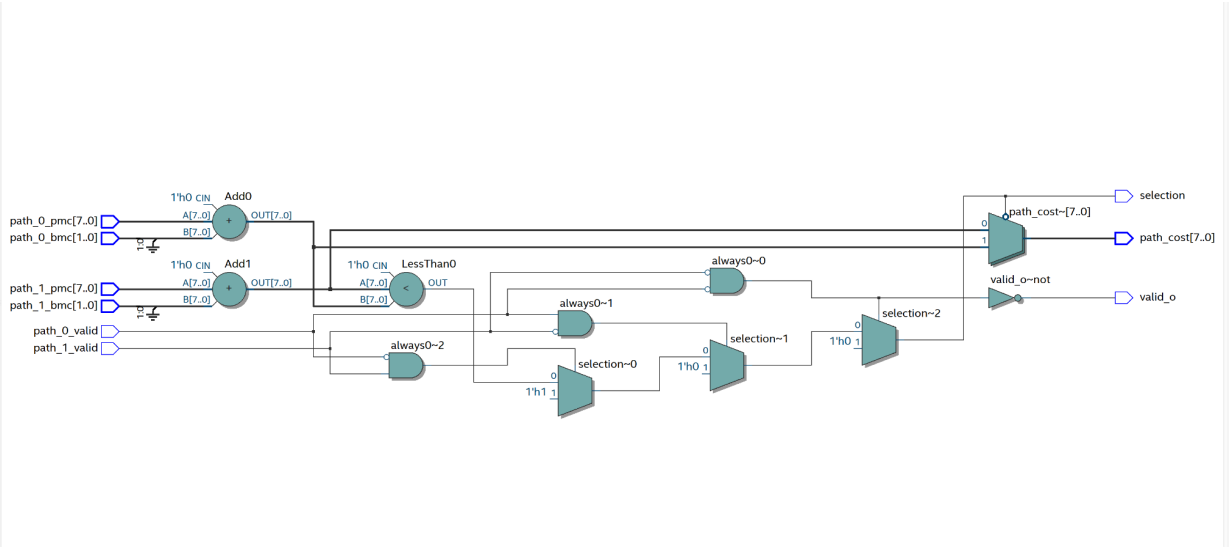
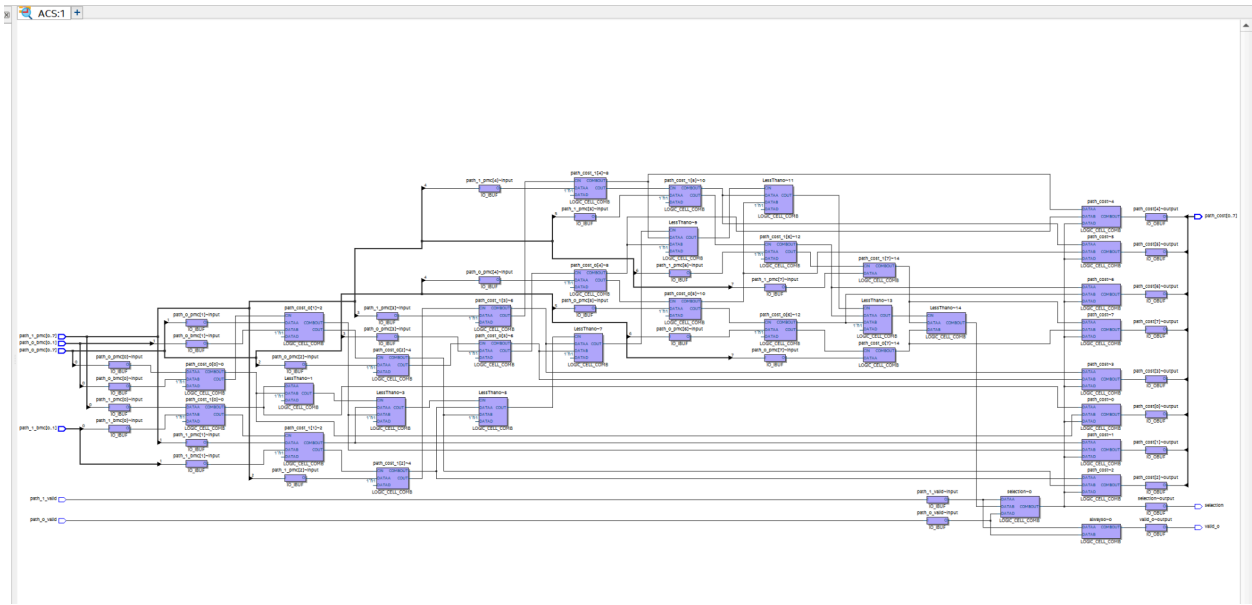
ACS.sv


1'h0 CIN
Add0
A[7..0]
B[7..0]
OUT[7..0]
path_0_pmc[7..0]
path_0_bmc[1..0]
1'h0 CIN
Add1
path_1_pmc[7..0]
path_1_bmc[1..0]
path_0_valid
path_1_valid
1'h0 CIN
LessThan0
A[7..0]
B[7..0]
OUT
always0~0
always0~1
always0~2
selection~0
selection~1
selection~2
1'h1
1'h0
path_cost~[7..0]
valid_o~not
selection
path_cost[7..0]
valid_o

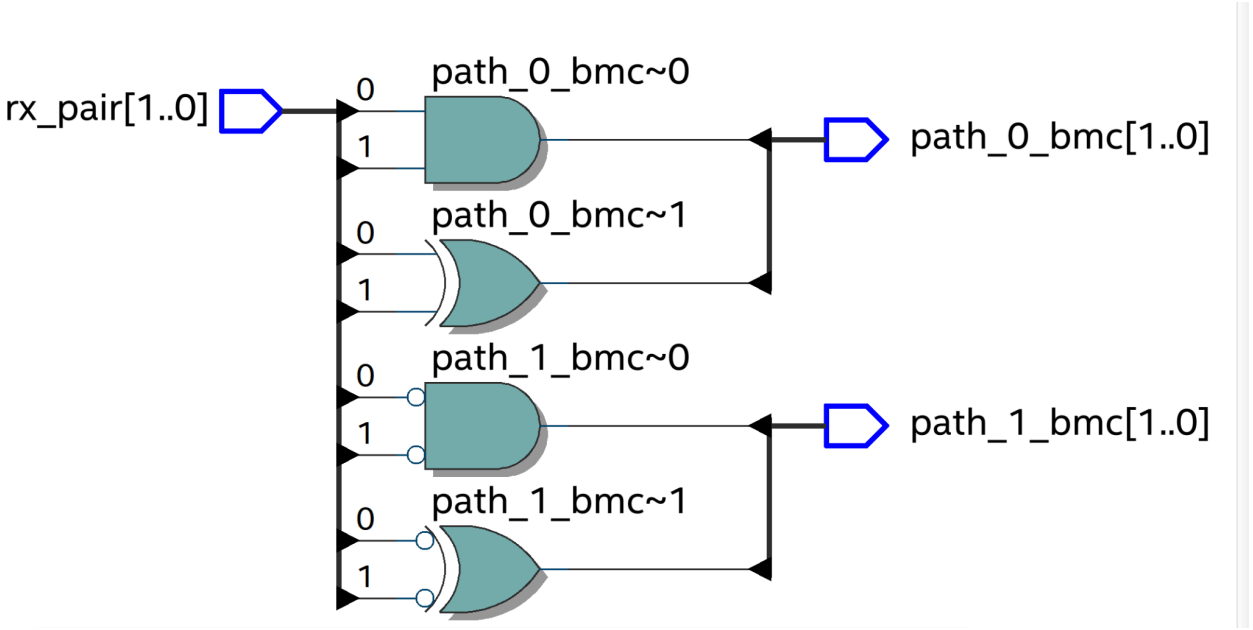

ACS:1

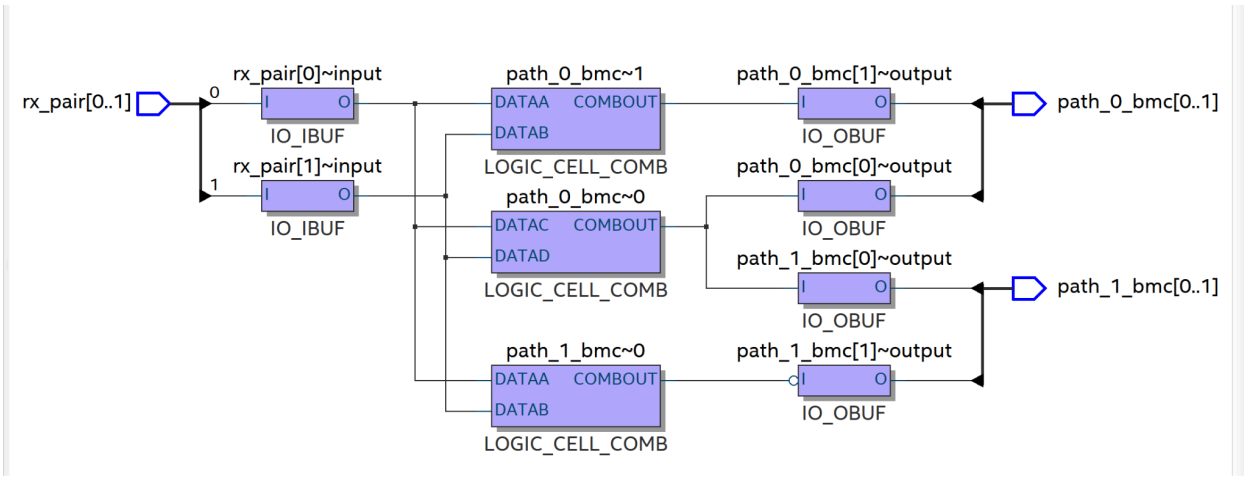
Analysis & Synthesis Resource Usage Summary

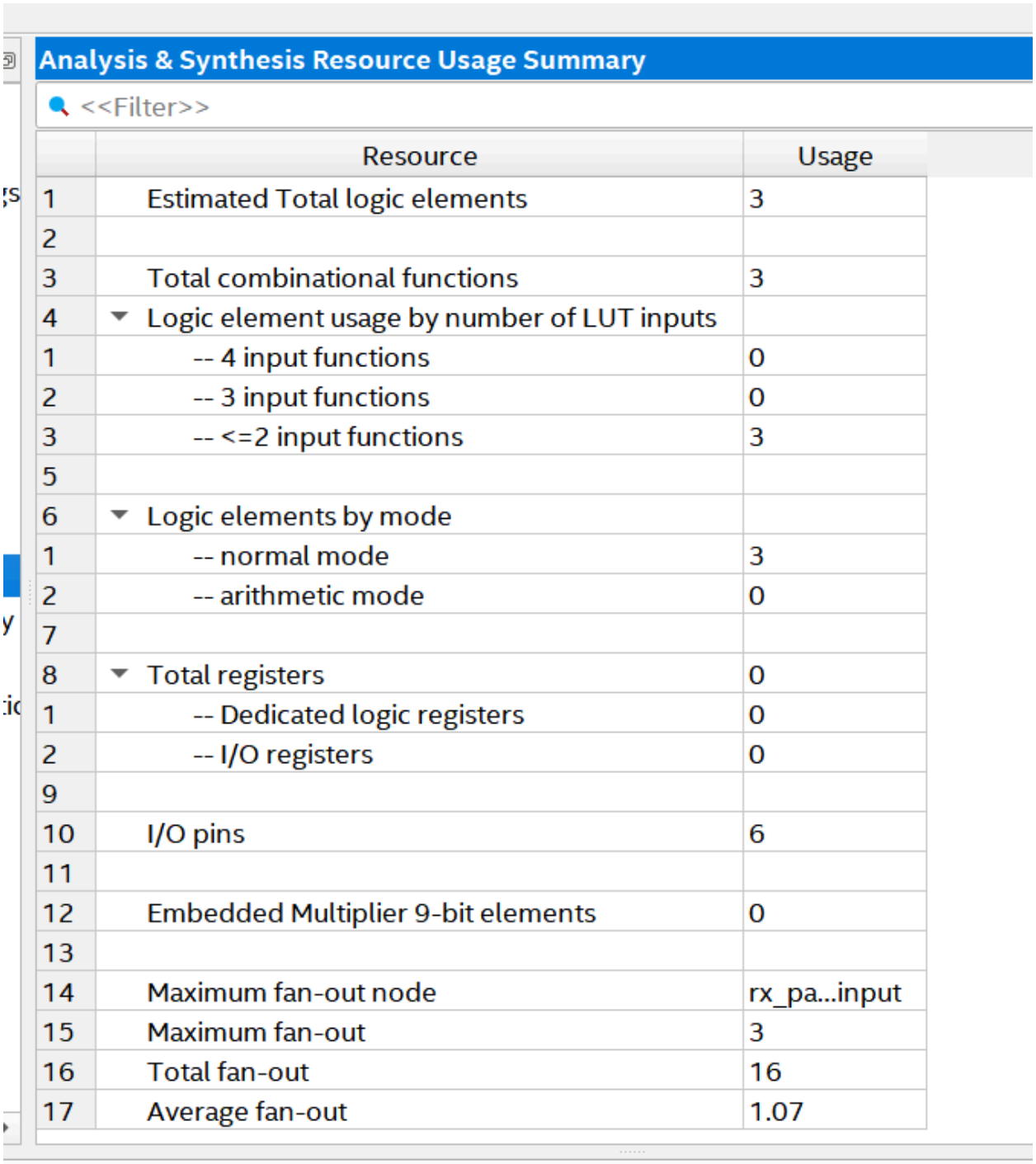
<<Filter>>

	Resource	Usage
1	Estimated Total logic elements	34
2		
3	Total combinational functions	34
4	▼ Logic element usage by number of LUT inputs	
1	-- 4 input functions	0
2	-- 3 input functions	20
3	-- <=2 input functions	14
5		
6	▼ Logic elements by mode	
1	-- normal mode	13
2	-- arithmetic mode	21
7		
8	▼ Total registers	0
1	-- Dedicated logic registers	0
2	-- I/O registers	0
9		
10	I/O pins	32
11		
12	Embedded Multiplier 9-bit elements	0
13		
14	Maximum fan-out node	selection~0
15	Maximum fan-out	9
16	Total fan-out	128
17	Average fan-out	1.31

BMC:


rx_pair[1..0]
0
1
path_0_bmc~0
path_0_bmc[1..0]
path_0_bmc~1
path_1_bmc~0
path_1_bmc[1..0]
path_1_bmc~1


rx_pair[0..1]
rx_pair[0]~input
IO_IBUF
rx_pair[1]~input
path_0_bmc~1
DATAA
COMBOUT
DATAB
LOGIC_CELL_COMB
path_0_bmc~0
DATAC
DATAD
path_1_bmc~0
path_0_bmc[1]~output
IO_OBUF
path_0_bmc[0]~output
path_1_bmc[0]~output
path_1_bmc[1]~output
path_0_bmc[0..1]
path_1_bmc[0..1]



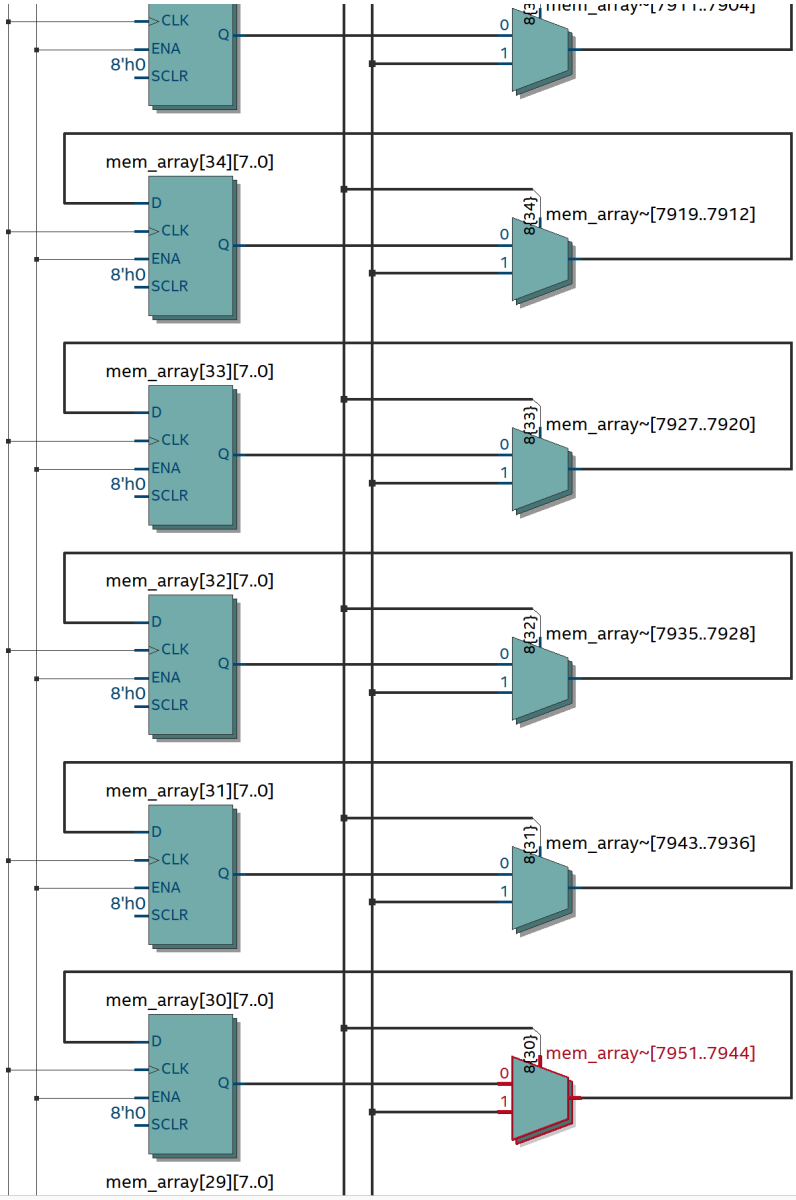
Analysis & Synthesis Resource Usage Summary

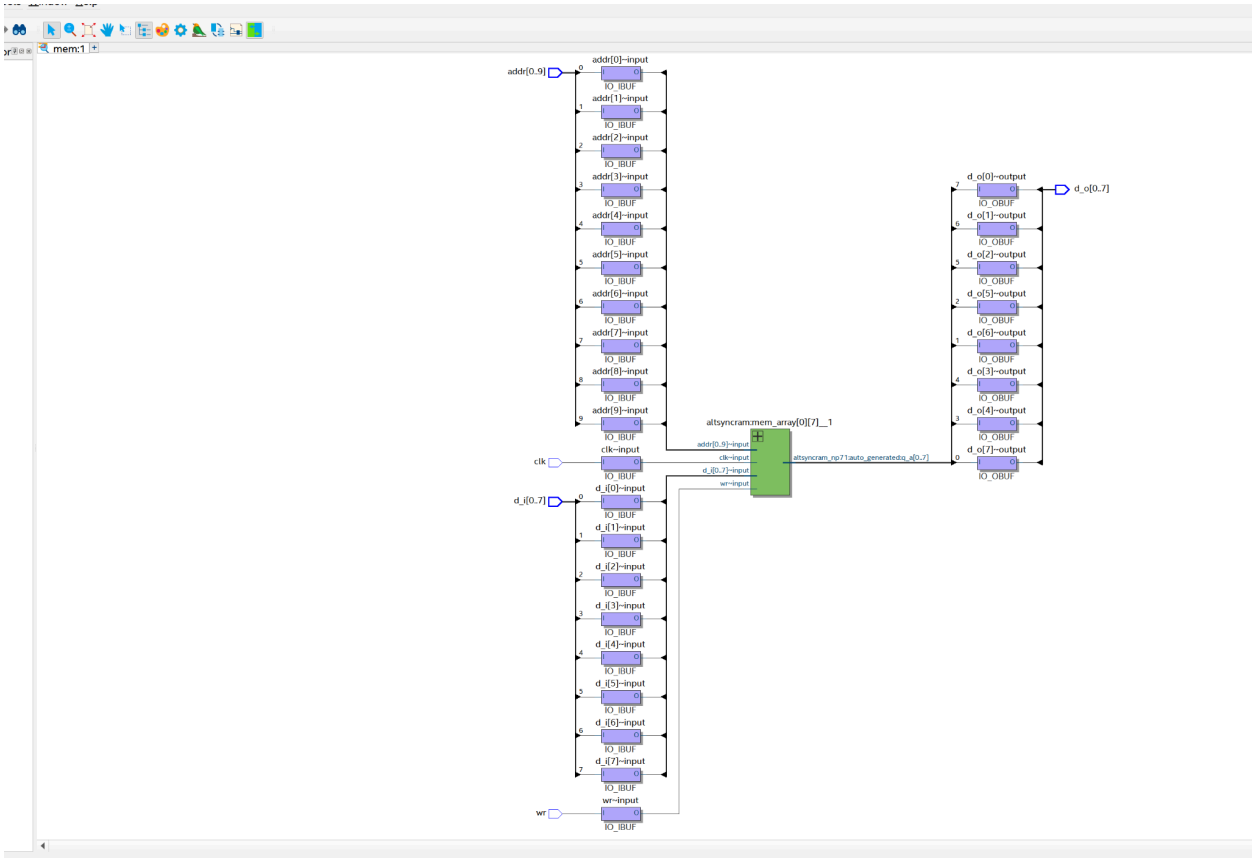
<<Filter>>

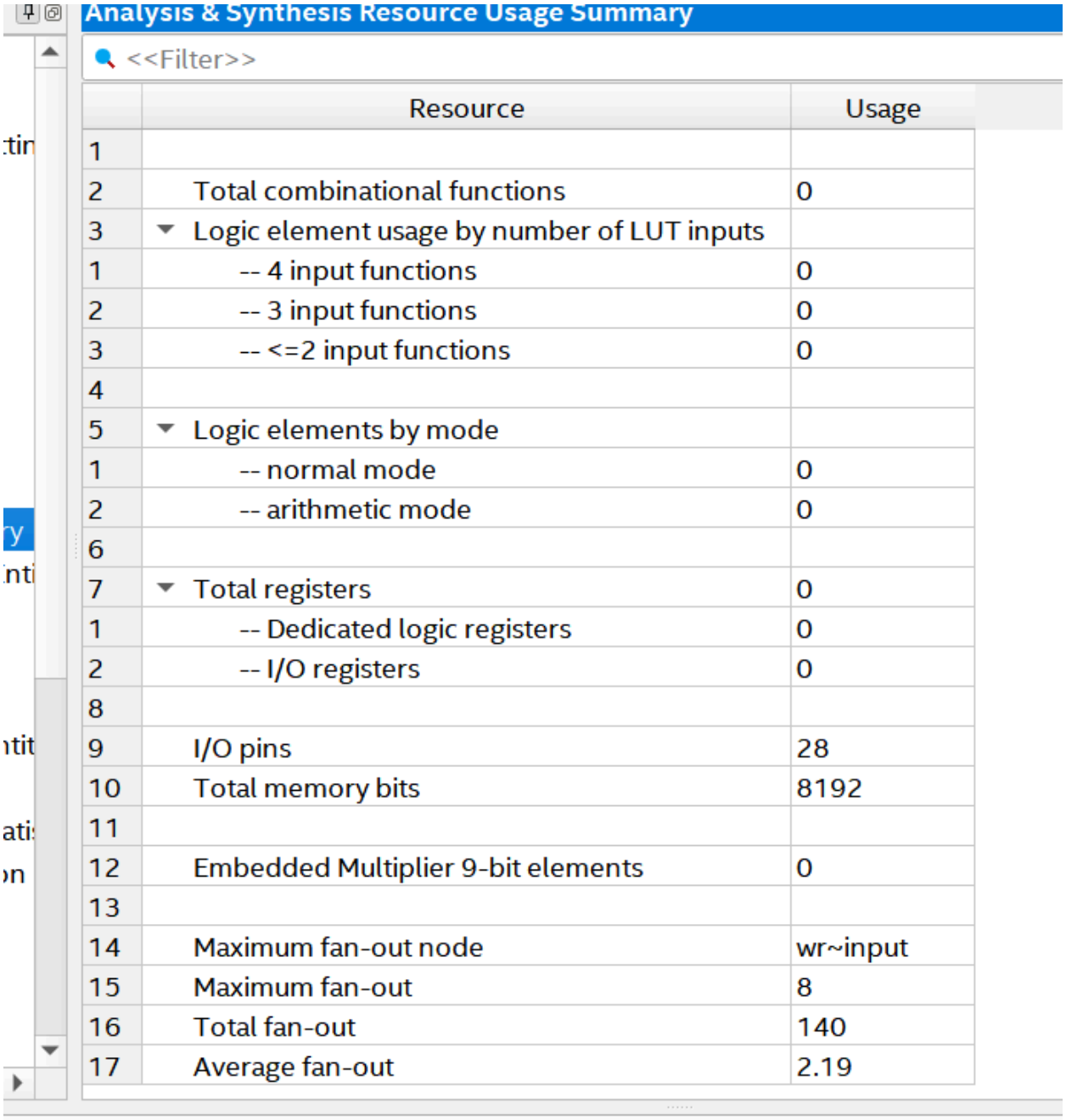
	Resource	Usage
1	Estimated Total logic elements	3
2		
3	Total combinational functions	3
4	▼ Logic element usage by number of LUT inputs	
1	-- 4 input functions	0
2	-- 3 input functions	0
3	-- <=2 input functions	3
5		
6	▼ Logic elements by mode	
1	-- normal mode	3
2	-- arithmetic mode	0
7		
8	▼ Total registers	0
1	-- Dedicated logic registers	0
2	-- I/O registers	0
9		
10	I/O pins	6
11		
12	Embedded Multiplier 9-bit elements	0
13		
14	Maximum fan-out node	rx_pa...input
15	Maximum fan-out	3
16	Total fan-out	16
17	Average fan-out	1.07

Mem_8x1024


RTL Viewer - C:/Users/Mark/Desktop/ece111/final1/mem - mem
File Edit View Tools Window Help
Search Intel FPGA
Page: 1 of 13
Netlist Navigator
mem
mem:1


mem_array[34][7..0]
mem_array[33][7..0]
mem_array[32][7..0]
mem_array[31][7..0]
mem_array[30][7..0]
mem_array[29][7..0]
D
CLK
ENA
SCLR
Q
8'h0
0
1
8[34]
8[33]
8[32]
8[31]
8[30]
mem_array~[7919..7912]
mem_array~[7927..7920]
mem_array~[7935..7928]
mem_array~[7943..7936]
mem_array~[7951..7944]


mem:1
addr[0..9]
addr[0]~input
addr[1]~input
addr[2]~input
addr[3]~input
addr[4]~input
addr[5]~input
addr[6]~input
addr[7]~input
addr[8]~input
addr[9]~input
clk
clk~input
d_i[0..7]
d_i[0]~input
d_i[1]~input
d_i[2]~input
d_i[3]~input
d_i[4]~input
d_i[5]~input
d_i[6]~input
d_i[7]~input
wr
wr~input
IO_IBUF
altsyncram:mem_array[0][7]__1
addr[0..9]~input
clk~input
d_i[0..7]~input
wr~input
altsyncram_np71:auto_generated|q_a[0..7]
d_o[0]~output
d_o[1]~output
d_o[2]~output
d_o[5]~output
d_o[6]~output
d_o[3]~output
d_o[4]~output
d_o[7]~output
d_o[0..7]
IO_OBUF

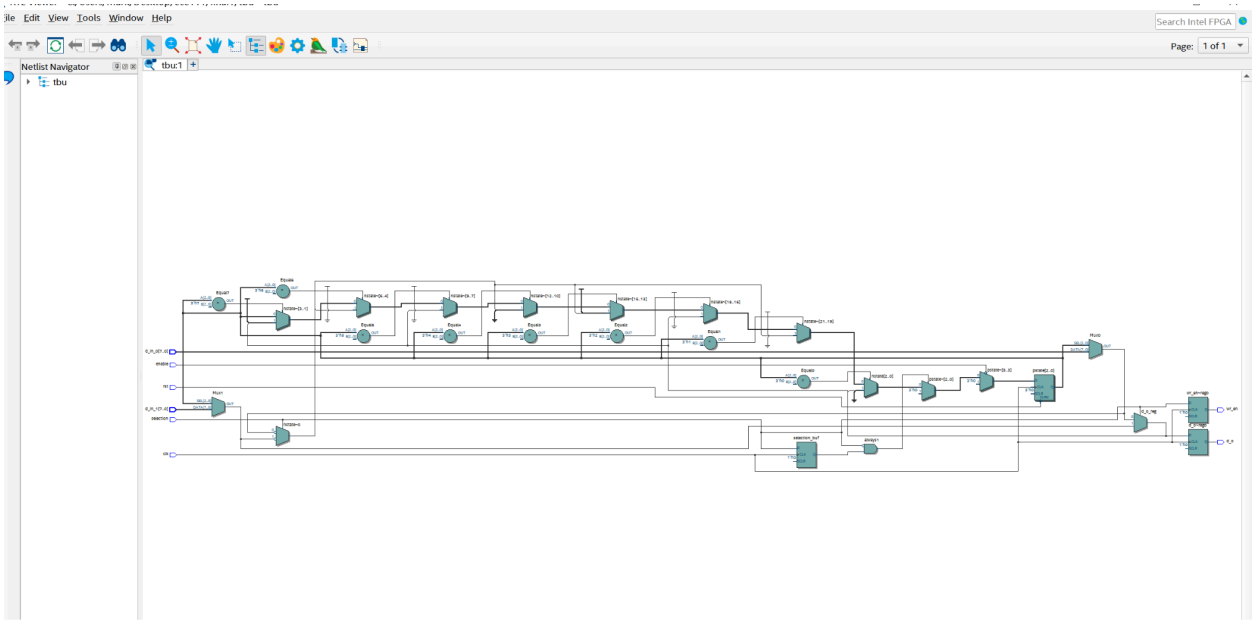


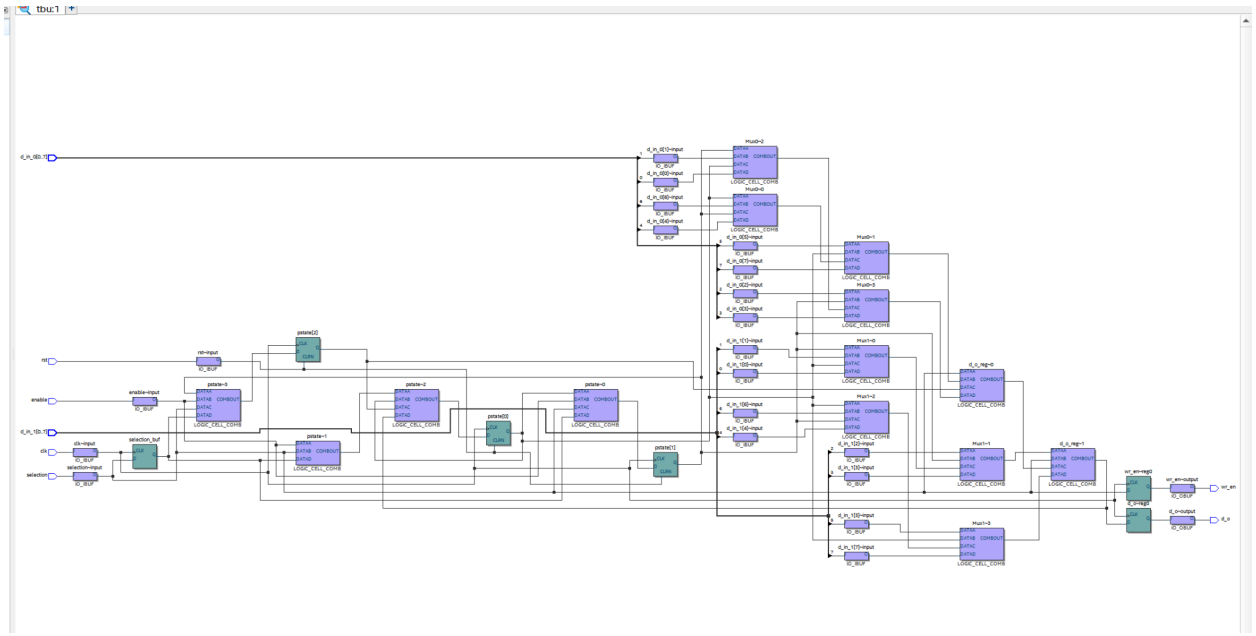
Analysis & Synthesis Resource Usage Summary

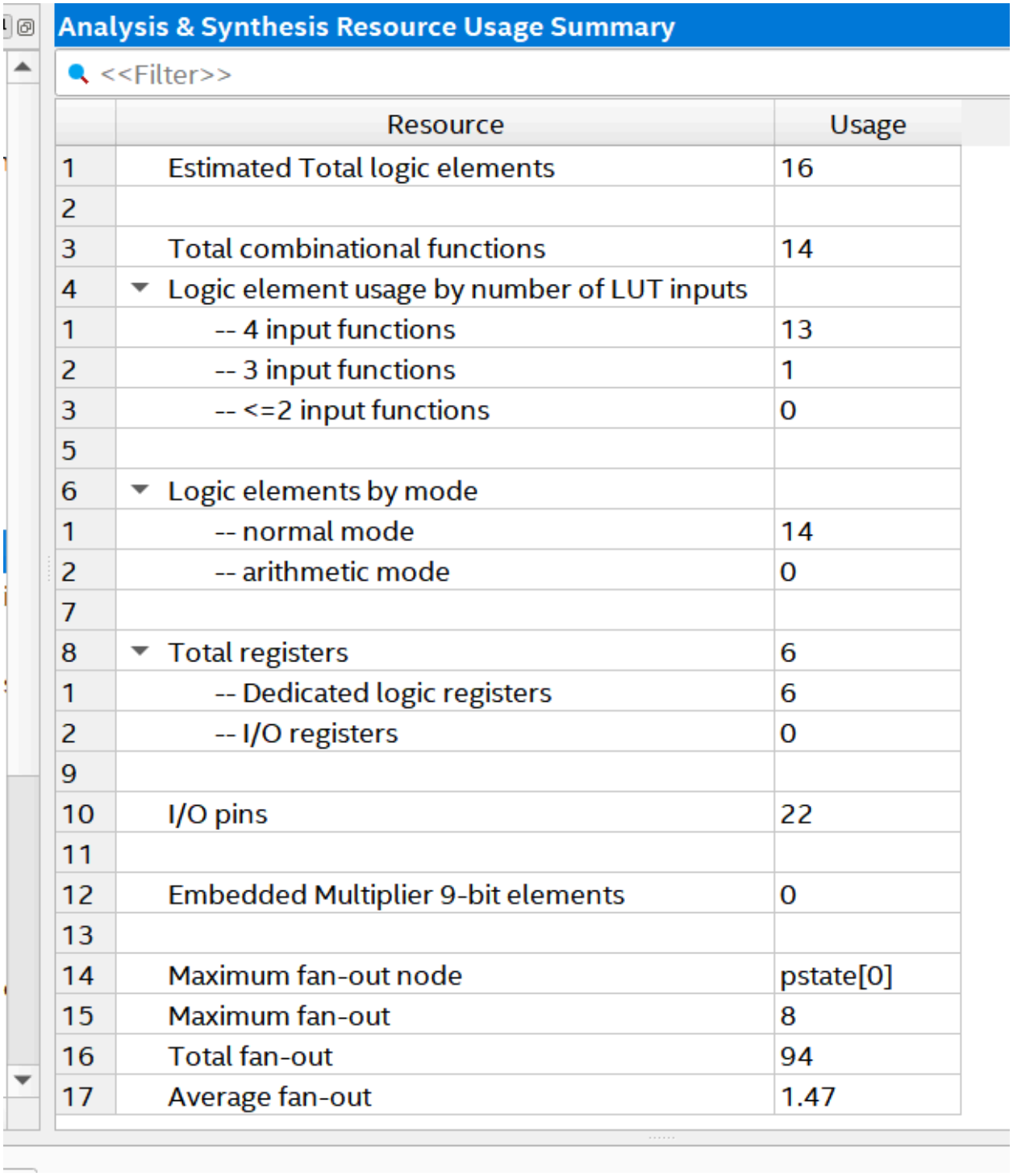
<<Filter>>

	Resource	Usage
1		
2	Total combinational functions	0
3	Logic element usage by number of LUT inputs	
1	-- 4 input functions	0
2	-- 3 input functions	0
3	-- <=2 input functions	0
4		
5	Logic elements by mode	
1	-- normal mode	0
2	-- arithmetic mode	0
6		
7	Total registers	0
1	-- Dedicated logic registers	0
2	-- I/O registers	0
8		
9	I/O pins	28
10	Total memory bits	8192
11		
12	Embedded Multiplier 9-bit elements	0
13		
14	Maximum fan-out node	wr~input
15	Maximum fan-out	8
16	Total fan-out	140
17	Average fan-out	2.19

TBU


File Edit View Tools Window Help
Search Intel FPGA
Page: 1 of 1
Netlist Navigator
tbu
tbu:1


tbu:1

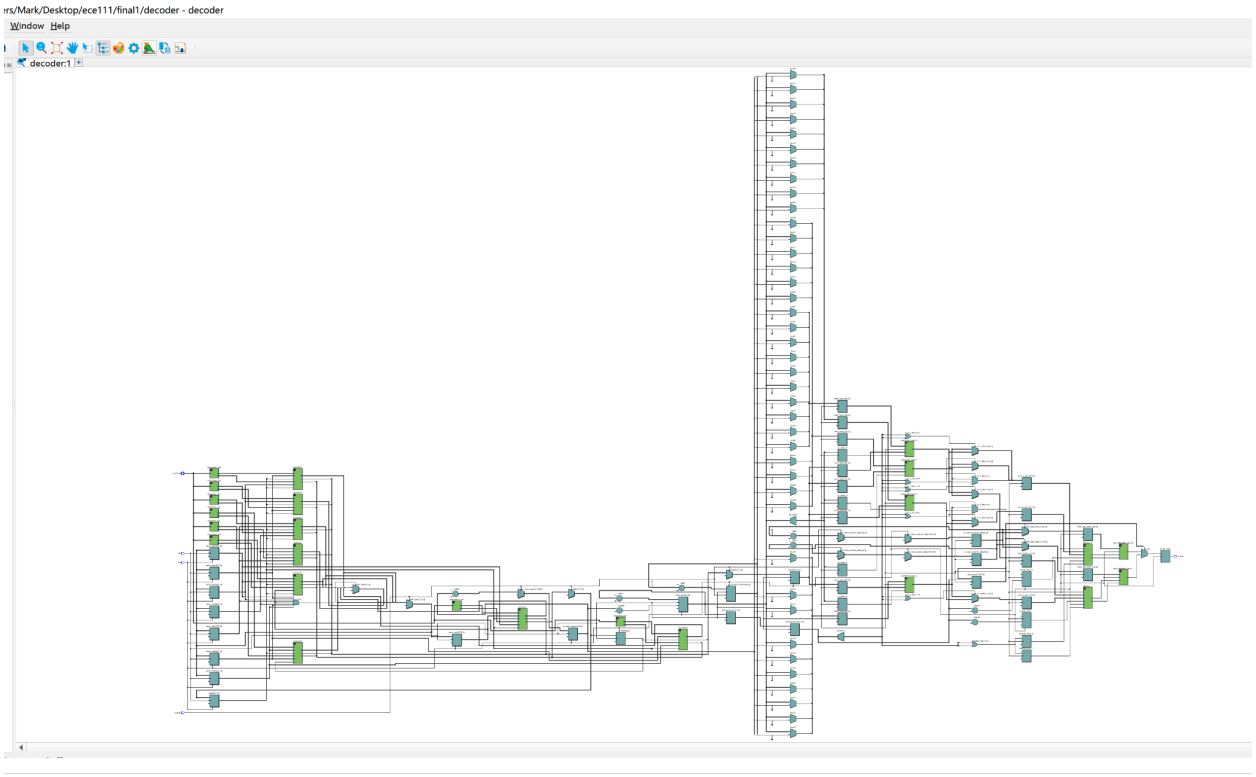


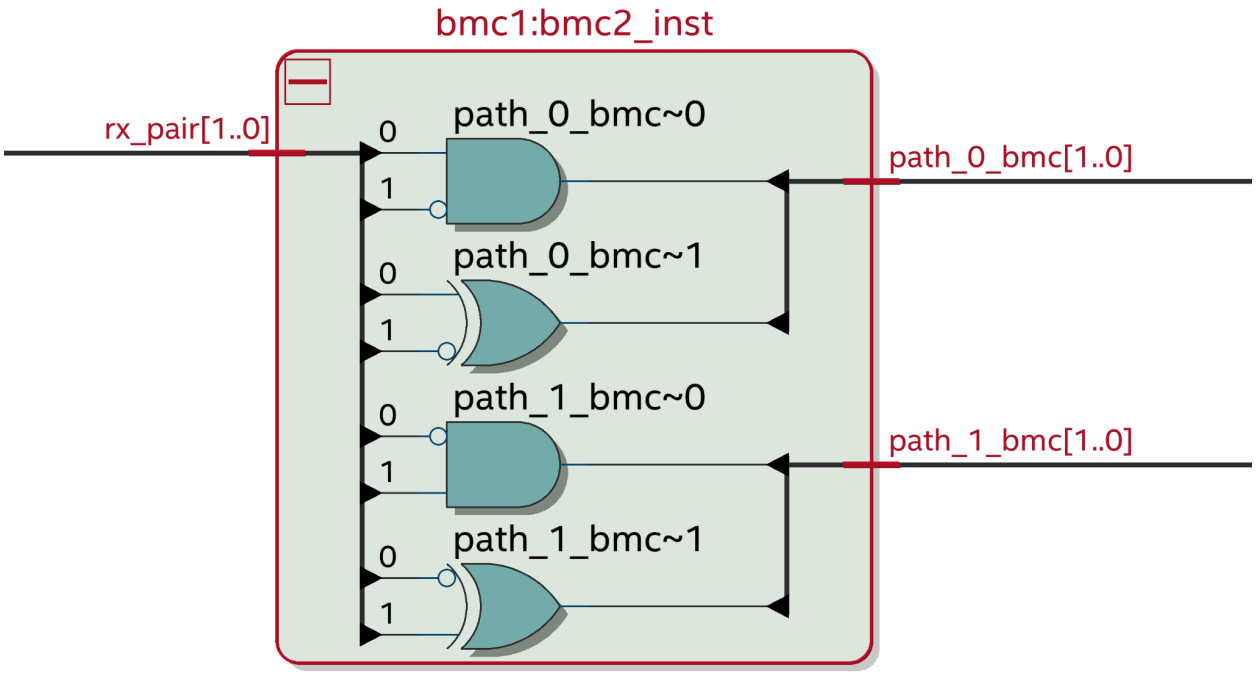
Analysis & Synthesis Resource Usage Summary

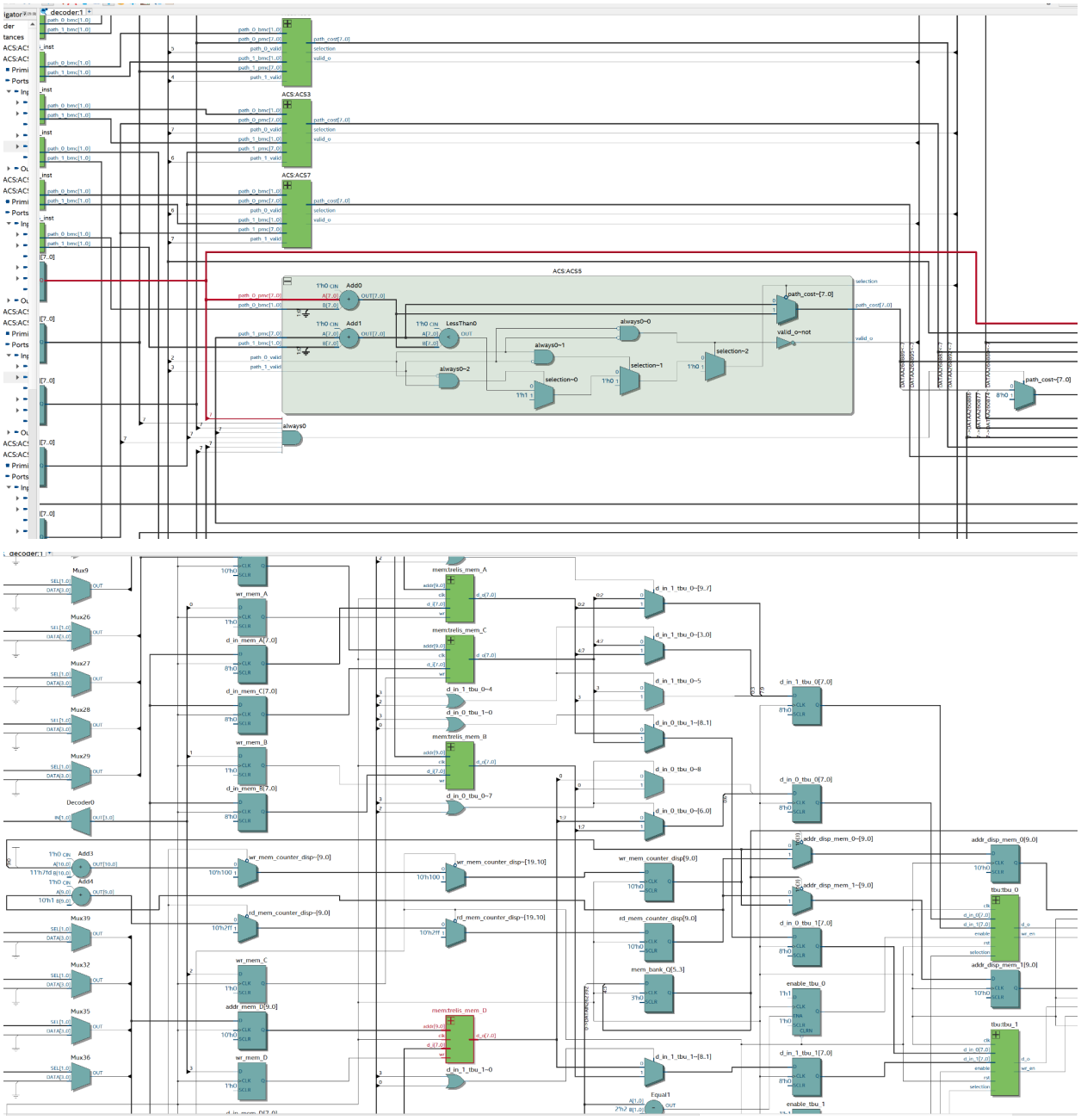
<<Filter>>

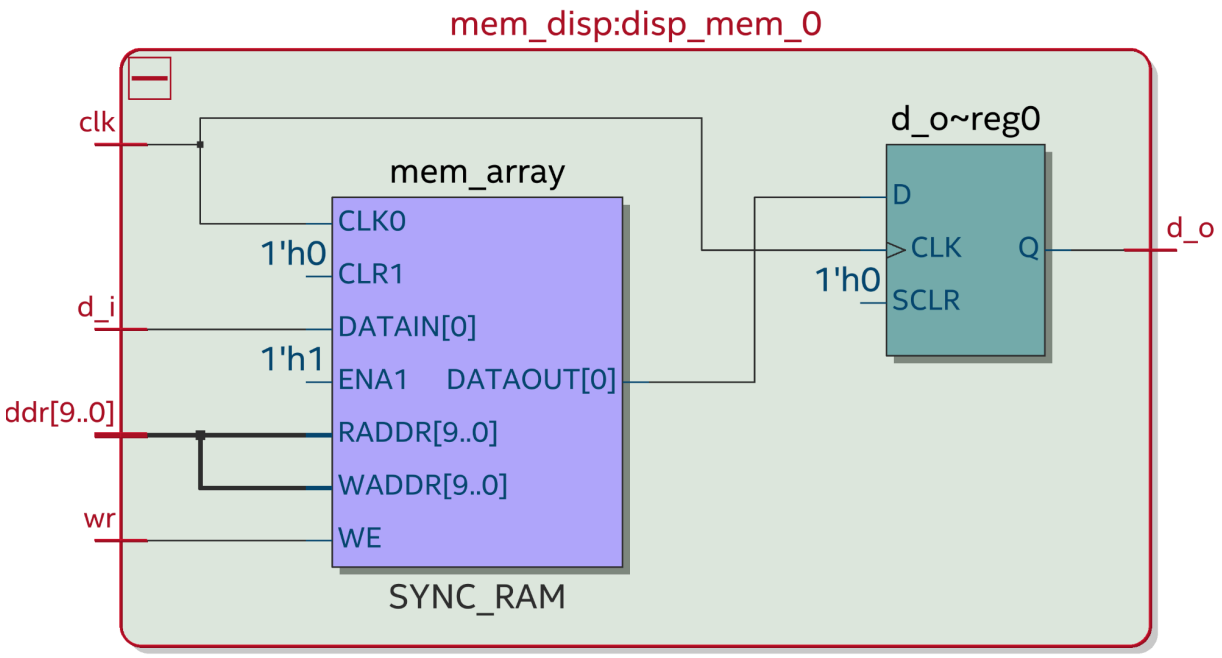
	Resource	Usage
1	Estimated Total logic elements	16
2		
3	Total combinational functions	14
4	▼ Logic element usage by number of LUT inputs	
1	-- 4 input functions	13
2	-- 3 input functions	1
3	-- <=2 input functions	0
5		
6	▼ Logic elements by mode	
1	-- normal mode	14
2	-- arithmetic mode	0
7		
8	▼ Total registers	6
1	-- Dedicated logic registers	6
2	-- I/O registers	0
9		
10	I/O pins	22
11		
12	Embedded Multiplier 9-bit elements	0
13		
14	Maximum fan-out node	pstate[0]
15	Maximum fan-out	8
16	Total fan-out	94
17	Average fan-out	1.47

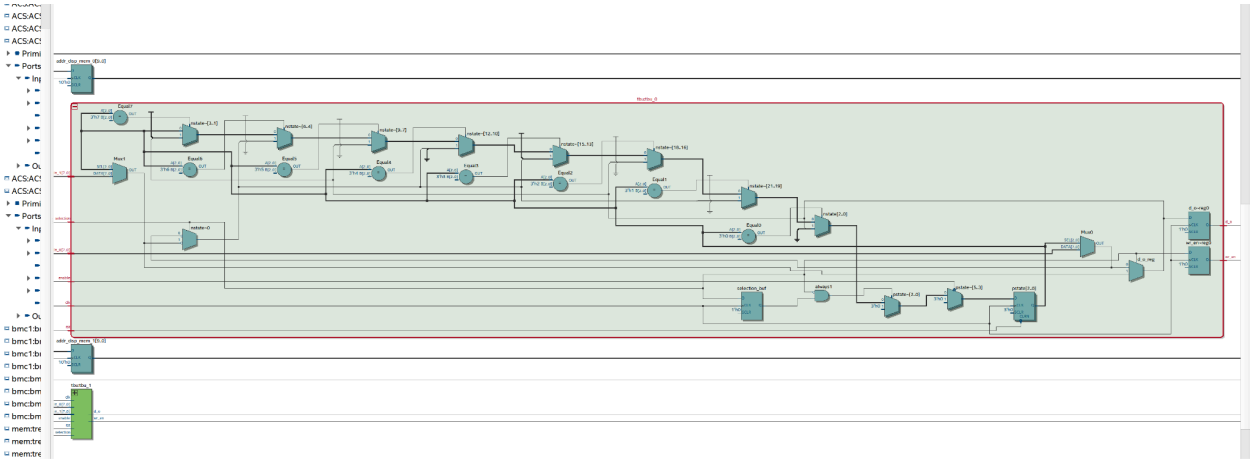
Decoder:

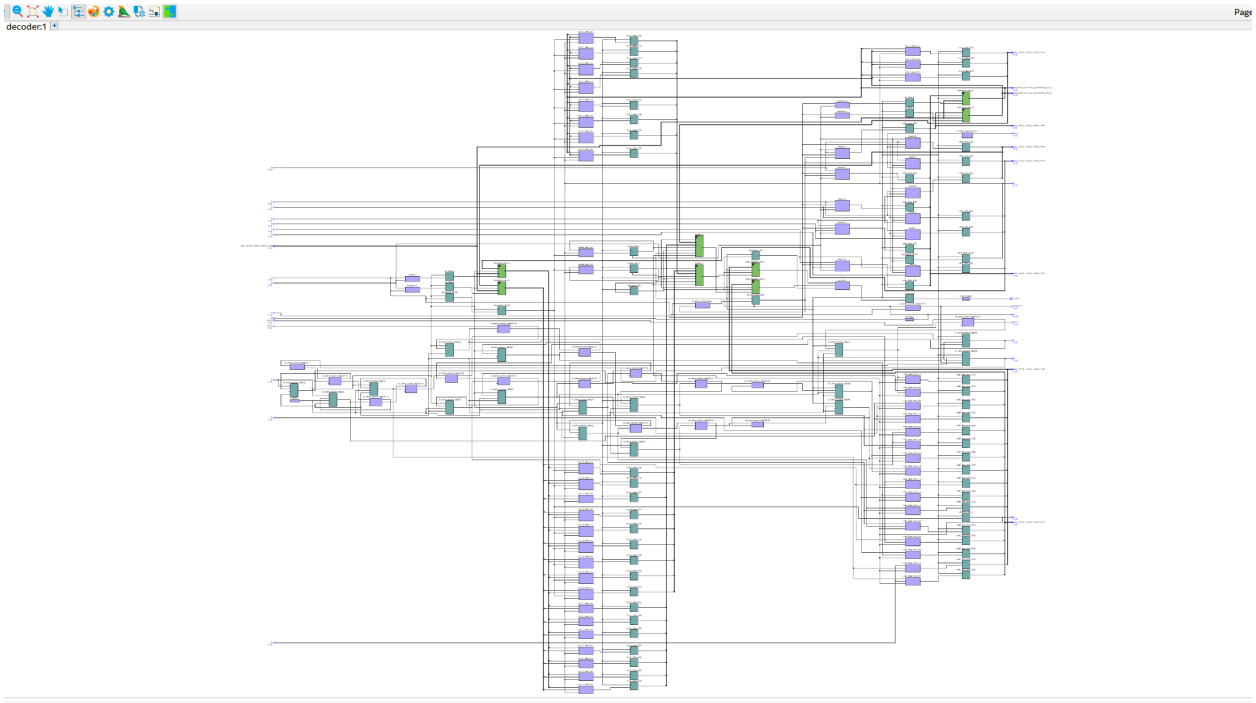

rs/Mark/Desktop/ece111/final1/decoder - decoder
Window Help
decoder:1

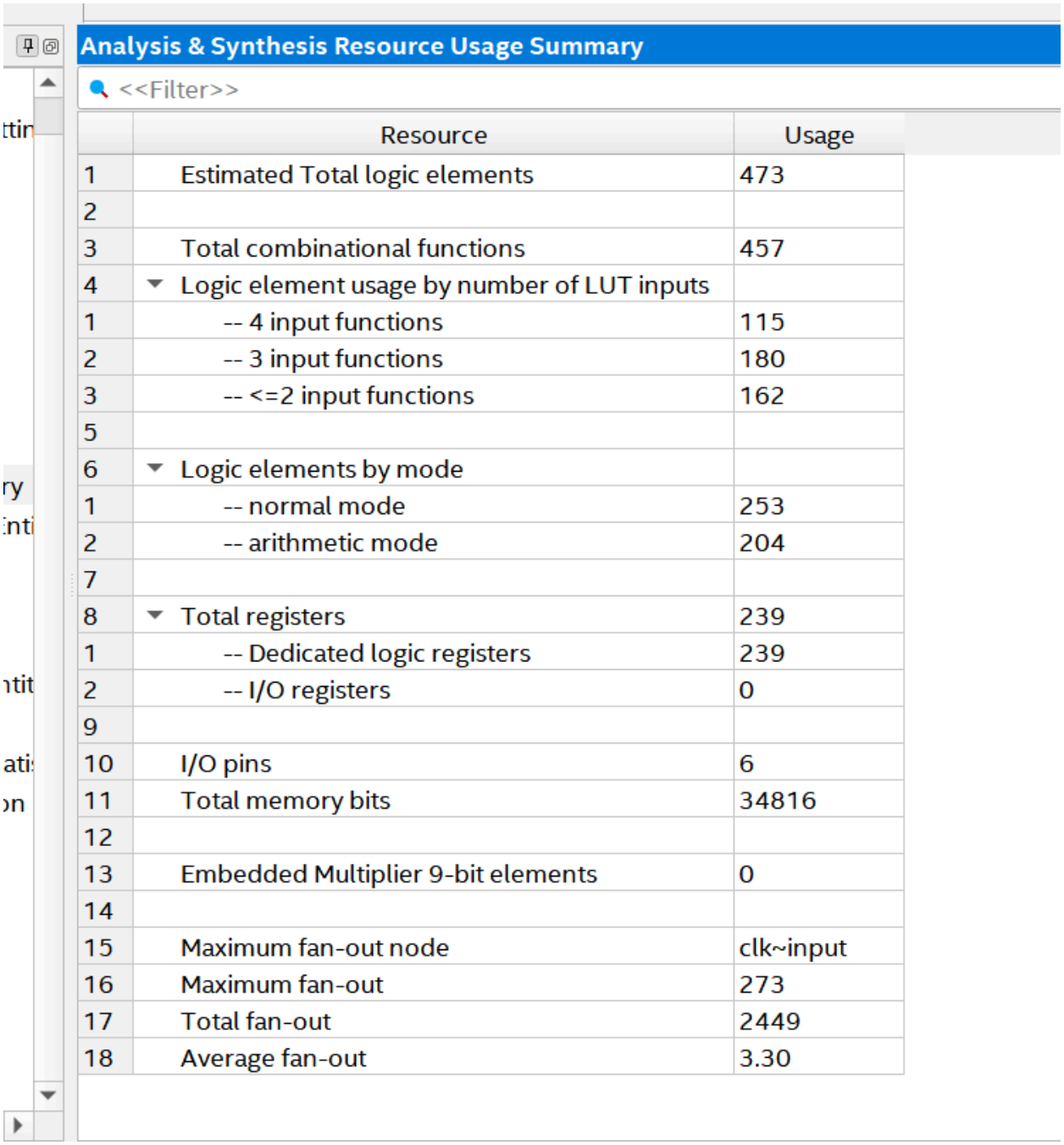

bmc1:bmc2_inst
rx_pair[1..0]
0
1
path_0_bmc~0
path_0_bmc~1
path_1_bmc~0
path_1_bmc~1
path_0_bmc[1..0]
path_1_bmc[1..0]


decoder:1
ACS:ACS3
ACS:ACS7
ACS:ACS5
Add0
Add1
LessThan0
path_cost~[7..0]
valid_o~not
always0~0
always0~1
always0~2
selection~0
selection~1
selection~2
always0
Mux9
Mux26
Mux27
Mux28
Mux29
Mux39
Mux32
Mux35
Mux36
Decoder0
Add3
Add4
wr_mem_A
wr_mem_B
wr_mem_C
wr_mem_D
d_in_mem_A[7..0]
d_in_mem_B[7..0]
d_in_mem_C[7..0]
addr_mem_D[9..0]
mem:trellis_mem_A
mem:trellis_mem_B
mem:trellis_mem_C
mem:trellis_mem_D
d_in_1_tbu_0~[9..7]
d_in_1_tbu_0~[3..0]
d_in_1_tbu_0~5
d_in_1_tbu_0~4
d_in_0_tbu_1~0
d_in_0_tbu_1~[8..1]
d_in_0_tbu_0~8
d_in_0_tbu_0~[6..0]
d_in_0_tbu_0~7
wr_mem_counter_disp~[9..0]
wr_mem_counter_disp~[19..10]
rd_mem_counter_disp~[9..0]
rd_mem_counter_disp~[19..10]
mem_bank_0[5..3]
addr_disp_mem_0~[9..0]
addr_disp_mem_1~[9..0]
d_in_0_tbu_0[7..0]
d_in_0_tbu_1[7..0]
d_in_1_tbu_0[7..0]
d_in_1_tbu_1[7..0]
enable_tbu_0
enable_tbu_1
tbu:tbu_0
tbu:tbu_1
Equal1


mem_disp:disp_mem_0
clk
d_i
ddr[9..0]
wr
mem_array
CLK0
1'h0
CLR1
DATAIN[0]
1'h1
ENA1
DATAOUT[0]
RADDR[9..0]
WADDR[9..0]
WE
SYNC_RAM
d_o~reg0
D
CLK
Q
1'h0
SCLR
d_o




decoder:1

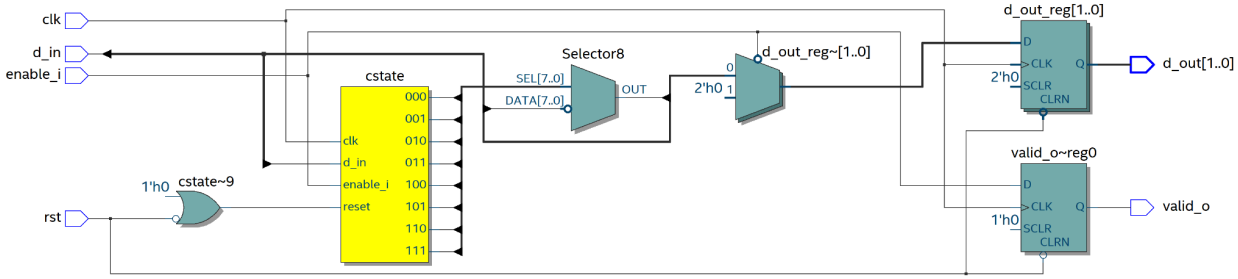


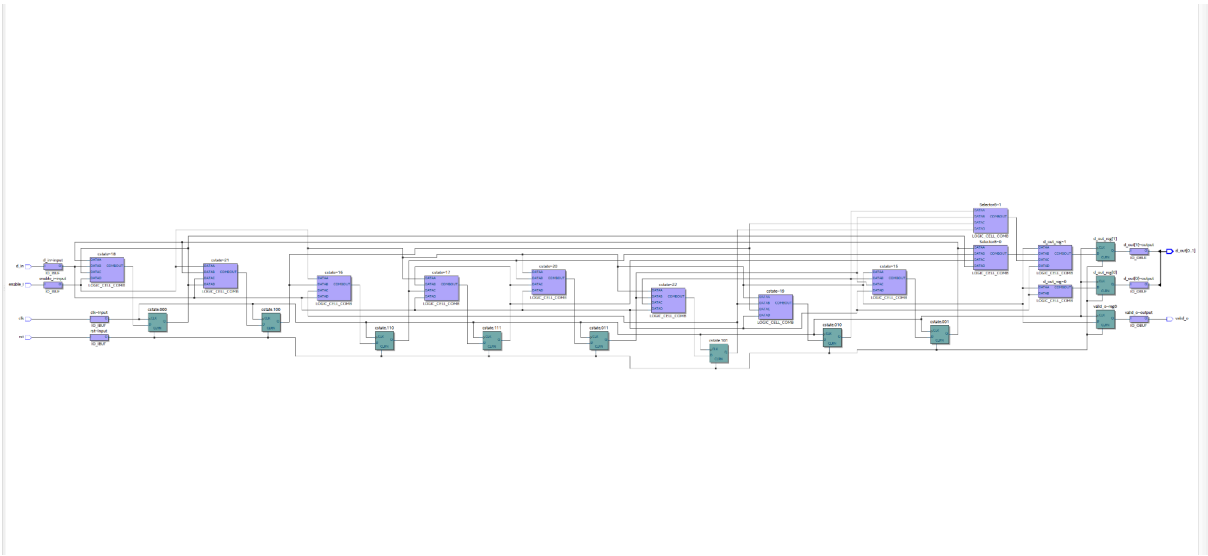
Analysis & Synthesis Resource Usage Summary

<<Filter>>

	Resource	Usage
1	Estimated Total logic elements	473
2		
3	Total combinational functions	457
4	▼ Logic element usage by number of LUT inputs	
1	-- 4 input functions	115
2	-- 3 input functions	180
3	-- <=2 input functions	162
5		
6	▼ Logic elements by mode	
1	-- normal mode	253
2	-- arithmetic mode	204
7		
8	▼ Total registers	239
1	-- Dedicated logic registers	239
2	-- I/O registers	0
9		
10	I/O pins	6
11	Total memory bits	34816
12		
13	Embedded Multiplier 9-bit elements	0
14		
15	Maximum fan-out node	clk~input
16	Maximum fan-out	273
17	Total fan-out	2449
18	Average fan-out	3.30

encode:

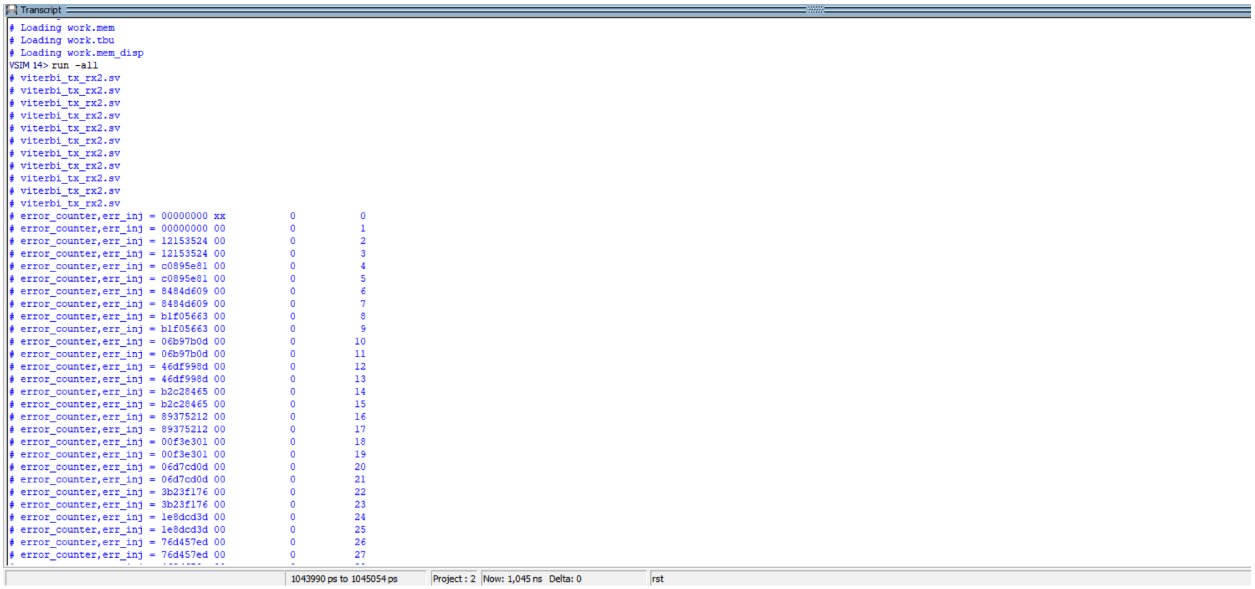

clk
d_in
enable_i
rst
1'h0
cstate~9
cstate
000
001
010
011
100
101
110
111
clk
d_in
enable_i
reset
Selector8
SEL[7..0]
DATA[7..0]
OUT
d_out_reg~[1..0]
0
2'h0
1
d_out_reg[1..0]
D
CLK
SCLR
CLRN
Q
2'h0
d_out[1..0]
valid_o~reg0
D
CLK
SCLR
CLRN
Q
1'h0
valid_o

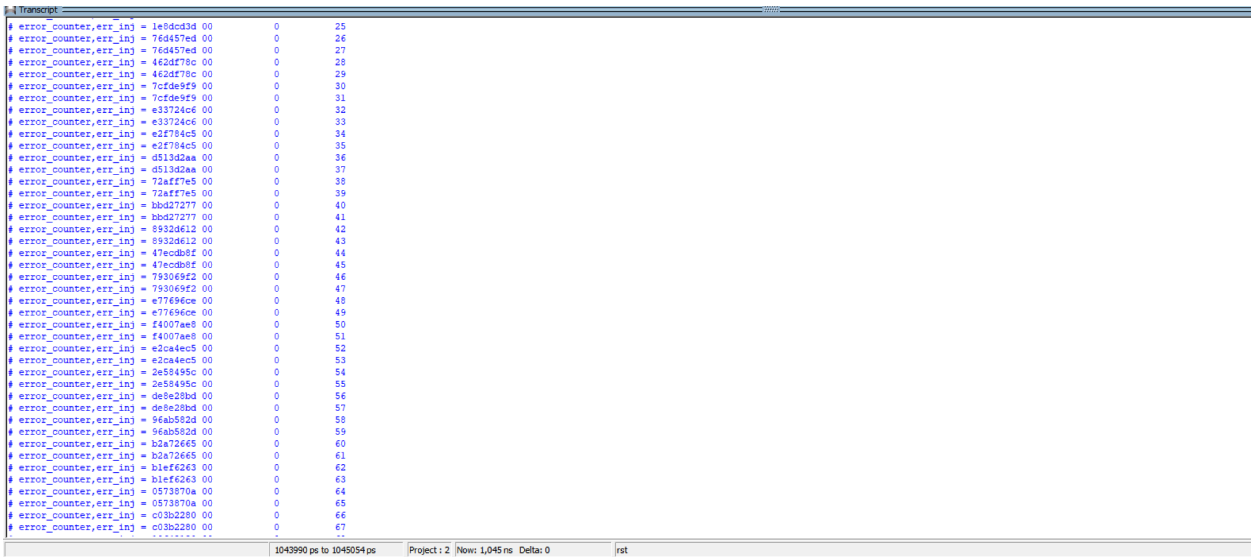


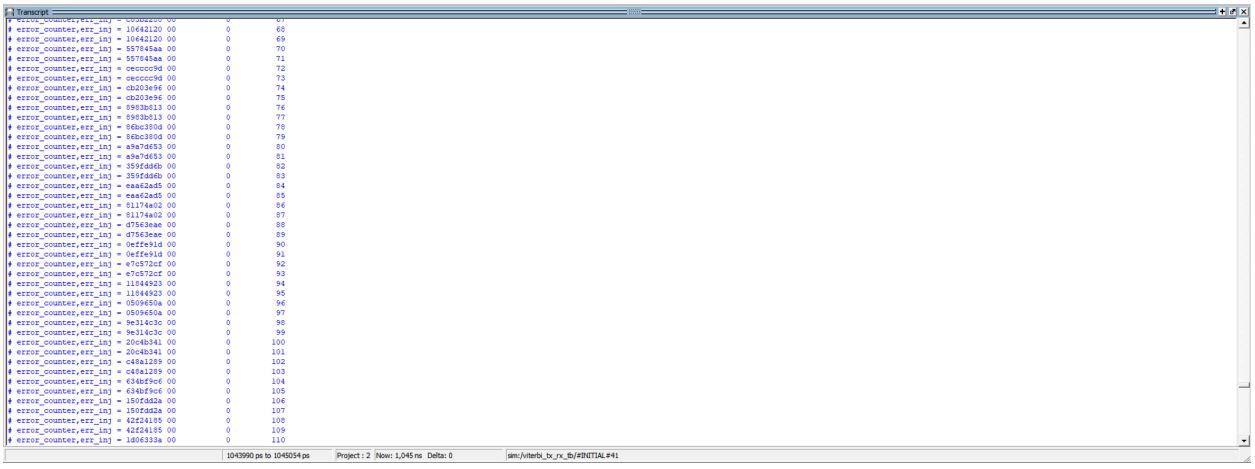
Analysis & Synthesis Resource Usage Summary

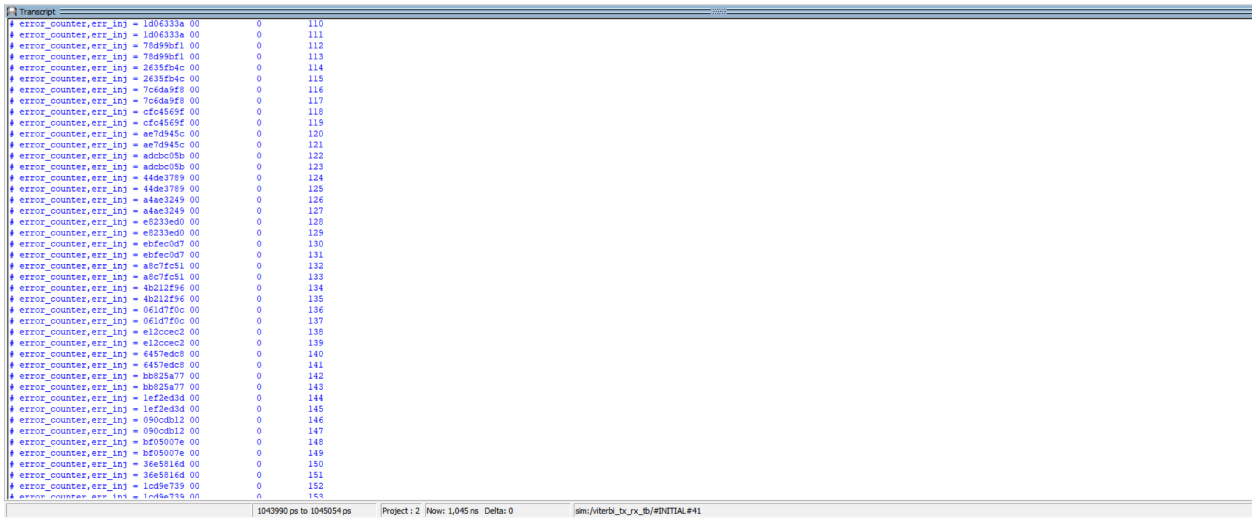
<<Filter>>

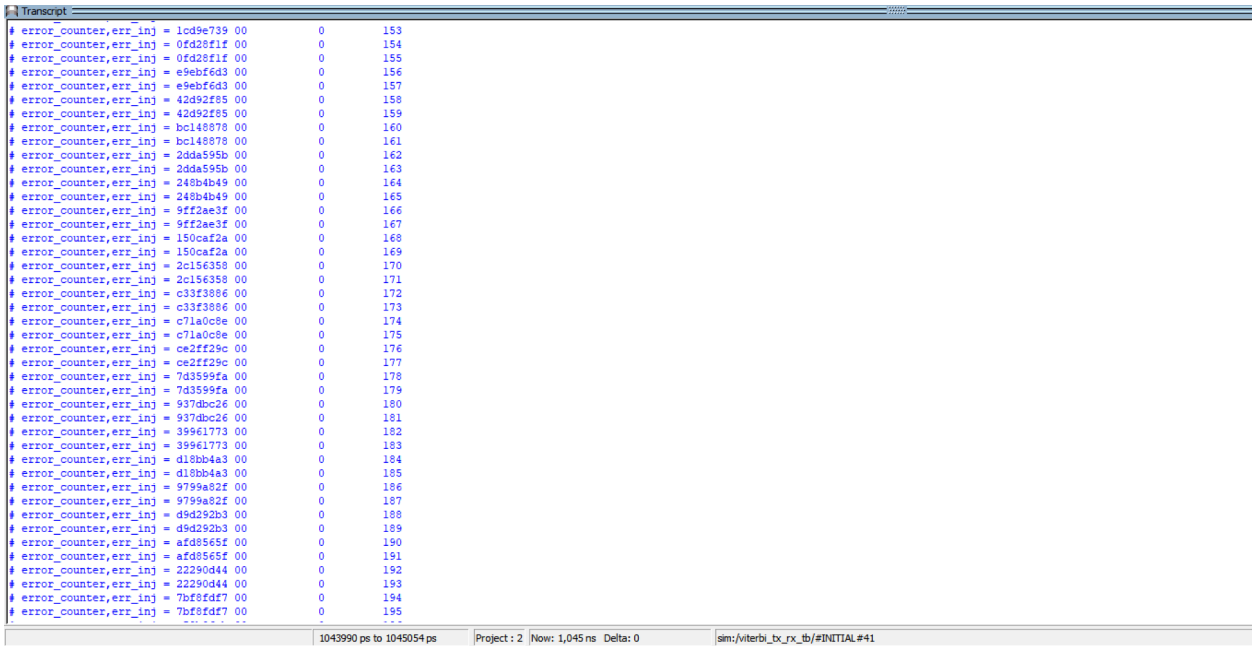
	Resource	Usage
1	Estimated Total logic elements	13
2		
3	Total combinational functions	12
4	▼ Logic element usage by number of LUT inputs	
1	-- 4 input functions	11
2	-- 3 input functions	0
3	-- <=2 input functions	1
5		
6	▼ Logic elements by mode	
1	-- normal mode	12
2	-- arithmetic mode	0
7		
8	▼ Total registers	11
1	-- Dedicated logic registers	11
2	-- I/O registers	0
9		
10	I/O pins	7
11		
12	Embedded Multiplier 9-bit elements	0
13		
14	Maximum fan-out node	enabl...input
15	Maximum fan-out	11
16	Total fan-out	89
17	Average fan-out	2.41


Transcript
Loading work.mem
Loading work.tbu
Loading work.mem_disp
VSIM 14> run -all
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
viterbi_tx_rx2.sv
error_counter,err_inj = 00000000 xx 0 0
error_counter,err_inj = 00000000 00 0 1
error_counter,err_inj = 12153524 00 0 2
error_counter,err_inj = 12153524 00 0 3
error_counter,err_inj = c0895e81 00 0 4
error_counter,err_inj = c0895e81 00 0 5
error_counter,err_inj = 8484d609 00 0 6
error_counter,err_inj = 8484d609 00 0 7
error_counter,err_inj = b1f05663 00 0 8
error_counter,err_inj = b1f05663 00 0 9
error_counter,err_inj = 06b97b0d 00 0 10
error_counter,err_inj = 06b97b0d 00 0 11
error_counter,err_inj = 46df998d 00 0 12
error_counter,err_inj = 46df998d 00 0 13
error_counter,err_inj = b2c28465 00 0 14
error_counter,err_inj = b2c28465 00 0 15
error_counter,err_inj = 89375212 00 0 16
error_counter,err_inj = 89375212 00 0 17
error_counter,err_inj = 00f3e301 00 0 18
error_counter,err_inj = 00f3e301 00 0 19
error_counter,err_inj = 06d7cd0d 00 0 20
error_counter,err_inj = 06d7cd0d 00 0 21
error_counter,err_inj = 3b23f176 00 0 22
error_counter,err_inj = 3b23f176 00 0 23
error_counter,err_inj = 1e8dcd3d 00 0 24
error_counter,err_inj = 1e8dcd3d 00 0 25
error_counter,err_inj = 76d457ed 00 0 26
error_counter,err_inj = 76d457ed 00 0 27
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
rst


Transcript
error_counter,err_inj = 1e8dcd3d 00 0 25
error_counter,err_inj = 76d457ed 00 0 26
error_counter,err_inj = 76d457ed 00 0 27
error_counter,err_inj = 462df78c 00 0 28
error_counter,err_inj = 462df78c 00 0 29
error_counter,err_inj = 7cfde9f9 00 0 30
error_counter,err_inj = 7cfde9f9 00 0 31
error_counter,err_inj = e33724c6 00 0 32
error_counter,err_inj = e33724c6 00 0 33
error_counter,err_inj = e2f784c5 00 0 34
error_counter,err_inj = e2f784c5 00 0 35
error_counter,err_inj = d513d2aa 00 0 36
error_counter,err_inj = d513d2aa 00 0 37
error_counter,err_inj = 72aff7e5 00 0 38
error_counter,err_inj = 72aff7e5 00 0 39
error_counter,err_inj = bbd27277 00 0 40
error_counter,err_inj = bbd27277 00 0 41
error_counter,err_inj = 8932d612 00 0 42
error_counter,err_inj = 8932d612 00 0 43
error_counter,err_inj = 47ecdb8f 00 0 44
error_counter,err_inj = 47ecdb8f 00 0 45
error_counter,err_inj = 793069f2 00 0 46
error_counter,err_inj = 793069f2 00 0 47
error_counter,err_inj = e77696ce 00 0 48
error_counter,err_inj = e77696ce 00 0 49
error_counter,err_inj = f4007ae8 00 0 50
error_counter,err_inj = f4007ae8 00 0 51
error_counter,err_inj = e2ca4ec5 00 0 52
error_counter,err_inj = e2ca4ec5 00 0 53
error_counter,err_inj = 2e58495c 00 0 54
error_counter,err_inj = 2e58495c 00 0 55
error_counter,err_inj = de8e28bd 00 0 56
error_counter,err_inj = de8e28bd 00 0 57
error_counter,err_inj = 96ab582d 00 0 58
error_counter,err_inj = 96ab582d 00 0 59
error_counter,err_inj = b2a72665 00 0 60
error_counter,err_inj = b2a72665 00 0 61
error_counter,err_inj = b1ef6263 00 0 62
error_counter,err_inj = b1ef6263 00 0 63
error_counter,err_inj = 0573870a 00 0 64
error_counter,err_inj = 0573870a 00 0 65
error_counter,err_inj = c03b2280 00 0 66
error_counter,err_inj = c03b2280 00 0 67
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
rst


Transcript
error_counter,err_inj = 10642120 00 0 68
error_counter,err_inj = 10642120 00 0 69
error_counter,err_inj = 557845aa 00 0 70
error_counter,err_inj = 557845aa 00 0 71
error_counter,err_inj = ceccccd 00 0 72
error_counter,err_inj = ceccccd 00 0 73
error_counter,err_inj = cb203e96 00 0 74
error_counter,err_inj = cb203e96 00 0 75
error_counter,err_inj = 8983b813 00 0 76
error_counter,err_inj = 8983b813 00 0 77
error_counter,err_inj = 86bc380d 00 0 78
error_counter,err_inj = 86bc380d 00 0 79
error_counter,err_inj = a9a7d653 00 0 80
error_counter,err_inj = a9a7d653 00 0 81
error_counter,err_inj = 359fdd6b 00 0 82
error_counter,err_inj = 359fdd6b 00 0 83
error_counter,err_inj = eaa62ad5 00 0 84
error_counter,err_inj = eaa62ad5 00 0 85
error_counter,err_inj = 81174a02 00 0 86
error_counter,err_inj = 81174a02 00 0 87
error_counter,err_inj = d7563eae 00 0 88
error_counter,err_inj = d7563eae 00 0 89
error_counter,err_inj = 0effe91d 00 0 90
error_counter,err_inj = 0effe91d 00 0 91
error_counter,err_inj = e7c572cf 00 0 92
error_counter,err_inj = e7c572cf 00 0 93
error_counter,err_inj = 11844923 00 0 94
error_counter,err_inj = 11844923 00 0 95
error_counter,err_inj = 0509650a 00 0 96
error_counter,err_inj = 0509650a 00 0 97
error_counter,err_inj = 9e314c3c 00 0 98
error_counter,err_inj = 9e314c3c 00 0 99
error_counter,err_inj = 20c4b341 00 0 100
error_counter,err_inj = 20c4b341 00 0 101
error_counter,err_inj = c48a1289 00 0 102
error_counter,err_inj = c48a1289 00 0 103
error_counter,err_inj = 634bf9c6 00 0 104
error_counter,err_inj = 634bf9c6 00 0 105
error_counter,err_inj = 150fdd2a 00 0 106
error_counter,err_inj = 150fdd2a 00 0 107
error_counter,err_inj = 42f24185 00 0 108
error_counter,err_inj = 42f24185 00 0 109
error_counter,err_inj = 1d06333a 00 0 110
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41


Transcript
error_counter,err_inj = 1d06333a 00 0 110
error_counter,err_inj = 1d06333a 00 0 111
error_counter,err_inj = 7fd99bf1 00 0 112
error_counter,err_inj = 7fd99bf1 00 0 113
error_counter,err_inj = 2635fb4c 00 0 114
error_counter,err_inj = 2635fb4c 00 0 115
error_counter,err_inj = 7c6da9f8 00 0 116
error_counter,err_inj = 7c6da9f8 00 0 117
error_counter,err_inj = cfc4569f 00 0 118
error_counter,err_inj = cfc4569f 00 0 119
error_counter,err_inj = ae7d945c 00 0 120
error_counter,err_inj = ae7d945c 00 0 121
error_counter,err_inj = adcbc05b 00 0 122
error_counter,err_inj = adcbc05b 00 0 123
error_counter,err_inj = 44de3789 00 0 124
error_counter,err_inj = 44de3789 00 0 125
error_counter,err_inj = a4ae3249 00 0 126
error_counter,err_inj = a4ae3249 00 0 127
error_counter,err_inj = e8233ed0 00 0 128
error_counter,err_inj = e8233ed0 00 0 129
error_counter,err_inj = ebfec0d7 00 0 130
error_counter,err_inj = ebfec0d7 00 0 131
error_counter,err_inj = a8c7fc51 00 0 132
error_counter,err_inj = a8c7fc51 00 0 133
error_counter,err_inj = 4b212f96 00 0 134
error_counter,err_inj = 4b212f96 00 0 135
error_counter,err_inj = 061d7f0c 00 0 136
error_counter,err_inj = 061d7f0c 00 0 137
error_counter,err_inj = e12ccec2 00 0 138
error_counter,err_inj = e12ccec2 00 0 139
error_counter,err_inj = 6457edc8 00 0 140
error_counter,err_inj = 6457edc8 00 0 141
error_counter,err_inj = bb825a77 00 0 142
error_counter,err_inj = bb825a77 00 0 143
error_counter,err_inj = 1ef2ed3d 00 0 144
error_counter,err_inj = 1ef2ed3d 00 0 145
error_counter,err_inj = 090cdb12 00 0 146
error_counter,err_inj = 090cdb12 00 0 147
error_counter,err_inj = bf05007e 00 0 148
error_counter,err_inj = bf05007e 00 0 149
error_counter,err_inj = 36e5816d 00 0 150
error_counter,err_inj = 36e5816d 00 0 151
error_counter,err_inj = 1cd9e739 00 0 152
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41


Transcript
error_counter,err_inj = 1cd9e739 00 0 153
error_counter,err_inj = 0fd28f1f 00 0 154
error_counter,err_inj = 0fd28f1f 00 0 155
error_counter,err_inj = e9ebf6d3 00 0 156
error_counter,err_inj = e9ebf6d3 00 0 157
error_counter,err_inj = 42d92f85 00 0 158
error_counter,err_inj = 42d92f85 00 0 159
error_counter,err_inj = bc148878 00 0 160
error_counter,err_inj = bc148878 00 0 161
error_counter,err_inj = 2dda595b 00 0 162
error_counter,err_inj = 2dda595b 00 0 163
error_counter,err_inj = 248b4b49 00 0 164
error_counter,err_inj = 248b4b49 00 0 165
error_counter,err_inj = 9ff2ae3f 00 0 166
error_counter,err_inj = 9ff2ae3f 00 0 167
error_counter,err_inj = 150caf2a 00 0 168
error_counter,err_inj = 150caf2a 00 0 169
error_counter,err_inj = 2c156358 00 0 170
error_counter,err_inj = 2c156358 00 0 171
error_counter,err_inj = c33f3886 00 0 172
error_counter,err_inj = c33f3886 00 0 173
error_counter,err_inj = c71a0c8e 00 0 174
error_counter,err_inj = c71a0c8e 00 0 175
error_counter,err_inj = ce2ff29c 00 0 176
error_counter,err_inj = ce2ff29c 00 0 177
error_counter,err_inj = 7d3599fa 00 0 178
error_counter,err_inj = 7d3599fa 00 0 179
error_counter,err_inj = 937dbc26 00 0 180
error_counter,err_inj = 937dbc26 00 0 181
error_counter,err_inj = 39961773 00 0 182
error_counter,err_inj = 39961773 00 0 183
error_counter,err_inj = d18bb4a3 00 0 184
error_counter,err_inj = d18bb4a3 00 0 185
error_counter,err_inj = 9799a82f 00 0 186
error_counter,err_inj = 9799a82f 00 0 187
error_counter,err_inj = d9d292b3 00 0 188
error_counter,err_inj = d9d292b3 00 0 189
error_counter,err_inj = afd8565f 00 0 190
error_counter,err_inj = afd8565f 00 0 191
error_counter,err_inj = 22290d44 00 0 192
error_counter,err_inj = 22290d44 00 0 193
error_counter,err_inj = 7bf8fdf7 00 0 194
error_counter,err_inj = 7bf8fdf7 00 0 195
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41

Transcript

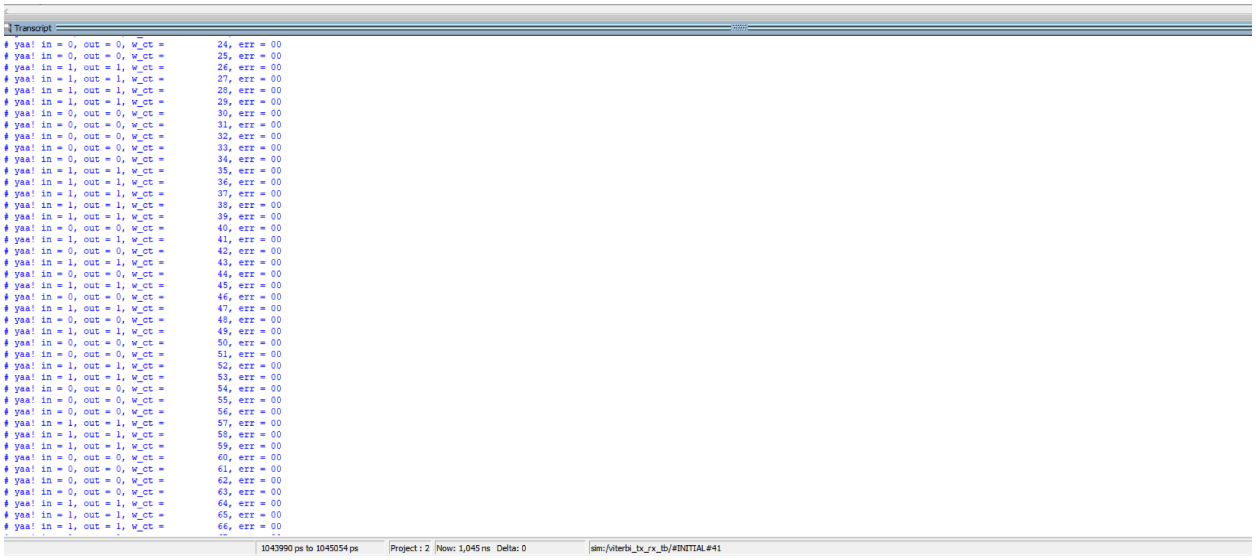
```
# error_counter,err_inj = e59b36cb 00          0          196
# error_counter,err_inj = e59b36cb 00          0          197
# error_counter,err_inj = f3091ae6 00          0          198
# error_counter,err_inj = f3091ae6 00          0          199
# error_counter,err_inj = 2d28db5a 00          0          200
# error_counter,err_inj = 2d28db5a 00          0          201
# error_counter,err_inj = 14cfc129 00          0          202
# error_counter,err_inj = 14cfc129 00          0          203
# error_counter,err_inj = f682e2ed 00          0          204
# error_counter,err_inj = f682e2ed 00          0          205
# error_counter,err_inj = ed536cda 00          0          206
# error_counter,err_inj = ed536cda 00          0          207
# error_counter,err_inj = b29fb665 00          0          208
# error_counter,err_inj = b29fb665 00          0          209
# error_counter,err_inj = da8ae2b5 00          0          210
# error_counter,err_inj = da8ae2b5 00          0          211
# error_counter,err_inj = efbe94df 00          0          212
# error_counter,err_inj = efbe94df 00          0          213
# error_counter,err_inj = 3cf11979 00          0          214
# error_counter,err_inj = 3cf11979 00          0          215
# error_counter,err_inj = 2231ff44 00          0          216
# error_counter,err_inj = 2231ff44 00          0          217
# error_counter,err_inj = e8740cd0 00          0          218
# error_counter,err_inj = e8740cd0 00          0          219
# error_counter,err_inj = 15090b2a 00          0          220
# error_counter,err_inj = 15090b2a 00          0          221
# error_counter,err_inj = 55f6adab 00          0          222
# error_counter,err_inj = 55f6adab 00          0          223
# error_counter,err_inj = 076fcf0e 00          0          224
# error_counter,err_inj = 076fcf0e 00          0          225
# error_counter,err_inj = 6e5daddc 00          0          226
# error_counter,err_inj = 6e5daddc 00          0          227
# error_counter,err_inj = cd5ebc9a 00          0          228
# error_counter,err_inj = cd5ebc9a 00          0          229
# error_counter,err_inj = fedf72fd 00          0          230
# error_counter,err_inj = fedf72fd 00          0          231
# error_counter,err_inj = e1f102c3 00          0          232
# error_counter,err_inj = e1f102c3 00          0          233
# error_counter,err_inj = 2b0eed56 00          0          234
# error_counter,err_inj = 2b0eed56 00          0          235
# error_counter,err_inj = 2779e94e 00          0          236
# error_counter,err_inj = 2779e94e 00          0          237
# error_counter,err_inj = b3d97667 00          0          238
```

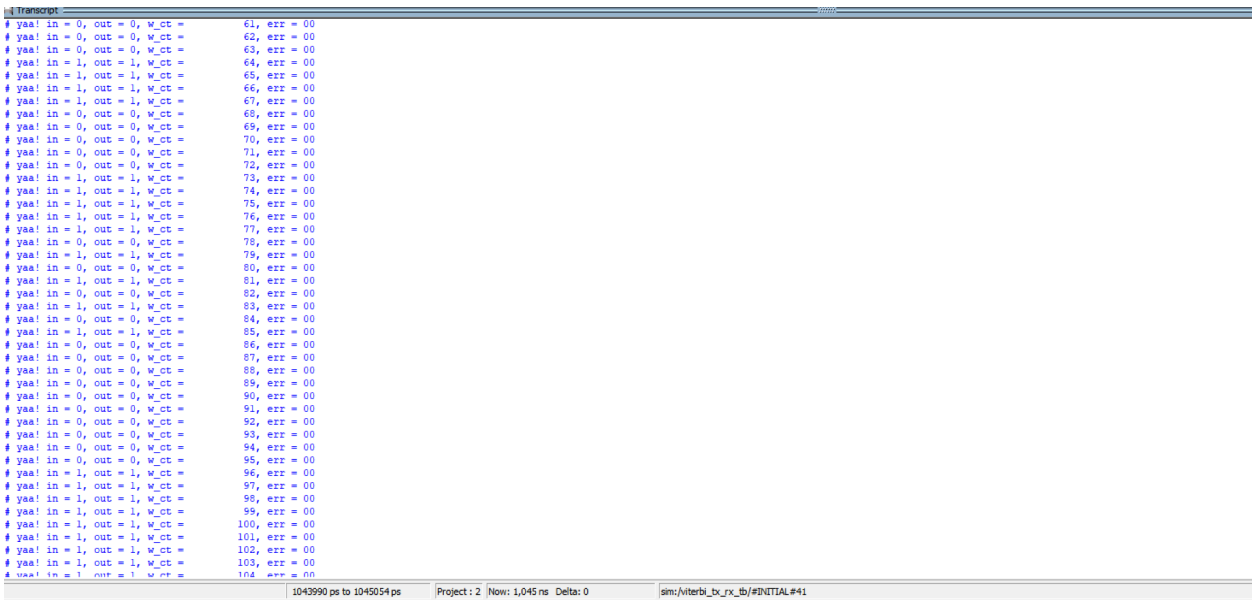
1043990 ps to 1045054 ps | Project : 2 | Now: 1,045 ns Delta: 0 | sim:/viterbi_tx_rx_tb/#INITIAL#41

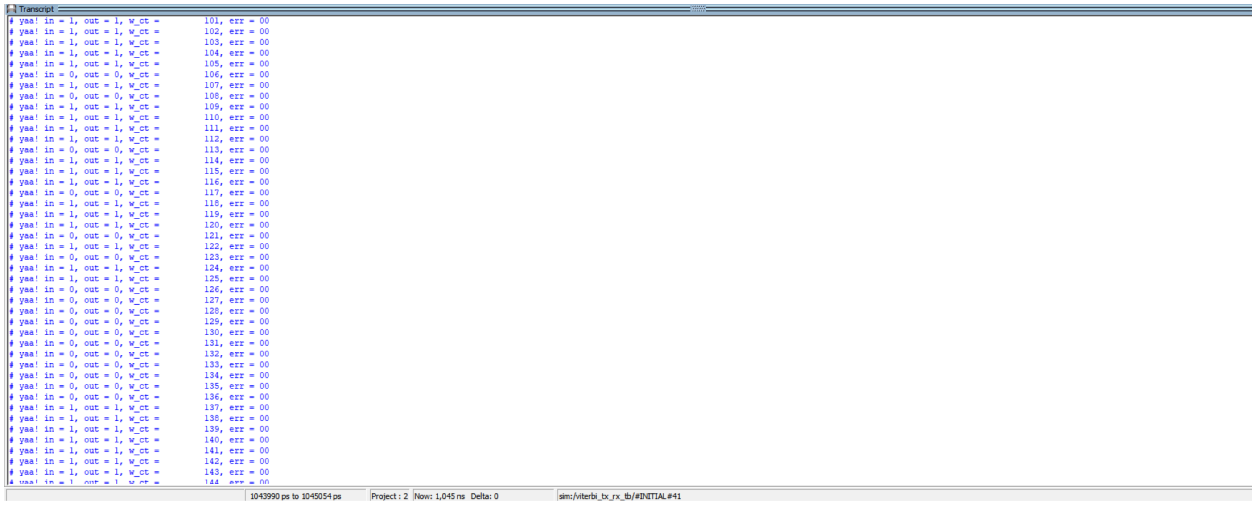
Transcript

```
# error_counter,err_inj = b3d97667 00          0          238
# error_counter,err_inj = b3d97667 00          0          239
# error_counter,err_inj = 8531340a 00          0          240
# error_counter,err_inj = 8531340a 00          0          241
# error_counter,err_inj = 5b6fb9b6 00          0          242
# error_counter,err_inj = 5b6fb9b6 00          0          243
# error_counter,err_inj = 9c0e8a38 00          0          244
# error_counter,err_inj = 9c0e8a38 00          0          245
# error_counter,err_inj = 3cd18779 00          0          246
# error_counter,err_inj = 3cd18779 00          0          247
# error_counter,err_inj = dc2bc4b8 00          0          248
# error_counter,err_inj = dc2bc4b8 00          0          249
# error_counter,err_inj = 4a74bf94 00          0          250
# error_counter,err_inj = 4a74bf94 00          0          251
# error_counter,err_inj = 49c65d93 00          0          252
# error_counter,err_inj = 49c65d93 00          0          253
# error_counter,err_inj = 823f2c04 00          0          254
# error_counter,err_inj = 823f2c04 00          0          255
# word_count =       10440
# yaa! in = 0, out = 0, w_ct =          0, err = 00
# yaa! in = 0, out = 0, w_ct =          1, err = 00
# yaa! in = 0, out = 0, w_ct =          2, err = 00
# yaa! in = 0, out = 0, w_ct =          3, err = 00
# yaa! in = 0, out = 0, w_ct =          4, err = 00
# yaa! in = 0, out = 0, w_ct =          5, err = 00
# yaa! in = 0, out = 0, w_ct =          6, err = 00
# yaa! in = 0, out = 0, w_ct =          7, err = 00
# yaa! in = 0, out = 0, w_ct =          8, err = 00
# yaa! in = 0, out = 0, w_ct =          9, err = 00
# yaa! in = 0, out = 0, w_ct =         10, err = 00
# yaa! in = 1, out = 1, w_ct =         11, err = 00
# yaa! in = 0, out = 0, w_ct =         12, err = 00
# yaa! in = 0, out = 0, w_ct =         13, err = 00
# yaa! in = 1, out = 1, w_ct =         14, err = 00
# yaa! in = 1, out = 1, w_ct =         15, err = 00
# yaa! in = 0, out = 0, w_ct =         16, err = 00
# yaa! in = 0, out = 0, w_ct =         17, err = 00
# yaa! in = 0, out = 0, w_ct =         18, err = 00
# yaa! in = 1, out = 1, w_ct =         19, err = 00
# yaa! in = 1, out = 1, w_ct =         20, err = 00
# yaa! in = 1, out = 1, w_ct =         21, err = 00
# yaa! in = 0, out = 0, w_ct =         22, err = 00
# yaa! in = 0, out = 0, w_ct =         23, err = 00
# yaa! in = 0, out = 0, w_ct =         24, err = 00
```

1043990 ps to 1045054 ps | Project : 2 | Now: 1,045 ns Delta: 0 | sim:/viterbi_tx_rx_tb/#INITIAL#41


Transcript
yaa! in = 0, out = 0, w_ct = 24, err = 00
yaa! in = 0, out = 0, w_ct = 25, err = 00
yaa! in = 1, out = 1, w_ct = 26, err = 00
yaa! in = 1, out = 1, w_ct = 27, err = 00
yaa! in = 1, out = 1, w_ct = 28, err = 00
yaa! in = 1, out = 1, w_ct = 29, err = 00
yaa! in = 0, out = 0, w_ct = 30, err = 00
yaa! in = 0, out = 0, w_ct = 31, err = 00
yaa! in = 0, out = 0, w_ct = 32, err = 00
yaa! in = 0, out = 0, w_ct = 33, err = 00
yaa! in = 0, out = 0, w_ct = 34, err = 00
yaa! in = 1, out = 1, w_ct = 35, err = 00
yaa! in = 1, out = 1, w_ct = 36, err = 00
yaa! in = 1, out = 1, w_ct = 37, err = 00
yaa! in = 1, out = 1, w_ct = 38, err = 00
yaa! in = 1, out = 1, w_ct = 39, err = 00
yaa! in = 0, out = 0, w_ct = 40, err = 00
yaa! in = 1, out = 1, w_ct = 41, err = 00
yaa! in = 0, out = 0, w_ct = 42, err = 00
yaa! in = 1, out = 1, w_ct = 43, err = 00
yaa! in = 0, out = 0, w_ct = 44, err = 00
yaa! in = 1, out = 1, w_ct = 45, err = 00
yaa! in = 0, out = 0, w_ct = 46, err = 00
yaa! in = 1, out = 1, w_ct = 47, err = 00
yaa! in = 0, out = 0, w_ct = 48, err = 00
yaa! in = 1, out = 1, w_ct = 49, err = 00
yaa! in = 0, out = 0, w_ct = 50, err = 00
yaa! in = 0, out = 0, w_ct = 51, err = 00
yaa! in = 1, out = 1, w_ct = 52, err = 00
yaa! in = 1, out = 1, w_ct = 53, err = 00
yaa! in = 0, out = 0, w_ct = 54, err = 00
yaa! in = 0, out = 0, w_ct = 55, err = 00
yaa! in = 0, out = 0, w_ct = 56, err = 00
yaa! in = 1, out = 1, w_ct = 57, err = 00
yaa! in = 1, out = 1, w_ct = 58, err = 00
yaa! in = 1, out = 1, w_ct = 59, err = 00
yaa! in = 0, out = 0, w_ct = 60, err = 00
yaa! in = 0, out = 0, w_ct = 61, err = 00
yaa! in = 0, out = 0, w_ct = 62, err = 00
yaa! in = 0, out = 0, w_ct = 63, err = 00
yaa! in = 1, out = 1, w_ct = 64, err = 00
yaa! in = 1, out = 1, w_ct = 65, err = 00
yaa! in = 1, out = 1, w_ct = 66, err = 00
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41


Transcript
yaa! in = 0, out = 0, w_ct = 61, err = 00
yaa! in = 0, out = 0, w_ct = 62, err = 00
yaa! in = 0, out = 0, w_ct = 63, err = 00
yaa! in = 1, out = 1, w_ct = 64, err = 00
yaa! in = 1, out = 1, w_ct = 65, err = 00
yaa! in = 1, out = 1, w_ct = 66, err = 00
yaa! in = 1, out = 1, w_ct = 67, err = 00
yaa! in = 0, out = 0, w_ct = 68, err = 00
yaa! in = 0, out = 0, w_ct = 69, err = 00
yaa! in = 0, out = 0, w_ct = 70, err = 00
yaa! in = 0, out = 0, w_ct = 71, err = 00
yaa! in = 0, out = 0, w_ct = 72, err = 00
yaa! in = 1, out = 1, w_ct = 73, err = 00
yaa! in = 1, out = 1, w_ct = 74, err = 00
yaa! in = 1, out = 1, w_ct = 75, err = 00
yaa! in = 1, out = 1, w_ct = 76, err = 00
yaa! in = 1, out = 1, w_ct = 77, err = 00
yaa! in = 0, out = 0, w_ct = 78, err = 00
yaa! in = 1, out = 1, w_ct = 79, err = 00
yaa! in = 0, out = 0, w_ct = 80, err = 00
yaa! in = 1, out = 1, w_ct = 81, err = 00
yaa! in = 0, out = 0, w_ct = 82, err = 00
yaa! in = 1, out = 1, w_ct = 83, err = 00
yaa! in = 0, out = 0, w_ct = 84, err = 00
yaa! in = 1, out = 1, w_ct = 85, err = 00
yaa! in = 0, out = 0, w_ct = 86, err = 00
yaa! in = 0, out = 0, w_ct = 87, err = 00
yaa! in = 0, out = 0, w_ct = 88, err = 00
yaa! in = 0, out = 0, w_ct = 89, err = 00
yaa! in = 0, out = 0, w_ct = 90, err = 00
yaa! in = 0, out = 0, w_ct = 91, err = 00
yaa! in = 0, out = 0, w_ct = 92, err = 00
yaa! in = 0, out = 0, w_ct = 93, err = 00
yaa! in = 0, out = 0, w_ct = 94, err = 00
yaa! in = 0, out = 0, w_ct = 95, err = 00
yaa! in = 1, out = 1, w_ct = 96, err = 00
yaa! in = 1, out = 1, w_ct = 97, err = 00
yaa! in = 1, out = 1, w_ct = 98, err = 00
yaa! in = 1, out = 1, w_ct = 99, err = 00
yaa! in = 1, out = 1, w_ct = 100, err = 00
yaa! in = 1, out = 1, w_ct = 101, err = 00
yaa! in = 1, out = 1, w_ct = 102, err = 00
yaa! in = 1, out = 1, w_ct = 103, err = 00
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41


Transcript
yaa! in = 1, out = 1, w_ct = 101, err = 00
yaa! in = 1, out = 1, w_ct = 102, err = 00
yaa! in = 1, out = 1, w_ct = 103, err = 00
yaa! in = 1, out = 1, w_ct = 104, err = 00
yaa! in = 1, out = 1, w_ct = 105, err = 00
yaa! in = 0, out = 0, w_ct = 106, err = 00
yaa! in = 1, out = 1, w_ct = 107, err = 00
yaa! in = 0, out = 0, w_ct = 108, err = 00
yaa! in = 1, out = 1, w_ct = 109, err = 00
yaa! in = 1, out = 1, w_ct = 110, err = 00
yaa! in = 1, out = 1, w_ct = 111, err = 00
yaa! in = 1, out = 1, w_ct = 112, err = 00
yaa! in = 0, out = 0, w_ct = 113, err = 00
yaa! in = 1, out = 1, w_ct = 114, err = 00
yaa! in = 1, out = 1, w_ct = 115, err = 00
yaa! in = 1, out = 1, w_ct = 116, err = 00
yaa! in = 0, out = 0, w_ct = 117, err = 00
yaa! in = 1, out = 1, w_ct = 118, err = 00
yaa! in = 1, out = 1, w_ct = 119, err = 00
yaa! in = 1, out = 1, w_ct = 120, err = 00
yaa! in = 0, out = 0, w_ct = 121, err = 00
yaa! in = 1, out = 1, w_ct = 122, err = 00
yaa! in = 0, out = 0, w_ct = 123, err = 00
yaa! in = 1, out = 1, w_ct = 124, err = 00
yaa! in = 1, out = 1, w_ct = 125, err = 00
yaa! in = 0, out = 0, w_ct = 126, err = 00
yaa! in = 0, out = 0, w_ct = 127, err = 00
yaa! in = 0, out = 0, w_ct = 128, err = 00
yaa! in = 0, out = 0, w_ct = 129, err = 00
yaa! in = 0, out = 0, w_ct = 130, err = 00
yaa! in = 0, out = 0, w_ct = 131, err = 00
yaa! in = 0, out = 0, w_ct = 132, err = 00
yaa! in = 0, out = 0, w_ct = 133, err = 00
yaa! in = 0, out = 0, w_ct = 134, err = 00
yaa! in = 0, out = 0, w_ct = 135, err = 00
yaa! in = 0, out = 0, w_ct = 136, err = 00
yaa! in = 1, out = 1, w_ct = 137, err = 00
yaa! in = 1, out = 1, w_ct = 138, err = 00
yaa! in = 1, out = 1, w_ct = 139, err = 00
yaa! in = 1, out = 1, w_ct = 140, err = 00
yaa! in = 1, out = 1, w_ct = 141, err = 00
yaa! in = 1, out = 1, w_ct = 142, err = 00
yaa! in = 1, out = 1, w_ct = 143, err = 00
1043990 ps to 1045054 ps
Project : 2
Now: 1,045 ns Delta: 0
sim:/viterbi_tx_rx_tb/#INITIAL#41

```
# yaa! in = 1, out = 1, w_ct =         144, err = 00
# yaa! in = 1, out = 1, w_ct =         145, err = 00
# yaa! in = 1, out = 1, w_ct =         146, err = 00
# yaa! in = 0, out = 0, w_ct =         147, err = 00
# yaa! in = 1, out = 1, w_ct =         148, err = 00
# yaa! in = 1, out = 1, w_ct =         149, err = 00
# yaa! in = 1, out = 1, w_ct =         150, err = 00
# yaa! in = 1, out = 1, w_ct =         151, err = 00
# yaa! in = 1, out = 1, w_ct =         152, err = 00
# yaa! in = 1, out = 1, w_ct =         153, err = 00
# yaa! in = 1, out = 1, w_ct =         154, err = 00
# yaa! in = 1, out = 1, w_ct =         155, err = 00
# yaa! in = 1, out = 1, w_ct =         156, err = 00
# yaa! in = 1, out = 1, w_ct =         157, err = 00
# yaa! in = 1, out = 1, w_ct =         158, err = 00
# yaa! in = 1, out = 1, w_ct =         159, err = 00
# yaa! in = 1, out = 1, w_ct =         160, err = 00
# yaa! in = 1, out = 1, w_ct =         161, err = 00
# yaa! in = 1, out = 1, w_ct =         162, err = 00
# yaa! in = 1, out = 1, w_ct =         163, err = 00
# yaa! in = 1, out = 1, w_ct =         164, err = 00
# yaa! in = 1, out = 1, w_ct =         165, err = 00
# yaa! in = 1, out = 1, w_ct =         166, err = 00
# yaa! in = 1, out = 1, w_ct =         167, err = 00
# yaa! in = 1, out = 1, w_ct =         168, err = 00
# yaa! in = 1, out = 1, w_ct =         169, err = 00
# yaa! in = 1, out = 1, w_ct =         170, err = 00
# yaa! in = 1, out = 1, w_ct =         171, err = 00
# yaa! in = 1, out = 1, w_ct =         172, err = 00
# yaa! in = 1, out = 1, w_ct =         173, err = 00
# yaa! in = 1, out = 1, w_ct =         174, err = 00
# yaa! in = 1, out = 1, w_ct =         175, err = 00
# yaa! in = 1, out = 1, w_ct =         176, err = 00
# yaa! in = 1, out = 1, w_ct =         177, err = 00
# yaa! in = 1, out = 1, w_ct =         178, err = 00
# yaa! in = 1, out = 1, w_ct =         179, err = 00
# yaa! in = 1, out = 1, w_ct =         180, err = 00
# yaa! in = 1, out = 1, w_ct =         181, err = 00
# yaa! in = 1, out = 1, w_ct =         182, err = 00
# yaa! in = 1, out = 1, w_ct =         183, err = 00
# yaa! in = 1, out = 1, w_ct =         184, err = 00
# yaa! in = 1, out = 1, w_ct =         185, err = 00
# yaa! in = 1, out = 1, w_ct =         186, err = 00
```

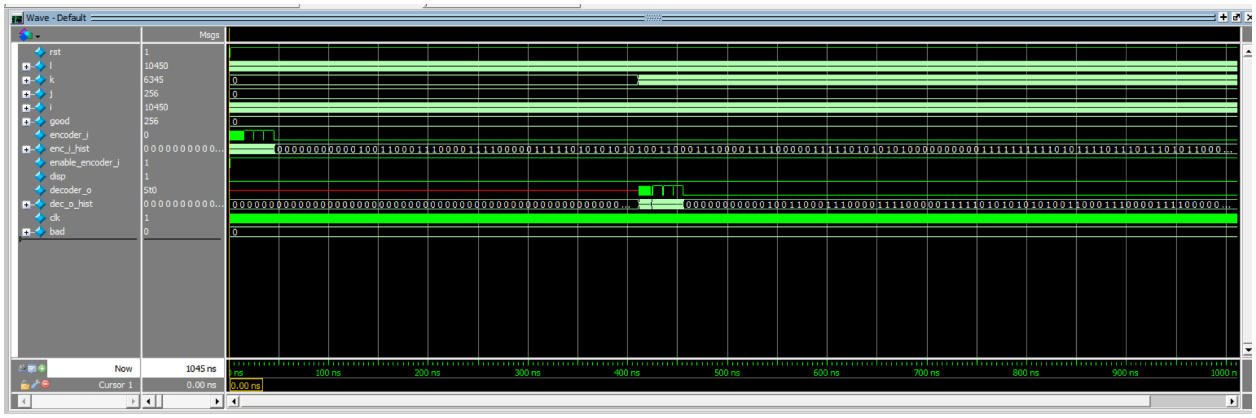
1043990 ps to 1045054 ps | Project : 2 | Now: 1,045 ns Delta: 0 | sim:/viterbi_tx_rx_tb/#INITIAL#41

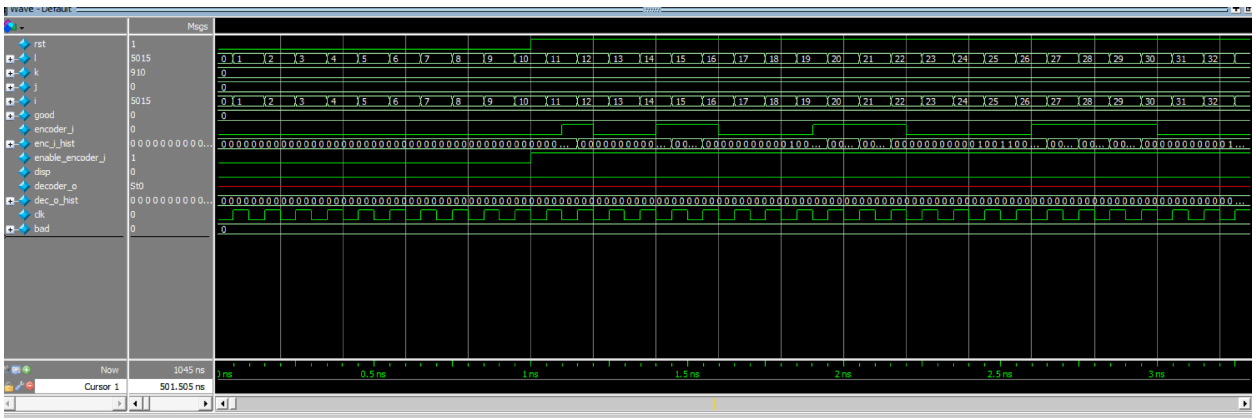
Transcript

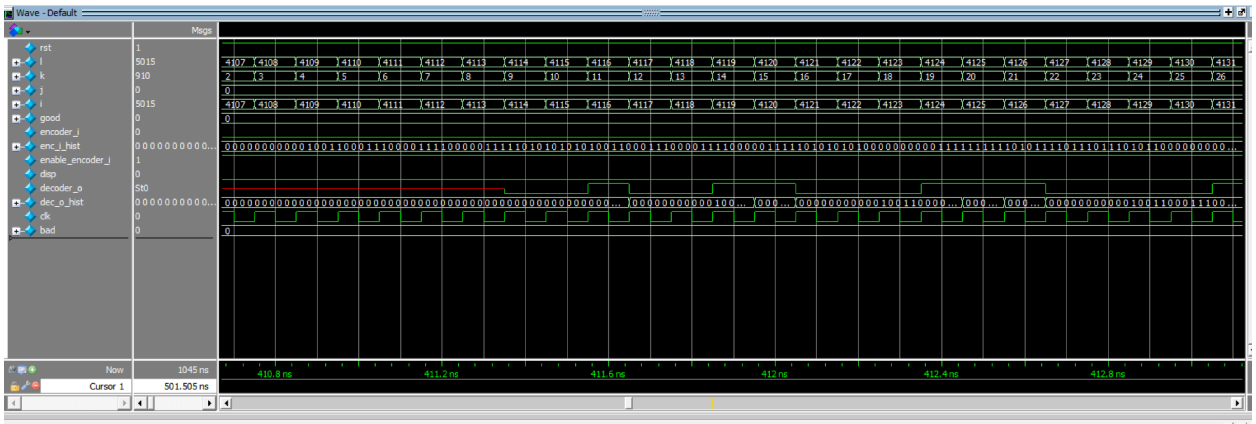
```
# yaa! in = 1, out = 1, w_ct =         187, err = 00
# yaa! in = 1, out = 1, w_ct =         188, err = 00
# yaa! in = 1, out = 1, w_ct =         189, err = 00
# yaa! in = 1, out = 1, w_ct =         190, err = 00
# yaa! in = 1, out = 1, w_ct =         191, err = 00
# yaa! in = 1, out = 1, w_ct =         192, err = 00
# yaa! in = 1, out = 1, w_ct =         193, err = 00
# yaa! in = 1, out = 1, w_ct =         194, err = 00
# yaa! in = 1, out = 1, w_ct =         195, err = 00
# yaa! in = 1, out = 1, w_ct =         196, err = 00
# yaa! in = 1, out = 1, w_ct =         197, err = 00
# yaa! in = 1, out = 1, w_ct =         198, err = 00
# yaa! in = 1, out = 1, w_ct =         199, err = 00
# yaa! in = 1, out = 1, w_ct =         200, err = 00
# yaa! in = 1, out = 1, w_ct =         201, err = 00
# yaa! in = 1, out = 1, w_ct =         202, err = 00
# yaa! in = 1, out = 1, w_ct =         203, err = 00
# yaa! in = 1, out = 1, w_ct =         204, err = 00
# yaa! in = 1, out = 1, w_ct =         205, err = 00
# yaa! in = 1, out = 1, w_ct =         206, err = 00
# yaa! in = 1, out = 1, w_ct =         207, err = 00
# yaa! in = 1, out = 1, w_ct =         208, err = 00
# yaa! in = 1, out = 1, w_ct =         209, err = 00
# yaa! in = 1, out = 1, w_ct =         210, err = 00
# yaa! in = 1, out = 1, w_ct =         211, err = 00
# yaa! in = 1, out = 1, w_ct =         212, err = 00
# yaa! in = 1, out = 1, w_ct =         213, err = 00
# yaa! in = 1, out = 1, w_ct =         214, err = 00
# yaa! in = 1, out = 1, w_ct =         215, err = 00
# yaa! in = 1, out = 1, w_ct =         216, err = 00
# yaa! in = 1, out = 1, w_ct =         217, err = 00
# yaa! in = 1, out = 1, w_ct =         218, err = 00
# yaa! in = 1, out = 1, w_ct =         219, err = 00
# yaa! in = 1, out = 1, w_ct =         220, err = 00
# yaa! in = 1, out = 1, w_ct =         221, err = 00
# yaa! in = 1, out = 1, w_ct =         222, err = 00
# yaa! in = 1, out = 1, w_ct =         223, err = 00
# yaa! in = 1, out = 1, w_ct =         224, err = 00
# yaa! in = 1, out = 1, w_ct =         225, err = 00
# yaa! in = 1, out = 1, w_ct =         226, err = 00
# yaa! in = 1, out = 1, w_ct =         227, err = 00
# yaa! in = 1, out = 1, w_ct =         228, err = 00
# yaa! in = 1, out = 1, w_ct =         229, err = 00
```

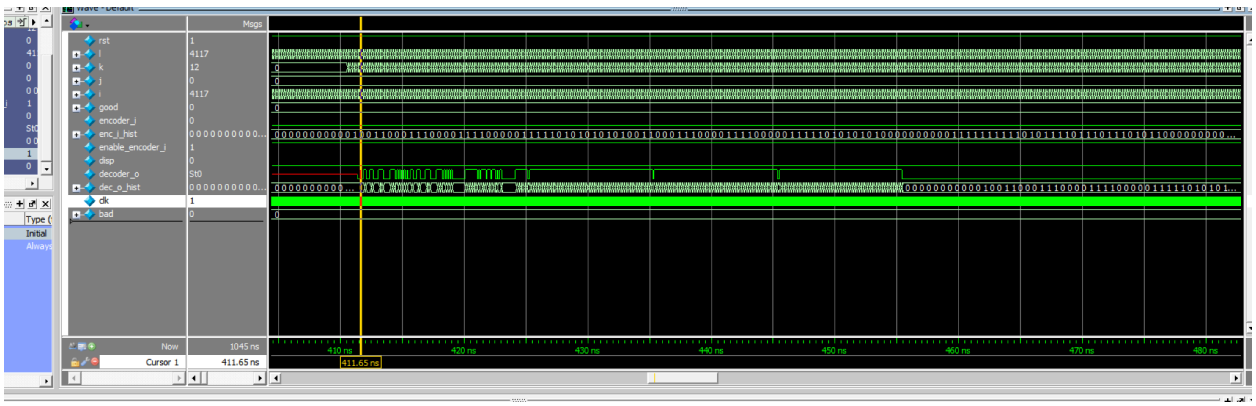
Transcript

```
# yaa! in = 1, out = 1, w_ct =         219, err = 00
# yaa! in = 1, out = 1, w_ct =         220, err = 00
# yaa! in = 1, out = 1, w_ct =         221, err = 00
# yaa! in = 1, out = 1, w_ct =         222, err = 00
# yaa! in = 1, out = 1, w_ct =         223, err = 00
# yaa! in = 1, out = 1, w_ct =         224, err = 00
# yaa! in = 1, out = 1, w_ct =         225, err = 00
# yaa! in = 1, out = 1, w_ct =         226, err = 00
# yaa! in = 1, out = 1, w_ct =         227, err = 00
# yaa! in = 1, out = 1, w_ct =         228, err = 00
# yaa! in = 1, out = 1, w_ct =         229, err = 00
# yaa! in = 1, out = 1, w_ct =         230, err = 00
# yaa! in = 1, out = 1, w_ct =         231, err = 00
# yaa! in = 1, out = 1, w_ct =         232, err = 00
# yaa! in = 1, out = 1, w_ct =         233, err = 00
# yaa! in = 1, out = 1, w_ct =         234, err = 00
# yaa! in = 1, out = 1, w_ct =         235, err = 00
# yaa! in = 1, out = 1, w_ct =         236, err = 00
# yaa! in = 1, out = 1, w_ct =         237, err = 00
# yaa! in = 1, out = 1, w_ct =         238, err = 00
# yaa! in = 1, out = 1, w_ct =         239, err = 00
# yaa! in = 1, out = 1, w_ct =         240, err = 00
# yaa! in = 1, out = 1, w_ct =         241, err = 00
# yaa! in = 1, out = 1, w_ct =         242, err = 00
# yaa! in = 1, out = 1, w_ct =         243, err = 00
# yaa! in = 1, out = 1, w_ct =         244, err = 00
# yaa! in = 1, out = 1, w_ct =         245, err = 00
# yaa! in = 1, out = 1, w_ct =         246, err = 00
# yaa! in = 1, out = 1, w_ct =         247, err = 00
# yaa! in = 0, out = 0, w_ct =         248, err = 00
# yaa! in = 1, out = 1, w_ct =         249, err = 00
# yaa! in = 1, out = 1, w_ct =         250, err = 00
# yaa! in = 1, out = 1, w_ct =         251, err = 00
# yaa! in = 1, out = 1, w_ct =         252, err = 00
# yaa! in = 1, out = 1, w_ct =         253, err = 00
# yaa! in = 1, out = 1, w_ct =         254, err = 00
# yaa! in = 1, out = 1, w_ct =         255, err = 00
# corrupted_bits =           0, OUT: good =         256, bad =           0
```


Wave - Default
Msgs
rst
l
k
j
i
good
encoder_i
enc_j_hist
enable_encoder_j
disp
decoder_o
dec_o_hist
clk
bad
Now
1045 ns
Cursor 1
0.00 ns


Msgs
rst
l
k
j
i
good
encoder_i
enc_j_hist
enable_encoder_j
disp
decoder_o
dec_o_hist
clk
bad
Now
1045 ns
Cursor 1
501.505 ns


Wave - Default
Msgs
rst
l
k
j
i
good
encoder_i
enc_j_hist
enable_encoder_j
disp
decoder_o
dec_o_hist
clk
bad
Now
1045 ns
Cursor 1
501.505 ns


Msgs
rst
l
k
j
i
good
encoder_i
enc_j_hist
enable_encoder_j
disp
decoder_o
dec_o_hist
clk
bad
Now
1045 ns
Cursor 1
411.65 ns

2. In part1, we used the encode is a recursive, systematic encoder, which differs from the encoder used in for the homework 7. In the encoder I used, for every input bit, there are two output bits. One is the original input data, which makes it systematic, and the other is a parity bit generated recursively, meaning the parity bit depends not just on the current input but also on the encoder's previous state, creating a feedback loop. This design is different from Homework 7. Since we did in homework 7's is non-systematic and non-recursive, that it did not output the original data bits directly and there was no feedback from previous states. Because of these differences, the output format between the two encoders is not the same. The decoder in this project expects inputs that include both the systematic data and the recursive parity bits, so using the Homework 7 encoder with this decoder wouldn't work. The project encoder outputs a more structured data stream that the decoder is specifically designed to process.

3. Mainly this decoder uses the Viterbi algorithm to recover the original input data by finding the path with the least number of errors. First it runs through the BMC to ACS then to TBU. These decoders go through three main parts. The first of these parts is the BMC, which mainly goes to calculate the Hamming distance between the received data and the desired output. It measures the error of each path. After this, the ACS goes to accumulate the path errors, comparing different paths and selecting the path with the least error to continue. Lastly, the TBU is to backtrack from the last state and determine the input bit sequence along the path with the minimum error. Therefore, if there are no errors during transmission and the received data is identical to the desired output. That the Hamming distance at each step is 0. So that, the branching metric is 0 and the cumulative path error is 0. The decoder accurately finds out the original data sent by the encoder by backtracking along the path that minimizes the error.