Veritools

# Using Simulator With Undertow Suite

Veritools

# STEPS FOR SIMULATING USING VCS:

- Source environment variables

  For example, envsource has all the environment variables set up.

  You can change the paths accordingly.

```
------------envsource file contents------------------------------
setenv VCSI_HOME <path where VCSI is installed>
setenv DEFAULT_VCS_HOME <path where VCSI is installed>
setenv VCS_HOME <path where VCSI is installed>
setenv TMPDIR /tmp
setenv VCS_NETHOST vt1
setenv VCS_LTD_LICENSE 1
setenv VCS_CC cc
```

- vtplivcs.o and vt_vcs.tab are present in our PLI directory

## VCS contd.

- <source> is the file that contains the source code files for Simulation
- To make the source file: add iv.v (found in our distribution directory) at the top with top level file next followed by all the .v files needed in simulation.
- Contents of iv.v file

```
// iv.v
module vtInteractive;
initial
        $vtIv;
endmodule
```

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## VCS cont.

- Add to source code close to top module

```
initial
begin
        $vtDumpvars();  /*dumps everything - created by our PLI routine.*/
        $vtTrace(1) /*enables event tracing of your complete design*/
end
```

- In the example(in our distribution directory), the above has been inserted in 'top.v' file.

# VCS cont.

- To compile through the simulator in interactive mode do as follows:

  vcsi <flags> -f source $UT_ROOT_DIR/PLI/vtplivcs.o –P $UT_ROOT_DIR/PLI/vt_vcs.tab
- For example,

```
./run_vcsi_int
-------run_vcsi_int contents-----------------------------------
#!/bin/csh –f
vcsi -Mupdate +vpi +cli +acc+2 -lm -line  -f source
$UT_ROOT_DIR/PLI/vtplivcs.o –P UT_ROOT_DIR/PLI/vt_vcs.tab
```

# VCS cont.

- To open the Undertow Suite in batch mode, the command lines is as follows:
  ut -iv -f <source> -sigfile <dump filename>
  <source> is the file that contains the source code files for simulation
  For example,
  ut -iv -f source -sigfile fsm.sigs -tracefile fsm.trace

  To view just the waveform,
  ut -v <signal_file>
  For example,
  ut -v vt.dump
- To open the Undertow Suite in interactive mode the command lines is as follows:
  ut -iv -vcs <vcs_simulator_executable> <simulator_options> -sigfile <signal_filename> -tracefile <trace_filename> -ivsimcmp "-f <file that lists all source code file names>“
  For example,
  ut -iv -vcs simv -sigfile fsm.sigs -tracefile fsm.trace -ivsimpcmp “-f source”

## STEPS FOR SIMULATING USING MODELTECH

- Sourcing environment Variables

  For example,

  ```
  ./envsource
  ------------envsource file contents----------------------------
  setenv PLIOBJS $UT_ROOT_DIR/PLI/vtpli_modtech.so
  setenv ModelTech <path where ModelTech has been installed>
  ```

- vtpli_modtech.so is available in our PLI directory.

# MODELTECH contd.

- <source> is the file that contains the source code files for Simulation
- To make the source file: add iv.v at the top with top level file next followed by all the .v files needed in simulation followed by "+libverbose" at the bottom.
- Contents of iv.v file

```
// iv.v
module vtInteractive;
initial
        $vtIv;
endmodule
```

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## MODELTECH contd.

- Add to source code close to top module

```
  initial
  begin
          $vtDumpvars();  /*dumps everything - created by our PLI routine.*/
  end
```

- In the example(in our distribution directory), the above has been inserted in 'top.v' file.

## MODELTECH contd.

- Compile through the simulator as follows:

```
./run_modeltech
run_modeltech : script for running all modelsim commands.
---------run_modeltech contents-------------------------------
#!/bin/csh -f
if (-e work) then
        rm -r -f work
endif
if (! -e work) then
        vlib work #creates new design library work
endif
vlog -f source #compiles the verilog files into the work library
vsim -c -do 'run -all' top vtInteractive +VTCOMPRESS250 +VTVECTORVALUES
```

# MODELTECH contd.

- To open the Undertow Suite in batch mode, the command lines are as follows:

  ```
  ut -iv -f <source_code_file> -sigfile <signal_file>
  ```

  <source_code_file> is the file that lists all the source code files.

  For example,

  ```
  ut -iv -f source -sigfile fsm.sigs
  ```

  To view just the waveform,

  ```
  ut -v <signal_file>
  ```

  For example,

  ```
  ut -v vt.dump
  ```

## MODELTECH contd.

- To open the Undertow Suite in interactive mode, the command lines are as follows:
- ut -iv -modeltech <simulator_executable_name> <top level module names> <simulator_options> -sigfile <signal_filename> -ivsimcmp “-f<file that lists all source code files>”

  For example,

  ut -iv -modeltech vsim top -sigfile fsm.sigs -ivsimpcmp “-f source"

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# STEPS FOR SIMULATING USING NCSIM

- Source environment variables

  For example,

```
./envsource
--------------envsource file contents-------------------------------------
#setenv CDS_INST_DIR <cadence installation directory>
setenv CDS_INST_DIR /cad_tools/LDV5.1
setenv ittsimUndertowSeDir $CDS_INST_DIR/tools/dfII/local/undertow
setenv LD_LIBRARY_PATH /usr/lib:/usr/openwin/lib:$CDS_INST_DIR/tools/dfII/
lib:$CDS_INST_DIR/tools/inca/lib:$CDS_INST_DIR/tools/lib:$CDS_INST_DIR/to
    ols/
lib:$CDS_INST_DIR/tools/verilog/lib:/usr/dt/lib:/usr/lib/x11:/usr/ucblib:/usr20/dt_c
    de/lib:/usr/
local/lib/gcc-lib:/usr/local/lib:{SILOS}/bin:$UT_ROOT_DIR/PLI
```

envsource *contd*.

# NCSIM contd.

envsource *contd.*

For Undertow versions 1.7 and up, please use the correct PLI according to the simulator type and version.

$UT_ROOT_DIR has the following :

ibpli.so.nc_verilog for NC Verilog . This is for CADENCE LDV versions 4.1, 5.1, 5.2 and up libpli.so.old_nc_verilog for CADENCE LDV versions earlier than 4.1 libpli.so.verilog_xl for Verilog-XL

Make sure you do the following:

```
%cd $UT_ROOT_DIR/PLI/
%cp <appropriate libpli.so.#> libpli.so
```

Also make sure LD_LIBRARY_PATH has $UT_ROOT_DIR/PLI in the path

- vt_veriuser.c and vtplinc.o are available in our PLI directory.

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## NCSIM contd.

- <source> is the file that contains the source code files for Simulation
- To make the source file: add iv.v (in our distribution directory) at the top with top level file next followed by all the .v files needed in simulation
- Contents of  iv.v file

```
// iv.v
module vtInteractive;
initial
        $vtIv;
endmodule
```

## NCSIM contd.

- Add to source code close to top module

```
initial
begin
        $vtDumpvars();  /*dumps everything - created by our PLI routine.*/
end
```

- In the example(in our distribution directory), the above has been inserted in 'top.v' file.

# NCSIM contd.

- If you are compiling your design through the simulator for the first time, follow these steps:

  a) Run "ncprep"

  ncprep -f source

  -f <file> : used to specify file that contains all the user verilog files. Here, 'source' is a file with all of the user's Verilog files(top.v, fsm1.v, fsm2.v, fsm3.v) and iv.v

  iv.v is available in the example directory.

  Note that ncprep will generate the following files and directories.

  - cds.lib
  - hdl.vars
  - INCA_LIB
  - ncvlog.args
  - ncelab.args
  - ncsim.args

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## NCSIM contd.

b) Run "ncvlog"

```
ncvlog -f ncvlog.arg
```

c)Add the following line into file "ncleab.args"

```
-ACCESS +RCW
```

d) Run "ncelab"

```
ncelab -f ncelab.args
```

e) Run "ncsim"

```
ncsim -f ncsim.args
```

# NCSIM contd.

- You can then compile through the simulator again as follows:

```
./run_ncsim
---------run_ncsim contents--------------------------------------------
#!/bin/csh -f
# Run the NC-Verilog parser (compile the source)
ncvlog -f ncvlog.args
if ($status != 0) then
exit
Endif

# Run the NC-Verilog elaborator (build the design hierarchy)
ncelab -f ncelab.args
if ($status != 0) then
exit
Endif
```

run_ncsim *contd.*

# NCSIM contd.

run_ncsim *contd*

```
# Run the NC-Verilog simulator (simulate the design)
#ncsim -f ncsim.args +VTCOMPRESS250 +VTVECTORVALUES
ncsim -f ncsim.args
---------------------------------------------------------------------------
```

NOTE: +VTCOMPRESS250 +VTVECTORVALUES will compress the size 0

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# NCSIM contd.

- Viewing the NC Sim Waveform in batch mode, the commands are as follows:

  ut -iv -f <source_code_file> -sigfile <signal_file>

  source_code_file is the file that lists all the source code files.

  For example,

  ut -iv -f source -sigfile fsm.sigs

  To view just the waveform,

  ut -v <signal_file>

  For example,

  ut -v vt.dump

## NCSIM contd.

- Viewing the NC Sim Waveform in interactive mode, the commands are as follows

  a) Cadence Verilog-XL

  ut -iv -xl verilog -f <file that lists all source code filenames> -sigfile <signal_filename>

  For example,

  ut -iv -xl verilog -f source -sigfile fsm.sigs

  b) Cadence NC Verilog-XL

  ut -iv -ncxlmode ncxlmode -f <file that lists all source code filenames> -sigfile <signal_filename>

  For example,

  ut -iv -ncxlmode ncxlmode -f source -sigfile fsm.sigs

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## NCSIM contd.

c) Cadence NC Verilog

ut -iv -nc ncverilog “-f <file that lists all source code filenames>” -sigfile <signal_filename>

For example,

ut -iv -nc ncverilog “-f source” -sigfile fsm.sigs

d) Cadence NC Sim (Compiled Simulator)

ut -iv -ncverilog ncsim "-f ncsim.args" -sigfile <signal_filename> -ivsimcmp "-f <file that lists all source code file names>"

For example,

ut -iv -ncverilog ncsim "-f ncsim.args" -sigfile fsm.sigs -ivsimcmp "-f source"

OR

ut -iv -ncverilog ncsim worklib.top:v -sigfile fsm.sigs -ivsimcmp "-f source"

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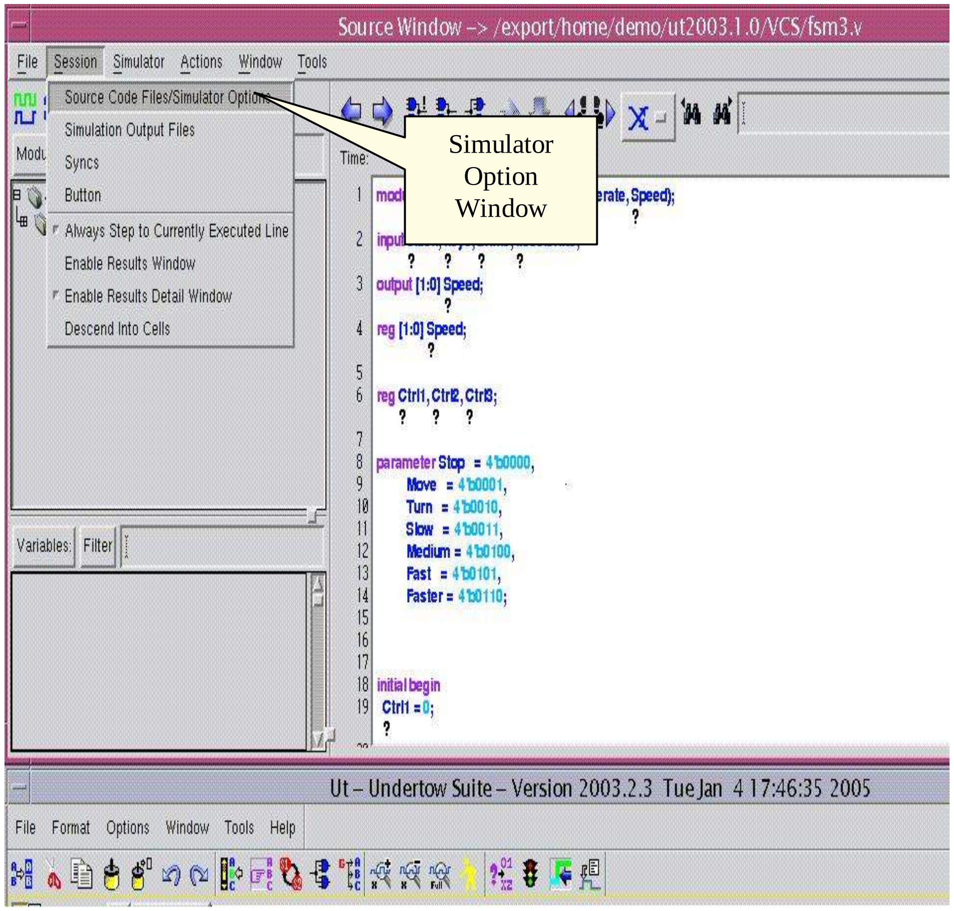
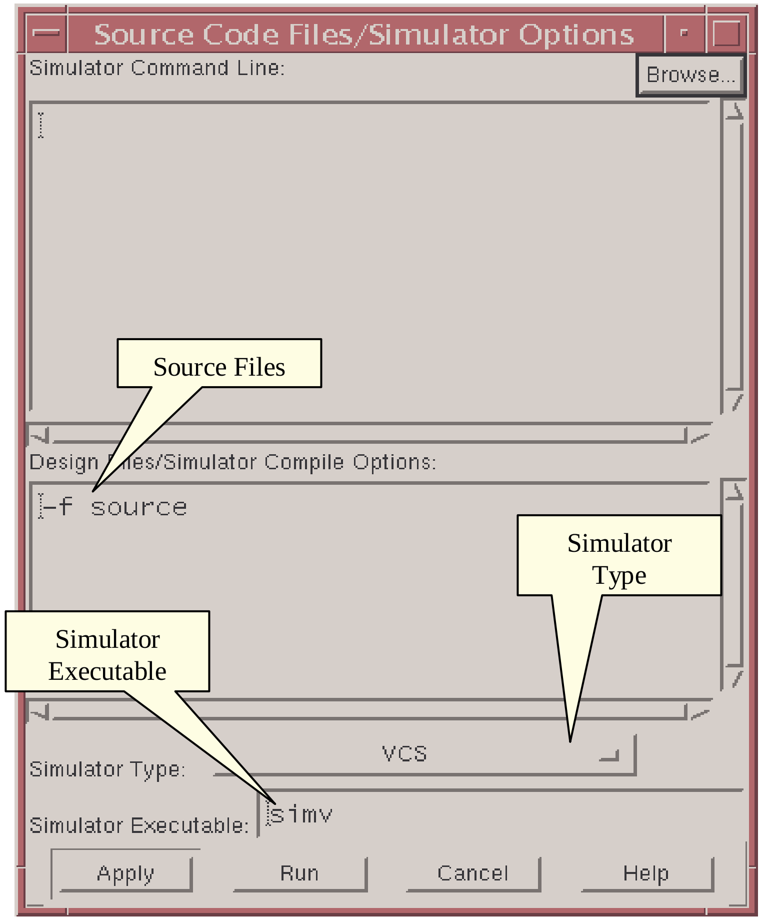
# Running Simulations


Source Window -> /export/home/demo/ut2003.1.0/VCS/fsm3.v
File
Session
Simulator
Actions
Window
Tools
Source Code Files/Simulator Options
Simulation Output Files
Syncs
Button
Always Step to Currently Executed Line
Enable Results Window
Enable Results Detail Window
Descend Into Cells
Time:
Variables:
Filter
Simulator Option Window
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 17:46:35 2005
File
Format
Options
Window
Tools
Help

```
mod                          erate, Speed);
                                 ?
input
    ?     ?    ?     ?
output [1:0] Speed;
              ?
reg [1:0] Speed;
          ?

reg Ctrl1, Ctrl2, Ctrl3;
     ?      ?      ?

parameter Stop   = 4'b0000,
          Move   = 4'b0001,
          Turn   = 4'b0010,
          Slow   = 4'b0011,
          Medium = 4'b0100,
          Fast   = 4'b0101,
          Faster = 4'b0110;



initial begin
 Ctrl1 = 0;
 ?
```

- After running the commands from the previous section to view those commands
- From the Source Code Window menu choose:
- Session => Source Code Files/Simulator Options

# Running Simulations contd.



Simulator Command Line:

Design Files/Simulator Compile Options:

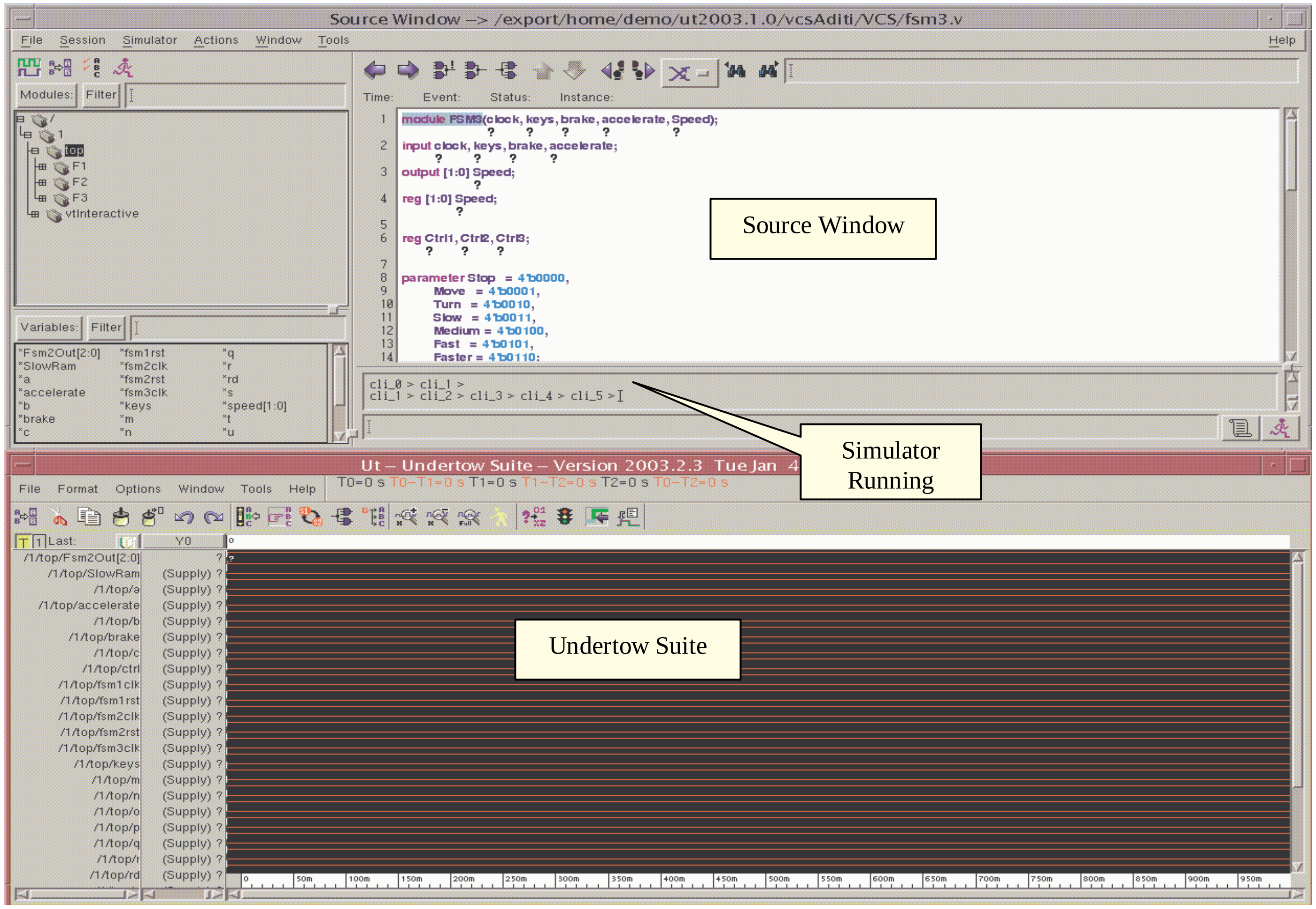
```
-f source
```

Simulator Type: VCS

Simulator Executable: simv

- Check for design files in the “Design Files/Simulator Compile Options:” text area and simulator executable in “Simulator Executable” text area
- Press Apply then Run
- Or from the Source Code Window menu choose:
- Simulator => Run

# Running Simulations contd.



Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Modules: Filter
/
1
top
F1
F2
F3
vtInteractive
Variables: Filter
Time: Event: Status: Instance:
Source Window
Simulator Running
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4
File Format Options Window Tools Help
T0=0 s T0–T1=0 s T1=0 s T1–T2=0 s T2=0 s T0–T2=0 s
Last: Y0
Undertow Suite
0 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m 550m 600m 650m 700m 750m 800m 850m 900m 950m

```
*Fsm2Out[2:0]   *fsm1rst   *q
*SlowRam        *fsm2clk   *r
*a              *fsm2rst   *rd
*accelerate     *fsm3clk   *s
*b              *keys      *speed[1:0]
*brake          *m         *t
*c              *n         *u
```

```
module FSM3(clock, keys, brake, accelerate, Speed);
                ?      ?     ?        ?           ?
input clock, keys, brake, accelerate;
        ?      ?     ?        ?
output [1:0] Speed;
               ?
reg [1:0] Speed;
            ?

reg Ctrl1, Ctrl2, Ctrl3;
      ?      ?      ?

parameter Stop   = 4'b0000,
      Move   = 4'b0001,
      Turn   = 4'b0010,
      Slow   = 4'b0011,
      Medium = 4'b0100,
      Fast   = 4'b0101,
      Faster = 4'b0110;
```

```
cli_0 > cli_1 >
cli_1 > cli_2 > cli_3 > cli_4 > cli_5 >
```

```
/1/top/Fsm2Out[2:0]              ?
/1/top/SlowRam        (Supply)   ?
/1/top/a              (Supply)   ?
/1/top/accelerate     (Supply)   ?
/1/top/b              (Supply)   ?
/1/top/brake          (Supply)   ?
/1/top/c              (Supply)   ?
/1/top/ctrl           (Supply)   ?
/1/top/fsm1clk        (Supply)   ?
/1/top/fsm1rst        (Supply)   ?
/1/top/fsm2clk        (Supply)   ?
/1/top/fsm2rst        (Supply)   ?
/1/top/fsm3clk        (Supply)   ?
/1/top/keys           (Supply)   ?
/1/top/m              (Supply)   ?
/1/top/n              (Supply)   ?
/1/top/o              (Supply)   ?
/1/top/p              (Supply)   ?
/1/top/q              (Supply)   ?
/1/top/r              (Supply)   ?
/1/top/rd             (Supply)   ?
```

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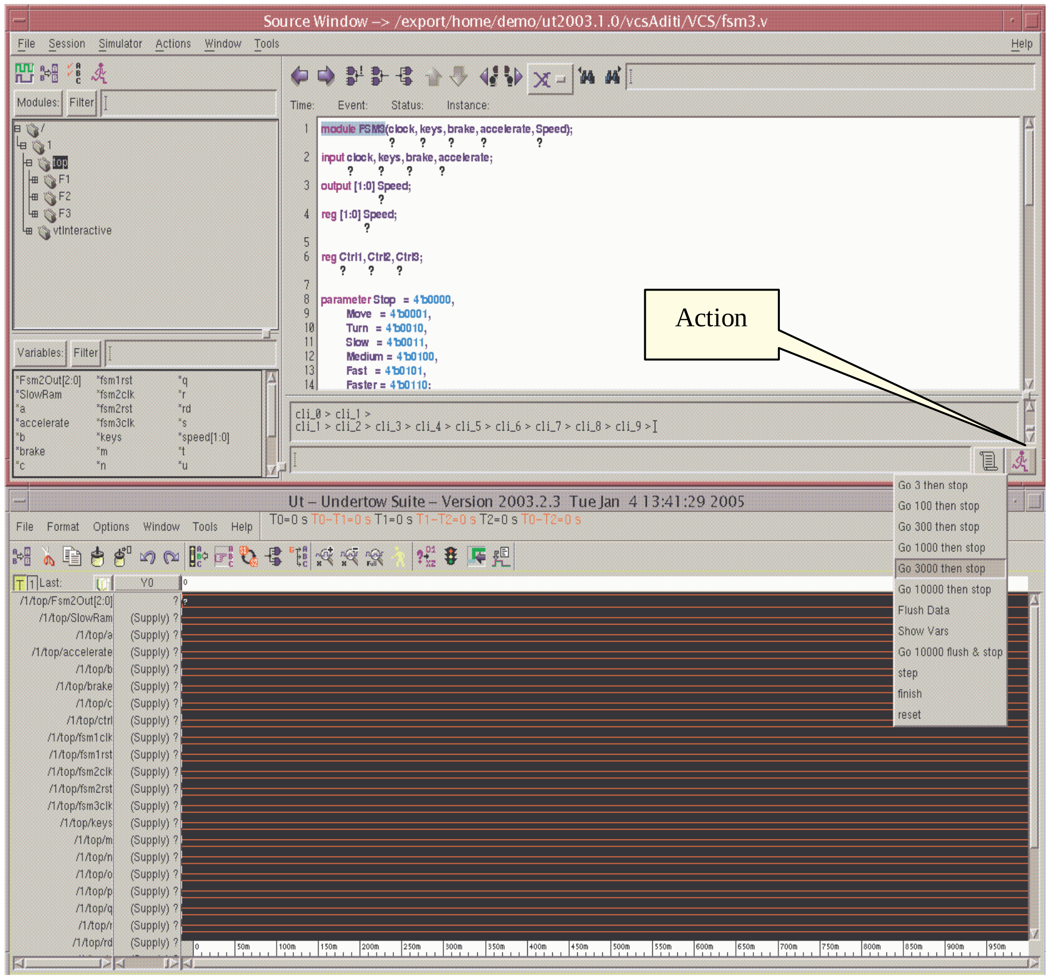
# Running Simulations contd.

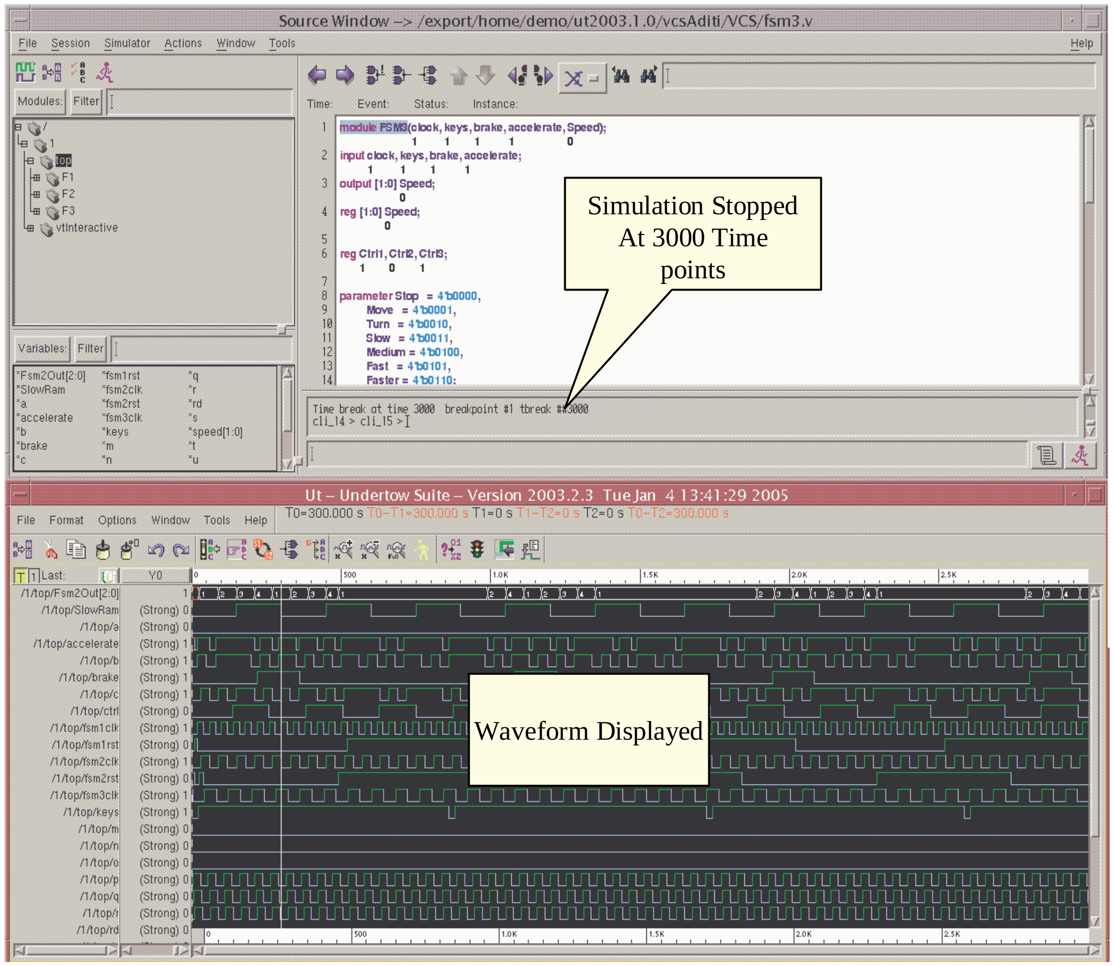


```
module FSM3(clock, keys, brake, accelerate, Speed);
               ?      ?      ?         ?              ?
input clock, keys, brake, accelerate;
         ?      ?      ?         ?
output [1:0] Speed;
                 ?
reg [1:0] Speed;
               ?

reg Ctrl1, Ctrl2, Ctrl3;
      ?      ?      ?

parameter Stop   = 4'b0000,
          Move   = 4'b0001,
          Turn   = 4'b0010,
          Slow   = 4'b0011,
          Medium = 4'b0100,
          Fast   = 4'b0101,
          Faster = 4'b0110;
```

```
cli_0 > cli_1 >
cli_1 > cli_2 > cli_3 > cli_4 > cli_5 > cli_6 > cli_7 > cli_8 > cli_9 >
```

- Click on the “Action” button to display the list of commands for running the simulator
- Select “Go 3000 then stop”
- The simulator will run 3000 time points and stop
- This action has set the first break point at 3000 time point

# Running Simulations contd.

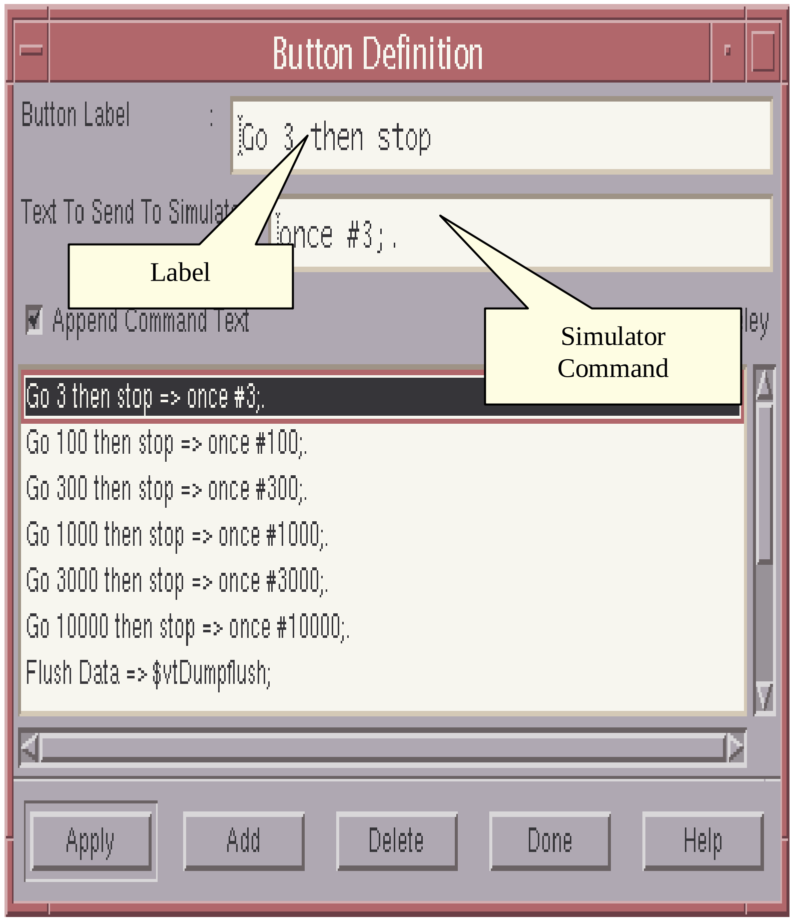

Source Window -> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 13:41:29 2005
T0=300.000 s T0-T1=300.000 s T1=0 s T1-T2=0 s T2=0 s T0-T2=300.000 s
Simulation Stopped At 3000 Time points
Waveform Displayed

```
module FSM3(clock, keys, brake, accelerate, Speed);
                1      1     1       1          0
input clock, keys, brake, accelerate;
      1      1     1      1
output [1:0] Speed;
             0
reg [1:0] Speed;
          0

reg Ctrl1, Ctrl2, Ctrl3;
     1      0      1

parameter Stop   = 4'b0000,
          Move   = 4'b0001,
          Turn   = 4'b0010,
          Slow   = 4'b0011,
          Medium = 4'b0100,
          Fast   = 4'b0101,
          Faster = 4'b0110;
```

```
Time break at time 3000  breakpoint #1 tbreak ##3000
cli_14 > cli_15 >
```

- To further run the simulator select the options from the “Action” button

# “Action” Button


Button Definition

Button Label : Go 3 then stop

Text To Send To Simulator : once #3;.

[✓] Append Command Text

Go 3 then stop => once #3;.
Go 100 then stop => once #100;.
Go 300 then stop => once #300;.
Go 1000 then stop => once #1000;.
Go 3000 then stop => once #3000;.
Go 10000 then stop => once #10000;.
Flush Data => $vtDumpflush;

- To change the definition of the options in the “Action” list
- From the Source Code Window menu choose:
- Session => Button
- Print the text in “Button Label” text area and simulator command in “Text To Send To Simulator” text area in the “Button Definition” window
- Press Apply

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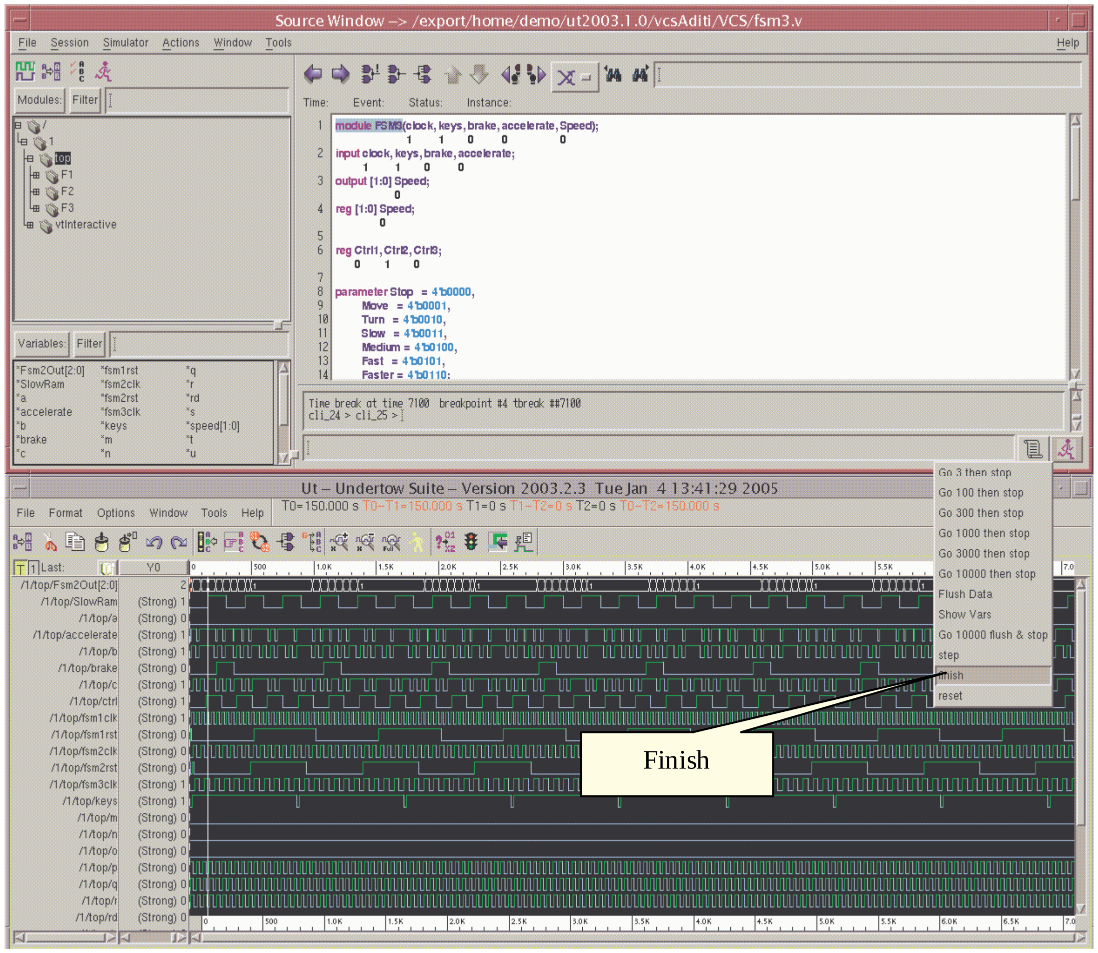
# Finish Simulation

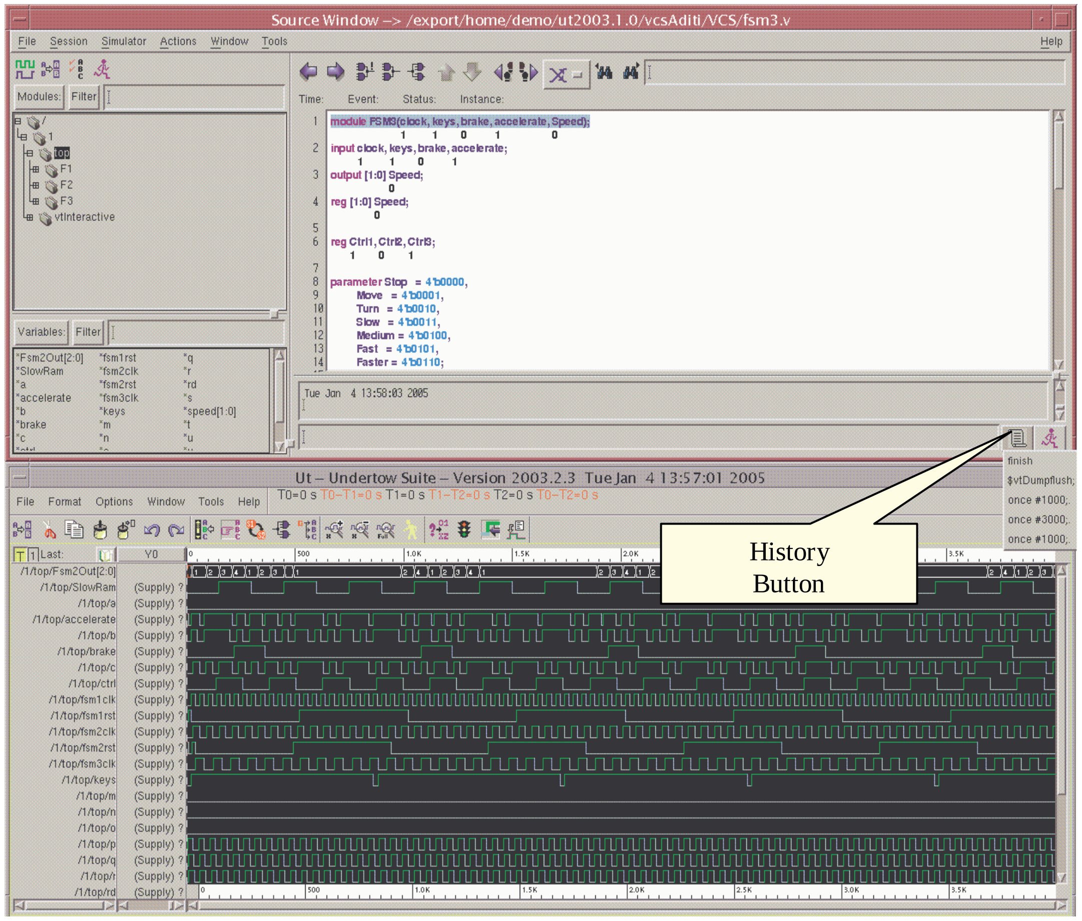

Source Window --> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 13:41:29 2005
Go 3 then stop
Go 100 then stop
Go 300 then stop
Go 1000 then stop
Go 3000 then stop
Go 10000 then stop
Flush Data
Show Vars
Go 10000 flush & stop
step
finish
reset
Finish

```
module FSM3(clock, keys, brake, accelerate, Speed);
                1     1     0     0         0
input clock, keys, brake, accelerate;
      1     1     0     0
output [1:0] Speed;
             0
reg [1:0] Speed;
          0

reg Ctrl1, Ctrl2, Ctrl3;
    0      1      0

parameter Stop  = 4'b0000,
     Move   = 4'b0001,
     Turn   = 4'b0010,
     Slow   = 4'b0011,
     Medium = 4'b0100,
     Fast   = 4'b0101,
     Faster = 4'b0110;
```

```
Time break at time 7100  breakpoint #4 tbreak ##7100
cli_24 > cli_25 >
```

- To finish the simulation click on “Finish” from the “Action” list
- This will exit the simulator after it has finished the given time points

# History


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Time: Event: Status: Instance:
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 13:57:01 2005
History Button

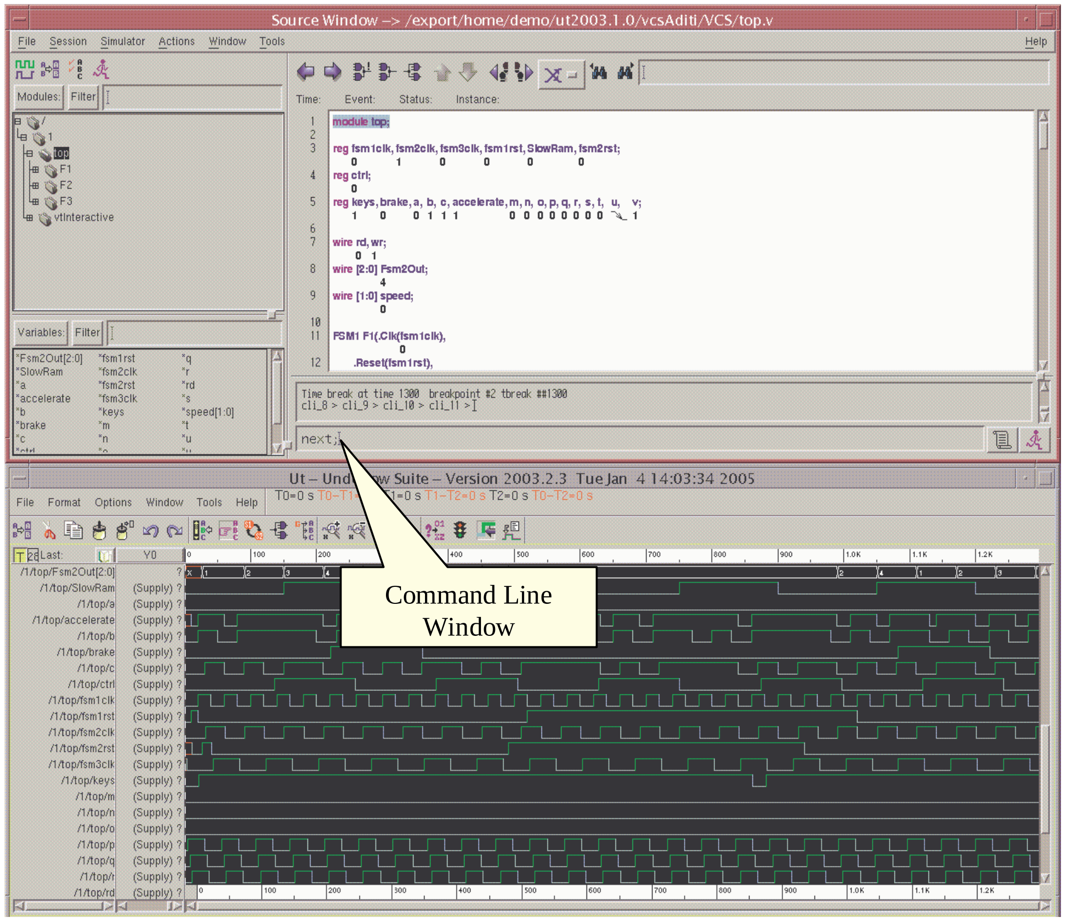
```
module FSM3(clock, keys, brake, accelerate, Speed);
                 1     1     0        1        0
input clock, keys, brake, accelerate;
        1     1     0        1
output [1:0] Speed;
              0
reg [1:0] Speed;
           0

reg Ctrl1, Ctrl2, Ctrl3;
      1      0      1

parameter Stop   = 4'b0000,
          Move   = 4'b0001,
          Turn   = 4'b0010,
          Slow   = 4'b0011,
          Medium = 4'b0100,
          Fast   = 4'b0101,
          Faster = 4'b0110;
```

```
Tue Jan  4 13:58:03 2005
```

```
finish
$vtDumpflush;
once #1000;
once #3000;
once #1000;
```

- Click on “History” button to display the list of previous executed commands.

# Command Line


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Modules: Filter
Variables: Filter
Time: Event: Status: Instance:
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 14:03:34 2005
File Format Options Window Tools Help
Command Line Window

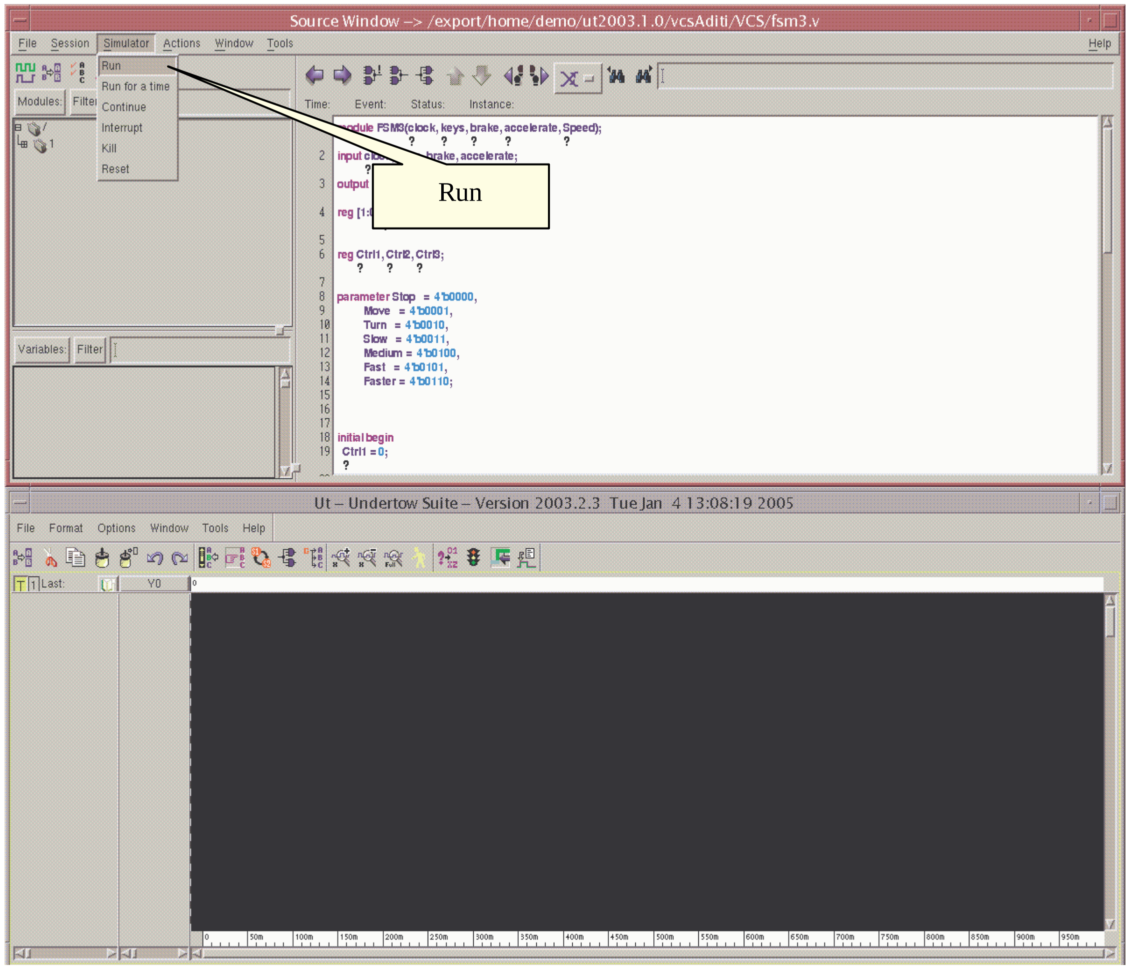
```
module top;

reg fsm1clk, fsm2clk, fsm3clk, fsm1rst, SlowRam, fsm2rst;
     0        1        0        0        0        0
reg ctrl;
     0
reg keys, brake, a, b, c, accelerate, m, n, o, p, q, r, s, t, u, v;
     1      0     0  1  1  1           0  0  0  0  0  0  0  0     1

wire rd, wr;
      0  1
wire [2:0] Fsm2Out;
           4
wire [1:0] speed;
           0

FSM1 F1(.Clk(fsm1clk),
              0
    .Reset(fsm1rst),
```

```
Time break at time 1300  breakpoint #2 tbreak ##1300
cli_8 > cli_9 > cli_10 > cli_11 >
```

```
next;
```

- To type the commands for the simulator use command line window
- Press "Enter" after typing the command

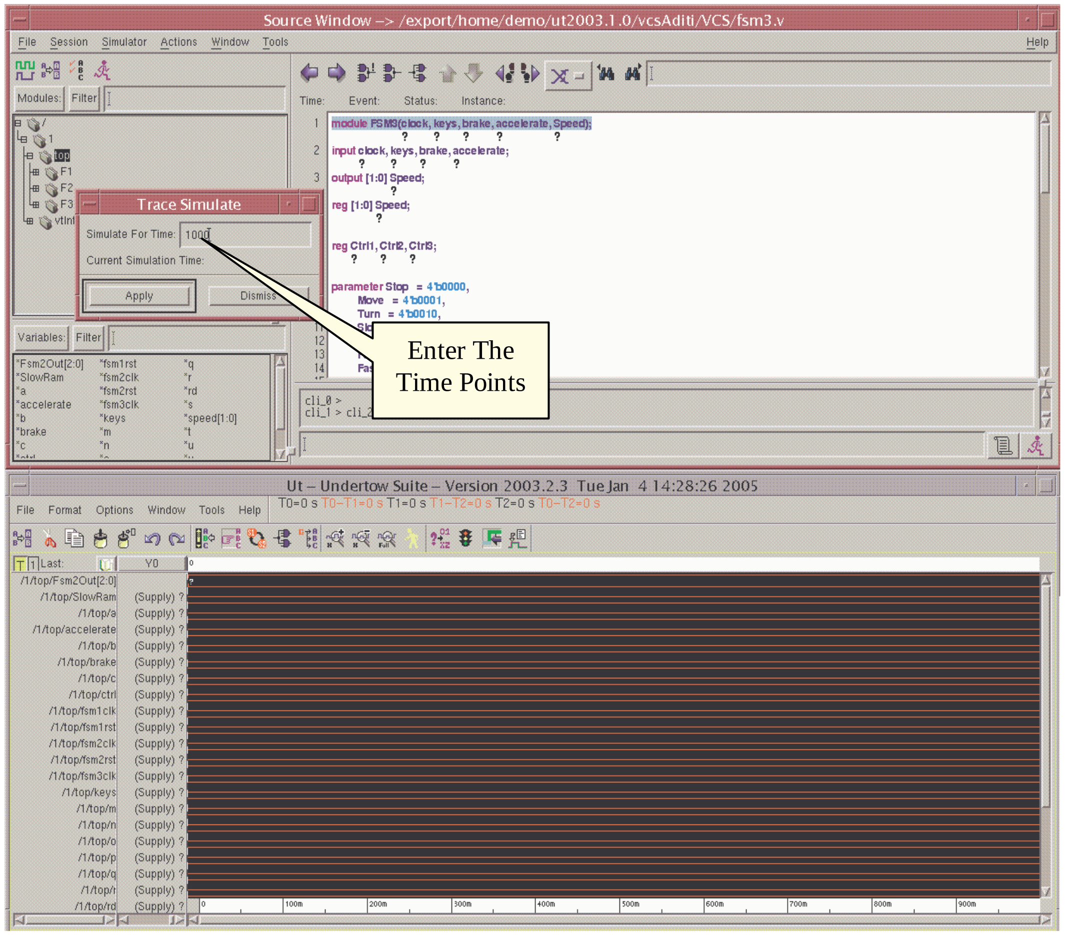
# Regaining the simulator


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Run
Run for a time
Continue
Interrupt
Kill
Reset
Modules: Filter
Variables: Filter
Time: Event: Status: Instance:
Run
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 13:08:19 2005
File Format Options Window Tools Help
Last:
Y0

```
module FSM3(clock, keys, brake, accelerate, Speed);
input clo      brake, accelerate;
output
reg [1:

reg Ctrl1, Ctrl2, Ctrl3;

parameter Stop  = 4'b0000,
      Move  = 4'b0001,
      Turn  = 4'b0010,
      Slow  = 4'b0011,
      Medium = 4'b0100,
      Fast  = 4'b0101,
      Faster = 4'b0110;



initial begin
 Ctrl1 = 0;
```

- To re-run the simulator after a simulation has exited
- From the Source Code Window menu choose:
- Simulator => Run
- This will restart the simulator from 0 time point

# Run For


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Trace Simulate
Apply
Dismiss
Enter The Time Points
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 14:28:26 2005
File Format Options Window Tools Help

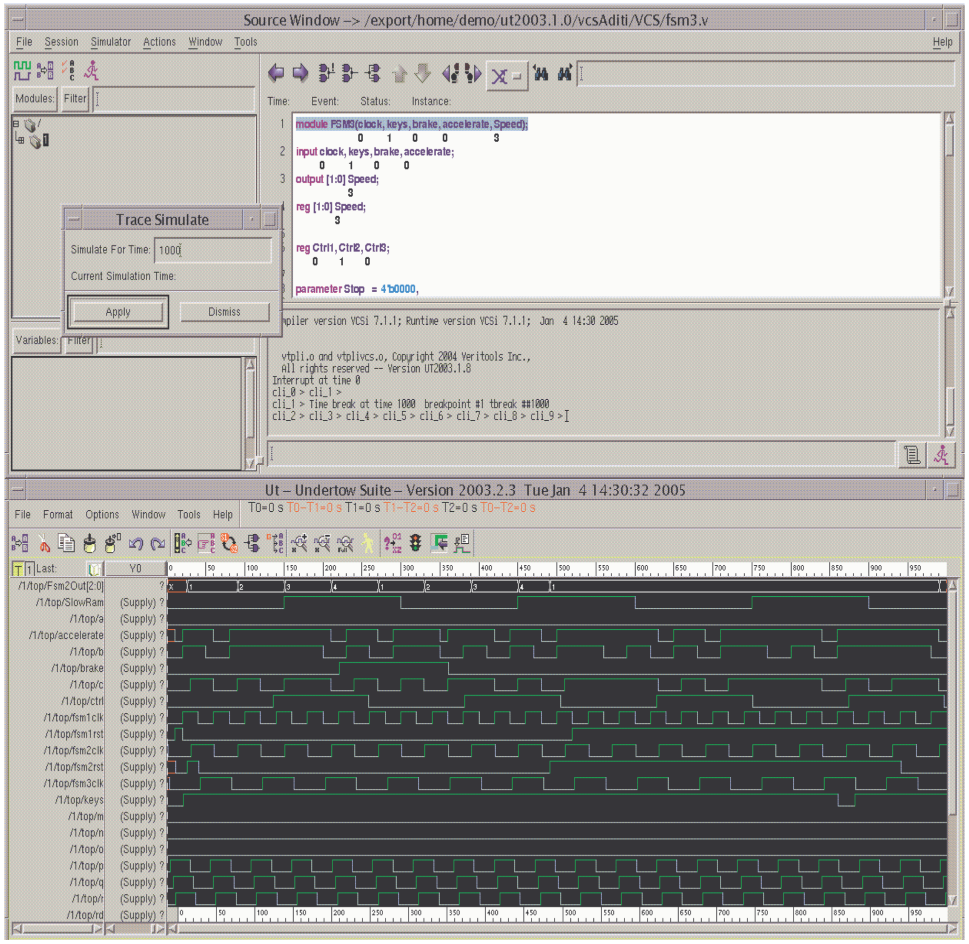
Simulate For Time: 1000
Current Simulation Time:

```
module FSM3(clock, keys, brake, accelerate, Speed);
input clock, keys, brake, accelerate;
output [1:0] Speed;
reg [1:0] Speed;

reg Ctrl1, Ctrl2, Ctrl3;

parameter Stop  = 4'b0000,
      Move  = 4'b0001,
      Turn  = 4'b0010,
```

```
cli_0 >
cli_1 > cli_2
```

- To run the simulation for given time points
- From the Source Code Window menu choose:
- Simulator => Run For a Time
- Enter the time point in “Simulate For Time” text area and press “Apply”

# Run For

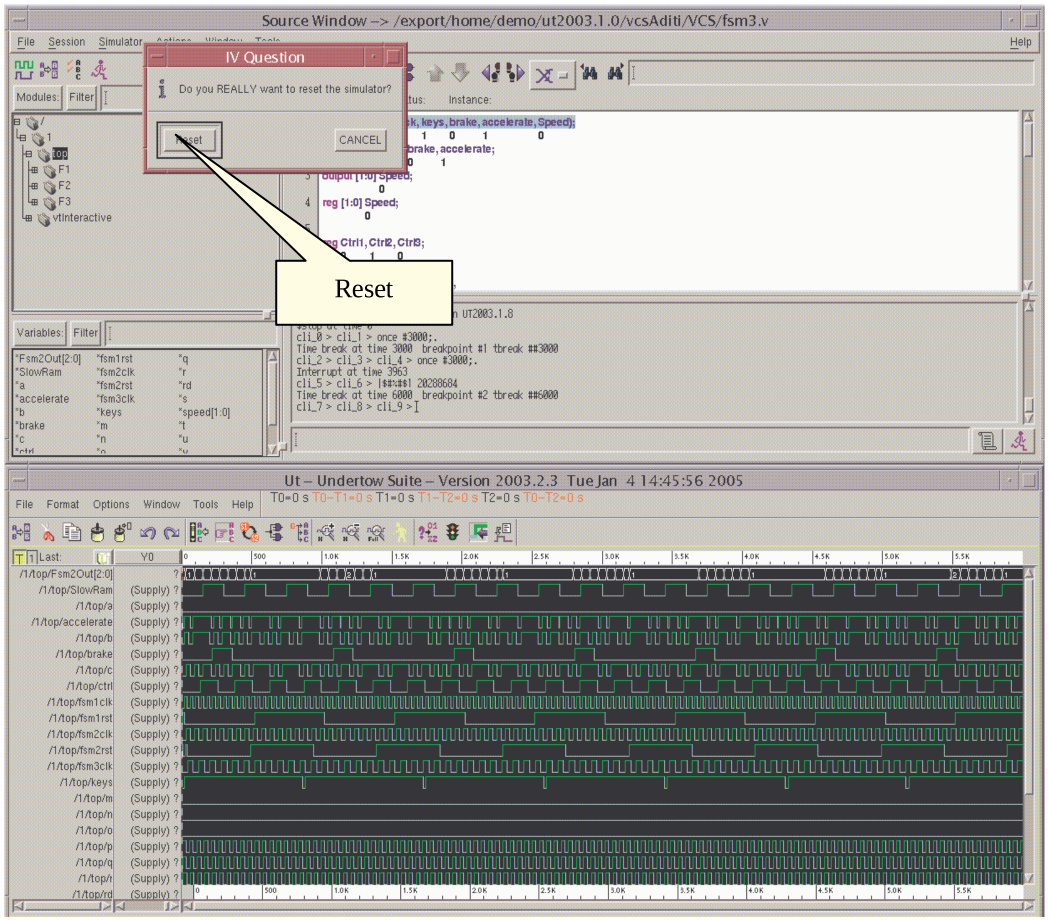

Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Trace Simulate
Simulate For Time: 1000
Current Simulation Time:
Apply
Dismiss
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 14:30:32 2005

```
module FSM3(clock, keys, brake, accelerate, Speed);
input clock, keys, brake, accelerate;
output [1:0] Speed;
reg [1:0] Speed;
reg Ctrl1, Ctrl2, Ctrl3;
parameter Stop  = 4'b0000,
```

```
mpiler version VCSi 7.1.1; Runtime version VCSi 7.1.1;  Jan  4 14:30 2005

  vtpli.o and vtplivcs.o, Copyright 2004 Veritools Inc.,
  All rights reserved -- Version UT2003.1.8
Interrupt at time 0
cli_0 > cli_1 >
cli_1 > Time break at time 1000  breakpoint #1 tbreak ##1000
cli_2 > cli_3 > cli_4 > cli_5 > cli_6 > cli_7 > cli_8 > cli_9 >
```

- This will run the simulator for the given time points and wait for next command
- This action has set the break point for the given time points
- To run the simulator without breakpoints type “.” in the command line window and press “Enter”
- Or from the Source Code Window menu choose:
- Simulator => Continue

# Reset Simulator

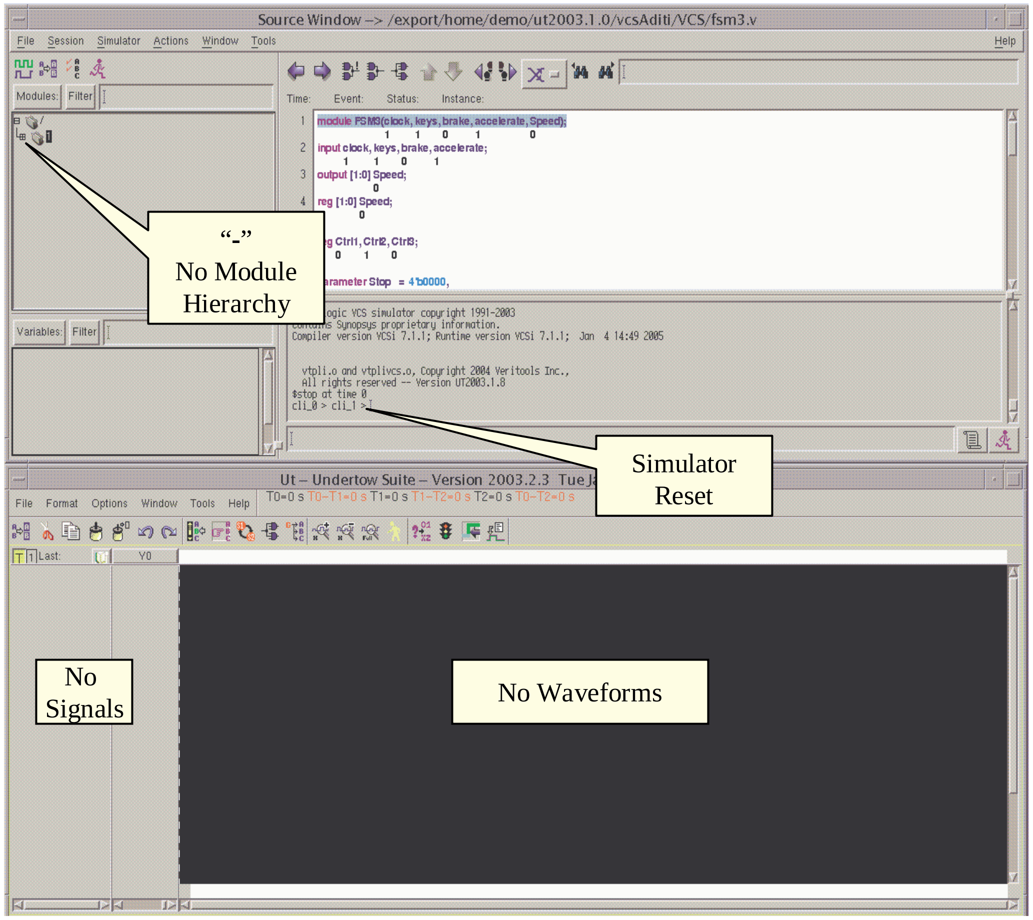

Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
IV Question
Reset
CANCEL
Reset
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 14:45:56 2005

Do you REALLY want to reset the simulator?

```
cli_0 > cli_1 > once #3000;.
Time break at time 3000  breakpoint #1 tbreak ##3000
cli_2 > cli_3 > cli_4 > once #3000;.
Interrupt at time 3963
cli_5 > cli_6 > |$#%#$1 20288684
Time break at time 6000  breakpoint #2 tbreak ##6000
cli_7 > cli_8 > cli_9 >
```

- To reset the simulator
- From the Source Code Window menu choose:
- Simulator => Reset
- Press “Reset” in the “IV Question” window

# Reset Simulator



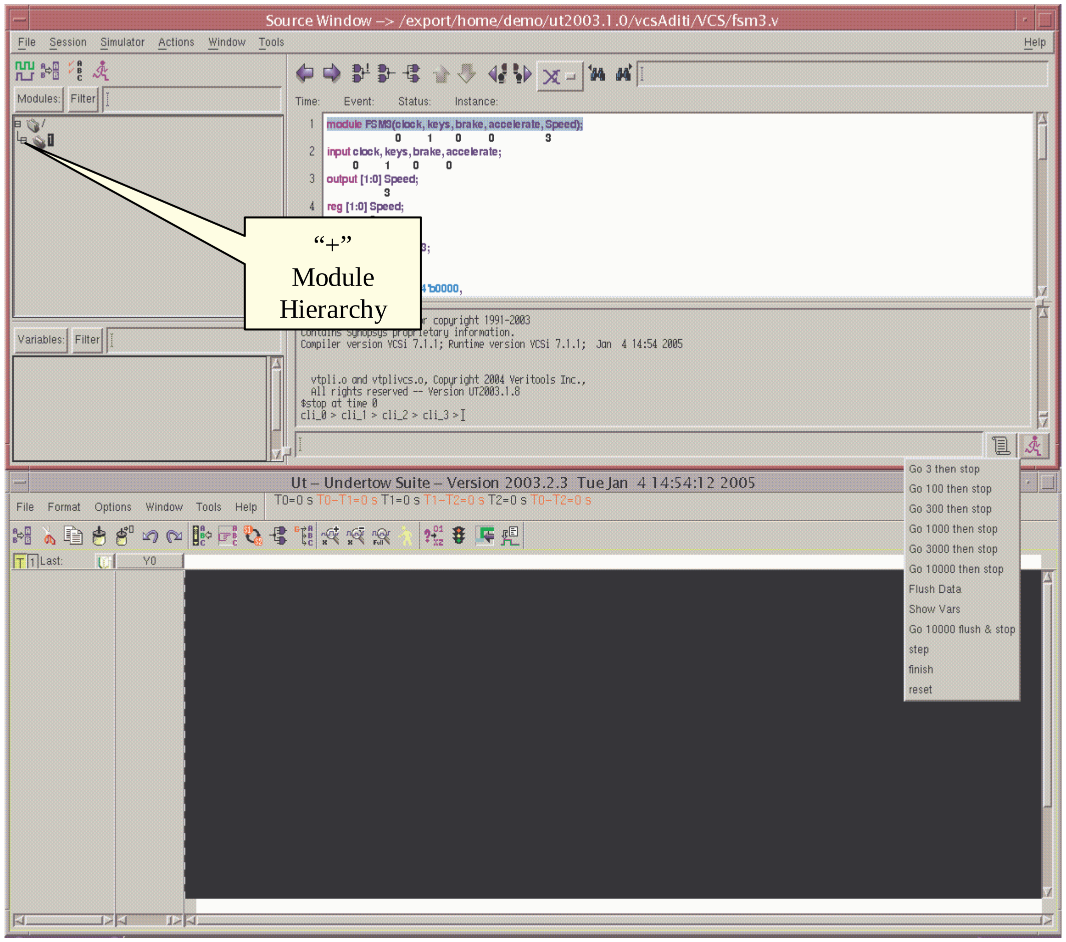
Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/fsm3.v
File Session Simulator Actions Window Tools Help
Modules: Filter
Variables: Filter
Time: Event: Status: Instance:
"_"
No Module Hierarchy
Simulator Reset
Ut – Undertow Suite – Version 2003.2.3 Tue Ja
File Format Options Window Tools Help
T0=0 s T0–T1=0 s T1=0 s T1–T2=0 s T2=0 s T0–T2=0 s
Last:
Y0
No Signals
No Waveforms

```
module FSM3(clock, keys, brake, accelerate, Speed);
                 1      1     0      1           0
input clock, keys, brake, accelerate;
      1      1     0      1
output [1:0] Speed;
             0
reg [1:0] Speed;
          0

g Ctrl1, Ctrl2, Ctrl3;
  0      1      0

arameter Stop  = 4'b0000,
```

```
ogic VCS simulator copyright 1991-2003
s Synopsys proprietary information.
Compiler version VCSi 7.1.1; Runtime version VCSi 7.1.1;  Jan  4 14:49 2005


 vtpli.o and vtplivcs.o, Copyright 2004 Veritools Inc.,
 All rights reserved -- Version UT2003.1.8
$stop at time 0
cli_0 > cli_1 >
```

- This will reset the simulator
- After the simulator has been reset, to access module (signal) hierarchy, select the option to simulate for a giver amount of time, from the "Action" list or give a command from the command line window

# Reset Simulator

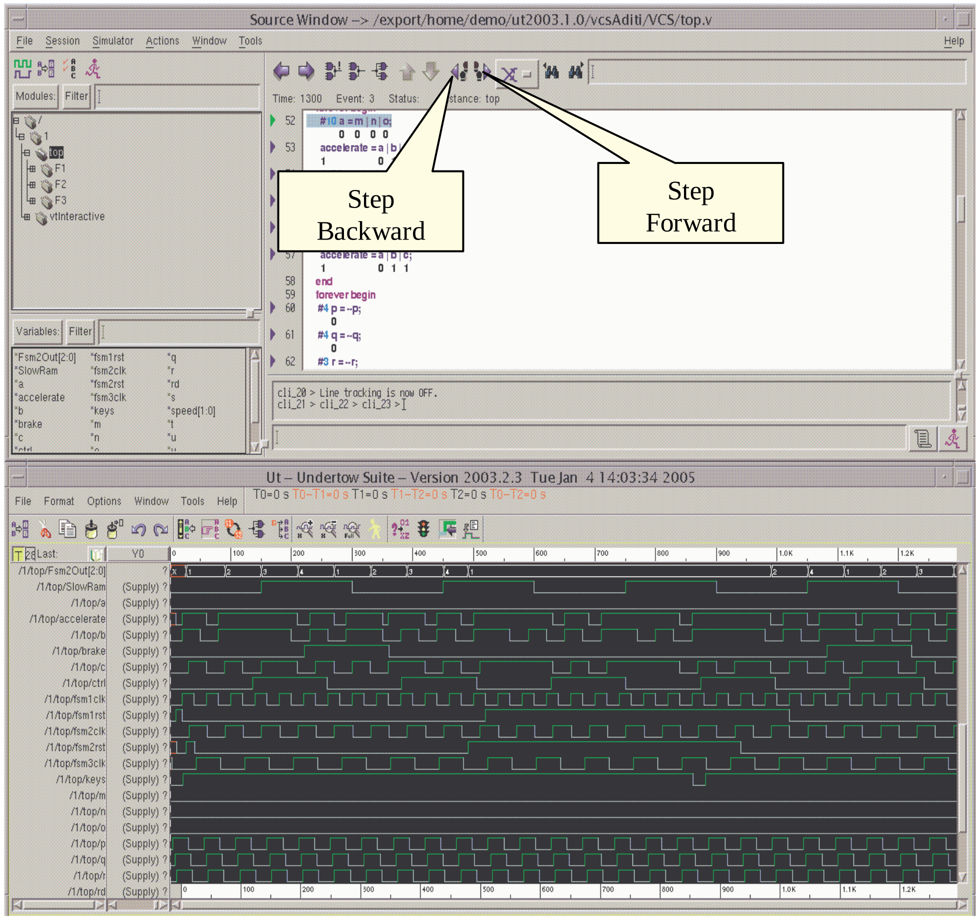


```
module FSM3(clock, keys, brake, accelerate, Speed);
                0     1     0     0          3
input clock, keys, brake, accelerate;
      0     1     0     0
output [1:0] Speed;
              3
reg [1:0] Speed;
```

```
r copyright 1991-2003
Contains Synopsys proprietary information.
Compiler version VCSi 7.1.1; Runtime version VCSi 7.1.1;  Jan  4 14:54 2005


  vtpli.o and vtplivcs.o, Copyright 2004 Veritools Inc.,
  All rights reserved -- Version UT2003.1.8
$stop at time 0
cli_0 > cli_1 > cli_2 > cli_3 >
```

- Giving the command to simulate for a given amount of time will give the access back to the module hierarchy

# Stepping Source Code


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Time: 1300 Event: 3 Status: Instance: top
Step Backward
Step Forward
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 14:03:34 2005
T0=0 s T0–T1=0 s T1=0 s T1–T2=0 s T2=0 s T0–T2=0 s
File Format Options Window Tools Help

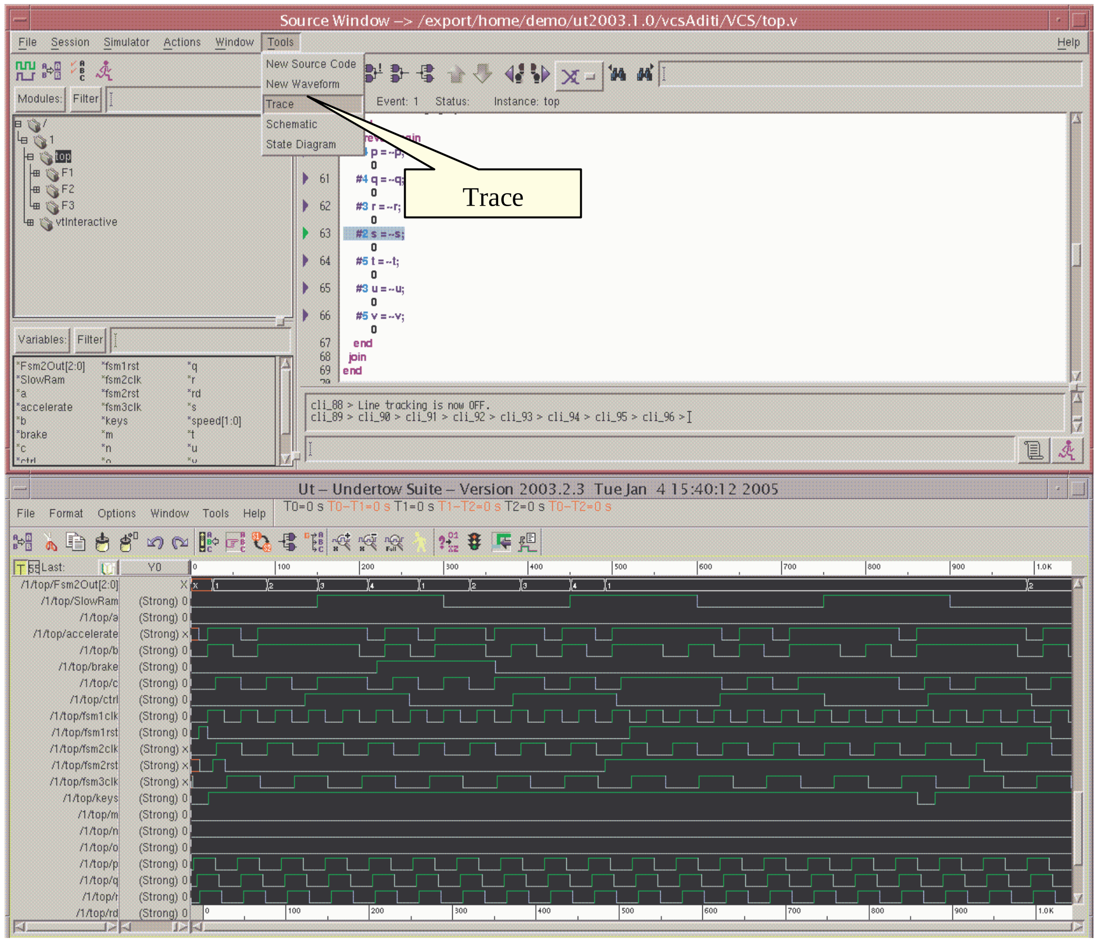
```
#10 a = m | n | o;
      0   0   0   0
accelerate = a | b
1              0
...
accelerate = a | b | c;
1              0   1   1
end
forever begin
 #4 p = ~p;
     0
 #4 q = ~q;
     0
 #3 r = ~r;
```

```
cli_20 > Line tracking is now OFF.
cli_21 > cli_22 > cli_23 >
```

- Stepping the Source Code
- “Step Backward” will step back through the prior simulation steps that are in the trace file
- If you are at the last simulation time, clicking on “Step Forward” will step the simulation further

If you are not at simulation “current time”, stepping forward will step forward through simulation steps currently in the trace file.

# Trace Window



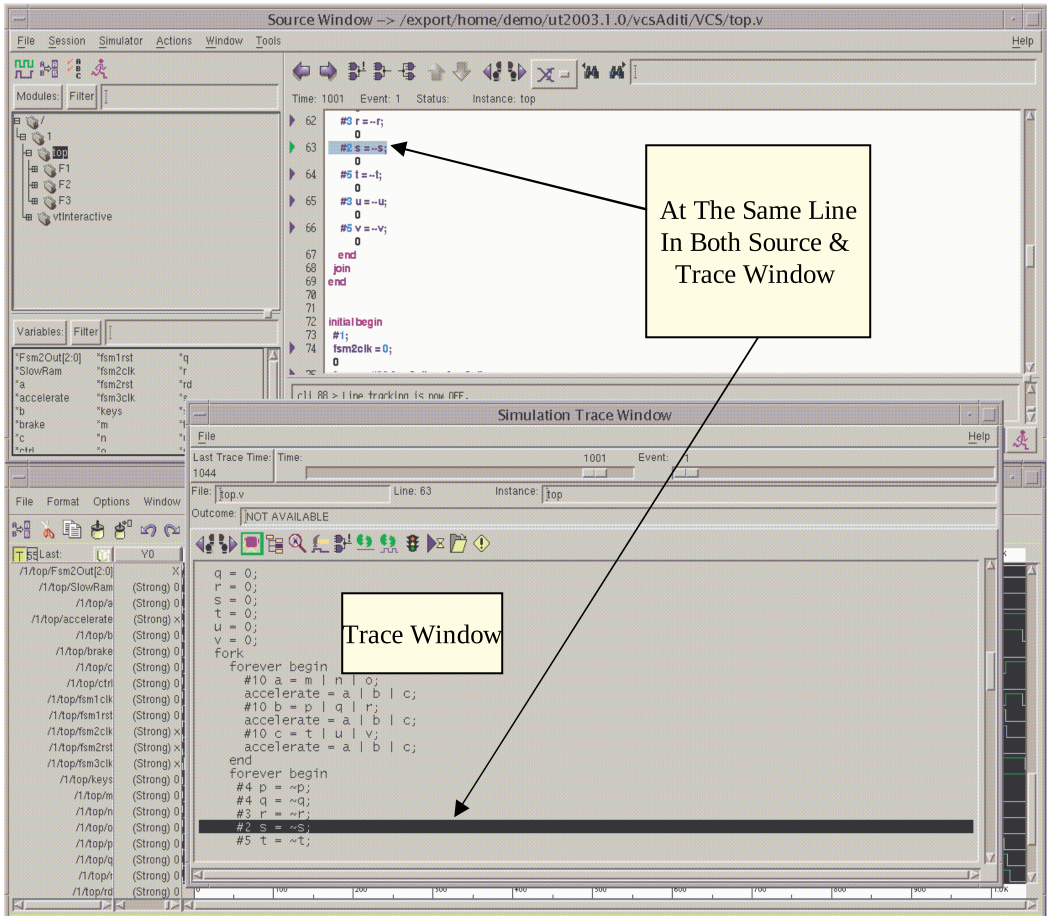
Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
New Source Code
New Waveform
Trace
Schematic
State Diagram
Trace
Event: 1 Status: Instance: top
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 15:40:12 2005
T0=0 s T0–T1=0 s T1=0 s T1–T2=0 s T2=0 s T0–T2=0 s

```
    #4 q = ~q;
    #3 r = ~r;
    #2 s = ~s;
    #5 t = ~t;
    #3 u = ~u;
    #5 v = ~v;
  end
 join
end
```

```
cli_88 > Line tracking is now OFF.
cli_89 > cli_90 > cli_91 > cli_92 > cli_93 > cli_94 > cli_95 > cli_96 >
```

- To display the trace window
- From the Source Code Window menu choose:
- Tools => Trace

# Trace Window



Source Window --> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Modules: Filter
top
F1
F2
F3
vtInteractive
Variables: Filter
At The Same Line In Both Source & Trace Window
Simulation Trace Window
Trace Window

Time: 1001 Event: 1 Status: Instance: top

```
62    #3 r = ~r;
        0
63    #2 s = ~s;
        0
64    #5 t = ~t;
        0
65    #3 u = ~u;
        0
66    #5 v = ~v;
        0
67   end
68  join
69 end
70
71
72 initial begin
73  #1;
74  fsm2clk = 0;
    0
```

```
cli 88 > Line tracking is now OFF.
```

Last Trace Time: 1044 Time: 1001 Event: 1

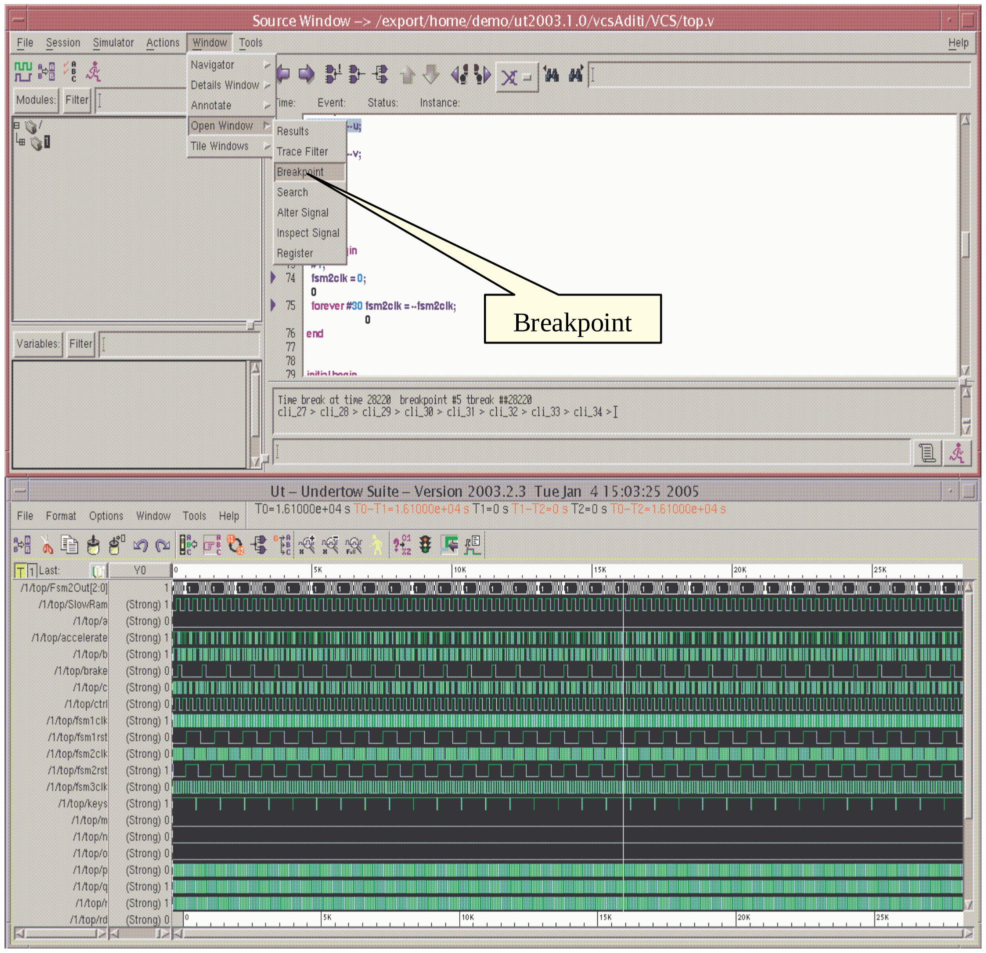
File: top.v Line: 63 Instance: top

Outcome: NOT AVAILABLE

```
q = 0;
r = 0;
s = 0;
t = 0;
u = 0;
v = 0;
fork
  forever begin
    #10 a = m | n | o;
    accelerate = a | b | c;
    #10 b = p | q | r;
    accelerate = a | b | c;
    #10 c = t | u | v;
    accelerate = a | b | c;
  end
  forever begin
   #4 p = ~p;
   #4 q = ~q;
   #3 r = ~r;
   #2 s = ~s;
   #5 t = ~t;
```

- The cursor on the trace window will point to the same line as the line of execution in the source code window

# Setting Breakpoints



Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Navigator
Details Window
Annotate
Open Window
Tile Windows
Results
Trace Filter
Breakpoint
Search
Alter Signal
Inspect Signal
Register
Modules: Filter
Variables: Filter
Time: Event: Status: Instance:
Breakpoint
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 15:03:25 2005
File Format Options Window Tools Help
T 1 Last: Y0
0 5K 10K 15K 20K 25K

```
fsm2clk = 0;
0
forever #30 fsm2clk = ~fsm2clk;
            0
end


initial begin
```

```
Time break at time 28220  breakpoint #5 tbreak ##28220
cli_27 > cli_28 > cli_29 > cli_30 > cli_31 > cli_32 > cli_33 > cli_34 >
```

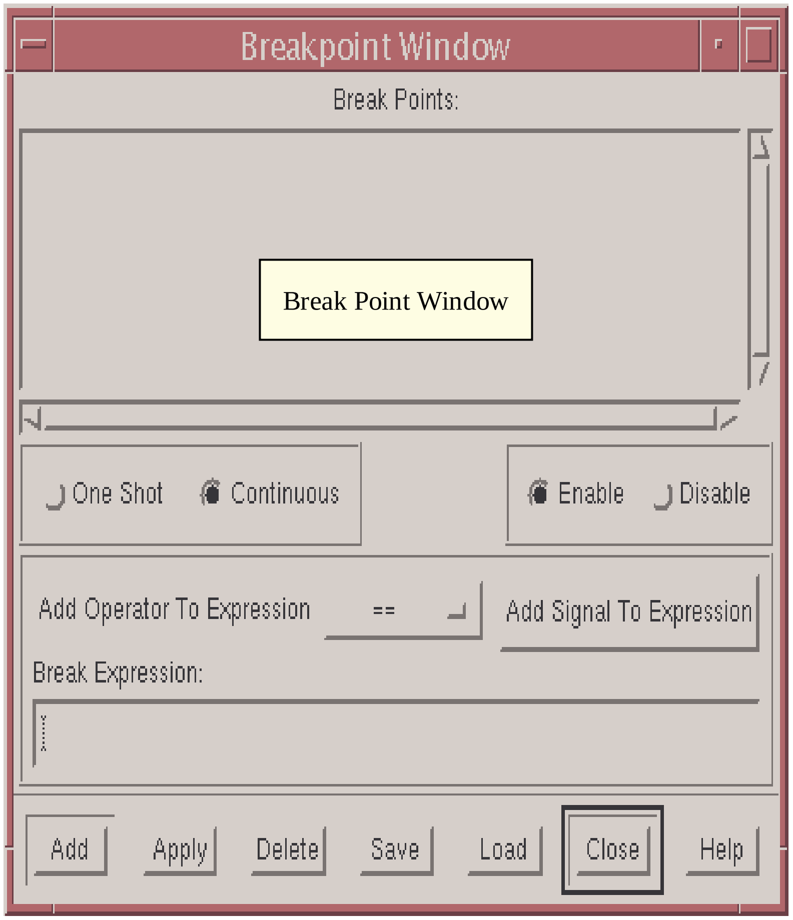
```
T0=1.61000e+04 s T0-T1=1.61000e+04 s T1=0 s T1-T2=0 s T2=0 s T0-T2=1.61000e+04 s
```

```
/1/top/Fsm2Out[2:0]            1
/1/top/SlowRam        (Strong) 1
/1/top/a              (Strong) 0
/1/top/accelerate     (Strong) 1
/1/top/b              (Strong) 1
/1/top/brake          (Strong) 0
/1/top/c              (Strong) 0
/1/top/ctrl           (Strong) 0
/1/top/fsm1clk        (Strong) 1
/1/top/fsm1rst        (Strong) 0
/1/top/fsm2clk        (Strong) 0
/1/top/fsm2rst        (Strong) 1
/1/top/fsm3clk        (Strong) 0
/1/top/keys           (Strong) 1
/1/top/m              (Strong) 0
/1/top/n              (Strong) 0
/1/top/o              (Strong) 0
/1/top/p              (Strong) 0
/1/top/q              (Strong) 1
/1/top/r              (Strong) 1
/1/top/rd             (Strong) 0
```

- To Set the breakpoint from the "Source Window"
- From the Source Code Window menu choose
- Window => Open Window -> Breakpoint

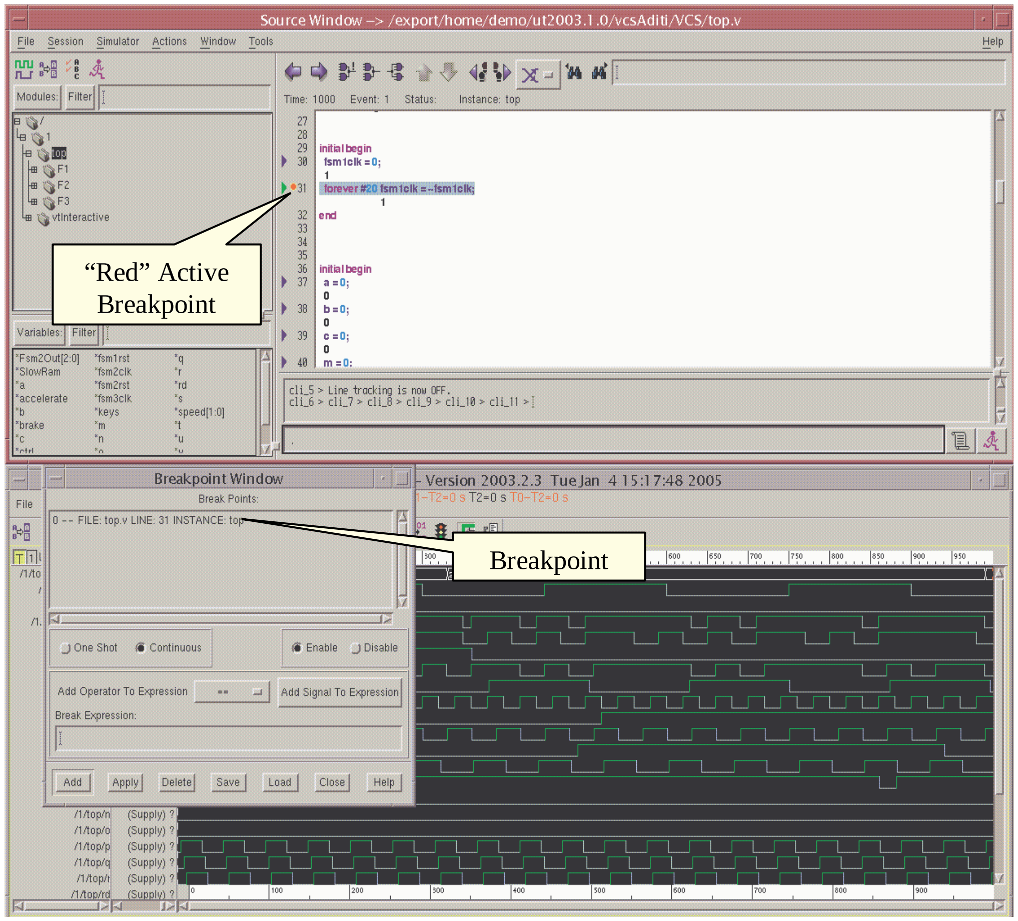
Veritools

# Breakpoint Window



Veritools

# Adding Breakpoints


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Modules: Filter
Variables: Filter
Breakpoint Window
Break Points:
One Shot Continuous
Enable Disable
Add Operator To Expression
Add Signal To Expression
Break Expression:
Add Apply Delete Save Load Close Help
"Red" Active Breakpoint
Breakpoint

Time: 1000 Event: 1 Status: Instance: top

```
27
28
29 initial begin
30  fsm1clk = 0;
    1
31  forever #20 fsm1clk = ~fsm1clk;
                1
32 end
33
34
35
36 initial begin
37  a = 0;
    0
38  b = 0;
    0
39  c = 0;
    0
40  m = 0;
```

```
cli_5 > Line tracking is now OFF.
cli_6 > cli_7 > cli_8 > cli_9 > cli_10 > cli_11 >
```

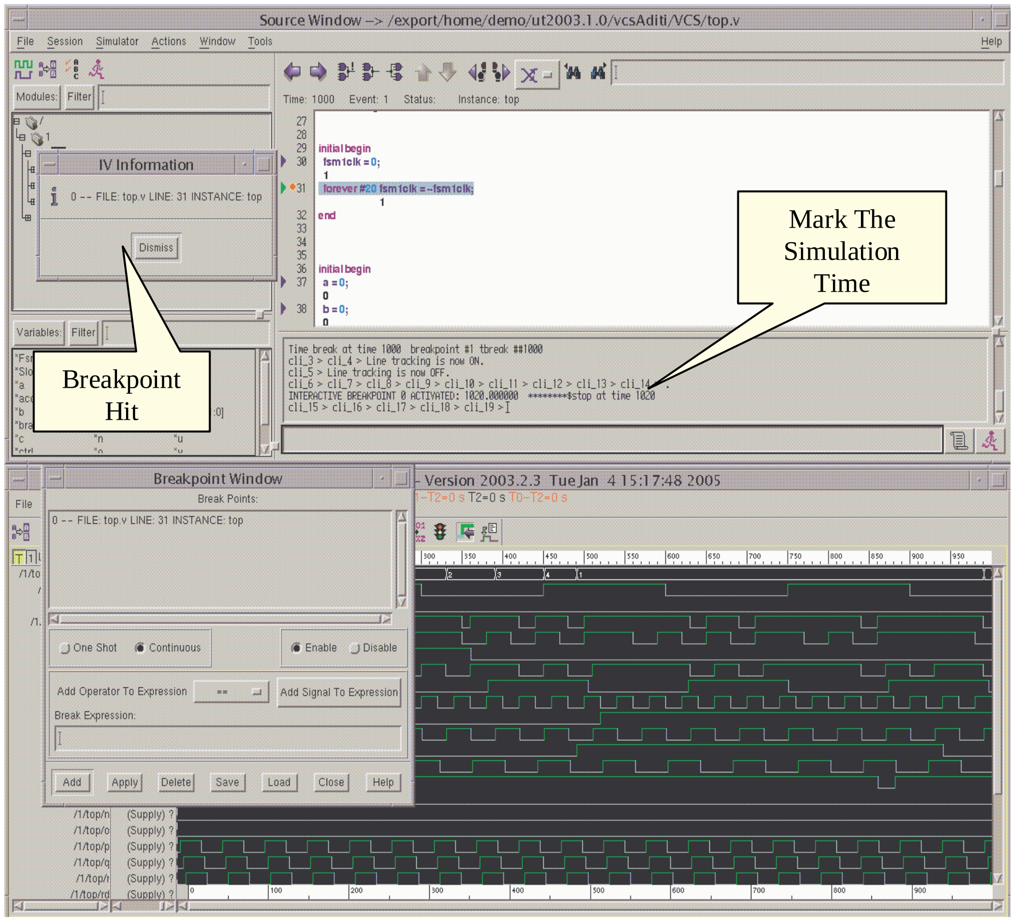
```
0 -- FILE: top.v LINE: 31 INSTANCE: top
```

Version 2003.2.3 Tue Jan 4 15:17:48 2005

- To set the break point Left click the mouse button on the line number in the "Source Code Window"
- "Red" color will indicates an active break point
- The list of breakpoints will appear in the "Breakpoint Window"

Veritools

# Adding Breakpoints



Source Window --> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Modules: Filter
IV Information
Dismiss
Variables: Filter
Breakpoint Hit
Mark The Simulation Time
Breakpoint Window
File
Break Points:
One Shot
Continuous
Enable
Disable
Add Operator To Expression
Add Signal To Expression
Break Expression:
Add Apply Delete Save Load Close Help
Version 2003.2.3 Tue Jan 4 15:17:48 2005

Time: 1000 Event: 1 Status: Instance: top

```
initial begin
 fsm1clk = 0;
 1
 forever #20 fsm1clk = ~fsm1clk;
            1
end



initial begin
 a = 0;
 0
 b = 0;
 0
```

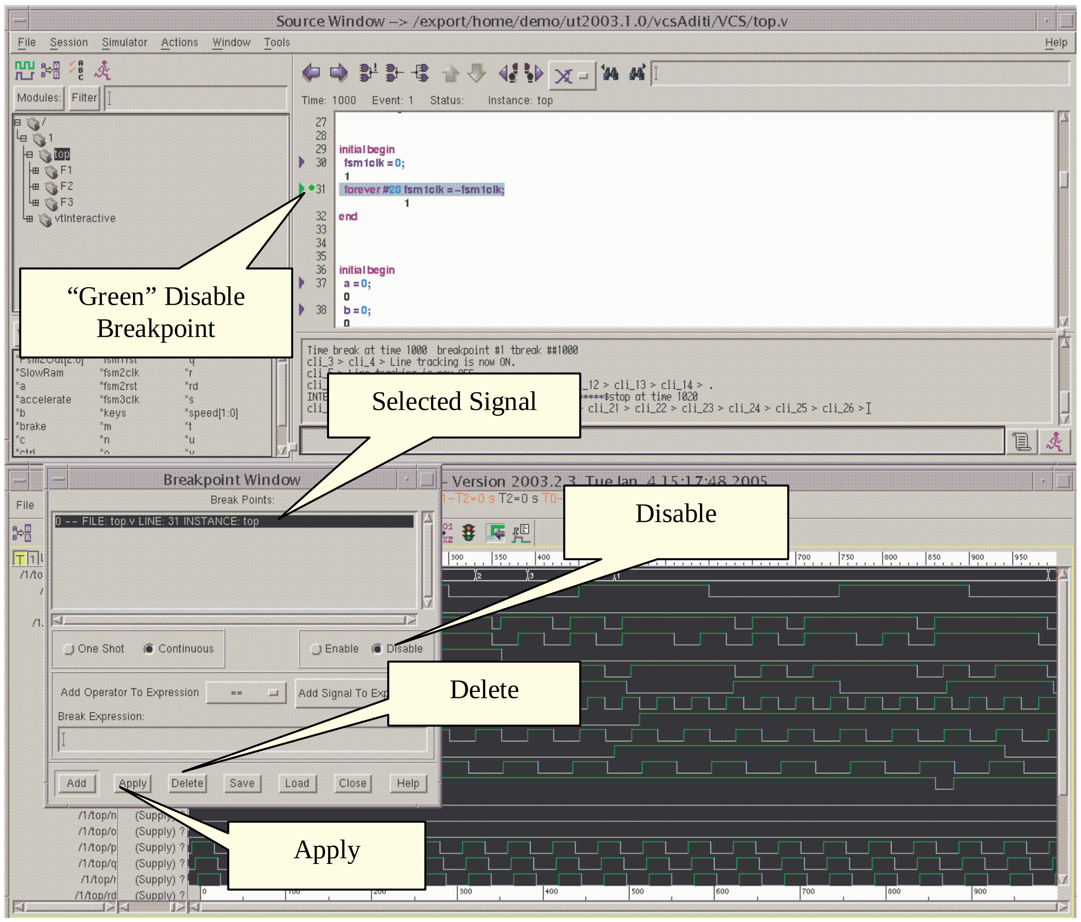
```
Time break at time 1000  breakpoint #1 tbreak ##1000
cli_3 > cli_4 > Line tracking is now ON.
cli_5 > Line tracking is now OFF.
cli_6 > cli_7 > cli_8 > cli_9 > cli_10 > cli_11 > cli_12 > cli_13 > cli_14 > .
INTERACTIVE BREAKPOINT 0 ACTIVATED: 1020.000000  ********$stop at time 1020
cli_15 > cli_16 > cli_17 > cli_18 > cli_19 >
```

0 -- FILE: top.v LINE: 31 INSTANCE: top

0 -- FILE: top.v LINE: 31 INSTANCE: top

- Doing a continue by typing a "." in the command line
- Or from the Source Code Window menu choose Simulator => Continue will cause the simulator to stop at the break point

# Disable & Deleting Breakpoints



Time: 1000 Event: 1 Status: Instance: top

```
initial begin
 fsm1clk = 0;
 forever #20 fsm1clk = ~fsm1clk;
end


initial begin
 a = 0;
 b = 0;
```

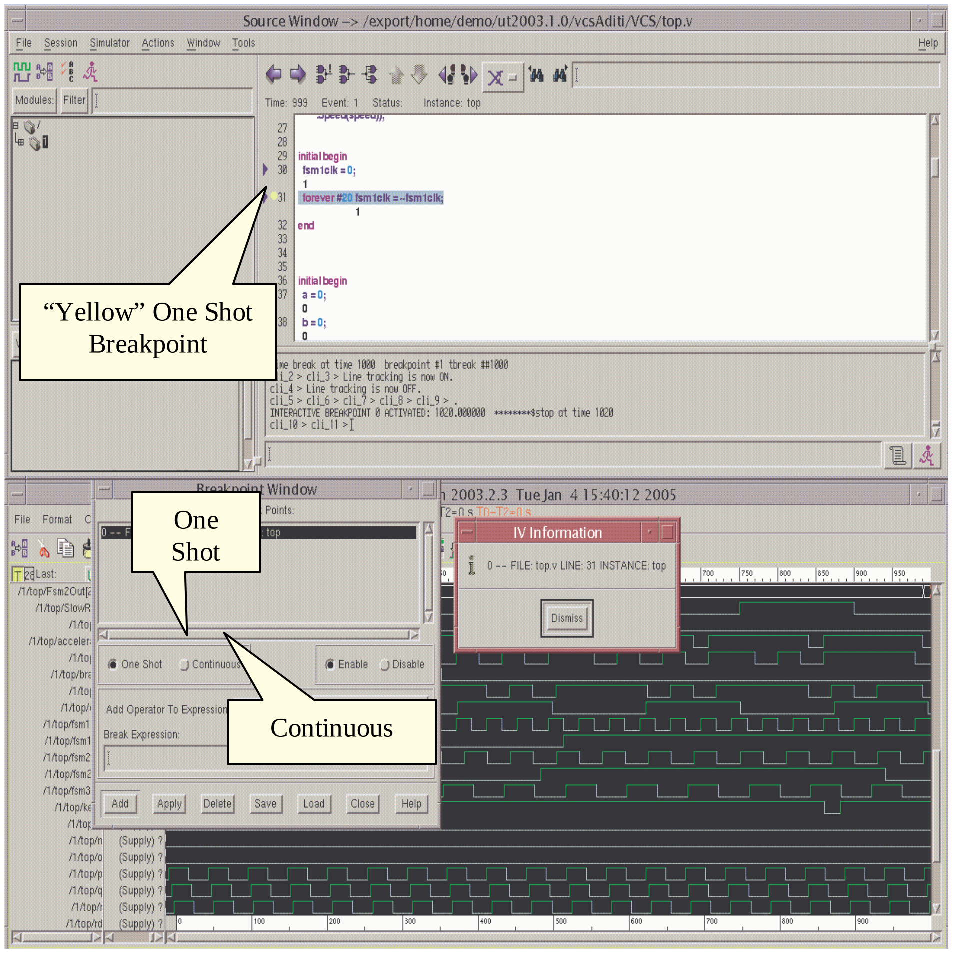
```
Time break at time 1000  breakpoint #1 tbreak ##1000
cli_3 > cli_4 > Line tracking is now ON.
```

Break Points:

```
0 -- FILE: top.v LINE: 31 INSTANCE: top
```

- To disable the breakpoint select the breakpoint in the "Breakpoint Window"
- Click on "Disable" button and then press "Apply"
- "Green" on the breakpoint line in the "Source Window" indicates disabled breakpoint
- To remove the breakpoint select the breakpoint in the "Breakpoint Window" and press "Delete"

# One Shot Breakpoint


Source Window --> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
"Yellow" One Shot Breakpoint
Breakpoint Window
One Shot
Continuous
Add Apply Delete Save Load Close Help
IV Information
Dismiss

Time: 999 Event: 1 Status: Instance: top

```
initial begin
 fsm1clk = 0;
 forever #20 fsm1clk = ~fsm1clk;
end


initial begin
 a = 0;
 b = 0;
```

```
ime break at time 1000  breakpoint #1 tbreak ##1000
cli_2 > cli_3 > Line tracking is now ON.
cli_4 > Line tracking is now OFF.
cli_5 > cli_6 > cli_7 > cli_8 > cli_9 > .
INTERACTIVE BREAKPOINT 0 ACTIVATED: 1020.000000  ********$stop at time 1020
cli_10 > cli_11 >
```

[✓ One Shot] Continuous — [✓ Enable] Disable

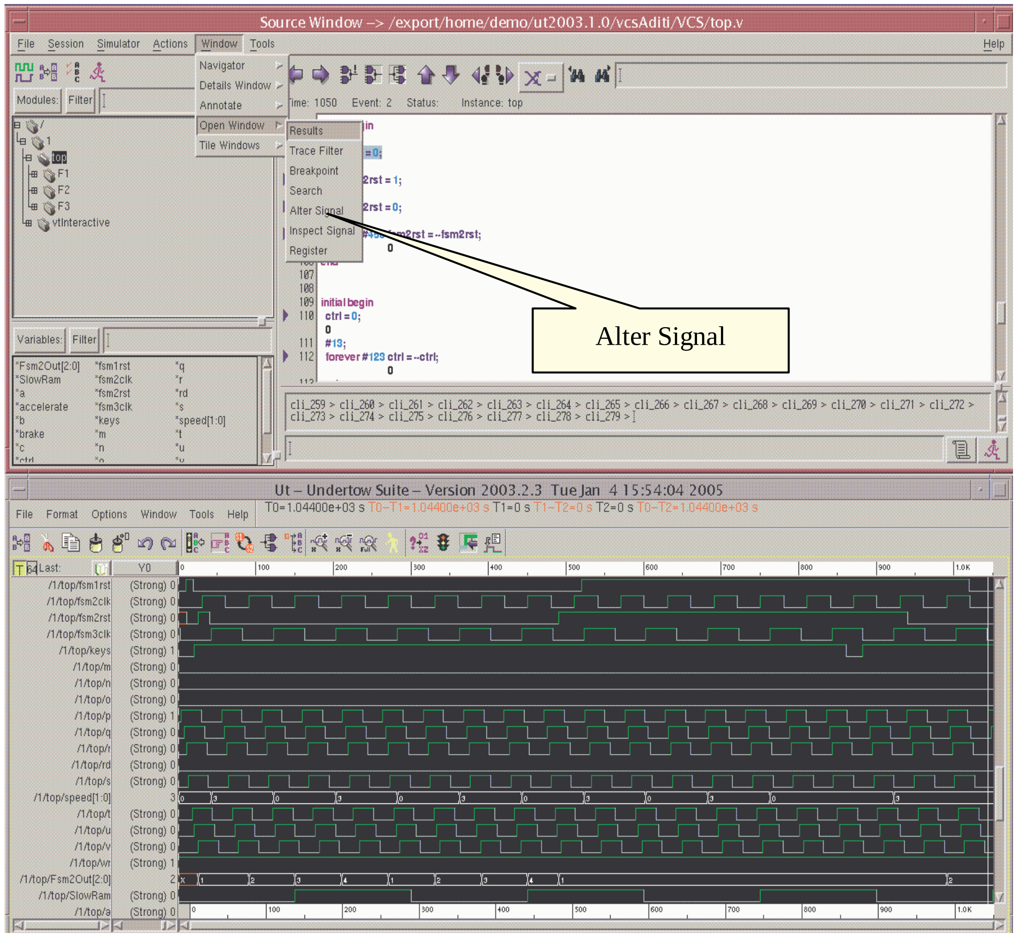
Add Operator To Expression

Break Expression:

0 -- FILE: top.v LINE: 31 INSTANCE: top

- "One Shot" allows the breakpoint to be hit only once during the given simulation time
- "Continuous" stops the simulation every time it reaches that breakpoint(default is "Continuous")
- To set the One Shot on the breakpoint select the breakpoint from the "Breakpoint Window" and select "One Shot" button
- "Yellow" indicates a One Shot break point
- If problem setting the One Shot toggle "Enable" and "Disable" buttons in the "Breakpoint Window"

# Alter Signal

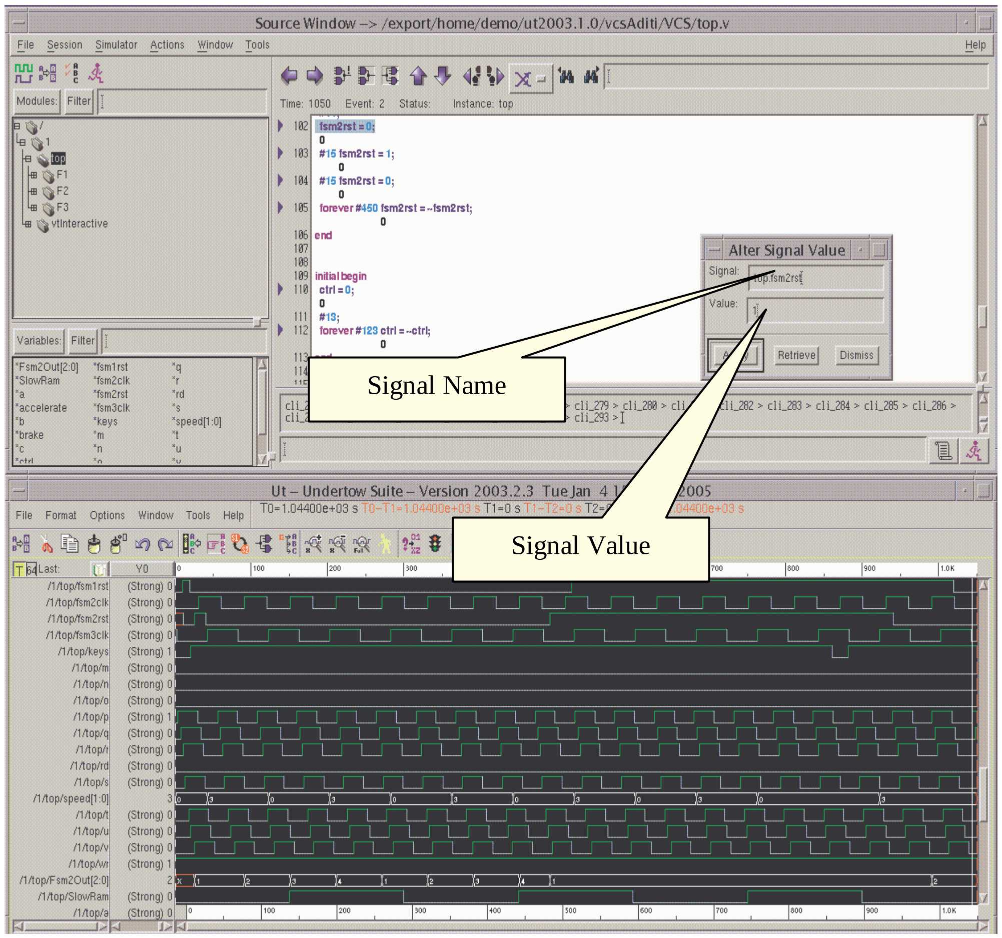


Source Window --> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Navigator
Details Window
Annotate
Open Window
Tile Windows
Results
Trace Filter
Breakpoint
Search
Alter Signal
Inspect Signal
Register
Alter Signal
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 15:54:04 2005
File Format Options Window Tools Help

```
initial begin
  ctrl = 0;
  #13;
  forever #123 ctrl = ~ctrl;
```

- Alter Signal allows the user to change the current value of the signals for the proceeding simulations only
- From the Source Code Window menu choose
- Window => Open Window -> Alter Signal

# Alter Signal



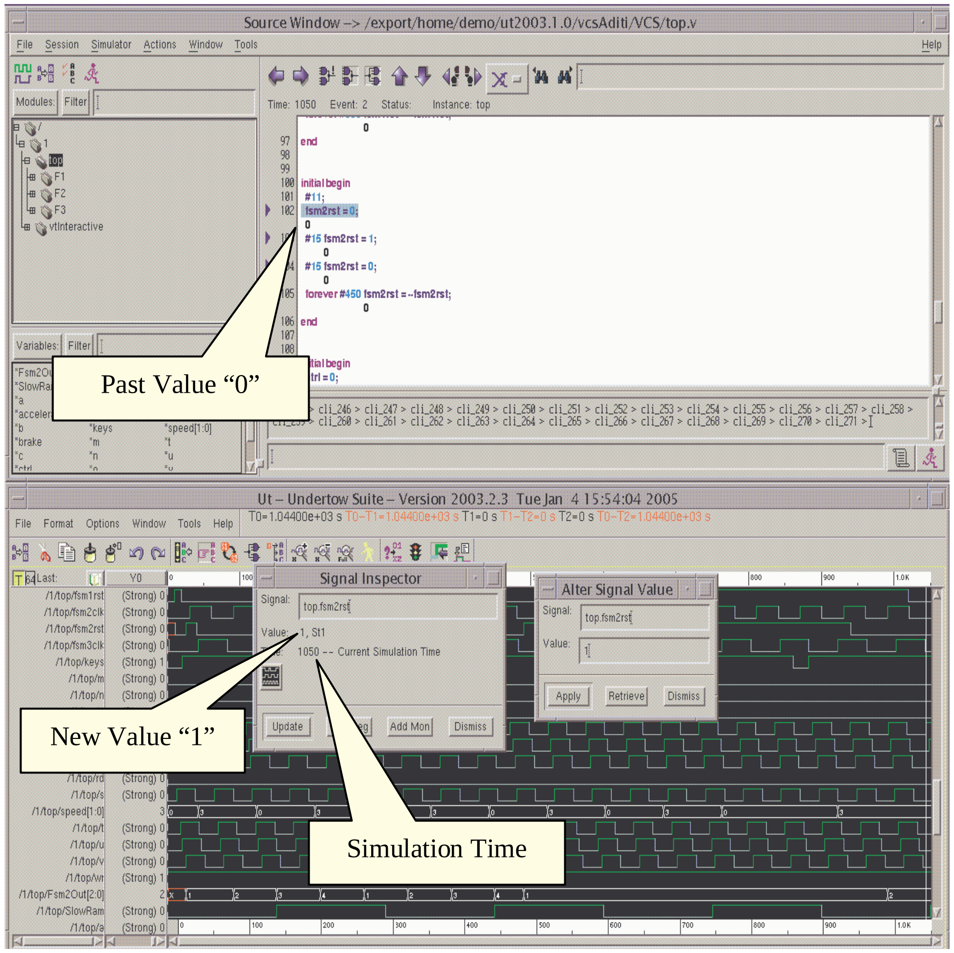
Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
Alter Signal Value
Signal: top.fsm2rst
Value: 1
Apply
Retrieve
Dismiss
Signal Name
Signal Value
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 2005

Time: 1050 Event: 2 Status: Instance: top

```
 fsm2rst = 0;
 0
 #15 fsm2rst = 1;
     0
 #15 fsm2rst = 0;
     0
 forever #450 fsm2rst = ~fsm2rst;
              0
end


initial begin
 ctrl = 0;
 0
 #13;
 forever #123 ctrl = ~ctrl;
              0
```

- Select the signal and drag and drop it in the text area for the “Signal” in the “Alter Signal Value” window
- Enter the new value for the signal for the proceeding simulations
- Press “Apply”

# Inspect Signal



Source Window -> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v

File Session Simulator Actions Window Tools Help

Time: 1050 Event: 2 Status: Instance: top

```
              0
end


initial begin
 #11;
 fsm2rst = 0;
 0
 #15 fsm2rst = 1;
     0
 #15 fsm2rst = 0;
     0
 forever #450 fsm2rst = ~fsm2rst;
              0
end


initial begin
 trl = 0;
```

```
> cli_246 > cli_247 > cli_248 > cli_249 > cli_250 > cli_251 > cli_252 > cli_253 > cli_254 > cli_255 > cli_256 > cli_257 > cli_258 >
> cli_260 > cli_261 > cli_262 > cli_263 > cli_264 > cli_265 > cli_266 > cli_267 > cli_268 > cli_269 > cli_270 > cli_271 >
```

Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 15:54:04 2005

T0=1.04400e+03 s T0–T1=1.04400e+03 s T1=0 s T1–T2=0 s T2=0 s T0–T2=1.04400e+03 s

Signal Inspector

Signal: top.fsm2rst

Value: 1, St1

Time: 1050 -- Current Simulation Time

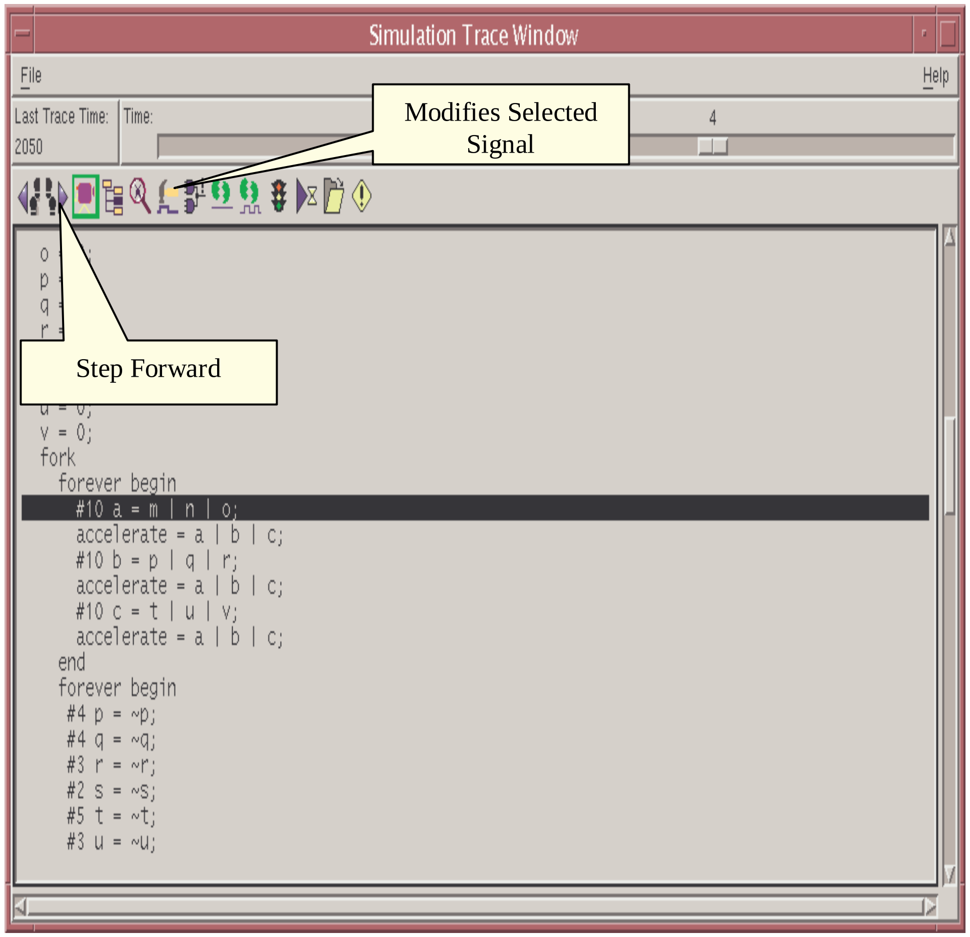
Alter Signal Value

Signal: top.fsm2rst

Value: 1

- To view the new changes in the value of the signal
- From the Source Code Window menu choose
- Window => Open Window -> Inspect Signal
- Select the signal and drag and drop it in the text area for the “Signal” in the “Signal Inspector” window
- Press “Update”
- The new value of the signal at the current time will be displayed

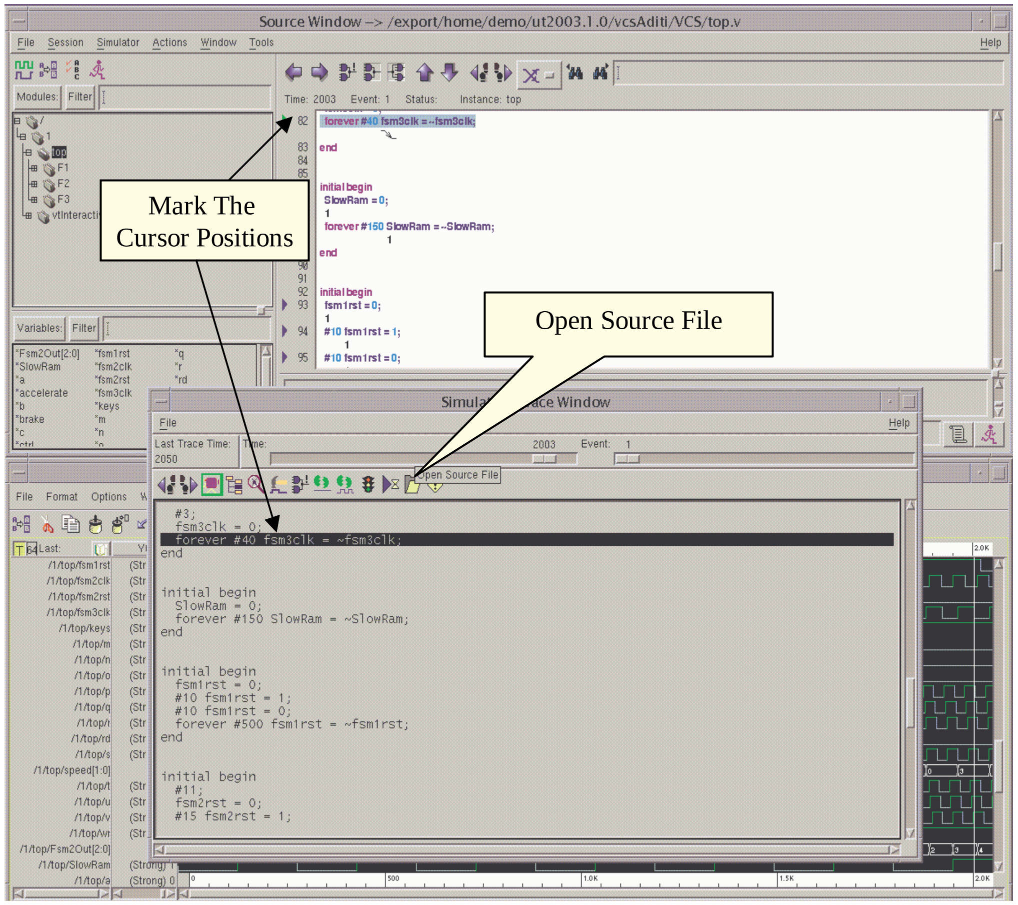
## Trace Window



```
o = 
p =
q =
r =
u = 0;
v = 0;
fork
  forever begin
    #10 a = m | n | o;
    accelerate = a | b | c;
    #10 b = p | q | r;
    accelerate = a | b | c;
    #10 c = t | u | v;
    accelerate = a | b | c;
  end
  forever begin
   #4 p = ~p;
   #4 q = ~q;
   #3 r = ~r;
   #2 s = ~s;
   #5 t = ~t;
   #3 u = ~u;
```

- “Simulation Trace Window” allows to move to next simulation point by using “Step Forward” button if you are at the last simulation time point
- Or to move backward in the past simulation time by using “Step Backward”
- To move forward in the past simulation use “Step Forward”
- If the simulator is running and last time point in simulation is reached clicking on “Step Forward” will advance the simulation one step further

# Source & Trace Window Synchronization

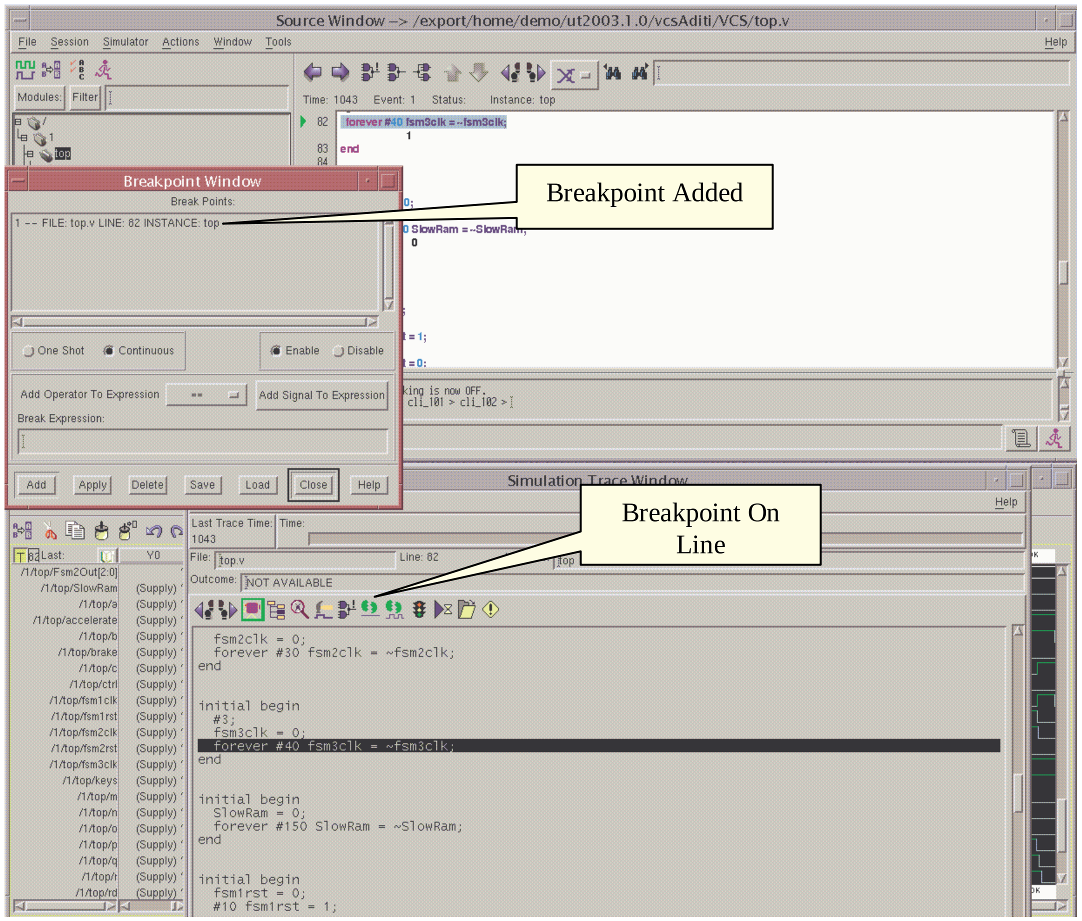

Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Time: 2003 Event: 1 Status: Instance: top
Mark The Cursor Positions
Open Source File
Simulation Trace Window
Last Trace Time: 2050
Time: 2003 Event: 1

```
 forever #40 fsm3clk = ~fsm3clk;

end


initial begin
 SlowRam = 0;
 forever #150 SlowRam = ~SlowRam;
end


initial begin
 fsm1rst = 0;
 #10 fsm1rst = 1;
 #10 fsm1rst = 0;
```

```
  #3;
  fsm3clk = 0;
  forever #40 fsm3clk = ~fsm3clk;
end


initial begin
  SlowRam = 0;
  forever #150 SlowRam = ~SlowRam;
end


initial begin
  fsm1rst = 0;
  #10 fsm1rst = 1;
  #10 fsm1rst = 0;
  forever #500 fsm1rst = ~fsm1rst;
end


initial begin
  #11;
  fsm2rst = 0;
  #15 fsm2rst = 1;
```

- To force the "Source Window" to be at the same point in simulation as "Trace Window" click on "Open Source File" button

# Trace - Breakpoints


Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Modules: Filter
Breakpoint Window
Break Points:
Add Operator To Expression
Add Signal To Expression
Add Apply Delete Save Load Close Help
Simulation Trace Window
Help
Breakpoint Added
Breakpoint On Line

Time: 1043 Event: 1 Status: Instance: top

```
82  forever #40 fsm3clk = ~fsm3clk;
83  end
84
```

```
1 -- FILE: top.v LINE: 82 INSTANCE: top
```

One Shot [✓ Continuous]   [✓ Enable] Disable

Add Operator To Expression: ==

Break Expression:

```
king is now OFF.
 cli_101 > cli_102 >
```

Last Trace Time: 1043   Time:

File: top.v   Line: 82   top

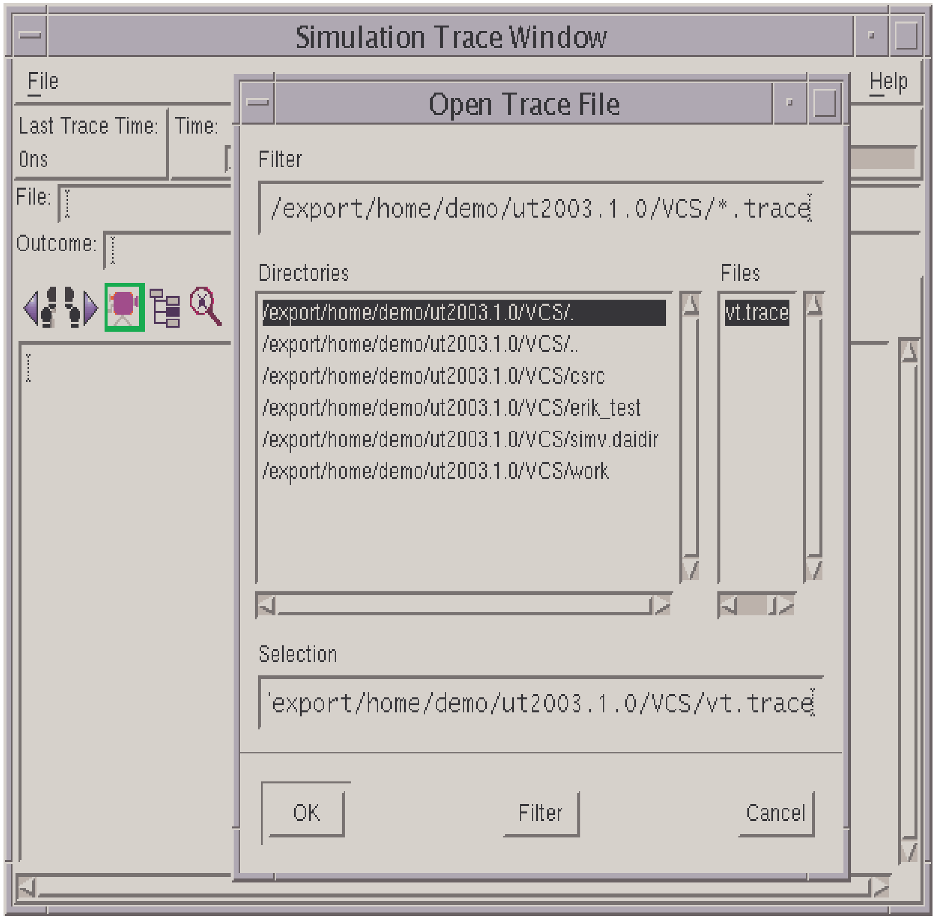
Outcome: NOT AVAILABLE

| | |
|---|---|
| /1/top/Fsm2Out[2:0] | |
| /1/top/SlowRam | (Supply) |
| /1/top/a | (Supply) |
| /1/top/accelerate | (Supply) |
| /1/top/b | (Supply) |
| /1/top/brake | (Supply) |
| /1/top/c | (Supply) |
| /1/top/ctrl | (Supply) |
| /1/top/fsm1clk | (Supply) |
| /1/top/fsm1rst | (Supply) |
| /1/top/fsm2clk | (Supply) |
| /1/top/fsm2rst | (Supply) |
| /1/top/fsm3clk | (Supply) |
| /1/top/keys | (Supply) |
| /1/top/m | (Supply) |
| /1/top/n | (Supply) |
| /1/top/o | (Supply) |
| /1/top/p | (Supply) |
| /1/top/q | (Supply) |
| /1/top/r | (Supply) |
| /1/top/rd | (Supply) |

```
  fsm2clk = 0;
  forever #30 fsm2clk = ~fsm2clk;
end


initial begin
  #3;
  fsm3clk = 0;
  forever #40 fsm3clk = ~fsm3clk;
end


initial begin
  SlowRam = 0;
  forever #150 SlowRam = ~SlowRam;
end


initial begin
  fsm1rst = 0;
  #10 fsm1rst = 1;
```

- To add the breakpoint in the “Simulation Trace Window” at the given cursor position
- Click in “Breakpoint On Line” button

# Virtual Trace



Filter: /export/home/demo/ut2003.1.0/VCS/*.trace

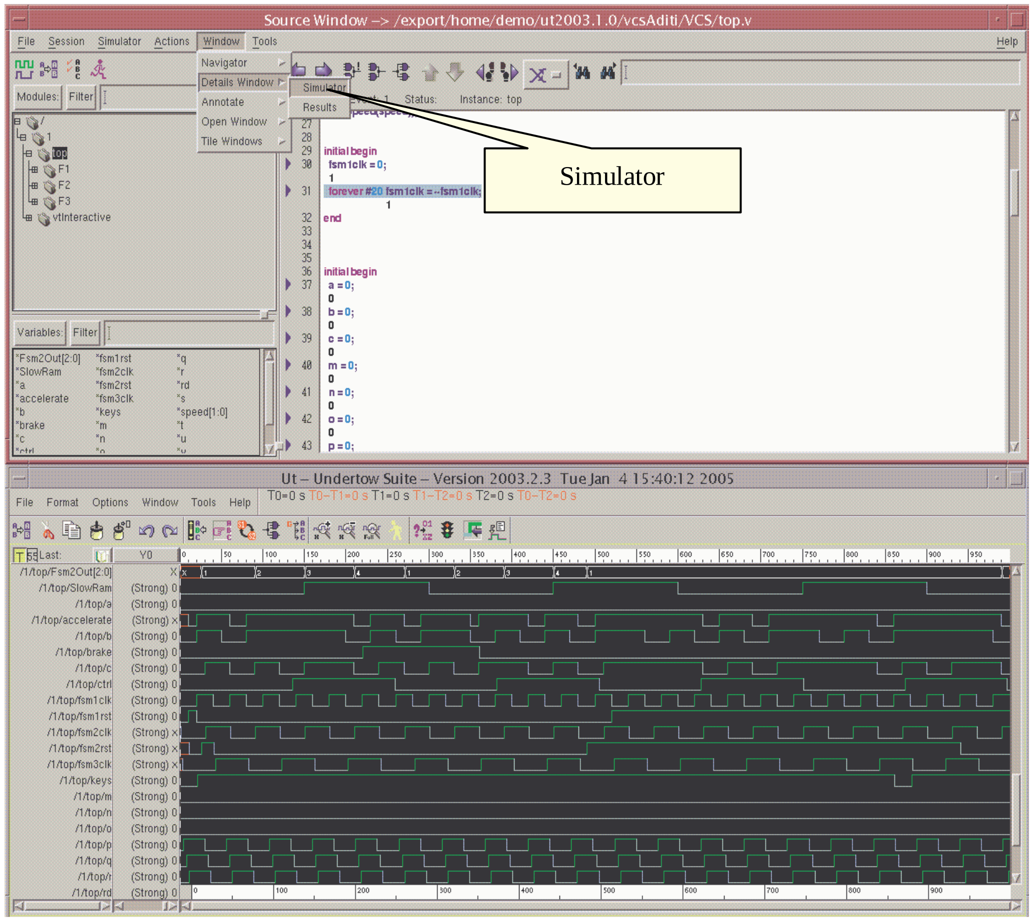
Directories:
/export/home/demo/ut2003.1.0/VCS/.
/export/home/demo/ut2003.1.0/VCS/..
/export/home/demo/ut2003.1.0/VCS/csrc
/export/home/demo/ut2003.1.0/VCS/erik_test
/export/home/demo/ut2003.1.0/VCS/simv.daidir
/export/home/demo/ut2003.1.0/VCS/work

Files:
vt.trace

Selection: 'export/home/demo/ut2003.1.0/VCS/vt.trace

- To view the trace file when the simulation is not running
- From the Simulation Trace Window menu choose:
- File => Open Trace File …
- Select the desired “.trace” file and click “Ok”

# Simulator Window

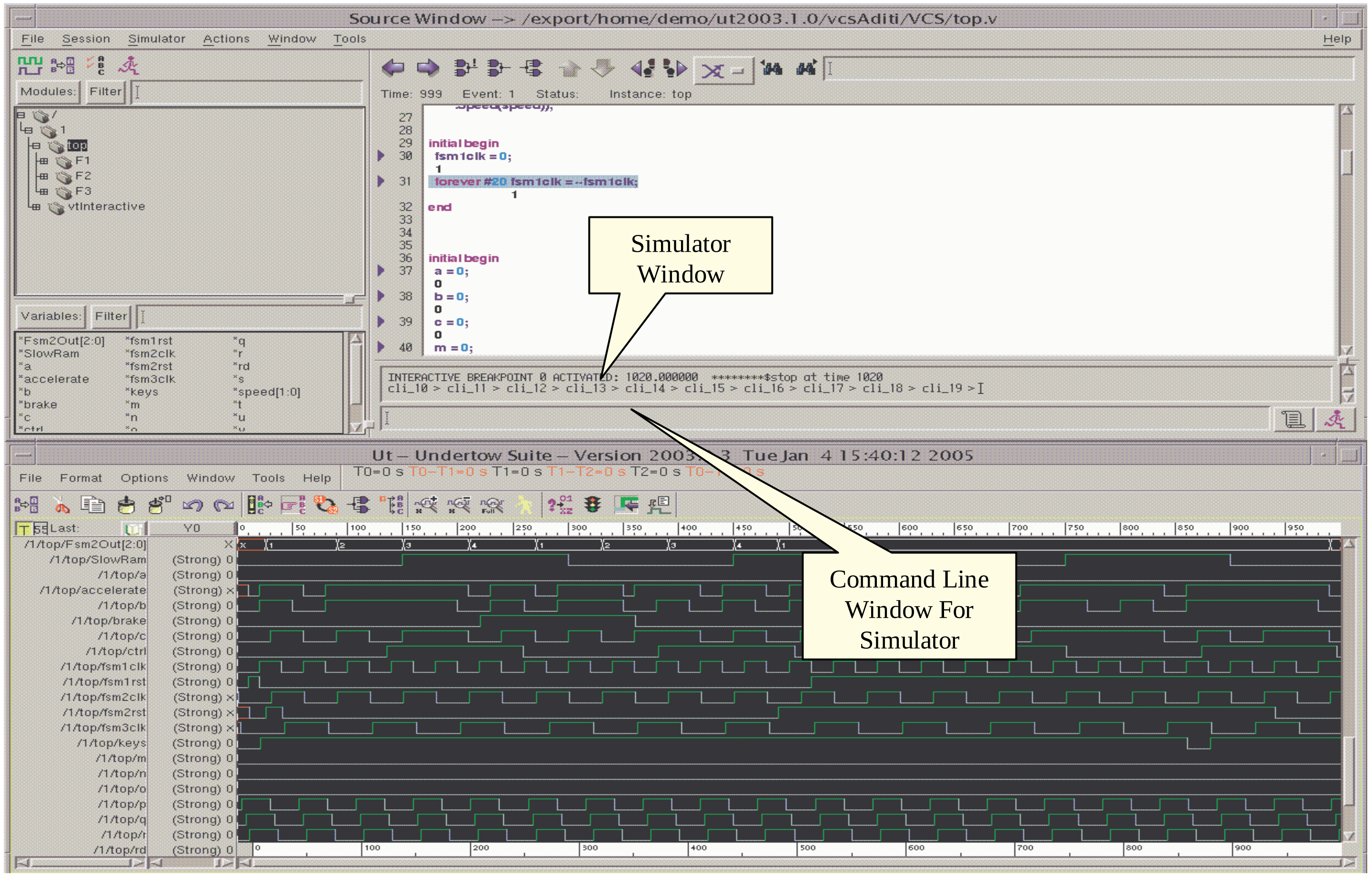


Source Window -> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v
File Session Simulator Actions Window Tools Help
Navigator
Details Window
Annotate
Open Window
Tile Windows
Simulator
Results
Status:
Instance: top
Modules:
Filter
Variables:
Simulator
Ut – Undertow Suite – Version 2003.2.3 Tue Jan 4 15:40:12 2005
File Format Options Window Tools Help
T0=0 s T0–T1=0 s T1=0 s T1–T2=0 s T2=0 s T0–T2=0 s

```
initial begin
 fsm1clk = 0;
 forever #20 fsm1clk = ~fsm1clk;
end

initial begin
 a = 0;
 b = 0;
 c = 0;
 m = 0;
 n = 0;
 o = 0;
 p = 0;
```

- To view the Simulator Window in the “Source Window”
- From the Source Window menu choose:
- Window => Details Window -> Simulator

# Simulator Window



Source Window –> /export/home/demo/ut2003.1.0/vcsAditi/VCS/top.v

Time: 999   Event: 1   Status:   Instance: top

```
initial begin
 fsm1clk = 0;
 1
 forever #20 fsm1clk = ~fsm1clk;
               1
end



initial begin
 a = 0;
 0
 b = 0;
 0
 c = 0;
 0
 m = 0;
```

```
INTERACTIVE BREAKPOINT 0 ACTIVATED: 1020.000000  ********$stop at time 1020
cli_10 > cli_11 > cli_12 > cli_13 > cli_14 > cli_15 > cli_16 > cli_17 > cli_18 > cli_19 >
```

Ut – Undertow Suite – Version 2003.1.3 Tue Jan 4 15:40:12 2005

Simulator Window

Command Line Window For Simulator