CS 137: File Systems

Class Overview

Today's Topics

- Purpose of class
- How class will be run
- Project
- Sources of filesystem papers
- Early reading
- Introduction to disk technology

Class Purpose

- ▶ Understand how filesystems work
- ▶ Review current research in filesystems
- ▶ Go away with graduate-level understanding

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- ▶ Get me to read good FS papers!

Class Mechanics

- ▶ Begin with general information on disk drives, SSDs, file systems
- ▶ Rest of term will be reading & discussing papers
- ▶ Early papers will be assigned by me
  - ▶ Give you background
  - ▶ Discuss in class
- ▶ See class calendar on Web site:
  - http://www.cs.hmc.edu/~geoff/cs137
- ▶ Later papers chosen by you
  - ▶ Goal is to have fun, learn lots
  - ▶ You will take turns leading discussion

Filesystem Homework

- ▶ 20% of grade
- ▶ We will use FUSE as a development framework
    - ▶ Frees you from kernel development
    - ▶ Otherwise quite similar to "real thing"
- ▶ First assignment: "Hello, world" filesystem
- ▶ Assignments 2 & 3: FAT filesystem

Class Project

- ▶ Filesystem development project
- ▶ Filesystem measurement project
- ▶ Written/oral report on some aspect of filesystems research
  - ▶ E.g. survey paper on RAID technology
- ▶ But I'm open to other ideas & suggestions
- ▶ 70% of grade
  - ▶ Other components: homework (20%), general participation during term (10%)

Where to Find FS Papers

- Specialized FS conferences
    - File and Storage Technology (FAST) (recent)
    - IEEE Mass Storage Conference (MassStor)
    - SIGOPS International Systems and Storage Conference (SYSTOR)
- Supercomputing conferences
    - IEEE High Performance Distributed Computing
    - Supercomputing

Where to Find Papers (cont'd)

- ▶ Filesystems are part of operating systems
  - ▶ So big OS conferences have FS papers
  - ▶ Symposium on Operating Systems Principles (SOSP)
  - ▶ Operating Systems Design & Implementation (OSDI)
  - ▶ Usenix Annual Technical Conference
  - ▶ Eurosys
- ▶ Important journals (current & older stuff)
  - ▶ ACM Transactions on Storage
  - ▶ ACM Transactions on Computer Systems
  - ▶ Communications of the ACM
  - ▶ IEEE Computer

Where to Find Papers (cont'd)

- ▶ Database conferences
  - ▶ ACM SIGMOD
  - ▶ Very Large Databases (VLDB)
- ▶ Architectural Support for Programming Languages and Operating Systems (ASPLOS)
- ▶ Sometimes architecture, networking, applications conferences
- ▶ Random other places—list is constantly changing

First Papers We'll Read

- ▶ How nasty disks really are (Ruemmler & Wilkes; Anderson; Patterson et al)
- ▶ Original Unix file system (for elegance)
- ▶ BSD Fast Filesystem (for speed)
- ▶ FAT32 (for ugliness) and NTFS (for breadth)

Disk Basics

(To be done on the board)

- ► Head/platter arrangements
- ► Motion technology
- ► Winchester drives
- ► Sectors and gaps
- ► Sector alignment
- ► Encodings and ECC
- ► General block layout
- ► Modern complexities
- ► Shingling