

## **structure**

**/**

**/boot**

kernel, initrd, bootloader and its config

**/root**

**/home**

**/bin (binary)**

user commands (general commands)

**/sbin (system binary)**

system commands (administration commands)

**/lib (library)**

shared libraries & kernel modules

**/opt (optional)**

third-party applications

**/tmp (temporary)**

**/etc (etcetera)**

host configurations files

**/dev (device)**

**/mnt (mount)**

peripheral devices

**/media**

**/var (variable)**

log server, print server, web server, mail server, cache server, client cache, a few application caches,...

## **/usr (user)**

non-essential executable program struct of usr look like / and important next to /

## **/proc (process)**

window to kernel

## **/sys (system)**

window to kernel

### **0.1 file**

every file have code named inode#

### **0.2 user**

every user have code named UID

### **0.3 group**

every group have code named GID

### **0.4 processor**

every process have code named PID

## Commands

### ls

ls command use to see all existing file in directory an you can make it optional wiht any switch

#### -a

this switch show you all of file in directory even hidden file

#### -i

show inode of files

#### -l

this swithc show you file with more detale such as (type,user,group,size,modified date)

any type of file:

regular file:-

directory: d

short cut (symbolic link, sym link): l

socket: s

pipe: p

special device-character: c

special device-block: b

#### \*

you can filter search by \*

mean zero to infinity character

#### ?

mean one character

#### [character]

mean special character

#### [!character]

mean not special character

#### [a-z]

mean a range of character

**[!a-z]**

mean not in range character

**arg1,arg2,...**

mean exactly same as every arguman

**pwd**

show to you corrend directory address from root

**whoami**

show your user

**cd**

cd use for change directory

**-**

change between two last address

**absolute**

cd /fjj/ffs/s/f/f

**relative**

cd-./dfff cd../dfdff (parent)

**rm**

delete !rm last rm command run

**-r**

delete directory with content

**-f**

no ask question

**cp**

copy

**-r**

copy directory

**mkdir**

make directory

**-p**

make any directory than not exist mkdir -p/s/sd/d

**rmdir**

delete directory

**clear**

clear terminal

**mv**

move file rename move+rename

**file**

show type of file

**man command**

man show you manual of any command and tool to give help

**hostname**

show hostname

**init**

**init 0**

shutdown os

**init 6**

reboot os

## **echo**

write any thing to any file  
echo ' ' >> /file name  
and show variable --> echo &x

## **echo \$?**

if = 0 -> last command excute seccesfully else last command excute failed

## **echo \$PATH**

path of commands

## **echo \$USER**

show user

## **echo \$UID**

user id

## **echo \$HOME**

~

## **echo \$SHELL**

default shell

## **echo \$OLDPWD**

old pwd

## **vi**

use vi to edit of creat text

## **passwd**

change password for users

## **exit**

exit from user

## **su - name**

switch user to name

**ctrl (r)+f1,..,f6 or ctrl+alt+f1,..f6**

changing terminal

**more**

in terminal you have no any thing like scroll so by more can see any thing withot removing

enter to go to the next line

space to go to the next page

**less**

like more but you can go up and down again and agani and exit with q

**nl**

count and writh lines

**pipe: |**

give result of before function and get to next function

cat new.txt | nl | less

**semicolon: ;**

if gone between to command commands are do like always

**ampersand: &&**

if a command run succesfully them run next command

**vertical bar: ||**

like or do one of command

\$(echo in subshell;exit 4)&& echo OK || echo bad exit  
in subshell  
bad exit

**touch**

make file

touch a1 a2 a3 b1 b2 b3 c1 c2 c3

touch a,b,ca,2,3 'wildcard'

**sort**

sort line of file (cat/tac)

## **which command**

tell me which path run 'command'

## **-a**

tell me all address than run this command

## **whereis command**

give me all path that have 'command'

## **info command**

information:

## **useradd/adduser**

add regular user  
hostname >>/>  
date >>/>  
dmesg >>/>

## **userdel**

delete user

## **groupadd**

add group

## **cat**

show file text

## **-n**

like cat file | nl

## **alias**

save long command to variable

## **unalias**

delete alias



## **meta character**

**\***

**?**

**[character]**

**[!character]**

**[a-z]**

**[!a-z]**

**arg1,arg2,...**

## **df**

show storage partition

**-h**

show storage partition

**-hT**

show type of partition

**-i**

show inodo if partitions

## **lsblk**

show hard devision

## **fdisk**

make partition

## **mkfs**

formating a partition

## **mount**

mount a directory to hard

## **umount**

un mount a directory

**-a**

mount every partition in fstab file that added new

## **history**

show command history !5 run fifth command from top !-5 run fifth command from down !!-1 run last command !p last command that start with p

history -d 149 delete line 149

history -c clear all history

history -w after -c

## **tune2fs**

about partition

**-l**

make list properties of a partition

## **grep**

filter a text by a keyword

## **mkswap**

make partition swap after choosing filesystem linux swap

mkswap /dev/name

## **swapon**

make swap on

swapon /dev/name

## **swapoff**

make swap off

## **uname -a**

kernel version

## **du -csh /address**

list disk usage of address physically

## **chmod**

change permission  
with cahr num of — reference -----  
u — g — o  
——a——  
chmod o+w file name

## **chown**

change owner

### **-r**

do to all child file

:

chgrp = chmod :

## **chgrp**

change group

## **newgrp**

change principle group

## **stat file**

status of file

## **umask**

set default permission but week inversly

## **find**

find [addres] -[option] [variable]  
find / -name '\*.mp3'  
find / -user ali  
find / -qroup it  
find / -perm 0400  
find / -size +10M  
find / -size -500M  
find / -mtime -7  
find / -atime -2

```

find / -ctime -14
find / -mmin -60
find / -amin -60
find / -cmin -30
find / -size +10M -size -50M
find / -mtime +7 -mtime -14
find / -amin +30 -amin -60
find / -type d -name test in double coutation
find / -type f -name
find /tmp -name name -user ali -group it -perm 0400 -size +40M
2; /dev/nul in end command not show you error
exec rm -f at the end of file delete all founded or any command
find / -lname for sym link
find / -samefile for link
find / -inum number for link by inod

```

## **expr**

do math equation

## **bash**

open new bash

## **ps**

show maked bash

## **mail**

make email and can send to another user and can be read by mail commands  
 male ali: mail to ali

## **reset**

reset the terminal and fix some bugs

## **gzip**

zip the file  
 -d || gunzip to unzipping  
 show with gzcat

## **bzip2**

compress better usually  
-d || bunzip2 to unzipping  
show with bzipcat

## **tar (tape archiver)**

-f filename (file)  
-c (creat)  
-x (extract)  
-t (test)  
-C path (destination)  
-v (verbose)  
tar -cf ./gooni.tar ./m\*  
-z (gzip, gunzip)  
-j (bzip2, bunzip2)  
tar -czf gooni.tar.gz filename  
tar -zxf gooni.tar.gzcat  
tar -cjf gooni.tar.bz2 filename  
tar -jxf gooni.tar.bz2

## **time command**

show time to execute totally a command

## **wget link**

download from link

## **sleep**

sleep 5  
delay for five second

## **seq**

seq 1 10  
write one to ten in order

## **any thing**

### **/etc/group**

list of all group

### **/proc/swaps**

list of swaps

### **/proc/meminfo**

list of memory

### **/proc/cpuinfo**

information of cpu

### **/proc/version**

version of linux

### **/etc/passwd**

name of all user maked user exist an 1000 to up

### **/etc/fstab**

file of partition mount

### **/dev**

partition

    /dev/null lool like black hole

### **/dev/hda,b,c,... IDE (PATA)**

### **/dev/sda,b,c,... (SCSI)**

### **/dev/sda,b,c,... (SATA)**

### **/dev/sda,b,c,... cool disk**

## **file of variable**

/.bash-profile underline instead minus

    /.profile

    /.bashrc

    /.bash-logout

## **vi app**

basic text editor in any linux

### **i**

go to the insert mode

### **I**

like i just go to the first of line

### **shift+r**

go to replace mode replace new to old char

### **esc key**

back to basic mode

### **:**

go to command line

q/q! => quite from vi

w/w! => save text /fours save

w /adres name=> save as

n/n! => open next file

e/e! /adres name=> open file in adres/open force

r /adres name=> write file in this file

x/ZZ => save and quite

every bash command => ...

set nu => set nummber to any line

nummber => go to line number

### **v**

go to visual mode

### **o**

open new line and go to insert mode

### **O**

open new line before curser and go to insert mode

## **h,j,k,l**

left down up right

3j = j+j+j

## **H,L,gg,G**

H go to first line of page

L go to last line of page

gg go to first of file

G go to last line of file

## **w,b**

w go to next word

b go to before word

## **0 \$**

0 go to first of first word of line

0 go to first of line

\$ go to last of line

## **ctrl+f,ctrl+b**

f go to forward page

b go to back page

## **x,X**

x delete from front of curser

X delet from back of curser

## **s,S**

s delete one char and go to insert mode

S delete one line and go to insert mode

## **dd**

cut total line

7dd cut 7 line

## **d num jahat**

cut nummber type jahat



**c**

like d then go to insert mode

**cc**

like dd then go to insert mode

**y**

copy to clip board

**yy**

copy total line to clip board

**p,P**

p past to right of curser

P past to left of curser

**search**

/word

?word

n down

N up

**u,ctrl+r,.**

undo

redo

repatate last command

**partitioning**

cable connection

partitioning fdisk

choosing filesystem

format mkfs

mount mount!=unmount

to view df -h

**partitioning method**

1- MBR Schene (MSDOS Style)

Master Boot Record —> 512B

2- GPT Scheme

GUID Partition Table

## **MBR**

max 4

if primary = max 4 extended=n/a logical=n/a if primary = 3 extended=  
max 1 logical= max 11 extended partition cant store data and contain logical  
partition

## **filesystem**

native — ext2,3,4,btrfs,reiserfs

non-native if

with modules — XFS,ZFS

withoun module — APFS,NTFS

cross-platfor — FAT12,16,32,iso9660,CDFS (joliet)

small partition <= 2TB < large partition

## **virtual memory**

windos page file

linux swap

with LRU algorithm (least Recently Used)

## **free -h**

show your swap

**dd if=/dev/zero of=/root/myswap bs=500M count=1**

make 500M free of / partition and named myswap

then with mkswap /root/myswap and swapon /root/myswap add it to main  
swam

## **link**

### **hard link / link**

make with ln filename linkname

like backup

look like pointer to inode

not work in diffrent partititon

### **symbolic link / sym link**

make with ln -s filename linkname

this link look like shortcut

## variable

### system var: usually capital

two module

local var — v = any

environment var — export v = any

variable in linux:

question sign (last command)

PATH (addresses of commands)

USER (user name that login)

HOME (address of home)

SHELL (address of bash)

PWD (save address of current directory)

OLDPWD ( ) work with cd -

HISTSIZE (500 last command)

MAIL (address of file than save email of user)

HOSTNAME

LS (underscore sign) COLORS

\$ current shell PID

PPID current shell parent PID

PS1 file of text than in terminal showed before every commands

ps1 code:

u user

h computer name

H hostname

d date

t time

w total current address

W last current directory

n new line

\$ user type sign

e color code

.....

env list of total environment variable

### user defined var: usually small

### Man Pages:

1.user commands (general commands)

2.system calls

3.library class

4.

5.config files

6.games 7.miscellaneous

8.system commands (administration command)

9.kernel routines  
all in /usr/share/man/...  
whatis fdisk  
apropos partition  
fdisk -help (wiht all commands)

## text processing

work with delimiter

set delemiter

cut -d double coutation and delemiter -f 1 toby- 3 /etc/passwd ; u3 cut -d

double coutation and one char -f 1,3 /etc/passwd

-f feild

head file

heat default=10 line

head -5 file name

tail like head

tale or head -n

expand command change tab to space default 8 and you can use -t 5 to five

space

unexpand change space to tab

od -tc/tc file name show tab or spase and totaly char

sort

-r reverce

-n sort numeric

-k 2 with feild 2

wc line/word/char number

-l -w -m -c -byte

uniq filename del repared line

-d print repeated line

-D print repeated line and count of repeated

-c count of repeat

join file1 file2 one colum must be same an another file

join -1 3 -2 4 file1 file2 join with another column 3 in file one and 4 in file

two

paste write file one them filetwo in row

-d and double coutation can use delemiter

split -num filename name of new file

default 1000line

split -b 4.7G file name file

cat file1 file2 show file2 after file1

rev recerse in every line

tac revers in total of file

tr a-z A-Z if a them A just srandard entry

recive operator ;

xargs in standard entry and write all of file in one line

ls /home 1;filename 2;filename/&1 pipe one  
tee command like three way on input two out put that on of always file and  
another is terminal of pipe  
tee -a append text  
grep anything  
grep -v none have  
grep -i case insensitive  
grep -n line nubber  
or sign cahr at the first of line bee char  
& char at teh last of line be char  
;word just word total in coutation  
[abcd] [a-b]  
or sign in bracet mean not these char  
.show lines than not null or just enter

## Processes

spawn  
-PID  
-lifetime normal exit or abnormal exit  
-UID  
-GID  
-Parent Processes  
-workingdirectory  
-environment  
-...  
ps show process  
-A (all)  
-e (all)  
-a (attached processes)  
-f (forest mode) ps tree -h/-p  
-w (wide output format)  
-l (long format)  
-u (user format)  
-x (background processes)  
-C command (special commands)  
-U username (User command)  
most useful  
ps -aux  
ps -ef  
ps -el  
top like taskmanager and put space lead to refres bar (default 3s)  
uptime show some detale like time uptime upusers lead avg  
d change delay  
k kill a process  
kill -l list of signals

SIGHUP reload 1  
 SIGINT interrupt, cancel 2 ctrl+c  
 SIGKILL kill 9  
 SIGTERM terminate 15  
 SIGCONT continue, unfreeze, unpause 18  
 SIGTSTP stop, freeze, pause 20 ctrl+z  
 kill -15 PID#  
 kill PID# default -15  
 kill -9 PID PID PID PID  
 killall vi  
 NI (nice of process) priority of process between -20 to +19 and +19 worse  
 priority and -20 is the best just super user can lower priority  
 nice -4 vi myfile  
 nice -vi myfile  
 renice in during the process change priority  
 renice 9 PID  
 renice -9 PID  
 tail -f show last of file and live it  
 du -csh /var  
 du -cs /var  
 du -sh /var  
 du -ch /var  
 jobs -l running command  
 fg num run one of those to foreground  
 bg like fg but run in background  
 & at the last of command lead to command run in background  
 nohup anycommand & keep running after logout

## useradd

swithc  
 -d new home dir address  
 -m make address than is up in disk  
 -g name of principle user group  
 -G name of subordinator user group  
 -s address of excuring default shell  
 -u user UID  
 -c command of discription  
 usermod -L name  
 usermod -U name  
 passwd -l name  
 passwd -u name  
 cshs to chang shell

## login

1

su - ali login mode  
su ali non-login mode  
/etc/skel/ files are copied to any when an account is made  
/.bash (underline) profile 1 3 no execute in non-login mode  
/.bashrc 2 2  
/etc/bashrc 3 1  
number is order of read and do  
.....  
/.bash (underline) logout  
su/su -empty switch user to root  
visudo like vi /etc/sudoers  
visudo of vi /etc/sudoers in this file can change accessibility of another user  
and user than in sudoers file can be like root and log can save its activity  
in this file % before name means its group not user  
in some linux root has no password with sudo su - root and then change  
root password  
useradd -u 500 newusr if before exists an user with UID 500 and we delete  
it and want to get this user to new user use this command  
userdel -r name delete user and home directory  
groupdel name  
pwunconv deactivate shadowing grpunconv  
pwconv activate shadowing grpunconv

## boot initialisation and shutdown

### BIOS

(Basic input/output System)

hardware clock (CMOS battery)

software clock

CHS (cylinder/head/sector) LBA (logical block addressing)

EFI

UEFI

### MBR

(master boot record)

512 B

446 B (bootloader information)

64 (partition table information)

2B (MBR validation check)

most famous bootloader in linux

1. LILO (linux loader) lilo /etc/lilo.conf

2. Grand unified bootloader (GRUB legacy) grub /boot/grub/menu.lst /boot/grub/grub.conf /etc/grub.conf

3. GRUB2 grub /boot/grub/grub.cfg /boot/grub2/grub.cfg /etc/grub.cfg

initrd is a file that kernel needs to it to prevent detection loop

bootloader  
 kernel  
 init  
 runlevel

- init and telinit to change runlevel
- init 0 shutdown
- init 1 single user mode
- init 2 multiuser -nfs -x11
- init 3 multiuser +nfs -x11
- init 4 unused
- init 5 multiuser +nfs +x11
- init 6 reboot
- we can't use init 0 or 6 in default
- usually default is 5 or 3
- /etc/inittab
- runlevel command show before and now runlevel N mean shutdown and s
- mean single user mode
- unused runlevel work like before runlevel init 4 = init 3
- startx up graphic service manual without use init 5
- service web ssh database dns proxy/cache
- applications apache openssh-server vsftpd mysql bind squid
- daemon httpd sshd vsftpd mysqld named squid
- name of script like daemon
- /etc/init.d/sshd stop—start—status—restart—reload—
- /etc/rc0.d
- /etc/rc1.d
- /etc/rc2.d
- /etc/rc3.d
- /etc/rc4.d
- /etc/rc5.d
- /etc/rc6.d
- Snnsshd to start
- Knnsshd to stop
- for start s00 to s99 in priority in /etc/rcn
- also for end

redhat base:

1. LSB: /etc/init.d/sshd stop—start—status—restart—reload—...
2. service sshd stop—...
3. chkconfig
4. systemctl

debian base

1. LSB
2. service
3. update-rc.d
4. systemctl

example for 3



```
update-rc.d crond default
update-rc -f dovecot remove
update-rc -f dovecot stop 24 2 3 4 5
```

## service managment

```
-System V (SssysVInit) -i init (centoOS 5, older)
  service sshd stop
  chkconfig — update-rc.d
  init 0
-upstart -i init (CentoOS 6)
  initctl stop sshd
  chkconfig — update-rc.d
  init 0
-systemd -i (CentOS 7, newer)
  systemctl stop sshd —i at moment
  systemctl start sshd —i at moment
  systemctl disable sshd -i next boot and always
  systemctl enable sshd—i next boot and always
  systemctl poweroff
-shutdown command
  shutdown -h now
  shutdown -h 120
  shutdown -r 10
  -h (shutdown, halt)
  -r (reboot)
  -c (candle)
  -f (fast boot)
  -F (force filesystem check)
```

## package managment

```
1. redhat rpm *.rpm
2. debian dpkg *.deb
  a-b.c.d-e.f.rpm
  a=package name
  b=version
  c=major release (major revision)
  d=minor release (minor revision)
  e=build number
  f=arch. -i x89, i386, i486, i586, i686 -i 32bit -i x86underline64, amd64 -i
64bit
  -i sparc,
  -i PowrPC,
  -i arm,
  -i ... ,
```

- i all, noarc (suit for any device)

rpm

- i (install)
- u (update)
- U (install/update)
- v (verbose)
- h (hash)
- e (erase)
- q (query)
- a (list all package names installed on this system)
- f (file)
- l (list all package files)
- c (list all package config files)

which chmod

rpm -qf /usr/bin/chmod

dpkg

- i (install) = rmp -i
- r (remove) = rmp -e
- s (status, query) = rmp -q
- S (search) = rmp -qf
- l (list all installed package) = rmp -qa
- L (list all package files) = rmp -ql

wrapper

- 1.yum (redhat base)
- 2.apt (debian base)

yum

- (yellowdog updater madified)
- /etc/yum.conf
- /etc/yum.repos.d/—.repos
- yum update
- yum update appname
- yum install appname
- yum remove appname apt (advanced package tools)
- /etc/apt/sources.list
- /etc/apt/sources.list.d/official-package-repositories.list
- apt -get update
- apt -get upgrade
- apt -get upgrade appname
- apt -get install appname
- apt -get remove appname
- get is optional

## shell:

sh, csh, ksh, tcsh, zsh, ... bash, ...  
 you should write your command in a text and run it with bash command

```

❏❏echo clear ❏❏ a
❏❏bash a
run file as alone command most use address
❏❏address/a to run
or
vi .bashunderlineprofile
and change PATH (add address of this file)
better named file than have .sh at end
# to comment
#! shibang address runner of command so #! /bin/bash
❏❏which top ❏❏ls -l /usr/bin/top
❏❏ls -l 'which top'
❏❏ls -l $(which top)
these command are equal to each other
aotumatic run in linux in cron service
crontab
-l list
-r remover
-e edit
min hrs dom moy dow cmd these caloumn ser the time of script
15 8 * * * /root/class/myscript.sh these line run than exploitat every day
in 8:15
15 8-10 * * * /root/class/myscript.sh
15 8,17 * * * /root/class/myscript.sh
how work with crone
cronetab -e
write =❏ 53 10 * * * /root/class.myscript.shadowing

```

## network

OSI

client server 1.Application A 2.Presentation P 3.Session S 4.Transport T 5.Net-work N 6.Data link D 7.Phisical P

physical layer

Wireless wlan0

Ethernet eth0

priority with Ethernet

naming approaches

1-Hostname = computerPunderlinename.domainunderlinename

www.google.com

mail.yahoo.com

kashani.lpir.org

(org, com, ir) TLD (top level domain)

(google, yahoo, lpir) SLD (second level domain)

www, mail sub-domain name

change hostname in /etc/hostname

```

2-Physical addr (mac addr)
dhclient (IP, Gateway, DNS)
3-IP Addr
ifconfig eth0 192.168.10.11
default netmasks
-i A:255.0.0.0
-i B:255.255.0.0
-i C:255.255.255.0
ifconfig eth0 192.168.10.11 netmask
11111111.11111111.11111111.11111111.00000000
debian base: /etc/network/interface
redhat base: /etc/sysconfig/network-scripts/ifcfg-eth0
command
ifconfig
ip addr show — ip a
...
ifconfig eth0 192.168.10.11
ip addr add 192.168.10.11 dev eth0
...
ifconfig eth0 down — ifdown eth0
ip link set eth0 down
...
ifconfig eth0 up — ifup eth0
ip link set eth0 up
...
route -n
ip route show — ip r
...
route add default gw 192.168.10.1
ip route add default via 192.168.10.1
ssh (22)
client — server A — server B
openssh-clients openssh-server (22) openssh-clients openssh-server (22)
1.remote console
ssh username@IP
2.secure copy
scp username@IP:path username@IP:path
for each user that i write in command in terminal can write no username
and just write addres

```