Operating Systems W14L2 - I/O Part 1 (ctd)

Class	Operating Systems
Created	@Dec 4, 2020 9:26 PM
Materials	
Reviewed	☐
Type	Lecture

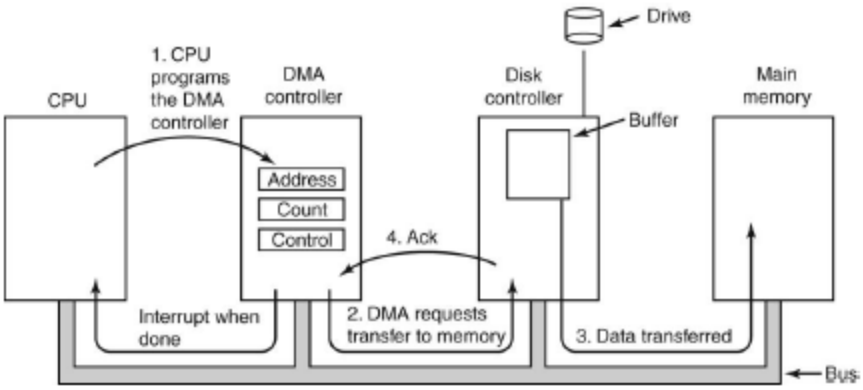
Initial Discussion

- If multiple devices are using a bus, the bus speed will slow to the slowest device *for all connected devices*
- Device rivers are 'clipped' onto the OS — The drivers add bits of code onto the OS

Interrupts

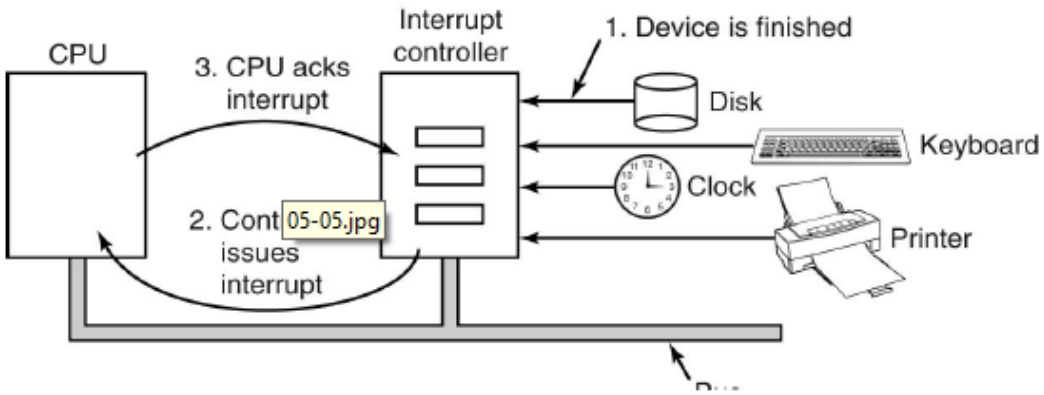
- OS must deal with inputs while not slowing anything down on the user's end
- **DMA:** Direct Memory Acces [chip]
  - Not efficient to request data one byte at time
  - DMA controller bus is independent from CPU in terms of accessing the system bus

  ▼ DMA Steps



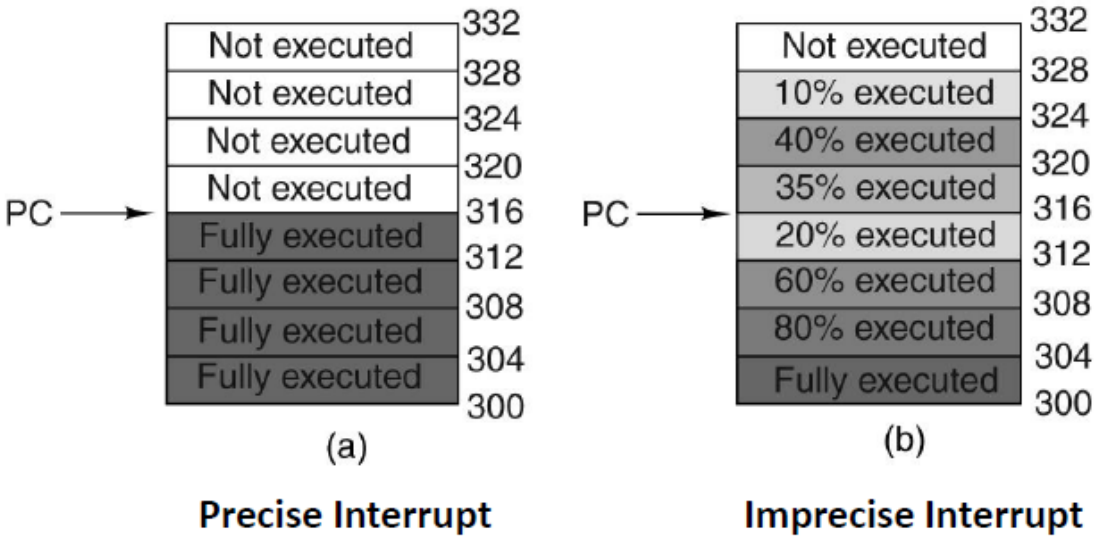
▼ Interrupt Controller (aka PIC)

- PIC orders interrupts by priority
- Motherboards can have multiple PICs, and thus number is fixed



- Precise interrupts make handling interrupts much simpler

▼ Precise versus Imprecise Interrupts

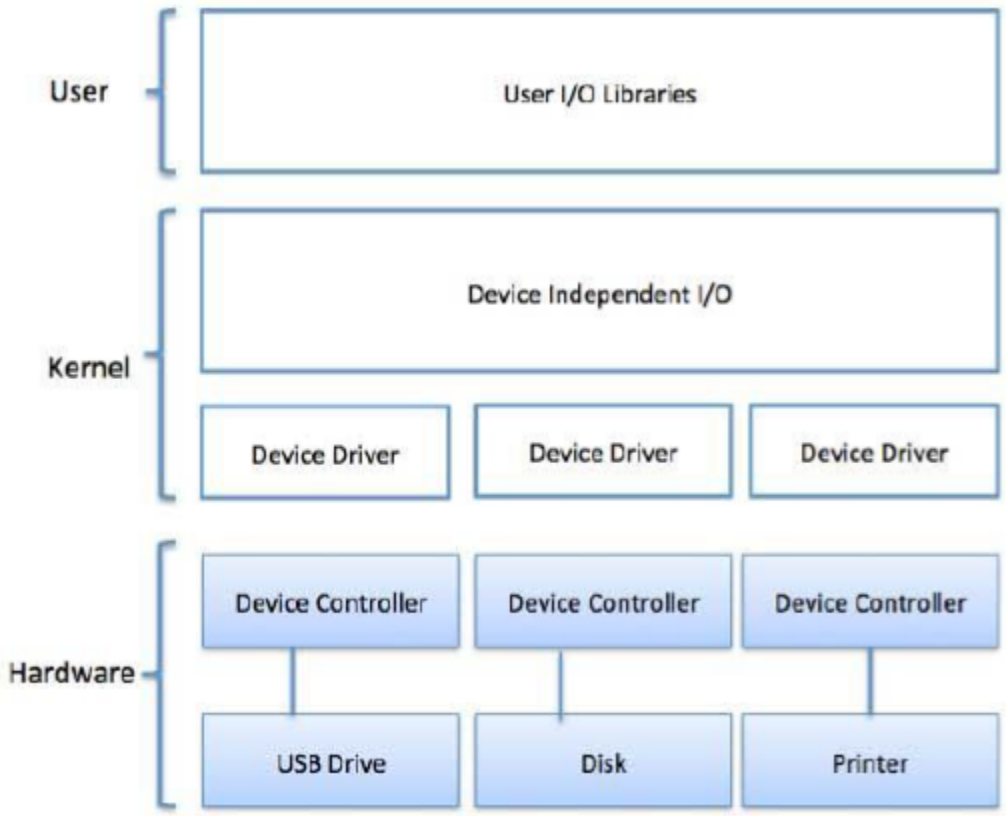


- Always question amount of information given
- There are other scenarios in which interrupts occur (i.e. interrupt-driven I/O)

The Software

▼ Big Picture

Always keep this in mind when comparing different devices and where they are handled.



- I/O software is *device independent*
  - Programmers should be able to write programs that can access any I/O devie without specifying in advance what the device is — Using same APIs
- Any eror handling (for I/O devices) should be solved as close to the hardware as possible
- Synchronous (blocking) vs. asynchronous (interrupt-driven)
- I/O software is *not* device driver (see above diagram)
- We also want there to be uniform interfacing
  - Different drivers must comply to certain "classes" that have different sets of the same functions (i.e. a speaker has play, volume functions, etc.
- Three ways for I/O
  1. Programmed
  2. Interrupt-driven

3. Using DMA

▼ 2x2 Analysis of Above Methods

	No Interrupts	**Use of Interrupts**
I/O-to-memory transfer through processor	Programmed I/O	Interrupt-driven I/O
Direct I/O-to-memory transfer		Direct memory access (DMA)