CS341 #34 — Disks & Signals

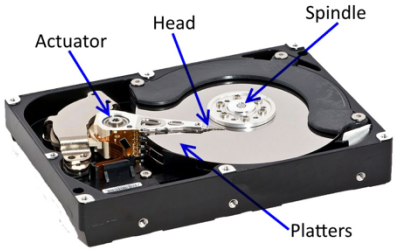
> **Solid State Drives/Solid State Disks (SSD)s**
NAND Flash. Use quantum tunneling through an insulator to write/erase! Limited number of erasures. No moving parts.
Requires separate controller:
Error-correcting code (ECC), Bad block mapping
Block erasing, Wear leveling
Read and write caching, Garbage collection , Encryption

Very fast random access & throughput. Can be limited by bus speeds.
e.g. SATAIII speeds 6Gbit/s (600MB/s bus)

Benchmarks measure 'IOPs'

SLC (Single bit per cell); 100K writes per cell
MLC Multilevel cell (2bits); 10K writes per cell
TLC Triple level (3bits per cell); 3-5K writes per cell, now QLC...

> **Spinning disks**



Cylinders. Platters. Heads.

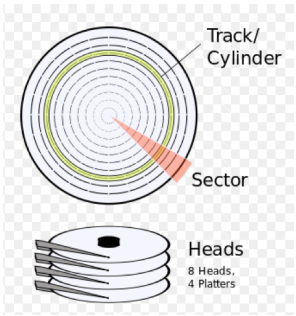
Two common rotational speeds
5400 & 7200rpm.
7200rpm = _____ revolutions per second
How many milliseconds for one revolution ? _____

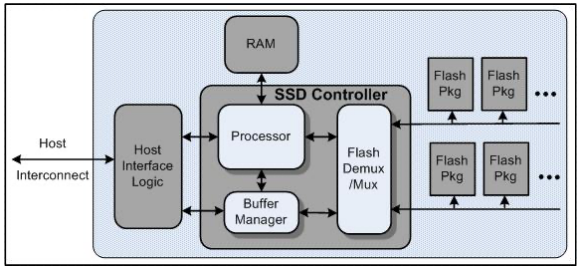
Access time?

Average seek time ~ 10ms (but seeking to next track ~ 1ms).
Average rotational latency.
Tiny contributions:
Command processing time (0.003ms)
Head settling time (0.1ms)

IOPs?

Image attrib:/www.usenix.org/legacy/event/usenix08/tech/full_papers/agrawal/agrawal_html/index.html





> **Signals**

For more information man -s7 signal

Can signals be queued?

Signal terminology.
Generated
Pending
Blocked
Delivered
Caught
Disposition

Signal disposition per thread or per process?

Signal disposition after fork?

… after exec?

What is signal masking ?

When would I use sigprocmask ?

When would I use pthread_sigmask ?

So which thread will get the signal?

What are Pending signals ?

From man -s7 signal

"A child created via fork(2) initially has an empty pending signal set; the pending signal set is preserved across an execve(2)."

Sending signals?
pthread_kill
raise
kill

Catching signals ?
sigwait
signalfd
signal
sigaction

Demo: Write a program that demonstrates sigprocmask to block and then unblock a signal.

What's wrong with `signal` ?

How do I use sigaction ?

```
int sigaction(int sig, struct sigaction *act, struct sigaction *oldact);
struct sigaction {
        void     (*sa_handler)(int);
        void     (*sa_sigaction)(int, siginfo_t *, void *);
        sigset_t   sa_mask;
        int        sa_flags;
};
```

```
struct sigaction sa;
sa.sa_handler = handler;
sigemptyset(&sa.sa_mask);   //Also  sigfillset
sa.sa_flags = SA_RESTART;
/* ^^^ Restart functions if interrupted by handler */
sigaction(SIGINT, &sa, NULL)
```

How do we complete and fix this code to catch SIGCHILD ?
(hint: WNOHANG and a while loop will be useful here)

```
int dezombify(int signal) {
  int status;
  pid_t child;
  child = waitpid(-1, &status, _______);

}

struct sigaction sa;
sa.sa_handler = _______________;
sig________ (_____);
sa.sa_flags =
sigaction(________, &sa, NULL)
```

How do I set a threads mask? Why would I want to?

```
int pthread_sigmask(int how, sigset_t *set,
                    sigset_t *oldset);
```

What happens to the new thread during *pthread_create* to *pending* signals and the thread's signal mask?