

Hubs and switches

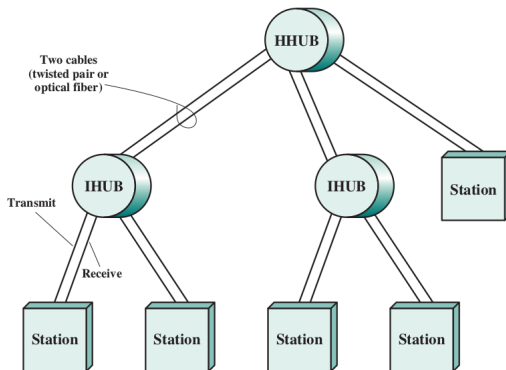
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A device that is used as a repeater in LANs

- 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

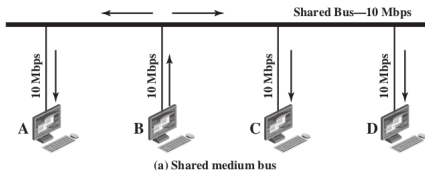
Two-level star topology



- 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)

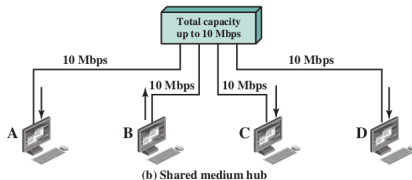
A replacement for hubs, particularly for high-speed LANs. Consider this shared-medium bus:



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

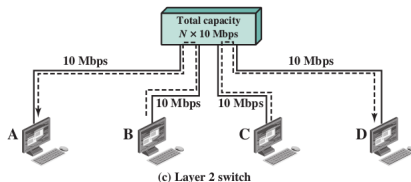
Layer 2 switches (switching hubs)

Shared-medium hub:



- 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.
- + 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)



- 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

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

- 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

Question

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

