

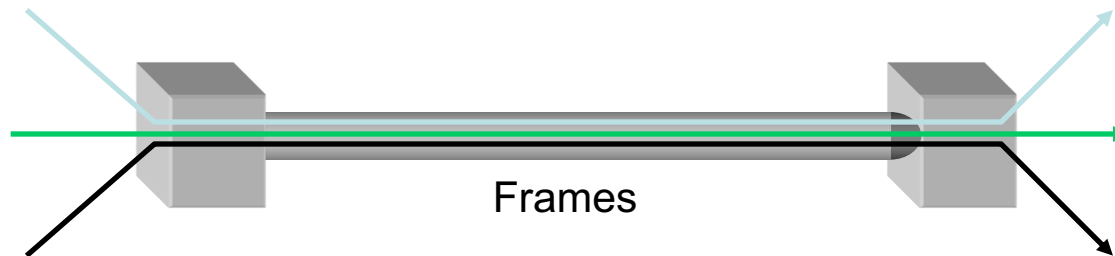
ECE 463

Introduction to Computer Networks

Lecture: Internet Architecture

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Multiplexing/Demultiplexing

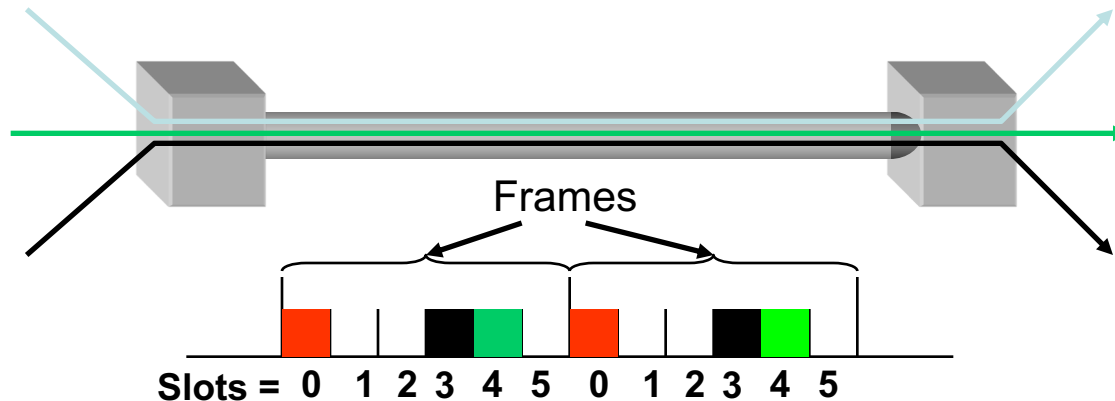


Sharing system resource among multiple users

Solution Space

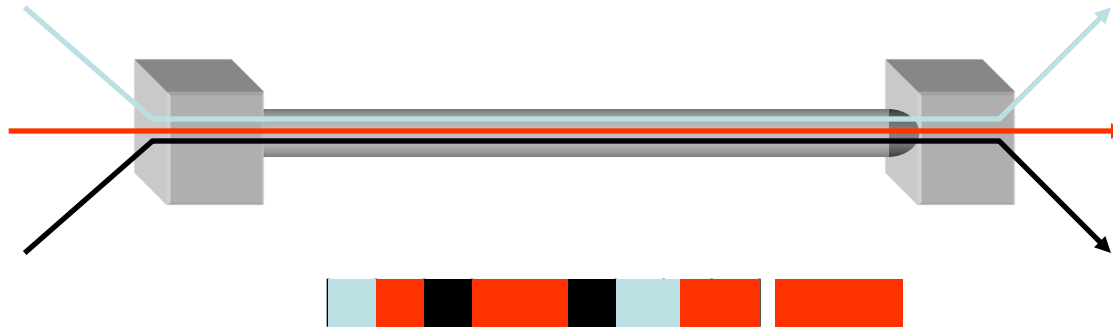
- Circuit switching
 - Used by Telephone networks
 - Many realizations: Time Division Multiplexing, Frequency Division Multiplexing
- Packet switching
 - Approach taken by Internet.

Time Division Multiplexing



- Time divided in frames and frames divided in slots
- Relative slot position inside a frame determines which conversation the data belongs to
 - E.g., slot 0 belongs to red conversation
- Issue:
 - If a conversation does not use its circuit the capacity is lost!

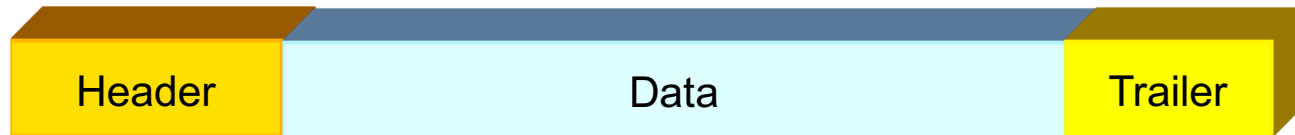
Packet Switching: Statistical Multiplexing



- Data from any conversation can be transmitted at any given time
 - A single conversation can use the entire link capacity if it is alone

Packet Switching

- Data are sent as formatted bit-sequences, so-called packets.
- Packets have the following structure:

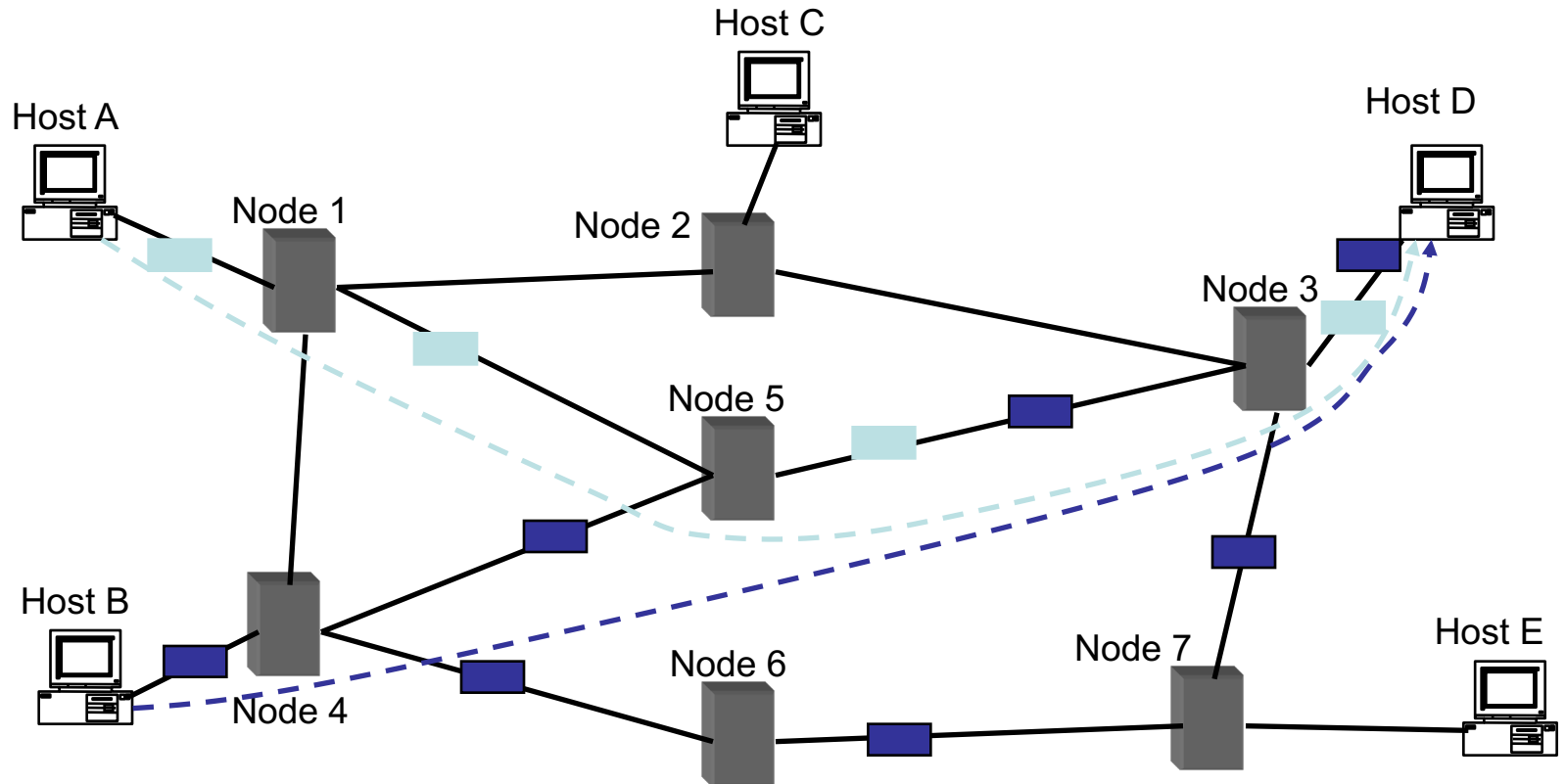


- At each node the entire packet is received, stored briefly, and then forwarded to the next node based on the header information (**Store-and-Forward Networks**)

Packet vs. Circuit Switching

- Packet-switching: Benefits
 - Ability to exploit statistical multiplexing
 - More efficient bandwidth usage
- Packet switching: Concerns
 - Needs to buffer and deal with congestion:
 - More complex switches
 - Harder to provide good network services (e.g., delay and bandwidth guarantees)

Datagram Packet Switching



- Each packet is independently switched
 - Each packet header contains destination address

Implications of Internet model

- “Best-effort” network
 - Packets may be lost
 - Packets may be delayed
 - Packets may arrive out of order