Intro. to Synopsys Verdi Debug System

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Outline

- Startup Verdi with Simulation Tool
- Verdi's Feature
  - nTrace
  - nWave
  - nMemory
  - nState

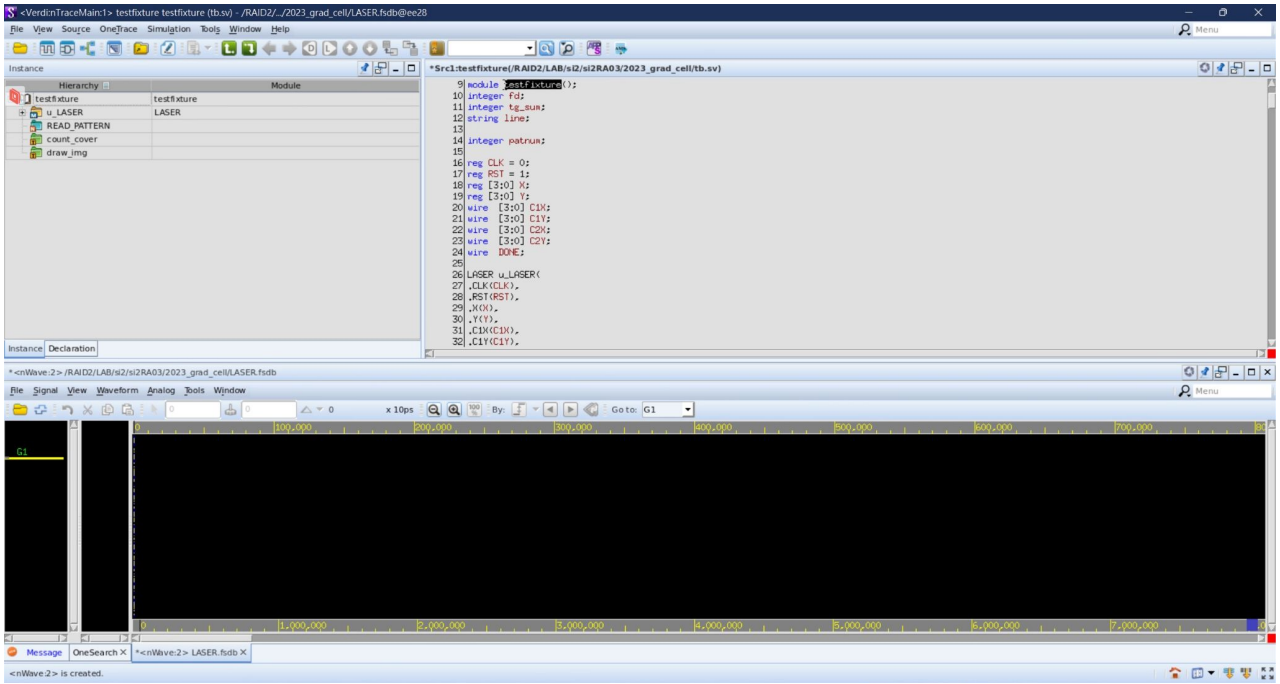
Startup

- ./01_run_vcs_rtl for dumping .fsdb
- ./04_verdi for starting Verdi

Verdi's Features

- RTL debug tool developed by Synopsys, it supports
  - Verilog
  - SystemVerilog
  - VHDL
- Features
  - nTrace
  - nWave
  - nMemory
  - nState

Startup

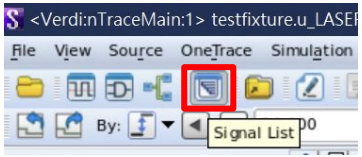

File View Source OneTrace Simulation Tools Window Help
Instance
Hierarchy
Module
testfixture
u_LASER
READ_PATTERN
count_cover
draw_img
Instance
Declaration
*Src1:testfixture(/RAID2/LAB/si2/si2RA03/2023_grad_cell/tb.sv)
module testfixture();
integer fd;
integer tg_sum;
string line;
integer patnum;
reg CLK = 0;
reg RST = 1;
reg [3:0] X;
reg [3:0] Y;
wire [3:0] C1X;
wire [3:0] C1Y;
wire [3:0] C2X;
wire [3:0] C2Y;
wire DONE;
LASER u_LASER(
.CLK(CLK),
.RST(RST),
.X(X),
.Y(Y),
.C1X(C1X),
.C1Y(C1Y),
File Signal View Waveform Analog Tools Window
Message
OneSearch
<nWave:2> is created.

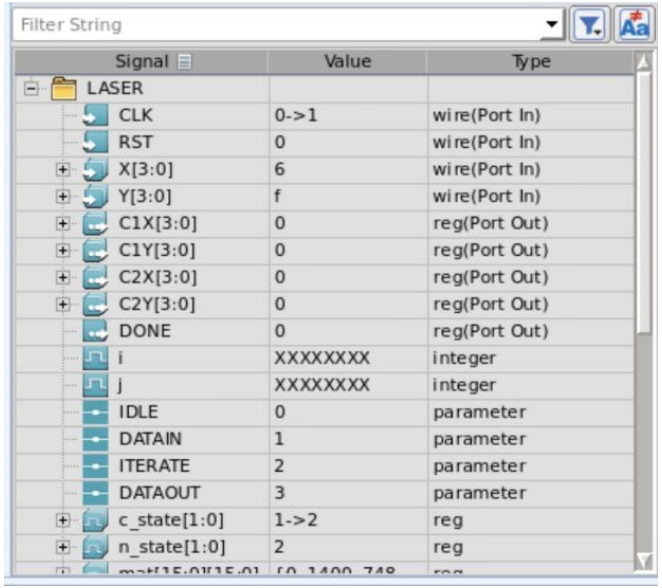
nTrace: Show Signal's Value

- Show the value of signal (Command: "x")

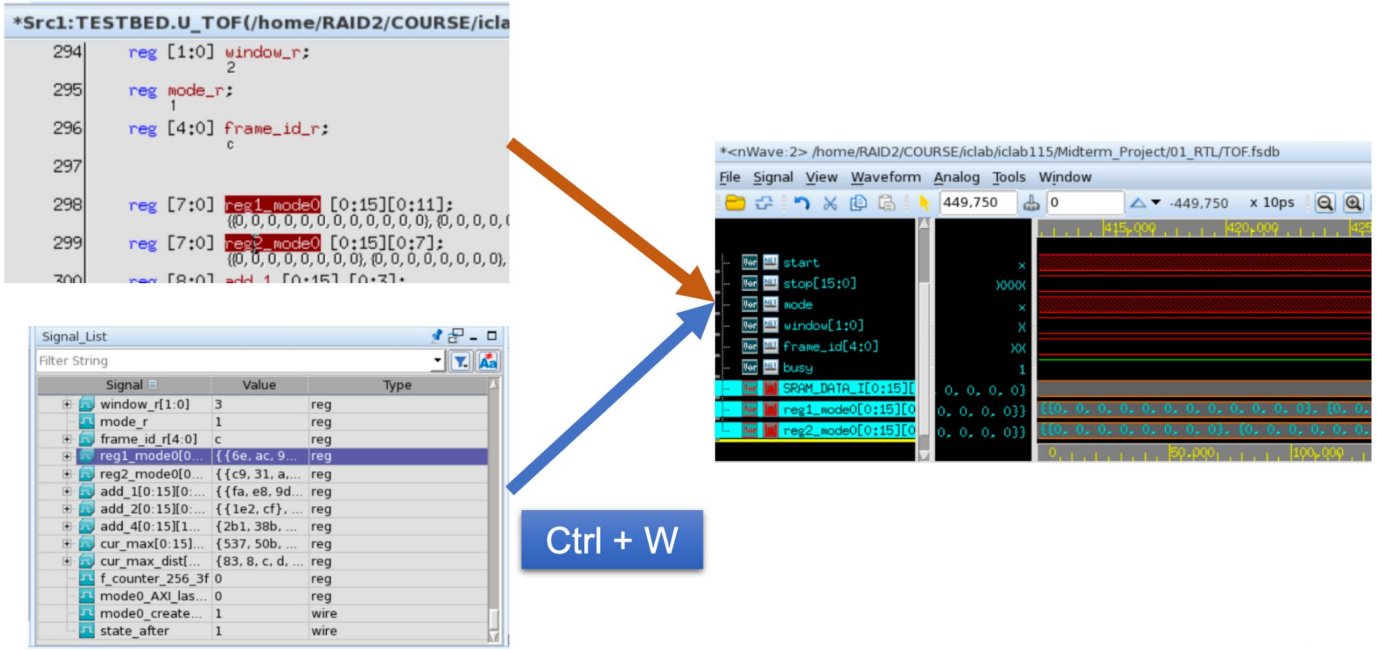
```
50 always@(posedge CLK) begin
                   1
51     if(RST)
           0
52         c_state <= IDLE; /* initial state */
           1->2
53     else
54         c_state <= n_state;
           1->2        2
55 end
56
57 always@(*) begin
58     case(c_state)
            1->2
59         IDLE: begin
60             if(!RST&&!DONE)
                    0     0
```

nTrace: Signal List

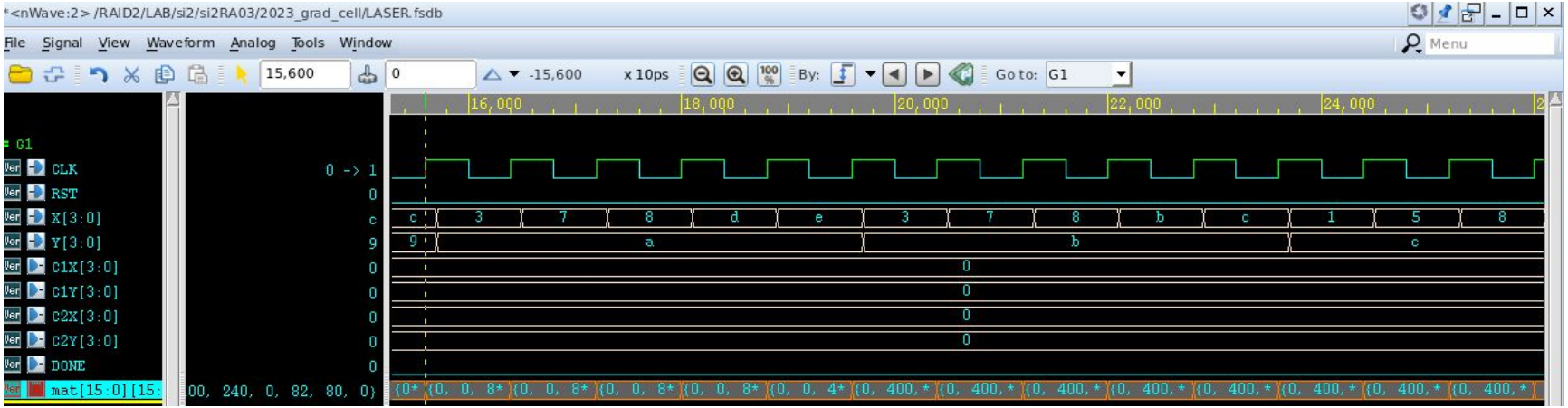




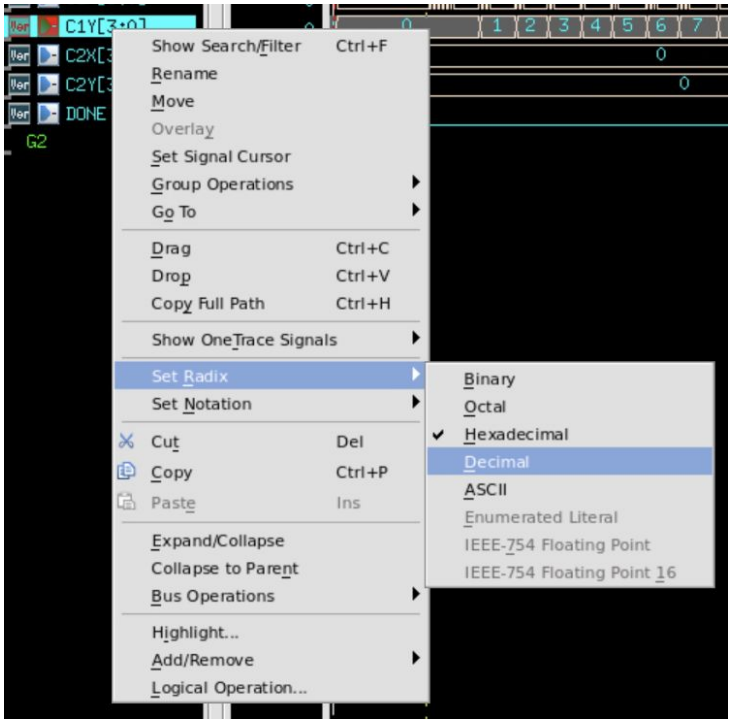
nTrace – Add Value Into Waveform



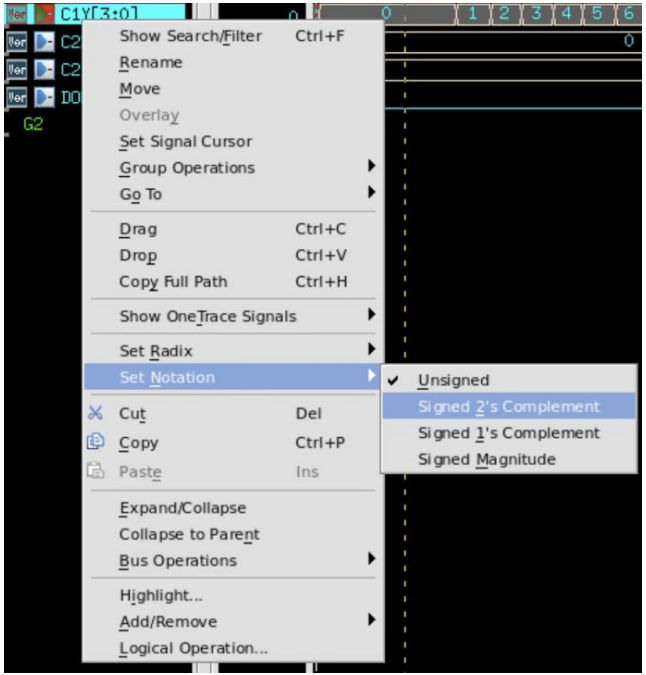
nWave


*<nWave:2> /RAID2/LAB/si2/si2RA03/2023_grad_cell/LASER.fsdb
File Signal View Waveform Analog Tools Window
Menu
15,600
0
-15,600
x 10ps
By:
Go to: G1
16,000
18,000
20,000
22,000
24,000
G1
CLK
RST
X[3:0]
Y[3:0]
C1X[3:0]
C1Y[3:0]
C2X[3:0]
C2Y[3:0]
DONE
mat[15:0][15:
0 -> 1
00, 240, 0, 82, 80, 0}

nWave - Change Radix of Signal



nWave - 2’s Complement

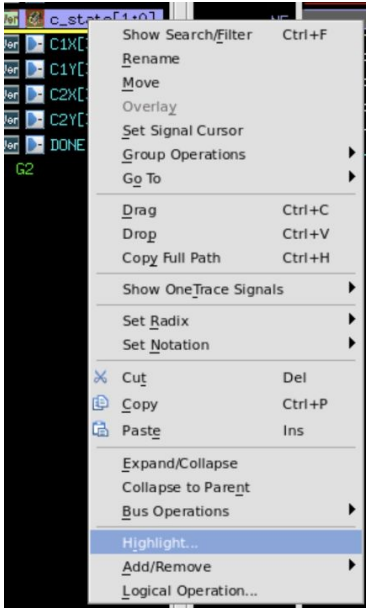


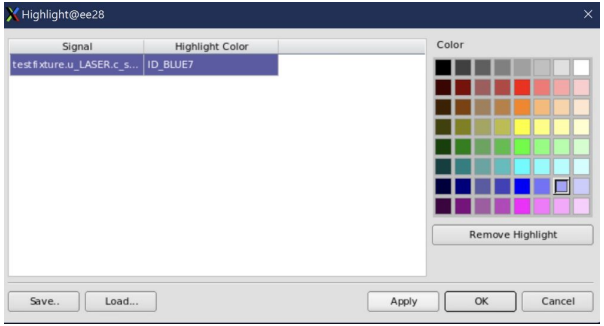
Eight-bit integers

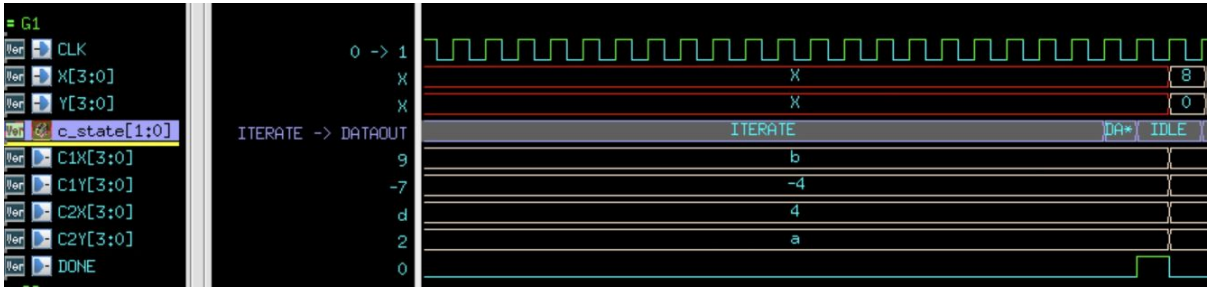
Bits	Unsigned value	Signed value (Two's complement)
0000 0000	0	0
0000 0001	1	1
0000 0010	2	2
0111 1110	126	126
0111 1111	127	127
1000 0000	128	−128
1000 0001	129	−127
1000 0010	130	−126
1111 1110	254	−2
1111 1111	255	−1

Source: [Two's complement - Wikipedia]

nWave - Highlight Signal

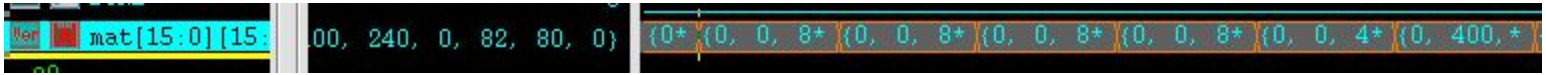




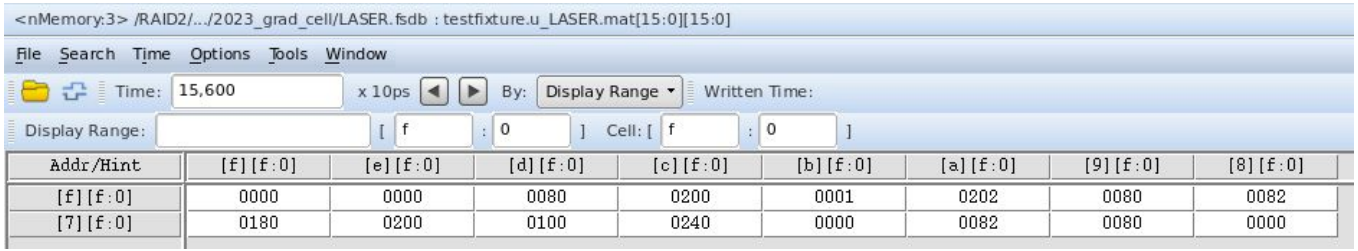


Vector

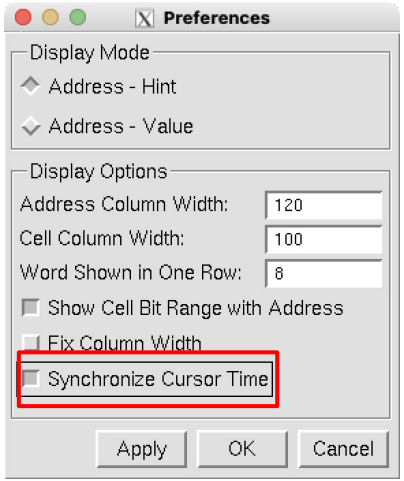
- How do we debug vector signal easier?



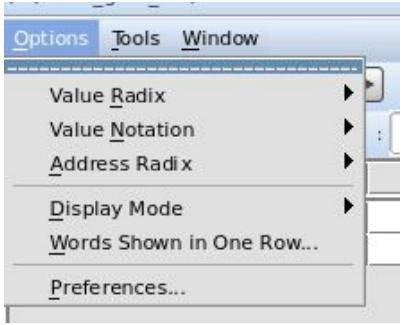
nMemory


<nMemory:3> /RAID2/.../2023_grad_cell/LASER.fsdb : testfixture.u_LASER.mat[15:0][15:0]
File Search Time Options Tools Window
Time: 15,600 x 10ps By: Display Range Written Time:
Display Range: [f : 0] Cell: [f : 0]
Addr/Hint [f][f:0] [e][f:0] [d][f:0] [c][f:0] [b][f:0] [a][f:0] [9][f:0] [8][f:0]
[f][f:0] 0000 0000 0080 0200 0001 0202 0080 0082
[7][f:0] 0180 0200 0100 0240 0000 0082 0080 0000

nMemory (Setting)

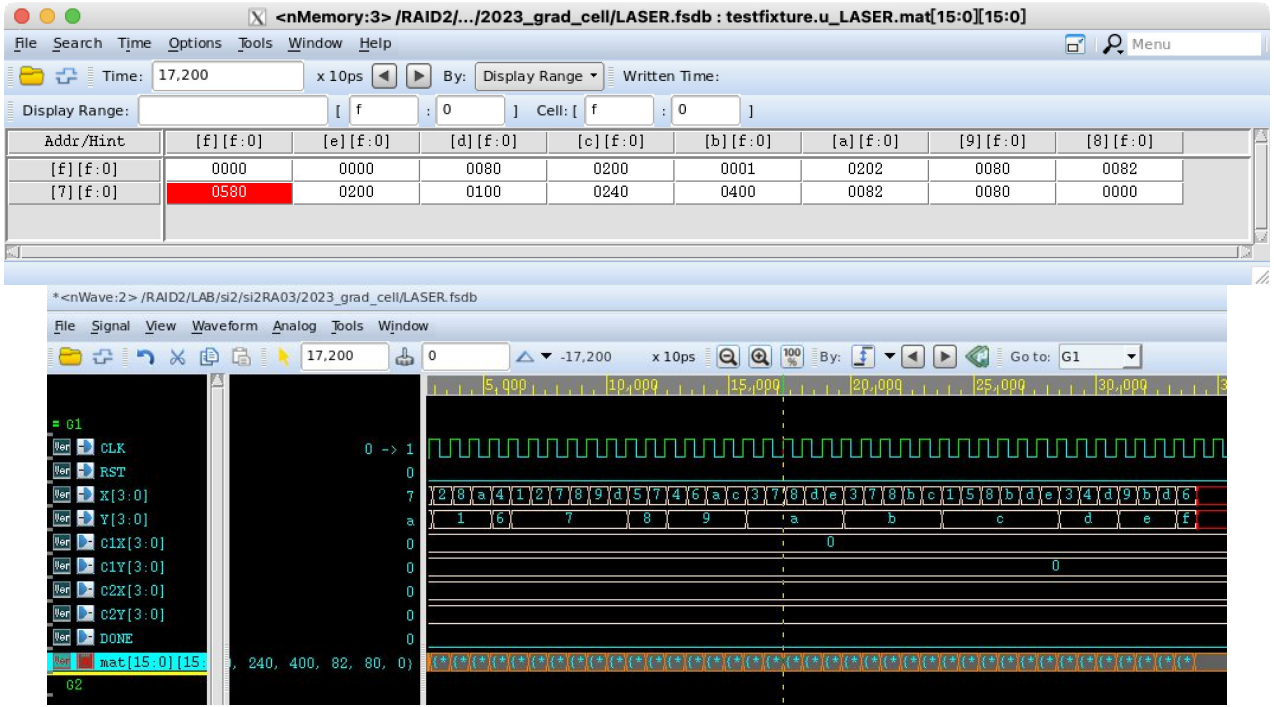


Synchronize with waveform



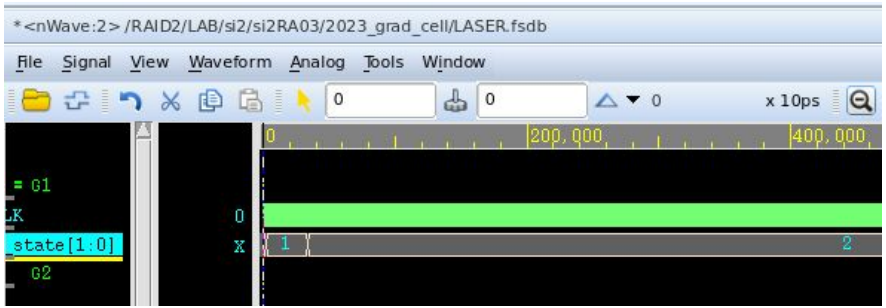
Set value's radix, notation and address radix

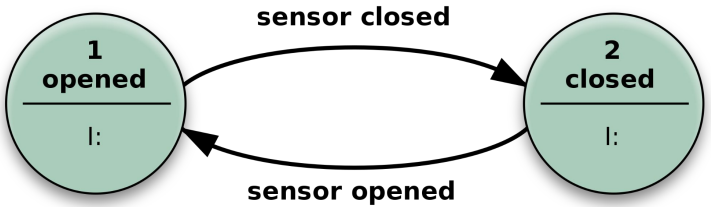
nMemory (Sync with Waveform)



Finite State Machine

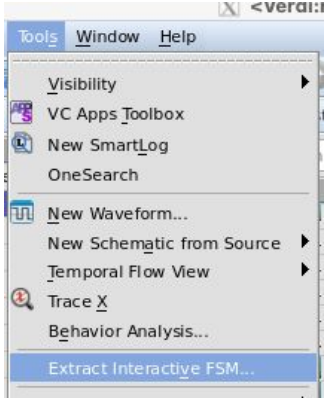
- How do we show the current state in “readable” format of the reg refered to FSM?

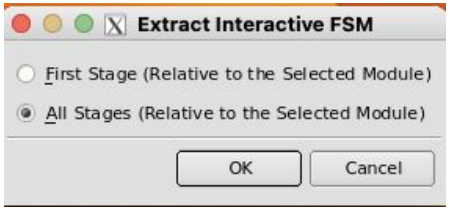


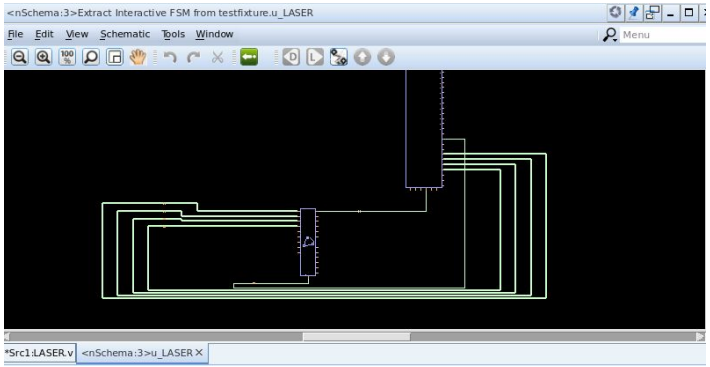


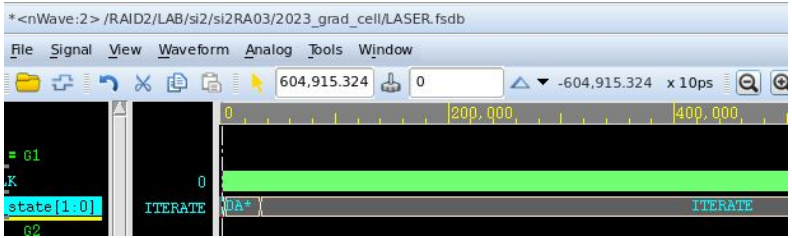
Source:
[Finite-state machine - Wikipedia]

nState (1/2)

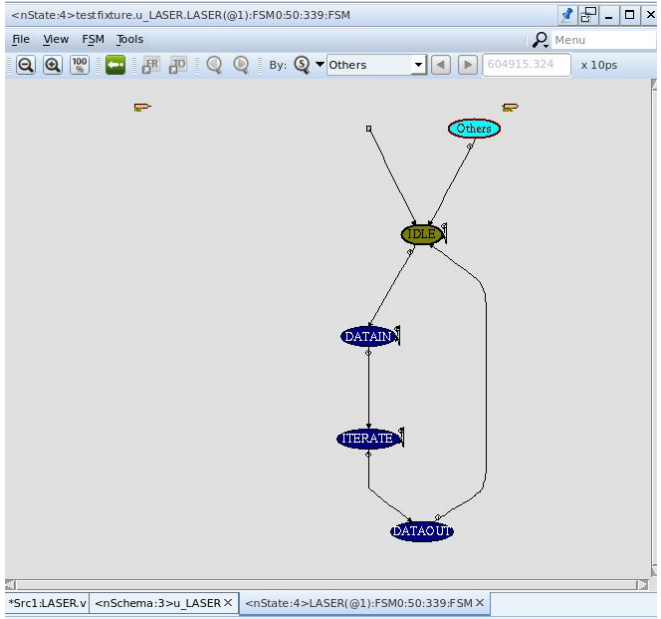

Tools
Window
Help
Visibility
VC Apps Toolbox
New SmartLog
OneSearch
New Waveform...
New Schematic from Source
Temporal Flow View
Trace X
Behavior Analysis...
Extract Interactive FSM...


Extract Interactive FSM
First Stage (Relative to the Selected Module)
All Stages (Relative to the Selected Module)
OK
Cancel

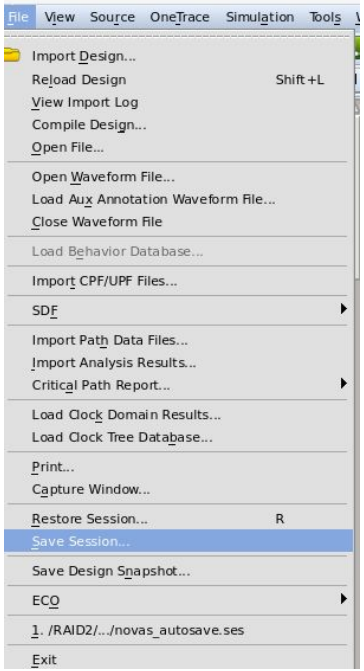

<nSchema:3>Extract Interactive FSM from testfixture.u_LASER
File Edit View Schematic Tools Window
*Src1:LASER.v
<nSchema:3>u_LASER


*<nWave:2> /RAID2/LAB/si2/si2RA03/2023_grad_cell/LASER.fsdb
File Signal View Waveform Analog Tools Window
604,915.324
-604,915.324
x 10ps
200,000
400,000
state[1:0]
ITERATE

nState (2/2)


<nState:4>testfixture.u_LASER.LASER(@1):FSM0:50:339:FSM
File View FSM Tools
Menu
By: Others
604915.324
x 10ps
Others
IDLE
DATAIN
ITERATE
DATAOUT
*Src1:LASER.v
<nSchema:3>u_LASER
<nState:4>LASER(@1):FSM0:50:339:FSM

Save Session



Conclusion

- nTrace showed the signal value and signal in list
- nWave displayed the waveform of signal
- nMemory eased the pain on observing value of 2d reg
- nState helped us dealing with FSM issues