

Assignment-1: Linux

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Batch: DevOps Batch – 1

Date: May 2025

Q1. Install and configure Tomcat version 9 on your Linux machine with the Manager and Host Manager sections enabled

Ans: Apache Tomcat is an open-source web server and servlet container used for hosting Java-based web applications. It's a widely used tool for deploying and running applications built with Java technologies. Tomcat is not a normal server like Apache or Nginx, because its main goal is to provide a good web environment to run Java applications only unlike other normal web servers.

Prerequisites to install Tomcat

Steps:

1. Launch a Ubuntu Linux server in AWS.
2. Sudo apt-get update
3. Sudo apt-get install openjdk-11-jdk
4. Next need to go to tomcat archive website & copy tomcat version in binary
eg: apache-tomcat-9.0.65.tar.gz
5. Need check java version: java-version
6. Cd /opt
7. We need to copy the tomcat tar file:
`wget https://archive.apache.org/dist/tomcat/tomcat-9/v9.0.65/bin/apache-tomcat-9.0.65.tar.gz`
8. Next need to extract the tar file : sudo tar -xvf apache-tomcat-9.0.65.tar.gz
9. Then need to remove the tar file: sudo rm -rf apache-tomcat-9.0.65.tar.gz
10. Need switch as root: sudo su
11. Need to go conf directory: cd /opt/apache-tomcat-9.0.65/conf
12. Then need to configure the user
13. Sudo vi tomcat-users.xml
--add below line at the end (2nd Last Line)
`<user username="admin" password="admin1234" roles="admin-gui, manager-gui"/>`
14. Need to link startup & shutdown files
`Sudo ln -s /opt/apache-tomcat-9.0.65/bin/startup.sh /usr/bin/startTomcat`
`Sudo ln -s /opt/apache-tomcat-9.0.65/bin/shutdown.sh /usr/bin/stopTomcat`
15. Sudo vi /opt/apache-tomcat-9.0.65/webapps/manager/META-INF/context.xml
Comment in the line: like <!-- Valve class name
Allow= "127 - ->

16. Sudo vi /opt/apache-tomcat-9.0.65/webapps/host-manager/META-INF/context.xml

Comment in the line: like <!-- Valve class name

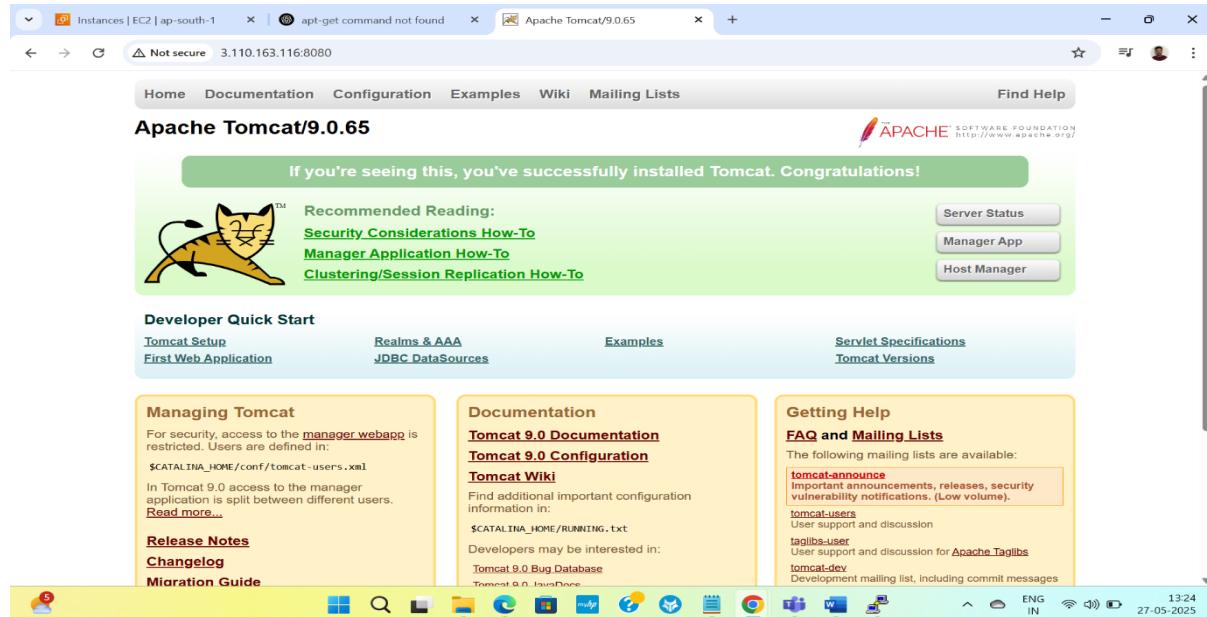
Allow= "127 - ->

17. Sudo stopTomcat

18. Sudo startTomcat

19. Then copy ip address in URL with :8080 tomcat server will open

20. Need to define in security groups that allow custom tcp 8080 my Ip



Server Status

Application Manager

The screenshot shows the Tomcat Web Application Manager interface. At the top, there's a header bar with a logo of a yellow cat, the Apache Software Foundation logo, and the URL "65.0.108.115:8080/manager/html". Below the header is a message box containing "Message: OK". The main content area has a title "Tomcat Web Application Manager". It includes a navigation bar with tabs: "Manager", "List Applications", "HTML Manager Help", "Manager Help", and "Server Status". The "List Applications" tab is selected. A table titled "Applications" lists the following entries:

Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/docs	None specified	Tomcat Documentation	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/examples	None specified	Servlet and JSP Examples	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/host-manager	None specified	Tomcat Host Manager Application	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/manager	None specified	Tomcat Manager Application	true	1	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes

Virtual Host Manager

The screenshot shows the Tomcat Virtual Host Manager interface. At the top, there's a header bar with a logo of a yellow cat, the Apache Software Foundation logo, and the URL "65.0.108.115:8080/host-manager/html". Below the header is a message box containing "Message: OK". The main content area has a title "Tomcat Virtual Host Manager". It includes a navigation bar with tabs: "Host Manager", "List Virtual Hosts", "HTML Host Manager Help", "Host Manager Help", and "Server Status". The "List Virtual Hosts" tab is selected. A table titled "Host name" lists the entry "localhost" with the note "Host Manager installed - commands disabled". Below this is a section titled "Add Virtual Host" with a "Host" sub-section. It contains a form with fields for "Name:" (with a placeholder box), "Aliases:" (with a placeholder box), "App base:" (with a placeholder box), and several checked checkboxes for deployment options: "AutoDeploy" (checked), "DeployOnStartup" (checked), "DeployXML" (checked), "UnpackWARs" (checked), and "Manager App" (checked).

2. Change the default Tomcat port to 9050.

Ans : To change the default port number from 8080 to 9050

Steps:

1. Should be root user if not then sudo su
2. Then Cd /opt/apache-tomcat-9.0.65/conf
3. Vi server.xml
4. In connector line need to change the port number from 8080 to 9050
5. Then need to add inbound security rules allow 9050
6. Then need to stop tomcat by using command sudo stopTomcat
7. Then sudo startTomcat
8. If we use ip address in URL with :9050 tomcat server will open

```
root@ip-172-31-4-200:/opt/apache-tomcat-9.0.65/conf
[root@ip-172-31-4-200 ~]# more server.xml
<!-- GlobalNamingResources -->
  <Resource name="UserDatabase" auth="Container"
    type="org.apache.naming.ResourceRef"
    description="User database that can be updated and saved"
    factory="org.apache.naming.factory.JndiResourceFactory"
    pathname="java:/comp/env/tomcat-users.xml" />
</GlobalNamingResources>

<!-- A "Connector" represents an endpoint of communication for receiving and
     sending requests and responses. Written for HTTP/1.1 (the protocol used
     by most applications), but you can also implement your own connectors
     for other protocols like JMS, JAVABEANS or CORBA. -->
<Connector port="8080" protocol="HTTP/1.1"
           connectionTimeout="20000"
           redirectPort="8443" />
<!-- A "Service" is a collection of one or more "Connectors" that receive
     external requests from clients. It also defines the "Container" which
     holds all "Components" (e.g. Servlets, JSPs, etc). -->
<Service name="Catalina">
  <!-- The connectors you see here are shared connectors, you can define one or more named shared
       connectors here and then refer to them below. -->
  <Connector name="tomcat-thrift" maxThreads="5000"
            maxBuckets="100" maxRequestThreads="4000" />
  <!-- A "Connection" represents an endpoint by which requests are received
       and responses are returned. Written for TCP, but you can also implement
       your own connectors for other protocols like JMS, JAVABEANS or CORBA. -->
  <Connector port="9050" protocol="HTTP/1.1"
             connectionTimeout="20000"
             redirectPort="8443" />
  <!-- A "Container" is the home where components are deployed
       and where they are managed. Written for the Java(tm) Platform,
       Enterprise Edition. -->
  <Container connectionTimeout="20000"
             maxThreads="4000"
             maxSpareThreads="2000"
             minSpareThreads="2000"
             maxProcessors="40000" />
<!-- Define an ajp13-style Connector on port 8009.
     Only functional under the AJP implementation, this feature
     will depend on the presence of one AJP listener. -->
```

Apache Tomcat/9.0.65

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:

- [Security Considerations How-To](#)
- [Manager Application How-To](#)
- [Clustering/Session Replication How-To](#)

Developer Quick Start

- [Tomcat Setup](#)
- [First Web Application](#)
- [Realms & AAA](#)
- [JDBC DataSources](#)
- [Examples](#)
- [Servlet Specifications](#)
- [Tomcat Versions](#)

Managing Tomcat

For security, access to the [manager webapp](#) is restricted. Users are defined in: `$CATALINA_HOME/conf/tomcat-users.xml`

In Tomcat 9.0 access to the manager application is split between different users. [Read more...](#)

Release Notes

Changelog

Migration Guide

Documentation

[Tomcat 9.0 Documentation](#)

[Tomcat 9.0 Configuration](#)

[Tomcat Wiki](#)

Find additional important configuration information in: `$CATALINA_HOME/RUNNING.txt`

Developers may be interested in:

- [Tomcat 9.0 Bug Database](#)
- [Tomcat 9.0 Javadoc](#)

Getting Help

[FAQ and Mailing Lists](#)

The following mailing lists are available:

- [tomcat-announce](#) Important announcements, releases, security vulnerability notifications. (Low volume).
- [tomcat-users](#) User support and discussion
- [taglibs-user](#) User support and discussion for [Apache Taglibs](#)
- [tomcat-dev](#) Development mailing list, including commit messages

Q3: Create a new user and configure the necessary settings for secure login via Putty or other

remote access tools:

1. Create a new user

2. Add new users under /etc/sudoers

3. Generate SSH key pair (as current user) - ssh-keygen -t rsa

4. This will create: ~/.ssh/id_rsa (private key)

~/.ssh/id_rsa.pub (public key)

5. Switch to the new user

6. Create .ssh directory for the new user:

mkdir -p ~/.ssh

chmod 700 ~/.ssh

7. Create or edit the authorized_keys file

8. From root user cat ~/.ssh/id_rsa.pub | sudo tee -a

/home/natasha/.ssh/authorized_keys

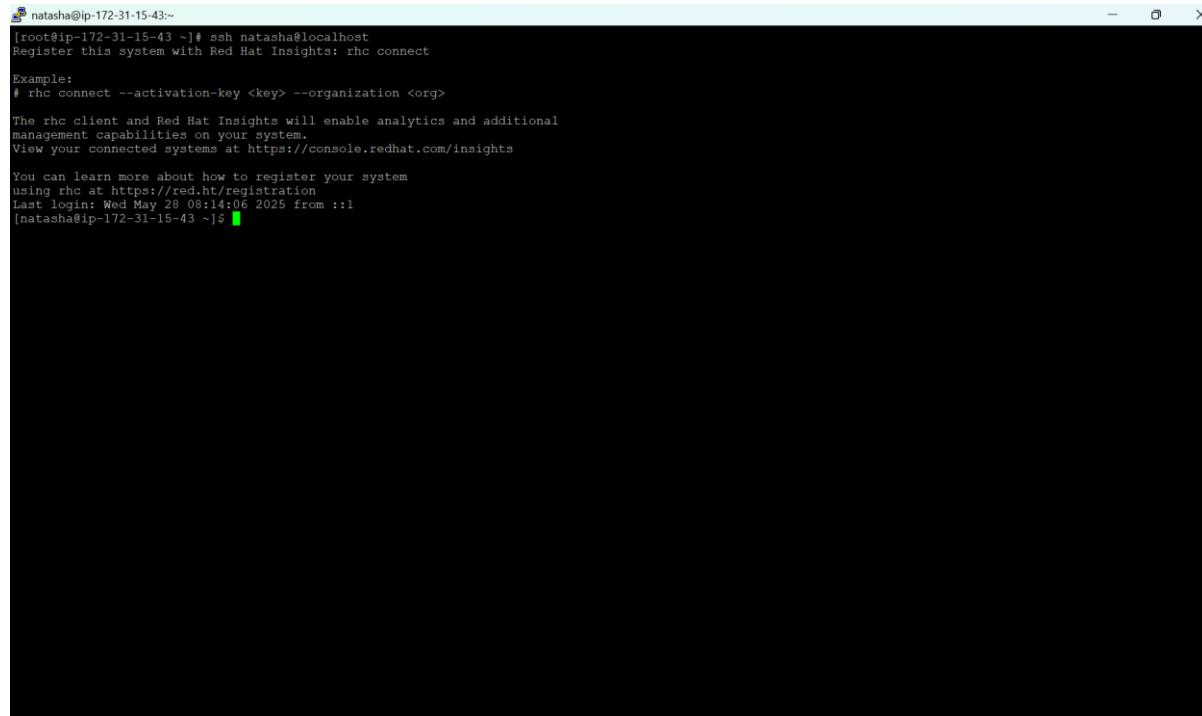
9. Fix permission

sudo chown -R natasha:natasha /home/natasha/.ssh

sudo chmod 700 /home/natasha/.ssh

sudo chmod 600 /home/natasha/.ssh/authorized_keys

10. ssh username@localhost

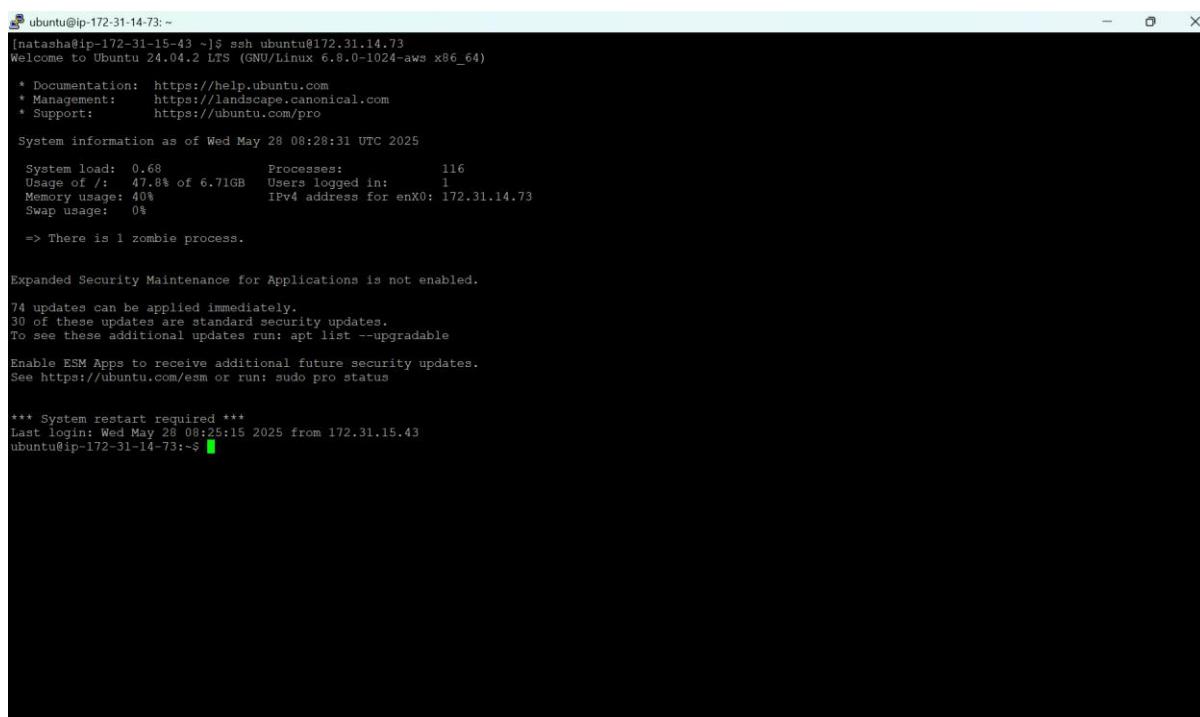


```
natasha@ip-172-31-15-43:~$ [root@ip-172-31-15-43 ~]# ssh natasha@localhost
Register this system with Red Hat Insights: rhc connect
Example:
# rhc connect --activation-key <key> --organization <org>
The rhc client and Red Hat Insights will enable analytics and additional
management capabilities on your system.
View your connected systems at https://console.redhat.com/insights

You can learn more about how to register your system
using rhc at https://red.ht/registration
Last login: Wed May 28 08:14:06 2025 from ::1
[natasha@ip-172-31-15-43 ~]$
```

Q4. Establish passwordless connection between two Linux server

1. Server1: ssh-keygen
2. cd .ssh
3. copy the content in id_rsa.pub
4. go to server2: cd .ssh
5. vi authorised keys: append the content copied from server1(do not redirect/delete just have to add/append)
6. on server1: ssh <server2-username>@private ip of server2
7. successfully established passwordless connection between two servers



```
ubuntu@ip-172-31-14-73:~ [natasha@ip-172-31-15-43 ~]$ ssh ubuntu@172.31.14.73
Welcome to Ubuntu 24.04.2 LTS (GNU/Linux 6.8.0-1024-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Wed May 28 08:28:31 UTC 2025

System load: 0.68 Processes: 116
Usage of /: 47.8% of 6.71GB Users logged in: 1
Memory usage: 40% IPv4 address for enX0: 172.31.14.73
Swap usage: 0%
=> There is 1 zombie process.

Expanded Security Maintenance for Applications is not enabled.

74 updates can be applied immediately.
30 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

*** System restart required ***
Last login: Wed May 28 08:25:15 2025 from 172.31.15.43
ubuntu@ip-172-31-14-73:~$
```

Q5. Create a new user account on your Linux machine and grant them sudo privileges.

1. Create user
2. Grant sudo permission under /etc/passwd
3. ALL=(ALL) NOPASSWD:ALL
4. Ex: run sudo useradd ram – sudo command has to work on new user account

```
[culry@ip-172-31-15-43 ~]$ sudo useradd larry
[culry@ip-172-31-15-43 ~]$ sudo ifconfig
sudo: ifconfig: command not found
[culry@ip-172-31-15-43 ~]$ sudo ipconfig
sudo: ipconfig: command not found
[culry@ip-172-31-15-43 ~]$ sudo fdisk -l
Disk /dev/xvda: 10 GiB, 10737418240 bytes, 20971520 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: D209C89E-EA5E-4FBD-B161-B461CCE297E0

Device      Start    End  Sectors  Size Type
/dev/xvda1   2048    4095     2048   1M BIOS boot
/dev/xvda2   4096  413695   409600 200M EFI System
/dev/xvda3  413696 20971486 20557791 9.8G Linux filesystem
[culry@ip-172-31-15-43 ~]$
```

Q6. Use the 'scp' command to securely copy files and directories between Linux machines without password

Ans: Continued from q4 question Number

1. Server1:ec2 server2: ubuntu
 2. On sever1: scp filename server2-username@private-ip-server2: /home/ubuntu

```
natasha@ip-172-31-15-43:~  
[natasha@ip-172-31-15-43 ~]$ touch file1  
[natasha@ip-172-31-15-43 ~]$ scp file1 ubuntu@172.31.14.73:/home/ubuntu  
file1  
[natasha@ip-172-31-15-43 ~]$
```

- ### 3. On server 2: ls

```
ubuntu@ip-172-31-14-73: ~
ubuntu@ip-172-31-14-73:~$ ls
file1
ubuntu@ip-172-31-14-73:~$
```

7. How can you list the contents of a tar.gz file and extract a particular file

Ans: To list and extract specific files from a tar.gz archive in Linux, use the tar command with appropriate options.

Command to create tar file with gz method

Eg : tar -cvfz etc.tar.gz /etc

Which will compress /etc directory by gz method

```
[root@ip-172-31-15-43 ~]# ls
[root@ip-172-31-15-43 ~]# tar -cvzf etc.tar.gz /etc
tar: Removing leading '/' from member names
/etc/
/etc/grub.d/
/etc/grub.d/00_header
/etc/grub.d/01_users
/etc/grub.d/08_fallback_counting
/etc/grub.d/10_linux
/etc/grub.d/10_reset_boot_success
/etc/grub.d/12_menu_auto_hide
/etc/grub.d/14_menu_show_once
/etc/grub.d/20_linux_xen
/etc/grub.d/20_ppc_terminfo
/etc/grub.d/25_bli
/etc/grub.d/30_uefi-firmware
/etc/grub.d/40_custom
/etc/grub.d/41_custom
/etc/grub.d/README
/etc/grub.d/35_fwupd
/etc/grub.d/00_tuned
/etc/depmod.d/
/etc/depmod.d/dist.conf
/etc/rhsm/
/etc/rhsm/rhsm.conf.cloud_save
/etc/rhsm/rhsm.conf
/etc/rhsm/ca/
/etc/rhsm/ca/redhat-entitlement-authority.pem
/etc/rhsm/ca/redhat-upd.pem
/etc/rhsm/facts/
/etc/rhsm/pluginconf.d/
/etc/rhsm/syspurpose/
/etc/rhsm/syspurpose/valid_fields.json
/etc/modprobe.d/
/etc/modprobe.d/tuned.conf
/etc/credstore/
/etc/NetworkManager/
/etc/NetworkManager/NetworkManager.conf
/etc/NetworkManager/conf.d/
/etc/NetworkManager/conf.d/30-cloud-init-ip6-addr-gen-mode.conf
```

List Contents of a tar.gz File

Eg: tar -tzvf etc.tar.gz

```
root@ip-172-31-15-43~:
/etc/updated
/etc/hostname
/etc/resolv.conf
/etc/subuid
/etc/subgid
[root@ip-172-31-15-43 ~]# ls
etc.tar.gz
[root@ip-172-31-15-43 ~]#
[root@ip-172-31-15-43 ~]# ls
etc.tar.gz
[root@ip-172-31-15-43 ~]# du -sh /etc
23M    etc
[root@ip-172-31-15-43 ~]# du -sh etc.tar.gz
5.4M   etc.tar.gz
[root@ip-172-31-15-43 ~]# tar -tzvf etc.tar.gz
drwxr-xr-x root/root    0 2025-05-28 08:37 etc/
drwxr-xr-x root/root    0 2025-04-23 14:16 etc/grub.d/
-rwxr--r-- root/root 9380 2025-03-25 00:00 etc/grub.d/00_header
-rwxr--r-- root/root  236 2025-03-25 00:00 etc/grub.d/01_users
-rwxr--r-- root/root  835 2025-03-25 00:00 etc/grub.d/08_fallback_counting
-rwxr--r-- root/root 20334 2025-03-25 00:00 etc/grub.d/10_linux
-rwxr--r-- root/root  833 2025-03-25 00:00 etc/grub.d/10_reset_boot_success
-rwxr--r-- root/root  892 2025-03-25 00:00 etc/grub.d/12_menu_auto_hide
-rwxr--r-- root/root  410 2025-03-25 00:00 etc/grub.d/14_menu_show_once
-rwxr--r-- root/root 14627 2025-03-25 00:00 etc/grub.d/20_linux_xen
-rwxr--r-- root/root 2562 2025-03-25 00:00 etc/grub.d/20_ppc_terminfo
-rwxr--r-- root/root  869 2025-03-25 00:00 etc/grub.d/25_bli
-rwxr--r-- root/root 1106 2025-03-25 00:00 etc/grub.d/30_uefi-firmware
-rwxr--r-- root/root 1166 2025-03-25 00:00 etc/grub.d/30_uefi-firmware
-rwxr--r-- root/root  218 2025-03-25 00:00 etc/grub.d/40_custom
-rwxr--r-- root/root  219 2025-03-25 00:00 etc/grub.d/41_custom
-rwxr--r-- root/root  483 2025-03-25 00:00 etc/grub.d/README
-rwxr--r-- root/root  725 2024-12-16 00:00 etc/grub.d/35_fwupd
-rwxr--r-- root/root 1100 2025-02-03 19:17 etc/grub.d/00_tuned
drwxr--r-- root/root    0 2025-04-23 14:16 etc/depmod.d/
-rw-r--r-- root/root 116 2025-04-14 00:00 etc/depmod.d/dist.conf
drwxr--r-- root/root    0 2025-04-14 00:00 etc/rhsm/
drwxr--r-- root/root 3151 2025-04-23 14:16 etc/rhsm/rhsm.conf.cloud_save
-rw-r--r-- root/root 3049 2025-04-23 14:16 etc/rhsm/rhsm.conf
drwxr--r-- root/root    0 2025-04-23 14:15 etc/rhsm/ca/
-rw-r--r-- root/root 2305 2022-06-23 10:36 etc/rhsm/ca/redhat-entitlement-authority.pem
-rw-r--r-- root/root 7411 2022-06-23 10:36 etc/rhsm/ca/redhat-upd.pem
drwxr--r-- root/root    0 2025-03-06 00:00 etc/rhsm/facts/
drwxr--r-- root/root    0 2025-03-06 00:00 etc/rhsm/pluginconf.d/
drwxr--r-- root/root    0 2025-04-23 14:16 etc/rhsm/syspurpose/
-rw-r--r-- root/root 347 2025-04-23 14:16 etc/rhsm/syspurpose/valid_fields.json
drwxr--r-- root/root    0 2025-04-23 14:16 etc/modprobe.d/
-rw-r--r-- root/root 674 2025-02-03 19:17 etc/modprobe.d/tuned.conf
```

Explanation:

- t: list contents
- z: handle gzip compression
- v: verbose (show file names)
- f: archive file to use
-

Extract a Specific File from .tar.gz

Eg: tar -xvf etc.tar.gz

It will extract to the current directory



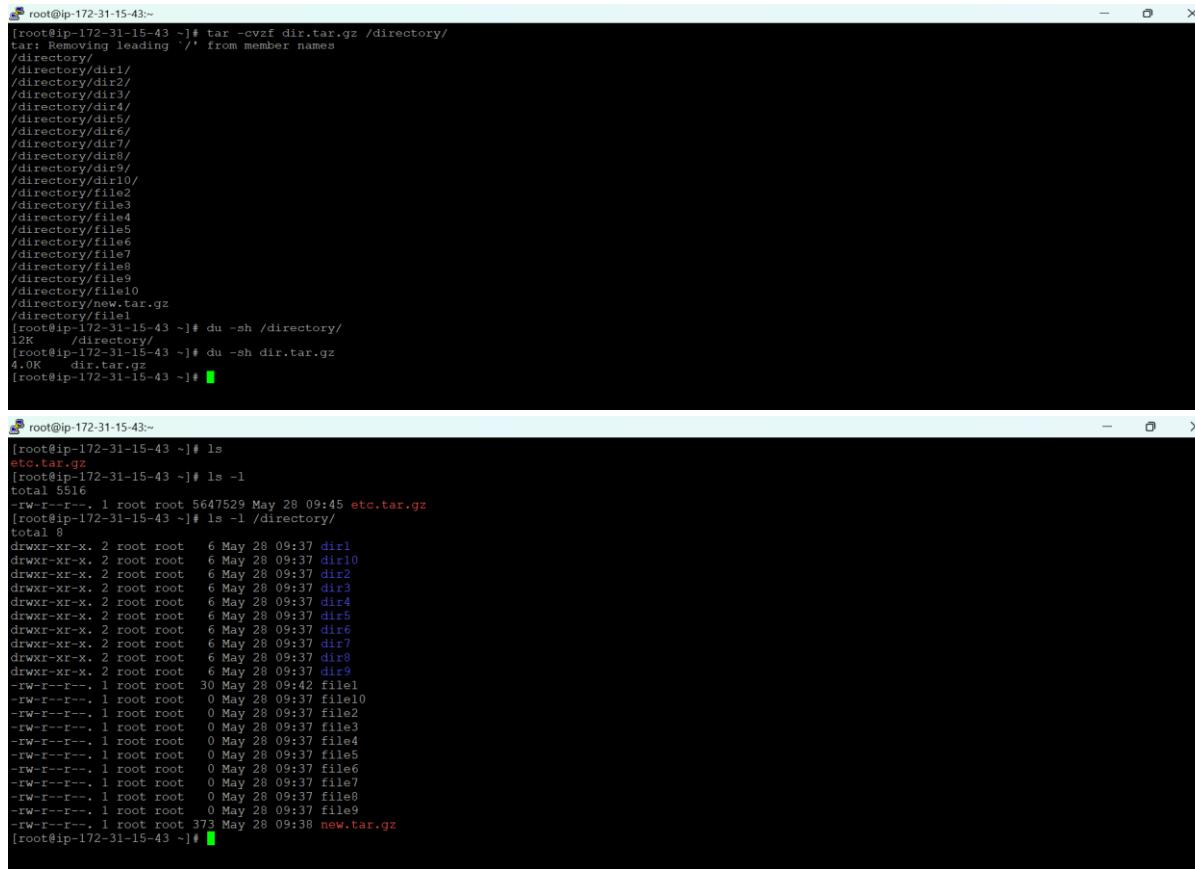
```
root@ip-172-31-15-43:~# ls
etc.tar.gz
[root@ip-172-31-15-43:~]# du -sh /etc
23M    /etc
[root@ip-172-31-15-43:~]# du -sh etc.tar.gz
5.4M   etc.tar.gz
[root@ip-172-31-15-43:~]#
```

8. How can you compress a directory or file into a tar archive on Linux

Ans: To compress a directory or file into a .tar archive on Linux, you use the tar command.

Command : tar -czvf archive_name.tar.gz /path/to/directory_or_file

Eg tar -cvzf new.tar.gz /directory



```
root@ip-172-31-15-43:~# tar -cvzf dir.tar.gz /directory/
tar: Removing leading '/' from member names
/directory/
/directory/dir1/
/directory/dir2/
/directory/dir3/
/directory/dir4/
/directory/dir5/
/directory/dir6/
/directory/dir7/
/directory/dir8/
/directory/dir9/
/directory/dir10/
/directory/file1
/directory/file3
/directory/file4
/directory/file5
/directory/file6
/directory/file7
/directory/file8
/directory/file9
/directory/
/directory/newtar.gz
/directory/file1
[root@ip-172-31-15-43:~]# du -sh ./directory/
12K   ./directory/
[root@ip-172-31-15-43:~]# du -sh dir.tar.gz
4.0K   dir.tar.gz
[root@ip-172-31-15-43:~]#
```



```
root@ip-172-31-15-43:~# ls
etc.tar.gz
[root@ip-172-31-15-43:~]# ls -l
total 5516
-rw-r--r--, 1 root root 5647529 May 28 09:45 etc.tar.gz
[root@ip-172-31-15-43:~]# ls -l /directory/
total 8
drwxr-xr-x, 2 root root 6 May 28 09:37 dir1
drwxr-xr-x, 2 root root 6 May 28 09:37 dir10
drwxr-xr-x, 2 root root 6 May 28 09:37 dir2
drwxr-xr-x, 2 root root 6 May 28 09:37 dir3
drwxr-xr-x, 2 root root 6 May 28 09:37 dir4
drwxr-xr-x, 2 root root 6 May 28 09:37 dir5
drwxr-xr-x, 2 root root 6 May 28 09:37 dir6
drwxr-xr-x, 2 root root 6 May 28 09:37 dir7
drwxr-xr-x, 2 root root 6 May 28 09:37 dir8
drwxr-xr-x, 2 root root 6 May 28 09:37 dir9
-rw-r--r--, 1 root root 30 May 28 09:42 file1
-rw-r--r--, 1 root root 0 May 28 09:37 file10
-rw-r--r--, 1 root root 0 May 28 09:37 file2
-rw-r--r--, 1 root root 0 May 28 09:37 file3
-rw-r--r--, 1 root root 0 May 28 09:37 file4
-rw-r--r--, 1 root root 0 May 28 09:37 file5
-rw-r--r--, 1 root root 0 May 28 09:37 file6
-rw-r--r--, 1 root root 0 May 28 09:37 file7
-rw-r--r--, 1 root root 0 May 28 09:37 file8
-rw-r--r--, 1 root root 0 May 28 09:37 file9
-rw-r--r--, 1 root root 376 May 28 09:38 new.tar.gz
[root@ip-172-31-15-43:~]#
```

Option	Meaning
c	Create a new archive
z	Compress using gzip
v	Verbose output (shows progress)
f	Filename of the archive

Other Compression options:

Format	Command Example	Compression Tool
.tar.gz	tar -czvf archive.tar.gz folder/	gzip
.tar.bz2	tar -cjvf archive.tar.bz2 folder/	bzip2
.tar.xz	tar -Clvf archive.tar.xz folder/	xz

9. Write a command to synchronise files and directories between 2 local folders

Ans: To synchronize files and directories between two **local folders** in Linux, use the rsync command.

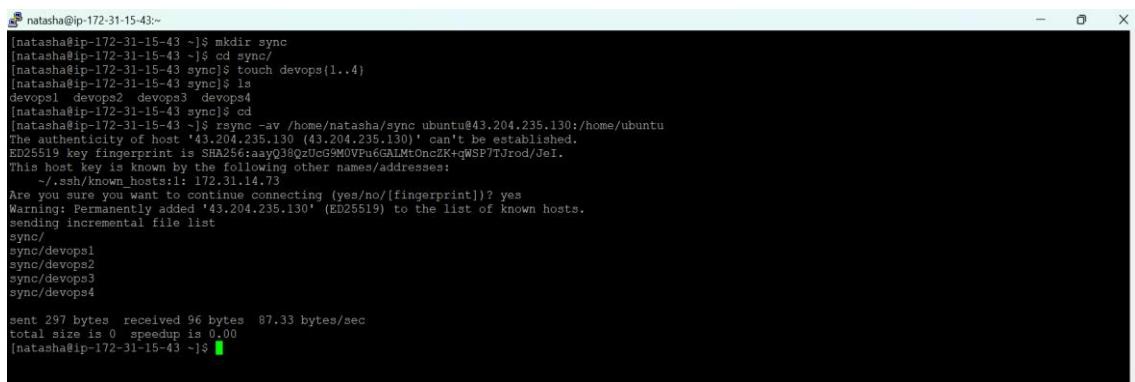
Command : rsync -av /source/directory/ /destination/directory/

rsync: the tool for syncing files

- -a: archive mode (preserves permissions, timestamps, etc.)
- -v: verbose (shows progress)

This will:

- Copy all files and folders **from source directory/ to destination directory/**
- Only copy **new or changed files** (efficient sync)



```

[natasha@ip-172-31-15-43:~] $ mkdir sync
[natasha@ip-172-31-15-43:~] $ cd sync/
[natasha@ip-172-31-15-43 sync]$ touch devops{1..4}
[natasha@ip-172-31-15-43 sync]$ ls
devops1 devops2 devops3 devops4
[natasha@ip-172-31-15-43 sync]$ cd ..
[natasha@ip-172-31-15-43 ~] $ rsync -av /home/natasha/sync ubuntu@43.204.235.130:/home/ubuntu
The authenticity of host '43.204.235.130 (43.204.235.130)' can't be established.
ED25519 key fingerprint is SHA256:aay03QzUcG9MVPU6GALMtOncZK+qWSP7TJrod/JeI.
This host key is known by the following other names/addresses:
  ~/ssh/known_hosts:1: 172.31.14.73
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '43.204.235.130' (ED25519) to the list of known hosts.
sending incremental file list
sync/
sync/devops1
sync/devops2
sync/devops3
sync/devops4

sent 297 bytes  received 96 bytes  87.33 bytes/sec
total size is 0  speedup is 0.00
[natasha@ip-172-31-15-43 ~] $

```

10. What is load average and swap memory in Linux

Ans: **Load average** shows the average number of processes waiting to be run on the CPU(s) over time.

Commands : top, uptime, or cat /proc/loadavg.

Eg: load average: 0.45, 0.60, 0.70

This shows load over the last:

- 1 minute, 5 minutes, 15 minutes

How to Interpret It:

- If you have 1 CPU core:
 - Load 1.00 means 100% usage (fully utilized).
 - Load >1.00 means CPU is overloaded.



```
ubuntu@ip-172-31-14-73:~$ uptime
10:39:50 up 10 min, 1 user,  load average: 0.00, 0.01, 0.01
ubuntu@ip-172-31-14-73:~$
```

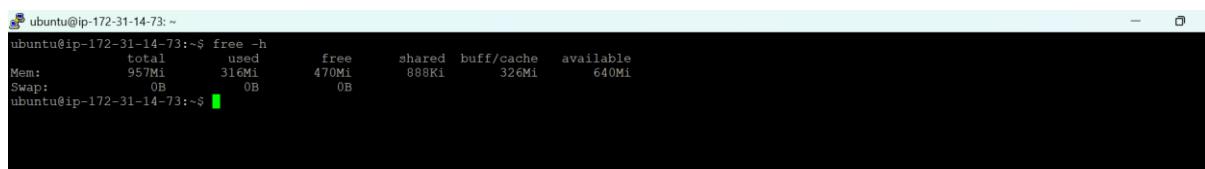
Swap is disk space used as virtual memory when physical RAM is full.

- It helps avoid out-of-memory crashes.
- It is much slower than RAM.

Command : free -h, top, or vmstat.

Eg: free -h

	total	used	free	shared	buff/cache	available
Mem:	8.0G	7.5G	0.2G	0.1G	0.3G	0.4G
Swap:	2.0G	1.0G	1.0G			



```
ubuntu@ip-172-31-14-73:~$ free -h
              total        used        free      shared  buff/cache   available
Mem:      957Mi       316Mi      470Mi      888Ki      326Mi      640Mi
Swap:      0B         0B         0B
ubuntu@ip-172-31-14-73:~$
```

If swap is in use, it usually means:

- Your system ran out of RAM.
- Processes are being pushed to slower disk-based memory.

Excessive swap usage = performance drop.

11. What are the important system directories in linux and what are they generally used for [Ex: var, home etc]

Ans: Important Linux System Directories

Directory	Purpose
/	Root directory – Top-level of the filesystem hierarchy. Everything starts here.
/bin	Essential user binaries (e.g., ls, cp, rm) needed for basic system use.
/sbin	Essential system binaries for system administration (e.g., reboot, ifconfig).
/etc	Configuration files for the system and services (e.g., /etc/ssh/ssh_config).
/home	User home directories (e.g., /home/alice, /home/bob). User data lives here.
/root	Home directory of the root user . Different from /home.
/var	Variable data – logs, databases, mail, print spool , etc.
/usr	User-related programs and data; contains subdirs like /usr/bin, /usr/lib.
/lib	Essential shared libraries needed by binaries in /bin and /sbin.

/tmp	Temporary files – cleared on reboot or periodically. Accessible by all users.
/opt	Optional software or third-party applications (e.g., <code>/opt/google/chrome</code>).
/dev	Represents device files (e.g., <code>/dev/sda</code> , <code>/dev/tty</code>). Interfaces to hardware.
/proc	Virtual directory containing process and kernel information (e.g., <code>/proc/cpuinfo</code>).
/sys	Virtual filesystem for kernel and hardware status (related to <code>/proc</code>).
/boot	Files needed for booting the system , including the kernel and GRUB files.
/media	Mount point for removable media (USB drives, CDs, etc.).
/mnt	General mount point for temporarily mounting filesystems.
/run	Holds runtime data like PID files and sockets (usually cleared on boot).

12. What are the package installers for Redhat, Ubuntu, Debian, CentOS, Alpine

Ans: Redhat (RHEL) : YUM / DNF,

CentOS : YUM/DNF

Ubuntu : APT

Debian : APT

Alpine : APK

```
ubuntu@ip-172-31-14-73:~$ sudo apt install locate
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  locate
0 upgraded, 1 newly installed, 0 to remove and 44 not upgraded.
Need to get 50.3 kB of archives.
After this operation, 177 kB of additional disk space will be used.
Get: http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 locate amd64 4.9.0-5build1 [50.3 kB]
Fetched 50.3 kB in 1s (100 kB/s)
Selecting previously unselected package locate.
(Reading database ... 193845 files and directories currently installed.)
Preparing to unpack .../locate_4.9.0-5build1_amd64.deb ...
Unpacking locate (4.9.0-5build1) ...
Setting up locate (4.9.0-5build1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-14-73:~$
```

```
natasha@ip-172-31-15-43:~$ sudo yum install locate
[sudo] password for natasha:
natasha is not in the sudoers file.
[natasha@ip-172-31-15-43 ~]$ exit
exit
[root@ip-172-31-15-43 sync]# exit
exit
[ec2-user@ip-172-31-15-43 ~]$ sudo su
[root@ip-172-31-15-43 ec2-user]# cd
[root@ip-172-31-15-43 ~]# sudo su natasha
[natasha@ip-172-31-15-43 root]$ cd
[natasha@ip-172-31-15-43 ~]$ pwd
/home/natasha
[natasha@ip-172-31-15-43 ~]$ 
[natasha@ip-172-31-15-43 ~]$ sudo yum install locate
[sudo] password for natasha:
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use "rhc" or "subscription-manager" to register.

Last metadata expiration check: 2:36:02 ago on Wed May 28 08:11:04 2025.
Dependencies resolved.

Transaction Summary
Install 2 Packages

Total download size: 224 k
Is this ok [y/N]: y
Downloading Packages:
(1/2): liburing-2.5-5.el10.x86_64.rpm                                              309 kB/s | 43 kB     00:00
(2/2): plocate-1.1.22-10.el10.x86_64.rpm                                            695 kB/s | 181 kB     00:00
                                                               781 kB/s | 224 kB     00:00

Total
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
```

Optional Assignment: Configure Gmail on your Linux machine using Postfix/Sendmail to enable sending emails from your Gmail Account through the command line

Ans: RHEL Machine Setup

Step 1: Yum install postfix to check whether installed the application or not by using command `rpm -qa | grep postfix`

Step 2: Yum install mailx

Step 3: then need to enter into postfix configuration file i.e., `/etc/postfix/main.cf`

`Cd /etc/postfix`

Step 4: need to take a backup if we are changing any configuration file it is better practice if anything happens after changing the configuration file we can roll back

Step 5: `vi main.cf` Add the following lines in bottom of file

`your_hostname (enter your hostname)`

step 6: at the bottom need to add the below commands

`#Location of sasl_passwd we saved`

`smtp_sasl_password_maps = hash:/etc/postfix/sasl/sasl_passwd`

`#Enables SASL authentication for postfix`

`smtp_sasl_auth_enable = yes`

`smtp_tls_security_level = encrypt`

`#Disallow methods that allow anonymous authentication`

`smtp_sasl_security_options = noanonymous`

step 7: `mkdir sasl under postfix directory`

`touch sasl_passwd`

step 8: In our mail need to change the settings

enable two factor authentication

in search bar type apps there you will get app password of 16 digit there you can create

name: `smtp generate`

step 9: `vi sasl_passwd`

`[smtp.gmail.com]:587 kmchandrashekhar.iitkgp@gmail.com:password` (16 digit password to paste continuously)

Step 10: enter command `postmap sasl_passwd under sasl directory`

Change the permission for both the files sasl files by using command

`Chmod 600 *(* for both the files permission)`

Step 11: `systemctl start postfix.service`

`Systemctl status postfix.service`

Step 12: `echo "Test Mail" | mail -s "Postfix TEST" kmchandrashekhar.iitkgp@gmail.com`

Step 13: how to attach a file

`echo "Test Mail" | mail -s "Postfix TEST" -a filename kmchandrashekhar.iitkgp@gmail.com`

step 14: if mail error then we can check in `/var/log/maillog`

/0/#inbox/FMfcgzQbfVBKSfvwmwQGPQwmDxHhXvZ

The screenshot shows a Gmail inbox with one email listed. The email is from "Cloud User <kmchandrashekhar.iitkgp@gmail.com>" and is addressed "to me". The subject is "Test Subject". The message was sent at 5:16 PM (0 minutes ago). The message body is empty, showing only the recipient's name "guru". The message header is expanded, showing the following details:

from: Cloud User <kmchandrashekhar.iitkgp@gmail.com>
to: kmchandrashekhar.iitkgp@gmail.com
date: May 30, 2025, 5:16 PM
subject: Test Subject
mailed-by: gmail.com

Below the message, there are standard reply and forward buttons, along with a smiley face icon.