Enabling home networking for digital entertainment™

IEEE Presentation

March 2005

Agenda

- News and Trends
- Video on Demand (VoD)
- Switched Digital Video (SDV)
- Digital Video Recorders (DVR)
- DVR and VoD
- Virtual VoD
- Networked DVR
- Home Networking of Digital Entertainment

News and Trends

Entertainment Center Works Well in 1 Room But Not Through House

Motorola Buys Ucentric

DVR to reach 10%, and HDTV 20% household penetration in 2005

Comcast and Cox to offer Voice Service to all subscribers by mid-2006

SBC Revs Up for Video as Cable, Internet Eat Into Phone Business

DirecTV to offer 50 national and 500 local HDTV channels by the end of 2005

Verizon Selects Motorola to Provide Infrastructure and Customer Premise Equipment on Verizon FTTP Network

Echostar to buy Voom Satellite for $200M

Ucentric Hooks-Up DirecTV Media Service

Verizon, SBC Saddle Up To Compete Head to Head with Cable in TV Service

Video on Demand (VoD)

- Traditional VoD is deployed by cable companies
  - Video stored at cable head-end
  - Consumer has control of VoD through modem return channel
  - Can start movie “on-demand” and have access to “trick modes” such as pause, rewind and fast forward
  - VoD available at every TV in the house
  - Can start on one TV and switch TVs during VoD session

- Direct Broadcast Satellite (DBS) uses the Digital Video Recorder (DVR) to provide “VoD”
  - No return channel
  - Combination of near VoD (staggered start times) plus DVR gives trick mode capability of VoD, but start times are every 20 minutes or so

Switched Digital Video (SDV)

- SDV does channel changing at the head end
- Allows unlimited number of titles
- SDV will enable “virtual VoD” through services like Microsoft’s IPTV product
  - Several telcos deploying this technology as they enter the video market

Digital Video Recorders (DVR)

- TiVo has popularized the DVR concept
  - Ability to pause live TV
  - Commercial skipping
  - Access to “trick modes” like a DVD player (fast forward, rewind, pause, etc.)
- USA will reach 10 percent household penetration this year – moving beyond early adopters to mass market
  - Over ½ of all DVR’s in 2006 to be deployed by Cable MSO’s
- DVRs that support HDTV content are now on the market, and having great market acceptance
  - Requires much larger HDD

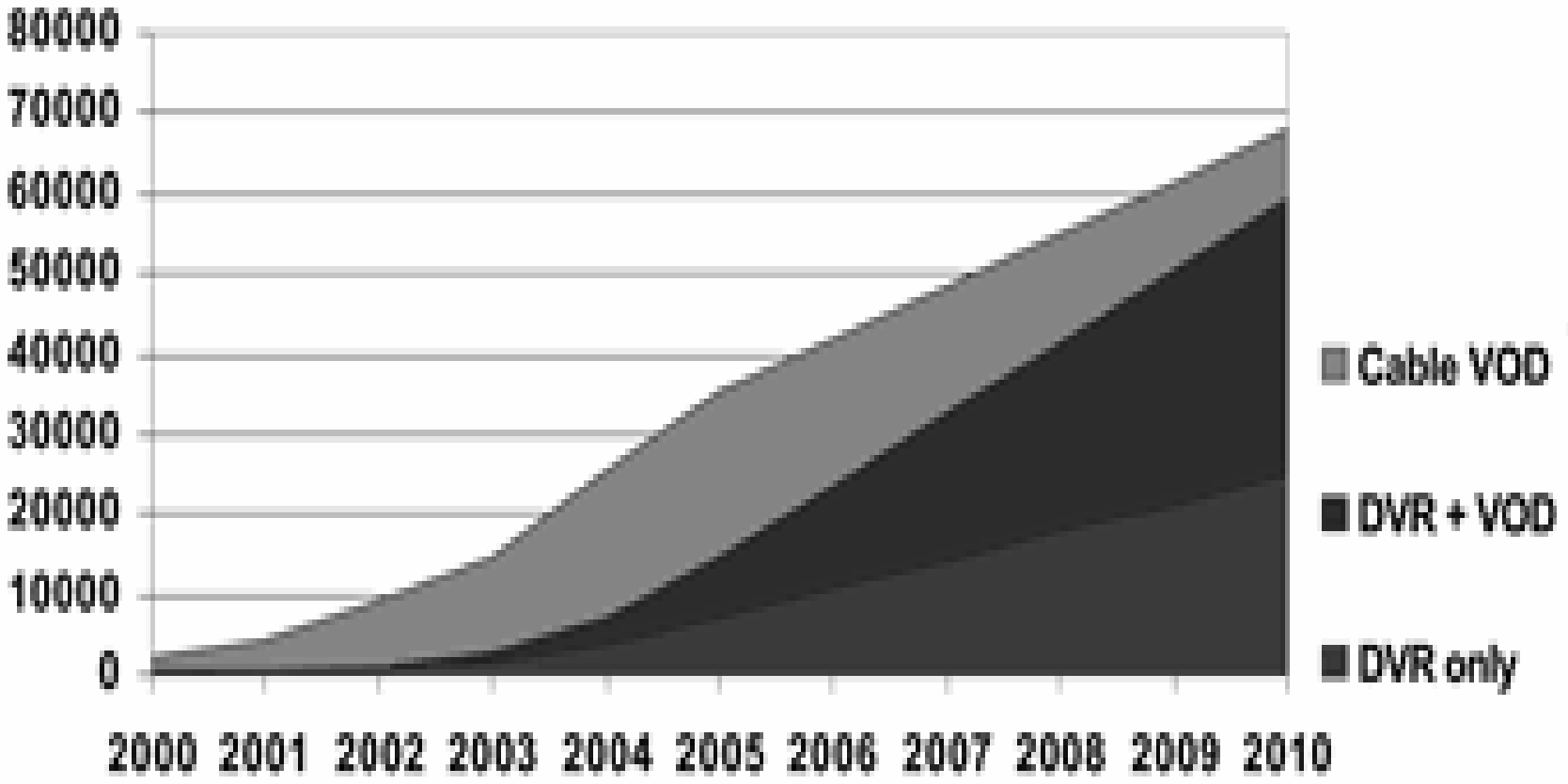
DVR and VoD

- In DBS, “VoD” = DVR
  - Need networking of STBs to allow consumer to change TVs during a “VoD session”
- Telcos deploying SDV will need networked DVR in combination with IPTV to give full VoD capabilities
- Downloadable movies services like Net Flix, Movie Link, etc. need DVR
- VoD from cable is only for the “top 100” videos – new release movies
- DVR users watch more VoD than non-DVR users (5/2004 Lyra Research report)
- MSO’s believe VoD and DVR are complimentary (huge library content + instant pause/rewind/record)

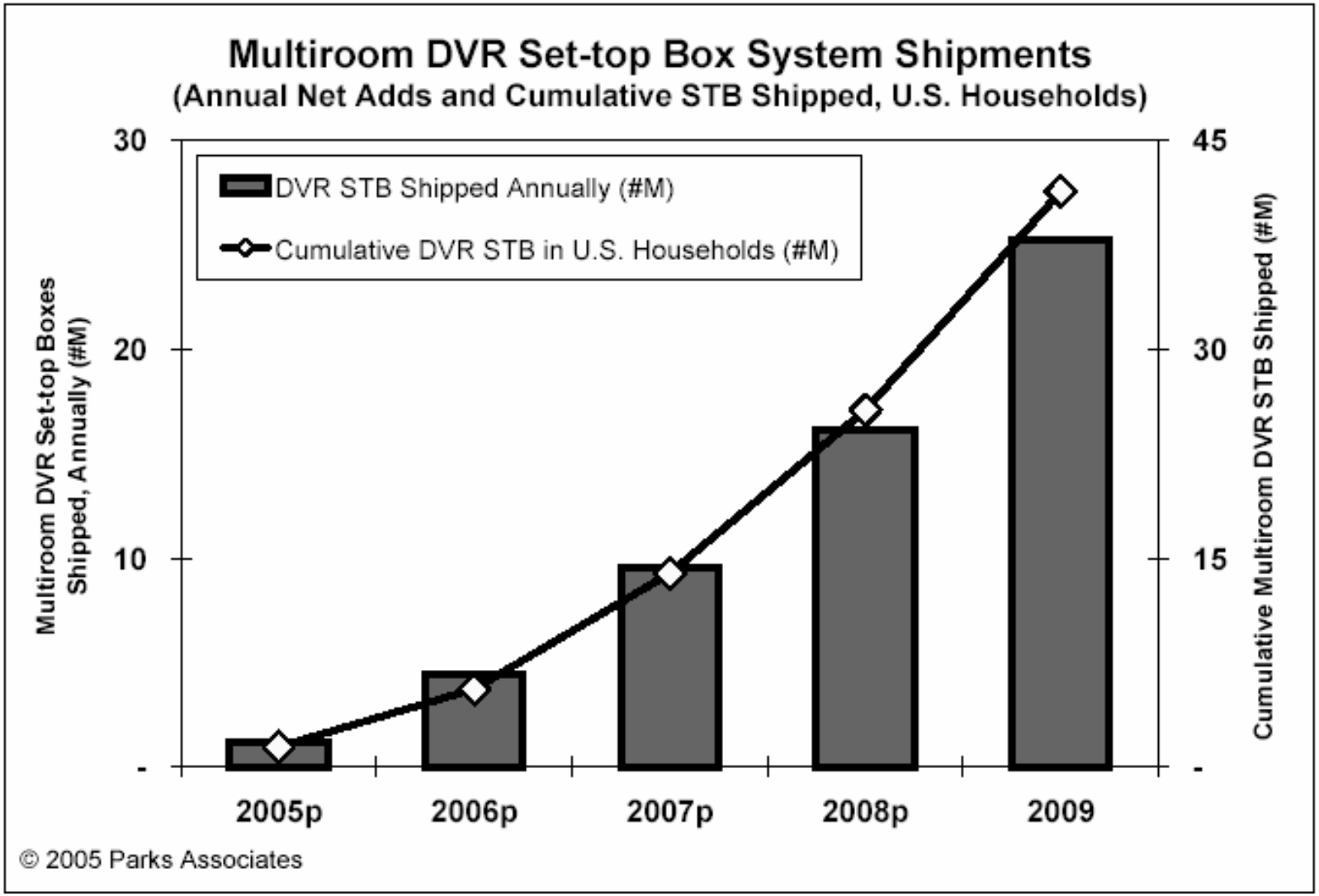
Networked/Multi-room DVR

- Research shows that once consumers have DVR, they want that capability at every TV
- HDD-based DVR in every room not economical, and does not address “any room access to all entertainment”
- Network DVR with server and thin clients is key concept, and also enables virtual VoD (SDV + Internet based VoD)

DVR vs VoD Market Growth



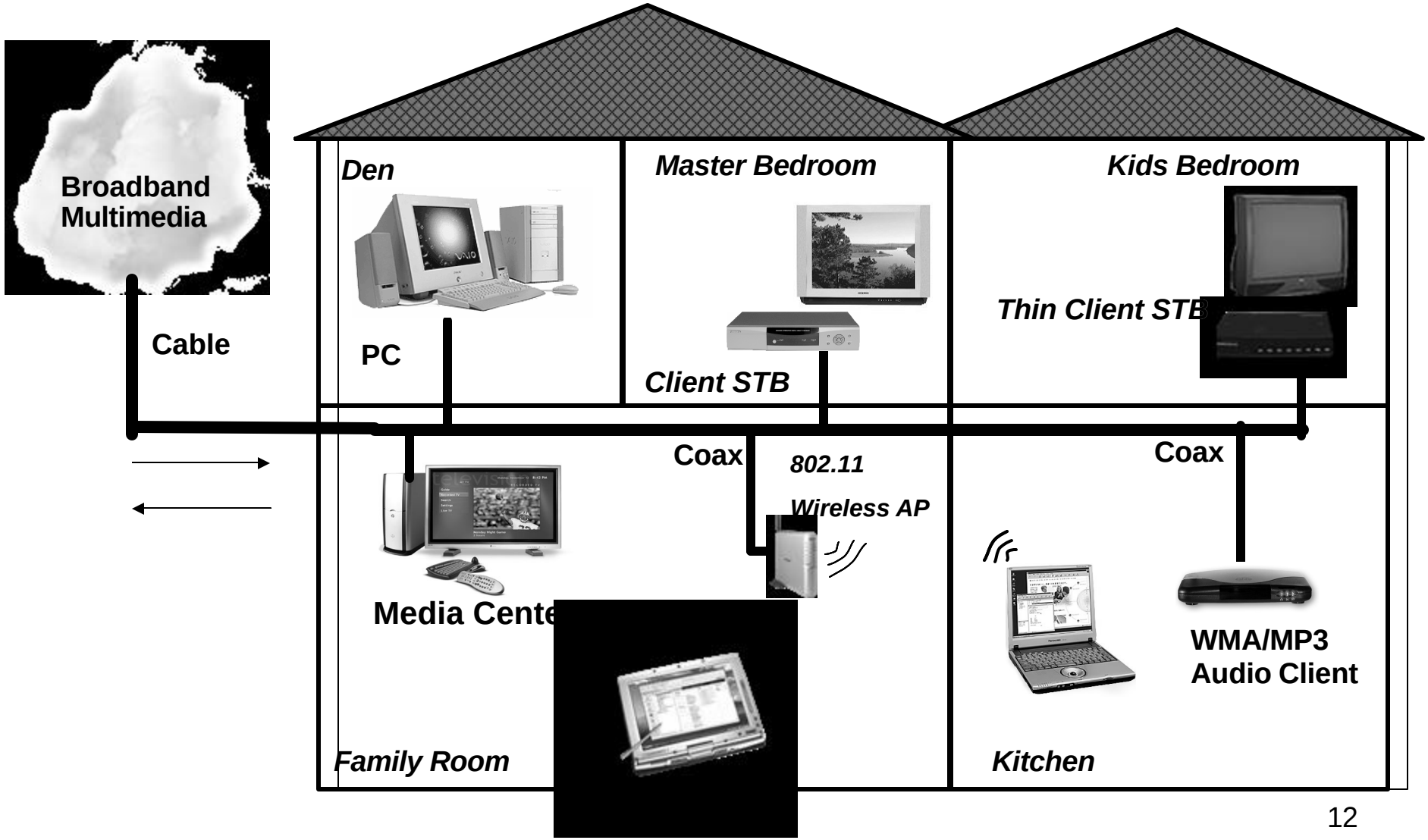
Multiroom DVR Market Growth



The Digital Entertainment Home Network

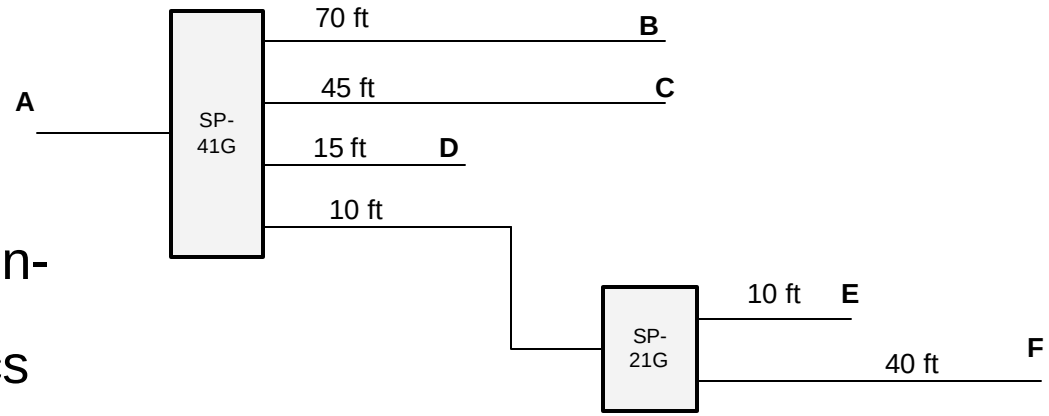
- Ethernet / Wireless / Powerline / Phoneline / Coax
- Ethernet
  - Only installed in ~1 Million homes, expensive to retrofit
- Wireless
  - Robustness + Unlicensed band = not viable for operators
- Powerline
  - Probability of high datarate is unacceptably low
- Phoneline
  - Poor location in home, low probability of high throughput
- Coax
  - ~100M homes, ideal location, huge bandwidth potential, very high probability of high datarate
  - Will likely coexist with wireless for in-room connectivity and data services

Coax, the Digital Backbone!

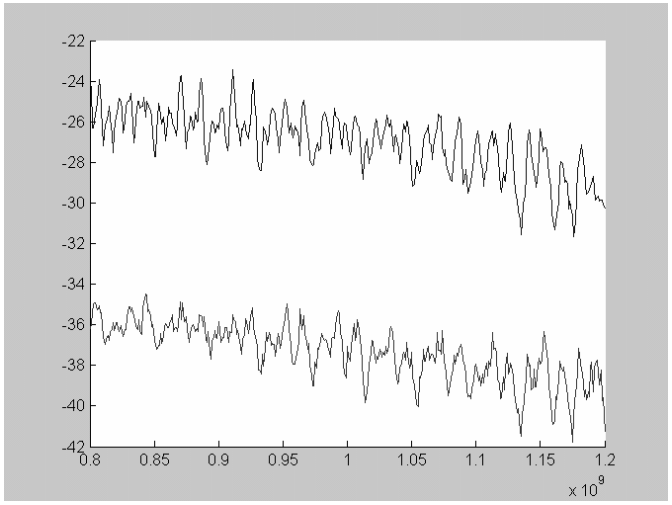


Cable Architecture

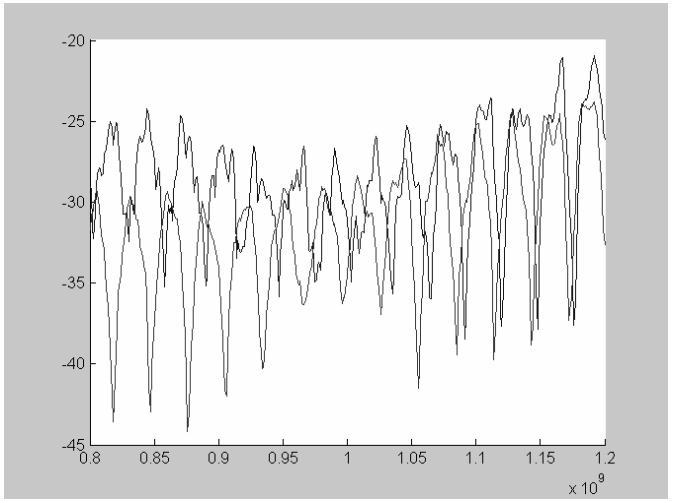
- World's most comprehensive database of in-home plant characteristics
- System designed with thorough understanding of in-home coax, devices and external plant characteristics



Frequency Response
Longest Path: B => F



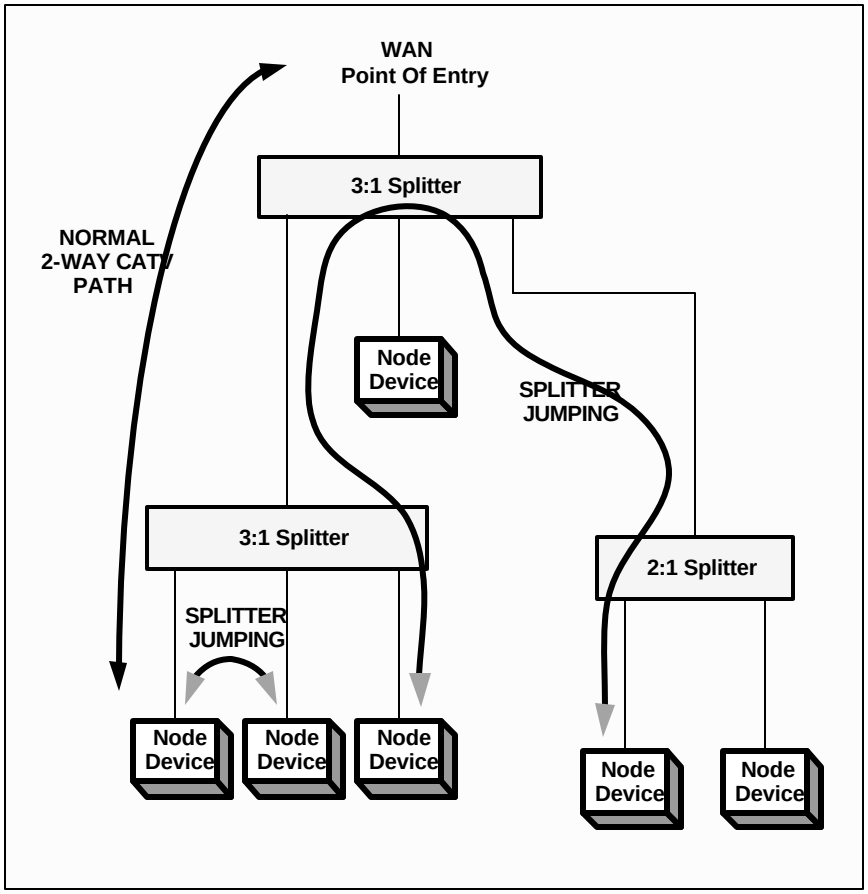
Frequency Response
Shortest Path: E => F



The Entropic Solution

- No changes to the home – no new wires
- Jumps backwards through splitters passively
- Peer-to-peer support for multiple video sources and scalability
- Coexists with all services delivered on coax
- >100Mbps net throughput supports multiple room DVR
- Supports full Quality of Service (QoS)

c.LINK Works From Room to Room

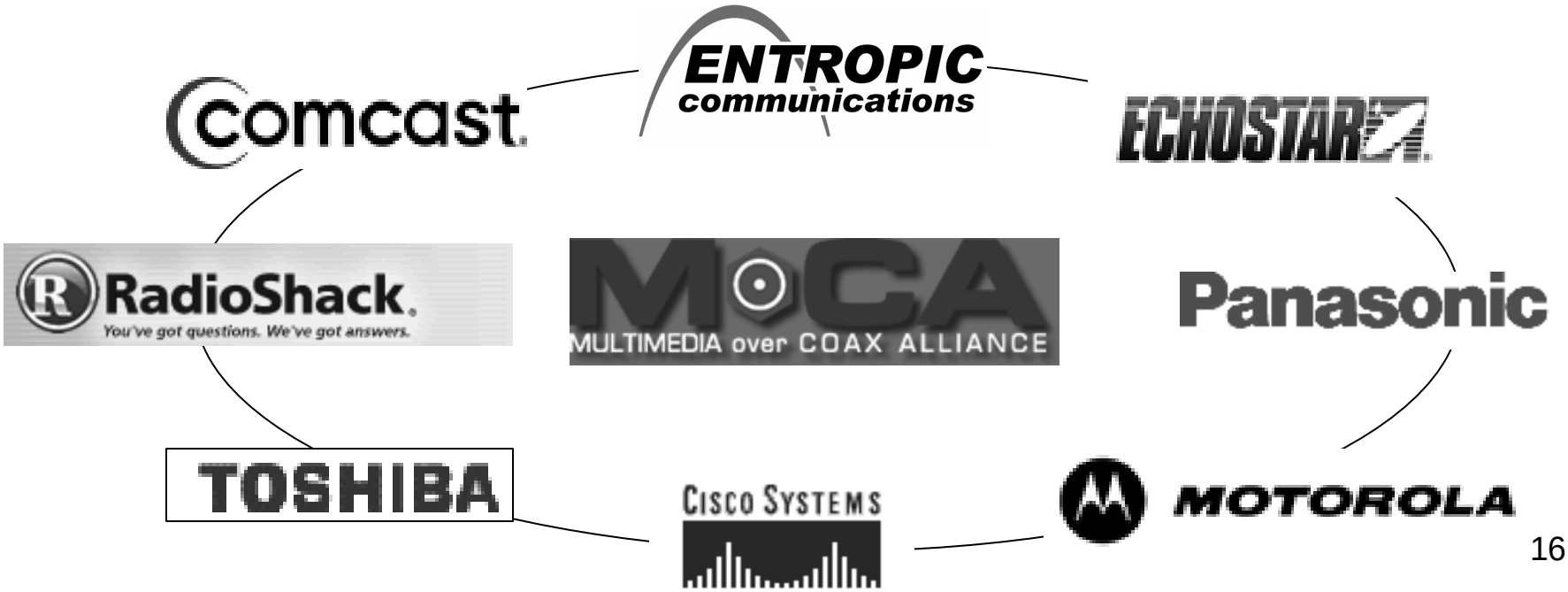


c.LINK™ - The Digital Entertainment Network

- Designed for digital entertainment networking
- Video quality packet error rate
- Very low latency to support video/gaming
- Extremely robust (video versus best effort data)
- Ubiquitous coverage at high datarates

Industry Standardization

- Founding members established MoCA to select a technology as the industry standard for Multimedia over Coax
- Large scale field trial to validate technology, specification, and interoperability certification process, then open to affiliates



Summary

- VoD and DVR are complimentary
  - Benefits of huge library content + Personalized recording and instantaneous control
- Satellite, Cable, and Telco have different VoD plans but all involve multi-room DVR functionality
- VoD and DVR are both entering the explosive growth phase
- Digital entertainment home network backbone WILL be coaxial cable for all major operators
- Leading coax technology is Entropic's c.LINK
  - Shipping in production today
  - Standardized through MoCA

THANK YOU.

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