Wireless Network Monitoring and Troubleshooting

Understanding WLANs: Concepts, Challenges, and Best Practices

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Outline

- Introduction
- Overview of WLANs
- Wi-Fi Standards
- Wireless Network Challenges
- Real-world scenarios
- Best Practices

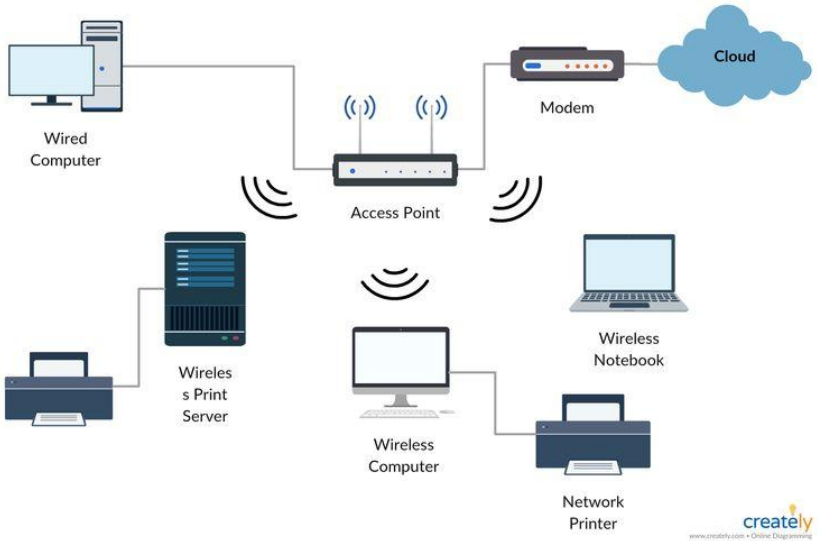
Wireless Network LANs (WLANs)

- Wireless LANs use high-frequency radio waves.
- Users connected by WLANs can move around within the network coverage area.

Why WLANS?

Key Components of a WLAN

- Wireless Access Point (AP)
- Wireless client devices
- Antenna
- Authentication server
- Wireless LAN controller
- DNS and DHCP servers



Wi-Fi Standards

- Most WLANs are based on the standard IEEE 802.11, known as Wi-Fi.
- Define how wireless networks function.

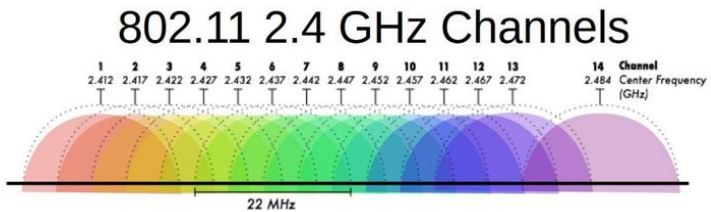
Wi-Fi Standards Continued

Standard	Frequency (GHz)	Data rate (Mbps)
802.11b	2.4	11
802.11g	2.4	54
802.11n	2.4 and 5	300-600
802.11ac	5	3500
802.11ax	2.4 and 5	9600
802.11ax with 6 GHz	6	9600

Frequency Bands

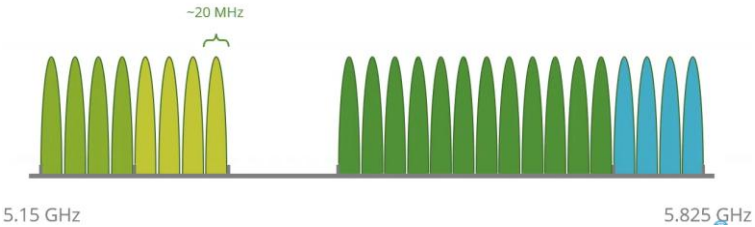
2.4 GHz Band

- 14 channels
- Only 3 non-overlapping channels

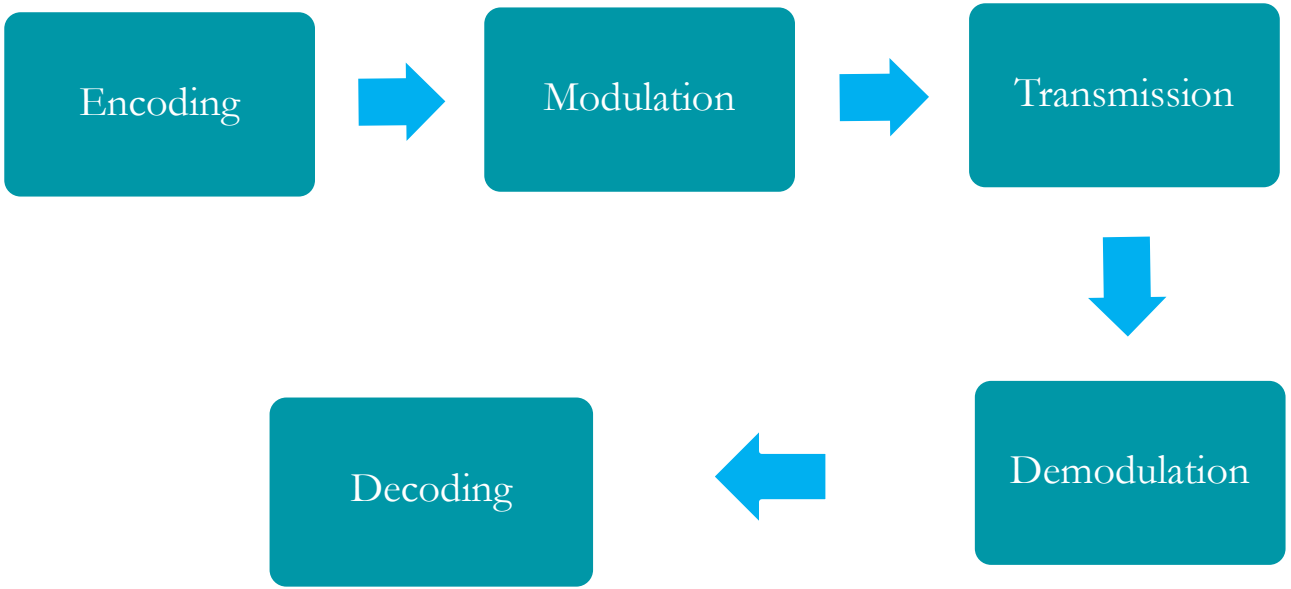


5 GHz Band

- 25 non-overlapping channels of 20 MHz
- Can be aggregated to 40 MHz and 80 MHz



Wireless Transmission Process



Common Wireless Network Challenges

- Interference Issues
- Signal Coverage and Dead Zones
- Bandwidth Congestion
- Device Compatibility
- Security Risks

Interference

❖ Disruption of Wi-Fi signals ❖ Results into slower speeds, disconnections or poor performance	Causes
	Nearby Wi-Fi networks using the same channel
	Non-Wi-Fi devices like Bluetooth, microwaves
	Physical obstructions like walls and furniture

Signal Coverage and Dead Zones

- The extent of the area to which the wireless signals are transmitted.
- Places where our signal can't reach

Causes
Distance from the access point
Thick walls, floors, glass, and furniture

Bandwidth Congestion and Overuse

- A network is overwhelmed by too much data traffic
- Leads to slowdowns, increased latency, and reduced performance

Causes
Too many users connected to a single AP
High-bandwidth applications like streaming and gaming

Device Compatibility Issues

- Verify that devices support the same Wi-Fi standards and protocols as the network infrastructure that supports them

Causes
Older devices using legacy Wi-Fi standards
Some devices only supporting 2.4GHz instead of 5GHz

Security Vulnerabilities

❖ Loopholes that cyber attackers can exploit in your network.	Causes
	Weak Encryption or Open Networks
	Unauthorized access and attacks

Real World Scenarios

- Slow Wi-Fi in a public place.
- Dropped connection while walking around an office.
- An office with a mix of old and new devices.
- Public Wi-Fi hotspot.
- Power Instabilities.
- Access Point with no uplink.

Best Practices

- Plan Proper AP Placement.
- Secure the Network.
- Optimize Frequency Use.
- Network Segmentation.
- Capacity Upgrades.
- Implement QoS to prioritize critical applications.
- Encourage upgrading to Wi-Fi 6 or Wi-Fi 5 devices.
- Use of dual or tri-band routers.
- Use of surge protectors and UPS.

Q&A

THE END