ECE 745 PROJECT

BUG REPORT

BY

GROUP 37

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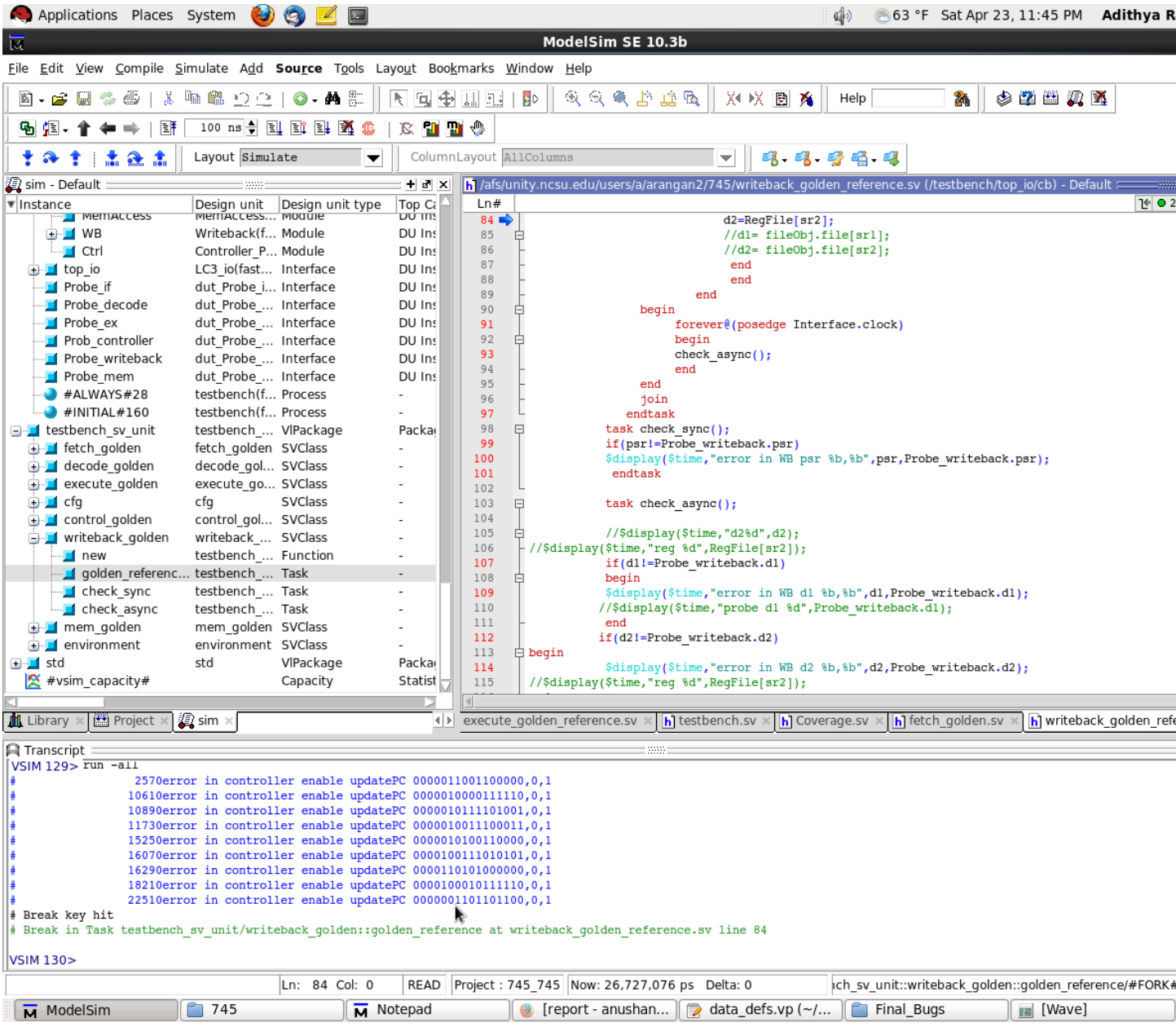
Bug1: The bug is in Controller

Description of the bug : Enable-UpdatePC has the bug in Controller unit. When BR-taken is low, Enable-UpdatePC has to go to Zero but the buggy DUT goes to 1.

We get this Bug for all branch instructions , since Enable-UpdatePC goes to 1even when BR-taken is Zero.

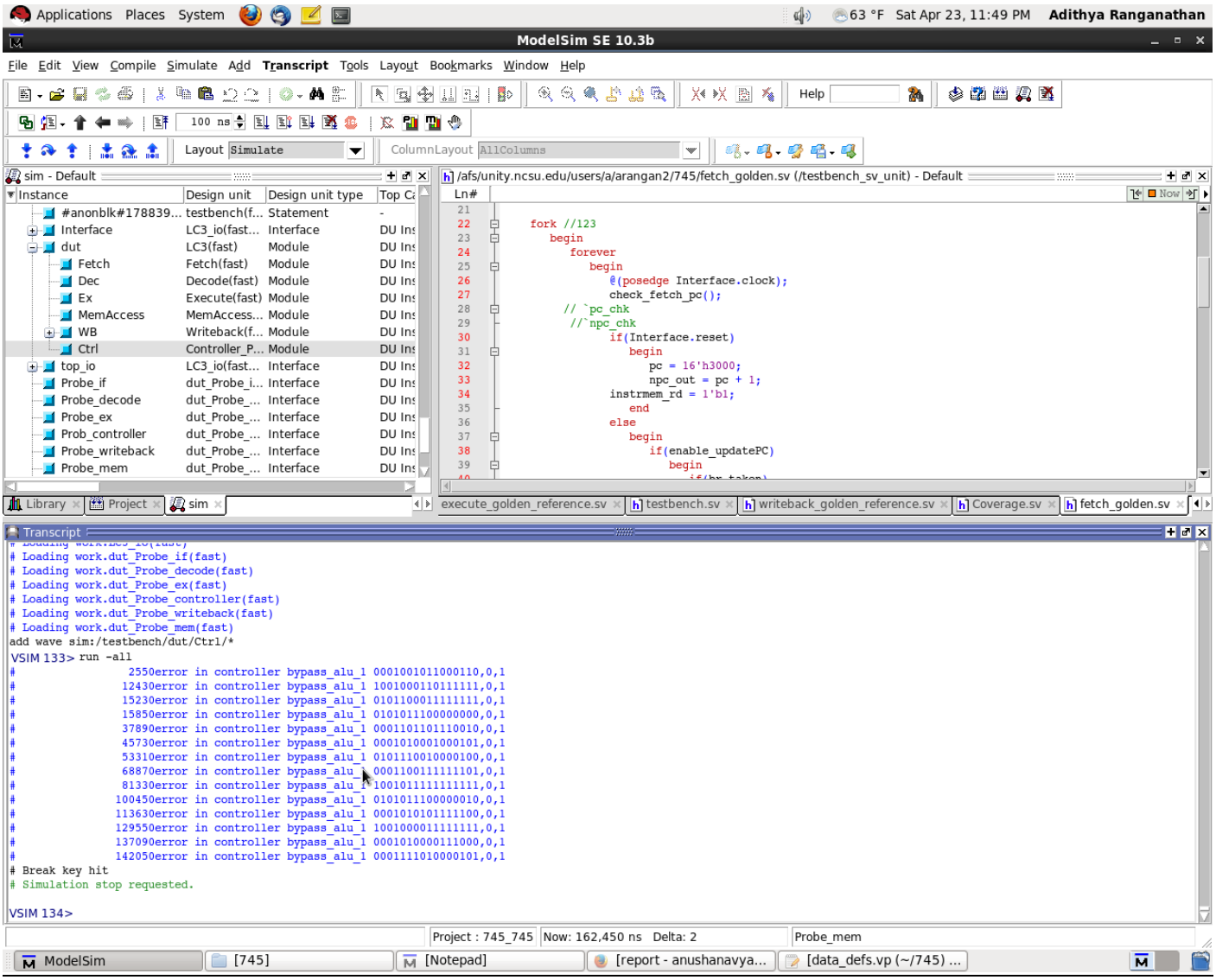
Instructions in pipeline: For all branch instructions, we detect the bug and Enable_updatePC is 1 without taking BR_taken in to consideration.



Bug2: CONTROLLER

When there is a BR instruction, we do not have any source registers for this instruction and there is no data dependency between this instruction in decode stage (IR[8:6]) and another instruction in execute stage whose Destination Register (IR_Exec[11:9]) even if they have the same values. Since there is no data dependency bypass_alu_1 should be 0 but instead it becomes 1.

Instructions in pipeline:



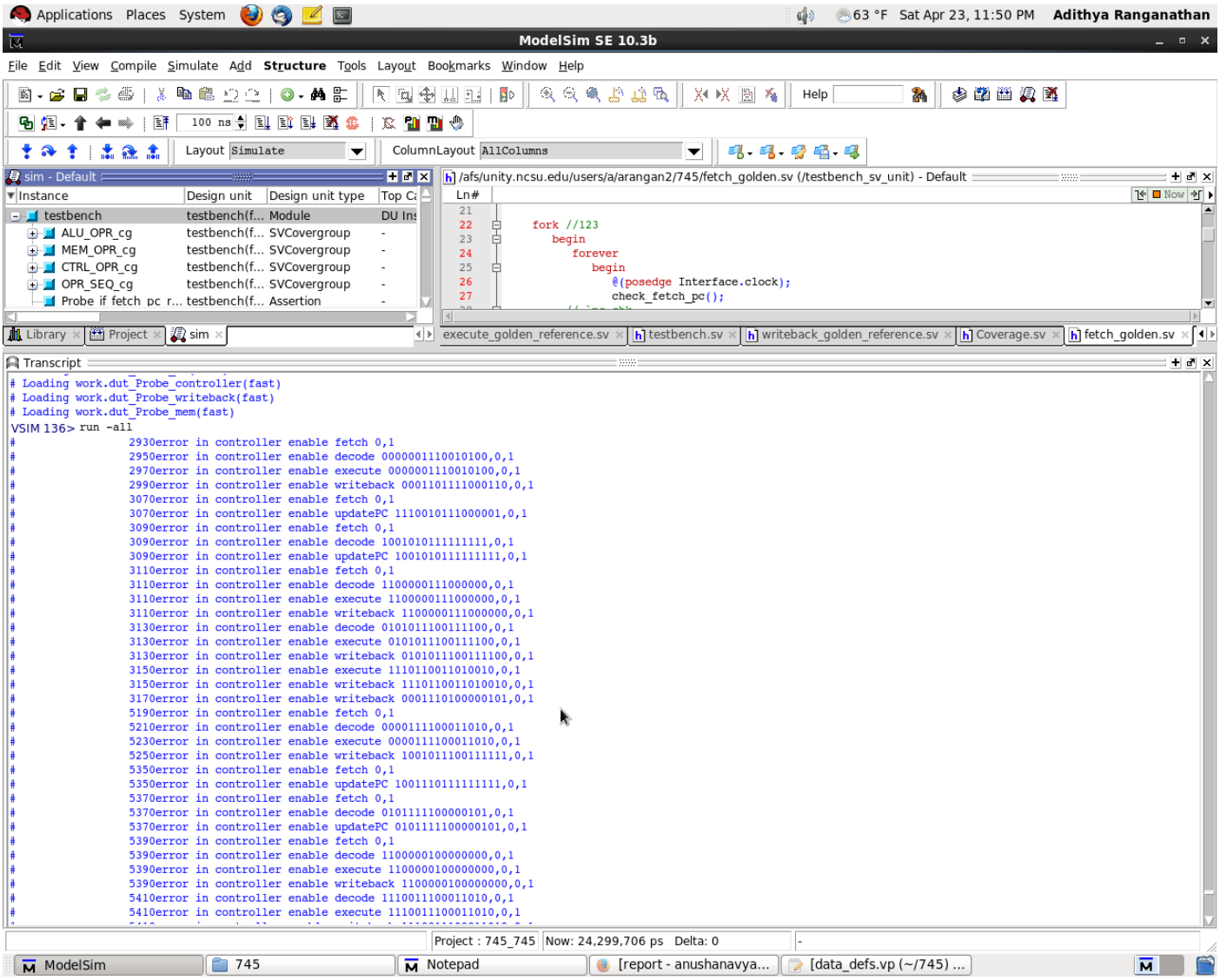
Bug3: CONTROLLER

Description of the bug : Enable and Br_taken signals are not matching in the Controller unit

If branch taken, then enable_updatePC and enable fetch should become 1 at the same cycle (enable fetch should only be high in the next cycle) and as a result of this, the pipeline propagates the error

(because enable _decode goes high in the next cycle and so on). Thus resulting in faulty behavior for 4 cycles after a taken-branch.
Example: When 0000111100111011 was driven both the enable_updatePC and enable_fetch went high when the branch is taken

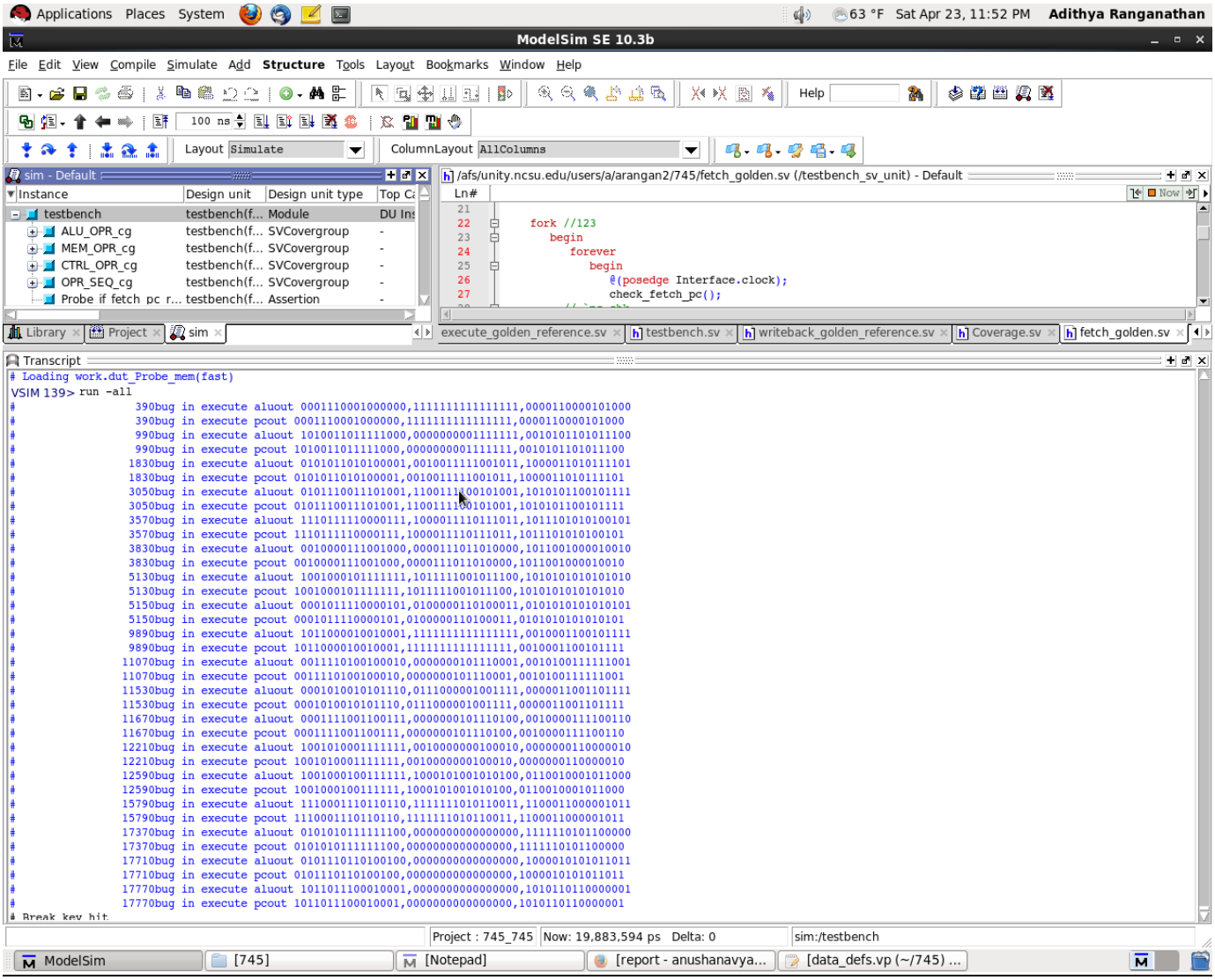
Instructions in pipeline



Bug4: EXECUTE

Description of the Bug : Aluout and PCout outputs of Execute stage are not the same. We get the Bug when Bypass_ALU_2 is 1. The reason is that the second operand of a dependent instruction for an alu-operation takes the Mem_Bypass_Val instead of Aluout.

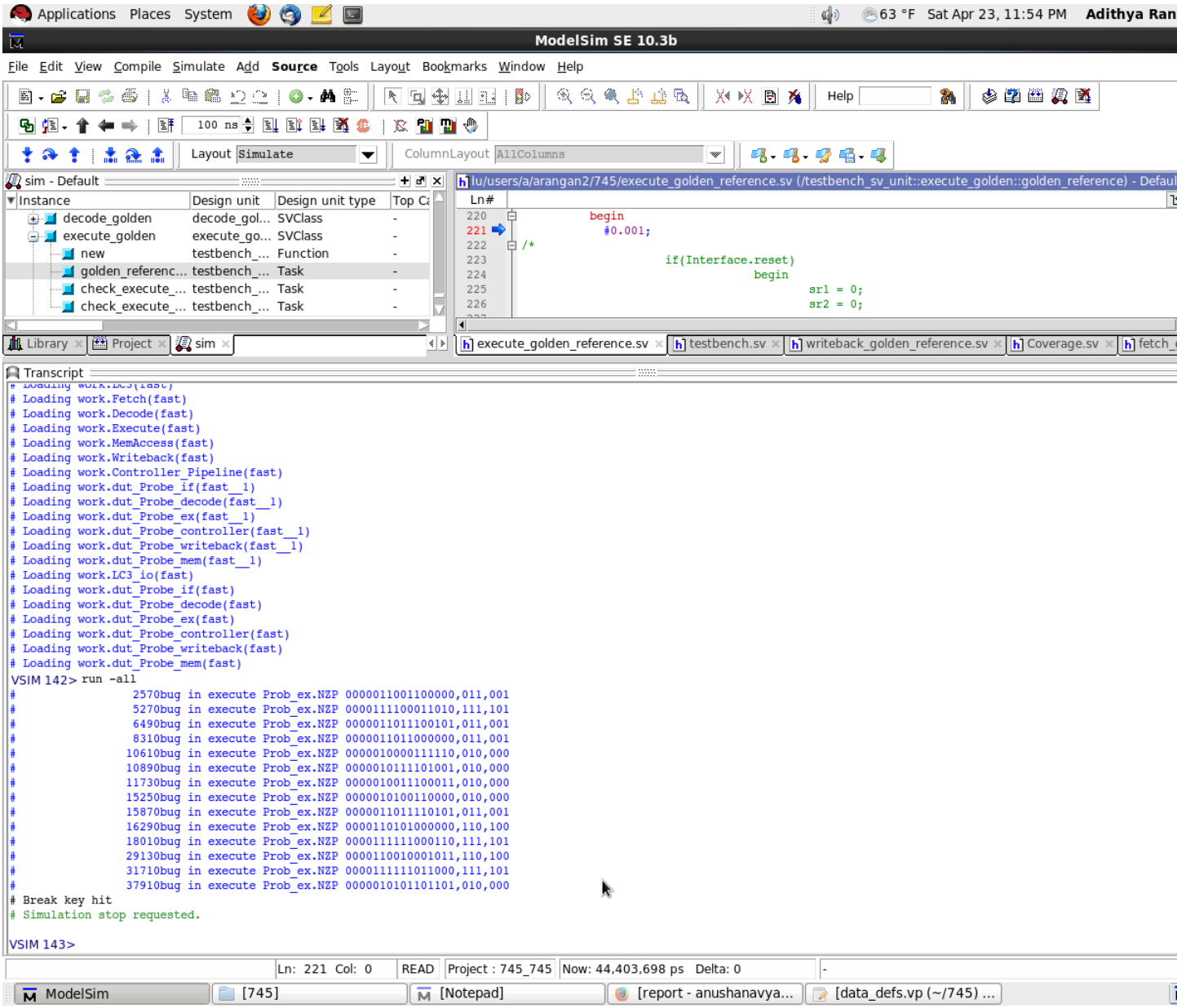
Instructions in pipeline:



Bug5: EXECUTE

The NZP value in execute stage does not turn out to be the same in Golden Reference and DUT. This is because the middle bit of NZP value for BR instruction always seems to be stuck at 0 ie NZP[1]=0 always. Hence we get an error when the middle bit of NZP goes high in golden reference but instead it stays low in the buggy DUT.

Instruction in pipeline


Applications Places System
63 °F Sat Apr 23, 11:54 PM Adithya Ran
ModelSim SE 10.3b
File Edit View Compile Simulate Add Source Tools Layout Bookmarks Window Help
sim - Default
Instance Design unit Design unit type
decode_golden decode_gol... SVClass
execute_golden execute_go... SVClass
new testbench_... Function
golden_referenc... testbench_... Task
check_execute_... testbench_... Task
check_execute_... testbench_... Task
Ln#
220 begin
221 #0.001;
222 /*
223 if(Interface.reset)
224 begin
225 sr1 = 0;
226 sr2 = 0;
Library Project sim
execute_golden_reference.sv testbench.sv writeback_golden_reference.sv Coverage.sv
Transcript
Loading work.Fetch(fast)
Loading work.Decode(fast)
Loading work.Execute(fast)
Loading work.MemAccess(fast)
Loading work.Writeback(fast)
Loading work.Controller_Pipeline(fast)
Loading work.dut_Probe_if(fast__1)
Loading work.dut_Probe_decode(fast__1)
Loading work.dut_Probe_ex(fast__1)
Loading work.dut_Probe_controller(fast__1)
Loading work.dut_Probe_writeback(fast__1)
Loading work.dut_Probe_mem(fast__1)
Loading work.LC3_io(fast)
Loading work.dut_Probe_if(fast)
Loading work.dut_Probe_decode(fast)
Loading work.dut_Probe_ex(fast)
Loading work.dut_Probe_controller(fast)
Loading work.dut_Probe_writeback(fast)
Loading work.dut_Probe_mem(fast)
VSIM 142> run -all
2570bug in execute Prob_ex.NZP 0000011001100000,011,001
5270bug in execute Prob_ex.NZP 0000111100011010,111,101
6490bug in execute Prob_ex.NZP 0000011011100101,011,001
8310bug in execute Prob_ex.NZP 0000011011000000,011,001
10610bug in execute Prob_ex.NZP 0000010000111110,010,000
10890bug in execute Prob_ex.NZP 0000010111101001,010,000
11730bug in execute Prob_ex.NZP 0000010011100011,010,000
15250bug in execute Prob_ex.NZP 0000010100110000,010,000
15870bug in execute Prob_ex.NZP 0000011011110101,011,001
16290bug in execute Prob_ex.NZP 0000110101000000,110,100
18010bug in execute Prob_ex.NZP 0000111111000110,111,101
29130bug in execute Prob_ex.NZP 0000110010001011,110,100
31710bug in execute Prob_ex.NZP 0000111111011000,111,101
37910bug in execute Prob_ex.NZP 0000010101101101,010,000
Break key hit
Simulation stop requested.
VSIM 143>
Ln: 221 Col: 0 READ Project : 745_745 Now: 44,403,698 ps Delta: 0
ModelSim [745] [Notepad] [report - anushanavya... [data_defs.vp (~/745) ...