# Hubs and switches

Radhika Sukapuram

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Hubs

A device that is used as a repeater in LANs

- Active central element of the star layout
- Each station is connected to the hub by two lines (transmit and receive)
- Acts as a repeater : When a single station transmits, the hub repeats the signal on the outgoing line to each station
- Physically a star, logically a bus
- Multiple levels of hubs can be cascaded in a hierarchical configuration

Two-level star topology
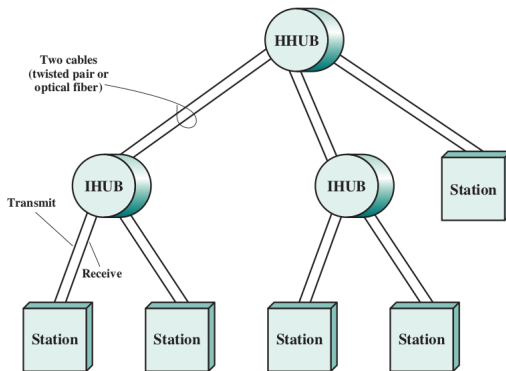
- Intermediate Hubs (IHUB) and Header Hubs (HHUB)
- Typically, a hub could be placed in a wiring closet of each floor of an office building
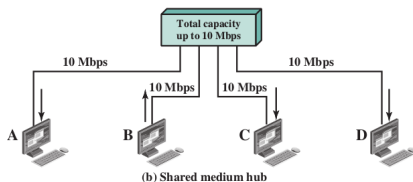
Layer 2 switches (switching hubs)

A layer 2 switch is a replacement for hubs, particularly for high-speed LANs. Consider this shared-medium bus:
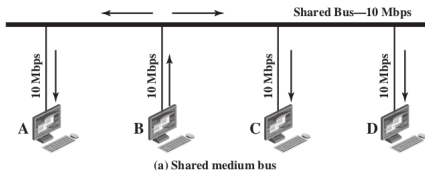
(a) Shared medium bus

all the stations must share the total capacity of the bus, which is 10 Mbps

Layer 2 switches (switching hubs)

Shared-medium hub:

**(b) Shared medium hub**

- Star arrangement: a transmission from any one station is received by the hub and retransmitted on all of the outgoing lines
- Only one station can transmit at a time. Why?
- + exploits standard building wiring practices in the layout of cable (compared to a bus).
- + the hub can be configured to recognize a malfunctioning station that is jamming the network and to cut that station out of the network
- 10 Mbps must be shared across stations

Layer 2 switches (switching hubs)

(c) Layer 2 switch
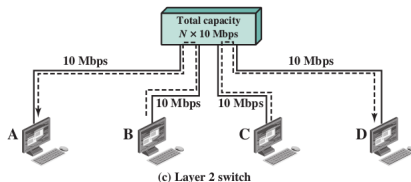
- an incoming frame from a particular station is switched to the appropriate output line to be delivered to the intended destination.
- At the same time, other unused lines can be used for switching other traffic
- B is transmitting a frame to A and at the same time C is transmitting a frame to D
- Current throughput on the LAN: 20 Mbps

Features of a layer 2 switch

- No change is required to the software or hardware of the attached devices to convert a bus LAN or a hub LAN to a switched LAN
- Each attached device has a dedicated capacity equal to that of the entire original LAN, assuming that the layer 2 switch has sufficient capacity with all attached devices
- Scales easily — additional devices can be attached by increasing the capacity of the layer 2 switch

Types of layer 2 switches

- Store-and-forward switch: The layer 2 switch accepts a frame on an input line, buffers it briefly, and then routes it to the appropriate output line
- Cut-through switch: The layer 2 switch begins repeating the incoming frame onto the appropriate output line as soon as the layer 2 switch recognizes the destination address
- — highest possible throughput

Question

A cut-through switch may propagate some bad frames.

(A) This is true because is unable to check the CRC prior to transmission

(B) This is false as it regenerates the FCS

Differences between layer 2 switches and bridges

- In a bridge frame handling is done in software while a layer 2 switch does it in hardware
- A bridge can typically only analyze and forward one frame at a time, whereas a layer 2 switch has multiple parallel data paths and can handle multiple frames at a time
- A bridge uses store-and-forward operation always while for a layer 2 switch a cut-through option is also possible

A bridge uses store-and-forward operation always. If a bridge receives a frame with an incorrect CRC, what does it do?

(A) It forwards the frame

(B) It drops the frame

(C) It does not check the CRC of a frame

A typical LAN configuration