# WLAN Concepts

WLAN - Wireless Network
- Commonly used in homes, offices and campus environments

Advantages : (1) Mobility within range
(2) Adaptations to rapidly changing technologies

Types: (1) WPAN
(2) WLAN
(3) WMAN
(4) WWAN

WLAN: IEEE 802.11
2.4 or 5 GHz Frequency
Wi-fi
Medium Range
(300 ft)

WPAN: IEEE 802.15
2.4 GHz Frequency
Bluetooth, Zigbee
Low power
Short Range (6-9 m)

WMAN: Large geographic area (city/district)
Uses specific licensed frequencies

WWAN: Extensive geographic area (national/global)
Uses specific licensed frequencies

## Bluetooth

- IEEE WPAN Standard
- Device pairing at up to 300 ft (100 m)

Bluetooth Low Energy (BLE)

- Supports mesh topology
- To large scale network

## WiMAX

long form - Worldwide interoperability for Microwave Access

* Alternative broadband wired internet connections

- IEEE 802.16 WLAN

devices

standard

Bluetooth Basic Rate / Enhanced Rate (BR / EDR)

- Up to 30 miles (50 km)

- Supports point-to-point topologies
- Optimized for audio-streaming

## Cellular Broadband

- Carry both voice and data
- Used by phones, tablets, laptops and automobiles

GSM (Global System of Mobiles) - Internationally recognized

CDMA (Code Division Multiple Access) - Primarily used in US

## Satellite Broadband

- Uses directional satellite dish alligned with satellite in geostationary orbit
- Needs clear line of site
- Typically used in rural locations where cable and DSL are unavailable

## 802.11 Standards

| IEEE | Radio Frequency | Description |
| --- | --- | --- |
| 802.11 | 2.4 GHz | Data Rate = ~ 2 Mb/s |

| | | |
|---|---|---|
| 802.11a | 5 GHz | Data Rate = ~ 54 Mb/s<br>Not interoperable w/ 802.11b or 802.11g |
| 802.11b | 2.4 GHz | Data Rate = ~ 11 Mb/s<br>Longer range than 802.11a<br>Better at penetrating buildings |
| 802.11g | 2.4 GHz | Data Rate = ~ 54 Mb/s<br>Backward compatiable w/ 802.11b |
| 802.11n | 2.4 / 5 GHz | Data Rate = 150 - 600 Mb/s<br>Require multiple antennas w/ MIMO technology |
| 802.11ac | 5 GHz | Data Rate = 450 Mb/s - 1.3 Gb/s<br>Supports up to 8 antennas |
| 802.11ax | 2.4 / 5 GHz | High-Efficiency Wireless (HEW)<br>Capable of using 1 GHz and 7 GHz frequencies |

## WLAN Components

WNICs : To communicate wirelessly
(1) Latest automobiles include integrated WNICs
Incorporate a radio transmitter/receiver

WNICs ⟷ USB wireless adapter

Wireless Home Router: Small, Wireless (2)

Functions: Access Point (AP) - To provide wires access

Switch - To interconnect wired devices
Router - To provide a default gateway to other networks / the Internet

(3) Wireless Access Points (WAP)

- Wireless clients use WNICs to discover nearby APs

- Clients attempt to associate / authenticate with an AP
- After being authenticated, wireless clients have access to network resources

AP Categories : (1) Autonomous APs
(2) Controller-based APs

Autonomous - Standalone devices
- Configured through CLI / GUI
- Acts independently
- Configured and managed manually by an admin

Controller-based - lightweight APs (LAPs)
- Used LWAPP to communicate with WLC
- Each LAP is automatically configured and managed by the WLC

(4) Wireless Antennas

External antennas types: Omnidirectional
Directional
Multiple Inputs Multiple Outputs (MIMO)

Omnidirectional - 360° coverage

| | |
|---|---|
| | - Ideal in houses and office areas |
| Directional | - Focus the radio signal in a specific direction |
| MIMO | - Uses up to 8 antennas to increase bandwidth |