Linux Operating system:

* Red hat – enterprise run Red hat OS – server production
* Debian – development environment run Debbian OS
* Susse – weired people – hybrid cloud environment
* Ubuntu – want to make linux operating system look like windows
* Fedora is owned by Red hat

4 Labs – each 7.5 percent

Quiz on Tues – power point information

Final Exam – written 20 multiple/fill in the blank

Practical Exam – Make virtual machine

Project – Group

Why Linux?

Server running services.

Unix system are hardware specific.

Linux:

1. Servers
2. Workstations
3. Embedded Appliances
4. Mac OS/X and ioS
5. Android – world largest using linux environment

Linux has 3 primary components:

User – applications/OS – Hardware

**Components of Linux System**

* Kernel − Kernel is the core part of Linux. ...Take hardware functionality and make it accessible to operating system.
* System Library − System libraries are special functions or programs using which application programs or system utilities accesses Kernel's features. ...they are library files which are stored in directory called lib. It is like dll in windows.
* System Utility − System Utility programs are responsible to do specialized, individual level tasks.

Open source is secure because of it’s complexity. Everyone looking at it and people look at flaws.

Red Hat vs Debian: Differences

* <https://www.educba.com/redhat-vs-debian/>

Linux:

kernel – program over 30 million lines of code – part of the OS – by itself kernel is useless.

GNU – System utilities + System libraries

Kernel + GNU = GNU Linux = Operating System

Linux is component of GNU Linux which makes hardware functional and we can run our programs on it.

Windows & Linux:

Linux is open source – secure, flexibility, restart in layers, works faster – older machine better choice – structure is different – not user friendly – no drivers or less drivers.

Windows is more compatible with hardware as they have drivers.

Unix vs Linux:

Unix – mainframe, servers, slow, costly,

Linux – fast, unix like programs, open source

Operating system: Android, Mac, ios, GNU Linux

Android: Linux = GNU + Google

Mac: Unix = GNU + Apple

ioS: Unix = GNU + Apple

GNU Linux: 100% linux = GNU Linux = 100% linux

Even though both Mac and Linux is unix based but Linux is fully linux where as Mac has GNU but in addition it has Apple libraries helping it to make it look like windows operating system.

Windows installation: virtual machine is file sitting on OS

3 partitions:

* Recovery
* Reserved
* C:\

Linux installation: everything is directory

3 partitions:

* /boot
* Swap is virtual memory
* / is root partition

Root (/) has many directories underneath.

SU stands for Switch user = makes u root user so it will ask for root user password

Sudo stand for Switch user & do =sudo command as admin = it will prompt for my password. It will give u access for admin right.

create new virtual machine – documented in separate file

People talk about Gnome, Cinnamon better then Gnome.

C:\Users\265167\Documents\Virtual Machines\JasLinuxMachine

***DAY 2:***

man = display manual pages

Whatis = tell u importance of ur command

Ls = list directory contents

Man fdisk = manipulate disk partition table

Apropos disk = search the manual page names and descriptions

Fdisk = manipulate disk partition table

Sudo mandb = refresh manpage

Fdisk –h

Man ls =

Difference between bash and shell.

Bash is today’s standard shell.

Shell is command line interpreter

* It takes language and convert them into function

Login Process – Not in exam

Pwd = print working directory = where am i?

Ls = what is here? = show directory names

Cd Desktop = relative move

/home/admin/Desktop = absolute move = if u start with / then it is absolute location

Doesn’t matter where I am it will take me to above absolute path

Cd /etc absolute

Cd ../../../etc

Then what do u do with files?

Create, delete, copy, move, rename, edit

Create = touch

Delete = rm

Copy = cp

Move = mv

Rename = mv

Directory management:

Create mkdir

Remove rmdir

Move them mv

dr means directory

* Means it is file

Relative vs absolute

Cd ../Downloads = is this absolute or relative????

Cd /home/admin/Desktop = absolute path

Pwd

Ls

Ls –l = expand to long listing

Ls –al = to see hidden files

Touch newfile.txt

Mv newfile.txt myfile.txt

Cp myfile.txt myfile.backup = create copy of file

Rm myfile.backup

Mkdir testdir

Cd testdir

Touch file.txt

Cd ..

Rm testdir = wont work if directory has something inside it

Rm –rf testdir = Remove directory without asking

Man rmdir

Man rm

ls –l

Identities

u — the user who owns the file (that is, the owner)

g — the group to which the user belongs

o — others (not the owner or the owner's group)

a — everyone or all (u, g, and o)

Permissions

r — read access

w — write access

x — execute access

Actions

+ — adds the permission

- — removes the permission

= — makes it the only permission

Want to test your permissions skills? Remove all permissions from foo.txt — for everyone.

Here are some common examples of settings that can be used with chmod:

* g+w — adds write access for the group
* o-rwx — removes all permissions for others
* u+x — allows the file owner to execute the file
* a+rw — allows everyone to read and write to the file
* ug+r — allows the owner and group to read the file
* g=rx — allows only the group to read and execute (not write)

To see the permissions of file = ls -l

-rw-rw-r-- 1 user group 150 Mar 19 08:08 foo.txt

What does 1 means here?

????????????????????????????????????????????????????????

-rw –rw –r

Su = switch user

Sudo = execute command as another user

Sudo groupadd testgroup

Sudo chown admin:testgroup myfile.txt

Sudo chmod u+x myfile.txt = modify to add executable permission to user

Sudo chmod g-w myfile.txt = remove write permission

Sudo chmod a+x myfile.txt = everybody has x permission

Pwd = will write the working directory on cmd

Pwd > redir.txt = will write the working directory in redir.txt file

Pwd >> redir.txt = will append working directory to redir.txt file

Pwd > redir.txt = will undo the appended changes

Grep = get regular expression

Du = disk usage

Script < data.txt

Sudo cat /etc/ssh/sshd\_config | grep –i root

IMPORTANT

Command line tools = vi, nano and gedit

Vi newtext.file = ok to use

nano newtext.file = very hard to use for jesie

gedit newtext.file = jesie love this cmd

Vi newfile.file = will create new file

* Insert mode = press i
* Command mode = press esc
* Esc =command mode, i = insert mode,

Not an editor command

* :w = write/save file???????????????
* :q=quit command mode
* :q! = quit w/o saving

a=append

(Capital a) A = append to end of the line

dd = delete line

X = delete character

5x = get rid of 5 character

5dd = get rid of 5 lines

**DAY 3:**

Good morning Jaswinder

Linux File System:

NTF or FAT in windows = modern file systems

.ext, .ext2, .ext3, .ext4 – file system in Linux

.ext4 – Current Debian File system

.xfs – Current Red Hat File system

Difference between tebibyte and terabyte?

* Marketing terminology
* Base 2 math idea = tebibyte
* Base 10 math idea = terabyte
* Converting from one to another, u will loose space.

FHS = Filesystem Hierarchy Standard

Everything in Linux is file

/bin = ls, executatable files

/boot = don’t poke around

/dev = device file, dynamic file

/etc = configuration files

/home = home directories

/lib = library files

/media = removable media like usb stick

/mnt = old directory for mounting temporary files

/opt = optional – put software packages

/proc = don’t mess around

/root = home directory for the root user

/run = real time directory – wont make changes

/sbin = system binaries

/srv = old server area

/tmp = temporary files

/usr = old version of home directory

/var = commonly used directory. Files that change size. Log files, spool files etc

In addition to being directory, some of them are also mountpoints ???????

Mp is directory that connects to physical hard drive.

If there is NO mp, var doesn’t have it’s own mp………..the data will go to root.

Anything where data doesn’t go to mp all live in under ROOT.

/etc/fstab = config file under etc directory. It contain information about physical device and associate with mountpoint. Know what fs to expect and what permission options.

LVM – Logical Volume Manager

Disk or partition of disk is physical volume.

When connect to system and it boots – it becomes files

/dev/sd b =sd suczi disk

/dev/hd a = hd hard disk

Take 1 or more physical vol and create Volume Group.

Vg\_name

Physical volume is physical disk

Volume group is 1 or more physical volumes

Logical Volume is a partition of the volume group. We can name logical volume as root, swap, home, opt etc.

Physical disk = partition table + sectors

Sector 0 ………….sector 1000

Fdisk is tool to do partition

Each partition will have some sectors

After **patitioning** u want to **format** the disk space.

Then u **mount** it. Mount /dev/sdb/mnt/desk

Uuid is tool to give consistent name

Click on Add

Choose Hard Disk

Press Next

Leave at SCSI

Create new virtual disk

Maximum size 20, single file

Finish

Repeat with 10, 10

U should have hard disk of 30, 20, 10, 10

--STUFF drawn on the board

Mountpoint = where we wana attach our disk space.

Example: /mnt/newdisk/pt

/opt/newapp

/opt/newapp2

Size = 10, 5,4 gb

Fstype = xfs, ext3, ext4

LAB 4 – Disk Management

Commands to run:

Su

Fdisk –l

Fdisk –l | grep /dev/sd

Fdisk /dev/sdb = it will take to utility

M

P

N = to create new partition

Press enter

Press enter for partition number

Press enter for first sector

+10G = for last sector

P = see

N = to create new partition

….

+5G for last sector

P

N= to create new partition

……

+4G for last sector

w= write partition to disk

**FORMAT above partitions**

Mkfs.xfs /dev/sdb1 =mkfs.fstype

Mkfs.ext3 /dev/sdb2

Mkfs.ext4 /dev/sdb3

**MOUNT the partition**

Cd /opt

Mkdir /mnt/newdisk

Mkdir /mnt/newdisk/p1

Mkdir /opt/newapp

Mkdir /opt/newapp2

**Make backup**

Cp /etc/fstab /etc/fstab.original

**Edit /etc/fstab**

Gedit /etc/fstab

# 20GB physical partition

/dev/sdb1

Device name, mount point, fstype, defaults, 0 0

Save gedit and close

Mount –a

Df –h

Cat /etc/fstab

**Day# 3**

Good morning powerpoint 8

User management

15 multiple choice questions – include user management - Quiz

Friday written exam – close

Practical – open book

Useradd username

Useradd Jaswinder

* create /home/Jaswinder
* Associate login shell = /bin/bash
* Group Jaswinder as Primary group

In order to set password, u need different command.

* Set the password using passwd Jaswinder

Useradd –m –d /home/mike1……………= pointless exercise just to put add comments

Example 2: GOOD example

* Put in different directory

Example 3:

/etc/passwd

/etc/group

Userdel – just remove configuration files. It doesn’ t remove home directory etc.

That’s why always use userdel –r username

Group u need for admin user is WHEEL group

Password goes to shadow file.

Username: hashed password

To become root user: su

Tail /etc/passwd

Tail /etc/group

Id testuser1 = give userid and group id

Tail /etc/shadow

Passwd testuser1

Tail /etc/shadow

Ls –l /etc/passwd

Ls –l /etc/group

Ls –l /etc/shadow

Useradd –d /home/test1 testuser2

Man useradd

Useradd –r = will create system account, no home directory, no user id

Ls –al /home/testuser1

Ls –al /etc/skel

Cp –r /etc/skel /etc/helpdesk.skel

Cd /etc/helpdesk.skel/

Pwd

Ls –al

Mkdir supportDocs

Touch userguide.pdf

Touch campusmap.pdf

Touch ticket.xls

Cd ..

Pwd

Ls –l

Useradd –m –k /etc/helpdesk.skel/ helpdeskuser

=m create home directory

Cd /home/helpdeskuser/

Ls –al

Man usermod

Usermod –aG wheel helpdeskUser //make them administrator IMP

Useradd –r apacheuser //created system user

Ls –l /home = wont see apacheuser

Id apacheuser = didn’t create home directory, doesn’t get expiry, no user id

Tail /etc/password

Groupadd testgroup1

Tail /etc/group = groups are container to hold users

Userdel testuser1 = don’t bother to delete user……..just create new one

Ls –l /home

Userdel –r testuser2 = better command

Lab:

D = directory

* = regular file

L = symbolic link = ln –s target of the link (existing file) linkname

Ln –s /Etc/sysconfig network

Chown user: group filename

Chmod to change permissions

Chown larry admin linux

Id larry

Lab 5:

Mkdir

touch

Yum install tree

Username, password in shadow file, userfile, group file, home directory, login sheel

Networking basics

Ping , ifconfig, route

Ping is equal to ping –t in windows

-ens33(interface name)

Nslookup – domain name lookup

Commands:

Cd /etc

Cat resolv.conf

Cd sysconfig/

Ls

Cat network

Cd network-scripts/

Ls –l Green files are scripts/executable

Ifconfig

Inet = sait ip address

Gedit ifcfg–ens33

Ping 10.163.37.234 to ping printer

Traceroute 8.8.8.8

If u are not root user then u need SUDO

**Script:**

Text based program. No compilation.

Collection of shell commands.

Launch unique shell

Command as admin:

Echo $PATH

Value of path is directories

Mkdir bin in /home/admin

Cd bin

Gedit variable.sh

#!/bin/bash

# this is a comment

Echo “Hello World”

Chmod a+x variabl.sh

Variable.sh //Run the script file

Cp variable.sh ~/Desktop/

/home/admin/Desktop/variable.sh

Gedit variable.sh

#Manually settting a variable

Var1=value

Echo “The value of var1 is: $var1”

Variable.sh

Gedit variable.sh

#Capture value of command output to a variable

Commandout=’ls’

Echo “The command output is $commandout”

Variable.sh

Gedit variable.sh

#Capture input from STDIN/keyboard

Echo “Type something in:”

Read INPUT

ECHO “YOU TYPED: $INPUT”

Variable.sh

Gedit variable.sh

#input from the command line options

Echo “you entered $# command line variables”

Echo “The script you ran in $0”

Echo “The first command line variable value is $1”

Variable.sh 1

Decision Making

Gedit decisions.sh

#!/bin/bash

# demo if-then and case

# if-then statements = TASK 1

If[ $# -eq 2 ]; then

Echo “the value of variables 1 is $1”

Echo “the value of variable 2 is $2”

Else

Echo “usage: decision.sh var1 var2”

Fi

Decision.sh

Usage: decision var1 var2

decision.sh value1 value2

gedit decision.sh

#case statement

Case “$1” in

SAIT)

Echo “MD113”

;;

NAIT)

Echo “Edmonton”

;;

\*)

Echo “some other things happen here”

Esac

decision.sh value1 value2

<https://linuxhint.com/read_file_line_by_line_bash/>

gedit loops.sh

#!/bin/bash

# while loop demo

#while loop

TEST=0

COUNT=0

While [ $TEST –ne 1 ]; do

Echo “value of TEST is $TEST

Echo “Value of cOUNT is $COUNT

COUNT=$[$COUNT+1]

Echo “Enter new value for TEST”

Read TEST

done

-----------------------------------

ch a+x loops.sh

loops.sh

gedit loops.sh

#!/bin/bash

# for loops demo

DATA=”MD022 MD315 MD321”

For ROOM IN $DATA; do

Echo “$ROOM is a room in Stan Grad”

done

**Commands - Solution: Create Users Accounts**

Su = switch to root directory

Useradd Larry = add user

Usermod –aG wheel Larry = make Larry an administrator

Useradd –r apacheuser = create system account user

Usermod –l apacheuser = lock the account

Usermod –s /sbin/nologin apache = configure the shell to be /sbin/nologin

Passwd Larry = set the password for Larry

To check things: tail /etc/group = to check groups

**Commands - Solution: Create Groups and Management**

Groupadd Admins = create group admin

Usermod -g Admins Larry = assigned Admin group to Larry

To check: Id Larry = to check the group of Larry

**Commands - Solution: configure the permissions**

Chgrp Admins Linux = change the group of the Linux directory

Chown Larry:Admins Linux = change the user of the Linux directory to Larry

Touch unix = create file name unix

Chmod u+r unix = change permission of unix file

Ln –s /etc/sysconfig/network network = link

Rwx if u have r-x means user doesn’t have write permission

**Commands - Solution: configure the ACL permissions**

**Setfacl –m u:Darryl2:rw ACL = user Darryl2 have rw permission**

**Setfacl –m g:Social:r ACL = group Social have r permission**

**Setfacl –m g:Admins:- ACL = group Admins have no permission**

**m stand for multiple files.**

**Getfacl ACL = to see the result**

**Commands - Solution: create user/groups with specific GID/UID**

Useradd JohnDoe

Usermod –u 2000 JohnDoe = gave uid to JohnDoe

Groupadd Developers

Groupmod –g 3003 Developers = gave gid to Developers

Usermod MiltKent –g Helpdesk = Make the users’ primary group the Helpdesk group

Usermod MiltKent –g Helpdesk –G Developers

**Usermod** JohnDoe –g3003 –G3004 = add user to group with their primary id and secondary id

Id Johndoe = see the result

**Commands - Solution: etc/passwd**

Useradd –c “Milt Kent” MiltKent = give full name to username Miltkent

Tail /etc/passwd = see the result

Usermod –u desireduid Miltkent = next increment

mkdir /export/home/username = Modify the users Home Directory to be contained in /export/home/

Practical Final Exam:

1. Create Virtual Machine

2. Create Users

3. Configure system firewall

4. Script

Remote System Access

Command line options:

1. SSH

2. Telnut – unsecure

3. VNC – GUI

4. remote x

Opening firewall = TCP port 22

Telnut runs TCP as well

VNC = multiplatform

Commands:

Linux 1 machine

Ifconfig

Make connection from linux 1 to linux2 machine and I want to be root user at linux2 machine

Ssh –l root 10.163.37.54 = for connection to 10..number as root user

Key fingerprint should not change

Cd /home/admin/Desktop

Touch sshfile = U will find file on the computer u connected to

Ssh [root@10.163.37.54](mailto:root@10.163.37.54)

KEY PAIRS

Ssh-keygen = run as user want to connect to other

RSA key pair = set of files on Linux1 (key.pub & key.private) . RSA is security company that does encryption. Public key I distribute to another machine and then use it as authentication method.

Things that are encrypted with public key can be decrypted with private key and vice versa.

Cd .ssh

Ls –l = see 2 files (id\_rsa, id\_rsa.pub)

Ssh –copy-id [root@10.163.37.54](mailto:root@10.163.37.54)

Ssh [root@10.163.37.54](mailto:root@10.163.37.54)

Exit

Linux 2 machine

Ifconfig

Excerise:

Ssh-keygen

Ssh-copy-id user@ipaddress

Ls –al

Cat authorized\_keys

Exit

Cat id\_rsa\_pub

1. create partition

2.format

3. mount

4. Edit

5. Run

SECURITY:

User

System

Network

**USER SECURITY:**

How to age password?

Chage –l username = current info for password changing

U have to be ROOT user

COMMAND DEMO:

Chage –l admin = admin is username

Sudo setenforce permissive

Sudo chage –M 90 admin

Passwd

Chage –l admin

Sudo chage –E 2019-12-31 admin

Process:

Create user

Chage

Setup password

**SYSTEM Security:**

WE DON’T WANT SELINUX FOR NOW IN OUR CLASS

Remote Access = Service management + Security management

Turn off service – NOBODY to access machine

Configure service – CERTAIN PEOPLE TO ACCESS MY MACHINE

Configure service & firewall

Systemctl –a = pile of stuff on my screen

Systemctl –a |grep –i ssh

Sudo systemctl status sshd = what’s going on with service

systemctl

Action(

status,

stop = immediate

start = does not survive reboot

restart

enable = only take effect on reboot

disable = only take effect on reboot

Servicename

Sudo getenforce = SELINUX has 2 commands setenforce and getenforce

1. enforce

2. permissive

3. disabled

Cat /etc/selinux/config = configuration file

FINAL EXAM:

How to run setenforce command

And gedit: SELINUX TO PERMISSIVE

SUDO GEDIT /etc/selinux/config

SELINUX = permissive

FIREWALL:

Iptables

3 types of Traffic:

Input traffic - Who destination ip is you

Output traffic – destination is anywhere else

Forward traffic – passing traffic through u.

Firewalld

EXAM = use GUI to setup firewall

Application – sundry – firewall

Option – change zone of connection – select work

Now if u scroll your zones - u will get probably same

U can turn http and https if u want people to see

To make it permanent = Options – Runtime to permanent

Port – Add 25681 tcp = open port

**Runtime to permanent**

Option – panic mode = drop every connection

Option – lock down = installed software which automatically wana make change to firewall

LAB – Security:

Linux Software:

Installing Software

* Yum = Yellowdog update manager
* Name of package is RPM

Process of Software deployment:

Yum install package

Yum install local.rpm

Systemctl nameof package

Cron is a task scheduling service.

At for scheduling only once.

Command Demo:

* Want web server on this system.
* Go online to find how to install linux web server
* Centos 7 run web server
* How to setup apache web server on centos 7

Sudo yum install httpd –y

Getenforce

Gedit /var/www/html/index.html

Systemctl start httpd

Systemctl enable httpd

Firewall is working if do localhost on firefox. It is working due to Apache web service.

Cd /etc

Cd httpd/

Pwd

Ls

Pwd

Sudo cp httpd.conf httpd.conf.orig

Sudo gedit httpd.conf

GUI

Options - System tools – software – gnome applications – internet browser

**LAB related Cron commands**

#!/bin/bash

# terrible backup script

echo "I should have backed something up"> -/Desktop/backup.txt

chmod a+x backup.sh

cd /etc

sudo gedit crontab

First 5 section: min, hour,day of month, month , day of week’’

Date

All \*

Specific then put that in

Sudo Gedit /etc/crontab

#AT 1pm every day , run the backup script

0 13 \* \* \* admin ~/bin/backup.sh

# Every Monday at 2:30 am txt = 1 is Monday = run on every Monday

30 2 \* \* 1 root touch /home/admin/Desktop/Mon230am.

#Every 5 mins during work hours, 8-5 weekdays except Wednesday do this.

\*/5 8-17 \* \* mon,tue,thu,fri admin touch ~/Desktop/every5min.txt

#Massive backup job runs at 1pm on Jan 1st every year

0 1 1 1 \* root /scripts/massivebackup.sh

Cd Desktop/

cd /etc/cron

Task #5

ps –ef

kill to end a process