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CHAPTER 1

Linux Basics

Linux

→ It is Open Source Operating System.

Source code
is open

→ handle memory
, devices etc...

→ Provide common
services for
comp. programs

→ Linux distribution ⇒ Operating System based
on Linux kernel.

→ example ⇒ Linux mint, Kali Linux
, Ubuntu

Terminal { Similar to Command prompt for windows }

username @ ComputerName : ~ \$

home directory

⇒ pwd (Print working directory) → Absolute path

⇒ cat Path to the file { Read the content of the
file }

⇒ ls { To know all the files inside present
directory }

⇒ ls -l { More details about two directories }

⇒ ls -a { Shows regular as well hidden files }

⇒ clear { Cleans the screen
terminal }

⇒ ls -la { Hidden + detailed }

{ In linux it is also
called dot files
→ Their name
starts with dot. }

* Navigating and Working with files

cd Directory name {Change directory}

cd .. {go back to previous directory}

cd {back to home no matter where you are}

mkdir foldername {Create directory in current directory}

make → directory

rmdir foldername {remove directory}

remove → directory

touch filename {Creates a file if file does not exist}

rm filename {remove file}

remove

cp filename to copy filename to paste
{Copy the file & paste it}

mv filename Destination path
{Moves a file}

→ You can even change name here

* Searching and Comparing

grep keyword filename

{ Prints the line in the file which has this keyword and highlight it for us }

diff file 1 file 2 { Prints the difference between the two files. }

passwd { To change password }

Variable name = Content of variable { Creates a variable with that variable name and contains the content after '=' sign. }

echo thing to display { echo just display the thing given to it }

⇒ **echo** \$Variable name { display content of the variable. }

info command name { gives information about the command }

* Saving results to a file

~~* **tee** filename~~ { Creates a file with the filename and save the results in that file of the command. }

Command name > filename

Command name >> filename { Append the results of the command to the filename }

* File Permissions

- in the beginning indicates that it is file
- d in the beginning indicates that it is directory.

$g_1 \Rightarrow \text{read}$

$\omega \Rightarrow \omega_{\text{write}}$

$x \Rightarrow \text{execute}$

Example:

914x 914-

Owner Permission

→ Group Permission

→ Normal Linsen

{Indicate it is
a file }

$$u \Rightarrow v_{sen}$$

$G \Rightarrow$ group

$0 \Rightarrow$ other people

Chmod

for what group
you want to
change permission

(u/g/o)

What permission
you want to
give or take
(or/w/x)

filename.

Chmod num1 num2 num3 file name.

Num1 Num2 Num3

Num 2 Num 3

file max.

• Permission for other people -

0 → No

1 → ~~execute~~ execute

2 → write

4 → read

b → read + write

7 → read + write + execute

11 group

11 11 WSC

* Compress and Extract tar and gz file

File name with space in terminal

↓
Aditya Shrivastava ✗

Aditya\ Shrivastava ✓

gzip filename

{To zip a file with .gz}

gunzip filename.gz

{Unzips the file}

For multiple file

tar cvf tarfilename.tar file1 file2

{Zipping multiple file}

tar xvf tarfilename.tar

{extracting .tar file}

* To edit a file

gedit filename

★ Install Software with APT

Sudo apt-get update

{Updates the apt-get tool}

{Allows us to run with
Administration Privileges}

Sudo apt-get install name of package

{Installs the package}

ls -l

{Number of directories
within the directory
for file it is 1}

Owner

Group

Date of Creation

Time of Creation

Filename

-rw-rw-r--

2

aditya

aditya

60

Aug

6

16:35

File1

Others permission

Group permission

Owner permission

Size of the file
In case of directory
it is page size (4096 bytes)

This can
be either
'-' or
'd'

- ⇒ file

d ⇒ directory

r ⇒ read

w ⇒ write

x ⇒ execute

★ Partitions

Linux { /dev/s

Pce

/dev/sda1

File System ⇒ ext
and

16:35 File1

next begins.

example ⇒ 1

★ Partitioning

Linux { /dev/sda , /dev/sdb etc... }

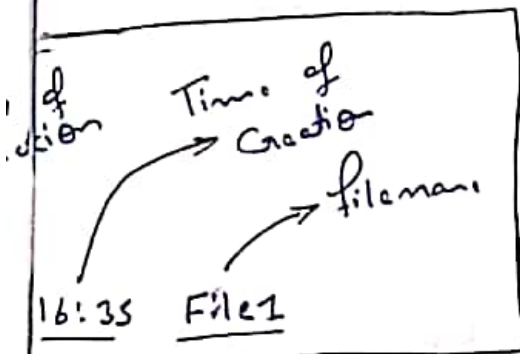
Partitioned

/dev/sda1

/dev/sda2

Unallocated

File System ⇒ It controls how data is stored and retrieved.



⇒ Without a file system
Information placed in a storage
medium would be one large
body of data with no way
to tell where one piece
of information stops and the
next begins.

next begins.

Example ⇒ NTFS , FAT32 , ext2 , ext3 , ext4

{ Used on
Linux alot }

{ newer
file system }

File System Compatible
with all operating
systems.

Linux , Mac , Windows

★ Shell Script

`#!/bin/sh` ← This Command tell, when you are running this file, run it in shell

`#` ← for adding Command

⇒ Write any valid bash Command.

⇒ for running Shell Script ⇒ `bash fileName.`

★ Environment Variables

⇒ It is a dynamic - named value that can affect the way running processes will behave on a Computer.

Example: LANG, PATH etc.

↓
This Variable contains a colon (:) Separated list of directories in which your system looks for executable files

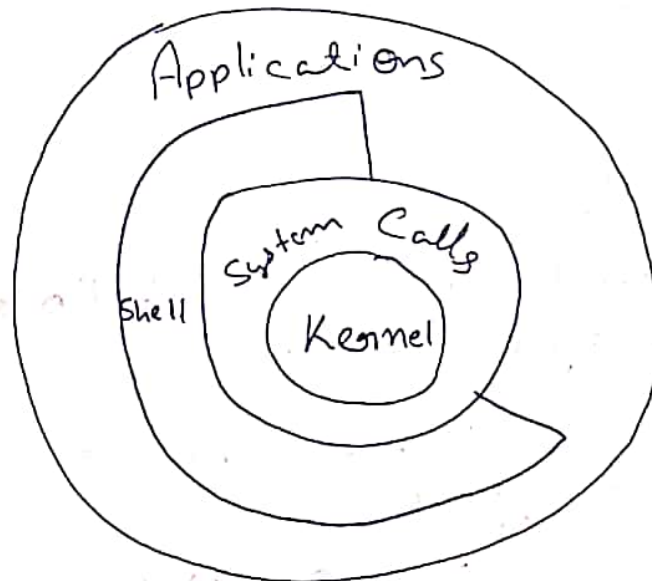
⇒ env Command displays all the environment variables.

Deleting Variable

`unset VariableName` ✓

UNIX → LINUX
{ MIT Bell labs } { Danish Computer }

★ Architecture of Linux OS



Kernel (Written in C)

- Heart of OS.
- Manages hardware devices like disks, memory, Network, USB device etc.
- It also manages users process etc.

⇒ System Calls are the standard library calls which queries the Kernel for specific need.

- Eg:-
- 1) time
 - 2) access file from a disk
 - 3) access packet in network device
 - 4) Start a user submitted process
 - 5) Kill a process.

Shell

- It is user interface which is used to run command line programs or utilities.
- Shell calls the Kernel system calls to get the output.
- Shell
 - bash ✓
 - ksh
 - csh

★ User

- ⇒ Different users have restrictions on which file they can access.
- ⇒ There is always a Super user whose name is root.
 - ↳ It can do anything.

⇒ Adding a new user:-

Sudo useradd username

Sudo passwd username

→ To set password for the new user.

★ Group

- ⇒ Group is an easy way to set privileges for entire set of people.

⇒ To Create group

Sudo **groupadd** groupname

⇒ To add a user to group

Sudo **usermod -a -G** groupname username

append

It means we are just adding the user to that group

-g means change the primary group to this new group

⇒ To delete user:

Sudo **userdel** username

* Setup and Connect to SSH Server

SSH username@IPaddress

Now you are connected to the server as the username specified with that IP address

★ SSH Key Authentication

⇒ Password authentication is probably the worst authentication.

Private Key
→ It will stay on our own PC.

Public Key
→ This is which will be uploaded to the Server.

⇒ To generate SSH Keys

ssh-keygen -t rsa

→ This will generate both the Public and Private Keys.

⇒ To copy the public key that we generated to the Server:

ssh-copy-id root@ServerIP

★ SFTP → Secure FTP

SFTP username@IP address

⇒ All of web page file should be in 'html directory'

www
var
↑
root

Put file address on your own computer
→ Make sure you are on correct directory on host computer.

{ Uploading
file }

get filename Location on our computer

{ To download
file }

Ping IP address

→ used to check connection to the network

Snap

⇒ Snap is universal package format created by Ubuntu.

Vim

Command mode ⇒ :q → to quit editing

⇒ Press i to go into insert mode.

⇒ Press Esc to go back to Command mode

dd ⇒ to delete a line

U ⇒ Undo your last option

:w → Write the current state to the file

:wq → Save & exit

:q! → quit with saving

:set number

→ To number the text file

Ctrl + n \Rightarrow node

q: "is looped or not" \Rightarrow $\{$ \rightarrow store in a hash map

if node is already in the hash map \Rightarrow then it is a looped node
else \Rightarrow not a looped node

if node is null \Rightarrow return false
if node is not null \Rightarrow return true

if node is not null \Rightarrow return true
if node is null \Rightarrow return false

CHAPTER 2

Intro to Linux Environment

OS with Linux

(2)

Intro to Linux Environment

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(1969) → C language & Unix Operating System

{ Dennis Ritchie Ken Thompson }

@

[bell labs]

(1975) → AT&T started selling Unix
Commercially.

{after legal battle}

Official AT&T UNIX

BSD UNIX

(1980) { Every company started making their
own versions of Unix
SUN, HP etc.. }

(1990) { Linus Torvalds Created Linux }

Linux distribution ⇒ Compilation of Linux kernel
bundled with system management tools

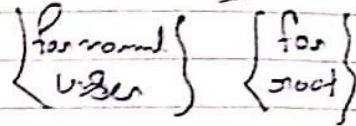
{ Software, desktop application
etc }

- | | | | |
|------------|-----------|---------------|---------------|
| 1. Red Hat | 3. Ubuntu | 5. Debian | 7. OpenSuse |
| 2. Fedora | 4. CentOS | 6. Linux Mint | 8. Kali Linux |

Shell

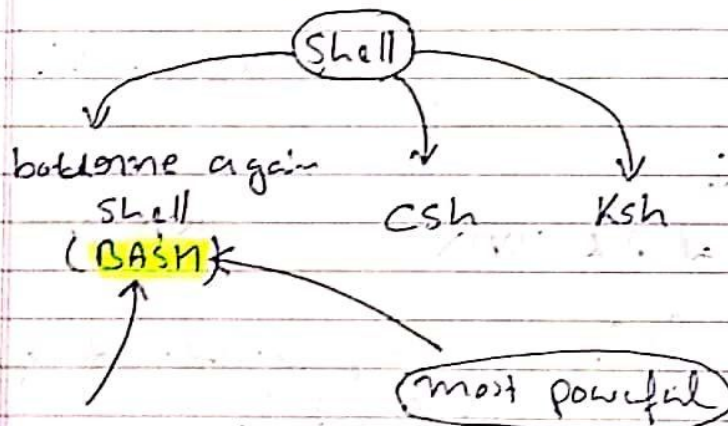
Present Working directory

username@hostname: PWD \$/#



⇒ To go from regular user to root:

SU -



{ earlier than this
was bourne shell
written by
Stephen Bourne
at Bell Labs
AT&T

Commands

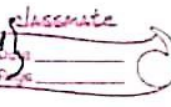
⇒ Internal Command ⇒ whose code is part of shell itself...

⇒ External Command ⇒ Command whose code resides in a file on disc.

man hier

[root]

To know more about
root file system



1. Binary Directories

bin,/sbin,lib,opt

binary for all the
user related command

Command that are
used by the
administration

Shared objects
.so

To store optional
Software

2. Configuration directories

boot, etc

Image of kernel
grub etc

editable text
configuration

Machine Specific
configuration files

3. Data directories → {Contains user data}

home, root, /usr, media, /mnt, /tmp

→ root is the only user that does not a directory in home directory

{Serves as a mount point for removable media devices}

{Temporary mount point}

{Application User can keep their temp data in this directory}

4. In memory directories

→ dev, /proc, /sys

→ directories which are not actually exist on the disc

(dev)

(Proc)

(Sys)

S. S.

S. S.

(dev) → Contains files related to hardware.
{ Everything in Unix is a file }

↓
{ Mouse is a file
Monitor is a file
CDROM is a file
Keyboard is a file }

(Proc) → { Contains files whose name is PID
of all the processes running on the
System along with other }

(Sys) → { Contains kernel info about the
hardware required for hot plugging }

5. System Resource directories

→ /usr

6. Variable Data directories

→ /var

→ { files which are unpredictable in
size like log etc. }

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* To get help in Linux

man { manual pages }

⇒ To know more about a command:

`man <command name>`

What is

→ { To know brief info
about a command }

Where is

→ { used to locate binary
in manual page }

man -k ~~keyword~~

→ { To Search in manual
using keyword }

————— X ————— X —————