OVERVIEW OF ERROR DETECTION AND CORRECTION SCHEME IN COMMUNICATION

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Abstract: Wireless communication systems are susceptible to errors while transmitting messages. This paper gives information of error detection and correction schemes used for error free data transmission. In this paper, all types of codes are discussed.

Index Terms: ARQ, FEC, CRC, EDAC

I.INTRODUCTION

Technology day by day moving towards the demand of error free transmission. Wireless communication systems are more sensitive to errors than wired communication systems. Generally the received data is damaged by noisy channels used in communication. There are two types of EDAC technique as Automatic Repeat Request (ARQ) and Forward Error Correction (FEC). This paper gives basic idea about different types of block codes. Technology is demanding error free signals.Commmunication systems are of two types as wired and wireless communication. Wireless communication systems are more sensitive to bit errors. Because of advancement in communication system, Chances of data to be damaged is more.EDAC techniques are used to reduce the interference in electronic system.

II. Types of Errors

Errors may be classified as

i. Single Bit Error-If one bit error occurred then it is single bit error.
ii. Multiple Bit Error- If more than one bit error occurred then it is said to be Multiple bit Error.
iii. Burst Error-If more than one consecutive bit is damaged then it is Burst Error.

III. Automatic Repeat Request (ARQ)

ARQ is method of sending and receiving information. In ARQ technique, receiver sends back a message regarding the information received. If correct information is received then receiver sends positive acknowledgement. While if error is received, then receiver sends negative acknowledgement.

A]. stop & wait ARQ

A stop-and-wait ARQ sender sends one frame at a time. it is a special case of the general sliding window protocol with transmit and receive window sizes equal to one and greater than one respectively. After sending each frame, the sender doesn't send any further frames until it receives an acknowledgement (ACK) signal. After receiving a valid frame, the receiver sends an ACK. If the ACK does not reach the sender before a certain time, known as the timeout, the sender sends the same frame again.

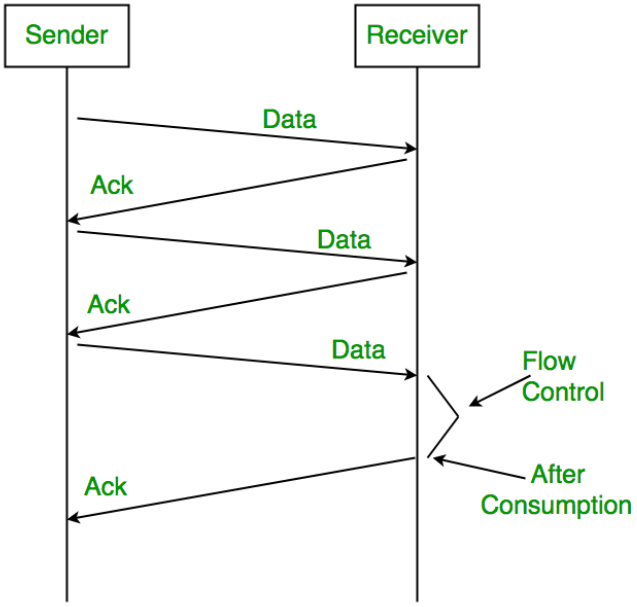

Fig. 1 stop & wait ARQ

B]. Go back N ARQ

Go-Back-N ARQ is a specific instance of the automatic repeat request (ARQ) protocol, in which the sending process continues to send a number of frames specified by a window size even without receiving an acknowledgement (ACK) packet from the receiver. It is a special case of the general sliding window protocol with the transmit window size of N and receive window size of 1. It can transmit N frames to the peer before requiring an ACK. The receiver process keeps track of the sequence number of the next frame it expects to receive, and sends that number with every ACK it sends. The receiver will discard any frame that does not have the exact sequence number it expects (either a duplicate frame it already acknowledged or an out-of-order frame it expects to receive later) and will resend an ACK for the last correct in-order frame.

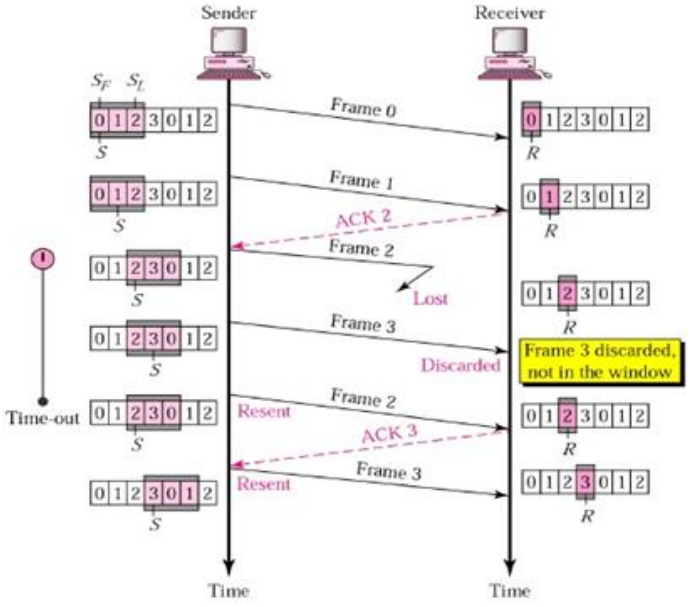

Fig.2 Go back N ARQ

C]. Selective Repeat ARQ

The receiver process keeps track of the sequence number of the earliest frame it has not received, and sends that number with every acknowledgement (ACK) it sends. If a frame from the sender does not reach the receiver, the sender continues to send subsequent frames until it has emptied its window. The receiver continues to fill its receiving window with the subsequent frames, replying each time with an ACK containing the sequence number of the earliest missing frame. Once the sender has sent all the frames in its window, it re-sends the frame number given by the ACKs, and then continues where it left off.

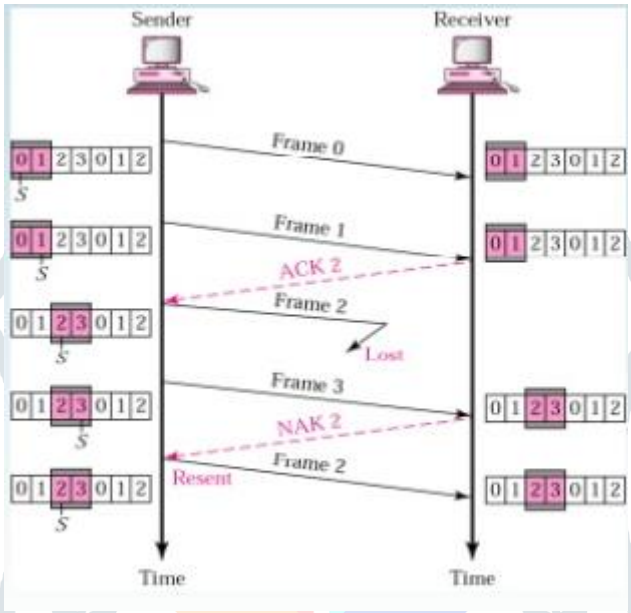

Fig.3 Selective **Repeat ARQ**

IV. Forward Error Correction (**FEC**) or **channel coding** -It is a technique used for controlling errors in data transmission over unreliable or noisy communication channels. The central idea is the sender encodes the message in a redundant way by using an **error-correcting code** (ECC).

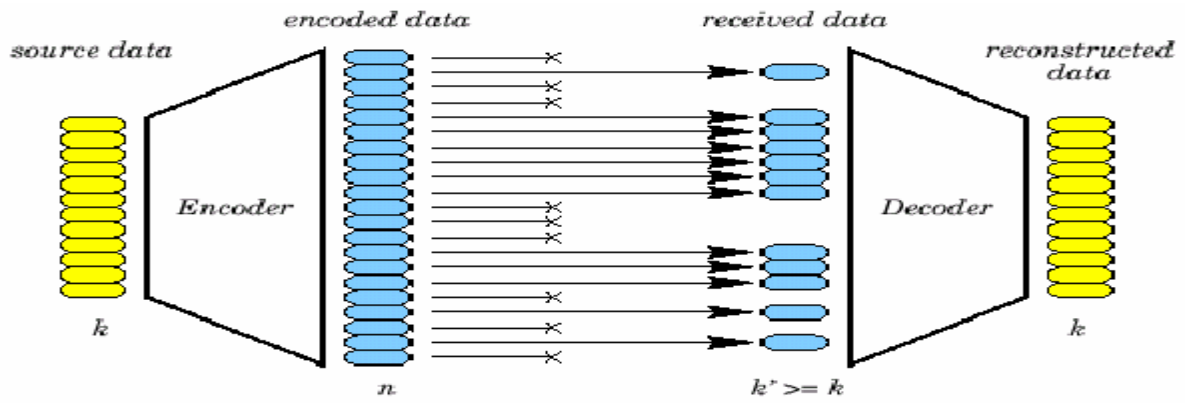

Fig.4 **Forward Error Correction**

FEC mainly classified into two parts as

1. Block Code

2. Convolutional Code

1. **BLOCK CODES** are a large and important family of error-correcting codes that encode data in blocks. There is a vast number of examples for block codes, many of which have a wide range of practical applications.

a. Cyclic Redundancy Check Code

b. Hamming Code

2. A **convolutional code** is a type of error-correcting code that generates parity symbols via the sliding application of a Boolean polynomial function to a data stream. The sliding application represents the convolution of the encoder over the data, which gives rise to the term convolutional coding.

V. Conclusion

This paper gives information about various error detection and correction schemes used for reliable and efficient transmission of data. ARQ method detects the error but cannot correct. FEC helps in sending data with less error.

VI. References

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