

Wireless networking refers to the technology that enables devices to communicate without physical connections.

Wireless LAN

1. Wireless LAN stands for Wireless Local Area Network.
2. A mobile user can connect to a LAN through a wireless connection.
3. WLANs use the IEEE 802.11 standard for wireless networking.
4. IEEE 802.11 defines the protocols and specifications for wireless communication.
5. Advantages of Wireless LAN -
 - a. Flexibility
 - b. Planning
 - c. Design
 - d. Robustness
 - e. Cost
 - f. Ease of Use

MAC Issues in Wireless LAN

- **ARP Spoofing:** This issue occurs when an attacker sends fake ARP messages to a network, redirecting the traffic to a malicious device.
- **Rogue Access Points:** Rogue access points are unauthorized wireless access points.
- **Interference:** Interference can occur when wireless LAN signals are blocked by other devices or objects in the environment.
- **Channel Overlap:** When multiple wireless access points use the same channel, it can result in channel overlap.
- **Authentication and Encryption:** Weak authentication and encryption can make wireless LANs vulnerable to security threats.

IEEE 802.11 Standard

IEEE 802.11 is a set of standards for wireless local area networks (WLANs). The standards define the specifications for WLANs. The standards cover areas such as frequency bands, data rates, modulation schemes, and security protocols.

Key standards within IEEE 802.11 :

- 802.11a: Uses 5GHz frequency band, 54 Mbps data rates
- 802.11b: Uses 2.4GHz frequency band, 11 Mbps data rates
- 802.11g: Uses 2.4GHz frequency band, 54 Mbps data rates
- 802.11n: Uses 2.4GHz frequency and 5GHz bands, 600 Mbps data rates
- 802.11ac: Uses 5GHz frequency band, 6.9 Gbps data rates
- 802.11ax: Uses 2.4GHz and 5GHz frequency bands, 9.6 Gbps data rates

Bluetooth

- Bluetooth is a wireless technology that uses short-range radio communication to connect devices.
- It operates on the 2.4 GHz ISM band and can provide data rates up to 3 Mbps.
- Bluetooth is designed for low-power, short-range connectivity.

Wireless Multiple Access Protocols

Wireless Multiple Access Protocols are used to enable multiple wireless devices to share the same communication medium.

Common Wireless Multiple Access Protocols:

- **Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA):** A protocol used in wireless LANs to avoid collisions when devices transmit simultaneously. CSMA/CA is used in IEEE 802.11 wireless networks.
- **Time Division Multiple Access (TDMA):** In TDMA, the channel is divided into time slots, and each device is assigned a specific time slot to transmit data. TDMA is used in cellular networks.
- **Frequency Division Multiple Access (FDMA):** In FDMA, the channel is divided into frequency bands, each device is assigned a specific band to transmit data. FDMA is used in analog cellular networks.
- **Code Division Multiple Access (CDMA):** In CDMA, each device is assigned a unique code, and all devices transmit on the same frequency band. CDMA uses digital spread spectrum technology to spread the signal.

Wireless Application

Wireless applications are software applications that are designed to be used on wireless networks.

Examples -

- Mobile banking
- Social networking
- E-commerce
- Location-based services
- Mobile gaming
- Healthcare
- Transportation

Data Broadcasting

- Data broadcasting is a technique used to transmit data to multiple devices simultaneously.
- In mobile computing, data broadcasting is used to deliver information to a large number of mobile devices.
- Data broadcasting can reduce network congestion by delivering the same data to multiple devices at once.
- Data broadcasting can be either one-to-many or many-to-many.
- There are various data broadcasting protocols used in mobile computing, such as DAB, T-DMB, DVB-H.
- Some applications of Data Broadcasting are:
 - broadcasting traffic updates, weather information, news updates, and emergency alerts to a large number of mobile devices.

Mobile IP

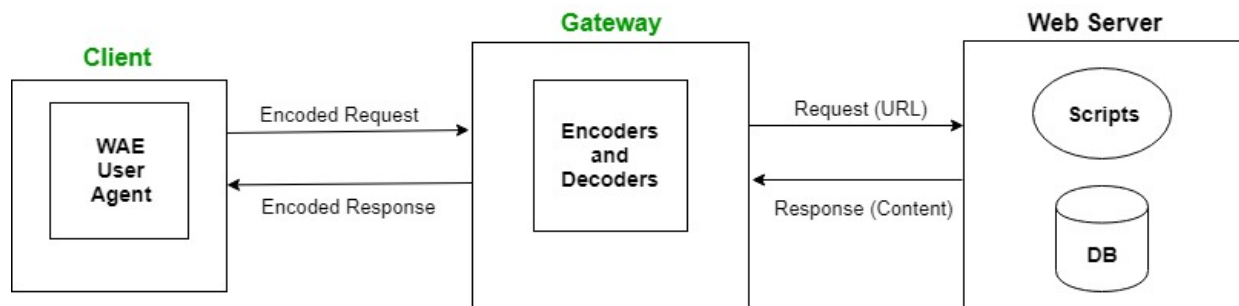
Mobile IP is a protocol developed to enable the communication of mobile devices that are moving between networks while maintaining their IP address and sessions.

- Mobile IP allows mobile devices to maintain their IP address even when they move from one network to another.
- Ongoing sessions such as VoIP calls and video streams can be maintained without stopping.
- Mobile IP uses tunneling to achieve this.
- Mobile IP requires the use of a Home Agent (HA) and a Foreign Agent (FA) to manage the tunneling process.
- The HA is the device on the home network, while the FA is the device on the foreign network.
- Mobile IP can be used in both IPv4 and IPv6 networks.
- Mobile IP can be used in wireless LANs, cellular networks, and satellite networks.

Wireless Application Protocol(WAP)

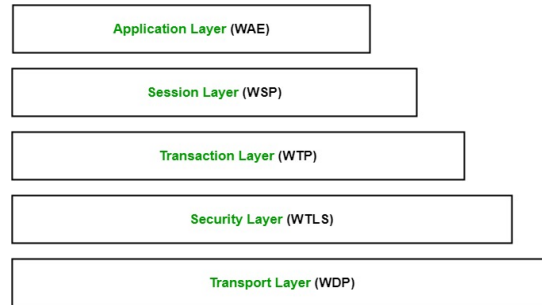
- WAP stands for Wireless Application Protocol.
- WAP is a set of communication protocols that enable users of mobile devices to access services on the Internet.
- WAP uses a markup language called Wireless Markup Language (WML) to create web pages that can be viewed on a mobile device.

WAP Architecture



- The WAP model consists of 3 levels known as Client, Gateway and Server.
- The mobile device sends the URL encoded request to a WAP gateway using WAP protocol.
- The WAP gateway translates this WAP request into a HTTP URL request and sends it over the internet.
- The server sends the response back to the mobile device through the WAP gateway in the WML file.

WAP Protocol stack(Application Environment):



1. **Application Layer:** This layer contains Wireless Application Environment (WAE) with mobile device specs and content programming languages like WML.
2. **Session Layer:** This layer contains Wireless Session Protocol (WSP) for fast connection suspension and reconnection.
3. **Transaction Layer:** This layer contains Wireless Transaction Protocol (WTP) for transaction support, running on top of UDP.
4. **Security Layer:** This layer contains Wireless Transaction Layer Security (WTLS) for data integrity, privacy and authentication.
5. **Transport Layer:** This layer contains Wireless Datagram Protocol, presenting consistent data format to higher layers.

Applications of WAP

- **Mobile banking and payments:** Secure and convenient mobile banking services.
- **Mobile entertainment:** Mobile games, music, and video streaming.
- **Mobile commerce:** Online shopping, product catalogs, and order tracking.
- **Mobile messaging:** SMS and MMS messaging services.
- **Mobile search:** Web, product search engines.
- **Mobile email:** Sending and receiving emails on mobile devices.
- **Location-based services:** Mapping, navigation, and real-time traffic updates.
- **Mobile health:** Remote health monitoring, telemedicine, and mobile health apps.