Lab session #02

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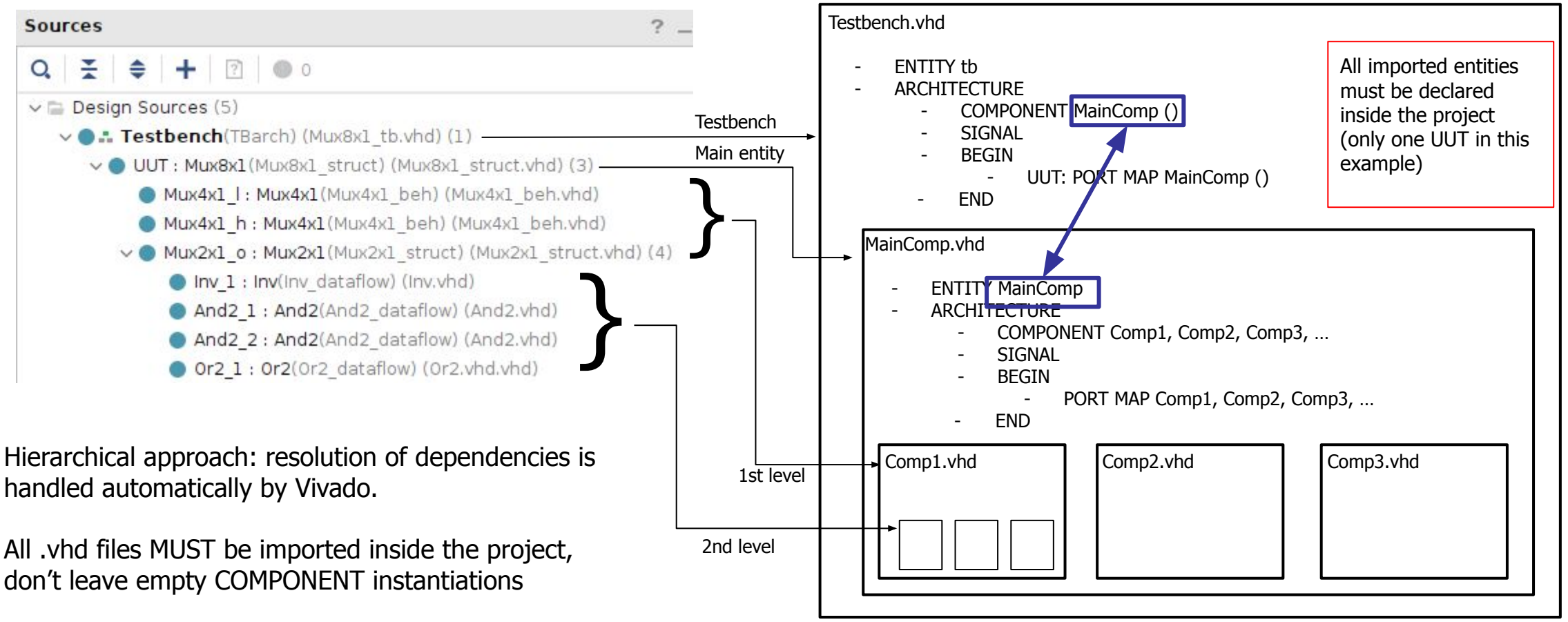
Before we start

- Vivado project structure:

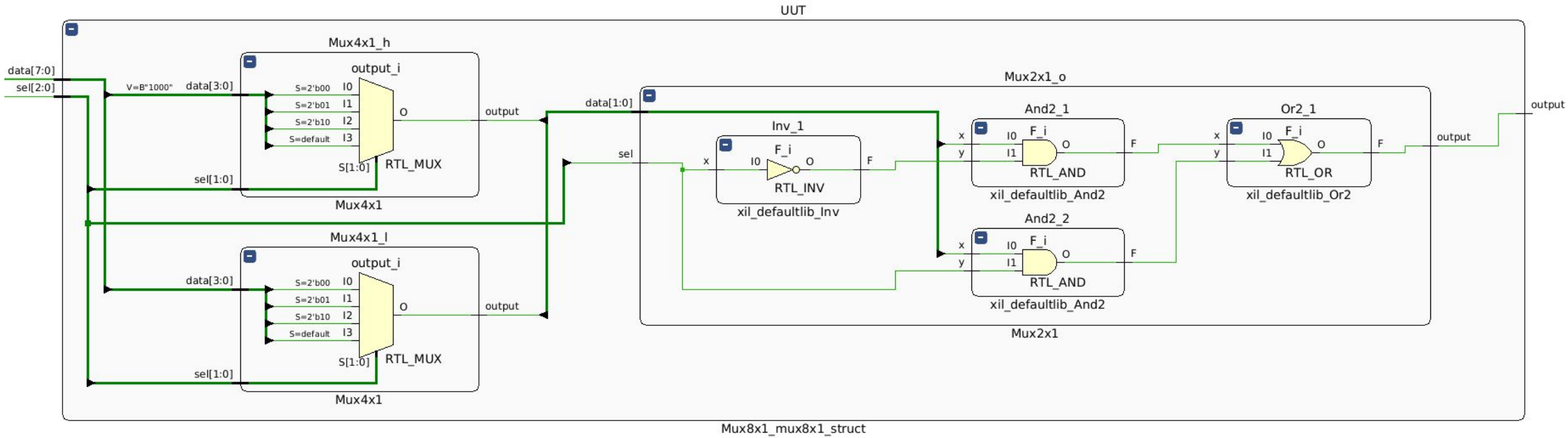


Hierarchical approach: resolution of dependencies is handled automatically by Vivado.

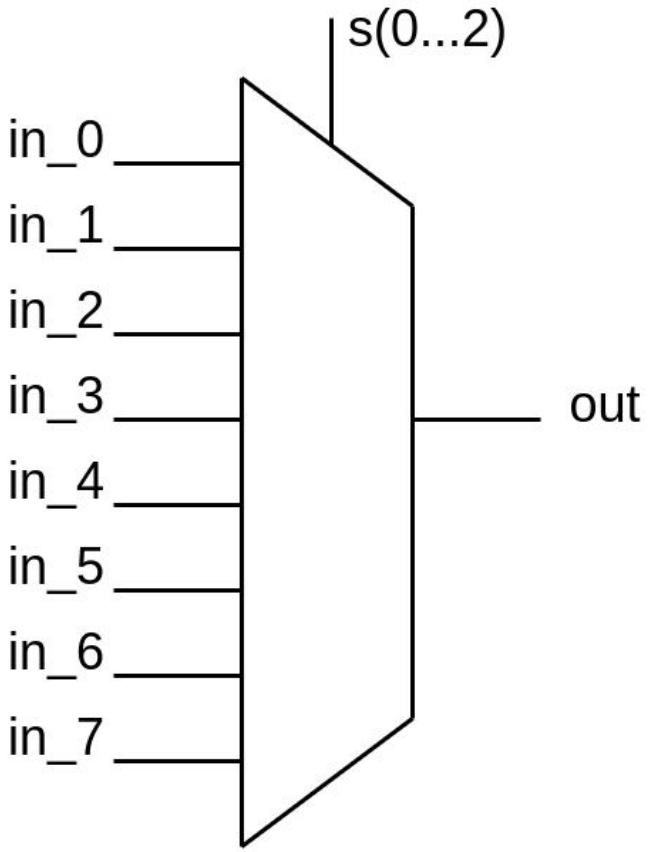
All .vhd files MUST be imported inside the project, don't leave empty COMPONENT instantiations

Before we start

- Vivado RTL structure:

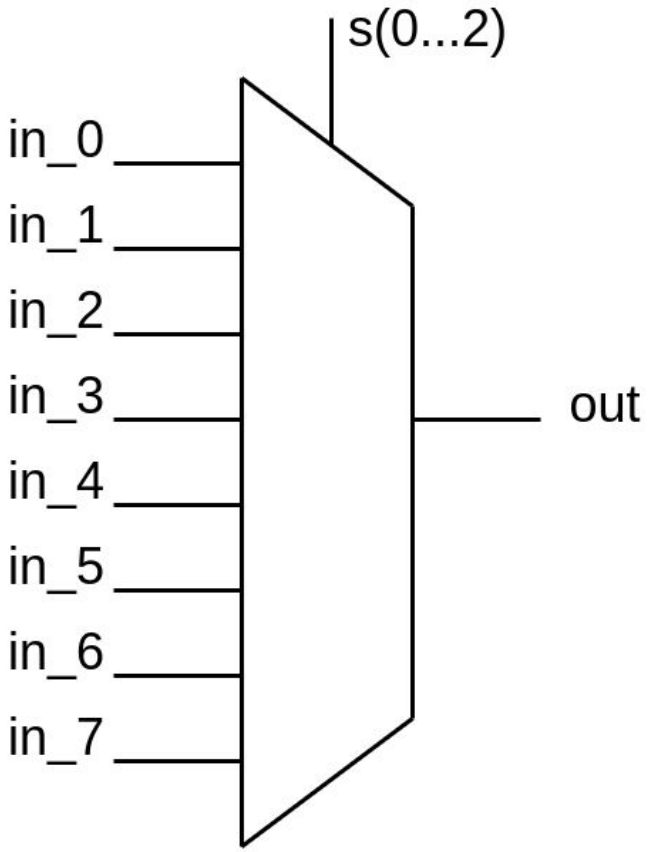


8to1 Multiplexer



- Describe a 8to1 MUX using 5 different styles:
  - DATAFLOW with WHEN ELSE statements
  - DATAFLOW with WITH SELECT WHEN statement
  - BEHAVIORAL with IF THEN ELSIF statements
  - BEHAVIORAL with CASE WHEN statement
  - STRUCTURAL with a hierarchical approach (2x 4to1 BEHAVIORAL MUX and 1 2to1 STRUCTURAL MUX
- Develop an appropriate testbench to perform the simulation and verify if the design is correct
- You should use a CONFIGURATION statement to enable switching between configurations

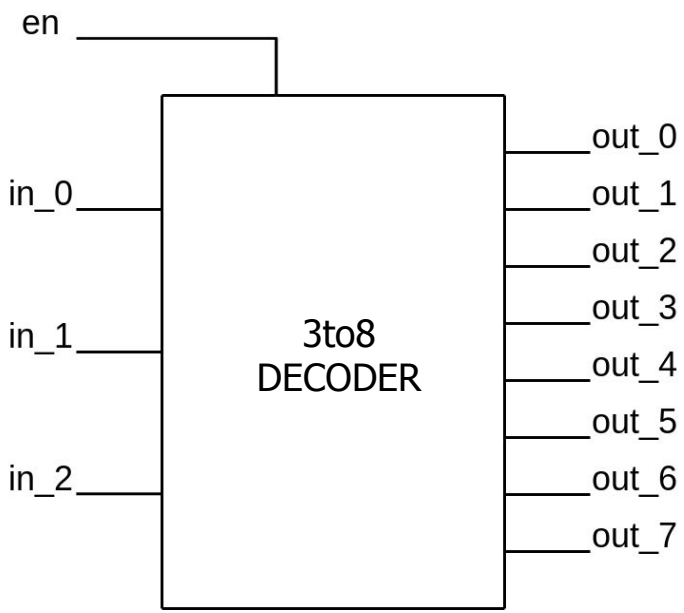
8to1 Multiplexer



8to1 MUX truth table:

s0	s1	s2	out
0	0	0	in_0
0	0	1	in_1
0	1	0	in_2
0	1	1	in_3
1	0	0	in_4
1	0	1	in_5
1	1	0	in_6
1	1	1	in_7

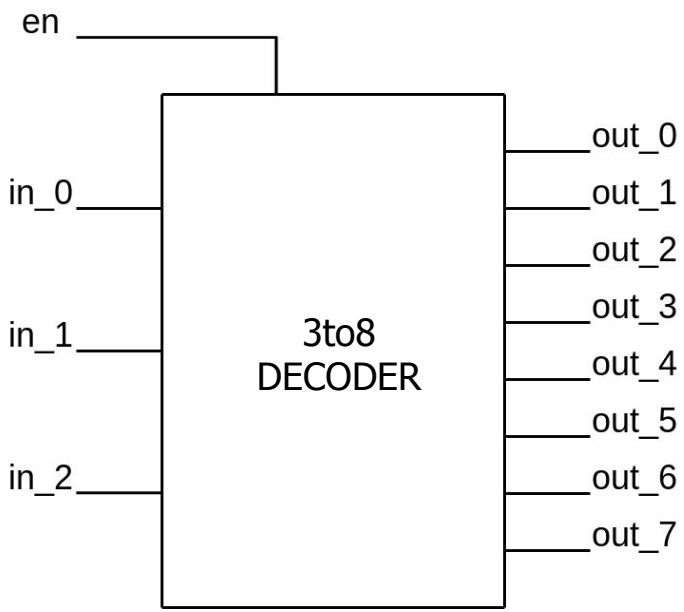
3to8 Decoder



- Describe a 3to8 DECODER using 4 different styles:
  - DATAFLOW with WHEN ELSE statements
  - DATAFLOW with WITH SELECT WHEN statement
  - BEHAVIORAL with IF THEN ELSIF statements
  - BEHAVIORAL with CASE WHEN statement

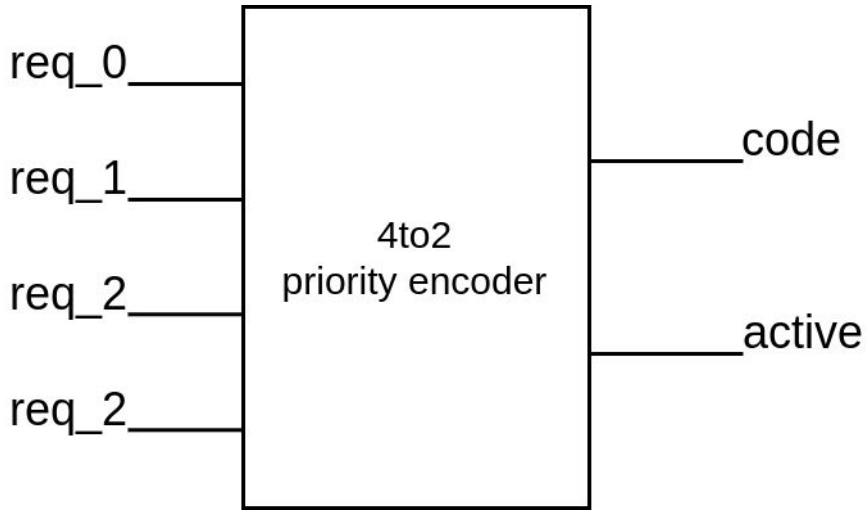
- Develop an appropriate testbench to perform the simulation and verify if the design is correct

3to8 Decoder



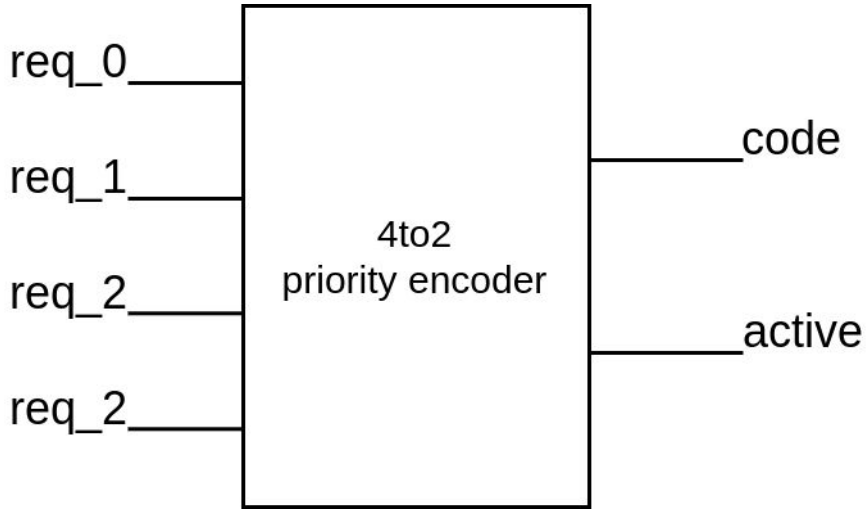
in_0	in_1	in_2	en	out_0	out_1	out_2	out_3	out_4	out_5	out_6	out_7
0	0	0	1	1	0	0	0	0	0	0	0
0	0	1	1	0	1	0	0	0	0	0	0
0	1	0	1	0	0	1	0	0	0	0	0
0	1	1	1	0	0	0	1	0	0	0	0
1	0	0	1	0	0	0	0	1	0	0	0
1	0	1	1	0	0	0	0	0	1	0	0
1	1	0	1	0	0	0	0	0	0	1	0
1	1	1	1	0	0	0	0	0	0	0	1
-	-	-	0	0	0	0	0	0	0	0	0

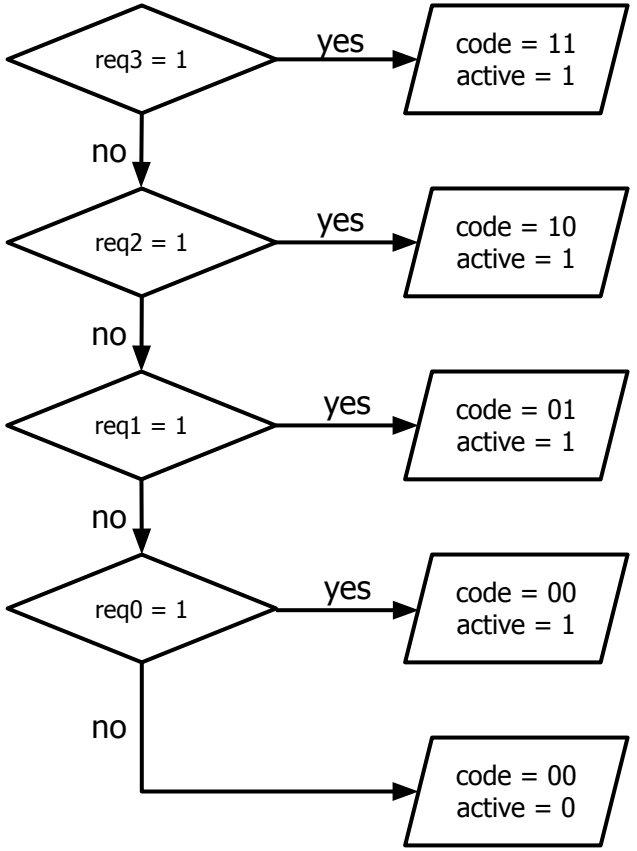
4to2 Priority Encoder

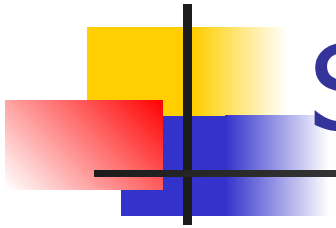


- Describe a 4to2 PRIORITY ENCODER using 4 different styles:
  - DATAFLOW with WHEN ELSE statements
  - DATAFLOW with WITH SELECT WHEN statement
  - BEHAVIORAL with IF THEN ELSIF statements
  - BEHAVIORAL with CASE WHEN statement
- Develop an appropriate testbench to perform the simulation and verify if the design is correct

4to2 Priority Encoder







Synthesis

Lastly, run synthesis on your designed multiplexer, decoder and priority encoder.

- Understand the differences between the different description styles of the same circuit, do the reported results change?
- Are you able to estimate a maximum working frequency? How?