



Computer System (I)

# Memory Mapped I/O Systems

朱金辉

华南理工大学软件学院

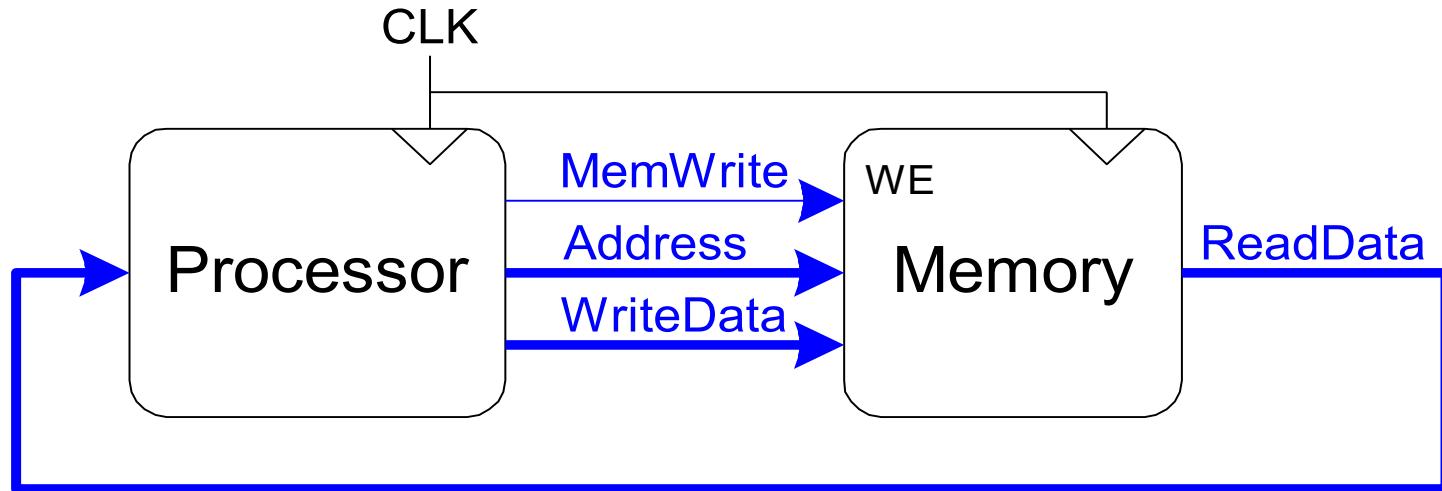
# Memory-Mapped I/O

- Processor accesses I/O devices just like memory (like keyboards, monitors, printers)
- Each I/O device assigned one or more address
- When that address is detected, data read/written to I/O device instead of memory
- A portion of the address space dedicated to I/O devices

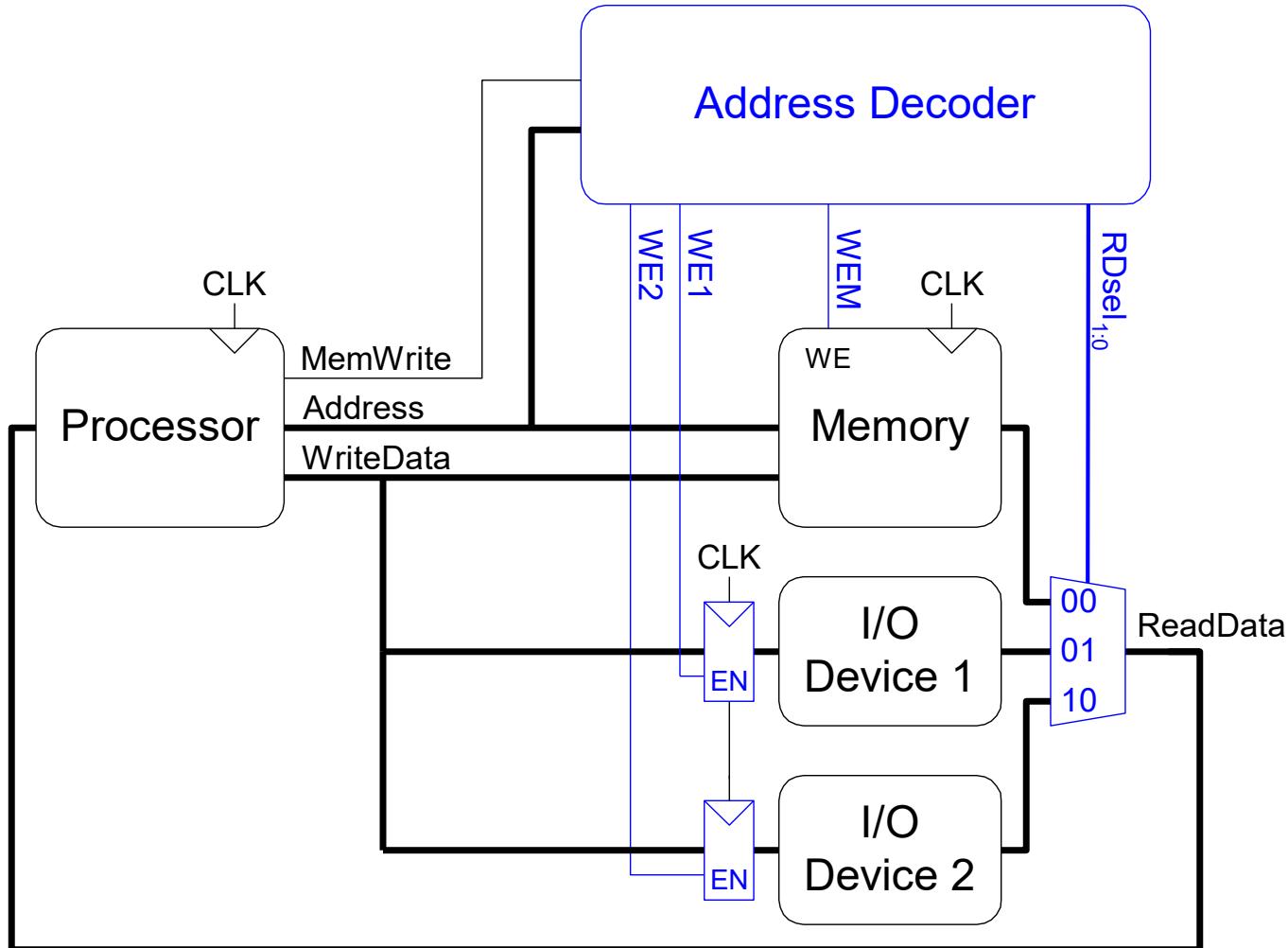
# Memory-Mapped I/O Hardware

- **Address Decoder:**
  - Looks at address to determine which device/memory communicates with the processor
- **I/O Registers:**
  - Hold values written to the I/O devices
- **ReadData Multiplexer:**
  - Selects between memory and I/O devices as source of data sent to the processor

# The Memory Interface



# Memory-Mapped I/O Hardware



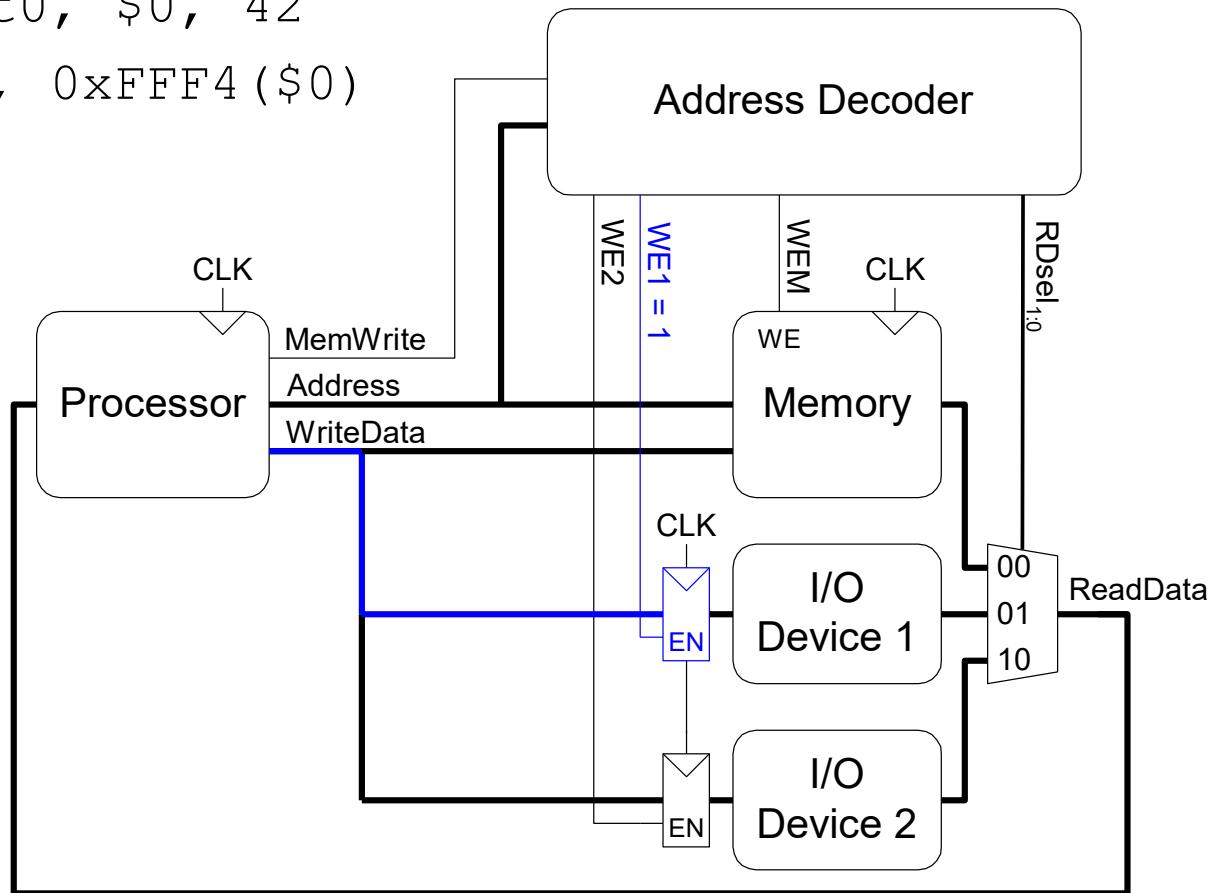
# Memory-Mapped I/O Code

- Suppose I/O Device 1 is assigned the address 0xFFFFFFFF4
  - Write the value 42 to I/O Device 1
  - Read value from I/O Device 1 and place in \$t3

# Memory-Mapped I/O Code

- Write the value 42 to I/O Device 1 (0xFFFFF4)

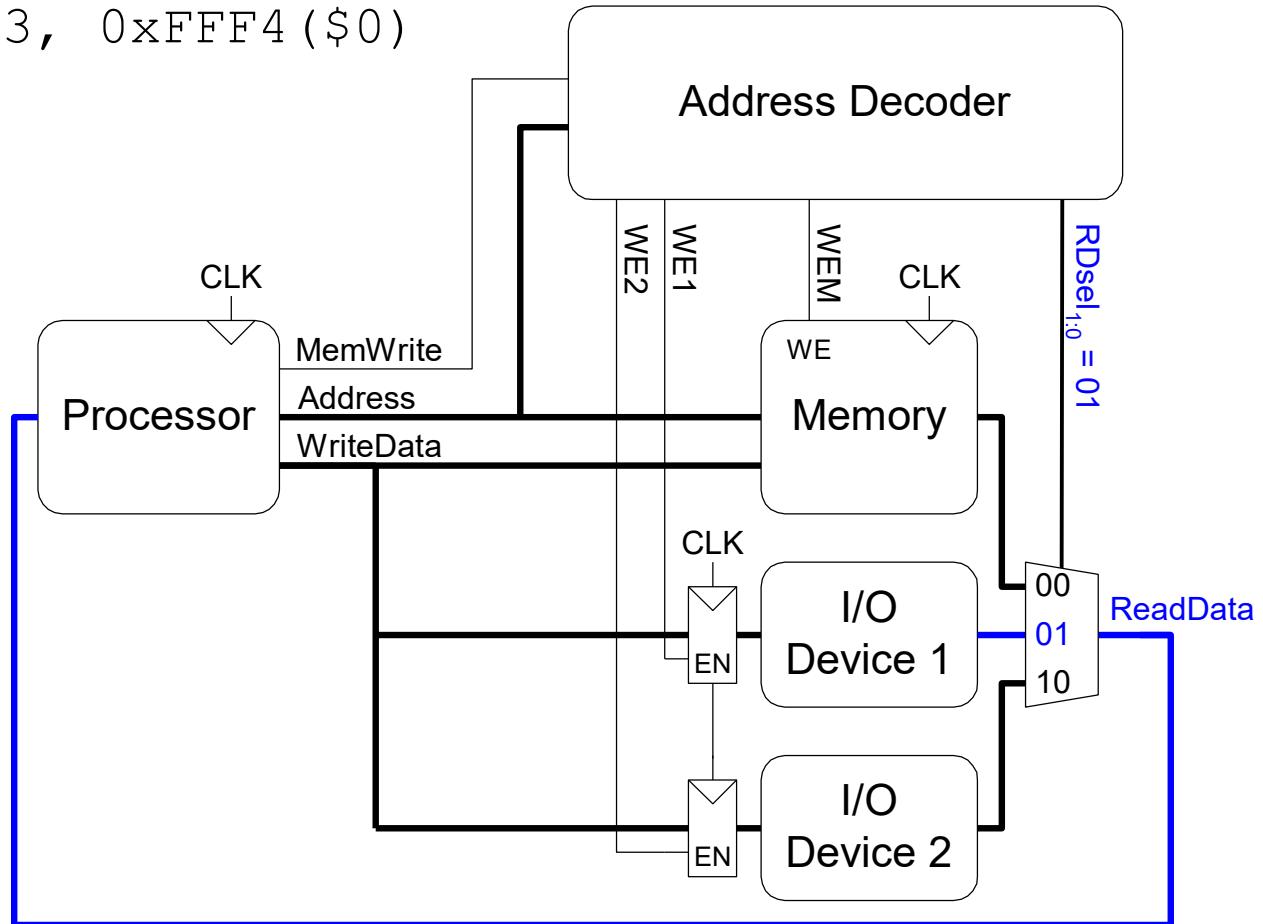
```
addi $t0, $0, 42  
sw $t0, 0xFFFF4 ($0)
```



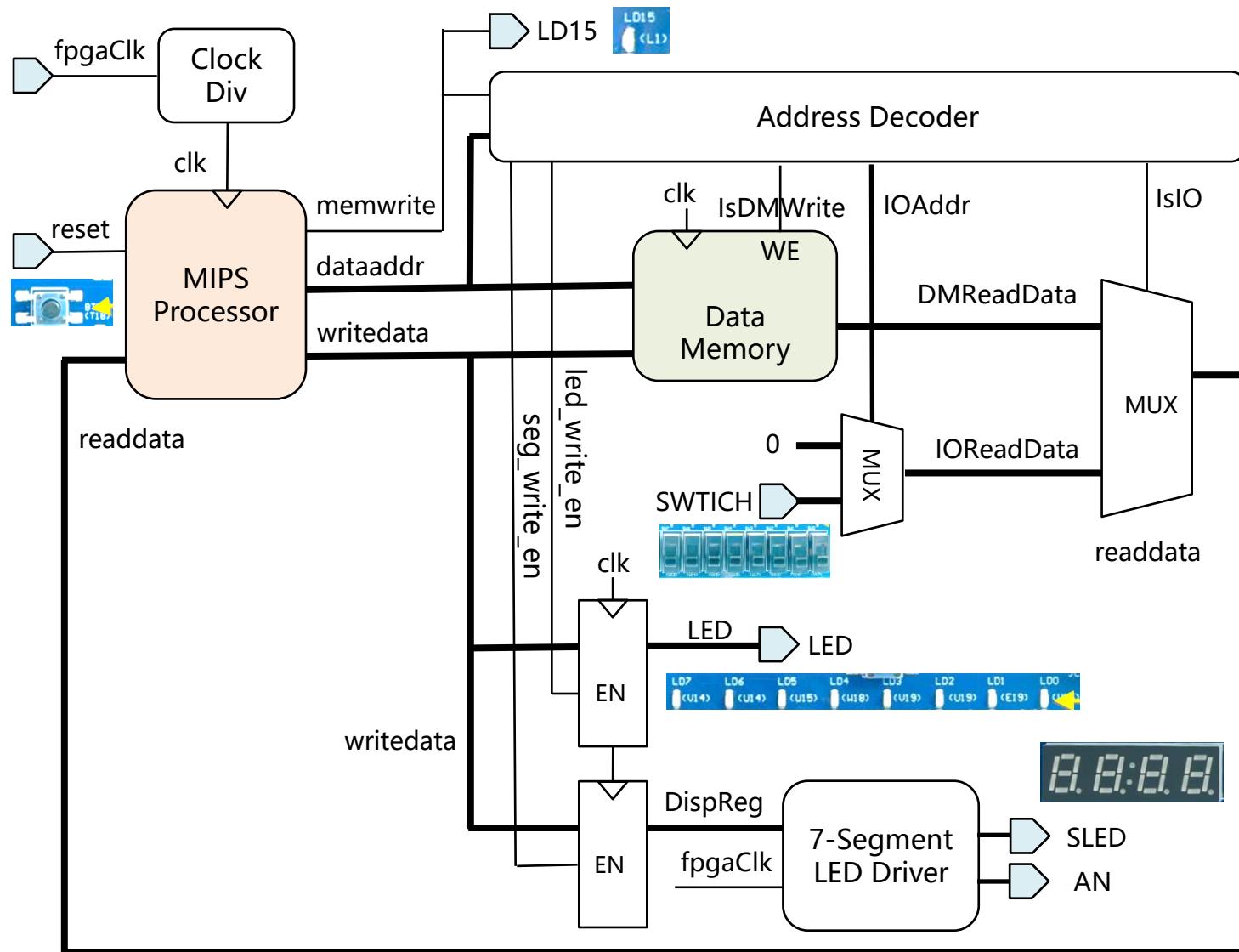
# Memory-Mapped I/O Code

- Read the value from I/O Device 1 and place in \$t3

lw \$t3, 0xFFFF4 (\$0)



# Lab3 Simplified block diagram



# Lab3 Simplified block diagram

