**8. Describe the Medium Access Control methodologies**

MAC is a sublayer of the Data Link Layer (Layer 2) that manages how multiple devices share and access a common communication medium (like air or cable) without collisions or interference.

In wireless networks, since the medium is shared and broadcast-based, MAC plays a critical role in avoiding data collisions.

**Point Coordination Function (PCF)**

* Uses a centralized polling mechanism managed by the Access Point.
* Operates during a Contention-Free Period (CFP).
* Devices do not contend for access; the AP grants permission to transmit.
* Eliminates collisions during CFP by scheduling communication.
* Rarely implemented in real-world Wi-Fi networks due to complexity.
* Suitable for time-sensitive traffic like voice and video.

**Distributed Coordination Function (DCF)**

* Based on CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance).
* All devices listen to the medium before transmitting.
* If the channel is busy, devices wait a random backoff period.
* No central controller; completely distributed.
* Default and mandatory access method in all Wi-Fi networks.
* Collisions can occur under heavy traffic, but are minimized through backoff.

**Enhanced Distributed Channel Access (EDCA)**

* Introduced in 802.11e for Quality of Service (QoS).
* Extends DCF by categorizing traffic into four Access Categories (ACs): Voice, Video, Best Effort, Background.
* Each category has its own contention window and backoff parameters.
* Higher-priority traffic (e.g., Voice) gets faster and more frequent access to the medium.
* Maintains backward compatibility with DCF.
* Widely used in modern Wi-Fi networks for handling multimedia traffic efficiently.