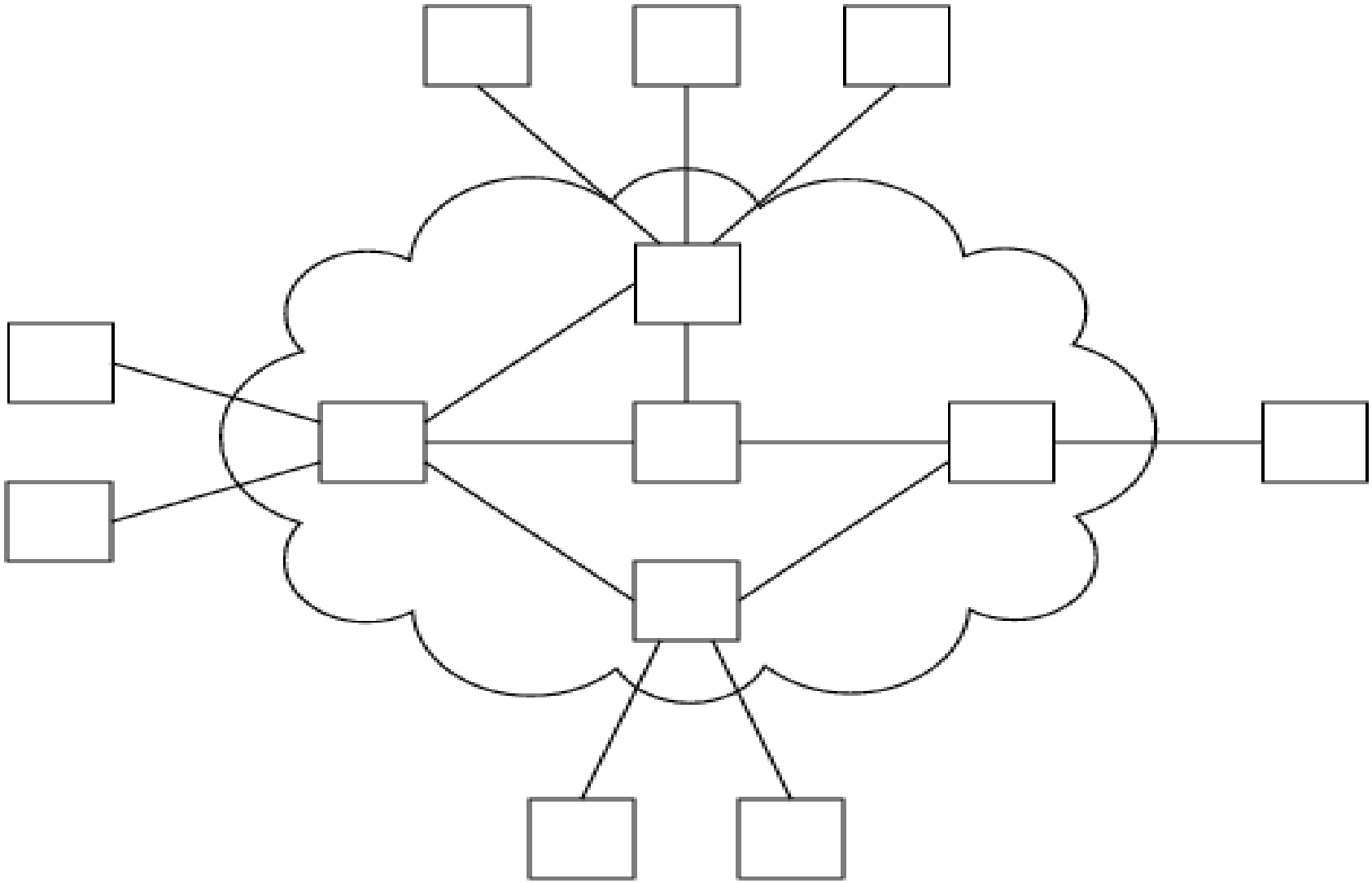
CS 348: Computer Networks

- Switching; 30th Aug 2012

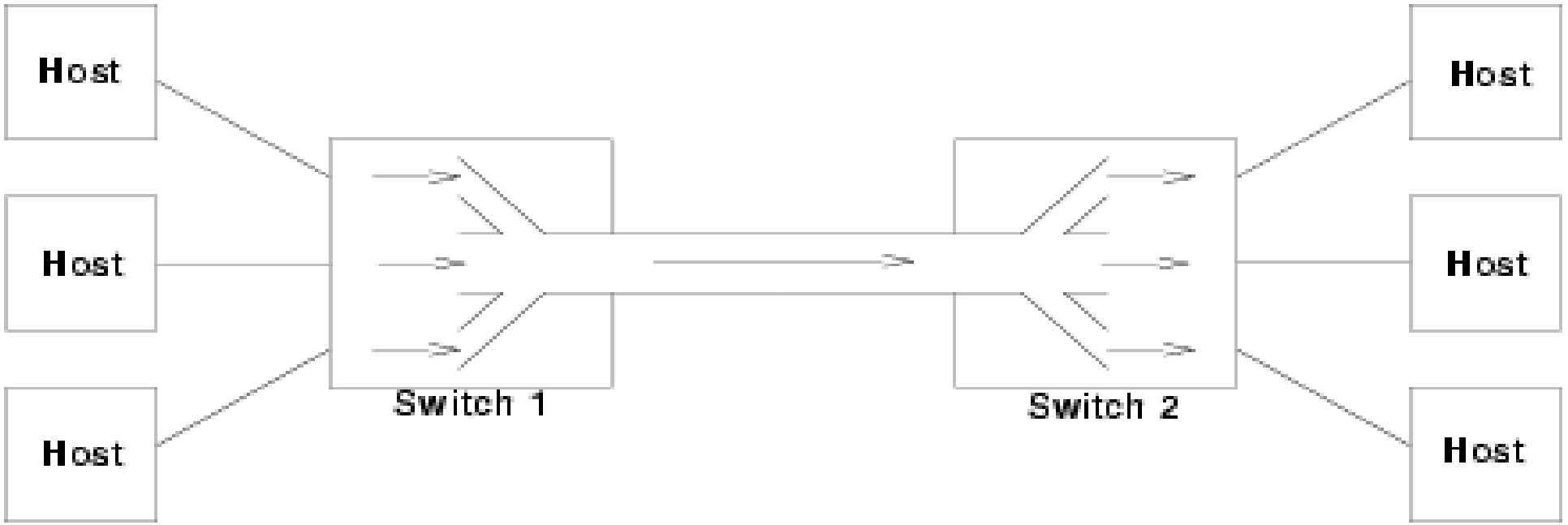
Instructor: Sridhar Iyer
IIT Bombay

Switched networks



Multiplexing

Need to *multiplex* links among multiple flows.

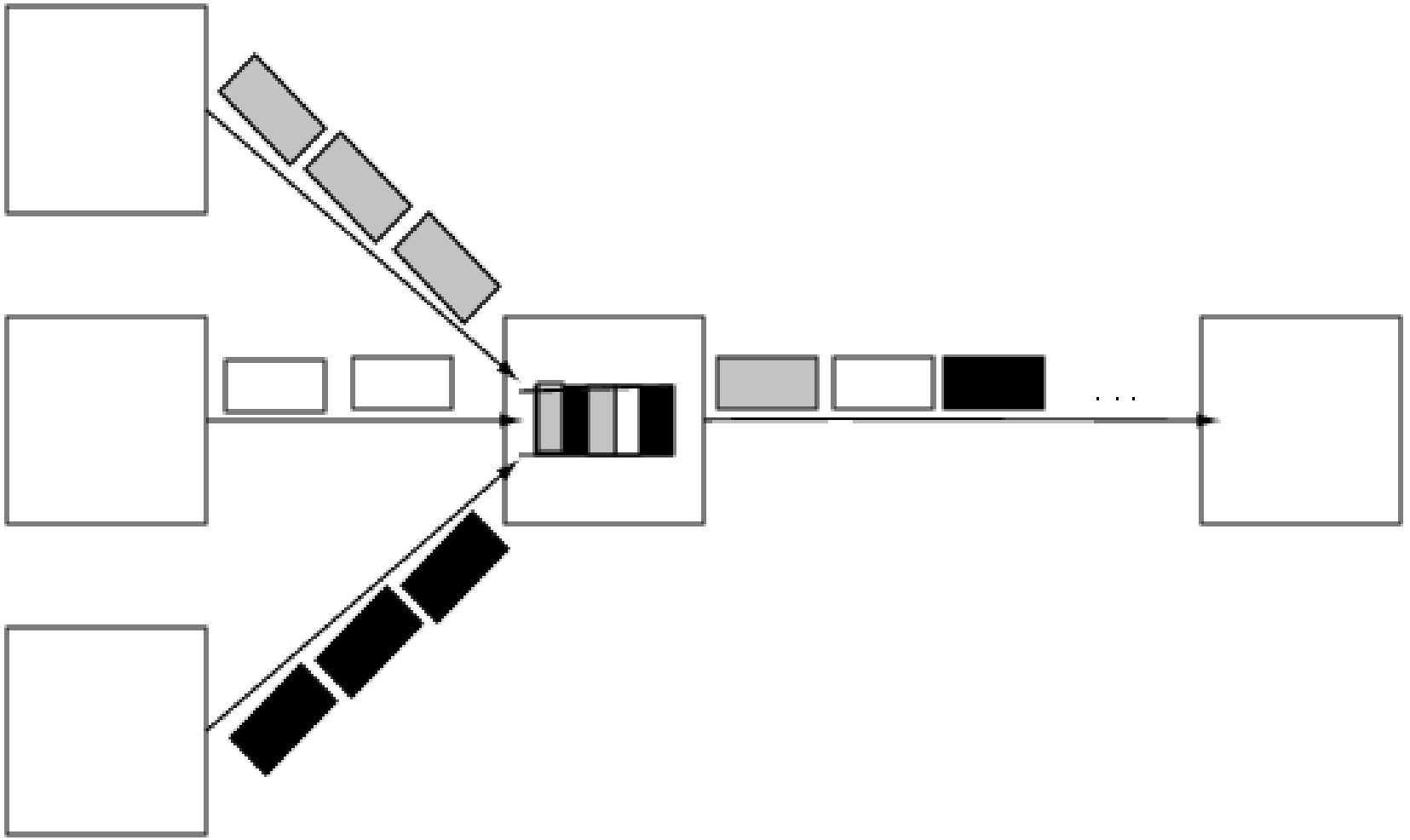


Statistical multiplexing

- Reschedule link on a per-packet basis; Packets from different sources interleaved on the link
- Buffer packets that are contending for the link;

  Packet queue may be processed FIFO, but not necessarily
- Buffer overflow is called congestion

Statistical multiplexing



Switching Strategies

- Circuit Switching: dedicated circuit; send/receive samples
- Packet Switching: deal with packets
  - Datagram Switching
  - Virtual Circuit Switching

Circuit switching

- Moving 8-bit samples from an input port to an output port
- Samples have no headers
- Destination of sample depends on *time* at which it arrives at the switch
- Path is determined at the time of connection establishment

- resources are reserved; only propagation delays
- unused bandwidth on an allocated circuit is wasted

Packet switching

- store-and-forward; send/receive packets
- Packets are forwarded one hop at a time
- Packets carry destination field
- Need to lookup destination for each packet (datagram or cell)

- greater network utilization, multiplexing possible

- typically ``best-effort'' service; may face congestion

Switch constraints

- Circuit switch must reject call if can’t find a path for samples from input to output
  - goal: minimize call blocking

- Packet switch must reject a packet if it can’t buffer the packet until it can be sent on output link
  - goal: minimize packet loss

Switching elements

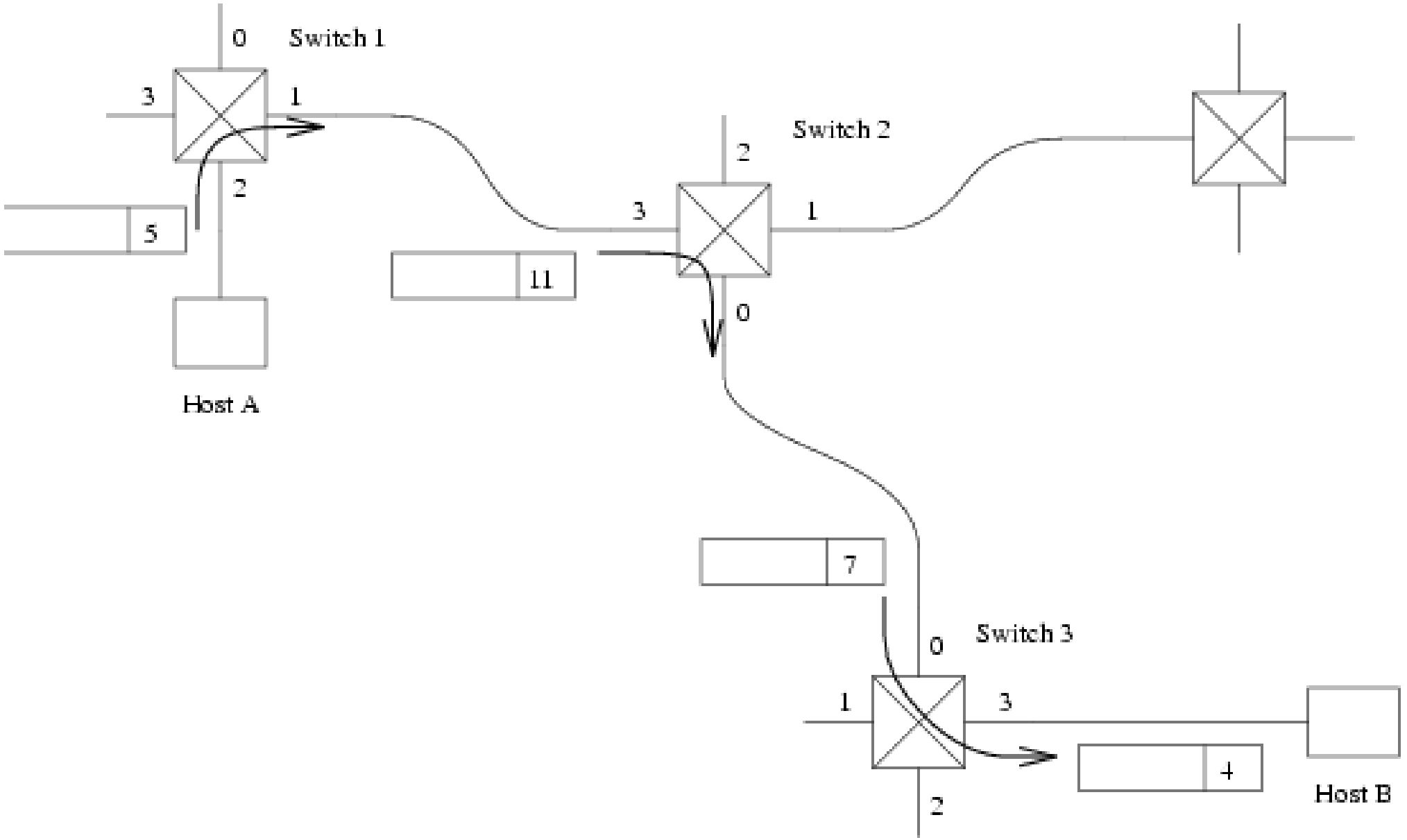
	Connectionless (router)	*Connection-oriented (switching system)*
Packet switch	Internet router	ATM switching system
Circuit switch		Telephone switching system

packets have headers; circuit samples don't

Connection-oriented has a setup phase; handled in *control plane* by *switch controller*

Packet Switching: Datagram v/s Cell

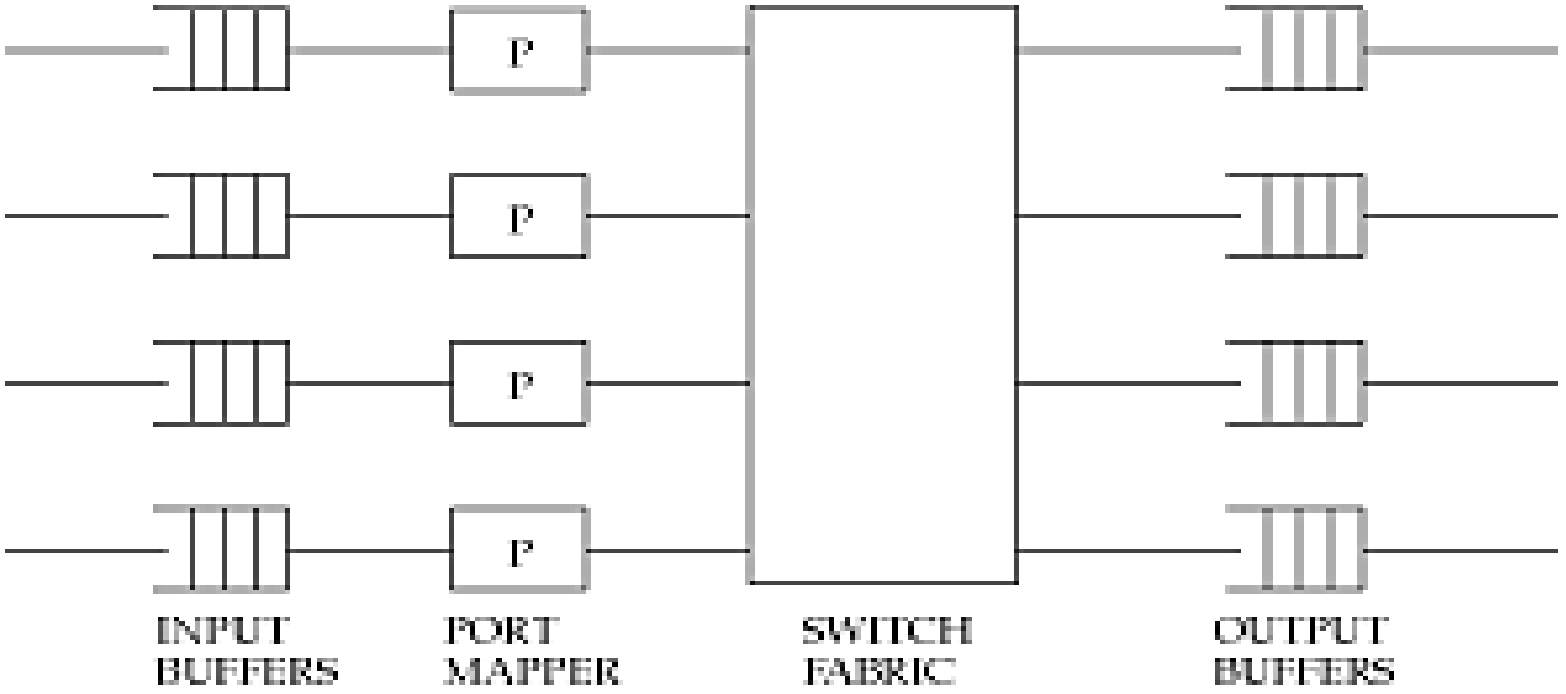
- Datagram
  - lookup based on entire destination address (larger packets)
  - Routing decisions for each packet
- Cell
  - lookup based on VCI (VC Identifier)
  - Connection setup phase to establish VCI tables
    No re-routing possible


0
Switch 1
3
1
2
5
Host A
11
Switch 2
2
3
1
0
7
Switch 3
0
1
3
2
4
Host B

Port mappers

- Look up output port based on destination address
- Easy for VCI:
  - Refer to table entry made during connection setup
- Harder for datagrams:
  - Find *longest prefix match*

Generic Switch



Latency: Time a switch takes to figure out where to forward a data unit