Introduction to Operating Systems: A Look at Unix

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Overview -- OS Basics

- ➲ **Modern Operating Systems**
- ➲ **Operating System Goals**
- ➲ **History of OSs and Unix**
- ➲ **The Varieties of Unix**
- ➲ **Unix Philosophy**
- ➲ **Basic Resources Controlled**
    - ◻ Processes
    - ◻ Files
        - – Access control
        - – Directories and Files
    - ◻ Utilities

Operating Systems

- ➲ **Microsoft, with 95, 98, NT, and 2000 has made the OS both more accessible and more opaque**
- ➲ **In order to fully understand Unix, it is important to have a better structural model of operating systems**
    - ◻ The difference between procedural and structural models
- ➲ **An operating system may be thought of as:**
    - ◻ an extended machine, an abstraction that makes the details of controlling devices – disks, printers – easier.
    - ◻ a resource manager that provides orderly and controlled access to a variety of components.

OS Resources and Controls

- OS's control access to
  - Memory
  - Files
  - Peripherals
  - CPU
- Key mechanisms used to control these resources
  - Kernel
  - Tables
  - Signals and messages
  - Daemons
  - Command interpreter

History of OS

- 1st generation: vacuum tubes and bread boards
- 2nd generation: transistors and batch systems
  - automated setup
- 3rd generation: multiprogramming
  - memory partitions
  - spooling
  - multitasking and timesharing
- 4th generation: Workstations
  - GUIs
  - network operating systems
  - distributed operating systems

The Early History of Unix

- 1969, Ken Thompson new operating system for PDP-7 unics, 1970 Unix
  - Based on a decade of work at MIT/Bell Labs on multics
  - Became the operating system for text processing
- 1974, University license agreement that gave it for free but kept control
  - Universities port it to multiple operating systems
- 1975, Ken Thompson took it to Berkley
  - 1978, BSD2
  - 1979, BSD3, TCP/IP communications protocols

The 1980's

- 1980s, DARPA adoption and funding of BSD4.1,4.2,1nd 4.3(1987)
  - Throughout the 1980', UNIX was ported to new chips – e.g the 68000 for the Stanford University Network—SUN.
- 1982, ATT began commercial sale
- 1983, IEEE 1003 organized to standardize POSIX
- 1984, Project Athena developed the X-Window System
  - initial release in 1984
  - 1988, the X consortium to advance an ANSI standard

The 1990's

- 1990s, IEEE P1295 began work on CDE
- 1991, Minix >> Linix
- 1993, UNIX accounts for 2/3's of HP's product sales
- 1996, Linux Redhat wins award
- When ATT and Sun announced the alliance known to standardize Unix:
  - DEC, IBM, HP responded by forming OSF
  - ATT and SUN responded by forming UI
- The common open software environment includes:
  - Unix
  - DCE/CORBA/.....
  - X windows/CDE…

The Varieties of Unix

- System V Release 4 (SVR4) (ATT)
- Berkley Software Distribution (BSD4.x-1,2,3)
- SunOS/Solaris, HPUX, AIX, Ultrix, Dynix
- Linux is the default PC version (Xenix early Microsoft PC version)
- POSIX (Portable Operating System Interface) – Not an operating system per se, but a standard to which versions "strive"

Basic Unix philosophy

- Open system
  - Small kernel == Portability
- Simple I/O model
  - Files == devices == processes == network resources
- Modularity
  - Tools and Utilities
  - Piping and redirection
  - Multiple processes
- User interaction via a shell
  - Shells are modifiable
  - Shells allow programming

System Functions and Commands

- Process management
- File Management
- Access Control
- Directory System Management
- Other Utilities

Process Management calls

- fork
- wait
- exit
- getid and setid
- kill
- alarm
- signals
- sigaction
- sigreturn

File Management calls

➲ create/open
➲ read/write
➲ stat
➲ seek
➲ pipe

Access Control Calls

➲ chmod
➲ chown
➲ chgrp

Directory/File System Management

➲ mkdir
➲ link
➲ mount
➲ cd
➲ rmdir

Utility Functions

➲ time
➲ getrusage (resource usage)
➲ utime (set access time)