

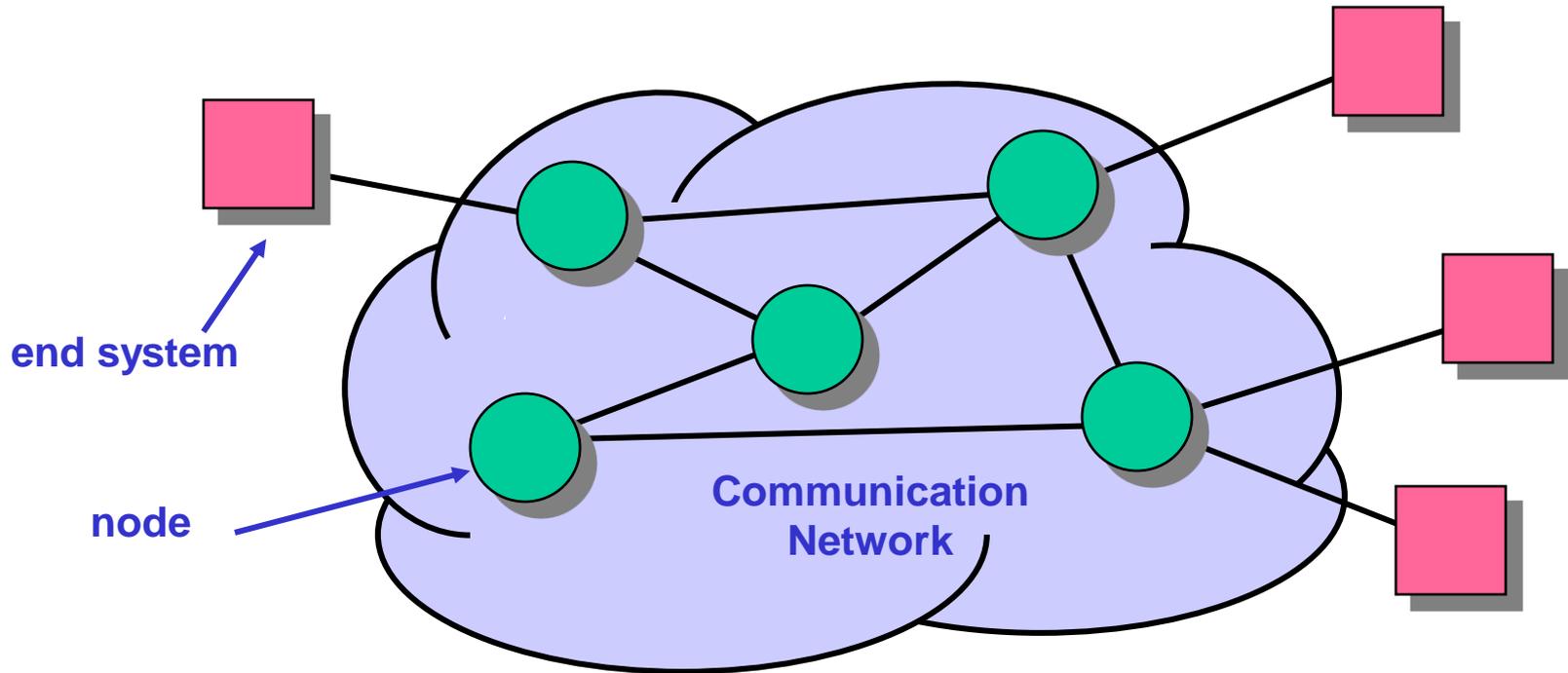
Packet-Switched Networks

Review

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Communication Networks

- A generic communication network:

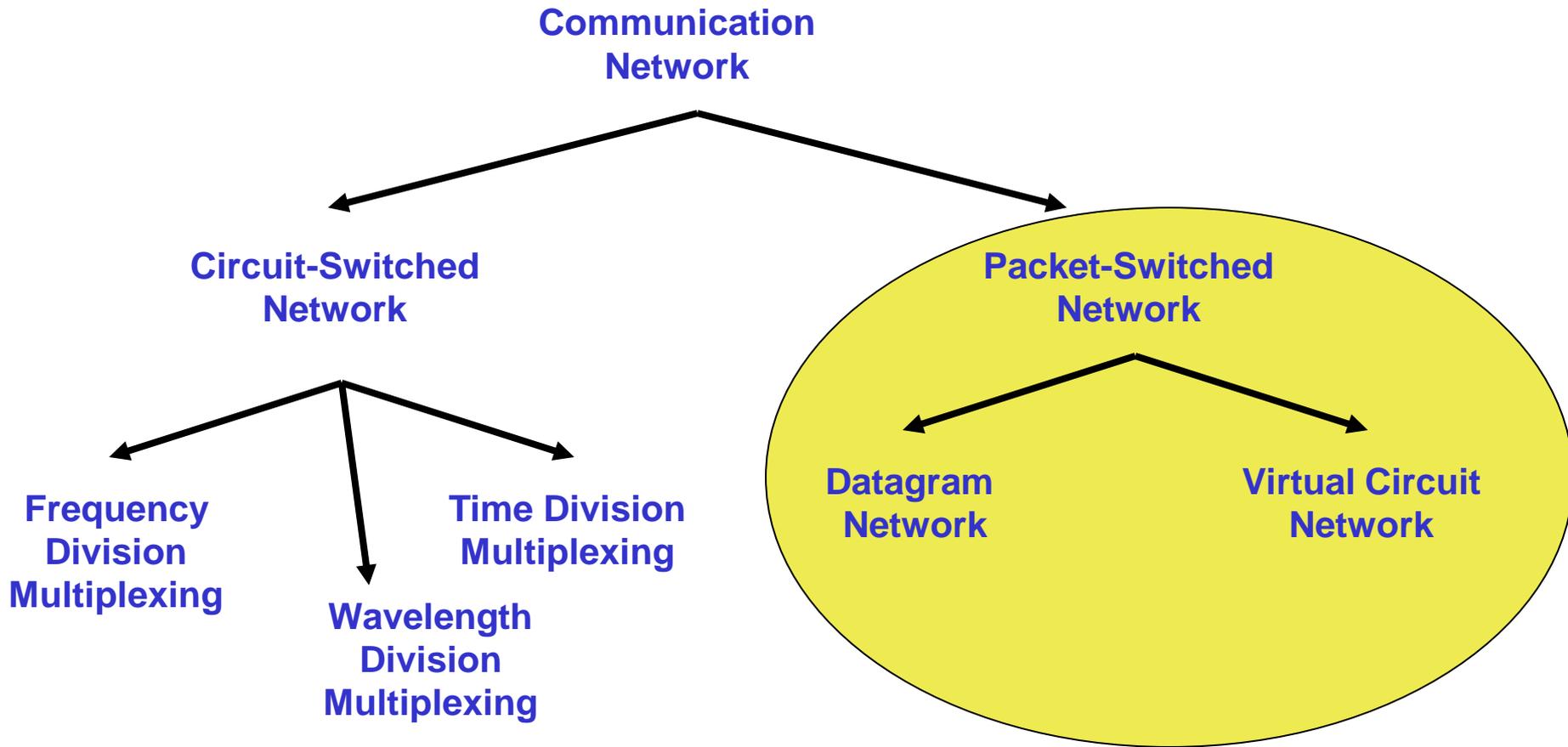


Other names for “end system”: station, **host**, terminal

Other names for “node”: switch, **router**, gateway

Taxonomy of Networks

- Communication networks can be classified based on the way in which the nodes exchange information:



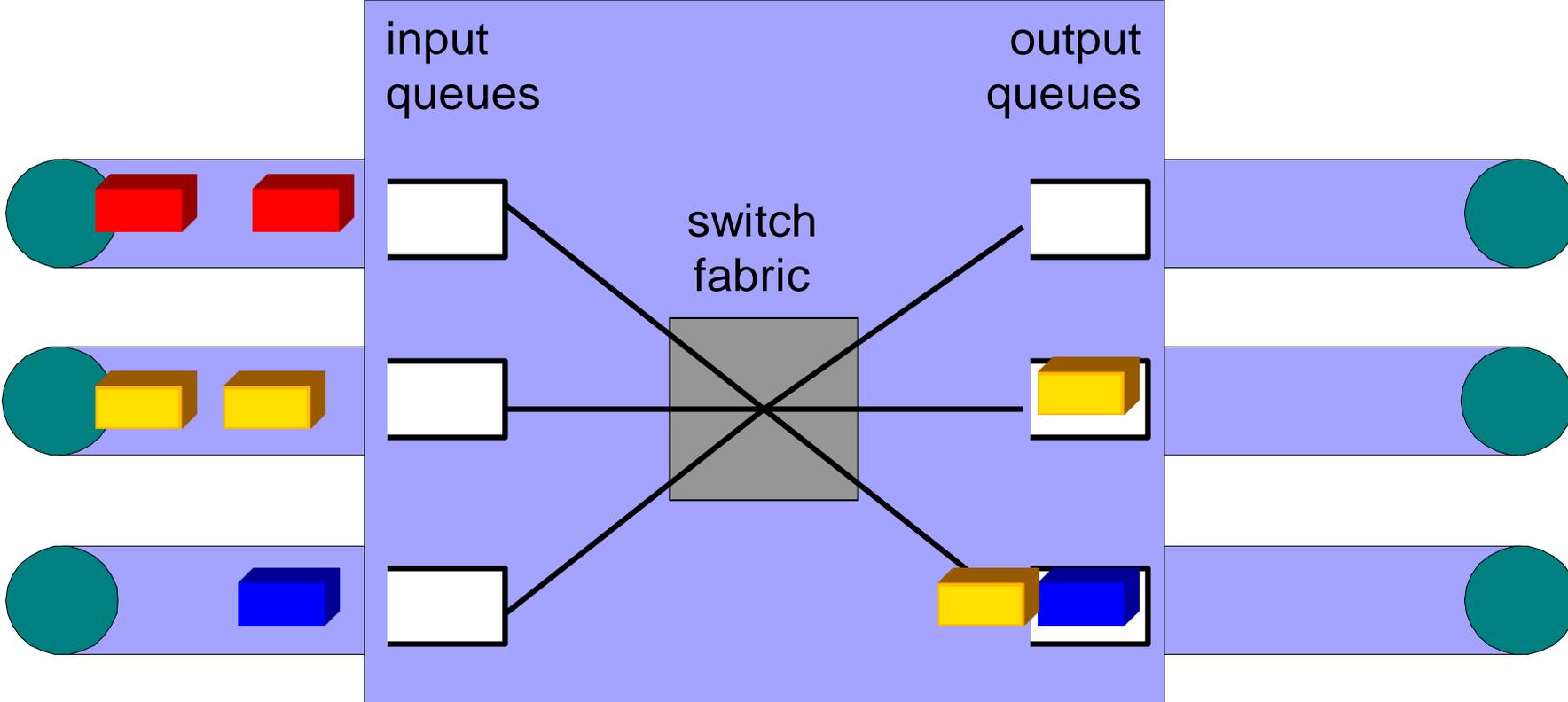
Packet Switching

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

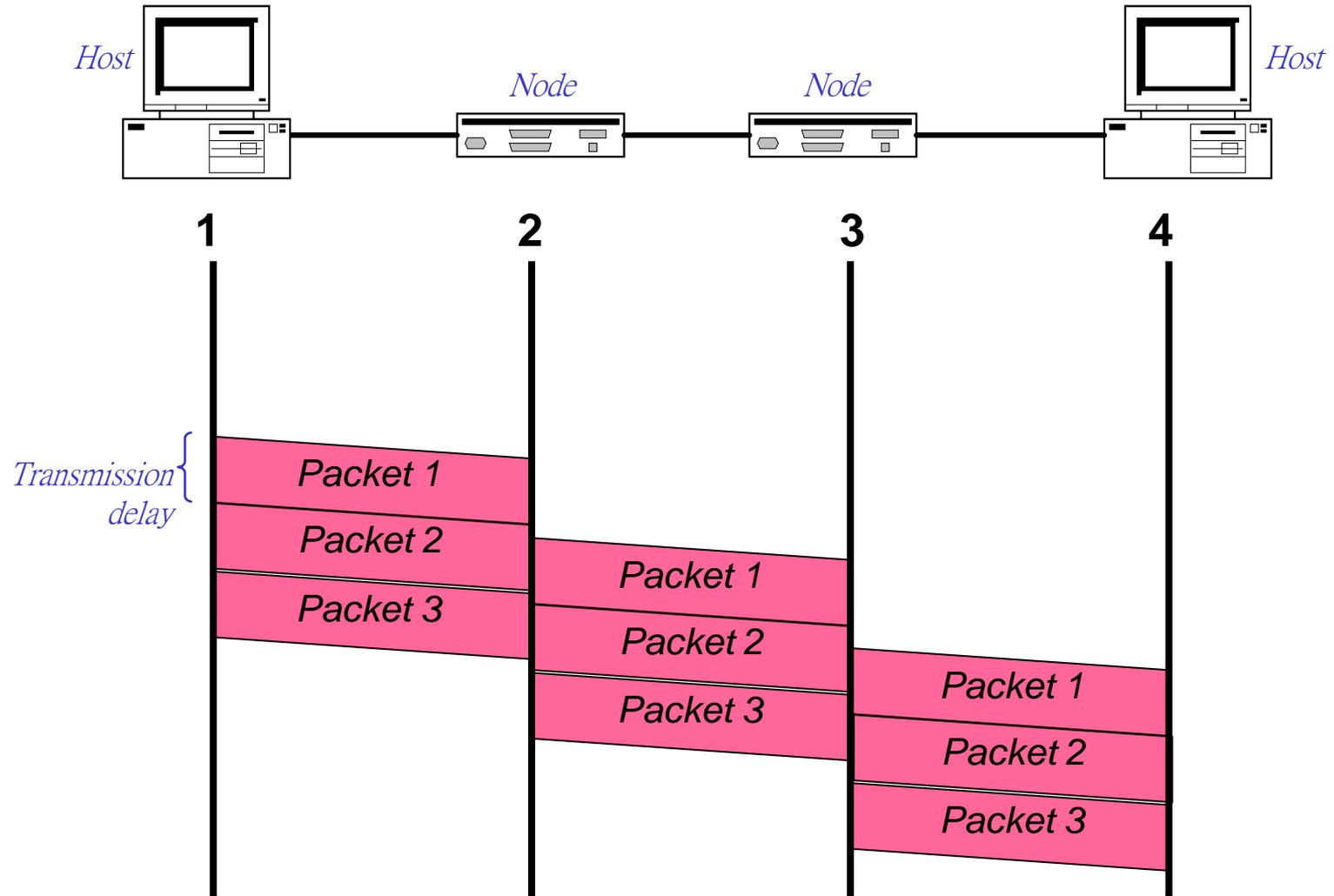


- Header and Trailer carry control information
- Each packet is passed through the network from node to node along some path (**Forwarding/Routing**)
- At each node the entire packet is received, stored briefly, and then forwarded to the next node (**Store-and-Forward Networks**)
- Packet transmission is never interrupted (no preemption)
- No capacity is allocated for packets

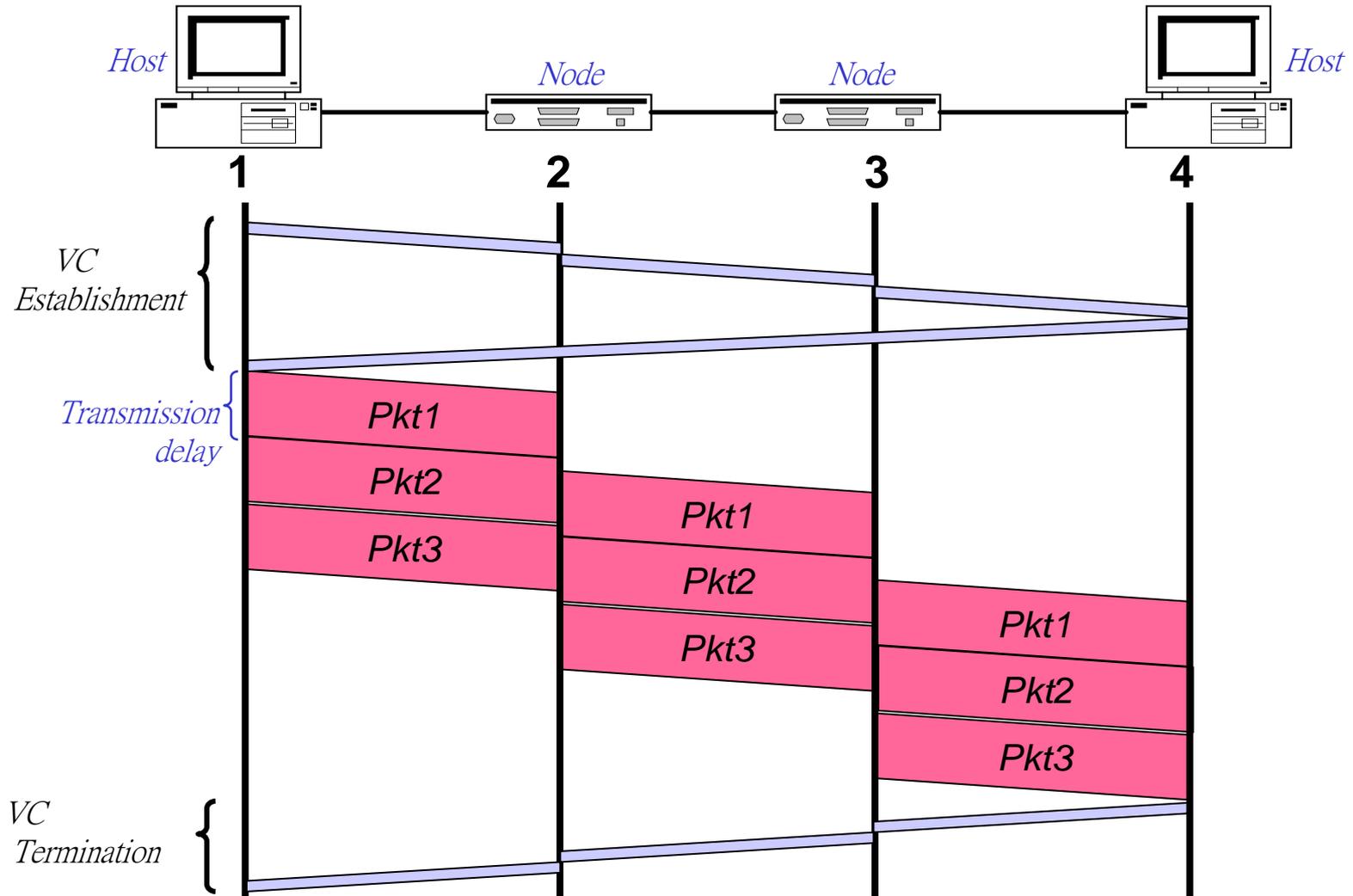
A Packet Switch



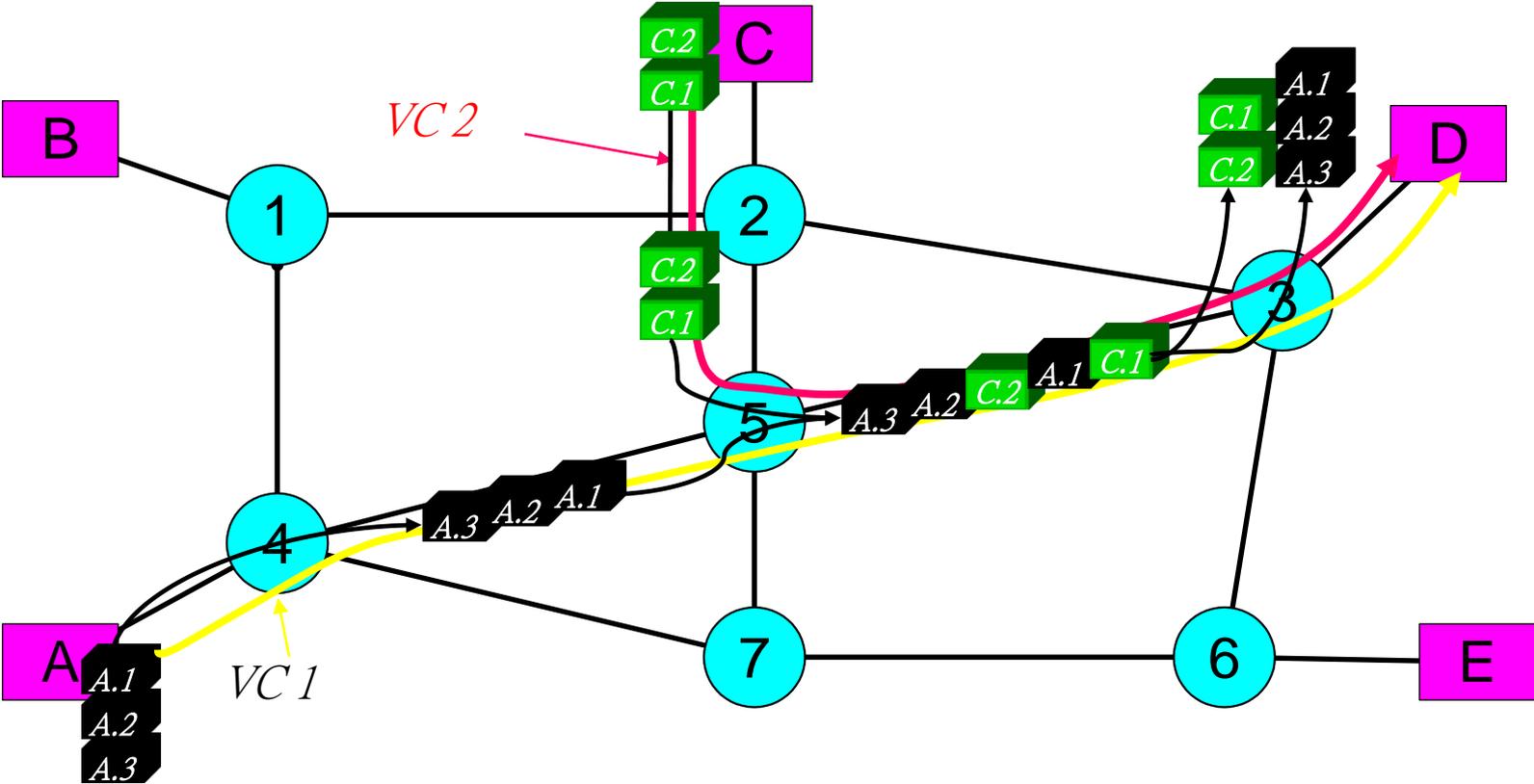
Timing of Datagram Packet Switching



Timing of VC Packet Switching



Virtual-Circuit Packet Switching



Packet Switching Technologies

- Both packet switching technologies are used today:
- **Datagram packet switching:**
 - IP routers (Internet)
 - Ethernet Switches (Switched LANs)
- **Virtual-circuit packet switching**
 - Asynchronous Transfer Mode (ATM)
 - Multi-protocol label switching (MPLS)

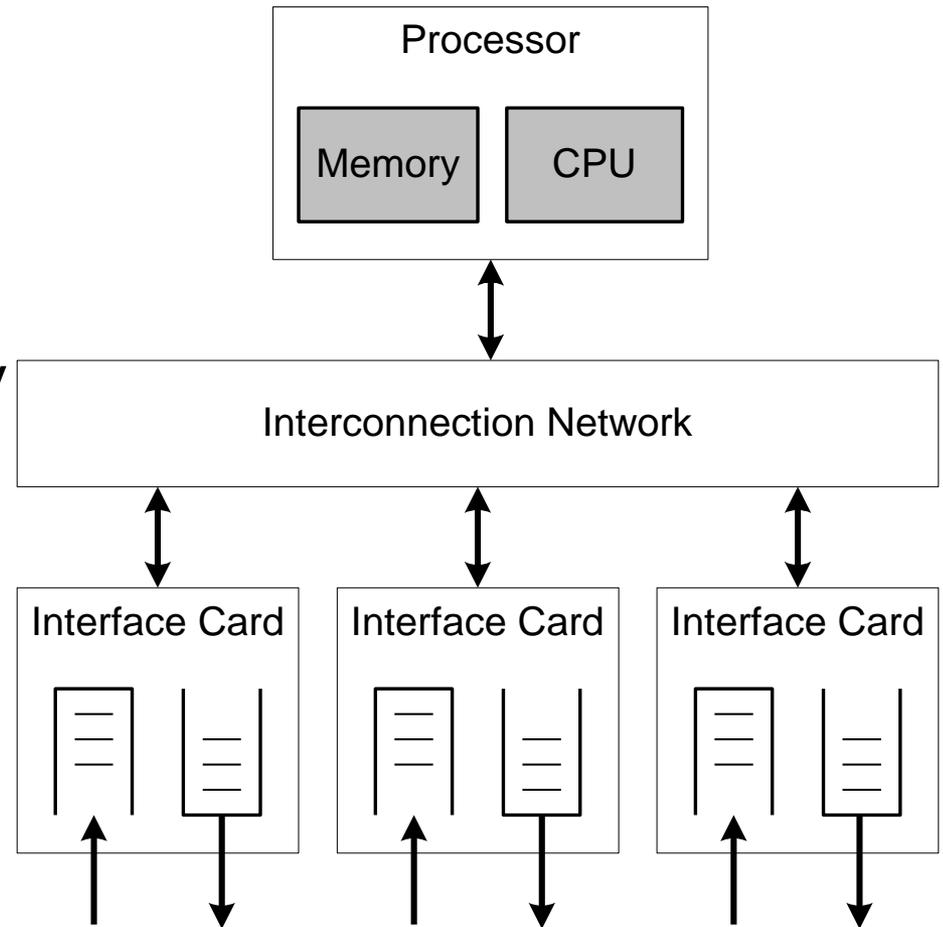
Packet Switch Architectures

Packet Switches

- Different types of packet switches:
 - IP routers
 - ATM switches
 - MPLS switches
 - Ethernet (LAN) switches
 - Frame Relay
- All types of packet switches have very similar characteristics

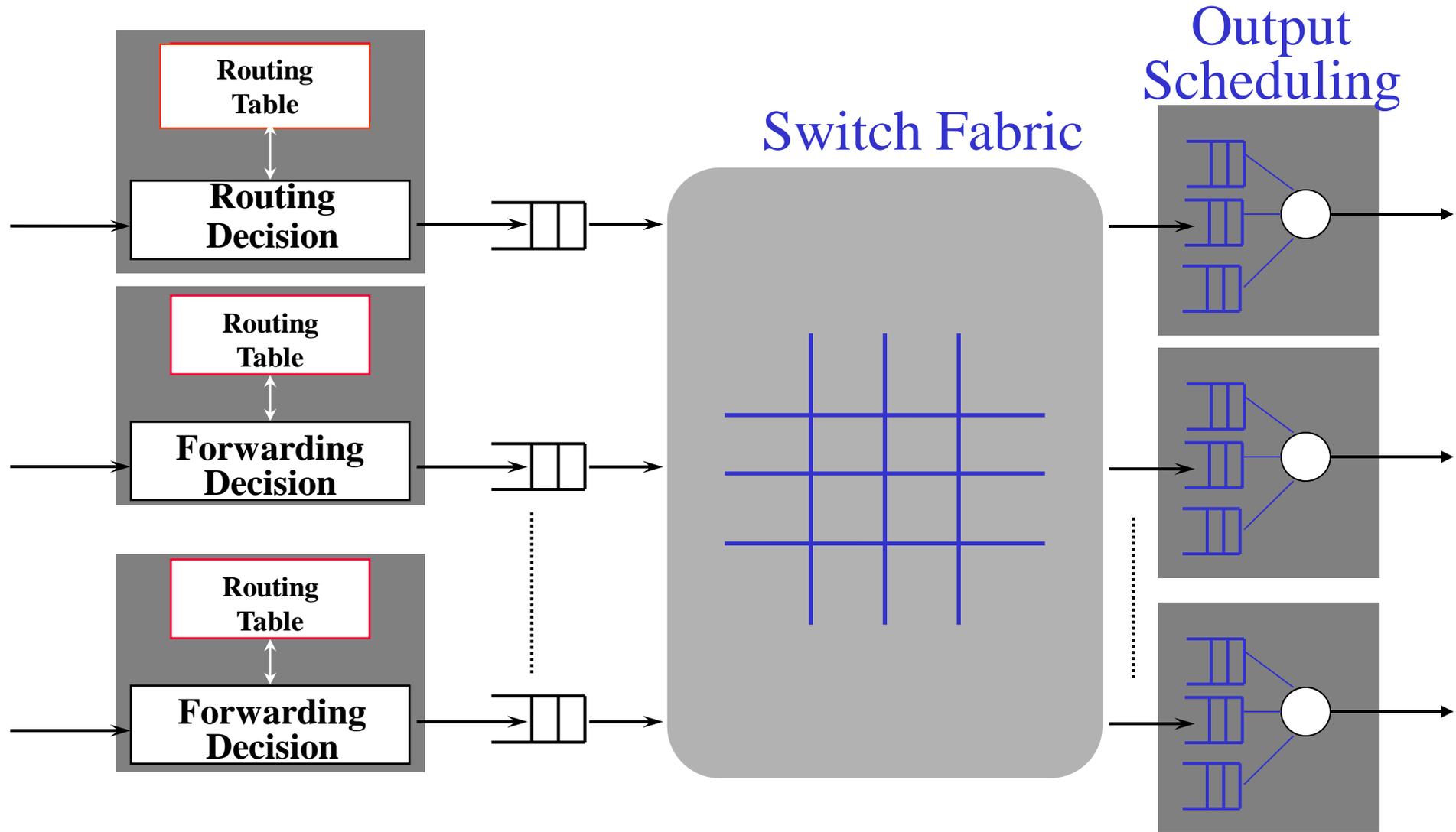
Switch Components

- Hardware components of a router:
 - Network interfaces
 - Interconnection network
 - Processor with a memory and CPU

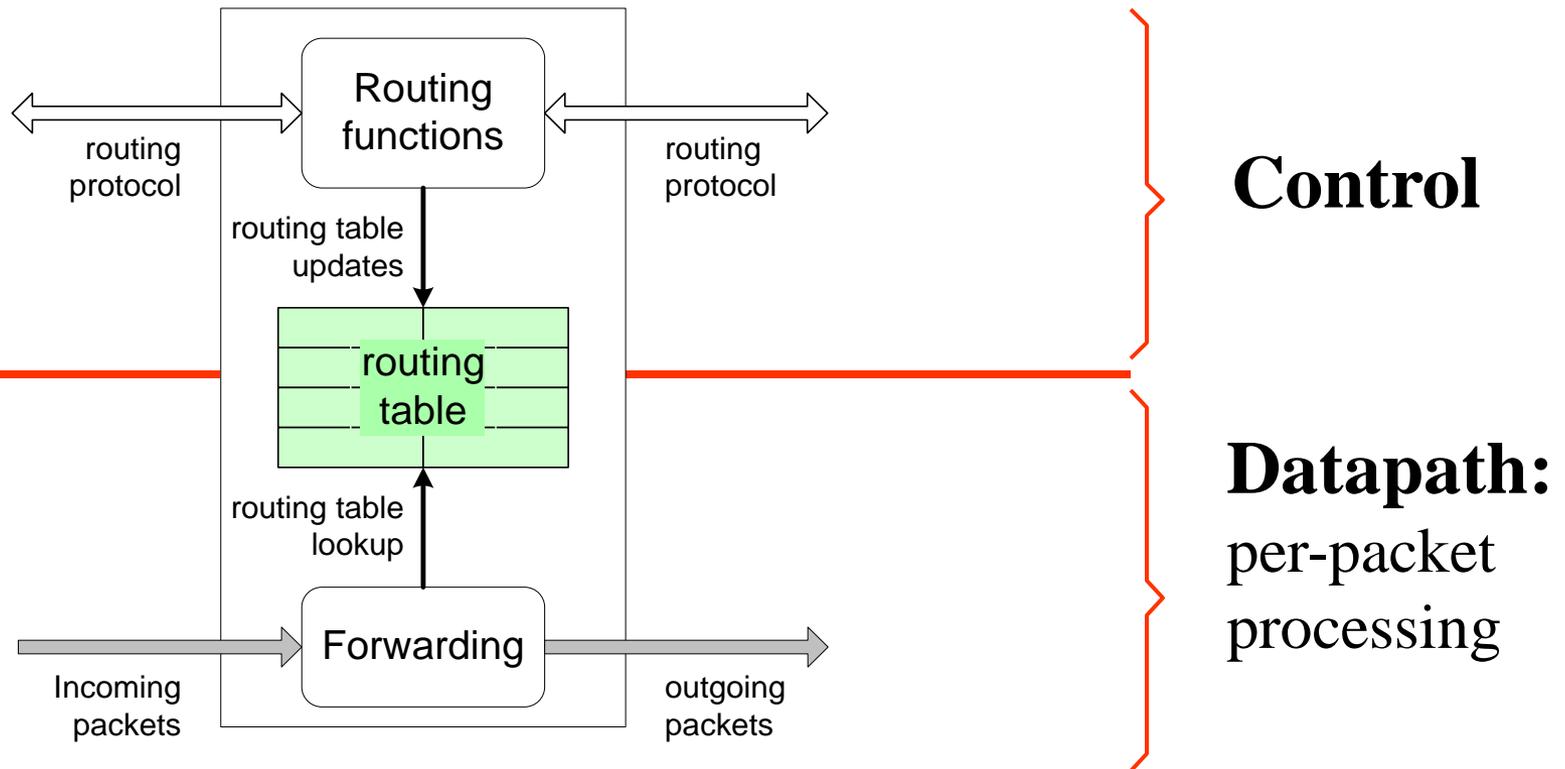


Basic Architectural Components

Per-packet processing



Functional Components



Routing and Forwarding

Routing functions include:

- route calculation
- maintenance of the routing table
- execution of routing protocols

Forwarding is per-packet processing

- On high-end packet switches routers, forwarding is highly parallelized, and most work is done on the interface cards

IP Router

- Lookup packet destination address in forwarding table.
 - If known, forward to correct port.
 - If unknown, drop packet.
- Decrement TTL, update header checksum.
- Forward packet to outgoing interface.
- Transmit packet onto link.

ATM Switch

- Look up VCI/VPI of cell in VC table.
- Replace old VCI/VPI with new.
- Forward cell to outgoing interface.
- Transmit cell onto link.

Ethernet Switch

- Lookup frame destination address in forwarding table.
 - If known, forward to correct port.
 - If unknown, broadcast to all ports.
- Learn source address of incoming frame.
- Forward frame to outgoing interface.
- Transmit frame onto link.