Quiz Feedback

Why is there a minimum size frame for Ethernet?

When a transmitter is transmitting information, it must detect that there is a collision while it is still transmitting information. If it gets a jamming signal once it is done transmitting, it won't know that it caused a collision.

If the maximum distance between nodes on an Ethernet LAN is 2500m and the data rate is 10 Mbps, calculate the minimum frame size.

Need to multiply the distance by 2.

$$T_{Frame} \geq 2T_{prop}$$

$$\frac{5000m}{2 \cdot 10^8 m/s} \cdot 10Mbps = 250bits \approx 32Bytes$$

Does utilization increase or decrease as more nodes are added on an Ethernet network? On Token Ring?

As the number of nodes goes up, the bus length doesn't increase. There are just more nodes on the bus. The probability of a collision occurring increases, and therefore, there are fewer chances to transmit data, and the utilization goes down.

For token ring, it's the opposite. The utilization goes up because there is less time that information besides data is being transmitted.

Extending LAN Range, continued

Repeater

Do not segment the network into collision domains.

Hubs

According to some sources, the hub is just a repeater and works only at the physical layers.

However, hubs can connect different parts of the network that are operating at different speeds. But, in this case, it does not break the network up into different collision domains.

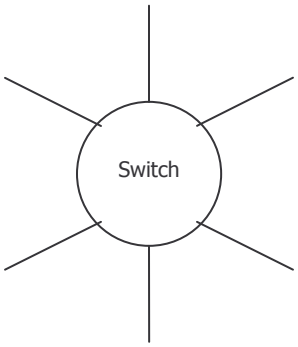
Bridges

Gather information regarding the packets that are being transmitted and build up forwarding tables. Once there has been enough network traffic, it knows where the different stations are. It only passes frames to the next segment if it is appropriate.

Bridges create separate collision domains. Thus, it is possible for more than one node to transmit at the same time.

Switches

Can have multiple devices connected to it.



Effectively increases the bandwidth because it breaks each port into its own collision domain. Decreases the probability of collisions and thus increases the bus utilization.
They are layer 2 devices and can therefore make decisions about routing. It will have a similar learning process to that of a bridge.

Cut-Through

Reads the frame up until it has access to the source and destination addresses. It forwards based on this information but does not do any error checking.

This is a good choice for a relatively noiseless environment. It is a lot faster.

Store-and-Forward

Entire frame is read and brought into the switch before it decides whether to pass it on to the next LAN segment. It does error checking, so it looks at the FCS portion of the frame. If it finds an error, it just discards it.

In a relatively noisy environment, this is a good choice.

Network Layer

Internet Protocol (IP)

Most commonly used protocol at the network layer.

It is a **connectionless** protocol. There is no establishment phase. There is no tear down phase. No flow control is performed (no sliding window or stop and wait). There is no error control. These services, instead, are provided by the data-link layer using protocols like HDLC or at the transport layer, which is above the Network layer, using protocols like TCP.

Error checking is only performed on the header.

It is an **unreliable** protocol.

ICMP – Internet Control Message Protocol

If a node receives information that is erroneous, there are messages that can e sent back to the originator to let it know that something happened.

TTL (Time to Live) – A counter that specifies the maximum number of routers that a packet can pass through before becoming undeliverable. As a packet passes through each router, this value gets decremented.

When it gets down to 0, the device tries to send a message back to the sender.

This TTL field is used when performing a trace route.

IP Packet Header

Version

Currently, 4.
When using version 6, the header changes drastically.

IHL – Internet Header Length

The number of 32-bit words in the header.
For the IPv4 header, this is typically 5.

Type of Service (TOS)

Not generally supported in version 4.

Was meant to be used to make some suggestions or requests to the router as to the path it takes. Request highest reliability or lowest cost. Routers, however, may not have this sort of information and it is therefore not usually used.

Total Length

Length, in bytes, of the entire frame. Includes Data + Header.

Since the length is 16 bits, this caps the maximum datagram size at 65536 bytes = 64KB.

Most Common Header

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