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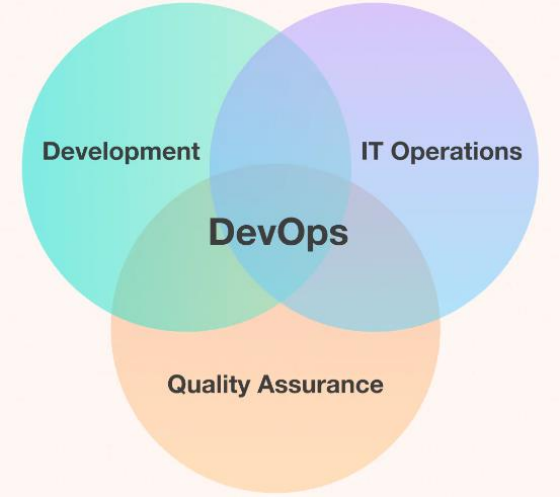
TASK 1

DevOps Concepts:

a) What is DevOps? How does DevOps Work?

The word DevOps is a combination of the terms development and operations, meant to represent a collaborative or shared approach to the tasks performed by a company's application development and IT operations teams. It is a set of practices, tools, and a cultural philosophy that automate and integrate the processes between software development and IT teams. It emphasizes team empowerment, cross-team communication and collaboration, and technology automation. DevOps describes the adoption of iterative software development, automation, and programmable infrastructure deployment and maintenance. While DevOps is not a technology, DevOps environments generally apply common methodologies. These include the following:

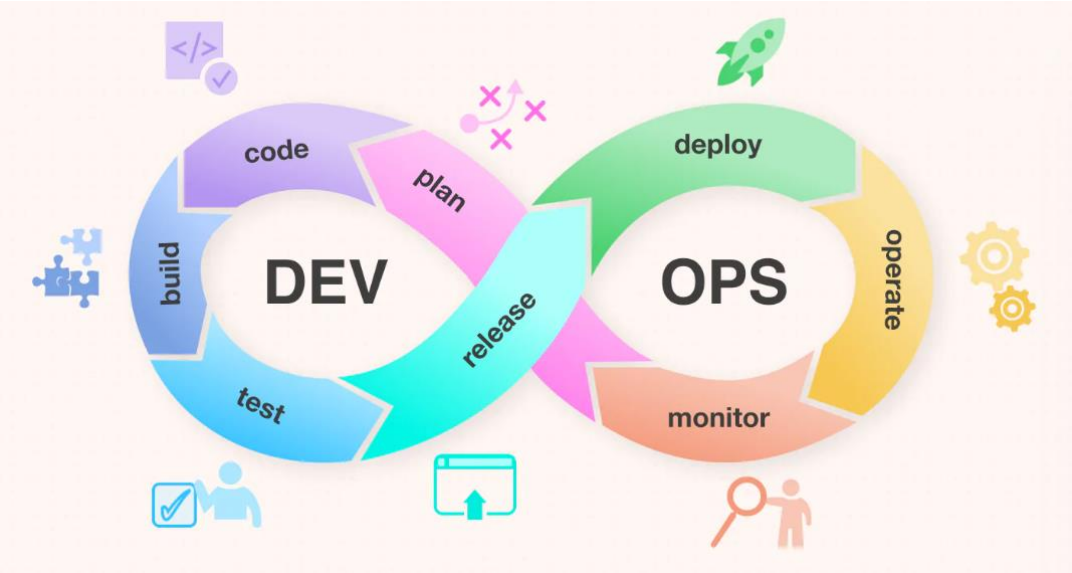
- Continuous integration and continuous delivery or continuous deployment (CI/CD) tools, with an emphasis on task automation,
- Systems and tools that support DevOps adoption, including real-time monitoring, incident management, configuration management and collaboration platforms,
- Cloud computing, microservices and containers implemented concurrently with DevOps methodologies.



DevOps works by breaking down the traditional barriers between development and operations teams, and by using tools and automation to streamline the software development process. DevOps teams work to create a culture of collaboration and shared responsibility, where developers and operations staff work together to build and deploy software. They use automation tools to automate tasks such as testing, building, and deploying code, which helps to speed up the development process and reduce errors.

b) Describe the DevOps lifecycle.

DevOps lifecycle is a series of automated development processes or workflows within an iterative development lifecycle. It follows a continuous approach; hence its lifecycle is symbolized in the form of an infinity loop. This loop depicts the collaborative and iterative approach throughout the application lifecycle, consisting of tools and technology stacks for each stage. The left part deals with software development and testing. And in contrast, the right side of the infinity loop represents the deployment and operations cycle.



1. **Plan:** In this stage, teams identify the business requirement and collect end-user feedback. They create a project roadmap to maximize the business value and deliver the desired product during this stage.
2. **Code:** The code development takes place at this stage. The development teams use some tools and plugins like Git to streamline the development process, which helps them avoid security flaws and lousy coding practices.
3. **Build:** In this stage, once developers finish their task, they commit the code to the shared code repository using build tools like Maven and Gradle.
4. **Test:** Once the build is ready, it is deployed to the test environment first to perform several types of testing like user acceptance test, security test, integration testing, performance testing, etc., using tools like JUnit, Selenium, etc., to ensure software quality.

5. **Release:** The build is ready to deploy on the production environment at this phase. Once the build passes all tests, the operations team schedules the releases or deploys multiple releases to production, depending on the organizational needs.
6. **Deploy:** In this stage, Infrastructure-as-Code helps build the production environment and then releases the build with the help of different tools.
7. **Operate:** The release is live now to use by customers. The operations team at this stage takes care of server configuring and provisioning using tools like Chef.
8. **Monitor:** In this stage, the DevOps pipeline is monitored based on data collected from customer behavior, application performance, etc. Monitoring the entire environment helps teams find the bottlenecks impacting the development and operations teams' productivity.

c) Describe the DevOps Principles.

DevOps principles are a set of values and practices that guide the culture and processes of DevOps. The following are the key principles of DevOps:

1. **Collaboration**: Work together and share responsibility.
2. **Automation:** Use tools and scripts to streamline tasks.
3. **DevOps Pipeline:** Establish a repeatable system, a loop that facilitates continuity in development.
4. **Continuous Integration and Delivery**: Deliver updates frequently and with value to users.
5. **Continuous Monitoring:** Keep an eye on the software in production to identify issues and fix them quickly.
6. **Infrastructure as Code:** Treat infrastructure as a code artifact that can be version controlled, tested, and deployed like any other software.
7. **Version Control:** Helps DevOps teams stay organized, focused, and up to date with what members of the team are doing. It also ensure teams collaborate faster and easier to support frequent software releases.
8. **Lean Thinking:** Use lean thinking principles to increase efficiency and reduce waste.

d) Explain the benefits of DevOps.

DevOps proponents describe several business and technical benefits, many of which can result in happier customers. Some benefits of DevOps include:

1. **Faster time-to-market:** DevOps helps teams deliver software updates more quickly through automation and collaboration.
2. **Higher quality software:** DevOps practices catch issues earlier in development, reducing bugs and defects in production.
3. **Improved collaboration and communication:** DevOps break down silos and encourages closer collaboration and communication between teams.
4. **Better feedback loops:** DevOps promotes continuous monitoring and feedback, allowing teams to address issues quickly and make improvements based on user feedback.
5. **Increased efficiency:** DevOps automates tasks and eliminates wasteful processes, helping teams work more efficiently.
6. **More reliable infrastructure:** Treating infrastructure as code allows for version control and consistent deployment, resulting in more reliable infrastructure.
7. **Cost savings:** DevOps reduces waste and increases efficiency, leading to cost savings for organizations.

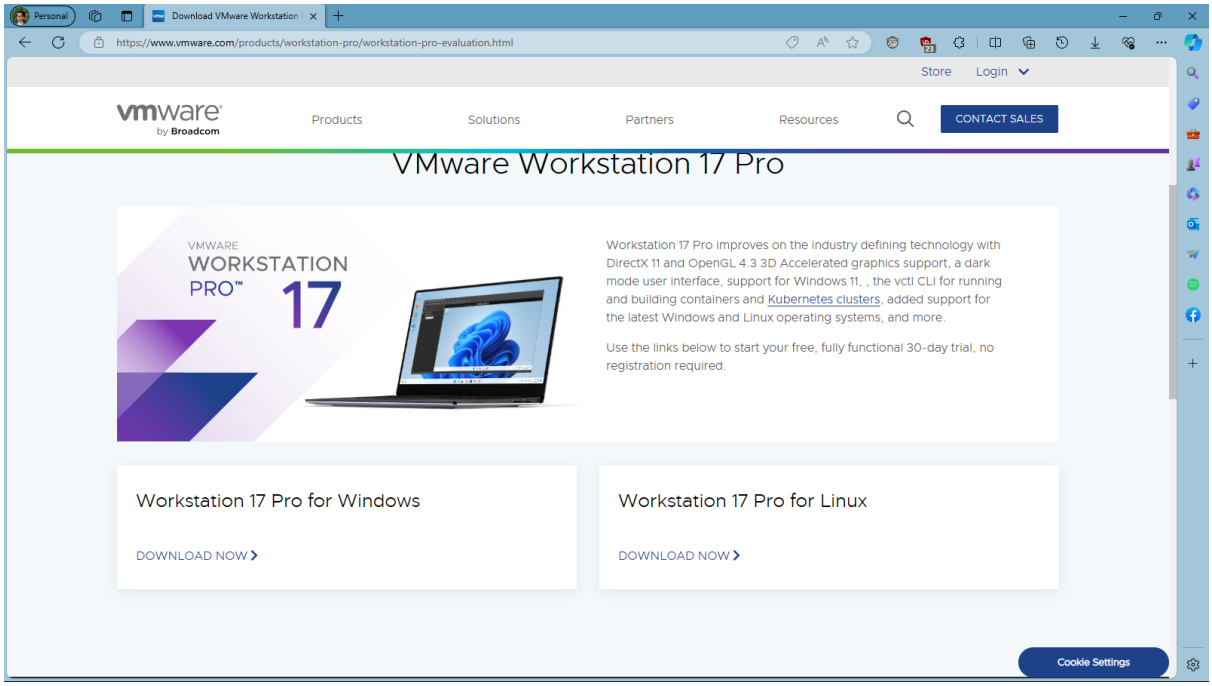
TASK 2

Preparing Lab Environment:

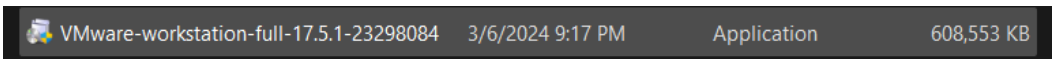
a) Installing VMware Workstation or VirtualBox?

To install VMware Workstation follow the following steps:

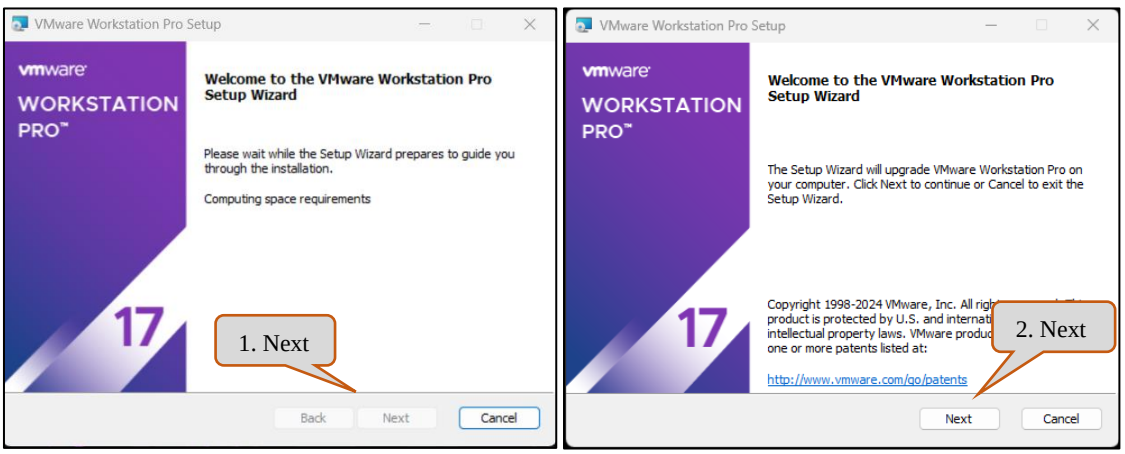
Step1: Go to Download VMware Workstation Pro and download workstation 17 pro for Windows or Linux according to the OS you have.

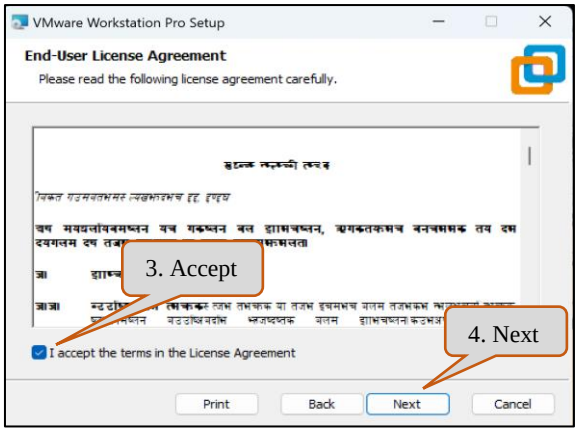


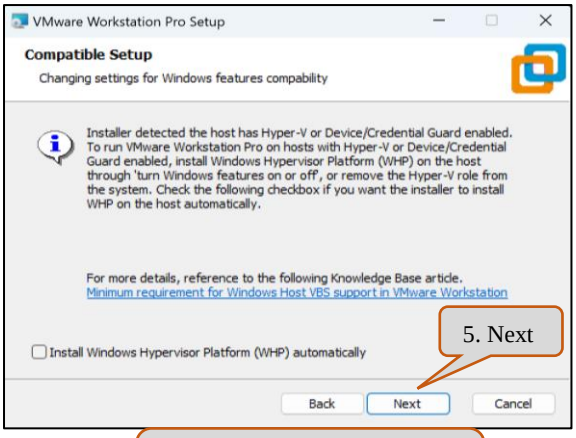
Step2: Run the installer named as "VMware-workstation-full-16.1.0-17198959.exe".

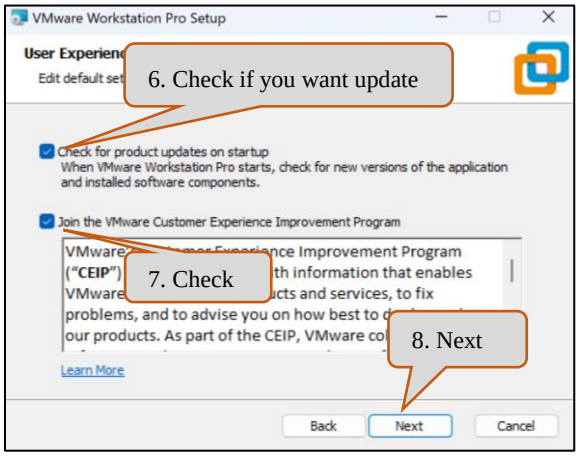


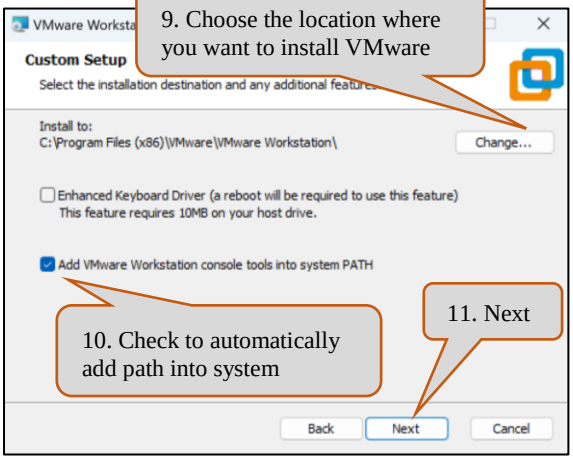
Step3: Follow the steps:

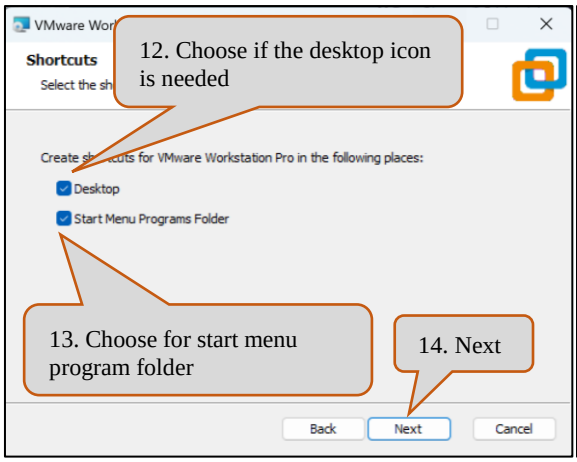


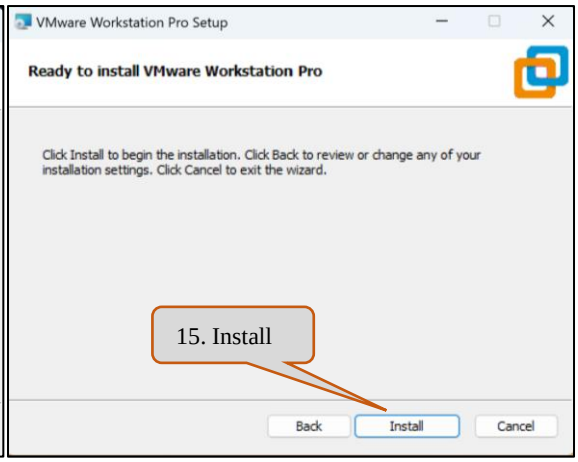

VMware Workstation Pro Setup
End-User License Agreement
Please read the following license agreement carefully.
3. Accept
I accept the terms in the License Agreement
4. Next
Print
Back
Next
Cancel

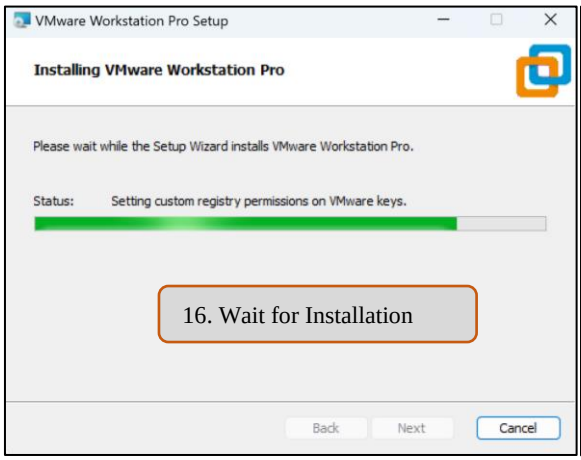

VMware Workstation Pro Setup
Compatible Setup
Changing settings for Windows features compability
Installer detected the host has Hyper-V or Device/Credential Guard enabled. To run VMware Workstation Pro on hosts with Hyper-V or Device/Credential Guard enabled, install Windows Hypervisor Platform (WHP) on the host through 'turn Windows features on or off', or remove the Hyper-V role from the system. Check the following checkbox if you want the installer to install WHP on the host automatically.
For more details, reference to the following Knowledge Base article.
Minimum requirement for Windows Host VBS support in VMware Workstation
Install Windows Hypervisor Platform (WHP) automatically
5. Next
Back
Next
Cancel

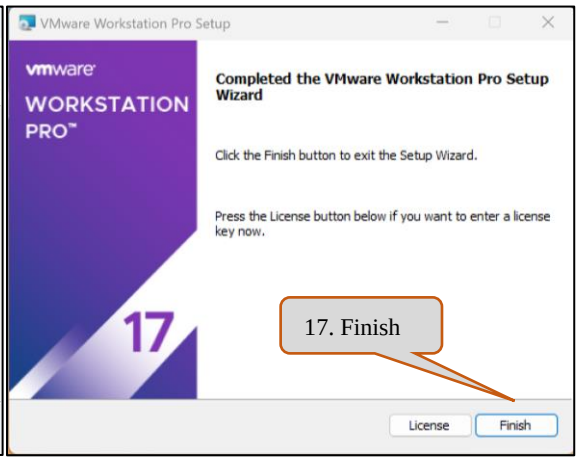

VMware Workstation Pro Setup
User Experien
Edit default set
6. Check if you want update
Check for product updates on startup
When VMware Workstation Pro starts, check for new versions of the application and installed software components.
Join the VMware Customer Experience Improvement Program
7. Check
("CEIP")
8. Next
Learn More
Back
Next
Cancel


9. Choose the location where you want to install VMware
Custom Setup
Select the installation destination and any additional features
Install to:
C:\Program Files (x86)\VMware\VMware Workstation\
Change...
Enhanced Keyboard Driver (a reboot will be required to use this feature)
This feature requires 10MB on your host drive.
Add VMware Workstation console tools into system PATH
10. Check to automatically add path into system
11. Next
Back
Next
Cancel


Shortcuts
12. Choose if the desktop icon is needed
Create shortcuts for VMware Workstation Pro in the following places:
Desktop
Start Menu Programs Folder
13. Choose for start menu program folder
14. Next
Back
Next
Cancel


VMware Workstation Pro Setup
Ready to install VMware Workstation Pro
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
15. Install
Back
Install
Cancel

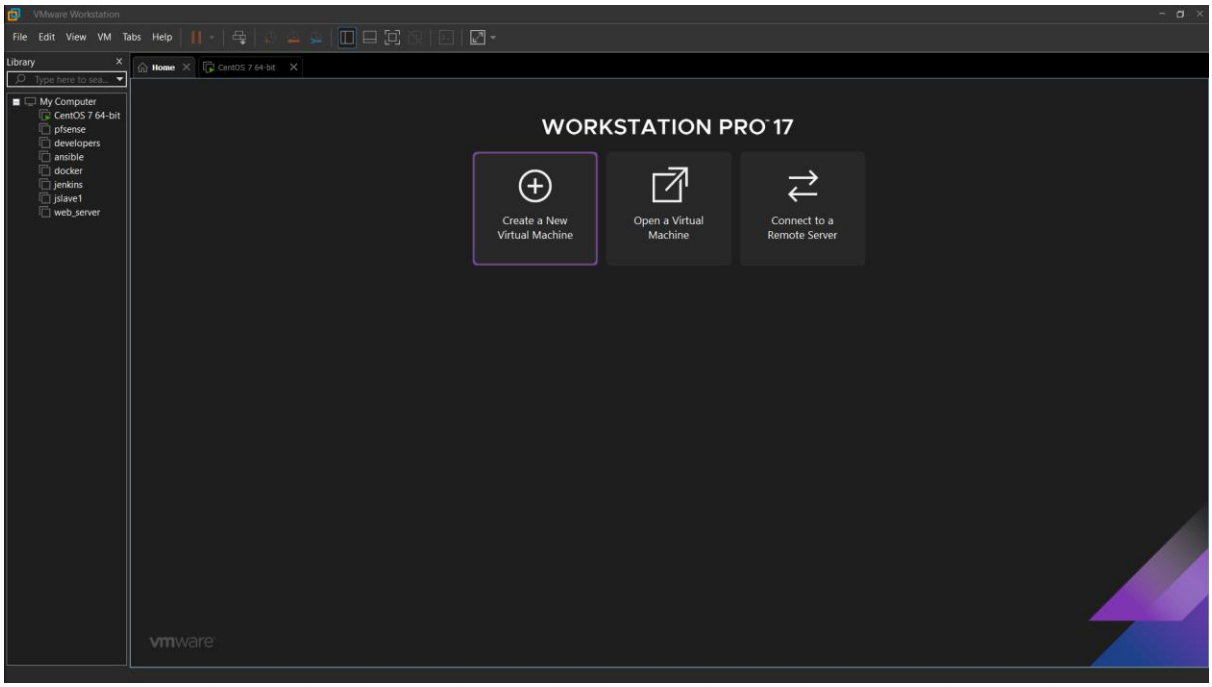

VMware Workstation Pro Setup
Installing VMware Workstation Pro
Please wait while the Setup Wizard installs VMware Workstation Pro.
Status: Setting custom registry permissions on VMware keys.
16. Wait for Installation
Back
Next
Cancel


VMware Workstation Pro Setup
vmware
WORKSTATION PRO™
17
Completed the VMware Workstation Pro Setup Wizard
Click the Finish button to exit the Setup Wizard.
Press the License button below if you want to enter a license key now.
17. Finish
License
Finish

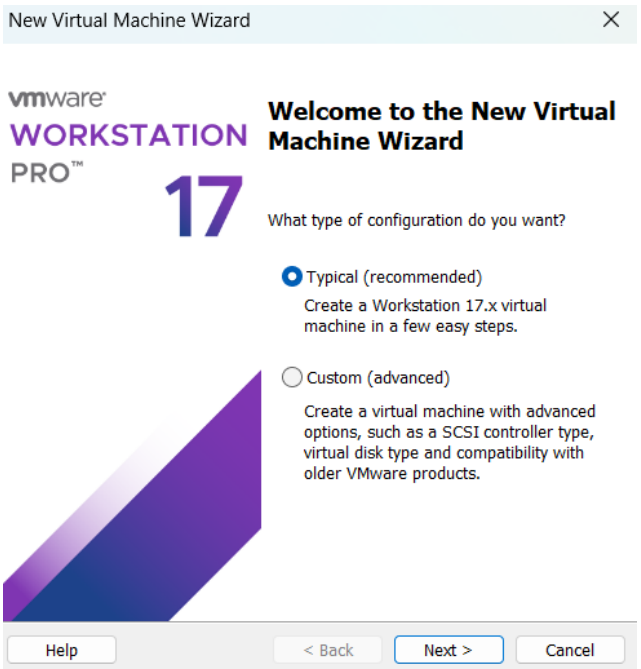
b) Creating Virtual Machine of CentOS 7.

To create the CentOS & virtual machine follow the following steps:

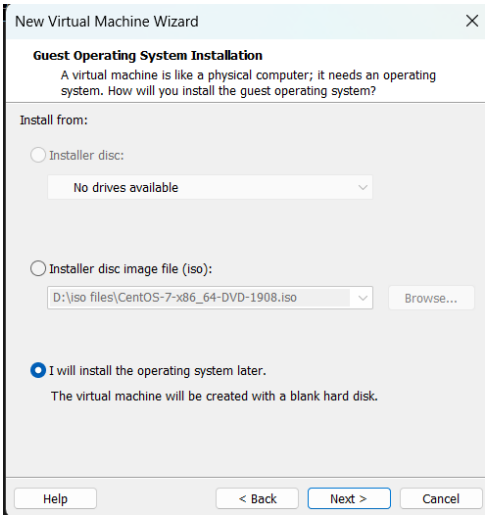
Step1: Open VMware Workstation, and select **create a new a Virtual Machine.**



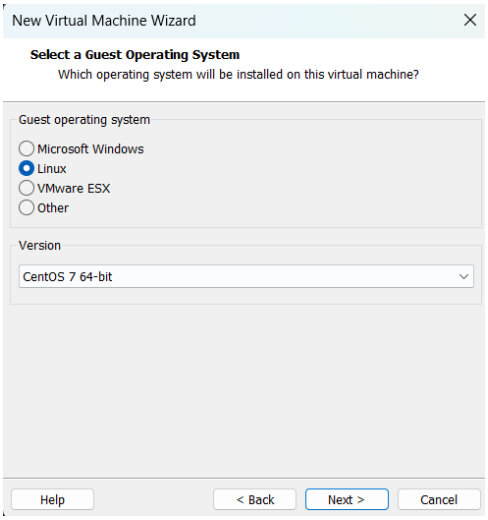
Step2: Choose **Typical(recommended)** then **Next.**



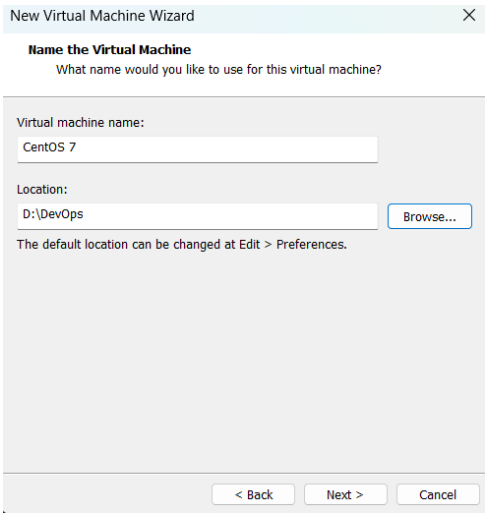
Step3: Choose **I will install the operating system later** then **Next .**



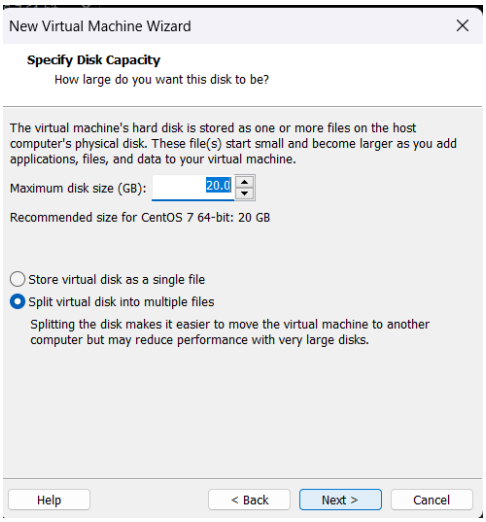
Step4: Choose **Linux** operating system and **CentOS 7 64-bit** as version and **Next.**



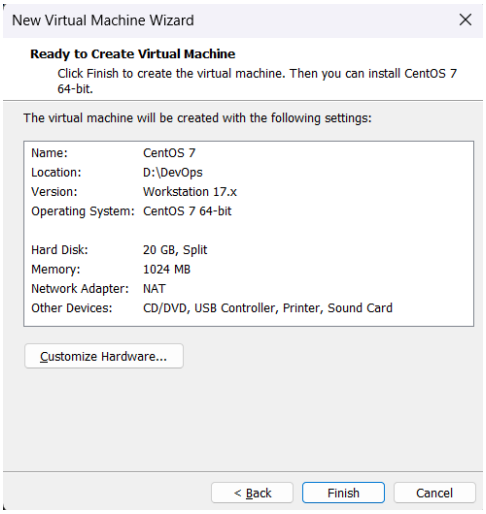
Step5: Add name for virtual machine and choose location for VM**.**



Step6: Specify Disk Capacity



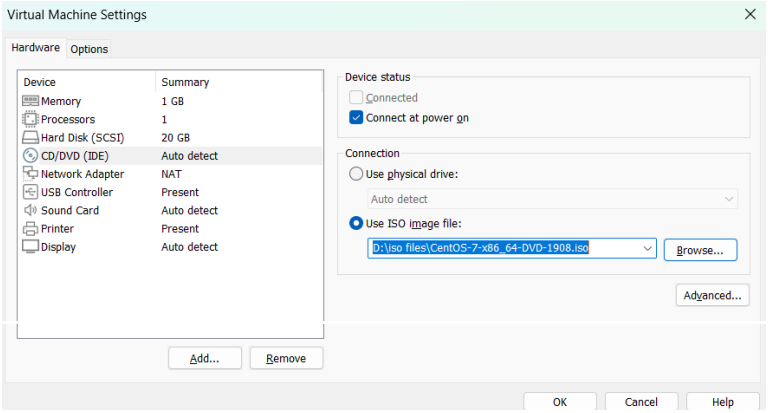
Step7: Customize hardware as per need and finish



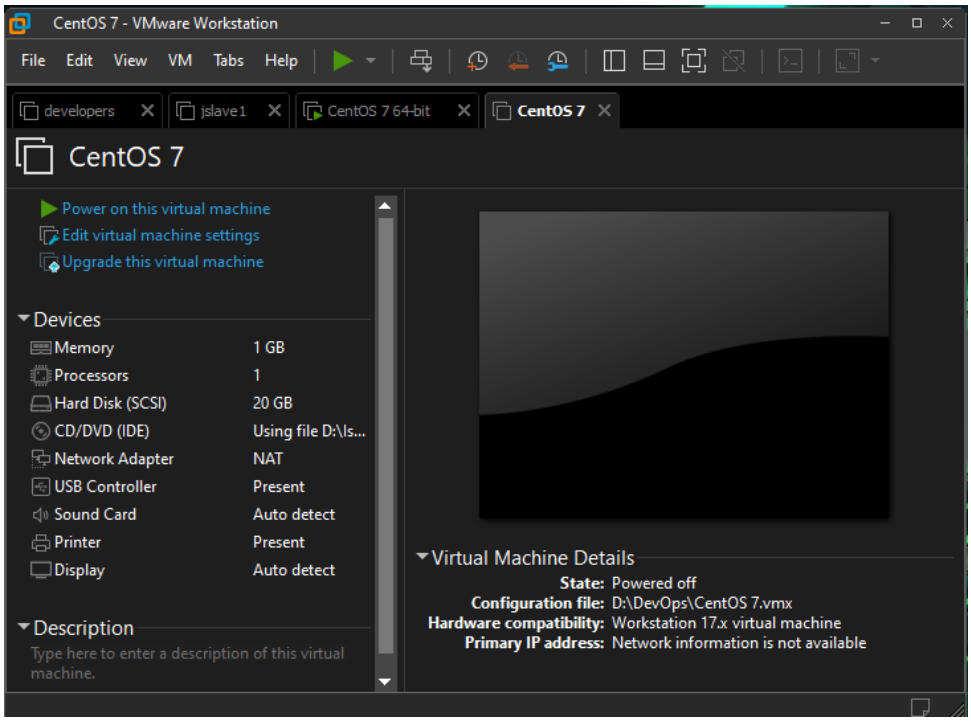
Step8: Download **centOS7 iso** file.

Step9: Go to **Edit virtual machine setting**

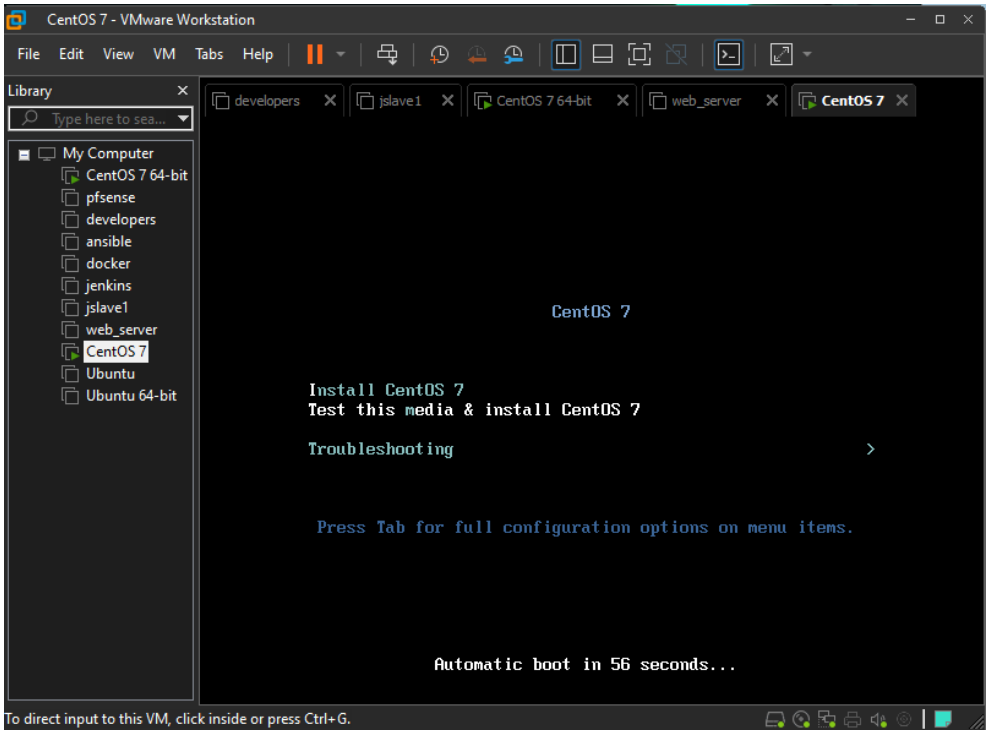
Step10: Go to CD/DVD ide, check **connect at power on,** and choose **use iso image file** and OK.



Step11: Now click **power on this virtual machine**.

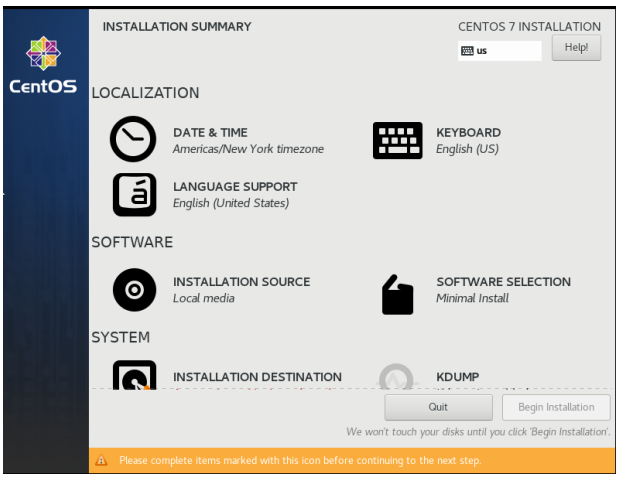


Step12: Select **Install CentOS 7** and press **Enter**.

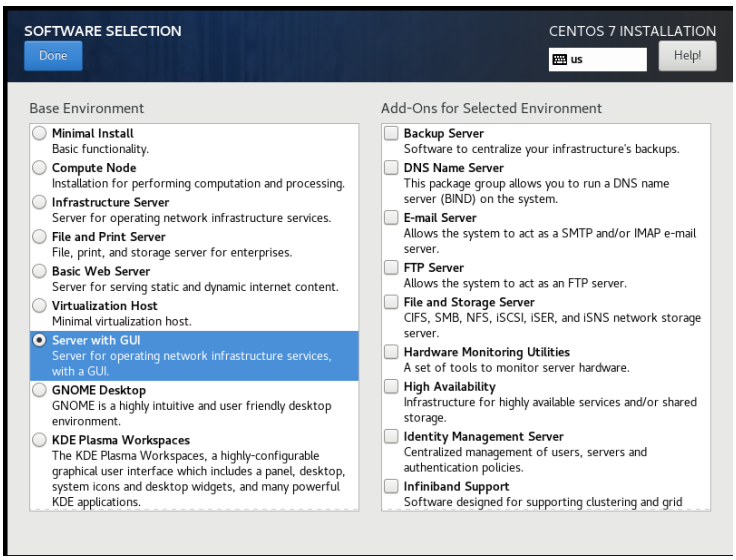


Step13: Select Language you like to use and press **continue**.

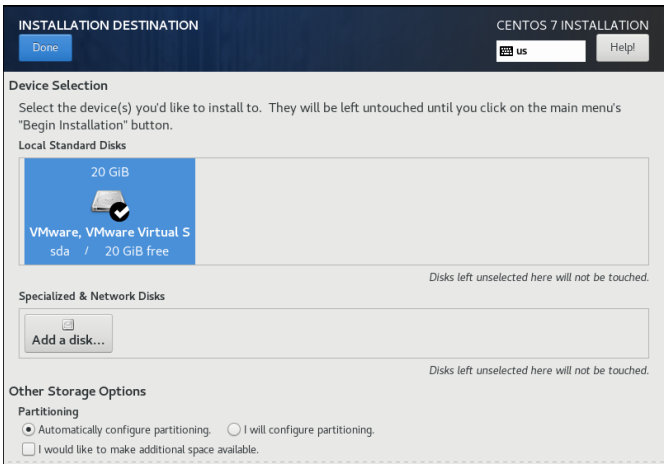
Step14:. Configure options Date and time, Language, Keyboard, Network and Hostname.



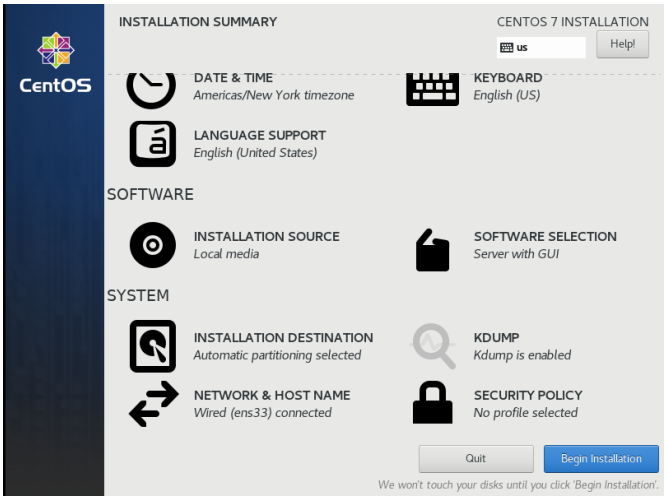
Step15: Choose the software **Software Selection > Server with GUI > Done**.



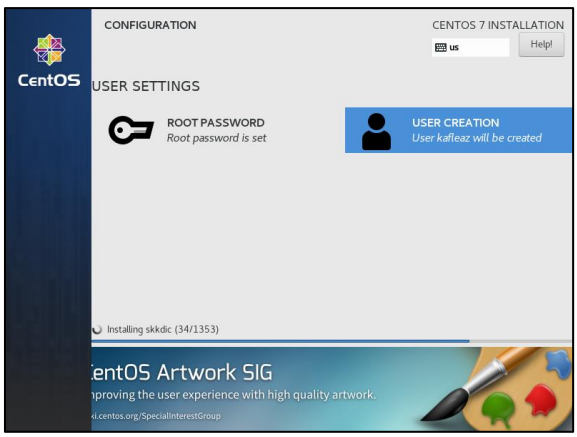
Step16: Choose **Installation Destination** as default and then **Done**.

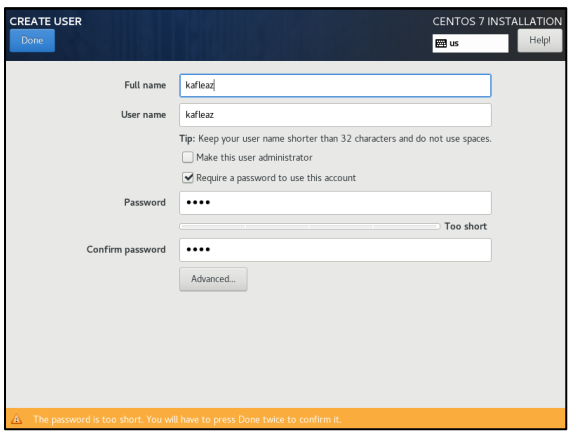


Step17: Select **Begin Installation**.

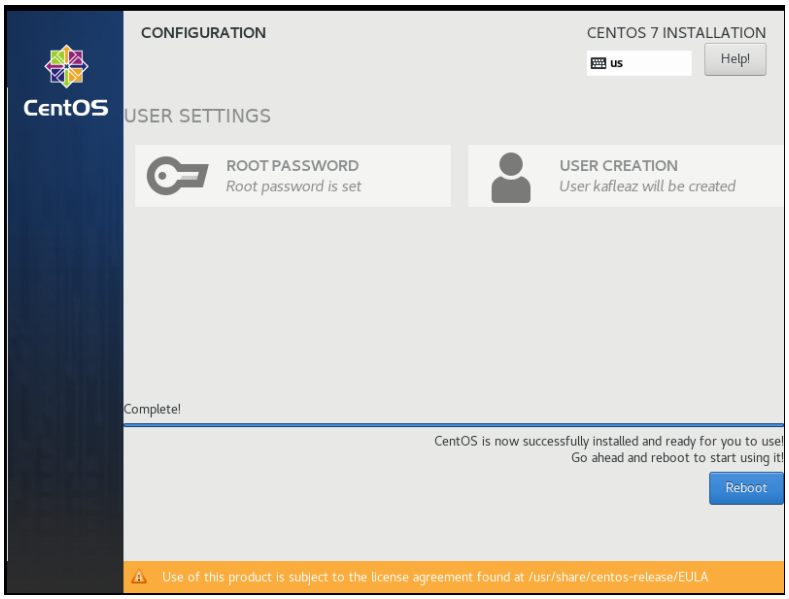


Step18: Set **password** for root and create a **user** and wait for installation.

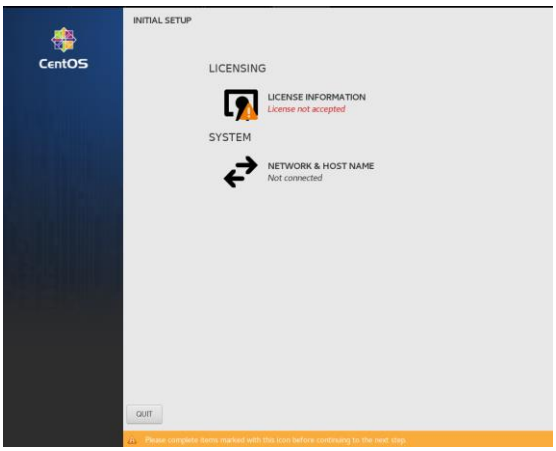


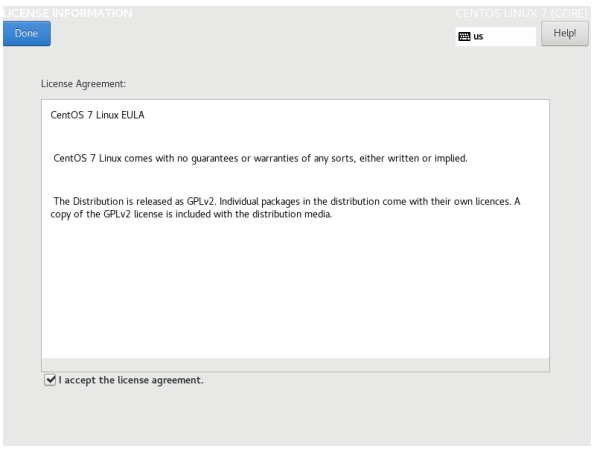


Step19: After completion of installation **Reboot**.

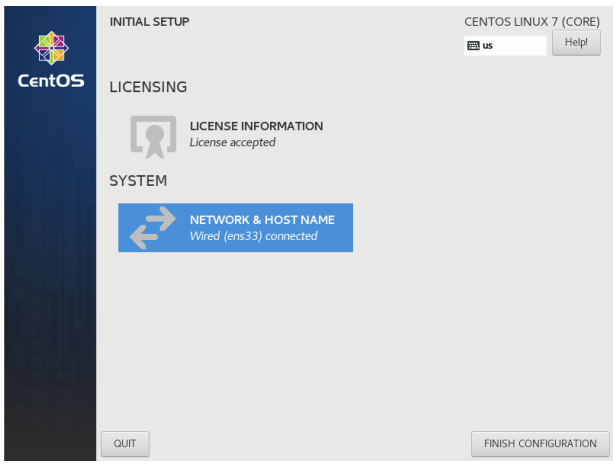


Step20: After reboot **Accept License agreement > Done and** Turn On Network.



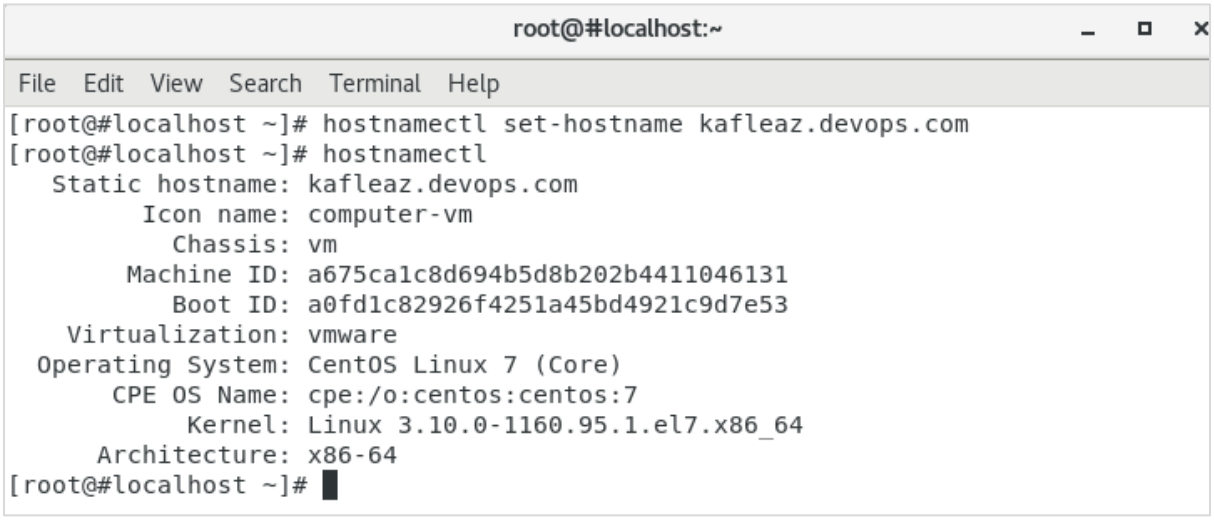


Step21:**Finish Configuration**.

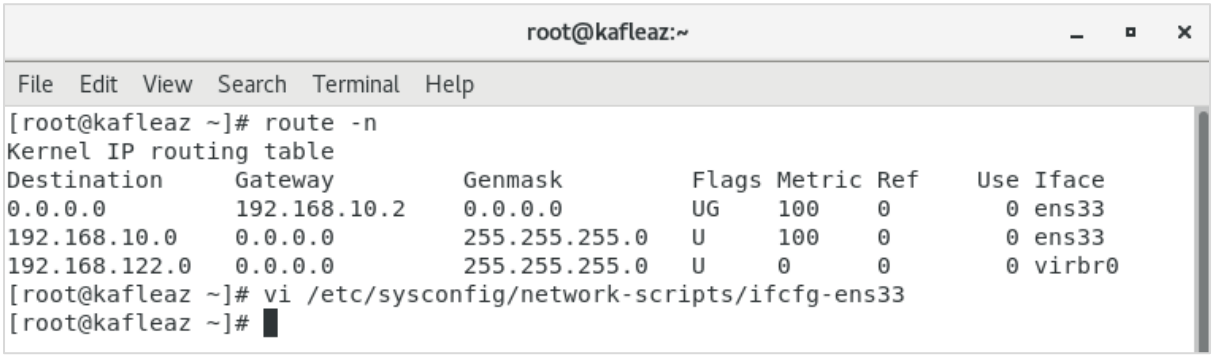


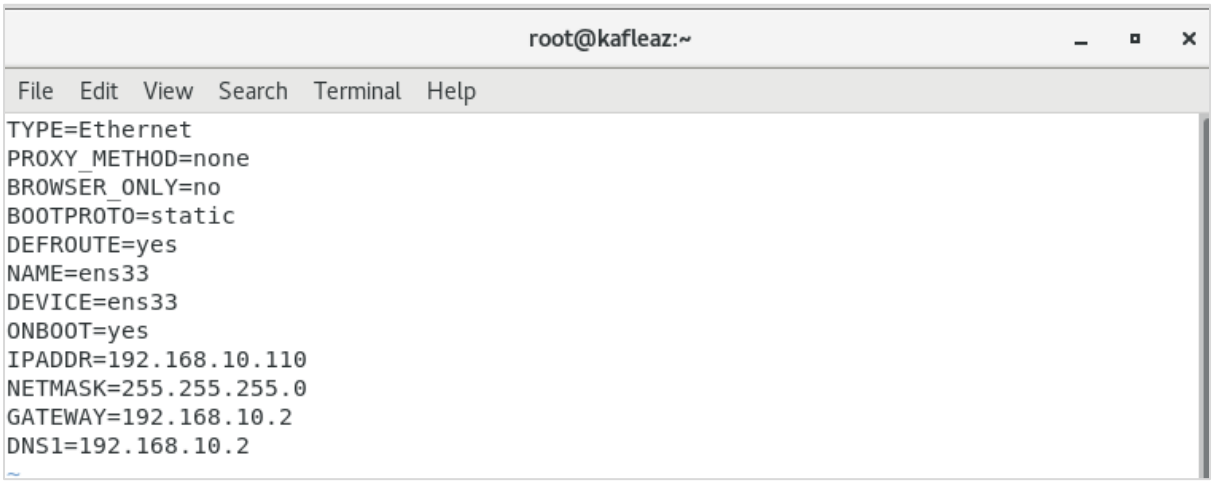
After following all the steps mentioned above our Virtual Machine of CentOS 7 is created successfully.

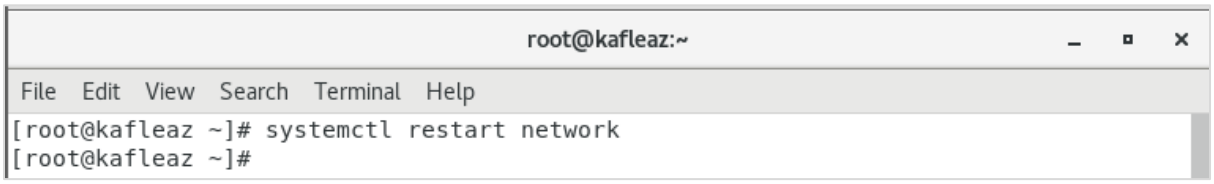
c) Assign the hostname of Linux machine as <yourname>.devops.com.



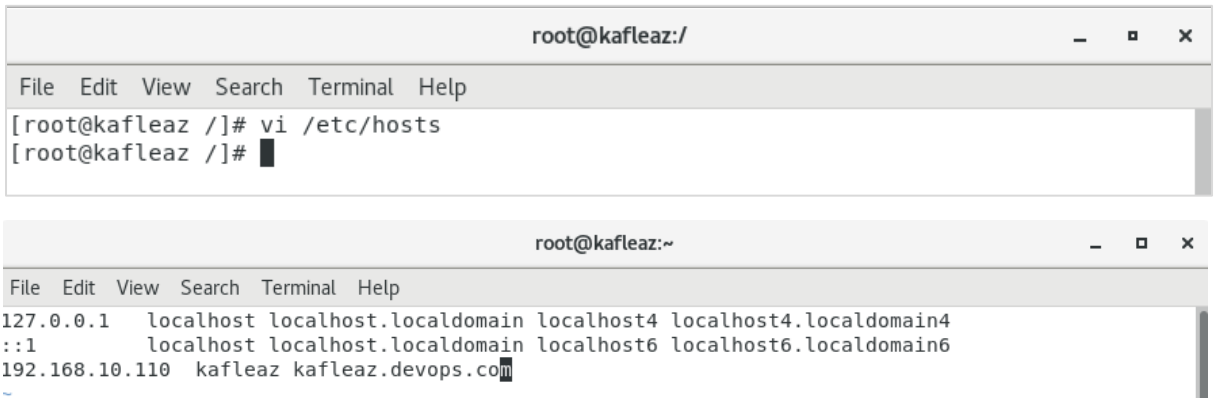
d) Configure your network interface with static ip address and start the network service.







e) Map your static ip address to your hosts name in configuration file /etc/hosts.



TASK 3

Linux Fundamentals:

a) Write brief history of Linux.

Linux is a free and open-source operating system created by Linus Torvalds in 1991. It was made as an alternative to proprietary operating systems like Windows and macOS. Linux is known for its stability, security, and flexibility, and is widely used in many industries. It is available in many different versions called distributions, and the Linux community continues to contribute to its development.

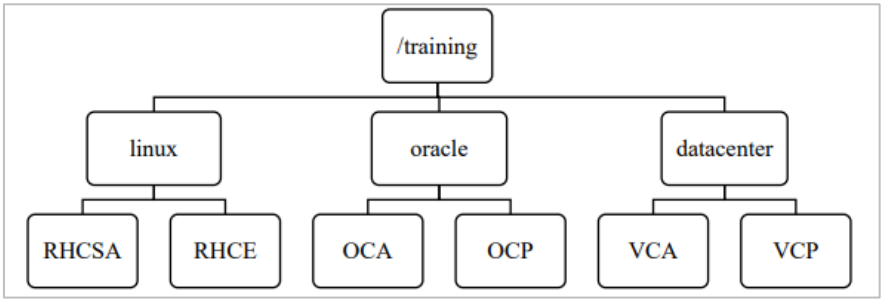
b) Describe briefly about the following Linux Filesystems Hierarchy:

/boot, /root, /user, /home, /usr/bin, /bin, /user/sbin, /sbin, /usr/lib64, /lib64, /usr/lib, /lib, /dev, /etc, /media, /mnt, /opt, /proc, /tmp, /var, /run.

1. **/boot:** Contains files needed for the boot process, including the Linux kernel and bootloader.
2. **/root:** Home directory for the root user, which is the system administrator.
3. **/user:** A directory that typically contains subdirectories for user-specific data and programs.
4. **/home:** Home directories for regular users on the system.
5. **/usr/bin:** Contains executable files for system-wide use.
6. **/bin:** Contains essential executable files required for booting and system maintenance.
7. **/usr/sbin:** Contains system administrator executables that are not essential for the system boot process.
8. **/sbin:** Contains essential system administrator executables required for system booting and maintenance.
9. **/usr/lib64:** Contains shared libraries for 64-bit applications.
10. **/lib64:** Contains shared libraries for 64-bit essential executables.
11. **/usr/lib:** Contains shared libraries for system-wide use.
12. **/lib:** Contains shared libraries for essential executables.
13. **/dev:** Contains device files for hardware devices.
14. **/etc:** Contains system configuration files.
15. **/media:** Mount point for removable media devices.
16. **/mnt:** Mount point for temporary filesystems.

17. **/opt:** Contains optional software packages.
18. **/proc:** A virtual filesystem that contains system process information.
19. **/tmp:** A directory for temporary files.
20. **/var:** Contains variable files, including logs and other data that changes frequently.
21. **/run:** Contains system runtime data.

c) Login from root user then create folders according to following tree structure.




```
root@kafleaz:/
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# mkdir -p /training/linux/RHCSA /training/linux/RHCE /training/oracle/OCA /trainin
g/oracle/OCP /training/datacenter/VCA /training/datacenter/VCP
```

```
root@kafleaz:/
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# tree training
training
├── datacenter
│   ├── VCA
│   └── VCP
├── linux
│   ├── RHCE
│   └── RHCSA
└── oracle
    ├── OCA
    └── OCP

9 directories, 0 files
[root@kafleaz /]#
```

d) Copy all the files that have *.conf* filename extensions inside */etc* directory to */root/backup* directory.

```
root@kafleaz:~/backup
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# mkdir /root/backup
[root@kafleaz /]# cp /etc/*.conf /root/backup/
[root@kafleaz /]# cd /root/backup/
[root@kafleaz backup]# ls
asound.conf                 host.conf      logrotate.conf  pnm2ppa.conf      sysctl.conf
brltty.conf                 idmapd.conf    man_db.conf     radvd.conf        tcsd.conf
chrony.conf                 ipsec.conf     mke2fs.conf     request-key.conf  updatedb.conf
dleyna-server-service.conf  kdump.conf     mtools.conf     resolv.conf       usb_modeswitch.conf
dnsmasq.conf                krb5.conf      nfs.conf        rsyncd.conf       vconsole.conf
dracut.conf                 ksmtuned.conf  nfsmount.conf   rsyslog.conf      wvdial.conf
e2fsck.conf                 ld.so.conf     nsswitch.conf   sestatus.conf     yum.conf
fprintd.conf                libaudit.conf  numad.conf      sos.conf
fuse.conf                   libuser.conf   oddjobd.conf    sudo.conf
GeoIP.conf                  locale.conf    pbm2ppa.conf    sudo-ldap.conf
[root@kafleaz backup]#
```

e) Create a directory /root/selected then move all files of /root/backup directory that have ‘o’ or ‘a’ as the second character of their file name to /root/selected directory.

```
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# mkdir /root/selected
```

```
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# mv /root/backup/?[oa]* /root/selected/
[root@kafleaz /]# ls /root/selected/
host.conf  locale.conf  logrotate.conf  man_db.conf  radvd.conf  sos.conf
[root@kafleaz /]#
```

f) Remove second character with r in path /root/backup.

```
root@kafleaz:/
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# rm -i /root/backup/?r*
rm: remove regular file ‘/root/backup/brltty.conf’?
rm: remove regular file ‘/root/backup/dracut.conf’?
rm: remove regular file ‘/root/backup/krb5.conf’?
[root@kafleaz /]#
```

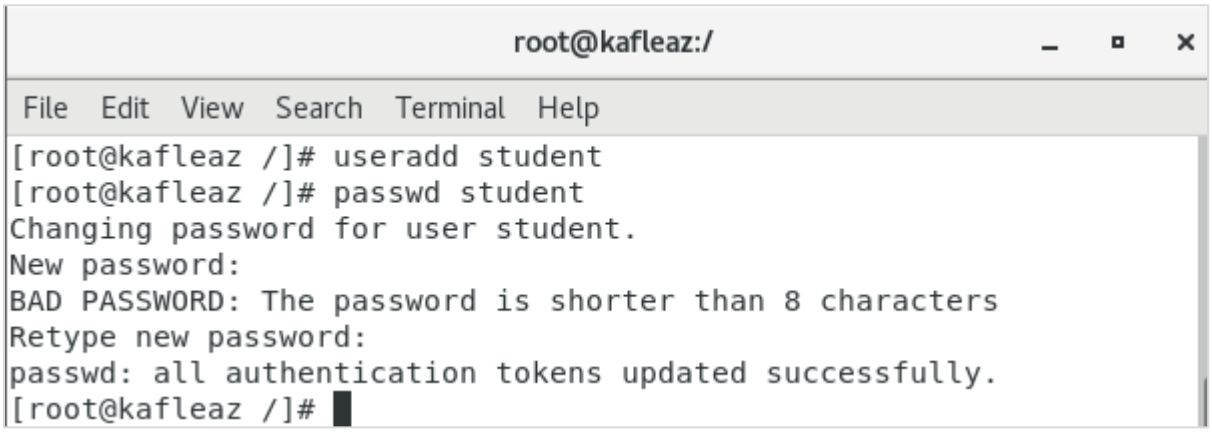
g) Remove all files and directories in path /root/backup.

```
root@kafleaz:/
File  Edit  View  Search  Terminal  Help
[root@kafleaz /]# rm -rf /root/backup/*
[root@kafleaz /]# ls /root/backup/
[root@kafleaz /]#
```

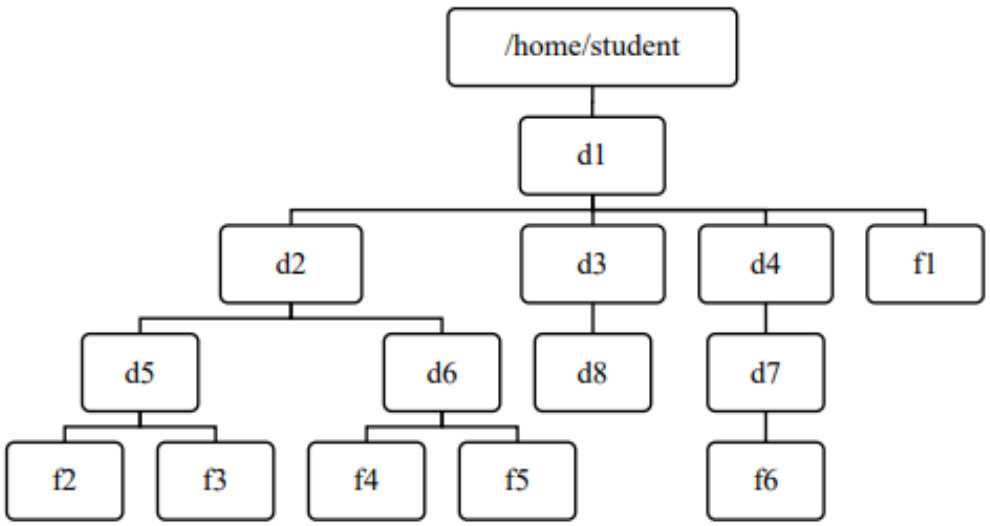
TASK 4

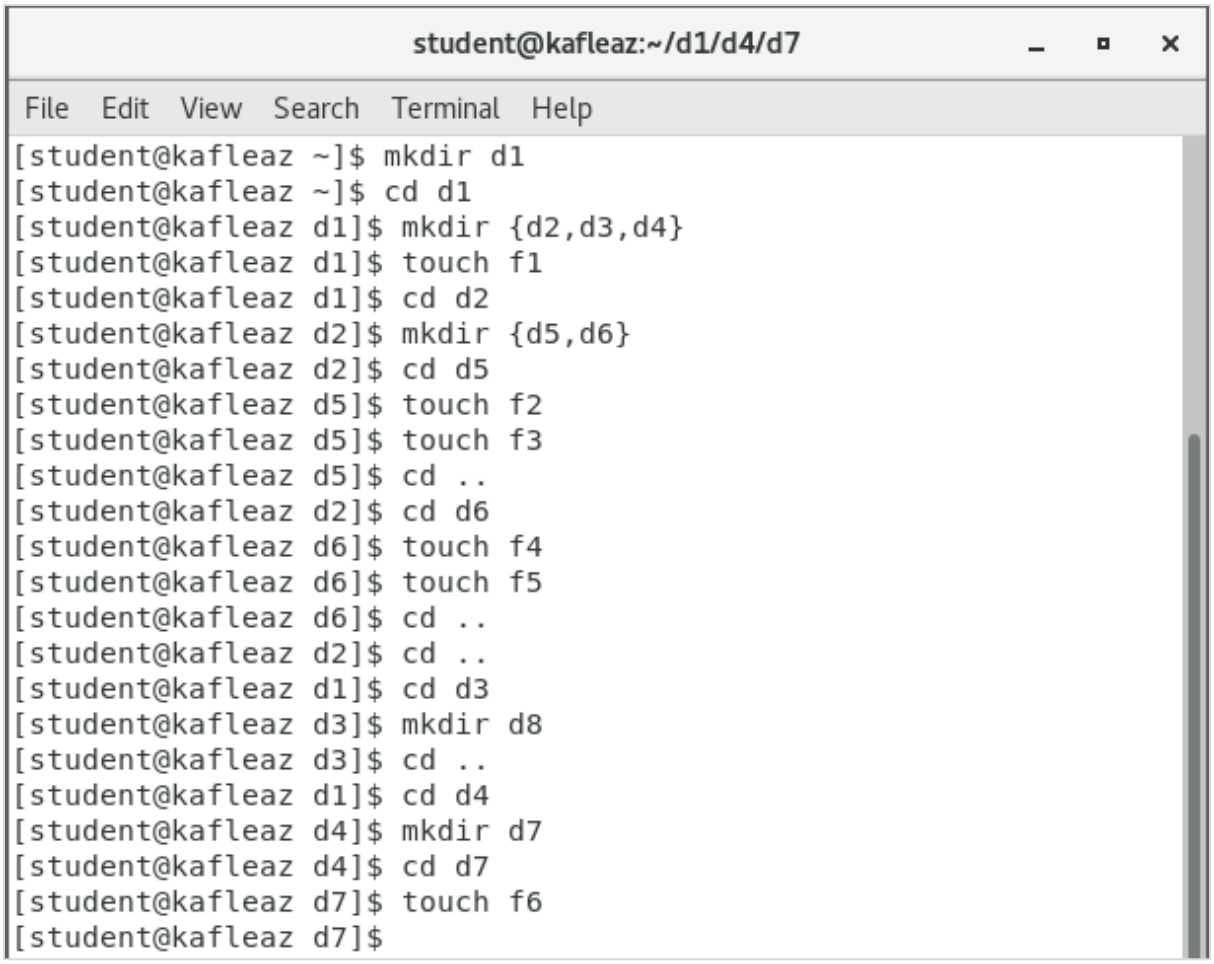
Users, Groups, Permission:

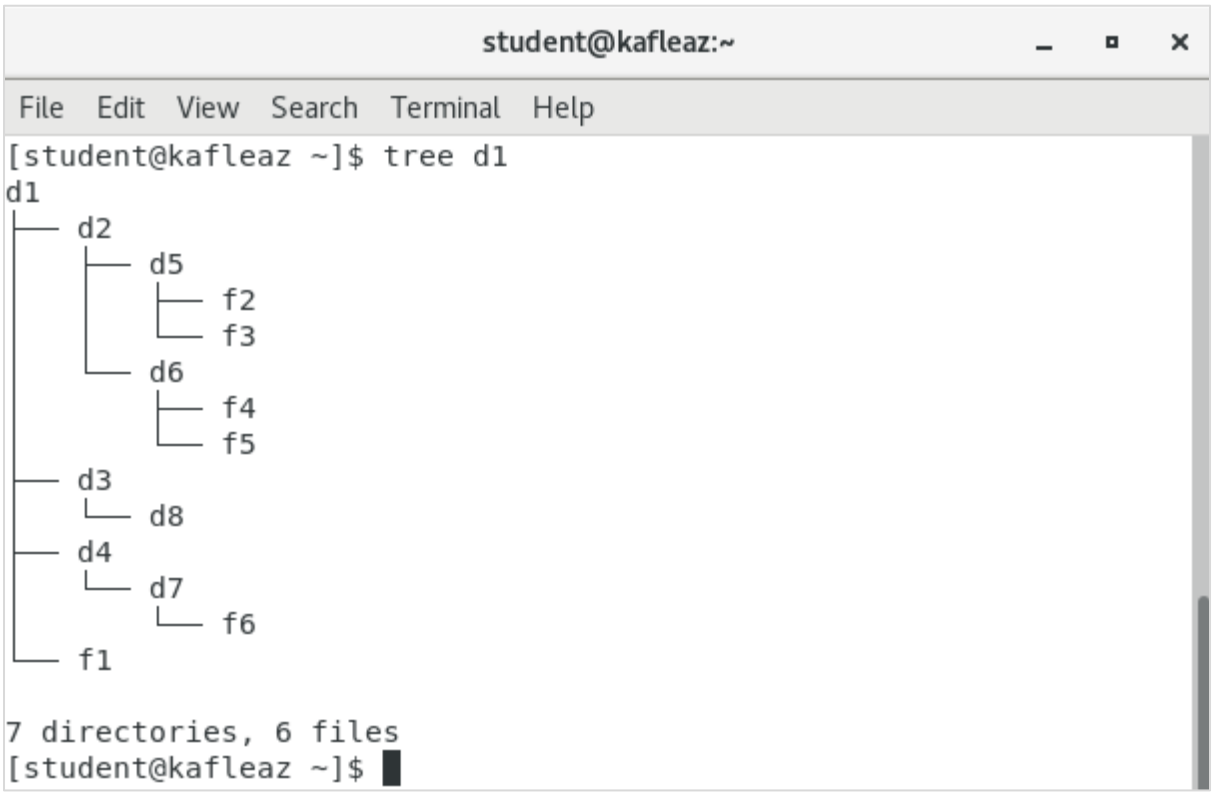
a) Create a user named student.



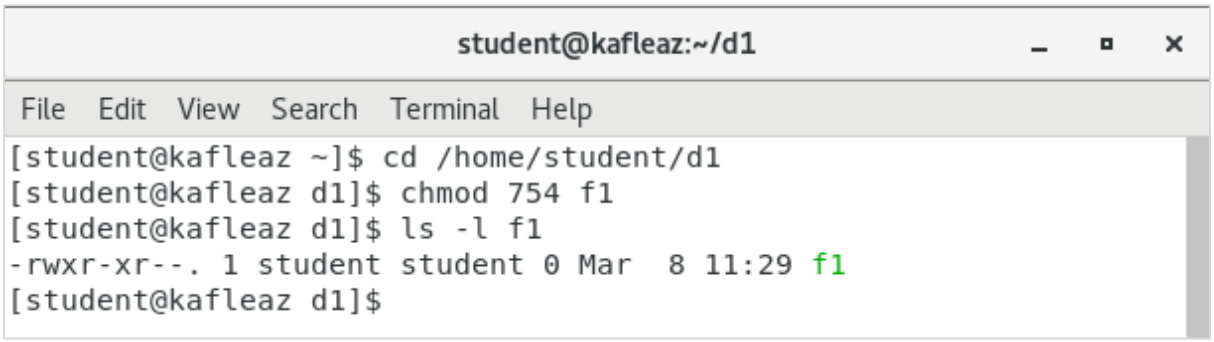
b) Login from student user then create files and folders according to following tree structure. [where, d→ directory and f→ file]



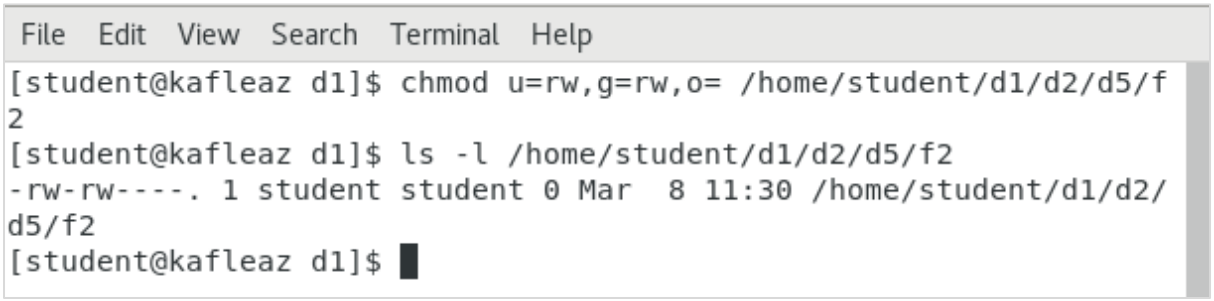

student@kafleaz:~/d1/d4/d7
File Edit View Search Terminal Help
[student@kafleaz ~]$ mkdir d1
[student@kafleaz ~]$ cd d1
[student@kafleaz d1]$ mkdir {d2,d3,d4}
[student@kafleaz d1]$ touch f1
[student@kafleaz d1]$ cd d2
[student@kafleaz d2]$ mkdir {d5,d6}
[student@kafleaz d2]$ cd d5
[student@kafleaz d5]$ touch f2
[student@kafleaz d5]$ touch f3
[student@kafleaz d5]$ cd ..
[student@kafleaz d2]$ cd d6
[student@kafleaz d6]$ touch f4
[student@kafleaz d6]$ touch f5
[student@kafleaz d6]$ cd ..
[student@kafleaz d2]$ cd ..
[student@kafleaz d1]$ cd d3
[student@kafleaz d3]$ mkdir d8
[student@kafleaz d3]$ cd ..
[student@kafleaz d1]$ cd d4
[student@kafleaz d4]$ mkdir d7
[student@kafleaz d4]$ cd d7
[student@kafleaz d7]$ touch f6
[student@kafleaz d7]$


student@kafleaz:~
File Edit View Search Terminal Help
[student@kafleaz ~]$ tree d1
d1
├── d2
│ ├── d5
│ │ ├── f2
│ │ └── f3
│ └── d6
│ ├── f4
│ └── f5
├── d3
│ └── d8
├── d4
│ └── d7
│ └── f6
└── f1
7 directories, 6 files
[student@kafleaz ~]$

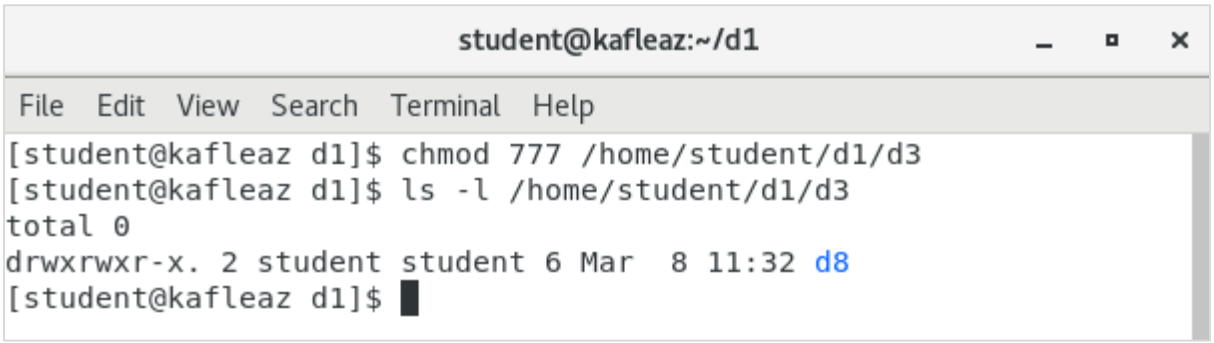
c) Change the permission of the file *f1* so that the owner will get full permission, group member will get read and execute permission and others will get read-only permissions.



d) Change permission of the file *f2* such that the owner's and group members will get read and write permission but others will get no permission.



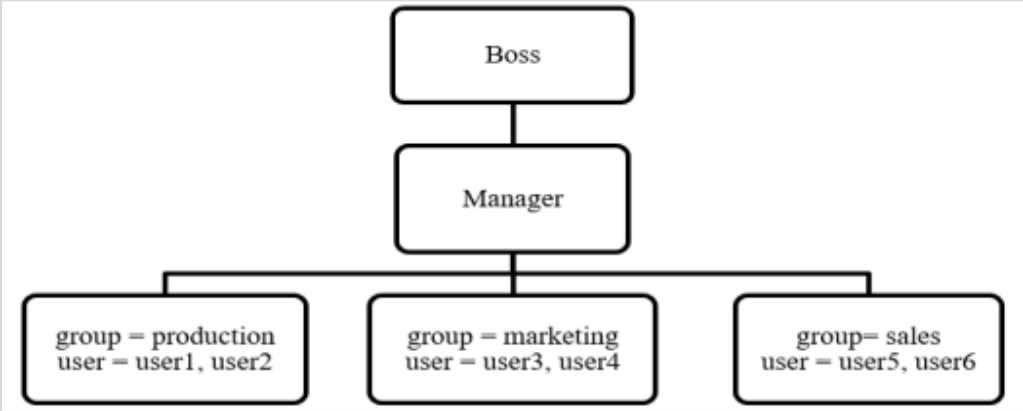
e) Change permission of directory *d3* such that all categories of users will get full permissions.



TASK 5

User and Group Administration:

a) Task below are based on following structure.



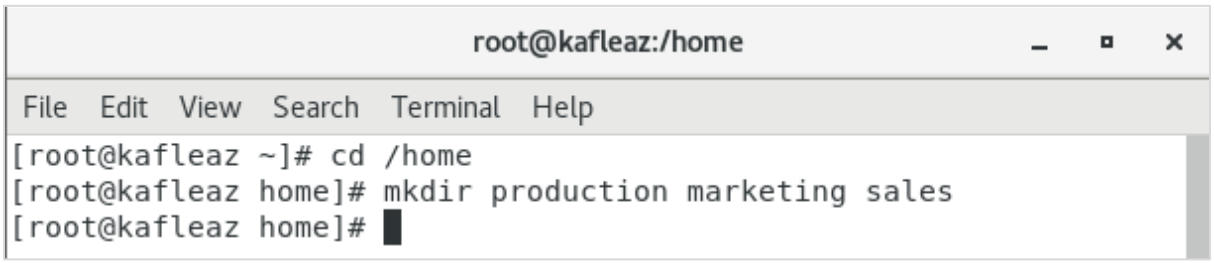
b) Create group for each department *(production, marketing, sales)*.

```
root@kafleaz:~
File  Edit  View  Search  Terminal  Help
[root@kafleaz ~]# groupadd production
[root@kafleaz ~]# groupadd marketing
[root@kafleaz ~]# groupadd sales
[root@kafleaz ~]#
```

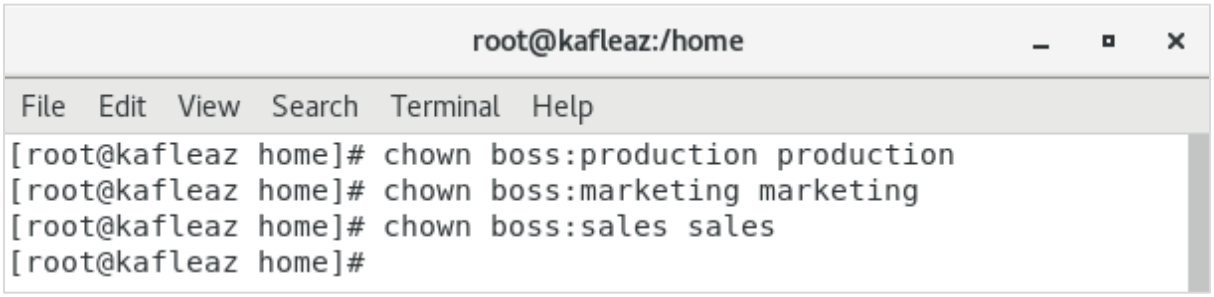
c) Create user account *(user1, user2, user3, user4, user5, user6, manager, boss)* for each employee assigning them respective group.

```
root@kafleaz:~
File  Edit  View  Search  Terminal  Help
[root@kafleaz ~]# useradd -G production user1
[root@kafleaz ~]# useradd -G production user2
[root@kafleaz ~]# useradd -G marketing user2
useradd: user 'user2' already exists
[root@kafleaz ~]# useradd -G marketing user3
[root@kafleaz ~]# useradd -G marketing user4
[root@kafleaz ~]# useradd -G sales user5
[root@kafleaz ~]# useradd -G sales user6
[root@kafleaz ~]# useradd -G production,marketing,sales manager
[root@kafleaz ~]# useradd boss
[root@kafleaz ~]#
```

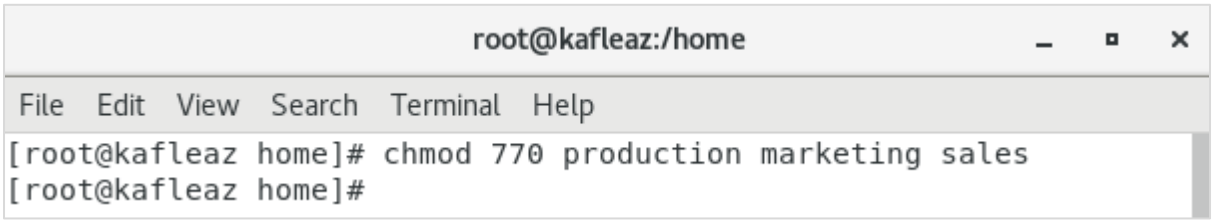
d) Create common directory *(production, marketing and sales)* for each department.



e) Change ownership of group directories such that *boss* will become the owner and the respective groups will be group owner.



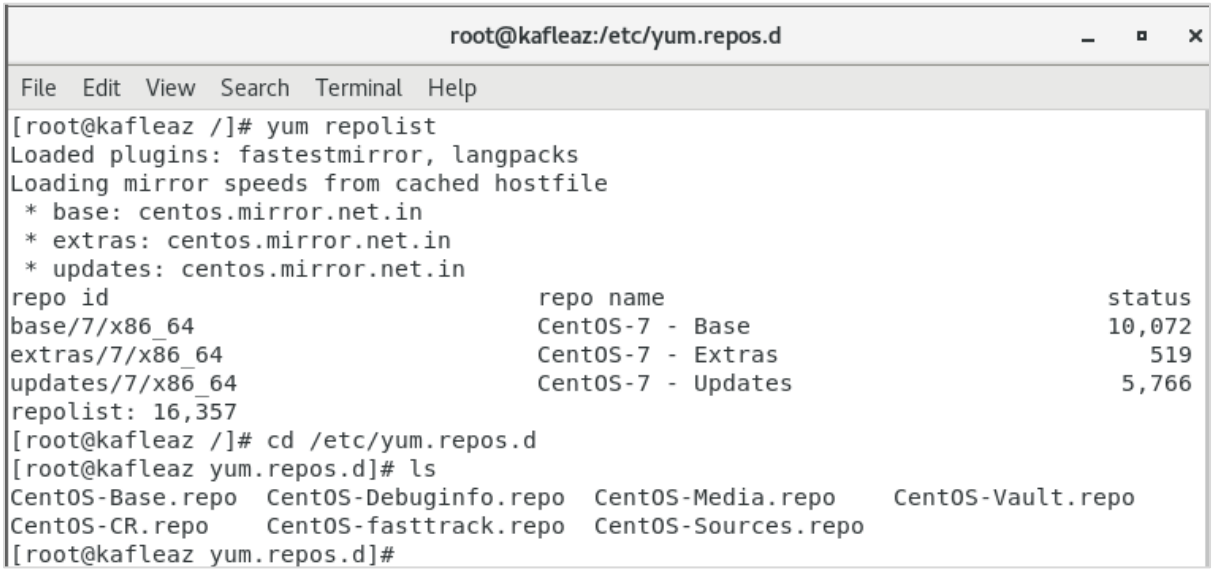
f) Change the permission of the group directories such that only the owner and group member will get full permission and other will not get any permission.



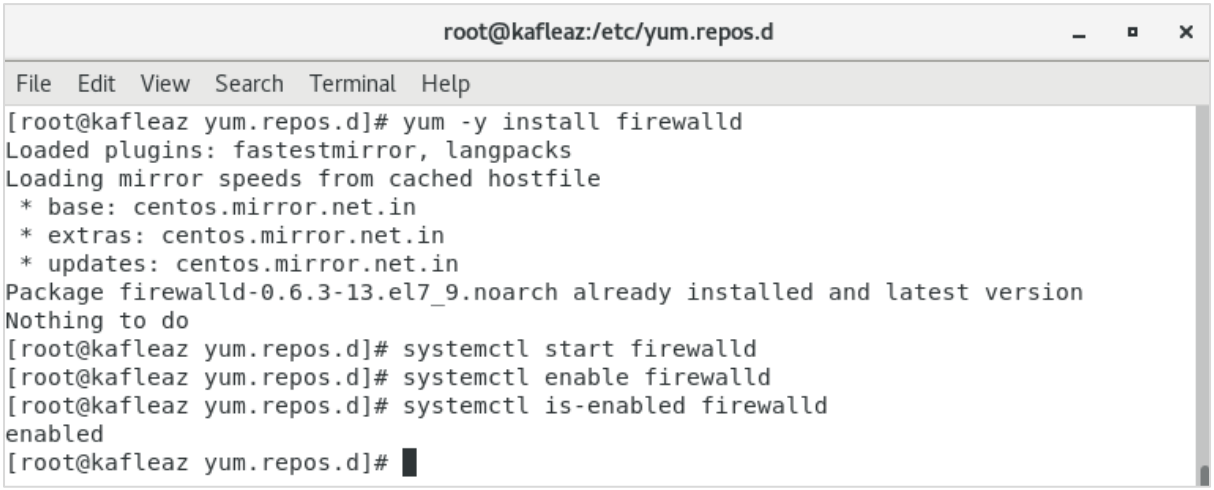
TASK 6

Package and Service Management, and Firewall Configuration in CentOS7:

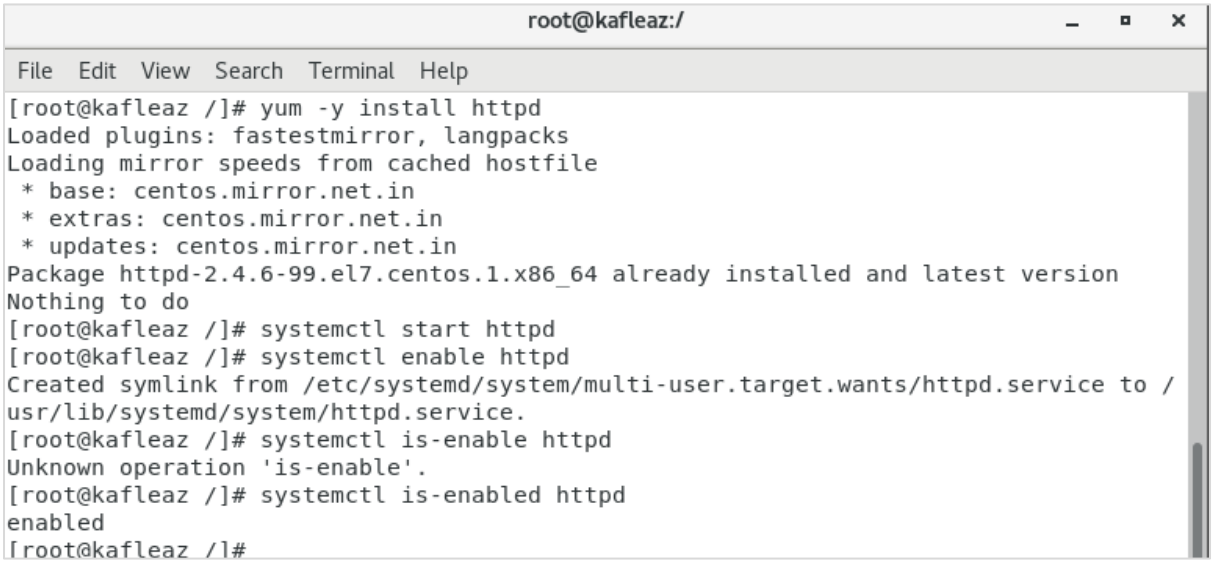
a) Enable EPEL repository (epel-release package) and verify the repo configuration in *etc/yum.repos.d*.



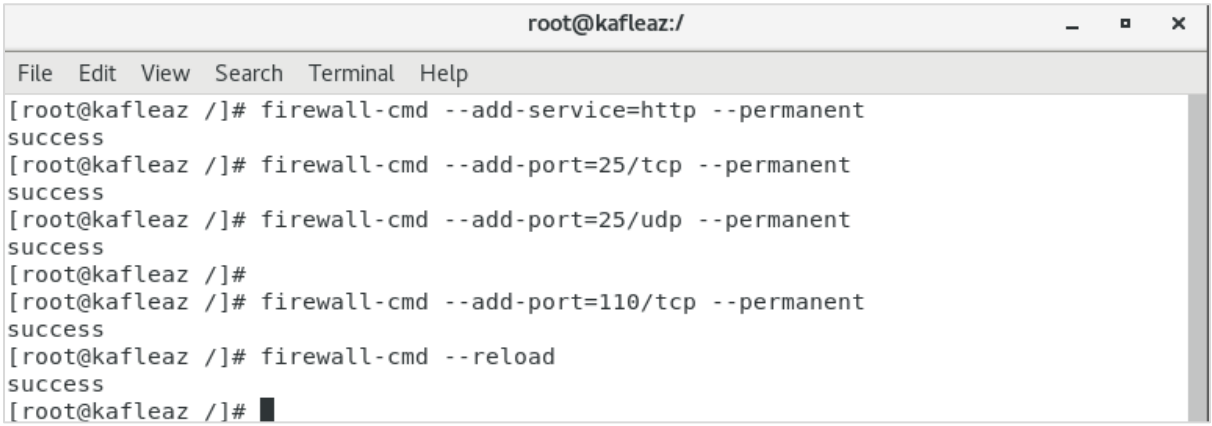
b) Install firewalld package as well as start and enable firewall services.



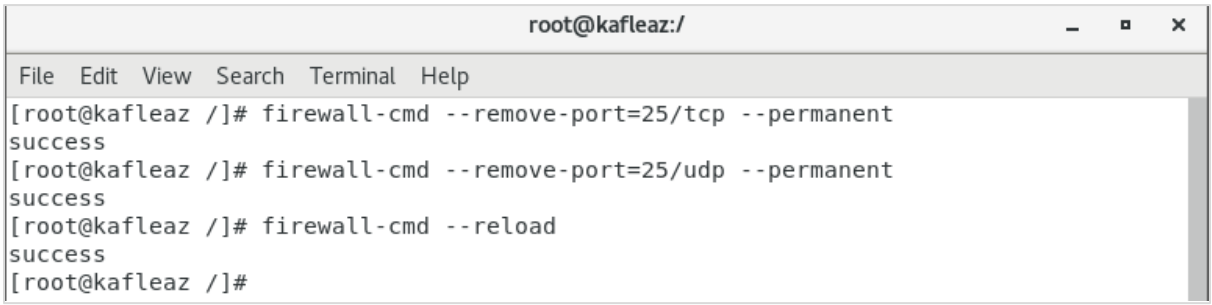
c) Install httpd package as well as start and enable httpd services.



d) Add the following services and ports to allow packets through the firewall.*[Service = http, smtp port = 25 /tcp, 25/udp, 110/tcp]*



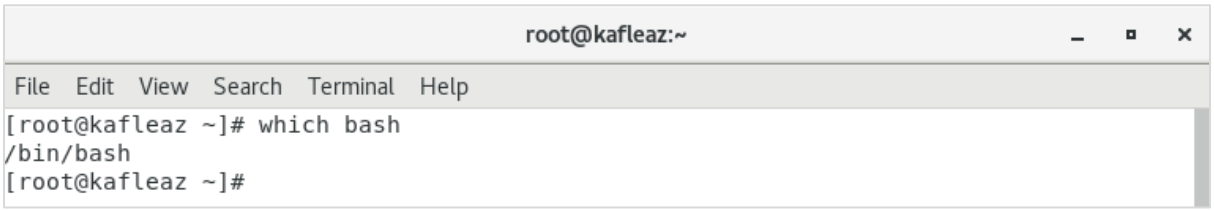
e) Remove the following services and ports to block packets through the firewall.*[Service = smtp port = 25 /tcp, 25/udp]*



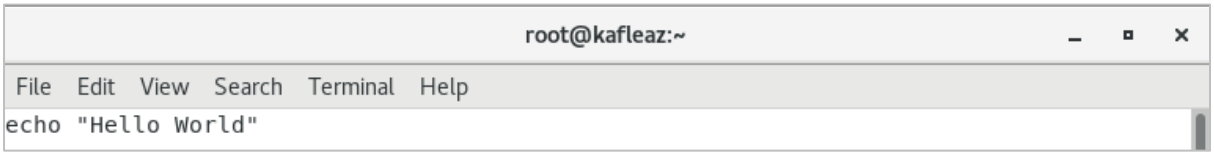
TASK 7

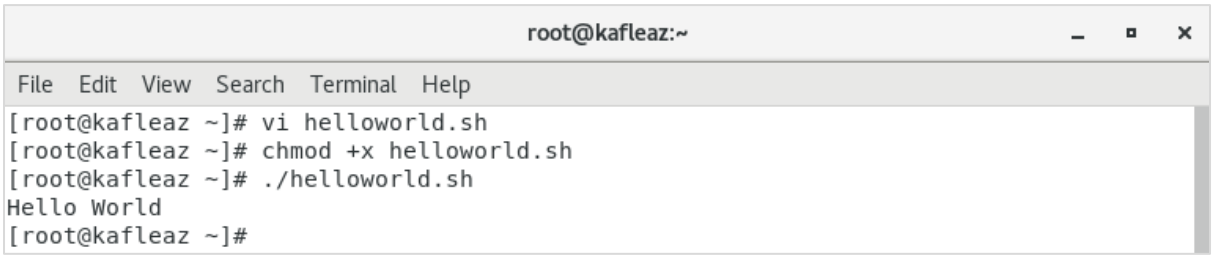
Bash Shell Scripting:

a) Write a command to find the path of the bash shell.

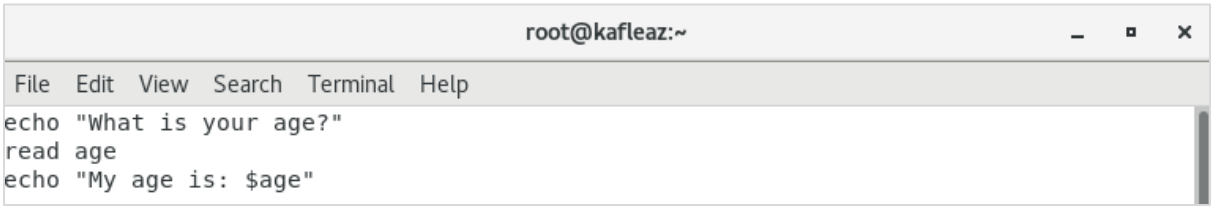


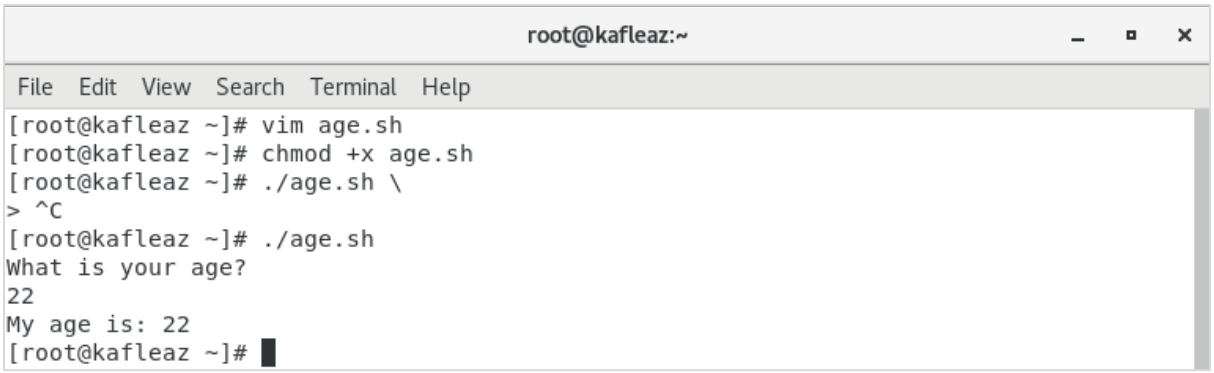
b) Write a script named helloworld.sh to display "Hello World".



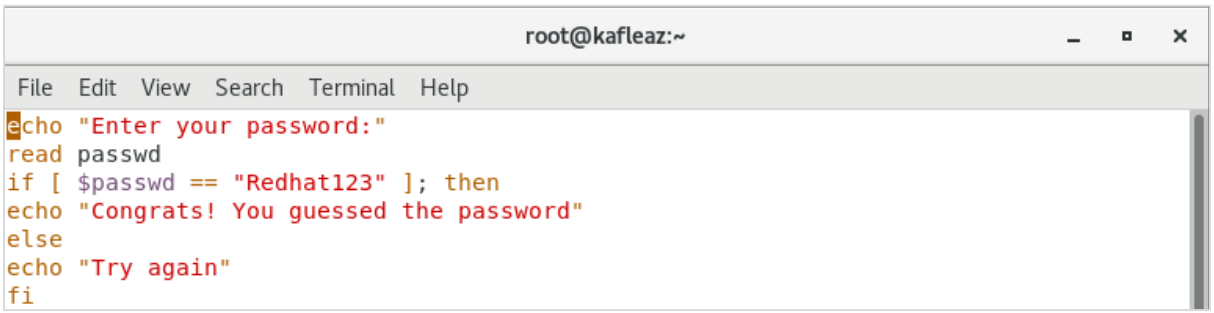


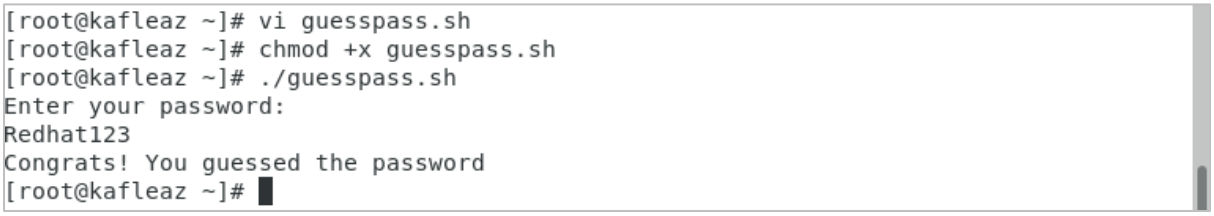
c) Write a script named age.sh to prompt for age and display it.



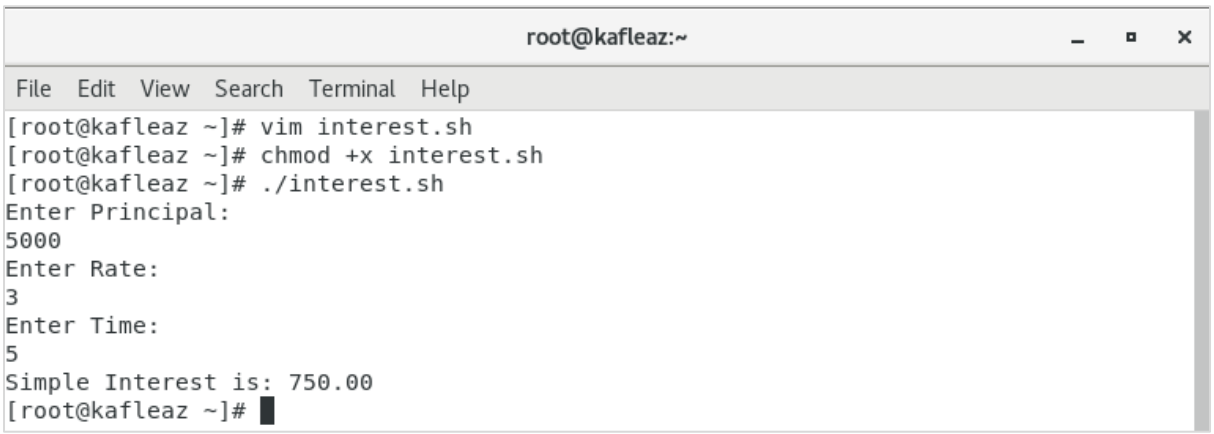


d) Write a script named guesspass.sh to guess admin password. [password = Redhat123]





e) Write a script to calculate simple interest.



f) Write a script to determine the type of tringle by reading the lengths of its sides.

root@kafleaz:~

File Edit View Search Terminal Help

```
echo "Enter the length of side 1: "
read side1
echo "Enter the length of side 2: "
read side2
echo "Enter the length of side 3: "
read side3

if [ $side1 = $side2 ] && [ $side2 = $side3 ]
then
        echo "This is an Equilateral Triangle"
elif [ $side1 = $side2 ] || [ $side1 = $side3 ] || [ $side2 = $side3 ]
then
        echo "This is an Isosceles Triangle"
else
        echo "This is a Scalene Triangle"
fi
```

root@kafleaz:~

File Edit View Search Terminal Help

```
[root@kafleaz ~]# vi triangle.sh
[root@kafleaz ~]# chmod +x triangle.sh
[root@kafleaz ~]# ./triangle.sh
Enter the length of side 1:
6
Enter the length of side 2:
9
Enter the length of side 3:
9
This is an Isosceles Triangle
[root@kafleaz ~]#
```

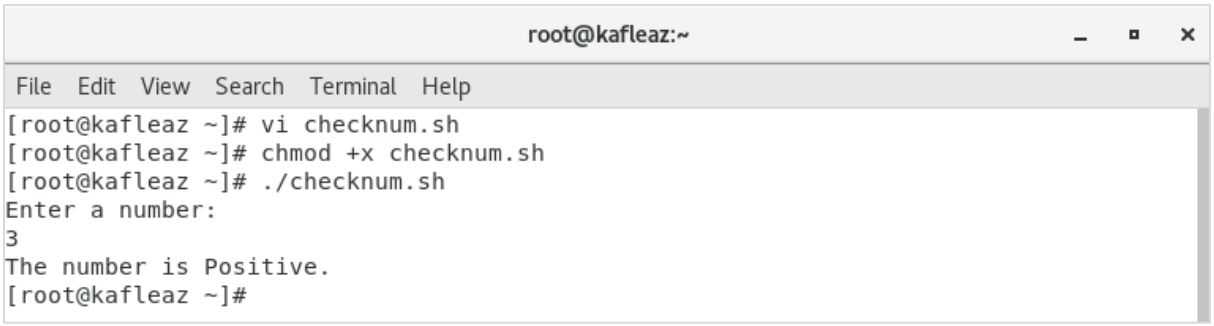
g) Write a script to determine if a user-inputted number is positive, negative, or Zero.

root@kafleaz:~

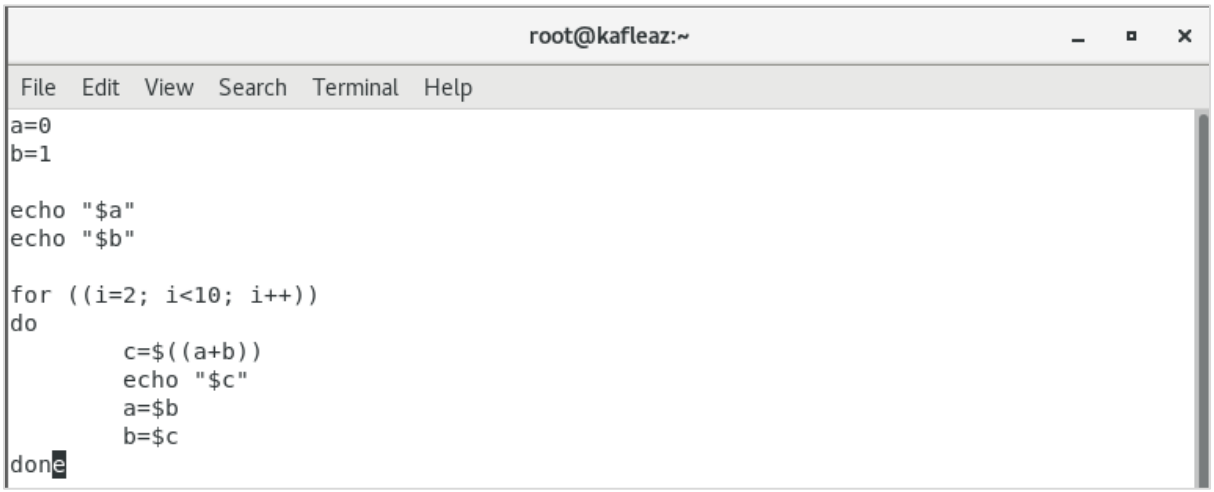
File Edit View Search Terminal Help

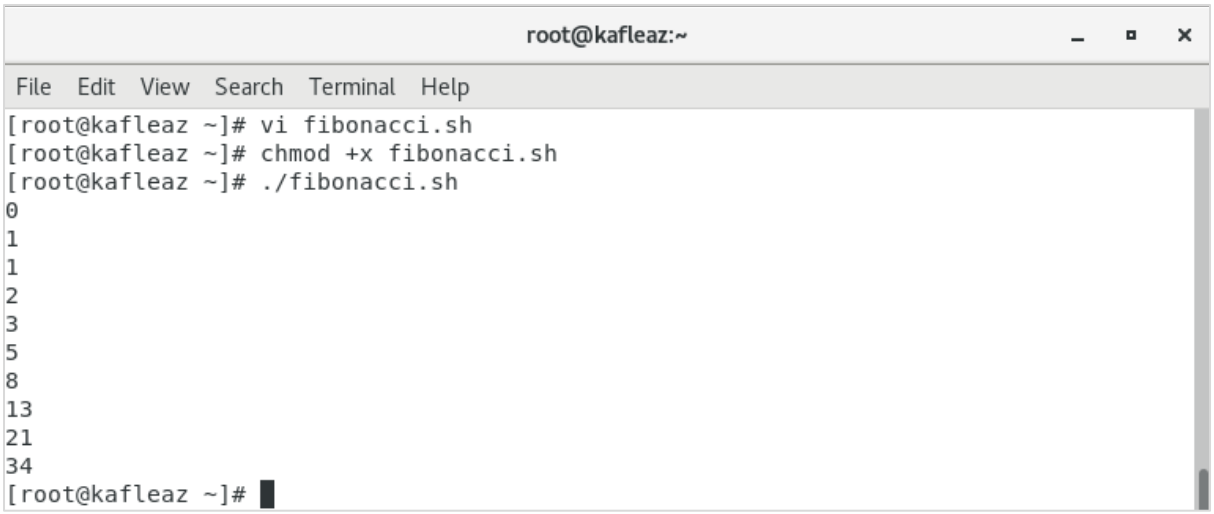
```
echo "Enter a number: "
read num

if [ $num -gt 0 ]
then
        echo "The number is Positive."
elif [ $num -lt 0 ]
then
        echo "The number is Negative."
else
        echo "The numbr is Zero."
fi
```



h) Write a script to print the first 10 elements of Fibonacci series.





i) Create a shell script named "bg.sh" inside /root directory which when execute with parameter 'boy', the output should be 'girl', when execute with the parameter 'girl, the output should be 'boy' & when execute with some other parameter or no parameter the output should be "enter boy or girl only"]