Chapter 1
What is UNIX?

Graham Glass and King Ables,
UNIX for Programmers and Users,

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Computer Systems

- Computer System: Hardware + Software

- Hardware: CPU, Memory (RAM/ROM), Disk drives, CD-ROM drives, Monitor, Graphics card, Keyboard, Mouse, Printer, Tape drive, Modem, Ethernet interface, Other peripherals.

- Software: Operating System, Application Programs

- UNIX is the name of a popular operating system.
Typical Personal Computer System
Hardware Key Components (1): CPU and Main Memory

Central Processing Unit

Chip that executes program commands

Intel Pentium 4 or Sun ultraSPARC III Processor

Main Memory

Primary storage area for programs and data that are in active use

Synonymous with RAM
Hardware Key Components (2) : Secondary Memory Devices

Secondary memory devices provide long-term storage

Information is moved between main memory and secondary memory as needed

- Hard disks
- Floppy disks
- ZIP disks
- Writable CDs
- Tapes

Central Processing Unit

Main Memory

Hard Disk

Floppy Disk
Hardware Key Components (3): Input / Output Devices

- Monitor
- Keyboard

Central Processing Unit

I/O devices facilitate user interaction

Main Memory

Hard Disk

Floppy Disk

Monitor screen
Keyboard
Mouse
Joystick
Bar code scanner
Touch screen
Computer Network
Software Component

- Applications
- **Operating System**
  - API: application program interface
  - File management
  - I/O
  - Kernel
    - Memory management
    - Resource scheduling
    - Program communication
    - Security
  - Network Module
Software Categories

- **Operating System**
  - controls all machine activities
  - Oversee operation of computer
  - Schedule programs for execution
  - Coordinate the execution of programs
  - Provides the user interface to the computer
  - manages resources such as the CPU and memory

- **Application program**
  - generic term for any other kind of software
  - word processors, missile control systems, games

- **Most operating systems and application programs have a **graphical user interface** (GUI)**
The shell as an interface between users and the operating system
**Figure 3.5** The booting process

**Step 1:** Machine starts by executing the bootstrap program already in memory. Operating system is stored in mass storage.

**Step 2:** Bootstrap program directs the transfer of the operating system into main memory and then transfers control to it.
UNIX is an operating system

- Provides a framework for executing programs and storing files

- File: collection of data normally stored on disk.

- Program: collection of instructions/data that is stored in a file.
UNIX API – the system calls
ultimately everything works through system calls
Process

- When a program is executed, it is loaded into memory. It is called a process when it is executing.

- Most processes read/write data from/to files

- Processes and files have an owner

- UNIX supports hierarchical directory structure

- Files and processes have a location within the directory structure

- UNIX provides the capabilities to create, modify and destroy files, programs, and processes.
Unix Attributes

• Sharing of resources: CPU (time slices), memory (pages), disk (blocks)

• Communication: process-device controller, process-process, etc. (pipes 1-way, sockets 2-way)

• Utilities: Unix comes with a large collection of utilities; we will study many of these.

• Programmer support: All kinds of compilers available; Access to parallel processing, file handling and interprocess communication via System calls in C
Advantages of UNIX

• It is **multitasking**, therefore, multiple programs can run at one time.

• It is **multiuser**, allowing more than a single user to work at any given time. This is accomplished by sharing processing time between each user and utilizing distributed computing systems.

• It is **safe**, preventing one program from accessing memory or storage space allocated to another, and enables protection, requiring users to have permission to perform certain functions, i.e. accessing a directory, file, or disk drive
The Unix Family Tree

UNICS (1969)

Fifth Edition (1973)

Sixth Edition (1976)

Seventh Edition (1978)

SVR5 (1983)

SunOS 5.x/Solaris (SUN)

HP-UX (HP)

AIX (IBM)

IRIX (SGI)

Digital UNIX (formerly OSF/1) (DEC)

BSD (1979)

SunOS 4.x (SUN)

ULTRIX (DEC)

NextStep (NeXT)
Two Main Varieties of Unix

• System V (AT&T) and
• BSD (Berkeley Standard Distribution)
  • Both are merged now. SunOS, IRIX, AIX, HP-UX have features from both varieties although most are System V Unix.
• Other Unix versions you may have heard of:
  • Linux (Fedora, Red Hat, Ubuntu, SUSE, etc.)
  • Sun Java Desktop OS, Solaris
  • Apple OS/X
Sub-Varieties of Unix

• Linux (Runs on PC architecture)
  ● Fedora
  ● Red Hat
  ● Ubuntu
  ● Sun Java Desktop OS, etc.

• Sun Solaris (Runs on SPARC architecture)

• Apple OS/X (Runs on PowerPC and Intel platforms)
Philosophies of Unix

• Pipe mechanism
  • Output of one process can be used as input for another process. e.g.
    • $ who | sort
  • Using the pipe mechanism, complex tasks can be broken down into simpler ones and combined using pipes etc.

• Super user
  • user who has complete control over the system resources. Typically the System's Administrator.
Review

- Computer Systems
- Unix as an operating system
- Processes
- Unix Attributes
- Unix Varieties
- Unix Philosophies