

MODULE-3: Data Link Layer

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DATA LINK LAYER.
Fundamental
Concept



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Module 3**Data Link Layer**

Elementary Data Link protocols, Stop and Wait, Sliding Window (Go Back N, Selective Repeat)

In the data link layer, the term *error control* refers primarily to methods of error detection and retransmission. Error control in the data link layer is often implemented simply: Any time an error is detected in an exchange, specified frames are retransmitted. This process is called automatic repeat request (ARQ).

Automatic Repeat Request (ARQ)

Purpose: To ensure a sequence of information packets is delivered in order and without errors or duplications despite transmission errors & losses.

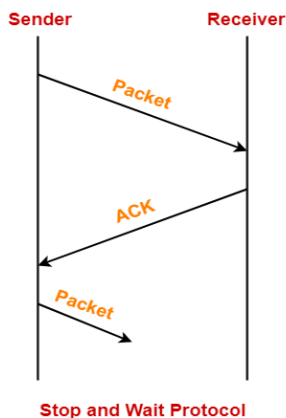
There are three types

- 1) Stop-and-Wait ARQ
- 2) Go-Back N ARQ
- 3) Selective Repeat ARQ

Stop & Wait ARQ

In stop and wait protocol,

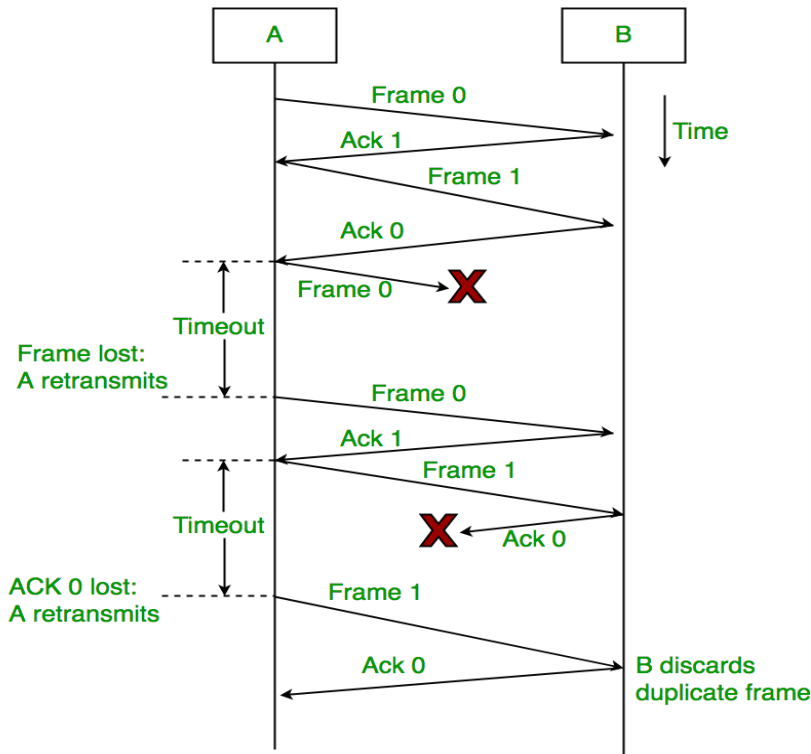
1. Sender sends one data packet and then waits for its acknowledgement.
2. Sender sends the next packet only after it receives the acknowledgement for the previous packet.



Working of Stop and Wait

- 1) Sender A sends a data frame or packet with sequence number 0.
- 2) Receiver B, after receiving data frame, sends an acknowledgement with sequence number 1 (sequence number of next expected data frame or packet)

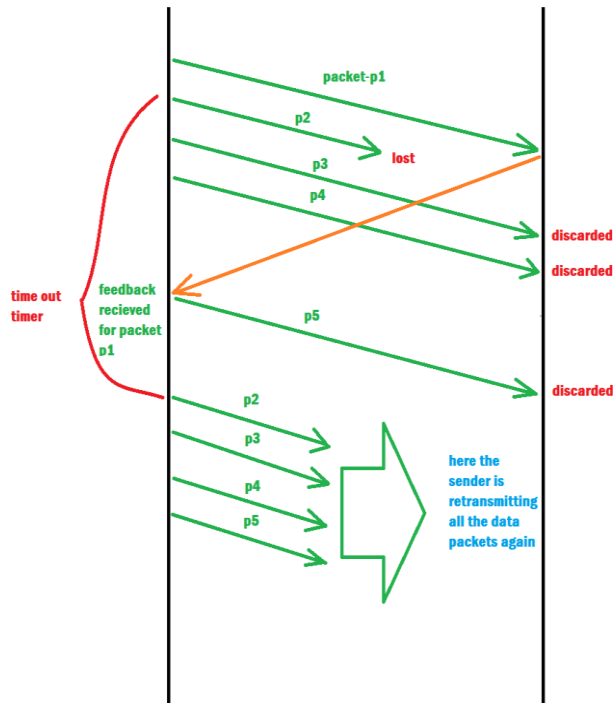
There is only one bit sequence number that implies that both sender and receiver have buffer for one frame or packet only.

**Go-Back N ARQ**

Go-Back-N ARQ (Go-Back-N automatic repeat request) is a flow control protocol where the sender continues to send several frames specified by a window size even without receiving feedback from the receiver node. It can be said that it's a special case of the general sliding window protocol where the transmitter or sender window size is **N** and the receiver's window size is **1**, which means that it can transmit N frames to the receiving node before waiting for a feedback.

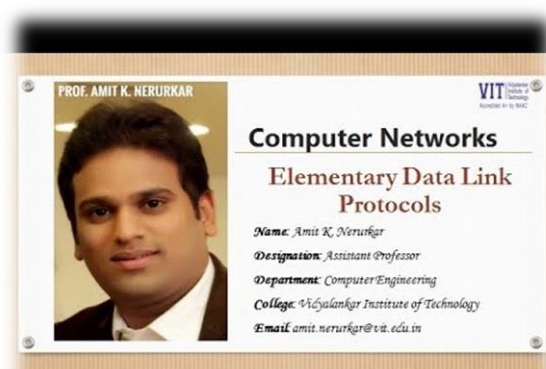
Consider a sender has to send data packets indexing from **p1 to p5**, it sends all the data packets in order (from p1 to p5), but the receiver has only

received p1 and the data packet p2 is lost somewhere in the network, then the receiver declines all the data packets after p2 (i.e. p3, p4, p5) because the receiver is waiting for packet p2 and will not accept any other data packet than that. So, now as the time out time index of p2 expires, the sender goes back 3 packets and starts sending all the data packets from p2 to p5 again.



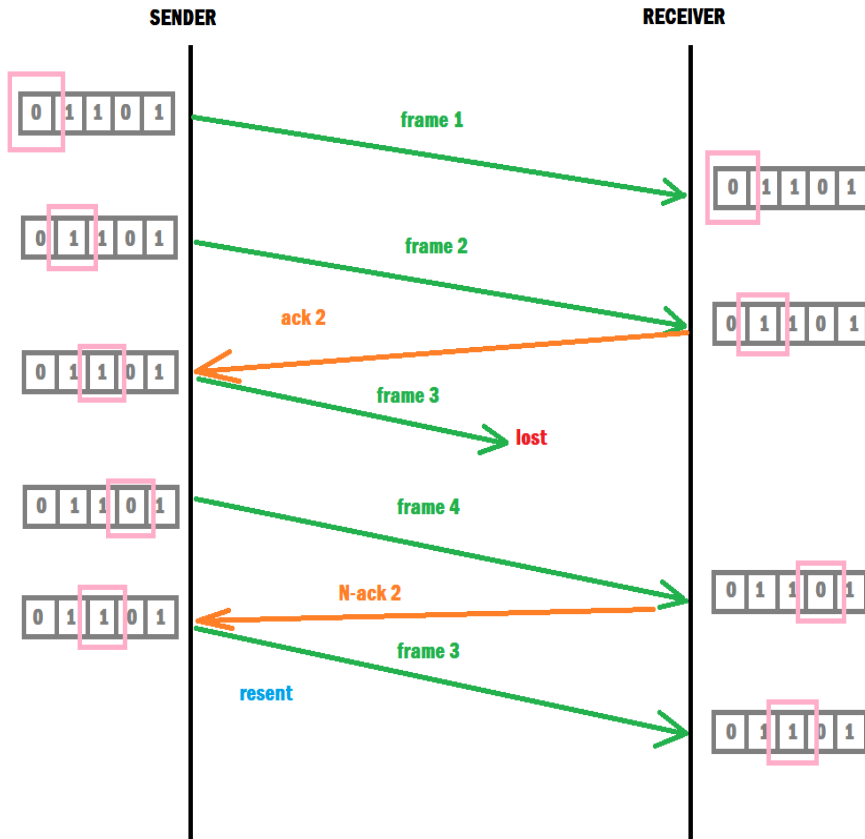
VIDEO

Elementary Protocols of Data Link Layer by Prof. Amit K. Nerurkar (AKN)



Selective Repeat

This protocol is almost like Go-Back-N ARQ protocol, or we can say that it is a modified form of GBN ARQ, the part where it differs is that here buffers are used and both receiver & sender maintain a window of size.

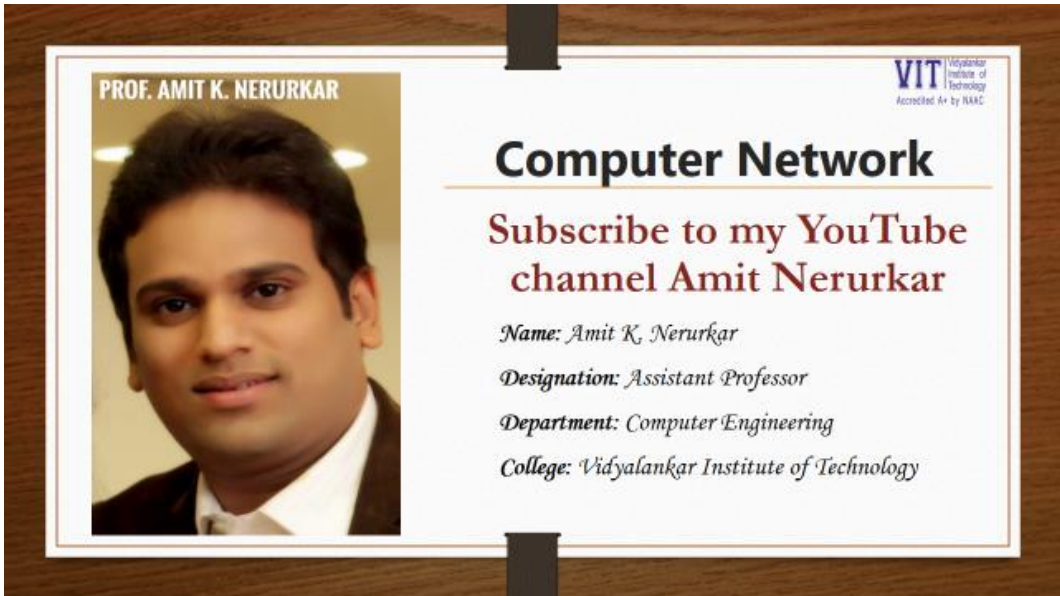


Now, the sender first sends **frame1**(i.e. 0) and immediately the receiver acknowledges the frame and then, the **frame2** is transmitted which too got acknowledged. Now, as we can see **frame3** is lost during the transmission & was unable to reach the receiver, but the next frame, which is **frame4** is transmitted and also accepted by the receiver, who then sends a negative acknowledgment due to which the sender only transmits **frame3** again instead of retransmitting all the frames starting from frame3.

References

1. TCP/IP Protocol Suite by Fourozan
2. Computer Networks by Tanenbaum
3. <https://www.gatevidyalay.com/stop-and-wait-arq-sliding-window-protocols/>
4. <https://www.studytonight.com/post/flow-control-gobackn-arq-protocol>

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Subjects Taught by Amit K. Nerurkar

1. C programming
2. Data Structure
3. Computer Network
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5. Artificial Intelligence
6. Soft Computing
7. Distributed Systems
8. Internet of Things
9. Linux Administration
10. Database Management System