

UNIX OPERATING SYSTEM

What is Unix?

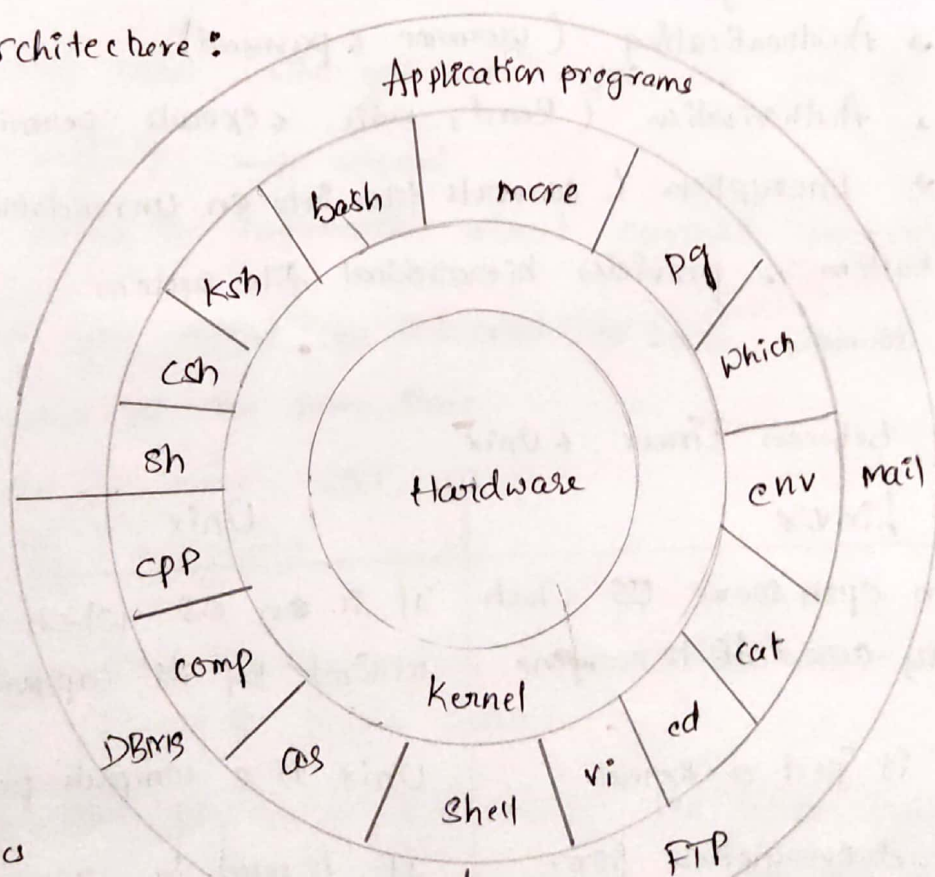
The Unix operating system is a set of programs that acts as a link between the computer & the user.

Operating system - The computer programs that allocate the system resources and coordinate all the details of the computer's internals is called the operating system @ kernel.

Shell - Users communicate with the kernel through shell.

- The shell is a command line interpreter. It translates commands entered by the user and converts them into a language that is understood by the kernel.

Unix Architecture:



4 basic

- * Kernel - The heart of the OS. It interacts with the hardware & most of the tasks like memory management, task scheduling & file management.
- * Shell - Cshell, Bourne shell, Korn shell.
- * Commands & utilities. Eg: cp, mv, cat, grep etc.
- * Files & Directories - All data organized into files. All files have directories.

Different variants of Unix:

- * Solaris
- * AIX
- * Red hat Linux
- * Linux
- * HP Unix

Linux Features:

- * Multiuser system - Several people can use a Unix computer at the same time
- * Multitasking - A user can also run multiple programs at the same time.
- * Portability - It supports different types of hardware
- * Security - 8 ways
 - Authenticating (username & password)
 - Authorization (Read, write & execute permission)
 - Encryption (converts files into an unreadable format)
- * File system - provides hierarchical file system
- * Open source

Differences between Linux & Unix

Linux	Unix
1. It is an open source OS which is freely accessible to everyone	It is an OS which can be only utilized by its copywriters
2. Linux is just a kernel	Unix is a complete package of OS
3. It is used everywhere from servers, PCs, smartphones, tablets to mainframes	It is used in servers, workstations and PCs
Examples: Ubuntu, Redhat Linux Arch Linux etc	Examples: SunOS, Solaris, AIX HP Unix

Linux

Windows

Linux is open source OS

While windows are not open source OS

2. Linux is free of cost

While it is costly

3. It's file name case sensitive

file name is case sensitive

4. More efficient

Less efficient

5. More security

Less security than Linux

6. Linux is widely used in hacking purpose based system

does not provide much efficiency in hacking.

Login Unix

⇒ To login - userid & password

\$ - command prompt

⇒ If you want know "who you are" you can use the command

who am i? → whoami

Whoami - gives the information about current users only

⇒ Some times you might be interested to know who is logged in to the computer at the same time

Commands - Users, who, w

\$ users - Eg - ashwin@test, qadir

\$ who → this command gives information about the users logged in to the system

\$ w → this command tells about the users who are logged in and what they are doing

\$ id → command tells about your userid, primary group id, and list of groups that belongs to you.

⇒ To log out → we use exit command.

Unix - File Management

All data in unix is organized into files. All files are organized into directories. These directories are organized into a tree like structure called the file system.

There are three basic types of files:

- * Ordinary files - An ordinary file is a file system that contains data, text @ program instructions
- * Directories - Directories store both special and ordinary files
They are equivalent folders
- * Special files - Some special files provide access to hardware such as hard drives, CD-ROM drives, modems & Ethernet adapter
Eg: Block file (b), character device file (c)

Listing files

⇒ To list the files and directories stored in the current directory

\$ ls

\$ ls -l → To get more information about listed files

Eg:

dwxr-xr-x	24	ashwin-test	dba	4096	Jan 28 00:13	ALM-HOME
-rw-r--r--	1	ashwin-test	dba	0	Apr 3 07:58	file

↓

File type & permission given to the file

↓

No. of memory blocks taken by the file

↓

Owner of the file

↓

Group of the owner

↓

File size in bytes

↓

Time created @ modified file

↓

File @ directory name

Hidden files

⇒ An invisible file is one, the first character of which is the dot @ the period character (.). In unix most of these files are used for configuration information

Eg: .profile - The Bourne shell (sh) initialization script

\$ ls -a → To list the invisible files

Creating files

(2)

⇒ To create an ordinary file in unix use vi editor.

\$ vi filename

i (insert)

type the content Esc

wq! Ⓢ ~~ctrl+z~~ shift + ~~zz~~

↳ to save the file

You can also edit the existing file

using the same command

⇒ To Display the content of the file

\$ cat filename

\$ cat -b filename - to display content with line numbers

⇒ Counting words in a file

\$ wc filename → To get a count of the total number of lines, words & characters contained in a file.

o/p: wc file

2	9	46	file
↓	↓	↓	↳ filename
No. of lines	No. of words	No. of characters	

⇒ Copying files

\$ cp source filename Destination-file → To make a copy of file

Eg: cp file1 file2

⇒ Renaming files

\$ mv old-file newfile → To change the name of a file

mv file1 file3

⇒ Deleting files

\$ rm filename → To delete an existing file

Unix - Directory Management

A Directory is a file which stores all the files & directories

Home Directory - The Directory in which you find yourself when you first login is called your home directory.

\$ cd ~ → ~ indicates home directory

\$ cd ~username → to go to any other user's home

\$ cd - → To go in your last directory

Absolute / Relative path

Directories are arranged in a hierarchy with root (/) at the top.

The position of any file in the hierarchy is described by its pathname

A pathname is absolute if it is described in relation to the root
Thus absolute path always begins with /

Eg: /etc/passwd
/usr/bin/ls

A pathname which is related to your current working directory is called Relative path. Relative path never starts with /

Eg: ./bin/ls

⇒ To print the current working directory

\$ pwd

⇒ To list the files in directory ⇒ \$ ls dirname

⇒ Creating Directories

\$ mkdir dirname - To create a directory

\$ mkdir /scratch/ashwin/test/directory - To create ^{requested} directory

Exercise - Create directory within directory in single command

Ans: mkdir -p /scratch/ashwin/test/directoryname1/directoryname2

Removing Directories

⇒ Directories can be deleted using `rmdir` command

\$ `rmdir dirname`

You can delete more directories at a time

Changing Directories

⇒ `cd` command - change directory is used to change directories
You can use it to change to any directory by specifying a valid absolute @ relative path

Eg: `cd dirname`

`cd |scratch|achwinites|ALM-HOME`

⇒ Renaming a directory

\$ `mv old-dir new-dir` - to rename a directory

⇒ Copying a directory

\$ `cp dir1 dir2`

Exercise: `cp -r old-dir new-dir`

Notes:

• `(dot)` → represents the current working directory

• `(dot dot)` → represents the one level above the current working directory
(parent directory)

Exercise 2 : * Create a Directory within directory (Exercise 1)

* Create two files in last directory

* I want you to remove all the files and Directories

In a single command

`mkdir -p ABC/ABCD`

In `ABCD` → file1 & file2

then remove all

`rm -rf *`

Final Answer

Unix - File permission / Access modes

Every file in unix has the following attributes

- * Owner permissions - The owner permissions determine what actions the owner of the file can perform on the file
- * Group permissions - The groups permissions determine what actions a user, who is a member of group that a file belongs can perform on a file
- * Other (world) permissions - The permissions for others indicate what action all other users can perform on a file.

The permission indicators

\$ ls -l

-rw-r--r-- 1 ashwin:test - dba 21 Apr 3 08:25 file3

↳ represents filetype & permission give to the file

The permissions are broken into groups of three

read (r), write (w), execute (x)

from above-

- * The first 3 characters (2-4) represent the permissions for the file's owner

Eg: rw- → here owner has read & write permission

- * The second group of three characters (5-7) - permissions for the group to which the file belongs

Eg: r-- → here only read permission is there

- * The last group of three characters (8-10) - permission for everyone else

Eg: r-- → read permission

File Access modes

Read - Grants the compatibility to read i.e. view the content of file

Write - Grants the compatibility to modify @ remove.

Execute - User with execute permission can run a file as a program

Changing permission

⇒ `chmod` - is the command we used to change the file @ the directory
 ↓
 permissions
Change mode

There are two ways to use `chmod`

* The symbolic mode

* Absolute mode

* Symbolic mode

With symbolic permissions you can add, delete @ specify the permission set you want by using operator `+`, `-` @ `=`

Eg: `ls -l`

`chmod g+rx filename`, `chmod o-rwx filename`

* Absolute Permission

The second way to modify permissions with the `chmod` command is to use a number to specify each set of permissions for the file

0	No permission	---
1	Execute permission	--X
2	Write permission	-W-
3	Execute & write (1+2=3)	-WX
4	Read	r--
5	Read + Execute	r-X
6	Read & write	rW-
7	All permissions (4+2+1=7)	rWX

Eg: `chmod -R 775 filename`

Unix Environment

→ We can set environment variables. We access the variables by using 'echo' command

Eg: Test = "unix programming"

\$echo \$Test

• profile - It presents in home directory

Pipe command - We used to connect two @ more commands by using |

⇒ Grep command - Global regular expression print
this command is used to search a file @ files for lines that have a certain pattern

Syntax - grep pattern file(s)

Eg: ls -l | grep "Aug"

Various options

- v → prints all lines that do not match pattern
- n → prints the matched line & its line number
- l → prints only the names of files with matching lines
- c → prints only the count of matching lines
- i → matches either upper @ lower case

⇒ Sort Command - arranges lines of text alphabetically @ numerically
\$ sort filename

Options

- n → Sorts numerically
- r → Reverses the order of sort
- f → Sorts upper & lowercase together

⇒ more command - It is the same way as cat. only difference is that in case of larger files the more command displays screenful o/p at a time
\$ more filename

⇒ find command

this command is used to find a particular file within a directory

(.) - for current directory

(/) - for root.

\$ find . -name "*.pdf"
@filename

⇒ gzip command

Command is used to truncate the file size. It is a compressing tool

It replaces the original file by the compressed file having '.gz' extension.

\$ gzip filename

⇒ gunzip command

Command is used to decompress a file. It is a reverse operating

gzip

\$ gunzip filename

⇒ date command

Command is used to display date, time, timezone (more).

date

⇒ sleep command

→ is used to hold the terminal by specified amount of time. By

default it takes time in seconds

sleep times

⇒ clear command

clear command is used to clear the terminal screen

\$ clear

⇒ df command

command is used to display the disk space used in the file system

\$ df

→ time command - used to display the time to execute a command

time

Unix - Process Management

Process - A process is an instance of a running program

Process ID - The operating system tracks processes through a five digit ID number known as the pid or the process id.

Each process in the system has a unique pid.

Listing the process

we use `ps` command or `ps -f`

Options for `ps`

- a → Shows information about all users
- x → shows information about processes without terminals
- u → shows additional information like CPU.
- e → Displays extended information.

Stopping process

`kill -9 PID`

⇒ `ping` command

It sends an echo request to a host available on the network

`$ ping hostname @ ip-address`

⇒ `history`

↳ gives all the commands

⇒ `diff`

→ compares the contents of two files and displays the differences

`diff file1 file2`

Interview Questions

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1. What is Linux?

Linux is a Unix based operating system. It is an open source OS that was designed to provide free & low cost OS for the computer users.

2. Difference b/w Unix & Linux?

3. What is Linux kernel?

4. What are the basic components of Linux?

kernel, shell, GUIs, system utilities, application programs

5. Advantages of Linux?

6. Define shell

→ It is an interpreter in Linux

7. Name some shells that are commonly used in Linux

Bash, csh, ksh, bsh

8. Define inode

Each file is given a unique name by the operating system which is called as the inode.

9. What is process id

The operating system uniquely identifies each process by a unique id called as the process id.

10. Name some Linux variants

Ubuntu, Redhat, Debian, Fedora

11. What is a root account?

The root account is like a system administrator account. It provides you full control of the system. You can create & maintain user accounts, assign different permissions for each account etc.

12. What is the maximum length for a filename in Linux?

255 characters

13. Is Linux OS virus free?

No, but less number of viruses

14. Which command is used to uncompress gzip files?
gunzip

15. What are the file permissions for Unix?
Read, Write, Execute

16. How to exit from Vi editors?

* :wq saves the current work & exists the Vi

* :q! exits the Vi without saving current work

17. Can you write a command to erase all files in the current directory including all its subdirectories?

rm -rf *

18. Describe a link in Unix

Link is used to assigning more than one name to a file.
It's like a pointer

ln originalfilename linkname

19. What is fork() system call?

This is used to create another process that duplicates the entire process structure & address space.

20. What do you mean by Super user?

The super user is a user with access to all files & commands within the system.

Eg: root

21. What do chmod, chown, chgrp commands do?

chmod - change the permission set of a file

chown - it changes the ownership of the file

chgrp - it changes the group of the file

22. What is the 'nohup' in Unix?

nohup is a special command to run a process in the background even when a user logs off from the system.