**9. Brief about the Block ACK mechanism and its advantages**

The **Block ACK** mechanism is used in Wi-Fi networks to improve the efficiency of acknowledgment for multiple data frames. Instead of sending an acknowledgment (ACK) for each frame individually, the receiver sends one Block ACK to acknowledge a group of frames, reducing the overhead of multiple ACKs.

**Working:**

1. Before data transmission, the sender and receiver agree to use Block ACK by exchanging a Block ACK Request and Block ACK frame. The Block ACK frame specifies the frames being acknowledged.
2. The sender transmits several data frames without waiting for individual ACKs for each one.
3. Instead of sending a separate ACK for each frame, the receiver sends a single Block ACK for the entire group of frames. The Block ACK frame contains a bitmap that indicates which frames were successfully received and which ones need to be retransmitted.

**Advantages of Block ACK:**

* By acknowledging multiple frames with one Block ACK, we reduce the number of control messages (ACKs), leading to less overhead and better network efficiency.
* Since the sender doesn’t have to wait for each ACK, it can transmit data faster, improving overall throughput, especially in high-speed networks.
* The bitmap in the Block ACK helps identify lost frames, so the sender only needs to retransmit the missing frames rather than the entire block, saving bandwidth.
* With fewer ACK frames to handle, overall latency is reduced, improving real-time communication and response times.
* In situations where large amounts of data are being transferred, Block ACK helps maintain network efficiency and avoid bottlenecks caused by excessive ACKs.