Name: Aswath S

College: Vellore Institute of Technology, Vellore

Reg.No: 21BEC2188

Wi-Fi Training Program 2025

Module 4

Question 7:

Describe the power saving scheme in MAC layer and explore on the types of Power saving mechanisms

Solution:

The **IEEE 802.11 MAC layer** includes mechanisms that allow a device (station or STA) to **enter sleep mode** when idle, and **wake up periodically** to receive data.

1. QoS NULL Frame (Sleep Indication)

- When the client is idle but associated with an Access Point (AP), it sends a **QoS NULL frame**.
- This frame has the **Power Management bit set to 1** in the Frame Control (FC) field.
- This informs the AP that the client is entering **power-saving mode**.
- The client then turns off its radio to conserve power.

2. Beacon & TIM/PVB Mechanism

- AP sends periodic **Beacon frames**, which include a **TIM (Traffic Indication Map)** Information Element.
- The TIM contains a **Partial Virtual Bitmap (PVB)** representing **AID (Association ID)** of clients with buffered data at the AP.
- The **DTIM interval** determines how often the client should wake up to check for this information.

3. Bitmap Representation

- Each bit in the PVB corresponds to an AID.
- If a bit is **set to 1**, it indicates **pending data** for that client.

4. Data Retrieval by Client

- On waking up, the client parses the TIM.
- If its **AID is set**, it sends a **PS-Poll frame** to the AP.
- The AP responds by delivering the buffered data.

Types of Power Saving Mechanisms

1. Legacy Power Save Mode (802.11 Standard)

- Involves using TIM and PS-Poll as described.

- Suitable for low-throughput or infrequent communication.

2. TWT (Target Wake Time) – 802.11ax (Wi-Fi 6)

- The client negotiates with the AP to **wake up at scheduled intervals**.
- Drastically reduces power consumption in IoT and battery-powered devices.
- Suitable for high-density environments.