DOCUMENT RESUME

ED 462 920	IR 021 075
TITLE	Pacific Telecommunications Council Annual Conference Proceedings (22nd, Honolulu, Hawaii, January 31-February 2, 2000).
INSTITUTION	Pacific Telecommunications Council, Honolulu, HI.
PUB DATE	2000-01-00
NOTE	649p.; For the 2000 proceedings, see IR 021 074. Some papers are not available from ERIC. Some figures may not reproduce clearly.
AVAILABLE FROM	For full text: http://web.ptc.org/library/proceedings/ptc2000/.
PUB TYPE	Collected Works - Proceedings (021)
EDRS PRICE	MF03/PC26 Plus Postage.
DESCRIPTORS	Communications Satellites; *Computer Networks; Developing Nations; Distance Education; Foreign Countries; *Information Networks; *Information Services; *Information Technology; Policy Formation; Socioeconomic Influences; Technological Advancement; *Telecommunications
IDENTIFIERS	Pacific Region; United States

ABSTRACT

This proceedings of the 2000 conference of the Pacific Telecommunications Council contains papers and summaries of sessions in the following areas: (1) socio/economic, including regional studies of China, the South Pacific, Southeast Asian, Latin America, Oceania, Korea, India, and the Asia-Pacific telecommunications market; (2) applications, including telecommunication in the service of humanitarian assistance, case studies in educational telecommunications, rural development strategies, applications of telecommunications to health and medicine, information technology and telecommunications, telecommunications management, and doing good business in the Pacific hemisphere; (3) Internet, including enabling e-commerce, telephony, strategies for financing and tracking the digital economy, government control in privacy and consumer protection, new network technologies, development issues, and content and culture; (4) satellites and submarines, including lessons in satellite planning, business issues in submarine fiber optic cable systems, submarine finance, submarine networks, commercial launch services, GMPCS (Global Mobile Personal Communications by Satellite), and high data rate and satellite wireless communications; (5) technology, including intelligent networks, infrastructure and services of broadband and emerging technologies, broadcast in the era of convergence, distance learning applications and directions, applications of technology for distributed learning, global, regional, and national issues in electronic business, and the political economy of Asia; and (6) policy/regulatory, including evolving trends in communication, regulatory issues and the Internet, joint ventures and strategic alliances in Asia, convergence policy challenges in Asia, policy and regulation, and impact of regulatory liberalization on the satellite industry. (Most papers contain references.) (MES)

Pacific Telecommunications Council Annual Conference Proceedings
(22nd, Honolulu, Hawaii, January 31-February 2, 2000)

PTC2000

TIME WARNER TELECOM

OCEANIC COMMUNICATIONS

AGENDA
Complete
Sessions

SPONSORS
Information
Sponsors List

EXHIBITORS
Information
Exhibitors List

MAPS
Exhibit Area
Hilton Hotel

WEBCAST
Schedule

INFORMATION
FAQ
Press Conferences
Attendees

Sessions

Socio/Economic Applications Internet Satellites&Submarines Technology Policy/Regulatory

Monday, 31 January 2000

1100-1230	1400-1530	1600-1730
M.1.1 Regional Studies - China	**M.2.1** Regional Studies – South Pacific	**M.3.1** Regional Studies – South East Asia
M.1.2 Telecommunication in the Service of Humanitarian Assistance	**M.2.2** Case Studies in Educational Telecommunications	**M.3.2** Rural Development Strategies
M.1.3 Enabling E-Commerce	**M.2.3** IP Telephony	**M.3.3** Strategies for Financing and Tracking the Digital Economy
M.1.4 Lessons in Satellite Planning	**M.2.4** State of the Industry Discussion: Submarine Fiber Optic Cable Systems- Today's Business Issues	**M.3.4** Submarine Finance
M.1.5 Intelligent Networks	**M.2.5** Essentials of Broadband & Emerging Technologies: Infrastructure & Services	**M.3.5** Broadcast in the Era of Convergence
M.1.6 Evolving Trends in Communication	**M.2.6** Regulatory Issues and the Internet	**M.3.6** Joint Ventures and Strategic Alliances in Asia: Their role in the New Century

Tuesday, 1 February 2000

0830-1000	1030-1200
T.1.1 Regional Studies – Latin America	**T.2.1** Regional Studies – Oceania
T.1.2 Applications of Telecommunications to Health and Medicine	**T.2.2** IT & Telecommunications
T.1.3 E-Commerce Strategies	**T.2.3** Privacy and Consumer Protection & Government Control
T.1.4 Submarine Networks	**T.2.4** Commercial Launch Services Industry Panel Discussion
T.1.5 Distance Learning Applications and Directions	**T.2.5** Applications of Technology for Distributed Learning
T.1.6 Convergence Policy Challenges in Asia	**T.2.6** Policy and Regulation

Wednesday, 2 February 2000

0830-1000	1400-1530	1600-1730
W.1.1 Regional Studies- Korea	**W.2.1** Regional Studies – India	**W.3.1** The Asia-Pacific Telecom Market
W.1.2 Telecom Management	**W.2.2** Doing Good Business in the Pacific Hemisphere	
W.1.3 New IP Network Technologies	**W.2.3** Development Issues	**W.3.3** Content & Culture
	W.2.4 GMPCS Panel	**W.3.4** High Data Rate and Satellite Wireless Communications

W.1.5 Electronic Business: Global, Regional and National Issues	**W.2.5** The Political Economy of Asia: New Perspectives	**W.3.5** IMT-2000 in Asia - Pacific
W.1.6 Impact of Regulatory Liberalization on the Satellite Industry	**W.2.6** Policy/Regulatory II	

Sessions

Socio/Economic

M.1.1 Regional Studies - China
Monday 31 January, 1100-1230
Location: South Pacific I

Chair:
KEN ZITA, Independent Consultant, International Telecoms Advisory, USA

M.1.1.1
DUNCAN CLARK, Partner, BDA (China) Limited, People's Republic of China; ERIC HARWIT, Associate Professor, University of Hawaii, USA
The Internet With Chinese Characteristics - Regulating the Unregulatable

M.1.1.2
PAUL KULLMAN, Second Commercial Secretary, United States Embassy, People's Republic of China
China's Broadband Buildout and Services

M.1.1.3
WILLIAM KRUEGER, Managing Director and CEO, Xin De Telecom International Ventures Co. Ltd., People's Republic of China
Coming of Age in the Information Age - The Post-CCF/Pre-WTO Environment in China for Foreign Participation in Telecommunications and Internet

M.1.1.4
TAO YUN, Managing Director, Q-east.com/Corecomm (China), People's Republic of China
E-commerce in China

The Internet With Chinese Characteristics - Regulating the Unregulatable*

Duncan Clark, Eric Harwit

Introduction

Since the early 1990s, Internet use in the People's Republic of China (PRC) has grown at a tremendous pace. Today, estimates indicate there are over 7 million Chinese with online access, and some 33 million users are forecast by 2003. In 1999 there will be an estimated $42 million in E-commerce transactions, but the number could hit $4 billion by 2003.[1]

The continued expansion of the Internet, however, depends on the efficient growth of nascent on-line corporations, ones that need to develop a financial base free from regulatory interference. Internet service and content providers (ISPs and ICPs) both face occasional (though often imprecise) intervention from government regulators.

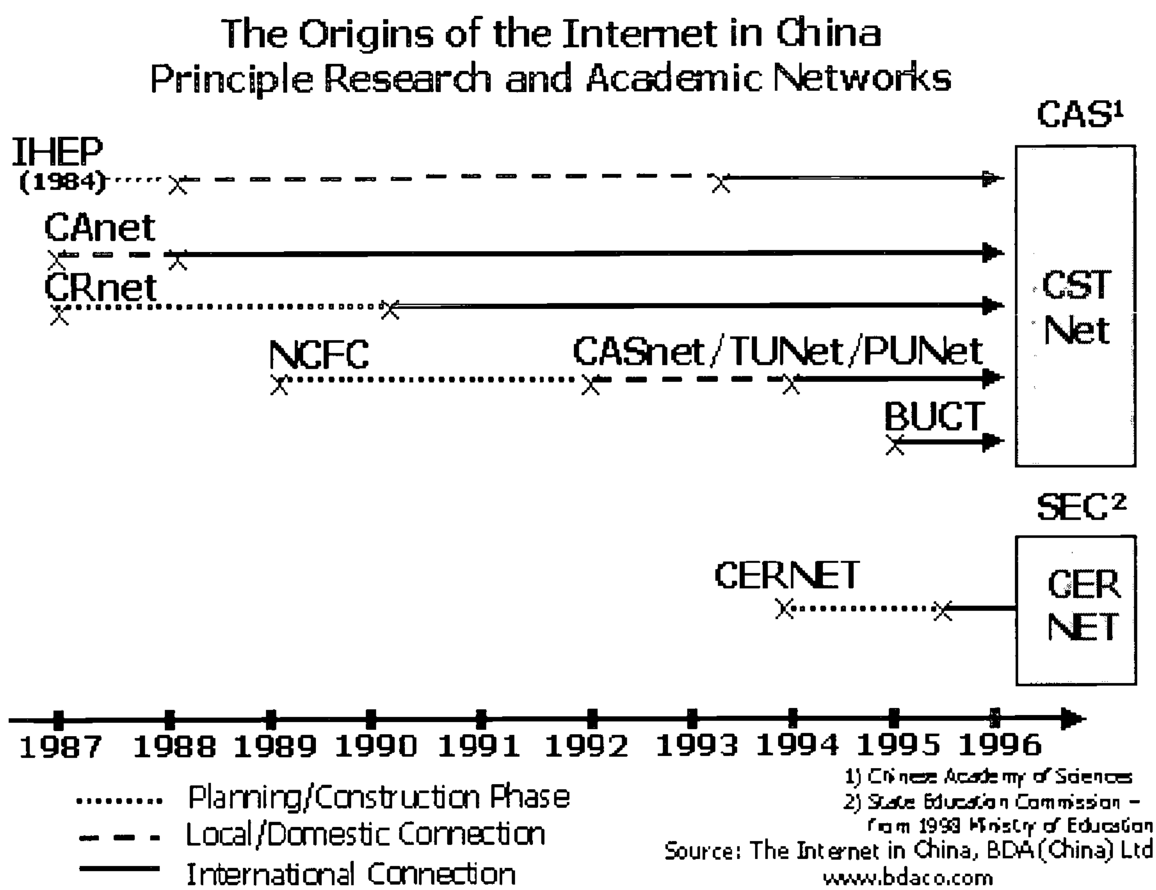
An implicit schism between information ministry leaders, who guard their bureaucratic prerogatives, and top central leaders, who want both economic reform and political stability, further complicates the technology's development. Though progress to date has been dramatic, it remains to be seen whether the Internet can realize its full potential in China without falling foul of official control. While the prospect of China's accession to the World Trade Organization (WTO) in 2000 provides a basis for less arbitrary bureaucratic intervention in the future, it is likely that conservative elements within the government will aim to frustrate full WTO compliance.

This paper focuses on several key areas of China's rapidly developing Internet infrastructure, applications and content, and progress in the face of government regulation. It begins with a brief overview of Internet growth over the past decade. This section outlines the ways political and market forces have shaped the spread of the data network.

The paper then examines the development and regulation of ISPs and ICPs in the contemporary period. It explores the growth and development of several ISPs, and discusses the financial viability of the main players. The essay then explores the ways the major domestic and foreign Chinese-language content providers have matured, and how they are shaping the PRC's economic and social landscape.

The essay concludes with analysis of the Internet's projected future growth. It focuses on the future roles of service and content providers, and charts the course of nascent innovations such as Internet telephony and E-commerce. It also notes how changing Internet content, and greater access to shared opinion from within and outside China, may eventually shape the country's nascent civil society.

Early development of China's Internet, 1987-1996



As in the early years of the Internet in the United States, China's first efforts at creating a data network were focused mainly on scholarly exchange of information. The country's first computer network, "China Academic Network," or CANet, was established in 1987[2], although the Institute of High Energy Physics in Beijing had. By the following year, the system began sending international electronic mail through a gateway in Germany. It was the CANet organization that chose "cn" as the PRC's national domain name.

In the early 1990s, other educational networks arose to complement the first systems. The China Research Network, or CRnet, was established in 1990 and began by hosting more than 10 research institutes. The Institute of High Energy Physics, or IHEP, began using a standard TCP/IP protocol with a link to Stanford University in 1994. In 1993, the State Education Commission began building CERNET (China Education and Research Network), a nationwide backbone with international links. CERNET's goal was to connect all of the country's universities and, later, secondary and even primary schools to one network.

Early control of the data network, then, generally fell under the auspices of the educational and academic sectors of the central government. Funding for CERNET's expansion, however, came from the larger central government budget. Perhaps more importantly, the network depended on lines leased from the state telecommunications regulator, the Ministry of Posts and Telecommunications (MPT), which in March, 1998, was reorganized as the Ministry of Information Industry (MII).

By the early 1990s, the commercial value of Internet provision became apparent to government officials, and they moved to harness the burgeoning data network with competing networks. In 1993, the MPT inaugurated a packet-data network, CHINAPAC, as newly-appointed Ministry Wu Jichuan, a life-long telecommunications bureaucrat, took the ministry's helm. Two years later, the ministry's ChinaNet was charged with providing public commercial services - ChinaNet acted as both a wholesale provider of Internet bandwith (licensed as an 'interconnecting network' by the government) and as a brand name for the provincial telecom administrations (PTAs) to offer their own retail ISP service.

As a relatively late arrival, MPT was unable to secure a monopoly position as a wholesale interconnecting network for the Internet but made a concerted and ultimately successful effort to dominate the retail ISP sector.

China's first commercial deployment of Internet service occurred in May 1995 when Beijing PTA (Beijing Telecom), a unit of the former MPT introduced its own ChinaNet service. Shanghai PTA (SPT) launched service in June 1995 and PTAs in Guangdong, Liaoning and Zhejiang launched commercial Internet service in the second half of 1995.

Early ChinaNET customers were to be state corporations, private companies or wealthy individuals who could afford connection fees.[3]

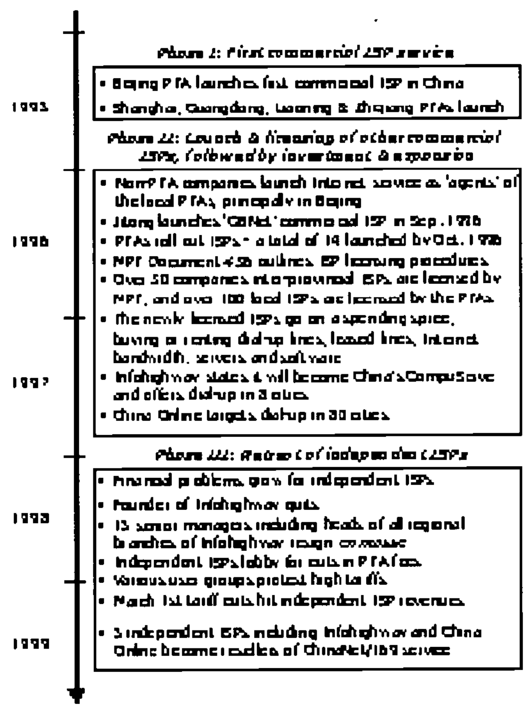
The MPT, however, had bureaucratic rivals for control of China's data networks. The Ministry of Electronics (MEI), began to compete with the MPT by creating a new corporation, Jitong, in late 1993. Jitong was meant to be a satellite-based network that used the MPT's lines for local access. The new company was to promote the so-called "Golden Projects," ones to link China's customs and financial networks, and to provide vital information for users across the nation. The MEI project was also seen as a top-level leadership attempt to instill some competition to the telecommunications sector; the rival telephone operator China Unicom, discussed below, was a similar venture created to challenge the monopoly MPT.

As of the summer of 1999, China had five interconnecting networks. The CERNET (under the Ministry of Education) and CSTNet (run by the Chinese Academy of Sciences) remained academically oriented networks with only 8 MB each, or 3% of China's total international bandwith of 241 MB. ChinaNET (under China Telecom) accounted for 195 MB, ChinaGBN (short for "Golden Bridge Network"), run by Jitong accounted for 18 MB and new entrant UniNet (under China Unicom) accounted for 12 MB.

In the 1998 reorganization of the telecommunications sector, the MEI was absorbed into the new information industry ministry, which was headed by former MPT chief Wu Jichuan. Jitong was absorbed along with the rest of the MEI into the MII. With the incorporation of the former State Council Information Leading Group into the new ministry, the MII emerged uncontested as the data systems' main regulator and policy director. Minister Wu, known for his fierce desire to maintain control over the course of the telecom sector, thereby assumed a role as the PRC's information czar.

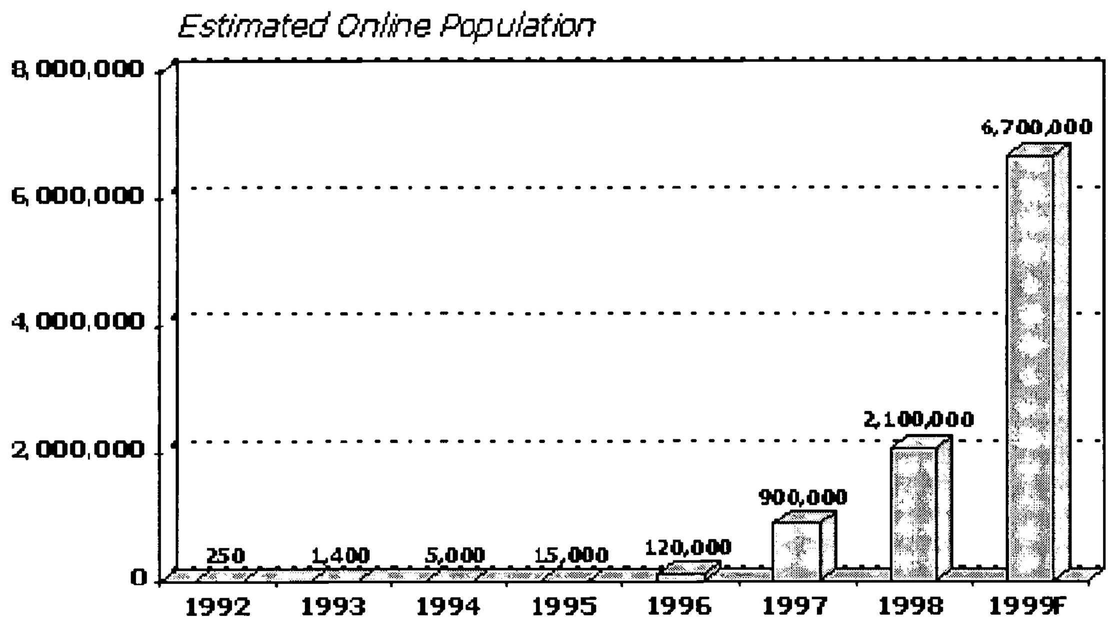
Accessing the Internet via bandwidth provided by the four main networks individual ISPs began to emerge from 1996. Though they were at first required to obtain a license from network administrators and acted effectively as agents of ChinaNet, some ISPs did manage to develop a certain degree of independence as detailed below.

The Evolution of ISPs in China, 1995-1999 - Three Phases



Source: The Internet in China, BDA (China) Ltd
www.bdaco.com

The need for new ISPs grew with the explosion of Internet user numbers in the late 1990s.



Source: The Internet in China, BDA (China) Ltd
www.bdaco.com

As of 1994, there were perhaps 5,000 users in the entire PRC. By the end of 1996, however, there were 120,000 with access, and the Internet population passed 2.1 million in 1998 before reaching its current level of some 4 million (see Table X).

Several nascent ISPs found themselves with excess capacity and thin profit margins. These early providers began by incurring immediate losses as they spent heavily on buying or renting dial-up lines, leased lines, Internet bandwidth, servers and software.

Some ISPs - such as ChinaNet and NetChina in Beijing - secured licenses from the local PTA, while others - such as Information Highway and China Online - secured inter-provincial licenses from the MPT and attempted aggressive regional or nationwide expansion.

Customer numbers were limited by hefty online fees, averaging 400 to 600 RMB per month (about $50-75) for forty hours.

Of these early providers, the ISPs owned or affiliated with the local PTAs emerged as dominant players. By late 1997, ChinaNet in Beijing had nearly 10,000 subscribers, and NetChina about 4,000. Though these numbers were relatively high at the time, expansion was slow as Internet content was limited, and the costs were great for citizens with per capita GDP (in Beijing) of only some 14,000 RMB (about $1700).

Other companies did not fare as well. Infohighway enjoyed early prominence as it revealed its ambition to become China's own equivalent of then-dominant US ISP CompuServe. However, the prohibitive cost of offering dial-up access in eight cities left the company heavily burdened with debt. High MPT leasing fees were major burdens for new ISPs. In late 1996, the ministry (using its operating arm, China Telecom) charged as much as $2 million for a 2 Mbps line; in the US, the equivalent rate would have been about $500,000[4]. Expansion of ISPs opportunities would only come with a diminution of the central ministry's dominance. Infohighway's high profile founder - Ms Zhang Shuxin - quit the company in early 1998 followed shortly after by 15 senior managers.

Following a popular campaign led by academics against the high cost of Internet and other communications which caught the attention of Premier Zhu Rongji, several of the early problems for Internet access were addressed with the sweeping March 1st cuts in leased line fees, fixed line connections charges and Internet tariffs. Leased line fees were cut by an average of 30%. The price of a second line for residential users was slashed to under US$30 from US$130-300. Internet hourly rates were slashed to RMB 4 per hour (c. 48 cents), bringing typical monthly bills for customers to US$15-20.

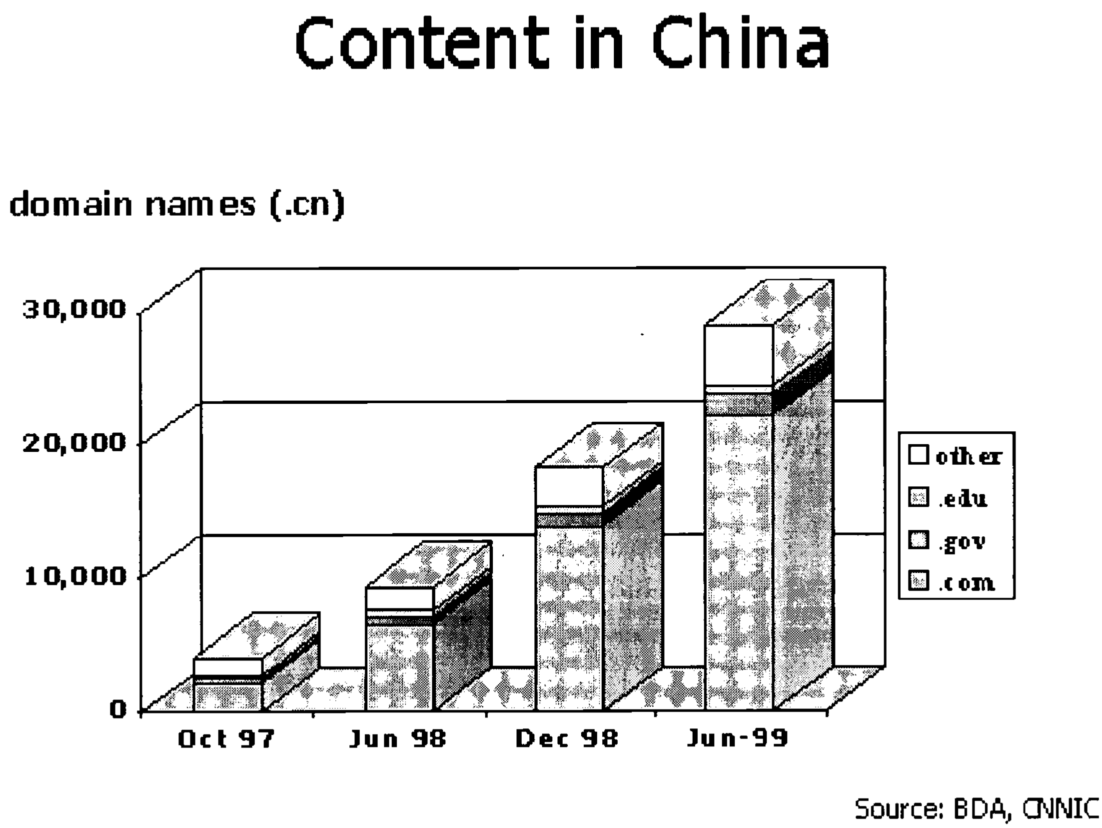
Unfortunately for most independent ISPs, the cuts in retail Internet rates - which they would have to implement in line with the dominant ChinaNet ISPs - hit harder than any savings in leased line fees made up. As a result, a number of independent ISPs threw in the towel and announced re-seller arrangements with ChinaNet - bringing full circle China's ISP evolution. To paraphrase Charles Darwin, China's ISP market has been an example of 'survival of the fattest'. Those with privileged (i.e., subsidized) access to the fattest 'pipes' - incoming dial-up lines, leased lines and Internet bandwidth - have emerged as the dominant species. For ISPs without subsidized access to these physical facilities, life has proved to be uncertain, brutal and short.

Nevertheless, the emergence of competition with the former state monopoly has brought benefits to subscribers as it forced China Telecom to make commitments to customer service. This mirrored developments in telecommunications. In the mid-1990s, Chinese telephone customers benefited from competition between the MPT and its MEI rival corporation, Unicom. Consumers saw lower prices and higher quality as the result of the new carrier's challenge. The 1998 MII absorption of Unicom, however, highlighted the central telecom ministry's continued desire to control the vital economic sector.

With a relaxation of MII regulation of access fees for customers, and of user fees for ISPs, competition among service providers will intensify in the coming years. The results may mirror the Unicom-MPT rivalry of the mid-1990s. As of late 1999, however, Wu Jichuan continued to lead the MII, and his conflict with some top leaders over the course of telecom development - particularly those espousing a WTO-led deregulation of the market - continued. Should the ministry again decide to re-centralize its control over the Internet through bureaucratic fiat, the losers could be nascent service providers and, ultimately, Chinese information consumers.

Internet Content

Content for Chinese users grew slowly in the early 1990s, but has greatly accelerated at the end of the decade.



Today, central government control remains somewhat schizophrenic, as the desire to exploit the Internet's commercial advantages conflicts with the official obsession with information control.

A large portion of the early web content for Chinese readers came (and still comes) from overseas sources. In the wake of Beijing's Tiananmen square demonstrations of 1989, overseas Chinese scholars founded China News Digest to spread news of the PRC derived from mainly western news wire services. Readers could subscribe through e-mail accounts, and receive daily briefings that could be displayed in Chinese language if users had proper software.

As ICPs saw a great expansion in the United States, Chinese turned to foreign content for information and entertainment. Yahoo!'s English-language site became the most popular site in China as the site provided a useful portal to the main US sites. The company's success prompted the launch in February 1998 of a local portal company- Sohoo.com (subsequently renamed Sohu.com) - which was funded by US investors and founded by a Chinese MIT graduate. In May 1998, Yahoo! itself launched a Chinese-language site.

The Chinese government has made several attempts to regulate access to overseas sites. At various times since the mid-1990s, officials have tried to block western news sources sometimes critical of China, such as the New York Times and the Washington Post. Other targets for control attempts have been pornographic sites, web pages printing or even broadcasting anti-government propaganda, and gambling sites.

Most of these attempts to control access to foreign sites have failed. Users find alternative routes - via proxies - to reach obtain desired web content, and government officials have done little to curb this activity other than a half-hearted and short-lived attempt in 1996 to have ISP customers register with the police when they initiate an account. Recently, more sophisticated efforts have been made to selectively block access to foreign sites through 'dynamic blocking' enforced at the level of the interconnecting network. This method is a response to criticism over the earlier slow access speeds resulting in part from the heavy handed attempt to block permanently a large number of foreign websites.

Domestic ICPs, which numbered about 4,000 in early 1999[5], face somewhat more government scrutiny. Popular sites currently include Netease (163.com), Sina, Sohu and free e-mail providers such as Capital Online (263.net). These sites provide mainly news, entertainment, and sports information, but often rely on officially sanctioned agencies for their own content. Some, such as Sohu and Sina, have provided links to foreign news about China, and to Chinese language sources published in various foreign countries, but more recently have been adopting more links to Xinhua Recently,

Even some foreign-based web sites opt for neutrality. Yahoo!'s Chinese site has provided predominantly links to mainly government sanctioned sites.

Of course, Chinese users can go directly to foreign content pages without passing through the domestic portals. In early 1999, for example, members of "Falun Gong" (a Chinese spiritual exercise group led by a Chinese individual in exile in the United States) staged demonstrations in China that were coordinated via an American-based Chinese language web page. Such activity shows the power of sites located outside of Chinese government jurisdiction, and indicates regulation of domestic portals is somewhat of a moot point.

Chinese officials, however, do pay attention to some of the popular domestic sites, and watch for offending material. Sohu, for example, saw a police raid in early 1999 after it inadvertently provided access to pornographic sites. A relatively new ICP, Netbig, was attacked for providing an independent ranking of some Chinese universities.[6]

Though the domestic ICPs practice some self-censorship in their content, they have so far been allowed financial cooperation with foreign sources. Sina, for example, is backed by Goldman Sachs, Softbank, Pacific Century Cyberworks and Dell among others, China.com - in part backed by the Hong Kong branch of the state-news organization Xinhua - is 10% owned by AOL. In July, 1999, China.com launched a successful US$80 million initial public offering of its stock on the US NASDAQ exchange.

Still, there seemed to be little opportunity for immediate profit, as estimated on-line advertising revenue for China as a whole was only US$3 million in 1998 and forecast to reach only US$10-12 million in 1999.

The permission of foreign corporations to invest in ICPs stands in contrast to rules on telecommunications operating corporations. China Unicom allowed arms-length foreign investment until its 1998 absorption into the MII; today, the previous partnerships are being systematically dismantled under Minister Wu's leadership. The MII may be allowing foreign capital in during the nascent growth of ICPS, and to force out foreign corporations when the companies reach greater economic viability.

Chinese ICPs, then, attract great interest from domestic subscribers, and from foreign investors hoping to profit from the rapidly growing viewing audience. Government regulation, however, may keep domestic content tame - either as a result of direct intervention through regulation or through self-censorship by ICPs. Chinese-language ICPs based outside of China may benefit from immunity to political sanction, but face the logistical challenge of keeping a 'local' feel to their content and therefore attracting advertising revenues and eventually targetting e-commerce opportunities. Ultimately the demands of local users, with their idiosyncratic likes and dislikes, will mean that most successful ICPs will be based onshore.

For the time being, the supply of Chinese-language content still does not meet the demand of China's rapidly growing online population. The range of content on offer has broadened considerably in recent years. In China as elsewhere, content serves as a mirror of the Internet's user base - originally drawn from an overwhelmingly young, educated and male group. It is not surprising, given the academic and technical background of China's first Internet users, that Chinese content initially comprised a limited number of esoteric topics of interest solely to these users. However, Chinese content has since broadened to cover almost every major subject, reflecting an increasingly diverse group of online users including female users (22% in a survey conducted by BDA) and a growing number of high-income urban professionals.

Future Developments and Conclusion

The value of the Internet to the China may lie in areas other than growth of ISPs and ICPs. Interconnected data networks, Internet telephony, and critically - although not in the short term - E-commerce, are already transforming business in developed nations, and China stands to see similar benefits for its own state enterprise-dominated economy.

Chinese state-owned, collectively managed, and private enterprises may all see a boost from the opportunity to electronically coordinate production. Manufacturers may find a wider variety of suppliers through web advertisement, and orders can be coordinated faster and more efficiently. The gap between developed coastal provinces and poorer inland areas could be narrowed as the producers in developing areas find a market in the wealthier areas.

Internet telephony has made quick progress in China, though the centrally controlled China Telecom carefully guards control over voice communication. In 1997, two brothers in southern Fujian province were arrested for competing with the company by selling long-distance phone service via the Internet for cut-rate prices. They were later cleared by a higher court, but the lower court itself refused to overturn its verdict. The visible hand of MII monopolistic practice shows it is reluctant to relinquish any influence over an industry with great profit potential.

The consumer market for E-commerce is still hobbled by infrastructural issues. For example, China lacks central credit clearing corporations, making the proliferation of credit cards difficult - although debit bank cards number over 100 million. The tool that has transformed American on-line purchasing is therefore rare in China. Companies selling merchandise depend on cash-on-delivery and nascent debit card accounts for their commerce. Recognizing this obstacle, the People's Bank of China and the leading state-owned commercial banks are actively engaged in setting standards for secure payment through the establishment of certification authorities. Companies such as Capital Electronic Center are already filling the gap by facilitating on-line payment for any of 12 debit or credit cards issued by the major commercial banks.

Domestic ICPs have pioneered e-commerce, such as Netease's online auction of PCs and now its permanent online auction community (www.auctions.163.com) and attempts by others including a venture under the Beijing Municipal Government aim to imitate Amazon.com in on-line book sales. On-line air ticket sellers affiliated with Air China, China Eastern, and China Southern, are optimistic about the future.[7]

In mid-1999, the government announced China Telecom would be divided into fixed, mobile and satellite companies, with the former retaining control of data networks. If the government perpetuates near monopoly control over networks and service provision, improved service and prices that come with competition may be slow in developing. Control over Internet content may also remain strict, with self-censorship a key factor in development of domestic ICPs.

One must note, however, the great success of Internet growth to date in China. The PRC is one of the few developing countries to imitate data network growth in "Internet time," and the central government, and its information chief Wu Jichuan, deserve grudging praise for their efforts. The rapid spread of infrastructure will no doubt have a beneficial effect on China's economy into the next early years of the next decade.

Control of content, however, may become a stifling force on ICP growth. Unless the Chinese government further relaxes its hold on the levers of information in China, Internet users will begin to turn to providers outside of the country for information. This development could not only retard the growth of domestic content providers, but could open great avenues for ideas that may be unpopular with a communist party intent on maintaining a monopoly on political power. The resulting flow of ideas could itself lead to a transformation of China's entire political and economic system, and perhaps a greater replication of the Internet revolution sweeping the developed democratic world. For now, however, it is clear that the

Internet has become an accepted feature of China's communications and media landscape - with no one entity possessing the power to pull the plug.

* Note: Unless otherwise stated, information in this essay is derived from the authors' own research, including a report entitled 'The Internet in China' published in June 1999 by BDA (China) Limited and The Strategis Group (details at www.bdaco.com).
[1]Business Week, August 2, 1999, p. 49.
[2]Some of the following history is derived from Milton Mueller and Zixiang Tan, China in the Information Age, Westport, CN, Praeger, 1997, pp. 81-91.
[3]Zixiang Tan, "Internet in China," in Pacific Telecommunications Conference Proceedings, January, 1996, p. 624.
[4]Paul Triolo and Peter Lovelock, "Up, Up, and Away - With Strings Attached," in China Business Review, November-December 1996, pp. 29.
[5]Business Week, February 1, 1999 (International edition via web site).
[6]Business Week, August 2, 1999 (International edition via web site)
[7]Business Week, February 1, 1999 (International edition via web site).

Biography

Duncan Clark
Partner, BDA (China) Limited

Duncan Clark founded BDA in Hong Kong and opened the firm's Beijing office in 1994.

BDA has become recognized as a leading Internet and telecoms advisory and investment firm, serving blue-chip clients from overseas targeting China and an increasing number of client in China seeking overseas partnerships, technology or investment. The firm's website is www.bdaco.com

Duncan is a frequent speaker at industry events around the world including Internet World in New York, Hong Kong and Beijing (April 2000), the GSM World Congress in Cannes and the upcoming Pacific Telecom Council in Honolulu in February 2000. He also writes a regular column in the Technology Post of the South China Morning Post (www.scmp.com) in Hong Kong and has been featured as a commentator in the printed media, radio and television including ABC News 'World News Tonight'.

Duncan was recently appointed to the Advisory Board of Netease.com, a leading portal and e-commerce player in China.

Prior to founding BDA, Duncan worked as an investment banker at Morgan Stanley & Co, in the firm's London office (1990-93) and in Hong Kong (1993-94). At Morgan Stanley, Duncan specialised in telecoms and high-technology corporate finance advisory, mergers & acquisitions and equity financing assignments.

Duncan graduated from the London School of Economics with a B.Sc (Hons) in Economics in 1990. A citizen of the UK, Duncan received his secondary education in the UK, US and France and is bilingual in English and French, fluent in Spanish and conversant in Mandarin and Cantonese.

CHINA'S BROADBAND BUILDOUT AND SERVICES

PAUL KULLMAN

MARKET OVERVIEW

China is building a nationwide broadband network, both terrestrial and wireless, to meet the country's rapidly growing demand for information services. China Telecom, China Unicom, the State Administration of Radio, Film and Television (SARFT) and other domestic competitors are scrambling to build broadband networks capable of supporting voice, video, and data traffic for internet telephony, distance learning, and electronic commerce, among other uses. To attain their infrastructure targets, these companies are buying various technologies such as asynchronous transfer mode (ATM), synchronous digital hierarchy (SDH), dense wavelength division multiplexing (DWDM), and digital subscriber line (DSL) as well as various media such as fiber optic cable, coax cable, microwave, and satellite.

Currently, a wide range of broadband products used in China are imported, and U.S. companies maintain a dominant position in broadband product sales to China. However, U.S. companies are facing increasingly stiff competition from third country imports, especially in the field of access products. Domestically manufactured telecommunications products tend to be low-end, but sell well in China because of their frequently lower price and Chinese government patronage. Foreign firms need to be aware of China's increasingly aggressive "buy local" policies and stress on technology transfer for market access, but, at least in the near-term, China will continue to depend heavily on cutting-edge broadband product imports.

MARKET TRENDS

China is rapidly expanding its broadband communications network and this trend will continue for at least the next 10 years. Since 1985, China has installed one million kilometers of toll and local fiber optic cables, 140,000 kilometers of microwave trunk lines, and 40 large-scale satellite earth stations. China has basically completed the construction of its backbone network and is now turning its attention to solving its access bottleneck to homes and businesses. To achieve its goal of installing fiber to major buildings in urban areas and fiber to large villages in rural areas by the end of 2000, China will need to make huge near-term investments. In 2000, China expects to invest about $2.5 billion to develop its broadband infrastructure. China's planned broadband investment over the next five years may reach $24 billion of which transmission systems will account for $15 billion, access networks $6 billion, and data communications hardware $3 billion.

Data Communications Development

Year	Number of users (,000)	Growth rate (%)
1996	140	n/a
1997	400	286
1998	1500	275
1999	5000	233
2005	50000	over 1000

Source: FCS and MII

Both consumer demand and government policy drive China's broadband buildout. The number of data users in China has rocketed from 140,000 in 1996 to 5 million by the end of 1999 and China expects to have 50 million users by the end of 2005. The 10th Five-Year Plan foresees a 45 percent annual growth in data and multimedia users. Chinese consumers and business people are spending more and more time on the internet. Web sites with domain names under ".cn" already reach beyond 20,000. Although most businesses are not yet taking steps towards robust networking, they are rapidly becoming more aware of efficiency gains through internal data communications and connection to the internet. Chinese companies are increasingly demanding seamless China-wide interconnectivity and gateway links to the rest of the electronic world. The private and public sectors are captivated by the potential of internet protocol (IP) telephony, electronic commerce, distance learning, telemedicine and electronic government.

Internet Telephony

IP telephony is a major instigator in creating a more competitive Chinese telecommunications environment and driving down telecommunications costs. MII has officially given permission to four Chinese companies -- China Telecom, China Unicom, Jitong Communications, and Netcom Corporation -- to conduct trial operations of IP phone services. If the trials prove successful, MII may issue commercial licenses beginning in January 2000 to additional qualified Chinese companies. Some analysts believe that the IP phone market may even begin to resemble China's paging market with about 2,800 companies competing with each other. Opening China's telecommunications services market to domestic competition will multiply demand for bandwidth.

Distance Education

China has used satellite TV education channels since 1986, and China now boasts over 20,000 small ground receiving stations. More than 70 percent of cable TV stations broadcast satellite education programs. China Radio and TV University has 13,000 classes, with over one million students. The university has trained 2.2 million college graduates. However, China's current satellite TV education system has limited capacity, operates in only one direction, and does not allow teachers and students to directly communicate with each other. To address these deficiencies, China plans to invest heavily over the next five years in upgrading its broadband satellite network. Direct TV and direct PC will play important roles of this improved network.

Electronic Commerce

From national ministries to local entrepreneurs, China is exploring commercial cyberspace. E-commerce has made great strides in China's marketplace and within the next six months Chinese consumers may be able to use credit and debit cards to buy and sell goods. According to the International Telecommunications Union, global electronic trade will generate $300 billion in revenues by the year 2000. This potential has not escaped Chinese entrepreneurs and authorities. Chinese small and medium-sized enterprises are eagerly seeking foreign partners to help prepare them for new electronic business opportunities. Reliable broadband communication will be key to the implementation of e-commerce in China.

Viewing telecommunications infrastructure as fundamental to China's economic growth, the Ministry of Information Industry (MII) champions China's broadband network construction, even to locations that are not currently cost-effective, and predicts that the broadband market will grow by one-third in just the next year. MII seeks to have "an advanced, unified and comprehensive communications network" in place by the end of 2000. The powerful State Development and Planning Commission is also actively involved in China's broadband buildout and has approved several broadband projects, including the Broadband IP Network Model Project, which is helping China to develop its own internet standards. Up to 90 percent of China's cities and counties will eventually have access to digital data networks.

IMPORT MARKET

The pace of China's transition from traditional narrowband networks to broadband networks is evolutionary. China wants to maximize the use of existing networks and the installation of any new broadband structures and equipment will have to mesh with the traditional communications system. Despite the development of data networks and the growth of internet users, China is likely to continue installing traditional exchanges over the next five years while deploying increasing numbers of exchanges, transmission lines and technologies that can handle both narrowband and broadband traffic. Broadband platforms should be capable of supporting a variety of services, including voice and data over ATM, internet access, business communications and intelligent networks.

Broadband Transmission

Over the past eight years, China has rapidly developed its broadband transmission capability, but has yet to install extensive systems that can provide network access to consumers and business people. China began building an extensive fiber-optic lattice in 1991 to replace its analog switch and coaxial cable networks. Today, China's broadband core transmission level is fairly complete. National backbones and provincial networks web the whole of China. Many coastal provinces are currently upgrading their SDH transmission networks to DWDM technology and implementing packet-based ATM and internet protocol to support the development of broadband.

Circuit switching wastes bandwidth, but packet switching has difficulty dealing with delay. To help address this delay problem China uses ATM technology as the switching node and SDH technology as the transmission path. ATM technology is well entrenched in China and experts believe that China will continue to use it for many years to come. About 85 percent of China's trunk lines use SDH technology. SARFT has constructed 12,000 kilometers of national trunk cables and more than 10 provinces have constructed intra-province SDH transmission trunks with speeds of 2.5 Gb/s for cable TV. SARFT combines SDH with the MPEG-2 system to transmit video, audio and data and many analysts believe that this combination will become the defacto standard platform to transmit TV signals in China. Chinese firms have conducted R&D to develop 155 Mb/s and 622 Mb/s SDH transmission, but U.S. firms maintain a dominant position in transmission technology with their SDH exports and, even more so, with DWDM technology. China is already replacing SDH technology with the latest DWDM technology along 12 major national routes.

China Telecom has adopted an 8 x 2.5 Gb/s DWDM system in 12 trunk line projects and is testing an 8 x 10 Gb/s system along the Shanghai - Nanjing corridor. China Unicom has built over 5,000 kilometers of optical cable and the company plans to use DWDM technology to expand its network. Netcom is testing IP telephony over DWDM on optical fiber rings across 15 cities using 6 x 1.25 Gb/s. Domestically produced DWDM systems, developed by the Wuhan Research Institute, are deployed between Jinan and Qingdao and Guangzhou and Shantou. The Wuhan Research Institute is trying to develop16 x 10 Gb/s DWDM system. The length of all of China's DWDM projects is 15,000 kilometers.

China's core and edge fiber optic switches include IP routers, ATM switches, hybrid MLPS IP switches, frame-relay WAN, digital multiplexers, web servers, and VOD servers. Shanghai Bell's S12 and Huawei's C&CO8 switches are able to combine narrow and broadband transmission over existing lines. Siemens' EWSD switch is one of the major imported switches being used. China is also looking into the benefits of optical add/drop multiplexing (OADM) and optical cross connection (OXC) equipment to add flexibility and self-healing ability to networks as well as software and hardware guaranteeing quality of service for VOIP services. VOIP will account for nearly a fifth of fixed-line service revenues before 2003.

Broadband Access

Access is the most lucrative market in China at present. There are four basic ways to provide high-speed access over the last mile: optic fiber, enhanced copper, coaxial cable and broadband wireless. China's telecommunication service providers are seeking low-cost ways to reach their end-users. Fiber-to-the-home and fiber-to-the-office appear to be too expensive for the market to bear at present, but as the fiber optic cable buildout reaches the "curb" and "villages," prices are expected to come down.

Twisted copper pair wires account for 93 percent of China's access lines. It is probable that DSL solutions, such as ADSL or HDSL, will be preferred in the coming years. However, installation of DSL modems is expensive and consequently ADSL and HDSL deployment currently remains low. A 3,000 subscriber DSL trial in Guangdong earlier in 1999 failed to whip up enthusiasm among local end-users and Beijing regulators. Nonetheless, Alcatel has signed a multi-year agreement with Guangdong PTA to deploy 50,000 ADSL lines in Guangdong Province. China Telecom's attempts to popularize ISDN have fallen short of expectations also. Instead of the targeted 200,000 ISDN subscribers by the end of 1998, China counted less than 26,000. Poor marketing and a lack of Chinese content on the internet are blamed for the lackluster reception of ISDN and DSL.

Hybrid Fiber Coax (HFC) may be able to resolve the access bottlenecks because SARFT, the entity most likely to use HFC, already boasts hook-ups to 80 million households. However, only 10 percent of these lines are bidirectional. Some provincial cable companies, such as Qingdao Cable Company, have installed bidirectional coaxial cable and now offer high-speed internet access. The deployment of set-top boxes in China is both a response to the rapid development of the internet and a preparation for the further development of the internet. China has about 11 million personal computers, but about 320 million television sets. The set-top box can turn an ordinary TV into a tool for surfing the net. In October 1999, Microsoft announced the launch of its Venus set-top box project, which uses Chinese with the Microsoft operating systems. Domestic enterprises such as the HiSense Group, Haier and Legend are also pushing their set-top boxes at about 1800 RMB per unit.

Another means of reaching end-users is via microwave and satellite. SARFT has an extensive microwave network, but it only works within shorter distances. Satellite broadband is what SARFT is focusing on. Although uploading of end-user information, e.g. movie and web-site selections, poses a significant problem, satellite transponders can offer the fastest download speeds at up to 38 Mbps. In areas where little fiber has been laid or where cable TV networks are not multimedia-compatible, a satellite-based network can solve access problems very quickly. The system run by the China Broadcasting Film Television Satellite Company, a Beijing-based subsidiary of China Central Television, uses U.S. technology and has announced plans to offer satellite service throughout China. Within three years, third generation cellular technology will arrive in China and mobile data communications combined with internet access products may begin enjoying good sales prospects.

The access equipment needs of China include DSLAM and other access-signal aggregators, internet access equipment, point-of-presence servers, gateways, access nodes, hubs (10 base T, token ring) and stacks, LAN modules; LAN switches and LAN-to-WAN, LAN-to-internet integration equipment; TDM multiplexers, data network terminating equipment; transmission modules; dial-up interfaces, bridges, local exchange switches, and IP telephony hardware. Access transport equipment includes ATM cables, two-way coaxial cable, V5 transport (standard in China), cable modems, xDSL (primarily ADSL, HDSL, HDSL2), splitters, ISDN and satellite access units. In the next three to five years, new tools, often called "middleware," will be required by Chinese service providers to handle huge volumes of data and multiple types of service requirements. Middleware is the hardware of a service provider that is not dedicated to switching and routing, but instead focused on coordinating applications and serving as the network's operating platform.

END USERS

China has eight major importers of broadband equipment: China Telecom; China Unicom; Jitong Communications Company (Jitong); China Network Communications Corporation (Netcom); SARFT; Ministry of Railways (MOR); Ministry of Water Resources (MWR); and China National Power Corporation (CNPC). China Mobile Communications Company may also prove to be an importer once third generation mobile is deployed. Local telecommunications operators should also be given attention (see attached contact list).

China Telecom is the largest broadband end-user in the Chinese market. China Telecom has adopted ATM as its core technology and slower frame relay for the access tier. The company is buying the best equipment available to meet demand for LAN interconnection and high-speed data transmission, including broadband multimedia communication services. It has tested such services as VOD, video-conferencing, distance learning and telemedicine. Many government agencies are using China Telecom's network to achieve remote sharing of resources and raise work efficiency. China Telecom wants to position itself as supplying "the" platform for the development of China's information-based national economy.

China Unicom is a small competitor to China Telecom, but is aggressively building out its own network. While China Unicom is using ATM as its core-level technology, it is using IP on the edge and access strata to establish a nationwide network providing a number of broadband services. It is currently setting up two IP platforms on its ATM base: a dedicated network with high quality of service guarantee and a public IP network. The company has begun offering its GSM cellular phone users the option of making their international calls over IP.

Jitong runs a data network that provides IP telephony and has spurred China Telecom to answer with its own IP service. The company's goal is to become an IP carrier, using HFC to access consumers. It will build a national fiber trunk to supplement its nationwide very small aperture terminal (VSAT) network, then cooperate with provincial and city CATV stations to improve access. It plans to invest around $150 million on its fiber trunks in the coming three years.

Netcom, a nascent firm executing IP telephony trials in 15 cities and expects to expand its service early in 2000, has a capitalization of $300 million. It is comprised of a consortium of the Chinese Academy of Sciences (CAS), MOR, SARFT, and the Shanghai city government. CAS provides the "brains," MOR the trunk lines, SARFT the access lines; and the Shanghai city government its internet gateway called Shanghai Infoport. Netcom representatives have said that its access fees will be set much lower than those of China Telecom.

SARFT, unlike MII, is both a regulator and operator in the cable TV field. SARFT is currently focusing on digital compression, CATV interconnects, and offering value-added services. It has ambitious expansion plans and is even hinting at providing telecommunications services. SARFT has the second largest access network in China, with 80 million cable subscribers. It is investing in a national fiber-optic trunk, spending approximately $500 million in each province on fiber-optic lines and high-bandwidth transmission equipment. Presently, SARFT's ambitions are limited in two ways: only 10 percent of its coaxial lines are bidirectional and it is not licensed to offer voice..

MOR, MWR and CNPC have extensive internal networks. Plans for MOR's network has been thrown around by Chinese leaders for the past two years. MOR at one time wanted to make its network open to the public, but then decision-makers wanted to incorporate its network into China Unicom's. The latest is that MOR has joined the Netcom consortium and is reportedly joining forces with Unicom only on certain ventures. MOR has 35,000 km of fiber already laid, using X.25 packet-switching technology. MWR and CNPC continue to oversee their own telecommunications networks.

Many provincial and local service providers, such as Beijing Telecom, are basing their access networks on SDH and frame relay technologies. According to press reports, even though Beijing started SDH construction in 1994, users are not satisfied. The situation is especially acute in Beijing because large information systems have been established by banks, foreign trade agencies, the customs service, science and educational institutes, and multinational companies. Beijing PTA's existing PSTN direct dial network and internet narrowband network hardly meet the demand for bandwidth and services. U.S. broadband firms may have opportunities to assist Beijing, as well as other localities, in providing broadband solutions in an economical manner.

COMPETITION

China's largest telecommunications equipment manufacturers are Huawei, Datang, Zhongxing, Great Dragon Telecom, Shanghai Bell, Jinpeng, and the Wuhan Research Institute. Of these, Huawei is reportedly the most technologically sophisticated and market savvy. While domestic firms can offer a price advantage over their foreign competitors' products, end-users have primarily chosen superior foreign products, especially for their core layer network needs. Operators often turn to foreign manufacturers, including Lucent, Alcatel, and Siemens, to purchase broadband equipment. However, in the name of "technological self-sufficiency," the Chinese government encourages national operators to purchase domestically manufactured equipment.

Where Chinese firms will have a significant advantage is with access tier end-users, who demand products tailored to their needs. These end-users, Chinese individuals and office network managers, currently perceive Chinese companies as more able to deliver such customized products and follow-up service. To be competitive, foreign firms either need to localize more or find agents and distributers that are on par with these Chinese manufacturers/service providers.

Huawei has developed HONET which integrates ADSL, HFC and LAN and interfaces with narrowband voice, data and video. It has also developed C&C08 switches which can handle both narrowband and broadband traffic. Datang is improving its SP30 exchange to satisfy data communication services and IP functions. It is also developing ATM access loop and SCDMA-based wireless access system, which, it claims has a price advantage over regular wireless access systems.

Zhongxing has developed an intelligent network technology that combines, mobile communications, internet and wideband communications. It has developed a ZXIN10 system which can provide "unchanged number after telephone removal, phone advertisement, phone banking, anti-fake telephone service, ISDN and advance call tariff information." Great Dragon's new telecommunications network is based on IP optical networking technology with DWDM and its United Access System combines traditional exchanges with IP technology instead of ATM.

A number of foreign firms have significant stakes in China's telecommunications market. Indeed, China is now the largest market for Ericsson, accounting for 12 percent of its worldwide sales. Lucent, Motorola, Nokia, Alcatel, and Siemens all have spent a decade or more investing in China and are selling well. Marconi, a new player with a joint venture named Shanghai GPT, has made several advances into the market, including a recent contract to upgrade MOR's network.

MARKET ACCESS

Continuing issues that affect market access are national security concerns, technology transfer requirements, and poor transparency and enforcement. The reason often given to block market access is national security, even if this is not said openly. This not only applies to services, but even to "sensitive" telecommunications equipment. Foreign firms need to raise the comfort level of Chinese government officials and end-users in order to gain greater access to the market.

Due to China's desire to develop its own telecommunications industry while modernizing its infrastructure and services with foreign equipment, gaining access to this lucrative market is challenging. In general, China's foreign investment laws state that preferences should be given to locally sourced products and that products produced by joint ventures in China must contain more than 60 percent local content in order to qualify as domestic products. Technology transfer is often a sticking point for companies that are willing to manufacture in China. Telecommunications products imported to China can avoid high tariffs if they are determined to be equipment that China cannot produce itself. But when domestic manufacturing capacities are achieved, tariffs tend to be applied to restrict imports.

Lack of transparency and consistency in laws governing the industry are obstacles that must be overcome. Although regulation of telecommunications appears to be strict, many policies are enforced in a wonton manner. This has its advantages if a company is seeking a loophole, but can also become disadvantageous should the government suddenly decide to enforce a regulation.

The conclusion of the 13-year WTO accession talks between the United States and China has given new hope to foreign companies struggling in China's oftentimes gray telecommunications market, but China's actual accession and implementation of its commitments will not occur for many months yet, if not a year. Moreover, phase-in periods will continue to restrict foreign company access for a while and, of course, China's actual implementation of various WTO commitments is still uncertain. A step in the right direction would be China's official release of telecommunications regulations that are consistent with China's WTO commitments. This would especially assist foreign software, internet service providers and internet content providers. MII officials have said that this should occur within the first half of 2000.

For now, if a foreign broadband firm wants to market its products in China, it should contact the designated Telecommunications Equipment License Processing Offices (TELPO) to handle and process telecom license applications. A piece of equipment must comply with China's industrial policy, relevant regulations, technical standards, and quality control requirements. The telecommunications equipment license is valid for three years and an application for renewal must be made three months before the license expires. Licensed telecommunications equipment and its packaging must display Chinese language labels, including license number, name of manufacturer, product name, model number, origin and product serial number.

Both domestic and foreign bank loans are frequently used to finance large equipment purchases. Traditional and other forms of finance leasing are also sometimes used. Venture capital has not been as popular in the market because investors must bear not only technology risk, but also risks due to political and regulatory uncertainties. However, in the past six months this has changed slightly. In order to get in on the ground floor, venture capitalists have been more willing to provide funds to small software and internet companies in China. This indicates that the rapid buildout of China's broadband infrastructure has been a success and that it is now facilitating the establishment of numerous broadband providers and rapid growth of broadband services.

KEY CONTACTS

Ministry of Information Industry
Development and Planning Division
Telecommunications Administration
Ministry of Information Industry
13 West Chang An Avenue
Beijing 100804, China
Tel: 8610 6608-8993
Fax: 8610 6608-9049

Telecommunications Equipment License Processing Office (TELPO)
(Xiao Xi Tian Office)
Address: #28 Xin Jie Kou Wai Dajie, Xi Cheng District
Beijing 100088
Tel: 8610 6238-2481
Fax: 8610 6238-2482

Telecommunications Equipment License Processing Office (TELPO)
(Yuetan Office)
Address: #11 Yuetan Nan Jie, Xi Cheng District
Beijing 100045
Tel: 8610 6809-4061

Fax: 8610 6802-8601

China Telecom
Chief Engineer's Office
33, Er Long Lu, Xicheng District
Beijing 100032
Tel: 8610 6602-7043
Fax: 8610 6602-7254

China Unicom
Technology Department
12/F, Office Tower 1, Henderson Center
18 Jianguomennai Avenue, Dongcheng District
Beijing 100005
Tel: 8610 6518-1800 ext.293
Fax: 8610 6518-3405

Jitong Communications Company
Value-Added Department
Jingbao Plaza
185 Andingmenwai Street, Dongcheng District
Beijing 100011
Tel: 8610 6222-7109
Fax: 8610 6426-2685

China Network Communications Corporation (CNCC)
(temporary address)
Rm. 50428, Friendship Hotel
#3 Bai Shi Qiao Road, Haidian District
Beijing 100873
Tel & Fax: 8610 6849-8888 ext. 50428

Ministry of Railways
No. 10 Fuxinglu, Haidian District
Beijing 100844
Tel: 8610 6324-1895
Fax: 8610 6324-1845

Ministry of Water Resources
No. 2 Baiguanglu Ertiao, Xuanwumen District
Beijing 100053
Tel: 8610 6320-2114

Fax: 8610 6320-2650

State Administration of Radio, Film and Television
No. 2 Fuxingmenwai Street
Beijing 100866
Tel: 8610 6609-3114
Fax: 8610 6609-2437

State Power Corporation of China
National Power Telecommunications Center
No. 1, Lane 2 Baiguang Road
Beijing 100761
Tel: 610 6341 5884
Fax: 8610 6354 8010

Guangdong PTA
Cui Xun
Director-General of Guangdong PTA
101 Tianhe Lu
Guangzhou City, Guangdong Province 510081, China

Shandong PTA
Huang Guorui
Deputy Director-General of Shandong PTA
27 Jing San Lu
Jinan City, Shandong Province 250001, China

Shanghai PTA
Cheng Xiyuan
Director-General of Shanghai PTA
61 Sichuan Bei Lu
Shanghai City 200085, China

Sichuan PTA
Sun Kangmin
Director-General of Sichuan PTA
72 Wen Miao Qian Jie
Chengdu City, Sichuan Province 610012, China

Shaanxi PTA
Zhang Xiushan
Ex-Deputy Director-General of Shaanxi PTA

185 Zhu Que Lu
Xi'an City, Shaanxi Province 710061, China

Beijing PTA
Lin Rong
Deputy Director-General of Beijing PTA
18 Tai Ping Hu Dong Li
Xicheng District, Beijing 100031, China

Hebei PTA
Dai Shuang
Director-General of Hebei PTA
1 Fan Xi Lu
Shijiazhuang City, Hebei Province, 050011, China

Tibet PTA
Xiang Baqudeng
Deputy Director-General of Tibet PTA
1 Lin Guo Dong Lu Yi Xiang
Lhasa, Tibet 850000, China

Hubei PTA
Liao Renbin
Deputy Director-General of Hubei PTA
798 Jie Fang Da Dao
Wuhan City, Hubei Province 430022, China

Jiangsu PTA
Feng Xiong
Deputy Director-General of Jiangsu PTA
301 Zhong Shi Bei Lu
Nanjing City, Jiangsu Province 210003, China

Liaoning PTA
Zhang Xuehong
Deputy General Manager of Liaoning Mobile Co. Ltd
157 Shi Fu Da Lu
Heping District, Shenyang City
Liaoning Province 110002, China

Hainan PTA
Wang Tan

Director-General of Hainan PTA
5 Nan Bao Lu
Haikou City, Hainan Province 570206, China

Fujian PTA
Liu Yaoming
Deputy Director-General of Fujian PTA
57 Wu Yi Zhong Lu
Fuzhou City, Fujian Province 350005, China

Zhejiang PTA
Sheng Mingcai
Deputy Director-General of Zhejiang PTA
3 Wu Lin Guang Chang Dong Ce
Hangzhou City, Zhejiang Province 310040, China

Tianjing PTA
Li Yue
Deputy Director-General of Tianjin PTA
4 Hua Yuan Lu
Heping District, Tianjin City 300041, China

TRADE PROMOTION OPPORTUNITIES

PT/Expo Comm, October 2000, Beijing, China
Organizer: EJ Krause & Associates
Tel: 8610 6841-5250
Fax: 8610 6841-1728

SuperComm, April 2001, Shanghai, China
Organizer: Telecommunications Industry Association
Tel: (202) 383-1482
Fax: (202) 383-1495

Biography

PAUL J. KULLMAN

Mr. Kullman is the Second Commercial Secretary at the U.S. Embassy in Beijing, China (http://www.usembassy-china.org.cn). He is responsible for assisting U.S. companies seeking to enter or expand their business in the Chinese market by providing commercial counseling, organizing trade events and tracking Chinese industry sector policies. Over the past year, Mr. Kullman has met with over 270 U.S. companies to discuss market strategies and assist with dispute resolution. His portfolio covers the high technology sectors (telecommunications, internet, electronic commerce, and broadcasting) and the service sectors (banking, consulting, education and entertainment).

Mr. Kullman took the lead in organizing the second China-United States Telecommunications Summit in Guangzhou, March 31-April 2, 1999. Commerce Secretary William Daley and Information Minister Wu Jichuan chaired the summit, which brought together officials, executives and academics to discuss key telecommunications issues. Over 65 telecommunications companies from China and the United States participated in the event. In conjunction with this Summit and to assist U.S. exporters and investors, he published a report entitled China's Telecommunications and IT Market.

He has worked aggressively to resolve bilateral policy issues. He has tried to bring about a fair resolution to the "Chinese-Chinese-Foreign" (CCF) telecommunications venture issue by investigating CCF policy developments, assessing their potential impact on U.S. telecommunications investors, and writing talking points, drafting letters and notifying the Chinese Ministry of Information Industry (MII) and State Development & Planning Commission of potential international fallout. Mr. Kullman has also strongly advocated in favor of giving Chinese consumers a choice of mobile phone technologies to lower costs and increase service quality. His efforts were instrumental in pressing the Chinese to announce the commercial deployment of CDMA technology in China.

Mr. Kullman was previously an international trade analyst in the Trade Compliance Center (TCC) at the U.S. Department of Commerce, where he investigated over 30 trade agreement cases from legal, economic and policy angles to ensure trade partner compliance. He specialized in intellectual property, investment and WTO-related issues. He also assisted in creating the U.S. Government's first comprehensive trade agreements database. From 1993 to 1996, as the Commerce Department's China Desk Officer, Mr. Kullman was a delegate of the U.S. negotiating team at the market access and intellectual property rights talks. He also assisted U.S. companies by researching and analyzing trade and investment data and writing guides on how to do business in China.

Mr. Kullman has a graduate degree in political science from George Washington

University and has studied at the Political Science Institute in Paris and done Fulbright research in Central America. He speaks Mandarin Chinese, French, Spanish, German, and Swedish.

Sessions

Coming of Age in the Information Age
The Post-CCF/Pre-WTO Environment in China for Foreign Participation in Telecommunications and Internet

William Krueger

Shining Success of the Opening and Reform Movement

By every conventional measure, the growth of the telecommunications services sector in China has been astounding: around 60 million fixed line customers have been connected over the past five years. Over 800,000 kilometers of state-of-the-art fiber optic cable has been laid. Last year alone, the number of new fixed line connections (17 million lines) exceeded the entire existing telephone system of Canada.

The emphasis until now has been on the construction of basic services infrastructure. Despite the impressive achievements of the past few years, there is still a tremendous amount of infrastructure to be built. Nationwide in China, basic fixed-line telephone service is available to only 7.1% of the population, a teledensity rate comparable to those of Kyrgyzstan and Egypt. But in Beijing and Shanghai, two of the most developed cities, fixed line access is available to over 40% of the population, comparable to the developed economies of South Korea and Ireland.

In absolute subscriber numbers, China is the third largest mobile telephone market in the world, with around 30 million subscribers, over half of whom have signed up in the past three years. However, with a national penetration rate of only 2%, compared to 25% in the US and 33% in Japan, the high double-digit annual growth rates are expected to continue for several more years.

During the same period of time, over 320 million television sets have been installed, with nearly 80 million households subscribing to cable TV. Sources in the Government claim that already 10% of these are wired for interactive cable services.

Within the past 2 years, Internet usage has grown from nearly nothing to 4 million identified users, with annual Internet access revenues estimated at US$1.2 billion.

Since the opening up and reform of the economy began 20 years ago, China`s overall economic development has both depended on and driven improvements in the quality, capacity and accessibility of its communications infrastructure.

Increasingly, the Government is concerned that the achievements in general economic growth and the advances in the telecommunications sector are not spreading rapidly enough beyond the coastal regions and major urban centers. Consequently, it should be expected that significant attention and resources will be directed toward shrinking the gap between the more developed regions and the less developed rural and interior populations, as part of the next stage of growth in basic telecommunications infrastructure and services.

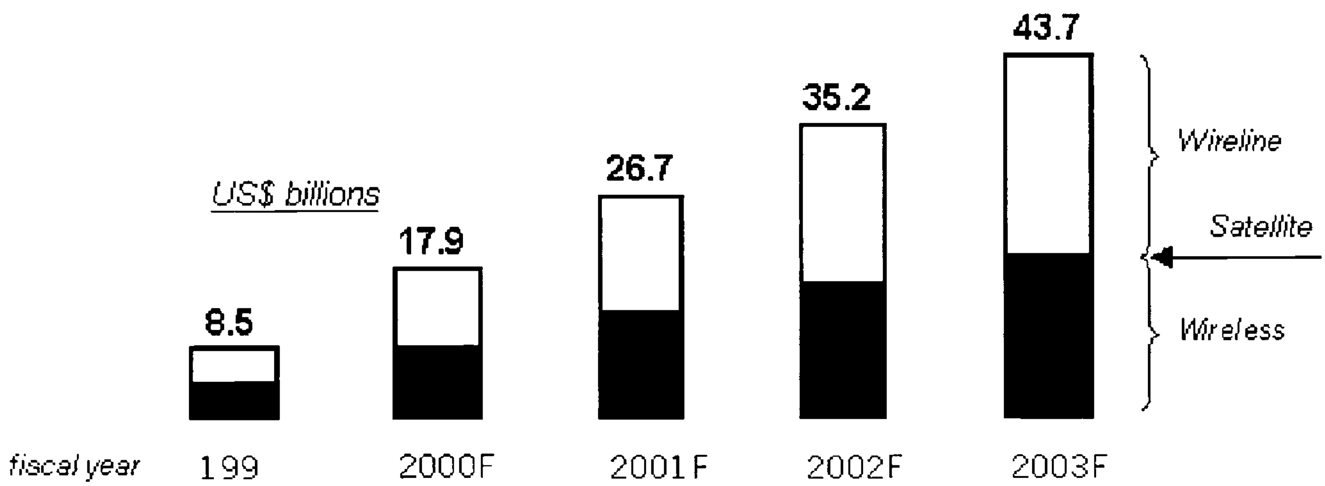
In the telecommunications sector, perhaps more clearly than in any other sector, China is playing both catch up and leapfrog at the same time. Just as most of China is still being wired for basic services, the application of Intelligent Networks solutions, trials of WAP/GPRS, advanced dual-directional paging, interactive cable TV, internet access and e-commerce web sites are being rolled out. Today, China is still very much in an infrastructure-construction, i.e. hardware acquisition, mode, but understanding and insight into the importance of enterprise models, services and systems integration, i.e. software, is rapidly growing, albeit from a small base.

In this article, I will concentrate on one of the most important challenges facing Chinese Government officials, policy makers, telecommunications operators and services providers, and the commercial enterprises who aspire to become players in the sector: How to finance the continuing advance of China's information society?

Size Matters

Research conducted for Xin De Telecom in early 1999 indicated that the operators, suppliers and regulators in China expect investments in the telecommunications infrastructure to total US$8 -10 billion per year during the five years 1999-2003. Approximately 40% of the planned investment is expected to be in the areas of mobile communications, mostly in GSM and Wireless Local Loop. The remaining 60% is expected to be in access networks, transmission systems, and data communications networks. Investments in satellite technologies were predicted to be relatively limited, due to existing regional over-capacity.

Five-Year Cumulative Planned Investment: US$44 billion



The research, conducted prior to the recent US-China WTO accord, most likely understates the positive impact of rolling out narrow-band CDMA and the pace of developments in the area of 3rd generation mobile communications. Although some cannibalization of the GSM investment plans of Unicom may occur, we expect that the overall impact will be a net increase in investments in mobile technologies. Taking the outlook for Unicom and Great Wall into account, we would expect an additional US$1.6 to 2.2 billion annually, or 60%, on top of the original US$16.8 billion projected for new investment in mobile networks during the 5 year period of 1999-2003.

In total, China's investments in telecommunications infrastructure will probably exceed US$50 billion over the next 4 to 5 years.

Rapid Growth with Chinese Characteristics

It is not only the size of the Chinese infrastructure investment requirements that impresses, but the unique political, commercial and cultural contexts in which the infrastructure growth is occurring.

Although the Chinese market represents the largest in terms of number of customers, and one of the largest in terms of equipment sales, there is today no comprehensive published body of laws and regulations governing the sector. The China telecommunications law is in preparation, and is expected to draw heavily from the approaches to market liberalization adopted by Germany and the United States.

With no published official handbook on the rules of the game, it often appears to outsiders that foreign-based manufacturers and investors are at the mercy of a mercurial and inconsistent regulatory regime. The lack of a clear telecommunications law, and the rapid, sometimes see-saw, evolution of foreign participation in the sector, make legal and political uncertainties another of the dominating characteristics of the Chinese telecommunications sector.

In this setting of rapid infrastructure expansion, heavy investment requirements and regulatory ambiguity, new operators and service providers have been launched, and existing operators have been launching new services. Oftentimes, as was the case with China Unicom at its outset, the new service providers have neither the capital nor the network infrastructure in place to do the business for which they have been licensed.

In contrast, there are entities such as the Ministry of Railways with its 33,400 kilometers of fiber optic cable, who want to use their infrastructure to provide telecommunications services, but who have not been granted the necessary approvals.

In general, it can be said that the sector needs cash, technical know-how and experienced management. All of these are already available in every aspect of the telecommunications market in China, but more is needed everywhere. The mix of requirements varies according to how much cash the operator is generating from current operations, how new is the technology or service to be deployed, and how closely the key success factors for the new business match the track record of the existing management team. Generally speaking, the newer the technology or the business model, the more important is the role of international suppliers, strategic partners, and capital providers.

Solving the "Chinese Puzzle"

For the better part of the past 150 years, China's seemingly vast array of opportunities for "getting in on the ground floor" has attracted countless commercial optimists and capitalist adventurers.

The intoxicating rush felt by those who are now making the trip to Beijing from Silicon Valley is not unique. The high occupancy rates and the deal-talk buzzing at the tables in every one of Beijing's 5-Star Hotels during the last business weeks of 1999 bring back memories of 1995, when almost every major player was lining up for a chance to sign-up a so-called "China-China-Foreign" deal with China Unicom.

For the corporate lawyers, investment bankers and telecom sector consultants who make Beijing their (business) home, it must have been an ironic juxtaposition of assignments. Harried, they were shuttling between meetings with their two sets of clients: one set trying hard to get out of their deals on decent terms, while the other set is trying hard to get into other deals on any terms.

The WTO accord between China and the United States, and the (as of this writing) expected accord with the European Union, will guarantee a proliferation of new opportunities in terms of the forms of participation for foreign strategic and financial players in China. Nevertheless, WTO membership is no panacea. The environment will still be very challenging.

The regulatory and legal environment is dynamic and evolving, continuing to be heavily influenced by policy and political issues, with significant gaps in the framework of underlying laws and regulations, and in the availability of impartial channels for dispute resolution. In addition, there are the typical international alliance challenges of how to align the expectations and interests of the parties, and bridge the cultural differences between the participants.

It is a well known characteristic of China business that for every positive policy move at the top of the Government, there are countless countermeasures available at the middle level that can either impede or accelerate the implementation of that policy into practice.

Therefore, with the ink barely dry on the first "C-C-F" co-operation termination agreements, and before the new generation of China business optimists make their commitments, it is a good time to revisit the basics for successful investment in commercially sound partnerships in China, specifically in the telecommunications and Internet sectors. In this way, the parties on all sides have a fighting chance of solving the puzzle we all face, that is how to get in and win in the Chinese market.

The Wise Man Built His House upon a Rock

Continued investments in the telecommunications sector are considered by the Central Government to be essential elements of China's development and modernization plans. Existing operators will expand their current networks and services, build new networks, and launch new services. New service providers will enter the markets and new technologies will be deployed.

The impending accession to WTO has only served to add additional urgency to those investment plans since it is hoped that the infrastructure build out will strengthen the competitive position of domestic operators and service providers in the run up to opening the domestic market to foreign operators.

Such ambitious growth plans will require enormous amounts of external capital and, WTO accession notwithstanding, only a limited portion of it can be raised through direct equity fundraising, especially in the short term. New financing structures and innovative application of existing financing forms are required to fill the gap. Along the way, the laws and regulations will have to be expanded to support and regulate such activities.

The dynamic environment of China's telecommunications sector continues to present significant challenges and opportunities to all participants, including the regulators, operators and service providers, equipment suppliers, lenders and equity investors, and financial intermediaries who are mandated and/or otherwise motivated to sort it all out and move forward.

Back to Basics

All parties are well advised to avoid signing up deals *today* that they hope or even expect will be supported by laws and regulations *tomorrow*. The best advice is to structure projects according to the current published laws and regulations, seeking the highest relevant level of government approvals, and building into the deals the ability to adapt the structure to the new opportunities in the environment as they evolve.

The First Rule: Use the Right Platform

Once the basic commercial, strategic and financial objectives are understood and agreed, the first step is to find what approved legal framework best suits the project and the partners' objectives.

In doing this, the foreign partners or investors should rely on sources of information other than their prospective domestic partners. The investors usually have only one chance to get the basic legal and financial structures right - experience shows that serious congenital defects in the structuring of China deals can be fatal.

Look at the deal from every angle: legal, financial, tax, accounting, industry regulations, foreign exchange, human resources motivation and management, business license requirements, etc. Do not let the pressure from the Chinese partner or the enthusiasm of the deal's internal or external sponsors override the need for prudent modeling and planning for contingencies.

The Second Rule: Match the Projects to the Players

According to the traditional wisdom in China business, the most important element is to find the right partner. Having displaced this as the top priority with my First Rule above, I raise the partnering issues as the next most important element of success.

Based on my observations, having the right partner is no cure for having the wrong business license, financial incentives, or legal structure. At the end of the day, and this is increasingly so, every Chinese partner is subject to the same laws and regulations, and no-one can save an ill-conceived venture from its fate.

My reference to partnership issues here is, however, meant to go much deeper and broader than just advising investors to find the most powerful patron. What matters is that all parties understand in advance the key success factors for the underlying business, agree on them, and have the right alignment of skills, resources, culture and commitment to follow through on them. Some of the issues that have to be frankly and clearly identified and understood include:

- investment horizons and exit strategies
- the relative importance of hardware (equipment and other fixed asset investment) versus software (system planning, design, integration and optimization)
- who leads and who follows on issues of marketing strategy, investments in web site design, corporate image and software enhancements
- mixing foreigners (and their headcount costs) with returnees (with similar expectations) and domestic talent in one project, let alone in a single company: control over hiring and HR development, setting the cultural "tone from the top"
- technology roadmap, local content objectives, preferred supplier commitments in all areas: equipment, technical support, financial support

The Third Rule: Comprehensive Know-how Exchange

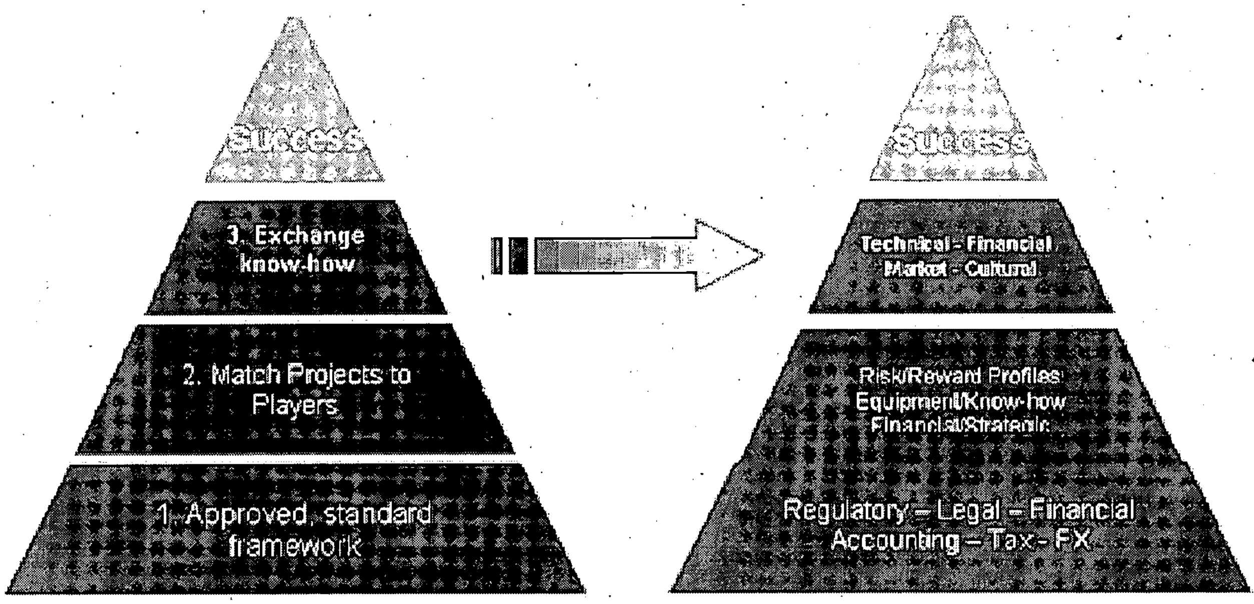
Successful China projects are characterized by a comprehensive *exchange*, rather than a one way *transfer*, of know-how that generates real insights and understanding amongst the participants.

Generally, the areas of exchange where all partners should expect not only to teach, but also to learn, can be categorized into Technical, Financial Management, Market and Cultural.

If the legal, financial and contractual structure of the project has been properly selected and developed, and the partners are clear about their roles and the requirements of the project, then the areas of know-how transfer will emerge naturally.

For example, a project that is funded by a single investor or corporate group will approach management reporting differently from a project that expects to go through several rounds of fundraising from diverse sources.

In the former, the accounting and reporting guidelines of the large strategic investor may be demanded, while in the latter, a parent company-neutral reporting system based on International Accounting Standards or US GAAP might be adopted. In either case, there will most likely be gaps in the training, experience and expectations of the local staff and management who are responsible for planning, accounting and reporting, and there may well be cultural chasms separating the foreign investors from the local partners on these issues.



Having addressed generally the opportunities and challenges facing players in the China telecommunications and Internet sector, I would next like to analyze in more detail the diverse and divergent agendas of the players. Finally, I will propose one concrete example of an investment structure that takes the considerations I have just discussed fully into account.

Diverse and Divergent Agendas

To start, I divide the players into the 4 categories in which they usually recognize themselves:

1. Investors and Lenders

For my purposes here, Investors are infrastructure equity investment funds focussed on Telecommunications, Internet, Asia, and China; tycoons and family groups; and venture capital groups. Lenders are project finance investors, banks, and hybrid debt/equity providers.

Investors and Lenders want:

- Attractive risks/returns profile
- Stable, legal investment channels
- Key projects, partners, sectors
- Feasible exit strategies
- Sizing to fit

The range of different investors and lenders provides a significant range of requirements in terms of returns expectations, investment horizons, and trade-offs in the area of minimum ownership percentage/maximum absolute investment amount. However, it is fair to say that all of them want transparency and the avoidance of "gray areas" of practice. They tend to be fashion conscious, looking for the projects whose profiles are consistent with the current thinking in the head-office as to what's hot and what's not.

2. Strategic Players

I define these as network operators and service providers based outside of China, and other groups who have a primary or secondary core business interest in the project or the opportunities it is expected to generate for them in their main areas of business.

Strategic Players want their involvement in China to be:

- Relevant to their core business
- Strategically interesting for advance presence/future alliances

They see themselves as operators, not financial partners, passive investors or suppliers of know-how. They are usually looking for geographical extensions or diversification of their ex-China organizations. They are sometimes sensitive to aligning themselves with an upstart operator or partner because they are afraid that by doing so, they might be passed over later for larger scale involvement with the operators who have historically dominated the market.

It is also true that they are generally much better at operating for themselves than they are at coaching others.

3. Equipment and Service Suppliers

These include manufacturers, software and systems integrators, and similar solutions providers. Their customers are the network operators and service providers.

Equipment & Services Suppliers want

- Shorter accounts receivable cycles and more cash sales
- Feasible risk reduction strategies
- Market share

While they would rather not provide anything but short term vendor financing for their sales, some suppliers have demonstrated significant creativity and longer term financial commitments in order to secure a ground-floor "Preferred Supplier" opportunity with a new operator or network project.

4. Network Operators and Service Providers

In China today, the first tier of national network operators and service providers include China Telecom, China Unicom, China Netcom, and Jitong.

The next tier includes most notably the PLA's Great Wall Telecom, the Ministry of Railways Telecommunications Bureau, the National Power Telecommunications Corporation, and the State Administration of Radio Film and Television. There are, in addition, an estimated 2,000 (and growing) Internet Service and/or Content Providers. Relevant for the future are the approximately 1,200 cable TV operators, and the world's largest paging industry, accessing around 80 million paging subscribers.

Network operators and service providers in China have a complex set of needs:

- Access to expertise in finance, management, marketing, etc.
- Technical support of new services and networks
- Cash and equipment on flexible terms
- Minimal foreign exchange exposure
- Independence from the interference of outsiders

Above all, they have network infrastructure to build, usually under a Government mandate. If they are new operators or launching a new network, they usually do not have enough internally generated cash or Government funding, if any, to finance the necessary investments until the point after which the project is self-financing.

In less restrictive markets, the new operator or the operator financing a new network or service would raise equity capital and recruit the expertise it lacks. In exchange, it would issue equity shares and hire experienced management to lead the way. Commonly, in the liberalized markets, domestic incumbents and foreign partners pool their capital, capabilities and human resources to achieve the right mix necessary for the company to thrive.

Chinese operators and service providers have not had these options. Their only legally unambiguous sources of financing and their main sources of technical support have been delivered through the following three channels:

1. Supplier Financing
2. Bank Loans
3. Finance Leasing

Until China passes the laws and regulations needed to bring the domestic environment in line with its WTO accord with the US, these three forms of financing are the only generally available legal channels for providing capital to telecommunications operators in the PRC. (Putting aside for the moment the limited opportunities to raise equity capital with a partial sale through a Hong Kong listing vehicle, such as China Telecom Hong Kong has done and Unicom will do.)

Even after China harmonizes its internal codes to match its WTO pact, it is clear that not every company or project that is both needy and worthy of risk capital will be able to issue shares in an IPO, nor will those who are permitted to list be able to cover all of their financing requirements through the equity markets.

At this point, most people would conclude that China does not have the necessary legal and regulatory structures to allow the four camps of participants to seek each other out, strike the deals that best suit them, and get on with the development of the nation. Since the participants cannot adjust China to suit their paradigms, I would suggest that they adjust their paradigms to suit the current conditions (and medium term opportunities) in China - because therein lies one solution to the "Chinese Puzzle."

Standardized Alternatives to IPO and FDI

A closer look at the standard forms of financing currently available for projects in the telecommunications sector reveals that finance leasing can be a surprisingly flexible alternative to either waiting for WTO reforms to take hold, or playing out of bounds in the "gray" zones.

Supplier Financing

Historically, network operators and service providers in China have relied heavily on equipment vendors for technical support and for keeping pace with new developments in applications. Obviously, even in the most full-service oriented of supply arrangements, there arise conflicts of interest and gaps in the skill sets of equipment vendors when it comes to going beyond constructing a network to actually operating one as a business.

Vendor financing has, however, played an extremely important role in financing the tremendous growth of the telecommunications infrastructure in China until today, despite the obvious limitations that manufacturing

Bank Loans

Domestic bank loans in China are limited to a one year term, and lending rates are determined by the central bank authorities. With no incentive to take on complicated or riskier credit, domestic banks lend against corporate guaranties, and can provide little flexibility in repayment terms, at least not officially. Foreign lenders have also lent historically against full-faith guaranties, with issues of transparency, reporting, foreign currency repayment risks, etc. limiting the market for foreign bank loans.

Finance Leasing

Conventional finance leasing in China has been established since 1981, and has provided since then more than US$7 billion of funding to all important sectors of the economy, largely from international lenders. Of that amount, more than US$2 billion has been used to finance the telecommunications sector.

The conventional finance leasing products have, with a few notable exceptions, been as rigid as the loans of the domestic commercial bank sector. Corporate or government guaranties and inflexible payment schemes, usually priced to float at a margin over LIBOR and requiring that the operator carry the full foreign currency risk, were the practice, if not the rule.

Using Finance Leasing at the Front End

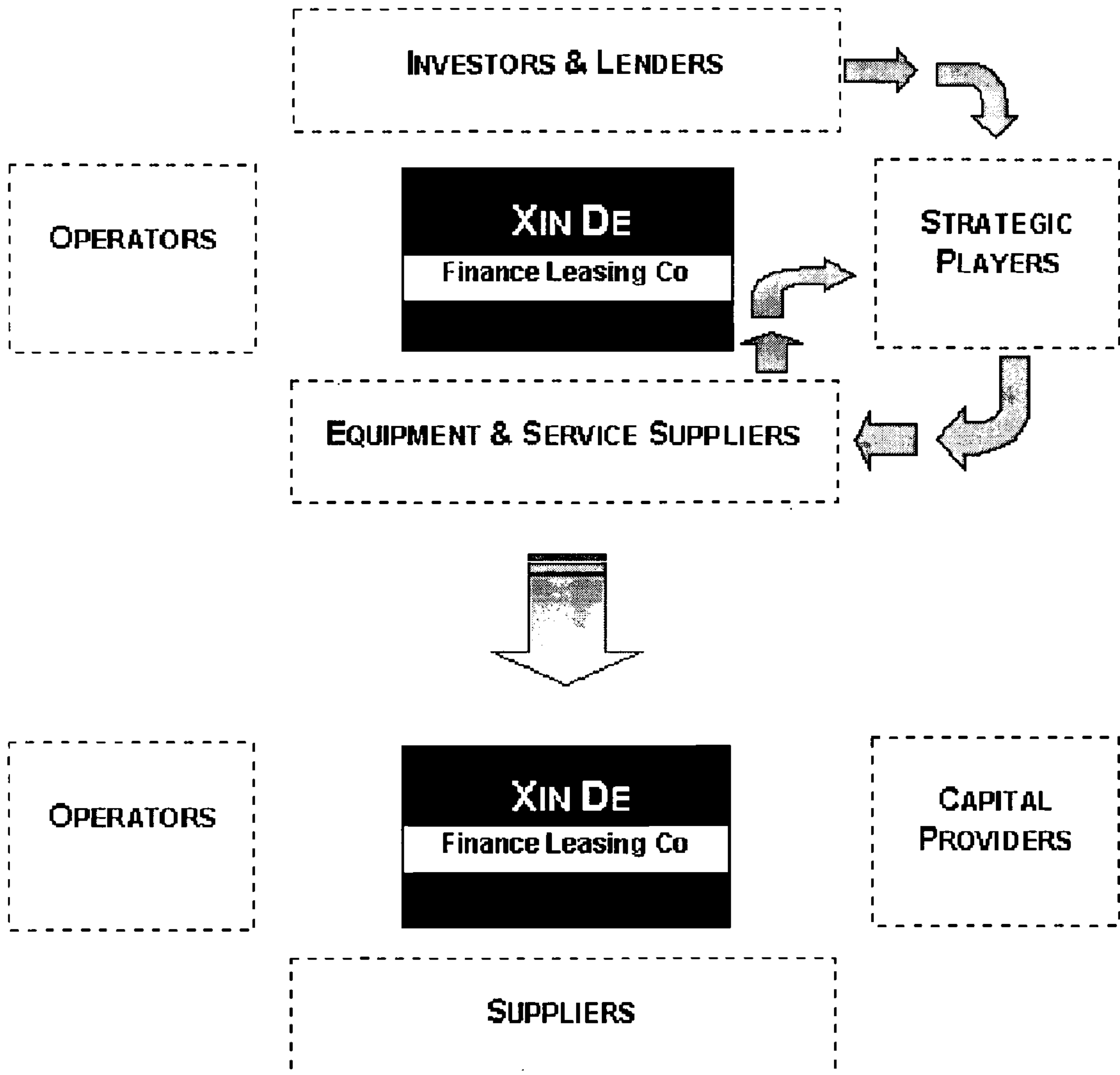
With the adoption of a new Contract Code in 1999, the Chinese Government has explicitly recognized the use of flexible lease structures as a source of funding for the telecommunications industry. That is to say, valid lease contracts can have flexible repayment arrangements, subject to agreement between the lessee and the lessor. It is permitted to adapt the repayment and returns to fit the conditions of the underlying projects and the requirements of the domestic and international funding sources.

In addition to the legislative support provided in the new Contract Code, MOFTEC has been promoting the development of flexible lease products, together with a trend towards industry specialization and away from generalist leasing companies.

An unprecedented lobbying effort by the Leasing Business Committee led to the adoption of supporting legislation that explicitly approves of flexible finance leasing. The efforts of the Leasing Business Committee (the leasing industry's MOFTEC-sponsored trade association), and MOFTEC`s encouragement, was stimulated by the article "New Wave Finance Leasing for the Telecom Sector: Xin De Telecom's Structured Participating Lease Solution", published in the August 1998 edition of the China Association of Foreign Invested Enterprises journal.

These developments are relevant to players in the telecommunications and Internet sector in China because finance leasing can provide a standardized, legal and Government endorsed platform for participation in the sector in the post-CCF, pre-WTO environment. Once WTO-dependent reforms are being adopted, such a platform can serve as both a complement to limited direct equity participation and a preparatory phase of financing, prior to IPO or other forms of direct equity participation.

When flexible finance leasing forms are used to deploy risk capital into major projects, Investors and Lenders join together with Strategic Players and Suppliers in a multi-layered category that can be referred to simply as "Capital Providers" (referring again to the four categories of participants I have discussed earlier). The Supplier Category is also expanded to include the Strategic Players to the extent that they have local capabilities and specific know-how that should be compensated at the project level.



The Capital Providers provide capital in different forms and in percentages that reflect their respective interests in the project and the nature of the project itself. All capital not otherwise being provided through direct equity investment can be channeled as loans to the lease company, which serves as a conduit for the transfer of risk capital into the project.

How to find the common ground among the four camps of participants with their diverse agendas? How can finance leasing, as currently permitted in China, provide the right platform?

Paradigm Shake-up

Most Investors and Lenders will immediately look through the lease company structure and focus on the project itself. They will generally feel confident in their ability to analyze all the risks, and will also be able to take the contractual arrangements in stride.

Strategic Players who are not comfortable with structured finance, project finance, and structures that provide a sort of "synthetic" equity, may be turned-off by the prospect of being cast in the roles of Capital Provider and Supplier. If, however, they can look beyond the labels and the channels to the substance of their involvement, they should be encouraged by a number of points, including:

Even if direct involvement in China operations are forbidden, their roles as lender to the lease company and supplier to the operator are perfectly legal and standard arrangements: no gray areas.

- Entering the relationship with the operator on this basis does not mean limiting the relationship to this basis. Rights of transfer or conversion with step-up privileges can be included in the funding and lease master facilities, enabling the Strategic Partner to transfer their claims directly to the operator in some other form of debt or equity, according to the governing laws and regulations as they develop.

Equipment and Services Suppliers who are not usually interested in taking medium term financial exposure in order to finance sales, and who, in most cases, will not consider financing more than the value of their equipment order, are nevertheless the most motivated of all the parties to launch the project.

Sophisticated suppliers will see the benefits of taking a medium term exposure in excess of today's sales in order to establish their position as a cornerstone supplier. This will be particularly true for projects that are characterized by multiple phases of roll-outs over time, where the equipment forms part of the system and the costs of the project are primarily based on equipment or infrastructure installation. Entering into a structured financing arrangement should yield better financial returns than having to provide cheap supplier credits and delayed payment terms on a piecemeal basis over the same period.

Network operators and service providers also enjoy the corresponding benefits mentioned above. Most important to them, however, is the sustainable nature of the financing provided through a flexible lease structure. The benefits of equity funding, that is the absence of a performance-independent debt service obligation, can be provided without having to wait for clarification on implementation of WTO, and without the risks of a non-standard arrangement. They can also use such arrangements to get to know a prospective Strategic Partner, tantamount to moving in together before getting married.

Wrap-up

The creeping deregulation of the telecommunications and Internet sector in China has resulted in the emergence of new domestic operators with limited track records in the technologies they have been licensed to operate. Tremendous investment in both financial and human capital is required to meet the ambitious development objectives of the Government and the mandated enterprises.

Investors, strategic players and suppliers are loaded with both kinds of capital in comparison with their Chinese counterparts. However, they cannot assume that success elsewhere in the world will guarantee success in China.

Therefore it is necessary that both sides approach the opportunities and challenges in the current environment with mutual respect and build their investment relationships on the proper platform. It is in the interests of both sides that the vehicle for their joint activities provides an environment for effective exchange of expertise and the development of a friendly, co-operative atmosphere.

The priorities facing Chinese operators today, combined with historical conditions, make the financing of network infrastructure the most important benefit that a foreign Investor, Strategic Player or Supplier can provide. The legal, standard channels for providing the necessary risk capital will expand with China's WTO accession, but it should be the pre-condition of every player to avoid gray areas and to structure their deals so that they are legal today and convertible to the new legal forms of tomorrow.

In this article, I have briefly outlined one approach - a finance leasing based participation model that can provide a legally standard and commercially workable platform for launching telecommunications and Internet projects today.

At the outset of this article, I provided a few statistics to illustrate what has been achieved in China over the past few years. For those of us who have participated in China's growth until now, looking back is not nearly as interesting as looking forward. Assuming this is true for the reader, here are a few of the outlook figures that have captured my attention:

The Wireless Opportunity

From a base of 23 million subscribers at the end of 1998, we expect to see a minimum of 100 million subscribers at the end of 2003. TACS, the old analog network of China Telecom, will slip from 36% market share to 2%, with GSM and narrow-band CDMA sharing 85% of the market. GSM will still be the dominant mobile technology, with more than 3 to 5 times the market share of narrow-band CDMA, however 3rd Generation Mobile will be well on its way to commercial adoption by 2003.

The Cable Opportunity

The nearly 80 million households currently subscribing to cable TV services will expand to 175 million by the end of 2003. Approximately 30 million of them, about 17% of the total, will be wired for dual-directional, interactive cable services. The Internet will be an "EntertaiNet" delivered over an upgraded cable infrastructure with a variety of in-bound/out-bound configurations possible.

The Internet Opportunity

By 2003, the number of regular Internet subscribers will be 8 to 9 times today's estimated 4 million users. The estimated 35 million users of the future will generate US$4.5 billion of access network revenues and fuel the proliferation of e-services, with Chinese characteristics.

Success, which I define as realizing the full potential of China in the Information Age, can only be achieved in the long run if the participants are convinced that the opportunities for "win-win" outcomes are reasonable. Success will be more likely if all the participants apply the basic concepts recommended above:

1. Build the participation on the right legal, regulatory and operational platform.
2. Align expectations and match the Projects to the Players.
3. Finally, remain open and responsive to participation in unexpected areas of know-how exchange - remember that brand name cash, equipment, and technical expertise are no replacement for trust and friendship amongst the individuals who are the key decision makers in any project.

The desired effect of China's accession to the WTO, that is, making it legally feasible for you to take an equity stake in a Chinese operator and get involved in the operations, is analogous to passing a law that permits marriage among consenting adults. It is not the same thing as outlawing celibacy. You still have to compete with a roomful of eligible suitors to find the right girl, and get her to want to dance with you.

Biography

Mr. William Krueger

Mr. William Krueger, a 40-year-old American, came to China in July 1996 to establish the joint venture that evolved into Xin De Telecom International Ventures Co. Ltd. He is the Managing Director and Chief Executive Officer, originally sent from Germany to represent Siemens AG in the Management Office and on the Board of Directors of the Company. Xin De Telecom, a joint venture of China International Trust and Investment Corporation (CITIC) and Siemens AG, with support from Deutsche Telekom, is headquartered in Beijing, where Mr. Krueger lives with his wife and three children.

Mr. Krueger, a professional musician as a child, graduated in Music and Theatre from the prestigious Northwestern University located near Chicago, Illinois in 1981. After receiving his MBA from Northwestern's Kellogg Graduate School of Management in 1986, Mr. Krueger joined Lehman Brothers on Wall Street and began a seven-year career in investment banking in the USA and Europe. Prior to joining Siemens AG to launch Xin De Telecom in China, Mr. Krueger was the European finance and administration director of American medical technology company, Haemonetics Corp. Mr. Krueger was based in Germany a total of five years. He speaks fluent German, serviceable French and cheerfully bad Chinese.

Mr. Krueger serves as an Honorary Member of the Board of the Beijing Music Festival and as Vice Chairman of the European Chamber of Commerce Telecom Industry Group. He has represented China as a member of the Chinese delegations to the Asia Pacific Economic Council (APEC) CEO Summit and the Pacific Basin Economic Council (PBEC). In Beijing, Mr. Krueger is a contributor and speaker at the annual conferences of the China Association of Foreign Invested Enterprises, sponsored by the Ministry of Foreign Trade and Economic Co-operations (MOFTEC).

Sessions

E-commerce in China

Tao Yun

I. Complete e-commerce models in developed countries

Any commerce model involves three infrastructures: information infrastructure, delivery infrastructure and transaction infrastructure. E-commerce models in western countries take big advantage of well-developed delivery infrastructure and transaction infrastructure and try to manage information flow, goods flow and payment flow as much as possible with electronic solutions (complete e-commerce models). The internet strengthens information infrastructure and catalyzes E-commerce development.

In developed countries, networks between for business to business commerce had been well used before the internet emerged. E-commerce had been applied more in business to business commerce (B to B) before it became solutions for business to consumer commerce (B to C).

II. Underdevelopment of infrastructures in China

However, in developing countries like China, e-commerce models are facing underdevelopment of delivery infrastructure and transaction infrastructure. Although the quick growth of the internet has facilitated information management and information exchange in China, delivery infrastructure and transaction infrastructure are very behind the trend and become bottlenecks of e-commerce development in China. In current stage in China, e-commerce models have to avoid heavy involvement of delivery infrastructure and transaction infrastructure and partial e-commerce model are more feasible.

Due to the underdevelopment of delivery infrastructure and transaction infrastructure, e-commerce in China has to be more local and physical than in developed countries. This is a big advantage for local companies to compete with international big names. Physical presence in the market is very important. Cheap labors may become big advantage in Chinese style "e-commerce" models.

In China, before the internet, there was not much network infrastructure. B to B e-commerce in China did not have strong foundation as in developed countries. The emerge of the internet boomed applications of network by attracting individuals rather than corporate users. Therefore, in China it is not necessarily that B to C e-commerce has to start after B-B models are adapted by the society. The network applications leapfrog from business users level to consumers.

Not much different from other media, advertisement revenue is a major income of a website. Yahoo, which generates 85% of its revenue from online advertisement, demonstrates a good example. So a basic revenue strategy, especially in early stage of a website, has to be based on increasing website traffic and consequently online advertisement revenue.

As an interactive media, internet websites can also generate revenue from online commerce commission. However, this may take some time to become the major revenue of a website. Pure e-commerce commission websites such as amazon.com are money loss examples in current stage.

III. Seventy e-commerce websites in China and their models

Survey in Chinese online shopping websites (total 71 sites) by Nov. 1999

Merchandises provided	Electronics	84%
	Books	50%
	Gifts	42%
	Clothes	21%
Payment solutions provided by the websites	Wire through post office	80%
	Pay when delivered	42%
	Wire through banks	27%
	Pay online with credit cards	27%
	Bank account transfer	15%
Delivery solutions	Mail	92%
	Deliver to door	45%

IV. Partial e-commerce model for China market

1. Avoid heavy involvement of delivery infrastructure and transaction infrastructure.

   The development of delivery and transaction infrastructures is out of the reach of internet companies in China. The worst situation is that internet companies input heavily to develop infrastructures that are supposed to be done by the government and other industries. When the infrastructures are not available, e-commerce companies should focus on building up information platform to make that part "e" and seek more physical solutions for delivery and transactions (partial e-commerce models).

2. Take advantage of cheap labor resource in China to combine with electronic solutions.

   Physical solutions in delivery and transaction are not necessarily second best solutions in China since labors are still very cheap in China. For example, in current e-commerce models, the most effective one is to order on line, deliver by labor and pay cash when delivered.

3. Be local and physical to compete with overseas competitors.

   Underdevelopment of delivery infrastructure and transaction infrastructure is a barrier for complete e-commerce model. It also can serve as a advantage of local companies to compete with overseas competitors. Because lot work has to be organized and implemented physically, it makes impossible for overseas competitors to do the work virtually with online solutions.

4. Focus on online advertisement revenue in the early stage. Transfer to e-commerce commission revenue when delivery and transaction infrastructures are more developed.

   Online advertisement revenue is still low in China (little over 1 million USD in 1999) but will grow fast in next few years (est. 17 million USD in 2000). Before e-commerce commissions becomes realistic, online advertisement revenue is the major revenue source for e-commerce websites.

Sessions

Applications

M.1.2 Telecommunications in the Service of Humanitarian Assistance

Monday 31 January, 1100-1230
Location: Tapa II

Moderator:
MOHAMMED HARBI, Head of Strategic Planning, External Affairs and Corporate Communications Units, International Telecommunication Union

Disasters, be it natural or manmade, knows no boundaries. The Tampere Convention on Emergency Telecommunications provides the legal framework for the use of telecommunications in international humanitarian assistance. This panel examines the legal, technical and commercial implications of the Convention, with special attention on the crucial role played by the amateur radio service and the needs of developing countries. The next crucial steps in the application of the Tampere Convention will also be explored.

Panelists:
M.1.2.1
LARRY E. PRICE, President, International Amateur Radio Union (IARU), USA
Disaster Telecommunications: An Example of the Highest and Best Use of the Amateur Radio Service

M.1.2.2
EI SUN OH, Consultant, Working Group on Emergency Telecommunications
A Model for National Pilot Studies in Emergency Telecommunications

Related Sessions
M.1.2 Telecommunication in the Service of Humanitarian Assitance
M.2.2 Case Studies in Educational Telecommunications
M.3.2 Rural Development Strategies
T.1.2 Applications of Telecommunications to Health and Medicine
T.2.2 IT & Telecommunications
W.1.2 Telecom Management
W.2.2 Doing Good Business in the Pacific Hemisphere

M.1.2.3

MARK PRUTSALIS, Systems Integration Manager,
Center of Excellence in Disaster Management and
Humanitarian Assistance, USA

M.1.2.4

G SAADE, CEO, TC2 International, USA


Telecommunications in the Service of Humanitarian Assistance - PTC, 31 Jan. 2000
M. Harbi
International Telecommunication Union (ITU)

Slide 1 of 20

Biography

Mr. Mohamed Harbi

Mr. Mohamed Harbi graduated from French schools and the University of Algiers in radiocommunications and electronics. He began his career in the Algerian Ministry of Telecommunications in the field of Frequency management (1965-1971). In 1972, he joined the Radio and TV Organisation where he was appointed Technical Director in 1977.

In 1981, he joined the ITU Headquarters in Geneva as Director of the Regulation and Engineering Department of the International Frequency Registration Board (IFRB). In 1989, he was elected Member of the IFRB by the Nice (France) ITU Plenipotentiary Conference and was elected Vice-Chairman in 1992/1993.

In 1994, he was elected Chairman of the new ITU / Radio Regulation Board.

In January 1995, Mr. Harbi was appointed Special Adviser to the ITU Secretary General in charge of special tasks (Assistance to Bosnia-Herzegovina, Palestinian Authority, Emergency Telecommunications).

In August 1999, he was appointed Head of the Strategic Planning, External Affairs and Corporate Communication Units of the ITU.

Disaster Telecommunications An Example of the Highest and Best Use of the Amateur Radio Service

Dr Larry E Price

Executive Summary

Disasters continue to plague humanity. Even with the technological innovations which man's ingenuity has concocted, there continue to be a variety of both natural and man-made catastrophes. These range from flood storm, earthquake and fire to the sometimes more devastating famine, civil disorder and revolt against authority. Yet, thankfully, not all of these sad occurrences are accompanied by *communications* emergencies.

This paper discusses the role of the Amateur Services in the restoration of *communications* to assist in the mitigation of the effects of disaster.

Unfortunately, a review of the major natural disaster emergencies clearly indicates that all too often these catastrophes occur in the developing world where the pre-emergency telecommunications infrastructure is, at best, marginal compared to those facilities which are available in the more developed world. Thus, once again, it is a demonstrable fact that the telecommunications **gap** between the two worlds that exists today stands in the way of human progress toward a higher standard of living for all. It is a fact, for example, that more than half the population of the world has never made a telephone call. Therefore, an outage of telephone service has a more severe effect in some countries than others where the disruption of service would hardly be noticed by the average person.

Just as there are two sources of disaster, natural phenomena and man-made occurrences; there are also two ways in which the Amateur Services may be able to contribute to a communications emergency. The first is through the use of their personally owned amateur radio equipment and the second is through the employment of their skills as communicators, forming a cadre of technically trained personnel familiar with the techniques of sending and receiving message traffic via radio. Obviously, these two manner of providing assistance are not mutually exclusive.

-

Definitions

In the field of telecommunications there are a number of cases where "terms of art" may give a somewhat different technical meaning to words than they way we commonly employ those words conversationally. Therefore, it may be useful at the outset to insure that we are all using the operative words in the same way. For example, in conversation the word *"amateur"* might reasonably mean sometime that is done in a haphazard or non-skilled fashion. However, the Latin word root *amator* means a Lover. This in **amateur radio** the practitioners do not lack expertise. Rather, they engage in radio communication because of their love of the radio art and science.

In fact, the Radio Regulations of the International Telecommunications Union (ITU) contain revealing definitions of the various radio services. The ITU is the inter-governmental United Nations Agency which deals with matters related to the technical, operational and regulatory aspects of all phases or radiocommunications. Those definitions provide in **Article S1.56** a definition of what the public often calls "ham radio

> S1.56 *amateur service:* A *radiocommunication service* for the purpose of self training, intercommunications and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

Since the earliest days of radiocommunications, dating back at least to the pre-World War I days, there have been volunteer radio operators using their personal stations to assist others in time of disaster. This usage of radio by amateurs is well documented in many sources and this heritage of yesteryear extends to the present day as we enter the 21st century. These operators are licensed by their respective national authorities after passing an examination about regulations, operations and theory of radio.

The Problem

Disaster telecommunications are generally considered to be the required communications capability after an unforeseen calamity has occurred. There is an initial period of confusion and disruption of normal communications channels due to overloading, power outages, downed lines, fallen towers and similar physical damage. During this initial period, it is important that urgent messages be able to be dispatched and relayed so that competent authorities may be notified of the disaster and that an assessment of the most pressing needs may be made. Relief efforts need to be coordinated and requests for assistance need to be prioritized.

Examples of communications requirements are:

> -damage reporting
> -coordination of evacuations to safe areas
> -rescue operations
> -medical supplies requests
> -cleanup operations

At the same time, these requirements tax the already burdened communications links because of the destruction that may have taken place, the needed personnel that may not be available to staff stations and the typical lack of commercially available power.

It is during this initial phase of the communications emergency, that the amateur service has often provided the first news to the "outside world" of the happening. This is because of the nature of the amateur network. It is a distributed network. It does not have a central control point with the attendant vulnerabilities that go with that configuration. While to the casual observer the amateur network sometimes seems chaotic, it is the lack of centralization that actually provides the strength and almost indestructibility of the network.

However, a census of the population and geographic distribution of universe of amateur radio operators shows that it is closely correlated with the amount of telecommunications development in a nation. While there are some notable exceptions, generally speaking, the more highly developed a country, the more radio amateurs there are. We leave it to others to argue the cause and effect of this fact, for our purposes, we merely note it. Thus, it should be no surprise to learn that the greatest number of licensed amateurs are in Japan and the second largest number are in the United States of America. Most countries of Europe have a fairly large number of amateurs but the countries of the African continent have very few amateurs.

This means that amateur operators travelling to the scene of a disaster to assist in the restoration of communications to facilitate humanitarian aide and relief efforts, need to be able to freely travel across national boundaries without the undue burden of being subjected to unreasonable regulatory barriers in the form of tariffs for the temporary importation of radiocommunication equipment. These relief operators also need to be able to have their operator license qualifications recognized by the host nation they are visiting without unnecessarily cumbersome requirements and fees.

A Way Forward

A number of individuals and they organizations they represent, have long recognized the merit of these arguments and put forward a possible solution. At the very first world conference of the ITU Development sector held in Buenos Aires in 1994, steps were taken to focus attention on this problem and to suggest a partial solution. Following through with important Resolutions in a number of venues thereafter, these efforts were reinforced at several subsequent ITU conferences including the second ITU Development conference held in Malta in 1998. These efforts came together in an intergovernmental conference convened in Tampere Finland in 1998 (ICET) which culminated in a new Treaty. This Treaty provides a setting through which the nations may agree on the certain rights and obligations to pave the way for easier mutual cooperation including trans-border shipment and recognition of radiocommunications equipment and operators.

Unfortunately, while the Treaty remains open for signature in New York at the office of the UN

Secretary General, not all nations have yet chosen to adhere to the terms by adding their signatures as parties.

Important steps that can be taken in the coming months to work toward a solution of the problem outlined in this paper are:

1. Encouragement of all nations to sign the Tampere intergovernmental agreement and ratify their obligations using their national process.
2. Creation of a more favorable regulatory climate in developing nations toward the promotion of a viable amateur service within their own borders.

This latter goal is also the subject of a joint initiative between the IARU and the ITU. A series of courses of instruction for governmental administrators of radiocommunications stressing the important contributions to emergency telecommunications of the amateur service has begun. The first course offering under this joint sponsorship was held in Dakar, Senegal in December, 1999. Pending the evaluation of those results, it is tentatively planned to held several more such courses during 2000 and beyond in not only African nations but perhaps in some developing countries in the Pacific rim as well as there are several appropriate sites where such courses might be sponsored.

One goal of such courses is to show government administrators that amateur networks must be allowed to hold on-the-air training sessions for practice in handling message traffic in a simulation of an emergency condition so that their operational skills can be honed. While in the United States and many countries of the Americas, we may take for granted that the right to so do is an automatic part of the privileges associated with our licenses as amateur operators, in some countries there remain regulatory bars to the handling of messages. These regulatory barriers are likely an archaic remnant of a bygone era when there existed many governmental monopolies on the carriage of telegrams.

-

Conclusion

As we enter the new century, telecommunications seems on the threshold of a new and almost unbelievable era in which wireless access will be a part of our daily lives. The new uses that are being invented by the engineers and scientists are seemingly wondrous and beyond belief. There will be those who put forward the proposition, as there have been with every innovation, that the problem of emergency communications has been solved with the new gee-whiz-bang-whatever. Not so.

Without in any way denigrating these new devices, please remember that man made them and they can and will break sometime. And that breakdown will always occur when least expected and when the resulting communications outage can least be tolerated.

Therefore, there will always continue to be a role in disaster communications for amateurs (that is, those people who do it out of love and dedication) to assist in the restoration of normal communications and to provide news to loved ones of those who are safe and sound. This last feature, known as Health and Welfare traffic, is too often overlooked in "professional" communications which quite naturally caters first to the needs of the injured, is a very important function that the amateur radio service can provide.

Biography

Dr Larry E Price

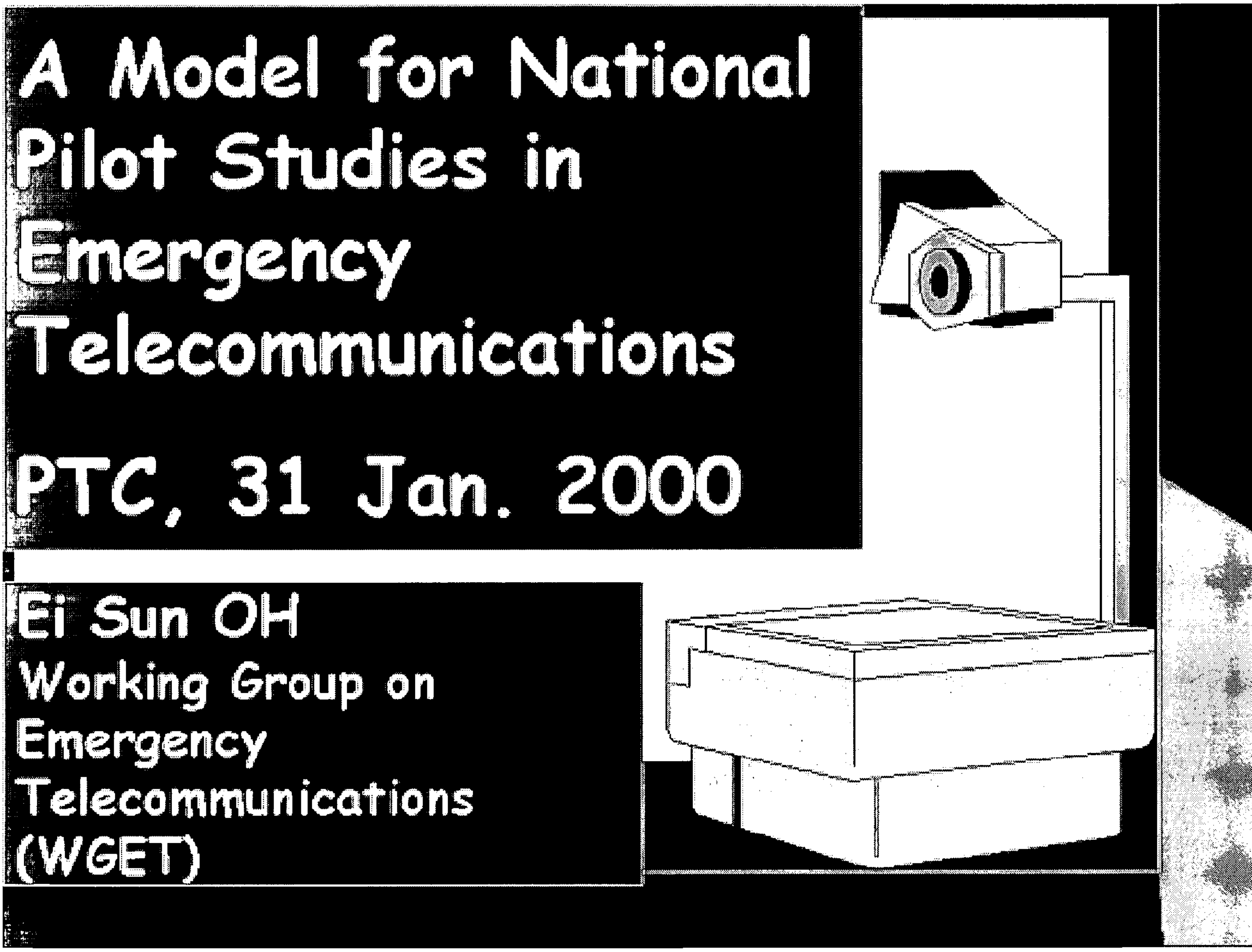
Dr Larry E Price is President, the International Amateur Radio Union (IARU). IARU is a worldwide non-governmental organization (NGO) that represents the interests of the 2.8 million licensed radio amateurs of the world. The Amateur Services (Amateur radio service and Amateur satellite service) are recognized radio services as defined in the Radio Regulations of the International Telecommunications Union (ITU) and operate all over the world in accordance with those international regulations.

IARU is a federation of 146 national amateur radio societies in that number of world nations. In essentially every nation of the world there is a national amateur radio society that represents the interests of radio amateurs within that country. IARU is the umbrella organization providing overall policy guidance and leadership.

A life long radio amateur enthusiast, he is a life member of the American Radio Relay League (ARRL), Inc, the national society for the USA as well as a life member of the International Amateur Radio Club (IARC) of Geneva, headquartered at ITU, the specialized agency of the United Nations for telecommunications. He served as a representative of the Amateur and Amateur Satellite Services at ITU World Radio Conferences in 1992, 95, 97 and 99. He will lead the Amateur Services delegation at WRC-2000 in Istanbul. In addition to work within the radiocommunications sector of the ITU, Price is active in the ITU-D (development sector) and represented Amateur Radio at both the first and second World Development Conferences (Buenos Aires- 1994 and Malta 1998) as well as at the World Telecommunications Policy Forum.

Price earned his doctorate in Finance and Economics following the receipt of an MBA degree. His undergraduate study was in electrical engineering with an emphasis on communications that resulted in the BSEE degree. He is a Senior Member of the Institute of Electrical and Electronic Engineers (IEEE).

Price worked as an engineer on several projects related to the defense industries before taking up academic pursuits. He served as professor and department head in a school of business administration. He is the author of a number of articles on amateur radio subjects. In the field of amateur radio he is an acknowledged expert, holding at one time or another every important leadership post and office within both ARRL and IARU.

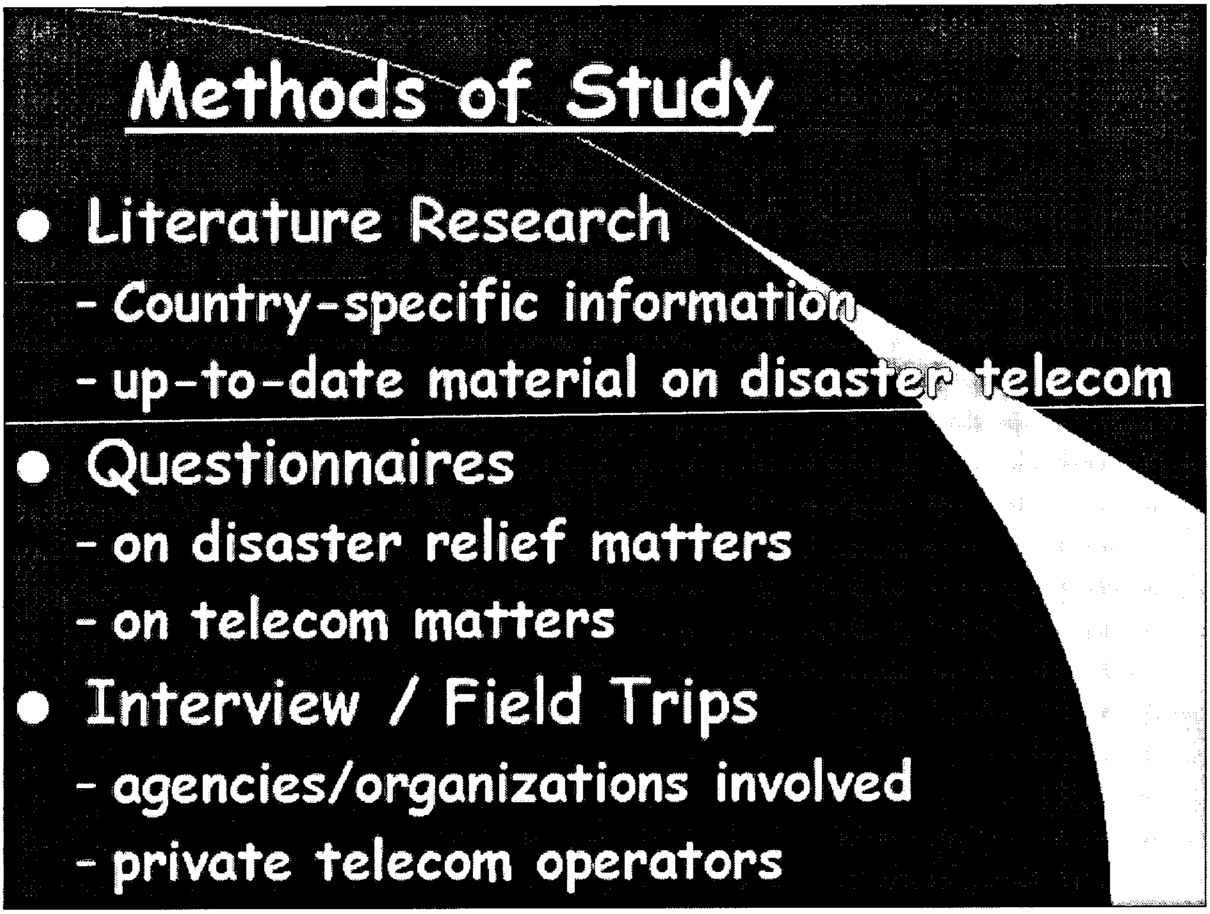

A Model for National Pilot Studies in Emergency Telecommunications
PTC, 31 Jan. 2000
Ei Sun OH
Working Group on Emergency Telecommunications (WGET)

Slide 1 of 18

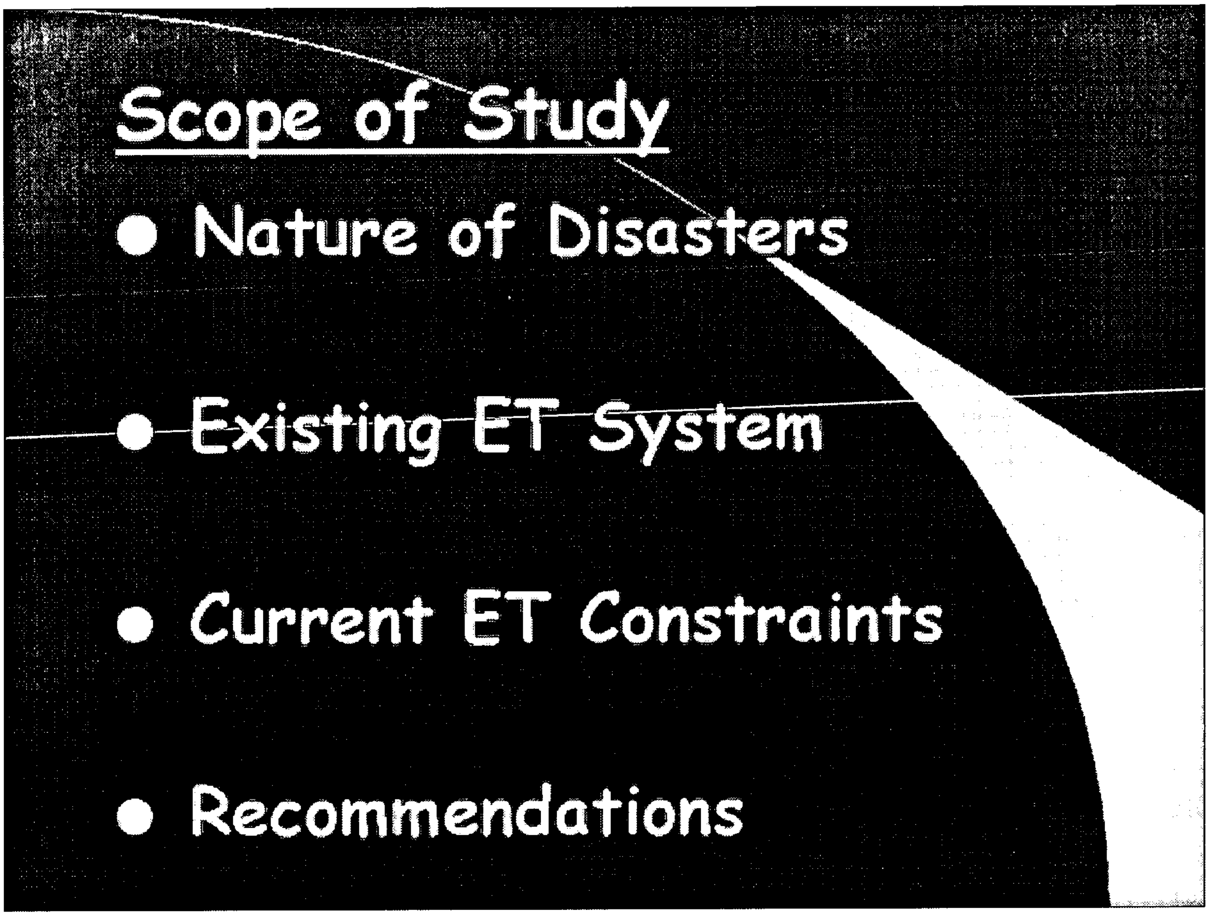
Slide 2 of 18


Partnership
• Ministry of Telecom / Telecom Regulator
• ITU / WGET / UN & its Specialized Agencies
• Private Telecom Companies
• Amateur Radio / NGOs

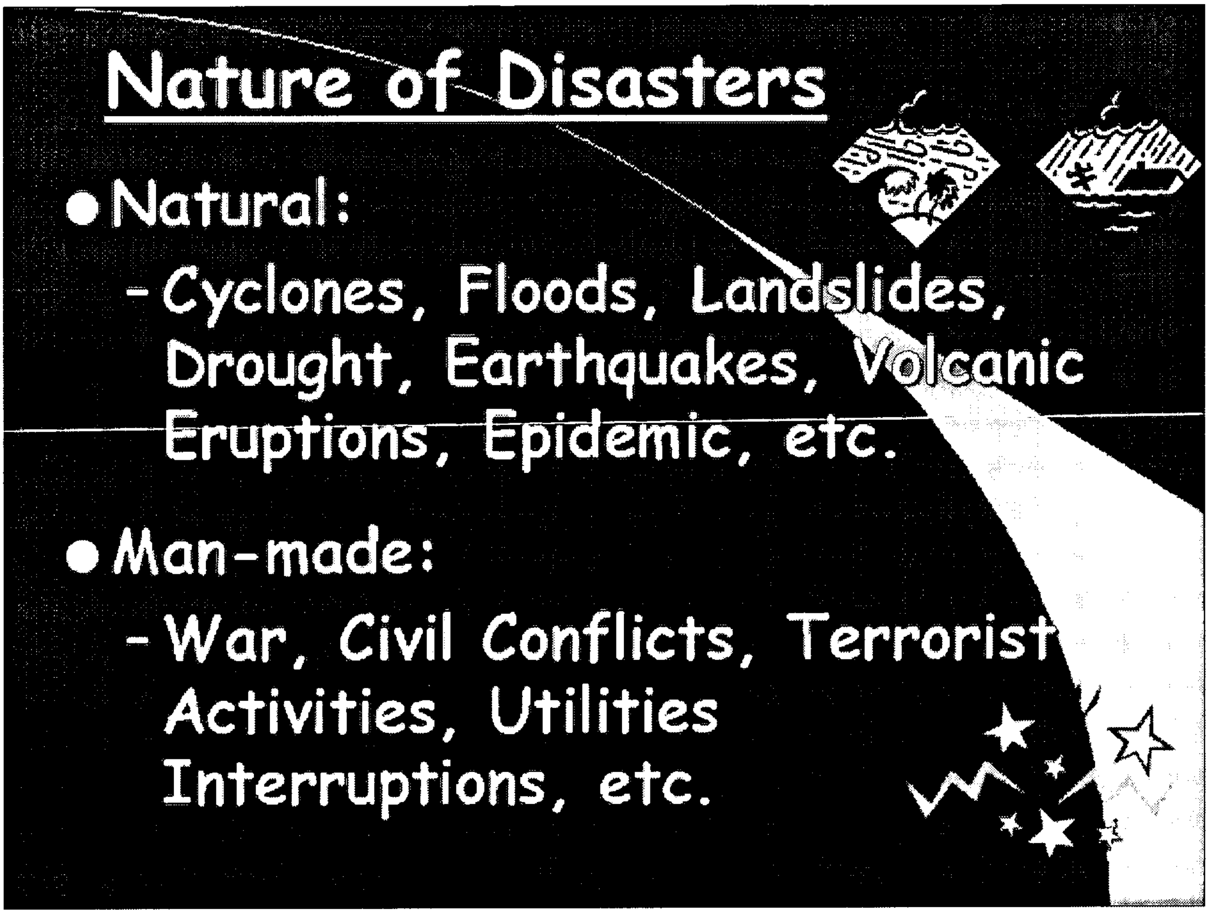
Slide 3 of 18


Methods of Study
Literature Research
- Country-specific information
- up-to-date material on disaster telecom
Questionnaires
- on disaster relief matters
- on telecom matters
Interview / Field Trips
- agencies/organizations involved
- private telecom operators

Slide 4 of 18

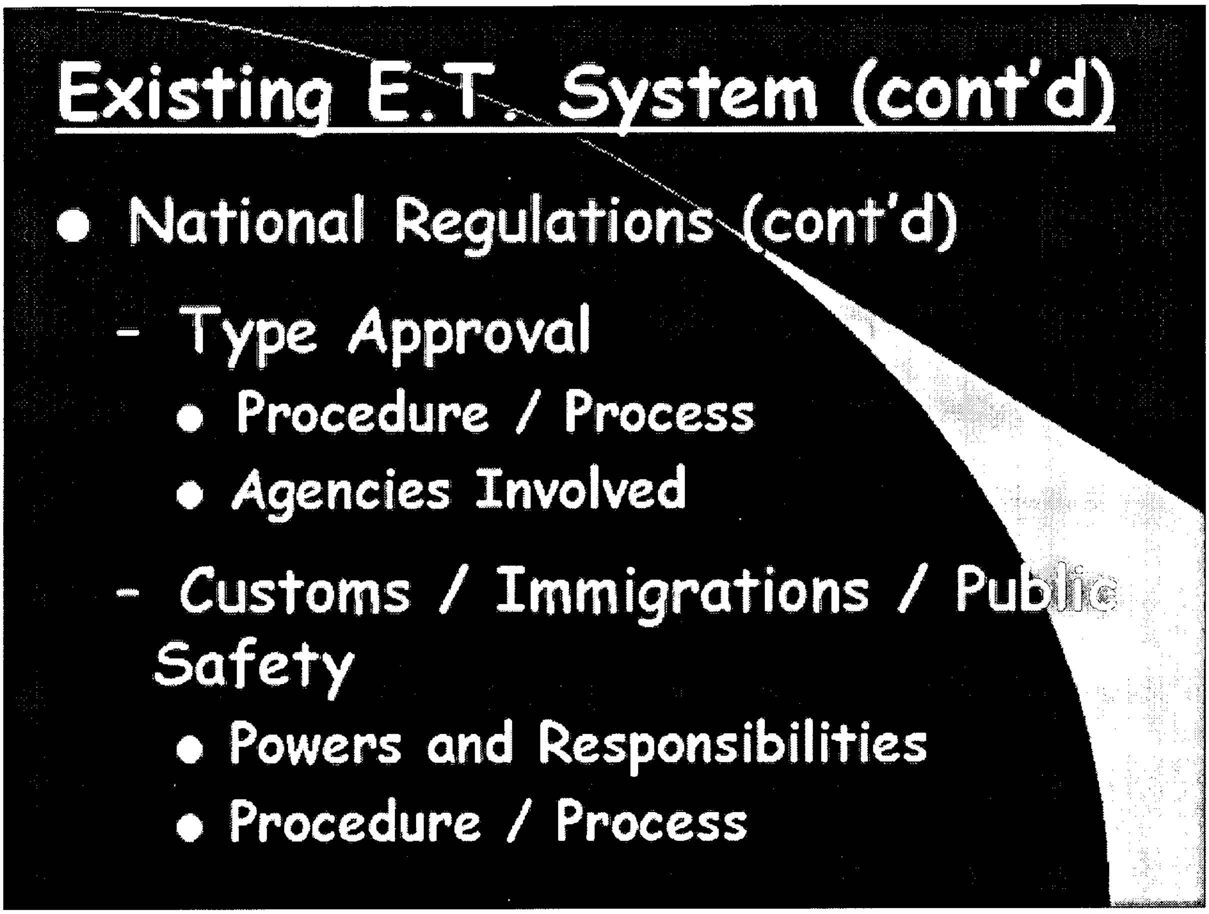

Scope of Study
Nature of Disasters
Existing ET System
Current ET Constraints
Recommendations

Slide 5 of 18


Nature of Disasters
• Natural:
– Cyclones, Floods, Landslides, Drought, Earthquakes, Volcanic Eruptions, Epidemic, etc.
• Man-made:
– War, Civil Conflicts, Terrorist Activities, Utilities Interruptions, etc.

Slide 6 of 18


Existing E.T. System
• National Regulations
– Telecom Agency
• Powers & Responsibilities
• Policy-maker / Regulator / Operator
– Licensing Conditions
• Operators & Telecom Workers
• E.T.-oriented conditions
• Enforcement Mechanisms


Existing E.T. System (cont'd)
• National Regulations (cont'd)
– Type Approval
• Procedure / Process
• Agencies Involved
– Customs / Immigrations / Public Safety
• Powers and Responsibilities
• Procedure / Process

Slide 8 of 18

Existing E.T. System (cont'd)

- E.T. Contingency Plans
  - Availability - Public & Private
  - Details / Specifics
  - Examples:
    - Redundancy
    - Dedicated Lines
    - Rapid Deployment after Disaster
    - Back-up operation center

Slide 9 of 18

Slide 10 of 18

Existing E.T. System (cont'd)

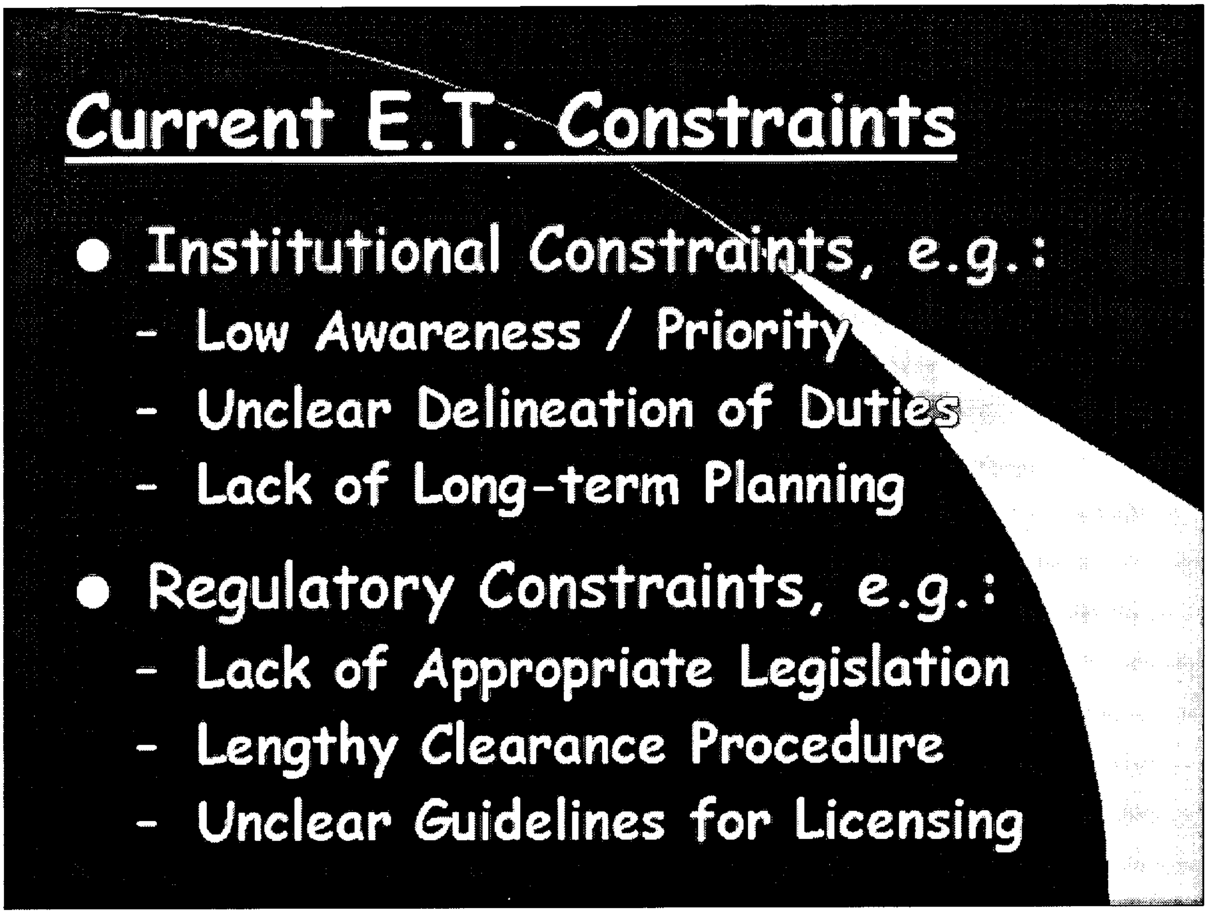
- Overall Disaster Preparedness
  - Plan ?
  - Is E.T. an Element ?
- Public Dissemination of Disaster Information
- Call Prioritization
  - Voluntary or Mandated ?

Slide 11 of 18

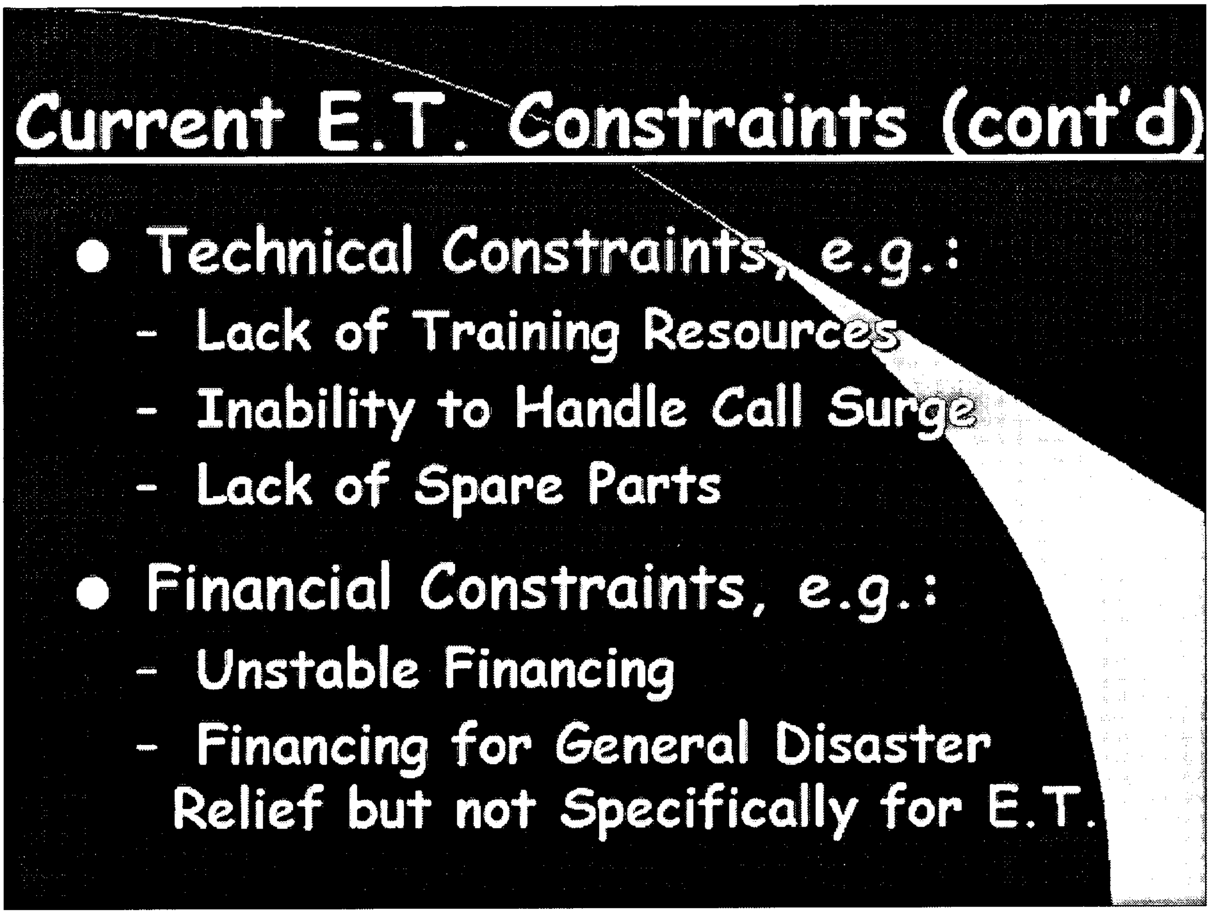
Existing ET System (cont'd)

- Equipment and Personnel
  - Variety
  - Location / Availability / Requirement
  - Training / Retention of Personnel

Slide 12 of 18



Slide 13 of 18



Slide 14 of 18

Recommendations

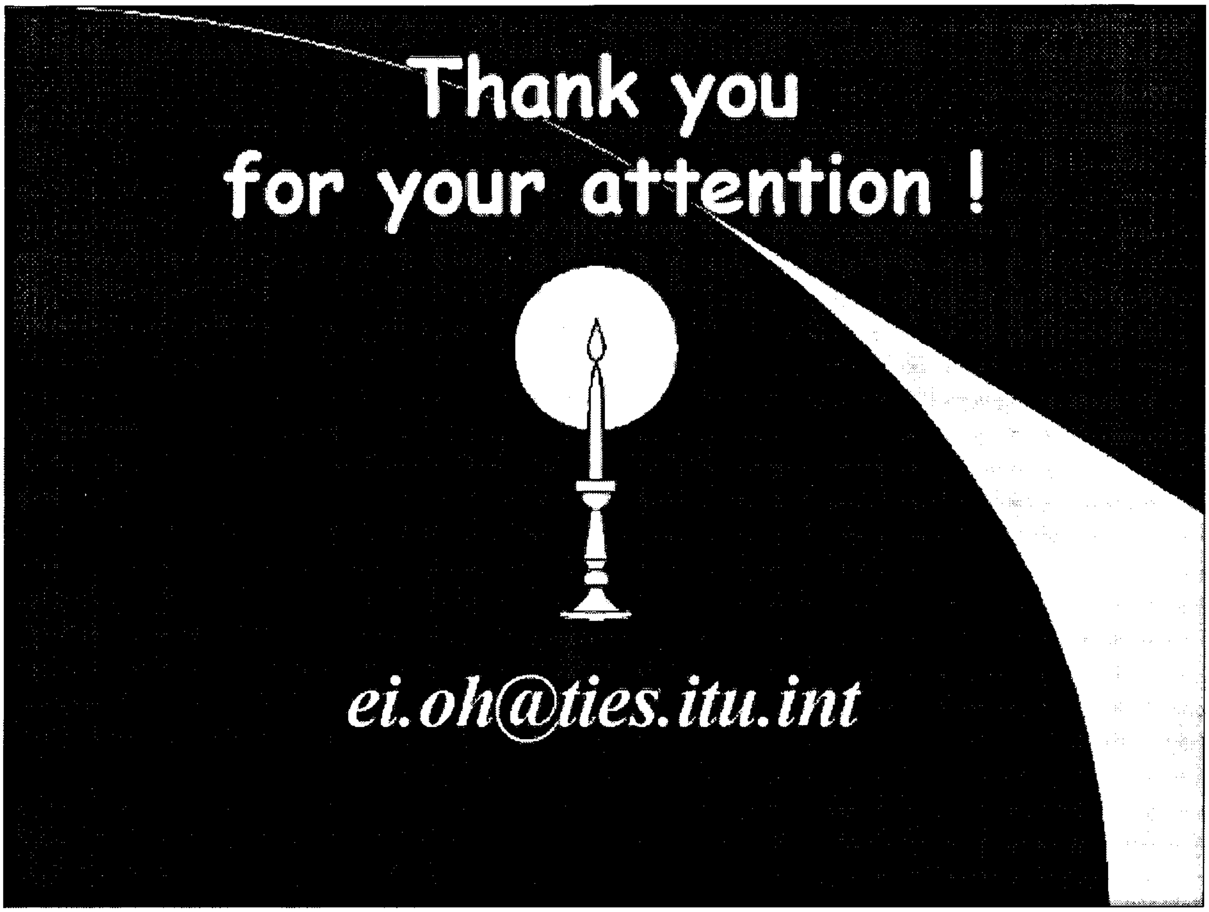
- Institutional - e.g.:
  - Ways for Raising Awareness
  - Clear Delineation of Duties
  - Introduction of Long-term Planning
- Regulatory - e.g.:
  - Model Legislation (e.g., based on Tampere Convention)
  - Clear Guidelines for Expedited Licensing and Type Approval

Recommendations (cont'd)

- Technical - e.g.:
  - Identification of Affordable Training Resources
  - Introduction of Call Prioritization
- Financial - e.g.:
  - Introduction of Innovative Financing Methods
  - Ear-marked Financing Specifically for E.T.

Slide 16 of 18

Slide 17 of 18



Slide 18 of 18

Biography

Dr. Ei Sun Oh

Dr. Ei Sun Oh is the scientific and legal consultant to the Working Group on Emergency Telecommunications (WGET), maintained by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) at Geneva, Switzerland. Dr. Oh represented the United Nations at various international and professional conferences. He was a member of the Drafting Team for the ***Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations***. He also provided strategic planning services to various high-tech companies. He authored articles on subjects ranging from emergency telecommunications and cyber-ethics to turbulent combustion and business management, including "Toward Internet Self-Regulation: A Survey of Ethical Models" (presented at PTC98) and the "To Regulate Or Not To Regulate" chapter of *Challenges to the Network: Internet for Development* (Geneva: ITU, 1999). Dr. Oh received his advanced academic degrees in law, business management, engineering and German from the University of California.

Biography

Mark T. Prutsalis
Systems Integration Manager
Center of Excellence in Disaster Management and Humanitarian Assistance

In June 1999, Mark Prutsalis joined the Center of Excellence in Disaster Management and Humanitarian Assistance (COE) - a US Government funded collaborating center to further civil-military cooperation in humanitarian operations, promote best practices in disaster management, and provide training to governments, UN agencies and NGOs. Mark is responsible for developing collaborative relationships between the Center of Excellence, its UN partners, and other international relief organizations. In particular, he is leading a project to support the World Health Organization's Health Information Network for Advanced Planning, and is working with the United Nations Children's Fund (UNICEF) and other UN agencies to implement a security incident reporting system in field offices around the world. Following the August 1999 earthquake, Mark traveled to Turkey where, jointly with the IBM Turkey office, they implemented a medical commodity tracking system in support of the Turkish Ministry of Health. He recently traveled to East Timor to evaluate the potential for implementing better disaster information management systems to help coordinate UN humanitarian relief efforts there.

Mark's extensive service in humanitarian relief and disaster management efforts began in 1991, when he joined Refugees International, a small non-profit refugee advocacy organization based in Washington, DC. At Refugees International, Mark served as an International Polling Station Officer during the 1993 UN-sponsored elections in Cambodia. In 1993 and 1994, he reviewed assistance projects and reported on the status of humanitarian assistance in areas of conflict, traveling extensively in Bosnia & Herzegovina, and spending months in the Rwandan refugee camps in Tanzania.

After the August 1994 influx of Rwandan refugees into Goma, Zaire, Mark joined the United Nations High Commissioner for Refugees (UNHCR), serving as the regional flight coordinator for the Great Lakes emergency. He was posted initially at the Entebbe logistics base in Uganda, as part of Operation Support Hope's Civil Military Operations Center, and later in UNHCR's Nairobi office. From 1995-1996, Mark returned to Washington to work as a consultant to UNHCR in external relations.

From 1996-1999, Mark was the Emergency Communications Officer for UNICEF, based in New York City. Whilst at UNICEF, he provided remote support to numerous UNICEF offices experiencing crisis, developed procedures for improved management of communications resources during emergencies, and conducted numerous security and communications assessments for oversees offices. In addition, he set corporate standards for telecommunications equipment, and oversaw implementation of "deep field" communications links using radio systems.

In January 1998, Mark oversaw the training of over 50 UNICEF staff in emergency communications procedures during a training exercise in Bamako, Mali. In the spring and summer of 1998, Mark organized two inter-agency assessment and communications assistance missions in support of Operation Lifeline Sudan, seeking to improve communications for staff security and operational effectiveness. Following Hurricane Mitch's devastation of Central America in 1998, Mark again joined an interagency team with colleagues from the World Food Programme to set up a regional communications network for the relief efforts in Honduras, Nicaragua, Guatemala and El Salvador. He also worked with the UN Security Coordinator's office and an inter-agency working group to develop minimum security standards for communications for all UN offices working in insecure environments.

Sessions

Internet

M.1.3 Enabling E-Commerce
Monday 31 January, 1100-1230
Location: South Pacific III

Chair:
DIANA SHARPE, Omega Partners and Chairman, International Telecommunication Users Group (INTUG)

M.1.3.1
A LEE GILBERT, Associate Director, Information Management Research Centre, Nanyang Business School and XU QING, Centre for Wireless Communications, Singapore
The Effect of Fixed Mobile Convergence on E-Commerce Policies: a fin de siecle analysis

M.1.3.2
SUPRIYA SINGH, Senior Research Fellow, Centre for International Research on Communication and Information Technologies (CIRCIT), Australia
Gender Differences in Internet Use and Electronic Commerce

(This session is purposely left flexible for open discussion and interaction)

Related Sessions
M.1.3 Enabling E-Commerce
M.2.3 IP Telephony
M.3.3 Strategies for Financing andTracking the Digital Economy
T.1.3 E-Commerce Strategies
T.2.3 Privacy and Consumer Protection & Government Control
W.1.3 New IP Network Technologies
W.2.3 Development Issues
W.3.3 Content & Culture

Sessions

The Effect of Fixed Mobile Convergence on E-Commerce Policies: a fin de siecle analysis

A Lee Gilbert, Xu Qing

Abstract

This study of the strategic deployment of FMC technologies is based on a case analysis of a prospective entrant into the mature Singapore market, supported by a survey of emergent subscriber views. Our conclusions analyze the implications of FMC in terms of shifting standards, laws, and norms: those rules will that shape the future of the telecommunications industry in the next century.

Introduction

Roughly a century ago, largely unforeseen synergies between the transport and telecommunications industries combined with the explosive diffusion of the Industrial Revolution and transformed the economic structure of Europe and North America.

> "As the century closed, the world became smaller. The public rapidly gained access to new and much faster communication technologies. Entrepreneurs, able to draw on unprecedented scale economies, built vast empires. Great fortunes were made. Every day brought forth technological advances to which old business models seemed no longer to apply. Those who mastered the basic laws of economics survived in the new environment. Those who did not, failed."
>
> Shapiro and Varian, *Information Rules*, 1999

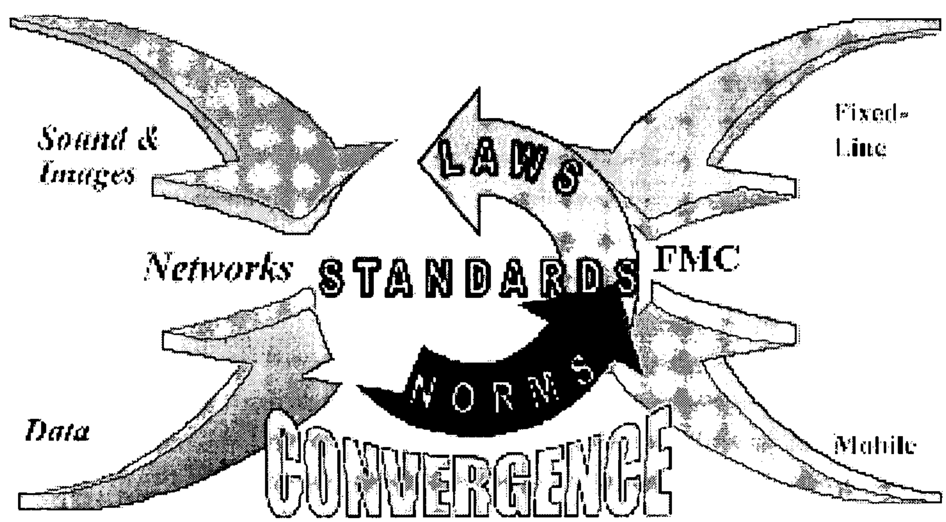
This transformation challenged the governance mechanisms of the era: nations had to learn not only to govern new telecommunications and transport markets, but to respond to the economic power unlocked by tools that enabled corporations so powerful they could dominate national markets. Courts heard cases that presented new conflicts, and developed new doctrines. Law was debated and passed. New bureaucracies emerged to develop and disseminate technical standards. Schools of business emerged to train a new generation according to informal norms that emerged from practice. Law firms organised services to help their clients cope with the new rules of the game. Laws, norms, and standards, by defining what is permissible and what is not, are the rules that establish industry boundaries and shape the behaviour of the firms operating within them [Spur 1999].

The emergence of knowledge-based industries represents a parallel challenge to the policy mechanisms and institutions of our current era. Digital technologies blur traditional boundaries among telecommunications, broadcast, publishing, and computing activities, in ways that obsolete many current rules. For example, new formats transcend copyright doctrine written in an era of static media. The rapid diffusion of cross-border electronic commerce creates radical new policy conflicts. At their nexus lies the accelerating scope of the convergence trend.

But, What is Convergence?

As with most jargon, the meaning of this industry term has evolved. Originally, convergence was viewed as a purely technical issue, a result of introducing digital technology from the computer domain to voice networks, which then used analog switching and transmission technology. This trend blurred distinctions between tasks performed by computers and by networks. By the 1998 PTC conference "Coping with Convergence: The Future is Now!" the scope of convergence had expanded to include new services enabled by digital technology, such as voice mail and delivery of short text messages to paging and handphone terminals. In Figure 1, arrows on the left portray the original meaning of the term, with those on the right representing the trend to FMC. The central ring of arrows represents the impact of convergence on policy, expressed as the rule types introduced earlier.

Figure 1: Interaction among Domains



Today, according to a recent article in the Economist, whose editors see "insurers doubling as banks, banks acting like insurers," the trend extends also to the blurring of industry boundaries. Convergence in global financial services may seem unrelated to recent trends in telecommunications industry. However, nothing could be further from the truth. As banking is a knowledge-intensive industry that has long used public telephone networks to deliver its services to clients, any major change in the functionality, cost, or value of the enabling technology will influence industry structure. For example, some banks now issue handphones to key clients for use in conducting transactions. With adequate local infrastructure and regulation, and programmed to provide adequate privacy and security, these mobile terminals can be linked to computers to provide real-time market data plus the capability to execute various transaction types on an "anywhere, anytime" basis. The global handphone link to a full range of online financial services, via mobile networks and the Internet, is emerging now. Info-, edu- and entertainment, with video screens and MP4.x player chips in 3G mobile terminals, are not far behind. From both the policy and managerial perspectives, current fixed-mobile convergence trends offer lessons for service delivery governance in these new hybrid global industries.

Driving Forces for Convergence

From this broader perspective, convergence results from three long-term trends:

- A shift to global production and markets, enabled by improved transport and communications infrastructure, and facilitated by multilateral political agreements;
- Significant shifts in the underlying economics of international business, due to the interactions among exponentially increasing returns to use accompanying the rapid diffusion of networks, steadily falling computing and transmission costs, and the higher fixed cost structure typical of software-driven innovation; *and*
- Proliferating choice in service configuration whenever analogue circuits are replaced with reprogrammable digital logic with links to online databases.

These trends not only enable the delivery of a supply of converged services, but the need to generate sufficient buyer demand to amortise the considerable fixed costs associated with development and initial implementation of FMC capabilities. These forces interact to shift bargaining power from service operators to customers. This paper explores the potential for such shifts in power to influence the emerging markets for fixed-mobile services (FMC), and identifies the policy implications.

Governing the Promise of FMC

Policy is about rulemaking, of which there are the three main types in Figure 2.

Figure 2: Examples of Rule Types Governing Telecommunications Services

RULE TYPE	NATIONAL	INTERNATIONAL	*SOURCE*

NORMS	**Local User Behaviour:** • Handphone use (by market segment) **Supplier Behaviour:** • Customer care practices	**Global User Behaviour:** • Use of International Roaming Services **Supplier Behaviour** • Use of Internet as Cross-border marketing channel • Use of SMS to influence buyer behaviour in malls	*Society:* *End Users, Suppliers, and Value-added providers*
LAWS	**Licensing** **Frequency Use** **Type approval** **Tax on services**	**Treaties & agreements:** • Frequency allocation • Settlements • Satellite slots	***Public Institutions***
STANDARDS	**Standard operating procedures**: • Billing • Network operations • Security	**Network protocols:** • Transmission • Switching **Commercial practices:** • Warranties	***Private Institutions***

Fixed-mobile convergence (FMC) is a subset of the trends noted above. FMC has the potential to free voice and data communications service subscribers from many of the present geographic and tariff restrictions associated with separate wireline and mobile links. Potentially, business and personal subscribers will communicate with each other and with automated systems through an intelligent network on an "anywhere, anytime, anyhow" basis, using features such as single-number services, integrated voicemail, data messaging, plus value-added data services such as Internet access. Such features can be tailored to the needs of specific market segments: school-age subscribers might desire a low-cost one-number solution that improves contactability, while professionals will select from a wider (and more expensive) range of solutions to meet the demands of their work and social lives. Ultimately, the policy impact of FMC service offerings depends not only on decisions and actions taken by subscribers, service operators, regulators and other stakeholders, but on interactions among emerging technical standards, norms, and legal structures that govern supplier and user behaviour.

Norms are informal, yet they dominate commercial activity. Our expectations that support will be "on-call 24x7," or that billing will be detailed and timely, varies across cultures and eras. Yet, these are major cost elements in a mobile operation. By definition, laws are rules of the state, or in the international arena, rules to which states agree. Laws and norms interact, yet are not congruent: most laws emanate from existing norms, yet certain laws (for example, those limiting the power of monopolies) seek to establish new norms. Unlike norms, laws are explicit and carry with them the threat of force. Standards vary from laws, in that they may originate in private sources, and as they define precise and often technical criteria, are different from norms. The Internet Engineering Task force, whose guidelines and procedures shape the future of global electronic commerce, is a private entity. Standards may acquire the force of law (if adopted by regulators or codified and agreed to among states). These rule domains overlap, and as changes in one domain affect the others, must be viewed as an interdependent system (Spar 1999).

Current FMC technology and service capabilities

Basic fixed mobile convergence takes place at three related levels (Nourouzi 1999):

- **Service convergence**. The ideal is the seamless delivery of fixed and mobile telephony and support service, including billing and customer care.
- **Network convergence**. Fixed and mobile networks that share a common physical infrastructure. This includes converged switches as well as intelligent networks and customer care platforms such as call centres.
- **Commercial convergence**. Resource pooling between functional units or firms. For example, sharing marketing, billing, and customer service capacity.

Once these services are in place, advanced "value-added" services come into play:

- **Multimedia** access, including text, Internet, video and voice; and
- **Data services**, including financial transactions and process monitoring.

The Strategic Context for FMC Service Governance in Singapore

Until the recent privatisation of state-owned telecommunications services, the Telecommunications Authority of Singapore (TAS) served both as operator and governing body. In 1992, Singapore Telecom (ST) became (albeit briefly) a monopoly operator, while TAS now regulates local postal telecommunication and services. TAS monitors telecom operators (including Internet service providers) and equipment suppliers in terms of price, service quality and equipment type approval.

TAS has full powers to grant, modify and suspend licenses to operate in Singapore, and has issued two basic services licenses, three for mobile services, and four to ISPs. ST, directly or through subsidiaries, holds one license of each type. New entrants, admitted following market liberalisation, hold the other licenses.

Liberalisation of the Singapore Telecommunications Market

Government policy is governed by a perception that the small island-state's economy depends heavily on the quality and capacity of its telecommunications services. The government liberalised its small market relatively slowly, beginning with privatisation (to ensure that ST had adequate access to capital for expansion), and only then admitting consortiums of local and overseas companies. Today, government-linked companies own substantial shares of the operating consortiums, while foreign members provide capital, management, and technical expertise.

In May 1995, TAS issued a license to operate mobile voice and paging services to the MobilieOne (M1). Simultaneously, TAS issued new paging licenses to M1, ST messaging and Hutchinson Intrapage. In 1997, TAS called for tenders for new license applications from one basic service and two mobile providers. Starhub won licenses to start basic and mobile service in 2000. TAS recently announced its intention to award additional ISP licenses, and plans further liberalisation in 2002.

Figure 3: Singapore Telecommunications Industry Profile (end 1998)

No. of main lines	1,716,300
Teledensity	54.25 per cent
No. of main lines added (1998)	56,000
Residences with multiple lines	12 per cent
No. of cellular subscribers added (1998)	277,000
No. of cellular subscribers (penetration)	1,020,000 (32.3 per cent)
Cellular service revenue	$441.83 million
No. of paging subscribers (penetration)	1,392,000 (44 per cent)
No. of Internet subscribers	360,000

Source: Pyramid Research

Singapore is relatively mature from both technological and market perspectives. ISDN has been available nationwide since 1989. Switching and transmission in all 27 exchanges were 100% digital by 1994. ST expects further growth in direct lines to come from demand for Internet access, and is actively promoting use of second lines in the home. Mobile penetration has taken off, from 9.8% in 1995, to 24% by December 1997, then to 32% within the next year, and is projected to reach 1.5 million by the year 2001.

Singtel Mobile (SM) has extensive cellular mobile experience: the firm started analog mobile services in 1988, introduced GSM 900 in 1994, and GSM 1800 the following year. Roaming is available to 100-plus countries on GSM 900 and 7 major countries on GSM 1800. SM currently its legacy analog mobile systems (but accepts no new subscribers) and will close its ETACS network and upgrade these customers to digital services by 2000. To boost its underutilised GSM 1800 network, SM recently introduced dual band GSM 900 & 1800 service. SM supports its mobile networks with 600-plus people and more than 800 base stations.

Data Services

Singapore Telecom (ST) provides both voice and data services. ST provides Local and International Leased Lines, Video Conferencing, Frame Relay, Packet Switching and VSAT data services. ST also provides International Virtual Private Networks and island wide ADSL coverage. Its Magix program, which enables subscribers to surf the net at speeds of up to 5.5 Mbps, provides access to multimedia services, including video-on-demand, games, news and music, and access to e-commerce on the Singapore One broadband network.

From 1985 to 1994, only academic researchers had Internet access. The public gained access in 1994 through Singnet, a 100% owned Singapore Telecom subsidiary. Two Internet service providers, Pacific Internet and CyberWay, compete in Singapore with Singnet. Of the 360,000 Internet dial-up subscribers at the end of 1998, ST and Pacific Internet shared more than 80%, with CyberWay a distant third.

Market Entry of MobileOne

M1 was formed in 1994 and won its mobile license in 1995. Its consortium combines government-linked companies (Keppel Group and the SPH publication group each own 35%) with two overseas telecoms firms (the remaining 30% is owned equally by Cable & Wireless and Hong Kong Telecom). With the trial as a springboard for its April 1, 1997 GSM 900 network launch, M1 soon captured 10% of the market. By end 1997, its market share reached 20%, and approached 30% the following year. M1 established a parallel CDMA network and paging services in mid-1998.

M1 is maintaining its growth rates, and showed a profit from its second full year of operation. The current strategy focuses on enhancing existing systems, expanding its subscriber base, and building strong customer relationships through service quality management. Both SM and M1 subsidise mobile terminals to attract new subscribers. Now, facing the imminent market entry of Starhub, both carriers have accelerated efforts to attract first-time subscribers. M1 is popular with young first-time subscribers, and currently operates only in Singapore.

Current situation-FMC

ST offers Singapore's pioneer FMC-based services. Its new PhoneNet offering is the first service in Asia to extend the office phone system to a hand phone. However, it may be awkward for ST to build and deliver a full range of basic FMC services. First, its legacy switches and all-digital network are not yet configured for FMC. Second, its administrative systems and customer care culture are not well-positioned to meet the demands of the FMC mission, while its entirely separate mobile and fixed line marketing and service management infrastructures may need broad restructuring.

Taken together, these factors mean that it will be very expensive for ST to fully deploy FMC, and that its progress in delivering FMC services is likely to be far slower than for an experienced new entrant. Over the longer run, ST may be able to deploy its strengths in multimedia to organise and deliver more advanced converged services such as mobile Internet access and data services. This would support a differentiation strategy focused on high value-added segments of the FMC market.

M1, with no fixed lines to integrate, is in an even more difficult position. While it may prefer to sustain its current cost leadership role, its competitors may be able to leverage scale economies in marketing and customer billing activities. This, combined with the capacity increase accompanying the Starhub entry into the mobile market, will tend to erode its current margins. Unless TAS policy changes, there is no path to FMC for M1 until new fixed-line licenses are allocated in 2002.

Case analysis

Formed in 1997, the Starhub consortium integrates the considerable resources of two local government-linked companies, Singapore Technologies Telemedia (STT) and Singapore Power (SP) with two global telecommunication giants, Nippon Telegraph and Telephone (NTT) and British Telecommunications (BT). The new firm announced that it sought both fixed and mobile licenses because it expects demand for seamlessly integrated communications services [Telecom & Wireless Asia].

STT (holding a 34.5% stake) is the telecommunication arm of diversified Singapore Technologies (ST) a local conglomerate with interests in technology, engineering, infrastructure, property and finance. Its wide-ranging ITC interests, estimated at S$800 million, include cable television, Internet, mobile data, mobile satellite, paging, GSM cellular services, satellite uplink/downlink and trunked mobile services. STT also provides local market knowledge. Despite a late start, its ST SunPage managed to capture more than 120,000 Singapore paging customers.

SP (with a 20% stake) is a utility and energy monopoly owned mostly by the government. Its core business is delivering electrical power and piped gas to domestic commercial and industrial consumers. Aside from financial strength, SP contributes its customer billing and on-line customer support system, plus local experience and capability in serving a large customer base. Over the years, SP has invested extensively in a world class power supply infrastructure in Singapore, and its national network of power ducts, well distributed substations, and accurate geographic information system facilitate low-cost access to its large customer base, especially in the Central Business District [Singapore Power Press Release].

NTT provides local and long distance services to more than 60 million residential and business exchange lines in the Japanese telecommunication market through a modernized and largely digital network. With a market capitalization of about US$150 billion, NTT has invested heavily in overseas carrier businesses, mostly in Asia. With Starhub, NTT aims to strengthen its position as an innovator and develop leadership in multimedia services through tie-ups and joint research projects with its partners. NTT brings knowledge of an emerging mobile standard (W-CDMA) that provides voice, high-resolution video, Internet connections, and fax transmission at speeds of up to two megabits per second. Arcstar, a global network connecting several hundred cities around the world, is another important asset.

BT is a major global player with a market capitalization of about US$40 billion. To date, its Family of Alliances includes12 telecommunications companies as partners, plus 20 distributors and 14 equity joint ventures such as Starhub. In its UK home market, BT delivers local, long distance and international telecommunications services to more than 27 million residential and business exchange lines through a fully modernized and largely digital network. Concert, a global network owned by BT, provides large capacity links to 1000 cities worldwide.

With ST a firmly entrenched incumbent, and M1 its low-cost competitor, Starhub must shape its strategy to occupy multiple niches and avoid being "stuck in the middle." Over the long term, E-commerce may provide one such opportunity. Over the short term, the key task is to attract and retain adequate market share. This requires an understanding of the expectations held by its target subscribers.

End User Perceptions of FMC

To tap subscriber perceptions of the emerging norms for FMC-enabled services, the authors collected data from a panel of 96 respondents. While these questions covered a wide range of issues, available space permits discussion of only two questions, below:[1]

QUESTION 1: On a scale of 1-5, how important to you as an individual user are these telecommunications features that may result from evolving fixed and mobile services?

Rank	Benefit Description	Mean
1.	Improved convenience	4.4

2.	Lower costs overall	4.4
3.	Improved mobility	4.2
4.	One point contact	3.9
5.	One number rather than two	3.6
6.	One phone handset rather than two	3.5
7.	One phone bill rather than two	3.5
8.	One voicemail rather than two	3.4
9.	One stop shopping	3.3

COMMENTS: The respondents in this sample, whose demographics are reasonably parallel to a typical handphone subscriber, desire both improved convenience and lower cost. They appear less interested in simplified billing and single number/single voicemail features. However, the local market launched simplified FMC services only recently, so few respondents had actual experience with FMC features.

The next question compares user and supplier ranking of various FMC functionalities or applications that might be included in subscriber packages:

QUESTION 2: on a scale of 1-5 indicate how likely you are to adopt the following products (if available in your country at affordable rates) at home and your office within the next 3 years:

Market:	Residential		Business	
Service Description[2]	Users	Supplier	Users	Supplier
High Speed Mobile Data	3.6	2	3.8	3.5
Internet Voice Telephony	3.6	1	3.6	1
Mobile Internet Access	3.5	2	3.6	4

IP-Based Data Services	3.4	2	3.8	4.5
One Voice mail	3.5	4	3.6	3
One Number	3.7	3	3.4	4
DECT/GSM	3.6	4	3.2	4
Short Message Services	3.4	2	3.4	3
Medium Speed Mobile Data	3.3	1	3.3	3
Mobile Virtual Private Network	3.1	1	3.4	3.5
HomeZone/CityZone	3.1	2	3	3.5
Other/don't know	3.2		3.6	

COMMENTS: The menu included five basic services that are part of the FMC portfolio, plus six value-added data and Internet access services. Independent of cost, users reported a clear preference for the more advanced services, versus basic FMC services. However, response patterns also revealed that few users had clear expectations for FMC packaging and pricing norms, so preferences may shift as norms emerge for such services. The supplier, with far more knowledge of FMC, perceived demand norms for FMC services rather differently. For example, users consistently rated VOIP and data access services higher than did suppliers. While this exploratory study must be treated with caution, it suggests that operators may do well to integrate FMC with value-added Internet access-based services.

Conclusion

Convergence describes the use of digital logic to bridge service delivery gaps among communications and computer technologies. Fixed-mobile convergence (FMC) is a subset that frees voice and data services from many current geographic and tariff restrictions, assuming that regulators actively work to enable this promise.

The convergence pattern in the telecommunications, computer and media industries is driven partly by interactions among behavioural factors, such as rapid Internet growth, rising demand for bandwidth, increasing use of mobile computing (e.g, PDAs), and killer applications (Chan 1999). Yet, economic forces are also in play. Mobile market revenue increases at an average rate of 31%, compared to a fixed line revenue growth of 9% from 1996 to 2002, while the mobile market share of total global revenues is expected to increase from around 13 to more than 30%. Emerging Bluetooth, G4, and WAP standards will combine with new business rules to transform the structure of many industries that rely on telecommunications.

The Starhub case study, focusing on FMC as a source of operational cost savings and product differentiation, also highlights immediate gains from avoiding investments in legacy technology. Rollout of the new Starhub system in the mature Singapore market is only a few months away: FMC services must meet user needs from the beginning, then rapidly adapted to respond to evolutionary changes in user preferences. The case also reveals the complex integrated network of global and local resources needed to support an FMC-based entry strategy. Starhub acquires a sophisticated subscriber base through its acquisition of Internet service provider Cyberway, and can later integrate voice and data services. This is a high-margin arena in which successful FMC experience is a source of competitive advantage.

The end user survey reveals that while few subscribers are aware of FMC's potential for service improvement, they see its functionality as a path to higher quality of life, with an expectation of lower total costs for FMC-enabled services. The immediate challenge for service operators is to understand what subscribers expect from the new generation of telephone services enabled by FMC technologies. In market segments where voice is the main service, one critical task will be to design packaging and pricing so that perceived cost and value are well aligned. As the informal norms that guide such patterns are likely to change rapidly during the early stages of FMC diffusion, it will be necessary to monitor subscriber demographics and their expectations carefully over time. Because they can establish the use of FMC services as the norm, large corporations are an obvious target market. Yet professionals and smaller firms seeking enhanced contactability and better costs control are likely to be segments in which FMC provides a source of differentiation. Here the normative use of FMC will be more difficult to establish.

To ensure rapid take-up of high-margin FMC data services, the strategic task will be to develop alliances with service industries that intend to deploy mobile networks as a service delivery mechanism. Here, FMC has the potential to serve as a source of sustainable competitive advantage for these alliances. Services that are imbedded into a SIM card will increase switching costs for customers with complex requirements, thus increasing both customer loyalty and operator margins.

From a policy perspective, convergence trends enable the era of interactive multimedia content, delivered over broadband mobile and fixed networks. From the view of the highly developed US market, former FCC Commissioner Rachelle Chong defined this as "convergence of the communications, information and entertainment industries." But whether we view convergence from the technological, content, or industry perspectives, it is clear that the combination of convergence and commerce will generate new rules across the boundaries of every domain it touches.

This blurring effect makes it difficult to formulate sound policy. Clearly, e-commerce shifts the geographic markets boundaries. Less obviously, its economic effects, increasingly derived more from returns to use than from economies of scale, alter industry structures. Convergence crosses traditional knowledge boundaries: information management, telecommunications, and computing experts have different models, language, and research agendas. Thus, predicting interactions among the many enabling technologies is difficult. Similarly, understanding the likely effects of convergence at the industry level proceeds slowly, partly because communications researchers focus mainly on broadcast and print media, and few collaborate with multimedia or market researchers. Further, many convergence issues cut across traditional policymaking venues. Even in a country as small as Singapore, resolving any major policy issue related to mobile e-commerce would bring at least three ministries and several government-linked corporations to the table. In the global arena, some e-commerce issues involve the ITU, others the WTO, while many simply fall between cracks in the structure. In the case of FMC, it is clear that as the neither the technological standards nor the behavioural norms have stabilised, it is premature to draft new laws. However, it is not too early to monitor emergent rules in these domains, to map these to current policies to identify laws which may need to be altered in the future, and to encourage field trials to accelerate learning.

References

Chan, T; "The future according to@," *Telecom Asia*, June 1999, pp. 69-72
Dogar, Rana; "Europe's Got Net Fever, *Newsweek*, 6 September 1999, p. 30.
Nourouzi, A; "The Key to Convergence," *Asia-Pacific Telecommunications*, June 1999, pp. 17.
Pyramid Research, "Market Research Report," *Asian Communications*, May 1999, pp. 65
Shapiro, and Varian, H; *Information Rules*, Harvard Business School, Boston, 1999.
Symonds, M; "The Net Imperative," in Survey of Business and the Internet, *Economist*, 26 June 1999.
Whitmore, S; "Meeting the Need for Speed," *Asiaweek*, 3 September 1999, p. 32.
Xu Qing, et al; *Fixed Mobile Convergence in Singapore*, unpublished MBA dissertation, Nanyang Business School, Singapore, December 1999.
___________, "Singapore's Telecom Market - Winning Bids Announced," *Asia Intelligence Wire: International Market Insight Report* 05/06/98
___________, "Singapore: Effective and Sustainable Competition Through Phased Liberalization," *Telecom & Wireless Asia*, 27/05/98.

Appendix: FMC service definitions

Cordless/mobile (e.g. DECT/GSM). This service allows a personal handset to act as a cordless at home or office (paying only fixed-line charges), and a mobile phone (paying airtime fees) when the user exceeds the home/office base station range. Users may subscribe both to fixed and mobile lines, but carry only one handset.

HomeZone/CityZone. Related to the above, this service bills mobile calls at tariffs that depend on user location. Thus, a mobile number linked to the home or office can take the place of a fixed line number.

Fixed/Mobile Virtual Private Network. This service provides closed user group facilities to allow employees or family members at any location (office, site, home etc) to communicate with one another using mobile phones as though they are PABX extensions. This requires short dial codes and low tariffs for calls to other sets within the user group.

Single telephone number for fixed and mobile service, This service allows calls to a specific number to be diverted automatically either to your mobile phone or your fixed phone depending upon your preference and current location.

One voice mail service for fixed and mobile service, This allows voice mail received at multiple numbers or extensions to be retrieved from one storage account.

Medium speed mobile data access, This services allows using mobile phones to access data services at speeds (with GPRS) eventually approaching 384 kbps. Even at 56 kbps, this provides adequate mobile access to text-based files. This enables applications such as share trading from mobile terminals.

High speed mobile data, Currently uses a 3rd generation mobile standard (e.g. W-CDMA) to provide bandwidth of 1Mbps or more. This will enable mobile access to image files.

Internet voice telephony. VOIP service allows voice calls over the Internet. This typically provides cheaper rates, although at a lower quality than normal PSTN services.

IP-based data services. Used by operators to provide special grade data lines at a lower cost using IP (Internet Protocol) packet switching. Some operators are now using this technology to offer cheaper, lower grade services for fax communications.

Mobile Internet Service, the use of mobile phone services to access the Internet. This uses the mobile phone as a terminal, or to guide a server to access the Internet and retrieve or transmit data. This enables applications such as mobile e-mail.

Short Message Service, allows mobile phone users to send and receive short data or text messages.

Other mobile data services include miscellaneous services (for example to provide links between laptop/palmtop computers and other remote or mobile devices).

Endnotes

1 Survey data collected by Xu, et al, in 1999. Interviews conducted in Singapore by authors.

2 Please see Appendices for detailed definitions.

Biography

A Lee Gilbert

Born in the USA, Dr. Lee Gilbert began his international career as a *senior consultant* for **SRI International**, and later served the **Institute of Systems Science** *as Deputy Director*, **Harvard Business School** *faculty as Future Information Systems Fellow*, the **UN Secretariat** *as Regional Adviser for Technology Transfer and Development,* and **Nanyang Business School** *as Director of its MBA (Management of I.T.) programme*. Professor Gilbert's research and teaching at IMARC addresses technology policy and electronic commerce. He assists varied private and public sector clients throughout the world to integrate computing and telecommunications solutions to business problems.

Xu Qing

Born in Fujian, China, Miss Xu received her Telecommunication Engineering degree from the Nanjing Institute of Posts & Telecommunication in 1991, then worked as an engineer in the telecommunications (**Fujitsu**) and computer (**Apple**) industries before joining the Business Development Group at the **Centre for Wireless Communications** in Singapore. She is now completing her MBA at the Nanyang Business School.

Sessions

Gender Differences in Internet Use and Electronic Commerce

Supriya Singh

Abstract [1]

Women use the Internet and electronic commerce at home less than men, though the gap is fast being bridged. This paper focuses on gender differences in the use of the Internet at home as seen from the women's perspectives. The paper's frameworks are global. However the available data that are most closely examined relate to Australia. It finds that women generally use the Internet as a tool for activities, rather than a technology to be mastered. Women prefer personal and contextualised information. If men and women's use of the Internet is seen as a continuum, then women are more on the "tool" side rather than play; more on the side of personal rather than impersonal communication. This is why women farmers use the Internet and Internet commerce more extensively than their farmer husbands or women generally in Australia. Women farmers use the PC, financial software programs and the Internet for their traditional roles of book-keeping and information gathering.

In studying use, it is also important to note that email is changing the nature of personal communication by making for more frequent conversation which straddles the boundaries of spoken and written communication. The electronic management of money through the use of personal financial management programs, such as *Quicken* and *MYOB,* also has the potential to concentrate control of money with the user.

The growing domestication of electronic commerce means that women have to be at the center of design and policy. This means a greater focus on the activities that technology makes possible, rather than the technology itself. It means a greater reliance on a mix of communication channels and designing for changes in the nature of the activity.

Keywords: gender, domestication, Internet, electronic commerce, Australia

1. Introduction

Isobel, 36, sounds like an e-commerce commercial when she describes how she and her husband bought a second hand car online. "We went through 'The Age' and we just did a search for the car we wanted and the price range we wanted and it came with about 20 alternatives. It was a private sale. We phoned and asked the fellow all about it and got someone in Melbourne to have a look at it for us." They went to Melbourne from their farm and purchased it overnight. "So it was as quick as that," she says.

Isobel [2] is not unusual for a farmer. However, the general pattern is that it is the men who are still more likely to be on the Internet at home than women. The gap is fast being bridged as the Internet becomes domesticated. There remain important differences however in the ways women and men use the Internet.

In the second and third sections, I focus on the relationship between the domestication and the feminisation of the Internet, through an examination of available quantitative data. In the fourth section the differences in men and women's access and use of the Internet and electronic commerce at home are explored through open-ended interviews with a snowball sample of 30 middle-income women in Australia. All of them have access to the Internet at home. Eighteen of the 30 women are from households where goods and services have been ordered and purchased over the Internet. It is a grounded qualitative study. The data were analysed with the help of NUD*IST, a program for qualitative analysis.

The focus is on women and the way they communicate with different people for various activities. Within this user and activity perspective, the questions explore the way women use the Internet and other communication channels and services to seek information, communicate, work, shop and pay for goods and services. The qualitative study of Internet use focuses on women's perceptions of Internet use. The conclusions are not generalisable, but aimed at generating greater insight into the nature of gendered use of the Internet within one culture.

In the fifth section I show how the Internet and electronic commerce is changing the nature of personal communication and domestic money. In the sixth section, I place the discussion of the gendered use of the Internet and Internet commerce within the wider discussion of gender, communication and technology. In the seventh and final section I consider the implications of this study of Internet use from the users' perspective for effective design and policy.

2. Gender and Internet Use

The gender gap between men and women's access to the Internet at home is narrowing. In the United States, women grew from 33 per cent as a percent of total users in 1996 to 49 per cent in May 1999 (eMarketer, 17 May 1999). The US picture where women's access to the Net is growing at a faster rate than men's access is replicated in Australia. Overall, the latest international data show that there are more men than women accessing the Internet (See Table 1).

Gender and the Profile of Internet Users - International Comparisons

Country	Males %	Females %
United States (May 99)	51	49
Australia (May 99)	54	46
Singapore 96 (at home)	72	28
Europe 98	78	22

Japan (Dec 98)	83	17
China (July 98)	93	7

Table 1

Sources:

Australian Bureau of Statistics (1999) Use of the Internet by Householders. Australia, May 1999. Catalogue no. 8147.0. Canberra: Australian Government Publishing Service.

CNET News.Com: China Net use exploding. http://www.news.com/News/Item/0,4,24114,00.html (consulted 22 July 1998).

CommerceNet: The CommerceNet Research Center World Wide Statistics. http:/www.commerce.net/stats/wwstats.html (consulted 10 July 1998)

eMarketer, 17 May 1999. eStats: 64.2 million U.S.Adults Online Monthly. http://www.emarketer.com/estats/051799_642mil.html (consulted 19 May 99)

National Computer Board: IT Household Survey Report. 1996. (1997). http://www.ncb.gov.sg/ncb/press/1996/hholds.html (consulted 30 November 1999).

Nikkei AsiaBizTech (1999). About 40 pct of New Internet users in Japan are Women http://www.nikkeibp.asiabiztech.com/Database/1999_Jan/13/Mor.04.gwif.html (consulted 1 July 1999)

The pattern of Internet access in the home is mimicking the career of the telephone (in an accelerated way), where the technology starts off as being male dominated, but then becomes more evenly gendered. Carolyn Marvin (1998) in her fascinating study of the use of the telephone showed how, when the telephone was new and seen as a male communication tool, the 'correct' way of using electrical communication was with brevity and efficiency (p. 21). Women who wanted to have long conversations on the phone, were seen to suffer from "electrical ineptitude" (p. 24). Women were excluded to the extent, that technical ignorance was a virtue of the "good" women (p. 22).

As a technology gets domesticated and feminised, gender differences are seen in the use of the technology rather than access. Publicly available data on gendered Internet use are thin, concentrating mainly on quantifying reasons and frequency of use. This is partly because the technology in the domestic context is still new and in the early stages of domestication. Unlike the telephone, TV and the radio, the majority of the homes do not have the Internet. The PC and the Internet have also not reached the stage where there are multiple and personal access points in the home, as has happened with the older media. The focus on the diffusion of the Internet is still on the implications for the market rather than its social effects.

Australian Bureau of Statistics (ABS) data on extent and frequency of use show that more men than women use the Internet at home. In May 1999, 19.8 per cent of males over the age of 18 used the Internet at home compared with 14.3 per cent of females (ABS, 1999b). Men also use the Internet more frequently at home (Table 2).

Frequency of Internet use at home by gender, Australia, 1998

Frequency	Males	Females
Daily	32.40%	27.85%
2-6 times a week	41.07	34.11
Once a week	17.53	18.86
Once every two weeks	2.30	6.42
Once every month	5.01	10.60
Less than once every month	1.25	0.24
Don't Know	0.43	1.69

Table 2

Source:
Australian Bureau of Statistics (1999). Unpublished data.

In Australia, ABS data show men use the Internet more for all activities, but particularly for study (27 per cent of male Internet users against 18 per cent of female Internet users) and activities relating to goods (54 per cent male against 38 per cent females) (Table 3). In 1998, men also used the Internet more for email than women - 62 per cent men to 55 per cent women (Office of Women's Policy, 1999).

This pattern of usage is similar to the United Kingdom, but differs from that in Japan. In the United Kingdom, men spend an average of 3.4 hours per week playing computer games, compared to 1.2 hours for women (Anderson et al., 1999). In Japan, women use the Internet more for entertainment than men (Nikkei AsiaBizTech, 1999).

Activities undertaken via the Internet by adults by gender, Australia, 1998

Activity	Female	Male
Studies	146 332 17.6%*	289 796 27.06%
Work	717 219 86.26%	962 745 89.90%

Surfing	453 995 54.60%	607 262 56.71%
Goods	313 092 37.66%	579 491 54.11%
Other	34 634 4.17%	83 904 7.84%
Total	831 438 43.7%	1 070 868 56.3%

* % is of female and male Internet users.
Table 3

Source:
Australian Bureau of Statistics (1999). Unpublished data.

3. Gender and Internet Commerce

The quantitative data make clear that electronic commerce is a domestic phenomenon. In 1998 in Australia, three fourths of the people (75 per cent) who ordered or purchased goods through the Internet in the previous 12 months did that from home (ABS, 1999a). But more men than women shop and pay on the Internet. ABS unpublished data for 1998 show that of the 479,529 adults who purchased on the Net, 69.1 per cent were men and 30.9 per cent were women. As a percentage of adults in general, 4.96 per cent of men bought on the Net, compared to 2.15 per cent of women.

The most recent Australian data for May 1999 show that women do not pay on the Internet as much as men. Women however use the older electronic channels such as Electronic Funds Transfer at Point of Sale (EFTPOS) more than men, with the use of the information kiosks, the phone and Automated Teller Machines being similar. The divide is with the Internet, as more than twice as many men than women pay on the Internet. This gap has not evened between February 1998 and May 1999 (See Table 4).

Electronic money transactions undertaken by persons aged 18 years and over - by gender May 1999 (February 1998 in brackets) (a)(b)

Electronic money transactions by persons 18 years and over	Males		Females		Persons	
	'000	%	'000	%	'000	%

Paid bills or transferred funds via the Internet	176 (32)	2.6 (0.5)	94 (12)	1.4 (0.2)	270	2.0
Paid bills via information kiosk	137 (28)	2.1 (0.4)	83 (41)	1.2 (0.6)	221	1.6
Paid bills or transferred funds via phone	2 666 (1 958)	39.9 (29.7)	2 669 (1 971)	38.6 (29.0)	5 335	39.3
Paid bills or withdrew funds via EFTPOS	3 993 (3 529)	59.8 (53.5)	4 432 (4 226)	64.2 (62.1)	8 425	62.0
Transferred or withdrew funds via ATM	4 853 (4354)	72.7 (65.9)	4 904 (4504)	71.0 (66.1)	9 757	71.8

Table 4

(a) Period covers the 3 months to February 1998 (in brackets) and February 1999.
(b) Percentages are of persons 18 years and over

Sources:

Australian Bureau of Statistics (1998) *Household use of Information Technology. Australia.* Catalogue no. 8128.0. Canberra: Australian Government Publishing Service.

Australian Bureau of Statistics (1999) *Use of the Internet by Householders. Australia, May 1999.* Catalogue no. 8147.0 Canberra: Australian Government Publishing Service.

ABS 1998 data show that males are more willing than females to access selected online services from home
(Table 5). The differences are greatest with shopping (23 per cent women against 33 per cent men) and Government information or form lodgement (40 per cent women against 48 per cent men). It must be noted however that with most activities other than gambling and shopping, at least one third of women 18 years and over are willing to access online services.

Adults willing to access selected online services from home by gender Australia, 1998

Online service	Female	Male

Shopping	1 555 144 22.84%*	2 161 481 32.65%
Banking	1 360 570 34.67%	2 596 977 39.23%
Gambling	149 820 2.20%	404 277 6.11%
Educational	3 284 836 48.24%	3 348 740 50.59%
Government information or form lodgement	2 753 054 40.43%	3 185 149 48.11%

* Percentage are adults.
Table 5

Source:
Australian Bureau of Statistics (1999). Unpublished data.

Women however are showing a faster growth in the use of Internet commerce. In the United States and Canada:

- 41 per cent of the 55 million online shoppers in mid-1999 are women
- Women buyers increased from 29 per cent to 38 per cent of the online purchasers in the last 9 months
  to June 1999 (eMarketer, 1 July 1999).

4. Gender Differences in the Use of the Internet and Electronic Commerce

Our qualitative study of the use of the Internet at home shows complex gender differences which go beyond differences in access, frequency and type of use.

The difference in use between the women who use the Internet more than their husbands or defacto partners (14), who use the Internet less (11) and those that use it as much as their partners (4) is not wholly explained by skills, expertise, education, use of the Internet at work or the rural urban divide. The difference is influenced by the location of the PC with the Internet, but it is not the complete answer. The one factor that is clear is that there is a farm divide. In our sample, we found that:

- Women use email and the Web instrumentally for activities which range from work, study, personal communication, seeking information, and helping their children do homework to buying and selling goods and services. To a lesser extent they participate in mailing lists and discussion groups. Women seldom associate their use of the Internet with a desire to play with, fix or master the technology.

- Women prefer personal and contextualised channels of communication. Women who perceive email as a personal communication channel are more likely to use it as part of a mix of channels for personal communication.

- Women on farms use the Internet more routinely than their partners, primarily for book-keeping and seeking information.

I now illustrate each of our findings with data from the qualitative study.

4.1 The Internet is a tool

Women use the Internet instrumentally as a tool for a wide range of activities. They seldom see the Internet as an object of play or something to fix and master. This is not to say that men do not use the Internet as a tool and that women never use it as play. In our sample, we have three women for whom tinkering with the technology is the activity. But if we place the use of technology as a tool and technology as play on a continuum, women are on the 'tool' side of the continuum.

Celia is typical of the 'technology as a tool' approach, which characterises most of the women in our sample. In Celia's household, everybody uses the Internet. Celia is an academic, 40-54 years old. Her husband is also an academic, her daughter is in university and her son is still at school. Celia's main use of the Internet at home is for work as she teaches online. She says "I tend to use it for research and specific things like downloading forms or getting yourself registered at a conference more like work accessories than hobby interests." Her daughter uses it for research for her study or to enrol in courses.

Celia's husband uses the email to write long letters to his family and friends. He also uses it for a chat group to investigate a particular medical condition he has. He is the one in the household who has booked accommodation for study tours on the Internet.

Celia's son is the most ardent user of the Internet in the household. Celia says, "My son almost guards the machine. He often puts it on and tells me if there are messages waiting. I very rarely have to put it on myself, because he's got there first."

Her son plays games on the computer for hours unlike the others in the household. She says, "He's much more adventurous with it, whereas the rest of us tend to think we'll look on the Internet because we need to know about something or other. We use it as a tool for the things we need it for." She says, "My son likes to get the whole circuitry out and look at it. That wouldn't interest me."

Celia's description of the way her son wants to play with the PC and the Internet, the way he wants to get to know how the machine works, finds an echo in other interviews where the woman uses the Internet at home but the man uses it more. Belinda, 25-39 uses the PC and the Internet regularly at work. She says she would use the Web at home if she were studying or had "a real purpose to look it up". At present she asks her friends to email her at her office address for after 8-9 hours on the PC at work, "sort of the last thing I want to do is come home to it."

Her defacto partner also uses the Internet intensively at work. But at home, he plays with voice-activated software. He has ordered microphones over the Internet, though has paid for them by cheque. Belinda says, "He likes to know how things work, how things tick."

Dorothy, 25-39, skilled at using the PC and the Internet at work says she prefers not to use it at home. To her it seems too much like work. "I don't want to turn on the computer" at home, she says. Her husband also uses the PC and the Internet continually at work. But he likes to tinker with the PC at home.

> I think there's more that play element. I come to my computer and find things that Damian has put on it. You know, he's played around and there's a funny button and I click on it and the message is, 'Hello my love Dorothy' or something. Or I've got these new little buttons, he's created icons which make it easier to do certain things. So he likes to play around. Or I come and find there's a picture on my screen when I open it up.

The stories of Celia, Belinda and Dorothy are particularly interesting because they have equal expertise in the use of the Internet as their husbands. All of them use the PC at work, just like their husbands. Belinda and Dorothy particularly see housework as a shared responsibility. Neither has children. So the difference of time availability at home is not such an important factor. Yet there is a distinct difference in their use of the Internet at home from the way their partners use it.

4.2 Women prefer personal communication channels

Women who perceive email as a personal and intimate medium are more likely to use it for communication. When women see email as impersonal, it blocks usage in the home.

These points are illustrated in Frances' story. Frances is in her 40s or early 50s, has a university degree, works part time and lives in a regional town in Victoria. Her first preference is face-to-face communication and then the phone.

She does not use email even though they have been connected at home for at least 18 months. Her dislike of email is so intense that she does not give out her email address, though at her workplace, there is a push to use the Internet. She has used the Internet to research a course on patchwork, in order to deliver it online, but does not see herself as an Internet user.

Frances says she finds the Internet a solitary activity, impersonal and alienating. When helping her children with their home work, she sits with them, but notes it is not for as long as she would have, if they were at a desk.

Frances avoids news groups "like the plague". She says, "All the men I know would use the Internet more than women because they're quite happy with its impersonal nature." She says, men

> enjoy the technology and the gadgets more than women do. They don't like to look you in the face. They like to stand back. They like that barrier. They can relate to that screen. I believe that women probably - I know this is a huge generalisation - enjoy the emotional response from spoken communication that technology doesn't provide.

As Frances says, this is a generalisation. It doesn't hold true for all the women we have interviewed to date. It also does not hold true for her husband. Frances says he is a "typical man". He uses the computer a lot in his workplace but at home,

> He doesn't use it a lot, no, not at all. He doesn't sit on it and play on it. He may email a few friends, but not for anything serious at all. If he had a serious message he would ring them up.

The theme of women wanting more face-to-face, more telephone communication comes up also with Harriet. She like Frances lives in a regional town. She is 40-54 years old, with a secondary education, in part time work and from a middle income household. Her children grown up and living away from home.

> She and her husband both use email to keep in touch with their children and friends. The email has replaced the phone to some extent because of the cost, "but I don't think there's anything the same as that personal contact. But I think the spin-off of personal conversations happening (is that) it leads the conversation in different directions."

Harriet says, her husband is happy with the email because "He's a practical man, and as long as it's practical he doesn't care about anything else." She finds email is not as intimate as the telephone. She likes "people and the personal touch."

Harriet says,

> Personally, I like a hand-written note and a special stamp on it for my mum, or send the same to her with just a little something, news-clipping, whatever,

> just to be in touch now and then. I thing there's nothing like a hand-written letter and even our exchange students in Canada say the same, you know, 'I'm emailing you, mum, but I wouldn't mind a real letter in return'.

4.3 The farm divide

Among the 30 women we interviewed, five are farmers. Another woman is involved with a farmers' organisation. All of them say they use the PC and the Internet more than their husbands.

There is little reliable comparative information of Internet use by gender within farm households. Our findings are in tandem with a survey of computer and Internet use by Queensland dairy farming families in July-August 1998. The survey showed that 70 per cent of the main computer users in the home were women. Financial software programs for the farm accounts were most often used by women in farms (Easdown, 1999).

The interviews suggest that one of the reasons for the greater use of the PC and the Internet by women in farms is that keeping the books and seeking information are seen as "inside" jobs, as jobs traditionally delegated to women. The PCs and the Internet are seen as domestic technologies within the home compared to tractors, which are the male technology in the paddock.

Isobel lives on a farm, 40 miles from a regional town. She is currently doing a Bachelor's course online and is working part time outside the farm. She is the computer literate person in the family, doing her studies on line, using email, chat lines and the Web. She downloads stock market reports every day, buys her vitamins and cleaning products on the Internet and pays for them with a Bankcard online.

Her husband does not use the PC and the Internet as much as she does. She says, "He's a farmer. He hasn't had much need." She says,

> There's not the number of farming businesses that has their products available across the Internet that we found. The only thing that we have been looking at is we'd like to export our wool and we've been looking at places in India that we could possibly contact. And that's the only real input he's had into searching on the Internet.

They have been looking up this prospect together. It has worked. She says,

> We just sort of put in Indian wool and we actually have got a contact name over there of one of the fellows who's the chairperson of all the importing of wool into India.

Like Isobel, Jemima is the main Internet user at home. Her husband too is a farmer. She says he is not interested, he is "a physical sort of fellow". Jemima, 25-39 lives 35 kilometres from a regional town. Her husband works in the family horticultural farm while she works part time in the town and has a small home based business. They have two children aged, five and seven years.

When we interviewed Jemima, she had had the Internet at home for only four weeks, though she had done an Internet course two years ago. She is excited about selling flowers on the Net and is planning to learn how to put up an electronic commerce site.

She says, her husband's business could use the Net to track the flowers as they go from Australia, say, to Hong Kong. They could have digital photographs to promote their flowers.

> It'd be wonderful because especially Geraldton Wax, there's so many different varieties and colours. If you could have an image on the screen for people to see on your Web page, you'd sell a lot more (Sometimes) we think, 'Oh, they're no good you know, won't sell'. Perhaps they will in another country. The trends are different over there.

She thinks if they photographed the flowers as they left and again as they reached their destination, they could refute claims that there were bugs in the flowers when they left Australia. She says, "If we could just see what the insect was and say, 'Well look, that's an Asian insect, it doesn't come from Australia', then you'd have a little bit more recourse there. You wouldn't lose you know $20,000 in shipment."

Jemima's plans are unlikely to be implemented for she and her husband are still trying to convince his parents to get a mobile phone. They now have a fax which means the faxes come all night. They do not have email as yet, though are investigating it.

5. A Change in the Nature of Communication and Money

Women's use of the Internet and electronic commerce is leading to fundamental changes in the nature of personal communication and the control of money in the home.

5.1 Email changes the nature of personal communication

Email is substituting partially for personal letters and less so for the telephone. The main issue however is that email is changing not only the mix of channels of communication but also changing the nature of personal communication. Just as word processing changed the activity of writing, with email women find themselves communicating more frequently and informally, particularly across time and distance. The nature of personal communication is also changing because email straddles the boundaries of spoken and written communication, and synchronous and asynchronous conversation.

Email is making for more frequent conversation in situations where there may have been little personal contact before. As Trixie, 40-54, says, email is "not as good as talking but it's way ahead of nothing and it's instant. It's wonderful." She says email has replaced letter writing to a great extent, but her phone bills remain astronomical.

This more frequent contact is due to email being a more convenient and often cheaper way of communicating across time and distance. Harriet, 40-54, for instance is in regular touch with her daughter in China because of the email.

Email also makes a different kind of incidental communication possible. Jemima, 25-39 with a small business, speaks of her sister emailing her a joke. Jemima then telephoned back to say thanks and the conversation proceeded.

The major change is because email has some of the characteristics of a letter and some of the telephone. One can see it as an informal, colloquial letter where one can write a short paragraph, not spellcheck, move things around, play with it, but like a telephone achieve the intimacy of nearly instant communication. It is particularly good for sharing documents. Or like Hortense, 40-54, you can see email as a "drawn out telephone conversation", and see yourself as talking on email.

This straddling of boundaries is in one sense leading to greater intimacy and communication within the family. In the future, women may become important creators of domestic context. It is the straddling of boundaries that also makes some women treat email more warily. There is the feeling that email is conversation, yet it has the fixity of the written word. There is instantaneous communication without the feedback of voice of the telephone or body language of face-to-face conversation. As Dorothy says, on email there is "less of a finding out and then responding". On the phone it is easier to know the boundaries of what feels comfortable and what doesn't. Email takes away some of the sensitivity that comes from non-verbal messages.

5.2 Transforming the nature of domestic money

Women in Australia use the Internet less for payments than men. In May 1999, 94,000 women used the Internet to pay bill or transfer funds via the Internet compared to 176,000 men (Australian Bureau of Statistics, 1999b). When these figures are interpreted together with women's lower use of the Internet, this gendered pattern is an important barrier to the emergence of a more routine, domestic form of electronic commerce.

The use of electronic payments via the Internet is closely linked to the electronic use of personal financial management programs such as *Quicken* and *MYOB* (Mind Your Own Business). These programs are used to get a greater sense of control over money flows. They also enable the user to specify the different components of domestic money. The nature of domestic money changes, becoming less nebulous and more calculable, less joint and more individual. In this sense, domestic money becomes more like market money (Singh, 1997).

Financial management programs have become a new way of earmarking money, of differentiating domestic, personal money from business money. This same distinction used to be done with cash in different jars, and later through different accounts with various financial institutions or separate credit cards for personal and business expenditure. Isobel uses *Quicken* for personal expenditure linked to the cheque butts, and uses *MYOB* for the farm business books. Jemima, a farmer in Victoria, uses *Quicken* for both business and personal expenditure, separating the different kinds of money within the same program.

The same earmarking function which differentiates personal money from business money also makes the nature of marriage money less nebulous. This is one reason why Prudence, 25-39, does not use a financial management program. She hated the idea of such a program when her husband suggested it. She says, "I don't want my life to be like that."

The use of personal financial management programs has changed the way money is managed in a physical sense. Once the kitchen table meetings move to the home office or the study and the PC, the management of money can become more individual rather than joint. Financial information is concentrated more than before with the manager of the money. If the user of the program is male, then there is potentially a greater likelihood of male control over money (Singh, 1996).

Jan Pahl, in a study of electronic money in households in the United Kingdom, also came to the conclusion that, "Men make more use of new forms of money than women do, and tend to dominate the use of new technologies such as Internet banking: this is changing the gender balance of financial power within families". (Pahl, 1999, p. viii) Pahl's conclusions are substantiated by market studies in the United States. Among online households, the male head of the household generally pays the household bills, whereas for households in general, it is the female head who usually pays the monthly bills (CyberAtlas, 1999b).

Interviews with the seven women in the CIRCIT sample who used financial management programs showed that:

- These programs have the potential to concentrate information about present and future patterns of income and expenditure with the user.

- This concentration of information about money can lead to greater decision making power for the user. Information about money, however, does not necessarily lead to greater power.

Ursula, a farmer in Victoria, married to a farmer with good accounting skills, says,

> We used to do the books together. Or I do them and then ask him if this is right? Does this go in this column? Now that I do them on *Quicken*, he's not involved at all (When) he does his monthly or two monthly budget he'll get the information from me."

She adds that their domestic and farm money continues to be joint, and major decisions are joint. For

Isobel, her use of the programs, she says, does mean she is in control of the finances. But she says this is something they have chosen to do.

The use of financial management programs is not necessarily a solitary activity. Vera, 55+, says she and her husband put in the details together. She says,

> We do it together. We get the Bankcard and he sits at the computer and I read out the figures I think it's because he's a single minded, highly focused person To him it has enormous value and it tells him exactly everything about [each transaction].

This concentration of information about money can lead to greater decision making power with the user. Control would be more likely if only one of the partners knew how to use the program. In some cases, where money has always been managed with the use of a personal financial management program, there is no sense that there has been a change. And even before that it may be the case, as with Angela, 25-39, that she has always had more information about their money and savings.

There is no necessary link between information about money and control of money, despite the truism that information is power. In a study of women in small business, Singh (1995) found it was possible for women to do the books, to be informed about money and yet powerless to influence decisions, a state of 'informed powerlessness'. Interviews with women farmers did not show a sense of powerlessness, but they demonstrated that having information about money does not necessarily translate to greater power. Marjorie, a farmer in Queensland, is particularly articulate on the point that power on the farm rests in production, not on Internet use, and not on cash projections and budgets. She doesn't think the men feel disempowered in using the Internet less than women or in not managing their money electronically. She says,

> It's more emasculating for a male to not produce. And that is a real survival thing for them. They have to produce. They can't fail. They mustn't fail with what they're doing because it's in your face isn't it? The crop's there dying ... It would be a personal disappointment to him and a failure I'm pretty sure that they live and breathe with what they can produce when they're working with soil.

The struggle on the farm is with prices and the seasons. It is these variables - prices and seasons - that change the relationship between the management of money and power.

Marjorie does the farm accounts. She says,

> In non-agricultural businesses that we've been in, we do use a cash flow and projections and we stay rigidly with them. But ... in agriculture that is just so much paper (Prices) went from $200 a ton this time last year to $80 a ton

> now ... So that was an uncontrolled variable and we put it in the cash flow at what we think is an average. And the weather is another uncontrollable variable So the cash flows (are) just an exercise. It's really of no relevance Power for us doesn't come into it. We're sort of both of us against those variables. We've got a united, a bigger enemy if you know what I mean.

So it is that Marjorie could do a five year cash flow plan, but it couldn't be definitive. The decision to buy a green tractor worth $350,000 could be made despite the cash flow projections, and may be a valid decision. It was to do with production, and it was important in dry country to be able to plant when the land still retained moisture, and so the more you could plant in a day was important. It was also important for conservation reasons.

Marjorie also explains that decisions to spend are made differently on the farm, because of the different nature of farm money. She says this is because their income is tied to the season, instead of weekly or fortnightly. They get large amounts at large intervals and the amount is unpredictable. This changes the way they decide how to use the money. There is little impulse gratification, for there is a delay between the decision to spend and acquisition. The decisions thus are more joint, for there is more time to discuss them.

6. Gender, Communication and Technology

Behind the questions about the gendered use of the Internet at home is the broader question that Judy Wajcman (1991) posed about gender and technology. Is the difference in men and women's use of technology connected to technology being in some sense "inherently patriarchal"? (p. 13) The use of the Internet also relates to the debate about the different cognitive styles of men and women - men wanting the "hard mastery" over technology, whereas women preferring the "soft mastery" which allows them to accommodate to the world (Turkle, 1984). This is a near fit with Pirsig's (1974) earlier dichotomies of romantic and classical dimensions of knowing.

There is also evidence of differences in the way men and women communicate. Tannen (1990) submits that many men engage the world as individuals in a hierarchical social order. They are either one-up or one-down. The key struggle is to preserve independence. Many women approach the world as a network of connections, where the key aim is to achieve intimacy. Tannen sees these differences as a continuum with more men ranged on the status end and women's concentration being on connection. These differences in communication styles continue in computer-mediated communication as Herring's (1994) research substantiates. Men and women have different styles in posting to the Internet - men having a more distant adversarial style while women were more personal and supportive.

When we place our findings of gender differences in the use of the Internet at home, we have an interesting situation. Women are said to prefer soft mastery, connection, the romantic way of knowing - yet it is women who use the Internet as a tool. It is the men who want to play and explore the possibilities of use.

The theme of women not being comfortable with technology comes up often in the interviews. Typically technology has been associated with masculinity. Our interviews show that when women become comfortable with the technology, the focus shifts from the technology to the activity. Domestic technologies that are primarily related to the conduct of household work - the washing machine, the refrigerator, the microwave, the stove, the oven - are not seen as technologies. Information communication technologies such as the telephone, the radio and the television - technologies used comfortably by women are also no longer seen as technologies. The technologies are now invisible. They are associated with activities - telephoning, hearing the radio, seeing television.

The telephone was often spoken about in the interviews, particularly when comparing the email and the telephone. It is interesting that none of the women we interviewed saw the telephone as technology. When we asked about gender differences in communication, women often spoke of the way they and their husbands use the telephone. Talking on the telephone was communication. The focus was not on the telephone.

The PC and the Internet are not as domesticated as the radio, the telephone and the television. They do not have a multiple and personalised presence in the house (Livingstone, 1999). Most households have only one PC. In Australia in February 1999, there were 3.7 million computers for the 2.6 million households that used the computer more than once a week (ABS, 1999a). The PC and the Internet are at present still seen as technologies that need to be learnt, that need expertise and training sessions.

In our interviews, there is a recognition of differences in the way men and women use the Internet at home. There is a similar recognition of differences in men and women's approach to communication and technology in general. Behind the perception of differences are women's stereotypes of males as "practical", "physical", "mechanical".

There is however a reluctance to see these differences as something innate to men and women. The women we interviewed explain these differences as a function of personality as with Edith or the social construction of gender as with Celia and Dorothy.

Edith disputes that the differences in the way she and her husband use the Internet has anything to do with being a man or a woman. She says,

> I think that the way Evan (her husband) and I tend to use communication patterns is more to do with our personalities and backgrounds, rather than the fact the he's a bloke and I'm not a bloke. The thing is, I notice the difference between myself and other women. I know women are on the phone to their girlfriends, three or four girlfriends, every day of the year.
>
> I don't. Now that's supposed to be the female pattern, it's the one that keeps getting spouted to us, and I know women who do this, but I haven't got time to do that. I mean I'm not interested in doing that.

Yet she too recognises that many women think they cannot handle machinery. She says, "I despair, after 25 years of the women's movement, we have failed young women in some way, and I don't know where or how." When she taught motorcycling women would come to her saying there was a problem with their motorbikes. She would say,

> 'Oh, have you checked your battery?'
> 'Oh, I don't know how to do that.'
> I said, 'Well, where is it?'
> 'I don't know.'

If a woman dropped her bike, she would almost without fail stand back waiting for a male to pick it up. Men were equally gendered in their responses. Edith says,

> I made sure I was standing next to my male colleague and I'd have my hand like this (she shoots out her hand) ready to grab his collar. I'd say, 'Wait!' They didn't even realise they were doing it half the time.

The differences between men and women's approach to technology continues to puzzle Celia. She says,

> I don't know what it is. It's just the same as when they were very small. I thought, 'Right, they're going to have a complete gender balance'. I gave my son dolls and houses and so on, our daughter we gave balls and trucks and all those things. But my son still wanted to kick a ball, climb a tree, and my daughter still wanted to put the teddies to bed and make little cakes and biscuits. We've given them both computers and they've had the same opportunities for computer work, but just somehow boys like all this spatial location stuff and are so good at this and how things work.

She adds,

> It's all this getting things to match up, which I think girls aren't interested in. We and his friends play for hours. I would get terribly bored with it. But I don't know what the answer is, why the boys like them so much more than girls. There are just so many other things to do. I remember going to a friend's house, before there were computers as such, but they had a joystick on the television, a kind of Nintendo. He had two sons and three daughters. It was the sons who said, 'Come on, come on, we can find you another seat to play', and the girls weren't interested. The boys just hogged this thing and liked it.

The importance of gender roles and the cultural meanings of space become clear when we examine the farm divide in PC and Internet use. The technologies are the same. Yet the PCs and the Internet are seen as domestic technologies within the home related to book-keeping, traditionally a female activity on farms. It is the men who are lagging, primarily because the Internet is not as yet directly related to production, which is predominantly the male sphere.

One of the reasons given for women's greater use of the PC and the Internet on farms is that women farmers are most often better educated than the male farmers. However education and expertise with the technology does not necessarily make for greater use at home. Women in our sample who did not use the Internet as much at home as the men were equally if not more proficient than the men. In four cases, the women did part of their paid work online. Yet, once they reached home, the PC and the Internet was seen more as part of the male terrain and activity at home.

7. Implications for Design and Policy

Research from the users' perspective in itself does not lead to answers for the designer and the policy maker. It is the attempt to link the different perspectives that is the key to "seeing differently" (Brown, 1997a), to modifying and implementing innovations. As John Seely Brown says,

> To do things differently, we must learn to see things differently. Seeing differently means learning to question the conceptual lenses though (sic) which we view and frame the world, our businesses, our core competencies, our competitive advantage, and our business models. If there is anything that is actually coming *into* focus today, it is the realization that we need to question much of what we think we know about how to conduct commerce, including marketing, distribution, service, and the notion of competition itself. Hardest of all, we need to be able to think about changing the architecture of our revenue streams, that is, the way we make money. (p. x)

A focus on women's use of the Internet makes clear that they value it as a tool but their emphasis is on the activity. This focus on the activity, on "technology in use" (Brown, 1997b, p. 205) is important for the designing of all new technologies. It comes to the fore when technology becomes powerful enough to be everywhere and invisible (Brown, 1997b, p. 208)

Silverstone and Haddon (1996) take the argument further by pointing out that all acceptance of new technologies is inherently a conservative process. Users choose to use the new technologies because they are seen to help them do better what they have done in the past. In the process, the activity itself may change. Hence as Brown (1997b) puts it, "Research on new work practices is as important as research on new products" (p. 205).

The Internet and electronic commerce are on their way to becoming domestic technologies. The gender gap in the extent of use is narrowing. The increase of women online is already leading to clothing becoming the fastest growing category of e-commerce in the United States (CyberAtlas, 1999a).

These trends mean an important shift for design and policy. Women are no longer a special group of disadvantaged consumers for whom special programs need to be devised, but are at the centre of the market. Many aspects of good design are of course common to both men and women. But design and policy now have to consciously focus on responding to women's needs as a central rather than a residual aspect.

It is in this context that our findings show that designers need to:

- Design services that focus on the activity
- Emphasise access and use rather than skills
- Design for a change in the nature of activity
- Use a mix of communication channels to enhance the personal aspect of the Internet

7.1 Designing services that focus on the activity

Users react favourably to services that focus on the activity, rather than on the services that are possible or can be provided. However, with women, there is the added dimension of the focus being on the activity rather than the technology. A focus on the activity means the user is led in easy steps to the completion of the activity without having to tussle with the technology.

In order to achieve this, the emphasis would be on reducing complexity, enabling connection between activities and making the technology invisible. The emphasis is on individuals' perceptions of innovations within their social and cultural context, rather than on the innate characteristics of the innovations. As Rogers (1995) has pointed out in his study of the diffusion of innovations, the reduction of complexity is one of the main ways to persuade men and women to adopt something new, overcoming the innate conservatism of the consumer.

Marjorie, a farmer, who is also an Internet trainer, says women - and to a certain extent men too - "want you to cut the waffle and get straight to the point. They're not really concerned as to why or how it works, but how it's going to help." So in her training sessions, she says,

> I cut out all the introductory stuff and I say, "You don't need any computer experience" and "You can just do this and (it) will get you to the weather map for Australia". Bang. How does it work? Who cares? We just do it.

Effective navigation is part of this effort to reduce complexity and increase trustworthiness. To achieve effective navigation, the women we interviewed say they want two things - plain English and a design which concentrates on the activities they want to complete, rather than a knowledge of the capabilities of the program and the providers' mind-set.

7.2 Emphasising access and use rather than skills development

A central theme of government policy relating to the Internet and electronic commerce is to develop the appropriate skills for business and citizens. Skills development is particularly at the forefront of policy because the information technology industries require people who are able to design and produce the technologies and services of today and the future.

However the emphasis on skills places the spotlight on the technology rather than the user and the activity. This emphasis on the technology is particularly problematical when women are one of the main groups towards which the skilling programs are directed.

The aim of both industry and policy is to arrive at a point when specific training is not needed to live with the Internet and electronic commerce. The focus from the design side needs to be on making the technology invisible. From the policy side, the approach that is most likely to succeed is to present technology as an enabler.

This approach would mean a significant recasting of training programs to resemble the access and use programs. The goal should not be a competency certificate vouching for technological skills but an ability to use services and technology to achieve what the user wants to do.

Providing access and use programs for women should also include providing an environment where women could work together on activities they see as meaningful - with a technology person available to provide support and facilitate additional ways of using the technology for the activity. In such a setting, the connecting powers of the technology could be harnessed to the preference of women to connect rather than compete.

7.3 Designing for a change in the nature of activity

A focus on the activity rather than the technology also means designing for changes in the nature of the activity. Just as the nature of writing changed with the word processor, expectations of communication are changing with email. Another major change has been in the area of managing money.

A major change with the domestication of electronic money and electronic commerce is that activities to do with money have become information activities. Yet electronic commerce does not connect seamlessly with other money-related activities in the household such as invoicing, bill payment and the management of domestic money. Each of these activities remains a separate activity, though for the user they are related information activities.

Winifred, 25-39, a housewife in Melbourne, describes the sequence of activities. She gets a bill in the mail, then she goes straight to the computer, types in the amount, and pays it on the Net. She says she sends it and "It's all done. Don't have to go through cheque books and cheque butts." But then she manually puts it into *Quicken*, prints a report and completes the process. She still has no way to connect all those money activities.

Rosemary, who regularly uses the Net to order her supplies for her direct marketing business and pays online, says she hopes the link is coming so that the payments get recorded into *Quicken*. Marjorie, a farmer, is hoping that the connection happens from the invoice end. She says, "If I was invoiced online I'd probably look at electronic payment."

7.4 Using a mix of channels to enhance the personal

The use of the telephone and email to supplement the information on a Web site provides a back-up of personal, interactive communication.

Some of the greatest successes have been Australian government sites that encourage initial contact by email so that users can alert them to their problems. This approach is problem/activity oriented, rather than provider focused and it avoids the call centre wait that users find so frustrating. On receiving the email a staff member can deal with the problem and get the local context right before contacting the consumer by phone. This final stage has the advantages of personal and interactive communication.

Odette speaks approvingly about this aspect of a government organisation's service. She says, "I'd much rather send them an email and they can muck around for a couple of hours and then ring me back." This way she gets the best of both worlds and does not have to wait. Ingrid, 25-39, in Tasmania also went to the Centrelink Web site because of the difficulty of getting through on the phone. "There's a little thing there where you can say what your request is about and give your number. They say they'll call you back in two days or something. Wonderful."

Sometimes it is the unreliability of the personal response that makes the Internet a pleasant alternative. Hortense, a farmer in Tasmania, finds the Australian Taxation Office site "easy to get around. I download publications [on] provisional tax, prescribed payments, business tax details." The incentive to go online was that the department's telephone service and response times were not satisfactory. She says, "There are times I've waited for two or three months for things and [they] haven't arrived." With the Internet, "you're not depending on a person".

Personal interaction is particularly valuable when the user is stuck. Odette says that many Web sites give a general email contact. This is not sufficient. She says,

> I do like to have the personal details of someone that you can get in touch with if you need more detail of information or you need to query it. And you want, you actually need that person's phone number I think or email address, a personal contact.

8. Conclusion

Electronic commerce has most often been addressed as a business and technological phenomenon. Studying it within the social and cultural context alerts one to the central role of gender differences in the use of the Internet and electronic commerce. It also places the emphasis on how these communication technologies have already changed the nature of personal communication for some women and men. These technologies have also changed the nature of money and will possibly transform money relationships in the home.

The CIRCIT at RMIT study found that women's use of the Internet is characterised by their emphasis on the Internet as a tool for activities rather than a technology to be mastered. Women were most responsive to these technologies when they perceived the Internet as a personal medium. This approach to the Internet has the potential to reshape the approach to design and policy - particularly in the way information is delivered and access and use is fostered.

[1] This paper summarises the study by Supriya Singh and Annette Ryan (1999). Gender, Desing and Electronic Commerce. Research Report No. 25, Melbourne: CIRCIT at RMIT. I would like to gratefully acknowledge the role of Annette Ryan in much of the interviewing and coding of the data, the analysis and review of the findings. I would also like to record with thanks that this project was funded by the Australian Research Council and the Department of Communications, Information Technology and the Arts.

[2] The names of the respondents are pseudonyms to preserve confidentiality.

References

Australian Bureau of Statistics (1998). *Household use of Information Technology. Australia.* Catalogue no. 8128.0. Australian Government Publishing Service, Canberra .

Australian Bureau of Statistics (1999a) *Household Use of Information Technology. Australia, 1998.* Catalogue no. 8146.0. Canberra: Australian Government Publishing Service.

Australian Bureau of Statistics (1999b) Use of the Internet by Householders. Australia, May 1999. Catalogue no. 8147.0. Canberra: Australian Government Publishing Service.

Anderson, B. McWilliam, A, Lacohee, H, Clucas, E. and Gershuny, J. (1999) Family life in the digital home - domestic telecommunications at the end of the 20th century. *BT Technology Journal Vol 17 No 1* 85-97.

Brown, John Seely (1997a). Introduction. In Brown, John Seely (ed) *Seeing differently: Insights on Innovation,* ix-xxiii. Boston: Harvard Business Review.

Brown, John Seely (1997b). Research that reinvents the corporation. In Brown, John Seely (ed) *Seeing differently: Insights on Innovation.* Pp. 203-219 Boston: Harvard Business Review.

CNET News.Com: China Net use exploding. http://www.news.com/News/Item/0,4,24114,00.html (consulted 22 July 1998).

CommerceNet: The CommerceNet Research Center World Wide Statistics. http:/www.commerce.net/stats/wwstats.html (consulted 10 July 1998).

CyberAtlas (1999a). Gender gap impacts e-commerce. http://cyberatlas.internet.com/markets/retailing/article/0,1323,6061_153661,00.html (accessed on 23 November 1999).

CyberAtlas (1999b). Number of online banking customers to triple by 2004. http://cyberatlas.internet.com/big_picture/demographics/article/0,1323,5961_179421,00.html (accessed on 23 November 1999).

Easdown, W. 1999. Rural computer and Internet training needs. Unpublished paper.

eMarketer, 17 May 1999. eStats: 64.2 million U.S.Adults Online Monthly. http://www.emarketer.com/estats/051799_642mil.html (consulted 19 May 99) .

eMarketer (1 July 1999). EStats: The Net jumps 16 per cent as women drive eCommerce. http://www.emarketer.com/estats/062899_nielsen.html (consulted 2 August 1999).

eMarketer (1999) eStats: Net User Demographics: Gender http://www.estats.com/estats/demo_sex_2.html (consulted at 13 September 1999).

Herring, S. (1994). Gender differences in computer-mediated communication: Bringing familiar baggage to the new frontier. Keynote talk at panel entitled "Making the Net*Work*: Is there a Z39.50 in gender communication?" American Library Association annual convention, Miami, June 27. http://www.inform.umd.edu/EdRes/Topic/WomensStudies/Computing/Articles+ResearchPapers/gender-differences-communication (consulted on 16 September 1999).

Livingstone, Sonia (1999). New media, new audiences? *New Media & Society, 1*(1), 59-66

Marvin, C. (1988). *When Old Technologies Were New: Thinking About Communications In The Late 19th Century.* Oxford: Oxford University Press.

National Computer Board: IT Household Survey Report. 1996. (1997). http://www.ncb.gov.sg/ncb/press/1996/hholds.html (consulted 30 November 1999)

Nikkei AsiaBizTech (1999). About 40 pct of New Internet users in Japan are Women http://www.nikkeibp.asiabiztech.com/Database/1999_Jan/13/Mor.04.gwif.html (consulted 1 July 1999).

Office of Women's Policy, Queensland. (1999). Commonwealth/State Ministers' Conference on the status of women, Agenda Item 5.1, May 1999. Unpublished paper.

Pahl, Jan (1999). Invisible Money: Family Finances in the Electronic Economy. Bristol: The Policy Press.

Pirsig, Robert M. (1974) *Zen & the Art of Motorcycle Maintenance: An Inquiry into Values*. London, UK:
The Bodley Head.

Rogers, Everett M. (1995). *Diffusion of Innovations*. 4th edition. New York: The Free Press.

Rural Women and ICTs: Project Overview, http://www.fbs.qut.edu.au/rwp/Project.htm (consulted 29 April 1999).

Silverstone, R. and L. Haddon (1996). 'Design and Domestication of Information and Communication Technologies: Technical Change and Everyday Life', in R Mansell and R. Silverston (eds) *Communication by Design:*
The Politics of Information and Communication Technologies, pp. 44-74. Oxford: Oxford University Press.

Singh, S. (1995). *For Love, not money: Women, information and the family business.* Melbourne: Consumer Advocacy and Financial Counselling Association.

Singh, S. (1996). *The use of electronic money in the home.* Policy Research Paper no. 41. Melbourne: Centre for International Research on Communication and Information Technologies.

Singh, S. (1997). *Marriage Money: The Social Shaping of Money in Marriage and Banking.* St. Leonards, NSW: Allen & Unwin.

Singh, S. and Ryan, A. (1999). *Gender, Design and Internet Commerce.* Research Report No. 25. Melbourne: Centre for International Research on Communication and Information Technologies at RMIT.

Tannen, Deborah (1990). *You just don't understand: Women and men in conversation.* Milsons Point, NSW: Random House Australia.

Turkle, S (1984) *The Second Self: Computers and the Human Spirit.* New York, NY: Simon and

Schuster.

Wajcman, J. (1991) *Feminism Confronts Technology*. North

Biography

Dr Supriya Singh

Dr Supriya Singh is a senior research fellow at the Centre for International Research on Communication and Information Technologies (CIRCIT) at RMIT University, Melbourne. At CIRCIT, Supriya's research has concentrated on the use of the Internet and electronic commerce by residential consumers and small business, focusing on issues of gender, trust and the cultural distinctiveness of money.

Her latest book is *Marriage Money: The Social Shaping of Money in Marriage and Banking* (Allen and Unwin, 1997). This follows her previous books on banking history in Malaysia and Australia, *Bank Negara Malaysia: The First 25 Years, 1959-1984* (Bank Negara Malaysia: 1984) and *The Bankers* (Allen and Unwin: 1991) and a study of Simunul Bajaus in Sabah, *On the Sulu Sea* (Angsana Publications: 1984).

Contact details: ssingh@circit.rmit.edu.au

http://www.circit.rmit.edu.au

Sessions

Satellites & Submarines

Related Sessions
M.1.4 Lessons in Satellite Planning
M.2.4 Submarine Round Table
M.3.4 Submarine Finance
T.1.4 Submarine Networks
T.2.4 Launch Services
W.2.4 GMPCS Panel
W.3.4 Satellite Wireless Communications

M.1.4 Lessons in Satellite Planning
Monday 31 January, 1100-1230
Location: Tapa I

Chair:
TIM LOGUE, Space and Telecom Policy Analyst, Coudert Brothers, USA

M.1.4.1
GERALD NAGLER, VP Business Development and CEDRIC BAXTER, Director, Advanced Systems Engineering, COMSAT Mobile Communications, USA
Investing In New Satellite Systems-Lessons Learned from the Recent Past

M.1.4.2
RAMIN KHADEM, Director, Finance & Administration, INMARSAT Ltd., United Kingdom
The Continuing Case for Mobile Satellite Services

M.1.4.3
MICHAEL S. WILLIAMS, Senior Vice President, Lockheed Martin Global Telecommunications, USA
Paper Presented by: ALBERT P'AN, Manager Sales, Lockheed Martin Global Telecommunications, USA
What's Happening to my Business Plan?

Sessions

Investing in New Satellite Systems - Lessons Learned from the Recent Past

Mr. Gerald Nagler and Mr. Cedric Baxter

Contents

Abstract

We have all seen how several high profile satellite ventures have proven to be very risky business. This has led the global investment community to ask many of us in the telecom industry, " Why are investments in new satellite systems inherently so risky?"

The answer lies in the many types of risk that satellite operators need to overcome to successfully introduce a new system. These risks often include: technical, regulatory, financial, competition, market access, and the challenge of effectively marketing and selling sometimes new and untried technologies. Perhaps the most significant risk involves the fact that implementation of a new satellite system inevitably takes many years, and much can change between the time the initial service concept is approved and the time the service is actually introduced.

This paper examines the major factors that decision-makers need to address to improve their likelihood of commercial success in launching new satellite communications services. We will focus, in particular, on mobile satellite communications since recent events in this area can be very instructive for planning satellite investments. The focus on mobile satellites also allows us to draw on our years of experience in the field, and share observations on pitfalls to avoid and ways to minimize risk.

All decision-makers planning new satellite systems recognize the problem of "long lead time" at a very early stage. The most commonly accepted approach for dealing with this risk is to conduct extensive market research. This has become the primary means for identifying the core target markets for a given service, and quantifying the expected volumes that each of these targets will contribute to the overall business. Despite the value of market research, it does not provide assurance that the main target markets identified as supporting the business case will, in fact, exist when the new satellite system is deployed. Nor can there be assurance that they will remain in place over the project's life.

No reasonable decision-maker disputes the merits of market research - it must be done. Nevertheless, most everyone agrees that the results of this research - no matter how thorough - must also be treated with caution and tempered by careful business judgment. This is because the research typically covers a 10-15 year forecast, and during this time frame significant changes in technology and consumer habits will occur. Moreover, the research results can be subject to favorable interpretations to attract investors or to structure the program in ways supported by management.

Most of the business cases for new satellite systems recognize these varying levels of risk, and try to address them in some way. Nevertheless, many projects that are approved, funded and implemented fail to achieve their expectations, as we have seen. Some of the main reasons for this are:

1. Massive Scale -- New, global satellite projects require billions of dollars in investment just to reach the market. This level of expenditure requires complex financing arrangements, along with the need to attract large numbers of subscribers who will generate high system utilization very quickly. If there is heavy reliance on debt financing, the lenders can place restrictions and obligations on the operator to achieve specified subscriber levels by a given date, or other milestones that can limit the operator's flexibility.
2. Changes in the Target Markets -- Once the service concept is agreed upon and the system design is approved, all efforts are focused on delivering the approved system. During this multi-year period of system implementation, it is not unusual for the primary target markets to shift, or even fail to materialize, while the design marches forward.
3. Advances by Competition -- During the long period of system development, competition has the opportunity to react and prepare. Very often, market conditions that led to approval of a given satellite system have changed dramatically by the time the service actually reaches the customer.

These issues are not always easy to overcome, but there are prudent steps decision-makers can take to improve the likelihood of success for a new satellite service. This paper identifies those steps and discusses them with real world examples.

Advantages of Satellite Systems

Given recent events involving several high profile satellite ventures, those who work outside the industry may question whether there is still a place for satellites to meet today's communications needs. There clearly have been some well-publicized setbacks for the satellite industry in the past year, but satellites still offer several key advantages in providing communications services.

- Coverage - A single satellite can cover up to one-third of the earth's surface. Satellites can also focus capacity on high-demand regions using spot beams, or contouring the satellite's footprint. The coverage capability of satellites allows for "instant communications infrastructure" in countries or regions that otherwise might remain behind for many years waiting for the growth of terrestrial services.

- Broadcasting - Satellites have established themselves as very effective means for TV distribution. Today, a great many TV signals are uplinked to a single satellite and then broadcasted to receive equipment throughout Europe, or similar geography.

- Thin Route Services - Satellites are well suited for providing communications to rural and remote regions that do not have sufficient demand to cost justify terrestrial connectivity. Communications needs from these regions can be efficiently combined via satellite and then distributed to their final destination.

- Data Services - VSATs have proven to be competitive with terrestrial networks for data communication even in regions where the telecom infrastructure is highly developed. The ability of satellites to provide a low cost "VPN in the sky" at speeds of 128 kbps or higher to hundreds of dispersed locations remains a significant advantage over terrestrial services. Satellites can also be used for remote monitoring of pipelines and other data gathering that can be efficiently routed to a hub for analysis and further distribution.

- Broadening Internet Access - Among the fastest growing uses of satellites is to provide internet access to regions in which terrestrial internet services are limited. Given the high proportion of web access to sites in the developed world, the distance insensitivity of satellites can bridge continents and provide cost effective internet access from remote regions.

- Mobile Services - Mobile satellite communications remains a relatively small niche, and faces increasing pressure from cellular and emerging terrestrial technologies. Despite this, satellites have proven effective in extending voice and data communications to users on the high seas, in the air, and on land.

Decision-makers considering investments in new satellite systems should be very confident that their proposed system effectively exploits one or more of the above advantages. Few people in the end-user community care about whether their communications are via satellite or other means. End-users will base their purchase decisions on cost, reliability, ease of use, etc. just like any other phone service. If satellites cannot effectively compete with terrestrial alternatives on these types of criteria, the decision team probably needs to regroup.

Developing and Validating the Business Case

Once a satellite service concept is proposed and the applicability of one or more of the inherent advantages of satellites (discussed above) is identified, the project team then begins to focus on assessing potential market demand and preparing a business case.

Market research has become a central tool for assessing demand. Nevertheless, a number of satellite ventures that have conducted extensive research have failed to achieve the subscriber levels projected in their business plans. The market research was done using highly reputable firms and the latest, most sophisticated techniques. Despite all this effort and cost, decision-makers ended up committing to satellite programs that achieved only a small portion of projected market acceptance. Some of the key lessons learned from the world of mobile satellite communications are discussed below:

- Market research done at a given point will be less valid by the time the satellite system is actually deployed - This is because the research typically covers a 10 year forecast, sometimes even longer, and during this time frame significant changes in technology and consumer habits are likely. Several global mobile satellite ventures conducted research in the early 1990s about the needs of executives to access reliable, low cost communications while traveling internationally. Based on this research, it became apparent that traveling executives would welcome a cellular-like service with global coverage. This led to a forecasted demand for millions of users, and was the rationale for billions of dollars in new satellite systems. While this all seemed reasonable to the experienced decision-makers at the time, what the research could not foresee is how quickly competitive offerings would enter the market to fill this need. The research and the decision-makers also could not foresee how the expectations of this target market (the traveling executive) would significantly increase for such product attributes as small size of phone, ease of use, quality of service, data capabilities and cost, placing unachievable demands on satellite service.

- Global mobile satellite services costing billions of dollars require hundred of thousands of subscribers to achieve profitability - This may seem obvious now, but the difficulty of attracting this many new users has proven far more daunting than expected. For example, in the case of global mobile satellite services, decision-makers tended to rely on the idea of attracting a small percentage of a large cellular user base (in excess of 300 million subscribers globally as of this writing). While it would seem reasonable that a satellite service should be able to attract, say, 3 out of 100 cellular users, this is not going to happen based on the novel appeal of satellite alone. The satellite service must work reliably and end users must view its inherent advantages, such as global coverage, as outweighing its weaknesses, such as larger size or the inability to use indoors.

- Implementing a commercial structure that can deliver the required subscriber numbers is likely to be far more difficult than expected - Whether the new satellite system is regional or global, a number of steps need to be taken to assure a coordinated service introduction, which is critical to long term success. These steps include the need for terminals to be designed and built, distributors to be adequately incentivized at each point in the value chain, marketing and sales to be in sync, and ground segment to be in place. Several Wall Street analysts have commented that recent global hand-held satellite systems were among the most complex new business undertakings in history. Although a certain level of complexity may be unavoidable, decision-makers need to be very careful to create a commercial structure that can effectively meet the challenges of attracting customers and delivering service. This has proven to be especially difficult for new, global systems that seek to distribute their equipment and provide service in more than a hundred countries. A solid technical solution is essential for satellites to compete with terrestrial services, but even with that, weakness in the venture's commercial structure can still be fatal.

Ensuring Satellite Service is Competitive

Satellites have traditionally been used to extend the reach of terrestrial services, such as providing a means for making phone calls internationally. In recent years, satellites have sought to attract new users who did not have ready access to terrestrial-based communications. The following discussion looks at two examples where satellite has attempted to penetrate very large and active markets served by terrestrial systems: television service to the home (direct broadcast satellites), and the global extension of cellular phone service.

Direct Broadcast Satellite Service in the US

In the US market, there are roughly 100 million homes receiving television. About 65 million of these rely on cable TV, about 10-12 million rely on satellite, and the remainder use traditional broadcast signals. In the 1990s, satellite was able to achieve very impressive growth levels by offering a total service package that a significant portion of the user base judged to be on a par with, or superior to, existing cable TV.

One such US-based direct broadcast satellite provider to the home is DirecTV operated by Hughes Electronics. Here are some results for DirecTV as of September 30, 1999:

- Revenue for the quarter ending September 30, 1999 more than doubled versus year ago to $1.3 billion.
- New subscribers for the quarter were 423,000 bringing the total to 7.7 million.
- Average subscriber revenue - roughly $40 per month, or $500 per year.
- Service contract and equipment install creates customer "loyalty."

Many of today's satellite ventures require billions of dollars in revenue to support their operations and DirecTV is an example of a satellite venture that is achieving this revenue stream. These results indicate that satellites can compete with terrestrial alternatives when consumers find the overall service offering to have comparable value.

Global Extension of Cellular Phone Service

The concept of providing a hand-held satellite phone that would extend the coverage of cellular service on a global basis attracted a great deal of attention in the 1990s. This was fueled by the knowledge that cellular service around the world had tens of millions of subscribers, cellular was growing at over 25 percent per year in many markets, and cellular had coverage/ roaming limitations that could be addressed by satellite. Given the huge demand for cellular, many concluded that there would be opportunities for a satellite service to capture some percentage of the existing user base. This thinking led to the creation of three global, mobile satellite ventures that collectively raised over $10 billion for their deployment.

Perhaps the most visible of the three systems, Iridium backed by Motorola, was the first to reach the market in November of 1998. Less than one year later, in August 1999, Iridium announced that it had filed for Chapter 11 bankruptcy protection. Shortly thereafter, another global mobile satellite venture, ICO, did the same. The third such system, Globalstar, was carefully planning a service roll-out for the first quarter of 2000 and looking to avoid the mistakes made by its predecessors.

Iridium was unable to attract the subscribers needed to satisfy its lenders despite the efforts of leading telecom companies around the world who supported the project. Iridium still has backing from many of these companies, and may yet become successful. Much more will be known by the time of PTC 2000 and in the months ahead. What is clear is that Iridium and the other global, handheld systems encountered a strong response from existing cellular operators who, upon learning of the ambitious plans of these systems, expanded coverage and took other steps to improve their service offerings.

Another major problem facing the new global mobile satellite systems was that their core business traveler market had become increasingly reliant on e-mail back to the home office, as opposed to voice communications. The dramatic growth around the world in the use of e-mail via the internet was not foreseen when these systems were being planned.

Time will tell whether the new global mobile systems will be successful. A key lesson learned is that widespread success needed to support these multi-billion dollar systems cannot be achieved unless the satellite service is found to be competitive with its cellular rivals in terms of most key product attributes. A portion of the market may be willing to pay more for the expanded coverage of satellite provided that such attributes as size of phone, price of service, ease of use, etc. are judged reasonable. However, if the tradeoffs of using a satellite phone are too great, satellite services will likely be relegated to niche markets which, in total, are probably not large enough to provide attractive returns on the billions of dollars needed for these new global, mobile systems.

Building in System Flexibility at the Start

In the early days of satellite communications, satellite systems evolved slowly and cautiously. Evolution typically consisted of incorporating incremental design changes to existing geostationary platforms. The fundamental reason for this cautious approach was the requirement for highly reliable, long lasting satellites.

This thinking worked well when there was a growing market for satellite systems and most procurements were for follow-on satellites. Geostationary designs, at an altitude of 35000 Km, incorporated "bent pipe" transponders, and as a result were flexible and could accommodate a wide variety of services including voice, low speed data, high speed data, fax and video. In fact, there are examples of domestic satellite systems in different countries that were originally designed for telephony and which effectively transitioned to TV distribution without changing the space segment when the demand for telephony services failed to materialize (e.g., Morales in Mexico and Arabsat in the Middle East).

In the last 10 years, satellite designs have advanced significantly. This is primarily due to the need for satellites to be more competitive with terrestrial systems, as discussed above. Many of the new satellite designs have moved from conventional geostationary systems to low earth orbit (LEO) satellites at an altitude of 700-1,500 Km, and medium earth orbit (MEO) satellites at an altitude of about 10,350 Km. These new systems require almost completely new satellite and ground segment designs that tend to be very costly and difficult to implement on time and on budget. The result is that many of these programs have been significantly late to market and faced cost overruns that have led to re-working the business case and boosting projected subscriber numbers.

LEO and MEO satellite systems have focused on narrow band services for hand held users (voice and 2.4 kbps data). The satellite designs are well suited for their intended purpose, but the focus on narrow band limits flexibility and makes it difficult to provide other services. If market demand for a MEO/ LEO system should shift from what is expected at service introduction, it becomes difficult to competitively satisfy new user requirements. As discussed above, such market shifts have proven increasingly likely during the many years from approval of concept to actual deployment.

The dilemma for the investor is whether to commit to a system that is optimized for a single application, or whether to support a system with greater flexibility. The more flexible approach inevitably results in a compromise from the optimized solution, but it tends to reduce risk. If a specific market requirement, such as hand-held voice, proves to be in high demand, then some revenues may be lost with a flexible space segment. If the demand for a specific application fails to develop, a flexible space segment may still provide opportunities for investment recovery.

Some of the design attributes in a flexible system are:

- Implementing a "bent pipe" satellite approach that shifts complexity to the ground segment. This enables the operator to more readily introduce advances in modulation techniques, computer processing, etc. by upgrading the ground segment with minimal impact on the deployed satellites.

- Pursuing a geostationary satellite approach that allows for design changes during construction by such relatively simple means as expanding the satellite's antenna. A geo solution also allows for greater flexibility in evolving the design of the mobile terminal. For example, if the market following service commencement begins seeking higher data rates, expanding the antenna on the mobile unit can cost effectively result in a new service offering without any change in existing space segment.

- Pursuing a regional versus global satellite solution, and applying the learning from the regional system to new satellites. If the long procurement lead time for a new satellite presents a problem, operators should seek short term capacity on other satellites until dedicated capacity is available.

Conclusion

Satellites still offer a number of key communications advantages. A single satellite can cover large areas of the earth's surface, providing an instant communications infrastructure where needed.

Market research is an essential tool for investment decisions involving new satellite systems, but research results must be tempered with sound judgement about the complexities and risks involved in achieving the market forecast. An additional complicating factor is the long lead time required to deploy a new satellite system, which typically exceeds five years. Given the pace of technology today, much will change from the point of concept approval to the start of commercial service. A new satellite system must be highly competitive with terrestrial services to achieve broad market acceptance. Satellites can serve specialized markets with offerings that fall short of comparable terrestrial alternatives, but these niche markets (e.g., communications to ships on the high seas) are probably not large enough to support the billions of dollars required for today's highly complex, global systems.

To minimize risk, high levels of flexibility should be built into the new satellite system at the start. Geostationary satellites that use "bent pipe" transponders, and concentrate the system's complexity in the ground segment, tend to be more flexible than a highly integrated global system with complexity built into the space segment. Further risk avoidance can be achieved by opting for a more regional approach that covers primary target markets versus a more costly global solution that may not result in sufficient additional subscribers to offset the added expense.

The greater flexibility of a geo system will probably not serve a specific market requirement as well as a system that is optimized for a particular application (e.g., LEOs/ MEOs for hand-held voice). However, if the anticipated market demand fails to develop as projected, the more flexible geo space segment should offer greater likelihood of investment recovery.

Biography

Gerald Nagler
Vice President of Business Development
COMSAT Mobile Communications

As vice president of business development for COMSAT Mobile Communications (CMC), Gerry Nagler directs the efforts of five related groups whose responsibilities include managing existing products and services that drive CMC's current business, and identifying and implementing new services that will result in long term growth. The focus of CMC Business Development ranges from day-to-day program management to evaluating future satellite systems in the post-2000 time frame. Business Development is also responsible for selling to and managing CMC's relationship with large, non-retail customers such as carriers and resellers.

Mr. Nagler joined COMSAT in 1989. Prior to becoming vice president of business development, Gerry held the position of manager, business development and later director of business development. His responsibilities included business planning, developing new services, acquiring maritime communications companies, and management of major accounts.

Prior to joining COMSAT, Mr. Nagler worked for the Arnold & Porter Consulting Group in Washington, D.C. where he specialized in international joint ventures. He also worked for DDB Needham Worldwide in Chicago developing marketing and advertising plans for clients that included General Mills, Clorox and Ramada Hotels.

Mr. Nagler has an M.B.A. degree from the University of Virginia, Darden Business School. He lives in Gaithersburg, Maryland with his wife and two sons.

Biography

Cedric Baxter
Director of Advanced Systems Engineering Business Development
COMSAT Mobile Communications

As director of advanced systems engineering of business development for COMSAT Mobile Communications (CMC), Cedric Baxter is responsible for advanced system design including space segment planning, transmission engineering, land earth station and mobile terminal design.

Mr. Baxter joined COMSAT in 1979. During the early part of 1999, he was team lead for the successful proposal to provide Inmarsat-B 64kbps service to the U.S. Navy. He has worked extensively with Inmarsat over the past eight years and has provided technical oversight for the Inmarsat-2 and 3 satellite programs. He was instrumental in promoting Mini-M for use on the Inmarsat-3 satellites and participated in Inmarsat's P21 space segment and ground segment design phases.

Prior to this, he worked on many satellite systems including CTS, ANIK-B, ARABSAT, SATCOL, PERUMTEL, COMSAT's DBS system, NBC satellite television distribution system, China's DBS system and VOA satellite interconnect system.

Before to joining COMSAT, Mr. Baxter worked for G.E. Valley Forge Space Center in Philadelphia, Pa. and Spar Aerospace in Montreal, Canada.

Mr. Baxter has a degree in Electrical Engineering from Kingston University in the UK.

Sessions

The Continuing Case for Mobile Satellite Services

Dr Khadem

Background

It is a great pleasure to be presenting a paper to PTC 2000, at the start of the second millennium. I can't say it is a particular pleasure to be writing this paper at a time when two aspiring global Mobile Satellite Services (MSS) players are in Chapter 11. Hopefully, by the time of PTC 2000 these companies have restructured and are able to operate again in some viable form.

You could argue that the business case for MSS has been amply established by Inmarsat; indeed it has been our success as a global operator that enticed others to enter this market. These include some regional systems and more importantly the global systems, Iridium, Globalstar and ICO. The real question that has been on all minds and continues to linger today is how large is the market?

Market for MSS

A market's existence at any point in time depends on a number of key parameters; the price, the need or utility of a product, and the price of alternatives, that may exist.

When Inmarsat was established these parameters all supported the business case for Inmarsat. The latter two, namely the need and utility of the service and alternative methods of communication, were clearly the drivers. If somewhat expensive to call back in the early 1980's from the middle of oceans or remote oil rigs, Inmarsat certainly represented value for money. No alternatives existed apart from HF radio, and in the case of seismic vessels looking for oil, the only true alternative was to put the data tapes with the seismic reads onto a plane for processing on land. With our high speed communications, huge cost savings were possible for seismic operations by instantaneously processing the information at the remote communications centres without having to interrupt the actual seismic mission at sea.

While there was competition from regional systems, such as AMSC, in the United States beginning in the 90's and continuing competition in the high seas with HF, there were no other serious global alternative solutions apart from Inmarsat. Inmarsat's business particularly in the land applications grew rapidly over this time. This was the period before sizeable penetration of cellular systems and in fact coincided with the time when major decisions were being made by aspiring global MSS players.

Market estimates, based on pure extrapolation of trends and projections using smaller portable units than what Inmarsat had on offer, seemed to bear out rather large potential demand. Obviously, with hindsight this does not appear so. But imagine a world where there are no serious alternatives to hand held phones even as large as the Iridium variety. Without the cellular phone that we all love and cherish today the case for using large brick size phones at high charges could be made. Many of us might have used these out of necessity and paid the necessary charges.

This is not to condone however the forecasts that were subsequently generated by many, often based on limited data from the early cellular phone experience. Based on what was known or could be foreseen then, these looked reasonable as no one could foresee how cellular expansion might erode the market for hand held mobile satellite services. Replicate the experience of users with Cellular phone, that is small GSM-like phones, and give them global mobility with one handset at around $1 a minute or so when calling outside the national or regional coverage and you likely will have a respectable market even in a world dominated by cellular phones.

So, the size of the market is indeed a function of a number of variables. Today, with the proliferation of cellular phone and roaming capabilities the market for voice can easily be met in most of the industrialized world if not universally in at least most of the world's metropolitan centres. In such circumstances the case for the satellite hand held phone providing similar functionality but at higher call charges is not obvious. The case for it can be made if the user equipment and call charges are not too different from what the customer experiences with his GSM-like phone, with the advantage of connectivity when outside cellular range.

Challenges - Lessons to be learned

There are a number of lessons to be learned from the experience of others in the satellite hand held sector. As ever, of course, one is wiser with hindsight.

Firstly, be sceptical of ambitious market projections even if supported by market studies, analysts' research and reports. Consider carefully disruptive emerging technologies, which ironically turned out to be the relatively "low tech" competing mobile radio concept turned cellular.

Secondly, avoid pre-occupation with "leading edge" technology rather focus on the market's needs, and the development and distribution of services. Fascination with ambitious technological infrastructure and deployment of the satellite hardware seems to have been at the cost of neglecting the development of services on the ground and the customers' ability and preparedness to pay for it.

Thirdly, make sure you have a distribution network that is tried and tested. This is often the weak link in the chain, rendering all other massive accomplishments of the business plan almost worthless when they cannot be translated into successful services that can generate the much needed cash to pay for those investments.

The overall implications for current operators and would be systems are profound: the satellite sector is risky; the markets to be addressed are often undeveloped and sometimes misunderstood; industrial partnerships must be based on sound business rationale and not biased towards self serving ends; the lead times involved in getting to market must focus the mind on contingency planning in facing competition; and keeping a lid on system and infra-structure costs and sky rocketing financing expenses are non-negotiable.

Ultimately, creation of Shareholder value is what all ventures are about. The $64,000 question is how to optimize on the risk-reward equation when embarking on massive infra-structure projects in the satellite sector. It goes without saying that there is no substitute for knowledge and familiarity with a sector; it is essential to walk before one runs and it is advisable to take on challenges of global proportions when one has accomplished more modest successes in satisfying customers' needs.

Data Market Opportunity

So much for voice. But what about data? The market opportunity for data rates has been amply demonstrated both in the satellite sphere and in the terrestrial mobile field. However getting large data files through at speeds in excess of 9.6 kbt/s is sometimes challenging as I am sure many of us will readily admit. Downloading an e-mail using your mobile data link seems to work but try to read that bulky attachment and you end up being one frustrated customer.

Inmarsat's strategy has focused on meeting the data communication requirements of mobile users and as such differentiate itself from the many other providers who are targeting the voice market and low speed data. There is a market explosion in mobile data needs and all telecom companies are experiencing this. Inmarsat has seen data growth rates in its mobile sector of 50% plus per annum.

Clearly, the proposed enhancements to the current 2nd generation mobile systems focused on higher data rates is aiming to meet these needs, such as GPRS and in due course, Edge.

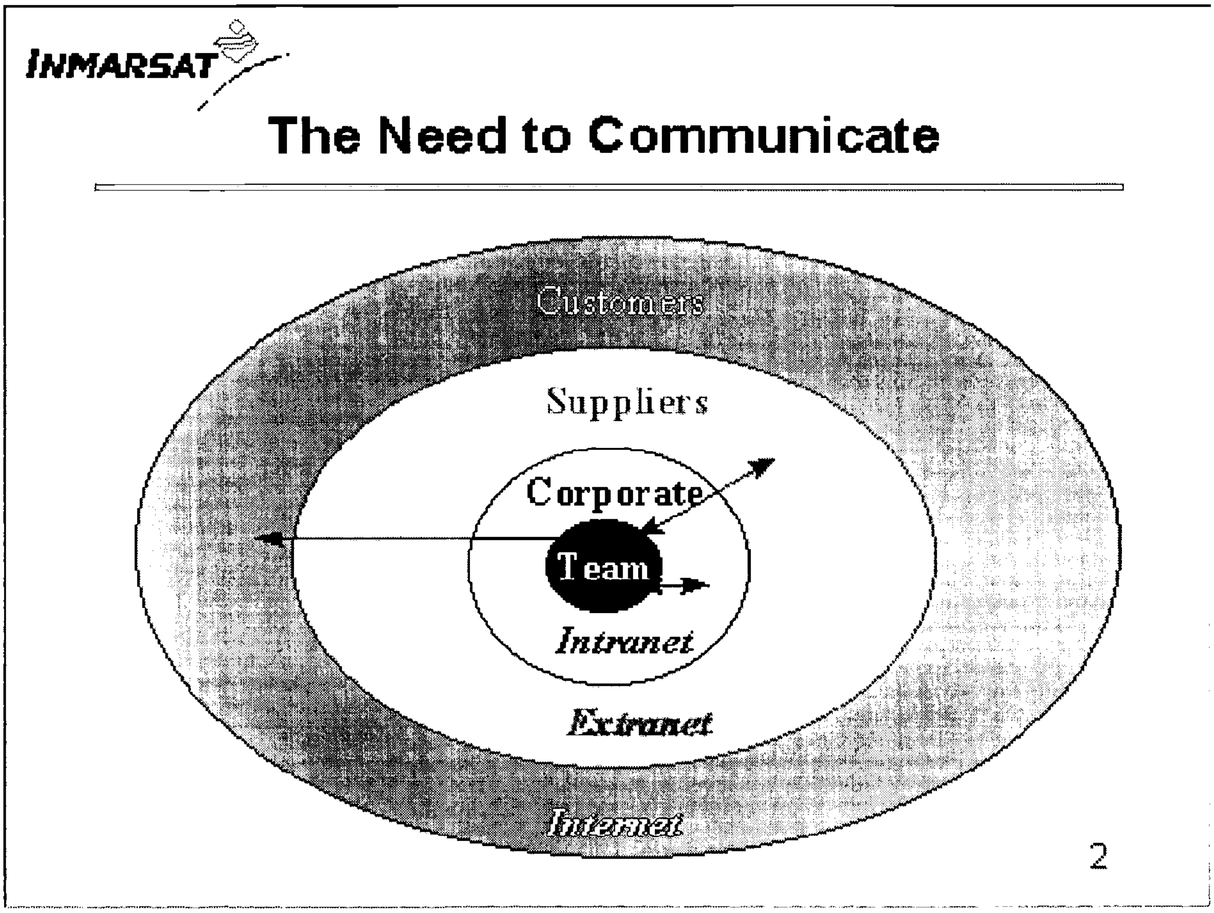
The fixed telecom networks are upgrading their services to provide high bandwidth services for commercial and residential users. The catalyst for growth in this sector is the internet. Consider the following projections in slide 1 made by some reputable organizations.

INMARSAT

Internet/Intranet - The Catalyst

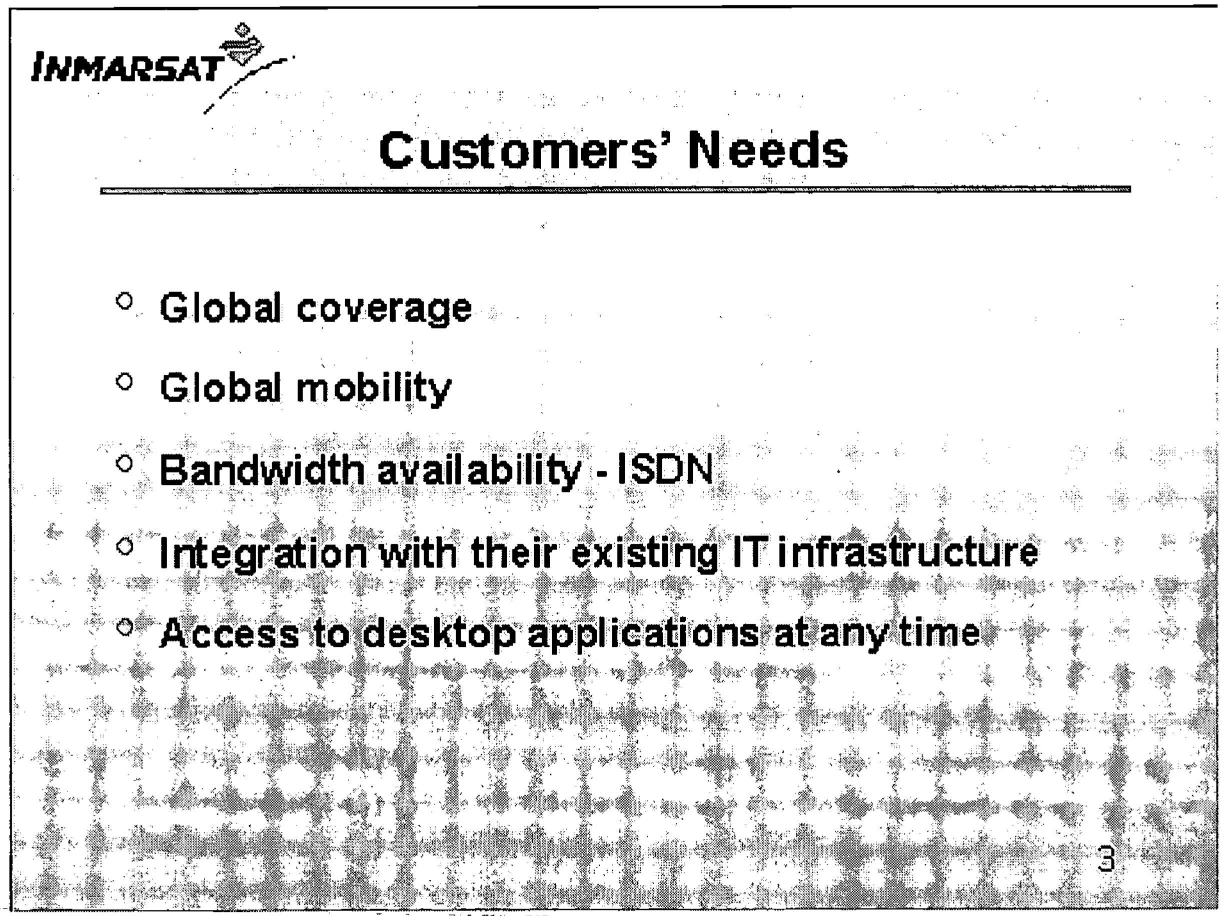
- 700 million Internet users by 2003 (Source: PA Consulting 1998)
- 70% of all corporations will have an Intranet by 2001 (Source: PA Consulting 1998)
- E-commerce forecast to be in excess of $850bn by 2002 in the US alone (Source: Financial Times 1999)
- E-commerce has enabled businesses to increase revenues by 10-20%; cut costs by 20-45% and reduce working capital by 60% (Source: Andersen Consulting 1998)

1



Today's office environment allows high data rate connections for intranet, extranet and internet applications (see slide 2). But once you are away from the office or home you have not much to choose from until the new advanced mobile data systems are put in place.

Inmarsat has recognized this void and introduced a solution for users communicating from distant locations who have no access to fixed services. We asked our customers who operate in a global environment what they wanted: They told us (see slide 3):



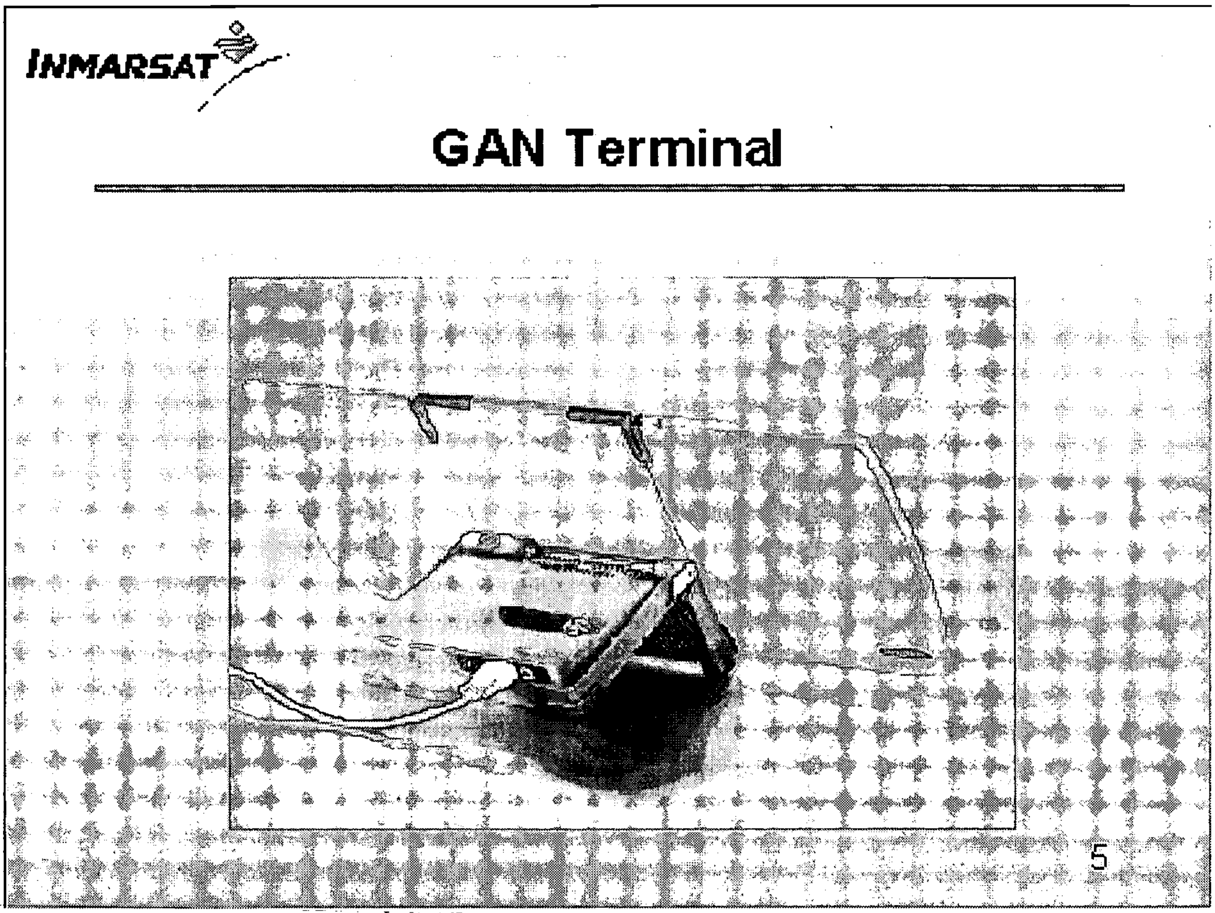
Our solution is to the Global Area Network, which delivers 64 kibts bandwidth (see slide 4) from a portable notebook size unit (see slide 5).

INMARSAT

Global Area Network

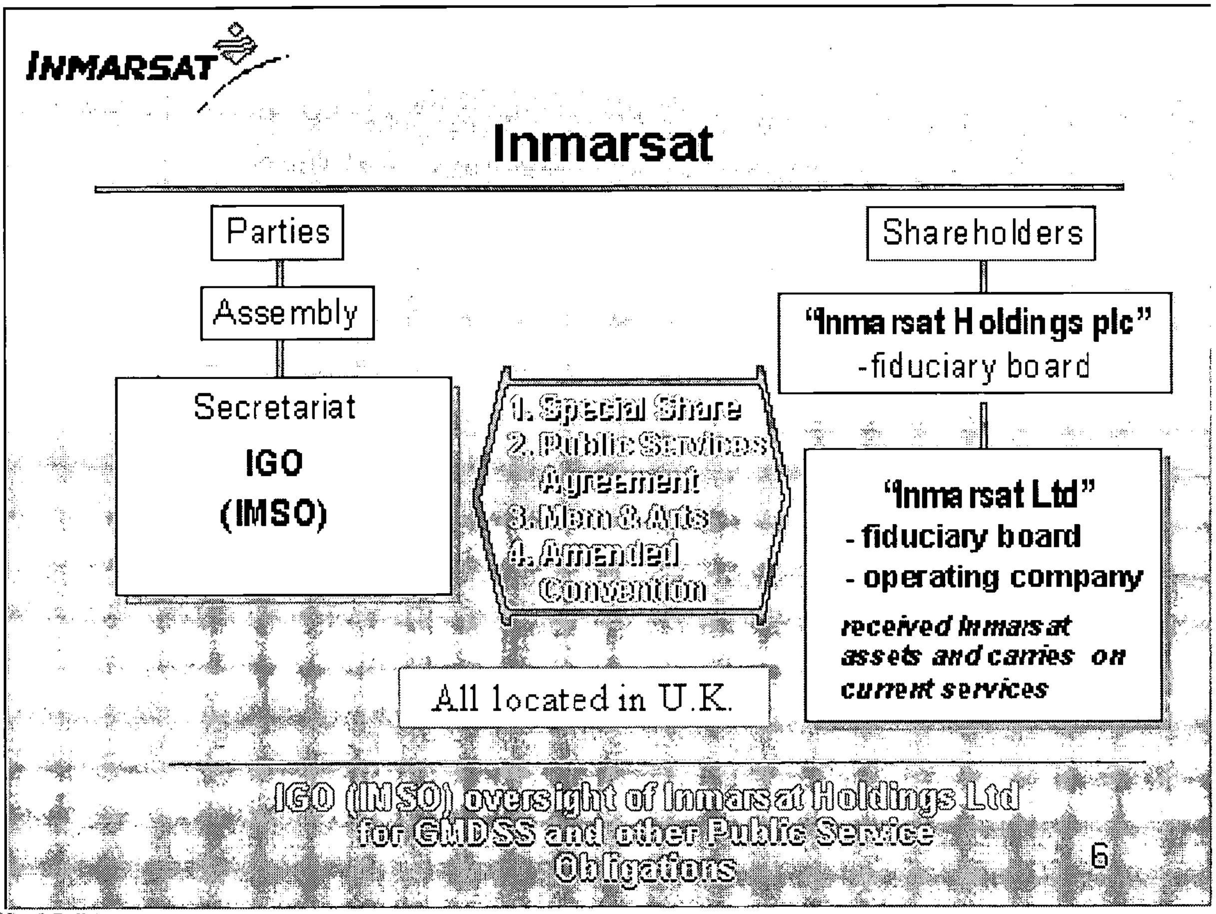
- Delivers the bandwidth (64Kbps)
- Mobility through Notebook sized/lightweight units
- Standard interfacing with ISDN
- Direct compatibility with Microsoft Windows applications
- In summary: The 1st mobile network with global coverage able to support IP protocol, anywhere

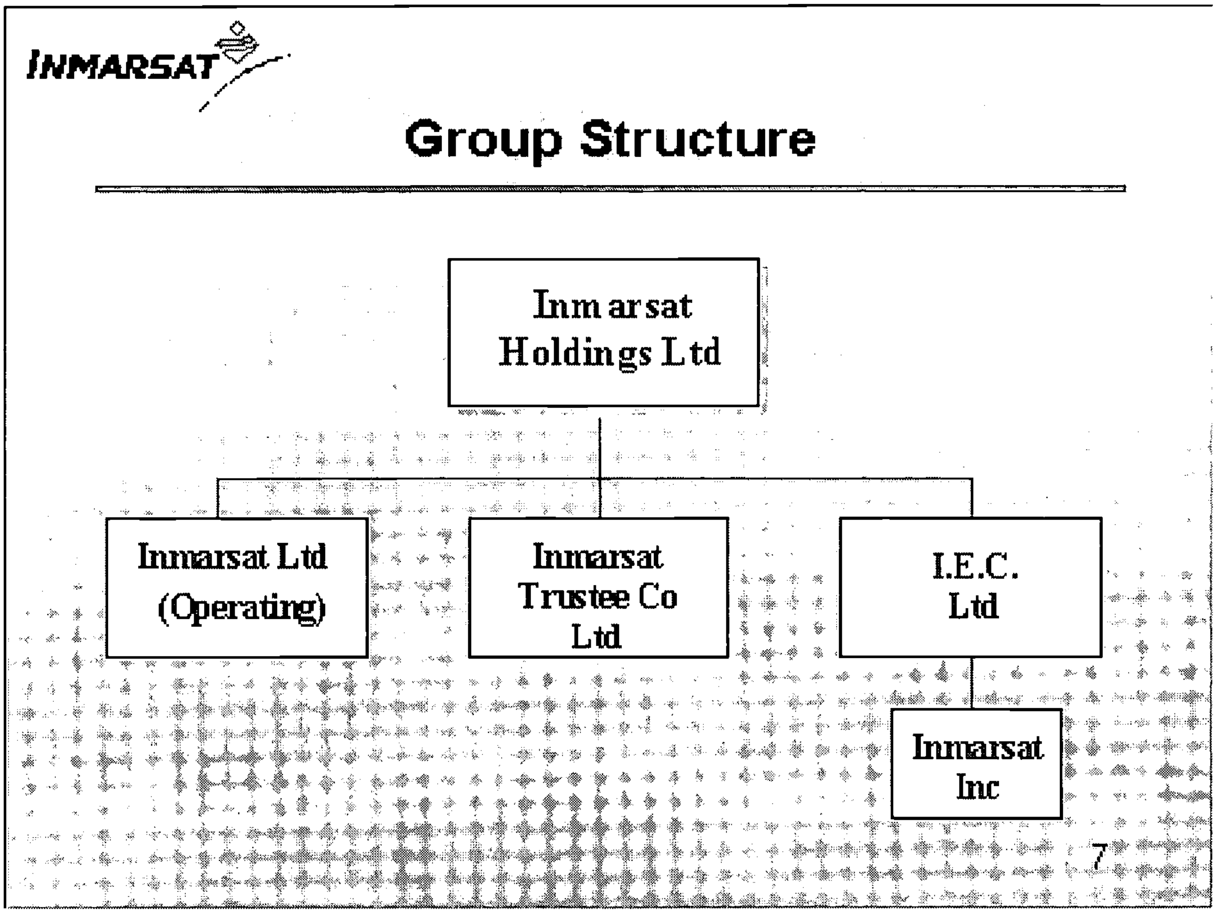
4



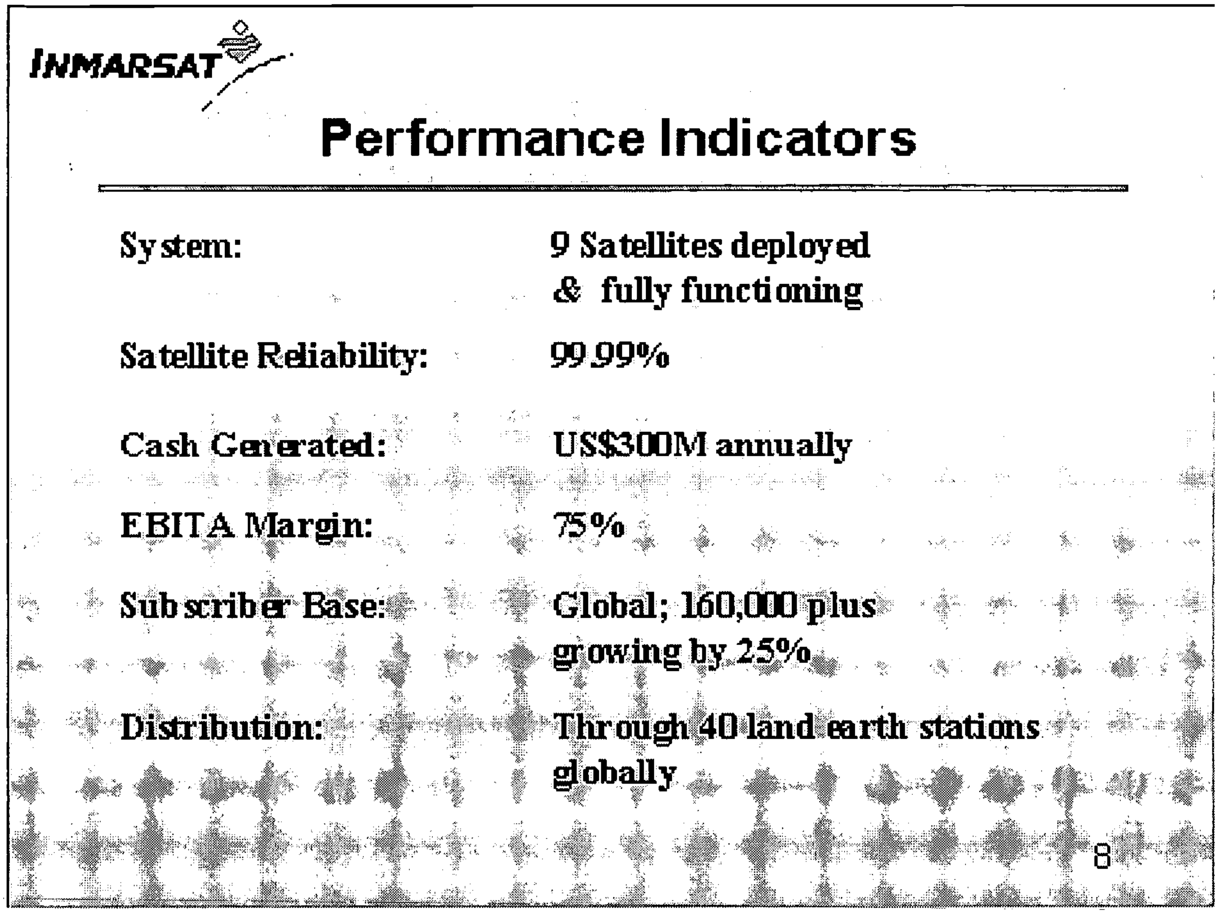
This represents the first mobile network with global coverage able to support IP protocol , the so called "plug and play" capability, anywhere in the world.

In case you don't know us well enough: we are Inmarsat Ltd, the privatized Inmarsat Organization that transformed itself into a limited liability company in April of last year. Our overall structure is shown in slide 6 and group structure in slide 7.


INMARSAT
Inmarsat
Parties
Assembly
Secretariat
IGO
(IMSO)
1. Special Share
2. Public Services Agreement
3. Mem & Arts
4. Amended Convention
Shareholders
"Inmarsat Holdings plc"
-fiduciary board
"Inmarsat Ltd"
- fiduciary board
- operating company
received Inmarsat assets and carries on current services
All located in U.K.
IGO (IMSO) oversight of Inmarsat Holdings Ltd for GMDSS and other Public Service Obligations
6



The table below (slide 8) shows some indicators of our performance.



We continue to be bullish about the MSS business; so much so that in December our Board approved a $1.4 billion programme for the purchase of a satellite system to provide data rates up to 432 khm/second. This programme extends our data focus to much higher speeds, broadband and multimedia applications. An important feature of our efforts is the integration of satellite broadband data with the 3G mobile standards. The Inmarsat 4 infrastructure will allow global communication via a palmtop or laptop to geostationary satellites and celestial connectivity to terrestrial networks. Please stay tuned and look out for further developments on our Inmarsat website.

Biography

Dr. Ramin Khadem

Dr Ramin Khadem is Chief Financial Officer at Inmarsat.

He obtained his Bachelors of Science in Electrical Engineering from the University of Illinois and subsequently obtained his Masters and Ph.D degrees in Economics from McGill University in Canada. He has also received specialized training in the following topics: Time Series and Forecasting from Carnegie-Mellon, Econometric analyses of the Financial and Monetary System from MIT and the Executive Management Forum from Harvard Business School.

Over the years he has seen Inmarsat grow from a start-up to its current position as the global mobile satellite consortium. He was part of the team that transformed Inmarsat from an international organization to a private company. This historic event, the first time ever that a treaty based entity has been privatized, took place on 15 April 1999 and paves the way for a more dynamic company and an Initial Public Offering (IPO).

Before joining Inmarsat, he held a variety of senior positions in the telecommunications sector in Canada, including at Bell Canada and at Teleglobe in Montreal.

What's Happening To My Business Plan?

Michael S. Williams

If you were to review the presentations given at this and similar forums over recent years, you would be struck by how reality has taken its toll on the earlier aspirations which have been presented. The all-too-public mobile venture failures have certainly caused severe consequences for the satellite industry as a whole. Financing worldwide for even the most sane business cases has gotten very difficult, and understandably so. Entrepreneurs with no existing revenue and no earnings stream are finding especially difficult times.

These high profile failures are stealing press time from quite a few lesser ventures which have "failed" in smaller and less noticeable ways. Tracking the stories from year to year shows a great deal of change in markets, in financial forecasts, and in the PR campaigns used in forums like PTC. Obviously, a number of us have had to deal with significant challenges to the business plans we assembled to help us sell and finance our ventures in a market where the rapid changes seem only to be accelerating. I wondered if we could come to grips with why that is. Here are my own thoughts.

The Ugly Truth: Too Many Business Decisions are Made (or Not Made) for the Wrong Reasons

In the early nineties, quite a few satellite-based ventures were envisioned, formulated, and sold to our corporate fathers, equity investors, debt providers, and their analysts. Many were very ambitious. Many were pretty routine. Based on my own discussions at the time, very few of the venture founders really believed that the advertised schedule or initial capital budget would be met. Nevertheless, the challenges associated with some of these larger ventures could get the blood boiling in any red-blooded American. The idea that markets could change so significantly as to nearly invalidate the original business case in a period of 5-6 years was never seriously considered.

But what happened in those 5-6 years. The use of the Internet in the daily life of people and businesses around the world exploded. Terrestrial GSM-based mobile communications exploded. Fiber optics became the predominant long-haul transport of choice. Processor speeds improved by orders of magnitude. Circuit-switched voice communications began being dwarfed by packet-based data communications. And everyone realized that voice was really just another form of data. Most notably, the cost of services and the terminals, which are really just productized processors, came crashing down with the volume generated by huge demand.

Even the simpler world of basic FSS communications changed pretty quickly. Who could have predicted the over-capacity of Ku Band transponders in the Pacific Ocean Region? A paper presented at this very forum in 1996 on the subject of Asia-Pacific satellites, by a member of a well-known satellite consulting company, stated:

> *"there will be no excess transponder supply and the transponder market will in fact remain tight over most of the next 10 years"*

Though we talked about building satellites "on a production line" and halving the "cycle time" and launching them far more economically and resolving local regulatory issues in a global way, none of that happened in any significant way. Certainly nowhere near the speed of these other market changes. An awful lot of people worried about beating the other satellite ventures to market when that really wasn't the real competition at all.

The entire role of communications by satellite changed. While still a very large market, it has become much more a collection of market niches which satellites serve well. The economics of providing basic transport by satellite dictated the industry consolidation still underway. Just as many satellite manufacturers decided they needed to move "up the value chain" to be transport service providers, the heritage transport service providers decided they needed to become infocom companies.

What happened to these early and mid- nineties business plans? Did anyone in the corporate offices admit that their ventures could be in fundamental trouble in this new market sea-state? Did they really even see it, given that the real competition was really not in their focus? Did the equity investors recognize the sea-state change? The debtors? The analysts? Not many! And just why?

Now for the ugly truth. Not many people really associated the sea-state changes with what they were doing. If they did, they certainly couldn't admit that they had been a key part of convincing people to invest their money in what was now a flawed venture. Quite a few had careers invested in the successful outcome of the venture. Better to redefine the original target market and financial forecasts without acknowledging what had been said the year before. Dealing with "the ugly truth" was much harder than spinning new stories and hoping for serendipitous good luck to save the day.

Market Forecasting - What's It Good For?

We all dabble at forecasting markets, even though it's becoming more and more like gazing into a crystal ball and prophesizing the future. We all use consultants to help forecast markets because they're "experts" and because they're viewed as "independent". Five independent consultants typically offer six independent projections of the future. Sometimes, you can even see correlation. But no one can effectively predict fundamental changes from trend lines. We're only good at extrapolating the trend line. Where we really need help, and what we have no good methods of attack is in identifying - beforehand - major departures from trend lines; changes that in a sense are measurable on the Richter scale. It's necessary to have forecasts from reputable "houses" help you get your project funded, to help sell it to your management or to investors. But, investors need more and more to be convinced of the robustness of the plan to all likely outcomes. The forecasts are not really useful for knowing the bumps in the road or hairpin turns ahead. We are all flying blind to some extent or other once the die is cast, after money gets spent, after programs get rolling.

Business planning and forecasting has been and continues to be largely an academic exercise, insulated from the cold realities of the real world, the market, what customers need, where technology is heading, and what new technologies are still below the horizon. Quite often, we're talking about events that change the course of history, discoveries, new products and services that cause significant, unpredicted change or disruption in predicted patterns and trends. Those that seem to be happening at an accelerating rate.

What can you conclude?

- Business plans need to be robust. The market forecasts are only point-in-time educated guesses. They need to be calibrated often. And not on a global basis, but rather region by region and service by service.
- The time-to-market needs to be as fast as possible. Taking years is hazardous.
- System designs and satellite designs in this rapidly changing sea-state need to be robust and often "on the shelf". Better to get approximately what you need to market fast than getting exactly what you want there late.
- The people who lead the business can't wait passively for the ultimate market outcome. They need to assume that the details of their original plan will be wrong and constantly adapt and drive their positions in changing markets to meet the financial commitments.

Do You Really Know Your Customers? Your Competition?

A major part of forecasting and developing a business plan relates to your real first hand understanding of and conviction about your markets, the real customers, and the real competition. What are they really thinking? What do they need? What are their gripes? What do they want and what can they spend? What do THEY think about your competition and how you stack up?

Jack Welch still terrifies his business leaders by visiting their customers regularly. He often learns what's losing market share for his businesses from their customers before he hears it from them. Woe be to the business leader who lets that happen to him. What good is second hand and third hand data from surveys? Another well-known CEO of a very fast growing satellite business always flies in coach class, middle seat if possible, to perform primary market research about what the ultimate consumers want and how they feel about current and future services. He also requires all of his people, at virtually all levels of his organization to do likewise. You can do a lot of talking on a long flight and your seatmates can't get away. We once spoke about a potential new venture that took us both a bit beyond markets we were familiar with. A good bit of the lack of familiarity was because there was precious little basis in anyone's current experience. I suggested we jointly spend a bit of money to bring in a well-known consultant to help with the forecasts. He looked at me as though I had three heads and asked why I had so little conviction about the idea and our ability to make it happen.

Don't We LOVE Our Technology?

Many of us come from an engineering heritage and work for companies where there is high technology content. There is a large constituency of techno-babble being propagated, within the walls of our companies, and more and more openly outside - in sales/marketing materials which eventually work their way to the end user or consumer. What we all too often fall into the trap of falling in love with technology - or our own spin, or our own proprietary way to solve what we feel is the problem. Technology looking for a need. We have the better mousetrap - of course the customers will come. Our widget is better that anyone else's. Its alphabet soup - to a large extent. VOIP, IP over ATM, GSM, TDMA, CDMA, LEO, MEO, GEO, et cetera, et cetera, et cetera. To us, technology is THE answer.

We lose sight of the target, what really matters.

What Really Matters?

Each of us has one or more criteria by which we are measured, and by which we measure others. The traditional markers for keeping score are financial, market, performance against plan, jobs created and job security, customer acceptance and customer satisfaction.

For what really matters, I believe that the order I just gave you is totally backwards. We, in engineering based, performance based corporate environments tend to lose sight of the customer. What matters to the customer should be our predominant focus. Let me describe a situation very close to my heart - the mobile cellular satellite phenomenon. Just look at what some engineers decided would "work" for a consumer handset. In the first place, how many users would want to carry around two handsets? One handset for terrestrial links, and one for the satellite? Secondly, how convenient is a handset the size of a loaf of Italian bread? How about the simplicity of a handset no bigger than a standard GSM phone; seamless roaming between ground and satellite; all transparent to the user. What counts for these consumers are reliable connectivity, features, convenient and light-weight packaging, and interoperability among networks wherever they travel, AT A COMPETITIVE PRICE.

What really matters is not losing sight of what really matters. This goes back to knowing your customer, knowing your competition; then acting on that knowledge.

As Time Goes On.... Seeing Things As They Are

There's a Chinese curse "may you always live in interesting times". Along the same lines, the German philosopher Hegel said: "We learn from history that we do not learn from history." Alvin Toffler, more recently added: "If we do not learn from history, we shall be compelled to relive it. But if we do not change the future, we shall be compelled to endure it. And that could be worse."

We do live in interesting times. The pace of technological change is absolutely mind-boggling. Telecommunications is a "hot" industry; one where "it's happening baby!" The nature of our industrial enterprise, collectively, is to change the future. The reality is that we have to be better at is recognizing our fallibility at predicting the future as we go about doing the things which we hope will change it.

We have to regularly revisit the assumptions on which our business plans are based and assure that we are fast enough to market and robust enough in our solution to prosper. We have to know that the messenger will not get shot over what can be interpreted as bad news. It's not typically bad news, but rather new news that requires a rapid response to keep the end objective viable. News that the world is not behaving like our market projections isn't bad news. Deluding yourself into believing that's not happening is bad news.

The indictment of most business plans is that once done, they sit on a shelf and gather dust until the next year's planning cycle. Our real business plans need to be burned into our brains. Our responses to change an expected part of our normal business lives.

So What's It All About?

To wrap this up, it's really about the real world not behaving as we once saw it in our crystal balls. There's nothing happening to My Business Plan. It hasn't changed - the world has. And that's the heart of the problem. We have to be better at building in robustness, at driving to market fast, at recognizing and accepting the implications of market sea states. And better at making tough decisions fast and responding to the new realities.

Thank you. I'm off to Baikonur Cosmodrome in Kazakhstan for the long awaited launch of the Garuda-1 satellite and the start of many years of providing competitive voice and data services to fertile markets around the globe. The ACeS plan is about to become a reality. I hope to come back next year and tell you that our business plan worked. Wish us luck.

Sessions

Technology

M.1.5 Intelligent Networks
Monday 31 January, 1100-1230
Location: Honolulu Suite

Chair:
DALE ROGERS, Global Accounts Director, TeleCommunications Systems, USA

M.1.5.1
KOJI TASAKI, Senior Engineer, Software Development Department III, Fujitsu Limited, Japan
Service Development System (SDS)

M.1.5.2
MATTS OLSEN, Director, Intelligent Networks, Ericsson Radio System AB, Sweden
Presenter: TOMAS BERN, Senior Account Manager - Value Added Solutions, GSM Marketing, Ericsson, USA
Intelligent Network Evolution within GSM Networks

M.1.5.3
LEE-LAN YIP, Senior Product Manager, Packet Telephony, Cisco Systems, USA

M.1.5.4
KAZUNORI YOZAWA, Vice President and General Manager, Western Region, NTT America, USA

Related Sessions

M.1.5 Intelligent Networks
M.2.5 Essentials of Broadband & Emerging Technologies: Infrastructure & Services
M.3.5 Broadcast in the Era of Convergence
T.1.5 Distance Learning Applications and Directions
T.2.5 Applications for Technology for Distributed Learning
W.1.5 Electronic Business: Global, Regional and National Issues
W.2.5 Political Economy
W.3.5 IMT-2000 in Asia-Pacific

Sessions

Service Development System (SDS)

Koji Tasaki

Introduction

For the central switching system, rapid service delivery is one of the most strongly requested tasks imposed by the service provider to the system vendor. To avoid losing marketing chance, system provider naturally wishes to provide new service as much as timely. To realize it, the service vendor has been requested to shorten the service developing term. However, as well known, the switching system is a very complicated system. It consists of much special hardware, on-line super-multiple task software. In addition, it requires much highest system reliability. From such reasons, service vendor has cost not a little developing term for a long time. Service vendor is still facing this problem nowadays. Especially the software programmability is the strongest bottleneck to the quick service delivery.

SDS (Service Development System) is our new solution for the software programmability. This is both the environmental approach and software system architectural approach for the switching system. On this special architectural software, SDS provides highly user-friendly and well-organized software-developing environment. It covers not only the software designing stage but also the software testing stage. That means SDS provide total software programmability. By using SDS environment, software-developing term can be reduced very much. In addition, since SDS provides highly user-friendly interface, it is applicable not only for the service vendor, but also for the service provider or service operator. In other words, SDS provides Customer programmability to the service provider. This is the quickest scheme for the service provider to provide new service and evolved form of software programmability.

IN (Intelligent Network) solution

Before describing about SDS, let us inspect IN (Intelligent Network) solution. IN is one of the well-known solutions for the rapid service delivery stated above and actually introduced onto some commercial telecommunication network in these days. IN also have two major aspects: One is system architectural aspect, and the other is environmental aspect. From the viewpoint of system architectural aspect, conventional switching system's functionality is separately implemented into two different nodes. One is Service Switching Point (SSP) that mainly handles only the switching of call, and the other is Service Control Point (SCP) that handles only the service logic itself. According to this functional separation, when a new service is introduced, only the service logic would be newly introduced onto SCP side software and no modification is required to the SSP side software. In addition, from the viewpoint of environmental aspect, Service Creation Environment (SCE) is provided as a developing environment for the service logic software on SCP. SCE aim to realize easy creation or modification of the service logic. Upon these advances, software programmability would be achieved and it would lead to the rapid service delivery.

Evaluation of Conventional Service Creation Environment (SCE)

Many tries have been done providing Service Creation Environment (SCE) to IN operators so that these operators themselves can start service programming. In spite of these efforts, not much improvement was observed in actual development efficiency. Nor many operators are actually involved in the service software development.

When the present Service Creation Environment (SCE) is evaluated, it will be understood that some of the important programming features are lacking in the present SCE.

The IN service software is composed of the following two different programs.

- Service execution program (Service scenario)

    The service logic software to provide the actual service to the network users.

- Service Management Program

This program provides various Operation and Management software such as service traffic measurement, subscriber data management, service related log data management, billing data collection, etc.

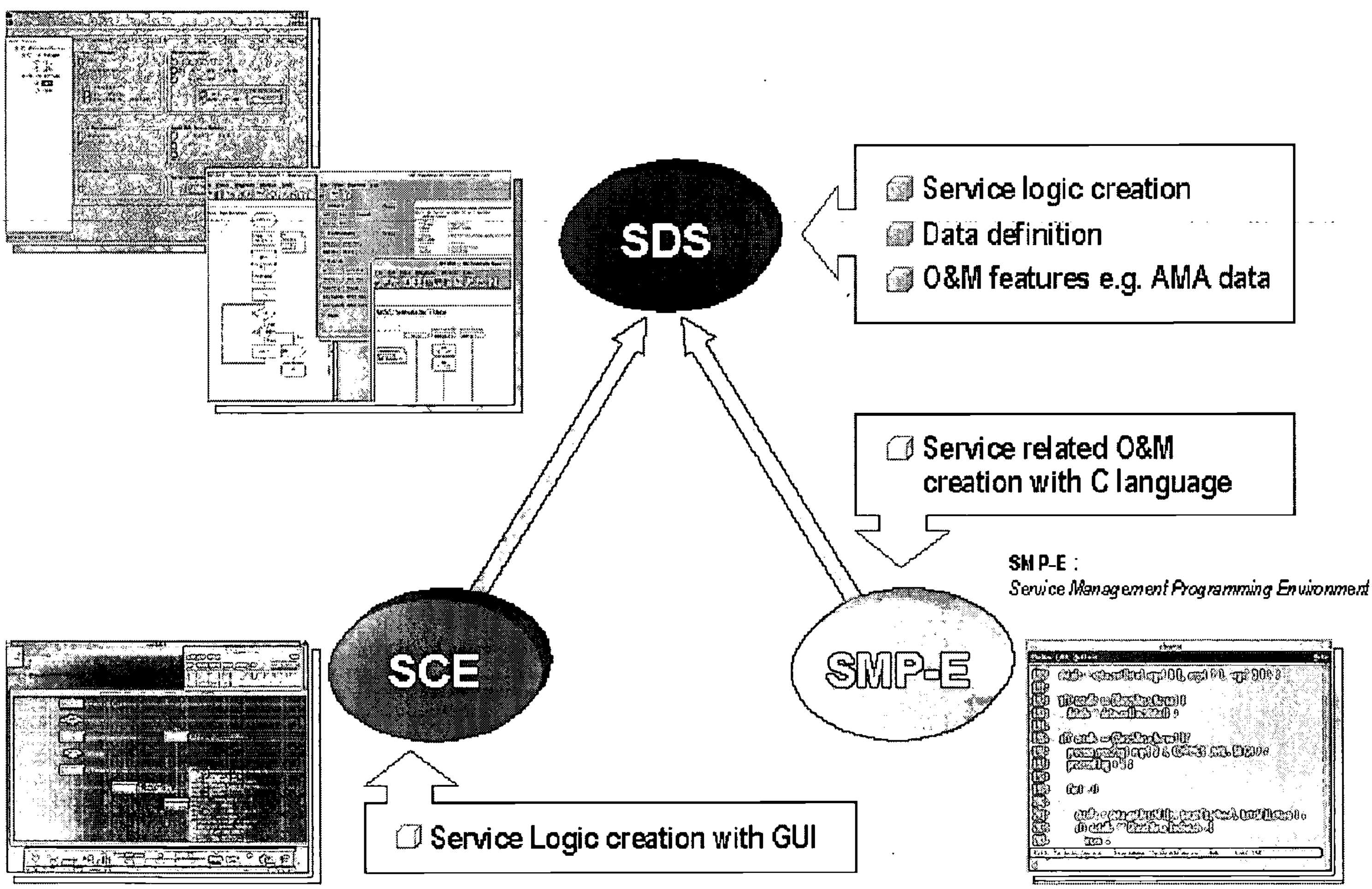
The present SCE provides powerful programming platform for developing service scenario software to some extent. However, this capability is faded out without well-organized service management programming environment.

The present SCE cannot provide effective countermeasure for its improvement. Operators are forced to make programming by simple C or C++ language. In other words, the present SCE is effective only for Service scenario programming but not for total service management programming.

SDS (Service Development System) solution

Service Development System (SDS) is developed to cover these SCE's weak points to provide real flexible programmability.In order to achieve this objective, SDS is so designed to provide both SCE and Service Management programming Environment: SMP-E.

With these arrangements, service providers can create, modify, and start services in a most timely manner.



Service Development System (SDS)

SDS enables full customer programmability that provides developing environment for any services by customer themselves. SDS delivers following functionality with Graphical User Interface (GUI) based operation.

- service scenario creation
- simulation debugging
- service/billing data definition

Service scenario creation part and simulation debugging part correspond to the SCE of IN architecture. Service/billing data definition part overcomes exactly the weak point of current SCE of IN solution.

From the viewpoint of environmental aspect of software development, SDS consists of two parts, SDS-scenario (SDS-s) for service scenario creation and SDS-data (SDS-d) for service/billing data definition. In addition, from the viewpoint of software testing stage, Simulation debugger is available for testing on created services with SDS-s and SDS-d.

We are using SDS for our own services development to deliver them to customers. Enhancement can conducted for the system on user's perspective because our service development team is one of SDS user.

<Software Architecture >

From the description above, it is easily understandable that SDS does not cover all the software of switching system. Surely, it is an ideal case that software programmability is archived in all the switching software. However, considering the complexity of it or system performance, it seems like unrealistic. Then SDS focuses on just the service logic software and some of O&M (operation & maintenance) features. The other parts of switching software are treated as platform software and no modification would be required by the introduction of new service. Just like the SSP software and the platform software of SCP side in IN.

To achieve the software programmability in O&M part, SDS adopts the SN (Service Node) type system configuration, that means service logic software, O&M part software and platform software are all implemented into one node.

As for the service logic description, SDS adopts MSC (Message Sequence Chart) and SDL (Specification and Description Language). MSC and SDL have been standardized by ITU-T, and well known as a convenient language to describe system specification. It is very suitable to describe state transition diagram just like the switching protocol or service-switching logic. Since SDS and our system adopt SN type system configuration, subscriber signaling or intra office signaling is used as the basic events between MSC/SDL part and platform part.

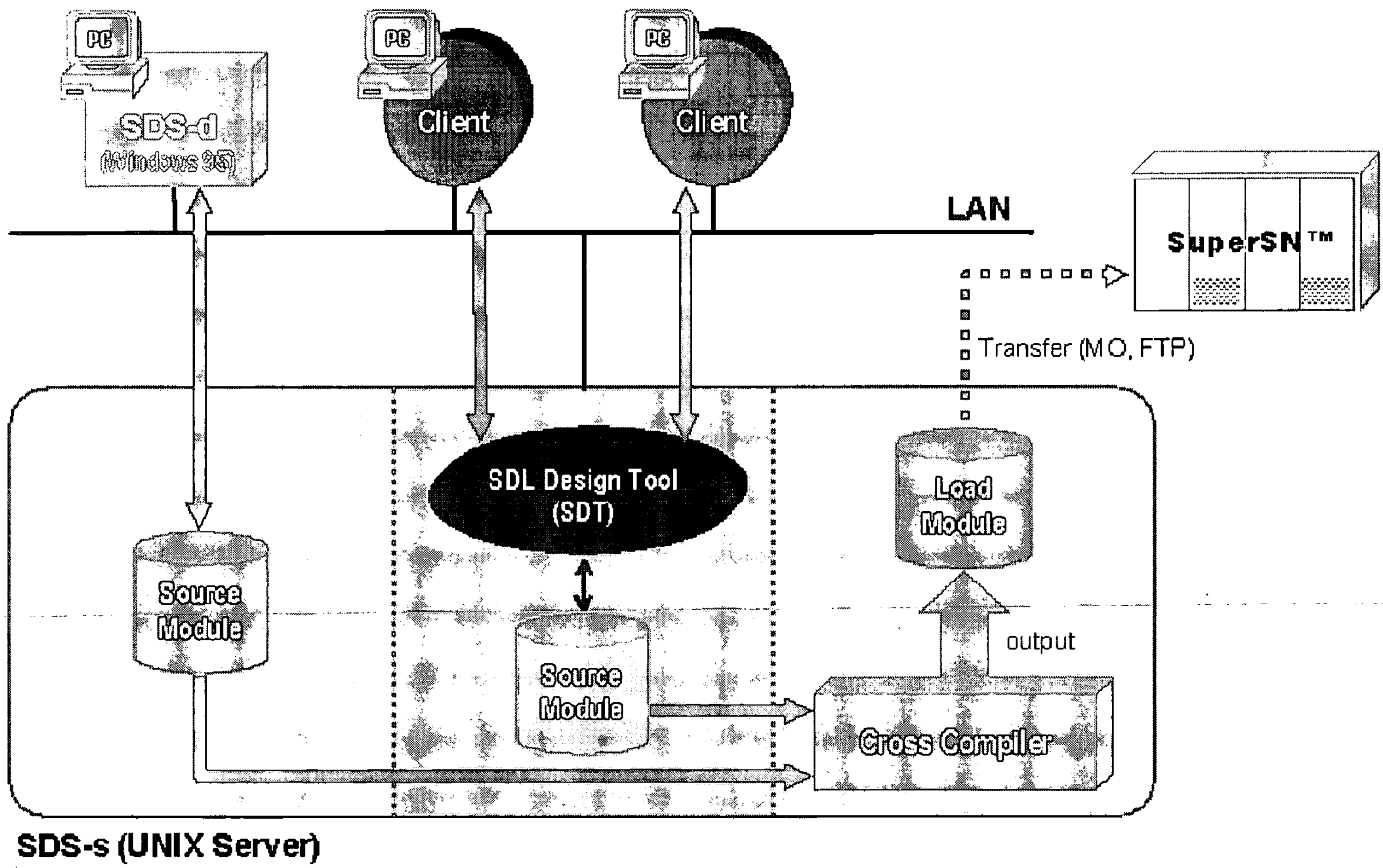
Since MSC/SDL are used as a service description and GUI interface is provided to describe MSC/SDL in SDS-s, service vendor need not to handle so called programming language. Just drawing event sequence chart, flow chart or state transition diagram, they can describe the service logic.

As for the O&M part, to achieve the software programmability, data oriented software architecture is adopted. O&M software consists of basic program part and data definition part. This O&M basic program part runs as a platform functionality and data part determine how to perform this O&M platform programs. As a basic O&M platform program, traffic data collection functionality and Bill record (AMA (Automatic Message Accounting) record) generation functionality are built in our SDS. To these programs, defined data gives information how to perform. Such like, which kind of traffic data should be collected, what is the name of traffic item to be collected, which kind of item should be collected in bill record, which format is used for the bill record, and so on. According to this software architecture, software designer can very easily add or modify O&M functionality only by adding or modifying data definition. They need not to create or modify some programs on this purpose. SDS-d is the environment so designed to create or modify these data definitions.

The data oriented software architecture is adopted not only O&M platform programs but also some programs that control service logic programs. New service logic would be easily created by MSC/SDL with GUI. However, it is not enough. It can not run alone. To use or activate this newly introduced service logic in our system, some platform programs are implemented. For example, service logic itself is treated as a service scenario. Which kind of service scenario is equipped in our system is managed by scenario management data. Therefore, when service designer wishes to introduce some new service scenario, he has to introduce new scenario management data simultaneously with the introduction of scenario itself. In addition, which condition such newly introduced service scenario would be activated in actual call processing is also controlled by some data definition. These data definition mechanisms are just resemble to the O&M data oriented programs stated above. Just adding or modifying data is enough. SDS-d covers these all the data definitions.

<System Architecture>

SDS system architecture is shown in the following figure. SDS-s runs on UNIX server and development working is performed through PC(s) connecting to the server by several operator(s). PC(s) can be located at remote site via LAN. SDS-d is also connected to UNIX server and run on Windows95.



Service Development System (SDS)

<Service Development Process >

In the present service development procedure, still much working is conducted on paper basis. In addition, development is performed with programming languages. Developer is required specific knowledge on both computer and program languages in this case. However, SDS can release developers from such specific requirements because most of process is conducted on GUI base. No such specific knowledge is required.

At first, service scenario is developed on graphical editor of SDS-s with high-level specification i.e. Message Sequence Chart (MSC). Here, only the general flow of procedure would be designed. This Message Sequence Chart would be compiled into SDL in environment of SDS-s. On this level, detailed procedure can be added into this SDL also on the graphical editor of SDS-s. Designer can easily modify the SDL that describe the service scenario by using preset object with drag and drop manner. Finally SDL would be compiled into C language and treated by the same manner of other platform programs originally described by C or C++ language.

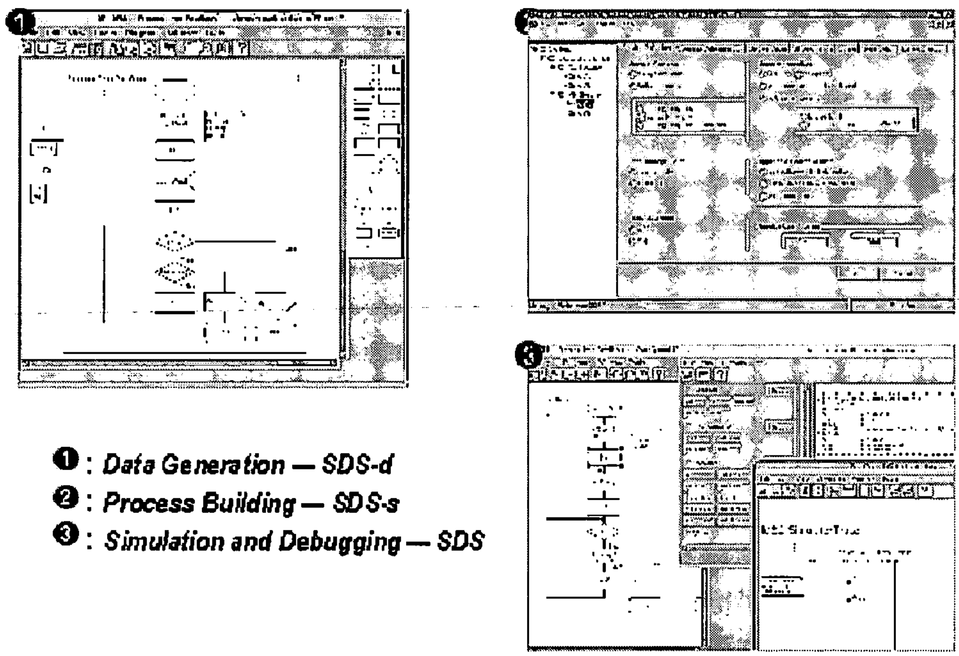
SDS-s has a capability to define functional components by combining several processes into one process. Once a functional component is defined, it can be used for further service scenario development. Development working can be more efficient manner by using the components. The components are increased by developing services as property.

Simulation and debug of the service logic are conducted with dedicated tools on the UNIX server. Simulation is performed with windows e.g.

flow chart, simulation process and its result. Simulation debugging is available on both MSC level and SDL level. The simulation debugger tool shows not only simulation results but also simulation processing in real time basis. A designer can check the progress visually. When a wrong process is detected, simulation stops at the suspected point. A result is indicated in the window at the same time. Up to the testing phase, all working is conducted on the UNIX server.

On the other hand, service/billing data is defined on SDS-d. Data name is defined by typing and data attribute is selected from preset attributes. After the process, data dictionary is generated. The data dictionary is referred by the service scenario or some platform programs. When modification of data attribute or format such as on billing data is required, SDS-d is just enough as for the operation.

According to our experiences on development with SDS, most of software bugs can be revealed and fixed in the integration test stage. Thus, less test items are required for further System Test phase on actual SN machine.

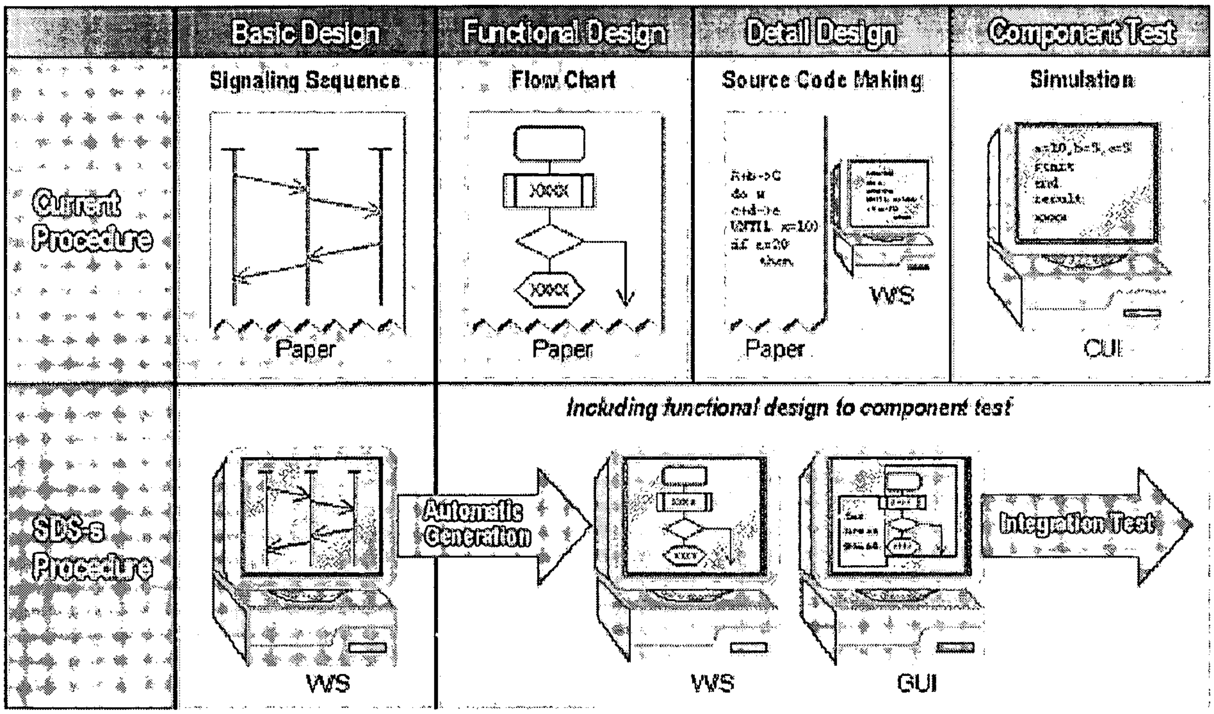


❶ : *Data Generation — SDS-d*
❷ : *Process Building — SDS-s*
❸ : *Simulation and Debugging — SDS*

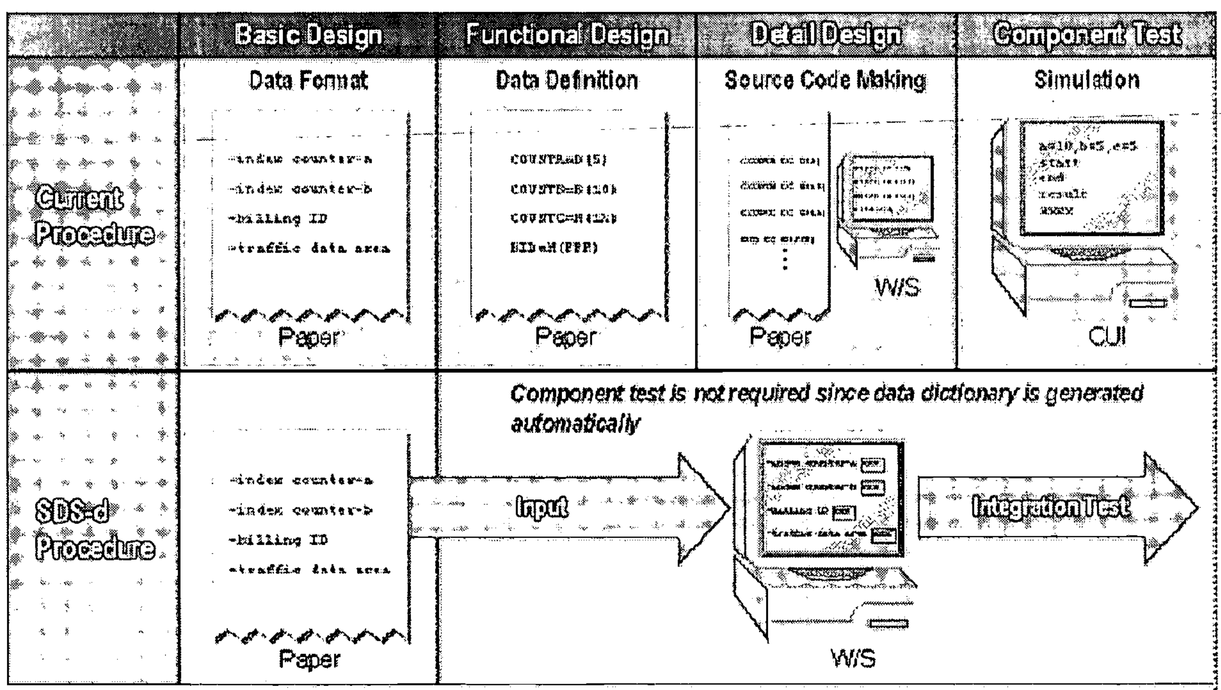
By SDS practice, development lead-time can be reduced because of following reasons.

- parallel development by several developers can be conducted
- less test items are required for System Test
- service scenario can be shared for other services

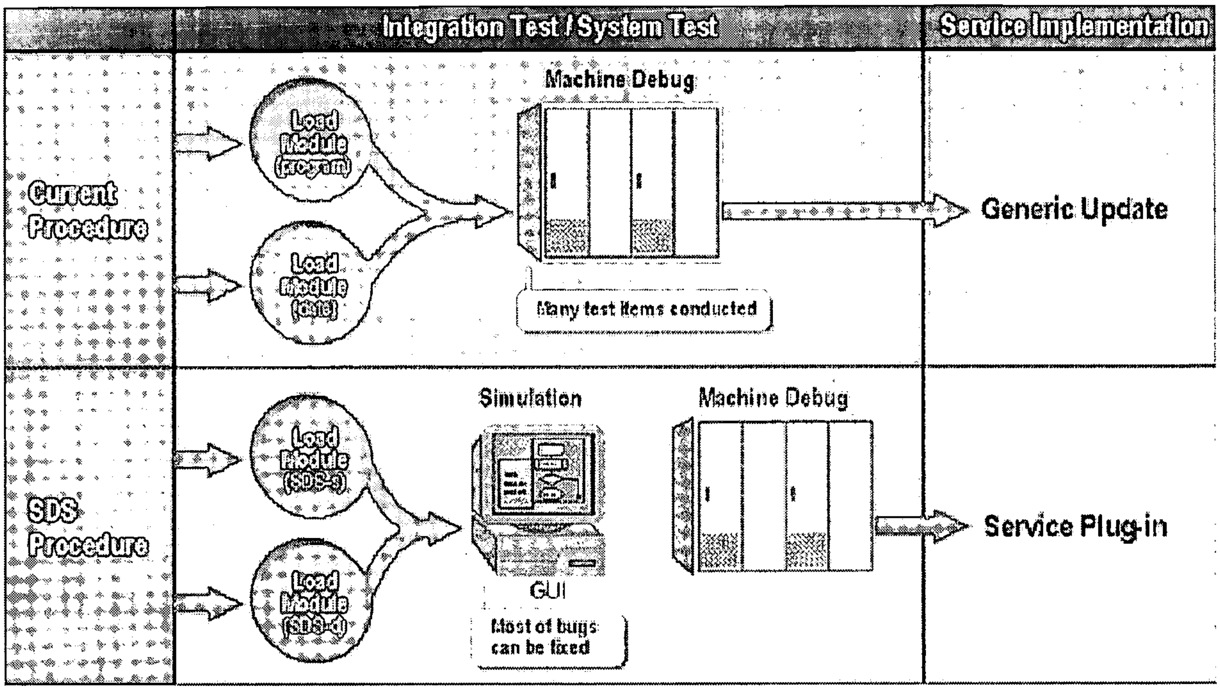
The next figure shows overall service development process.



Service Logic Generation Basic Design ~Component Test



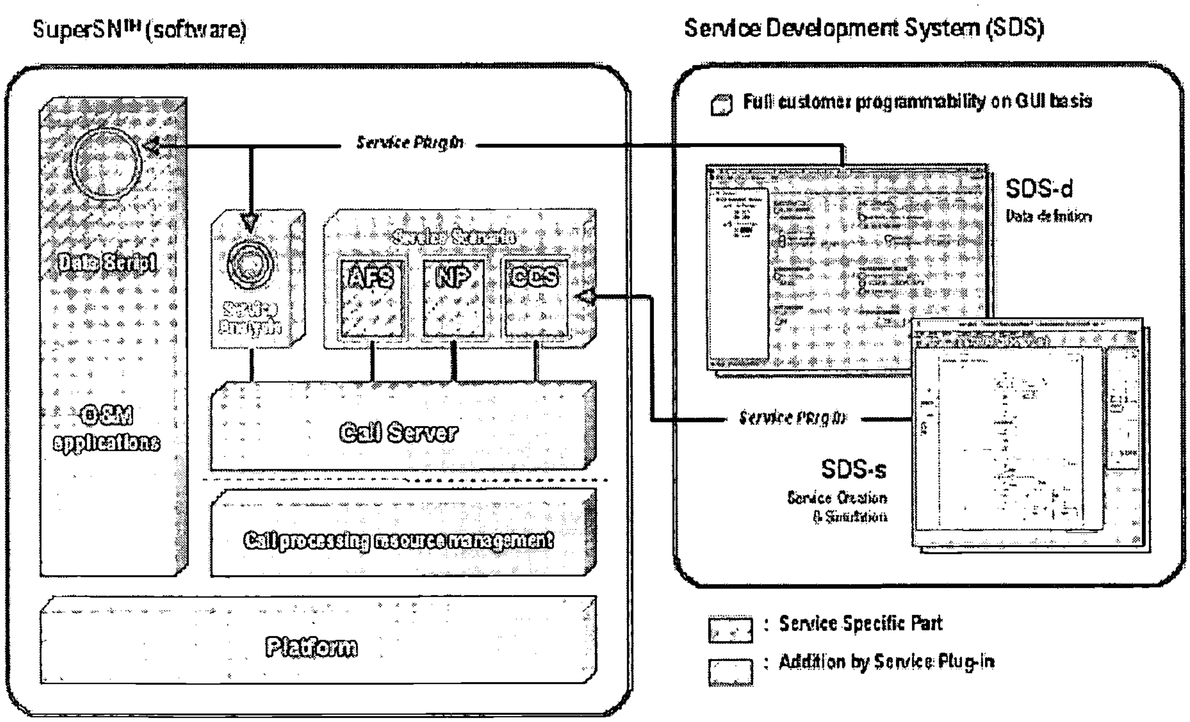
Service Data Definition n Basic Design - Component Test



Testing Phase n Integration Test - Service Implementation

Implementation of New Services

When a service is ready for commercial implementation, program is transferred to system through MO or LAN. The created service designed on SDS-s and data dictionary designed on SDS-d are implemented into system with Service Plug-in manner. The Service Plug-in manner can provide program loading and service activation without any interruption on present services. New service implementation can be conducted under on-line condition. The next figure shows Plug-in manner for service implementation.



Service Creation & Plug-in

Centralized Database functionality

To achieve full customer programmability, new service must be introduced easily. However, such new service may use some centralized database with any type of record format. Considering such case, designer also needs to introduce such database with customer programmability. As stated above, SDS and our system perform as Service Node. Then the demand of such centralized database is thought to be much high, because it is one of the typical features of SN or IN.

Our system also equipped this database functionality with customer programmability. As for this database functionality, SDS does not provide any creation environment yet. Currently only the command interface is provided in our system to create or modify the database. By using this command interface, designer can create and introduce new database in our system. Of course, it is so designed that designer can define any type of record format. Since command interface is adopted, the creation or the modification of database can be conducted under on-line environment naturally.

On SDS environment with this database functionality, we have developed some of major benchmark IN services: Number portability service, Advanced Free Phone services, and Credit Card Calling service.

Summary

Advantages of SDS and service implementation are summarized.

- features combined both SCE and SMP-E
- full simulation and debug tool
- operations based on GUI
- service implementation by Plug-in manner without any service interruption
- training and consultant services

With these advantages, SDS can bring real customer programmability environment to customers with full confidence.

Biography

Koji Tasaki

Koji Tasaki works as a senior engineer at Software Development Department III,Platform Development Division I, Network System Group, FUJITUS LIMITED Mainly engaged in IN software development of switching office.

Mar./1989 Graduate from Department of Science, Kyoto Univ.

Mar./1991 Graduate from Master cource of geophsyics, Kyoto Univ.

Apr./1991 Entered in FUJITSU LIMITED

Sessions

Intelligent Network Evolution within GSM Networks

Thomas Bern

Abstract.

Intelligent Network (IN) technology has been available in GSM networks for several years. Initially the protocols developed for wireline networks have been reused, e.g. the ETSI CS-1 protocol. Proprietary additions to handle specifics for GSM networks have sometimes been introduced in order to better meet the needs of mobile networks.

One aspect that has contributed to the success of GSM is the roaming between countries, i.e. between networks belonging to different operators. Up till now this has allowed origination of calls and reception of terminating calls when travelling, without any special registration with the visited operators. A basic feature set has been available; this has however not included any IN based services.

Over the last few years the use of IN technology has become more widespread. A major driving force is Prepaid services, which today are used by significant numbers of subscribers in most networks. The higher penetration of IN has triggered the development of a dedicated IN protocol, CAMEL, for GSM networks. In the same way as the standardized MAP (Mobile Application Protocol) is part of the Memorandum of Understanding (MoU) between GSM operators, and thus the foundation for the roaming, CAMEL is becoming a part of the MoU. It allows access to the subscriber's set of IN services even when he/she is roaming.

One type of service, where the benefits can be easily seen, is Virtual Private Network. The introduction of CAMEL will allow a user to access the company short number dialing plan even if travelling abroad. Another early CAMEL based service is Operator Controlled Number Translation. The service will allow the global usage of e.g. short access numbers for Voice Mail. An example, today the Swedish operator Telia uses 133 for access to Voice Mail. Within Sweden no other digits are required for a user to get access to the mailbox. When roaming, a full-length international number has to be dialed plus the user's own CLI plus a four digit password. With the introduction of CAMEL the code to dial will be 133 even when roaming.

It is expected that over the next few years the vast majority of GSM operators will introduce CAMEL in their networks. And, as CAMEL is fully standardized, there will be strong competition between the IN equipment and service vendors.

CAMEL will also play an important role in the 3rd generation cellular systems currently being standardized in Europe. But more important is the evolution of the Intelligent Network concepts being processed within the 3rd Generation Partnership, 3GPP. The current plans are to include an Open Service Architecture, and a Virtual Home Environment in the specifications for the 3rd generation networks.

The Open Service Architecture will introduce for example standardized Application Programming Interfaces, APIs, towards Application Servers hosting the actual applications. It is expected that this will create a market for application developers, thus opening up for a multitude of services, sometimes even tailored for a particular subscriber.

With the Virtual Home Environment a user can access and use his/her personal set of applications even when roaming.

At the same time as the wideband access of 3rd generation systems will open for a range of new applications, the Open Service Architecture and the Virtual Home Environment will contribute to a wider range of applications, and increased accessibility and usability. It is expected, that the network and service usage will increase, thus creating new revenue streams for the operators, and service providers.

Biography

Thomas Bern

Tomas Bern, who joined Ericsson in 1988, is currently holding a position as Senior Account Manager, GSM Value Added Solutions based in Richardson, USA. He has previously held various management positions within O&M design and GSM product management.

He holds a MSc in Engineering Physics from Chalmers University of Technology, Gothenburg, Sweden.

Sessions

Policy/Regulatory

Related Sessions

M.1.6 Evolving Trends in Telecommunications
M.2.6 Regulatory Issues and the Internet
M.3.6 Joint Ventures
T.1.6 Convergence Policy Challenges in Asia
T.2.6 Policy and Regulation
W.1.6 Impact of Regulatory Liberalization on the Satellite Industry
W.2.6 Policy/Regulatory II

M.1.6 Evolving Trends in Telecommunications
Monday 31 January, 1100-1230
Location: Tapa III

Facilitator:
EDWARD R. SLACK, Director, International Services, Comsat Mobile Communications, USA

Leaders in various aspects of the telecommunications field will express their views as to how they see the telecommunications industry moving as new forms of technology become available and applied to user needs in the period 2005-2010. Experts from different parts of the telecommunications industry (i.e. equipment, regulatory, multimedia, etc.) will give their vision of the future form and evolution of telecommunications and industry structure, and give us insights as to whether or not today's players will have a role in the future industry structure.

Panelists:

M.1.6.1
HARRY L. BOSCO, Chief Technical Officer, Lucent Technologies, USA;
The Future of Information Networking
Power Point Presentation

M.1.6.2
CHUCK COULSON, Executive Director, Global Communications and Utilities, Oracle Service Industries, USA, and
MARK G. DIXON, Senior Director, Comms Solutions Architecture Global Communications & Utilities, Oracle Service Industries
e-Business for Next-Generation Comms Carriers
Power Point Presentation

M.1.6.4

DELBERT D. SMITH, Dorsey & Whitney LLP,
USA

The Trends Towards Value Added Services: Telemedicines and e-Health

Sessions

The Future of Information Networking

Harry Bosco

Power Point Presentation

To understand the direction of information networking, look beyond the sustaining technology that dominates in today's market, and understand the impacts of new technology paradigms and the new frontiers of innovation. Of equal importance is to view these within the prevailing supply-side business models that hold sway over the market today. Finally, understand the changing limits of what is possible, and what applications will emerge as the source of value for consumers and enterprises. The result is an existence as different from today as todays have been from earlier centuries.

The rate of innovation in communication has continued to increase over the past century to where now we need to look at the trends in several of the key disruptive technologies to anticipate the future capabilities. For example, the density of semiconductor devices continues to double every 18 months (referred to as Moore's law), and all indications are that this will continue until at least 2016 with known improvements in processes and materials. We will be down to transistors that are measured in single digit atoms. The semiconductor technology improvement curve is actually slower than the other two key disruptive technologies: wireless and optical. Wireless is on a trend that doubles the number of customers in a given spectrum by two every nine months. This can result in higher bandwidth per customer per given spectrum or more customers. Optical has taken a major step over the past five years and now is on a trend to double the capacity on a given fiber every 9-12 months. If you look at the evolution of the key disruptive technologies and the market demand for broadband multimedia data outstripping voice demands, you conclude some basic trends in networking for 2000+. We will have systems on chips; the core networks will be optical with packets being transferred across them; networks will perform functions well beyond basic connectivity; services will be provided by distributed content engines that are programmed by hundreds of companies/people. Networks in the future will work seamlessly with existing networks via gateways. Multimedia applications will be enhanced by both network capabilities and innovations in the areas of video technology, signal processing, microprocessors, etc.

As stated, the core of emerging information networks will be rooted in the optical networking innovations found in Photon Valley where price-performance has doubled every 9 to 12 months. Optical Networking, as described in the *Bell Labs Technical Journal*, operates predominantly in the optical domain where the unit of bandwidth granularity - the optical channel or wavelength - is much larger than in Time Division Multiplexed (TDM) networks. In an optical network, the optical channel ("frequency slot") may be considered as analogous to a time slot in a TDM system with optical-network elements manipulating optical channels ("frequency slots") similar to the way TDM elements manipulate time slots. The aggregation of multiple "optical slots" or frequencies is referred to as Wave Division Multiplexing (WDM.)

The debut of WDM in commercial networks was as an economic alternative to deploying additional fiber to address unexpected data-induced growth in traffic. The economic viability of WDM was directly attributed to advances in optical amplifiers as well as in waveguide technology. For years, those relative scale economics for backbone transport were advanced by finding more channels on a length of fiber, increasing the modulation rates, and in further amplifier innovations. Soon, with the advent of commercial optical Add/Drop Multiplexers, applications beyond point-to-point long haul began to make sense for this technology.

Optical Networking Reaches Puberty

At some point in the evolution of a market, the expected continuity of progression is disrupted. Incrementalism takes a back seat to new paradigms - new possibilities. In information networking, we appear to be at such a juncture. For the last several decades, the prevailing principle in network design was to substitute cheap silicon for expensive bandwidth - to localize traffic where possible by making extensive use of local servers. However, at today's level of optical networking innovation, that design rule may have inverted on itself. Optically-enabled bandwidth has become comparatively cheap, and the scalability of silicon-based routers and switches has become relatively more expensive - in terms of both costs and performance.

Several recent events in optical research suggest that we are at this point. In September 1999 Bell Labs scientists Brandon Collings, Matthew Mitchell, Luc Boivin, and Wayne Knox succeeded in dividing the traditional frequencies in the "C" and "L" bands to transport 75 Mb/s to 200Mb/s in 1,022 individual wavelengths using standard 80nm amplifiers. Employing spectral slicing, that channel count could increase to 2,500, and leveraging the bandwidth available between 1280nm and 1620nm (all "5 windows"), this technology could yield over 10,000 channels. Furthermore, using Optical TDM, it is likely that data rates could increase to 2.5Gb/s per channel.

This technology, which builds on earlier femto-second chirped-pulse laser research, is particularly appealing for access applications where 75Mb/s per channel could be delivered over 50Kms on an unshared basis! The economics of this implementation look promising compared to cable modem technology where data rates on the order of 5Mb/s *on a shared bases* are common.

Channelization of this magnitude, along with other innovations discussed below, suggests radically new architectural opportunities. Ian Hawker, Vivek Tandon, David Cotter and Alan Hill, in their visionary 1994 *British Telecommunications Engineering* article, explored such virtually "switchless" network architectures based on dynamically allocated and re-usable wavelengths. Among the benefits they outlined were:

- Full optical interconnection without any electronic routing or buffering,
- Allocated bandwidth on demand - with all devices being bit-rate independent,
- Negligible delay following wavelength allocation, and
- Low blocking and high reliability.

The new currency of the bandwidth realm - photon channels -- is seemingly unlimited in supply. Beyond the number of wavelengths and the opportunity for wavelength re-use, there are options for service flexibility introduced by fiber infrastructures that package 432 or 864 fibers per cable. In addition to the calculus of absolute bandwidth, the value of this packaging derives from the delivery options it affords to service providers such as the purveyors of dark fiber and dedicated lambdas. The propagation of pure optical networks will extend from the core of the network to the metropolitan area networks and eventually in the enterprise networks. The state of metro WDM networks is where core WDM networks were two years ago, but they are moving fast.

Options for delivering channels of photons are available even when fiber is not. Lucent, for example, has developed the WaveStar OpticAir OLS that can transmit, in its initial incarnation, four channels of 2.5Gb/s over the air - at distances up to 4.4Km. This system uses the same 1550nm WDM technology as the fiber-based systems and is eye-safe, secure and re-usable. The OpticAir OLS link consists of two terminal units that are each used to transmit and receive the signals. Each terminal unit consists of a telescope, one or more shelves depending on the number of wavelengths deployed, and high power amplifiers. The system also includes optical translator units to allow easy deployment of the system into existing networks and to provide an open interface for multi-vendor access.

A pivotal component of a lambda routing network would be a fully-optical wavelength router. The design of this router would need to scale to thousands of wavelengths. It would have to support multiple functions, including optical layer restoration for mesh and ring networks, as well as optical channel management to add and drop service traffic or connect service traffic through a network via optical line systems (OLSs).

The WaveStar LambdaRouter is one such non-blocking, rate and format-independent element that provides these capabilities. It can operate at any optical layer bit rate including 40 Gbps and beyond. It has a fabric protection switch time of 50 msec maximum and a signal interruption of 10 msec maximum.

The fabric of this device is based on MEMS technology. It relies on an array of hundreds of electrically-configurable, microscopic mirrors fabricated on a single substrate to direct light. The switching concept is based on freely moving mirrors being rotated around micro-machined hinges. All optical connections to working and spare mirrors are easily accessible for field reconfiguration.

A complimentary and equally essential innovation would be a wavelength signaling capability such as WaveWrapper. WaveWrapper is an out-of-band wavelength-specific signaling solution that supplies information about the condition of the wavelength for performance monitoring, routing and protection/restoration. It also provides "strong" Forward Error Correction. It is, in fact, a variation on the ITU-T Recommendation G.975 frame format for "strong" FEC used today in submarine systems. For every 238 bytes of input, 17 bytes of "wrap" are added -- 16 for FEC and the other byte for the wavelength condition.

Optical logical gates to support true optical packet architectures may surface in two to four years. Until then, if bona fide optical networking is to come to light, a signaling capability, independent of the restrictions and requirements of legacy SONET/SDH systems -- or its "light" incarnations, is necessary. (Enhancing SONET/SDH to support all of the above necessary wavelength management functions would actually yield two incompatible versions of SONET/SDH.) Today, WaveWrapper is the far more cost-effective, *traffic-type agnostic* enabler of the dynamic routing of thousands of wavelengths - superior to SONET/SDH or electrical routing alternatives.

However, the paths of these thousands of wavelengths can nearly grind to a halt as they reach Local Area Networks. Local electronic switch-routers require additional and expensive ports to interconnect to Storage Area Network servers - costs, delay, complexity, and congestion all increase. And, those severs can spend up to 90% of their time processing the I/O flow. One option is to migrate necessary WDM and routing functions to a PC-like card that plugs directly into the server. Lucent's OptiStar series of adapter cards and software is an example of this option. They replace the connection between the switch-router and the WDM systems with a 2.5Gb/s fiber link directly to the server. Switch-router complexity and costs are significantly reduced, and server I/O functions are largely off-loaded to the OptiStar cards. As a result, wide area networks and local area networks can be integrated into a single Optical Area Network. Geographical limitations on the Storage Area Networks are eliminated.

For several applications, the elimination of barriers to traffic flow in the core - in terms of costs, latency, capacity, and jitter - and the effective "massive bandwidth-based" solution to Quality of Service place new and demanding requirements on edge devices. High density, low latency routers with terabit capacities - (4Tb/s to 6Tb/s) that have the flexibility to support interfaces from 45Mb/s to 10Gb/s interfaces - will be required. To provide optimal network operations and management, standards-compliant routing protocols, including BGP4, OSPF and IS-IS, will be necessary.

The optical bandwidth capacity of networks is increasing at rates far beyond any levels our collective silicon heritage would prepare us to comprehend. Network designers, who have just begun to struggle to accommodate10Gb/s or 40GB/s lasers in their plans, awoke to headlines in November 1999 about Bell Labs transmitting information at the rate of 160Gb/s over 300 kilometers on a single wavelength. The electrical - optical performance gap is widening to levels such that the former is increasingly the principal bottleneck for information flow. Hierarchical network designs with core electrical routers providing packet management will become increasingly cumbersome and expensive. Network designers will want to dedicate abundant and relatively inexpensive wavelength channels for traffic segmentation. While this will require some additional management functions at the edge routers and switches, from an expense and scalability perspective, it is absolutely the right architectural direction.

End-to-end managed photon channels - enabled by these and other technologies (including a variety of metro and enterprise WDM solutions) - offer a whole host of benefits. In addition to the costs and scalability issues already discussed, the Quality of Service issue plaguing Internet customers today diminishes or even disappears. Customers can change the bandwidth or manage the traffic on their own dedicated channels to meet their particular latency and jitter needs without impacting others sharing wavelengths on the same fiber.

Eliminating Information Swamps

Innovations, like those described above, have the potential of moving the habitat of networked users from "information deserts" to "information swamps." Critical to the achievement of enlightenment, fulfillment, and entertainment is network software that filters, seeks out, and replicates the interests of consumers and business enterprises. "Information Overload" can be just as damaging as too little information.

Lightweight Operating Systems born with network knowledge, such as Java, are enabling greater and greater amounts of "Personalization." Networks will evolve to provide individuals with the ability to tailor how they communicate with others. Networks will provide the means to gather, manage and organize information so that it will be more accessible and more useful to individuals than ever before. Networks will be home to avatars that represent the interests of corporal individuals. They will provide the filtering, tuning, adjudication, and other flow controls on information. These Persona-oriented capabilities will be a significant value-add for retail service providers.

Another major class of capabilities relates to managing the needs, not of the individual, but of the group. Each group or enclave, whether residential, enterprise or social, will want to define the set of rules that manages information within and among alternative enclaves and personas. Today, for example, firewall software helps control the flow of information within and external to enterprises and other enclaves of information production and consumption.

A third class of capabilities relates to formatting information as appropriate for network conditions and appliance display options. These display options range from those found on the small wireless device worn on a "body net" to a holodeck-like display - that favorite hang-out of the Star Trek characters.

Photon Economics

The success of e-commerce and other information-rich initiatives delivered over the networks characterized above is premised on the assumption that bandwidth becomes cheap. The technologies emerging from Photon Valley and other neighborhoods of networking innovation are providing the means to validate that very assumption. Costs to transport a bit one kilometer are declining by orders of magnitude. Of course, the mechanism by which that cost structure gets converted into price hinges on an efficient and competitive service provider marketplace.

Today, that marketplace is undergoing such a transformation to a highly competitive model with over 15,000 carriers worldwide. While geographical pockets of little or no competition exist, the trend is clearly in the opposite direction. New tools to promote market efficiency, such as bandwidth trading exchanges, are emerging. These institutions will help define a common currency to facilitate price comparisons, fill "pipes" for efficiency, and provide a mechanism to measure and meet spot demand.

Will this price collapse be self-limiting? Will profitability decline to levels that provoke mass exodus of the very suppliers that introduced the competitive dynamic?

No! Bandwidth exhibits a price elasticity of approximately -1.5. This means that, as price declines, enough additional bandwidth will be demanded that overall market revenue will increase. Obviously, the per-unit profits will fall, but opportunity expands. This has been the experience in the DRAM market where demand exhibits a similar price elasticity. The pivotal question is will the applications for all of that bandwidth materialize? The answer is "Yes"!

Health Care: In Need of Photons

Life styles, culture and the massive proliferation of bit generators all point to an explosion of information networking requirements. For example, one dimension of our social fabric ripe for change is the Health Care Industry. This sector of the economy is big - really big. In the U.S. spending is estimated at $1.2 trillion! It is attracting a significant flow of capital - over $1.2 billion from October 1998 to October 1999. Between one and two new venture-backed "E-Health" companies are appearing every week. Yet, this is an industry that is littered with inefficiencies - a U.S. Senate report estimated that 33 cents of every dollar spent in the U.S. on health care was wasted. Not surprisingly, according to the Health Care Financing Administration, 71% of the total spending on Health Care occurs in areas with inadequate IT investment.

Opportunity for change? In Photon Valley the regional medical facility stores all images and records in holographic data bases - instantly available to radiologists in any number of different locations. They access those files from an Optical Area Network through servers equipped, for example, with OptiStar cards - cards that provide a direct link to the WDM network. For comparison purposes, they may instantly access older images from another regional medical center across the country since OptiStar-based networks do not impose the distance limitations required when connecting to Storage Area Networks via a switch-router. This often eliminates the need for additional imaging that might have been required if the other studies were not immediately accessible.

(Access times to centrally-stored studies must approximate instancy for Photon Valley radiologists. For example, consider the 52.5 hours it takes to download a cardiology study over a 28.8Kb/s modem; the 59 minutes it takes over a T1line; or the 2 seconds it requires on a 2.5Gb/s channel. Physicians with busy schedules or patients in emergency rooms awaiting treatment both would have a very strong preference for the latter.)

Patients in Photon Valley are comfortable with this technology; they always have access to audit trails of anyone viewing their records. Many consumers retain the services of third parties to maintain all of their medical information on their behalf - information that can then be accessed as needed in an emergency away from home.

Physicians write lab orders and prescriptions on hand-held devices which in turn transmit the information via radio frequencies directly onto a wavelength using Optical Pico Cells. This passive networking approach uses no electronics; it operates by means of an electro-absorbtion optical modulator. Information can then be cross-checked with appropriate data and forwarded for processing. This addresses the 40% of the handwritten versions that traditionally required rework, and the 15% that may have contained errors.

Photon Valley physicians bond with and provide pre- and post-visit information to their patients via avatars - software generated images of themselves that can respond to questions and provide instructions. In some cases, avatars can be designed to provide an image more suitable for the information exchange with a particular patient in terms of gender, language, race, and other personal attributes. This often eliminates the need for more costly in-person visits or, more importantly, the costs of mistakes. Physicians collect status information from their patients via RF-enabled implants and can contact that patient (or that patient's software agent), if attention is warranted, before the condition becomes critical.

Getting There

To get to this future, you must break ranks with old market paradigms and journey within the CyberScape. In the CyberScape, technology breakthroughs are channeled into the creation of new capabilities, or Cyber-Gateways, that transit the customer through the barriers to insight, awareness, content, fulfillment, and entertainment. What are those barriers, or at least, those barriers that can be addressed through information networking? Among others, they include time and geography constraints, our own human form factor limitations, isolation, uncertainty, and, of course, costs.

We are not even at the end of the beginning of the explosion of bandwidth and information consumption. The solutions for the providers of information and network services will emerge from updated models of reality - models that we at Lucent understand very well. That understanding is essential for successfully navigating within the CyberScape and achieving commercial success.

Biography

Harry L. Bosco

Harry L. Bosco assumed the position of Chief Operating Officer Optical Networking Group on November 1, 1997, and in October 1999 he assumed the added role of Chief Technical Officer of Service Provider Networks.

Mr. Bosco's AT&T career began in 1965 in the Data Communications area of Bell Labs. He worked on hardware/software designs for 4ESS in Holmdel, New Jersey, and in 1977 was made supervisor of the Network Design Group for 5ESS at Naperville, Illinois.

From 1981 to 1983 he headed a department whose responsibilities included overall project management, generics planning, and hardware and software system architecture for the 5ESS switch, the flagship product of AT&T Network Systems.

Beginning in 1983, Mr. Bosco's work involved responsibility for a number of operations systems - computer-aided systems that monitor and maintain equipment in the telephone network. That work, in turn, led to an appointment as director of a laboratory responsible not only for operations systems but for several new ventures related to the medical field.

In 1984 he was appointed Director, Product Management - New Medical Ventures, in Network Systems where he assumed responsibility for the Medical Diagnostic Systems Business Unit.

In 1989 Mr. Bosco was appointed Customer Business Unit Head for Commercial Applications in the Operations Systems Business Unit and in 1990 was appointed the Data Networking Vice President.

Mr. Bosco assumed the position of Network Systems ATM Platform Organization Vice President in April 1992. He remained in that assignment through 1994.

In January 1995 Mr. Bosco was appointed the Network Systems Chief Architect and Chief Technical Officer. His responsibilities spanned the following organizations: Advanced Engineering Research, Global Public Networks Architecture, Network Systems Architecture, and Strategic Portfolio Management.

On March 1, 1996, Mr. Bosco assumed the position of Lucent Technologies Consumer Products Chief Technical Officer and Wired Technology and Initial Production Center Vice President. He remained in this position until July 1, 1997. At which time he became the Lucent Technologies President of the Network Systems Broadband Networking Unit on July 1, 1997.

Mr. Bosco is the Bell Labs Technical Journal Editorial Board Chairman. He also serves as a technology advisor at Wake Forrest University and serves as a Board of Trustee member at Monmouth University.

Mr. Bosco received an ASEE from Pennsylvania State University in 1965, a BSEE from Monmouth College in 1972, and an MSEE from Polytechnic Institute of New York in 1974.

e-Business for Next-Generation Comms Carriers

Mark G. Dixon, Chuck Coulson
Power Point Presentation

Executive Summary

The telecommunications industry is the midst of rapid, accelerating change. Technology innovation continually fuels rapid changes in business processes. The Internet, with its technology, business and cultural implications, is literally revolutionizing the core economics upon which business in the communications market is based.

To succeed in this fast paced dynamic market, NextGeneration (NextGen) comms carriers must not only accommodate changing technology and market conditions, but must exploit these changes to their advantage. They must transform themselves by adopting the following ***NextGen e-Business Imperatives:***

1. Know and empower your customers
2. Deliver high value
3. Enable self-service
4. Provision in real time
5. Claim your share of e-commerce flow
6. Deliver products without programming
7. Exploit the Internet; don't just accommodate it

These Business Imperatives are enabled by with the following ***e-Business Systems Characteristics***:

1. Enhanced services
2. Customer access channel independence
3. Internet-architected applications
4. Common data model
5. Zero-touch, end-to-end process integration
6. Enterprise workflow
7. Front office - back office integration
8. Message-based external integration

Comms Markets are Changing Rapidly

The telecommunications industry is in the midst of rapid, accelerating change. Successful NextGen comms carriers must not only accommodate changing technology and market conditions, but must exploit these changes to their advantage.

Technology Innovation

The comms industry is experiencing rapid and sustained technology innovation plus the beneficial convergence of several major enabling technologies in the areas of computer hardware and software, networking, user interface and electronics miniaturization. The synergistic nature of such technology convergence is accelerating the rate of change beyond the effects of any single technology innovation. Figure 1 illustrates a few of the synergistic technology transformations underway within the comms industry.

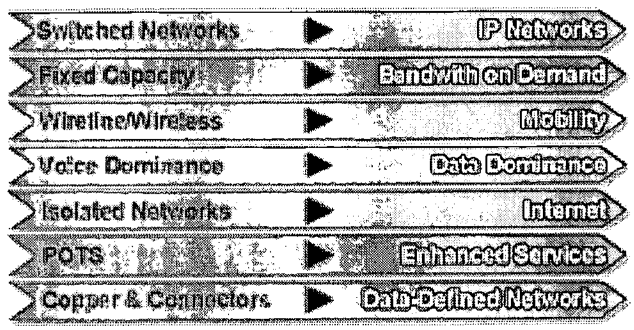


Figure 1 - Technology Transformations

Switched Networks -> IP Networks.

Traditional switched networks are giving way to packet-switched Internet Protocol (IP) networks, initially for data transmission and eventually for voice communications. The cost of bandwidth in IP networks is significantly lower than in switched networks. Reliability and availability in IP networks is approaching the levels achievable in traditional switched networks, removing a common criticism of IP technology.

Fixed Capacity -> Bandwidth on Demand.

Traditional comms business models, constrained by technology in switched networks, require customers to order blocks of bandwidth (e.g. T1 line), whether or not the customer will use the bandwidth all the time. Technology improvements will now enable customers to receive increased or decreased bandwidth as it is needed, rather than ordering changes in bandwidth ahead of time.

A simple analog is the way we commonly use dimmer switches to control light intensity. Electricity consumption is automatically regulated upon demand, without requiring a person to order more or less electricity from the utility company.

Wireless/Wireline -> Mobility.

Rather than simply differentiating between wireline and wireless telephony as competing technologies, we are now able to consider them as cooperative and integrated channels of access for a mobile user. Single number access spanning multiple wireline and wireless devices, the integration of traditional paging and cellular/PCS services and unified messaging (email, voice mail and fax accessible by PC, TV, mobile phone or wireless PDA) are all examples of converging technologies benefiting mobile users.

Voice Dominance -> Data Dominance.

Calendar year 1998 was the first time when more data than voice was carried on telecommunications networks. Several sources estimate that by 2008, voice traffic will be essentially negligible when compared with data traffic. While voice traffic continues to grow, the accelerating rate of data traffic growth is

Because of this transformation, networks must be engineered primarily for data transmission in a way that will accommodate voice traffic, rather than the reverse, which has been the case to date.

Isolated Networks -> Internet.

The global Internet has effectively integrated diverse data communications networks around the world. Rather than several similar, but isolated networks, we now have broad interconnection among networks all over the world, using generally-accepted standards.

POTS -> Enhanced Services.

Plain Old Telephone Service (POTS) is yielding to enhanced services in both consumer and business markets. Enhanced services can be key differentiators in competitive markets.

Copper and Connectors -> Data-Defined Networks.

Traditional networks are giving way to data-defined networks, wherein the network topology and services are largely configured by data, rather than complex interconnections of physical components. This allows much more flexibility while improving the fundamental reliability and maintainability of the network.

For example, traditional "copper and connectors" networks required a great deal of human intervention for maintenance and repair. Rather than being trapped in a labor-intensive "copper and connectors" paradigm, carriers can progressively employ technology to automatically detect and repair network faults through logical rerouting. Physical repairs can be effectively deferred without disrupting service.

Business Process Changes

Business process changes in the comms industry are driven and enabled by rapid changes in technology. NextGen carriers will seek to exploit these business changes and take advantage of new trends before their competitors. Figure 2 illustrates some of the basic business transformations made possible by and demanded by technology innovation.

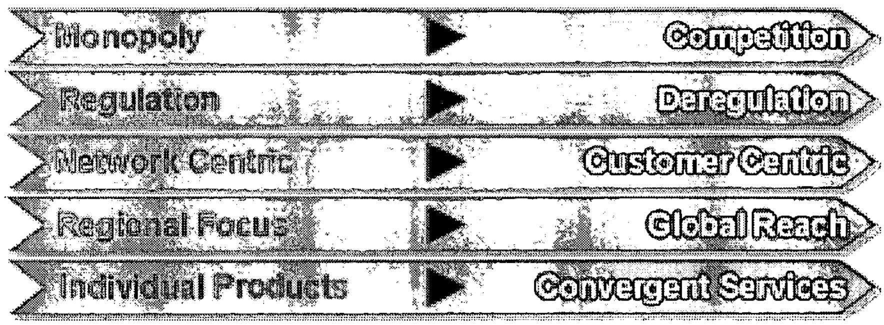


Figure 2 - Business Model Transformations

Monopoly -> Competition.

Traditional monopolies have been challenged as technology allowed the introduction of alternative communication routes and methods. Business practices suitable for monopolistic environments are inadequate for a fast-changing competitive environment where margins are eroding in the face of competitive price pressure and customers have freedom to choose between alternative suppliers of service.

Regulation -> Deregulation.

Current regulatory environments progressively favor competition, not monopoly. As potential for competition is demonstrated, regulatory bodies around the world are removing governmental obstacles to competition as incumbent carriers, the traditional monopolies, can demonstrate that their previously captive markets are really opened to active competition.

Network-Centric -> Customer-Centric.

Perhaps the most significant market change in the transition from monopoly to competition is the fact that a carrier's most important asset is now knowledge about their customers and ability to act on that knowledge to serve customers in a market-differentiated way. No longer is it sufficient to have an adequate communications network. Customer centricity, measured in terms of convenience, quality and enhanced service, is the hallmark of a NextGen carrier.

Regional Focus -> Global Reach.

The communications market has become a truly global market. Carriers that have traditionally provided services focused within the constraints of regional or national boundaries, are increasingly focusing outward towards global interconnection and consolidation. A few supercarriers, with full global reach and broad ranges of complementary services are emerging through the consolidation of smaller players. Remaining niche companies must effectively interconnect with the major carriers to compete in an increasingly global business environment.

Individual Products -> Convergent Services.

Providing services beyond traditional connectivity and bandwidth can be a strong differentiator for a carrier in an increasingly competitive market. Innovative combinations of such services can further separate a carrier from its competitors. Convergence can refer to "convergent billing," or the combination of bills from multiple, but un-integrated lines of business (e.g. wireless, wireline, ISP) on a single bill, but in the broader sense includes true integration of services, such as a Single Number/Unified Messaging service offering could integrate wireline, wireless, fax service, and interactive television offering into a unified service that leverages multiple business lines to provide enhanced services to a customer.

The Internet

The Internet embodies both dramatic technological innovation and convergence plus unprecedented and rapid cultural change. The effects on business, political institutions and personal life are vast and yet unmapped. The effective NextGen carrier will progressively learn how to exploit the Internet, not just accommodate its effects.

Figure 3 lists a few key characteristics of the Internet and some of the most significant resultant effects.

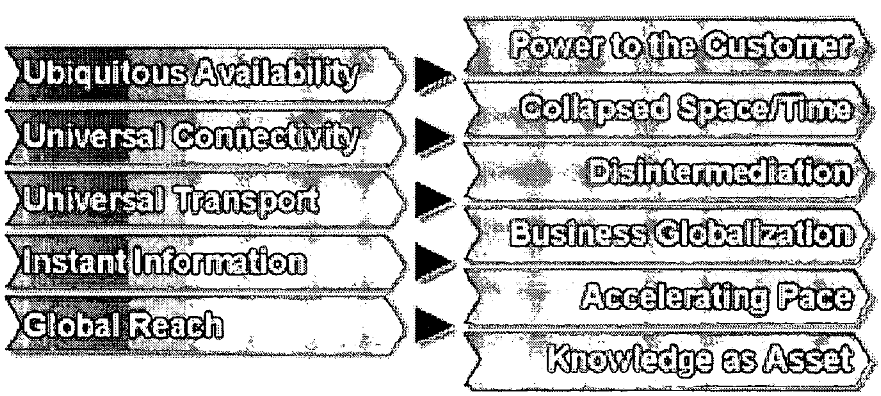


Figure 3 - The Internet Drives Dramatic Changes

Internet Characteristics

- ***Ubiquitous Availability.*** Access to the Internet is available to anyone, anywhere a browser and communication connection exists. This does not mean that everyone is the world has immediate access, but means that access is available, in a standard, widely accepted way, all over the world, with a minimal, standard set of requirements. Never before has such a globally universal method of information exchange and interaction been so readily available.

- ***Universal Connectivity.*** Internet standards allow simple, easily implemented and widely understood methods of communication connectivity to be employed. Standards such as TCP/IP, HTTP, HTML and Java enable connectivity among a broad range of computers and devices, where only a few years ago, network interconnection was limited by proprietary and competing protocols.
- ***Universal Transport.*** Globally accepted standards for information interchange, notably email and web access, have provided a universal way to transport information between people all over the world.
- ***Instant Information***. Information is instantly accessible, on demand, to people all over the world. No traditional methods of information distribution, such as broadcast, newspapers, periodicals or books, offer such rapid access to broad information sources at the time required by individual requestors.
- ***Global Reach***. The Internet is inherently global in nature. Information access ignores traditional regional or national boundaries.

Internet Results

These essential characteristics of the internet have dramatically affected business and culture in the following ways:

- **Power to the Customer.** The Internet shifts power away from the supplier of goods and services to the customer. It intensifies competition as customers dictate when, where and what they will buy.
- **Collapsed Space/Time.** The Internet literally reduces miles and days to miniscule moments in time. Because information interchange is virtually instantaneous, interpersonal interaction across the internet can often replace travel and speed up commerce. The implications for global business in the areas of cost reduction, business process acceleration and cross-border interaction are enormous.
- **Disintermediation.** The Internet enables direct interaction between product manufacture and customers, with no middle-men. Expensive intermediary infrastructure is often no longer necessary. Traditional distribution models are being replaced by customer-to-manufacturer direct relationships.
- **Business Globalization.** Because the Internet effectively gives parties in any location in the world the ability to exchange information rapidly and to execute commerce easily, businesses large and small are rapidly becoming more gobal.
- **Accelerating Pace.** The instantaneous nature of communication and interaction via the Internet is dramatically accelerating the pace of business. Time to market must be dramatically reduced; customer demands and business results must be assessed and acted upon more rapidly; entire market life cycles are being sharply reduced.
- **Knowledge as Asset.** Effectively leveraging knowledge of customers, their preferences and their

history of interaction with a company, is an asset that sets apart successful companies from also-rans. Acting decisively, quickly and effectively upon that knowledge is essential to succeed in the competitive market.

Economic Changes

Because of the rapid business process changes induced by technology innovation and the Internet, the Comms industry is undergoing fundamental transformation in the basic economics of its underlying business, as illustrated in Figure 4:

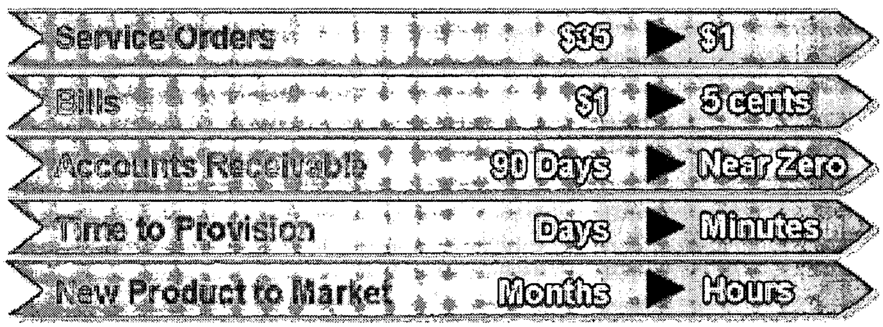


Figure 4 - New Economics

Service Orders.

The average cost of service orders will plummet as customers are enabled to serve themselves and as zero-touch end-to-end process automation is employed to take labor costs out of the standards service provisioning, activation and trouble resolution processes.

Bills.

As production, mailing and processing of paper bills is replaced by electronic bill presentment and payment, the average costs of bills will be reduce by a factor of 20 or more.

Accounts Receivable.

Rather than maintaining traditional and costly extended accounts receivable themselves, carriers will progressively employ methods such as pre-paid services, credit-card billing and third party credit to reduce accounts receivable towards zero.

Time to Provision.

Customers are increasingly demanding that services be placed into production immediately upon ordering. Carriers who learn how to provide real time provisioning will be able to steal away high value customers who increasingly rely on rapid response for their own competitive advantage.

*New **Products to Market.***

Rapidly configuring and introducing new products, services and bundles in response to perceived market conditions or competitive pressures will enable carriers to seize and maintain market share in a dynamic market.

e-Business Answers NextGen Challenges

NextGen comms carriers must decisively embrace e-Business to succeed in this new economic environment by sharply improving value and reducing costs. NextGen carriers must not just cope with, but creatively exploit rapid changes induced by technology innovation and the Internet.

Major Challenges

As illustrated in Figure 5, comms carriers must improve value they provide to their customers while reducing the cost to provide services. It is not enough to either incrementally increase value or reduce costs. Radical new paradigms or ways of approaching these two major challenges must be employed in order to compete. Legacy business models and information systems must be replaced with e-Business (customer-focused, Internet-enabled) business models and systems. A new e-Business approach to solving business problems (e.g. customer self-service) can often increase value to the customer at a substantially reduced price.

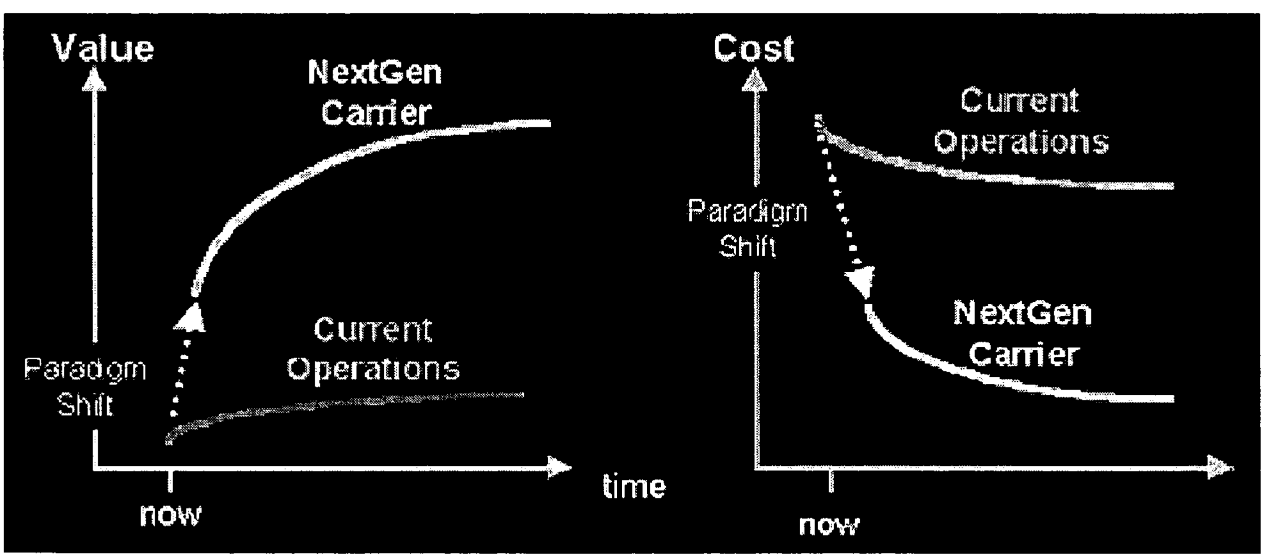


Figure 5 - Increase Value / Decrease Cost

Increase Value

Delivering greater value for customers includes the following major improvement areas:

- ***Customer convenience.*** A NextGen carrier will differentiate itself in the way it provides convenience for its customers. This will include providing exceptional service on demand - what the customer wants, when the customer needs it, in a way that is easy for the customer to get. For example, providing required bandwidth on demand, rather than subjecting the customer to difficult ordering processes and provisioning delays, will build customer loyalty by aligning customer needs directly with the carrier's ability to deliver. Similarly, convergence of several services (e.g. mobility, long distance, unified messaging, data) into interoperative bundles tailored to specific customer needs will tend to bond the customer to the carrier.
- ***Quality of Service (QoS).*** Measurable availability, dependability and repeatability characteristics, matched to customer needs and backed up by enforceable service level agreements (SLA) will clearly differentiate carriers from each other in the market.
- ***Value Added Services.*** Many NextGen carriers will choose to rise above commodity margins by delivering enhanced services beyond traditional connectivity and bandwidth. Services such as high speed access (e.g. xDSL), configurable networks (e.g. Virtual Private Networks), mobile internet access, interactive television, application hosting, on-line directory services and e-commerce, will generate new revenue flows and build customer loyalty.

Decrease Cost

To decrease unit costs, NextGen companies will improve make substantial improvements in the following areas:

- ***Operational Efficiency.*** The biggest initial win for carriers will be to allow self service for both customers and employees. Customer interaction through web applications may provide a 10x or 20x improvement in transaction costs, while giving customers or employers more freedom to interact when and how they wish.

  Removing traditional organizational barriers will reduce redundancy, decrease errors and re-work and simplify systems operations.

  Managing in real time means responding instantaneously to customer needs, plus acting proactively and decisively to modify business processes as market conditions change. This requires readily available and highly accessible information in the formats required by decision makers.

  Success must be measured with new customer-centric metrics (e.g. customer satisfaction, customer inquiry response times, speed of growth, time to market).

- ***Flexibility.*** In a dynamic market, a carrier cannot afford to be locked into hard-to-change systems or business processes. A NextGen carrier must be able to enter and expand markets quickly, decrease time-to-market and enable rapid scaling of systems and business processes in response to market demand.

NextGen e-Business Imperatives

The following seven foundation principles, or "NextGen e-Business Imperatives" will enable NextGeneration carriers to successfully meet the critical demands of sharply increasing value while drastically reducing operational costs:

Know and empower your customers.

Intimately knowing your customers and empowering them to bond with your company as a critical extension to their business or lifestyle will:

- Increase customer satisfaction
- Increase customer loyalty
- Allow you to retain your best customers
- Guard against competitive intrusion

Much has been said in the comms industry about the importance of knowing who customers are, across traditional line-of-business boundaries (e.g. wireless, wireline, ISP) and across functional boundaries (e.g. sales, service). This comprehensive ability to progressively understand who the customer is, what history the customer has with the company, what product preferences the customer has, how profitable the customer is, how quickly the customer is growing, and what services the customer needs, must be regarded as the single most important capability for the NextGen carrier. Because customers in the new e-Business world hold premier economic power, a carrier must intimately know customers in order to serve them.

However, a carrier's knowledge about the customer is not enough. A carrier's independent action on that knowledge is not enough. It is not enough just to react to customer demands based on body of historical data.

While intelligent, albeit reactionary responses to customer inquiries may be beneficial, customers must be empowered to easily act for themselves for themselves, in ways that leverage the progressive relationship between the customer and carrier.

Each customer should be able to choose the channel of interaction with the carrier of choice, at the time when the customer chooses to engage. Whether the channel be via a traditional call center, over the web, through a wireless phone or PDA or via a web-connected television, the customer should be able to choose the time and method of interaction.

A customer should be provided the ability to tightly bond with its chosen carrier, so it can regard the carrier as an integral and critical extension to its core business, not must a necessary appendage.

A customer should be able to exploit the progressive knowledge that is accumulated about a customer's interaction with the carrier in a way that is beneficial for the customer. For example, if a customer can easily access and analyze a carrier's historical information about the customer-carrier relationship, new and innovative and long-term business relationships may be fostered.

Enable self-service.

Providing facilities for both customers and employees to serve themselves will both reduce costs and more tightly link customers to the NextGen carrier. The benefits that accrue include:

- For Customer Self Service:
    - Connected and empowered customers
    - Real time demand satisfaction
    - Lower cost per transaction
    - Enable rapid growth
- For Employee Self Service:
    - Reduced staff costs
    - Lower training costs
    - Lower cost per transaction
    - Employee satisfaction

An apocryphal story about early telephony in the United States illustrates this principle. As telephony was beginning to rapidly spread throughout the United States, young women at manual switchboards were the critical link in connecting callers to their intended destination. One observer commented that if telephony continued to advance at the current rate, soon every woman in the United States would need to be employed as a telephone operator!

Interestingly enough, his prediction came true, although not in the way he surmised. Today every woman and every man who uses a telephone is her or his own telephone operator, dialing the destination through the familiar telephone keypad. Centralized operators are now necessary for only exception handling. Rapid scaling, lower unit cost and customer satisfaction were realized as customers became progressively empowered through technology innovation to act for themselves.

As customers become progressively empowered to use automatic, on-line methods, such as the web or intelligent mobile phones, to perform routine tasks such as product ordering, problem reporting and configuration changes, expensive response from centralized call centers will be used to handle exceptions, while customers do most tasks themselves.

Similarly, entire expensive business processes in human resources and financial departments will become unnecessary as employees are empowered to handle traditional labor-intensive tasks such expense reporting, benefits configuration and human resource data maintenance.

Deliver high value.

In a competitive comms environment, customers can easily select services from several sources. Carriers must offer their customers the services the customer want, in the manner the customers request, when the customers request them. High value service has been described earlier in this document under the headings of customer convenience, quality of service and value added services.

Delivering high value will allow carriers to secure the rewards of :

- New non-commodity revenue sources
- Customer satisfaction
- Retention of high-value customers

Provision in real time.

The competitive comms business environment will progressively demand that services be provisioned in real time, triggered by customer service requests. Real time provisioning will provide the following benefits:

- Customer satisfaction
- Real-time demand fulfillment
- Quality improvement
- Cost reduction
- Protection against competitive intrusion

Deliver products without programming.

The traditional method for introducing new products into a carrier's portfolio often required the carrier to develop new software to order, provision and bill for a service. Such software-based products such as MCI's famous "friends and family" promotion became key market differentiators because competitive long distance carriers could not deliver similar products without expensive, time-consuming software changes in key operational systems. Delays in product introduction often cost much more that the simple cost of software development. The larger cost is economic opportunity forfeited to competitors who enter markets more quickly.

NextGen carriers must employ easily configurable systems for order management, provisioning, network activation and billing to provided these benefits:

- Rapid product configuration
- Rapid market entry
- Cost reduction

Claim your share of e-commerce flow.

Carriers face new competition from emerging companies, particularly in the Internet market, and must act decisively to share in the burgeoning e-commerce market that uses data networks to transact business. Carriers that do not act quickly run the risk of being relegated to merely transporting data at commodity rates, while other companies reap the lucrative rewards of electronic commerce.

For example, Yahoo offers on-line Yellow Pages directories, bypassing the franchise on business directories traditionally monopolized by telephone companies. With its Yellow Pages directory, Yahoo not only dilutes a traditionally lucrative revenue stream for carriers, but strengthens a working relationship with its business customers that favorably positions Yahoo as a vendor for additional services, such as strategic procurement.

On the other hand, U S WEST exploited the Internet to position its Yellow Pages operation, U S WEST DEX, as a national yellow pages and white pages directory service beyond its regulated RBOC boundaries in a preemptive strike against competition such as Yahoo.

Exploit the Internet; don't just accommodate it.

It is not enough to just "go with the flow" as the Internet and related forces re-shape the communications business environment. Carriers must not just react to technology and business changes, but should seize opportunity in this time of dynamic change. The Internet represents opportunities for carriers to experience significant advancements in the areas of:

- Customer bonding
- New markets and revenue sources
- Global reach
- Speed of action and reaction
- Cost reduction

e-Business Systems Characteristics

The following paragraphs highlight how NextGen carriers will employ e-Business systems to succeed in a changing, competitive environment.

Enhanced services

NextGen e-business systems will deliver enhanced, Internet-enabled services (e.g. application hosting, unified messaging, Video on Demand) that add significant customer value beyond commodity connectivity and bandwidth.

Customer access channel independence

NextGen e-business systems will empower customers in all facets of their relationship with the carrier, providing the customer highly personalized interaction independent of the channel of interaction chosen by the customer.

Internet-architected applications

NextGen e-business applications will be based on a solid foundation of Internet architecture and standards plus scalable, reliable and maintainable technology. Moreover, applications will exploit this architecture and technology, not just add web front-ends to existing legacy systems. These applications will also exploit the new business processes enabled by the Internet.

Common data model

NextGen e-business systems will leverage common data models in crucial areas such as customer/account master, product and services catalog and installed based data base, in order to leverage progressive knowledge about customers, react quickly to customer needs and market trends, enable flow-through automation, build links across traditional business boundaries, improve data quality, simplify business process integration, and effectively manage the enterprise from a unified strategic perspective.

Zero-touch, end-to-end process integration

NextGen e-business systems will automate end-to-end flow-through processes, thus removing redundant, costly and error-prone human interactions from the order/provision/activation/billing cycle. This will lower costs, increase quality and bolster customer satisfaction.

Enterprise workflow

NextGen e-business systems will implement integrated workflow control across the enterprise, not just within selected operational areas. Such integrated workflow will allow business processes to be coordinated across traditional organizational boundaries, will reduce the cost to adapt to new business processes, and will support rapid market entry and growth.

Front office - back office integration

NextGen e-business systems will integrate front office processes (e.g. marketing, sales, order management) with back office processes (e.g. finance, human resources, supply chain) to reduce costs and increase responsiveness. Business growth will not be sustained by great web store-fronts if not backed up by strong, efficient business systems which also harness e-business efficiencies and performance characteristics.

External integration

NextGen e-business systems will not only be integrated within their native enterprise, but will exploit the Internet to integrate with both customers and suppliers in order to increase responsiveness, decrease costs and assure quality throughout the chain of supply.

e-Business Systems Enable NextGen Imperatives

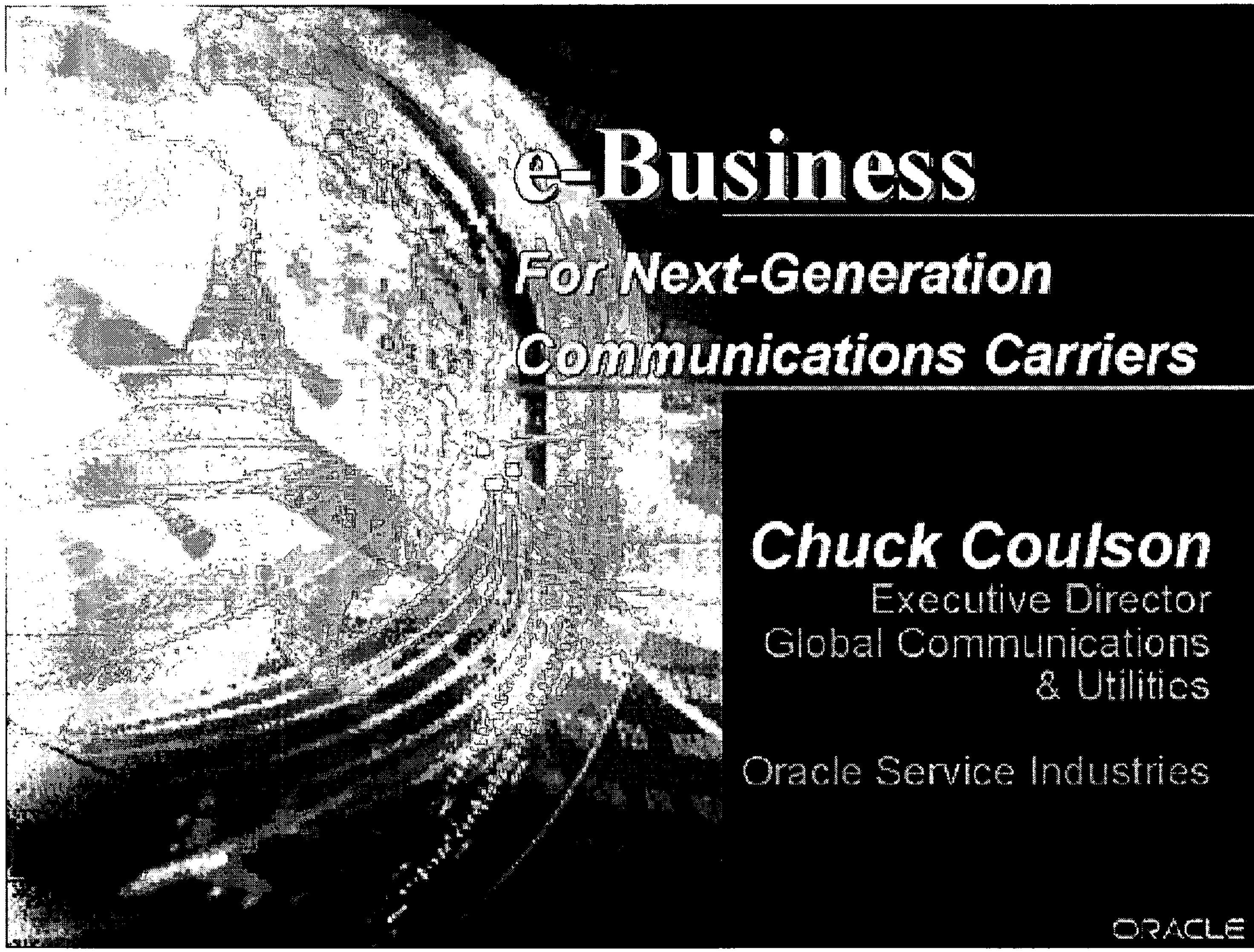
The following chart shows how the eight characteristics of e-business systems directly support and enable the NextGen e-Business imperatives.

e-Business System Characteristics / NextGen e-Business Imperatives	Enhanced Services	Access Independence	Internet Architected	Common Data Model	Process Integration	Enterprise Workflow	Front Office Back Office	External Integration
Know and Empower Customers	●	●	●	●				
Deliver Value on Demand	●		●			●		
Enable Self Service	●	●	●			●		
Share in E-Commerce Flow	●		●					
Provision in Real Time			●	●	●	●	●	●
Products without Programming			●	●		●		
Exploit the Internet	●	●	●				●	●

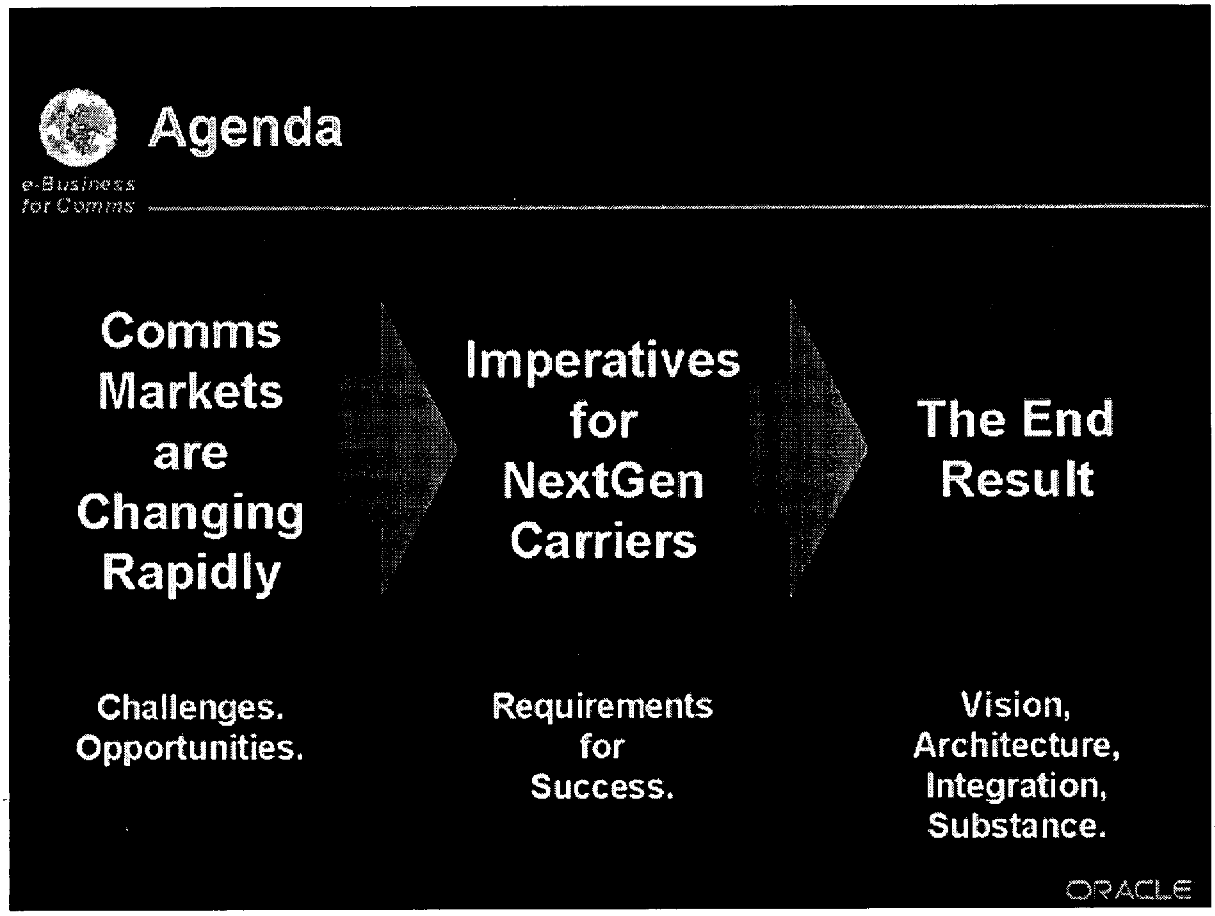
Figure 6 - Enabling e-Business Imperatives

For example, in order for a company to know and empower its customers, it must employ an active common data model (customer/account master, installed base master) to progressively gain knowledge about customers and their current services, buying preferences, channel interaction preferences and service history. Armed with that knowledge, a company can empower its customers to learn about, select, order and configure the products and services of choice, using any of a wide variety of interaction channels. All of this is enabled by Internet-architected applications.

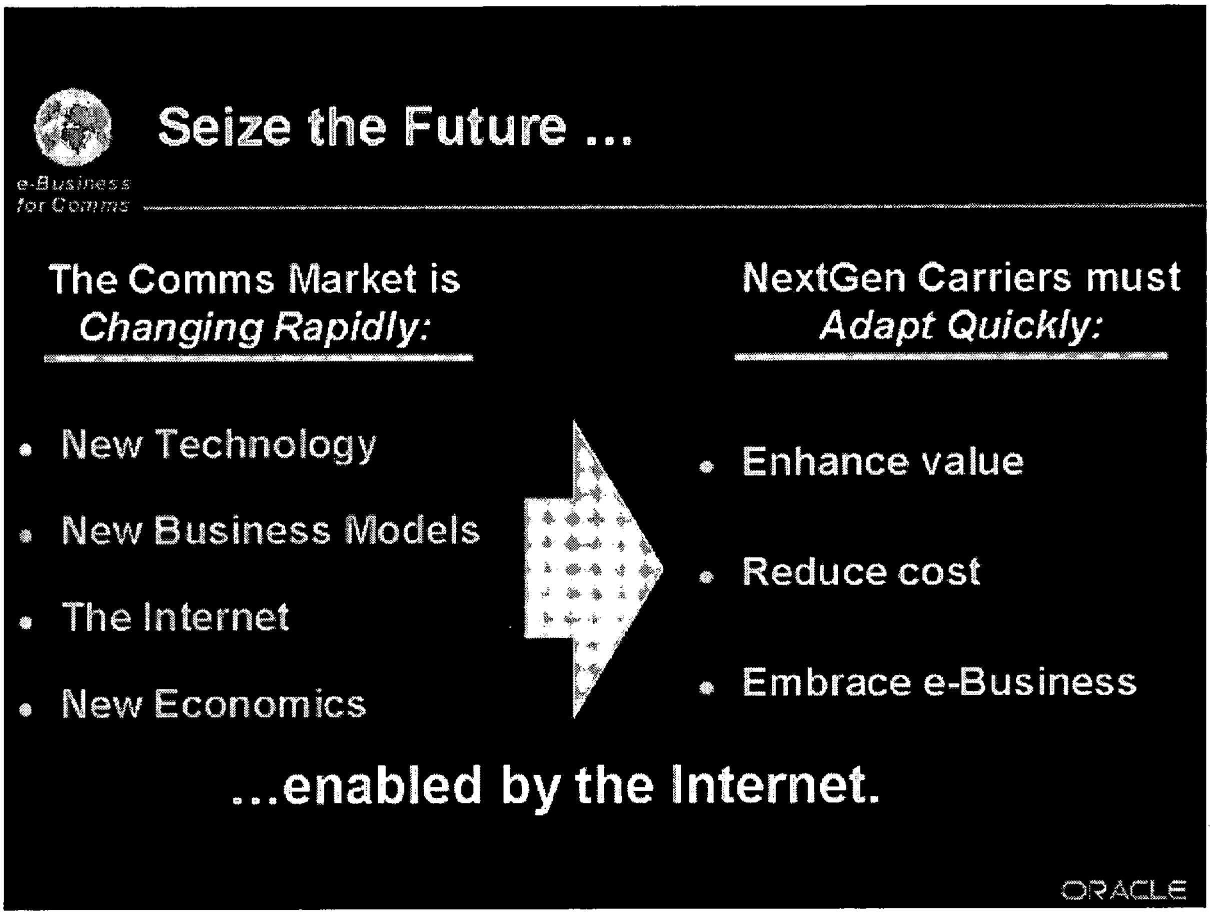
Like this example, each of the seven NextGen imperatives are supported and enabled by the e-business system characteristics.


e-Business
For Next-Generation
Communications Carriers
Chuck Coulson
Executive Director
Global Communications
& Utilities
Oracle Service Industries
ORACLE

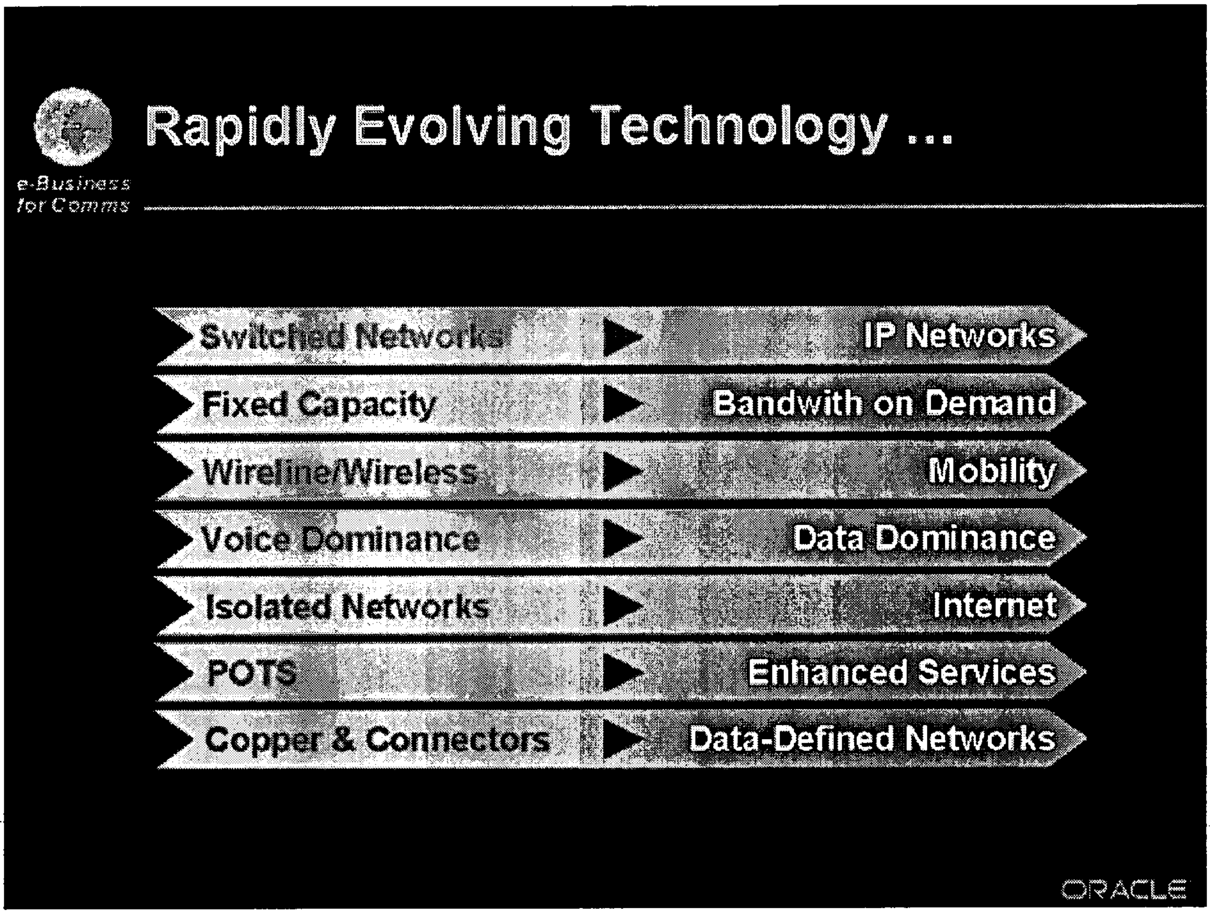
Slide 1 of 22


Agenda
e-Business
for Comms
Comms Markets are Changing Rapidly
Imperatives for NextGen Carriers
The End Result
Challenges. Opportunities.
Requirements for Success.
Vision, Architecture, Integration, Substance.
ORACLE

Slide 2 of 22


Seize the Future ...
e-Business for Comms
The Comms Market is Changing Rapidly:
New Technology
New Business Models
The Internet
New Economics
NextGen Carriers must Adapt Quickly:
Enhance value
Reduce cost
Embrace e-Business
...enabled by the Internet.
ORACLE

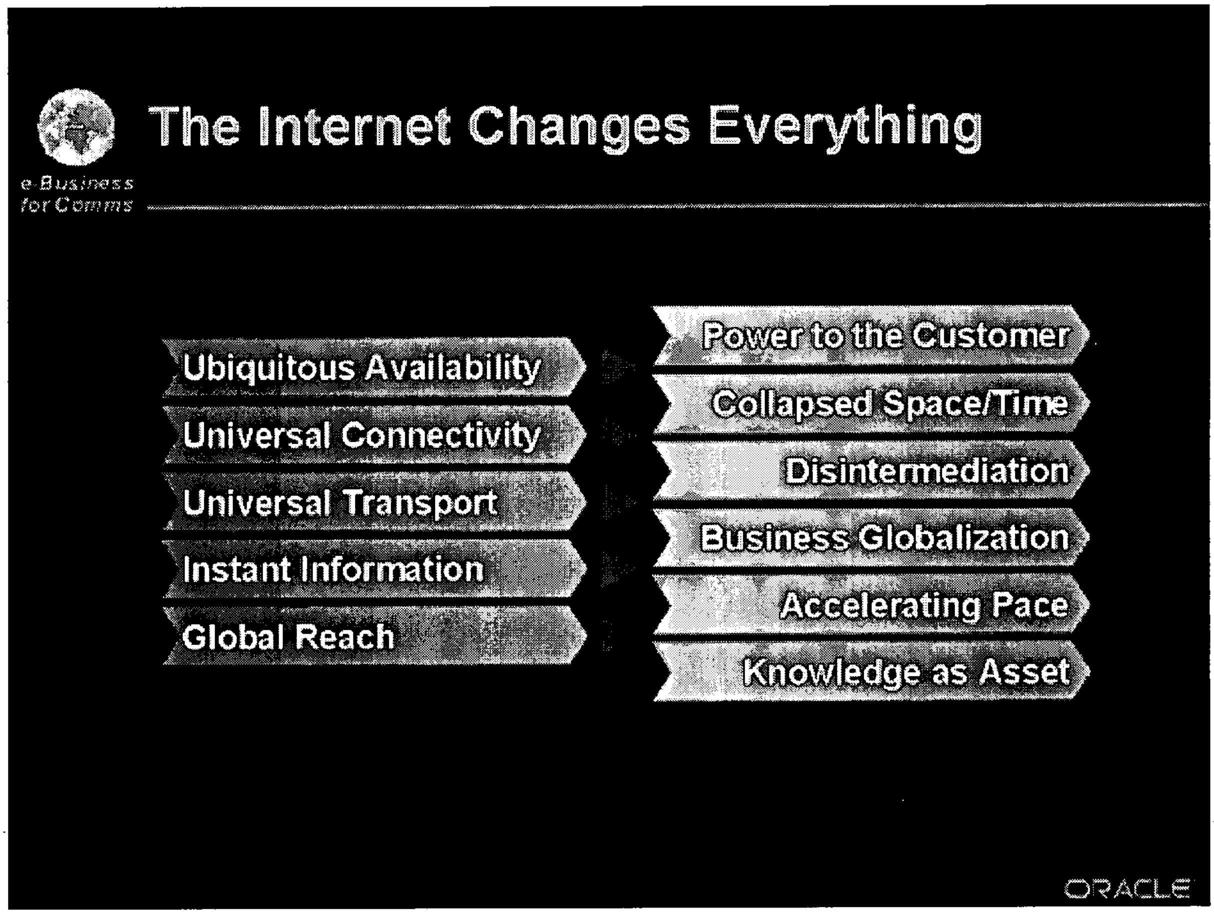
Slide 3 of 22


Rapidly Evolving Technology ...
e-Business for Comms
Switched Networks
IP Networks
Fixed Capacity
Bandwith on Demand
Wireline/Wireless
Mobility
Voice Dominance
Data Dominance
Isolated Networks
Internet
POTS
Enhanced Services
Copper & Connectors
Data-Defined Networks
ORACLE

Slide 4 of 22


e-Business for Comms
… Enables Dramatic Business Change …
Monopoly
Competition
Regulation
Deregulation
Network Centric
Customer Centric
Regional Focus
Global Reach
Individual Products
Convergent Services
… Creating Dynamic Opportunity.
ORACLE

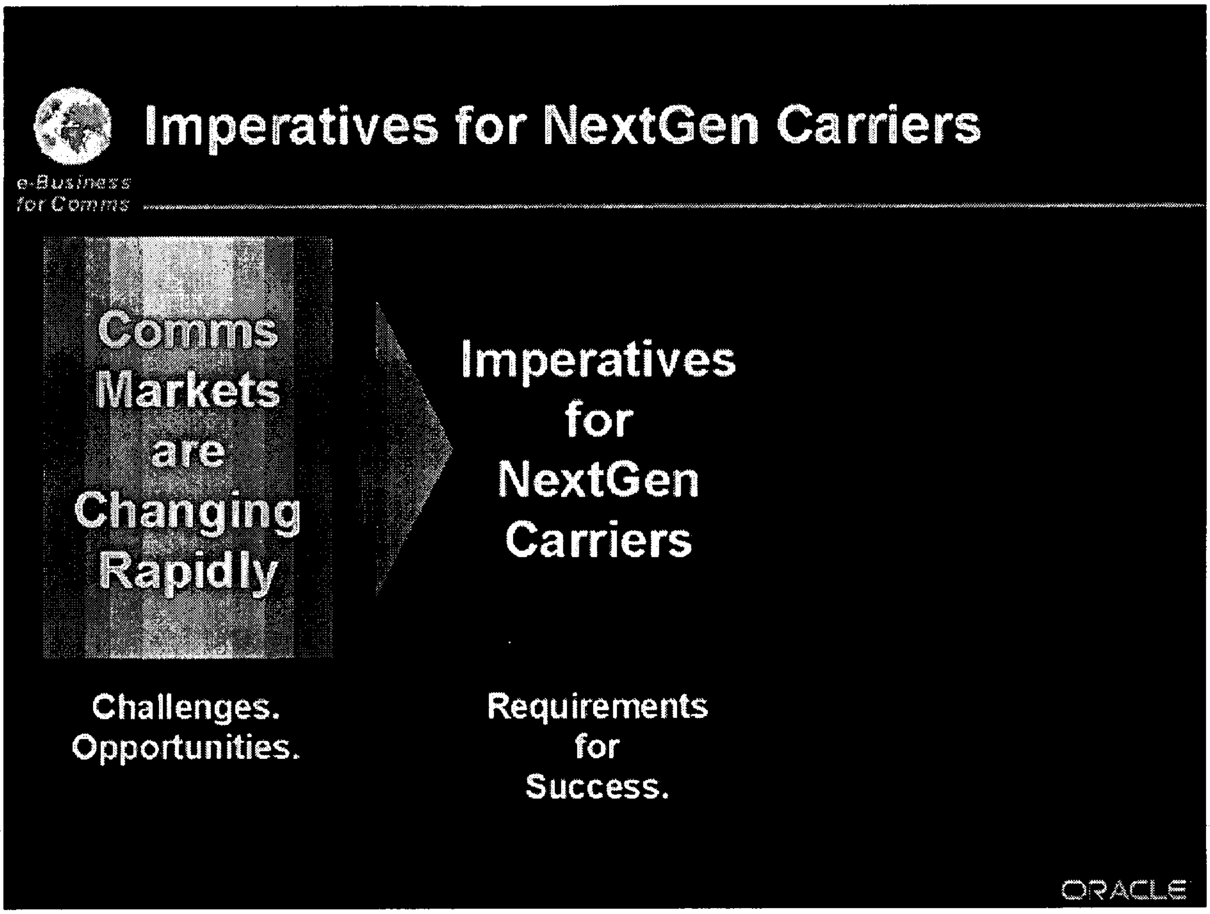
Slide 5 of 22


The Internet Changes Everything
e-Business for Comms
Ubiquitous Availability
Universal Connectivity
Universal Transport
Instant Information
Global Reach
Power to the Customer
Collapsed Space/Time
Disintermediation
Business Globalization
Accelerating Pace
Knowledge as Asset
ORACLE

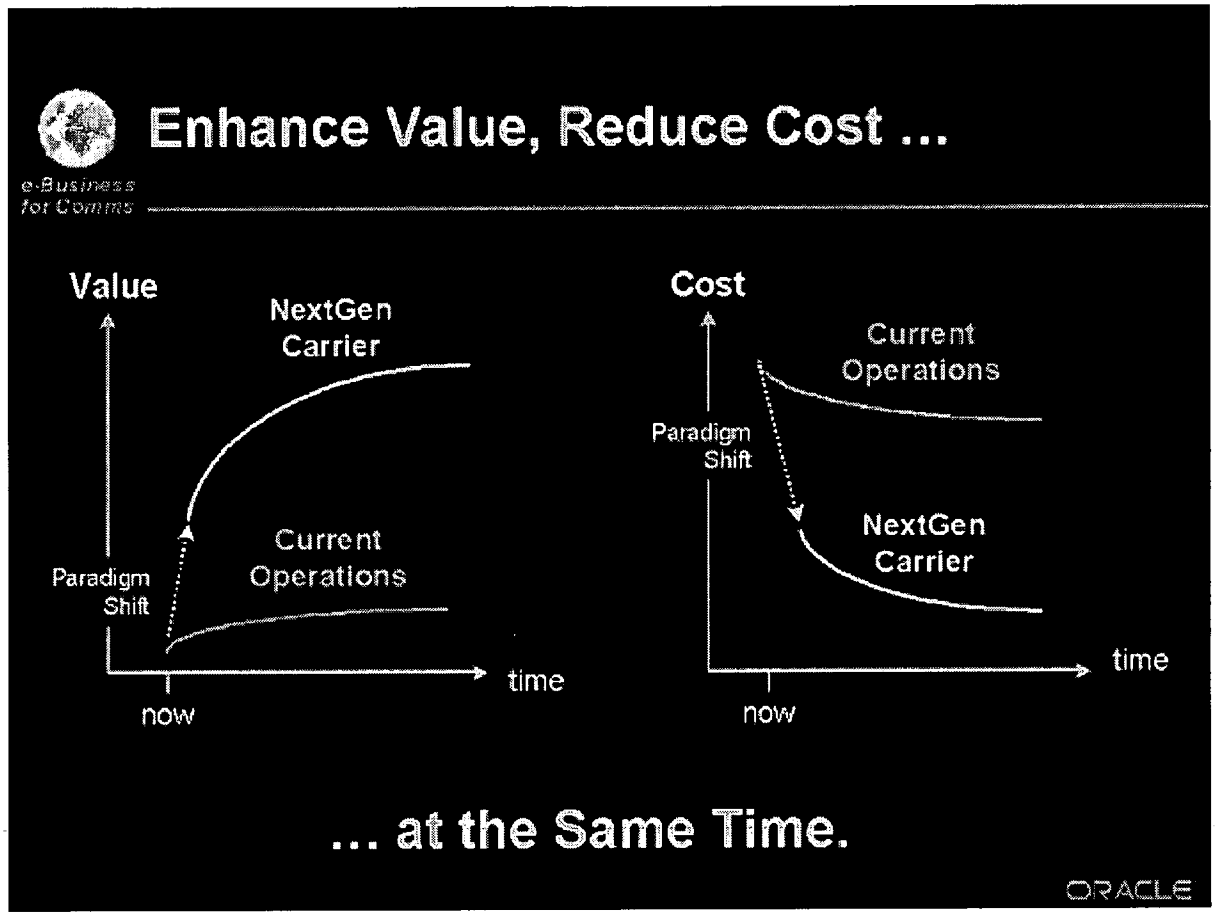
Slide 6 of 22


E-Business Enables and Demands ...
e-Business for Comms
Service Orders $35 $1
Bills $1 5 cents
Accounts Receivable 90 Days Near Zero
Time to Provision Days Minutes
New Product to Market Months Hours
... dramatic economic change.
ORACLE

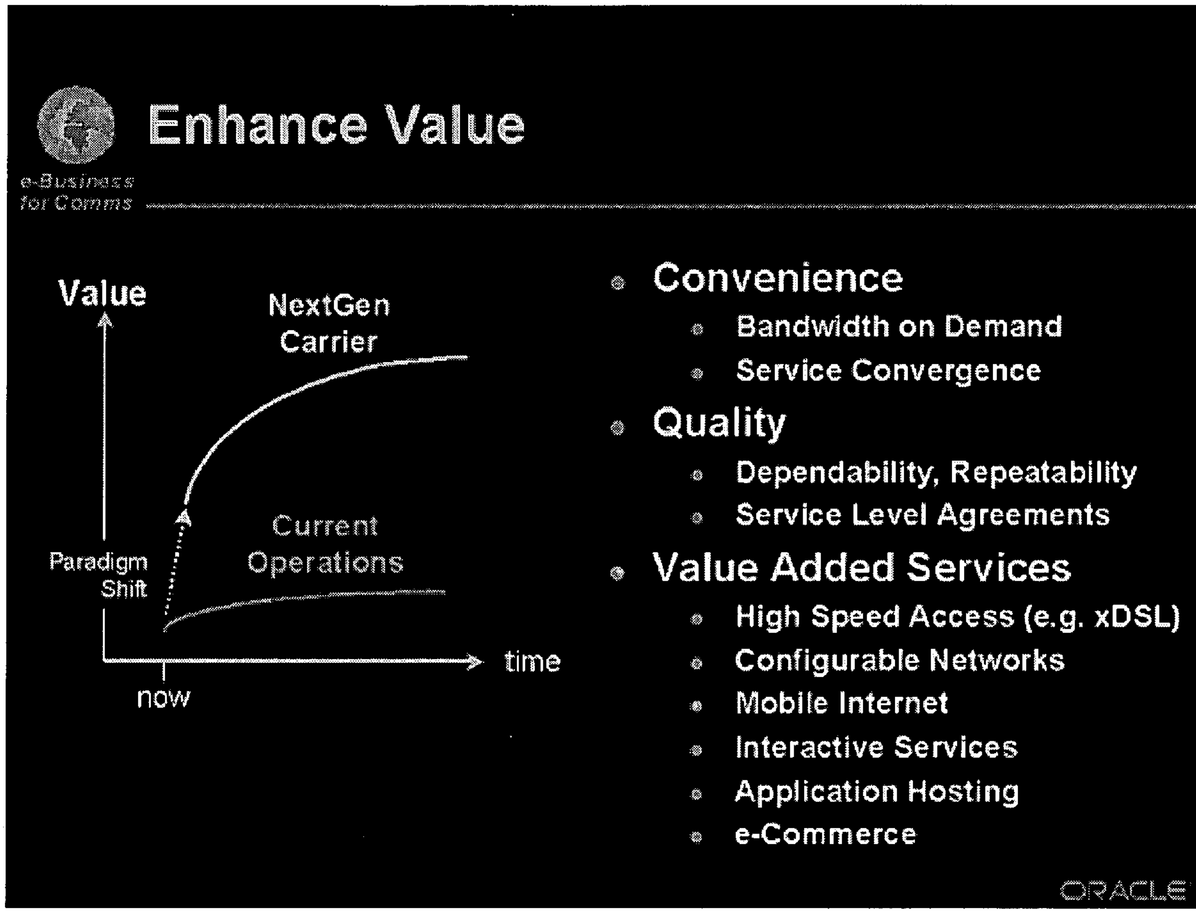
Slide 7 of 22


Imperatives for NextGen Carriers
e-Business for Comms
Comms Markets are Changing Rapidly
Imperatives for NextGen Carriers
Challenges. Opportunities.
Requirements for Success.
ORACLE

Slide 8 of 22


Enhance Value, Reduce Cost ...
e-Business for Comms
Value
NextGen Carrier
Paradigm Shift
Current Operations
time
now
Cost
Current Operations
Paradigm Shift
NextGen Carrier
time
now
... at the Same Time.
ORACLE

Slide 9 of 22

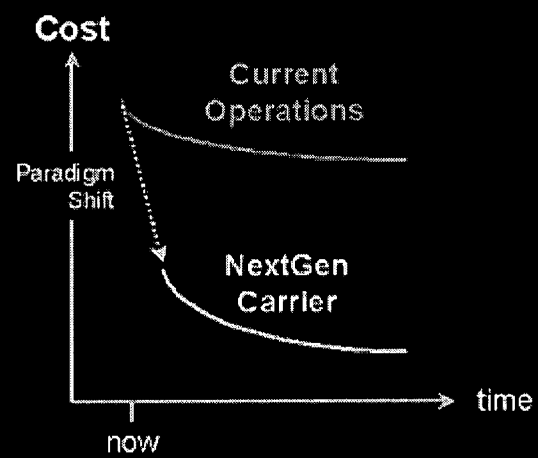


Slide 10 of 22

Reduce Cost

e-Business for Comms

- Operational Efficiency
  - Allow self service (to customer and employees)
  - Remove traditional organizational barriers
  - Manage in real time
  - Measure success with new customer-centric metrics
- Flexibility
  - Enter and Expand Markets Quickly
  - Decrease time-to-market
  - Enable rapid scaling



ORACLE

Slide 11 of 22

NextGen e-Business Imperatives

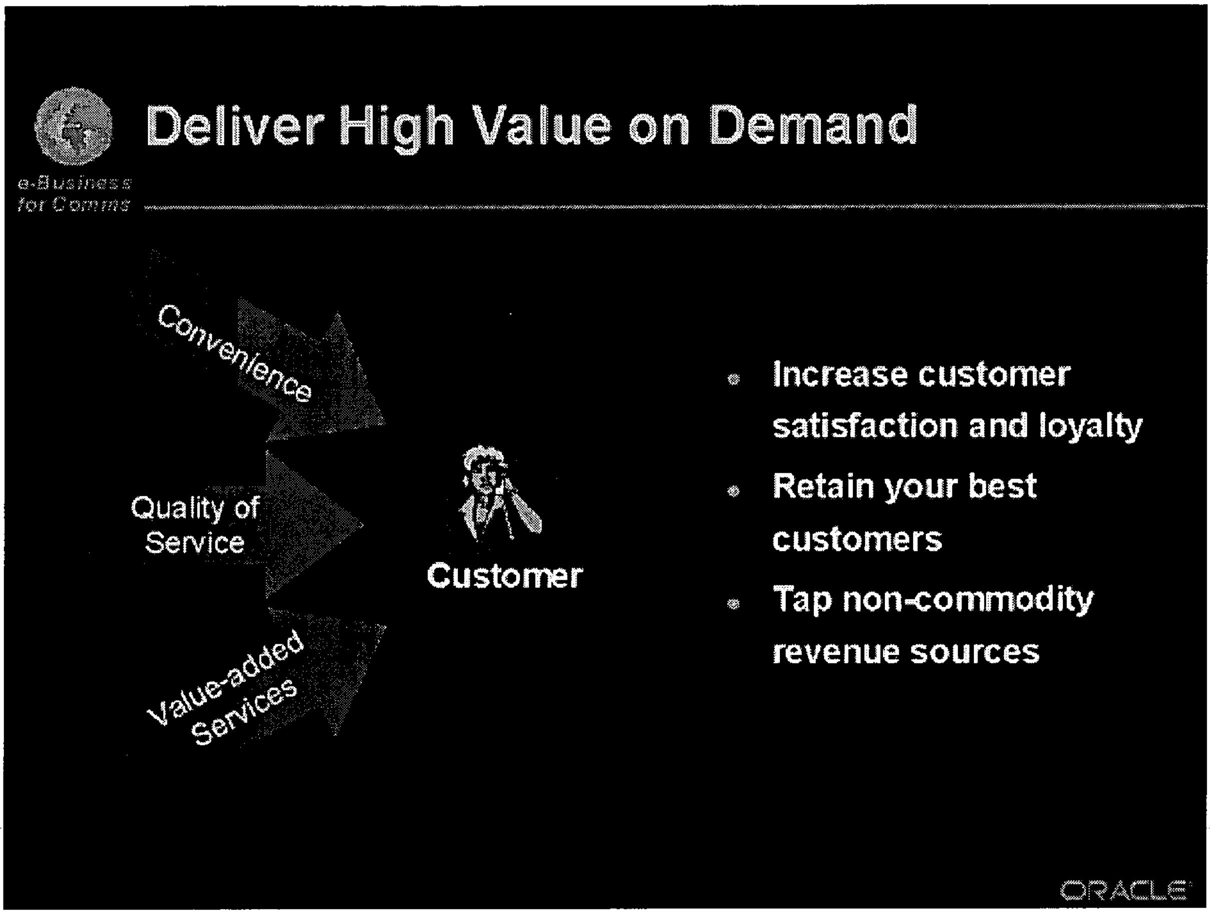
e-Business for Comms

- Know and empower your customers
- Deliver high value on demand
- Enable self-service
- Provision in real time
- Claim your share of e-commerce flow
- Deliver products without programming
- Exploit the Internet; don't just accommodate it

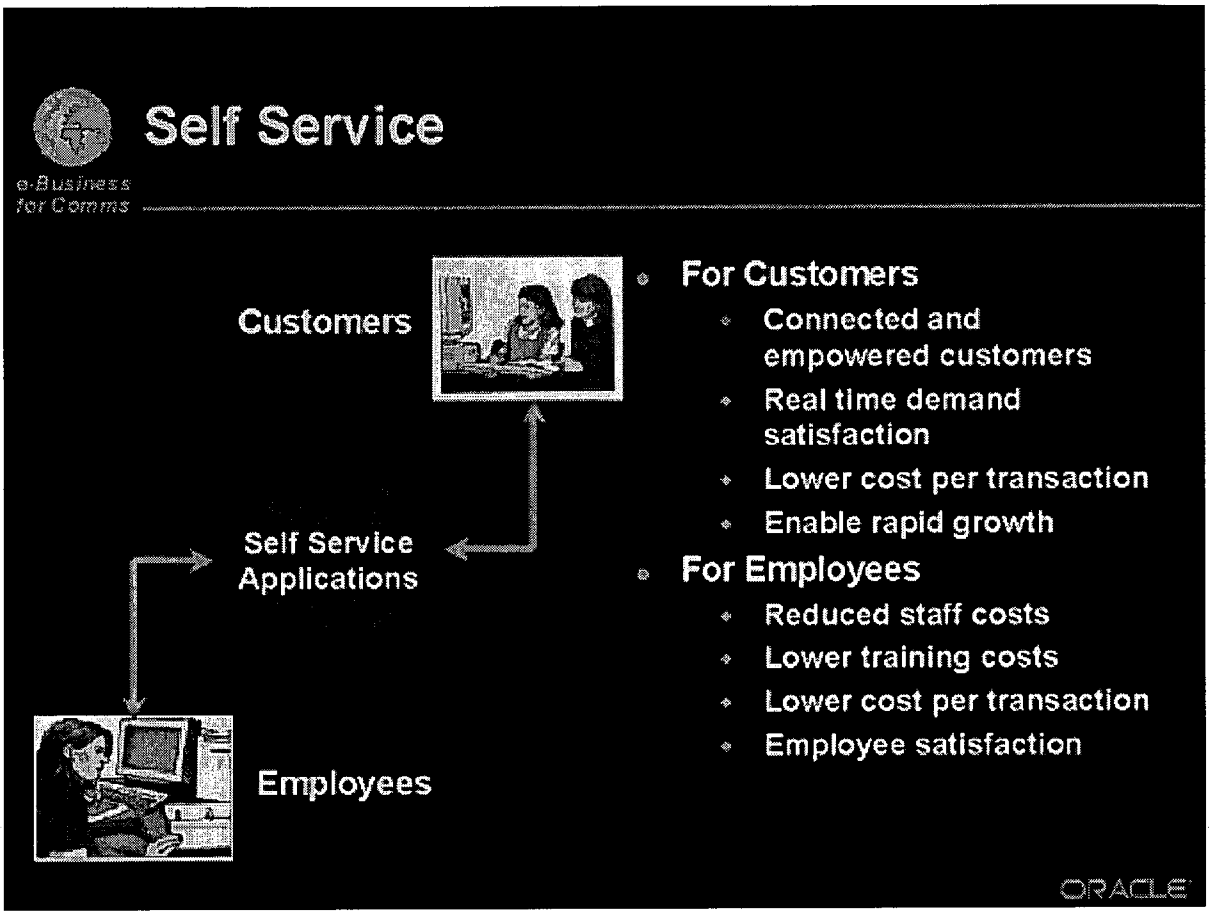
Add Value and Reduce Cost by Embracing e-Business

ORACLE

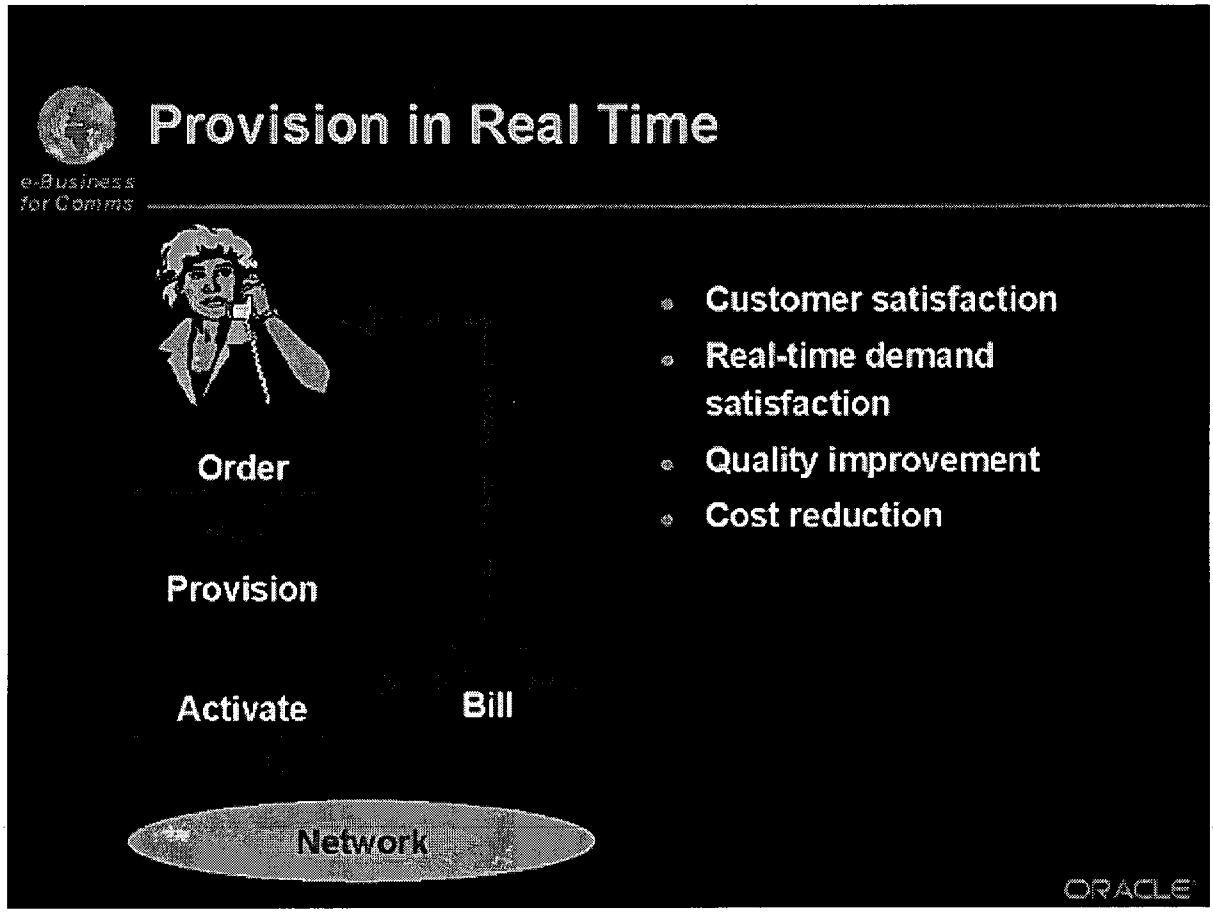
Slide 13 of 22



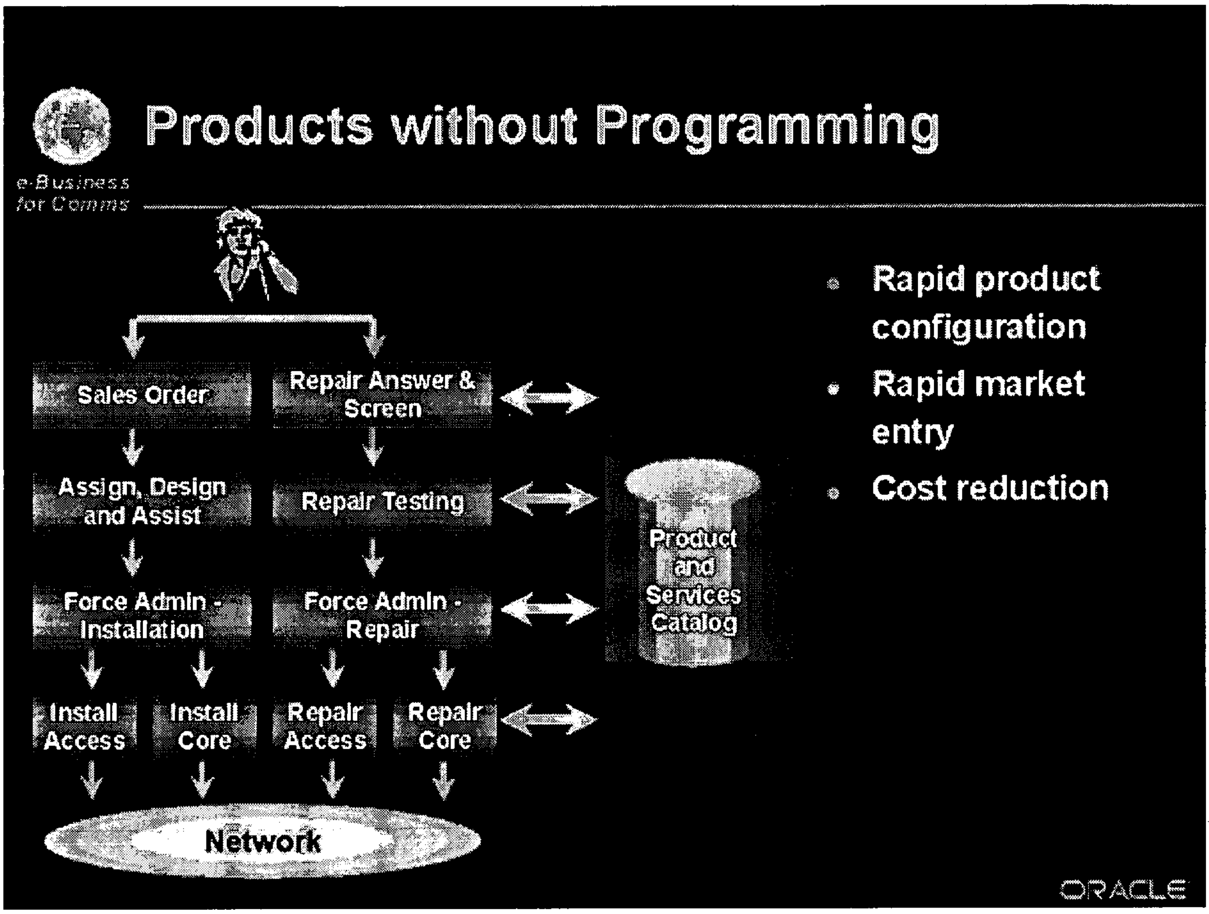
Slide 14 of 22



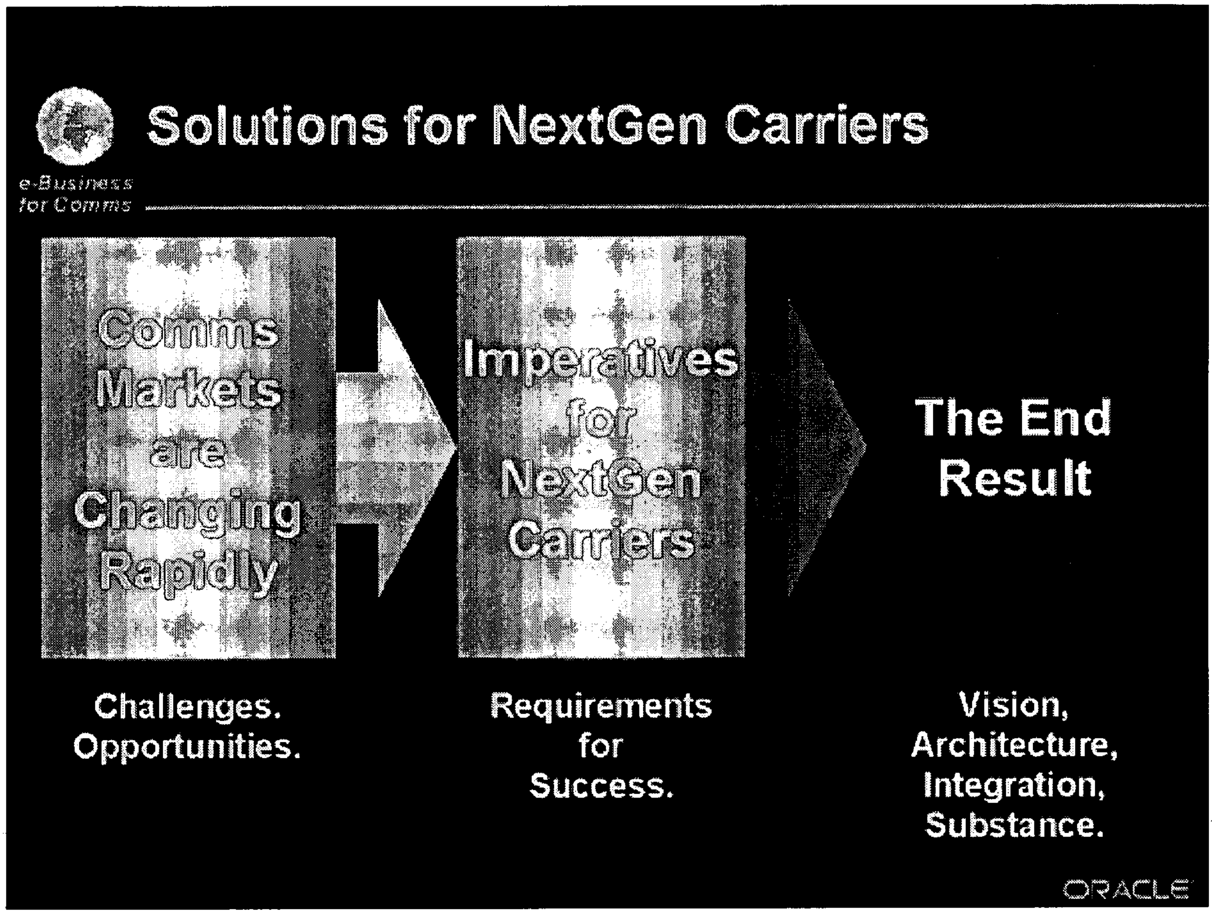
Slide 15 of 22



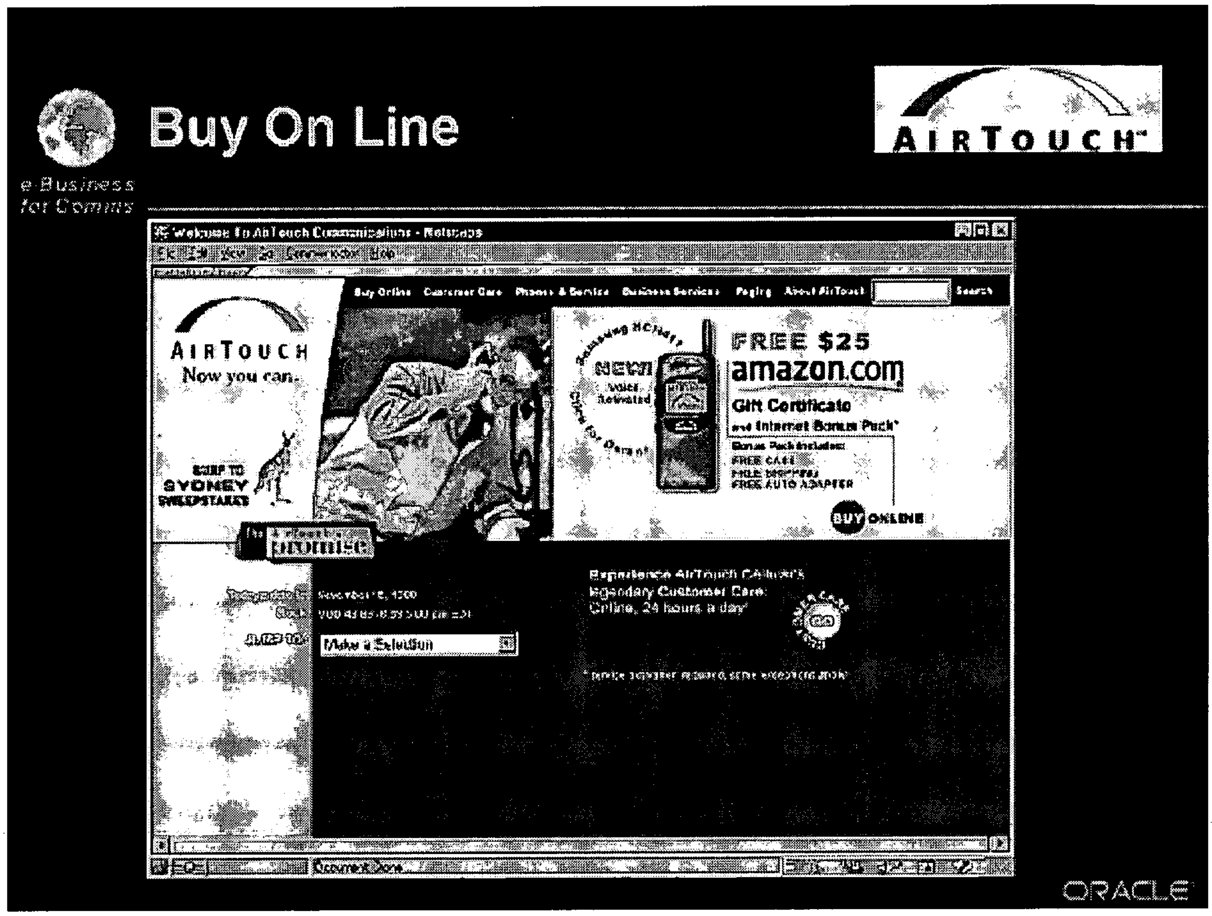
Slide 16 of 22



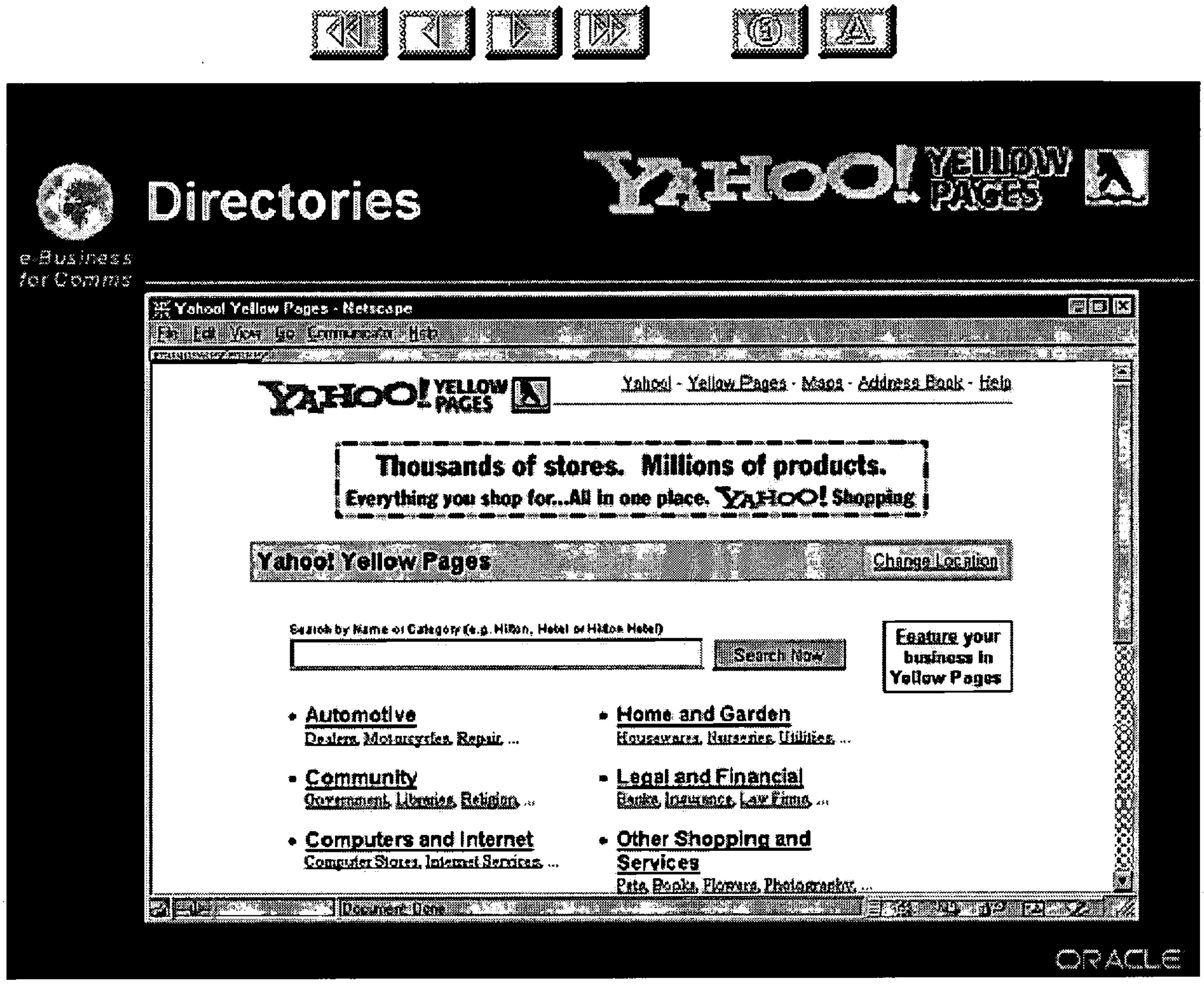
Slide 17 of 22



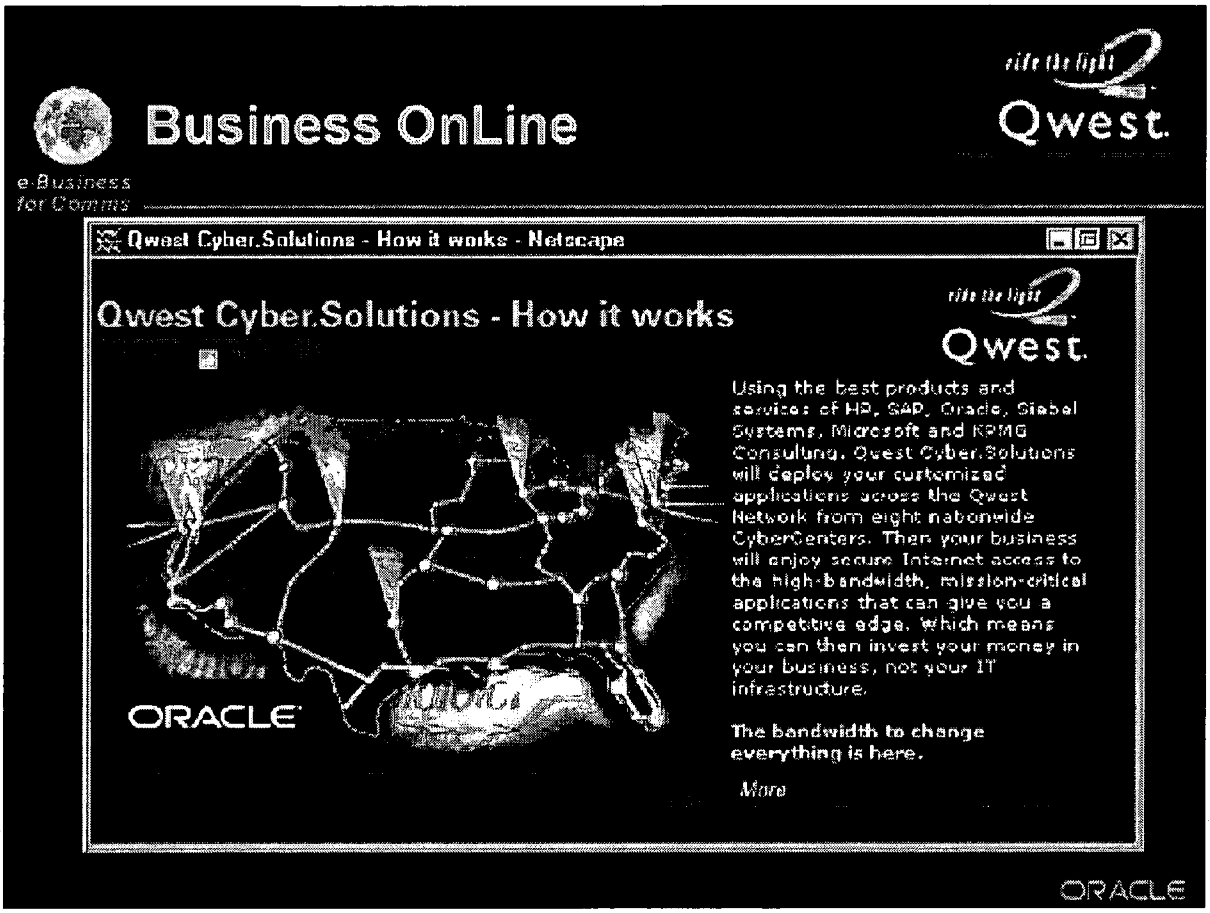
Slide 18 of 22



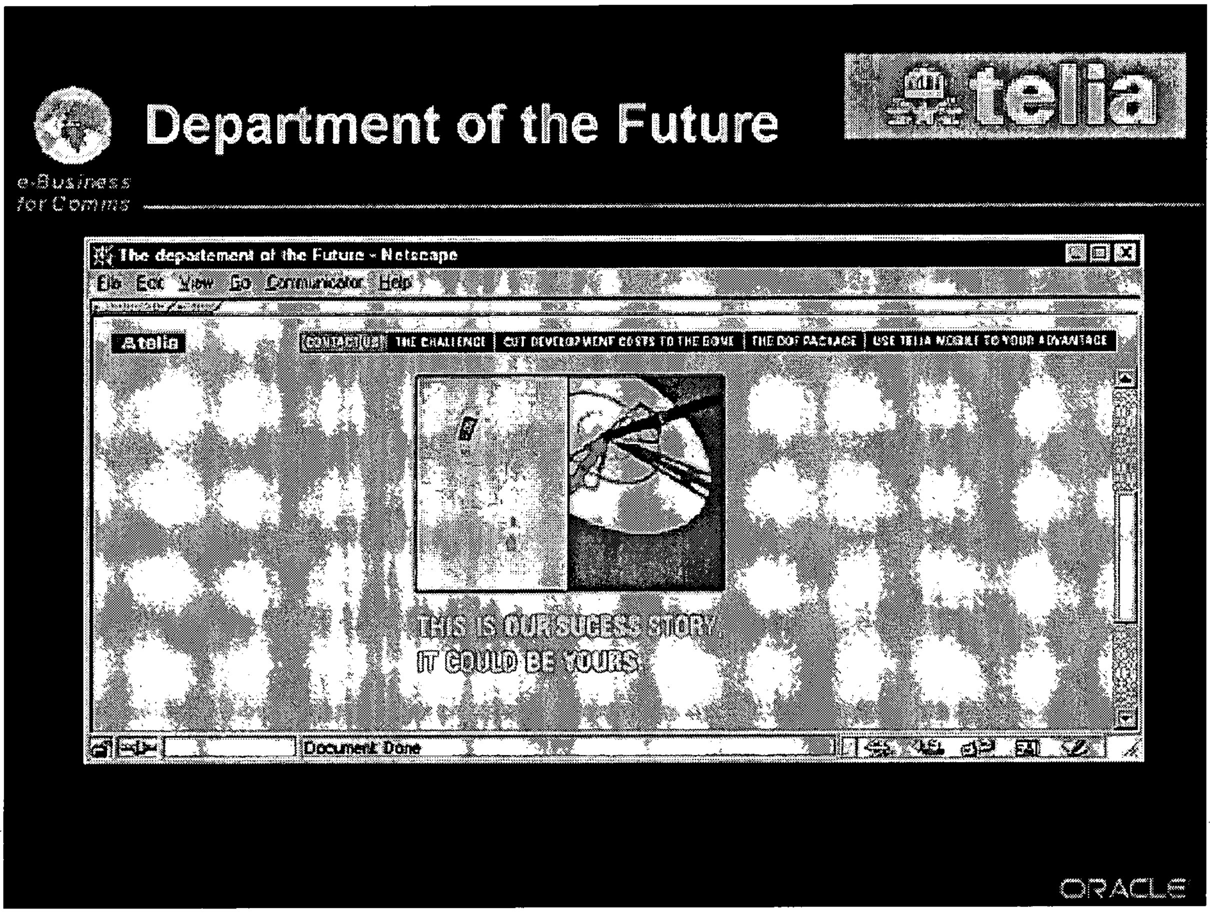
Slide 19 of 22



Slide 20 of 22



Slide 21 of 22



Slide 22 of 22

Sessions

Socio/Economic

M.2.1 Regional Studies - South Pacific
Monday 31 January, 1400-1530
Location: South Pacific I

Related Sessions

M.1.1 Regional Studies - China
M.2.1 Regional Studies - South Pacific
M.3.1 Regional Studies - South East Asia
T.1.1 Regional Studies - Latin America
T.2.1 Regional Studies - Oceania
W.1.1 Regional Studies- Korea
W.2.1 Regional Studies - India
W.3.1 The Asia-Pacific Telecom Market

Chair:
WINSTON THOMPSON, Chief Executive, Telecom Fiji Limited, Fiji

M.2.1.1
CHRISTINA HIGA, Director, PEACESAT and NORMAN H. OKAMURA, Director, Telecommunications and Information Policy Group, Social Science Research Institute, University of Hawaii, USA
The Emergence of Pacific Partnerships for Distance Learning, Telehealth, and Telecommunications in the Pacific Islands Region: An Environmental Scan

M.2.1.2
MICHAEL OGDEN, Assistant Professor, University of Hawaii at Manoa, USA
The Telecommunications Gap: A Pacific Islands Perspective

M.2.1.3
ERIC JONES, Manager, INMARSAT, Earth Station, BT Pacific, New Zealand
New Mobile Satellite Network Opportunities for the Pacific Region Nations using second and third generation INMARSAT satellites
(Power Point Presentation)

Sessions

The Emergence of Pacific Partnerships for Distance Learning, Telehealth, and Telecommunications in the Pacific Islands Region: An Environmental Scan

Christina Higa, Norman H. Okamura

I. Introduction

The Pacific Islands Region have yet to enjoy the many benefits brought about by the revolutionary changes in telecommunications, information policy and technology systems. The large expanse of the Pacific Ocean, the small size and market population of the political jurisdictions, the absence of a strong economic base, and other factors have led to only a gradual lessening of the costs of telecommunications and the adaptation of telecommunications driven technologies throughout the region. This is despite the clear understanding by many Pacific Island leaders of the need and importance of access to the Internet, distance learning and telehealth programs for development, institutional capacity building and for economic and business improvement in the region.

While the rate of change continues to be slower than that of the developed economies, the use of telecommunications and information technology for public service and development has significantly changed over the past two years, especially in the "Western" Pacific. This paper provides an overview of some of the recent developments in distance learning, telehealth, telemedicine, and public service telecommunications in the region. The paper focuses mainly on the Western Pacific Islands region, and provides insight into the new partnerships that have evolved among the region's public and private organizations. The paper also describes some of the anticipated developments that will occur in the Year 2000 and some of the activities in the South Pacific.

II. Overview of Developments

The changes in the Pacific Islands Region are summarized in two parts: the Western Pacific and the South Pacific. Only a summary is provided here since the limitations on the paper preclude a more detailed exploration of these changes.

The classification of these Pacific Island jurisdictions is artificial, and based largely on political and historic relationships, and not geography, ethnicity, or culture. The political relations are significant since the funding for many telecommunications developments are very different between the Western and South Pacific.

A. Western Pacific

- The American Samoa Government has established a high-speed, fiber optics, ATM based network that interconnects public and private educational institutions, the hospital and clinics, and other government agencies. The network is one of the most extensive and modern networks anywhere, and interconnects government, education, health care, and other agencies seamlessly with OC-3 ATM capacity on redundant fiber optics links. The ASG also has several links to Honolulu for video teleconferencing and Internet access, including: a T-1, a 384 Kbps circuit (that has been donated by the American Samoa Telecommunications Authority), and a PEACESAT satellite link.
- The College of Micronesia (COM) has established a 64 Kbps link to the Internet through the FSM Telecom. This link provides direct access to the Internet for students and faculty at the COM main campus on Pohnpei.
- The Yap State Department of Education has established an interagency network using spread-spectrum microwave technologies. This network does not rely on the land-line last mile connections of the telecommunications company.
- The Yap State DOE has also developed a multimedia capability. Students have developed a variety of skills in producing CDs using digital images, audio clips, written text in both Yapese and English.
- The College of the Marshall Islands, through PEACESAT, has established a 7-day a week, 24-hour, dedicated, 64 Kbps link to the Internet. This has been working through the Digital PEACESAT capabilities.
- The University of Guam has implemented a PEACESAT Hub Site and tested voice, data, and compressed video teleconferencing through the network system. UOG has an H.320 video teleconferencing system and has also acquired (2) H.323 video teleconferencing systems for campus connections.
- The Republic of Palau Department of Education has implemented an on-island Sony video teleconferencing system using Integrated Services Digital Networking (ISDN). The network and systems are able to conduct multi-point video teleconferences at 128 Kbps and point-to-point conferences at 384 Kbps.
- The Pacific Resources Program Office (PRPO) of the Tripler Army Medical Center has established an Internet based digital imaging and consultation capability for store and forward consultations. These systems have been deployed in both the Western and South Pacific.
- The Pacific Resources for Education and Learning has established agreements with many cable television providers to provide video based educational programs to many jurisdictions in the Western Pacific.
- PEACESAT conducted demonstrations of Digital PEACESAT services in most of the Pacific Island jurisdictions. Voice and data or video teleconferencing at 128 Kbps on 3m to 3.5m antennas was demonstrated in the Republic of the Marshall Islands, Guam, Chuuk, Pohnpei, Yap, and Fiji.[1]

B. South Pacific

- One of the most important developments in the South Pacific is the University of the South Pacific (USP) Network (USPNet). Through funding provided by Japan, Australia, and New Zealand, the USP is establishing a 64 Kbps internal link to each of its campuses and 128 Kbps for shared video teleconferencing.[2]
- The Fiji Internet Group (FIG) remains a model for consortium building and sharing of resources in the South Pacific. FIG is a consortium of regional organizations that share capacity to the Internet. It is an excellent example of sharing resources, although the resources remain very costly. FIG has 10 users that share a 19.2 Kbps link. The cost of the 19.2 Kbps link to the Internet is $4,000 USD per month.
- Several South Pacific entities have signed on to Project Oxygen, and it is anticipated that fiber optics will be in place some time in the year 2000. Some of the entities that have signed up include Fiji and the Republic of Palau.[3]

III. Pacific Island Intersects and Bridges - PEACESAT and STAN

Some of the distance learning and telemedicine links in the Pacific Islands Region, especially the Western Pacific, are interconnected with Hawaii and to each other through a link between PEACESAT and the State of Hawaii Telehealth Access Network (STAN). PEACESAT and STAN provide a gateway for the Pacific Islands to access educational and health resources in Hawaii, nationally and internationally.

PEACESAT is a public service satellite network that was established 30 years ago. PEACESAT currently uses a dedicated GOES satellite through a Memorandum of Understanding between the National Telecommunications and Information Administration (NTIA), the National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA). The network consists of 53 earth stations in 22 Pacific Island economies. The satellite network is used primarily for high-quality analog voice communications. In recent years, PEACESAT has implemented a digital satellite capability. The digital capabilities introduce enhanced PEACESAT services such as voice, data and compressed video teleconferencing. Frame Relay Access Devices enable concurrent voice and data or video teleconferencing used exclusively for non-commercial, non-personal, public service applications. This network is closely coupled with the STAN.[4]

The STAN is a health and education public service telecommunications network that extends the delivery of health care and education into rural communities in Hawaii and the Pacific Islands Region. The network is used for health and medical care consultations, transfer of medical imagery, distance learning, administrative teleconferences, information access (Internet, Intranet), and patient eligibility information system applications.

The STAN was initiated through a partnership among the Hawaii Health Systems Corporation, the High Technology Development Corporation, PEACESAT, and the Telecommunications and Information

Policy Group of the Social Science Research Institute. Since that time, the Veterans Administration, Pacific Resources for Education and Learning, and the Telemedicine Project of the UH School of Medicine have become integral partners in the development of the network.

The STAN network currently interconnects 16 hospitals, 5 VA clinics, 5 UH and primary care clinics, and 4 additional sites connected through an ATM network and other network connections. Several of the STAN sites that have satellite receive antennas. This enables the sites to downlink satellite programs in C or KU bands and distribute it to other sites as appropriate. This is particularly useful for Pacific Island locations that are not within the footprint coverage of these satellites.

The STAN also has 15 ISDN BRIs to enable dial-in local, national and international links. The ISDN allows interconnection with other ISDN video teleconferencing sites throughout the world. Currently there are no Pacific Islands with off-island ISDN. Therefore, the PEACESAT/STAN connection again acts as a bridge for the Pacific Islands. The Pacific Islands are able to video conference with ISDN capable locations such as Washington D.C, Japan, New Zealand, etc. by connecting to the PEACESAT/STAN video teleconferencing Multipoint Conference Unit (MCU). The MCU is also used in Hawaii to connect teleconferencing sites of the University of Hawaii, the State of Hawaii, and the Hawaii Department of Education all at once.

STAN can also connect to the Hawaii Interactive Television System, or HITS, through either analog or digital links, greatly expanding the sites and programming that can be delivered through the network.

Finally, with the connections to American Samoa and other Pacific Island jurisdictions, through both Digital PEACESAT and Intelsat, the STAN is able to bridge a wide range of public service and development telecommunication applications.

Uses of the Network

Many programs are being delivered over the network. The number of users and applications are increasing rapidly. The following describes some of the uses of the network.

- The UH Primary Care Roundtable has networked with the Hawaii Health Systems Corporation for statewide discussion on primary care issues and problems.
- The School of Public Health delivered two (2) graduate courses to the LBJ Tropical Medical Center and the Department of Health/Public Health of American Samoa.
- The UH Telecommunication Information Policy Group of the Social Science Research Institute delivered a course on telecommunication applications to the American Samoa Department of Education resource teachers in preparation for newly deployed information and telecommunication technologies in American Samoa. Many students of this course later became key personnel involved in the development of the American Samoa telecommunication strategic plan and consortium.

- The Kauai Community College delivered a course in cardiac arrythmias to the medical and nursing staffs of the LBJ Tropical Medical Center. This course was very successful and indicated the value and effectiveness of distance learning. Thirty health care professionals enrolled and completed the course and all thirty students passed the advanced cardiac life support (ACLS) certification tests.
- The LBJ Tropical Medical Center has conducted business meetings with the Hawaii Management Alliance Association (HMAA), American Medical Development, HHSC and many others. The private non-profits call in to the STAN bridge using ISDN and are then interconnected to American Samoa. HMAA meets on a weekly basis with LBJ TMC for medical referral management meetings. HMAA's services to LBJ TMC has resulted in millions of dollars of savings for the American Samoa health care facility.
- The College of Tropical Agriculture and Human Resources (CTAHR), U.S. Department of Agriculture, and Food and Drug Administration have conducted a statewide conference for farmers on food labeling and marketing. Farmers in Hawaii were able to participate in live interactive video teleconferences with FDA in Washington D.C. on newly implemented food regulations. The farmers participated mainly from HHSC health care video teleconferencing facilities. [5]
- UH CTAHR and the Agriculture Development for the American Pacific (ADAP) have conducted meetings with Land Grant programs.
- Nephrologists and dietitians from St. Francis Hospital in Honolulu provide consultation to the renal dialysis center at the LBJ TMC in American Samoa. This consultation actually enabled LBJ TMC to remain certified for medical reimbursements as there are currently no nephrologists on-Island.
- Physical therapy sessions for wheel chair fitting and developmental disability evaluations (gait, body movements and interaction observations) are conducted through video teleconferencing between LBJ TMC and the University of Hawaii Affiliated Programs.
- The initiation of video teleconferencing has been completed through a bridging of the Pacific Resources for Education and Learning (PREL) in the Pacific with the Republic of the Marshall Islands, the University of Guam, American Samoa, and other sites.
- A PREL conference on the island of Kauai was connected to the LBJ TMC for distance learning exchanges. Pacific Islanders were able to present via teleconference to an audience in Kauai, Hawaii. PREL has conducted many teleconferences through the network.
- Many exchanges between students in American Samoa, the Hawaii Department of Education schools, and the UH Laboratory School have been conducted. The cultural exchanges included topics on language, geography, science, music and art. Through an ISDN link to STAN school children at Fenn elementary school in Medina, Ohio were able to meet students at Pago Pago elementary in American Samoa. The Pago Pago children shared traditional Samoan song and dance while the Fenn students danced to good old rock and roll. [6]
- The rural hospital sites have also hosted statewide meetings for education, professional societies, and others. These would not have been possible without the network links provided through the STAN.

Matching Funds and Partnerships

The STAN was based on the common understanding by the Partners that there was a critical need for a common telecommunications and information infrastructure to build the "critical mass" of users to accomplish the project objectives. The resulting network is based on many real partnerships; and, through the partnerships, matching funds were made available to implement the project, far exceeding the original proposal. Substantial amounts of the matching contributions will not be formally recorded as matches. Some of both the formal and informal "matching" funds for the project are summarized.

- Harry and Jeanette Weinberg Foundation - The Hawaii Health Systems Corporation (HHSC) received a grant from the Harry and Jeanette Weinberg Foundation for $3 million. This grant enabled the HHSC to initiate many telehealth application experiments. It also enabled HHSC to become a managing partner in building an infrastructure that interconnects hospitals in the rural communities of Hawaii.
- Distance Learning and Medical Links, U.S. Department of Agriculture - The Kauai Veterans Memorial Hospital received a grant from the US DOA. This grant enabled KVMH to build a connection to the Pacific Missile Range Facility where the DOD contributed 4 T-1s to Honolulu and to the Maui High Performance Computing Center (MHPCC). This grant is for $230,000.
- Rural Health Care Corporation (RHCC) - The HHSC and other partners were successful in receiving RHCC discounts for telecommunication network links to the HHSC. As a result the connectivity among the various partners has been substantially reduced, despite the fact that all sites now have better connectivity.
- High Technology Development Corporation - The HTDC provided funds to support the base personnel to design and implement the connections between the network and PEACESAT.
- The U.S. Public Health Service contributed a server, router, hub and dial-up modems for use by the LBJ Tropical Medical Center and the Department of Health. The amount of the contribution was about $7,000.
- Pacific Missile Range Facility, U.S. Department of Defense - The PMRF is providing 4 T-1s from Kauai to Honolulu and 4 T-1s from Honolulu to the MHPCC. The telecommunication links PMRF has granted to STAN has an economic value of about $2,000 per T-1 or $16,000 monthly.
- American Samoa Telecommunications Authority (ASTCA)/PEACESAT - The ASTCA provided a 384 Kbps link from the LBJ Tropical Medical Center to the PEACESAT/STAN connection. This link has been provided at no charge for education, health, and government. The economic value of this link is $8,000 USD per month.
- PEACESAT - The PEACESAT Program of the University of Hawaii provides satellite and other telecommunication links into the Pacific Islands region. The PEACESAT provides this connection and interconnection with the STAN and HTIRC, in part, through grants that have been received from the National Telecommunications and Information Administration.

Partnerships among organizations are much more difficult to establish than most would suspect. The nature of the grants and other contributions made by the various organizations is tremendous and shows the level of cooperation among the organizations.

IV. **Extraordinary Developments in American Samoa**

One of the most exciting distance learning, telehealth, and telemedicine activities in the Pacific Islands region is taking place in American Samoa. [7]

American Samoa has 29 public schools and 13 private K-12 schools, a community college (American Samoa Community College), a hospital (LBJ Tropical Medical Center (TMC), and clinics in remote communities operated by the Department of Health. All but five of the public schools are located on Tutuila Island. The AS Department of Education operates a public school on Aunu'u (1 mile off the coast) and 4 other public schools are on the three islands of the Manu'a group, located approximately 60 miles to the east. The private schools are all on Tutuila.

During the past year, the American Samoa Government has developed an infrastructure that is unparalleled in the Pacific Islands Region. The historic backdrop for these developments dates back to 1997, when the ASG, through the American Samoa Power Authority (ASPA) and PEACESAT applied for grants from the U.S. Department of Agriculture and the National Telecommunications and Information Administration. Both grants were successful.

As a result, in November 1997, Governor Tauese Sunia convened a Task Force and appointed the Lieutenant Governor, Togiola Tulafono, to chair an inter-agency consortium to coordinate distance learning, telehealth and telemedicine, and public service telecommunications. The Consortium became known as the ASG Distance Education, Learning, and Telehealth Application (DELTA) Consortium.[8] [9]

In support of the DELTA Consortium, the American Samoa Telecommunications Authority (ASTCA) made a critical, first time in the Pacific, donation of telecommunications capacity for health and educational networking. The contribution consisted of a 384 Kbps link between American Samoa and the PEACESAT Program of the University of Hawaii. This first time contribution of such capacity dramatically increased communications between American Samoa and organizations in Hawaii.

The DELTA link enabled credit and non-credit courses and training programs to be delivered, business meetings to be conducted, and allowed free flowing Internet and electronic mail access. Through the link, American Samoa could communicate with counterpart organizations in not only in Hawaii, but also throughout the world. This is accomplished through bridging the DELTA link to the PEACESAT and STAN networks that have both ISDN and satellite downlinks. Through the links, American Samoa has extended their dialogue with counterparts through virtual connections. As previously mentioned examples of these uses include connecting students in American Samoa with students in Ohio and having American Medical Development dial into Hawaii to present telemedicine technologies to American Samoa.

In 1998, the American Samoa DOE, with encouragement from the Lieutenant Governor, submitted an application for "E-Rate" funding, made available through the Telecommunications Act of 1996. The funding was approved by the Schools and Libraries Division of the Universal Services Administrative Company in late February 1999 and the AS DOE was awarded $3.5 million for Year 1 (1999) and a Year 2 award of $2.7 million to continue its E-Rate activities and network.

The work immediately began upon receiving notification of Year 1 funding and the joint accomplishments of the American Samoa DELTA Consortium and the Department of Education have been simply amazing. Today, American Samoa has implemented:

- The networking of 45 public and private schools through a very high-speed fiber optics network using ATM technologies with redundancy based on fiber rings and additional cards and re-routing of data;
- The interconnection of the Executive Office Building, LBJ Tropical Medical Center, and the American Samoa Community College to the E-Rate Network. Agreement was established to provide use of the video teleconferencing facilities for use by the schools and DOE.
- The interconnection of the outer islands in American Samoa (Manua and Aunu`u) through multiple T-1s to the E-Rate network.
- A full T-1 for video teleconferencing and Internet access.
- The purchase of additional computers for the schools so that a 12:1 student to computer ratio will be in place by the end of the year, with plans to achieve the specific objective of 10:1 in the Year 2000.
- The installation of eleven new servers for electronic mail, web, Intranet applications, and file management services. One is used for off-site backup.
- A training program called "T-3" is now in place that enables teachers to learn about educational applications; and,
- American Samoa and PREL are in the process of establishing partnerships for adaptation of educational courseware and programs.

The American Samoa DELTA and DOE are also planning further developments. Some of these include:

- A video teleconferencing system will be installed by the Pacific Resources for Education and Learning in all high schools by the end of 1999, along with a H.323 Multipoint Conference Bridge. This will enable the schools and students to participate in course delivery and teacher training programs.
- Through E-Rate funding, AS DOE will be wiring all classrooms to be telephone and data ready. The design of the wiring will also include patch panels that will enable video teleconferencing to be used in the classroom.

- The LBJ TMC and the DOH will be piloting telemedicine applications into the remote islands of Manu`a.

Concurrent to these technical developments, the DELTA and DOE have established an organizational and personnel infrastructure that will provide support for the schools, technical support for the network and servers, a management information systems group, and an instructional technologies support unit focused on courseware applications and student and teacher applications. Although this organization is not fully in place and still in its infancy, it appears as through this effort will yield the results intended by the DELTA Consortium and the DOE.

The DOE E-Rate infrastructure was designed to support asynchronous Internet, Intranet, synchronous video and multimedia (e.g., NetMeeting) distance learning modalities. One of the elements of the Educational Technologies Program has been to build a video teleconferencing network to support synchronous distance learning programs and training programs. Today, in collaboration with the ASG DELTA Consortium, the DOE has use of video teleconferencing facilities at:

- Feleti Barstow Public Library
- Executive Office Building
- LBJ Tropical Medical Center
- American Samoa Community College
- American Samoa Power Authority

To share these facilities, the DOE has enabled these organizations to interconnect to the DOE network. In exchange, the organizations will make their conference rooms and classrooms available to the DOE for in-service teacher training and educational course delivery. Further, a Multipoint Conference Bridge and H.320/H.323 gateway will be installed in American Samoa for bridge to bridge connections with STAN via PEACESAT.

V. **Partnerships in the Western Pacific**

There has emerged, in the past two years, a strong and unprecedented cooperative effort among government, education, health care, and regional organizations in the Pacific Islands Region. There are several important reasons why these partnerships have developed.

First, the Pacific Partners recognize that given resource constraints, no organization can do it alone. As such, the Partners recognize that sharing resources and using the strengths of other organizations are important to optimize the limited resources of individual organizations. Building and maintaining partnerships is never an easy task. However, new leadership in several organizations led to new opportunities to initiate collaborative actions. This has been actualized in practice.

Second, the Pacific Partners recognize that it is essential to build a "critical mass" in health care and distance learning. Building a critical mass in the Pacific means that a link for health care will be shared with education, and a link established for education will be shared with health care organizations. This level of resource sharing meant that there would be a closer coupling of organizations that have worked fairly independently in the past.

Third, the organizations have shared values. In health care, the Partners believe that telehealth systems can help to improve the quality of, and access to, health care in rural and/or underserved areas in the Pacific Islands region. The Partners also believe that telehealth systems can help to lessen the costs of delivering quality and accessible health care, and enable Hawaii to share resources with the Pacific. In education, the PREL and regional educational agencies share the belief that distance learning can help to deliver education, teacher training, and courses that would otherwise not be available to schools in remote locations.

Finally, the Partners recognize that organizational successes will come for everyone through partnerships and a focus on humanitarian concerns.

As a result, the Partners have shared visions to:

- Improve the quality and access to health care in Hawaii and the Pacific Regions through the use of telehealth and telemedicine.
- Share health care, education, and technology resources with the Pacific Islands Region.
- Collaborate on the development of common telehealth and DLT infrastructure and applications to contain costs and optimize on investments.
- Share information and to undertake collaborative research and development activities.

Some of the Pacific Partners in this effort include:

- Hawaii Health Systems Corporation

  The Hawaii Health Systems Corporation (HHSC), established by the Hawaii State Legislature in 1996, is the nation's fourth largest public hospital corporation and consists of 12 Health Care Provider (HCP) facilities located throughout the islands of the State of Hawaii. [10] The HHSC is the major health care provider for the islands of Maui, Lanai, and Hawaii. Specialized physician resources are concentrated largely in Honolulu, the capital of Hawaii.

  As a public corporation, the HHSC has a special obligation to deliver quality, accessible, and effective health care to rural communities in a period of declining general funded budgets and inadequate information technology and human resources. This was a special problem due to the geography of the regions, the separation of HHSC HCP facilities, and the legislative mission to provide quality health care. To respond to these challenges, the HHSC initiated, in late 1997, an aggressive plan to implement a telehealth and telemedicine program based on public and private partnerships.

This led the HHSC to very deliberately and consciously work to establish the State of Hawaii Telehealth Access Network (STAN).

- High Technology Development Corporation

The HTDC has been a major force in building the partnerships that led to the creation of the STAN and PEACESAT links. HTDC's role has been to facilitate the "conversations" that have been necessary to build partnerships, and to further specific development efforts through providing technical and other resources.

- Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT)

The PEACESAT is generally known as a public service satellite communications network. This characterization represents only a part of the PEACESAT's program mission. PEACESAT has three major program missions. PEACESAT facilitates the development of programs to use telecommunications and information technology; conducts public service telecommunications application experiments in the Pacific Island region; and operates a public service satellite communications network for public service application experiments.

PEACESAT facilitates the use of telecommunications and information technologies in the Pacific Island region by assisting governments, educational institutions, regional organizations, and non-profit organizations to understand and use telecommunications and information technologies.

- Pacific Resources for Education and Learning (PREL)

The PREL is one of 10 regional educational laboratories funded by the U.S. Department of Education.

The PREL service area generally includes the U.S. territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands, and the Freely Associated States, including the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau.

One of the exciting developments in the educational arena has been the establishment of a formal Memorandum of Understanding between PREL and PEACESAT. Under the MOU, PREL and PEACESAT are collaborating on several important developments.

<u>E-Rate Technical Assistance to Guam and CNMI</u> - PREL has defined providing technical assistance to Guam and CNMI as critical to assisting the K-12 public and private schools,

and the public libraries, to get connected for voice, data, and video teleconferencing capabilities. Since PEACESAT assisted American Samoa in designing their E-Rate Network, PREL has partnered with PEACESAT to provide consultation assistance to Guam and CNMI.

PRELStar Sites - PREL is working with PEACESAT to activate the Digital PEACESAT capabilities for the Pacific entities (i.e., the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau) that do not qualify for E-Rate funding. For these jurisdictions, the PREL and PEACESAT will activate the Digital PEACESAT capabilities for voice, data, and video teleconferencing. Other sites will follow the initial implementation.

General Network Support - PEACESAT has also agreed to provide general network and bridging services for video teleconferencing to PREL and to provide other telecommunications and information technology related advice when needed.

- Veterans Administration

The Veterans Administration operates one of the largest hospital and clinical networks in the U.S. The Honolulu VAMROC is responsible not only for veterans in Hawaii, but throughout the Pacific Islands region. The VA has a field office in American Samoa and operates a clinic in Guam. The overlapping geographic areas of responsibilities and the VA with the interests and activities of HHSC, HMAA, PREL, and others have led to a general cooperative agreement to work together.

One of the most interesting forms that this cooperation will take will be the establishment of a link that will enable VA technical personnel to trouble-shoot and assist the LBJ Tropical Medical Center to maintain the clinical information system through remote data access and video teleconferencing.

VI. Summary

The entities in the Pacific Islands Region have not been full beneficiaries of the changes in telecommunications policy, technology and development. However, the developments over the past two years suggest that as the Pacific Islands enter the new millennium, the pace of developments in distance learning and telehealth will quicken, aided in part through the realization of partnerships, and continued building of momentum and demand for information exchange and access. The development in the Pacific and the number of partners and increasing transparency of the network will also grow, inhibited only by the cost of telecommunication resources in the Pacific Islands Region.

The development of the USP network may also lead to some exchanges between the South and Western Pacific jurisdictions as local infrastructure in the jurisdictions expand. American Samoa and Samoa (formerly Western Samoa) may lead the way since preliminary discussions have occurred over the interconnection of the two Samoan entities through a contribution of excess capacity by the two Samoa carriers.

It is further anticipated that some of the costs and capacity may be resolved through fiber optics (e.g., the addition of Southern Cross and the new fiber to be installed by Project Oxygen) and the activation of other satellites in the region. However, in the Pacific Islands it remains to be realized that cost, not capacity, will prevail as the major determinant in advancing telecommunication applications for health, education and other public service activities.

[1] The digital PEACESAT demonstrations were very news worthy in many islands, as it was often the first time demonstration of off-island interactive video teleconferencing. News articles appeared in the June 20, 1999 issue of *Pacific Sunday News* and October 27, 1999 issue of the *Marshall Islands Journal*.

[2] The January 1999 issue of the *Hawaii's Web and Internet News* provides for more information on the USPNet.

[3] See Project Oxygen Web Site at http://www.oxygen.org/

[4] The STAN network was one of the first operational ATM networks in Hawaii. *ATM WORLD* featured an article on STAN in the 1998, Volume 2, Number 3 issue.

[5] See CTHAR press release on video teleconferencing connections at http://www2.ctahr.hawaii.edu/oc/cnews/may99/adaprel.asp

[6] For more information on this story please refer to the *Medina County Newspaper*, June 5, 1999.

[7] The seven islands of American Samoa stretch approximately 600 miles along a line running southeast to northwest and lie 12 o to 15 o south of the equator, 4,150 miles from the continental United States, 2,300 miles southwest of Hawaii, and 1,600 northeast of New Zealand. Six of the seven islands are inhabited with Tutuila hosting approximately 80% of the entire population of 55,000 people.

[8] Consortium members include: American Samoa Telecommunication Authority, American Samoa Power Authority, LBJ Tropical Medical Center, Department of Health, Department of Education, Department of Public Works, American Samoa Community College, Office of Federal Programs, TEMCO, ASDRO and University of Hawaii TIP-G.

[9] The *American Samoa Government Newsletter* Volume 1, Issue 9, June/July 1998 focuses on the development and initial activities of the DELTA Consortium.

[10] The HHSC has over 1,250 staffed acute care, psychiatric, intensive care, and long-term beds; and, 3,200 employees.

Biography

Christina Higa

Christina Higa is the Associate Director of the Telecommunications and Information Policy Group (TIP-G) of the Social Science Research Institute of the University of Hawaii and the Director of PEACESAT. TIP-G undertakes interdisciplinary telecommunication and information policy, planning, and technology research and application projects. Under TIP-G, Ms. Higa has managed large and complex telecommunication projects, including: the Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) program, which provides public service satellite telecommunications to 22 Pacific Island economies; the Emergency Management Network; and the Distance Education Learning Technologies and Applications Project. Ms. Higa brings with her more than 10 years of experience in public service telecommunications and the Pacific Island region.

Dr. Norman H. Okamura

Dr. Norman H. Okamura is a Telecommunication Specialist with the Social Science Research Institute of the University of Hawaii and the Director of the Telecommunication Information Policy Group. Dr. Okamura specializes in public service and development telecommunications and information policy, planning, technology systems and regulation. Prior to his tenure with the SSRI, Dr. Okamura served as the Administrator of the State of Hawaii Information and Communication Services Division (1984-1992), Senior Manager with the KPMG Peat Marwick Honolulu Office (1992); Assistant Professor and Research Projects Administrator of the Department of Urban and Regional Planning (1978-1984), and as an Educational Associate with the Curriculum Research and Development Group (1975-1978).

Dr. Okamura has directed the development of the Hawaii Wide Area Integrated Information Access Network (HAWAIIAN); Hawaii Interactive Television System (HITS); State SONET network, ASK-2000; toll-free government access and many other networks. Dr. Okamura led the design effort for the PEACESAT digital network, DELTA Hawaii network and the State Telehealth Access Network (STAN).

In addition to bringing strong telecommunication and technical knowledge and skills, Dr. Okamura conducted ongoing telecommunication infrastructure studies of the Pacific Islands, has served as advisor to many public service agencies, and is current on the developments of both commercial and public service networks in the region.

Sessions

New Mobile Satellite Network Opportunities for the Pacific Region Nations using second and third generation INMARSAT satellites.

Eric Jones

Power Point Presentation

Background and Introduction

BT's Global INMARSAT services have become well established via the BT Pacific Land earth Station (LES) in the Pacific Ocean region since its opening in May 1997. These services include the traditional maritime A, B and C services and the M and mini-M land mobile services. This paper covers land and maritime mobile and portable/relocatable services as these can provide the most cost effective use of INMARSAT for network applications in the Pacific. The fastest growing INMARSAT service is currently the mini-m. This is a thin route voice/fax/data service, which in fact is now experiencing the most rapid expansion of all of BT's INMARSAT services. The service is particularly suited to Pacific Island applications being relatively low cost in terms of both infrastructure and services. It is flexible in application and does not require the use of a customer owned central hub station or switch. Demand in the Pacific for Basic Internet and data communications services is growing at least as fast as the demand for voice communications placing ever-increasing demand upon bandwidth. The standard mini-m service has a maximum data transmission rate of 2.4 kbps but this has now been recently enhanced by the new "M4" land mobile service option that permits as one of its services the transmission of 64kbps data. This can provide economical land mobile access to ISDN or similar data services from relatively low cost transceivers. BT market this service under the name "SATELAN" and this is the first such service in the region. INMARSAT second and third Generation satellites are now also being used to provide dedicated links and "bandwidth on demand" type services for mobile virtual private networks (VPN's). This enables low cost data link services to be provided to mobile and/or relocatable stations around the world globally at data rates as high as 256kbps. These services can be provided as part of a BT managed Network such as the "Bandwidth Efficient Satellite Transport (BEST) service. This network enables access on demand to higher bandwidth as required for occasional file transfer, Videoconferencing, Internet Access, and general telecommunications. As lessons learned from LEO and MEO satellite systems come to light, this paper indicates that the use of INMARSAT's Geostationary satellites for such mobile network applications will continue to be a primary choice for many years to come.

INMARSAT's Traditional services....A reminder

INMARSAT A: Analogue voice and Telex transmission services since 1982. Global coverage using companded FM/SCPC providing analogue voice band services supporting in band data and fax at rates up to 14.4kbps. Mobiles use antennas of some 1.2meter diameter and if used at sea, then 3-axis gyro stabilization of the antenna is required. Satisfies the Global Maritime Distress and Safety System requirements (GMDSS)

INMARSAT B : The digital successor to the A system offering data at up to 64 kbps in addition to use of the normal 9.6kbps transmission medium. Satisfies GMDSS and is a Global service.

INMARSAT C: A store and forward text only service available globally. This is essentially a Telex type message service, however, email transmission via INTERNET to C terminals is also available. The C system is also used for poll/response applications (position reports) and SCADA and is frequently linked with GPS positioning systems. The service is used extensively for charting purposes both on Land and at Sea in fleet management applications for vehicle location and messaging. Max transmission rate is 600bps. Satisfies GMDSS.

INMARSAT M: The first of the Land Mobile options for Global service. This briefcase sized model uses compressed voice, fax and data at 4.8kbps. This has largely been superseded by the mini-m service. Does not satisfy GMDSS but is used extensively in the maritime environment.

INMARSAT mini-M: The Laptop sized Land Mobile model. Uses compressed voice, Fax and data at 2.4kbps. Does not satisfy GMDSS. This service uses INMARSAT third generation satellites (and above) as the higher powered spot beams are necessary to support this near Global service.

INMARSAT's new M4 Service

M4 is the technical name for INMARSAT's latest satellite mobile technology. M4 stands for **M**ulti-**M**edia **M**ini-**M** and reflects the high-speed data capability to support multi-media applications. This service can only be supported by INMARSAT third generation (and above) satellites as it relies on the use of High Powered spot beams. BT market their applications using INMARSAT M4 service as the **BT SATELAN** Service and it is available today.

The M4 system and the traditional B system both provide services at up to 64kbps, however there are a few differences between the technology used in M4 applications solutions and that provided by suppliers of the Inmarsat B satellite terminals. These can be summarised as follows:

Inmarsat B supports 56 and 64 Kb/s data, which is routed via the ISDN. INMARSAT M4 equipment supports 56 and 64 kb/s data via the ISDN but also an analogue data service at speeds up to 33.6 kb/s via the PSTN.

Inmarsat B is supported via the satellite global beam giving almost near global coverage including the world's oceans whereas M4 is supported via spot beams only which cover approximately 98% of the world's land mass.

Inmarsat B does not support the use of SIM cards.

M4 pricing plans will provide cheaper airtime than Inmarsat B standard rates. M4 satellite terminals are lighter in weight (approx 4.5 Kg) and are battery powered. B-Sat terminals are bulky, require large antennas and are powered by an external battery source or generator.

INMARSAT M4 and hence BT's SATELAN services are currently intended for Land portable applications only. M4 does not satisfy GMDSS.

The M4 service provides a range of application solutions including: remote video-conference, secure corporate intranet access, public internet access, remote monitoring and inspection, store and forward video transfer and broadcast quality voice transmission plus a range of customised applications being developed and packaged by BT which will be released over the lifetime of the service.

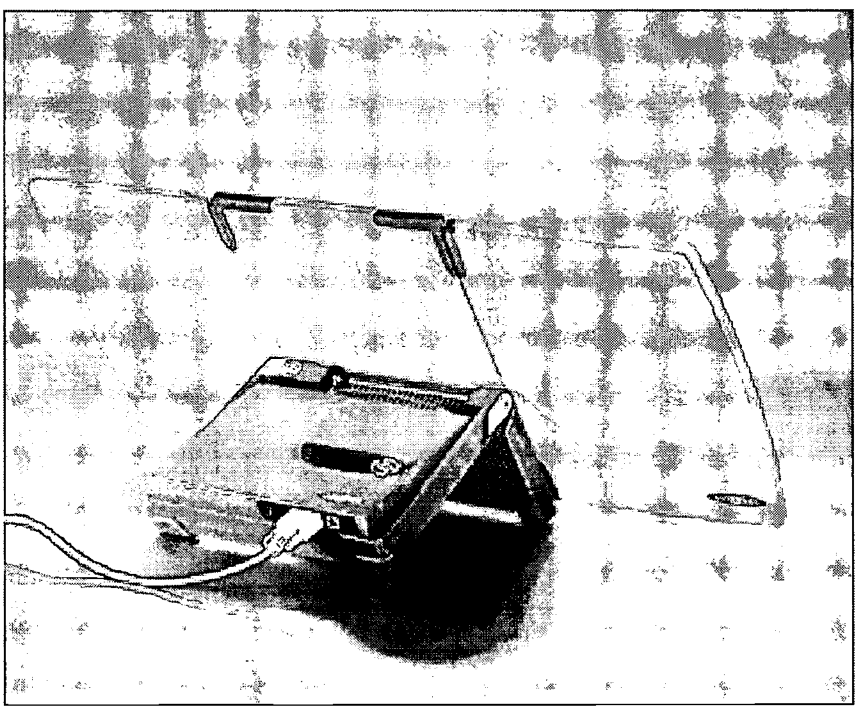
Note that there are regulatory and licensing restrictions to the use of the M4 satellite communications equipment therefore use of the M4 technology in any territory is subject also to local regulation.

SERVICE ROLL OUT SUMMARY

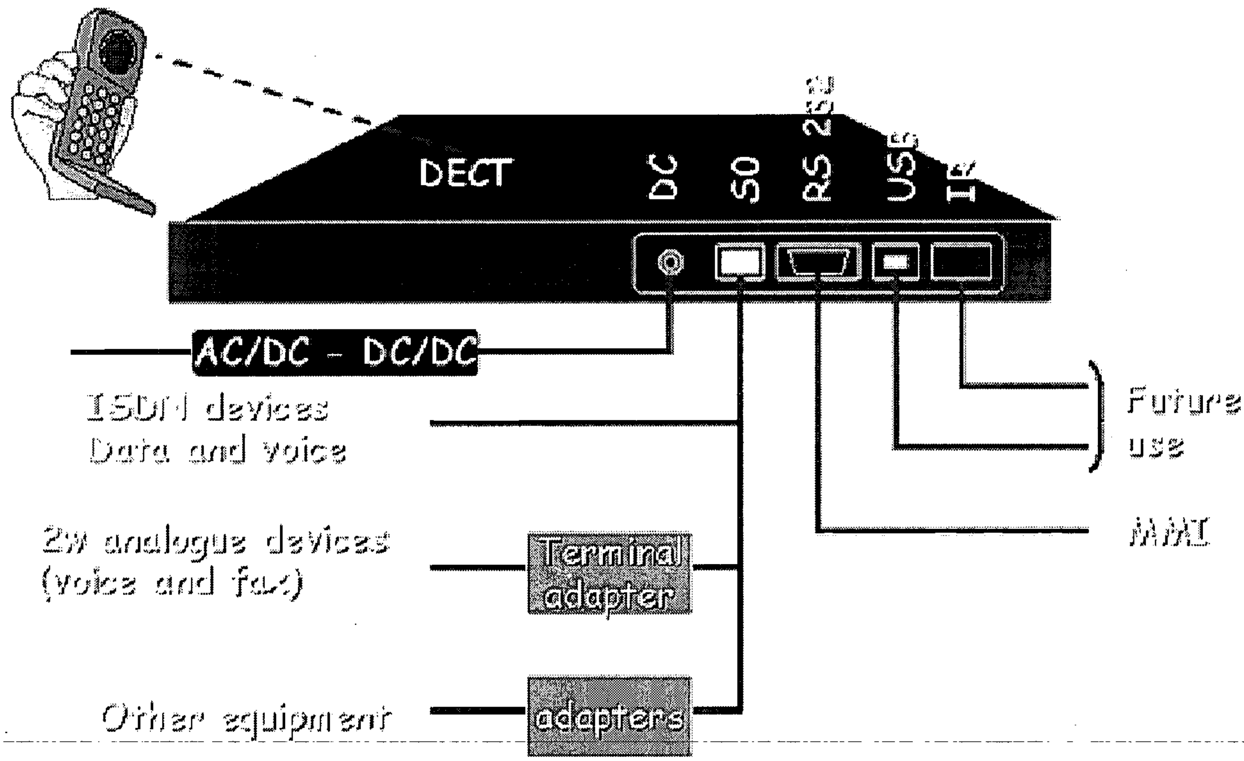
Note the service provided by BT is covered Globally using just two INMARSAT Land Earth Stations, Goonhilly (UK) and BT Pacific (NZ)

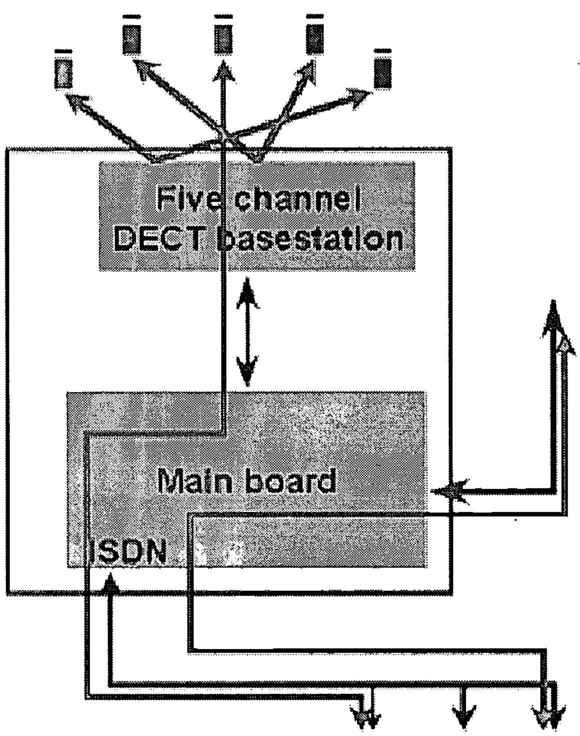
Service/Region	GHY AORE	GHY AORW	GHY IOR	BT PACIFIC
VOICE	Sept 1999	Sept 1999	Sept 1999	Sept 1999
2.4 KB/S FAX	Sept 1999	Sept 1999	Sept 1999	Sept 1999
2.4 KB/S DATA	Sept 1999	Sept 1999	Sept 1999	Sept 1999
64 KB/S CLEAR CHANNEL	Sept 1999	Sept 1999	Sept 1999	Sept 1999
56/64 KB/S ISDN	Sept 1999	Sept 1999	Sept 1999	Sept 1999

M4 TERMINAL MANUFACTURED BY THANE & THRANE (ABOVE) AND NERA (BELOW)



Comms Interfaces





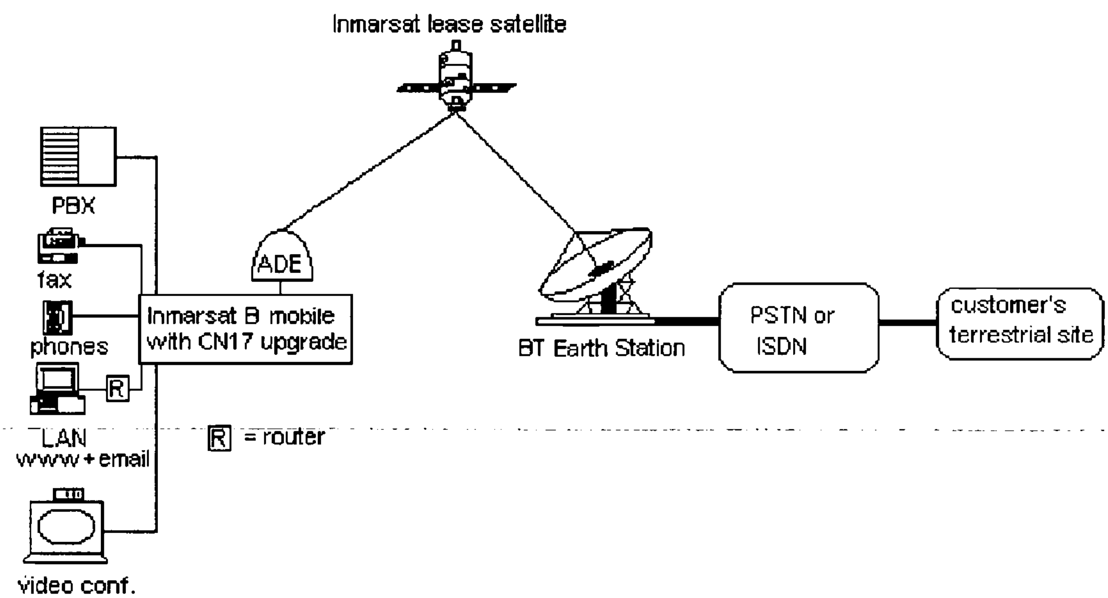
Flexibility

- 5 channel DECT base station
  - 12 handset can be "subscribers"
  - Max. 5 active at the same time
- 8 devices connected to the "ISDN bus"
  - Max 2 active at the same time

Inmarsat have introduced commercial use of their second generation spacecraft. The service is being rolled out in stages. The stages are:-

Stage 1 - July 1999

This allows Inmarsat B mobiles with the suitable change note 17 (CN17) software to access a single private and reserved, leased channel on the 2nd generation lease satellites. This channel is for the sole use of that mobile and will support High-Speed Data (64kb/s) or 16kb/s voice or 9.6kb/s fax or asynchronous data calls. The type of lease required for the mobile must be specified at the time the service is ordered. The connection backward from the BT Earth Station to the terrestrial customer can be made either via PSTN or ISDN using the usual dialed number plan of those networks. A diagram of this architecture is shown below with some of the possible applications, which can be supported;



A minimum lease period of 6 months applies. The service charge in this case will be either;

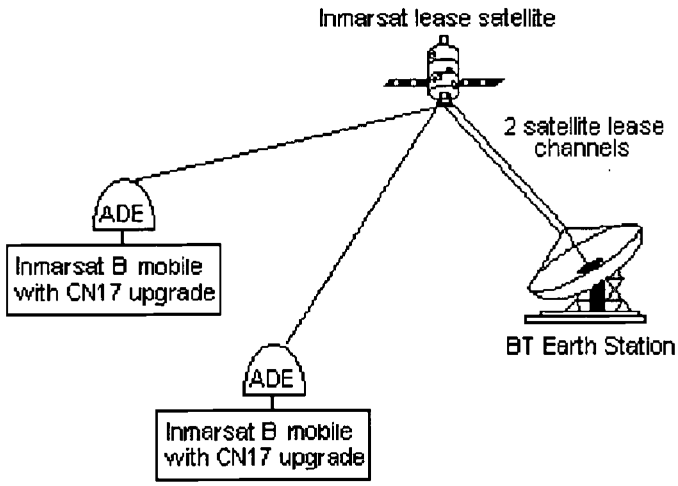
1. A fixed fee based upon a certain assumed calling pattern plus the satellite lease charge or
2. A fixed amount for the satellite lease plus a per minute charge for the PSTN or ISDN calls made from mobile.

The coverage maps of the three lease satellites are attached in appendix 1. A typical terminal, which can access the lease satellites, is shown being used in appendix 2.

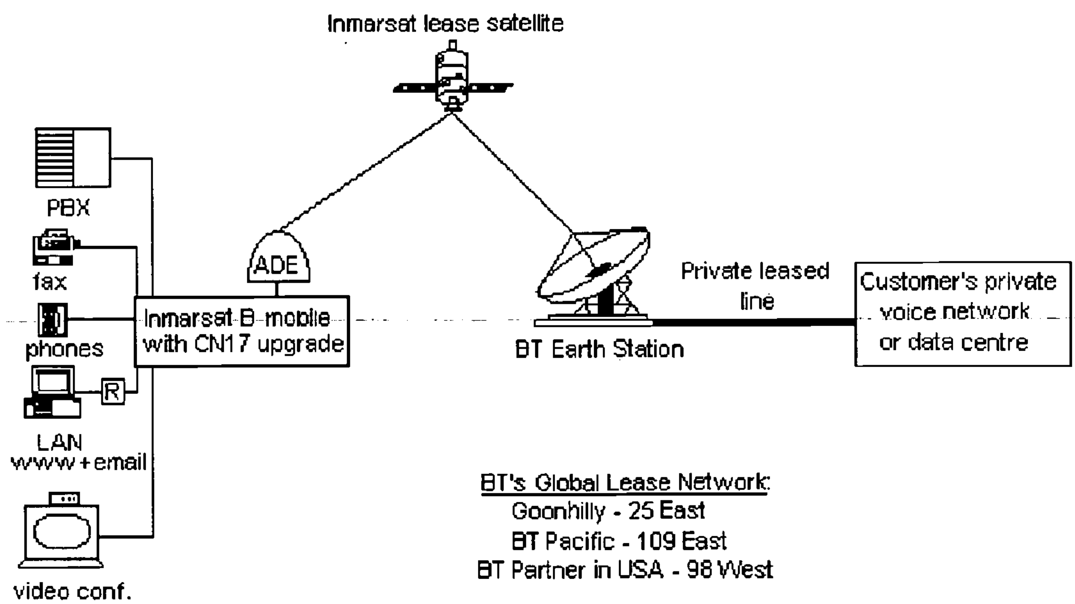
Stage 2 - November 1999

Features made available at this stage are mobile-to-mobile connections using two leased channels on the same satellite and the facility of having a private leased line backhaul from the BT earth Station to the customer's site.

An example diagram of mobile-to-mobile leasing is shown below;

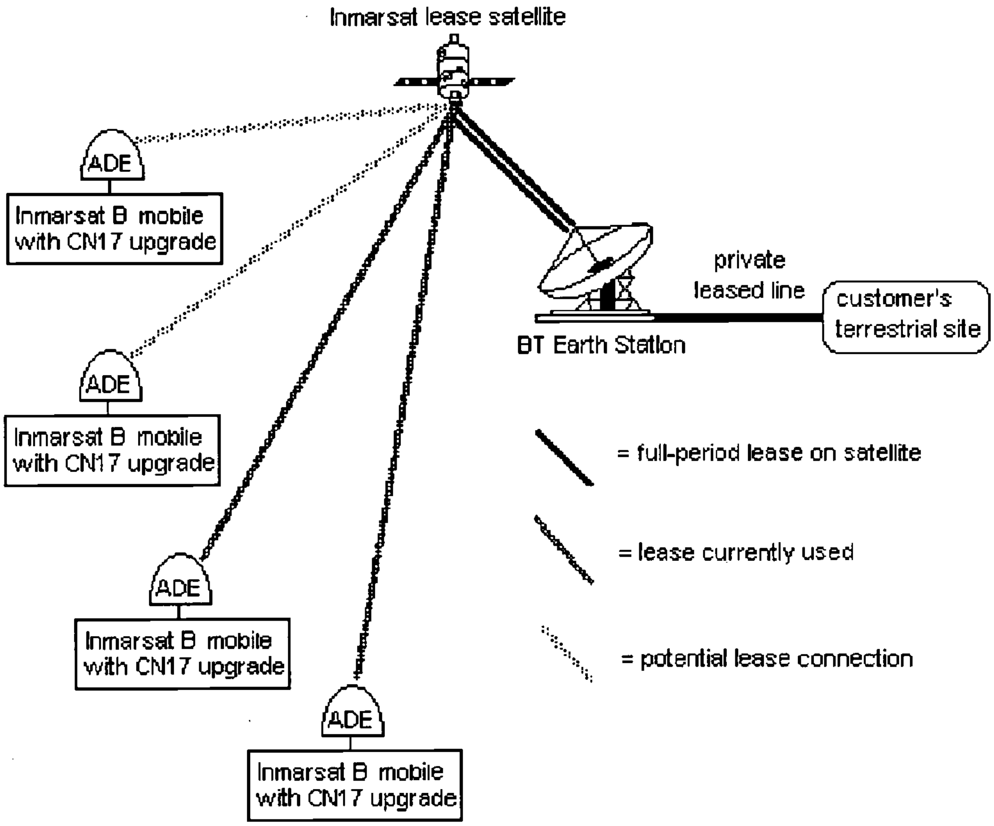


An example of a private leased backhaul is shown below;



Stage 3 - January 2000

In this stage, lease operation can be made available to multiple groups of mobiles sharing a smaller group of leased channels on a satellite. This 'group operation' gives the customer more flexibility, as common resource sharing is then possible bringing further efficiencies. The diagram gives an example of where four mobiles are registered to access two lease channels. Any two of the four mobiles can access the two circuits at any time simultaneously. In this scenario a customer will need some local operating procedure to ensure that the reserved leased capacity is shared in a useful manner between the sites that require it. The backhaul will be dimensioned to accommodate the total leased satellite capacity.

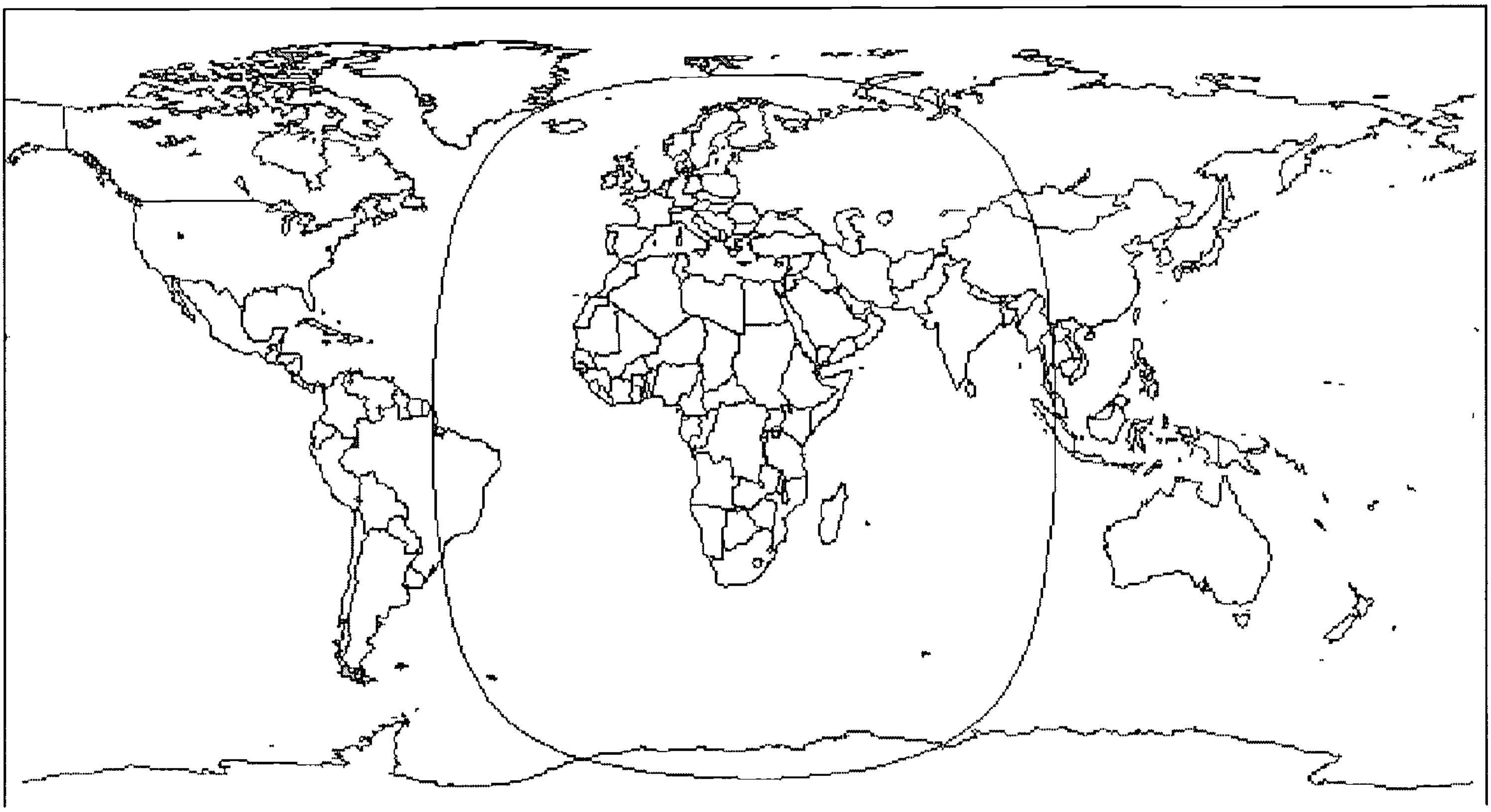


Mobility management

Also in stage 3 full mobility management is employed which allows to-mobile calls to be automatically routed to a mobile whether it is registered on the operational satellites and being used in demand-assigned mode or active in lease mode on a lease satellite.

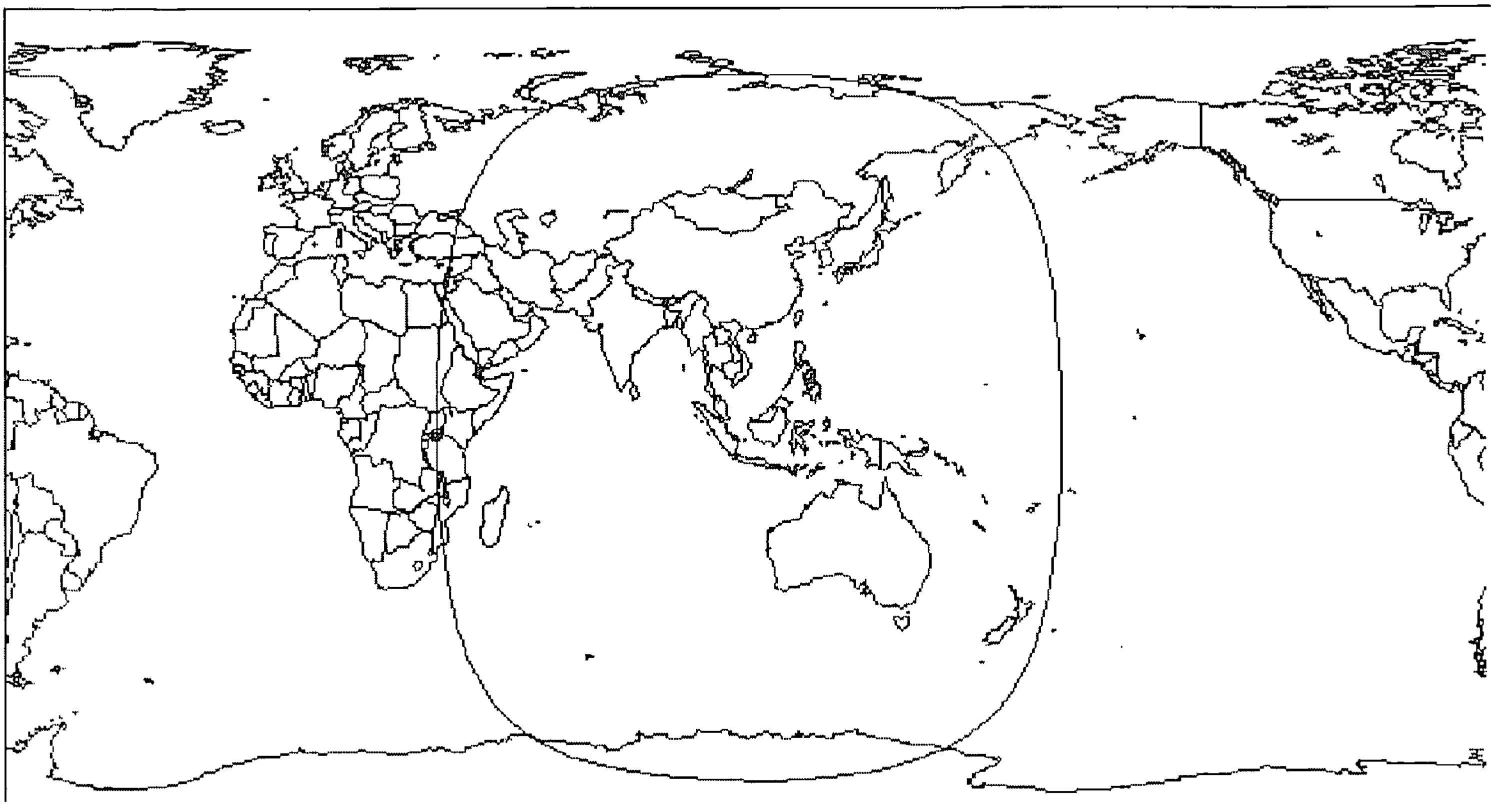
<u>**25 East Lease Satellite Coverage**</u>

5• mobile elevation:



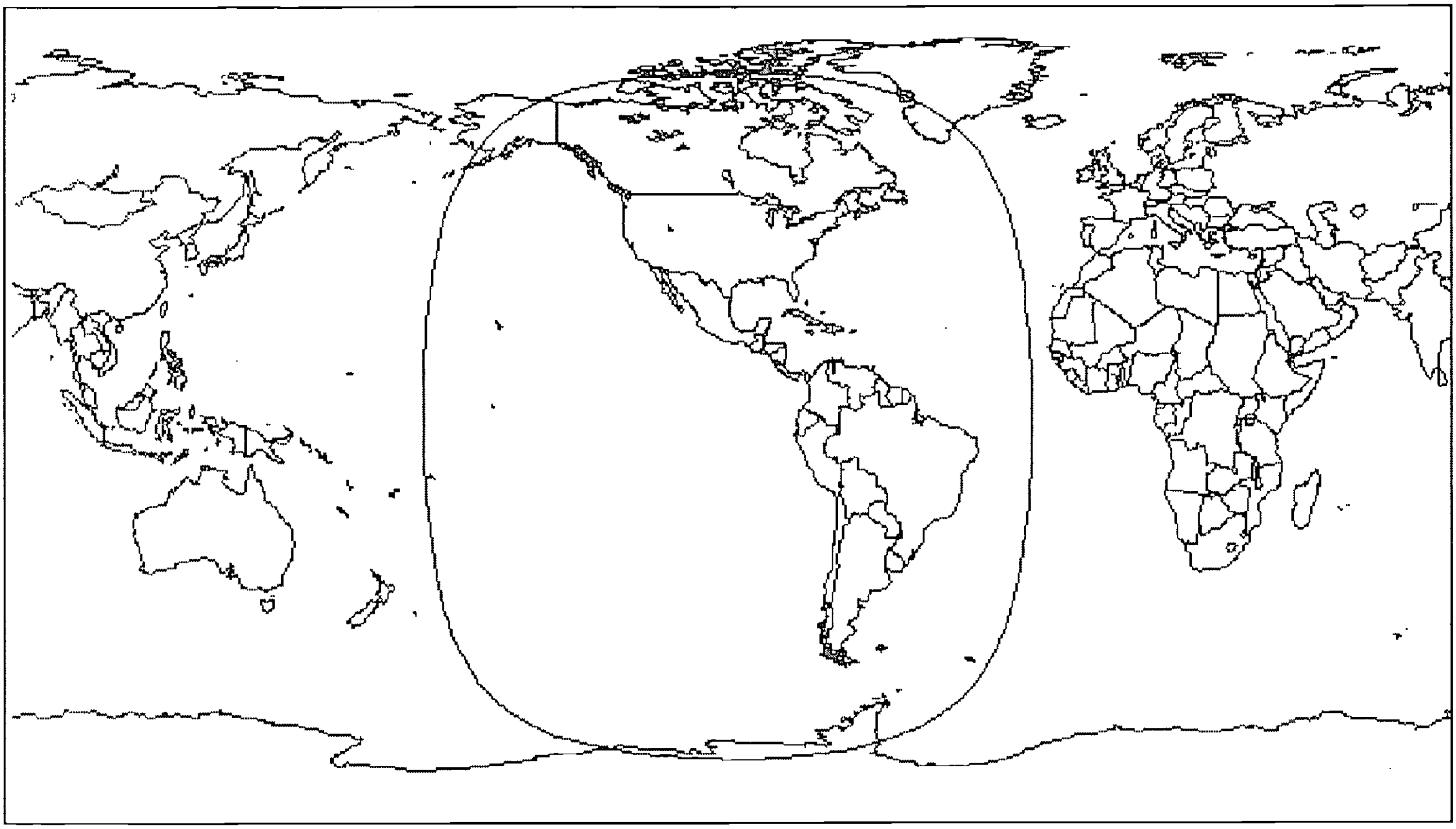
109 East Lease Satellite Coverage

5• mobile elevation:



98 West Lease Satellite Coverage

5• mobile elevation:



BT's Bandwidth efficient Satellite Transport System (BEST)

BT has launched of a new range of dedicated bandwidth services for use with the Inmarsat Leased Network of satellites. As demand continues to grow for both on-demand services and increased data capacity, BT is working to bring new cost-effective world wide leased capacity solutions to the Inmarsat community.

Leased services from BT A&M include:

- Voice and 9.6kbit/s data/fax
- High Speed Data (HSD) 64kbit/s
- BT BEST - Up to 512kbit/s plus bandwidth resource pooling

By utilising the Inmarsat Leased Network, BT customers will gain significant savings in charges and have greater access to channel availability which is unaffected by seasonal or unusual traffic volumes by on-demand users. To complete the leased capacity, end-to-end dedicated circuits can be provided via 64 kbit/s leased lines.

BT BEST can offer Virtual Private Network (VPN) solutions together with high bandwidth. This can accommodate both day to day telephony and LAN requirements of a defined group of users, plus greater bandwidth on demand for large file transfers or video conferencing. Members of a BT BEST private network can be added or removed in minutes ensuring maximum utilisation of the available capacity as and when mobiles require access to the VPN.

FEATURES

Turnkey Services BT and our Global Service Partners, offer complete services including:

- Leased airtime;
- BT BEST mobile retrofit kits;
- Land Earth Station (LES) facilities; and
- Terrestrial links and interfaces to private networks

Full Support will be available via BT BEST Service Partner s who will provide in-life service support and maintenance, and remote operator training. The BT BEST Network Operations Centre (BNOC) will provide 24 hour, seven days a week transmission plan change control, service monitoring and assistance

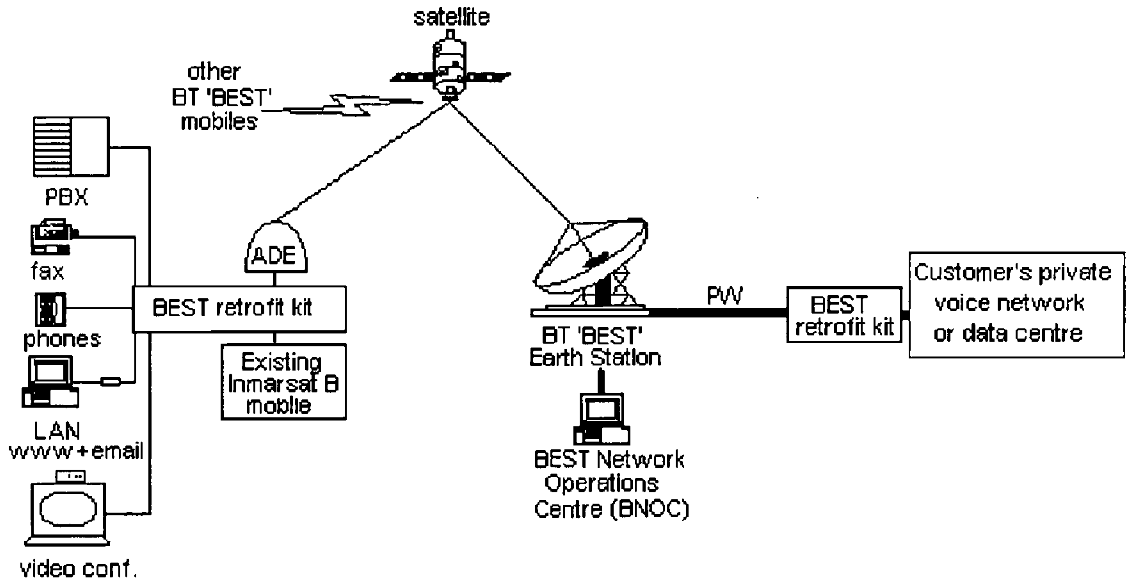
BT BEST Technology provides significant gains in communication efficiencies by 'pooling' a customer's multi-media capacity requirements on a single point-to-multipoint broadcast bearer channel. This 'pool' is then shared, on demand **using Frame Relay,** by the mobiles of the entire network or fleet. Advanced statistical multiplexing, demodulation and satellite channel coding techniques are then used to further optimise the network grade of service and minimise the satellite loading. To track the latest advances in technology, BT BEST uses Commercial Off-The-Shelf (C

TS) equipment at each mobile node. This supports interfaces for ISDN, LANs and IP, telephony. The telephony interface automatically compresses voice (but maintains toll-quality), supports G3 fax and V32 modem data. E1/T1 or E&M signalling interfaces are provided to support PBXs.

BT BEST Key benefits include :

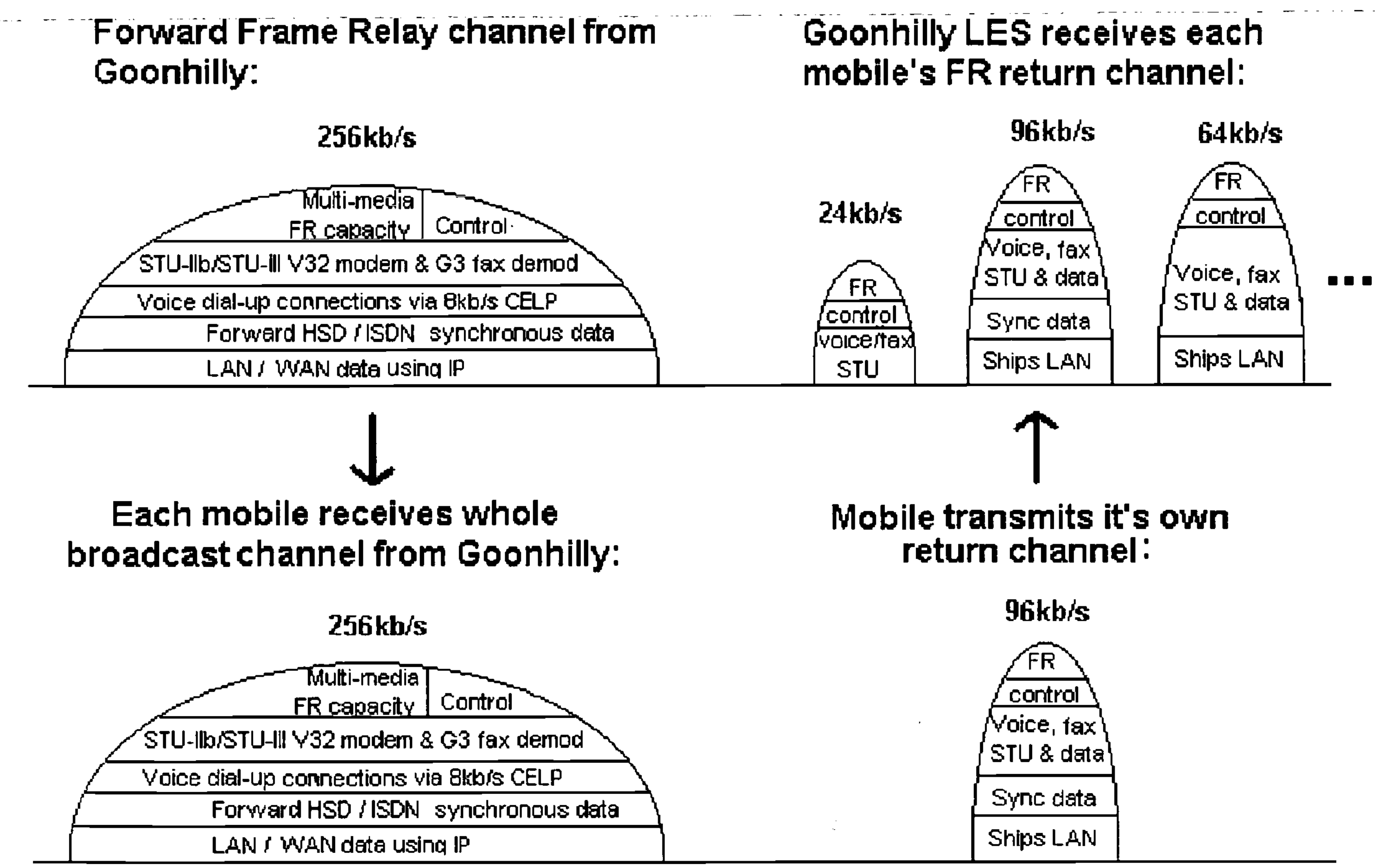
- Fixed monthly service charges
- Pre-determined grade of service
- Land transportables can be operate with existing licences
- Mobile terminals can easily revert back to on-demand access

Typical BT BEST network



Capacity. The pool reserved for a BT BEST private network, will be carefully sized and dimensioned to offer the optimum quality and grade of service appropriate to the customer's traffic demands and budget.

__Typical BT BEST Transmission Plan;__



Communication Services

- Voice: 16 kbit/s (Inmarsat mode) - 8Kb/s ACELP (BT BEST mode) with DTMF dialling and echo cancellation
- Fax: 9.6 kbit/s
- Telex: 50 Baud (Inmarsat mode)
- Voice-band data: V.32 is supported at 9.6 kbit/s
- Synchronous data from 8kbit/s to 64kbit/s via V.35 digital port.
- LAN / WAN connections
- *From* mobile 8kbit/s - 256kbit/s
- *To* mobile 48kbit/s - 512kbit/s or more

System Specifications - Model N Mobile Terminals

- Frequencies: L-band. Inmarsat 3rd/2nd Generation compliant
- EIRP: up to 33dBW, G/T: -4 dB/K (standard dish) or +3.7 (big dish)
- Modulation O-QPSK, ¾ or ½ rate, Reed-Solomon (optional)

Antenna Unit

- 1 m stabilised parabolic dish, gain 21.8 dB Tx, 21.1 dB Rx
- Inclination tracking Big dish is 2.3m, 30dBi. Maritime steerability
- Hemispheric coverage, 0°- 90°, with tracking
- Normal mode (with gyro) or rapid mode (if gyro fails)
- Automatic search
- Cable unwrap

Ship Motion

- Max turning rate: 12°/sec, roll: ±30°, pitch: ±10°, yaw: ±8°

Physical Characteristics

- Above Deck Equipment (ADE) Size:
  H = 1445 mm, D = 1420 mm, weight: 90 kg,

Environmental Conditions

- Vibration, precipitation and icing: As approved by Inmarsat.

Equipment

- ADE Temperature: -25°C to 55°C, rain: 100 mm/hour.
- BDE Temperature: -25°C to 55°C, humidity: 95 % at 40°C
- ADE-BDE Cabling Length up to 44 m: single, flexible, 20 mm diameter. Length to 44-77 m: One coaxial 06230
- Voltage: 240/110 VAC ± 10%, 50-60 Hz

SUMMARY OF THE INMARSAT M4, CN-17 and BT BEST SERVICES

M4

- INMARSAT's M4 service provides 64kbps capability mixed with enhanced mini-m services
- M4 uses Laptop sized terminals with expanding antennas.
- Provides WAN connectivity within the Spot Beams of 3rgd generation INMARSAT satellites

CN-17 LEASED LINE SERVICES

- Allows an INMARSAT B terminal to access leased line services on 2nd and 3rd Gen. satellites
- Provides 64kbps service to leased data lines or the ISDN.
- Provides leased line WAN connectivity for INMARSAT B terminals.
- The B terminal can be configured for On demand use or Leased line use at will.

BT's Bandwidth Efficient Transport System (BEST)

- The BEST system is a quasi VSAT network expansion of existing mobile satellite technology.
- The applications can be either mobile or fixed.
- The network can be configured on demand or on schedule for optimal bandwidth efficiency.
- Use of Frame Relay to provide VPN efficiency.
- Uses INMARSAT B terminals with CN-17 software and associated BEST network equipment.
- A user can choose between BEST (leased line) services or circuit switched services on demand.
- Highly efficient use of INMARSAT B terminals.
- Can provide a quickly rolled out high bandwidth (256kbps) service to mobiles globally.

Eric Jones

Manager BT Pacific
Inmarsat Land Earth Station
Auckland NZ.

December 1999

Sessions

Applications

M.2.2 Case Studies in Educational Telecommunications
Monday 31 January, 1400-1530
Location: South Pacific III

Chair:
VICKI KAJIOKA, Advanced Technology Specialist, Department of Education, State of Hawaii, USA

M.2.2.1
ZHANG YUELIN and ZHEN KAI YUAN, Professor, Southeast University, People's Republic of China
The Construction of Distance Education and Learning Systems in JiangSu Province

M.2.2.2
SARAH MILLER, Associate Research Fellow, Centre for International Research on Communications and Information Technologies (CIRCIT) at Royal Melbourne Institute of Technology, Australia

Presenter:
SUPRIYA SINGH, Senior Research Fellow, Centre for International Research on Communication and Information Technologies (CIRCIT)
Improving Online Access Through Schools: An Australian Study

M.2.2.3
JAMES BANNAN, PRELStar Program Specialist, Pacific Resources for Education and Learning (PREL), USA
PRELStar Distance Learning in the Pacific: Educational Opportunities for the 21st Centrury

Sessions

The Construction of Distance Education and Learning System in JiangSu Province of China

Zhang YueLin and Zhen KaiYuan

Abstract:

The swift development of Internet offers a basis for the construction of the modern distance education system. Along with the wide use of computer multi-media technology, with the continuous promotion of network band width, and with the popularization of computer network education, the modern distance education appears. It caused a very big change of educational mode, educational pattern, educational method and educational idea of the traditional education system.

This paper introduces the technology background of developing modern distance education, and the various phases of distance education. This paper especially combined with the JiangSu Education and Research Network introduces several typical system of distance education under lower band width environment during the past late two years. They are the basis of the JiangSu "Network University" and its management which will be realized with 155Mbps high band width.

Key Words:

Internet distance education network university

1. Introduction

With the swift development of Internet, the distance education and learning system which is based on the computer network technology, got a very rapid development. The main technical factors used for the distance education and learning system caused by the promoting application of computer network, are as follows:

(1). The development of voice technology

Owing to the development of multi-media interactive voice technology of computer and network, there exist voice conference system which is suitable to the Internet, for example, the telephone conference system based on IP, electronic white board, combined with image and data transmission, etc.

(2). The development of video technology

Owing to the development of video technology based on Internet we can watch video display and pictures program directly from the network and can also use the video technology for the distance education, including the static pictures, pre-fabricated moving images (cinema and video tapes), real-time moving pictures (such as video conference system).

(3). Development of web technology

The World Wide Web which promotes the swift development of Internet, IE which combines multi-media as a whole, and Netscape browser make the users of various desk easy to inquire. Because the browsers are easy unity, simple, common and very convenient to the users, they become the world wide browser to get Internet information sources.

(4). Development of database

Owing to the development of database, we can save the multi-media information and various data in database. Data management and retrieval become more convenient . The database technology development and web interface technology make Internet full of a big amount of fresh information,

Make full use of the four main factors, mentioned above, the Internet and interactive multi-media technology and E-mail, BBS system, the distance education learning system offers a very nice learning environment between teachers and students.

2. the development of modern distance education

There are two most basic factors of teaching processing: the information conveying style and teaching sources, Knowledge should be given to the students through certain information conveying style. In the traditional classrooms, teachers give knowledge to the students by oral presentations, blackboard writing.

In order to enlarge the knowledge sources field for the students, textbooks and library are involved in the whole teaching process.

Any change of the above two teaching factors may influence the learning environment of students, the teachers functions, and the change which is concerning to the students to grasp knowledge information.

Distance education technology could influence the traditional educational mode. The distance educational system development may be divided into three phases:

(1). Correspondence education phase, base on word technology

This correspondence education of distance education system is based on the students' self learning. There is no "face to face" between teachers and students. Teachers deliver learning materials, text books, tutorial materials, topics answers to the students by the traditional correspondence communication from the post offices.

(2). Broadcasting, T. V. Education phase, based on simulated technology

There exists the synchronized one way teaching and learning between teachers and students under broadcasting and T.V. education system. That is to say, the students have to watch and listen to the broadcasting and T.V. teaching programs under appointed time, so as to realize a synchronized learning schedule but students can not get communication with teachers as in the traditional education system.

(3) network, multi-media education phase based on digital technology

This phase is characterized in using computer, network and multi-media education technology, thus the modern distance education realized. Digital library technology, VOD technology, video conference system and electronic white board, etc, to make full use of all these modern education technology can cause a synchronized learning and two-way communication between teachers and students. Of course, one-way self-learning is also available to get individual information the students need.

It is no doubt that the development of modern distance education technology makes students enjoying a vivid learning environment. The network university, based on the Internet is quite different from the traditional education mode and forms a new type university of distance education and learning with vivid, active interactive teaching and learning network environment.

3. The distance education model system in the education and research network of JiangSu Province

JiangSu is a very rich province in East china. JiangSu education and research network developed the application and research of distance education technology during past late two years, based on low speed channel network environment (most of the connected channels are 64 Kbps between universities.) The Network also researched in the new teaching method and mode under network environment. The JiangSu network developed some distance education model system which offers a basis of large scale modern distance education for the next phase. These distance education model systems are:

(1) On line English language reading training system

On line English language reading training system is a multi-media courses system which is based on computer network and used in the real distance education. It is used for on line English language reading training for the low level students of English language major. The system is developed by NanJing University, and has been used in the distance education of NanJing university and SuZhou University.

(2). Mathematics distance education system

Mathematics distance education system is used to form a high class mathematics course based on network. It makes students to learn and review high class mathematics and hand up the correspondent exercises. This system was developed by NanJing Normal University. Mathematics distance education system covers all contents of high class mathematics courses for students of technology, equipped with a great number of exercises and problems and a guide for solution by elicitation method, and can be widely common use. This system may also be used to process distance teaching in colleges, correspondence school and training units.

(3). Academic exchange of Chinese medicine and medical and distance education supplementary system

This system was developed by NanJing Chinese Medicine and Medical University. It first created academic forum on modern study of Chinese medical and medicine on the network enabling domestic and foreign scholars in this field to make academic exchange and to understand the new development on the network. This system includes a set of Chinese medic in computer aided education system based on six editions of teaching materials on Chinese medicals and medicine.

The course consists of about 1000 pictures of original plants of Chinese medicine and crude drugs. Based on this system a database of Chinese medicine therapies will be gradually established, which may enable correspondence students to grasp and enlarge the knowledge of Chinese medical and medicine on the network. This system has also an English edition of Chinese accupuncture computer aided education system, which attracts a large number of domestic and foreign readers to study on the network and download files.

(4) Distance education management system based on Web

It is developed by Southeast university, adopting Web technology. Students, teachers and system administrators may visit station points by browser to process learning of distance education teaching and management. The system offers various learning measures (such as, registration, course selection, learning discussion and inquiry) to students. The network teachers possess the functions of compiling questions@ connecting and managing the students. Network teachers have the right to accept the application for learning, registration, increase and decrease the numbers of students and teachers and revise personal information of teachers and increase and decrease or revise courses.

4. The construction of JiangSu Province distance education system (Network University)

JiangSu province distance education system (Network University) will had accepted(?) 400 under graduates student in 1999, using 155Mbps high speed channel and covering 5 famous cities along YangTze river (the longest river in China,) named NanJing, ZhenJiang, ChangZhou, WuXi, and SuZhou. The sponsors are Southeast University (SEU) -The authors of this paper work at this school and the Nanjing University of Posts and Telecommunications (NUPT) located in NanJing, JiangSu provice. The JiangSu University of Technology in ZhenJiang, The JiangSu Institute of Petro-Chemistry in ChangZhou, the WuXi University of light Industry in WuXi and SuZhou University in SuZhou are in charge of the teaching and administration affairs for the 400 enrolled students.

(1). The significance of the network

JiangSu is a developed province with developed telecommunication technology and electronics engineering. Southeast University is very good in this field.

There are quite a lot of high school graduate students (about several hundred thousands a year) but only one third of them can enter universities because of limited enrolled numbers. So a part of the rest students could only enter the adult education, correspondence education, night school etc.

The development of the construction of distance education and learning system, based on network, will enlarge the scale of enrolled students. So it solves the trouble problem of the existing universities. The distance education system will be another approach of the high education.

(2). The structure of network topology

JiangSu distance network uses SDH (Synchronous Digital Hierarchy) 155 Mbps. optical fiber channel. The JiangSu Education Research Network (JSERNET) in SEU is the center. The network is combined with the campus network of SEU and NUPT with high speed, then forms the NanJing-ZhenJiang-ChangZhou-WuXi-SuZhou-NanJing circular network topology structure, based on 155 M SDH channel. The network protocol is IP over SDH.

(3). The Network protocol

The JiangSu province distance education network is IP protocol. The multi-media telecommunications obeys H.323 of ITU-T protocol, which can transmit the multi-media audio and video data on the exchange network, and in the mean time can support the multicast protocol. The JiangSu network, based on IP can easily connect the existing various city campus network, so as to reduce expenses and capital costs.

(4). The mode of network education

JiangSu Network University has already begun. Now we are teaching English language, calculus, C language programming etc. for the fresh students. The hardware is point to multipoint media video conference system, based on TCP/IP protocol Vcon Co. And VOD & Live Server of 3CX Co.. The video conference system is equipped with electronic white board and large screen projector. As the "Chairperson " using the video conference system ,SEU and NUPT organize all the tutoring affairs to the students.

(5). The administration of network educational activities

The JiangSu distance education network sponsored by SEU and NUPT can enroll 400 high school graduates and have two majors. One is Computer Science and Technology, another, Telecommunication Engineering. These students will be given courses from the network video-studio in the two sponsor universities through the network to the distance classrooms of the above mentioned six schools in the five jiangSu cities.

5. Conclusion

JiangSu province distance education and learning system (Network University) had begun in September 1999. Then there were 400 undergraduates studying from wide network based on IP protocol. Now, the construction of network, the construction of video studio and distance classrooms, the production of course ware, education plan and so on are under processing in tense. We hope its success and are also looking forward to expressing its model function and promoting the big development of China distance education and learning.

Biography

Mr. Zhang YueLin

Mr. Zhang YueLin: Professor, graduated from the Dept. of Computer S ience of Southeast University., has been a teacher of the dept. of Computer Science, has been the Deputy Director of the President office of SEU. Now is the Director of Southeast University Information Center in charge of the telecommunicatins of the School.

Mr. ZHEN KaiYuan

Mr. ZHEN KaiYuan: Professor, graduated from TsingHua University, member of PTC, member of Society of Satellite Professionals International, member of Pan-Pcific Distance learning Association. has been teaching for 45 years. has visitd many countries, such as USA, U.K., Canada, Japan, Benelux, Germany, France, Philipines, Sweden, Denmark, Switzerland, Italy, and Macau District, HongKong District as well.

Sessions

Improving Online Access Through Schools: An Australian Study

Sarah Miller

Abstract

Public access to, and training in, information technology and online services remains a significant gap for the Australian community. This paper asserts that schools can provide a meaningful place to enhance community access and use of online services. It focuses on Australian schools, which contributed to a national pilot program *Facilitating Community Access to IT through Schools*. Evaluation data on 30 schools participating in the program was collected via closed-ended surveys, open ended questionnaires and interviews with 35 key stakeholders.

We found that schools provide an educational and community context as well as substantial technical and human resources to facilitate and encourage participation in online activities. A diversity of program models was evident. Significant trends included a tendency to provide a mix of access centres and basic training for members of the school and wider community. The projects were seen as important to the building of a relationship between schools and their communities.

> While school staff felt that continuation of project activity was valuable they face significant challenges in the provision of community access both in the short and long term. Key problems faced by schools include the resourcing of projects such as staffing and security, content related issues, problems with infrastructure and a shortage of avenues to readily share and receive information on other initiatives.

Introduction

Current Internet access and usage rates in the home and work indicate inequities in distribution of, access to and use of, online services in Australia. Policy imperatives to reduce inequities have largely focused on the provision of public access programs. This paper explores the potential use of schools to alleviate inequities in online access and use. It is based on the evaluation of the Community Access to Information Technology through Schools project.[1]

We found that schools can provide a valuable resource - of equipment and staff - which can contribute strongly to the broad objectives of a population capable of accessing and using online services.

Participation in project activity also extended the role of schools as community learning centres. However significant challenges remain in achieving these gaols, both in the short and long term. The paper examines some of the tensions in the schools as public access centres models, and also some of the more successful features. These can hopefully be replicated in other regions, bearing in mind the context specific nature of the program. It concludes by noting solutions to improve the accessibility of online services in schools.

Online Communications: Inequities in Access

There is evidence that disadvantaged groups within Australia have less access to, or use of, the Internet. Recent Australian Bureau of Statistics' (ABS) data shows that 40 per cent of the adult population used the Internet in the 12 months to May 1999 (ABS 1999a). While this represents a relatively high use, only 22 per cent of households in Australia have Internet access - of those with Internet access almost 100 percent have email access.

ABS data suggests that there is a correlation between income, place of residence, gender, family structure and access to and use of the Internet and email (ABS 1999a, ABS 1998a, 1998b, Pattinson 1998). High income earners residing in urban areas are far more likely to have Internet access at home than low income earners in rural regions. For example, nearly 73 per cent of people with access to the Internet and email at home live in urban areas (ABS 1999a, p.4). 1998 figures demonstrate that 41 per cent of those with Internet access at home have a household income of over A$66 000, while only 14 per cent of households with access to the Internet have household incomes of up to A$27 000 (ABS 1998b, p.19). These figures suggest that that cost of communication services is a barrier to access, and that a lack of interest, understanding and/or awareness are others (ACOSS 1997, Singh and Ryan 1999, ABS 1999b).

In recognition of the inequity in distribution of, access to, and use of online services, policy initiatives have been introduced by Australian governments that promote access and use of online services within the community. These are particularly aimed at "disadvantaged" people; for example, rural and remote communities, people living in low socioeconomic regions, and people with disabilities.

The governments interest in enhancing access to online services is informed by economic and social frameworks, including the need to position Australia within the "global information economy". In 1997 the Prime Minister released the *Investing for Growth* Strategy, which states,

> "Australia is part of the global communications and online technology age that is dramatically and rapidly changing our economy and society. As we move into the twenty first century our economic, political and social processes will become increasingly knowledge and information based. This will require increased emphasis on 'information literacy', development of the industries and greater information intensity in the activities of all industries, governments and the wider community. Information and communication technologies, and access to them will be vital for Australia's future." (Commonwealth 1997, p.65).

The emphasis here is on the provision of access to enable individuals, and the nation to participate in new economic frameworks and a "new world order". The emphasis on economics over social frameworks reflects the broader shift in political thinking that has emerged in Australia and elsewhere over the last two decades. However, the achievement of equity within telecommunications is still politically relevant and on the policy agenda (CIRCIT forthcoming).

Policy Statements

At the national level there have been several high level expert groups committed to the provision of community access to online services. For example the Broadband Services Expert Group's (BSEG) report *Networking Australia's Future* recommended that A$10 million over three years be provided to community groups in order to encourage use of online services, to assist in the creation of "innovative applications of communications services" and to provide community access to the emerging online services (BSEG 1994, p.41). In 1997 the Information Policy Advisory Council (IPAC) saw a need to "deploy and encourage innovative community and consumer-orientated applications and content, including services for disadvantaged users" (IPAC 1997).

The latest strategy document released by the National Office for the Information Economy, *A Strategic Framework for the Information Economy* sets out the government's vision, strategic priorities, objectives and proposed actions for the information economy. It is committed to access for all Australians. "All Australians - wherever they live and work, and whatever their economic circumstances - need to be able to access the information economy at sufficient bandwidth and affordable costs; and need to be equipped with the skills and knowledge to harness the information economy's benefits for employment and living standards" (NOIE 1998).

In response to the recommendations of expert groups and other sources, several Federal Government initiatives have supported access to, and training in, online services, which rely on the provision of public access points.

Some of the major initiatives include:

- The *Regional Telecommunications Infrastructure Fund, Networking the Nation* which commits A$400 million over five years to enable regional, rural and remote communities to identify their communications needs and develop and implement projects that meet those needs. It seeks to enhance the parity between non-metropolitan and metropolitan access to and use of telecommunications as a conduit for communication, information, education, employment and commerce.

  Recently additional funding was allocated to this program under the banner of the Telstra Social Bonus package including $70 million for the Building Additional Rural Networks, and $45 million for the Networking the Nation Local Government Fund.

- *AccessAbility,* a Commonwealth grant which aims to make online services more accessible to people with disabilities. The programs are not limited to public access and training initiatives, but also include the development of standards, software and hardware suitable for people with disabilities. Two rounds of funding have been announced, the first in 1998/1999 and the second in 1999/2000.
- The *Online Public Access Initiative* program, which was implemented in 1996/97, provided A$2 million to support 24 projects that enhanced public access to online services in public spaces such as libraries and community centres. Most of the money was spent in rural and regional areas, although there was also a number of successful programs in metropolitan regions.

Why Schools?

Commonwealth and state governments have proposed the use of schools as public access points. Several important factors support these decisions including the large investment made in schools on IT, the limited use of services occurring during school hours, the general accessibility of schools, the willingness of schools to foster and enhance existing relationships with the local community, and the professionalism and skills of staff and students.

At the state level several programs foster the schools as public online access model.

- The *Country Online* initiative in New South Wales (NSW) aims to assist country people to use school based computer and Internet facilities and through them, to access a range of government and private information resources and services. Trained volunteers will supervise the access, which will occur after schools hours. The Department of Education and Training established this program in NSW in March 1998.
- The *Skills.net* project developed out of the Victorian Government's policy to "Establish a network of Community Communications Centres throughout Victoria with online information and services available on multimedia computers for use by those who otherwise do not have access to computers" (Department of Premier and Cabinet, 1996).

  In April 1999, Skills.net announced the *Skills.net in Schools* program, funded under the *Networking the Nation* scheme. This aims to establish a network of 25 schools in regional, rural and remote locations in Victoria providing free or low cost access and training in online services and the Internet for those in the community who otherwise would not have such access.[2]

Libraries, community centres and telecentres are being used as public access points. Several initiatives are underway in states and territories, and federally, which support this.

The *Community Access to IT through Schools* (CAITS) program needs to be considered in the context of these existing initiatives, and the policy background which has supported it.

Our findings support the use of schools as Public Access Centres. Projects participating in the project demonstrate significant progress towards objectives of access and use, and participants' comments indicate support for schools as community learning centres. However, several challenges face schools. Moreover we don't assume that this approach will suit all communities or people within them. A diversity of public access centres should be adopted.

It is important that the initiatives do not result in the duplication of services and networks, and associated redundancies. Yet we cannot assume that the provision of several access centres in a region will even meet community demand. ABS data remind us that there is still a long way to go before we have parity of communications access and use in rural and metropolitan areas, across socioeconomic divides and gender lines.

We cannot just assume that it is only a matter of time before equity and access occurs within the communications arena. High penetration of telephone usage across Australia occurred under the regime of a natural monopoly, Telecom, and through the provision of the Community Telephone Plan and the Universal Service Obligation. While the latter obligation remains, the future of access and equity issues remain uncertain in the new era of competition, and privatisation (CIRCIT Forthcoming).

Community Access to IT through Schools

The Education Network Australia (EdNA) Schools Pilot Project *Facilitating Community Access to IT through Schools (CAITS)* aims to provide community access to online technologies, through schools, in rural areas and areas of socioeconomic disadvantage within Australia. Its objectives are to:

1. Make information technology equipment and specialist assistance available outside school hours, to ensure that groups that would otherwise be disadvantaged in their understanding of information technologies are given opportunities to familiarise themselves with these technologies.
2. Encourage the use of the Internet, including EdNA Online, in the wider education community to support lifelong learning.
3. Strengthen the role of schools as learning centres for their communities.

The program was designed to encourage a diversity of models to explore the potential roles that schools can play in enhancing access to IT and online services for their community.

A$75 000 was made available to each state and territory to secure the establishment of at least one Community Access to Information Technology through Schools project. States and territories took very different approaches to allocating funds. On a state and territory basis, the preferred project model was the cluster of schools. Within three states, funding was only given to schools operating within a cluster. One state and one territory provided funding for both single entities and cluster projects. The Northern Territory was the only region to fund single projects.

The total number of projects funded in this period is 50. This comprised 79 schools and two other centres. Evaluation material was collected on 30 of these projects.

The schools in the program provide public access points where few, if any, other opportunities exist. Although not formally recorded, anecdotal evidence indicated that most participants in the projects did not have access to computers at home, let alone the Internet. By providing free access to equipment and training the schools are meeting a need in 'disadvantaged' communities. In at least nine cases the schools were the only local public centre that provided such access. This was not only the case in rural regions, it also occurred in some urban areas such as Lanyon in the Australian Capital Territory (ACT). The difference being the distance travelled to use a public access centre. For example Numbulwar, a town five hours drive away from the nearest regional centre has fewer than 10 computers in the entire community, outside the school.

The majority of project co-ordinators regarded their community as disadvantaged in their access to IT and online services. This disadvantage meant that the community was often ignorant about the potential benefits of IT and online services. Projects targeting community members were designed to overcome some of the following obstacles for their participants.

- Lack of access to information and services;
- Skills shortage in the use of IT and online services;
- Fear of technology; and
- Ignorance about technology.

Co-ordinators believe that school can provide an important space for public access, and this was backed up by the community demand for access and training. All participants interviewed expressed their pleasure at coming to the school to learn. They were comfortable in the school environment. A participant at Condingup in Western Australia stated:

> "It sort of brings people together again, like when your children have finished school, you feel like you've lost something, you've lost that contact with the school. But by having something like this, you've still got people who are involved with the school mixing with the people who have become uninvolved with the school because their children have left. I felt like that. It feels like you've really lost something after being involved for twenty years.
>
> You can still come back here and be involved in something@. I got a real kick out of coming back into the school after having been lost for a long time. So I think that's good for PR."

Schools were keen to develop projects that reflected the context in which they operated and to meet their communities needs.

Approaches

A high proportion of the projects had the following characteristics:

- A government primary school located in a rural and/or remote region;[3]
- Providing training in IT and online services;
- Occurring after school hours for up to five hours per week;
- Targeting parents and family of students at the school, or the wider community as the second most common option;
- Using school staff for the provision of user and technical support;
- Little collaboration with other schools involved in the project (except where explicitly involved in a cluster).

The most common approach to encouraging use of IT and online services was to invite members of the community to participate in free IT training sessions. Nearly all projects had some component of training embedded within them, with the majority making this the focus of the project activity.

Variation in projects are examined according to:

- Familiarisation and use strategies:
  - Access;
  - Components and conduct of training; and
- Funding.

Familiarisation Strategies

Access to IT equipment and online services was provided by at least 50 per cent of projects although the level of access differed greatly. The three most common models to access were:

- Open Access Centre

Generally a room or separate centre within the school grounds that houses networked computers and other IT facilities. Community members are able to use the services within the centre on a regular basis either at specified times, ie. after school hours on Wednesday evenings or, in one case, at any time. Specialist assistance and supervision is available in the open access centre model. However, the approach is to support participants on a needs basis rather than provide a specific training program.

- Virtual Access Centre

The supply of equipment and Internet connection enabling participants to access and use the IT and online services from their own home.

- Limited Access

Provision for members of the community (usually a school community) to use IT services on an ad hoc basis, when staff are available for supervision, such as during training sessions or after school hours when staff are still present. Specialist assistance is not made available in this model. It is usually an adjunct to another form of access or training.

Advantages of the Open Access Centre approach are that it allows participants to work at their own pace and to focus on activities that they are interested in. They can play and explore the services and seek assistance as the need arises. They can actually complete a task such as conducting an assignment, communicating via email to a friend or searching on the Internet. It provides an opportunity to use the service on a needs basis. This approach can work well for all levels of learners including beginners, but this does require adequate and often intense support. To balance this, all the access centres in this program offered some form of training.

In all but one case the open access centres are physical locations. A virtual access centre is offered by the Alice Springs School of the Air (ASSOA) to overcome the barriers of distance faced by its disperse clientele. The ASSOA services clients across 1.3 million square kilometres of central Australia. They provided all of the remote 35 families of students from year four to seven with computers, modems and printers. The ASSOA paid Internet connection costs, while families were responsible for their connection time. This provides 24 hours access to the School of the Air internal Web site and the Internet. Training sessions are provided at their "Get Together" week, in which remote families including students meet at the School of the Air in Alice Springs. Parents and supervisors are trained in the use of email and Internet.

To work, the access centre approach needs adequate staffing, supervision, and resolution of security and other issues affecting the school. It is important that the school recognises its own resource requirements and the community contexts in which it operates when making a decision about an appropriate strategy. It is worth noting that projects that provided the Open Access Centre or Virtual Access Centre all received significant amounts of funding (A$37 500 was awarded to two of the open access schemes), and funding was from more than one source.

Limited access centres on the other hand, require much less funding, as they are reliant on individual staff present at the school within working hours, or after working hours when classes are being conducted. However, this is generally in a voluntary capacity. In these cases the participants had to be fairly self reliant as training and support was not provided.

Training Programs

Training was a vital component of the CAITS program. All but one program provided their target audience (which included students, family, school community and the wider community to varying degrees) with some training in IT and/or online services. In two other cases training in online services did not occur, and this was due to a lack of adequate equipment. Holt Primary School and Wongutha Christian Aboriginal Parent Directed School were not able to provide online access, as their schools did not have online capacity. However, computer training was offered at both these schools.

In all cases the courses were free.

Training was conducted by:

- School staff members in 20 of the projects;
- External professionals in nine of the projects;
- Community members in three of the projects; and
- Students in two of the schools.

Evaluation data collected by schools and CIRCIT indicate a high level of satisfaction with the training. This is not to say that there were not some issues with the format of the training but generally these related to the timing and duration of courses rather than the presentation of material itself.

Projects provided basic training in a range of IT and online services comprising introductory courses on the following:

- Computers;
- Word processing;
- Databases and spreadsheets;
- Internet and Email;
- Using computers for educational purposes; and
- Using Internet for educational purposes.

All projects designed and ran courses for beginners. Even then some had to be redesigned to a more basic level.

> "Many parents and people from the community, they had never ever used a keyboard@They were learning capital letters, and the use of arrow keys. We weren't expecting it to be that basic". (Our Lady Star of the Sea)

Although not asked directly, it appears that most projects developed their own content. This may lead to duplication. The exceptions to this are likely to have occurred when professionals were bought in to conduct training and in isolated instances where content development was outsourced. For example, in the Southern Yorke Cluster, the local TAFE College provided the course material, which was then adapted by the project team to suit their needs. This content was shared across four schools. Collaboration on content development should be encouraged.

Relevant Web sites were also an important component of the content in online courses. The use of "relevant Web sites" was noted on numerous occasions as a strategy to attract participants' interest. For example, at Maningrida and Ernabella tutors liked to show culturally relevant (Anangu and Aboriginal) sites. The Northern Territory co-ordinator noted that given the popularity of football, showing Australian Football League (AFL) sites was also a good strategy for engaging participants.

A Successful Model

Through project activity the CAITS program is enhancing community access to IT and online services.

The main benefits of the project activity can be summarised as:

- Facilitating community members' ability to use computers and the Internet;
- Providing opportunities for the community to develop new skills;
- Providing opportunities for the community to access and use information that is relevant to their lives;
- Reducing the disparity between information rich and information poor;
- Enhancing relationships between the school and the local community; and
- Developing economies of scope in the use of IT and online services.

Other benefits were noted in individual projects including fostering information literacy of the community, enhancing community cohesion, and promoting new learning opportunities.

Participation rates in programs varied according to a range of factors, most notably the amount of funding received. Given the amount of funding received, all completed projects have reached significant audiences.

Participating in Online Activities

The degree to which projects have positively impacted upon their community would need to be measured over a longer period of time than is possible here. Long term indicators could measure sustained use of online services, and benefits associated with that use, as well as the outcomes of improved school and community relationships

In the short term we use the number of people participating in projects as indicators of the effect of the project on the community. All completed projects have reached a significant audience, given the amount of funding they received. There has been significant variation in the number of people participating. The scale of reach is largely determined by the amount of funding received, as illustrated in Table 1, but there are a few cases where funding does not seem to have been adequately used.

The projects identified in the table are all those that had completed their activities at the time of the evaluation, April 1999.

Table 1: Participation Rates in Completed Projects

Projects	Participants	Funding	Comments
ASSOA	155	$17505	They provided modems, 1800 help line, connection fees etc., as well as intensive training sessions.
Bees Creek	20	$2000	Training in IT and online services
Bradshaw	40	$415	Information sessions only. No training or access.
Karama	15	$140	Internet training. Baby sitting provided.
Larapinta	35	$2729	12 students selected to train eight parents over a 10 week course.
Our Lady of the Sacred Heart	33	$1356	Training in online services. Email accounts established.
Malak	44	$1000	3 training sessions in IT and online services.

Source: CIRCIT 1999, Report to the EdNA Schools Advisory Group, Evaluation of the Facilitating Community Access to Information Technology through Schools Project.

Projects that received larger grants are able to increase the participation rates in the program, and the extent to which participants are supported through the activities.

Table 2 documents usage rates for IT and online services across the 30 projects.

Table 2: Participants Use of Computers and Online Services

PROJECT	Number accessing computers	Number accessing online services	Repeat use of computers	Phase of project
Alawa	15	15	15	Inconclusive
Anangu	60	60	60	Mid Implementation
ASSOA	155	155	155	Completion
ASEC	50	18	N/R	Late implementation
Bees Creek	15	20	15	Completion
Berry Springs	47	47	30	Late
Bradshaw	N/A	N/A	N/A	Completion
CITA	N/R	N/R	N/R	Mid
Condingup	48	15	48	Mid
Esperance SH	N/R	N/R	N/R	Early implementation
Gold Ck/Holy	129	59	129	Late
Holt PS	5	-	5	Mid
Karama PS	15	15	4	Completion
Larapinta	35	35	35	Completion
Lanyon	30	30	30	Mid
Lyons	14	14	12	Late

Malak	44	44	44	Completion
Maningrida	N/R	N/R	N/R	Early
Meander	99	99	99	Late
Nightcliff HS	24	24	6	Early
Nightcliff PS	N/R	N/R	N/R	Inconclusive
Norseman	16	8	N/R	Mid
Numbulwar	8	8	8	Early
Our Lady of the Sacred Heart	33	32	33	Completion
Our Lady Star of the Sea	45	40	40	Mid
Southern Yorke	62	62	62	Early
Tas NG	NR	NR	NR	Early
Wagaman	22	22	22	Early
Wongutha	58	0	N/R	Mid Implementation
Yipirinya	NR	NR	NR	Early

N/A: Not applicable NR: Not recorded

Tables 1 and 2 indicate that the CAITS project enabled 1019 participants to use computers and 796 participants to use online services. These figures are not final, as only seven projects had completed their activities at the time the evaluation was conducted. Half were still in early or mid phases of project activity. Also there is likely to be some overlap in the numbers of people accessing computers and Internet services.

Enhancing Relationships between schools and local communities

Today, many schools, particularly primary schools seek to position themselves as learning centres and as community centres. The role of a learning centre differs from the latter in that it has specific focus on educational and learning related activities, but both share an ethos of integration with the local community. However, by and large schools still operate as self-contained communities - particularly at the secondary level. This project appears to be extending relationships between schools and their local communities. A trend noted by other researchers examining schools use of online services. (Lifelong Learning Associates 1999)

There are many potential benefits of these relationships for schools, their students and staff, and for the wider community. These are summarised for each stakeholder group accordingly.

For schools, students and staff

- Enhancing students learning experience and outcomes;
- Providing new opportunities for professional development;
- Attracting potential clients to the school;
- Actively involving parents and the community in the learning experience; and
- Building new alliances with community and business.

For Community

- Equipping parents with more skills to assist their children's learning;
- Improving understanding of the educational uses of online services and the educational curriculum more broadly;
- Providing economies of scope in the use of IT resources;
- Providing new opportunities for lifelong learning.

The CAITS program was seen as an important factor contributing to the relationship building between schools and their local communities. For example, Staff at Our Lady of the Scared Heart noted that this was the first instance that the school had become involved in a community access activity. It provided important opportunities for the community to get to know the school.

Staff at Wagaman commented on the importance of building relationships which "involve the community in the learning and teaching process".

There are degrees to which schools championed their roles as learning/community centres. In a few schools it has become a fundamental goal or purpose and in most cases teachers often carry this understanding and approach with them in their interactions with parents and the wider community. Staff at one school commented,

> "We want to break down the narrow purposes of schools, to make schools responsive to community needs, to see the school and the community as part of the same family". (Lyons Primary)

A staff member at another school suggested that enhancing the role of the school as a learning centre,

> "Has been the main focus. The project enabled us to do this. We have taken over an adjacent building and created a community centre". (Holt Primary)

Some schools felt that their location, in often remote communities, necessitated a high level of engagement and a sharing of facilities. For example schools located in remote Aboriginal communities have a role to play in servicing the homeland communities. They may also provide access to further education through the school such as in distance education, and acting as annexes for Batchelor College in Darwin.

In some of the Aboriginal communities community members have extensive involvement in the management of schools. For example in the Anangu Schools in SA, the individual communities and their school councils have a role to play in decisions on school issues and policy/curriculum directions. This was agreed by the Anangu Education Services, the Minister, the Pitjantjatjara/Yankunytjatjara Education Committee (PYEC) and the communities that PYEC represents. The school also employs Aboriginal Education Workers (AEWs) to teach Pitjantjatjara and Yankunytjatjara culture and language as most students at Ernabella are Anangu and speak either Pitjantjatjara or Yankunytjatjara as their first language.

Schools have established a range of initiatives to enhance the role of schools as learning centres. School resources used by the community include a wide array of human and physical resources; for example, the use of rooms to house a range of non-school related activities as diverse as band practice, karate, first aid and aerobics. Many schools also host specific activities for parents, including some whose children do not attend the school. Discussion groups, open library sessions, fundraising nights, individual participation in school council, Parent and Council membership, and other informal and formal networks have developed between schools and the community. These facilitate the representations of schools as community centres.

Parents and the wider community invest time and energy in establishing, maintaining and enhancing schools. Parents are often involved in classroom activities assisting teachers, and may work on the school council or in the cafeterias.

Community members contributed to the CAITS projects including as trainers, support staff, in publicity and as participants. A couple of project co-ordinators have indicated that community members will continue to work on the project once funding ceases, and in one case will actually coordinate the project. Payment of all project staff including community members should be considered for long term projects.

Some schools believe that the viability of projects is dependent upon volunteer work by community members. People will be required to develop, maintain and continue project activity. Yet the use of volunteer staff may be difficult in the long term. There is an increasing reliance on volunteers in the school system, mainly due to reductions in government spending. The expectation is that the community will continue to support schools. However, volunteer labour is being stretched in many directions and is not necessarily sustainable. The use of non-school staff also raises other issues, such as security.

Further examination of the ways in which public access centres at schools can build relationships between school and community is warranted.

Challenges

While schools members embraced the opportunity to provide community access to IT and online services, and to foster their roles as learning centres, they do face significant challenges in meeting these objectives both in the short and long term. This section examines some of those challenges.

The main issues identified through the evaluation comprise:

- Staffing
- Content
- Security of after school hour access
- Comfort and Trust
- Sustainability

Staffing

The resourcing of community access to information technology and online services is an issue for schools in the short and long term, as there was much reliance on the voluntary participation of school staff. Each project had at least one person who provided the impetus for the development of the project, and who was a driving force in the maintenance of it. This person was usually a principal or teacher of the school. They had a range of tasks including liaison with the community and school committees, project planning and management and often they were also a tutor/trainer. Coordinators had to be multiskilled professionals.

Some staff were feeling the pressure of these combined roles, but most were still enthusiastic about the project.

Payment, reimbursement, relief teaching, as well as funding and recognition, were all important factors in encouraging staff to participate in projects. Another vital factor was motivation from other people who were prepared to assist with community access to IT in the school. Yet finding people with the skills and commitment to participate in the project was not always easy, as is indicated in the following quotes:

"The specific challenges I have faced meeting my objectives [are] availability of skilled personnel time. Teachers are already involved in other activities usually on a voluntary capacity and demands of extra curriculum activities made it difficult to maintain regular workshops." (Our Lady of the Sacred Heart)

"The greatest challenge has been getting other people involved in the project." (Norseman District HS).

"Very little support from a key stakeholder in regard to IT at the school which impacted on organisational factors@Need to enlist support of external IT personnel to gain after hours access to the Internet. However, other staff at the school contributed to the achievement of the project." (Karama Primary)

There are a number of positive aspects of using school staff, for example they are familiar with the school and its systems, including the security systems and they have (usually) had teaching experience. Another positive aspect of this is that teachers improved their own skills by participating in and conducting training sessions. Professional development of teachers is itself an issue requiring on-going commitment. (Senate 1998, Lifelong Learning Associates 1999).

Content

Some of the most common challenges confronting project staff related to the training programs. These included:

Finding suitable times to run the courses.

Often school hours suited participants, but not the school, while suitability of after school hours varied considerably with some learners preferring afternoon sessions, and others evening sessions. Due to the resource implications, few schools chose to operate over the weekends.

Length of courses

There was insufficient time to fully develop participants' skills in many of the programs. However, limited funding curbed the ability of schools to provide longer and more intensive courses. Further funding would assist these difficulties.

Course Level

Nearly all courses were aimed at the beginner level, but there was still great variation in the skills of participants, and projects were not able to meet the diverse training and skilling needs of clients, except where one-on-one sessions or very small groups training occurred. A shortage of equipment also meant that many classes required participants to share computers, further impacting upon the variation in skill levels.

The unsuitability of many Web pages to rural conditions was raised on three separate occasions. Infrastructure limitations mean that many areas are not able to download graphics-intensive sites, or those requiring high capacity equipment. Simple text based pages were often more suitable to the rural conditions particularly when trying to encourage participants to use a service and to understanding the benefits to them.

Given that the course content reflected community needs either based on surveys, teachers' observation, or discussions during training, and that the majority of courses were introductory, it can be concluded that there is a need for more introductory courses in the Internet, email and computing including spreadsheets and databases. Ideally these courses should be provided free of charge or at a low cost, as many disadvantaged members of the community could not otherwise afford to come. Opportunities for participants to learn at their own pace and on a needs basis could also be encouraged through access centres.

Charging Fees

All courses were free. The overwhelming sense was that this was an important inducement for the community.

- "Making the course free was a big hit with the local community." (Southern Yorke)
- "Because it is a free service the response is greater." (Lanyon)

Most other co-ordinators made similar comments. However, three schools felt that participants were not as committed to the process because they had not paid for it. Tutors from St Frances of Assisi commented: "We found that when people make a financial commitment, they turn up more regularly than if they are getting it for free".

Many schools will need to charge community members if they are to provide a similar program in the future. Even then, they will be reliant on volunteer labour and in-kind support from the school, its staff and members of the community. Charging a fee is likely to deter participants, particularly low- or no-income earners, but in some rural areas, where the disadvantage is related more to distance and lack of access rather than cost, it is probably suitable to charge a reasonable fee for the courses.

The context in which the training is occurring, including the socioeconomic level, the availability of other access centres, the school's ability to resource the activities, including the teachers' ability to do so, and other factors all need to be taken into account when considering charging user fees.

Security

School security is an issue that needs to be addressed by all projects. Schools usually maintain responsibility for security, but community or commercial organisations can take responsibility for school security for after hours activities provided they sign contracts. In all but one case projects ensured that staff were present during access and training activities, and maintained responsibility for security. The only school to allow persons in unsupervised was the Meander Access Centre. Although housed in a school building the centre is seen to be owned by the community.

> "All members of the community are welcome to use the centre any time of day or night. The unlimited access is achieved though a security system. A local builder developed a lock box, which is a security lock that allows the centre to track who is entering, and the date and time they arrive and leave. It works on a key pad system, and all members of the centre are provided with a password, which they enter into the key pad upon arrival. They have never had any trouble. Nothing's been lost, stolen or broken in all that time. We get people coming in at all hours of the night." (Meander PS)

Liability is another issue that schools need to address.

Education Departments could consider these issues and provide schools with enough information to make informed decisions. Case studies and guidelines might also assist.

Infrastructure

Access to infrastructure that is adequate and reliable is a particular issue for the rural and remote regions of Australia. A lack of adequate infrastructure can mean that a public access centre is the only, or main, source of access for an entire community.

The bandwidth available to schools differs dramatically across states and territories and across projects. Many states are in the process of developing, or have recently established policies to network schools to a capacity of 64 kb, (1 channel ISDN), such as VicOne in Victoria. Projects like this mean that schools have access to infrastructure and services that can be made available to the community.

There are however, various problems with the infrastructure and availability of online services. These include:

- Unsuitable infrastructure (affected by weather and conditions);
- Unreliability of infrastructure (regular breakdowns);
- Slow speed; and
- High cost.

Across all states and territories problems with infrastructure were mentioned in 11 projects.

The weather and geographical conditions in many areas also played havoc on the equipment. Given their location in Central Australia, dust and heat remain a serious threat to the longevity of the equipment in Ernabella. The school has employed a full time technician and they also implement some simple solutions to combat these problems. For example, the air conditioner is on in the room housing the server all the time.

Some communities with fewer resources and less funding through CAITS are unable to combat their conditions, particularly the weather. In wet season, when floods are common, hardware is affected. Floods also affect the mobility of the population and therefore their ability to access services such as the CAITS projects.

One school in the Esperance Cluster, the Wongutha CAPS, was not able to provide Internet access to the community due to limited access to infrastructure. Another school in WA, Condingup Primary School, which is situated 60 kilometres east of Esperance (itself 800 kilometres from Perth), commented on the unreliability of the infrastructure that was available. Some people living in the region only have access to radio phones, which do not support an adequate Internet service. Others had phone lines, but frequent line drop out causes delay and frustration. When this occurs the user has to start from scratch to dial up their account, log on, wait for material to download, and then start using their service. This can take half an hour or more. Sometimes they are unable to connect at all.

The slow speed of Internet access in regions with low bandwidth is also a problem, particularly when trying to encourage people to use a service and to explore its benefits. It was also difficult training people where connections were slow. Web sites that are graphic-intensive, as required for low literacy participants, can be a problem, as they require high bandwidth.

"A lot of schools have been investigating ways to route the Internet through Wide Area Networks (WANS). They have been using Dlink hubs, Banksia Web ramps. This means that groups can sit down together and use the Internet in remote regions. However there are real problems, these solutions are limited by the bandwidth, and modem availability. They are improving." (NT Co-ordinator)

"The other two weren't as successful, our Internet class would been, however, our Internet facility is very slow at the moment. We are looking to change to a new provider. We are hoping that this will make it faster." (OLSSS)

However, certain remote regions had access to optic fibre cable and ISDN capacity through Telstra's network. For example, the Ernabella Anangu School, which is located in the Marsden Ranges in the North West Corner of SA, had access to this cable and established a proxy server. This enables six computers to be connected to the Internet at once.

Sustainability of Schools as Public Access Centres

Overwhelming support for the use of schools as public access centres project was noted by participants and staff. Project staff had volunteered to be involved and therefore shown a predisposition to the activities. This was supported by the conduct of the projects, which were enthusiastically received within the school community and the wider community. Given that community access is not a prime function of a school, it may not be feasible to continue these activities without further support from government and/or industry.

> Five projects indicated that they had received other funding for the CAITS projects. These monies enabled projects to extend their service, and assisted in the project's development. Educational funding targeting new learning technologies in schools also assisted many schools with the provision of hardware, software and Internet connection. Each state and territory has a range of programs in facilitating the uptake and use of online services in the classroom, with the expectation that learning experiences and outcomes will be improved.

The continuation of CAITS programs without subsequent funding is unlikely. Certainly the provision of free training to the community would cease in the majority of schools. Limited Access models may remain and schools may continue to build on the relationships with the local community in other ways.

Some schools are pursuing opportunities for further funding through other sources such as the RTIF, Networking the Nation fund and state-based initiatives such as Skills.net, Tasmania Communities Online and others. Two of the projects saw CAITS activity continuing through other funding programs and activities.

The following comments indicate options for sustainability.

> Larapinta Primary School in Darwin: "We would enjoy the opportunity to continue to provide the community with access to online services but without appropriate and ongoing funding it is difficult to see how this is possible, particularly after school hours."

> Numbulwar states that it will not be able to fund online access for community members, given the high cost to schools of providing that access. The school is located near the Gulf of Carpentaria, without a local ISP and technical support making online costs too high to fund. Without continued support the school will be unable to continue the CAITS project beyond its completion date. There is already a lack of services in this community, and fewer than 10 computers.

> Maningrida Primary School has suggested leasing the six iMacs to community members. Similarly Lyons Primary school plans to lease out laptops to the community at a reasonable rate, as well as providing limited access after school on Thursdays. It is also considering a more informal approach than training such as an Internet Cafe session where people could use the Internet and or discuss with others any issues of concern, and gain some supported use.

At least two projects in the NT believed that the training aspect would continue with the assistance of parents as volunteers and are thinking of introducing a user pays system to fund the activity. At least four others hoped that it would continue but weren't sure exactly how they would fund and resource it.

Our Lady Star of the Sea (OLSOS) will continue to provide limited access as this requires little staff assistance, and because it occurs during work hours security is not a problem. They also allow the local youth group to use the facilities and this will continue.

Conclusions

Providing access to and use of services to disadvantaged members of the community is never likely to be a self-supporting activity. The only way this can occur is through subsidy of the program, whether that comes through the schools, or through other funding. Diversifying activities is necessary to subsidise such programs, yet given that community access is not a prime function of schools, and that many schools are already strained by cuts to education funding, it would be difficult to see how this activity could be self sustaining. Funding models that combine government, schools and parent subsidies could be examined. Improved understanding of the benefits of these approaches to all stakeholders may also assist.

The primary conclusions drawn from this evaluation research are:

1. Public access to, and training in, IT and online services remains a significant gap for disadvantaged members of the community.
2. A major challenge is to build on low levels of "technological" and "information" literacy within the community.
3. Schools provide a valuable resource - of equipment and staff - which can contribute strongly to the broad objectives of a population capable of accessing and using online services.
4. A range of different models with the primary means being the offering of training courses and the provision of access to existing facilities, appear to have generally been successful in engaging with the local community and should be encouraged.
5. Projects that have been substantially implemented provide evidence of significant achievement of improving access, encouraging use and life long learning, and fostering schools as community learning centres.
6. The projects were seen as important aspects of the relationship of schools with their communities, but they were additional to the usual focus of the schools. In many cases they were conducted through the voluntary commitment of school staff.
7. A realistic amount of funding is necessary to maintain training and access approaches.
8. Nearly all projects responding to the evaluation indicated that continuation of community access activities would be valuable, but warned of limitations without further funding. Disadvantaged communities will always find it difficult to resource such activity.

References

ABS May (1999a) *Use of Internet by Householders*, May 1999, ABS Cat No. 8147.0

ABS (1999b) *Report on the Use of IT on Farms,* 1997-1998, ABS, Cat No 8150.0.04.001.

ABS (1998a) *Household Use of Information Technology,* ABS Cat No. 8128.0

ABS (1998b) *Use of the Internet by Householders,* February 1998, ABS Cat No.8147.0

ACOSS (1997) *Electronic Communication and the Community Sector: Research Report from the Australian Council of Social Service*, Communications Research Forum, Old Parliament House, Canberra, 2-3 October 1997.

Broadband Services Expert Group, (1994) *Networking Australia's Future,* AGPS, Canberra.

CIRCIT (1999) *Report to EdNA Schools Advisory Group on the Evaluation of the Facilitating Community Access to Information Technology through Schools Project*, Commonwealth of Australia, http://www.circit.rmit.edu.au/projects/caits.html

CIRCIT Policy Forum Report (forthcoming) Telecommunications *Policy in Australia: Resolving Tensions in the Implementation of social, Competition and Commercial Objectives*, CIRCIT.

Commonwealth Government of Australia, (1997) *Investing for Growth: The Howard Government's Plan for Australian Industry,* Commonwealth of Australia, 1997.

Department of Premier and Cabinet (1996), *Victoria 21 Into the Information Age,* Melbourne 1996.

Information Policy Advisory Council (1997) *A National Policy Framework for the structural Adjustment within the New Commonwealth of Information*, DOCA, Canberra. 1997.

Lifelong Learning Associates (1999) *Improving Teaching and Learning through the Use of Information and Communication Technologies,* EdNA.

National Telecommunications and Information Administration (1999) *Falling through the Net: Defining the Digital Divide,* Department of Commerce, Washington DC.

NOIE (1998) *A Strategic Framework for the Information Economy, Identifying Priorities for Action*, Canberra.

Pattinson, B (1997) 'Access to and Use of Information Technology and Telecommunications Systems in Regional Australia', *Communications Research Forum,* Old Parliament House, Canberra 24-25 September 199.

Senate Employment, Education and Training Reference Committee (1998) *A Class Act, Inquiry into the Status of the Teaching Profession,* Commonwealth of Australia, Canberra.

Skills.Net Web site http://www.nevernever.net.au/skills.net/school/sc_info.html (accessed 16/04/99).

Singh and Ryan (1999), *Gender Design and Electronic Commerce,* CIRCIT at RMIT Research Report, No.25, CIRCIT at RMIT, Melbourne.

[1] A copy of the report can be found at http://www.circit.rmit.edu.au/projects/caits.html

[2] http://www.nevernever.net.au/skills.net/school/sc_info.html (accessed 16/04/99).

[3] The evaluation indicated a total of 26 primary schools, three high schools, two community education centres, and 2 other non-schools. The rest were not specifically identified as either primary or secondary schools. One of the reasons for the high proportion of primary schools participating may be that they tend to view themselves much more a community resource, and have strong links with local communities than secondary schools.

Biography

Sarah Miller

Sarah Miller is an Associate Research Fellow at the Centre for International Research on Communications and Information Technologies, (CIRCIT) at RMIT. She joined CIRCIT in 1996, after completing a Masters in Environmental Science from Monash University and a Bachelor of Arts Degree, with honours from Melbourne University. Sarah has worked on a range of projects evaluating community access to information and communications services, including evaluations of the Chronic Illness Alliance Online Project, the Skills.net Program and a national program 'Facilitating Community Access to IT through Schools'. Sarah is currently managing CIRCIT's evaluation of the OTFE Learning Networks Trial. She is a member of the Australasian Society of Evaluators.

Sessions

PRELStar Distance Learning in the Pacific; *Educational Opportunities for the 21st Centrury*

James Bannan

Pacific Resources for Education and Learning (PREL), on behalf of its partners and the Pacific educational community, is pleased to present PRELStar: A Pacific Islands Distance Learning Program, which is funded by a U.S. Department of Education Star Schools program grant. PRELStar is designed to provide quality educational opportunities throughout the Pacific by building on the collaborative partnerships of the Hawaii Department of Education, other participating telecommunications organizations, and the Departments of Education throughout the Pacific.

In 1997, Pacific Resources for Education and Learning (PREL) began this five-year U.S. Department of Education Star Schools program. Building on the cooperative experiences of the Hawaii Department of Education, University of Hawaii, PEACESAT, Oceanic Cablevision, and GTE Hawaiian Telephone, and with the support of the nine other Pacific Entities' Departments of Education, a technical and program services network was designed for the Pacific Region. The project focuses on servicing an area of 4.9 million square miles, an area of rural, isolated communities struggling with emerging economies, challenging fiscal resources, and many under-certified teachers. The service region includes:

- Hawaii (21.45N, 158W)
- American Samoa (14.158S, 170.41W)
- Republic of the Marshall Islands (RMI)(7N 171.25E)
- Federated States of Micronesia (FSM) - Kosrae (5.2N, 163.01E)
- FSM - Pohnpei (6.5N, 158.15E)
- FSM - Chuuk (7.25N, 151.45E)
- FSM - Yap (9.4N, 138.1E)
- Guam (13.3N, 144.45E)
- Commonwealth of the Northern Mariana Islands (CNMI) (14.3N, 145.3E)
- Republic of Palau (7.3N, 134.3E)

In response to these conditions, the PREL Star program addresses the needs of these communities by working towards U.S. national education goals and meeting federal Star Schools priorities and objectives. PREL Star is designed to:

- Expand students' access to high-quality academic instruction through distance learning.
- Increase content and expertise of teachers through professional development opportunities provided through distance learning.

- Extend academic opportunities for adults through the use of distance learning.
- Provide support materials and training to students and teachers that enable them to take the greatest possible advantage of distance learning opportunities. Integrate and expand telecommunication networks for the delivery of distance learning.

This presentation will discuss the challenges of integrating and expanding telecommunications networks in the Pacific and the solutions that PRELStar and participating telecommunications organizations and the Pacific island departments of education are designing to provide programs and expanded telecommunications services that are desperately needed in a learning environment without adequate resources.

Challenges

First, there is a very diverse population spread out over an area one and a half times the size of the continental United States. Only three of the Pacific governmental entities are connected by undersea communications: Hawaii, Guam and the Commonwealth of the Northern Mariana Islands (CNMI). The Republic of the Marshall Islands (RMI) is an example of the dispersed population. There are 113 private and public schools. The RMI schools are located on 75 different islands, only two of which have telephone systems. The rest must rely on single-side band (SSB) radios. Because it is such a large area with few densely populated centers, the Pacific region has not received adequate satellite coverage. The satellite signals over the Pacific are weak, and a satellite dish measuring eight meters in diameter must be used for adequate reception.

Second, shipping and travel costs are high. Shipments of equipment to Pacific islands can take anywhere between one and six months to arrive. Infrequent airline flights and high air fares present problems for anyone providing technical assistance to the region.

Third, on the major islands in the Freely Associated States (the Republic of the Marshall Islands, the Federated States of Micronesia (FSM), and the Republic of Palau), Telephones are available but cost $1.75 to $3.00 a minute to call long distance. Internet is now becoming more popular and is available in the major population centers. Again, the cost is higher than in Hawaii and on the mainland. Rates in FSM run $20 a month for 5 hours of service and $3.00 an hour for anything above the 5 hours, much less than a telephone call but still high. In RMI the regular rate is $80 a month, but they give schools a break at $30 a month plus the hourly rate above 30 hours. Speed isn't the greatest but it does work. Often schools will use web ramp type modems so that several computers can be connected to a single dial up. On a limited basis, schools are doing collaborative work with other schools around the world. Even at these prices, in many areas the Internet is still the most economical way to communicate. On most of the less populated islands, single-side band (SSB) radios are the only means of communication.

Fourth, in addition to the distance-learning and communication challenges, there are also many challenges when it comes to maintaining equipment. High temperatures and salt air create an extremely corrosive environment that results in short equipment life. A satellite dish that is considered top quality and durable on the United States mainland must be modified to include all stainless steel hardware when it is being installed near a corrosive ocean environment. In addition, tropical typhoons such as Paka, which hit Guam with 240-mile-per-hour winds in December, 1997, are a constant threat to the survivability of downlink sites.

Solutions

If there is any certain about technology in the Pacific it is that there is nothing certain. For two years we developed and nurtured a technological solution using the Orion III satellite. The satellite has the greatest footprint for the Pacific Island states. When it's launch was delayed a year ago in October, we started developing a system to bike videos to the cable companies in the Pacific. This was implemented in January, 1999. In May, when the Orion III was launched we had already decided tape delayed programming was just as effective as live broadcast at 1/10 the cost. Internet and video conferencing were still needed. The only snag was the rocket failed to achieve a useable orbit. Our entire original infrastructure was lost. If there is anything we have learned about technology it is to have a backup. Never put all of your eggs in one basket. PRELStar has engaged a number of companies in the search for answers to the challenge of providing telecommunication services to remote regions of the Pacific.

With renewed insights, PRELStar, with its collaborating agencies are focusing on evolving alternative media, customized to meet varying needs and at the same time building the sustainable capacity within the region.

Connectivity in Hawaii is as good or better than anywhere in the continental US. Schools are connected at 384kb and faster. Videoconferencing is available in over 20 sites and cable television is in 95% of the schools. I remember that in 1990 the goal was to have voice, data, and video in every classroom by the year 2000. Although it isn't 100%, it is close thanks to a lot of hard work by a lot of people and thanks to the help from the E-rate.

E-rate is a Federal Communicationa Corporation (FCC) program. The goal is to provide telecommunications so that all students can have access to the "Super-highway' for Internet and other technology services. Guam, CNMI and America Samoa along with Hawaii, qualify for these funds. America Samoa has received over 1.5 million a year to help get all of their schools connected. Guam and CNMI were assisted this year by PREL and PEACESAT in making out their E-rate applications so that their schools can also be connected with high-speed communications. Unfortunately, RMI, FSM, and Palau do not qualify for E-rate.

This inequality of funds causes many problems when you are trying to provide distance learning across the Pacific. It does, however, help when a project like PRELStar can direct its minimal technology funds to the more needy areas. For entity states that are not eligible for E-rate, alternative systems are being designed, capitalizing on enhancing current infrastructure with the emerging technologies. Working together, PEACESAT and PRELStar are in the process of upgrading to a low bandwidth 2 way digital satellite solution using the GOES satellites that PEACESAT operates. This will increase Internet bandwidth from the islands and provide a fair amount of video conferencing at 128 kbs. With today's compression standards we find this rate is adequate for distance learning. It is not ideal and we are always striving for higher bandwidth within a reasonable cost.

Two developments through PanPacific Education and Communications Experiment by Satellite (PEACESAT), a PRELStar partner, reflect promising alternatives. PEACESAT is a public service satellite telecommunications network that links educational institutions, regional organizations and governments in the Pacific Islands region. Its mission to facilitate the sharing of knowledge, information, culture, and resources and help lessen the barriers of the Pacific Ocean was enhanced through acquisition of GOES-7 from the National Oceanic and Atmospheric Administration and a Distance Education Learning Technologies and Applications (DELTA - Hawaii) grant.

GOES-7, an environmental satellite, was recently transitioned to 175 degrees West to support PEACESAT by providing a sturdier communications base for their operations in the Pacific. The old analog PEACESAT is now becoming digital PEACESAT. For the Pacific entity states this means that with a digital modem, a site could communicate at speeds of 64 to 256 Kbps, depending on the type of PEACESAT earth station that is used (e.g. 3m, 3.5m or 6 meter) and whether the earth station is maintained and aligned properly. This data rate will support compressed video teleconferencing among sites.

To take advantage of this capability, however, a site must have a video teleconferencing system that will enable video inputs and outputs to be converted into digital data, a properly aligned antenna, and a digital satellite modem and interface to the PEACESAT Earth Station. With assistance from PRELStar and PEACESAT, three entities (Federated States of Micronesia - Yap and Kosrae and The Republic of the Marshall Islands) are designing their sites for this video teleconferencing capabilities.

This architecture is based largely on an Asynchronous Transfer Mode (ATM) technology backbone that allows for interconnections of multiple protocols and services such as voice, data and compressed video. Capabilities are enhanced with:

> Satellite Network Interconnections - PEACESAT at the University of Hawaii provides narrow band networking between Pacific Island jurisdictions for voice and data communications. The entity states are in the process of implementing satellite terminals that will provide higher speed capacity to these jurisdictions.
>
> Video conferencing -Video CODEC Units with TVs, cameras and microphones are being installed at local sites. A Multi-Point Conference Unit (MCU) for video teleconferencing is located at PEACESAT. The MCU has the "cascade" function that enables other MCUs (used by the University of Hawaii, Hawaii State Government, and the Hawaii Department of Education) to interconnect for larger conferences.

Internet Capabilities - Servers, routers, switches and hubs for Electronic Mail, File and Web Services are used at the many of the sites. PEACESAT also uses a SUN with Solaris for electronic mail. Dial-Up Modems are provided for local dial-up access from schools and government offices.

When fully implemented, the digital network will enable connections from 8 country sites with the capability to support multiple concurrent data links on continuous, 7 day a week, 24 hour a day, basis. The concurrent links will be supported via digital circuits and time-division multiple access technology. These technologies will enable Internet nodes to be established under the PEACESAT umbrella for public service and educational telecommunications.

Through the support of this network, the PREL Star network design in each entity state is customized to meet varying needs within the region.

Through the support of the infrastructure developed through E-rate and the integration of existing PEACESATs, land stations, the PREL Star network design in each entity state is customized to meet varying needs within the region.

The restructured infrastructure design since the failed mission of Orion III has resulted in several benefits for the departments of education throughout the pacific entity states:

Each unique setting has required each entity state to actively participate in the design of their infrastructure. A collaborative effort among the cable companies, telecommunications entities, departments of education and PRELStar has emerged that has transferred the value of the system into the creativity and capacity of the local setting, thereby creating a sustainable future. The customized nature of each system creates learning environments that are meaningful, empowers the local designers and ensures the perpetuation of cultural perspectives that are important to each entity state.

With digital video and the Internet, the combination of information sources, audiences, and instructional courses are limited only by the bandwidth, and that is limited only by funding and creative planning.

Biography

James Bannan

James Bannan (Jim) is currently employed by Pacific Resources for Education and Learning (PREL) as a Program Manager for Star Schools. He was formerly with the Hawaii State Department of Education (DOE) for twenty six years, thirteen of which were in the technology field. He was in charge of the Distance Learning Technology Program for the Department of Education. Jim has a masters degree in education, is a graduate of the certificate program in Computer Science, and is a graduate of the Telecommunications and Information Resource Management program at the University of Hawaii.

With an extensive technology background, Jim helped start and manage the Distance Learning Technology (DLT) program at the Hawaii DOE for six years. He believes that Distance Learning allows us to merge computer, video, and networking technologies so that any person located any place will be able to have access to information and education.

Sessions

Internet

Related Sessions
M.1.3 Enabling E-Commerce
M.2.3 IP Telephony
M.3.3 Strategies for Financing andTracking the Digital Economy
T.1.3 E-Commerce Strategies
T.2.3 Privacy and Consumer Protection & Government Control
W.1.3 New IP Network Technologies
W.2.3 Development Issues
W.3.3 Content & Culture

M.2.3 IP Telephony
Monday 31 January, 1400-1530
Location: Tapa I

Chair:
JIM HEBERLE, Vice President, Sales and Marketing, Monterey Telecommunications Technology Inc., USA

M.2.3.1
WILLIAM KENNEDY, Chief Technology Officer and TONY HOUSTON, Director of Engineering, Rapid Link Telecommunications, USA
Voice over Internet Protocol (VoIP) Public and Private International Networks: A Look into the Affects on the Global Economy and the Need for Worldwide IP Standards

M.2.3.2
GEORGE DARBY, President, Teleport Asia, USA
Internal Protocol Convergence and the Mobility Market

M.2.3.3
ROBERT HARBISON, Co-Founder and Principal Consultant, Venture View, LCC, USA
The Effects of IP Telephony on Emerging Economies

Sessions

Voice over Internet Protocol (VoIP) Public and Private International Networks: A Look into the Affects on the Global Economy and the Need for Worldwide IP Standards

William Kennedy, Tony Houston

Session Focus: The paper and presentation will focus on the initial vision (birth) and operation of an international VoIP production network, the required next steps in the evolution of VoIP and its impact upon global society.

Session Abstract: A new wave in the future of telecommunications is starting to quickly grow, and some carriers, corporations and nations will not be prepared. Now is the time to enter the VoIP technology arena before the cost of entry far exceeds the infrastructure and technical resources of some stakeholders' ability to join. To appropriately understand and develop the evolution of convergence, potential entrants need to have a firm grasp of the past, present and proposed future of the technology.

Introduction: The introduction of convergent (VoIP) technology will have an effect upon society, business and the manner in which technology-based services are provided. Any significant change in government, economic theory, industry or technology has shared a common list of promises and limitations.

Voice over Internet Protocol (VoIP) is an emerging communications technology that offers the convergence of the traditional voice and data networks. A better explanation and view of VoIP is that of a revolution in which worldwide winners and losers, along with some players and nations commanding a vast lead, are similar to the one resulting from the Industrial Revolution.

Understanding the benefits, limiting factors and worldwide predictable outcome may be improved by examining the driving (market) forces and obstacles of the past. VoIP is a telecommunications marketing tool that is no longer about cutting costs, but rather about growing market share and generating revenue. This analysis will foresee worldwide telecommunications and socio-economic outcomes and overview a brief technical case study discussion of an operational international VoIP network including the prediction of the next generation global telecommunications model.

Discussion: Today, the current worldwide telecommunications infrastructure is divided between voice centric and data centric parts. The voice centric area includes voice and wireless services. The data centric area consists of Virtual Private Networks, Managed Network Service and Internet services. Formerly, these parts were viewed as separate and each had its own business model and pricing structure. With the advent of VoIP, the industry has provided an opportunity to converge data, voice and video networks into one.

Current forces driving the VoIP revolution include:

- Perception of VoIP convergence as a corporate (carrier and enterprise) competitive advantage
  - Maintain ROI and price curve - early to market advantage
  - Maintain low Total Cost of Ownership (TCO)
- Communications industry revolution
  - Regulatory changes/Telecommunications Reform Act of 1996
  - World Trade Organization deregulation initiatives
  - Creating demand
  - Inevitable conversion to a Web-enabled world
  - Generation shift in preference
- Toll avoidance
- Increase in technology development
- Emergence SS7/C7 functionality
- Ubiquitous transportation to end users (media independent)
- E-business (global commerce)

Current factors limiting the VoIP revolution include:

- Shortage of trained technical and business marketing staff
- Rapid decrease of per minute rates of the Public Switch Telephone Network (PSTN)
- Current regulation
- Lack of unified VoIP standards and interoperability
- User acceptance
- Issues surrounding security
- Need for reliability
- Quality standards
- Network monitoring tools
- "Last mile" bandwidth
- Separation of voice and data networks
- Legacy infrastructure

Current Socio-economic Environment: While the shift to VoIP will be rather modest for the coming year (2000), the expensive and hard lessons learned combined with improvements in VoIP technology will result in the quick and global convergence of the presently separate voice and data networks.

The importance of this ongoing VoIP revolution is not just about technology, but rather the other less discussed convergence of the Operations Support Systems (OSS). Much like the convergence in the VoIP arena, this effort will result in a single and interconnected back office, billing and rating and business reporting and data mining system. Each component will build into one another as part of a work flow process that is quickly expandable and flexible to address new services or customer demands.

In the near future, not having a robust and integrated VoIP and OSS, and retaining the old tried and true PSTN, will be much like owning the rails that the railroad utilized to control commerce throughout the United States in the early 20th century. Today, the rails are still in place yet hold no value because of the lack of vision and perception of the next advancement in technology and marketplace.

The simple truth today is that the VoIP race is on and as the old adage goes "to the winner goes the spoils." The VoIP race is global and, drawing upon the outcome of the Industrial Revolution, its effect will long be felt throughout the industrial and third world nations. Based on what history shows, the implications for the late entry of corporations and nations into the new convergence of technology are predictable and can be explained through econometric modeling.

The United Nations 1999 discussion of human development indicated that while technology and its advancements were improving life for many people around the world, technology is also widening the gap between rich and poor. According to a U.N. report released on 12 July 1999, "The top 20 percent of the world's population earns 74 times as much as the bottom 20 percent. Globalization does not necessarily make the situation worse, but governments should take into account ... (the) concern for profits for people who have been affected by turmoil in the global marketplace." In a market driven economic system, the U.N.'s recommendation for poor and technology deficient countries to "leap-frog" old industries and economic systems and be brought up to par with industrialized nations is unrealistic.

This new VoIP revolution will be a true double-edged sword -- it will bring wealth and increased gross national product (GNP) to the top industrial nations, while causing already disenfranchised nations to fall even further behind. For better or worse, the growing global market force is capitalism and capitalism is the driving force behind the VoIP technology and its application. The predicted result is that the rich and well-educated will have once again led and reaped the vast windfall from this next technical revolution. In this case, history is indeed an excellent predictor of the future.

This scenario will also be played out within industrial nations with the same results for the poor and under-educated. The lone wild card with industrial nations is the handful of new start-up companies and existing corporations who embrace, test, deploy and plan for integrating convergence into their core business. These new companies in addition to the vast amount of technical benefit received will also derive extremely valuable relationships with national and international PTTs. The added variable of relationships will result in a real time to market advantage as well as establish a lower barrier to enter into new markets. These relationships take a lot of time to build as well as maintain. Thus, being first to market with the proper convergent network will allow for the establishment of relationships, which will add as much value to the new companies as their product line.

The reasons for established telecommunications corporations not to enter the new convergence technology are numerous and each offers a good argument for inaction. The most compelling reason for not entering the VoIP technology race is that they would be forced to cannibalize their own customers to roll out any form of VoIP product line. The fallacy of this argument is that this opens a profitable niche market for new start-up companies.

The disadvantage of not starting or buying into VoIP and the application of convergence into an operational environment is the loss of valuable business development, technology lessons learned and development of OSS to support a new product line and customer base. In the past, multinational and large national telecommunications and technical corporations only had to repackage their current product lines. This business model will not prove to be beneficial in the technological future. The few deep-pocketed corporations who are lucky enough to literally buy in at a later date by acquiring a successful start-up company will still be behind in technical skills, experience and business development those who understand the new IP based operating model.

Technical Discussion of Current VoIP Standards (H.323): At this point in its innovation, Packet Based Networks (PBN) have yet to provide a guaranteed Quality of Service (QoS). PBNs such as the public Internet pose a significant challenge in assuring the reliability sufficient to pass real-time H.323 audio, video and/or data communications. While it is possible, intimate knowledge of the architecture, as well as the political prowess to form the necessary relationships is needed to guarantee the desired QoS -- a task not many can successfully master.

In today's business model, support for audio and data of the H.323 model is mandatory; video is still an optional component and will soon be required as well. Since the ability to use a specified common mode of transportation is required, all terminals supporting this media type need to interoperate. In short, H.323 traffic requires an infrastructure design that will standardize the existing and future public Internet.

At one time, the delivery of packet information over the public Internet was the object, while the time it took to deliver the message was of little or no importance. Now, passing real-time data such as H.323, time is of the essence. The overall goal is to decrease current latency (the time it takes for a packet to transmit from one point to the next) while ensuring optimal delivery. This requires reconsideration and re-engineering of the existing router protocols that make up the public Internet.

Private circuits, ATM and frame relay presents a quick solution. However, in the true spirit of competition, the need to offer value-adds and the ability to cut costs, this approach will only result in the slow and painful demise of carriers choosing to implement it.

While the use of gateway technology is nothing new in the data communications world, the employment of VoIP gateways into the telecommunications arena will function in the following manner:

> Voice calls originating over a Class 5 switch can be passed directly to a VoIP gateway, transported over any available medium supporting IP transmission to a receiving gateway, then back into another Class 5 switch and terminating to an end user.

Traditionally, voice traffic passed over a single circuit, each conversation using one circuit (DS0). With the advent of the time divisional multiplexer (TDMUX), eight conversations share one of those circuits. Use of the TDMUX is still far from utilizing the circuit's full capacity despite its efficiency. VoIP is better described as an aggregator. This type of aggregation, with as many as twelve voice conversations traveling across a single voice circuit, can produce a 100 percent efficient usage of the transmission medium through which these conversations are carried. The true challenge presented today is not the compression of those conversations, but in finding and building the most cost effective and efficient infrastructure in which a business may remain competitive in a quickly emerging and technologically advanced society. The survival of any business in the telecommunications industry depends on it.

Inherent to any technological breakthrough, there is the requirement and then the challenge of developing both test equipment and standards in which to define what is an acceptable level of quality. VoIP is no exception. Until recently, quality was defined subjectively. A user picks up a phone, makes a call, and the call is rated on a scale of one to five. New products have been developed testing that allows quantitative results to be obtained. As a conversation is in progress, the receiving apparatus compares the signal to a pre-programmed signal and issues a comparative score.

The pressing challenge now is to develop the standards. International Telecommunications Union (ITU) has long been the telecommunications standards committee; however, several different standards committees should hold discussions to determine the standards of interoperability as it applies to convergence.

Case Study: Transition from an ICB Company to a World Class Internet Communications Service Provider

<u>Overview</u>

The following case study details the VoIP architecture addressing H.323, a new approach and utilization and redesign of public IP networks and the departure of the type and quality demands of the new traffic payload. This is followed by a discussion of the evolution of the traditional voice and data networks into a combined infrastructure. Several items of interest include billing and rating, performance management and reutilization of both traditional voice and data infrastructure and trained technical staff. The issues surrounding the movement from a subjective to quantifiable unit of measurement, the next logical step, is also addressed.

The presentation concludes with a review of past, current and future VoIP trends and the effect upon cost modeling and entry fee for new telecommunications stakeholders.

<u>Case Study</u>

The ABC Dial-Now Telecommunications Corporation was established as an international callback (ICB) company and maintained a steady and predictable growth in that market segment. ABC Dial-Now focused primarily as a business-based model that relied on "off-the-shelf" technology and toll rate avoidance.

While the company's services were illegal in several nations, a few minor workarounds allowed continued operation. The first utilization of the Internet in the ICB business operation was the use of the Web to start the callback process, making it more difficult to deter interruption of the ICB business operation. This sparked the entry into VoIP.

Within the ABC Dial-Now corporation, the senior management team realized very early in the discussion of VoIP and convergence theory (process) that a sizable market and profitable niche would be open to operations that could quickly adopt and overcome the technical and business problems.

Management first wanted to determine the technology and market viability of shifting the product offering and core business. The planned approach was divided into several segments: Cost effectiveness of converting (cannibalize) the existing customer base to the new product (service) offering, performing standard business marketing research and developing of marketing and sales plans. The last portion was conducting VoIP technical research and initiate technical and product bench testing.

The most difficult decision for any carrier is the decision to base the rebuilding of the business based upon cannibalizing their own customer base from a proven yet soon to be (predicted) declining product to an unproven technology - and new business model. After marketing and sales research was completed, the company entered the market with a first generation VoIP system. They also decided to build (invest in) a completely integrated OSS, technology infrastructure and marketing approach. The early findings in examining the legacy OSS and back office infrastructure was that legacy support systems proved not to be capable of supporting the new business model. However, since both the new and old product lines would be required to coexist, the company decided also to invest in the continued operation and integration of the legacy systems into the new IP-based infrastructure.

The time frame from the decision to build an international VoIP network and implementation of a working and profitable VoIP network was less than six months. The company responded to rapid growth by investing in technical training, equipment, networks, troubleshooting and marketing.

The first attempt at implementing a VoIP network based on utilizing a first generation gateway product was not successful. The failure in the first implementation was directly related to the current state of the VoIP product development. Specifically, the problems were in the low volume (capacity and cost effectiveness) of the first generation VoIP gateways, inability to implement a stable and robust Network Management System (NMS) and utilize the legacy billing and rating solution. While the first generation VoIP product line could have been implemented, without a total resolution to serious system operational problems, only little if any revenue would have been generated. However, what the company did gain in this effort was a clearer focus of the ultimate goal, and the engineers learned how much they needed to grow and learn.

This resulted in the approval for the design and implementation of a second generation VoIP and IP based OSS infrastructure. The next step was a detailed and meticulous, step-by-step analysis of the current technology model. The modeling tool selected for the legacy ICB and technical infrastructure was a Statistical Process Control (SPC) model. While this model is more often utilized in a manufacturing environment, its focus on process flow was determined to function extremely well. Each process was broken down to determine which factors were successful and what part of the process was in need of redesign and implementation. Additionally, the process exchange was documented and utilized for the design of the new OSS and back office infrastructure. Upon completion of the initial modeling, a computer simulated model was developed to determine any unexpected problems when the system was implemented as a whole.

Based upon the need to keep the doors of the business open, the initial step was to complete the SPC analysis of the legacy system and make as many corrective actions and changes that could be economically made. With this development completed, a limited functionality of billing and rating of the selected second-generation VoIP system could now be processed by the legacy system.

The lessons learned in the development and implemented new functionality allowed for modeling and simulation testing and problem identification of the proposed integrated OSS and back office systems. The remaining implementation work was now centered in the area of the OSS, back office and NMS systems. The primary OSS system solution was to integrate customer service and the rating and billing systems, followed by the NMS and then the national activity reporting system.

A key outcome from this initial analysis and development was that the cost of designing a custom VoIP system solution would prove far too costly for a small corporation. Therefore, the company decided to design the OSS and back office system utilizing commercial "off-the-shelf" (COTS) products and only develop small yet critical components and software modifications of the total system as required. A second generation VoIP gateway vendor was quickly selected and production implementation began.

The next problem addressed was moving from a subjective to a quantifiable test and measurement of voice, data and fax traffic. In the old system, the range was one to five with five representing the best quality. This area proved to be the most time consuming and difficult to overcome during service turn-up with VoIP carrier alliance partners. This resulted in combining several existing and new products to provide a mathematical model for obtaining the quality required in the Service Level Agreements (SLA).

Within six months, ABC Dial-Now had an operational and revenue generating VoIP based network that terminated traffic internationally. The remaining implementation work was now centered in the area of the OSS, back office and NMS systems. The OSS and back office solutions were selected and extensive Proof of Concept (POC) testing began. Based on the successful conclusion of the POC testing, the OSS systems were selected. The implementation of a totally integrated legacy and IP-based OSS system, which proved to be a slow and educational process, resulted in a truly unified system with all of the benefits and problems.

Additionally, the technical experience gained from the design, planning and implementation process created a vast increase in technical know how and intellectual capital. These events added value to the corporation and allowed for more business growth and network expansion.

Proposed Next Generation Convergent IP Network

For the next generation of convergent IP networks to deliver a completely integrated solution, numerous system wide and product improvements must be addressed. This section will look forward and present a proposed model for the next generation of integrated convergent networks.

The essential component of the new convergent IP model will be a totally integrated infrastructure schema. The transport mechanism of the IP model includes the public Internet, the accounting system using OSS, the "last mile" through high speed xDSL or broadband with the user interface and a familiar Web Based Application for steering. This new schema will be tied together by a central network control hardware and software system. (See page 12, figure 1)

What is truly needed to effectively employ the public Internet architecture is threefold. First, to successfully pass voice, video and data/fax traffic from end user to end user, "last mile" transmission methods must extend beyond the conventional limit of 64k into a Class 5 switch. For voice, this bandwidth limit is satisfactory; however, video communications will make plain old telephone service (POTS) obsolete, just as cable TV did for the antennae industry.

Current rollouts of broadband, direct digital satellite, ADSL, VDSL, and soon Zipper VDSL must be in place. Since video requires a full 384kbs bandwidth per session to achieve full motion duplex video (30 frames per second), which is minimally acceptable to the consumer, increased level and quality of service is required. Compounding that by such lucrative features as interactive TV, subscriber video, Pay Per View, as well as multi-user gaming, will reduce the seemingly huge surplus bandwidth limits of these media to barely adequate. Direct digital satellites will be the first, followed shortly by ADSL, in reaching their limit and eventually their usefulness. Allowing for the evolution to higher bandwidth media such as Zipper VDSL will require the ubiquity of a protocol such as IP.

Secondly, the ability to secure and guarantee the quality and bandwidth of a transmission from end to end will need to be in place. The ability to dynamically size and secure reliable packet delivery is most daunting. Non-existent routing protocols will need to be developed and deployed globally. However, defining these protocols is much closer than imagined. The RFC (Request for Comments) committee is already discussing solutions such as RSVP, Mbone, and several new ideas that will provide the standard protocols.

RSVP (resource ReSerVation Protocol) although not yet a dynamic protocol, IP tunneling using RSVP is embryonic, and to a certain extent useful. Unfortunately, to take advantage of this technology today industry entrants must own, or have very close relationships with the owners of, the routers in question and overcome the internal bureaucracy within the organization(s) in question. Practical applications of this technology are security and real time communications.

MBone (Multicast backBONE) in contrast to traditional Internet applications having utilized point-to-point connections for exchanging data between two parties, enables simultaneous transmission of a single stream of data to many parties. Data packets sent to multiple parties is referred to as multicast packet transmission. Practical applications of this technology obviously are in the broadcast arena. Users wishing to subscribe to a specific broadcast would simply "join" the broadcast stream.

Perhaps new protocols such as DTCP (Dynamic Tunnel Control Protocol) working in conjunction with IDRP (Inter-Domain Routing Protocol) can be designed as scaleable, inter-autonomous system tunneling router protocols, capable of supporting policy based routing for TCP/IP Internet, both IPv4 and IPv6. Connecting end points through virtual point-to-point links called "tunnels" will be mandatory to maintain the QoS needed. These end points (consumers) are still not exactly defined but they will be in the year to come. Recent introductions of new technology in the electronic consumer market place will clarify that.

The third and quite possibly the most complex issue of all involves end user applications. As always, convincing the end users to employ new technology into their lives is always difficult. Historically, the business will quickly adopt any technology that gives a competitive advantage over their competition. The ability to better serve customers, reduce cost and improve quality have always been a priority for businesses worldwide.

What then is the motivation of the consumer to subscribe? To put it simply, consumers want the freedom to choose a service provider for any communications or entertainment needs. They desire a variety of television, telecommunications and Internet communications service providers with real time billing. A consumer may choose to receive TV broadcasts from anywhere in the world, a special broadcast on a Pay Per View channel from another country and video conferencing through yet another provider possibly on the opposite side of the world. Multi-user applications, gaming, education systems, and whatever the industry can devise, will all contribute to the enticement of the end user to participate.

Prior to the introduction of VoIP, billing has been very straightforward. The customer picked up the phone and placed a voice call to a single destination. Each time the call requires the exact number of resources from point A to point B. Data, fax or voice transmissions all use the same bandwidth. That is all changing. Not only do we now have to consider the amount of time a communications event last, but also how many resources it requires to establish and maintain the service. As stated in the case study portion, the major problem is extending the life cycle and integrating the long standing and costly legacy system. With the growing customer demand for all of their services to be billed on one statement, it will prove difficult to revert to several different statements for each service.

Voice for example, today's compression algorithms use 8kbs worth of bandwidth, while fax on the other hand demands as much as eight times more. A business can not bill the same price for different services. Data communications such as video can use as many as 64 times the required resources of a single voice conversation. Clearly a solution must be made on a universal level using the Open Systems Settlement Protocol.

Once the dynamics of these soon to be developed technologies are complete, a controller (see figure 1) much like in SS7/C7, will be in charge of finding the best path throughout the public Internet matrix and instruct each router to reserve the bandwidth required. Once all routers are in place, the tunnel is locked from end to end for the duration of the communication event. The timer starts, sending instructions to the billing system reporting the size of the communications channel. Once the event is complete, the tunnel is then torn down and the billing record is closed. The construction of the size of the tunnel will depend on the communication event. Voice can easily pass through an 8kbs stream, while a fax may use a full 64kbs.

Video streams may vary in size depending on the complexity and quality desired ranging from 128kbs to 512kbs. The duration, or life, of the tunnel multiplied by the size of the tunnel will be where the consumer incurs cost.

Conclusion: VoIP and convergence represent a tremendous shift in the global telecommunications marketplace and the manner in which global business is conducted. The effect of IP based convergence will be a far reaching technology and once again help determine the new market and technology leaders and have a very real socio-economic impact. Moreover, like other revolutionary occurrences, the effect and impact of this IP based telecommunications event will be felt socially, economically and politically on a global scale.

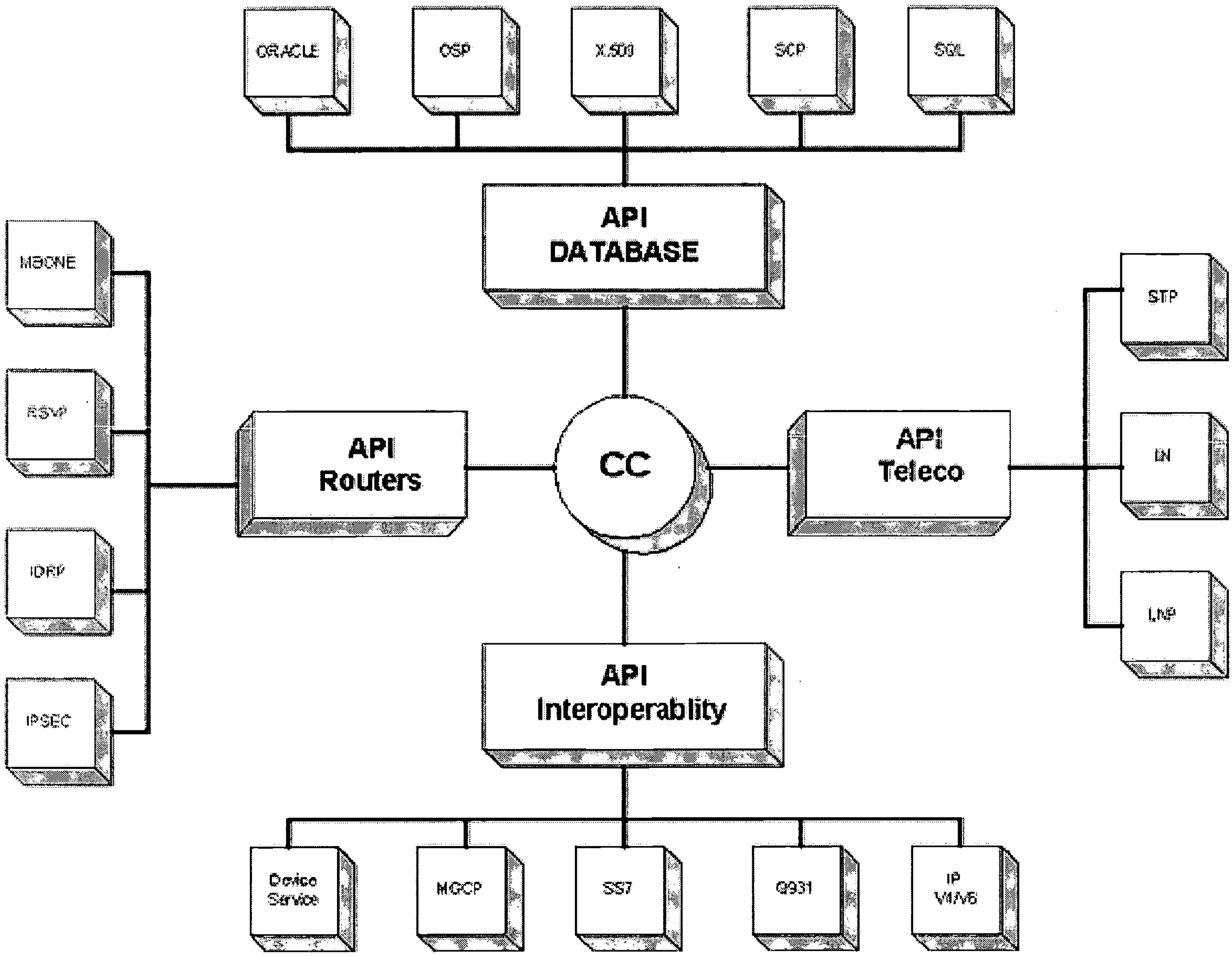
While the technology powering the currently installed and planned convergent global network is not perfect, it has been proven to be economically workable and a driving base line infrastructure of the future. With the ability for a business customer to utilize one vendor for their data, voice, fax, voice mail, e-mail and video conferencing, consumers and business alike can increase productivity and cut costs. The driving forces of convergence will make the funding and technical talent available to overcome the majority of the limiting factors.

As illustrated by the case study of the ABC Dial-Now, without a doubt, VoIP and convergence are quickly becoming a reality that will soon face its last hurdle -- the integration of VoIP and convergence into global business and information technology implementation plans. The remaining challenge will be for the convergent leaders to take the next step and illustrate how they plan or will capitalize on the long-term possibilities of the Internet and IP.

The paper concludes with a view of the anticipated future convergent and VoIP architecture (see figure 1). This anticipated architecture addresses the corrective actions and continued product and standards changes that will be required to make this new form of IP-based infrastructure a sustainable and robust replacement for the traditional PSTN global network.

The evolutionary progress of VoIP is slowly starting to take its toll on both the traditional voice and data worlds. Once deployed into a true global network, the world of telecommunications will awaken to find that the rules of engagement (business process) are no longer just bent, but forever changed.

Figure 1. Proposed architecture diagram of next generation convergent IP-based network showing the new requirement for open API layers to allow the interaction between different products and protocols being controlled by a single network control point.


ORACLE
OSP
X.500
SCP
SQL
API DATABASE
MBONE
RSVP
IDRP
IPSEC
API Routers
CC
API Teleco
STP
IN
LNP
API Interoperablity
Device Service
MGCP
SS7
Q931
IP V4/V6

William F. Kennedy
Chief Technology Officer

William F. Kennedy serves as chief technology officer (CTO) for Rapid Link managing the network engineering and operations groups and the information technology department. His goal is to keep Rapid Link ahead of the competition in the telecommunications industry by testing new products and constantly updating the company's operations. His work on development and implementation of Rapid Link's Internet Protocol-based (IP) network has shaped the protocols and standards that future generations of IP-based networks will use.

Dr. Kennedy strives to keep Rapid Link's networks free from error, while implementing new technologies to satisfy the customers' needs for clear, reliable international telecommunications service.

Dr. Kennedy oversees efforts to bring Rapid Link to a next generation Internet-based communications service provider status. He creates plans to seamlessly integrate new products, systems and network operations. He implements all new technology into Rapid Link's network operations center and guides the transitions to the company's global operations.

He has received several awards for his technological expertise, including the Sprint International Product Champion Award for Telecom Georgia Tublisa and VodaCom (South Africa). Additionally, he received the Florida Governor's Award for Technology Innovation for his doctoral dissertation addressing Decision Support Systems (DSS) in a state-wide program coined Project CHOICE in 1986.

Dr. Kennedy taught business research, information technology and economics at both undergraduate and graduate level at Averett College, Strayer College, Troy State University, Saint Leo College, Mount Olive College and Hillsborough Community College. He is also a member of the Computer Science Industrial Advisory Board at Southern Polytechnic State University.

Dr. Kennedy retired from the U.S. Air Force in 1991 with 20 years of service. He held the position of Senior Officer, Command Information Systems, U.S. Central Command, at MacDill Air Force Base in Florida. Before joining Rapid Link, Kennedy was the Director of Information Technology at Nextel Communications.

He earned a Doctorate at Nova University in 1987. He also holds a Master of Business Management from Webster University, a Bachelor of Arts in Criminology from Saint Leo College and an Associate of Arts from Thomas Nelson Community College. He has more than 10 years of adjunct graduate level teaching experience at several colleges and universities.

He was born on November 9, 1951 in Warren, Ohio. He currently resides in Alpharetta, Georgia with his wife, Sandra, and two daughters, Katherine and Juliana.

Biography

Anthony P. Houston
Director of Engineering

Anthony P. "Tony" Houston joined Rapid Link as director of engineering. He is a systems integration specialist and has developed Internet Protocol-based (IP) technology for more than 14 years. He works directly with Rapid Link's chief technology officer in bringing the company to a next generation of IP telephony.

Houston uses his knowledge of data communications to produce convergent networks supporting data, fax and voice exchange over Public Internet-based networks. His work will shape the protocols and standards that future generations of IP-based networks will use.

Houston's technical expertise includes:

Operating Systems:	Novell Netware (version 2.0a to 3.2), Windows NT Server (version 3.1 to 4.0), MS Back Office Server 4.0, Windows NT Workstation (version 3.51 to 4.0), Windows 9x (version 950a and 950b, 98), MS Windows (version 286 to 3.11), DOS (version 2.0 to 6.22), MAC OS (version 6.8 to 7.61)
Software:	MS Office (version 4.3 to 97), MS Project 98, MS Internet Information Server (version 1.0 to 4.0), MS Front Page (version 1.0 to 98), Computer Associates ARCserve for NT (version 6.5), Cheyenne Inoculan (version 1.0 to 4.0), McAfee NetShield for NT, DCA Irma Lan DFT, MS File and Print Services for Netware, MS Name and Directory Services for Netware, Conference Server, Internet Mail Server.

Networking: Remote Access Server RAS, Dynamic Host Control Protocol Server DHCP, Domain Name Services DNS, Windows Internet Name Services WINS, Proxy Server 1.0, Routing, Bridging, TCP/IP, IPX/SPX, NetBeui, Netbios, AppleTalk, Ethertalk

LAN: Ethernet, Fast Ethernet, HP 100VG, ArcNet, Stack and Managed Hubs, Bay Network Switches, Retiming, SNMP

WAN: T-1, Fractional T-1, Leased 56k, Frame Relay, x.25, ISDN, Dial on Demand, Ascend, routers, TSU/CSU/DSU, Vina Technologies

Houston brings a wide variety of corporate technology experience to Rapid Link, including 10 years as an independent technology consultant and project manager.

Before joining Rapid Link, Houston was the chief technology consultant and project manager for his own consulting firm. He has worked with several international clients, in Europe, Taiwan, and Canada. He has built prototypes for such names as NASA, Delta Airlines, DCA, Novell and Microsoft and has implemented corporate wide computer network infrastructures for many others.

He has technical experience includes Novell Netware, Windows NT Server, MS Back Office Server 4.0, Windows 95, and MAC OS operating systems, and has extensive software and networking abilities.

He currently resides in Stone Mountain, Georgia.

Internal Protocol Convergence and the Mobility Market

George E. Darby, J.D., M.B.A. [1]

Abstract

The Internet Protocol ("IP") is the protocol of choice to bridge wireless and wired networks and to provide message payload conversion. A major technological and marketing hurdle remains, however: how to turn mobile phones into handheld computers, or the converse, how to add mobile telephony to handheld computers. This "wireless device" challenge presently has two probable winners: small computers based on Windows CE, and mobile phones based on Symbian EPOC. This paper focuses on the efforts to integrate an operating system, Web browsing, computing, email, video telephony, and voice telephony in a handheld device, and concludes with observations about the probable product/markets resulting from such integration and their importance in the Asia/Pacific region.

Digital Convergence has evolved to IP Convergence. Digital Convergence, the transmission, switching, and storage of voice, data, and video as a digital bitstream, is a commercial reality in the U.S. There are several terrestrial solutions for broadband delivery to homes and offices, and commercial services include digital movies on demand [2]. Wireless broadband, however, is a different story: there are no broadband wireless devices and consequently, no broadband wireless markets (or vice versa). By 2005, data should account for more than 50 per cent of global mobile network traffic, according to industry analyst Analysys, [3] and an estimated one billion people will have wireless phones. Today, wireless data is less than 1 percent of the mobility market. How will the wireless data market go from "none" to predominance in five years? The usual answer applies: the Internet, and the Internet Protocol.

The Internet Protocol ("IP") currently enables the most cost effective *payload* and *protocol* conversion. *Payload* conversion services involve converting speech to email, email to speech, email to fax, fax to email, and other conversions between two message payload types. In addition to the wizardry that performs *payload* conversions, IP Convergence involves: (i) reducing the need for *protocol* conversions for a given payload type (voice, data, or video) as a message shuttles among circuit-switched, packet-switched, wireless, and wireline facilities, and (ii) developing multimedia wireless devices that approach or equal the functionality of desktop computers. Broadly speaking, in places without flat-rate local calling, or where terrestrial cable plant is of poor quality or not available, most Internet access will likely be via smart phones. The rapid adoption in 1999 of the first wave of smart phones in Japan, discussed at length below, demonstrates the high correlation between new IP services and wireless devices in regions without flat-rate local calling. Not only does IP Convergence facilitate fixed/mobile integration, and more efficient use of radio channels for voice and other payload types, it brings the Internet to the unwired population.

Provision of payload conversion, reduction of protocol conversion by pervasive adoption of IP, and transparency of the wireline/wireless interface, underlie the forecasted domination of wireless networks by data. IP Convergence is very real, and billions of dollars, pounds, marks, and yen are being spent in the race to overhaul network infrastructure and services. For example, British Telecommunications will focus its new service development almost entirely on IP-based services. Peter Bonfield, the CEO of BT, reportedly told shareholders at BT's annual meeting in July, 1999, that the only way to succeed anymore was to "exploit high speed, Internet Protocol networks." [4] The real beneficiaries of improved payload conversion and reduced protocol conversion are mobile phones. Said succinctly, IP is converging on the mobility market.

For the foreseeable future, IP is the protocol of choice to bridge wireless and wireline networks. The ITU's H.323 Recommendation [5] for using IP for all payload types, the IETF's RTP/RTCP and MPLS protocols, the efforts of the ATM Forum, IMTC, and other industry associations, trials of fixed/mobile integration using IP (e.g., carrier trials by VIAG Interkom, and manufacturer trials by Nortel in its Unified Networks initiative), and BT's statement of strategic direction substantiate "IP as *lingua franca*". Far less clear than the "protocol of convergence" is how "smart" a smart phone must be to support IP Convergence, i.e., what computing platform should be used for smart phones. Smartness depends upon the GUI, software applications, operating system, processing power, storage, memory, network and peripheral interfaces, and power management. At a minimum, smartness requires voice telephony, Web browsing, email, and a personal information manager for contacts and notes ("PIM"). At a maximum, smartness combines desktop computer equivalence and mobility.

Desktop computer equivalence. "Desktop computer equivalence" may seem far-fetched, but it is largely a matter of whether the user composes non-trivial amounts of email, revises email attachments, and prefers a legible, XML/HTML-based Web browser. For use in smart phones, a power-managed, instant-on operating system is needed, such as PalmOS, Symbian EPOC, or Microsoft Windows CE. The market for "mobile telephony added to handheld computers" is actually broader than handheld personal computers ("HPCs"), defined as palmtop PCs with integral keyboards, and palm personal computers ("PPCs"), defined as palmtop PCs without integral keyboards. The market includes sub-notebook PCs and full notebook PCs, and could be stated as "whatever supports a virtual office". Smaller HPCs that run the Windows CE ("WinCE") operating systems are the same size as sub-notebook PCs that run the Windows 98 or Windows NT operating system used in desktop computers. For instance, the NEC Mobilepro 770 (a WinCE device) and the Sony VAIO PCG-C1R (a Win98/WinNT device) sub-notebook PC are both approximately 9.5" x 5" x 1" (24 cm x 12.5 cm x 2.5 cm); their carrying cases are interchangeable, but the C1R has a built-in digital camera and large hard drive. A GSM or UMTS PC Card (or CF+ Card) could be used in a PPC, an HPC, a sub-notebook PC, or whatever the user carries as a computing platform to add high datarate, wireless connectivity. For ease of reference, the term "smart phone" will hereafter mean "smart mobile phone".

Like sound systems, the forms that smart phones will take range from a single integrated unit to discrete components. At one end is a handset with integral keypad, an LCD display (which won't be a touchscreen in lower priced phones), and some ability to use email and to browse the Web. In the mid-range will be larger, "clamshell" smart phones with accessories, and at the high-end will be "component HPC systems". Just as there is a spectrum of price/performance in sound systems, there will be a spectrum of price/performance in smart phones. To telegraph the primary conclusion of this paper, there will be no single, dominant operating system for smart phones. Rather, there will be several popular operating systems, and new operating systems may emerge that are tailored to smart phone niche markets.

Smart phones designers must solve two difficult problems to deliver a mass market, high end, smart phone.

Problem No. 1: How to Talk and Type Simultaneously. How can a smart phone user take notes or revise stored information during a conversation, or do more than trivial amounts of text entry? If a mobile worker does non-trivial amounts of text entry, that worker is going to need a smart phone with keyboard: stylus-based and 9-key predictive text entry are acceptable only for limited amounts of text entry. A keyboard-enabled smart phone may be: a clamshell smart phone like the Nokia 9110; a handset smart phone with an accessory keyboard and display, such as an NTT DoCoMo i-mode phone with Sharp MT-200 accessory keyboard/display; or (in the future) a GSM or UMTS card in a multimedia HPC. From a design standpoint, the accessories (keyboard, display, earset, etc.) could be cabled to an HPC or smart phone, or they could have a wireless interface, such as Bluetooth. The text-entry problem has been recognized by manufacturers. At Telecom '99, Ericsson showed its Chatboard snap-on keyboard, which can be attached to several of Ericsson's GSM phone models to enable faster SMS and email handling.

Problem No. 2: Handling Attachments and Webpages. Will smart phone users tolerate "miniature videotex" or worse as a graphical user interface? Cahners In-Stat Group found that nearly 90 percent of respondents in a recent survey would like wireless Internet access to both send and receive e-mail, and two-thirds of this group stated that it is either very important or extremely important to view e-mail attachments received on a wireless device. Of course, the Web cannot be ignored, especially if desktop equivalence is the goal. The large file size of most Webpages, slow airlink datarates, and small display screens in handsets has prompted the development of microbrowsers and the server-side processing of HTML Webpages (i) to remove graphics and animation (to reduce Kb/Webpage transmitted over the airlink and to reduce the RAM footprint of the microbrowser in the handset) and (ii) to better fit the low pixel count of the average smart phone LCD.

The most broadly adopted solution for "taking the fat out of Webpages" is the combination of Wireless Markup Language ("WML") and the Wireless Application Protocol ("WAP"). [6] In broad terms, WML is analogous to HTML and HTML's successor, eXtended Markup Language ("XML"); WAP is analogous to HTTP. Technically, WAP is a new set of the four OSI layers above the Network layer in the OSI model, plus additional security and transaction layers. A WML microbrowser uses client software that is incompatible with that for XML/HTML servers. British Telecommunications' U.K. mobile phone subsidiary, Cellnet, plans to begin providing WAP services before the end of 1999.

If a primary use of a smart phone is more than voice calls and receiving plain email and WAPped

Webpages, users will buy keyboard-equipped smart phones and a display on which attachments can be viewed and revised. Attachments are usually files produced by a desktop computer application. A smart phone that supports a keyboard and half-VGA display (640 x 240 pixels) can also run a "real" Web browser, one that can access and display, in 65K or more colors, XML/HTML-encoded Webpages. Such an "HPC smart phone" should also run office application suites and vertical industry software applications, e.g., specialized software for financial services, real estate, insurance, and other "workflow engineered" markets. Finally, an HPC smart phone should support the software and network interfaces required for the smart phone to be managed as a network element in an enterprise network.

The initial candidates: PalmOS, Symbian EPOC, and Microsoft WinCE

Nokia has sold a smart phone model, the 9000 series, since 1996 in the GSM 900 market only. The current version, the Nokia 9110, uses the Geoworks GEOS operating system and an AMD 486 CPU, and has email, address book, text editor, and partner PC sync software. The history of the Nokia 9000 series is instructive as smart phones become a mass market. The Nokia 9000 series has not been a top seller. Probable reasons for slow sales include the phone's non-availability in GSM 800, 1500, 1800 and 1900 markets, high price, few software applications, limited Web services, low usage of SMS, and proprietary Web browser. The 9110 does, however, show the technical feasibility of combining a QWERTY keyboard in a clam-shell, 253 gram, smart phone with half-VGA touchscreen and even a second, external LCD for traditional dialing functions. In 1998, NTT DoCoMo selected GEOS as the operating system for NTT's Dialo smart phone, manufactured by Toshiba. The Dialo is a GSM PDC (GSM 800 and 1500) version of a PHS smart phone called GENIO. GEOS does not appear to be a mainstream operating system for future smart phones.

PalmOS. PPC smart phones, i.e., handsets with monochrome LCD, integral keypad but no keyboard, a PIM (calendar, address book, notepad), desktop syncing, and with some ability to use email and to browse the Web, have arrived @ in the CDMA market. The first of the new PPC smart phones, Qualcomm's "pdQ", became commercially available in October, 1999, from Sprint PCS (list price, US $800, plus service agreement). The pdQ uses the Palm "operating platform" ("PalmOS") to support email, a PIM, partner PC syncing, and a microbrowser for "Web access" to proprietary servers. [7]

The pdQs on sale now use a proprietary "web clipping" server and handset software. In August, 1999, Qualcomm licensed WAP and may include WAP in its future smart phones. Perhaps the prospect of competing against a constellation of WAP-compliant servers deployed to support Motorola, Nokia, Ericsson, and other WAP licensees led Qualcomm to license WAP and to reconsider deploying, or persuading wireless ISPs to deploy, proprietary servers. Qualcomm was the first licensee of PalmOS for use in smart phones. At Telecom '99, Nokia and Palm announced a venture that would jointly develop a Nokia smart phone with Palm's pen- and touch-sensitive screen applications; it was not clear whether such Nokia phones would run PalmOS or Symbian EPOC. Palm has also agreed to collaborate with Alcatel to develop smart phones with Palm applications.

Although two smart phone models use GEOS, and a few smart phone manufacturers may use PalmOS, the mainstream candidate operating systems for smart phones are Symbian EPOC and Microsoft WinCE.

EPOC and WinCE not only support baseline PPC functions (Internet email, Web-browsing, PIM, and synchronization with PCs) well, EPOC supports a text editor and keyboard, and WinCE additionally provides "Pocket" versions of the Microsoft Office application suite (Word, Excel, PowerPoint, Access, and Internet Explorer) and other "desktop equivalent" application and network software.

Symbian EPOC. The Ericsson R380 smart phone was announced in March, 1999, and is planned for market launch in early 2000. [8] The R380 includes a touchscreen; email, PIM, handwriting recognition, and voice recognition software; and a WAP-compliant microbrowser for Web access. Although Ericsson makes mobile phones for every major airlink standard, the R380 is designed for GSM 900 and 1900 markets. The R380 uses the Symbian EPOC operating system, and has the ARM710T CPU (as does Psion's 5mx HPC). Symbian was formed in June 1998 as an independent joint venture between Ericsson, Nokia, Motorola and Psion, is headquartered in London, and has offices in Japan, Sweden, and Silicon Valley. [9] According to press reports, Nokia and Ericsson wanted to use WinCE in their smart phones, but turned to Psion and created the Symbian joint venture after deciding that the unit licensing fees demanded by Microsoft for WinCE were unacceptably high. Prominent members of the Symbian joint venture include Nokia, Ericsson, Psion, Motorola, Matsushita, Sun Microsystems, Oracle, and Sybase. The "hardware" members of Symbian sell an estimated 9 out of every 10 mobiles phones sold. When Symbian was formed in mid-1998, Symbian received both broad rights to Psion's EPOC operating system and many of Psion's software engineers.

Windows CE. WinCE is the dominant operating system in HPCs (but not in PPCs, where PalmOS still has the lead). Microsoft is faced with a situation in which all major smart phone manufacturers who are prospective licensees of WinCE have already licensed Symbian EPOC. Just as it did in catching up with Internet technology, Microsoft is devoting significant resources to promote WinCE for use in smart phones. In 1999, Microsoft acquired Sendit, a Swedish company, and STNC, a British company; both companies are major players in software for smart phones. Before its acquisition by Microsoft, STNC was a key software developer for Symbian. STNC published a microbrowser, called Hitchhiker, that handled native HTML Web pages, and did not need or use WAP-compliant Web pages. Symbian, however, chose WAP/WML rather than Hitchhiker for Symbian's microbrowser.

Higher end smart phones that provide (i) office application suites, (ii) LAN and other network interfaces, and (iii) vertical industry software applications, e.g., specialized software for financial services, real estate, insurance, medical, legal, outside sales, and other "workflow engineered" markets will probably use WinCE rather than Symbian EPOC. Major software application developers and publishers only write applications for a limited number of operating systems, and the Windows family of operating systems, all of which are based on the Win32 API, are *the* operating system for business applications. Moreover, WinCE is a modular operating system, e.g., different versions of WinCE are used in PPCs that lack keyboard interfaces versus PPCs that have accessory keyboard interfaces. Different versions of WinCE are also used in HPCs; for instance, some HPCs have a USB port (HP Jornada 820, NEC Mobilepro 800), while other HPCs do not (HP Jornada 680, NEC Mobilepro 770).

At Telecom '99, British Telecommunications and Microsoft announced that they will jointly create "wireless devices" running WinCE that will provide voice telephony and Internet access. No manufacturer or timeline was disclosed. Deutsche Telekom's T-Mobil mobile phone subsidiary made a similar announcement concerning WinCE. Also at Telecom '99, Microsoft demonstrated a Microsoft-branded smart phone running WinCE; the Microsoft smart phone accessed a Webserver using a GSM Data connection (9.6 Kbps) and featured an HTML microbrowser.

Time to place your bets

The question on the minds of marketing managers of all smart phone manufacturers and wireless carriers is what "data oriented" feature set and data rates will the emerging smart phone market favor? The answer to that question determines what types of smart phones will sell and what operating system will best address user requirements. To complicate matters, the feature set and data rates will change as airlink interfaces and related airlink data services and pricing change.

The Holy Grail of global mobile telephony, at least for the next 5 years, is the third generation ("3G") standard commonly called Universal Mobile Telecommunications System ("UMTS") and referred to in ITU Recommendations as IMT-2000. To accommodate competing commercial interests and infrastructure, IMT-2000 will probably be a set of three optional airlink interfaces: (1) Direct Sequence Frequency Division Duplex ("DS-FDD", a type of CDMA based on ETSI UTRA and supported by GSM carriers); (2) Multi-Carrier Frequency Division Duplex ("MC-FDD", a second type of CDMA based on cdma2000 and supported by cdmaOne carriers); and (3) time division duplex ("TDD", a third type of CDMA based on a second mode of ETSI UTRA and "harmonized" with TD-SCDMA, an approach favored by China). The wideband CDMA airlink protocols planned for UMTS use 5MHz, 10MHz, or 20MHz radio channels, and will be completely different from GSM's current 200 kHz, TDMA channels.

The choice of an airlink interface in a given geographic area is a commercial decision that could be driven by equipment vendor discounting rather than technical specifications. Having three airlink interfaces as options in UMTS yields a "standard" that could require inclusion of all three airlink interfaces to produce a truly global mobile phone. A global GSM phone, i.e., a phone that works with the PDC, PCN, and PCS variants of GSM, would follow an analogous approach: multi-band, tri-standard. Of today's GSM phones, the tri-band, dual standard Motorola L7089 comes the closest to being global, but does not currently support Japan's PDC standard. Handling multiple airlink interfaces and/or frequency bands obviously complicates technical design and increases cost. Most consumers today don't have, or even know about or need, multi-band, tri-standard GSM phones. The range of features and capabilities found in GSM phones is analogous to the range of features and capabilities found in tomorrow's UMTS phones. Some consumers will buy UMTS phones as fashion accessories; other consumers will buy UMTS phones that are equivalent to desktop computers and can videoconference. Some consumers may even buy videophones as fashion accessories. NEC, NTT DoCoMo, and Sharp, in fact, showed "concept" smart phones with digital video capability at Telecom '99.

According to ITU publications, the main objectives for UMTS and the IMT-2000 airlink interfaces are: (i) full coverage and mobility at 144 Kbps, preferably 384 Kbps (except for satellite coverage at 9.6 Kbps); (ii) limited coverage and mobility for 2 Mbps; (iii) adaptable to new services; and (iv) improved spectrum efficiency. Only a few areas worldwide (e.g., Tokyo) are now approaching the theoretical maximum number of GSM subscribers and need immediate improvements in spectrum efficiency. Globally, the commercial reasons to migrate to UMTS are not voice, but the demand for high-speed wireless data. Migration of voice services from GSM and D-AMPS to UMTS is straightforward: 8 Kbps compressed voice under GSM, 8 Kbps compressed voice under UMTS. The lure of lucre from data services for email, Web browsing, collaborative computing, and multimedia is motivating wireless carriers to undertake the complex and costly migration from GSM and D-AMPS data services to UMTS data services.

The airlink interfaces and data service definitions are driven by international standards bodies. The artistry in strategic planning for smart phones lies in the selection of device form factor (the physical dimensions of a wireless device as optimized for mobile use), operating system, and application software based on market segmentation. These variables will be tailored to market segments to a greater degree than current mobile phones are. Globally, current mobile phones are approximately 99+% voice service and a miniscule amount of data service or text messaging. The predicted transition to predominately data service by 2005 means there are large bets to be placed and risks to be faced. At the heart of these segmentation and risk issues is the smart phone operating system. Although GEOS was used in the first smart phone, PalmOS in the second, and the heavyweights are betting on Symbian EPOC, only WinCE currently has the applications and interfaces to support "desktop equivalent" smart phones. Symbian EPOC and its third party application developers may rise to the challenge, however.

Fluid Definition of the Smart Phone

The product definition of a smart phone requires that the operating system, application software, feature sets, wireless data services, product life cycle, and market segmentation be properly considered, and that the resulting smart phone be technically feasible to manufacture and sell at a profit. Today's reality is that wireless data services are transitioning from SMS and GSM Data to something, but is that something USSD, HSCSD, and/or GPRS? Today's wireless data rates (9.6 to 14.4 Kbps) are slow, but will users pay for the multiple timeslots required by HSCSD to deliver v.34 to v.90 datarates (38.8 or 57.6 Kbps, assuming good RF propagation)? Could it be that mass adoption of mobile Web browsing will not occur until 57.6 Kbps or higher rates can be economically delivered using GPRS? Will WAPped Web browsing be acceptable to users accustomed to desktop Web browsing?

The "simultaneous talk and text entry" and "handle email attachments and real Webpages" problems will drive the creation of higher end smart phones. The Communicator Pal MT-200, a display and keyboard accessory, is Sharp's early recognition that smart phone keypads and small LCDs may be adequate only for "quick check" or "last resort" email and Web browsing, and that users with needs for non-trivial text entry and display will be a viable market. The MT-200 interfaces with many current GSM PDC phones, has a PIM and HTML browser, and permits the user to compose email and to view some types of attachments; it lacks PC syncing. It targets the "10 yen email" market created in 1999 by NTT DoCoMo's i-mode phones. [10]

The most promising near-term market for smart phones is Asia, specifically Hong Kong, Japan, S. Korea, and Taiwan, places with low Internet penetration. The huge, longer term market is China. Asia boasts some of the world's highest mobile-phone penetration rates: in Hong Kong, about 50% of the population has a mobile phone; in Japan, 38%, and in South Korea, 30% of the population has a mobile phone. There is a major gap, however, between mobile phone ownership and Internet usage. Only 14% of Hong Kong's population is online; Japan has 12%, and South Korea has 5% online, according to IDC and US Dept. of Commerce reports. There has already been an amazing acceptance of smart phones in Japan. More than **two million** "i-mode" mobile phones were sold in Japan by NTT DoCoMo alone in the **eight month** period from February to October, 1999. Rapid acceptance of i-mode phones is no doubt stimulated by NTT's pervasive measured rate (toll) terrestrial local exchange service; flat-rate, dial-up access to the PSTN (and therefore, to the Internet) does not exist in Japan. NTT DoCoMo's i-mode phones, the most common of which weighs 90 grams (3.17 ounces), include a microbrowser and a limited form of email. More advanced i-mode phones will run Java Virtual Machines, and support applications such as e-commerce, on-line games, and better graphics. It is unclear whether future i-mode phones will support full email, PIM, and PC sync software, or a new product category will be introduced by NTT DoCoMo.

Given the gap between mobile phone penetration and on-line penetration in Asia, and the meteoric adoption of NTT DoCoMo's i-mode phones, Internet access through smart phones should find an immediate and receptive market in Asia. To reiterate, in places without flat-rate local calling, or where terrestrial cable plant is of poor quality or not available, the first wave of Internet access will likely be via smart phones and GPRS ("Generalized Packet Radio Service", or GPRS, provides up to 168 Kbps).

SmarTone and Cable & Wireless HKT in Hong Kong, KG Telecom in Taiwan, and MobileOne in Singapore are leapfrogging USSD and HSCSD and deploying GPRS. [11] By the middle of 2000, these carriers' GPRS-equipped networks should deliver transmission speeds of 115Kbps and higher, and thereafter transition to EDGE and UMTS. Given its size and underdeveloped local exchange cable plant, the smart phone market in China could surpass that of the rest of the world combined. Globally, about 200 million mobile phones were in use in 1999; if all those were in China, there would be about 14% penetration.

GPRS can be priced by the packet or by airtime. If priced by the packet, GPRS is much better for Web browsing than GSM Data or HSCSD services: an HSCSD user could pay per minute for four simultaneous calls, yet obtain only a 38.8 Kbps datarate; or could use a four-times faster packet-switched GPRS connection and pay nothing for airtime unless actual packets are transferred. Even if priced by airtime, GPRS will probably be a fraction of the cost of GSM Data, since GPRS is a shared service. Both EDGE and UMTS have packet-switched components, so wireless carriers will eventually have to deal with pricing and operating packet services. GPRS is not a dead end, but USSD and HSCSD may be. HSCSD is a circuit-switched technology, and should have lower latency than GPRS, but GPRS' higher datarates probably more than compensate for the risk of higher latency. Moreover, at v.90 speeds and above, latency problems are often not in the "last mile" link between cell center and smart phone, but arise from congestion in terrestrial switching centers.

GPRS as a driver for HPC smart phones

GPRS trials are now underway or scheduled by more than 45 operators in the Americas, Asia/Pacific, and Europe. Production models of GPRS mobile phones should be shown at CeBit 2000 in Hannover. How does the current availability of GPRS, with its higher data rates, better pricing, and native packet technology affect the choice of smart phone operating system? One effect is that GPRS obviates the need for WAP and WML. WAP/WML is the chosen technology of Symbian EPOC. The WAP microbrowser experience is reminiscent of videotex: text-centric and poor graphics. The WinCE experience on a half-VGA HPC with a 115Kbps connection is close to using a desktop computer online, more so if a large format HPC is used [12]. If a standard XML/HTML and HTTP browser can be used in a smart phone, there is no need for protocol conversion of Web content as a page transits from wireline to wireless networks. If the 115 Kbps and 384 Kbps datarates enabled by GPRS and EDGE become available as planned in 2000 and in 2001, respectively, the only reason to use a microbrowser will be memory and processor limitations in a smart phone. Dedicated Webservers that contain only WAP-compliant "low fat" Webpages will never be a substantial part of the universe of Webservers. Moreover, it is possible that "dynamic WAPping" Webservers (Webservers that filter out graphics and animation the moment an HTML Webpage is requested by a smart phone user) will provide unacceptably slow response and even corrupted pages. As noted above, browsing WAPped Webpages is like using a miniature videotex terminal: the thrill is gone @ or wrong: WAPping deletes graphics and animation from HTML Webpages, and thereby also eliminates all information content embedded in the graphics and animation; the deleted information could be useful or even critical to the user. Most WAPped Webpages do not appear to be Webpages at all, but "DOS era" numbered lists and text, aka menu screens. The 100x150 pixel, gray-scale displays on smart phones do not remotely resemble the color, half-VGA displays on most HPCs. Nonetheless, there will probably be a market for smart phones with WAP microbrowsers, but it may quickly become a low-end, low margin market. [13]

Available datarates, processing power, and human factor analysis lead to the conclusion that there will be a market for keyboard-equipped smart phones that provide XML/HTML-based Web browsing, as well as less powerful smart phones. Keyboards for smart phones will come in three categories: integral, like the Nokia 9110; proprietary accessory keyboard, like the Ericsson Chatboard and the keyboard for the HP Jornada 680 PPC; and generic keyboard adapters. [14] Smart phones with minimal user applications that support high datarates will serve as HPC "dataport companions." There would be less need to upgrade one's "dataport" smart phone if its primary functions were voice and high speed data, as opposed to a sophisticated GUI and text handling.

The author segments the emerging smart phone market into the following five categories:

Dataport smart phones. Voice telephony and GPRS, EDGE, or UMTS data capability, additional features (e.g., external antennas, error correction memory) to maintain high data rates in cell fringes, but with no, or only rudimentary, Web browsing and email applications (the rudimentary browser and emailer are to be used when an HPC, PPC, or notebook PC is not available).

Baseline smart phones. Voice telephony, Web microbrowser, and email. NTT DoCoMo's i-mode phones fit in this category.

PPC smart phones. Symbian EPOC-based devices that provide voice telephony, PIM, Web microbrowser, and email. Ericsson's R380 and Qualcomm's pdQ smart phones fit in this category. [15]

HPC smart phones. WinCE-based smart phones that provide an XML/HTML Web browser; half-VGA or better, color screen; office application suites; enterprise network management interfaces; and video telephony in addition to voice telephony, PIM, and email. These devices will have integral or accessory keyboards large enough for touch typing. HPC smart phones equipped for video telephony will probably include a CCD camera built into the upper lip of the clam-shell case, like the Sony VAIO PCG-C1X. [16] HPC smart phones could use a docking cradle in an automobile, and thereby serve triple duty: as a smart phone, an HPC, and AutoPC.

Smart phone HPCs. A smart phone HPC is a "component smart phone," i.e., an HPC with an earset and a GSM or UMTS PC Card. Currently available wireless data cards, such as the AirCard 300 (a Type II PC Card that provides an NDIS LAN interface to a WinCE HPC) could be extended to provide full GSM and UMTS functionality. [17] WinCE HPCs already have multimedia capability; some have an integral digital camera. When a headset (more accurately, an "earset", given the predominance of "over the ear" earphones with integral boom microphones) is worn for voice telephony, the dialing function could be by speech recognition or by keyboard. The GSM and UMTS PC Card market would include both HPCs and notebook PCs. Smart phone HPCs could dock in cradles for powering, PC syncing, LAN access, and handsfree operation (e.g., in cars).

HPC smart phones and smart phone HPCs are therefore highly probable, but none have been announced. NTT DoCoMo, Matsushita, and Sharp have licensed or have R&D programs for both WinCE and Symbian EPOC, but are currently introducing only Symbian EPOC-based smart phones. Microsoft has obtained commitments from manufacturers to use a Microsoft Exchange-based unified messaging system to provide wireless message payload storage, conversion, and serving, has joint ventures with British Telecom and with T-Mobil, and has commitments from other manufacturers to use WinCE in desktop "Web-phones", so wireless devices that rely on WinCE and Exchange Server are likely.

Conclusion

"Baseline" smart phones that use GSM Data are now available. GSM PPC and GPRS smart phones should be commercially available in late 2000. The potential market for the early smart phones appears to be greatest in Asia, particularly in Hong Kong, Japan, S. Korea, and in other places where Internet access is burdened by measured rate terrestrial networks or poor quality cable plant. In anticipation of the emerging data services market for smart phones, several wireless carriers are leaping over USSD and HSCSD and implementing GPRS.

The PPC smart phone strategy presumes that PIM, email, WAPped ("miniature videotex") Web browsing, and PC syncing, in addition to voice telephony, will satisfy users' requirements for mobile voice and data services. For viewing files attached to email, composing non-trivial amounts of email, and using office application suites, the PPC smart phone strategy requires the user to carry a separate computing device, such as an HPC, a notebook PC, or a keyboard and display accessory.

The HPC smart phone strategy presumes a demand for "real" Web browsing, viewing and revising files attached to email, composing non-trivial amounts of email, using office application suites and vertical industry applications, and enabling enterprise network device management. These user requirements will support a market for either HPC smart phones or for smart phone HPCs. A "smart phone HPC" could be an HPC enhanced with a PC Card (or, in the future, a CF+ Card) that accesses a GSM or UMTS network, or it could be a standard HPC coupled with a "minimal smart phone" or "dataport smart phone." Using a smart phone as a dataport means having to hook up a special cable, to carefully position a smart phone linked by infrared to a PPC or HPC (infrared supports up to 4 Mbps versus 115Kbps or less using a cable and serial port), or to use a proximate area network, like Bluetooth, to connect the devices.

This author predicts that baseline smart phones and PPC smart phones will dominant the smart phone market until dissatisfied users who want to browse XML/HTML Webpages, to view and revise files attached to email, to compose non-trivial amounts of email, and to use office application suites create the HPC smart phone and smart phone HPC markets. The emergence of these higher end markets should coincide with the availability of EDGE and UMTS in the 2001 to 2002 timeframe, but may emerge as soon as GPRS is commercially established.

As noted above, a GSM or UMTS PC Card could be used in an HPC or a subnotebook PC, and even in a handset. Being able to connect a device to a GSM or UMTS network by inserting a PC Card would give a user more flexibility, and, from the user's cost perspective, would separate telecom upgrades from portable computer upgrades.

Looking deeper into the crystal ball, using a Bluetooth (or other proximate area network) earset with a smartphone HPC, the smartphone HPC could be in the user's car (base station) while the user dines in an adjacent restaurant. In this way, the earset and smart phone HPC combination could become a PHS, CT2, or DECT substitute. Extending this thought, a smart phone "server HPC" could broker Internet and PSTN access to any user within Bluetooth range @ in effect, a microcell wireless local loop reseller or Internet Access Provider.

[1] The author has no affiliation with any of the software publishers or manufacturers discussed in this paper.

[2] "*Oceanic unveils nation's first interactive TV*", Pacific Business News, Vol. 37, No. 37, p.1 (Nov. 19, 1999).

[3] See http://race.analysys.co.uk/news/br079/ .

4 www.exporttoday.com/archive/september99/article3.html .

5 For acronyms and standards not defined in this paper, please refer to http://webopedia.internet.com , www.gsmdata.com/glossary.htm , or www.mobiletelecoms.com/glossary.htm.

6 See www.wapforum.org.

7 See www.qualcomm.com and search on "pdQ".

8 See http://www.ericsson.com/ and search on "R380".

9 See www.symbian.com.

10 See http://www.sharp.co.jp/sc/gaiyou/news-e/981125-1.html.

11 See www.telecomasia.net and search on "GPRS".

12 E.g., NEC Mobilepro 800 HPC, which has an 800 x 600 pixel, 65K color, 9" diagonal touchscreen.

13 Another potential threat to smart phones with WAP microbrowsers is a microbrowser and display that provided a thumbnail image of an XML/HTML Webpage, and permitted the user to select an area to view in native XML/HTML. This concept is called a "virtual desktop", and permits lower resolution LCDs and CRTs to display accurately selected portions (pixel areas) of a higher resolution screen.

14 See www.microfoundry.com/keymate.htm .

15 Smart phones based on the Geoworks operating system also fit in the PPC smart phone category, but have limited support among manufacturers and even less support among third party application software developers.

16 See www.ita.sel.sony.com/ and search on "C1X".

17 See www.sierrawireless.com/news/JUN-21-99.html and www.rim.net/products/pc_card/m-pccard.html.

Sessions

The Effects of IP Telephony on Emerging Economies

Robert W. Harbison

Throughout the history of telecommunications, the smaller countries and corporate enterprises have been at a distinct disadvantage in competing with the large telecommunications giants such as AT&T and the nationalized telecom carriers such as BT, DT, and NTT. The telecommunications giants have been able to set standards, pricing, and service offerings that have made it difficult for the smaller communications companies to effectively compete for corporate, wide area, and international services.

IP Telephony

In 1995 a small Israeli company, Vocaltec, offered an end-user software package known as Internet Phone that would digitize and packetize voice and direct the communication stream over the Internet to another user with the same software, providing the first Internet-based free telephone calls. This was the beginning of the voice communications revolution. These calls were of course subject to Internet delays, packet loss, irregular packet delivery over the Internet known as jitter, and they were in no way comparable to the quality of service experienced with conventional switched telephone networks: but it was free, and that started the communications revolution goldrush.

IP Telephony Gateways

By 1997 there was an increasing number of both new and old companies offering Internet Protocol Telephony Gateways, including Lucent, Nortel, Seimens, Cisco, Ascend, 3Com, Delta 3, NetSpeak, Nuera, Clarent, IDT Net2Phone, StarVox, and so many others that the list would include more that 100 companies. The beginnings of this new communications revolution focused on one primary communication protocol that evolved as a defacto standard, i.e., H.323, but the physical delivery technologies seemed to cover every potential physical network type. They included voice over IP (VoIP), voice over frame relay (VoFR), Voice over ATM (VoATM), voice over DSL (VoDSL), and have become collectively know as voice over X-media offerings or VoX technologies.

IP Telephony Gatekeepers

Ultimately through 1997 and 1998 most companies began to realize that a separate control point was needed to build scalable VoX networks and they gateway functionality need to be separated from the gatekeeper control functions. The H.323 protocol evolved to H.323 v2.0 and subsequently to v2.1 to further define the functions of the gateways and gatekeepers. VoX industry pundits such as Jeff Pulver declared 1998 to be the Year of the Gatekeeper and although there were many gatekeeper developments and offerings, there still did not seem to be any great degree of large scale implementation or competition to the dominant communications carriers.

Although the intention of f H.323 version 2.x protocols was to delineate gateway and gatekeeper functionality in an attempt to provide interoperability between vendors, many parts of the protocol could be optionally implemented and still be qualified as meeting the specifications. These optional implementations of the enhanced services actually went further to devolve interoperability then to improve it.

As the leading router vendors began providing H.323 voice compression cards for their routers, the role of the H.323 gatekeeper increased and a number of third party software companies such as StarVox, Vocaltec, and Lucent began to use their software-based gatekeepers to control router-based voice gateways. This was founded on the belief that major corporations and carrier networks would be more likely to implement high reliability routers over software-based voice gateways. Many of these gatekeeper / gateway combinations also used computer telephony integration (CTI) or the H.323/H.450 Enhanced Services to build enhanced service offerings that were more tightly integrated with the PBX and the corporate networks. The StarVox Communications Server is an example of these enhanced offerings. From a carrier perspective, Central Office (CO) switches were also IP telephony gateway enabled through the GR-303 protocol to be able to provide IP gateways and clients with the traditional Centrex functionality of Class 5 Switches. The AGS iMerge Gateway is an example of these CO offerings that extend Centrex features to IP telephony gateways and clients.

IP Telephony Applications

By 1999 IP telephony still was not being adopted in large scale, although there were a number of IP telephony IPOs in the consumer-to-consumer calling segment: most notably ITXC, IDT Net2Phone, and Clarent who each provide low cost world-wide calling. Again, the industry pundits made the predictions that 1999 would be the year of the IP Telephony application and adoption of IP telephony would require enhanced services, billing and accounting, and application integration with the existing corporate networks. Directories were labeled as the target mechanism for integrating conventional telephony services, IP telephony services, corporate policies, billing and accounting, and enhanced communications services such as one number portability and follow-me services, guest office and hoteling services, and support for the ever increasing number of mobile workers and telecommuters.

1999 produced a number of notable IP telephony billing and accounting systems including products from Mind CTI, Kennan, and Portal Systems. Enhanced gateway functionality and network directory integration were provided by such companies as Lucent, StarVox, and Vocaltec.

IP Telephony Protocols

IP telephony providers such as Clarent, ITXC, Net2Phone and many others claimed to be carrying millions of call minutes, but IP telephony was still not being adopted in any notable large scale. The many players included the corporate enterprise, the internet service providers (ISPs), network service providers (NSPs), competitive local exchange carriers (CLECs), dominant inter-exchange carriers (IECs), and of course all of the small independent IP telephony networks being promoted by each vendor. Seemingly, the reason for lack of large-scale adoption was that all of the different players still could not create any noticeable degree of interoperability between their various systems and a range of new protocols were evolving from both the voice and data sides of the industry. The standards in flux have kept many companies and carriers from rolling out large-scale offerings. Today there are at least four voice over date protocols competing for various parts of this new communications revolution and include a combination of the simple gateway control protocol (SGCP) with the Internet protocol device control (IPDC) to create the master gateway control protocol (MGCP). MGCP is now controlled within the International Telecommunications Union (ITU) as H.GCP. Another variation of the MGCP is Megaco and is supported by a large consortium of vendors. Finally, there is the session initiation protocol (SIP) that evolved out of work at Columbia University.

Throughout 1999, there were many interoperability labs and testing facilities created with great fanfare, but very little in the way of true interoperability between products was ever announced and at the end of 1999, most IP telephony products could only operate with products from the same company. The exception to this has been third party gatekeepers controlling router-based gateways through the H.323/H.225 session control protocols.

The Year 2000 Freeze, aka the Y2K Blues

Probably the single most important factor in slowing the adoption of IP telephony has been the IT department requirements to address the Y2K paranoia, whether real or imagined. Most large corporations, ISPs, NSPs, LECs, CLECs, and IECs understandably had IT freezes regarding implementing any new technologies until after the year 2000 turnover. These freezes on new technology implementation and adoption generally didn't inhibit IT managers and CIOs from looking at and reviewing IP telephony and may prove to be a very important factor in allowing the technology to improve and mature to a far more stable and deployable technology.

As It managers reviewed and tested IP telephony products throughout 1999 with the intention of beginning deployments in 2000, the information and feedback they provided to manufacturers and software developers have allowed the products to improve their feature-sets, interoperability, scalability, manageability, and more robust deployment and support capabilities.

IP Telephony in a Wireless World

The 1999 Y2K freeze also provided the time and opportunity for many of the IP telephony manufacturers to begin integrating their products with the rapidly evolving voice and data wireless industry. The rapid growth of the wireless industry has provided companies such as Ericsson, Motorola, Nokia, and Qualcomm with extraordinary revenues that have allowed them to invest in network infrastructures and include, email, short message services and IP telephony into their products. Most new wireless phones in 2000 will be capable of integrating with the Internet and instant messaging services (IMS) of some sort or another. At the same time, IP telephony providers such as Lucent, Nortel, Cisco, 3Com, StarVox, InterTel, Vocaltec and many others are offering fully integrated IP telephony service over wireless delivery. The cellular telephone and the handheld personal digital assistant (PDA) are rapidly becoming one in the same as illustrated by the Nokia 9000 and the Qualcomm pdQ Smartphones.

The Opportunities of IP Enabled Networks

The business opportunities for Telcos, CLECs, ISPs, NSPs, PT&Ts, and even independent corporations are enormous. Regardless of the previous three years statements by world-wide Telcos that IP telephony rate arbitrage would have a short life, IP telephony has been very instrumental in leveling the playing field and have forced the major world Telcos to vastly reduce their pricing. IP telephony continues to provide a tremendously lower cost and is forcing these Telcos to further reduce their pricing.

Although the rate arbitrage issue is still alive and driving prices down, the real adoption of IP telephony will be in providing vastly enhanced services to subscribers for world-wide calling and message communication services. The selection and provisioning of these services will be user configurable via phone and DTMF touchtone, cell-phone and wireless application protocol (WAP), computer browsers, etc. This will allow the individual user to select services dynamically as needed, reducing the Telco's or ISP's customer service requirements.

Telco and CLEC Carrier Network Telephony

Although Telco and CLEC grade requirements for network telephony are continuing to evolve, the important issues are extremely high reliability and scalability to be able to carry thousands, even tens of thousands of calls through any single point of presence. Although improvements in digital signal processors are now delivering the needed hardware densities for large scale implementation to support the needed scalability, the real problems lie in potential regulatory issues, access charges, and rate settlement issues.

Will Telco and CLEC carriers charge by the minute, flat rate as ISPs currently charge, or will new billing paradigms evolve? It has been said that what is good for the Telcos is not good for competitive or alternate carriers. Telco carriers do not want to see the per minute charges diminish or become flat rate, nor do they wish to have competitive carriers connect to the PSTN without equal access charges and tariffs being applied. Each of these trying issues will continue impede network telephony adoption by major carriers unless it is simply for background services that will reduce their own operating costs.

Internet Telephony Service Providers

Internet Service Providers are in a unique position to provide network telephony offerings to both individual users as well as enhanced services to business and corporate users. This is due not only to their existing network connections and bandwidth management capabilities, but primarily because they are already in the service provider business with ever increasing number of both individual and business subscribers.

Those ISPs that adopt network telephony are being referred to in the press and trade journals as Internet Telephony Service Providers or ITSPs. ITSPs can provide a variety of network telephony services that are user-oriented services, business-oriented services, or a combination thereof.

A growing number of ISPs have become, or are in the process of becoming, ITSPs as well. Companies such as Qwest, PSINet, NetCom-Mindspring-Earthlink and others are currently offering some form of network telephony. Since these large ISP/ITSPs own or contract their POPs and network backbones, the quality of voice over their networks is controllable and the billing issues and rate settlement are straight forward issues.

ITSP Personal Subscriber Telephony Services

ITSP Personal Subscriber Telephony Services (PSTS) can provide users with PC-to-PC Internet telephony connectivity by providing gateway services that become the directory, on-line registry service and routing service for it's subscriber base. Further, ITSPs can provide enhanced network telephony services that connect the subscribers to the Public Switched Telephone Network (PSTN) through ITSP-based gateways and provide a variety of messaging services.

PC-to-PC Internet Telephony Communications Services

When providing a purely PC-to-PC based set of Internet telephony communications services, there is still a need for the ITSP to have a directory service of subscribers, a on-line registration system of users currently available for voice communications, and a routing service to route calls and connect the parties transparently.

There is a need for a Gatekeeper to register available end-points, subscribers, as they come on line to the ITSP network. The gatekeeper software must be capable of handling thousands upon thousands of concurrent users and potentially communicating with gateways from different vendors.

Enhanced PC to Conventional PSTN Services

ITSPs can also provide and enhanced set of personal subscriber telephony services that allow the subscribers to place ***off-net*** telephone calls to conventional TDM-based PSTN telephones. In this configuration the ITSPs POP locations become the ***hop-off*** point in such a fashion that the personal subscriber uses the Internet for the long distance segment of the telephone call and at the ITSP POP it is converted into a TDM-based call and connected to the local PSTN.

ITSP Business Subscriber Telephony Services

In providing business communications services, the ITSP must consider the volume of calls placed by corporate customers and that it is likely that CPE based gateways will be required to adequately handle the corporate needs. There are a number of important aspects to consider with CPE-based voice gateway solutions.

Business Communications Services

The need for CPE-based network telephony gateways becomes evident when reviewing the corporate calling needs and patterns. Typically, a corporation or business would lease on-net voice services from a major Telco carrier to provide less expensive calling rates between corporate offices. This would require an additional T1 line from the corporate office to the carrier POP to carry the voice channels. Since the corporation also has local loop lease lines connected to its ISP of choice, voice can be carried over the ISP connection at a substantially lower rates than those offered by the Telco as we saw above in **Error! Reference source not found.**. It is important to recognize that the network telephony gateway must therefore be CPE-based and located at the customer site.

By providing CPE-based gateways, the ITSP can provide many of the enhanced services offerings by integrating with the existing PBX and network directory. The ITSP can provide and manage not only a data VPN for its business subscribers, but also a voice VPN as well.

The gatekeeper servers would be located within the ITSP, NSP or Telco and provide for many different gateways to access the network and provide originating and terminating services. Since the gatekeeper servers can be managed from anywhere in the network, as any other data service, the improved management capabilities allow the ITSP to continue to manage both the data and voice networks for the customers creating a stronger bond and commitment between the ITSP and their customers. With many different ISPs to chose from, customers have readily switched whenever new offerings or lower rates became available from another ISP. When a customer has both their voice and data being carried by an ITSP, it is unlikely that they will be willing to switch to a different ISP or ITSP with considerable forethought.

Not only does this aid the ITSP in maintaining customer ownership, but it also provides them with another stream of potential recurring maintenance revenue.

Inter-Enterprise Communications Services

Probably the most important and revenue producing opportunities will come from providing ubiquitous communications between multiple business enterprises.

With the expansive network backbones and network interconnections that today's ISPs have, it provides an ideal means of inter-connecting network telephony services between multiple customers, clients, and other businesses.

This would require that the network telephony gateways support the implementation of directory services through the light directory access protocols (LDAP) to provide the necessary access, profiles, and authentication services to ensure that the VPNs were properly implemented and enforced for security purposes. This would provide business-to-business network telephony solutions between various businesses, suppliers, and customers creating an increasingly strong bond between the customers and the ITSP.

Summation: The IP Enabled Network Opportunity

Network telephony has emerged as one of the most important and fast growth industries of our time. It provides the capability of lowering the cost of call minutes, network infrastructures, and network management, as well as the immense capability to provide an entire new range of communications services that can be integrated with collaborative computing applications.

The tremendous advantages available to emerging economies include;

- the ability to reduce the infrastructure build-out costs
- the ability to compete on a more level playing field for pricing
- providing new and enhanced services that can be tailored to local needs
- further integration with the newly evolving wireless technologies
- networks and services that are much easier to provision and manage
- software-based systems that can be rapidly adapted to new needs and services

The combination of reduced costs and new services will result in an overall increase in call minute usage that will further spur the growth of network telephony as the preferred communications media of the future. Those who embrace it will see revenues increase and those who do not will almost surely see declines. These trends will be first noticed in the international and corporate communications arenas through network service providers and VPNs with personal communications services soon to follow from Telco carriers and ITSPs.

Biography

Robert W. Harbison

Mr. Harbison is a co-founder and Principal Consultant of VentureView LLC, a consultancy that specializes in working with startup companies, as well as the venture capital and investment banking community. He has an extensive history in the computer industry beginning with Digital Equipment Corporation in 1967. Mr. Harbison's extensive 30+ years in the computer business have taken him from DEC minicomputers through mainframes, SNA, LAN/WAN integration and design, TCP/IP, directory services, and computer telephony integration.

Mr. Harbison has held numerous positions including field service, customer support, technical writer, network design and analysis, sales, marketing, industry analyst and consultant, and most recently as the co-founder of two successful venture-backed startup companies focused on network telephony, StarVox Inc., and computer telephony training and certification, the Computer Telephony Institute.

This broad technology background has enabled him to develop a unique insight into the newly evolving voice-over-net technologies that are enabling the convergence of our existing voice and data networks.

Sessions

Related Sessions

Satellites & Submarines

M.2.4 State of the Industry Discussion: Submarine Fiber Optic Cable Systems - Today's Business Issues

Monday 31 January, 1400-1530
Location: Tapa II

Moderator:
LAWRENCE CODACOVI, President & CEO, Pangea Ltd.

Global telecommunications deregulation has unleashed an astounding increase in international service providers and a seemingly endless flow of investments in transport facilities. Equally impressive investments are being made in terrestrial and satellite transport capacity. The Asia-Pacific has joined the telecom boom. Some 250 carriers are now providing international services in the region, and these will be joined by an additional 100 to 150 more in the near term. These and others will vie for traffic in deregulated economies now numbering 11 and growing to 19 by 2002.

Meanwhile, the number of Internet hosts worldwide passed 56 million in 1999. Slightly more than 29 percent of these were territorial domains, of which the Asia-Pacific region accounted for nearly 8% or just over 4,400,000. As of mid-1999, this region accounted for nearly 27 million of the 179 million Internet users worldwide.

The Asia-Pacific is widely recognized as a new frontier for investments and services as it becomes what TeleGeography, Inc., calls competition's "third axis" for international telecom services. While the media, analysts and prognosticators debate these issues along with others focusing on supply, demand, investment and "glut," there are others that must be addressed as the Asia-Pacific moves forward on procuring its broadband international infrastructure and allied services. To address these, PTC '00 has assembled a world-class panel of experts armed to participate in a lively give-and-take "free for all" discussion on the diverse elements that impact our industry in the Asia-Pacific Region. Following this, audience participation is warmly welcomed.

Panelists:

JEAN GODELUCK, Chief Operating Officer, Alcatel Submarine Networks

ALAN ROBINSON, Director, Capacity Management, Cable and Wireless

OWEN BEST, VP Asia Pacific, FLAG Telecom

KATSUTOSHI TAMURA, General Manager, Submarine Networks Business Development, Fujitsu

WIILIAM CARTER, President, Global Crossing Development Company

YASUHIKO NIIRO, President, KDD Cable Systems, Inc.

BRADLEY HOLMES, President, Project Oxygen Networks Ltd.

LIM TOON, Chief Operating Officer, Singapore Telecom

THOMAS SOJA, President, T Soja Associates

ERNIE WAN, Chief Technical Officer & VP Operations, Southern Cross Cables Limited

JOHN TIBBLES, Vice President, International Backbone Development, MCI Worldcom

Chairing this distinguished group of participants is

Lawrence M. Codacovi, President and CEO of Pangea Ltd. Mr. Codacovi, a 40-year telecommunications veteran, most recently served as Senior Vice President of MCI WorldCom's international unit. In these and in prior responsibilities, Mr. Codacovi has been involved in the network planning and acquisition process on virtually every major submarine optical fiber system in place today. Thought-provoking topics to be addressed by the panel include:

- Submarine System Supply and Demand— A Realistic Prognosis
- Gaps in Connectivity—Where is New Investment Needed?
- Will shore-to-shore cable systems continue to be developed? Are backhaul costs reasonable?
- Traffic Drivers—Internet, Intranet, VPNs and Others
- What is the future of Sonet/SDH on submarine cables? Are wavelengths the product of the future?
- Optical Fiber Throughput Trends—Where is Technology Taking Us?
- Financing—will funds be available for future cable systems? What are the key financial drivers in successful financing?
- Who are the Customers—Carriers, End Users, Systems Integrators and Others
- The Impact of Carrier Growth and Consolidation on Carriers' Carriers
- Is there a Bright Market for Dark Fiber?
- Talent Pool Concerns—Finding the Right People
- Addressing Quality through Systems Integration and Global Connectivity
- Supplier Concerns—Cable Manufacturing and Installation Resources

Sessions

State of the Industry Discussion: Submarine Fiber Optic Cable Systems - Today's Business Issues

Global telecommunications deregulation has unleashed an astounding increase in international service providers and a seemingly endless flow of investments in transport facilities. For example, one industry report indicates that the number of international carriers worldwide has grown to more than 1800 in 1999 from approximately 500 in 1996, while another forecasts that the cumulative investment in submarine fiber optic systems will reach $48.5 billion in 2004 from $16.7 billion in 1998. Equally impressive investments are being made in terrestrial and satellite transport capacity.

The Asia-Pacific has joined the telecom boom. Some 250 carriers now providing international services in the region, and these will be joined by an additional 100 to 150 more in the near term. These and others will vie for traffic in deregulated economies now numbering 11 and growing to 19 by 2002.

Meanwhile, the number of Internet hosts worldwide passed 56 million in 1999. Slightly more than 29 percent of these were territorial domains, of which the Asia-Pacific region accounted for nearly 8% or just over 4,400,000. As of mid-1999, this region accounted for nearly 27 million of the 179 million Internet users worldwide.

The Asia-Pacific is widely recognized as a new frontier for investments and services as it becomes what TeleGeography, Inc., calls competition's "third axis" for international telecom services. With this emergence come the same old questions of rising capacity, falling prices, accurate traffic flow predictions, the impact of the Internet and other bandwidth consumers, the long-term prospects of deregulation, and especially what all this means for submarine optical fiber system investors, installers and operators.

While the media, analysts and prognosticators debate these issues along with others focusing on supply, demand, investment and "glut," there are others that must be addressed as the Asia-Pacific moves forward on procuring its broadband international infrastructure and allied services. To address these, PTC '00 has assembled a world-class panel of experts armed to participate in a lively give-and-take "free for all" discussion on the diverse elements that impact our industry in the Asia-Pacific Region. Following this, audience participation is warmly welcomed.

Confirmed participants are:

- Mr. Jean Godeluck, Chief Operating Officer, Alcatel Submarine Networks
- Mr. Owen Best, VP Asia Pacific, FLAG Telecom
- Mr. Katsutoshi Tamura, General Manager, Submarine Networks Business Development, Fujitsu
- Mr. William B. Carter, President, Global Crossing Development Company
- Dr. Yasuhiko Niiro, President, KDD Cable Systems, Inc.

- Mr. Greg Attorri, Managing Director, Telecommunication Group, Morgan Stanley Dean Witter
- Amb. Bradley P. Holmes, President, Project Oxygen Network Ltd.
- Mr. Lim Toon, Chief Operating Officer, Singapore Telecom
- Mr. Thomas A. Soja, President, T Soja Associates
- Mr. Ernie Wan, Chief Technical Officer & VP Operations, Southern Cross Cables Limited
- Ms. Claire Calandra, Executive Vice President, Chief Operating Officer, Tyco Submarine Systems
- Mr. John Tibbles, Vice President, International Backbone Development, MCI WorldCom
- Mr. Alan Robinson, Director, Capacity Management, Cable & Wireless

Chairing this distinguished group of participants is Lawrence M. Codacovi, President and CEO of Pangea Ltd. Mr. Codacovi, a 40-year telecommunications veteran, most recently served as Senior Vice President of MCI WorldCom's international unit. In these and in prior responsibilities, Mr. Codacovi has been involved in the network planning and acquisition process on virtually every major submarine optical fiber system in place today.

Thought-provoking topics to be addressed by the panel include:

- Submarine System Supply and Demand - A Realistic Prognosis
- Gaps in Connectivity - Where is New Investment Needed?
- Will shore-to-shore cable systems continue to be developed? Are backhaul costs reasonable?
- Traffic Drivers - Internet, Intranet, VPNs and Others
- What is the future of Sonet/SDH on submarine cables? Are wavelength's the product of the future?
- Optical Fiber Throughput Trends - Where is Technology Taking Us?
- Financing - will funds be available for future cable systems? What are the key financial drivers in successful financing?
- Who are the Customers - Carriers, End Users, Systems Integrators and Others
- The Impact of Carrier Growth and Consolidation on Carriers' Carriers
- Is there a Bright Market for Dark Fiber?
- Talent Pool Concerns - Finding the Right People
- Addressing Quality through Systems Integration and Global Connectivity
- Supplier Concerns - Cable Manufacturing and Installation Resources

Sessions

Technology

M.2.5 Essentials of Broadband & Emerging Technologies: Infrastructure & Services

Monday 31 January, 1400-1530
Location: Tapa III

Moderator/Presenter:
RAY HORAK, President and GPB, The Context Corporation, USA

This session explores the world of broadband communications, focusing on infrastructure and services. Infrastructure is examined in terms of access and transport technologies, including Digital Subscriber Line (DSL), Wireless Local Loop (WLL) and SONET/SDH. The services discussion compares and contrasts IP (Internet Protocol) versus ATM (Asynchronous Transfer Mode). Ray Horak is an internationally acclaimed author and lecturer, this session is a highly dynamic, fast-paced and plain-English discussion of the latest developments in the broadband networked world.

Related Sessions
M.1.5 Intelligent Networks
M.2.5 Essentials of Broadband & Emerging Technologies: Infrastructure & Services
M.3.5 Broadcast in the Era of Convergence
T.1.5 Distance Learning Applications and Directions
T.2.5 Applications for Technology for Distributed Learning
W.1.5 Electronic Business: Global, Regional and National Issues
W.2.5 Political Economy
W.3.5 IMT-2000 in Asia-Pacific

Biography

Ray Horak

Ray Horak is the founder and President of The Context Corporation, an independent consultancy based in Mt. Vernon, Washington. Context consults with carriers, manufacturers, distributors and end users across a wide range of communications system and network technologies and their application.

Ray is an internationally acclaimed lecturer and author, noted for his skill in making complex technical subjects understandable at all levels. His substantial experience includes Asia, Australia, Europe, the Middle East, New Zealand and South America, as well as North America. He currently serves on the faculty of Network World Technical Seminars, teaching their cornerstone seminars, Essentials of Networking & Data Communications. Abroad, he is on the faculties of IDG and AIC.

Ray is the author of the best-selling Communications Systems & Networks, published by IDG Books. He has authored well over 100 articles for leading industry trade publications and is a member of the Advisory Board of Datapro Information Services Group. He serves on numerous Editorial Advisory Boards, and is Consulting Editor for several publications, including Newton's Telecom Dictionary.

He has over 25 years' experience in networking, having held management positions with Communications Group Inc., CONTEL and various CONTEL subsidiaries, and Southwestern Bell Telephone Company. His experience also includes AT&T and Bell Telephone Laboratories. Ray holds BBA and MBA degrees from The University of Texas at Austin.

Sessions

Policy/Regulatory

M.2.6 Regulatory Issues and the Internet
Monday 31 January, 1400-1530
Location: Honolulu Suite

Chair:
JAMES SAVAGE, President, Raincoast Group, Canada

M.2.6.1
MICHAEL REEDE; PETER LEONARD, Partner, Gilbert & Tobin, Australia
Emerging eMarkets - Positioning For Regional eCommerce Opportunities

M.2.6.2
CHANG-HUN PARK, Director, Corporate Planning, Korea Telecom, Republic of Korea
Internet and Local Competition

M.2.6.3
ROBERT FRIEDEN, Professor of Telecommunications, Penn State University, USA
The Potential Regulatory and Universal Service Consequences of Internet-mediated Accounting Rate Arbitrage

Sessions

Emerging eMarkets - Positioning For Regional eCommerce Opportunities

Michael Reede

The Elusive eStrategy - Act or Perish

On 14 May 1999 Paul Volker the former US Federal Reserve Chairman reached the somewhat disturbing conclusion that:

> *"The fate of the world economy is now totally dependent on the growth of the US economy, which is dependent on the stock market, whose growth is dependent on about 50 stocks, half of which have never reported any earnings"*

The world's major capital markets and economies have been radically affected by the growth of Internet technologies and the market capitalisation of Internet and electronic commerce stocks. These stock prices may well be over-inflated; certainly traditional valuation methodologies and price earnings ratios would support such a conclusion. However there is a widely held belief that significant revenue and profit generating opportunities will continue to be derived from exploiting the Internet.

This phenomenon is partly driven by capital markets and their vested interests in premium listings, the rise of "day traders" and a general resurgence in stock markets. Nevertheless, when all of the hyperbole is stripped away, ecommerce is causing fundamental economic shifts of relevance to all governments and corporations in the Asia Pacific region. Undoubtedly, major opportunities will arise for regional businesses as a result of the rapid global expansion of ecommerce.

In the next 24 months, perhaps sooner, the regional market will have taken shape and winners and losers from the digital economy will emerge. A gap is now beginning to emerge between those corporations that have embraced the digital economy and those that have not. Despite the evident opportunities, there remains an unnecessary level of concern associated with significant online forays. This is partially because business models have been changing rapidly. Yet, we now have a much better view of successful online strategies and the capital flows and transactions associated with them.

Pure internet businesses will face a shakeout over the next five years. Some will survive and prosper while others will vanish. There have been spectacular successes and there will be spectacular collapses. However, one principle is certain, all traditional businesses must have an effective online strategy or they will suffer.

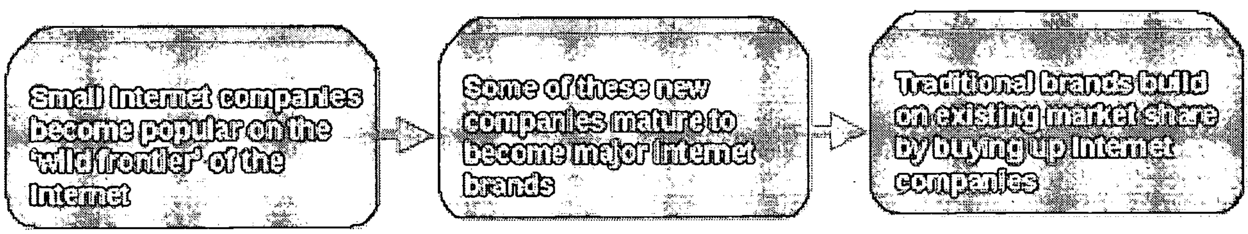
Creating Order Amongst Disorder

The hype surrounding the Internet can cause a sense of structure to be lost, yet there are a number of reasonably clear levels to the market. A recent University of Texas study has characterised these levels in the following manner:

- *Level 1 - Internet infrastructure* - Telecommunications companies, Internet service providers, Internet backbone providers, networking hardware and software manufacturers, PC and server manufacturers, security providers and manufacturers of fibre-optics and associated equipment (eg Regional carriers, CISCO, Lucent, QWest, Compaq, IBM);
- *Level 2 - Internet applications infrastructure* - Software products and services that facilitate web transactions and transaction intermediaries, Internet consultants, Internet commerce applications, multimedia applications, web development software, search engine software online trading and web and relational databases (eg Microsoft, Adobe, Netscape and Oracle);
- *Level 3 - Internet intermediaries* - Typically an Internet pure play that does not directly generate revenues from transactions but from advertising, membership and subscription fees and commissions, including vertical and horizontal portals, content providers, Internet advertising providers, online travel agents and brokerages (eg Yahoo!, E*trade);
- *Level 4 - Internet commerce providers* - Companies conducting web based ecommerce transactions such as e-tailers, manufacturers selling direct online, online entertainment, and professional services (eg Amazon.com).

Asia Pacific ecommerce success stories may emerge from particular layers of the digital economy. Already equipment and applications are dominated by North American corporations and regional corporations will find it difficult to achieve the upper hand in this competitive sector. However, the major regional telecommunications carriers, if sufficiently enlightened, are capable of developing a strong position in electronic commerce at each level. Broadcasters and other media companies, banks and other financial institutions, brokers and a variety of merchants around the region also have strong offline attributes that present significant on-line opportunities.

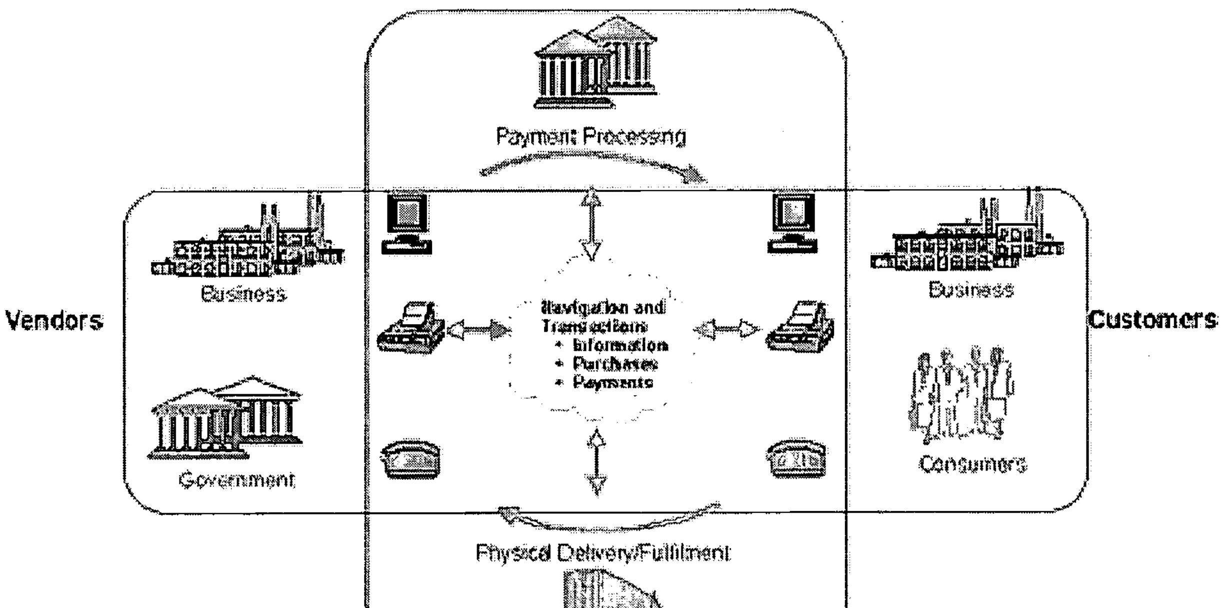
Levels 3 and 4 will also produce many regional "pure play" ecommerce companies. The models are rarely unique. Typically they have been launched in markets where the competition has been thin and have succeeded by keeping a close watch on Silicon Valley and the West Coast venture capital markets and imitating US models.



The last 12 months has seen a variety of these businesses launched around the region. Many are unknown and are seeking to obtain a competitive edge. However, a number of the entrepreneurs behind these vehicles are also looking for a quick exit, either through an IPO or sale to a traditional business willing to buy into the learning curve, rather than start with a total greenfields project. There will be a high level of activity in the next few years in capital markets (VC, mezzanine and IPO funding) and acquisitions. Capital values will not always be great but in the right circumstances there will be significant multiples.

Electronic Commerce and its Underlying Trends

In its broadest sense, the term "electronic commerce" covers all transactions which, at some point, involve the use of both telecommunications infrastructure and information technology. A more workable definition is that ecommerce is anything which generates a cashflow from the Internet. It involves not only the web interface so apparent to users, but its interrelationship with suppliers of offline goods and services, the banking system and physical logistics enterprises.



Source: Paul Mirabello, BCG

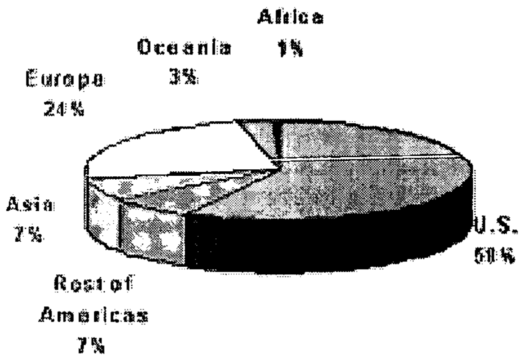
In many ways, ecommerce is simply a new way of doing business. However, it also presents some very new business paradigms with the following features:

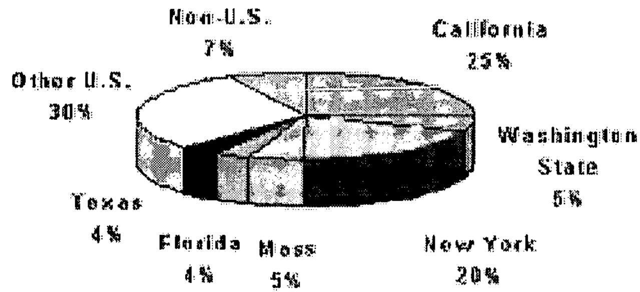
- services are becoming more important than products;
- mass production is being supplanted by demand driven production, which in turn requires electronically integrated supply chain systems;
- customised bundling of services supported by sophisticated user profiles;
- differential pricing and fine market segmentation;
- services and products can be both commoditized and personalised; and
- "dynamic brokering" achieved through intelligent agents.

US Centricism - A Global Network with a North American Focus

The current World Wide Web is decidedly North American in culture and focus, although this influence is slowly declining. While the Internet provides a global information infrastructure for users, content generation and traffic remain highly concentrated. Of the 100 most visited web sites, 93 per cent are in the United States. Of these, almost half are in either California or New York. The portal giants are all US companies - including Yahoo!, AOL, Netscape, Microsoft, Infoseek and Disney. [1]

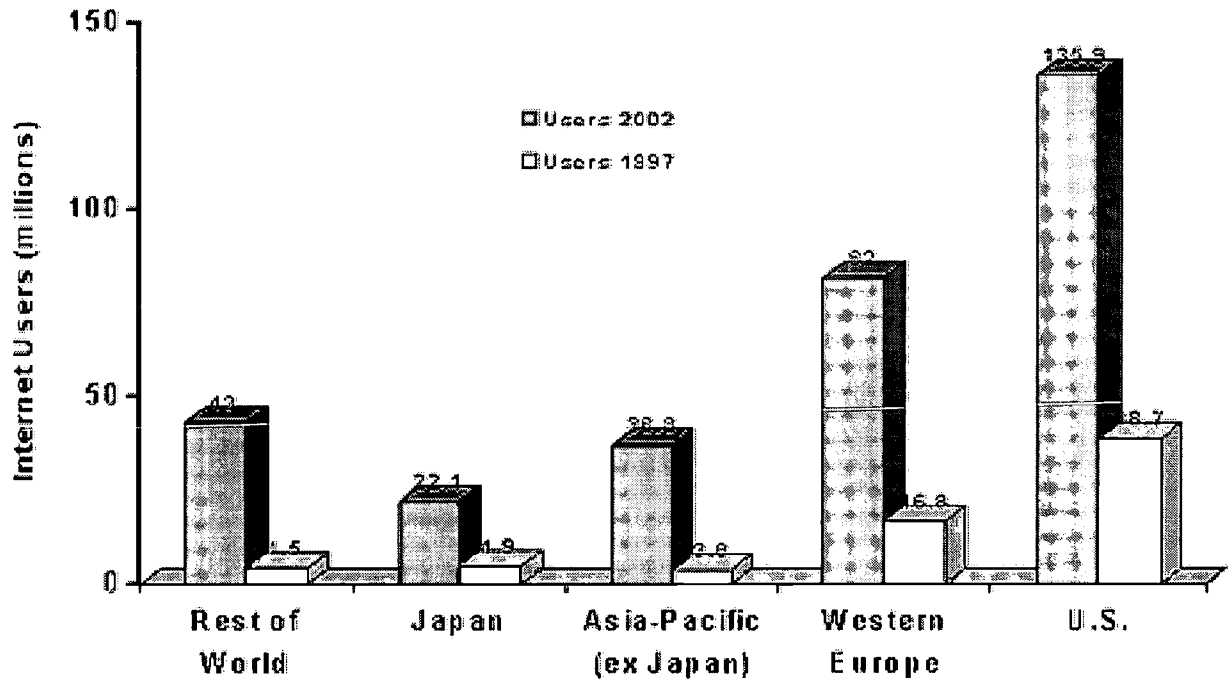
Global Website Distribution





The number of Internet users in the Asia Pacific region is expected to increase significantly between 1997 and 2002 [2], but these figures are still dwarfed by the massive anticipated increase in users in the United States and in Western Europe during the same period. Nevertheless, the Asia-Pacific region *is* the next most significant in terms of sheer numbers and growth opportunities. The Yankee Group estimates 175 million paying Internet subscribers in the Asia Pacific region by 2006. The introduction of new lower cost technologies may result in even greater market penetration in emerging economies.

Internet User Growth 1997 - 2002



The Asia Pacific region therefore reflects a significant proportion of the world's population and a significant and growing proportion of users and websites. This nascent digital economy must address the following issues:

- Increased levels of trade in service outflows to North America with a consequential impact on the competitiveness and profitability of local corporations, tax collection and data control. US-based e-commerce businesses, particularly those supplying or trading intangibles such as shares, may siphon a substantial proportion of business from regional companies or institutions.
- Consequential impacts on domestic media and data traffic patterns. Given the highly asymmetrical nature of content flows between the US and the region, US carriers are not prepared to follow the traditional international PSTN model in which capacity at the US end is provided on a reciprocal basis, and at cost. As a result, the region may not only lose retail level revenue (e.g. share trading) to US-based e-commerce businesses but also may have to bear high capacity costs to the US over which that trade occurs.
- A continued drift in skills that may emphasise the gap between sophisticated and less sophisticated digital economies.

Already such US centric features of the Internet are having a significant dollar value impact:

- Sites targeted at Asia Pacific users are being physically set up in the US, although they appear to be hosted in domestic markets. US site operators are profiling users around the world and developing broad loyalty, in a virtual environment that does not recognise geographic boundaries.
- Stock exchanges are losing trading volume to US securities markets. As markets become more

open, and securities regulation becomes more flexible, cross border trading will become more common and geographic monopolies of exchanges will become more tenuous. Already the NASDAQ is attracting a large number of offshore technology listings. The SEHK forecast that it could lose up to forty per cent of its trading volume if it had no online strategy.

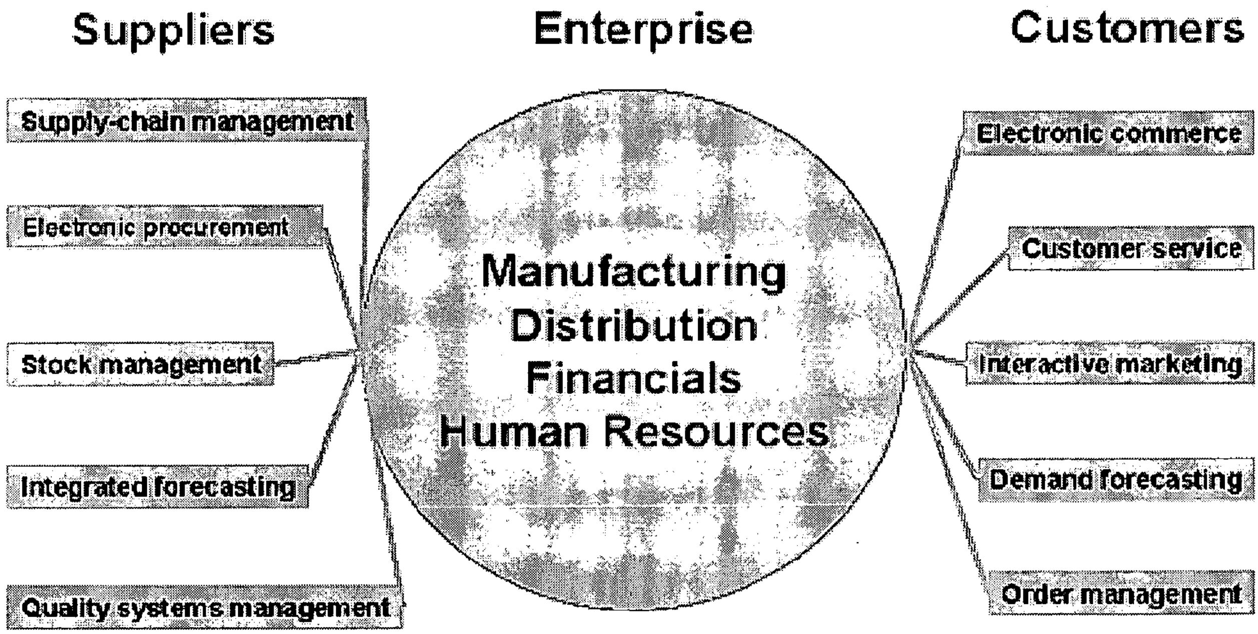
Business to Business eCommerce

While consumer Internet products have occupied most press coverage the key driver behind e-commerce growth has been business to business ecommerce, which accounts for approximately 80% of worldwide e-commerce activities. Business to consumer ecommerce is establishing new businesses and enormous stock values, but it is business to business ecommerce that is altering supply chains, lowering cost structures and changing competitive advantage.

Electronic data exchange is not new, but it has suffered from technology incompatibility, high equipment costs and closed corporate cultures. The Internet is ubiquitous and open, making it easy to add new suppliers and customers to integrated supply chain arrangements. It is capable of being deployed both inside and outside an organisation. An integrated supply chain provides more choice, facilitates real-time bidding by suppliers and stronger customer relationships through user profiles and loyalty programs.

However, the full benefits of the open, lost cost technological environment of the Internet will not be realised without a matching transformation in business relationships between companies in a supply chain. Rather than manufacturers analysing online orders from consumers and compiling orders to component suppliers, the suppliers can be given open access to the manufacturer's databases so they can monitor consumer orders, on a real time basis, and despatch components required to enable the manufacturer to meet those orders.

A striking example is provided by the growth of Dell. Dell maintains a totally integrated supply chain structure and allows its suppliers and customers access to supply chain information unavailable 2 years ago. As a result it has developed a unique cost and quality proposition. This is the "butterfly" or "vortex" business model that has proven very successful on the Internet but which is counterintuitive to traditional business philosophy.



If suppliers in emerging markets do not participate in the business to business ecommerce "clusters" being created in the world's larger economies, they may find themselves excluded from critical supply chains and critical market knowledge. This is perhaps one of the greatest concerns for corporations in the Asia Pacific region. It reflects the failure of "traditional" industry to recognise that they are part of the digital economy and apply new solutions to established ways of doing business. Business to business ecommerce will challenge existing cost and price advantages generated from lower labour costs in the region.

A recent survey by the Gartner Group in the Asia Pacific Region examined the number of corporations with business to business ecommerce implementation plans under way and to begin within the next year. [3] Australia and New Zealand lead implementation with close to 60% of businesses to implement ecommerce plans in this period and Singapore was close behind. However, Malaysia, Taiwan, India, Thailand and Korea all sit below 20% and Hong Kong and China and Indonesia are only approaching 30%.

Such slow uptake rates could have serious trading implications for certain industries. There is a need for the development of regional digital business communities either by way of joint ventures or alliances.

Business to Consumer eCommerce

Business to consumer ecommerce presents a different set of dynamics. A significant proportion of business to consumer e-commerce is actually cannibalising the revenue streams of the physical distribution models utilised by traditional businesses.

All online providers of both goods and services must support communication systems and advertising to achieve brand recognition for their domain names. Retail ecommerce providers for physical products also face significant fixed costs in terms of distribution logistics. Corporations such as Amazon.com are enormous logistical exercises with a significant number of staff engaged in customer service satisfaction.

It is likely that only large e-commerce sites which attract the necessary brand recognition and trust will overcome consumer distrust of virtual shopping environments. A market structure not unlike the physical distribution world may be probable. That is, the larger sites will develop economies of scale and scope and customer loyalty, sometimes in conjunction with a physical store presence, while smaller wholly virtual offerings will find life more difficult.

"Click and Mortar" Businesses

"Click and mortar" businesses are a new hybrid model which recognises that on line channels are often not a complete solution. Consumers will invariably *search* for a product, *experience* that product and then *close the transaction*. Search engines provide the first step and merchant arrangements enable transaction closure. It is the importance of experiential factors which determine the balance of on-line and off-line strategy. Whilst it is possible to "experience" exerts from a compact disk on line, the same is not true of buying a motor vehicle. There are many products that consumers will simply not buy without physical fulfilment. It is in this category that "click and mortar" businesses will be successful.

Under the click and mortar model the internet channel is used to significantly reduce supply chain and marketing costs and provide consumers with a high level of information. However, the consumer is then directed to a physical store to experience the product. Interesting additions to this model include providing on line customers with digital certificates which entitle them to a discount for a physical product. In effect a "gain sharing" exercise with customers who use low cost Internet sales channels.

Disintermediation and Re-Intermediation

One of the inevitable by-products of ecommerce will be the disintermediation of offline businesses. This phenomenon involves the displacement, by e-commerce services selling directly to customers, of products and service providers whose basic function is to act as an intermediary.

As a counterbalance, these intermediaries are being replaced through the re-intermediation of on-line businesses. Consumers faced with increasingly complex on-line information and products are looking for third parties in the on-line environment whom they can trust to provide information and facilitate transactions. However, re-intermediators are technically sophisticated information providers. They are not necessarily the corporations that have been displaced.

It is the existing intermediaries that are most exposed to the dynamics of ecommerce. They have all previously occupied lucrative positions because of their ability to either capture and analyse information (brokers and travel agents) or aggregate products from a range of manufacturers and manage more cost effective supply chains (physical distributors). The economics of these businesses have irreversibly changed.

Information broking is increasingly driven by technology platforms which are able to project content to the world through a web interface, reducing price, but hopefully increasing volume. Distributors can be replaced by direct to market strategies or by manufacturer "clusters" which establish "vertical portals". There is still room and indeed opportunity for logistics enterprises, DHL and UPS have been online success stories. However, "shopfront" distributors will come under increased pressure.

Search Engines and Configurators

Basic search engines have long been recognised as a method of attracting an audience seeking search functionality and then providing advertising, product referrals and content channels. Yahoo! and Excite are 2 of the better known examples of search engines that have developed significant international portal strategies.

Configurators are a more sophisticated refinement of a basic search engine which uses intelligent agents to find the best product offers. For example, a configurator may prompt questions tailored for particular a product category and weight individual user criteria for that product. The configurator will then compile a matrix of product choices, including the lowest cost alternative. Already, there have been disputes in the United States between configurators and portals. As the primary objective of portals is encouraging user loyalty, configurator services that encourage informed user selection rather than brand commitment are anathema to the portal strategy. In the Internet world just as one model is perfected another model is used to erode it.

Internet Access Strategies

Internet access is a vanilla business with low entry barriers, low prices and low margins. Taken alone, it is not a formula for success. Those ISPs that currently provide access alone must convert themselves into vertical or horizontal portals, a host or retail provider for application services or a host for merchants. In the next 2 years, ISPs will either pursue the right strategic transactions or wither on the vine.

As increased competition sees access revenue rapidly dry up, migration to more sustainable revenue streams based on e-commerce is required. This shift will provide a real challenge for entrepreneurs in the Asia Pacific Region, entailing the re-engineering of ISP business plans in light of a much more sophisticated and consumer driven business environment.

Increasingly, consumers are expecting access to be free. One of the better known examples is Freeserve in the UK market that experienced a massive capitalisation on listing, largely as a result of phenomenal subscriber growth and a telecommunications access regime that attributed access charges to ISPs. However, even in markets where wholesale access revenue is unavailable, free ISP access models have been launched aggressively based on advertising revenues and referral fees, for example from banks pursuing home loan mortgage business.

These developments are eroding pure access revenues and it may not be long before consumers generally expect free Internet access and this revenue stream is further debased.

Content Strategies

Regional corporations have good opportunities to become content generators and aggregators and to use this as a launching vehicle into ecommerce. The dominance of US websites indicates an opportunity for localised content development, as attractive localisation will command a significant audience. Even in the Australian market (which is culturally similar to the US) most of the very popular sites are domestic sites (although a number of them are joint ventures with US partners).

Content is critical in any ecommerce strategy as it:

- provides direct revenue;
- increases traffic and hence carrier revenue;
- decreases reliance on mirror and cache arrangements;
- increases the attractiveness of ISPs in peering negotiations; and
- attracts customers and aggregates transactions.

In a pay television model, consumers are charged for access to content. In a free-to-air or typical broadcasting model, that content is free, therefore driving up usage and enabling revenue from advertising. Because the Internet has devalued content so significantly, content strategies alone have not proven successful and are often loss leaders for other revenue streams. The developing ecommerce model is to provide valuable independent information for free but to profit from ecommerce transactions and, to a lesser extent, advertising.

Unique subscription content remains a revenue option, but this will often be for niche rather than mainstream content. The expectation for narrowband access is that content is free. While this perception may change for more sophisticated broadband services, there is no going back.

Advertising Revenue on the Net

Advertising is proving to be a useful revenue source for some portal and content providers. Some estimates of advertising growth are exponential. Seventy-five per cent of Yahoo!'s 1998 revenue was derived from advertising and its advertising revenue is projected to grow at 100% to 200% per annum.

However, in the United Kingdom web sites currently only sell 10-15% of advertising space and even in the US, 60% of advertising revenue is captured by the top 10 web sites. Such statistics suggest that that advertising may be successful for very large sites with a significant number of hits but provide a poor revenue model for sites that attract a lower number of "eyeballs". In the online advertising environment, scale is important. Of more concern are recent figures that show that only 3-5% of web advertisements result in a "click through" to the source site of the advertiser.

Portals and Content Aggregation

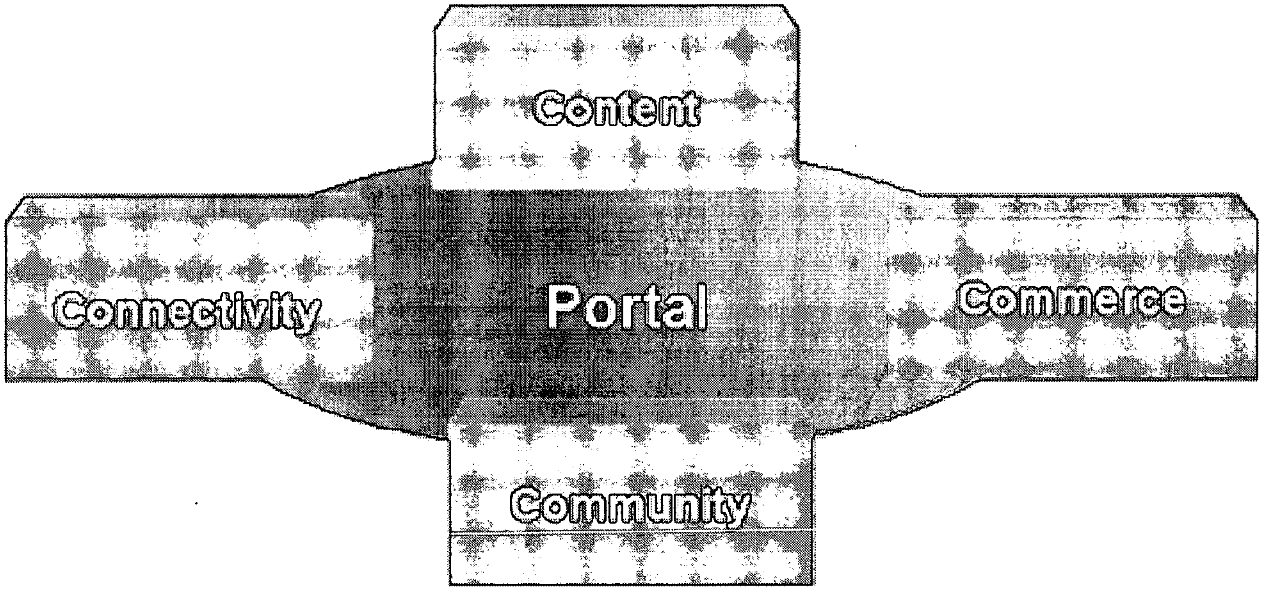
A simple view of portals is that they are loss leaders which generate traffic on communications networks. A more optimistic view is that they can be positioned as a critical distribution bottleneck by helping content providers reach their audience, assisting advertisers to deliver their messages and providing a platform upon which to layer longer-term revenue generating ecommerce services. Put another way, if you can't sell to the audience, sell your audience.

Most major portals have emerged from search engines (Yahoo!, Infoseek, Excite), special interest sites (Amazon.com) and major ISPs (AOL, FreeServe). The basic portal strategy is to secure content, control it, and exploit user profiles so as to engage in targeted promotions to achieve portal loyalty or portal "stickiness". Loyalty is also sometimes encouraged with unique software, for example a personal finance software package.

There is room for portal strategies in emerging Asia Pacific markets where Internet usage at a mass-market level is a more recent phenomenon. Portals in this region can also fulfil an important role in cultural conversion through "localisation". Both Yahoo and Excite have already been involved in ventures for the repackaging of US content with domestic content to deliver more local flavour. Yet the region is demanding more services in Chinese, Hindi, Malay, Korean, Tagalog and other languages.

Complex portal strategies, particularly those developed by telecommunications carriers, have the potential to enhance value in a variety of ways:

- design consultancies for website development and hosting fees for third party sites;
- sharing in merchant revenues for acting as a distribution channel;
- aggregating and hyperlinking sites thereby cross selling services;
- using customer data to enhance personal service offerings;
- stimulating network usage to support carriage revenues;
- developing services packages to create logical service bundles; and
- generating content and advertising revenues.



Sophisticated portals are now a mix of basic and premium content, search engines, advertising, financial applications, data mining, ecommerce and "web farms" that skim revenue contribution from every model. Indeed the portal model is one of revenue stream diversification.

Traditional Media Leverage

One of the more interesting factors to emerge from the loss making standalone ecommerce ventures in the United States is the large amount spent on mass media advertising, particularly television broadcasting to gain URL recognition. Not surprisingly, many of the most popular sites are those operated by mainstream media providers who can cross market into their online services. Any significant regional broadcaster without an online strategy is losing a valuable opportunity to create value for a relatively small investment. Mainstream media providers have the ability to deploy significant cross media leverage. However, "brochureware" conversion of existing content has not been successful. The more astute media proprietors have developed standalone Web strategies, not simply extended from their traditional base. However, they have then advertised and cross-linked from that base.

Financial Institutions

Pure ecommerce is best suited to complex transactional services which are already fully automated and simply require web interface access and suitable levels of security. Online securities trading, banking and personal financial management all lend themselves to this model. The strong brand recognition and perceived trustworthiness of existing financial institutions position them best to take advantage of this market. While many institutions are concerned that they will cannibalise existing high margin business, their choice is to cannibalise or be cannibalised.

Traditional securities trading has been built on a series of closed systems both, at the level of technology and exchange membership. Opening those systems is creating a revolution. The retail sector of the market is growing rapidly but commissions are tumbling and in many cases are preserved only by minimum commissions set by the exchanges. There is now little value in pure technical execution and value has shifted to advisory services. This has implications for brokers that conduct a significant proportion of retail trade. It also has implications for established upper echelon brokers as perceptions of the value of their service will also change.

Not surprisingly the corporations succeeding in online banking are banks. This is partially because of existing regulatory regimes which prevent banking business being conducted by licensed banks, but also because internet users are highly unlikely to trust any other provider of online banking services. The banking system is also the financial engine which is touched by each and every ecommerce transaction at some point.

While the participants of online banking are quite predictable there are a range of arrangements involving banks that are supporting ecommerce generally and which involve other parties. Banks across the region are establishing payment gateways through which they receive transaction information captured on the web interfaces of merchant sites. These payment gateways, often provided by third party e-commerce platform providers, establish the technology systems linking web interfaces with the banking system and facilitating transaction clearance. They will ultimately become a very significant source of credit card transactions.

A range of e-commerce business models also depend on upstream banking arrangements, including bill payment services provided by bill aggregators and cheque payment services. The latter are two examples of services that provide consumers with the ability to pay all of their bills online, whether the payee has established electronic payment systems or not. Examples in the US market are CheckFree and Transpoint and a number of local variations are emerging around the region including B-Pay in Australia and ECBills in Hong Kong.

Consumer Access in Emerging Markets - Will Some Economies Falter

Perhaps the greatest challenge in emerging markets is to stimulate a critical mass of users by overcoming entry barriers caused by poor networks and prohibitively expensive CPE. The more developed telecommunications markets are now facilitating a wide variety of access networks and bandwidths including:

- Traditional narrowband ISP dial-up services across the fixed PSTN (available in all countries).
- Broadband access either using cable modems over wide pay television networks or, in limited cases, switched broadband ATM networks and, increasingly, through LMDS (for example, the Telstra and Optus cable modem services in Australia, Cable & Wireless Hong Kong Telecom's broadband switched network in Hong Kong and the Wharf Cable pay TV network in Hong Kong and Singapore Cable Vision's network in Singapore).
- Satellite access technologies (for example DirecPC in the US and other models increasingly being pursued in the region using global satellite, such as Teledesic).
- Use of the broadcasting spectrum for internet access through datacasting techniques, particularly during the migration to digital television.

Regional markets such as Australia, Hong Kong, Japan and Singapore support all these access technologies while other markets have more limited options. Increasingly speed of access will be a defining characteristic to require both domestic broadband networks, but also greater bandwidth into US and European nodes. There is a distinct possibility that within the region a variety of countries will not be able to participate in higher bandwidth solutions and applications because of in their constrained telecommunications networks.

Prices for PCs capable of supporting basic internet access are falling dramatically and there is still a possibility of lower fixed consumer costs to access the Internet as a result of the "network computing" concept advocated by Sun Microsystems and the recent acceptance by Microsoft of an application service provider model. A number of major industry participants also believe that longer term access through television service delivery platforms will provide the best means of reaching a mass market in certain Asia Pacific countries.

Conclusion

Economic prosperity relies on high-speed access to critical networks of information and commerce. The public Internet facilitates both, but is ultimately a platform on which rich functionality will be carried. Only regional corporate participation will determine whether that functionality and content is controlled within or outside the Asia Pacific region.

The Internet is a great equaliser that provides new regional opportunities. Yet, as the technologies and methodologies deployed to facilitate ecommerce become more sophisticated, those further down the learning curve will struggle to bridge the competitive gap. The signs of a failure to create the right policy settings and develop astute commercial strategies are already evident in some countries. The implications will reach well into the new millennium.

[1]Financial Times 20/21 June 1998.
[2]Source: International Data Corp.
[3]See the Gartner Group Report Internet Service Providers and Electronic Commerce in the Asia Pacific Region 1999

Biography

Michael Reede

Michael Reede is a partner with the Australian law firm Gilbert & Tobin and specialises in advising clients in the communications, technology and Internet sectors.

Michael has worked extensively throughout the Asia Pacific region assisting telecommunications carriers, pay television operators, broadcasters and internet and ecommerce providers. He also assists clients operating outside these sectors that are seeking to implement an effective ecommerce strategy.

He advises clients on joint ventures, capital raisings, commercial transactions, major capacity and content acquisition, regulatory strategy, risk assessment, communications market liberalisation, intellectual property, competition law and Internet regulation.

His expertise relating to ecommerce includes:

- business to consumer ecommerce projects, joint ventures and alliances;
- business to business ecommerce projects, supply chain integration and logistics
- commercial transactions relating to the development of narrowband and broadband portals;
- online broking and financial services;
- Internet related content development, acquisition and advertising;
- retail Internet services including banking, auctions, gambling, travel services and search engines;
- Internet payment mechanisms, smart cards, digital cash, payment gateways and bill aggregation services;
- website development and hosting arrangements;
- the deployment of fixed, mobile, satellite and LMDS access networks;
- Internet capable mobile services such as GPRS and 3G; and
- software development and licensing and application service provision;
- intellectual property, hyperlinking arrangements, security and cryptography.

He has worked closely with client teams managing the constant and turbulent commercial developments so common to the communications sector and has developed a strong understanding of commercial trends and technical innovation.

Michael is a frequent speaker at communications industry conferences in the region and a contributor to publications in the fields of communications law and regulation.

He holds a Bachelor of Law and a Bachelor of Commerce degrees from the University of New South Wales and a Master of Arts (Asian Studies).

Gilbert & Tobin Contact Details

Gilbert & Tobin
Lawyers
50 Carrington Street
SYDNEY NSW 2000
AUSTRALIA
http://www.gtlaw.com.au
Telephone: + 61 2 9367 3000
Facsimile: + 61 2 9367 3111

Sessions

The Potential Regulatory and Universal Service Consequences of Internet-mediated Accounting Rate Arbitrage

Rob Frieden

Throughout the Internet's infancy both governments and operators worked to incubate and promote services. Governments accepted the concept that Internet-mediated services should qualify for reduced regulation, or none at all. Regulators endorsed the view that Internet Service Providers ("ISPs") should not have to pay the same interconnection charges and universal service contributions borne by telecommunications carriers. ISPs justified these exemptions by offering services that did not constitute the functional equivalent as telecommunications, e.g., electronic mail and access to the variety of information and entertainment services via the World Wide Web. The ISPs emphasized network connectivity and access to a "seamless" "network of networks."

Over a relatively short period of time the Internet has become substantially commercial and largely free of government subsidies. The services now available via the Internet include telephone service equivalents. Notwithstanding such substantial changes, ISPs only recently have begun to revise the terms and conditions for facilities interconnection, and they continue to enjoy financially advantageous opportunities to access the public switched telephone network ("PSTN") without incurring the local and international access charges borne by conventional telecommunication carriers.

Seamless connectivity among millions of routers, servers and users has promoted ease of use, convenience and the opportunity for serendipitous discoveries in World Wide Web "surfing," i.e., the ability to move from one source of information to another and from carriage over one network to another at the click of a mouse. But this very same connectivity makes it possible for ISPs to engineer access to global networks, capable of providing telephony, without having negotiated and fully paid for such network functionality.

The current Internet pricing model creates the greater potential for financial "free riders," and unintended cross-subsidy beneficiaries that do not pay their fair share, as well as involuntary underwriters that pay more than their fair share. Cost allocation and recovery is more complex for the Internet relative to conventional telecommunication models, because of preexisting arrangements for network interconnection, and the seamless integration of all networks into a universal Internet. While telecommunication routings follow pre-established, somewhat limited options, Internet routings operate on a far more random, "best efforts" basis.

The Internet as a Medium for Arbitrage

Absent network congestion the cost to carry or process an additional minute of Internet traffic approaches zero, because the incremental cost is near zero.[1] This pricing system enhances consumer welfare, stimulates usage and revenue generation and accrues positive networking externalities.[2] The Internet adds thousands of new sites and users daily with such expanded access opportunities accruing greater utility for all users. As long as ample capacity remains available along with moderate transport and content costs, ISPs need not meter traffic and can offer service on an All You Can Eat ("AYCE") usage insensitive basis.

ISPs can offer AYCE service, because they have been able to recover high fixed costs and incur relatively low incremental costs absent network congestion. They can represent that their network extends globally even though few, outside of a small group of Tier-1 backbone network operators, actually have built or leased such an extensive array of facilities. Until recently, ISPs have incurred little additional expense in providing their customers opportunities to access the Internet networks of networks via incumbent telecommunication carriers' facilities.[3] Accordingly, ISPs have had opportunities to tap into the same financial and distance insensitive service opportunities as that available when telecommunication entrepreneurs exploit the porousness of telecommunication networks and the relative ease in accessing the PSTN. One can consider Internet-mediated telephony[4] in the same context as other technological innovations like call-back,[5] switched hubbing,[6] refile,[7] and international simple resale[8] that provide new, lower priced alternatives to the "retail" rate for toll telephone services.

Internet telephony shifts the balance of market power from carriers, which traditionally have set prices on a cost-plus basis, to consumers who may emphasize price and consider telephony a commodity business. If telephony minutes of use become fungible, with voice traffic subordinate to an increasing volume of data, then service providers will have limited, if any, ability to saddle users with rates significantly above cost, despite the fact that carriers do plow back a large percentage of any financial surplus to achieve universal service and infrastructure development objectives.

The onset of Internet-mediated telephony has the potential for bringing to a head the long simmering debate over the propriety of pricing telecommunication services above cost, in part to promote a universal service mission. It also may triggrer closer examination of what constitutes the actual cost a carrier incurs to route a minute of telecommunication traffic:

> a polarisation [exists] between a group of countries with relatively competitive prices and low accounting rates, and a second group of countries with prices significantly above cost. . .. The danger is real, especially between OECD countries and a number of non-OECD countries who have difficulty in envisaging the benefits which they can attain from competitive telecommunication markets.[9]

Internet Telephony Threatens the Status Quo

Currently international accounting rates for most routes substantially exceed the total cost incurred by two or more "foreign correspondents" to switch and route a call from originator to recipient[10]. The onset of higher capacity submarine cables and satellites coupled with digital signal processing and switching and circuit multiplication technologies have significantly reduced per-mile and per-call costs,[11] although the cost savings may not be the same for nations lacking the traffic volumes and funds available to support new technologies having lower per unit costs. However, absent competitive or regulatory pressure to reduce accounting rates and retail collection charges to levels commensurate with such lower costs, carriers that terminate more calls than they originate want to maintain the status quo. Accordingly, accounting rates continue to overstate cost and overcompensate some operators:

> The pace in introducing competition in international telecommunication markets and the reform of these markets is slow, and there is an apparent reluctance in many cases by governments to accelerate reform in this area. It therefore cannot be expected that significant changes in prices (collection charges) and accounting rates will take place given present attitudes and policy frameworks.[12]

In the absence of competitive necessity, an aggressive campaign by regulators in sufficient numbers, or widespread use of Internet telephony and other arbitrage tactics, many carriers continue to benefit from traffic retardation strategies that reduce outbound calling and expand asymmetry between inbound and outbound traffic volumes.[13] For some nations, purposefully high accounting rates and commensurately high collection charges accrue financial dividends by reducing the volume of outbound traffic that otherwise would offset at least a portion of the settlement surplus. Even as they may reduce some high profit operator-assisted outbound international calls, call-back and other call-reorigination services[14] increase the volume of inbound calls typically subject to an accounting rate settlement.[15] For nations requiring carriers to route return traffic proportionate with what they received inbound,[16] carriers from other nations with more outbound traffic than inbound traffic face the potential for expanding settlement deficits if outbound calling continues to grow even as demographic characteristics, or regulatory policies elsewhere continue to dampen demand for inbound calling. Carriers with inbound traffic surpluses typically operate in small and developing countries, but others operate in nations that appear to have a strategy of deliberately maintaining high accounting and collection rates.[17]

Outbound international call retardation strategies create pent up demand and stimulate accounting rate and collection arbitrage opportunities and incentives by users and entrepreneurial carriers[18] to find ways to route traffic that reverse the accounting rate settlement, or avoid triggering one entirely. A settlement surplus generates a source of hard currency for telecommunications infrastructure development, and such transfer payments from users in developed nations to carriers in developing ones can enhance consumer welfare and promote networking externalities. On the other hand, no guarantees exist that only developing countries will pursue an outbound call retardation strategy, or that beneficiaries of settlement surpluses will use the funds for infrastructure development as opposed to funding the general treasury or stock dividends. Likewise reduced outbound international calling may retard trade, industry and integration of a nation regionally and globally.

As the Internet Evolves ISPs May Use a Telecoms-style Financial Settlement System

As the Internet matures and provides an increasing array of services, ISPs will implement cost-based interconnection arrangements. This outcome already has begun with the unilateral actions taken by the Tier-1 ISPs to remedy the "free-ridership" problem by requiring payment for access to their networks by smaller ISPs. Ironically this outcome also may trigger regulatory decisions that will force ISPs to incur their proper share of costs attributable to PSTN access. A "rough justice" Sender Keep All interconnection system for ISPs have proven increasingly unworkable and inequitable where an increasingly diversified set of carriers generate different traffic volumes and congestion becomes a worrisome factor. Just as the ISPs have worked to remedy their free ridership problem generated by smaller ISPs, so too will telecommunication carriers seek regulatory remedies to an analogous free ridership problem when ISPs provide telephony services that divert traffic and revenues from incumbent telecommunication carriers and which so far have been provided without triggering access charge payments and contributions to universal service funds.

Already alternative pricing systems have come into place that create a hierarchy of ISPs based on such factors as traffic volume, number of interconnection points accessible to the ISP, and the bandwidth of lines used by the ISP. It appears that a declining number of ISPs will consent to, and be satisfied with, zero cost, "all for one and one for all" interconnection. Such public peering has resulted in significant congestion resulting in degraded service. In response to the combination of congestion and the potential for free-rider/subsidized ISPs, Tier-1 ISPs have established private peering points and have largely exited preexisting public peering points. Free access to these private peering points is limited to similarly situated, Tier-1 ISPs. Other ISPs can secure access to these new interconnection points for a price. The terms and conditions under which smaller ISPs secure access to Tier-1 ISP facilities has begun to parallel the contractual, private correspondent telecommunications model: smaller ISPs now must lease facilities from a Tier-1 ISP. Possibly in the future a Tier-1 ISP might require a usage-based financial settlement.

The diversification and proliferation of ISPs occurs at the same time as ISPs have grown more conscious of Internet traffic volumes and patterns. This subject has become more important to ISPs, because demand has grown so quickly and dramatically that operators have had difficulty in making timely system upgrades. Necessary transmission and switching capacity enhancements to keep up with demand force ISPs collectively to make substantial additional investments lest the Internet become bogged down and inoperable. ISPs, which conscientiously make infrastructure upgrades, rightly object to a cost-free interconnection arrangement available to other ISPs who have failed to make commensurate investments.

A single ISP's failure to invest in infrastructure improvements may occur due to a lack of financial resources, comparatively lower concerns about customer service, or perhaps even the absence of an immediate need for upgrades to serve its direct subscribers. ISPs that do not invest in network upgrades may not constitute a weak link in the global sense as not much traffic might transit or terminate their facilities. But to the extent these non-upgrading ISPs nevertheless experience the same kind of growth in subscribership, the traffic demands of such growing subscriber ranks aggregated with growing demand everywhere, exacerbate the potential for congestion throughout the Internet.

The growing ranks of Internet subscribers threaten to convert the World Wide Web into the "World

Wide Wait" absent substantial and expedited upgrades in bandwidth, modem banks, routers and the variety of facilities that make up the Internet. The Tier-1 ISPs and those operators most conscientious about making necessary service improvements may consider a financial settlement mechanism essential for maintaining the Internet's ability to handle vastly more subscribers, traffic and Web sites. These ISPs have an additional justification for changing the terms and conditions for interconnection, viz., the pattern of Internet traffic. The potential for congestion and degraded service over the Internet results from total increased demand, but also for spikes in traffic over specific routes.

In summary, the current Internet pricing system cannot:

- prioritize traffic based on willingness of sender or recipient to pay a premium price;
- reserve capacity; and
- offer more reliable service than "best efforts" routing for a price higher than the zero cost/true peering, or capacity leases of smaller ISPs.

The Similarities Between Telecommunications and the Evolving Internet Pricing System

Interconnection between and among telecommunication carriers constitutes an essential element of what it means to operate as a common carrier. Common carriers have a legal duty to interconnect their facilities with other carriers on fair terms and conditions. No doubt exists whether a telephone company will agree to interconnect its facilities with another carrier, nor whether the interconnecting carrier should receive compensation for providing such access. Telecommunications carrier-to-carrier interconnection agreements typically involve a transfer payment when traffic flows are asymmetrical. The contractual terms and conditions for this "correspondent" or "connecting carrier" relationship primarily address traffic flow and volume without regard to a carrier's market share or size. Once qualified as a carrier, the venture receives compensation for terminating traffic. This arrangement may involve negotiations, application of a uniform revenue division plan, or a per minute access charge.

Historically, the telephony compensation plan has contemplated relative parity in terms of interconnection and negotiation leverage primarily because the parties voluntarily sought to interconnect facilities and expand geographical coverage. Market entry, by competitive local and long distance carriers having different incentives and negotiating leverage, has necessitated legislative and regulatory edicts to mandate interconnection with some degree of government oversight of the terms and conditions for such access.[19] Before the onset of competition, extensive carrier-to-carrier interconnection was certain and the parties focused on what type of cross-subsidies were needed to support a universal service mission.

The Regulatory Paradox

Just as the Internet becomes disaggregated into tiers of service providers, the overall utility of the Internet grows as it becomes a medium for real time delivery of audio, video and telephone services in addition to text and e-mail. Even as Internet operators insist they do not provide telecommunication services, the diversification of applications available via the Internet include functionally equivalent services like Internet telephony.[20] This similarity of services raises a number of conflicting, countervailing and paradoxical marketplace and regulatory circumstances:

- As the Internet disaggregates with different types of interconnection arrangements nations consider it a key vehicle to promote a larger, cohesive universal service mission, even though private peering may foreclose complete connectivity between and among individual networks;
- Many nations have telecommunications policies that require subsidization of telecommunications and Internet access at schools, libraries, rural areas and the residences of the elderly and poor even though Internet service providers persist in claiming no duty to support such mission; and
- Diversifying Internet services now include unregulated features functionally equivalent to what regulated common carriers offer.

Internet Telephony as a Telecommunications Service

Nations have expressed reluctance to consider Internet-mediated telephony as the functional equivalent of common carrier provides telephone service. For example, the United States Federal Communications Commission currently considers Internet-mediated telephony an unregulated "enhanced"or "information service."[21] However, the Commission did acknowledge that the "record currently before us suggests that certain 'phone-to-phone IP telephony' services lack the characteristics that would render them "information services"[22] within the meaning of the statute, and instead bear the characteristics of 'telecommunications services.'" "Phone-to-phone IP telephony" enables users to access Internet-mediated telecommunication services via ordinary telephone handsets and pay phones instead of specially-configured personal computers. With the ease of ordinary telephone access,[23] the market for Internet telephony may grow substantially. Should this occur the financial demands of a now expanded universal service mission may exceed available funding sources.[24] A real potential exists for significant migration of traffic from customary switching and routing, subject to international accounting rate settlements, coupled with domestic access charges and universal service fund ("USF") contributions, to Internet-mediated switching and routing heretofore exempt from such financial burdens.

Because Internet telephony has several component parts, possibly offered by different companies, the FCC had to specify which aspects of Internet telephony constitutes telecommunications possibly subject to regulation and the duty to make USF contributions. The Commission stated that the definition of telecommunications contained in the Telecommunications Act of 1996 limits even the potential for regulation to transmitters of voice and data traffic, thereby excluding providers of hardware and software. Accordingly, "[c]ompanies that only provide software and hardware installed at customer premises do not fall within this category, because they do not transmit information."[25]

On the other hand, for ventures meeting a four-part test,[26] the FCC stated its tentative conclusion that the service provided constitutes telecommunications, primarily because:

From a functional standpoint, users of these services obtain only voice transmission, rather

> than information services such as access to stored files. The provider does not offer a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information. Thus, the record currently before us suggests that this type of IP telephony lacks the characteristics that would render them "information services" within the meaning of the statute, and instead bear the characteristics of "telecommunications services."[27]

Conclusions

Technological and marketplace conditions favor increased reliance on the Internet as the preferred medium for both interactive information and telecommunications services. In advance of legislative and regulatory responses to the Internet's maturation, ISPs already have revised their interconnection and settlement agreements to reflect a hierarchical infrastructure more akin to the telecommunications industrial structure than a flat and democratic "network of networks." Many ISPs now offer the functional equivalent of telecommunications services and they have implemented a transfer payment system that accounts for the use of each other's facilities for "transiting" traffic. Nevertheless these very same ISPs currently balk at having to pay for access to the PSTN even when originating and terminating telephony equivalent services.

Already the foundation exists for the Internet to merge with, or become indistinguishable from the various carrier networks that provide telecommunications. Most incumbent telecommunications carriers already provide Internet services and increasingly ISPs provide telecommunications services, often via the transmission facilities of incumbent local and interexchange carriers. This technological and marketplace convergence will necessitate legislative and regulatory responses to eliminate asymmetrical regulations and other anomalies that distort the marketplace. Until such adjustments occur, we cannot easily determine whether an Internet-mediated, packet-switched telecommunication service operates more efficiently than conventional circuit switched services. Regardless of its comparative efficiency, the Internet will become the preferred medium for routing telecommunications traffic, simply because carriers can avoid having to settle accountings based on an accounting rate and can evade domestic access charges and universal service funding contributions.

National regulators have often used asymmetrical regulation to incubate technologies and to stimulate competition. Clearly the Internet has thrived in a mostly unregulated environment ISPs currently enjoy. But at some point, the Internet will have matured and diversified to a point where a preferential regulatory status unfairly tilts the competitive playing field and creates unnecessary marketplace distortions. The Internet has the capacity and versatility to become a one-size-fits-all telecommunication and information services medium. As it becomes an essential medium, large ISPs will demand financial compensation from smaller ISPs and all ISPs should bear the full cost of PSTN access.

NOTES

[1]This pricing scenario presupposes that an ISP does not incur usage sensitive prices for any major element of service. For many Asia-Pacific routes, the need to access network access points in far away locations, e.g., the United States, does impose significant costs. To offset the charges of facilities-based telecommunications carriers, ISPs may charge end users on a usage sensitive basis, e.g., an hourly surcharge after an initial allocation of access time.
[2]A positive network externality exists when the cost incurred by a user of the Internet does not fully reflect the benefit derived with the addition of new users and points of communications. See John Farrell and Garth Saloner, "Standardization, Compatibility and Innovation," 16 Rand J. of Economics 70 (Spring, 1985); Michael L. Katz. and Carl Shapiro," Network Externalities, Competition and Compatibility," 75 American Economic Review 424 (1985).
[3]The author acknowledges that Afree rider @ opportunities via other ISPs are becoming more scarce as the Internet becomes more hierarchical and larger ISPs demand and receive payments for providing transit services to ISPs with fewer customers, less bandwidth and limited sources of desirable content. See Rob Frieden, ALast Days of the Free Ride? The Consequences of Settlement-Based Interconnection for the Internet, @ 1 Info No. 3, 225-238 (June, 1999).
[4]See Robert Frieden, ADialing for Dollars: Will the FCC Regulate Internet Telephony? @ 23 Rutgers Computer and Technology Law Journal 47 (1997).
[5]A>Callback = is a technology used to provide international telecommunications service forma a foreign country through a . . . switch [in the U.S. or other nation with low collection charges and options for private line resale and routing options that reduce or eliminate accounting rate liability]. Philippine Long Distance Telephone Co. v. International Telecom, Ltd., D/B/A Kallback Direct, File No. E-95-29, Memorandum Opinion and Order, FCC 97-233 at 2, n.10 (rel. July 18, 1997)[hereinafter cited as PLDT Complaint]. See also Rob Frieden, AFalling Through the Cracks: International Accounting Rate Reform at the ITU and WTO, @ 22 Telecommunications Policy No. 11, 963-975 (December 1998); Rob Frieden, AWithout Public Peer: The Potential Regulatory and Universal Service Consequences of Internet Balkanization, @ 3 Virginia Journal of Law & Technology 8 (Fall, 1998) available at **http://vjolt.student.virginia.edu;** Rob Frieden, AThe Impact of Call-back and Arbitrage on the Accounting Rate Regime, @ 21 Telecommunications Policy 21 No. 9/10, 819-827 (1997); Organisation for Economic Co-Operation and Development, Committee for Information, Computer and Communications Policy, Refile and Alternative Calling Procedures: Their Impact on Accounting Rates and Collection Charges, OECD/GD(95)19 (Paris, 1995)[hereinafter cited as 1995 OECD Refile and Call-back Report]; Organisation for Economic Co-Operation and Development, Committee for Information, Computer and Communications Policy, New Technologies and Their Impact on the Accounting Rate System, OECD/GD(97)14 (Paris, 1997)[hereinafter cited as 1997 Accounting Rate Study].
[6]The FCC defined switched hubbing as Athe routing of U.S. switched traffic over U.S. international private lines, whether resold or facilities-based, that terminate in equivalent countries and then forwarding that traffic to a third, non-equivalent country by taking at published rates and reselling the international service of a carrier in the equivalent country. @ Policy Statement on International Accounting Rate Reform. 11 FCC Rcd. 3146 (1996) citing Market Entry and Regulation of Foreign-Affiliated Entities, Report and Order, IB Docket No. 95-22, 11 FCC Rcd. 3873 (1995).
[7]ARefile or the hubbing of traffic is using one country to collect traffic and switch this traffic to other countries . . .. For example, the price of a call from Denmark-Finland-Australia is cheaper than a direct call from Denmark to Australia . . . US$0.46 + US$1.03 compared to US$2.01. In this case a third

country calling service [using conventional switched services] would be viable having a margin of US$ 0.52 per minute. @ 1995 OECD Refile and Call-back Report at 11.

[8]International simple resale (AISR @) involves the use of a private line by more than one customer with access to the public switched network at one or both ends. ISR presents both profit enhancing opportunities and bypass threats to facilities-based carriers providing the capacity. On one hand, A[f]acility providers today find that it is more profitable to provide excess capacity to resellers and allow them to find customers and market this capacity rather than marketing this capacity themselves. Resale allows more segmented and flexible marketing including more market oriented prices. @ 1997 OECD Accounting Rate Study at 36. On the other hand, AISR service provision by-passes the international charging and settlements system, and therefor places significant [downward] pressure on accounting rates. @ Id. at 38.

[9]IDat 32.

[10]Carrier correspondents Amatch @ half-circuits to erect a complete link from call originator to call recipient. The half-circuit concept operates on the presumption that carrier correspondents achieve a Awhole circuit @ by linking two half-circuits at the theoretical midpoint of a submarine cable, or at the satellite providing the transmission link. In the submarine cable scenario, each carrier has responsibility to secure access to circuits linking transmission facilities on its territory to the location where the cable makes its landfall (referred to as the cablehead), possibly located in a different nation, and onward to the midpoint. For more background on international telecommunications operations and policy see Rob Frieden, International Telecommunications Handbook (Norwood, MA: Artech, 1996).

[11]See International Telecommunication Union, Informal Expert Group on International Settlements, AThe Cost of International Telephone Calls,@ available at http://www.itu.ch/intset/dot/ dot.htm (reporting that the per minute cost for routing an international telephone call via an INTELSAT satellite including operating expenses is US$0.02 and that factoring all switching, routing, interconnection and administrative costs, including license fees, advertising and taxes Athe average per minute cost of an international call is probably around $0.25. @ Using a total service long run incremental cost methodology, which factors in a reasonable contribution to common costs, the FCC established Aupper end: settlement rate benchmarks of 15.44 for carriers in upper income nations; 19.1 4 for carriers in middle income nations and 23.44 for carriers is lower income countries. See 1996 International Settlement Policy Rulemaking at &47. The Commission proposed a 9-224 upper range for benchmark settlement rates for carriers in upper income nations; 12-264 for carriers in middle income nations and 13-33 4 for carriers in lower income nations. id. at &48 In it 1997 International Settlement Policy Order the Commission responded to foreign carrier and government opposition to its proposed timetable by creating a fourth income category and by extending the transition period. The FCC established the following benchmarks and timetables for compliance: U.S.-licensed carriers operating on routes to upper income countries have one year from the effective date of this Order (until January 1, 1999) to reach the applicable benchmark rate of 15 cents with carriers in upper income countries. U.S.-licensed carriers have two years, or until January 1, 2000, to reach the applicable rate of 19 cents with upper middle income countries, and until January 1, 2001 to reach the same rate with lower middle income countries. They have until January 1, 2002 to reach the applicable 23 cent rate with low income countries, and an additional year, until January 1, 2003, to do so with countries with a telephone line penetration rate (teledensity) of less than one.

[12]1997 OECD Accounting Rate Study at 6.

[13]Many international carriers have objected to the FCC=s campaign to reduce international accounting rate tactics on fairness and jurisdictional levels. However, an appellate court has ruled that the FCC=s settlement rate prescription did not violate domestic or international law, nor did it impose its jurisdiction extraterritorially. See Cable and Wireless plc v. FCC, 166 F.3d 1224 (D.C. Cir. 1999).
[14]A[C]ountry direct benefits U.S. [and other] consumers but inflates the settlements deficit by converting foreign-originated traffic into U.S.-billed calls. @ Accounting Rate Policy Statement at &12.
[15]AThe traditional settlement rate system assumes that a customer =s physical location determines the place of origin of an international call, with the carrier in the originating country paying a settlement rate to the carrier in the terminating country. However, service innovations such as call-back allow customers to change the originating country for settlement purposes. The result is that many more calls are originated for settlement purposes from countries like the United States with vigorous retail and wholesale markets than in monopoly markets that lack similar competition. These traffic routing patterns will only be exacerbated as countries implement their market access commitments under the WTO Basic Telecom Agreement. @ 1997 Accounting Rate Report and Order at &12. Call-back operators look for opportunities to reduce accounting rate exposure, through refile, and to avoid them entirely by routing traffic via private lines that Aleak @ into the PSTN.
[16]For nations with large populations, high gross domestic products, large ex patriate and immigrant communities, and multiple facilities-based carriers e.g., the United States, operators may have collection rates at levels below one-half the accounting rate. Such carriers expect to recoup outbound traffic losses with inbound traffic subject to an accounting rate settlement that would overcompensate the carrier for terminating the call.
[17]A thriving international Adial-a-porn @ industry has developed in such diverse and unpredicted places as Guyana, Russia, and Tuvalu in part because operators can tap into a share of comparatively higher accounting rates well above the FCC=s settlement rate prescription.
[18]Many facilities-based carriers offer services with lower per minute charges than conventional, up International Direct Distance dialing. While such carriers do not want to cannibalize high margin services, they recognize the need to compete with call-back operators.
[19]Incumbent carriers do not need interconnection with these new carriers to achieve expanded geographical coverage. Accordingly incumbent carriers have no incentive to interconnect and recognize that such interconnection promotes traffic and revenue migration. See Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, First Report and Order, 11 FCC Rcd. 15499, 15612 (1996) [hereinafter cited as Local Competition First Report and Order], Order on Reconsideration, CC Docket No. 96-98, 11 FCC Rcd. 13042 (1996), partially reversed and remanded sub nom., Iowa Utilities Board v. FCC, 120 F.3d 753 (8th Cir. 1997), reversed in part and remanded sub nom., AT&T Corp. v. Iowa Utilities Board, 119 S.Ct. 721 (1999).
[20]For background on the possible regulation of Internet telephony see Robert M. Frieden, ADialing for Dollars: Will the FCC Regulate Internet Telephony? @ 23 Rutgers Computer and Tech. L. J. 47-79 (1997); Dennis W. Moore, Jr., ARegulation of the Internet and Internet Telephony Through the Imposition of Access Charges, @ 76 Tex. L. Rev. 183-214 (1997).
[21]The FCC first attempted to create a Abright line @ separation between enhanced service functions, which are unregulated and subject to robust competition and basic transport capacity that is regulated and not robustly competitive. See Second Computer Inquiry, Final Dec. 77 FCC 2d 384 mod. on recon. 84 FCC 2d 50 (1980), further mod., 88 FCC 2d 512 (1981), aff'd sub nom. Computer & Comms. Ind. Ass =n

v. FCC, 693 F.2d 198 (D.C. Cir. 1982) cert. denied 461 U.S. 938 (1983). However, the Commission subsequently decided that structural separation imposed unnecessary costs and burdens. It opted for non-structural safeguards like account auditing and the complaint process. See Third Computer Inquiry, Report and Order, 104 FCC 2d 958 (1986), mod. on recon., 2 FCC Rcd. 3035 (1987) (Phase I), further recon., 3 FCC Rcd. 1135 (1988); Phase II, CC Docket No. 85-229, Report and Order, 2 FCC Rcd. 3072 (1987), recon. denied, 3 FCC Rcd. 1150 (1988); partially reversed and remanded sub nom., California v. FCC, 905 F.2d 1217 (9th Cir. 1990); on remand, 6 FCC Rcd. 7571 (1991); partially reversed and remanded sub nom., California v. FCC, 39 F.3d 919 (9th Cir. 1994). See also Robert M. Frieden, AThe Third Computer Inquiry: A Deregulatory Dilemma,@ 38 Federal Communications Law Journal, 383-410 (1987); Robert M. Frieden, AThe Computer Inquiries: Mapping the Communications/Information Processing Terrain, @ 33 Federal Communications Law Journal, 55-115 (1981).

[22]Federal-State Joint Board on Universal Service, CC Docket 96-45, Report to Congress, 13 FCC Rcd. 11,501, at & 83 (1998), available at http://www.fcc.gov./Bureaus/ Common_Carrier/Reports/ fcc98067.html [hereinafter cited as 1998 Universal Service Report to Congress].

[23]Internet telephony Aoffer users the ability to call from their computer to ordinary telephones connected to the public switched network, or from one telephone to another. . . . [A] user first picks up an ordinary telephone handset connected to the public switched network, then dials the phone number of a local gateway. Upon receiving a second dialtone, the user dials the phone number of the party he or she wishes to call. The call is routed from the gateway over an IP network, then terminated through another gateway to the ordinary telephone at the receiving end.@ Id. at & 84.

[24]In June 1998, the FCC reduced the amount of funds available for universal service subsidies to schools and libraries in response to a financial shortfall in funds raised from interexchange carriers and the decision of most carriers to impose a USF surcharge on consumers. See Federal Communications Commission, AFCC Reforms Universal Service Support Mechanism for Schools and Libraries, @ (CC Docket No. 96-45), Report No. CC 98-17, (rel. June 12, 1998).

[25]1998 Universal Service Report to Congress] at & 86.

[26]An Internet telephony provider subject possibly subject to USF contribution requirements must meet the following conditions: (1) it holds itself out as providing voice telephony or facsimile transmission service; (2) it does not require the customer to use CPE different from that CPE necessary to place an ordinary touch-tone call (or facsimile transmission) over the public switched telephone network; (3) it allows the customer to call telephone numbers assigned in accordance with the North American Numbering Plan, and associated international agreements; and (4) it transmits customer information without net change in form or content. Id. at & 88.

[27] Id. at & 89.

Biography

Rob Frieden

Rob Frieden
Professor of Telecommunications
Penn State University 105-c
Carnegie Building
University Park, Pennsylvania 16802
(+ 1 814) 863-7996;
rmf5@psu.edu

Sessions

Socio/Economic

M.3.1 Regional Studies - South East Asia
Monday 31 January, 1600-1730
Location: South Pacific I

Chair:
DAN WEDEMEYER, Professor, Department of Communications, University of Hawaii at Manoa, USA

M.3.1.1
BUHA SIHAR PANAILI, Manager, Satellite Services, PT Lintasarta, Indonesia
Expanding Terrestrial Frame Relay Services Utilizing Satellite Communication Solution

M.3.1.2
ANDREAS W.YANUARDI, Engineer, Rural Communication Laboratory - DivRisTI, R&D Division - PT Telekomunikasi Indonesia, Indonesia
IVR Application as a Voice Based Information Service for Rural Communication (An Alternative Solution for Rural Economic Development in Developing Countries)

M.3.1.3
ARIYANTO, Access Network Engineer, R&D Division and SOENDOJOADI, Manager, Optical Access Network Laboratory, R&D Division, PT Telekomunikasi, Indonesia
Access Network Infrastructure Development: TELKOM approach to the future network

Expanding Terrestrial Frame Relay Services Utilizing Satellite Communication Solution

Buha Sihar Panaili

ABSTRACT

Corporate Internet, Intranet and Internet POP proliferation have urged the deployment of high-speed WAN interconnection. Frame Relay as one of WAN solution has been accepted well among data communication users in Indonesia particularly for. The service launched two years ago is currently available mainly in big cities where banking community are existing. Variety of services are available in big cities such as ISDN which mainly based on wire-line access solution.

The widespread distribution of manufacturing industry as well as mining industry has led to a demand for Frame Relay services in a wider //broader coverage not limited only in big cities but also in remote areas where telecommunication infrastructure not yet available.

This paper describes how satellite communication in general and VSAT technology in particular will lead to frame Relay wider distribution across Indonesia.

BACKGROUND

Internet as an infrastructure is believed to have been adopted by companies as the future of multimedia infrastructure and coupled with it's global coverage more and more companies in Indonesia either banks or manufacturing are using corporate internet /intranet as the way to communicate with their branches and external companies.

The need for higher speed application such as intranet and LAN to LAN interconnection has led to some dissatisfaction among data communication users in particular due to line inability to provide high quality line.

City such as Jakarta is currently in a process to finish it's Jakarta Multimedia City Initiative scheduled to be accomplished in 2001. This initiative based on fiber technology from STM-1 to STM-16 are being followed by other cities such as Surabaya, Bandung , Medan and Batam .

Frame Relay by it's nature was designed to work in an environment where link quality surpass that old telephone line then telecommunication providers sought ways to overcame that draw back.

Experience shows that by using a mixture of fiber line and dial up analog for it's last mile connection, PING test show result as much as 250 ms while in typical application for pure terrestrial link average PING is 50-60 ms.

Other facts since inter city terrestrial link is not that reliable compared to fiber link in big cities than satellite link as trunk solution has been deployed as well for that purpose.

To enhance network reliability by providing alternate route /diversity to terrestrial using VSAT link in case of failure and link degradation for frame relay nodes have been deployed in certain areas where majority customers asked for high network availability.

This condition has led network operators to reconsider of using satellite link solution to avoid either less reliable trunk condition and last mile problem even though delay issues will emerge along with that solution.

VSAT AS TRUNK BETWEEN FRAME RELAY NODE

WAN services as intended by customers is supposed to be able to serve areas where their business is exist. VSAT with it's easily deployed nature offer an advantage for that purpose. Frame Relay services is not an exception in this case and this can be clearly seen in terms of numbers of circuit growth in 2 years time deployment.

Figure 1 illustrated Frame Relay network deployment in big cities where interconnection between nodes are totally using fiber links.

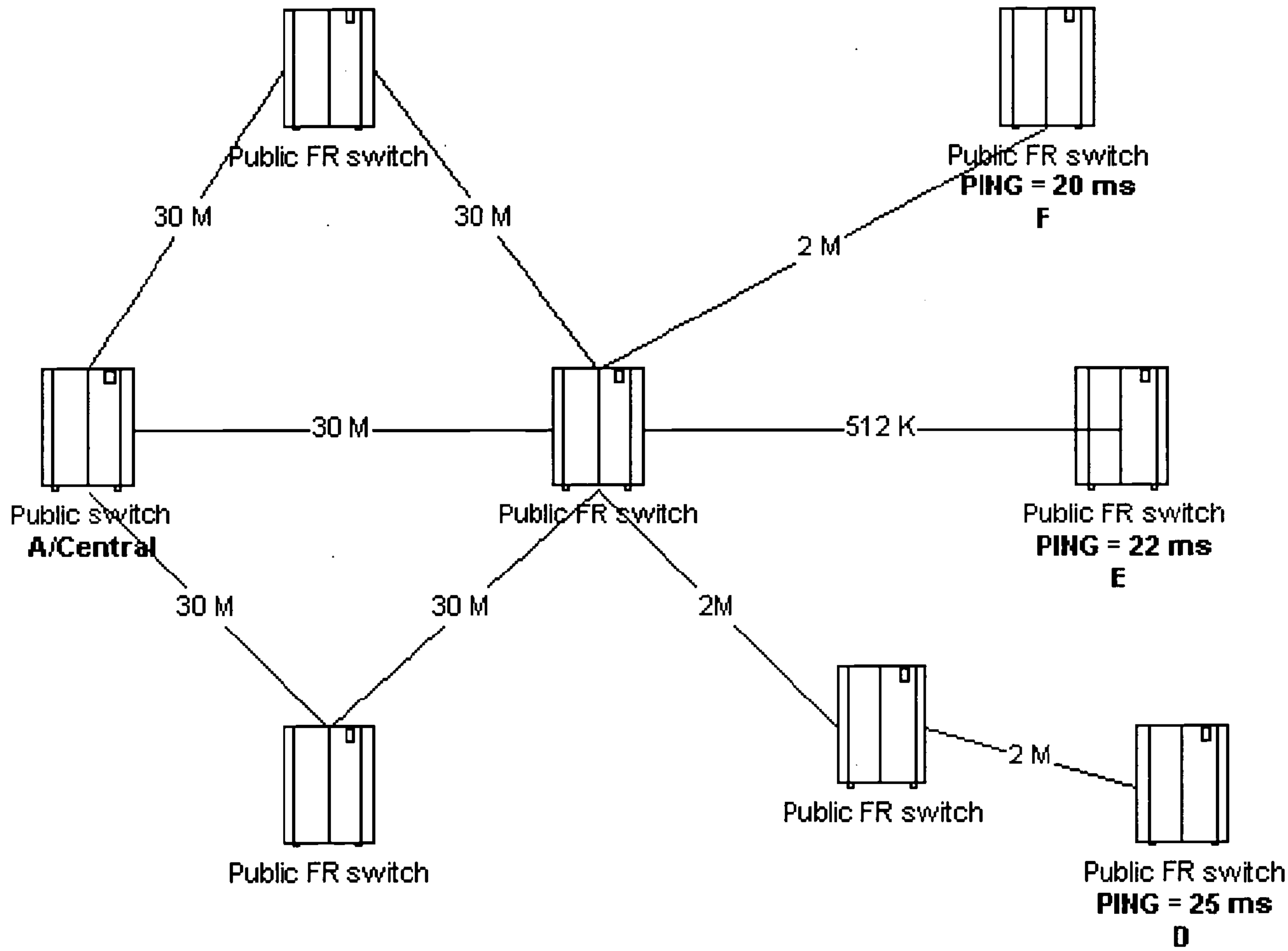


FIG 1 Fiber Interconnected F Relay Network

This situation will not be available in small city with less business activity so the idea to spread this service for remote areas is by utilizing VSAT solution.

Antenna deployment generally starting with a 2.4-m dish and 10W RF power will be adequate to support Frame Relay node from 64kbps to 512kbps.

Customers who previously subscribe other WAN service will start with CIR 32kbps and access speed 64kbps. This is adequate to handle LAN to LAN traffic with moderate traffic and business expand there will be enough capacity to increase speed and CIR that this trunk can carried. If we look fig 2 its obvious that by selecting a 4.5 m antenna at the main ring site and redundant outdoor configuration will provide ample capacity to anticipate customer growth.

This flexibility in terms of development is one of the key that VSAT offered and eventually that will support the idea of provide service at remote areas with minimal start up capacity and investment. But for areas where market prediction will grow faster based on number of customers using data communication antenna diameter 3.8 m is a good start up to accommodate quick customer growth and also to provide alternate route for 2M fiber link.

For instance for eastern area Indonesia 64kbps using 2.4 antenna is interconnected to main nodes in Java with startup capacity 16 port capacity from 19.2 to 38.4kbps access speed. Antenna reconfiguration as bandwidth increase or customer traffic increase can be easily perform with minimum network downtime. Due to the fact that satellite contribute delay to the network a teleport type Antenna at Frame Relay main nodes was set up minimize inter node traversing/delay time. Teleport using larger antenna size and more RF power to accommodate more VSAT as a point of entry to Frame Relay 'cloud'.

DOWNSIZING NODE CAPACITY ACCORDING TO USER NEEDS

Initial market prediction for frame relay services has forced the deployment of nodes which has trunk capacity in 2 Mbps . This capacity was predicted with the assumption that customers traffic will be in high speed mode for example 64k and 128kbps.

But the economic downturn has made customers to lower their requirement and instead of using 64k choose 19.2 CIR as they thruput choice. Along with that, number of customers intended to lease the capacity is not as expected and eventually there'll be idle capacity in some areas with 2 Mbps start up link.

With VSAT solution this 2Mbp link is converted from fiber based link to satellite solution with capacity close to CIR leased by that customers and this will avoid trunk inefficiency in that specific nodes.

This practical solution is applied in many areas where market demand is foreseen to be flat or stay as it is.

VSAT FRAME RELAY TO REACH REMOTE AREAS

For manufacturing and mining business sector where site/location choosed hardly possible to justify the installation of terrestrial frame relay than the only choice is to install VSAT Frame Relay using 1.8 m antenna at remote with 5W RF power.

This is possible by having that remote connected to HUB site of 7.2 m antenna .

Baseband section will be interconnected with Frame Relay gateway that is collocated at the HUB site and eventually that specific remote has already connected with Frame Relay 'cloud' and available for any PVC connection elsewhere around the fiber ring Frame relay network.

One of the drawbacks though from this configuration that further traffic expansion from this remote site will be hard to justify due to the antenna size which is intended for link up to 64kbps. The possible solution to this case is by deploying small nodes and total earth station reconfiguration from a customer premises solution to exchange type solution.

BACK UP RING TO INCREASE NETWORK AVAILABILITY

New services instead of the new technology offered also must bring with it network reliability to make sure transformation from old services happen smoothly.

Public Frame Relay services as well should cater for this problem and geographic diversity configuration is the most suitable for that purpose.

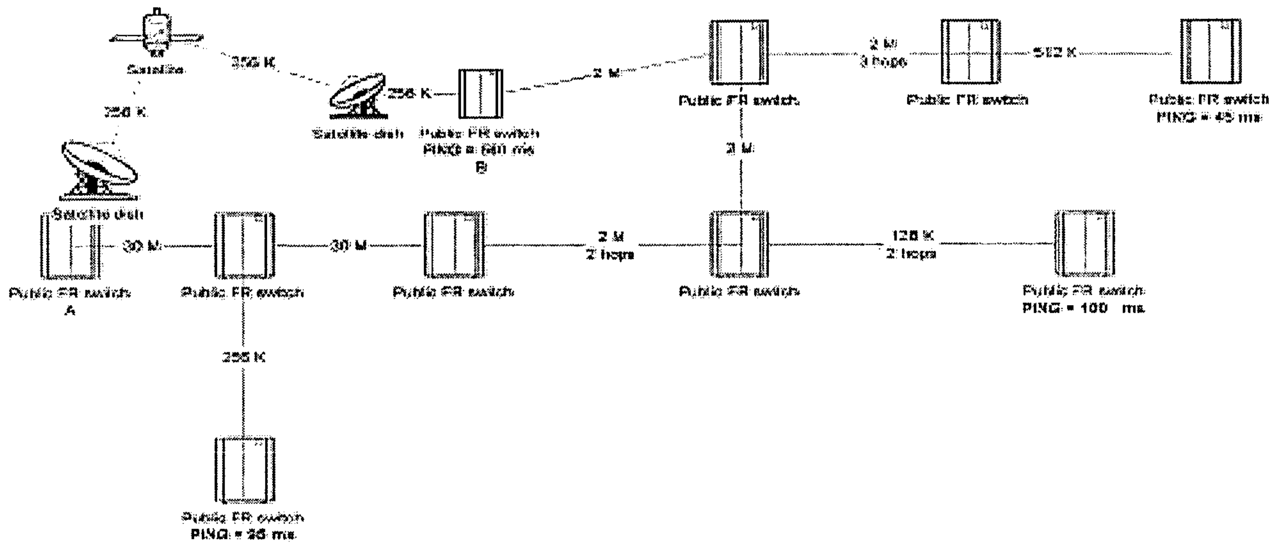
If we examine configuration below that routing to point B can be either go through totally fiber link or in case of failure the system will automatically routed the traffic through VSAT link. This will guarantee link availability and keep the service to the customer but thing we have to concern in this case that traffic from A to B will experience a delay from 100ms to 560 ms .

Even though on the VSAT side we can upgrade the link up to 2 Mbps chances that the inherit satellite will eventually cause 5 times delay.

For this back up ring solution VSAT configuration will be based on teleport type in which at the central site a 5m or a 7m antenna will be deployed while at the remote Frame Relay node a 2.4 antenna (5-10W)/single system configuration is enough as start up . Again this calculation will depend on number of Frame Relay nodes that this link have to support for any fiber link failure.

Other things we have to concern is application response time such as SNA real time application which is very sensitive to link delay. In this case customer should configure a larger time out (T1) to anticipate network round trip delay due to failure in fiber link and rerouting through VSAT link.

FIG 2 RING TYPE ROUTING



RESPONSE TIME ANALISYS AND APPLICATION REQUIREMENT

PING test is performed either from GB/main node or from collocated node.

Provided table of test result and refer to the diagram and pinpoint number of nodes, transmission types used in between nodes.

Location I	Location II	Configuration	PING response time (ms) Central - Loc II
A/Central	B		7
C	D	Fig 3	25
C	E		22
C	F		20
C	G	Fig 4	45
C	H		60
C	I		70

C	J		85
C		Fig 2	95
C			100
C	B		560

Figure 3 illustrated response times of fiber based Frame relay network perform in term of round trip delay imposed by network for specific application.

It clearly suggest that 20ms is the average response time packet round trip delay if number of nodes it traversed is less than three nodes. This is an ideal condition for application to perform well.

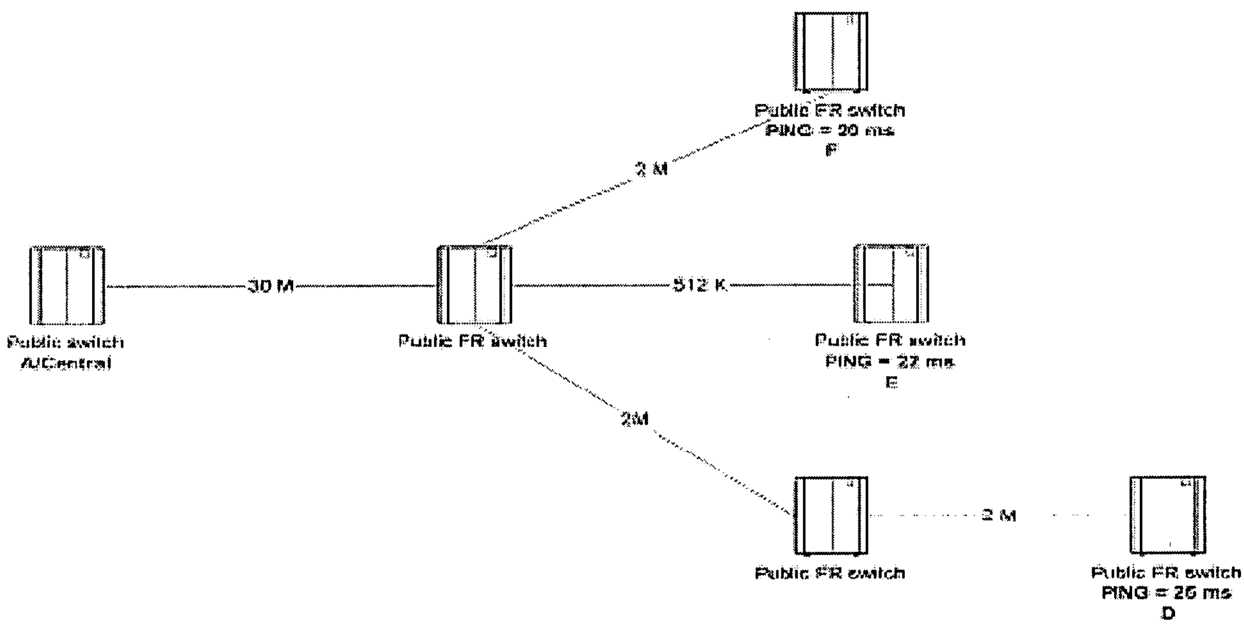


FIG-3 Response time for pure fiber network

In figure 4 further illustrated that additional nodes and less bandwidth deployed will add some delays in the network performance and eventually affect QoS.

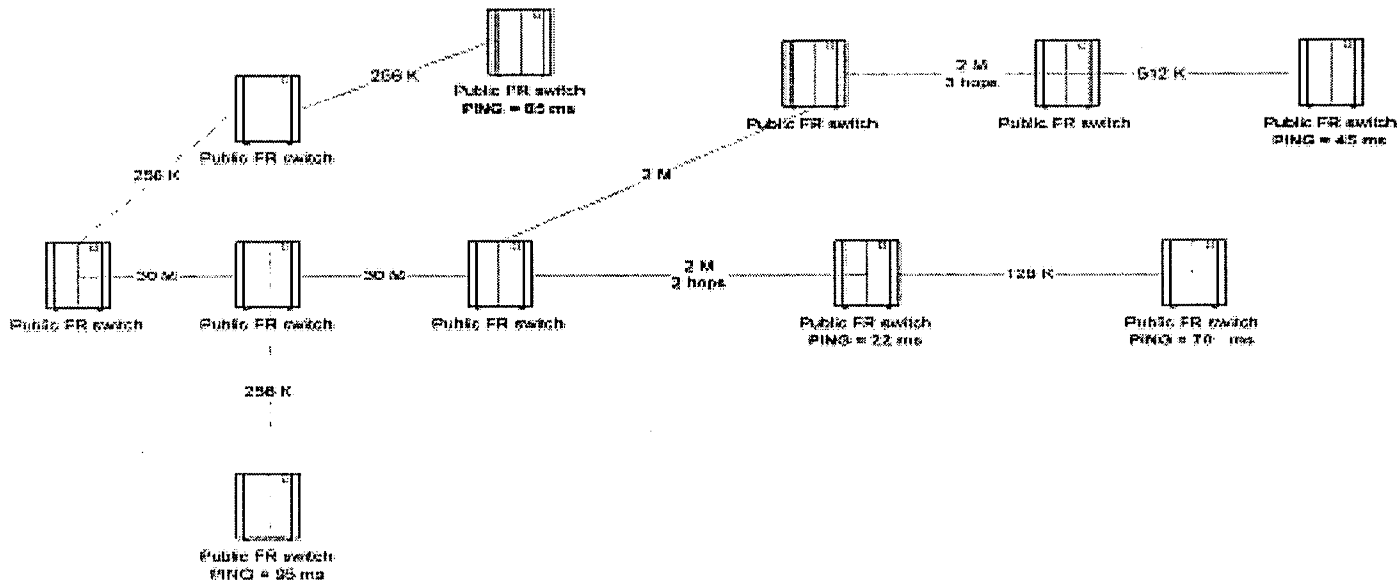


FIG 4 Fiber network with extended nodes

The other possible configuration is ring Frame Relay network with regional HUB to accommodate traffic from Frame Relay nodes that have small number of customers.

Especially for regional with less reliable fiber backbone by terminating and distributing traffic from remote nodes will decrease the possibility of total failure compared to terminating with star configuration by using single HUB to terminate traffic.

The other aspect by routing the traffic from other satellite link will give benefit to network reliability. But delay issue emerge from this solution is exist and has to be carefully adjust to customers application timer parameters.

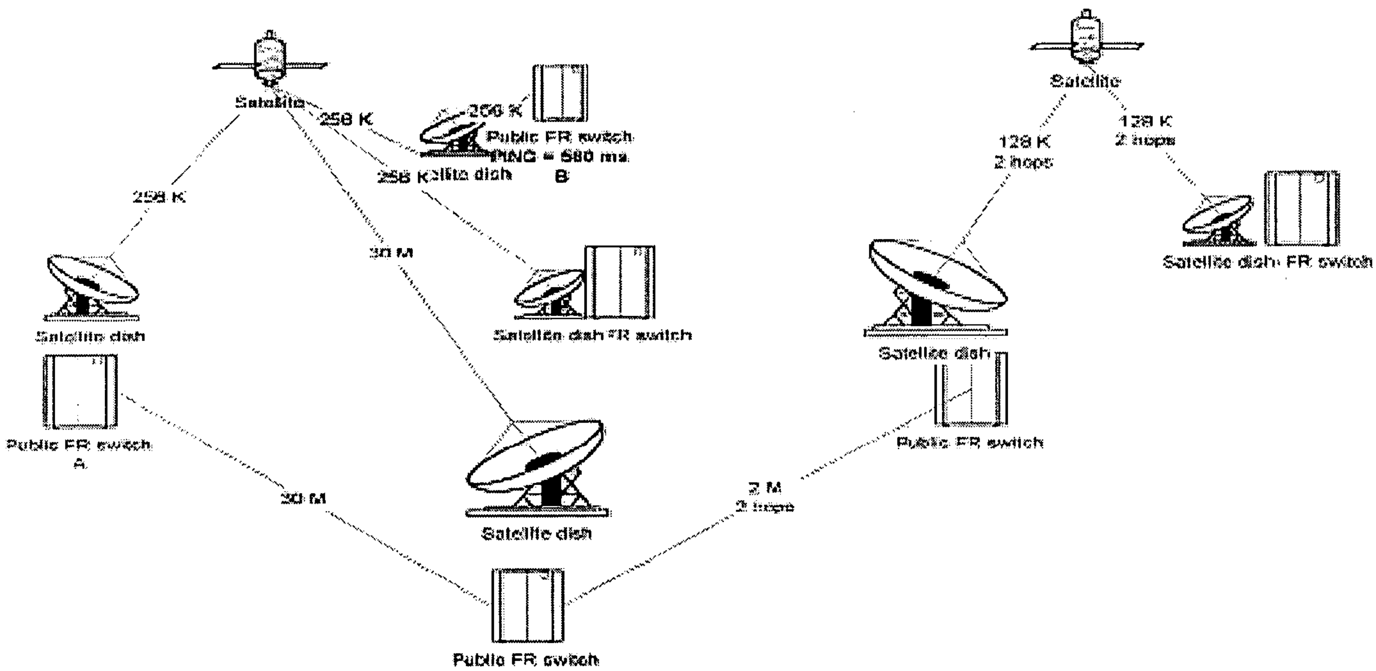


FIG 5 Regional HUB Frame relay

Application critical to network delay such as voice with maximum delay tolerable in an average of 125ms is not suitable if voice frames transported using frame relay with satellite link backbone. Alternative solution by adjusting customer's router frame size is also not acceptable as well. Customers in remote areas usually start to subscribe frame relay services for data application such as on line and inter-branch application. Eventually as they find that capacity is still available on their circuit, customers ask for voice application and not realizing that traffic to it's location actually provided by satellite.

CONCLUSION

VSAT as an alternative transmission media to interconnect Frame Relay nodes is a good solution for network expansion especially with its ability to start up in small capacity nodes . Besides that since Frame Relay technology demand low BERT link quality than a shift to VSAT is a good option even though delay which is inherit in satellite link is something that has to overcome by choosing the right application the customers can pass through the network.

Apart from that due to it's nature of single hop than the consequences of traversing from many nodes in reaching the customers headquarters is a good nature of VSAT or satellite technology.

Further assessment of customer traffic profile will be able to find out either the traffic is symmetric or asymmetric and if that is the case than VSAT solution will be much intended due to its ability to provide asymmetric link.

With frame relay infrastructure deployed in Indonesia and with the support of satellite communication, proliferation of Internet as the way to interconnect worldwide is clearly seen. More than 80 % of dedicated Internet connection using frame relay as it's backbone and more circuits are expected to use this infrastructure in 2000 for Internet connection due to it is available all over Indonesia and more cost effective compared digital leased line solution.

Considering Telkom-1 satellite launch success whereby it provide much better EIRP (3 dB increment compare to Palapa B2 R) it will offer better link performance and therefore using satellite either as access for Frame Relay cloud network or trunk solution will bring great advantage for network reliability.

REFERENCES

1. ***Handbook on VSAT systems and Earth Station,*** *Supplement* no 3 ITU Handbook on Satellite Communication, Geneva 1994
2. ***Satellite Communication Application Handbook***, Bruce R Elbert Artech House London 1997
3. ***Passport FRAME RELAY UNI User Guide***, Northern Telecom - 1996
4. ***SNA over Frame Relay,- The Frame Relay Forum*** -The APPN Implementers Workshop -Sept 30,97 David Sinicrope IBM Corporation Networking Architecture and System Design
5. ***" Frame Relay Services " by To Chee Eng*** Data Communication Asia-Pacific, December 98 & March 99
6. ***"Signalling in ATM Networks "*** Raif O Onvural , Rao Cherukuri ;Artech House 1998

Biography

Buha Sihar Panaili
Phone :62-21-8440174
Fax 62-21-3107958
E-mail : buha@lintasarta.co.id
http://lintasarta.co.id

Kranggan Permai
Blok S3/12 RT 12/15
Pondok Gede Bekasi 17433
INDONESIA

Summary of qualifications

1999-1995 PT Aplikanusa Lintasarta Jakarta

Manager for Satellite Services

- Managing country wide satellite network comprise of 1500 terminals
- Managing regional VSAT network with 3 regional operators
- Managing interconnection with Frame Relay network in 35 cities throughout Indonesia to from seamless network

Education

1990 IPPM/Inst.Pendidikan dan Pembinaan Manajemen Jakarta

MBA for Fresh Graduate

- Mayoring marketing management.
  1983-1988 Bandung Institute of Technology Bandung
- **Sarjana S1** mayoring telecommunication engineering
  1987-1988 PT INTI (Indonesia Telecommunication Industry) Bandung
- Research and design of Satellite Earth Station
  1985 June-August PT Telkom Jakarta
- On job training on microwave laboratory

1997 PT Aplikanusa Lintasarta Jakarta

Professional experience

Pioneering INTRANET initiative for company wide usage. This service currently available throughout Indonesia and can be accessed by employees for quick information retrieval

1995 PT Aplikanusa Lintasarta Jakarta

Manager

- Set up regional cooperation with Hutchinson Hongkong for regional VSAT services covering South and Far East Asia.
- Set up regional cooperation with Telecom Malaysia for TDMA satellite services.
- Set up VSAT and terrestrial network to support dissemination of lightning information system around Indonesia with ITB Bandung
- Minister of Home affairs network set up for 330 VSAT locations /1994
- Bank BNI VSAT project for 300 locations /1994
- Central Bank On line VSAT project for 44 cities/branches /1993-94
- Indonesia Digital Data Network Implementation in 1991 which become the embryo for this current nation wide Frame Relay Network.
- Indonesia Credit Card Project for Non Alignment Movment Meeting/1993

1989-1990 PT Guna Elektro Jakarta
Implementation of railway/PJKA communication system for West Java and South Sumatra line.

Patents and publications	1. **NETWORK ASIA 98/Singapore** Provision of seminar material title ***"VSAT to Compliment Existing Telecommunication Infrastructure"*** presented by Director General of Post and Telecommunication/Indonesia 2. VSAT ASIA 97/Singapore Paper Title ***"VSAT Services and Market Demands"*** 3. VSAT ASIA 98 /Singapore Paper Title ***" Challenges Faced by VSAT Operator"*** (presented during economic down turn in Indonesia and highest circuit dismantle in VSAT business) 4. COMMUNIC ASIA 99/Singapore (Satellite Communication Summit) Paper Title ***"VSAT to promote public and private Frame Relay services"***
Additional professional activities	• As a contributor to "Forum of Telecommunication and Management Information of Petroleum of Indonesia" • Build relationship with • SATMEX /Mexico • Hongkong Telecom • IMPSAT COLUMBIA and Argetina • Americatel/Florida • PANAMSAT • Comsys, Satellite Communic Consltancy, UK • Analysis Consultancy European VSAT Market

Professional membership	PACIFIC TELECOMMUNICATION COUNCIL 2454 S Beretania Street, Suite 302 Honolulu, Hawaii 96826 - 1596 USA
	• ITB Alumni Association/ Jl. Gatot Subroto JAKARTA • ASSI, Indonesia Satellite Association http,//www.assi.or.id. • SSPI, The Society of Satellite Professionals International
Languages	Spanish / level of ability moderate
	It's purpose is to accommodate further understanding on South/latin American telecommunication development and to be able to communicate with colleagues from Latin American Companies.
Community activities	
	1994 / Bandung : Organizer / member on Indonesia Electronic Exhibition conducted by ITB's Electrical Department
	1985 / Bandung : Organizer / member on Indonesia Electronic Exhibition conducted by ITB's Electrical Department
Extracurricular activities	Regular annual meeting with Indonesia satellite operators to discuss operational and regulation issues.
	• Palapa Satellite Comm. User Forum Meeting • British Council membership # B 00093137
Hobbies	Swimming, Golf, Reading science fiction and management bulletin
Interest and activities	Cross border / international especially developing countries telecommunication initiatives to further enhance coordination and understanding between different telecommunication entities.
Family	2 sons 6 and 5 years old, 1 daughter 1 year

IVR APPLICATION AS A VOICE BASED INFORMATION SERVICE FOR RURAL COMMUNITY (An Alternative Solution for Rural Economic Development in Developing Countries)

Andreas W. Yanuardi

Abstract

Indonesia is a country that has a lot of natural resources that are found in rural areas and most of Indonesian people live there. The improvement in telecommunication technologies that are combined with information technologies recently has created many services, whose characteristics are not only for individual but also for community needs. One of those services is IVR (Interactive Voice Response) which applies a computer and telephone network; the computer contains any information accessed by users through telephone network. By integrating the existing infrastructure with IVR services, it is proposed to introduce a system providing information service for the rural community called RIRC (Rural Information Riched Community), a voice based information service. The main objectives of developing RIRC are endeavoring the utilization of telecommunication facilities to give rural community a more prosperous life and to give an opportunity for rural community to have more information source choices. This paper will discuss about RIRC system, the strategy to apply this service over the rural areas and possibility to enhance the system.

1. INTRODUCTION

Rural areas might be likely taking the biggest part in the development of Indonesia, because of both major populations and great natural resources of Indonesia are found in rural areas. Nevertheless the development of telecommunication infrastructures in rural areas still have some constraints, such as low demand density for telecommunication infrastructure and low utilization of telecommunication infrastructure.

The major causes of rural community's low-demand density for telecommunication-service provision are:

1. The economic and educational level of rural community is lower than urban community's.
2. The telecommunication service that is provided has less correlation to the rural community activities on both economic and educational field.

Market segment for telecommunication services recently is still dominant in urban area. Hence, only the urban population gets benefits from the improvement in telecommunication and information technologies services. In case there are no alternatives in order to conduct telecommunication facilities in rural areas, it will raise telecommunication-unbalanced distribution between urban and rural areas.

Based on the above realities, in order to stimulate economic growth over the rural areas, service provider has to develop a new service suitable for rural community. However, service provider generally faces difficulties in provisioning the telecommunication facility in rural areas of developing country. The most common difficulties are high investment and low revenue generated by its service.

To overcome these difficulties, it is proposed to make a new service using the existing infrastructure so that the rural network function is not only as media communication but also as information source relevant to the rural activities. In order to match with the expectations of rural capability and rural background, the information service should have characteristic of simple operation, inexpensive cost and relevant with the subject.

The improvement in telecommunication technologies that are combined with information technologies support the developing of technology based on voice such as IVR (Interactive Voice Response) which applies a computer and telephone network. By integrating the existing infrastructure with IVR services, it is proposed to introduce a system providing information service for the rural community called RIRC (Rural Information Riched Community), a voice based information service which researched by Rural Communication Laboratory - RisTI since 1997. The launching of this new community information service that agrees with the rural community activities will increase rural community prosperity and finally reduce the constraints on telecommunication provision.

2. THE FUNCTIONS OF RIRC

The presence of RIRC service has some main functions as follows:

- To be one of the communication service solutions to make telecommunication infrastructure more useful than ever to gain the economic activity of rural community
- To be a rural information service that can be used by all economics level of rural community and can be understood by all education levels of rural community
- Motivating the rural community to communicate each other and also receive as well as use it in rural social life.

Based on the consideration of condition and service functions above, the users of RIRC service can be classified into three segments:

- Segment 1 : Group of people who have ability to become a telephone subscriber
- Segment 2 : Group of people who do not have ability to become a telephone subscriber, but they need any information
- Segment 3 : Group of people who do not have ability to become a telephone subscriber, and do not understand information

3. System Configuration of RIRC

RIRC, as shown on figure-1, consist of 4 (four) major sub-systems. They are PSTN, IVR Server, Facilitator and End User Terminals

PSTN

PSTN is main network used for delivery stream of information in this service. Facilitator and the users access the information on IVR Server through PSTN. The access network for PSTN is not limited into copper wire only, but some of them are radio even satellite (VSAT - Very Small Aperture Terminal).

Intelligent Network can be an attractive alternative solution for charging system when RIRC wanted to be commercial with assistance from benefactor, therefore the users who dial to RIRC Server will not be charge any more.

IVR SERVER

IVR Server is a collection of hardware and software that performs IVR application. It also contains information voice database whose information is related to the rural community's activities. The content of the information is flexible, it depends on the information priority needed by the rural community.

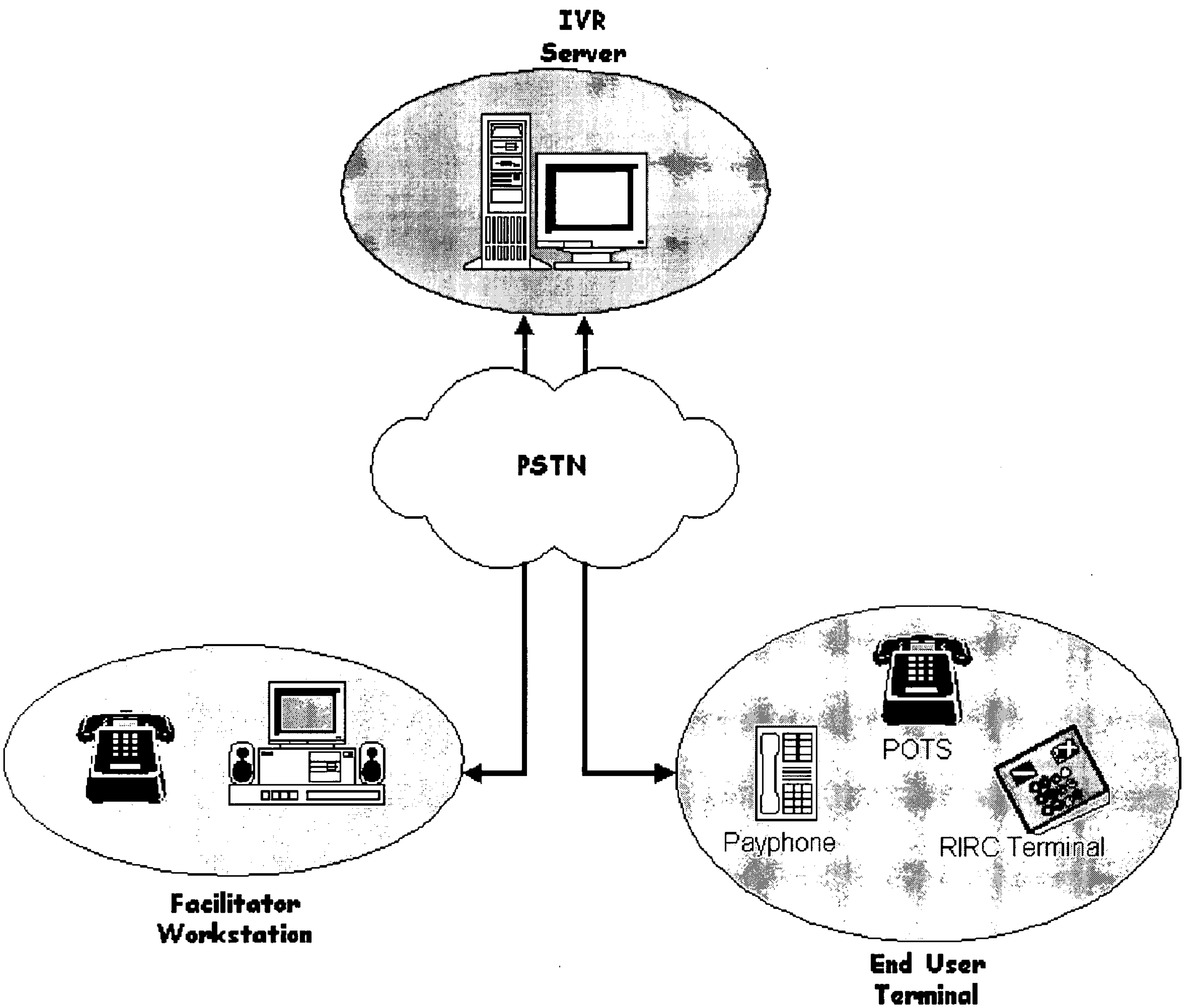


Figure-1: System Configuration of RIRC

Based on its function, information voice database in this server can be divided into four types of information as follows:

1. Menu information.

   This information is used to guide the users to choose what kind of information they want to access and what kind of language they want to use.

2. Retrieval information.

Retrieval information is such information the users can access or retrieve anytime they want. As the main information of this service, this information consists of the amount of information relevant with community's activities to increase their economy and welfare. The facilitator has responsibility to update it in a periodic time.

3. Interactive information.

   When the users have any problems they can submit their questions into the server. After the facilitator makes a note of it, then stores the answer of their questions into the server, the users can access the solution of their problems. Interactive information has commercial prospect such as information about commodity and agribusiness. Based on that consideration, interactive information involves internal users (rural community) and external users (urban community).

4. Notification information.

   Notification is needed to notify the facilitator if there are any questions submitted by the users. As soon as the question is submitted, the system will send notification information to the facilitator.

Facilitator

Facilitator is a group of people who are responsible to maintain the content of information on the server.

The main tasks of the facilitator are to:

- Fill in the information on the server and update it periodically
- Make a note of the question submitted by the users
- Give the answer of the user's problems and store it into the server

Facilitator is equipped with AIC (automatic information capturing), a software and hardware to capture and record information from radio and television automatically, as information source for the facilitator and can be stored to the server after pass an editing process first.

Indonesian government has a particular institution in each subdistrict that consists of group of people namely farmer assistants who giving elucidation and training to the farmer. However, occasionally the quantity of the assistants is not comparable with the quantity of the farmer. In this case, RIRC can be used as an alternative solution to solve that problem in which the assistants will act as the facilitator in RIRC system.

End user terminals

End user terminal is a part on the user side used by the rural community to access information from the server through telephone line. It can be grouped into three types:

- POTS Terminal

  Rural community who becomes a telephone subscriber can access RIRC service by using their own telephones (either fixed or mobile). By dialing to the RIRC service, the users will be guided to choose language and information they desire.

- Payphone Terminal

For rural community who does not have ability to become a telephone subscriber (segment 2) can access RIRC service through payphone. Accessing procedure through payphone is same as POTS.

- RIRC Terminal

RIRC terminal is provided to accommodate rural community who does not know much about information they need. This terminal gives a simple procedure to access the information, therefore rural community in the third segment can use it as introducing process to know the information and learning process in order to get information through telephone.

The unique thing of this terminal is it can dial automatically to the server when off hook or when the users press hands free button to access the information by using microphone and speaker setting on this terminal. It also uses symbol button as a substitute for a series of number button. The symbol describes the kind of information desired, for example cow as a symbol of animal husbandry information then question mark button is used to submit a question, etc.

4. Program Algorithm

A key success in the operation of this service heavily relies on the simplification in accessing information, besides the information content. For information access simplification, program algorithm in RIRC should be capable of executing various tasks based on minimum control access sent by user terminal. Figure 2 describes program algorithm to arrange process in RIRC.

Language used in RIRC service consists of two different languages: Indonesian language and local language. It makes this service more friendly to the users because some of rural community in the isolated area usually prefer to use local language than Indonesian language even some of them can not speak Indonesian well.

Basically information database for both POTS/Payphone terminal and RIRC terminal is equal. The difference is only at the menu information and sequence process to access the information. To differentiate whether the users use RIRC terminal or user terminal (POTS/Payphone), IVR server send a signal/digit to end user terminal. If that signal is received by RIRC terminal, it will respond the signal by sending a signal response to the server so that IVR server knows which context has to be used.

The information stored in IVR Server is information related to economic activities so the information can stimulate rural community to increase economic growth such as agriculture, home industries, animal husbandry, plantation, health info etc. The information is not limited to guidance, but some of them are transaction, consultation and daily information about goods prices.

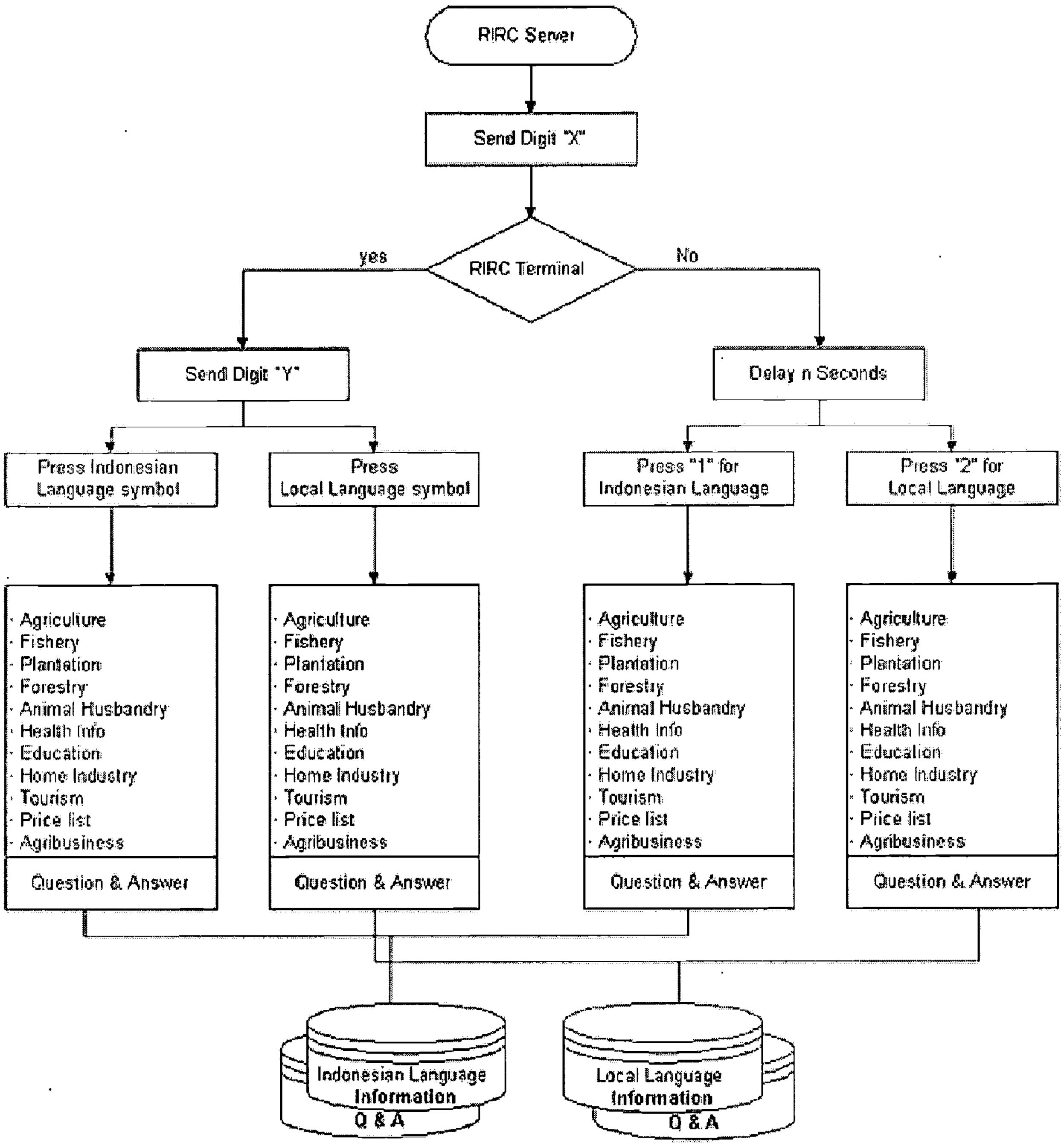


Figure-2: Program Algorithm of RIRC

Information and consultation are expected to stimulate economic activity in rural area efficiently. The readiness of information about product guidance and market is expected to make product higher. Sometimes rural community who will trade their outcomes to the market center via brokers do not know the price list of their goods in the market center so that they can not sell their outcomes optimally. This problem will be reduced by giving the price list information to the IVR Server.

5. Implementation Model

Based on demographic, geographic and telecommunication infrastructure of existing rural, there are three different class of implementation area:

- **Model A (Covered by existing network)**

  Area that classified into model A is an area that covered by existing network. The network is not limited into one access network only such as copper wire, but some of them are radio and/or satellite. The population of this area is concentrated mode and has a chance to be a new urban area.

- **Model B (New area covered by terrestrial network)**

  Model B is an area that located out of local exchange coverage area and population of model B area is scattered in small group. The area can still be covered by Local exchange as long as the distance less than 100Km by using terrestrial network.

- **Model C (New area covered by satellite network)**

  The main characteristics of model C area are:

- Out of local exchange coverage area
- Population is scattered individually
- Hard to reach, so it will be efficient to serve by using satellite network

The configuration of models above can be seen in picture below

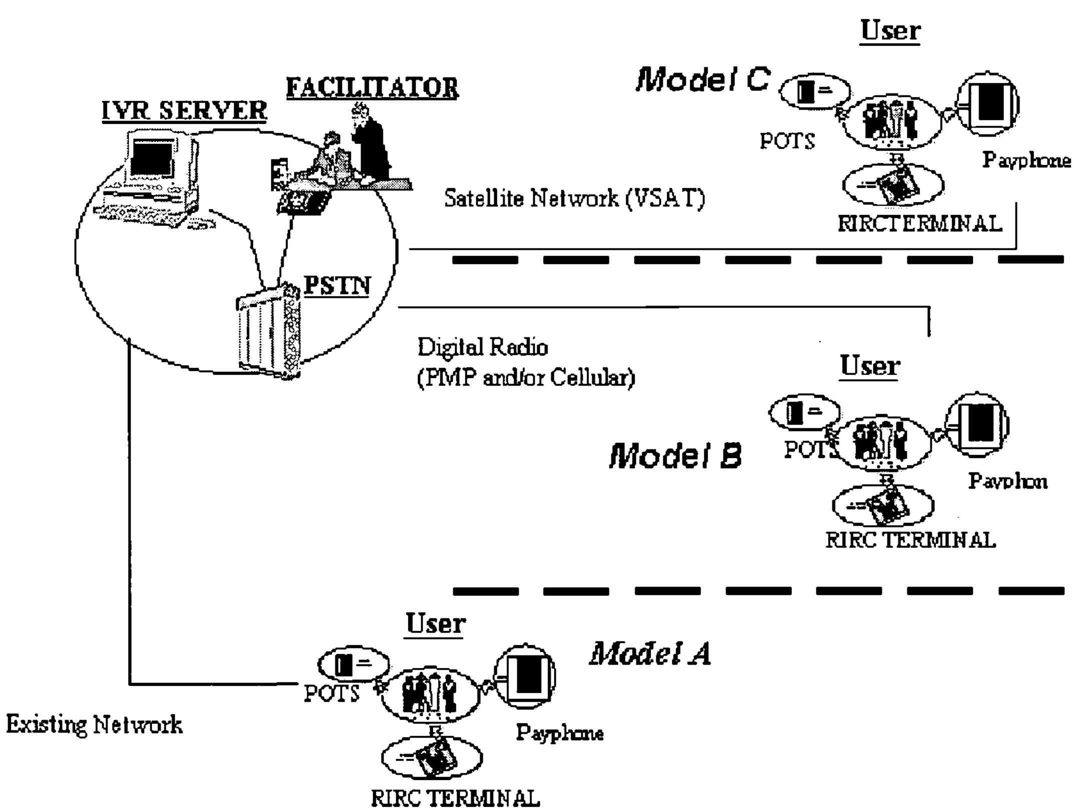


Figure-3: Implementation Model

6. Future Works

To give more simplicity and expand the service, the next development is focused on the broadening of the information sources diversification and the ease of information filling in to the server by using Text to Speech software for the Indonesian language. Therefore, the facilitator has ability to put the information in text form, afterwards Text to Speech software will convert it into voice so that information filling up process and editing process will be easier.

Besides Text to Speech software, to enhance RIRC services it is proposed to expand information stored in IVR server by connecting IVR server in each region as if hyperlink capability in the Internet Network. Therefore, user in server boundary A can access information from server in boundary B without knowing that the connection is out of boundary area. The service of RIRC has a chance to be expanded so that the service has national coverage.

7. Conclusion

- RIRC is a form of telecommunication role improvement based on rural community background of the developing country.
- The presence of RIRC service is an effort to train rural community, therefore they can have telecommunication skill and basic acknowledgement about information technology and finally will increase telephone network productivity and rural community welfare.
- Key success of this service is not only depend on the reliability equipment but also strongly rely on the quality of information performance.

REFERENCES:

1. Sulasmono, Halim, "*Telkom Approach in New Market Environment for Rural Area*", Asia Pacific Rural Telecom Conference, Jakarta, Indonesia, 1995
2. Achmad, Sofyan, "*Virtual Tele-Information for Rural Community - An Approach to bring powerful telecommunication for rural community* ", Canada, 1997
3. Prasetio, Samudra," *Rural Telemedicine in Indonesia (An approach to selecting proper application)* ", PTC'99, Honolulu, Hawaii,1999
4. Telkom, PT, "*Kajian Profitabilitas Layanan Telekomunikasi Rural Tipe III di Indonesia*", Indonesia, 1997
5. Telkom, PT, "*Rural Information Riched Community*", Indonesia, 1996
6. Telkom, PT, "*The Strategy of Implementation of Indonesian Rural Network*", Indonesia, 1996.
7. Tetscher, Walt, "*Voice Processing* ", London, 1993

Biography

Andreas W. Yanuardi

Right now, I work for RisTI (R&D Division) of PT Telekomunikasi Indonesia. I have been joining to the company since 1997. I got my bachelor degree in Telecommunication Engineering from Sekolah Tinggi Teknologi Telekomunikasi in 1997. In DivRisTI I was pointed in Rural Communication lab, the main activities of the lab. is searching or/and developing an alternative relative solution for rural people so they can use telecommunication infrastructure as well as urban people. Recently, I am responsible for research on a voice based information service for rural community.

Company's URLs : www.telkom.co.id and www.ristinet.com

Sessions

Access Network Infrastructure Development: TELKOM approach to the future network

Ariyanto, Soendojoadi

1. Introduction

The present access network development in Indonesia in characterized by a slow growth in the number of telephone subscriptions, and correspondingly a roll out of copper based copper access line, which is predominant access technology. As of March 31, 1999, TELKOM and the KSO Units had 5.65 million Lines in Service, consisting of 3.04 million Lines in Service in TELKOM Regions and 2.61 Lines in Service in KSO Regions (see table 1). Compare to the number of population (approximately 200 millions), the average telephone density is still very low (about 2.9 telephone / 100 people). The number above is insignificant in the big cities, which are believed that the density is much higher than that. On the other hand, in some rural areas such as most city in Kalimantan and Irian, the density is much less (approximately 0.5).

The unfortunate situation in the late 1997 up to now, which is marked by political and economics difficulties had an impact on the telecommunication infrastructure provision. The impact is identified as the slow growth in the telephone subscription and the phenomena of service cancellation in the big cities.

Net additional Lines in Service during the first quarter of 1999 were 75,053 lines, which was 43.3% lower than the 132,458 net additional Lines in Service during the comparable period of 1998. Of the net Lines in Service added, 21,937 Lines in Service were added in TELKOM Regions and 53,116 were added in KSO Regions.

During the first quarter of 1999, a number of 69,676 subscribers cancelled their lines. Of these, 47,109 lines were in TELKOM Regions and 22,567 lines were in the KSO Regions. The cancellation comprises of 20,803 business subscribers or 29.86%; 48,630 residential subscribers or 69.79%, and 243 social subscribers or 0.35%.

Table 1: Operational data of the number of installed line

OPERATIONAL DATA FOR THE FIRST QUARTER OF 1998 AND 1999

OPERATIONAL INDICATOR	Unit	Q1/98	Q1/99	Growth (%)
Exchange Capacity				
TELKOM Division	Lines	4,128,520	4,354,271	5.47
KSO Division	Lines	3,572,933	3,858,698	8.00
Total Exchange Capacity (TELKOM & KSO Division)	Lines	**7,701,453**	**8,212,969**	6.64
Installed Line				
TELKOM Division	Lines	3,668,065	3,916,221	6.77
KSO Division	Lines	2,959,209	3,326,438	12.41
Total Installed Line (TELKOM & KSO Division)	Lines	**6,627,274**	**7,242,659**	9.29
Line In Service :				
TELKOM Division	Lines	2,807,407	3,036,761	8.17
KSO Division	Lines	2,307,517	2,609,936	13.11
Total Line In Service : (TELKOM & KSO Division)	Lines	**5,114,924**	**5,646,697**	10.40

There are some basic factors influencing that phenomena instead of just blaming of economic difficulties, as follows:

- The stagnant of traditional service (POTS) which is characterized by circuit switch based network deployment in develop cities. More than 1 million connection line is idle due to the improper implementation planning. It is also stated in the recommendation that to fostering the number of connection line, TELKOM has to think to enhance the service toward the second curve of multimedia service which is colored by data centric based network.
- The traditional service (POTS) is still used especially to provide greater access to some undeveloped regions. The re-usage of idle capacity to these regions is one of alternative solution recommended by this group.

The rest of this paper will briefly open all related discussions on providing greater access to the network possible in Indonesia and the enhancement of bandwidth of access network to accelerate the deployment of second curve business through the some actual consideration policy and implementation strategy.

2. General Actual Policy for Access Network Implementation

The Key terms of TELKOM's Access Network Implementation

The main guidelines for TELKOM Access network Implementation is based on three key terms, i.e.: flexibility, simplicity and cost effectiveness.

Flexibility implies:

- Easy and fast implementation of new services.
- Allocation of bandwidth on demand.
- Easy and fast adaptation to large changes in demand and traffic pattern.
- Easy and smooth interworking with other networks.
- Easy updating of transmission, switching, etc.

However, this new network will tend to be much more complex than the present one. It will also require more sophisticated technology and more intelligent control and management functions. Unless we try hard to choose simple solutions, the result could be a network that is complicated to plan, supervise and operate. Thus, **Simplicity** should be the key to the design of the future network, in terms of planning, engineering, supervision, management and operation. Particular attention will have to be given to efficient and simple signaling systems.

It would not be so difficult to build networks which are both **Flexible** and **Simple**, provided that unlimited funds were available, but that is not at all the case. On the contrary, it will be more important than ever before to minimize the cost of the network, including not only the capital cost, but also the cost for installation, maintenance, future replacement, etc. Especially, management costs will be more important than today. Thus, **Cost Effectiveness** will be the third important property.

Master Plan Guidelines for Access Network Implementation

TELKOM's access network implementation strategy will be based on the three implementation concepts, i.e.: Technology implementation concept, Network implementation planning concept, and Network development concept. Technology implementation concept will deal with how one technology is chosen and implemented in the network. Network planning concept will explain the norm basis of TELKOM network implementation planning whereas Network development concept will shortly describe a stepping of network development.

a. Technology Implementation concept

The modern network has various technology alternatives. This condition causes a big shift in network planning procedural. Activity of technology selection becomes more critical as can be seen in the figure below.

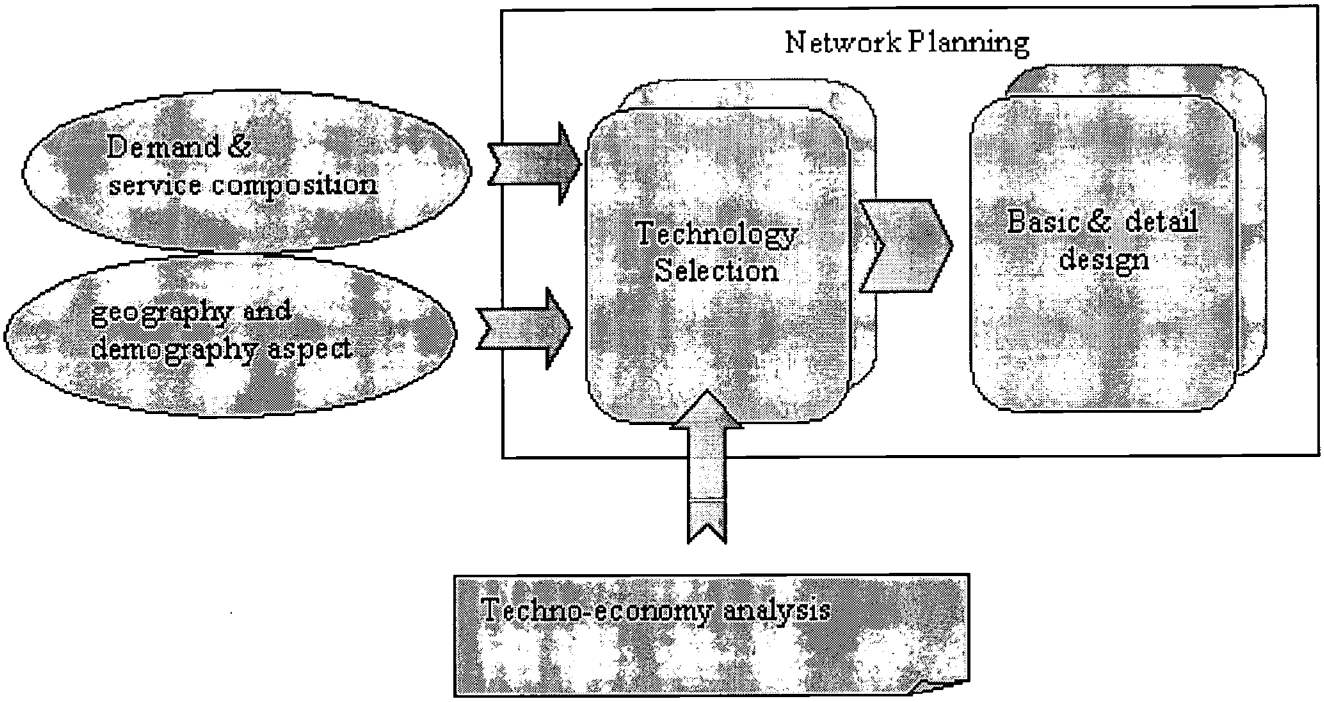


Figure 1: Technology Implementation concept

Considering the variety of Indonesian condition; such as geography and demography; some 'mature' alternative technology solution should be implemented based on specific needs in one area by looking the demand, technical characteristics, and techno-economy result. Similarly, the network development will maximize the technology capability as long as it is feasible to run the business. Therefore, the advance and variety of the network will always be followed and the system technology will be up dated periodically. The evaluation of the technology selection will follow the some rules:

- Technology selection based on service demand condition
- Technology selection for network consolidation supporting
- Technology selection to support bandwidth enhancement
- Technology selection based on the geographically condition ,
- Technology selection by considering technical recommendation
- Technology selection to support company competitiveness

b. Network Implementation Planning concept

The implementation of one technology in the network is a complex activity of telecommunication operator. The issues on investment become the only parameter that should be filled. Therefore the network implementation planning will play as a key role for one technology to be deployed in TELKOM network. The norm bases of TELKOM network implementation planning are as follows:

- Network element capability to provide service demand planning

- Timely based Network element capacity planning
- Existing network optimization planning
- Area priority of implementation planning
- Investment efficiency to demand fulfilling planning

c. Network development concept

TELKOM releases that to provide multimedia service in the network, there is a need an accommodative development pattern. It means that the development of the infrastructure must have an ability to adjust demand needs, competition climate and company investment capability. Therefore TELKOM has set a future network properties that should be considered in the development, i.e.: flexibility, simplify, and cost-effectiveness. These attributes will always be coloring of all network development concepts that can be divided into:

- *Development phasing*
  The phasing means that the network development should be implemented gradually as the time basis. TELKOM is not to take a revolutionary change in their network. But the strategy is to step-by-step take a market and then expands. In other word, TELKOM makes two periods of development, consolidation and expansion. In consolidation period, TELKOM network development concept is aimed to study the technical network performance, Business opportunity analysis and customer responses.

- *Existing network optimization*
  Existing network optimization is done by making the reengineering of inefficient installed network, reallocating equipment and reallocation of the demand.

- *Bandwidth enhancement*
  Bandwidth enhancement development is also become one of telecommunication development model of TELKOM in order to foster the implementation of multimedia services. Bandwidth enhancement effort of TELKOM is done by applying xDSL technology in the copper existing network, opticalization in the green field area and introducing the new concept of providing access network through a service connection.

- *Area based development*
  In line with the priority of development due to the geographical variety, TELKOM focus the development of modern network in big cities as a part of development of physical Nusantara-21 vision, i.e. by creating multimedia cities. The other area, the network development is aimed to foster the utilization of the network by empowering the telephone service to the rural community.

3. TELKOM's Access Network Implementation Strategy

Due to the extensive of geographical condition, TELKOM opens up various technologies to be adopted in access network implementation. The possible networks that can be adopted in TELKOM environment are:

- Copper access network
- Optical access network
- Radio Access network
- Satellite access network

Each technology is chosen by a tight consideration that depends on the condition matching in the field. The next sub chapter will explain the strategy that currently has been used by TELKOM in deploying access network infrastructure.

3.1 Selective implementation toward second curve business provisioning

Considering that access network implementation requires very large investment, the selection of implementation target should be very tight and should be matched by the company investment capability. This can be done by weighting method. By this method, the area which is had the highest weight will become the first priority and so on. Therefore, the selective development of access network in new area is very crucial.

Some criteria that can be used to judge the highest priority of area development are:

- Demand pool location
- The average of traffic generated per subscriber
- Competitor network existence

a. Copper Access Network (CAN) implementation

The old paradigm implementation concept stressed the access network development on POTS infrastructure provisioning basis. Number of copper pair installed in access network was become a successful parameter of telecommunication infrastructure development in National 5-years development plan. As the consequences there was a huge number of copper based access network and more over it causes a lack on new services provisioning that requires a wide bandwidth. The improper implementation area has caused a huge number idle capacity of telephone lines.

Considering the facts, the new paradigm of copper access network development will be based on bandwidth enhancement in existing copper network through the insertion of xDSL technology in business area and big city residential to anticipate new service provision. The new development of POTS infrastructure basis and idle capacity re-usage is directed to the rural area and suburban.

b. Optical Access Network (OAN) Implementation

Since 1996, TELKOM was modernizing its access network by deploying OAN. The OAN deployment motivation:

- To enhance the capability and performance of the access network for the current service portfolio
- To reduce the investment and operation costs
- To cope with limited underground infrastructure
- To prepare the access network for the future multimedia services

Introduction of OAN is related to the current rolled out of telephone lines. The current installation of copper pairs with long average loop lengths (several km) in areas with a potential future demand seems questionable, since future demand is likely to require a costly future restructuring of such a network structure. An alternatives access network structures with shorter copper loop lengths has proven to be more cost-effective for NB services, and in addition has an inherent higher capacity potential by the use of xDSL technology.

TELKOM has set the strategy of introduction OAN in various areas in TELKOM's network:

- *Defining city segmentation for deploying fiber*
  It is divided to 4 segmentations regarding the Line Unit capacity, LU capacity growth and strategic function of such city. And for every segment, the priority of OAN deployment is matched by LEX condition by considering exchange capacity and number of business customer.

- *Defining priority OAN roll-out application modes based in certain area*
  Table 2: Priority of OAN roll-out

Subscriber segment	Building Structure	Area Type	Priority
Business	Large business	Existing network and new build	1
Business	Small business	Existing network and new build	2
Residential	Apartment	Existing network and new build	3
Residential	Single large house	New build area	3
Residential	Single house	Existing areas	4

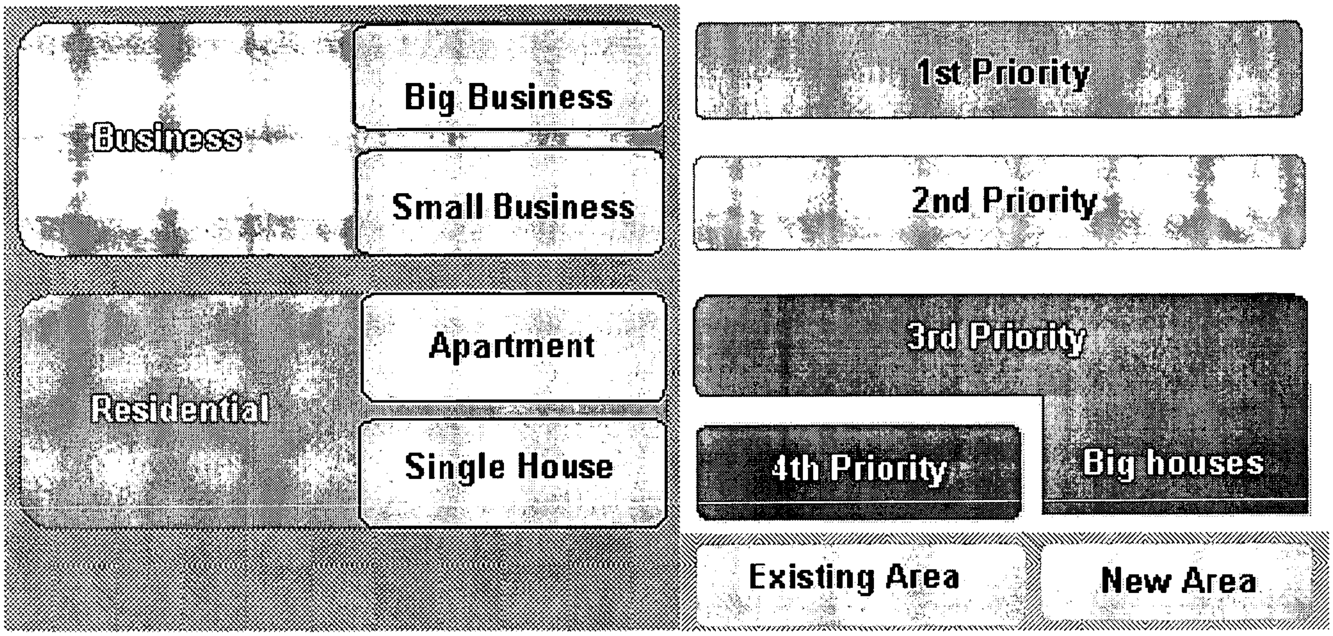


Figure 2: Priority of OAN Implementation

As a part of fostering OAN implementation, TELKOM has adopted the Islandization approach. It means that operator will purchase optical equipment from several vendors, but only deploy systems from one vendor in one specific exchange area. This simplifies the roll-out of an OAN, the network management system, optimizes the OA&M of equipment and should be efficient with respect to human resources. However, within a branch area, which for example may include five local exchange areas, optical equipment from two different vendors may be deployed. This approach will be evaluated regularly.

c. Radio Access Network (RAN) Implementation

The general rules of TELKOM RAN implementation strategy are as follows:

- RAN is expected to be a flexible telecommunication network infrastructure to foster the provision of POTS services
- Implementation criteria for RAN:
    - as permanent solution if:
        - geographically can not be reached by wireline network
        - the existing cable network can not be enhanced to support new demand due to economical reason

- as temporary solution: out of above criteria, but it has to be followed by the development of cable network in the future as a replacement of RAN.

- Implementation model for RAN

Table 3: Implementation Model for RAN

Model	Distribution/Application	Range (km)	Density	Traffic/subscriber	Example Location
A	Indoor	< 0.1	> 4000	> 130 mE	HRB
B	Centralized	2 - 6	200 - 4000	> 130 mE	New industry area, real estate, Office
C	Trough	2 - 6	200 - 4000	60 - 130 mE, > 130 mE	Protocol area, river, and beach
D	Scatter	> 6	< 200	< 60 mE, 60 - 130 mE	Suburban and rural area
E	Combination	< 10	-	> 130 mE	Big Cities

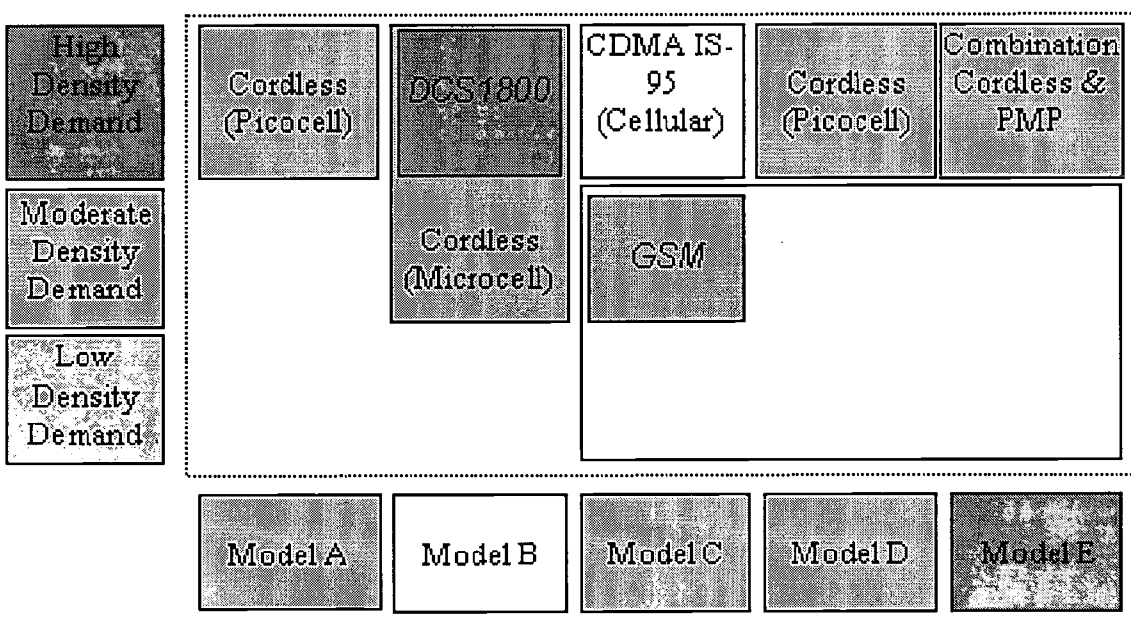


Figure 3: RAN Technology Mapping: Range Vs Density Demand

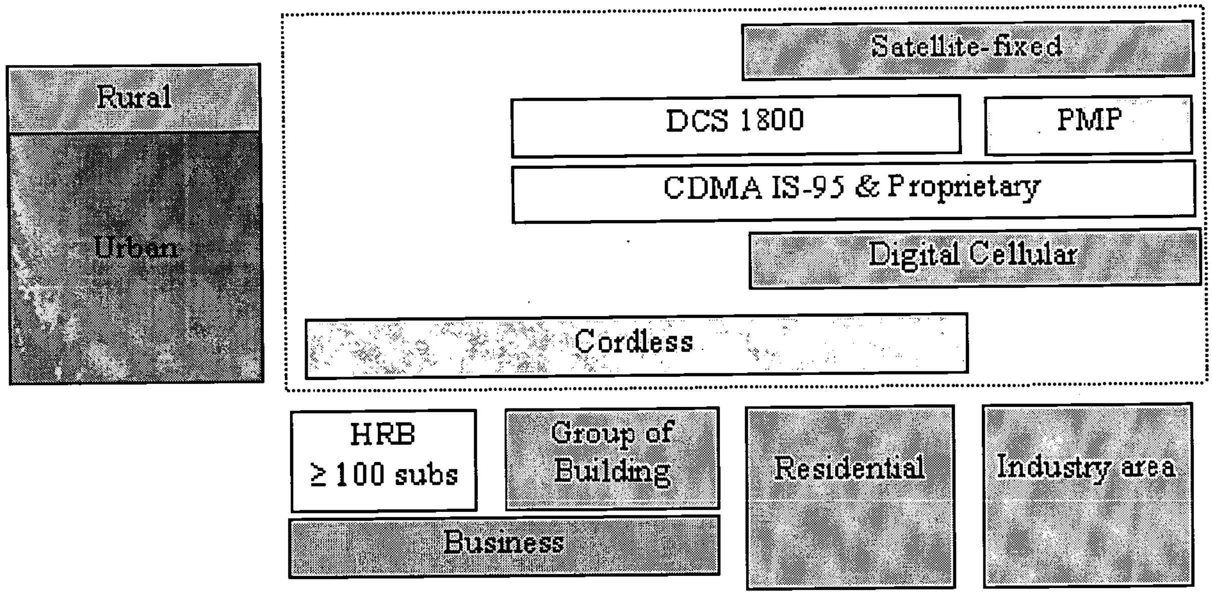


Figure 4: Application mode for RAN

d. Satellite Technology Implementation for Access Network

Previously satellite technology was used as a backbone network connecting some big island in Indonesia Archipelago. The advance of technology has created a chance for satellite technology to be used in access. However, satellite technology implementation in access is faced some of predicted facts:

- B4 satellite will be out of operation in the year of 2003
- The occurrence of broadband satellites in the early millennium that offers alternative solution for transponder hiring.
- Some Asia Pacific countries have their own satellite. The transponder hiring business seems will not prospectus anymore.
- Introduction of GMPCS technology in the early 1998.

Considering that fact, TELKOM launched TELKOM-1 satellite on August 1999. TELKOM-1 has a capability more than previous TELKOM's satellites such as:

- More transponders. TELKOM-1 has 36 transponders and from that number 24 transponders will replace the B2R satellite (C-band) and another 12 transponders (extended C-band) will be used for other application
- More transmit power and wide coverage area including a whole Indonesia, South East Asia, up to Hongkong, Taiwan, Papua and Northern Australia. with a better quality of service
- Support for access network provisioning especially for internet/intranet access and multimedia application such as distance learning and Bandwidth on Demand (BOD) via VSAT
- Blank spot area access provisioning

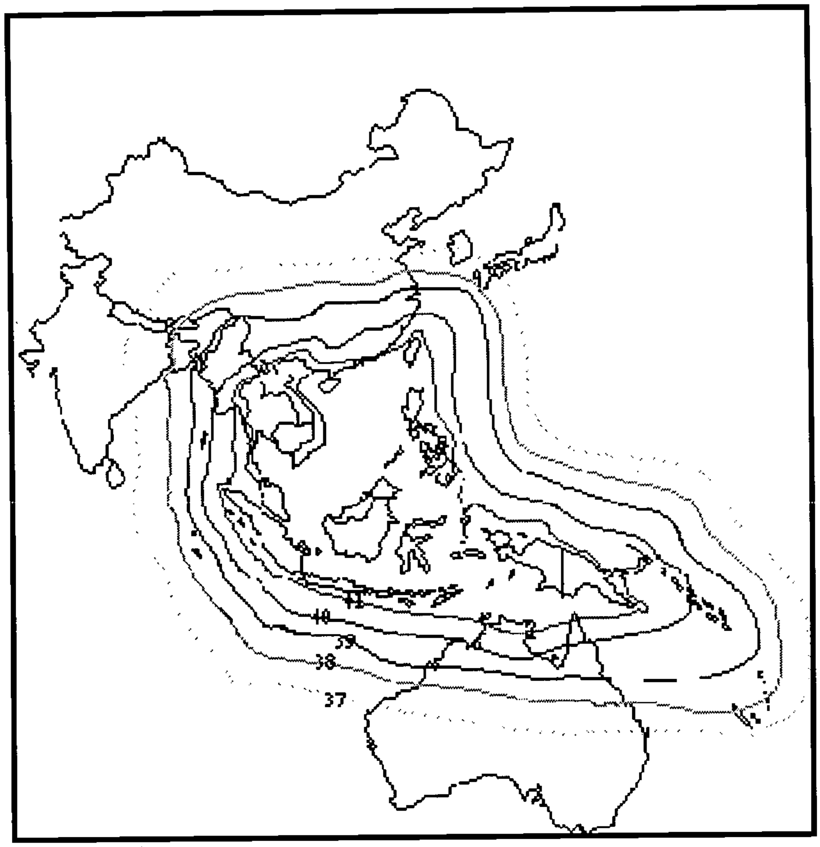


Figure 5 : TELKOM-1 Coverage Area

3.2 Public Access Network development: Provide greater access

Information plays an important role within the global information society. Information should be made accessible throughout the country. Consequently universal access is a necessity in the information era.

Universal access means placing an affordable telephone service within people's reach. For example, by installing public or community telephones ('Wartel' or Telephone Kiosks) within walking distance of people's houses. It might be important to note that availability, accessibility and affordability of service are three essential elements of universal access.

Government of Indonesia has imposed the USO of all telecommunications providers including TELKOM. The USO is one strategy to fulfill the element of public access. However, due to the extensive geographical condition of Indonesia and its low telephone density at the moment, it is obvious that public access, is difficult to be achieved in short time with a traditional network technology.

Kiosk/Wartel Installed

Until the first Quarter of this year, TELKOM has provided some of its infrastructure to dedicate for public access network. The installed Lines In Service for wartel/kiosk during the first quarter of 1999 were 100,376 lines, which was 73.15% higher than the 132,458 installed Lines In Service during the comparable period of 1998. Of the net Lines In Service installed, 47,626 Lines In Service were installed in TELKOM Regions (or approximately 119.35 % higher) and 52,750 were installed in KSO Regions (about 45.48 % higher). The increasing number of wartel/kiosk installed seems to have a close relationship with a number of service cancellations, which is also increased due to the economic difficulties.

Table 4: Operational data for public phone network (1st quarter 1999)

Public Phone TELKOM Division :				
Pay Phone :	Lines	73,921	83,994	13.63
- Coin Phone	Lines	45,792	50,997	11.37
- Card Phone	Lines	28,129	32,997	17.31
Wartel/Kiosk/TUT	Lines	21,712	47,626	119.35
Total Public Phone TELKOM Division :	Lines	**95,633**	**131,620**	37.63
Public Phone KSO Division :				
Pay Phone :	Lines	43,685	41,734	-4.47
- Coin Phone	Lines	25,243	23,509	-6.87
- Card Phone	Lines	18,442	18,225	-1.18
Wartel/Kiosk/TUT	Lines	36,260	52,750	45.48
Total Public Phone KSO Division :	Lines	**79,945**	**94,484**	18.19
Public Phone TELKOM & KSO Division :				
Pay Phone :	Lines	117,606	125,728	6.91
- Coin Phone	Lines	71,035	74,506	4.89
- Card Phone	Lines	46,571	51,222	9.99
Wartel/Kiosk/TUT	Lines	57,972	100,376	73.15
Total Public Phone TELKOM & KSO Division :	Lines	**175,578**	**226,104**	28.78

Development of Community access center

Instead of just installed a new line for kiosk, the enrichment of service creation for special purposes by applying IVR system have also been identified. For agrarian rural and forest cutting community areas in particular, TELKOM will encourage community access with 'voice reached community' initial program, which will give the skill to communicate and receive, as well as managed information with effective telecommunication technology. Voice riched community program, called '**Desa Maju**', is also considered correct for agrarian rural community since verbal community contact still gives color to the activities of their way of life, therefore it is necessary to conserve it in accordance to the situation and condition of the development of the community. **Desa Maju** will still provide access to agrarian rural areas to information in form of data or text, especially for facilitators and Guides as well as rural authorities. This program also represents program that will fill and strengthen communication programs of village community that has taken place so far, i.e. *Kelompencapir* and Learning Group (Paket KEJAR)

4. Approaching to the future development

Providing the whole area in TELKOM region and seems still a very long way to go. Therefore, TELKOM thinks an approach to fostering the implementation. The new paradigm concept has been introduced and applied in the 5 years telecommunication development plan. The concept is called Service Connection Unit based access network implementation.

Service Connection Unit (SCU) based Access Network implementation

Service Connection Unit (SCU) concept is based on the properties of future network as mentioned before. The need for network, which has a flexibility, simplicity and cost-effectiveness, will be a tremendous phenomenon in providing access network bandwidth.

The concept is aimed as a platform for company business strategy and to decide a cost-effective infrastructure development pattern in order to encompass business opportunity and increase company revenue. The concept is also directed to bring a paradigm shift, which is previously based on infrastructure development oriented to service provisioning oriented.

Basically SCU concept is a simplification and service grouping that can represent all services in the future. SCU can be divided into 3 segments, i.e.: Telephony Connection Unit (TCU), Data Connection Unit (DCU), and Video Connection Unit (VCU). These segmentations are based on the bandwidth needed that can be accommodate and the characteristics of particular service itself to the network.

The Nature of SCU

a. **Telephony Connection Unit (TCU)**

TCU is a quantity measure of narrowband services line unit, both analog (voice ~ 3.4 kHz) and digital up to 2 Mbps. The bandwidth needed for each category and its attribute of TCU is described below:

Table 5: TCU category

Category	Bandwidth	Attribute

Voice:		
- POTS	300 - 3400 Hz	- Analog / Digital
- Modem	< 64 kbps	
- Analog LL	300 - 3400 Hz	- Bi-directional Symmetry
ISDN:		- Circuit switch / LL
- BRA	144 kbps	- 64 kbps based
- PRA	2 Mbps	
- Multi BRA	384 kbps	
Digital LL	Nx64 kbps, n=1,..., 30	

b. **Data Connection Unit (DCU)**

DCU is a quantity measure of High-speed data services which has bitrate greater than 2 Mbps (³ 2 Mbps).

This segment covers HSD services, which has characteristic as follows:

Table 6: DCU category

Category	Bandwidth	Attribute
High Speed Data	>= 2 Mbps	- Digital - Bi-directional Symmetric/ Asymmetric - Packet-switch based/ LL

The provision of DCU services is based on the bandwidth needed (e.g.: 2 Mbps, 4 Mbps, 8 Mbps) and the bitrate which is not 2 Mbps multiplication.

c. **Video Connection Unit (VCU)**

VCU is a quantity measure of video services, whether analog or digital video services.

This segment covers video services, which has characteristic as follows:

Table 7: VCU category

Category	Bandwidth/bitrate	Attribute
Video Analog	6 - 8 MHz	- Analog, Digital - Broadcast, on-demand
Video Digital	~ 2, 4, 6, ... Mbps	

The example of the applications, which is covered in VCU, is CATV and VOD. The programs that can be viewed in CATV: broadcast TV, Premium channel and Pay per View (PPV), whereas the program that can be enjoyed in VOD: *movie.*

SCU to AN Technologies Mapping

SCU concept is a relevant concept to new technology development. SCU can be accommodate to access network technologies that can be mapped into the following table:

Table 8: SCU to AN technologies mapping

		SLU		
		TLU	DLU	VLU
Access Network Technology	Copper (conventional)	O		
	HDSL	O		
	ADSL	O	O	O
	NB-PON (Passive Optical Network)	O		
	Digital Loop Carrier (DLC)	O		
	Active Optical Network (AON)	O		
	BB-PON (Passive Optical Network)	O	O	O
	HFC	O	O	O
	WLL-CDMA	O		
Transport	ATM	O	O	O
	PSTN/ISDN	O		

Network Technology	Router	O	O	
	HE/HUB	O	O	O

This mapping is important for the planner to design a suitable network for providing variety of new services and planning for network evolution.

SCU to Telecommunication Infrastructure Relationship

SCU implementation is aimed to give strategic business direction of TELKOM to encompass opportunity, revenue and to create an efficiency in investing telecommunication infrastructure. Therefore, the right development strategy will determine the goal achievement.

As described before, SCU implementation can be TCU, DTU, VCU or even combination of them. The figure below depicts SCU implementation schemes. In the beginning, the composition of TCU, DCU, and VCU is determined. Each service can be accommodated by suitable access network technologies. However, in the service provisioning for DCU and VCU, the infrastructure can also serve telephone services (TCU). The advance of access network technologies has made one infrastructure to accommodate more than one service in one line.

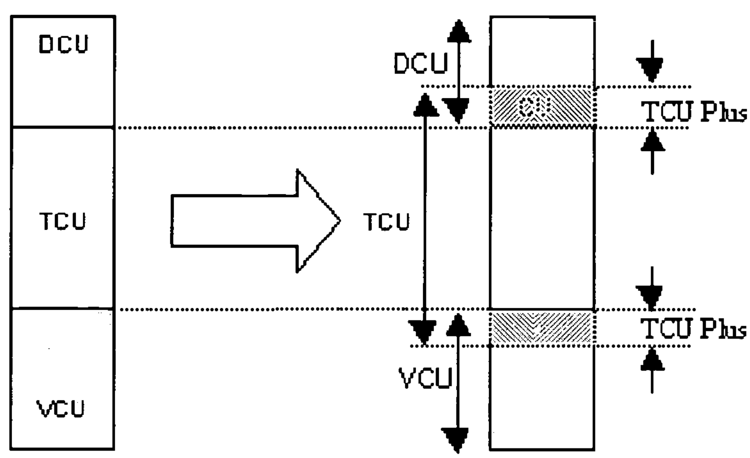


Figure 6: SCU to Telecommunication Infrastructure Relationship

By following that schemes, TELKOM business strategy in service provisioning can be clearly set so the deployment of AN infrastructure will be fit to the service demand.

1. **Conclusion**

- Two strategic tasks for implementing access network in the whole TELKOM regions are as follows:

  - providing greater access to the network possible in Indonesia
  - the enhancement of bandwidth of access network to accelerate the deployment of second curve business

- Realizing the two tasks above has been anticipate by TELKOM through its actual policy which is reflected in the Master Plan of Access Network development.
- The access network implementation strategy is also set up to support the realization of master plan. The implementation strategy focuses on the selective deployment for the specific model area.
- To fostering the implementation an approach to the access network provision has been introduced and applied in the 5 years national development. The approach is called service connection unit (SCU) based access network implementation. The concept is related to the strategy to build a flexible and simple access network in a cost effectiveness manner.

Biography

ARIYANTO

PRESENT POSITION : Optical Access Network Lab Engineer DivRisTI (R&D Division) - PT.TELEKOMUNIKASI INDONESIA

DATE OF BIRTH : 8 April 1973

EDUCATION :1996, Bachelor degree in Telecommunication Engineering from STTTelkom, Bandung - Indonesia 1997, Master of Engineer in Telecommunication Engineering from Royal Melbourne Institute of Technology (RMIT), Melbourne, Australia

WORK EXPERIENCE:

1998 - now :	Optical Access Network Lab Engineer at RisTI Division

PROFESSIONAL EXPERIENCE:

1998	: ACOAN (Asian Conference on Optical Access Network) - speaker
1998 - now	: Member of FTTH Trial Project team in RisTI based on Sister Lab Program with NTT Japan
1998	: Introducing New Telecommunication Business Concept for TELKOM (Services Connection Unit Concept - SCU)
1998 - now	: Member of Access Network Team on Jakarta Multimedia City (JMMC) Project

1999 : Member of HFC Field Trial Team in Bandung, cooperate with Aria West

1998 - 1999 : Member of TELKOM Fundamental Technical Plan Team - Section of Access Network

Co Author:

NAME : SOENDOJOADI

PRESENT POSITION : Manager of Optical Access Network Lab DivRisTI (R&D Division) - PT.TELEKOMUNIKASI INDONESIA Tbk.

DATE OF BIRTH : 25 May 1967

EDUCATION :1990, Sepuluh Nopember Institute of Technology, Surabaya - Indonesia Telecommunications System

WORK EXPERIENCES:

1991 - 1992: Engineer - Development Plan Department at Regional Telecommunication Area XII - Irian Jaya, Indonesia

1993 - 1994: Engineer - Network Planning Center (NPC) at Center of Information Technology Planning and Development (CITPAD) - Bandung, Indonesia

1995 - 1998: Engineer - Optical Access Netowrk Lab. At CITPAD/RisTI Division - Bandung, Indonesia

1999 - now : Manager - Optical Access Network Lab at RisTI Division - Bandung, Indonesia

PROFESSIONAL EXPERIENCES:

1993 - 1994 :	Coordinator of RisTI Team on Jakarta Network Long Term Planning Project (PLANITU)
1993 - 1994 :	Member of RisTI team on Palembang and Surabaya Network Long term Planning Project (PLANITU)
1995 - 1998 :	Coordinator of development of access network design tool (ACTRESS-I)
1996 - 1998 :	Engineer of T-AURORA joint development project - cooperated with NTT Japan (Sister Lab Program)
1997 :	Coordinator of development of Hybrid Fiber Coaxial (HFC) Network - System Specification
1997 :	Introducing New Telecommunication Business Concept for TELKOM (Satuan Sambungan Layanan- SSL)
1997 :	Member of RisTI Team for developing Access Network Optimization Toward Broadband Services
1997 - 1998 :	Coordinator of FTTH Trial Project in RisTI based of Sister Lab Program with NTT Japan
1998 :	Consultant of Analysis of Siemens Micro Demand Forecast for Bogor area.
1998 - 1999 :	Member of Access Network Team on Jakarta Multimedia City (JMMC) Project
1998 - 1999 :	Running HFC Field Trial in Bandung, cooperated with AWI/DivRE III - TELKOM

Company 's URLs : www.telkom.co.id and www.ristinet.com

Sessions

Satellites & Submarines

Related Sessions
M.1.4 Lessons in Satellite Planning
M.2.4 Submarine Round Table
M.3.4 Submarine Finance
T.1.4 Submarine Networks
T.2.4 Launch Services
W.2.4 GMPCS Panel
W.3.4 Satellite Wireless Communications

M.3.4 Submarine Finance
Monday 31 January, 1600-1730
Location: Honolulu Suite

Chair:
TOM SOJA, President, T Soja & Associates, Inc., USA

M.3.4.1
LARRY OLSEN, Vice-Chariman and Chief Financial Officer, Worldwide Fiber, Canada
Financing Transoceanic Submarine Cables

M.3.4.2
JAMES BRENNAN, Vice President, Sales and Marketing, Tyco Submarine Systems, USA
Advancements in the Financing of Undersea Fiber Optic Cable Systems

M.3.4.3
LEIGH FRAME, Alcatel Submarine Networks, France

Sessions

Advancements in the Financing of Undersea Fiber Optic Cable Systems

James Brennan

Abstract

The interplay of new financing initiatives with dynamics among new players such as entrepreneurs, carriers, carriers' carriers, and other service providers, is dramatically changing the undersea cable marketplace at a rapid pace. Solutions for funding undersea systems in the telecommunications market have advanced from traditional debt solutions to seed capital, equity and vendor financing. This advancement in financing is primarily due to the expansion of clients, as a result to the increase in voice, data, and Internet growth as well as the positive impact to clients' and investors' earnings.

This paper will examine the supplier and financial markets' focus on financing and how they have led to the present situation to include venture capitalists, investment and multinational banks, anchors, and suppliers. The paper will also depict financing throughout the Systems' life cycle, i.e., design, manufacture, installation and maintenance.

In particular, the paper will consider the evolution of financing solutions, such as, resolving standard and fixed price contracts and time to market issues. In addition, the paper will discuss the role of equity participation and finance solutions that will be key factors in the continuing growth of the undersea market in the new millennium.

Biography

James F. Brennan

Mr. Brennan has twenty years experience in the financial/investment banking community, with a background in mergers and acquisitions. He has completed several deals estimating 3.5 billion dollars in the Telecom industry. He has spoken recently at two capital market forums.

Mr. Brennan is currently the Vice President of Global Sales and Marketing at Tyco Submarine Systems Ltd.

Sessions

Technology

M.3.5 Broadcast in the Era of Convergence
Monday 31 January, 1600-1730
Location: Tapa I

Chair:
REVA SAY LEUNG, Exeuctive Director, Telcordia, USA

M.3.5.1
MINZ-HEONG SONG, Senior Researcher, Korea Telecom, Republic of Korea
Pay TV Industry in the Era of Convergence

M.3.5.2
VIVIAN LUO, Director, Business Planning & Development, Hughes Communications Inc., USA
Streaming Media: Opportunities and Challenges

M.3.5.3
MICHAEL BOND, Manager, Engineering & Product Development, Williams Global Access Services, USA
Applications for Multimedia Broadcasting via Satellite

Related Sessions
M.1.5 Intelligent Networks
M.2.5 Essentials of Broadband & Emerging Technologies: Infrastructure & Services
M.3.5 Broadcast in the Era of Convergence
T.1.5 Distance Learning Applications and Directions
T.2.5 Applications for Technology for Distributed Learning
W.1.5 Electronic Business: Global, Regional and National Issues
W.2.5 Political Economy
W.3.5 IMT-2000 in Asia-Pacific

Pay TV Industry in the Era of Convergence

Min-Zheong Song, Ph.D.

1. Introduction

The TV industries are about to experience fundamental change. A new era of content (online & offline) service is beginning in which TV, radio, computing, Internet, publishing, education and training resources, together with transactional activities like shopping, banking become inseparable in terms of the content industry.

This change is evolutionary. The old boundaries between broadcasting and telecommunications are being dismantled. More and more radio channels can be accessed through the Internet, and TV channels are also appearing on the Internet. Internet can be accessed through PC or TV. Interactive advertising is accessed now through PC, and also through TV in some case (PPV).

Linked to the extension of large capacity networks, hundreds of TV thematic channels are now being offered to the viewer in more developed countries, as well as in less developed ones by spill-over phenomenon. Through the spill-over are over 300 TV channel accessible via satellite dish in Korea

Former regulations, based on a different view of the various types of industries, need to be changed. Today it seems that liberalization will be the major trend worldwide.

The industry is evolving rapidly and M& A are flowing across the boundaries of countries and sectors. Furthermore, huge investments are being made, apparently justified by the need to control the end-user. Main operators such as Time Warner, News Corp. are trying to be one step ahead in the changing value chain.

The aim of this paper is to analyze the traditional and new media market. Then, some strategies in Pay-TV business will be brought out in the new paradigm of convergence between broadcasting and telecommunication sector. Chapter 2 describes the concept of convergence, offering some definitions, marking out the areas of most significant change facing the communications industries in terms of real practice of the convergence. Chapter 3 describes the current state of the media/communications market, including TV ownership. It identifies already existing trends that are a function of convergence phenomena. It discusses some obstacles to convergence that requires regulatory attention. Chapter 4 examines on-going trends in the converging marketplace, and highlights the new emerging market.

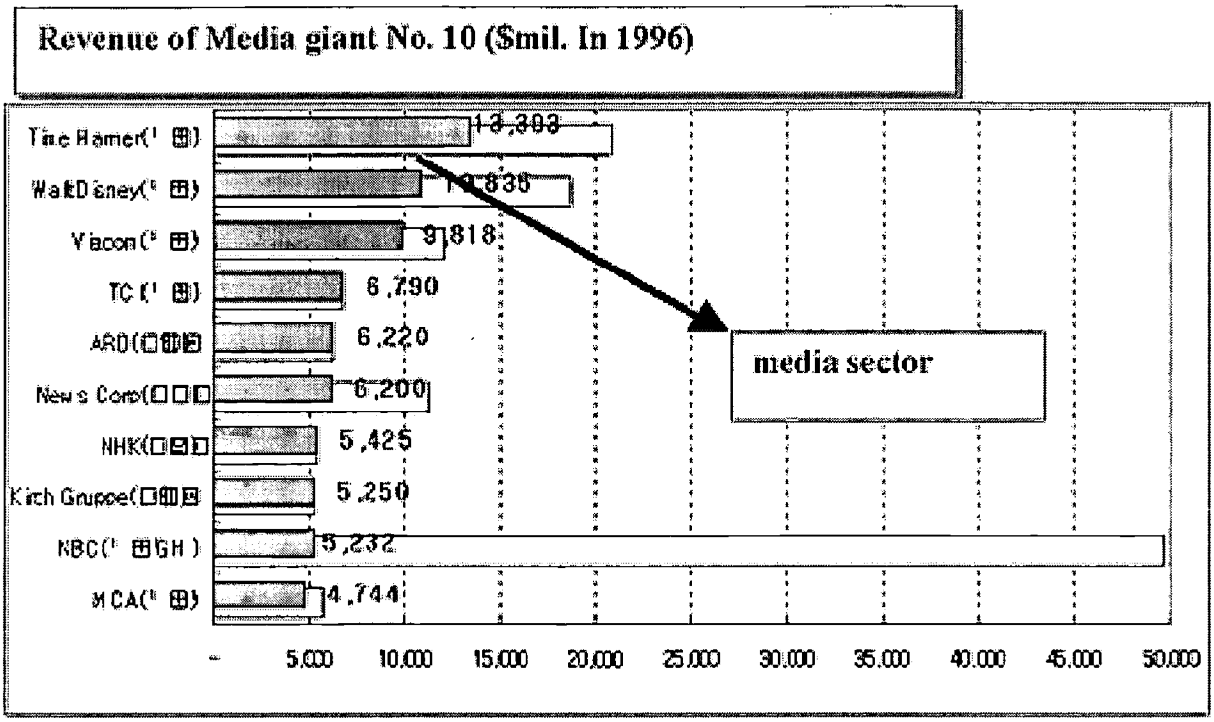
Chapter 5 looks at the landscape of commercial TV sector in terms of the market competition among pay-TV service provider, and points some illustrative strategies in Pay-TV business. There are some tentative conclusions in terms of 2 issues, access to the viewer & access to diffusion rights.

2. Convergence Practice - A Changing Paradigm

2.1 Convergence Practice and Digitization Effect

The definition is offered by KPMG as follows: *"Convergence is an on-going process which entails the coming together of the following: Content from the audio-visual and publishing industries; potentially separate physical infrastructures able to carry similar sorts of information at increasingly lower costs; the interactive information storage and processing capabilities of the computer world; the ubiquity, improving functionality and ease of use of consumer electronics."*

It is important to note that convergence is not a 'naturally occurring' phenomenon. The shape, speed and manner in which convergence will occur will be determined by the industrial strategies of giant corporations, perhaps about 20 mostly in the United States, Europe and Japan. Even though 'open platforms' of the information society offer the individual access to information services, as mass entertainment is brought into the converged environment, it remains firmly under the control of a handful of corporations, often operating in alliances or joint ventures with each other.



* data of the year 1995. ※ Source: IDATE, 1998

The KPMG Corporate Finance survey of global take-over activity in 1998 found that total international mergers and acquisitions (M&A) rose by some 60% over 1997 to an all-time high of US$544.31 billion.

The convergence of industrial muscle will change the economics of all the industries involved, including broadcasting and publishing. And changing the economics means changing the nature of the industries. So for organizations with a message to convey, the first point is that the broadcasting and communications environment of 2010 will be different to that of 2000, and change will be required to meet its challenges. This will be the case even if the media landscape of ten years' time at first glance looks familiar, with traditional networks and publishers continuing to succeed.

Further discussion of the nature of convergence depends upon the technological advance: "digitization". It means taking a piece of information and turning it into a series of binary digits (encoding): each piece is known as a byte and looks like "00110110". One byte might represent a single alphabetical letter. This is the basic building block for all forms of computing and electronic data transfer.

Digital signals have certain benefits in their own right, and it is no accident that it is where these can be most directly applied with a strong user attractiveness that digital applications have become most familiar. For instance, because they are composed of discrete, non-continuous values, distortion can more easily be detected, isolated and removed: hence the 'perfect sound' of CDs. Significantly, compression has developed to the point where encoding and decoding video pictures in real time is possible. Digital TV is reality, and will change the landscape.

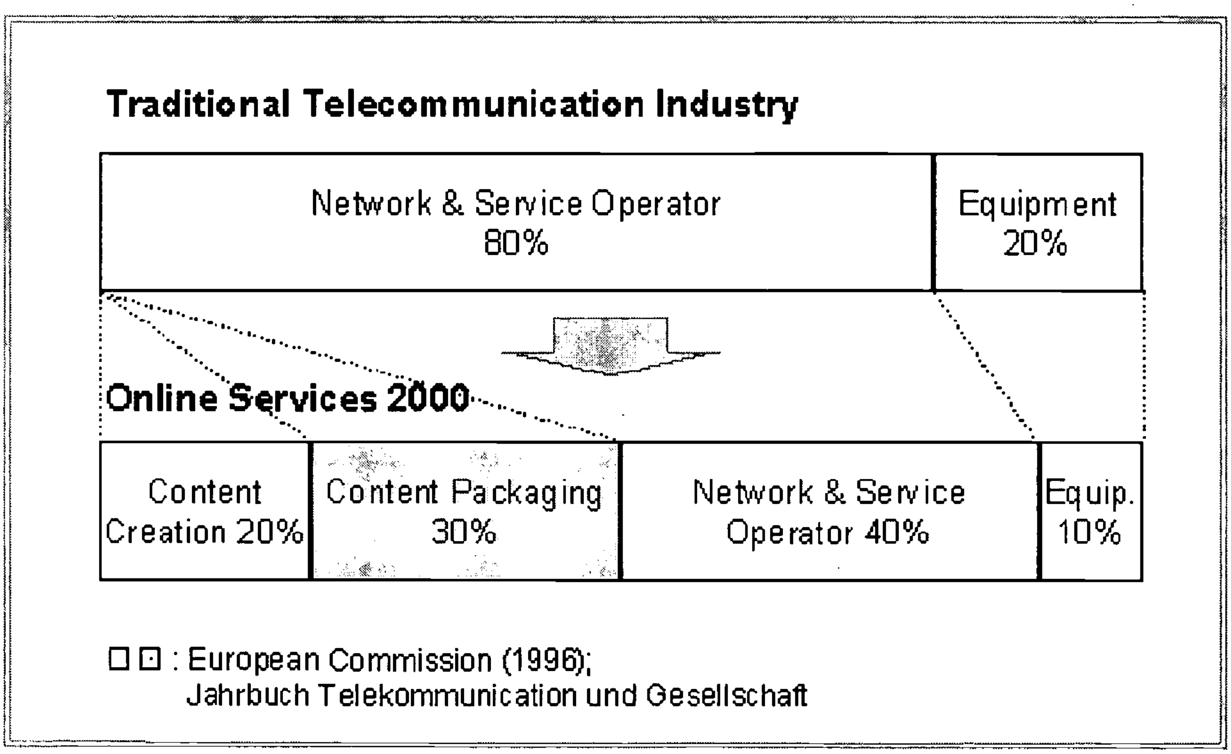
In principle, cable has the greatest potency as a digital TV (DTV) delivery system, because it can offer higher 'bandwidth' (ie simultaneous transmission capacity) than the others. In the US and some European markets, cable TV has now penetrated a majority of homes and is the most powerful delivery system for TV as well as other services (Internet phone). But digital process of cable network is not easy because of the sunk cost.

Now, the pioneer of the Digital TV is satellite TV like DirecTV, BSkyB, SkyPerfecTV etc. The first country to implement digital terrestrial television (DTTV) is the UK.[1] BDB (consortium of Carlton and Granada; 50:50) launched ONdigital with 15 channel on 13, Nov. 1998. It offers its customers simple plug and play technology with no legal requirement to connect to a telephone line. BDB selected BT as the key supplier for its new, state of the art customer management center.

BSkyB launched digital satellite service *Sky Digital* (Spring 1998), offering 150 channels (mostly variants of their existing analogue channels) and BIB launched 'pseudo-interactive' TV (autumn 1998), offering home shopping and banking as well as information service and limited internet access including e-mail, all available through terrestrial, cable, satellite TV.

2.2 Environmental Change by the Convergence Practice

1. From scarcity to abundance: Broadcasting sees a dramatic, rapid increase in quantity and availability, with up to 250 TV channels on offer to viewer by the end of 1998. 'Spectrum scarcity' isn't the principal constraint around broadcasting any more. 8 times as many terrestrial TV stations and 10 times as many satellite channels become possible.



2. Importance of the Service (packaging): The delivery system is not important, because digital information can be delivered through a variety of systems, and because it will be cheaper and cheaper to transmit. Information (entert-ainment) services from TV industry arrive in the household via terrestrial, telephony (online), cable or satellite systems. The consumer is not interested in which physical structure is used. For companies, there will be a decreasing amount of value in simply owning delivery systems, but a corresponding increase in the value of additional services, carefully marketed *'packages' or 'bundles' of information services,* and *subscriber management.* It is no longer enough for telecommunication operators to provide lines, or for software suppliers to sell operating systems. They need to move into strategic alliance with or ownership of entertainment and information producers and suppliers, in order to create service packages.

3. Looser regulation (or deregulation): Broadcasting has historically been one of the most highly regulated areas of economic activity because of spectrum scarcity. Where only a tiny number of channels was possible, it was both practically possible, and a matter of intense public policy interest, to regulate what was made available through them. The new media that have grown massively in the 1990s are virtually unregulated. Although issues such as control of pornography and other crime via Internet, and protection of intellectual property rights, have generated substantial discussion, there is almost no regulation of the content of new media. An issue facing all governments and regulators is whether to seek to bring all new media into the existing regulatory net, or whether to loosen the impediment of regulation across the converging media. The conglomerates are lobbying for the deregulation. The market should be left alone to innovate, and because the media will proliferate to such an extent that comprehensive monitoring and enforcement of regulation would be impossible.

   Now, everything becomes a service. Broadcasting has had a special place in the cultural life and been rarely thought of as a service. In fact, KBS 1, 2 and MBC in Korean TV market still have 'public service' duties and remits, a result of the tight regulation on content, diversity and availability. Broadcasting doesn't correspond to the usual economic concept of a 'service', because its consumption has had virtually no relation to expenditure. The license fee for KBS, a flat rate poll tax, reflects nothing of consumer preference, while commercial services (both TV and radio) are paid for by advertisers, not consumers (hence the inclusive term 'free-to-air' for the terrestrial channels). Now, the situation of the terrestrial TV is strongly challenged by cable & satellite TV, a new service which is subject only to 'light touch' regulation, and which works on a direct service basis. The effect on the main free-to-air channels of this competitive environment has already been tangible: they are more ratings-driven and commercially minded and this has effect on their scheduling and commissioning of program content. Then, all output will increasingly have to redefine itself as a 'service', and all providers will have to seek extensions of their services into as many new outlets/platforms as possible, normally through alliances or merger as described above.

4. Consumer Influence: The viewer becomes consumer. They have more choices, including not just channel choice but the choice to go online, to download video games, to interact with TV. PC is

competing with TV for the consumer's 'eyeball time'. As of 1997, the U.S. online households spend 12.8 hours per week online. The time they spend online is at the cost of TV watching, video watching, listening to the radio and making phone calls. These networks come to resemble the broadcast ones. Online advertising revenues in the US are predicted to equal 10% of TV advertising by the year 2000. Broadcasters need to have good information, strong adaptability to consumer preference, willingness to have a direct relationship with the consumer and to work to extend and deepen that relationship and above all ability to package and promote services in a way that is appealing to the consumer. All of this will feed back very directly into the type of content which is acceptable and desirable to the service providers to buy or commission, and it feeds back to any organization seeking to supply, influence or insert messages into that content.

2.3 Emerging services by the Convergence

This section gives a brief summary of the potential new services that may be available within the multi-channel, multimedia, converged environment:

1. *Digital broadcasting:* The immediate direct quality benefits of digital broadcasting are picture and sound of a much higher quality (CD-quality stereo sound and high definition pictures), improved coverage, and new program production (wide-screen format, small screen cinema).

2. *Niche broadcasting and 'narrow-casting':* Theme-channels offering one genre are the bulk of services. The obvious areas have been all-movie and all-sport channels, the premium channels (TV archives, comedy, wildlife, cartoons, soaps, and various 'consumer' categories such as home shopping, women's lifestyle, men and motors, pop music). A true 'niche' market specifically targets a tight interest group. Thus a niche channel consists of programs for freshwater anglers. This is an area where the existing traditional consumer publishing houses see potential for expansion, extending their 'brands' into 'masthead' programming. 'Narrow-casting' is similar in that it attempts to target a highly specific audience. Narrow-casting makes sense only where the consumer group is very tightly defined and the provider has good knowledge of them and their needs. A key feature of both niche broadcasting and narrow-casting is that they make use of only a tiny amount of spectrum capacity.

3. *Back-up programming and text alongside broadcast:* Because digital broadcasting removes spectrum scarcity, much greater quantities of extra information can be transmitted alongside broadcast programming. It allows delivery of great range of data services within the broadcast signal. These could be back-up information to the programming (e.g. a drama on one channel with newly created programming about the author's biography), or simply other services such as weather, travel, market information, available on a split or switched screen.

4. *Time-shifting schedules:* It is important to understand what the new channels will be used for. The

word 'Channel' will no longer denote an all-day, continuous, mixed content, single schedule transmission. A 'channel' will simply be a potential stream of information that the broadcaster can choose when and how to use, and for how long. Many channels will simply repackage programming available on others. This allows the broadcaster to 'time-shift' programming. The same program start on one channel at 6.00pm, the second at 6.30, the third at 7.00 and so on. This is part of reorienting broadcasting to the consumer: The viewer can choose at his or her convenience when to start watching.

5. *Near-video on demand (NVOD):* It is a compromise service which attempts to offer the main benefits of video on demand (VOD) at less capital cost. Similar to time-shifting, but usually extending over a longer period, NVOD means offering the consumer a choice of when and where to consume a piece of programming. The most obvious application is for movies, though it could be applied to any other program type. A broadcaster offers a movie subscription service, which consists of a package of movies of that month. These will be transmitted at a whole range of different times and on different channels, with the subscriber again deciding the time of his or her 'appointment'.

6. *Video on demand (VOD):* It offers a truly interactive service. The consumer tells the provider exactly the time and date on which they wish to watch the programs, and the provider responds by delivering it down what is, essentially, the viewer's own personal channel. The viewer may have the ability to pause, rewind or fast forward the program during transmission. In order for this to happen, the recipient must have a relationship with the provider similar to that between a network PC and its server. The programming must be stored on a central server, ready to be called up by the user. Because of the high storage capacity involved, the high bandwidth required and the need for an interactive link, cable is the system with most potential to develop true VOD.

7. *Interactive broadcasting:* 'True' interactive services are those where the interactive process is part of the product itself. As delivery systems become interoperable, and telecommunications and TV move closer together, the potential for the service provider to have an interactive link in broadcasting as in online services grows. Cable has the potential, while satellite is incapable of truly interactive services because the viewer cannot send a satellite signal back up from the dish, and if possible, there is a time-delay in satellite broadcasting which disrupts the mutual response. Real interactive services are downloading & playing computer games against other households, playing quiz show games against the studio contestants, questioning and voting in TV debates, 'community' debate and interchange on air, choosing own camera angles and ordering instant replays for sports events, making moral choices for characters in soap opera, and interactive educational services.

8. *Internet on TV:* The more sophisticated the above services are, the nearer they approach to bringing the culture of the Internet into TV. Perhaps the ultimate symbol of convergence would be the marriage of the two. Whether this will or will not happen has been the subject of considerable hype and speculation. Increasingly, online users will be able to process video and therefore to watch broadcast items on their PC. While this may be of use in the office and mobile

environments, it will have little impact in the home. In fact, every home has a TV set and so the user will prefer to use a TV to watch TV. In that sense, the real prize is to develop an Internet access system which can be used with a TV, thereby bringing the online experience to the majority of households which do not have PCs.

BIB offered a highly restricted Internet access ('the top 100 sites') from 1998. But the more likely route is to build in the data storage and processing capacity of the PC to the set-top box used for receiving digital TV, and later into digital-capable TV sets. Microsoft claims that Web TV has a consumer product ready for market that can do this. If this occurs, the consumer will use a single hand-held remote to surf around a TV world where broadcast offerings, information and transactional services and the World Wide Web site. The opportunities for horizontal linking of information in different formats and locations, and for developing interactive relationships between providers and consumers multiply many times.

4 Main Stages for Internet Delivery via TV

Type	description	case
Type I Enhanced TV	One-way broadcasting which is pseudo interactive Offers news, information services, enhanced advertising and teletext services, weather and simple play along games As much as 80% of the most popular Internet web sites could be broadcast	In France, TPS claims that 96% of those who have the service (interactive weather and basic games), use it everyday. UK's Ondigital uses Enhanced TV method for psuedo-interactive services.
Type II The "Walled Garden"	Closed loop online model with restricted Internet access and content sectioned into categories (AOL uses this method). The closed loop online model means that broadcasters should not lose their audience via leakage to other sites	BIB plans to take the "Walled Garden" approach with no open Internet access planned yet. Delivery will be via digital satellite, terrestrial, cable or ADSL, using modem plus a phone line for the return path TPS in France already provides this environment in home banking, where the graphics are broadcast, but the account data is inserted via phone

Type III **The Portal TV**	Viewer's have full access through a portal, which would direct them to their favorite areas, via an easy to use navigation system(EPG)	The portal TV method used by Web TV, and planned by UK cable Echostar provides this service via Web TV
Type IV **High Bandwidth** **Interactive TV**	High bandwidth interactivity via cable modems and ADSL, and eventually fiber optic cables and Ka band satellites	This enables true two way services as video telephony AT&T's @Home, Time Warner's Road Runner can provide this service if their cable network is upgraded to fiber optics.

Source: "Internet@digital.TV-Executive Summary", Vision Consultancy Group 1999.

9. *Interface agents and 'push' technologies:* On the Internet, users are free to move rapidly. This makes tracking them, holding their attention and measuring your impact on them extremely problematic limiting its appeal to advertisers, among others. Among the responses to this, two stand out as particularly important. Interface agents are designed to assist the user in navigating the Web. They include Web browsers and search agents, and the proprietary versions of these which Internet providers offer as part of their package. They also include services which provide tailored information, such as Compuserve's Executive News Service (ENS), which continuously searches 30 news wires for key words selected by the user, then places the stories into the user's folders. Push technologies will allow a provider to 'push' packages of information down the line to individual consumers known to have a standing interest in a given subject. The more that broadcasting services converge with all other information services, the more likely it becomes that interface agents and push technologies will also be required for navigating the TV universe. The Electronic Program Guide (EPG) replaces current remote control handsets, and includes 4 cursor direction buttons. When the TV is switched on, the EPG will begin displaying menus for the various channels, information services and transactional services on offer through, for example, OpenTV. If the Internet and TV do converge, the EPG will be the user's first navigational tool for the combined media.

3. World TV Market

This chapter starts with a sketch of the world TV market, and then discusses the TV industry value chain and how it changes in an era of convergence. This is followed by a sketch of some of the main corporate strategies which are shaping convergence.

3.1 Overview of World market

According to IDATE data, the world TV market continued to grow in 1997: the increase of over 5% in world revenues. The TV and Film sector in the 3 regions (US, Western Europe, Japan) is characterized by the existence of 3 final markets of equal importance.

World audiovisual market - 1997

	USA	Europe	Japan	*Total*	**97/96**
TV Ad.	40,790	24,065	16,596	*81,451*	**3.3%**
License fee	370	12,597	5,163	*18,130*	**-0.8%**
Pay-TV	28,535	13,547	2,240	*44,322*	**12.9%**
Video	15,900	6,188	4,825	*26,913*	**4.6%**
Theaters	6,336	4,201	1,465	*12,002*	**3.2%**
Total	*91,931*	*60,598*	*30,289*	*182,815*	***5.2%***

Source: IDATE, 1999 Ed.

The TV market accounts for 78.7% of total revenues in the sector and can be subdivided into 2 segments:

1. ***Free TV:*** Not directly financed by the user, but by TV ad. And the taxpayer (license fee).

2. ***Pay TV:*** Directly financed by subscription fee. Pay-TV can assume different forms in regard to the offer (**subscription to one particular channel or a bouquet of channels, PPV**) and broadcasting network (transmission network: **cable, satellite, terrestrial**). Pay TV contributes **24%** to the worldwide financing of audiovisual activities. Behind the strong growth in the pay TV market is the successful performance of digital TV, especially in the US and Europe. There was a downturn in the consumption of traditional TV, to the profit of the more finely targeted thematic channels that meet viewers' expectations more effectively.

In terms of the audiovisual revenues, the US has a dominant position with 46.1%, then followed by Europe with 29.7%, and by Japan with 12.8%. In the US, pay service (**pay TV [31% of total revenues],** cinema & video) now lead with 55.2% of total revenues, compared with 54% the year before.

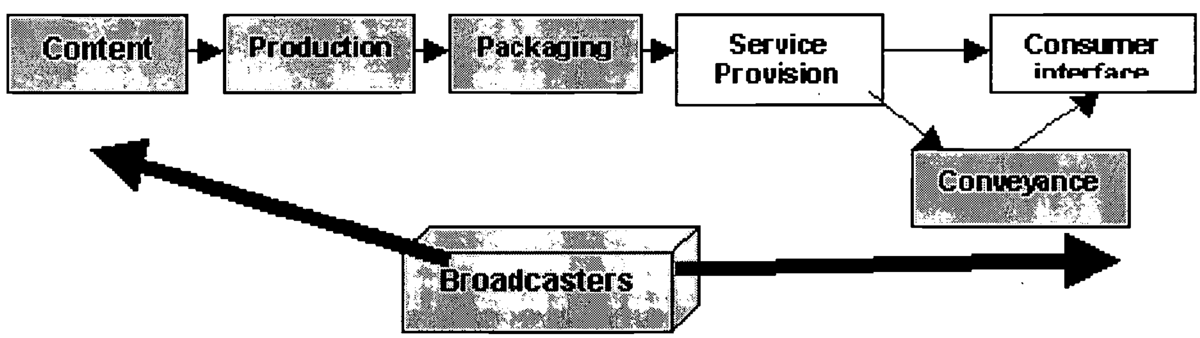
In Europe, the traditional importance of public TV and the late arrival of **pay TV (22.4% of total revenues)** explain the majority share accounted for indirect funding through advertising and license fee, representing 62.1% of total revenue in 1997. But, British pay TV was one of the big drivers of this growth. Its revenues increased 45.5% per year faster than inflation[2] (since cable continues to fail in its growth targets, this is almost entirely due to BSkyB's success). These are trends which are forecast to continue well into the next century, by all forecasters.

In Japan, the TV advertising revenues still account for 71.3% and the **pay TV revenues 22.4% of total revenues** in 1997.

3.2 TV Industry's M&A in the Era of Convergence

The 'value chain' is a way of depicting the process of manufacturing and delivering audio-visual products by stages. At each stage value is added to the product, but some stages add more value than others. By examining how these relative values change we can gain insights into the way the broadcasting industry will change in the convergence era.

content is the raw material input, including the creative human resources production is the processing of the content into finished AV products packaging is the 'bundling' of these products into channels by broadcasters conveyance is the transmission to the viewer via a physical infrastructure



In the value chain prior to convergence, packaging would feed straight into conveyance, the transmission to the viewer by cable, terrestrial or satellite, and into the consumer interface (TV set). In the convergence value chain, the right hand end shows two changes:

1. A function of service provision appears: Once the products have been packaged in a form attractive to potential users, ie into a channel, a service provider offers them to the consumer, providing them with their main interface with the product. Thus a new function appears in the market, that of providing access to packages of services, including installation, customer management and billing.

2. The function of conveyance is pulled to one side. This reflects the fact that the consumer has no interest in the method by which the service is delivered, and which is becoming increasingly irrelevant. The consumer's primary relationship is with the **service provider.** This reflects a change in the relationship between broadcasters and their audience who is customers who must be

directly managed and looked after. The traditional broadcasters are poorly placed to do this; those with the requisite experience in managing mass subscriber systems are News International/BSkyB and BT.

Expertise in packaging, combined with access to the consumer, appear to be the areas where value is the highest. Thus the consumer interface becomes one of the main locations of value in the convergence chain. The other location is at the beginning of the chain, with content.

Even counting for the fact that a 'channel' may be a package of a few hours broadcasting per week, or may simply time-shift the schedule of another channel, the sheer fact remains that by the end of 1998 there will be abundant 'spectrum' and no new money with which to fill it.

Spectrum scarcity is replaced by content scarcity. There is a high premium on content, and anyone with content to trade is suddenly going to be in a much more powerful position. The shortage of content is reflected in various ways. For instance, large corporations have rushed to buy up all the major libraries and archives of content in the world over the last few years. Disney bought the US major network ABC and recently 43% of Infoseek's stake in June, 1998 and launched new portal site Go Network. The BBC's program archive is spoken of as 'the last great unexploited archive in the world', something the Corporation itself is addressing by beefing up its commercial arm, BBC Worldwide, and striking deals with cable companies to turn the archives into new channels. Another indicator is the cost of rights to premium content. BSkyB paid over £640 million for 5 years exclusive rights to premier-ship football, 5 times the cost of its previous contract.

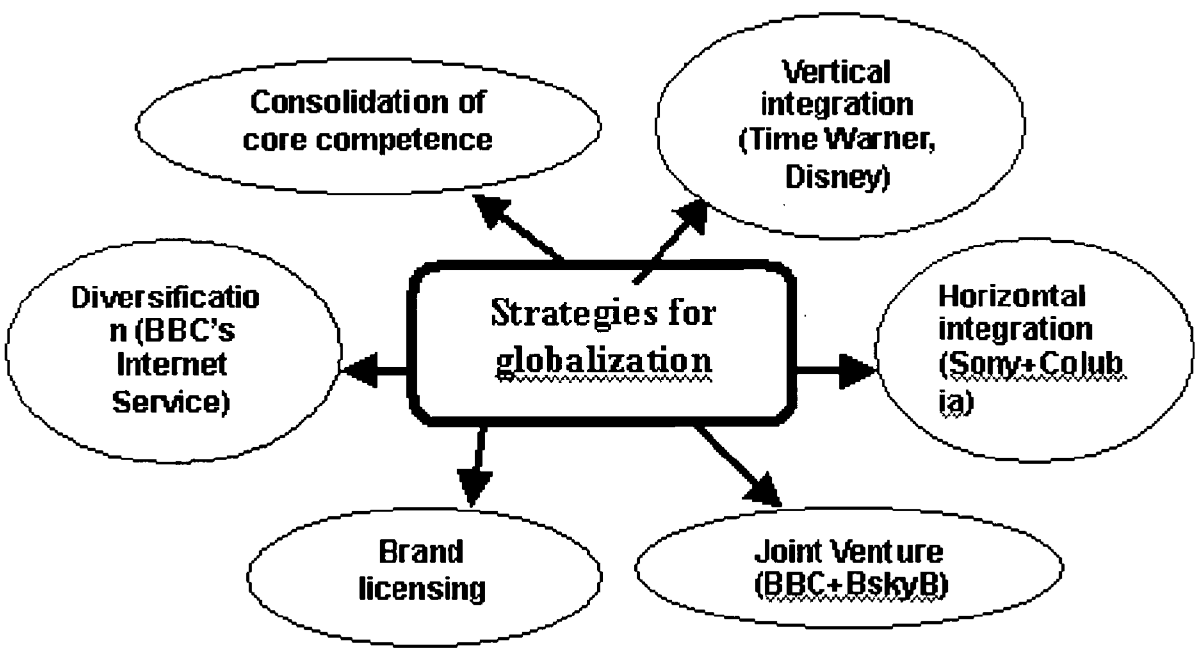
And a further indication is the soaring cost of 'talent'. Writers, actors, performers, even whole series which have a proven record of success are now receiving ever-increasing fees as more and more competition scrambles to grab first broadcast rights to new product. This has brought a dawning realization among the talent and in the independent production sector that they can break the bonds of the restrictive and underpaid deals in which traditional broadcasters who both commission, package and sell on programs had held them.

The power of content packaging is reflected in the concentration of content ownership in the US, where mergers over the last 5 years have put a small number of entertainment combines, each with annual profits of over $7 billion, in control of the content end of the value chain -- able to hold the rest of the chain to ransom. In 1996 the number of media corporations with dominant power in society is closer to 10. The newest dominant 10 are: Time Warner, Disney, Viacom, News Corp., Sony, Tele-Communications-Inc, Seagram, Westinghouse, Gannett and General Electric.[3] There is no wall any more among telecoms, IT and TV industries. Everyone could deal with Disney.

In the converging environment, a great deal of the output of the communications media will consist of existing product, repeated, refreshed and repackaged, and rebroadcast across the range of different platforms and formats in order to extract the maximum value. One can see this already in the operations of the movie industry, where following the release of a major film, a two to three year cycle is followed, marked out in terms of 'windows': e.g. premiere, first release to cinemas, mass release to cinemas, TV premiere on subscription channel, video release, general rights sale to terrestrial TV (note that terrestrial TV is last in line!).

The movie industry also provides the best current illustration of another implication of the importance of content: a winning strategy may be to produce less, but market more strongly, by creating mutually supporting products across a range of industries and outlets, both new and traditional, eg the hit song and soundtrack from the movie, CD-ROM derivatives, Web pages, video games and toys. The key to success will be the abilities to refresh and repackage content in new and exciting ways.

With convergence now a fact rather than a speculation, the media and other converging industries are adopting strategies to put themselves in a better position to exploit the new opportunities, or to defend their core businesses against competition. Some strategies for globalization (geographical expansion(BBC Worldwide's US entry)) are following:



1. Consolidation of core competencies: Many of the large media groups have been pulling out of regional newspapers: Thomson Corporation, Reed Elsevier have all sold their regional newspaper holdings in the last few years.

2. Vertical integration: This means moving up or down the value chain in order to gain further control. A content owner and producer like Disney may move along the chain into packaging (The Disney Channel) and even into conveyance (by buying ABC). Starting from the other end of the chain, pay TV operators like BSkyB "package channels, control the consumer interface and in recent years have moved upstream and purchased many (and often exclusive) movies and sports' rights".

3. Diversification: This involves moving into new media sector in order to spread content. It can also be seen in the BBC's planned expansion of its BBC Online service to become, among other things, its third stream of continuous news (after Radio 5 Live and BBC 24).

4. Licensing your brands: This is a way of extending the brand to markets which the brand owner cannot itself reach. For instance, Carlton TV sells Carlton Select (an archive channel) to the cable and satellite channels, since it does not currently have the spectrum capacity to rebroadcast this content -- although that will change when BDB comes onstream.

5. Joint ventures: These are becoming crucial to the future success of the largest media groups, not only within their own industries (as with BBC/Flextech or the recent production tie-up between Virgin radio and CBS), but more especially across industries in order to be positioned for convergence. BBC and BT worked together on BT's interactive media trial, while BT was using lessons learned from the trial to forge a joint venture with BSkyB and others as British Interactive Broadcasting. Microsoft, which had never had an involvement in the entertainment industries, now has an alliance with NBC and together they produce MSNBC, a cable offering looking at new computer ideas.

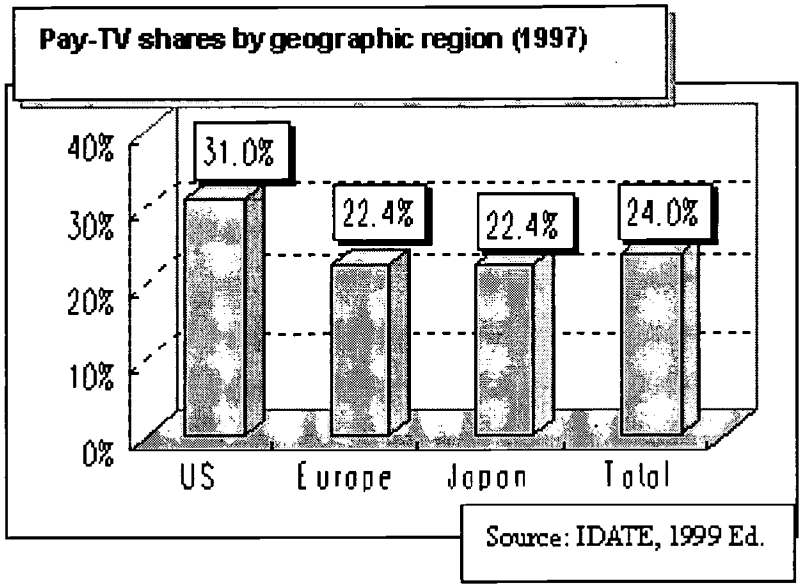
6. Horizontal integration: As opposed to a move up or down the value chain of one's own industry, this refers to a sideways move into another industry with complimentary properties. The more spectacular horizontal integration are across converging media, e.g. Sony's purchase of Columbia's Hollywood studio. There may be many more of these to come, e.g. it is speculated that Microsoft may buy NBC20 in order to get its hands on entertainment content.

They are employed in combination, where a company divests itself of regional industry (consolidation), but then expanded its core competencies geographically by buying other media sectors.

As the large corporations in the converging industries prepare such forward strategies, they are uncertain as to what the response of regulators will be, whether it is under competition law or under media or cultural regulation. Some mergers have been ruled against in the European market, as have some anti-competitive strategies. For them, the uncertainty of the regulatory environment is not merely an irritant but potentially extremely costly in terms of both lost investments and the opportunity costs.

In the US, AT&T has acquired TCI and MediaOne this year. If all of AT&T's affiliates and joint ventures are added into the mix, AT&T would in fact have direct access to ca. 41% of the cable market, which will break the 30% ceiling. US's FCC is investigating this case now.

4. Development of Pay TV market: Cable vs. Satellite



This chapter begins by reporting some of the trends from studies projecting the overall market situation in the future, in the US, Europe and Japan. It then examines some strategies of the major players in the converging market.

4.1 Growth of the US market

As of end of 1998, cable continues its progress with a penetration rate exceeding 60%, and satellite TV has taken a great leap forward thanks to technological advances. Digital bouquets are proliferating, 2 broadcasters (DirecTV & Echostar) share a market of ca. 10 million subscribers after M&A.

Revenue trends in the audiovisual sector in the USA ($mil.)

	1997	1998	Growth rate(97/98)
Basic Cable	20,623	22,275	8%
Premium Cable	4,982	5,323	3.3%
Pay-Per-View	815	1,033	26.7%
Satellite		2,946	27%
Video	15,900	16,059	1%
TV/Cable Ad.	40,790	43,000	5.4%
Federal subsidy	370	370	0%
Cinema theater	6,366	6,685	5%
Total	92,166	97,691	6.1%

For 1997/98, the federal subsidy and video and satellite revenues are IDATE estimates. Figures for ad. Are estimated by the Television Bureau of Advertising. Source: IDATE (1999 Ed.), from NCTA, P.Kagan, Screen Digest, Television Bureau of Advertising , and the professional press.

Confronted with the new competition especially from satellite, the US cable operators must remedy a number of weakness:

1. The US cable market remains fragmented in terms of numbers of players and its geographical organization. Each city is still being served by a large number of operators.

2. The US cable operators suffer from a poor image. Nevertheless, the cable industry possesses a certain know-how in assembling and marketing audiovisual products. And the introduction of PPV and that of addressable terminal enabling segmentation of the offering have put them ahead of their competitors from the sphere of telecommunications.

3. Cable operators suffer from being financially fragile. Low profitability rates and high levels of debt are penalizing companies at a time when networks are being upgraded and concentration is taking place in the sector.

The biggest satellite operator, DirecTV has ca. 77% satellite market share in the US, as of Mar. 1999 after the acquisition of USSB and Primestar. DirecTV's revenue per subscriber per month has reached $45 ($40 for a cable system). DirecTV and Echostar's churn rates have remained at 1% a month, considerably below cable's.

DirecTV generally does not produce its own programming. It purchases it from third parties. DirecTV's success depends in large part on it's ability to make good judgments about programming sources and obtain programming on favorable terms. About 45% of operating expenses of DirecTV was programming in 1998. DirecTV's strategies are following: Expend channel capacity; introduce exciting new interactive services; broaden and strengthen distribution approaches; provide more value through superior programming and unparalleled customer service; and minimize churn.

4.2 Growth of the European market

All recent forecasts point to the media industries in Europe, traditional and new combined, continuing to grow over the next five years. The European market will gradually change over to a system of customized, payable services, the major players are fine-tuning their competition strategies accordingly.

1997 confirmed the attraction that new audiovisual products hold for European households. Satellite is one of the main drivers for growth. The subscriber number rose 11.5% after 16% increase the year before. On the other hand, cable subscriptions rose by ca. 7% and cable subscribers in Europe was ca. 40 million. Pay TV (cable & satellite) revenues, amounting to $13.5 billion in 1997, exceeded income from license fees for the first time and the share accounted for by pay TV stood at 22.4% of total revenues.

The 1996 launching of the first digital bouquets by satellite and by cable opened up the digital market in Europe, and in 1998, digital terrestrial TV began, firstly in the UK.

The audiovisual market in Europe may gradually be switching over th a pay system but it must be recalled that the industry on the Old Continent is still subsidized by the public powers. Lastly, Member States are occasionally obliged to guarantee the financial balance of public channels through exceptional subsidies. In the context of pay TV development, these subsidies could allow European producers to maintain and improve their competitive position in a market that is being international.

The general European figure hides wide variations between markets. Some countries have cable penetration rates up to 85%. Nevertheless, national free-to-air services currently have the bulk of viewing.

In terms of main trends applying to Europe:

1. Leisure spending has been increasing faster than growth in GDP,

2. Consumer spending on audio-visual services has been a relatively small segment of leisure spending (around 8% in Europe as a whole), largely because TV consumption has not been related to expenditure

3. Since 1990, consumer expenditure has been increasing both in real terms and as a proportion of TV revenues, because the license fees have been held fairly flat, declining from 80% of the income for European TV broadcasters in 1985 to 50% in 1994.

4. TV advertising had grown strongly and was set to overtake newspapers in total, but the biggest growth had been in pay TV services.

From these trends, some points is to be caught:

1. European consumer expenditure on TV is a very underdeveloped market with room for new services, which will be highly attractive to all converging industries.

2. Pay TV is growing fast. Even if advertising will still be the largest single source of revenue in European TV in 2006, pay TV will be close.[4]

3. New services can grow strongly in income terms, even when their audience share is low,[5] because the growth of pay TV doesn't have to be at the cost of advertising-funded free-to-air channels. **Pay TV** revenues accounted for **27% of TV revenues in Europe at the end of 1997 (47.9% for advertising).**

4. European free TV still remains the engine room for the European audiovisual industry. But the sector most under pressure across Europe should be the license-fee funded public service broadcasters. License fees accounted for 25% of TV revenues in Europe at the end of 1997.

In Europe, there are now more than 300 channels, 2/3 of which are private. As programs become digitized, private channels both new (Pro7, DSF, RTL4) and old (ITV, Fininvest, Canal+), plus the public channels, should offer more thematic channels. Especially digital terrestrial TV started last year in the UK. Segmentation of programs, which will take the shape of a bouquet offering, will enable broadcasters to improve profitability. Recently, BBC is to be allowed by the British government to charge a higher license fee to viewers who subscribe to digital TV services *(Aug. 2, Reuters).*

The average cable penetration rate was 28% of TV households at the end of 1997, but there are wide differences among European countries, with subscription rates varying from 1% in Greece and Italy to 90% in Belgium and the Netherlands. But 4 out of the 5 biggest European countries by population are at the bottom of the table with a TV household penetration rate of less than 10%: France, the UK, Spain and Italy. In 1998, digital broadcasting has been the driver for growth in the satellite market in a number of countries where digital TV has already been launched, mainly France, Spain and Italy.

IDATE (1999) says some reasons for the insignificance of German market in comparison of French and Spanish market:

1. The difficulty for the government to promote the growth of a competitive market, trying at the same time to ensure that the public service would have an equal chance of success.

2. The exceptionally high number of free channels which did not encourage viewers to pay for services that gave them nothing really new at the time.

3. 3 levels of regulation (European, national and regional) governing TV broadcasting and complicating the process of decision-making.

4. Concentration in the audiovisual sector which has meant that it is only the main analogue TV players that are active in the digital sector.

The UK is a pioneer in digital process any way. The first DST, launched in Oct. 1998, Sky Digital offers 200 channels including 60 radio stations. BIB (British Interactive Broadcasting), a consortium (since Nov. 1998) comprising BSkyB and BT, is operating the interactive services of their digital bouquet via satellite or telephone line, such as home shopping and home banking. In Nov. 1998 also DTT introduced its first digital service. Carton and Granada have each 50% of BDB (British Digital Broadcasting), a joint venture operating a pay-TV service under the name of ONdigital. This terrestrial digital bouquet is offering now 15 channels. Cable & Wireless Communications is planing to launch a 200-channel digital bouquet over its cable network at the end of 1999. It plans also a set of interactive Internet-based commercial services. The shopping mall, named "TV Mall", will enable subscribers to do their shopping at home and obtain access to banking or information services as well as video games.

France has become the leading market in Europe for digital satellite TV, in terms of both bouquets and subscribers. 1997 in France remained the year of DTV and 1998 followed in the same path. Special feature of the French Pay-TV landscape: A cable network has met with limited success. There are 2.4 million cable subscribers and 1.4 million satellite subscriber at 31 March 1998 out of a total of 6.9 million homes passed. In the context of financial difficulties, cable operators have had to face competition from satellite since 1993. Now, there are 3 digital satellite bouquets, Canal Satellite Digital, TPS and ABSat. There are about 1.6 million French households who have gone in for digital satellite services in the space of 2 years, which makes France European leader in this sector. Under pressure from satellite, cable has been forced to digital and there are over 100,000 subscribers receiving digital programs via cable.

1998 is a year of importance in Spain in regard to cable and satellite. Satellite was responsible for the introduction of digital TV in 1997 with Canal Satellite Digital in Feb. and Via Digital in Sep. 1997. CSD has 700,000 subscribers and Via Digital 350,000 by the end of 1998. Because of the smallness of the domestic market, these 2 operators intend to merge their activities. Regarding cable, the government has issued calls for tender for cabling all provinces in 1998, which made its real debut. 29 licenses have been allocated since July 1997 for cable TV and telephone services. In July 1998, Cableuropa launched its first cable telephony services in Valencia and is aiming to introduce new services in 1999 that will include a digital bouquet and high-speed Internet access. Telefonica de Cable holds a license for operating in all markets and has deployed the necessary infrastructure for offering cable services throughout the country.

The TV market in Italy is characterized by the supremacy of free TV. Cable is virtually non-existent in the Italian market. But, Satellite is the main preoccupation of Italian operators. In March 1996, Telepiu launched its digital satellite service. In Sep. 1997, Canal+ acquired 90% control of the Italian pay channel and changed Telepiu's strategy. Telepiu had 900,000 subscribers including 350,000 for D+(basic digital bouquet) at the end of 1998. The second digital Pay-TV bouquet, Stream has been launched in July 1996. In regard to cable, it was not until 1995 that the public telecommunications group STET (Telecom Italia) announced the Socrates project, which was to make digital cable available in 10 million homes by the end of 1998. Following the privatization of Telecom Italia in 1997, the investment intention of Telocom Italia has diminished. However, Stream has introduced a digital TV service destined for cabled households.

4.3 Growth of Japanese Market

Japan had experienced high growth in free publicly funded satellite TV and also the take-off in satellite or cable pay-TV, thanks to a proliferation of offers. Pay-TV in Japan has already attracted 6.7 million households (excluding NHK) at the end of 1998. Pay-TV in Japan has undergone its initial development phase in the form of community antenna networks, then the proper pay-TV service via cable has started and 4.7 million households are covered as of 1998. Satellite broadcasting is growing too with 2 pay bouquets, SkyPerfecTV and DirecTV Japan. In all, pay-TV still only accounts for 7.5% of total audiovisual industry revenues.

1997 and 1998 are marking the real launch of pay-TV in Japan, after an initial development of private satellite channel (WOWOW) and local cable networks. In Japan, it is prospected that the start-up will not have a negative impact on free terrestrial TV funded by license fees or advertising revenues. This will enjoy sustained growth while the predominance of terrestrial channels in terms of audience remains far removed from any attack by cable and satellites. Terrestrial TV is moreover likely to enjoy a new boom with the planned introduction of digital broadcasting in 2000. Moreover, prior to the launching of new digital satellite services, there were about 20 channels being broadcast via cable or satellite.

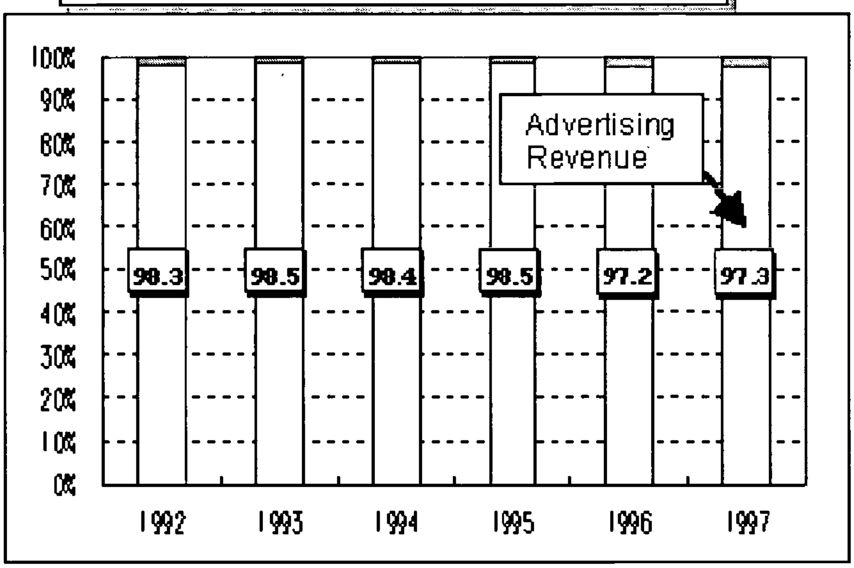
The pay-TV market in Japan is entering a phase of industrial structuring marked by the arrival of powerful conglomerates. Cable has not yet reached the critical mass that would shelter it from competition from satellite TV. In regard to satellite, having inherited the first bouquet to be launched in Japan, SkyPerfecTV has a lead in terms of subscriber. Overall, the pay-TV market is enjoying sustained growth.

4.4 Growth of Korean Market

As of 1998, 6% of Korean households are subscribed and about 14.3% of Korean households are using C-band dish directly at home to watch the foreign channels (ca. 305 channel available) through spill over. But it is pointed that such trials will be marginal in terms of the overall spending, since conventional channels like KBS, MBC, SBS continue to hold the major share of the audience, and thus be able to deliver the mass audiences required by most advertisers.

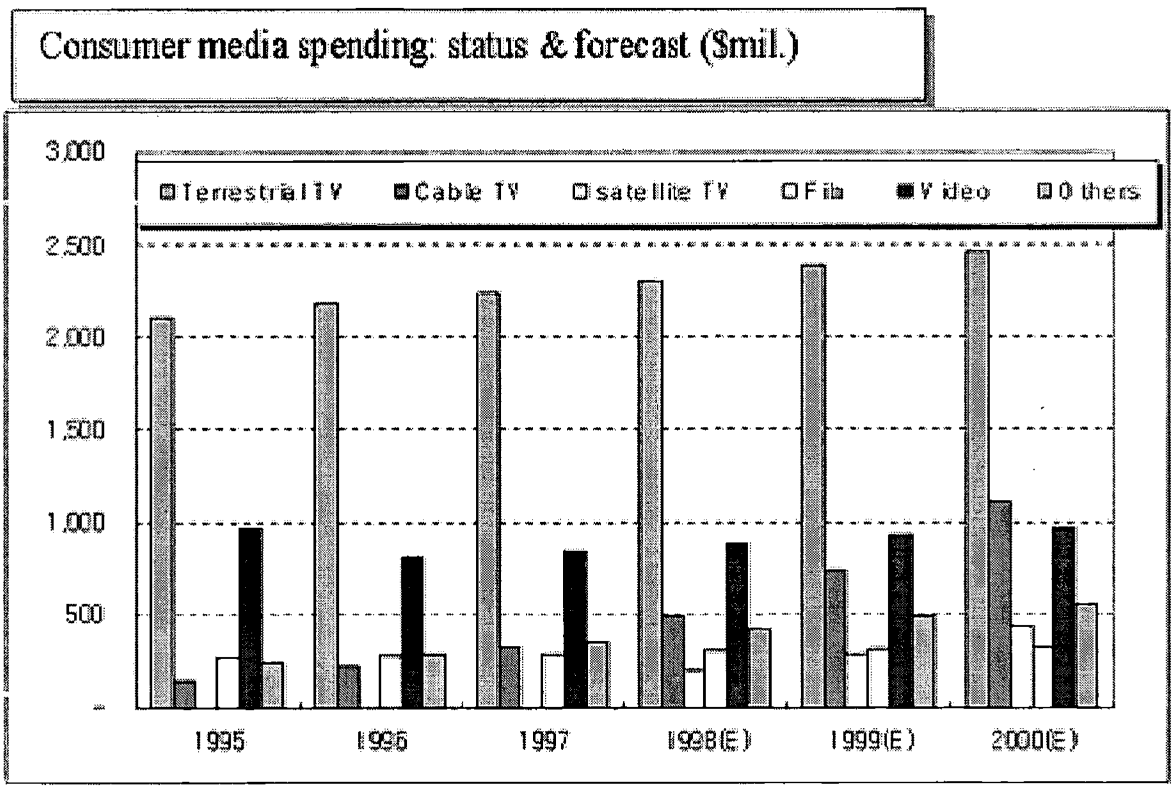
There will be a digital offering available in 2001, since the new Broadcasting Act will be passed at the End of 1999. The advertising is the key financial source of TV industry in Korea.

MBC's revenue trend (1992~1997) (%)



The advertiser's experiment with WWW and other online channels is marginal. Total advertising expenditure on TV including cable TV has increased 25% from $1.43 billion in 1995 to $1.78 billion in 1996. In 1997, the Korean expended about $3.65 billion (annually $81 per capita) for TV advertising, just twice as the figure in the previous year.

Up until 1995, 3 national terrestrial broadcasters enjoyed a monopoly without external threat from foreign broadcasters. Since 1995, there have been 8 local terrestrial broadcasting companies licensed to operate in as many major provincial capitals scattered across the country. At the same time, 29 cable program providers are in operation. After the enactment of the new Broadcasting Act, there will be more than 70 additional satellite channels on air. In terms of the pay TV, the whole country is now covered by 77 system operators (SO), 2 network operators (NO), and 29 program provider (PP). The number of cable subscribers who pays the monthly fee, is ca. 1.2 million households (9% of the TVHH) at the end of 1999.



Source: Ministry of Culture and Tourism, 1997

Source: Ministry of Culture and Tourism, 1997

5. Conclusion

Vertical integration and horizontal competition seem to be the 2 basic movement influencing the structure of TV industry. The **real competition** will focus **on the product** itself rather than on its distribution method or infrastructure.

Typically, control of bottleneck in a production process is used to enhance market power. It may take a form of horizontal monopolization. The supply chain in the broadcasting industry comprises essentially the following stages:

1) Content
2) Packaging of content into channels
3) Bundling of channels into packages (in case of pay-TV)
4) Delivery
5) Conditional access
6) Reception
7) Revenue collection

Now, the competition problems in those stages of the TV market can be described as follows:

1. ***Content:*** Exclusive purchase of content is important for the commercial advantage of a subscription service. If potential viewers can watch an event on a free-to-air basis, it is difficult for the subscription service provider to persuade them to pay for the specific service. And, if it is also available on a rival service provider, a unique selling proposition has been lost. Ironically, exclusivity agreements could be welfare enhancing in some cases. If there is no exclusivity, the potential for free-riding in the marketing of a key event may lead to under-investment in promotional activities. On the other hand, it could have effects on industry structure. Recently, there is dramatic price inflation in the market for key rights. Service providers are likely to adopt more aggressive competitive strategies. The right holder views pay-TV as a major source of additional income that seems set to grow rapidly. The exclusive relationship between content provider / rights holders and pay-TV service providers have an impact on the competition between competing pay-TV infrastructures and overall penetration.

2. ***Content (program) packaging into channels:*** Cable and satellite service providers offer a number of thematic channels. The viewer can pay for a stand-alone event. PPV services are allocated transponder capacity for the duration of the event. The content packaging is a means of branding content and signaling quality to potential viewers in an industry where asymmetric information is significant barrier to consumer rationality. A holder of dominant position in the wholesale packaging market can exercise monopsony power vis-à-vis right s holders and also leverage its power into vertically integrated retail markets by applying a price squeeze on its competitors. BSkyB in the UK invests heavily in the acquisition of satellite broadcasting rights for premium content, using its significant subscriber base to finance a number of exclusive agreements especially in genre of cinema and sports. In 1995-96, 34% of BSkyB's programming budget was spent on movie acquisition. Monopolization of wholesale programming may have both horizontal and vertical effects. The exclusive acquisition of a number of key movie rights by the same operator may prevent a rival movie channel being developed. In addition, exclusive control of key rights may be used to strengthen market position in the channel packaging (bundling) in the wholesale market (vertical foreclosure). BSkyB is the major supplier of content to the UK cable industry, providing 55% of English language cable programming and 71% of satellite channels. The competition issue relating to rights is not the possession of exclusivity over any individual event or film but rather the existence of barriers to entry on the overall market for the wholesale supply of such content.

3. ***Channel bundling into packages (in case of pay-TV):*** Unlike terrestrial TV, in case of subscription TV the bundling possibility arises. For instance, BSkyB bundles a number of channels into its package, which is sold on to retail DTH subscribers as well as in the wholesale market to cable operators. While retail bundling is welfare enhancing because it permits desirable types of price discrimination, but also can be anti-competitive. Thus a compulsory retail bundle can be constructed by a dominant broadcaster in a way likely to impede entry.

4. ***Delivery:*** There are 3 main methods to deliver content to the viewer: terrestrial, cable and satellite. In Europe, premium pay-TV is available via terrestrial TV in France, Spain, Italy. In the UK, BSkyB package is a cheaper one to receive via DTH than via cable. Digital applications are dependent on the ability of the viewer to interact directly with the service provider via a return path. For digital cable the return path is included in the delivery infrastructure. With satellite and terrestrial delivery the return path is through the telephone network.

5. ***Conditional access:*** The service can be encoded in such a way that the signal is rendered unintelligible without the use of specialist decoding equipment (encryption). Bound up with conditional access are other set-top-box issues, such as Electronic Program Guide (EPG) and Application Program Interface issues. Conditional access is encryption system and a major bottleneck in competition among the pay-TV broadcasters. The dominant analogue encryption system in the UK is Videocrypt 1 owned by News Datacom. BSkyB control the market with this. Widespread concern over the potential for monopoly abuse in this sector is now in common: Access is to be provided on fair, reasonable and non-discriminatory terms.

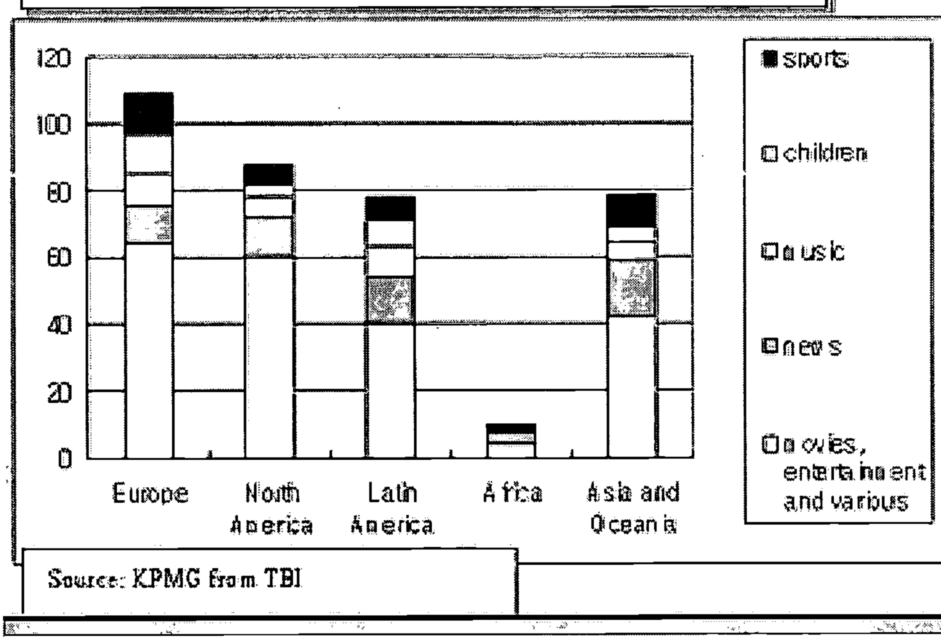
6. ***Reception equipment:*** For DTH, the household receives the signal via a dish mounted on the outside of the house, connected to a set-top Integrated Receiver Decoder (IRD). To be descrambled and reconfigured, the digital signal must pass through the IRD or STB before the image can be displayed on screen. The STB contains the vital decompression, demodulation and general intelligence equipment that ensures the smooth functioning of the system. STB subsidies may be required to encourage the early take up of digital TV services. But in the vertically integrated world of broadcasting, the recovery of such subsidy raises competition policy problems. Moreover, the situation is more complicated if the interactive service provider uses the STB. This raises the further issue of how to split recovery of the subsidy between broadcast services and other services.

7. ***Revenue collection:*** Subscriber Management System (SMS) provide the management of pay TV customers, providing billing services and handling customer requests. SMS is a key bottleneck because of the core competencies required to run an efficient SMS operation. Various parts of the SMS function can be offered by competing providers with core competencies in offline and online transaction processing, e.g. pay-TV service providers, telcos, financial service organizations and retailers. SMS is a retailing function for pay-TV services and, in future for all types of digital video and information services. Competing SMS providers using the same CA technologies and the same or different smart cards are common e.g. Multichoice/Viasat in Scandinavia.

It is common that digital bouquet (Digital Pay-TV) operators are more interested in acquiring the largest market share than for rapid return on investments.
The **ways to develop revenue** are followings:

To develop advertising revenues (but limited)
To get more subscriber to pay TV
To make each customer to spend more money for pay channels
To find other revenue sources: PPV, interactive advertising

In recent world-wide trend, private packagers are booming in Latin America, developing at a high pace in Europe, Middle East and Asia Pacific, and remain stable in North America (now rather mainly via DTH), Africa (concentrated in a few countries like South Africa). A method to develop revenue, PPV service is evolving now toward NVOD service. PPV is using a large number of channels to permit the frequent programming of the same movie. The PPV development is a characteristic of the new digital packages and illustrates the move toward quantity.



Number of thematic channels per genres (1997)

Source: KPMG from TBI

Due to the multiplexing technology, content can be more specialized in the sense that it can develop a specific theme and satisfy the end user. In the period between 1995 and 1997, thematic channels have significantly increased all over the world (40%) and there have been more than 370 thematic channels broadcasting. The growth of the thematic channels has been influenced by the launching of new digital satellite platforms which have made it possible to offer thematic packages with a higher number of channels. Channels have started to be tailored to a more and more specific typology of end users.

One of the most important strategies is "interactivity" offer. The home shopping channels have shown a dramatic growth, both at local and global level. It is a sign of the increasing trend of the interactive use of the TV. Thematic channels tend to globalize. As the channels go global, they tend to adapt their offer to the country particularity. The channels are preparing all over the world different language version, i.e. Disney Channel, CNN, some Sky Channels, etc.

On a worldwide basis, advertising remains the main contributor of TV funding. An interest thing is following: In the 90's due to the sharp competition of non public channels, the audience of the public channels has first decreased, then stabilized, or even grown in some markets. This trend is obvious in Europe. The renewed interest for public channels are more interesting, just because public TV is accessible to the most numerous part of the population and to propose programs which might not attract the attention of advertisers.

Final consequence of the sharp competition among all channels is the **content shortage.** As channels become more competitive, the need for acquired programs increases more rapidly than the program offer. But, as especially the thematic channels need to secure content, program price tend to increase mostly in the genre of sport and cinema. In the matter of the program acquisition, the role of rights owner is reinforced at the expense of the broadcasters and of the packagers.

Now, some options are to be drawn for precise strategies.

1. **Advertising as revenue**: Pay-TV broadcasters tend to think TV advertising more like specialized magazines in terms of "focused thematic channel". More focused advertising is needed, i.e. toy advertising in children channel.

2. **Development of revenue sources:** Even though advertising revenues are still increasing, the growth of total TV revenues is being driven by pay-TV. The interactive advertising leading to electronic commerce seems to have a very high potential. EC seems to get 10% of the global purchases in the developed countries in 1998 and Electronic Programming Guide (EPG) system must be developed in the context of multi-channel. Then, on the long term, the rights holders could make their sales without any packager, especially for rights on movies and sports. The consumer or the audience does not need any packager to buy or view a movie stored in PC, or Set Top Box for TV use to watch the movie.

3. **Interactivity:** Traditional TV cable operators begin to offer telephony, Internet access and other services together with TV bouquets. Now, pay and free thematic channels via cable and satellite are widely available. These channels are operated generally by TV companies. But telecommunications sector is increasingly buying shares in these companies in terms of diversification and economics of scale in the digital era. New interactive services such as web-casting, interactive advertising and electronic commerce are now technically possible for TV. New possibilities for interactive TV are widening the boundaries of imagination. Now, some alliances or marketing cooperation between TV broadcaster and telecommunication company are necessary

to enhance more interactivity in terms for the transmission speed and bandwidth.

4. **Content:** The lack of suitable programs to be broadcast by all these new channels is increasing the value of diffusion rights. The rights holder is final winner. In the pre-satellite environment, spectrum scarcity allowed existing broadcasters to exert significant purchasing power. However, growth in the number of delivery mechanisms and channels has caused market power to gravitate away from broadcasters and towards key talent. Competition between broadcasters for talent and program rights causes their prices to escalate. This process is obvious in the competition for major sports rights. But, in an environment of expanding numbers of channels, competition between broadcasters is likely to drive up the price of acquiring rights to popular programming and key talent across a range of genres.

Finally, 2 key issues for TV business appear to be:

1. **Access to the viewer**

Pay TV is now driving the growth of TV revenues and interactive TV is about to become reality. In terms of the penetration of digital TV[6], the UK is a good example. According to KPMG's prediction, by 2002 just over half of all British TV households will still be watching solely terrestrial analogue TV. The rest will be multi-channel although not all receiving digital services as some cable and satellite analogue remains. In 2002, digital satellite will be in 15% of homes, digital terrestrial in just 8%, and digital cable in 15% in the UK. Audience share is the principal measurement of success against which broadcasters are currently judged, but **in the digital era other measurements may be more significant,** not least profitability.

Even where multi-channel penetration is high, viewers in multi-channel households continue to spend the majority of their time with terrestrial free-to-air channels.

People are resistant to rapid change and the role of habit cannot be ignored, especially with regard to leisure. Also, the new technologies are not replacements but additions to traditional broadcasting, therefore companies can concentrate on maximizing the profitability of their core businesses.

Even though the traditional broadcasting companies are still surviving, they are just only one part of one industry involved in the era of convergence. Other industries including the US entertainment combines, the Japanese and other electronics manufacturers, the large global telecommunications providers and all the computing industries may see the future somewhat differently, and are telling the broadcasters so.

The EC's study of the economic effects of convergence predicted that: *"On-line multimedia will grow rapidly towards the latter five years of the projection period and by 2005 will, in many markets, vie with pay television as the largest consumer AV expenditure category."*[7]

The key is not just the weight of numbers of people experiencing the new culture of multimedia, but also their significance to advertisers. It is 'young people' group, i.e. the 12-34s who are switching on to a different way of doing things:

- For user power, against corporate dictation;
- For open access, against proprietary manipulation;
- For horizontal hyperlinks, against hierarchical menus;

  For interactivity, against passivity;
- Quick to be 'disloyal' to single TV providers except where their branding is attractive to youth culture, pro-surfing;
- Comfortable with pre-selection and personalization.

This group using usually online media (interactive media) are now better and higher educated, disproportionately male young people who show these characteristics. But it is likely to change quite quickly as the PC moves up to household penetration levels of 40%, already being reached in the US and to be reached in Europe within 3~4 years.

A key decision is whether the new culture of the online age represents a small but significant addition to the cultural economy, or a paradigm shift in the way all information-based services will be used. If the latter, then the rate of change, particularly in the latter 5 years of the ten-year period, could be much faster and with more profound effects than any of the predictions envisage.

The 'convergence generation' is here. The challenge of convergence is how to keep pace with this new generation as they make their preferences known with great intensity.

Important is the fact. The traditional broadcaster like BBC, NHK, KBS are forced into examining the external environment of the future by the very serious threat to its existence posed the expiry of license fee agreement, has embraced the necessity of a convergence-based strategy so firmly as to risk undermining existing services by extracting some percentage of their value for reinvestment in new ones. Therefore, it is suggested to prepare for convergence in communications-related industries. This gives 5 years for strategy formation, forward planning and operational experimentation especially to focus on the young people who will use the TV for interactive purpose.

The TV market will diversify, general entertainment channels will lose some of their audience to niche channels, and all channels over-the-air, by satellite or by cable, will progressively switch to digital transmission. But as already mentioned, the 'free TV' model will remain dominant, with its attractions of mass viewing for advertisers and familiar program schedules for viewers.

Now, still important question is following: In near future, new services will have to deal with the same challenges facing TV today? How to reach the viewer especially in the interactive environment? In the pierce competition, will the service provider profit or suffer from this change? To access to the viewer, 2 options are to be selected, and open system where there is no gateway or a closed system where few structures control access to specific viewers.

The increased program choice and interactive capabilities of DTV can be expected to lead to a growth in the proportion of the population willing to pay for TV services. This trend is accentuated by an increase in personal disposable incomes. Although the change to digital will increase the number of pay-TV subscribers, the impact on average expenditure per subscriber is not clear, just because the time budget per day for media use is limited in terms of the leisure time budget of all people.

2. **Access to diffusion rights** .

The market would polarize into a limited amount of **high cost product during peak time** (provided by the traditional broadcasters) combined with a growing demand for other **low cost services in other hours.** As viewers fragment and the major broadcasters fight with increasing ruthlessness to try to keep them, content does change. As the evidence for this situation is the UK case showed: After 7 years of increasing competitiveness since the 1990 Broadcasting Act, accelerating since the 1996 Act which relaxed, to a limited extent, the ownership rules. TV is no longer to 'inform, educate and entertain'. TV is now entertainment itself, and that includes news and documentaries. Of different types of content, movies and premium sporting events are the principal drivers of pay TV. And the issue of access to TV rights for major sporting events has become now a major issue around the world, in the developed as well as the developing countries.

The industry is moving from a situation where spectrum is scarce, and hence where content has to compete for scarce retail outlets, to the reverse situation where abundant spectrum competes for scarce content. Economic rents will tend to shift from the owners of delivery methods to owners of content that is towards the top of the vertical chain of production.

Even if the both genres, sports and movies are important to pay TV, their market power is different. The movie is a durable good which can be viewed in a number of windows, where the price of the following window constrains the price of the preceding window, and where recycled archive movies compete with current offerings. But sport is an instantly perishable good, where the competition at any particular time comprises only those other sporting events played live at that time which are regarded as a reasonable substitute by the consumer. Therefore, the market power in sporting markets may be greater than in movie markets.

Regarding the market for sports rights, there is a supply and demand of sports rights. There is a very wide array of sports available for broadcasters, ranging from major worldwide sport such as soccer, tennis and golf to minor sports. The rights owner is free to sell the rights so as to maximize returns.

In case of channel packaging: If a specific sports event induces a viewer to subscribe to specific pay TV service such as Sky Sports, the event generates not just the Sky Sports subscription but the subscription to the basic package that all viewers must purchase before they can purchase premium channels.

All such induced revenues are factored into the valuation. A related reason why channels may wish to acquire sports rights that will attract large audiences is channel inertia. There is evidence that viewers watching a program on channel A tend to stick with channel A at the end of the program, rather than switch to channel B.[8] Someone switches channel only if he or she is unhappy with his or her present viewing. In this case, the value of the initial program is increased by advertising revenue from the second program. This effect could apply to subscription channels if induced viewing of subsequent programs increases consumer loyalty, and hence allows higher prices to be charged without inducing churn.

The value of sports rights have additional benefits. Above all, 2 characteristics of the evolution of pay TV markets are significant:

1. Key sports rights drive dish sales for satellite TV: This effectively locks the consumer into satellite TV for the lifetime of the dish. I.e, in Italy, 75% of Telepiu subscriber base take the premium soccer service.
2. There is a way in which key rights affect the competition between rival systems for the delivery of pay TV: In the early stage of competition between 2 rival systems, control of key programming assets can tip the balance in one direction. A bidder is willing to bid an additional amount for the benefit of tipping the market in its direction, and to avoid the disadvantage of it tipping in the other direction.

Currently, just by common consent, the key content rights are released Hollywood blockbuster movies and premium sports, even if other programming material is valuable. For some programming in particular the rights holder benefits from highly inelastic demand for the product. Such key rights are to describe as the 'battering ram' of pay TV.

Pay TV, in particular digital pay TV is uncertain market. There are likely to be advantages in being a first mover, but there are also a number of costs and benefits of adopting particular technological solutions. Generally the CAS (and also SMS, billing etc.) could be supplied and operated by independent 3rd parties. But the content packaging and marketing function are a gateway that controls the subscriber. Content through it on scrambled and encrypted basis is delivered via cable and satellite and digital terrestrial TV which permit viewers to be switched on and off. Pay TV model is not open in that sense.

There are a number of broad concerns about pay-TV:.

1. **Ability of the first mover is huge:** It exerts gateway power over other content suppliers and over viewer, distort market outcomes and make excess profits. This issue should be at the heart of the media policy discussions and also technical argument about the conditional access.
2.

There is a potential cost: It is associated with the deployment of proprietary or delivery-specific standards, either for decoding or for conditional access. This issue concerns interoperability issues in the transition to digital TV.

3. **The future of public broadcasting is not clear:** There is a fear that this first mover will undermine the financial viability of established broadcasters (like KBS, BBC) who are viewed as having a particular public role. This will be more important as pay TV increases its share of the broadcasting market.

Endnotes

[1] Autumn 1998, DTTV launched: includes all five national 'free-to-air' channels currently available (i.e. BBC1 through to Channel 5) and existing regional channels such as S4C, all remaining 'free' to the viewer (i.e. disregarding the license fee); plus a range of new channels on subscription from new consortium British Digital Broadcasting

[2] Bunting, Helen, "The Future of the UK Media Industy," FT Telecoms and Media Publishing, 1996

[3] Ben H. Bagdikian, The Media Monopoly, Beacon Press, Boston, 1997 edition

[4] Zenith media, Television in Europe, February 1997

[5] In 1997, in the UK, 4 million households are willing to pay an additional £120 (basic package) to £350 (premium) for programs to which they devote on average 35% of their viewing time.

6 Styles, Paul, The future of digital broadcasting, presentation slides, KPMG, May 1997

7 The Economic Implications of New Communications Technologies on the Audio-visual Markets, Norcontel study for DG X of the European Commission, 1997

8 Borwise, P. and Ehrenberg, A., Television and its Audience, Sage Publications, 1988, p. 34

Sessions

Streaming Media: Opportunities and Challenges

Vivian Luo

Abstract

On April 1, 1999, Yahoo announced to acquire Internet audio and video broadcasting upstart Broadcast.com for $5.7 billion. News of the acquisition created big bang in the Wall Street, sending Broadcast.com shares soaring. This event also caused investors to quickly push upwards the valuations of related companies, from the branded, leading software solution and service provider RealNetworks, Inc., to small-cap, niche players such as Audiohighway.com and TCI Music, Inc. By delivering live or on-demand audio and video content over the Internet, streaming media technology has received strong acceptance from both Internet users and industry players ranging from ISPs to software vendors to content aggregators to network infrastructure providers. Traditional broadcasters are also monitoring its development since such technology may threaten traditional means of video distribution, especially given that broadband access is growing more ubiquitous and more affordable to both business and consumer users.

After the aggressive buying of Net stocks in late March and early April, shares of broadcast.com, RealNetworks, and other streaming media players, together with the whole Internet sector, had provided investors with a reality check by the time this paper was written (up again since October 1999!). However, the wealth creation opportunities of the dot-com gold rush and the potential of streaming media to the World Wide Web still remain very attractive, if not more so. Streaming media will not be a novelty but rather, an integral part of Internet services. It is the technological pathway to true media convergence. This paper reviews the history of streaming media, examines its market segmentation and value proposition, and analyzes streaming media's roles and opportunities in the Internet, its promises for new media, and the challenges facing it going forward.

Introduction

The last year of 20th century marked the beginning of broadband and streaming media frenzy. Splashes were made as Yahoo acquired streaming media content aggregator Broadcast.com for $5.7 billion in April, followed by a series of exciting events in the arena of audio/video distribution over the Internet.

Streaming media allows multimedia content to be played on computers as it is being received, rather waiting until the entire file is downloaded. Media that can be streamed include synchronized graphics, text, sound, video, 3D images, music and virtual reality environment. Although streaming media is still in its infancy and generated only about $100 million in revenue in 1998 (excluding adult content), it is a popular element found on many leading consumer-oriented web sites. Streaming media as a cost-effective way to distribute media-rich contents or broadcast live events is also gaining awareness among corporations, government agencies, and educational institutions. Media companies, old and new alike, are searching strategic alliances and creating game plans to rush into this fresh field of Internet and new media.

History of Streaming Media

Following the development of MPEG-1 and MPEG-2 and the invention of multicasting by Steve Deering in early 90s, streaming media entered the Internet in 1995 with its first delivery system by Xing Technology. Major historical events that highlight RealNetworks are outlined as follows:

- 1995
  - Xing Technology Corporation (acquired by RealNetworks on August 10, 1999) developed StreamWorks, the first live and on-demand audio/video delivery system over the Internet, also known as "streaming" digital video.
- 1996
  - Progressive Networks (renamed to RealNetworks in late 1997) announced the RealMedia architecture
    * First cross-platform streaming media platform on the Internet
  - 40 companies, including Progressive Networks and Netscape, to support Real Time Streaming Protocol (RTSP)
- 1997
  - Progressive Networks (RealNetworks) announced RealVideo
    * First feature-complete, cross-platform video broadcast solution for the Web
    * More than 10 Million RealAudio users upgraded to RealVideo
- 1998
  - RealNetworks announced RealSystem G2
  - SureStream multiple bit rate encoding available
  - More than 20 internet industry companies announced support for "Ask, Tell, & Help: Fair Practices and Convention for Handling File Formats on the Internet"
  - Xing Technology Corporation released the first true high quality push multicast video servers
  - Virage, Inc. released the first streaming video search engine
- 1999
  - RealNetworks launched RealJukebox and announced the Gold release of RealJukebox and

RealJukebox Plus
- Turning Internet PC's into the best way to experience music
- First complete digital music system provides users with everything needed to acquire, play, and manage their personal music collections
- RealNetworks introduced RealServer 7.0 and RealProducer 7.0, the latest advancement to RealSystem G2
- RealServer 7.0 delivers up to 250% improvement in server capacity

- RealProducer 7.0 delivers the quality of MPEG-1 video at half the data rate and delivers true VHS video experience at 800 Kbps

Applications and Market Segmentation

Streaming media applications span from sporting events, concert tours, movie clips, interactive chats, multimedia presentation, advertising, video conferencing, training sessions, corporate information dissemination, education, newscast, and live event broadcasting, etc. Applications can be live or on demand. Major market segments include corporate communication, commercial broadcasting, digital entertainment, and distance learning.

Corporate Communications

In the corporate market segment, streaming media is used for immediate and simultaneous distribution of important information such as human resource programs, CEO updates, company brochure distribution, new sales initiatives, video catalog, product demo, multimedia presentation, online help, press release, etc. In planning a major press event or an important internal speech, a corporation can invite reporters, investors and employees around the world to attend from their desktops.

Commercial Broadcasting

With significantly lower costs and world-wide coverage, live events broadcasting over the Internet has gained popularity. Trade shows, conferences, fashion premiers, and even live-baby delivery have been "aired" over Internet.

Digital Entertainment

Most excitement created by streaming media is new ways of distributing and enjoying music, movie, and other entertainment packages. With streaming media, the Internet is creating new digital entertainment frontiers. Music, movie clips, interactive games, sports events, etc., are entering the computer screens at a speed the current bandwidth can barely catch up with.

Distance Learning

A natural application and market segment of streaming media is web-based distance learning. Currently there are hundreds of web sites offering distance learning curriculums, from music lessons to computer programming to business administration credentials to professional license courses. The popularity of web-based distance learning is expected to keep rising with the spread of broadband access, which will make dazzling online graphics, including high-quality video. This will create great market potential for streaming media. Steward Skorman, president of HungyMinds.com, predicted that "five years from now, with broadband access, online education could rival the entertainment business. "

Value Propositions and Roles in Internet

Choice, effectiveness, cost savings, speed, flexibility, and reach represent the major advantages of streaming media. Streaming media over the Internet condenses geography, solves time zone conflicts, and provides an affordable supplement to videoconferences. It provides easy collection of viewing behavior statistics, allowing broadcasters and content providers to easily asses and maximize the attractiveness of broadcasts and content.

Internet broadcasting is about 60% of the cost of traditional broadcasting. Prices drop even further when ISPs deploy multicasting. Traditional broadcasting cost for a corporate CEO speech to 28 offices is $92,000, compared to $15,000 via Internet broadcast.

A scalable technology, streaming media can be scaled to run on a range of implementations: single user, department-sized multiple-server environment, or large system designed to serve many thousands of users.

Content and applications requiring security or privacy are not stored on users' computers. It eliminates the requirement for large storage devices to view media content and minimizes the wait for playback.

The next major improvement of the Web experience will be audio and video experiences. Streaming media promotes Web site usage. Research shows that users stay longer at sites that have streaming media, revisit these sites more often than the sites without streaming media.

Streaming media enhances web-based advertising and "push content". The commercial value of advertising is expected to increase for broadcast applications in conjunction with streaming media.

Jae Kim, an associate analyst at Paul Kagan Associates Inc., says the expanded multimedia market represented by streaming media will total more than $10 billion in the next few years. Kim says streaming media's economic impact goes beyond the traditional "units-times-price equals market revenue" calculation. "The real value of this lies in the realization of cost savings and the leveraging of a company's or individual's knowledge base across a multitude of new users.

The impact of streaming media on Internet will be huge. Currently Microsoft Audio and video sites on the Internet are already growing faster than traditional Web sites. Internet radio and television sites are proliferating faster than the Internet itself. A potentially big breakthrough in streaming media application is game business, which will be fueled by the streaming technology. Below are examples that show the roles and opportunities of streaming media in the Internet:

Internet Radio

The fastest growing segment of Webcasting is radio and radio stations streaming on the Internet. Traditional radio stations and new Internet radio companies are jumping on the Internet radio bandwagon in large numbers. There are over 1,600 live and on-demand radio stations on the Net. According to radio industry researchers, 4,168 radio stations in the U.S. maintained an online presence in 1998. This number is expected to double by the end of 1999. BRS Media, a full service Internet e-commerce firm that assists radio in building and branding on the power of the Net, estimated that the total number of radio Webcasters exceeded 2,700 during the month of September 1999. In a span of over 36 months the number of radio Webcasters leapt from 56 to over 2,700. One out of four radio stations with a site on the net are Webcasting live online. Forrester Research predicts that e-commerce revenues from Internet radio should grow from $64 million in 1998 to $750 million in 2002.

Internet users are responding. About 20% of all Internet users, or 6% of the entire U.S. population, have listened to radio stations on the Internet, according to Arbitron research. Nearly 70 percent who have visited the site once have returned to it again. About half said they listened one or more times per week. The average time spent online with an interactive radio station is eight hours per week."

Music Download

The Internet has created a long list of new-generation online music companies, and the digital distribution of music is just beginning to take off. Forrester Research estimates that the digital music download business will exceed $1 billion by 2003, while London-based Market Tracking International (MTI) projects that the Internet music market will reach $4 billion by 2004. According to Media Metrix, the number of people who listened to digital music on the Internet in August 1999 jumped to over 4 million, up from a few hundred thousand a year ago.

All the major portals - Yahoo, AOL, Microsoft - offer music download. Emerging companies in the digital music distribution list are: Musicmaker.com, EMusic.com, ARTISTdirect Network, MCY, The Orchard, CDuctive, MJuice.com, BuyMP3.com, Liquid Audio, Global Music Network, MP3.com, Tunes.com, RollingStone.com, etc. Musicmaker.com, headquartered in Reston, Virginia, is the largest custom compilation CD and secure digital download music site on the Internet. It offers music fans the opportunity to build their own CD's by selecting and organizing songs from a library approaching 200,000 tracks from over 100 labels, including EMI Recorded Music, Virgin Records, Capital Records, Zomba, Jive, Platinum, Fantasy, Rounder, Alligator, Roadrunner, and TVT. Musicmaker's library spans a wide range of music genres, including rock, alternative, pop, hip-hop, jazz, punk, classical, blues and country. Powerful search engines help find selections by genre, artist, title and label, and RealAudio allows tracks to be sampled before selection. CD's include up to 20 tracks or 70 minutes of music and can be personalized with unique labels as well as imprints on juke boxes. CD's range from $9.95-$24.95, depending on the number of tracks, and orders are taken through secure credit card links and are shipped within two business days. Musicmaker.com offers nearly 100,000 licensed songs in three secure digital downloading formats: Liquid Audio, Microsoft MS Audio 4.0 and a musicmaker.com proprietary secure MP3 format. Each digitally downloaded track is available at $1.00 per song. Musicmaker.com also has exclusive marketing agreements with Columbia House, the world's largest music club."

Movie Preview

There are over twenty Web sites that offer movie previews or full-length videos using streaming media. To name a few, Broadcast.com, MovieFlow.com, Sputnik7.com, Video Pipeline, WireBreak Entertainment, are companies offering or plan to offer streaming movies. Field in race to build cinemas in cyberspace has grown more crowded as additional companies announced plans to stream movies and other video on Internet. Santa Monica-based Trimark, independent studio with large movie library, signed a deal with Broadcast.com early 1999 for screening films on Internet. In August, Trimark announced CinemaNow, new subsidiary to form its own streaming video Web site. Trimark envisions CinemaNow to be "premiere online destination" for "independent, art house and niche-oriented feature-length motion pictures." Site also will sell DVD and VHS versions of films. CinemaNow will use Microsoft and RealNetworks technology to stream films.

Sports Events

To bring the real intensity of sports experiences to worldwide audiences, digital sports companies are creating comprehensive networks of sports programming available at a Mouse' click. Quokka Sports, a digital sports entertainment company and developer of Quokka Sports Immersion[a], is poised to bring Web surfers a high-intensity digital experience that takes sports entertainment to a new level. After establishing a reputation with breakthrough coverage of the Whitbread Race, the company is now creating a comprehensive network of sports programming. Quokka has secured digital broadcasting rights for a wide variety of global sporting events -- events characterized by excitement, adventure and wide appeal to sports fans, with exceptionally attractive demographics for advertisers and sponsors.

Internet Communications

Email is the first communications tool offered by the Internet, followed by IP voice and instant messaging. The Internet is becoming even a more powerful communications platform with the capability of audio and video streaming. Event411.com creates comprehensive, easy-to-use event- planning Web sites that provide indispensable, interactive tools for hosts and guests involved in any important individual or organizational event. Event411.com provides access to listings of almost 1 million local businesses, and an online store offering thousands of gift items and event-related merchandise.

Travel

Streaming media brings virtual reality of travel attractions to cyber visitors. One company entering this field is PSAZZ.com. With "CyberTravel For The 21st Century", PSAZZ.com will be the first completely integrated web site for buyers and sellers of travel products. Cyber visitors will be hosted by the concierge of the company's virtual "Internet Travel Club," a unique service, where they will be able to access electronic magazines with on-demand videos, guided by travel experts, of virtually any destination. Content will also feature interviews with celebrities. Viewers will be alerted to and be able to purchase travel packages to unique, upcoming world events.

Distance Learning

With a 50% annual increase in demand for learning programs delivered online, streaming media is an ideal tool to implement distance learning. . Federal Emergency Management Association (FEMA) have used streaming media to deliver disaster training over the Internet at a significantly lower cost than sending experts to the field. GirlGeeks?, a career, training and empowerment community on Web, provides unique blend of interactive multi-media content with female IT leaders, on-line affinity groups, personalized training, and career-building resources to aspire and train young women in computing, the Internet and Information Technology.

Asymetrix Learning Systems, Inc., an online learning solutions provider, and click2learn.publisher, a new "browser-based" free authoring and publishing system that allows anyone to create and publish online courseware, and receive royalties on courses sold through the click2learn.com network, are working together to develop over 200 courses. Authors, instructors and subject matter experts can create courses using only a web browser and see their creation in a WYSIWYG environment before posting it to click2learn.com. Finished courseware is automatically published on click2learn.com, making courses instantly available to individual users of the site.

Real Estate

VideoHomeTours.com introduced its signature product VideoHomeTours which films and produces full motion walk-through tours of properties and places them on the Internet. VideoHomeTours.com offers customers a variety of tour packages - starting at less than $100 - that help minimize the time and effort it takes to buy and sell property and maximize return. Owners can choose to customize their home tours with voice-over narration from a professional tour guide, background music and digital editing. Packages include a listing on the
VideoHomeTours.com web site as well as links from other real estate related sites.

Value Chain and Major Players

The key areas of streaming media in its value chain are technology/software, network, and content.

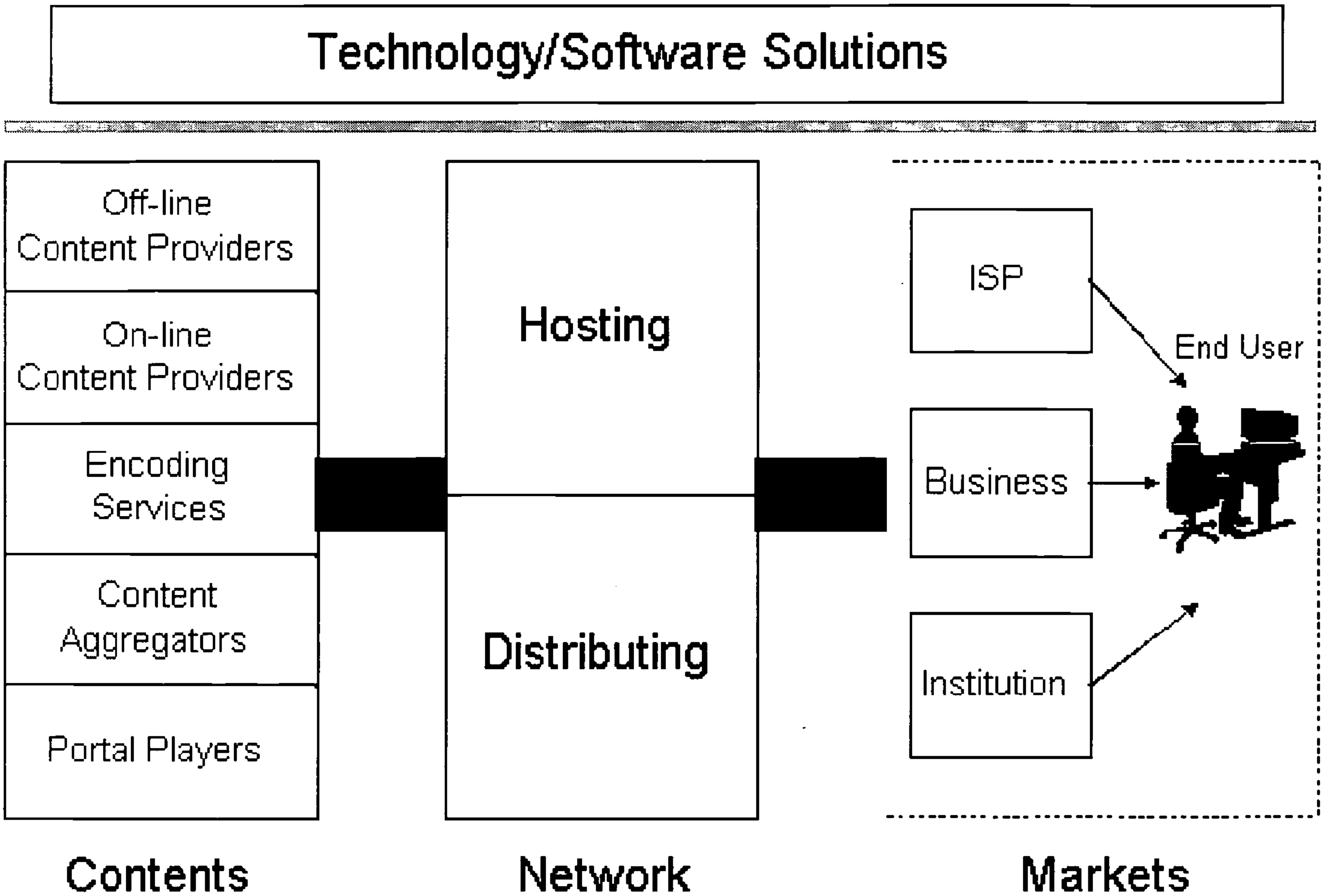


Figure 1. Value Chain of Streaming Media

Software

Streaming media software is the user interface tool that allows audio/video streams to be played while being downloaded. It can also be software and technology solutions for decoding, production, and network infrastructure. Major players that provide streaming media software and solutions are RealNetworks, Microsoft, Apple, Liquid Audio, Inktomi, a2b, Macromedia, and Starburst Communications. User interface software, or media player, is now mostly free to consumers, as software providers aim to accelerate market penetration and grab market share. Three leading brands are RealNetwork's RealSystem, Microsoft's Windows Media Player, and Apple's Quick Time TV. Microfost claims that it has over 40 million users of Windows Media Player, which is increasing at a rate of "more than one new user every second." By contrast, RealNetworks says it has 72 million "unique users" of the RealPlayer. In October, 1999, Nielsen//NetRatings said that RealPlayer outpaced Media Player by 10 to 1 and bested Apple's Quicktime by about 4 to 1. RealNetworks has topped 7 million downloads of the latest test version of RealPlayer. Over 10 million consumers have downloaded the QuickTime 4 player, driven by the high quality viewing experience of the "Star Wars: Episode 1, The Phantom Menace" trailer. Apple has the exclusive license for the Sorenson video compression technology used in

QuickTime 4 that provides a high-quality viewing experience with minimal artifacts.

Network

Streaming media network consists of hosting and distribution of media content. As streaming media consumes lot of bandwidth, multicasting plays an important role in the network deployment. In the traditional streaming method called unicasting, a new stream is opened for each client, using up a huge amount of bandwidth. In multicasting, a single stream is delivered to a multicasting node, most likely on an ISP; the stream is then multiplied via a router to all the clients who are turning in. Traditional client-server networks are being replaced by more flexible networks using decentralized caching and mirroring to better support streaming media applications.

Major network providers that specifically target streaming media applications are RealNetworks, Broadcast.com, INTERVU, and VStream. Other companies that offer hosting and distribution of streaming media content include Akamai Technologies, Concentric Networks, Globix, InfoLibria, Digital Island, Activate.net, Skycache, iBeam, ACT Technologies, Astound Inc., Wavo Corp, Astounding.com, etc.

Content

To viewers, what counts is content. Software and network are tools to allow contents to reach viewers and allow for a best viewing experience. Content generation in streaming media involves with editing, encoding and compression of analog content into digital format. Other than few original streaming media content creators, most players in the content arena are the content aggregators. The list of content creator and aggregator is broadcast.com, Global Music Network, MP3.com, NetRadio, Image Radio, About.com, Audible Inc., Spike Networks, Rivals.com, Live On Line Inc., Spinner.com, Entertainment Boulevard, Quokka.com, WireBreak Entertainment, GlobalStream.com, Musicmaker.com, Emusic.com, iNEXTV, Audio Book Club, Isee3D, Streamland.com, Liquid Audio, Virgin Entertainment Group, On24 Inc., ForeignTV.com, etc.

Technologies and Protocols

Encoding, media player, servers, networking and delivery mechanisms are key areas that technologies play important roles in streaming media. Live on-site encoding is becoming the industry-standard, where racks of audio and video, computer encoding, and routing equipment placed in heavy armored, wheeled cases for live on-site encoding. Streaming media co-location is used to increase efficiency and facilitates the use of interactive streaming media. Multicasting and scalability features such as splitting are deployed in streaming media network, and satellites are used due to many benefits satellites offer including coverage and broadcast advantages.

There are three major network protocols:

- TCP (Transmission Control Protocol)

- Transport-oriented protocol
- Reliability is first priority
- Treats audio/video as any other data type
  > Does not require additional or specialized software
- Works well for small Web sites
- Not the optimum solution for streaming media

- UDP (User Datagram Protocol)
  - Works well for professional media companies that require high performance and specialized functions
  - Adequate reliability - Looks for major problems only
  - Requires specialized software
  - Enables buffering, load balancing, live streaming, multicasting, random access play (interactive)
  - Problems bridging firewalls

- Real-Time Transport Protocol (RTP)
  - Doesn't guarantee real-time data delivery
  - Provides mechanism to send and receive applications to support streaming data
  - Typically runs on top UDP
  - General enough to support other protocols

Business Models

The business models of streaming media players mainly fall into four categories:

1. Technology and software players: companies are offering consumers free software download to establish market share; at the same time, businesses and Net players that plan to integrate streaming media into their platforms are required to pay to license the technologies and software.

2. Network providers: network providers charge a monthly fee and/or broadcast fee to host and/or distribute streaming media contents. Their major customers are businesses and portals. Depending on the archiving and streaming capacity required, a two-hour live event broadcast costs from several hundred dollars to several thousand dollars.

3. Portals: portals build streaming media sites to attract traffic. Usually contents are available to viewers free of charge, and the revenue source is mainly from advertising. Streaming video portals that are running subscriber-fee or pay-per-view models are mostly (or only) adult contents.

4. e-Commerce: typical example of streaming media e-Commerce model is digital music distribution. RealAudio and other media players allow listeners to sample tracks. Selections can be personalized with unique labels as well as imprints on juke boxes. Customers pay for their selected tracks or CDs, either downloaded or shipped.

Strategic alliances are being formed to combine leadership positions in technology, portals, and contents. Leading Internet brands such as AOL have signed marketing agreements with music or other streaming media portals such as Musicmaker.com to cross-promote music sales through reciprocal links, advertising and other marketing initiatives. Co-branded sites are being developed. The following profiles of several major players in different categories give a glimpse of what streaming media companies are doing.

Challenges and Issues

The biggest challenge of streaming media at the current stage is lack of sufficient bandwidth, especially the last mile connection. There are only about 2 million Internet users who have broadband Internet access, while Internet users who downloaded RealPlayer or Microsoft Windows Media have exceeded 20 million. Streaming media, especially full-screen video, is a bandwidth intensive application. It not only requires high speed Internet access, but also demands a highly reliable network. Some protocols, such as TCP, are not efficient for media intensive applications like streaming media, as continual data receipt conformations make it "chatty" and data recover takes a long time. Loss of packets and latency issues put heavy strain on streaming media applications. There are also specialized server requirements to work with limited bandwidth. Most of the media content currently hosted on intranets and Internet sites is in a downloadable format. Users must provide the massive memory necessary to store the content before and after playback and wait for the files to be copied from the server to their PC.

Due to the pressure streaming media puts on the network, many ISPs impose a fifteen-minute time limit on streaming media. This greatly slows down the penetration of streaming media and the pace of media convergence.

Divergence in the types of formats used and lack of industry standards creates market confusion. Although many portals have started to include encoded contents that match different formats, that requires viewers to either install all the media players or have the platform that covers all the standards.

It is also yet to see whether and how long before video over the Internet will eventually catch up with the quality and popularity of TV viewing. Streaming video technology views motion at 15-22 frames per second while in broadcast television the standard is 30 frames per second. Although technological improvement may not be difficult, there are issues related with consumer habits, interface problems, and ease of use.

Last but not the least challenge for streaming media going forward is the lack of content availability and the differences between contents for traditional media vs. new media contents. Currently streaming media production costs are quite high, and top-notch production caliber of webcasts is rare to find. Most streaming video content is produced in QuickTime and then converted to other formats. As bandwidth becomes more ubiquitous and bit becomes cheaper, content will remain the king.

Content availability is one of the streaming media industry's major keys to success. Control of content and distribution gives enormous value to vertically integrated companies. To be competitive, Web companies will have to generate more original content by evolving into media/web companies, or market share will be invaded by media companies with strong web distribution channels. A natural move will be merger of media companies and companies with VOD technologies and capacities.

Conclusions

Streaming media is revolutionizing the way organizations create, archive, deliver and display information. It is changing how media is distributed and the way people do entertainment. Demand for streaming media will grow as broadband access gains momentum. As broadband penetration increases and more and more Web-specific contents become available, interactive media and video-on-demand will become major streaming media enablers. Full user interactivity will create large market opportunities in distant learning, gaming, and video conference. With streaming media, TV, radio, and the Internet are on the way to converge into a single broadcast medium. Internet will deliver TV-like scheduled programming as well as video on demand. Streaming media will also increase Web advertising and e-Commerce revenues. As traditional media and entertainment companies look into ways to incorporate streaming media into their strategies, a new media is starting to take shape, with the Internet as a powerful delivery platform.

References

- Dr. Satish Menon, SGI MediaBase: Intelligent Media Streaming for intranets an the Internet
- K. Lagana, RealSystem G2: management and Control of Streaming Media Over Corporate networks
- The Forrester Report, Webcasting's New Model
- The Forrester Report, Interactive TV Cash Flows
- The Forrester Report, Video On-Demand Gets Real
- Neal Page, Streaming Web Video
- Jupiter Communications, Web Media: Confronting the Limits of Online Video
- www.streamingmedia.net
- www.itknowledge.com

Biography

Ms. Vivian Luo

Ms. Vivian Luo is a Director of Business Planning and Development at Hughes Communications, Inc., where she has performed extensive work on strategic planning and business development to help the company create new telecommunications ventures. Her duties include market research, competitive analysis, business plan development, financial modeling, strategic alliances, and mergers & acquisitions. Her industry experience includes subscriber-based services, data networking, Internet infrastructure, E-commerce, multicasting, digital media, and content acquisition. Prior to joining Hughes, Ms. Luo worked for a merchant investment bank, Financial Frontiers Corp, handling mergers & acquisition transactions. She was in charge of the identification of acquisition opportunities, company valuation, investment/divestiture analysis, due diligence, deal structuring, deal negotiation and closing. Ms. Luo holds a BachelorÕs Degree in Electrical Engineering, a MasterÕs Degree in Applied Mathematics from the University of Southern California, and an MBA from the Anderson School of Management at UCLA.

Sessions

Applications for Multimedia Broadcasting via Satellite

Michael Bond

The advancement and standardization of satellite transmission technology has created a new opportunity for the delivery of IP-based services to sites around the world. This new opportunity offers exciting possibilities for certain applications where it is necessary or desirable to transmit streaming and/or file data from a centralized location to remote sites around the country or the world. While pieces and parts of this technology have been around for some time, the implementation and penetration of open standards, such as Digital Video Broadcast (DVB), have focused these capabilities into a set of coherent products with the ability to support today's applications more efficiently that ever before.

The purpose of this document is to describe different types of applications that justify distribution by satellite in the Internet and Enterprise markets. These applications typically have one or more of the following characteristics:

- Origination from a single site with simultaneous distribution to many remote sites.
- Remote sites are located in geographically diverse areas.
- Remote sites have poor or expensive connectivity to the centralized site.
- Applications require delivery of large volumes of data to remote sites, with small volumes of return data, i.e. the data communication application is asymmetrical.
- Applications involve delivery of multimedia services, such as streaming video and audio, MPEG files and Web pages, or other multimedia content.

The key to understanding and evaluating which applications justify satellite distribution as opposed to terrestrial options is to accept the following.

> *In virtually all cases, the decision whether to use satellite or terrestrial connectivity options is based on economics, not technology. Most applications could use either satellite or terrestrial connectivity. However, satellites have a clear economic benefit for some applications and terrestrial options have a clear economic benefit for others.*

There are two basic categories of satellite-based applications. They are:

1. Real Time Applications (Streaming or Interactive)
2. Store and Forward Applications (Non-Real Time)

I. Real Time Applications

Real Time applications involve the distribution of time sensitive content, such as video and/or audio programs and interactive services, to the end user. The content for these applications usually requires significant amounts of bandwidth. Attempting to distribute content that utilizes Real Time applications to multiple sites or locations via terrestrial options creates financial barriers to entry for the service. Satellites are well positioned to help service and content providers overcome these barriers. Good examples of Real Time applications being distributed over satellite exist today in both the Enterprise and the Internet markets.

Delivery of IP-Based Streaming Video & Audio Services

The demand for access to streaming video or audio content is expanding. More and more content providers are looking to distribute their niche market programming, including IP-based video and audio services, to desktop users around the world. Important applications currently exist in both the Internet and the Enterprise markets. In virtually all cases, the requirements are to deliver content from a central location to multiple remote locations simultaneously.

While IP Multicast is an important element for local delivery of streaming content within a Local Area Network (LAN), it does not overcome the limitations of using a terrestrial solution to deliver content from one point to many points in a Wide Area Network (WAN). The costs incurred to provide a terrestrial solution for streaming service to many remote sites simultaneously can be overwhelming. Only satellites can provide the option for ubiquitous delivery without incurring additional charges for delivery at each destination.

Enterprise Market

In the Enterprise market, satellite delivery is already being used by high-technology companies such as Cisco and Intel to deliver their IP streaming (corporate communications and training) content to the desktop at their remote sites in the US and around the world. These and other companies recognized early that distributing streaming content to their employees via their Wide Area Network (WAN) was not the most cost effective solution. Satellites provide the critical advantage of being able to bypass the WAN and drop a video stream(s) directly into a LAN.

For example, many Enterprise customers have found that MPEG 1 video streams encoded at 1.5 Megabits per second (Mbps) produce acceptable video quality when viewed at the desktop. Even LANs equipped with 10BaseT Ethernet Hubs (approximately 3 - 4 Mbps of usable bandwidth) have the capability to work with a single 1.5 Mbps video stream. 100BaseT Ethernet Switches (which are now being installed in most corporate LANs) have the capability to support multiple 1.5 Mbps video streams simultaneously.

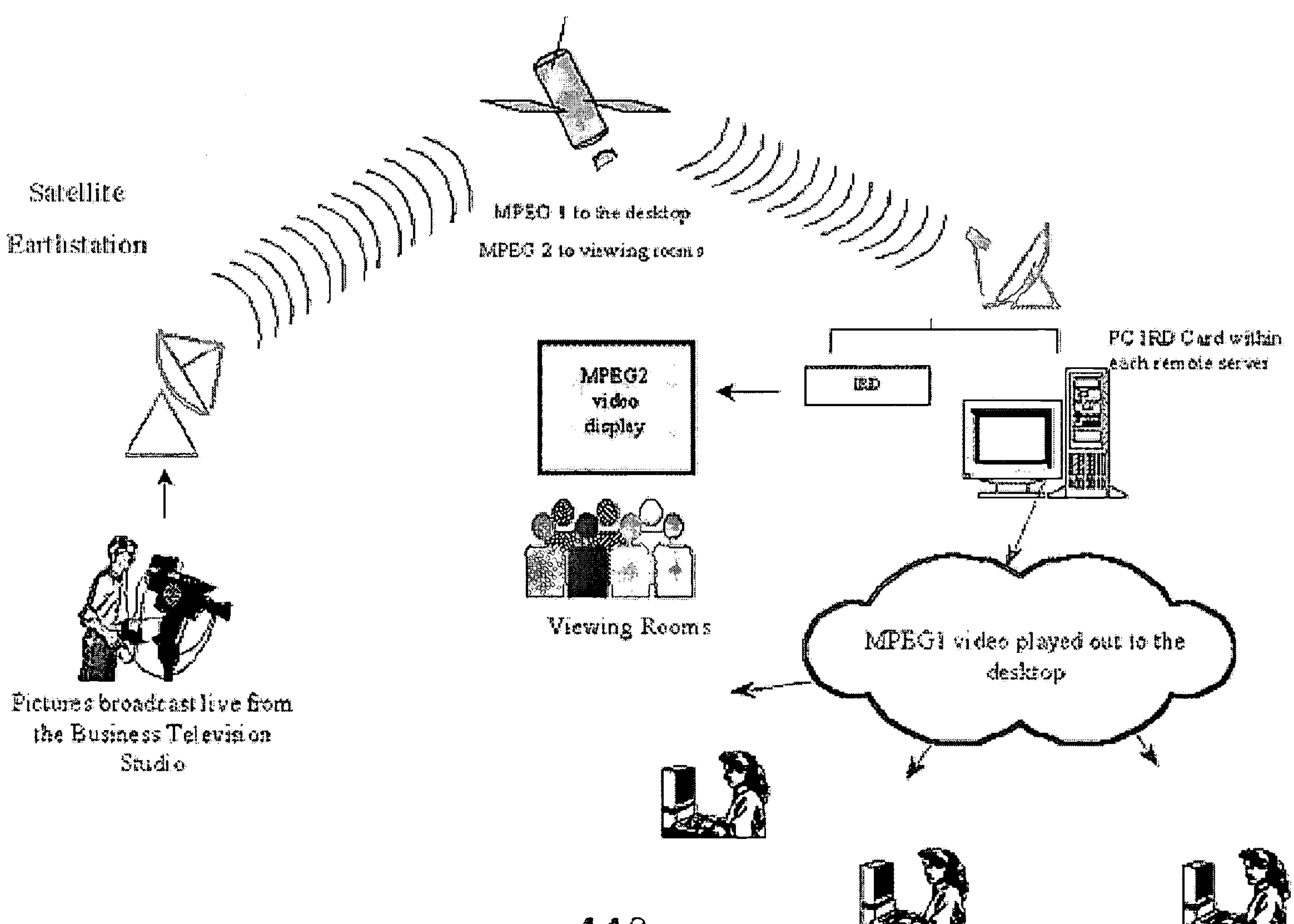
In comparison, total WAN bandwidth available in large corporate offices is often limited to a single T-1 circuit (1.536 Mbps). Smaller offices tend to have much less bandwidth. This existing bandwidth is used to support applications such as email, Internet access and other critical business applications. Attempting to stream video content over a typical Enterprise WAN would completely disrupt virtually all other applications. In addition, most Enterprise WANs are not configured to support IP Multicast transmissions making it difficult to provide an effective solution.

Delivering the video stream by satellite provides Enterprise networks the capability to maximize capabilities of an IP Multicast stream by providing the capability to drop the stream behind the router and directly onto the LAN. This solution provides the best-case scenario to minimize WAN bandwidth costs and traffic on each LAN.

As pictured below, typical applications in the Enterprise market include:

- Transmission of multimedia (video and audio) content to the desktop.
- Distribution of targeted, subscription programming channels.

Live and On-Demand Satellite Broadcasting



When evaluating the option to use satellites for delivering streaming content to Enterprise networks, it is important to remember that the larger the number of sites, the more likely a satellite solution will be cost justified. That also means there will be a minimum number of sites that must require access to the content for the satellite network to be economically justified. The minimum number of sites varies by region based on the fact that alternative costs vary by region. However, the following information can provide a baseline for evaluation.

Minimum Number of Sites to Justify Satellite Distribution		
Region	**Number**	**Assumption**
North America	**20**	**Sites have geographic diversity**
Asia / Pacific	**4**	**Sites are in multiple countries**
Europe	**8**	**Sites are in multiple countries**

Internet Market

The Internet Market is beginning to experience similar bandwidth requirements for streaming services. To date most of the streaming services on the Internet have been targeted at very low bandwidth users who were equipped with 28.8 or 56K modems. While the minimal bandwidth required by these services does not create a bandwidth concern, it also provides unacceptable quality video for the end user.

The emergence of DSL, cable modems and other high-speed local access options have significantly increased the bandwidth available to homes and businesses. However, the increase in bandwidth also increases the expectations of users. Users attempt to view streaming services over the Internet using DSL or cable modems, expect significantly better quality services than they experienced using dialup connections. As the content being streamed grows from 28.8 Kbps to 300 - 500 Kbps for each individual stream, the bandwidth requirements for ISPs will increase dramatically.

Content, technology and service providers are in the early stages of testing, developing and implementing the capability to stream content from a centralized location to remote locations by satellite. The concept is to utilize the benefits of satellite delivery to support the point-to-multipoint delivery of streaming content.

It is interesting to note that the basic model being deployed to deliver streaming content to ISPs is virtually identical to model that has been the standard for cable television distribution in the US for almost 20 years. Both streaming video and cable television services have the same distribution requirements. They both have a requirement to distribute the same content from a central location to many locations around a region or around the world. Cable television services are distributed to cable headends and streaming services are distributed to ISPs.

Distribution of streaming content via satellite to the Internet market will be successful when:

- Content being distributed is intended for Internet users.
- Content is applicable to many people within a region or around the world.

Satellite Delivered Internet Services

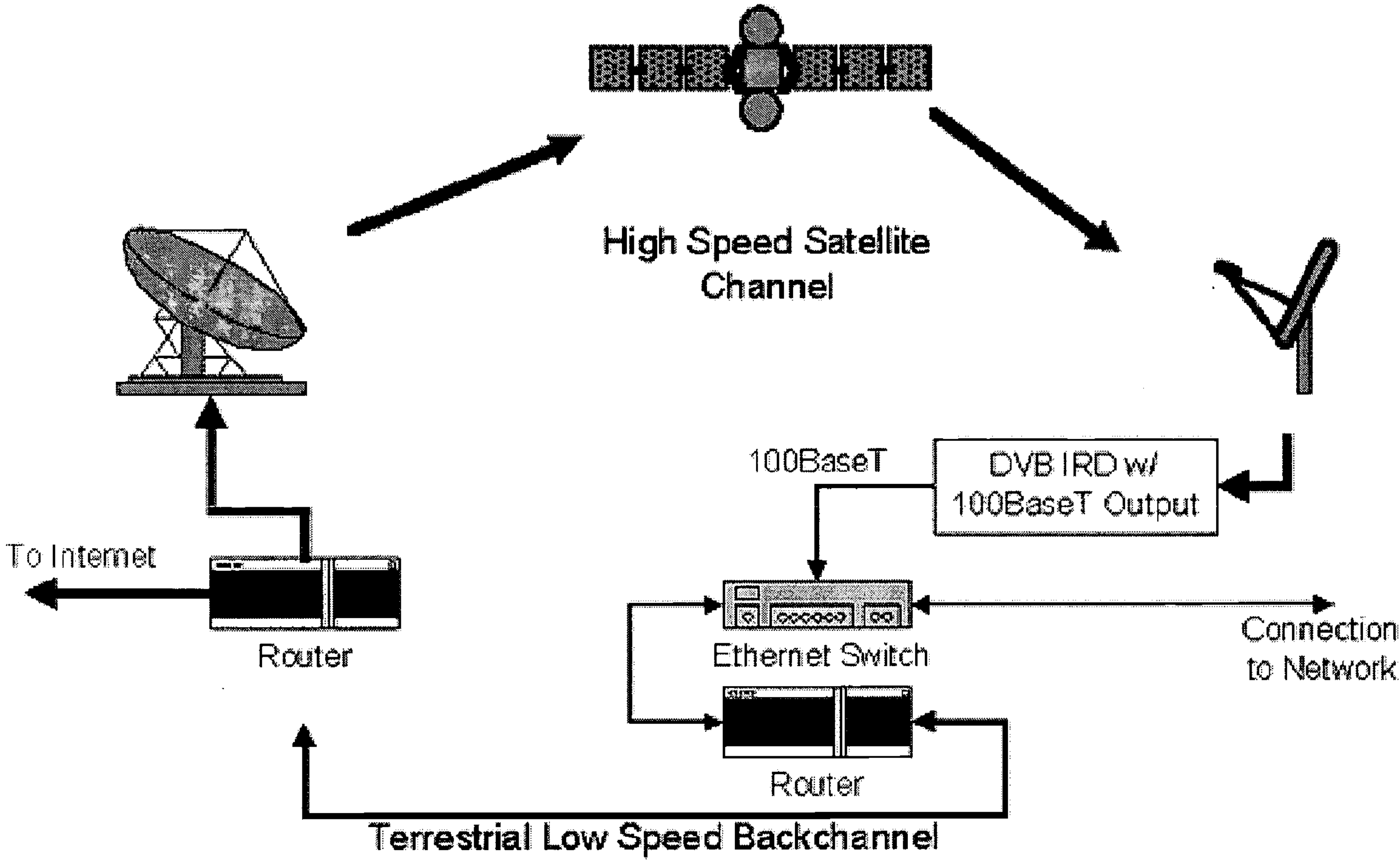
An important application for satellite delivery is the transmission of Internet content. Internet browsing is an asymmetrical operation. Typically, users receive as much as 10 times more data from the Internet than they send back to the Internet. This means that the wide bandwidth of satellites can be used to distribute information to ISPs (for relay to end users) while small pipes can be used to backhaul requests for information back to the Internet.

Internet Market

The use of satellites to deliver Internet content is a rapidly growing market. Virtually all of this growth is occurring outside the US. Satellites provide several benefits that are fueling the growth of Internet provided services around the world.

- Since satellites are wireless, the only infrastructure required to activate the service at a remote site is the addition of a downlink system.
- In many areas of the world where telecommunications capabilities are underdeveloped or highly regulated, satellites provide the most cost effective solution to ISPs looking to add Internet bandwidth.

The asymmetrical nature of web browsing has provided the opportunity to take advantage of the MCPC (Multiple Channel per Carrier) capability of DVB networks to maximize throughput on a transponder and minimize downlink antenna sizes. The typical configuration of a DVB-based network is shown below. Since requests from a user to a web site to view a web page require only a small volume of data, they are supported using a low speed backchannel. This backchannel could be either a terrestrial or a satellite link as is appropriate for the site. The delivery of the Web page information to the site requires the larger volume of data and it is routed through the DVB satellite link to ISP to be passed onto the end user.



DVB Internet access providers will offer new services in the very near future. These services will provide additional benefits that cannot be cost-effectively duplicated by as terrestrial alternatives. The services are based around the capability of satellites to cost-effectively deliver services from a single point to multiple points. Examples of these services include:

- Adding cache servers at ISP downlink sites to enable faster response times for end users. Cache servers have the capability to store popular Internet content locally at an ISP. Local storage of the content enables faster retrieval for end users. The information in these cache servers will be updated on a regional basis by satellite.
- Bundling streaming media services (as mentioned above) with basic Internet access.

In general the distribution of Internet content over satellite will be success when one or more of the following apply:

- ISP downlink sites are located in cities or countries with poor or expensive terrestrial Internet access options.
- Satellite Internet service provider add additional service options such as local caching or access to streaming content.

Enterprise Market

Many of the same benefits for satellite delivery of Internet services to ISPs apply to the Enterprise market. The applications can apply to the delivery of Internet services and even Intranet services for specific corporations. However, the market is much smaller in size.

The best opportunity for providing Internet or Intranet services over satellite in the Enterprise market is to support multinational corporations with operations in developing countries. While the bandwidth requirements for corporate offices are significantly less than ISPs, the traffic that is carried on corporate WANs today is critical to the success of the company. One of the options being evaluated by many corporations is a hybrid solution. In a hybrid WAN solution certain types of traffic, such as Internet services, are offloaded to a satellite delivery service in order to ensure that Internet browsing by employees does not adversely affect critical corporate applications.

In general the distribution of Internet or Intranet content over satellite in the Enterprise market will most likely be successful when:

- Offices of multinational corporations are located in cities or countries with poor or expensive terrestrial Internet access options.
- The opportunity exists within the corporation to offload certain traffic, such as Internet traffic, in order to make better utilization of the existing terrestrial WAN capabilities.

II. Store and Forward Applications

Store and Forward applications represent a very different category of multimedia broadcast applications. These applications revolve around the concept of storing or saving a multimedia, database or a spreadsheet file and forwarding or delivering that file to the intended audience for use at a later time and or date, i.e. Non-Real time. Store and Forward applications can range from simple file delivery services to sophisticated, automated and/or interactive multimedia reception and display devices.

File Delivery Applications

The simplest multimedia broadcast application is the delivery of data files via satellite. In this application individual or collections of files are transmitted by a user from a single site to many sites around the country or around the world. At the receive sites files are stored to a specific computer or server where it can be accessed by the intended user. Applications exist in both the Enterprise and the Entertainment/Communications markets.

Most of today's file delivery systems include the option to provide "Reliable File Delivery." A Reliable File Delivery system includes the capability to confirm and report that a file has been correctly received at each destination site. Confirmation and reporting are provided through the use of an automated, low speed backchannel communication using a WAN connection, an Internet connection or even a dialup POTS line.

In the event that files are received with errors, the system automatically retransmits the file to the destination site until is received correctly.

In both the Enterprise and the Entertainment/Communications markets, satellite file delivery is an attractive option when one or more of the following apply:

- Files are to be distributed from one single origination site (or from a few origination sites by backhauling files to a central uplink location) to many downlink sites. It is important to remember that the more downlink sites, the more compelling the case for satellite file delivery.
- File sizes are very large or significant numbers of files need to be delivered simultaneously. When individual files or a combination of files are measured in 100's of Megabytes or even Gigabytes in size, satellite file delivery becomes a financially attractive alternative.
- The current method of distribution involves the use of CDs or DVDs. The biggest disadvantage of CD or DVDs is that they can quickly become outdated. Delivering files by satellite eliminates the possibility that content in the field can become outdated because it can easily be updated.
- Timeliness is an essential component in the successful delivery of the files. It is important to remember that there are two types of timeliness. One involves speed and the other involves punctuality. When speed is the major requirement for an application, satellite file delivery offers the fastest delivery possible to multiple locations. When the application requires that all files be punctually delivered to the various sites at the same time, today's satellite file delivery systems provide one of the most reliable technologies available.

In most cases, the main competitor to satellite file delivery is the use of overnight delivery services such as FedEx, UPS, Airborne, etc.

Enterprise Market

Several important applications exist in the Enterprise market where satellite file delivery can be used as an enabling technology to improves the cost effectiveness and quality of communications.

Multimedia Files for Video Servers

The primary application for distributing multimedia files in an Enterprise network is to update video servers at remote locations. This is one of the most exciting options to consider. The on-going process of updating Enterprise LANs from Ethernet Hub based networks to Ethernet Switch based networks is finally providing the bandwidth necessary to support on-demand playback of video content by individual users. On-demand playback has the potential to significantly improve the availability and accessibility of content to Enterprise users, in comparison to the use of physical storage mediums such as videotape. In the on-line world the most recent content is always available. However, one of the primary challenges to make these systems successful is regular updating of content on the video servers.

The size of video-based multimedia content creates a problem. Even when compressed to the most common formats (MPEG, AVI, QuickTime), video files tend to be very large. For example, a 60-second

MPEG-1 video file encoded at a rate of 1.5 Mbps occupies approximately 11 MB of disk space when saved. While transmitting one such file to multiple sites over the typical Enterprise WAN infrastructure can be accomplished, sending multiple files or even one file multiple times can create a significant burden on WAN resources. This is when satellite file distribution becomes a viable option.

Satellite File Delivery provides the capability necessary to update video servers in a region or around the world. In addition, it can be a simple addition to a satellite network that is already supporting the delivery of real-time streaming content.

Database and Spreadsheet Updates / Published Documents

Large corporations tend to have large databases and often times these are stored in multiple locations. These databases are typically used to track parts, prices, pictures or other information that need updating on a regular basis. When implemented, a satellite file delivery system can replace an existing manual process of updating the information using CDs or DVDs that are shipped to each site. Services for this type of application are more likely to be customized to meet the needs of the individual customer.

Another satellite file delivery application is the transmission of large published documents. Many times, published documents that contain pictures or graphics can be very large. For applications such as newspaper or newsletter distribution, where the documents are created centrally and printed locally, satellite distribution offers a competitive option.

Entertainment / Communications Market

While the market for Entertainment and Communications use of satellite file delivery services is not necessarily associated with an IP-based network, such as the Internet, satellite file delivery has already made a significant impact on the distribution of electronic content and it will continue to do so in the future.

Electronic Deliver of Commercials

In the US, many commercials for broadcast and cable television are already being delivered to local stations electronically. The commercials are digitized and stored for transmission to broadcast locations on a just-in-time basis. Once at the broadcast location, the commercials are played at the appropriate time and for however many days, weeks or months desired by the advertiser. When it is time to replace the old commercial with a new one, the new one is downloaded to the broadcast location.

The process to deliver this electronic media is satellite file delivery. While the technology is only being used for commercials at this time due to disk storage limitations, it could easily be expanding to accommodate syndication of broadcast television content in the future as the cost for disk storage systems decreases.

Electronic Cinema

At some point in the near future, the demand for higher quality images or more cost- effective distribution of movies will drive Hollywood and the movie theaters chains to convert from film to an electronic format such as HDTV. When this happens, satellite file delivery will almost certainly be an important contributor.

Satellite file delivery has the capability to support the two major concerns of moving to an electronic format. They are:

- Reliable and cost-effective delivery.
- Security of the electronic copies of first-run movies.

Multimedia Display Devices

Satellite file delivery by itself is a powerful technology for certain applications, however it can also be an "enabling technology" for sophisticated Multimedia Display Devices. The combination of satellite file delivery capabilities, video and audio compression standards and decreasing costs of large volume hard disk storage devices on computers has created the capability to develop multimedia display devices. These multimedia display devices can include high-quality video and audio presentations in either an automated or an interactive viewing environment.

The advantages of the computer based playback system are:

- Messages or advertising can be created and distributed from a central location, providing better control over the content seen by the viewer.
- Programming content can be changed dynamically and consistently at a large number of sites by a small number of people.
- The devices have the capability to operate unattended, meaning the systems remain up-to-date because no human interaction is required.
- Satellite file delivery minimizes the costs for distribution by establishing a broadband WAN to deliver the content anytime or anywhere it is needed.

Electronic Point of Sale Advertising

In the Entertainment/Communications market, automated applications are used for point of sale advertising. The concept is to use a computer-based playback system anywhere a videotape payback system is being used or where video information could enhance the opportunity to sell a specific product. Video and audio programs are played back from MPEG files on the computer. The programs are output to an adjacent television or a network of televisions for display. Different programs or combinations of programs can be scheduled to play at different times of the day or days of the week. New files (programs) and playback schedules are downloaded into the system over the satellite. Customized programs or program playback schedules can be developed for specific regions or locations to target the demographics of typical customers. Depending on the capability of the system, some options to customize the programming content can be delegated to the local site. The key to the success of this application is content. The content must remain fresh and entertaining in order for this application to be successful. Satellite file delivery enables the cost-effective distribution of content necessary to keep content updated and fresh at remote site.

Information Display

In the Enterprise market, an Automated Multimedia Display device using high-quality video and audio segments can be an effective tool to communicate corporate benefits, safety or other type of information to employees in common areas. As with Point of Sale products, the key to the success of Information Display devices is content and satellite file delivery provides the most cost effective solution to make this happen.

Interactive Multimedia Server/Display Applications

Another category of sophisticated multimedia applications supports the interactive exchange of information between the target audience and the device. The actual devices used to display the information can be very similar to the one used in the Point of Sale application. The primary difference is the addition of an interface device, such as a touch screen monitor or a keypad, where a user can select information on demand.

Advantages of this type of system are virtually the same as for the Point of Sale system. They are:

- Content can be created and distributed from a central location, providing better control over the content and the context in which it is seen by the viewer.
- The system facilitates the use of high-quality video and audio in the programs displayed.
- Content can be changed dynamically and consistently at a larger number of sites by a small number of people.
- Distribution costs are minimized while effectiveness is maximized.

Interactive Multimedia Kiosks

Interactive Kiosks are an opportunity in the Entertainment / Communication market. The electronics in these kiosks are similar in design and function to the electronic point of sale devices. The only difference in the devices is that the content displayed on the Interactive Kiosk is displayed at the discretion of the user, not a scheduled playback list. The operations of these devices are very similar to an interactive CD. The kiosk are designed to provide information or entertainment related to a certain subject or range of subjects.

The major difference between this device and existing kiosks is this device contains the capability to display high quality video content and the content is easily updateable using satellite file delivery.

Asynchronous Interactive Multimedia Training Systems

Asynchronous Training is a new buzzword in the Enterprise industry. It essentially means learning in a non real-time or a just-in-time environment. Examples of non real-time training include self-paced instruction such as those found in manual, Computer Based Training (CBT) or Web Based Training (WBT) sessions.

The major difference between an asynchronous interactive multimedia training system and existing devices is the integration of high-quality video streaming. This application expands on the existing CBT or WBT systems to include video and the ability to update systems remotely via Satellite File Delivery. Additional options to the system include automated registration and reporting via web-based systems to create an end-to-end solution.

III. Summary

In summary, multimedia broadcasting by satellite enables the expansion of communications in both the Internet and Enterprise markets. Typically, these applications are ones that already involve or could benefit from the use of video and audio presentations. Satellite delivery is the right solution for the applications described in this document for two main reasons.

- Economics. For the applications described in this document, satellites provide a better economic solution.
- Wireless Connectivity. The wireless connectivity capability of satellites provides the capability to access areas of countries or regions that have not or will not be penetrated by terrestrial alternatives.

Should you have any further questions or a specific application you are encouraged to contact a consultant or service provider.

Biography

Michael Bond
Director, Business Television Operations, Loral CyberStar

A twelve-year veteran of the business television industry, Michael Bond is Director of Business Television Operations for Loral CyberStar. He is responsible for operation of the transmission systems used by Loral CyberStar to provide service to customers in the Americas as well as assisting in implementation of new products in the region. Prior to joining Loral CyberStar, Bond managed the Engineering and Product Development department for BTV - The Americas at Williams Global Access Services where he was responsible for the research and development of new products and services that Williams Global Access Services offered to its customers. Previously, Bond held a variety of other positions including Manager of Customer Operations, Sales Representative and Manager of International Development. He is widely known throughout the industry for his knowledge of the international BTV/satellite communications marketplace. He published an article describing Japan's BTV market in 1991, he spearheaded an effort to form a joint venture company in Australia to support Asia/Pacific BTV Networks in 1993, and sold and implemented the first-ever BTV network in Latin America in 1994. Bond graduated from Texas A&M University in 1987 with a bachelor's degree in business management.

Sessions

Socio/Economic

T.1.1 Regional Studies - Latin America

Tuesday 1 February, 830-1000
Location: South Pacific III

Chair:
JUDITH D. O'NEILL, Chairman Telecommunication Practice Group, Thelen Reid & Priest LLP, USA

T.1.1.1
FABIO FERRREIRA KUJAWSKI, Counsel, Carvalho de Freitas e Ferreira Attorneys at Law and PAULO MARCOS BRANCHER, Brazil
Brazilian Regulation on Service Contracting Procedures and the Purchase of Equipment or Materials by Telecommunications Service Providers

T.1.1.3
JUDITH D. O'NEILL, Chairman Telecommunication Practice Group, Thelen Reid & Priest LLP, USA
Telecommunications in Latin America: The Dawn of a New "Economy" in the Sector

Related Sessions
M.1.1 Regional Studies - China
M.2.1 Regional Studies - South Pacific
M.3.1 Regional Studies - South East Asia
T.1.1 Regional Studies - Latin America
T.2.1 Regional Studies - Oceania
W.1.1 Regional Studies- Korea
W.2.1 Regional Studies - India
W.3.1 The Asia-Pacific Telecom Market

Sessions

BRAZILIAN REGULATION ON SERVICE CONTRACTING PROCEDURES AND THE PURCHASE OF EQUIPMENT OR MATERIALS BY TELECOMMUNICATIONS SERVICE PROVIDERS

Fabio Ferreira Kujawski, Paulo Marcos Brancher

Special thanks to Ricardo Barretto Ferreira da Silva

REGULATORY ASPECTS

The Brazilian Telecommunications Regulator Agency - ANATEL, through Resolution 155, of August 16, 1999 (hereinafter referred to as "Resolution" or "Resolution N.° 155"), enacted the regulation on service contracting procedures and the purchase of equipment or materials by telecommunications service providers.

Resolution N.° 155 provides further discipline on clauses included in the Concession Contracts and Authorization Terms for the provisioning of Fixed Switched Telephone Service - FSTS, and similar clauses contained in the Brazilian Satellite Exploitation Rights Term entered into by the Providers of Telecommunications Services and the National Telecommunications Agency - ANATEL.

As regards the Concession Contracts and Authorization Terms, the Provider shall base its purchase/contracting decisions, with respect to the various offers presented, on the satisfaction of the objective price criteria, delivery terms and technical specifications established in the pertinent regulations.

In the event of equivalence of proposals presented by duly qualified companies, the Provider shall apply as tie-breaking criteria:

- Preference to services offered by companies located in the Brazil; or
- Preference for equipment and material produced in the Brazil, among which, those with domestic technology.

The equivalency mentioned above will be determined when the following conditions are cumulatively present:

- The domestic price is lower or equal to the price of the imported product, placed in national territory, including the taxes incurred;

- The delivery term is compatible with the requirements of the service; and
- The technical specifications established in the pertinent regulations are satisfied, including relatively to ANATEL's certification patterns, when applicable.

Resolution 155 does not apply to Providers, whose legal nature is that of a public company or mixed capital company, for which specific Law governs the procedures for the acquisition of services, equipment and materials.

APPLICABILITY OF RESOLUTION 155

For purposes of the Regulation, the following concepts apply:

I - Equipment and materials

Are those classified in categories I, II and III, defined in the Communications Equipment Certification Model Guidelines, approved by Resolution 47 of ANATEL's Board of Directors, of August 7, 1998, and those stipulated in the list of products for telecommunications attached to ANATEL Act 1522, of October 7, 1998.

It is possible to notice that the equipment and materials referred to in categories I, II and III are the ones subject to ANATEL's certification process. This could always work as a reference to those products subject to Resolution 155. In cases the Provider is not sure whether certain equipment requires ANATEL's certification, it is provident to file a consultation before the Agency, in order to clarify whether Resolution 155 should be adopted or dismissed.

II - Services

Are those related to research and development, planning, design, physical implementation and installation, operation, maintenance, supervision and evaluation tests of telecommunications systems.

In what concerns the definition of Services, more specifically, the extent of "telecommunication system" it was possible to verify that Decree n. 97,057/88 has defined such expression, as follows: "the gathering of telecommunication network and other components organized to the exploitation of telecommunication services."

Said Decree is no longer enforceable since it was conceived to regulate Law n. 4,117/62 (Brazilian Telecommunication Code), which was almost completely revoked by the General Telecommunication Law (Law 9,472/97). However, since this is the only legal text, which defines such term, it is important to consider it as a reference in the extent of telecommunication system.

As it can be observed, there are two expressions of such definition, which are relevant to the comprehension of telecommunications system: "telecommunication network" and "telecommunication services". General Interconnection Regulation (Resolution 40/98 - ANATEL), Article 3rd, VII, sets forth that Telecommunication Network is the gathering of continuous operational circuits and equipment, including transmission, switching and multiplex functioning or any other which is essential for the provisioning of telecommunication service.

Telecommunication Services Regulation (Resolution 73/98 - ANATEL), Article 2nd, establishes that Telecommunication service is the group of activities which enables the offering, transmission, emission or reception of symbols, characters, signs, writings, images, sounds or information of any nature, by wire, radio-electricity, optical or any other electromagnetic means.

Unfortunately, within the scope of Resolution N.º 155, it is possible to conclude that ANATEL did not adopt an objective criteria for Services definition, which could be very simply accomplished by a single list of services, as it was partially made in what refers to the definition of Equipment.

Given these facts, Telecom Service Providers shall file a consultation before ANATEL, so as to assure that a certain service is in or out of the scope of Resolution N.º 155.

III - Equipment and materials produced in the Country

Are those processed in industries established in Brazil, resulting from the plant's production line, and submitted to the assembly, part and component integration and laboratory test stages.

IV - Equipment and materials produced in the Country with Brazilian technology

Are those designed, developed and submitted to laboratory and field tests by technicians residing and domiciled in Brazil, who are knowledgeable and master the technologies involved, and which meet the technical and legal specifications, rules and standards prevailing in the Country.

SPECIFIC PROVISIONS

As regards Article 3rd of the Resolution, for the purpose of contracting services or purchasing equipment or materials, the Telecom Service Provider shall disclose, during at least five consecutive working days, on its Internet site, the intention to undertake the purchase or contracting, clearly indicating the subject matter thereof and the place from which further information may be obtained, in order to enable presentation of offers by suppliers established in Brazil.

However, the Provider will not be required to abide by the procedures established in the main provision of said article:

a. when the contracting or purchasing amounts of the services or equipment or materials are inferior than R$ 1,000,000.00 (one million reais);

b. in the cases of emergency or public catastrophe, when urgency of service is construed in a situation that may occasion damage or jeopardize the safety of persons, works, services, equipment and other public or private goods.

The non-applicability of Resolution N.º 155, as per the above mentioned exceptions [items (a) and (b)] does not exempt the Provider to comply with other clauses included in the FSTS Concession Contracts and Authorization Terms, which govern the preference to be given to Brazilian equipment and domestic service providers in draw offers.

The Provider shall formally communicate the result of the service contracting process or purchase of equipment or materials to the suppliers that presented offers, within the maximum period of ten days from the suppliers' selection date. This information shall permit identification of the criteria employed for the contracting decision.

The supplier that deems it has been discriminated or adversely affected by the decision of the Provider may formalize its claim to ANATEL directly or through a Trade Association, within the maximum period of 10 days from receiving communication of the result of the contracting process. Upon formalizing a claim to ANATEL, the supplier or Association shall send a copy of the claim to the respective Provider.

The Provider shall maintain all information pertaining to the contracting of services and purchase of equipment or materials for a minimum period of 30 days following communication to the supplier of the result of the contracting process.

When the Provider receives a copy of the claim formulated by the Supplier or Trade Association, it shall maintain all the documentation pertaining to the contracting process in question, until ANATEL's final decision.

For verification of compliance with the Resolution, the Provider shall permit ANATEL agents access to its facilities and all the probative documents pertaining to the service contracting and equipment or material purchase.

When requested, the Provider shall supply and make available to ANATEL, within the period of ten days, all the documentation requested pertaining to the service contracting or equipment or material purchasing process.

SANCTIONS

In case of non-compliance with Resolution N.° 155, the Provider can be subject to the application of a fine of up to R$ 30,000,000.00 (thirty million reais), without prejudice to the other sanctions provided in Law, in the Concession Contracts, in the Authorization and Satellite Exploitation Right Terms.

Consequently, violation of any provision contained in Resolution N.° 155 will be considered a serious nature infringement.

SPECIFIC PROCEDURES

ANATEL, in the discharge of its official duty or by denunciation, may institute an Administrative Proceeding to ascertain non-compliance with the Resolution. ANATEL's decision in the Administrative Proceeding shall be justified, being assured the right to ample defense, in accordance with the Agency's Internal Regulation.

ANATEL may charge the administrative costs resulting from the ascertainment of the denunciation or claim presented directly by the Supplier or through a Trade Association when the denouncer or claimant, individually or cumulatively:

a) is a recidivist in the presentation of denunciations or claims considered unfounded by ANATEL;

b) uses the denunciation or claim as an instrument for delaying formalization of the contracting process result by the Provider;

c) uses a denunciation or claim as an instrument to obtain, directly or indirectly, some kind of advantage alien to the scope of the process.

It is relevant to mention that the Association of the Fixed Switched Telephone Service Providers, named ABRAFIX, filed a lawsuit before the Brazilian Federal Justice, in September 1999, aiming at suspending the legal effects of Resolution N.° 155. Fixed Switched Telephone Service Providers understand that Resolution N.° 155 causes serious delays in the Companies' purchasing/contracting process, as well as represents an illegal interference of the Public Power in private-owned companies. However, Court decisions so far did not concede any provisional measure to suspend the effects of Resolution N.° 155, although the lawsuit is still in course.

São Paulo, January 2000.

FABIO KUJAWSKI

PAULO MARCOS BRANCHER

Biography

Fabio Ferreira Kujawski
Av. Nove de Julho, 5593,
Phone (55-11) 3066.5999/852.6600
Direct phone: (55-11) 3066.5972
01407-200 - São Paulo - SP - Brazil Fax (55-11) 282.8735
www.carvalhodefreitaseferreira.com.br
E-mail (1): ffk@mandic.com.br
E-mail (2): kujawski@cff.com.br

Born in the Capital City of the State of São Paulo, Brazil, in 1974. Graduated from the Catholic University of São Paulo Law School, with emphasis on International Public and Economic Law and International Commerce. Assistant Professor at the Catholic University of São Paulo Law School, in the field of Public Law. Worked at the São Paulo and Miami Offices of Baker & McKenzie Attorneys-at-Law (from 1994 to 1996). Currently, Mr. Kujawski works as a Counsel at "Carvalho de Freitas e Ferreira Attorneys at Law", in the field of Telecommunications, Public and Corporate Law. In 1998 and 1999, Mr. Kujawski was retained as Off-counsel for the Brazilian Telecommunications Regulatory Agency (ANATEL), for drafting the "Fixed Switched Telephone Services Regulation" and "Telecommunications Equipment Certification Regulation". Attended several International Symposiums and Congresses, including as Speaker and Moderator. In 1999, Mr. Kujawski joined the 13th International Congress of the Brazilian Computer and Telecommunications Law Association - ABDI, at which presented a speech on "Mediation and Arbitration Procedures in the Brazilian Telecommunications Regulatory Agency (ANATEL)". Still in 1999, Mr. Kujawski was co-responsible for preparing and negotiating the pioneer Network Interconnection Agreements involving Fixed and Mobile Telecommunications Services Providers, as of the privatization of the former State-owned Telecommunications Companies. Within the telecommunications regulatory environment, Mr. Kujawski's areas of expertise are Fixed and Mobile Telephony, Satellite, Internet, Value Added Services, Cable TV, InfraStructure, Billing and Collection Affairs, Certification of Equipment, among others. Author of several legal-related articles published worldwide, in the field of Telecommunications and Public Law.

1 This annual Brazilian Conference is also co-sponsored bt CLA (The Computer Law Association Inc., Washington, DC, USA.)

TELECOMMUNICATIONS IN LATIN AMERICA: THE DAWN OF A NEW "ECONOMY" IN THE SECTOR

Judith D. O'Neill

It is easy to get excited about investment in Latin America in general, and in telecommunications in particular, particularly in such "hot spots" as Peru, Mexico, Chile and others, as evidenced by the hundreds of companies that have done so over the past decade. My presentation is designed to put that investment into a sober context of benefits and burdens, while observing what appears to be a phenomenon of a new economy driving the sector. The presentation begins with a brief history of the opening of the telecommunications markets in Latin America, with emphasis on a few countries that have attracted a high level of investor interest. These include particularly Mexico, Chile and Peru, but also others who have rebalance tariffs, privatized the incumbent telephone company and/or otherwise pursued private investment in their telecoms sectors. This brief background will examine private investment in the context of the Risk Factors to be considered; discuss some risks realized in the course of investment in Latin America; and finally look toward the new Millennium as the economics of the sector change..

PART I. INTRODUCTION

Latin America has an interesting and successful recent history of attracting investment into its telecommunications sectors. Mexico privatized TELMEX, its then incumbent monopoly in December of 1990; Argentina, privatized ENTEL in 1990; Chile privatized both Entel and CTC in 1988; Venezuela sold control of CANTV in 1991; Peru completed its sale of contol to Telefonica del Peru in 1995, Brazil belatedly and with vigor opened its incumbent carrier to private investment more recently and Colombia is now in the process of doing the same with its local as well as long distance carriers. The histories are different, but similar. The similarities are described in this Part, while some of the national anecdotes of transitioning to a market driven telecoms economy are set forth in Part II.

The Latin American "model of privatization" is to sell a percentage of the shares of the incumbent telco's to a strategic investor, in exchange for which the investor gets operating and management control. This is true even with as little as 20.4% sold of TELMEX, 40% sold of CANTV; and 45% sold of ENTEL Peru. Typically, the company's shares are divided into different classes of stock which allow the investor comfort in its control even though it controls a minority of the company's equity. Also, typically in Latin America, the privatization of the incumbent is accompanied by a Concession Agreement which acts as a license, a contractual obligation and a grant of a limited monopoly for a defined period of time. In Latin

America, the exclusivity periods ranged from 5 years to 10 years depending on the country and were limited to basic telephony service. Cellular, data and value added services were opened to competition roughly simultaneously with the privatization of the incumbent operator.

The valuation of each company privatized, took into account its revenue streams, identifiable costs, customer base, cost of deploying infrastructure in accordance with the mandates of the Concession Agreement, and the regulation of tariffs. The latter was further refined to an examination of long distance and international versus local exchange service, monthly recurring charges, per minute usage charges, installation charges, and commercial versus residential charges. As we will see below, the economics of the aforegoing has dramatically changed in the late 1990's and can be expected to continue to produce a completely new paradigm in the new Millennium. Part III will examine this.

PART II: UNIQUE NATIONAL ATTRIBUTES

The following section describes select attributes of some of the more dramatic events in the transition of a centralized to a market-based competitive telecommunications sector in Latin America. Due to time and space, the anecdotes are presented for only three countries; Chile, Mexico and Peru, though they exist equally in all of the countries in Latin America.

A. Chile

In 1978, then President Pinochet, commenced the opening of the telecommunications sector in Chile with new laws and the introduction of private investment and competition in non-basic, value added services in Chile. Almost simultaneously, he withdrew Chile from the Andean Pact, citing as his reason the Pact's inclination against a decentralized, market-based economy.

The commencement of continuous updates on the new telecommunications laws, and the appearance of new service providers propelled the telecommunications sector in Chile to a level of private investment which exceeded virtually all of its neighbors in the 1980's. Then, in 1988, the Government of Chile, through the Secretariat of Communications, undertook to sell all of its shares in the dual telecoms monopoly. Entel Chile had been the monopoly for long distance and international service and Compania de Telefonos de Chile ("CTC") had been the monopoly for local exchange service.

Alan Bond's Bond Group of Australia bought CTC, the larger and more profitable of the two companies. Telefonica of Spain bought a minority share, but controlling stake, in Entel Chile. Within two years of the sales, the Bond Group encountered financial and legal problems which landed its leader in jail in Australia and forced the need to sell of its telecommunications properties, including CTC.

As the Government of Chile had not maintained control over the transfer contractually, the transaction of sale was privately conducted between Telefonica of Spain (the obviously interested and most motivated purchaser) and the Bond Group in Australia. The result was that Chile, having spent twelve years introducing competition in its telecommunications sector was again faced with the potential of monopoly control of its two major carriers.

The Antimonpoly Commission and then the Chilean Courts reviewed the matter, received extensive legal briefs, read all material written on the break-up of AT&T in the U.S. as a comparison, and after four years of litigation, reach a conclusion. The Court up-held CTC's right to enter the long distance and international market to compete with Entel and others, once CTC completed certain digitalization and other acts designed to eliminate its bottleneck capabilities. Also, it granted Entel the right to provide local exchange service. Finally, and most resoundingly, it required the divestiture by Telefonica of its interests in one or the other of the companies within 18 months of the decision. Telefonica logically elected to dispose of its interests in Entel, and maintained control of CTC, the larger of the companies.

CTC went on to do a very successful capital markets offering in the U.S. and the Chilean market opened to multicarrier long distance and local exchange service in the mid-1990's. In long distance service, eight operators immediately rushed in to compete upon the opening of the market. The small size of the population coupled with the steep in international service made Chile the least expensive international dial tone in the Western Hemisphere. It also caused the eventual merger of competitors and elimination of others.

Nevertheless, Chile's commitment to enforcement of its rules and regulations, and the robust growth of its economy fueled investment in its telecommunications sector throughout the decade. Recently, however, a decree by the Government concerning regulation of tariffs, specifically related to the monthly recurring charge, has caused a moratorium on investment in local exchange service in the country. This phenomenon is a manifestation of the changing nature of the economics of the sector examined in the last Part IV of this paper.

B. Mexico.

Mexico has had an interesting history with the U.S.. Being a contiguous neighbor, greatly impacted by all actions by the U.S. regulator and the corresponding positioning of U.S. carriers, Mexico has had an unique position in U.S. international telecommunications policy and statistics; and conversely, a great impact positively and negatively on the development of the Mexican telecommunications sector. In the 1970's and the 1980's the government-owned Mexican PTT corresponded with AT&T, the U.S. long distance carrier that accounted for over 90% of the international traffic to its southern neighbor.

When AT&T's competitor, the then GTE-Sprint, tried to gain market entry in the 1980's, AT&T had made Mexico a deal it could not refuse and Mexico resisted competitive entry even at the strong encouragement of the U.S. Government. In an international settlements environment where most international carriers "settled" their accounts with each other on a 50-50 basis (each carrier paying the other 50% of the accounting rate agreed to between them to complete the call on either end), AT&T had agreed to pay Mexico 70%, while AT&T would accept 30%. Since international traffic was then and for some time thereafter over 40% of the Mexican company's total revenue and over 90% of its international traffic was with the U.S., the AT&T deal quickly became literally the life-line of the Mexican telephone company. This was true to the point that when in the late 1980's the U.S. Federal Communications Commission ("FCC") set out vigorously to impose its International Settlements Policy on U.S. carriers exchanging traffic with TELMEX, which would require the brisk shift to 50-50 from 70-30, the officers of TELMEX flew to Washington to impress upon the FCC the severe threat of bankruptcy of the company if such a program were instituted "cold turkey". The FCC recanted and allowed a "phase in" to then U.S. "normalcy". In the meantime, as part of the FCC's campaign to expand competition in the U.S. international traffic market, it seized the opportunity to "encourage" Mexico to share at least 5% of its traffic with the new lead U.S. international competitor, MCI.

The irony of this piece of Mexican telecommunications history as we will see below, is that it is now MCI-Worldcom's and AT&T's Mexican long distance subsidiaries suffering most from Mexican regulation and enforcement policies which they believe are designed to "control" the level at which they compete with TELMEX today in an open telecommunications sector; to the point that the two had declared a "moratorium" on their further investment in the Mexican telecommunications sector and urged the FCC to intervene on their behalf. Not surprisingly, a considerably more mature Mexican commercial government than the one the U.S. dealt with in the 1980's, has reminded the FCC of Mexico's sovereignty and has sought to resolve the conflict completely free of U.S. intervention.

In the late 1980's the Mexican telephone company was an under-performing monopoly that, typically for its era, and bureaucratic ownership, used sharp cross-subsidies of its services to mask severe inefficiencies. The result was a national monopoly provider to telecommunications services, with strong governmental protection, that almost literally gouged its international customers, with rates at hundreds of multiples above cost, while barely covering one third of its costs to provide the limited local exchange service it provided.

Following two in-depth corporate restructuring studies conducted by U.S. consultants, TELMEX reorganized itself into five divisions, designed to allow the company to identify its costs, subsidies and revenue streams and rationalize them. The "corporatization" took about 18 months, after which 20.4% of TELMEX's shares were sold to private strategic investors for nearly U.S.$2 billion. This sobered those who laughed at TELMEX's pre-restructuring estimate of its corporate worth at U.S.$10 billion. The international 1990-91 IPO was a raving success with overseas markets clamoring for a larger share and a share value that went from U.S.$0.10 just prior to privatization, to U.S.$65 at its peak! The rest, as they say, is history.

The TELMEX privatization was structured to serve Government's priorities which included Mexican blood voting the last vote in TELMEX's management, and a foreign ownership not to exceed 10% of the company's equity, at least in the area of voting stock. For reasons related to the pre-privatization raising of capital by the company, and the need to cede management and operational control to the strategic investors, the restructured company ended up with three classes of stock for privatization. Class AA represents 20.4% of the company, but most of its voting shares. It controls the company. Of that class, Grupo Carso purchased 10.4% (being the "Mexican blood") and France Telecom and South Western Bell evenly shared the "foreign strategic 10%. SBC also made a passive investment in options on 5% of the non-voting shares which resulted to be very successful for it.

The privatization brought with it, a new Mexican telecommunications law of October 1990 and a six-year exclusivity period for TELMEX over long distance service, in exchange for a very vigorous (perhaps overly so in hind-sight) build-out and service obligation, and a mandatory reversing of the cross-subsidies. Having personally worked on the TELMEX privatization, I can relate that it was truly the turning point in the explosion of the Mexican telecommunications sector.

Within one year of the expiration of the exclusivity period, the Government and regulator, now COFETEL, accepted suggestions from interested parties and from TELMEX as to how to go about how to introduce Mexico's multi-carrier system. While long distance and private line service had been the lucrative pursuits for most, local exchange also was given attention and carriers encouraged to enter.

More than a dozen new operators were licensed in long distance from the expiry of the exclusivity period in 1996 through present. While levels of investment are high, the road has been rocky for some. Also, since 1996, other services have been opened and new technologies are being deployed with private operators in almost regular pace with the industrialized world.

Mexico's economy has recovered from its fall in the late 1980's, and its telecommunications sector is increasingly robust and supportive of and supported by its economy. Nevertheless, like investment anywhere, and certainly in emerging economies, risk factors must be carefully assessed.

C. Peru

Basic telephony was characterized by two monopolies in Peru prior to its privatization in 1995, similarly to the Chilean structure. One was for local exchange and domestic service and the other for international service. The companies were combined and 45% of each was sold to Telefonica Internacional S.A., the international investment subsidiary of Telefonica of Spain for over U.S. $2 billion. While the price paid substantially exceeded the next bid, the deal had in it a management contract for Telefonica, which allowed it recoup some of its investment, as it caused the company to grow and succeed economically. Again, typically of Latin American privatizations, the Telefonica del Peru concession contained a series of build-out obligations which were both rigorous and costly, particularly in the rural areas.

While Telefonica complied with its contractual obligations tensions grew between it and the regulator, OSIPTEL, and eventually reached the point of Government's wanted to terminate the exclusivity period in advance of its 5th year anniversary. Telefonica, on the other hand, objected to Government's proposal to license competitors upon the conclusion of the exclusivity period, under terms and conditions which

Telefonica believed were more favorable to the new entrants than to Telefonica. Citing a provision of its Concession Agreement which allows it all the benefits of any concession granted after its own, with terms and conditions more advantageous than its own, Telefonica threatened to challenge OSIPTEL's granting of any more favorable license following the expiry of the exclusivity period.

The parties resolved the matter by a balanced compromise. Telefonica agreed to give up a year of its exclusivity period, in exchange for the elimination of its continuing obligation, after the opening of the sector to competition, to build out in costly, low-return rural and other areas.

In this fashion, the sector opened a year ahead of schedule and investment has been robust in Peru.

Similarly to Chile and Mexico, and Argentina as well, Telefonica had virtually completed the rebalancing of its tariffs, a Concession obligation, by the time of the opening of the sector. The implications of this are explained below in Part IV which introduces the new economics of the sector on the near horizon.

PART IV: THE CHANGING ECONOMICS OF TELECOMMUNICATIONS

As noted above, Latin America is and has been ahead of many countries with emerging economies in the development of its telecommunications sectors and the attraction of private investment. Similarly, it has been substantially advanced in its promulgation of rules and regulations, changing as required to keep up with constant change in technology and services. All of the above drives or suppresses competition and growth depending on how the change is effected and how effective enforcement is executed.

In Mexico, we have seen investment moratoria declared by MCI Worldcom and AT&T based on alleged failure of the Government to enforce the telecommunications regulations against TELMEX which most affect the economics of service-provision by the competitors. While resolution has commenced of these issues in Mexico, full resolution is not yet a reality, and the sector has suffered a slow-down in investment at a time when investment should have been the most robust in Mexico's history.

On the other hand, one sees in Mexico, a reversal of the cross subsidies which previously characterized the service of TELMEX. For example, before privatization, TELMEX's local exchange service failed to cover one third of its costs and was permanently subsidized by TELMEX's dramatically high international tariffs. That has reversed, forced, in part, by the requirements of its Concession and the introduction of competition in long distance and international service. As new international operators can compete on price, without regard to local exchange service, if the incumbent does not lower international prices and remain competitive, it will lose a large portion of its revenue and its best and most lucrative customers. In fact, some of the most vigorous of the complaints of TELMEX's interconnection and access charge practices demonstrated a policy of avoidance of competition in this lucrative market.

Currently, ITU reports show dramatically higher local exchange charges than those which characterized the pre-privatization company. Indeed, TELMEX' monthly recurring charge is on par with other countries of Latin America which have rebalanced their tariffs to eliminate the cross subsidies. Thus, it is significantly higher than monthly recurring residential charges of companies in other countries that have not been obligated to rebalance. The latter means that those countries remain largely without formal or effective competition. This is because competition forces rebalancing of tariffs in order for the incumbent to maintain market share in the price-competitive and lucrative markets like long distance, international and commercial.

Similarly, Argentina and Peru have monthly recurring charges which reflect a rebalancing of tariffs and elimination of much of the cross-subsidies that previously characterized the company's finances. This means necessarily, a higher monthly recurring residential charge than countries such as Paraguay, Surinam and others that have not yet eliminated their cross subsidies (again typically revealing a lack of competition which threatens the market share of lucrative and over-charged markets).

As noted earlier, the law and the vigorous competition in Chile contributed to the elimination of cross subsidies and the balancing of tariffs with cost of providing the service. Thus, like Argentina, Peru and Mexico, Chile had monthly recurring residential charges which reflected its cost of providing the service, and operators competed vigorously in long distance and international pricing for market share.

At the end of 1999, however, the Government forced a lowering of monthly recurring charges which substantially impacted the revenue balance of local exchange carriers. That is, with long distance and international tariffs subject to severe competition and thus as marginally low as possible, the monthly recurring charge is one of the few revenue sources available to generate margin. While it cannot create wide margins as monopoly international services once did due to the economy of the market of residential users, it at least covered its costs and generated profit in a rebalanced tariffing environment. Now Chilean local exchange carriers are saying that the new rules no longer allow that. Thus, they have declared a moratorium on the construction of local exchange infrastructure. Perhaps by the time of the PTC conference, we shall have a resolution of the dispute.

What all of the above, and current marketing of services in other countries, like the U.S., cause us to think about is how networks will be paid for in the future. In a technological environment where long distance is virtually the same as local exchange service (eg. AT&T advertises its "one service" which encompasses the entire of the U.S., local and long distance; Venzuela has reduced its domestic long distance to two regions, all else within them is local exchange; Sprint sells its "ten cent" minute anywhere in the country, etc); wireline virtually the same as wireless (Uganda's second national operator uses exclusively a GSM cellular network with software distinctions for price-capped services; Canada and U.S. move toward wireless local loop being interchangeable with cellular and fixed line telephony); data equals voice services (GPRS and UMTS provide telephony services with internet access, interactive email and other mixed services features), etc.

Thus, technological convergence; global seamless mergers of services and service operators and new means of delivery, like the INTERNET, point toward different measures of financing infrastructure build-out. For example, whereas long distance and international revenues were used predominantly in the past by operators as a primary revenue stream which supported financing of build-out, those streams have shrunk substantially in a competitive environment. The same is true for international settlements. Now, as we are seeing in Chile, the same could be true in the future for the monthly recurring charge on local exchange service. Prepaid services and cellular or other wireless substitutes for local exchange service, already threaten this revenue stream. As voice over the internet is refined to basic telephony quality, monthly recurring charges and per minute rates will be vestiges of the past. In the new economy, then, what will operators look to in order to finance network build-out. Will it be retail advertising on the INTERNET??

I thank the PTC for its characteristic excellent organization of this Millennium conference and for the insight to focus an independent panel on Latin America. Please contact me at joneill@thelenreid.com or at judithtrp@aol.com should you have any questions.

Biography

Judith D. O'Neill, Esq.
Chairman Telecommunications Practice
Thelen Reid & Priest LLP
40 W. 57th Street
New York, New York 10019
joneill@thelenreid.com

Sessions

Applications

T.1.2 Applications of Telecommunications to Health and Medicine

Tuesday 1 February, 830-1000
Location: South Pacific I

Moderator:
GARRET YOSHIMI, Senior Vice President, ISDI, USA

Panelists:
T.1.2.1
DAVID HUHTA, Chief Technical Officer, University of Hawaii John A. Burns School of Medicine, Telemedicine Project, USA
Technical and Training Barriers to Implementing a Telemedicine Consultation System in Rural and Underserved Areas

T.1.2.2
A.M. KIMBALL, University of Washington; C. HORWITCH, Virginia Mason Medical Center; M. OBERLE, University of Washington; L. SCHUBERT, University of Washington; C. MEYER, University of Washington; L. SHIH, University of Washington; J. BROWN, University of Washington
Cybermedicine in Asia Pacific; Responsiveness in an International Network

Presenters:
JACQUELINE BROWN and MARK OBERLE, University of Washington, USA

T.1.2.3
MICHAEL DAVIS, Partner; SHAUN BERG, Lawyer, Ward & Partners Lawyers, Australia
International Telemedicine - Solving the

Related Sessions
M.1.2 Telecommunication in the Service of Humanitarian Assitance
M.2.2 Case Studies in Educational Telecommunications
M.3.2 Rural Development Strategies
T.1.2 Applications of Telecommunications to Health and Medicine
T.2.2 IT & Telecommunications
W.1.2 Telecom Management
W.2.2 Doing Good Business in the Pacific Hemisphere

Regulatory and Legal Challenges

Sessions

Technical and Training Barriers to Implementing a Telemedicine Consultation System in Rural and Underserved Areas

DAVID HUHTA

The University of Hawaii Telemedicine Curriculum Research Project is concerned primarily with developing a web-based curriculum to train physicians and other health care providers in the effective use of telemedicine technology. Key to the development of the curriculum is a working Telemedicine Consultation Service providing service to Hawaii's rural communities. This presentation will provide an overview and status report of the project, which is at the midpoint of a two year timeline. Hawaii's geography and telecommunications infrastructure present challenges to implementing a network for real-time two-way video connections. A specific requirement for this project is to deploy next generation ip-based conferencing technology while maintaining compatibility with legacy ISDN-based systems. The project uses both ISDN and TCP/IP over SONET for connections to remote sites. Connections have also been made to existing networks, such as Hawaii's State Telehealth Access Network. Physician training challenges include integration into current practice of new communications technologies as well as new diagnostic tools. The introduction of new technologies presents a real challenge to a health care setting already stretched for time by the efficiency demands of managed care and federal regulation. Overcoming this reluctance is a significant task that requires a clear demonstration of benefit. Video teleconferencing and store and forward electronic data systems are new technologies to the health care setting which take time to integrate into health care practice. Instruments used in distance consultation are subtly different from the usual tools, and their use requires instruction, practice and experience before the practitioner will accept them into the work flow.

Sessions

Cybermedicine in Asia Pacific; Responsiveness in an International Network

A.M. KIMBALL, M. OBERLE, and J. BROWN

Cybermedicine, the "overlap" between informatics and public health is a burgeoning field with numerous domestic and international applications. The Asia Pacific Economic Cooperation Emerging Infections Network (APEC EINet) is an electronic network of health experts and policymakers founded in 1996. The network provides information about emerging infectious disease issues relevant to the 21-member economies within APEC. The success of this network has served as a "proof of concept" that telecommunication based networks linked to trade interests represent a feasible innovative strategy to enhance regional surveillance and control of new infections

Biography

Dr. Mark Oberle

Dr. Mark Oberle returned to the School of Public Health in September 1999 as associate dean for public health practice. He will coordinate collaborations with state and local institutions and organizations and will direct the Northwest Center for Public Health Practice.

From 1987-1992 he was the Centers for Disease Control and Prevention liaison officer to the School and served as assistant dean for public health practice and a visiting associate professor of epidemiology and health services.

In late 1998 Dr. Oberle concluded a 21-year career with the CDC, most recently as medical officer in the Public Health Practice Program Office and director of the Prevention Guidelines Database project. He also directed a project to develop electronic information and telemedicine networks for public health agencies in Georgia. Early in his career he was a CDC Epidemic Intelligence Service officer for Puerto Rico and the U.S. Virgin Islands.

Dr. Oberle earned an A.B. in biology at Harvard, and M.D. at Johns Hopkins, and completed a pediatric internship at the University of California at San Francisco and an M.P.H. at UC-Berkeley. He is a fellow of the American College of Preventive Medicine. In 1995 he received the U.S. Public Health Service Meritorious Service Medal and the Community Service Award from the UW School of Public Health.

Dr. Oberle is an internationally recognized ornithologist and is writing the definitive guide to the birds of Puerto Rico.

Biography

Jacqueline Brown

Jacqueline Brown is director of technology outreach and partnerships in the University of Washington's Office of Computing and Communications. She recently moved from Princeton University where she was responsible for academic computing, web, and user services. She holds degrees in astrophysics and in library science. She is active on the national information technology scene in the areas of teaching and learning, high speed networking, and professional development.

Sessions

International Telemedicine - Solving the Regulatory and Legal Challenges

Michael Davis and Shaun Berg

Abstract

Telemedicine promises to provide improved access to greater range of medical services. Yet, the number of self-sustaining international telemedicine projects remains small. Its cost effectiveness and commercial sustainability is still to be proved. The level of regulatory uncertainty in the implementation of international telemedicine programs is a significant barrier to entry for many potential participants. In this paper we provide a checklist of the policy and regulatory issues relevant to the establishment of an international telemedicine system. The paper includes:

- A discussion of risk management strategies to deal with the wide range of issues including the legal and regulatory issues likely to be encountered by health professionals and organisations involved in providing international telemedicine services
- A summary of legislative and regulatory responses in the United States, Europe and the Asian region to the growth of telemedicine
- An analysis of how existing regulatory regimes in the Asian region impact on the practice of international telemedicine.

The paper concludes that greater international effort to establish professional and technical standards for the provision of telemedicine services will remove barriers to the implementation of international telemedicine projects while protecting the interests of patients and local health professionals.

Introduction

Telemedicine provides the possibility of access to a wide range of medical services for the vast number of people in the world who are deprived of these services due to isolation or poverty.[1] The potential benefits for patients who currently do not have access to such services are immense. There are also ancillary benefits to medical practitioners who wish for continuing training in new and developing areas of medicine. The concept of telemedicine, and the benefits it potentially provides, have been recognized and embraced by a growing number of health organisations. Medical policy makers are beginning to perceive an opportunity to enhance the services currently available within their own communities, to promote humanitarian programs for the benefit of remote or underprivileged communities and to assist the export of professional services to other markets. However, legislators and regulators have been slow to act and there remain considerable problems in the implementation of telemedicine projects, particularly at international level.

This paper is an attempt, in the absence of a satisfactory international regime, to grapple with these problems, to form conclusions as to how laws and regulations are likely to apply to international telemedicine projects and to suggest strategies that could reduce the inherent risks.

International Telemedicine Programs

International telemedicine projects for the diagnosis and treatment of patients are attracting increasing interest from both the public and private sectors because of the availability and reducing cost of communications hardware and services and the willingness of the medical profession to use these technologies. However international policy makers and regulators are yet to respond to the complex legal and regulatory issues that are now being identified. In implementing international telemedicine projects, sponsors are exposed to unfamiliar legal systems and professional standards. What may be considered a legitimate practice in a doctor's country of registration may be inappropriate and constitute malpractice in the country where the patient is situated. Furthermore, the registration of a medical practitioner in one country is unlikely to be recognized as authority to practice in another country through telemedicine. This may result in the medical practitioner being subject to criminal or civil breaches of the medical registration laws of the foreign country.

The legal and regulatory issues, if not carefully addressed, can represent either barriers to the implementation of a telemedicine project, or risks that could jeopardize the successful operation of such a service. These legal and regulatory issues, while remaining difficult and esoteric problems, should not be considered in isolation. They represent one stratum of a more complicated scenario associated with the implementation of international telemedicine services. There are other issues, raising equally complex problems, all of which should be considered by persons or organisations involved in the provision of international telemedicine.

Telemedicine across International Borders

The focus of this discussion will be the provision of medical services to persons across international borders via telemedicine. Other forms of telemedicine, such as general medical education or training not involving the treatment of specific patients, do not pose the difficult legal and regulatory problems discussed in this paper.

The diagnosis and treatment of patients is typically achieved by employing modern teleconferencing equipment over local and international public telecommunications links, perhaps in combination with ordinary telephony or Internet services. In some scenarios, remote physicians can transmit data obtained from medical imaging and other diagnostic equipment for analysis or consideration.

The provision of medical services across international orders raises unique and difficult issues. Regulatory regimes for the provision of medical services differ from country to country. The majority of regimes do not allow for the provision of services using telemedicine facilities. This creates a conundrum for the sponsors of such projects - how to create a system that allows the provision of medical services without breaching local regulatory requirements?

The answer to this question is not easily found. Too much caution may result in a service that is not timely or cost effective or unduly restricted in the services it can provide. The stricter the checks and balances, the greater the cost and the less likelihood that the services can be economically justified. At the other end of the spectrum there are systems, in which these issues are not considered at all, involving considerable legal risk for the participants, as we shall illustrate in this paper.

The Role of Risk Management

Notwithstanding the increasing availability of technology that delivers a high standard of communication at reasonable cost, legal and regulatory uncertainty helps to account for the fact that there are currently only a small number of self-sustaining international telemedicine projects.

It is therefore necessary to have an understanding of the regulatory and policy issues relevant to the establishment of an international telemedicine program. First, we will examine the general issues that affect the implementation of an international telemedicine system, and then we will concentrate on the issue of licensure, particularly as it applies in certain countries in the Asian region.

An holistic approach to the legal and regulatory issues based upon principles of risk management is required. The problem of licensure is a fundamental issue governed by domestic laws of the countries where patients are diagnosed or treated. The other issues are capable of resolution by the implementation of appropriate risk management systems.

Legal and Regulatory Issues

The legal and regulatory aspects of the implementation of an international telemedicine project should be considered in the context of a wider analysis of all risks involved. There are many ways of identifying and classifying these risks, but we consider there to be six essential categories of risk that must be assessed in determining whether to implement an international telemedicine service.

They are:

- financial risk

- technological risk
- regulatory risk
- exposure to legal liability for error
- insurance cover
- telemedicine specific risk.

Financial Risk

The cost of providing infrastructure to support telemedicine services is significant. There are initial set-up costs and ongoing maintenance and upgrade costs. The sponsor must commit to immediate establishment and future operating costs.

The service is viable only if the appropriate commitment to training of medical professionals in the use of the equipment, and supervision at the patient end are coordinated. All these factors need to be considered at the time of deciding whether telemedicine is the optimal way to provide medical services to patients in remote locations.

The decision to implement a telemedicine project must be a commitment not only to install and maintain the equipment, but also to commit to the ongoing training of persons using the equipment, the monitoring of security of data transmitted as well as the security of the equipment itself. There must be appropriate supply and maintenance of the equipment by suitably trained professional service providers. All these factors impinge on one another. For example, if the maintenance of the equipment is not satisfactory, then

Physicians cannot provide a proper diagnosis and the patient suffers by either not receiving the promised service or not receiving adequate care.

The system must also be capable of operating within the existing telecommunications infrastructure. The use of communications networks that are unreliable can result in the provision of a service that is ineffective, and potentially dangerous. Sponsors must be aware of the overall costs of implementing and providing the service. It is not simply a matter of placing the equipment at a location that, for all intents and purposes, appears to operate satisfactorily. The costs associated with establishing a telemedicine service demand a proper analysis of the use and benefit of providing the infrastructure.

The cost/benefit analysis must be coordinated with an appraisal of the most appropriate geographical location for the equipment. This is an obvious point, but the equipment must be located, in times of limited supply and high demand, in locations where the maximum demand can be met. Not only must the local geography be considered but also the cultural interaction between groups. It is pointless placing telemedicine infrastructure at a midpoint between two communities that do not, for their own reasons, interact. The decision is important and requires a significant amount of local knowledge. Consultations between the providers and the end users are required prior to the decision to install costly equipment in locations where there is little understanding of the benefits of telemedicine. The demand for services requires careful and thoughtful consideration.

Potentially, telemedicine can provide a range of services to the patient. The balance of cost/benefit to the community should be the main criterion in determining the actual equipment to be provided. There is little point in providing a highly expensive full-range telemedicine facility if the supervision or medical expertise is not available at the patient-end. The decision to provide telemedicine services and the particular equipment to install should be linked to the availability of professional medical support in the key elements of the network.

The following checklist of issues to minimize financial risk is suggested:

1) The sponsor must commit to immediate and future costs - these include set-up, maintenance and upgrade of the equipment;

2) Training is an essential adjunct to a telemedicine system - for medical practitioners and supervisors;

3) Existing telecommunications infrastructure must be capable of supporting reliable operation of telemedicine system;

4) Consultation with the local community must occur - to determine the location that will maximize the advantage to those communities;

5) Reliable and user-friendly network equipment must be provided - linking the capabilities of the equipment to the human expertise available.

The decision to install telemedicine equipment is only the first step. There must also be a commitment to the maintenance, training and upgrade of the service. In times of limited resources such services must be offered to those with the greatest need. This must be assessed using information from persons with an understanding of the economic, social and cultural interests of the peoples being supplied. The matching of resources to need can then take place in a systematic and considered way.

Technological Risk

The users of telemedicine equipment inevitably face risks associated with the performance of the equipment or of the hardware or software associated with the equipment. Technical failures can emanate from a number of different quarters.

These include:

- the failure of the telemedicine equipment due to inherent problems or due to the failure properly to maintain the equipment;

- problems associated with the services provided by telecommunications carriers or internet service providers;
- problems with or irregularity in the supply of electric power;
- poor quality audio or images so that medical practitioners have insufficient information with which to provide a meaningful diagnosis;
- the telemedicine equipment may not be adequate to the requirements of the diagnosing medical practitioner; and
- service and maintenance support of the equipment may be inadequate.

The provider of a telemedicine network faces a number of technological risks in the installation of telemedicine equipment. The risks of failure of either the equipment or the telecommunications services are the most obvious. It is not the purpose of this paper to consider the actual technological risks that may arise. This task is best left to the specialists. However, identification of the risks and strategies to counter those risks are within the ambit of our discussion.

Telemedicine equipment is complex and dynamic. The suppliers of this type of equipment must be sensitive to the end user and should produce highly reliable and performance-oriented products. Undoubtedly this is also the desire of suppliers. However, the relationship that is created between the supplier and end-user will be subject to the terms of the contract entered into between these parties. The contract may include an indemnity clause, a limitation of liability clause or an exclusion of liability. This may result in the risk being shifted from the supplier of the equipment to the network provider. The network provider should consider this issue in negotiation with suppliers.

Another significant factor in implementing a telemedicine network is the regular maintenance of the equipment. The availability of cost effective maintenance of equipment is a factor to be considered in the costing of the service. It is important that the equipment does not fail. The importance of this issue is increased if the equipment is being used for more complex procedures. In certain circumstances the patient could be endangered by the breakdown of the equipment. The network provider will need to consider these factors in implementing a maintenance regime. In our view the network provider must decide whether a 'just in time' maintenance regime is sufficient or whether a 'just in case' policy is more appropriate.

There is always a risk that the service provided by telecommunications carriers or Internet service providers will fail. These issues will need to be considered on a case by case basis. Countries have different systems to regulate the performance standards of telecommunications carriers. In some legal systems, there is a greater chance of recovering damages from telecommunications carriers or Internet service providers if they are made aware in advance of the services being provided through their networks.

The following is a checklist of strategies to counter the likely technological risks:

1) Be aware of who has legal responsibility in the event of failure of telemedicine equipment;

2) Ensure that suitably qualified persons are available who can provide maintenance support to the telemedicine network;

3) Implement a maintenance regime that is appropriate to the risks to patients in the event of failure of the equipment; and

4) Provide the telecommunications carrier and other infrastructure providers with information in relation to the nature of the telemedicine service.

These issues should be considered individually and in conjunction with each other. There is little value in being satisfied in relation to one criterion yet being exposed to risk at other levels. A holistic analysis of the risks is required.

Regulatory Risk

Regulatory factors are country-specific and it is not possible in this paper to canvass the regulatory risks associated with the implementation of a telemedicine network to the same extent as the other risks we have identified. Some general risks can nonetheless be identified. There are a variety of ways in which a telemedicine network provider may encounter problems with local regulatory regimes.

These include:

- The provision of telemedicine may contravene local laws and be illegal;
- The practice of telemedicine may require a license that is not available or that has been refused on previous occasions;
- Even if the provision of telemedicine is officially sanctioned, there may be significant delays in obtaining official approval;
- Local medical professional bodies may resist the provision of telemedicine by outsiders and exercise a range of tactics to oppose or delay its introduction;
- Local participants may encounter pressure from government officials or other interests to cease involvement in the service;
- Local custom or tradition may be incompatible with aspects of the telemedicine service; or
- Cultural issues may hinder the implementation of the service.

These risks can be reduced or eliminated by the creation of relationships with local officials and health professionals that foster understanding and cooperation. Furthermore, the situation may be assisted by the implementation of education programs that would promote the benefits of telemedicine. This issue is highlighted because it will affect the ability of network providers to implement telemedicine programs within the time frames originally planned. These factors will therefore need to be considered in advance to ensure that the projected timing of the implementation of the program is realistic. These issues can also add costs to the initial funding assessment that will need to be factored into the relevant budgets. A satisfactory resolution of these issues will be important to the success in the provision of telemedicine in the short and long term.

Exposure to Legal Liability for Error

Even if the financial, technological and regulatory obstacles have been overcome, there is the constant risk of legal sanctions and exposure to the payment of compensation in the event of error in the delivery of the telemedicine services. If errors are made by the medical practitioner in the diagnosis or treatment of the patient resulting in loss to the patient, the following risks apply:

- The doctor and the telemedicine network provider may be exposed to criminal and civil sanctions in the form of compensation claims and criminal penalties;
- The providers of telemedicine services may become subject to official orders to cease the service at the remote location.

Where a telemedicine network provider that employs medical staff provides the service, the provider faces potential legal liability for errors committed by the medical staff or for other errors in the delivery of the service. If litigation results, courts are likely to be faced with a range of unique legal issues including determining what is the standard of care required by a medical practitioner in the provision of telemedicine. It will also be required to assess the liability of other service providers within the network. These are just two of a number of local legal issues that will become clearer over time.

One possibility is that local law relating to the standard of care in telemedicine will eventually be defined or enacted. It may be decided that the standard required of doctors diagnosing and treating via telemedicine is higher than the general standard required of a doctor at the location of the patient. In this scenario, there will be circumstances in which it will be inappropriate and legally dangerous for the doctor to diagnose using telemedicine equipment. Therefore there will be circumstances in which doctors who are remote from the patient should decline to offer diagnosis or treatment. This means the scope of the services that the telemedicine provider is able to offer will need to be carefully defined and they may be more limited than originally contemplated.

On the other hand, it is the view of some lawyers that patients cannot expect the same standard of care in telemedicine consultations as in the normal clinical environment. This could result in telemedicine services being perceived as being less useful to patients compared with services that are available locally.

This results in a conundrum that is beyond the scope of this paper. However, it highlights the difficulty providers of telemedicine services encounter in assessing the legal risks involved in the implementation of an international telemedicine program.

Insurance Cover

There is a risk that indemnity from an insurer may not be available in certain situations in which the medical professional incurs legal liability. Traditionally, medical practitioners are protected from these risks by appropriate insurance cover. Medical practitioners will be reluctant to be involved in telemedicine services if they are exposed to legal liability without adequate insurance protection. Medical practitioners who practice telemedicine should not simply assume they have sufficient insurance cover. The insurer, if a claim arises, may take the approach that that the practice of telemedicine was not sanctioned by the law of the location of the patient and is therefore illegal and/or outside the scope of the policy. Obviously each policy would need to be considered on its merits. However, our experience is that medical protection insurance policies require special extensions if the insured doctor wishes to practice outside his or her own locality of registration.

It is important that medical practitioners intending to practice telemedicine seek an enforceable ruling from their insurers in relation to their insurance cover. Network providers also need to ensure that they have comprehensive insurance cover.

Telemedicine Specific Risks

Medical practice is governed by a complex set of rules, standards and laws that determine the issue of the medical practitioner's responsibility for injury or damage suffered by patients in the course of receiving medical treatment. In most countries, if a medical practitioner is legally responsible for such damage, he or she can be sued. In some circumstances, he or she may also become the subject of an official inquest or disciplinary action that could result in a range of penalties including the forfeiture of the right to practice medicine.

Confidentiality is an essential issue in the provision of telemedicine services. If a medical practitioner breaches his or her duty to keep medical information about patients confidential, there may be exposure to legal action for damages or disciplinary action. In these circumstances telemedicine poses an additional legal issue for medical practitioners. The use of the Internet for communications poses a particular problem because it is so vulnerable to unauthorized interception. It is important that these issues are considered in the implementation of a telemedicine service.

We consider that many of these hurdles can be cleared by the implementation of risk management systems. The remaining topic for consideration is the issue of licensure. This issue raises unique difficulties that require consultation with policy makers and regulators in individual countries.

Licensure

Every country of the world has its own system of medical practitioner licensing and registration. Some States of the United States have enacted specific laws regulating the practice of telemedicine.[2] To date, Malaysia is the only country in the Asia Pacific region that has enacted legislation regulating the practice of telemedicine.

In 1997 the Malaysian Parliament passed the. [3] The Act defines telemedicine as 'the practice of medicine using audio, visual and data communications.' The Act provides that no person other than a fully registered medical practitioner in Malaysia may practice telemedicine unless that person is a registered or licensed medical practitioner outside Malaysia, holds a certificate issued by Malaysia and practices telemedicine through a Malaysian medical practitioner. Other provisions of the legislation include a legal requirement that telemedicine must not be provided unless the patient has been fully informed of the potential risks, consequence and benefit, and has given his or her written consent. Obtaining informed consent in most countries is part of the legal duty of the medical provider. Obtaining written consent is, however, an additional requirement that is rarely imposed upon doctors providing local medical treatment.

In most countries, the question remains as to whether a doctor needs to be registered in the country where the patient is located before he or she can practice telemedicine. The following are the arguments for both views.

The "Yes" Arguments

Conventional wisdom would lend weight to the argument that it does not matter where the doctor is located, since the medical services are provided *to the patient.* The mere provision of a diagnosis (probably in the form of medical advice) to a patient would be sufficient for the doctor to be practicing medicine in that country.

In legal terms this seems to make sense. Interpreted this way, the law controls the receipt of medical services, whatever the source of those services. If these services were provided negligently from abroad, there would be no remedy or sanction available to a local citizen. If doctors were required to have a license before they can practice telemedicine, remedies would normally be available in the event of malpractice or negligence.

The existing practice in the United States tends to favor this view. Telemedicine is practiced widely across the United States and in some States the law has caught up with the practice. In some States full licensing is required from the out-of-state physicians, while some require a special limited license for these practitioners. In some States, however, there seems to be a limitation on the frequency of the practice of telemedicine in the State rather than requiring a certificate or licensure. The *Telemedicine Act* of Malaysia would also seem to be an indication that at least one Asian country recognizes the benefits of telemedicine but intends to maintain careful control over its practice.

The European Union has adopted a mutual recognition system, which enables the practice of medicine across national borders.[4] A mutual recognition system involves the harmonization of standards for registration and professional conduct. A medical practitioner who is registered in his or her home country is not required to obtain additional licenses to practice in other countries of the Union. In general terms, issues of standards, enforcement and administration need to be negotiated between the parties to the mutual recognition system. Nevertheless, the mutual recognition system in force in Europe makes the practice of telemedicine considerably less complicated within the borders of the European Union.

The "No" Arguments

If doctors are required to register and obtain a license in every country in which they intend to provide services through telemedicine, this could prove to be an impractical and costly venture for any doctor. It would be more sensible for doctors only to require to be registered in the country where the doctor is normally located.

The following are three arguments supporting that view. It should be kept in mind that these are merely arguments and there are no judicial precedents on this matter at the present time. Consequently the following should not be regarded as a statement of the law. Further, we consider these arguments are relatively weak and unlikely to be successful if tested in a court.

Legislation Only Regulates Conduct of Doctors

Medical registration legislation regulates the conduct of doctors, rather than the reception of services by patients. For example, the *Medical Practitioners Ordinance* of Hong Kong provides for the regulation of medical practice, which includes providing medical diagnosis - not *receiving* medical diagnosis. Similar provisions can be found in the relevant laws of Japan and Australia.

Since these laws regulate the conduct of medical practitioners in the provision of medical services, how does a domestic law apply extraterritorially to doctors resident and practicing overseas? According to this theory, logic would require that doctors would only require registration if they were providing medical services within the territory of the country concerned, rather than providing it through telemedicine from another country.

The Nature of Telemedicine

The nature of telemedicine itself raises interesting questions. In normal medical practice, during a consultation a doctor will usually take a history, perform an examination, make a diagnosis and then prescribe some form of treatment. This may take the form of prescribing medication, ordering further tests or even performing surgical operations. Legislators regard medical services as activities that require adequate legal protection for patients by licensing of those who provide the services.

It is argued that in the case of telemedicine the patient is only likely to be receiving advice. Just as there is a difference between an accountant giving tax advice and actually preparing the client's tax returns, there is also a difference between providing medical advice and medical treatment. If telemedicine involves merely the provision of advice during a consultation, why should a doctor require the same registration as a doctor providing full medical services?

It must be noted that, however, under the existing laws of some countries, such as Hong Kong, this argument would be contrary to the actual terms of the law, which provides that medical practice includes a mere diagnosis without actually providing any form of treatment.

Regulation of Medical Practice in Asia Pacific Countries

Countries in the Asia Pacific region have a diverse range of legal systems and the system of medical licensing and registration is different in each country. Some countries have strict requirements with respect to the practice of medicine. In these countries, medical practice tends to be defined as including the diagnosis of any form of disease regardless of whether medical or surgical treatment is given. There is no doubt that the practice of telemedicine would be encompassed by these broad definitions.

These countries usually require the passing of a licensing exam before granting the right to hold a license to practice medicine. If the doctor is not a graduate of a local educational institution then some countries require foreign doctors to undertake bridging courses before being allowed to sit the licensing exam.

Other countries in Asia have a comparatively relaxed regime of medical registration. In Indonesia, for example, there is no strict regulatory system of licensing and registration as exists in Australia and the United States.

It is generally true to state that for a doctor to practice in any country in the Asian region, he or she is required to undertake some form of licensing or registration procedure before being legally entitled to do so. In a recent major project, we examined the specific requirements in a number of countries.[5]

Australia

Each State controls the registration of doctors treating patients in its own jurisdiction. Registration under a State Act allows qualified persons to practice medicine in accordance with the Act. Only qualified persons are able to provide medical treatment under the State Act. Broad definitions of medical treatment such as "all medical or surgical advice, attendance, services, procedures and operations" are used.[6]

There is a mutual recognition of medical qualifications scheme in place in Australia under Commonwealth legislation that means that doctors registered in One State are entitled to registration in other States.[7]

Hong Kong

Medical practice in Hong Kong is defined as including 'the diagnosis of any form of disease whether the cases so diagnosed be treated medically or surgically or not.' Under the relevant sections of the Act, before a certificate of practice can be granted, the doctor must pass the Medical Licensing Examination and complete a certain period of supervised assessment.

Japan

In order to provide medical services in Japan, one must obtain recognized qualifications and pass the State Examination of Physicians. Only after passing the examination is a doctor entitles to be granted a license from the Ministry of Health and Welfare. While there are no restrictions on the nationality of the applicant it would appear that one would require a license before being able to provide telemedicine services to patients in Japan.

The Philippines

In the Philippines, Chapter 31 of the Philippine Administrative Code (referred to as the *Medical Law*) provides for the registration of medical practitioners. In particular, the law requires that a person practicing medicine must be registered after having graduated from a 'reputable institution' and having satisfactorily passed the examination.[8]

Registration is not required for 'physicians and surgeons from other countries called in consultation'.[9] Some of the activities involved in providing telemedicine may fall within this exception.

Singapore

The *Medical Registration Act* 1997 provides that registration is only provided to people who are qualified from a Singapore institution or one recognized by the Medical Council. There is no scope in the Act for the registration of foreign doctors or one who wishes to practice temporarily in Singapore for purposes other than education or training.

South Korea

In South Korea the law governing the practice of medicine is regulated by the *Medical Treatment Act* 1973. The law provides that for a doctor to be licensed he or she must be a Korean national, obtain qualifications at an institution recognized by the Minister of Health and Social Affairs, and satisfactorily pass the national admission exam.

Curiously, the law also provides for 'a person who has a foreign medical license and stays in the country for a fixed period' to 'conduct medical treatment within the limits' prescribed by the Ministry of Health and Social Affairs. Presumably, medical practitioners could attempt to negotiate an agreement with the Ministry to practice legally in South Korea.

Sri Lanka

Under the *Medical Ordinance*, a person may practice medicine only if registered by the Medical Council.

To do so, one must pass an examination and be a citizen of Sri Lanka. The ordinance also provides that a person who is not qualified to be registered but is a resident in Sri Lanka temporarily may apply to the Medical Council to be registered for the period that he or she is temporarily resident in Sri Lanka and came upon the invitation of the Sri Lankan Government or the University of Sri Lanka. Due to these strict requirements, permission for doctors to practice telemedicine in Sri Lanka may be somewhat difficult to obtain.

Conclusion

While legal and regulatory issues should be prominent in the planning of international telemedicine projects, they should be understood in the context of a wider risk management analysis that is essential to the implementation of successful systems. An holistic approach to the issue of risk management will result in a telemedicine system that is flexible and timely. These are essential features in times of increasing opportunity to provide services, improving technologies, and lagging legal and regulatory responses.

One of the fundamental steps in the implementation of international telemedicine projects is consultation with the local regulators of medical registration. Countries with more rigid regimes may agree to make provision for telemedicine once the benefits are observed in other countries.

A recent report to the US Congress stated:

> 'Much has been written about the barriers to telemedicine and the policies and programs needed to overcome those barriers. Yet, these writings are generally more likely to agree on the nature of the problems than on the solutions.'[10]

The solutions are in the hands of national and international policy makers and the leaders of the medical professions. When mutual recognition of medical qualifications and a broad consensus as to acceptable standards for the provision of telemedicine across national borders are developed, the real benefits of telemedicine will be seen.

1 Defined broadly, telemedicine uses telecommunications networks to transmit images, audio or other medical data (x-rays, high-resolution images, patient records etc.) from one location to another. Transmissions involve ordinary telephone lines, the Internet or private networks, using telephones, videoconferencing equipment and other communications hardware.

2 US Department of Commerce, Telemedicine Report to Congress, 31 January 1997, http://www.ntia.doc.gov/reports/telemed/conclude.htm

3 Telemedicine Act 1997 (Malaysia).

4 European Council Directive 73/148/EEC of 21 May 1973 on the abolition of restrictions on movement and residence within the Community for nationals of Member States with regard to establishment and the provision of services. See http://europa.eu.int/eur-lex/en/lif/dat/en_373L0148.html. See

also Council Directive 89/48/EEC of 21 December 1988 on a general system for the recognition of higher-education diplomas awarded on completion of professional education and training of at least three years' duration (http://europa.eu.int/eur-lex/en/lif/dat/en_389L0048.html) and Council Directive 92/51/EEC of 18 June 1992 on a second general system for the recognition of professional education and training to supplement Directive 89/48/EEC (http://europa.eu.int/eur-lex/en/lif/dat/en_392L0051.html).

5 Davis, Berg and Lee, Australian Doctor Services Legal Report, Ward & Partners Lawyers, January 1999

6 Medical Practitioners Act (South Australia)

7 Mutual Recognition Act (Commonwealth)

8 Medical Law §770, §775 and §772

9 Medical Law § 771

10 US Department of Commerce, Telemedicine Report to Congress, 31 January 1997 (http://www.ntia.doc.gov/reports/telemed/conclude.htm) p 1

Biography

Michael Davis

Michael Davis is a partner of Ward & Partners, a prominent South Australian legal firm.

He was educated at The University of Adelaide and graduated with a Bachelor of Laws in 1973. In 1996 he obtained the Master of Space Studies degree from the International Space University in Strasbourg, France.

In 1992 he was appointed Chairman of the Board of the Satellite Communications Research Centre (now called the Institute of Telecommunications Research) He continues to serve as a member of that Board.

In 1995, he was granted study leave to participate in the Master of Space Studies program at the International Space University in Strasbourg, France. Upon graduation in 1996, he was seconded by his firm to work for the University and to engage in research into international telecommunications regulatory and policy issues. He has authored or co-authored a number of papers on space and telecommunications related topics and has regularly presented papers at international space and telecommunications conferences.

In August 1997, he returned to Ward & Partners where he has established a specialist in space and telecommunications. He is also Senior Regional Representative of the International Space University and is a guest lecturer at that institution.

He has been a member of the Pacific Telecommunications Council since 1996 and has presented at previous PTC meetings. His article entitled *The WTO Agreement on Basic Telecommunications Services* was published in the Pacific Telecommunications Review of September 1997.

Shaun Berg

Shaun Berg was educated at the University of Adelaide and holds degrees in Law and Commerce.

He completed his study in Law with Honours in 1998. Since completing his study he has worked as a lawyer with Ward & Partners in the Commercial Law area. He works in closely with Michael Davis and they have collaborated on a number of projects involving the application of new technologies including a major report on the legal aspects of international telemedicine.

Sessions

Internet

T.1.3 E-Commerce Strategies
Tuesday 1 February, 830-1000
Location: Tapa I

Related Sessions
M.1.3 Enabling E-Commerce
M.2.3 IP Telephony
M.3.3 Strategies for Financing andTracking the Digital Economy
T.1.3 E-Commerce Strategies
T.2.3 Privacy and Consumer Protection & Government Control
W.1.3 New IP Network Technologies
W.2.3 Development Issues
W.3.3 Content & Culture

Chair:
JAGDISH RAO, Consultant, USA

T.1.3.1
HILARY B. THOMAS, Vice President, International Business Development and Strategic Alliances, eCharge, USA
Challenges and Opportunities for Telcos in Electronic Commerce

T.1.3.2
SANG-CHUL LEE, Professor of Journalism and Director of Communication Institute, Chung-and University; MYUNG-JUN LEE, President, Internet Marketing and Messaging Automation Solution (iMAs); and SUNG-YON HWANG, Ph.D Student, Chung-Ang University Department of Journalism & Mass Communications, Republic of Korea
A Developmental Strategy for e-Commerce in Korea

T.1.3.3
MUTSUYA ASANO, Chair of Executive Board of MultiMedia Pilot Project Consortium, Telecom Services Association and Director of Telecommunications Relations IBM Japan, Ltd., Japan
A New Approach to Electronic Commerce in the Cross-Border Environment Interconnection of Multiple Electronic Commerce Test-Beds Project in the Asia Pacific Region (power point

presentation)

Challenges and Opportunities for Telcos in Electronic Commerce

Hilary B. Thomas

Abstract.

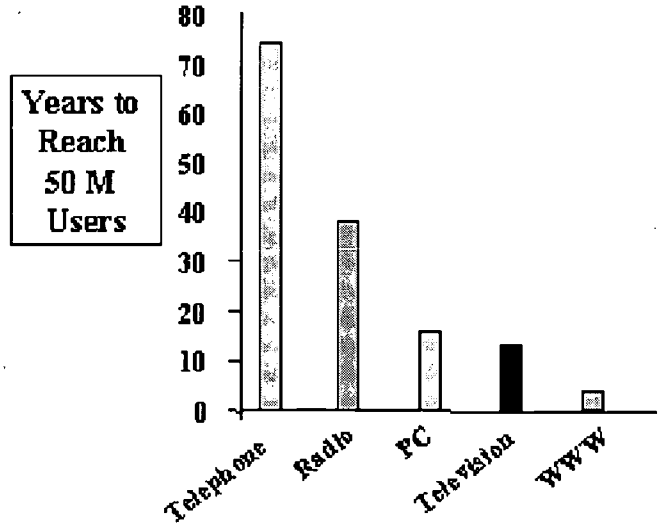
Electronic commerce is at the core of the business revolution created by the Internet and the World Wide Web. It will impact businesses, governments and consumers around the world. It will create enormous revenues, enormous challenges and enormous opportunities. And it will change the face of the telecommunications industry. This paper reviews the size and scope of electronic commerce; it examines some of the challenges, especially those facing less developed markets, which may be at risk of losing rather than gaining from the "new order". And it highlights some of the opportunities that are available to telecommunications companies as a result of shifting roles among the players.

Introduction: the size and scope of electronic commerce.

Twenty years ago we used to ask audiences "How many of you have a computer in your office?"

Ten years ago we asked, "How many of you have a computer at home?" Five years ago we began to ask, "How many of you are online?" In each of these cases the answer was about the same; twenty to thirty percent of the hands would go up. Now we ask, "How many of you have purchased something over the Internet?". At the time of writing the statistics for the 1999/2000 holiday season are not in, but I am prepared to guess that when I ask that question in Honolulu in January 2000, the answer will be considerably higher than thirty percent, though some will only have purchased a book from Amazon. Since the introduction of the World Wide Web the rate of change in electronic services has surpassed all expectations and all the frequently cited "hockey stick" curves of innovation. It has taken the World Wide Web four years to achieve the same number of users as it took the television 13 years, the PC 16 years, radio 38 years and telephone 74 years.

Exhibit 1
Acceleration of Innovation



One year ago, according to Business Week ([1]), personal computer penetration of US households was just over half (53%). That's about 55 million households. Over eighty percent or 44 million households were online. That's a benchmark change. Before the World Wide Web, online connections barely reached one third, many personal computers were purchased without a modem, and we were still looking for the first consumer who would *buy a computer in order to go online.* Now it's my guess that to access the Internet is a primary reason for the purchase of at least thirty percent - maybe half - of the personal computers sold today. In 1998 less than 10% of all households (11 million) had purchased online. In 1999 most estimates suggest that this has more than doubled, to 25 million households, representing 20% of all households and as many as 70% of online users. That's a benchmark without precedent. And much of the credit (and much of the revenue) goes to Amazon.com.

In the mid-eighties an industry colleague of mine issued pins which proclaimed *"1990 I can't wait"* - a somewhat sardonic reference to all the forecasts which saw massive growth in our industry by 1990. We had a huge New Year's party that year, but we were still waiting!

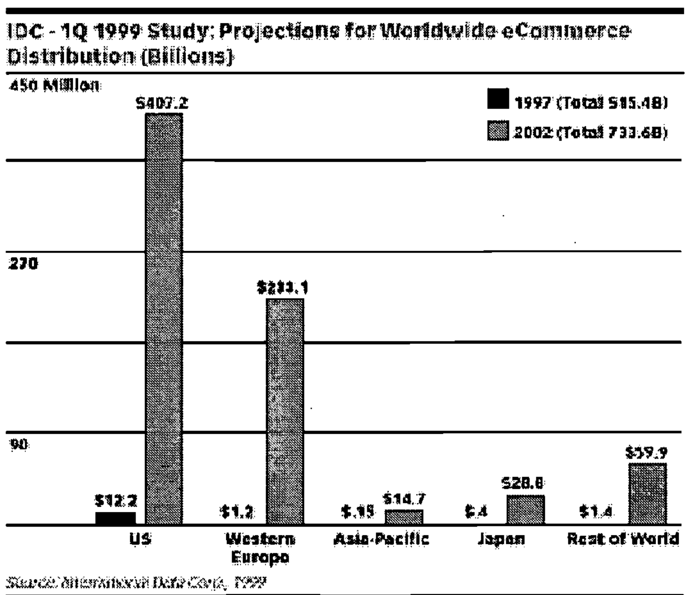
We'd been waiting ten or fifteen years, but we only waited a few more. In 1993 the World Wide Web unleashed on the real world the previously esoteric technologies and services which my colleagues and I had pioneered at the Association of Viewdata Information Providers, (London 1976), the Videotex Industry Association (Washington DC, 1982) and the Interactive Services Association (Washington DC, 1989). Suffice it to say that the Interactive Services Association is now called the Internet Alliance (Washington DC, 1998). We must all move with the times. And move fast if we want to succeed in the world of electronic commerce.

Even in those pioneering days of interactive services we recognized that there were the two words that mattered. Interactive, and Services. Although it supports the triad of information, entertainment and transactions, the Internet is not, first and foremost, an information medium. It's not primarily an advertising medium either. Ultimately, it fails itself, and us, if it does not take full advantage of its ability to consummate a transaction between any two individual users. It's a communications medium. It's interactive. And the ability to support interactive transactions is the bedrock of electronic commerce.

World e-commerce: level playing field or slippery slope

The pundits, some of them the same ones who waited with me for 1990, are projecting phenomenal growth for

e-commerce. Forrester Research projects worldwide total e-commerce revenues will grow from US$80 billion in 1998 to $2,000 billion in 2002. IDC's projection for the same timeframe is $734 billion. eStats suggests that worldwide e-commerce will reach US$1,244 billion by 2003.



A little care must be taken in interpreting e-commerce projections however reliable the source. While some forecasters attempt to measure pure, end-to-end online transactions, others acknowledge that they include transactions that are initiated, but not completed online; so the Nokia phone that you ordered from a web-site but paid for at the store is included. And few projections successfully distinguish between the three core categories of electronic commerce; business-to-business, business-to-government and business-to-consumer. While the antics of Amazon.com get far more press and attention, the far greater impact of electronic commerce is the migration of Electronic Data Interchange (EDI) to Electronic Commerce on the Internet (ECI). (1) The mighty power of the wwweb. is that it has provided a set of protocols, a standard which blasts the boundaries of proprietary and limiting standards such as X12 and Edifact, enabling companies small and large, anywhere around the world, to compete (if infrastructure, economics and regulations permit) for business with governments and multinational enterprises everywhere. It opens up global markets for small and regional companies. It has the potential to provide that much touted "level playing field" which will change the face of trade.

In reality, the playing field isn't too level yet. In fact it looks more like the slope of one of those awesome waves I have seen on the North Shore. In July 1999 there were 56.2 million www hosts connected by the Internet and Intranets around the world. Ninety six percent (96%) of those hosts are located in countries that are inhabited by sixteen percent (16%) of the world's population. In the "developed countries" there are 312 hosts per 1000 population. In "developing countries" there are six. (2)

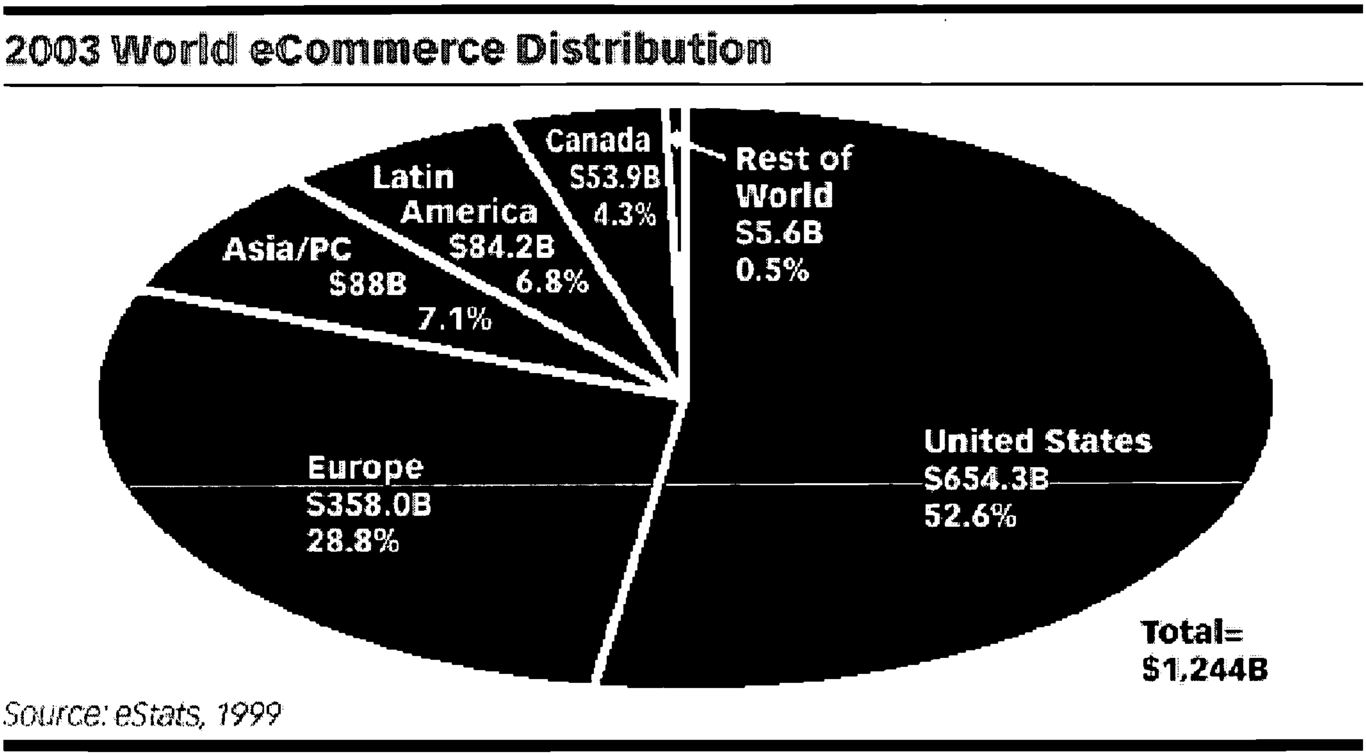
Worldwide e-commerce is similarly skewed. In March 1998 ActivMedia estimated that 70% of e-commerce websites and 93% of the e-commerce revenues were US based. Europe generated only 2% of e-commerce revenues (with 10% of websites) and Australia/Asia/Pacific only 1.2% (with 6% of websites located in Australia and 1% in the rest of the Asia/Pacific region).

Distribution of Web Revenues vs. Websites

Country	% EC Revenues	% of Websites
United States	93%	70%
UK/Europe	2%	10%
Canada	2%	7%
Australia	1%	6%
Latin America	2%	2%
Asia/Pacific	0.2%	1%
All Other	0.2%	2%

Source: ActivMedia, March, 1998

eStats forecasts that in 2003 over 50% of worldwide e-commerce will still take place in the United States. Asia/Pacific (including Japan, Australia and New Zealand) will have not quite reached 7%. Hidden by these statistics is the fact that the majority of web accesses from most countries are with US based web sites. [Eighty percent of web sites accessed by Australian users, for example.] This e-commerce revenue is generated in Australia and gained by the United States.

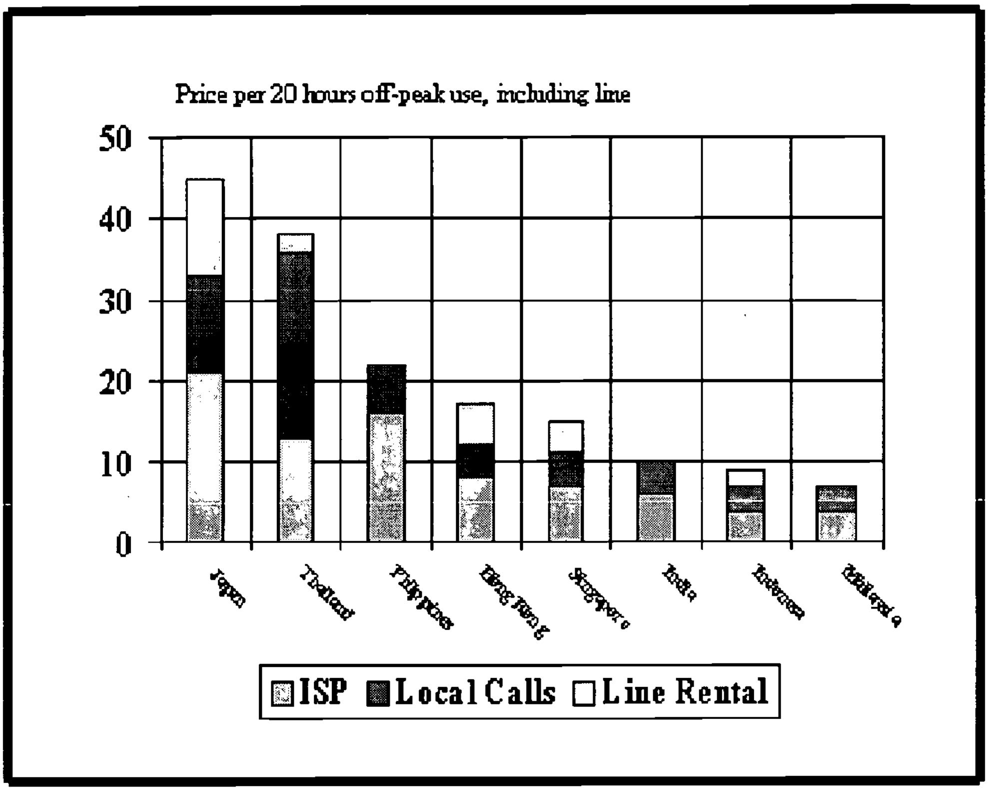


Challenges to global development of e-commerce.

The barriers to growth of e-commerce in developing countries are high. They include low teledensity, poor infrastructure, the high cost of dial up telephony, low personal computer use, high cost of Internet use, high credit risk and low credit card penetration to name but a few. Add to that cumbersome customs and restrictive regulatory and political environments, struggling economies, low education standards, language barriers, poverty, and lack of awareness in the market, and it is easy to conclude that there is no future for a level playing in e-commerce, especially in the mass market.

There is resistance even in North America and Europe. Nearly 40% of Internet users express discomfort with using credit cards online. Privacy issues rank high, exacerbated by lack of trust in untested Internet companies, and user experience is often frustrated by poorly designed interfaces or failure of interactions. While the network itself is increasingly robust, it was not designed for the task of global commerce. Add to this the speed of development of the market, which puts pressure on merchants and software providers to launch products before they are fully tested. This results in the risk of an unacceptably high incidence of negative experience for consumers.

Growth Inhibitors

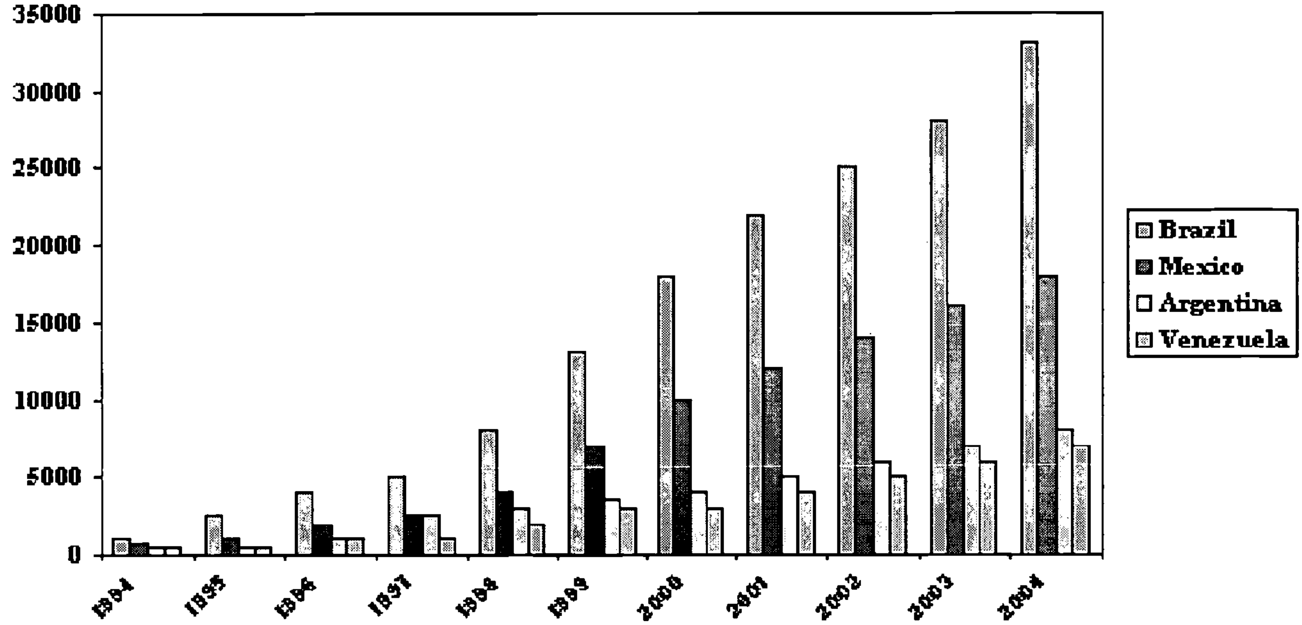


In twenty-five years in this industry, one of the more frequent questions I have been asked is, "When will the paperless society be a reality?". In the past my answer has usually been "Never" for some very sobering reasons. At the beginning of the twenty first century:

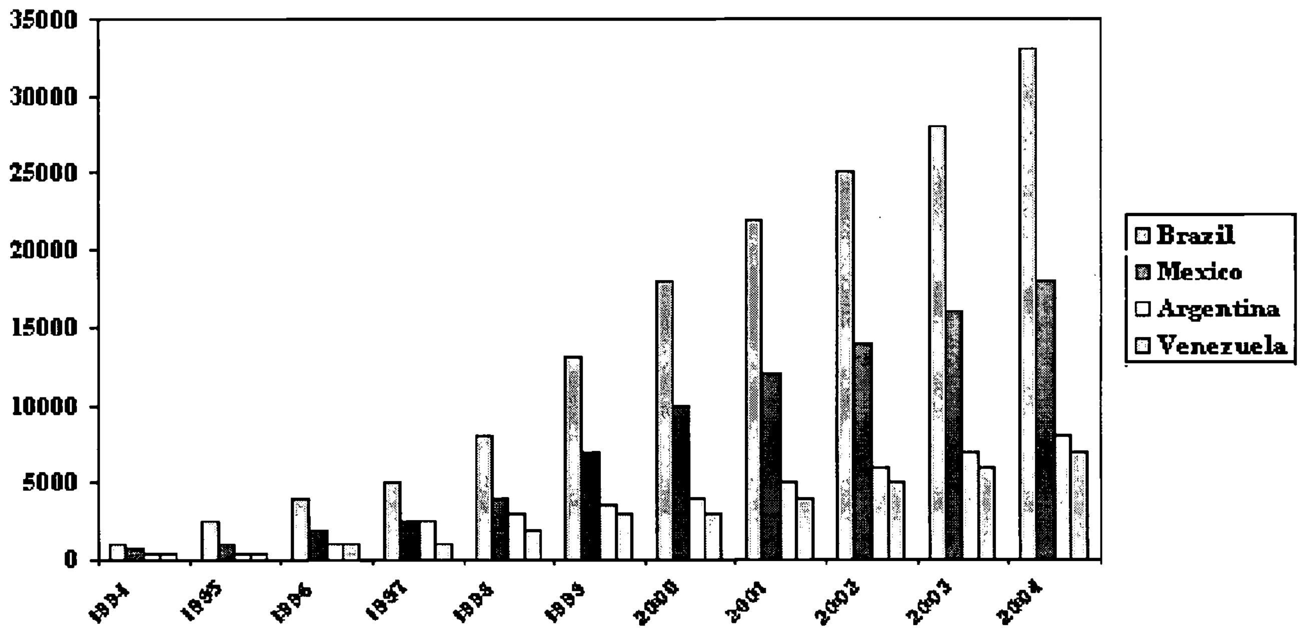
- Over 20% of households in the United States don't have a bank account.
- More than half the population of the world has never made a phone call.
- One in six of the planet's population (855 million people) is illiterate.

Today I could argue that these same sobering facts will help to drive the "new economy". As a result of the combination of mobile telephony, the world wide web and payment solutions from companies such as eCHARGE that do not require traditional banking infrastructure, e-commerce can now be offered in developing markets, even to the un-banked. In future, with sophisticated multi-media interfaces, e-commerce will even be offered to those who are currently defined as illiterate. But that's the subject of another paper which I haven't had time to write yet.

Growth Accelerators



Mobile as Key Infrastructure Driver ... in Latin America

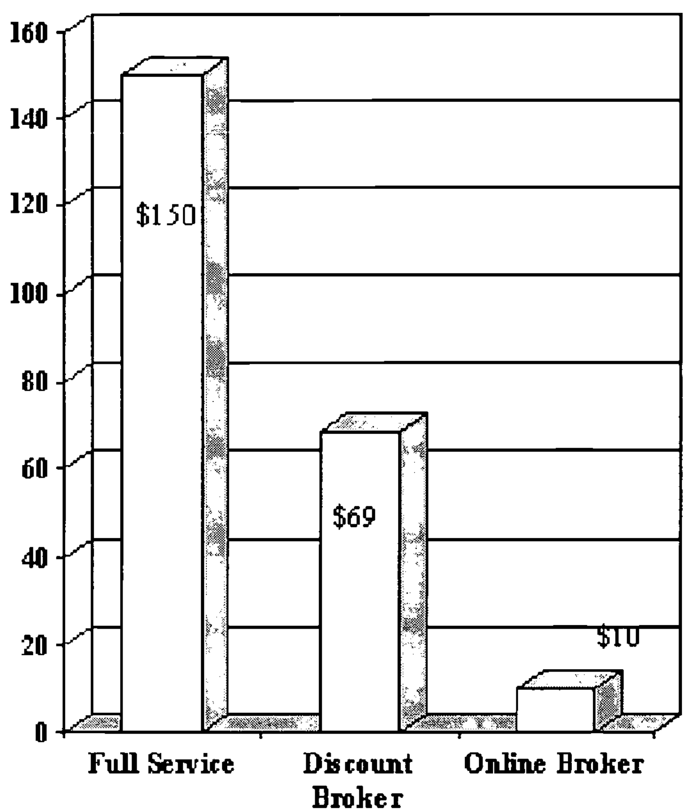


Cellular/PCS Subscribers 1994-2004

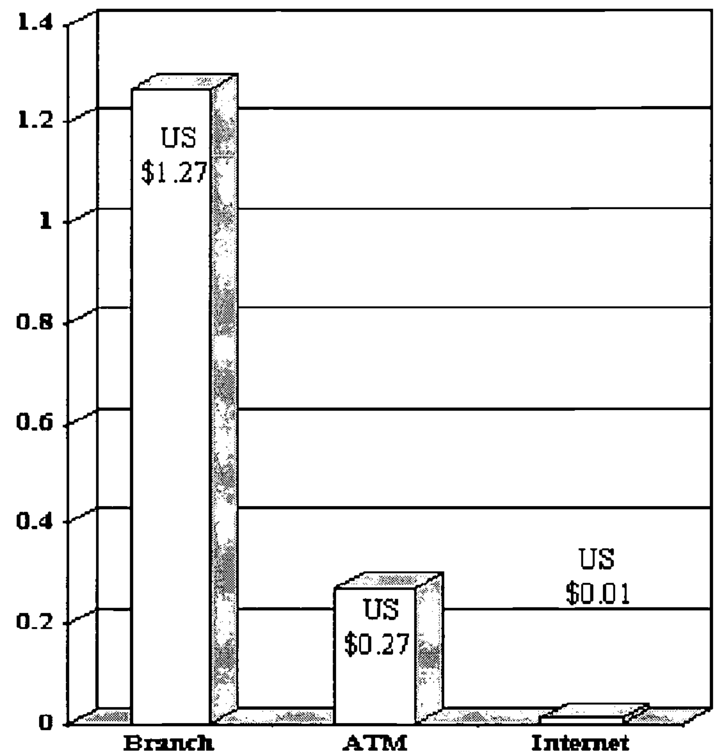
Why do it electronically

In the shorter term, if nations or businesses are shut out of e-commerce for long, they will fall far behind as the new order of trade and economic development begins to form. There are some pretty powerful reasons for this. For example, the average cost of a full service trading transaction is estimated at $150. While a discount broker may reduce this to $70, the average online trade costs $10. The cost of a branch banking transaction is approximately US$1.30. At an ATM it costs the bank about 30 cents. The cost of a credit card transaction is 27cents. At eCHARGE we believe that we will be able to complete an e-commerce payment transaction for significantly less than 10 cents.

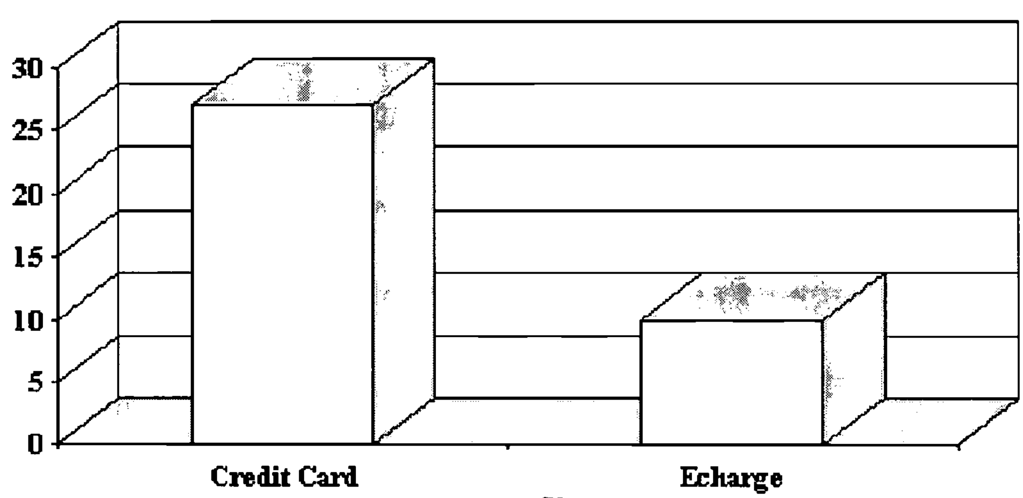
Cost of Trading Transactions:



Cost of Banking Transactions:



Online Purchase Credit Card vs ECharge



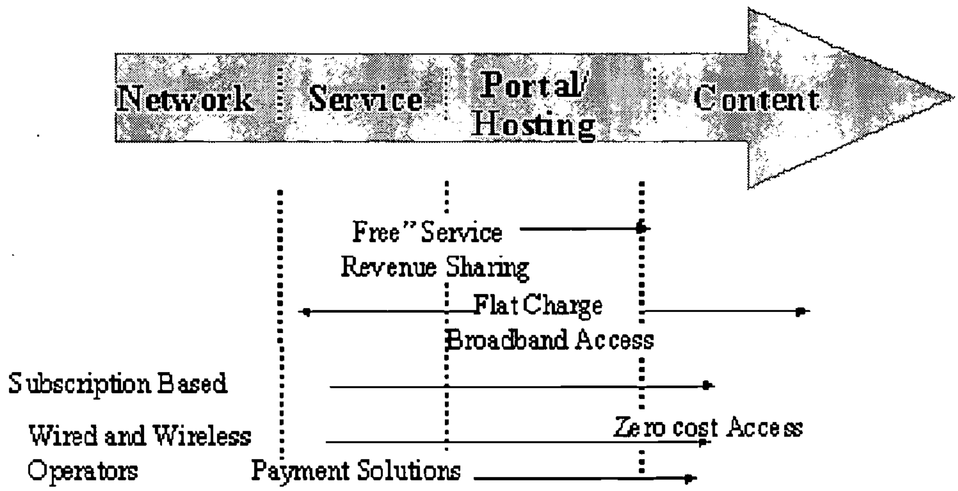
These statistics suggests that businesses (and therefore consumers) will be forced to use electronic commerce to survive.

The change is fundamental and it won't be easy in any part of the world. We are looking at globalization, the extension of traditional markets, the demise of distance. We are looking at changed paradigm of competitiveness across all sizes of business. Without a legacy "small players can be global players". Ultimately every business in the world will be affected in some way by this change.

Telecommunications Companies and e-commerce

From the perspective of my company, eCHARGE, and companies like ours, e-commerce offers both a challenge and an opportunity to leverage existing assets of telecommunications and financial services industry and to combine them with new Internet forces. Together we can play a critical role at the heart of the new trading model. eCHARGE is developing global payment solutions which offer to place telcos at the core of e-commerce and e-commerce revenue streams. And payment solutions are just one of the ways in which telcos can benefit from joining their strengths to those of an Internet partner. Since e-commerce, and therefore ebusiness, is based on transactions, it is a communications business, it is here, at the Pacific Telecommunications Council, that the Internet (and ECI) ultimately belongs. It does not belong in publishing; the electronic information pioneers discovered twenty years ago that it didn't work to put a copy of the print newspaper online. Nor does it belong in advertising; despite what some existing web-based IPOs would have us believe, the advertising model just doesn't fit. Leave that to television, which, by the way, may gain more revenue from e-commerce this holiday season than all the web sites which placed those prime-time ads. The Internet is a medium of trade. And e-commerce pioneers are finding, just as the publishers did before them, that e-commerce is not just a shift of the way we trade to the Internet. E-commerce is creating a new dynamic for global trade, and with that new dynamic come new roles, challenges and opportunities for almost everyone, and in particular, for telecommunications companies. Bernard Lanvin of the ITU (3) describes a new trade paradigm in which the underpinning of all trade is telecommunications and everything is driven by value added services, from software, to transport, to insurance, to banking, which ride on that infrastructure. Already, activities at pioneering telcos indicate that some of those value-added services will become part of the infrastructure. As bandwidth becomes a commodity, Internet Service Providers (ISPs), especially those owned and operated by telcos, are moving from their network base towards wholesale services such as e-commerce platforms, application hosting, and payment services. It is a small step before ISP access becomes a commodity too, and these companies will scramble to differentiate themselves, and their revenue streams, by providing retail applications, content and commerce.

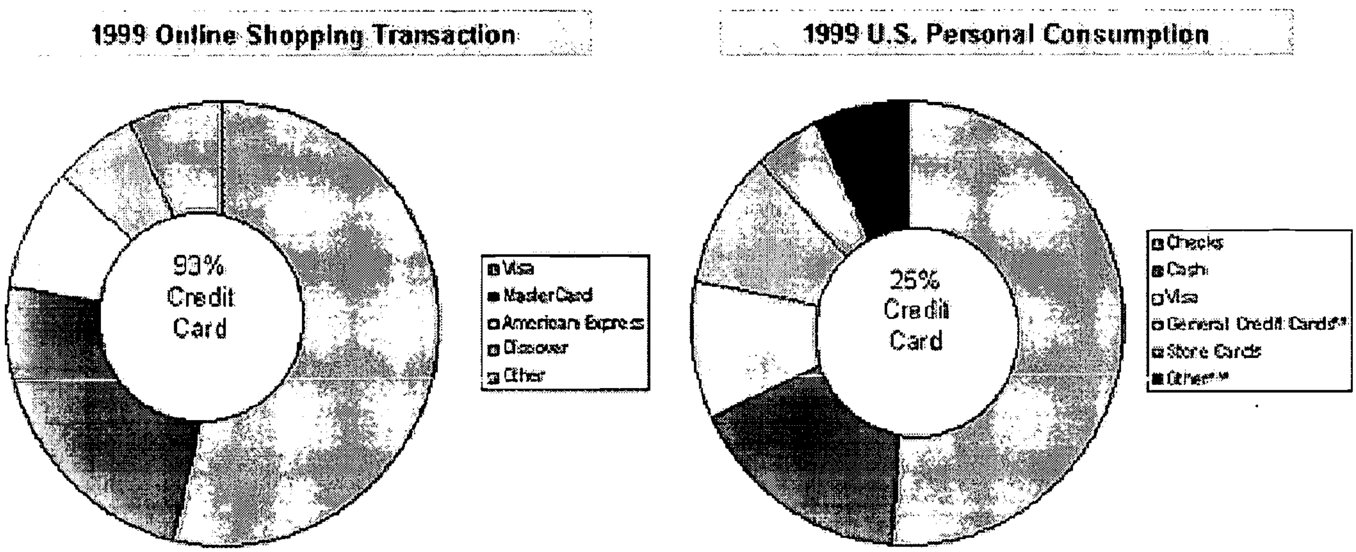
Exhibit 8
ISP Trends



The Challenge to the Establishment

Electronic commerce will only attain the goals to which its pundits aspire if it develops it's own legacy. The first generation of e-commerce payment solutions, for example, has been less than successful. In part this can be attributed to the legacy they have inherited. The legacy of systems (technology, infrastructure, cost and pricing), of business structure (multinational associations of thousands of banks) and attitudes (management and consumer attitudes and habits) to which they have been anchored. In 1999, 93% of online shopping transactions were paid for by credit card compared with 25% of all US personal consumption expenditures. (Source: The Industry Standard, 1999.)

How Purchases are Made Online



For VISA this is as much a problem as a benefit. e-commerce represents less than 5% of VISA's revenue but results in over 50% of charge-backs. Further, Visa must deal with the legacy described above, not the least of which is the legacy of attitude. Neither managers nor consumers change their behavior overnight, as is demonstrated by the 40% or so of Internet users in the US who state that they feel discomfort using, or are unwilling to start using, a credit card on the Net. This may not be an entirely logical fear; many of them read credit card numbers to strangers and computers over the telephone, but the world of the Internet has not yet earned consumers' trust. Apparently, nor have credit cards in many markets. The current profile of online purchasing doesn't leave much room for the huge percentage of the world's population that does not own a credit card. The average Japanese citizen may have four and half credit or debit cards in his pocket, but many people who do not carry "plastic" fall in the target demographics of e-commerce. Young people, for example, and the Chinese. And it's not just the developing countries that resist adopting credit on the Internet. In Australia one of the major ISP operators reports that one third of its subscribers pay monthly subscriptions for Internet access by mailing a check or by cash at the local telephone store.

The Opportunity: Disintermediation of the Financial Services Industry

In a recent paper entitled "The Demise of Banks and Credit Cards in the e-commerce Economy", Ron Erickson, Chairman of eCHARGE wrote,

"A significant opportunity exists to fashion a solution that leverages the advantages and power of the Internet while at the same time responding to the consumers' demand for choice, empowerment and a trusted medium. " (4)

The opportunity to which he is referring is to build the third generation of payment vehicles. Erickson claims that this next generation instills fear in the hearts of banks and conventional credit card issuers. Power in the marketplace, he claims, derives from customer relationships. How big is your customer database? How many eyeballs do you have? How many transactions can you facilitate?

Who is lurking in the wings, ready to provide the next generation of simple, trusted, private alternative solutions to facilitate transactions between e-commerce businesses and consumers.

- Who owns a larger database of merchants and consumers than the credit card companies?
- Who owns the global channel for interactive, transaction-based business and consumer commerce?
- Who has the most ubiquitous system of billing and collection?
- Who is the most trusted company in many households? The most trusted brand? The most promptly paid bill?
- Who needs to change its basic business from commodity to value added competitive service?

The answer, of course, is the telephone companies. What I am telling you is that e-commerce needs YOU! Telcos have many assets, tangible and intangible, which can be leveraged to position you as the leaders in electronic commerce.

1. You own direct, dependent relationships with everyone. More people than any other commercial activity. More than bank accounts! More than credit cards.

2. The databases you possess exceed those of credit cards and banks by orders of magnitude.

3. The relationship between you and your customers is built on trust. You provide what has been shown by research to be the most trusted service. Telephone service is perceived as essential, used in emergency, friendly. Telcos are, *and need tools to remain*, the trusted third party.

4. While undergoing deregulation you are opening up to competition. You and your competitors are seeking value added services to reinforce and even reinvent the relationship with customers.

5. Your most important asset is your billing infrastructure. There is cheaper bandwidth, but no better billing infrastructure.

6. You know the payment business especially the ex-PTTs. You sold stamps, money orders and bonds. Some even had (still have) banking licenses. It is not a great stretch to imagine these skills being leveraged in the Internet commerce space after all most consumers dial up the Internet on their telephone.

7. Most of you own ISPs or will do soon, and you provide web development and hosting services, e-commerce platforms.wholesale business opportunities which are increasingly important to you.

8. You know your customers' credit and payment histories. This is a major asset that can be leveraged in e-commerce.

9. You are the most attractively positioned player in e-commerce. Of course you need partners to help you to respond in Internet time to the challenges and opportunities of e-commerce. That's why eCHARGE is focussing on revenue sharing partnerships with you.

10. You should email me at hthomas@eCHARGE.com.

So far, real world brick and mortar enterprises have dominated the Internet e-commerce payments market. Banks and Credit card companies are struggling to understand the e-commerce revolution, as they struggle to recreate themselves in the new order. They struggle under a burden of legacy. They are ripe for disintermediation. And there is no better catalyst for this than telcos. And not just traditional telcos. Cable companies, CLECs, utilities, wireless providers and many others who have the muscle *and the agility* to leverage it will exploit this opportunity

There is a profound change coming. Banks and credit card companies will be the victims. Companies such as eCHARGE, joining forces with our telco partners, will succeed by leveraging the marriage of our new e-commerce solutions with your assets and by adapting adroitly to the new way. Together we are positioned to share in a piece of the biggest opportunity that has come our way since Alexander Graham Bell and Tom Watson first established interpersonal communication across a piece of copper wire one hundred and twenty five years ago.

References.

1. Business-to-Business Commerce: The Internet Evolution. Hilary Bryn Thomas. In NetSuccess. Ed: Christina Ford Haylock and Len Muscarella. AdamsMedia (1999).
2. Challenges to the Network: Bernard Lanvin UNETAD Presentation to WTO (Sept. 1999)
3. Lanvin. Op cit.
4. The Demise of Banks and Credit Cards in the e-Commerce economy. Ron Erickson. In Electronic Commerce Advisor. (Sept/Oct 1999)

Biography

Hilary Thomas

Hilary Thomas is an interactivist. She has been involved in interactive services and electronic commerce for twenty five years. In the pioneering days of viewdata and Minitel she consulted to European and Asian PTTs, North American telcos, publishers and electronics companies, and others experimenting with the precursors of the world wide web. For seven years she was President of France Telecom's Minitel companies in North America, establishing business relationships for France Telecom with LDC's and RBOCs. In 1988 she led the team which launched the world's first fully electronic bill presentment, payment and settlement solution for consumers. Since leaving France Telecom in 1992 she has consulted to many e-commerce companies, both large, established enterprises and Internet start-ups. In February 1999 she joined one of these start-ups, becoming Vice President of International Business Development for eCHARGE Corporation, a Seattle-based company offering global payment solutions for advancing technologies.

A Developmental Strategy for E-Commerce in Korea

Sang-Chul Lee, Myung-Jun Lee and Sung-yon Hwang

I. Study Purpose

The World Wide Web has been a vital medium in popularizing the use of the Internet since it first started in 1993. Access to computers and the Internet has been soaring worldwide ever since. The web has now not only revolutionized the basic infrastructure for the popular uses of the Internet but greatly contributed to increasing e-commerce on the Internet. E-commerce is mostly likely to provide enterprises, especially the venture-type, with an opportunity for global business.

The Internet is greatly influencing the existing marketing. On-line marketing is changing the way people shop and ship. E-shopping makes it faster, cheaper and easier as well as more convenient. Here is an example:

It is 3:30 P.M. and I have gone (Christmas) shopping. Actually, I have not "gone" anywhere. I am sitting at my desk, discovering what a mall would look like after a neutron bomb hit. All goods, no humans. I am shopping on line. While waiting for a call back from a source in California, I send a calendar to a niece in France. Click. While on hold for an editor in Washington, I buy a sweater for a son-in-law in Montana. Click. While waiting for a ride home, an amaryllis wings its way to New York and a bird feeder to Boston. Click. Click. Within an hour and a half, with assorted interruptions, I have bought, wrapped and shipped four presents.[1]

An Internet survival event was held in Seoul, Korea in June 1999 where a bunch of people provided with a bath gown and a credit card only were supposed to sustain a 100-hour life not only by ordering the necessary food and clothes but by fulfilling a set of assigned tasks all through e-commerce. This event shows how e-commerce is no longer a novelty, even in Korea.

The Korea's Ministry of Information and Communication aims to increase the number of PCs and Internet access not only by cutting the cost of PCs but by decreasing monthly internet service charges. With 7.2 million PCs in use, only 16 in 100 people had PCs at the end of 1998 and only nine in 100 had access to the Internet. The comparable figures in the U.S. during the same period accounted for more than 50% of American households owning computers and 30% of all households having Internet access. The low figure is attributed not only to the high price of PCs but also to the high cost of using the Internet. PC prices in Korea range from 1.2 to 2.4 million won ($1000 to $2000).

The Korean Ministry of Information and Communication plans to bring PC prices down to about one million won ($800). To make the Internet more accessible to everyone, the Ministry plans to encourage PC online service providers and Internet service providers to abolish joining up fees and bring down the basic monthly charge to 4,000 won ($3) or less. A flat rate for connection to online services will be introduced as well.[2]

Many Korean enterprises have already entered e-commerce but business is not yet at a satisfactory stage. This is due primarily to a failure to develop the relevant market strategy in net commerce. As a result, this study aims at examining a marketing strategy appropriate to cyber commerce.

II. Research Problems

- First, how has the marketing strategy changed as a result of emerging e-commerce?
- Second, this study intends to examine the current marketing strategies of Korean enterprises involved with e-commerce?
- Third, this study aims at exploring marketing strategies appropriate to the e-commerce?

III. The Internet and Marketing Revolution

1. The Coming of E-Commerce

The emerging e-commerce has brought a revolutionary change to all social sectors. Cyber commerce has loomed up a new market both for enterprises and consumers as e-commerce has become a vital force coupled with the ever-increasing use of the Internet. More particularly, net commerce is favorably viewed as a form of new commerce transaction because it provides the consumers with such advantages as reduced cost, variety of choice and convenience.

Table 1 shows differences between e-commerce and traditional commerce. This table shows there are far many more advantages to e-commerce compared with the traditional terms of commodity distribution, business space and time, sale base and procedure, marketing activities, customer response and seed money.

<Table 1> Comparison of On-line and Traditional Transaction

	Traditional	**On-line**

Distribution	• Enterprise Wholesale Retail Customer	• Enterprise Customer
Region and Time	• Limited to a few regions • Time Constraint	• Unlimited globally • 24 hour
Base and Method	• Market Place • Display	• Market space • Information
Customer Information	• Salesman • Reinput of information	• On line • Digital data
Marketing Activity	• One-way Marketing	• One-to-One, Internet marketing
Customer Response	• Delayed response • Slow response to customer needs	• Virtual response • Virtual response to customer needs
Seed Money	• Land and Building	• Internet Server and Homepage

Source : No Jae-bum, The Introduction of E-Commerce and Response of Enterprise, Samsung Economy Research Institute, http://econdb.seri-samsung.org/ows-doc/ cgi-bin/ceo_info-19960522.htm.

The Internet-based e-economy is becoming a social and economic infrastructure in an age of digital economy. The future of enterprises will depend on whether they will successfully adapt to the changing climate called e-commerce. E-commerce is characterized by its ability to connect the whole world and is regarded as a core element of national development beyond the mere scope of enterprise.

As shown in Table 2, e-commerce will bring positive effects both to the enterprise and to the consumer. Positive effects for the enterprise include decrease of fixed price and overhead cost, 24-hour business over the globe, expansion of new business domain and interactive marketing with customers while consumers are positively effected by purchasing a commodity at a lower price, virtual and convenient purchasing, variety of commodity choice, and easy access to commodity information.

<Table 2> Effects of E-Commerce

	Enterprise	Consumer
Positive	- reduced fixed overhead cost - 24 hour business over the globe - expansion of new business scope - interactive marketing with consumer	- purchase at a lower price - fast and convenient purchase - a wider selection of product - access to vast information
Negative	- reduced intermediate merchant - reduced price by over competition - penetration of global conglomerate with strong brand	- exposure and misuse of private information - difficulty in returning inferior goods - frequent transaction frauds

E-commerce can be divided into four units--business to consumer, business-to-business, business to administration and administration to consumer. In more simple terms, consumer and business, which are the subjects of e-commerce, will provide or be provided the various services and goods on the Internet.

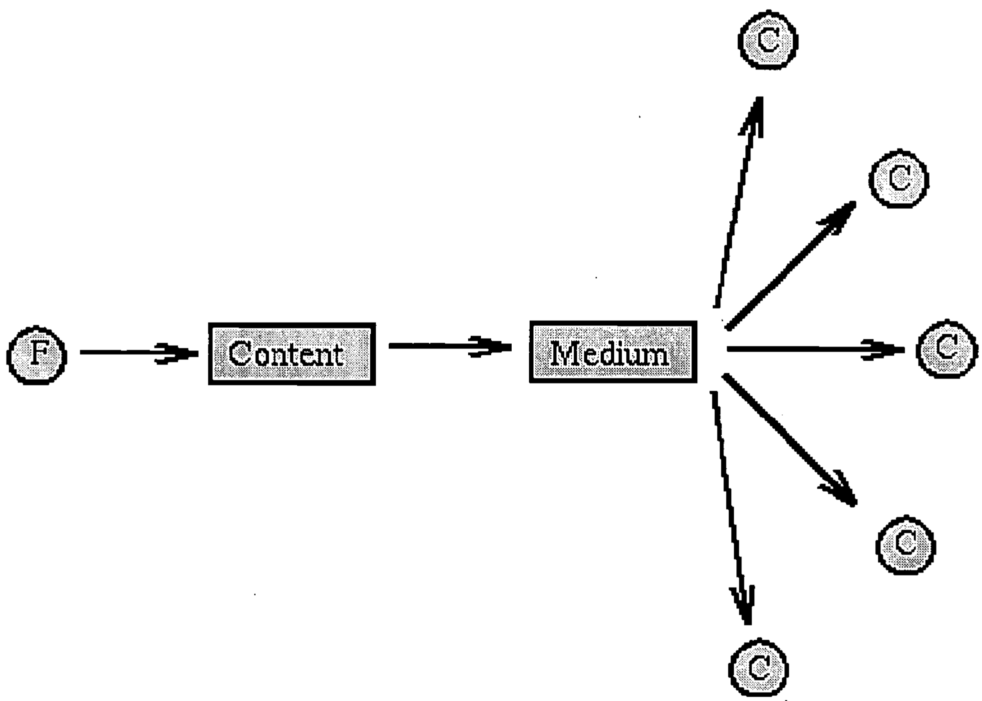
<Table 3> Kinds of E-Commerce

	Definition	Comparison
Business-to-Business	on-line product and service transaction on shopping mall	World (w)- small in E-Commerce scope Korea (k)- large in E-Commerce scope
Business - to-Consumer	transaction between provider of raw materials and enterprise, between enterprise and banks	W- expected to reach $200 billion by 2000. K - almost none

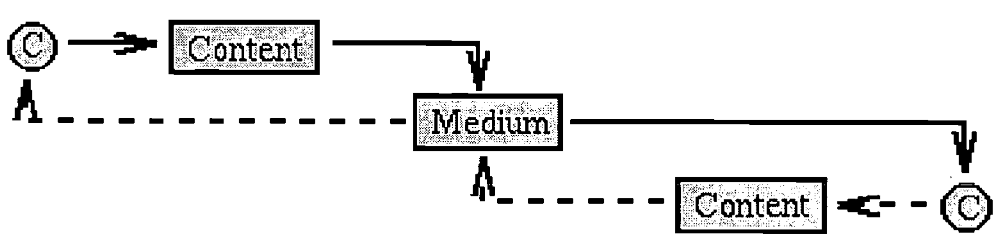
2. The Internet and Marketing Revolution

The emerging Internet and the social change thereupon greatly affected the marketing environment. The conceptual framework upon the coming of the Internet and the subsequent change of the marketing environment is shown in the study of Donna L. Hoffman and P. Novak.[3]

<Figure 1>
Traditional One-to-Many Marketing Communications Model for Mass Media



<Figure 2>
Model of Marketing Communications for Interpersonal and Computer-Mediated Communications



<Figure 3> -
New Model of Marketing Communications in a Hypermedia Computer-Mediated Environment

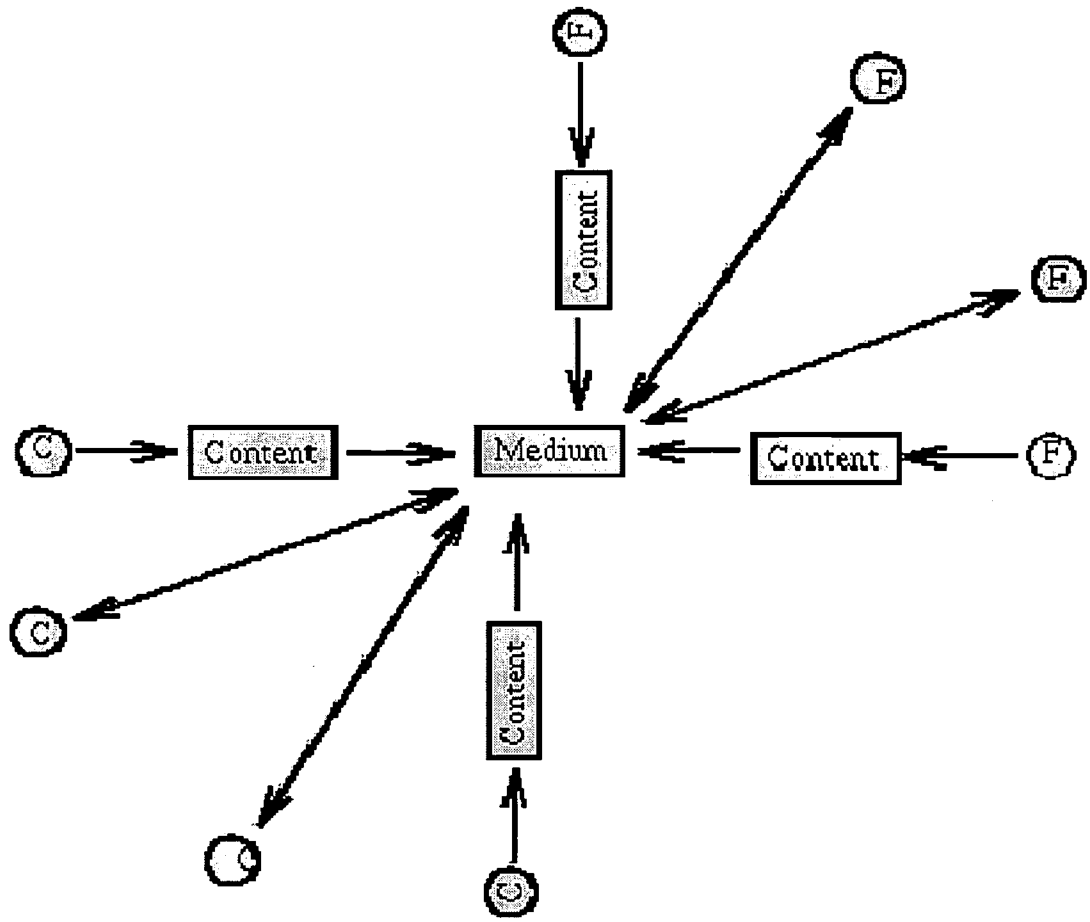
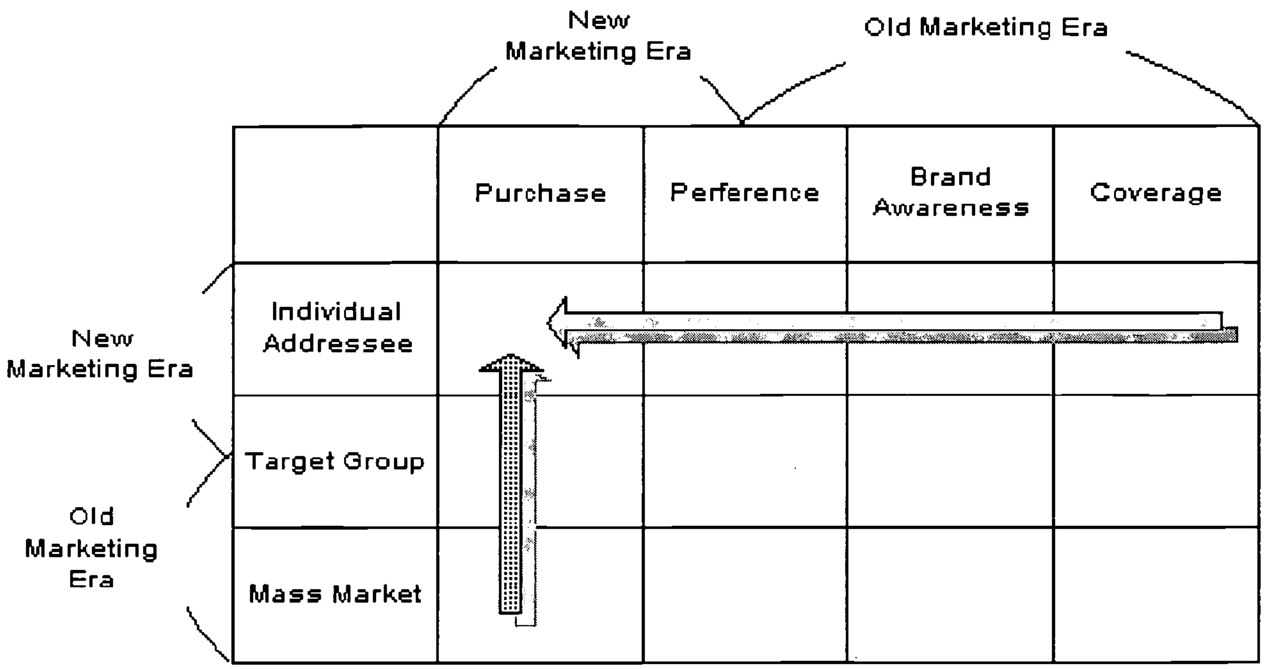


Figure 1 shows a traditional one-to-many marketing model for mass media whereby the factory sends contents through mass media one-way to the consumer. Figure 2 shows a computer-mediated communication model that is more interactive than the traditional one-to-many mass media model. Figure 3 shows a totally different hypermedia computer-mediated model by the Internet encompassing features of all media.

As examined above, a marketing strategy needs to be changed into one appropriate for Internet marketing. Paul Postma shows in Figure 4 such changes in marketing strategy. As shown in this figure, the internet-induced changed marketing strategy is more immediate and definite than the traditional marketing strategy.

<Figure 4> Old and New Marketing



That is, the internet-led marketing strategy is a marketing strategy activity that allows each individual to purchase the commodity immediately. This is because the Internet is a medium just transactional on line beyond a mere marketing medium. The marketing strategy in the internet-based e-commerce environment should appeal to each individual consumer, and therefore the strategy should be geared to inciting the desire for purchase that can be moved on the virtual act of purchasing on- line by sending the consumer an individualized and customized message.

The internet-based marketing concept most proper in this change is one-to-one marketing. The key concept of this marketing is the pursuit of a marketing activity based on information related to individual consumer under a slogan that deals with each customer differently. This marketing method is recognized as a most appropriate model in an internet-based interactive marketing environment that combined the advantages of the traditional DB-based marketing based on information related to consumers and consumer relationship marketing that increases purchasing by increasing the relationship with the consumers.

IV. The Situation of Korean Internet Marketing

1. The Situation of Korean E-commerce

The Internet-based e-commerce started in Korea in 1996 when the mega-rate department stores installed Internet shopping malls. The local conglomerates followed the department stores in installing and expanding e-commerce.

Table 4 shows a picture of e-commerce in Korea in terms of transaction value, the number of shopping malls and Internet users. The Korean e-commerce is conducted on an enterprise-to-customer base rather than enterprise-to-enterprise base. This kind of e-commerce practice is different from that of the worldwide e-commerce trend. However, e-commerce based on business-to-business is expected to be expanded.

<Table 4 > Situation of E-Commerce

		98	99	2002	
Domestic (Korea)	Transaction scale (100 million won)	100-150	350-1,000	2,100-2,721	B-to-C
	Number of Shopping malls	170-400	1,000-1,500	5,000	
	Number of Internet users (10 thousand)	310-341	525-600	1,900	
World	Transaction scale (10 million US $)	204-430	350-460	2940-4250	B-to-B
	Number of Internet users (100 million)	1-1.25	2	3.2	3.4

Table 5 shows a picture of major shopping malls in Korea including Hotel Lotte, Interpark, Hansol CS Club, Metaland, Neogate and Jong-Ro Book Center. As e-commerce marketing increases, consortiums exclusively dealing in e-commerce are booming in Korea. Table 6 shows major consortiums.

<Table 5> Major Shopping Malls in Korea

	Business	URL
Hotel Lotte	The first shopping mall in department store, gift certificates, perfume, food, etc.	http://www.internet.shopping.co.kr
InterPark	Dacom's shopping mall Net book store, shopping store,	http://www.interpark

Hansol CS Club	Home appliance, stationary, etc.	http://www.hansolcs.co.kr
Metaland	One stop shopping, one stop payment Integrated business system	http://www.metaland.com
Neo Gate	Gift, health, theme shopping, etc.	http://www.hiweb.kornet.nm.kr
Jong-Ro Book Center	Complete book site	http://book.shopping.co.kr

<Table 6> E-Commerce Consortium in Korea

Consortium	Business	Participant
Commerce Net Korea	- Domestic partner of commerce Net - Introduction of new technology in e-Commerce. - Standardization, international cooperation. - Recommendation of the related policy	Samsung Electronics, LG Telecom, Hotel Lotte, and 13 others
ICEC	- Study of core internet technology	Hyundai Information, Shinsegea, and 17 others.
Eletropia	- Development of e-commerce model	Samsung , LG , Hyun-dai and Daewoo Electronics

2. The Korean Situation of Internet Marketing

There is not much difference between the traditional Korean mass media and its on-line marketing strategy though the Korean e-commerce continues to improve. The Korean internet-commerce is conducted as part of the existing enterprise publicity rather than as an independent or venture-type of business. This means that a viable marketing strategy is not well developed as a genuine one to activate net commerce. The marketing methods of Korean e-commerce include running banner heads on major Internet sites, and registering the company's site in search engine. Recently, there is an effort to make each company's site portal.

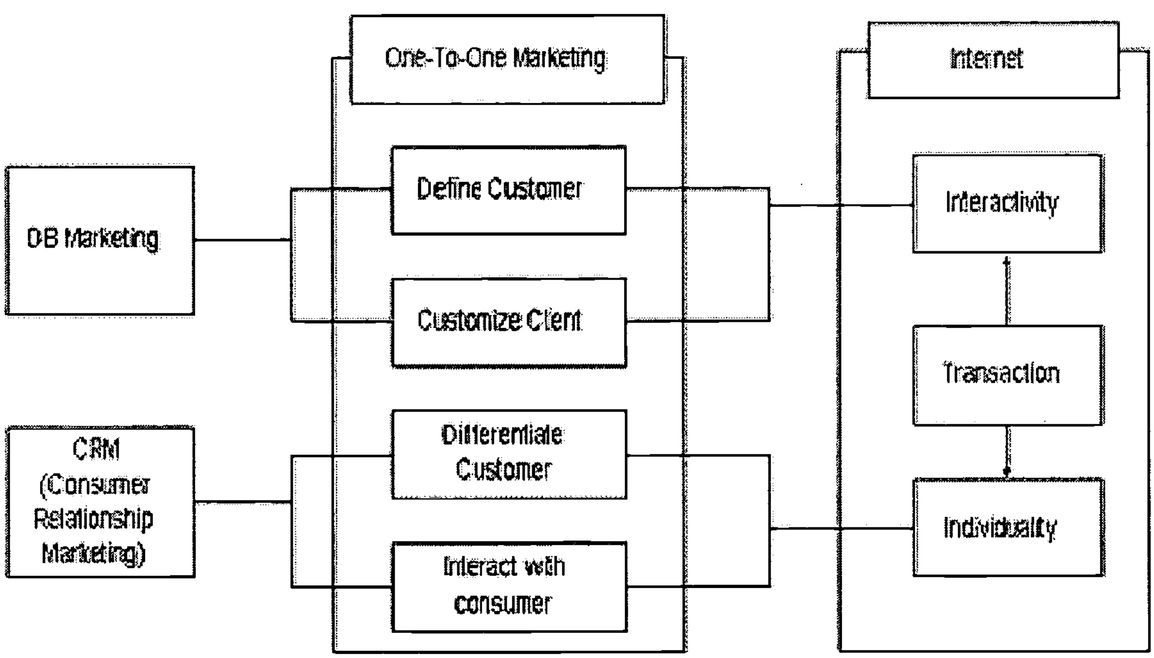
Goldbank, the first e-commerce venture enterprise in Korea, has been highly successful because it uses the basic one-to-one marketing method that sends information about common purchases or new commodities on an e-mail basis.

V. One-to-One Marketing as Internet Marketing Strategy

1. Concepts of One-to-One Marketing

The high value of Internet marketing can offer goods and services proper to individual interest and demand. The formation of a one-to-one relationship through personalization is one of the most important elements in making Internet marketing highly successful. The prime example is a function that provides customized information to the individual customer.

Figure 5 shows a picture of the one-to-one marketing concept. The most appropriate model is one based on one-to-one linkage in the e-commerce environment. As is shown in Figure 5, the one-to-one model is a developed one in which DB marketing and CRM are applicable to the Internet. This model is well suited to internet-interactivity and the individualized medium. This kind of hybrid model of DB marketing and CRM will be very effective especially in that the cyber transaction will be done on real time.



<Figure 5> Concept of One- to-One Marketing

<Table 7> comparison between One-to-One and Mass Marketing

Mass Marketing	One-to-One Marketing
Consumer Attraction	Consumer Keeping
Promotion	Consumer Service
Market Share	Consumer Share
Quality of Product	Quality of Consumer
Automation	Information
Management	Empowerment
Monologue	Dialogue

The effects of one-to-one marketing have already been proven to be highly successful as shown in cases of Amazon, CDNow, Dell, Cisco, Bank of America and Manhattan Bank. The most successful enterprises on the Internet are already adopting a one-to-one marketing system. A few Korean enterprises started to introduce the one-to-one marketing system in late 1998.

2. Technical Problems for Installing One-to-One Marketing

One-to-one marketing is a technique that provides the customer with customized product and service information by classifying the vast customer DB into purchasing features, taste and interest of the individual customer. The one-to-one marketing is different from push mail (spam mail) in that one-to-one marketing is providing the individual client with customized information while push mail is to send the same information to all customers registered in a mailing list.

In an effort to achieve the more effective one-to-one marketing, first, the product information should be sent in real time to individual clients once information about a new product appears in the shopping malls.

The various information that the customer wants should be individualized and automatically transmitted in real time to a customer's choice of pager, cellular phone or e-mail. The shopping malls should be loaded with the automation solution for one-to-one marketing that can analyze the database about each customer. Such automation solutions as DW and OLAP Tool can analyze the customer database.

Second, a customer should be able to check a product's brand even if the customer doesn't know the brand's name by loading a large quantity of synonyms. Technical problems need to be constantly addressed so as to recognize a new brand's name.

Third, one-to-one marketing solutions should be able to automatically check and provide the customer with information about a new product. In other words, the solution needs to arrange a product list, check product's price and category as well as expand and register the timing of a new product.

3. One-to-One Marketing Solution

As shown elsewhere, the one-to-one marketing solution is so complicated that very few are developed. It is the installment, checking and analysis of DB, the matching function of product and customer information, and the mailing function of various types of messages that is so complicated.

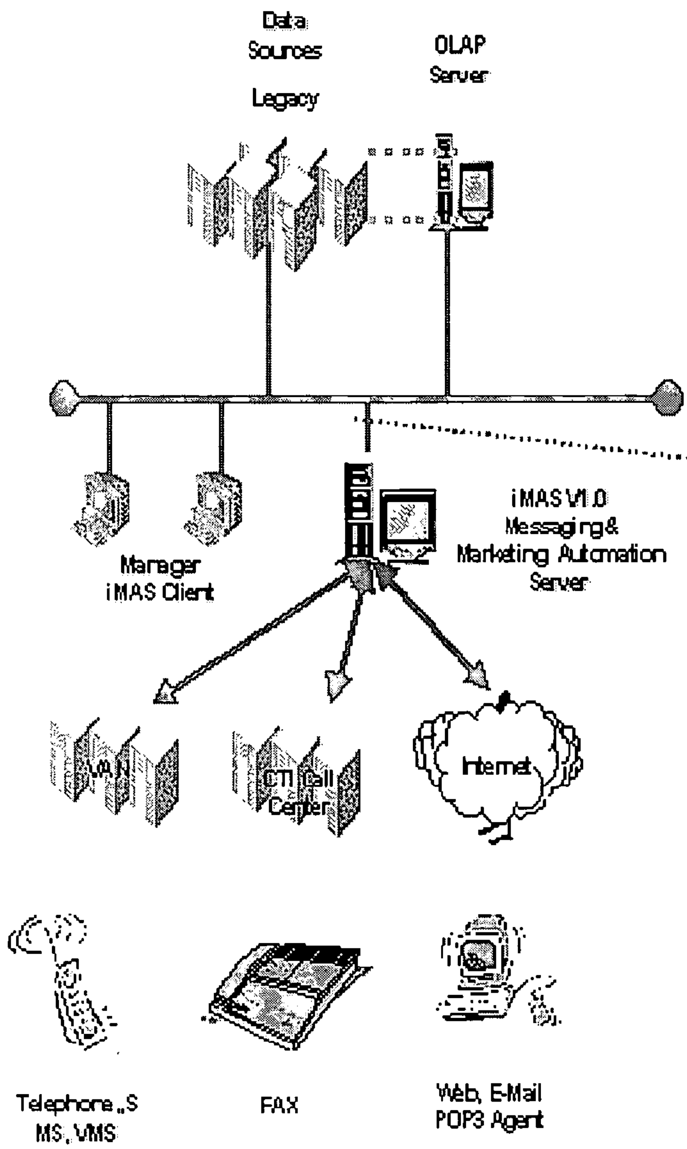
IMas was chosen as a model case for one-to-one marketing solution primarily because it is almost monopolizing Korea's e-commerce market. Also available are Broadvision by Broadvision Company and MailChute by Rubric.

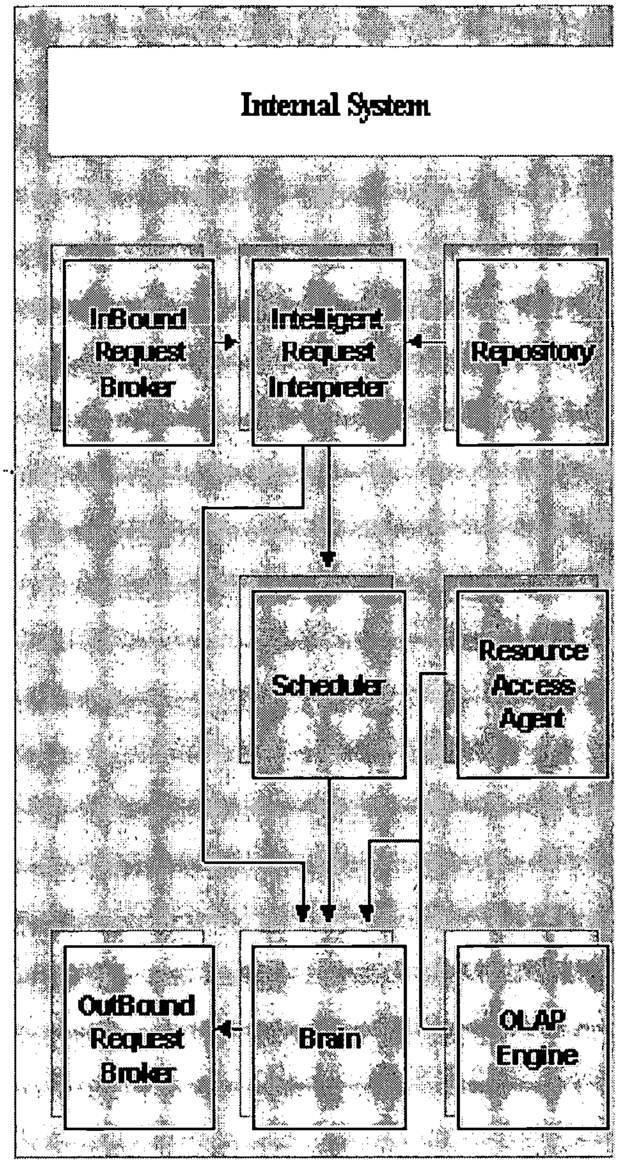
Imas seems to monopolize Korea's e-commerce market due to the unique functions as follows: the first function is to manage client member using RDBMS. Managing the profile of each client member will be the base for an analysis of future taste of customer. The second function is an automatic transmission and management of multi-media information by administering a transmission schedule. The third function is creating contents and e-mail information by utilizing a DB agent and an HTTP agent. The fourth function is to check shipping and transmission error. The fifth function is to customize information by client member using the various information and statistics of client members. The sixth function is to make a one-line survey and manage DB. The seventh function is to manage a marketing history of the customer. This function is to enable the customer to induce the new purchasing by sending the information of a new product. This can patronize a customer. The eighth function is to store and revise information. A high-speed SMTP engine needs to be loaded to install high capacity DB marketing to manage over 100,000 customers. This kind of a powerful mailing engine is especially applicable to insurance and banking companies.

Because of the aforementioned advantages, this one-to-one marketing solution is provided or to be provided to 27 companies. These include 13 companies (LG Shopping Mall, SK Business Transaction Portal, Hyundai Department, Lotte, Goldbank, SSADA. Com, Dreamline, Daewoo Motor, Kyobo Book Center, Chosun Trade, Technomart, 39 Shopping, Grand Department), 4 Dailies (Digital Chosun, Yonhap News Agency, ET News and Hankyerae), 9 banks (Enterprise Bank, Samsung Insurance, LG Insurance, Agriculture Federation, BC Card, Hankkuk Investment Trust, Samsung Stock, Hanjin Investment Stock, Sejong Stock) and Seoul City Government. The main reason that iMAS solution has so many customers in Korea is that this solution has unique functions compared to other similar solutions.

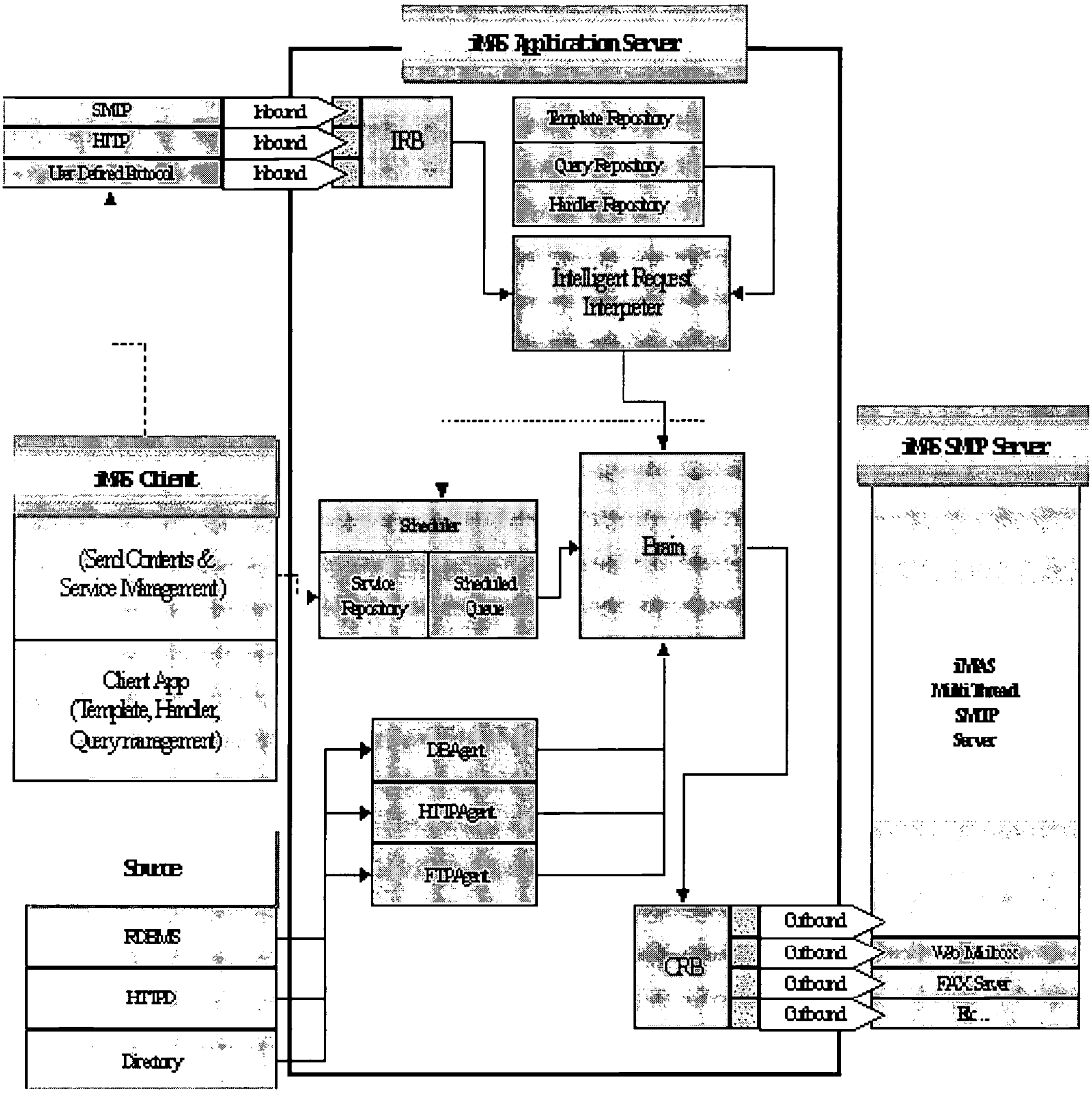
Looking at the working procedure of the iMAS solution, the solution first needs to store information about the client, then seek the client most probable to buy and send the new product information to that customer by the customer's choice of pager, cellular phone or e-mail.

<Figure 6> Working Process of iMAS





<Figure 7 > System of iMAS



VI. Conclusion

E-Commerce is rapidly emerging as a new market interwoven with a global reach. Market procedure has been transformed from a market-based transaction into a cyber-based one. This kind of rapid change has become a matter of survival rather than one of accommodation.

One-to-one marketing is a method that apply an information about customer's pattern of use and purchase to a marketing strategy. This kind of marketing strategy is not only to induce customer to purchase by providing customer with information about goods but to enhance customer intimacy.

The Korean e-commerce market is still at a rudimental stage. The major problem was due to the lack of trust from customer towards e-business enterprises primary because customers were concerned about privacy and the safe delivery of right goods that customers order.

Another problem is that the Korean e-commerce enterprises have been negligent in storing, managing, processing and effectively utilizing the various information of customers. Customers thus should have spent lots of time in searching goods what customers want.

The e-commerce is most likely to expand rapidly even in Korea in view of the phenomenal increase of internet users. The Korean cyber enterprises therefore needs a one-to-one marketing strategy effectively to cope with the rapid expansion of e-commerce.

Endnotes

[1]Ellen Goodman, "The Cyber-Christmas Spirit Isn't Quite the Realing Thing," International Herald Tribune, December 23, 1998, .98.
[2]Kim Hoo-ran, "Government Plans to Put PCs Within Everyone's Reach," Korea Herald, August 7, 1999, p.12.
[3]) Donna L. Hoffman and P. Novak , Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations, http://ecommerce.vanderbilt.edu/cmepaper.revision.july11.1995/cmepaper.html

Biography

Sang-Chul Lee

Sang-Chul Lee is a Professor of Journalism and Director of Communication Institute at Chung-ang University

Myung-Jun Lee

Myung-Jun Lee is President of Internet Marketing and Messaging Automation Solution (iMAs)

Sung-yon Hwang

Sung-yon Hwang is a Ph.D. student in Journalism at Chung-ang University

Sessions

A NEW APPROACH TO ELECTRONIC COMMERCE IN THE CROSS-BORDER ENVIRONMENT

Interconnection of Multiple Electronic Commerce Test-Beds Project in the Asia Pacific Region

(power point presentation)

Mutsuya Asano

ABSTRACT

With the advancement of technology, electronic commerce has become possible over the insecure Internet and expanded at a quantum leap. But technology alone does not solve all issues. When one places oneself particularily in the cross-border environment, one will face quite a different facets. Different are purchase behavior of consumers, cultures. legal and/or regulatory systems.

The collaborative APEC initiative of electronic commerce has been under way to identify the EC-relevant issues especially in the cross-border environment and to share the outcome through the interconnection of the EC test-beds in the APEC region. The interconnection took place first between Singapore and Japan and developed into multiple links between Japan and other APEC economies. The interconnection of multiple EC test-beds becomes far much complexed than that of just a link between two locations.

A new approach was taken, with a concept called " E-market" to cope with the complexed aspects of connecting the multiple locations of EC test-beds. This paper examines the way how to implement the multiple interconnection at a minimum cost with the improved ease of use for the end users.

INTRODUCTION

The Telecom Services Association of Japan (TELESA), non-profit organization of approximately four hundred member companies mostly engaged in Value-Added Network Services and Internet Services established a consortium to conduct a field trial of electronic commerce initiatives in the cross-border environment and to identify the EC-relevant issues. The consortium went into the APEC Telecommunications Working Group and proposed the international interconnection of Electronic Commerce Test-Beds in the APEC member economies. The project is called INGECEP (Integrated Next

Generation of Electronic Commerce Environment Project), a collaborative APEC initiative with an utmost emphasis on user trust and confidence and to contribute APEC-wide EC policy making with the outcome of the project.

The field trial of the interconnection of EC test-beds started between Singapore and Japan since July 1998. "User trust and confidence" is a key word for the INGECEP project. A number of concerns were addressed from the Japanese consumers when they were asked to participate in the project. The concerns were primarily relevant to;

1) Security over the insecure Internet

2) Proper privacy protection

3) Clear indication of terms and conditions

4) Tracking capability of delivery status

5) National language support

The INGECEP project was built to cope with those concerns. The feedback from the consumers indicated that they felt secured enough in the INGECEP project. In a sense, the objective of the field trial was successfully achieved to solve most of EC-relevant issues in the cross border environment between Singapore and Japan. However, with the growing interest in the project among APEC member economies, the number of requests was increasingly raised to interconnect to other APEC member economy's EC test-beds. In the course of discussions, it becomes apparent to resolve the new requirements for interconnecting the EC test-beds at multiple locations.

REQUIREMENTS FOR EC TEST-BEDS AT MULTIPLE LOCATIONS

In the case of interconnection to Singapore, the two test-beds were built anew solely to link between the two countries based on the agreed specifications. The candidate EC test-beds in other APEC member economies had been running independently. It would pose a threat in terms of cost to adapt the existing system in line with the interconnection specifications. The cost of development and operation to have a link with TELESA's test-bed in Japan is required to remain at the minimum level. Secondly, the existing EC test-beds were built and operated in accordance with each APEC member economy's market needs. The interconnection should not overburden them with the linkage to Japan. This leads to a certain measure to be taken so that autonomous operation could be maintained at each site and the differences of legal and/regulatory system, business practices and cultures could be absorbed somewhere through the interconnection in a loose-coupling manner. Thirdly, each APEC member economy should be able to function either as a merchant or consumer. In the case of interconnection to Singapore, Japan's and

Singapore's role is fixed to consumer and merchant respectively.

ELECTRONIC MARKET

A new approach called "Electronic Market" was taken to enlarge the scope of international interconnection of EC test-beds in the Asia Pacific region and to meet the above requirements for linkage at multiple locations with cost kept at a minimum level. The Electronic Market is a set of rules which can be applied to the international interconnection of EC test-beds, and a model vehicle to verify its effectiveness in the cross-border electronic commerce. The Electronic Market provides reliable and trustworthy paths between consumers and merchants through the following globalization, localization and directory functions so that both consumers and merchants could be relieved from the specific local peculiarity.

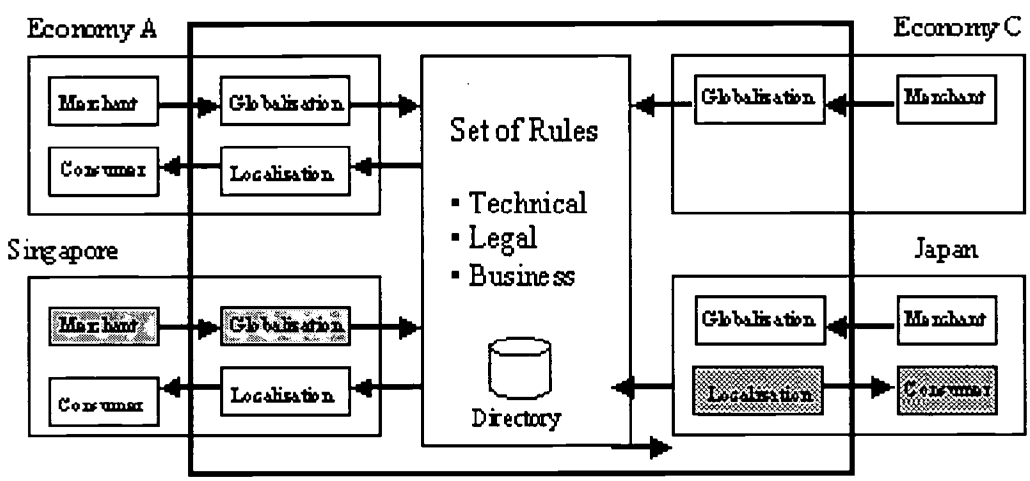


Figure-1 A concept of Electronic Market

Here is a set of rules defined for globalization functions over international interconnection.

- Consumer protection or T's and C's
- Privacy protection
- Currency
- Language
- Export/Import Restriction
- Order placement
- Money Transfer
- Logistics
- etc.

The above is not a full list of rules but to let readers know what sort of rules should be considered. The following indicates some of examples how the localization functions are implemented in accordance with defined globalization functions.

1) Consumer Protection

In the Terms and Conditions, one of important elements to consumers is a period of cooling off, i.e. a period of cancellation without any reason to return the goods after its delivery. The consumer protection system varies from country to country. No regulations at all to 7 or 15 days depending on the country. The localization function means that it is a responsibility of the consumer country to adapt to its own rule. For example, Japan TELESA sets 7 days.

2) Currency

Currency indication is determined to use either of merchant country or the US dollar. The localization function is to provide conversion from either merchant country's currency or the US dollar to the consumer country's currency. In Japan case, the conversion is made to the Japanese Yen. In addition, duty tax peculiar to the goods is also indicated.

3) Language

English is decided for use as an language. The feedback from the Japanese consumers during the interconnection test with Singapore indicates that 75 percent of end users want Japanese indication instead of English. In the Electronic Market, computerized translation capability is being offered to the Japanese consumers as one of localization functions.

4) Order placement

With the increasing number of links to multiple sites, the consumers are supposed to follow a different set of order placement procedures, which is very confusing to them. The localization function absorbs the differences and gives the consumers a single set of interface regardless of the country or test-bed site.

TEST PILOT SYSTEM

The test pilot system was developed based on the concept of "Electronic Market" as shown below.

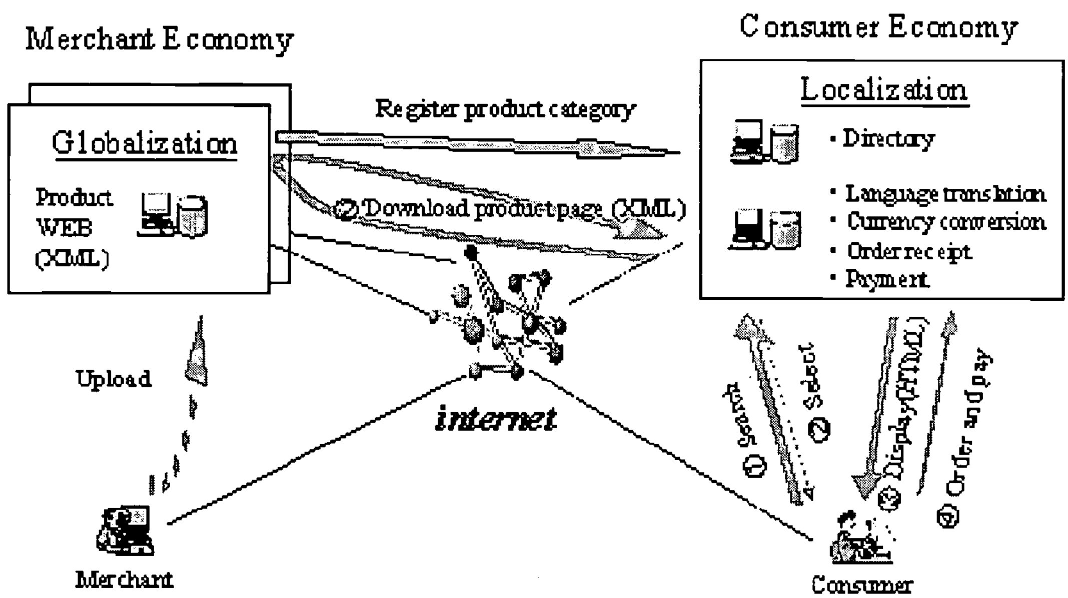


Figure-2 Test Pilot System

The product information in English is written in XML (eXtended Mark-up Language) and put on the Web within the merchant country. When the consumer browses and selects a product in particular in the consumer country, the localization function gets initiated to download the most updated product descriptions and its price from the merchant country's Web, translate into Japanese with the computerized translation capability, convert the product price into the Japanese Yen, calculate duty tax for proper indication and display them all to the consumer's PC.

ADVANTAGE

The Electronic Market has a number of advantages over the past system both from consumer's and merchant's perspective as indicated below.

1) Consumer's benefits

- User trust and confidence will be enhanced because there is an organization to provide the localization functions in the consumer country's jurisdiction and to act as an agent of consumers to place an order.
- User convenience or ease of use will be improved through the localization functions such as a single set of interface for order placement and pay settlement. What's more, user feels comfortable with Japanese indication through computerized translation capability and conversion to Japanese currency being offered.
- User is able to enjoy shopping for the goods which is not available in the local market.

2) Merchant's benefits

- Merchant is able to enter easily into the foreign market
- Merchant is relieved from foreign regulations and foreign market peculiarity
- Cost might be kept at the minimum level

PARTICIPANTS IN THE INGECEP PROJECT

There are two APEC member economies actually in links with Japan. CNK (Commerce Net Korea) and MECC (Malaysian Electronic Commerce Consortium) run their own test bed and has connected to TELESA's test-bed since last December. It is planned to increase the number of shops and goods in each country gradually. Singapore is under assessment to upgrade into the Electronic Market method. There are more and more APEC member economies getting interested in this project. They are Taiwan, Peru, Thailand and the USA.

FUTURE PLAN OF ACTIONS

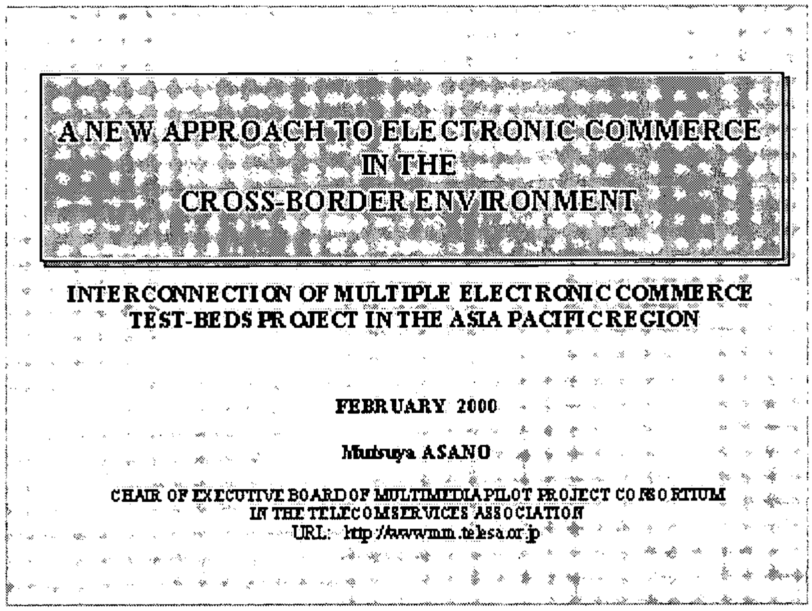
Here is the current plan of actions in the near future for the INGECEP project.

- Link more with other APEC member economies and assess the new pilot system based on the concept of Electronic Market

- Enlarge the scope of Electronic Market or develop a set of rules jointly with participating economies

- Joint study to establish the way how to interwork the distributed directory to improve the user convenience.

Two months have passed since the test pilot system started with Korea and Malaysia. It is too early to assess the results, but a favorable feedback is already pouring in from the end users. We are encouraged with the current feedback. We welcome all parties concerned to join the project and jointly develop a set of rules for globalization functions to foster the global electronic commerce. The more the participants join, the more robust set of rules in the global electronic commerce.


A NEW APPROACH TO ELECTRONIC COMMERCE
IN THE
CROSS-BORDER ENVIRONMENT
INTERCONNECTION OF MULTIPLE ELECTRONIC COMMERCE
TEST-BEDS PROJECT IN THE ASIA PACIFIC REGION
FEBRUARY 2000
Mutsuya ASANO
CHAIR OF EXECUTIVE BOARD OF MULTIMEDIA PILOT PROJECT CONSORTIUM
IN THE TELECOMSERVICES ASSOCIATION
URL: http://www.mm.telesa.or.jp

Slide 1 of 15

BACK GROUND

- ELECTRONIC COMMERCE:
  TECHNOLOGY MAKE EC POSSIBLE
- WHAT ABOUT IN THE CROSS-BORDER ENVIRONMENT?
  DIFFERENT ARE;
  - LEGAL AND REGULATORY SYSTEM
  - PURCHASE BEHAVIOR
  - BUSINESS PRACTICE
  - CULTURE
- REDUCE A GAP TO RELIEVE DISTRUST BETWEEN MERCHANT AND CONSUMER IN THE CROSS-BORDER ENVIRONMENT

Slide 2 of 15

INT'L INTERCONNECTION OF EC TEST-BEDS PROJECT

- INGECEP: INTEGRATED NEXT GENERATION OF ELECTRONIC COMMERCE ENVIRONMENT PROJECT
- WHAT: A COLLABORATIVE PROJECT IN THE ASIA PACIFIC (APEC) REGION
  - TO ACTUALLY INTERCONNECT EC TEST-BEDS
  - TO PROMOTE GLOBAL ELECTRONIC COMMERCE THRU FIELD TRIAL
- PROPOSE: - IDENTIFY EC-RELEVANT ISSUES IN THE CROSS-BORDER ENVIRONMENT
  - CONTRIBUTE TO EC POLICY MAKING WITH THE TEST RESULTS
- FOCUS: USER TRUST AND CONFIDENCE
- ACTUAL INTERCONNECTION: WITH SINGAPORE FROM OCTOBER 1998

Slide 3 of 15

OUTCOME

ISSUES OR CONCERNS	SURVEY BY NIKKEI MULTIMEDIA	SURVEY FOR NGECEP PARTICIPANTS
SECURITY	35%	0%
QUALITY OF GOODS	9%	5%
DELIVERY OF GOODS	6%	5%
PRIVACY PROTECTION	4%	0%

Slide 4 of 15

OPEN ISSUES

- DISPUTE SETTLEMENT
- PRODUCT LIABILITY
- REFUND FOR TAX AND DUTY
- NATIONAL LANGUAGE SUPPORT

Slide 5 of 15

NEW REQUIREMENTS TO LINK WITH MULTIPLE SITES

COMMON TO ALL PARTICIPANTS:

(1) EQUAL PARTNERSHIP

(2) EASY TO CONNECT WITH COST AT A MINIMUM

(3) RESPECT AUTONOMY (INTERWORKING FROM TIGHT TO LOOSE COUPLING)

Slide 6 of 15

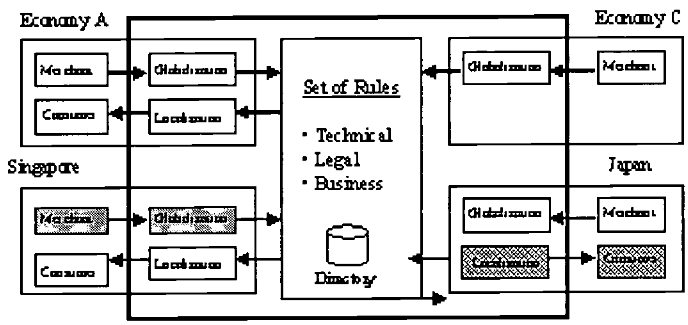
FACTS TO BE TAKEN INTO ACCOUNT

VARIES FROM COUNTRY TO COUNTRY:

* CONSUMER PROTECTION SYSTEM
* PRIVACY PROTECTION POLICY
* PAYMENT SYSTEM
* DUTY AND TAX RATE
* CURRENCY
* LANGUAGE
* CULTURE/CONSUMER PURCHASE BEHAVIOR
* BUSINESS PRACTICES, etc.

Slide 7 of 15

A NEW APPROACH "ELECTRONIC MARKET"



Slide 8 of 15

GLOBALIZATION vs LOCALIZATION

GLOBALIZATION: A SET OF RULES TO AND FROM INTERNATIONAL LINKS

LOCALIZATION: ABSORB DIFFERENCES AND ADAPT TO LOCAL ENVIRONMENT

A SET OF RULES

* CONSUMER PROTECTION (T'S AND C'S)
* PRIVACY PROTECTION
* CURRENCY (MERCHANT CURRENCY OR US$)
* LANGUAGE (ENGLISH)
* EXPORT/IMPORT RESTRICTION
* ORDER PLACEMENT
* MONEY TRANSFER
* LOGISTICS, etc.

Slide 9 of 15

LOCALIZATION FUNCTIONS

Ex.

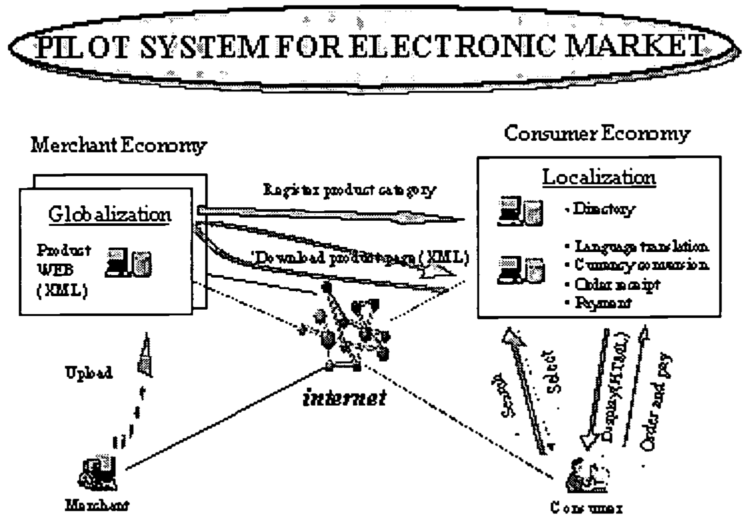
(1) COOLING-OFF (A CANCELLATION IN T'S AND C'S)
7 DAYS FOR JAPAN

(2) CURRENCY
CURRENCY CONVERSION TO JAPANESE YEN WITH TAX AND DUTY RATE

(3) LANGUAGE
COMPUTERIZED TRANSLATION CAPABILITY FROM ENGLISH TO JAPANESE

(4) ORDER PLACEMENT
A SINGLE ORDER PLACEMENT PROCEDURE FOR JAPANESE CONSUMER

Slide 10 of 15



Slide 11 of 15

ADVANTAGE TO CONSUMER

1. TRUST AND CONFIDENCE
   * SINGLE POINT OF CONTACT (TO ACT AS AN AGENT WITHIN THE CONSUMER COUNTRY'S JURISDICTION)
2. USER CONVENIENCE
   * A SINGLE POINT OF INTERFACE (i.e., ORDER PLACEMENT AND PAYMENT)
   * LOCALIZATION (e.g., LANGUAGE, LOCAL CURRENCY, TAX, PAYMENT)
3. ATTRACTIVENESS
   * A VARIETY OF PRODUCTS FROM APEC ECONOMIES

ADVANTAGE TO MERCHANT

- EASY TO ENTER INTO FOREIGN MARKET
- RELIEVED FROM FOREIGN REGULATIONS
- RELIEVED FROM FOREIGN AND PARTICULAR MARKET SITUATION
- SMALL COST FOR INTERNATIONAL LINK

Slide 13 of 15

INGECEP PARTICIPANTS

- JAPAN: TELESA (Telecom Services Association)
- KOREA: CNK (Commerce Net Korea)
- MALAYSIA: MECC (Malaysian Electronic Commerce Consortium)

- INTERESTED IN THE PROJECT
  - SINGAPORE (Update to Electronic Market)
  - TAIWAN
  - PERU
  - THAI
  - USA

FUTURE PLAN OF ACTIONS

1. LINK MORE WITH OTHER APEC MEMBER ECONOMIES AND ASSESS THE NEW PILOT SYSTEM
2. ENLARGE THE SCOPE OF ELECTRONIC MARKET OR A SET OF RULES JOINTLY WITH PARTICIPATING ECONOMIES
3. JOINT STUDY TO ESTABLISH THE WAY HOW TO INTERWORK THE DISTRIBUTED DIRECTORY

Slide 15 of 15

Biography

Mutsuya Asano

Mutsuya Asano He graduated from Waseda University where he majored in the Electrical Engineering and joined IBM Japan in 1970. He is Director of Telecommunications Relations of IBM Japan in charge of issue management in the telecommunications area not only in Japan but for the whole Asia Pacific region. With the establishment of the consortium in 1996, dealing with Electronic Commerce project in the Telecoms Services Association in Japan, he has been appointed Chair of Executive Board of the organization.

Sessions

Satellites & Submarines

Related Sessions

M.1.4 Lessons in Satellite Planning
M.2.4 Submarine Round Table
M.3.4 Submarine Finance
T.1.4 Submarine Networks
T.2.4 Launch Services
W.2.4 GMPCS Panel
W.3.4 Satellite Wireless Communications

T.1.4 Submarine Networks

Tuesday 1 February, 830-1000
Location: Honolulu Suite

Chair:
RAYNALD LECONTE, Director, Submarine Systems, France Telecom, France

T.1.4.1
KATSUTOSHI TAMURA, General Manager, Submarine Networks Business Division; TATSUO MATSUMOTO, Senior Director, Submarine Telecommunications Engineering Division and COLIN ANDERSON, Manager, Business Development, Submarine Networks Sales & Marketing Department, International Telecommunications Business Group, Fujitsu Limited, Japan
Tera-bit Optical Submarine Networks - Meeting the Market's Capacity Demands at the Lowest Overall Cost

T.1.4.2
HAJIME OHTA, Assistant General Manager, Submarine Systems Division, Transmission Operations Unit; MAKOTO SAITOH, Engineering Manager, Submarine Systems Manager; and KOJI TAKAHASHI, Assistant General Manager, 1st Asia Division, NEC Corporation, Japan
Undersea Network Planning and Ultra-High Speed Submarine Technologies for Evolution of Asia-Pacific Region in Brilliant 21st Century

Disscusant:
DAVE FOOT, Cheif Executive Officer, Global

Marine Systems, United Kingdom

Sessions

Tera-bit Optical Submarine Networks - Meeting the Market's Capacity Demands at the Lowest Overall Cost

Katsutoshi Tamura, Tatsuo Matsumoto and Colin Anderson

Power Point Presentation (html version) (download file)

Abstract

The demand for international traffic capacity continues unabated into the year 2000, and telecommunications network vendors are working to introduce the most cost-effective technologies and network architectures to meet the carriers requirements for both capacity and cost, in the earliest possible timeframe.

Much of the discussion about submarine telecommunications networks is focussed on maximum capacity. It is true that there is what seems to be a never-ending quest for higher system capacity, driven by the demands of Internet traffic. And fortunately the same technological revolution that has enabled low-cost computing power to fuel the Internet, has so far allowed us to increase the capacity of both terrestrial and submarine optical communications systems, with ever-decreasing costs per traffic unit.

However, while there is still a major emphasis on capacity, when faced with various new technologies, we need to compare the relative costs to decide which technologies to adopt in order to achieve lowest costs for future submarine telecommunication systems.

In this paper, we try to look at the price implications as well as the capacity implications of the various technology options.

We look briefly at the recent history of submarine international telecommunications links, and at how various leading edge technologies have already made a huge impact on the capacity per dollar invested in submarine cable networks. We then look at the latest enabling technologies, and evaluate what their impact might be on capacity and price trends, on a cost per unit capacity basis.

Introduction

Typically, an optical submarine network comprises terminal transmission equipment which transmits several channels of data on different optical wavelengths to the far-end via a string of cascaded optical amplifiers in the submerged part of the network.

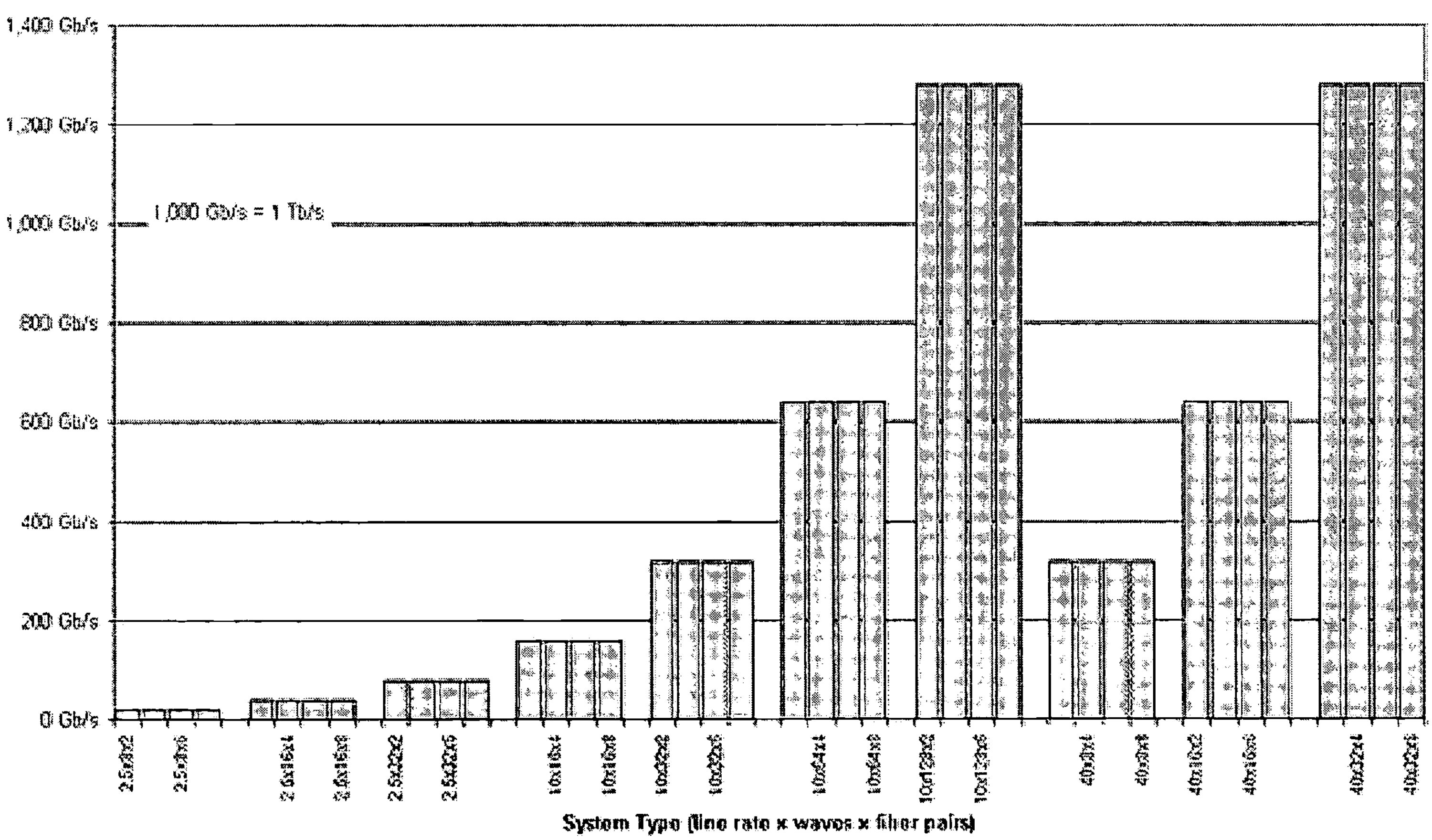
The advent of the erbium doped-fiber optical amplifier (EFFA) has enabled this architecture, and has revolutionised WDM telecommunications networks including those of submarine cable systems.

First studied in the mid-1960's, doped-fiber optical amplifiers became a practical reality the laboratory in the mid-1980's; and a practical device in telecommunications networks in the early 1990's. Despite what may seem a slow start, the development and commercialisation of erbium based optical amplifiers in the latter part of the 1990's has been dramatic.

From optical submarine networks one wave of 2.5Gb/s or 5 Gb/s in 1995, we are now at the stage of installation of systems with 32 waves of 10 Gb/s (320Gb/s per fiber), and systems with 64 waves per fiber will be commercially available in the next 1 or 2 years.

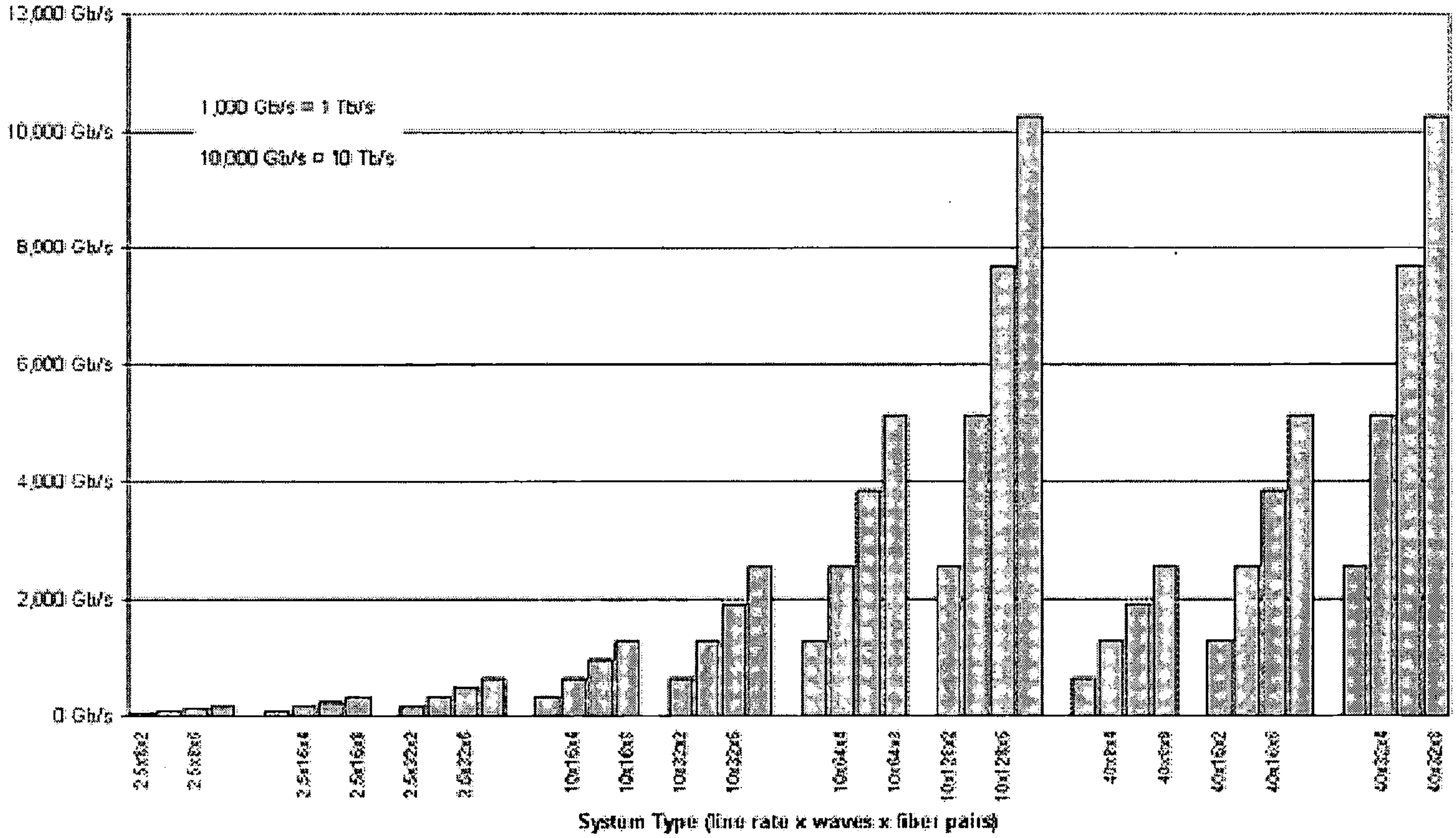
In the foreseeable future, we can expect that systems with 128 waves of 10 Gb/s utilising both C-band and L-band optical amplifiers in parallel will become a reality, and that systems with N waves of 40 Gb/s will follow. This gives a possible capacity per optical fiber as shown in Figure 1.

Figure 1: Transmission Capacity per Optical Fiber
(8 waves x 2.5Gb/s ~ 32 waves x 40Gb/s)



Submarine cable system currently employ up to 4 fiber pairs for the submerged plant, and systems with up to 8 fiber pairs will be commercially available by 2002. Hence the total capacity per cable for the various technologies is as shown in Figure 2.

Figure 2: Transmission Capacity per System
(8 waves x 2.5Gb/s ~ 32 waves x 40Gb/s, 1 ~ 8 fiber pairs)

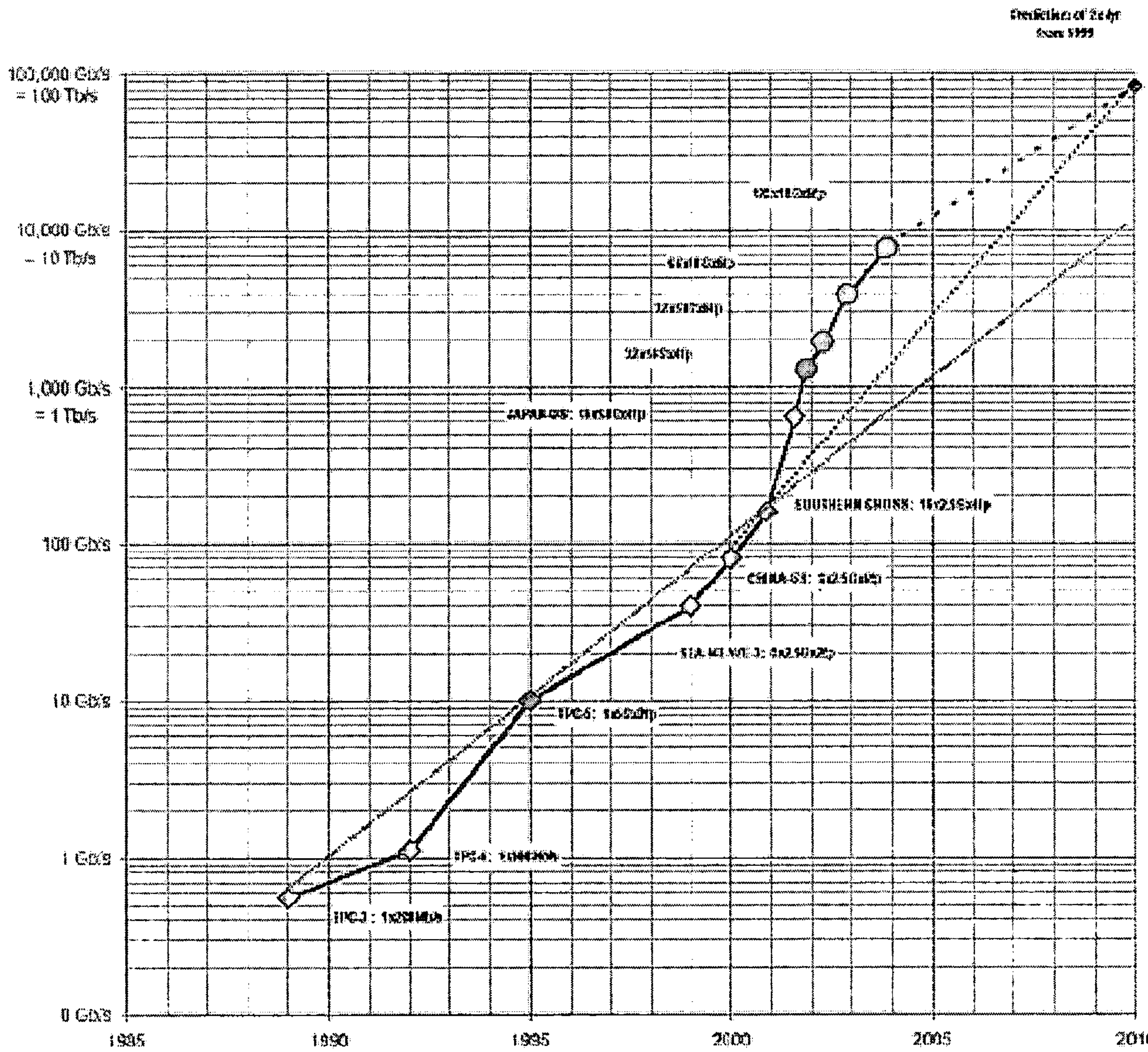


If we look at the history of total capacity against time for submarine cable system deployed from around 1989 to the present, we can plot the data shown in Figure 3.

From the TPC-3 cable with a capacity of 560 Mb/s (2 x 280Mb/s), to the Japan-US cable, at 16 x 10Gb/s x 4 fiber pairs (640 Gb/s), we see that the greatest rate of change has been in the near past when 10Gb/s line rate DWDM was first introduced.

But extending the graph to include the foreseen technology (described below), and also including a prediction for the year 2010 based upon the popular 'rule-of-thumb' growth rate of "two times per year" starting from 1999, then the expected growth rate in technically achievable capacity the next few years will probably be somewhat less in the 1999 - 2001 period.

Figure 3: Transmission Capacity per System Against Time (History and Prediction 1989 ~ 2010)



Price History

System Price Breakdown

It is informative to look at the way in which the breakdown of the price of submarine networks has been changing over recent years, while this capacity expansion has been taking place.

In the past, a large percentage of the price of submarine cable systems was in the submerged plant. However with the increase in number of waves of WDM systems, the relative cost of the submerged plant has decreased, and the relative cost of the terminal equipment has increased dramatically. In addition, the floor space requirement for the terminal equipment has increased dramatically, which has impacted the customer's overall system deployment costs.

For a previous system with up to 8 waves of 2.5Gb/s, typically 50 % ~ 65 % of the price was in submerged plant. The fully equipped terminal equipment comprised 8 % ~ 25 % of the total price, (depending on the average length of span between terminal stations with the Submarine line terminal Equipment (SLTE)).

At present, for a long-haul WDM network utilising 32 waves at 10 Gb/s per fiber, only 20 % ~ 35 % of the total price of the fully-equipped system is in the submerged plant. But when fully equipped, the terminal equipment typically comprises around 50 % ~ 60 % of the total price.

For a 'short haul' network with several landings and hence several shorter submarine links between them, using 32 waves of 10 Gb/s per fiber, the cost price of submerged plant will be typically 20 % ~ 40 % of the fully-equipped system, and the fully equipped terminal equipment represents about 50 % ~ 65 % of the total price.

These changes in the relative cost of terminal and submerged equipment will continues as long as the number of waves of the existing 10 Gb/s line rate increases, with the terminal stations equipment comprising above 70 % of the total system costs in some cases.

Overall Price per Unit Capacity

In addition to the changes in the relative breakdown of the overall price, it is certainly true that the total price per unit capacity ("price per bit" or "price per STM-1", etc) has decreased rapidly in recent years. In fact this drop in price has been one of the factors which has stimulated a recent an increase in deployment of submarine systems. The Internet has provided the necessary traffic demand, and the newer transmission technologies have provided a price per bit which has been decreasing at a greater rate than the rate of decline in selling price of international circuit capacity.

A simple analysis of existing networks recently deployed, shows that with the technology migration from 8 waves x 2.5 Gb/s to 16 waves x 2.5 Gb/s, the price per STM-1 for fully equipped systems has dropped by more than 40 %.

Figure 4: System Price per STM-1 over 2,000 km for Various Transmission Technologies (8 ~ 32 x 2.5 Gb/s, 16 ~ 32 x 10 Gb/s, 2 ~ 8 fiber pairs)

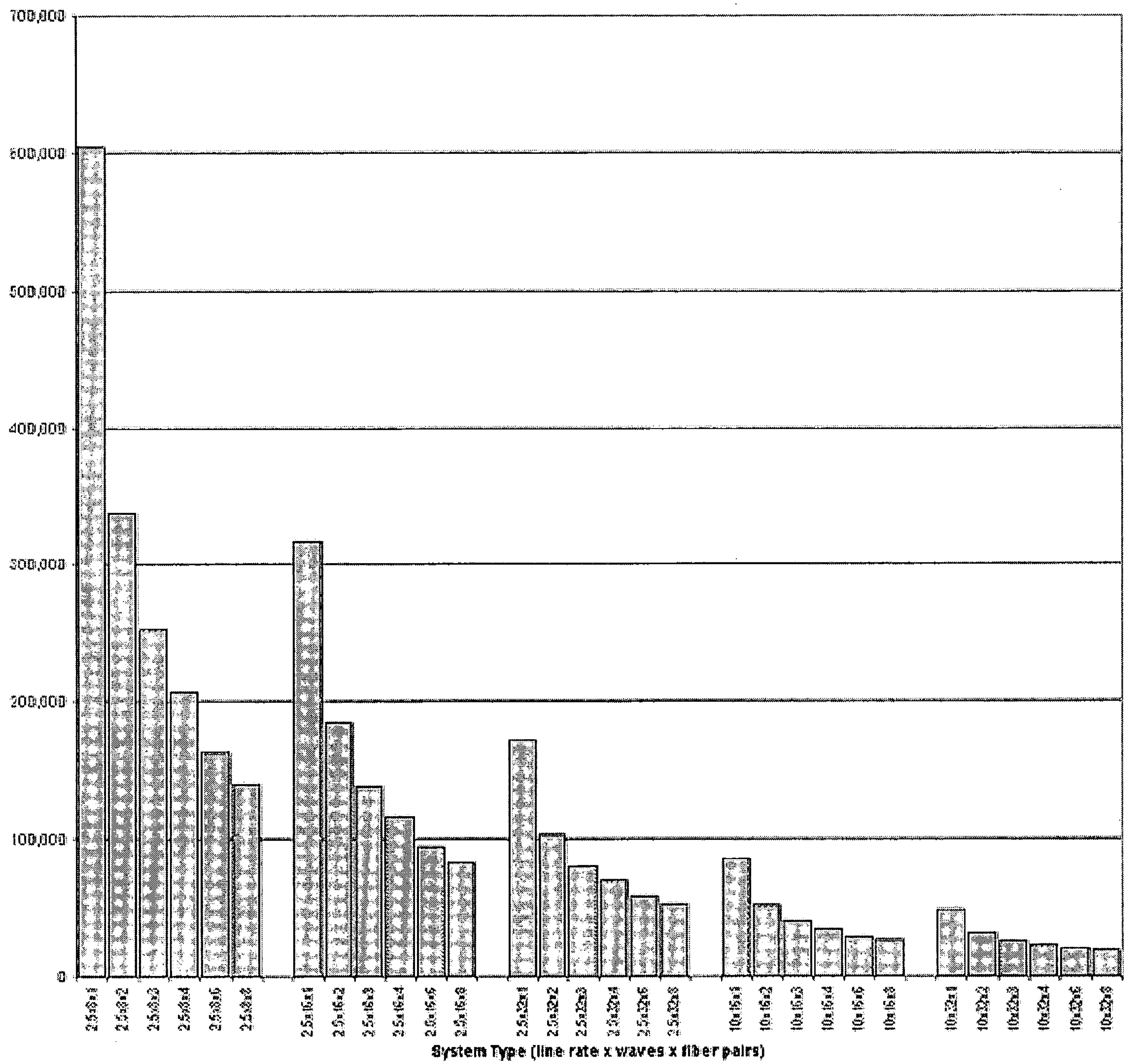
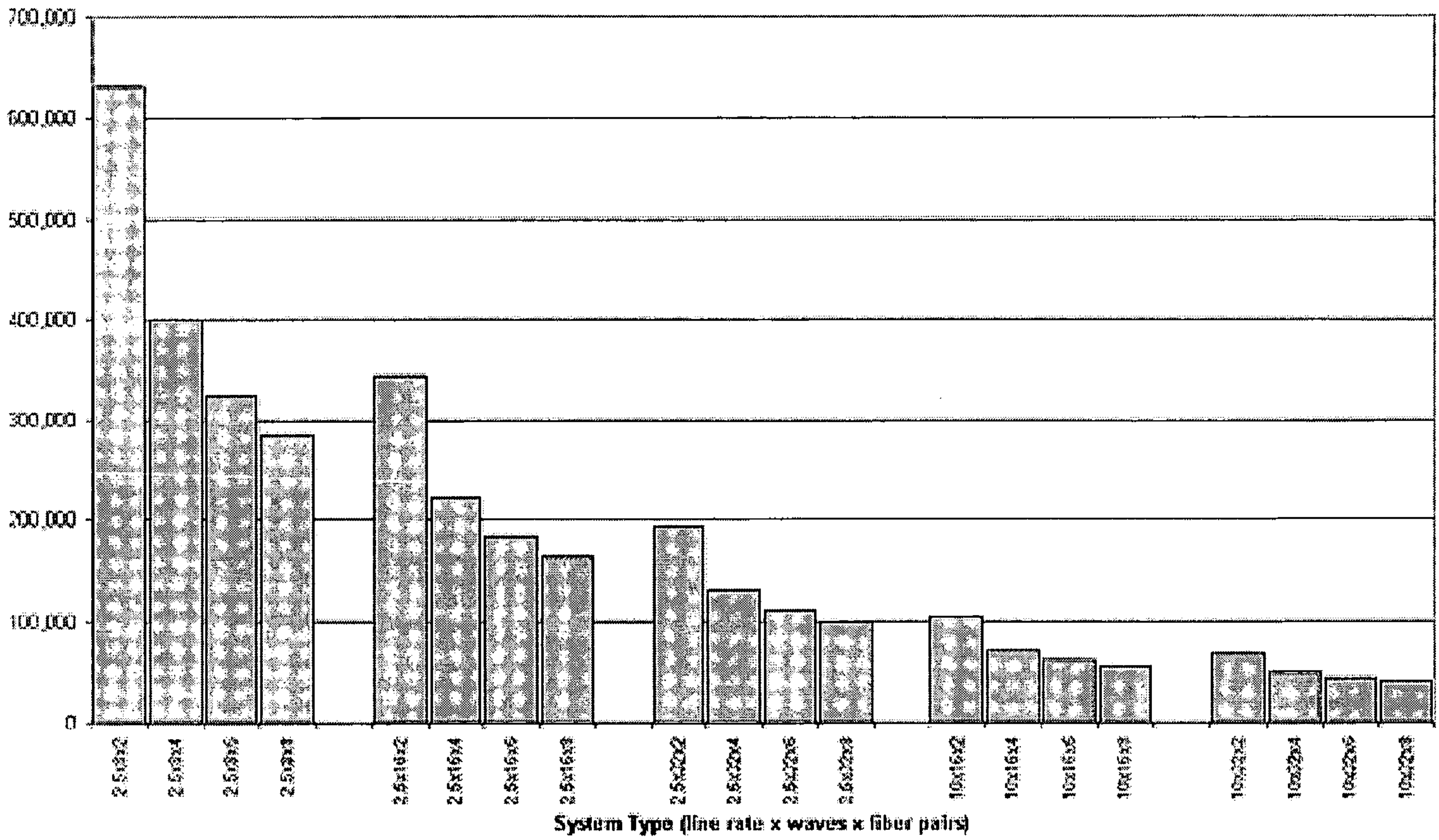


Figure 5: System Price per STM-1 over 8,000 km for Various Transmission Technologies (8 ~ 32 x 2.5 Gb/s, 16 ~ 32 x 10 Gb/s, 2 ~ 8 fiber pairs)



Similarly, with the introduction of 16 wave x 10 Gb/s technology, the price per STM-1 for fully equipped systems has dropped by approximately 65 % compared to 16 wave x 2.5 Gb/s systems.

The price per STM-1 of 32 wave x 10 Gb/s systems will probably be 30 ~ 35 % lower than for similar 16 x 10Gb/s systems.

Technology History & Trends

Here we summarise the recent advancements that have bought us to the current status, and look ahead to near-term future technologies.

Advances in Submerged Equipment

Optical Amplifier Band-width & Amplitude Response

The EDF amplifiers used to date have used the optical "C" band centered on approximately 1,550 nm. Another band, the "L" band, is also available by using an EDF amplifier with a different length of erbium doped fiber.

Big advances have already been made in increasing the bandwidth and amplitude response flatness of

Erbium Doped Amplifiers. Terrestrial systems with 80 waves of 10 Gb/s in the C-Band and 90 waves of 10 Gb/s in the L-band have been announced in June 1999 (total 1,700 Gb/s or 1.7 Tb/s per fiber). For submarine systems, we can expect that band-widths exceeding 26 nm will be useable in the C-band, and exceeding 30 nm in the L-band.

Number of Channels, Bit Rate, Channel Spacing

The channel spacing of submarine systems has moved from 1.6 nm to 0.8 nm for systems such as Japan-US, and then to 0.4 nm for 320 Gb/s per fiber. 0.4 nm in wavelength represents 50 GHz in frequency difference of the WDM waves. For N x 10 Gb/s systems a channel spacing of 0.3 nm may be possible in future, but it is not expected that further reductions to around 0.2 nm will be possible in the short term.

A channel spacing of 0.4 nm allows us to put up to 64 waves in the C-band on one optical fiber, and by using two amplifiers (one for C-band and one for L-band) it will be possible to increase this to around 128 channels per optical fiber in the near future.

Simple engineering theory tells us two important things about D-WDM (Dense Wavelength Division Multiplex) multi-wavelength transmission systems with cascaded EDFA's:

(1) if the total power remains limited (which it must do, to avoid non-linear effects in the fiber) then the power per channel must be decreased by half (3 dB) if the number of channels (waves) is doubled.

(2) the noise generated by each amplifier is further amplified by each following amplifier, which in turn adds its own noise.

So doubling the number of channels reduces the power per wave, which requires that the optical repeaters be spaced closer together to maintain the required signal to noise ratio (SNR). But the increase in number of repeaters also increase the noise contribution of the amplifiers.

In EDF amplifiers, Amplifier Spontaneous Emission (ASE) is a major contributor to the noise, and a point is reached where adding repeaters (decreasing the repeater spacing) does not improve the overall performance. At this point, the maximum span between SLTE's has been reached for the particular technology (for example N waves of bit-rate 10 Gb/s).

Optical Amplifier Pumping Technologies

Early EDF amplifiers employed a single pump laser with wavelength of 1,480 nm. In the case of submarine systems, typically two pump lasers were shared between two amplifiers to give some redundancy in case of failure of one laser, and hence achieve the extremely high reliability necessary for 25 year design life of the submerged plant.

This optical pumping was usually in the backward direction (against the direction of the signal being amplified) which gives rise to a higher pump power at the output end of the doped fiber. Such architecture provides good output power, but is not the best for low noise.

Optical Amplifier Noise Figure

Use of 980 nm pumping in the forward direction can both increase the available gain and decrease the noise figure of the amplifier. In the past, the reliability of 980 nm lasers was lower than that of 1,480 nm lasers, but recent advances in development of 980 nm semiconductor pumping lasers has brought significant improvements in their long-term reliability and price - and consequently they are now acceptable for use in high-reliability submarine systems.

By utilising the 980 nm pump lasers, the noise figure of the optical amplifiers has been reduced from around 6.7 dB to around 5.5 dB, which greatly increases the maximum span achievable with high numbers of waves, and saves system cost.

Furthermore, the use of four pump lasers per amplifier pair (two 1,480 nm lasers for backward pumping, and two 980 nm lasers for forward pumping) has further improved the system reliability against hardware failures - typically any three of the four pumping lasers could fail and the system would still not have any traffic interruption.

Optical Output Power

Advances in pumping lasers have also already given higher pumping powers for lower costs, and the introduction of forward optical pumping at 980 nm in addition to the backward pumping at 1,480 nm has meant that the amplifier is no longer the limiting factor regarding output power. The amplifier itself can provide more than +15dBm of output power, but the effective area of the optical fiber which is used for the transmission of the optical signal determines what maximum output power can be used without incurring significant distortions due to non-linear effects in the fiber.

Non-Linear Effects / Fiber Effective Area

Non-Linear effects in the optical fiber of the transmission line are a major limiting factor for system with high numbers of waves (32 x 10Gb/s, 64 x 10Gb/s etc).

Non-Zero Dispersion Shifted Fiber (NZ-DSF) typically has a relatively small "effective area" (compared to Single Mode Fiber (SMF)) of around 50 m m^2, which limits the output power for long-haul systems to around +9 dBm ~ +10 dBm. In recent systems such as Japan-US, an optical fiber with larger "effective area" is used for the first half of the inter-amplifier span (where the power is highest), and NZ-DSF is used for the remainder of the span (since the attenuation of the "large effective area" fiber is still somewhat higher than the attenuation of NZ-DSF fiber).

Large Effective Area fibers have an effective area of around 75 m m^2, but ideally future transmission fibers will have an even higher effective area, and allow higher output powers from the repeaters. There are some promising candidate fiber types with effective areas of 110 ~ 140 m m^2, and further research is underway. The final choice of fiber is also dependent upon with chromatic dispersion compensation techniques chosen.

Dispersion Compensation

Use of zero-dispersion optical fiber might seem the ideal solution to chromatic dispersion which causes pulse spreading of the optical signals. However zero dispersion fiber actually leads to other significant technical issues - in particular, four-wave mixing (4WM)

There is hence a need to use fiber with small but non-zero chromatic dispersion - and hence the advent of NZ-DSF. Compensation for the remaining dispersion has usually been done by using an optical fiber with opposite chromatic dispersion in part of one span after approximately every five repeaters.

Unfortunately the dispersion characteristics of the NZ-DSF and of the opposite dispersion fiber are not uniform with wavelength. The dispersion is actually slightly different for each of the wavelengths used for the WDM channels - and until now the differences of the positive and negative dispersion fibers do not cancel out. So whilst we can select the lengths of positive and negative dispersion optical fiber to balance the chromatic dispersion of a particular channel (say channel 16), there is residual dispersion for all other channels, and it is worst for the outer channels of the band (for example channel 1 and channel 32).

Such residual dispersion introduced by the mismatch of the "dispersion slope" of the two optical fibers requires further dispersion compensation at the terminal stations on a channel-by-channel basis, the complexity of which increases as the number of channels increases. It adds expense, and also adds to the floor space area required at the terminal station.

An ideal solution to the problem of dispersion compensation seems to be to use two fibers of equal or similar length with characteristics which exactly cancel each other - not only for one channel but for the entire bandwidth used. Such architectures are sometimes referred to as "+D / -D" or "RDF" (Reverse Dispersion Fiber) schemes.

Active Amplitude-Slope Compensation

The overall amplitude slope of the optical fiber in the transmission line depends on the length of the system. In the past this slope has been compensated by passive slope equalisers introduced after approximately every 5 or 10 repeaters.

But such passive equalisers cannot cancel the slope exactly even at beginning of system life, and cannot compensate changes in amplitude slope, for example due to cable aging. Hence additional system margins have traditionally been introduced in the system design, to cope with imperfect compensation throughout the system lifetime.

The advent of active variable amplitude slope equalisers allows us to perfectly compensate for the cable slope, not only at beginning of life, but also throughout the system lifetime. This gives additional margin which can allow longer spans of reduced numbers of repeaters, saving significant costs.

Advances in Terminal Equipment

The increased relative value of the terminal systems in current and future systems means that this is an area which must be studied very actively to ensure that cost-down can be achieved.

Modulation Techniques

Return to Zero (RZ) modulation has been adopted for 10Gb/s systems rather than the previous Non-Return-to-Zero (NRZ) which was adopted for 2.5Gb/s systems. Whilst this scheme gives good results for 10 Gb/s WDM systems, other modulation techniques (such as Optical Duo-Binary Modulation) are under evaluation for use in future 40 Gb/s systems. Such advanced schemes can offer larger dispersion tolerances, and since they require narrower optical spectrum bandwidth, they will allow closer channel spacing for WDM and consequently more channels in a specified bandwidth.

Forward Error Correction

Forward Error Correction (FEC) involves redundant information sent in addition to the traffic signal, and so the data rate is somewhat increased.

The redundant information is used by the FEC decoder at the receiving end to allow correction of bit errors which have occurred in transmission. The increased data rate decreases the system margin slightly, but this is far off-set by the improvement in Signal-to-Noise Ratio (SNR).

In 1960 a particularly powerful algorithm was developed by I S Reed & G Solomon, now usually referred to as a Reed-Solomon Code or RS code. The Reed Solomon Code is a widely used technology - originally used primarily in satellite systems, it is now adopted in every CD player, and has also been employed for digital video satellite broadcasting.

In the Out-of-Band FEC used in used in optical submarine networks since the introduction of 2.5Gb/s systems, the bit rate is typically increased by around 7%, and an improvement in SNR of 4 dB ~ 6 dB is readily achieved.

As mentioned above, much of the early development work on FEC came about due to the deployment of geostationary satellites. In recent years, inter-planetary spacecraft such as the Voyager and Galileo missions have employed much more powerful FEC techniques. Thanks partly to such work, new FEC techniques are also available for use in submarine systems, and in the near future advanced FEC will allow improvements of 7 dB ~ 10 dB in SNR of long-haul submarine systems. The improvement of approximately 3 dB over systems with conventional FEC will allow the number of waves to be approximately doubled, assuming other parameters remain the same.

Dispersion Compensation

Introduction of +D / -D or RDF fiber technology in the transmission line will greatly reduce the need for dispersion compensation at the terminal stations, especially in case of long-haul systems. In addition, we can expect some new technologies such as to replace the conventional Dispersion Compensating Fiber (DCF) at the terminal stations, further saving on both cost and floor space. Fiber gratings are a likely to be the first of these.

Tuneable Lasers

Existing systems with even 16 wavelengths present a problem regarding spares. The 16 transmitter units are different, and so common sparing can only be achieved if some wavelengths are left free for use in case of hardware failures.

Tuneable lasers are now becoming commercially available - and although they will not cover the entire optical band initially, at least 4 channels (1.6 nm) can already be covered by one device. This means a reduction in the required spares holdings to cover all channels by a factor of four - and a 64 wave systems would require 16 spare transmitter units instead of 64 spares.

Floor Space Requirements

As the number of waves is increased, the floor space requirements at terminal stations will continue to increase.

In view of the limited space available at many submarine cable landing stations, this increasing floor space requirement by the terminal equipment will lead to some different architectures being adopted in future networks.

In view One possibility is to locate only the Cable Termination (CT) and Power Feeding Equipment (PFE) at the cable landing station, and locate the SLTE (which represents the large floor area) at the relevant Central Office (CO) station. However since the CO station is usually within a city, its floor space there is also at a premium. Another possibility is to locate the CT and PFE at the cable landing station (near the coast) and locate the SLTE at an intermediate submarine terminal equipment station between the coastal landing station and the CO.

Next Generation 40 Gb/s Systems

A line rate of 40 Gb/s is the next logical step after the current 10 Gb/s line rate. However there are still many technical challenges related to 40 Gb/s optical systems. Particular key issues are:

(1) the very high-speed optical and electronic components required for 40 Gb/s modulation and demodulation; and

(2) overcoming the transmission distance limitations imposed by the more severe effects of chromatic dispersion, Self Phase Modulation (SPM) and Polarisation Mode Dispersion (PMD) at 40 Gb/s rates.

Although it is difficult to predict with confidence when 40 Gb/s optical transmission systems be widely deployed, it seems fairly certain that they will start to be deployed increasingly for terrestrial systems over the next 5 years.

What is certain from past history of such migrations of line rate, for example 140 Mb/s to 565 Mb/s in PDH systems or 2.5 Gb/s to 10 Gb/s in SDH systems, is that the key criteria that will need to be met to ensure that rapid growth in deployment of such new systems will be:

(1) increased capacity at significantly decreased price per bit

(2) decreased space and power requirements

The usual rule-of-thumb is that to achieve wide acceptance, the new system must offer around half of the cost per bit. In case of 40 Gb/s systems compared to 10 Gb/s systems that means 4 times the capacity for approximately 2 times the price (and certainly less than 3 times the price). For the price comparisons and models presented below, we have assumed this price relativity between 10 Gb/s and 40 Gb/s terminal electronics.

Submarine Network Price Trends

We have modelled the total costs of various submarine networks using current prices, and where necessary, "best available estimate " assumptions.

We used two network models:

(1) one model for relatively short segments between the Submarine Line Terminal Equipment (SLTE) (approximately 2,000 km);

(2) a second model for relatively longer segments between SLTE's (approximately 8,000 km).

In fact, N x 40Gb/s system may initially be limited to maximum spans far less than 8,000 km. However we have included the best estimates of the configuration for such systems into the model assuming that technology eventually solves the outstanding issues for long systems.

The outcome of this analysis is as shown in Figures 6 and 7.

Figure 6: System Price per STM-1 over 2,000 km for Various Transmission Technologies (16 ~ 128 x 10Gb/s, 8 ~ 32 x 40 Gb/s, 2 ~ 8 fiber pairs)

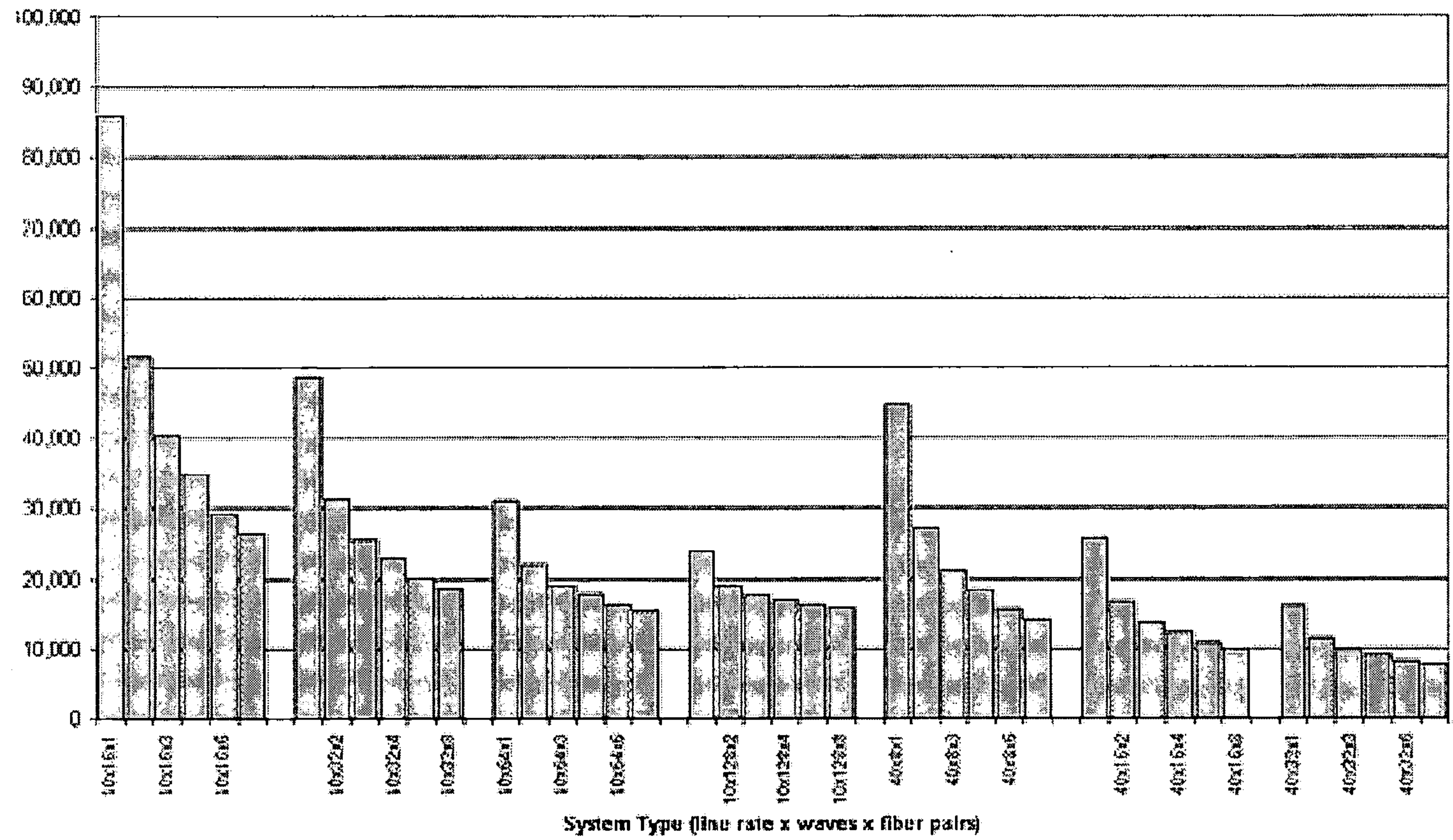
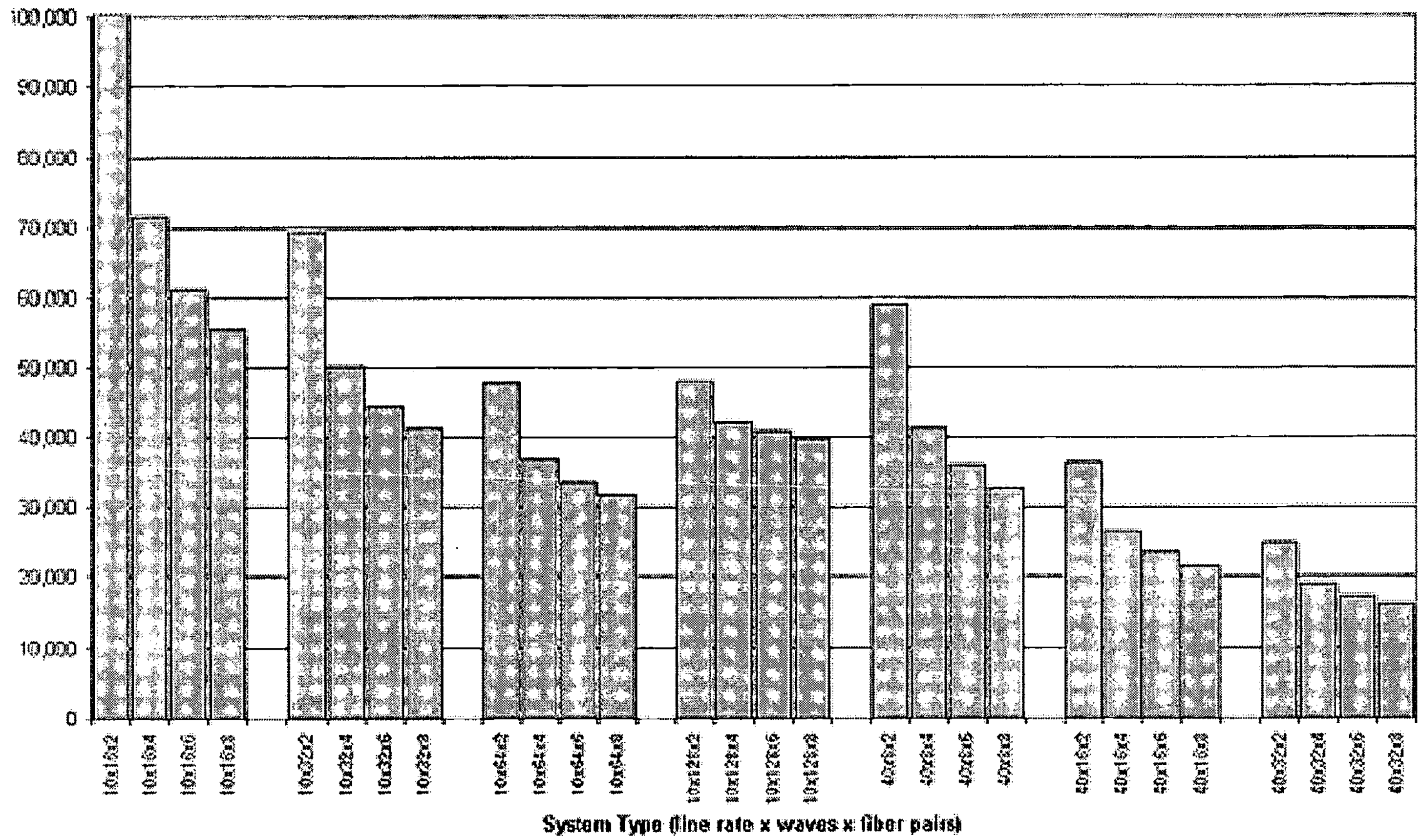


Figure 7: Systems Price per STM-1 over 8,000 km



for Various Transmission Technologies
(16 ~ 128 x 10Gb/s, 8 ~ 32 x 40 Gb/s, 2 ~ 8 fiber pairs)

If we assume that 32 x 10Gb/s (320 Gb/s per fiber pair) is the current state-of-the-art for contracted systems, an analysis of the output of such modelling can be summarised as follows:

64 x 10 Gb/s compared to 32 x 10 Gb/s (640 Gb/s / fp compared to 320 Gb/s / fp)

For long-haul networks we can expect 64 x 10 Gb/s systems to be about -25 % lower in cost per bit. (-20 % to -30% depending on number of fiber pairs, and lower for the higher total capacities).

For short-haul networks we can expect 64 x 10 Gb/s systems to be about -23 % lower in cost per bit. (-17 % to -30% depending on number of fiber pairs, and lower for the higher total capacities).

128 x 10 Gb/s compared to 64 x 10 Gb/s (1,280 Gb/s / fp compared to 640 Gb/s / fp)

For long-haul networks we can expect 128 x 10 Gb/s systems using C-band and L-band to be approximately 10 % ~ 15 % higher in cost per bit than the 64 x 10 Gb/s systems. (Double the capacity per cable but at some price penalty per bit).

For short-haul networks we can expect 128 x 10 Gb/s systems (using C-band and L-band) to be about the same cost per bit as 64 x 10 Gb/s systems. (Double the total capacity, with price per bit within a few percent of the 64 x 10 Gb/s systems).

8 x 40 Gb/s Systems compared to 32 x 10 Gb/s (320 Gb/s / fp)

For the same capacity of 320 Gb/s per fiber pair, 40 Gb/s systems might be around 15 % ~ 20 % lower in cost per bit than equivalent 10 Gb/s systems in long-haul or short-haul networks.

16 x 40 Gb/s Systems compared to 64 x 10 Gb/s *(640 Gb/s / fp)*

For the same capacity of 320 Gb/s per fiber pair, 40 Gb/s systems might be around 25 % lower in cost per bit than equivalent 10 Gb/s systems for both long-haul and short-haul networks.

32 x 40 Gb/s compared to 16 x 40 Gb/s (1,280 Gb/s / fp compared to 640 Gb/s / fp)

32 x 40 Gb/s systems, when technically feasible, might offer around 50 % lower costs per bit 64 x 10 Gb/s systems for both long-haul and short-haul networks.

The above leads us to the conclusion that 64 x 10 Gb/s systems are economical compared to 32 x 10 Gb/s systems, and will continue to be a good solution to offer total capacities up to 5 Tb/s per cable (64 x 10G x 8 fp) at low cost per bit.

However for the next step in capacity, 128 x 10 Gb/s systems may not be as attractive from the viewpoint of cost or floor space requirements.

When 40 Gb/s systems become available, the will probably be very competitive at the level of 320 Gb/s per fiber and above, and will offer lowest costs per bit at capacities from 320 Gb/s to 10 Tb/s (32 x 40G x 8 fp) per cable.

The 40 Gb/s systems can also be expected to help to minimise the terminal station floor space requirements, which start to be become very large for N x 10 Gb/s systems where N > 32.

However initially it should probably be assumed that the floor space savings will be 50 % and not 75 %. There are two reasons for this suggestion:

(1) Initially the electronics for one channel of 40 Gb/s can be expected to be more bulky than the electronics for one channel of 10 Gb/s.

(2) Depending upon the speed of deployment of 40 Gb/s systems into terrestrial networks, it may be necessary to interface to the 40 Gb/s SLTE equipment at 4 x 10 Gb/s initially, and so some de-multiplexing functionality may be required in the SLTE.

Future Network Architectures & Protection Schemes

The above analysis does not include network protection equipment (NPE) which is typically 10 Gb/s SDH Multiplex equipment with a ring protection scheme, usually Multiplex Section Shared Protection Ring network protection protocol (MS-SPRing). The price of such NPE in a complete network is typically around 15 % of the total network price when fully equipped, and a much smaller percentage of the initial network configuration (perhaps 3 ~ 7 %).

Although this is not at all insignificant, it is lower than the relative prices of the terminal submarine line terminal equipment, and the submerged plant (cables, repeaters, etc).

Optical NPE equipment is already available, and can offer fast switching times, as well as protocol transparency. Such optical NPE's will allow transparent transmission of formats such as SDH, SONET, and TCP/IP, or any mix of them, without the usual optical-to-electrical conversion (which is protocol dependent).

In future as 10 Gb/s becomes a preferred terrestrial network line interface rate, there may be less requirement for de-multiplexing to STM-16, STM-4, and/or STM-1 line rates at the submarine terminal station, and the optical NPE will become very attractive.

We can also expect that optical NPE will reduce in price as terrestrial networks begin to utilise it in future.

Another view is that network protection at the submarine network layer may not be required at all. Submarine network may evolve to be high capacity point-to-point networks, with the network protection undertaken at another level, perhaps by Internet Protocol (IP). However, this is in our view unlikely to happen quickly.

Conclusion

We have tried to identify what impacts recent technology developments have had on both system capacity, system price and cost-per-unit capacity for submarine telecommunications networks.

Looking into the near future, we have identified what we believe are they key promising technologies which will be able to be exploited to give further capacity increases, and at the same time further reductions in cost of capacity.

The era of Terabit submarine networks is certainly already with us, and the same kind of technology developments which made them feasible seem likely to be able to continue to offer the solutions which the market-place demands.

Biography

Katsutoshi Tamura

Katsutoshi Tamura is currently General Manager of the Submarine Networks Business Division in Fujitsu Limited's International Telecommunications Business Group, where he is responsible for all sales and marketing and all commercial aspects of Fujitsu's submarine networks business activities in overseas markets.

Mr Tamura was born in the city of Zushi, near Kamakura, some 50 km south of Tokyo, where he and his family still live. He graduated from Tokyo's Rikkio University (also known as St Paul's University) in 1968, with a degree in economics.

He joined Fujitsu Limited in 1968, and was initially engaged in the sales and marketing of terrestrial telecommunications systems in Asia, and satellite communications equipment to worldwide markets.

He has spent the past 20 years in the submarine telecommunications business group, where his group's recent achievements have included successful bids for the China-US Cable Network, the SEA-ME-WE 3 Cable Network, the Japan-US Cable Network, and the Southern Cross Cable Network.

Tatsuo Matsumoto

Tatsuo Matsumoto is currently Senior Director of Fujitsu Limited's Submarine Telecommunications Engineering Division, and is responsible for all system engineering and project management of overseas submarine cable networks.

He was born in Yuki city, in Ibaraki Prefecture north of Tokyo, and graduated from the Fujitsu Technical Institute in 1967, after which he joined the Transmission Engineering Group of Fujitsu Limited, based in Kawasaki, Japan.

His work experience over the past 20 years includes significant involvement in research into reliability of transmission systems, development of terrestrial transmission systems, development of power-line protection equipment, and the system engineering, planning and development of terminal equipment for submarine cable systems.

He has recently had in-depth involvement in the project management of several projects including the SEA-ME-WE 3 Cable Network, the Southern Cross Cable Network, and the Japan-US Cable Network, as well as in the planning and bidding for future networks.

Mr Matsumoto is a member of The Institute of Electronics, Information and

Communication Engineers (IEICE) Communications Society.

Colin Anderson

Colin Anderson was born in Wanganui, New Zealand, a small city approximately 200 km north-west of the capital city of Wellington.

He received a BSc degree, majoring in physics, from Victoria University in Wellington New Zealand in 1975. From 1976 he worked for Philips New Zealand Ltd in engineering and marketing roles, until he joined Fujitsu New Zealand Ltd in 1986, as a senior marketing engineer for telecommunications systems.

In 1984 he started part-time post-graduate business study, and in 1988 received an MBA degree from the Victoria University Graduate School of Business and Government.

In 1992 he moved to Tokyo Japan, to take up a position in the International Telecommunications Business Group of Fujitsu Limited, initially as an assignee on a 2-year contract, primarily supporting optical and wireless SDH transmission business in the South Pacific region.

Now, 7 years later, he is a full-time staff member of the parent company, Fujitsu Limited, and is currently Business Development Manager in the Submarine Networks Sales & Marketing Department of the International Telecommunications Business Group.

Mr Anderson is a member of The Institute of Electrical and Electronic Engineers (IEEE) Communications Society.

Fujitsu Limited URL: <http://www.fujitsu.co.jp/index-e.html>

Please direct any related communications to:

FUJITSU LIMITED
International Telecommunications Business Group
Submarine Networks Business Division
Solid Square Building, East Tower 12th Floor
580 Horikawa-cho, Saiwai-ku, Kawasaki-shi
Kanagawa-ken 210-0913 / 212-0013

JAPAN

Attention: Colin Anderson
Manager, Business Development
Telephone: (+81) (44) 540 4098
Facsimile: (+81) (44) 540 4148
E-Mail: anderson@tel.fujitsu.co.jp

Sessions

Internet

T.2.3 Privacy and Consumer Protection & Government Control

Tuesday 1 February, 1030-1200
Location: Honolulu Suite

Chair:
WALDA ROSEMAN, President, CompassRose International, Inc., USA

T.2.3.1
JOHN AYOADE and TOSHIO KOSUGE, Professor, University of Electro-Communications, Japan
Presented by: MATSUTOMO TANAKA, Associate Professor, University of Electro-Comms, Japan.
Communication Security Policies, Models and Mechanisms: Solving Conflict between Privacy and Lawful Access in Communication

T.2.3.2
HELEN E. DISENHAUS, Attorney at Law, Swidler Berlin Shereff Friedman, LP, USA
Government Regulation & Protection of Privacy

Government Regulation & Protection of Privacy

3/15/00

Click here to start

Click here to download

Table of Contents

EC

USA

USA

USA

Other Countries

Trends

Action Required

Privacy Policy

Topics for a Web Site Privacy Policy

Topics for a Web Site Privacy Policy

Surf More About It

Surf More About It

Government Regulation & Protection of Privacy

HELEN E. DISENHAUS

PTC 2000
Honolulu, Hawaii
February 1, 2000

Swidler Berlin
Shereff Friedman, LLP
202-424-7500 (tel)
202-424-7645 (fax)

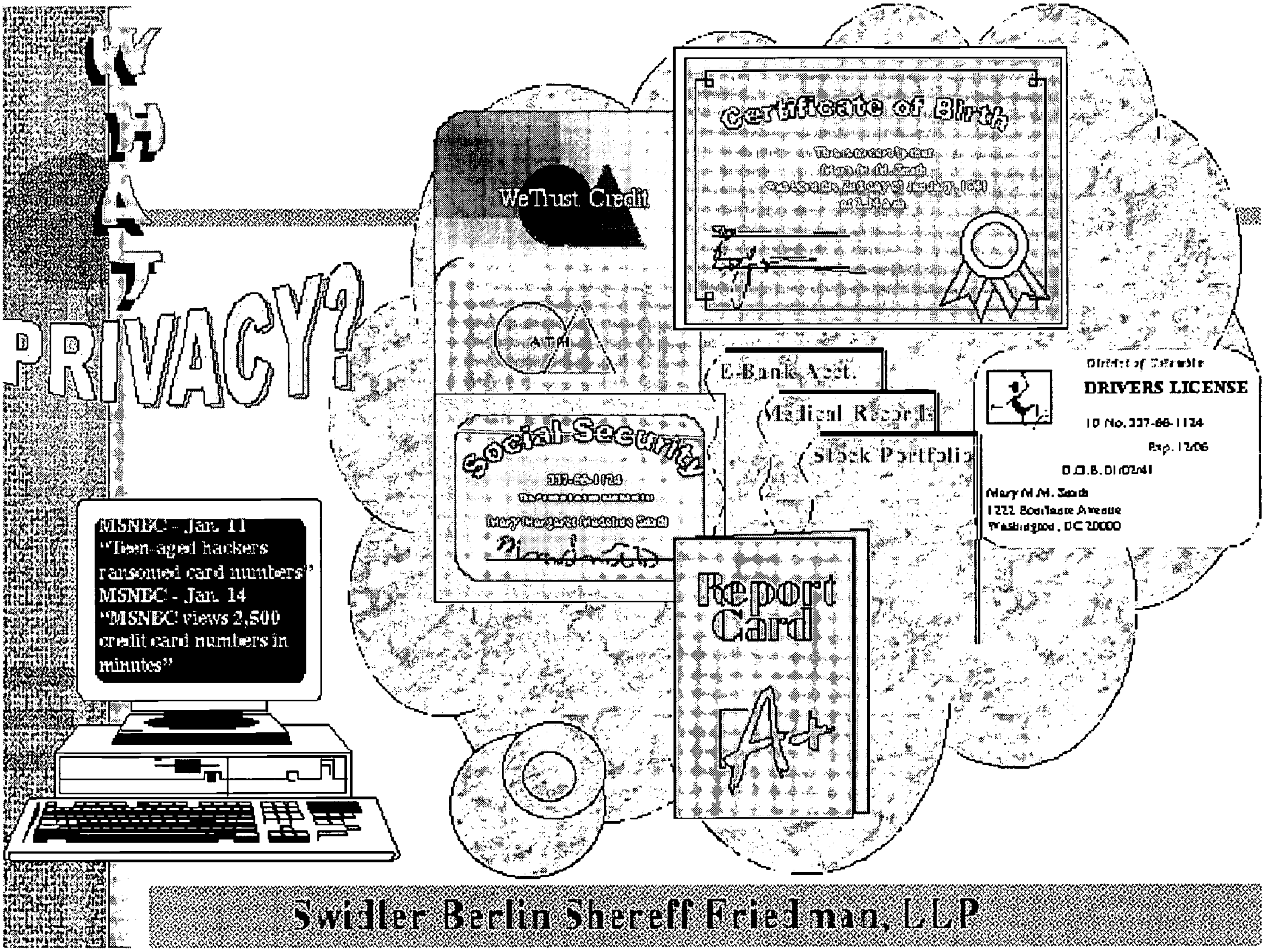
Suite 300
3000 K Street, NW
Washington, D.C.
20007

Slide 1 of 24

Notes:

Housekeeping - my views, not firm or clients

Late addition - paper will be available from PTC on-line or give me a card



Slide 2 of 24

Notes:

I'm a lawyer, so the most I can manage is one token jazzy slide, intended to illustrate what Ayoade-san was saying about customer concern about consumer's concern about access to the vast amount of private information available onpline- He gave us an a

Personal data has been collected for some time

Difference is the ease of collection and access and opportunity for misuse resulting from the increased use of the Internet and e-commerce

Easy global access to data means the issue is global

In the News

- Credit Card Numbers Held Hostage
- Frequent Flyer Accounts Unlocked
- Singapore Issues Guidelines on ISP Security Scans
- US/EU Privacy Accord Delay

Swidler Berlin Shereff Friedman, LLP

Slide 3 of 24

Notes:

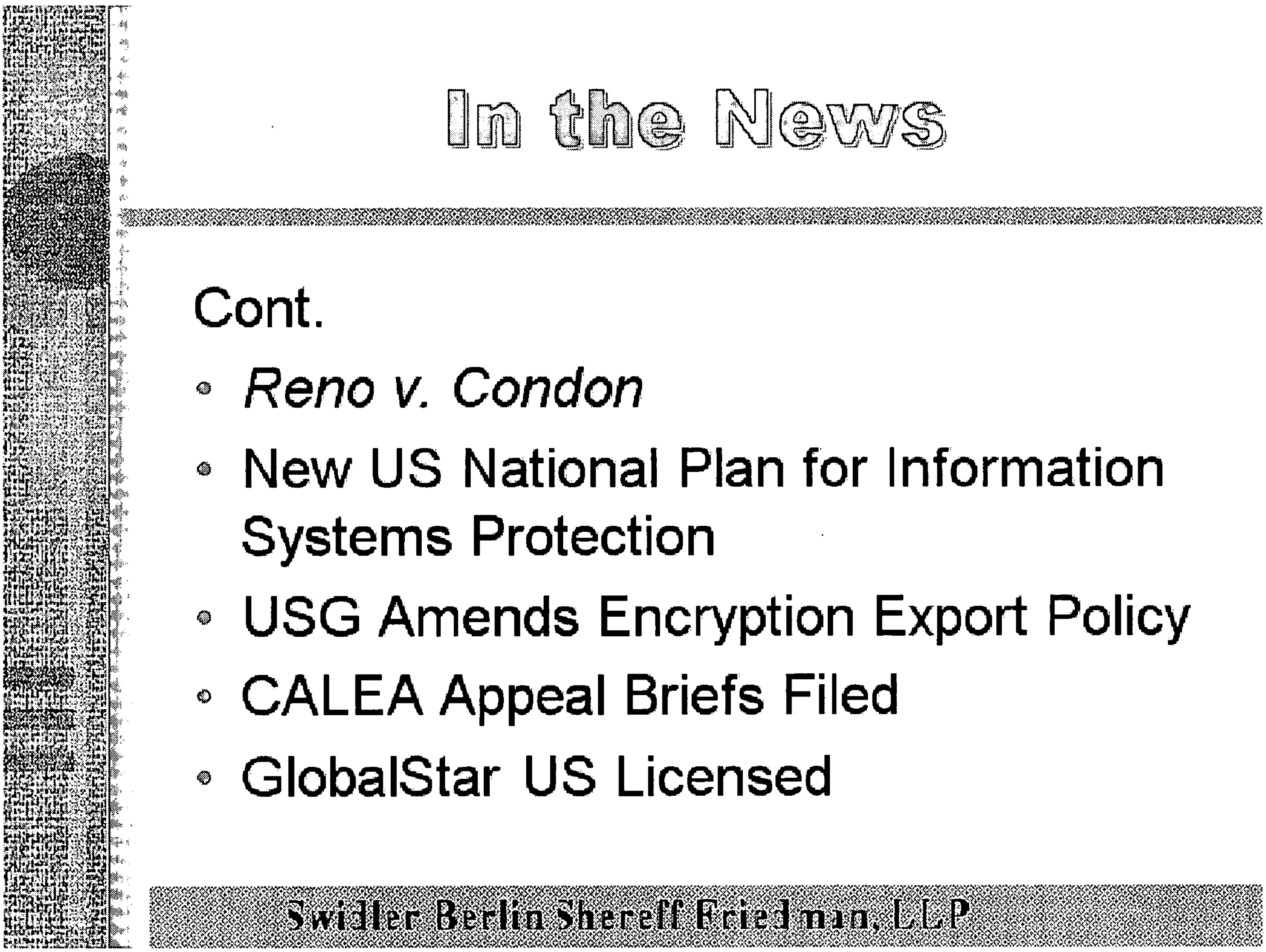
Just this year:

MSNBC reporert foundt 7500 card numbers in a few minutes by following a few instructions

Airline acknowledges failure of database maintenance staff to restore "lock" jeopardized credit card and other sensitive consumer data

"Safe Harbour" discussions aim for March accord

Singapore, whose government has an interest in all authorized ISPs, in the face of reports that 200,000 subscriber computers were scanned for viruses without notice by Ministry of Home Affairs, issued new guidelines for scanning - consent, non-intrusive,



Slide 4 of 24

Notes:

9-0 against states' rights when states want to use private data collected under police power for commercial use - upholds Driver's Privacy Protection Act of 1994 (DPPA) - personal info as article of commerce - not interfering w/ state reg of citizens but

USG concerned about database breaches - meeting with privacy advocates for accommodation of privacy interests

USG now allows export of more privacy-enhancing technology, but still requires notice of Internet (as opposed to paper) export of publicly available source code, such as that forming an "open cryptographic interface:" discretionary licensing issue, tech

Globalstar USA license held up for 180 days - need for wiretqp opportunity before US break-out since earth stqtions in Canada - FBI, DoJ, DoDAppeal of CALEA rules implementing '94 law - 8/99, FCC in response to FBI, expanded "punch list" of access feature

Topics Covered

- Development of Privacy Regulation
- Current Concerns
- Illustrative Regulatory Schemes
- Trends
- Action Required
- Privacy Policy
- Topics for a Web Privacy Policy
- Surf More About It

Swidler Berlin Shereff Friedman, LLP

Notes:

Note that we will not have time to discuss all government security issues

Development of Privacy Regulation

- Early Legislation
  - 1361 - Justice of the Peace Act prohibits eavesdropping and Peeping Toms (Eng.)
  - 1776 - Swedish Access to Public Records Act
- Academic Consideration
  - 1890 - Warren/Brandeis *Harv.L. Rev.* article re privacy as right to be left alone

Swidler Berlin Shereff Friedman, LLP

Development of Privacy Regulation

Cont.

- International Initiatives
  - 1948 - Universal Declaration of Human Rights
  - 1965 - OAS's American Declaration of the Rights and Duties of MAN
  - 1981 - OECD Guidelines Governing the Protection of Privacy and Transborder Data Flows of Personal Data

Swidler Berlin Shereff Friedman, LLP

Slide 7 of 24

Current Concerns

- Right to Privacy
- National Security
- Commerce
  - Internet Magnifying Access and Issues
    - Security Needed for E-Commerce Activity
    - Lure of Marketing Data
- Globalization

Swidler Berlin Shereff Friedman, LLP

Illustrative Regulatory Schemes

- EU - Comprehensive Legislation
- US - Piecemeal "Sectoral" Legislation
- Other - Co-regulation (industry self-reg)
- Other Illustrative Laws

Swidler Berlin Shereff Friedman, LLP

Slide 9 of 24

Notes:

Lots of legislative initiatives - anti-spam- also states

EC

- Comprehensive Legislation
- Global Impact
  - US Accord Delayed - End of March?
  - Canadian Legislation Soon
  - Japanese Initiatives
- Action against Non-Implementing States

Swidler Berlin Shereff Friedman, LLP

EC

Cont.

- Directive 97/66/EC - 15 December 1997
  - Processing of Personal Data and Protection of Privacy in the Telecommunications Sector
- Directive 95/46/EC - 24 October 1995
  - Protection of Individuals with regard to the Processing of Personal Data and the Free Movement of Such Data

Swidler Berlin Shereff Friedman, LLP

EC

- Data Protection Requirements
  - Permissible Collection
  - Data Secure
  - Use Only for Limited Stated Purpose
  - Correction Opportunity
  - Right to Consent or Opt Out
  - Remedy for Unlawful Processing
  - Destruction When Purpose of Collection Fulfilled

Swidler Berlin Shereff Friedman, LLP

Slide 12 of 24

EC

Cont.

- Global Issue
  - EC Citizens' Personal Data to be Protected even if Data Exported to and Processed Outside Europe

Swidler Berlin Shereff Friedman, LLP

Slide 13 of 24

USA

- Piecemeal, More to Come
- Electronic Communications Privacy Act
- Cable Communications Policy Act
- FOIA; Privacy Act of 1974
- DHHS proposed "Standards for Privacy of Individually Identifiable Health Information"

Swidler Berlin Shereff Friedman, LLP

Slide 14 of 24

Notes:

ECPA - prohibits unauthorized access to stored communications and prohibits providers of electronic communications from monitoring or disclosing the contents of stored communications - prohibits unauthorized access by outsiders, including alterning or pre

CCPA - prohibits cable operator from using system to collect personal infor and disclosng and yield consumer info re what is collected

FOIA (gov-held data), Privacy Act (gov personnel)

COPA - effective 4/21/00 - directed to operators of web sites directed to children and collecting personal info from them - notice, consent, review, games and prizes, security, ISP filterning, requiring credit card or code info to protect under 17 from se

Torts - trespass, misappropriation, public disclosure of private facts, libel

other issues - digital signatures

USA

Cont.

- Related Issues
  - EC Safe Harbour Negotiations
  - CALEA
  - CPNI
  - Telecom Licensing and Nat'l Security
- State Law (Financial, Medical, On-line)
- Common Law Tort

Swidler Berlin Shereff Friedman, LLP

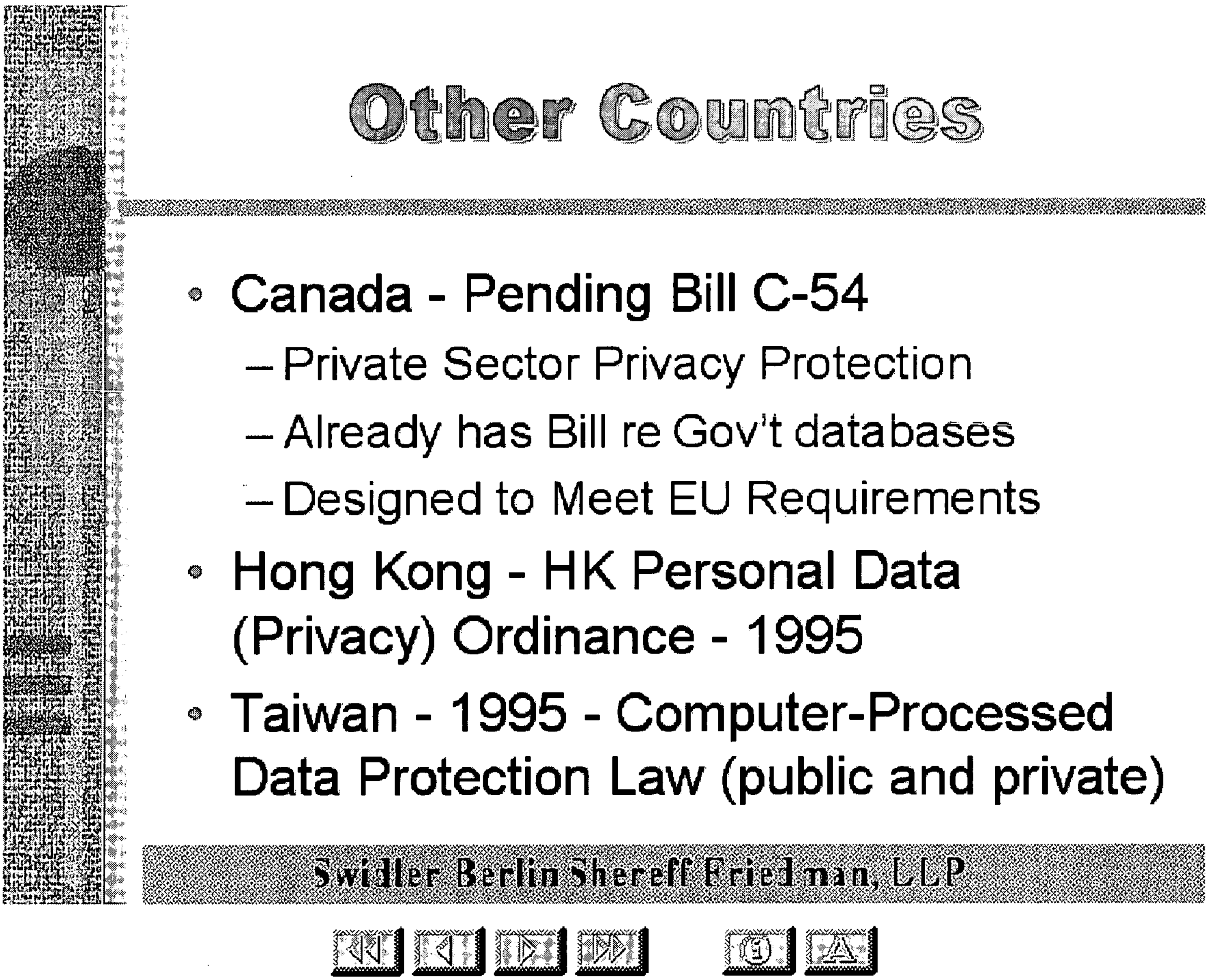
USA

Cont.

- Financial Services Legislation
  - FTC Regulations due 5/12/00
- Right to Financial Privacy Act
- Fair Credit Reporting Act
- Children's Online Privacy Act of 1998

Swidler Berlin Shereff Friedman, LLP

Slide 15 of 24



Slide 17 of 24

Trends

- Globalization of Issues
- Comprehensive Legislation
- Technological Solutions
- More Deference to Privacy in Commercial rather than Government Security Contexts
- Notice and Consent
- Enforcement

Swidler Berlin Shereff Friedman, LLP

Action Required

- Participate in Regulatory Process
- Identify New Developments
  - Domestic
  - International
- Develop and Update Privacy Policy
- Monitor Policy Compliance
- Update Contracts
- Respond to Business Opportunities

Swidler Berlin Shereff Friedman, LLP

Notes:

Acceptable Use Policy

Guidelines v.Mandatory Legislation

Join industry groups, amend user agreements, join privacy organization

Contracts with customers giving consent to otherwise-prohibited activity or use; contracts with content providers re warranties, indemnification, termination for violation of AUP, limitation of liability

Privacy Policy

- Satisfy Legal Requirements
- Comply with Industry Guidelines
- Make Complete, Accurate Disclosure
- Monitor Closely and Frequently
- Update Regularly

Swidler Berlin Shereff Friedman, LLP

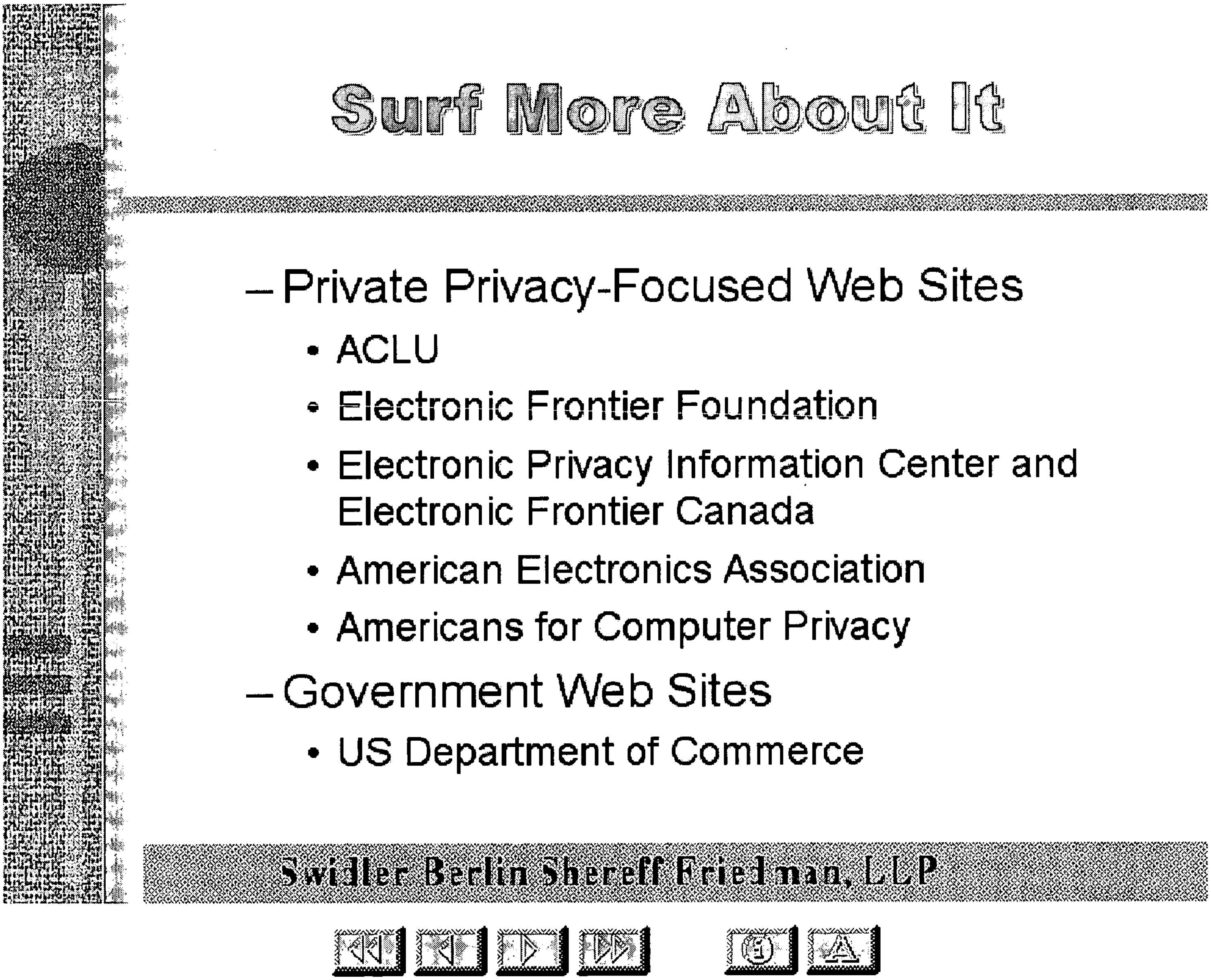
Slide 21 of 24

Topics for a Web Site Privacy Policy

Cont.

- Correction of Information by customer
- Age and Content Restrictions
- Security of Transactional Data
- Cookies
- Customer Contact if questions

Swidler Berlin Shereff Friedman, LLP



Slide 23 of 24

Notes:

---

http://www.aclu.org

http://www.eff.org http://www.efc.ca

http://ww.epic.org

http://ww.doc.gov

(other Canadian: Coalition for Public Information, Canadian Health Coalition, BC Civil Liberties Assoc., BC FoI and Privacy Assoc,National Privacy Coalition, Public Inerest Advocay Center

Surf More About It

Cont.

- 1999 Privacy Survey
  - "Privacy and Human Rights 1999"
  - http://www.privacyinternational.org/survey
- EPIC Online Guide to Privacy Resources
  - www.epic.org/privacy/privacy_resources_faq.html

Sessions

Internet

W.1.3 New IP Network Technologies
Wednesday 2 February, 830-1000
Location: Tapa III

Chair:
EIJI HAYASHI, Engineering Advisor, NEC Corporation, Japan

W.1.3.1
STEVE COUGHLAN, Director, Internet Service Provider Marketing, Telecommunications Line of Business (LOB), Compaq Computer Corporation, USA
Next Generation Networks - A Strategic View

W.1.3.2
HAKAN MITTS, Technology Manager, NOKIA Corporation, Finland
Mobility in Cellular IP Networks

W.1.3.3
SIEW-FAY HO, Technical Consultant, Service Provider, Cisco Systems Inc. Asia Pacific Division, Australia
Presenter: Kumaran Singaram, Director, Service Provider Business, Cisco Systems, Singapore
The New World - IP + ATM

W.1.3.4
SHIN-ICHIRO HAYANO, Manager, Transmission Planning Office; KAZUSIGE ARAI, Manager, Transmission Planning Office; KURENAI MURAKAMI, Senior Manager, Systems Engineering, Network Product Development Laboratories; MASARU YAMAGUCHI, Transmission Planning Office, NEC Corporation,

Related Sessions

M.1.3 Enabling E-Commerce
M.2.3 IP Telephony
M.3.3 Strategies for Financing andTracking the Digital Economy
T.1.3 E-Commerce Strategies
T.2.3 Privacy and Consumer Protection & Government Control
W.1.3 New IP Network Technologies
W.2.3 Development Issues
W.3.3 Content & Culture

Japan
Next Generation Photonic IP Networking

Sessions

The New World - IP + ATM

Siew-Fay Ho and presented by Kumaran Singaram

Executive Summary

The telecommunications market is developing at an incredible pace and service providers there will soon have to contend with end-user demands for value-added services such as managed services and managed intranets, IP-based Virtual Private Networks (VPNs), Web-to-host solutions, Voice over IP and Network Commerce.

Telecommunication and networking trends elsewhere in the world is moving toward IP (Internet Protocol) as the standard network protocol although ATM (Asynchronous Transfer Mode) will still play an important role, to integrate multiple traffic types.

This white paper highlights the competitive advantages service providers can gain by providing value-added services to their customers and offers two alternative architectures on which they can base their services: ATM-based networks with Multi-Protocol Label Switching (MPLS) and Packet Over SONET/SDH (POS).

New Market and Opportunities

The telecommunication market in every country in going through deregulation at varying degrees. In a competitive market, carriers need to find ways to retain existing customers; win new customers; generate new revenue stream and maintain profit margin in the face of expected price competition for basic services. Therefore, carriers must provide more than basic connectivity services in the new market to stay competitive. Service providers and Telephone companies in the United States and Europe are already offering many value-added services to their customers. These new services range from IP-VPN to Managed Services to total system integration and out-sourcing for corporate customers.

Following paragraphs summarised the benefits and driving factors for carriers to want to deliver more than what they are doing today :-

- **New Revenue Opportunities**

Value-added services revenue, though small in proportion to basic services revenue today, is growing at a very high rate. They will drive tomorrow's revenue when the profit margins for basic services erode with the introduction of competition. Basic services such as IDD and leased lines are becoming commodities where price is a major purchase consideration. It is services that can better cater to the needs and applications of the end-users and add values to them that will continue to command a premium in the face of competition and continue to bring in healthy profits for service providers.

- **Retaining Existing Customers**

  Customers who utilise value-added services are less likely to change service providers over a slight difference in price of basic services. Service providers who can provide higher value services to customers are more likely to enjoy stronger customer. They will be seen as strategic partners and not mere suppliers.

- **Winning New Customers**

The ability to provide one-stop-shop services is a key differentiation from service providers who just provide basic transport services. A service provider that meets all the communication needs of a customer will eliminate the hassle of dealing with different suppliers. Today, a customer needs to buy networking equipment from an networking equipment vendor; services from the telecommunication services; workstations from a computer vendor; applications from a software vendor; and then often has to integrate all these components together himself. Service providers who have the ability to off-load the customer by doing more of what they are doing today; are in a much better position to win new customers than providers who do not.

Value-added Services

Managed Services/Managed Intranets

Also known as outsourcing, Managed Services are generally defined as short-term contracts of three years or less, for a range of services that generally include: data transport between a number of sites, equipment lease and maintenance; and ongoing remote network monitoring and reporting. Other services, such as network design and implementation, testing, and ongoing support may also be included in a managed service offering. As demands increase, and the market evolves towards a full network/system integration model, offerings are expected to become more comprehensive, possibly incorporating the LAN; WAN; and supporting services such as DHCP/DNS, email, web-hosting ; even productivity tools and ERP applications such as Human Resource, Finance; etc.

The market for Managed Services is already quite substantial. According to a 1996 Yankee Group report, 37 per cent of US Fortune 1000 companies have begun or will begin outsourcing their ongoing network operations by the end of 1998. The market perception of outsourced services is improving as service providers increase their focus on network services and away from strictly transport services. Yankee attributes this shift in perception to service providers demonstrating that they can help end-users focus on business issues by taking over the time-consuming and labour-intensive aspects of managing the network.

Yankee Group and IDC reported that the worldwide Managed Services and network integration market was worth US$30 billion in 1997. This market has been increasing at a compound annual growth rate (CAGR) of 14 per cent, and is expected to be worth almost US$48 billion by the year 2000. Consulting/integration services and equipment supply/maintenance services each makes up one-third of the overall market, while transport is a relatively small 12% of the total market. Clearly, service providers who continue to focus only on traditional transport offering will be missing out on significant service differentiation opportunities.

However, how active a carrier (especially the traditional telephone companies) in developing the managed services market is often directly related to the extent of competition it faces in the market. Competition is the driving factor that moves the market for Managed Services and other Value Added Services in any country.

IP VPN (Virtual Private Network)

IP-based Virtual Private Networks are proving to be popular alternatives for corporate customers who previously built their private networks on leased lines or frame relay. With IP VPNs, enterprises can enjoy the same security and reliability of a private network, while avoiding the substantial capital costs and increased technology risks of leased lines or frame relay. However, IP VPNs presents an enormous challenge for service providers who need to meet the Class of Service (COS) needs of enterprise users while providing scaleability.

End-user and Service Provider requirements for IP VPN services can be grouped into four categories:

- Any to Any Connectivity
    - IP VPN should provide connectivity for all the sites within a VPN without requiring explicit configuration of a circuit between the two points (which is required in an ATM network).
- Connectivity and Addressing
    - Flexible access: Both hard wired and switched access, leveraging emerging broadband access offerings (eg. xDSL);
    - Internet gateways: Connectivity to extranets and the Internet at large; and

  - Support for private address plans: No change to enterprise IP address assignments which in many cases are not globally unique.

- Performance
  - Service level agreements: Reliability, availability and serviceability guarantees; and
  - COS: Tiered service based on application classes and users, delay and throughput characteristics, and bandwidth guarantees between major sites.

- Management
  - Customer service management capabilities: Web-based, real-time reporting.

- Security
  - Security and address isolation: Hard boundaries that ensure no traffic leakage between VPNs.

Web-Hosting

During 1998, the Web-to-Host market will emerge from its infancy. IDC Research indicates that the Web-to-Host market will expand the reach of the mainframe beyond the traditional trained user.

"The opportunity for host access vendors to expand their customer base is real and attainable. Corporate migrations to an intranet infrastructure will lay the foundation for future deployments," said IDC. "We believe that vendors must shift from the strategy of seeding the market with free bundles to one of targeted solutions in Internet, intranet, and extranet environments."

IDC forecasts that Web-to-Host solutions will begin to dominate the host access market by 2002 when they will represent 81 per cent of total host access shipments. The worldwide market for Web-to-Host Browsers will grow from US$24 Million in 1997 to US$1 Billion in 2002. The worldwide market for Web-to-Host browser licenses will increase at a compound annual growth rate (CAGR) of 111 per cent, from US$24 million in 1997 to US$1 billion in 2002.

Application Service Provider

Over the past nine months or so, the application service hosting model emerge, with Usinternetworking being the leading pioneer as application service provider (ASP). Software for rent, transaction-based pricing, seat-based pricing are new terms that are very attractive, for enterprise wide solution for small and medium companies, to leading functional applications for large enterprises. This market is new but its model is so appealing that research organization like IDC, C.E. Unterberg, Towbin, and others estimated that it would grow to US$21Billion by 2001. The stock exchange, however, think this could even be bigger and rewarded Usinternetworking with a market capitalization of US$2.7Billion at Nov 99, 100 time more than its annual revenue.

The challenges however, is how can applications running across network with good performance, secure, and cheap enough for this to be successful. Computer network, hardware, operating system, database, directory system, application software all need to be redesign to optimize in a virtual shared environment. An IP-based network infrastructure is needed to support this service.

In April 99, the ASP forum was formed to promote the awareness of its potential, and to develop solutions in meeting all these challenges. Many industry players are actively promoting this industry. For instance, Cisco Systems runs an ASP initiatives program to realized the benefits of the ASP model. The programe includes bridging independent software vendors with potential ASP; co-developing with operating system vendor in Network-Based Application Recognition (NBAR); and providing test lab and certification for ASPs.

The ASP forum has grow from 25 founding members, to more than 100 members in 6 months. Many ASPs has also started to provide services in US for applications for Commerce, HR, finance, Enterprise Resource Planning, Customer Relationship management, and Supply Chain Management. Cahners In-stat group estimated that they are 68 active ASPs in US in June, 99. Since then, many software vendor like SAP, Oracle, Siebel, Peoplesoft, and service provider like Cable & Wireless, Enron communication had also announced their plan in this space.

Others

Other value-added services includes unified messaging, conferencing, web-hosting, call centre, etc.

These highly demanded services however are being enabled by a series of technological developments, the most important of which is ***Internet Protocol (IP)****. Therefore, it begin to make more sense for Service Provider to embrace IP in the core of their network rather than having it just at the edge. Today, carriers are building pure SDH and ATM networks in the core and then surround them with a layer of routers to deliver the IP capability. The future will see IP to be more tightly coupled within the ATM and the transmission network equipment.*

Important Networking Trends

The World Is Moving Towards IP

IP is the dominant network protocol today and its dominance is ever increasing with the growth of the Internet and intranet sites. Most of the new services discussed above are IP-based services. All major enterprise applications such as Electronic Commerce and Intranets uses Web browsers and run over TCP/IP protocols..

Other protocols such as IPX, Appletalk and DECNET are diminishing in the corporate networks while IP increases its share. Even IBM and Novell have both committed to support IP. Many SNA networks using Front End Processors have converted to router based IP backbones. The IP dominance will be further accelerated by the proliferation of Internet, Intranet, Electronic Commerce and the emergence of more and more IP-based software applications.

The dominance of IP will change the service requirements from these corporate customers from generic leased lines to more IP-based services such as IP VPN, dial-IP, etc. According to the Yankee Group, telecom revenue will grow to US$260 billion by 2000 from US$190 billion in 1997, with data services, particularly IP, accounting for most of this increase. Market researcher CIMI Corp. expects that "from the year 2000 onwards, 80 per cent of service provider profits will be derived from IP-based services."

Therefore, it is critical that service providers and Carriers start developing their own IP expertise, networks and services today, otherwise, not only that they will miss out on new revenues from the IP based value-added services but see their customers and businesses threatened by new IP-savvy competitors move into their market.

Benefits of IP

IP has been the glue for the Internet - the fastest growing and largest network in history. Through the Internet, IP's scalability, flexibility and resiliency is proven. Many supporting services and applications (e.g. AAA servers, DHCP/DNS servers, IPSec, etc) have also been developed around IP which makes it very useful in real life. Some of the key benefits of IP is briefly outlined below:-

- Ubiquity

  IP is everywhere, all PCs now ship with versions of the Windows operating system which are IP-ready today with built-in TCP/IP stacks. The world's biggest network which reaches hundreds of thousands of households - the Internet, is a pure IP network.

- Any-to-any connectivity

As IP is a connectionless protocol, no explicit connections (physical or virtual) need to be set-up between two end points before they can communicate. A user that connects to an IP backbone can reach all other users connecting to the same backbone without the need to set-up any end-to-end calls or connections. In contrary, in a connection oriented network such as ATM, all users connected to the same physical network would still not be able to communicate with each other if an end to end virtual circuit is not established between the two end points. And the act of establishing connections imposes either network/signaling or operational overhead depending on whether it is PVC or SVC type of connection. Worse, because all applications are still IP based, complex mechanisms such as MPOA are often required for the mapping of IP attributes (e.g. addressing, QOS) to ATM attributes in a ATM based network.

- Scalability

IP is the only network protocol that is able to support tens and hundreds thousand of users in real networks as evidenced by the Internet. The use of Border Gateway Protocol (BGP-4) and CIDR (Classless Internet Domain Routing) Addressing scheme greatly reduces the number of routing entries required in a backbone IP router. CIDR also relieves the IPV4 address shortage situation and ensures that existing address space can last for a much longer time than previously expected.

- Security

IP, through its inherent features such as sub-netting and filtering, provides security to the network. It allows network operators to control access to the network based on sender or recipient address, or based on the type of applications. Additional security can be provided through encryption and password mechanisms such as those defined in IPSec.

- Flexibility

IP is flexible and supports various types of physical media at the deskstop, whether it is Ethernet, Fast Ethernet, FDDI or Gigabit Ethernet. For an ATM network, users need to have ATM Interface Cards on their desktops which is not feasible for most customers. In fact, with the power of market economics which drives the prices of Ethernet and Fast Ethernet NIC cards down, ATM to the desktop is becoming a thing of the past ! This is a good example of the triumph of market forces over pure technology merits.

- Multicast

IP supports multicast easily. A user can initiate to join a multicast group and access services such as video broadcast over the IP network. This provides a foundation for the development on many on-lines services such as on-line news , on-line training, etc.

- Application Aware

As IP headers contains a wealth of information, an IP network is application-aware. Based on the TCP port numbers in the header, an IP network can "sense" the type of application carried in the IP packet, allowing service providers to assign different Class of Service to different application types. This enables services providers to provide differentiated services over their competitors.

- Ease of Accounting

  Through readily available and affordable off-the shelf application packages such as Radius, accounting and billing for IP based services can be done easily. In fact, the Radius software that many ISPs used to provide authentication, authorisation and accounting for their dial-access subscribers is easily available and down-loadable as freeware.

With such undeniable benefits, IP is indeed proving to be a tough competitor to ATM and may eventually replace it as the WAN backbone of choice.

ATM In Public Networks Today

ATM is the high-speed cell-switching technology developed by ITU-T as part of the B-ISDN architecture. ATM has lost the race to the desktop to Ethernet (Fast Ethernet and Gigabit Ethernet) but it is still a good backbone technology due to its multi-service and QoS capabilities.

Many public ATM networks have been deployed worldwide, both trial and commercial, in the last few years. Most of these however, still have limited users. A 1997 survey from Distributed Networking indicated that the combined number of ATM users in the United Stated is less than 1,000. This is in stark contrast to frame relay or Business Internet (see Figure 1).

Figure 1 Comparison of Service Revenues

(Source: Distributed Networking)

While IP is the promise of the future, frame relay and leased line service has been enjoying big success today. Most corporate networks in Asia are built with leased line services while frame relay gradually becomes a substitute to leased line in the US market. Therefore, it is not surprising that ATM finds success in many carrier networks where it is used as a backbone for frame relay networks (e.g. AT&T's frame relay network), or the backbone for the Internet (e.g. MCI, UUNET). In addition to frame relay, ATM also supports leased line service through the use of Constant Bit Rate Class of Service. The capability to provide leased line service is not available from a pure IP based network today. This multi-service capability is exactly why many carriers still choose to build ATM networks today.

In frame relay networks, ATM provides traffic management and service quality which cannot be achieved with frame switching. In Internet backbone, ATM is useful not for its QoS (the Internet is still a best effort service today) but for its high bandwidth and traffic engineering (the ability to explicitly fix a end to end path for IP packets to move from one point to another). In the past, before Packet over SONET/SDH (POS) was invented, ATM was the only technology available for inter-routers links to go beyond T3 (45Mbps). As a result, many ATM networks were deployed in Internet backbones and LAN/campus networks purely for it's broadband capability. With the introduction of POS on Backbone routers, some Internet backbones are built on POS technology which enable inter-router links to go up to STM-1, STM-4 and beyond; many Internet backbones nowadays are deployed with POS technology.

In short, the Internet and frame relay services are generating the ROI on ATM backbones today. Carriers who have invested on pure ATM networks, offering native ATM services are not seeing sufficient returns and are seeking to offer more high growth services from the ATM backbone, especially IP-based value-added services.

Can ATM replace IP?

Can ATM replace IP ? In short, the answer is no. Regardless of the underlying transmission or switching platform, whether it is ATM or SDH or frame relay, hardly any network today exists without the upper IP layer. This is because most applications today are developed based on IP and make heavy use of IP's powerful features. On the contrary, there is hardly any native ATM applications today. The following figure shows the difference between the two, even though both can use ATM as transport. Figure 2 depicts native ATM application applications are directly encapsulated in ATM cells and with no IP layer in between; whereas Figure 3 depicts an IP based application where applications are first encapsulated in IP packets before being encapsulated in ATM cells. Almost all applications in the market today follows the structure of Figure 3. The lack of native ATM applications is a key reason why ATM to the desktop did not take off.

Figure 2 Native ATM Application

Figure 3 IP-Based Application

This reality tells even if the backbone is ATM backbone, the traffic running over it are IP traffic. There has to be IP devices somewhere in the network that handles the processing of these IP traffic. Service Providers and Carriers have all the while been leaving the customers to build the IP network themselves and be contented with just providing pure transport services such as leased line frame relay and ATM circuits.

Two Alternative Architectures For the Next Generation Backbone

The need for an IP-aware backbone to support the new IP-based value-added services is becoming more widely recognised and understood. With an IP-aware backbone, service providers are able to differentiate traffic based on actual user applications (e.g. email, Web browsing) and classify the traffic into premium, regular and discount service classes and price them accordingly. Service provider will also be able to provide detailed reports to their customers on the usage of their networks.

There are two different approaches to delivering an IP-aware backbone.

Approach (1): ATM-Based Networks With MPLS (Multi-Protocol Label Switching)

Until now, ATM networks have traditionally been described as "multiservice", which simply means that one network is capable of supporting multiple services, such as frame relay, circuit emulation, and others. Service providers usually build a separate router based IP backbone to support IP-related services, though these IP backbones may use ATM for transport.

Today there is another option, MPLS (Multi-Protocol Label Switching). MPLS enables service providers to achieve IP+ATM integration. In this network architecture, intelligent switches dynamically forward IP traffic in a connectionless manner while at the same time switching native frame relay and ATM traffic in the same ATM network.

MPLS in an IP+ATM Infrastructure

ATM MPLS integrates native IP and ATM in the same switch. With ATM MPLS, an ATM switch can function like an IP router. This means that a carrier who once have a pure ATM network with no IP capability can now have both ATM and IP in the same network. With MPLS, a carrier can use its ATM network to provide all the IP based services (e.g. IP-VPN) that was listed earlier.

MPLS is built upon the simple, yet powerful, concept of attaching labels to IP packets traversing an ATM network. Each label represents an edge port in the network, and together, they provide the ATM network with the information required to facilitate cut-through switching. A significant benefit of MPLS is that it is topology-based rather than flow-based. As labels are created to represent a "session" between two edge routers, all IP traffic moving between those two edge routers can use the same label . These labels are dynamically generated and modified on the fly based on real time changes in the status of the network.

Label Switching is like using postal codes for routing mail. Before the advent of postal codes, post office personnel had to read the entire address and then decide which branch should receive the letter. With postal codes, mail room personnel know immediately where to route a letter. Similarly, with Label Switching, the ATM switches in the backbone know immediately where to forward any given IP packet with the appropriate IP Class of Service. These labels are generated by the MPLS capable switches based on IP routing protocols (such as OSPF, IS-IS) and Label Distribution Protocols as defined in the Internet Engineering Task Force (IETF) standards. ATM PNNI is not needed for ATM MPLS support.

In other approaches, such as Multi-Protocol switching Over ATM (MPOA), every IP flow (the number of IP flow is associated with the number of hosts e.g. PCs, that a customer has in his network) required an ATM switched virtual circuit (SVC) to traverse the network. Using SVCs to route IP flows works when there are only several thousand flows in a network. When there are hundreds of thousands of IP flows (typical in service provider networks), per-flow switching methods will not be able to scale up.

Another benefit of Label Switching over other integration schemes stems from its ability to enforce multiple levels of IP QoS end-to-end within a shared backbone. With labeling based on user applications, the IP+ATM backbone can differentiate delay-sensitive and discard-sensitive traffic, such as mission-critical SNA and Voice over IP traffic, from less sensitive traffic such as Web surfing. The ability to differentiate traffic enables service providers to segment IP traffic into premium, regular, and discount service classes and price them accordingly, allowing users to choose the level of service appropriate to their applications.

By providing an elegant scheme for routing IP flows across on ATM backbone, Label Switching enables service providers to support legacy services and provision the high-growth IP services that will form the basis of tomorrow's service portfolio.

In Detail : Why Is MPLS (Multi-Protocol Label Switching) Better ?

In existing ATM networks, IP runs "on top" of ATM network with really no integration. Internet Service Providers, for example, use ATM PVCs (Private Virtual Circuits) to connect their routers with RFC 1483 encapsulation. This creates an overlay model (shown in Figure 4) which is neither scalable nor manageble as all the routers on the cloud become IP neighbours interconnected via ATM virtual circuits.

It also uses network resources inefficiently because the ATM links are invisible to IP routing. This means, for example, that a PVC using many hops (in terms of ATM switches) will be used by IP routing just as readily as a single-hop (in terms of ATM switches) PVC, as both PVCs are each a single IP hop. Also, having multiple VCs carried in a single ATM port causes severe inefficiencies with IP multicast traffic, with numerous copies of the same packet being carried on a single ATM link, one for each VC. Another problem is that routing protocols such as OSPF do not perform very well on large fully meshed clouds due to the routing table update traffic duplication and the large number of neighbour states that have to be maintained.

Recently, there has been some confusion in the market with other overlay technologies such as LANE (LAN Emulation) and MPOA. MPOA and LANE have centralised architectures which relies on a large number of SVC calls/connections between clients and the central servers (e.g. MPS, LES, BUS). Inheriting all the problems of a overlay model has made LANE and MPOA having more problems on scalability, performance and security due to the use of SVCs and a centralised architecture. This issues have confined the deployment of MPOA and LANE so far to a LAN/campus environment. With Gigabit Ethernet products available in the market, it is expected that LANE and MPOA will diminish from even the LAN and campus networks. Gigabit Ethernet's simplicity is a stark contrast to ATM's complexity.

Figure 4 The IP Over ATM Overlay Model (LANE, MPOA, 1483, 1577)

MPLS solves the meshing problem by eliminating the notion of an ATM 'cloud' and end to end virtual circuits: the ATM links are treated as IP links and each ATM switch becomes an IP routing peer (Figure 5). Putting IP intelligence into the ATM switch will resolve the IP scalability issue by eliminating the overlay of IP links on ATM and offer a truly distributed routing/labeling/switcing model that takes advantage of the wealth of capabilities offered in each layer.

Figure 5 MPLS Backbone

An ATM MPLS switch has 3 major functions built-in, i.e. : routing, label distribution and switching.

The routing part is needed on the ATM MPLS switch to make use of routing algorithms such as OSPF and IS-IS for exchanging reachability information between the switches and calculating the best route between two switches. The Label Distribution part is needed to translate that reachability information into labels that can be understood by the ATM switches. Finally, the switching part will use the hardware capabilities in the ATM switch to switch labels at wire speed.

A ATM MPLS switch enables service providers to support legacy services such as frame relay and leased lines over the ATM backbone while at the same time provision the high growth IP based services that will form the basis of tomorrow's service portfolio.

Approach (2) Packet Over SONET /SDH

(i) Packet Over SONET/SDH

In a POS network, IP packets are transmitted directly in the network without being segmented and encapsulated in ATM cells. A POS network boosts the speed and performance of router-based IP networks with giga-routers connected over high-speed SONET/SDH and equipped with IP QOS capabilities. It is the most bandwidth efficient and simplest technology if IP is the dominant traffic in the network. POS offers a 25%-to-30% gains in bandwidth efficiency because the overhead required in ATM is eliminated. Packets are statistically multiplexed into a high speed SONET or SDH transmission link. This eliminates the overhead in cell headers and results in more optimum use of bandwidth. POS networks today are highly scalable up to STM-16 (10Gbps) links, even faster than many ATM networks today. Support for even higher speed and Terabit routers are expected in the near future. Recent developments in IP QoS techniques also helps to deliver QoS in an POS network based on IETF's work on Differentiated Services.

To the ISPs, another key strength of POS is its simplicity in designing and operating a IP only network as the IP network operators do not need to learn a new technology - ATM. A POS network is a natural expansion of the existing narrowband router backbone.

Therefore, the author believes that POS will be the dominant backbone technology for Internet backbone, eliminating the ATM layer. ATM however, will remain in the at the access layer for customer aggregation before connecting to a POS core network.

Figure 6 IP Over SONET/SDH (POS) Architecture

Optical Internetworking

Existing Telecom networks typically have a transmission network layer to aggregate (through time-multiplexing) all data and voice traffic from various overlay networks including PSTN, X.25, ATM, frame relay, DDN, mobile, etc. The transmission network has evolved from PDH-based to primarily SDH-based today and WDM/ DWDM in the near future. As the volume of IP traffic rapidly increasing within a Telco network, and to be precise, IP traffic, the role of a transmission/transport layer to multiplex traffic is being challenged by some.

When the combined IP traffic (from Internet, Intranet, and other IP-based services) is sufficient to fill up an entire fiber, vendors and service providers alike are reviewing the traditional networking model today. The new model of optical internetworking is coming our way! Vendors are incorporating the capabilities of transmission equipment, such as SDH, DWDM, into their data networking gears. When that happens, there will not be a need to invest in a separate transmission network underneath the IP layer.

Figure 7 Optical Internetworking

Conclusion

Many service providers have acknowledged that IP is a dominant network protocol today and IP-based applications such as IP VPN, Web-to-Host and Network Commerce are gaining footholds everywhere. Many service providers are building networks to prepare for this new IP world. However, many ATM networks that have been built by service providers today are not integrated with IP. Not only are they not able to deliver true IP capabilities, they are adding another layer of complexity to IP networks.

ATM is an ideal backbone technology for a Carrier that needs to support multiple legacy services such as leased line, frame relay and native ATM with stringent QOS capabilities. But traditional ATM (without MPLS) adds additional complexity and scalability problem to the IP layer network design. MPLS solves the scalability and network complexity problems in a traditional ATM network and should always be considered for any Carriers that intend to provide IP based services or support end-user's IP traffic in its ATM network.

MPLS will truly enable carriers to achieve the vision of an integrated network.

Sessions

Satellites & Submarines

Related Sessions

W.2.4 GMPCS Panel
Wednesday 2 February, 1400-1530
Location: Hononlulu Suite

Chair:
HAN SUK KIM, Vice President/Head, Management Research Lab, Korea Telecom, Korea

Participants:
TIM LOUGE, Space & Telecom Policy Analyst, Coudert Brothers, USA

JOHN MELBY, Motorola

CARLTON JENNINGS, CEO and President, Iridium South Pacific, Australia
Now Becomes Yesterday

TARE CHARLES BRISIBE, International Space University France, Strasbourg Central Campus, France
Policy and Regulatory Developments in Asia-Pacific After the GMPCS MoU and the WTO General Agreement on Trade in Services: A Case for GMPCS System Operators

Discussant:
SALLYE CLARK, Director, International and Government Affairs, Teledesic LLS, USA

Agenda

SUNDAY
JANUARY 30, 2000

0800-1800
Exhibitor Registration

0800-1800
Conference Registration

0800-1800
Planet PTC Open

0900-1030
Special Interest Groups

1030-1330
Board of Trustees'/Members' Meeting

1300-1630
Super Bowl Party
ericsson

1700-1800
PTC2000 Conference Opening

1800-1930
Opening Reception
bell atlantic

gte

MONDAY
JANUARY 31, 2000

0730-0830
Speakers' Breakfast
worldwide

0730-0830
First-Time Attendees/New Members' Breakfast
loral

0830-1000
Morning Plenary

1000-1030
Break
astrolink

1100-1230
Concurrent Sessions

1145-1630
Exhibits Open

1215-1400
Lunch in Exhibits Area

1400-1530
Concurrent Sessions

1530-1600
Break
astrolink

1600-1730
Concurrent Sessions

TUESDAY
FEBRUARY 1, 2000

0730-0830
Speakers' Breakfast
worldwide

0830-1000
Concurrent Sessions

1000-1030
Break
atc

1030-1200
Concurrent Sessions

1145-1800
Exhibits Open

1200-1400
Lunch in Exhibit Area

1300-1430
Special Panel I

1400-1630
Vendor Presentations

1500-1630
Special Panel II

1530-1600
Break
subic telecom

1645-1800
Exhibitors' Reception

WEDNESDAY
FEBRUARY 2, 2000

0730-0830
Speakers' Breakfast
worldwide

0830-1000
Concurrent Sessions

0945-1330
Exhibits Open

1000-1030
Break

1030-1200
Plenary Sessions

1200-1400
Luncheon with Speaker
sk telecom

1400-1530
Concurrent Sessions

1530-1600
Break

1600-1730
Concurrent Sessions

1730-1815
Closing Wrap-up

1830-2000
Closing Function at Lagoon Green

Exhibitor Information

"Customer interaction and the quality of exhibit traffic was excellent." "Very busy, and one of the best opportunities to meet the right people I've been to. Almost everyone in the industry we were looking to meet was there." -Testimonials from PTC'99 Exhibitors

Order a copy of the PTC2000 program and registration brochure.

INVITATION TO EXHIBIT AT PTC2000

In traditional PTC style, industry leaders, government officials, educators, engineers, policy analysts and others will engage in frank and open exchanges of information and ideas. Each annual forum is noted for diversity of content and richness of information. Exhibits of services, products and equipment form a central part of this yearly Pacific telecommunications "information event".

The annual PTC meeting continues to offer the best available one-stop exposure to the major telecommunications stakeholders in the Pacific Hemisphere. We invite you to put forward a positive organizational image to the telecom experts gathered for this prestigious event.

WHAT IS PTC?

The Pacific Telecommunication Council (PTC) is the only international non-governmental and non-profit membership organization dedicated specifically to promoting the development, understanding and beneficial use of telecommunica-tions and information technology throughout the entire Pacific Hemisphere - an area encompassing North, Central, and South America; Northeast, South and Southeast Asia; and Oceania (Australia, New Zealand, Melanesia, Micronesia, and Polynesia).

WHO ATTENDS PTC2000

- Top executives from carriers, suppliers, broadcasters and user organizations
- Key government officials responsible for policy formulation and implementation
- International consultants, telecommunication attorneys, and policy analysts
- Senior representatives from international and regional organizations
- Renowned scholars and noted researchers
- 1600-1700 participants from 45 countries

OPPORTUNITIES AWAIT YOU AT PTC2000

Take advantage of this opportunity to:

1. Announce new products, services, contracts, and ventures
2. Invite your Asia/Pacific/Americas colleagues to meet with you in Hawaii
3. Explore new Asia/Pacific/Americas markets and opportunities
4. Use it as a base for your own regional meeting

PTC2000 Exhibitors

booth	company
1	Telcordia Technologies
2	International Engineering Consortium
3	ATC Teleports, Inc.
4-5	GRIC Communications
6-9/15-18	High Tech Hawaii – Where It All Comes Together
10-11	concert
12	The Aerospace Corporation
13	Cambridge Strategic Management Group (CSMG)
14	Switch & Data Facilities Co.
19	Cordell Mfg. Inc.
20-21	pulver.com
22	Cisco Systems
23	Epoch Internet
24	Arbinet
25	*Asian Communications*
26-27	N.E.T.
28	Lyncole XIT Grounding
29	AIG Telecom LLC
30	CPDI
31-32	Orbital Sciences Corporation
33	Pacific Communications Co.
34	New Global Telecom, Inc.
35-36	SK Telecom
37-38	Redcom Laboratories, Inc.

booth	company
76-78	The Boeing Company
79	Tundra Communications, Inc.
80-81	Trans Global Communications, Inc.
82-83	KDD Submarine Cable Systems Inc.
84	KDD R&D Laboratories
85-86	INTELSAT
87-88	Cable & Wireless
89-90	Intertec Publishing *Satellite Communications & Global Telephony*
91-92	WorldxChange Communications
93	Design Publishers
94-95	Arianespace Inc.
96-97	FLAG Telecom Limited
98-99	Japan Satellite Systems Inc.
100	BizTone.com
101	*Space News*
102-103	INMARSAT
104	Voiceware Systems
105-106	QUALCOMM
107-108	Ericsson Inc.
109	Net2Phone – IDT Corporation
110	OrbLynx
111	GTE Supply
112-114	Fortec Inc.& Associates
115-116	General Telecom

39-40	MCI WorldCom
41-42	Guam-Philippines Cable Company
43-44	Lockheed Martin Consolidated Space Operations Contract
45	Justice Telecom Corporation
46	D.W. Smith & Associates
47	*Telecom Asia*
48	iaxis, inc.
49	Phoenix International
50-51	France Telecom
52-53	Rapid Link Telecommunications
54	it-International Telecom Inc.
55-56	NTT Communications Corporation
57	Telemobile – Wireless Communication Solutions
58	Asia Capacity Exchange (ACE)
59	Open Technology Ltd.
60	RevCom, Inc.
61	Singapore Exhibiton Services Pte. Ltd.
62	ITXC Corporation
63	WCI Cable, Inc.
64-65	NTT Mobile Communications Network, Inc. (DoCoMo)
66-67	ECI Telecom Inc.
68	Clarent Corporation
69	Nortel Networks
70	Strategic Service Alliance, Inc.
71	Westell Inc.
72	Motorola Satellite Series
117	Softel Telecommunications, Inc.
118-119	mPhase Technologies Inc
120	Global Telesystems Group
121	KMI Corporation
122	Japan Asian Network Consulting Co. Ltd.
123-124	GoldenThread Communications Inc.
125	NX Networks
126	China Global Telecom Group
A	ACT Networks, Inc.
B	Vision Accomplished Hawaii Overseas Teleport
C	Worldwide Fiber, Inc.
D	Cirilium Corporation
E	GST Telecommunications
F	Nuera Communications
G	iLocus.com
H	SkyTiger.Net
I	Tekelec
J	IMMIX Telecom
K	Pirelli Jacobson, Inc.
L	q-east.com/PacAmTel

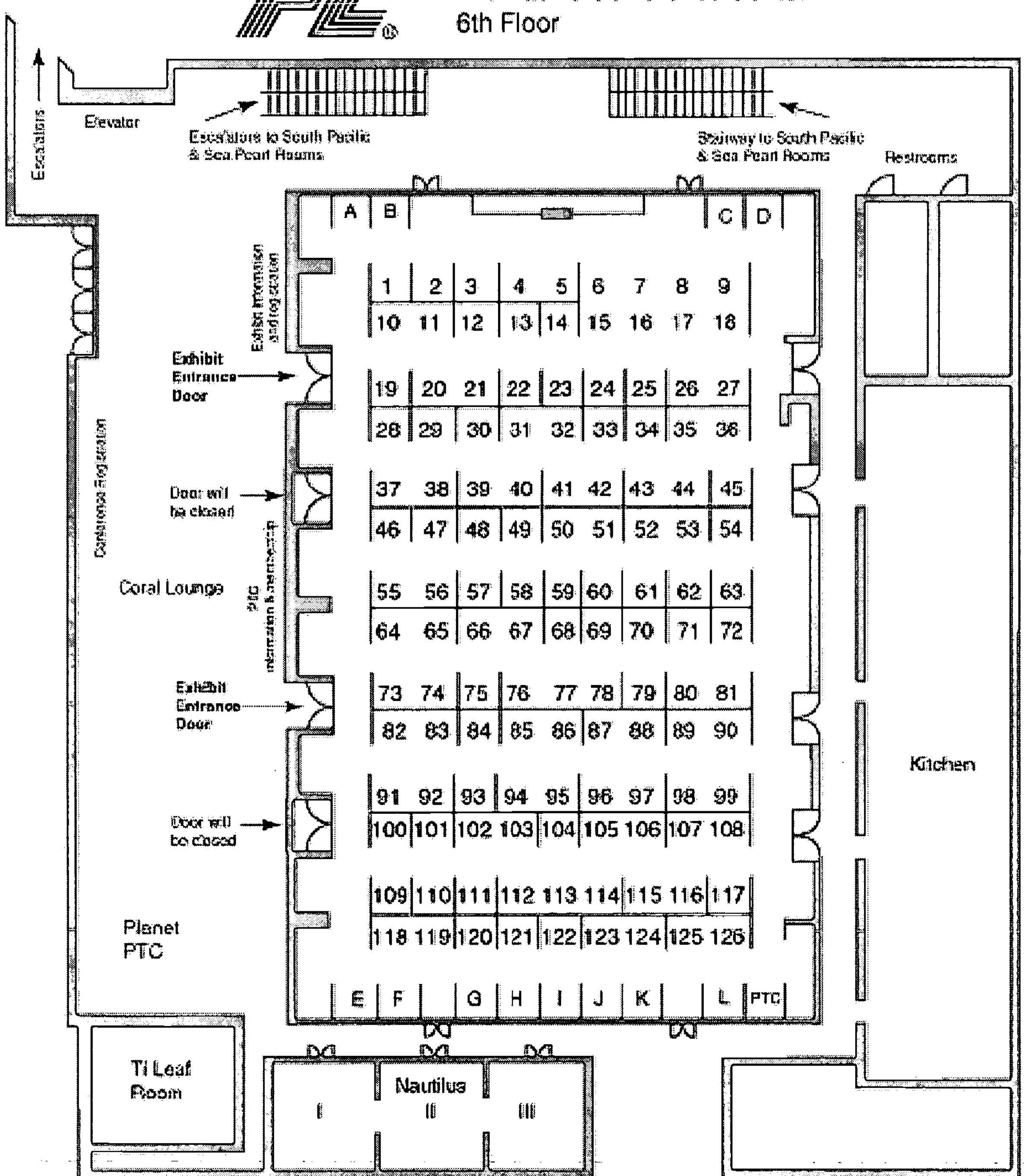
73-74	Lucent Technologies
75	National Exchange Carrier Association (NECA)

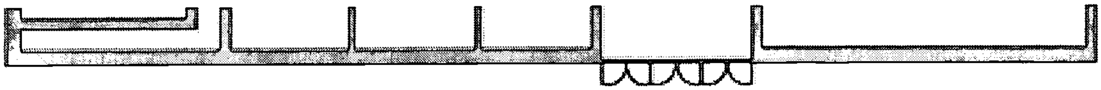
Hilton Maps

list of exhibitors

Exhibitors Layout

PTC2000 Exhibit Layout
Hilton Hawaiian Village
Mid Pacific Conference Center
6th Floor

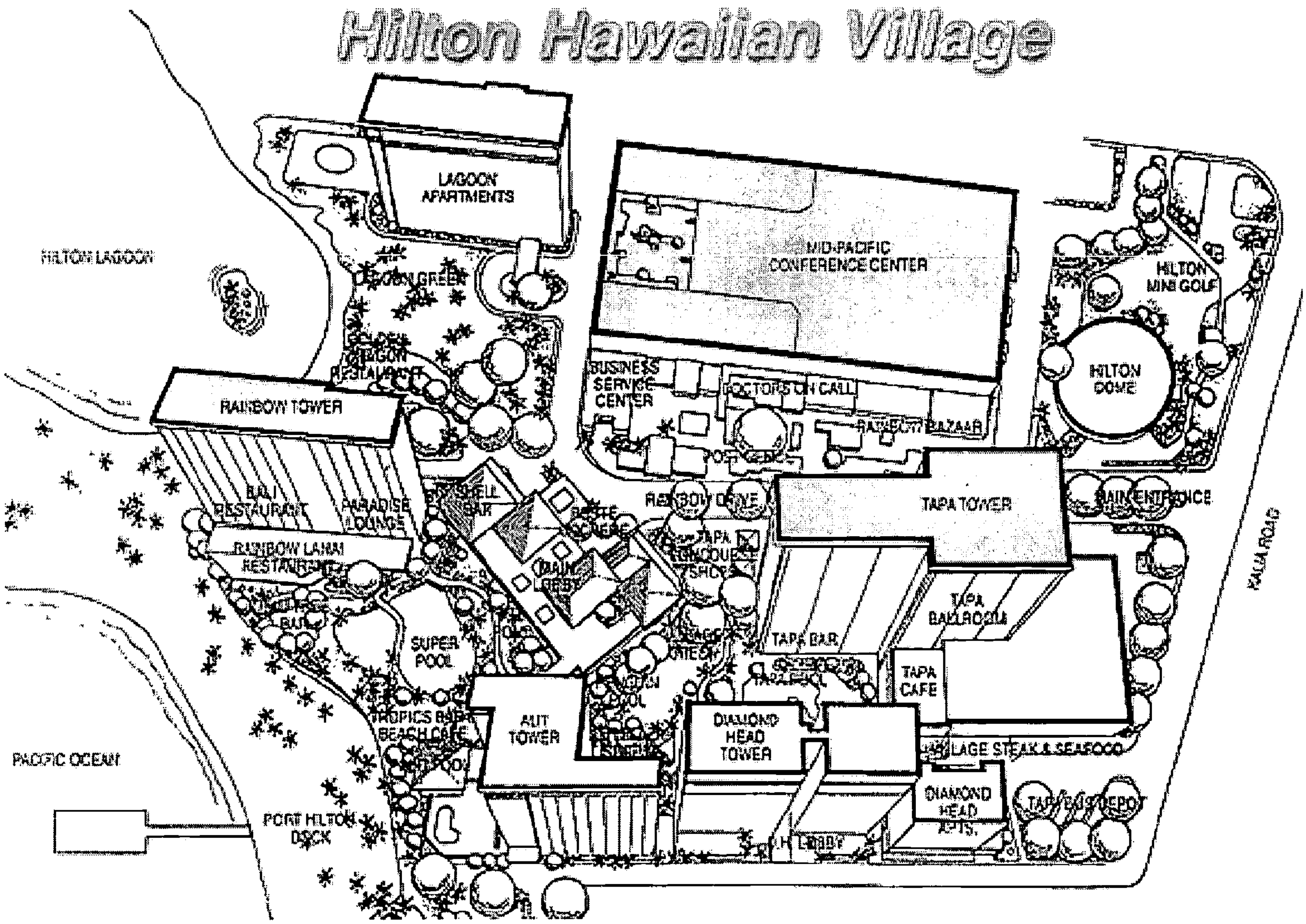




Ceiling Height 17' 11.5"
Booth Size 8'x10' (approx. 2.44 x 3.056 meters)
8' High backwall (2.44 meters)
3' High Side Dividers (.91 meters)

Fire Escape

Hilton Maps



BEST COPY AVAILABLE

Webcast

You will need the Real Player to view these webcasts. Download here.

Monday

Morning Plenary: Panel Discussion: Future of Datacoms and Applications in the Telecom Industry: The View from the Top (more info)
Monday 31 January, 0830-1030
Location: Tapa II

M.1.2 Telecommunications in the Service of Humanitarian Assistance (more info)
Monday 31 January, 1100-1230
Location: Tapa II

M.2.4 State of the Industry Discussion: Submarine Fiber Optic Cable Systems - Today's Business Issues (more info)
Monday 31 January, 1400-1530
Location: Tapa II

M.3.6 Joint Ventures and Strategic Alliances in Asia: Their Role in the New Century (more info)
Monday 31 January, 1600-1730
Location: Tapa II

Tuesday

T.1.6 Convergence and Policy in Asia (more info)
Tuesday 1 February, 8:30-10:00
Location: Tapa II

T.2.6 Policy and Regulation (more info)
Tuesday 1 February, 1030-1200
Location: Tapa II

Special Panel I: Next Generation Internet in the Asia-Pacific Region (more info)
Tuesday 1 February, 1300-1430
Location: Tapa II

Special Panel II: **The Next Generation Network: How do we get there?** (more info)
Tuesday 1 February, 1500-1630
Location: Tapa II

Wednesday **W.1.5 Electronic Business: Global, Regional and National Issues** (more info)
Wednesday 2 February, 830-1000
Location: Tapa I

Plenary Session: **Future of Telecom as Seen From the New Faces Who Hope to Shape It** (more info)
Wednesday 2 February, 1030-1200
Location: Tapa I

W.2.5 Political Economy (more info)
Wednesday 2 February, 1400-1530
Location: Tapa I

W.3.4 Satellite Wireless Communications (more info)
Wednesday 2 February, 1600-1730
Location: Tapa I

Closing Wrap-up
Wednesday 2 February, 1730-1815
Location: Tapa I

Frequently Asked Questions

Registration

- Registration Fees
- Guests
- Registration Confirmation
- Pre- Registration List Deadline
- Cancellation / Refund Policy
- Registration Substitutions
- On - Site Registration Hour

Services

- Planet PTC
- Computer Kiosks
- Assistance
- Special Needs
- Literature Bin
- Waldenbooks
- Rainbow Express-Keiki Club
- Federal Express
- Budget
- United Airlines

Conference Information

- Social Event Tickets
- PTC' 2000 Closing Event
- Badges and Admittance
- Membership Area
- PTC Press Room
- PTC2000 POLICIES
- Computer Kiosks

- Interested in speaking opportunities?
- Would you like an opportunity to showcase your latest products and technologies to more than 1600 industry representatives?
- Would you like to increase your organization's visibility?
- Who attends this most important gathering of the Year 2000?
- Interested in advertising in the Conference Program?

Registration Fees

↑ top

Registration fees include official program events, materials, social events, exhibits and all scheduled meal functions as outlined in the final program. A valid form of photo identification must be presented to claim registration materials. All credit card transactions are processed in US dollars and are subject to current exchange rates. Only US dollars are accepted. International funds must be submitted in US dollars. Mail, Fax, or submit via the PTC website completed registration forms with payment to:

PTC2000
2454 S. Beretania Street, Suite 302
Honolulu, HI 96826-1596 USA

Fax: +1.808.944.4874
WWW: http://www.ptc.org

Registration forms not accompanied with a form of payment will not be processed. For customer assistance, phone PTC Conference Department at +1.808.941.3789

Register by January 6, 2000 top

PTC Member For-Profit/Non-Profit **$700**
PTC Individual Member/Program Participant **$600**
Non Member **$1,100**
Faculty **$550**
Student **$125**

Register from January 7, 2000– On Site top

PTC Member For-Profit/Non-Profit **$750**
PTC Individual Member/Program Participant **$650**
Non Member **$1,250**
Faculty **$650**
Student **$150**

One- Day - Only Registrations top (US$350 for one-day)

One-Day registrants may attend Sunday only, Monday only, Tuesday only or Wednesday only and may not pick up their registration materials until the day of their valid One-Day registration. A One-Day registrant is entitled to attend educational sessions, breaks and meal functions for that day only.

Guests top

A guest is recognized as a spouse/significant other, friend or an adult child (18 or older). Guests are welcome to attend the opening and closing social functions provided a guest ticket has been purchased for each specific event. Children under 18 are not allowed to attend any PTC functions. Persons wishing to arrange for childcare should contact the hotel concierge for the Keiki Program.

Registration Confirmation top

PTC will fax a written confirmation to you within seven (7) working days of receipt by PTC. If you do not receive a confirmation within this time, please call the PTC Conference Department at +1.808.941.3789. Additional preregistration information will be sent to you approximately 30 days prior to PTC2000.

Pre- Registration List Deadline top

To be included in the Preregistration List, PTC must receive your completed registration form and payment by 5:00 p.m. (Hawaii-time) on Monday, January 24, 2000. No exceptions.

Cancellation / Refund Policy top

Written cancellation between 30 September 1999 and 29 December 1999 are subject to a US$100 administrative fee. **No refunds will be made after 29 December 1999.**

Registration Substitutions top

Written substitutions made after 29 December 1999 are subject to a US$50 administrative fee. Liability of sponsor is limited to the amount of the registration fee. Paid registrations may be transferred to a substitute attendee.

On - Site Registration Hours top

Saturday 29 January	**Sunday 30 January**	**Monday 31 January**	**Tuesday 1 February**	**Wednesday 2 February**
1400-1700	0800-1800	0715-1700	0715-1630	0715-1630

• A valid form of photo identification must be presented to claim registration materials.
• Materials may not be picked up for another person.

Social Event Tickets top

Additional Opening and Closing Reception tickets for a spouse or guest may be purchased in advance for US$55 each. Please indicate the additional purchase and complete the guest badge information on the conference registration form and include payment with your registration fee. Additional tickets or vouchers will be made available with your registration packet.

IMPORTANT: Please provide the name of the individual, who will be held responsible to collect these tickets from the Conference Registration Cashier's Desk on Saturday, January 29, 2000 or Sunday, January 30, 2000 during conference registration hours. The tickets will only be released with this individual's signature (please refer to the Conference Registration Form). Tickets must be presented at entrance to function.

PTC' 2000 Closing Event Wednesday, 2 February top

In order to provide an accurate guarantee to our host, attendance to the event must be reserved at the PTC Booth, located in the Coral Lounge of the Mid-Pacific Conference Center at the Hilton Hawaiian Village. Vouchers enclosed in your registration packet must be exchanged for tickets. Vouchers may be exchanged during registration hours on Saturday, 29 January 2000, and until noon (12:00) on Monday, 31 January 2000. Vouchers will only be exchanged when the card enclosed in your registration packet is presented. Tickets will not be given out without this card. Additional tickets may be purchased at the information desk. Don't delay, exchange the vouchers for your tickets early.

Badges and Admittance top

Official PTC2000 badges must be worn for admittance to all PTC Events. Cost of lost or replacement badge is $25.

Membership Area top

Stop by the Member Services desk for all information concerning services and benefits offered by PTC. The Member Services Area is open during registration hours.

PTC Press Room top

The PTC Press Room is available for working press only. Office hours are 8:00a.m.–5:00p.m., Sunday through Wednesday, January 30 through February 2, 2000. A Media Briefing Reception is scheduled for 4:30–5:30 p.m., Saturday, January 29, 2000.

PTC2000 POLICIES ↑ top

No- Smoking Policy In consideration of the PTC Annual Conference delegates, we request that there be no smoking during the general sessions or in the conference foyer. Thank you for your consideration and cooperation.

Private Party Policy Organizations hosting hospitality or social events must inform the PTC secretariat of location, day and time of the event. Further, hosted parties at which attendance is restricted to either verbal or written invitation are not permitted if they conflict with any official PTC2000 activity.

Planet PTC ↑ top

Planet PTC provides Internet access to the workings of the conference. Conference papers, the conference program, the general schedule and special announcements are available on-line. Use Planet PTC to make contacts, to set up meetings, to request information and to contact other conference delegates. Relax with colleagues over a cup of cappuccino at Planet PTC and discus the latest telecommunications technologies.

Waldenbooks ↑ top

A mini-shop of books on telecommunications, management, finance and easy reading will be available in the Coral Lounge of the Mid Pacific Conference 31 January – 2 February 2000.

Rainbow Express-Keiki Club ↑ top

The Hilton Hawaiian Village provides a fun, safe environment for guests ages 5–12. Full and half day programs are available Monday through Sunday. Activities relating to Hawaiian culture are scheduled each day. For further information, contact the Hilton Hawaiian Village at 1-808-949-4321 or sign-up at the social director's desk in the main lobby.

Special Needs ↑ top

Do you have any special needs (i.e. physical, dietary) that we can address to make your participation more enjoyable and beneficial? Please indicate on the registration form or phone at +1.808.941.3789.

Budget ↑ top

Budget has been selected as the official car rental provider for PTC2000. Special rates are available one-week prior and one week after the meeting dates. Call Budget toll-free at 1-800-777-0169, International attendees may contact Budget at 1-808-838-1111. When making reservations, please provide the BCD Code: UO59319 to guarantee special PTC2000 rates.

Literature Bin ↑ top

A literature area will be designated for those wishing to have their organization's literature and/or publications prominently displayed and easily accessible by all conference attendees. A nominal fee is charged for this service. For more information, contact Misty Wheeler at: Tel: 1-808-941-3789, Fax: 1-808-944-487 or E-mail: misty@ptc.org

Federal Express ↑ top

Federal Express will be servicing PTC2000 delegate courier needs. A manned booth, located in the Mid Pacific Conference Center, will be stocked with small, medium and large FEDEX boxes and letter envelopes free of charge. Please have your account number available, if you wish to bill to your Federal Express account (P.O. Box numbers are not accepted). In most cases, FEDEX is able to handle everything from overnight letters to large, heavier freight. If you have any questions, contact Account Executive, Clayton Chow at 1.800.448.9961 ext. 0262 or Customer Service at +1.800.463.3339.

Assistance ↑ top

In furthering the mission of promoting dialogue on telecommunications issues in the Pacific region, the Pacific Telecommunications Council provides assistance to individuals who would otherwise not be able to participate in the annual conference. Funds set aside through member organization donations and other sources are made available to qualified participants. PTC's objective is to assist as many qualified participants as possible from developing countries. Only partial support is given. For further information, please contact Genevieve Curry at Tel: 1-808-941-3789, Fax: 1-808-944-4874 or E-mail: genevieve@ptc.org

United Airlines ↑ top

United Airlines has been selected the official airline provider for PTC2000. United will provide round trip transportation to PTC2000 in the United States and Canada at fares of either 5% discount off any United, United Express or Shuttle by United published fares, Including First Class, in effect when tickets are purchased subject to all applicable restrictions, or a 10% discount off applicable BUA, or like fares in effect when tickets are purchased 0 days in advance. United Airlines is also pleased to offer an additional 5% discount towards the purchase of tickets purchased at least 60 days in advance of travel. Reservations and schedule information may be obtained by calling the United Meeting desk at 1-800-521- 4041 and referencing Meeting ID # 559DY.

Computer Kiosks top

Additional facilities are available at the Computer Kiosk for delegates to view and print the PTC2000 conference proceedings. Located on the 6th Floor of the Mid-Pacific Conference Center (on the same level as the South Pacific and Sea Pearl Suites).

Press Conference Schedule

Press conferences are held in the Ti Leaf Room, Mid Pacific Conference Center.

- **Pacific Internet Exchange**
- **IMMIX**
- **Softel**
- **Hawaiian Language Center UH Hilo**
- **Lyncoln XLT Grounding**
- **GTX**
- **eCHARGE**
- **Fujitsu**
- **oCen Communications and Telia Clearinghouse Services to cooperate on voice over IP**
- **Sonsub Awarded Contract for CRABSS**

PTC2000 Attendees List:

- Complete Attendees List
- Attendee Search
- Organization Search

Attendees List

- Complete Attendee List
- **Attendee Search**

Last Name

Search

- Company Search

PTC2000 Attendees List

- Complete Attendee List
- Attendee Search

- **Company Search**

Company

Search

ERIC
Educational Resources Information Center

REPRODUCTION RELEASE
(Specific Document)

NOTICE

REPRODUCTION BASIS

☒ This document is covered by a signed "Reproduction Release (Blanket) form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").

EFF-089 (9/97)