Semester: <u>V</u>   Subject: <u>Computer Network</u>   Academic Year: <u>2023-24</u>

<u>Module -2</u>

Data Link Layer: Flow Control and Error Control

Flow control and Error control are the two main responsibilities of the Data link layer. Let us understand what these two terms specify. For the node-to-node delivery of the data, the flow and error control are done at the data link layer.

1. Flow Control:

It is an important function of the Data Link Layer. It refers to a set of procedures that tells the sender how much data it can transmit before waiting for acknowledgment from the receiver.

Purpose of Flow Control:

Any receiving device has a limited speed at which it can process incoming data and also a limited amount of memory to store incoming data. If the source is sending the data at a faster rate than the capacity of the receiver, there is a possibility of the receiver being swamped. The receiver will keep losing some of the frames simply because they are arriving too quickly and the buffer is also getting filled up.

This will generate waste frames on the network. Therefore, the receiving device must have some mechanism to inform the sender to send fewer frames or stop transmission temporarily. In this way, flow control will control the rate of frame transmission to a value that can be handled by the receiver.

Flow Control mainly coordinates with the amount of data that can be sent before receiving an acknowledgment from the receiver and it is one of the major duties of the data link layer.

- For most of the protocols, **flow control** is a set of procedures that mainly tells the sender how much data the sender can send before it must **wait for an acknowledgment** from **the receiver**.

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- The data flow must not be allowed to overwhelm the receiver; because any receiving device has a very limited speed at which the device can process the incoming data and the limited amount of memory to store the incoming data.

- The processing rate is slower than the transmission rate; due to this reason each receiving device has a block of memory that is commonly known as **buffer,** that is used to store the incoming data until this data will be processed. In case the buffer begins to fillup then the receiver must be able to tell the sender to halt the transmission until once again the receiver become able to receive.

Thus, the flow control makes the sender; wait for the acknowledgment from the receiver before the continuation to send more data to the receiver.

Example – Stop & Wait Protocol and sliding window technique.

2. Error Control:

The error control function of the data link layer detects the errors in transmitted frames and re-transmits all the erroneous frames.

Purpose of Error Control:

The function of error control function of the data link layer helps in dealing with data frames that are damaged in transit, data frames lost in transit and acknowledged frames that are lost in transmission. The method used for error control is called Automatic Repeat Request (ARQ) which is used for the noisy channel.

Error Control contains both error detection and error correction. It mainly allows the receiver to inform the sender about any damaged or lost frames during the transmission and then it coordinates with the retransmission of those frames by the sender.

The term Error control in the data link layer mainly refers to the methods of error detection and retransmission. Error control is mainly implemented in a simple way and that is whenever there is an error detected during the

exchange, then specified frames are retransmitted and this process is also referred to as **Automatic Repeat request(ARQ).**

Example – Stop & Wait ARQ and Sliding Window ARQ

Difference between Flow Control and Error Control :

S.NO.	Flow control	Error control
1.	Flow control is meant only for the transmission of data from sender to receiver.	Error control is meant for the transmission of error free data from sender to receiver.
2.	For Flow control there are two approaches: Feedback-based Flow Control and Rate-based Flow Control.	To detect error in data, the approaches are: Checksum, Cyclic Redundancy Check and Parity Checking. To correct error in data, the approaches are: Hamming code, Binary Convolution codes, Reed-Solomon code, Low-Density Parity Check codes.
3.	It prevents the loss of data and avoid over running of receive buffers.	It is used to detect and correct the error occurred in the code.
4.	Example of Flow Control techniques are: Stop & Wait Protocol and Sliding Window Protocol.	Example of Error Control techniques are: Stop & Wait ARQ and Sliding Window ARQ (Go-back-N ARQ, Selected Repeat ARQ).