Wireless Networks

Dr. Frank Walsh
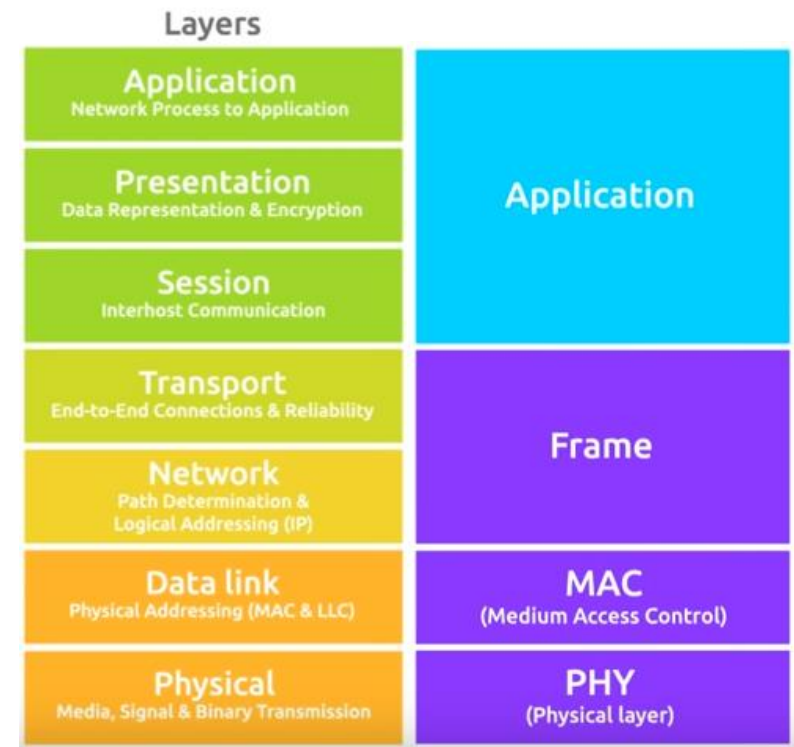
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Wireless Network Protocols & IoT

- Vital enabler for IoT
  - Vast majority of IoT solutions will include one or more wireless technologies
- Expected 8-fold growth in mobile data between 2015 and 2020
- Wireless enabled devices are a major reason for explosion in connected devices and the IoT

Ulusar, Umit Deniz, Fadi Al-Turjman, and Gurkan Celik. "An overview of Internet of things and wireless communications." *Computer Science and Engineering (UBMK), 2017 International Conference on*. IEEE, 2017.

Network Protocol Suites & Standards

- A Protocol Suite is a group of protocols designed to work together
- Typically use open, widely used protocols.
  - Example: Wifi, HTTP, FTP, TCP, IP…
- Protocol Standards established by Institute of Electrical and Electronics Engineers (IEEE) or the Internet Engineering Task Force (IETF)
- Protocol suites based on open standards ensures that products from different manufacturers can work together for efficient communications

Layers

Application — Network Process to Application	Application
Presentation — Data Representation & Encryption	
Session — Interhost Communication	
Transport — End-to-End Connections & Reliability	Frame
Network — Path Determination & Logical Addressing (IP)	
Data link — Physical Addressing (MAC & LLC)	MAC (Medium Access Control)
Physical — Media, Signal & Binary Transmission	PHY (Physical layer)

Wireless Advantages

- Look – no wires!
- Mobility
- Deployment
- Productivity
- Convienence

# Problems

Physical differences from wired link ….

- *decreased signal strength:* radio signal attenuates as it propagates through matter (path loss)
- *interference from other sources:* standardized wireless network frequencies (e.g., 2.4 GHz) shared by other devices (e.g., phone); devices (motors) interfere as well
- *multipath propagation:* radio signal reflects off objects ground, arriving at destination at slightly different times

- make communication across (even a point to point) wireless link much more "difficult"
- Security/Speed/

Wireless Technologies Comparison
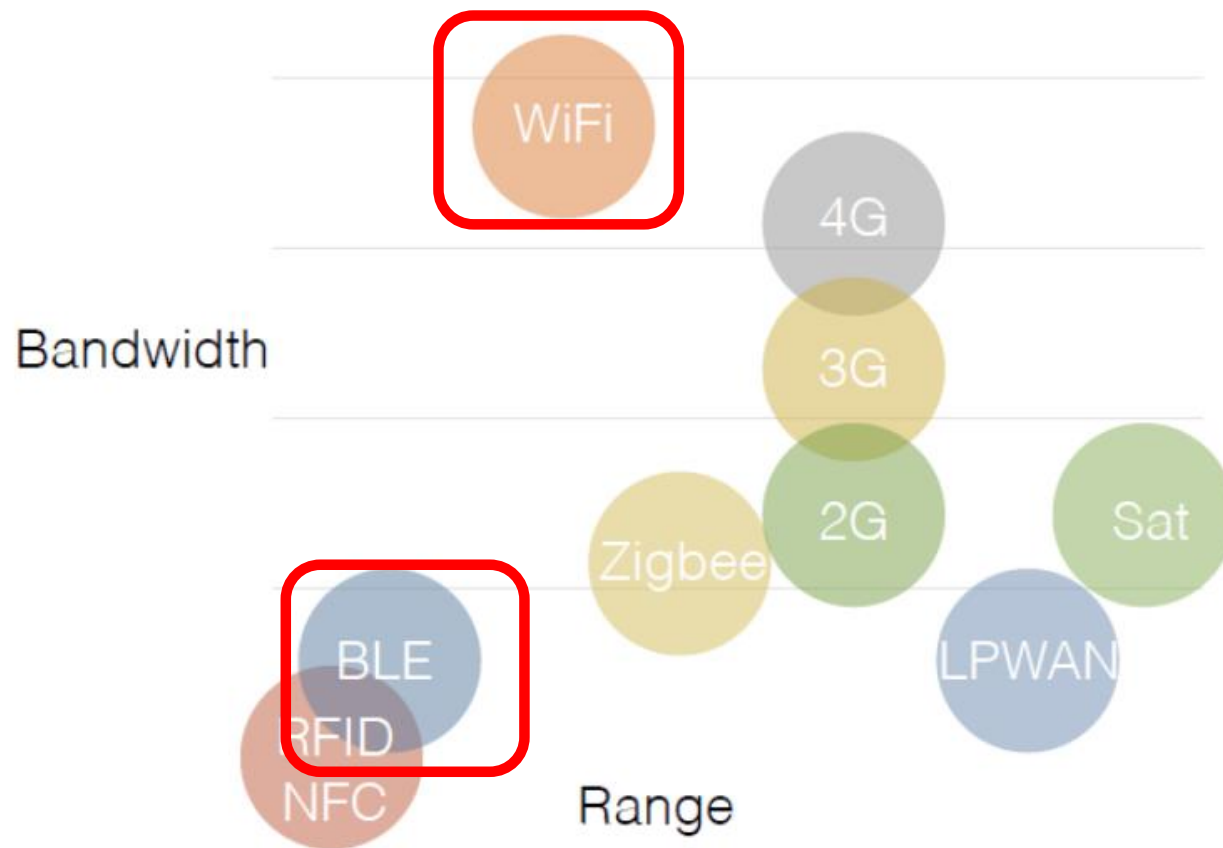
Wireless Networks Classification

- Wireless technologies can be classified **broadly** according to network type:
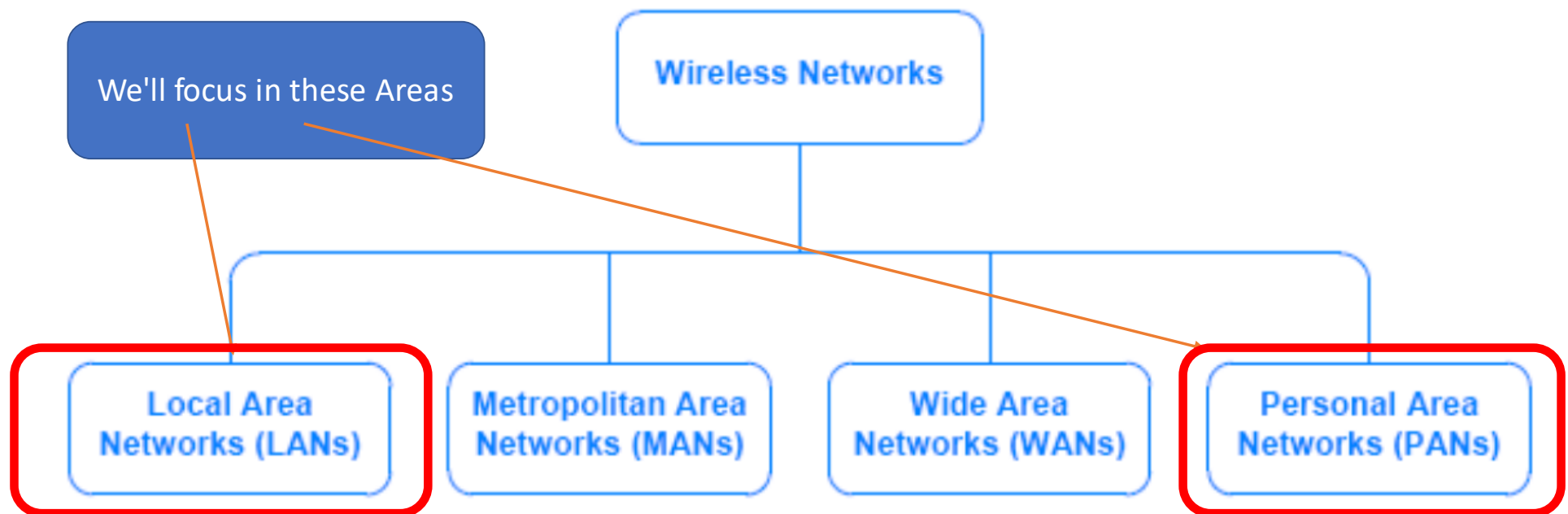
ISM Wireless Bands

- A region of electromagnetic spectrum is reserved for use by Industrial, Scientific, and Medical (ISM) groups
- These frequencies are not licensed to specific carriers
  - are broadly available for products, and are used for LANs and PANs