Wireless local area networks: IEEE 802.11

Motivations

- Simplicity
- Nomadic user support
- Robustness
    - Lack of physical infrastructure
- Spontaneous Deployment
- Cost

WLAN would be your home wifi adhering to the 802.11 standard. WWAN would be your cellular networks, 3g and 4g

Infrared vs Radio

- Infrared is only good for short range, direct, point-to-point communication

- Infrared can used diffused reflected light (Light that has been bouncing off surfaces) but generally it is ideal to have a line of sight.

- Infrared is inexpensive, requires no license and does not experience interference with other electronics.

- Radio will give a long term experience, the waves can travel long distances and penetrate obstacles, also has a much higher data rate

Infrastructure vs ad-hoc

In an infrastructure scenario there would be an AP responsible for forwarding messages, flow control etc. The AP is the gateway to the network. This is good for hotspots, firewalls, office WLANs etc.

In an ad-hoc scenario each device can communicate with each other and perform routing functions. It is a peer to peer connection and is useful for military scenarios, IoT and Vehicular networks

WiFi/802.11

802.11b

- Higher speed physical layer extension of 802.11 in the 2.4 GHz band
- Data rates of 11, 5.5, 2 and 1 Mbps
- Lowest cost
- Longest range as with 802.11g
- Other appliances can interfere in the same frequency band

802.11a

- Operates in the 5GHz band

- Not directly compatible with 802.11b or 802.11g (different bands)
- Shorter range
- Speed up to 54Mbps with OFDM
- Can be expensive
- Not compatible with 802.11a/b

20MHz spacing between channels in 802.11a

OFDM

- Technique used to distribute data over several carriers spaced apart ay precise intervals

802.11g

- Tries to combine the best features of both 802.11b and 802.11a
- Data rates up to 54Mbps
- 2.4GHz band
- Interoperable with 802.11b
- Longest range as with 802.11b

`Summary`

Standard	Spectrum	Maximum Physical Rate	Maximum Layer 3 data rate (typical)	Transmission
802.11	2.4 GHz	2 Mbps	1.2 Mbps	FHSS, DSSS or IR
802.11a	5.0 GHz	54 Mbps	32 Mbps	OFDM
802.11b	2.4 GHz	11 Mbps	6-7 Mbps	DSSS
802.11g	2.4 GHz	54 Mbps	32 Mbps	OFDM

802.11n

- Uses MIMO to achieve a higher data rate
- Physical rate up to 600 Mbps
- Operates in the 2.4 and 5 GHz bands

802.11ad (WiGig)

- New kid on the block
- up to 7 Gbps
- 60 GHz ISM band
- Range ~ few metres
  - Used for the transfer of very short range, high volumes of data

Acronyms

WLAN: Wireless Local Area Networks DSSS: Direct Sequence Spread Spectrum OFDM: Orthogonal Frequency Division Multiplexing ISM: Industrial, Scientific and Medical (band)