Lab 1

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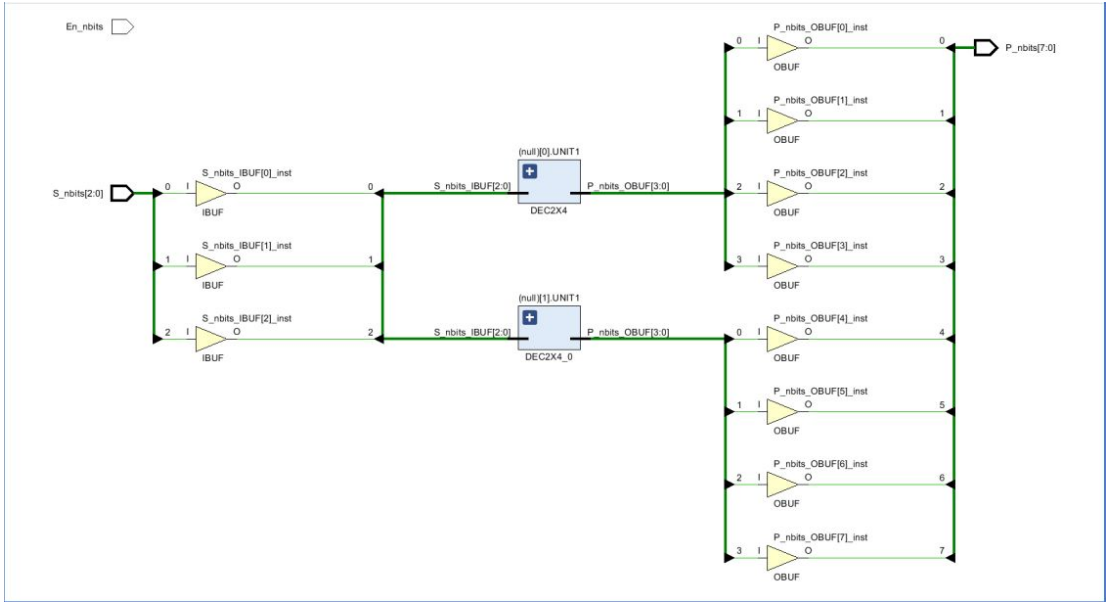
Objective

Create 3x8 decoder using

Generate function



Generate function

This was the generate

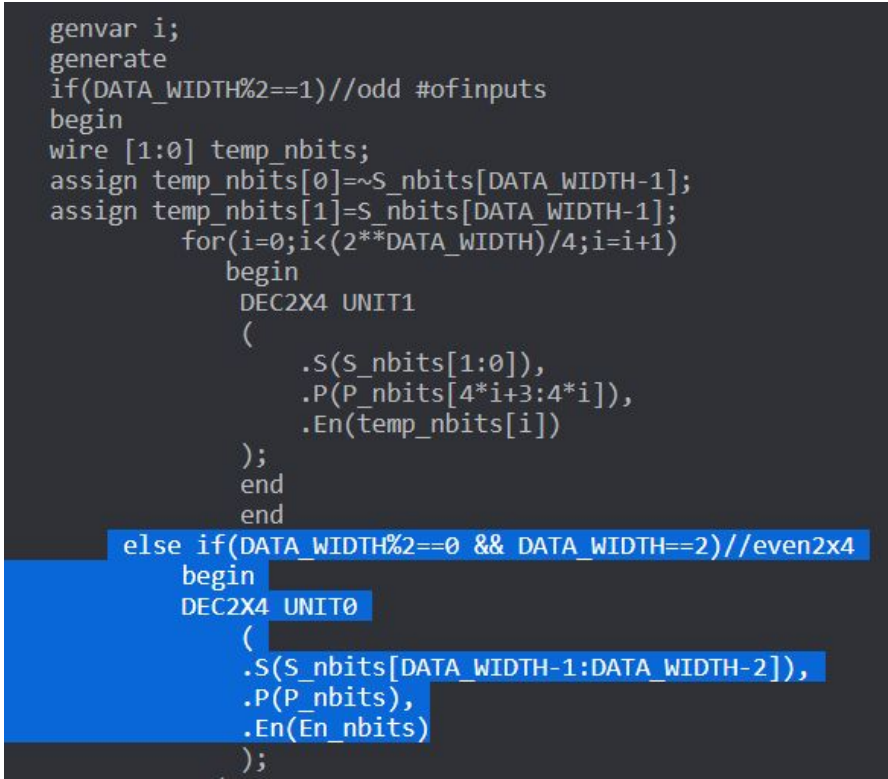
Function we used to help

Build the decoder.

```
genvar i;
generate
if(DATA_WIDTH%2==1)//odd #ofinputs
begin
wire [1:0] temp_nbits;
assign temp_nbits[0]=~S_nbits[DATA_WIDTH-1];
assign temp_nbits[1]=S_nbits[DATA_WIDTH-1];
        for(i=0;i<(2**DATA_WIDTH)/4;i=i+1)
           begin
            DEC2X4 UNIT1
            (
                .S(S_nbits[1:0]),
                .P(P_nbits[4*i+3:4*i]),
                .En(temp_nbits[i])
```

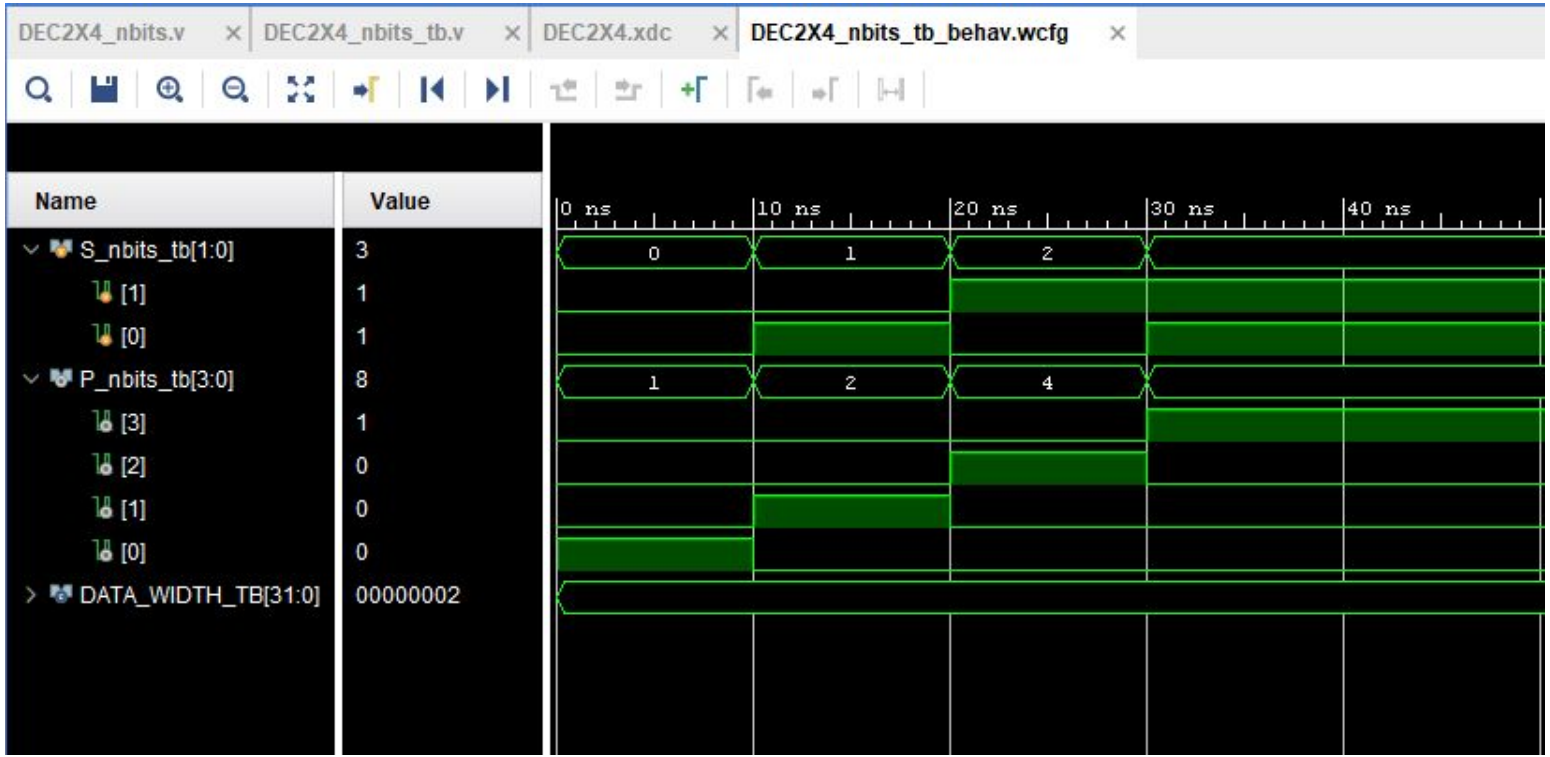
Problems

One problem we had was after we figured out the generate function, the code would not run properly and we did not know what was wrong. We found the solution was to add an if statement after.

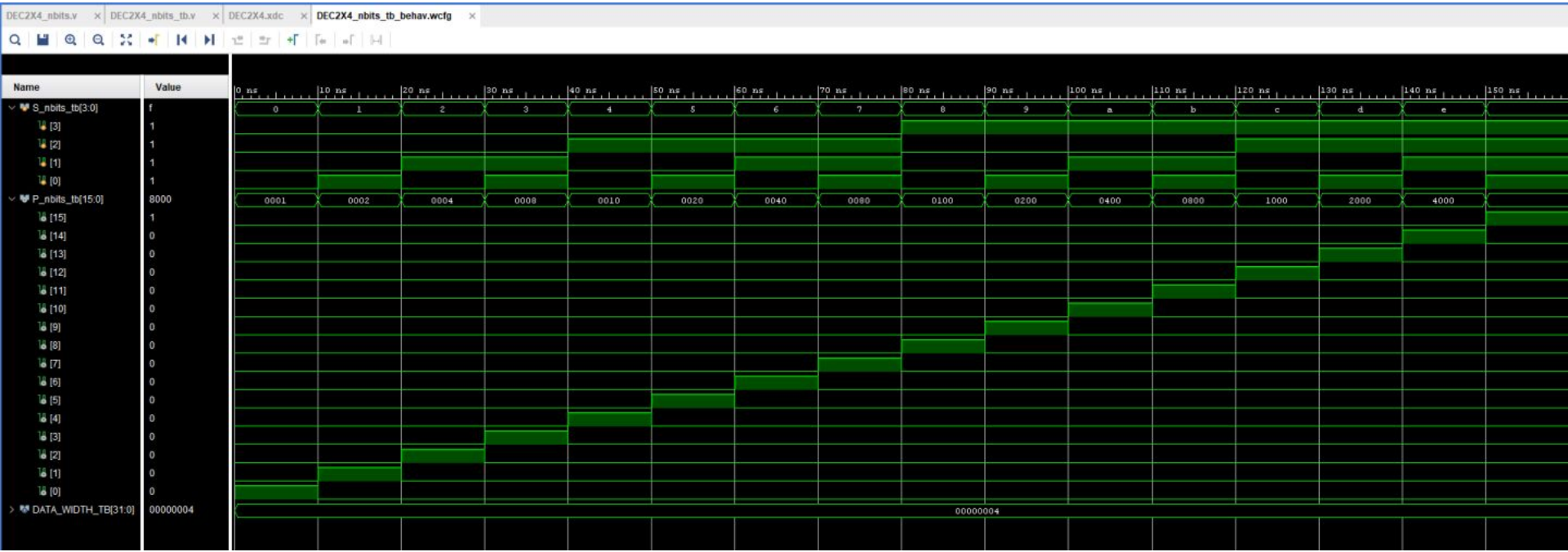


```
genvar i;
generate
if(DATA_WIDTH%2==1)//odd #ofinputs
begin
wire [1:0] temp_nbits;
assign temp_nbits[0]=~S_nbits[DATA_WIDTH-1];
assign temp_nbits[1]=S_nbits[DATA_WIDTH-1];
        for(i=0;i<(2**DATA_WIDTH)/4;i=i+1)
           begin
            DEC2X4 UNIT1
            (
                .S(S_nbits[1:0]),
                .P(P_nbits[4*i+3:4*i]),
                .En(temp_nbits[i])
            );
            end
            end
    else if(DATA_WIDTH%2==0 && DATA_WIDTH==2)//even2x4
        begin
        DEC2X4 UNIT0
            (
            .S(S_nbits[DATA_WIDTH-1:DATA_WIDTH-2]),
            .P(P_nbits),
            .En(En_nbits)
            );
```

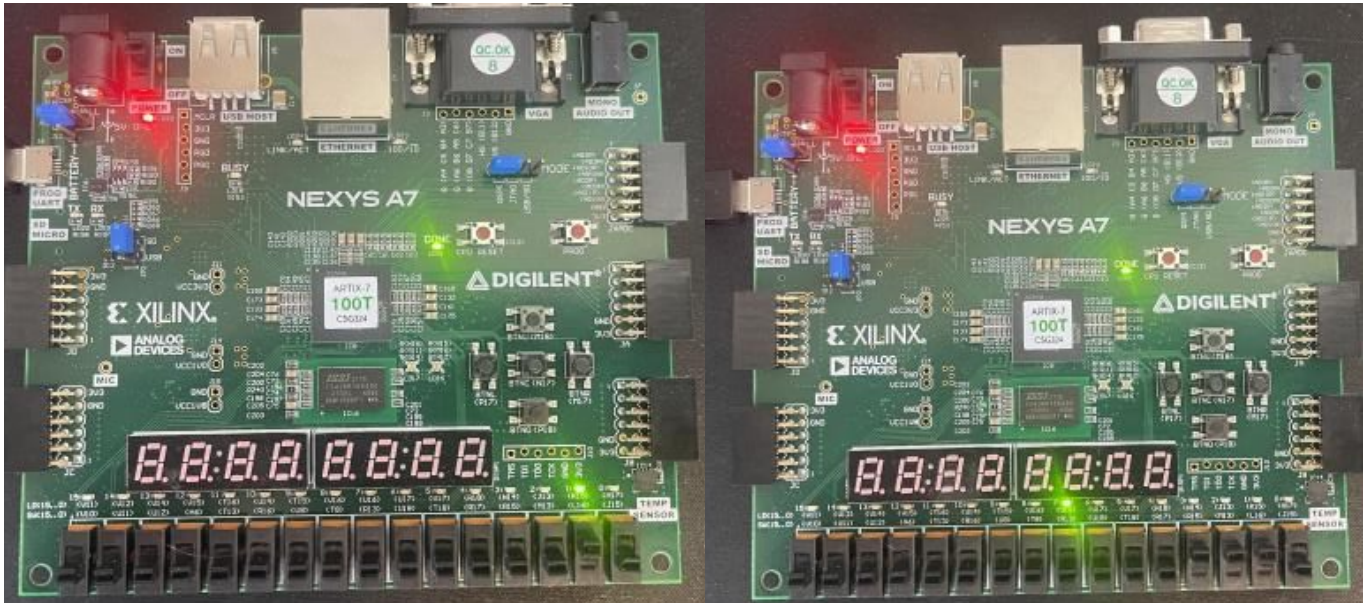
Test bench


DEC2X4_nbits.v
DEC2X4_nbits_tb.v
DEC2X4.xdc
DEC2X4_nbits_tb_behav.wcfg
Name
Value
S_nbits_tb[1:0]
3
[1]
1
[0]
1
P_nbits_tb[3:0]
8
[3]
1
[2]
0
[1]
0
[0]
0
DATA_WIDTH_TB[31:0]
00000002
0 ns
10 ns
20 ns
30 ns
40 ns
0
1
2
1
2
4

Test bench Cont.



Results



The image on the left shows the decoder at 01 and the image on the right shows it at 111 to show that it is fully functioning.