Hybrid Fiber Wireless Reshapes the Future of Communications

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Background and credits

- 40 yrs in computing/communications
- Internet protocol designer, systems architect, R&D senior executive
- Researcher in distributed systems, radio design and networking systems

- MIT Communications Futures Program
- Andrew Lippman, David D. Clark, Charles Fine, and our grad students

Wireless much more than a "third pipe"

- 802.11n beats copper and 4G cellular in the first 100 meters, AND supports
- User-at-the-center networking
  - Localized awareness and search
  - Access nearby devices
- Group-based, not point-to-point
  - Groups of devices configured on demand
  - Groups of users in constant linkage

What matters: Personal Mobility

- Humans move in a fully connected world that extends reach and control
- Services not tied to terminals, accounts not associated with physical terminations
- E.g., the "Amulet" - your virtual sphere of influence and access travels wherever you carry go with it

When always live, wireless creates "context"

- Communications embedded in context
  - Social
  - Mobile
- Enabled by identity (relationships)
- *Centered on awareness and discovery*
- *Shared use of services and resources*
- *Negotiation enabled by "intelligence" in agents each user controls throughout the "cloud"*

Beyond spectrum sharing: wireless interworking

- Limiting view: spectrum "sharing" - mutual avoidance – focused on "interference"

- When radios interwork cooperatively:
  – can assist each other, and create joint gains – as the Internet did
  – Interference no longer a problem – scalable network capacity

Fiber – key to wireless broadband at scale

- Highest capacity wireless architecture is a distributed, low power short range system
- Fiber (or equivalent) backbone to provide longer interconnect links among nodes
- Fiber-to-Radio eventually becomes direct microwave-optical up/down conversion (in early trials today)

Air power – the 21st century tussle

- Most wireless will be very localized, very dense (homes, buildings, campuses)
- Wireless supported by fiber – fiber transport is utility underlying wireless, not single termination.
- Strategy for fiber is to capture wireless support market.