Introduction to BSD Unix

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SUOS CULTORES SCIENTIA CORONAT

What is BSD?

- Version of Unix developed at UC Berkeley, under contract from DARPA
- BSD = Berkeley Software Distribution
- FreeBSD is based on 4.4BSD; all the source code is available
- ***THE*** research OS of the 1980’s and early 1990’s

Why not Linux?

- Both have freely-available code
- The BSD kernel stems from a small group and a focused design philosophy; code was only ever put in by 4 people
- More modular kernel makes programming easier to understand

Ok, But Why FreeBSD?

- Widely available and used implementation based on 4.4BSD
- Could have used
  - OpenBSD: secure, reliable; not widely used
  - NetBSD: also widely-used
- FreeBSD has its own version of the book!
- FreeBSD used in a leading OS

A Few BSD Innovations

- TCP/IP networking
- Virtual Memory
- the C shell
- the vi editor
- fast file system
- freely-available Unix (non-AT&T code)

UNIX Philosophy

- timesharing
- multiple processes (processes are cheap)
- replaceable user interface (shell)
- file system is a tree
- files are sequences of bytes
- ``everything is a file''

Unix Philosophy II

- simple priority scheduling
- swapping
- later versions had demand paging
- algorithms and data structures selected for simplicity
  - algorithms and data structures selected for simplicity
    - algorithms and data structures selected for simplicity

Unix Philosophy III

- build simple, basic tools
- construct complex tools out of simple tools

BSD Design Overview

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4BSD Design Goals

- Some of these came about in the early 80’s
- Virtual memory support: support for processes with large, sparse address spaces
- 3rd-party device support
- Terminal-independent support libraries for screen-based applications

4BSD Design Goals II

- Standardized research operating system; first DARPA, then POSIX
- TCP/IP protocol stack promoting easy sharing of resources (r-commands, telnet, ftp)
- Modularized kernel
- Sockets for network programming (flexible, simple base)

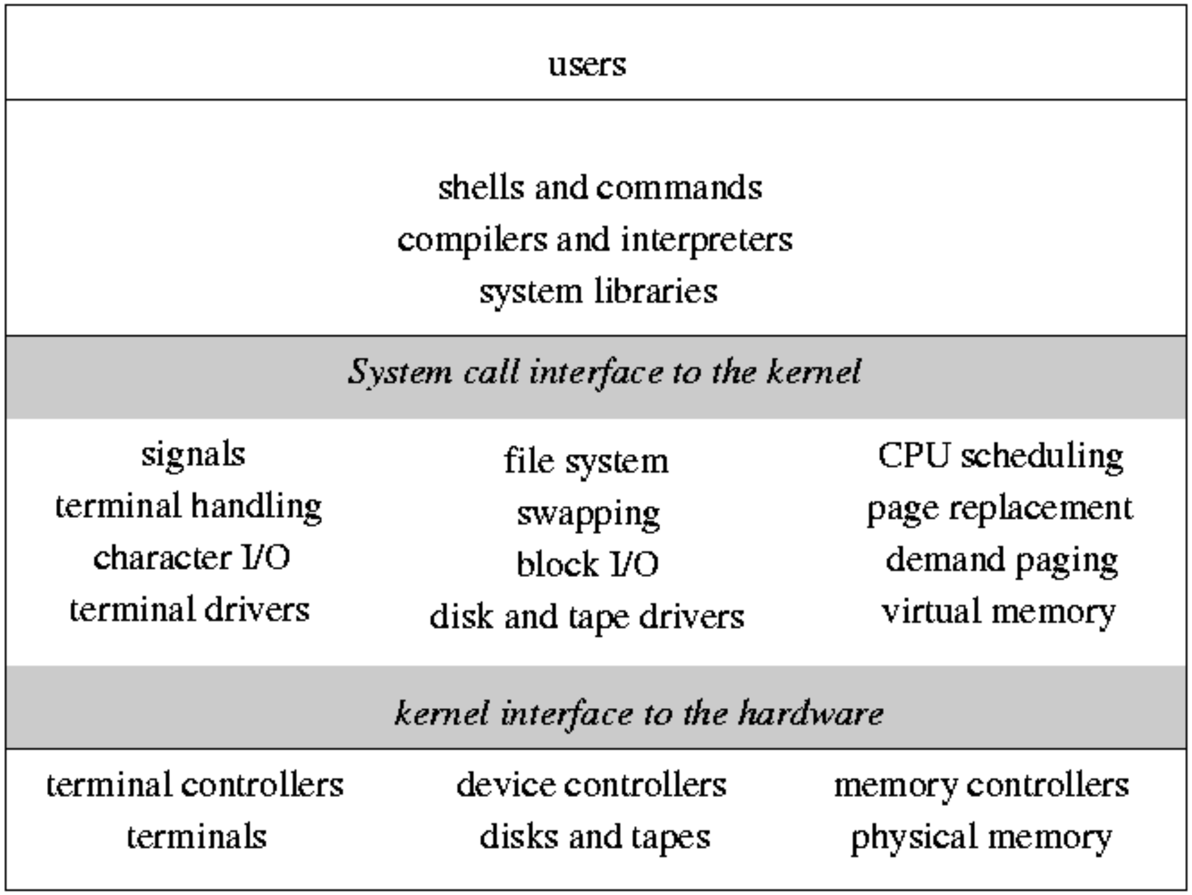
4BSD Design Goals III

- First, solid basic functionality, then:
  - Performance improvements after implementing basic functionality (Chapin's law of optimization: Make it work, then make it fast.)
  - Diversity into heterogeneous support (multiple processors, file systems)

FreeBSD Development

- Unlike the CSRG @ UCB, FreeBSD doesn’t have dedicated staff
- Elected core members must answer to committers
  - Allows for turnover/refreshing the core
- New stable release about every two years

BSD Layers



users

shells and commands
compilers and interpreters
system libraries

System call interface to the kernel

signals terminal handling character I/O terminal drivers	file system swapping block I/O disk and tape drivers	CPU scheduling page replacement demand paging virtual memory

kernel interface to the hardware

terminal controllers terminals	device controllers disks and tapes	memory controllers physical memory

Four Basic Facilities

- Processes
- File Systems and devices
- Communications
- System Startup