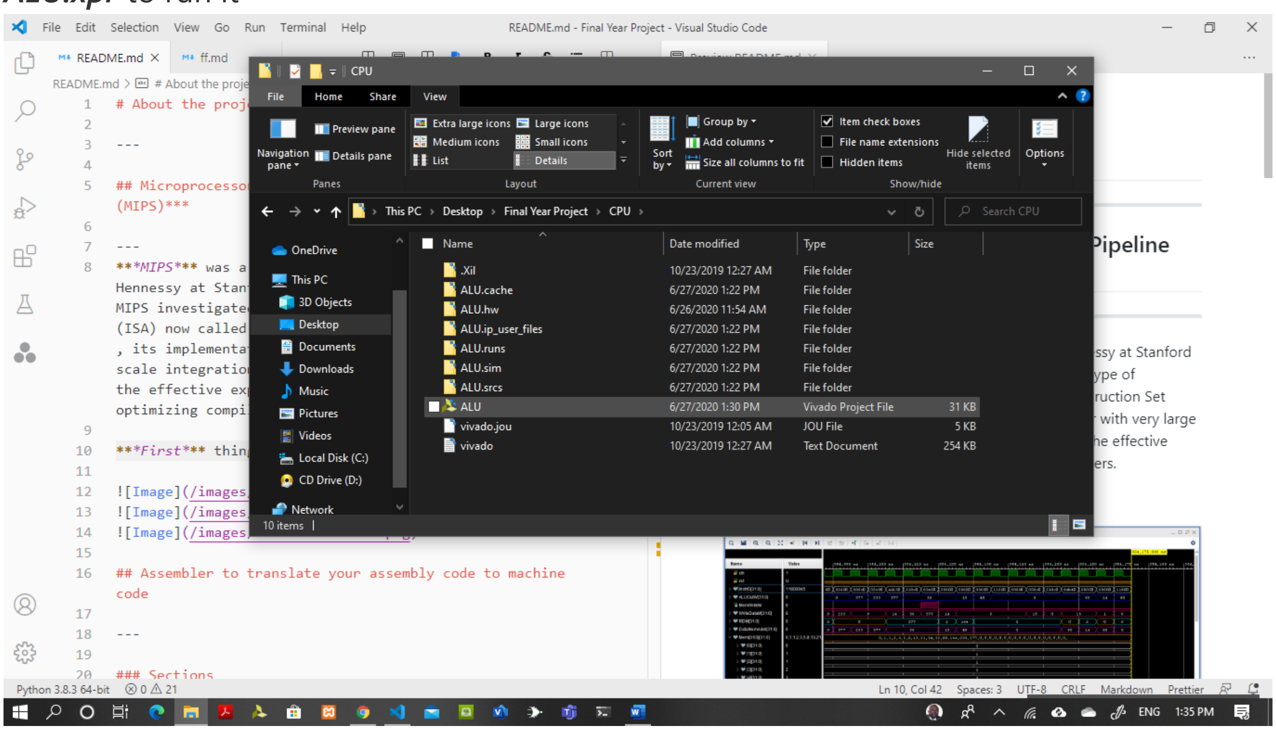
Setting up the project and running

Microprocessor without Interlocked Pipeline Stages *(MIPS)*

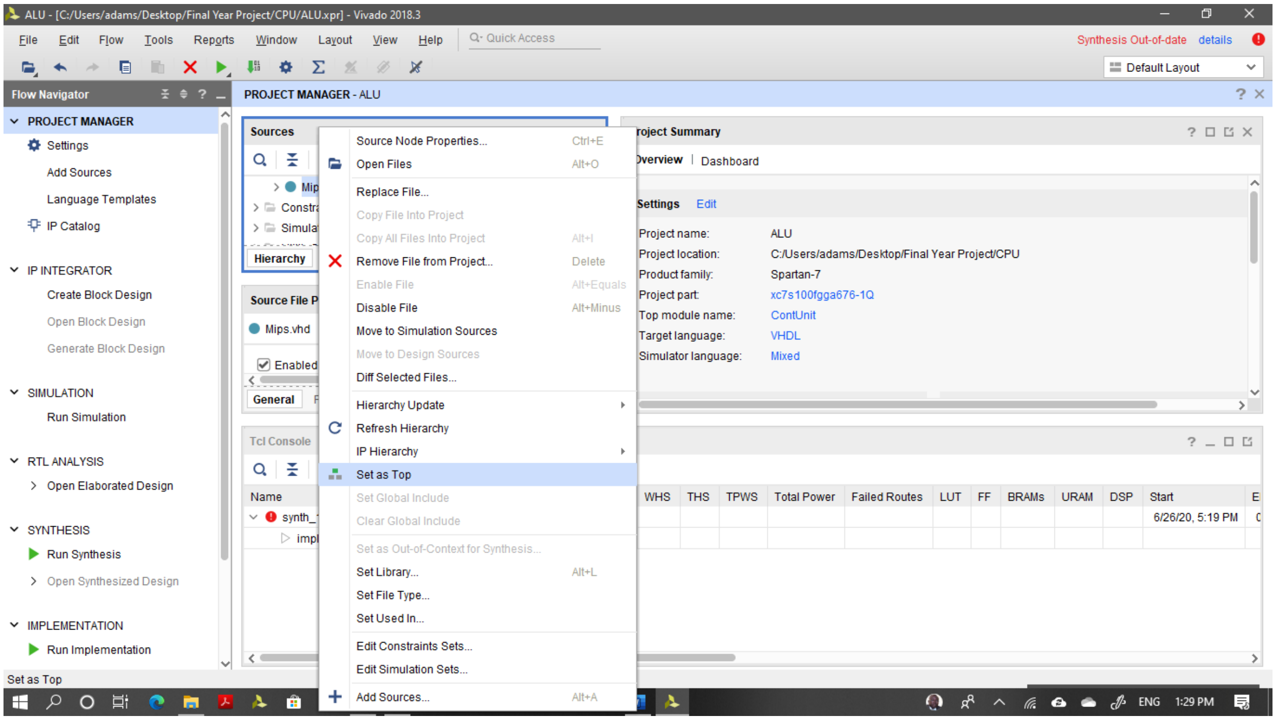
MIPS was a research project conducted by John L. Hennessy at Stanford University between 1981 and 1984. MIPS investigated a type of instruction set architecture (ISA) now called Reduced Instruction Set Computer (RISC), its implementation as a microprocessor with very large scale integration (VLSI) semiconductor technology, and the effective exploitation of RISC architectures with optimizing compilers.

First make sure you have **xilinx** installed on your machine if not install from xilinx

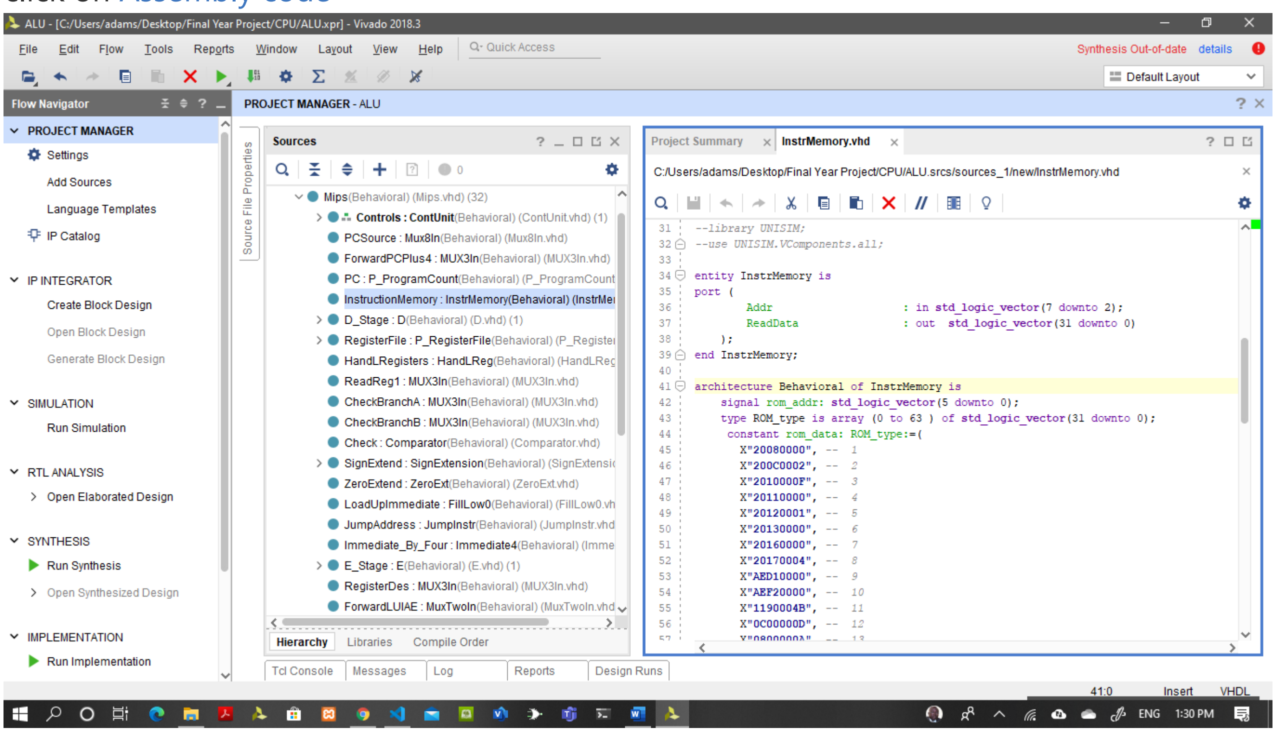
Next thing to do is to locate the folder ***Final Year Project/ALU*** and double click on ***ALU.xpr*** to run it



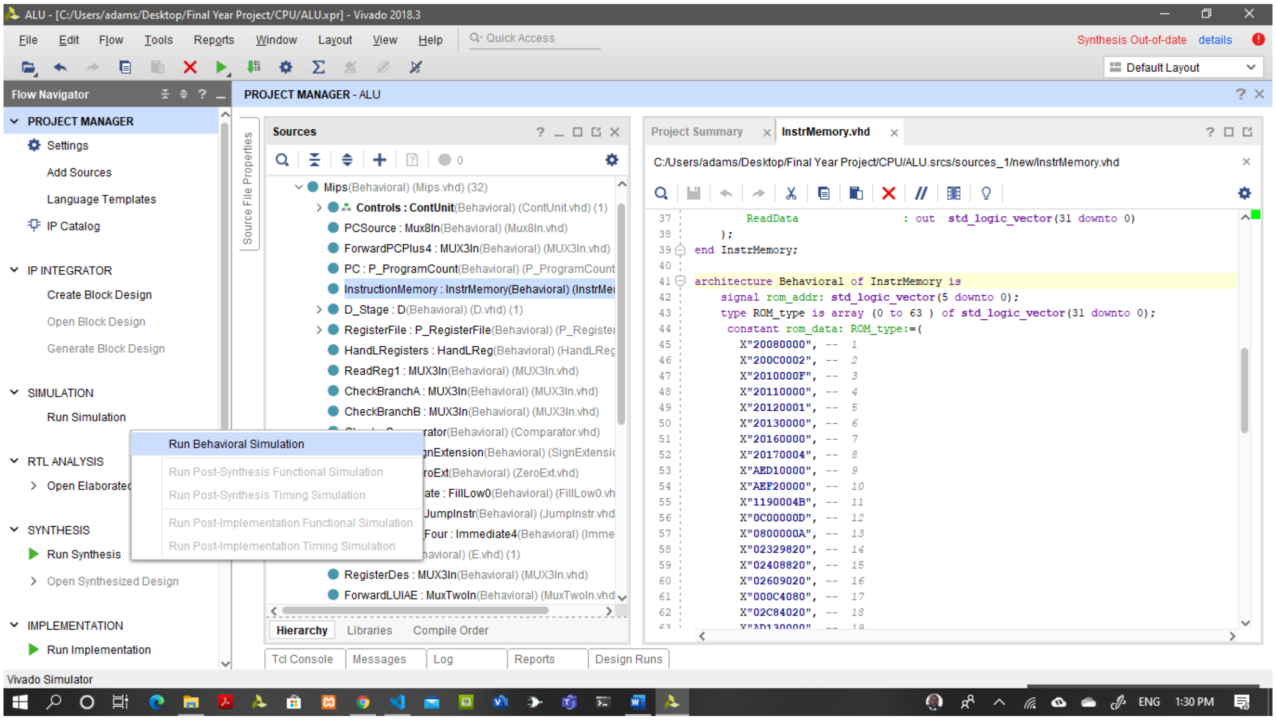
you will see an interface like this set ***Mips*** on top from the drop down manu

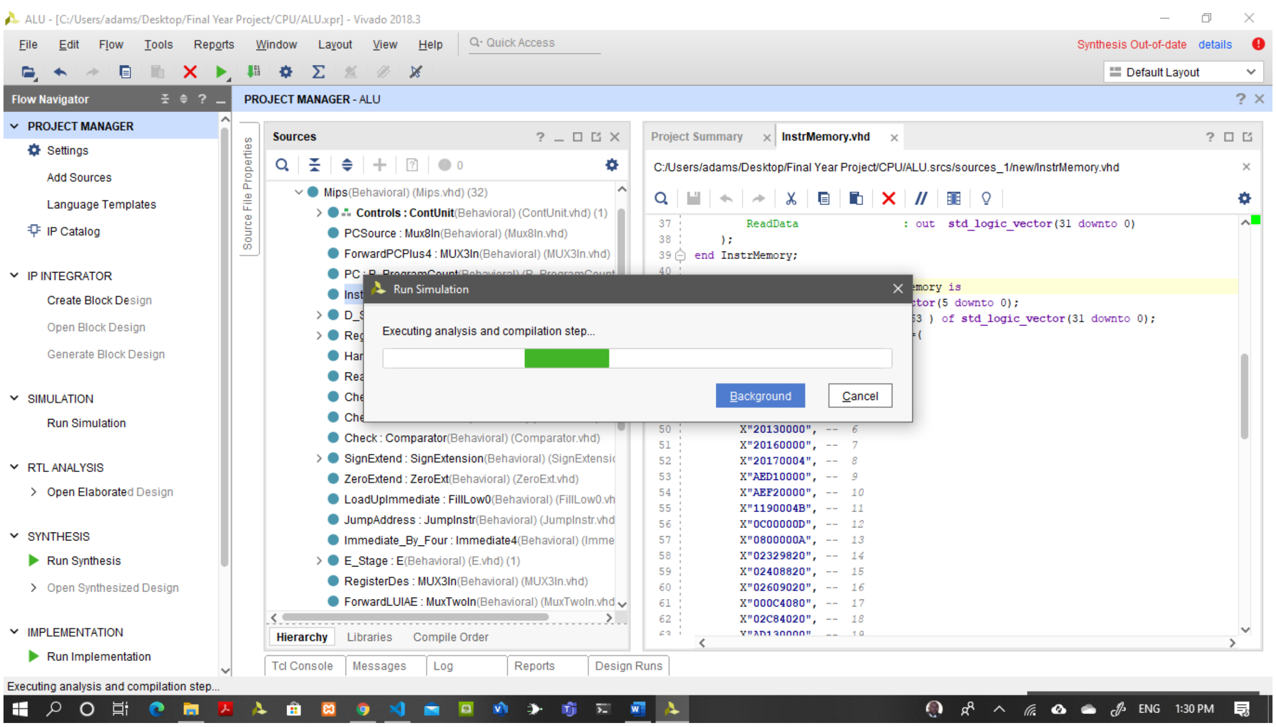


Next expand the project and double click on ***InstrMemory*** to open it To get instructions click on Assembly code

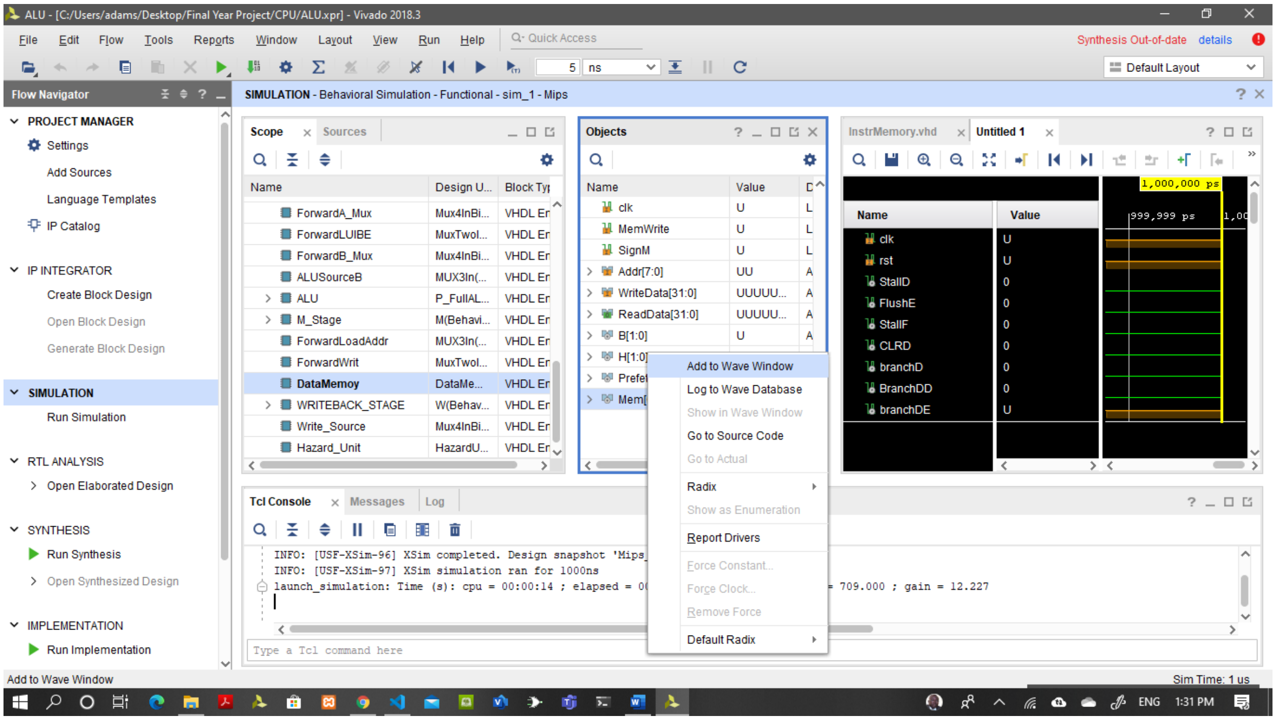


Next click on simulation to simulate your instructions

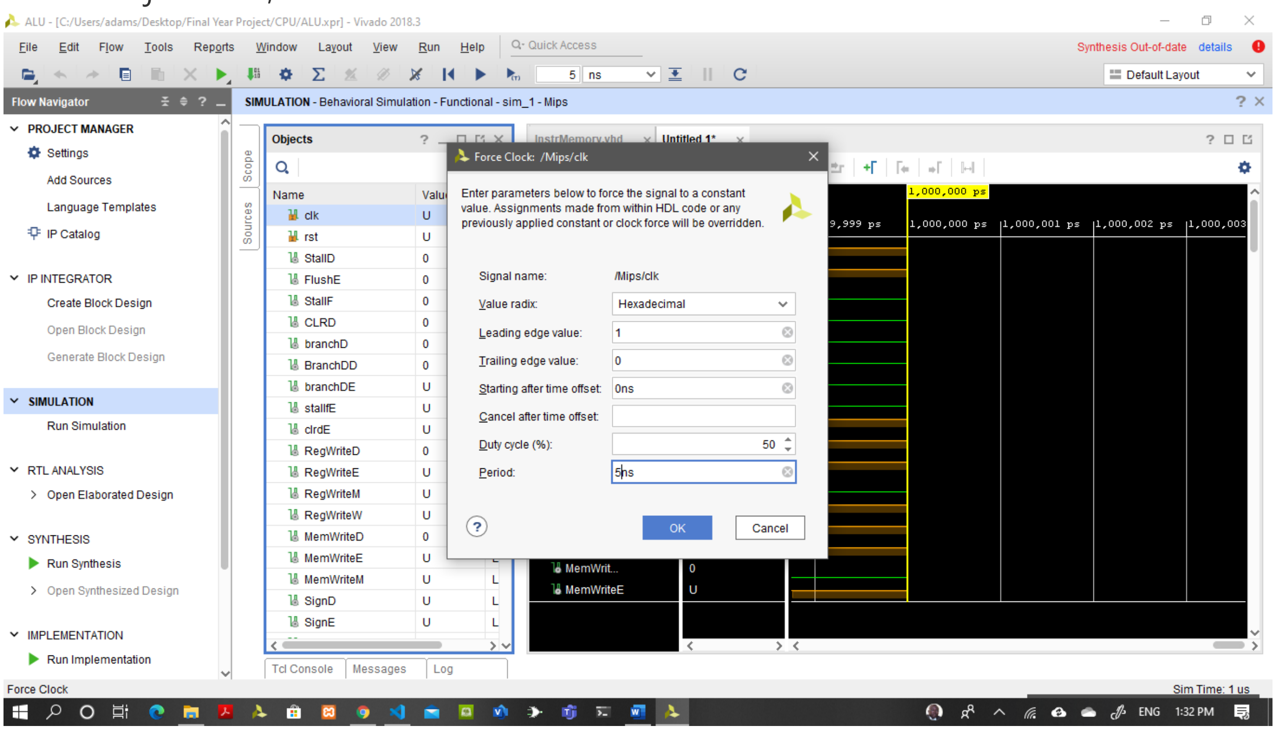




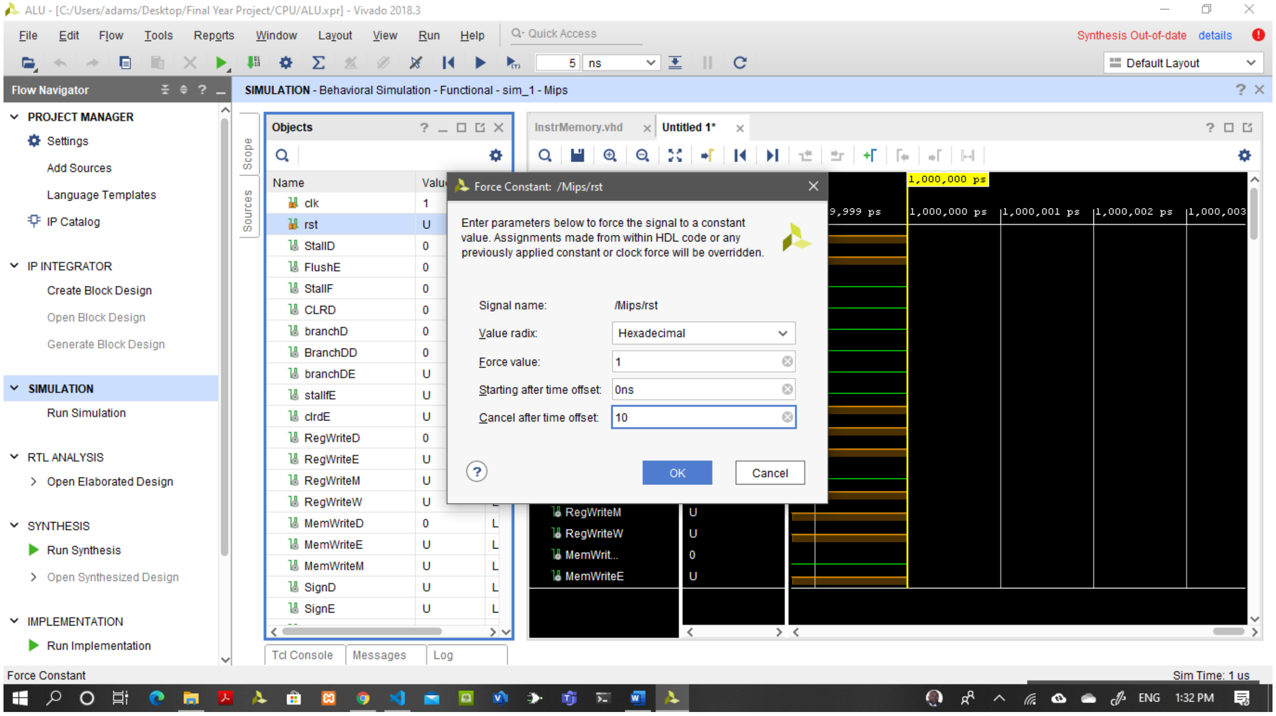
Now select **DataMemory** from ***scope*** and click on it. Click on Mem from objects and select add to ***add to wave window***



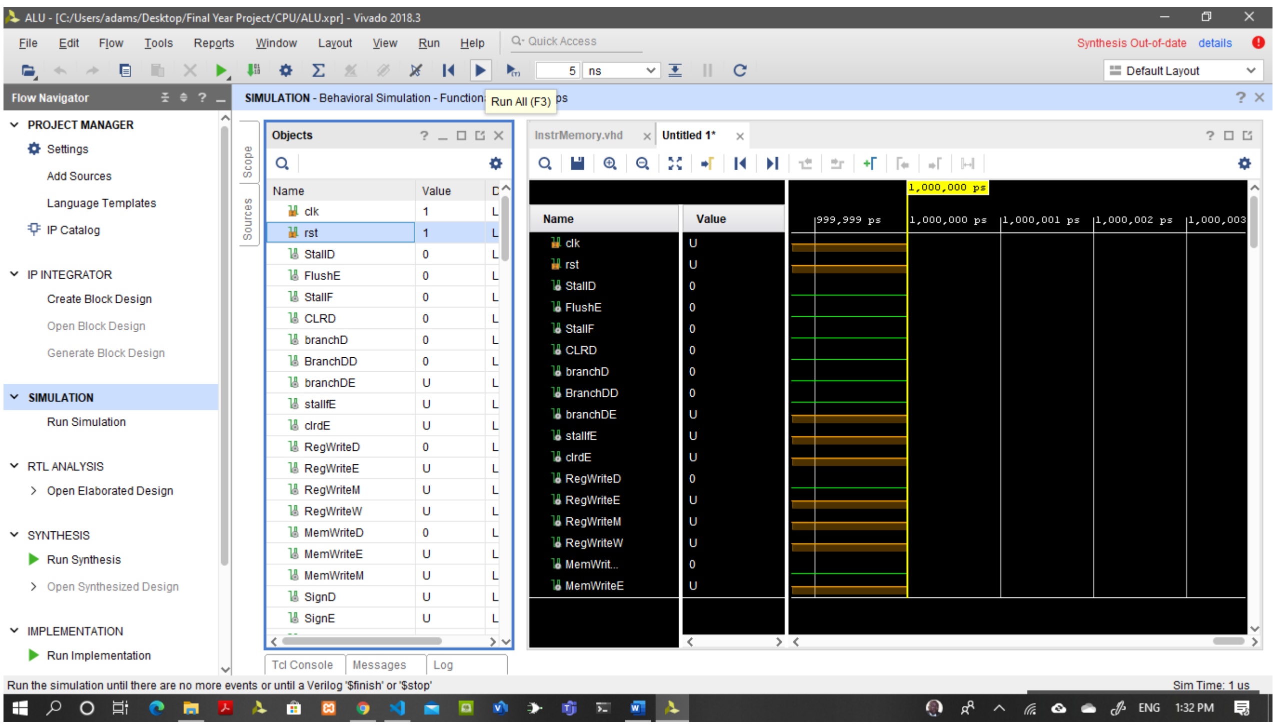
*In the object view, click on clk and select force clock. Fill the form as it is in this readme



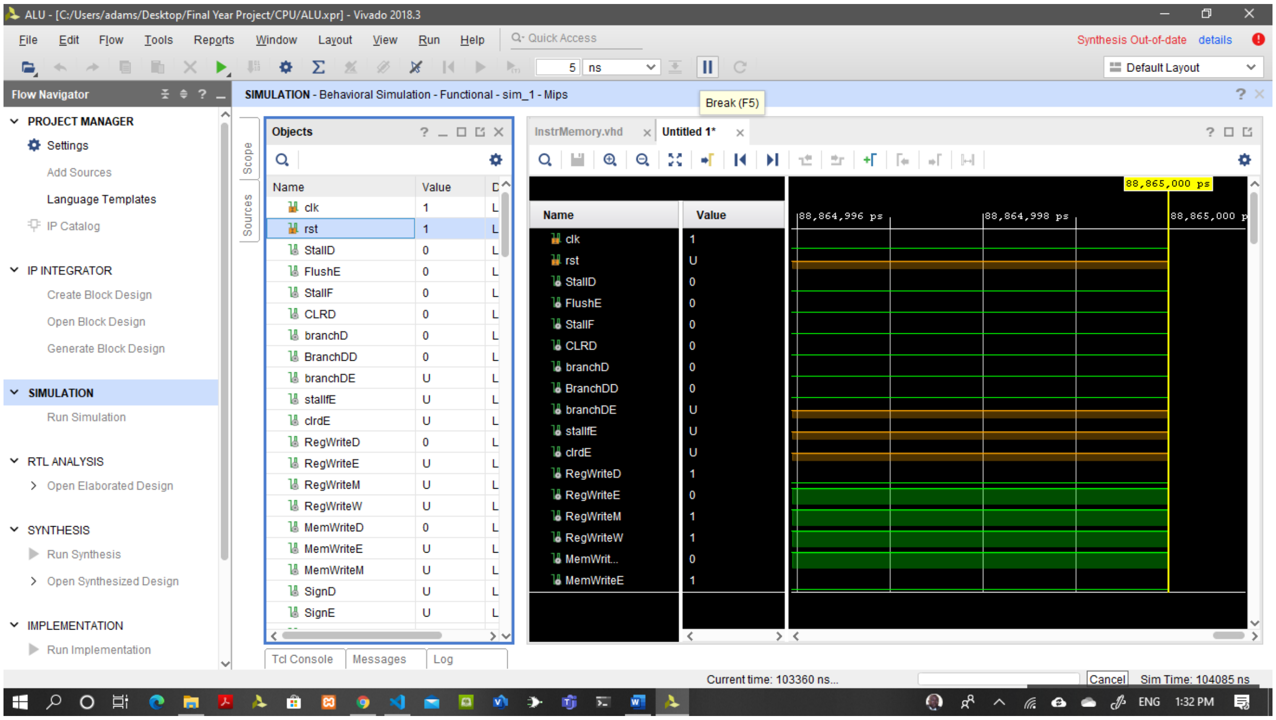
*Next the object view, click on rst and select force constant. Fill the form as it is in this readme



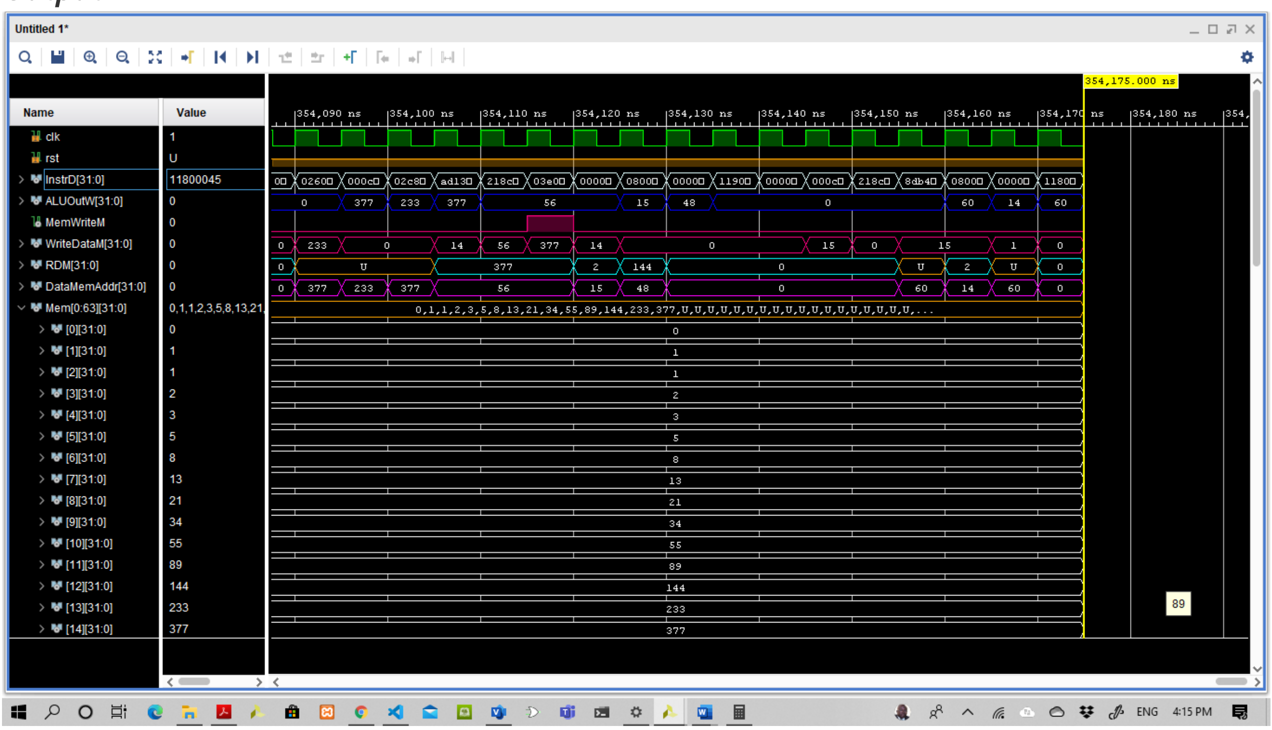
Click on run



Click on stop



Output



Assembler to translate your assembly code to machine code

Assembler

An assembler is a program that converts assembly language into machine code. It takes the basic commands and operations from assembly code and converts them into binary code that can be recognized by a specific type of processor.

Assemblers are similar to compilers in that they produce executable code. However, assemblers are more simplistic since they only convert low-level code (assembly language) to machine code.

to run the assembler:

---

1. Install and open vscode
2. Install julia extensions
3. Open the file ***instr.txt*** and type any MIPS instruction

> a. ***Supported instructions for I_TYPE***

```
addi, addiu, slti, sltiu, lui, lb, lh, lw, lbu, lhu, sb, sh, sw, blez, bgtz, bltz,
```

> b. ***Supported instructions for R_YYPE***

```
slt, sltu, and, or, xor, nor,mthi, mtlo, mfhi, mflo, subu, sllv, srlv, srav, sll,
```

> c. ***Supported instructions for J_YYPE***

```
jr, jalr, jal, j
```

> ***Sample instructions***

```
addi $t0, $0, 0      #   index of iterator
addi $t4, $0, 2      #   index1 of iterator
addi $s0, $0, 15     #   limit of loop
addi $s1, $0, 0      #   first fibonacci num
addi $s2, $0, 1      #   second fibonacci num
addi $s3, $0, 0      #   container for the next fibonacci num
addi $s6, $0, 0      #   $s6 = 0
addi $s7, $0, 4      #   $s7 = 4
sw $s1, 0($s6)       #   store $s1 at $s6
sw $s2, 0($s7)       #   store $s2 at $s7

loop:   beq $t4, $s0, result       #   check if index1 == limit; go to result
```

```
loop:   beq $t4, $s0, result        #   check if index1 == limit; go to result
        jal fibonacci               #   call fibonacci()
        j loop                      #   go to loop

fibonacci:      add $s3, $s1, $s2       #   add first and second
                add $s1, $s2, $0        #   swape first with second
                add $s2, $s3, $0        #   swape second with next
                sll $t0, $t4, 2         #   $t0 = mul t4 by 4
                add $t0, $s6, $t0       #   $t0 += $s6
                sw $s3, 0($t0)          #   store next
                addi $t4, $t4, 1        #   $t4 += 1
                jr $ra                  #   return to the called function


result:     beq $t4, $0, done            #       check if $t4 == 0; go to done
                sll $t5, $t4, 2          #       $t5 = mul t4 by 4
                addi $t4, $t4, -1        #       $t4 -= 1
                lw $s4, 0($t5)           #       $s4 = load the content at memory ac
                j result                 #       go to result

done:   # done
```

4. Now opne the file "output.jl"

you will see ***include("reads.jl")*** hold ***Ctrl*** and ***enter*** to run it

```
include("reads.jl")
```

5. Now open the file ***InstructionBin.txt*** or ***InstructionHex.txt*** to get the instructions

```
        20080002
        AC080000
        20090003
        AC090004
        200A0004
        AC0A0008
        200B0005
        AC0B000C
        200C0006
        AC0C0010
        200D0007
        AC0D0014
        200E0008
        AC0E0018
        200F0003
        AC0F001C
        20180002
```

```
AC180020
20100001
AC100024
```