

University of Illinois at Urbana-Champaign
Dept. of Electrical and Computer Engineering

ECE 220: Computer Systems & Programming

LC-3 I/O Implementation

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Two Schemes Exist for Accessing I/O Registers

How does the processor access I/O registers?

How do we really name I/O registers?

With bits!

(That's really ALL we have, remember?)

So **we have two options:**

1. create a new space of names, or
2. use an existing space of names.

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Option 1: Add I/O Instructions, Such as IN and OUT

Let's think about the first option:

- a new space of names
- (names are bit patterns).

To access this space,

- we **need to add opcodes**
- that use the new names,
- for example, **IN** and **OUT**.

Few modern ISAs use this approach.

x64 (and x86) are the notable exceptions.

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Option 2: Use Memory Addresses for I/O

For the second option, we can

- **use part of the memory namespace**
- and **perform I/O with loads and stores.**

This approach is called **memory-mapped I/O**.

Most modern ISAs use this approach.

So does the LC-3 ISA.

x64 (and x86) also support it.

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