

# MODULE 7: UNDERSTANDING WIRELESS AND MOBILE NETWORKS

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TASK: I.3HD

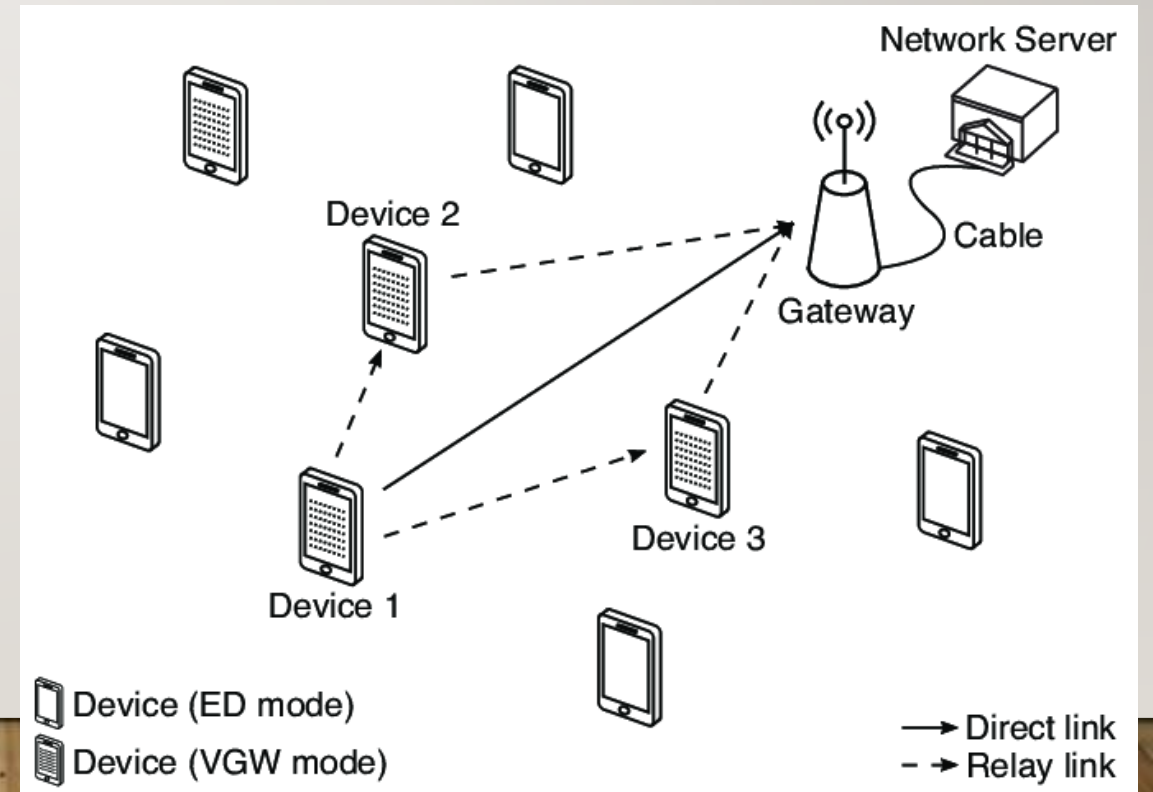
# OVERVIEW

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- Wireless Communication
- Mobility
- Components of Wireless Networks
- Wireless LAN (Wi-Fi)
- Cellular Networks (4G/5G)
- Practical Scenario: Secure Home Network

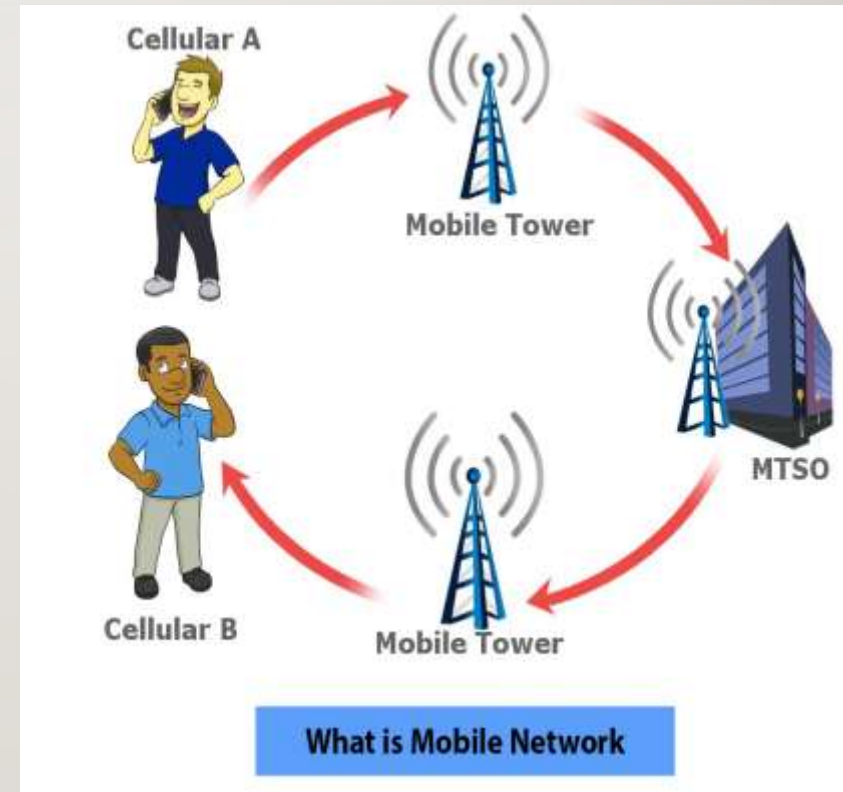
# WIRELESS COMMUNICATION

- Transmitting data over electromagnetic waves
- Flexibility and mobility
- No physical cables needed



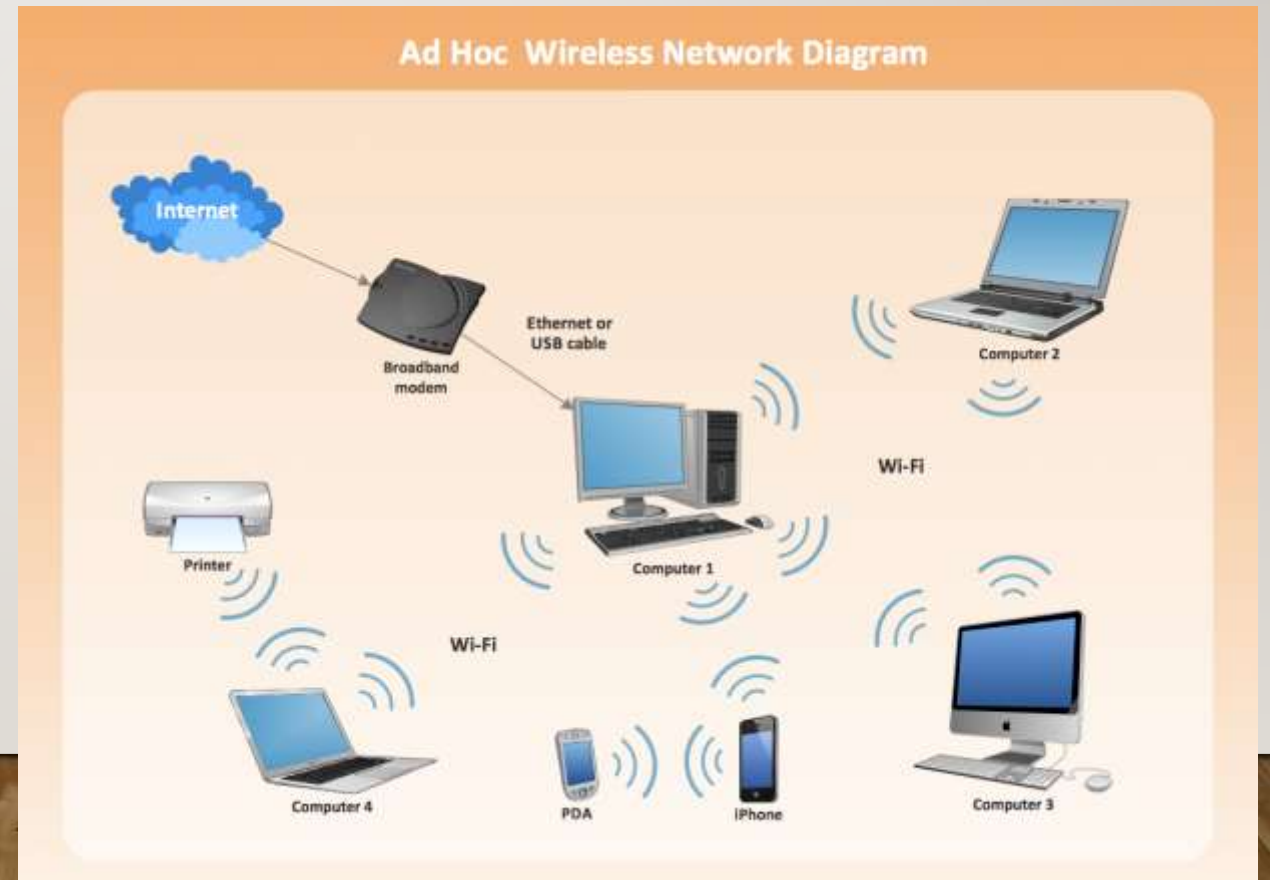
# ILLUSTRATION OF MOBILE USERS SWITCHING NETWORKS

- Ability to move while maintaining connectivity
- Changing points of attachment
- Crucial for mobile devices



# COMPONENTS OF WIRELESS NETWORKS

- Wireless Hosts (e.g., smartphones, laptops, IoT devices)
- Base Stations (e.g., access points, cell towers)
- Wireless Links





# WIRELESS LAN (WI-FI)

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- IEEE 802.11 standards
- Different data rates and ranges
- Dual-band routers (2.4 GHz and 5 GHz)

Standard	Frequency	Maximum Speed	Backwards compatibility
802.11	2.4 GHz	2 Mbps	-
802.11a	5 GHz	54 Mbps	-
802.11b	2.4 GHz	11 Mbps	-
802.11g	2.4 GHz	54 Mbps	802.11b
802.11n	2.4 and 5 GHz	600 Mbps	802.11a/b/g
802.11ac	5 GHz	1300 Mbps	802.11a/n
802.11ad	2.4 GHz, 5 GHz and 60 GHz	7 Gbps	802.11a/b/g/n/ac

# PRACTICAL SCENARIO: SECURE HOME NETWORK

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- Choosing the right equipment
- Setting up the network
- Security measures
- Optimizing performance
- Managing devices



# CHOOSING THE RIGHT EQUIPMENT

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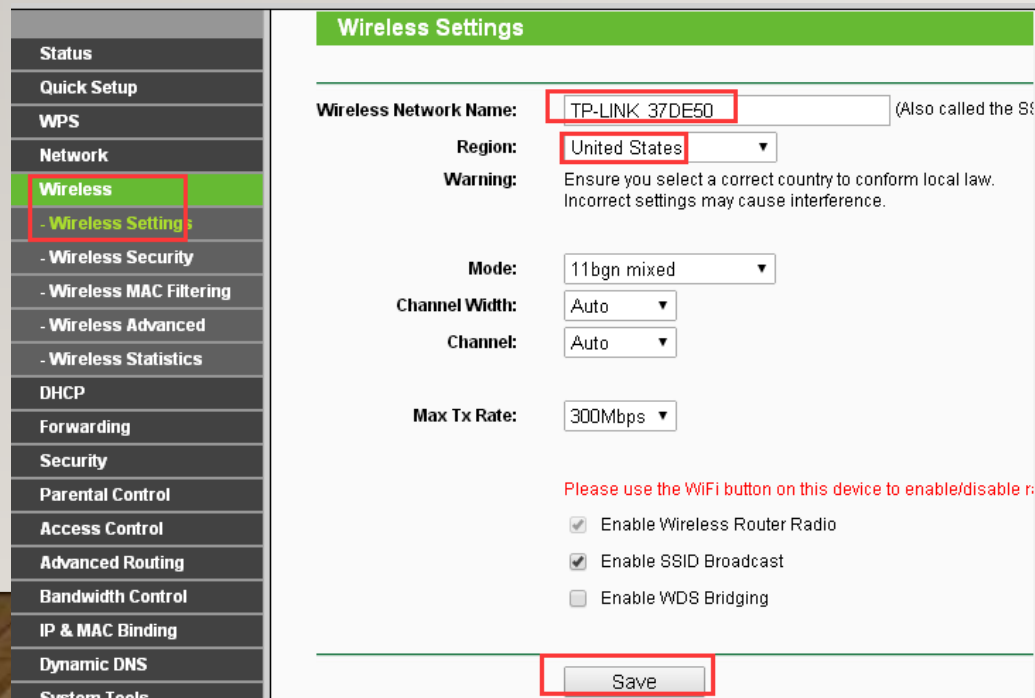
- Dual-band router (Wi-Fi 6 preferred)
- Additional access points for coverage





# SETTING UP THE NETWORK

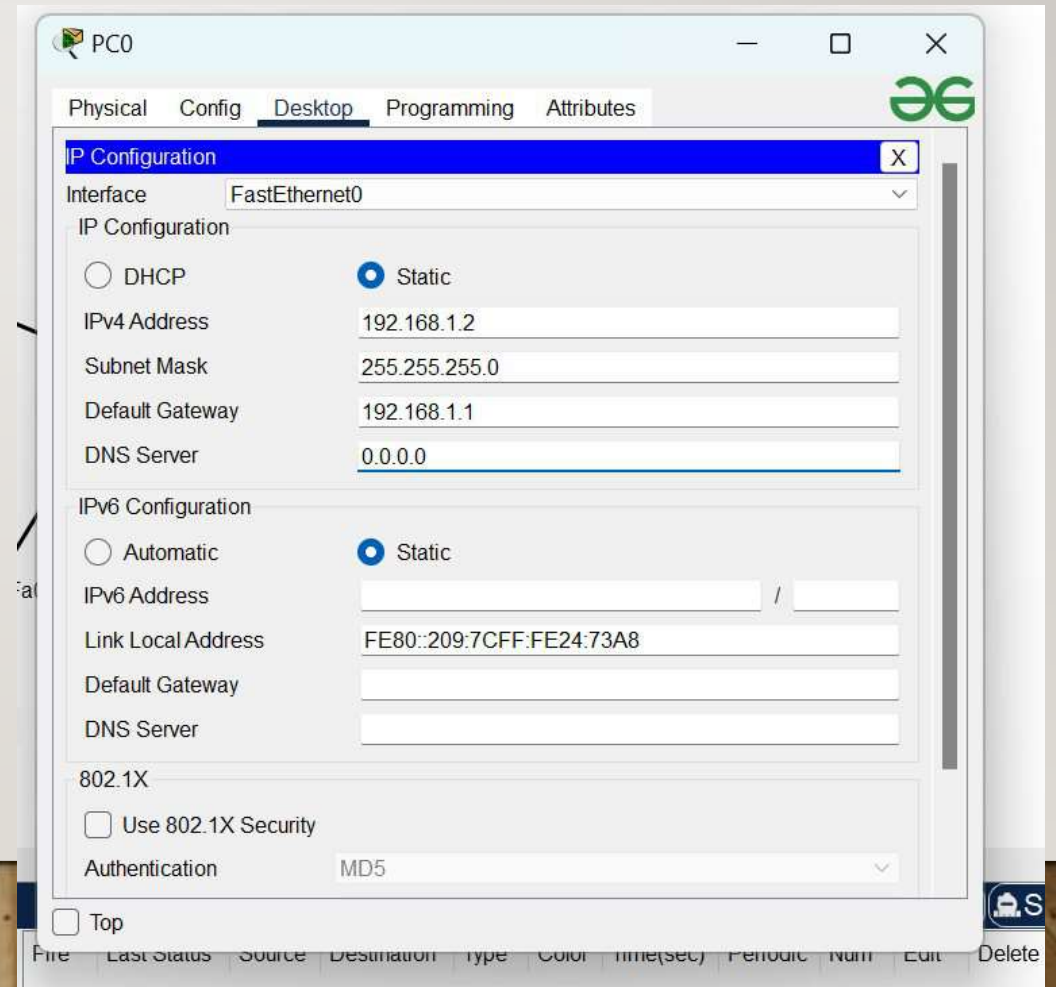
- Connect router to ISP modem
- Configure SSIDs for 2.4 GHz and 5 GHz
- Use strong, unique passwords



The image shows a web-based configuration interface for a router. On the left is a sidebar menu with options: Status, Quick Setup, WPS, Network, **Wireless** (highlighted with a red box), Wireless Security, Wireless MAC Filtering, Wireless Advanced, Wireless Statistics, DHCP, Forwarding, Security, Parental Control, Access Control, Advanced Routing, Bandwidth Control, IP & MAC Binding, Dynamic DNS, and System Tools. The main content area is titled "Wireless Settings" and contains the following fields:

- Wireless Network Name:** TP-LINK\_37DE50 (highlighted with a red box). A note says "(Also called the SSID)".
- Region:** United States (highlighted with a red box). A warning below states: "Ensure you select a correct country to conform local law. Incorrect settings may cause interference."
- Mode:** 11bgn mixed
- Channel Width:** Auto
- Channel:** Auto
- Max Tx Rate:** 300Mbps

At the bottom, there is a red text instruction: "Please use the WiFi button on this device to enable/disable radio". Below this are three checkboxes: "Enable Wireless Router Radio" (checked), "Enable SSID Broadcast" (checked), and "Enable WDS Bridging" (unchecked). A "Save" button is at the bottom right, highlighted with a red box.



The image shows a "PC0" window titled "IP Configuration" with tabs for Physical, Config, Desktop, Programming, and Attributes. The "Config" tab is active. The window shows settings for the "FastEthernet0" interface.

**IP Configuration**

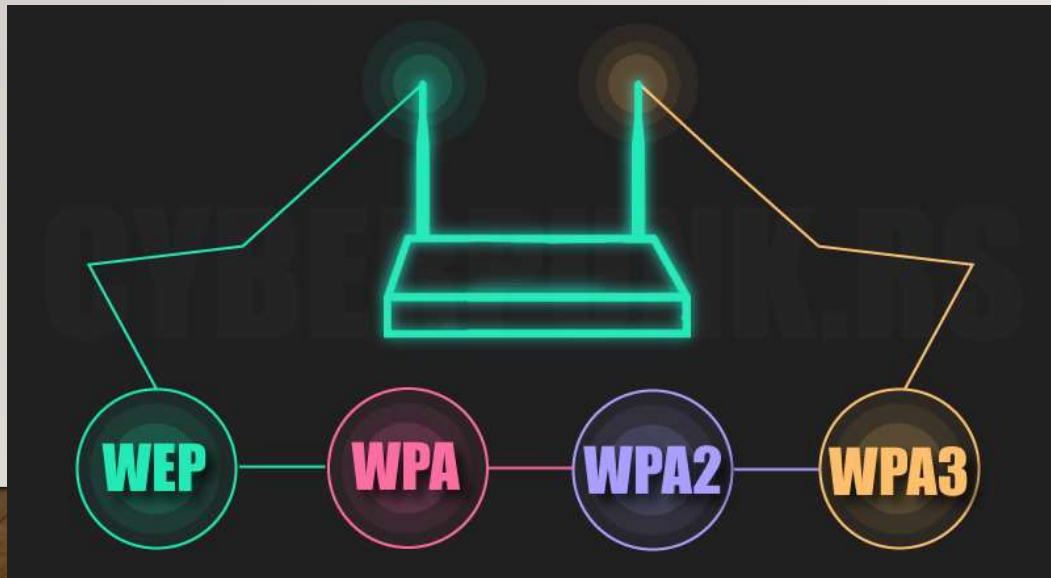
- Interface:** FastEthernet0
- IP Configuration:**
  - ☐ DHCP
  - ☒ Static
  - IPv4 Address:** 192.168.1.2
  - Subnet Mask:** 255.255.255.0
  - Default Gateway:** 192.168.1.1
  - DNS Server:** 0.0.0.0
- IPv6 Configuration:**
  - ☐ Automatic
  - ☒ Static
  - IPv6 Address:** [empty] / [empty]
  - Link Local Address:** FE80::209:7CFF:FE24:73A8
  - Default Gateway:** [empty]
  - DNS Server:** [empty]
- 802.1X:**
  - ☐ Use 802.1X Security
  - Authentication:** MD5

At the bottom left, there is a "Top" button. At the bottom right, there is a table with columns: File, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, Num, Edit, and Delete.

# SECURITY MEASURES

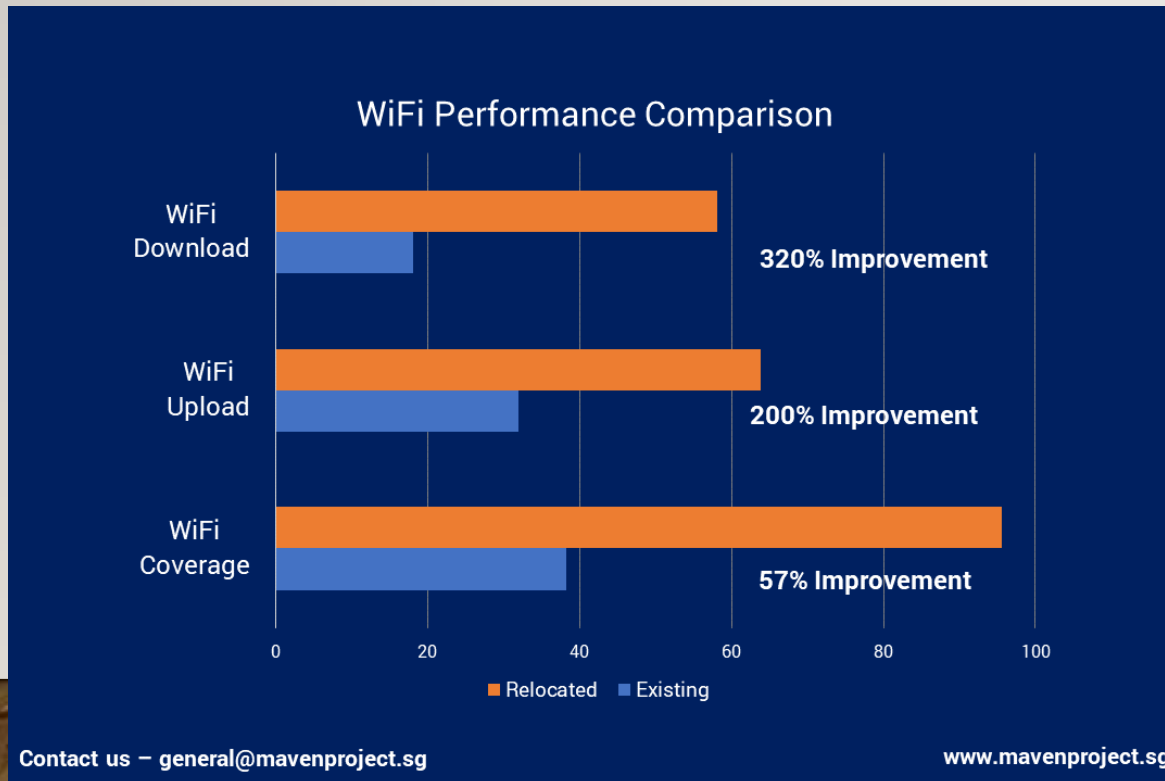
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- Enable WPA3 encryption
- Create strong passwords
- Set up a guest network
- Enable MAC filtering



# OPTIMIZING PERFORMANCE

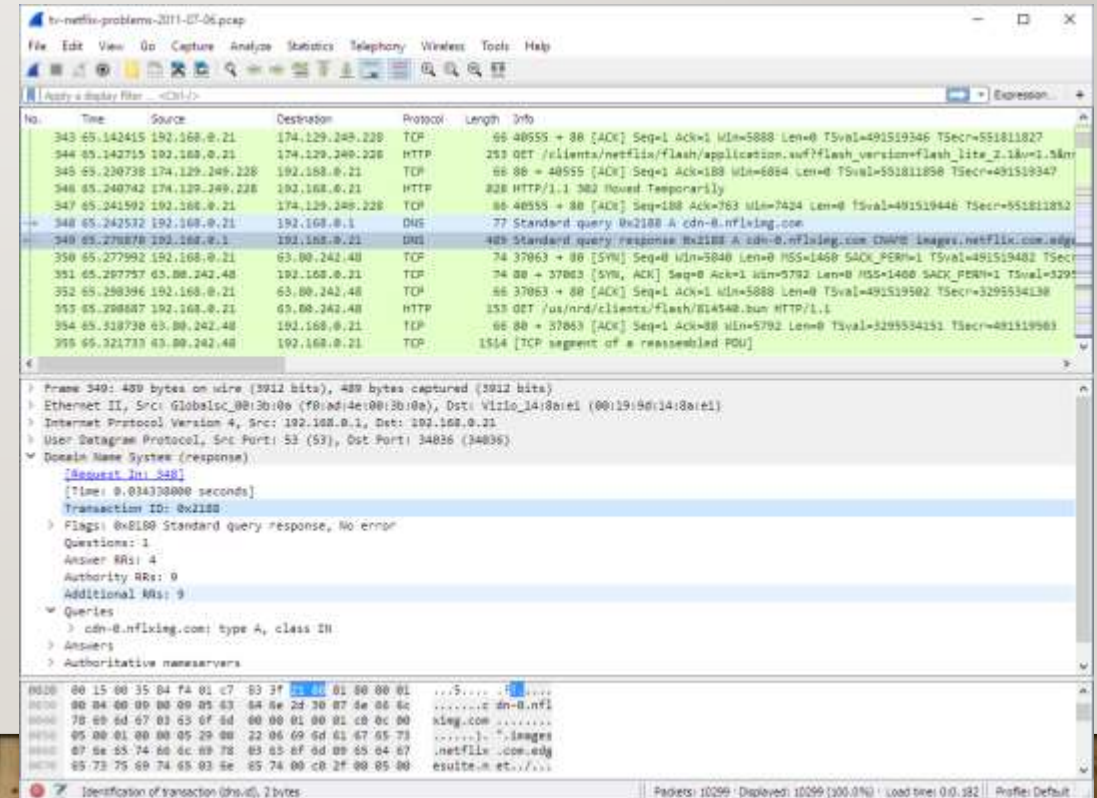
- Select least congested channels
- Adjust QoS settings





# MANAGING DEVICES

- Regular firmware updates
- Network monitoring tools
- Periodic reviews of network settings

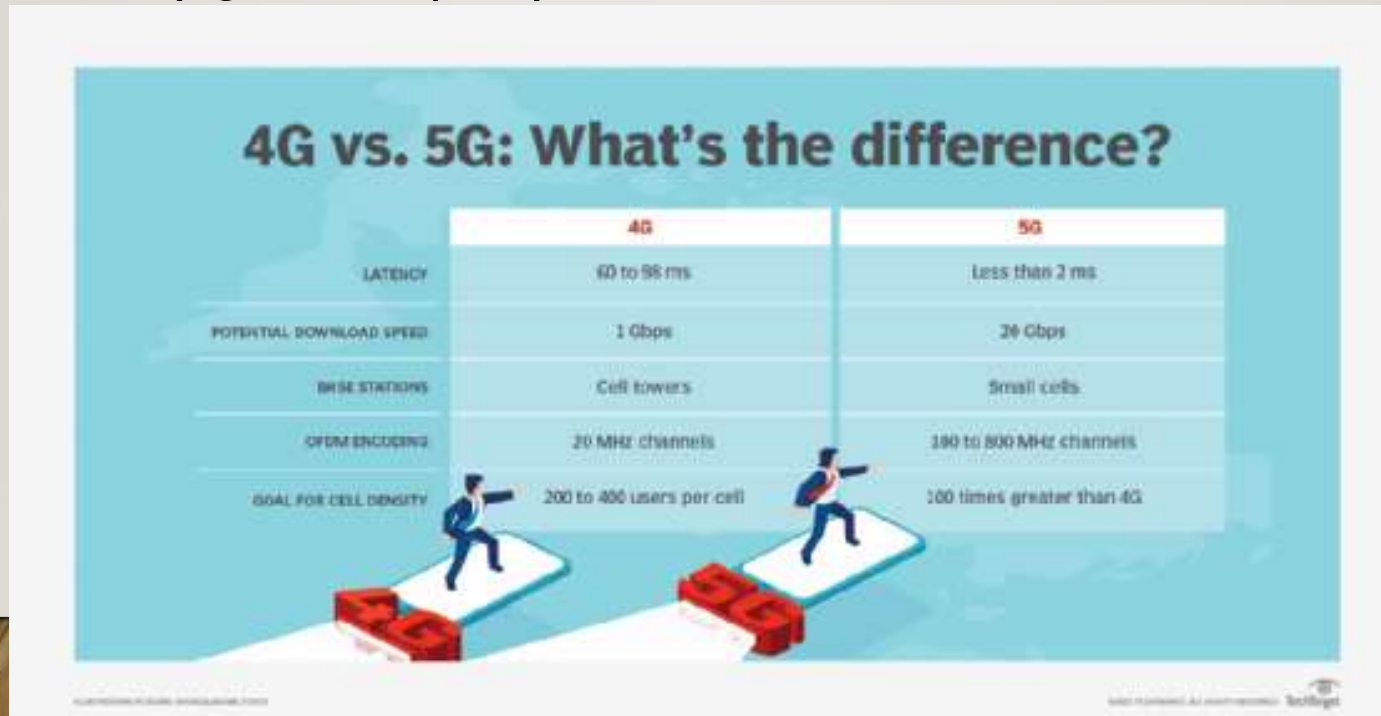




# 4G AND 5G CELLULAR NETWORKS

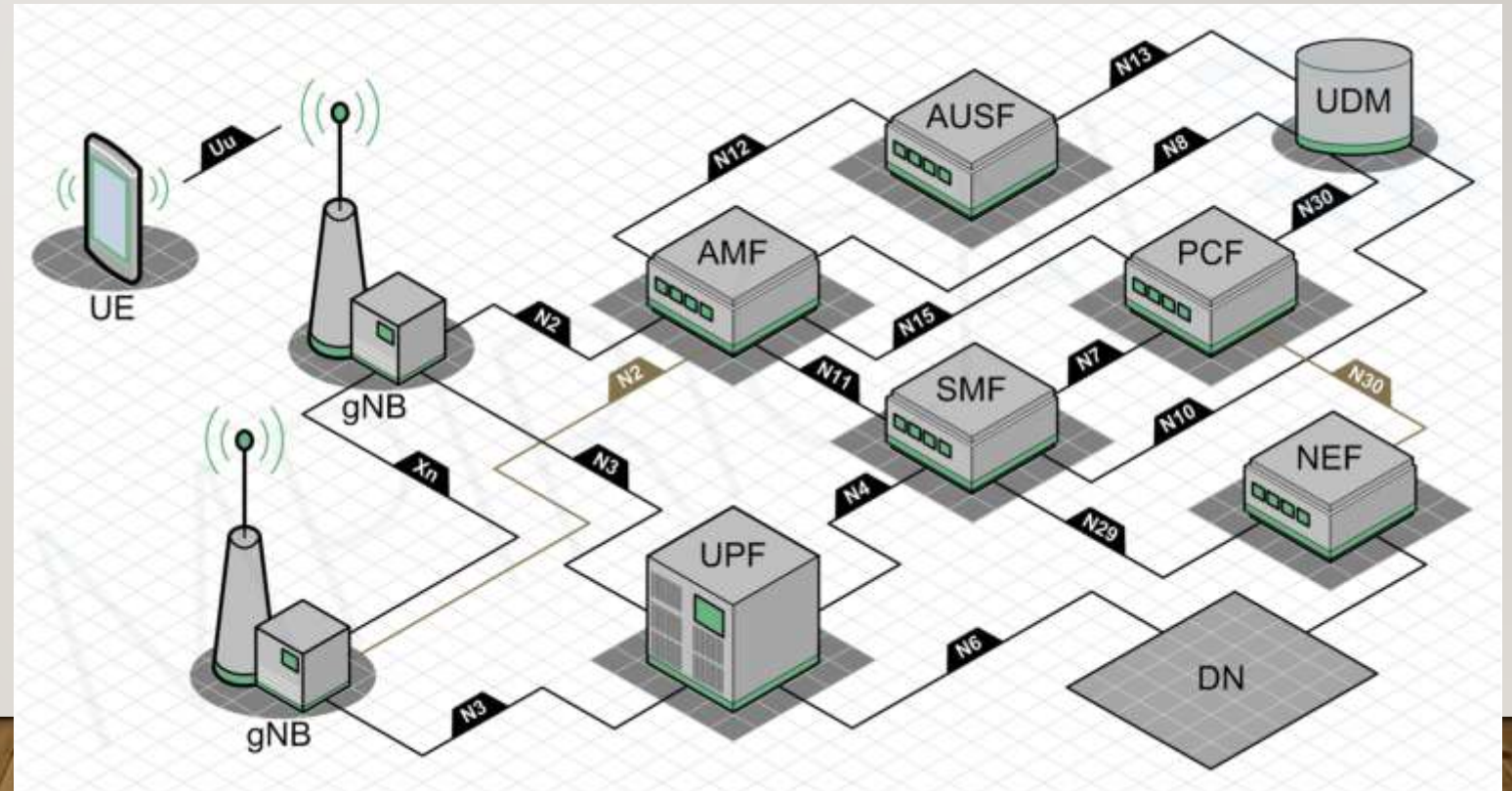
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- 4G: High-speed mobile internet
- 5G: Higher speeds, lower latency, greater capacity



# 5G TECHNOLOGIES

- Higher frequency bands (millimeter waves)
- Massive MIMO
- Advanced beamforming





# POTENTIAL APPLICATIONS OF 5G

- Smart cities
- Autonomous vehicles
- Remote healthcare
- Industrial IoT



# CONCLUSION

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- Recap
  - Wireless and mobile network
  - Wireless LAN (WIFI)
  - Setting up a secure home network
  - 4G and 5G cellular network
- Always implement best practices



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**THANK YOU**