

CSE 260M / ESE 260
Intro. To Digital Logic & Computer Design

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&
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This week

- Thursday: Break!
- Hw #7 — Posted Tonight! (Due Friday after break)
- Tues (Dec. 3): Exam 2. IN *Hillman 70*

Lecture Review

- Last week:
 - Compiler
 - li a0,4096
 - addi a0,a0,954
 - Load Immediate (li) is a pseudo-op.
 - My summary was sloppy / incorrect
 - https://pages.hmc.edu/harris/ddca/ddcarv/DDCArv_AppB_Harris.pdf
 - Translates to two instructions: lui and addi. Exactly as shown

lui: Load Upper Immediate

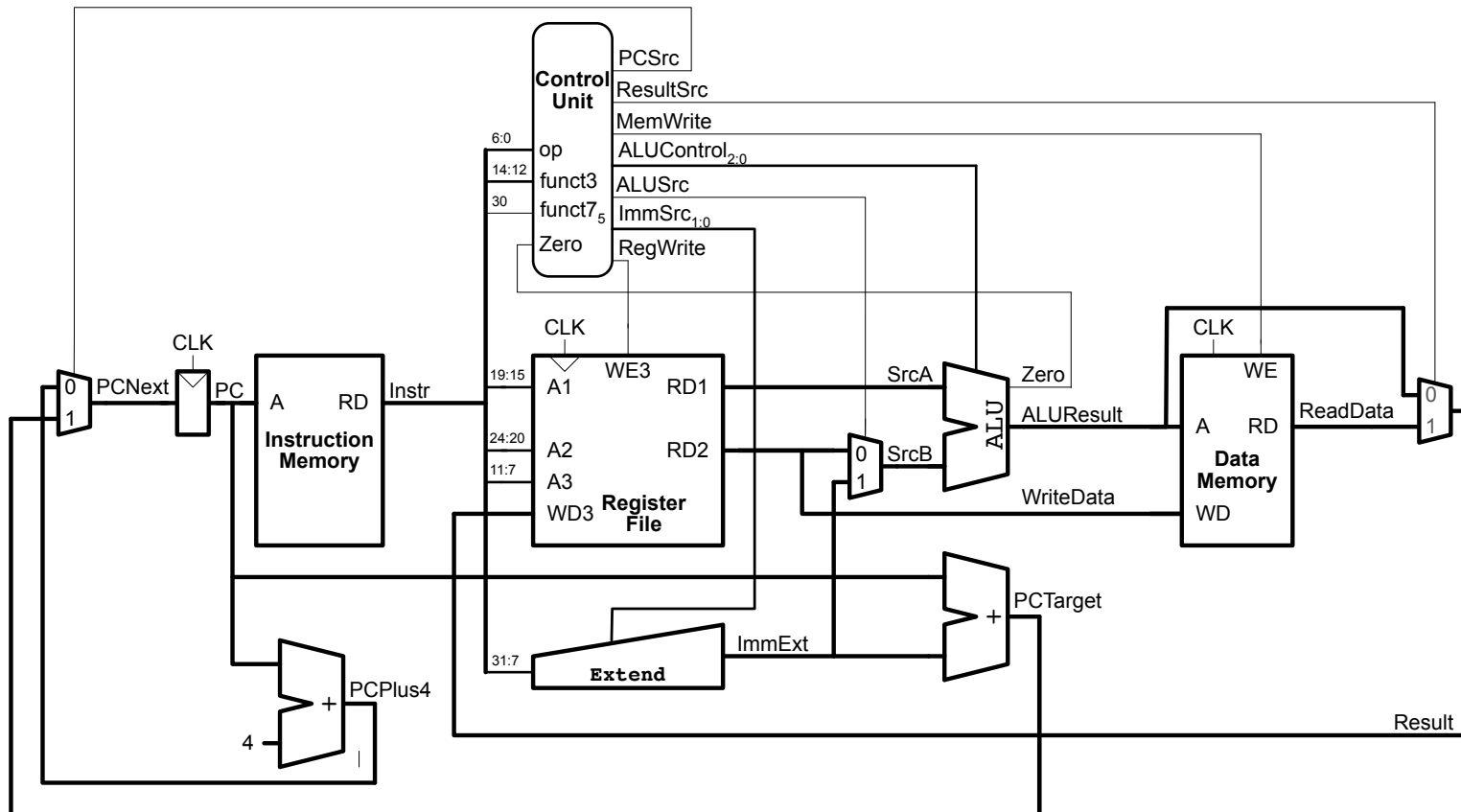
- Lui is really useful for working with larger values

Studio Review

- Display setup / features
- Quick test
- 7-segment display

Chapter 7

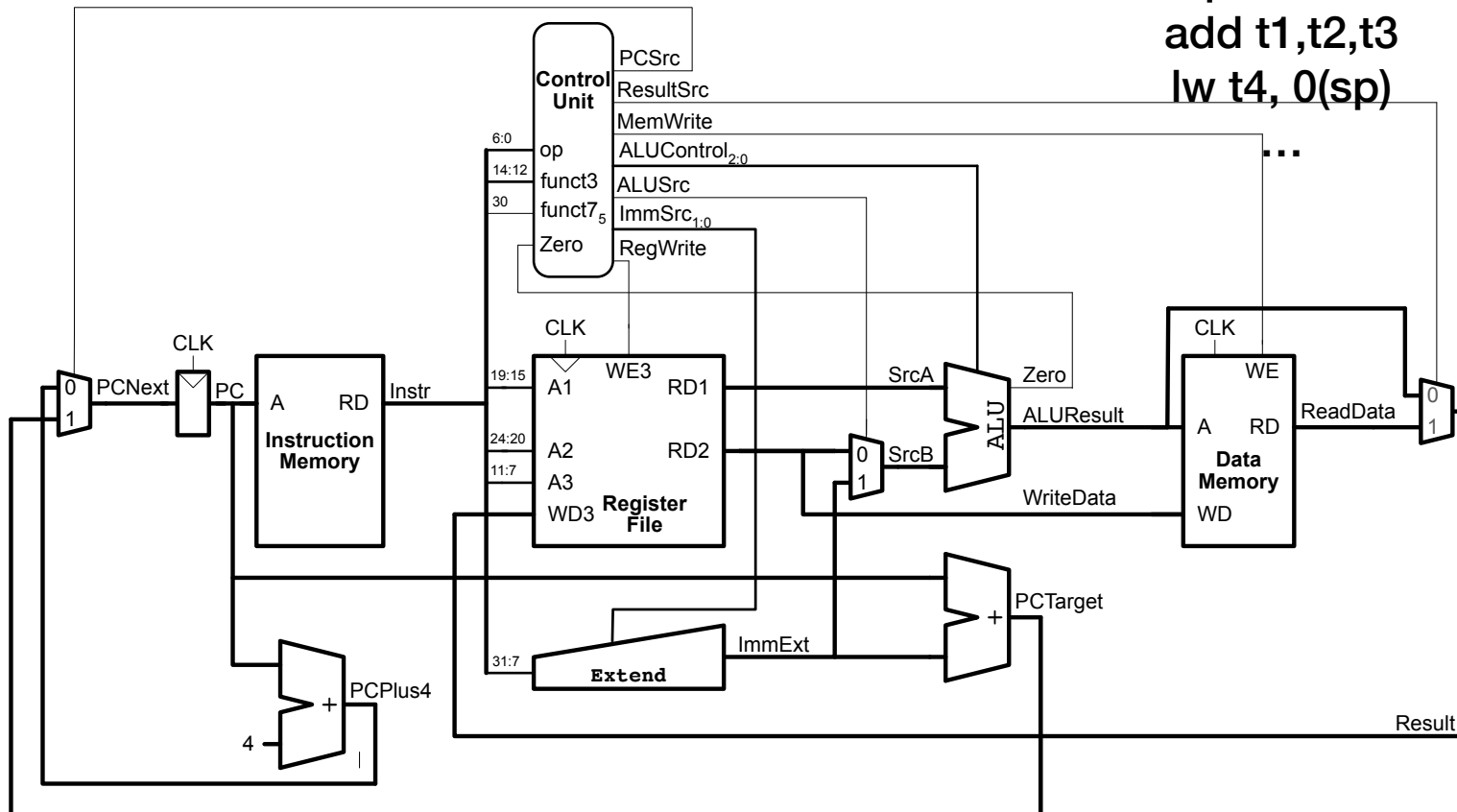
Simple, Single-Cycle RISC-V Computer



Simple, Single-Cycle RISC-V Computer

Consider a sequence of instructions:

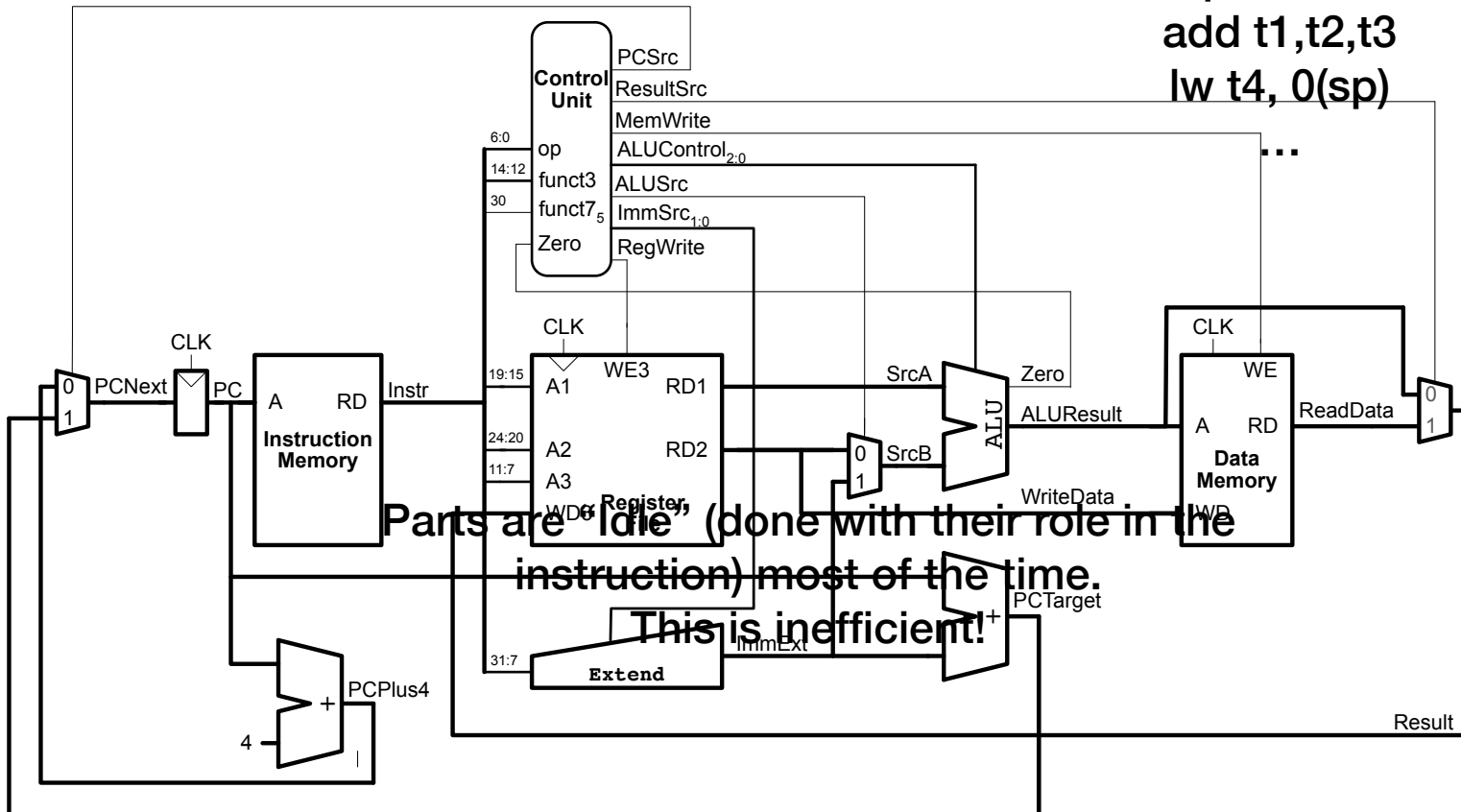
add t1,t2,t3
lw t4, 0(sp)



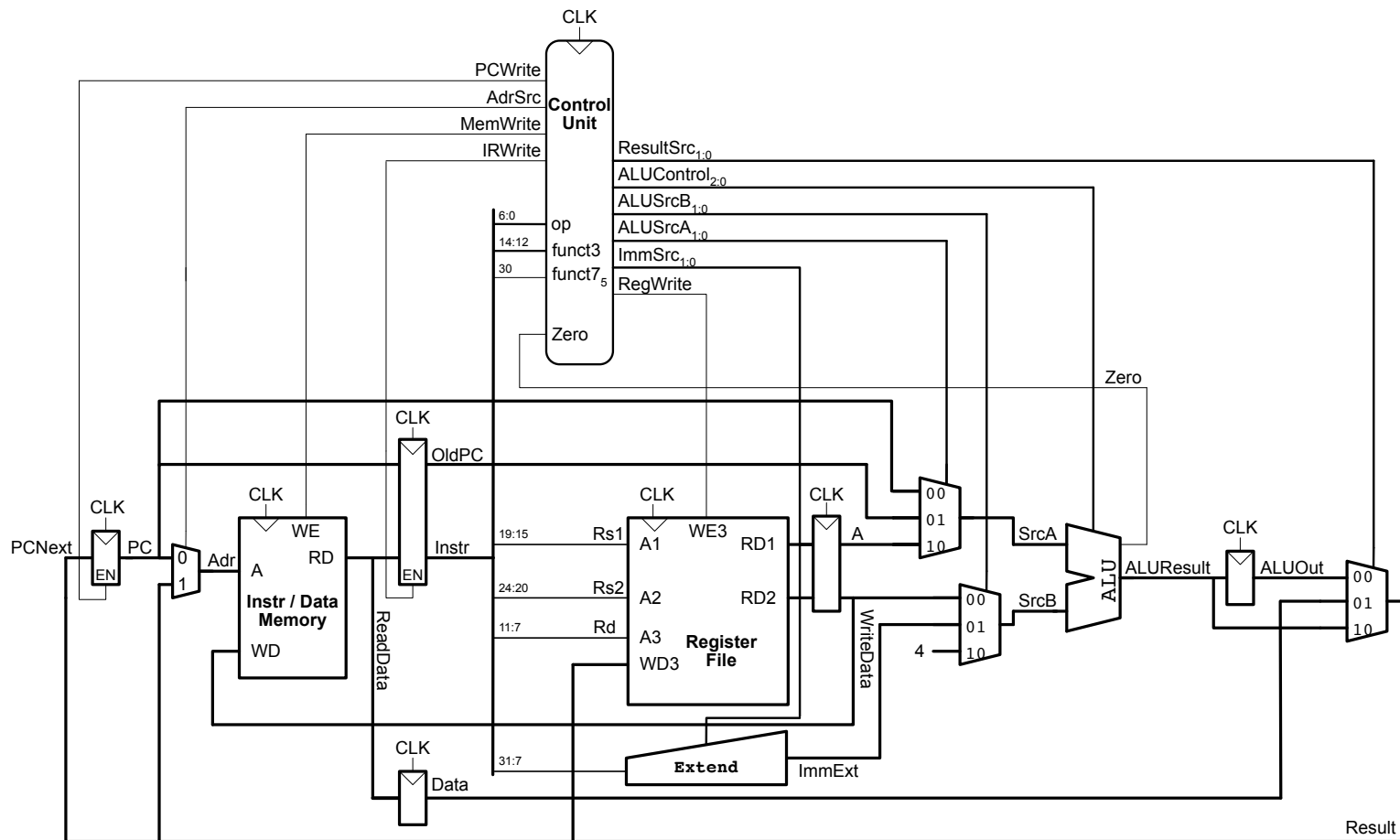
Simple, Single-Cycle RISC-V Computer

Consider a sequence of instructions:

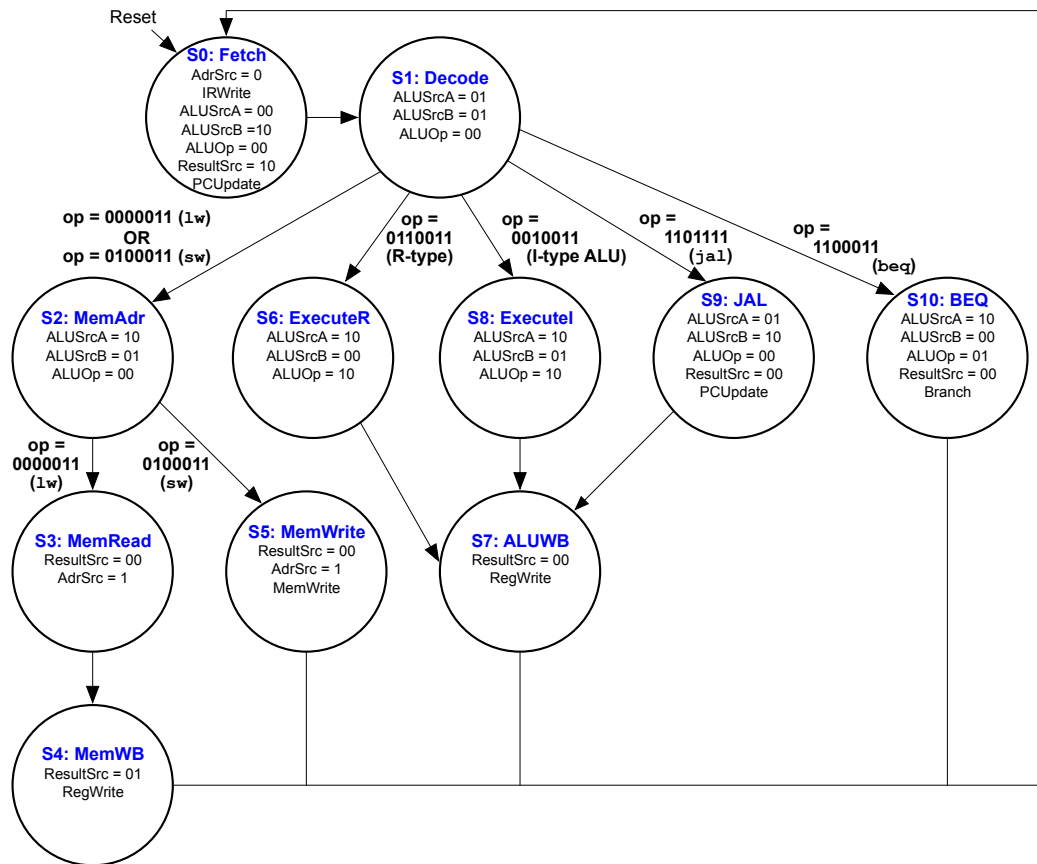
add t1,t2,t3
lw t4, 0(sp)



Multi-Cycle RISC-V Computer



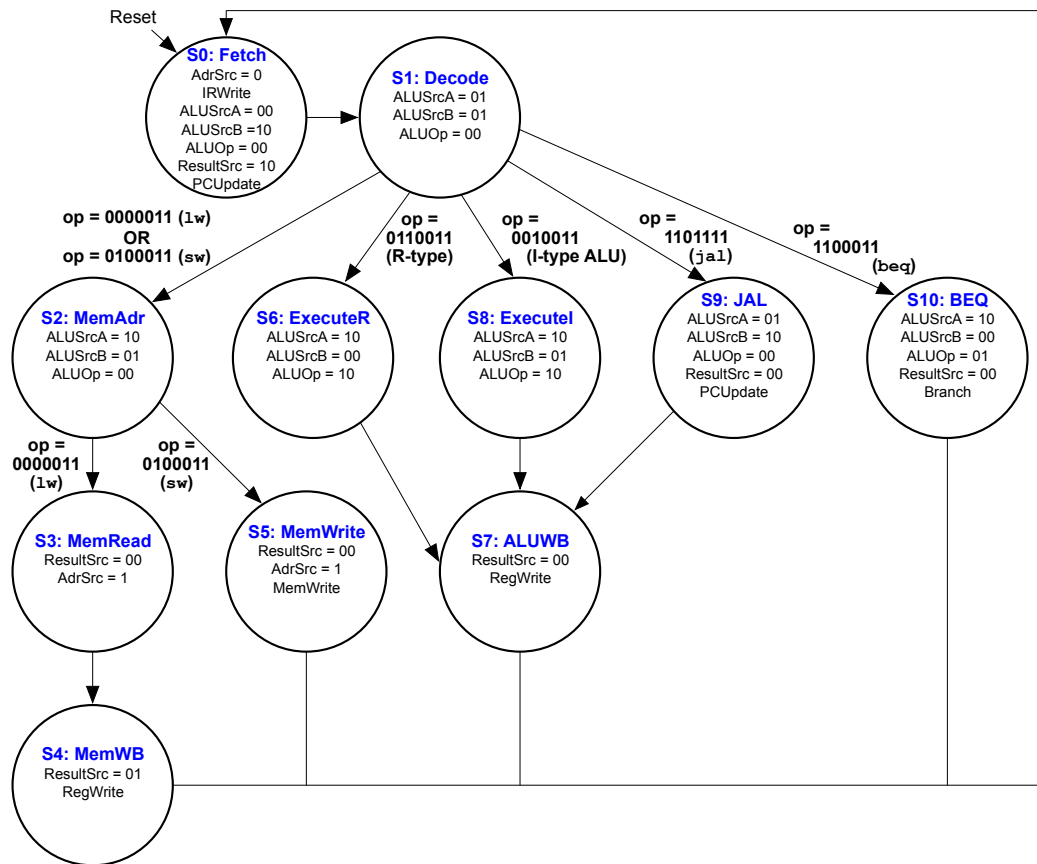
Process



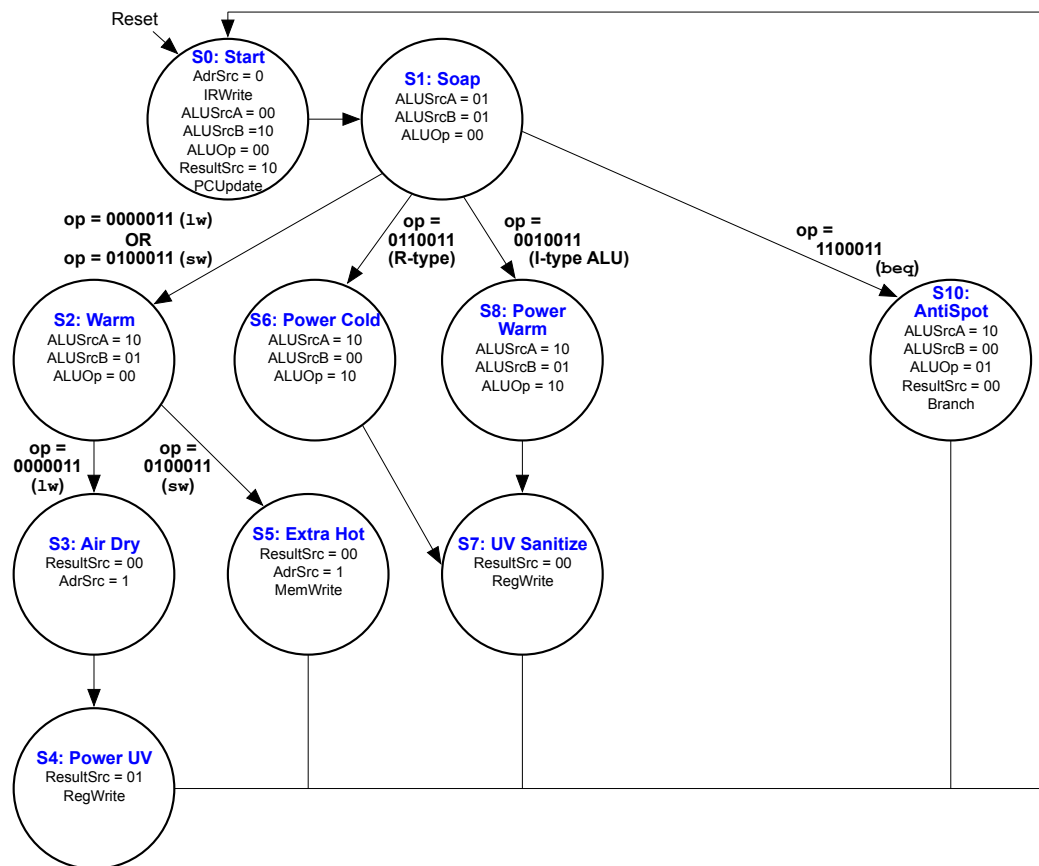
Pros/Cons of Multi-Cycle

- Instructions take only required time: Not constrained by the slowest instruction!
- A little more complex

Process



Process: Hw 4 / Washer



Next Improvement: Pipelines

Laundry

- Laundry machines
 - Washer takes 30 minutes
 - Dryer takes 1 hour (ugh)
- How long does it take to do 1 load of laundry all the way through?
- What about 2 loads?
- What's the approx. average for 50 loads of laundry?

A Pipeline / Factory

- My career: Develop Medical Equipment
 - Along....



Customer Order

- Body style / size
- “Flair” (style and color)
- Body shape

Process

1. Parts prep: read order, put order in bin, put part for order in bin
2. Slide bin down line to “assembler”.
3. Slide down to cleaner
4. Slide down to packer
5. Move to shipping



Registers:

Between stages;

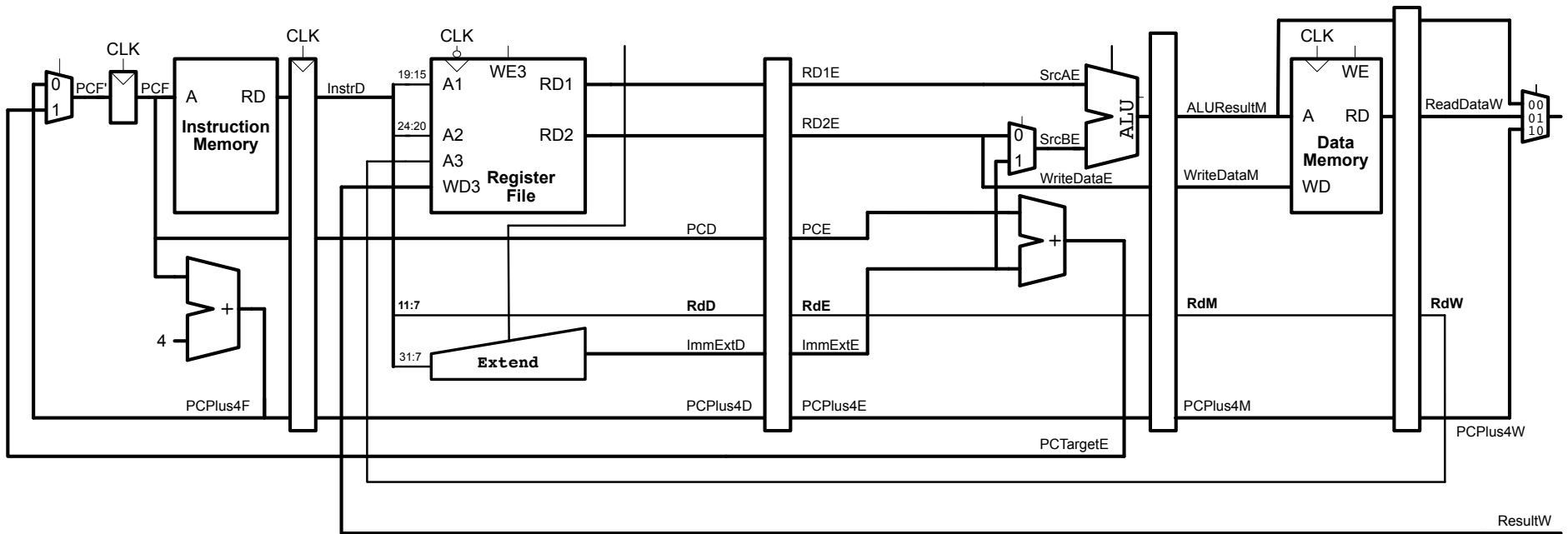
Like the parts bin (hold parts for ins...)

but parts move, not bins

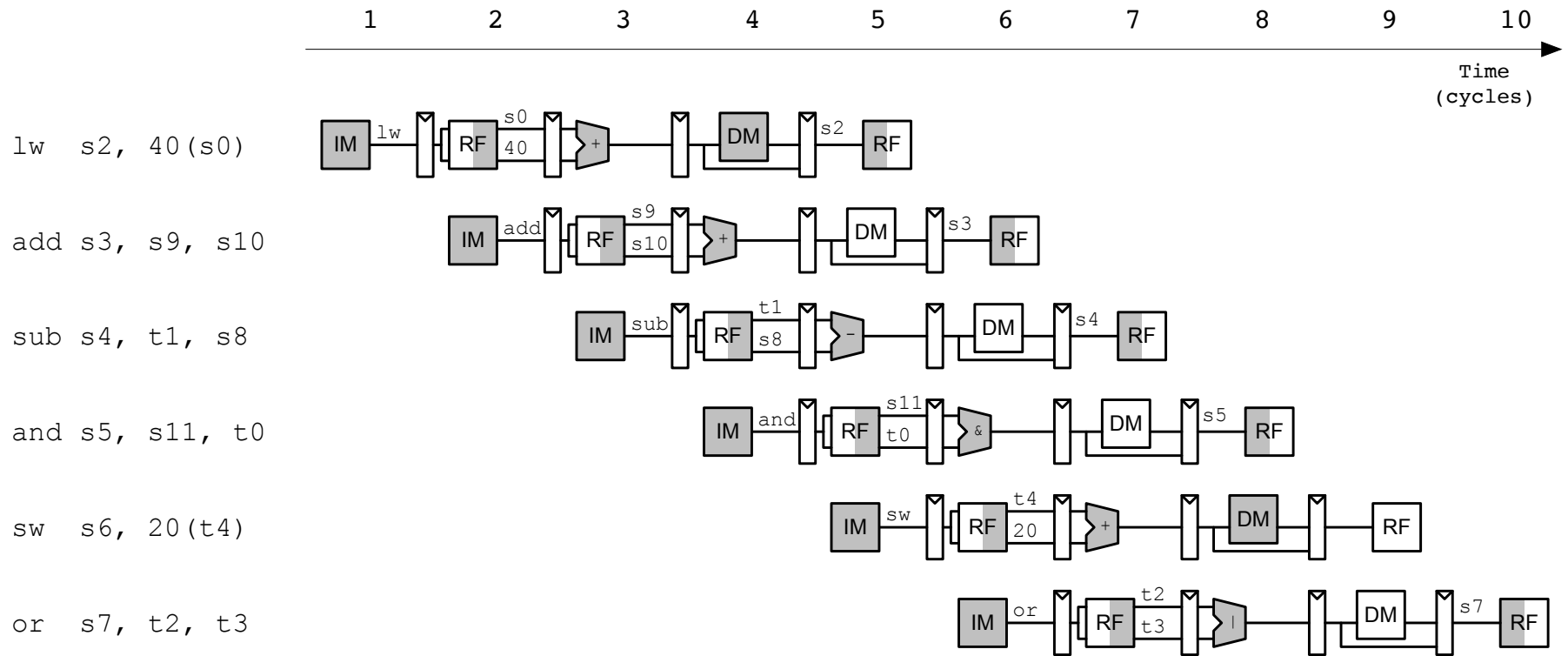
Pipeline CPU

Each Stage

Each Stage



Pipeline CPU



**Pipelining: A sequence of operations
(and overlapping a single “instruction” (load of laundry))
Execution overlaps in time**

Next Time

- Studio
 - Bring full kits!