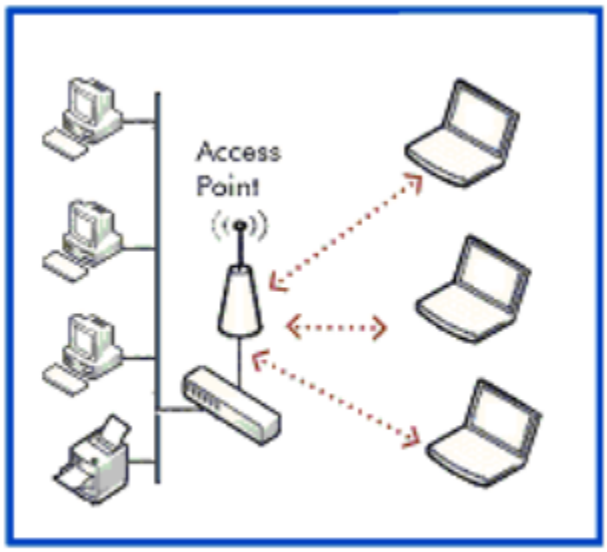
Wi-Fi topologies define how devices connect and communicate in a wireless network. Below are the key Wi-Fi modes—Infrastructure Mode, Repeater Mode, Ad-hoc Mode, and Bridge Mode

Infrastructure Mode

The most common Wi-Fi topology, where devices (clients) connect to a central access point (AP), such as a router. The AP manages the network and often connects to a wired network (e.g., Ethernet) for internet access.



Infrastructure mode

Here ,Clients (laptops, phones) associate with the AP, which handles traffic and security (e.g., WPA3 encryption).

Use Cases:

- Home or office Wi-Fi networks for internet access.
- Enterprise environments with multiple APs for broader coverage.
- Public hotspots (e.g., cafes, airports).

Advantages	Centralized management, scalability, and security.
Limitations	Requires an AP, limited by AP range.

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Repeater Mode

A device (repeater) extends the range of an existing Wi-Fi network by receiving the signal from an AP and retransmitting it.

The repeater connects to the main AP and rebroadcasts the signal, effectively doubling the coverage area. It uses the same SSID and security settings.

Use Cases:

- Homes with dead zones (e.g., upstairs or basement).
- Large offices or warehouses needing extended coverage.

Advantages	Simple way to boost range without additional wiring.
Limitations	Halves bandwidth (repeater uses the same channel to receive and transmit), potential latency increase.

Ad-hoc Mode

A peer-to-peer topology where devices connect directly to each other without an AP or router.

Devices form a temporary network (e.g., laptop-to-laptop) using their wireless adapters. No central coordinator is needed.

Use Cases:

- File sharing between two laptops in a remote location.
- Gaming or collaboration in areas without infrastructure.
- Emergency networks when infrastructure fails.

Advantages	Quick setup, no need for additional hardware.
Limitations	Limited range, no internet access unless one device shares it, less secure, and harder to manage with many devices.

Bridge Mode

Connects two separate networks (wired or wireless) to act as a single network, "bridging" them together.

A bridge device (e.g., an AP in bridge mode) links two LANs, passing traffic between them. It can be wireless-to-wireless or wireless-to-wired.

Use Cases:

- Connecting two office buildings wirelessly (point-to-point bridge).
- Linking a wired device (e.g., a smart TV) to a Wi-Fi network.
- Extending a network across physical barriers (e.g., floors).

Advantages	Expands network without complex routing, maintains single subnet.
Limitations	Requires compatible hardware, potential throughput reduction in wireless bridges..

Mesh Mode

Multiple APs (nodes) work together to create a seamless, self-healing Wi-Fi network with a single SSID. Nodes communicate wirelessly to extend coverage.

Use Case:

Whole-home Wi-Fi systems (e.g., Google Nest, Eero) for consistent coverage in large spaces

Key Point: Unlike repeaters, mesh nodes use dedicated backhaul channels (often 5 GHz or 6 GHz) to avoid bandwidth loss.

Workgroup Bridge Mode

A device acts as a wireless client to connect multiple wired devices (e.g., via a switch) to a Wi-Fi network.

Use Case

Connecting a group of wired office devices (printers, PCs) to a wireless network without individual Wi-Fi adapters.

Key Point: Essentially turns a wired segment into a wireless client.