



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 >> Linux
- ⇒ 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, HPUNIX, 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)