Difference Between Flow Control and Error Control

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Key Difference - Flow Control vs Error Control

Data communication is the process of sending data from the source to the destination through a transmission medium. For effective data communication, it is necessary to use techniques. The sender and receiver have different speeds and different storage capacities. When the data reaches the destination, the data is stored temporarily in the memory. That memory is known as a buffer. The speed differences and buffer limitations can affect the reliable data communication. Flow control and Error control are two different mechanisms that are used for accurate data transmission. If the sender speed is higher and the receiver speed is lower, there is a speed mismatch. Then the flow of data sent should be controlled. This technique is known as flow control. During the transmission, errors can occur. If the receiver identifies an error, it should inform the sender that there is an error in the data. So, the sender can retransmit the data. This technique is known as Error Control. Both occur in the data link layer of the OS model. The **key difference** between the Flow Control and Error Control is that **Flow Control is to maintain the proper flow of data from the sender to the receiver while Error Control is to find out whether the data delivered to the receiver is error free and reliable.**

What is Flow Control?

When sending data from one device to another device, the sending end is known as the source, sender or the transmitter. The receiving end is known as the destination or the receiver. The sender and receiver might have different speeds. The receiver will not be able to process the data if the data sending speed higher. So, the flow control techniques can be used.

One simple flow control method is, Stop and Wait flow control. First, the transmitter sends the data frame. When it is received, the receiver sends an acknowledgement frame (ACK). The transmitter can send data, only after receiving the acknowledgement frame from the receiver. This mechanism controls the flow of transmission. The main drawback is that only one data frame can be transmitted at a time. If one message contains multiple frames, the stop and wait will not be an effective flow control method.

Figure 01: Flow control and Error Control

In Sliding Window method, both the sender and receiver maintain a window. The window size can be equal or less than the buffer size. The sender can transmit till the window is full. When the window is full, the transmitter has to wait till receiving an acknowledgement from the receiver. A sequence number is used to track each frame. The receiver acknowledges a frame by sending an acknowledgement with the sequence number of the next expected frame. This acknowledgement announces the sender that the receiver is ready to accept windows size number of frames starting with the number specified.

What is Error Control?

Data is sent as a sequence of frames. Some frames might not reach the destination. The noise burst can affect the frame, so it may not be recognizable at the receiving end. In this situation, it is called the frame is lost. Sometimes, the frames reach the destination, but there are some errors in bits. Then the frame is called a damaged frame. In both cases, the receiver does not get the correct data frame. In order to avoid these issues, the sender and receiver have protocols to detect the transit errors. It is important to turn the unreliable data link into a reliable data link. There are three techniques for error control. They are Stop-and-Wait, Go-Back-N, Selective-Repeat. Collectively, these mechanisms are known as Automatic Repeat Request (ARQ).

In Stop and Wait ARQ, a frame is sent to the receiver. Then the receiver sends the acknowledgement. If the sender did not receive an acknowledgement with in a specific time period, then the sender resends that frame again. This time period is found using a special device called the timer. When sending the frame, the sender starts the timer. It has a fixed time. If there is no recognizable acknowledgement from the receiver, the sender will retransmit that frame again.

In Go-Back-N-ARQ, the sender transmits a series of frames up to the window size. If there are no errors, the receiver sends the acknowledgement as usual. If the destination detects an error, it sends a negative acknowledgement (NACK) for that frame. The receiver will discard error frame and all future frames till the error frame is corrected. If the sender receives a negative acknowledgement, it should retransmit error frame and all succeeding frames.

In Selective-Repeat ARQ, the receiver keeps track of the sequence numbers. It sends a negative acknowledgement from only the frame which is lost or damaged. The sender can only send the frame for which the NACK is received. It is more efficient that Go-Back-N ARQ. Those are the common error control techniques.

What is the Similarity Between Flow Control and Error Control?

- Both Flow Control and Error Control occurs in Data Link Layer.

What is the Difference Between Flow Control and Error Control?

Flow Control vs Error Control	
Flow control is the mechanism for maintaining the proper transmission from the sender to the receiver in data communication.	Error control is the mechanism of delivering error-free and reliable data to the receiver in data communication.
Main Techniques	
Stop and Wait and Sliding Window is examples of flow control techniques.	Stop-and-Wait ARQ, Go-Back-N ARQ, Selective-Repeat ARQ are examples of error control techniques.

Summary - Flow Control vs Error Control

Data is transmitted from the sender to receiver. For reliable and efficient communication, it is essential to use techniques. Flow Control and Error Control are two of them. This article discussed the difference between Flow Control and Error Control. The difference between the Flow Control and Error Control is that Flow Control is to maintain the proper flow of data from the sender to the receiver while Error Control is to find out whether the data delivered to the receiver is error free and reliable.

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