SYNCHRONOUS TRANSMISSION AND ERROR HANDELING [1]

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[1]Ref: Data and Computer Communications by William Stallings

SYNCHRONOUS TRANSMISSION

- For sizable blocks of data ,synchronous transmission is far more efficient than asynchronous.Asynchronous transmission requires 20% or more overhead.The control information, preamble, and postamble in synchronous transmission are typically less than 100 bits.
- With Synchronous transmission, a block of bits is transmitted in a steady stream without start and stop codes. The block may be many bits in length. To prevent timing drift between transmitter and receiver ,their clocks must somehow be synchronized.
- Various techniques for this are:-
  - 1. Provide a separate clock line between transmitter and receiver.One side(transmitter or receiver) pulses the line regularlywith one short pulse per bit time.The other side uses these regular pulses as a clock. It works well for short distances ,but over long distances the clock pulse are subjected to same impairement as the data signal,and timing errors can occur.
  - 2. Other way is for digital signals use Diffential Manchester OR Manchester encoding.For Analog signals the carrier frequency itself can be used to synchronize the receiver based on the phase of the carrier
- With synchronous transmission ,there is another level of synchronisation required, to allow the receiver to determine the beginning and end of a block of data. To achieve this ,each block begins with a preamble bit pattern and generally ends with a postamble bit pattern. Other bits are added to the block that convey control informtion used in the data link control procedures discussed later. The data plus preamble and control information are called a frame.

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TYPES OF ERRORS

- In digital transmission systems, an error occur when a bit is altered between transmission and reception; that is a binary 1 is transmitted and a binary 0 is received or vice versa.
- Two general types of errors which occur are:-
  - **1. Single bit error:-**It is an isolated error condition which alters one bit but does not effect nearby bits.
  - **2. Burst error :-**A burst error of length B is a contiguous sequence of B bits in which the first and last bits and any number of intermediate bits are received in error.Thus, in an error burst there is a cluster of bits in which a number of errors occur , although not necessarily all of yhe bits in the cluster suffer an error.

ERROR DETECTION

- All the error detection techniques work on the following principle.For a given frame of bits , additional bits that constitute an error-detecting code are added by the transmitter.This code is calculated as a function of the other transmitted bits.Typically for a data block of 'k' bits,the error-detection algorithm yields an error detection code of 'n-k' bits where(n-k)¡k .The error-detection code also referred as the 'check bits',is appended to the data block to produce a frame of n bits,which is then transmitted.The receiver performs the same error-detection calculations on the data bits and compare this value with the value of the incoming error-detection code.A detected error occurs if and only if there is a mismatch.

Error detection Algorithms

- **1. Parity Check:-**This scheme is to append a parity bit to end of a block of data.The value of this bit is selected so that the character has an even number of 1s(Even parity) or an odd number of 1s(odd parity).However if two(ar any even number) of bits are inverted due to error,an undetected error occurs.Typically even parity is used for synchronous transmission and odd parity for asynchronous transmission.The use of parity bit is not fullproof, as noise impulses are often long enough to destroy more than one bit,particularly at high data rate.
- **2. Cyclic Redundancy Check:-**(To be discussed in detail in next slide).