



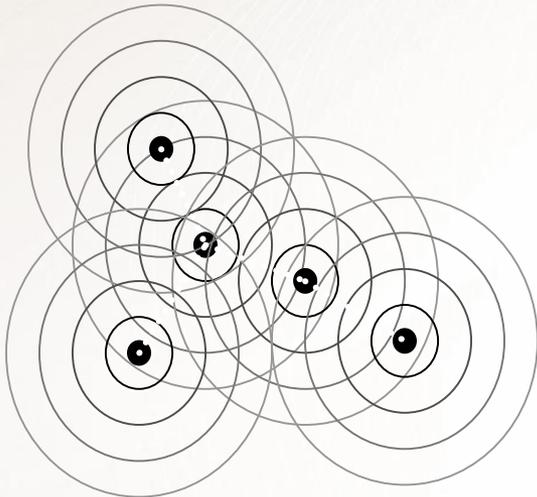
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Wireless Networking

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(Slide content courtesy of David Schwab, U of S)

- The use of infra-red or radio frequency signals to share information and resources between devices
- A hot computer industry buzzword:
 - Lots of advertising by companies and media
 - Wireless Broadband, 3G/4G/5G, LTE, Bluetooth
- Mobile Internet, Pervasive Computing, IoT, etc.
 - Ubiquitous
 - Global
 - Revolutionary

■ IEEE 802.11

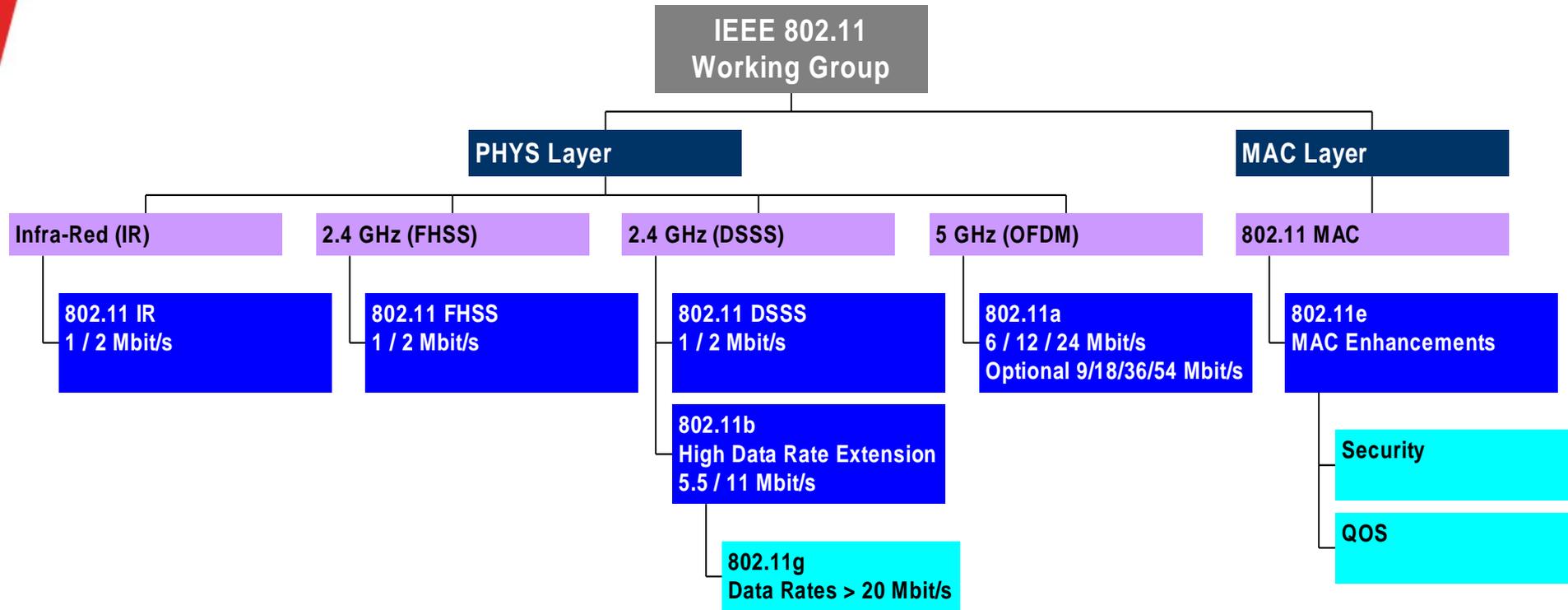
- Fast (11b)
- High power
- Long range
- Single-purpose
- Ethernet replacement
- Easily Available
 - Apple Airport, iBook, G4
 - Cisco Aironet 350

■ Bluetooth

- Slow
- Low power
- Short range
- Flexible
- Cable replacement
- “Vapourware”
 - Anoto, Test cards, phone



IEEE 802.11 Family Tree: Historical Look



- Pro:
 - High bandwidth (up to 11 Mbps)
 - Two modes of operation: infrastructure vs. ad hoc
- Con:
 - Incompatibility between old and new cards
 - Signal blocked by reinforced concrete or tinted glass
 - High channel BER can degrade performance (lots!)
 - No standard for hand-off between base stations
 - Some channel numbers overlap in spectrum
 - High power consumption in laptops

- Routing protocols used to improve wireless connections
- Infrastructure-free, dynamic
- True Peer-to-Peer routing
- Fault tolerant

- Examples: AODV, DSDV, TORA, DSR, ...



- Think USB, not Ethernet
- Created by Ericsson
- PAN - Personal Area Network
 - 1-2 Mbps connections
 - 1600 hops per second FHSS
 - Includes synchronous, asynchronous, voice connections
 - Piconet routing
- Small, low-power, short-range, cheap, versatile radios
- Used as Internet connection, phone, or headset

- Wireless networks are “broadcast” networks
- Wireless sniffers
- IEEE 802.11:
 - ESSID – Extended Services Set ID
 - WEP – Wired Equivalent Privacy
 - 40 bit RC4 (RSA) encryption
- Bluetooth Security
 - Rapid hop sequence
 - Short range
 - Encrypted transmissions

- An alternative to traditional ISPs and wired Internet
- A grassroots movement established in 1996
 - 802.11 Wireless LAN cards
 - Roof mounted antennae
 - Free software (FreeBSD)
- Multi-hop routing, Internet connectivity
- Cheap nodes, and lots of them
- Public wireless mesh networks popular in many large cities, including San Francisco, Seattle, London, ...

- Better mobility support
- Better security
- Wider selection
- Lower prices
- Less configuration required
- More end-user focus
- Better software
- Less visible
- More popular