

# Computer Networks and Distributed Systems

## Datalink-protocol framing and Ethernet

Based on textbook “*Conceptual Computer Networks*” (WIP) © by José María Foces Morán and José María Foces Vivancos. All rights reserved

### Context

- Based on this lecture presentation:

<http://paloaalto.unileon.es/cn/lect/CN-Ch1-2018-Section5.pdf>

- Topic outline:
  - Error detection codes: Hor. Parity, Vert. parity, Internet Checksum and CRC

### Exercises

- Calculate the even, 1’s parity of each of the following two 7-bit blocks: 110 0100, 1100 000 (Slide no. 77)

Even 1’s parity of 110 0100 =  $1 \text{ xor } 1 \text{ xor } 0 \text{ xor } 0 \text{ xor } 1 \text{ xor } 0 \text{ xor } 0 = 1$

Even 1’s parity of 110 0000 =  $1 \text{ xor } 1 \text{ xor } 0 \text{ xor } 0 \text{ xor } 0 \text{ xor } 0 \text{ xor } 0 = 0$

- Assume a datalink protocol that uses bidimensional parity in which each 7-bit block is appended one bit of horizontal parity and, for each 6-byte block a 1-byte vertical parity is computed (The same scheme employed in the textbook example at slide no. 78). The data which bidimensional parity is to be calculated are the following:

1010100 1110000 0001110 0000000 1111111 1000001

Calculate the parity bit of each of the preceding six 7-bit blocks and, finally, calculate the vertical parity byte.

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

- Solve the CRC calculation of the example in pg. 101 and 102 of the textbook, which is also explained in slide 92 and on. Checkpoint yourselves as you compute each row by checking you obtain the correct result per the table in slide 95.

We solved this CRC calculation in the B1 sessions held on Thursday and Friday, nevertheless, I want to note that once the transmitter has computed the CRC, it sends

Message M alongside the CRC to the receiver: [M | CRC]. The receiver applies the CRC calculation algorithm to M, and instead of appending a number of 0's equal to the order of the generator, it appends the received CRC and, if the resulting CRC' is 0, then, it concludes that most probably no error took place which leads it to accept the frame and begin its processing.

4. A layer-2 protocol uses the CRC generator following polynomial:  $C(x) = 1 + x + x^3$ . We want to transmit the message  $M(x) = x^3 + x^2 + 1$ .

Compute the CRC by following the guidelines in slide 92 and on. (Exam solution at this URL: <http://paloalto.unileon.es/cn/CN-ExRefSol2013.pdf> contains the solution so you can checkpoint the algorithm progress).