Exercise (SS 2022)

Comunication Systems and Protocols

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Task 1: CRC

1.1 Assume that a specific CRC scheme employs $G(x) = x^4 + x^3 + x^2 + 1$ as its generator polynomial. Does this guarantee the detection of all error patterns with an odd number of erroneous bits in a protected frame? Justify your answer.

Task 2: Flow-Control

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2.1 An approach used to synchronize communication processes is the use of Flow-Control. Complete the signals in figure 2.1 to perform two transmissions of DATA values 0xA and 0x5 using Level-Triggered Closed-Loop Flow Control II. This approach uses Valid and Busy signals. A grey color symbolises that the DATA line is idle and that no value is being driven on the bus. Ignore delays and consider that a read occurs at the rising edge and signal change at falling edge of the clock, and that the receiver required 1 cycle to read the value.

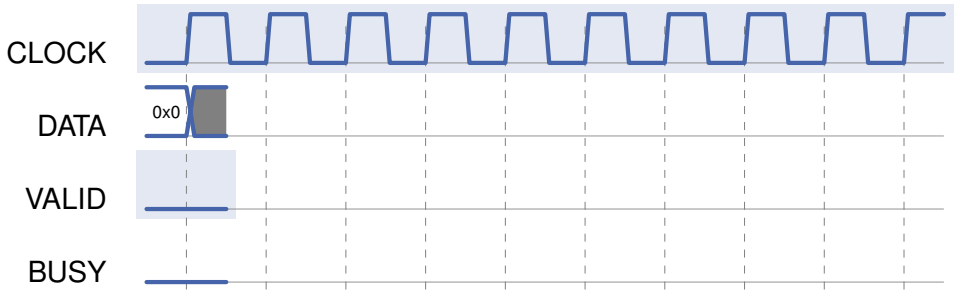

Figure 2.1: Signal sequence

Task 3: FireWire Arbitration

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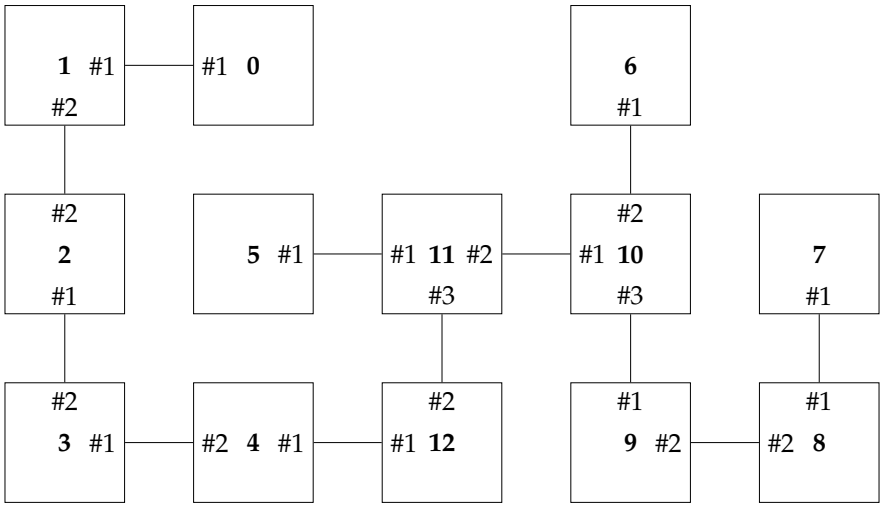

Figure 3.1: FireWire network

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3.1 The nodes in Figure 3.1 having address **2**, **5**, **7**, **10** would like to transmit data and start requesting at the same time. Describe in which order are the nodes granted request.

- Assume that every node needs one time unit for processing and forwarding of its request signal.
- If a node receives multiple bus requests, it will always forward the request that it receives from the port with the lowest number.

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The FireWire network shown in Figure 3.2 is given.

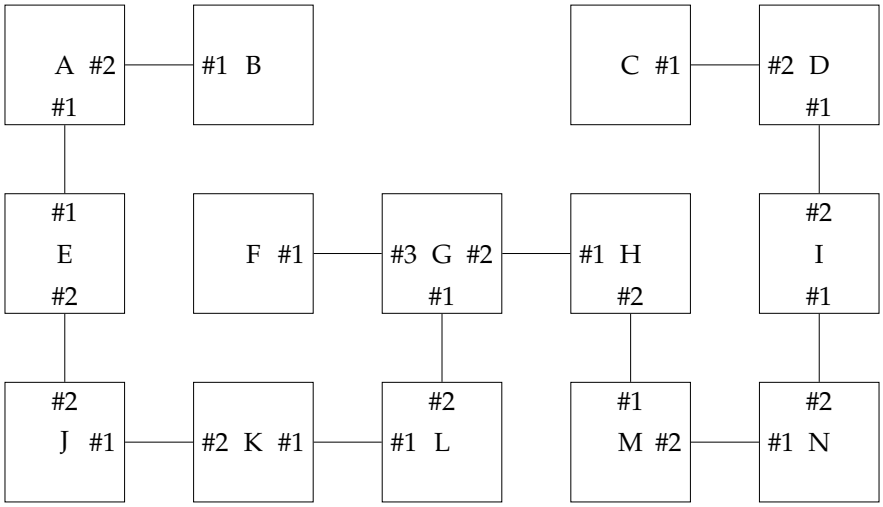

Figure 3.2: FireWire network

A normal FireWire bus cycle should be considered. For simplification, several assumptions should be taken into account:

- A list of nodes wanting to send is given.
- All nodes start requesting the bus at the same time.
- Processing of arbitration requests are done in zero time. There are no delays for propagation of the arbitration decision.
- If a node receives multiple bus requests, it will always forward the request that it receives from the port with the lowest number.

3.2 The nodes in Figure 3.2 are named using letters from A to N. Which node is the root of the FireWire network? /2

3.3 The following nodes in Figure 3.2 request access to the bus: **B, D, G, H, I, L, M**. Determine the order in which the nodes will be granted access to the bus. /4