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جامـــــــعة المـــــستـقبـل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قـســـــــــم الانظمة الطبية الذكية

Lecture: (1)

INTRODUCTION ABOUT WIRELESS TOPOLOGIES

Subject: Wireless Sensor Network
Level: Third
Lecturer: M.Sc Ola Ali

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❖ Introduction

- A technology that enables two or more entities to communicate without network cabling.
- Wireless networking today is about where broadcast radio was in the late 1920s.
- The use of wireless technology is quickly becoming the most popular way to connect to a network.
- Wi-Fi is one of the many available technologies that offer us the convenience of mobile computing.

❖ Needs Of Wireless Networks

- Mobile communication is needed.
- Communication must take place in a terrain that makes wired communication difficult or impossible.
- A communication system must be deployed quickly.
- Communication facilities must be installed at low initial cost.
- The same information must be broadcast to many locations.

❖ How Wireless Networks Work

Wireless networks work by using radio waves to transmit data between devices, such as smartphones, laptops, and routers, without the need for physical cables.

➢ Main Parts:

- **Router:** The main device connected to the internet.
- **Wireless Devices:** Devices like phones and laptops that connect to the router.

➢ How It Works:

- The router sends out radio signals (e.g., 2.4 GHz or 5 GHz).
- Devices pick up the signal and connect using a password.
- Data moves back and forth between the devices and the internet.

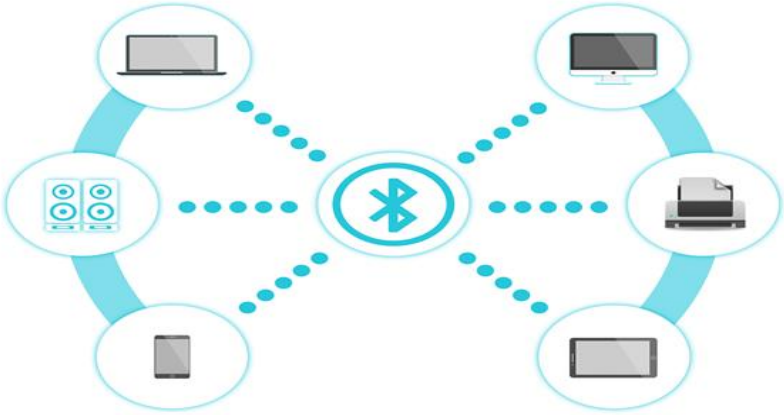
- **Communication:**
  - Devices send requests (e.g., open a website).
  - The router sends the request to the internet and brings back the result.
- **Security:**
  - The connection is encrypted (e.g., WPA2/WPA3) to keep data safe and block unauthorized access.

❖ Wireless Networks Types

- A wireless network is any type of computer network that uses wireless data connections for connecting network nodes.
- Examples: Wi-Fi (Wireless Fidelity) and Bluetooth.

➢ Bluetooth

- Bluetooth is a specification (IEEE 802.15.1) for the use of low-power radio communications to link phones, computers, and other network devices over short distances without wires.



➢ Wi-Fi (Wireless Fidelity)

- Wi-Fi is a wireless networking technology that allows computers and other devices to communicate over a wireless signal.
- Wi-Fi is a local area wireless technology.
- Wi-Fi networks use radio technologies to transmit and receive data at high speed.
- **Standards:**
  - IEEE 802.11 b
  - IEEE 802.11 a
  - IEEE 802.11 g

Q1//Scan the QR Code to start the "Wireless Topologies" Challenge!

❖ IEEE Standards Details

- **IEEE 802.11 b:**
  - Introduced in late 1999.
  - 4-6 Mbps (actual speed).
  - Most Popular / Least Expensive.
  - 100-150 feet range.
  - Operates at 2.4GHz radio spectrum.
  - Interference from mobile phones and Bluetooth devices which can reduce the transmission speed.
- **IEEE 802.11 a:**
  - Introduced in 2001 (Page 11).
  - 15 – 20 Mbps (Actual speed) (Page 11).
  - 50 – 75 feet range (Page 11).
  - More Expensive (Page 11).
  - Operates at 5 GHz (less popular) (Page 11).
  - Not compatible with 802.11b (Page 11).

- **IEEE 802.11 g:**
  - Introduced in 2003 .
  - 54 Mbps speed .
  - Compatible with 'b' .
  - 100 – 150 feet range .
  - Combine the feature of both standards (a, b)
  - 2.4 GHz radio frequencies

❖ Comparison of Wired & Wireless Network

- **Installation:**
  - Wired: Installation is so Difficult.
  - Wireless: Installation is Easy.
- **Time:**
  - Wired: Time of Installation is more.
  - Wireless: Time of installation is less.
- **Reliability:**
  - Wired: Reliability is high.
  - Wireless: Reliability is Reasonably high.

- **Speed & Bandwidth:**
  - Wired: High (100mbps).
  - Wireless: Low (54mbps).

❖ Advantages of Wireless Network

- Speed.
- Cost.
- Centralized Software Management.
- Resource Sharing.
- Electronic Mail.
- Flexible Access.
- Workgroup Computing.

❖ Disadvantages of Wireless Network

- Server Faults Stop Applications Being Available.
- Network Faults Can Cause Loss Of Data.
- Network Fault Could Lead To Loss Of Resources.
- User Work Dependent Upon Network.

❖ Applications

- Cable replacement for peripherals .
- Mobile extension of wired networks .

- Fixed wireless between homes and businesses and the Internet.
- Mobile access to the Internet from outdoor areas

❖ Conclusion

- In high-density urban areas, there may be multiple networks like MPLS, Metro Ethernet, fiber networks, ADSL .
- WiMAX is a technology for providing high-speed access to rural areas. It can provide DSL-like speeds .
- Various terrain types such as hills with a rather high density of trees, moderate tree density, or flat areas with low tree density can dictate the use of WiMAX technology .
- Radio Waves are unpredictable and may go beyond the coverage area of the premises. Some parts of the coverage area may not get the radio waves .


THANK YOU!