ECE 463
Introduction to Computer Networks
Lecture: Internet Architecture

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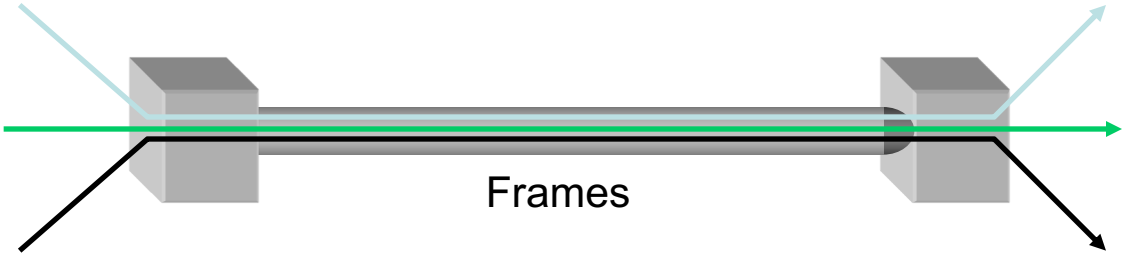
Multiplexing/Demultiplexing

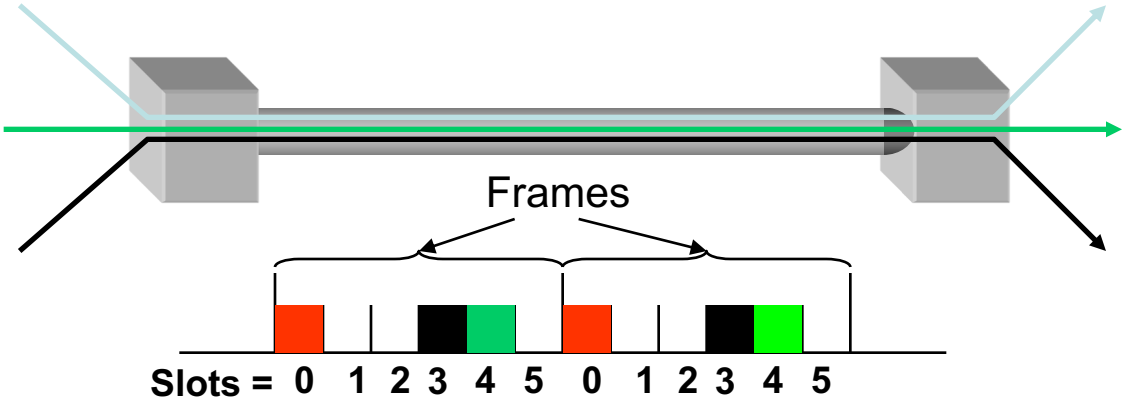


Sharing system resource among multiple users

Circuit Switching

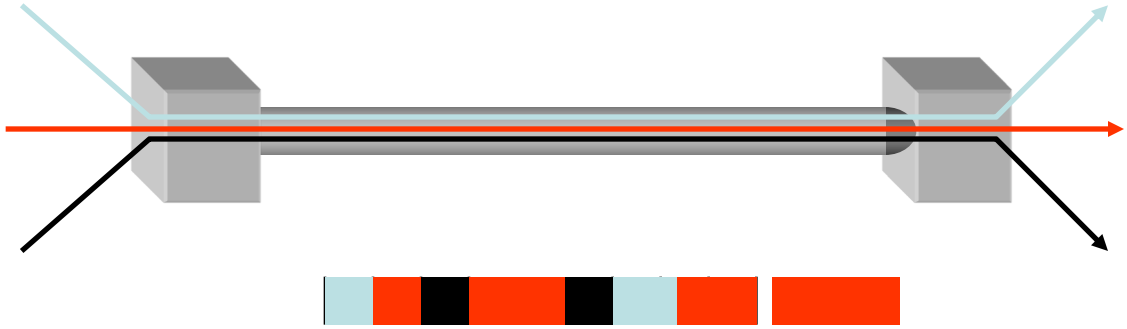
- Three phases
  1. circuit establishment
  2. data transfer
  3. circuit termination
- If circuit not available: busy
- Examples
  - Telephone networks
  - ISDN (Integrated Services Digital Networks)

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:

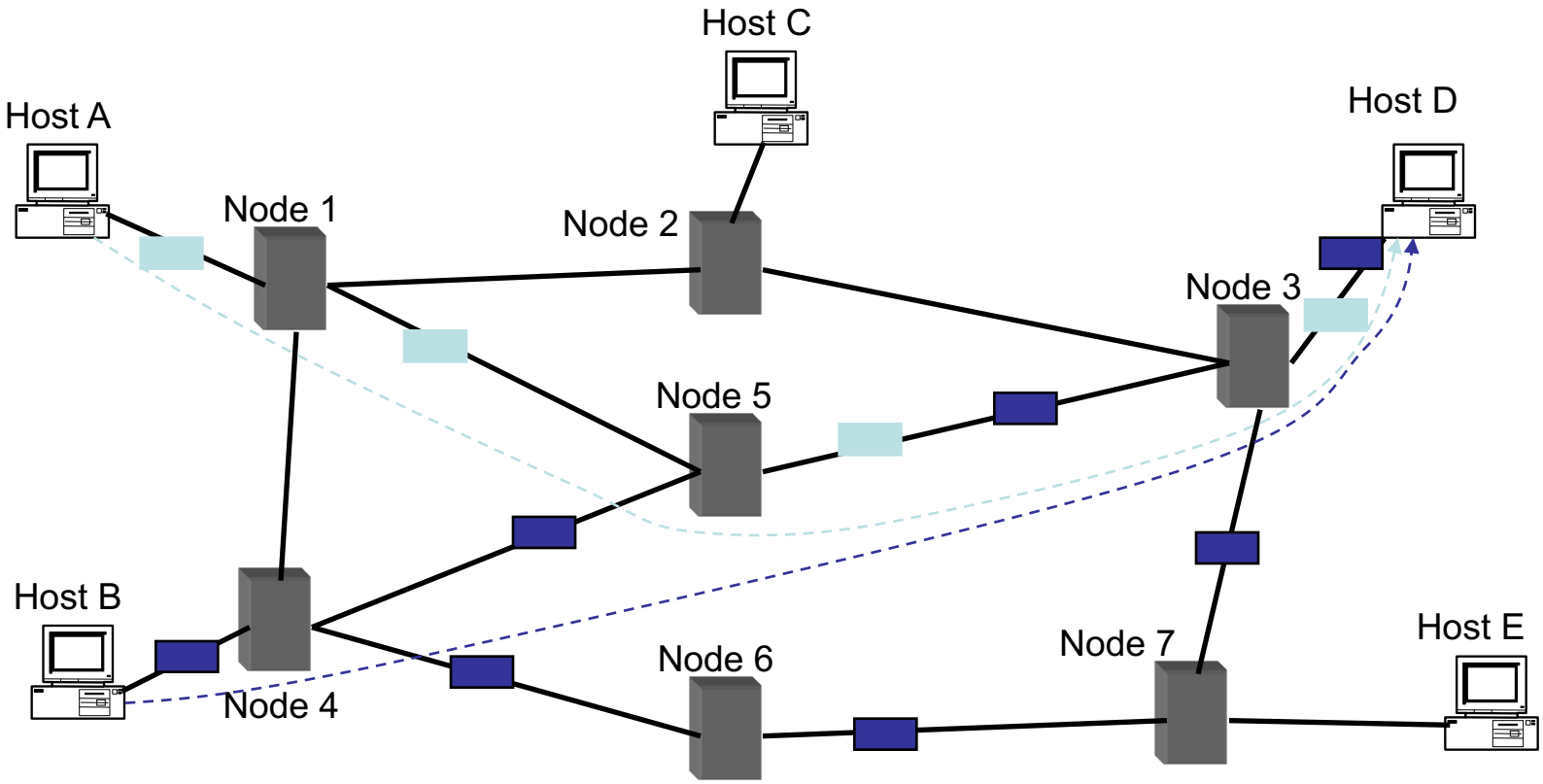
- At each node the entire packet is received, stored briefly, and then forwarded to the next node based on the header information (**Store-and-Forward Networks**)

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