

[linux for Beginners? Understand Linux Distributions & Kernel](#)



Definition:

- **Linux is an open-source operating system based on Unix.**
- **It is known for its security, flexibility.**

History:

- **Created by Linus Torvalds in 1991.**
- **The name "Linux" comes from Linus + Unix.**

UNIX

Unix is a powerful, multiuser, multitasking operating system originally developed in the 1970s at AT&T's Bell Labs, which serves as the foundation for many modern operating systems.

Linux vs Unix

Unix is licensed and Linux is Open Sourced.

Linux is inspired by Unix and is designed to be Unix-like. It follows many of the same principles and standards, making it compatible with Unix software and commands.



Linux is an open-source kernel.

A kernel is the core part of an operating system, managing system resources and communication between hardware and software.

Linux Distributions (Distros)

An operating system made from a software collection, which includes the Linux kernel and often a package management system.

ubuntu



CentOS

Key Features:

- **Open Source:** Source code is freely available and can be modified.
- **Multiuser:** Multiple users can access system resources simultaneously.
- **Multitasking:** Can run multiple tasks simultaneously.
- **Security:** Strong security features and regular updates.
- **Portability:** Can run on various hardware platforms.

Market Demand:

Job Roles: Linux skills are in demand for roles such as system administrators, DevOps engineers, cloud architects, software developers, network engineers, and cybersecurity professionals.

Industry Adoption: Many companies, from tech giants like Google, Facebook, and Amazon to financial institutions and healthcare providers, rely on Linux for their IT infrastructure.

Recommendation for Beginners:

Ubuntu: It's widely used, has extensive documentation, and a large community for support.

Centos:

- **Community version of Red Hat Enterprise Linux (RHEL).**
- **Commonly used in enterprise environments.**

[What is Virtualization? | Hypervisor Types | Virtual Machines](#)



Why we need Virtual Machine?

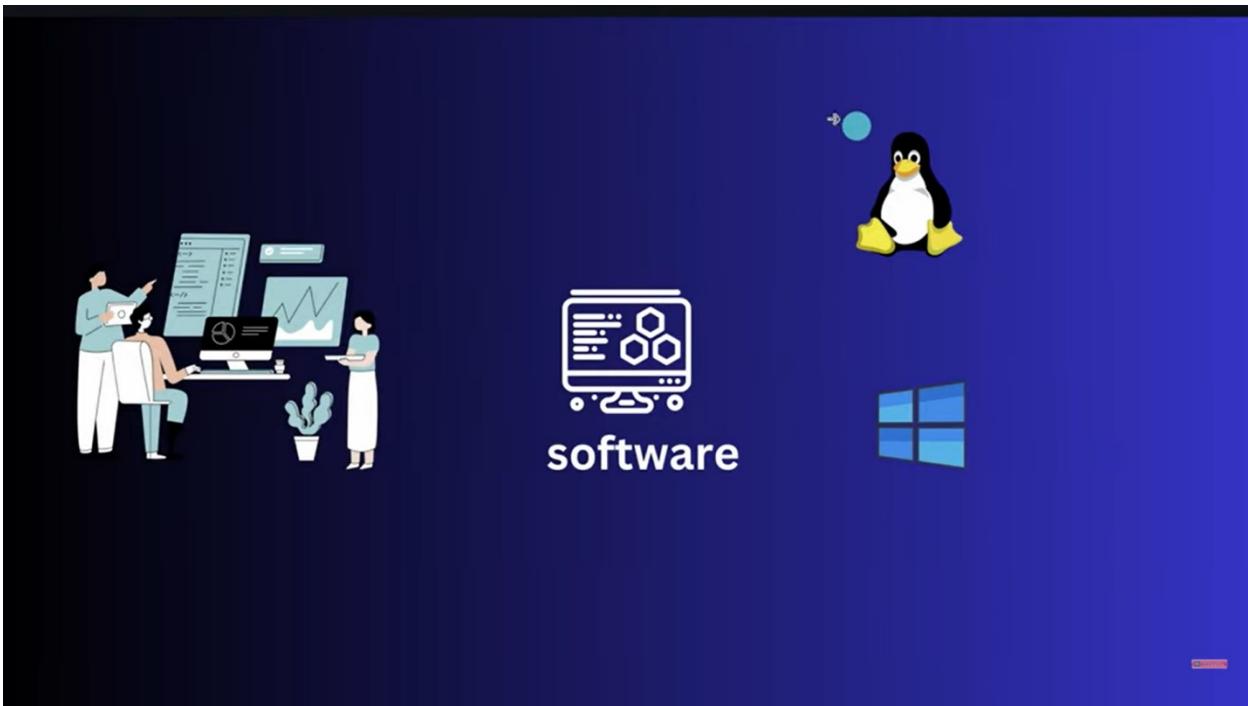


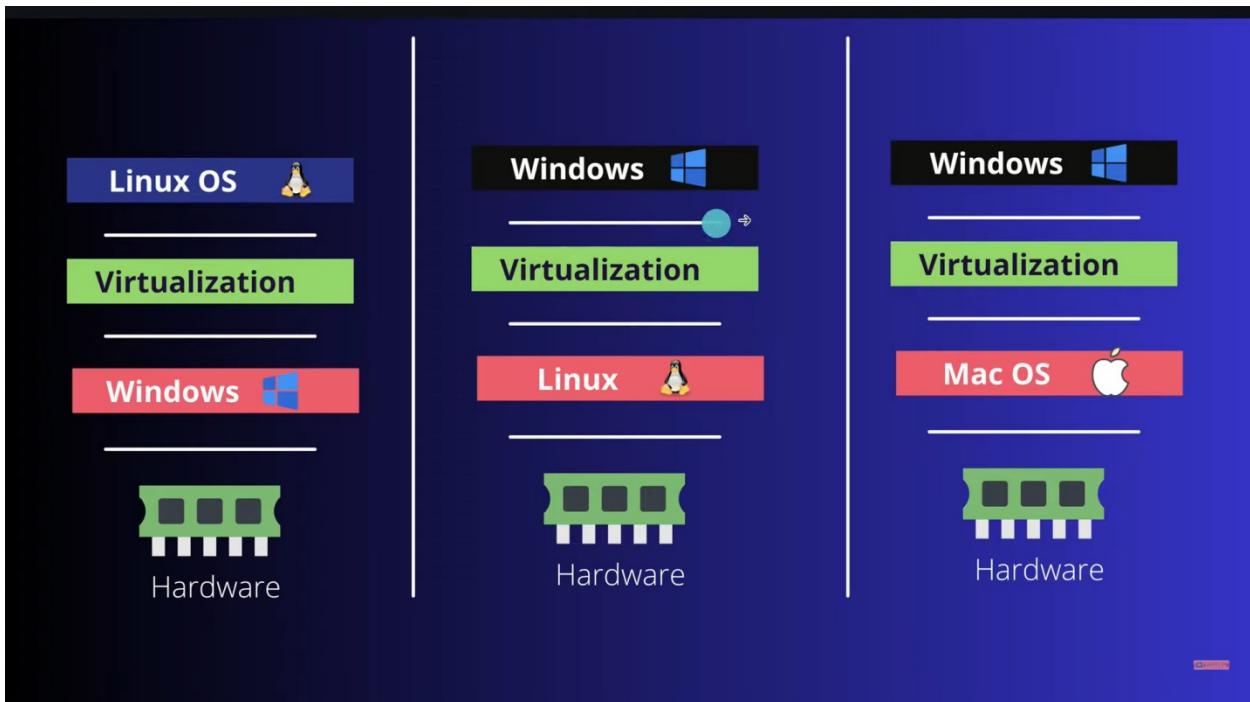
Applications



RAM, CPU, SDD

Hardware







Hypervisor

It is software that creates and runs
virtual machines (VMs).



HOST OS



Hypervisor



How Hypervisor works?

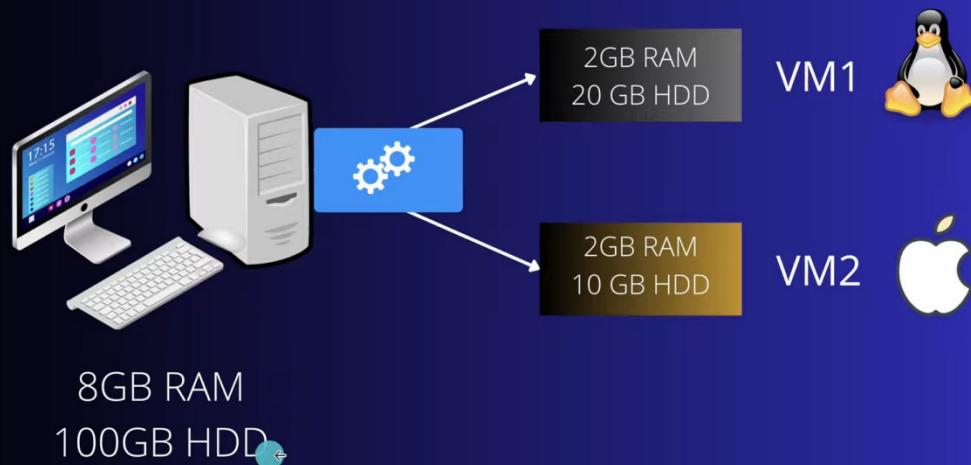
- Virtual boxes share hardware resources from Host OS
- Separate set of virtual CPU, RAM, storage etc
- VMs are fully isolated (independent of hosted OS)



Hypervisor



QUESTION



ANSWER

Benefits of VMs

- We don't need new resources to use different OS
- No risk of any issues with your primary OS
- Testing any app on different OS

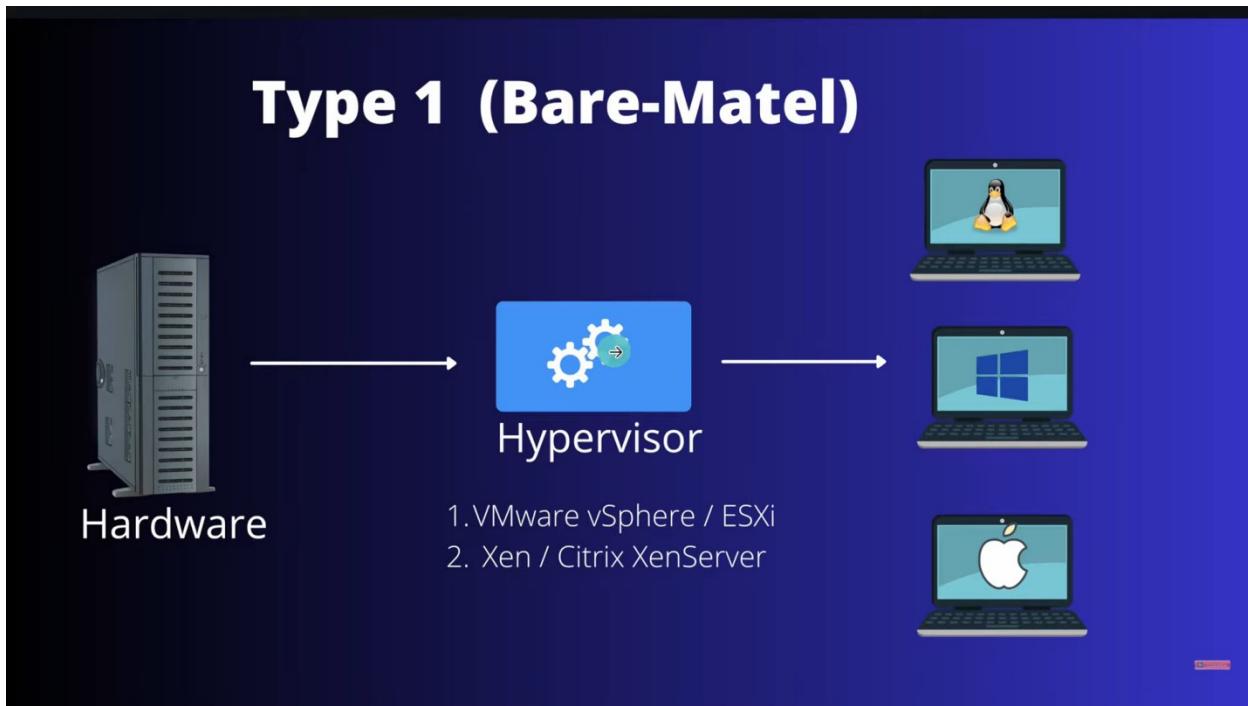
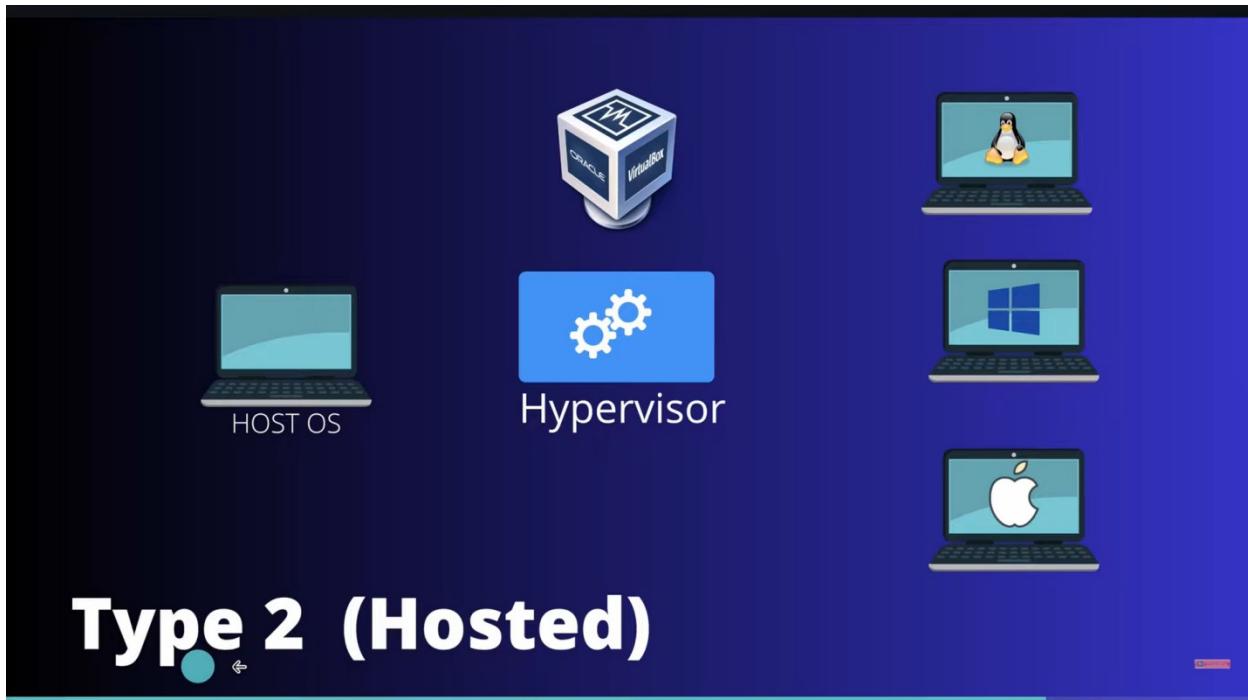


Types of Hypervisor

Type1(Bare Metal)

Type2 (hosted)





Type 1 (Bare-Metal)

Used by Cloud Providers and
Enterprise Servers.

Virtualization Use Case

- Cheap
- Reduces
 - workload
 - Space
 - Energy
- Easy backup using snapshot
- Easy recovery

Getting Started with PuTTY and WinSCP

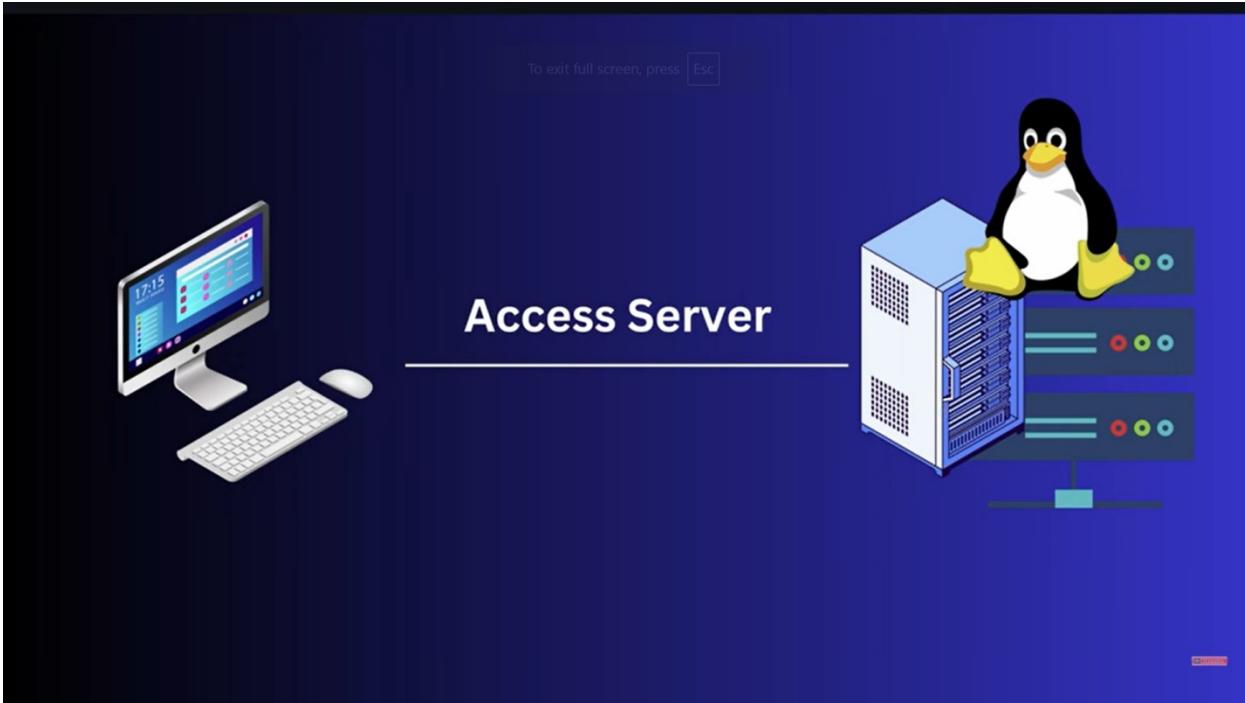


Putty

PuTTY is a free and open-source terminal.

It's widely used for remote access to servers via SSH.

Putty Connection with VM Ware(RHEL) – Ubuntu – CMD Windows Terminal



WinScp

A free SFTP, SCP, and FTP client for Windows that allows secure file transfer between your local machine and a remote server.



[What is SCP command in Linux? Transfer files between Linux Remote Servers](#)

SCP (Secure Copy Protocol)

is a command-line tool used for securely transferring files between a local and a remote host, or between two remote hosts, using SSH for encryption and authentication.

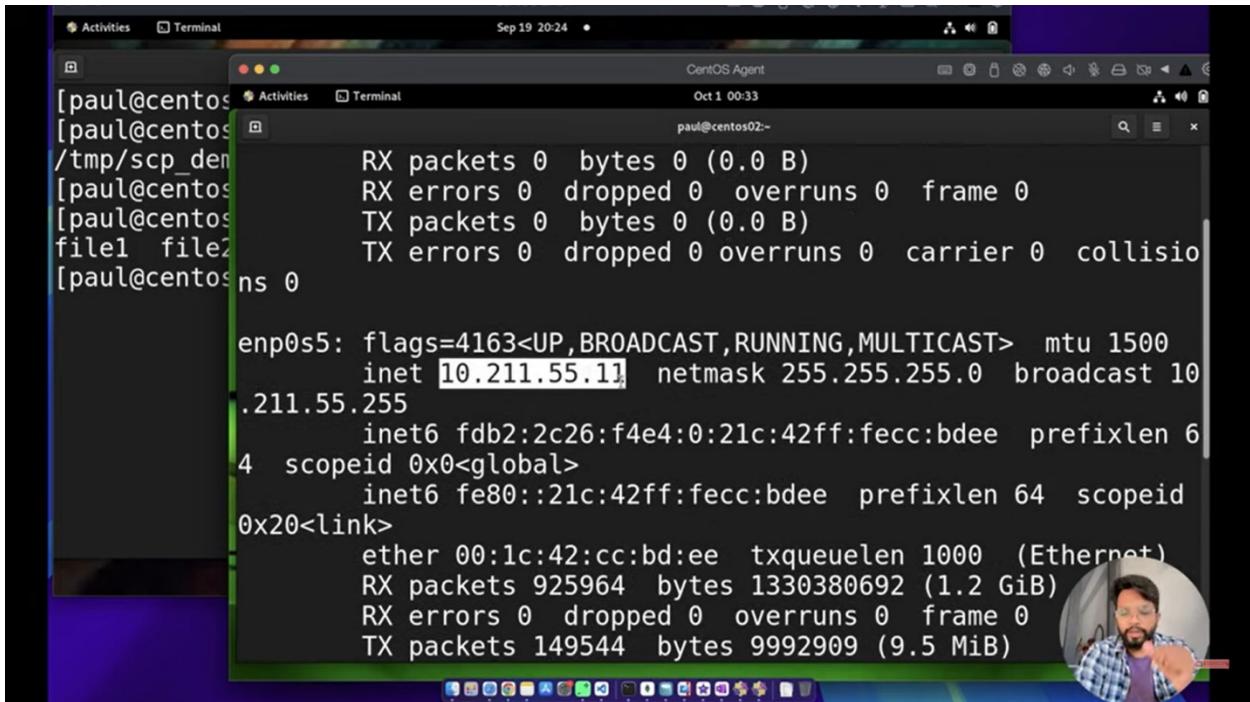


```
scp /local/file  
username@remote_host:/path/
```

```
[paul@centos01 ~]$  
[paul@centos01 ~]$ cd /tmp/  
[paul@centos01 tmp]$ mkdir scp_demo  
[paul@centos01 tmp]$ cd scp_demo/  
[paul@centos01 scp_demo]$ touch file1 file2  
[paul@centos01 scp_demo]$ ls  
file1 file2  
[paul@centos01 scp_demo]$ echo Hello> file1  
[paul@centos01 scp_demo]$ cat file1  
Hello  
[paul@centos01 scp_demo]$
```

```
[paul@centos01 scp_demo]$  
[paul@centos01 scp_demo]$ pwd  
/tmp/scp_demo  
[paul@centos01 scp_demo]$  
[paul@centos01 scp_demo]$ ls  
file1 file2  
[paul@centos01 scp_demo]$
```

Go to Cento2 – Server 2 Check IP .. # ifconfig



```
[paul@centos ~]$ scp file1 paul@10.211.55.11:/tmp/
[paul@centos ~]$ cd /tmp/
[paul@centos tmp]$ ls
CentOS Agent
Oct 1 00:33
paul@centos02:-
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
enp0s5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.211.55.11 netmask 255.255.255.0 broadcast 10.211.55.255
                inet6 fdb2:2c26:f4e4:0:21c:42ff:fecc:bdee prefixlen 64
                scopeid 0x0<global>
                inet6 fe80::21c:42ff:fecc:bdee prefixlen 64 scopeid 0x20<link>
                        ether 00:1c:42:cc:bd:ee txqueuelen 1000 (Ethernet)
                        RX packets 925964 bytes 1330380692 (1.2 GiB)
                        RX errors 0 dropped 0 overruns 0 frame 0
                        TX packets 149544 bytes 9992909 (9.5 MiB)
```

```
[paul@centos02 ~]$
[paul@centos02 ~]$ cd /tmp/
[paul@centos02 tmp]$
```

```
[paul@centos01 scp_demo]$ scp file1 paul@10.211.55.11:/tmp/
file1          100%    6      8.0KB/s   00:00
[paul@centos01 scp_demo]$
```

```
[paul@centos02 tmp]$ cat file1
Hello
[paul@centos02 tmp]$
```

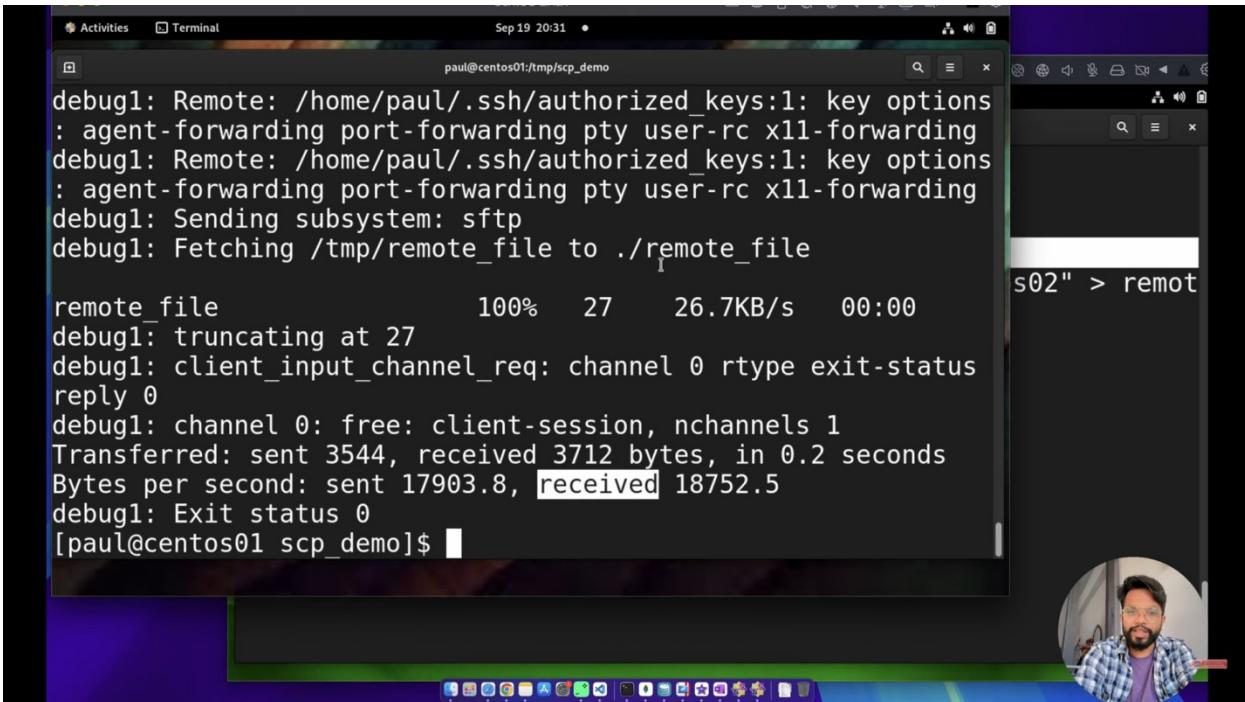
now server 1 receives file from server 2

```
[paul@centos02 tmp]$ touch remote_file
[paul@centos02 tmp]$ echo "This is file from centos02" > remote_file
[paul@centos02 tmp]$ cat remote_file
This is file from centos02
[paul@centos02 tmp]$
```

```
[paul@centos01 scp_demo]$ ls
file1  file2
[paul@centos01 scp_demo]$
```

```
[paul@centos01 scp_demo]$ scp -v paul@10.211.55.11:/tmp/remote_file .
```

-V : Verbose “.” : --- Current dir



A screenshot of a Linux desktop environment. In the foreground, a terminal window titled "Terminal" is open, showing the command "scp paul@centos01:/tmp/remote_file .". The output of the command is displayed, including debug logs and file transfer details. In the background, there is a video call interface with a circular video feed of a person with a beard and glasses.

```
debug1: Remote: /home/paul/.ssh/authorized_keys:1: key options
: agent-forwarding port-forwarding pty user-rc x11-forwarding
debug1: Remote: /home/paul/.ssh/authorized_keys:1: key options
: agent-forwarding port-forwarding pty user-rc x11-forwarding
debug1: Sending subsystem: sftp
debug1: Fetching /tmp/remote_file to ./remote_file
remote_file          100%   27    26.7KB/s  00:00
debug1: truncating at 27
debug1: client_input_channel_req: channel 0 rtype exit-status
reply 0
debug1: channel 0: free: client-session, nchannels 1
Transferred: sent 3544, received 3712 bytes, in 0.2 seconds
Bytes per second: sent 17903.8, received 18752.5
debug1: Exit status 0
[paul@centos01 scp_demo]$
```

```
file1  file2  remote_file
[paul@centos01 scp_demo]$ rm remote_file
[paul@centos01 scp_demo]$ ls
file1  file2
[paul@centos01 scp_demo]$
```

```
[paul@centos01 scp_demo]$
[paul@centos01 scp_demo]$ scp paul@10.211.55.11:/tmp/remote_file .
remote_file          100%   27    5.2KB/s  00:00
[paul@centos01 scp_demo]$ ls
file1  file2  remote_file
[paul@centos01 scp_demo]$
[paul@centos01 scp_demo]$ cat remote_file
This is file from centos02
[paul@centos01 scp_demo]$
```

```
[paul@centos01 scp_demo]$  
[paul@centos01 scp_demo]$ scp file1 file2 paul@10.211.55.11:/tmp/  
file1                      100%     6    12.0KB/s  00:00  
file2                      100%     0    0.0KB/s  00:00  
[paul@centos01 scp_demo]$  
[paul@centos01 scp_demo]$ scp file* paul@10.211.55.11:/tmp/  
file1                      100%     6    12.6KB/s  00:00  
file2                      100%     0    0.0KB/s  00:00  
[paul@centos01 scp_demo]$ scp * paul@10.211.55.11:/tmp/  
file1                      100%     6    13.3KB/s  00:00  
file2                      100%     0    0.0KB/s  00:00  
mydir is not a regular file  
failed to upload file mydir to /tmp/mydir  
remote_file                 100%   27    67.7KB/s  00:00  
[paul@centos01 scp_demo]$
```

Dir .. -r

Working with Multiple Files

```
vim -o file1 file1
```

To read multiple files at once

```
[paul@redhat01 vim]$ vim -o 10_if-else.sh myfile
```

```
#!/bin/bash
read -p "Enter your marks: " marks
if [[ $marks -gt 40 ]]
then
    echo "You are PASS"
else
    echo "You are FAIL!!!!!!!!!!!!"
fi
~
~
~
~
10_if-else.sh          1,1      All
HI This is my new file.
~
~
~
~
~
~
~
~
myfile
"myfile" 3L, 26B
```



now Go to file 2 cursor Ctrl +WW (up + down too)

```
[paul@centosvm viTutorial]$ nano myfile
[paul@centosvm viTutorial]$ ls
myfile  myfile_new  names
[paul@centosvm viTutorial]$ 
[paul@centosvm viTutorial]$ cat myfile_new
Hi

My name is Raju

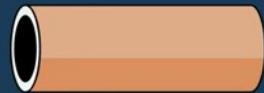
My name is Sham

[paul@centosvm viTutorial]$ cat myfile
Hi

My name is Raju
[paul@centosvm viTutorial]$ 
```

PIPING

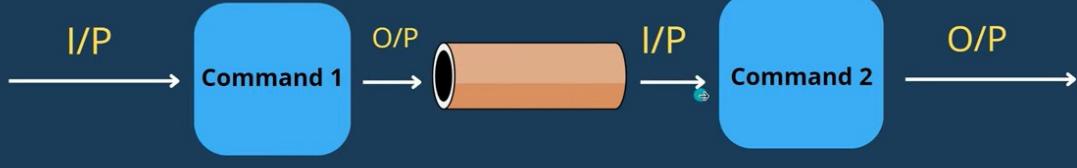
What is a Pipe?



Pipes are used to redirect a stream from one program to another program.

The output of one command redirect it to the input of another.

How Piping works?



Pipe Syntax

We use '| symbol to separate two commands.

Output of first command passed/redirected to second command.

```
$ command1 | command2
```



```
ps -ef | less
```

UID	PID	PPID	C	S	TIME	CMD
root	1	0	0	14:37	?	00:00:06 /usr/lib/systemd/systemd --switched-root --system
root	2	0	0	14:37	?	00:00:00 [kthreadd]
root	3	2	0	14:37	?	00:00:00 [pool_workqueue_release]
root	4	2	0	14:37	?	00:00:00 [kworker/R-rcu_gp]
root	5	2	0	14:37	?	00:00:00 [kworker/R-sync_wq]
root	6	2	0	14:37	?	00:00:00 [kworker/R-slub_flushwq]
root	7	2	0	14:37	?	00:00:00 [kworker/R-netns]
root	9	2	0	14:37	?	00:00:00 [kworker/0:0H-events_highpri]
root	11	2	0	14:37	?	00:00:00 [kworker/u512:0-events_unbound]
root	12	2	0	14:37	?	00:00:00 [kworker/R-mm_percpu_wq]
root	13	2	0	14:37	?	00:00:00 [kworker/u512:1-ipv6_addrconf]
root	14	2	0	14:37	?	00:00:00 [rcu_tasks_kthread]
root	15	2	0	14:37	?	00:00:00 [rcu_tasks_rude_kthread]
root	16	2	0	14:37	?	00:00:00 [rcu_tasks_trace_kthread]
root	17	2	0	14:37	?	00:00:00 [ksoftirqd/0]
root	18	2	0	14:37	?	00:00:01 [rcu_preempt]
root	19	2	0	14:37	?	00:00:00 [rcu_exp_par_gp_kthread_worker/1]
root	20	2	0	14:37	?	00:00:00 [rcu_exp_gp_kthread_worker]

```
root@localhost:~# ps -ef | grep httpd
root      3912      3588  0 15:40 pts/0    00:00:00 grep --color=auto httpd
root@localhost:~#
```

Case 1

Find no. of files present in a directory.



RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || | | | | | | | |

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My Computer RHEL-10

Mar 3 3:43 PM siddhartha@localhost:/etc - bash /etc

```
root@localhost:/etc# ls -l
total 1316
-rw-r--r--. 1 root          root          16 Feb 27 16:56 adjtime
-rw-r--r--. 1 root          root          1529 Nov 29 2023 aliases
drwxr-xr-x. 3 root          root          65 Feb 27 16:49 alsa
drwxr-xr-x. 2 root          root          4096 Feb 27 16:50 alternatives
-rw-r--r--. 1 root          root          541 Jun 24 2024 anacrontab
-rw-r--r--. 1 root          root          55 Jun 17 2024 asound.conf
-rw-r--r--. 1 root          root          1 Jun 24 2024 at.deny
drwxr-x---. 4 root          root          100 Feb 27 16:39 audit
drwxr-xr-x. 3 root          root          4096 Feb 27 16:56 authselect
drwxr-xr-x. 4 root          root          71 Feb 27 16:39 avahi
drwxr-xr-x. 2 root          root          53 Feb 27 16:49 bash_completion.d
-rw-r--r--. 1 root          root          2709 Nov 29 2023 bashrc
-rw-r--r--. 1 root          root          535 Jul 27 2024 bindresvport.blacklist
drwxr-xr-x. 2 root          root          6 Aug 30 2024 binfmt.d
dr-xr-xr-x. 2 root          root          61 Feb 27 16:39 bluetooth
-rw-r-----. 1 root          brlapi         33 Feb 27 16:40 brlapi.key
drwxr-xr-x. 7 root          root          84 Feb 27 16:40 brltty
-rw-r--r--. 1 root          root          30583 Jul 4 2024 brltty.conf
```

To direct input to this VM, move the mouse pointer outside or press Ctrl+G.

```
root@localhost:/etc# ls -l | wc -l  
236  
root@localhost:/etc#
```

There are two files
names.txt
country.txt

Combine both files content using cat and sort it.



combine

```
[paul@cvm pipes]$ cat countries.txt  
India  
Nepal  
Japan  
Singapore  
France  
Spain  
  
[paul@cvm pipes]$ cat names.txt  
Raju  
Sham  
Baburao  
Kabira  
Raju  
Kachra  
Sham  
[paul@cvm pipes]$
```

```
[paul@cvm pipes]$ cat names.txt countries.txt
Raju
Sham
Baburao
Kabira
Raju
Kachra
Sham
India
Nepal
Japan
Singapore
France
Spain
```

```
[paul@cvm pipes]$
```

```
[paul@cvm pipes]$ cat names.txt countries.txt | sort
```

```
Baburao
France
India
Japan
Kabira
Kachra
Nepal
Raju
Raju
Sham
Sham
Singapore
Spain
```

```
[paul@cvm pipes]$ |
```

Find unique records from a file.

names.txt

```
Raju  
Sham  
Baburao  
Kabira  
Raju  
Kachra  
Sham
```

```
Baburao  
Kabira  
Kachra  
Raju  
Sham
```

```
[paul@cvm pipes]$ cat names.txt  
Raju  
Sham  
Baburao  
Kabira  
Raju  
Kachra  
Sham  
[paul@cvm pipes]$  
[paul@cvm pipes]$ cat names.txt | sort  
Baburao  
Kabira  
Kachra  
Raju  
Raju  
Sham  
Sham  
[paul@cvm pipes]$
```

```
[paul@cvm pipes]$ cat names.txt | sort | uniq  
Baburao  
Kabira  
Kachra  
Raju  
Sham  
[paul@cvm pipes]$
```

Case4

How to see only 30-37th Line in a file of 100 lines?



1.....
2.....
3.....

98.....
99.....
100.....

```
81,Lithuania  
82,Poland  
83,Bouvet Island  
84,Falkland Islands (Malvinas)  
85,Jersey  
86,Cameroon  
87,Iceland  
88,Belgium  
89,Fiji  
90,Guinea  
91,Bulgaria  
92,Bouvet Island  
93,Albania  
94,French Guiana  
95,Hungary  
96,French Guiana  
97,El Salvador  
98,Netherlands Antilles  
99,Åland Islands  
100,Greece  
[paul@cvm pipes]$ |
```

```
[paul@cvm pipes]$ cat data.txt | head -38
```

Col 1 --> Col 37

```
23,Denmark
24,Palau
25,Austria
26,Macao
27,Tonga
28,Morocco
29,Comoros
30,Angola
31,Mayotte
32,"Taiwan, Province of China"
33,Somalia
34,Russian Federation
35,Denmark
36,American Samoa
37,Lebanon
[paul@cvm pipes]$
```

```
[paul@cvm pipes]$ cat data.txt | head -38 | tail -7
31,Mayotte
32,"Taiwan, Province of China"
33,Somalia
34,Russian Federation
35,Denmark
36,American Samoa
37,Lebanon
[paul@cvm pipes]$
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || | | | | | | | | | | | | | | | | |

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My Computer RHEL-10

siddhartha@localhost:~ - bash

Mar 3 3:48 PM

```
root@localhost:~# netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address       State
udp      0      0 localhost.localdomain:bootpc 192.168.56.254:bootps ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State      I-Node    Path
unix   3      [ ]      STREAM    CONNECTED  17890    /run/systemd/journal/stdout
unix   3      [ ]      STREAM    CONNECTED  17007    ...
unix   3      [ ]      STREAM    CONNECTED  19411    ...
unix   3      [ ]      STREAM    CONNECTED  18159    /run/dbus/system_bus_socket
unix   3      [ ]      STREAM    CONNECTED  16916    ...
unix   3      [ ]      DGRAM     CONNECTED  16049    ...
unix   3      [ ]      DGRAM     CONNECTED  16047    ...
unix   3      [ ]      STREAM    CONNECTED  16754    /run/gdm/dbus/dbus-6tBb3aQC
unix   3      [ ]      STREAM    CONNECTED  15933    ...
unix   3      [ ]      STREAM    CONNECTED  11006    /run/systemd/journal/stdout
unix   3      [ ]      STREAM    CONNECTED  18915    /run/dbus/system_bus_socket
unix   3      [ ]      STREAM    CONNECTED  18832    ...
unix   3      [ ]      STREAM    CONNECTED  11974    ...
unix   3      [ ]      STREAM    CONNECTED  19409    /run/user/1000/bus

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
```

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RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || | | | | | | | | | | | | | | | | | | |

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My Computer RHEL-10

siddhartha@localhost:~ - bash

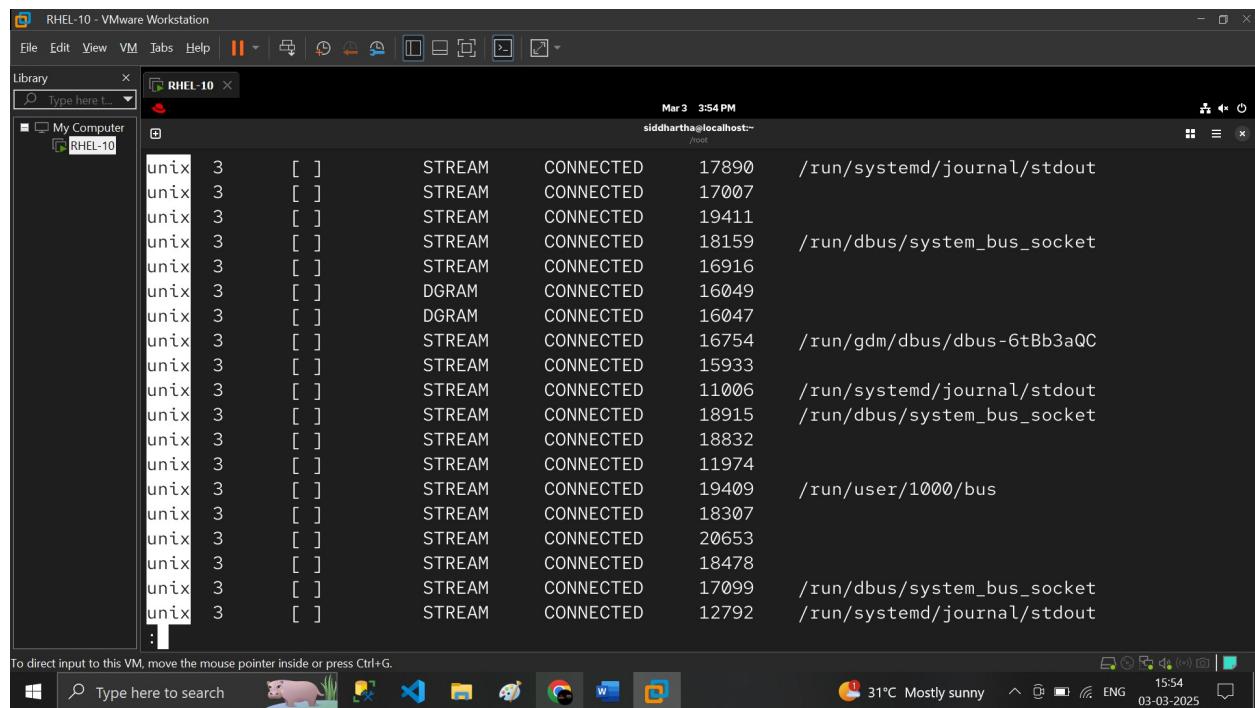
Mar 3 3:53 PM

```
root@localhost:~# netstat | more
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address       State
udp      0      0 localhost.localdomain:bootpc 192.168.56.254:bootps ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State      I-Node    Path
unix   3      [ ]      STREAM    CONNECTED  17890    /run/systemd/journal/stdout
unix   3      [ ]      STREAM    CONNECTED  17007    ...
unix   3      [ ]      STREAM    CONNECTED  19411    ...
unix   3      [ ]      STREAM    CONNECTED  18159    /run/dbus/system_bus_socket
unix   3      [ ]      STREAM    CONNECTED  16916    ...
unix   3      [ ]      DGRAM     CONNECTED  16049    ...
unix   3      [ ]      DGRAM     CONNECTED  16047    ...
unix   3      [ ]      STREAM    CONNECTED  16754    /run/gdm/dbus/dbus-6tBb3aQC
unix   3      [ ]      STREAM    CONNECTED  15933    ...
unix   3      [ ]      STREAM    CONNECTED  11006    /run/systemd/journal/stdout
unix   3      [ ]      STREAM    CONNECTED  18915    /run/dbus/system_bus_socket
unix   3      [ ]      STREAM    CONNECTED  18832    ...
unix   3      [ ]      STREAM    CONNECTED  11974    ...
unix   3      [ ]      STREAM    CONNECTED  19409    /run/user/1000/bus

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
```

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```
Mar 3 3:54 PM siddhartha@localhost:~$ netstat -an | grep :127.92
unix  3      [ ]        STREAM   CONNECTED    17890   /run/systemd/journal/stdout
unix  3      [ ]        STREAM   CONNECTED    17007   17007
unix  3      [ ]        STREAM   CONNECTED    19411   19411
unix  3      [ ]        STREAM   CONNECTED    18159   /run/dbus/system_bus_socket
unix  3      [ ]        STREAM   CONNECTED    16916   16916
unix  3      [ ]        DGRAM    CONNECTED    16049   16049
unix  3      [ ]        DGRAM    CONNECTED    16047   16047
unix  3      [ ]        STREAM   CONNECTED    16754   /run/gdm/dbus/dbus-6tBb3aQC
unix  3      [ ]        STREAM   CONNECTED    15933   15933
unix  3      [ ]        STREAM   CONNECTED    11006   /run/systemd/journal/stdout
unix  3      [ ]        STREAM   CONNECTED    18915   /run/dbus/system_bus_socket
unix  3      [ ]        STREAM   CONNECTED    18832   18832
unix  3      [ ]        STREAM   CONNECTED    11974   11974
unix  3      [ ]        STREAM   CONNECTED    19409   /run/user/1000/bus
unix  3      [ ]        STREAM   CONNECTED    18307   18307
unix  3      [ ]        STREAM   CONNECTED    20653   20653
unix  3      [ ]        STREAM   CONNECTED    18478   18478
unix  3      [ ]        STREAM   CONNECTED    17099   /run/dbus/system_bus_socket
unix  3      [ ]        STREAM   CONNECTED    12792   /run/systemd/journal/stdout
:
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.



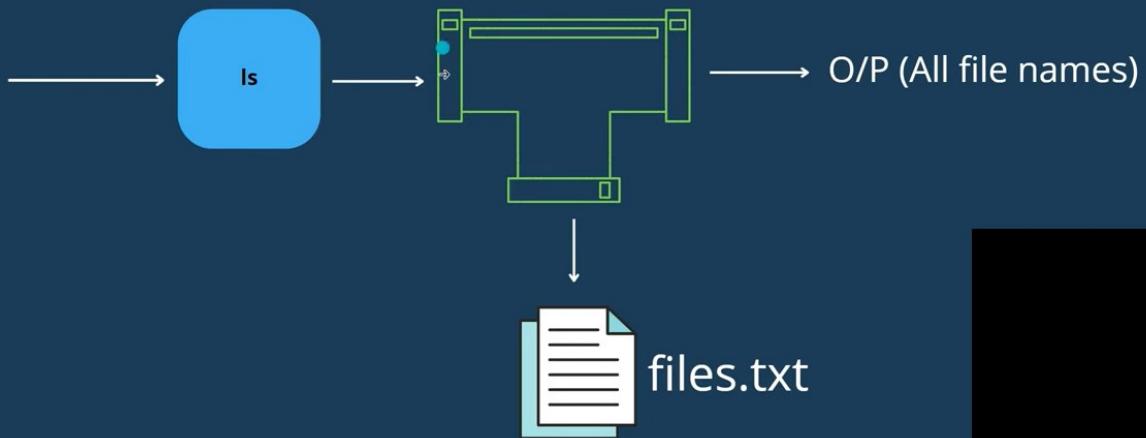
31°C Mostly sunny 15:54 03-03-2025

TEE Command

Tee reads standard input and copies it both to stdOutput and to a file.

We can see the information going through pipeline.

```
$ ls | tee files.txt
```



```
root@localhost:~# ls
anaconda-ks.cfg  test.sh
root@localhost:~# ls > test.txt
root@localhost:~# ls -ltr
total 12
-rw-----. 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rwxrwxrwx. 1 root root    49 Feb 27 18:17 test.sh
-rw-r--r--. 1 root root   33 Mar  3 15:57 test.txt
root@localhost:~# cat test.txt
anaconda-ks.cfg
test.sh
test.txt
root@localhost:~#
```

```
root@localhost:~# ls | tee test.txt
anaconda-ks.cfg
test.sh
root@localhost:~# ls -ltr
total 12
-rw-----. 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rwxrwxrwx. 1 root root    49 Feb 27 18:17 test.sh
-rw-r--r--. 1 root root    24 Mar   3 15:59 test.txt
root@localhost:~# cat test.txt
anaconda-ks.cfg
test.sh
root@localhost:~# 
```

```
root@localhost:~# ls | tee test.txt
anaconda-ks.cfg
test.sh
root@localhost:~# ls -ltr
total 12
-rw-----. 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rwxrwxrwx. 1 root root    49 Feb 27 18:17 test.sh
-rw-r--r--. 1 root root    24 Mar   3 15:59 test.txt
root@localhost:~# cat test.txt
anaconda-ks.cfg
test.sh
root@localhost:~# ls | tee test.txt | wc -l
3
```

```
root@localhost:~# ls
anaconda-ks.cfg  test.sh  test.txt
root@localhost:~# ls > test1.txt | wc -l
0
root@localhost:~# 
```

that's the reason Tee cmd is used

xargs

It convert the stdInput into command line argument

```
root@localhost:~# ls | echo  
  
root@localhost:~# ls | xargs echo  
anaconda-ks.cfg test1.txt test.sh test.txt  
root@localhost:~# ls | xargs echo "Hi"  
Hi anaconda-ks.cfg test1.txt test.sh test.txt  
root@localhost:~# █
```



file1
file2
file3
file4
file5

To do:

Take/read the name from FileNames.txt and create those no. of files in the present directory.

```
[paul@cvm pipes]$ cat FileNames.txt
file1
file2
file3
file4
file5
[paul@cvm pipes]$ ls -ltr
total 28
-rw-rw-r--. 1 paul paul    42 Sep  9 07:24 names.txt
-rw-rw-r--. 1 paul paul    42 Sep  9 07:52 countries.txt
-rw-rw-r--. 1 paul paul 1369 Sep  9 07:59 data.txt
-rw-rw-r--. 1 paul paul    33 Sep  9 10:12 files.txt
-rw-rw-r--. 1 paul paul    52 Sep  9 11:44 test.txt
-rw-rw-r--. 1 paul paul   62 Sep  9 11:44 test1.txt
-rw-rw-r--. 1 paul paul   30 Sep  9 11:49 FileNames.txt
[paul@cvm pipes]$
```

```
[paul@cvm pipes]$ cat FileNames.txt | xargs touch
[paul@cvm pipes]$ ls -ltr
total 28
-rw-rw-r--. 1 paul paul    42 Sep  9 07:24 names.txt
-rw-rw-r--. 1 paul paul    42 Sep  9 07:52 countries.txt
-rw-rw-r--. 1 paul paul 1369 Sep  9 07:59 data.txt
-rw-rw-r--. 1 paul paul    33 Sep  9 10:12 files.txt
-rw-rw-r--. 1 paul paul    52 Sep  9 11:44 test.txt
-rw-rw-r--. 1 paul paul   62 Sep  9 11:44 test1.txt
-rw-rw-r--. 1 paul paul   30 Sep  9 11:49 FileNames.txt
-rw-rw-r--. 1 paul paul     0 Sep  9 11:51 file1
-rw-rw-r--. 1 paul paul     0 Sep  9 11:51 file3
-rw-rw-r--. 1 paul paul     0 Sep  9 11:51 file2
-rw-rw-r--. 1 paul paul     0 Sep  9 11:51 file5
-rw-rw-r--. 1 paul paul     0 Sep  9 11:51 file4
[paul@cvm pipes]$
```

Mastering Linux GREP Command with 15+ Practical Use Cases

15 Cases of grep command

1. To ignore the upper and lower case while searching
2. To search everything except given pattern/keyword
3. To print how many times (count) given keyword present in file
4. To search for exact match of given keyword in a file
5. To print the line no. of matches of given keyword in a file
6. To search a given keyword in multiple files
7. To suppress file names while search a given keyword in multiple files
8. To search multiple keywords in a file
9. To search multiple keywords in multiple file
10. To only print file names which matches given keywords
11. To get the keywords/pattern from a file and match with another file
12. To print the matching line which start with given keyword
13. To print the matching line which end with given keyword
14. Suppose we have 100 files in a directory (dirA) and we need to search a keyword in all the files
15. We can use egrep command for the multiple keywords search
16. If you just wanna search but don't want to print on terminal or If you want to suppress error message

grep command

"Global Regular Expression Print"

Grep command search for a particular string/keyword from a file and print lines matching a pattern.

It check line by line and print lines matching given pattern.

grep command syntax

grep [OPTION].. Pattern [File]..

◀

```
[paul@centos01 grep]$ grep -e file1.txt file.txt keywords.txt users.csv  
[paul@centos01 grep]$ less users.csv █
```

```
id,firstname,lastname,email,email2,profession  
1000,Jsandye,Delila,Jsandye.Delila@yopmail.com,Jsandye.Delila@gmail.com,fire  
fficer  
1001,Dode,Henebry,Dode.Henebry@yopmail.com,Dode.Henebry@gmail.com,fire  
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,fire  
1003,Tracey,Frendel,Tracey.Frendel@yopmail.com,Tracey.Frendel@gmail.com,fire  
ter  
1004,Oralee,Woodberry,Oralee.Woodberry@yopmail.com,Oralee.Woodberry@gmail.com,fire  
rker  
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,fire  
1006,Nataline,Tice,Nataline.Tice@yopmail.com,Nataline.Tice@gmail.com,fire  
1007,Sissy,Clarissa,Sissy.Clarissa@yopmail.com,Sissy.Clarissa@gmail.com,fire  
r  
1008,Kristina,Zenas,Kristina.Zenas@yopmail.com,Kristina.Zenas@gmail.com,fire  
ter  
1009,Molli,Chick,Molli.Chick@yopmail.com,Molli.Chick@gmail.com,devel  
1010,Lorie,Land,Lorie.Land@yopmail.com,Lorie.Land@gmail.com,firefig  
1011,Harrietta,Gillan,Harrietta.Gillan@yopmail.com,Harrietta.Gillan@gmail.com,devel  
oper  
1012,Adele,Clarissa,Adele.Clarissa@yopmail.com,Adele.Clarissa@gmail.com,fire  
fficer  
1013,Celestyna,Pettiford,Celestyna.Pettiford@yopmail.com,Celestyna.Pettiford@gmail.com,fire
```

```
[paul@centos01 grep]$ grep Kara users.csv  
1083,Kara-Lynn,Ailyn,Kara-Lynn.Ailyn@yopmail.com,Kara-Lynn.Ailyn@gmail.com,firef  
ighter  
[paul@centos01 grep]$ █
```

Case1

To ignore the upper and lower case while searching
`grep -i "keyword" file`

```
[paul@centos01 grep]$ grep -i kara users.csv
1083,Kara-Lynn,Ailyn,Kara-Lynn.Ailyn@yopmail.com,Kara-Lynn.Ailyn@gmail.com,firef
ighter
[paul@centos01 grep]$
```

Case2

To search everything except given pattern/keyword
`grep -v "keyword" file`

```
[paul@centos01 grep]$
[paul@centos01 grep]$ grep -v Kara users.csv
```



```
paul@centos01:~/tutorials/grep
1006,Nataline,Tice,Nataline.Tice@yopmail.com,Nataline.Tice@gmail.com,developer
1007,Sissy,Clarissa,Sissy.Clarissa@yopmail.com,Sissy.Clarissa@gmail.com,developer
1008,Kristina,Zenas,Kristina.Zenas@yopmail.com,Kristina.Zenas@gmail.com,firefighter
1009,Molli,Chick,Molli.Chick@yopmail.com,Molli.Chick@gmail.com,developer
1010,Lorie,Land,Lorie.Land@yopmail.com,Lorie.Land@gmail.com,firefighter
1011,Harrietta,Gillan,Harrietta.Gillan@yopmail.com,Harrietta.Gillan@gmail.com,developer
1012,Adele,Clarissa,Adele.Clarissa@yopmail.com,Adele.Clarissa@gmail.com,police officer
1013,Celestyna,Pettiford,Celestyna.Pettiford@yopmail.com,Celestyna.Pettiford@gmail.com,worker
1014,Dolli,Tryck,Dolli.Tryck@yopmail.com,Dolli.Tryck@gmail.com,developer
1015,Marylou,Jerald,Marylou.Jerald@yopmail.com,Marylou.Jerald@gmail.com,police officer
1016,Wendi,Ailyn,Wendi.Ailyn@yopmail.com,Wendi.Ailyn@gmail.com,developer
1017,Allis,Barrus,Allis.Barrus@yopmail.com,Allis.Barrus@gmail.com,firefighter
1018,Norine,Melleta,Norine.Melleta@yopmail.com,Norine.Melleta@gmail.com,firefighter
1019,Cacilie,Gaulin,Cacilie.Gaulin@yopmail.com,Cacilie.Gaulin@gmail.com,developer
1020,Marjie,Shaver,Marjie.Shaver@yopmail.com,Marjie.Shaver@gmail.com,developer
1021,Carmencita,Salchunas,Carmencita.Salchunas@yopmail.com,Carmencita.Salchunas@gmail.com,developer
```

Case3

To print how many times (count) given keyword present in file
grep -c "keyword" file

```
[paul@centos01 grep]$ grep -c doctor users.csv
15
[paul@centos01 grep]$
```

Case4

To search for exact match of given keyword in a file
grep -w "keyword" file

```
[paul@centos01 grep]$ grep -iw karly users.csv
1098,Karly,Roarke,Karly.Roarke@yopmail.com,Karly.Roarke@gmail.com,firefighter
[paul@centos01 grep]$
```

Case5

To print the line no. of matches of given keyword in a file
grep -n "keyword" file

```
[paul@centos01 grep]$ grep -in karly users.csv
100:1098,Karly,Roarke,Karly.Roarke@yopmail.com,Karly.Roarke@gmail.com,firefighter
[paul@centos01 grep]$
```

Case6

To search a given keyword in multiple files
grep "keyword" file1 file2...

Note: By default result of multiple files shows file name in output.

```
[paul@centos01 grep]$ grep -i karly users.csv file.txt file1.txt
users.csv:1098,Karly,Roarke,Karly.Roarke@yopmail.com,Karly.Roarke@gmail.com,fire
fighter
[paul@centos01 grep]$
```

```
[paul@centos01 grep]$ grep -i merry users.csv file.txt file1.txt
users.csv:1031,Merry,Rese,Merry.Rese@yopmail.com,Merry.Rese@gmail.com,developer
users.csv:1056,Merry,Decato,Merry.Decato@yopmail.com,Merry.Decato@gmail.com,poli
ce officer
file.txt:Merry
[paul@centos01 grep]$
```

Case7

To suppress file names while search a given keyword in multiple files
grep -h "keyword" file1 file2...

```
[paul@centos01 grep]$ grep -ih merry users.csv file.txt file1.txt
1031,Merry,Rese,Merry.Rese@yopmail.com,Merry.Rese@gmail.com,developer
1056,Merry,Decato,Merry.Decato@yopmail.com,Merry.Decato@gmail.com,police officer
Merry
[paul@centos01 grep]$
[paul@centos01 grep]$
```

Case8

To search multiple keywords in a file
grep -e "keyword1" -e "keyword2" file

```
[paul@centos01 grep]$ grep -ie merry -e Kara -e Karly users.csv
1031,Merry,Rese,Merry.Rese@yopmail.com,Merry.Rese@gmail.com,developer
1056,Merry,Decato,Merry.Decato@yopmail.com,Merry.Decato@gmail.com,police officer
1083,Kara-Lynn,Ailyn,Kara-Lynn.Ailyn@yopmail.com,Kara-Lynn.Ailyn@gmail.com,firef
ighter
1098,Karly,Roarke,Karly.Roarke@yopmail.com,Karly.Roarke@gmail.com,firefighter
[paul@centos01 grep]$
```

```
[paul@centos01 grep]$ egrep "Kara|Merry|Karaly" users.csv  
1031,Merry,Rese,Merry.Rese@yopmail.com,Merry.Rese@gmail.com,developer  
1056,Merry,Decato,Merry.Decato@yopmail.com,Merry.Decato@gmail.com,police officer  
1083,Kara-Lynn,Ailyn,Kara-Lynn.Ailyn@yopmail.com,Kara-Lynn.Ailyn@gmail.com,firefighter  
[paul@centos01 grep]$
```

Case9

To only print file names which matches given keyword

```
grep -l "keyword" file1 file2...
```

```
[paul@centos01 grep]$ grep -l Merry users.csv file.txt  
users.csv  
file.txt  
[paul@centos01 grep]$
```

Case10

To get the keywords/pattern from a file and match with a another file

```
grep -f keyword.txt file
```

```
[paul@centos01 grep]$ ls  
file1.txt file.txt keywords.txt users.csv  
[paul@centos01 grep]$  
[paul@centos01 grep]$ cat keywords.txt  
Kelly  
Raju  
[paul@centos01 grep]$  
[paul@centos01 grep]$ grep -f keywords.txt users.csv file.txt file1.txt  
users.csv:1071,Kelly,Japeth,Kelly.Japeth@yopmail.com,Kelly.Japeth@gmail.com,poli  
ce officer  
file1.txt:Raju  
[paul@centos01 grep]$
```

```
[paul@centos01 grep]$ grep -f keywords.txt *  
file1.txt:Raju  
keywords.txt:Kelly  
keywords.txt:Raju  
users.csv:1071,Kelly,Japeth,Kelly.Japeth@yopmail.com,Kelly.Japeth@gmail.com,poli  
ce officer  
[paul@centos01 grep]$ █
```

Case11

To print the matching line which start with given keyword
grep "[^]keyword" file



```
paul@centos01:~/tutorials/grep
id,firstname,lastname,email,email2,profession
1000,Jsandye,Delila,Jsandye.Delila@yopmail.com,Jsandye.Delila@gmail.com,police officer
1001,Dode,Henebry,Dode.Henebry@yopmail.com,Dode.Henebry@gmail.com,firefighter
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,doctor
1003,Tracey,Frendel,Tracey.Frendel@yopmail.com,Tracey.Frendel@gmail.com,firefighter
1004,Oralee,Woodberry,Oralee.Woodberry@yopmail.com,Oralee.Woodberry@gmail.com,worker
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,doctor
1006,Nataline,Tice,Nataline.Tice@yopmail.com,Nataline.Tice@gmail.com,developer
1007,Sissy,Clarissa,Sissy.Clarissa@yopmail.com,Sissy.Clarissa@gmail.com,developer
1008,Kristina,Zenas,Kristina.Zenas@yopmail.com,Kristina.Zenas@gmail.com,firefighter
1009,Molli,Chick,Molli.Chick@yopmail.com,Molli.Chick@gmail.com,developer
1010,Lorie,Land,Lorie.Land@yopmail.com,Lorie.Land@gmail.com,firefighter
1011,Harrietta,Gillan,Harrietta.Gillan@yopmail.com,Harrietta.Gillan@gmail.com,developer
1012,Adele,Clarissa,Adele.Clarissa@yopmail.com,Adele.Clarissa@gmail.com,police officer
1013,Celestyna,Pettiford,Celestyna.Pettiford@yopmail.com,Celestyna.Pettiford@gmail.com,worker
users.csv
```



```
[paul@centos01 grep]$
[paul@centos01 grep]$ less users.csv
[paul@centos01 grep]$
[paul@centos01 grep]$ grep ^100 users.csv
1000,Jsandye,Delila,Jsandye.Delila@yopmail.com,Jsandye.Delila@gmail.com,police officer
1001,Dode,Henebry,Dode.Henebry@yopmail.com,Dode.Henebry@gmail.com,firefighter
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,doctor
1003,Tracey,Frendel,Tracey.Frendel@yopmail.com,Tracey.Frendel@gmail.com,firefighter
1004,Oralee,Woodberry,Oralee.Woodberry@yopmail.com,Oralee.Woodberry@gmail.com,worker
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,doctor
1006,Nataline,Tice,Nataline.Tice@yopmail.com,Nataline.Tice@gmail.com,developer
1007,Sissy,Clarissa,Sissy.Clarissa@yopmail.com,Sissy.Clarissa@gmail.com,developer
1008,Kristina,Zenas,Kristina.Zenas@yopmail.com,Kristina.Zenas@gmail.com,firefighter
1009,Molli,Chick,Molli.Chick@yopmail.com,Molli.Chick@gmail.com,developer
[paul@centos01 grep]$
```

Case12

To print the matching line which end with given keyword

```
grep "keyword$" file
```



Case13

Suppose we have 100 files in a directory (dirA) and we need to search a keyword in all the files

```
grep -R "keyword" dirA/
```

```
[paul@centos01 grep]$  
[paul@centos01 grep]$ ls  
file1.txt file.txt keywords.txt users.csv  
[paul@centos01 grep]$  
[paul@centos01 grep]$ cd ..  
[paul@centos01 tutorials]$ ls  
grep redirections users.csv wildcards  
[paul@centos01 tutorials]$  
[paul@centos01 tutorials]$
```

```
[paul@centos01 tutorials]$  
[paul@centos01 tutorials]$ grep "Raju" grep/  
grep: grep/: Is a directory  
[paul@centos01 tutorials]$  
[paul@centos01 tutorials]$ grep -R "Raju" grep/  
grep/file1.txt:Raju  
grep/keywords.txt:Raju  
[paul@centos01 tutorials]$ █
```

```
[paul@centos01 tutorials]$ grep "Raju" grep/
grep: grep/: Is a directory
[paul@centos01 tutorials]$
[paul@centos01 tutorials]$ grep -R "Raju" grep/
grep/file1.txt:Raju
grep/keywords.txt:Raju
[paul@centos01 tutorials]$
[paul@centos01 tutorials]$ grep "Raju" grep/*
grep/file1.txt:Raju
grep/keywords.txt:Raju
[paul@centos01 tutorials]$
```

Case14

We can use egrep command for the multiple keywords search

```
egrep "key1|key2|key3" file
```

Case15

If you just wanna search but don't want to print on terminal

```
grep -q "keyword" file
```

If you want to suppress error message

```
grep -s "keyword" file
```

```
paul@centos01 tutorials]$  
[paul@centos01 tutorials]$ cd grep/  
[paul@centos01 grep]$  
[paul@centos01 grep]$ ls  
file1.txt file.txt keywords.txt users.csv  
[paul@centos01 grep]$  
[paul@centos01 grep]$ grep Kara users.csv  
1083,Kara-Lynn,Ailyn,Kara-Lynn.Ailyn@yopmail.com,Kara-Lynn.Ailyn@gmail.com,firef  
ighter  
[paul@centos01 grep]$  
[paul@centos01 grep]$ grep -q Kara users.csv  
[paul@centos01 grep]$ echo $?  
0  
[paul@centos01 grep]$ grep -q Ooara users.csv  
[paul@centos01 grep]$ echo $?  
1  
[paul@centos01 grep]$ █
```

```
[paul@centos01 grep]$ ls  
file1.txt file.txt keywords.txt users.csv  
[paul@centos01 grep]$  
[paul@centos01 grep]$ ls | grep -i file  
file1.txt  
file.txt  
[paul@centos01 grep]$ █
```

What is Linux Pgrep, Fgrep, ZGrep, PDFGrep, Egrep, Grep Commands



```
[root@centos01 tutorials]# grep Sara users.csv  
120, Sara-Ann,Faust, Sara-Ann.Faust@yopmail.com, Sara-Ann.Faust@gmail.com, firefighter  
[root@centos01 tutorials]#  
[root@centos01 tutorials]# grep Lucy users.csv  
146, Lucy,Reneta, Lucy.Reneta@yopmail.com, Lucy.Reneta@gmail.com, firefighter  
940, Lucy,Crudden, Lucy.Crudden@yopmail.com, Lucy.Crudden@gmail.com, police officer  
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]# grep Lucy users.csv  
146, Lucy,Reneta, Lucy.Reneta@yopmail.com, Lucy.Reneta@gmail.com, firefighter  
940, Lucy,Crudden, Lucy.Crudden@yopmail.com, Lucy.Crudden@gmail.com, police officer  
[root@centos01 tutorials]# egrep "Sara|Lucy|Candy" users.csv  
120, Sara-Ann,Faust, Sara-Ann.Faust@yopmail.com, Sara-Ann.Faust@gmail.com, firefighter  
146, Lucy,Reneta, Lucy.Reneta@yopmail.com, Lucy.Reneta@gmail.com, firefighter  
352, Candy,Myrilla, Candy.Myrilla@yopmail.com, Candy.Myrilla@gmail.com, developer  
873, Candy,Bertold, Candy.Bertold@yopmail.com, Candy.Bertold@gmail.com, firefighter
```

```
[root@centos01 tutorials]# ps -ef | grep nginx  
root      1238      1  0 03:06 ?        00:00:00 nginx: master process /usr  
/sbin/nginx  
nginx    1240    1238  0 03:06 ?        00:00:00 nginx: worker process  
nginx    1241    1238  0 03:06 ?        00:00:00 nginx: worker process  
root      3415    3068  0 03:33 pts/0    00:00:00 grep --color=auto nginx  
[root@centos01 tutorials]#  
[root@centos01 tutorials]# pgrep nginx  
1238  
1240  
1241
```

```
[root@centos01 tutorials]# cat example.txt  
  
hello.buddy  
hello buddy  
hello?buddy  
hello*buddy  
helloobuddy  
hellooooobuddy  
[root@centos01 tutorials]#  
[root@centos01 tutorials]# grep hello.buddy example.txt  
hello.buddy  
hello buddy  
hello?buddy  
hello*buddy  
helloobuddy  
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]# cat example.txt
hello.buddy
hello buddy
hello?buddy
hello*buddy
helloobuddy
hellooooobuddy
[root@centos01 tutorials]#
[root@centos01 tutorials]# grep hello.buddy example.txt
hello.buddy
hello buddy
hello?buddy
hello*buddy
helloobuddy
[root@centos01 tutorials]# fgrep hello.buddy example.txt
hello.buddy
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]#
[root@centos01 tutorials]# grep "hello*buddy" example.txt
helloobuddy
hellooooobuddy
[root@centos01 tutorials]# fgrep "hello*buddy" example.txt
hello*buddy
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]#
[root@centos01 tutorials]# ls -ltr
total 288
-rw-r--r--. 1 root root 13264 Aug 27 2007 dummy.pdf
-rw-r--r--. 1 root root 29 Feb 12 10:18 file2
-rw-r--r--. 1 root root 79436 Feb 12 13:09 users.csv
drwxr-xr-x. 3 root root 94 Feb 16 08:34 myfolder1
-rw-r--r--. 1 root root 112640 Feb 16 08:38 myfiles.tar
-rw-r--r--. 1 root root 41245 Feb 16 08:41 myfolder.zip
drwxr-xr-x. 3 root root 62 Feb 16 08:42 testfolder
-rwxr--r--. 1 root root 26 Mar 5 16:30 test.sh
-rw-r--r--. 1 root root 19189 Mar 6 13:32 users.csv.gz
-rw-r--rw-. 1 root root 73 Mar 11 03:47 testfile1.txt
-rw-r--r--. 1 root root 76 Mar 11 04:01 example.txt
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]# cat users.csv.gz
```

```
H00}0G0080
800J.fX0^00pao00
0'0v00|00.000!0R600Z0V000TOY000u0yjw090;30sH0ov0~0`090!0009x0;00j0d001g00000V
=x0a0X0Q0 2_*~0yo#00000xs'0LA0]i0B07000x&0"0
00o0000^q00{000内=00u00|
    ;0VCY00 00C0e0`000#
0e00K_pF0_kg0i0r[00H/005$4          00ED09B0000`003V
cc00000
00A,<>0tz|0/00o00D0=0N0000p;0000G{0<00l0ζb:8000t1000J0X09W_08-00N00,0E0a00
00000\0l03
00|8000`0300&0 0(H0*0&9000r000T0\0(cJ0`00:Q0Wn00y000|D]005za0P0iY04c00006000~0
01s00TÉ000000~0000Z0B00      00G0>00Uy0!I0bVo00t00nN01v0x020W3v0~v00t0^+ 0
00_000{0%0000000xq0700=X0rxF002jfK0gk00S00<0
W+0081 '0陀 2o30iB8!+vg=0060000F00u
0{01E00000000"0h000H00(000=0 0?00|'$'墨0{.x00L6w000900sbe0000000Cu000tt0700τ00
0m00r0 0?000o000 0000i0W/hvT0+00e 0u1000:最 z1000Z. 0m01000>wb0mF0?c00f?)@%0000
```

```
[root@centos01 tutorials]# zgrep Sara users.csv.gz
120,Sara-Ann,Faust,Sara-Ann.Faust@yopmail.com,Sara-Ann.Faust@gmail.com,firefig
hter
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]# ls -ltr
total 288
-rw-r--r--. 1 root root 13264 Aug 27 2007 dummy.pdf
-rw-r--r--. 1 root root 29 Feb 12 10:18 file2
-rw-r--r--. 1 root root 79436 Feb 12 13:09 users.csv
drwxr-xr-x. 3 root root 94 Feb 16 08:34 myfolder1
-rw-r--r--. 1 root root 112640 Feb 16 08:38 myfiles.tar
-rw-r--r--. 1 root root 41245 Feb 16 08:41 myfolder.zip
drwxr-xr-x. 3 root root 62 Feb 16 08:42 testfolder
-rwxr--r--. 1 root root 26 Mar 5 16:30 test.sh
-rw-r--r--. 1 root root 19189 Mar 6 13:32 users.csv.gz
-rw-r--rw-. 1 root root 73 Mar 11 03:47 testfile1.txt
-rw-r--r--. 1 root root 76 Mar 11 04:01 example.txt
[root@centos01 tutorials]#
```

```
# cat dummy.pdf
```

```
0000012330 00000 n
0000000244 00000 n
0000011154 00000 n
0000011176 00000 n
0000011368 00000 n
0000011709 00000 n
0000011910 00000 n
0000011943 00000 n
0000012140 00000 n
0000012196 00000 n
0000012429 00000 n
0000012494 00000 n
trailer
</Size 16/Root 14 0 R
/Info 15 0 R
/ID [ <F7D77B3D22B9F92829D49FF5D78B8F28>
<F7D77B3D22B9F92829D49FF5D78B8F28> ]
>>
startxref
12787
%%EOF
[root@centos01 tutorials]#
```

```
[root@centos01 tutorials]#
[root@centos01 tutorials]# less dummy.pdf
'dummy.pdf' may be a binary file. See it anyway? █
```

```
%PDF-1.4
%äüöß
2 0 obj
</Length 3 0 R/Filter/FlateDecode>>
stream
x<9C>=<8E><CB>
^B1^LE<F7><F9><8A><BB>v^Q<93><B6><E9><B4>^N<E8>~<A0><E0>^0<F8>^@^W<82><B3><99>
^P<AD><8E>d<93>[r^R"X<E9>^M<81><B0>^2<B1>G
<CA>^Y<CB>^M<97>^]><DF>Y<AD><E5>AS!<8B><9C>0X<AA>r<B9>b^?Vh1<FD>^]<A3><A8>8<F1
<F1><E2>^0(0<B2>VN<9A>3J<E8>$o<D1>z^L^>\6^P<EB><E6>Cw<EC><FE><9A>$3:j<A8>0<FD><E
<E8>Q<A6><CE>N<85>f<9A><F1>^A, (
endstream
endobj
```

```
[root@centos01 tutorials]# grep "Dummy" dummy.pdf
[root@centos01 tutorials]# pdfgrep "Dummy" dummy.pdf
Dummy PDF file
[root@centos01 tutorials]#
```

Linux FIND COMMAND Tutorial With Practical 12 UseCases or Examples

12 Cases of find command

1. How to search a file based on their size?
2. How to find only file or directory in a given path?
3. How to search a file based on it's name?
4. How to ignore upper & lower case in file name while searching?
5. How to search files for a given user only?
6. How to search a file based on the inode no.?
7. How to search a file based on the no. of links?
8. How to search a file based on their permissions?
9. How to search all the files which start with letter a?
10. How to search all the files which are created after last.txt file?
11. How to search all the empty files in a given directory?
12. How to search all the empty files and delete them?
13. How to search all the files whose size are between 1-50 MB

find command

Find command search for files in a directory hierarchy.

find command syntax

find [options] [path...] [expression]



Basic Example

find /path/ -name <file_name>



```
paul@centos8:~/tutorials/find_command
[paul@centos8 find_command]$ 
[paul@centos8 find_command]$ ls
50MB.bin  b123  d123  f123  myfolder  slink
a123      c123  e123  hlink  root-file
[paul@centos8 find_command]$ 
[paul@centos8 find_command]$ find . -name a123
./a123
[paul@centos8 find_command]$ find . -name a1234
[paul@centos8 find_command]$ █
```

Case1

How to search a file based on their size?

find /path/ -size 50M



M for MB

k for KB

G for GB

c for bytes

```
[paul@centos8 find_command]$ find . -size 48M
./50MB.bin
[paul@centos8 find_command]$ ls -lh
total 48M
-rw-rw-r--. 1 paul paul 48M Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123
-rwxrwxrwx. 1 paul paul 0 Nov 29 22:50 b123
-rw-rw-r--. 2 paul paul 0 Nov 29 22:50 c123
---x--x--x. 1 paul paul 0 Nov 29 22:50 d123
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123
-rw-rw-r--. 2 paul paul 0 Nov 29 22:50 hlink
drwxrwxr-x. 2 paul paul 22 Dec  8 14:35 myfolder
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file
lrwxrwxrwx. 1 paul paul 4 Dec  8 14:37 slink -> c123
[paul@centos8 find_command]$
```

Case2

How to find only file or only directory in a given path?

find /path/ -type f

f for file

d for directory

l for symbolic link

b for block device

s for socket

```
[paul@centos8 find_command]$ find . -type l  
./slink  
[paul@centos8 find_command]$ find . -type d  
./myfolder  
[paul@centos8 find_command]$ find . -type f  
./a123  
./b123  
./c123  
./d123  
./e123  
./f123  
./50MB.bin  
./myfolder/testfile  
./hlink  
./root-file  
[paul@centos8 find_command]$
```

Case3

How to search a file based on it's name?

find /path/ -name <file_name>

```
[paul@centos8 find_command]$ find . -name a123  
./a123  
[paul@centos8 find_command]$  
[paul@centos8 find_command]$ find . -name a12  
[paul@centos8 find_command]$ find . -name a123  
./a123  
[paul@centos8 find_command]$ find . -name A123  
[paul@centos8 find_command]$
```

Case4

How to ignore upper & lower case in file name while searching files?

```
find /path/ -iname <file_name>
```

```
[paul@centos8 find_command]$ find . -name A123
[paul@centos8 find_command]$
[paul@centos8 find_command]$ find . -iname A123
./a123
[paul@centos8 find_command]$
```

Case5

How to search files for a given user only?

```
find /path/ -user root
```

```
[paul@centos8 find_command]$ ./root-file
[paul@centos8 find_command]$ ls -ltr
total 48944
-rw-rw-r--. 2 paul paul 0 Nov 29 22:50 hlink
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123
---x---x---. 1 paul paul 0 Nov 29 22:50 d123
-rw-rw-r--. 2 paul paul 0 Nov 29 22:50 c123
-rwxrwxrwx. 1 paul paul 0 Nov 29 22:50 b123
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123
drwxrwxr-x. 2 paul paul 22 Dec 8 14:35 myfolder
lrwxrwxrwx. 1 paul paul 4 Dec 8 14:37 slink -> c123
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file
[paul@centos8 find_command]$
```

Case6

How to search a file based on the inode no.?

find /path/ -inum <inode_no._of_file>

#inode # - Ref Number of Every File in Memory

```
root@localhost:~# ls -li
total 16
33896877 -rw----- 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
35312658 -rw-r--r-- 1 root root 43 Mar 3 16:05 test1.txt
35319472 -rwxrwxrwx. 1 root root 49 Feb 27 18:17 test.sh
35312653 -rw-r--r-- 1 root root 33 Mar 3 16:01 test.txt
root@localhost:~#
```

```
root@localhost:~# ls -li
total 16
33896877 -rw----- 1 root root 1006 Feb 27 16:57 anaconda-ks.cfd
35312658 -rw-r--r-- 1 root root 43 Mar 3 16:05 test1.txt
35319472 -rwxrwxrwx 1 root root 49 Feb 27 18:17 test.sh
35312653 -rw-r--r-- 1 root root 33 Mar 3 16:01 test.txt
root@localhost:~# find -inum ^C
root@localhost:~# find -inum 35319472
./test.sh
root@localhost:~#
```

Case7

How to search a file based on the no. of links?

find /path/ -links <no._of_link>

```
[paul@centos8 find_command]$ find . -links 3
./c123
./hlink
./hlink1
[paul@centos8 find_command]$ find . -links 2
./myfolder
[paul@centos8 find_command]$ ls -ltr
total 48944
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 hlink1
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 hlink
-rw-rw-r--. 1 paul paul          0 Nov 29 22:50 f123
-rw-rw-r--. 1 paul paul          0 Nov 29 22:50 e123
---x--x--x. 1 paul paul          0 Nov 29 22:50 d123
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 c123
-rwxrwxrwx. 1 paul paul          0 Nov 29 22:50 b123
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul          18 Nov 29 23:01 a123
drwxrwxr-x. 2 paul paul          22 Dec  8 14:35 myfolder
lrwxrwxrwx. 1 paul paul          4 Dec  8 14:37 slink -> c123
-rw-r--r--. 1 root root          0 Dec 10 15:18 root-file
[paul@centos8 find_command]$
```

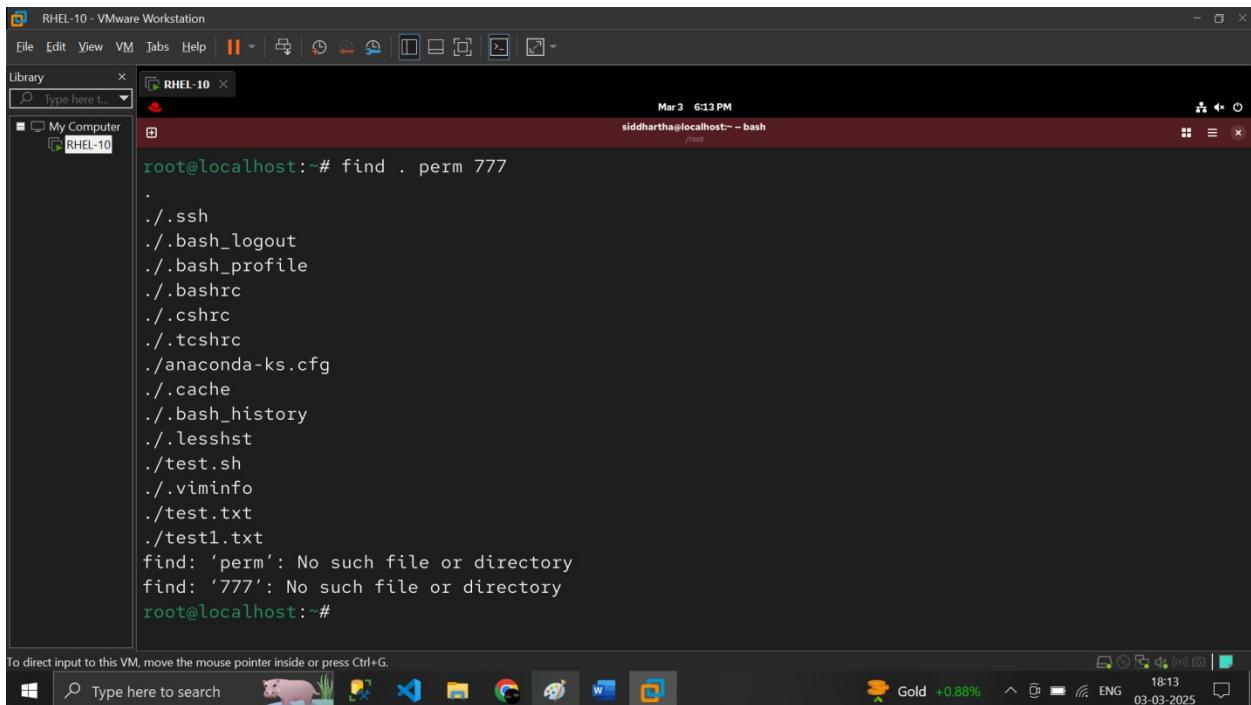
Case8

How to search a file based on their permissions?

`find /path/ -perm /u=r`

`find /path/ -perm 777`

```
[paul@centos8 find_command]$ find . -perm 777
./b123
./slink
[paul@centos8 find_command]$ ls -ltr
total 48944
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 hlink1
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 hlink
-rw-rw-r--. 1 paul paul          0 Nov 29 22:50 f123
-rw-rw-r--. 1 paul paul          0 Nov 29 22:50 e123
---x---x--x. 1 paul paul          0 Nov 29 22:50 d123
-rw-rw-r--. 3 paul paul          0 Nov 29 22:50 c123
-rwxrwxrwx. 1 paul paul          0 Nov 29 22:50 b123
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul          18 Nov 29 23:01 a123
drwxrwxr-x. 2 paul paul          22 Dec  8 14:35 myfolder
lrwxrwxrwx. 1 paul paul          4 Dec  8 14:37 slink -> c123
-rw-r--r--. 1 root root          0 Dec 10 15:18 root-file
[paul@centos8 find_command]$
```



```
[paul@centos8 find_command]$ ./b123  
[paul@centos8 find_command]$ ./d123  
[paul@centos8 find_command]$ ./myfolder  
[paul@centos8 find_command]$ ./slink  
[paul@centos8 find_command]$ ls -ltr  
total 48944  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink1  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink  
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123  
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123  
---x---x--x. 1 paul paul 0 Nov 29 22:50 d123  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 c123  
-rwXrwxrwx. 1 paul paul 0 Nov 29 22:50 b123  
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin  
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123  
drwxrwxr-x. 2 paul paul 22 Dec 8 14:35 myfolder  
lwxrwxrwx. 1 paul paul 4 Dec 8 14:37 slink -> c123  
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file  
[paul@centos8 find_command]$
```

Case9

How to search all the files which start with letter a?

```
find /path/ -iname a*
```

```
root@RHEL-10:~# find . iname "*t"
.
./.ssh
./.bash_logout
./.bash_profile
./.bashrc
./.cshrc
./.tcshrc
./anaconda-ks.cfg
./.cache
./.bash_history
./.lesshtst
./test.sh
./test.txt
./.viminfo
./test1.txt
find: 'iname': No such file or directory
find: '*t': No such file or directory
root@RHEL-10:~#
```

Case10

How to search all the files which are modified/created after last.txt file?

`find /path/ -newer last.txt`

```
[paul@centos8 find_command]$ ls -ltr
total 48944
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink1
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123
---x---x---x. 1 paul paul 0 Nov 29 22:50 d123
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 c123
-rwxrwxrwx. 1 paul paul 0 Nov 29 22:50 b123
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123
drwxrwxr-x. 2 paul paul 22 Dec 8 14:35 myfolder
lrwxrwxrwx. 1 paul paul 4 Dec 8 14:37 slink -> c123
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file
[paul@centos8 find_command]$
```

```
[paul@centos8 find_command]$ find . -newer a123
.
./myfolder
./myfolder/testfile
./slink
./root-file
[paul@centos8 find_command]$ █
```

I

Case11

How to search all the empty files in a given directory?

```
find /path/ -empty
```

```
root@RHEL-10:~# find . -empty
./.ssh
./.cache
root@RHEL-10:~# █
```

Case12

How to search all the empty files in a given directory
and at the same time delete them?

```
find /path/ -empty -exec rm {} \;
```

```
[paul@centos8 find_command]$ find . -name emp*
./empty-file
[paul@centos8 find_command]$ find . -name emp* -exec rm {} \;
[paul@centos8 find_command]$ ls -ltr
total 48944
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink1
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123
---x--x--x. 1 paul paul 0 Nov 29 22:50 d123
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 c123
-rwxrwxrwx. 1 paul paul 0 Nov 29 22:50 b123
-rw-rw-r--. 1 paul paul 50111000 Nov 29 22:56 50MB.bin
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123
drwxrwxr-x. 2 paul paul 22 Dec 8 14:35 myfolder
lrwxrwxrwx. 1 paul paul 4 Dec 8 14:37 slink -> c123
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file
[paul@centos8 find_command]$
```

Case13

How to search all the files whose size are between 1-50 MB?

```
find /path/ -size +1M -size -50M
```

```
siddhartha@RHEL-10:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos
siddhartha@RHEL-10:~$ su --
Password:
root@RHEL-10:/home/siddhartha# cd
root@RHEL-10:~# ls
anaconda-ks.cfg test1.txt test.sh test.txt
root@RHEL-10:~# ls -lh
total 16K
-rw-----. 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rw-r--r--. 1 root root 43 Mar 3 16:05 test1.txt
-rwxrwxrwx. 1 root root 49 Feb 27 18:17 test.sh
-rw-r--r--. 1 root root 33 Mar 3 16:01 test.txt
root@RHEL-10:~# find . -size +30M -size 50M
root@RHEL-10:~# pwd
/root
root@RHEL-10:~#
```

```
[paul@centos8 find_command]$ find . -size +1M -size -50M  
./50MB.bin  
[paul@centos8 find_command]$ ls -lh  
total 48M  
-rw-rw-r--. 1 paul paul 48M Nov 29 22:56 50MB.bin  
-rw-rw-r--. 1 paul paul 18 Nov 29 23:01 a123  
-rwxrwxrwx. 1 paul paul 0 Nov 29 22:50 b123  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 c123  
---x--x--x. 1 paul paul 0 Nov 29 22:50 d123  
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 e123  
-rw-rw-r--. 1 paul paul 0 Nov 29 22:50 f123  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink  
-rw-rw-r--. 3 paul paul 0 Nov 29 22:50 hlink1  
drwxrwxr-x. 2 paul paul 22 Dec 8 14:35 myfolder  
-rw-r--r--. 1 root root 0 Dec 10 15:18 root-file  
lrwxrwxrwx. 1 paul paul 4 Dec 8 14:37 slink -> c123  
[paul@centos8 find_command]$ █
```

Case14

How to search 15 days old files?

```
find /path/ -mtime 15
```

```
[paul@centos8 find_command]$ find . -mtime 2  
./myfolder  
./myfolder/testfile  
./slink  
[paul@centos8 find_command]$ █
```

2 days old file

LINUX TIPS and TRICKS To Improve Productivity

Case1:

Tab for autocomplete

Suppose you want to go to directory cd /home/paul/tutorials

we can use Tab for autocomplete which will speed up your task and reduce chances of error

Case2:

Switch to the last working directory cd -

cd /etc/nginx

Case3:

Running multiple commands in one line using ;

\$command1; command2; command3

Example: whoami; pwd;

Command1 && Command2 (2 will run only if 1 was successful)



RHEL-10 - VMware Workstation

File Edit View VM Help | Mar 4 4:45 AM siddhartha@RHEL-10:/home/siddhartha - bash

```
root@RHEL-10:~# cd
root@RHEL-10:~# cd ..
root@RHEL-10:~# ls
afs boot etc lib media opt root sbin sys usr
bin dev home lib64 mnt proc run srv tmp var
root@RHEL-10:~# pwd
/
root@RHEL-10:~/# cd /home/
root@RHEL-10:/home# ls
siddhartha
root@RHEL-10:/home# cd /siddhartha
bash: cd: /siddhartha: No such file or directory
root@RHEL-10:/home# cd siddhartha/
root@RHEL-10:/home/siddhartha# ls
Desktop Documents Downloads Music Pictures Public Templates Videos
root@RHEL-10:/home/siddhartha#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Type here to search

04:45 ENG 04-03-2025

Network configure

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || Type here ...

Library My Computer RHEL-10

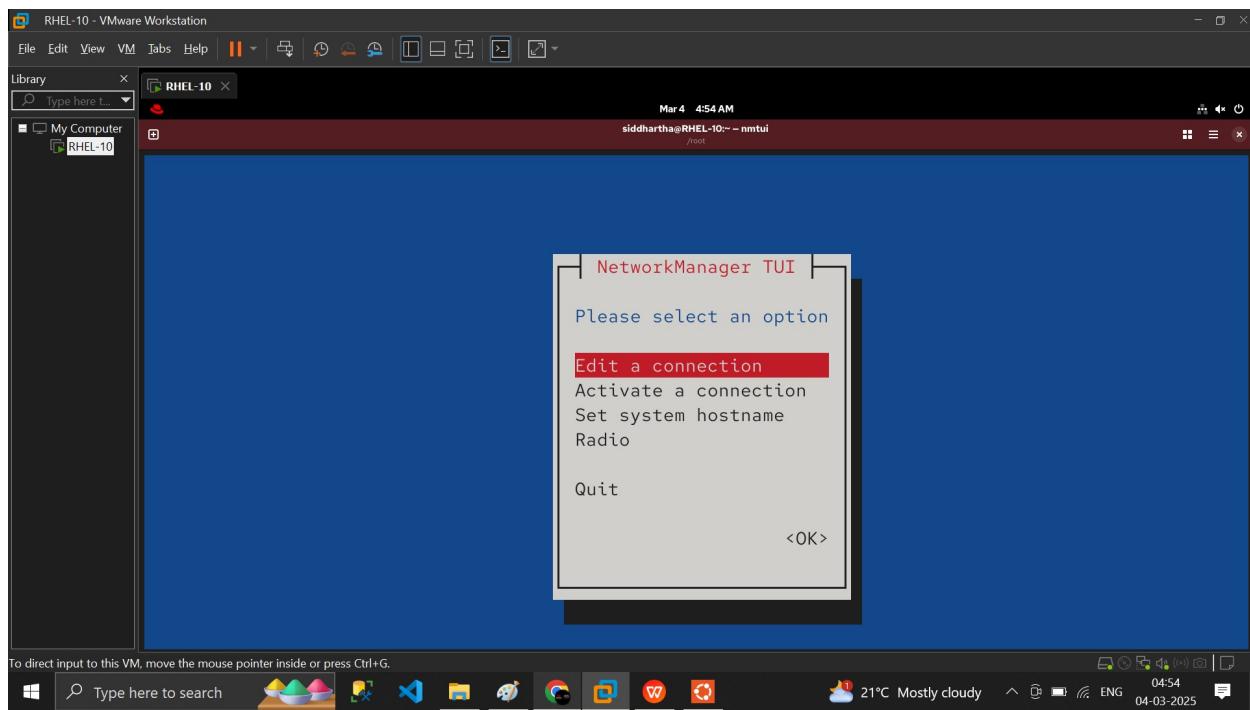
RHEL-10

Mar 4 4:52 AM siddhartha@RHEL-10:~ bash

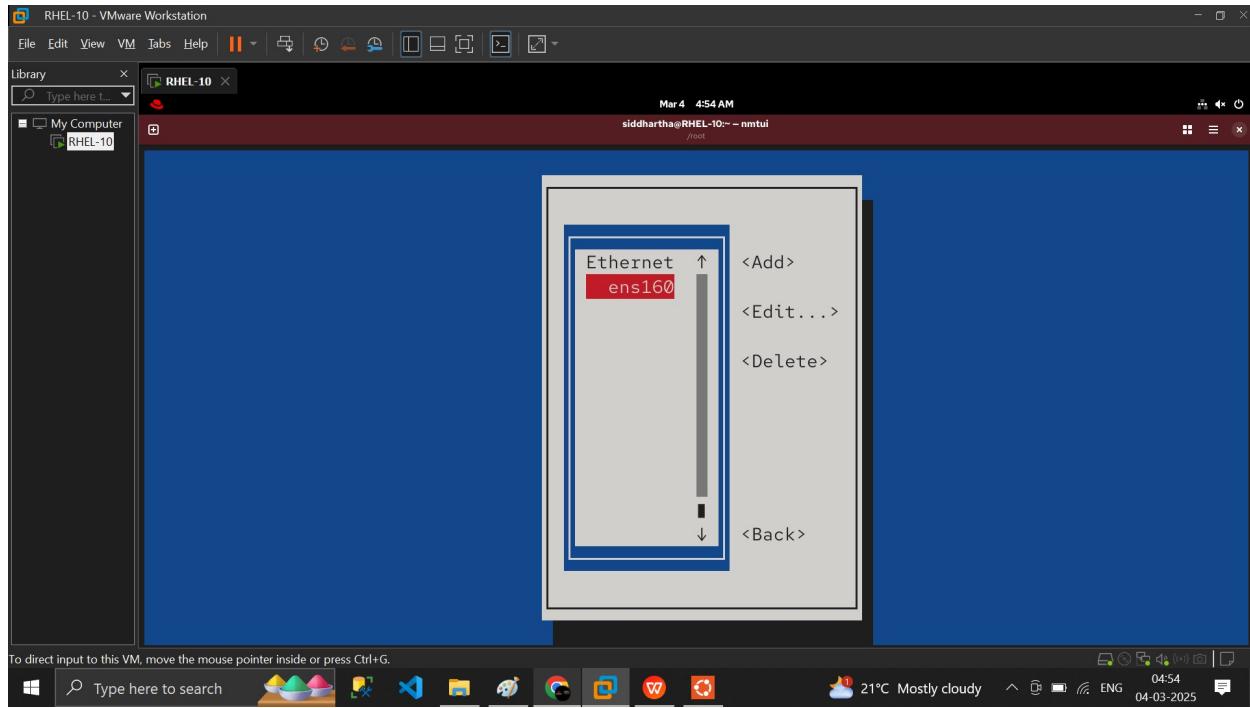
```
root@RHEL-10:~# nmcli conn show
NAME      UUID
lo        95c2ccdb-a2b7-4283-b1c5-512d6f4d1494  type    loopback  device lo
ens160   233551b4-daf1-3edd-9334-ea0ee50cf9d  type    ethernet  --
root@RHEL-10:~# nmcli device show ens160
GENERAL.DEVICE:                         ens160
GENERAL.TYPE:                            ethernet
GENERAL.HWADDR:                          00:0C:29:56:4F:95
GENERAL.MTU:                             1500
GENERAL.STATE:                           30 (disconnected)
GENERAL.CONNECTION:                      --
GENERAL.CON-PATH:                        --
WIRED-PROPERTIES.CARRIER:                on
IP4.GATEWAY:                            --
IP6.GATEWAY:                            --
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

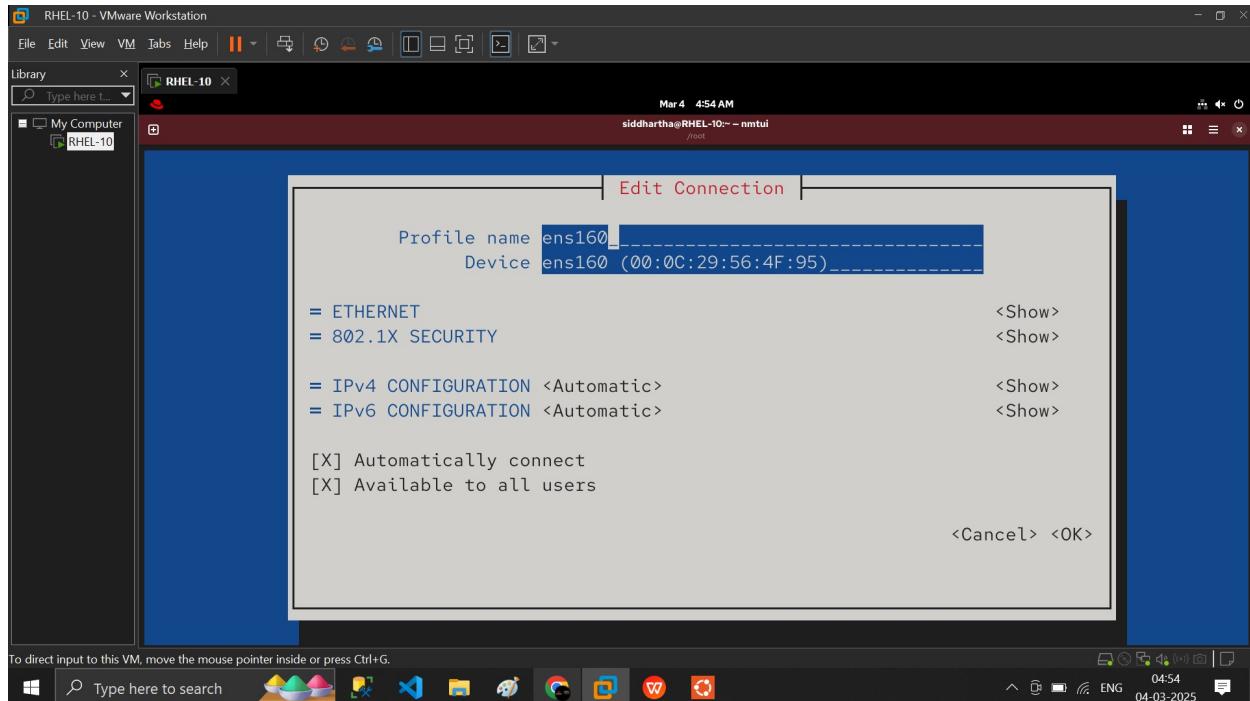
Windows Start Type here to search Icons 21°C Mostly cloudy 04:52 ENG 04-03-2025



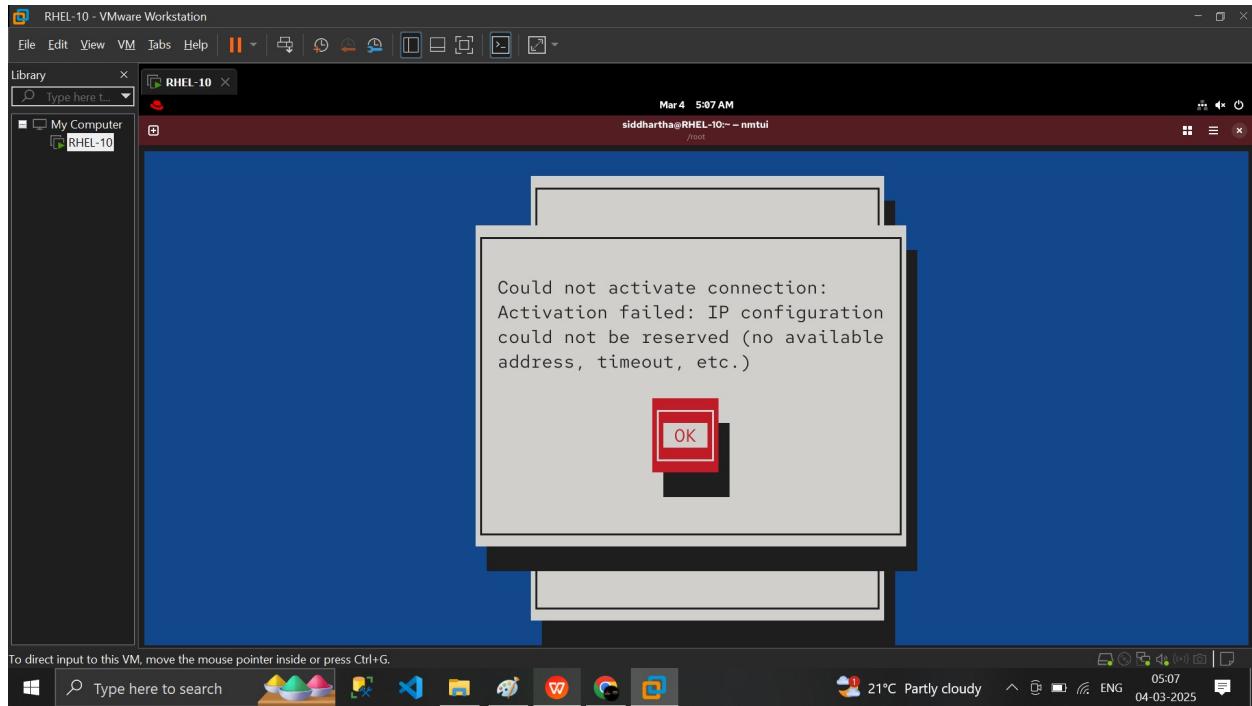
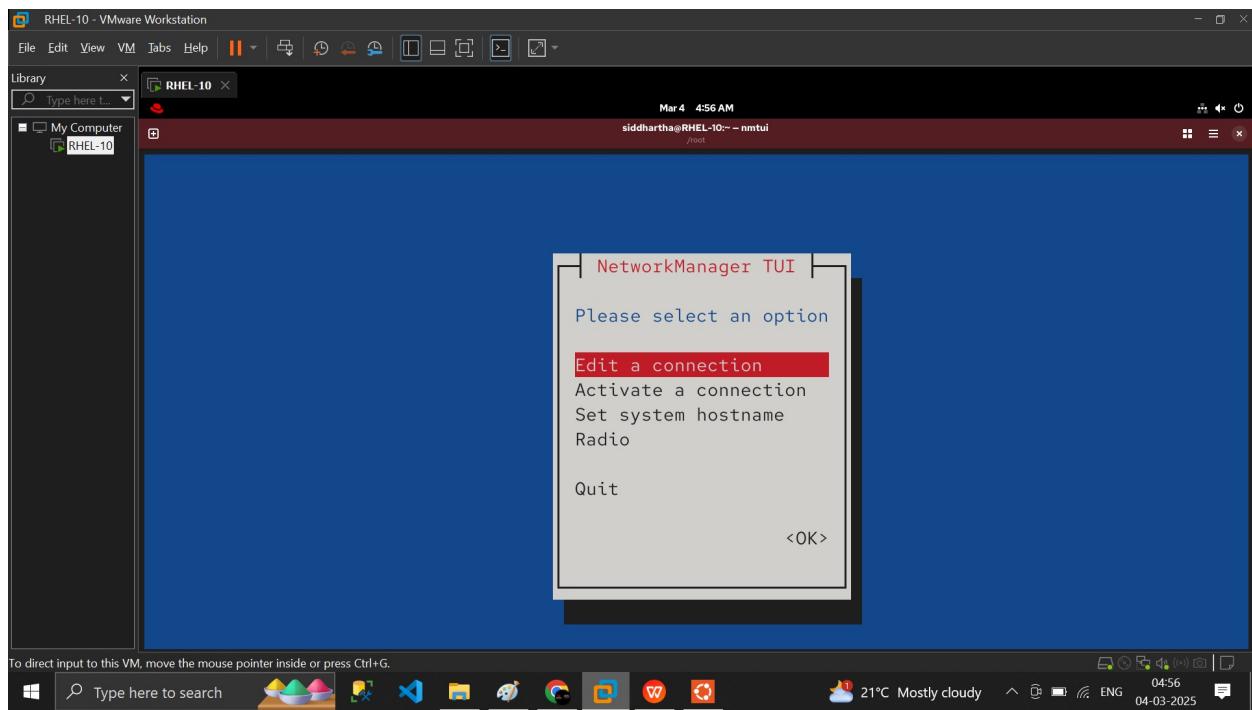
```
# edit
```



Edit



Back - Go for Activate Connection



RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Library Type here t... ▾

My Computer RHEL-10

RHEL-10

Mar 4 5:00 AM siddhartha@RHEL-10:~ - bash /root

```
GENERAL.CONNECTION: --  
GENERAL.CON-PATH: --  
WIRED-PROPERTIES.CARRIER: on  
IP4.GATEWAY: --  
IP6.GATEWAY: --  
root@RHEL-10:~# nmcli device show ens160  
root@RHEL-10:~# nmcli device show ens160  
GENERAL.DEVICE: ens160  
GENERAL.TYPE: ethernet  
GENERAL.HWADDR: 00:0c:29:56:4f:95  
GENERAL.MTU: 1500  
GENERAL.STATE: 70 (connecting (getting IP configuration))  
GENERAL.CONNECTION: ens160  
GENERAL.CON-PATH: /org/freedesktop/NetworkManager/ActiveConnection/20  
WIRED-PROPERTIES.CARRIER: on  
IP4.GATEWAY: --  
IP6.ADDRESS[1]: fe80::20c:29ff:fe56:4f95/64  
IP6.GATEWAY: --  
IP6.ROUTE[1]: dst = fe80::/64, nh = ::, mt = 1024  
root@RHEL-10:~#
```

To direct input to this VM, click inside or press Ctrl+G.

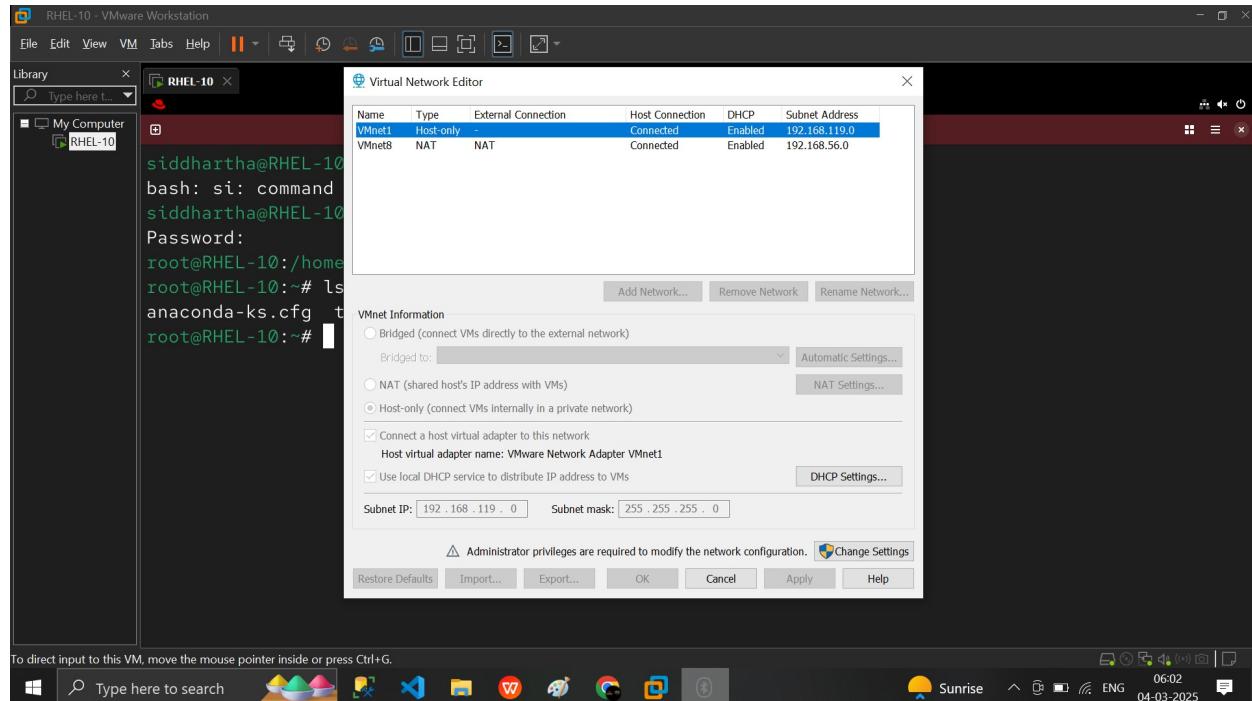
Type here to search

Windows Start Menu

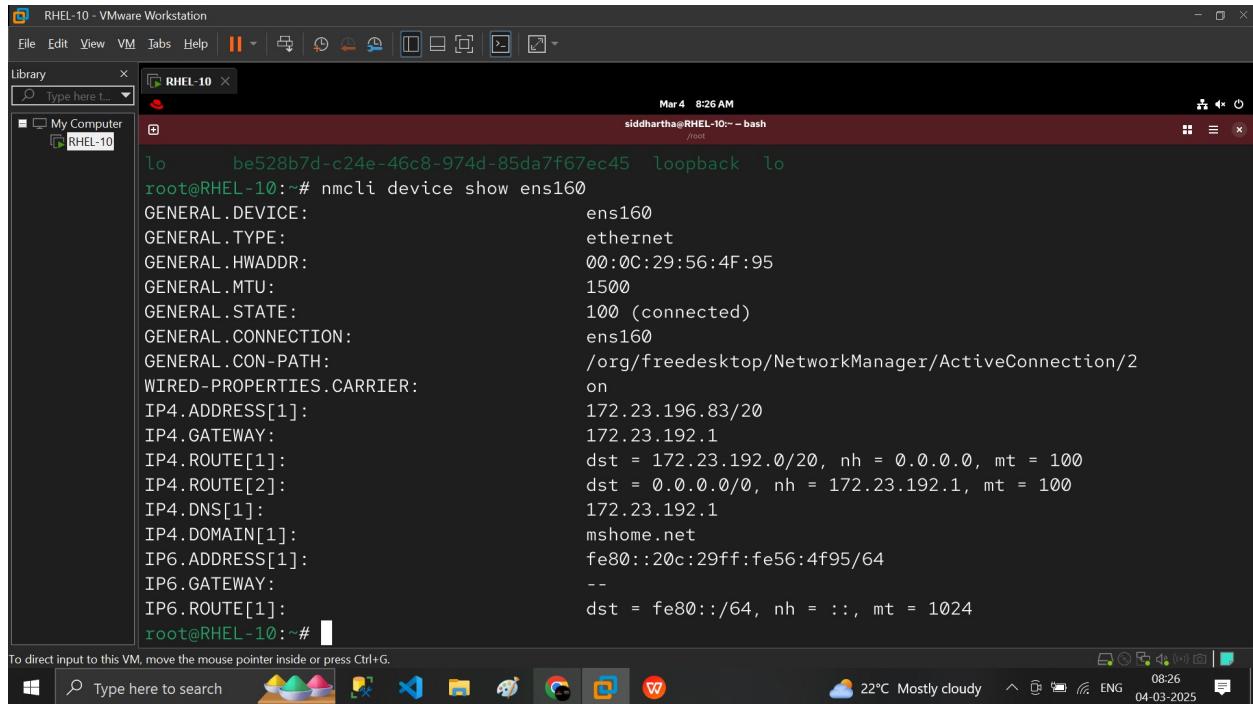
Cloud Explorer File Explorer Task View Taskbar

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Edit - Virtual network editor



```
# change setting
```



```
be528b7d-c24e-46c8-974d-85da7f67ec45  loopback  lo
root@RHEL-10:~# nmcli device show ens160
GENERAL.DEVICE:                ens160
GENERAL.TYPE:                  ethernet
GENERAL.HWADDR:                00:0C:29:56:4F:95
GENERAL.MTU:                   1500
GENERAL.STATE:                 100 (connected)
GENERAL.CONNECTION:            ens160
GENERAL.CON-PATH:              /org/freedesktop/NetworkManager/ActiveConnection/2
WIRED-PROPERTIES.CARRIER:      on
IP4.ADDRESS[1]:                172.23.196.83/20
IP4.GATEWAY:                  172.23.192.1
IP4.ROUTE[1]:                  dst = 172.23.192.0/20, nh = 0.0.0.0, mt = 100
IP4.ROUTE[2]:                  dst = 0.0.0.0/0, nh = 172.23.192.1, mt = 100
IP4.DNS[1]:                     172.23.192.1
IP4.DOMAIN[1]:                 mshome.net
IP6.ADDRESS[1]:                fe80::20c:29ff:fe56:4f95/64
IP6.GATEWAY:                  --
IP6.ROUTE[1]:                  dst = fe80::/64, nh = ::, mt = 1024
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Case2:

Switch to the last working directory cd -

```
cd /etc/nginx
```

```
[paul@cvm tips]$ |
```

```
RHEL-10 - VMware Workstation
File Edit View VM Tabs Help || Type here ...
Library X
RHEL-10 X
My Computer
RHEL-10
Mar 4 8:30 AM
siddhartha@RHEL-10:~ bash
root
root@RHEL-10:~# pwd
/root
root@RHEL-10:~# cd /etc/ngnix
bash: cd: /etc/ngnix: No such file or directory
root@RHEL-10:~# cd /etc/ngnix/
bash: cd: /etc/ngnix/: No such file or directory
root@RHEL-10:~# cd -
/home/siddhartha
root@RHEL-10:/home/siddhartha# ls
Desktop Documents Downloads Music Pictures Public Templates Videos
root@RHEL-10:/home/siddhartha# cd /etc/ngnix/
bash: cd: /etc/ngnix/: No such file or directory
root@RHEL-10:/home/siddhartha# cd
root@RHEL-10:~# ls
anaconda-ks.cfg test1.txt test.sh test.txt
root@RHEL-10:~# whoami
root
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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Case3:

Running multiple commands in one line using ;

\$command1; command2; command3

Example: whoami; pwd;

Command1 && Command2 (2 will run only if 1 was successful)

```
Mar 4 8:31
siddhartha@RHEL-10:~ bash
root
root@RHEL-10:~# whoami; hostname; ls; pwd
root
RHEL-10
anaconda-ks.cfg test1.txt test.sh test.txt
/root
root@RHEL-10:~#
```

Case4:

To read big files cat is not a good option, better to use less
cat csv
less csv, we can easily search and navigate, go to top and end of the file

Case5:

Empty a file without deleting it: >filename
testfile

If we need to empty this file we can use the above method

```
[lpaul@cvm tips]$ cat csv
-----First Line-----
firstname,lastname,email,profession
Barbara,Kellby,Barbara.Kellby@yopmail.com,police officer
Hermione,Lauraine,Hermione.Lauraine@yopmail.com,developer
Starla,Ranjiv,Starla.Ranjiv@yopmail.com,firefighter
Mariele,Magdalen,Mariele.Magdalen@yopmail.com,worker
Lizzie,Carey,Lizzie.Carey@yopmail.com,police officer
Chastity,Barbey,Chastity.Barbey@yopmail.com,police officer
Selia,Kunin,Selia.Kunin@yopmail.com,worker
Vevay,Koehler,Vevay.Koehler@yopmail.com,developer
```

```
# less csv
```

```
-----First Line-----  
firstname,lastname,email,profession  
Barbara,Kellby,Barbara.Kellby@yopmail.com,police officer  
Hermione,Lauraine,Hermione.Lauraine@yopmail.com,developer  
Starla,Ranjiv,Starla.Ranjiv@yopmail.com,firefighter  
Marielle,Magdalen,Marielle.Magdalen@yopmail.com,worker  
Lizzie,Carey,Lizzie.Carey@yopmail.com,police officer  
Chastity,Barbey,Chastity.Barbey@yopmail.com,police officer  
Selia,Kunin,Selia.Kunin@yopmail.com,worker  
Vevay,Koehler,Vevay.Koehler@yopmail.com,developer
```

```
root@RHEL-10:~# touch sid.txt  
root@RHEL-10:~# ls  
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt  
root@RHEL-10:~# echo " siddhartha here from Bangalore" > sid.txt  
root@RHEL-10:~# ls  
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt  
root@RHEL-10:~# cat sid.txt  
siddhartha here from Bangalore  
root@RHEL-10:~# > sid.txt  
root@RHEL-10:~#
```

Case6

```
tail -f | grep "error" for live monitoring file with given text  
we can give example with sudo tail -f
```

```
# less /var/log/messages
```

RHEL-10 - VMware Workstation

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Library RHEL-10

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My Computer RHEL-10

```
Mar 4 08:38 AM
siddhartha@RHEL-10:~ less /var/log/messages
root

156a9489c5863b3ae60) (gcc (GCC) 14.2.1 20240801 (Red Hat 14.2.1-1), GNU ld version 2.41-48.el10) #1
SMP PREEMPT_DYNAMIC Mon Sep 23 04:19:12 EDT 2024
Feb 27 16:58:44 localhost kernel: Command line: BOOT_IMAGE=(hd0,gpt2)/vmlinuz-6.11.0-0.rc5.23.el10.x
86_64 root=/dev/mapper/rhel-root ro crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M resume=UUID=447d8b6
2-49d9-4bf8-8f98-f6ea81911931 rd.lvm.lv=rhel/root rd.lvm.lv=rhel/swap rhgb quiet
Feb 27 16:58:44 localhost kernel: Disabled fast string operations
Feb 27 16:58:44 localhost kernel: BIOS-provided physical RAM map:
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] ACPI NVS
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] usable
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000e03ffff] usable
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000e03c000-0x0000000000e041ffff] ACPI NVS
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000e042000-0x0000000000fb6ffff] usable
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000fb6f000-0x0000000000fbdefff] reserved
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000fbdf000-0x0000000000fbfaffff] ACPI data
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000fbfb000-0x0000000000fbfeffff] ACPI NVS
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000fbff000-0x0000000007fffffff] usable
Feb 27 16:58:44 localhost kernel: BIOS-e820: [mem 0x0000000000ffc00000-0x000000000ffc29ffff] reserved
:
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || | | | | | | | | | | |

Library RHEL-10

Type here to... ▾

My Computer RHEL-10

```
Mar 4 08:39 AM
siddhartha@RHEL-10:~ tail -f /var/log/messages
root

root@RHEL-10:~# tail -f /var/log/messages
Mar 4 08:38:10 RHEL-10 gnome-shell[2544]: ./clutter/clutter/clutter-actor.c:8689: Actor 'unnamed [StDrawingArea]' tried to allocate a size of -2147483648.00 x -2147483648.00
Mar 4 08:38:10 RHEL-10 gnome-shell[2544]: ./clutter/clutter/clutter-actor.c:8689: Actor 'unnamed [StBin]' tried to allocate a size of -2147483648.00 x -2147483648.00
Mar 4 08:38:34 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:38:34 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:38:34 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:38:34 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:39:40 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:39:40 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:39:40 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
Mar 4 08:39:40 RHEL-10 ptyxis[3310]: context mismatch in svga_surface_destroy
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Type here to search

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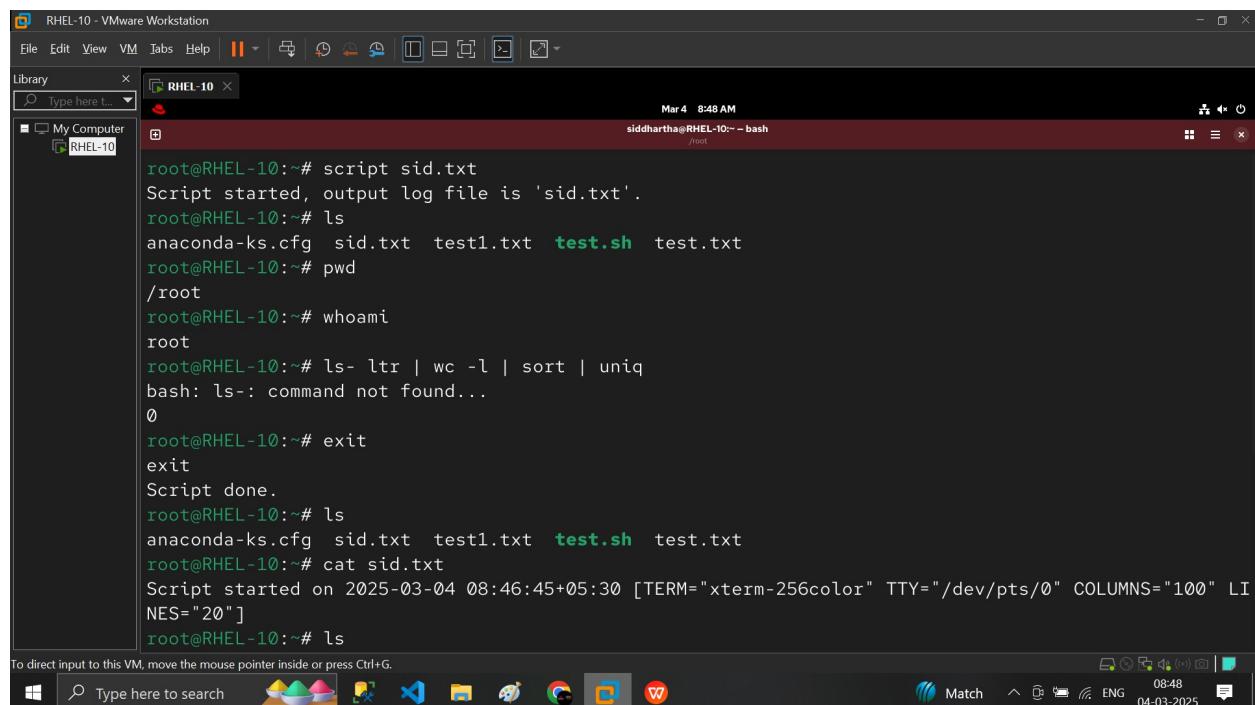
[root@cvm ~]#
[root@cvm ~]# tail -f /var/log/messages | grep paul
Sep 15 05:19:26 cvm su[438639]: (to root) paul on pts/2

Case7

To record all the commands executed in a script

\$script -> then perform all the tasks -> Ctrl+D to stop the script

If your trainer, boss, colleague teach you a process then we can record it using this

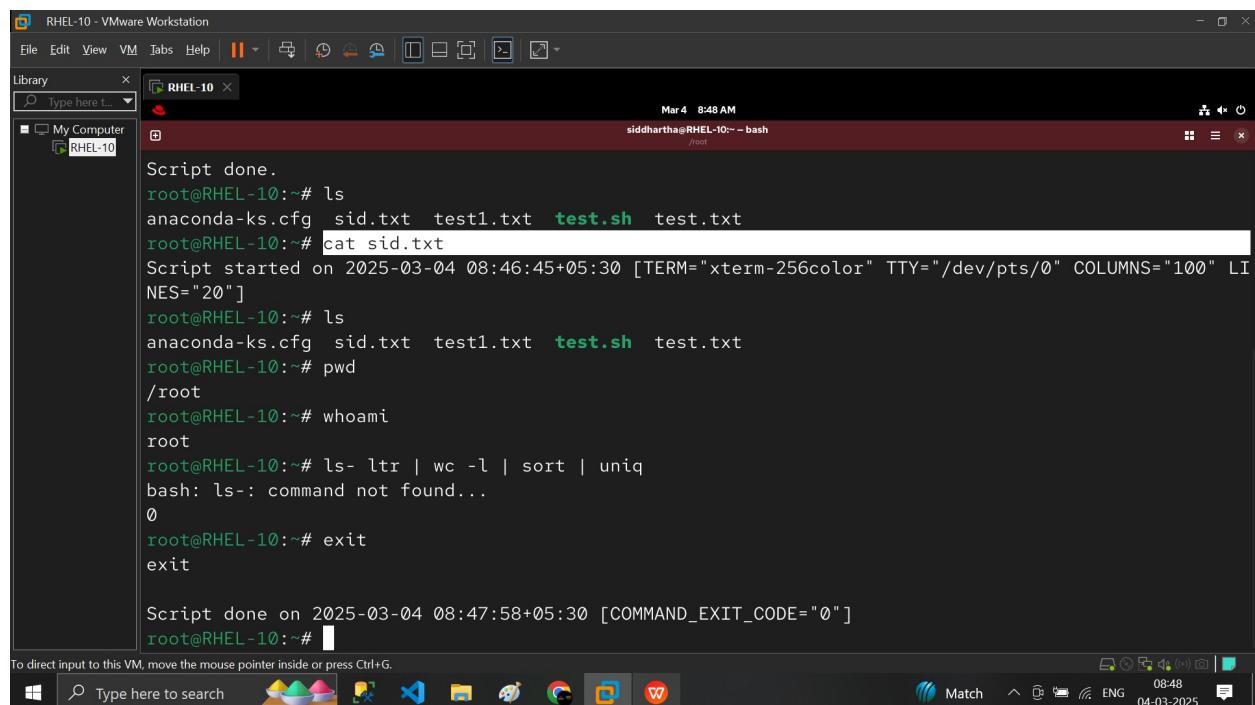


The screenshot shows a VMware Workstation window titled "RHEL-10 - VMware Workstation". Inside, a terminal window titled "RHEL-10" is open. The terminal output is as follows:

```
root@RHEL-10:~# script sid.txt
Script started, output log file is 'sid.txt'.
root@RHEL-10:~# ls
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# pwd
/
root@RHEL-10:~# whoami
root
root@RHEL-10:~# ls- ltr | wc -l | sort | uniq
bash: ls-: command not found...
0
root@RHEL-10:~# exit
exit
Script done.
root@RHEL-10:~# ls
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# cat sid.txt
Script started on 2025-03-04 08:46:45+05:30 [TERM="xterm-256color" TTY="/dev/pts/0" COLUMNS="100" LI
NES="20"]
root@RHEL-10:~# ls
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

The taskbar at the bottom shows various icons for Microsoft Office applications like Word, Excel, and Powerpoint, along with a search bar and system status indicators.



The screenshot shows a VMware Workstation window titled "RHEL-10 - VMware Workstation". Inside, a terminal window titled "RHEL-10" is open. The terminal output is as follows:

```
Script done.
root@RHEL-10:~# ls
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# cat sid.txt
Script started on 2025-03-04 08:46:45+05:30 [TERM="xterm-256color" TTY="/dev/pts/0" COLUMNS="100" LI
NES="20"]
root@RHEL-10:~# ls
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# pwd
/
root@RHEL-10:~# whoami
root
root@RHEL-10:~# ls- ltr | wc -l | sort | uniq
bash: ls-: command not found...
0
root@RHEL-10:~# exit
exit

Script done on 2025-03-04 08:47:58+05:30 [COMMAND_EXIT_CODE="0"]
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

The taskbar at the bottom shows various icons for Microsoft Office applications like Word, Excel, and Powerpoint, along with a search bar and system status indicators.

```
root@RHEL-10:~# bc -l
bc 1.07.1
Copyright 1991-1994, 1997, 1998, 2000, 2004, 2006, 2008, 2012-2017 Free Software Foundation, Inc.
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.
9 +6
15
7* 5
35
4-6
-2
^C
(interrupt) Exiting bc.
root@RHEL-10:~#
```

Case9

Ctrl + a: to move cursor to the start

Ctrl + e: to move the cursor to end

Case10

Ctrl + u: To clear the terminal

Ctrl + y: To redo commands in the terminal

Case11

Ctrl + r: Reverse search for the commands we ever used

Case12

Ctrl + l: Clear screen

Case13

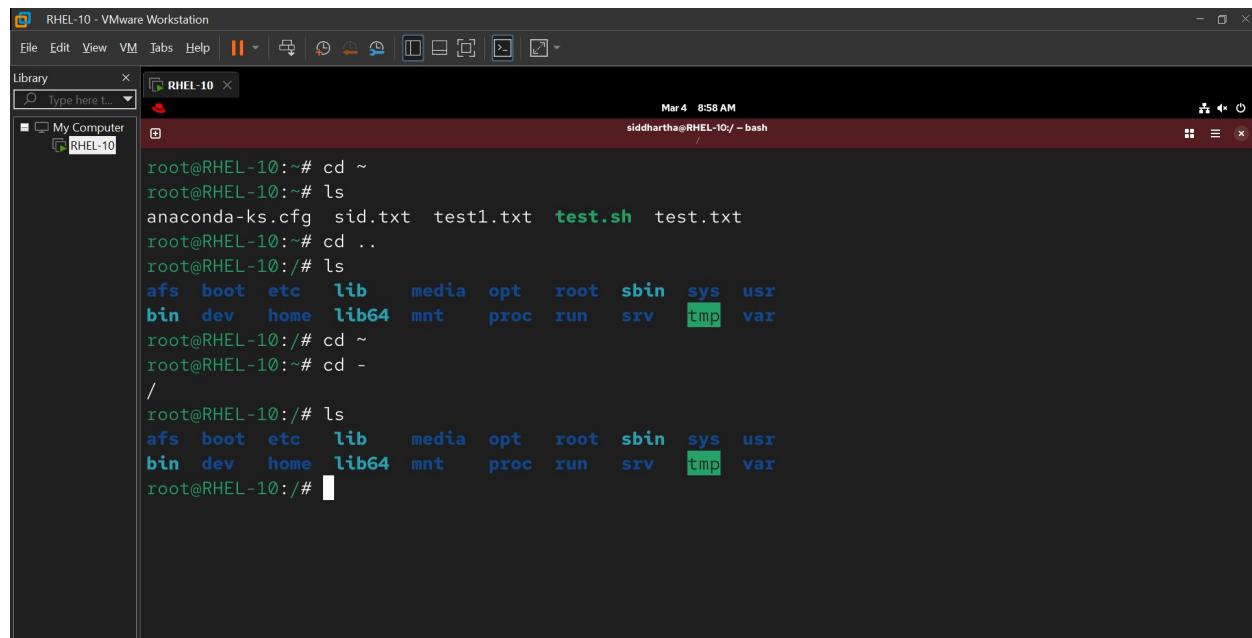
Ctrl + d: To delete one character at a time from starting (opp of backspace)

Case14

cd ~ :Switch the path to home directory

Case15

history command to see all the commands executed frequently



```
root@RHEL-10:~# cd ~
root@RHEL-10:~# ls
anaconda-ks.cfg  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# cd ..
root@RHEL-10:/# ls
afs  boot  etc  lib  media  opt  root  sbin  sys  usr
bin  dev   home lib64 mnt   proc  run   srv   tmp  var
root@RHEL-10:/# cd ~
root@RHEL-10:~# cd -
/
root@RHEL-10:/# ls
afs  boot  etc  lib  media  opt  root  sbin  sys  usr
bin  dev   home lib64 mnt   proc  run   srv   tmp  var
root@RHEL-10:/#
```

```
Mar 4 9:00 AM
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# cd ..
root@RHEL-10:~# ls
afs boot etc lib media opt root sbin sys usr
bin dev home lib64 mnt proc run srv tmp var
root@RHEL-10:~# echo " new file " > new.txt
root@RHEL-10:~# ls
afs boot etc lib media new.txt proc run srv tmp var
bin dev home lib64 mnt opt root sbin sys usr
root@RHEL-10:~# mv new.txt ~
root@RHEL-10:~# ls
afs boot etc lib media opt root sbin sys usr
bin dev home lib64 mnt proc run srv tmp var
root@RHEL-10:~# cd ~
root@RHEL-10:~# ls
anaconda-ks.cfg new.txt sid.txt test1.txt test.sh test.txt
root@RHEL-10:~#
```

```
Mar 4 9:01 AM
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# history
315 ls
316 cd ~
317 cd -
318 ls
319 cd
320 ls
321 cp sid.txt ~
322 ls
323 cp test.sh ~
324 cd ..
325 ls
326 echo " new file " > new.txt
327 ls
328 mv new.txt ~
329 ls
330 cd ~
331 ls
332 history
root@RHEL-10:~# history -c
root@RHEL-10:~#
```

Linux Wildcards in Hindi With Simple Examples

WildCards & Regex

```
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls  
a123 config.xml file1_backup images script_new.sh test500  
async.sh container.yml file2_ importantfile script.sh test99  
b123 d123 file2_backup main.yml test01 users.csv  
c-123 dates.txt image1.jpg names test10 xyz456pqr  
c123 file1 image2.jpg remote.xml test100  
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls *.xml  
config.xml remote.xml  
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls *.yml  
container.yml main.yml  
[paul@centos01 wildcards]$ ls *.jpg  
image1.jpg image2.jpg  
[paul@centos01 wildcards]$ █
```

What are WildCards?

Wildcards are special characters that represent one or more characters in filenames or commands, allowing users to select multiple files at once.

1. **Asterisk (`*`)**: Matches any number of characters, including none.
 - Example: `*.txt` matches all files ending with ` .txt`.
2. **Question Mark (`?`)**: Matches exactly one character.
 - Example: `file?.txt` matches `file1.txt`, `file2.txt`, etc.
3. **Square Brackets (`[]`)**: Matches any one of the enclosed characters.
 - Example: `file[12].txt` matches `file1.txt` and `file2.txt`.
4. **Braces (`{}`)**: Matches a group of patterns.
 - Example: `file{1,2}.txt` matches `file1.txt` and `file2.txt`

- **How to file all the XML files in a directory**
- **Create 20 files like file1 file2 ... file20**
- **Find all the files with name _123 (where _ can be any character)**
- **Find all the files whose name is exactly 4 characters ex a123, test...**
- **Find files whose name start with a,b or c**
- **Find files whose name included numeric**

```
[paul@centos01 wildcards]$ touch file{1..100}
[paul@centos01 wildcards]$ ls
a123          file18        file33  file50  file68  file85      importantfile
async.sh       file19        file34  file51  file69  file86      main.yml
b123          file1_backup  file35  file52  file7   file87      names
c-123         file2         file36  file53  file70  file88      remote.xml
c123          file20        file37  file54  file71  file89      script_new.sh
config.xml     file21        file38  file55  file72  file9       script.sh
container.yml  file22        file39  file56  file73  file90      test01
d123          file23        file4   file57  file74  file91      test10
dates.txt      file24        file40  file58  file75  file92      test100
file1          file25        file41  file59  file76  file93      test500
file10         file26        file42  file60  file78  file94      test99
file100        file27        file43  file61  file79  file95      users.csv
file11         file28        file44  file62  file8   file96      xyz456par
file12         file29        file45  file63  file80  file98
file13         file2_backup  file46  file64  file81  file99
file14         file3         file47  file65  file82  image1.jpg
file15         file30        file48  file66  file83  image2.jpg
file16         file31        file49  file67  file84  images
file17         file32        file5   file68  file85
[paul@centos01 wildcards]$
```

```
[paul@centos01 wildcards]$ ls file{1..10}
file1  file10  file2  file3  file4  file5  file6  file7  file8  file9
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ ls file{1..100}
file1  file18  file27  file36  file45  file54  file63  file72  file81  file90
file10  file19  file28  file37  file46  file55  file64  file73  file82  file91
file100  file2  file29  file38  file47  file56  file65  file74  file83  file92
file11  file20  file3  file39  file48  file57  file66  file75  file84  file93
file12  file21  file30  file4  file49  file58  file67  file76  file85  file94
file13  file22  file31  file40  file5  file59  file68  file77  file86  file95
file14  file23  file32  file41  file50  file6  file69  file78  file87  file96
file15  file24  file33  file42  file51  file60  file7  file79  file88  file97
file16  file25  file34  file43  file52  file61  file70  file8  file89  file98
file17  file26  file35  file44  file53  file62  file71  file80  file9  file99
[paul@centos01 wildcards]$
```

```
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ rm file{1..100}
[paul@centos01 wildcards]$ ls
a123  config.xml  file2_backup  main.yml  test01  u
async.sh  container.yml  image1.jpg  names  test10  x
b123  d123  image2.jpg  remote.xml  test100
c-123  dates.txt  images  script_new.sh  test500
c123  file1_backup  importantfile  script.sh  test99
[paul@centos01 wildcards]$
```

```
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls ?123  
a123 b123 c123 d123  
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls *123  
a123 b123 c-123 c123 d123  
[paul@centos01 wildcards]$ █
```

```
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls ???  
a123 abcd b123 c123 d123 test  
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ ls ????  
c-123 names  
[paul@centos01 wildcards]$
```

```
root@RHEL-10:~# ls  
anaconda-ks.cfg new.txt sid.txt test1.txt test.sh test.txt  
root@RHEL-10:~# ls [abc]*  
anaconda-ks.cfg  
root@RHEL-10:~# ls [tst]*  
sid.txt test1.txt test.sh test.txt  
root@RHEL-10:~# █
```

```
root@RHEL-10:~# ls  
anaconda-ks.cfg new.txt sid.txt test1.txt test.sh test.txt  
root@RHEL-10:~# ls *[1-9]*  
test1.txt  
root@RHEL-10:~# █
```

```
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# ls *[1-9]*
test1.txt
root@RHEL-10:~# ls *[a-z]*
anaconda-ks.cfg  new.txt  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# █
```

```
[paul@centos01 wildcards]$ ls *[A-Z]*
ls: cannot access '*[A-Z]*': No such file or directory
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ touch ABC
[paul@centos01 wildcards]$ ls *[A-Z]*
ABC
[paul@centos01 wildcards]$
```

- Find all files that start with "test" and have exactly 6 characters in their name (e.g., **test01**, **test99**)
- Find all files that have at least one underscore in their name
- List all files that do not contain the letter "e" in their name
- Find all files that start with a capital letter [A-Z]

```
p123      dates.txt    importantfile test
[paul@centos01 wildcards]$ 
[paul@centos01 wildcards]$ ls test*
test  test01  test10  test100  test500  test99
[paul@centos01 wildcards]$ 
[paul@centos01 wildcards]$ ls test??
test01  test10  test99
[paul@centos01 wildcards]$ █
```

```
root@RHEL-10:~# touch sid_txt
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# ls *_*
sid_txt
root@RHEL-10:~# █
```

no e in the list of files

```
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# ls | grep -v 'e'
anaconda-ks.cfg
sid.txt
sid_txt
root@RHEL-10:~# █
```

```
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ touch Prashant
[paul@centos01 wildcards]$ 
[paul@centos01 wildcards]$ ls [A-Z]*
ABC  Prashant
[paul@centos01 wildcards]$
```

Questions:

1. How would you list all files that start with the letter "a" and end with .sh in the current directory? 
1. What command would you use to move all files with a .jpg extension to the images directory?
1. How can you delete all files that have "backup" somewhere in their filename?

```
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# ls t*.sh
test.sh
root@RHEL-10:~#
```

```

usync.sh
[paul@centos01 wildcards]$ ls
12345      c-123          file1_backup   main.yml      test      users.csv
a123      c123          file2_backup   names       test01    xyz456pqr
ABC        config.xml     image1.jpg    Prashant    test10
abcd      container.yml   image2.jpg    remote.xml  test100
async.sh    d123          images       script_new.sh test500
b123      dates.txt     importantfile script.sh    test99

[paul@centos01 wildcards]$
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ ls *.jpg
image1.jpg  image2.jpg
[paul@centos01 wildcards]$ mv *.jpg im
image1.jpg  image2.jpg  images/      importantfile
[paul@centos01 wildcards]$ mv *.jpg images/
[paul@centos01 wildcards]$ ls
12345      b123          d123          importantfile  script_new.s
a123      c-123          dates.txt     main.yml      script.sh
ABC        c123          file1_backup   names       test
abcd      config.xml     file2_backup   Prashant    test01
async.sh    container.yml images       remote.xml  test10
[paul@centos01 wildcards]$

```

With Simple Examples | MD Prashant

```

[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ ls images/
image1.jpg  image2.jpg
[paul@centos01 wildcards]$

```

del name backup in filename

```

[paul@centos01 wildcards]$ ls
12345      b123          d123          importantfile  script_new.sh  test100
a123      c-123          dates.txt     main.yml      script.sh      test500
ABC        c123          file1_backup   names       test
abcd      config.xml     file2_backup   Prashant    test01
async.sh    container.yml images       remote.xml  users.csv
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ ls *backup*
file1_backup  file2_backup
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ rm *backup*
[paul@centos01 wildcards]$ ls
12345      b123          d123          names       test      test99
a123      c-123          dates.txt     Prashant   test01    us
ABC        c123          images       remote.xml  test10    xy
abcd      config.xml     importantfile script_new.sh test100
async.sh    container.yml main.yml     script.sh   test500
[paul@centos01 wildcards]$

```

- **Caret (`^`)**: Matches the start of a line.
 - Example: `^Hello` matches any line starting with "Hello".
- **Dollar Sign (`\$`)**: Matches the end of a line.
 - Example: `world\$` matches any line ending with "world".

```
[paul@centos01 wildcards]$ cat users.csv
Raju raju@email.com
Sham
Baburao
Paul paul@email.com
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$
```

```
Raju raju@email.com
Sham
Baburao
Paul paul@email.com
users.csv (END)
```

```
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ grep ^R users.csv
Raju raju@email.com
[paul@centos01 wildcards]$
[paul@centos01 wildcards]$ grep ^B users.csv
Baburao
[paul@centos01 wildcards]$ █
```

```
[paul@centos01 wildcards]$  
[paul@centos01 wildcards]$ grep .com$ users.csv  
Raju raju@email.com  
Paul paul@email.com  
[paul@centos01 wildcards]$
```

Questions:

1. How would you use grep to find lines that start with "Warning" in a log file?
 2. What regex pattern would you use with grep to find all lines containing an email address in a text file?
-
1. Write a grep command to find lines that contain a date in the format YYYY-MM-DD in a file.

```
grep -E '\b[0-9]{4}-[0-9]{2}-[0-9]{2}\b' dates.txt
```

Linux Redirects | Linux Stdin Stdout Stderr

UseCases

- Merging multiple files into a single file.
- Split a big file into a small file with relevant data.

```
[paul@centos01 redirections]$ ls  
data1 data2 users.csv  
[paul@centos01 redirections]$ cat data1  
Raju  
Sham  
[paul@centos01 redirections]$ cat data2  
Paul  
Alex  
[paul@centos01 redirections]$ cat data1 data2  
Raju  
Sham  
Paul  
Alex  
[paul@centos01 redirections]$ cat data1 data2 > data3  
[paul@centos01 redirections]$
```

```
data1 data2 data3 users.csv  
[paul@centos01 redirections]$  
[paul@centos01 redirections]$ cat data3  
Raju  
Sham  
Paul  
Alex  
[paul@centos01 redirections]$ █
```

- **Split a big file into a small file with relevant data.**

```
# less user.csv
```

```
paul@centos01:~/tutorials/redirections
id,firstname,lastname,email,email2,profession
1000,Jsandye,Delila,Jsandye.Delila@yopmail.com,Jsandye.Delila@gmail.com,police officer
1001,Dode,Henebry,Dode.Henebry@yopmail.com,Dode.Henebry@gmail.com,firefighter
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,doctor
1003,Tracey,Frendel,Tracey.Frendel@yopmail.com,Tracey.Frendel@gmail.com,firefighter
1004,Oralee,Woodberry,Oralee.Woodberry@yopmail.com,Oralee.Woodberry@gmail.com,worker
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,doctor
1006,Nataline,Tice,Nataline.Tice@yopmail.com,Nataline.Tice@gmail.com,developer
1007,Sissy,Clarissa,Sissy.Clarissa@yopmail.com,Sissy.Clarissa@gmail.com,developer
1008,Kristina,Zenas,Kristina.Zenas@yopmail.com,Kristina.Zenas@gmail.com,firefighter
1009,Molli,Chick,Molli.Chick@yopmail.com,Molli.Chick@gmail.com,developer
1010,Lorie Land,Lorie.Land@yopmail.com,Lorie.Land@gmail.com,firefighter
```

```
# grep doctor user.csv
```

```
[paul@centos01 redirections]$ less users.csv
[paul@centos01 redirections]$ less users.csv
[paul@centos01 redirections]$
[paul@centos01 redirections]$ grep doctor users.csv
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,doctor
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,doctor
1027,Cindelyn,Wareing,Cindelyn.Wareing@yopmail.com,Cindelyn.Wareing@gmail.com,doctor
1030,Zaria,Prouty,Zaria.Prouty@yopmail.com,Zaria.Prouty@gmail.com,doctor
1034,Elie,Lemuela,Elie.Lemuela@yopmail.com,Elie.Lemuela@gmail.com,doctor
1037,Emilia,Bury,Emilia.Bury@yopmail.com,Emilia.Bury@gmail.com,doctor
1040,Ruthe,Estella,Ruthe.Estella@yopmail.com,Ruthe.Estella@gmail.com,doctor
1042,Marti,Emmaline,Marti.Emmaline@yopmail.com,Marti.Emmaline@gmail.com,doctor
1044,Jennica,Roscoe,Jennica.Roscoe@yopmail.com,Jennica.Roscoe@gmail.com,doctor
1045,Aimil,Roche,Aimil.Roche@yopmail.com,Aimil.Roche@gmail.com,doctor
```

```
paul@centos01:~/tutorials/redirections
[paul@centos01 redirections]$
[paul@centos01 redirections]$ grep doctor users.csv > doctor_data
[paul@centos01 redirections]$ ls
data1 data2 data3 doctor_data  users.csv
[paul@centos01 redirections]$
[paul@centos01 redirections]$ less doctor_data
```

```
1002,Orelia,Ashely,Orelia.Ashely@yopmail.com,Orelia.Ashely@gmail.com,doctor  
1005,Siana,Hanshaw,Siana.Hanshaw@yopmail.com,Siana.Hanshaw@gmail.com,doctor  
1027,Cindelyn,Wareing,Cindelyn.Wareing@yopmail.com,Cindelyn.Wareing@gmail.com,doctor  
1030,Zaria,Prouty,Zaria.Prouty@yopmail.com,Zaria.Prouty@gmail.com,doctor  
1034,Elie,Lemuela,Elie.Lemuela@yopmail.com,Elie.Lemuela@gmail.com,doctor  
1037,Emilia,Bury,Emilia.Bury@yopmail.com,Emilia.Bury@gmail.com,doctor  
1040,Ruthe,Estella,Ruthe.Estella@yopmail.com,Ruthe.Estella@gmail.com,doctor  
1042,Marti,Emmaline,Marti.Emmaline@yopmail.com,Marti.Emmaline@gmail.com,doctor  
1044,Jennica,Roscoe,Jennica.Roscoe@yopmail.com,Jennica.Roscoe@gmail.com,doctor  
1045,Aimil,Roche,Aimil.Roche@yopmail.com,Aimil.Roche@gmail.com,doctor  
1050,Kassey,Stephie,Kassey.Stephie@yopmail.com,Kassey.Stephie@gmail.com,doctor
```

Types of Redirection

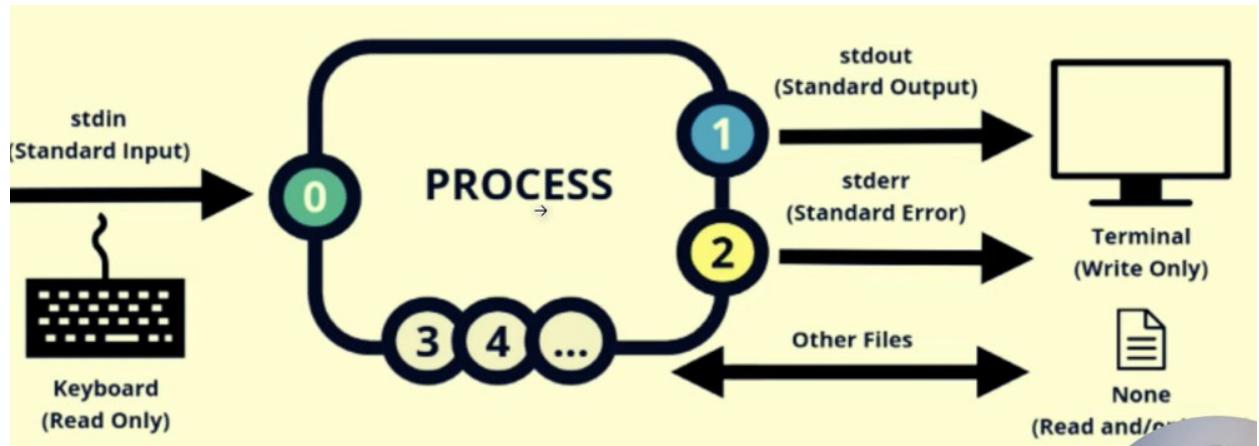
- **Standard Input (stdin)**
- **Standard Output (stdout)**
- **Standard Error (stderr)**

File Descriptors

In Linux, a **file descriptor** is an integer that represents open file. There are three standard file descriptors:

1. **Standard Input (stdin): File descriptor 0**
2. **Standard Output (stdout): File descriptor 1**
3. **Standard Error (stderr): File descriptor 2**

These descriptors help the system understand where send or receive data.



RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Type here to search

Library x RHEL-10 x Type here to search

My Computer RHEL-10

Mar 4 10:30 AM siddhartha@RHEL-10:~ - bash /root

```
root@RHEL-10:~# ls > file.txt
root@RHEL-10:~# ls
anaconda-ks.cfg file.txt new.txt sid.txt sid_txt test1.txt test.sh test.txt
root@RHEL-10:~# cat file.txt
anaconda-ks.cfg
file.txt
new.txt
sid.txt
sid_txt
test1.txt
test.sh
test.txt
root@RHEL-10:~# pwd > file.txt
root@RHEL-10:~# cat file.txt
/root
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

```
root@RHEL-10:~# ls >> file.txt
root@RHEL-10:~# cat file.txt
/root
anaconda-ks.cfg
file.txt
new.txt
sid.txt
sid_txt
test1.txt
test.sh
test.txt
root@RHEL-10:~#
```

```
[paul@centos01 redirections]$ cat myfile
[paul@centos01 redirections]$
[paul@centos01 redirections]$ echo "Hello" > myfile
[paul@centos01 redirections]$ cat myfile
Hello
[paul@centos01 redirections]$
[paul@centos01 redirections]$ echo "Buddy" >> myfile
[paul@centos01 redirections]$ cat myfile
Hello
Buddy
[paul@centos01 redirections]$
```

Error (stderr - 2)

If any command gives you error then it is considered as stderr - 2

We can redirect the error to a file:

Ex: `cd /root/ 2> error_file`

To redirect both standard output and error to a file:

Ex: `cd /root/ > error_file 2>&1`

```
[paul@centos01 redirections]$ [paul@centos01 redirections]$ cd /root/  
-bash: cd: /root/: Permission denied  
[paul@centos01 redirections]$ [paul@centos01 redirections]$ cd /root/ > error.txt  
-bash: cd: /root/: Permission denied  
[paul@centos01 redirections]$ [paul@centos01 redirections]$ cat error.txt  
[paul@centos01 redirections]$
```

```
[paul@centos01 redirections]$ cd /root/ 2> error.txt  
[paul@centos01 redirections]$ [paul@centos01 redirections]$ cat error.txt  
-bash: cd: /root/: Permission denied  
[paul@centos01 redirections]$
```

```
[paul@centos01 redirections]$ [paul@centos01 redirections]$ ls 2>> error.txt  
data1 data2 data3 doctor_data error.txt files.txt myfile users.csv  
[paul@centos01 redirections]$ [paul@centos01 redirections]$ ls &>> error.txt  
[paul@centos01 redirections]$ [paul@centos01 redirections]$ cat error.txt  
-bash: cd: /root/: Permission denied  
data1  
data2  
data3  
doctor_data  
error.txt  
files.txt  
myfile  
users.csv  
[paul@centos01 redirections]$ ls dfdkfdjfhjdklj  
ls: cannot access 'dfdkfdjfhjdklj': No such file or directory  
[paul@centos01 redirections]$ █
```

```
root@RHEL-10:~# ls  
anaconda-ks.cfg file.txt new.txt sid.txt sid_txt test1.txt test.sh test.txt  
root@RHEL-10:~# > file.txt  
root@RHEL-10:~# cat file.txt  
root@RHEL-10:~# ls kmdklmbsdmsm &>> file.txt  
root@RHEL-10:~# cat file.txt  
ls: cannot access 'kmdklmbsdmsm': No such file or directory
```

Input (stdin - 0)

Input is used when feeding file contents to a file

Ex:

- `cat < file_name`
- `cat << EOF`

```
root@RHEL-10:~# ls
anaconda-ks.cfg  file.txt  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# cat file.txt
ls: cannot access 'kmdklmldsdsdmsm': No such file or directory
root@RHEL-10:~# cat < file.txt
ls: cannot access 'kmdklmldsdsdmsm': No such file or directory
root@RHEL-10:~#
```

```
[paul@centos01 redirections]$ ls dfdkfdjfjhjklj &>> error.txt
[paul@centos01 redirections]$ cat error.txt
-bash: cd: /root/: Permission denied
data1
data2
data3
doctor_data
error.txt
files.txt
myfile
users.csv
ls: cannot access 'dfdkfdjfjhjklj': No such file or directory
[paul@centos01 redirections]$
```

Linux Compression: tar, gzip, and zip

Commands Explained

What is File Compression

File compression reduces the size of files by encoding their data more efficiently.

This is especially useful for backup, storage, and file transfer.

```
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid_txt      test.sh
file.txt          sid.txt  test1.txt    test.txt
root@RHEL-10:~# gzip sid.txt
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt.gz  test.sh
file.txt          sid_txt  test1.txt    test.txt
root@RHEL-10:~# 
```

```
root@RHEL-10:~# ls
anaconda-ks.cfg  new.txt  sid.txt.gz  test.sh
file.txt          sid_txt  test1.txt    test.txt
root@RHEL-10:~# gunzip sid.txt.gz
root@RHEL-10:~# ls
anaconda-ks.cfg  file.txt  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# 
```

What is File Compression

File compression reduces the size of files by encoding their data more efficiently.

This is especially useful for backup, storage, and file transfer.

```
# Compressing a file  
gzip filename.txt  
  
⇒  
# Decompressing a file  
gunzip filename.txt.gz
```

gzip is used only in file compression not the directory

```
[paul@centos01 archive]$ ls  
backup data.txt users.csv  
[paul@centos01 archive]$  
[paul@centos01 archive]$ ls backup/  
file1 file2 file3  
[paul@centos01 archive]$  
[paul@centos01 archive]$ gzip backup/  
gzip: backup/ is a directory -- ignored  
[paul@centos01 archive]$
```

for compression of dir .. tar cmd is used

```
# Creating a tar archive  
tar -cvf archive_name.tar file1.txt file2.txt  
  
# Compressing the tar archive with gzip  
tar -czvf archive_name.tar.gz file1.txt file2.txt
```

```
# Decompressing a tar.gz archive  
tar -xzvf archive_name.tar.gz  
  
# Decompressing a tar.bz2 archive  
tar -xjvf archive_name.tar.bz2
```

Tar" stands for "tape archive"

```
[paul@centos01 archive]$ tar -cvf backup.tar backup/  
backup/  
backup/file1  
backup/file2  
backup/file3  
[paul@centos01 archive]$ █
```

```
[paul@centos01 archive]$ ls -ltr  
total 1953148  
-rwxr-xr-x. 1 paul paul 8104 Jun 27 15:12 users.csv  
-rw-r--r--. 1 paul paul 2000000000 Jun 27 15:15 data.txt  
drwxr-xr-x. 2 paul paul 45 Jun 27 15:16 backup  
-rw-r--r--. 1 paul paul 10240 Jun 27 15:51 backup.tar  
[paul@centos01 archive]$ █
```

now compress the tar file using gzip

```
[paul@centos01 archive]$ ls -ltr
total 1953148
-rwxr-xr-x. 1 paul paul      8104 Jun 27 15:12 users.csv
-rw-r--r--. 1 paul paul 2000000000 Jun 27 15:15 data.txt
drwxr-xr-x. 2 paul paul       45 Jun 27 15:16 backup
-rw-r--r--. 1 paul paul    10240 Jun 27 15:51 backup.tar
[paul@centos01 archive]$
[paul@centos01 archive]$ gzip backup.tar
[paul@centos01 archive]$
[paul@centos01 archive]$ ls
backup backup.tar.gz data.txt users.csv
[paul@centos01 archive]$
```

```
[paul@centos01 archive]$ ls -ltr
total 1953140
-rwxr-xr-x. 1 paul paul      8104 Jun 27 15:12 users.csv
-rw-r--r--. 1 paul paul 2000000000 Jun 27 15:15 data.txt
drwxr-xr-x. 2 paul paul       45 Jun 27 15:16 backup
-rw-r--r--. 1 paul paul     212 Jun 27 15:51 backup.tar.gz
[paul@centos01 archive]$
[paul@centos01 archive]$ mkdir test
[paul@centos01 archive]$
[paul@centos01 archive]$ cp backup.tar.gz test/
[paul@centos01 archive]$ cd test/
[paul@centos01 test]$
```

```
[paul@centos01 test]$
[paul@centos01 test]$ ls
backup.tar.gz
[paul@centos01 test]$
```

Decompress

```
# Decompressing a tar.gz archive
tar -xzvf archive_name.tar.gz

# Decompressing a tar.bz2 archive
tar -xjvf archive_name.tar.bz2
```

```
[paul@centos01 test]$ ls
backup.tar.gz
[paul@centos01 test]$ tar -xvf backup.tar.gz
backup/
backup/file1
backup/file2
backup/file3
[paul@centos01 test]$ ls
backup backup.tar.gz
[paul@centos01 test]$ ls -ltr
total 4
drwxr-xr-x. 2 paul paul 45 Jun 27 15:16 backup
-rw-r--r--. 1 paul paul 212 Jun 27 15:53 backup.tar.gz
[paul@centos01 test]$
[paul@centos01 test]$ ls backup
file1 file2 file3
[paul@centos01 test]$
```

All in one cmd .. First Compress then decompress

```
[paul@centos01 test]$ ls
backup
[paul@centos01 test]$ tar -czvf backup.tar.gz backup/
backup/
backup/file1
backup/file2
backup/file3
[paul@centos01 test]$ ls
backup backup.tar.gz
[paul@centos01 test]$ tar -xzvf backup.tar.gz backup/
backup/
backup/file1
backup/file2
backup/file3
[paul@centos01 test]$ ls
backup backup.tar.gz
[paul@centos01 test]$
```

3rd part ZIP

```
# Compressing multiple files  
zip archive_name.zip file1.txt file2.txt
```

```
# Decompressing a zip archive  
unzip archive_name.zip
```



```
[paul@centos01 test]$ touch file1 file2  
[paul@centos01 test]$  
[paul@centos01 test]$ ls  
backup backup.tar.gz file1 file2  
[paul@centos01 test]$  
[paul@centos01 test]$  
[paul@centos01 test]$ zip files.zip file1 file2  
    adding: file1 (stored 0%)  
    adding: file2 (stored 0%)  
[paul@centos01 test]$ ls  
backup backup.tar.gz file1 file2 files.zip  
[paul@centos01 test]$ ls -ltr  
total 8  
drwxr-xr-x. 2 paul paul 45 Jun 27 15:16 backup  
-rw-r--r--. 1 paul paul 201 Jun 27 15:57 backup.tar.gz  
-rw-r--r--. 1 paul paul 0 Jun 27 15:58 file2  
-rw-r--r--. 1 paul paul 0 Jun 27 15:58 file1  
-rw-r--r--. 1 paul paul 298 Jun 27 15:59 files.zip  
[paul@centos01 test]$ █
```

```
# Decompressing a zip archive  
unzip archive_name.zip
```



file1



file2



files.zip

```
[paul@centos01 test]$ ls  
backup backup.tar.gz file1 file2 files.zip  
[paul@centos01 test]$ rm file1 file2  
[paul@centos01 test]$ ls  
backup backup.tar.gz files.zip  
[paul@centos01 test]$  
[paul@centos01 test]$  
[paul@centos01 test]$ unzip files.zip  
Archive: files.zip  
  extracting: file1  
  extracting: file2  
[paul@centos01 test]$ ls  
backup backup.tar.gz file1 file2 files.zip  
[paul@centos01 test]$
```

check what all files/folder present in tar.gz file

```
[paul@centos01 test]$ ls  
backup backup.tar.gz file1.gz files.zip  
[paul@centos01 test]$  
[paul@centos01 test]$ tar -tzvf backup.tar.gz  
drwxr-xr-x paul/paul          0 2024-06-27 15:16 backup/  
-rw-r--r-- paul/paul         12 2024-06-27 15:16 backup/file1  
-rw-r--r-- paul/paul         12 2024-06-27 15:16 backup/file2  
-rw-r--r-- paul/paul         12 2024-06-27 15:16 backup/file3  
[paul@centos01 test]$ █
```

read the compress file .gz

```
[paul@centos01 test]$  
[paul@centos01 test]$ zcat file1.gz  
hello  
[paul@centos01 test]$ █
```

Content inside ZIP files-

```
[paul@centos01 test]$ ls  
backup backup.tar.gz file1.gz files.zip  
[paul@centos01 test]$  
[paul@centos01 test]$  
[paul@centos01 test]$ zipinfo files.zip  
Archive: files.zip  
Zip file size: 298 bytes, number of entries: 2  
-rw-r--r-- 3.0 unx 0 bx stor 24-Jun-27 15:58 file1  
-rw-r--r-- 3.0 unx 0 bx stor 24-Jun-27 15:58 file2  
2 files, 0 bytes uncompressed, 0 bytes compressed: 0.0%  
[paul@centos01 test]$ █
```

#unzip

```
paul@centos01:~/tutorials/archive/test$ [paul@centos01 test]$  
[paul@centos01 test]$ unzip -l files.zip  
Archive: files.zip  
  Length      Date      Time    Name  
-----  
        0  06-27-2024 15:58  file1  
        0  06-27-2024 15:58  file2  
-----  
        0                           2 files  
[paul@centos01 test]$ █
```

Understand Linux Hard & Soft Links | Linux LN command

We are going to use ln command



What are links?

A connection between a file name and actual data on the disk.

we can call it a shortcut.

```
[paul@centos01 links]$ ls
multi
[paul@centos01 links]$
[paul@centos01 links]$ cat multi/dir1/dir2/dir3/myfile.txt
This is a sample file.
[paul@centos01 links]$
```

```
[paul@centos01 links]$ ln -s multi/dir1/dir2/dir3/myfile.txt myfile_s
[paul@centos01 links]$
[paul@centos01 links]$ ls
multi myfile_s
[paul@centos01 links]$
```

```
[paul@centos01 links]$ ls -ltr
total 0
drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi
lrwxrwxrwx. 1 paul paul 31 Jun 28 10:46 myfile_s -> multi/dir1/dir2/dir3/myfile.txt
[paul@centos01 links]$
[paul@centos01 links]$ cat myfile_s
This is a sample file.
[paul@centos01 links]$
```

What are links?



myfile.txt



myfile_link_1

myfile_link_2

myfile_link_3

```
[paul@centos01 links]$
[paul@centos01 links]$ ln -s multi/dir1/dir2/dir3/myfile.txt
[paul@centos01 links]$ ls
multi myfile_s myfile.txt
[paul@centos01 links]$
```

```
[paul@centos01 links]$ cat myfile.txt
This is a sample file.
[paul@centos01 links]$ ls -ltr
total 0
drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi
lrwxrwxrwx. 1 paul paul 31 Jun 28 10:46 myfile_s -> multi/dir1/dir2/dir3/myfile.txt
lrwxrwxrwx. 1 paul paul 31 Jun 28 10:48 myfile.txt -> multi/dir1/dir2/dir3/myfile.txt
[paul@centos01 links]$
[paul@centos01 links]$
```

Types of Link

- Hard Link
- Soft Link

Soft Link

Link will be removed if original file is deleted or removed.

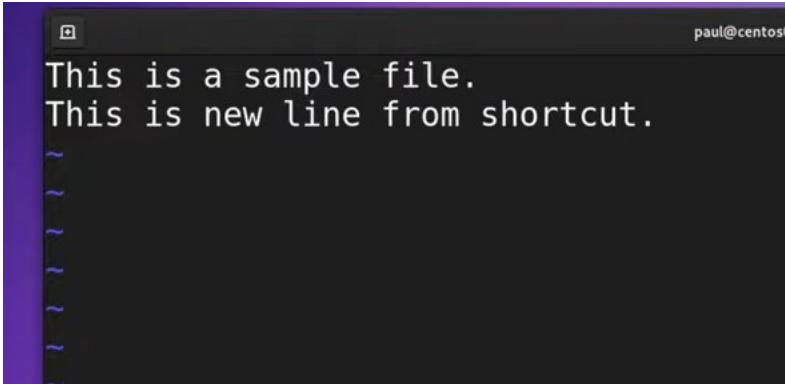
```
ln -s myfile myfile_link
```

```
[paul@centos01 links]$ ls
multi myfile_s myfile.txt
[paul@centos01 links]$
[paul@centos01 links]$ rm myfile.txt
[paul@centos01 links]$ ls
multi myfile_s
[paul@centos01 links]$ cat myfile_s
This is a sample file.
[paul@centos01 links]$
```

```
paul@centos01:~/tutorials/links
[paul@centos01 links]$
[paul@centos01 links]$
[paul@centos01 links]$ ls
multi myfile_s myfile.txt
[paul@centos01 links]$
[paul@centos01 links]$ rm myfile.txt
[paul@centos01 links]$ ls
multi myfile_s
[paul@centos01 links]$ cat myfile_s
This is a sample file.
[paul@centos01 links]$ █
```

now Change the file & check

```
[paul@centos01 links]$
[paul@centos01 links]$ ls
multi myfile_s
[paul@centos01 links]$ cat myfile_s
This is a sample file.
[paul@centos01 links]$
[paul@centos01 links]$ vi myfile_s
```



This is a sample file.
This is new line from shortcut.
~
~
~
~
~
~

```
[paul@centos01 links]$ cat myfile_s  
This is a sample file.  
This is new line from shortcut.  
[paul@centos01 links]$
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ ls  
multi myfile_s  
[paul@centos01 links]$ cat myfile_s  
This is a sample file.  
[paul@centos01 links]$  
[paul@centos01 links]$ vi myfile_s  
[paul@centos01 links]$  
[paul@centos01 links]$ cat myfile_s  
This is a sample file.  
This is new line from shortcut.  
[paul@centos01 links]$  
[paul@centos01 links]$ cat multi/dir1/dir2/dir3/myfile.txt  
This is a sample file.  
This is new line from shortcut.  
[paul@centos01 links]$
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ ls -li  
total 0  
 3940 drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi  
50555763 lrwxrwxrwx. 1 paul paul 31 Jun 28 10:46 myfile_s -> multi/dir1/dir2/  
dir3/myfile.txt  
[paul@centos01 links]$  
[paul@centos01 links]$ ls -li multi/dir1/dir2/dir3/myfile.txt  
50555765 -rw-r--r--. 1 paul paul 55 Jun 28 10:50 multi/dir1/dir2/dir3/myfile  
.txt  
[paul@centos01 links]$  
[paul@centos01 links]$ █
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ rm multi/dir1/dir2/dir3/myfile.txt  
[paul@centos01 links]$
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ ls  
multi myfile_s  
[paul@centos01 links]$ ls -ltr  
total 0  
drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi  
lrwxrwxrwx. 1 paul paul 31 Jun 28 10:46 myfile_s -> multi/dir1/dir2/dir3/myf  
ile.txt  
[paul@centos01 links]$ cat myfile_s  
cat: myfile_s: No such file or directory  
[paul@centos01 links]$ █
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ rm myfile_s  
[paul@centos01 links]$ █
```

Hard Link

Deleting, renaming or removing the original file will not effect the link.

ln myfile myfile_hard_link

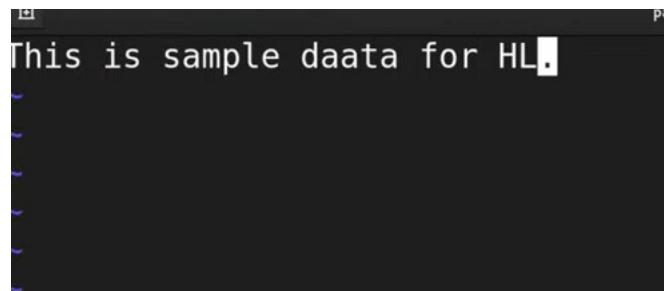
```
[paul@centos01 links]$  
[paul@centos01 links]$ touch multi/dir1/dir2/dir3/myfile.txt  
[paul@centos01 links]$  
[paul@centos01 links]$ █
```

```
[paul@centos01 links]$ ln multi/dir1/dir2/dir3/myfile.txt myfile_hl  
[paul@centos01 links]$  
[paul@centos01 links]$ ls  
multi myfile_hl  
[paul@centos01 links]$ █
```

```
[paul@centos01 links]$  
[paul@centos01 links]$ ls -ltr  
total 0  
drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi  
-rw-r--r--. 2 paul paul 0 Jun 28 10:54 myfile_hl  
[paul@centos01 links]$  
[paul@centos01 links]$ ls -li  
total 0  
      3940 drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi  
50555763 -rw-r--r--. 2 paul paul 0 Jun 28 10:54 myfile_hl  
[paul@centos01 links]$  
[paul@centos01 links]$ ls -li multi/dir1/dir2/dir3/myfile.txt  
50555763 -rw-r--r--. 2 paul paul 0 Jun 28 10:54 multi/dir1/dir2/dir3/myfile.  
txt  
[paul@centos01 links]$
```

same inode Number

```
[paul@centos01 links]$  
[paul@centos01 links]$  
[paul@centos01 links]$ cat myfile_hl  
[paul@centos01 links]$  
[paul@centos01 links]$ cat multi/dir1/dir2/dir3/myfile.txt  
[paul@centos01 links]$  
[paul@centos01 links]$ vi myfile_hl
```



```
[paul@centos01 links]$ vi myfile_hl  
[paul@centos01 links]$ cat myfile_hl  
This is sample daata for HL.  
[paul@centos01 links]$  
[paul@centos01 links]$ cat multi/dir1/dir2/dir3/myfile.txt  
This is sample daata for HL.  
[paul@centos01 links]$  
[paul@centos01 links]$  
[paul@centos01 links]$ rm multi/dir1/dir2/dir3/myfile.txt  
[paul@centos01 links]$
```

still file exist even after deleting orifinal file . no data loss

```
[paul@centos01 links]$ ls -ltr  
total 4  
drwxr-xr-x. 3 paul paul 18 Jun 28 09:49 multi  
-rw-r--r--. 1 paul paul 29 Jun 28 10:56 myfile_hl  
[paul@centos01 links]$  
[paul@centos01 links]$ cat myfile_hl  
This is sample daata for HL.  
[paul@centos01 links]$
```

```
# note : - ionode is the block where dosk number is located
```

Usecase



config.xml

config_v1.xml

config_v2.xml

config_v3.xml

Environment Variables in Linux?

What are Env Variables?



Allows you to store data in memory that can be easily accessed by any program or script running from the shell.

What are Env Variables?

Store information about the shell session
and the working environment

VAR_NAME=VALUE

How to see the existing Env Variables?

- **printenv**
- **env**

```
# env
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || □ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞

Library × Type here ... RHEL-10 ×

My Computer RHEL-10

```
root@RHEL-10:~# ls
anaconda-ks.cfg  file.txt  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# env
SHELL=/bin/bash
SESSION_MANAGER=local/unix:@/tmp/.ICE-unix/2523,unix/unix:/tmp/.ICE-unix/2523
COLORTERM=truecolor
HISTCONTROL=ignoredups
XDG_MENU_PREFIX=gnome-
PTYXIS_PROFILE=c929e4cc1bac7e461b0f7e9067c04d65
HISTSIZE=1000
HOSTNAME=RHEL-10
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=gnome
GPG_TTY=/dev/pts/0
PWD=/root
LOGNAME=siddhartha
XDG_SESSION_DESKTOP=gnome
XDG_SESSION_TYPE=tty
SYSTEMD_EXEC_PID=3280
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Start Type here to search Icons 32°C Partly sunny 14:49 ENG 04-03-2025

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || □ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞

Library × Type here ... RHEL-10 ×

My Computer RHEL-10

```
TERM=xterm-256color
LESSOPEN=||/usr/bin/lesspipe.sh %
USER=siddhartha
DISPLAY=:0
SHLVL=2
QT_IM_MODULE=ibus
XDG_SESSION_ID=c2
XDG_RUNTIME_DIR=/run/user/0
JOURNAL_STREAM=9:19849
XDG_DATA_DIRS=/root/.local/share/flatpak/exports/share:/home/siddhartha/.local/share/flatpak/exports/share:/var/lib/flatpak/exports/share:/usr/local/share/:/usr/share/
PATH=/root/.local/bin:/root/bin:/home/siddhartha/.local/bin:/home/siddhartha/bin:/usr/local/bin:/usr/local/sbin:/usr/bin:/usr/sbin
GDMSESSION=gnome
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
MAIL=/var/spool/mail/siddhartha
PTYXIS_VERSION=46.6
OLDPWD=/home/siddhartha
_=~/usr/bin/env
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Start Type here to search Icons 32°C Partly sunny 14:49 ENG 04-03-2025

How to see a specific Env Variable?

- **printenv HOME**
- **echo \$HOME**

```
root@RHEL-10:~# echo $HOME  
/root  
root@RHEL-10:~#
```

```
[paul@centos01 ~]$ /tmp/print_username.sh  
Current User is paul  
[paul@centos01 ~]$  
[paul@centos01 ~]$ su - Alex  
Password:  
Last login: Sat Jun 29 02:04:32 IST 2024 on pts/0  
[Alex@centos01 ~]$  
[Alex@centos01 ~]$ /tmp/print_username.sh  
Current User is Alex  
[Alex@centos01 ~]$  
[Alex@centos01 ~]$ █
```

There are two environment variable types in the bash shell:

- Global variables**
- Local variables**

How to create local user-defined variables that are visible within your shell process.

- **MY_VAR=Hello**
- **echo \$MY_VAR**

```
[paul@centos01 env]$ echo $MYVAR  
  
[paul@centos01 env]$ MYVAR=hello  
[paul@centos01 env]$  
[paul@centos01 env]$ echo $MYVAR  
hello  
[paul@centos01 env]$ MYVAR=hi  
[paul@centos01 env]$  
[paul@centos01 env]$ echo $MYVAR  
hi  
[paul@centos01 env]$ █
```

```
[paul@centos01 env]$ env | grep MYVAR  
[paul@centos01 env]$  
[paul@centos01 env]$ echo $MYVAR  
hello world  
[paul@centos01 env]$
```

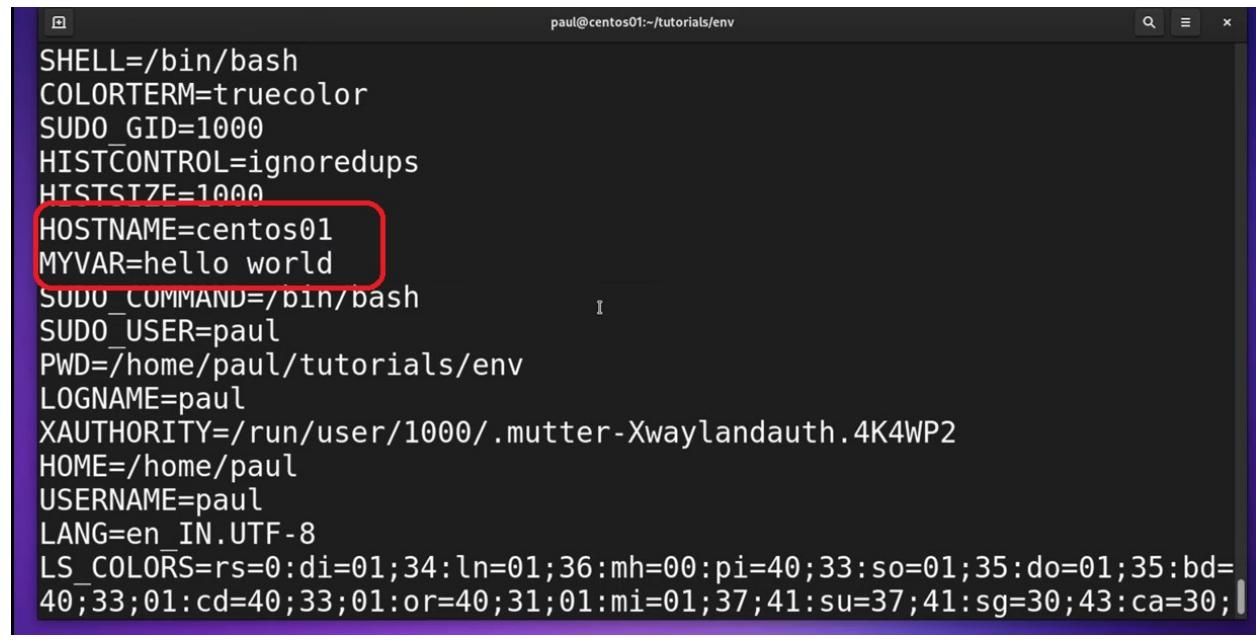
other shell

```
[paul@centos01 ~]$  
[paul@centos01 ~]$  
[paul@centos01 ~]$ echo $MYVAR  
[paul@centos01 ~]$ █
```

no Value

```
[paul@centos01 env]$ echo $MYVAR  
hello world  
[paul@centos01 env]$  
[paul@centos01 env]$ unset MYVAR  
[paul@centos01 env]$  
[paul@centos01 env]$ echo $MYVAR  
  
[paul@centos01 env]$ █
```

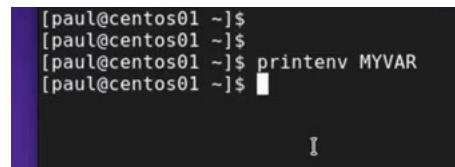
```
[paul@centos01 env]$ export MYVAR="hello world"
[paul@centos01 env]$
[paul@centos01 env]$ env | grep MYVAR
MYVAR=hello world
[paul@centos01 env]$ █
```



```
SHELL=/bin/bash
COLORTERM=truecolor
SUDO_GID=1000
HISTCONTROL=ignoredups
HSTSTZ=1000
HOSTNAME=centos01
MYVAR=hello world
SUDO_COMMAND=/bin/bash
SUDO_USER=paul
PWD=/home/paul/tutorials/env
LOGNAME=paul
XAUTHORITY=/run/user/1000/.mutter-Xwaylandauth.4K4WP2
HOME=/home/paul
USERNAME=paul
LANG=en_IN.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=
40;33;01:cd=40;33;01:or=40;31;01:mi=01;37;41:su=37;41:sg=30;43:ca=30;|
```

```
[paul@centos01 ~]$
[paul@centos01 env]$ printenv MYVAR
hello world
[paul@centos01 env]$ █
```

open new terminal



```
[paul@centos01 ~]$
[paul@centos01 ~]$
[paul@centos01 ~]$ printenv MYVAR
[paul@centos01 ~]$ █
```

Set Env Var Using Profile

Set Env variable permanent for a user.

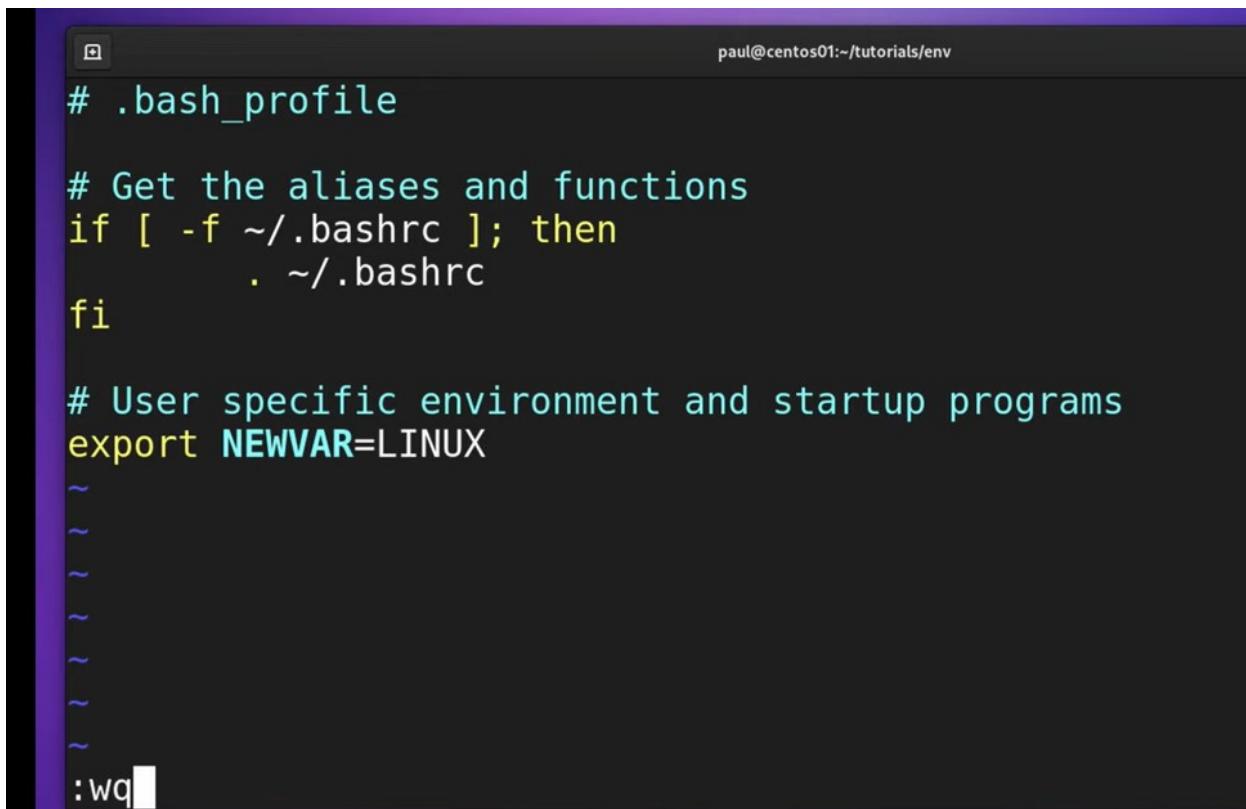
- Edit `~/.profile` (ubuntu)
- Edit `~/.bash_profile` (centos)

And set variables

- `export MYVAR=VALUE`
- `source ~/.profile` (to apply immediately)

```
[paul@centos01 env]$ echo $NEWVAR  
[paul@centos01 env]$ █
```

```
[paul@centos01 env]$ ls -lt ~/.bash_profile
-rw-r--r--. 1 paul paul 141 Jun 29 03:02 /home/paul/.bash_profile
[paul@centos01 env]$
[paul@centos01 env]$ vi ~/.bash_profile █
```



A screenshot of a terminal window titled "paul@centos01:~/tutorials/env". The window displays the contents of the .bash_profile file. The file starts with a comment "# .bash_profile" and an "if" block that checks for the existence of .bashrc. It then contains several blank lines followed by an "export" command setting NEWVAR=LINUX. At the bottom of the file, there is a ":wq" command to save and quit. The terminal window has a dark background with light-colored text.

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi

# User specific environment and startup programs
export NEWVAR=LINUX

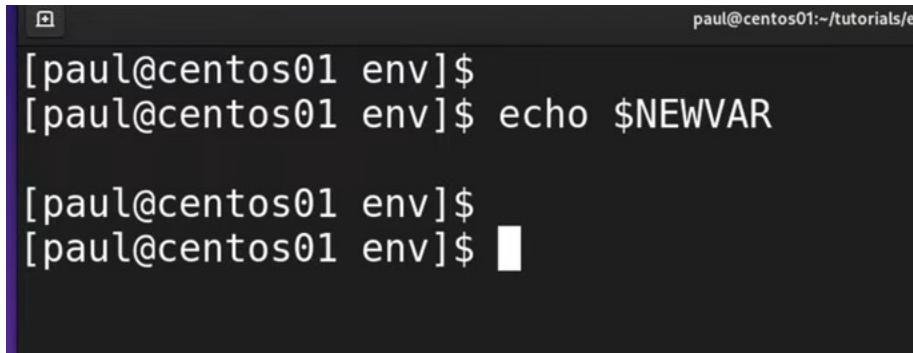
~
~
~
~
~
~
~

:wq█
```

```
[paul@centos01 env]$ vi ~/.bash_profile
[paul@centos01 env]$ cat ~/.bash_profile
# .bash_profile

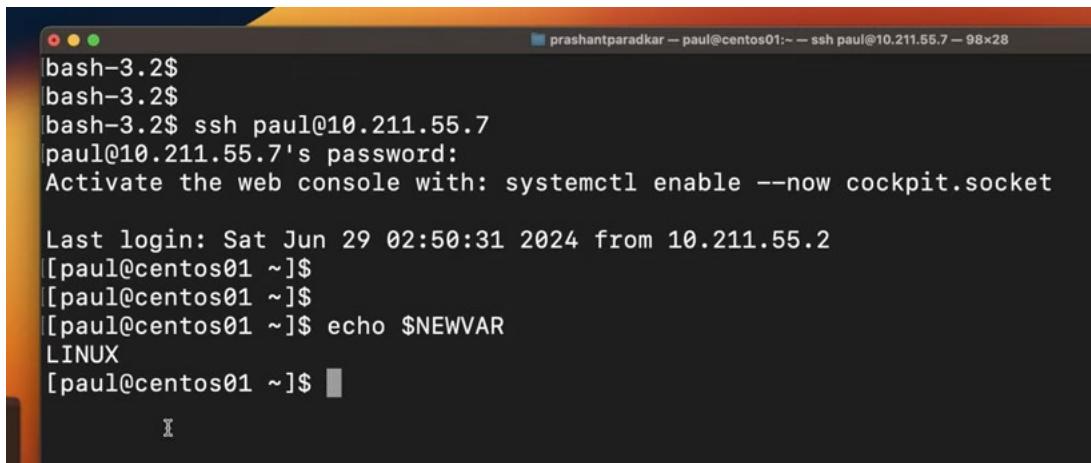
# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi

# User specific environment and startup programs
export NEWVAR=LINUX
[paul@centos01 env]$
```

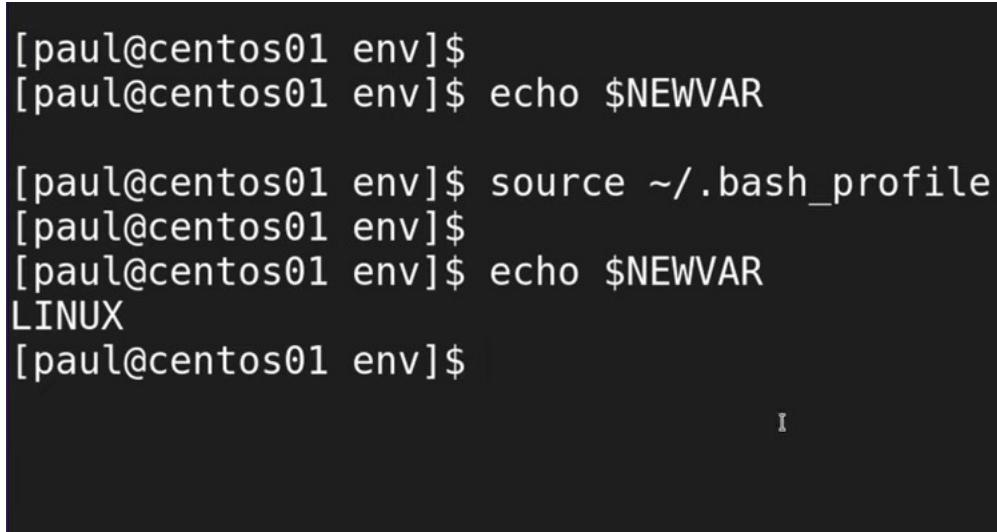


```
[paul@centos01 env]$  
[paul@centos01 env]$ echo $NEWVAR  
  
[paul@centos01 env]$  
[paul@centos01 env]$ █
```

not Displaying th value .. now Logout & login .. open in other terminal - ssh



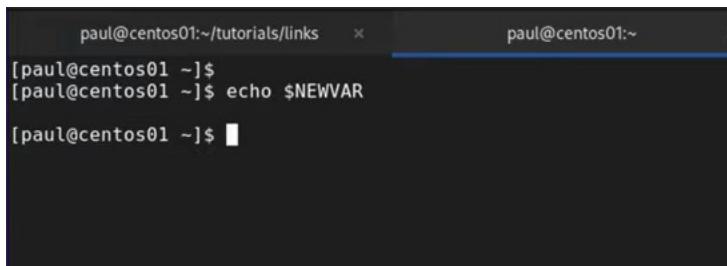
```
bash-3.2$  
bash-3.2$  
bash-3.2$ ssh paul@10.211.55.7  
paul@10.211.55.7's password:  
Activate the web console with: systemctl enable --now cockpit.socket  
  
Last login: Sat Jun 29 02:50:31 2024 from 10.211.55.2  
[paul@centos01 ~]$  
[paul@centos01 ~]$  
[paul@centos01 ~]$ echo $NEWVAR  
LINUX  
[paul@centos01 ~]$ █
```



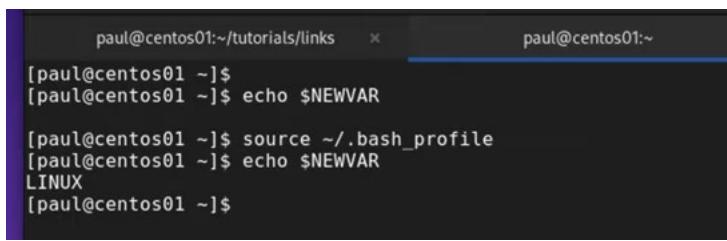
```
[paul@centos01 env]$  
[paul@centos01 env]$ echo $NEWVAR  
  
[paul@centos01 env]$ source ~/.bash_profile  
[paul@centos01 env]$  
[paul@centos01 env]$ echo $NEWVAR  
LINUX  
[paul@centos01 env]$ █
```

```
[paul@centos01 env]$ [paul@centos01 env]$ env | grep NEWVAR  
NEWVAR=LINUX  
[paul@centos01 env]$  
[paul@centos01 env]$ su - Alex  
Password:  
Last login: Sat Jun 29 02:10:41 IST 2024 on pts/0  
[Alex@centos01 ~]$  
[Alex@centos01 ~]$ echo $NEWVAR  
  
[Alex@centos01 ~]$ exit  
logout  
[paul@centos01 env]$ echo $NEWVAR  
LINUX  
[paul@centos01 env]$ █
```

new Tab



```
paul@centos01:~/tutorials/links × paul@centos01:~  
[paul@centos01 ~]$ [paul@centos01 ~]$ echo $NEWVAR  
[paul@centos01 ~]$ █
```



```
paul@centos01:~/tutorials/links × paul@centos01:~  
[paul@centos01 ~]$ [paul@centos01 ~]$ echo $NEWVAR  
[paul@centos01 ~]$ source ~/.bash_profile  
[paul@centos01 ~]$ echo $NEWVAR  
LINUX  
[paul@centos01 ~]$ █
```

```
[paul@centos01 links]$ echo $NEWVAR  
LINUX  
[paul@centos01 links]$  
[paul@centos01 links]$ ls -lt ~/.bashrc  
-rw-r--r--. 1 paul paul 493 Jun 29 03:17 /home/paul/.bashrc  
[paul@centos01 links]$  
[paul@centos01 links]$ vi ~/.bashrc  
[paul@centos01 links]$ █
```

```
paul@centos01:~/tutorials/links
# Uncomment the following line if you don't like systemctl's auto-pa
ing feature:
# export SYSTEMD_PAGER=

# User specific aliases and functions
if [ -d ~/.bashrc.d ]; then
    for rc in ~/.bashrc.d/*; do
        if [ -f "$rc" ]; then
            . "$rc"
        fi
    done
fi

unset rc

export NEWVAR=LINUX
```

30,19 Bot

```
[paul@centos01 links]$ source ~/.bashrc
[paul@centos01 links]$
```

now open new tab

```
paul@centos01:~/tutorials/links
[paul@centos01 ~]$
[paul@centos01 ~]$ echo $NEWVAR
LINUX
[paul@centos01 ~]$
```

Set Env variable permanent for All users.

- Edit /etc/profile/

And set variables

- export MYVAR=VALUE
- source /etc/profile/

```
[paul@centos01 links]$  
[paul@centos01 links]$ echo $GVAR  
  
[paul@centos01 links]$ vi /etc/profile
```

Read only

```
# /etc/profile  
  
# System wide environment and startup programs, for login setup  
# Functions and aliases go in /etc/bashrc  
  
# It's NOT a good idea to change this file unless you know what you  
# are doing. It's much better to create a custom.sh shell script in  
# /etc/profile.d/ to make custom changes to your environment, as this  
# will prevent the need for merging in future updates.  
  
pathmunge () {  
    case ":${PATH}:" in  
        *:"$1":*)  
            ;;  
        *)  
            if [ "$2" = "after" ] ; then  
                /etc/profile" [readonly] 78L, 1899B
```

1,1

Top

```
# Sudo access
```

```
[paul@centos01 links]$ sudo vi /etc/profile  
[sudo] password for paul: █
```

```
# /etc/profile  
  
# System wide environment and startup programs, for login setup  
# Functions and aliases go in /etc/bashrc  
  
# It's NOT a good idea to change this file unless you know what you  
# are doing. It's much better to create a custom.sh shell script in  
# /etc/profile.d/ to make custom changes to your environment, as this  
# will prevent the need for merging in future updates.  
  
pathmunge () {  
    case ":${PATH}:" in  
        *:"$1":*)  
            ;;  
        *)  
            if [ "$2" = "after" ] ; then  
                /etc/profile" 78L, 1899B
```

1,1

Top

```
unset -f pathmunge  
  
if [ -n "${BASH_VERSION-}" ] ; then  
    if [ -f /etc/bashrc ] ; then  
        # Bash login shells run only /etc/profile  
        # Bash non-login shells run only /etc/bashrc  
        # Check for double sourcing is done in /etc/bashrc.  
        . /etc/bashrc  
    fi  
fi  
  
#Global variables  
export GVAR=GLOBALVALUE
```

-- INSERT --

84,1

Bot

```
[paul@centos01 links]$  
[paul@centos01 links]$ echo $GVAR  
  
[paul@centos01 links]$ source /etc/profile  
[paul@centos01 links]$ echo $GVAR  
GLOBALVALUE  
[paul@centos01 links]$  
[paul@centos01 links]$ su - Alex  
Password:  
Last login: Sat Jun 29 03:08:42 IST 2024 on pts/0  
[Alex@centos01 ~]$  
[Alex@centos01 ~]$ echo $GVAR  
GLOBALVALUE  
[Alex@centos01 ~]$
```

ALIAS in Linux To Boost your Productivity



Raju

```
#tar -czvf backup.tar.gz /dir1/dir2/logs
```



Sham

```
#backup ➔
```

What is Alias?

A custom shortcut that represents

- A longer command or
- Series of commands

Syntax

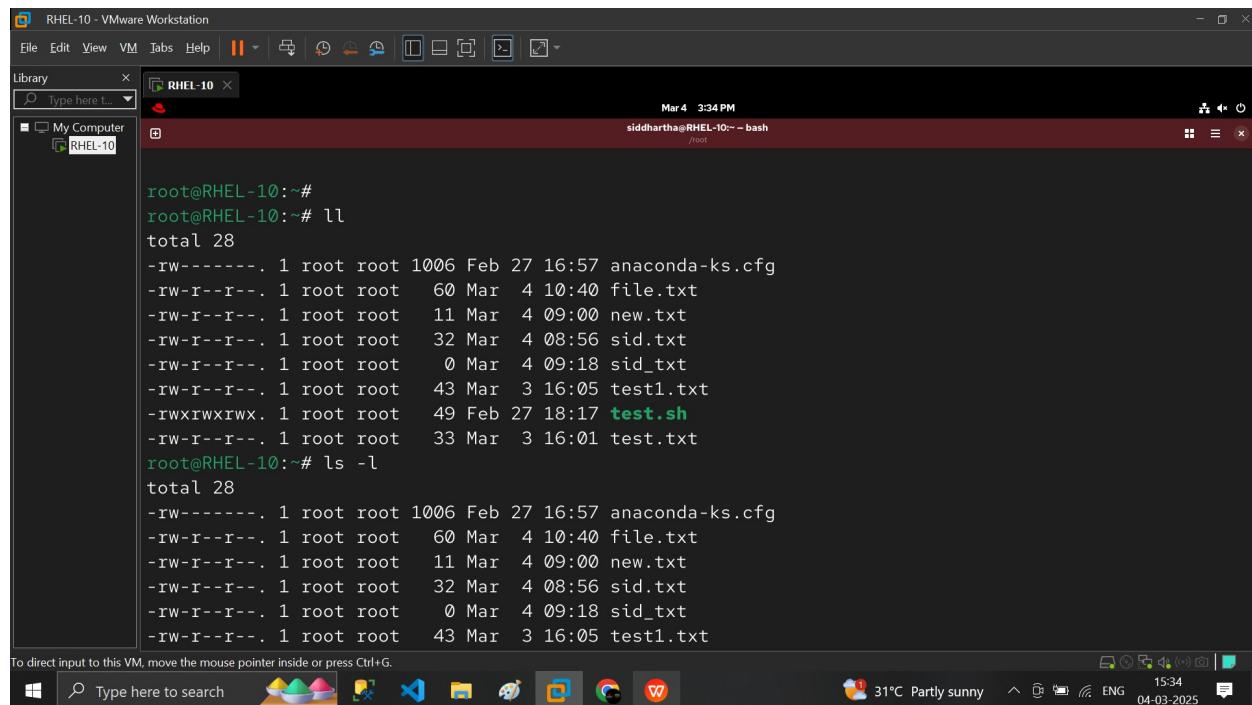
```
alias short_name="your command"
```

Ex: alias l="ls"

```
[paul@cs-client ~]$ alias l="ls -ltr"
[paul@cs-client ~]$
[paul@cs-client ~]$ l
total 84
-rw-rw-r--. 1 paul paul 43211 Oct  8 2014 Linux_logo.jpg
drwxr-xr-x. 2 paul paul       6 Nov 21 18:44 Documents
-rw-r--r--. 1 paul paul 13858 Dec 26 19:35 pic1.jpg
-rwxrwxrwx. 1 paul paul 1280 Dec 28 13:33 countries.txt
-rwxrw-r--. 1 paul paul    70 Jan  1 23:30 test.sh
-rw-rw-r--. 1 paul paul   202 Jan 12 14:05 fact
-rw-rw-r--. 1 paul paul    21 Jan 17 17:57 myfile
-rw-rw----. 1 paul paul      0 Jan 18 22:08 file5
-rw-rw-r--. 1 paul paul    80 Jan 20 14:43 myfile.tx
-rw-rw-r--. 1 paul paul     6 Jan 20 14:45 file1
drwxrwxr-x. 2 paul paul    48 Jan 25 14:35 tmp
drwxrwxr-x. 11 paul paul   136 Feb 13 15:02 tutorials
[paul@cs-client ~]$
```

```
[paul@cs-client ~]$ alias list="ls -ltr"
[paul@cs-client ~]$
[paul@cs-client ~]$ list
total 84
-rw-rw-r--. 1 paul paul 43211 Oct  8 2014 Linux_logo.jpg
drwxr-xr-x. 2 paul paul       6 Nov 21 18:44 Documents
-rw-r--r--. 1 paul paul 13858 Dec 26 19:35 pic1.jpg
-rwxrwxrwx. 1 paul paul 1280 Dec 28 13:33 countries.txt
-rwxrw-r--. 1 paul paul    70 Jan  1 23:30 test.sh
-rw-rw-r--. 1 paul paul   202 Jan 12 14:05 fact
-rw-rw-r--. 1 paul paul    21 Jan 17 17:57 myfile
-rw-rw----. 1 paul paul      0 Jan 18 22:08 file5
-rw-rw-r--. 1 paul paul    80 Jan 20 14:43 myfile.tx
-rw-rw-r--. 1 paul paul     6 Jan 20 14:45 file1
drwxrwxr-x. 2 paul paul    48 Jan 25 14:35 tmp
drwxrwxr-x. 11 paul paul   136 Feb 13 15:02 tutorials
[paul@cs-client ~]$ █
```

```
[paul@cs-client ~]$ alias -p
alias egrep='egrep --color=auto'
alias fgrep='fgrep --color=auto'
alias grep='grep --color=auto'
alias l='ls -ltr'
alias l.='ls -d .* --color=auto'
alias list='ls -ltr'
alias ll='ls -l --color=auto'
alias ls='ls --color=auto'
alias vi='vim'
alias xzgrep='xzgrep --color=auto'
alias xzgrep='xzgrep --color=auto'
alias xzgrep='xzgrep --color=auto'
alias zgrep='zgrep --color=auto'
alias zgrep='zgrep --color=auto'
alias zgrep='zgrep --color=auto'
[paul@cs-client ~]$
```



The screenshot shows a VMware Workstation interface with a single running virtual machine named "RHEL-10". The terminal window displays a root shell session on the RHEL-10 system. The user has run several commands to demonstrate file listing and searching:

```
root@RHEL-10:~#
root@RHEL-10:~# ll
total 28
-rw----- 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rw-r--r-- 1 root root 60 Mar 4 10:40 file.txt
-rw-r--r-- 1 root root 11 Mar 4 09:00 new.txt
-rw-r--r-- 1 root root 32 Mar 4 08:56 sid.txt
-rw-r--r-- 1 root root 0 Mar 4 09:18 sid_txt
-rw-r--r-- 1 root root 43 Mar 3 16:05 test1.txt
-rwxrwxrwx 1 root root 49 Feb 27 18:17 test.sh
-rw-r--r-- 1 root root 33 Mar 3 16:01 test.txt
root@RHEL-10:~# ls -l
total 28
-rw----- 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
-rw-r--r-- 1 root root 60 Mar 4 10:40 file.txt
-rw-r--r-- 1 root root 11 Mar 4 09:00 new.txt
-rw-r--r-- 1 root root 32 Mar 4 08:56 sid.txt
-rw-r--r-- 1 root root 0 Mar 4 09:18 sid_txt
-rw-r--r-- 1 root root 43 Mar 3 16:05 test1.txt
```

The terminal window also shows the system status bar indicating the date (Mar 4), time (3:34 PM), user (siddhartha), and session (bash). The VMware toolbar at the top includes icons for File, Edit, View, VM, Help, and various system controls. The taskbar at the bottom of the host operating system shows icons for File Explorer, Task View, Start, Taskbar, and several application windows.

```
root@RHEL-10:~# alias -p
alias cp='cp -i'
alias egrep='grep -E --color=auto'
alias fgrep='grep -F --color=auto'
alias grep='grep --color=auto'
alias l.='ls -d .* --color=auto'
alias ll='ls -l --color=auto'
alias ls='ls --color=auto'
alias mv='mv -i'
alias rm='rm -i'
alias which='(alias; declare -f) | /usr/bin/which --tty-only --read-alias --read-functions --show-ti
lde --show-dot'
alias xzgrep='xzgrep --color=auto'
alias xzfgrep='xzfgrep --color=auto'
alias xzgrep='xzgrep --color=auto'
alias zgrep='zgrep --color=auto'
alias zfgrep='zfgrep --color=auto'
alias zgrep='zgrep --color=auto'
root@RHEL-10:~#
```

Use-Case of Alias

- Customizing Commands
- Shortening Lengthy Commands
- Navigating Directories
- Personalizing Commands

```
[paul@cs-client tutorials]$ ls
arc awk common filetypes find_command java permissions scripts sed
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ tar -czvf backup1.tar.gz arc/
arc/
arc/test.tgz
arc/myfolder/
arc/myfolder/file1
arc/myfolder/file2
arc/myfolder/file3
arc/myfolder/file4
arc/myfolder/file5
arc/myfolder/50MB.bin
[paul@cs-client tutorials]$ ls
arc backup1.tar.gz filetypes java scripts
awk common find_command permissions sed
[paul@cs-client tutorials]$ █
```

```
[paul@cs-client tutorials]$ alias backup="tar -cvzf"
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ ls
arc backup1.tar.gz filetypes java scripts
awk common find_command permissions sed
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ backup backup2.tar.gz java/
java/
java/Test.class
java/test.jar
java/Test.java
java/MANIFEST.MF
[paul@cs-client tutorials]$ █
```

```
[paul@cs-client ~]$ cd tutorials/scripts/
[paul@cs-client scripts]$ pwd
/home/paul/tutorials/scripts
[paul@cs-client scripts]$
[paul@cs-client scripts]$ alias myscript="cd /home/paul/tutorials/scripts"
[paul@cs-client scripts]$
[paul@cs-client scripts]$ cd
[paul@cs-client ~]$
[paul@cs-client ~]$ pwd
/home/paul
[paul@cs-client ~]$ myscript
[paul@cs-client scripts]$ pwd
/home/paul/tutorials/scripts
[paul@cs-client scripts]$ █
```



```
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ ls
arc backup1.tar.gz common find_command permissions sed
awk backup2.tar.gz filetypes java scripts
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ rm backup1.tar.gz
[paul@cs-client tutorials]$ ls
arc backup2.tar.gz filetypes java scripts
awk common find_command permissions sed
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ rm -i backup2.tar.gz
rm: remove regular file 'backup2.tar.gz'? n
[paul@cs-client tutorials]$ ls
arc backup2.tar.gz filetypes java scripts
awk common find_command permissions sed
[paul@cs-client tutorials]$ █
```

-i : interactive

```
[paul@cs-client tutorials]$ alias rm="rm -i"
[paul@cs-client tutorials]$
[paul@cs-client tutorials]$ rm backup2.tar.gz
rm: remove regular file 'backup2.tar.gz'? █
```

```
[paul@cs-client ~]$ ls -la
total 148
drwx----- 10 paul paul 4096 May 15 12:18 .
drwxr-xr-x 13 root root 147 Apr 1 15:53 ..
-rw----- 1 paul paul 6519 May 15 17:52 .bash_history
-rw-r--r-- 1 paul paul 18 Apr 8 2022 .bash_logout
-rw-r--r-- 1 paul paul 141 Apr 8 2022 .bash_profile
-rw-r--r-- 1 paul paul 377 May 15 12:18 .bashrc
drwxr-xr-x 10 paul paul 4096 Nov 21 18:45 .cache
drwx----- 11 paul paul 4096 Nov 21 18:45 .config
-rwxrwxrwx 1 paul paul 1280 Dec 28 13:33 countries.txt
drwxr-xr-x 2 paul paul 6 Nov 21 18:44 Documents
-rw----- 1 paul paul 16 Nov 21 18:44 .esd_auth
-rw-rw-r-- 1 paul paul 202 Jan 12 14:05 fact
-rw-rw-r-- 1 paul paul 6 Jan 20 14:45 file1
-rw-rw---- 1 paul paul 0 Jan 18 22:08 file5
-rw----- 1 paul paul 930 Dec 8 13:57 .ICEauthority
-rw----- 1 paul paul 58 Mar 31 01:09 .lesshtst
-rw-rw-r-- 1 paul paul 43211 Oct 8 2014 Linux_logo.jpg
drwx----- 3 paul paul 19 Nov 21 18:44 .local
```

```

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi

# User specific environment
if ! [[ "$PATH" =~ "$HOME/.local/bin:$HOME/bin:" ]]
then
    PATH="$HOME/.local/bin:$HOME/bin:$PATH"
fi
export PATH

# Uncomment the following line if you don't like systemctl's aut
ure:
# export SYSTEMD_PAGER=

# User specific aliases and functions
#
#.bashrc" 19L, 377C

```

19,0-

```

[paul@cs-client ~]$
[paul@cs-client ~]$ vi .bashrc
[paul@cs-client ~]$ less .bashrc
#

```

```

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi

# User specific environment
if ! [[ "$PATH" =~ "$HOME/.local/bin:$HOME/bin:" ]]
then
    PATH="$HOME/.local/bin:$HOME/bin:$PATH"
fi
export PATH

# Uncomment the following line if you don't like systemctl's au
ure:
# export SYSTEMD_PAGER=

# User specific aliases and functions
alias l="ls -ltr"

```

(END)

```
[paul@cs-client ~]$ source .bashrc
[paul@cs-client ~]$
[paul@cs-client ~]$ l
total 84
-rw-rw-r--. 1 paul paul 43211 Oct  8 2014 Linux_logo.jpg
drwxr-xr-x. 2 paul paul      6 Nov 21 18:44 Documents
-rw-r--r--. 1 paul paul 13858 Dec 26 19:35 pic1.jpg
-rwxrwxrwx. 1 paul paul 1280 Dec 28 13:33 countries.txt
-rwxrw-r--. 1 paul paul    70 Jan  1 23:30 test.sh
-rw-rw-r--. 1 paul paul   202 Jan 12 14:05 fact
-rw-rw-r--. 1 paul paul    21 Jan 17 17:57 myfile
-rw-rw----. 1 paul paul      0 Jan 18 22:08 file5
-rw-rw-r--. 1 paul paul    80 Jan 20 14:43 myfile.tx
-rw-rw-r--. 1 paul paul      6 Jan 20 14:45 file1
drwxrwxr-x. 2 paul paul     48 Jan 25 14:35 tmp
drwxrwxr-x. 11 paul paul   158 May 15 17:49 tutorials
[paul@cs-client ~]$ █
```

now Logoff + loging .. alias Still exist

```
[paul@cs-client ~]$ l
total 84
-rw-rw-r--. 1 paul paul 43211 Oct  8 2014 Linux_logo.jpg
drwxr-xr-x. 2 paul paul      6 Nov 21 18:44 Documents
-rw-r--r--. 1 paul paul 13858 Dec 26 19:35 pic1.jpg
-rwxrwxrwx. 1 paul paul 1280 Dec 28 13:33 countries.txt
-rwxrw-r--. 1 paul paul    70 Jan  1 23:30 test.sh
-rw-rw-r--. 1 paul paul   202 Jan 12 14:05 fact
-rw-rw-r--. 1 paul paul    21 Jan 17 17:57 myfile
-rw-rw----. 1 paul paul      0 Jan 18 22:08 file5
-rw-rw-r--. 1 paul paul    80 Jan 20 14:43 myfile.tx
-rw-rw-r--. 1 paul paul      6 Jan 20 14:45 file1
drwxrwxr-x. 2 paul paul     48 Jan 25 14:35 tmp
drwxrwxr-x. 11 paul paul   158 May 15 17:49 tutorials
[paul@cs-client ~]$ █
```

note.. Below applicable to all the users

```
[paul@cs-client ~]$  
[paul@cs-client ~]$ less /etc/bash  
bash_completion.d/ bashrc  
[paul@cs-client ~]$ less /etc/bash  
bash_completion.d/ bashrc  
[paul@cs-client ~]$ less /etc/bashrc  
[paul@cs-client ~]$ █
```

adv

- **Saves time and efforts**
- **Increase productivity**
- **Reduce risk of errors**
- **Improved readability**

What Is Linux File System

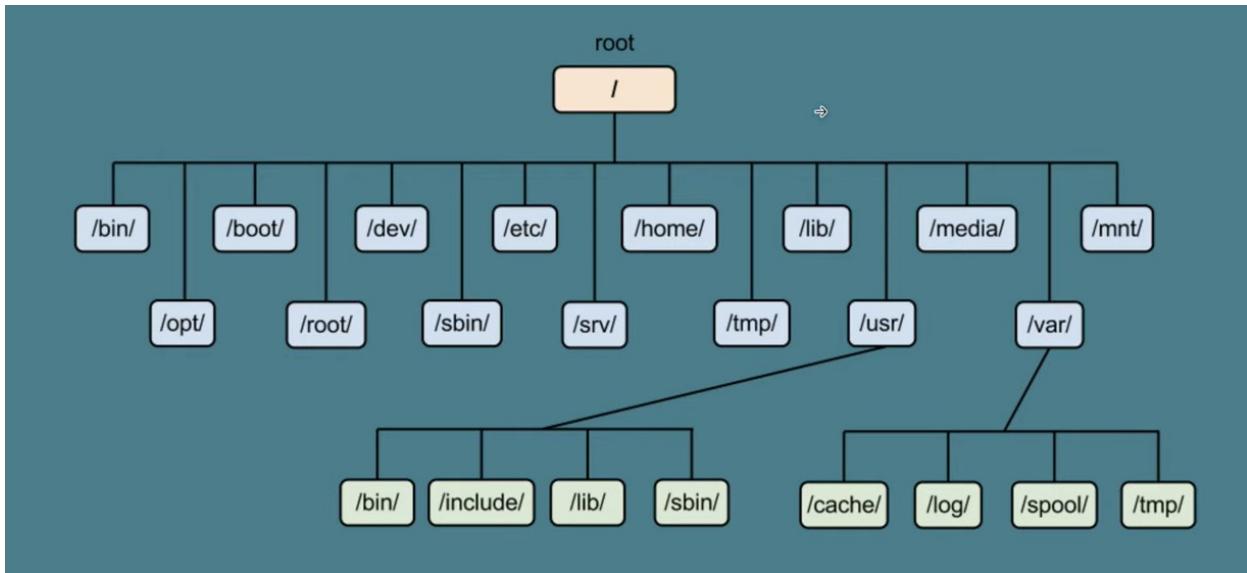
```
[paul@centos01 ~]$  
[paul@centos01 ~]$ pwd  
/home/paul  
[paul@centos01 ~]$ cd  
[paul@centos01 ~]$  
[paul@centos01 ~]$ ls  
db      Downloads  paulfile  script    tutorials  
Desktop   mkdir     Pictures   Templates  Videos  
Documents  Music     Public    test.sh  
[paul@centos01 ~]$  
[paul@centos01 ~]$ cd /etc/  
[paul@centos01 etc]$ pwd  
/etc  
[paul@centos01 etc]$
```

parent Dir

```
[paul@centos01 etc]$  
[paul@centos01 etc]$ cd /  
[paul@centos01 /]$  
[paul@centos01 /]$ ls  
afs  boot  etc  lib   media  opt   root  sbin  sys  usr  
bin  dev   home  lib64  mnt   proc  run   srv   tmp  var  
[paul@centos01 /]$
```

OS store and manage data on disk or partitions using a structure called **Filesystem.**

FileSystem includes files, directories and it's related permissions.



Location/path format

- Windows
 - C:\Program Files\Java
- Linux
 - /etc/folder

- Case Sensitive
- Extensions

```
[paul@centos01 ~]$  
[paul@centos01 ~]$ touch file  
[paul@centos01 ~]$ echo hello > file  
[paul@centos01 ~]$ cat file  
hello  
[paul@centos01 ~]$  
[paul@centos01 ~]$ touch File  
[paul@centos01 ~]$ ls  
db      Downloads  mkdir    Pictures  Templates  Videos  
Desktop   file      Music    Public    test.sh  
Documents  File      paulfile script    tutorials  
[paul@centos01 ~]$ █
```

I

Types of File System

- ext3 ↵
- ext4
- XFS
 - [Ubuntu, Debian, Fedora, CentOS, RedHat]
- Btrfs (B-tree FS)
 - [OpenSUSE and SUSE Linux Enterprise Server]
- FAT

How to check your Linux FileSystem?

- **lsblk -f**
- **df -Th**
- **cat /etc/fstab**

```
root@RHEL-10: # df -Th
Filesystem      Type  Size  Used  Avail Use% Mounted on
/dev/mapper/rhel-root xfs   17G  3.8G  13G  23% /
devtmpfs        devtmpfs 4.0M    0  4.0M  0% /dev
tmpfs           tmpfs   870M   84K  870M  1% /dev/shm
efivarfs        efivarfs 256K   56K  196K  23% /sys/firmware/efi/efivars
tmpfs           tmpfs   348M   7.2M  341M  3% /run
tmpfs           tmpfs   1.0M    0  1.0M  0% /run/credentials/systemd-journald.service
/dev/nvme0n1p2   xfs   960M  313M  648M  33% /boot
/dev/nvme0n1p1   vfat   599M   8.3M  591M  2% /boot/efi
tmpfs           tmpfs   174M  136K  174M  1% /run/user/1000
tmpfs           tmpfs   174M   60K  174M  1% /run/user/0
root@RHEL-10: ~#
```

XFS vs EXT4

- **XFS**

- Optimized for large files and volumes, offering superior performance and scalability.

- **EXT4**

- Performs well across various file sizes but less efficient with extremely large files.

For High-throughput and extensive parallel processing capabilities, XFS is typically more effective than ext4.

What is inode?

An inode in Linux is a data structure that stores metadata about a file or directory.

The filesystem uses the inode number to locate the inode, which then contains pointers to the data blocks where the actual file data is stored.

```
[paul@centos01 dir_1]$ ls
file_1 file_2 file_3
[paul@centos01 dir_1]$ ls -l
total 12
-rw-r--r--. 1 paul paul 2 Jun 29 13:06 file_1
-rw-r--r--. 1 paul paul 2 Jun 29 13:06 file_2
-rw-r--r--. 2 paul paul 2 Jun 29 13:06 file_3
[paul@centos01 dir_1]$
```

```
root@RHEL-10:~# ls -li
total 28
33896877 -rw----- 1 root root 1006 Feb 27 16:57 anaconda-ks.cfg
35312672 -rw-r--r-- 1 root root 60 Mar 4 10:40 file.txt
2759983 -rw-r--r-- 1 root root 11 Mar 4 09:00 new.txt
35312669 -rw-r--r-- 1 root root 32 Mar 4 08:56 sid.txt
35312670 -rw-r--r-- 1 root root 0 Mar 4 09:18 sid_txt
35312658 -rw-r--r-- 1 root root 43 Mar 3 16:05 test1.txt
35319472 -rwxrwxrwx. 1 root root 49 Feb 27 18:17 test.sh
35312653 -rw-r--r-- 1 root root 33 Mar 3 16:01 test.txt
root@RHEL-10:~# █
```

/ (root) Directory

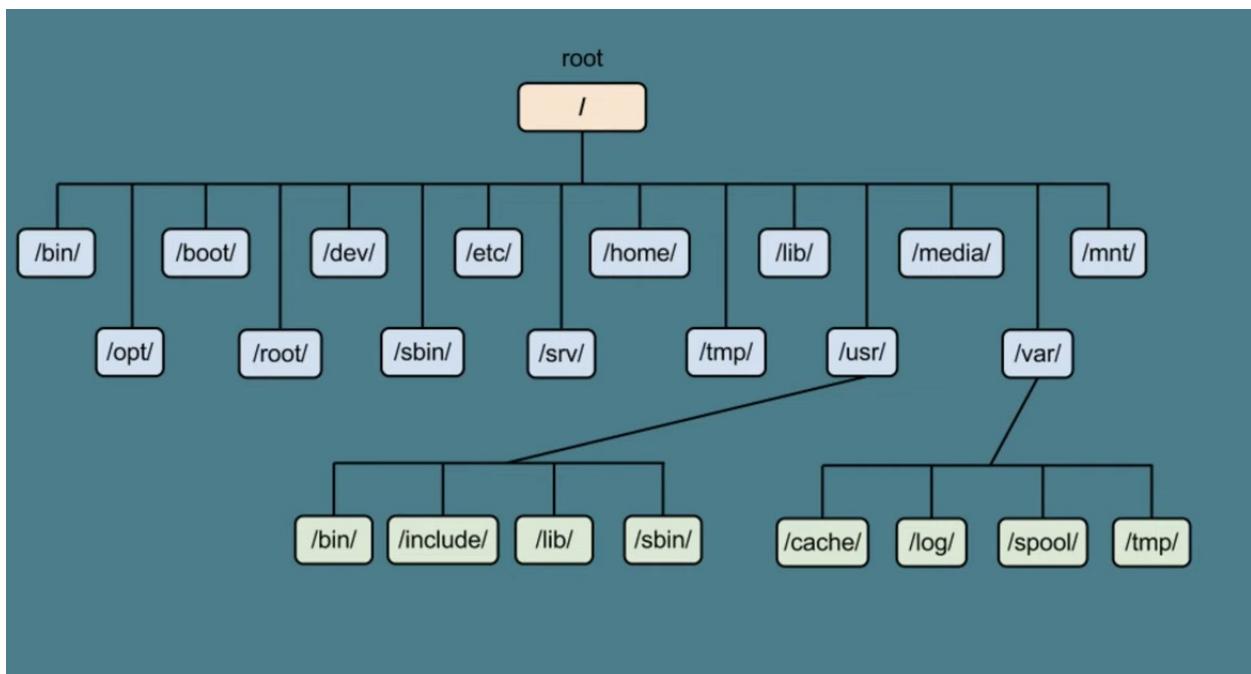
The Linux filesystem starts at the root directory, denoted by a single slash (/), from which all other files and directories branch out.

- **/bin:** Contains essential user binaries (executables), such as common commands like ls, cp, etc.
- **/etc:** Holds system configuration files.
 - Ex: User, Network, Services, System Apps
- **/home:** Contains the personal directories of all users.
- **/root:** The home directory for the root user (administrator).
- **/var:** Where variable data such as logs and databases are stored.
- **/tmp:** Temporary files created by system and users.

- **/boot** - Holds files needed for system boot-up, including the Linux kernel, an initial RAM disk image, bootloader configuration (like GRUB).
- **/dev** - This directory contains device files which represent and provide access to hardware devices such as hard drives, sound devices etc.
- **/lib, /lib64** - These directories contain essential shared libraries and kernel modules that are needed to boot the system and run the commands in the root filesystem. The /lib64 directory exists on systems that support 64-bit applications.
- **/media** - This is the mount point for removable media such as USB drives, CD-ROMs, etc. When these devices are mounted, typically, directories corresponding to their mount points are created within /media.

- **/mnt** - Similar to /media, this is a traditional mount point where system administrators can mount temporary filesystems while using or configuring them.
- **/opt** - Intended for the installation of add-on application software packages. Large software packages that are not part of the default installation can be placed here to avoid cluttering the system directories.
- **/proc** - A virtual and dynamic directory as it only exists in memory. It does not use disk space. It contains information about system resources, hardware, and running processes. It's a pseudo-filesystem that provides an interface to kernel data structures.
- **/run** - A temporary filesystem that stores transient state files, like process IDs or lock files, since it is cleared and recreated at every boot.

- **/sbin** - Contains binary (executable) files that are mostly needed by the system administrator. These include system management commands like fdisk, shutdown, ip, etc.
- **/srv** - Contains data which servers hosted on the system may need, such as web pages served by a web server.
- **/sys** - Similar to /proc, this is another virtual filesystem that provides an interface to the kernel. It contains information and settings about the system's devices, drivers, and some kernel features.
- **/usr** - Considered the secondary hierarchy because it contains all user applications and a variety of other things for day-to-day operations, including libraries, documentation, and much more. Subdirectories include /usr/bin, /usr/sbin, /usr/local, and /usr/share, among others.



Types Of Files In Linux

File Symbol	File Type
-	Regular file
d	Directory
l	Link
c	Device File
s	Socket
p	FIFO or Named Pipe
d	Block device

s socket

Special file to enable communications between two processes.

Find under /run/

Example: /run/chrony/chronyd.sock

```
[root@cs8 test]# find / -type s
/run/gssproxy.sock
/run/vmware/guestServicePipe
/run/mcelog-client
/run/chrony/chronyd.sock
/run/.heim_org.h5l.kcm-socket
/run/avahi-daemon/socket
/run/libvirt/libvirt-sock-ro
/run/libvirt/libvirt-admin-sock
/run/libvirt/virtlockd-sock
/run/libvirt/virtlogd-sock
/run/libvirt/libvirt-sock
/run/dbus/system_bus_socket
/run/lsm/ipc/sim
/run/lsm/ipc/simc
/run/cups/cups.sock
/run/rpcbind.sock
```



```
root@RHEL-10:~# find / -type s
/run/systemd/inaccessible/sock
/run/systemd/notify
/run/systemd/userdb/io.systemd.DynamicUser
/run/systemd/io.systemd.ManagedOOM
/run/systemd/journal/dev-log
/run/systemd/journal/socket
/run/systemd/journal/stdout
/run/systemd/journal/io.systemd.journal
/run/systemd/private
/run/systemd/coredump
/run/systemd/io.systemd.Credentials
/run/systemd/io.systemd.BootControl
/run/systemd/io.systemd.sysext
/run/systemd/io.systemd.Hostname
/run/udev/control
/run/lvm/lvmpolld.socket
/run/user/1000/systemd/inaccessible/sock
/run/user/1000/systemd/notify
/run/user/1000/systemd/private
```

```
[root@cs8 test]#  
[root@cs8 test]# ls -l /run/gssproxy.sock  
srw-rw-rw-. 1 root root 0 Jan 24 23:08 /run/gssproxy.sock  
[root@cs8 test]#
```

p FIFO or Named-pipe

Sends data from one process to another so that the receiving process reads the data first-in-first-out manner.

Can be created using `mkfifo` command

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || | | | | | | | | | | | |

Library X Type here to... RHEL-10

My Computer RHEL-10

```
root@RHEL-10: # find / -type p
/run/systemd/inaccessible/fifo
/run/systemd/sessions/3.ref
/run/systemd/sessions/2.ref
/run/systemd/sessions/4.ref
/run/systemd/sessions/c2.ref
/run/systemd/inhibit/1.ref
/run/systemd/inhibit/2.ref
/run/systemd/inhibit/3.ref
/run/systemd/inhibit/10.ref
/run/systemd/inhibit/11.ref
/run/systemd/inhibit/12.ref
/run/systemd/inhibit/17.ref
/run/user/1000/systemd/inaccessible/fifo
/run/user/1000/gnome-session-leader-fifo
find: '/run/user/1000/gvfs': Permission denied
find: '/run/user/1000/doc': Permission denied
/run/user/0/systemd/inaccessible/fifo
/run/dmeventd-server
/run/dmeventd-client
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Start Type here to search File Explorer Task View Microsoft Edge File Explorer Microsoft Edge Microsoft Word 32°C Mostly sunny 17:06 ENG 04-03-2025

```
root@RHEL-10:~# ls -l /run/systemd/inaccessible/fifo
p-----. 1 root root 0 Mar 4 14:34 /run/systemd/inaccessible/fifo
root@RHEL-10:~#
```

b block device file

A file that refers to a device.

Find under /dev/

Example: /dev/sda1

```
root@RHEL-10:~# find / -type b
/dev/nvme0n1
/dev/nvme0n1p1
/dev/nvme0n1p2
/dev/nvme0n1p3
/dev/sr0
/dev/dm-0
/dev/dm-1
/run/systemd/inaccessible/blk
find: '/run/user/1000/gvfs': Permission denied
find: '/run/user/1000/doc': Permission denied
/run/user/0/systemd/inaccessible/blk
root@RHEL-10:~#
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || □ □ □ □ □ □ □ □

Library x RHEL-10 x Mar 4 5:09 PM

Type here t... siddhartha@RHEL-10:~ - bash

My Computer RHEL-10

```
root@RHEL-10:~# fdisk -l
Disk /dev/nvme0n1: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VMware Virtual NVMe Disk
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: 9E4ABEA4-365A-4C31-A126-538BC34B3F79

Device      Start      End  Sectors  Size Type
/dev/nvme0n1p1    2048  1230847  1228800   600M EFI System
/dev/nvme0n1p2 1230848  3327999  2097152     1G Linux extended boot
/dev/nvme0n1p3 3328000 41940991 38612992 18.4G Linux LVM

Disk /dev/mapper/rhel-root: 16.41 GiB, 17620271104 bytes, 34414592 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
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows icon Type here to search

Cloud icon 32°C Mostly sunny ENG 04-03-2025

c character device file

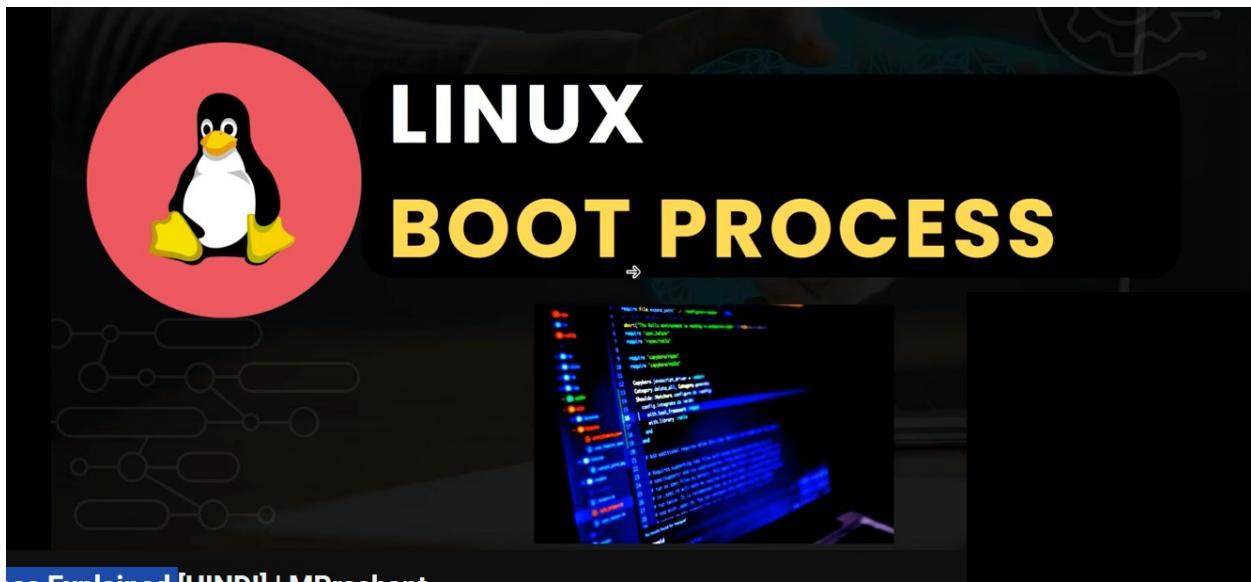
We can create using **mknod** command.

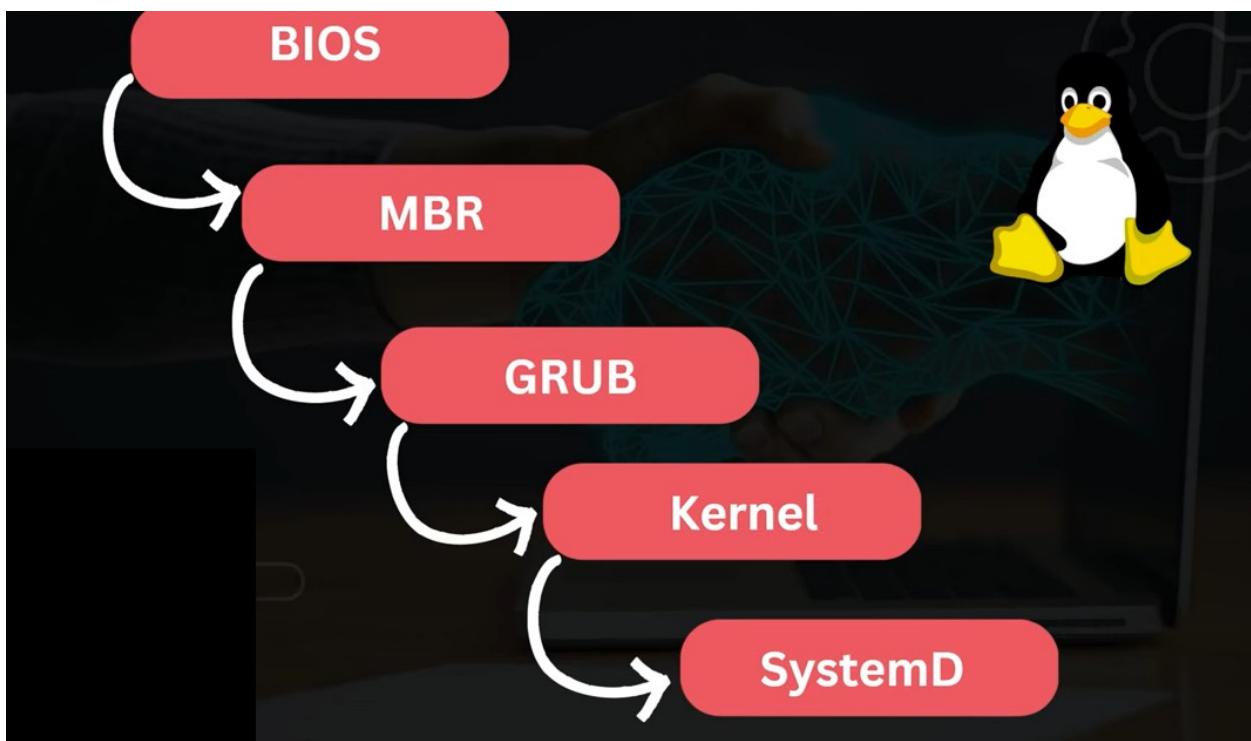
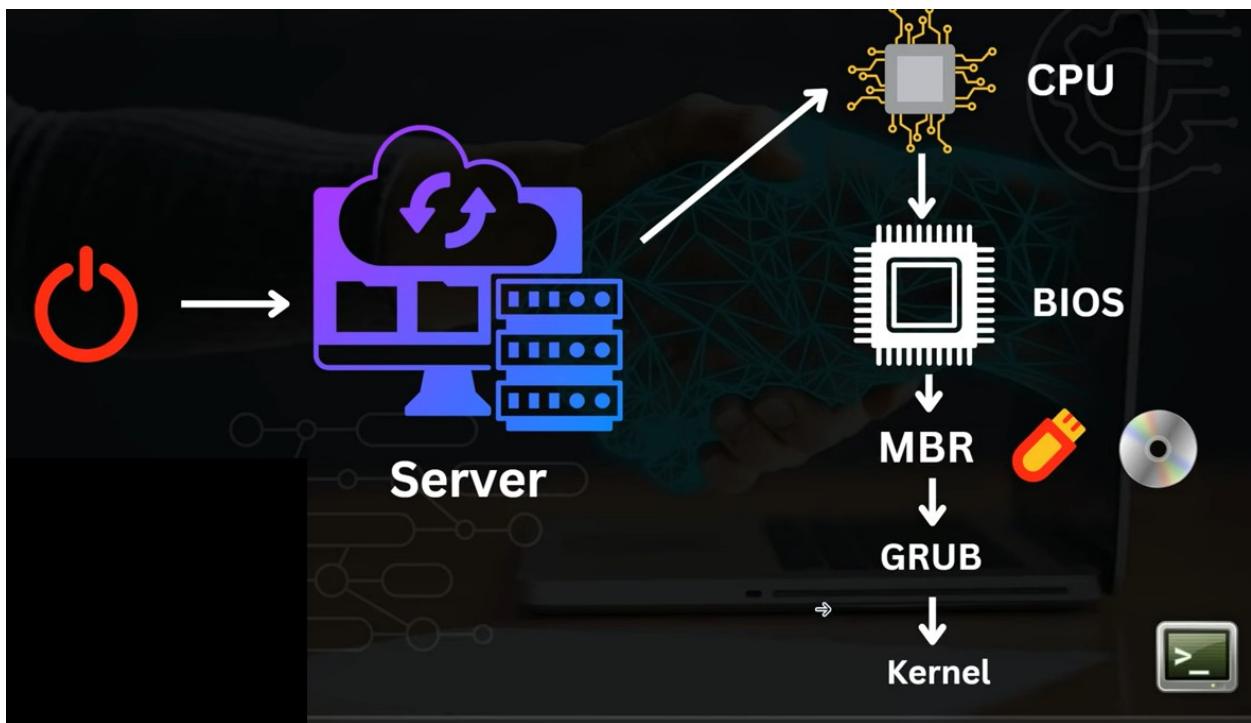
These files are present in **/dev** folder

File that reads/writes data in character

Example: **/dev/input/mouse2**

Linux Boot Process Explained





Master Boot Record (MBR) is a sector on a hard disk drive that contains information about the operating system and partitions. It's responsible for booting the operating system.

GRUB, or GNU GRUB, is a bootloader that manages the boot menu for Linux and other Unix-based operating systems. It's a key part of the Linux boot process.

HOW GRUB WORKS

1. GRUB starts after BIOS finishes hardware tests
2. GRUB loads from the Master Boot Record (MBR)
3. GRUB takes control of the system and loads the Linux kernel
4. GRUB presents a menu where the user can choose their operating system

Installing GRUB

1. Find the latest version of the GRUB package on the official GNU website
2. Open the root shell prompt and run the /sbin/grub-install command
3. Restart your machine

Configuring GRUB

- The primary configuration file for changing menu display settings is called grub and is located in the /etc/default folder
- You can configure GRUB to automatically load a specified OS after a user-defined timeout

- Basic I/O system.
- First Program that executed which is stored in read-only memory on motherboard of computer.
- Perform POST (power-on self-test) verify the hardware components and peripheral to ensure if computer is in working condition.
- Check for bootable device like pendrive, hardisk etc.
- Handover control to first sector of device i.e. MBR

Apart from BIOS, UEFI (Unified Extensible Firmware Interface) is used.

MBR

- Master Boot Record
- 512 bytes, first sector of any bootable device contains machine code instructions to boot a machine and having following info
 - Boot loader (446 bytes)
 - Partition Table (64 bytes)
 - Error Checking (2 bytes)
- It will load the boot loader into the memory and handover to it.

GRUB

- Load `/boot/grub2/grub.cfg` at boot time
- At this stage, User will see GUI asking different OS or kernels configured to boot.
- Once you selected the kernel, it locates the corresponding kernel binary
`/boot/vmlinuz-<kernel-version>`
- Main job is to load kernel and initrd/initramfs image into memory
- Once load kernel in RAM, it passes control to it

In RHEL7

Default boot loader is GRUB2

GRUB is for x86 architecture, it could be different for others arch like for Intel Itanium - ELILO

KERNEL

- First kernel is loaded into read-only mode
- Initramfs/initrd gets decompressed and then it first loads temporary file system.
- Initrd then detects and load the drivers from temporary filesystem to load actual file system.
- Mount other partitions like LVM, RAID etc and unmount itself.
- Once main filesystem is mounted, kernel initialize the first process `init/SystemD`

You can find these images under `/boot` folder

SYSTEMD

- First service loaded with process ID 1
- Start all required processes
`/etc/systemd/system/default.target`
- To bring the system to the run-level/targets (0-6)

You can find the different runlevels files under

`/usr/lib/systemd/system`

`ls -l runlevel*`

```
root@RHEL-10:~# ps -ef | grep systemd
root          1      0  0 16:35 ?          00:00:05 /usr/lib/systemd/system --switched-root --syste
m --deserialize=44 rhgb
root         777      1  0 16:35 ?          00:00:01 /usr/lib/systemd/systemd-journald
root         821      1  0 16:35 ?          00:00:00 /usr/lib/systemd/systemd-udevd
root         944      1  0 16:35 ?          00:00:00 /usr/lib/systemd/systemd-logind
siddhar+    2429      1  0 16:35 ?          00:00:01 /usr/lib/systemd/systemd --user
siddhar+    2523    2429  0 16:35 ?          00:00:00 /usr/libexec/gnome-session-binary --systemd-serv
ice --session=gnome
root        3459      1  0 16:36 ?          00:00:00 /usr/lib/systemd/systemd --user
root        4907    3476  0 17:42 pts/0          00:00:00 grep --color=auto systemd
root@RHEL-10:~#
```

TARGETS

`# systemctl get-default`

To check the current default target(run-

Linux File Permissions For Beginners

```
[paul@centos01 perm]$  
[paul@centos01 perm]$ ls  
ndir nfile.txt rdir rfile.txt script.sh  
[paul@centos01 perm]$  
[paul@centos01 perm]$ cat nfile.txt  
cat: nfile.txt: Permission denied  
[paul@centos01 perm]$  
[paul@centos01 perm]$ cd ndir/  
bash: cd: ndir/: Permission denied  
[paul@centos01 perm]$  
[paul@centos01 perm]$ cd rdir/  
[paul@centos01 rdir]$  
[paul@centos01 rdir]$ touch myfile  
touch: cannot touch 'myfile': Permission denied  
[paul@centos01 rdir]$
```

```
[paul@centos01 perm]$  
[paul@centos01 perm]$ ls  
ndir nfile.txt rdir rfile.txt script.sh  
[paul@centos01 perm]$  
[paul@centos01 perm]$ ./script.sh  
bash: ./script.sh: Permission denied  
[paul@centos01 perm]$
```



How to check permissions of a file?

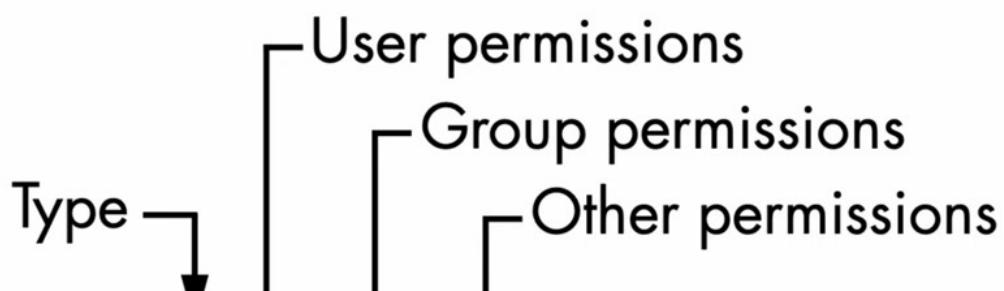
#**ls -ltr**

```
drwxr-xr-x. 2 paul paul 64 Feb  8 17:02 Downloads  
-rw-r--r--. 1 paul paul  0 Feb 10 12:16 paulfile  
-rwxr-xr-x. 1 paul paul 24 Apr 13 16:20 test.sh
```

```
[paul@centos01 perm]$ ls -l
total 12
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
-rw-----. 1 root root  6 Aug  4 12:16 nfile.txt
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--r--. 1 root root 23 Aug  4 11:26 rfile.txt
-rw-r--r--. 1 paul paul 31 Aug  4 11:49 script.sh
[paul@centos01 perm]$
[paul@centos01 perm]$ █
```

Each permission set can contain four basic representations:

- r means that the file is readable.
- w means that the file is writable.
- x means that the file is executable (you can run it as a program).
- - means “nothing” (more specifically, the permission for that slot in the set has not been granted).



rwx rw- r--

```
[paul@centos01 perm]$  
[paul@centos01 perm]$ ll  
total 12  
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir  
-rw----- 1 root root 6 Aug 4 12:16 nfile.txt  
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir  
-rw-r--r--. 1 root root 23 Aug 4 11:26 rfile.txt  
-rw-r--r--. 1 paul paul 31 Aug 4 11:49 script.sh  
[paul@centos01 perm]$  
[paul@centos01 perm]$ cat nfile.txt  
cat: nfile.txt: Permission denied  
[paul@centos01 perm]$ █
```

```
[paul@centos01 perm]$ ll  
total 12  
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir  
-rw----- 1 root root 6 Aug 4 12:16 nfile.txt  
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir  
-rw-r--r--. 1 root root 23 Aug 4 11:26 rfile.txt  
-rw-r--r--. 1 paul paul 31 Aug 4 11:49 script.sh  
[paul@centos01 perm]$  
[paul@centos01 perm]$ cat nfile.txt  
cat: nfile.txt: Permission denied  
[paul@centos01 perm]$ █  
[paul@centos01 perm]$ vi rfile.txt  
[paul@centos01 perm]$ █
```

```
[paul@centos01 perm]$ ll
total 12
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
-rw-----. 1 root root 6 Aug 4 12:16 nfile.txt
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--r--. 1 root root 23 Aug 4 11:26 rfile.txt
-rw-r--r--. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$
[paul@centos01 perm]$ cat nfile.txt
cat: nfile.txt: Permission denied
[paul@centos01 perm]$
[paul@centos01 perm]$ vi rfile.txt
[paul@centos01 perm]$ cd ndir/
bash: cd: ndir/: Permission denied
[paul@centos01 perm]$ █
```

```
[root@centos01 ~]# ls -l
drwxr-xr-x. 2 root root 6 Aug 4 12:10 nfile.txt
-rw-r--r--. 1 root root 22 Aug 4 11:29 rdir
-rw-r--r--. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$ 
[paul@centos01 perm]$ cat nfile.txt
cat: nfile.txt: Permission denied
[paul@centos01 perm]$ 
[paul@centos01 perm]$ vi rfile.txt
[paul@centos01 perm]$ cd ndir/
bash: cd: ndir/: Permission denied
[paul@centos01 perm]$ cd rdir/
[paul@centos01 rdir]$
```

```
[paul@centos01 perm]$ ll
total 8
drwxr-xr--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--r--. 1 root root 23 Aug 4 11:26 rfile.txt
-rw-r--r--. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$ █
```

How to modify permissions of a file?

#chmod a+rwx file.txt

u mean user
g mean group
o mean other
a mean all

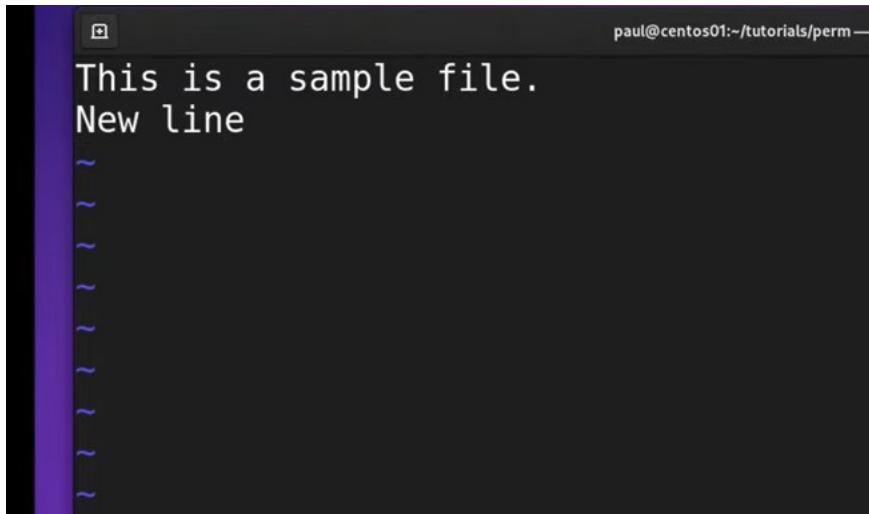
```
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--r--. 1 root root 23 Aug  4 11:26 rfile.txt
-rw-r--r--. 1 paul paul 31 Aug  4 11:49 script.sh
[paul@centos01 perm]$
[paul@centos01 perm]$ chmod a+rwx rfile.txt
chmod: changing permissions of 'rfile.txt': Operation not permitted
[paul@centos01 perm]$
[paul@centos01 perm]$ chmod u+x script.sh
[paul@centos01 perm]$ █
```

```
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--r--. 1 root root 23 Aug  4 11:26 rfile.txt
-rwxr--r--. 1 paul paul 31 Aug  4 11:49 script.sh
[paul@centos01 perm]$
```

```
[paul@centos01 perm]$  
[paul@centos01 perm]$ ./script.sh  
Hello Script  
[paul@centos01 perm]$
```

```
[root@centos01 perm]# ll  
total 8  
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir  
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir  
-rw-r--r--. 1 root root 23 Aug 4 11:26 rfile.txt  
-rwxr--r--. 1 paul paul 31 Aug 4 11:49 script.sh  
[root@centos01 perm]#  
[root@centos01 perm]# chmod o+w rfile.txt  
[root@centos01 perm]# ll  
total 8  
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir  
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir  
-rw-r--rw-. 1 root root 23 Aug 4 11:26 rfile.txt  
-rwxr--r--. 1 paul paul 31 Aug 4 11:49 script.sh  
[root@centos01 perm]#
```

```
paul@centos01 perm]$  
paul@centos01 perm]$ ll  
total 8  
rwxr--r--. 2 root root 22 Aug 4 11:29 ndir  
rwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir  
rw-r--rw-. 1 root root 23 Aug 4 11:26 rfile.txt  
rwxr--r--. 1 paul paul 31 Aug 4 11:49 script.sh  
paul@centos01 perm]$  
paul@centos01 perm]$ vi rfile.txt █
```



This is a sample file.
New line
~
~
~
~
~
~
~
~

```
[paul@centos01 perm]$ cat rfile.txt  
This is a sample file.  
New line  
[paul@centos01 perm]$ █
```

How to modify permissions of a file?

#chmod a+rwx file.txt

u mean user
g mean group
o mean other
a mean all

```
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug 4 14:24 rfile.txt
-rwxr--r--. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$
[paul@centos01 perm]$ chmod a+rwx script.sh
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug 4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$
```

Remove other user permission

```
[paul@centos01 perm]$ chmod o-rwx script.sh
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug 4 14:24 rfile.txt
-rwxrwx---. 1 paul paul 31 Aug 4 11:49 script.sh
[paul@centos01 perm]$
```

- **chmod u+x file.txt**
- **chmod g-w file.txt**
- **chmod u=rwx,g=rw,o=r file.txt**

```
[paul@centos01 perm]$ chmod u=rwx,g=rw,o=r script.sh
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug  4 14:24 rfile.txt
-rwxrwxr--. 1 paul paul 31 Aug  4 11:49 script.sh
[paul@centos01 perm]$ █
```

I

Recursively updates the file permissions

chmod -R u+x mydir

```
[paul@centos01 perm]$ mkdir testdir
[paul@centos01 perm]$ cd testdir/
[paul@centos01 testdir]$ touch file1 file2 file3
[paul@centos01 testdir]$ ll
total 0
-rw-r--r--. 1 paul paul 0 Aug  4 14:27 file1
-rw-r--r--. 1 paul paul 0 Aug  4 14:27 file2
-rw-r--r--. 1 paul paul 0 Aug  4 14:27 file3
[paul@centos01 testdir]$
```

```
[paul@centos01 perm]$ chmod -R u=rwx testdir/
[paul@centos01 perm]$
[paul@centos01 perm]$ ls testdir/
file1 file2 file3
[paul@centos01 perm]$ ls -l testdir/
total 0
-rwxr--r--. 1 paul paul 0 Aug  4 14:27 file1
-rwxr--r--. 1 paul paul 0 Aug  4 14:27 file2
-rwxr--r--. 1 paul paul 0 Aug  4 14:27 file3
[paul@centos01 perm]$
```

Numeric (Octal) Method



How to modify permissions of a file?

#chmod 777 file.txt



#chmod 644 file.txt

```
[paul@centos01 perm]$ chmod 000 script.sh
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug  4 14:24 rfile.txt
-----. 1 paul paul 31 Aug  4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug  4 14:27 testdir
[paul@centos01 perm]$
[paul@centos01 perm]$ chmod 777 script.sh
[paul@centos01 perm]$ ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug  4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug  4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug  4 14:27 testdir
[paul@centos01 perm]$
```

Different supported no.

- 0: No permission.
- 1: Execute only. 
- 2: Write only.
- 3: Write and execute (1+2).
- 4: Read only.
- 5: Read and execute (4+1).
- 6: Read and write (4+2).
- 7: Read, write, and execute (4+2+1).

Using CHOWN

- **chown user:group filename**
- **chown paul:QA file.txt**

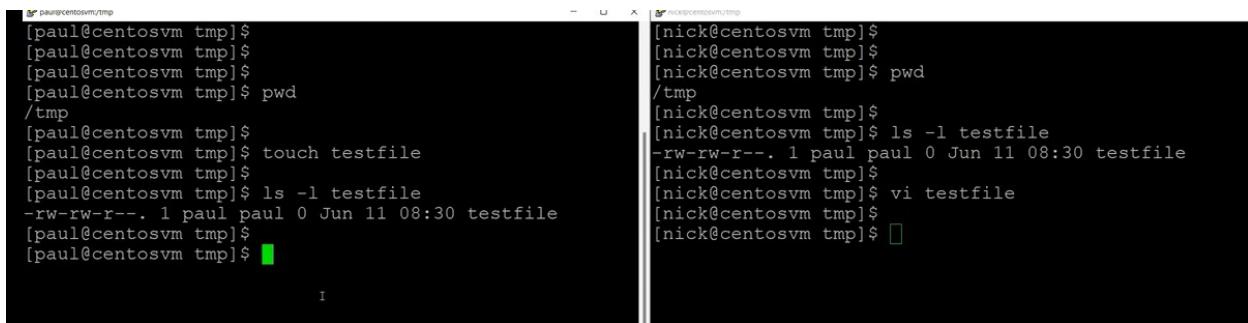
```
[root@centos01 perm]# ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--rw-. 1 root root 32 Aug  4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug  4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug  4 14:27 testdir
[root@centos01 perm]#
[root@centos01 perm]# chown paul:root rfile.txt
[root@centos01 perm]#
[root@centos01 perm]# ll
total 8
drwxr--r--. 2 root root 22 Aug  4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug  4 11:29 rdir
-rw-r--rw-. 1 paul root 32 Aug  4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug  4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug  4 14:27 testdir
```

Using CHGRP

- **chgrp group filename**

```
[root@centos01 perm]# ll
total 8
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--rw-. 1 paul root 32 Aug 4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug 4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug 4 14:27 testdir
[root@centos01 perm]#
[root@centos01 perm]# chgrp paul rfile.txt
[root@centos01 perm]# ll
total 8
drwxr--r--. 2 root root 22 Aug 4 11:29 ndir
drwxr-xr-x. 2 root root 22 Aug 4 11:29 rdir
-rw-r--rw-. 1 paul paul 32 Aug 4 14:24 rfile.txt
-rwxrwxrwx. 1 paul paul 31 Aug 4 11:49 script.sh
drwxr-xr-x. 2 paul paul 45 Aug 4 14:27 testdir
[root@centos01 perm]#
```

Linux Access Control List (ACL) | Linux File Permissions Using getfacl & setfacl



The screenshot shows two terminal windows side-by-side. The left window, titled 'paul@centosvm:tmp\$', shows a user named 'paul' performing actions like navigating to the directory, creating a file, and listing its permissions. The right window, titled 'nick@centosvm:tmp\$', shows another user named 'nick' performing similar actions. Both windows use the standard Linux terminal interface with a black background and white text.

```
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ pwd
/tmp
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ touch testfile
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ ls -l testfile
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ ls -l testfile
-rw-rw-r--. 1 paul paul 0 Jun 11 08:30 testfile
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ 

[nick@centosvm tmp]$ 
[nick@centosvm tmp]$ 
[nick@centosvm tmp]$ pwd
/tmp
[nick@centosvm tmp]$ 
[nick@centosvm tmp]$ ls -l testfile
-rw-rw-r--. 1 paul paul 0 Jun 11 08:30 testfile
[nick@centosvm tmp]$ 
[nick@centosvm tmp]$ vi testfile
[nick@centosvm tmp]$ 
[nick@centosvm tmp]$ 
```

What is ACL?

It allows you to give more specific set of permissions to a file or directory without changing the base ownership and permissions.

Commands: **setfacl** & **getfacl**

```
root@RHEL-10:~# ls
anaconda-ks.cfg  file.txt  new.txt  sid.txt  sid_txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# getfacl sid.txt
# file: sid.txt
# owner: root
# group: root
user::rw-
group::r--
other::r--

root@RHEL-10:~#
```

Commands for ACL

For adding permission for user -

setfacl -m u:user:rwx <target_file>

For adding permission for group -

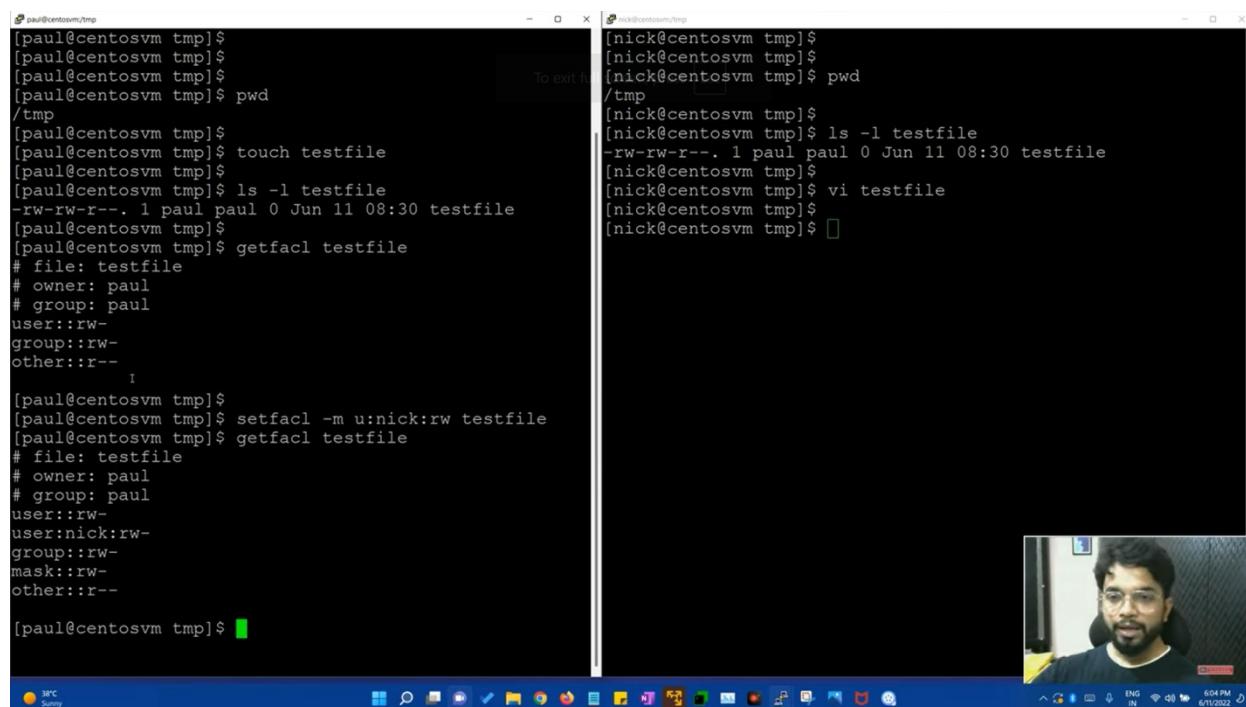
setfacl -m g:group:rwx <target_file>

To remove a specific entry -

setfacl -x u:user:rwx <target_file>

To remove all entries

setfacl -b <target_file>



The image shows two terminal windows side-by-side. The left terminal window, titled 'paul@centosvm:tmp', shows a sequence of commands to create a file, change its permissions, and then add and remove specific access controls. The right terminal window, titled 'nick@centosvm:tmp', shows similar commands being run by another user named 'nick'. Both windows display the output of the 'getfacl' command to show the current access control lists.

```
paul@centosvm:tmp$ [paul@centosvm tmp]$ [paul@centosvm tmp]$ [paul@centosvm tmp]$ [paul@centosvm tmp]$ pwd /tmp [paul@centosvm tmp]$ [paul@centosvm tmp]$ touch testfile [paul@centosvm tmp]$ [paul@centosvm tmp]$ ls -l testfile -rw-rw-r--. 1 paul paul 0 Jun 11 08:30 testfile [paul@centosvm tmp]$ [paul@centosvm tmp]$ getfacl testfile # file: testfile # owner: paul # group: paul user::rw- group::rw- other::r-- I [paul@centosvm tmp]$ [paul@centosvm tmp]$ setfacl -m u:nick:rw testfile [paul@centosvm tmp]$ getfacl testfile # file: testfile # owner: paul # group: paul user::rw- user:nick:rw- group::rw- mask::rw- other::r-- [paul@centosvm tmp]$
```

```
nick@centosvm:tmp$ [nick@centosvm tmp]$ [nick@centosvm tmp]$ [nick@centosvm tmp]$ pwd /tmp [nick@centosvm tmp]$ [nick@centosvm tmp]$ ls -l testfile -rw-rw-r--. 1 paul paul 0 Jun 11 08:30 testfile [nick@centosvm tmp]$ [nick@centosvm tmp]$ vi testfile [nick@centosvm tmp]$ [nick@centosvm tmp]$
```

```
root@RHEL-10:~# setfacl -m u:root:rw sid.txt
root@RHEL-10:~# getfacl sid.txt
# file: sid.txt
# owner: root
# group: root
user::rw-
user:root:rw-
group::r--
mask::rw-
other::r--

root@RHEL-10:~#
```

⊕

siddhart

```
root@RHEL-10:~# ls -l sid.txt
-rw-rw-r--+ 1 root root 32 Mar  4 08:56 sid.txt
root@RHEL-10:~#
```

Commands for ACL

For adding permission for user -

setfacl -m u:user:rwx <target_file>

For adding permission for group -

setfacl -m g:group:rwx <target_file>

To remove a specific entry -

setfacl -x u:user:rwx <target_file>

To remove all entries

setfacl -b <target_file>

```
My Computer RHEL-10 siddhartha@RHEL-10 ~
root@RHEL-10:~# setfacl -m g:root:rwx sid.txt
root@RHEL-10:~# getfacl sid.txt
# file: sid.txt
# owner: root
# group: root
user::rw-
user:root:rw-
group::r--
group:root:rwx
mask::rwx
other::r--

root@RHEL-10:~#
```

Remove permissions

```
root@RHEL-10:~# setfacl -x u:root sid.txt
root@RHEL-10:~# getfacl sid.txt
# file: sid.txt
# owner: root
# group: root
user::rw-
group::r--
group:root:rwx
mask::rwx
other::r--
```

```
root@RHEL-10:~# cat sid.txt
siddhartha here from Bangalore
Hi Sidd here
root@RHEL-10:~# ls -l sid.txt
-rw-rw xr--- 1 root root 45 Mar  4 18:30 sid.txt
root@RHEL-10:~# setfacl -b sid.txt
root@RHEL-10:~# getfacl sid.txt
# file: sid.txt
# owner: root
# group: root
user::rw-
group::r--
other::r--

root@RHEL-10:~# ls -l sid.txt
-rw-r--r--. 1 root root 45 Mar  4 18:30 sid.txt
root@RHEL-10:~#
```

```
[paul@centosvm myfolder]$ ls -ltr
total 0
-rw-rw-r--. 1 paul paul 0 Jun 11 08:45 file1
-rw-rw-r--. 1 paul paul 0 Jun 11 08:50 file2
[paul@centosvm myfolder]$ █
```

Commands for ACL

**For adding permission for user in all the files inside a folder -
setfacl -Rm "entry" <target_file/folder>**

```
[paul@centosvm myfolder]$ cd ..
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ setfacl -Rm u:nick:rw myfolder/
[paul@centosvm tmp]$ 
[paul@centosvm tmp]$ cd myfolder/
[paul@centosvm myfolder]$ ls -ltr
total 0
-rw-rw-r--+ 1 paul paul 0 Jun 11 08:45 file1
-rw-rw-r--+ 1 paul paul 0 Jun 11 08:50 file2
[paul@centosvm myfolder]$           I
[paul@centosvm myfolder]$ getfacl file1
# file: file1
# owner: paul
# group: paul
user::rw-
user:nick:rw-
group::rw-
mask::rw-
other::r--


[paul@centosvm myfolder]$ █
```

**Linux DISK SPACE Monitoring Commands - DF
DU FREE**

System Monitoring

(df, du, free)

df command

Show information about the file system

df -h

-h Human Readable

-BM or -BG scale sizes by size

```
root@RHEL-10:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/mapper/rhel-root  17G  3.8G   13G  23% /
devtmpfs        4.0M     0  4.0M   0% /dev
tmpfs          870M  84K  870M   1% /dev/shm
efivarfs       256K  56K  196K  23% /sys/firmware/efi/efivars
tmpfs          348M  7.2M  341M   3% /run
tmpfs          1.0M     0  1.0M   0% /run/credentials/systemd-journald.service
/dev/nvme0n1p2  960M 313M  648M  33% /boot
/dev/nvme0n1p1  599M  8.3M  591M   2% /boot/efi
tmpfs          174M 136K  174M   1% /run/user/1000
tmpfs          174M   60K  174M   1% /run/user/0
root@RHEL-10:~#
```

```
root@RHEL-10:~# df -h -Bk
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/mapper/rhel-root 17141760K 3888140K 13253620K 23% /
devtmpfs          4096K     0K    4096K   0% /dev
tmpfs            890712K    84K  890628K   1% /dev/shm
efivarfs         256K     56K    196K  23% /sys/firmware/efi/efivars
tmpfs            356288K   7324K  348964K   3% /run
tmpfs            1024K     0K   1024K   0% /run/credentials/systemd-journald.service
/dev/nvme0n1p2  983040K  319664K  663376K 33% /boot
/dev/nvme0n1p1  613184K  8488K  604696K   2% /boot/efi
tmpfs            178140K   136K  178004K   1% /run/user/1000
tmpfs            178140K    60K  178080K   1% /run/user/0
root@RHEL-10:~#
```

- BG - Gigabytes

```
root@RHEL-10:~# df -h -BG
Filesystem      1G-blocks  Used Available Use% Mounted on
/dev/mapper/rhel-root 17G     4G    13G  23% /
devtmpfs          1G     0G    1G   0% /dev
tmpfs            1G     1G    1G   1% /dev/shm
efivarfs         1G     1G    1G  23% /sys/firmware/efi/efivars
tmpfs            1G     1G    1G   3% /run
tmpfs            1G     0G    1G  0% /run/credentials/systemd-journald.service
/dev/nvme0n1p2  1G     1G    1G  33% /boot
/dev/nvme0n1p1  1G     1G    1G   2% /boot/efi
tmpfs            1G     1G    1G   1% /run/user/1000
tmpfs            1G     1G    1G   1% /run/user/0
root@RHEL-10:~#
```

du command

Summarize disk usage of the set of FILES, recursively for directories.

du -h

du -h FILE/PATH

du -hc FILE/PATH for total volume

If you want to see even size of file then use a

du -ahc FILE/PATH for total volume

-BM or -BG scale sizes by size

```
[root@RHEL-10:~# du -h  
16K      ./ssh  
0        ./cache  
80K      .  
root@RHEL-10:~# ]
```

```
[paul@centosvm ~]$ du -h /home/paul/scripts/  
8.0K    /home/paul/scripts/python_script  
68K    /home/paul/scripts/nextlevel  
252K    /home/paul/scripts/  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ du -h /home/paul/tutorials/archive/  
2.0G    /home/paul/tutorials/archive/myfolder  
2.0G    /home/paul/tutorials/archive/folder1/myfolder  
2.0G    /home/paul/tutorials/archive/folder1  
4.9G    /home/paul/tutorials/archive/           I  
[paul@centosvm ~]$
```

```
root@RHEL-10:~# du -hc  
16K      ./ssh  
0        ./cache  
80K      .  
80K      total  
root@RHEL-10:~# ]
```

```
[paul@centosvm ~]$ du -ahc /home/paul/tutorials/archive/  
1000M   /home/paul/tutorials/archive/myfolder/file1  
1000M   /home/paul/tutorials/archive/myfolder/file2  
2.0G    /home/paul/tutorials/archive/myfolder  
2.0M    /home/paul/tutorials/archive/folder1/myfolder.tar.gz  
1000M   /home/paul/tutorials/archive/folder1/myfolder/file1  
1000M   /home/paul/tutorials/archive/folder1/myfolder/file2  
2.0G    /home/paul/tutorials/archive/folder1/myfolder  
2.0G    /home/paul/tutorials/archive/folder1  
1000M   /home/paul/tutorials/archive/testfile  
2.0M    /home/paul/tutorials/archive/myfolder.tar.gz  
4.9G    /home/paul/tutorials/archive/  
4.9G    total
```

free command

Display amount of free and used memory in the system

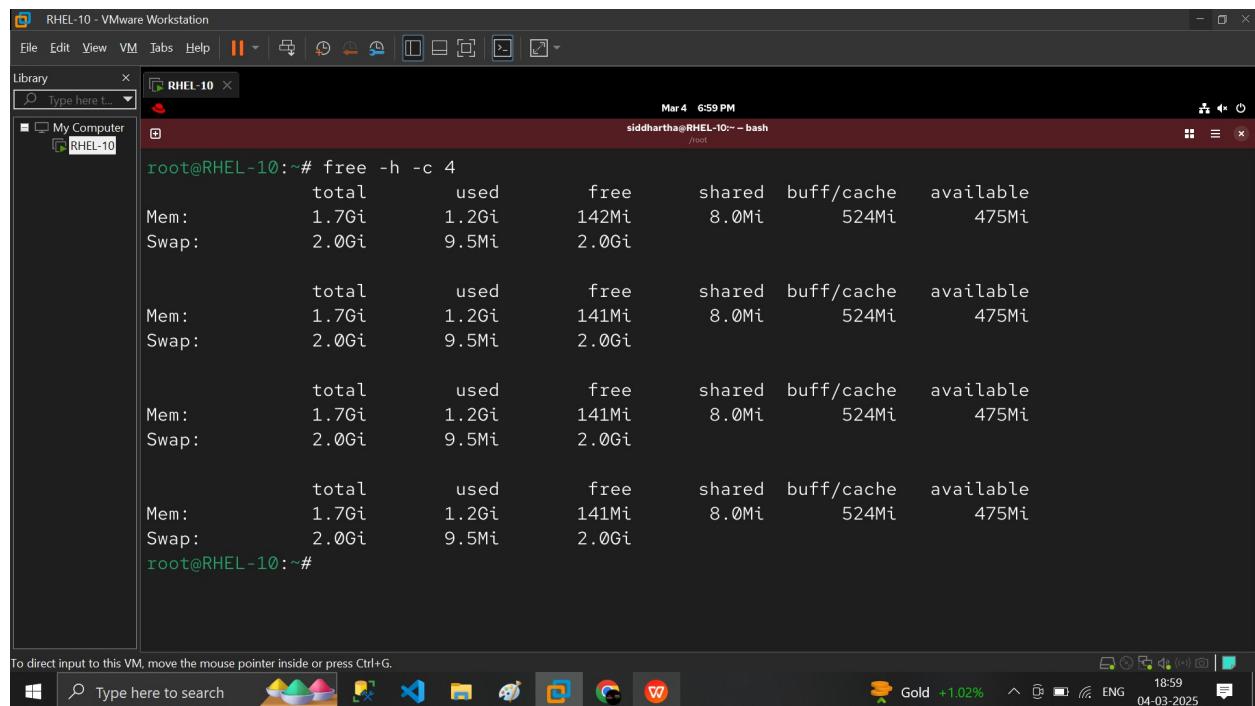
`free`

`free -h`

`free -s N` (Keep refreshing memory after N sec)

`free -c N` (Exit after repeating N times)

```
siddhartha@RHEL-10:~ - bash
/root
root@RHEL-10:~# free
      total        used        free      shared  buff/cache   available
Mem:    1781428     1292264     147960        8236      536632     489164
Swap:  2097148         9728    2087420
root@RHEL-10:~# free -h
      total        used        free      shared  buff/cache   available
Mem:   1.7Gi       1.2Gi      144Mi      8.0Mi      524Mi     477Mi
Swap:  2.0Gi       9.5Mi      2.0Gi
root@RHEL-10:~#
```



```
root@RHEL-10:~# free -h -c 4
              total        used        free      shared  buff/cache   available
Mem:       1.7Gi      1.2Gi     142Mi      8.0Mi      524Mi     475Mi
Swap:      2.0Gi      9.5Mi      2.0Gi

              total        used        free      shared  buff/cache   available
Mem:       1.7Gi      1.2Gi     141Mi      8.0Mi      524Mi     475Mi
Swap:      2.0Gi      9.5Mi      2.0Gi

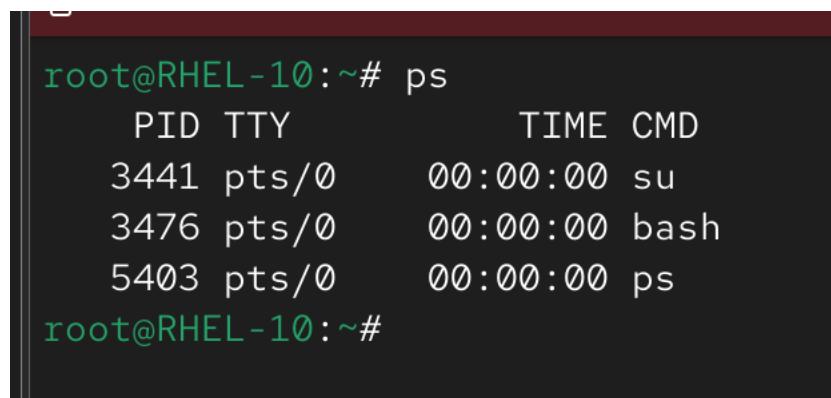
              total        used        free      shared  buff/cache   available
Mem:       1.7Gi      1.2Gi     141Mi      8.0Mi      524Mi     475Mi
Swap:      2.0Gi      9.5Mi      2.0Gi

              total        used        free      shared  buff/cache   available
Mem:       1.7Gi      1.2Gi     141Mi      8.0Mi      524Mi     475Mi
Swap:      2.0Gi      9.5Mi      2.0Gi
root@RHEL-10:~#
```

How to use the PS command in Linux | What is PS command

ps (process status)

Used to display all the running process in the linux system.



```
root@RHEL-10:~# ps
  PID TTY          TIME CMD
 3441 pts/0    00:00:00 su
 3476 pts/0    00:00:00 bash
 5403 pts/0    00:00:00 ps
root@RHEL-10:~#
```

Syntax:

`ps [OPTIONS]`

`ps` - Shows the process of current shell

PID - unique process ID

TTY - terminal type of user logged in to

TIME - amount of CPU in min and sec that process has been running

CMD = name of the command that launched the process

Most widely used command

To see all the running processes

`ps -e`

`ps -A`

`ps -ef (for full format)`

RHEL-10 - VMware Workstation

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My Computer RHEL-10

Mar 4 7:03 PM siddhartha@RHEL-10:~ - bash

```
3518 ? 00:00:00 gvfsd-metadata
4244 ? 00:00:02 kworker/u513:1+events_unbound
4285 ? 00:00:00 kworker/u516:0-ttm
4554 ? 00:00:02 kworker/u514:2-events_unbound
4913 ? 00:00:01 kworker/u513:2-events_unbound
5096 ? 00:00:01 sssd_kcm
5243 ? 00:00:01 kworker/1:1-events
5260 ? 00:00:00 kworker/u514:1-events_unbound
5287 ? 00:00:00 kworker/1:0-events_power_efficient
5306 ? 00:00:00 kworker/0:2-xfs-inodegc/dm-0
5349 ? 00:00:00 kworker/u517:0-ttm
5376 ? 00:00:00 kworker/0:0-events
5382 ? 00:00:00 kworker/u517:1-ttm
5384 ? 00:00:00 kworker/u516:3-ttm
5386 ? 00:00:00 kworker/u514:0-writeback
5397 ? 00:00:00 kworker/1:2-events
5409 ? 00:00:00 kworker/0:1-events
5428 ? 00:00:01 packagekitd
5438 pts/0 00:00:00 ps
```

root@RHEL-10:~#

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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RHEL-10 - VMware Workstation

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RHEL-10 Mar 4 7:03 PM siddhartha@RHEL-10:~ - bash /root

```
root@RHEL-10:~# ps -A
 PID TTY      TIME CMD
  1 ?        00:00:06 systemd
  2 ?        00:00:00 kthreadd
  3 ?        00:00:00 pool_workqueue_release
  4 ?        00:00:00 kworker/R-rcu_gp
  5 ?        00:00:00 kworker/R-sync_wq
  6 ?        00:00:00 kworker/R-slub_flushwq
  7 ?        00:00:00 kworker/R-netns
  9 ?        00:00:00 kworker/0:0-highpri
 11 ?        00:00:00 kworker/u512:0-events_unbound
 12 ?        00:00:00 kworker/R-mm_percpu_wq
 13 ?        00:00:00 kworker/u512:1-ipv6_addrconf
 14 ?        00:00:00 rcu_tasks_kthread
 15 ?        00:00:00 rcu_tasks_rude_kthread
 16 ?        00:00:00 rcu_tasks_trace_kthread
 17 ?        00:00:01 ksoftirqd/0
 18 ?        00:00:01 rcu_preempt
 19 ?        00:00:00 rcu_exp_par_gp_kthread_worker/1
 20 ?        00:00:00 rcu_exp_gp_kthread_worker
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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RHEL-10 - VMware Workstation

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RHEL-10

Mar 4 7:05 PM siddhartha@RHEL-10:~ - bash

```
root@RHEL-10:~# ps -ef
UID      PID  PPID   C STIME TTY          TIME CMD
root         1     0  0 17:04 ?        00:00:06 /usr/lib/systemd/systemd --switched-root --system
root         2     0  0 17:04 ?        00:00:00 [kthreadd]
root         3     2  0 17:04 ?        00:00:00 [pool_workqueue_release]
root         4     2  0 17:04 ?        00:00:00 [kworker/R-rcu_gp]
root         5     2  0 17:04 ?        00:00:00 [kworker/R-sync_wq]
root         6     2  0 17:04 ?        00:00:00 [kworker/R-slab_flushwq]
root         7     2  0 17:04 ?        00:00:00 [kworker/R-netns]
root         9     2  0 17:04 ?        00:00:00 [kworker/0:0H-events_highpri]
root        11     2  0 17:04 ?        00:00:00 [kworker/u512:0-events_unbound]
root        12     2  0 17:04 ?        00:00:00 [kworker/R-mm_percpu_wq]
root        13     2  0 17:04 ?        00:00:00 [kworker/u512:1-ipv6_addrconf]
root        14     2  0 17:04 ?        00:00:00 [rcu_tasks_kthread]
root        15     2  0 17:04 ?        00:00:00 [rcu_tasks_rude_kthread]
root        16     2  0 17:04 ?        00:00:00 [rcu_tasks_trace_kthread]
root        17     2  0 17:04 ?        00:00:01 [ksoftirqd/0]
root        18     2  0 17:04 ?        00:00:01 [rcu_preempt]
root        19     2  0 17:04 ?        00:00:00 [rcu_exp_par_gp_kthread_worker/1]
root        20     2  0 17:04 ?        00:00:00 [rcu_exp_gp_kthread_worker]
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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```
root@RHEL-10:~# ps -ef | more
UID      PID  PPID  C STIME TTY      TIME CMD
root      1      0  0 17:04 ?
root     2      0  0 17:04 ?
root     3      2  0 17:04 ?
root     4      2  0 17:04 ?
root     5      2  0 17:04 ?
root     6      2  0 17:04 ?
root     7      2  0 17:04 ?
root     9      2  0 17:04 ?
root    11      2  0 17:04 ?
root    12      2  0 17:04 ?
root    13      2  0 17:04 ?
root    14      2  0 17:04 ?
root    15      2  0 17:04 ?
root    16      2  0 17:04 ?
root    17      2  0 17:04 ?
root    18      2  0 17:04 ?
root    19      2  0 17:04 ?
```

To see all the running process in BSD (Berkeley Software Distribution) format

Ideally it gives you more information

ps aux

```
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# ps aux
USER        PID %CPU %MEM    VSZ   RSS TTY      STAT START  TIME COMMAND
root          1  0.0  1.5 50708 27316 ?      Ss 17:04 0:06 /usr/lib/systemd/systemd --switch
root          2  0.0  0.0     0   0 ?      S 17:04 0:00 [kthreadd]
root          3  0.0  0.0     0   0 ?      S 17:04 0:00 [pool_workqueue_release]
root          4  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/R-rcu_gp]
root          5  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/R-sync_wq]
root          6  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/R-slub_flushwq]
root          7  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/R-netns]
root          9  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/0:0H-events_highpri]
root         11  0.0  0.0     0   0 ?      I 17:04 0:00 [kworker/u512:0-events_unbound]
root         12  0.0  0.0     0   0 ?      I< 17:04 0:00 [kworker/R-mm_percpu_wq]
root         13  0.0  0.0     0   0 ?      I 17:04 0:00 [kworker/u512:1-ipv6_addrconf]
root         14  0.0  0.0     0   0 ?      I 17:04 0:00 [rcu_tasks_kthread]
root         15  0.0  0.0     0   0 ?      I 17:04 0:00 [rcu_tasks_rude_kthread]
root         16  0.0  0.0     0   0 ?      I 17:04 0:00 [rcu_tasks_trace_kthread]
root         17  0.0  0.0     0   0 ?      S 17:04 0:01 [ksoftirqd/0]
root         18  0.0  0.0     0   0 ?      I 17:04 0:01 [rcu_preempt]
root         19  0.0  0.0     0   0 ?      S 17:04 0:00 [rcu_exp_par_gp_kthread_worker/1]
root         20  0.0  0.0     0   0 ?      S 17:04 0:00 [rcu_exp_gp_kthread_worker]
```

```
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# ps -ef | grep httpd
root      5508     3476  0 19:11 pts/0    00:00:00 grep --color=auto httpd
root@RHEL-10:~#
```

To see the process by username

ps -u <user_name>
ps -G <group_name>

RHEL-10 - VMware Workstation

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Library x Type here t... RHEL-10 x

My Computer RHEL-10

```
root@RHEL-10:~# ps -u root
 PID TTY      TIME CMD
  1 ?        00:00:06 systemd
  2 ?        00:00:00 kthreadd
  3 ?        00:00:00 pool_workqueue_release
  4 ?        00:00:00 kworker/R-rcu_gp
  5 ?        00:00:00 kworker/R-sync_wq
  6 ?        00:00:00 kworker/R-slub_flushwq
  7 ?        00:00:00 kworker/R-netns
  9 ?        00:00:00 kworker/0:0H-events_highpri
 11 ?       00:00:00 kworker/u512:0-events_unbound
 12 ?       00:00:00 kworker/R-mm_percpu_wq
 13 ?       00:00:00 kworker/u512:1-kpsmoused
 14 ?       00:00:00 rcu_tasks_kthread
 15 ?       00:00:00 rcu_tasks_rude_kthread
 16 ?       00:00:00 rcu_tasks_trace_kthread
 17 ?       00:00:04 ksoftirqd/0
 18 ?       00:00:01 rcu_preempt
 19 ?       00:00:00 rcu_exp_par_gp_kthread_worker/1
 20 ?       00:00:00 rcu_exp_gp_kthread_worker
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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RHEL-10 - VMware Workstation

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My Computer RHEL-10

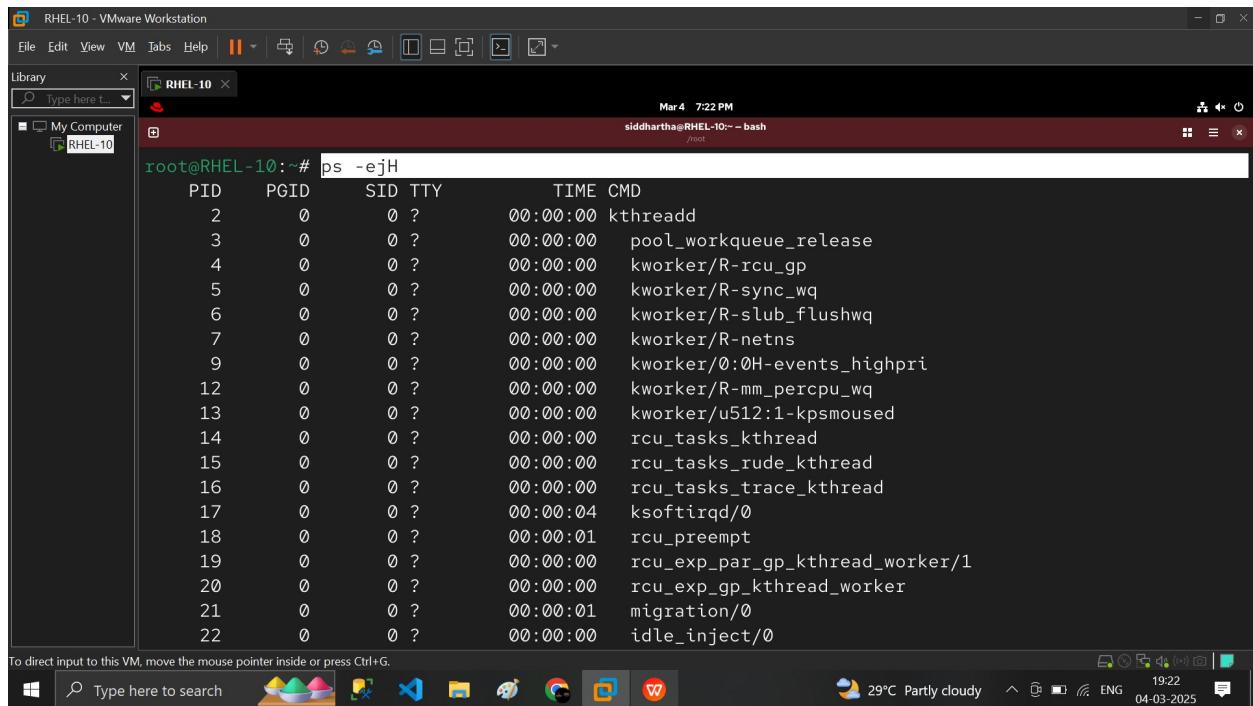
```
root@RHEL-10:~# ps -u siddhartha | more
 PID TTY      TIME CMD
2429 ?        00:00:01 systemd
2431 ?        00:00:00 (sd-pam)
2448 ?        00:00:00 gnome-keyring-d
2461 tty2     00:00:00 gdm-wayland-ses
2467 ?        00:00:00 dbus-broker-lau
2471 ?        00:00:01 dbus-broker
2474 tty2     00:00:00 gnome-session-b
2521 ?        00:00:00 gnome-session-c
2523 ?        00:00:00 gnome-session-b
2552 ?        00:03:46 gnome-shell
2558 ?        00:00:00 gvfsd
2564 ?        00:00:00 gvfsd-fuse
2590 ?        00:00:00 at-spi-bus-laun
2596 ?        00:00:00 dbus-broker-lau
2597 ?        00:00:00 dbus-broker
2599 ?        00:00:00 at-spi2-registr
2607 ?        00:00:00 xdg-permission-
2617 ?        00:00:00 gnome-shell-cal
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

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To see the process tree

ps -ejH



The screenshot shows a terminal window titled "RHEL-10" running on a VMware Workstation interface. The terminal is displaying the output of the command "ps -ejH". The output lists various kernel threads with their Process ID (PID), Parent Process ID (PGID), Session ID (SID), TTY, CPU time (TIME), and Command (CMD). The terminal window has a dark background with white text. The VMware interface includes a toolbar at the top, a sidebar on the left, and a status bar at the bottom showing system information like date, time, and battery level.

PID	PGID	SID	TTY	TIME	CMD
2	0	0	?	00:00:00	kthreadd
3	0	0	?	00:00:00	pool_workqueue_release
4	0	0	?	00:00:00	kworker/R-rcu_gp
5	0	0	?	00:00:00	kworker/R-sync_wq
6	0	0	?	00:00:00	kworker/R-slub_flushwq
7	0	0	?	00:00:00	kworker/R-netns
9	0	0	?	00:00:00	kworker/0:0H-events_highpri
12	0	0	?	00:00:00	kworker/R-mm_percpu_wq
13	0	0	?	00:00:00	kworker/u512:1-kpsmoused
14	0	0	?	00:00:00	rcu_tasks_kthread
15	0	0	?	00:00:00	rcu_tasks_rude_kthread
16	0	0	?	00:00:00	rcu_tasks_trace_kthread
17	0	0	?	00:00:04	ksoftirqd/0
18	0	0	?	00:00:01	rcu_preempt
19	0	0	?	00:00:00	rcu_exp_par_gp_kthread_worker/1
20	0	0	?	00:00:00	rcu_exp_gp_kthread_worker
21	0	0	?	00:00:01	migration/0
22	0	0	?	00:00:00	idle_inject/0

How to Use Kill Command? | Linux Kill Command Tutorial i

kill command

Used to terminate a process manually.

Syntax:

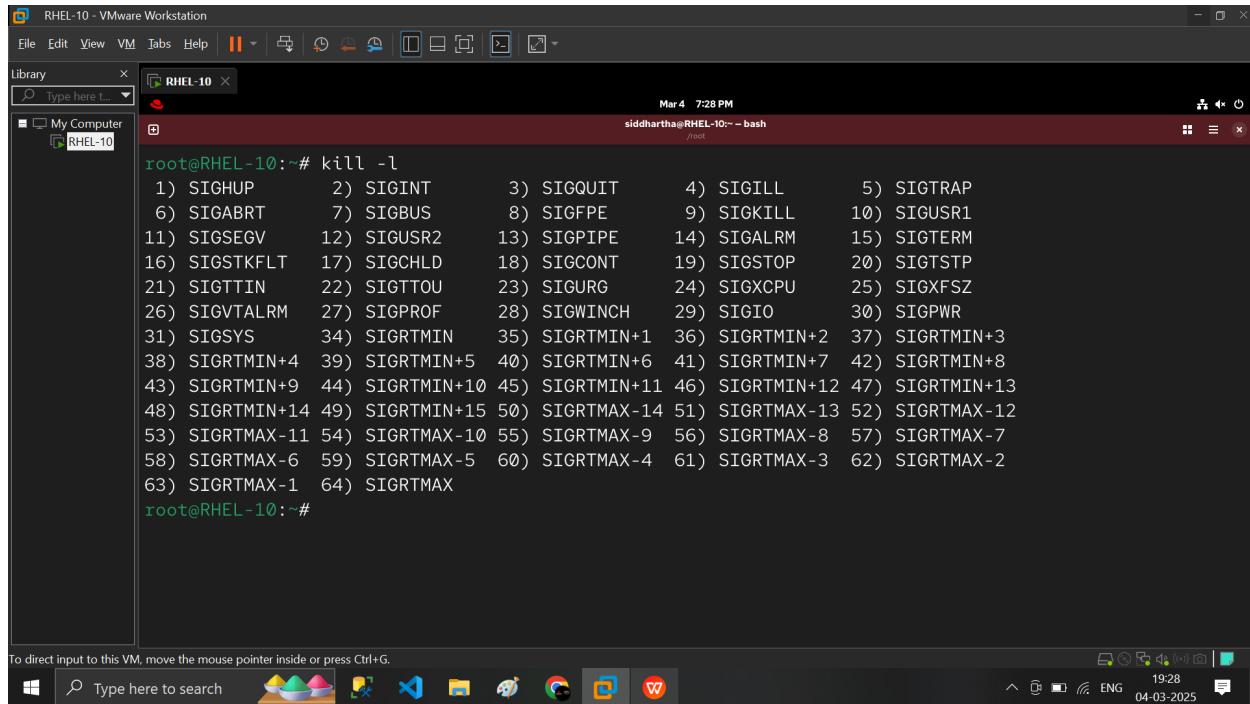
`kill [OPTIONS] [PID]`

OPTION = signal name or no.

PID = Process ID

To see all the signal names

`kill -l`



```
root@RHEL-10:~# kill -l
 1) SIGHUP      2) SIGINT      3) SIGQUIT      4) SIGILL      5) SIGTRAP
 6) SIGABRT     7) SIGBUS      8) SIGFPE       9) SIGKILL     10) SIGUSR1
11) SIGSEGV     12) SIGUSR2     13) SIGPIPE     14) SIGALRM     15) SIGTERM
16) SIGSTKFLT   17) SIGCHLD     18) SIGCONT     19) SIGSTOP     20) SIGTSTP
21) SIGTTIN     22) SIGTTOU     23) SIGURG      24) SIGXCPU     25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF     28) SIGWINCH    29) SIGIO       30) SIGPWR
31) SIGSYS      34) SIGRTMIN    35) SIGRTMIN+1  36) SIGRTMIN+2  37) SIGRTMIN+3
38) SIGRTMIN+4  39) SIGRTMIN+5  40) SIGRTMIN+6  41) SIGRTMIN+7  42) SIGRTMIN+8
43) SIGRTMIN+9  44) SIGRTMIN+10 45) SIGRTMIN+11 46) SIGRTMIN+12 47) SIGRTMIN+13
48) SIGRTMIN+14 49) SIGRTMIN+15 50) SIGRTMAX-14 51) SIGRTMAX-13 52) SIGRTMAX-12
53) SIGRTMAX-11 54) SIGRTMAX-10 55) SIGRTMAX-9  56) SIGRTMAX-8  57) SIGRTMAX-7
58) SIGRTMAX-6  59) SIGRTMAX-5  60) SIGRTMAX-4  61) SIGRTMAX-3  62) SIGRTMAX-2
63) SIGRTMAX-1  64) SIGRTMAX
root@RHEL-10:~#
```

Most Widely used kill commands

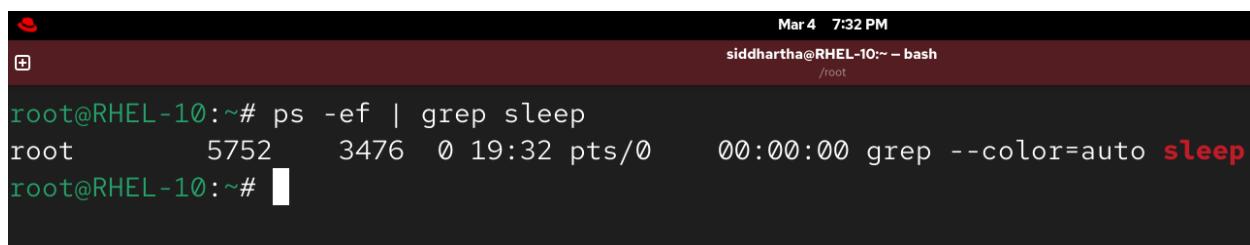
kill PID

kill -1 PID (to restart the process)

kill -2 PID (interrupt from keyboard like Ctrl+c)

kill -9 PID (forcefully terminate the process)

kill -15 PID (kill process gracefully)



```
root@RHEL-10:~# ps -ef | grep sleep
root      5752     3476  0 19:32 pts/0    00:00:00 grep --color=auto sleep
root@RHEL-10:~#
```

```
[paul@centosvm ~]$ ps -ef | grep sleep
root      64822    920  0 12:43 ?        00:00:00 sleep 60
paul      64823  35374  0 12:44 pts/0    00:00:00 sleep 30s
paul      64825  64605  0 12:44 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ ps -ef | grep sleep
root      64833    920  0 12:44 ?        00:00:00 sleep 60
paul      64835  64605  0 12:44 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ ps -ef | grep sleep
root      64833    920  0 12:44 ?        00:00:00 sleep 60
paul      64836  35374  0 12:45 pts/0    00:00:00 sleep 30s
paul      64838  64605  0 12:45 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ kill 64836
[paul@centosvm ~]$ 
```

```
[paul@centosvm ~]$ ps -ef | grep sleep
root      64833    920  0 12:44 ?        00:00:00 sleep 60
paul      64839  35374  0 12:45 pts/0    00:00:00 sleep 30s
paul      64842  64605  0 12:45 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ kill -9 64839
[paul@centosvm ~]$ 
```

interrupt Kill -2

```
[paul@centosvm ~]$ ps -ef | grep sleep
root      64833    920  0 12:44 ?        00:00:00 sleep 60
paul      64839  35374  0 12:45 pts/0    00:00:00 sleep 30s
paul      64842  64605  0 12:45 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ kill -9 64839
[paul@centosvm ~]$ 
```



```
[paul@centosvm ~]$ ps -ef | grep sleep
root      64850    920  0 12:45 ?        00:00:00 sleep 60
paul      64851  35374  0 12:46 pts/0    00:00:00 sleep 30s
paul      64853  64605  0 12:46 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ kill -2 64851
[paul@centosvm ~]$ ps -ef | grep sleep
root      64850    920  0 12:45 ?        00:00:00 sleep 60
paul      64855  64605  0 12:46 pts/1    00:00:00 grep --color
=auto sleep
[paul@centosvm ~]$ 
```

```

paul@centosvm ~]$ ps -ef | grep sleep
bot      64864      920  0 12:46 ?        00:00:00 sleep 60
aul      64866    35374  0 12:47 pts/0    00:00:00 sleep 30s
aul      64868    64605  0 12:47 pts/1    00:00:00 grep --color
auto sleep
paul@centosvm ~]$ kill -15 64866
paul@centosvm ~]$ [paul@centosvm ~]$ sleep 30s
[paul@centosvm ~]$ sleep 30s
[paul@centosvm ~]$ sleep 30s
Terminated
[paul@centosvm ~]$ sleep 30s
Killed
[paul@centosvm ~]$ sleep 30s
[paul@centosvm ~]$ sleep 30s
^C
[paul@centosvm ~]$ sleep 30s
Terminated
[paul@centosvm ~]$ 

```

```

[paul@centosvm ~]$ ps -ef | grep httpd
root      1317      1  0 Jul03 ?
apache   64305    1317  0 12:19 ?
apache   64306    1317  0 12:19 ?
apache   64307    1317  0 12:19 ?
apache   64308    1317  0 12:19 ?
paul     64880    64605  0 12:48 pts/1  00:00:00 grep --color=auto httpd
[paul@centosvm ~]$ 
[paul@centosvm ~]$ kill 1317
-bash: kill: (1317) - Operation not permitted
[paul@centosvm ~]$ kill -9 1317
-bash: kill: (1317) - Operation not permitted
[paul@centosvm ~]$ su - root
Password: 

```

```

[root@centosvm ~]# ps -ef | grep httpd
root      1317      1  0 Jul03 ?
apache   64305    1317  0 12:19 ?
apache   64306    1317  0 12:19 ?
apache   64307    1317  0 12:19 ?
apache   64308    1317  0 12:19 ?
root     64921    64893  0 12:48 pts/1  00:00:00 grep --color=auto httpd
[root@centosvm ~]#
[root@centosvm ~]# kill -1 1317
[root@centosvm ~]#
[root@centosvm ~]# ps -ef | grep httpd
root      1317      1  0 Jul03 ?
apache   64924    1317  0 12:49 ?
apache   64925    1317  0 12:49 ?
apache   64926    1317  0 12:49 ?
apache   64927    1317  0 12:49 ?
root     65140    64893  0 12:49 pts/1  00:00:00 grep --color=auto httpd
[root@centosvm ~]# 

```

How to Send Email from Linux using SendMail

To install all the required packages

```
yum install procmail mailx sendmail sendmail-cf -y
```

In your authinfo file, you need to add the below line (Please make sure to use your own username and password)

```
AuthInfo:smtp.gmail.com "U:your_username" "P:your_password" "M:PLAIN"
```

Changes in sendmail.mc

```
define(`SMART_HOST', `smtp.gmail.com')  
FEATURE(`authinfo')
```

Update sendmail.cf and authinfo.db file

```
m4 sendmail.mc 'closing_angle_bracket' sendmail.cf  
makemap hash authinfo 'opening_angle_bracket' authinfo
```

Restart your sendmail service

```
systemctl restart/start sendmail
```

To send mail

```
mail -s "Subject" user@email.com
```

Body

Ctrl + D

Package need to be installed

```
yum install procmail mailx sendmail sendmail-cf -y
```

sendmail
Sendmail-cf
procmail
Mailx

```
[root@centos ~]# yum install procmail mailx sendmail sendmail-cf -y
Last metadata expiration check: 21:08:26 ago on Monday 19 July 2021 07:05:56 PM
EDT.
Package procmail-3.22-47.el8.x86_64 is already installed.
Package mailx-12.5-29.el8.x86_64 is already installed.
Package sendmail-8.15.2-34.el8.x86_64 is already installed.
Package sendmail-cf-8.15.2-34.el8.noarch is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[root@centos ~]#
[root@centos ~]# rpm -qa | grep mail
mailcap-2.1.48-3.el8.noarch
sendmail-cf-8.15.2-34.el8.noarch
sendmail-8.15.2-34.el8.x86_64
mailx-12.5-29.el8.x86_64
procmail-3.22-47.el8.x86_64
[root@centos ~]#
```

Configs for sendmail

cd /etc/mail/

sendmail.mc
sendmail.cf

```
[root@centos ~]# cd /etc/mail
[root@centos mail]# ls -ltr
total 252
-rw-r--r--. 1 root root 1847 Dec  3 2020 virtusertable
-rw-r--r--. 1 root root 127 Dec  3 2020 trusted-users
-rw-r--r--. 1 root root 92 Dec  3 2020 Makefile
-rwxr-xr-x. 1 root root 2700 Dec  3 2020 make
-rw-r--r--. 1 root root 997 Dec  3 2020 mailertable
-rw-r--r--. 1 root root 64 Dec  3 2020 local-host-names
-rw-r--r--. 1 root root 233 Dec  3 2020 domaintable
-rw-r--r--. 1 root root 469 Dec  3 2020 access
-rw-r--r--. 1 root root 1061 Dec  3 2020 submit.mc
-rw-r--r--. 1 root root 42364 Dec  3 2020 submit.cf
-rw-r--r--. 1 root root 59319 Dec  3 2020 sendmail.cf.bak
-rw-r--r--. 1 root root 5586 Dec  3 2020 helpfile
-rw-r-----. 1 root root 12288 Jul 19 15:51 virtusertable.db
-rw-r-----. 1 root root 12288 Jul 19 15:51 access.db
-rw-r-----. 1 root root 12288 Jul 19 15:51 domaintable.db
-rw-r-----. 1 root root 12288 Jul 19 15:51 mailertable.db
-rw-r--r--. 1 root root 0 Jul 19 15:52 aliasesdb-stamp
-rw-r--r--. 1 root root 7389 Jul 20 12:23 sendmail.mc
-rw-r--r--. 1 root root 59622 Jul 20 12:23 sendmail.cf
[root@centos mail]#
```

Create additional config

Set your authorization informations by putting the following line to /etc/mail/authinfo file:

```
AuthInfo:smtp.gmail.com "U:philippaul019@gmail.com" "P:abcd" "M:PLAIN"
```

```
[root@centos mail]#
[root@centos mail]# vi authinfo
```

```
AuthInfo:smtp.gmail.com "U:philippaul019@gmail.com" "P:abcd" "M:PLAIN"
~
~
~
~
~
~
```

Changes in sendmail.mc

```
define(`SMART_HOST', `smtp.gmail.com')
FEATURE(`authinfo')
```

```
# less sendmail.mc
```

```
dnl # Do not advertize sendmail version.
dnl #
dnl define(`confSMTP_LOGIN_MSG', `$j Sendmail; $b')dnl
dnl #
dnl # default logging level is 9, you might want to set it higher to
dnl # debug the configuration
dnl #
dnl define(`confLOG_LEVEL', `9')dnl
dnl #
dnl # Uncomment and edit the following line if your outgoing mail needs to
dnl # be sent out through an external mail server:
dnl #
define(`SMART_HOST', `smtp.gmail.com')
FEATURE(`authinfo')
dnl #
define(`confDEF_USER_ID', ``8:12'')dnl
dnl define(`confAUTO_REBUILD')dnl
define(`confTO_CONNECT', `1m')dnl
define(`confTRY_NULL_MX_LIST', `True')dnl
define(`confDONT_PROBE_INTERFACES', `True')dnl
define(`PROCMAIL_MAILER_PATH', `/usr/bin/procmail')dnl
define(`ALIAS_FILE', `/etc/aliases')dnl
define(`STATUS_FILE', `/var/log/mail/statistics')dnl
.
```

Update sendmail.cf and access.db file

```
# m4 sendmail.mc >sendmail.cf  
# makemap hash authinfo < authinfo
```

Restart your sendmail service

```
# systemctl restart/start sendmail
```

```
[root@centos mail]# m4 sendmail.mc >sendmail.cf  
[root@centos mail]# makemap hash authinfo < authinfo  
[root@centos mail]#  
[root@centos mail]# systemctl status sendmail
```

```
[root@centos mail]# systemctl status sendmail  
● sendmail.service - Sendmail Mail Transport Agent  
   Loaded: loaded (/usr/lib/systemd/system/sendmail.service; disabled)  
   Active: active (running) since Tue 2021-07-20 15:27:33 EDT; 52min  
     Process: 2334 ExecStart=/usr/sbin/sendmail -bd $SENDMAIL_OPTS $SENDMAIL_ARGS  
     Process: 2329 ExecStartPre=/etc/mail/make aliases (code=exited, status=0/SUCCESS)  
     Process: 2328 ExecStartPre=/etc/mail/make (code=exited, status=0/SUCCESS)  
   Main PID: 2345 (sendmail)  
     Tasks: 1 (limit: 4800)  
    Memory: 5.0M  
      CGroup: /system.slice/sendmail.service  
              └─2345 sendmail: accepting connections  
  
Jul 20 15:26:32 centos systemd[1]: Starting Sendmail Mail Transport Agent  
Jul 20 15:26:32 centos sendmail[2334]: My unqualified host name  
Jul 20 15:27:32 centos sendmail[2334]: unable to qualify my host  
Jul 20 15:27:33 centos sendmail[2345]: starting daemon (8.1.2)  
Jul 20 15:27:33 centos systemd[1]: sendmail.service: Can't  
Jul 20 15:27:33 centos systemd[1]: Started Sendmail Mail Transport Agent  
Jul 20 15:29:29 centos sendmail[2381]: STARTTLS=server, relaying=from  
Jul 20 15:29:29 centos sendmail[2381]: 16KJTTNF002381: from  
Jul 20 15:29:31 centos sendmail[2383]: STARTTLS=client, relay=
```

```
[root@centos mail]#  
[root@centos mail]# systemctl restart sendmail
```

It's time to SendMail

```
# mail -s "Subject" user@email.com  
Body  
Ctrl + D
```

Check your spam, you should see your email now!

```
[root@centos mail]# systemctl status sendmail  
● sendmail.service - Sendmail Mail Transport Agent  
   Loaded: loaded (/usr/lib/systemd/system/sendmail.service; disabled; vendor  
             Active: active (running) since Tue 2021-07-20 16:23:23 EDT; 23s ago  
   Process: 3266 ExecStart=/usr/sbin/sendmail -bd $SENDMAIL_OPTS $SENDMAIL  
   Process: 3261 ExecStartPre=/etc/mail/make aliases (code=exited, status=0  
   Process: 3260 ExecStartPre=/etc/mail/make (code=exited, status=0/SUCCESS  
 Main PID: 3280 (sendmail)  
    Tasks: 1 (limit: 4800)  
   Memory: 3.2M  
   CGroup: /system.slice/sendmail.service  
           └─3280 sendmail: accepting connections  
  
Jul 20 16:22:22 centos systemd[1]: sendmail.service: Success  
Jul 20 16:22:22 centos systemd[1]: Stopped Sendmail Mail Transport Agent.  
Jul 20 16:22:22 centos systemd[1]: Starting Sendmail Mail Transport Agent.  
Jul 20 16:22:22 centos sendmail[3266]: My unqualified host  
Jul 20 16:23:22 centos sendmail[3266]: unable to qualify my domain  
Jul 20 16:23:22 centos systemd[1]: sendmail.service: Can't  
Jul 20 16:23:22 centos sendmail[3280]: starting daemon (8).  
Jul 20 16:23:23 centos systemd[1]: Started Sendmail Mail Transport Agent.  
1 lines 1-20/20 (END)
```

```
[root@centos etc/mail]
[root@centos mail]#
[root@centos mail]# mail -s "Linux Mail" pparadkar076@gmail.com
Hello Prashant,

Kindly like subscribe
EOT
[root@centos mail]#
```

Hello Prashant,

Kindly like subscribe

[Reply](#)

[Forward](#)

Linux Service Management Using SYSTEMCTL

Command

Linux systemctl command to control system services. I'll also show you how to use the systemctl linux tutorial to learn how to use systemctl. If you're working with Linux systems, then you need to know about the systemctl command! This command is essential for managing system services and settings. In this video, I'll show you how to use systemctl to control system services and settings. I also provide a systemctl linux

What is systemctl?



**It is used to control the status of the services.
Control systemd system.**

Example: **systemctl status <service_name>**

```
sudo systemctl start/stop <service_name>
```

- Start or stop a service.

To Check the status

```
sudo systemctl status <service_name>
```

To restart the service

```
sudo systemctl restart <service_name>
```

```
# systemctl restart httpd  
#systemctl status httpd
```

```
● httpd.service - The Apache HTTP Server  
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; di>  
   Active: active (running) since Thu 2023-04-13 14:39:16 IS>  
     Docs: man:httpd.service(8)  
   Main PID: 137863 (httpd)  
     Status: "Started, listening on: port 80"  
       Tasks: 213 (limit: 4595)  
     Memory: 21.5M  
    CGroup: /system.slice/httpd.service  
            ├─137863 /usr/sbin/httpd -DFOREGROUND  
            ├─137873 /usr/sbin/httpd -DFOREGROUND  
            ├─137874 /usr/sbin/httpd -DFOREGROUND  
            ├─137875 /usr/sbin/httpd -DFOREGROUND  
            └─137876 /usr/sbin/httpd -DFOREGROUND  
  
Apr 13 14:39:00 cs-client systemd[1]: httpd.service  
Apr 13 14:39:00 cs-client systemd[1]: Stopped The Apache  
Apr 13 14:39:00 cs-client systemd[1]: Starting The Apache  
Apr 13 14:39:16 cs-client httpd[137863]: AH00558:  
Lines 1-19
```

```
sudo systemctl enable <service_name>
```

- Enabling a service causes the system to start the service upon reboot or whenever a computer starts up.
- The enable subcommand does not start the particular service immediately.
- You need admin rights

To enable and start at same time

```
sudo systemctl enable --now sshd
```

To check if a service is enabled?

```
sudo systemctl is-enabled sshd
```

```
[root@cs-client ~]# systemctl stop httpd.service
[root@cs-client ~]#
[root@cs-client ~]# systemctl is-enabled httpd.service
disabled
[root@cs-client ~]#
[root@cs-client ~]# systemctl enable httpd.service
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/httpd.service.
[root@cs-client ~]#
[root@cs-client ~]# █
```

```
# systemctl status httpd
```

```
[root@cs-client ~]# systemctl status httpd
● httpd.service - The Apache HTTP Server
  Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled)
  Active: inactive (dead)
    Docs: man:httpd.service(8)

Apr 13 14:38:59 cs-client systemd[1]: Stopping The Apache HT>
Apr 13 14:39:00 cs-client systemd[1]: httpd.service: Succeede>
Apr 13 14:39:00 cs-client systemd[1]: Stopped The Apache HT>
Apr 13 14:39:00 cs-client systemd[1]: Starting The Apache HT>
Apr 13 14:39:16 cs-client httpd[137863]: AH00558: httpd: Cou>
Apr 13 14:39:16 cs-client systemd[1]: Started The Apache HT>
Apr 13 14:39:26 cs-client httpd[137863]: Server c...
Apr 13 14:43:04 cs-client systemd[1]: Stopping The Apac...
Apr 13 14:43:05 cs-client systemd[1]: httpd.servic...
Apr 13 14:43:05 cs-client systemd[1]: Stopped The Apac...
Lines 1-15/15 (END)
```

```
sudo systemctl disable <service_name>
```

- Disabling a service
- One can manually start the service

To prevent the service to start

```
sudo systemctl mask <service_name>
```

To check if a service is enabled?

```
sudo systemctl unmask <service_name>
```

```
[root@cs-client ~]# systemctl is-enabled httpd.service
enabled
[root@cs-client ~]#
[root@cs-client ~]# systemctl disable httpd.service
Removed /etc/systemd/system/multi-user.target.wants/httpd.service.
[root@cs-client ~]# systemctl is-enabled httpd.service
disabled
[root@cs-client ~]#
[root@cs-client ~]# systemctl mask httpd.service
Created symlink /etc/systemd/system/httpd.service → /dev/null
[root@cs-client ~]#
```

```
[root@cs-client ~]#
[root@cs-client ~]# systemctl start httpd
Failed to start httpd.service: Unit httpd.service is masked.
[root@cs-client ~]#
[root@cs-client ~]# systemctl unmask httpd.service
Removed /etc/systemd/system/httpd.service.
[root@cs-client ~]#
[root@cs-client ~]# systemctl start httpd
```

Computer Control Commands

systemctl poweroff



systemctl reboot

systemctl -i reboot (ignoring logged-in users)

To List the sockets in memory available for interprocess communication (IPC)

systemctl list-sockets

systemctl --show-types list-sockets

systemctl --show-types list-sockets 'systemd*' systemctl --show-types list-sockets --all

```
siddhartha@RHEL-10:~$ systemctl --show-types list-sockets
LISTEN          TYPE            UNIT
@ISCSIADM_ABSTRACT_NAMESPACE   Stream    iscsid.socket
@ISCSID_UIP_ABSTRACT_NAMESPACE Stream    iscsiuiio.socket
[::]:9090        Stream    cockpit.socket
kobject-uevent 1      Netlink   systemd-udevd-kernel.socket
/dev/rfkill       Special   systemd-rfkill.socket
/run/.heimdhalo.h5l.kcm-socket Stream    sssd-kcm.socket
/run/avahi-daemon/socket     Stream    avahi-daemon.socket
/run/cups/cups.sock        Stream    cups.socket
/run/dbus/system_bus_socket Stream    dbus.socket
/run/dmeventd-client        FIFO     dm-event.socket
/run/dmeventd-server         FIFO     dm-event.socket
/run/initctl           FIFO     systemd-initctl.socket
lines 1-13...skipping...
LISTEN          TYPE            UNIT
@ISCSITADM_ABSTRACT_NAMESPACE  Stream    iscsid.socket
@ISCSID_UIP_ABSTRACT_NAMESPACE Stream    iscsiuiio.socket
[::]:9090        Stream    cockpit.socket
kobject-uevent 1      Netlink   systemd-udevd-kernel.socket
/dev/rfkill       Special   systemd-rfkill.socket
/run/.heimdhalo.h5l.kcm-socket Stream    sssd-kcm.socket
/run/avahi-daemon/socket     Stream    avahi-daemon.socket
/run/cups/cups.sock        Stream    cups.socket
```

```
RHEL-10 - VMware Workstation
File Edit View VM Tabs Help || Library RHEL-10 Type here ...
RHEL-10 Mar 5 3:09 PM
siddhartha@RHEL-10:~$ systemctl --show-types list-sockets
LISTEN          TYPE      UNIT                         ACTIVATES
@ISCSIADM_ABSTRACT_NAMESPACE Stream  iscsid.socket           iscsid.service
@ISCSID_UIP_ABSTRACT_NAMESPACE Stream  iscsiuiio.socket       iscsiuiio.service
[::]:9090        Stream   cockpit.socket           cockpit.service
kobject-uevent 1    Netlink  systemd-udevd-kernel.socket  systemd-udevd.service
/dev/rfkill      Special  systemd-rfkill.socket       systemd-rfkill.service
/run/.heimd.org.h5l.kcm-socket Stream  sssd-kcm.socket         sssd-kcm.service
/run/avahi-daemon/socket Stream  avahi-daemon.socket       avahi-daemon.service
/run/cups/cups.sock  Stream  cups.socket             cups.service
/run/dbus/system_bus_socket Stream  dbus.socket            dbus-broker.service
/run/dmeventd-client FIFO    dm-event.socket          dm-event.service
/run/dmeventd-server FIFO    dm-event.socket          dm-event.service
/run/initctl      FIFO    systemd-initctl.socket     systemd-initctl.service
/run/lvm/lvmpolld.socket Stream  lvm2-lvmpolld.socket    lvm2-lvmpolld.service
/run/pcscd/pcscd.comm Stream  pcscd.socket           pcscd.service
lines 1-15...skipping...
LISTEN          TYPE      UNIT                         ACTIVATES
@ISCSITADM_ABSTRACT_NAMESPACE Stream  iscsid.socket           iscsid.service
@ISCSID_UIP_ABSTRACT_NAMESPACE Stream  iscsiuiio.socket       iscsiuiio.service
[::]:0090        Stream   cockpit.socket           cockpit.service
kobject-uevent 1    Netlink  systemd-udevd-kernel.socket  systemd-udevd.service
/dev/rfkill      Special  systemd-rfkill.socket       systemd-rfkill.service
/run/.heimd.org.h5l.kcm-socket Stream  sssd-kcm.socket         sssd-kcm.service
/run/avahi-daemon/socket Stream  avahi-daemon.socket       avahi-daemon.service
/run/cups/cups.sock  Stream  cups.socket             cups.service
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
Windows Start Type here to search 1509 ENG 05-03-2025
```

```
RHEL-10 - VMware Workstation
File Edit View VM Tabs Help || Library RHEL-10 Type here ...
RHEL-10 Mar 5 3:09 PM
siddhartha@RHEL-10:~$ systemctl --show-types list-sockets
lines 1-19...skipping...
LISTEN          TYPE      UNIT                         ACTIVATES
@ISCSIADM_ABSTRACT_NAMESPACE Stream  iscsid.socket           iscsid.service
@ISCSID_UIP_ABSTRACT_NAMESPACE Stream  iscsiuiio.socket       iscsiuiio.service
[::]:9090        Stream   cockpit.socket           cockpit.service
kobject-uevent 1    Netlink  systemd-udevd-kernel.socket  systemd-udevd.service
/dev/rfkill      Special  systemd-rfkill.socket       systemd-rfkill.service
/run/.heimd.org.h5l.kcm-socket Stream  sssd-kcm.socket         sssd-kcm.service
/run/avahi-daemon/socket Stream  avahi-daemon.socket       avahi-daemon.service
/run/cups/cups.sock  Stream  cups.socket             cups.service
/run/dbus/system_bus_socket Stream  dbus.socket            dbus-broker.service
/run/dmeventd-client FIFO    dm-event.socket          dm-event.service
/run/dmeventd-server FIFO    dm-event.socket          dm-event.service
/run/initctl      FIFO    systemd-initctl.socket     systemd-initctl.service
/run/lvm/lvmpolld.socket Stream  lvm2-lvmpolld.socket    lvm2-lvmpolld.service
/run/pcscd/pcscd.comm Stream  pcscd.socket           pcscd.service
/run/systemd/coredump SequentialPacket  systemd-coredump.socket -
/run/systemd/io.systemd.BootControl Stream  systemd-bootctl.socket -
/run/systemd/io.systemd.Credentials Stream  systemd-creds.socket -
/run/systemd/io.systemd.Hostname Stream  systemd-hostnamed.socket  systemd-hostnamed.service
/run/systemd/io.systemd.sysext Stream  systemd-sysext.socket -
/run/systemd/journal/dev-log Datagram  systemd-journald-dev-log.socket  systemd-journald.service
/run/systemd/journal/socket Datagram  systemd-journald.socket    systemd-journald.service
lines 1-22 byte 2458 (press RETURN)
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
Windows Start Type here to search 1509 ENG 05-03-2025
```

The screenshot shows a VMware Workstation interface with a RHEL-10 VM running. The terminal window displays the output of the command `systemctl | grep -i running`, listing numerous system services and their status. The desktop environment includes a taskbar with icons for various applications like File Explorer, Edge, and FileZilla.

```
siddhartha@RHEL-10: ~$ systemctl | grep -i running
cups.path
init.scope
session-2.scope
accounts-daemon.service
alsa-state.service
atd.service
audited.service
avahi-daemon.service
chronyd.service
colord.service
crond.service
cups.service
dbus-broker.service
firewalld.service
fwupd.service
gdm.service
irqbalance.service
libstoragemgmt.service
mcelog.service
ModemManager.service
NetworkManager.service
packagekit.service
polkit.service
rsyslog.service
rtkit-daemon.service
sshd.service
sssd-kcm.service
switcheroo-control.service
systemd-journal.service
systemd-logind.service
systemd-udevd.service
tuned.service
udisks2.service
unownner.service
loaded active running CUPS Scheduler
loaded active running System and Service Manager
loaded active running Session 2 of User siddhartha
loaded active running Accounts Service
loaded active running Manage Sound Card State (restore and store)
loaded active running Deferred execution scheduler
loaded active running Security Audit Logging Service
loaded active running Avahi mDNS/DNS-SD Stack
loaded active running NTP client/server
loaded active running Manage, Install and Generate Color Profiles
loaded active running Command Scheduler
loaded active running CUPS Scheduler
loaded active running D-Bus System Message Bus
loaded active running firewalld - dynamic firewall daemon
loaded active running Firmware update daemon
loaded active running GNOME Display Manager
loaded active running irqbalance daemon
loaded active running libstoragemgmt plug-in server daemon
loaded active running Machine Check Exception Logging Daemon
loaded active running Modem Manager
loaded active running Network Manager
loaded active running PackageKit Daemon
loaded active running Authorization Manager
loaded active running System Logging Service
loaded active running RealtimeKit Scheduling Policy Service
loaded active running OpenSSH server daemon
loaded active running SSDS Kerberos Cache Manager
loaded active running Switcheroo Control Proxy service
loaded active running Journal Service
loaded active running User Login Management
loaded active running Rule-based Manager for Device Events and Files
loaded active running Dynamic System Tuning Daemon
loaded active running DTask Manager
loaded active running Daemon for power management
```

: A Linux Command for Quickly Seeing What is Running on Your System

TOP Command

The top (table of processes) command shows a real-time view of running processes in Linux and displays kernel-managed tasks.

The command also provides a system information summary that shows resource utilization, including CPU and memory usage.

How to monitor the Linux system using Top command.

How to Kill a process using Top command

How to change the nice value using Top command

More Top command shortcuts

What is Top Command?

The top (table of processes) command shows a real-time view of running processes in Linux and displays kernel-managed tasks.

The command also provides a system information summary that shows resource utilization, including CPU and memory usage.

Linux Top Command Shortcuts:

top then c = shows commands absolute path

top then k = kill a process by PID

top then n = to change the no. of task displayed

top then d, s = to change interval of refresh

top then M = To sort the Linux running process by memory usage

top then r = you can change the nice value of a PID

top then u = to filter task by user

top then f = Field Management

top then h = help

top then z or b = Toggle: 'z' color/mono; 'b' bold/reverse (only if 'x' or 'y')

top then x y = 'x' sort field; 'y' running tasks

top then i = process which some memory usage

```
top - 15:18:51 up 11 min,  2 users,  load average: 0.10, 0.34, 0.35
Tasks: 316 total,   1 running, 311 sleeping,   4 stopped,   0 zombie
%Cpu(s):  6.0 us,  6.2 sy,  0.0 ni, 81.4 id,  0.0 wa,  5.7 hi,  0.7 si,  0.0 st
MiB Mem : 1739.6 total,   146.8 free, 1162.2 used,   586.6 buff/cache
MiB Swap:  2048.0 total,   2035.7 free,    12.2 used.   577.5 avail Mem

      PID USER      PR  NI  VIRT   RES   SHR S %CPU %MEM TIME+ COMMAND
2738 siddhar+  20  0 3926824 168424 91948 S 13.6  9.5  0:37.34 gnome-shell
3545 siddhar+  20  0 1691308 154924 74628 S 9.1  8.7  0:17.59 ptyxvis
  946 root     20  0 462556  7964 6684 S 2.3  0.4  0:05.45 vmtoolsd
  604 root     20  0     0     0   0 I 1.0  0.0  0:00.76 kworker/u514:26-events_unbound
2923 siddhar+  20  0 508684 36944 27976 S 1.0  2.1  0:05.53 vmtoolsd
3903 siddhar+  20  0 230676  5096 3048 R  0.6  0.3  0:00.47 top
  486 root    -51  0     0     0   0 S 0.3  0.0  0:00.12 irq/16-vmwgfx
  694 root     20  0     0     0   0 S 0.3  0.0  0:00.58 xfsaifl/dm-0
  887 root    -51  0     0     0   0 S 0.3  0.0  0:00.17 irq/73-vmw_vmc
1101 root     20  0 487972 27844 12928 S 0.3  1.6  0:01.13 tuned
  1 root     20  0 50640 26128 10084 S 0.0  1.5  0:04.61 systemd
  2 root     20  0     0     0   0 S 0.0  0.0  0:00.04 kthreadd
  3 root     20  0     0     0   0 S 0.0  0.0  0:00.00 pool_workqueue_release
  4 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/R-rcu_gp
  5 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/R-sync_wq
  6 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/R-slub_flushwq
  7 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/R-netns
  9 root     20  0     0     0   0 I 0.0  0.0  0:00.22 kworker/0:1-events
 10 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/0:0H-events_highpri
 11 root     20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/u512:0-events_unbound
 12 root     20  0     0     0   0 I 0.0  0.0  0:00.07 kworker/u512:1-ipv6_addrconf
 13 root    -20  0     0     0   0 I 0.0  0.0  0:00.00 kworker/R-mm_percpu_wq
```

top then c = shows commands absolute path

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top then c = shows commands absolute path

top then k = kill a process by PID

top then n = to change the no. of task displayed

top then d, s = to change interval of refresh

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
894	root	20	0	365896	12216	10236	S	0.3	0.7	10:23.03	vmtoolsd
1084	root	20	0	416632	30684	15320	S	0.3	1.7	0:36.20	tuned
74349	paul	20	0	65528	5140	4240	R	0.3	0.3	0:00.07	top
1	root	20	0	254472	15088	9760	S	0.0	0.8	0:52.71	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.06	kthreadd
3	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_gp
4	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_par_gp
6	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker70:0
9	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	mm_percpu_ticker
10	root	20	0	0	0	0	S	0.0	0.0	0:06.68	ksoftirqd/0



```
Help for Interactive Commands - procps-3.3.15
Window 1:Def: Cumulative mode Off. System: Delay 5.0 secs; Secure mode Off.

[Z,B,E,e] Global: 'Z' colors; 'B' bold; 'E'/'e' summary/task memory scale
[l,t,m] Toggle Summary: 'l' load avg; 't' task/cpu stats; 'm' memory info
[0,1,2,3,I] Toggle: '0' zeros; '1/2/3' cpus or numa node views; 'I' Irix mode
[f,F,X] Fields: 'f'/'F' add/remove/order/sort; 'X' increase fixed-width

[L,&,<,>] Locate: 'L'/'&' find/again; Move sort column: '<'/'>' left/right
[R,H,V,J] Toggle: 'R' Sort; 'H' Threads; 'V' Forest view; 'J' Num justify
[c,i,S,j] Toggle: 'c' Cmd name/line; 'i' Idle; 'S' Time; 'j' Str justify
[x,y] Toggle highlights: 'x' sort field; 'y' running tasks
[z,b] Toggle: 'z' color/mono; 'b' bold/reverse (only if 'x' or 'y')
[u,U,o,O] Filter by: 'u'/'U' effective/any user; 'o'/'O' other criteria
[n,#,^O] Set: 'n'/'#' max tasks displayed; Show: Ctrl+'O' other filter(s)
[C,...] Toggle scroll coordinates msg for: up,down,left,right,home,end

k,r Manipulate tasks: 'k' kill; 'r' renice
d or s Set update interval
W,Y Write configuration file 'W'; Inspect other output 'Y'
q Quit
( commands shown with '.' require a visible task display window )
Press 'h' or '?' for help with Windows,
Type 'q' or <Esc> to continue [
```

Fields Management for window 1:Def, whose current sort field is %CPU
Navigate with Up/Dn, Right selects for move then <Enter> or Left commits,
'd' or <Space> toggles display, 's' sets sort. Use 'q' or <Esc> to end!

* PID	= Process Id	CODE	= Code Size (KiB)	CGNAME	= Control Group name
* USER	= Effective User Nam	DATA	= Data+Stack (KiB)	NU	= Last Used NUMA nod
* PR	= Priority	nMaj	= Major Page Faults		
* NI	= Nice Value	nMin	= Minor Page Faults		
* VIRT	= Virtual Image (KiB)	nDRT	= Dirty Pages Count		
* RES	= Resident Size (KiB)	WCHAN	= Sleeping in Functi		
* SHR	= Shared Memory (KiB)	Flags	= Task Flags <sched.		
* S	= Process Status	CGROUPS	= Control Groups		
* %CPU	= CPU Usage	SUPGIDS	= Supp Groups IDs		
* %MEM	= Memory Usage (RES)	SUPGRPS	= Supp Groups Names		
* TIME+	= CPU Time, hundredt	TGID	= Thread Group Id		
* COMMAND	= Command Name/Line	OOMa	= OOMEM Adjustment		
PPID	= Parent Process pid	OOMs	= OOMEM Score curren		
UID	= Effective User Id	ENVIRON	= Environment vars		
RUID	= Real User Id	vMj	= Major Faults delta		
RUSER	= Real User Name	vMn	= Minor Faults delta		
SUID	= Saved User Id	USED	= Res+Swap Size (KiB)		
SUSER	= Saved User Name	nsIPC	= IPC namespace Inod		
GID	= Group Id	nsMNT	= MNT namespace Inod		
GROUP	= Group Name	nsNET	= NET namespace Inod		
PGRP	= Process Group Id	nsPID	= PID namespace Inod		
TTY	= Controlling Tty	nsUSER	= USER namespace Ino		
TPGID	= Tty Process Grp Id	nsUTS	= UTS namespace Inod		
SID	= Session Id	LXC	= LXC container name		
nTH	= Number of Threads	RSan	= RES Anonymous (KiB)		
P	= Last Used Cpu (SMP)	RSfd	= RES File-based (Ki		
TIME	= CPU Time	RSlk	= RES Locked (KiB)		
SWAP	= Swapped Size (KiB)	RSsh	= RES Shared (KiB)		

How to Manage Processes on Linux with nohup, nice, bg, fg, jobs Commands

Linux nohup command

Linux bg command

Linux fg command

Linux jobs command

Linux nice command

How to check the nice value of a process?

How to change nice value of a process?

How to run a process or script with nohup?

What is nohup in Linux?

How to run a job or process in background in Linux?

How to run a job or process in foreground in Linux?

How to see the active jobs in Linux?

How to resume a stopped jobs or process in Linux?

Linux nice value

Niceness scale goes from -20 to 19. The lower the no. more priority that task gets.

Process priority = nice

(ex: nice -n 5 process)

jobs - Will show active jobs.

bg - Resume jobs to the background.

fg - Resume job to the foreground.

How to resume a specific job?

```
bg %<job_id>
fg %<job_id>
```

nice value

Niceness scale goes from -20 to 19. The lower the no. more priority that task gets.

Process priority = nice
(ex: **nice -n 5 process**)

•

```
[root@centosvm ~]# /home/paul/echo.sh
Hi
Hi
^Z
[1]+  Stopped                  I  /home/paul/echo.sh
[root@centosvm ~]#
[root@centosvm ~]# ps -ef | grep echo
root      13848  11447  0 16:56 pts/0    00:00:00 /bin/bash /home/paul/echo.sh
root      13866  11447  0 16:56 pts/0    00:00:00 grep --color=auto echo
[root@centosvm ~]#
```

check, nice value

```
root@centosvm ~]# /home/paul/echo.sh
Hi
^Z
[1]+  Stopped                  /home/paul/echo.sh
root@centosvm ~]# ps -ef | grep echo
root      13848  11447  0 16:56 pts/0    00:00:00 /bin/bash /home/paul/echo.sh
root      13866  11447  0 16:56 pts/0    00:00:00 grep --color=auto echo
root@centosvm ~]#
root@centosvm ~]# ps -l 13848
S  UID      PID  PPID C PRI  NI ADDR SZ WCHAN TTY          TIME CMD
T  0  13848   11447  0  80   0 -  3186 -      pts/0        0:00 /bin/bash /home/paul/echo.sh
root@centosvm ~]#
root@centosvm ~]# kill -9 13848
root@centosvm ~]# ps -ef | grep echo
root      13903  11447  0 16:58 pts/0    00:00:00 grep --color=auto echo
[1]+  Killed                  /home/paul/echo.sh
root@centosvm ~]#
```

nohup

If you want your process keep running even after closing your terminal, you can use nohup

nohup process &
nohup process > /dev/null 2>&1 &

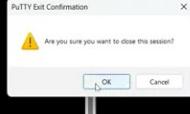
```
[paul@centosvm ~]$ ./echo.sh
Hi
^Z
[1]+  Stopped                  ./echo.sh
[paul@centosvm ~]$ ps -ef | grep echo
paul      14035  2575  0 17:02 pts/0    00:00:00 /bin/bash ./echo.sh
paul      14039  2575  0 17:03 pts/0    00:00:00 grep --color=auto echo
[paul@centosvm ~]$
```

```
[paul@centosvm ~]$ ./echo.sh
[paul@centosvm ~]$ ps -ef | grep echo
paul      14035  2575  0 17:02 pts/0    00:00:00 /bin/bash ./echo.sh
paul      14043  8086  0 17:03 pts/1    00:00:00 grep --color=auto echo
[paul@centosvm ~]$
```

```
[paul@centosvm ~]$  
[paul@centosvm ~]$ jobs  
[paul@centosvm ~]$  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14035    2575  0 17:02 pts/0    00:00:00 /bin/bash  
./echo.sh  
paul      14043    8086  0 17:03 pts/1    00:00:00 grep --col  
or=auto echo  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14070    8086  0 17:03 pts/1    00:00:00 grep --color=auto echo  
[paul@centosvm ~]$
```

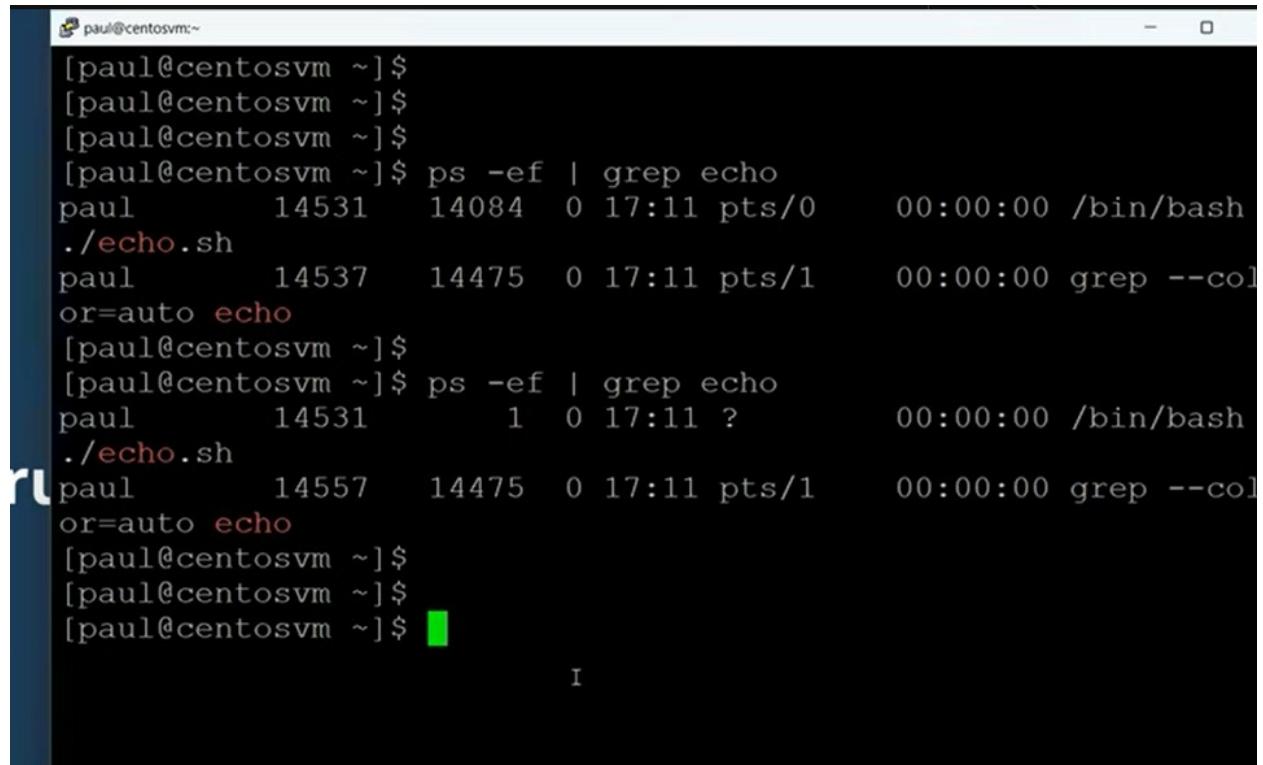
I

```
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ nohup ./echo.sh &  
[1] 14531  
[paul@centosvm ~]$ nohup: ignoring input and appending output  
to 'nohup.out'  
  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14531    14084  0 17:11 pts/0    00:00:00 /bin/bash  
./echo.sh  
paul      14540    14084  0 17:11 pts/0    00:00:00 grep --col  
or=auto echo  
[paul@centosvm ~]$
```



```
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14531    14084  0 17:11 pts/0    00:00:00 /bin/bash  
./echo.sh  
paul      14537    14475  0 17:11 pts/1    00:00:00 grep --col  
or=auto echo  
[paul@centosvm ~]$  
[paul@centosvm ~]$
```

still process running @ BG



```
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14531  14084  0 17:11 pts/0    00:00:00 /bin/bash  
./echo.sh  
paul      14537  14475  0 17:11 pts/1    00:00:00 grep --col  
or=auto echo  
[paul@centosvm ~]$  
[paul@centosvm ~]$ ps -ef | grep echo  
paul      14531          1  0 17:11 ?    00:00:00 /bin/bash  
./echo.sh  
paul      14557  14475  0 17:11 pts/1    00:00:00 grep --col  
or=auto echo  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$
```

Understand Cron Job in Linux with Practical Example [

What is a Cron Job?

A cron job is a scheduled task that allows you to run scripts or commands at specified intervals.

• Why use Cron Jobs?

- **Cron jobs automate repetitive tasks, ensuring they run at scheduled times without manual intervention.**
- **Ex: Backing up files, Running system maintenance, or sending email reports.**

• How does Cron Work?

- **Cron uses a daemon (a background process) called cron to execute scheduled tasks.**
- **The configuration for these tasks is stored in a file called a crontab.**
- **Name of the service is: **crond****

```
# systemctl status crond.service / crond
```

```
● crond.service - Command Scheduler
   Loaded: loaded (/usr/lib/systemd/system/crond.service; enabled; preset: enabled)
   Active: active (running) since Wed 2025-03-05 17:48:56 IST; 31min ago
     Invocation: 43dd59c1373c4f069ca1ab49b8ee6340
      Main PID: 1120 (crond)
        Tasks: 1 (limit: 10678)
       Memory: 1M (peak: 3M)
          CPU: 148ms
         CGroup: /system.slice/crond.service
                  └─1120 /usr/sbin/crond -n

Mar 05 17:48:57 RHEL-10 crond[1120]: (CRON) STARTUP (1.7.0)
Mar 05 17:48:57 RHEL-10 crond[1120]: (CRON) INFO (Syslog will be used instead of sendmail.)
Mar 05 17:48:57 RHEL-10 crond[1120]: (CRON) INFO (RANDOM_DELAY will be scaled with factor 19% if us>
Mar 05 17:48:57 RHEL-10 crond[1120]: (CRON) INFO (running with inotify support)
Mar 05 18:01:01 RHEL-10 CROND[2441]: (root) CMD (run-parts /etc/cron.hourly)
Mar 05 18:01:01 RHEL-10 CROND[2440]: (root) CMDOUT (/etc/cron.hourly/0anacron:)
Mar 05 18:01:01 RHEL-10 CROND[2440]: (root) CMDOUT ()
Mar 05 18:01:01 RHEL-10 CROND[2440]: (root) CMDOUT (/etc/cron.hourly/0anacron: line 11: /etc/default/lines 1-19
```

- Command to edit crontab: **crontab -e**
- How to view your current cron jobs: **crontab -l**
- Deleting cron jobs with **crontab -r**
(Warning: it will remove all the jobs)

Managing Crontab Entries

• Basic Format of a Cron Job

```
○ * * * * * /usr/bin/python3 /path/to/task.py
```

Explanation of the syntax:

minute hour day(month) month day(week) command.

```
* * * * * command-to-be-executed
- - - - -
| | | | |
| | | +---- Day of the week (0 - 7) (Sunday is 0 or 7)
| | | +----- Month (1 - 12)
| | +----- Day of the month (1 - 31)
| +----- Hour (0 - 23)
+----- Minute (0 - 59)
```

"At every minute."

next at 2024-08-14 22:17:00

* * * *

* any value

value list

separator

- range of values

/ step values

ly (non-standard)

ly (non-standard)

ly (non-standard)

ly (non-standard)

ly (non-standard)

ly (non-standard)

ot (non-standard)

Digitized by srujanika@gmail.com

† 14.30'

at 14:30.

"At 14:30."

next at 2024-08-15 14:30:00

⑧ 11 * *

30 14 * * *

* any value

value list
,

separator

- range of values

/ step value

1-31 allowed values

“At 14:30 on day-of-month 15 in February.”

next at 2025-02-15 14:30:00

random

30 14 15 2 *

minute hour day month day
(month) (week)

*	any value
,	value list separator
-	range of values
/	step values
@yearly	(non-standard)
@annually	(non-standard)
@monthly	(non-standard)
@weekly	(non-standard)
@daily	(non-standard)
@hourly	(non-standard)
@reboot	(non-standard)

“At 14:30 on Sunday.”

next at 2024-08-18 14:30:00

30 14 * * SUN

minute hour day month day
(month) (week)

*	any value
,	value list separator
-	range of values
/	step values
0-6	allowed values
SUN-SAT	alternative single values
7	sunday (non-standard)

```
[paul@centos01 cron]$ crontab -e  
no crontab for paul - using an empty one  
crontab: installing new crontab  
[paul@centos01 cron]$  
[paul@centos01 cron]$ crontab -l  
30 14 * * 0 /tmp/basic.sh  
[paul@centos01 cron]$ █
```

```
30 14 * * 0 /tmp/basic.sh
```

Practical

```
[paul@centos01 cron]$ ls
create_file.sh
[paul@centos01 cron]$ cat create_file.sh
#!/bin/bash

PATH="/home/paul/tutorials/cron"
/usr/bin/touch $PATH/testfile

echo "Cron job sample file">> $PATH/testfile

[paul@centos01 cron]$
[paul@centos01 cron]$ ./create_file.sh
[paul@centos01 cron]$ ls
create_file.sh testfile
[paul@centos01 cron]$ cat testfile
Cron job sample file
[paul@centos01 cron]$
```

```
[paul@centos01 cron]$ ls  
create_file.sh testfile  
[paul@centos01 cron]$ rm testfile  
[paul@centos01 cron]$ ls  
create_file.sh  
[paul@centos01 cron]$ █
```

```
# now create file.sh run the script using CronJob
```

```
[paul@centos01 cron]$ ls  
create_file.sh  
[paul@centos01 cron]$ pwd  
/home/paul/tutorials/cron  
[paul@centos01 cron]$ crontab -e  
crontab: installing new crontab  
[paul@centos01 cron]$ ls  
create_file.sh  
[paul@centos01 cron]$
```

```
30 14 * * 0 /tmp/basic.sh
* * * * * /home/paul/tutorials/cron/create_file.sh
~
```

```
[paul@centos01 cron]$ date  
Wednesday 14 August 2024 10:24:39 PM IST  
[paul@centos01 cron]$ █
```

CronJob File Created

```
[paul@centos01 cron]$ date  
Wednesday 14 August 2024 10:24:39 PM IST  
[paul@centos01 cron]$  
[paul@centos01 cron]$ ls  
create_file.sh  
[paul@centos01 cron]$ date  
Wednesday 14 August 2024 10:24:53 PM IST  
[paul@centos01 cron]$ date  
Wednesday 14 August 2024 10:25:00 PM IST  
[paul@centos01 cron]$ ls  
create_file.sh testfile  
[paul@centos01 cron]$  
[paul@centos01 cron]$ cat testfile  
Cron job sample file  
[paul@centos01 cron]$
```

Examples

- **0 0 * * *** (**12 midnight daily**)
- **30 8 1 * *** (**1st of every month, 8:30 AM**)
- ***/15 * * * *** (**Every 15 min**)
- **15 14 * * 1-5** (**2:15 PM Monday to Friday**)
- **15 14 * * MON-FRI**
- **0 20 10,20,30 2 ***

Special Characters:

- **Asterisk (*)**: Represents all possible values for a field. For example, using an asterisk in the month field means every month.
- **Comma (,)**: Allows you to specify multiple values in a field. For example, MON,WED,FRI in the day of the week field means Mondays, Wednesdays, and Fridays.
- **Dash (-)**: Specifies a range of values. For example, 2-5 in the day of the week field represents Tuesday through Friday.
- **Slash (/)**: Specifies increments. For example, */15 in the minutes field means "every 15 minutes."

• Special Strings in Cron

- Using @reboot, @daily, @hourly, etc., for easy scheduling.
- Example: Running a script at reboot.
 - **@reboot /path/to/script.sh**

```
paul@centos01:~/tutorials/cron$ crontab -l
30 14 * * 0 /tmp/basic.sh
* * * * * /home/paul/tutorials/cron/create_file.sh
[paul@centos01 cron]$
[paul@centos01 cron]$ █
```

```
30 14 * * 0 /tmp/basic.sh
* * * * * /home/paul/tutorials/cron/create_file.sh
@reboot /tmp/basic.sh
```

```
[paul@centos01 cron]$ crontab -e
crontab: installing new crontab
[paul@centos01 cron]$
[paul@centos01 cron]$ crontab -l
30 14 * * 0 /tmp/basic.sh
* * * * * /home/paul/tutorials/cron/create_file.sh
@reboot /tmp/basic.sh
[paul@centos01 cron]$
```

Common Special Strings

1. @reboot: Run once, at startup.
 - Example: @reboot /path/to/script.sh
 - This runs the specified script each time the system boots.
2. @yearly or @annually: Run once a year, "0 0 1 1 *".
 - Example: @yearly /path/to/script.sh
 - This runs the script at midnight on the 1st of January every year.
3. @monthly: Run once a month, "0 0 1 * *".
 - Example: @monthly /path/to/script.sh
 - This executes the script at midnight on the first day of each month.
4. @weekly: Run once a week, "0 0 * * 0".
 - Example: @weekly /path/to/script.sh
 - This schedules the script to run at midnight on Sunday of each week.
5. @daily or @midnight: Run once a day, "0 0 * * *".
 - Example: @daily /path/to/script.sh
 - This runs the script at midnight every day.
6. @hourly: Run once an hour, "0 * * * *".
 - Example: @hourly /path/to/script.sh
 - This executes the script at the start of every hour.

Redirect Output of Task

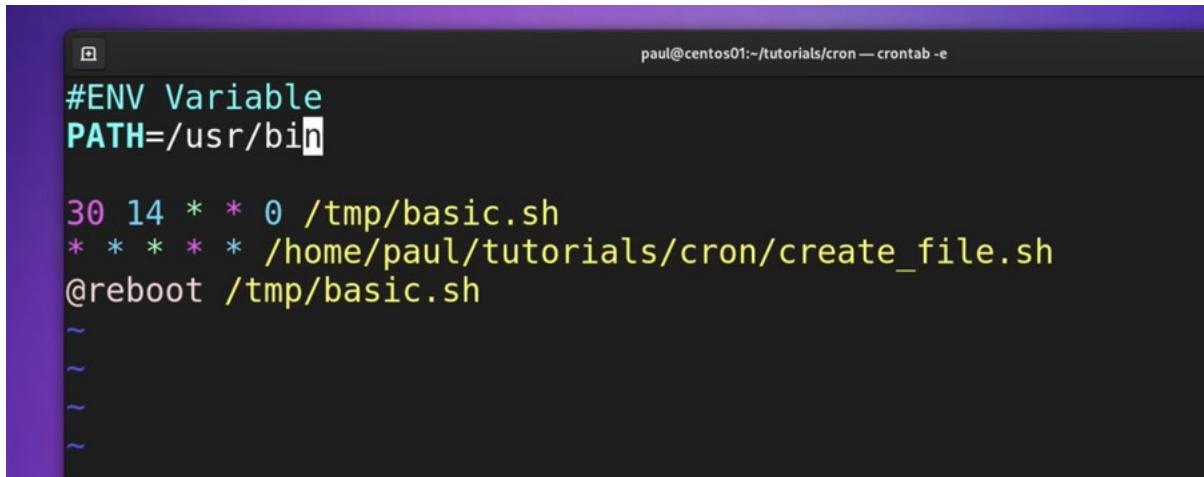
```
* * * * * /bin/ls /some/directory > /tmp/listing.txt 2>&1
```

- **Environment Variables in Cron**

- **Setting specific environment variables for a cron job.**

```
# Set PATH in crontab
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin

# Cron job entries below
* * * * * /path/to/script.sh
```



A screenshot of a terminal window titled "crontab -e". The window shows the following content:

```
#ENV Variable
PATH=/usr/bin

30 14 * * 0 /tmp/basic.sh
* * * * * /home/paul/tutorials/cron/create_file.sh
@reboot /tmp/basic.sh
~
~
~
~
```

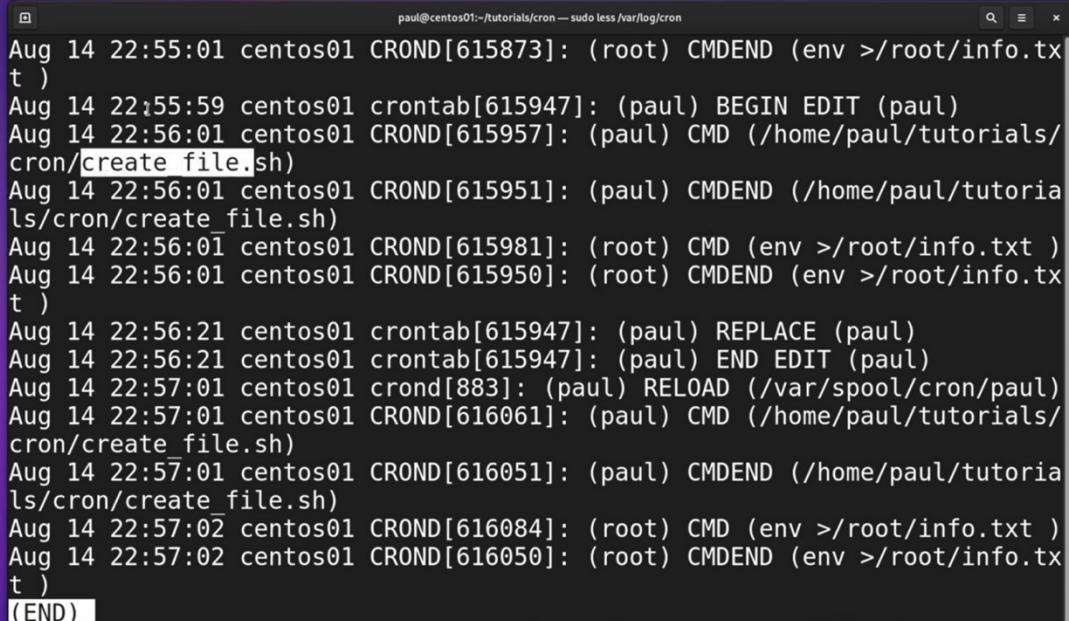
```
[paul@centos01 cron]$ crontab -e
crontab: installing new crontab
[paul@centos01 cron]$ █
```

no Error as it is env Var

• Common Issues and Troubleshooting Tips

- Check log under **/var/log/cron**

```
[root@centos01 ~]# less /var/log/cron
[paul@centos01 cron]$ less /var/log/cron
/var/log/cron: Permission denied
[paul@centos01 cron]$ sudo less /var/log/cron
[sudo] password for paul: █
```



A screenshot of a terminal window titled "paul@centos01:~/tutorials/cron — sudo less /var/log/cron". The window displays a log of cron events from August 14, 2023. The log shows several cron entries, including edits to the cron tab, reloads of the cron daemon, and command executions. The log ends with a "(END)" message.

```
Aug 14 22:55:01 centos01 CROND[615873]: (root) CMDEND (env >/root/info.txt )
Aug 14 22:55:59 centos01 crontab[615947]: (paul) BEGIN EDIT (paul)
Aug 14 22:56:01 centos01 CROND[615957]: (paul) CMD (/home/paul/tutorials/cron/create_file.sh)
Aug 14 22:56:01 centos01 CROND[615951]: (paul) CMDEND (/home/paul/tutorials/cron/create_file.sh)
Aug 14 22:56:01 centos01 CROND[615981]: (root) CMD (env >/root/info.txt )
Aug 14 22:56:01 centos01 CROND[615950]: (root) CMDEND (env >/root/info.txt )
Aug 14 22:56:21 centos01 crontab[615947]: (paul) REPLACE (paul)
Aug 14 22:56:21 centos01 crontab[615947]: (paul) END EDIT (paul)
Aug 14 22:57:01 centos01 crond[883]: (paul) RELOAD (/var/spool/cron/paul)
Aug 14 22:57:01 centos01 CROND[616061]: (paul) CMD (/home/paul/tutorials/cron/create_file.sh)
Aug 14 22:57:01 centos01 CROND[616051]: (paul) CMDEND (/home/paul/tutorials/cron/create_file.sh)
Aug 14 22:57:02 centos01 CROND[616084]: (root) CMD (env >/root/info.txt )
Aug 14 22:57:02 centos01 CROND[616050]: (root) CMDEND (env >/root/info.txt )
(END)
```

Linux Ping Command to Troubleshoot Network Issues



What a PING Command can do?

- Check Network Connectivity
- Check Internet Connection
- Check Network Interface Card
- Check Latency on network
- DNS Resolution

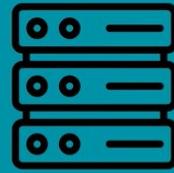
PING

Packet Internet Groper

How ping command works?

ping 192.168.0.0
0% packet loss

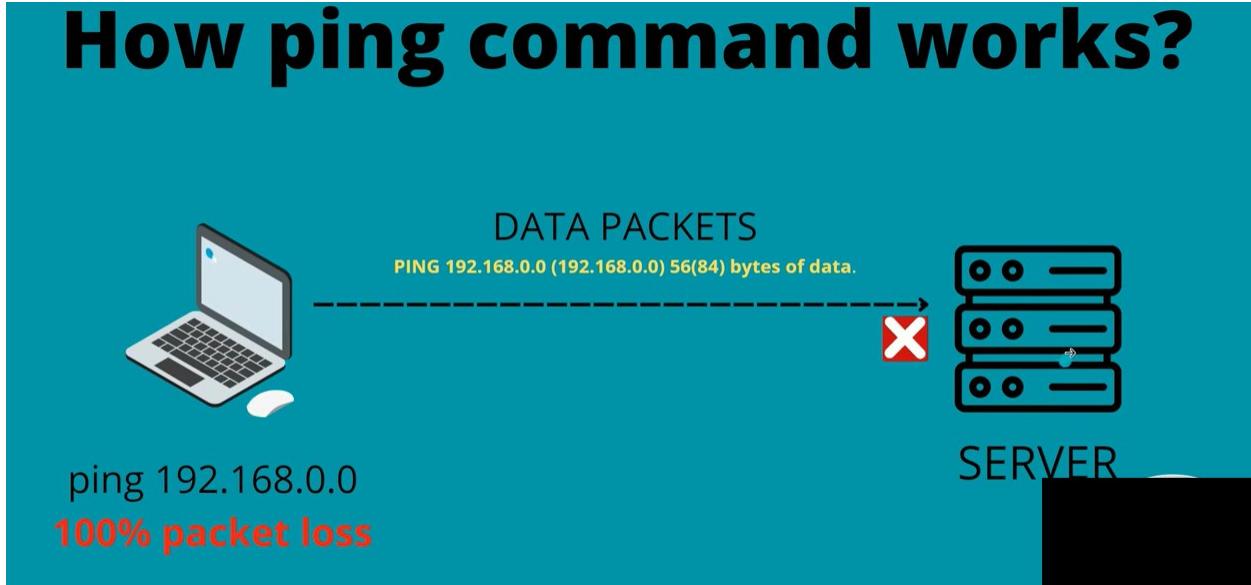
DATA PACKETS
PING 192.168.0.0 (192.168.0.0) 56(84) bytes of data.
64 bytes from 192.168.0.0: icmp_seq=1 ttl=64 time=0.070 ms



SERVER

ICMP (Internet Control Message Protocol)

How ping command works?

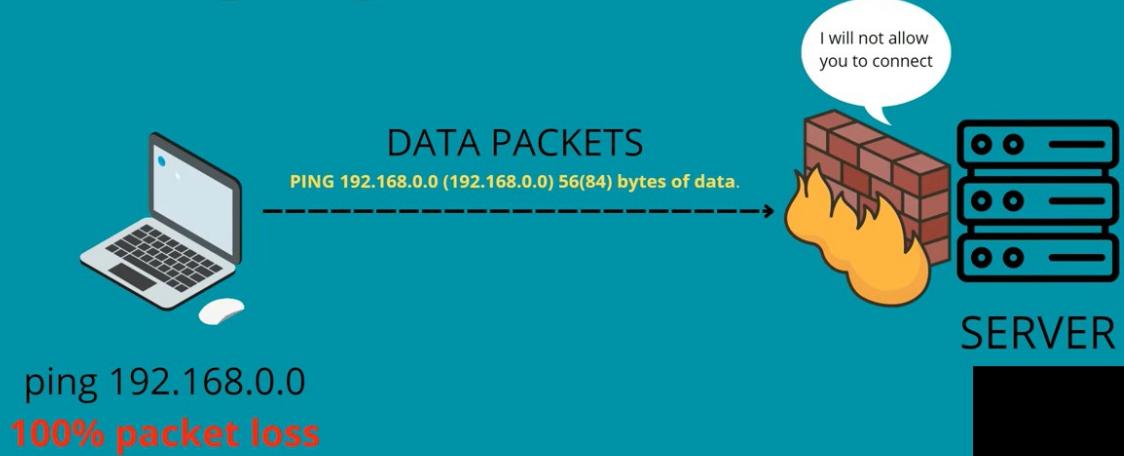


```
PING localhost (127.0.0.1): 56 data bytes
request timeout for icmp_seq 0
request timeout for icmp_seq 1
request timeout for icmp_seq 2
request timeout for icmp_seq 3
request timeout for icmp_seq 4
request timeout for icmp_seq 5
```

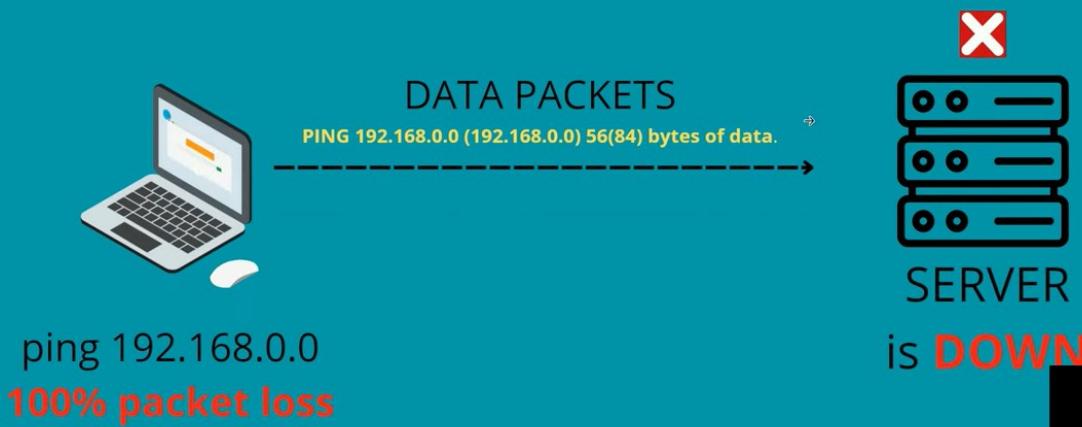
or

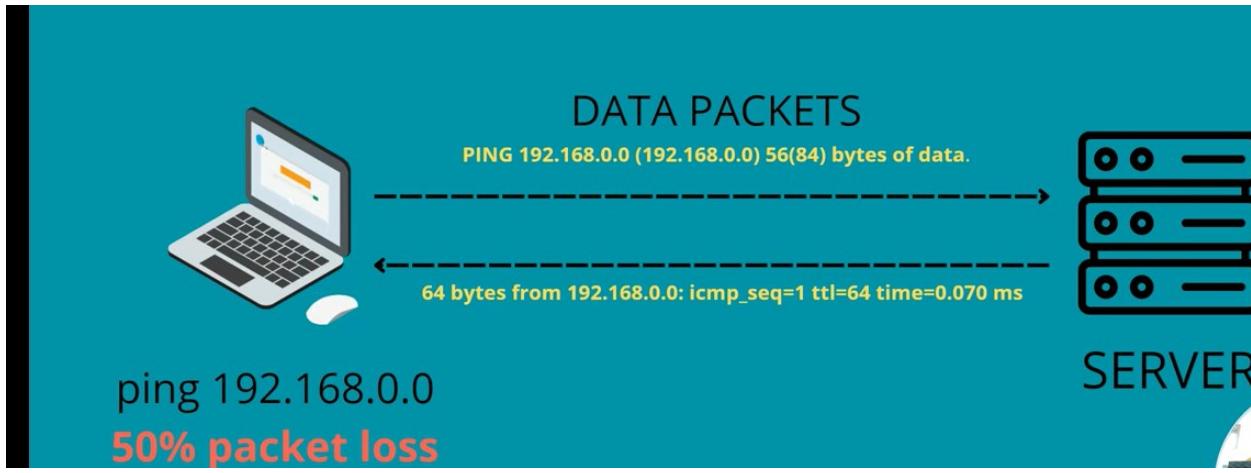
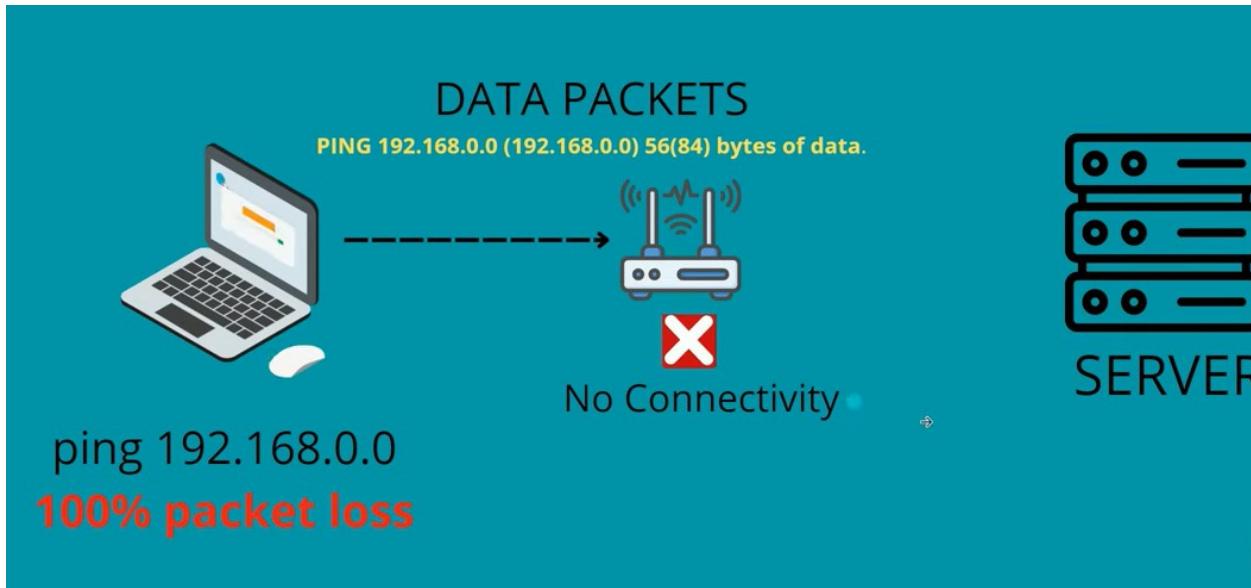
destination host unreachable

How ping command works?



How ping command works?





Ping command can also be used for DNS resolution

Filter URLs			II	+	🔍	All	HTML	CSS	JS	XHR	Fonts	Images	Media	WS	Other	<input type="checkbox"/> Disable Cache	No Throttling
us	Method	Domain	File	Remote IP	Initiator	Type	Transferred	Size	0 ms								
	GET	googleads.g.doubleclick.net	ui?gadsid=AOF	unknown	img											NS_BINDING_REDI...	
	GET	adservice.google.com	si?gadsid=AOF	[2404:6800:4009:829:2002]:443	img	html	719 B	0 B	204 ms								
	GET	adservice.google.co.in	si?gadsid=AOF	[2404:6800:4009:80c::2002]:443	img	html	1.02 KB	0 B	97 ms								

```
paul@centosvm:~]$ ping www.google.com
PING www.google.com(bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004)) 56 data bytes
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=1 ttl=118 time=23.3 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=2 ttl=118 time=23.2 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=3 ttl=118 time=23.8 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=4 ttl=118 time=25.2 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=5 ttl=118 time=27.7 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=6 ttl=118 time=27.7 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=7 ttl=118 time=29.0 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=8 ttl=118 time=25.1 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=9 ttl=118 time=24.3 ms
AC
```

```
paul@centosvm:~]$ ping www.google.com
PING www.google.com(bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004)) 56 data bytes
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=1 ttl=118 time=26.1 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=2 ttl=118 time=24.0 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=3 ttl=118 time=25.4 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=4 ttl=118 time=26.2 ms
64 bytes from bom07s45-in-x04.1e100.net (2404:6800:4009:832::2004): icmp_seq=5 ttl=118 time=26.9 ms
^C
--- www.google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4008ms
rtt min/avg/max/mdev = 24.024/25.741/26.930/0.998 ms
[paul@centosvm ~]$
```

Ping hostname

Ping IP

Ping -c 3 (for three times only)

Ping -i 2 (interval to send packets)

Ping -c 5 -q (this will only give you summary)

Ping -f (to send packets as fast as possible to test the network performance)

ping -s 500 (change size of the packet)

ping -w 10 (to stop printing after 10 sec)

ping -D www.google.com (also print timestamp to remember the time)

ping -a (audible)



Use Linux Netstat Command to Troubleshoot Network Issues

(netstat)

Network Monitoring and Troubleshooting

netstat command

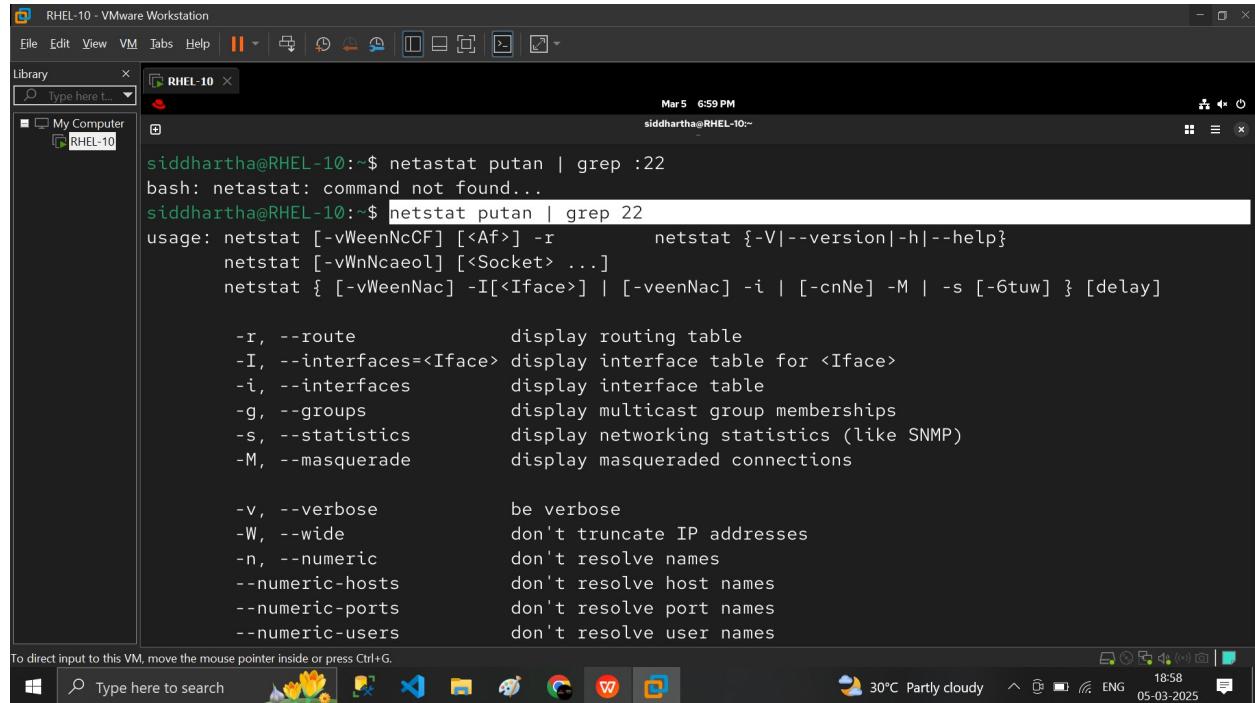
netstat is a command-line network utility that displays:

- network connections for TCP, UDP
- routing tables,
- a number of network interface
- network protocol statistics.

Case:

To identify no. of connection on a given port or IP.

netstat -putan | grep <PORT/IP>



The screenshot shows a Linux terminal window titled "RHEL-10 - VMware Workstation". The terminal is running on a Red Hat Enterprise Linux 10 host. The user has typed "netstat putan | grep :22" and received an error message: "bash: netastat: command not found...". Then, they typed "netstat putan | grep 22" and got the usage information for the netstat command. The usage output is as follows:

```
siddhartha@RHEL-10:~$ netastat putan | grep :22
bash: netastat: command not found...
siddhartha@RHEL-10:~$ netstat putan | grep 22
usage: netstat [-vWnNcCF] [<Af>] -r          netstat {-V|--version|-h|--help}
      netstat [-vWnNcaeol] [<Socket> ...]
      netstat { [-vWnNac] -I[<Iface>] | [-veenNac] -i | [-cnNe] -M | -s [-6tuw] } [delay]

      -r, --route           display routing table
      -I, --interfaces=<Iface> display interface table for <Iface>
      -i, --interfaces       display interface table
      -g, --groups          display multicast group memberships
      -s, --statistics      display networking statistics (like SNMP)
      -M, --masquerade      display masqueraded connections

      -v, --verbose         be verbose
      -W, --wide             don't truncate IP addresses
      -n, --numeric          don't resolve names
      --numeric-hosts        don't resolve host names
      --numeric-ports        don't resolve port names
      --numeric-users        don't resolve user names
```

The terminal window is part of a VMware desktop environment, with a Windows taskbar visible at the bottom showing various application icons like File Explorer, Edge, and Google Chrome.

```
siddhartha@RHEL-10:~$ netstat -putan | grep :22
usage: netstat [-vWnNcCF] [<Af>] -r          netstat {-V|--version|-h|--help}
               netstat [-vWnNcaeol] [<Socket> ...]
               netstat { [-vWnNac] -I[<Iface>] | [-veenNac] -i | [-cnNe] -M | -s [-6tuw] } [delay]

      -r, --route           display routing table
      -I, --interfaces=<Iface> display interface table for <Iface>
      -i, --interfaces      display interface table
      -g, --groups          display multicast group memberships
      -s, --statistics     display networking statistics (like SNMP)
      -M, --masquerade     display masqueraded connections

      -v, --verbose         be verbose
      -W, --wide             don't truncate IP addresses
      -n, --numeric          don't resolve names
      --numeric-hosts       don't resolve host names
      --numeric-ports        don't resolve port names
      --numeric-users        don't resolve user names
      -N, --symbolic        resolve hardware names
      -e, --extend           display other/more information

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
```

```
siddhartha@RHEL-10:~# netstat -putan | grep :22
tcp        0      0 0.0.0.0:22              0.0.0.*:*                LISTEN      1103/sshd: /usr/sbi
tcp6       0      0 ::1:22                 ::*:*                  LISTEN      1103/sshd: /usr/sbi
root@RHEL-10:~#
```

netstat command

(t-tcp, u-udp, n-numerical addr, l-listening port, p-PID programname)

To see all the sockets
netstat -a

List all the TCP ports
netstat -at

List all the TCP v6 ports
netstat -6at

List all the UDP ports
netstat -au

List all listening ports
netstat -l

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Library Type here t. My Computer RHEL-10

RHEL-10 Mar 5 7:03 PM siddhartha@RHEL-10:~ /root

```
root@RHEL-10:~# netstat -a | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:ipp            0.0.0.0:*
tcp      0      0 0.0.0.0:ssh             0.0.0.0:*
tcp6     0      0 localhost:ipp            [::]:*
tcp6     0      0 [::]:websm              [::]:*
tcp6     0      0 [::]:ssh                [::]:*
udp      0      0 0.0.0.0:53840           0.0.0.0:*
udp      0      0 RHEL-10:bootpc          _gateway:bootps        ESTABLISHED
udp      0      0 0.0.0.0:mdns             0.0.0.0:*
udp      0      0 localhost:323            0.0.0.0:*
udp6     0      0 [::]:45214              [::]:*
udp6     0      0 [::]:mdns               [::]:*
udp6     0      0 localhost:323            [::]:*
raw6     0      0 [::]:ipv6-icmp          [::]:*                7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags       Type      State         I-Node    Path
unix    3      [ ]        STREAM    CONNECTED   18221    /run/user/1000/bus
unix    3      [ ]        STREAM    CONNECTED   18113
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Type here to search

30°C Partly cloudy ENG 05-03-2025

```
root@RHEL-10:~# netstat -at | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address      State
tcp      0      0 localhost:ipp            0.0.0.0:*            LISTEN
tcp      0      0 0.0.0.0:ssh             0.0.0.0:*            LISTEN
tcp6     0      0 localhost:ipp            [::]:*              LISTEN
tcp6     0      0 [::]:websm             [::]:*              LISTEN
tcp6     0      0 [::]:ssh               [::]:*              LISTEN
root@RHEL-10:~#
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || Type here ...

Library RHEL-10 My Computer

siddhartha@RHEL-10:~ bash

```
root@RHEL-10:~# netstat -at | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:ipp            0.0.0.0:*
tcp      0      0 0.0.0.0:ssh             0.0.0.0:*
tcp6     0      0 localhost:ipp            [::]:*
tcp6     0      0 [::]:websm              [::]:*
tcp6     0      0 [::]:ssh                [::]:*
root@RHEL-10:~# netstat -au | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 0.0.0.0:53840           0.0.0.0:*
udp      0      0 RHEL-10:bootpc          _gateway:bootps       ESTABLISHED
udp      0      0 0.0.0.0:mdns            0.0.0.0:*
udp      0      0 localhost:323           0.0.0.0:*
udp6     0      0 [::]:45214             [::]:*
udp6     0      0 [::]:mdns              [::]:*
udp6     0      0 localhost:323           [::]:*
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Start Type here to search File Explorer Microsoft Edge Google Chrome Microsoft Word Microsoft Excel Microsoft Powerpoint 30°C Partly cloudy ENG 19:04 05-03-2025

/root

```
root@RHEL-10:~# netstat -atl | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:ipp            0.0.0.0:*
tcp      0      0 0.0.0.0:ssh             0.0.0.0:*
tcp6     0      0 localhost:ipp            [::]:*
tcp6     0      0 [::]:websm              [::]:*
tcp6     0      0 [::]:ssh                [::]:*
root@RHEL-10:~#
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help | || □ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞

Library X Type here to... RHEL-10

My Computer RHEL-10

```
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# netstat -atl | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:ipp            0.0.0.0:*
tcp      0      0 0.0.0.0:ssh             0.0.0.0:*
tcp6     0      0 localhost:ipp            [::]:*
tcp6     0      0 [::]:webasm            [::]:*
tcp6     0      0 [::]:ssh               [::]:*
root@RHEL-10:~# netstat -atln | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 127.0.0.1:631           0.0.0.0:*
tcp      0      0 0.0.0.0:22              0.0.0.0:*
tcp6     0      0 ::1:631                :::*
tcp6     0      0 ::1:9090              :::*
tcp6     0      0 ::22                  :::*
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.



```
root@RHEL-10:~# netstat -atlnp | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State      PID/Program name
tcp      0      0 127.0.0.1:631           0.0.0.0:*
tcp      0      0 0.0.0.0:22              0.0.0.0:*
tcp6     0      0 ::1:631                :::*
tcp6     0      0 ::1:9090              :::*
tcp6     0      0 ::22                  :::*
```

Routing table info

```
root@RHEL-10:~# netstat -r
Kernel IP routing table
Destination      Gateway          Genmask         Flags   MSS Window irtt Iface
default         _gateway        0.0.0.0        UG        0 0          0 ens160
172.23.192.0    0.0.0.0        255.255.240.0   U        0 0          0 ens160
root@RHEL-10:~#
```

netstat command

To get the list of all the interface
netstat -i

Which port a process is using?
netstat -ap | grep <process_name>

How to see statistics by protocol?
netstat -s

```
root@RHEL-10:~# netstat -i
Kernel Interface table
Iface      MTU     RX-OK RX-ERR RX-DRP RX-OVR     TX-OK TX-ERR TX-DRP TX-OVR Flg
ens160    1500      121      0      0 0        141      0      0      0 BMRU
lo        65536      18      0      0 0        18      0      0      0 LRU
root@RHEL-10:~#
```

```
# stats
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Library x

Library x Type here t... ▾

My Computer RHEL-10

RHEL-10 x Mar 5 7:10 PM siddhartha@RHEL-10:~ - bash

```
6 packets to unknown port received
0 packet receive errors
107 packets sent
0 receive buffer errors
0 send buffer errors

UdpLite:
TcpExt:
    0 packet headers predicted
IpExt:
    InMcastPkts: 42
    OutMcastPkts: 32
    InBcastPkts: 1
    InOctets: 14367
    OutOctets: 10653
    InMcastOctets: 4844
    OutMcastOctets: 3968
    InBcastOctets: 229
    InNoECTPkts: 130
MPTcpExt:
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Type here to search

30°C Partly cloudy ENG 05-03-2025

```
root@RHEL-10:~# netstat -an
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 RHEL-10:bootpc          _gateway:bootps      ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State         I-Node Path
unix    3      [ ]      STREAM   CONNECTED  18221  /run/user/1000/bus
unix    3      [ ]      STREAM   CONNECTED  18113
unix    3      [ ]      STREAM   CONNECTED  20860
unix    3      [ ]      STREAM   CONNECTED  18269
unix    3      [ ]      STREAM   CONNECTED  17363  /run/systemd/journal/stdout
unix    3      [ ]      STREAM   CONNECTED  18595  /run/dbus/system_bus_socket
unix    3      [ ]      STREAM   CONNECTED  18503  /run/dbus/system_bus_socket
unix    3      [ ]      STREAM   CONNECTED  18780  /run/dbus/system_bus_socket
unix    3      [ ]      STREAM   CONNECTED  17842
unix    3      [ ]      STREAM   CONNECTED  18206
unix    3      [ ]      STREAM   CONNECTED  18147  /run/systemd/journal/stdout
unix    3      [ ]      STREAM   CONNECTED  16768
unix    3      [ ]      STREAM   CONNECTED  19086  /run/user/1000/wayland-0
unix    3      [ ]      STREAM   CONNECTED  17904
```

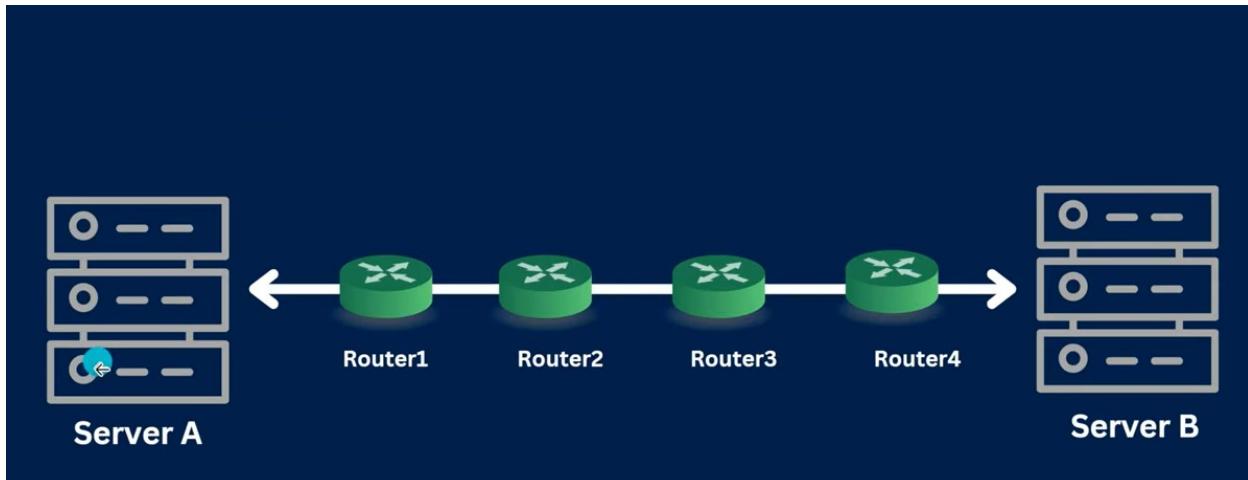
Linux TraceRoute for Network Troubleshooting |

What is TraceRoute?

Tracks the route packets on how the data travels on internet from your computer to destination.

The only required parameter is the name or IP address of the destination host .

\$traceroute IP



```
[root@cs-server ~]# yum install traceroute
Last metadata expiration check: 1:11:58 ago on Monday 10 April 2023 01:47:15 PM EDT.
Package traceroute-3:2.1.0-6.el8.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[root@cs-server ~]#
```

```
[paul@cs-server ~]$ traceroute www.google.com
traceroute to www.google.com (142.251.42.4), 30 hops max, 60 byte packets
 1 reliance.reliance (192.168.29.1)  5.920 ms  5.895 ms  5.875 ms
 2 10.21.168.1 (10.21.168.1)  6.044 ms  6.023 ms  6.002 ms
 3 172.26.86.120 (172.26.86.120)  12.887 ms  12.635 ms  172.26.86.116 (172.26.86.116)
 4 192.168.82.184 (192.168.82.184)  12.569 ms  192.168.82.186 (192.168.82.186)  10.0
 5 172.26.102.133 (172.26.102.133)  15.887 ms  16.195 ms  13.551 ms
 6 172.26.102.147 (172.26.102.147)  14.601 ms  11.203 ms  12.710 ms
 7 172.25.111.4 (172.25.111.4)  11.011 ms  172.25.111.2 (172.25.111.2)  10.924 ms  17
 8 * * *
 9 * * *
10 * 72.14.243.188 (72.14.243.188)  28.081 ms *
11 209.85.168.26 (209.85.168.26)  26.062 ms  27.968 ms  74.125.32.0 (74.125.32.0)  3
12 * * *
13 72.14.236.218 (72.14.236.218)  29.976 ms  142.250.227.72 (142.250.227.72)  31.448
14 108.170.248.219 (108.170.248.219)  32.811 ms bom12s19-in-f4.1e100.net (142.251.4
```

Default packet length is 60byte to change it
traceroute google.com 100

Default no. of packet per hop is 3, to change it
traceroute -q 1 google.com

Default port is 33434, to change it
traceroute -p 21101 google.com

To use IPV6 or 4
traceroute -4/6 google.com

To route through gate
traceroute -g 192.168.42.45 google.com

```
[root@cs-server ~]# traceroute -q 1 www.google.com
traceroute to www.google.com (142.251.42.36), 30 hops max, 60 byte packets
 1 reliance.reliance (192.168.29.1)  5.498 ms
 2 10.21.168.1 (10.21.168.1)  5.453 ms
 3 172.26.86.226 (172.26.86.226)  10.864 ms
 4 192.168.82.182 (192.168.82.182)  9.379 ms
 5 172.26.102.133 (172.26.102.133)  10.424 ms
 6 172.26.102.147 (172.26.102.147)  9.323 ms
 7 172.25.111.4 (172.25.111.4)  11.621 ms
 8 *
 9 *
10 *
11 74.125.51.166 (74.125.51.166)  36.365 ms
12 142.250.214.102 (142.250.214.102)  36.260 ms
13 108.170.248.203 (108.170.248.203)  36.333 ms
14 bom12s20-in-f4.1e100.net (142.251.42.36)  29.139 ms
[root@cs-server ~]#
```

Linux Package Management | Linux YUM, DNF, RPM | Rollback Patches

- What is package management?
- Package management tools
 - yum
 - dnf
 - rpm
 - apt
- Difference between Upgrade or Update?
- Rollback the patches or update

It's all about packages

PACKAGE MANAGEMT

- Installing
- Upgrading
- Deleting
- View Package Info
- Packages config

Manage software using YUM/DNF and RPM for your Red Hat-based Linux systems like CentOS.

APT for Debian based, Ubuntu, Kali Linux etc



YUM

**YELLOW-DOG
UPDATER
MODIFIED**

- YUM is the primary package management tool for redhat.
- YUM performs dependency resolution when installing, updating, and removing software packages.
- YUM can manage packages from installed repositories in the system or from .rpm packages.



YUM

COMMANDS

- How to install and remove a package


```
#yum install nginx -y
#yum remove nginx
```
- How to upgrade or update a package


```
#yum upgrade package
#yum update package
```

```
[root@cs8 ~]# yum install nginx
Last metadata expiration check: 1:53:29 ago on Thursday 02 February 2023 03:5
7:04 PM IST.
```

```
7:04 PM IST.
Dependencies resolved.
=====
Package      Arch   Version           Repo      Size
=====
Installing:
nginx        x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 appstream 570 k
Installing dependencies:
nginx-all-modules
nginx-filesystem
nginx-mod-http-image-filter
nginx-mod-http-perl
nginx-mod-http-xslt-filter
nginx-mod-mail
=====
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 appstream 23 k
noarch 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 appstream 24 k
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 appstream 35 k
```

```
[root@cs8 ~]# nginx -v
nginx version: nginx/1.14.1
[root@cs8 ~]#
```

```

[root@cs8 ~]# yum remove nginx
Dependencies resolved.
=====
 Package      Arch    Version           Repository   Size
=====
 Removing:
 nginx        x86_64  1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 1.6 M
 Removing unused dependencies:
 nginx-all-modules
 noarch     1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 0
 nginx-filesystem
 noarch     1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 0
 nginx-mod-http-image-filter
 x86_64    1:1.14.1-9.module_el8.0.0+1060+3ab382d3
 nginx-mod-http-perl
 x86_64    1:1.14.1-9.module_el8.0.0+1060+3ab382d3
 nginx-mod-http-xslt-filter
 x86_64    1:1.14.1-9.module_el8.0.0+1060+3ab382d3
 nginx-mod-mail

[root@cs8 ~]# yum upgrade nginx
Last metadata expiration check: 1:57:25 ago on Thursday 02 February 2023 03:5
7:04 PM IST.
Dependencies resolved.
Nothing to do.
Complete!
[root@cs8 ~]# 

[root@cs8 ~]# yum update nginx
Last metadata expiration check: 1:58:03 ago on Thursday 02 February 2023 03:5
7:04 PM IST.
Dependencies resolved.
Nothing to do.
Complete!
[root@cs8 ~]# 

```

What is the difference between yum Update & Upgrade?

Upgrade: Will delete the old packages

Update: Keep the old packages, we can rollback

YUM COMMANDS

- you can see all the options using
`#yum -option`
- To check the available updates for packages
`#yum check-update`

```
[root@cs8 ~]#  
[root@cs8 ~]# yum check-update  
Last metadata expiration check: 2:00:06 ago on Thursday 02 February 2023 03:55  
7:04 PM IST.
```

PACKAGE ROLLBACK

- To see the past work done related to packages, which will show you the activity with date and time

```
#yum history
```

- We can simply undo or redo any action using `#yum history undo/redo <id>`

```
[root@cs8 ~]# yum history  
ID      | Command line          | Date and time   | Action(s) | Alter  
ed  
--  
7 | install nginx           | 2023-02-02 17:51 | Install    | 8  
6 | install ksh -y          | 2023-02-01 01:51 | Install    | 1  
5 | remove nginx            | 2023-01-24 23:52 | Removed    | 8  
4 | install nginx            | 2023-01-24 23:51 | Install    | 8  
3 | install telnet           | 2023-01-20 13:06 | Install    | 1  
2 | install java-1.8.0-openj | 2023-01-03 00:52 | Instal  
1 |                           | 2022-11-21 18:02 | Instal  
EE  
[root@cs8 ~]#
```

```
[root@cs8 ~]# yum history  
ID      | Command line          | Date and time   | Action(s) | Altered  
--  
7 | install nginx           | 2023-02-02 17:51 | Install    | 8  
6 | install ksh -y          | 2023-02-01 01:51 | Install    | 1  
5 | remove nginx            | 2023-01-24 23:52 | Removed    | 8  
4 | install nginx            | 2023-01-24 23:51 | Install    | 8  
3 | install telnet           | 2023-01-20 13:06 | Install    | 1  
2 | install java-1.8.0-openj | 2023-01-03 00:52 | Install    | 9  
1 |                           | 2022-11-21 18:02 | Instal  
1436 EE
```

```
[root@cs8 ~]#
```

Roll back

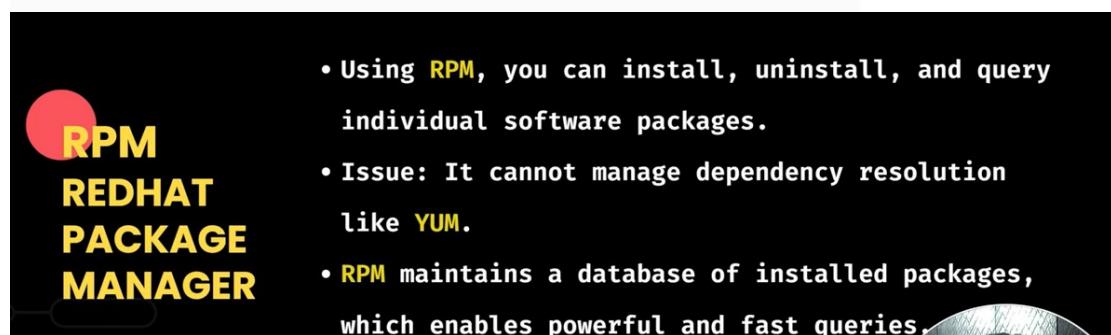
```
[root@cs8 ~]# yum history
ID      | Command line          | Date and time      | Action(s)       | Altered
-----
7 | install nginx           | 2023-02-02 17:51 | Install        | 8
6 | install ksh -y          | 2023-02-01 01:51 | Install        | 1
5 | remove nginx            | 2023-01-24 23:52 | Removed        | 8
4 | install nginx            | 2023-01-24 23:51 | Install        | 8
3 | install telnet           | 2023-01-20 13:06 | Install        | 1
2 | install java-1.8.0-openj | 2023-01-03 00:52 | Install        | 9
1 |                         | 2022-11-21 18:02 | Install        | 1436 EE

[root@cs8 ~]# yum history undo 7
Last metadata expiration check: 2:03:37 ago on Thursday 02 February 2023 03:57:
04 PM IST.

nginx-all-modules
noarch 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 0
nginx-filesystem
noarch 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 0
nginx-mod-http-image-filter
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 29 k
nginx-mod-http-perl
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 60 k
nginx-mod-http-xslt-filter
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 25 k
nginx-mod-mail
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 108 k
nginx-mod-stream
x86_64 1:1.14.1-9.module_el8.0.0+1060+3ab382d3 @appstream 163 k

Transaction Summary
=====
Remove 8 Packages

Freed space: 2.0 M
Is this ok [y/N]:
```



- To install, upgrade or delete an .rpm package using RPM,

```
#rpm -i package-file
```



```
#rpm -U package-file
```

```
#rpm -ivh package-file
```

```
#rpm -evh package-file
```

(v-verbose, h for hash to show progress)

CentOS 8 / CentOS AppStream x86_64 / ksh-20120801-254.el8.x86_64.rpm

ksh-20120801-254.el8.x86_64.rpm



Start free for 3 agents

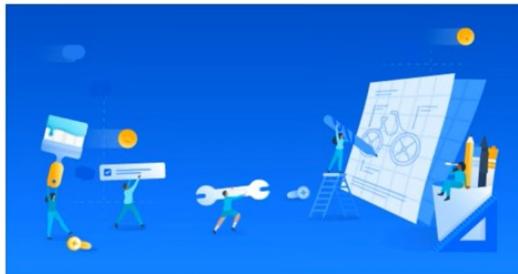
Eliminate dev and IT silos with Jira Service Management. Agents are free.

Jira Service Management

Description

ksh - The Original ATT Korn Shell

Property	Value
Operating system	Linux
Distribution	CentOS 8



Start free for 3 agents

Jira Service Management provides modern ticketing for high velocity teams. Start free.

Jira Service Management

[Sign](#)

Download 2

Type	URL	⋮
Binary Package	https://vault.centos.org/centos/8/AppStream/x86_64/os/Packages/ksh-20120801-254.el8.x86_64.rpm	
Source Package	https://vault.centos.org/8.5.2111/AppStream/Source/SPackages/ksh-20120801-254.el8.src.rpm	
Mirror	vault.centos.org	

Install Howto

Install ksh rpm package:

```
# dnf install ksh
```

```
[root@cs8 ~]#
[root@cs8 ~]# wget https://vault.centos.org/centos/8/AppStream/x86_64/os/Packages/ksh-20120801-254.el8.x86_64.rpm
--2023-02-02 18:07:13--  https://vault.centos.org/centos/8/AppStream/x86_64/os/Packages/ksh-20120801-254.el8.x86_64.rpm
Resolving vault.centos.org (vault.centos.org)... 18.161.125.71, 18.161.125.105,
18.161.125.8, ...
Connecting to vault.centos.org (vault.centos.org)|18.161.125.71|:443... connected.
HTTP request sent, awaiting response...
```

```
[root@cs8 ~]#
[root@cs8 ~]# ls -ltr
total 936
-rw-r--r--. 1 root root 948504 Apr 27 2020 ksh-20120801-254.el8.x86_64.rpm
-rw-----. 1 root root    1003 Nov 21 18:38 anaconda-ks.cfg
-rw-r--r--. 1 root root   1282 Nov 21 18:42 initial-setup-ks.cfg
-rw-r--r--. 1 root root  10240 Jan 11 14:34 myfile
[root@cs8 ~]#
[root@cs8 ~]#
```

```
[root@cs8 ~]#
[root@cs8 ~]# ls -ltr
total 936
-rw-r--r--. 1 root root 948504 Apr 27 2020 ksh-20120801-254.el8.x86_64.rpm
-rw-----. 1 root root    1003 Nov 21 18:38 anaconda-ks.cfg
-rw-r--r--. 1 root root   1282 Nov 21 18:42 initial-setup-ks.cfg
-rw-r--r--. 1 root root  10240 Jan 11 14:34 myfile
[root@cs8 ~]#
[root@cs8 ~]# rpm -ivh ksh-20120801-254.el8.x86_64.rpm
Verifying... ###### [100%]
Preparing... ###### [100%]
Updating / installing...
 1:ksh-20120801-254.el8 ###### [100%]
```

RPM

- To query all the installed packages

```
#rpm -qa
```

- More info about the package

```
#rpm -qi <package_name>
```

- Info about config files for a package

```
#rpm -qc <package_name>
```

```
# rpm -qa
```

```
pulseaudio-libs-14.0-4.el8.x86_64
gvfs-goa-1.36.2-14.el8.x86_64
python3-gobject-base-3.28.3-2.el8.x86_64
kexec-tools-2.0.25-2.el8.x86_64
libgomp-8.5.0-17.el8.x86_64
xorg-x11-xkb-utils-7.7-28.el8.x86_64
gvfs-smb-1.36.2-14.el8.x86_64
libblockdev-utils-2.28-1.el8.x86_64
sssd-proxy-2.7.3-4.el8.x86_64
taglib-1.11.1-8.el8.x86_64
libglvnd-glx-1.3.4-1.el8.x86_64
xdg-user-dirs-gtk-0.10-13.el8.x86_64
selinux-policy-targeted-3.14.3-110.el8.noarch
pciutils-3.7.0-3.el8.x86_64
jbig2dec-libs-0.16-1.el8.x86_64
at-spi2-atk-2.26.2-1.el8.x86_64
cockpit-276.1-1.el8.x86_64
colord-libs-1.4.2-1.el8.x86_64
libvirt-daemon-driver-interface-8.0.0-10.module_el8.7.0+1218+
fuse3-libs-3.3.0-16.el8.x86_64
[root@cs8 ~]# █
```

```
[root@cs8 ~]#
[root@cs8 ~]# rpm -qa | grep ksh
ksh-20120801-254.el8.x86_64
[root@cs8 ~]# █
```

```
[root@cs8 ~]# rpm -qi ksh
Name        : ksh
Version     : 20120801
Release     : 254.el8
Architecture: x86_64
Install Date: Thursday 02 February 2023 06:08:36 PM IST
Group       : Unspecified
Size        : 3399441
License      : EPL
Signature    : RSA/SHA256, Sunday 26 April 2020 07:48:41 AM IST, F
8483c65d
Source RPM  : ksh-20120801-254.el8.src.rpm
Build Date   : Friday 24 April 2020 08:27:19 AM IST
Build Host   : x86-01.mbox.centos.org
Relocations  : (not relocatable)

Architecture: x86_64
Install Date: Thursday 02 February 2023 06:08:36 PM IST
Group       : Unspecified
Size        : 3399441
License      : EPL
Signature    : RSA/SHA256, Sunday 26 April 2020 07:48:41 AM IST, Key ID 05b555b3
8483c65d
Source RPM  : ksh-20120801-254.el8.src.rpm
Build Date   : Friday 24 April 2020 08:27:19 AM IST
Build Host   : x86-01.mbox.centos.org
Relocations  : (not relocatable)
Packager    : CentOS Buildsys <bugs@centos.org>
Vendor      : CentOS
URL         : http://www.kornshell.com/
Summary     : The Original ATT Korn Shell
Description  :
KSH-93 is the most recent version of the KornShell by David K
AT&T Bell Laboratories.
KornShell is a shell programming language, which is upward comp
with "sh" (the Bourne Shell).
[root@cs8 ~]#
```

```
[root@cs8 ~]#
[root@cs8 ~]# rpm -qc ksh
/etc/binfmt.d/kshcomp.conf
/etc/kshrc
/etc/skel/.kshrc
[root@cs8 ~]# █
```

```
[root@cs8 ~]# rpm -qc nginx
/etc/logrotate.d/nginx
/etc/nginx/fastcgi.conf
/etc/nginx/fastcgi.conf.default
/etc/nginx/fastcgi_params
/etc/nginx/fastcgi_params.default
/etc/nginx/koi-utf
/etc/nginx/koi-win
/etc/nginx/mime.types
/etc/nginx/mime.types.default
/etc/nginx/nginx.conf
/etc/nginx/nginx.conf.default
/etc/nginx/scgi_params
/etc/nginx/scgi_params.default
/etc/nginx/uwsgi_params
/etc/nginx/uwsgi_params.default
/etc/nginx/win-utf
```

MPRASHANT

From Redhat/Centos 8

- sudo dnf list available
- sudo dnf list installed
- sudo dnf update/upgrade
- sudo dnf install package.name
- sudo dnf remove package.name
- sudo dnf info package.name
- sudo dnf search package



```
[root@cs8 ~]# dnf list available | wc -l
6104
[root@cs8 ~]#
```

```

[root@cs8 ~]# dnf list available | wc -l
6104
[root@cs8 ~]# dnf list installed | wc -l
1435
[root@cs8 ~]# dnf list installed | grep ksh
ksh.x86_64                                         20120801-254.el8
@System
[root@cs8 ~]# dnf list installed | grep nginx

ksh.x86_64                                         20120801-254.el8
@System
[root@cs8 ~]# dnf list installed | grep nginx
nginx.x86_64                                         1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-all-modules.noarch                         1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-filesystem.noarch                         1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-mod-http-image-filter.x86_64                1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-mod-http-perl.x86_64                        1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-mod-http-xslt-filter.x86_64                 1:1.14.1-9.module_el8.0.0+
1060+3ab382d3                                     @appstream
nginx-mod-mail.x86_64                            1:1.14.1-
1060+3ab382d3                                     @appstream
nginx-mod-stream.x86_64                           1:1.14.1-
1060+3ab382d3                                     @appstream
[root@cs8 ~]# ■
[root@cs8 ~]# dnf info ksh
Last metadata expiration check: 2:18:31 ago on Thursday 02 February 2023 03:5
7:04 PM IST.
■

```

dnf install http (apache webserver)

```

noarch 85.8-2.el8                                         appstream 75 |
httpd-filesystem
    noarch 2.4.37-47.module_el8.6.0+1111+ce6f4ceb.1 appstream 41 |
httpd-tools x86_64 2.4.37-47.module_el8.6.0+1111+ce6f4ceb.1 appstream 108 |
mod_http2 x86_64 1.15.7-5.module_el8.6.0+1111+ce6f4ceb appstream 155 |
Installing weak dependencies:
apr-util-bdb
    x86_64 1.6.1-6.el8                                         appstream 25 |
apr-util-openssl
    x86_64 1.6.1-6.el8                                         appstream 27 |
Enabling module streams:
httpd          2.4

Transaction Summary
=====
Install 9 Packages

Total download size: 2.1 M
Installed size: 5.6 M
Is this ok [y/N]: ■

```

For Ubuntu



- `apt install package_name`
- `apt remove package_name`
- `apt autoremove (to remove the dependencies)`
- `apt update (to update the repo)`
- `apt-cache search apache`

If you're a Linux user and you need to manage user accounts, then this video is for you! I'll show you how to use the user account management tools to create, delete, and modify user accounts in a simple and easy way. This video is likely to be of great help to you if you're looking to manage user accounts on a Linux system!

Topics we will cover in this topics are:

How to create a user in Linux with `useradd` command
How to delete a user in Linux with `userdel` command
How to modify a user in Linux with `usermod` command
How to create a group in Linux
How to delete a group in Linux
How to assign a group to a user in Linux

To get more info about users and groups
`/etc/passwd` file
`/etc/shadow` file
`/etc/group` file

Commands we are covering in this video are
`useradd`
`userdel`
`usermod`
`groupadd`
`groupdel`

LINUX

USER ACCOUNT MANAGEMENT

Linux User Account Management | USERADD, USERMOD, Examples

Topics

- useradd
- userdel
- usermod
- groupadd
- groupdel

Files

- /etc/passwd
- /etc/group
- /etc/shadow

How to create a user?

- `useradd <user_name>`
- `useradd -g <group_name> -s /bin/bash -c "description" -m -d /home/<user_name> <user_name>`

```
[root@cs8 home]# useradd shan
[root@cs8 home]# ls
alex nick paul shan
[root@cs8 home]#
[root@cs8 home]# id shan
uid=1004(shan) gid=1004(shan) groups=1004(shan)
[root@cs8 home]# 

[root@cs8 home]# ls -ltr
total 8
drwx----- 4 alex QA    141 Jan  2 00:46 alex
drwx----- 5 nick QA   4096 Jan 20 14:47 nick
drwx----- 10 paul paul 4096 Feb 13 15:07 paul
drwx----- 3 shan shan   92 Feb 16 22:33 shan
[root@cs8 home]#
```

How to create a user?

- `useradd <user_name>`
- `useradd -g <group_name> -s /bin/bash -c "description" -m -d /home/<user_name> <user name>`

```
[root@cs8 home]# useradd -g QA -s /bin/bash -c "Part of QA Team" -m -d /
/home/victor victor
[root@cs8 home]#
[root@cs8 home]# id victor
uid=1005(victor) gid=1001(QA) groups=1001(QA)
[root@cs8 home]#
```

```
[root@cs8 home]# ls -ltr
total 8
drwx----- 4 alex    QA      141 Jan   2 00:46 alex
drwx----- 5 nick    QA      4096 Jan  20 14:47 nick
drwx----- 10 paul   paul    4096 Feb  13 15:07 paul
drwx----- 3 shan    shan    92  Feb  16 22:33 shan
drwx----- 3 victor  QA      92  Feb  16 22:37 victor
[root@cs8 home]#
```

How to delete a user?

- **userdel <name_of_user>**
- **userdel -r (will remove home directory)**
- **userdel -f (force delete even if the user is logged in)**

```
[root@cs8 home]# userdel -r victor
[root@cs8 home]# ls
alex  nick  paul  shan
[root@cs8 home]# id victor
id: 'victor': no such user
[root@cs8 home]#
```

How to modify a user?



To add user to a new group, but default group will remain same

usermod -G <group_name> <user_name>

To change the default group

usermod -g <group_name> <user_name>

```
[root@cs8 home]# id shan
uid=1004(shan) gid=1004(shan) groups=1004(shan)
[root@cs8 home]#
[root@cs8 home]# usermod -G QA shan
[root@cs8 home]#
[root@cs8 home]# id shan
uid=1004(shan) gid=1004(shan) groups=1004(shan),1001(QA)
[root@cs8 home]#
```

```
[root@cs8 home]#
[root@cs8 home]# less /etc/group
```

```
root:x:0:
bin:x:1:
daemon:x:2:
sys:x:3:
adm:x:4:
tty:x:5:
disk:x:6:
lp:x:7:
mem:x:8:
kmem:x:9:
wheel:x:10:paul
cdrom:x:11:
mail:x:12:postfix
man:x:15:
dialout:x:18:
floppy:x:19:
games:x:20:
tane:x:33:
```

```
[root@cs8 home]# ls -ltr
total 8
drwx----- 4 alex QA 141 Jan 2 00:46 alex
drwx----- 5 nick QA 4096 Jan 20 14:47 nick
drwx----- 10 paul paul 4096 Feb 13 15:07 paul
drwx----- 3 shan shan 92 Feb 16 22:33 shan
[root@cs8 home]#
```

How to modify a user?

⇒

To add user to a new group, but default group will remain same

usermod -G <group_name> <user_name>

To change the default group

usermod -g <group_name> <user_name>

```
[root@cs8 home]# usermod -g QA shan
[root@cs8 home]#
[root@cs8 home]# ls -ltr
total 8
drwx----- 4 alex QA 141 Jan 2 00:46 alex
drwx----- 5 nick QA 4096 Jan 20 14:47 nick
drwx----- 10 paul paul 4096 Feb 13 15:07 paul
drwx----- 3 shan QA 92 Feb 16 22:33 shan
[root@cs8 home]# █
```

Other usermod options:

-m -d /home/newfolder (to move the content of home folder to this new folder)



-p (we can use passwd command also)

-s shell type

-L -U (Lock/Unlock a user)

```
[root@cs8 home]# ls
alex nick paul shan
[root@cs8 home]# mkdir shan/myfolder
[root@cs8 home]#
[root@cs8 home]# usermod -m -d /home/shan_new shan
[root@cs8 home]# ls
alex nick paul shan_new
[root@cs8 home]# ls -ld shan_new/
drwx-----. 4 shan QA 108 Feb 16 22:47 shan_new/
[root@cs8 home]# ls -ld shan_new/myfolder/
drwxr-xr-x. 2 root root 6 Feb 16 22:47 shan_new/myfolder/
[root@cs8 home]# █

[root@cs8 home]# passwd shan
Changing password for user shan.
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: all authentication tokens updated successfully.
[root@cs8 home]# █
```

```
[shan@cs8 ~]$ 
[shan@cs8 ~]$ whoami
shan
[shan@cs8 ~]$ █
```

```
[paul@cs8 ~]$
[paul@cs8 ~]$ su - shan
Password:
█
```

Password:

```
#####
#                               #
#      Property of XYZ Group!      #
# Unauthorized access is prohibited #
#                               #
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

[shan@cs8 ~]\$ █

```
[root@cs8 home]#
[root@cs8 home]# usermod -L shan
[root@cs8 home]#
[root@cs8 home]# su - paul
█
```

```
#####
#                               #
#      Property of XYZ Group!      #
# Unauthorized access is prohibited #
#                               #
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

```
[paul@cs8 ~]$ █
```

```
[paul@cs8 ~]$ su - shan
Password:
su: Authentication failure
[paul@cs8 ~]$ █
```

```
[root@cs8 ~]#
[root@cs8 ~]# usermod -U shan
[root@cs8 ~]#
[root@cs8 ~]# su - paul
█
```

```
#####
#                               #
#      Property of XYZ Group!      #
# Unauthorized access is prohibited #
#                               #
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

[paul@cs8 ~]\$ █

```
[root@cs8 ~]#
[root@cs8 ~]# usermod -U shan
[root@cs8 ~]#
[root@cs8 ~]# su - paul
█
```

```
#####
#                               #
#      Property of XYZ Group!      #
# Unauthorized access is prohibited #
#                               #
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

[paul@cs8 ~]\$ █

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ su - shan  
Password: █
```

[root@cs8 ~]# su - paul

```
#####
#                               #
#      Property of XYZ Group!      #
# Unauthorized access is prohibited #
#                               #
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

```
[shan@cs8 ~]$  
[shan@cs8 ~]$ su -  
Password: █
```

How to create a group?

- **groupadd <group_name>**

```
[root@cs8 ~]#  
[root@cs8 ~]#  
[root@cs8 ~]# groupadd TEST  
[root@cs8 ~]# less /etc/group█
```

```
setroubleshoot:x:977:  
flatpak:x:976:  
named:x:25:  
gdm:x:42:  
gnome-initial-setup:x:975:  
sshd:x:74:  
postdrop:x:90:  
postfix:x:89:  
dovecot:x:97:  
dovenuull:x:974:  
slocate:x:21:  
tcpdump:x:72:  
paul:x:1000:  
QA:x:1001:luru,shan  
nginx:x:973:  
apache:x:48:  
shan:x:1004:  
TEST:x:1005:  
(END)
```

```
[root@cs8 ~]# groupdel TEST  
[root@cs8 ~]# less /etc/group
```

```
brlapi:x:978:  
setroubleshoot:x:977:  
flatpak:x:976:  
named:x:25:  
gdm:x:42:  
gnome-initial-setup:x:975:  
sshd:x:74:  
postdrop:x:90:  
postfix:x:89:  
dovecot:x:97:  
dovenull:x:974:  
slocate:x:21:  
tcpdump:x:72:  
paul:x:1000:  
QA:x:1001:luru,shan  
nginx:x:973:  
apache:x:48:  
shan:x:1004:  
(END)
```

```
[root@cs8 ~]#  
[root@cs8 ~]# useradd victor  
[root@cs8 ~]#  
[root@cs8 ~]# less /etc/passwd
```

```
root:x:0:0:root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
games:x:12:100:games:/usr/games:/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/sbin/nologin
dbus:x:81:81:System message bus:/:/sbin/nologin
systemd-coredump:x:999:997:systemd Core Dumper:/:/sbin/
systemd-resolve:x:193:193:systemd Resolver:/:/sbin/nologin
tss:x:59:59:Account used for TPM access:/dev/null:/sbin/nologin
polkitd:x:998:996:User for polkitd:/:/sbin/nologin
/etc/passwd
```

```
flatpak:x:979:976:User for flatpak system helper:/:/sbin/nologin
named:x:25:25:Named:/var/named:/bin/false
gdm:x:42:42::/var/lib/gdm:/sbin/nologin
gnome-initial-setup:x:978:975::/run/gnome-initial-setup:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
postfix:x:89:89::/var/spool/postfix:/sbin/nologin
dovecot:x:97:97:Dovecot IMAP server:/usr/libexec/dovecot:/sbin/nologin
dovenull:x:977:974:Dovecot's unauthorized user:/usr/libexec/dovecot:/sbin/nologin
tcpdump:x:72:72:::/sbin/nologin
paul:x:1000:1000:paul:/home/paul:/bin/bash
nick:x:1001:1001:Member of QA Team:/home/nick:/bin/bash
alex:x:1002:1001::/home/alex:/bin/bash
nginx:x:976:973:Nginx web server:/var/lib/nginx:/sbin/nologin
apache:x:48:48:Apache:/usr/share/httpd:/sbin/nologin
luru:x:1003:1001:Part of QA Team:/home/bawre:/bin/bash
shan:x:1004:1001::/home/shan_new:/bin/bash
victor:x:1005:1005::/home/victor:/bin/bash
(END)
```

```
[root@cs8 ~]#
[root@cs8 ~]# less /etc/shadow
```

```
gnome-initial-setup:!!!:19317::::::::::
sshd:!!!:19317::::::::::
postfix:!!!:19317::::::::::
dovecot:!!!:19317::::::::::
dovenuull:!!!:19317::::::::::
tcpdump:!!!:19317::::::::::
paul:$6$G.27p.ctG6RMGsTj$NwKzT4cMTbLBAbzWwzCTrJ8qvU44D8Ee1ycgrwopmlWTmX
q/dj88c1nyf.KE/YHJWzC1sC7MNm8gIXiaFAhDxe0:19317:0:99999:7:::
nick:$6$EtXLhwfVRanh ygHt$k0Jr7ob033MEH5dL03vT9Pzx1ty4.z808yQRsBSFcWqHs
OfVNo3xWE/uxeyzMXTToAnYsTk64YtFHHDr1gCMj0:0:0:99999:7:::
alex:$6$mXzcr1.BUqfmR1Fj$K3bWx33cdy9aMHFoFFe2t8cUiPSHwms hJ5qSbtzb cR6rv
Xehnzqep7iBuwYwLEVS01kyUHR0vQu6k6u7tM6zw.:0:0:99999:7:::
nginx:!!!:19381::::::::::
apache:!!!:19390::::::::::
luru:luru1:19404:0:99999:7:2:14195:
shan:$6$uhtW8rHamZGtyQqL$UDhu61UtBdz3qTNgHZbFbmONtfn
zM0hqaazWmlvh uwpBW B.RxS6.gVdFhkP8LL0306I:/19404:0:99
victor:!!!:19404:0:99999:7:::
(END)
```

Files

In files, we can check

- In a group how many users are added
- UserId GroupID HomeDIR and Shell Type, description about user
- In shadow file, when was last password changed, max day to expire etc

Linux Password Aging | Linux CHAGE Command

**LINUX
PASSWORD AGING**

Two ways to set the Password Aging options

- One time using 'chage' command
- Making default for every new user by making change in /etc/login.defs file

chage

```
chage [-m mindays] [-M maxdays] [-d lastday]
      [-I inactive] [-E expiredate] [-W warndays]
      user_name

-d Days since Jan 1, 1970 that password was last changed.
-m No. of days required a user is allowed to change
password
-M Max no. of days password is valid
-W No. of days before password expire, user will be warn
-I No. of days after password expire, account is disbable
-E Days since Jan 1, 1970 that password was last changed.
```

```
paul:$6$.n.:19317:0:99999:7:::
[--] [---] [---] - [---] ---
|   |   |   |   |||+-----> 9. Unused
|   |   |   |   ||+-----> 8. Expiration date
|   |   |   |   |+-----> 7. Inactivity period
|   |   |   |   +-----> 6. Warning period
|   |   |   +-----> 5. Maximum password age
|   |   |   +-----> 4. Minimum password age
|   |   +-----> 3. Last password change
|   +-----> 2. Encrypted Password
+-----> 1. Username
```

```
[root@cs8 ~]# id paul
uid=1000(paul) gid=1000(paul) groups=1000(paul),10(wheel)
[root@cs8 ~]#
```

```
[root@cs8 ~]# grep paul /etc/shadow  
paul:$6$G.27p.ctG6RMGsTj$NwKzT4cMTbLBAbzWWzCTrJ8qvU44D8Ee1ycgrwopmWTmX  
q/dj88c1nyf.KE/YHJWzC1sC7MNm8gIXiaFAhDxe0:19317:0:99999:7:::  
[root@cs8 ~]#
```

```
paul:$6$.n.:19317:0:99999:7:::  
[--] [---] [---] - [---] ---  
| | | | | |||+-----> 9. Unused  
| | | | | ||+-----> 8. Expiration date  
| | | | | +-----> 7. Inactivity period  
| | | | +-----> 6. Warning period  
| | | +-----> 5. Maximum password age  
| | +-----> 4. Minimum password age  
| +-----> 3. Last password change  
+-----> 2. Encrypted Password  
+-----> 1. Username  
[root@cs8 ~]# chage -M 90 -W 10 paul  
[root@cs8 ~]#  
[root@cs8 ~]# grep paul /etc/shadow  
paul:$6$G.27p.ctG6RMGsTj$NwKzT4cMTbLBAbzWWzCTrJ8qvU44D8Ee1ycgrwopmWTmX  
q/dj88c1nyf.KE/YHJWzC1sC7MNm8gIXiaFAhDxe0:19317:0:90:10:::  
[root@cs8 ~]#
```

File /etc/login.def

PASS_MAX_DAYS 90
PASS_MIN_DAYS 10
PASS_MIN_LEN 8
PASS_WARN_AGE 10

```
[root@cs8 ~]#  
[root@cs8 ~]# less /etc/login.defs
```

```
# Please note that the parameters in this configuration file control t
he
# behavior of the tools from the shadow-utils component. None of these
# tools uses the PAM mechanism, and the utilities that use PAM (such a
s the
# passwd command) should therefore be configured elsewhere. Refer to
# /etc/pam.d/system-auth for more information.
#
# *REQUIRED*
#   Directory where mailboxes reside, _or_ name of file, relative to t
he
#   home directory. If you _do_ define both, MAIL_DIR takes precedenc
e.
#   QMAIL_DIR is for Qmail
#
#QMAIL_DIR      Maildir
MAIL_DIR        /var/spool/mail
:■

HOME_MODE      0700

# Password aging controls:
#
#       PASS_MAX_DAYS    Maximum number of days a password may be used
#       PASS_MIN_DAYS    Minimum number of days allowed between passwo
d changes.
#       PASS_MIN_LEN     Minimum acceptable password length.
#       PASS_WARN_AGE    Number of days warning given before a passwor
expires.
#
PASS_MAX_DAYS  99999
PASS_MIN_DAYS  0
PASS_MIN_LEN   5
PASS_WARN_AGE  7

#
# Min/max values for automatic uid selection in userad
:
#
#       PASS_MIN_DAYS    Minimum number of days allowed between passwor
d changes.
#       PASS_MIN_LEN     Minimum acceptable password length.
#       PASS_WARN_AGE    Number of days warning given before a password
expires.
#
PASS_MAX_DAYS  99999
PASS_MIN_DAYS  0
PASS_MIN_LEN   5
PASS_WARN_AGE  7

#
# Min/max values for automatic uid selection in useradd
#
UID_MIN          1000
UID_MAX          60000
# System accounts
SYS_UID_MIN     201
:■
```

```
#  
# Min/max values for automatic uid selection in useradd  
#  
UID_MIN 1000  
UID_MAX 60000  
# System accounts  
SYS_UID_MIN 201  
SYS_UID_MAX 999  
  
#  
# Min/max values for automatic gid selection in groupadd  
#  
GID_MIN 1000  
GID_MAX 60000  
# System accounts  
SYS_GID_MIN 201  
SYS_GID_MAX 999  
:  
#  
#      PASS_MAX_DAYS   Maximum number of days a password may be used.  
#      PASS_MIN_DAYS   Minimum number of days allowed between password  
d changes.  
#      PASS_MIN_LEN    Minimum acceptable password length.  
#      PASS_WARN_AGE   Number of days warning given before a password  
expires.  
#  
PASS_MAX_DAYS 99999  
PASS_MIN_DAYS 0  
PASS_MIN_LEN 5  
PASS_WARN_AGE 7  
  
#  
# Min/max values for automatic uid selection in userad  
#  
UID_MIN 1000  
UID_MAX 60000
```

[root@cs8 ~]#

[root@cs8 ~]# vi /etc/login.defs █

```

# Password aging controls:
#
#      PASS_MAX_DAYS   Maximum number of days a password may be used.
#      PASS_MIN_DAYS   Minimum number of days allowed between password changes.
#      PASS_MIN_LEN    Minimum acceptable password length.
#      PASS_WARN_AGE   Number of days warning given before a password expires.
#
PASS_MAX_DAYS      99999
PASS_MIN_DAYS      0
PASS_MIN_LEN       5
PASS_WARN_AGE      7

#
# Min/max values for automatic uid selection in useradd
#
# Password aging controls:
#
#      PASS_MAX_DAYS   Maximum number of days a password may be used.
#      PASS_MIN_DAYS   Minimum number of days allowed between password changes.
#      PASS_MIN_LEN    Minimum acceptable password length.
#      PASS_WARN_AGE   Number of days warning given before a password expires.
#
PASS_MAX_DAYS      90
PASS_MIN_DAYS      10
PASS_MIN_LEN       8
PASS_WARN_AGE      10

#
# Min/max values for automatic uid selection in useradd
#
UID_MIN             1000
:wq

```

[root@cs8 ~]# useradd sham
[root@cs8 ~]#
[root@cs8 ~]# grep sham /etc/shadow
sham:!:19405:10:90:10:::
[root@cs8 ~]#

Linux SU and SUDO Commands | How to Give SUDO Access to a User using SUDOERS |

[sudo access to a user using sudoers. I'll also show you a simple way to create a sudo user on Fedora 8 using the wheel group. Finally, I'll explain what sudo is and how it works. If you're looking to learn more about the Linux SU and SUDO commands, then this video is for you! I'll be demonstrating how to give sudo access to a user, how to use sudoers to manage who has sudo access, and how to](#)

create a sudo user on Fedora 8. By the end of this video, you'll have a solid understanding of the Linux SU and SUDO commands and how to use them to your advantage!

How to switch or change user in Linux?
How to use su command in Linux?
How to exit from current user in Linux?
How to exit from current shell in Linux?
How we can use SUDO command to execute command as root?
What is sudo command?
How sudo command works?
What is sudoers in Linux?
What is visudo in Linux?
How to edit sudoers file in Linux?
What is wheel group in Linux?
How to give sudo access to a user in Linux?
How to create a sudo user?
How to give partial sudo permission to a user in Linux?
Troubleshoot Sudo issues

Timelines



SU & SUDO COMMANDS

Topics

- **How to switch a user?**
- **How to exit from current user?**
- **What is use of SUDO?**
- **How to provide a SUDO access to a user?**
- **What is visudo?**
- **Working with sudoers file**

How to change a user?

```
#su - <username>
```

```
#su <username>
```

```
[nick@cs8 ~]$  
[nick@cs8 ~]$ whoami  
nick  
[nick@cs8 ~]$ su - paul  
Password: █
```

```
# #  
# Property of XYZ Group! #  
# Unauthorized access is prohibited #  
# #  
#####
```

City: Mumbai
Country: India

HOSTNAME: cs8
OS: Redhat, 7.4
KERNEL: 3.10.0.693

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ whoami  
paul  
[paul@cs8 ~]$ █
```

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ pwd  
/home/paul  
[paul@cs8 ~]$ █
```

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ pwd  
/home/paul  
[paul@cs8 ~]$ ls  
countries.txt  file1          myfile      test.sh  
Documents       file5          myfile.tx  tmp  
fact           Linux_logo.jpg  pic1.jpg   tutorials  
[paul@cs8 ~]$ cd tutorials/  
[paul@cs8 tutorials]$ █
```

How to exit as a current user or shell?

#exit

What is SUDO?

Super User DO

It is a way to temporarily grant a user administrative rights.

```
[nick@cs8 ~]$  
[nick@cs8 ~]$ yum install nginx  
Error: This command has to be run with superuser privileges (under the root user on most systems).  
[nick@cs8 ~]$  
[nick@cs8 ~]$ sudo yum install nginx  
[sudo] password for nick:  
nick is not in the sudoers file. This incident will be reported  
.  
[nick@cs8 ~]$ █
```



```
[paul@cs8 ~]$  
[paul@cs8 ~]$ sudo yum install nginx  
[sudo] password for paul:  
Last metadata expiration check: 1:19:32 ago on Wednesday 15 March 2023 10:32:54 PM IST.  
█
```

**Details of sudo is present under
`/etc/sudoers`**

We can edit the above file using

#visudo

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ su -  
Password: █
```

```
[root@cs8 ~]#  
[root@cs8 ~]# less /etc/sudoers█
```

```
## Sudoers allows particular users to run various commands as
## the root user, without needing the root password.
##
## Examples are provided at the bottom of the file for collections
## of related commands, which can then be delegated out to particular
## users or groups.
##
## This file must be edited with the 'visudo' command.

## Host Aliases
## Groups of machines. You may prefer to use hostnames
## using
## wildcards for entire domains) or IP addresses instead
# Host_Alias      FILESERVERS = fs1, fs2
/etc/sudoers

Defaults    secure_path = /sbin:/bin:/usr/sbin:/usr/bin

## Next comes the main part: which users can run what software on
## which machines (the sudoers file can be shared between multiple
## systems).
## Syntax:
##
##       user      MACHINE=COMMANDS
##
## The COMMANDS section may have other options added to it.
##
## Allow root to run any commands anywhere
root      ALL=(ALL)          ALL

:#
root      ALL=(ALL)          ALL

## Allows members of the 'sys' group to run networking, software
## service management apps and more.
# %sys  ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE, DELEGATING
## PROCESSES, LOCATE, DRIVERS

## Allows people in group wheel to run all commands
%wheel    ALL=(ALL)          ALL

## Same thing without a password
# %wheel      ALL=(ALL)        NOPASSWD: ALL

## Allows members of the users group to mount and unmount
## cdrom as root
:#

```

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ id  
uid=1000(paul) gid=1000(paul) groups=1000(paul),10(wheel) context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023  
[paul@cs8 ~]$ █
```

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ su - nick  
Password: █
```

```
[nick@cs8 ~]$  
[nick@cs8 ~]$ id  
uid=1001(nick) gid=1001(QA) groups=1001(QA) context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023  
[nick@cs8 ~]$ █  
-----  
[root@cs8 ~]#  
[root@cs8 ~]# usermod -aG wheel nick  
[root@cs8 ~]#  
[root@cs8 ~]# id nick  
uid=1001(nick) gid=1001(QA) groups=1001(QA),10(wheel)  
[root@cs8 ~]#  
[root@cs8 ~]# su - nick  
█
```

```
[nick@cs8 ~]$ sudo yum install nginx  
[sudo] password for nick:  
Last metadata expiration check: 1:29:16 ago on Wednesday 15 March 2023 10:32:54 PM IST.  
█
```

```
[root@cs8 ~]#  
[root@cs8 ~]# id nick  
uid=1001(nick) gid=1001(QA) groups=1001(QA)  
[root@cs8 ~]# █
```

```
[root@cs8 ~]#  
[root@cs8 ~]# su - nick  
█
```

```
[nick@cs8 ~]$  
[nick@cs8 ~]$ updatedb  
updatedb: can not open a temporary file for '/var/lib/mlocate/ml  
ocate.db'  
[nick@cs8 ~]$ sudo updatedb  
nick is not in the sudoers file. This incident will be reported  
[nick@cs8 ~]$ █
```

```
[nick@cs8 ~]$ su -  
Password: █
```

```
[root@cs8 ~]#  
[root@cs8 ~]#  
[root@cs8 ~]# visudo█
```

```
## Sudoers allows particular users to run various commands as  
## the root user, without needing the root password.  
##  
## Examples are provided at the bottom of the file for collectio  
ns  
## of related commands, which can then be delegated out to parti  
cular  
## users or groups.  
##  
## This file must be edited with the 'visudo' command.  
  
## Host Aliases  
## Groups of machines. You may prefer to use hostn  
using  
## wildcards for entire domains) or IP addresses i  
# Host_Alias      FILESERVERS = fs1, fs2  
"/etc/sudoers.tmp" 120L, 4327C
```

```
## Command Aliases
## These are groups of related commands...

## Networking
# Cmnd_Alias NETWORKING = /sbin/route, /sbin/ifconfig, /bin/ping
, /sbin/dhcclient, /usr/bin/net, /sbin/iptables, /usr/bin/rfcomm,
/usr/bin/wvdial, /sbin/iwconfig, /sbin/mii-tool

## Installation and management of software
# Cmnd_Alias SOFTWARE = /bin/rpm, /usr/bin/up2date, /usr/bin/yum

## Services
# Cmnd_Alias SERVICES = /sbin/service, /sbin/chkconfig, /usr/bin
/systemctl start, /usr/bin/systemctl stop, /usr/bin
load, /usr/bin/systemctl restart, /usr/bin/systemct
r/bin/systemctl enable, /usr/bin/systemctl disable

## Installation and management of software
# Cmnd_Alias SOFTWARE = /bin/rpm, /usr/bin/up2date, /usr/bin/yum

## Services
# Cmnd_Alias SERVICES = /sbin/service, /sbin/chkconfig, /usr/bin
/systemctl start, /usr/bin/systemctl stop, /usr/bin/systemctl re
load, /usr/bin/systemctl restart, /usr/bin/systemctl status, /us
r/bin/systemctl enable, /usr/bin/systemctl disable

## Updating the locate database
#Cmnd_Alias LOCATE = /usr/bin/updatedb

## Storage
# Cmnd_Alias STORAGE = /sbin/fdisk, /sbin/sfdisk, /
/sbin/partprobe, /bin/mount, /bin/umount

# Cmnd_Alias SOFTWARE = /bin/rpm, /usr/bin/up2date, /usr/bin/yum

## Services
# Cmnd_Alias SERVICES = /sbin/service, /sbin/chkconfig, /usr/bin
/systemctl start, /usr/bin/systemctl stop, /usr/bin/systemctl re
load, /usr/bin/systemctl restart, /usr/bin/systemctl status, /us
r/bin/systemctl enable, /usr/bin/systemctl disable

## Updating the locate database
Cmnd_Alias LOCATE = /usr/bin/updatedb

## Storage
# Cmnd_Alias STORAGE = /sbin/fdisk, /sbin/sfdisk, /
/sbin/partprobe, /bin/mount, /bin/umount

## Delegating permissions
-- INSERT --
```

```
## systems).
## Syntax:
##
##      user      MACHINE=COMMANDS
##
## The COMMANDS section may have other options added to it.
##
## Allow root to run any commands anywhere
root    ALL=(ALL)        ALL
nick    ALL=LOCATE

## Allows members of the 'sys' group to run networking, software
',
## service management apps and more.
# %sys ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE
, PROCESSES, LOCATE, DRIVERS
:|]

[root@cs8 ~]# visudo
[root@cs8 ~]# |
```



```
[root@cs8 ~]#
[root@cs8 ~]# su - nick|
```

```
[nick@cs8 ~]$
[nick@cs8 ~]$ sudo updatedb
[sudo] password for nick:
[nick@cs8 ~]$
[nick@cs8 ~]$ sudo yum install nginx
Sorry, user nick is not allowed to execute '/bin/yum install nginx'
as root on cs8.
[nick@cs8 ~]$ |
```

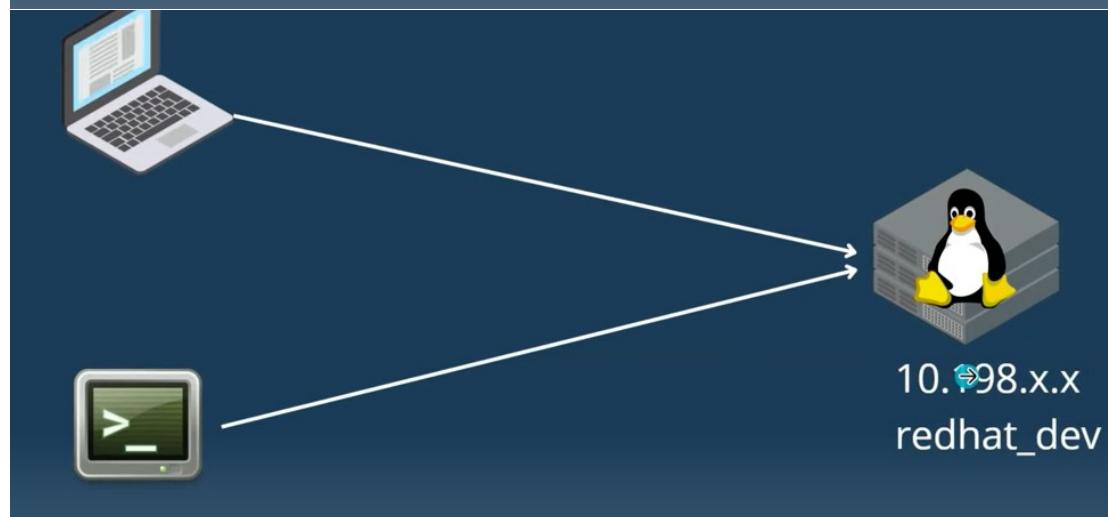
Learn Linux SSH Basics - How to Connect to a Server | Linux SSH Tutorial Part-1

At the end of the video?

- What is SSH?
- Why it is called SSH?
- Some basics of SSH
- How to use SSH in Linux?
- Example of SSH
 - Access Linux server using Putty
 - Access a Linux server from another server

What is SSH?

SSH or Secure Shell is a **network communication protocol** that enables two computers/devices to communicate and share data.



Why it is called as secure shell?

Because communication between host and client will be in encrypted format.

More about SSH

The default port for SSH client connections is 22

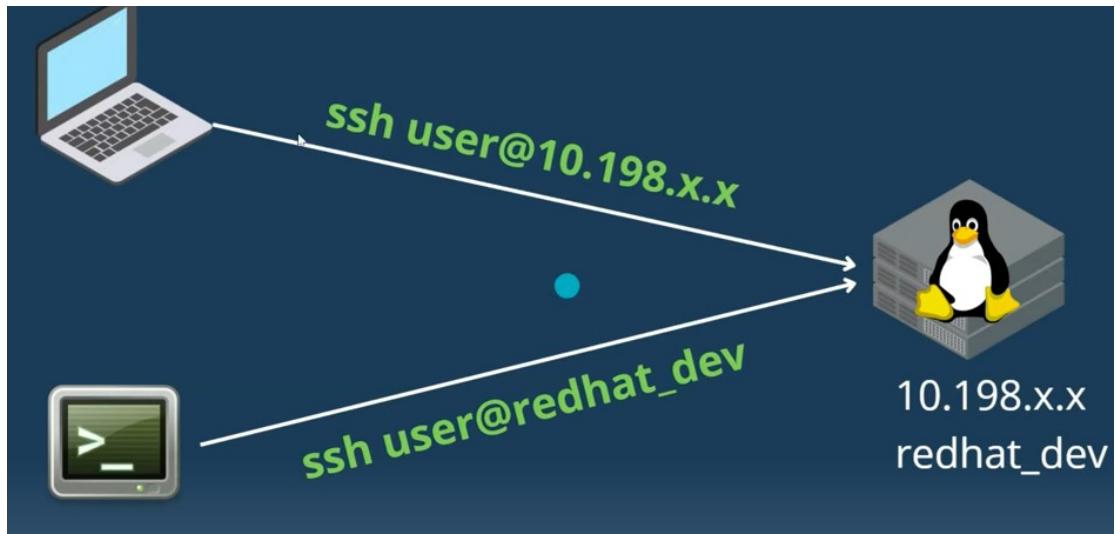
We can change the default port and use one between 1024 and 32,767

More about SSH

SSH is also a command in Linux

It is used to access an another Linux server or accessing a Linux server from a terminal.

Syntax: **ssh user_name@host(IP/Domain_name)**



How to use SSH?

To use SSH, ssh service must be installed on Linux server

You can check using



rpm -qa | grep ssh, or

check the file **/etc/ssh/sshd_config**

If not already installed then install below two

install openssh-clients openssh-server

and now enable the ssh or check if it is enabled using

systemctl status sshd

```
[paul@centosvm ~]$  
[paul@centosvm ~]$ file /etc/ssh/sshd_config  
/etc/ssh/sshd_config: regular file, no read permission  
[paul@centosvm ~]$  
[paul@centosvm ~]$  
[paul@centosvm ~]$ rpm -qa | grep ssh  
libssh-config-0.9.4-3.el8.noarch  
openssh-clients-8.0p1-10.el8.x86_64  
openssh-askpass-8.0p1-10.el8.x86_64  
qemu-kvm-block-ssh-4.2.0-59.module_el8.5.0+1063+c9b9feff.1.x86_64
```

```
[paul@centosvm ~]$ systemctl status sshd
● sshd.service - OpenSSH server daemon
   Loaded: loaded (/usr/lib/systemd/system/sshd.service; enabled; v
   Active: active (running) since Sat 2022-09-03 16:40:52 EDT; 21h a
     Docs: man:sshd(8)
           man:sshd_config(5)
 Main PID: 1099 (sshd)
   Tasks: 1 (limit: 11090)
  Memory: 2.3M
    CGroup: /system.slice/sshd.service
            └─1099 /usr/sbin/sshd -D -oCiphers=aes256-gcm@openssh.com

Sep 03 16:40:51 centosvm systemd[1]: Starting OpenSSH server daemon
Sep 03 16:40:52 centosvm sshd[1099]: Server listening on 0.0.0.0 port
Sep 03 16:40:52 centosvm sshd[1099]: Server listening on :: port 22
Sep 03 16:40:52 centosvm systemd[1]: Started OpenSSH server daemon.
Sep 03 16:41:43 centosvm sshd[2443]: Accepted password for paul from
Sep 03 16:41:43 centosvm sshd[2443]: pam_unix(sshd:session): session
Sep 03 16:50:57 centosvm sshd[2869]: Accepted password for paul from
Sep 03 16:50:57 centosvm sshd[2869]: pam_unix(sshd:session): session
Sep 04 13:09:40 centosvm sshd[18303]: Accepted password for paul f
Sep 04 13:09:41 centosvm sshd[18303]: pam_unix(sshd:session): ses
lines 1-21/21 (END)
```

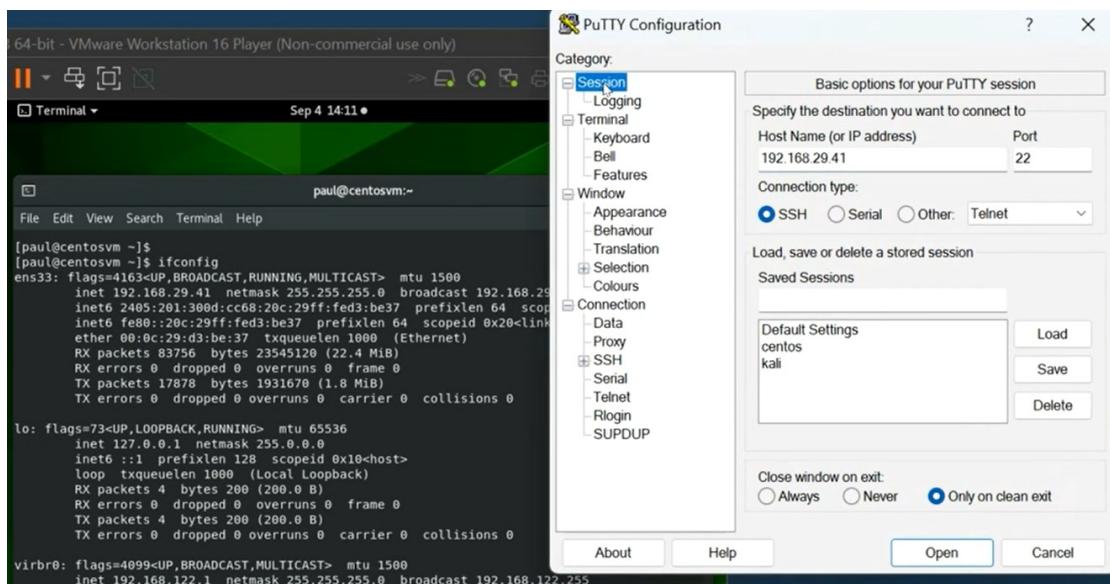
Examples

- Example of SSH
 - Access Linux server using Putty
 - Access a Linux server from another server

```
[paul@centosvm ~]$ [paul@centosvm ~]$ ifconfig ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.29.41 brd 192.168.29.255 netmask 255.255.255.0 broadcast 192.168.29.255
inet6 2405:201:300d:cc68:20c:29ff:fed3:be37 brd fe80::20c:29ff:fed3:be37/64 prefixlen 64 scopeid 0x20<link>
inet6 fe80::20c:29ff:fed3:be37 brd fe80::20c:29ff:fed3:be37/64 prefixlen 64 scopeid 0x20<link>
ether 00:0c:29:d3:be:37 txqueuelen 1000 (Ethernet)
RX packets 83756 bytes 23545120 (22.4 MiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 17878 bytes 1931670 (1.8 MiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 brd 127.0.0.1 netmask 255.0.0.0 broadcast 127.0.0.1
inet6 ::1 brd ::1 netmask 128 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
RX packets 4 bytes 200 (200.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 4 bytes 200 (200.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
inet 192.168.122.1 brd 192.168.122.255 netmask 255.255.255.0 broadcast 192.168.122.255
ether 52:54:00:7a:2a:f0 txqueuelen 1000 (Ethernet)
```

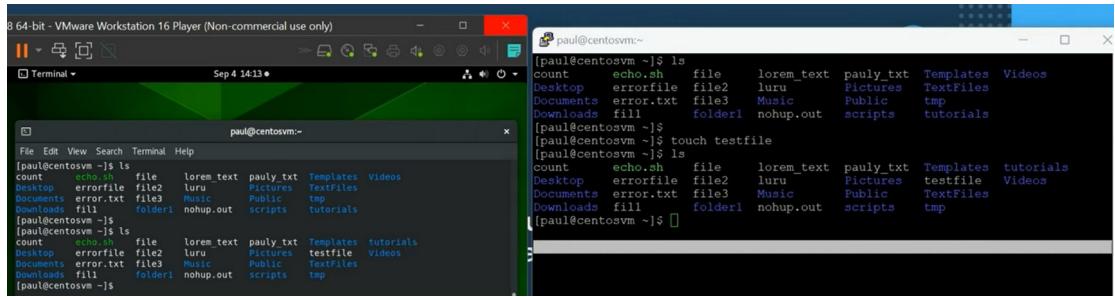


```
14:12 ● paul@centosvm:~$ login as: paul
paul@192.168.29.41's password:
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Sun Sep 4 13:32:47 2022
[paul@centosvm ~]$ [paul@centosvm ~]$ [paul@centosvm ~]$
```



```
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.29.41 brd 192.168.29.255 netmask 255.255.255.0 broadcast 192.168.29.255
inet6 2405:201:300d:cc68:20c:29ff:fed3:be37 brd fe80::20c:29ff:fed3:be37/64 prefixlen 64 scopeid 0x20<link>
inet6 fe80::20c:29ff:fed3:be37 brd fe80::20c:29ff:fed3:be37/64 prefixlen 64 scopeid 0x20<link>
ether 00:0c:29:d3:be:37 txqueuelen 1000 (Ethernet)
RX packets 83756 bytes 23545120 (22.4 MiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 17878 bytes 1931670 (1.8 MiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



The image shows two terminal windows side-by-side. Both are running on a CentOS VM, indicated by the prompt [paul@centosvm ~]. The left window shows a series of 'ls' commands being run, listing files and folders such as 'echo.sh', 'file', 'lorem_text', 'pauly.txt', 'Templates', 'Videos', 'Desktop', 'errorfile', 'file2', 'luru', 'Pictures', 'Textfiles', 'Documents', 'error.txt', 'file3', 'Music', 'Public', 'tmp', 'Downloads', 'fill', 'folder1', 'nohup.out', 'scripts', and 'tutorials'. The right window shows similar commands being run, including 'touch testfile' and another 'ls' command, resulting in a list identical to the left window's output.

How to SSH Login Without a Password on a Linux Server

More about SSH

There are two ways to access the remote server

- Using password
- Without password (by passing the SSH key)

How to access remote server without password?

If you frequently access the server then its good idea to configure your ssh keys so that you can login without password.

Follow the steps below

1. Generate A New SSH Key Pair on Local Machine.
2. Copy Public Key to Remote Machine.
3. Login to Remote Server without password

ssh-keygen

ssh-copy-id

Step1: Generate an SSH key using
ssh-keygen

You can check the generated keys using
ls -l .ssh
cat ~/.ssh/id_rsa.pub

CentosVm ----- Kali Linux

```
paul@centosvm ~]$  
paul@centosvm ~]$  
paul@centosvm ~]$ ifconfig  
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
inet 192.168.29.115 netmask 255.255.255.0 broadcast 192.168.29.255  
inet6 fe80::20c:29ff:fe11:71b0 prefixlen 64 scopeid 0x20<link>  
inet6 2405:201:300d:cc68:14f4:172a:8633:be4 prefixlen 64 scopeid 0x0<global>  
inet6 2405:201:300d:cc68:20c:29ff:fe11:71b0 prefixlen 64 scopeid 0x0<global>  
inet6 2405:201:300d:cc68:63e7:443f:2cc0:91e3 prefixlen 64 scopeid 0x0<global>  
ether 00:0c:29:11:71:b0 txqueuelen 1000 (Ethernet)  
RX packets 92432 bytes 8804825 (8.3 MiB)  
RX errors 0 dropped 0 overruns 0 frame 0  
TX packets 25948 bytes 2735449 (2.6 MiB)  
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
paul@centosvm ~]$ ssh kali@192.168.29.115  
The authenticity of host '192.168.29.115 (192.168.29.115)' can't be established.  
ECDSA key fingerprint is SHA256:PdSsOECZmdmQiENDoMAJS7Oed4rLWLugBulRdugxks.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.29.115' (ECDSA) to the list of known hosts.  
ali@192.168.29.115's password:  
Linux kali 5.16.0-kali7-amd64 #1 SMP PREEMPT Debian 5.16.8-1kali1 (2022-04-01) x86_64  
  
The programs included with the Kali GNU/Linux system are free software;  
the exact distribution terms for each program are described in the individual files in /usr/share/doc/*/*copyright.  
  
ali GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.  
last login: Mon Sep 5 19:29:03 2022 from 192.168.29.41
```

```
[paul@centosvm ~]$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/paul/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/paul/.ssh/id_rsa.
Your public key has been saved in /home/paul/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:EdGLtj0qlFMVzi5GT/JlusmGl+TY8LzFMzwNBkM8FvU paul@centosvm
The key's randomart image is:
+---[RSA 3072]---+
|      o+++. |
|      =* .   |
|    ++*oo E  |
|    .+B.*    |
|    +So* o   |
|    +..%oB o  |
|    . .o.%B . |
|    . .o o +  |
paul@centosvm ~]$ ls .ssh
id_rsa  id_rsa.pub  known_hosts
paul@centosvm ~]$
```

Step2: Copy your public SSH key to remote server,
(on remote server it is copied under
~/ssh/authorizedkeys file)

ssh-copy-id root@192.168...

```
[paul@centosvm ~]$ [paul@centosvm ~]$ ssh-copy-id kali@192.168.29.115  
/usr/bin/ssh-copy-id: INFO: Source of key(s) to bTo exit full screen,  
led: "/home/paul/.ssh/id_rsa.pub"  
/usr/bin/ssh-copy-id: INFO: attempting to log in with the  
new key(s), to filter out any that are already installed  
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be install  
ed -- if you are prompted now it is to install the new ke  
ys  
kali@192.168.29.115's password:  
  
Number of key(s) added: 1  
  
Now try logging into the machine, with: "ssh 'kali@192.  
168.29.115'"  
and check to make sure that only the key(s) you wanted we  
re added.  
[paul@centosvm ~]$
```

What is SUID and SGID in Linux?

What is SUID?

The special permission for the user.

A file with SUID set always executes as the user who
owns the file, regardless of the user executing the
command.

show as 's' or 'S'

Example of SUID?

rwsr-xr-x. 1 root root 33424 Feb 18 2022 /usr/bin/passw

How to set/unset SUID?

- `chmod u+s <file_name>`
- `chmod u-s <file_name>`

```
[root@centos8 ~]#  
[root@centos8 ~]# ls -l /usr/bin/passwd  
-rwsr-xr-x. 1 root root 33424 Feb 18 2022 /usr/bin/passwd  
[root@centos8 ~]# su - paul  
[paul@centos8 ~]$ █
```

```
[root@centos8 ~]#  
[root@centos8 ~]# find / -perm /u=s  
find: '/proc/459608/task/459608/fd/5': No such file or directory  
find: '/proc/459608/task/459608/fdinfo/5': No such file or directory  
find: '/proc/459608/fd/6': No such file or directory  
find: '/proc/459608/fdinfo/6': No such file or directory  
find: '/run/user/1000/gvfs': Permission denied  
█
```

```
/usr/bin/crontab  
/usr/bin/sudo  
/usr/bin/vmware-user-suid-wrapper  
/usr/bin/passwd  
/usr/bin/chfn  
/usr/bin/chsh  
/usr/bin/at  
/usr/bin/user_check.sh  
/usr/sbin/grub2-set-bootflag  
/usr/sbin/pam_timestamp_check  
/usr/sbin/unix_chkpwd  
/usr/sbin/mount.nfs  
/usr/lib/polkit-1/polkit-agent-helper-1  
/usr/libexec/spice-gtk-x86_64/spice-client-glib-  
/usr/libexec/cockpit-session  
/usr/libexec/dbus-1/dbus-daemon-launch-helper  
/usr/libexec/Xorg.wrap
```

```
[root@centos8 ~]# su - paul
```

```
[paul@centos8 ~]$  
[paul@centos8 ~]$  
[paul@centos8 ~]$ ls -l /root  
ls: cannot open directory '/root': Permission denied  
[paul@centos8 ~]$  
[paul@centos8 ~]$ ls -l /usr/bin/ls  
-rwxr-xr-x. 1 root root 143248 Oct 15 10:41 /usr/bin/ls  
[paul@centos8 ~]$
```

```
# change the perm @ root
```

```
-----  
[root@centos8 ~]# chmod u+s /usr/bin/ls  
[root@centos8 ~]# su - paul  
[paul@centos8 ~]$
```

```
[paul@centos8 ~]$ ls -l /root
total 8
-rw-----. 1 root root 1003 Nov 21 18:38 anaconda-ks.cfg
-rw-r--r--. 1 root root 1282 Nov 21 18:42 initial-setup-ks.cfg
[paul@centos8 ~]$
[paul@centos8 ~]$ ls -l /usr/bin/ls
-rwsr-xr-x. 1 root root 143248 Oct 15 10:41 /usr/bin/ls
[paul@centos8 ~]$
```

What is SGID?

If set on a file, it allows the file to be executed as the group that owns the file.

If set on a directory, any files created in the directory will have their group ownership set to the directory owner.

What is SGID?

It is also especially useful for directories that are often used in collaborative efforts between members of a group.

Any member of the group can access any new file.

How to set/unset GUID?

- `chmod g+s <file_name>`
- `chmod g-s <file_name>`

```
[nick@centos8 tmp]$ id
uid=1001(nick) gid=1001(QA) groups=1001(QA) context=unconfined
_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
[nick@centos8 tmp]$
```

```
[root@RHEL-10:~# id  
uid=0(root) gid=0(root) groups=0(root) context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023  
root@RHEL-10:~# exit  
logout  
siddhartha@RHEL-10:~$ id  
uid=1000(siddhartha) gid=1000(siddhartha) groups=1000(siddhartha),10(wheel) context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023  
siddhartha@RHEL-10:~$ █
```

```
[nick@centos8 tmp]$ mkdir qa_configs  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxr-xr-x. 2 nick QA 6 Jan  3 00:37 qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ chmod 777 qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxrwx. 2 nick QA 6 Jan  3 00:37 qa_configs/  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$ su - paul  
Password:  
[paul@centos8 ~]$ █
```

```
[paul@centos8 ~]$ id  
uid=1000(paul) gid=1000(paul) groups=1000(paul),10(wheel) context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023  
[paul@centos8 ~]$ █
```

```
[paul@centos8 ~]$  
[paul@centos8 ~]$ cd /tmp/qa_configs/  
[paul@centos8 qa_configs]$ █
```

```
[paul@centos8 qa_configs]$  
[paul@centos8 qa_configs]$ touch paul_file  
[paul@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan  3 00:38 paul_file  
[paul@centos8 qa_configs]$ █
```

```
# come back to nick
```

```
[nick@centos8 tmp]$  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxrwx. 2 nick QA 23 Jan 3 00:38 qa_configs/  
[nick@centos8 tmp]$ cd qa_configs/  
[nick@centos8 qa_configs]$ █
```

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 3 00:38 paul_file  
[nick@centos8 qa_configs]$ █
```

nick want to change the existing file paul created

```
[nick@centos8 qa_configs]$ vi paul_file █
```

```
--  
~  
~  
~  
-- INSERT -- W10: Warning: Changing a readonly  
Press ENTER or type command to continue █
```

now set for SGID

```
[nick@centos8 tmp]$ chmod g+s qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwsrwx. 2 nick QA 23 Jan 3 00:38 qa_configs/  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$ su - paul  
Password:  
[paul@centos8 ~]$ █
```

```
[paul@centos8 ~]$  
[paul@centos8 ~]$ cd /tmp/qa_configs/  
[paul@centos8 qa_configs]$  
[paul@centos8 qa_configs]$ touch paul_file2  
[paul@centos8 qa_configs]$ exit  
logout  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ cd qa_configs/  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan  3 00:38 paul_file  
-rw-rw-r--. 1 paul QA    0 Jan  3 00:41 paul_file2  
[nick@centos8 qa_configs]$ su -  
Password:  
[root@centos8 ~]# cd /tmp/qa_configs/  
[root@centos8 qa_configs]# touch root_file  
[root@centos8 qa_configs]# exit  
logout  
[nick@centos8 qa_configs]$ █
```

Even root user .. assigned in QA

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan  3 00:38 paul_file  
-rw-rw-r--. 1 paul QA    0 Jan  3 00:41 paul_file2  
-rw-r--r--. 1 root QA    0 Jan  3 00:42 root_file  
[nick@centos8 qa_configs]$ █
```

```
[nick@centos8 qa_configs]$ vi paul_file2
[nick@centos8 qa_configs]$ cat paul_file2
HI Paul
[nick@centos8 qa_configs]$ █
```

Linux Sticky Bit

What is RESTRICTED DELETION FLAG OR STICKY BIT?

Only file owner, directory owner can delete or rename a file or directory.

show as 't' or 'T'

```
[nick@centos8 ~]$ id
uid=1001(nick) gid=1001(QA) groups=1001(QA) context=unconfined_u:u
nconfined_r:unconfined_t:s0-s0:c0.c1023
[nick@centos8 ~]$ █
```

```
[nick@centos8 ~]$
[nick@centos8 ~]$ cd /tmp/
[nick@centos8 tmp]$ mkdir qa_configs
[nick@centos8 tmp]$ ls -ld qa_configs/
drwxr-xr-x. 2 nick QA 6 Dec 30 01:03 qa_configs/
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$ chmod g+w qa_configs/
[nick@centos8 tmp]$ 
[nick@centos8 tmp]$ ls -ld qa_configs/
drwxrwxr-x. 2 nick QA 6 Dec 30 01:03 qa_configs/
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ cd qa_configs/  
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ touch nick_file  
[nick@centos8 qa_configs]$ ls  
nick_file  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-r--r--. 1 nick QA 0 Dec 30 01:05 nick_file  
[nick@centos8 qa_configs]$ █
```

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ su - alex  
Password: █
```

```
[alex@centos8 ~]$ id  
uid=1002(alex) gid=1001(QA) groups=1001(QA) context=unconfined_u:u  
nconfined_r:unconfined_t:s0-s0:c0.c1023  
[alex@centos8 ~]$ █
```

```
# Alex deleted Nick file  
[alex@centos8 ~]$  
[alex@centos8 ~]$ cd /tmp/qa_configs/  
[alex@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-r--r--. 1 nick QA 0 Dec 30 01:05 nick_file  
[alex@centos8 qa_configs]$  
[alex@centos8 qa_configs]$ rm nick_file  
rm: remove write-protected regular empty file 'nick_file'? y  
[alex@centos8 qa_configs]$ ls -ltr  
total 0  
[alex@centos8 qa_configs]$ █
```

As qa_configs- has below perm

```
[alex@centos8 qa_configs]$  
[alex@centos8 qa_configs]$ cd ..  
[alex@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-x. 2 nick QA 6 Dec 30 01:07 qa_configs/  
[alex@centos8 tmp]$ █
```

To resolve the issue we use Sticky bit

Go to nick

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ cd ..  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-x. 2 nick QA 6 Dec 30 01:07 qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$ chmod o+t qa_configs/  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-t. 2 nick QA 6 Dec 30 01:07 qa_configs/  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ touch nick_file  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-r--r--. 1 nick QA 0 Dec 30 01:09 nick_file  
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ su -  
Password:  
[nick@centos8 qa_configs]$ su - alex  
Password: █
```

now check wjith Alex , as nick created a file

```
[alex@centos8 ~]$  
[alex@centos8 ~]$ cd /tmp/qa_configs/  
[alex@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-r--r--. 1 nick QA 0 Dec 30 01:09 nick_file  
[alex@centos8 qa_configs]$  
[alex@centos8 qa_configs]$ rm nick_file  
rm: remove write-protected regular empty file 'nick_file'? y  
rm: cannot remove 'nick_file': Operation not permitted  
[alex@centos8 qa_configs]$ █
```

now go to nick , he has right to delete the file

```
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ ls -ltr  
total 0  
-rw-r--r--. 1 nick QA 0 Dec 30 01:09 nick_file  
[nick@centos8 qa_configs]$  
[nick@centos8 qa_configs]$ rm nick_file  
[nick@centos8 qa_configs]$ ls  
[nick@centos8 qa_configs]$ █
```

Capital T - now in nick user .. rm current sticky bit + exe perm

```
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-t. 2 nick QA 6 Dec 30 01:10 qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ chmod o-t qa_configs/  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-x. 2 nick QA 6 Dec 30 01:10 qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ chmod o-x qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr--. 2 nick QA 6 Dec 30 01:10 qa_configs/  
[nick@centos8 tmp]$ █
```

```
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ chmod o+t qa_configs/  
[nick@centos8 tmp]$  
[nick@centos8 tmp]$ ls -ld qa_configs/  
drwxrwxr-T. 2 nick QA 6 Dec 30 01:10 qa_configs/  
[nick@centos8 tmp]$
```

How to Change Default Permission in Linux with UMASK



```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ ls  
[paul@cs8 permissions]$ touch file1  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
[paul@cs8 permissions]$
```

HOW TO CHECK CURRENT DEFAULT PERMISSION?

umask

output: 0022 or 0002

```
# octal /. numeric perm - 002
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask  
0002  
[paul@cs8 permissions]$ █
```

PERMISSION WILL BE....

Permission = 0777 - 0022 = 0755

A	B →	C
Number	Permisison Type	Symbol
0	No Permission	---
1	Execute	--x
2	Write	-w-
3	Execute + Write	-wx
4	Read	r--
5	Read + Execute	r-x
6	Read + Write	rw-
7	Read + Write + Execute	rwx

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ umask -S  
u=rwx,g=rwx,o=x  
[paul@cs8 ~]$ █
```

How to Change Default permissions

SYNTAX OF **UMASK**

umask u+rw,g+w,o+wx

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask  
0002  
[paul@cs8 permissions]$ umask u+rw,g+rw,o-r  
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask  
0006  
[paul@cs8 permissions]$ touch file2  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
[paul@cs8 permissions]$ █
```

```
[paul@cs8 permissions]$ touch file3  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
[paul@cs8 permissions]$ █
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ exit  
logout  
[root@cs8 ~]# su - paul  
[paul@cs8 ~]$ █
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask  
0002  
[paul@cs8 permissions]$ touch file4  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
[paul@cs8 permissions]$ █
```

when You exit & login the perm is change back to default

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask  
0002  
[paul@cs8 permissions]$ touch file4  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
[paul@cs8 permissions]$ █
```

TO CHANGE DEFAULT PERMISSION PERMANENTLY..

Add the permission in .bashrc
file.

```
[paul@cs8 permissions]$
```

```
[paul@cs8 permissions]$ less /etc/bashr
```

```
# /etc/bashrc

# System wide functions and aliases
# Environment stuff goes in /etc/profile

# It's NOT a good idea to change this file unless you know what you
# are doing. It's much better to create a custom.sh shell script in
# /etc/profile.d/ to make custom changes to your environment, as this
# will prevent the need for merging in future updates.

# Prevent doublesourcing
if [ -z "$BASHRCSCOURCED" ]; then
    BASHRCSCOURCED="Y"

    # are we an interactive shell?
    if [ "$PS1" ]; then
        if [ -z "$PROMPT_COMMAND" ]; then
            case $TERM in
                /umask
                    # By default, we want umask to get set. This sets it for non-login
                    # shell.
                    # Current threshold for system reserved uid/gids is 200
                    # You could check uidgid reservation validity in
                    # /usr/share/doc/setup-*/uidgid file
                    if [ $UID -gt 199 ] && [ `'/usr/bin/id -gn` = `'/usr/bin/id -un`" ]
                ); then
                    umask 002
                else
                    umask 022
                fi

                SHELL=/bin/bash
                # Only display echos from profile.d scripts if
            ll
                # and interactive - otherwise just process them
                for i in /etc/profile.d/*.sh; do
                    if [ -r "$i" ]; then
                :
```

```
[paul@cs8 permissions]$
```

```
[paul@cs8 permissions]$ cd
```

```
[paul@cs8 ~]$
```

```
#ls -la
```

```
#  
drwx----- 11 paul paul 4096 Nov 21 18:45 .config  
-rwxrwxrwx. 1 paul paul 1280 Dec 28 13:33 countries.txt  
drwxr-xr-x. 2 paul paul 6 Nov 21 18:44 Documents  
-rw----- 1 paul paul 16 Nov 21 18:44 .esd_auth  
-rw-rw-r--. 1 paul paul 202 Jan 12 14:05 fact  
-rw-rw-r--. 1 paul paul 59 Jan 8 14:52 file1  
-rw----- 1 paul paul 930 Dec 8 13:57 .ICEauthority  
-rw----- 1 paul paul 50 Jan 18 22:06 .lessht  
drwx----- 3 paul paul 19 Nov 21 18:44 .local  
drwxr-xr-x. 4 paul paul 39 Nov 21 18:03 .mozilla  
-rw-rw-r--. 1 paul paul 21 Jan 17 17:57 myfile  
drwxrw---- 3 paul paul 19 Nov 21 18:44 .pki  
-rw-rw-r--. 1 paul paul 0 Dec 13 18:13 .testfile  
-rwxrw-r--. 1 paul paul 70 Jan 1 23:30 test.sh  
drwxrwxr-x. 2 paul paul 48 Nov 29 01:17 tmp  
drwxrwxr-x. 10 paul paul 125 Jan 18 21:54 tutorial:  
-rw----- 1 paul paul 15583 Jan 18 22:06 .viminfo  
-rw-rw-r--. 1 paul paul 169 Jan 5 16:35 .wget-hst  
[paul@cs8 ~]$ █
```

Vi .bashrc

```
.bashrc  
  
# Source global definitions  
if [ -f /etc/bashrc ]; then  
    . /etc/bashrc  
fi  
  
# User specific environment  
if ! [[ "$PATH" =~ "$HOME/.local/bin:$HOME/bin:" ]]  
then  
    PATH="$HOME/.local/bin:$HOME/bin:$PATH"  
fi  
export PATH  
  
# Uncomment the following line if you don't like seeing  
# the shell prompt on each command line.  
# export SYSTEMD_PAGER=  
  
".bashrc" 18L, 376C
```

```
. /etc/bashrc
fi

# User specific environment
if ! [[ "$PATH" =~ "$HOME/.local/bin:$HOME/bin:" ]]
then
    PATH="$HOME/.local/bin:$HOME/bin:$PATH"
fi
export PATH

# Uncomment the following line if you don't like systemctl's auto-paging feature:
# export SYSTEMD_PAGER=

# User specific aliases and functions
```

```
umask 0-r
:woq
```

```
[paul@cs8 ~]$ source .bashrc
[paul@cs8 ~]$ umask
0006
[paul@cs8 ~]$
```

```
[paul@cs8 ~]$
[paul@cs8 ~]$ touch file5
[paul@cs8 ~]$ ls -ltr
total 20
drwxr-xr-x.  2 paul paul      6 Nov 21 18:44 Documents
drwxrwxr-x.  2 paul paul     48 Nov 29 01:17 tmp
-rwxrwxrwx.  1 paul paul 1280 Dec 28 13:33 countries.txt
-rwxrw-r--.  1 paul paul     70 Jan  1 23:30 test.sh
-rw-rw-r--.  1 paul paul     59 Jan  8 14:52 file1
-rw-rw-r--.  1 paul paul   202 Jan 12 14:05 fact
-rw-rw-r--.  1 paul paul    21 Jan 17 17:57 myfile
drwxrwxr-x. 10 paul paul   125 Jan 18 21:54 tutorials
rw-rw----.  1 paul paul      0 Jan 18 22:08 file5
[paul@cs8 ~]$
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
[paul@cs8 permissions]$ touch file5  
[paul@cs8 permissions]$ touch file6  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file5  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file6  
[paul@cs8 permissions]$ █
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ exit  
logout  
[root@cs8 ~]# su - paul  
[paul@cs8 ~]$ █
```

```
[paul@cs8 ~]$  
[paul@cs8 ~]$ umask  
0006  
[paul@cs8 ~]$ █
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ ls -ltr  
total 0  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file5  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file6  
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ mkdir folder1  
[paul@cs8 permissions]$ █
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ ls -lt  
total 0  
drwxrwx--x. 2 paul paul 6 Jan 18 22:34 folder1  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file6  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file5  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ umask 0-x█
```

```
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ mkdir folder2  
[paul@cs8 permissions]$  
[paul@cs8 permissions]$ ls -lt  
total 0  
drwxrwx---. 2 paul paul 6 Jan 18 22:35 folder2  
drwxrwx--x. 2 paul paul 6 Jan 18 22:34 folder1  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file6  
-rw-rw----. 1 paul paul 0 Jan 18 22:08 file5  
-rw-rw-r--. 1 paul paul 0 Jan 18 22:04 file4  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file3  
-rw-rw----. 1 paul paul 0 Jan 18 22:03 file2  
-rw-rw-r--. 1 paul paul 0 Jan 18 21:58 file1  
[paul@cs8 permissions]$ █
```

Linux Chown, Chgrp Command | Linux File Ownership Command

chown: To change user ownership

chgrp: To change group ownership

```
paul@centosvm ~]$  
paul@centosvm ~]$  
paul@centosvm ~]$ cd /tmp/  
paul@centosvm tmp]$  
paul@centosvm tmp]$ touch testfile  
paul@centosvm tmp]$  
paul@centosvm tmp]$ ls -l testfile  
paul@centosvm tmp]$ ls -l testfile  
-rw-rw-r--. 1 paul paul 0 Jun 9 16:31 testfile  
paul@centosvm tmp]$  
paul@centosvm tmp]$ █
```

```
[nick@centosvm ~]$  
[nick@centosvm ~]$  
[nick@centosvm ~]$  
[nick@centosvm ~]$ cd /tmp/  
[nick@centosvm tmp]$  
[nick@centosvm tmp]$ ls -l testfile  
[nick@centosvm tmp]$ ls -l testfile  
-rw-rw-r--. 1 paul paul 0 Jun 9 16:31 testfile  
[nick@centosvm tmp]$  
[nick@centosvm tmp]$  
[nick@centosvm tmp]$ vi █
```

Now change the testfile owner perm from paul to nick using sudo - Super user

```
[paul@centosvm tmp]$ chown -c nick testfile
chown: changing ownership of 'testfile': Operation not
permitted
[paul@centosvm tmp]$
[paul@centosvm tmp]$ sudo chown -c nick testfile
[sudo] password for paul:
changed ownership of 'testfile' from paul to nick
[paul@centosvm tmp]$
[paul@centosvm tmp]$ ls -l testfile
-rw-rw-r--. 1 nick paul 0 Jun  9 16:31 testfile
[paul@centosvm tmp]$
[paul@centosvm tmp]$ █
```

```
[nick@centosvm tmp]$
[nick@centosvm tmp]$ vi testfile █ I
```

```
[nick@centosvm tmp]$ cat testfile
Hi Raju
[nick@centosvm tmp]$
[nick@centosvm tmp]$ █
```

now Change the owner/group

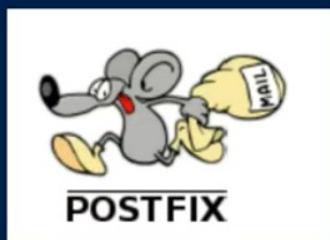
```
[paul@centosvm tmp]$
[paul@centosvm tmp]$ sudo chgrp -c nick testfile
changed group of 'testfile' from paul to nick
[paul@centosvm tmp]$ █
```

```
[nick@centosvm tmp]$ ls -l testfile
-rw-rw-r--. 1 nick nick 8 Jun  9 16:35 testfile
[nick@centosvm tmp]$
[nick@centosvm tmp]$ █
```

I

Linux POSTFIX Tutorial to send EMAIL

LINUX TUTORIAL



POSTFIX

How to Send Emails Using Gmail S

Topics

- PostFIX Setup on Linux Centos
- Edit Configuration for Google SMTP
- How to send email
- How to attach a file in email

Installation

```
>yum install postfix
```

```
>yum install mailx
```

```
[root@cs8 ~]#  
[root@cs8 ~]# rpm -qa | grep postfix  
[root@cs8 ~]# █
```

```
[root@cs8 ~]#  
[root@cs8 ~]# yum install postfix  
Last metadata expiration check: 0:26:15 ago on Saturday 18  
March 2023 10:54:48 PM IST.  
█  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
Preparing : 1/1  
Running scriptlet: postfix-2:3.5.8-4.el8.x86_64 1/1  
Installing : postfix-2:3.5.8-4.el8.x86_64 1/1  
Running scriptlet: postfix-2:3.5.8-4.el8.x86_64 1/1  
Verifying : postfix-2:3.5.8-4.el8.x86_64 1/1  
█  
Installed:  
postfix-2:3.5.8-4.el8.x86_64  
  
Complete!
```

```
[root@cs8 ~]#  
[root@cs8 ~]# rpm -qa | grep mailx  
mailx-12.5-29.el8.x86_64  
█
```

```
[root@cs8 ~]# yum install mailx
Last metadata expiration check: 0:27:47 ago on Saturday 18
March 2023 10:54:48 PM IST.
Package mailx-12.5-29.el8.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[root@cs8 ~]#
```

PostFix Configuration

/etc/postfix/main.cf

```
[root@cs8 ~]#
[root@cs8 ~]# cd /etc/postfix/
[root@cs8 postfix]# ls -l
```

```
-rw-r--r--. 1 root root 13963 Jun  4 2018 virtual
-rw-r--r--. 1 root root 13194 Jun  4 2018 canonical
-rw-r--r--. 1 root root 21111 Sep  8 2019 access
-rw-r--r--. 1 root root 13436 Jan 11 2020 transport
-rw-r--r--. 1 root root  6372 Feb 23 2022 master.cf.proto
-rw-r--r--. 1 root root  6372 Feb 23 2022 master.cf
-rw-r--r--. 1 root root 29130 Feb 23 2022 main.cf.proto
-rw-r--r--. 1 root root 29369 Feb 23 2022 main.cf
drwxr-xr-x. 2 root root     6 Feb 23 2022 postfix-files.d
-rw-r--r--. 1 root root 20163 Feb 23 2022 postfix-files
drwxr-xr-x. 2 root root     6 Feb 23 2022 dynamicmaps.cf.d
1 root root    60 Feb 23 2022 dynamicmaps.cf
-rw-r--r--. 1 root root 29694 Mar 17 17:37 main.cf_bkp
drwxr-xr-x. 2 root root     61 Mar 17 19:30 sasl
-rw-r--r--. 1 root root 1704 Mar 18 18:11 main.cf.rpmsave
[root@cs8 postfix]#
```

```
[root@cs8 postfix]# cp main.cf main.cf_bkp
```

```
-rw-r--r--. 1 root root 23802 Oct  9  2016 header_checks
-rw-r--r--. 1 root root 13963 Jun  4  2018 virtual
-rw-r--r--. 1 root root 13194 Jun  4  2018 canonical
-rw-r--r--. 1 root root 21111 Sep  8  2019 access
-rw-r--r--. 1 root root 13436 Jan 11  2020 transport
-rw-r--r--. 1 root root 6372 Feb 23  2022 master.cf.proto
-rw-r--r--. 1 root root 6372 Feb 23  2022 master.cf
-rw-r--r--. 1 root root 29130 Feb 23  2022 main.cf.proto
-rw-r--r--. 1 root root 29369 Feb 23  2022 main.cf
drwxr-xr-x. 2 root root      6 Feb 23  2022 postfix-files.cf
-rw-r--r--. 1 root root 20163 Feb 23  2022 postfix-files
drwxr-xr-x. 2 root root      6 Feb 23  2022 dynamicmaps.cf
-rw-r--r--. 1 root root     60 Feb 23  2022 dynamicmaps.cf
drwxr-xr-x. 2 root root     61 Mar 17 19:30 sasl
-rw-r--r--. 1 root root 1704 Mar 18 18:11 main.cf.rpmsa
-rw-r--r--. 1 root root 29369 Mar 18 23:23 main.cf_bkp
```

```
[root@cs8 postfix]#
```

```
[root@cs8 postfix]# vi main.cf
```

```
■ Global Postfix configuration file. This file lists only a subset
# of all parameters. For the syntax, and for a complete parameter
# list, see the postconf(5) manual page (command: "man 5 postconf").
#
# For common configuration examples, see BASIC_CONFIGURATION_README
# and STANDARD_CONFIGURATION_README. To find these documents, issue
# the command "postconf html_directory readme_directory", or go
# to
# http://www.postfix.org/BASIC_CONFIGURATION_README.
#
@@@
"main.cf" 738L, 29369C
```

Add the following lines

```
relayhost = [smtp.gmail.com]:587  
myhostname= <your_hostname>
```

```
# Global Postfix configuration file. This file lists only a subset  
# of all parameters. For the syntax, and for a complete parameter  
# list, see the postconf(5) manual page (command: "man 5 postconf").  
#  
# For common configuration examples, see BASIC_CONFIGURATION_README  
# and STANDARD_CONFIGURATION_README. To find these documents, use  
# the command "postconf html_directory readme_directory", or go to  
# http://www.postfix.org/BASIC_CONFIGURATION_README.html etc.  
#  
# For best results, change no more than 2-3 parameters at a time,  
# and test if Postfix still works after every change.  
  
# COMPATIBILITY  
#  
# The compatibility_level determines what default settings Postfix  
# will use for main.cf and master.cf settings. These defaults  
# change over time.  
#  
# To avoid breaking things, Postfix will use backwards-compati  
/relayh  
# gateway host instead.  
#  
# In the case of SMTP, specify a domain, host, host:port, [host]:port,  
# [address] or [address]:port; the form [host] turns off MX lookups.  
#  
# If you're connected via UUCP, see also the default_transport parameter.  
#  
#relayhost = $mydomain  
#relayhost = [gateway.my.domain]  
#relayhost = [mailserver.isp.tld]  
#relayhost = uucphost  
#relayhost = [an.ip.add.ress]  
  
#REJECTING UNKNOWN RELAY USERS  
#  
# The relay_recipient_maps parameter specifies optional lookups  
# with all addresses in the domains that match $relay_domains  
#  
# If this parameter is defined, then the SMTP server will rej
```

Add the following lines

```
relayhost = [smtp.gmail.com]:587  
myhostname= <your_hostname>
```

```
#  
# If you're connected via UUCP, see also the default_transport parameter.  
#  
#relayhost = $mydomain  
#relayhost = [gateway.my.domain]  
#relayhost = [mailserver.isp.tld]  
#relayhost = uucphost  
#relayhost = [an.ip.add.ress]  
relayhost = [smtp.gmail.com]:587■  
  
# REJECTING UNKNOWN RELAY USERS  
#  
# The relay_recipient_maps parameter specifies optional lookup tables  
# with all addresses in the domains that match $relay_domains.  
#  
# If this parameter is defined, then the SMTP server will reje  
# mail for unknown relay users. This feature is off by default  
#  
# The right-hand side of the lookup tables is conveniently ign  
-- INSERT --
```

```
[root@cs8 postfix]#  
[root@cs8 postfix]# vi main.cf  
[root@cs8 postfix]#  
[root@cs8 postfix]# hostname -f  
cs8  
[root@cs8 postfix]#
```

```
[root@cs8 postfix]# vi main.cf■
```

```

# list, see the postconf(5) manual page (command: "man 5 postconf").
#
# For common configuration examples, see BASIC_CONFIGURATION_README
# and STANDARD_CONFIGURATION_README. To find these documents, use
# the command "postconf html_directory readme_directory", or go to
# http://www.postfix.org/BASIC_CONFIGURATION_README.html etc.
#
# For best results, change no more than 2-3 parameters at a time,
# and test if Postfix still works after every change.

# COMPATIBILITY
#
# The compatibility_level determines what default settings
# will use for main.cf and master.cf settings. These default
# change over time.
#
# To avoid breaking things, Postfix will use backwards-comp
/myhostname

# DO NOT SPECIFY A PRIVILEGED USER OR THE POSTFIX OWNER.
#
#default_privs = nobody

# INTERNET HOST AND DOMAIN NAMES
#
# The myhostname parameter specifies the internet hostname of the
# mail system. The default is to use the fully-qualified domain name
# from gethostname(). $myhostname is used as a default value for
# other configuration parameters.
#
#myhostname = host.domain.tld
#myhostname = virtual.domain.tld
myhostname = cs8

# The mydomain parameter specifies the local internet domain name.
# The default is to use $myhostname minus the first component.
# $mydomain is used as a default value for many other configuration
# parameters.

:w

```

Add the following lines

```

relayhost = [smtp.gmail.com]:587
myhostname= <your_hostname>

```

Add the following lines

```
# 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
```

```
[root@cs8 postfix]#
[root@cs8 postfix]# vi main.cf
```

Go last @ the end & add below - Highlighted

```
smtp_tls_CAfile = /etc/pki/tls/certs/ca-bundle.crt

# Use TLS if this is supported by the remote SMTP server, otherwise use
# plaintext (opportunistic TLS outbound).
#
smtp_tls_security_level = may
meta_directory = /etc/postfix
shlib_directory = /usr/lib64/postfix

#####
# 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
-- INSERT (paste) --
```

Create a file under /etc/postfix/sasl/

Filename: sasl_passwd

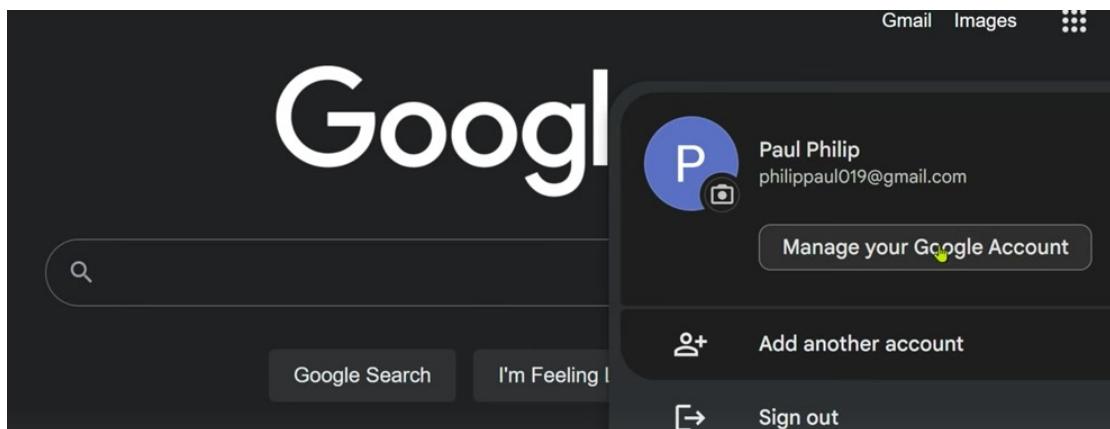
Add the below line

[smtp.gmail.com]:587 email@gmail.com:password

```
[root@cs8 postfix]#  
[root@cs8 postfix]#  
[root@cs8 postfix]# pwd  
/etc/postfix  
[root@cs8 postfix]# mkdir sasl  
[root@cs8 postfix]# cd sasl/  
[root@cs8 sasl]# touch sasl_passwd  
[root@cs8 sasl]# ls  
sasl_passwd  
[root@cs8 sasl]#
```

Add the below line

[smtp.gmail.com]:587 email@gmail.com:password



#2 step Verification

Google Account

Home Personal info Data & privacy Security People & sharing Payments & subscriptions About

Protect your account

Recent security activity

App password removed	10:50 PM · Madhya Pradesh, India
App password created	Mar 17 · Madhya Pradesh, India
Signing in with 2-Step Verification was turned on	Mar 17 · Madhya Pradesh, India

[Review security activity \(7\)](#)

How you sign in to Google

Make sure you can always access your Google Account by keeping this information up to date

2-Step Verification	On since Mar 17
>Password	Last changed Mar 24, 2021

Privacy Terms Help About

Windows Imported From IE Python Links Web WebBootcamp Web Projects Viddyoze Mine Docs

Google Account X

Home Personal info Data & privacy Security People & sharing Payments & subscriptions About

4 RESULTS

- Your connections to third-party apps & services Security
- Third-party apps with account access Security
- App passwords** Security
- Web & App Activity Data & privacy

Search Help Center for "apps" >

Signing in with 2-Step Verification was turned on Mar 17 · Madhya Pradesh, India

[Review security activity \(7\)](#)

How you sign in to Google

Make sure you can always access your Google Account by keeping this information up to date

2-Step Verification	On since Mar 17
>Password	Last changed Mar 24, 2021

Google Account

← App passwords

App passwords let you sign in to your Google Account from apps on devices that don't support 2-Step Verification. You'll only need to enter it once so you don't need to remember it. [Learn more](#)

You don't have any app passwords.

Select the app and device for which you want to generate the app password.

Select app

Mail

Calendar

Contacts

YouTube

Other (Custom name)

Select device

GENERATE

Google Account

← App passwords

App passwords let you sign in to your Google Account from apps on devices that don't support 2-Step Verification. You'll only need to enter it once so you don't need to remember it. [Learn more](#)

You don't have any app passwords.

Select the app and device for which you want to generate the app password.

smtp

X

GENERATE

← App passwords

Generated app password

Your app password for your device

lrjv potx grye ihgi

How to use it

Go to the settings for your Google Account in the application or device you are trying to set up. Replace your password with the 16-character password shown above. Just like your normal password, this app password grants complete access to your Google Account. You won't need to remember it, so don't write it down or share it with anyone.

Email
securesally@gmail.com

Password

DONE

```
[root@cs8 sasl]# vi sasl_passwd
```

```
[smtp.gmail.com]:587 philippaul019@gmail.com:lrjvpotxgryeihgi  
~  
~  
~  
~  
~  
~  
~  
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~  
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~  
~  
~  
-- INSERT --
```

Convert the sasl_passwd file into db file

```
postmap /etc/postfix/sasl/sasl_passwd
```

For the security, change the file ownership

```
chown root:root /etc/postfix/sasl/sasl_passwd  
chmod 600 /etc/postfix/sasl/sasl_passwd
```

```
[root@cs8 sasl]#  
[root@cs8 sasl]# pwd  
/etc/postfix/sasl  
[root@cs8 sasl]# ls -ltr  
total 4  
-rw-r--r--. 1 root root 62 Mar 18 23:36 sasl_passwd  
[root@cs8 sasl]# postmap sasl_passwd  
postmap: warning: /etc/postfix/main.cf, line 748: overriding earlier entry: s  
mtp_tls_security_level=may  
[root@cs8 sasl]#
```

```
[root@cs8 sasl]#  
[root@cs8 sasl]# ls -ltr  
total 12  
-rw-r--r--. 1 root root 62 Mar 18 23:36 sasl_passwd  
-rw-r--r--. 1 root root 12288 Mar 18 23:36 sasl_passwd.db  
[root@cs8 sasl]#
```

```
[root@cs8 sasl]# chmod 600 *  
[root@cs8 sasl]# ls -ltr  
total 12  
-rw-----. 1 root root 62 Mar 18 23:36 sasl_passwd  
-rw-----. 1 root root 12288 Mar 18 23:36 sasl_passwd.db  
[root@cs8 sasl]#
```

Start the Postfix service

systemctl start/enable postfix
systemctl stop/disable postfix
systemctl restart postfix

```
[root@cs8 sasl]#  
[root@cs8 sasl]# systemctl start postfix.service  
[root@cs8 sasl]# systemctl status postfix.service
```

```
● postfix.service - Postfix Mail Transport Agent
   Loaded: loaded (/usr/lib/systemd/system/postfix.service; disabled; vendor>
   Active: active (running) since Sat 2023-03-18 23:39:28 IST; 6s ago
     Process: 39429 ExecStart=/usr/sbin/postfix start (code=exited, status=0/SU>
     Process: 39427 ExecStartPre=/usr/libexec/postfix/chroot-update (code=exite>
     Process: 39422 ExecStartPre=/usr/libexec/postfix/aliasesdb (code=exited, s>
     Process: 39421 ExecStartPre=/usr/sbin/restorecon -R /var/spool/postfix/pid>
 Main PID: 39498 (master)
    Tasks: 3 (limit: 4595)
   Memory: 8.3M
      CGroup: /system.slice/postfix.service
              ├─39498 /usr/libexec/postfix/master -w
              ├─39499 pickup -l -t unix -u
              └─39500 qmgr -l -t unix -u

Mar 18 23:39:28 cs8 postfix[39466]: /usr/sbin/postconf: warning:
Mar 18 23:39:28 cs8 postfix[39470]: /usr/sbin/postconf: warning:
Mar 18 23:39:28 cs8 postfix[39471]: postsuper: warning: /etc/postfix/main.cf
Mar 18 23:39:28 cs8 postfix/postsuper[39471]: warning: /etc/postfix/main.cf
lines 1-19
```

How to send email

```
echo "Test Mail" | mail -s "Postfix TEST"
paul@gmail.com
```

```
[root@cs8 sasl]#
[root@cs8 sasl]#
[root@cs8 sasl]# echo "Test Email From MPrashant" | mail -s "MPras
hant Postfix Tutorial" philippaul019@gmail.com
[root@cs8 sasl]# send-mail: warning: /etc/postfix/main.cf, line 74
8: overriding earlier entry: smtp_tls_security_level=may
postdrop: warning: /etc/postfix/main.cf, line 748: overriding ear
lier entry: smtp_tls_security_level=may
```

MPrashant Postfix Tutorial



root <philippaul019@gmail.com>
to me ▾

Test Email From MPrashant

Reply

Forward

```
[root@cs8 postfix]#
```

```
[root@cs8 postfix]# vi main.cf █
```

```
# comment out
# Use TLS if this is supported by the remote SMTP server, otherwise use
# plaintext (opportunistic TLS outbound).
#
#smtp_tls_security_level = may
meta_directory = /etc/postfix
shlib_directory = /usr/lib64/postfix

#####
# 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

-- INSERT --
```

```
[root@cs8 postfix]# systemctl restart postfix.service █
```

```
[root@cs8 ~]#
```

```
[root@cs8 ~]# vi testfile
```

```
[root@cs8 ~]# cat testfile
```

```
Hi This is Paul
```

```
[root@cs8 ~]# █
```

```
[root@cs8 ~]# echo "Test Email From MPrashant" | mail -s "MPrashant Postfix Tutorial" -a testfile philippaul019@gmail.com
[root@cs8 ~]# █
```

MPrashant Postfix Tutorial

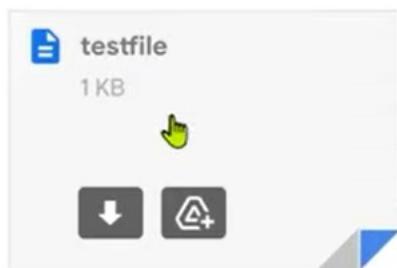
Inbox x

P

root <philippaul019@gmail.com>
to me ▾

Test Email From MPrashant

One attachment • Scanned by Gmail ⓘ



Hi This is Paul

Linux Log Monitoring | How to Do Log Analysis?

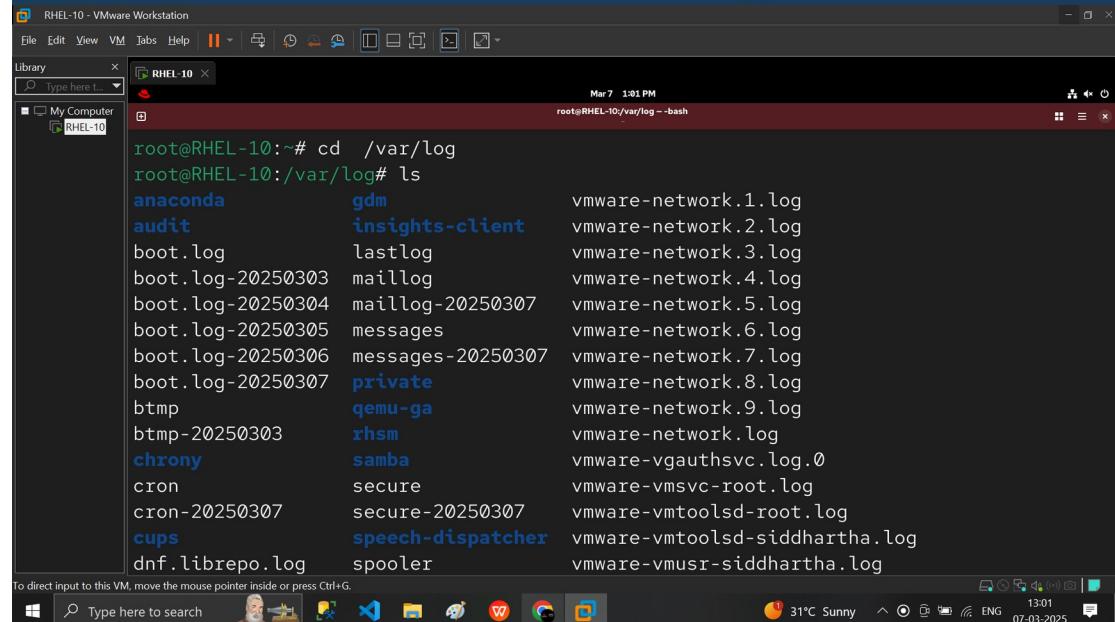
What are log files?

A log file stores events, processes, messages, and other data from applications, operating systems, or devices.

They provide information based on the actions performed by users, playing an important role in monitoring

Log directory in Linux

/var/log

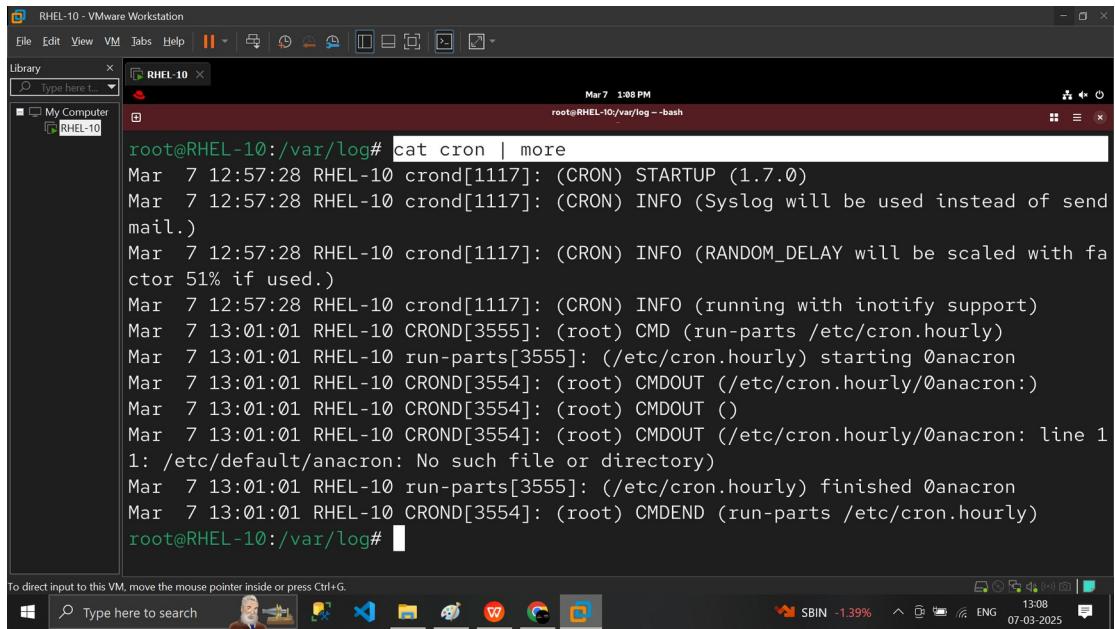


The screenshot shows a terminal window titled "RHEL-10" running on a VMware Workstation interface. The terminal is displaying the output of the command "ls" run from the root directory of the "/var/log" directory. The listing includes various log files such as "anaconda", "audit", "boot.log", "cron", "cups", "dnf.librepo.log", "gdm", "insights-client", "lastlog", "maillog", "messages", "private", "qemu-ga", "rhsm", "samba", "secure", "secure-20250307", "speech-dispatcher", "spooler", and several "vmware" logs. The terminal window has a dark background with white text and a red header bar.

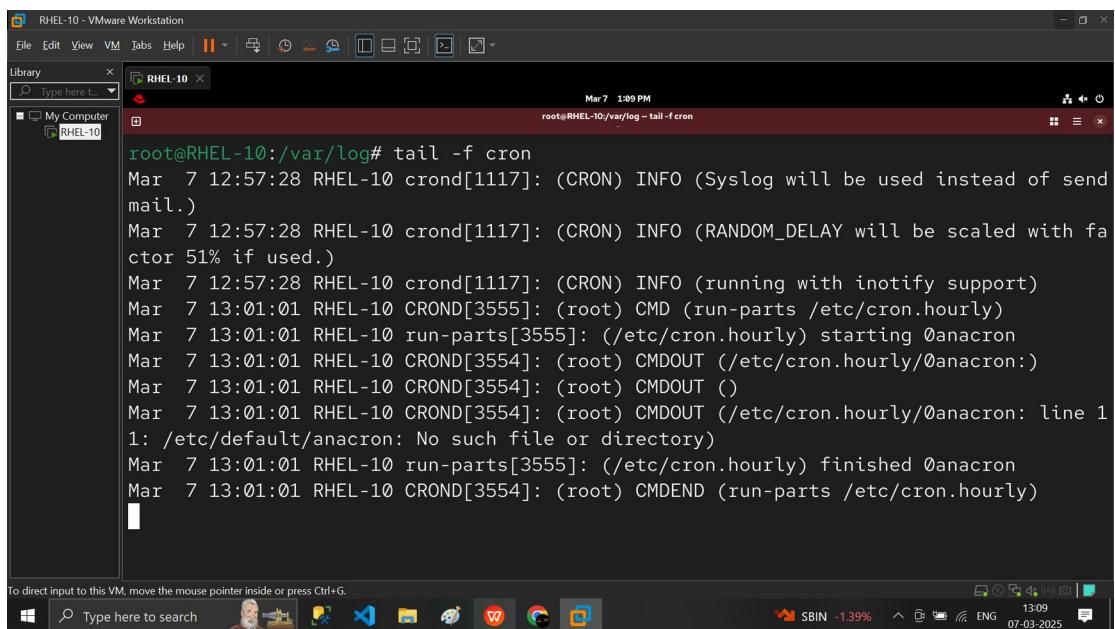
```
root@RHEL-10:~# cd /var/log
root@RHEL-10:/var/log# ls
anaconda           gdm          vmware-network.1.log
audit              insights-client vmware-network.2.log
boot.log          lastlog       vmware-network.3.log
boot.log-20250303 maillog       vmware-network.4.log
boot.log-20250304 maillog-20250307 vmware-network.5.log
boot.log-20250305 messages      vmware-network.6.log
boot.log-20250306 messages-20250307 vmware-network.7.log
boot.log-20250307 private       vmware-network.8.log
bttmp              qemu-ga      vmware-network.9.log
bttmp-20250303    rhsm         vmware-network.log
chrony             samba        vmware-vgauthsvc.log.0
cron               secure       vmware-vmsvc-root.log
cron-20250307     secure-20250307 vmware-vmtoolsd-root.log
cups               speech-dispatcher vmware-vmtoolsd-siddhartha.log
dnf.librepo.log    spooler      vmware-vmusr-siddhartha.log
```

log file

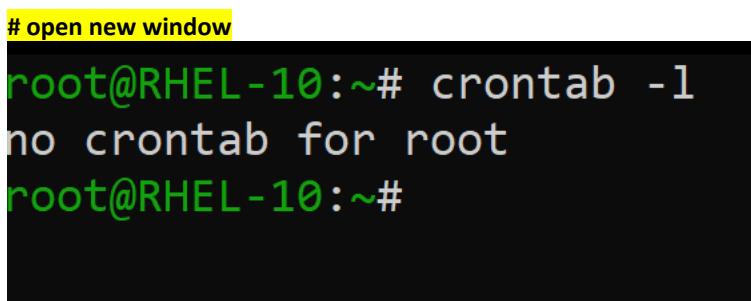
- **boot**
- **chron**
- **secure**
- **maillog**
- **httpd**
- **messages**



```
root@RHEL-10:/var/log# cat cron | more
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) STARTUP (1.7.0)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (Syslog will be used instead of send mail.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (RANDOM_DELAY will be scaled with factor 51% if used.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (running with inotify support)
Mar 7 13:01:01 RHEL-10 CROND[3555]: (root) CMD (run-parts /etc/cron.hourly)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) starting 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron:)
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT ()
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron: line 1
1: /etc/default/anacron: No such file or directory)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) finished 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDEND (run-parts /etc/cron.hourly)
root@RHEL-10:/var/log#
```



```
root@RHEL-10:/var/log# tail -f cron
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (Syslog will be used instead of send mail.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (RANDOM_DELAY will be scaled with factor 51% if used.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (running with inotify support)
Mar 7 13:01:01 RHEL-10 CROND[3555]: (root) CMD (run-parts /etc/cron.hourly)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) starting 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron:)
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT ()
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron: line 1
1: /etc/default/anacron: No such file or directory)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) finished 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDEND (run-parts /etc/cron.hourly)
```



```
# open new window
root@RHEL-10:~# crontab -l
no crontab for root
root@RHEL-10:~#
```

see the change

```
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (Syslog will be used instead of send mail.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (RANDOM_DELAY will be scaled with factor 51% if used.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (running with inotify support)
Mar 7 13:01:01 RHEL-10 CROND[3555]: (root) CMD (run-parts /etc/cron.hourly)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) starting 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron:)
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT ()
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron: line 1
1: /etc/default/anacron: No such file or directory)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) finished 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDEND (run-parts /etc/cron.hourly)
Sai@123
Mar 7 13:13:27 RHEL-10 crontab[3722]: (root) LIST (root)
```

```
siddhartha@siddhartha@RHEL-10:~$ crontab -l
no crontab for siddhartha
siddhartha@siddhartha@RHEL-10:~$
```

```
mail.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (RANDOM_DELAY will be scaled with factor 51% if used.)
Mar 7 12:57:28 RHEL-10 crond[1117]: (CRON) INFO (running with inotify support)
Mar 7 13:01:01 RHEL-10 CROND[3555]: (root) CMD (run-parts /etc/cron.hourly)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) starting 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron:)
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT ()
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDOUT (/etc/cron.hourly/0anacron: line 1
1: /etc/default/anacron: No such file or directory)
Mar 7 13:01:01 RHEL-10 run-parts[3555]: (/etc/cron.hourly) finished 0anacron
Mar 7 13:01:01 RHEL-10 CROND[3554]: (root) CMDEND (run-parts /etc/cron.hourly)
Sai@123
Mar 7 13:13:27 RHEL-10 crontab[3722]: (root) LIST (root)
Mar 7 13:16:45 RHEL-10 crontab[3816]: (siddhartha) LIST (siddhartha)
```

How to Use Linux DMESG Command for System Monitor

SYSTEM MONITORING

(dmesg)

Linux System Monitoring Commands like Dmesg
using these commands we can monitor the Linux system
and it's hardware related issues including memory, harddisk, drivers related messages.

dmesg command

Linux utility that displays kernel-related messages retrieved from the kernel ring buffer.

dmesg command

The ring buffer stores information about hardware, device driver initialization, and messages from kernel modules that take place during system startup.

dmesg command

dmesg

dmesg -HTx (human readable, timestamp, decode)

dmesg | more

dmesg | less

dmesg | head -10

dmesg | tail -10

```
root@RHEL-10:/var/log# cd ~
root@RHEL-10:~# ls
anaconda-ks.cfg  file.txt  new.txt  sid.txt  test1.txt  test.sh  test.txt
root@RHEL-10:~# dmesg
[    0.000000] Linux version 6.11.0-0.rc5.23.el10.x86_64 (mockbuildg1e3fcc3816254156a9489c5863b3ae60) (gcc (GCC) 14.2.1 2
0240801 (Red Hat 14.2.1-1), GNU ld version 2.41-48.el10) #1 SMP PREEMPT_DYNAMIC Mon Sep 23 04:19:12 EDT 2024
[    0.000000] Command line: BOOT_IMAGE=(hd0,gpt2)/vmlinuz-6.11.0-0.rc5.23.el10.x86_64 root=/dev/mapper/rhel-root ro cras
hkernel=1G-4G:192M,4G-64G:256M,64G-:512M resume=UUID=447d8b62-49d9-4bf8-8f98-f6ea81911931 rd.lvm.lv=rhel/root rd.lvm.lv=rhel
hel/swapp rhgb quiet
[    0.000000] Disabled fast string operations
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x0000000000000fff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000000001000-0x0000000000001fff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000002000-0x0000000000009ffff] usable
[    0.000000] BIOS-e820: [mem 0x000000000000c0000-0x000000000000ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000000100000-0x0000000000e03ffff] usable
[    0.000000] BIOS-e820: [mem 0x0000000000e03c000-0x0000000000e041ffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000000e042000-0x0000000000fb6effff] usable
[    0.000000] BIOS-e820: [mem 0x0000000000fb6f000-0x0000000000fbdeffff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000fbdf000-0x0000000000fbfaffff] ACPI data
[    0.000000] BIOS-e820: [mem 0x0000000000fbfb000-0x0000000000fbfeffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000000fbff000-0x0000000007fffffff] usable
[    0.000000] BIOS-e820: [mem 0x0000000000fc00000-0x000000000ffc29ffff] reserved
[    0.000000] NX (Execute Disable) protection: active
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
```

RHEL-10 - VMware Workstation

```
[ 2.317303] ... max period: 000000007fffffff
[ 2.317322] ... fixed-purpose events: 0
[ 2.317340] ... event mask: 000000000000000f
[ 2.317955] signal: max sigframe size: 1776
[ 2.318146] rcu: Hierarchical SRCU implementation.
[ 2.318167] rcu: Max phase no-delay instances is 400.
[ 2.318379] Timer migration: 3 hierarchy levels; 8 children per group; 3 crossnode level
[ 2.319955] NMI watchdog: Perf NMI watchdog permanently disabled
[ 2.327899] smp: Bringing up secondary CPUs ...
[ 2.328956] smboot: x86: Booting SMP configuration:
[ 2.328956] .... node #0, CPUs: #1
[ 0.015047] Disabled fast string operations
[ 2.332177] smp: Brought up 1 node, 2 CPUs
[ 2.332205] smboot: Total of 2 processors activated (9983.99 BogoMIPS)
[ 2.399955] node 0 deferred pages initialised in 64ms
[ 2.400413] Memory: 1730528K/2096160K available (16384K kernel code, 5710K rwdta, 13564K rodata, 4236K init, 5088K bs
s, 355256K reserved, OK cma-reserved)
[ 2.401404] devtmpfs: initialized
[ 2.402304] x86/mm: Memory block size: 128MB
[ 2.403370] ACPI: PM: Registering ACPI NVS region [mem 0x00000000-0x00000fff] (4096 bytes)
[ 2.403370] ACPI: PM: Registering ACPI NVS region [mem 0xe03c000-0xe041fff] (24576 bytes)
[ 2.403370] ACPI: PM: Registering ACPI NVS region [mem 0xfbfb000-0xfbfefff] (16384 bytes)
[ 2.403729] clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 1911260446275000 ns
[ 2.404434] futex hash table entries: 32768 (order: 9, 2097152 bytes, linear)
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

RHEL-10 - VMware Workstation

```
[ 16.922456] Initialized host personality
[ 18.270743] NET: Registered PF_VSOCK protocol family
[ 18.821065] VMware vmxnet3 virtual NIC driver - version 1.9.0.0-k-NAPI
[ 18.853962] vmxnet3 0000:03:00.0: enabling device (0000 -> 0003)
[ 18.949170] vmxnet3 0000:03:00.0: # of Tx queues : 2, # of Rx queues : 2
[ 19.129541] vmxnet3 0000:03:00.0 eth0: NIC Link is Down
[ 19.372791] snd_ens1371 0000:02:01.0: enabling device (0000 -> 0001)
[ 19.934750] input: PC Speaker as /devices/platform/pcspkr/input/input6
[ 19.971989] block nvme0n1: No UUID available providing old NGUID
[ 21.463851] NET: Registered PF_QIPCRTR protocol family
[ 21.622149] RAPL: PMU: API unit is 2^-32 Joules, 0 fixed counters, 10737418240 ms ovfl timer
[ 21.796127] vmxnet3 0000:03:00.0 ens160: renamed from eth0
[ 24.657320] vmxnet3 0000:03:00.0 ens160: intr type 3, mode 0, 3 vectors allocated
[ 24.658106] vmxnet3 0000:03:00.0 ens160: NIC Link is Down
[ 24.778688] vmxnet3 0000:03:00.0 ens160: NIC Link is Up 10000 Mbps
[ 30.525681] block dm-0: the capability attribute has been deprecated.
[ 34.588133] rfkill: input handler disabled
[ 164.745716] rfkill: input handler enabled
[ 172.843271] rfkill: input handler disabled
[ 185.309569] input: VMware DnD UIInput pointer as /devices/virtual/input/input7
[ 191.223099] evm: overlay not supported
[ 617.846553] hrtimer: interrupt took 4880546 ns
root@RHEL-10:~#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Library Type here to search

My Computer RHEL-10

RHEL-10

Mar 7 1:32 PM root@RHEL-10: ~ dmesg -HTx

```
kern :notice: [Mar 7 12:57] [Fri Mar 7 12:57:02 2025] Linux version 6.11.0-rc5.23.el10.x86_64 (mockbuild@le3fcc38162) (mockbuild@le3fcc38162) on 2025-03-07 12:57:02 +0000
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] Command line: BOOT_IMAGE=(hd0,gpt2)/vmlinuz-6.11.0-rc5.23.el10
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] Disabled fast string operations
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-provided physical RAM map:
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] ACPI NVS
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000001000-0x0000000000001fff] reserved
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000002000-0x000000000000ffff] usable
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000100000-0x0000000000e03ffff] usable
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000e03c000-0x0000000000e041ffff] ACPI NVS
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x0000000000e42000-0x000000000fbgefff] usable
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x000000000fbff000-0x000000000fbdefff] reserved
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x000000000fbfb000-0x000000000fbfafff] ACPI data
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x000000000fbfb000-0x000000000fbfefff] ACPI NVS
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x000000000fbff000-0x000000000fbfc29fff] usable
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] BIOS-e820: [mem 0x000000000fc000000-0x000000000ffc29fff] reserved
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] NX (Execute Disable) protection: active
kern :info: [+0.000000] [Fri Mar 7 12:57:02 2025] APIC: Static calls initialized
kern :debug: [+0.000000] [Fri Mar 7 12:57:02 2025] e820: update [mem 0x0b2c7018-0xb0b2cf057] usable ==> usable
kern :debug: [+0.000000] [Fri Mar 7 12:57:02 2025] e820: update [mem 0x0b2c4018-0xb0b2c6057] usable ==> usable
kern :debug: [+0.000000] [Fri Mar 7 12:57:02 2025] e820: update [mem 0x0b2c2018-0xb0b2c3857] usable ==> usable
kern :debug: [+0.000000] [Fri Mar 7 12:57:02 2025] e820: update [mem 0x0b2c0018-0xb0b2c1e57] usable ==> usable

:
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

dmesg command

dmesg | grep <search_string>

You can search related to

- memory
- usb
- sda
- ram
- tty
- error

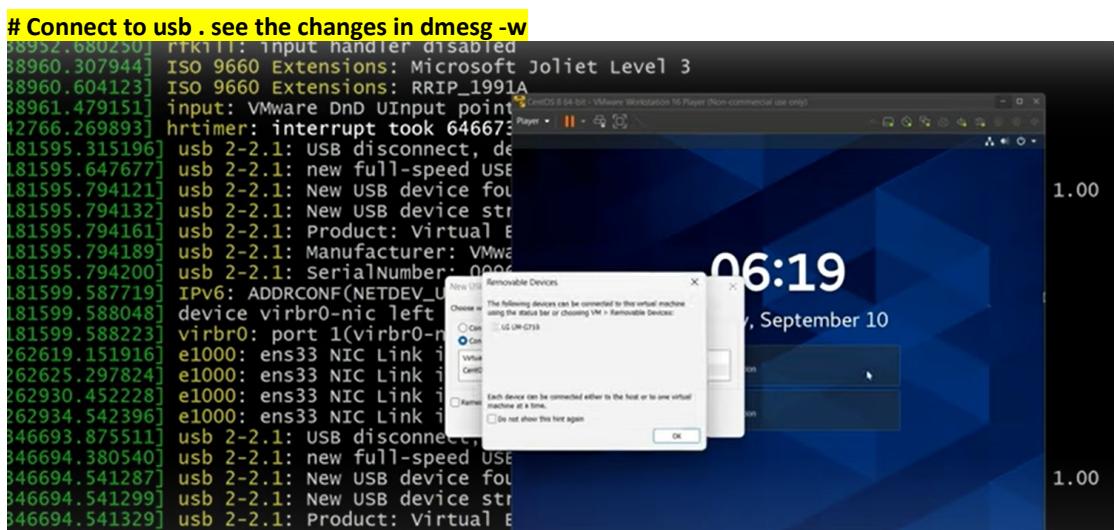
```
[root@RHEL-10:~]# dmesg | grep memory
[ 1.389427] ACPI: Reserving SRAT table memory at [mem 0xfbbec0c0-0xfbbec967]
[ 1.389429] ACPI: Reserving FACP table memory at [mem 0xfbfa331-0xfbfa424]
[ 1.389431] ACPI: Reserving DSDT table memory at [mem 0xfbbec968-0xfbfa330]
[ 1.389432] ACPI: Reserving FACS table memory at [mem 0xfbfe000-0xfbfe03f]
[ 1.389433] ACPI: Reserving FACS table memory at [mem 0xfbfe000-0xfbfe03f]
[ 1.389435] ACPI: Reserving APIC table memory at [mem 0xfbfa499-0xfbfbabd]
[ 1.389436] ACPI: Reserving MCFG table memory at [mem 0xfbfbadb-0xfbfac16]
[ 1.389438] ACPI: Reserving HPET table memory at [mem 0xfbfac17-0xfbfac4e]
[ 1.389439] ACPI: Reserving WET table memory at [mem 0xfbfbac4f-0xfbfac76]
[ 1.389440] ACPI: Reserving WSMT table memory at [mem 0xfbfbac77-0xfbfac9e]
[ 1.390239] Early memory node ranges
[ 1.465978] PM: hibernation: Registered nosave memory: [mem 0x00000000-0x00000fff]
[ 1.465981] PM: hibernation: Registered nosave memory: [mem 0x00001000-0x00001fff]
[ 1.465984] PM: hibernation: Registered nosave memory: [mem 0x000a0000-0x000fffff]
[ 1.465985] PM: hibernation: Registered nosave memory: [mem 0x000c0000-0x000fffff]
[ 1.465987] PM: hibernation: Registered nosave memory: [mem 0xb2c0000-0xb2c0fff]
[ 1.465989] PM: hibernation: Registered nosave memory: [mem 0xb2c1000-0xb2c21fff]
[ 1.465990] PM: hibernation: Registered nosave memory: [mem 0xb2c2000-0xb2c2cff]
[ 1.465991] PM: hibernation: Registered nosave memory: [mem 0xb2c3000-0xb2c3fff]
[ 1.465992] PM: hibernation: Registered nosave memory: [mem 0xb2c4000-0xb2c4fff]
[ 1.465994] PM: hibernation: Registered nosave memory: [mem 0xb2c6000-0xb2c6fff]
[ 1.465995] PM: hibernation: Registered nosave memory: [mem 0xb2c7000-0xb2c7fff]
[ 1.465998] PM: hibernation: Registered nosave memory: [mem 0xb2cf000-0xb2cffff]
```

```
[root@RHEL-10:~]# dmesg | grep tty
[ 2.241690] printk: legacy console [tty0] enabled
[ 12.761576] systemd[1]: Created slice system-getty.slice - Slice /system/gettt
[ 12.771565] systemd[1]: Reached target getty.target - Login Prompts.
[root@RHEL-10:~]#
```

```

root@RHEL-10:~# dmesg -w
[    0.000000] Linux version 6.11.0-0.rc5.23.el10.x86_64 (mockbuild@le3fcc3816254156a9489c5863b3ae60) (gcc (GCC) 14.2.1 20240801 (Red Hat 14.2.1-1), GNU ld version 2.41-48.el10) #1 SMP PREEMPT_DYNAMIC Mon Sep 23 04:19:12 EDT 2024
[    0.000000] Command line: BOOT_IMAGE=(hd0,gpt2)/vmlinuz-6.11.0-0.rc5.23.el10.x86_64 root=/dev/mapper/rhel-root ro cras
[    0.000000] hkernel=1G-4G:192M, 4G-64G:256M,64G-:512M resume=UUID=447d8b62-49d9-4bf8-8f98-f6ea81911931 rd.lvm.lv=rhel/swap rhgb quiet
[    0.000000] Disabled fast string operations
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000000001000-0x0000000000001fff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000002000-0x0000000000009ffff] usable
[    0.000000] BIOS-e820: [mem 0x000000000000c000-0x000000000000ffff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000010000-0x000000000e03bffff] usable
[    0.000000] BIOS-e820: [mem 0x0000000000e03c000-0x000000000e041ffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000000e042000-0x000000000fb6effff] usable
[    0.000000] BIOS-e820: [mem 0x000000000fb6f000-0x000000000fbdeffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000fbdf000-0x000000000fbfaffff] ACPI data
[    0.000000] BIOS-e820: [mem 0x000000000fbfb000-0x000000000fbfeffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x000000000fbff000-0x0000000007fffffff] usable
[    0.000000] BIOS-e820: [mem 0x000000000fc00000-0x000000000ffc29ffff] reserved
[    0.000000] NX (Execute Disable) protection: active
[    0.000000] APIC: Static calls initialized
[    0.000000] e820: update [mem 0x0b2c7018-0x0b2cf057] usable ==> usable
[    0.000001] e820: update [mem 0x0b2c4018-0x0b2c6057] usable ==> usable
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

```



```

62930.452228] e1000: ens33 NIC Link is Down
62934.542396] e1000: ens33 NIC Link is Up 1000 Mbps Full duplex, Flow Control: None
46693.875511] usb 2-2.1: USB disconnect, device number 5
46694.380540] usb 2-2.1: new full-speed USB device number 6 using uhci_hcd
46694.541287] usb 2-2.1: New USB device found, idVendor=0e0f, idProduct=0008, bcdDevice= 1.00
46694.541299] usb 2-2.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
46694.541329] usb 2-2.1: Product: Virtual Bluetooth Adapter
46694.541359] usb 2-2.1: Manufacturer: VMware
46694.541369] usb 2-2.1: SerialNumber: 000650268328
46696.763556] IPv6: ADDRCONF(NETDEV_UP): virbr0: link is not ready
18580.899959] usb 1-1: new high-speed USB device number 2 using ehci-pci
18581.894958] usb 1-1: New USB device found, idVendor=1004, idProduct=633e, bcdDevice= 4.00
18581.894983] usb 1-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
18581.895097] usb 1-1: Product: LM-G710
18581.895162] usb 1-1: Manufacturer: LGE
18581.895178] usb 1-1: SerialNumber: LMG710EMWaf9ef9bf

```

```

root@RHEL-10:~# dmesg -l warn
[    2.316955] core: CPUID marked event: 'cpu cycles' unavailable
[    2.316955] core: CPUID marked event: 'instructions' unavailable
[    2.317109] core: CPUID marked event: 'bus cycles' unavailable
[    2.317128] core: CPUID marked event: 'cache references' unavailable
[    2.317147] core: CPUID marked event: 'cache misses' unavailable
[    2.317166] core: CPUID marked event: 'branch instructions' unavailable
[    2.317184] core: CPUID marked event: 'branch misses' unavailable
[    6.337270] device-mapper: core: CONFIG_IMA_DISABLE_HTABLE is disabled. Duplicate
IMA measurements will not be recorded in the IMA log.
[   19.971989] block nvme0n1: No UUID available providing old NGUID
[   30.525681] block dm-0: the capability attribute has been deprecated.
[   617.846553] hrtimer: interrupt took 4880546 ns
root@RHEL-10:~#

```

```

root@RHEL-10:~# dmesg -l debug
[ 0.000000] e820: update [mem 0x0b2c7018-0x0b2cf057] usable ==> usable
[ 0.000000] e820: update [mem 0x0b2c4018-0x0b2c6057] usable ==> usable
[ 0.000000] e820: update [mem 0x0b2c2018-0x0b2c3857] usable ==> usable
[ 0.000000] e820: update [mem 0x0b2c0018-0x0b2c1e57] usable ==> usable
[ 1.357970] e820: update [mem 0x00000000-0x0000ffff] usable ==> reserved
[ 1.357978] e820: remove [mem 0x000a0000-0x000fffff] usable
[ 1.389534] system APIC only can use physical flat
[ 1.465456] system APIC only can use physical flat
[ 2.157640] pcpu-alloc: s233472 r8192 d28672 u524288 alloc=1*2097152
[ 2.157644] pcpu-alloc: [0] 000 001 002 003 [0] 004 005 006 007
[ 2.157651] pcpu-alloc: [0] 008 009 010 011 [0] 012 013 014 015
[ 2.157657] pcpu-alloc: [0] 016 017 018 019 [0] 020 021 022 023
[ 2.157663] pcpu-alloc: [0] 024 025 026 027 [0] 028 029 030 031
[ 2.157668] pcpu-alloc: [0] 032 033 034 035 [0] 036 037 038 039
[ 2.157674] pcpu-alloc: [0] 040 041 042 043 [0] 044 045 046 047
[ 2.157680] pcpu-alloc: [0] 048 049 050 051 [0] 052 053 054 055

```

Linux LogRotate with Example



```
root@RHEL-10:~# logrotate
logrotate 3.22.0 - Copyright (C) 1995-2001 Red Hat, Inc.
This may be freely redistributed under the terms of the GNU General Public License

Usage: logrotate [-dfv?] [-d|--debug] [-f|--force] [-m|--mail=command]
          [-s|--state=statefile] [--skip-state-lock] [--wait-for-state-lock]
          [-v|--verbose] [-l|--log=logfile] [--version] [-?|--help] [--usage]
          [OPTION...] <configfile>
root@RHEL-10:~#
```

Config Files

- **/etc/logrotate.conf**
- **/etc/logrotate.d/**

Log Files Location

- **/var/log/**

```
# see "man logrotate" for details
#
# global options do not affect preceding include directives
#
# rotate log files weekly
weekly

# keep 4 weeks worth of backlogs
rotate 4

# create new (empty) log files after rotating old ones
create

# use date as a suffix of the rotated file
dateext
/etc/logrotate.conf
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

```
# rotate log files weekly
weekly

# keep 4 weeks worth of backlogs
rotate 4

# create new (empty) log files after rotating old ones
create

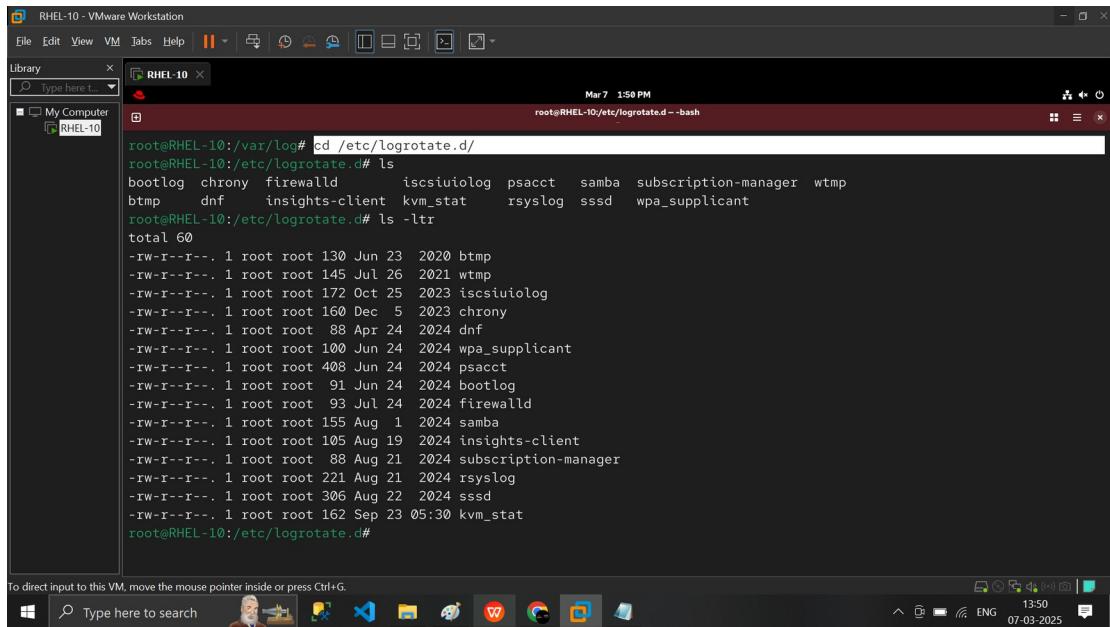
# use date as a suffix of the rotated file
dateext

# uncomment this if you want your log files compressed
#compress

# packages drop log rotation information into this directory
include /etc/logrotate.d

# system-specific logs may also be configured here.
(END)
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.



```
root@RHEL-10:/var/log# cd /etc/logrotate.d/
root@RHEL-10:/etc/logrotate.d# ls
bootlog chrony firewalld    iscsiuilog  psacct   samba  subscription-manager  wtmp
btmp      dnf     insights-client  kvm_stat   rsyslog  sssd   wpa_supplicant
root@RHEL-10:/etc/logrotate.d# ls -ltr
total 60
-rw-r--r--. 1 root root 130 Jun 23 2020 btmp
-rw-r--r--. 1 root root 145 Jul 26 2021 wtmp
-rw-r--r--. 1 root root 172 Oct 25 2023 iscsiuilog
-rw-r--r--. 1 root root 160 Dec  5 2023 chrony
-rw-r--r--. 1 root root  88 Apr 24 2024 dnf
-rw-r--r--. 1 root root 100 Jun 24 2024 wpa_supplicant
-rw-r--r--. 1 root root 408 Jun 24 2024 psacct
-rw-r--r--. 1 root root  91 Jun 24 2024 bootlog
-rw-r--r--. 1 root root  93 Jul 24 2024 firewalld
-rw-r--r--. 1 root root 155 Aug  1 2024 samba
-rw-r--r--. 1 root root 105 Aug 19 2024 insights-client
-rw-r--r--. 1 root root  88 Aug 21 2024 subscription-manager
-rw-r--r--. 1 root root 221 Aug 21 2024 rsyslog
-rw-r--r--. 1 root root 306 Aug 22 2024 sssd
-rw-r--r--. 1 root root 162 Sep 23 05:30 kvm_stat
root@RHEL-10:/etc/logrotate.d#
```

#less httpd

```
# Note that logs are not compressed unless "compress" is configured,
# which can be done either here or globally in /etc/logrotate.conf.
/var/log/httpd/*log {
    missingok
    notifempty
    sharedscripts
    delaycompress
    postrotate
        /bin/systemctl reload httpd.service > /dev/null 2>/dev/null || true
    endscript
}
httpd (END)
```

#less firewalld

```
/var/log/firewalld {
    weekly
    missingok
    rotate 4
    copytruncate
    minsize 1M
}
firewalld (END)
```

man logrotate

```
LOGROTATE(8)           System Administrator's Manual           LOGROTATE(8)

NAME
       logrotate - rotates, compresses, and mails system logs

SYNOPSIS
       logrotate [--force] [--debug] [--state file] [--skip-state-lock] [--wait-for-state-lock]
       [--verbose] [--log file] [--mail command] config_file [config_file2 ...]

DESCRIPTION
       logrotate is designed to ease administration of systems that generate large numbers of log
       files. It allows automatic rotation, compression, removal, and mailing of log files.
       Each log file may be handled daily, weekly, monthly, or when it grows too large.

       Normally, logrotate is run as a daily cron job. It will not modify a log more than once
       in one day unless the criterion for that log is based on the log's size and logrotate is
       being run more than once each day, or unless the -f or --force option is used.

       Any number of config files may be given on the command line. Later config files may over-
       write earlier ones. To quit, press q. To get help, press h.
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

```
[root@redhat01 ~]#
```

```
[root@redhat01 ~]#
[root@redhat01 ~]# mkdir myapp
[root@redhat01 ~]# cd myapp/
[root@redhat01 myapp]#
[root@redhat01 myapp]# touch my_app.log
[root@redhat01 myapp]# ls
my_app.log
[root@redhat01 myapp]#
```

```
[root@redhat01 myapp]#
[root@redhat01 myapp]# pwd
/var/log/myapp
[root@redhat01 myapp]#
[root@redhat01 myapp]# cd /etc/logrotate.d/
[root@redhat01 logrotate.d]#
[root@redhat01 logrotate.d]# ls
bootlog  firewalld      kvm_stat    rsyslog          wpa_supplicant
btmp     httpd          mysqld      samba            wtmp
chrony   insights-client nginx      sssd
dnf      iscsiuiolog    psacct     subscription-manager
[root@redhat01 logrotate.d]#
```

```
[root@redhat01 logrotate.d]#
[root@redhat01 logrotate.d]# touch myapp
[root@redhat01 logrotate.d]# vi myapp
[root@redhat01 logrotate.d]#
```

```
/var/log/myapp/*.log{
    daily
    size 10M
}
~
```

```
[root@redhat01 logrotate.d]# cd /var/log/myapp/
[root@redhat01 myapp]#
```

```
[root@redhat01 myapp]# ls
my_app.log
[root@redhat01 myapp]# ls -lh
total 4.0K
-rw-r--r--. 1 root root 5 Jan 24 22:47 my_app.log
[root@redhat01 myapp]#
```

```
# make size More than 15MB - truncation
[root@redhat01 myapp]# truncate -s 15M my_app.log
[root@redhat01 myapp]# ls -lh
total 4.0K
-rw-r--r--. 1 root root 15M Jan 24 22:50 my_app.log
[root@redhat01 myapp]#
```

```
[root@redhat01 myapp]#
[root@redhat01 myapp]# logrotate -d /etc/logrotate.conf
```

```
considering log /var/log/kvm_stat.csv
log /var/log/kvm_stat.csv does not exist -- skipping

rotating pattern: /var/log/myapp/*.log 10485760 bytes (4 rotations)
empty log files are rotated, old logs are removed
considering log /var/log/myapp/my_app.log
  Now: 2024-01-24 22:51
  Last rotated at 2024-01-24 20:58
  log needs rotating
rotating log /var/log/myapp/my_app.log, log->rotateCount is 4
dateext suffix '-20240124'
glob pattern '-[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]'
set default create context to unconfined_u:object_r:var_log_t:s0
glob finding old rotated logs failed
set default create context to unconfined_u:object_r:var_log_t:s0
renaming /var/log/myapp/my_app.log to /var/log/myapp/my_app
creating new /var/log/myapp/my_app.log mode = 0644 uid = 0

rotating pattern: /var/log/nginx/*.log after 1 days (10 rotations)
empty log files are not rotated, old logs are removed
considering log /var/log/nginx/access.log
```

now Log got rotated

```
[root@redhat01 myapp]#  
[root@redhat01 myapp]# logrotate /etc/logrotate.conf  
[root@redhat01 myapp]# ls -ltr  
total 4  
-rw-r--r--. 1 root root 15728640 Jan 24 22:50 my_app.log-20240124  
-rw-r--r--. 1 root root 0 Jan 24 22:53 my_app.log  
[root@redhat01 myapp]#
```

```
# delete the rotate file
```

```
[root@redhat01 myapp]# mkdir archive
[root@redhat01 myapp]# ls
archive  my_app.log  my_app.log-20240124
[root@redhat01 myapp]# rm my_app.log-20240124
rm: remove regular file 'my_app.log-20240124'? y
[root@redhat01 myapp]# ls
archive  my_app.log
[root@redhat01 myapp]# █
```

```
[root@redhat01 myapp]# vi /etc/logrotate.d/myapp
```

```
/var/log/myapp/*.log{
    daily
    size 10M
    olddir /var/log/myapp/archive
    compress
}
~
```

```
[root@redhat01 myapp]#
[root@redhat01 myapp]# ls -ltr
total 0
-rw-r--r--. 1 root root 0 Jan 24 22:53 my_app.log
drwxr-xr-x. 2 root root 6 Jan 24 22:54 archive
[root@redhat01 myapp]#
[root@redhat01 myapp]# truncate -s 15M my_app.log
[root@redhat01 myapp]# ls -ltr
total 0
drwxr-xr-x. 2 root root 6 Jan 24 22:54 archive
-rw-r--r--. 1 root root 15728640 Jan 24 22:56 my_app.log
[root@redhat01 myapp]# █
```

backup - compressed + rotation

```
[root@redhat01 myapp]#
[root@redhat01 myapp]# cd archive/
[root@redhat01 archive]# ls
[root@redhat01 archive]#
[root@redhat01 archive]# logrotate /etc/logrotate.conf
[root@redhat01 archive]# ls -lh
total 16
-rw-r--r--. 1 root root 15288 Jan 24 22:56 my_app.log-20240124.gz
[root@redhat01 archive]# ls -lh
total 16K
-rw-r--r--. 1 root root 15K Jan 24 22:56 my_app.log-20240124.gz
[root@redhat01 archive]# █
```

```
[root@redhat01 archive]#  
[root@redhat01 archive]# systemctl status logrotate.timer  
● logrotate.timer - Daily rotation of log files  
  Loaded: loaded (/usr/lib/systemd/system/logrotate.timer; enabled; pr  
  Active: active (waiting) since Wed 2024-01-24 20:30:03 EET; 2h 28min  
    Until: Wed 2024-01-24 20:30:03 EET; 2h 28min ago  
  Trigger: Thu 2024-01-25 00:00:00 EET; 1h 1min left  
 Triggers: ● logrotate.service  
  Docs: man:logrotate(8)  
        man:logrotate.conf(5)  
  
Jan 24 20:30:03 redhat01 systemd[1]: Started Daily rotation of log files.  
[lines 1-10/10 (END)]
```

Linux RSYNC

What is RSYNC

A utility for efficiently transferring and synchronizing files across different systems or locations.

It's known for its speed, flexibility, and efficiency.

RSYNC Feature

Optimize file transfers by sending only the changes made, and ensure that file permissions, ownership, and timestamps are preserved.

RSYNC SYNTAX

rsync [options] source destination

Options

- -a or --archive for archiving files,
- -v or --verbose for verbose output,
- -z or --compress for compression,
- and --progress to show progress during transfer."

```
root@Siddhartha:/tmp/rsync# ls
file.txt
root@Siddhartha:/tmp/rsync# ■
```

```
siddhartha@siddhartha: ~
root@Siddhartha:~# root@Siddhartha:~# ls
sid.txt
root@Siddhartha:~# cd /tmp
root@Siddhartha:/tmp# ls
rsync
systemd-private-98ff4bf3f9f14348adaff180aec2cc49-systemd-logind.service-wCOSRt
systemd-private-98ff4bf3f9f14348adaff180aec2cc49-systemd-resolved.service-QWytXG
root@Siddhartha:/tmp# cd rsync
root@Siddhartha:/tmp/rsync# ls
file.txt
root@Siddhartha:/tmp/rsync# ■
```

Remote Server

```
File Edit View VM Tabs Help Mar 7 2:22 PM
Library Type here ...
RHEL-10
My Computer RHEL-10
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-ModemManager.service-sAGTAe
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-polkit.service-Es8XBB
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-rtkit-daemon.service-8zHcMB
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-switcheroo-control.service-gH2vEk
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-systemd-logind.service-0PCAGW
systemd-private-0e2f7a85d5774ebc8dd8f5ac58cd5aac-upower.service-X0umDY
vmware-root_942-2697663758
vmware-root_944-2697139479
vmware-root_946-2688685205
vmware-root_948-2688554130
vmware-root_949-4021784396
vmware-root_950-2697008400
vmware-root_951-4013330126
vmware-root_952-2730562329
vmware-root_953-3979774151
vmware-root_966-2999001944
root@RHEL-10:/tmp# mkdir rsync
root@RHEL-10:/tmp# cd rsync
root@RHEL-10:/tmp/rsync# ls
root@RHEL-10:/tmp/rsync#
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

```
ash-3.2$ ls
file1.csv          file2          mywebserver-01.pem
ash-3.2$ rsync file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
ash-3.2$ ls
file1.csv          file2          mywebserver-01.pem
ash-3.2$
```

-v : verbose

```
bash-3.2$ rsync -v file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
file1.csv

sent 79786 bytes received 42 bytes 31931.20 bytes/sec
total size is 79688 speedup is 1.00
bash-3.2$
```

RSYNC SYNTAX

rsync [options] source destination

Options

- **-a or --archive for archiving files,**
- **-v or --verbose for verbose output,**
- **-z or --compress for compression,**
- **and --progress to show progress during transfer."**

```
# compress
bash-3.2$ rsync -vz --progress file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
file1.csv
    79688 100%   44.75MB/s    0:00:00 (xfer#1, to-check=0/1)

sent 19317 bytes  received 42 bytes  5531.14 bytes/sec
total size is 79688  speedup is 4.12
bash-3.2$
```

```
# Archive
```

```
bash-3.2$ rsync -vza --progress file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
building file list ...
1 file to consider
file1.csv
    79688 100%   44.75MB/s    0:00:00 (xfer#1, to-check=0/1)

sent 19364 bytes  received 42 bytes  7762.40 bytes/sec
total size is 79688  speedup is 4.11
```

```
bash-3.2$ ls -ltr
total 168
-r-----@ 1 prashantparadkar  staff      1674 Feb  3 13:46 mywebserver-01.pem
-rw-r--r--  1 prashantparadkar  staff     79688 Feb  3 15:36 file1.csv
-rw-r--r--  1 prashantparadkar  staff  104857600 Feb  3 15:59 file2
bash-3.2$
```

```
[root@redhat01 rsync]#
[root@redhat01 rsync]# ls -ltr
total 80
-rw-r--r--. 1 501 games 79688 Feb  3 2024 file1.csv
[root@redhat01 rsync]#
```

```

bash-3.2$ rsync -vza --progress file1.csv root@10.211.55.5:/tmp/rsync/
|root@10.211.55.5's password:
building file list ...
1 file to consider
file1.csv
    79705 100%   75.35MB/s    0:00:00 (xfer#1, to-check=0/1)

sent 314 bytes received 726 bytes 416.00 bytes/sec
total size is 79705 speedup is 76.64
bash-3.2$ ■

id,firstname,lastname,email,email2,profession
100,AnneCorinne,Hunfredo,AnneCorinne.Hunfredo@yopmail.com,AnneCorinne.Hunfredo@gmail.com,developer
101,Lynnea,Francyne,Lynnea.Francyne@yopmail.com,Lynnea.Francyne@gmail.com,doctor
102,Wendi,Dorine,Wendi.Dorine@yopmail.com,Wendi.Dorine@gmail.com,doctor
103,Jillayne,Clie,Jillayne.Clie@yopmail.com,Jillayne.Clie@gmail.com,police officer
104,Stephanie,Charity,Stephanie.Charity@yopmail.com,Stephanie.Charity@gmail.com,doctor
105,Arabel,Hylan,Arabel.Hylan@yopmail.com,Arabel.Hylan@gmail.com,doctor
106,Zondra,Roarke,Zondra.Roarke@yopmail.com,Zondra.Roarke@gmail.com,worker
107,Chastity,Israeli,Chastity.Israeli@yopmail.com,Chastity.Israeli@gmail.com,worker
108,Merle,Gabrielli,Merle.Gabrielli@yopmail.com,Merle.Gabrielli@gmail.com,worker
109,Carmela,Mike,Carmela.Mike@yopmail.com,Carmela.Mike@gmail.com,doctor
110,Hildegaard,Pacorro,Hildegaard.Pacorro@yopmail.com,Hildegaard.Pacorro@gmail.com,doctor
111,Gabriella,Eugenia,Gabriella.Eugenia@yopmail.com,Gabriella.Eugenia@gmail.com,worker
112,Ezmeralda,Kunin,Ezmeralda.Kunin@yopmail.com,Ezmeralda.Kunin@gmail.com,doctor
113,Leontine,Peti,Leontine.Peti@yopmail.com,Leontine.Peti@gmail.com,worker
114,Sissy,Romelda,Sissy.Romelda@yopmail.com,Sissy.Romelda@gmail.com,firefighter
115,Steffane,Cyrie,Steffane.Cyrie@yopmail.com,Steffane.Cyrie@gmail.com,police officer
116,Deedee,Mandler,Deedee.Mandler@yopmail.com,Deedee.Mandler@gmail.com,police officer
117,Fredericka,Mott,Fredericka.Mott@yopmail.com,Fredericka.Mott@gmail.com,police officer
118,Aurelie,Magdalene,Aurelie.Magdalene@yopmail.com,Aurelie.Magdalene@gmail.com,worker
119,Layla,Ivens,Layla.Ivens@yopmail.com,Layla.Ivens@gmail.com,worker
120,Randa,Gibbeon,Randa.Gibbeon@yopmail.com,Randa.Gibbeon@gmail.com,doctor
121,Nonnah,Idelia,Nonnah.Idelia@yopmail.com,Nonnah.Idelia@gmail.com,worker
122,Gloria,Goth,Gloria.Goth@yopmail.com,Gloria.Goth@gmail.com,developer
123,Ida,Gibbeon,Ida.Gibbeon@yopmail.com,Ida.Gibbeon@gmail.com,worker
124,Letizia,Neva,Letizia.Neva@yopmail.com,Letizia.Neva@gmail.com,firefighter
125,Shirlee,Gilbertson,Shirlee.Gilbertson@yopmail.com,Shirlee.Gilbertson@gmail.com,worker
126,Melina O'Carroll,Melina O'Carroll@yopmail.com,Melina.O'Carroll@gmail.com,police officer

```

RSYNC SYNTAX

rsync [options] source destination

Options

- **-b taking backup before delete**
- **-d delete files before copying**
- **--backup-dir=/tmp/**

Backup

```
bash-3.2$ bash-3.2$ rsync -vzab --progress file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
building file list ...
1 file to consider

sent 91 bytes received 20 bytes 44.40 bytes/sec
total size is 79708 speedup is 718.09
bash-3.2$
```

```
[root@redhat01 rsync]# [root@redhat01 rsync]# ls
file1.csv file2
[root@redhat01 rsync]# ls -ltr
total 102480
-rw-r--r--. 1 501 games 104857600 Feb  3  2024 file2
-rw-r--r--. 1 501 games      79708 Feb  3  2024 file1.csv
[root@redhat01 rsync]#
```

no Change in above

now make some changes in csv file .. see the changes in remote server

```
bash-3.2$ vi file1.csv
bash-3.2$ rsync -vzab --progress file1.csv root@10.211.55.5:/tmp/rsync/
root@10.211.55.5's password:
building file list ...
1 file to consider
file1.csv
    79710 100%   75.35MB/s    0:00:00 (xfer#1, to-check=0/1)

sent 319 bytes received 726 bytes 418.00 bytes/sec
total size is 79710 speedup is 76.28
bash-3.2$
```

red - Backup file / # yellow - New file

```
[root@redhat01 rsync]# [root@redhat01 rsync]# ls
file1.csv file2
[root@redhat01 rsync]# ls -ltr
total 102480
-rw-r--r--. 1 501 games 104857600 Feb  3  2024 file2
-rw-r--r--. 1 501 games      79708 Feb  3  2024 file1.csv
[root@redhat01 rsync]# ls -ltr
total 102560
-rw-r--r--. 1 501 games 104857600 Feb  3  2024 file2
-rw-r--r--. 1 501 games      79708 Feb  3  2024 file1.csv~
-rw-r--r--. 1 501 games      79710 Feb  3  2024 file1.csv
[root@redhat01 rsync]#
```

```
# check ..
```

```
[root@redhat01 rsync]# less file1.csv
```

```
1077,Tracey,Taima,Tracey.Taima@yopmail.com,Tracey.Taima@gmail.com,worker  
1078,Ardenia,Francyne,Ardenia.Francyne@yopmail.com,Ardenia.Francyne@gmail.com,firefighter  
1079,Dione,Madaih,Dione.Madaih@yopmail.com,Dione.Madaih@gmail.com,police officer  
1080,Kamilah,Ummersen,Kamilah.Ummersen@yopmail.com,Kamilah.Ummersen@gmail.com,developer  
1081,Karly,Claudine,Karly.Claudine@yopmail.com,Karly.Claudine@gmail.com,developer  
1082,Jany,Damarr,Jany.Damarr@yopmail.com,Jany.Damarr@gmail.com,doctor  
1083,Joleen,Helve,Joleen.Helve@yopmail.com,Joleen.Helve@gmail.com,doctor  
1084,Addia,Martguerita,Addia.Martguerita@yopmail.com,Addia.Martguerita@gmail.com,firefig  
1085,Talya,Idelia,Talya.Idelia@yopmail.com,Talya.Idelia@gmail.com,worker  
1086,Marnia,Silvan,Marnia.Silvan@yopmail.com,Marnia.Silvan@gmail.com,developer  
1087,Flory,Janene,Flory.Janene@yopmail.com,Flory.Janene@gmail.com,firefighter  
1088,Mahalia,Mott,Mahalia.Mott@yopmail.com,Mahalia.Mott@gmail.com,developer  
1089,Cordi,Quent,Cordi.Quent@yopmail.com,Cordi.Quent@gmail.com,doctor  
1090,Jsandye,Gaulin,Jsandye.Gaulin@yopmail.com,Jsandye.Gaulin@gmail.com,police officer  
1091,Inga,Ailyn,Inga.Ailyn@yopmail.com,Inga.Ailyn@gmail.com,police officer  
1092,Doro,Rheingold,Doro.Rheingold@yopmail.com,Doro.Rheingold@gmail.com,doctor  
1093,Laurene,Marlie,Laurene.Marlie@yopmail.com,Laurene.Marlie@gmail.com,police officer  
1094,Kamilah,Payson,Kamilah.Payson@yopmail.com,Kamilah.Payson@gmail.com,doctor  
1095,Bernardine,Esmaria,Bernardine.Esmaria@yopmail.com,Bernardine.Esmaria@gmail.com,worke  
1096,Joleen,Cullin,Joleen.Cullin@yopmail.com,Joleen.Cullin@gmail.com,developer  
1097,Silvana,Penelopa,Silvana.Penelopa@yopmail.com,Silvana.Penelopa@gmail.com,doctor  
1098,Heddie,Lacombe,Heddie.Lacombe@yopmail.com,Heddie.Lacombe@gmail.com,doctor  
1099,Debee,Thema,Debee.Thema@yopmail.com,Debee.Thema@gmail.com,developer:  
This is new line  
PPQ  
(END)
```

```
# Backuo file
```

```
[root@redhat01 rsync]# less file1.csv~
```

```
1081,Karly,Claudine,Karly.Claudine@yopmail.com,Karly.Claudine@gmail.com,developer  
1082,Jany,Damarr,Jany.Damarr@yopmail.com,Jany.Damarr@gmail.com,doctor  
1083,Joleen,Helve,Joleen.Helve@yopmail.com,Joleen.Helve@gmail.com,doctor  
1084,Addia,Martguerita,Addia.Martguerita@yopmail.com,Addia.Martguerita@gmail.com,firefig  
1085,Talya,Idelia,Talya.Idelia@yopmail.com,Talya.Idelia@gmail.com,worker  
1086,Marnia,Silvan,Marnia.Silvan@yopmail.com,Marnia.Silvan@gmail.com,developer  
1087,Flory,Janene,Flory.Janene@yopmail.com,Flory.Janene@gmail.com,firefighter  
1088,Mahalia,Mott,Mahalia.Mott@yopmail.com,Mahalia.Mott@gmail.com,developer  
1089,Cordi,Quent,Cordi.Quent@yopmail.com,Cordi.Quent@gmail.com,doctor  
1090,Jsandye,Gaulin,Jsandye.Gaulin@yopmail.com,Jsandye.Gaulin@gmail.com,police officer  
1091,Inga,Ailyn,Inga.Ailyn@yopmail.com,Inga.Ailyn@gmail.com,police officer  
1092,Doro,Rheingold,Doro.Rheingold@yopmail.com,Doro.Rheingold@gmail.com,doctor  
1093,Laurene,Marlie,Laurene.Marlie@yopmail.com,Laurene.Marlie@gmail.com,police officer  
1094,Kamilah,Payson,Kamilah.Payson@yopmail.com,Kamilah.Payson@gmail.com,doctor  
1095,Bernardine,Esmaria,Bernardine.Esmaria@yopmail.com,Bernardine.Esmaria@gmail.com,work  
1096,Joleen,Cullin,Joleen.Cullin@yopmail.com,Joleen.Cullin@gmail.com,developer  
1097,Silvana,Penelopa,Silvana.Penelopa@yopmail.com,Silvana.Penelopa@gmail.com,doctor  
1098,Heddie,Lacombe,Heddie.Lacombe@yopmail.com,Heddie.Lacombe@gmail.com,doctor  
1099,Debee,Thema,Debee.Thema@yopmail.com,Debee.Thema@gmail.com,developer:  
This is new line  
PP  
(END)
```

Linux Apache Web Server HTTPD | Setup with Example

Web Server HTTPD service, how we can setup a web server in our Linux environment CENTOS, deploy our first simple HTML

Based web page and how we can access our web page from browser.

HTTP Daemon is a software program that runs in the background of a web server and waits for the incoming server requests.

The daemon answers the request automatically and serves the hypertext and multimedia documents over the Internet using HTTP.

What is HTTPD?

HTTP Daemon is a software program that runs in the background of a web server and waits for the incoming server requests.

The daemon answers the request automatically and serves the hypertext and multimedia documents over the Internet using HTTP.

```
[root@centosvm ~]# yum install httpd
Last metadata expiration check: 3:59:56 ago on Wednesday 29 September 2021 10
5:57 AM EDT.
Package httpd-2.4.37-39.module_el8.4.0+778+c970deab.x86_64 is already install
.
Dependencies resolved.
Nothing to do.
Complete!
[root@centosvm ~]#
```

```
[root@centosvm ~]# httpd -version
Server version: Apache/2.4.37 (centos)
Server built:   May 20 2021 04:33:06
[root@centosvm ~]#
```

Config Location:

/etc/httpd/conf/httpd.conf
/var/www/html/index.html (you need to add this file)

Logs:

log var/log/httpd

How to start service

systemctl start httpd

```
[root@centosvm ~]# cd /etc/httpd/conf
[root@centosvm conf]# ls
httpd.conf  magic
[root@centosvm conf]# less httpd.conf

#
# Listen: Allows you to bind Apache to specific IP addresses and/or
# ports, instead of the default. See also the <VirtualHost>
# directive.
#
# Change this to Listen on specific IP addresses as shown below to
# prevent Apache from glomming onto all bound IP addresses.
#
#Listen 12.34.56.78:80
Listen 80

#
# Dynamic Shared Object (DSO) Support
#
# To be able to use the functionality of a module which was built as a DSO you
# have to place corresponding 'LoadModule' lines at this location so the
# directives contained in it are actually available _before_
# Statically compiled modules (those listed by 'httpd -l'
# to be loaded here.
#
# Example:
: #
```

```
[root@centosvm ~]# cd /etc/httpd/conf
[root@centosvm conf]# ls
httpd.conf  magic
[root@centosvm conf]# less httpd.conf
[root@centosvm conf]# cd /var/www/
[root@centosvm www]# ls
cgi-bin  html
[root@centosvm www]# cd html/
[root@centosvm html]# clear
```

```
# Script
[File Edit Format View Help]
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>

<body style="text-align: center;">
    <h1>Congratulations </h1>
    <h2>This is our first WebSite using Apache WebServer</h2>
    <br>
    <br>
    <script src="https://cdn.jsdelivr.net/npm/axios/dist/axios.min.js"></script>
    <script src="app.js"></script>
</body>

</html>
```

```
[root@centosvm html]# vi index.html
[root@centosvm html]# ls
index.html
[root@centosvm html]#
```

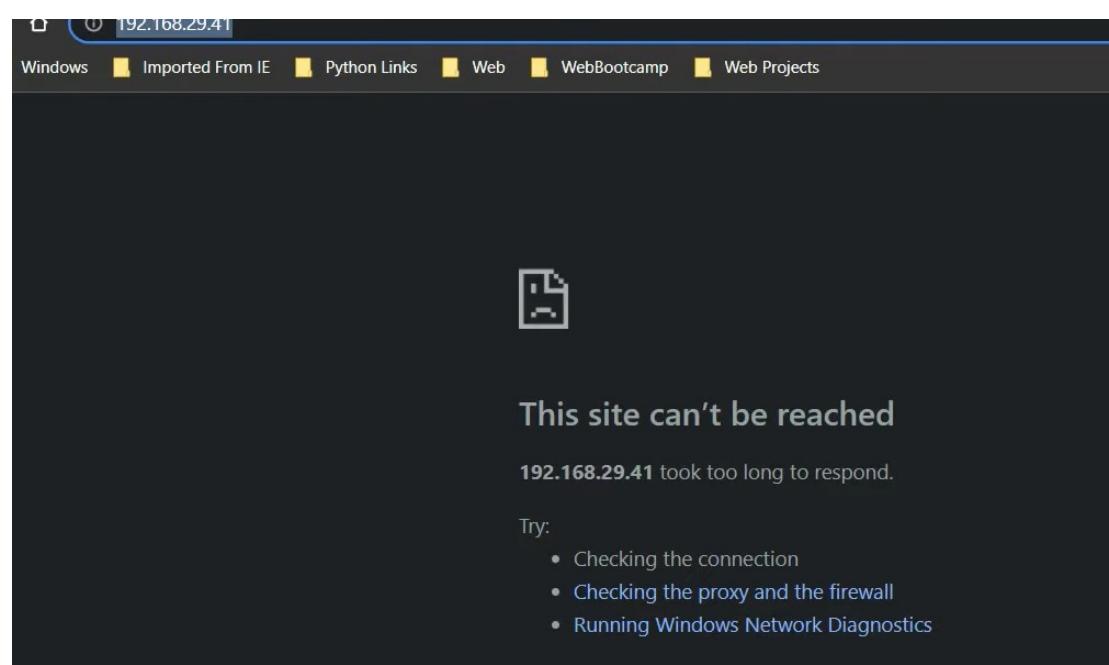
```
# Start the httpd service
```

```
root@centosvm html]# systemctl status httpd
  httpd.service - The Apache HTTP Server
    Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor
      Active: inactive (dead)
        Docs: man:httpd.service(8)

ep 29 11:29:05 centosvm systemd[1]: Starting The Apache HTTP Server...
ep 29 11:29:08 centosvm httpd[34257]: AH00558: httpd: Could not reliably
ep 29 11:29:08 centosvm systemd[1]: Started The Apache HTTP Server...
ep 29 11:29:08 centosvm httpd[34257]: Server configu
ep 29 11:35:34 centosvm systemd[1]: Stopping The Apache HTTP Server...
ep 29 11:35:35 centosvm systemd[1]: httpd.service: Stopped The Apache HTTP Server...
ep 29 11:35:35 centosvm systemd[1]: Stopped The Apache HTTP Server...
root@centosvm html]# cl
```

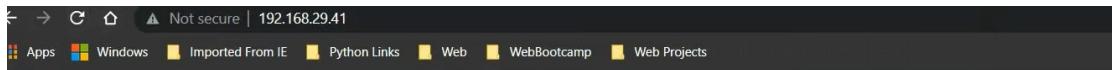
```
[root@centosvm html]# systemctl start httpd
[root@centosvm html]# ip a
```

```
# ip addr
1: ens33: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:d3:be:37 brd ff:ff:ff:ff:ff:ff
    inet 192.168.29.41/24 brd 192.168.29.255 scope global dynamic noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fed3:be37/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
2: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
```



firewall blocking

```
[root@centosvm html]# systemctl status firewalld.service
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor
     Active: active (running) since Wed 2021-09-29 11:35:19 EDT; 2h 40min ago
       Docs: man:firewalld(1)
     Main PID: 34679 (firewalld)
        Tasks: 2 (limit: 11091)
      Memory: 25.3M
        CGroup: /system.slice/firewalld.service
                  └─34679 /usr/libexec/platform-python -s /usr/sbin/firewalld --nofor>
Sep 29 11:35:17 centosvm systemd[1]: Starting firewalld - dynamic firewall dae>
Sep 29 11:35:19 centosvm systemd[1]: Started firewalld - dynamic firewall daem>
Sep 29 11:35:19 centosvm firewalld[34679]: WARNING: AllowZoneDrifting is enable>
[root@centosvm html]# systemctl stop firewalld.service
```



Congratulations

This is our first WebSite using Apache WebServer

What is NGINX WebServer With Example Setup on Linux

What is NGINX WebServer With Example Setup on Linux

What is NGINX Web Server service, how we can setup a web server in our Linux environment CENTOS, deploy our first simple HTML Based web page and how we can access our web page from browser.

What is NGINX?

It is a web server that accept request via HTTP/s and respond to display website content through storing, processing and delivering web pages to users.

NGINX can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache.

Installation

1. Setup yum repo for RHEL/CENTOS
sudo vi /etc/yum.repos.d/nginx.repo

2. Add the following to nginx.repo

```
[nginx]
name=nginx repo
baseurl=https://nginx.org/packages/centos/8/\$basearch/
gpgcheck=0
enabled=1
```

3. Update the yum repo

```
sudo yum update
```

4. Install NGINX Open source package:

```
sudo yum install nginx
```

[NGINX web server](#)

[what is NGINX](#)

[NGINX http server](#)

[NGINX web server in Hindi](#)

nginx server, apache web server, what is nginx server, what is nginx web server, nginx web server explained, NGINX web server tutorial for beginners, NGINX web server tutorial, http server from scratch, nginx web server for beginners, nginx web server tutorial for begginers, web server

What is NGINX?

It is a web server that accept request via HTTP/s and respond to display website content through storing, processing and delivering web pages to users.

This can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache.

Companies like [Airbnb](#), [Netflix](#), [WordPress.com](#), and many others deploy NGINX for scalability and performance reasons.

Installation

1. Setup yum repo for RHEL/CENTOS
`sudo vi /etc/yum.repos.d/nginx.repo`

2. Add the following to nginx.repo

```
[nginx]
name=nginx repo
baseurl=https://nginx.org/packages/centos/8/$basearch/
gpgcheck=0
enabled=1
```

3. Update the yum repo
`sudo yum update`

4. Install NGINX Open source package:
`sudo yum install nginx`

```
root@centosvm ~]#
root@centosvm ~]# sudo vi /etc/yum.repos.d/nginx.repo
```

```
root@centosvm ~]# sudo vi /etc/yum.repos.d/nginx.repo
root@centosvm ~]#
root@centosvm ~]# sudo yum update
```

```
grub2-tools-minimal-1:2.02-99.el8_4.1.x86_64
httpd-2.4.37-39.module_el8.4.0+950+0577e6ac.1.x86_64
httpd-filesystem-2.4.37-39.module_el8.4.0+950+0577e6ac.1.noarch
httpd-tools-2.4.37-39.module_el8.4.0+950+0577e6ac.1.x86_64
krb5-libs-1.18.2-8.3.el8_4.x86_64
libcurl-7.61.1-18.el8_4.1.x86_64
libdb-5.3.28-42.el8_4.x86_64
libdb-utilis-5.3.28-42.el8_4.x86_64
nspr-4.32.0-1.el8_4.x86_64
nss-3.67.0-6.el8_4.x86_64
nss-softokn-3.67.0-6.el8_4.x86_64
nss-softokn-freebl-3.67.0-6.el8_4.x86_64
nss-sysinit-3.67.0-6.el8_4.x86_64
nss-util-3.67.0-6.el8_4.x86_64
platform-python-3.6.8-38.el8_4.x86_64
podman-3.2.3-0.11.module_el8.4.0+942+d25aada8.x86_64
podman-catalogonit-3.2.3-0.11.module_el8.4.0+942+d25aada8.x86_64
poppler-20.11.0-2.el8_4.1.x86_64
poppler-glib-20.11.0-2.el8_4.1.x86_64
poppler-utils-20.11.0-2.el8_4.1.x86_64
python3-libs-3.6.8-38.el8_4.x86_64
python3-subscription-manager-rhsm-1.28.13-4.el8_4.x86_64
python3-sympurpose-1.28.13-4.el8_4.x86_64
selinux-policy-3.14.3-67.el8_4.2.noarch
selinux-policy-targeted-3.14.3-67.el8_4.2.noarch
sos-4.0-12.el8_4.noarch
strace-5.7-2.1.el8_4.x86_64
subscription-manager-1.28.13-4.el8_4.x86_64
subscription-manager-rhsm-certificates-1.28.13-4.el8_4.x86_64
tzdata-2021c-1.el8.noarch
nstalled:
    grub2-tools-efi-1:2.02-99.el8_4.1.x86_64
```

```
[root@centosvm ~]# sudo yum install nginx
Last metadata expiration check: 0:04:32 ago on Thursday 21 October 2021 06:59:03 AM EDT.
Dependencies resolved.
=====
| Package           | Arch   | Version      | Repository | S
|=====|
| Installing:      |
|   nginx          | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 57
| Installing dependencies: |
|   nginx-all-modules | noarch | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 2
|   nginx-filesystem | noarch | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 2
|   nginx-mod-http-image-filter | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 3
|   nginx-mod-http-perl | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 4
|   nginx-mod-http-xslt-filter | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 3
|   nginx-mod-mail | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 6
|   nginx-mod-stream | x86_64 | 1:1.14.1-9.module_e18.0.0+184+e34fea82 | appstream | 8
| Enabling module streams: |
|   nginx          |          | 1.14
| Transaction Summary |
|=====|
| Install  8 Packages
|
```

Start and check the status of nginx systemctl status/start/stop nginx

Another way of verifying curl -I 127.0.0.1

```
[root@centosvm ~]# systemctl status nginx
● nginx.service - The nginx HTTP and reverse proxy server
  Loaded: loaded (/usr/lib/systemd/system/nginx.service; disabled; vendor preset: disabled)
  Active: inactive (dead)

Mar 22 16:55:58 centosvm systemd[1]: nginx.service: Succeeded.
Mar 22 16:55:58 centosvm systemd[1]: Stopped The nginx HTTP and reverse proxy server.
Mar 22 16:56:04 centosvm systemd[1]: Starting The nginx HTTP and reverse proxy server...
Mar 22 16:56:04 centosvm nginx[16611]: nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
Mar 22 16:56:04 centosvm nginx[16611]: nginx: configuration file /etc/nginx/nginx.conf test is successful
Mar 22 16:56:04 centosvm systemd[1]: nginx.service: Failed to parse PID from file /run/nginx.pid: Invalid
Mar 22 16:56:04 centosvm systemd[1]: Started The nginx HTTP and reverse proxy server.
Mar 22 17:10:07 centosvm systemd[1]: Stopping The nginx HTTP and reverse proxy server...
Mar 22 17:10:07 centosvm systemd[1]: nginx.service: Succeeded.
Mar 22 17:10:07 centosvm systemd[1]: Stopped The nginx HTTP and reverse proxy server.
lines 1-14/14 (END)
```

```
[root@centosvm ~]# curl -I 127.0.0.1
curl: (7) Failed to connect to 127.0.0.1 port 80: Connection refused
[root@centosvm ~]#
[root@centosvm ~]#
[root@centosvm ~]# systemctl start nginx
[root@centosvm ~]#
[root@centosvm ~]# systemctl status nginx
● nginx.service - The nginx HTTP and reverse proxy server
  Loaded: loaded (/usr/lib/systemd/system/nginx.service; disabled; vendor preset: disabled)
  Active: active (running) since Tue 2022-03-22 17:12:49 EDT; 5s ago
    Process: 16828 ExecStart=/usr/sbin/nginx (code=exited, status=0/SUCCESS)
    Process: 16826 ExecStartPre=/usr/sbin/nginx -t (code=exited, status=0/SUCCESS)
    Process: 16825 ExecStartPre=/usr/bin/rm -f /run/nginx.pid (code=exited, status=0/SUCCESS)
  Main PID: 16830 (nginx)
     Tasks: 2 (limit: 11091)
    Memory: 3.7M
   CGroup: /system.slice/nginx.service
           └─16830 nginx: master process /usr/sbin/nginx
              ├─16831 nginx: worker process

Mar 22 17:12:48 centosvm systemd[1]: Starting The nginx HTTP and reverse proxy server...
Mar 22 17:12:49 centosvm nginx[16826]: nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
Mar 22 17:12:49 centosvm nginx[16826]: nginx: configuration file /etc/nginx/nginx.conf test is successful
Mar 22 17:12:49 centosvm nginx[16826]: nginx: pid file "/run/nginx.pid" failed to create: Permission denied
```

```
[root@centosvm ~]# curl -I 127.0.01
HTTP/1.1 200 OK
Server: nginx/1.14.1
Date: Tue, 22 Mar 2022 21:13:13 GMT
Content-Type: text/html
Content-Length: 4009
Last-Modified: Thu, 21 Oct 2021 11:12:28 GMT
Connection: keep-alive
ETag: "61714b1c-fa9"
Accept-Ranges: bytes
```

Configs

/etc/nginx/nginx.conf
/usr/share/nginx/html

```
[root@centosvm ~]# cd /etc/nginx/
[root@centosvm nginx]# ls -ltr
total 72
-rw-r--r--. 1 root root 3610 Oct  7 2019 win-utf
-rw-r--r--. 1 root root  664 Oct  7 2019 uwsgi_params.default
-rw-r--r--. 1 root root  664 Oct  7 2019 uwsgi_params
-rw-r--r--. 1 root root  636 Oct  7 2019 scgi_params.default
-rw-r--r--. 1 root root  636 Oct  7 2019 scgi_params
-rw-r--r--. 1 root root 2656 Oct  7 2019 nginx.conf.default
-rw-r--r--. 1 root root 5170 Oct  7 2019 mime.types.default
-rw-r--r--. 1 root root 5170 Oct  7 2019 mime.types
-rw-r--r--. 1 root root 2223 Oct  7 2019 koi-win
-rw-r--r--. 1 root root 2837 Oct  7 2019 koi-utf
-rw-r--r--. 1 root root 1007 Oct  7 2019 fastcgi_params.default
-rw-r--r--. 1 root root 1007 Oct  7 2019 fastcgi_params
-rw-r--r--. 1 root root 1077 Oct  7 2019 fastcgi.conf.default
-rw-r--r--. 1 root root 1077 Oct  7 2019 fastcgi.conf
drwxr-xr-x. 2 root root   6 Oct  7 2019 default.d
drwxr-xr-x. 2 root root   6 Oct  7 2019 conf.d
-rw-r--r--. 1 root root 2470 Oct 21 22:06 nginx.conf_bkp
-rwxrwxrwx. 1 root root 2470 Mar 22 16:55 nginx.conf
[root@centosvm nginx]# less nginx.conf
```

```
worker_processes auto;           I
error_log /var/log/nginx/error.log;
pid /run/nginx.pid;

# Load dynamic modules. See /usr/share/doc/nginx/README.dynamic.
include /usr/share/nginx/modules/*.conf;

events {
    worker_connections 1024;
}

http {
    log_format  main  '$remote_addr - $remote_user [$time_local] "$request" '
                      '$status $body_bytes_sent "$http_referer" '
                      '"$http_user_agent" "$http_x_forwarded_for"';

    access_log  /var/log/nginx/access.log  main;

    sendfile          on;
    tcp_nopush        on;
    tcp_nodelay       on;
    keepalive_timeout 65;
    types_hash_max_size 2048;

    include           /etc/nginx/mime.types;
    default_type     application/octet-stream;
}

# Settings for a TLS enabled server.
#
server {
    listen      443 ssl http2 default_server;
    listen      [::]:443 ssl http2 default_server;
    server_name ;
    root       /usr/share/nginx/html;

    ssl_certificate "/etc/pki/nginx/server.crt";
    ssl_certificate_key "/etc/pki/nginx/private/server.key";
    ssl_session_cache shared:SSL:1m;
    ssl_session_timeout 10m;           I
    ssl_ciphers PROFILE=SYSTEM;
    ssl_prefer_server_ciphers on;

    # Load configuration files for the default server block.
    include /etc/nginx/default.d/*.conf;

    location / {
    }

    error_page 404 /404.html;
        location = /40x.html {
    }

    error_page 500 502 503 504 /50x.html;
        location = /50x.html {
    }
}
```

```
[root@centosvm nginx]# cd /usr/share/nginx/html/
[root@centosvm html]# ls -ltr
total 24
-rw-r--r--. 1 root root 368 Oct  7 2019 nginx-logo.png
-rw-r--r--. 1 root root 4020 Oct  7 2019 50x.html
-rw-r--r--. 1 root root 3971 Oct  7 2019 404.html
-rw-r--r--. 1 root root 4148 Oct  7 2019 powerledby.png
-rw-r--r--. 1 root root 4009 Oct 21 07:12 index.html
[root@centosvm html]#
```

```
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.29.41 netmask 255.255.255.0 broadcast 192.168.29.255
      inet6 2405:201:302a:481e:20c:29ff:fed3:be37 prefixlen 64 scopeid 0x0<global>
      inet6 fe80::20c:29ff:fed3:be37 prefixlen 64 scopeid 0x20<link>
        ether 00:0c:29:d3:be:37 txqueuelen 1000 (Ethernet)
          RX packets 256852 bytes 30072114 (28.6 MiB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 38905 bytes 4112878 (3.9 MiB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
      inet 127.0.0.1 netmask 255.0.0.0
      inet6 ::1 prefixlen 128 scopeid 0x10<host>
        loop txqueuelen 1000 (Local Loopback)
          RX packets 76 bytes 13911 (13.5 KiB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 76 bytes 13911 (13.5 KiB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
        ether 52:54:00:aa:2a:f0 txqueuelen 1000 (Ethernet)
```

```
root@centosvm html]#
root@centosvm html]# systemctl status firewalld.service
firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2022-03-21 14:52:22 EDT; 1 day 2h ago
     Docs: man:firewalld(1)
 Main PID: 990 (firewalld)
    Tasks: 2 (limit: 11091)
   Memory: 30.9M
      CGroup: /system.slice/firewalld.service
              └─990 /usr/libexec/platform-python -s /usr/sbin/firewalld --nofork --nopid

ar 21 14:52:20 centosvm systemd[1]: Starting firewalld - dynamic firewall daemon...
ar 21 14:52:22 centosvm systemd[1]: Started firewalld - dynamic firewall daemon.
ar 21 14:52:23 centosvm firewalld[990]: WARNING: AllowZoneDrifting is enabled. This is considered an ins
I
root@centosvm html]#
root@centosvm html]# systemctl stop firewalld.service
root@centosvm html]#
```



NGINX

```
[root@centosvm html]# cd /usr/share/nginx/html/
[root@centosvm html]# ls -ltr
total 24
-rw-r--r--. 1 root root 368 Oct  7 2019 nginx-logo.png
-rw-r--r--. 1 root root 4020 Oct  7 2019 50x.html
-rw-r--r--. 1 root root 3971 Oct  7 2019 404.html
-rw-r--r--. 1 root root 4148 Oct  7 2019 poweredby.png
-rw-r--r--. 1 root root 4009 Oct 21 07:12 index.html
[root@centosvm html]#
[root@centosvm html]#
```

```
# index.html
<h1>NGINX Tutorial</h1>

<div class="content">
    <p>This page is used to test the proper operation of the
        <strong>nginx</strong> HTTP server after it has been
        installed. If you can read this page, it means that the
        web server installed at this site is working
        properly.</p>

    <div class="alert">
        <h2>Website Administrator</h2>
        <div class="content">
            <p>This is the default <tt>index.html</tt> page that
                is distributed with <strong>nginx</strong> on
                Red Hat Enterprise Linux. It is located in
                <tt>/usr/share/nginx/html</tt>.</p>

            <p>You should now put your content in a location of
                your choice and edit the <tt>root</tt> configuration
                directive in the <strong>nginx</strong>
                configuration file
                <tt>/etc/nginx/nginx.conf</tt>.</p>

            <p>For information on Red Hat Enterprise Linux, please v
            m/">Red Hat, Inc. website</a>. The documentation for Red Hat Enterpris
```

Logs

/var/log/nginx/

- error.log
- access.log

```
[root@centosvm nginx]# cd /var/log/nginx/
[root@centosvm nginx]# ls -ltr
total 32
-rw-r--r--. 1 root  root  906 Oct 21 22:58 error.log-20211023.gz
-rw-r--r--. 1 root  root  823 Oct 21 23:07 access.log-20211023.gz
-rw-rw-r--. 1 nginx root   99 Oct 29 06:00 access.log-20211030.gz
-rw-rw-r--. 1 nginx root  351 Oct 31 02:10 access.log-20211031.gz
-rw-rw-r--. 1 nginx root  185 Nov 13 15:55 error.log-20211117.gz
-rw-rw-r--. 1 nginx root  100 Nov 13 15:55 access.log-20211117.gz
-rw-rw-r--. 1 nginx root 1150 Mar 22 17:43 error.log
-rw-rw-r--. 1 nginx root 1431 Mar 22 17:43 access.log
[root@centosvm nginx]#
[root@centosvm nginx]# less access.log
```

I

```
127.0.0.1 - - [22/Mar/2022:16:48:54 -0400] "GET / HTTP/1.1" 502 4020 "-" "curl/7.61.1" "-"
127.0.0.1 - - [22/Mar/2022:16:50:43 -0400] "GET / HTTP/1.1" 502 4020 "-" "curl/7.61.1" "-"
127.0.0.1 - - [22/Mar/2022:16:53:15 -0400] "HEAD / HTTP/1.1" 502 0 "-" "curl/7.61.1" "-"
127.0.0.1 - - [22/Mar/2022:16:55:49 -0400] "HEAD / HTTP/1.1" 502 0 "-" "curl/7.61.1" "-"
127.0.0.1 - - [22/Mar/2022:16:56:07 -0400] "HEAD / HTTP/1.1" 200 0 "-" "curl/7.61.1" "-"
127.0.0.1 - - [22/Mar/2022:17:13:13 -0400] "HEAD / HTTP/1.1" 200 0 "-" "curl/7.61.1" "-"
192.168.29.179 - - [22/Mar/2022:17:43:25 -0400] "GET / HTTP/1.1" 200 4009 "-" "Mozilla/5.0 (Windows NT Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/99.0.4844.74 Safari/537.36" "-"
192.168.29.179 - - [22/Mar/2022:17:43:25 -0400] "GET /nginx-logo.png HTTP/1.1" 200 368 "http://192.168.29.179" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/99.0.4844.74 Safari/537.36" "-"
192.168.29.179 - - [22/Mar/2022:17:43:26 -0400] "GET /poweredby.png HTTP/1.1" 200 368 "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/99.0.4844.74 Safari/537.36" "-"
192.168.29.179 - - [22/Mar/2022:17:43:26 -0400] "GET /favicon.ico HTTP/1.1" 404
```

NGINX Reverse Proxy Setup with Example Using HTTPD

What is proxy & Reverse Proxy, how we can setup a NGINX reverse proxy in our Linux CENTOS environment , with Apache webserver in backend.

What is a proxy server?

In computer networking, a proxy server is a server application that acts as an intermediary between a client requesting a resource and the server providing that resource.

What is a reverse proxy server?

A proxy service which takes a client request, passes it on to one or more servers.

Proxying is typically used to distribute the load among several servers,

seamlessly show content from different websites,

or pass requests for processing to application servers over protocols other than HTTP.

How to solve access denied issue in NGINX reverse proxy?

[crit] 59982#0: *2 connect() to 127.0.0.1:8080 failed (13: Permission denied)

while connecting to upstream, client: 192.168.29.179, server: ..., request: "GET / HTTP/1.1",

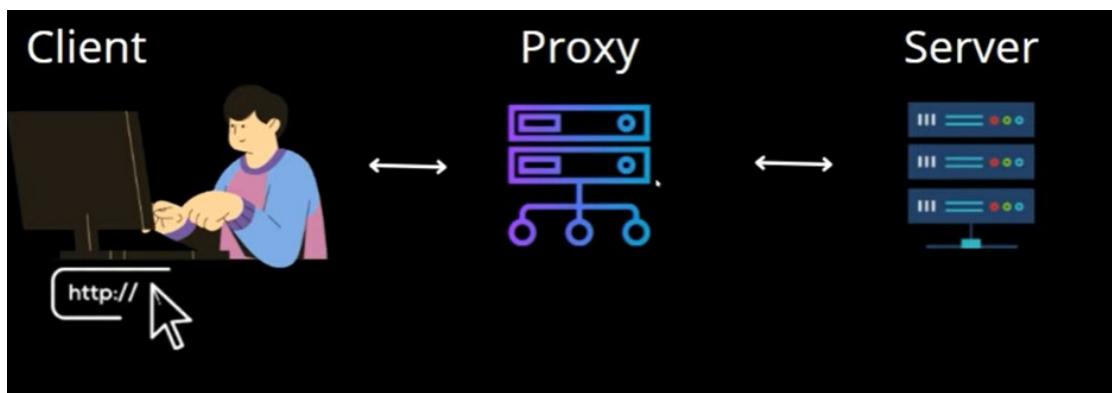
upstream: "http://127.0.0.1:8080/", host: "192.168.29.41"

httpd,http server from scratch,web server explained,web server in hindi,httpd hindi,what is httpd,what is web server,nginx,nginx tutorial,nginx tutorial for beginners,nginx web server,nginx web server in hindi,nginx web server tutorial,nginx web server configuration,nginx web server configuration on centos,nginx in hindi,nginx tutorial in hindi,what is nginx,what is nginx web server in hindi,nginx hindi,nginx kya hota h,nginx setup,nginx setup on linux

nginx reverse proxy configuration,nginx reverse proxy in hindi,nginx tutorial in hindi,nginx web server configuration on centos,nginx reverse proxy configuration examples,nginx,reverse proxy,nginx tutorial,nginx reverse proxy,nginx reverse proxy example,nginx tutorial for beginners,nginx reverse proxy setup,nginx tutorial linux,nginx as reverse proxy,reverse proxy nginx,reverse proxy tutorial,nginx reverse,reverse proxy setup,nginx configuration

What is proxy?

In computer networking, a proxy server is a server application that acts as an intermediary between a client requesting a resource and the server providing that resource.



Reverse Proxy

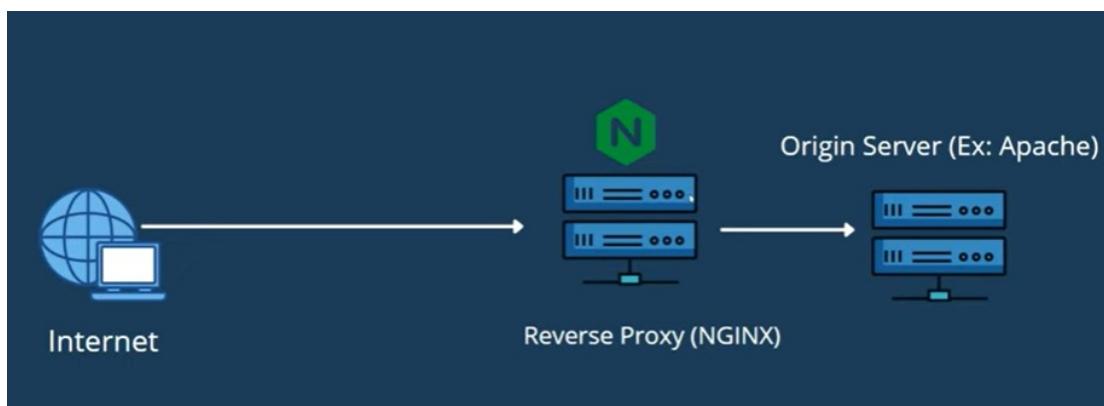
A proxy service which takes a client request, passes it on to one or more servers.

Proxying is typically used to distribute the load among several servers, seamlessly show content from different websites, or pass requests for processing to application servers over protocols other than HTTP.

Reverse Proxy

A proxy service which takes a client request, passes it on to one or more servers.

Proxying is typically used to distribute the load among several servers, seamlessly show content from different websites, or pass requests for processing to application servers over protocols other than HTTP.



```
root@centosvm ~]# systemctl status httpd.service
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
     Active: active (running) since Tue 2022-05-31 14:16:26 EDT; 55min ago
       Docs: man:httpd.service(8)
Main PID: 3010 (httpd)
    Status: "Total requests: 4; Idle/Busy workers 100/0;Requests/sec: 0.0012; Bytes served/sec: 0 B/sec"
      Tasks: 213 (limit: 11091)
     Memory: 24.4M
        CGrou[...]
```

May 31 14:16:26 centosvm systemd[1]: Starting The Apache HTTP Server...
May 31 14:16:26 centosvm httpd[3010]: AH00558: httpd: Could not reliably determine the server's fully qualified domain name, using 127.0.0.1 for Port 80
May 31 14:16:26 centosvm systemd[1]: Started The Apache HTTP Server.
May 31 14:16:26 centosvm httpd[3010]: Server configured, listening on: port 8080
root@centosvm ~]#
root@centosvm ~]# systemctl status nginx.service

systemctl status nginx.service

```
DOCS: man:httpd.service(8)
Main PID: 3010 (httpd)
    Status: "Total requests: 4; Idle/Busy workers 100/0;Requests/sec: 0.0012; Bytes served/sec: 0 B/sec"
      Tasks: 213 (limit: 11091)
     Memory: 24.4M
        CGrou[...]
```

Firewall - status off

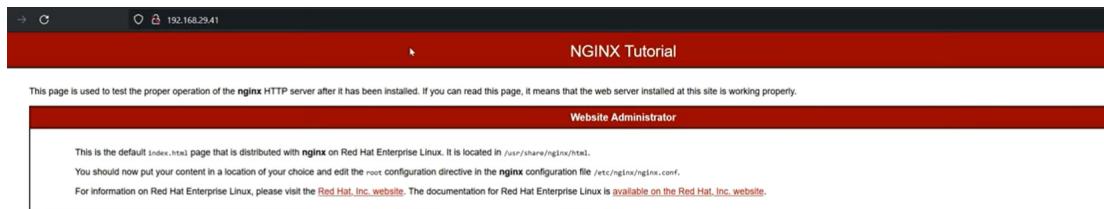
```
[root@centosvm ~]# systemctl status firewalld.service
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor preset: enabled)
     Active: inactive (dead) since Tue 2022-05-31 14:14:19 EDT; 58min ago
       Docs: man:firewalld(1)
  Process: 1012 ExecStart=/usr/sbin/firewalld --nofork --nopid $FIREWALLD_ARGS (code=exited, st
Main PID: 1012 (code=exited, status=0/SUCCESS)

May 31 13:53:46 centosvm systemd[1]: Starting firewalld - dynamic firewall daemon...
May 31 13:53:48 centosvm systemd[1]: Started firewalld - dynamic firewall daemon.
May 31 13:53:49 centosvm firewalld[1012]: WARNING: AllowZoneDrifting is enabled. This is consid
May 31 14:14:19 centosvm systemd[1]: Stopping firewalld - dynamic firewall daemon...
May 31 14:14:19 centosvm systemd[1]: firewalld.service: Succeeded.
May 31 14:14:19 centosvm systemd[1]: Stopped firewalld - dynamic firewall daemon.
[root@centosvm ~]#
```

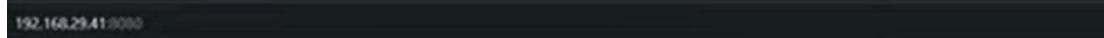
```
root@centosvm ~]# ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 192.168.29.41 brd 192.168.29.255 netmask 255.255.255.0
              broadcast 192.168.29.255
        inet6 fe80::20c:29ff:fed3:be37 brd fe80::ff:fe37:fed3:be37/64
              prefixlen 64 scopeid 0x20<link>
        ether 00:0c:29:d3:be:37 txqueuelen 1000 (Ethernet)
        RX packets 3351 bytes 301629 (294.5 KiB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 2182 bytes 286267 (279.5 KiB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 brd 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 brd ::1 prefixlen 128 scopeid 0x10<host>
              loop txqueuelen 1000 (Local Loopback)
        RX packets 0 bytes 0 (0.0 B)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 0 bytes 0 (0.0 B)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

irbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        inet 192.168.122.1 brd 192.168.122.255 netmask 255.255.255.0
              broadcast 192.168.122.255
        ether 52:54:00:aa:2a:f0 txqueuelen 1000 (Ethernet)
        RX packets 0 bytes 0 (0.0 B)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 0 bytes 0 (0.0 B)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



```
# port8080
```



Congratulations

This is our first WebSite using Apache WebServer

```
[root@centosvm ~]#
[root@centosvm ~]# cd /etc/httpd/
[root@centosvm httpd]# ls
conf  conf.d  conf.modules.d  logs  modules  run  state
[root@centosvm httpd]# cd conf
[root@centosvm conf]# less httpd.conf
```

```
ServerRoot "/etc/httpd"

#
# Listen: Allows you to bind Apache to specific IP addresses and/or
# ports, instead of the default. See also the <VirtualHost>
# directive.
#
# Change this to Listen on specific IP addresses as shown below to
# prevent Apache from glomming onto all bound IP addresses.

Listen 12.34.56.78:80
listen 8080

#
# Dynamic Shared Object (DSO) Support

# To be able to use the functionality of a module which was built as a DSO you
# have to place corresponding 'LoadModule' lines at this location so the
# directives contained in it are actually available _before_ they are used.
# Statically compiled modules (those listed by 'httpd -l') do not need
# to be loaded here.

# Example:
# LoadModule foo_module modules/mod_foo.so

Include conf.modules.d/*.conf
```

Changes in the conf

Config Location: /etc/nginx/nginx.conf

```
location /some/path/ {
    proxy_pass http://www.example.com/link/;
}
```

```
location / {
    proxy_pass http://127.0.0.1:8080/;
}
```

```
[root@centosvm conf]#
[root@centosvm conf]# cd /etc/nginx/
[root@centosvm nginx]# ls
conf.d      fastcgi.conf.default   koi-utf      mime.types.default  nginx.conf.default  uwsgi_params
default.d   fastcgi_params        koi-win      nginx.conf          scgi_params       uwsgi_params.default
fastcgi.conf fastcgi_params.default mime.types  nginx.conf_bkp    scgi_params.default win-utf
[root@centosvm nginx]#
[root@centosvm nginx]#
[root@centosvm nginx]# vi nginx.conf
```

```

access_log /var/log/nginx/access.log main;

sendfile      on;
tcp_nopush    on;
tcp_nodelay   on;
keepalive_timeout 65;           I
types_hash_max_size 2048;

include        /etc/nginx/mime.types;
default_type   application/octet-stream;

# Load modular configuration files from the /etc/nginx/conf.d directory.
# See http://nginx.org/en/docs/ngx_core_module.html#include
# for more information.
include /etc/nginx/conf.d/*.conf;

server {
    listen       80 default_server;
    listen       [::]:80 default_server;
    server_name  ;
    root         /usr/share/nginx/html;

    # Load configuration files for the default server block.
    include /etc/nginx/default.d/*.conf;

    location / {
    }
}

```

```

# Load modular configuration files from the /etc/nginx/conf.d directory.
# See http://nginx.org/en/docs/ngx_core_module.html#include
# for more information.
include /etc/nginx/conf.d/*.conf;

server {
    listen       80 default_server;
    listen       [::]:80 default_server;
    server_name  ;
    root         /usr/share/nginx/html;

    # Load configuration files for the default server block.
    include /etc/nginx/default.d/*.conf;

    location / {
        proxy_pass http://127.0.0.1:8080;           I
    }

    error_page 404 /404.html;
    location = /40x.html {
    }

    error_page 500 502 503 504 /50x.html;
    location = /50x.html {
    }
}

127.0.0.1:8080 is URL for Apache Webserver
As both NGINX and Apache are on same server

```

```

[root@centosvm nginx]# systemctl stop nginx.service
[root@centosvm nginx]# systemctl start nginx.service
[root@centosvm nginx]# I

```



last part Troubleshooting

Check the logs

/var/log/nginx/

sudo cat /var/log/audit/audit.log | grep nginx | grep denied

```
[root@centosvm nginx]# cd /var/log/nginx/  
[root@centosvm nginx]# █
```

```
[root@centosvm nginx]# ls -ltr  
total 48  
-rw-r--r--. 1 root root 906 Oct 21 2021 error.log-20211023.gz  
-rw-r--r--. 1 root root 823 Oct 21 2021 access.log-20211023.gz  
-rw-rw-r--. 1 nginx root 99 Oct 29 2021 access.log-20211030.gz  
-rw-rw-r--. 1 nginx root 351 Oct 31 2021 access.log-20211031.gz  
-rw-rw-r--. 1 nginx root 185 Nov 13 2021 error.log-20211117.gz  
-rw-rw-r--. 1 nginx root 100 Nov 13 2021 access.log-20211117.gz  
-rw-rw-r--. 1 nginx root 331 Mar 22 17:43 error.log-20220323.gz  
-rw-rw-r--. 1 nginx root 355 Mar 23 01:48 access.log-20220323.gz  
-rw-rw-r--. 1 nginx root 293 May 7 17:27 error.log-20220508.gz  
-rw-rw-r--. 1 nginx root 306 May 7 17:27 access.log-20220508.gz  
-rw-rw-r--. 1 nginx root 2282 May 31 15:18 error.log  
-rw-rw-r--. 1 nginx root 2694 May 31 15:18 access.log  
[root@centosvm nginx]#  
[root@centosvm nginx]# less access.log  
[root@centosvm nginx]# less error.log █
```

```
022/05/31 14:14:33 [crit] 2777#0: *1 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET / HTTP/1.1", upstream: "http://127.0.0.1:8080/", host:  
022/05/31 14:14:33 [crit] 2777#0: *1 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET /nginx-logo.png HTTP/1.1", upstream: "http://127.0.0.1:  
host: "192.168.29.41", referrer: "http://192.168.29.41/"  
022/05/31 14:14:33 [crit] 2777#0: *1 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET /poweredby.png HTTP/1.1", upstream: "http://127.0.0.1:  
host: "192.168.29.41", referrer: "http://192.168.29.41/"  
022/05/31 14:14:33 [crit] 2777#0: *1 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET /favicon.ico HTTP/1.1", upstream: "http://127.0.0.1:8  
02.168.29.41", referrer: "http://192.168.29.41/"  
022/05/31 14:17:25 [crit] 2777#0: *7 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET / HTTP/1.1", upstream: "http://127.0.0.1:8080/", host:  
022/05/31 14:17:25 [crit] 2777#0: *7 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET /nginx-logo.png HTTP/1.1", upstream: "http://127.0.0.  
host: "192.168.29.41", referrer: "http://192.168.29.41/"  
022/05/31 14:17:25 [crit] 2777#0: *10 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET /poweredby.png HTTP/1.1", upstream: "http://127.0.0.  
host: "192.168.29.41", referrer: "http://192.168.29.41/"  
022/05/31 15:18:52 [crit] 3925#0: *1 connect() to 127.0.0.1:8080 failed (13: Permission denied) while  
client: 192.168.29.179, server: , request: "GET / HTTP/1.1", upstream: "http://127.0.0.1:8080/", host:  
END) █
```

now fix it

How to solve Access denied issue?

```
[crit] 59982#0: *2 connect() to 127.0.0.1:8080 failed (13: Permission denied)
```

```
while connecting to upstream, client: 192.168.29.179, server: _, request: "GET /  
HTTP/1.1", upstream: "http://127.0.0.1:8080/", host: "192.168.29.41"
```

Solution

List of all the httpd SELinux boolean

```
#getsebool -a | grep httpd
```

Enable the network connect boolean

```
#setsebool httpd_can_network_connect on -P
```

```
root@centosvm nginx]#  
root@centosvm nginx]# getsebool -a | grep httpd
```

it needs to be on

```
httpd_can_connect_zabbix --> off
httpd_can_network_connect --> off
httpd_can_network_connect_cobbler --> off
httpd_can_network_connect_db --> off
httpd_can_network_memcache --> off
httpd_can_network_relay --> off
httpd_can_sendmail --> off
httpd_dbus_avahi --> off
httpd_dbus_sssd --> off
httpd_dontaudit_search_dirs --> off
httpd_enable_cgi --> on
httpd_enable_ftp_server --> off
httpd_enable_homedirs --> off
httpd_execmem --> off
httpd_graceful_shutdown --> off
httpd_manage_ipa --> off
httpd_mod_auth_ntlm_winbind --> off
httpd_mod_auth_pam --> off
httpd_read_user_content --> off
httpd_run_ipa --> off
httpd_run_preupgrade --> off
httpd_run_stickshift --> off
httpd_serve_cobbler_files --> off
httpd_setrlimit --> off
httpd_ssi_exec --> off
httpd_sys_script_anon_write --> off
httpd_tmp_exec --> off
httpd_tty_comm --> off
```

Enable the network connect boolean

```
#setsebool httpd_can_network_connect on -P
```

```
root@centosvm nginx]# setsebool httpd_can_network_connect on -P
root@centosvm nginx]#
root@centosvm nginx]# getsebool -a | grep httpd
```

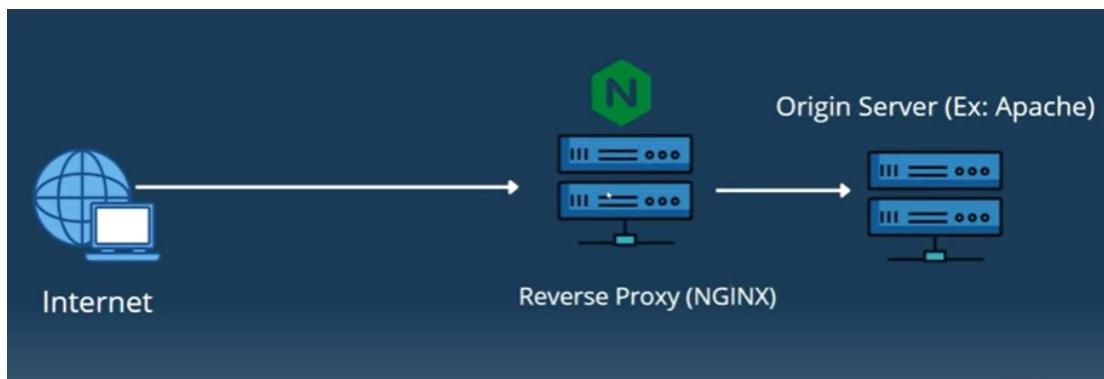
```
httpd_can_connect_zabbix --> off
httpd_can_network_connect --> on
httpd_can_network_connect_cobbler --> off
httpd_can_network_connect_db --> off
httpd_can_network_memcache --> off
httpd_can_network_relay --> off
httpd_can_sendmail --> off
httpd_dbus_avahi --> off
httpd_dbus_sssd --> off
httpd_dontaudit_search_dirs --> off
httpd_enable_cgi --> on
httpd_enable_ftp_server --> off
httpd_enable_homedirs --> off
httpd_execmem --> off
httpd_graceful_shutdown --> off
httpd_manage_ipa --> off
httpd_mod_auth_ntlm_winbind --> off
httpd_mod_auth_pam --> off
httpd_read_user_content --> off
httpd_run_ipa --> off
httpd_run_preupgrade --> off
httpd_run_stickshift --> off
httpd_serve_cobbler_files --> off
httpd_setrlimit --> off
httpd_ssi_exec --> off
httpd_sys_script_anon_write --> off
httpd_tmp_exec --> off
httpd_tty_comm --> off
httpd_unified --> off
```

```
# nginx reverse proxy has been setup
```

```
  192.168.29.41
```

Congratulations

This is our first WebSite using Apache WebServer



FTP in Linux | FTP Server in Linux

FTP

The **File Transfer Protocol** is a communication protocol used for the transfer of computer files between a client and server on a computer network.

Uses TCP/IP

[Unmute \(m\)](#)

FTP

FTP also used to upload/download files from websites and servers.





Remote Server FTP Setup:

- Need root access
- Install **vsftpd** service (if not already)
- **yum install vsftpd**

Config
/etc/vsftpd/vsftpd.conf

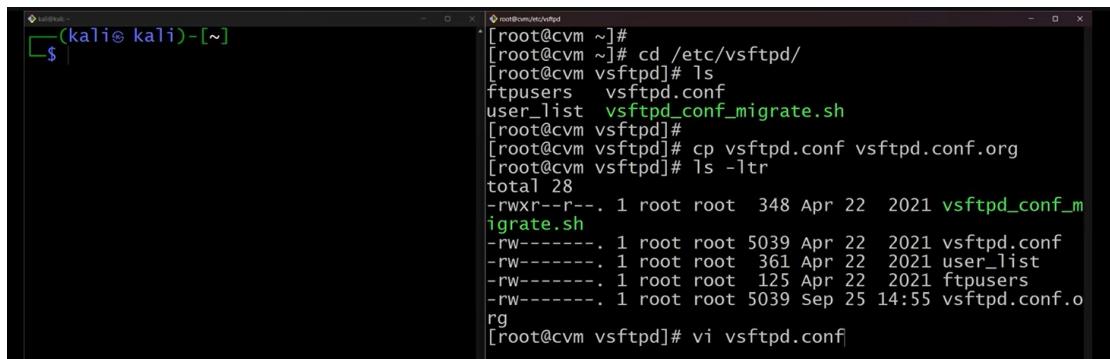
```
[root@kali ~]$ rpm -qa | grep vsftpd
[root@kali ~]$ yum install vsftpd -y
Error: This command has to be run with superuser privileges (under the root user on most systems).
[root@kali ~]$ su -
Password:
[root@kali ~]# yum install vsftpd -y
Last metadata expiration check: 1:28:23 ago on Sunday 25 September 2022 01:25:23 PM EDT.
Dependencies resolved.
=====
 Package Arch Version Repository Size
=====
 Installing:
 vsftpd x86_64 3.0.3-34.el8 appstream 181 k
 Transaction Summary
```

Remote Server FTP Setup:

Config Changes

/etc/vsftpd/vsftpd.conf

- anonymous_enable=NO
- Uncomment
 - ascii_upload_enable=YES
 - ascii_download_enable=YES
- May add
 - use_localtime=YES



```
[root@cvml ~]# cd /etc/vsftpd/
[root@cvml ~]# ls
vsftpd.conf
user_list  vsftpd_conf_migrate.sh
[root@cvml vsftpd]#
[root@cvml vsftpd]# cp vsftpd.conf vsftpd.conf.org
[root@cvml vsftpd]# ls -ltr
total 28
-rwxr--r--. 1 root root 348 Apr 22 2021 vsftpd_conf_migrate.sh
-rw-----. 1 root root 5039 Apr 22 2021 vsftpd.conf
-rw-----. 1 root root 361 Apr 22 2021 user_list
-rw-----. 1 root root 125 Apr 22 2021 ftpusers
-rw-----. 1 root root 5039 Sep 25 14:55 vsftpd.conf.org
[root@cvml vsftpd]# vi vsftpd.conf
```

changes

- anonymous_enable=NO
- Uncomment
 - ascii_upload_enable=YES
 - ascii_download_enable=YES
- May add
 - use_localtime=YES

```
t of vsftpd options.  
# Please read the vsftpd.conf.5 manua  
ll idea of vsftpd's  
# capabilities.  
#  
# Allow anonymous FTP? (Beware - allo  
you comment this out).  
anonymous_enable=NO  
#  
# Uncomment this to allow local users  
local_enable=YES  
#  
# Uncomment this to enable any form o  
d.  
write_enable=YES  
#  
# Default umask for local users is 07  
change this to 022,
```



```
ever accidentally do ASCII  
# mangling on files when in ASCII mode  
(5) man page explains  
# the behaviour when these options are  
# Beware that on some FTP servers, ASC  
a denial of service  
# attack (DoS) via the command "SIZE /  
I mode. vsftpd  
# predicted this attack and has always  
ting the size of the  
# raw file.  
# ASCII mangling is a horrible feature  
ascii_upload_enable=YES  
ascii_download_enable=YES  
#  
# You may fully customise the login ba  
#ftpd_banner=Welcome to blah FTP servi  
#  
# You may specify a file of disallowed  
addresses. Apparently  
-- INSERT --
```

finally Local time .. go to the last end page

```
# When "listen" directive is enabled, vsftpd runs in stand-alone mode and
# listens on IPv4 sockets. This directive cannot be used in conjunction
# with the listen_ipv6 directive.
listen=NO
#
# This directive enables listening on IPv6 sockets. By default, listening
# on the IPv6 "any" address (::) will accept connections from both IPv6
# and IPv4 clients. It is not necessary to listen on *both* IPv4 and IPv6
# sockets. If you want that (perhaps because you want to listen on specific
# addresses) then you must run two copies of vsftpd with two configuration
# files.
# Make sure, that one of the listed !!
listen_ipv6=YES

pam_service_name=vsftpd
userlist_enable=YES

use_localtime=YES
-- INSERT --
```

Remote Server FTP Setup:

- Start and enable vsftpd service
 - **systemctl start vsftpd**
 - **systemctl enable vsftpd**
- Stop firewall or allow FTP to firewall
 - We will temporarily stop firewall
 - **systemctl stop firewall**

```
[root@cvm vsftpd]# systemctl start vsftpd.service
[root@cvm vsftpd]# systemctl status vsftpd.service
● vsftpd.service - Vsftpd ftp daemon
   Loaded: loaded (/usr/lib/systemd/system/vsftpd.service)
   Active: active (running) since Sun 2022-09-25 14:58:40
     Process: 109772 ExecStart=/usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf
   Main PID: 109773 (vsftpd)
      Tasks: 1 (limit: 11090)
     Memory: 584.0K
        CPU: 0.000 CPU(s) since start
       CGroup: /system.slice/vsftpd.service
                  └─109773 /usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf

Sep 25 14:58:40 cvm systemd[1]: Starting Vsftpd ftp da...
Sep 25 14:58:40 cvm systemd[1]: started vsftpd ftp da...
lines 1-12/12 (END)
```

inactive firewall

```
[root@cvm vsftpd]# systemctl stop firewalld.service
[root@cvm vsftpd]# systemctl status firewalld.service
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service)
   Active: inactive (dead) since Sun 2022-09-25 14:59:17
     Docs: man:firewalld(1)
   Process: 1022 ExecStart=/usr/sbin/firewalld --nofork --
 Main PID: 1022 (code=exited, status=0/SUCCESS)

Sep 20 10:17:47 cvm systemd[1]: Starting firewalld - dynamic firewall...
Sep 20 10:17:49 cvm systemd[1]: Started firewalld - dynamic firewall...
Sep 20 10:17:50 cvm firewalld[1022]: WARNING: AllowZone...
Sep 25 14:59:11 cvm systemd[1]: Stopping firewalld - dynamic...
Sep 25 14:59:17 cvm systemd[1]: firewalld.service: Success...
Sep 25 14:59:17 cvm systemd[1]: Stopped firewalld - dynamic...
lines 1-13/13 (END)
```

Client side - Kali Linux

Client Server FTP Setup:

- Need root access
- Install ftp service (if not already)
- yum install ftp

```

[(kali㉿ kali)-[~]]$ 
[(kali㉿ kali)-[~]]$ 
[(kali㉿ kali)-[~]]$ ftp
bash: ftp: command not found...
Install package 'ftp' to provide command 'ftp'? [N/y] | 
[(kali㉿ kali)-[~]]$ 

```

How to transfer file?

- **ftp 192.168.0.0 (ip of remote server)**
- Enter username/password
- put <file_name>

The screenshot shows a terminal session with three windows:

- Kali Linux Terminal:** Shows the user navigating to the home directory and attempting to run the 'ftp' command.
- CVM Terminal:** Shows the user running 'ifconfig' to check network interfaces. The output includes details for ens33, including flags, MTU, IP address (192.168.29.41), netmask, broadcast address, and various statistics for RX and TX packets.
- Kali Linux Terminal:** Shows the user connecting to the remote server at 192.168.29.41 using the 'ftp' command. The connection is successful, and the user is prompted for a password. After logging in, they use the 'put' command to transfer a file, followed by 'bye' to disconnect.

now Create a file in client side

The image shows two terminal windows side-by-side. The left terminal window is on a Kali Linux system, and the right is on a host system named 'cvm'. In the Kali window, a file named 'ftp_testfile.txt' is created and contains the text 'This is test file from Kali Linux'. The host window shows the file has been received.

```
kali㉿kali:[~]
└$ echo "This is test file from Kali Linux" > ftp_testfile.txt

(kali㉿kali:[~])
└$ cat ftp_testfile.txt
This is test file from Kali Linux

(kali㉿kali:[~])
└$
```

```
paul@cvm:~]$ |
```

Now FTP to remote Server - send the file ..

The terminal window shows the user connecting to a remote FTP server at 192.168.29.41. After logging in, the user uses the 'put' command to upload 'ftp_testfile.txt' to the remote location. The transfer is completed successfully.

```
(kali㉿kali:[~])
└$
```

```
(kali㉿kali:[~])
└$
```

```
(kali㉿kali:[~])
└$ ftp 192.168.29.41
Connected to 192.168.29.41.
220 (vsFTPd 3.0.3)
Name (192.168.29.41:kali): paul
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
ftp> put ftp_testfile.txt
local: ftp_testfile.txt remote: ftp_testfile.txt
229 Entering Extended Passive Mode (|||35
087|)
150 ok to send data.
 0%      0      0.00 KiB/s    --:-- ET
100%     34      50.08 KiB/s   00:00 ET
A
226 Transfer completed.
34 bytes sent in 00:00 (11.19 KiB/s)
```

```
[paul@cvm ~]$ |
```

```

kali㉿kali:~ [~]
└$ ls -l
(kali㉿kali:~) [~]
└$ ls -l
(kali㉿kali:~) [~]
└$ ftp 192.168.29.41
Connected to 192.168.29.41.
220 (vsFTPd 3.0.3)
Name (192.168.29.41:kali): paul
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
ftp> put ftp_testfile.txt
local: ftp_testfile.txt remote: ftp_testfile.txt
229 Entering Extended Passive Mode (|||35
087|)
150 ok to send data.
 0%      0      0.00 KiB/s    --- ET
100%     34      50.08 KiB/s  00:00 ET
A
226 Transfer complete.

-rw-r--r--, 1 paul paul 34 Sep 25 15:06 ftp_testfile.txt
[paul@cvm ~]$ cat ftp_testfile.txt
This is test file from Kali Linux
[paul@cvm ~]$
```

```

ftp>
ftp> pwd
Remote directory: /home/paul
ftp>
ftp> cd videos
250 Directory successfully changed.
ftp> pwd
Remote directory: /home/paul/videos
ftp>
ftp> |
```

```

ftp>
ftp>
ftp> put ftp_testfile.txt
local: ftp_testfile.txt remote: ftp_
testfile.txt
229 Entering Extended Passive Mode (
|||52732|)
150 Ok to send data.
 0%      0      0.00 KiB/s    --:
100%     34     183.44 KiB/s   00:
00 ETA
226 Transfer complete.
34 bytes sent in 00:00 (14.41 KiB/s)
ftp>

```

```

ftp>
ftp>
ftp> put ftp_testfile.txt
local: ftp_testfile.txt remote: ftp_
testfile.txt
229 Entering Extended Passive Mode (
|||52732|)
150 Ok to send data.
 0%      0      0.00 KiB/s    --:
100%     34     183.44 KiB/s   00:
00 ETA
226 Transfer complete.
34 bytes sent in 00:00 (14.41 KiB/s)
ftp>

```

[paul@cvm ~]\$
[paul@cvm ~]\$
[paul@cvm ~]\$ cd Videos/
[paul@cvm Videos]\$ ls -ltr
total 4
-rw-r--r--. 1 paul paul 34 Sep 25 15:11 ftp_tes
tfile.txt
[paul@cvm Videos]\$ ls
ftp_testfile.txt
[paul@cvm Videos]\$ cat ftp_testfile.txt
This is test file from Kali Linux
[paul@cvm Videos]\$

```

# testfolder
`-
34 bytes sent in 00:00 (14.41 KiB/s)
ftp>
ftp> pwd
Remote directory: /home/paul/Videos
ftp>
ftp> mkdir testfolder
257 "/home/paul/Videos/testfolder" c
reated
ftp> cd testfolder
250 Directory successfully changed.
ftp>

```

[paul@cvm Videos]\$ ls
ftp_testfile.txt testfolder
[paul@cvm Videos]\$

```

# for Multiple files Transfer
```
(kali㉿kali)-[~]
$ ls
Desktop Music
Documents Pictures
Downloads Public
echo.sh Templates
file1 test.txt
file2
ftp_testfile.txt
```

```

[paul@cvm Videos]\$ touch mydata.txt
[paul@cvm Videos]\$ ls
ftp_testfile.txt mydata.txt testfolder
[paul@cvm Videos]\$

FTP connect

```

└─(kali㉿kali)-[~]
$ ftp 192.168.29.41
Connected to 192.168.29.41.
220 (vsFTPd 3.0.3)
Name (192.168.29.41:kali): paul
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>

```

The screenshot shows two terminal windows. The left window is on the Kali Linux server, displaying the command `mput file1 file2` which is highlighted with a red box. The right window is on a Windows client named CVM, showing the directory `/Videos` and the files `file1`, `ftp_testfile.txt`, and `testfolder`. The client has also run the command `ls`.

```

ftp>
ftp>
ftp> mput file1 file2
mput file1 [ampqy?]
229 Entering Extended Passive Mode (|||12372|)
150 Ok to send data.
      0          0.00 kib/s
226 Transfer complete.
mput file2 [ampqy?]
229 Entering Extended Passive Mode (|||40241|)
150 ok to send data.
      0          0.00 kib/s
226 Transfer complete.
ftp> pwd
Remote directory: /home/paul/videos
ftp>

```

[paul@cvm ~]\$
[paul@cvm ~]\$
[paul@cvm ~]\$ ls
file1 ftp_testfile.txt testfolder
file2 mydata.txt
[paul@cvm ~]\$ |

Download a File from Server to client .. GET Cmd(client side)

create a file in server (Paul-usr) then in client side ... type “GET file_name” .. see the change

The screenshot shows two terminal windows. The left window is on the Kali Linux server, displaying the command `get download_testfile` which is highlighted with a red box. The right window is on a Windows client named CVM, showing the directory `/Videos` and the files `file1`, `ftp_testfile.txt`, and `testfolder`. The client has also run the command `ls`.

```

ftp>
ftp>
ftp> pwd
Remote directory: /home/paul/videos
ftp>
ftp> get download_testfile
local: download_testfile remote: dow
nload_testfile
229 Entering Extended Passive Mode (|||6760|)
150 Opening BINARY mode data connect
ion for download_testfile (0 bytes).
      0          0.00 kib/s
226 Transfer complete.
ftp> bye
221 Goodbye.

```

[paul@cvm ~]\$
[paul@cvm ~]\$
[paul@cvm ~]\$ ls
file1 ftp_testfile.txt testfolder
file2 mydata.txt
[paul@cvm ~]\$ touch download_testfile
[paul@cvm ~]\$ |

ls-

```
(kali㉿ kali)-[~]
└─$ ls
Desktop          ftp_testfile.txt
Documents        MUSIC
Downloads        Pictures
download_testfile Public
echo.sh          Templates
file1            test.txt
file2            Videos
(kali㉿ kali)-[~]
└─$
```

Learn Linux NFS Fast-

```
[root@cs-client apps]#
[root@cs-client apps]# hostname
cs-client
[root@cs-client apps]# ls
[root@cs-client apps]# touch myfile
[root@cs-client apps]# ls
myfile
[root@cs-client apps]# ls
myfile testfile
[root@cs-client apps]#
```

```
[root@cs-server apps]#
[root@cs-server apps]# hostname
cs-server
[root@cs-server apps]# ls
[root@cs-server apps]# ls
myfile
[root@cs-server apps]# touch testfile
[root@cs-server apps]# ls
myfile testfile
[root@cs-server apps]#
```

linux nfs,
linux nfs tutorial,
linux nfs server,
network file system,
learn linux,
nfs,
nfs server,
nfs server client configuration in linux,
nfs server configuration in linux step by step,
nfs mount autosfs,
nfs server configuration in linux,
nfs server in linux,
nfs server and client configuration in linux,
nfs setup in linux,
what is nfs,
what is nfs in linux,
how to setup NFS in linux,
step by step nfs configuration in linux,
how to configure nfs4 in linux,
Linux admin course,
Linux admin videos

Linux NFS Fast



NFS Configuration Setup

We need to setup in two parts

- Client Side Configuration
- Server Side Configuration

```
[root@cs-client ~]#  
[root@cs-client ~]#  
[root@cs-client ~]# hostname  
cs-client  
[root@cs-client ~]#
```

```
[root@cs-server ~]#  
[root@cs-server ~]#  
[root@cs-server ~]# hostname  
cs-server  
[root@cs-server ~]#
```

Server Side Configuration

- To install NFS Packages

```
yum install nfs-utils libnfsidmap
```

- Enable and start the NFS Services

```
systemctl enable rpcbind, nfs-server  
systemctl start rpcbind, nfs-server, rpc-statd,  
nfs-idmap
```

- To Install NFS Packages

```
yum install nfs-utils libnfsidmap
```

```
[root@cs-server ~]#  
[root@cs-server ~]# yum install nfs-utils libnfsidmap -y  
Last metadata expiration check: 3:14:39 ago on Tuesday 28 March 2023  
0:25 AM EDT.  
Package nfs-utils-1:2.3.3-59.el8.x86_64 is already installed.  
Package libnfsidmap-1:2.3.3-59.el8.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@cs-server ~]#
```

```
[root@cs-server ~]# systemctl start rpcbind.service nfs-server.service rpc-statd.service nfs-idmapd.service
[root@cs-server ~]#
[root@cs-server ~]# systemctl status rpcbind.service nfs-server.service

● rpcbind.service - RPC Bind
  Loaded: loaded (/usr/lib/systemd/system/rpcbind.service; enabled; vendor prese>
  Active: active (running) since Tue 2023-03-28 06:45:59 EDT; 8s ago
    Docs: man:rpcbind(8)
 Main PID: 51180 (rpcbind)
   Tasks: 1 (limit: 11222)
  Memory: 1.7M
    CGroup: /system.slice/rpcbind.service
lines 1-8

- RPC Bind
  Loaded: loaded (/usr/lib/systemd/system/rpcbind.service; enabled; vendor prese>
  Active: active (running) since Tue 2023-03-28 06:45:59 EDT; 8s ago
    Docs: man:rpcbind(8)
 Main PID: 51180 (rpcbind)
   Tasks: 1 (limit: 11222)
  Memory: 1.7M
    CGroup: /system.slice/rpcbind.service
lines 1-8...skipping...
● rpcbind.service - RPC Bind
  Loaded: loaded (/usr/lib/systemd/system/rpcbind.service; enabled; vendor prese>
  Active: active (running) since Tue 2023-03-28 06:45:59 EDT; 8s ago
    Docs: man:rpcbind(8)
 Main PID: 51180 (rpcbind)
   Tasks: 1 (limit: 11222)
  Memory: 1.7M
    CGroup: /system.slice/rpcbind.service
      └─51180 /usr/bin/rpcbind -w -f

Mar 28 06:45:58 cs-server systemd[1]: Starting RPC Bind...
Mar 28 06:45:59 cs-server systemd[1]: Started RPC Bind.
```

Server Side Configuration



- Create a directory for NFS and give all the permissions
`mkdir /server/apps`
- Modify the `/etc/exports` file and add new shared filesystem
`/apps <IP_allow>(rw, sync, no_root_squash)`
- `exportfs -rv`

```
[root@cs-server ~]# cd /  
[root@cs-server /]# mkdir server  
[root@cs-server /]# cd server/  
[root@cs-server server]# mkdir apps  
[root@cs-server server]# cd apps/  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]#
```

```
# give Full permissions for server + apps
```

```
[root@cs-server ~]# chmod 777 /server/
[root@cs-server ~]# chmod 777 /server/apps/
[root@cs-server ~]# ls -ld /server/
drwxrwxrwx. 3 root root 18 Mar 28 06:47 /server/
[root@cs-server ~]# ls -ld /server/apps/
drwxrwxrwx. 2 root root 6 Mar 28 06:47 /server/apps/
[root@cs-server ~]#
```

```
[root@cs-server ~]# vi /etc/exports
```

```
/server/apps *(rw,sync,no_root_squash)
```

222

```
[root@cs-server ~]# exportfs -rv  
exporting *:/server/apps  
[root@cs-server ~]# █
```

Server side task completed

Client Side Configuration

- To install NFS Packages

```
yum install nfs-utils rpcbind
```

- Enable and start the rpcbind service

```
systemctl enable rpcbind
```

```
[root@cs-client ~]#  
[root@cs-client ~]# yum install nfs-utils rpcbind -y  
Last metadata expiration check: 2:40:01 ago on Tuesday 28 March  
2023 01:41:24 PM IST.  
Package nfs-utils-1:2.3.3-59.el8.x86_64 is already installed.  
Package rpcbind-1.2.5-10.el8.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@cs-client ~]# █
```

```
[root@cs-client ~]#  
[root@cs-client ~]# systemctl start rpcbind  
[root@cs-client ~]# systemctl status rpcbind  
● rpcbind.service - RPC Bind  
    Loaded: loaded (/usr/lib/systemd/system/rpcbind.service; enabled)  
    Active: active (running) since Tue 2023-03-28 16:11:15 IST;  
      Docs: man:rpcbind(8)  
   Main PID: 896 (rpcbind)  
     Tasks: 1 (limit: 4595)  
    Memory: 852.0K  
   CGroup: /system.slice/rpcbind.service  
           └─896 /usr/bin/rpcbind -w -f  
  
Mar 28 16:11:15 cs-client systemd[1]: Starting RPC Bind...  
Mar 28 16:11:15 cs-client systemd[1]: Started RPC Bind.  
lines 1-12/12 (END)
```

Client Side Configuration

- To stop the firewall

```
systemctl stop firewall / iptable
```

- Show mount from NFS Server

```
showmount -e <IP of server side>
```

```
[root@cs-client ~]#  
[root@cs-client ~]# systemctl stop firewalld.service  
[root@cs-client ~]# systemctl status firewalld.service  
● firewalld.service - firewalld - dynamic firewall daemon  
    Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled)  
    Active: inactive (dead) since Tue 2023-03-28 16:22:29 IST;  
      Docs: man:firewalld(1)  
    Process: 991 ExecStart=/usr/sbin/firewalld --nofork --nopid  
   Main PID: 991 (code=exited, status=0/SUCCESS)  
  
Mar 28 16:11:17 cs-client systemd[1]: Starting firewalld - dyna  
Mar 28 16:11:18 cs-client systemd[1]: Started firewalld - dyna  
Mar 28 16:11:18 cs-client firewalld[991]: WARNING: AllowZoneDr  
Mar 28 16:22:28 cs-client systemd[1]: Stopping firewalld - dyna  
Mar 28 16:22:29 cs-client systemd[1]: firewalld.service: Success  
Mar 28 16:22:29 cs-client systemd[1]: Stopped firewalld - dyna  
lines 1-13/13 (END)
```

```
[root@cs-server ~]# exportfs -rv
exporting *:/server/apps
[root@cs-server ~]#
[root@cs-server ~]#
[root@cs-server ~]# ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.29.211 netmask 255.255.255.0 broadcast 192.168.
29.255
        inet6 2405:201:300d:cb1d:a00:27ff:fed9:428 prefixlen 64 scop
eid 0x0<global>
        inet6 fe80::a00:27ff:fed9:428 prefixlen 64 scopeid 0x20<link
>
      ether 08:00:27:d9:04:28 txqueuelen 1000 (Ethernet)
      RX packets 377642 bytes 507474814 (483.9 MiB)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 94005 bytes 26747479 (25.5 MiB)
      TX errors 0 dropped 0 overruns 0 carrier 0 col
```

```
[root@cs-client ~]#
[root@cs-client ~]# showmount -e 192.168.29.211
Export list for 192.168.29.211:
/server/apps *
[root@cs-client ~]# █
```

Client Side Configuration

- Create a mount point (a directory)
`mkdir /mnt/apps`
- Mount the NFS file system
`mount <IP_Server>:/server/apps /mnt/apps`

```
[root@cs-client /]#
[root@cs-client /]# mkdir mnt
mkdir: cannot create directory 'mnt': File exists
[root@cs-client /]# cd mnt/
[root@cs-client mnt]# mkdir apps
mkdir: cannot create directory 'apps': File exists
[root@cs-client mnt]# ls
apps
[root@cs-client mnt]# cd apps/
[root@cs-client apps]# pwd
/mnt/apps
[root@cs-client apps]#
```

```
[root@cs-client ~]#
[root@cs-client ~]# showmount -e 192.168.29.211
Export list for 192.168.29.211:
/server/apps *
[root@cs-client ~]#
[root@cs-client ~]#
[root@cs-client ~]# mount 192.168.29.211:/server/apps /mnt/app
s/
[root@cs-client ~]# ■
```

```
[root@cs-client ~]#
[root@cs-client ~]# df -h
Filesystem           Size   Used  Avail Use% Mounted on
devtmpfs              360M     0  360M   0% /dev
tmpfs                 389M     0  389M   0% /dev/shm
tmpfs                 389M    12M  378M   3% /run
tmpfs                 389M     0  389M   0% /sys/fs/cgrou
up
/dev/mapper/cs-root      17G   6.8G   11G  40% /
/dev/nvme0n1p1       1014M  258M  757M  26% /boot
tmpfs                  78M   12K    78M   1% /run/user/42
tmpfs                  78M   4.0K    78M   1% /run/user/10
00
192.168.29.211:/server/apps  17G   6.5G   11G  38% /mnt/apps
[root@cs-client ~]# ■
```

```
[root@cs-client ~]# cd /mnt/apps/
[root@cs-client apps]# ■
```

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]#
```

```
[root@cs-server ~]# cd /server/apps  
/  
[root@cs-server apps]# █
```

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]#  
[root@cs-client apps]# pwd  
/mnt/apps  
[root@cs-client apps]#
```

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]#
```

create a server side file & check whether Client side file is created

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]#  
[root@cs-client apps]# pwd  
/mnt/apps  
[root@cs-client apps]#
```

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]# touch myfile  
[root@cs-server apps]# ls  
myfile  
[root@cs-server apps]#
```

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]#  
[root@cs-client apps]# pwd  
/mnt/apps  
[root@cs-client apps]# ls  
myfile  
[root@cs-client apps]#
```

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]# touch myfile  
[root@cs-server apps]# ls  
myfile  
[root@cs-server apps]#
```

Do it same for Client side to

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]#  
[root@cs-client apps]# pwd  
/mnt/apps  
[root@cs-client apps]# ls  
myfile  
[root@cs-client apps]# touch testfile  
[root@cs-client apps]#
```

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]# touch myfile  
[root@cs-server apps]# ls  
myfile  
[root@cs-server apps]# ls  
myfile testfile  
[root@cs-server apps]# █
```

Vi- Edit the File | client side see the same display in server side too

```
[root@cs-client apps]#  
[root@cs-client apps]# ls  
[root@cs-client apps]# pwd  
/mnt/apps  
[root@cs-client apps]# ls  
myfile  
[root@cs-client apps]# touch testfil  
e  
[root@cs-client apps]# vi myfile  
[root@cs-client apps]# cat myfile  
Hi Hello  
[root@cs-client apps]#
```

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/server/apps  
[root@cs-server apps]# touch myfile  
[root@cs-server apps]# ls  
myfile  
[root@cs-server apps]# ls  
myfile testfile  
[root@cs-server apps]# cat myfile  
Hi Hello  
[root@cs-server apps]#
```

Linux SAMBA Server Fast

Linux Samba server. By following our simple step-by-step guide, you'll be able to Garrett your network and share files between your Windows and Linux systems with ease!

If you're looking to set up a Linux Samba server, then this video is for you! By the end, you'll have everything you need to know to get started, including instructions on how to configure the server and access it from your Windows systems. Don't miss out on this exciting tutorial!

You'll be amazed by what you can do with a Linux Samba server! Not only can you access your files from any computer in your office, but you can also share files and printers with other users on your network. If you're looking to set up a Linux Samba server for work or for personal use,

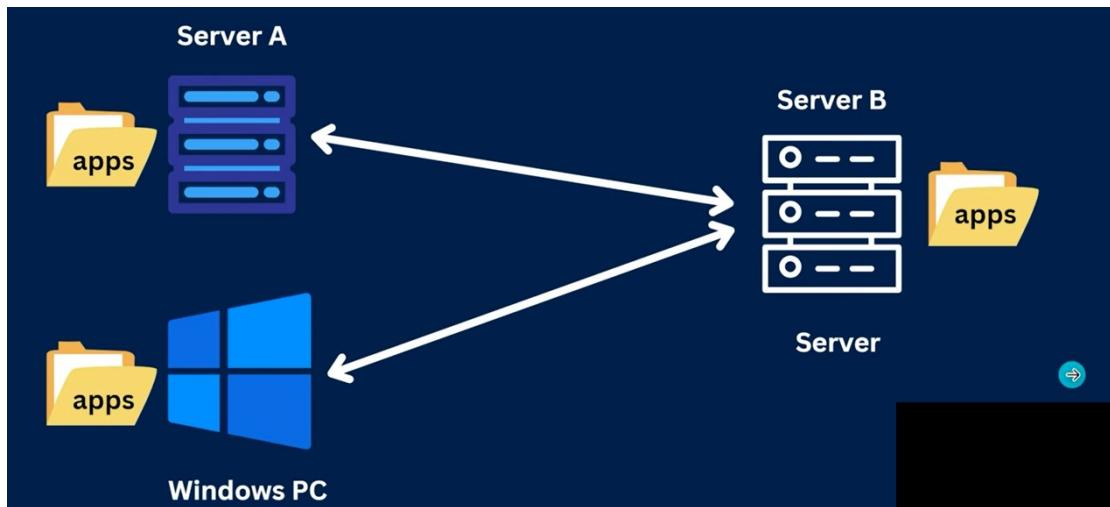
Topics

- What is SAMBA?
- Samba server side setup and configuration
- Accessing shared dir from Windows
- Client side samba setup and accessing shared dir
- Securing the Samba Server Side

SAMBA

A Linux utility or tool to share Linux files and print services to other OS.

Using *Server Message Block (SMB)* and
Common Internet File System (CIFS) protocols



Server Side Configuration

- To install Samba Packages

```
yum install samba samba-client samba-common
```

- Enable Samba through Firewall

```
firewall-cmd --permanent --zone=public --add-service=samba  
firewall-cmd --reload
```

```
[root@cs-server ~]# yum install samba samba-client samba-common -y
Last metadata expiration check: 2:04:49 ago on Saturday 01 April 2
023 11:39:16 AM EDT.
Package samba-4.17.5-0.el8.x86_64 is already installed.
Package samba-client-4.17.5-0.el8.x86_64 is already installed.
Package samba-common-4.17.5-0.el8.noarch is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[root@cs-server ~]#
```

```
[root@cs-server ~]#
[root@cs-server ~]# systemctl status firewalld.service
```

- firewalld.service - firewalld - dynamic firewall daemon
 Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; v>
 Active: inactive (dead) since Sat 2023-04-01 09:51:05 EDT; 3h >
 Docs: man:firewalld(1)
 Process: 1056 ExecStart=/usr/sbin/firewalld --nofork --nopid \$P>
 Main PID: 1056 (code=exited, status=0/SUCCESS)

```
Apr 01 09:47:26 cs-server systemd[1]: Starting firewalld - dynamic>
Apr 01 09:47:27 cs-server systemd[1]: Started firewalld - dynamic>
Apr 01 09:47:27 cs-server firewalld[1056]: WARNING: AllowZoneDrif>
Apr 01 09:51:05 cs-server systemd[1]: Stopping firewalld - dynami>
Apr 01 09:51:05 cs-server systemd[1]: firewalld.service: Succeeded>
```

Server Side Configuration

- Create a directory for Samba and give all the permissions
`mkdir /samba/apps`
- Change SELinux security context for samba shared directory in case SELinux is enabled
`chcon -t samba_share_t /samba/apps`

Go to Root / Dir

```
[root@cs-server /]#
[root@cs-server /]# mkdir -p /samba/apps
[root@cs-server /]# cd /samba/apps/
[root@cs-server apps]# touch samba_testfile
[root@cs-server apps]# ls
samba_testfile
[root@cs-server apps]# cd
[root@cs-server ~]# cd /samba/apps/
[root@cs-server apps]# ls -ltr
total 0
-rw-r--r--. 1 root root 0 Apr  1 13:47 samba_testfile
[root@cs-server apps]# ■

[root@cs-server /]#
[root@cs-server /]#
[root@cs-server /]# chmod a+rwx samba/
[root@cs-server /]# chmod a+rwx samba/apps/
[root@cs-server /]# chmod a+rwx samba/apps/*
[root@cs-server /]# ■
```

- **Change SELinux security context for samba shared directory in case SELinux is enabled**
chcon -t samba_share_t /samba/apps

```
[root@cs-server /]#
[root@cs-server /]# cd
[root@cs-server ~]#
[root@cs-server ~]# chcon -t samba_share_t /samba/apps/
[root@cs-server ~]# ■
```

Server Side Configuration

«

- Modify /etc/samba/smb.conf file to add our shared dir

[global]

workgroup = SAMBA
netbios name = centos
security = user
map to guest = bad user
dns proxy = no

[Apps]

path = /samba/apps
browsable = yes
writable = yes
guest ok = yes
guest only = yes
read only = no

```
[root@cs-server ~]#  
[root@cs-server ~]# vi /etc/samba/smb.conf
```

```
# See smb.conf.example for a more detailed config file or  
# read the smb.conf manpage.  
# Run 'testparm' to verify the config is correct after  
# you modified it.  
#  
# Note:  
# SMB1 is disabled by default. This means clients without support for SMB2 or  
# SMB3 are no longer able to connect to smbd (by default).
```

```
# SMB3 are no longer able to connect to smbd (by default).
```

```
[global]
workgroup = SAMBA
netbios name = centos
security = user
map to guest = bad user
dns proxy = no
hosts allow = 192.168.0.0/24

[Apps]
comment = Shared Dir
path = /samba/apps
browsable = yes
writable = yes
guest ok = yes
guest only = yes
read only = no
```

```
-- INSERT --
```

Server Side Configuration

- Verify the setting by using

```
>testparm
```

```
# test
[root@cs-server ~]# testparm
Load smb config files from /etc/samba/smb.conf
Loaded services file OK.
Weak crypto is allowed by GnuTLS (e.g. NTLM as a compatibility fallback)

Server role: ROLE_STANDALONE

Press enter to see a dump of your service definitions
```

```
# Global parameters
[global]
    dns proxy = No
    map to guest = Bad User
    netbios name = CENTOS
    security = USER
    workgroup = SAMBA
    idmap config * : backend = tdb

[Apps]
    comment = Shared Dir
    guest ok = Yes
    guest only = Yes
    path = /samba/apps
    read only = No
[root@cs-server ~]#
```

Server Side Configuration

- Enable and start the services

```
>systemctl enable smb nmb
>systemctl start smb nmb
```

```
[root@cs-server ~]#
[root@cs-server ~]# systemctl start smb nmb
[root@cs-server ~]# systemctl status smb nmb
```

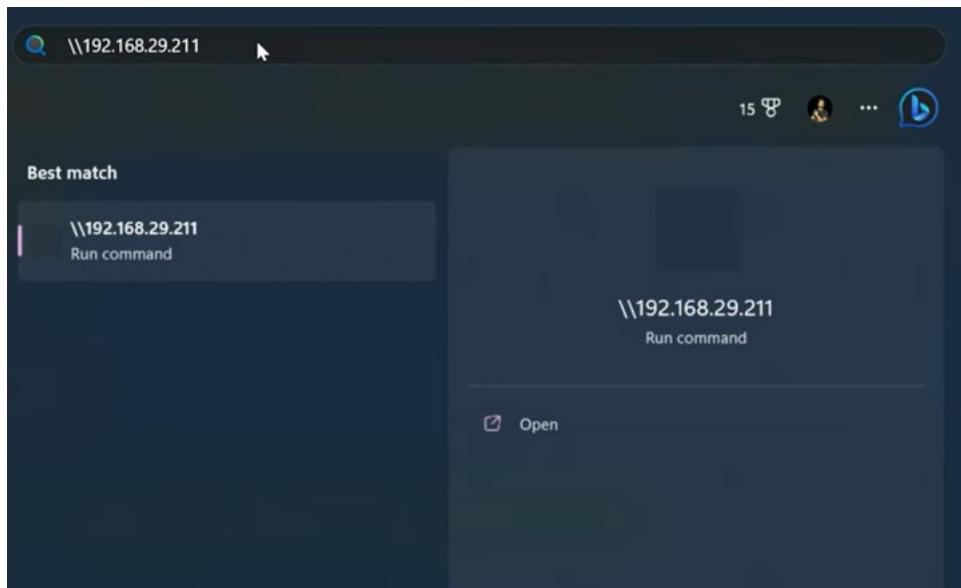
```
● smb.service - Samba SMB Daemon
  Loaded: loaded (/usr/lib/systemd/system/smb.service; disabled; vendor)
  Active: active (running) since Sat 2023-04-01 13:55:14 EDT; 7s ago
    Docs: man:smbd(8)
          man:samba(7)
          man:smb.conf(5)
  Main PID: 16067 (smbd)
    Status: "smbd: ready to serve connections..."
      Tasks: 3 (limit: 11222)
     Memory: 6.3M
        CGroub: /system.slice/smb.service
                  └─16067 /usr/sbin/smbd --foreground --no-process-group
                    ├─16070 /usr/sbin/smbd --foreground --no-process-group
                    └─16071 /usr/sbin/smbd --foreground --no-process-group
```

```
Apr 01 13:55:14 cs-server systemd[1]: Starting Samba SMB !
Apr 01 13:55:14 cs-server smbd[16067]: [2023/04/01 13:55:14]
Apr 01 13:55:14 cs-server smbd[16067]:      smbd version 4.1'
1 lines 1-18
```

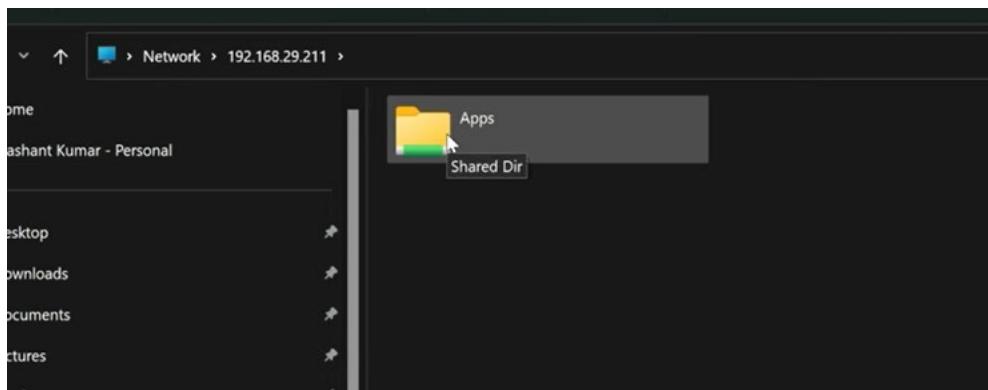
Accessing the directory from Windows

- Start -> Search

>\\\192.168.1.1 (ip of your Linux server)



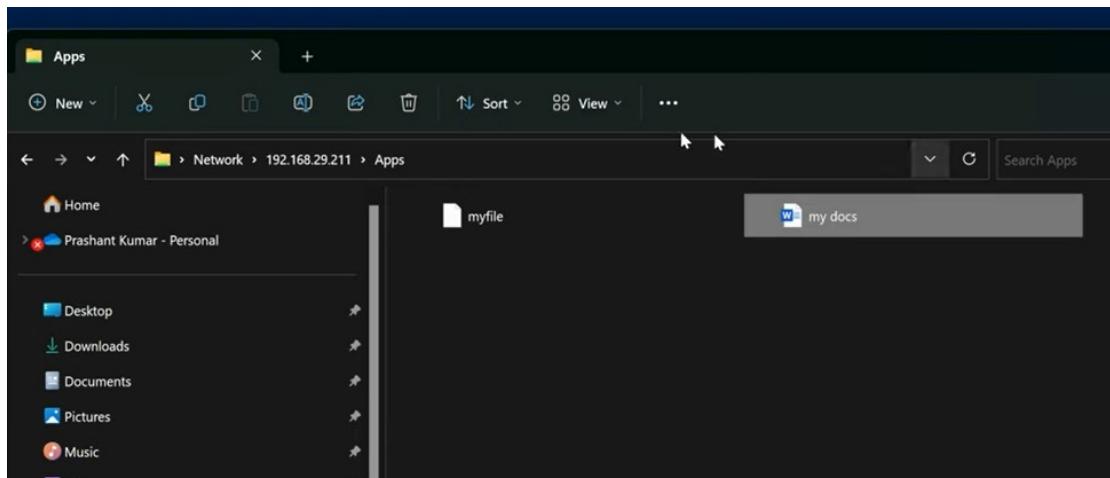
App folder created in windows through Linux Server



```
# Create a file in root - server (Samba app) Check the status on Windows folder
```

```
[root@cs-server ~]#
[root@cs-server ~]# cd /samba/apps/
[root@cs-server apps]# ls
samba_testfile
[root@cs-server apps]# touch myfile
[root@cs-server apps]#
```

```
# open the folder Check the file & edit it do some changes Check the same in Linux Server
```



```
[root@cs-server apps]# ls -ltr
total 0
-rwxrwxrwx. 1 root    root    0 Apr  1 13:47 samba_testfile
-rw-r--r--. 1 root    root    0 Apr  1 13:57 myfile
-rwxr--r--. 1 nobody  nobody  0 Apr  1 13:57 'my docs.docx'
[root@cs server apps]#
```

Client Side Configuration

- To install SAMBA Packages

```
yum install cifs-utils samba-client
```

```
[root@cs-client ~]# [root@cs-client ~]# yum install cifs-utils samba-client -y
■
sssd-ad-2.8.2-1.el8.x86_64
sssd-client-2.8.2-1.el8.x86_64
sssd-common-2.8.2-1.el8.x86_64
sssd-common-pac-2.8.2-1.el8.x86_64
sssd-ipa-2.8.2-1.el8.x86_64
sssd-kcm-2.8.2-1.el8.x86_64
sssd-krb5-2.8.2-1.el8.x86_64
sssd-krb5-common-2.8.2-1.el8.x86_64
sssd-ldap-2.8.2-1.el8.x86_64
sssd-proxy-2.8.2-1.el8.x86_64
Installed:
cifs-utils-7.0-1.el8.x86_64
samba-client-4.17.5-0.el8.x86_64
Complete!
[root@cs-client ~]#
```

Client Side Configuration

- Create a mount point (a directory)

```
mkdir /mnt/samba/apps
```



- Mount the Samba dir

```
mount -t cifs <IP_Server>/Apps /mnt/samba/apps
```

```
[root@cs-client ~]#  
[root@cs-client ~]# cd /  
[root@cs-client /]#  
[root@cs-client /]# cd /mnt/  
[root@cs-client mnt]#  
[root@cs-client mnt]# mkdir -p samba/apps  
[root@cs-client mnt]# cd samba/apps/  
[root@cs-client apps]# pwd  
/mnt/samba/apps  
[root@cs-client apps]# █
```

Note: Enter Without passwd

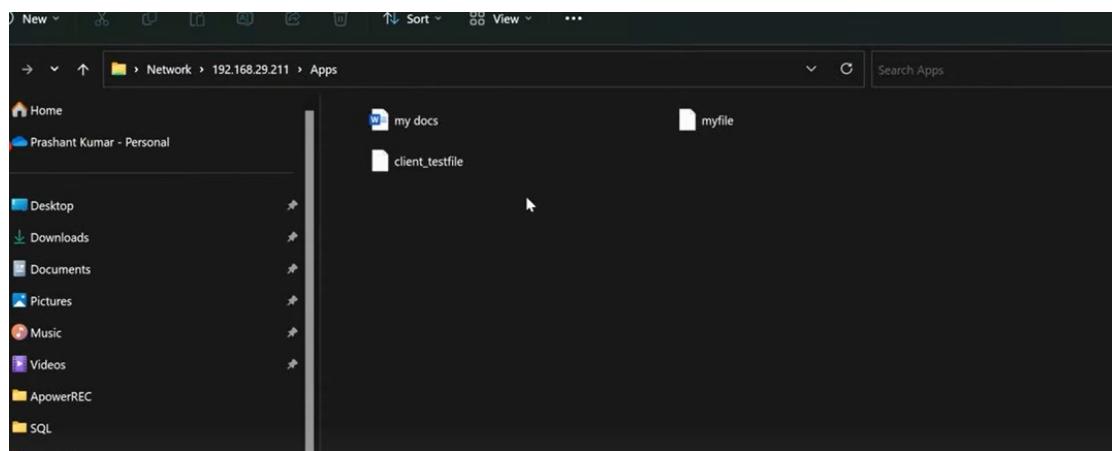
```
[root@cs-client apps]# mount -t cifs //192.168.29.211/Apps /mnt/samba/apps/  
Password for root@//192.168.29.211/Apps:  
[root@cs-client apps]# █
```

```
[root@cs-client ~]# df -h  
Filesystem          Size  Used Avail Use% Mounted on  
devtmpfs            360M    0  360M   0% /dev  
tmpfs              389M    0  389M   0% /dev/shm  
tmpfs              389M   6.2M  383M   2% /run  
tmpfs              389M    0  389M   0% /sys/fs/cgroup  
/dev/mapper/cs-root    17G   6.8G  11G  40% /  
/dev/nvme0n1p1      1014M  258M  757M  26% /boot  
tmpfs                78M   12K   78M   1% /run/user/42  
tmpfs                78M   4.0K   78M   1% /run/user/1000  
//192.168.29.211/Apps    17G   6.5G  11G  38% /mnt/samba/apps  
[root@cs-client ~]# █
```

```
[root@cs-client apps]#  
[root@cs-client apps]# pwd  
/mnt/samba/apps  
[root@cs-client apps]# ls -ltr  
total 0  
-rwxr-xr-x. 1 root root 0 Apr  1 23:27 myfile  
-rwxr-xr-x. 1 root root 0 Apr  1 23:27 'my docs.docx'  
[root@cs-client apps]# touch client_testfile  
[root@cs-client apps]# ls -ltr  
total 0  
-rwxr-xr-x. 1 root root 0 Apr  1 23:27 myfile  
-rwxr-xr-x. 1 root root 0 Apr  1 23:27 'my docs.docx'  
-rwxr-xr-x. 1 root root 0 Apr  1 23:41 client_testfile  
[root@cs-client apps]#
```

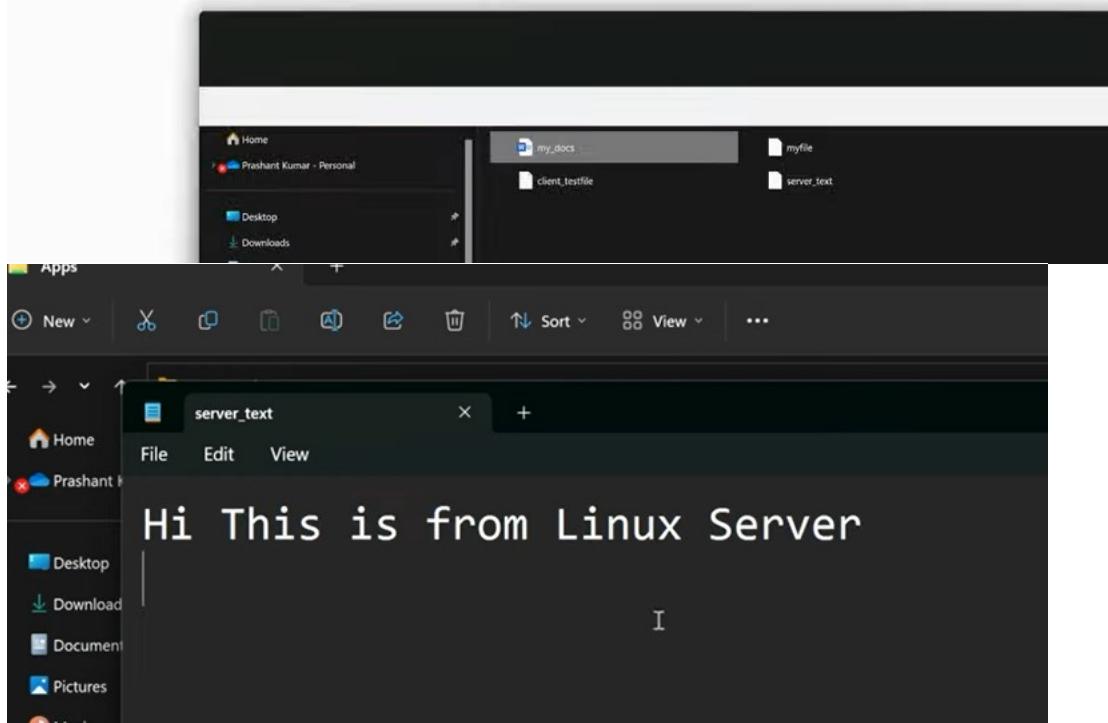
check in server Side

```
[root@cs-server apps]#  
[root@cs-server apps]# pwd  
/samba/apps  
[root@cs-server apps]# ls -ltr  
total 0  
-rwxrwxrwx. 1 root root 0 Apr  1 13:47 samba_testfile  
-rw-r--r--. 1 root root 0 Apr  1 13:57 myfile  
-rwxr--r--. 1 nobody nobody 0 Apr  1 13:57 'my docs.docx'  
-rwxr--r--. 1 nobody nobody 0 Apr  1 14:11 client_testfile  
[root@cs-server apps]#
```



Read the file in windows

```
[root@cs-server apps]#  
[root@cs-server apps]# vi server_text.txt  
[root@cs-server apps]#
```



```

• groupadd smbgrp
• useradd -M -d /samba_secure -s /usr/sbin/nologin
  -G smbgrp testuser

• mkdir /samba_secure
• chown testuser:smbgrp /samba_secure
• chmod 2770 /samba_secure
• chcon -t samba_share_t /samba_secure

• smbpasswd -a testuser
• smbpasswd -e testuser

```

```

[root@cs-server /]#
[root@cs-server /]# groupadd smbgrp
[root@cs-server /]# useradd -M -d /samba_secure -s /usr/sbin/nologin -G smbgrp testuser
Creating mailbox file: File exists
[root@cs-server /]# id testuser
uid=1003(testuser) gid=1005(testuser) groups=1005(testuser),1004(smbgrp)
[root@cs-server /]#

```

```

lrwxrwxrwx.  1 root  root      7 Jun 22  2021 lib  -> usr/lib
lrwxrwxrwx.  1 root  root      7 Jun 22  2021 bin  -> usr/bin
dr-xr-xr-x.  5 root  root  4096 Nov 21 08:03 boot
drwxr-xr-x.  2 root  root      6 Jan  4 03:19 app
drwxr-xr-x.  3 root  root  4096 Jan  4 14:16 app1
drwxr-xr-x.  3 root  root  4096 Jan  4 14:17 app2
drwxr-xr-x.  2 root  root      6 Jan  5 08:30 test
drwxr-xr-x. 14 root  root   169 Jan 10 15:43 usr
drwxr-xr-x. 23 root  root  4096 Mar  9 05:13 var
drwxrwxrwx.  3 root  root     18 Mar 28 06:47 server
drwxrwxrwx.  4 nobody nobody  36 Apr  1 14:28 samba
dr-xr-xr-x. 13 root  root      0 Apr  2 05:44 sys
drwxr-xr-x. 21 root  root  3340 Apr  2 05:44 dev
dr-xr-xr-x. 208 root  root      0 Apr  2 05:44 proc
drwxr-xr-x.  4 root  root     34 Apr  2 08:59 home
dr-xr-x---.  7 root  root  4096 Apr  2 10:12 root
drwxr-xr-x.  45 root  root  1340 Apr  2 12:05 run
drwxrwxrwt. 16 root  root  4096 Apr  2 12:26 tmp
drwxr-xr-x. 153 root  root  8192 Apr  2 12:26 etc
[root@cs-server /]#

```

```
[root@cs-server /]#  
[root@cs-server /]# mkdir /samba_secure  
[root@cs-server /]#  
[root@cs-server /]# ls -ld samba_secure/  
drwxr-xr-x. 2 root root 6 Apr  2 12:27 samba_secure/  
[root@cs-server /]#  
[root@cs-server /]# chown testuser:smbgrp samba_secure/  
[root@cs-server /]#  
[root@cs-server /]# ls -ld samba_secure/  
drwxr-xr-x. 2 testuser smbgrp 6 Apr  2 12:27 samba_secure/  
[root@cs-server /]#  
[root@cs-server /]# chmod 2770 samba_secure/  
[root@cs-server /]# ls -ld samba_secure/  
drwxrws---. 2 testuser smbgrp 6 Apr  2 12:27 samba_secure/  
[root@cs-server /]# █
```

```
[root@cs-server /]#  
[root@cs-server /]# chcon -t samba_share_t /samba_secure/  
[root@cs-server /]#  
[root@cs-server /]# smbpasswd -a testuser  
New SMB password:  
Retype new SMB password:  
[root@cs-server /]#  
[root@cs-server /]# smbpasswd -e testuser  
Enabled user testuser.  
[root@cs-server /]# █
```

Add the following lines in /etc/smb.conf

```
[Secure]  
path = /samba_secure/  
valid users = @smbgrp  
guest ok = no  
writable = yes  
browsable = yes
```



Restart the services

```
# systemctl restart smb  
# systemctl restart nmb
```

```
[root@cs-server /]#  
[root@cs-server /]# vi /etc/samba/smb.conf█
```

Go to Last / EOF

```
# SMB1 is disabled by default. This means clients without support for SMB2 or
# SMB3 are no longer able to connect to smbd (by default).

[global]
    workgroup = WORKGROUP
    netbios name = centos
    security = user
    map to guest = bad user
    dns proxy = no

[Apps]
    comment = Shared Dir
    path = /samba/apps
    browsable = yes
    writable = yes
    guest ok = yes
    guest only = yes
    read only = no
```

Shift+I

[Apps]

```
comment = Shared Dir
path = /samba/apps
browsable = yes
writable = yes
guest ok = yes
guest only = yes
read only = no
```

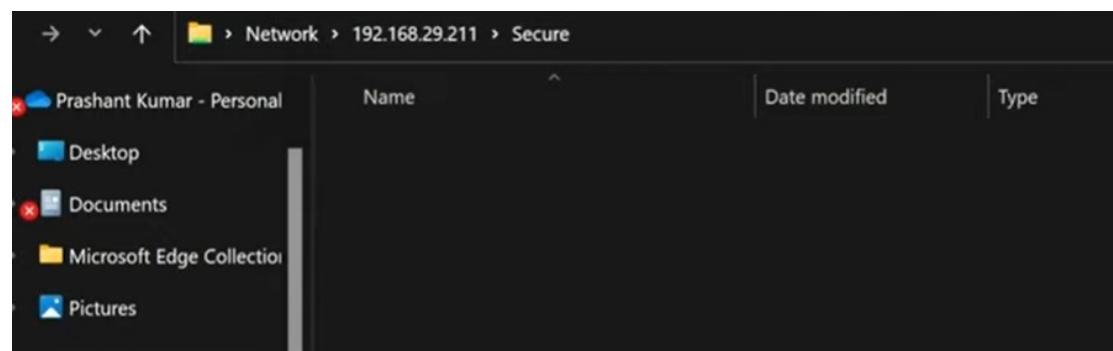
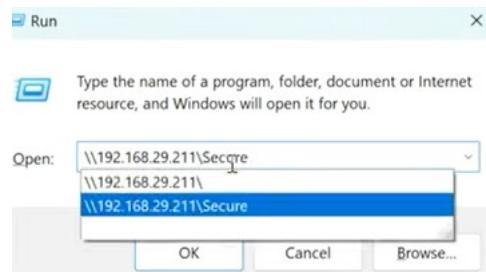
[Secure]

```
path = /samba_secure
valid users = @smbgrp
guest ok = no
writable = yes
browsable = yes
```

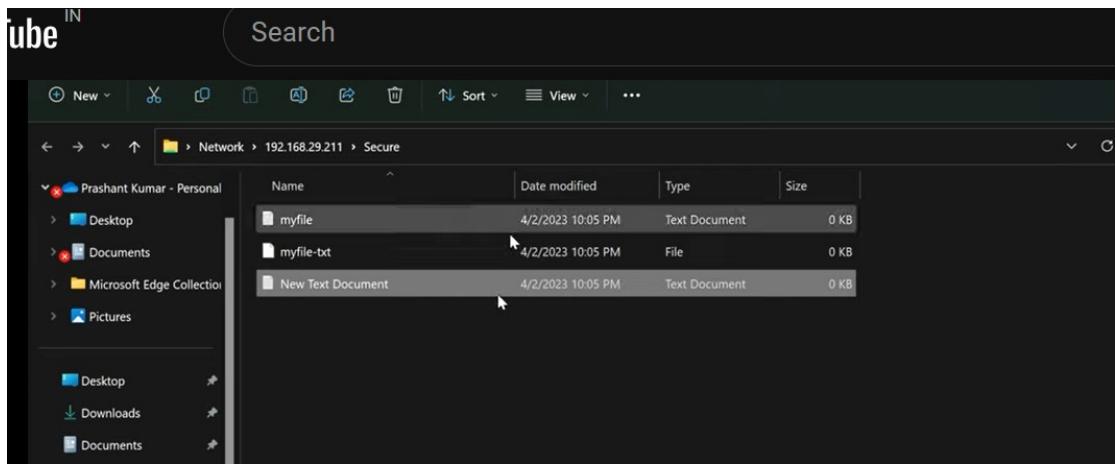
:wq

```
[root@cs-server /]# systemctl restart smb.service nmb.service
[root@cs-server /]#
```

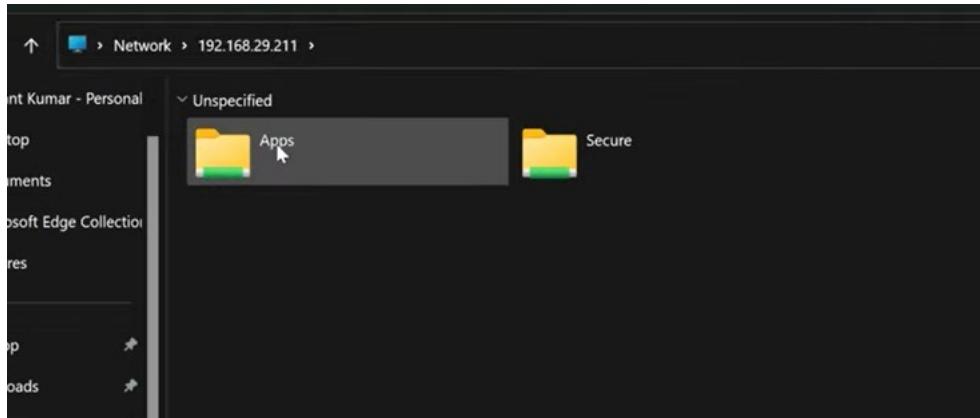
Windows + R / run cmd



```
[root@cs-server /]#
[root@cs-server /]# cd samba_secure/
[root@cs-server samba_secure]# ls
[root@cs-server samba_secure]# touch myfile-txt
[root@cs-server samba_secure]# touch myfile.txt
[root@cs-server samba_secure]# ls
myfile-txt  myfile.txt
[root@cs-server samba_secure]#
```



```
[root@cs-server samba_secure]# ls
myfile-txt  'New folder'
myfile.txt  'New Text Document.txt'
[root@cs-server samba_secure]#
```



What is LVM in Linux with Example

LVM
LOGICAL VOLUME MANAGER

Today's video coverage

- What is LVM and it's example
- Advantage of LVM
- Possibilities of LVM
- Real-time LVM Example
- Adding New Space/disk using LVM
- Extending the space using LVM

Advantage of LVM

Possibilities of LVM

Real-time LVM Example

Adding New Space/disk using LVM

Extending the space using LVM

Creating a partition using fdisk command

LVM

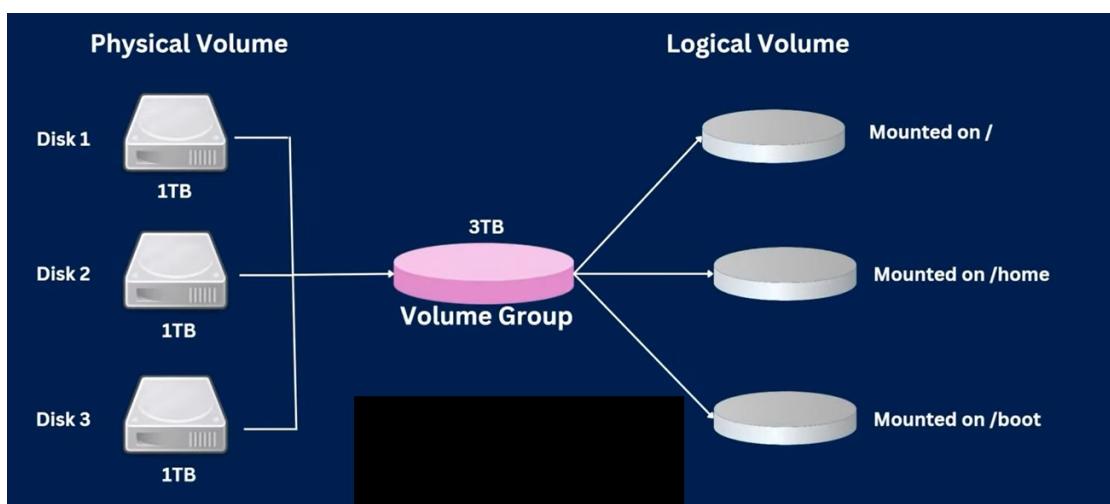
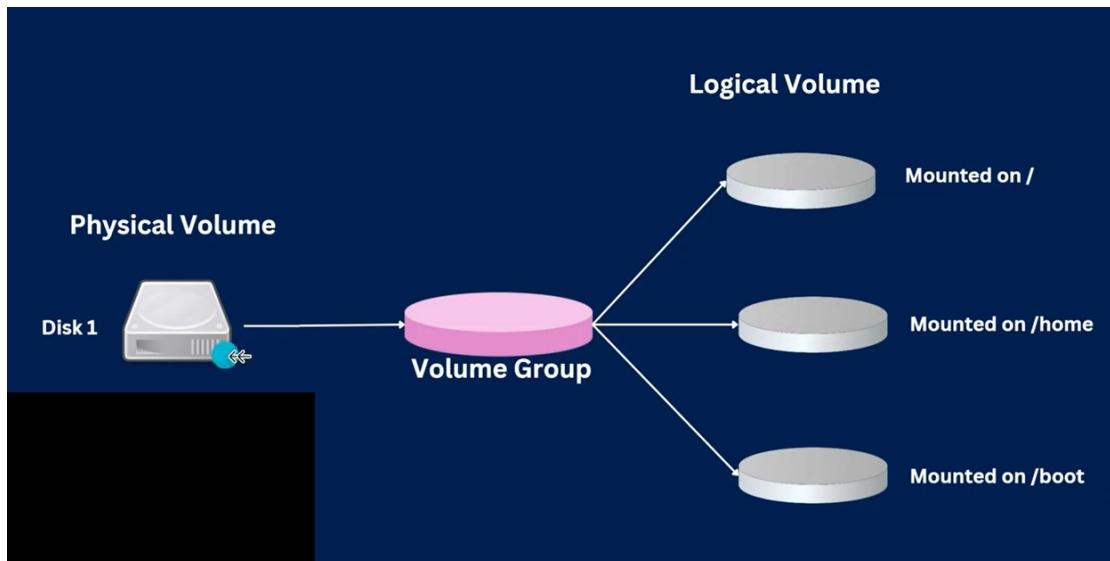
LVM is used to manage volume and disk on the Linux server.

Logical Volume Manager allows disks to be combined together.

Example of LVM

Like partition of disk in windows C, D drive similarly we can do the same in the Linux.

- Single disk can be divided into different partitions.
- Multiple disks combined and group them into one -> then change it into different partitions

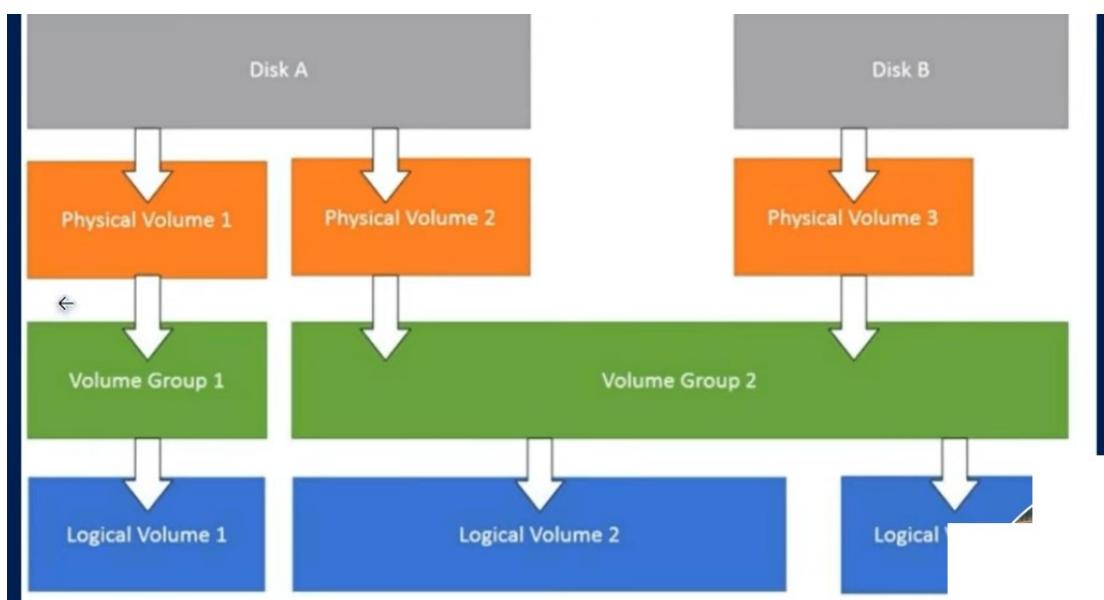


Advantage of LVM

- In case of disk is running out of space, you can add new disk without breaking partitions of your file system.

Possibilities of LVM

- New space can be created on a server for new project
- In case of low disk space, increase the space.
- In case of extra space allocated to a partition, capacity can be reallocated (reduce capacity in one volume group and add it to another).

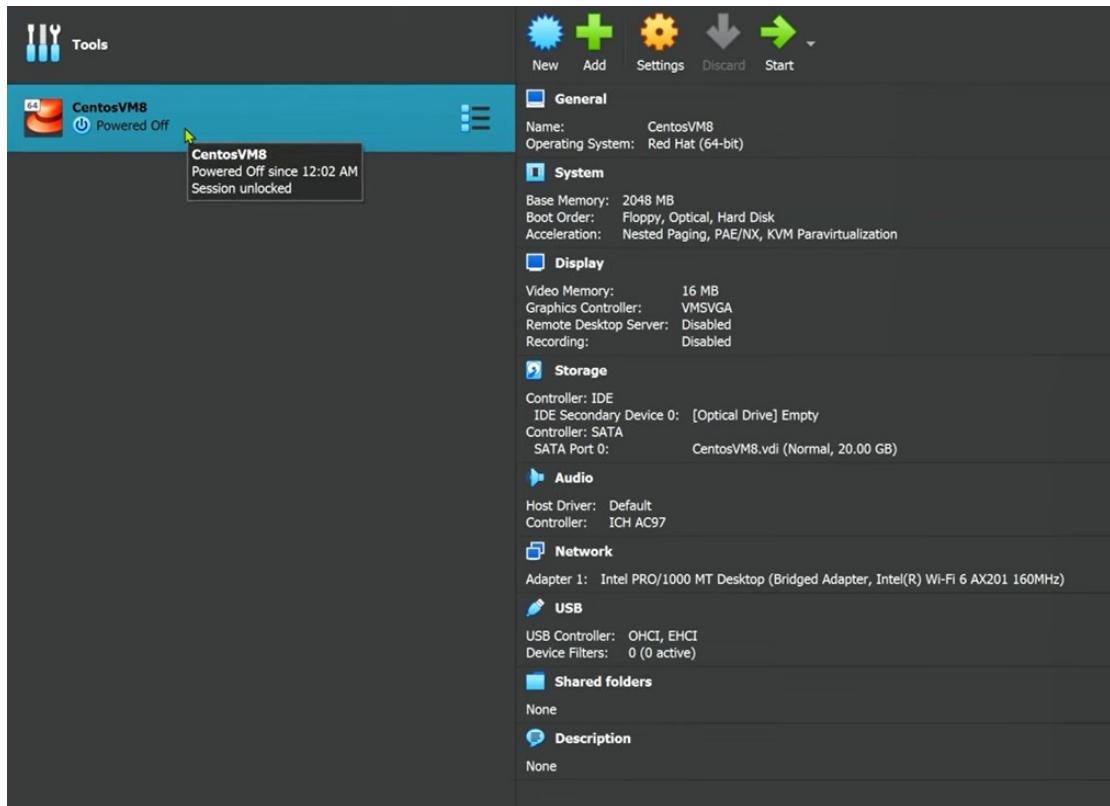


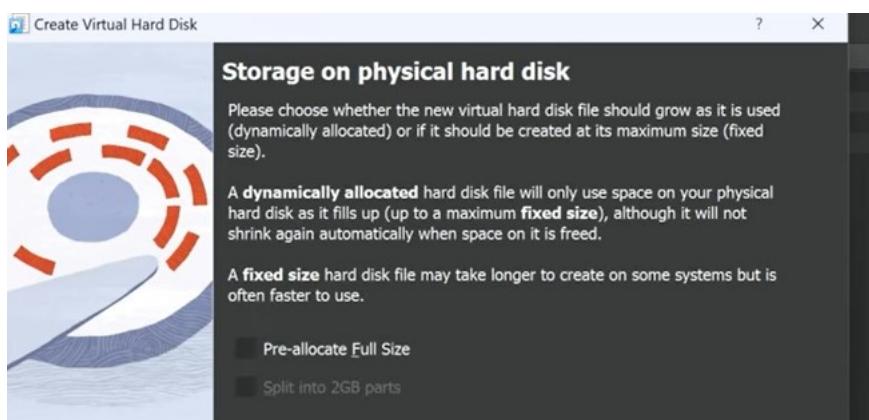
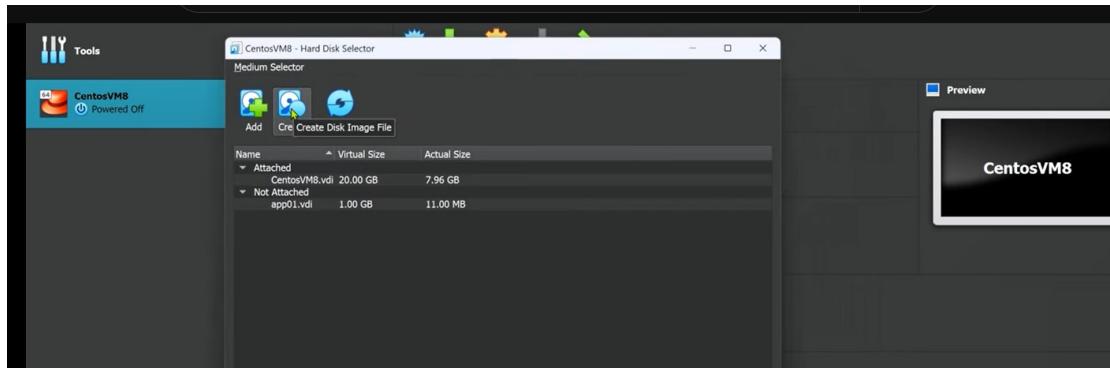
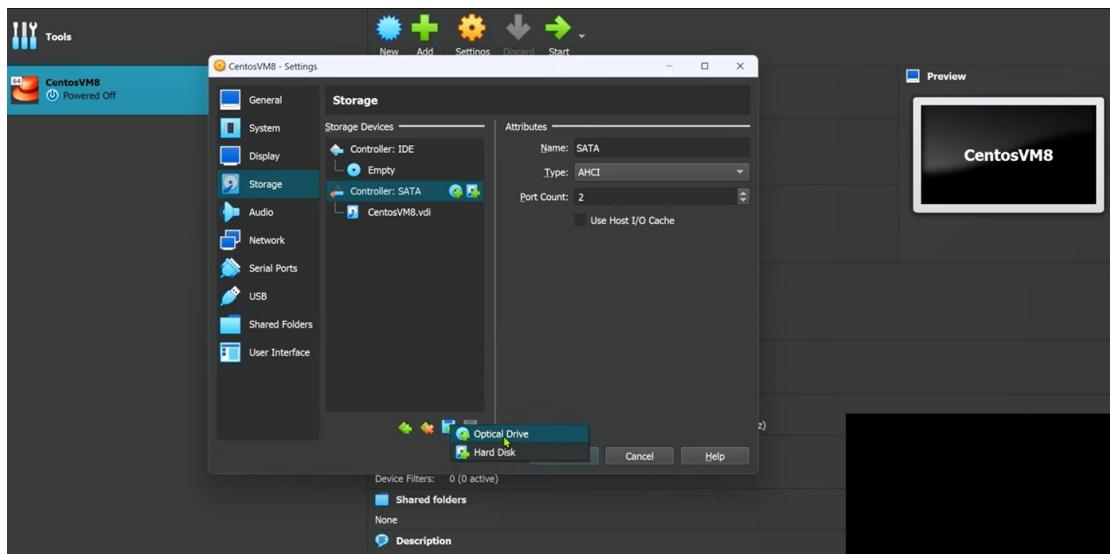
Requirement

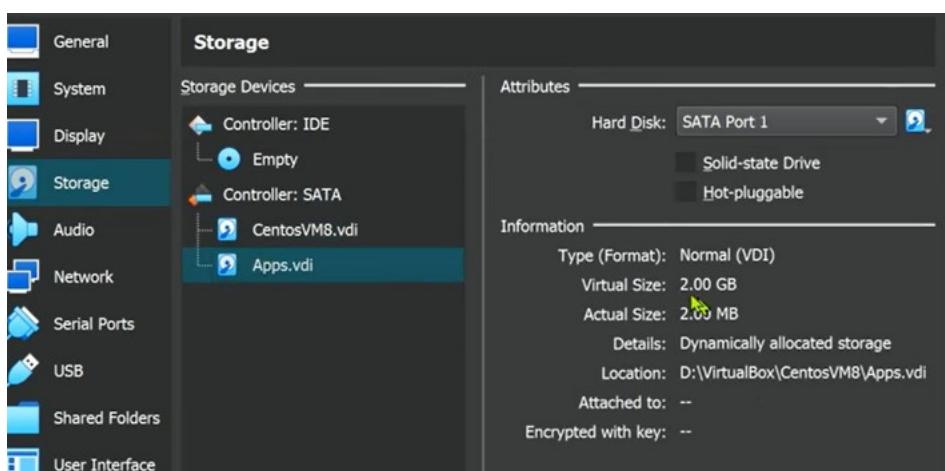
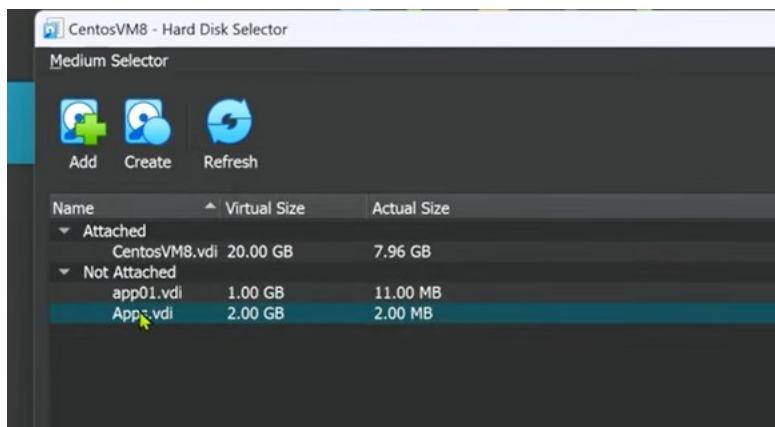
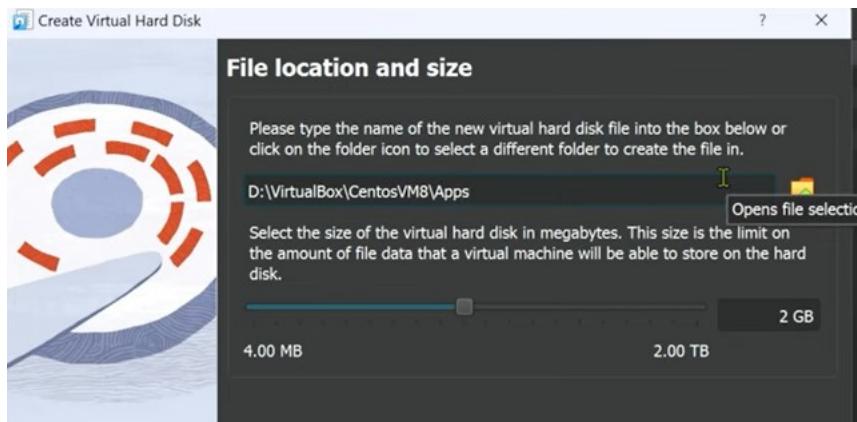
We need to deploy two new applications app1 and app2 on our server and need a separate partitions and space for each applications.

Steps of LVM for adding new space

1. Install a new Hard Disk drive
2. Make a partition to use it
3. Designate physical volume (PV)
4. Manage Volume Group (VG)
5. Manage Logical Volume (LV)
6. Apply a filesystem
7. Set a mount point







```
[root@localhost ~]#  
[root@localhost ~]# fdisk -l
```

```
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x7a7e5db6

Device      Boot   Start     End   Sectors  Size Id Type
/dev/sda1    *       2048  2099199  2097152   1G 83 Linux
/dev/sda2          2099200 41943039 39843840  19G 8e Linux LVM
```

```
Disk /dev/sdb: 2 GiB, 2147483648 bytes, 4194304 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
```

Partition using 'fdisk'

Follow the below steps to create new partition.

1. Choose **n** to create new.
2. Choose **p** to create a primary partition.
3. Choose which number of partition we need to create.
4. Press **Enter** twice to use the full space of the Disk.
5. We need to change the type of newly created partition type **t**.
6. Which number of partition need to change, choose the number which we created its **1**.
7. Here we need to change the type, we need to create LVM so we going to use the type code of LVM as **8e**, if we do not know the type code Press **L** to list all type codes.
8. Print the Partition what we created to just confirm.
9. Here we can see the ID as **8e LINUX LVM**.
10. Write the changes and exit fdisk.

```
[root@localhost ~]#
[root@localhost ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.32.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x6b1d2df3.

Command (m for help):
```

Help:

DOS (MBR)

- a toggle a bootable flag
- b edit nested BSD disklabel
- c toggle the dos compatibility flag

Generic

- d delete a partition
- F list free unpartitioned space
- l list known partition types
- n add a new partition
- p print the partition table
- t change a partition type
- v verify the partition table
- i print information about a partition

Misc

- u change display/entry units
- x extra functionality (experts only)

Script

- I load disk layout from sfdisk script file
- O dump disk layout to sfdisk script file

Save & Exit

- w write table to disk and exit
- q quit without saving changes

Create a new label

- g create a new empty GPT partition table
- G create a new empty SGI (IRIX) partition table
- o create a new empty DOS partition table
- s create a new empty Sun partition table

Command (m for help): n

```
Command (m for help): n
Partition type
  p    primary (0 primary, 0 extended, 4 free)
  e    extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-4194303, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-4194303, d
):
```

Created a new partition 1 of type 'Linux' and of size 2 Gi

Command (**m** for help):

Created a new partition 1 of type 'Linux' and of size 2 GiB

Command (**m** for help): **t**

Selected partition 1

Hex code (type L to list all codes): L

c (FAT-						
2 XENIX root	39	Plan 9	83	Linux	c4	DRDOS/se
c (FAT-						
3 XENIX usr	3c	PartitionMagic	84	OS/2 hidden or	c6	DRDOS/se
c (FAT-						
4 FAT16 <32M	40	Venix 80286	85	Linux extended	c7	Syrix
5 Extended	41	PPC PReP Boot	86	NTFS volume set da		Non-FS d
ata						
6 FAT16	42	SFS	87	NTFS volume set db		CP/M / C
TOS / .						
7 HPFS/NTFS/exFAT	4d	QNX4.x	88	Linux plaintext de	Dell Uti	
lity						
8 AIX	4e	QNX4.x 2nd part	8e	Linux LVM		
9 AIX bootable	4f	QNX4.x 3rd part	93	Amoeba		
ss						
a OS/2 Boot Manag	50	OnTrack DM	94	Amoeba BBT		

```
14 Hidden FAT16 <3 61 SpeedStor          ab Darwin boot      f4 SpeedSto
r
16 Hidden FAT16      63 GNU HURD or Sys af HFS / HFS+
ndary
17 Hidden HPFS/NTF 64 Novell Netware   b7 BSDI fs        fb VMware V
MFS
18 AST SmartSleep  65 Novell Netware   b8 BSDI swap      fc VMware V
MKCORE
1b Hidden W95 FAT3 70 DiskSecure Mult bb Boot Wizard hid fd Linux ra
id auto
1c Hidden W95 FAT3 75 PC/IX           bc Acronis FAT3
1e Hidden W95 FAT1 80 Old Minix       be Solaris boot
```

Hex code (type L to list all codes): 8e

u change display/entry units
x extra functionality (experts only)

Script

I load disk layout from sfdisk script file
O dump disk layout to sfdisk script file

Save & Exit

w write table to disk and exit
q quit without saving changes

Create a new label

g create a new empty GPT partition table
G create a new empty SGI (IRIX) partition table
o create a new empty DOS partition table
s create a new empty Sun partition table

Command (m for help): w

The partition table has been altered.

Calling ioctl() to re-read partition table.

Syncing disks.

[root@localhost ~]#

```
Device      Boot   Start     End   Sectors Size Id Type
/dev/sda1    *      2048 2099199 2097152 1G 83 Linux
/dev/sda2          2099200 41943039 39843840 19G 8e Linux LVM
```

```
Disk /dev/sdb: 2 GiB, 2147483648 bytes, 4194304 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: dos
Disk identifier: 0x6b1d2df3
```

```
Device      Boot Start     End   Sectors Size Id Type
/dev/sdb1          2048 4194303 4192256 2G 8e Linux LVM
```

Designate Physical Volumes (PV) so that it will be available to LVM as storage capacity.

Command to create a PV:

```
# pvcreate /dev/sdb1
```

Display PV capacity and additional information:

```
# pvdisk
```

```
[root@localhost ~]#
[root@localhost ~]# pvcreate /dev/sdb1
  Physical volume "/dev/sdb1" successfully created.
[root@localhost ~]# pvdisk
```

```
PE Size          4.00 MiB
Total PE        4863
Free PE         0
Allocated PE    4863
PV UUID         tLlcI7-VGok-XgE5-gRp0-dUhG-VZiJ-KWTPeJ

"/dev/sdb1" is a new physical volume of "<2.00 GiB"
--- NEW Physical volume ---
PV Name          /dev/sdb1
VG Name
PV Size          <2.00 GiB
Allocatable      NO
PE Size          0
Total PE         0
Free PE          0
Allocated PE     0
PV UUID          3sgPqd-idrl-5K0m-Vo9B-a1cP-RSWZ-
```

Manage Volume Groups (VGs)

VG must have at least one member (vg00 is our group name and others are our PVs)

```
#vgcreate vgapps /dev/sdb1 /dev/sdb2
```

To display information for a VG named vg00
⇒

```
#vgdisplay vgapps
```

```
[root@localhost ~]#
[root@localhost ~]# vgcreate vgapps /dev/sdb1
  Volume group "vgapps" successfully created
[root@localhost ~]#
[root@localhost ~]# vgdisplay █
```

```
[root@localhost ~]# vgdisplay
--- Volume group ---
VG Name          vgapps
System ID
Format           lvm2
Metadata Areas   1
Metadata Sequence No 1
VG Access        read/write
VG Status         resizable
MAX LV
Cur LV
Open LV
Max PV
Cur PV          1

Metadata Areas   1
Metadata Sequence No 1
VG Access        read/write
VG Status         resizable
MAX LV
Cur LV
Open LV
Max PV
Cur PV          1
Act PV           1
VG Size          <2.00 GiB
PE Size          4.00 MiB
Total PE         511
Alloc PE / Size  0 / 0
Free PE / Size   511 / <2.00 GiB
VG UUID          guq6tM-p8Rv-9Lfx-nl14-p60A-mG
```

Manage Logical Volumes (LVs)



To create a Logical Volume

```
# lvcreate -L size(1G or 1T) -n lvname vgname
```

To display information for a LV

```
# lvdisplay /dev/vgapps/<lvname>
```

```
[root@localhost ~]# lvcreate -L 1000M -n app1-lv vgapps
Logical volume "app1-lv" created.
[root@localhost ~]# lvcreate -L 1000M -n app2-lv vgapps
Logical volume "app2-lv" created.
[root@localhost ~]#
```

```
[root@localhost ~]#
[root@localhost ~]# lvdisplay ■
```

```
--- Logical volume ---
LV Path          /dev/vgapps/app1-lv
LV Name          app1-lv
VG Name          vgapps
LV UUID          xbstd7-e7Qv-F2kw-ltvt-EZmf-d0y2-Bm1HzD
LV Write Access  read/write
LV Creation host, time localhost.localdomain, 2023-01-04 14:13:37 -050
0
LV Status        available
# open           0
LV Size          1000.00 MiB
Current LE       250
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 8192
Block device     253:2
```

--More--

```

---- Logical volume ----
LV Path          /dev/vgapps/app2-lv
LV Name          app2-lv
VG Name          vgapps
LV UUID          ZQEDup-rcwr-751L-fMnc-oJre-daEg-iX1El8
LV Write Access   read/write
LV Creation host, time localhost.localdomain, 2023-01-04 14:13:44 -050
0
LV Status        available
# open           0
LV Size          1000.00 MiB
Current LE       250
Segments         1
Allocation       inherit
Read ahead sectors auto

```

Apply a filesystem and set a mount point.

- Run the **mkfs.ex4** command on the LV.
- Create a mount point by using mkdir.
- Manually mount the volume using the mount command, or edit the /etc/fstab file to mount the volume automatically when the system boots.
- Use the **df -h** command to verify the storage available.

```

[root@localhost ~]# mkfs.ext4 /dev/vgapps/app1-lv
mke2fs 1.45.6 (20-Mar-2020)
Creating filesystem with 256000 4k blocks and 64000 inodes
Filesystem UUID: 18645054-71de-40c5-b9ea-5b7de6bf0d9b
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done

[root@localhost ~]# mkfs.ext4 /dev/vgapps/app2-lv
mke2fs 1.45.6 (20-Mar-2020)
/dev/vgapps/app2-lv contains a ext4 file system
      created on Wed Jan  4 14:16:18 2023
Proceed anyway? (y,N)

```

```
Proceed anyway? (y,N) y
Creating filesystem with 256000 4k blocks and 64000 inodes
Filesystem UUID: e6f4de31-2406-4d87-9183-f8a6c33e86bc
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376
```

```
Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting informati
```

```
[root@localhost ~]# █
```

```
[root@localhost ~]#
[root@localhost ~]# mkdir /app1
[root@localhost ~]# mkdir /app2
[root@localhost ~]#
[root@localhost ~]# mount /dev/vgapps/app1-lv /app1/
[root@localhost ~]# mount /dev/vgapps/app2-lv /app2/
[root@localhost ~]# █
```

```
[root@localhost ~]# df -Th
Filesystem      Type   Size  Used Avail Use% Mounted on
/devtmpfs       devtmpfs 877M    0  877M  0% /dev
tmpfs           tmpfs   907M    0  907M  0% /dev/shm
tmpfs           tmpfs   907M   18M  890M  2% /run
tmpfs           tmpfs   907M    0  907M  0% /sys/fs/cgroup
/dev/mapper/cs-root xfs    17G  5.5G  12G  33% /
/dev/sda1        xfs   1014M 258M  757M  26% /boot
tmpfs           tmpfs   182M   12K  182M  1% /run/user/42
tmpfs           tmpfs   182M  4.0K  182M  1% /run/user/1000
/dev/mapper/vgapps-app1--lv ext4  966M  24K  900M  1% /app1
/dev/mapper/vgapps-app2--lv ext4  966M  24K  900M  1% /app2
[root@localhost ~]# █
```

```
[root@localhost ~]#
[root@localhost ~]# cat /etc/mtab █
```

```
cgroup /sys/fs/cgroup/freezer cgroup rw,seclabel,nosuid,nodev,noexec,relatime,freezer 0  
0  
cgroup /sys/fs/cgroup/cpuset cgroup rw,seclabel,nosuid,nodev,noexec,relatime,cpuset 0 0  
none /sys/kernel/tracing tracefs rw,seclabel,relatime 0 0  
configfs /sys/kernel/config configfs rw,relatime 0 0  
/dev/mapper/cs-root / xfs rw,seclabel,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota 0 0  
selinuxfs /sys/fs/selinux selinuxfs rw,relatime 0 0  
systemd-1 /proc/sys/fs/binfmt_misc autofs rw,relatime,fd=41,pgrp=1,timeout=0,minproto=5,  
maxproto=5,direct,pipe_ino=19309 0 0  
hugetlbfs /dev/hugepages hugetlbfs rw,seclabel,relatime,pagesize=2M 0 0  
debugfs /sys/kernel/debug debugfs rw,seclabel,relatime 0 0  
mqueue /dev/mqueue mqueue rw,seclabel,relatime 0 0  
fusectl /sys/fs/fuse/connections fusectl rw,relatime 0 0  
/dev/sda1 /boot xfs rw,seclabel,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota 0 0  
sunrpc /var/lib/nfs/rpc_pipefs rpc_pipefs rw,relatime 0 0  
tmpfs /run/user/42 tmpfs rw,seclabel,nosuid,nodev,relatime,size=1856:  
gid=42 0 0  
tmpfs /run/user/1000 tmpfs rw,seclabel,nosuid,nodev,relatime,size=18!  
000,gid=1000 0 0  
/dev/mapper/vgapps-app1--lv /app1 ext4 rw,seclabel,relatime 0 0  
/dev/mapper/vgapps-app2--lv /app2 ext4 rw,seclabel,relatime 0 0  
[root@localhost ~]#
```

```
[root@localhost ~]#  
[root@localhost ~]# vi /etc/fstab
```

```
# /etc/fstab  
# Created by anaconda on Mon Nov 21 12:30:17 2022  
#  
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.  
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.  
#  
# After editing this file, run 'systemctl daemon-reload' to update systemd  
# units generated from this file.  
#  
/dev/mapper/cs-root / xfs defaults 0 0  
UUID=189866f5-f9a4-4fb5-869f-5f63281a407c /boot xfs defaults 0 0  
0 0  
/dev/mapper/cs-swap none swap defaults 0 0  
/dev/mapper/vgapps-app1--lv /app1 ext4 defaults 0 0  
/dev/mapper/vgapps-app2--lv /app2 ext4 defaults 0 0
```

```
[root@localhost ~]# mount -av  
/ : ignored  
/boot : already mounted  
none : ignored  
/app1 : already mounted  
/app2 : already mounted  
[root@localhost ~]#
```

```
[root@localhost ~]# df -h
Filesystem           Size  Used Avail Use% Mounted on
devtmpfs              877M    0  877M   0% /dev
tmpfs                 907M    0  907M   0% /dev/shm
tmpfs                 907M   18M  890M   2% /run
tmpfs                 907M    0  907M   0% /sys/fs/cgroup
/dev/mapper/cs-root     17G  5.5G  12G  33% /
/dev/sda1             1014M 258M  757M  26% /boot
tmpfs                 182M   28K  182M   1% /run/user/1000
/dev/mapper/vgapps-app1--lv 966M   24K  900M   1% /app1
/dev/mapper/vgapps-app2--lv 966M   24K  900M   1% /app2
[root@localhost ~]#
```

Apply a filesystem and set a mount point.

- Run the `mkfs.ex4` command on the LV.
- Create a mount point by using `mkdir`.
- Manually mount the volume using the `mount` command, or edit the `/etc/fstab` file to mount the volume automatically when the system boots.
- Use the `df -h` command to verify the storage available.

Extending a Disk using LVM

For the first time we have created a VG, now we will extend it
`# vgextend vgapps /dev/sdb2`

Add space to LV
`# lvextend -L+1G /dev/vgapps/app1-lv`

Make this new space available to FileSystem

Here is the basic command for ext4:
`# resize2fs /dev/vgapps/app1-lv 3T`

YOU CAN USE the below command for XFS
`#xfs_growfs /dev/vgapps/app1-lv (now check using df`

`# check YT*`

SELinux in Linux

- What is SELinux?
- History
- DAC vs MAC
- How SELinux works?
 - Labeling and Enforcement
- SELinux Boolean
- Examples

What is SELinux?

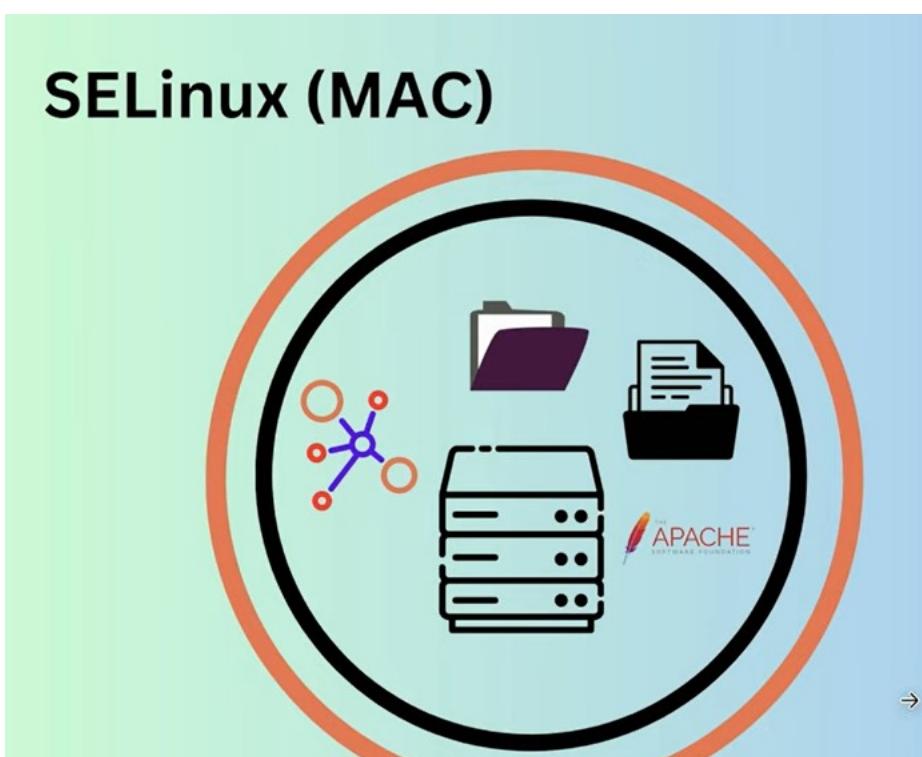
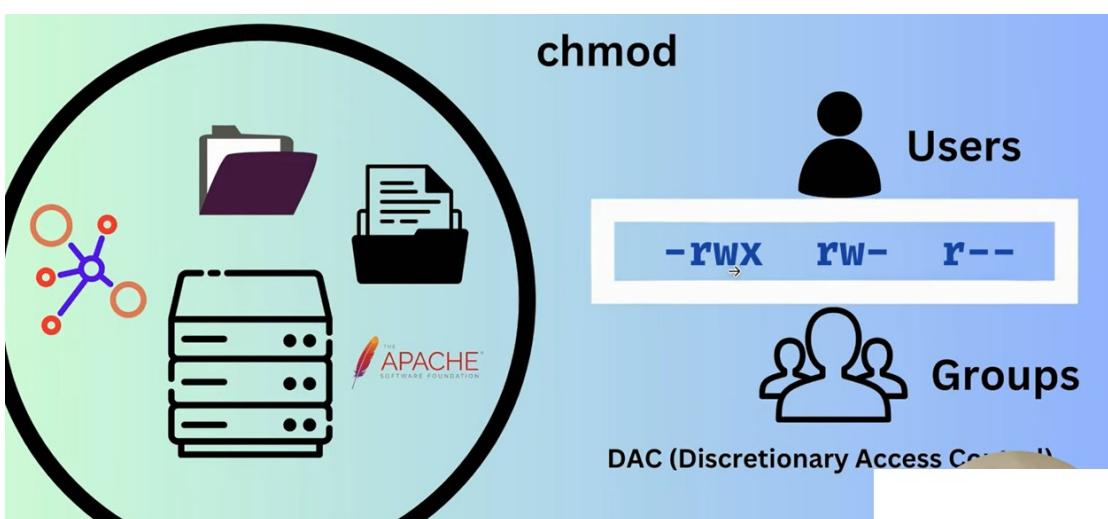
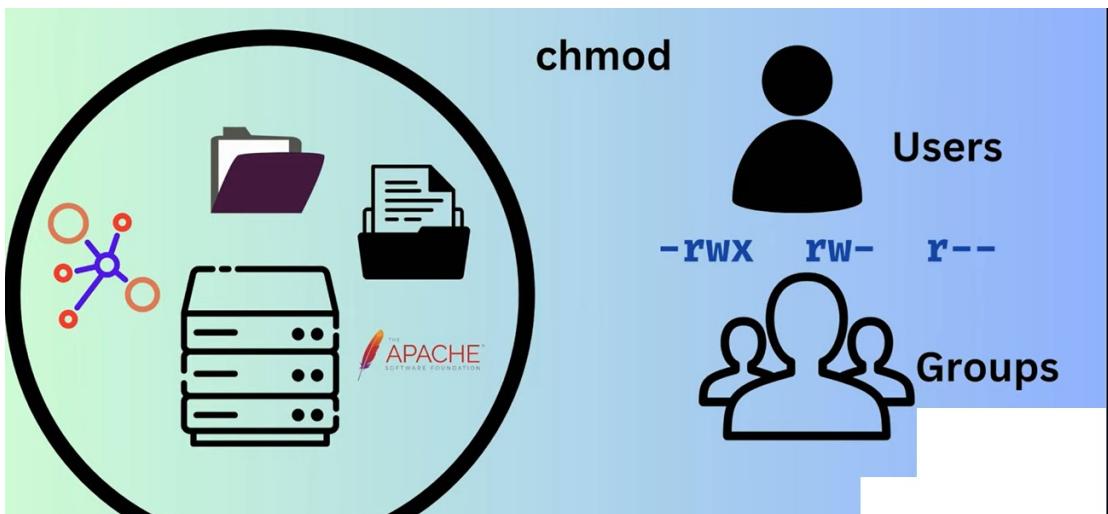
Security-Enhanced Linux

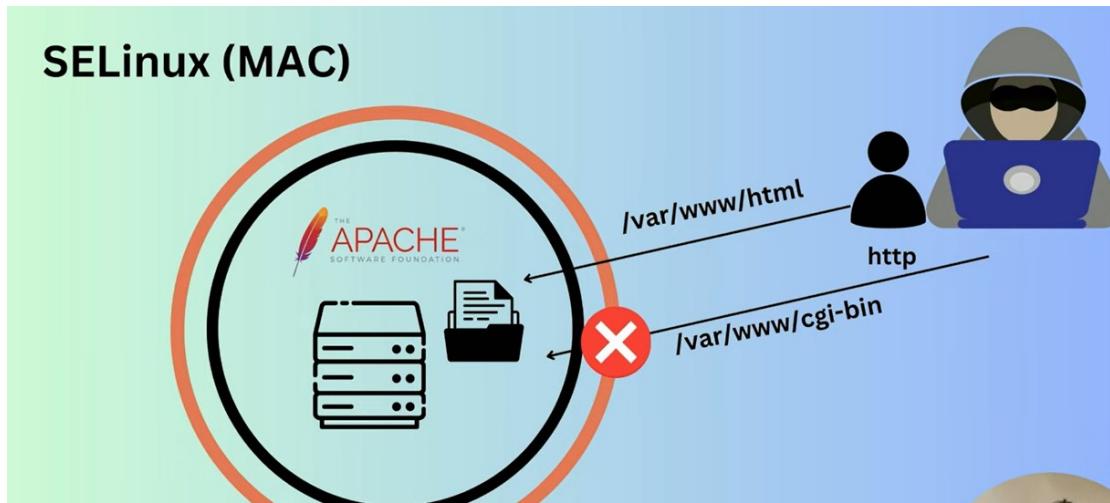
- A Linux Kernel Security Module
- Provides additional layer of access control and Mandatory Access Control (MAC) to enhance the security.

What is SELinux?

Security-Enhanced Linux

- A Project of US NSA
(National Security Agency) with SELinux Community





SELinux Options?

- Enforcing (by default enabled in Redhat)
- Permissive (disabled but logs the activity)
- Disable

SELinux Options?

- Enforcing (by default enabled in Redhat)
- Permissive (disabled but logs the activity)
- Disable

How to check SELinux Status?

`#sestatus or getenforce`

```
root@RHEL-10:~# sestatus
SELinux status:                 enabled
SELinuxfs mount:                /sys/fs/selinux
SELinux root directory:         /etc/selinux
Loaded policy name:              targeted
Current mode:                   enforcing
Mode from config file:          enforcing
Policy MLS status:              enabled
Policy deny_unknown status:     allowed
Memory protection checking:    actual (secure)
Max kernel policy version:     33
root@RHEL-10:~#
```

Change SELinux settings?

#setenforce 0 = Permissive/Disable
#setenforce 1 = Enable

Change SELinux settings permanent?

/etc/selinux/config

SELINUX=enforcing/disabled/permissive

```
[root@redhat01 ~]# cd /etc/selinux/
[root@redhat01 selinux]# ls
config  semanage.conf  targeted
[root@redhat01 selinux]# less config
```

```
# to persistently set the bootloader to boot with selinux=0:  
#  
#     grub --update-kernel ALL --args selinux=0  
#  
# To revert back to SELinux enabled:  
#  
#     grub --update-kernel ALL --remove-args selinux  
#  
SELINUX=enforcing  
# SELINUXTYPE= can take one of these three values:  
#     targeted - Targeted processes are protected,  
#     minimum - Modification of targeted policy. Only selected processes are protected.  
#     mls - Multi Level Security protection.  
SELINUXTYPE=targeted  
  
(END)
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

Windows Start Type here to search Air: Moderate 16:11 08-03-2025

Create a file before rebooting

```
#fixfiles -F onboot  
.autorelabel
```

To prevent incorrectly labeled and unlabeled files from causing problems, SELinux automatically relabels file systems when changing from the disabled state to permissive or enforcing mode.

Before rebooting the system for relabeling, make sure the system will boot in permissive mode, for example by using the `enforcing=0` kernel option.

```
[root@redhat01 selinux]#  
[root@redhat01 selinux]# fixfiles -F onboot  
System will relabel on next boot  
[root@redhat01 selinux]#
```

```
[root@redhat01 selinux]#  
[root@redhat01 selinux]# cd /  
[root@redhat01 /]# ls -la
```

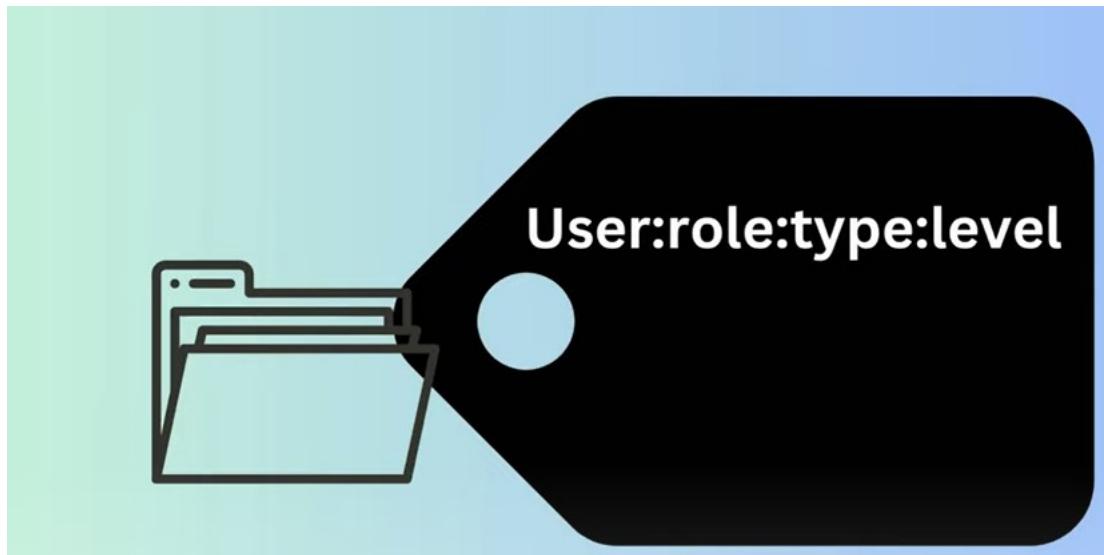
```
dr-xr-xr-x. 2 root root 6 Aug 10 2021 afs
-rw-r--r--. 1 root root 3 Jul 8 04:36 .autorelabel
lrwxrwxrwx. 1 root root 7 Aug 10 2021 bin -> usr/bin
dr-xr-xr-x. 6 root root 4096 Jul 6 00:16 boot
drwxr-xr-x. 18 root root 3240 Jul 7 20:53 dev
drwxr-xr-x. 132 root root 8192 Jul 8 03:54 etc
drwxr-xr-x. 3 root root 18 Jul 6 00:17 home
lrwxrwxrwx. 1 root root 7 Aug 10 2021 lib -> usr/lib
lrwxrwxrwx. 1 root root 9 Aug 10 2021 lib64 -> usr/lib64
drwxr-xr-x. 2 root root 6 Aug 10 2021 media
drwxr-xr-x. 2 root root 6 Aug 10 2021 mnt
drwxr-xr-x. 2 root root 6 Aug 10 2021 opt
dr-xr-xr-x. 281 root root 0 Jul 7 20:53 proc
dr-xr-x---. 5 root root 4096 Jul 8 04:35 root
drwxr-xr-x. 44 root root 1120 Jul 7 20:59 run
lrwxrwxrwx. 1 root root 8 Aug 10 2021 sbin -> usr/sbin
drwxr-xr-x. 2 root root 6 Aug 10 2021 srv
dr-xr-xr-x. 12 root root 0 Jul 7 20:53 sys
drwxrwxrwt. 17 root root 4096 Jul 8 04:34 tmp
drwxr-xr-x. 12 root root 144 Jul 5 23:24 usr
drwxr-xr-x. 21 root root 4096 Jul 7 20:55 var
```



It's a good practice to take snapshot of your system before making changes to SELinux

Two main concepts of SELinux

- Labeling
- Type enforcement



To check the label of a file or a directory

#ls -lZ

```
root@RHEL-10:~# ls -lZ
total 28
-rw-----. 1 root root system_u:object_r:admin_home_t:s0      1006 Feb 27
16:57 anaconda-ks.cfg
-rw-r--r--. 1 root root unconfined_u:object_r:admin_home_t:s0     60 Mar  4
10:40 file.txt
-rw-r--r--. 1 root root unconfined_u:object_r:etc_runtime_t:s0    11 Mar  4
09:00 new.txt
-rw-r--r--. 1 root root unconfined_u:object_r:admin_home_t:s0     45 Mar  4
18:30 sid.txt
-rw-r--r--. 1 root root unconfined_u:object_r:admin_home_t:s0     43 Mar  3
16:05 test1.txt
-rwxrwxrwx. 1 root root unconfined_u:object_r:admin_home_t:s0     49 Feb 27
18:17 test.sh
-rw-r--r--. 1 root root unconfined_u:object_r:admin_home_t:s0     33 Mar  3
16:01 test.txt
root@RHEL-10:~#
```

ot unconfined u:object r:admin home t:s0

To check the label of a process (ex: httpd)

```
#ps axZ | grep httpd
```

```
siddhartha@RHEL-10:~ - bash
root@RHEL-10:~# ps axZ | grep httpd
unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 3617 pts/0 S+    0:0
  grep --color=auto httpd
root@RHEL-10:~#
```

```
[root@redhat01 ~]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor
   Active: active (running) since Sat 2023-07-08 00:19:19 EEST; 4h 23min ago
     Docs: man:httpd.service(8)
   Main PID: 34992 (httpd)
      Status: "Total requests: 8; Idle/Busy workers 100/0;Requests/sec: 0.0005
        Tasks: 213 (limit: 10511)
       Memory: 16.5M
         CPU: 43.006s
      CGroup: /system.slice/httpd.service
              ├─34992 /usr/sbin/httpd -DFOREGROUND
              ├─34993 /usr/sbin/httpd -DFOREGROUND
              ├─34994 /usr/sbin/httpd -DFOREGROUND
              ├─34995 /usr/sbin/httpd -DFOREGROUND
              └─34996 /usr/sbin/httpd -DFOREGROUND

Jul 08 00:19:19 localhost.localdomain systemd[1]: Starting The
Jul 08 00:19:19 localhost.localdomain httpd[34992]: AH000558: h

[root@redhat01 ~]# netstat -taZ | grep httpd
tcp6      0      0 [::]:http            [::]:*                LISTEN
  34992/httpd          system_u:system_r:httpd_t:s0
[root@redhat01 ~]#
[root@redhat01 ~]#
```

```
[root@redhat01 ~]#
[root@redhat01 ~]# cd /var/www/html/
[root@redhat01 html]# ls -ltr
total 0
[root@redhat01 html]#
```

```
[root@localhost ~]# cd /var/www/html  
[root@localhost html]# pwd  
/var/www/html  
[root@localhost html]# ls  
[root@localhost html]# vi index.html
```

```
<!DOCTYPE HTML>  
<html lang="en">  
<head>  
    <meta charset="UTF-8">  
    <meta http-equiv="X-UA-Compatible" content="IE=edge">  
    <meta name="viewport" content="width=device-width, initial-scale=1.0">  
    <title>Document</title>  
</head>  
<body>  
    <h1>This is SELinux Tutorial by MPrashant</h1>  
</body>  
</html>
```

```
[root@redhat01 html]# ifconfig  
enp0s5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
        inet 10.211.55.5 netmask 255.255.255.0 broadcast 10.211.55.255  
              inet6 fe80::14e4:42ff:fe00:bade prefixlen 64 scopeid 0x0  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
        inet 127.0.0.1 netmask 255.0.0.0
```

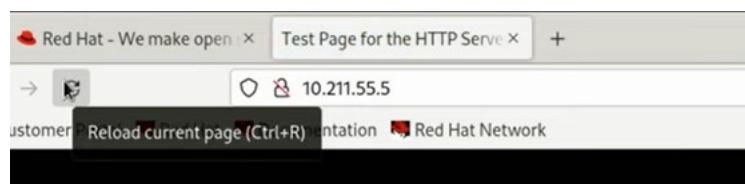


```
[root@localhost ~]# whoami  
root  
[root@localhost ~]#  
[root@localhost ~]# mkdir test  
[root@localhost ~]# cd test/  
[root@localhost test]#  
[root@localhost test]#
```

```
[root@localhost ~]# mkdir test  
[root@localhost ~]# cd test/  
[root@localhost test]#  
[root@localhost test]# pwd  
/root/test  
[root@localhost test]# vi index.htm
```

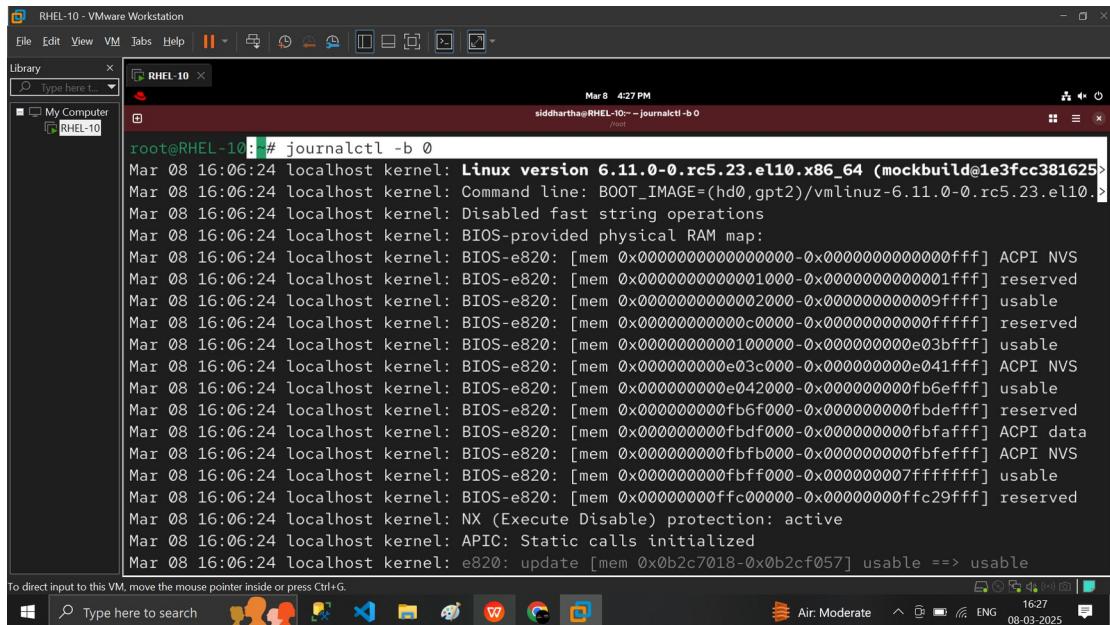
```
<!DOCTYPE HTML>  
<html lang="en">  
  <head>  
    <meta charset="UTF-8">  
    <meta http-equiv="X-UA-Compatible" content="IE=edge">  
    <meta name="viewport" content="width=device-width, initial-scale=1.0">  
    <title>Document</title>  
  </head>  
  <body>  
    <h1>This is SELinux Tutorial by MPrashant NEW VERSION</h1>  
  </body>  
</html>  
~  
~  
~  
[root@localhost test]# mv index.html /var/www/html/  
mv: overwrite '/var/www/html/index.html'? y  
[root@localhost test]#
```

```
[root@redhat01 html]# ls  
index.html  
[root@redhat01 html]# ls -lt  
total 4  
-rw-r--r--. 1 root root 322 Jul  8 04:50 index.html  
[root@redhat01 html]#  
[root@redhat01 html]# chmod 777 index.html  
[root@redhat01 html]# ls -lt  
total 4  
-rwxrwxrwx. 1 root root 322 Jul  8 04:50 index.html  
[root@redhat01 html]#
```



Checking errors related to SELinux

#journalctl



```
root@RHEL-10:~# journalctl -b 0
Mar 08 16:06:24 localhost kernel: Linux version 6.11.0-0.rc5.23.el10.x86_64 (mockbuild@1e3fcc381625)
Mar 08 16:06:24 localhost kernel: Command line: BOOT_IMAGE=(hd0,gpt2)/vmlinuz-6.11.0-0.rc5.23.el10.x86_64 root=UUID=4a200000-0000-0000-0000-000000000000 ro
Mar 08 16:06:24 localhost kernel: Disabled fast string operations
Mar 08 16:06:24 localhost kernel: BIOS-provided physical RAM map:
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] ACPI NVS
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000001000-0x0000000000001fff] reserved
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000002000-0x000000000009ffff] usable
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000000c000-0x00000000000ffff] reserved
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000010000-0x000000000e03ffff] usable
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000e03c000-0x000000000e041ffff] ACPI NVS
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x0000000000e042000-0x000000000fb6effff] usable
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000fb6f000-0x000000000fbdeffff] reserved
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000fbdf000-0x000000000fbfaffff] ACPI data
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000fbfb000-0x000000000fbfeffff] ACPI NVS
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000fbff000-0x0000000007fffffff] usable
Mar 08 16:06:24 localhost kernel: BIOS-e820: [mem 0x000000000ffc00000-0x000000000ffc29ffff] reserved
Mar 08 16:06:24 localhost kernel: NX (Execute Disable) protection: active
Mar 08 16:06:24 localhost kernel: APIC: Static calls initialized
Mar 08 16:06:24 localhost kernel: e820: update [mem 0xb02c7018-0xb02cf057] usable ==> usable
```

```

[38510]: AnalyzeThread.run(): Set alarm timeout to 10
[38510]: AnalyzeThread.run(): Cancel pending alarm
[38510]: failed to retrieve rpm info for /var/www/html/index.html
[38510]: SELinux is preventing /usr/sbin/httpd from setattr access on the fi
[38510]: SELinux is preventing /usr/sbin/httpd from setattr access on the fi

***** Plugin restorecon (99.5 confidence) suggests *****

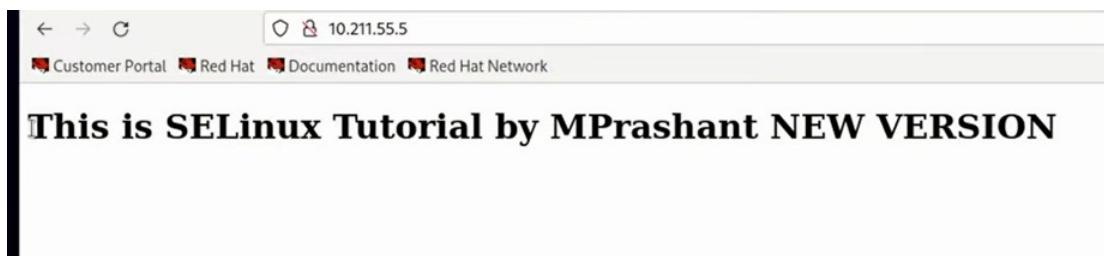
If you want to fix the label.
/var/www/html/index.html default label should be httpd_sys_content_
Then you can run restorecon. The access attempt may have been stopp
Do
# /sbin/restorecon -v /var/www/html/index.html

***** Plugin catchall (1.49 confidence) suggests *****

If you believe that httpd should be allowed setattr acce
Then you should report this as a bug.
You can generate a local policy module to allow this acc
Do
allow this access for now by executing:

[root@redhat01 ~]#
[root@redhat01 html]# ls -lZ
total 4
-rwxrwxrwx. 1 root root unconfined_u:object_r:admin_home_t:s0 322 Jul  8 04:50
index.html
[root@redhat01 html]#
[root@redhat01 html]# /sbin/restorecon -v /var/www/html/index.html
Relabeled /var/www/html/index.html from unconfined_u:object_r:admin_home_t:s0
to unconfined_u:object_r:httpd_sys_content_t:s0
[root@redhat01 html]#
[root@redhat01 html]# ls -lZ
total 4
-rwxrwxrwx. 1 root root unconfined_u:object_r:httpd_sys_content_t:s0 322 Jul
3 04:50 index.html
[root@redhat01 html]# ■

```



Change type in a label

#chcon -t <type> FILENAME



Where the context stored?

etc/selinux/targeted-contexts/files/file_contexts

```
root@redhat01 ~]# less /etc/selinux/targeted-contexts/files/  
root@redhat01 ~]# less /etc/selinux/targeted-contexts/files/file_contexts  
  
/var/www(.*)? system_u:object_r:httpd_sys_content_t:s0  
/etc/ppp(.*)? -- system_u:object_r:pppd_etc_rw_t:s0  
/dev/clp[0-9]* -c system_u:object_r:vfio_device_t:s0  
/dev/mei[0-9]* -c system_u:object_r:mei_device_t:s0  
/dev/tpm[0-9]* -c system_u:object_r:tpm_device_t:s0  
/dev/uio[0-9]*+ -c system_u:object_r:userio_device_t:s0  
/dev/xvc[0-9]* -c system_u:object_r:tty_device_t:s0  
/dev/dm-[0-9]*+ -b system_u:object_r:fixed_disk_device_t:s0  
/dev/mpt[0-9]*ctl -c system_u:object_r:mptctl_device_t:s0  
/etc/gdm(3)?/Xsession -- system_u:object_r:xsession_exec_t:s0  
/usr/lib(.*)?bin(.*)? system_u:object_r:bin_t:s0  
/usr/doc(.*)?/lib(.*)? system_u:object_r:usr_t:s0  
/usr/lib(.*)?sbin(.*)? system_u:object_r:bin_t:s0  
/etc/kde[34]?/kdm/Xreset -- system_u:object_r:xsession_exec_t:s0  
/var/www(.*)?/logs(.*)? system_u:object_r:httpd_log_t:s0  
/lib/ld-[^/]*\.so(\.[^]*)* -- system_u:object_r:ld_so_t  
/etc/gdm(3)?/PreSession/* -- system_u:object_r:xsessio  
/etc/kde[34]?/kdm/Xsession -- system_u:object_r:xsessio  
/etc/kde[34]?/kdm/Xstartup -- system_u:object_r:xsessio  
  
'var/www/html(.*)?/uploads(.*)? t:s0 system_u:object_r:httpd_sys_rw_content  
'etc/selinux/([^\/*)?)users(.*)? g_t:s0 -- system_u:object_r:selinux_conf  
'etc/selinux/([^\/*)?)logins(.*)? t:s0 system_u:object_r:selinux_login_config  
'etc/selinux/([^\/*)?)policy(.*)? system_u:object_r:semanage_store_t:s0  
'etc/selinux/([^\/*)?)setrans\.conf g_t:s0 -- system_u:object_r:selinux_conf  
'opt/ibm/java.*/jre/.+\.\so(\.[^/]*)* t:s0 -- system_u:object_r:textrel_shli  
'etc/selinux/([^\/*)?)contexts(.*)? system_u:object_r:default_context_t:s0  
'usr/Brother/(.*)?inf/brprintconf.* system_u:object_r:bin_t:s0  
'var/www/html(.*)?/wp-content(.*)? t:s0 system_u:object_r:httpd_sys_rw_content
```

Boolean

Just by setting some pre-defined properties to either ON or OFF

Ex: Ftp server to access home dir

To check Boolean

```
#getsebool -a
```

```
#semanage boolean -l
```

RHEL-10 - VMware Workstation

File Edit View VM Tabs Help || Library < Type here ... > My Computer RHEL-10

RHEL-10 Mar 8 4:38 PM siddhartha@RHEL-10: ~ bash

```
root@RHEL-10: ~# getsebool -a
abrt_anon_write --> off
abrt_handle_event --> on
abrt_upload_watch_anon_write --> on
antivirus_can_scan_system --> off
antivirus_use_jit --> off
auditadm_exec_content --> on
authlogin_nsswitch_use_ldap --> off
authlogin_radius --> off
authlogin_yubikey --> off
awstats_purge_apache_log_files --> off
boinc_execmem --> on
cdrecord_read_content --> off
cluster_can_network_connect --> off
cluster_manage_all_files --> off
cluster_use_execmem --> off
cobbler_anon_write --> off
cobbler_can_network_connect --> off
cobbler_use_cifs --> off
cobbler_use_nfs --> off
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

To set Boolean

```
#setsebool -P bool_name on/off
```

```
httpd_anon_write --> off
httpd_builtin_scripting --> on
httpd_can_check_spam --> off
httpd_can_connect_ftp --> off
httpd_can_connect_ldap --> off
httpd_can_connect_mythtv --> off
httpd_can_connect_zabbix --> off
httpd_can_manage_courier_spool --> off
httpd_can_network_connect --> off
httpd_can_network_connect_cobbler --> off
httpd_can_network_connect_db --> off
httpd_can_network_memcache --> off
httpd_can_network_relay --> off
httpd_can_sendmail --> off
httpd_dbus_avahi --> off
httpd_dbus_sssd --> off
httpd_dontaudit_search_dirs --> off
```

```
[root@redhat01 ~]#
[root@redhat01 ~]# setsebool httpd_can_connect_ftp 1
[root@redhat01 ~]# getsebool -a | grep httpd | more
```

```
httpd_builtin_scripting --> on
httpd_can_check_spam --> off
httpd_can_connect_ftp --> on
httpd_can_connect_ldap --> off
httpd_can_connect_mythtv --> off
httpd_can_connect_zabbix --> off
httpd_can_manage_courier_spool --> off
httpd_can_network_connect --> off
```

Linux FIREWALL Management - firewalld service, rules

we're going to show you how to lock down your Linux system with firewall rules. You'll be able to restrict access to specific ports and services, keeping your computer safe from unauthorized users.

Firewall-cmd is a powerful tool you can use to protect your Linux system. In this tutorial, we're going to show you how to add firewall rules using this tool. By the end of this video, you'll be able to lock down your Linux system securely!

you'll be able to add firewall rules that will allow you to do things like access your computer from outside world, enable SSH access, and more. This is a powerful tool that you need to know how to use, so be sure to watch this video and learn how to unlock powerful Linux firewall rules!

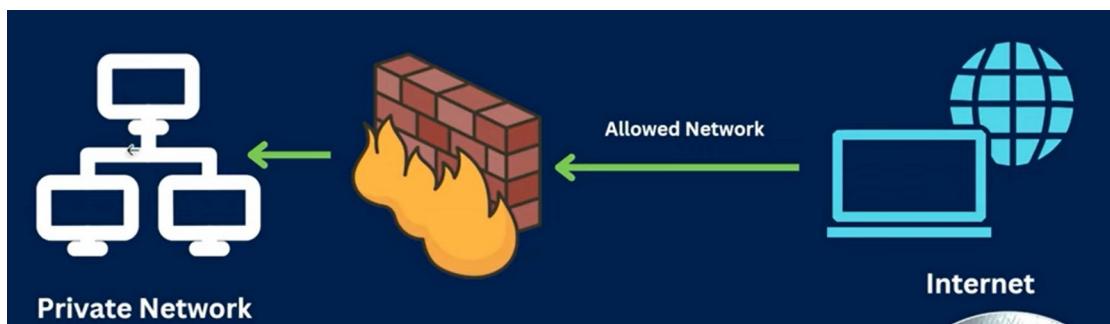
Topics

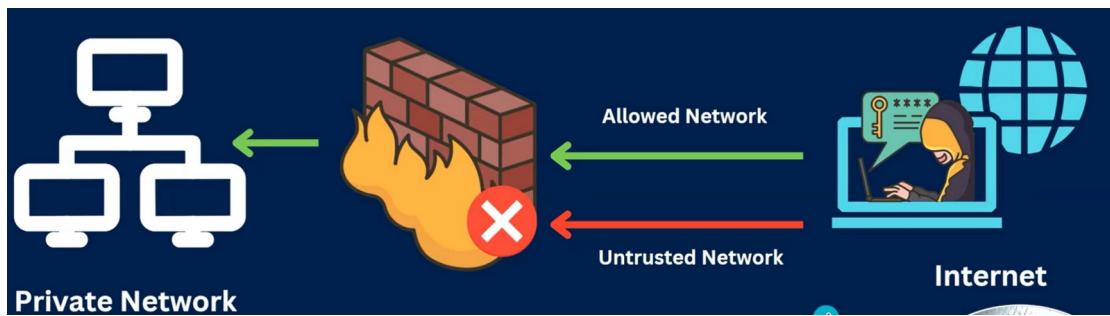
- What is a Firewall?
- firewalld service in Linux
- Enable/disable firewall
- How to see the existing firewall rules?
- Adding & Deleting Firewall Rules
- Adding/removing ports
- Block incoming/outgoing traffic
- Block ICMP

What is a Firewall?

A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on the rules defined.

Basically used to determine and block untrusted network to access out system.





Types of Firewall?

1. Software Based

Running on Operating System

2. Hardware Based

A dedicated appliance with Firewall software between two different networks (mostly used by network team)



Tools on Linux For Managing Firewall?

1. **iptables**

2. **firewalld** - newer version of Centos, Redhat, Fedora etc

Listing, Adding, Deleting firewalld rules!

Check if firewalld service is installed?

```
#rpm -qa | grep firewalld
```

```
[root@cs8 ~]# rpm -qa | grep firewall
firewalld-filesystem-0.9.3-13.el8.noarch
firewalld-0.9.3-13.el8.noarch
python3-firewall-0.9.3-13.el8.noarch
[root@cs8 ~]# █
```

Stop/Start firewalld service?

1. `systemctl start/enable firewalld`
2. `systemctl stop/disable firewalld`
3. `systemctl status firewalld`
4. `systemctl restart firewalld`

```
[root@cs8 ~]# systemctl status firewalld.service
● firewalld.service - firewalld - dynamic firewall daemon
  Loaded: loaded (/usr/lib/systemd/system/firewalld.service;>
  Active: active (running) since Tue 2023-03-14 00:42:28 IST
    Docs: man:firewalld(1)
 Main PID: 75472 (firewalld)
   Tasks: 3 (limit: 4595)
  Memory: 28.5M
    CGroup: /system.slice/firewalld.service
           └─75472 /usr/libexec/platform-python -s /usr/sbin/>

Mar 14 00:42:27 cs8 systemd[1]: Starting firewalld - dynamic >
Mar 14 00:42:28 cs8 systemd[1]: Started firewall
Mar 14 00:42:28 cs8 firewalld[75472]: WARNING: /
Mar 14 00:44:49 cs8 firewalld[75472]: WARNING: /
Mar 15 11:36:12 cs8 firewalld[75472]: WARNING: /
Lines 1-15/15 (END)
```

#Systemctl stop firewalld

```
[root@cs8 ~]# systemctl status firewalld.service
● firewalld.service - firewalld - dynamic firewall daemon
  Loaded: loaded (/usr/lib/systemd/system/firewalld.service;>
  Active: inactive (dead) since Wed 2023-03-15 13:31:36 IST
    Docs: man:firewalld(1)
 Process: 75472 ExecStart=/usr/sbin/firewalld --nofork --nop>
 Main PID: 75472 (code=exited, status=0/SUCCESS)

Mar 14 00:42:27 cs8 systemd[1]: Starting firewalld - dynamic >
Mar 14 00:42:28 cs8 systemd[1]: Started firewalld - dynamic f>
Mar 14 00:42:28 cs8 firewalld[75472]: WARNING: AllowZoneDrift>
Mar 14 00:44:49 cs8 firewalld[75472]: WARNING: All<-->
Mar 15 11:36:12 cs8 firewalld[75472]: WARNING: All<-->
Mar 15 13:31:35 cs8 systemd[1]: Stopping firewalld
Mar 15 13:31:36 cs8 systemd[1]: firewalld.service
Mar 15 13:31:36 cs8 systemd[1]: Stopped firewalld
```

```
[root@cs8 ~]#  
[root@cs8 ~]# systemctl start firewalld.service  
[root@cs8 ~]# systemctl status firewalld.service  
● firewalld.service - firewalld - dynamic firewall daemon  
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled)  
   Active: active (running) since Wed 2023-03-15 13:31:45 IST  
     Docs: man:firewalld(1)  
 Main PID: 95669 (firewalld)  
    Tasks: 2 (limit: 4595)  
   Memory: 25.6M  
  CGroup: /system.slice/firewalld.service  
          └─95669 /usr/libexec/platform-python -s /usr/sbin/fw  
Mar 15 13:31:45 cs8 systemd[1]: Starting firewa  
Mar 15 13:31:45 cs8 systemd[1]: Started firewa  
Mar 15 13:31:45 cs8 firewalld[95669]: WARNING:
```

```
Check the rules of firewalld  
#firewall-cmd --list-all  
  
Listing of all the services firewalld is aware of:  
#firewall-cmd --get-services  
  
To reload the config of firewalld  
#firewall-cmd --reload
```

Public Zone

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)
```

```
target: default  
icmp-block-inversion: no  
interfaces: ens160  
sources:  
services: cockpit dhcpcv6-client ssh  
ports:  
protocols:  
forward: no  
masquerade: no  
forward-ports:  
source-ports:  
icmp-blocks:  
rich rules:
```

```
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --get-services
```

```
client amqp amqps apcupsd audit bacula bacula-client bb bgp bt  
tcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorre  
nt-lsd ceph ceph-mon cfengine cockpit collectd condor-collecto  
r ctdb dhcp dhcpcv6 dhcpcv6-client distcc dns dns-over-tls docke  
r-registry docker-swarm dropbox-lansync elasticsearch etcd-clie  
nt etcd-server finger foreman foreman-proxy freeipa-4 freeipa-  
ldap freeipa-ldaps freeipa-replication freeipa-trust ftp gale  
ra ganglia-client ganglia-master git grafana gre high-availabi  
lity http https imap imaps ipp ipp-client ipsec irc ircs iscsi  
-target isns jenkins kadmin kdeconnect kerberos kibana klogin  
kpasswd kprop kshell kube-apiserver ldap ldaps libvirt libvirt  
-tls lightning-network llmnr managesieve matrix md  
minidlna mongodb mosh mountd mqtt mqtt-tls ms-wbt  
mysql nbd nfs nfs3 nmea-0183 nrpe ntp nut openvpn  
io ovirt-storageconsole ovirt-vmconsole plex pmcd  
bapi pmwebapis pop3 pop3s postgresql privoxy prome
```

```
[root@cs8 ~]# firewall-cmd --reload  
success  
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpcv6-client ssh
  ports:
  protocols:
  forward: no
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
[root@cs8 ~]#
```

```
Firewall has multiple zones, to get list
#firewall-cmd --get-zones
```

```
To see the list of active zones
```

```
#firewall-cmd --get-active-zones
```

```
To get firewall rules for a specific zone
```

```
#firewall-cmd --zone=public --list-all
```

```
[root@cs8 ~]# firewall-cmd --get-zones
block dmz drop external home internal libvirt nm-shared public
trusted work
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
  target: default  
  icmp-block-inversion: no  
  interfaces: ens160  
  sources:
```

```
[root@cs8 ~]# firewall-cmd --get-active-zones  
public  
  interfaces: ens160  
[root@cs8 ~]# █
```

To add or remove a service

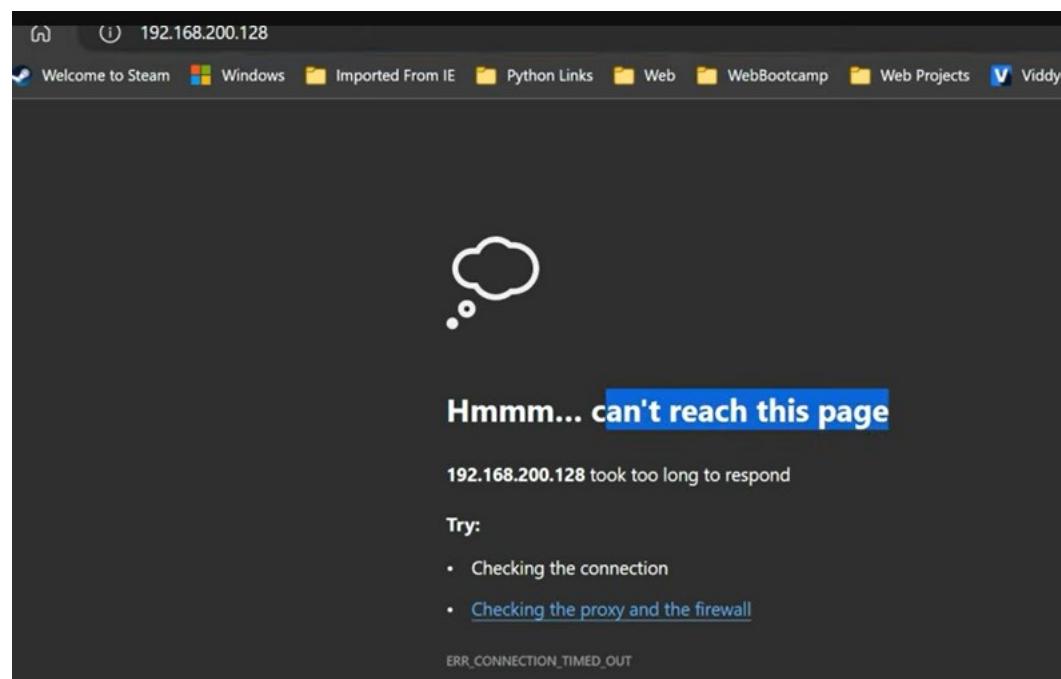
```
#firewall-cmd --add-service=<name_of_service>  
#firewall-cmd --remove-service=<name_of_service>
```

To reload the config

```
#firewall-cmd --reload
```

```
[root@cs8 ~]# systemctl status h  
halt-local.service      httpd.socket  
halt.target              hybrid-sleep.target  
hibernate.target         hypervfcopyd.service  
htcachelclean.service   hypervkvpd.service  
httpd-init.service       hypervvssd.service  
httpd.service  
[root@cs8 ~]# systemctl status httpd █
```

```
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled)
   Active: active (running) since Tue 2023-03-14 00:38:27 IST
     Docs: man:httpd.service(8)
 Main PID: 75148 (httpd)
    Status: "Total requests: 4; Idle/Busy workers 100/0; Requests/s: 0.00"
      Tasks: 278 (limit: 4595)
     Memory: 14.2M
    CGroup: /system.slice/httpd.service
            ├─75148 /usr/sbin/httpd -DFOREGROUND
            ├─75157 /usr/sbin/httpd -DFOREGROUND
            ├─75158 /usr/sbin/httpd -DFOREGROUND
            ├─75159 /usr/sbin/httpd -DFOREGROUND
            ├─75160 /usr/sbin/httpd -DFOREGROUND
            └─75526 /usr/sbin/httpd -DFOREGROUND
```



```
[root@cs8 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpcv6-client ssh
  ports:
  protocols:
  forward: no
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --get-services
```

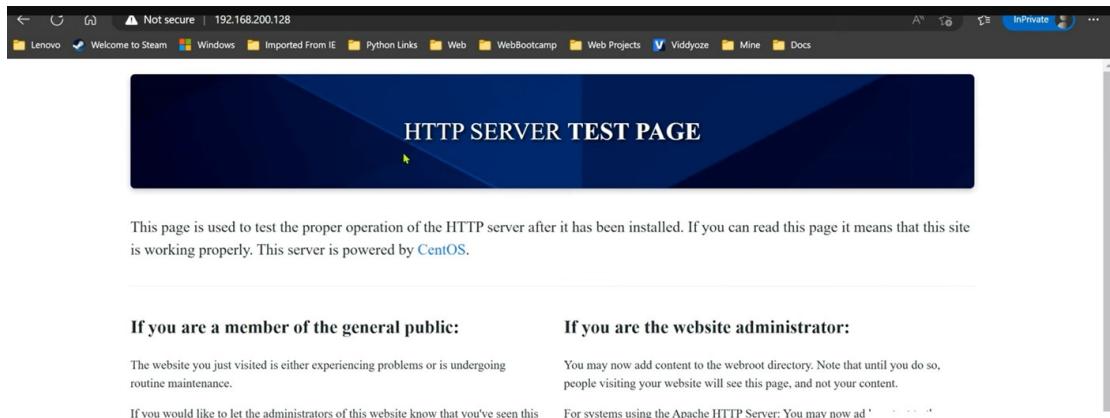
```
-target isns jenkins kadmin kdeconnect kerberos kibana klogin
kpasswd kprop kshell kube-apiserver ldap ldaps libvirt libvirt
-tls lightning-network llmnr managesieve matrix mdns memcache
minidlna mongodb mosh mountd mqtt mqtt-tls ms-wbt mssql murmur
mysql nbd nfs nfs3 nmea-0183 nrpe ntp nut openvpn ovirt-image
io ovirt-storageconsole ovirt-vmconsole plex pmcd pmproxy pmwe
bapi pmwebapis pop3 pop3s postgresql privoxy prometheus proxy-
dhcp ptp pulseaudio puppetmaster quassel radius rdp redis redi
s-sentinel rpc-bind rquotad rsh rsyncd rtsp salt-master samba
samba-client samba-dc sane sip sips slp smtp smtp-submission s
mtps snmp snmptrap spideroak-lansync spotify-sync squid ssdp s
sh steam-streaming svdrp svn syncthing syncthing-gui synergy s
```

```
[root@cs8 ~]#
[root@cs8 ~]# firewall-cmd --get-services | grep http
```

```
RH-Satellite-6 RH-Satellite-6-capsule amanda-client amanda-k5-client amqp amqps apcupsd audit bacula bacula-client bb bgp btcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorrent-lsd ceph ceph-mon cfengine cockpit collectd condor-collector ctdb dhcp dhcipv6 dhcipv6-client distcc dns dns-over-tls docker-registry docker-swarm dropbox-lansync elasticsearch etcd-client etcd-server finger foreman foreman-proxy freeipa-4 freeipa-ldap freeipa-ldaps freeipa-replication freeipa-trust ftp galera ganglia-client ganglia-master git grafana gre high-availability http https imap imaps ipp ipp-client ipsec irc ircs iscs-target isns jenkins kadmin kdeconnect kerberos kibana klogin kpasswd kprop kshell kube-apiserver ldap ldaps -tls lightning-network llmnr managesieve matri
```

```
[root@cs8 ~]#  
[root@cs8 ~]# firewall-cmd --add-service=http  
success  
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
  target: default  
  icmp-block-inversion: no  
  interfaces: ens160  
  sources:  
    services: cockpit dhcipv6-client http ssh  
    ports:  
    protocols:  
    forward: no  
    masquerade: no  
    forward-ports:  
    source-ports:  
    icmp-blocks:  
    rich rules:  
[root@cs8 ~]# █
```



To add or remove a service

```
#firewall-cmd --add-service=<name_of_service>
#firewall-cmd --remove-service=<name_of_service>
```

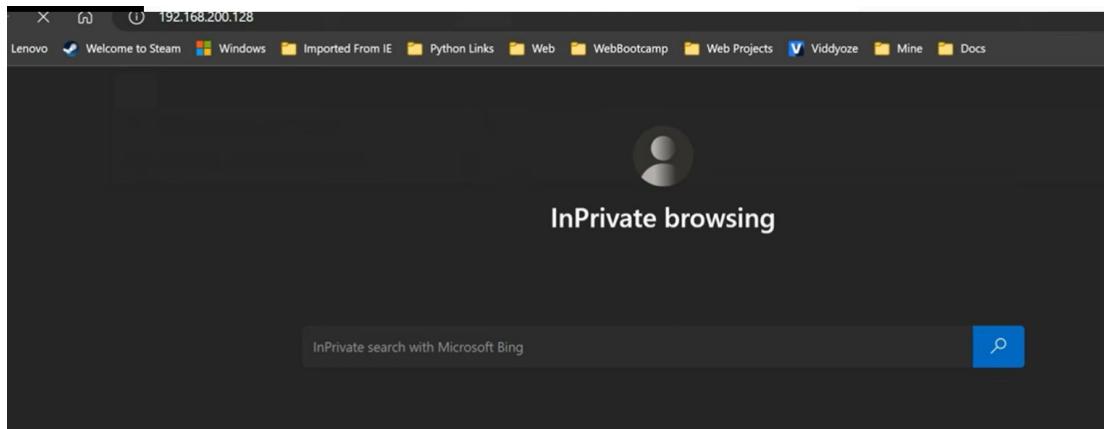
To reload the config

```
#firewall-cmd --reload
```

```
[root@cs8 ~]# firewall-cmd --reload
success
[root@cs8 ~]#
```

Http No more

```
[root@cs8 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
    services: cockpit dhcpcv6-client ssh
  ports:
  protocols:
  forward: no
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
[root@cs8 ~]#
```



To add or remove a service permanently

```
#firewall-cmd --add-service=<name_of_service> --permanent
#firewall-cmd --remove-service=<name_of_service> --permanent
```

```
[root@cs8 ~]# firewall-cmd --add-service=http --permanent
success
[root@cs8 ~]#
```

```
[root@cs8 ~]# systemctl restart firewalld.service
[root@cs8 ~]#
```

permanently added

```
[root@cs8 ~]#
[root@cs8 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpcv6-client http ssh
  ports:
  protocols:
  forward: no
  masquerade: no
  forward-ports:
  source-ports: □
  icmp-blocks:
  rich rules:
```

```
[root@cs8 ~]# firewall-cmd --reload
```

```
success
```

```
[root@cs8 ~]# firewall-cmd --list-all
```

http Still exsisted

SUCCESS

```
[root@cs8 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpcv6-client http ssh
  ports:
  protocols:
  forward: no
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
[root@cs8 ~]# █
```

To add or remove a port

```
#firewall-cmd --add-port=20201/tcp
#firewall-cmd --remove-port=20201/tcp
```

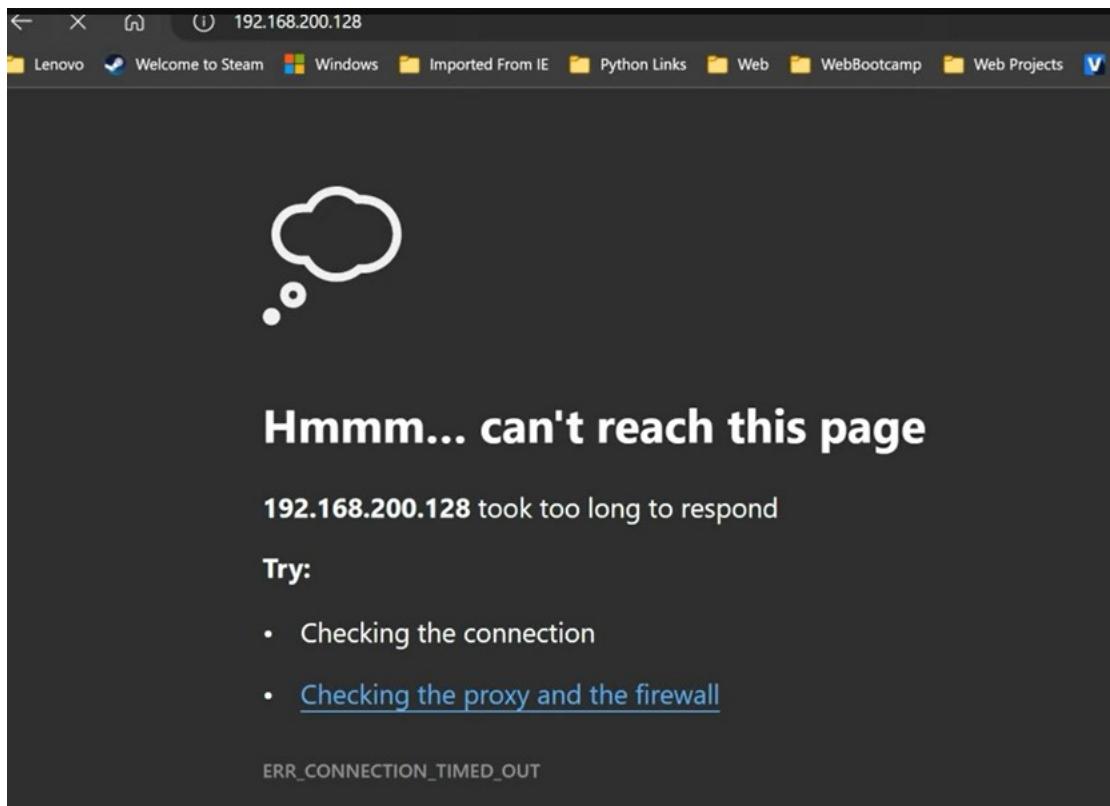
now remove

```
[root@cs8 ~]#
[root@cs8 ~]# firewall-cmd --remove-service=http --permanent
success
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --reload  
success  
[root@cs8 ~]# █
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
target: default  
icmp-block-inversion: no  
interfaces: ens160  
sources:  
services: cockpit dhcpcv6-client ssh  
ports:  
protocols:  
forward: no  
masquerade: no  
forward-ports:  
source-ports:  
icmp-blocks:  
rich rules:  
[root@cs8 ~]#
```

Add New Port



```
[root@cs8 ~]#  
[root@cs8 ~]# firewall-cmd --add-port=80/tcp  
success  
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
target: default  
icmp-block-inversion: no  
interfaces: ens160  
sources:  
services: cockpit dhcpcv6-client ssh  
ports: 80/tcp  
protocols:  
forward: no  
masquerade: no  
forward-ports:  
source-ports:  
icmp-blocks:  
rich rules:
```



This page is used to test the proper operation of the HTTP server after it has been installed. If you can read this page it means that this site is working properly. This server is powered by [CentOS](#).

If you are a member of the general public:

The website you just visited is either experiencing problems or is undergoing routine maintenance.

If you are the website administrator:

You may now add content to the webroot directory. Note that until you do so, people visiting your website will see this page, and not your content.

To block incoming traffic from an IP

```
#firewall-cmd --add-rich-rule='rule  
family="ipv4"  
source address="192.168.0.0"  
reject'
```

```
[root@cs8 ~]# firewall-cmd --add-rich-rule='rule family="ipv4"  
source address="192.168.0.0" reject'  
success
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
  target: default  
  icmp-block-inversion: no  
  interfaces: ens160  
  sources:  
    services: cockpit dhcpcv6-client ssh  
    ports: 80/tcp  
    protocols:  
    forward: no  
    masquerade: no  
  forward-ports:  
  source-ports:  
  icmp-blocks:  
  rich rules:  
    rule family="ipv4" source address="192.168.0.0" reject
```

To block outgoing traffic to a IP or URL

```
#firewall-cmd --direct --add-rule  
          ipv4 filter OUTPUT 0  
          -d <IP> -j DROP
```

Block this Address

```
[root@cs8 ~]#  
[root@cs8 ~]# host -t a www.facebook.com  
www.facebook.com is an alias for star-mini.c10r.facebook.com.  
star-mini.c10r.facebook.com has address 157.240.242.35  
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --direct --add-rule ipv4 filter OUT  
PUT 0 -d 157.240.242.35 -j DROP  
success  
[root@cs8 ~]#  
  
[root@cs8 ~]# ping www.facebook.com  
PING star-mini.c10r.facebook.com (157.240.242.35) 56(84) bytes  
of data.  
ping: sendmsg: Operation not permitted  
ping: sendmsg: Operation not permitted  
ping: sendmsg: Operation not permitted  
ping: sendmsg: Operation not permitted
```

To block ICMP incoming traffic

```
#firewall-cmd --add-icmp-block-inversion
```

```
C:\Users\ppara>ping 192.168.200.128
```

```
Pinging 192.168.200.128 with 32 bytes of data:  
Reply from 192.168.200.128: bytes=32 time<1ms TTL=64  
  
Ping statistics for 192.168.200.128:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\Users\ppara>
```

```
C:\Users\ppara>■
```

```
[root@cs8 ~]# firewall-cmd --add-icmp-block-inversion  
success  
[root@cs8 ~]#
```

```
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
  target: default  
  icmp-block-inversion: yes  
  interfaces: ens160  
  sources:  
  services: cockpit dhcpcv6-client ssh  
  ports: 80/tcp  
  protocols:  
  forward: no  
  masquerade: no  
  forward-ports:  
  source-ports:  
  icmp-blocks:  
  rich rules:
```

```
C:\Users\ppara>ping 192.168.200.128

Pinging 192.168.200.128 with 32 bytes of data:
Reply from 192.168.200.128: Destination net unreachable.

Ping statistics for 192.168.200.128:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

C:\Users\ppara>

Discover How to Access Your Linux Server with Ease - Linux Cockpit! A Web Interface for Linux Server

Admin Works

- Network settings
- Configure firewall
- Manage Storage
- Create VMs
- Manage User Accounts
- Monitor Logs

Linux cockpit!

The Linux cockpit is a web interface that makes it easy to manage your Linux server from anywhere in the world. Whether you're a system administrator or just a user, this tool is a great way to get access to your server and navigate through its system settings. In this video, we'll show you how to access the Linux cockpit and use it to manage your server!

Cockpit Installation

- To install in Fedora/CentOS 8/RHEL 8, execute:

```
sudo dnf install cockpit
```

- To install in Ubuntu/Debian 10,

```
sudo apt install cockpit
```

```
[root@cs8 ~]# rpm -qa | grep cockpit
cockpit-system-276.1-1.el8.noarch
cockpit-podman-53-1.module_el8.7.0+1216+b022c01d.noarch
cockpit-bridge-276.1-1.el8.x86_64
cockpit-storaged-276-1.el8.noarch
cockpit-packagekit-276-1.el8.noarch
cockpit-ws-276.1-1.el8.x86_64
cockpit-276.1-1.el8.x86_64
[root@cs8 ~]#
```

Start Cockpit Service

- sudo systemctl start cockpit.socket
- sudo systemctl enable --now cockpit.socket

```
[root@cs8 ~]# systemctl status cockpit.socket
● cockpit.socket - Cockpit Web Service Socket
  Loaded: loaded (/usr/lib/systemd/system/cockpit.socket; disabled; )
  Active: active (running) since Thu 2023-03-23 13:15:14 IST; 1h 1mi
    Docs: man:cockpit-ws(8)
   Listen: [::]:9090 (Stream)
    Tasks: 0 (limit: 4595)
   Memory: 8.0K
  CGroup: /system.slice/cockpit.socket

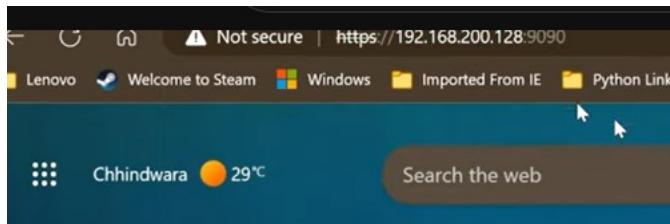
Mar 23 13:15:14 cs8 systemd[1]: Starting Cockpit Web Service Socket.
Mar 23 13:15:14 cs8 systemd[1]: Listening on Cockpit Web Service Socket
lines 1-11/11 (END)
```

Navigating Cockpit

- To access Cockpit, point the web browser to your computer or server IP on the port 9090

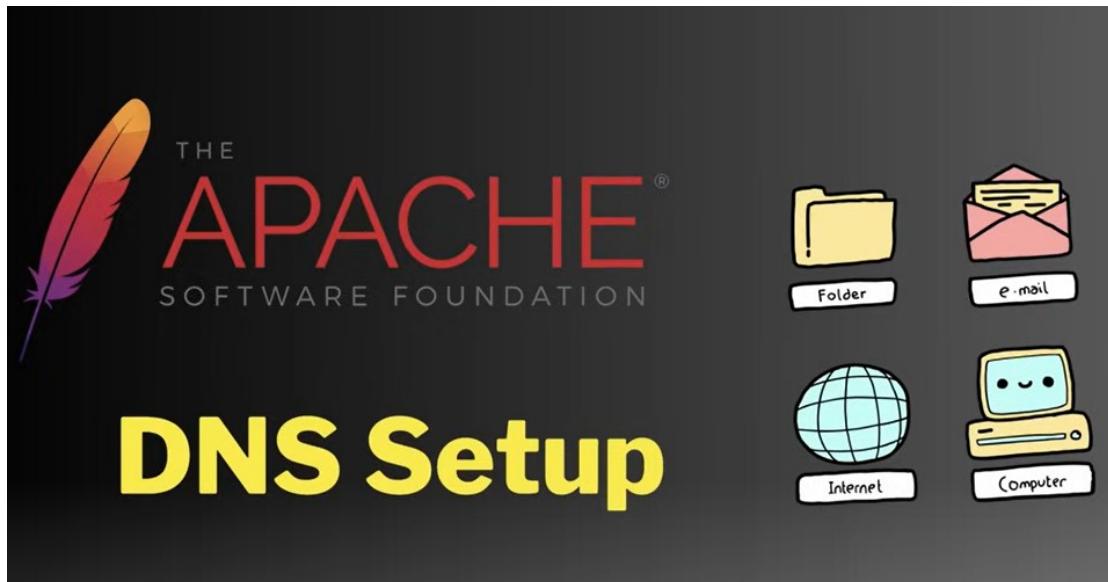
https://<server_IP>:9090

```
[root@cs8 ~]# ifconfig
ens160: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.200.128 brd 192.168.200.255 netmask 255.255.255.0 broadcast 192.168.200.255
              inet6 fe80::20c:29ff:fe8e:3b32 prefixlen 64 scopeid 0x20<link>
                      ether 00:0c:29:8e:3b:32 txqueuelen 1000 (Ethernet)
                      RX packets 36837 bytes 5062381 (4.8 MiB)
                      RX errors 0 dropped 0 overruns 0 frame 0
                      TX packets 43273 bytes 45282688 (43.1 MiB)
                      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



```
[root@cs8 ~]#  
[root@cs8 ~]# firewall-cmd --list-all  
public (active)  
  target: default  
  icmp-block-inversion: no  
  interfaces: ens160  
  sources:  
  services: cockpit dhcpcv6-client ssh  
  ports:
```

Ultimate DNS Server & Apache Setup Guide with Custom Domain | DNS Config with Example



Dive into the essentials of setting up an Apache HTTPD web server and configuring a DNS server for your custom domain in this complete tutorial. I'll guide you through the process of installing and configuring Apache HTTPD, crafting a simple example webpage, and then setting up a BIND DNS server to manage www.mywebapp.com. Perfect for beginners and intermediate users looking to gain practical experience in web and DNS server management.

Link for slides: <https://www.canva.com/design/DAGDzGS2...>

Topics Covered

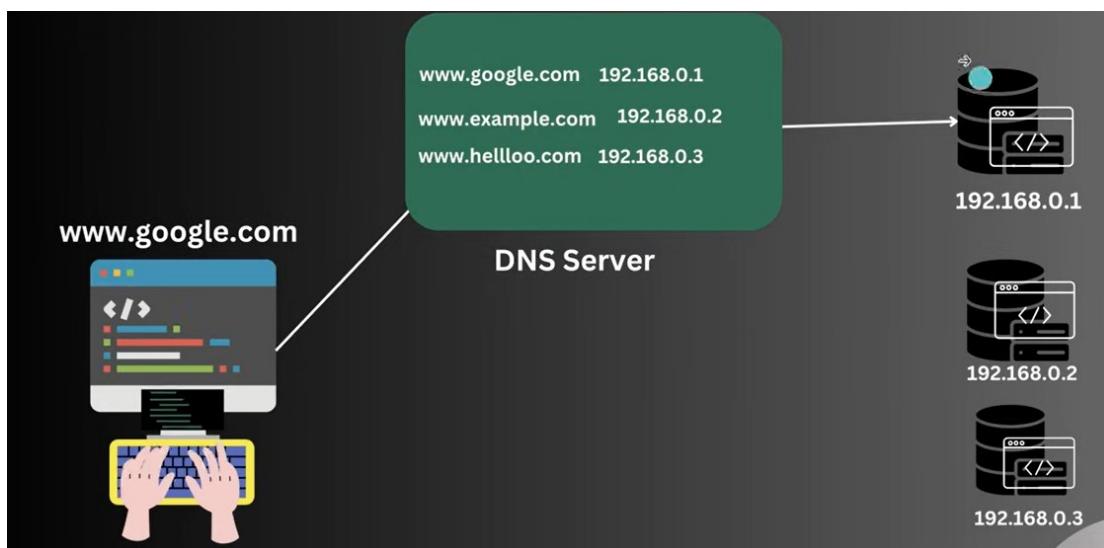
- Lap setup: Virtual Machine with Centos OS
- Setup Apache webserver (HTTPD) with our custom webpage
- Setup DNS Server on our machine
- Bind Package, Named Service
- Firewall Enable
- DNS config changes
named.conf and zone files
- Access our website with our own custom domain name i.e. www.mywebpage.com

HTTP Daemon is a software program that runs in the background of a web server and waits for the incoming server requests.

The daemon answers the request automatically and serves the hypertext and multimedia documents over the Internet using HTTP.

DNS, or Domain Name System, is the internet service that translates human-friendly domain names like www.example.com into machine-readable IP addresses.

DNS, or Domain Name System, is the internet service that translates human-friendly domain names like **www.example.com into machine-readable IP addresses.**



Setting Up Apache WebServer

Installation (CentOS or RedHAT)

Package we need to install

- `sudo yum install httpd`
- `systemctl start/stop/status httpd` (`httpd` is the process or service name)

Enable the Service in Firewall

```
firewall-cmd --add-service=http --permanent  
firewall-cmd --reload
```

Webserver config file under

- `/var/www/html/index.html`
- `/etc/httpd/conf/httpd.conf`

```
[root@centos02 ~]#  
[root@centos02 ~]# yum install httpd
```

```
root@centos02:~# httpd
Installing dependencies:
apr           aarch64    1.7.0-12.el9      appstream   119 k
apr-util      aarch64    1.6.1-23.el9      appstream   96 k
apr-util-bdb  aarch64    1.6.1-23.el9      appstream   13 k
centos-logos-httdp noarch    90.4-1.el9       appstream  252 k
httpd-core    aarch64    2.4.57-8.el9      appstream   1.5 M
httpd-filesystem noarch    2.4.57-8.el9      appstream   13 k
httpd-tools   aarch64    2.4.57-8.el9      appstream   82 k
Installing weak dependencies:
apr-util-openssl aarch64    1.6.1-23.el9      appstream   15 k
mod_http2     aarch64    2.0.26-1.el9      appstream  158 k
mod_lua       aarch64    2.4.57-8.el9      appstream   58 k
Transaction Summary
=====
Install 11 Packages

Total download size: 2.3 M
Installed size: 11 M
Is this ok [y/N] ?
```

```
root@centos02:~# 
Verifying : httpd-core-2.4.57-8.el9.aarch64          7/11
Verifying : httpd-filesystem-2.4.57-8.el9.noarch      8/11
Verifying : httpd-tools-2.4.57-8.el9.aarch64          9/11
Verifying : mod_http2-2.0.26-1.el9.aarch64          10/11
Verifying : mod_lua-2.4.57-8.el9.aarch64            11/11

Installed:
apr-1.7.0-12.el9.aarch64
apr-util-1.6.1-23.el9.aarch64
apr-util-bdb-1.6.1-23.el9.aarch64
apr-util-openssl-1.6.1-23.el9.aarch64
centos-logos-httdp-90.4-1.el9.noarch
httpd-2.4.57-8.el9.aarch64
httpd-core-2.4.57-8.el9.aarch64
httpd-filesystem-2.4.57-8.el9.noarch
httpd-tools-2.4.57-8.el9.aarch64
mod_http2-2.0.26-1.el9.aarch64
mod_lua-2.4.57-8.el9.aarch64

Complete!
[root@centos02 ~]#
```

```
[root@centos02 ~]#
[root@centos02 ~]# systemctl start httpd.service
[root@centos02 ~]# systemctl status httpd.service
```

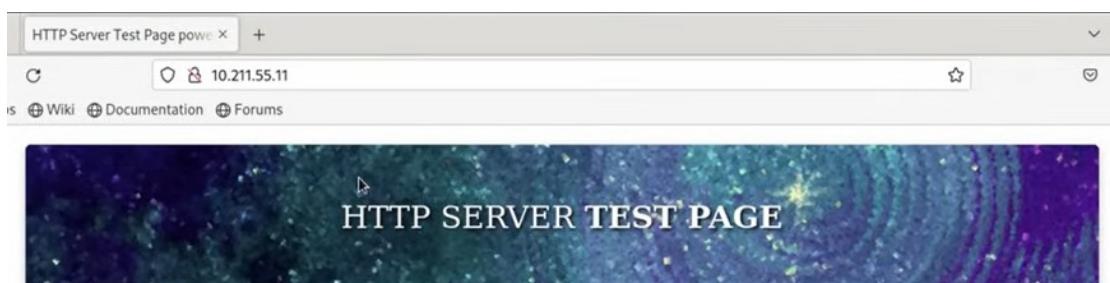
```
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; pre>
   Active: active (running) since Mon 2024-04-29 21:59:05 IST; 8s ago
     Docs: man:httpd.service(8)
   Main PID: 4344 (httpd)
      Status: "Started, listening on: port 80"
        Tasks: 177 (limit: 10121)
       Memory: 15.5M
          CPU: 61ms
        CGroup: /system.slice/httpd.service
                  ├─4344 /usr/sbin/httpd -DFOREGROUND
                  ├─4345 /usr/sbin/httpd -DFOREGROUND
                  ├─4346 /usr/sbin/httpd -DFOREGROUND
                  ├─4347 /usr/sbin/httpd -DFOREGROUND
                  └─4348 /usr/sbin/httpd -DFOREGROUND

Apr 29 21:59:05 centos02 systemd[1]: Starting The Apache HTTP Se
Apr 29 21:59:05 centos02 httpd[4344]: AH00558: httpd: Could not
Apr 29 21:59:05 centos02 systemd[1]: Started The Apache HTTP Se
Apr 29 21:59:05 centos02 httpd[4344]: Server configured, listenin
lines 1-20
```

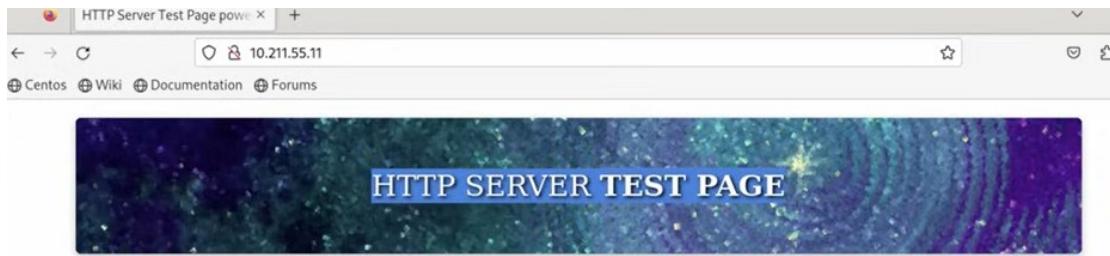
SERVER -IP

```
[root@centos02 ~]# ifconfig
docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
        ether 02:42:9a:ad:53:79 txqueuelen 0  (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 10.211.55.11 netmask 255.255.255.0 broadcast 10.211.55.255
        inet6 fdb2:2c26:f4e4:0:21c:42ff:fecc:bdee prefixlen 64 scopeid 0x0<global>
          inet6 fe80::21c:42ff:fecc:bdee prefixlen 64 scopeid 0x20<link>
            ether 00:1c:42:cc:bd:ee txqueuelen 1000  (Ethernet)
              RX packets 6118 bytes 3136036 (2.9 MiB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 3332 bytes 318158 (310.7 KiB)
              TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



This page is used to test the proper operation of the HTTP server after it has been installed. If you can read this page it means that this site is working properly. This server is powered by CentOS.



This page is used to test the proper operation of the HTTP server after it has been installed. If you can read this page it means that this site is working properly. This server is powered by [CentOS](#).

If you are a member of the general public:

The website you just visited is either experiencing problems or is undergoing routine maintenance.

If you would like to let the administrators of this website know that you've seen this page instead of the page you expected, you should send them e-mail. In general, mail sent to the name "webmaster" and directed to the website's domain should reach the appropriate person.

For example, if you experienced problems while visiting

If you are the website administrator:

You may now add content to the webroot directory. Note that until you do so, people visiting your website will see this page, and not your content.

For systems using the Apache HTTP Server: You may now add content to the directory `/var/www/html/`. Note that until you do so, people visiting your website will see this page, and not your content. To prevent this page from ever being used, follow the instructions in the file `/etc/httpd/conf.d/welcome.conf`.

For systems using NGINX: You should now put your content in a location of your choice and edit the `root` configuration directive in

Setup Our Personal Webpage

Installation (CentOS or RedHAT)

Package we need to install

- `sudo yum install httpd`
- `systemctl start/stop/status httpd` (`httpd` is the process or service name)

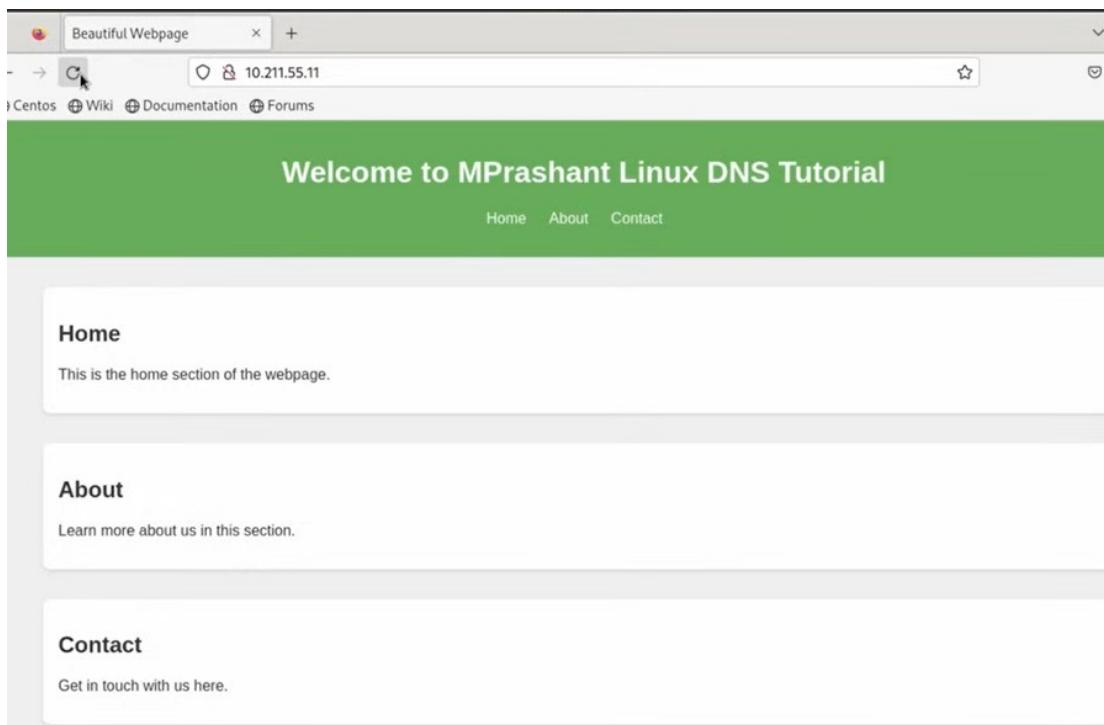
Enable the Service in Firewall

```
firewall-cmd --add-service=http --permanent  
firewall-cmd --reload
```

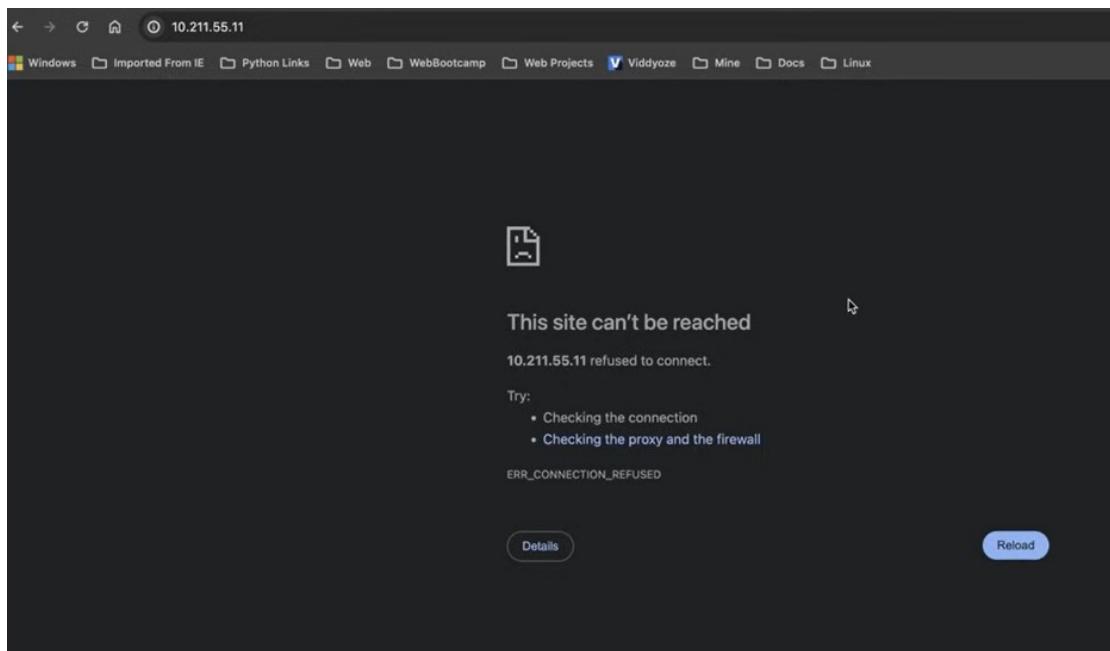
Webserver config file under

- `/var/www/html/index.html`
- `/etc/httpd/conf/httpd.conf`

```
[root@centos02 ~]#  
[root@centos02 ~]# cd /var/www/html/  
[root@centos02 html]# ls  
[root@centos02 html]#  
[root@centos02 html]# cp /root/index.html .  
[root@centos02 html]#  
[root@centos02 html]# ls  
index.html  
[root@centos02 html]# cat  
  
[root@centos02 html]#  
[root@centos02 html]# systemctl restart httpd.service  
[root@centos02 html]#
```

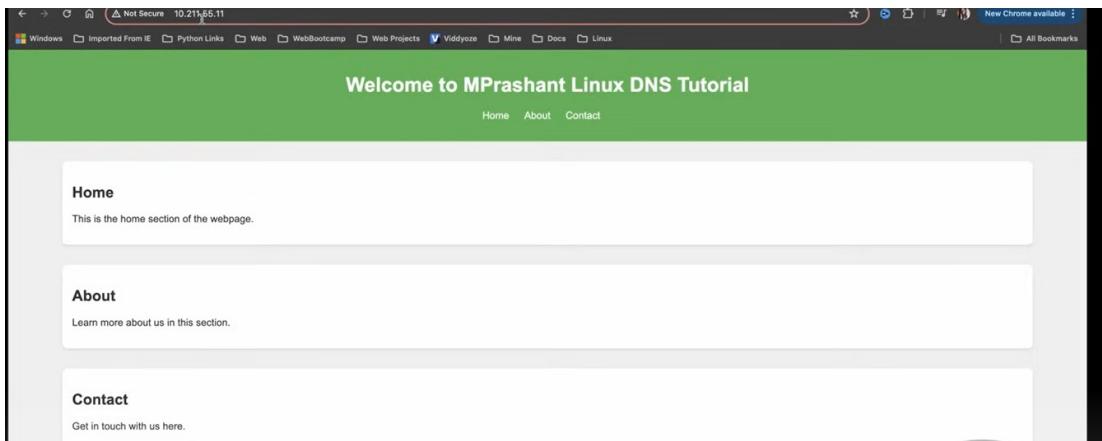


now Locate this address / browse in Chrome / Mozilla

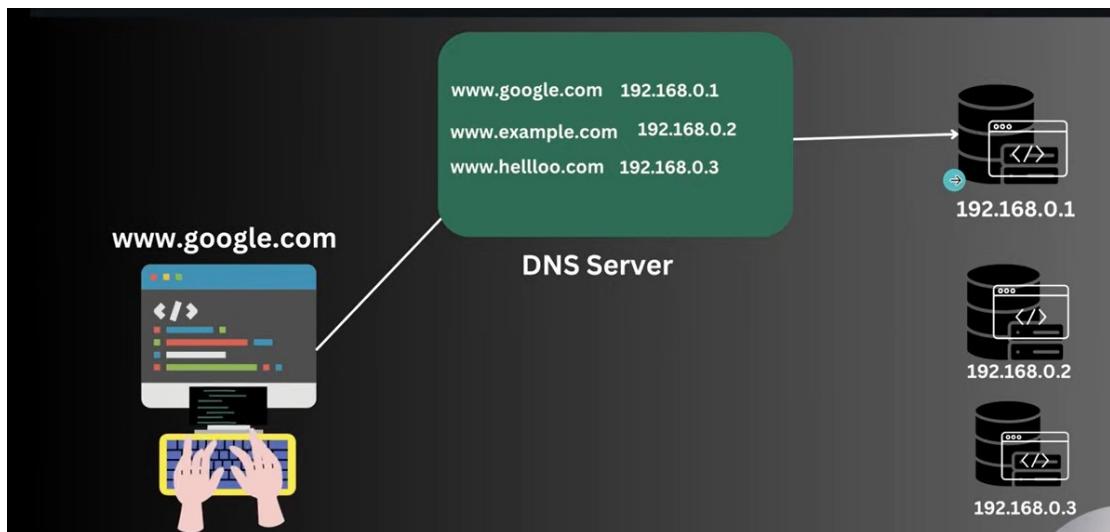


Enable Firewall For HTTP Service

```
[root@centos02 html]# firewall-cmd --add-service=http --permanent
[root@centos02 html]# firewall-cmd --reload
[root@centos02 html]#
```



Setting up DNS SERVER



Installation (CentOS or RedHAT)

Package we need to install for the DNS is BIND (Berkeley Internet Name Domain)

- `sudo yum install bind bind-utils`
- `systemctl start/stop/status named` (`named` is the process or service name)

Enable the Service in Firewall

```
firewall-cmd --add-service=dns --permanent
firewall-cmd --reload
```

DNS config file under

- `/etc/named.conf`

Directory where all the zone files are present where you define hostname to IP

- `/var/named`

```
[root@centos02 ~]#
[root@centos02 ~]# yum install bind bind-utils -y
```

```
Installing      : python3-ply-3.11-14.el9.noarch          2/5
Installing      : python3-bind-32:9.16.23-15.el9.noarch    3/5
Installing      : bind-dnssec-utils-32:9.16.23-15.el9.aarch64 4/5
Running scriptlet: bind-32:9.16.23-15.el9.aarch64        5/5
Installing      : bind-32:9.16.23-15.el9.aarch64          5/5
Running scriptlet: bind-32:9.16.23-15.el9.aarch64        5/5
Verifying       : python3-ply-3.11-14.el9.noarch          1/5
Verifying       : bind-32:9.16.23-15.el9.aarch64          2/5
Verifying       : bind-dnssec-doc-32:9.16.23-15.el9.noarch 3/5
Verifying       : bind-dnssec-utils-32:9.16.23-15.el9.aarch64 4/5
Verifying       : python3-bind-32:9.16.23-15.el9.noarch        5/5

Installed:
  bind-32:9.16.23-15.el9.aarch64
  bind-dnssec-doc-32:9.16.23-15.el9.noarch
  bind-dnssec-utils-32:9.16.23-15.el9.aarch64
  python3-bind-32:9.16.23-15.el9.noarch
  python3-ply-3.11-14.el9.noarch

Complete!
```

Installation (CentOS or RedHAT)

Package we need to install for the DNS is BIND (Berkeley Internet Name Domain)

- **sudo yum install bind bind-utils**
- **systemctl start/stop/status named** (named is the process or service name)

```
[root@centos02 ~]#
[root@centos02 ~]# systemctl start named
[root@centos02 ~]# systemctl status named
```

Enable the Service in Firewall

```
firewall-cmd --add-service=dns --permanent  
firewall-cmd --reload
```

```
[root@centos02 ~]# firewall-cmd --add-service=dns --permanent  
success  
[root@centos02 ~]# firewall-cmd --reload  
success  
[root@centos02 ~]#
```

```
[root@centos02 ~]# less /etc/named.conf
```

```
// Provided by Red Hat bind package to configure the ISC BIND named(8) DNS
// server as a caching only nameserver (as a localhost DNS resolver only)
//
// See /usr/share/doc/bind*/sample/ for example named configuration files
//

options {
    listen-on port 53 { 127.0.0.1; };
    listen-on-v6 port 53 { ::1; };
    directory      "/var/named";
    dump-file      "/var/named/data/cache_dump.db";
    statistics-file "/var/named/data/named_stats.txt";
    memstatistics-file "/var/named/data/named_mem_stats.txt";
    secroots-file   "/var/named/data/named.secroots";
    recursing-file  "/var/named/data/named.reCURsing";
    allow-query     { localhost; };

    /*
     - If you are building an AUTHORITATIVE DNS server, do NOT
     .
```

```
/* https://fedoraproject.org/wiki/Changes/CryptoPolicy */
include "/etc/crypto-policies/back-ends/bind.config";
};

logging {
    channel default_debug {
        file "data/named.run";
        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";
[END]
```

```
[root@centos02 ~]# cd /var/named/
[root@centos02 named]# ls
data      named.ca      named.localhost  slaves
dynamic  named.empty   named.loopback
[root@centos02 named]# █
```

DNS Server Config Changes

```
[root@centos02 ~]# ifconfig
[root@centos02 ~]# ifconfig
docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
        ether 02:42:9a:ad:53:79 txqueuelen 0 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 10.211.55.11 netmask 255.255.255.0 broadcast 10.211.55.255
        ether fdb2:2c26:f4e4:0:21c:42ff:fecc:bdee prefixlen 64 scopeid 0x0<global>
          inet6 fe80::21c:42ff:fecc:bdee prefixlen 64 scopeid 0x20<link>
            ether 00:1c:42:cc:bd:ee txqueuelen 1000 (Ethernet)
              RX packets 13539 bytes 9163469 (8.7 MiB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 7348 bytes 1349615 (1.2 MiB)
              TX errors 0 dropped 0 overruns 0 carrier 0 collisions
```

```
[root@centos02 ~]#
[root@centos02 ~]# vi /etc/named.conf
```

```
/*
// named.conf
//
// Provided by Red Hat bind package to configure the ISC BIND named(8) DNS
// server as a caching only nameserver (as a localhost DNS resolver only).
//
// See /usr/share/doc/bind*/sample/ for example named configuration files.
//

options {
    listen-on port 53 { 127.0.0.1; 10.211.55.11; };
    listen-on-v6 port 53 { ::1; };
    directory      "/var/named";
    dump-file     "/var/named/data/cache_dump.db";
    statistics-file "/var/named/data/named_stats.txt";
    memstatistics-file "/var/named/data/named_mem_stats.txt";
    secroots-file  "/var/named/data/named.secroots";
    recursing-file "/var/named/data/named.recurising";
    allow-query    { localhost; };

    /*
        // If you are creating a public DNS server, then you will need
        // to change the above allow-query line to something like:
        // allow-query { 127.0.0.1; 10.0.0.0/8; };
        // Additionally you will need to provide at least one valid
        // nameserver entry in your /etc/resolv.conf file.
    */
}
```

Add Your own Custom Zone

```
root@centos02:~# vi /etc/named.conf
channel default_debug {
    file "data/named.run";
    severity dynamic;
};

zone "." IN {
    type hint;
    file "named.ca";
};

zone "mywebapp.com" IN {
    type master;
    file "mywebapp.com.fzone";
    allow-query { any; };
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";
~
```

```
[root@centos02 ~]#
[root@centos02 ~]# vi /etc/named.conf
[root@centos02 ~]#
[root@centos02 ~]# named-checkconf
[root@centos02 ~]#
```

```
[root@centos02 ~]# cd /var/named
[root@centos02 named]# ls
data  dynamic  named.ca  named.empty  named.localhost  named.loopback  slaves
[root@centos02 named]#
[root@centos02 named]#
[root@centos02 named]# touch mywebapp.com.fzone
[root@centos02 named]# ls
data  mywebapp.com.fzone  named.empty      named.loopback
dynamic  named.ca        named.localhost  slaves
[root@centos02 named]#
```

```
root@centos02 named]#
root@centos02 named]# vi mywebapp.com.fzone
```

https://bind9.readthedocs.io/en/v9.18.14/chapter3.html#soa-rr

Centos Wiki Documentation Forums

3.5. Zone File

- 3.5.1. Resource Records
- 3.5.2. Discussion of MX Records
- 3.5.3. Setting TTLs
- 3.5.4. Inverse Mapping in IPv4
- 3.5.5. Other Zone File Directives
- 3.5.6. BIND Primary File Extension: the \$GENERATE Directive
- 3.5.7. Additional File Formats

4. Name Server Operations

5. DNSSEC

6. Advanced Configurations

7. Security Configurations

8. Configuration Reference

Or common features. Comments in the file explain these features where appropriate. Zone files consist of **Resource Records (RR)**, which describe the zone's characteristics or properties.

```

1 ; base zone file for example.com
2 $TTL 2d ; default TTL for zone
3 $ORIGIN example.com. ; base domain-name
4 ; Start of Authority RR defining the key characteristics of the zone (domain)
5 @ IN SOA ns1.example.com. hostmaster.example.com. (
6                               2003080800 ; serial number
7                               12h      ; refresh
8                               15m      ; update retry
9                               3w      ; expiry
10                          2h      ; minimum
11 )
12 ; name server RR for the domain
13           IN NS ns1.example.com.
14 ; the second name server is external to this zone (domain)
15           IN NS ns2.example.net.
16 ; mail server RRs for the zone (domain)
17           3w IN MX 10 mail.example.com.
18 ; the second mail servers is external to the zone (domain)
19           IN MX 20 mail.example.net.

```

```

$TTL 2d ; default TTL for zone

@ IN SOA ns1.example.com. hostmaster.example.com. (
    800 ; serial number
    12h ; refresh
    15m ; update retry
    3w ; expiry
    2h ; minimum
)

```

Centos Wiki Documentation Forums

3.5. Zone File

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- 3.5.5. Other Zone File Directives
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- 3.5.7. Additional File Formats

4. Name Server Operations

5. DNSSEC

6. Advanced Configurations

7. Security Configurations

```

11 )
12 ; name server RR for the domain
13           IN NS ns1.example.com.
14 ; the second name server is external to this zone (domain)
15           IN NS ns2.example.net.
16 ; mail server RRs for the zone (domain)
17           3w IN MX 10 mail.example.com.
18 ; the second mail servers is external to the zone (domain)
19           IN MX 20 mail.example.net.
20 ; domain hosts includes NS and MX records defined above
21 ; plus any others required
22 ; for instance a user query for the A RR of joe.example.com will
23 ; return the IPv4 address 192.168.254.6 from this zone file
24 ns1 IN A 192.168.254.2
25 mail IN A 192.168.254.4
26 joe IN A 192.168.254.6
27 www IN A 192.168.254.7
28 ; aliases ftp (ftp server) to an external domain
29 ftp IN CNAME ftp.example.net.

```

```

$TTL 2d ; default TTL for zone

@ IN SOA ns1.example.com. hostmaster.example.com. (
    800 ; serial number
    12h ; refresh
    15m ; update retry
    3w ; expiry
    2h ; minimum
)
; name server RR for the domain
IN NS ns1.example.com.

www IN A 10.211.55.11

```

```
[root@centos02 named]# vi mywebapp.com.fzone
[root@centos02 named]#
[root@centos02 named]# named-checkzone mywebapp.com mywebapp.com.fzone
zone mywebapp.com/IN: loaded serial 800
OK
[root@centos02 named]#
```

```
[root@centos02 named]#
[root@centos02 named]# less /etc/named.conf
```

```
logging {
    channel default_debug {
        file "data/named.run";
        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

zone "mywebapp.com" IN {
    type master;
    file "mywebapp.com.fzone";
    allow-query { any; };
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";

(END)
```

```
[root@centos02 named]# systemctl restart named
[root@centos02 named]# systemctl status named
```

Verify DNS Setup

```
[root@centos02 named]# nslookup www.google.com
Server:      10.211.55.1
Address:     10.211.55.1#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.251.208.100

[root@centos02 named]#
```

```
[root@centos02 named]# nslookup www.mywebapp.com
Server:      10.211.55.1
Address:     10.211.55.1#53

Non-authoritative answer:
Name:   www.mywebapp.com
Address: 13.248.169.48
Name:   www.mywebapp.com
Address: 76.223.54.146

[root@centos02 named]#
```

```
[root@centos02 named]# vi /etc/resolv.conf
```

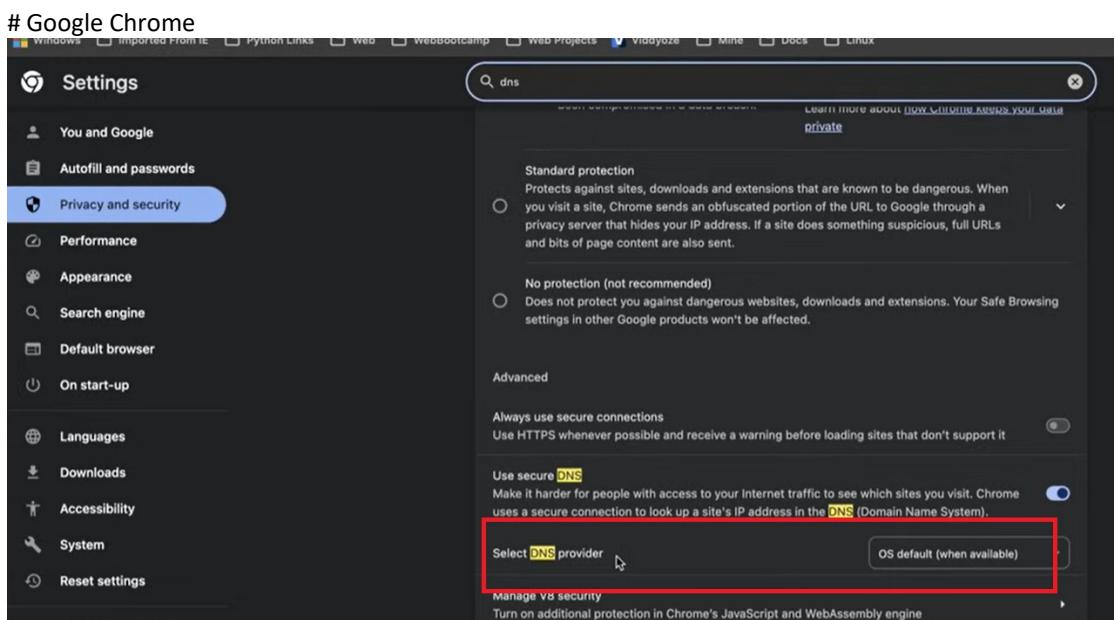
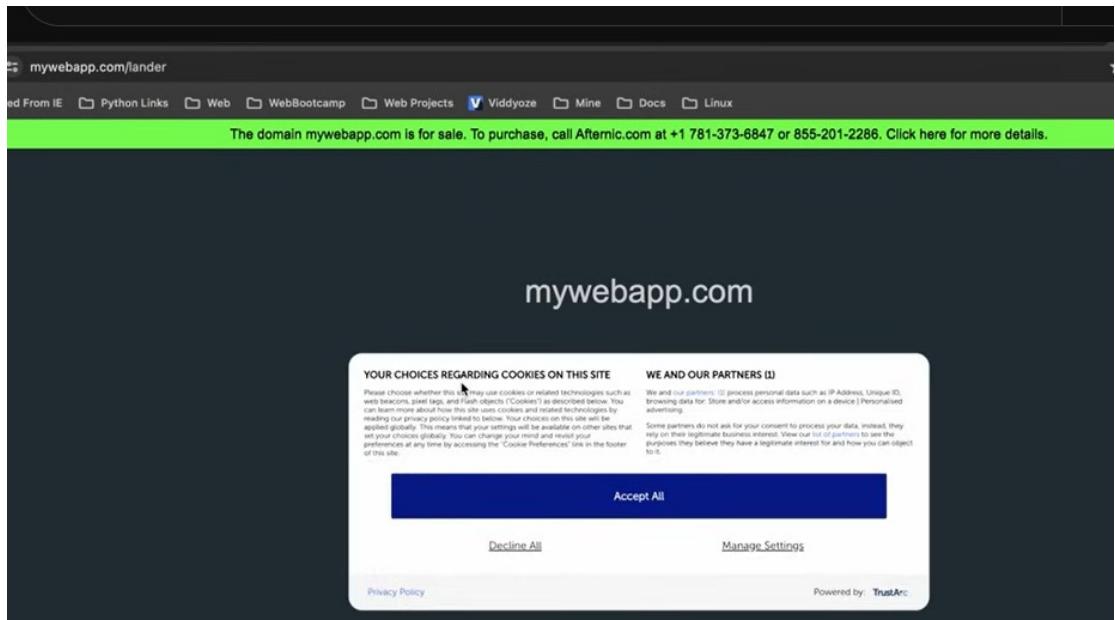
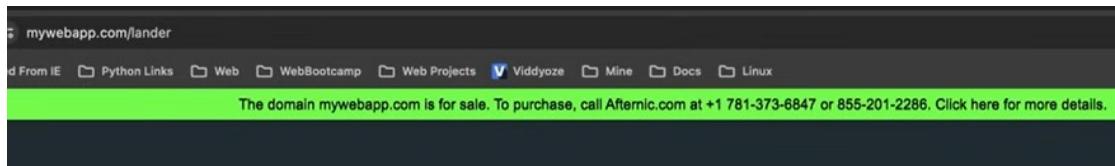
```
# Generated by NetworkManager
search localdomain
nameserver 10.211.55.11
```

DNS Mapping

```
[root@centos02 named]# nslookup www.mywebapp.com
Server:      10.211.55.11
Address:     10.211.55.11#53

Name:   www.mywebapp.com
Address: 10.211.55.11

[root@centos02 named]#
```



Here's how to configure your DNS settings on different operating systems:

- Windows: Go to Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings. Right-click your network connection, select Properties, then select Internet Protocol Version 4 (TCP/IPv4) or Version 6 (TCP/IPv6) and click Properties. Here, you can set your preferred DNS server.
- macOS: Go to System Preferences > Network, select your network interface, click Advanced, and go to the DNS tab. You can add your DNS server here.
- Linux: This depends on your distribution and network manager, but typically you can edit /etc/resolv.conf directly or configure through network management tools (like NetworkManager) to add your DNS server.

DNS Translate

- Hostname to 192.168.1.2 (Called A Record)
- 192.168.1.2 to hostname (Called PTR Record)
- Hostname to hostname (Called CNAME Record)

Zones Files

- Forward zone - resolve Domain to IP
- Reverse zone - resolve IP to Domain

Mastering Linux AWK and CUT commands

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat data
ID Name Salary Country
1 Pol 25000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print $2}' data
Name
Pol
Bont
Loki
Hina

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat data
ID Name Salary Country
1 Pol 25000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print $2}' data
Name
Pol
Bont
Loki
Hina

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print $2,$4}' data
Name Country
Pol India
Bont Belgium
Loki Germany
Hina India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |
```

FILENAME	The pathname of the current input file
NF	Number of fields in current record
NR	Number of current record from start of input
FNR	Number of current record from start of current input file
OFS	Output field separator used by print , usually Space

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat data
ID Name Salary Country
1 Pol 25000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print $NF}' data
Country
India
Belgium
Germany
India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cl|
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ ls -ltr
total 10
-rw-r--r-- 1 Prashant 197121 173 Jul 24 00:43 names
-rw-r--r-- 1 Prashant 197121 1891 Jul 24 02:12 country.txt
-rw-r--r-- 1 Prashant 197121 38 Jul 24 03:04 externalfile
-rw-r--r-- 1 Prashant 197121 73 Jul 24 03:21 posix
-rw-r--r-- 1 Prashant 197121 9 Jul 24 22:09 ex_file
-rw-r--r-- 1 Prashant 197121 37 Jul 24 22:28 IndianUsers
-rw-r--r-- 1 Prashant 197121 104 Jul 26 18:01 data

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ ls -ltr | awk '{print $NF}'
10
names
I
country.txt
externalfile
posix
ex_file
IndianUsers
data

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat names
firstname
Kara-Lynn
Correy
Theodora
Rosaline
Ezmeralda
Janenna
Alie
Jaime
Georgina
Karolina
Selma
Eugine
Brandise
Valera
Violet
Ann-Marie
Brietta
Concettina
Rivalee
Julietta
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print NR}' names
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print NR $0}' names
1firstname
2Kara-Lynn
3Correy
4Theodora
5Rosaline
6Ezmeralda
7Janenna
8Alie
9Jaime
10Georgina
11Karolina
12Selma
13Eugine
14Brandise
15Valera
16Violet
17Ann-Marie
18Brietta
19Concettina
20Rivalee
21Juliet
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print NR, $0}' names
1 firstname
2 Kara-Lynn
3 Correy
4 Theodora
5 Rosaline
6 Ezmeralda
7 Janenna
8 Alie
9 Jaime
10 Georgina
11 Karolina
12 Selma
13 Eugine
14 Brandise
15 Valera
16 Violet
17 Ann-Marie
18 Brietta
19 Concettina
20 Rivalee
21 Juliet
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{print NR ":" " $0}' names
1: Firstname
2: Kara-Lynn
3: Correy
4: Theodora
5: Rosaline
6: Ezmeralda
7: Janenna
8: Alie
9: Jaime
10: Georgina
11: Karolina
12: Selma
13: Eugine
14: Brandise
15: Valera
16: Violet
17: Ann-Marie
18: Brietta
19: Concettina
20: Rivalee
21: Julieta
```

CSV File

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat country.txt
id,firstname,lastname,email,email2,profession,country
100,Theodora,Edison,Theodora.Edison@yopmail.com,Theodora.Edison@gmail.com,firefighter,India
101,Andree,Lory,Andree.Lory@yopmail.com,Andree.Lory@gmail.com,firefighter,India
102,Pierrette,Klotz,Pierrette.Klotz@yopmail.com,Pierrette.Klotz@gmail.com,police officer,Belgium
103,Sibella,Harday,Sibella.Harday@yopmail.com,Sibella.Harday@gmail.com,police officer,Peru
104,Atlanta,Ivens,Atlanta.Ivens@yopmail.com,Atlanta.Ivens@gmail.com,police officer,India
105,Paola,Slifka,Paola.Slifka@yopmail.com,Paola.Slifka@gmail.com,developer,Belgium
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India
107,Lucille,Hillel,Lucille.Hillel@yopmail.com,Lucille.Hillel@gmail.com,police officer,Lebanon
108,Korrie,Hurley,Korrie.Hurley@yopmail.com,Korrie.Hurley@gmail.com,police officer,Belgium
109,Teddie,Roxanna,Teddie.Roxanna@yopmail.com,Teddie.Roxanna@gmail.com,firefighter,Germany
110,Marnia,Delacourt,Marnia.Delacourt@yopmail.com,Marnia.Delacourt@gmail.com,firefighter,Argentina
111,Jsandye,Cressida,Jsandye.Cressida@yopmail.com,Jsandye.Cressida@gmail.com,firefighter,Equatorial Guinea
```

```
$ awk -F, '{print $4}' country.txt
email
Theodora.Edison@yopmail.com
Andree.Lory@yopmail.com
Pierrette.Klotz@yopmail.com
Sibella.Harday@yopmail.com
Atlanta.Ivens@yopmail.com
Paola.Slifka@yopmail.com
Hollie.Lipson@yopmail.com
Lucille.Hillel@yopmail.com
Korrie.Hurley@yopmail.com
Teddie.Roxanna@yopmail.com
Marnia.Delacourt@yopmail.com
Jsandye.Cressida@yopmail.com
Steffane.Seessel@yopmail.com
Rosaline.Sadowski@yopmail.com
Cherrita.Engdahl@yopmail.com
Blake.Audly@yopmail.com
Marita.Pearse@yopmail.com
Lilith.Munn@yopmail.com
Mary.Schlosser@yopmail.com
Hyacinthe.Nikaniki@yopmail.com
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk -F, '{print $7}' country.txt
Country
India
India
Belgium
Peru
India
Belgium
India
Lebanon
Belgium
Germany
Argentina
Equatorial Guinea
Germany
Martinique
Germany
Belgium
India
Thailand
Burundi
Belgium
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat data
ID Name Salary Country
1 Pol 25000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{if($3>40000) print $0}' data
ID Name Salary Country
2 Bont 45000 Belgium
3 Loki 55000 Germany

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk '{if($2=="Pol"){$3=80000} print $0}' data
ID Name Salary Country
1 Pol 80000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$
```

```

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat country.txt
id,firstname,lastname,email,email2,profession,country
100,Theodora,Edison,Theodora.Edison@yopmail.com,Theodora.Edison@gmail.com,firefighter,India
101,Andree,Lory,Andree.Lory@yopmail.com,Andree.Lory@gmail.com,firefighter,India
102,Pierette,Klotz,Pierette.Klotz@yopmail.com,Pierette.Klotz@gmail.com,police officer,Belgium
103,Sibella,Harday,Sibella.Harday@yopmail.com,Sibella.Harday@gmail.com,police officer,Peru
104,Atlanta,Ivens,Atlanta.Ivens@yopmail.com,Atlanta.Ivens@gmail.com,police officer,India
105,Paola,Slifka,Paola.Slifka@yopmail.com,Paola.Slifka@gmail.com,developer,Belgium
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India
107,Lucille,Hillel,Lucille.Hillel@yopmail.com,Lucille.Hillel@gmail.com,police officer,Lebanon
108,Korrie,Hurley,Korrie.Hurley@yopmail.com,Korrie.Hurley@gmail.com,police officer,Belgium
109,Teddie,Roxanna,Teddie.Roxanna@yopmail.com,Teddie.Roxanna@gmail.com,firefighter,Germany
110,Marnia,Delacourt,Marnia.Delacourt@yopmail.com,Marnia.Delacourt@gmail.com,firefighter,Argentina
111,Jsandye,Cressida,Jsandye.Cressida@yopmail.com,Jsandye.Cressida@gmail.com,firefighter,Equatorial Guinea
112,Steffane,Seessel,Steffane.Seessel@yopmail.com,Steffane.Seessel@gmail.com,doctor,Germany

```

Search

```

$ awk '/India/ {print $0}' country.txt
100,Theodora,Edison,Theodora.Edison@yopmail.com,Theodora.Edison@gmail.com,firefighter,In
101,Andree,Lory,Andree.Lory@yopmail.com,Andree.Lory@gmail.com,firefighter,India
104,Atlanta,Ivens,Atlanta.Ivens@yopmail.com,Atlanta.Ivens@gmail.com,police bfficer,India
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India
116,Marita,Pearse,Marita.Pearse@yopmail.com,Marita.Pearse@gmail.com,developer,India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |

```

```

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'NR=="8" {print $0}' country.txt
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |

```

```

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'NR=="8",NR=="10" {print $0}' country.txt
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India
107,Lucille,Hillel,Lucille.Hillel@yopmail.com,Lucille.Hillel@gmail.com,police officer,Leba
108,Korrie,Hurley,Korrie.Hurley@yopmail.com,Korrie.Hurley@gmail.com,police officer,Belgium

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)

```

```

MINGW64:/c/Users/Lenovo/Desktop/SED

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat data
ID Name Salary Country

1 Pol 25000 India
2 Bont 45000 Belgium
3 Loki 55000 Germany
4 Hina 35000 India

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'NF==0 {print NR}' data
2
I
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |

```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'END {print NR}' country.txt
21

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'END {print NR}' data
6

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ |

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'BEGIN {for(i=0;i<=10;i++) print i;}' 0
1
2
3
4
5
6
7
8
9
10

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ awk 'BEGIN {while(i<10){i++; print "num is " i}}' num is 1
num is 2
num is 3
num is 4
num is 5
num is 6
num is 7
num is 8
num is 9
num is 10

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat names
Firstname
Kara-Lynn
Correy
Theodora
Rosaline
Ezmeralda
Janenna
Alie
Jaime
Georgina
Karolina
Selma
Eugine
Brandise
Valera
Violet
Ann-Marie
Brietta
Concettina
Rivalee
Julietta

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cut -c1,5 names
ft
K-
Ce
Td
Rl
Er
Jn
A
Je
Gg
Kl
Sa
En
Bd
Vr
Ve
AM
Bt
Ce
Rl
Je

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat |
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cut -c1 names
f
K
C
T
R
E
J
A
J
G
K
S
E
B
V
V
A
B
C
R
J
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cut -c1-5 names
first
Kara-
Corre
Theod
Rosal
Ezmer
Janen
Alie
Jaime
Georg
Karol
Selma
Eugin
Brand
Valer
Viole
Ann-M
Briet
Conce
Rival
Julie
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cat country.txt
id,firstname,lastname,email,email2,profession,country
100,Theodora,Edison,Theodora.Edison@yopmail.com,Theodora.Edison@gmail.com,firefighter,India
101,Andree,Lory,Andree.Lory@yopmail.com,Andree.Lory@gmail.com,firefighter,India
102,Pierette,Klotz,Pierette.Klotz@yopmail.com,Pierette.Klotz@gmail.com,police officer,Belgium
103,Sibella,Harday,Sibella.Harday@yopmail.com,Sibella.Harday@gmail.com,police officer,Peru
104,Atlanta,Ivens,Atlanta.Ivens@yopmail.com,Atlanta.Ivens@gmail.com,police officer,India
105,Paola,Slifka,Paola.Slifka@yopmail.com,Paola.Slifka@gmail.com,developer,Belgium
106,Hollie,Lipson,Hollie.Lipson@yopmail.com,Hollie.Lipson@gmail.com,developer,India
107,Lucille,Hillel,Lucille.Hillel@yopmail.com,Lucille.Hillel@gmail.com,police officer,Lebanon
108,Korrie,Hurley,Korrie.Hurley@yopmail.com,Korrie.Hurley@gmail.com,police officer,Belgium
109,Teddie,Roxanna,Teddie.Roxanna@yopmail.com,Teddie.Roxanna@gmail.com,firefighter,Germany
110,Marnia,Delacourt,Marnia.Delacourt@yopmail.com,Marnia.Delacourt@gmail.com,firefighter,Argentina
111,Jsandye,Cressida,Jsandye.Cressida@yopmail.com,Jsandye.Cressida@gmail.com,firefighter,Equatorial Guinea
112,Steffane,Seessel,Steffane.Seessel@yopmail.com,Steffane.Seessel@gmail.com,doctor,Germany
113,Rosaline,Sadowcki,Rosaline.Sadowcki@yopmail.com,Rosaline.Sadowcki@gmail.com,firefighter,Martinique
```

```
Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
```

```
$ cut -d, -f 2 country.txt
firstname
Theodora
Andree
Pierette
Sibella
Atlanta
Paola
Hollie
Lucille
Korrie
Teddie
Marnia
Jsandye
Steffane
Rosaline
Cherrita
Blake
Marita
Lilith
Mary
Hyacinthe
```

```

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cut -d, -f 1- country.txt --output-delimiter=":"
id:firstname:lastname@email1@email2:profession:Country
100:Theodora:Edison:Theodora.Edison@yopmail.com:Theodora.Edison@gmail.com:firefighter:India
101:Andree:Lory:Andree.Lory@yopmail.com:Andree.Lory@gmail.com:firefighter:India
102:Pierrette:Klotz:Pierrette.Klotz@yopmail.com:Pierrette.Klotz@gmail.com:police officer:Belgium
103:Sibella:Harday:Sibella.Harday@yopmail.com:Sibella.Harday@gmail.com:police officer:Peru
104:Atlanta:Ivens:Atlanta.Ivens@yopmail.com:Atlanta.Ivens@gmail.com:police officer:India
105:Paola:Slifka:Paola.Slifka@yopmail.com:Paola.Slifka@gmail.com:developer:Belgium
106:Hollie:Lipson:Hollie.Lipson@yopmail.com:Hollie.Lipson@gmail.com:developer:India
107:Lucille:Hillel:Lucille.Hillel@yopmail.com:Lucille.Hillel@gmail.com:police officer:Lebanon
108:Korrie:Hurley:Korrie.Hurley@yopmail.com:Korrie.Hurley@gmail.com:police officer:Belgium
109:Teddie:Roxanna:Teddie.Roxanna@yopmail.com:Teddie.Roxanna@gmail.com:firefighter:Germany
110:Marnia:Delacourt:Marnia.Delacourt@yopmail.com:Marnia.Delacourt@gmail.com:firefighter:Argentina
111:J sandy: Cressida: J sandy.Cressida@yopmail.com: J sandy.Cressida@gmail.com: firefighter: Equatorial Guinea
112:Steffane:Seessel:Steffane.Seessel@yopmail.com:Steffane.Seessel@gmail.com:doctor:Germany
113:Rosaline:Sadowski:Rosaline.Sadowski@yopmail.com:Rosaline.Sadowski@gmail.com:firefighter:Belgium
114:Cherrita:Engdahl:Cherrita.Engdahl@yopmail.com:Cherrita.Engdahl@gmail.com:doctor:Germany
115:Blake:Audly:Blake.Audly@yopmail.com:Blake.Audly@gmail.com:worker:Belgium
116:Marita:Pearse:Marita.Pearse@yopmail.com:Marita.Pearse@gmail.com:developer:India
117:Lilith:Munn:Lilith.Munn@yopmail.com:Lilith.Munn@gmail.com:worker:Thailand
118:Mary:Schlosser:Mary.Schlosser@yopmail.com:Mary.Schlosser@gmail.com:firefighter:Burundi
119:Hyacinthe:Nikaniki:Hyacinthe.Nikaniki@yopmail.com:Hyacinthe.Nikaniki@gmail.com:police officer:Peru

```

```

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ cut -d, -f 1- country.txt --output-delimiter=":"
id | firstname | lastname | email | email2 | profession | Country
100 | Theodora | Edison | Theodora.Edison@yopmail.com | Theodora.Edison@gmail.com | firefighter | India
101 | Andree | Lory | Andree.Lory@yopmail.com | Andree.Lory@gmail.com | firefighter | India
102 | Pierrette | Klotz | Pierrette.Klotz@yopmail.com | Pierrette.Klotz@gmail.com | police officer | Belgium
103 | Sibella | Harday | Sibella.Harday@yopmail.com | Sibella.Harday@gmail.com | police officer | Peru
104 | Atlanta | Ivens | Atlanta.Ivens@yopmail.com | Atlanta.Ivens@gmail.com | police officer | India
105 | Paola | Slifka | Paola.Slifka@yopmail.com | Paola.Slifka@gmail.com | developer | Belgium
106 | Hollie | Lipson | Hollie.Lipson@yopmail.com | Hollie.Lipson@gmail.com | developer | India
107 | Lucille | Hillel | Lucille.Hillel@yopmail.com | Lucille.Hillel@gmail.com | police officer | Lebanon
108 | Korrie | Hurley | Korrie.Hurley@yopmail.com | Korrie.Hurley@gmail.com | police officer | Belgium
109 | Teddie | Roxanna | Teddie.Roxanna@yopmail.com | Teddie.Roxanna@gmail.com | firefighter | Germany
110 | Marnia | Delacourt | Marnia.Delacourt@yopmail.com | Marnia.Delacourt@gmail.com | firefighter | Argentina
111 | J sandy | Cressida | J sandy.Cressida@yopmail.com | J sandy.Cressida@gmail.com | firefighter | Equatorial Guinea
112 | Steffane | Seessel | Steffane.Seessel@yopmail.com | Steffane.Seessel@gmail.com | doctor | Germany

```

```

MINGW64:/c/Users/Lenovo/Desktop/SED
$ ls -ltr
total 10
-rw-r--r-- 1 Prashant 197121 173 Jul 24 00:43 names
-rw-r--r-- 1 Prashant 197121 1891 Jul 24 02:12 country.txt
-rw-r--r-- 1 Prashant 197121 38 Jul 24 03:04 externalfile
-rw-r--r-- 1 Prashant 197121 73 Jul 24 03:21 posix
-rw-r--r-- 1 Prashant 197121 9 Jul 24 22:09 ex_file
-rw-r--r-- 1 Prashant 197121 37 Jul 24 22:28 IndianUsers
-rw-r--r-- 1 Prashant 197121 104 Jul 26 18:01 data

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ ls -ltr | awk '{print $NF}'
10
names
country.txt
externalfile
posix
ex_file
IndianUsers
data

Prashant@PrashantIsLive MINGW64 ~/Desktop/SED (master)
$ ls -ltr | awk '{print $NF}' | cut -c1,2
10
na
co
ex
po
ex
In
da

```