

EECS 370 Discussion

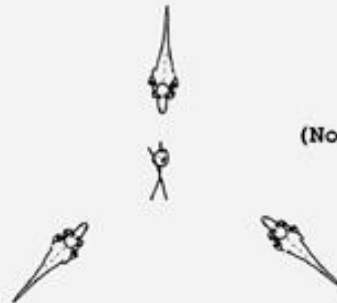
Sample Exam Questions

Name: _____

1. The velociraptor spots you 40 meters away and attacks, accelerating at 4 m/s^2 up to its top speed of 25 m/s . When it spots you, you begin to flee, quickly reaching your top speed of 6 m/s . How far can you get before you're caught and devoured?



2. You are at the center of a 20m equilateral triangle with a raptor at each corner. The top raptor has a wounded leg and is limited to a top speed of 10 m/s .



(Not to scale)

The raptors will run toward you. At what angle should you run to maximize the time you stay alive?

3. Raptors can open doors, but they are slowed by them. Using the floor plan on the next page, plot a route through the building, assuming raptors take 5 minutes to open the first door and halve the time for each subsequent door. Remember, raptors run at 10 m/s and they do not know fear.

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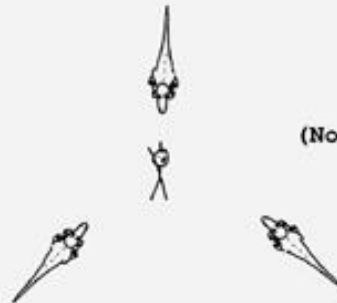
Not Really...

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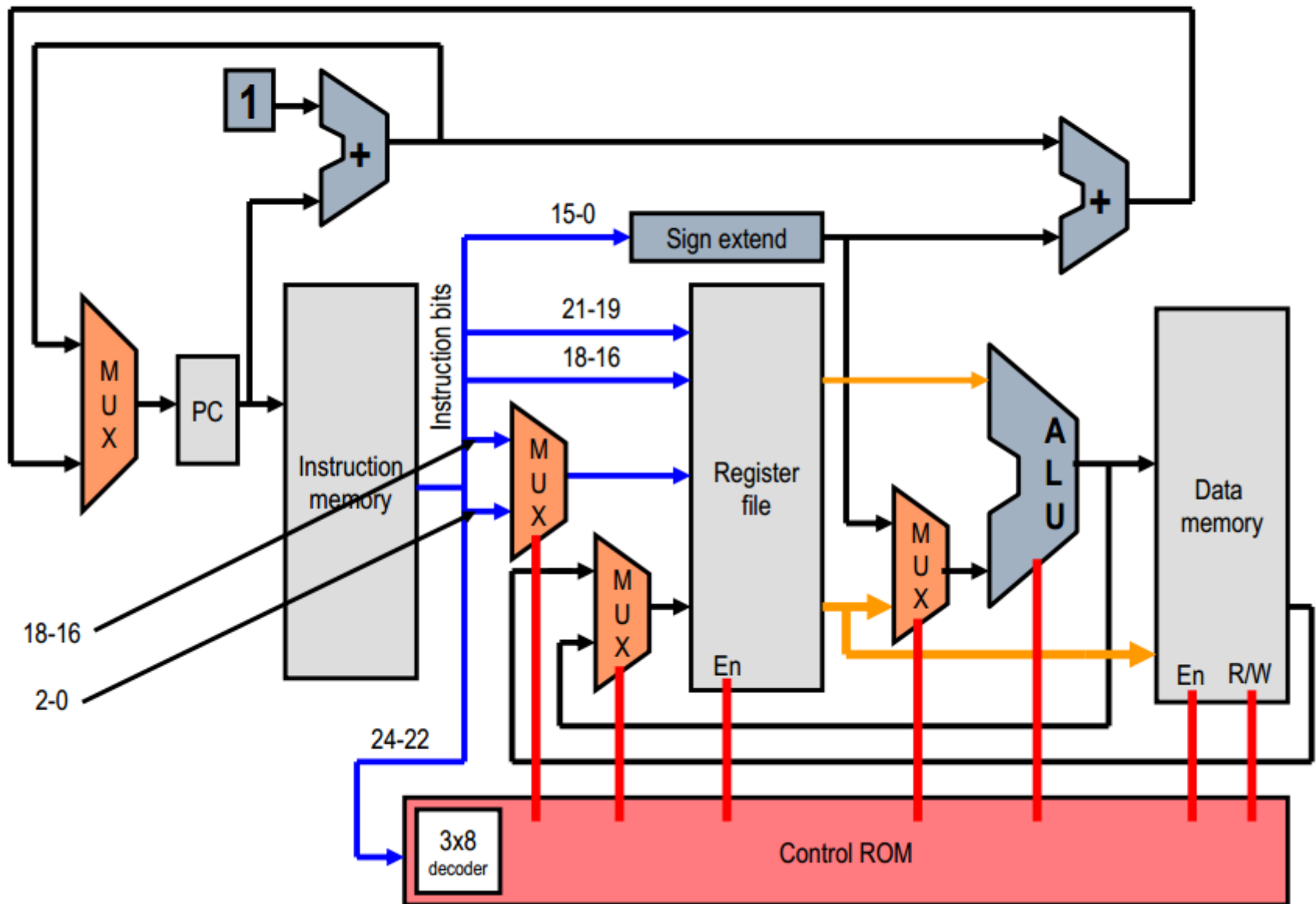
xkcd.com

EECS 370 Discussion

Topics Today:

- Processor Components
- Single-Cycle Datapath
- Project 2
- Time for Questions

LC2Kx Datapath Implementation



EECS 370 Discussion

Processor Components

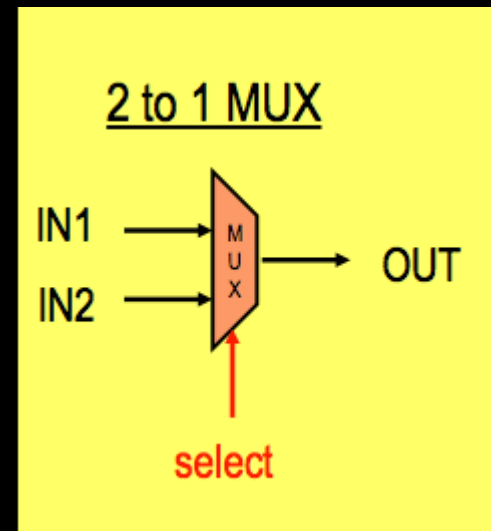
Control Blocks

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Processor Components - Mux

- Used to choose options

```
if (select == 0) {  
    OUT = IN1;  
} else {  
    OUT = IN2;  
}
```

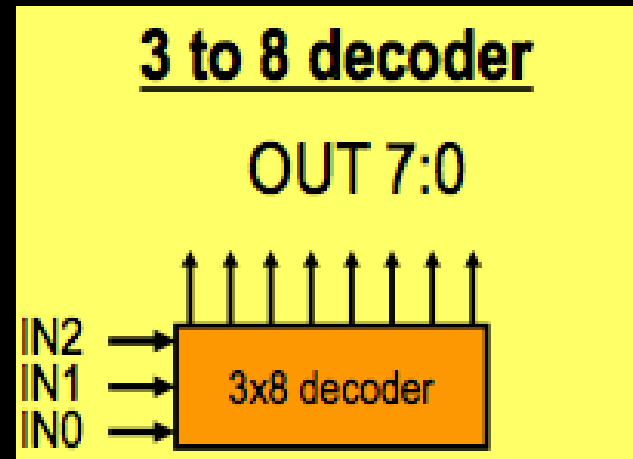


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Processor Components - Decoder

Allows an N-bit binary number to select one of 2^N output lines

IN	OUT
000	00000001
001	00000010
010	00000100
011	00001000
100	00010000
101	00100000
110	01000000
111	10000000

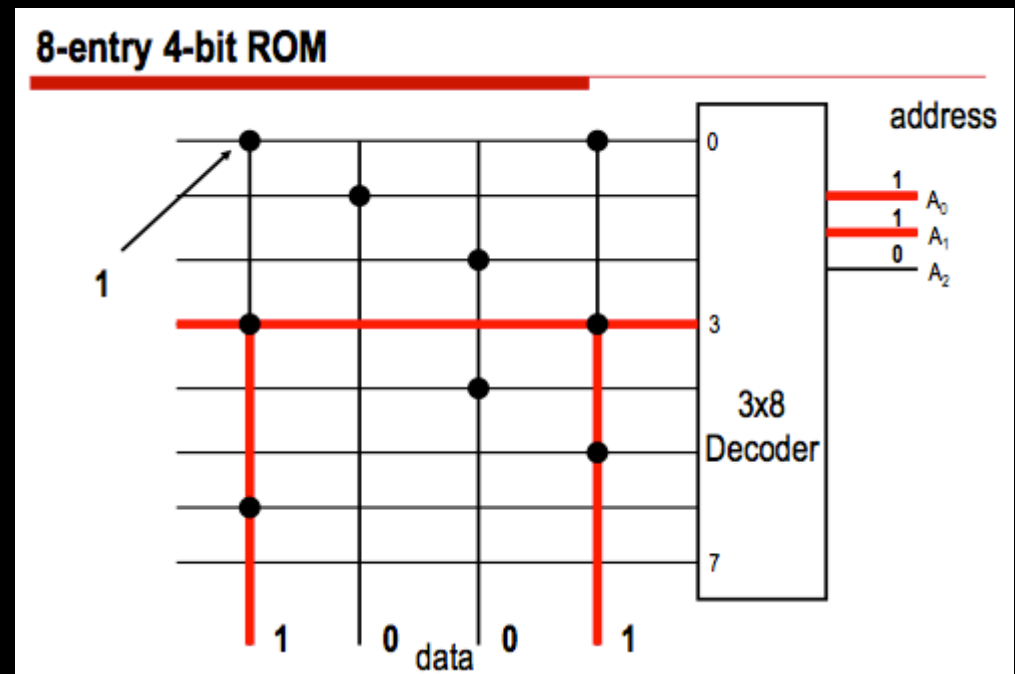


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Processor Components – ROM

Just a memory!

Address	Data
000	1001
001	0100
010	0010
011	1001
100	0010
101	0001
110	1000
111	0000



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Processor Components – ROM



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Processor Components – ROM



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Processor Components

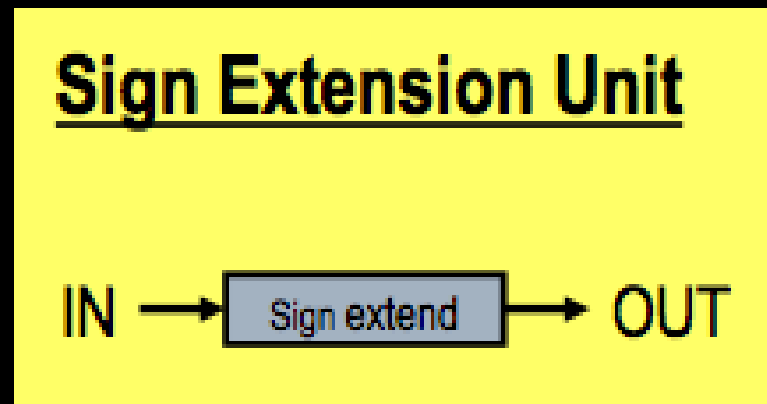
Mathematic Blocks

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Processor Components – Sign Extension Unit

Increases the number of bits in a value

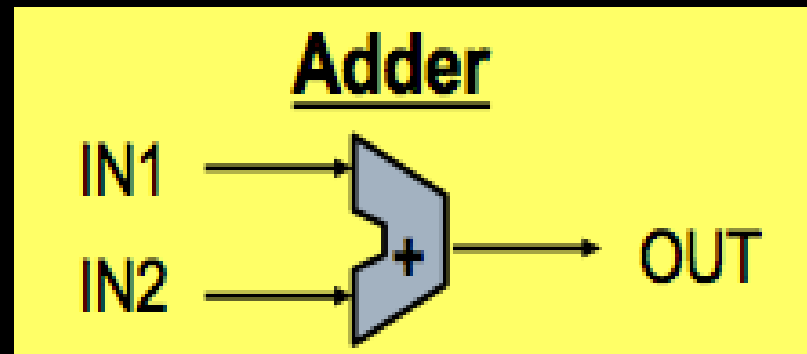
Adds 1s or 0s as appropriate



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Processor Components – Adder

$$\text{OUT} = \text{IN1} + \text{IN2};$$



Is this a Half-Adder or Full-Adder?

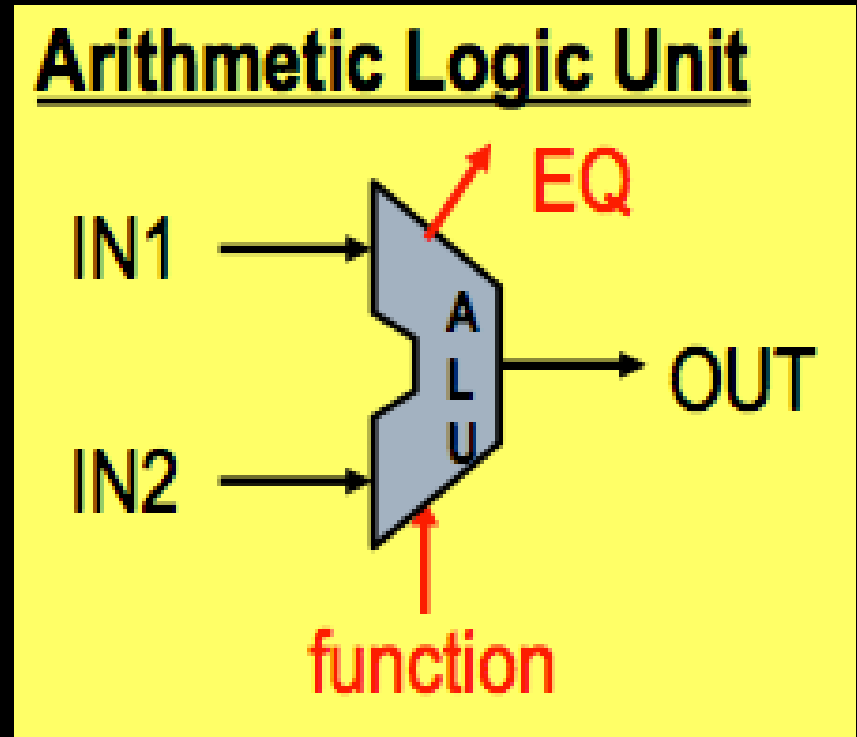
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Processor Components – ALU

Performs math operations

```
if (f == 0) {  
    OUT = IN1 + IN2;  
} else {  
    OUT = IN1 ~& IN2;  
}
```

```
EQ = (IN1 == IN2);
```



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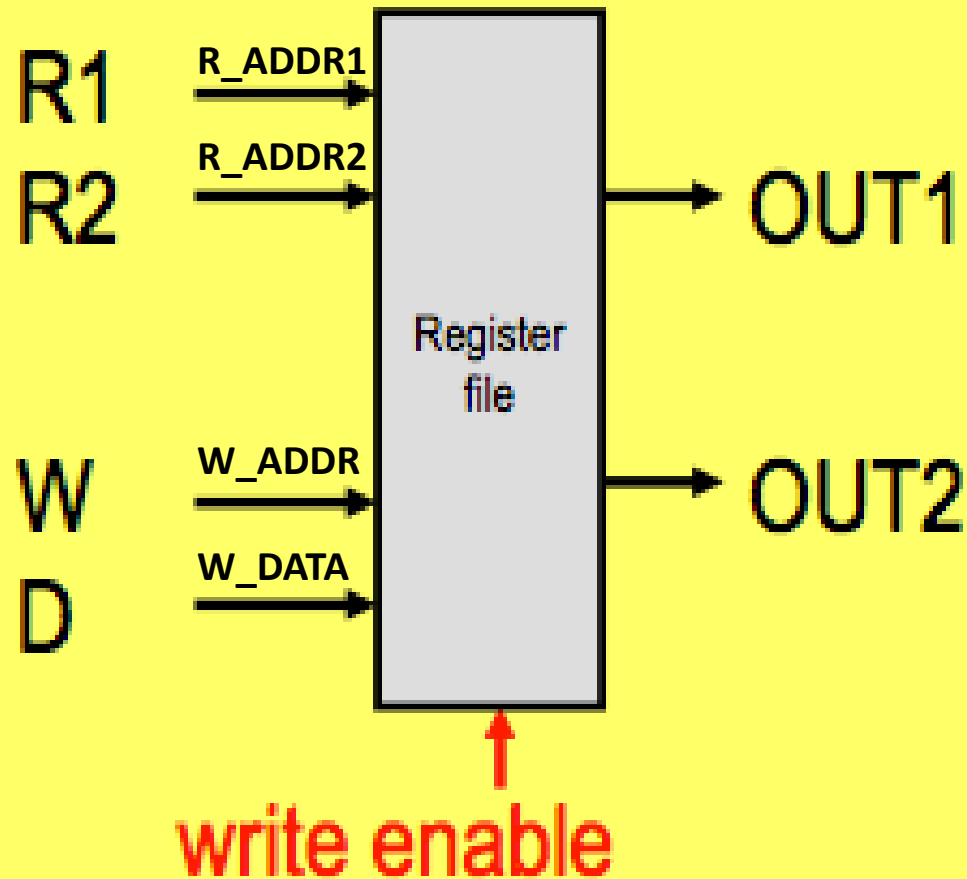
Processor Components

State Blocks

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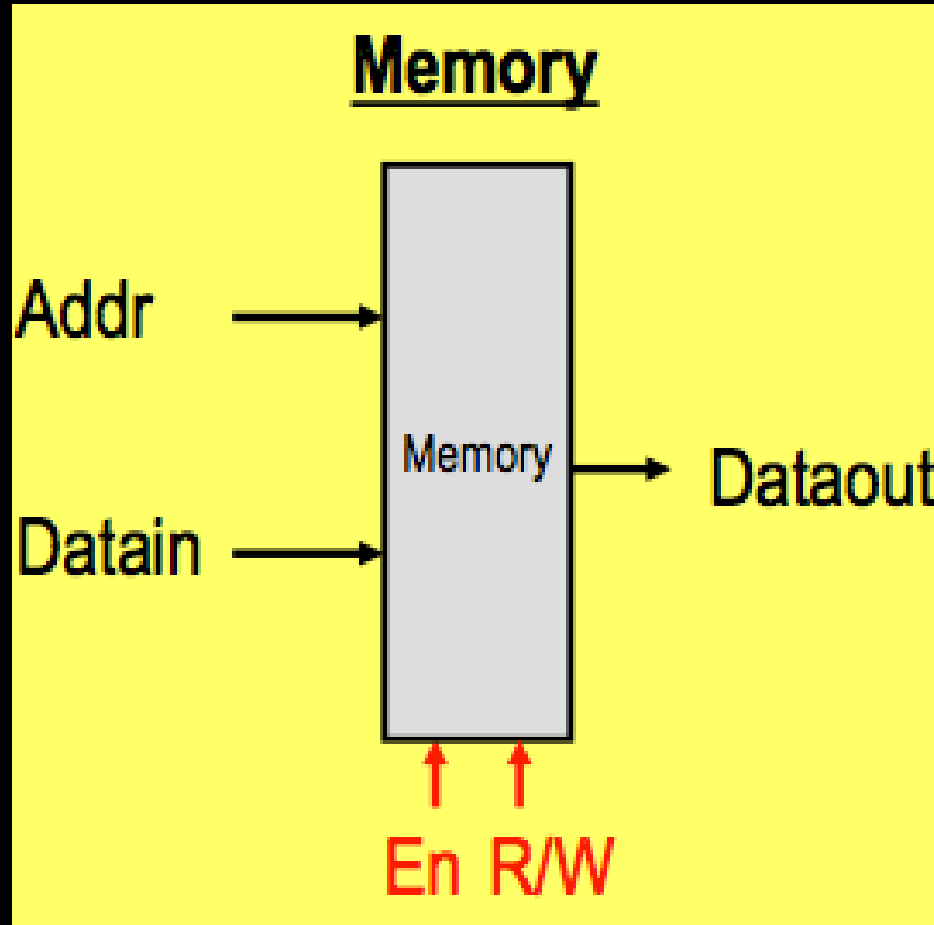
Processor Components – Registers

Register File or Register



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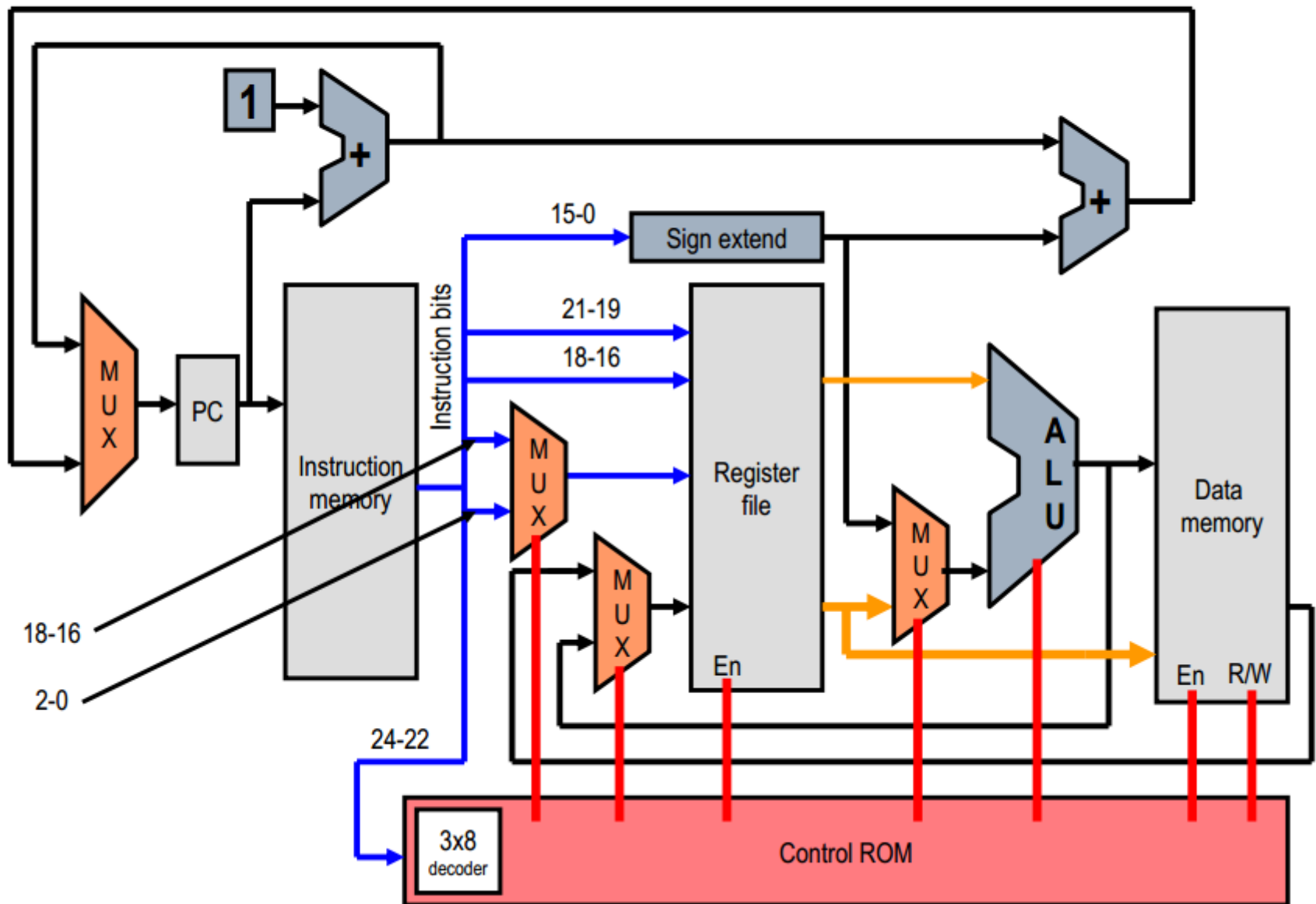
Processor Components – Memory



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Single Cycle Datapath

LC2Kx Datapath Implementation



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Single Cycle Datapath

Key Concept: Entire path executes in a single clock cycle

Fetch Instruction

Decode Instruction

Execute Instruction

Memory Access

Writeback Data

This limits the clock speed to slowest instruction

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Single Cycle Datapath

Inst	I-Mem Access	Read Register	ALU Operation	D-Mem Access	Write Register
add	✓	✓	✓		✓
nand	✓	✓	✓		✓
lw	✓	✓	✓	✓	✓
sw	✓	✓	✓	✓	
beq	✓	✓	✓		
jalr	✓	✓			
noop	✓				
halt	✓				

Example: 5ns Reg Access, 10ns ALU Op, 20ns Mem Access

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Project 2

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Project 2

Suggested Register Convention

HIGHLY recommended you follow this

Register	Use
R0	Value 0
R1	Input N
R2	Input R
R3	Return Value
R4	Local Variable
R5	Stack Pointer
R6	Temporary Value
R7	Return Address

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Exam Review Questions

