

Bivas Bhattacharya

Department of

Electronics and Communication Engineering



Error Detection and Correction Techniques

Bivas Bhattacharya

Department of Electronics and Communication Engineering

Error Detection and Correction Techniques



Error detection and correction

- Complete error free link is not possible. Error can occur to any link anytime. Probability may be different for different kind of links
- For wireless link probability is much high than other wired and optical links
- There are few techniques that can be used to detect and, in some cases, correct such bit errors
- If packet error detected it can be retrieved in Linked layer itself or can be stopped to flow to upper layers

Error Detection and Correction Techniques



Error detection and correction

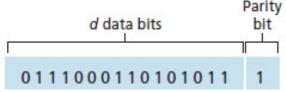
- Even with error detection techniques employed, there may be undetected bit errors which may cause trouble to upper layers
- We thus want to choose an error-detection scheme which keeps the probability at a level suitable for the link type.
- Generally, more sophisticated error-detection andcorrection techniques (that is, those that have a smaller probability of allowing undetected bit errors) incur a larger overhead—more computation is needed to compute and transmit a larger number of error-detection and correction bits.

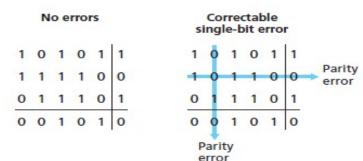
Error Detection and Correction Techniques



Parity check method

- Append a parity bit at the end of data d
- Even parity: Total number of ones in the d+1 bits is even





Two-dimensional even parity

- Single bit error can be detected, but can not be corrected
- Location of bit error can be found if row and column parity are calculated for a set of data
- If two bit complementary error occurs it can detect that
- Parity bits are additional bits to be transmitted than the data
- Using FEC retransmission can be reduced

Error Detection and Correction Techniques

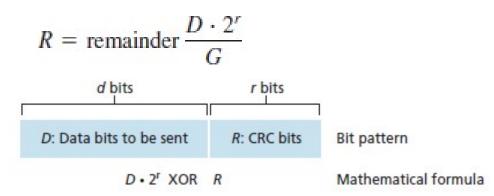


CRC method

- An error-detection technique used widely in today's computer networks is based on cyclic redundancy check (CRC) codes.
- CRC codes are also known as polynomial codes, since it is possible to view the bit string to be sent as a polynomial whose coefficients are the 0 and 1 values
- Consider the d-bit piece of data, D, that the sending node wants to send to the receiving node.
- The sender and receiver must first agree on an r + 1 bit pattern, known as a generator, which we will denote as G.
- We will require that the most significant (leftmost) bit of G
 be a 1

Error Detection and Correction Techniques





IEEE link layer protocols use 32-bit CRC polynomial

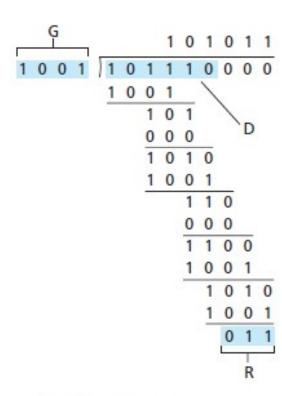
$$G_{\text{CRC-32}} = 100000100110000010001110110110111$$

- Receiver side divides the (d+r)-bit data by G and checks for reminders
- If 0 no error , if non zero then error occured

Error Detection and Correction Techniques



CRC method ...



A sample CRC calculation



THANK YOU

Bivas Bhattacharya

Department of

Electronics and Communication Engineering

bivas@pes.edu