Packet Switching vs. Circuit Switching

Packet Switching

Definition

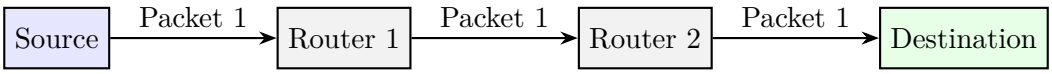
In packet switching, data is broken into small packets. Each packet is transmitted independently through the network and may take different paths to reach the destination.

Key Mechanisms:

- **Store-and-Forward:** Each router must receive the entire packet before forwarding it to the next hop.
- **Queuing:** Packets may experience delays when waiting in output queues, especially under heavy traffic.

Implication

Packet switching is efficient in utilizing bandwidth but introduces variable delays (latency and jitter).



Store-and-forward: each router holds the packet before forwarding.

Circuit Switching (Alternative to Packet Switching)

Definition

Circuit switching establishes a dedicated communication path between two hosts for the entire session. Resources are reserved for the duration of the communication.

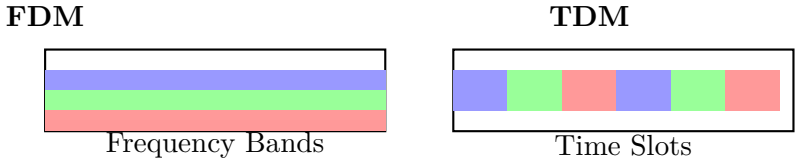
Key Characteristics:

- Guaranteed constant transmission rate.
- No queuing delay once the circuit is established.
- Inefficient under bursty traffic, since unused bandwidth is wasted.

Circuit path reserved before transmission.

Circuit Switching: FDM vs. TDM

- **Frequency Division Multiplexing (FDM):**
  - Frequency spectrum is divided into separate channels.
  - Each call gets a unique frequency band.
  - Continuous allocation until call ends.
- **Time Division Multiplexing (TDM):**
  - Time is divided into slots.
  - Each call gets periodic time slots for transmission.
  - More flexible than FDM.



Comparison

Aspect	FDM	TDM
Resource	Frequency bands	Time slots
Allocation	Continuous	Periodic
Efficiency	Wastes spectrum if idle	More efficient with idle slots