

Lab 3 Preview

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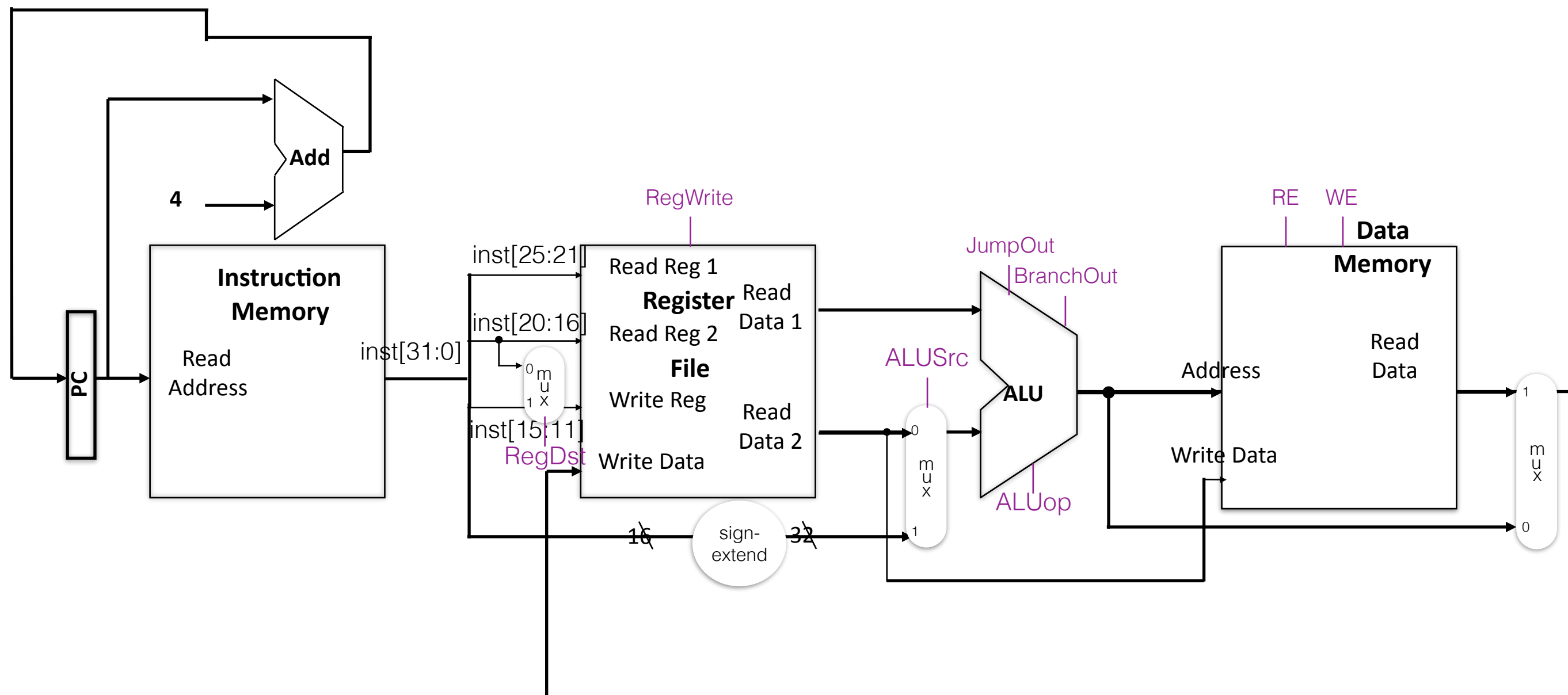
Announcement

- Lab 2 due this Friday
 - Interview with any of us
- Lab 3 due next Friday
 - Please complete the lab as soon as possible
- Hung-Wei's — right after this lecture and until 6pm.

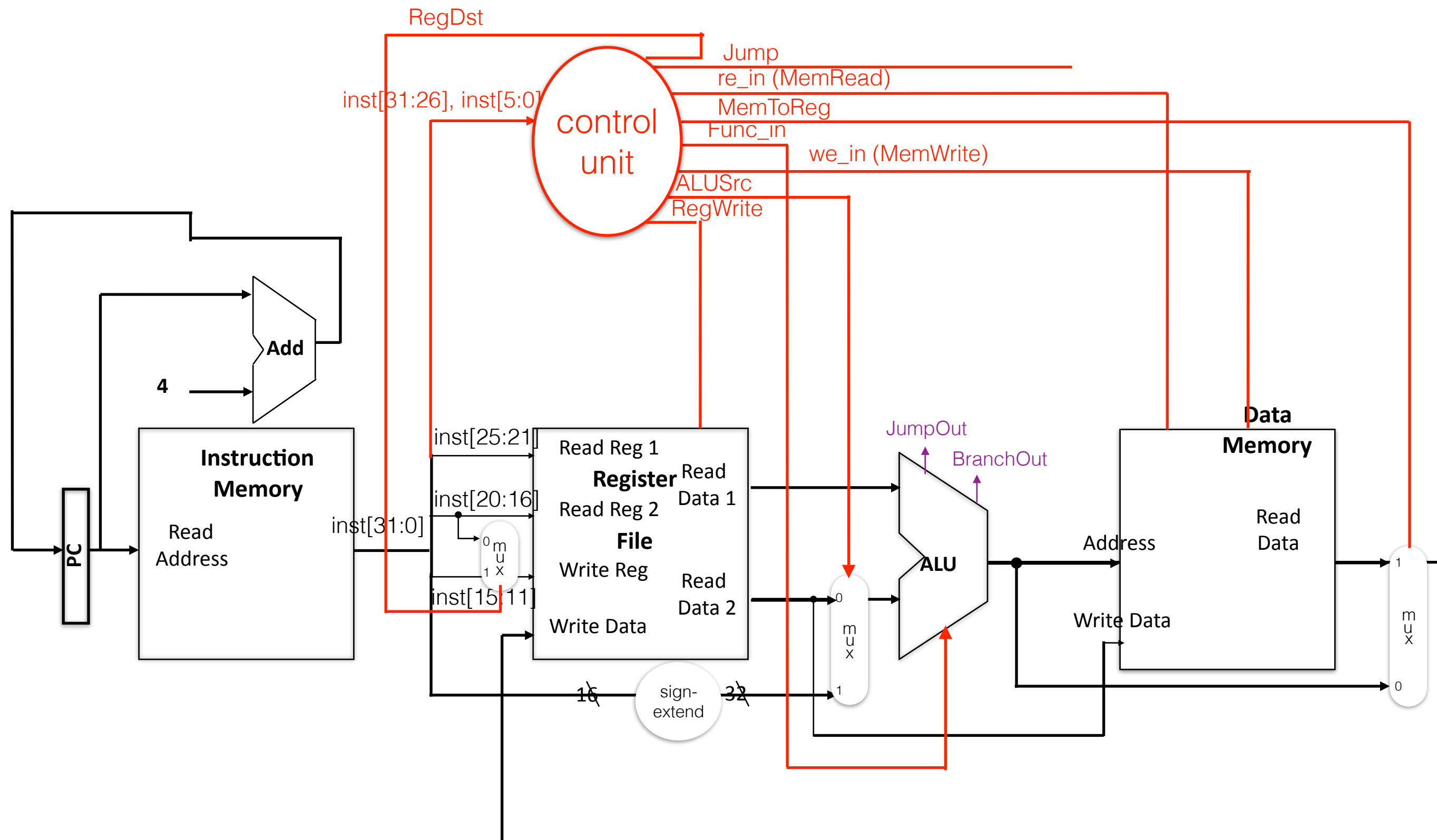
In Lab 3...

- You will be adding a control unit on top of the datapath in the previous lab.
 - The processor will support lw, sw, add, addi, sub, and, or nor, xor
 - No branch yet

Lab 2: single-cycle datapath



Lab 3: adding control to Lab2!



Control Unit

- We need to support lw, sw, add, addi, sub, and, or, nor, xor.

instruction				control unit output							
	type	opcode inst[31:26]	funct inst[5:0]	func_in	RegDst	ALUSrc	RegWrite	MemRead	MemWrite	MemTo Rea	Jump
lw	I	0x23		100000	0	1	1	1	0	1	0
sw	I	0x2b		100000	X	1	0	0	1	X	0
add	R	0	0x20	100000	1	0	1	0	0	0	0
addi	I	0x8		100000	0	1	1	0	0	0	0
sub	R	0	0x22	100010	1	0	1	0	0	0	0
and	R	0	0x24	100100	1	0	1	0	0	0	0
or	R	0	0x25	100101	1	0	1	0	0	0	0
nor	R	0	0x27	100111	1	0	1	0	0	0	0
xor	R	0	0x26	100110	1	0	1	0	0	0	0
sll	R	0	0x0	000000	1	0	1	0	0	0	0
sra	R	0	0x3	000011	1	0	1	0	0	0	0

Benchmarks

- In this lab, we provide the following benchmark programs
 - http://cseweb.ucsd.edu/classes/su19_2/cse141L-a/Media/lab3/lab3-test.zip
 - http://cseweb.ucsd.edu/classes/su19_2/cse141L-a/Media/lab3/nbhelloworld.zip
 - No branches
 - Start with PC 0x400000
 - That's why the default PC is 0x400000
 - But depends on your hardware design, you may have to make it 0x3FFFC.

Hello, world

.text

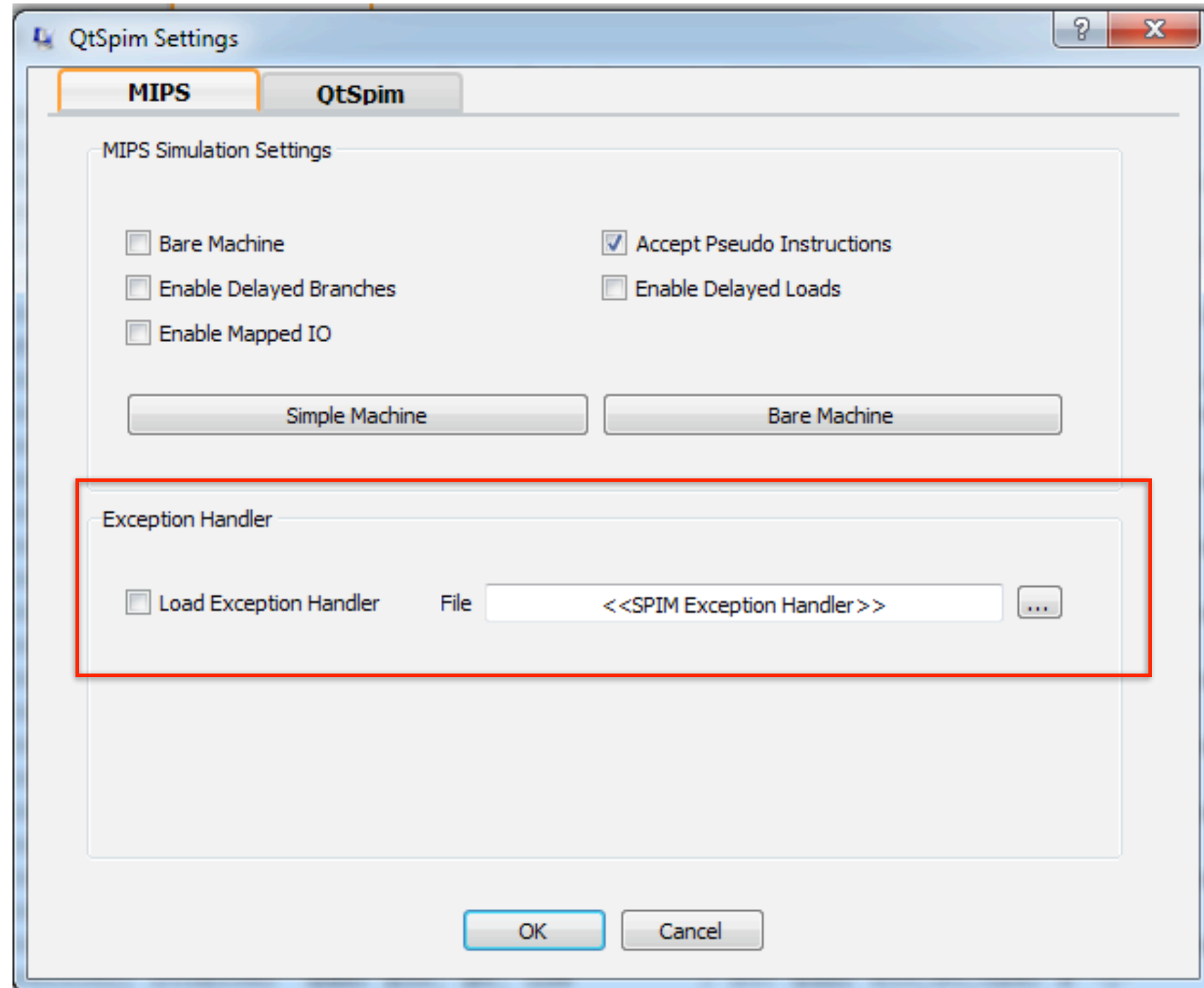
```
__start:  
addi $10,$0,0x4000  
sub $20,$0,$10  
sub $20,$20,$10    # $20 should now contain 0xffffc000  
sub $20,$20,$10    # $20 should now contain 0xffff8000  
sub $20,$20,$10    # $20 should now contain 0xffff0000  
  
addi $10,$0,0x48    # $10 is now 'H'  
sw $10,12($20)     # write word  
  
addi $10,$0,0x65    # 'e'  
sw $10,12($20)     # write word  
  
addi $10,$0,0x6C    # 'l'  
sw $10,12($20)     # write word
```

why are we doing this?



PCSpim/QtSpim

- A MIPS Simulator
- Demo



Interview questions

- Simulate No-Branch Hello World for 1 us
- Show the waveforms
- Repeat the above, simulate for 5 us
- Show us the schematics, explain it
- Get the Fmax

Q & A