44. Error Detection

Outcomes –

1. Understand the transmission errors.
2. Know the types of Errors.
3. Understand Error detection and Error Correction.
4. Know the various Error detection techniques.

Error –

* Data is transmitted to the nodes via a transmission medium.
* We don’t know what happens when the data leaves from node 1 to other, hence transmission may occur during transmission.
* This error caused is known as Transmission Error.
* For a smoother communication, the error must be detected and corrected/handled.
* The error detection and correction happens in two layers of the OSI reference model – Data-link Layer and Transport Layer.

Types of Errors –

1. Bit Error.
2. Burst error.

Bit errors –

* The errors which occurs in frames while data transmission, in which the data within the body is changed by one bit is known as Bit error.
* Bit Error is often referred as Single Bit Error.

Data by Sender Transmission Process Data to receiver (Single Bit Error)

10101010101 --------------🡪------------- 10101000101

* Here a single bit is changed during transmission process.

Burst errors –

* When there are more than one errors in the bits during the transmission, is known as Burst Errors.

Data by Sender Transmission Process Data to receiver (Burst Error)

10101010101 --------------🡪------------- 10100000001

* Here multiple bits are changed during transmission process.
* The burst error is detected from the start point to the end point of the error.
* In the above example, the error starts from 5 to 9 bits, hence the length of burst error is 5 bits.

How to detect the errors –

* Generally the error detection is done in the receiver side of the network communication.
* The receiver has to check whether the data sent by the sender is transmitted without changes or not.
* For this the receiver needs a copy of the data that the data has to be received.
* Hence, with a frame a redundant data in bits is sent.
* The receiver algorithm checks if data is correctly transmitted or not, if same – accepts it and sends following acknowledgement to the sender, if Not-Same – Sends acknowledgement for that as well.

Error Detection and correction –

* For the error Correction, a redundant data needs to be send as well to check and compare the data present with the sender and the receiver.
* The error correction can be done in two ways –

1. Either the receiver asks the sender to send the whole data packet again.
2. It uses the error-correction code to correct a certain amount of errors.

Types of Error Correction Techniques –

1. Vertical Redundancy Check (VRC).
2. Longitudinal Redundancy Check (LRC).
3. Cyclic Redundancy Check (CRC).
4. Checksum – Internet Checksum or Arithmetic Checksum.