**WLAN OPERATION**

There are three WLAN modes:

- Infrastructure Mode

- Ad Hoc Mode

- Tethering

**I. Infrastructure Mode**

A diagram of a distribution system

AI-generated content may be incorrect.

- **Centralized Network:** Devices connect to a central Wireless Access Point (WAP) or router.

- **WAP as Bridge:** WAP connects wireless devices to wired network/internet.

**- Managed Access:** WAP handles device connections and IP addresses.

- **Advantages:**

* Scalability: Easy device addition/removal.
* Centralized Management: Easier control.
* Security: WPA/WPA2/WPA3 encryption.
* Internet Access: WAP links to router.
* Stability: more stable than Ad-Hoc.

- **Common Use:** Homes, offices, public Wi-Fi.

**II. Ad Hoc Mode**

**- Peer-to-Peer**: Direct device-to-device connection.

**- No Access Point**: No central WAP/router required.

**- Temporary Networks**: Used for short-term connections.

**- Limited Range**: Range depends on direct device communication.

**- Simple Setup**: Easier than infrastructure mode.

**- Lower Security**: Less secure than infrastructure.

**- Limited Scalability**: Not ideal for many devices.

**- Use Cases**:

* File sharing between laptops.
* Local multiplayer gaming.
* Temporary connections without Wi-Fi.

**III. Tethering**

- Phone as Modem: Uses phone's cellular data for internet access.

- Sharing Methods:

* Wi-Fi Hotspot: Wireless sharing.
* USB Tethering: Wired connection.
* Bluetooth: Slower, less common.

- Key Points:

* Convenient for on-the-go internet.
* Consumes cellular data (monitor usage).
* Drains phone battery.
* Carrier restrictions may apply.
* Speed depends on cellular signal.
* Secure with strong password when using wifi tethering.

- sUse Cases:

* Laptop internet access while traveling.
* Tablet internet without Wi-Fi.
* Sharing internet with others.

**IV. Basic Service Set**

- Definition:

* The fundamental building block of an infrastructure-based WLAN.
* Consists of an Access Point (AP) and associated wireless devices (stations).
* Defines the basic coverage area of a WLAN.

- Components:

* Access Point (AP): Central device managing communication between wireless devices and the wired network.
* Stations (STAs): Wireless devices (laptops, smartphones, tablets) that connect to the AP.

- Operation:

* STAs communicate with each other through the AP.
* The AP acts as a bridge, forwarding data between STAs and between STAs and the wired network.
* Each BSS is identified by a BSSID (Basic Service Set Identifier), which is the AP's MAC address.

- Types of BSS:

* Infrastructure BSS: The most common type, using an AP for connection management.
* Independent BSS (IBSS) / Ad Hoc: A peer-to-peer network without an AP, where devices communicate directly.

- Importance:

* Forms the foundation of infrastructure-based WLANs.
* Enables efficient wireless device connectivity and communication.
* BSSID allows wireless devices to distinguish between different WLANs.

**V. Extened Service Set**

- **Definition:**

* A group of interconnected Basic Service Sets (BSSs).
* Extends WLAN coverage, enabling seamless roaming.
* Creates a larger, unified WLAN.

- **Components:**

* Basic Service Sets (BSSs): Individual WLANs with Access Points (APs).
* Distribution System (DS): Wired network (e.g., Ethernet) linking APs.
* ESSID: Shared network name across all BSSs.

- **Operation:**

* Seamless roaming: Devices switch APs within the ESS without losing connection.
* DS: Facilitates AP communication and device information sharing.
* ESSID: Identifies all APs as part of the same network.

- **Advantages:**

* Expanded WLAN coverage.
* Seamless user mobility.
* Improved WLAN scalability.

- **Applications:**

* Large office buildings, schools, hospitals, public areas.
* Any environment requiring continuous WLAN coverage.

**A diagram of a computer network

AI-generated content may be incorrect.VI. 802.11 Frame Structure**

A close-up of a computer screen

AI-generated content may be incorrect. **- Frame Control:**

**+ Specifies frame type, protocol, and control options**

+ Determine how the frame is processed

**- Duration:**

+ Contains frae duration or association ID

+ Used for **managing wireless medium access**

**- Address Fields:**

**+ Contain MAC addresses of source and destination devices**

+ May include AP, source, destination, and DS addresses.

- **Sequence Control:**

**+ Manages frame fragmentation and reassembly.**

+ Ensures frames are received in the correct order

**- Frame Body;**

+ Contains the actual data being transmitted

+ Variable size depending on frame type and data.

**- Frame Check Sequence (FCS):**

+ Used for error detection within the frame

+ Ensures data integrity.

**VII. CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance).**

* **Purpose:** Avoid data collisions in wireless (shared medium).
* **Carrier Sense:**
  + Devices "listen" before transmitting.
  + If medium is busy, device waits.
* **Collision Avoidance Mechanisms:**
  + **IFS (Interframe Space):** Time delay between frames, prioritizes frame types.
  + **Random Backoff:** Random wait time if medium is busy, reduces simultaneous retries.
  + **RTS/CTS (Request to Send/Clear to Send):**
    - RTS: Device requests transmission permission from AP.
    - CTS: AP grants permission.
    - "Reserves" the medium, minimizing collisions.
* **Process:**
  + Device wants to transmit.
  + Device performs carrier sense (listens).
  + If medium is free:
    - Device transmits after IFS.
  + If medium is busy:
    - Device waits random backoff time.
    - Retries carrier sense.
  + Optional: RTS/CTS exchange before data transmission.
* **Importance:** Ensures reliable WLAN communication, improves network efficiency.

Nguồn và nội dung liên quan

**VIII. Wireless Client and AP Association**

Wireless devices complete the following three stage process, as shown in the figure:

* Discover a wireless AP
* Authenticate with AP
* Associate with AP

A diagram of a structure

AI-generated content may be incorrect.

**Revision:**

1. Ad hoc mode is used when two devices connect wirelessly in a peer-to-peer (P2P) manner without using APs or wireless routers.  
2. The correct answer is True: When two or more BSSs need to support roaming clients, they can be joined together to create an ESS.  
3. An 802.11 wireless frame has four address fields.  
4. In passive mode, the AP openly advertises its service by periodically sending broadcast beacon frames containing the SSID, supported standards, and security settings.  
5. In active mode, wireless clients initiate the process by broadcasting a probe request frame with the SSID on multiple channels. APs configured with the SSID will send a probe response that includes the SSID, supported standards, and security settings.