**Summary**

I/O is managing i/p and o/p. I/O has:

1. Protocols as to how/what parts come in, interfaces for device I/O
2. Dedicated handlers
3. Decouple I/O details from core processing-abstract I/O device detail from applications

Basic I/O device features:

1. Control registers – command (stores the flow and functionality of the process), data transfers, status (gives the status of the process)
2. Microcontroller - CPU
3. On device memory
4. Other logic like analog to digital converters.

CPU device interconnect:

1. PCI
2. SCSI bus
3. Peripheral bus
4. Bridges

Device drivers:

These are device specific s/w components.

1. For each device, there will be a device driver
2. They are responsible for device access, management and control
3. They are provided by device manufacturers per OS version
4. Each OS standardizes interfaces.

Types of devices:

1. Block: disk
2. read/write blocks of data
3. Direct access to arbitrary block

2. Character: keyboard, mouse

a. get/put char

3. Network devices

OS representation of device - special device file.

CPU device interactions:

Access device registers - memory loading and storing

Memory mapped I/O - part of ‘host’ physical memory dedicated for device interaction.

I/O port - dedicated in/out instructions for device access.

Path from device to CPU is:

1. Interrupt
2. Polling

Programmed I/O:

No additional h/w support. CPU ‘programs’ the device via command registers and data movement (DMA controls).

DMA controller: DMA’s data buffer must be in physical memory until transfer completes.