

A Look at the Future: Advanced Wireless Technologies



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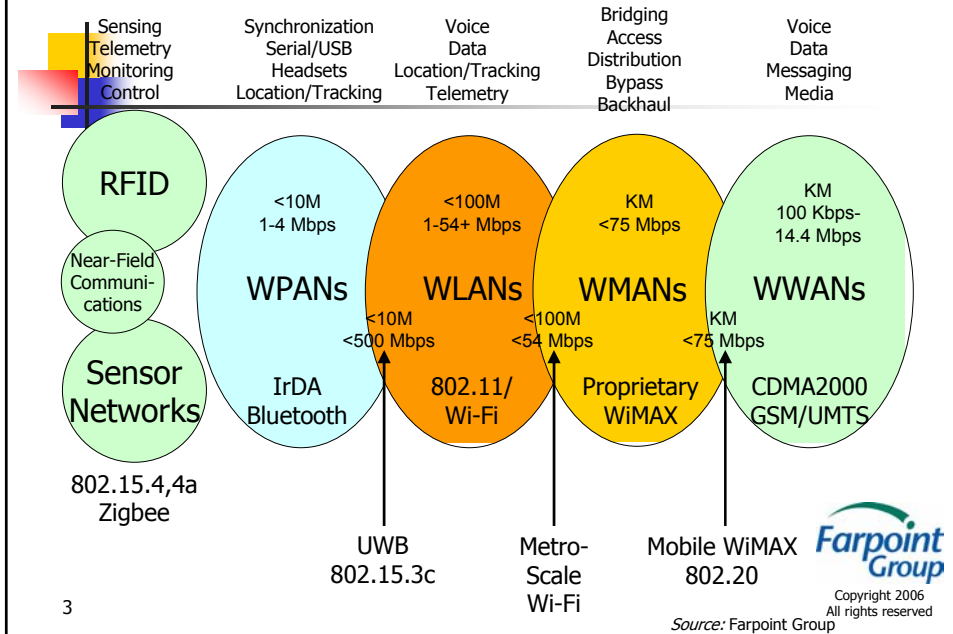
Key Themes

- **Broadband**
 - An imprecise term
 - Higher throughput and support for time-bounded traffic
- **Mobility**
 - Operational portability
- **Convergence**
 - No single technology or system can do the whole job
 - “Hard handoff” across physical layers
- **4G**
 - Moving to a broadband, mobile, all-IP, time-bounded future
 - Throughput to 100 Mbps and beyond



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The Big Picture...



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OFDM

- Essentially, an inverse multiplexing technique
 - Divide a single high-speed channel into multiple, parallel, lower-speed, non-overlapping channels
 - Very similar to DWDM
- Applying appropriate channel codes and interleaving can result in excellent throughput and reliability
- Used in IEEE 802.11a and .11g (WLANs), 802.16/WiMAX
- Will become the dominant technology base
 - Flarion – acquired by Qualcomm)
 - The next CDMA

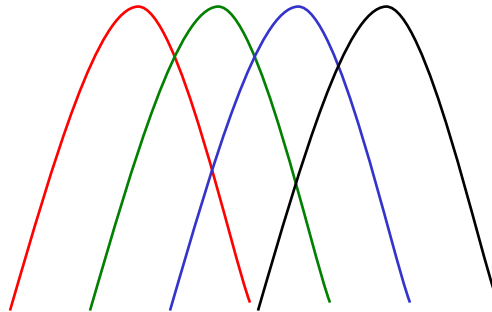
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OFDM Carriers



Four (in this case) non-overlapping, *interleaved* carriers

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The Most Important Wireless Technology of All: *MIMO*

- **Multiple-Input, Multiple-Output**
 - What's being "inputted" and "outputted" is the radio channel itself
- More than a multiple-antenna technology – significant signal processing
- *Depends* upon multipath!
- Initial application in WLANs – 802.11n
 - Pre-n, MIMO-Enhanced WLANs (MEWs) available today
 - Eventual fading of .11b/g
 - Eventual application in cellular and metro
- *MISO* and *SIMO* also possible...

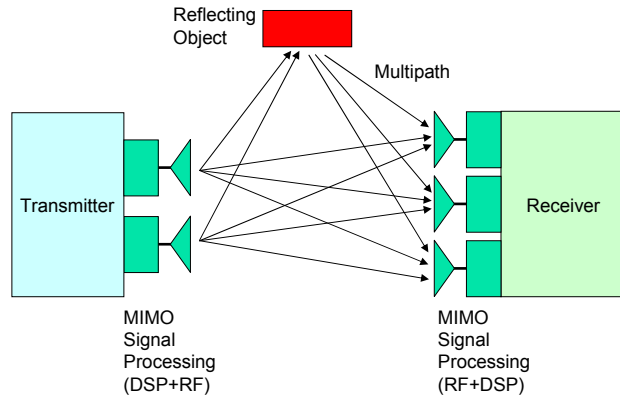
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MIMO Example – 2T, 3R



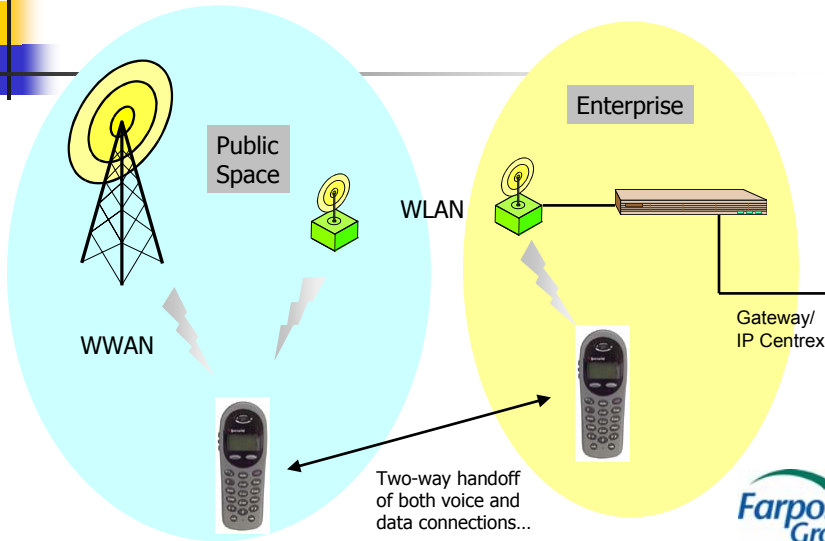
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Convergence...



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