Lecture 14

I/O, Block, Devices & Disks

- enable dev
- enable mem

in a modern machine

CPU
nx3GHz

10 MB/s
\leq 100ms

North bridge

PCI

device

280-300ms
\leq 26MB/s

(DMA) General DMA sequence

cpu

memory

device

descriptor

start

read descr

start transfer

DMA

interrupt
Generic device driver IO sequence

User

Kernel

HW

CPU

IM

- network
- disk
- graphics
- HID

controller

PCI

SATA, SCSI, SAS
Fibre Channel...
Controller

read xyz

\[ \text{data} \]

\[ \text{status} \]

device addr

more complicated for write

\[ \text{write} \]

\[ \text{RDY} \]

\[ \text{data} \]

\[ \text{RDY} \]

\[ \text{data} \]

Disk

track

head

\[ \text{each track is a circle} \]

\[ \text{rotational speed} \]

\[ \text{seek time} \]

\[ \text{data density (2-1)} \]
RPM: 5400-15,000
11ms 4ms
Seek time: 10ms - 3ms

7200 RPM: 200 GB (100 MB/s 120 rps)
8MB/t = 6M bit on a track
66,000 bits/inch
250,000 tracks/inch

→ 512 byte block
Block address (LBA)
[Unit #]

Operation) 3ms seek, 4ms rot, 200 MB/s

Access time

Seek 1.5ms
Rotation 2ms
Transfer 3.5ms
7 MB
Seek 5ms
Rot 4ms
Trans 9 MB