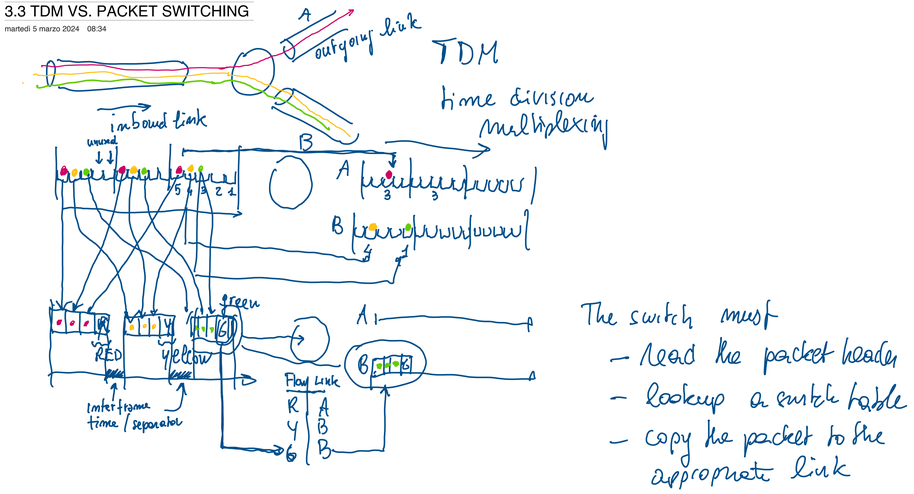
3.3 TDM VS. PACKET SWITCHING

martedì 5 marzo 2024 08:34



Packet switching is a fundamental principle in network communications, where data is divided into packets before being sent over the network. Each packet is treated independently, can take different paths to the destination, and is reassembled into the original message once it arrives. This method contrasts with Time Division Multiplexing (TDM), a form of multiplexing where the available bandwidth of a resource is divided into time slots assigned to different communication channels.

Similarities between Packet Switching and Time Division Multiplexing:

- Data Transmission: Both are used to transmit data across networks, although using different methodologies. They are foundational technologies that enable communication between devices over shared or dedicated mediums.
- Multiplexing: At a fundamental level, both involve multiplexing, which is the process of combining multiple signals or data streams into one. Packet switching does this by interleaving packets from different sources over the same network medium, while TDM does it by allocating distinct time slots to different data streams.
- Digital Transmission: Both methods are compatible with digital transmission systems and are widely used in digital networks to optimize the use of network resources and manage data traffic effectively.

Differences between Packet Switching and Time Division Multiplexing:

- Resource Allocation: In packet switching, network resources (such as bandwidth) are used on-demand, allowing for dynamic allocation based on current network traffic. Conversely, TDM allocates fixed time slots for each communication channel regardless of the actual demand, which can lead to inefficient use of resources if a channel has no data to transmit during its allocated slot.
- Flexibility and Efficiency: Packet switching provides higher flexibility and can be more efficient in handling bursty data traffic because it allocates resources as needed. TDM, while efficient for constant-rate data streams (like voice communications), is less flexible since the time slots are pre-assigned and fixed, potentially leading to wasted bandwidth during periods of inactivity.
- Quality of Service (QoS): TDM can offer guaranteed quality of service since each channel is guaranteed a specific portion of the bandwidth. Packet switching, being more dynamic, generally cannot guarantee QoS because packet delay and loss depend on the network's current load. However, modern packet-switched networks can implement QoS mechanisms to prioritize certain types of traffic.
- Path and Reliability: Packet-switched networks allow packets to take different paths to the destination, which can enhance reliability and robustness by routing around congested or failed network segments. TDM's rigid structure means that if the dedicated path fails, the communication channel is disrupted until the path is restored or rerouted.