CS305
Computer Architecture

Hardware and OS Interaction for IO

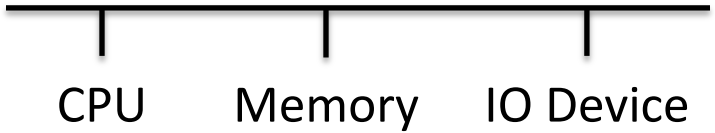
Bhaskaran Raman
Room 406, KR Building
Department of CSE, IIT Bombay

http://www.cse.iitb.ac.in/~br

Hardware and OS Interaction for IO

- I/O control: how does OS control I/O ?
- How does OS learn of I/O device state?
- How does data transfer happen?

I/O Control



I/O Mapped I/O

- Special instructions in ISA for I/O
- OS executes these
- These instructions specify: device #, cmd, args

Memory Mapped I/O

- A portion of memory address space designated for I/O
- Main memory will NOT respond to these addresses, but I/O devices
- OS can read/write from/to these locations, to communicate with the device

How Does OS Learn I/O Device State?

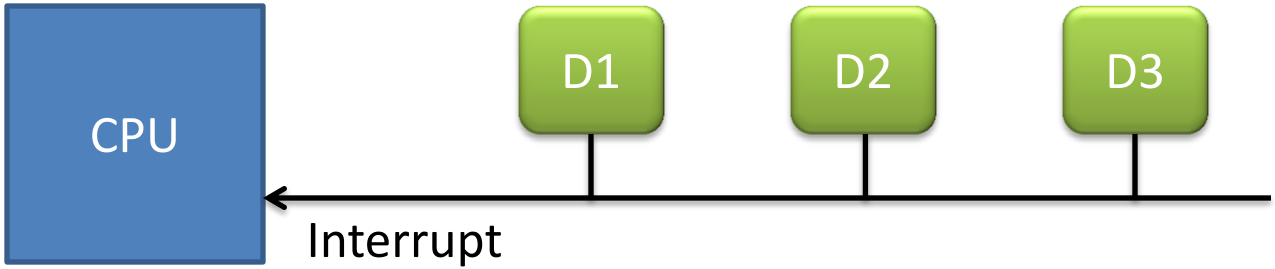
Polling

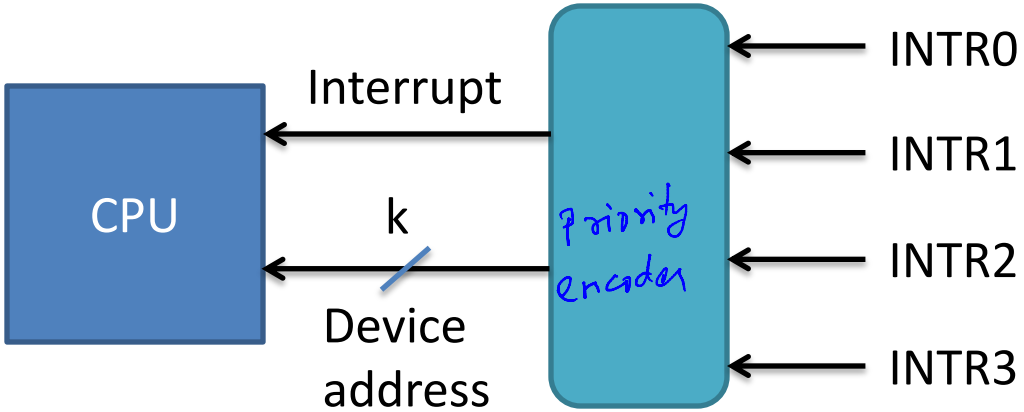
- OS polls one device after another

Interrupts

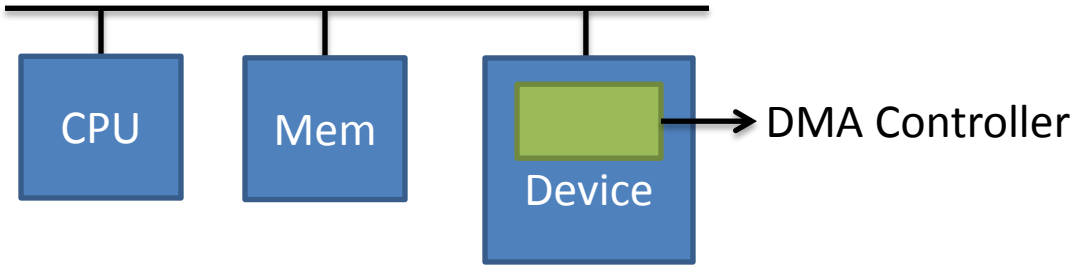
- I/O device interrupts the processor (external exception)

Interrupt Selection





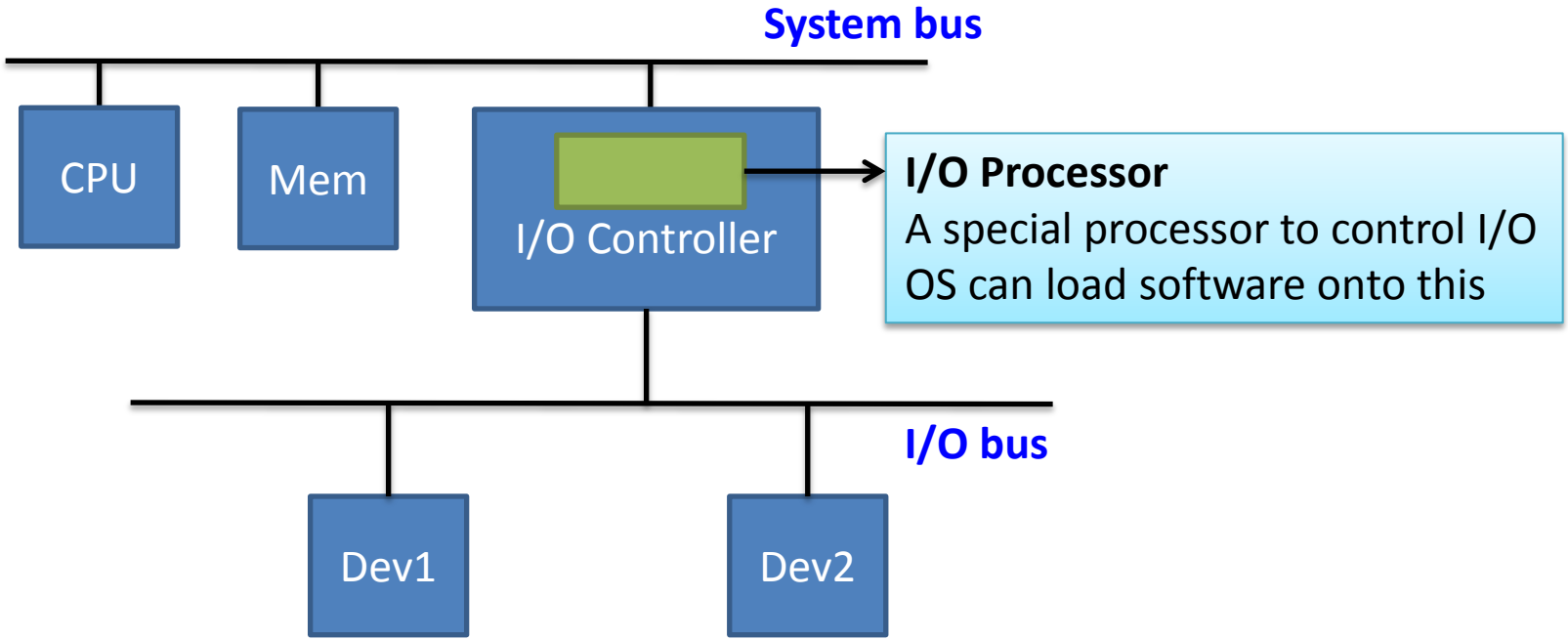
How Does Data Transfer Happen?



DMA Controller

- Requests CPU for bus control (== bus arbitration)
- Performance data transfer between device and main memory
- OS should have told DMA controller which mem addr. to use for the transfer

The I/O Processor



Summary

- How does OS control I/O?
  - I/O mapped versus memory mapped I/O
- How does OS know of device state?
  - Polling versus interrupts
- How does data transfer happen?
  - No DMA versus DMA