**Certification Path**

**Windows Administrator**

RHCA I RH124

RHCA II RH134

RHCA III RH254

**Linux Administrator**

RHCA Rapid RH199

RHCA III RH254

**Lab setup**

We have two computers “**Desktop and Server**”. Each have name desktop.example.com and server.example.com. each system has user account with name **student** and password **student**. The root password is **radhat**.

**Linux Operating System Commands**

**What is Shell**

The shell is a program that takes keyboard commands and passes them to the operating system to carry out action.

Almost all Linux distributions supply a shell program from the GNU Project called bash.

The name “bash” is an acronym for “Bourne Again Shell”

**usermod -L rizwan**

usermod is command

-L is option

rizwan is argument

**Chapter No. 1**

**Login to Terminal**

Use ssh to connect to remote server. Use

ssh-keygen command to generate certificate and copy the certificate to remote servers using ssh-

copy-to command

**SSH key-based authentication**

Use ssh-keygen command on development system to generate the certificate. It will create two file (private & public ) and place in home director .ssh folder 🡪 copy the public file to remote server using ssh-copy-id.

**Terminal**

Terminal is used to access the Shell to enter the commands

When we first log in to our system our current working directory is set to our home directory.

After terminal lunch, we should see prompt like below

username@computer\_name:pwd$

it will usually include your username@machinename, followed by the current working directory and a $ sign if normal user or # sign for root user.

after the $ sign we will enter Linux commands.

echo $PS1

ps1\_old =“$PS1”

$PS1 = new value look for more option at page no. 181

**Commands History**

we can recall entered commands by pressing up & down arrows keys from keyboard

or use history command to show previous entered commands. To execute the previous command from history, issue command !number

**Simple Commands**

who i am find about login user information

date this will show the date

cal this will show current month calendar

hostname show system name

uname Operating System Name

uname -a Operating System name and other detail

id show information about login

**Chapter No. 2**

**Linux Hierarchy**

/ The root directory, where everything begins

/bin contain programs which is required for system to boot

/boot contain Linux Kernel

/dev contain devices

/etc contain system wise configuration

/home contain user home directory

/lib contain shared library

/list+found lost files

/media contain mount point for USB, CD etc

/mnt same like media but used in older version of OS

/opt contain optional installed software.

/proc contain system related files

/root contain home directory for root user

/sbin contain program which perform vital tasks. Root user have access only

/tmp contain temporary files

/usr contain program used by all users

/var contain variable type of data file

/var/log contain different logs files

man 7 hier this command show help regarding Linux hierarchy

**Managing Files & Directories**

file file\_name determine file type. for example, command file file\_name will show type of file mean text file, picture etc.

less view file contents. read text file. use **/word** to search, n from keyboard for find next,

q to quit space to page down /word to search word n to search next occurrence of work

G to move to end of file g to move to beginning of file h to show help on screen

cp copy files only

cp -r copy directory

mv move / rename files and directories

mkdir create directory

mkdir -p will create directory even not exist

rmdir remove directories

rm remove files only

rm -rf remove files and directories

stat show file or directory statistic

touch create empty file

>filename create empty file as well

**Wildcards**

\* Matches any Characters

? Matches single characters

[characters] matches any ch member of set

[! characters] matches any ch not member of set

[[:class:]] matches any ch member of specified class

[: alnum:] match any alphanumeric characters

[: alpha:] match any alphabetic characters

[: digit:] match an digit

[: lower:] match any lowercase letters

[: upper:] match any uppercase letters

**Navigation / File System commands**

pwd print working directory (current location)

cd change to user home directory.

cd .. or cd - both command have same result, takes to one level up

cd ~ change to home directory

cd ~username change to home directory of mentioned user

chmod change permission on file or directory

mkdir create directory or Folder

Absolute Path start from root directory up to target directory

Relative Path two special symbols (.) and (..) are used. The (.) is used for current working directory where

(..) is refer to one level up from current directory

ls list directory contents

clear (Ctrl + l ) clear the screen

history show all previous entered commands

Ctrl + a beginning of line

Ctrl + e end of line

Ctrl + f forward one character

Ctrl + b backward one character

**Symbolic Links**

Symbolic links allow use to give multiple name to same files. There two type of links

Soft links

Hard Links

ln create hard and symbolic links

ln file link this will create hard link

ln –s file link this will create soft link

**Note:** hard link has two major limitations:

It cannot create link with file lying in different partition

It cannot create link with directory

**Chapter No. 3**

**Users & Groups**

id show information about login user

ps u will show process related to user

passwd this command is used to change user password

/etc/group/ groups are defining here

su this command is used to switch users

su username

su - this command will switch user to root user

sudo usermod –L username this command will lock user account

**Managing User Accounts**

**Create users & Group**

useradd username this command will create user

useradd –G groupname username this command will create user in mention group

groupadd groupname this command will create group

groupadd –g number groupname this command will create group with number specified.

**Modify users**

usermod modify user information

**Delete user**

userdel -r username delete user & home directory

**note:** always remove user with –r option

deluser username groupname this will remove user from group

**Adding user to another group**

sudo usermod -aG groupname username

**User Account Expiration**

chage -m 0 –M 90 –W 7 –I 14 username chage command is used account expiration setup.

**Locking and Unlocking User account**

usermod –L username lock user account

usermod –U username unlock user account

**No login user account**

usermod –s /sbin/nologin username user created with this command can authenticate from

system but cannot login interactively to system

local user information are stored in /etc/passwd and password are store in /etc/shadow and group info are

store in /etc/group, password expiry default information are store in /etc/login.def

**Centralized LDAP & Kerberos Servers**

To configure linux system to use central LDAP server following files need to be changes.

/etc/ldap.conf

/ect/krb5.conf

/etc/sssd/sssd.conf

/ect/nsswitch.conf

/etc/pam.d/\*

/etc/openldap/cacerts

to configure above file manully, can raise error. Use any of the tool below

authconfig , authconfig-tui , authconfig-gtk

configure LDAP and Kerberos

**Chapter No. 4**

**Permission**

id display user identity ( id command will show user info, group etc)

chmod change a file or directory permission

umask set the default file permissions

su run shell as different user

sudo execute command as different user

chown change file owner

chgrp change file group membership

passwd change user password (passwd username)

use ls –l command to see the directory listing

**Output**

**Type Permission user group size date & time file / directory name**

d rwx rwx r-x 2 vagrant vagrant 4096 2008-01-10 16:40 dir1

owner grp world





**r=4 w=2 r=1**

**first digit is equal to 1 , 2nd digit is equal to 2 and 3rd is equal to 4**

**0 0 0 = 0 (0 + 0 + 0)**

**0 0 1 = 1 (0 + 0 + 1)**

**0 1 0 = 2 (0 + 2 + 0)**

**0 1 1 = 3 (0 + 2 + 1)**

**1 0 0 = 4 (0 + 2 + 1)**

**1 0 1 = 5 (0 + 2 + 1)**

**1 1 0 = 6 (4 + 2 + 0)**

**1 1 1 = 7 (4 + 2 + 1)**

**when user owns a file or directory, user have full control over it’s access.**

**User accounts are define in /etc/passwd file**

**User groups are define in /etc/group file**

**User passwords are define in /etc/shadow file**

**Only file owner or root user can change file mode**

To assign permission to file issue below commands

chmod 644 filename

Changing Identities

su switch user

sudo running command with root user

Changing file owner and Group

chown this command is used to change the owner or group of file or directory

sudo chown new\_owner: file name or path to file

getting file permission information

getfacl filename

getfacl /directory

**Symbolic method for permission**

chmod whowhatwhich filename /directory

who u (user), g (group), o (other), a (all)

what + (add), - (remove), = (exactly)

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

chmod u+rwx filename this command will give user read, write and execute permission on file

chmod u-rwx filename this command will remove user read, write and execute permission on file

**Special Permission**

The setuid and setgid permission on file means that file will run with group not with user that run the file

ls –l /usr/bin/passwd ( this s is called sticky bit that mean only root can delete the file )

ls –ld /tmp ( the . is called group id )

setuid = u+s = 4

setgid = g+s = 2

sticky = o+t = 1

should be first in permission setup

chmod g+s directory

OR

Chmod 2770 directory

**Default Permission setup**

Default permission are setup using umask.

Command umask will show the value which is (0002) 🡪 the defult umask value is store in /etc/profile and

/etc/bashrc 🡪 to override default value change value in .bash\_profile and .bachrc file.

**Chapter No. 5**

**Access Control List**

A command getfacl file\_name command is used to get permission report of file

Security Enhanced Linux (SELINUX)

SELINUX is additional security layer 🡪 SELINUX have three mode 🡪 enforcing mode , Permissive and disabled

To see the current SELINUX mode 🡪 issue the command (getenforce) 🡪 SELinux Booleans are switchs to

control the behavior 🡪command getsebool –a will show list of Boolean values 🡪 to change the mode enter

below commands

setenforce enforcing or setenforce 1

setenforce permissive or setenforce 0

-Z is used with ls command to see the SELINUX information regarding file & directories.

**Chapter No. 6**

**Process Management**

Ctrl – z FROM Keyboard are used to suspend the process

Ctrl – c FROM Keyboard are used to Kill the process

Ctrl – \ FROM Keyboard are used to core dump the process

ps report a snapshot of current process ( command ps , ps x

top display task

jobs display active jobs

bg place a job in background

fg place a job in foreground

kill pid send a signal to a process

killall kill allprocess by name

pkill work same like killall command but advance cretiria can be used

shutdown shutdown or reboot system

Note: w command is used to see all login users 🡪 w with –f flag give some more information 🡪

To terminate the login user 🡪

**Chapter No. 7**

**Skip**

**Chapter No. 8**

**Creating and Mounting File System**

To create and manage disk, partition and file system

File System reside on SATA or SCSI (Hard Drive) devices and need to mount manually to access it.

mount command is used for this purpose.

blkid command give existing partition with file system.

To see all connected hard disk to system,

sudo lshw –class disk -short

**Hard Disk Related Commands**

df -h this will show disk information

free this will show RAM information

**blkid this command will show existing partition**

mount drive\_name mount\_location mount hard drive

mount uuid=“something” mount\_location same as above

umount unmount the drive

lsof drive\_name show which process using partition

fdisk this command is for disk partition with MBR

gdisk this command is for disk partition with GPT

mkfs this command is use to format the partition with file system

after connecting hard disk, login in to server 🡪 run sudo lshw –class disk –short 🡪 run sudo fdisk –l

command to see the new disk 🡪 check the disk name, it will be /dev/sda or /dev/sdb, a and b represent the number of disks 🡪 run sudo fdisk /dev/sdb🡪 press m 🡪 press p to see available partition 🡪 if no partition available 🡪 press n 🡪 follow wizard 🡪 to assign type press t 🡪 choose type e.g. 82 🡪 press w to save the partition 🡪 /dev/sdb1 or /dev/sdb2, 1 and 2 are represent the number of partitions. 🡪 issue partprobe command to re-read the partition.

After partition is created 🡪 next step is to apply file system and format the partition 🡪 Linux support many FS but two are common (xfs and ext4) 🡪 issue mkfs –t ext3 /dev/sdb1

After formatting with FS 🡪 next step is to mount the drive 🡪 mount drive\_name mount\_drive\_location

Last step is to make the mounting persistent 🡪 add the info to /etc/fstab/ file

UUID=some\_number mount\_point ext4 default 0 0

Run the following command to check the new disk mounting status

sudo lsblk

Run the following command to check the new disk mounting status

df –h

Above procedure will work for GTP partition is well.

**Creating Swap partition**

To create swap partition, 3 action require

1. Creation partition
   1. fdisk 🡪press n to create 🡪 follow wizard 🡪 press w
2. Assign 82 Linux swap
   1. fdisk 🡪press t 🡪 choose partition 🡪 press L 🡪 enter 82 🡪 press w 🡪 partprobe /dev/sdb2
3. Format swap signature on the device
   1. mkswap /dev/sdb2 🡪 this command will give UUID 🡪 free
   2. activate the free space using command swapon -s
   3. to check run command (free)
   4. Last step is to make the mounting persistent 🡪 add the info to /etc/fstab/ file

UUID=some\_number swap swap default 0 0

**Chapter No. 12**

**Managing Logical Volume**

To use LVM, five step are required.

Step 1. Create new partition with type Linux LVM

Step 2. Create Physical Volume

Step 3. Create Volume Group

Step 4. Create Logical Volume

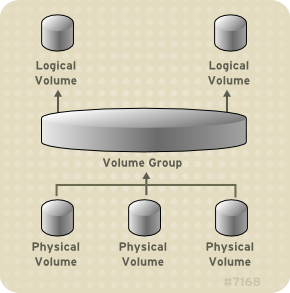
Step 5. Add File System

1. Create two partition of harddisk using fdisk disk\_name 🡪 enter 🡪 press n 🡪 follow wizard and create two partitions size 250 MB 🡪 partprobe 🡪
2. Create physical volumes 🡪 enter pvcreate /dev/sdb1 /dev/sdb2
3. Create Volume Group 🡪 vgcreate shazam /dev/sdb1/ /dev/sdb2
4. Create logical volume 🡪 lvcreate –n storage –L 400M shazam

This command will create device /dev/shazam/storage without file system

1. To add file system 🡪 mkfs –t xfs /dev/shazam/storage
2. Create mount point 🡪 mount /dev/shazam/storage /storage

And add the line to /etc/fstab file

1. Pvdisplay /dev/sdb command will show information about
2. 

**Chapter No. 9**

**Service Management and Boot Troubleshooting**

Daemons are process which run in background.

To check the services status, we are using systemctl command. If it is not working, then install first using

sudo apt-get install systemd

process use sockets. This is primary commination channel.

systemctl –t help this command will give help regarding systemctl

to check apache2 status, run the below command

systemctl status apache2.service

**Chapter No. 10**

**Networking**

We can build all types of networking system using Linux, like

Firewalls

routers

name servers

NAS (Network Attached Storage)

etc etc

ping for connectivity checking

ip addr show eth0 this command will show ip information

ifconfig same as above

ip –s link show eth0 show traffic statistic for Ethernet 0

ip route show routing info

traceroute print route

tracepath trace path

netstat print network info

ss –ta similar to netstat command, show the service and port no. in use.

netstat same is above command

nmcli this is a tool called network manager command line.

Hostname show computer name

Hostnamectl status show the computer information

ftp file transfer protocol

wget non-interactive downloader

ssh for connection

**Reading / handling Text Files**

cat concatenate files, same like less command. Used to concate multiple files.

sort sort text lines

uniq omit repeated lines

grep print line matching pattern (ls –l /usr/bin | grep zip)

wc word count

head output first part of file (head –n 5 text\_file.txt)

tail output last part of file (tail –n 5 text\_file.txt)

tee read from standard input and write to standard output

> used for redirection e.g. (ls –l > ls\_output.txt)

> file\_name make the file empty, means delete the content. Or if file not exist, create new.

Commands &> output.txt this command record both output and error both

ls -l /user/bin 2> /dev/null /dev/null is called bit bucket in Linux. Mean trash.

echo display text message on screen (echo “hello”) but if pass \* to echo like echo \* will

display all directories

echo \* display all directories

echo d\* display all directories staring with d

echo [[:upper:]]\* display all directories start with upper characters

echo ~ show home directory for user

printenv | less show all environment variable for user

tail –n 100 filename > filename this command will copy last 100 lines to another file

cat file1 file2 > combine this command will combine two file into one

**Searching in Linux**

history | grep “tail” this command will search tail in history

**Getting Help for commands**

type show the type of commands (type ls , type cp )

which show the location of commands

man show help about command

man man show help about manual.

man –k command search command in help file

apropos display appropriate command

info show help about command

pinfo command show help about command (pinfo need to be install first)

whatis show help about command

help show help regarding command (help cp)

--help also give help regarding command ( mkdir –help)

alias used to create our own command (alias p=’pwd’ ) or (unalias p ) for deleting

info coreutils help for core utilities

install application help files are located at /usr/shared/doc location. We can use less or gedit to read the application help

sosreport this command is used to collect system configuration and diagnostic information.

**The Environment Setup**

printenv print all environment ( this command is used to see all environemt)

set set shell option ( same as above )

export Export Environment

alias create new commands based on existing commands

There are two type of variables

Environment variables

Shell Variables values are set by bash

Below are the files, mainly used in environment setup

/etc/profile/

~/.bash\_profile

~/bash\_login

~/.profle

~/.bashrc

/etc/bash\_bashrc

**VIM Text Editor**

**Starting vim**

To start vim , enter vi command and to exit enter :q command

**Entering text**

To insert text , press I from keyboard

To insert line above line O and for below lowercase o

**Save File**

To save text , press :w from keyboard

**Delete Line**

To delete the current line press dd from keyboard

d$ from current location to end of line

d0 from current location to beginging of line

dG from current location to end of file.

**Undo**

for undo, command

**copy & Paste**

press dd from keyboard to cut and p to paste the line

press y is used for copy and p is used for paste is well

**Searching**

f is used for searching single word

/phrase is used for searching

press n for next occurrence

**Replacing**

: %s /searchingword/replacebyword/g g mean globally

: %s /searchingword/replacebyword/gc g mean globally , c will ask for confirmation

**Moving in multiple open files**

:n to move to next time

:N to move back to first file

:buffers will show all open files

:e filename this command will open another file for editing

:buffer number will open file with buffer number

VIM Tutor

Vimtutor this command will start vim tutor and give help

**Packages**

To install high level software in Ubuntu we use apt-get install software\_name ( apt-get remove name)

To install low level software in Ubuntu we use dpkg --install software\_name

To install high level software in Redhat we use yum install software\_name (yum erase name)

To install low level software in Redhat we use rpm -i software\_name

**Storage Media**

We can handle all type of storage in Linux, like

Physical storage (hard disks)

Network storage

Virtual Storage (RAID)

Logical Volume Manager (LVM)

mount mount file system ( This command will show mount points )

umount unmount file system

fsck check and repair file system

fdisk partition table

mkfs create file system

fdformat format floppy disk

dd write block level data directly to device

genisoimage (mkisofs) create ISO 9660 image file

wodim (cdrecord) write data to optical storage media

md5sum calculate an md5 checksum

Managing Storage

1st step to manage storage is to attach storage device to file system tree. This process is call mount.

file fstab located at /etc/fstab shows all devices ( harddisk partitions)





Device Name mount point FS Opt frequency Order

mount to show all mount points

umount /dev/hdc to unmount the CD-ROM

mount /dev/hdc /mnt/cdrom

above command will mount CD-ROM on cdrom directory created by me.

Create new file system / formatting the drive

Connect USB drive to system, then run following command

fdisk

after finishing partition using fdisk , then use mkfs command to create file system

sudo mkfs –t ext3 /dev/sdb1

**System Logging and NTP**

All logs are store in /var/log location

**Creating Play Ground**

create a directory with name playground in home directory.

mkdir playground

create two more directories dir1 and dir2 inside playground

cd playground

mkdir dir1 dir2

copy passwd file from etc directory to playground directory

cp /etc/passwd .

cp -i /etc/passwd . (copy file and give warring if file exist )

cp -v /etc/passwd . (show messages on screen)

rename the file passwd to fun

mv passwd fun

now move fun file to other directory

mv fun dir1

mv fun dir2

create hard links

ln fun fun-hard

ln fun dir1/fun-hard

ln fun dir2/fun-hard

create soft link

ln –s fun fun-sym

ln –s ../fun dir1/fun-sym

delete hard linklink

rm fun-hard

use ls –l command to see the directory listing

**Output**

**Type Permission user group size date & time file / directory name**

d rwxrwxr-x 2 vagrant vagrant 4096 2008-01-10 16:40 dir1