Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Use Cases and Market Potential of PAC Corresponding to Call for Presentation]
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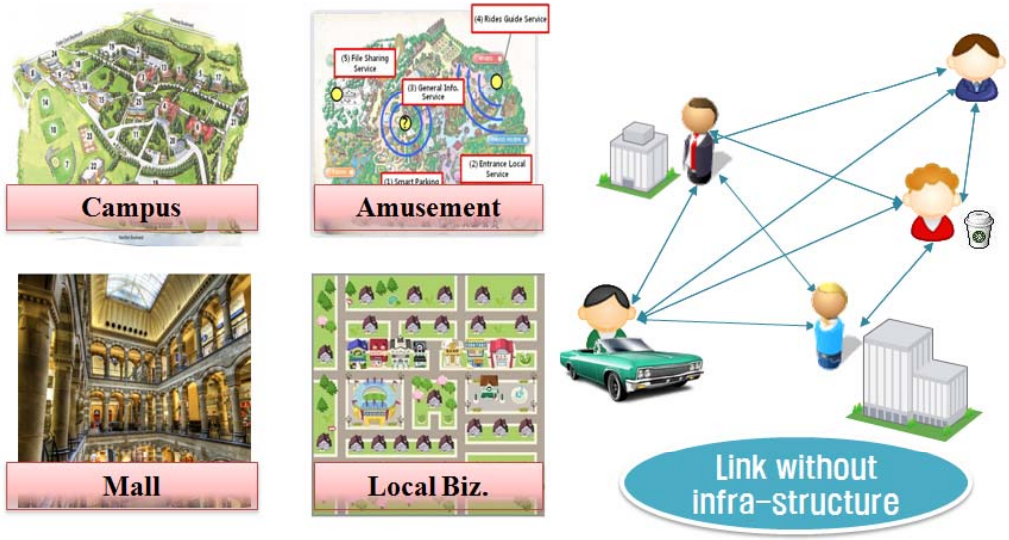
Re: [.]

Abstract: [Representative use-cases for Peer Aware Communication (PAC) to support local and dynamic traffic service within hundreds of meters nearby a user and expected market potential]

Purpose: [To show use cases and market potential corresponding to CFP of PAC and to clarify the scope of PAR & 5C]

Opening

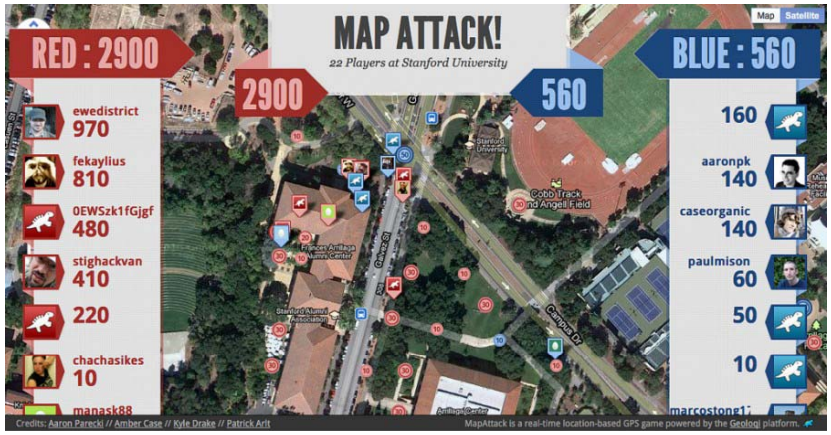
- Peer Aware Communication (PAC)
  - Discover information around me
  - Without infrastructure
  - Low power consumption
  - High performance



Service Trend at Local Vicinity

- Geo-social networking
  - Who's here, 1 km
- Location-based Game
  - 'check-in' game: Foursquare, Gowala
  - over 25 various games from Wikipedia
- Location-based Service
  - Google Latitude, Around Me

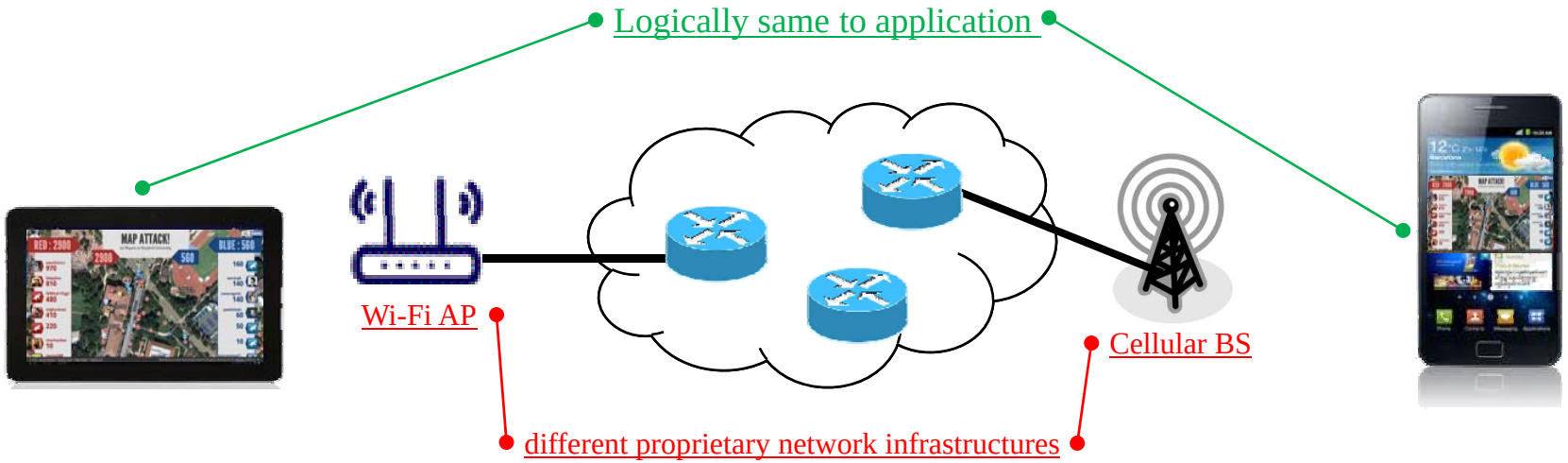
Around Me



Map Attack

Service Trend at Local Vicinity

- Near-me Area Network (NAN)
  - A logical communication network built on top of existing physical network infrastructures that focuses on communication among wireless devices in close proximity



Service Trend at Local Vicinity

- Near-me Area Network (NAN)
  - Some services are meaningful only to a group of people in close proximity
    - Ben is going to the ABC supermarket to buy three bottles of red wine. The supermarket offers a 30 percent discount on the purchase of six bottles, so he sends a message to other customers to see if they would like to buy the other three bottles of wine.
    - Susan bought a movie ticket 15 minutes ago, but she now feels dizzy and can't watch the film. She sends out messages to people around the cinema to see if anyone will purchase her ticket at 50 percent off.
    - In a theme park, guests would like to know each ride's queue status to reduce their waiting time. So, they take a photo of the queue they're in and share it with other guests through a NAN application.
    - Ann works in Causeway Bay and would like to find someone to have lunch with. She checks her friend list to see who is closest to her at this moment and invites that friend to join her.
    - Carol just lost her son in the street, so she sends out his picture, which is stored in her mobile device, to passers-by to see if they can find him.

Problem of Existing Approaches for Near-me Area Network

- Virtue
  - NAN provides common discovery platform to Apps
- Limitation
  - high control overhead
    - due to periodic report from Apps and updates from server
    - 10s of protocol steps for connection setup
  - long latency
    - the communication path between devices is long even though two devices are geographically close in the same segment

Peer-awareness by direct communication in close proximity

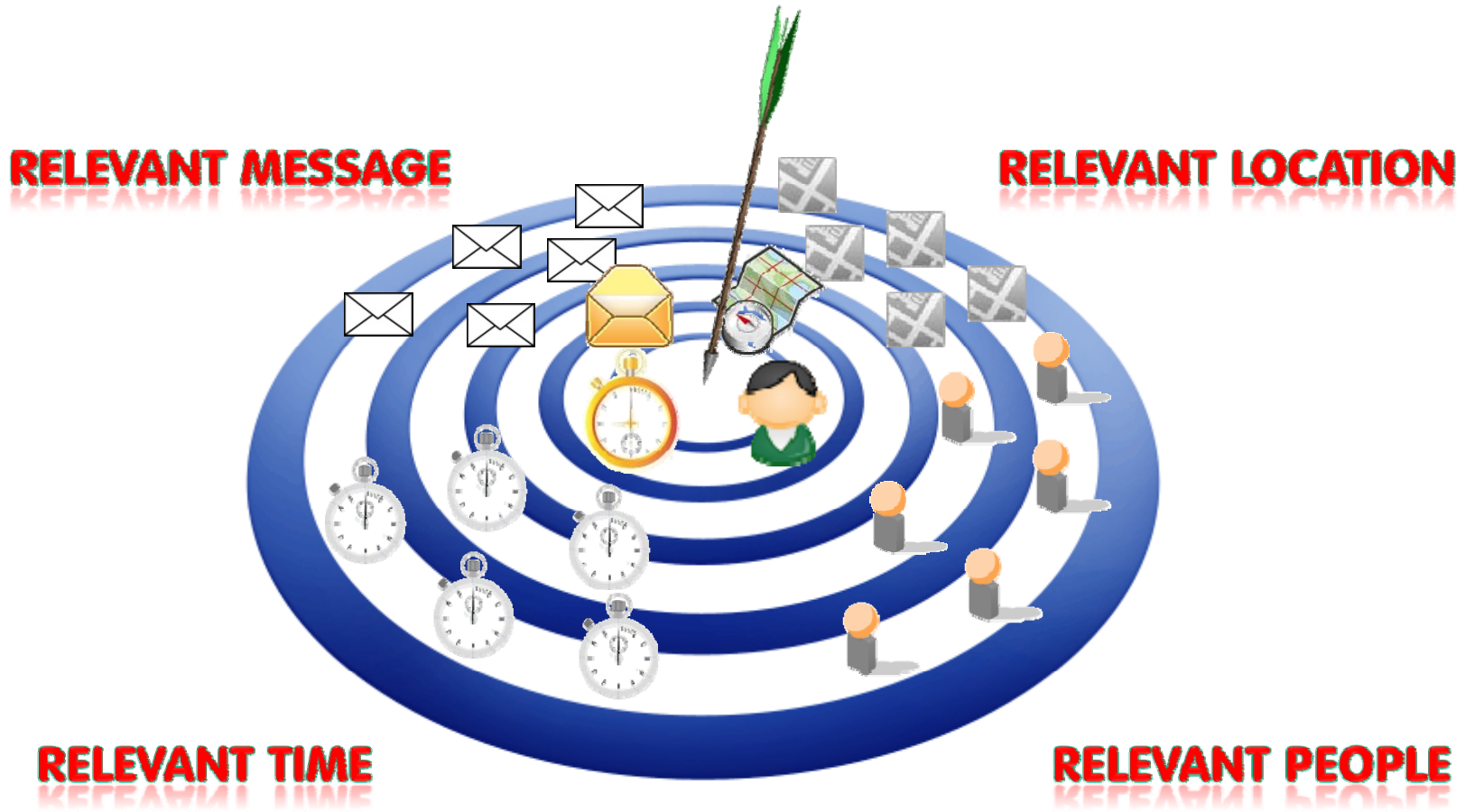
Peer Awareness

Who's Nearby, Not Who You Know

- Proximity-awareness
  - local people /event or location information
- Interest-awareness
  - match interests for shopping, gaming, or etc
- Service-awareness
  - find service identification
- Interface-awareness
  - notify other communication interfaces

[Tech Crunch]

Peer Awareness



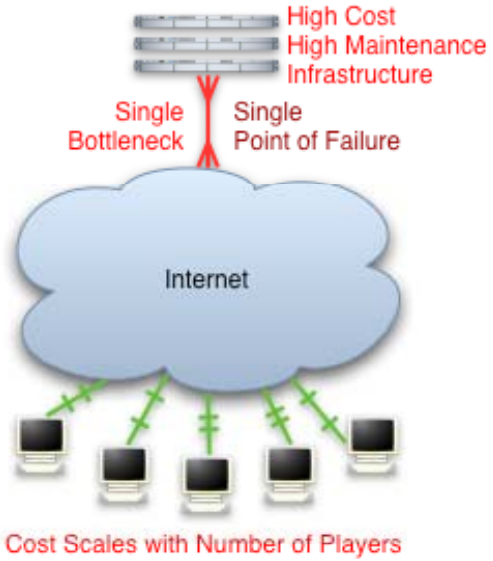
Peer Awareness

- Peer Discovery
  - Broadcasting only prior to connection setup
  - Autonomous awareness (less user manipulations)
- Peer Discovery Information (PDI)
  - Service ID, user ID, Protocol ID
  - Customer information : membership, wish list
  - Service/Resource locator: URL*, SIP call-ID
  - Local advertisements: coupon, deal, flash-mob
  - Alarm, emergency message

*URL (Uniform Resource Locator), **SIP (Session Initiation Protocol)

Infrastructure-less Architecture

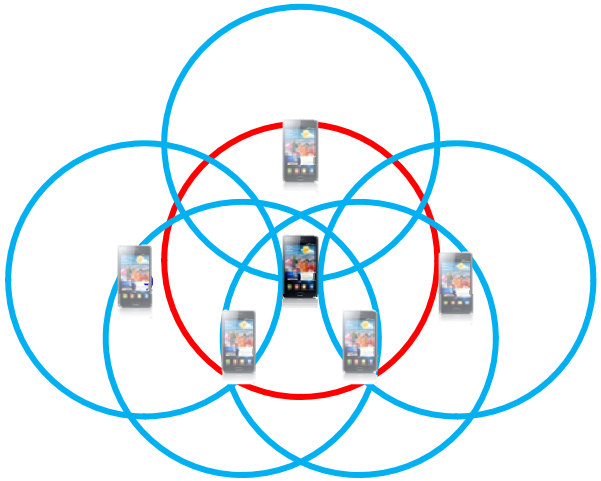
- No BS, no AP
  - No cost for deployment or maintenance
  - No network control overhead
  - Low power consumption compared to using BS/AP with GPS
  - Fulfill both massive and riche market
  - Useful for crowded and even isolated places which is not reached by infra as well
- No LBS server
  - Low cost to implement local search
  - More applications from contents providers
  - Avoid tracking and storing personal geo-location
  - No single point of hazard from cracking



[Centralized Game Model] from Ashwin Bharambe

Peer-to-Peer Communication

- No coordinator node
  - Border-less network
  - Scalable networks to cover 100s of devices
- Long range to cover large site
  - Enhance service/market potential
- Direct link
  - Low latency
  - Efficient resource usage
  - Low power consumption



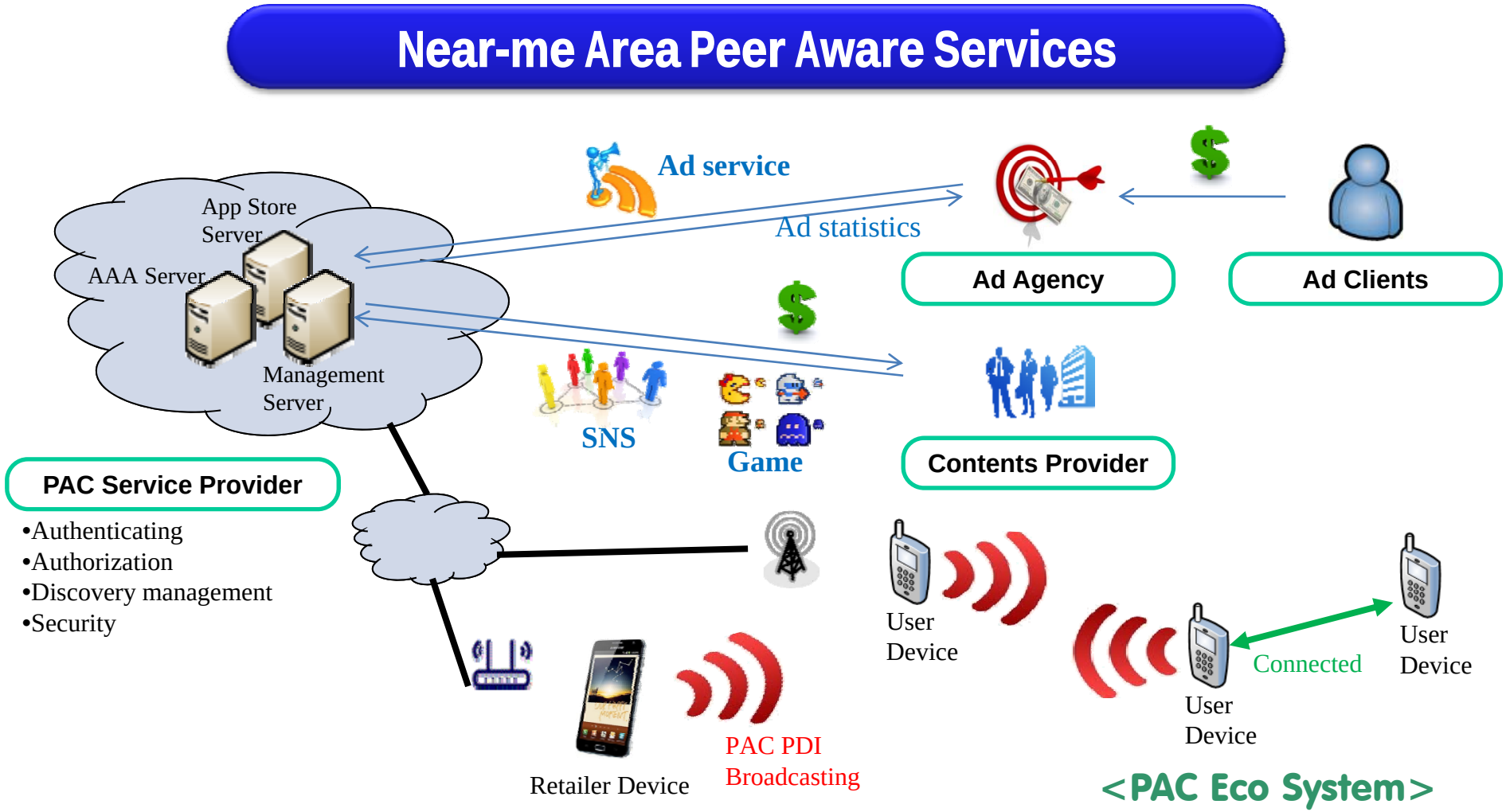
Fully Distributed Coordination

- Distributed protocol
  - Distributed synchronization
    - enables low duty cycling for discovery
    - enables efficient signaling and transmission mechanism
  - Distributed resource management
    - distributed multiple access
    - distributed scheduling
    - distributed interference management
- Benefit
  - Simple & Scalable
  - Proper to device-centric operation

PAC Characteristics

- Scalability
  - 1s to 100s of meters of range
  - High discovering capacity up to couple of 1000s of PDIs
- Simplicity
  - Days operation with low power consumption
  - Minimal system/protocol overhead
  - Cross-layer optimization
- Efficiency
  - Distributed protocol with high efficiency
  - High spectral reuse

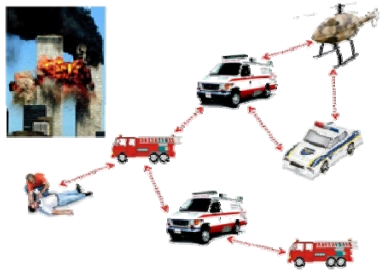
PAC Biz. Model



PAC Use-cases

- Urban/Crowded
  - SNS, Advertisements, Gaming,
  - Broadcasting/Multicasting
  - Service/Connectivity discovery
- Rural/Isolated
  - SNS, Advertisements
- Public safety
  - Back-up network at emergency

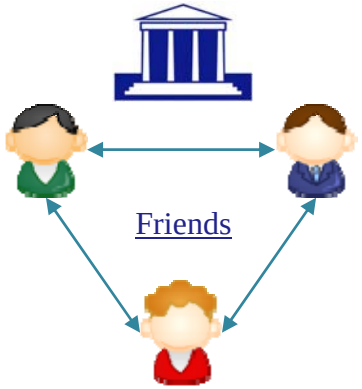
Social Networking



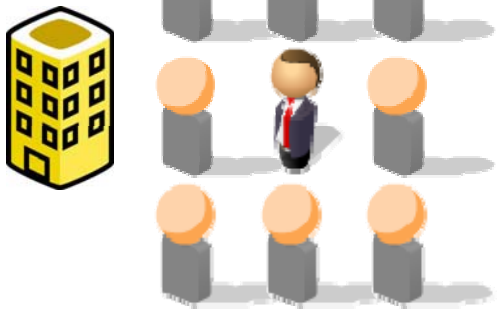
Public Safety

Use-case 1: Peer Aware Social Networking

Food Truck



Friends

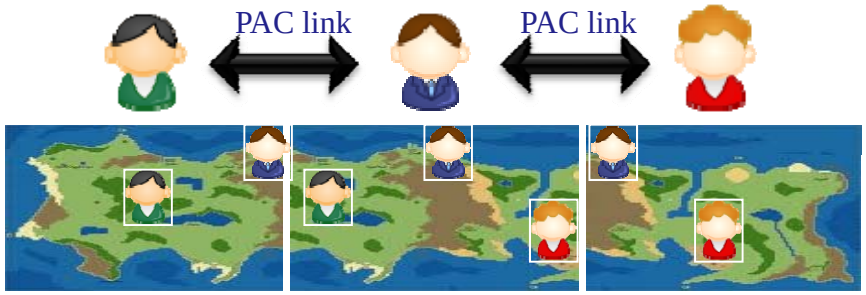


Company

Neighbors

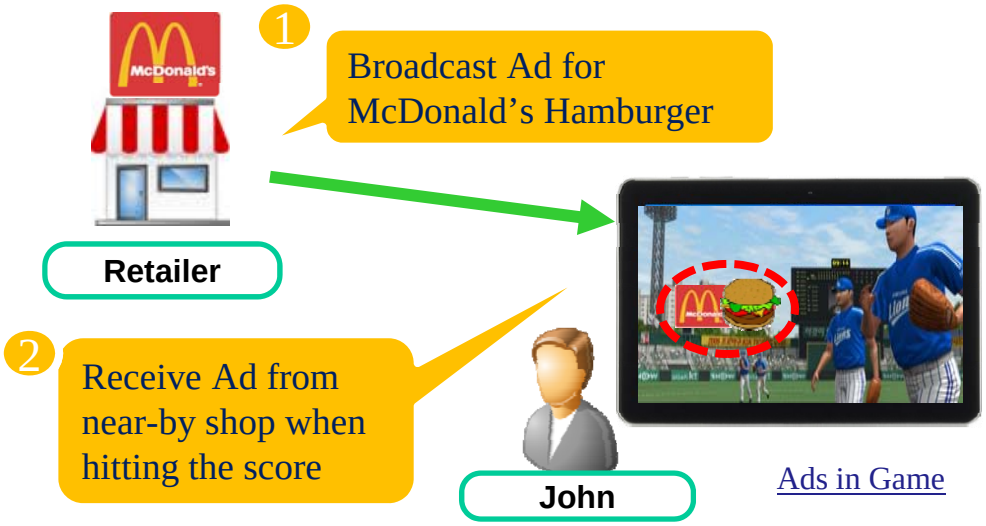
- Geo-social networking
  - Relevant to situation/context
- Proximal filtering
  - Avoid too many messages from social network
- Proximal search
  - Suitable for dynamically changing proximal info.
  - Proximal answering engine
  - Proximal profile matching
- Augmented society
  - Complementing real world
- Advertising platform
  - By relevant information

Use-case 2: Distributed Service Platform



Distributed Game Model

- Distributed platform
  - For collaborative applications that is scalable and efficient
  - Gaming, streaming, file sharing, productivity, education
- Advertising platform
  - By user interaction/context



Ads in Game

Personal DJ

Use-case 3: Alarm & Emergency Service

Car Accident Alarm

Finding people

Connecting people

- Accident alarm
  - Fast notification in near-by area
  - Intelligent response system
- Emergency platform
  - Robust link to infrastructure or public officer, or among distant peoples
  - Coverage enhancement
  - Finding an injury
- Urban sensing
  - Monitoring hazard syndrome and inform to people in the area
  - Chemical effusion, air pollution, water contamination

Potential Spectrum Bands

- Unlicensed
  - No need for licensees, fast adoptions
- Licensed
  - Easier to find Biz model (compared to unlicensed)
- Potential spectrum bands
  - Unlicensed : TV White Space, WLAN(2.4GHz, 5GHz), local license-exempt band
  - Licensed: under utilized existing bands (e.g. TDD band)