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**HW5**

1. Parity Check: Even parity check means the total number of 1s is even. That is, in a system  
   the raw data has an odd number of 1s, then add a 1, otherwise add a 0. Assume we are  
   sending raw data 0x9, 0xc, 0x6 and 0x7.
   1. Please write down the data with the CRC to be transferred. For example, in even parity  
      check, if the raw data is 1101, then the data to be transferred is 1101 1. The check bit  
      1 was added to the end.
   2. Say we have the two raw data 10 and 11, the row parity check for them is 10, of which  
      the 1 corresponds to the raw data 00 and the 0 corresponds to the raw data 11. The  
      column parity check for 10 and 11 is 01, of which the 0 corresponds to the first bit 1 of  
      the raw data 10 and the first bit 1 of the raw data 11, the 1 corresponds to the 2nd bit 0  
      of the raw data 10 and the 2nd bit 1 of the raw data 11. Using these two parity checks,  
      if we receive data as the following.  
      – Pease specify where the error is.  
      – If there is an error, please correct it and briefly describe how you find and correct  
      the error.

Table

Description automatically generated

Converting the input data as binary bits, the results are shown below:

|  |  |
| --- | --- |
| **Hex** | **Binary** |
| 0x9 | 1001 |
| 0xc | 1100 |
| 0x6 | 0110 |
| 0x7 | 0111 |

Using the binary equivalents, computing the Parity Check is as follows. The bit in Row 2, column 1 had an error and is now corrected, as it was originally 0, but it should be a 1 to make the checked bits correct. This makes sense now with the checked row and checked column because by not setting row 2 column 1 to 1, then the final column and row checked bits would have resulted in 11000, which was incorrect. This is determined by simply performing the xor operation for row 2 and column 1, that is to say the original data would show: 1^0^0^0=1 for the column 1 parity, and 0^1^0^0=1 for the row 2 parity. Therefore, I set the first bit to 1 instead as seen in the table, since this now correctly computes the checked parity output:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | RAW | DATA |  |  | CHECK |
|  | 1 | 0 | 0 | 1 | 0 |
|  | **1** | 1 | 0 | 0 | 0 |
|  | 0 | 1 | 1 | 0 | 0 |
|  | 0 | 1 | 1 | 1 | 1 |
| CHECK | 0 | 1 | 0 | 0 | 1 |

1. CDMA coding: assume there are 2 users: user1 tries to send raw data -1 and -1. user 2 tries  
   to send raw data 1 and -1. User1 uses code -1, 1, -1, -1, 1, 1, -1, -1. User 2 users code 1,  
   -1, 1, 1, -1, -1, 1, 1. Referring to the page 14 in the slides and describe what receiver1 and  
   receiver2 receive and how they decode it.
   1. User 1: would send (-1, -1) for every 1 in their code and (1,1) for every -1 in their code, resulting in the receiver1 to see 1, 1 -1,-1 1,1 1, 1 -1,-1 -1,-1 1,1 1,1
   2. User 2: would send (1,-1) for every 1 in their code and (-1, -1) for every -1 in their code, resulting in the receiver2 to see: 1,-1, -1,1 1,-1 1,-1, -1,1, -1,1, 1,-1, 1,-1

Both signals are then added together to form a signal of 2,0, -2,0, 2, 0, 2, 0, -2, 0, -2, 0, 2, 0, 2, 0

The receivers then add and subtract each two numbers to receive the original signals:

Thus signal 1=2+0 -2+0 2+0 2+0 -2+0 -2+0 2+0 2+0 = 2 -2 2 2 -2 -2 2 2= 1 -1 1 1 -1 -1 1 1

Signal 2=2-0 -2-0 2-0 2-0 -2-0 -2-0 2-0 2-0= -2 -2 2 2 -2 -2 2 2=-1 -1 1 1 -1 -1 1 1

1. Describe why CSMA/CA instead of CSMA/CD is used in wireless network.
   1. CSMA/CD which utilizes Collision Detection is based on an individual node and to be used on a wireless network would require the wireless transceiver to send and receive on the same channel at the same time, this limitation means it is impossible to detect a collision. CSMA/CD will only work after a collision.

CSMA/CA which utilizes Collision Avoidance, however, checks the medium before sending and using this to minimize the possibility of a collision all together when sending.

1. What is the triangle routing, please specify its pros and cons.
   1. Triangle Routing works by transmitting packets of Data in Communications Networks by sending a packet to a proxy system before transmission. Cons of Triangle Routing include increasing the impact of possible network partitions and delaying the delivery of a packet due to the load onto the network. Pros of Triangle Routing are that it is a method that allows for packets to be sent to the mobile host and pass through the home agent, it also may be useful in avoiding problems associated with network address translation (NAT).