Computer Network

Data-Link Layer

Lecture : 16

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TCP/IP

TCP/IP Layer	Hardware	Software/Protocols
Application	None	HTTP, FTP, SMTP, POP3, IMAP, DNS, SSH
Transport	None	TCP, UDP
Internet	Routers	IP (IPv4/v6), ICMP, IGMP, ARP, RARP Routing(DVR(RIP), LSR(OSPF), BGP)
Data Link	Switches, Bridges, NICs	Ethernet (MAC framing), Wi-Fi (802.11 MAC), PPP, Frame Relay, HDLC
Physical	Cables (fiber, coaxial, twisted pair), Hubs, Repeaters, Connectors (RJ-45), Amplifier	ONLY physical standards (IEEE 802.3 for wiring, IEEE 802.11 PHY for Wi-Fi)

Data-Link Layer

Responsibility
Framing
Error Detection
Error Recovery
Flow Control
Access Control
Addressing
Link Management
Framing and Encapsulation

Stop and Wait

1. The values of parameters for the Stop-and-Wait ARQ protocol are as given below:

Bit rate of the transmission channel = 1Mbps
Propagation delay from sender to receiver = 0.75 ms
Time to process a frame = 0.25ms
Number of bytes in the information frame =1980
Number of bytes in the acknowledge frame = 20
Number of overhead bytes in the information frame = 20

Assume that there are no transmission errors. Then the transmission efficiency (expressed in percentage) of the Stop-and - Wait ARQ protocol for the above parameters is _____(correct to 2 decimal places)

Flow Control

Half-Duplex. Vs Full-Duplex

Sliding Window: Window Size, Sequence Number

2. Consider the sliding window flow-control protocol operating between a sender and a receiver over a full-duplex error-free link. Assume the following:

The time taken for processing the data frame by the receiver is negligible.
The time taken for processing the acknowledgement frame by the sender is negligible.
The sender has infinite number of frames available for transmission.

The size of the data frame is 2,000 bits and the size of the acknowledgement frame is 10 bits.
The link data rate in each direction is 1 Mbps (=10^6 bits per second).
One way propagation delay of the link is 100 milliseconds.

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The minimum value of the sender's window size in terms of the number of frames, (rounded to the nearest integer) needed to achieve a link utilization of 50% is _____

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3. Station A uses 32-byte packets to transmit messages to Station B using a sliding window protocol. The round-trip delay between A and B is 80 ms and the bottleneck bandwidth on the path between A and B is 128 kbps. What is the optimal window size that A should use?

GoBack-N ARQ

Window Size

GoBack-N ARQ

Independent ack, Cumulative ack {every frames ack or bundled based on ack timer}

Cumulative ack {every frames ack}: default

GoBack-N ARQ

Sequence number & sequence bits

Sequence number & sequence bits

Thank You