Chapter One

The Essence of UNIX

Objectives
- Define operating systems in general and the UNIX operating system in particular
- Describe Linux as it relates to UNIX
- Explain the function of UNIX shells
- Describe the options for connecting to a UNIX system
- Define the syntax used for entering UNIX commands

Objectives (cont.)
- Use the date, cal, who, man, whatis, and clear commands
- Perform basic command-line editing operations
- Enter multiple commands on a single command line
- Recall a command from the command history
- Log in to and log out of UNIX
Understanding Operating Systems

- Operating System (OS)
  - The most fundamental computer program
  - Enables you to store information, process raw data, use application software, compile your own programs, and access attached hardware, such as a printer or keyboard

- UNIX Operating System
  - Leading OS for workstations, which are computers on a local area network (LAN)

**PC Operating Systems**

- A personal computer (PC) OS conducts all the input, output, processing, and storage operations on a stand-alone computer

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The diagram illustrates the operating system model and the common PC operating systems.
Mainframe Operating Systems
- A mainframe OS controls a large computer system with multiple processors that conduct input, output, processing, and storage operations for many users.

![Mainframe Operating Systems Example](image)

Network Operating Systems
- A network OS controls the operations of a server computer, sometimes called a host, which accepts requests from user programs running on other computers, called clients.

![Network Operating Systems Example](image)

Server-based vs. peer-to-peer networks
- Server-based network
  - Centralized processing approach
  - Data and applications server resident
  - If server fails, entire network fails
- Peer-to-peer
  - Distributed processing approach
  - Data and applications workstation resident
  - Each system is both a server and a client
Introducing the UNIX Operating System

UNIX can be used on systems functioning as:
- Dedicated servers or client workstations in a server-based network
- Client/server workstations connected to a peer-to-peer network
- Stand-alone workstations not connected to a network

UNIX is a multi-user system
- Allows many users access and share the resources of a server computer

UNIX is a multitasking system
- Allows user to execute more than one program at a time

UNIX is a portable operating system
- Used in many computing environments

UNIX Concepts

Shell
- The interface between user and OS

Hierarchical Structure
- Directory and subdirectory organization

Layered components
- Layers of software surround the computer’s inner core
Linux and UNIX

- Linux is UNIX-like
  - Not written from traditional UNIX code
- Linux is original code
  - Includes POSIX standards
- Other Linux information
  - Created by Linus Torvalds
  - Offers all the complexity of UNIX
  - Linux can coexist with other OSs

Introducing UNIX Shells

A shell is a UNIX program that interprets the commands you enter from the keyboard.
Choosing Your Shell

- Shells interpret commands and act as first-class programming languages
- A default shell is associated with your account when created – Bash is the default shell in Linux
- A list of some UNIX shells:
  - Bourne
  - Korn
  - C shell
  - Bash

Choosing User Names and Passwords

- To use UNIX, a user must log in by providing a unique user name and password
- UNIX system administrators create accounts by adding user names and passwords
- Users log in to UNIX or Linux systems as long as they have accounts on the workstation or host (server) computer

Connecting to a UNIX System

- Remotely through telnet or ssh
- Through network client software
- As peer on peer-to-peer network
- On a stand-alone PC
- Through a dumb terminal
Connecting to UNIX Using Telnet

- telnet is terminal emulation software
  - Deemed insecure
- Better: ssh
  - Connects your PC to a server, or host
    - PC could be running UNIX, Linux, Windows OS, or Macintosh OS
    - Once connected to a UNIX host, work with UNIX may begin
  - Uses IP addresses or domain names to access remote systems

Logging in to UNIX

- Log in by entering username and password when UNIX system booted or connected to
- Enter at prompt (command-line mode) or into login box (GUI mode)
- Now commands can be issued at the command prompt

Logging In to UNIX

ssh is accessed in Red Hat Linux using the GNOME interface
Entering Commands

To interact with UNIX, a command is entered at the command prompt.

UNIX is case-sensitive and most commands are typed in lower case.

Two categories of commands:
- User-level: perform tasks
- System administration: system management

Entering Commands

The date command:
- Displays the system date, which the system administrator maintains.

The cal command:
- Shows the system calendar.

The who command:
- Shows who is using the system and their current location.

Figure 1-8 Example of cal (current month) command
Entering Commands

- Command-line editing
  - Certain keystrokes perform command-line editing (shell dependent)

- Multiple command entry
  - More than one command on one line by separating with a semicolon (;)

- The clear command
  - Clears the current screen
Entering Commands

- Command-line history
  - Use up and down arrow keys to scroll through command history

- The whatis command
  - Displays a brief description of a command for help purposes

Entering Commands

The man program displays the UNIX online reference manual, called the man pages, for help purposes.

Logging Out of UNIX

- Logging out ends your current process and indicates to UNIX that you are finished

- Logging out is shell dependent
  - Bourne, Korn, Bash – exit command
  - C shell – logout command
Understanding the Role of the UNIX System Administrator

- System administrator manages the UNIX system
  - Adds users and deletes old accounts
  - Also called the superuser
  - Unlimited permission to alter system
  - Unique user name: root
  - Prompt ends with # (pound) symbol

Changing Passwords

- For security purposes, changing passwords is necessary
  - Use the passwd command
  - UNIX allows new password if:
    - The new password differs by at least three characters
    - It has six or more characters, including at least two letters and one number
    - It is different from the user name

Viewing Files Using the cat, more, less, head, and tail Commands

- Use cat, more, and less to view an entire file contents
  - cat displays a whole file at one time
  - more displays a file one screen at a time, allowing scroll down
  - less displays a file one screen at a time, allowing scroll down and up
Viewing Files Using the `cat`, `more`, `less`, `head`, and `tail` Commands

- Use head and tail to view the first few or last few lines of a file
  - head displays the first few lines
  - tail displays the last few lines

Redirecting Output

- The greater than sign (>) is called a redirection symbol
- Create a new file or overwrite an existing file by attaching (>) to a command that produces output
- To append to an existing file, use two redirection symbols (>>)

Chapter Summary

- The operating system controls all computer resources and provides the base upon which application programs can be used or written
- A server-based network is centralized where security and maintenance are handled by the system administrator and all systems rely on the server; a peer-to-peer network is decentralized where security and maintenance is distributed to each system and if one of the systems fails, the network continues to function
Chapter Summary

- UNIX is a multi-user, multitasking operating system.
- UNIX systems may be configured as servers or as client workstations in a server-based network, as client/server workstations in a peer-to-peer network, or stand-alone workstations when no network connection.

Chapter Summary

- The concept of the layered components that make up an OS originated with UNIX.
- Linux is a UNIX-like OS and can coexist with Windows and MS-DOS.
- In UNIX, you communicate with the OS programs through an interpreter called the shell and UNIX provides shells such as the Bourne, Korn, and C shells, with Bash being the most popular on Linux systems.

Chapter Summary

- In UNIX, the system administrator sets up accounts for users that supply a username and password.
- You work with UNIX by typing commands that you can learn by referring to the online manual called man pages; commands have specific syntax and allow you to see brief descriptions of commands, see who is logged in, display the system calendar, and log out.
Chapter Summary

- Most shells provide basic command-line editing capabilities and keep a history of your most recently used commands.

- You can view the contents of files with view commands such as cat, less, more, head, and tails.

| Command | Purpose | Options/Commands
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>cal</td>
<td>Show the system calendar</td>
<td>-d displays the Julian date format</td>
</tr>
<tr>
<td>cat</td>
<td>Display multiple files</td>
<td>-n displays line numbers</td>
</tr>
<tr>
<td>clear</td>
<td>Clear the screen</td>
<td></td>
</tr>
<tr>
<td>date</td>
<td>Display the system date</td>
<td>-w displays the time in Greenwich mean time</td>
</tr>
<tr>
<td>exit or logout</td>
<td>Exit UNIX</td>
<td></td>
</tr>
<tr>
<td>head</td>
<td>Display the first few lines of a file</td>
<td>-n displays the first n lines of the specified file</td>
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<tr>
<td>less</td>
<td>Display a long file one screen at a time and scroll up and down</td>
<td></td>
</tr>
<tr>
<td>man</td>
<td>Display the online manual for the specified command</td>
<td></td>
</tr>
<tr>
<td>more</td>
<td>Display a long file one screen at a time and scroll down</td>
<td></td>
</tr>
<tr>
<td>passwd</td>
<td>Change your UNIX password</td>
<td></td>
</tr>
<tr>
<td>tail</td>
<td>Display the last few lines of a file</td>
<td>-n displays the last n lines of the specified file</td>
</tr>
<tr>
<td>who</td>
<td>Display a brief description of a command</td>
<td></td>
</tr>
<tr>
<td>whoami</td>
<td>See who is logged in</td>
<td>-A displays all users</td>
</tr>
<tr>
<td>whois</td>
<td>See who is logged in</td>
<td>-h displays column headings</td>
</tr>
<tr>
<td>-</td>
<td>displays a quick list of users</td>
<td></td>
</tr>
</tbody>
</table>