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Homework 5

Problems:

1, 3, 17, 18, and Review Question 15.

Question: 1

Suppose the information content of a packet is the bit pattern 1110 0110 1001 1101 and an even parity scheme is being used. What would the value of the field containing the parity bits be for the case of a two-dimensional parity scheme? Your answer should be such that a minimum-length checksum field is used.

Answer:

The minimum length checksum field should be 4*4 matrix. For our data, two dimensional (even) parity:

1	1	1	0	1
0	1	1	0	0
1	0	0	1	0
1	1	0	1	1
1	1	0	0	0

Note: Two-dim Parity = Generalization of the simple (one-dim) parity scheme:

1. Form an MxN matrix of bits, then
2. Add a (even or odd) parity bit to each row and to each column

Question: 3

Suppose the information portion of a packet (D in Figure 5.3) contains 10 bytes consisting of the 8-bit unsigned binary ASCII representation of string "Networking." Compute the Internet checksum for this data.

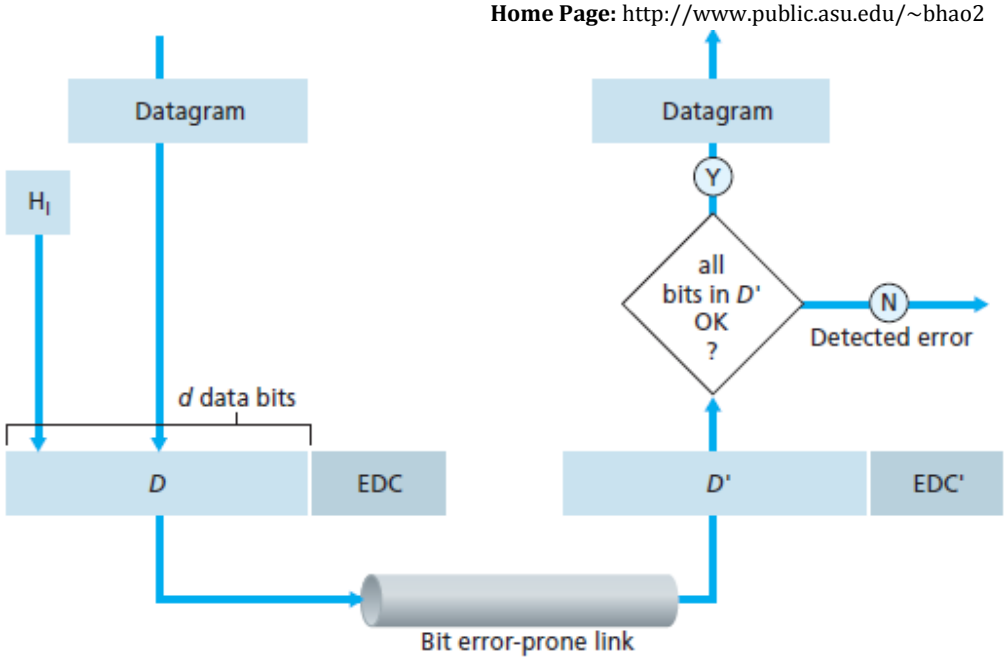

Figure 5.3 ♦ Error-detection and -correction scenario

Answer:

The ASCII code for "Networking" is 078 101 116 119 111 114 107 105 110 103 in decimal. Converting to Binary representation:

0100 1110 0110 0101 0111 0100 0111 0111 0110 1111 0111 0010 0110 1011 0110 1001 0110 1110 0110 0111

Calculate the checksum:

0100 1110 0110 0101+0111 0100 0111 0111 = 1100 0010 1101 1100

1100 0010 1101 1100+0110 1111 0111 0010=1 0011 0010 0100 1110(overflow, wrap around) => 0011 0010 0100 1111

0011 0010 0100 1111+0110 1011 0110 1001=1001 1101 1011 1000

1001 1101 1011 1000+0110 1110 0110 0111=1 0000 1100 0001 1111 =>0000 1100 0001 1111 (overflow)

1's complement of 0000 1100 0001 1111 is **1111 0011 1110 0000**.

Question: 17

Recall that with the CSMA/CD protocol, the adapter waits K * 512 bit times after a collision, where K is drawn randomly. For K = 100, how long does the adapter wait until returning to Step 2 for a 10 Mbps broadcast channel? For a 100 Mbps broadcast channel?

Answer:

The one bit time for 10Mbps is 1/10000000 s = 0.0001 ms

The one bit time for 100Mbps is 1/100000000 s = 0.00001 ms

Waiting time for a 10Mbps broadcast channel is K*512*0.0001= 5.12 ms

Waiting time for a 100Mbps broadcast channel is K*512*0.00001= 0.512ms

Question: 18

Suppose nodes A and B are on the same 10 Mbps broadcast channel, and the propagation delay between the two nodes is 325 bit times. Suppose CSMA/CD and Ethernet packets are used for this broadcast channel. Suppose node A begins transmitting a frame and, before it finishes, node B begins transmitting a frame. Can A finish transmitting before it detects that B has transmitted? Why or why not? If the answer is yes, then A incorrectly believes that its frame was successfully transmitted without a collision. Hint: Suppose at time t = 0 bits, A begins transmitting a frame. In the worst case, A transmits a minimum-sized frame of 512 + 64 bit times. So A would finish transmitting the frame at t = 512 + 64 bit times. Thus, the answer is no, if B's signal reaches A before bit time t = 512 + 64 bits. In the worst case, when does B's signal reach A?

Answer:

When t = 0, A begins transmitting.

At t = 512+64 bit time, A finished transmitting.

The worst case, B begins transmitting at t = 324 (just before the first bit of A arrives to B)

At t = 324+325=649, the first bit of B arrives to A.

Since 649>576, so A accomplished transmitting before B starts transmitting. This means A will think its frame was transmitted successfully without collision.

Question: Review Question 15

What is the maximum number of VLANs that can be configured on a switch supporting the 802.1Q protocol? Why?

Answer:

Under IEEE 802.1Q, the maximum number of VLANs on a given Ethernet network is 4,094 (the 4,096 provided for by the 12-bit VID field minus reserved values 0x000 and 0xFFF).