Slotted ALOHA improves throughput compared to pure ALOHA by introducing synchronization and reducing collisions, resulting in more efficient use of the communication channel.

Here's how slotted ALOHA achieves this improvement:

Pure ALOHA:

In pure ALOHA, devices transmit data whenever they have it, without any coordination or synchronization. This can lead to collisions when multiple devices transmit simultaneously, causing data loss and inefficiency.

Slotted ALOHA:

In slotted ALOHA, the time is divided into discrete time slots. Devices are required to transmit data only at the beginning of these time slots. This introduces synchronization, which helps reduce collisions and improves overall efficiency.

Key Points of Improvement in Slotted ALOHA:

1. Collision Reduction: Since devices transmit only at the start of time slots, the chances of collisions are significantly reduced. Collisions can still occur if two or more devices start transmitting at the same time, but the probability of this happening is lower compared to pure ALOHA.

2. Improved Channel Utilization: With fewer collisions, slotted ALOHA achieves better channel utilization. Devices don't waste time transmitting in the middle of time slots, reducing the likelihood of overlapping transmissions.

3. Synchronization: Slotted ALOHA introduces synchronization by aligning transmissions to the start of time slots. This synchronization simplifies collision detection and resolution, making the protocol more predictable.

4. Higher Throughput: Due to reduced collisions and improved channel utilization, slotted ALOHA achieves a higher throughput compared to pure ALOHA. More successfully transmitted packets contribute to increased overall data throughput.

Example:

Imagine a scenario where multiple wireless devices want to transmit data packets over a shared channel. In pure ALOHA, devices start transmitting whenever they have data, leading to potential collisions. In slotted ALOHA, time is divided into slots, and devices transmit only at the beginning of each slot. This reduces the chances of simultaneous transmissions and collisions. As a result, slotted ALOHA improves throughput because collisions are minimized, leading to a higher proportion of successfully transmitted packets.

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