Slide 1

Administivia

- Homework 4 due at 5pm today.

Slide 3

Disks — Hardware

- Magnetic disks:
  - Cylinder/head/sector addressing may or may not reflect physical geometry
    - controller should handle this.
  - Controller may be able to manage multiple disks, perform overlapping seeks.
- RAID (Redundant Array of Inexpensive/Independent Disks):
  - Basic idea is to replace single disk and disk controller with “array” of disks and RAID controller.
  - Two possible payoffs — redundancy and performance (parallelism).
  - Six “levels” (configurations) defined.
- Optical disks — CD, CD-R, CD-RW, DVD. Okay to skim details!

Slide 2

Device Specifics, Recap/Continued

- Next, a tour of major classes of devices. For each, we look first at what the hardware can typically do, and then at what kinds of device driver functionality we might want to provide.
  - (Review improved notes from last time.)

Slide 4

Disk Formatting

- Low-level formatting — each track filled with sectors (preamble, data, ECC bits).
- Higher-level formatting — master boot record, partitions (logical disks), partition table. Master boot record points to boot block in some partition. Partition table gives info about partitions (size, location, use).
- Partition formatting — boot block, blocks for file system (more about that in next chapter).
Disk Arm Scheduling Algorithms

- A little more about hardware: Time to read a block from disk depends on seek time, rotational delay, and data transfer time. First two usually dominate.
- Earlier we said that typical device driver for disk maintains a queue of pending requests (one per disk, if controller is managing more than one). What order to process them in? several “disk arm scheduling algorithms”:
  - FCFS.
  - SSF (shortest seek first).
  - Elevator.

Disk Error Handling

- Almost all disks have sectors with defects. Some controllers can recognize them (repeated failures) and avoid them; if not, o/s (device driver) must do this.
- Other kinds of errors also possible, e.g., failure to correctly position read/write head; also must be handled either by controller (if possible) or o/s.

Other I/O-Related Topics

- “Stable storage” — use two disks to provide what appears to be a single more reliable one (i.e., write either succeeds or leaves old data in place).
- Power management significant — some devices have “sleeping” and “hibernating” states, o/s can try to determine when it would make sense to use them. Example — screen savers, screen blanking.

Minute Essay

- Anything about I/O that’s particularly unclear? that you want to hear more about?