Comprehensive Linux Operations

Project Overview

This project spans various aspects of Linux system administration, including file management, user and group management, service control, process handling, and more. You will be completing tasks that simulate real-world scenarios, providing hands-on experience with Linux commands and configurations.

Project Breakdown

Part 1: Creating and Editing Text Files (20 minutes):

Scenario: You are tasked with documenting the configurations and settings for a new server. You'll use different text editors to create and update these documents.

1.Using Nano:

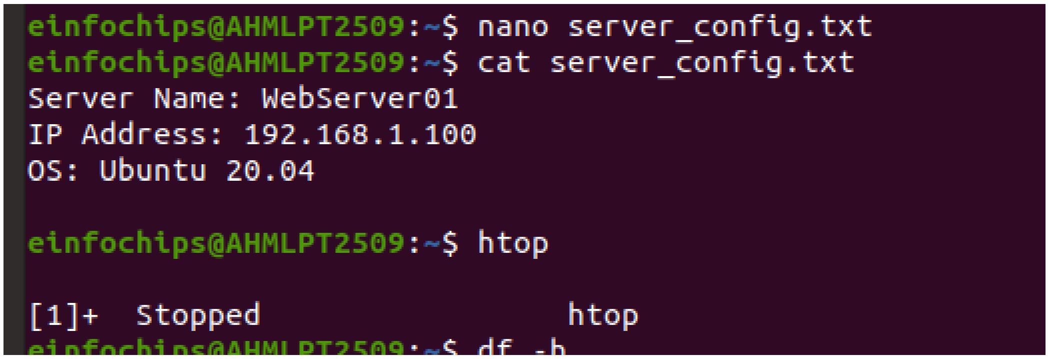
Create and Open File with Nano:

Create a file `server_config.txt` using Nano:

```
nano server_config.txt
```

2. Add the following content:

```
Server Name: WebServer01
IP Address: 192.168.1.100
OS: Ubuntu 20.04
```



```
einfochips@AHMLPT2509:~$ nano server_config.txt
einfochips@AHMLPT2509:~$ cat server_config.txt
Server Name: WebServer01
IP Address: 192.168.1.100
OS: Ubuntu 20.04

einfochips@AHMLPT2509:~$ htop

[1]+  Stopped                 htop
einfochips@AHMLPT2509:~$ df -h
```

- Save and exit (Ctrl+O, Enter, Ctrl+X).

Server Name: WebServer01

- specifies the name of the server
- used to identify the server within a network or system.

IP Address: 192.168.1.100

- IP address of the server,
- IP address is used to identify and locate the server within a network.

OS: Ubuntu 20.04

- operating system running on the server,
- which is Ubuntu 20.04. This information is useful for knowing the environment and compatibility for software and applications.

3. Using Vi:

1. Edit the same file with Vi:

```
vi server_config.txt
```

2. Append the following text:

```
Installed Packages: Apache, MySQL, PHP
```

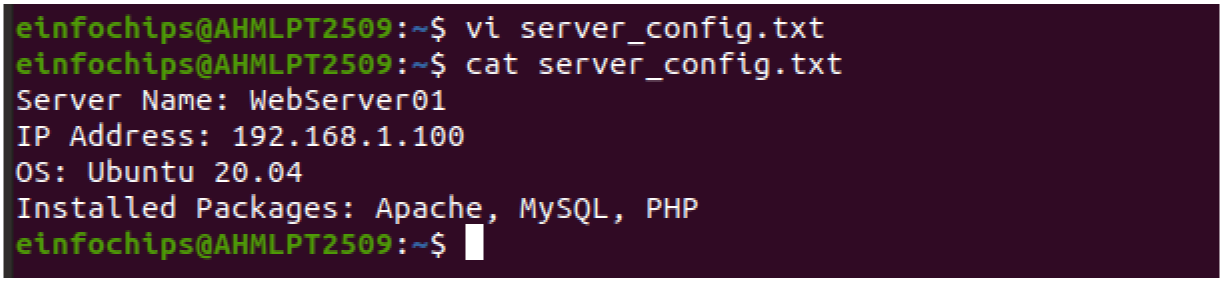
- Save and exit (Esc, `:wq`).

Enter Insert Mode:

- Press i to enter insert mode.
- see -- INSERT -- at the bottom of the terminal, indicating that you can now edit the file.

3. Append the Specified Content:

```
Installed Packages: Apache, MySQL, PHP
```



```
einfochips@AHMLPT2509:~$ vi server_config.txt
einfochips@AHMLPT2509:~$ cat server_config.txt
Server Name: WebServer01
IP Address: 192.168.1.100
OS: Ubuntu 20.04
Installed Packages: Apache, MySQL, PHP
einfochips@AHMLPT2509:~$ 
```

4. Save and Exit:

- Press **Esc** to exit insert mode.
- Type **:wq** and press Enter. This command writes the file (saves it) and quits Vi.

4. Using Vim:

1.Further edit the file with Vim:

```
vim server_config.txt
```

2.Add the following text:

```
Configuration Complete: Yes
```

- Save and exit (Esc, `:wq`).

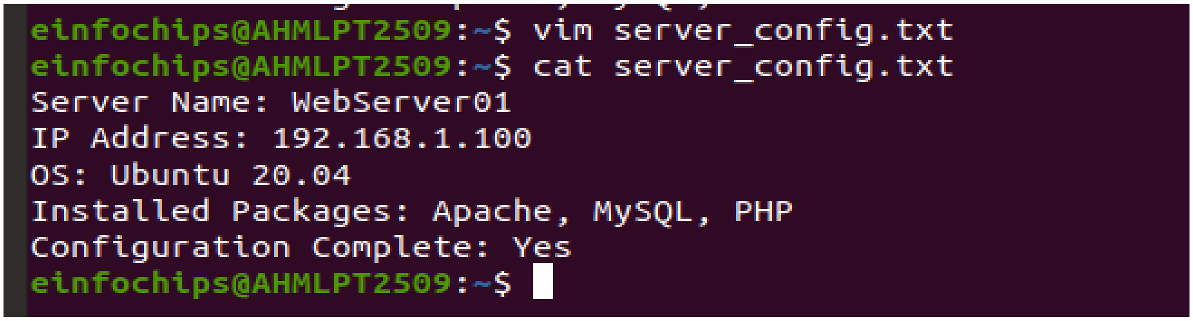
3. Enter Insert Mode:

- Press i to enter insert mode.

- see -- INSERT -- at the bottom of the terminal, indicating that you can now edit the file.

4. Add the Specified Content:

```
vim server_config.txt
```



```
einfochips@AHMLPT2509:~$ vim server_config.txt
einfochips@AHMLPT2509:~$ cat server_config.txt
Server Name: WebServer01
IP Address: 192.168.1.100
OS: Ubuntu 20.04
Installed Packages: Apache, MySQL, PHP
Configuration Complete: Yes
einfochips@AHMLPT2509:~$ 
```

5. save and Exit:

- Press Esc to exit insert mode.
- Type :wq and press Enter. This command writes the file (saves it) and quits Vim.

Part 2: User & Group Management (20 minutes):

Scenario: You need to set up user accounts and groups for a new team joining the project.

1. Adding/Removing Users:

Add a new user `developer`:

```
sudo adduser developer
```

- **sudo**: This stands for "superuser do" used to execute commands with superuser (root) privileges. need root privileges to add a new user.

- **adduser**: add a new user to the system. It is more user-friendly than the useradd command because it creates a home directory and sets up the user's environment.

- **developer**: This is the username of the new user you are adding.

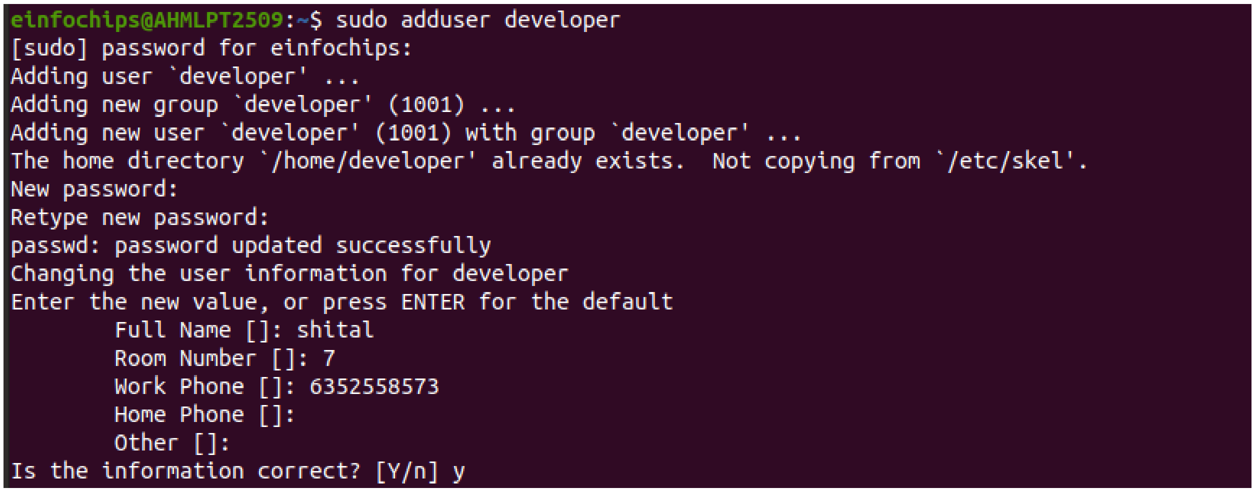
- After running the sudo adduser developer command,

Enter Password:

- enter your own password to confirm , necessary privileges to run the sudo command.

Set User Password:

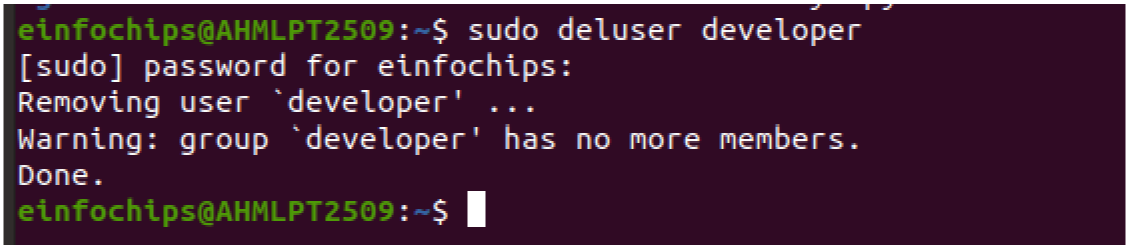
- enter a password for the new user (developer), need to enter it twice to confirm.



```
einfochips@AHMLPT2509:~$ sudo adduser developer
[sudo] password for einfochips:
Adding user `developer' ...
Adding new group `developer' (1001) ...
Adding new user `developer' (1001) with group `developer' ...
The home directory `/home/developer' already exists.  Not copying from `/etc/skel'.
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for developer
Enter the new value, or press ENTER for the default
        Full Name []: shital
        Room Number []: 7
        Work Phone []: 6352558573
        Home Phone []:
        Other []:
Is the information correct? [Y/n] y
```

2. Remove the user `developer`:

```
sudo deluser developer
```



```
einfochips@AHMLPT2509:~$ sudo deluser developer
[sudo] password for einfochips:
Removing user `developer' ...
Warning: group `developer' has no more members.
Done.
einfochips@AHMLPT2509:~$
```

- **sudo**: stands for "superuser do" and is used to execute commands with superuser (root) privileges. You need root privileges to remove a user.

- **deluser**: This is a command to remove a user from the system. It removes the user's entry from the /etc/passwd file, effectively deleting the user account.

- **developer**: This is the username of the user you are removing.

  User Deletion: The deluser command will remove the user account from the system.

  Home Directory:
  - By default, the deluser command does not remove the user's home directory.

- If you also want to remove the home directory, you need to add the --remove-home option:

sudo deluser --remove-home developer

Group Membership: The user will be removed from any groups they were a member of.

1. Example of Removing a User and Their Home Directory:

- If you want to remove the user developer and also delete their home directory.

  sudo deluser --remove-home developer
- Execute sudo deluser developer to remove the user.
- execute sudo deluser --remove-home developer to also remove the user's home directory.

2. Force Removal:

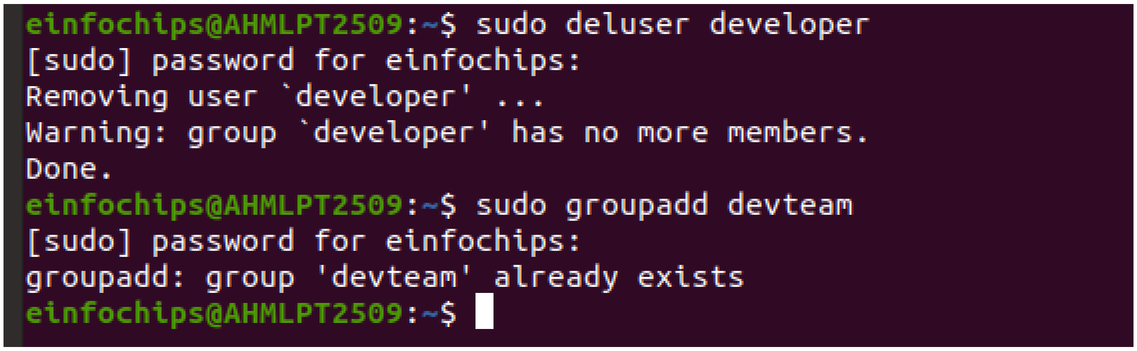
- If the user is currently logged in or if there are running processes belonging to the user, you might need to forcefully remove the user:

sudo deluser --force --remove-home developer

3. Managing Groups:

1. Create a group `devteam`:

```
sudo groupadd devteam
```



```
einfochips@AHMLPT2509:~$ sudo deluser developer
[sudo] password for einfochips:
Removing user `developer' ...
Warning: group `developer' has no more members.
Done.
einfochips@AHMLPT2509:~$ sudo groupadd devteam
[sudo] password for einfochips:
groupadd: group 'devteam' already exists
einfochips@AHMLPT2509:~$ 
```

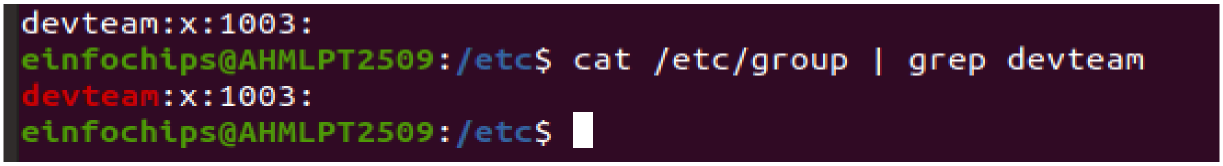
- **sudo**: This stands for "superuser do" and is used to execute commands with superuser (root) privileges. You need root privileges to add a new group.

GID Assignment:

- system assigns a unique group ID (GID) to the new group. This GID is used to identify the group within the system.

cd /etc/group

cat /etc/group | grep devteam

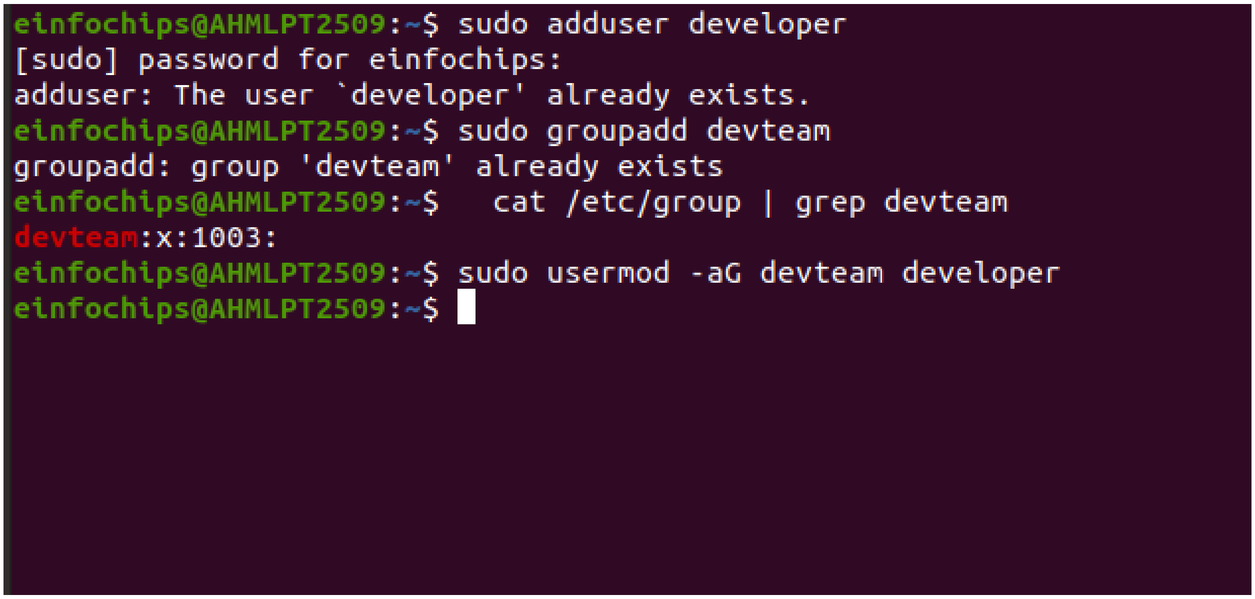


```
devteam:x:1003:
einfochips@AHMLPT2509:/etc$ cat /etc/group | grep devteam
devteam:x:1003:
einfochips@AHMLPT2509:/etc$ 
```

- x: placeholder for the group password (not commonly used).
- 1003: The unique GID assigned to the group.

2. Add the user `developer` to the `devteam` group:

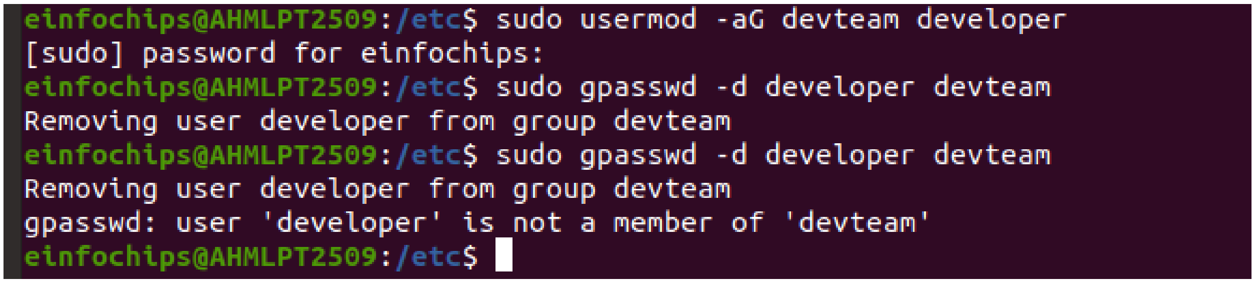
```
sudo usermod -aG devteam developer
```



```
einfochips@AHMLPT2509:~$ sudo adduser developer
[sudo] password for einfochips:
adduser: The user `developer' already exists.
einfochips@AHMLPT2509:~$ sudo groupadd devteam
groupadd: group 'devteam' already exists
einfochips@AHMLPT2509:~$   cat /etc/group | grep devteam
devteam:x:1003:
einfochips@AHMLPT2509:~$ sudo usermod -aG devteam developer
einfochips@AHMLPT2509:~$ 
```

3. Remove the user `developer` from the `devteam` group:

```
sudo gpasswd -d developer devteam
```



```
einfochips@AHMLPT2509:/etc$ sudo usermod -aG devteam developer
[sudo] password for einfochips:
einfochips@AHMLPT2509:/etc$ sudo gpasswd -d developer devteam
Removing user developer from group devteam
einfochips@AHMLPT2509:/etc$ sudo gpasswd -d developer devteam
Removing user developer from group devteam
gpasswd: user 'developer' is not a member of 'devteam'
einfochips@AHMLPT2509:/etc$
```

# Part 3: File Permissions Management (20 minutes):

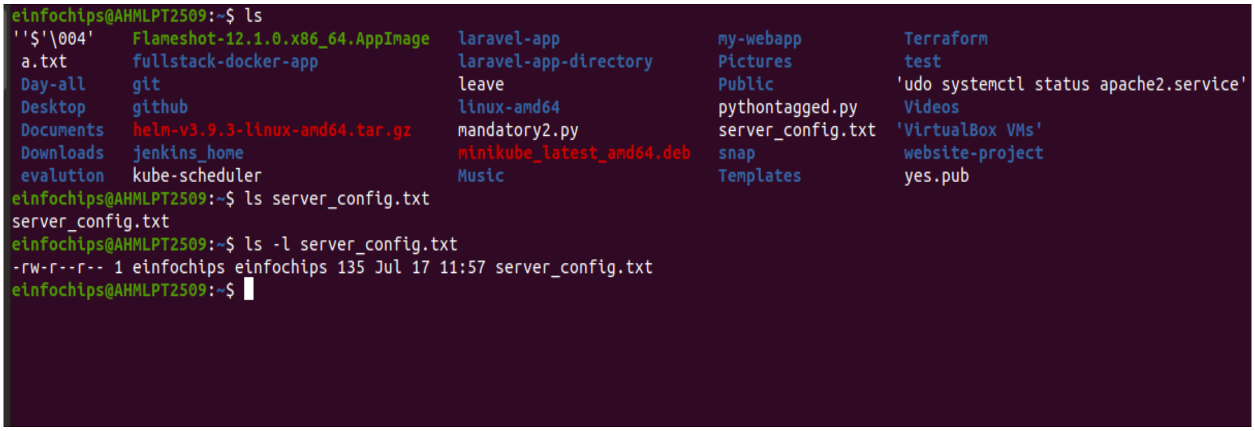
Scenario: Ensure that only the appropriate users have access to specific files and directories.

1. Understanding File Permissions:

View permissions for `server_config.txt`:

```
ls -l server_config.txt
```

- Discuss the output (e.g., `-rw-r--r--`).

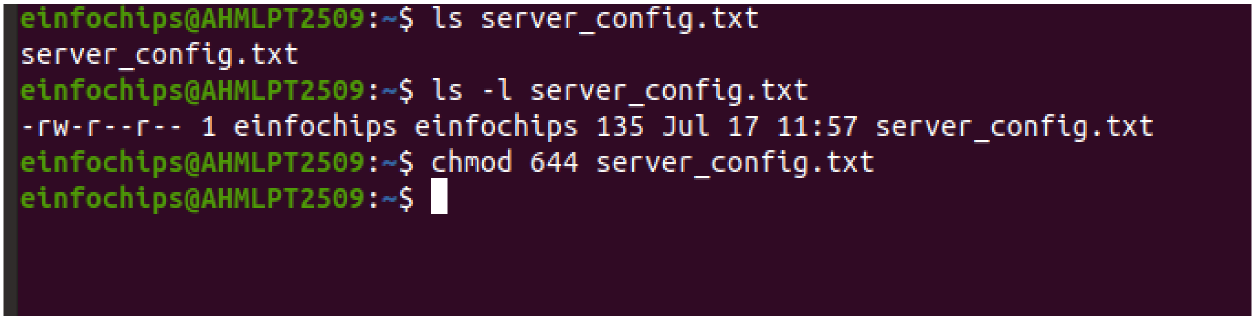


```
einfochips@AHMLPT2509:~$ ls
''$'\004'    Flameshot-12.1.0.x86_64.AppImage   laravel-app              my-webapp          Terraform
 a.txt       fullstack-docker-app               laravel-app-directory    Pictures           test
 Day-all     git                                leave                    Public            'udo systemctl status apache2.service'
 Desktop     github                             linux-amd64              pythontagged.py    Videos
 Documents   helm-v3.9.3-linux-amd64.tar.gz     mandatory2.py            server_config.txt 'VirtualBox VMs'
 Downloads   jenkins_home                       minikube_latest_amd64.deb snap              website-project
 evalution   kube-scheduler                     Music                    Templates          yes.pub
einfochips@AHMLPT2509:~$ ls server_config.txt
server_config.txt
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 einfochips einfochips 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$
```

2. Changing Permissions and Ownership:

1. Change permissions to read/write for the owner and read-only for others:

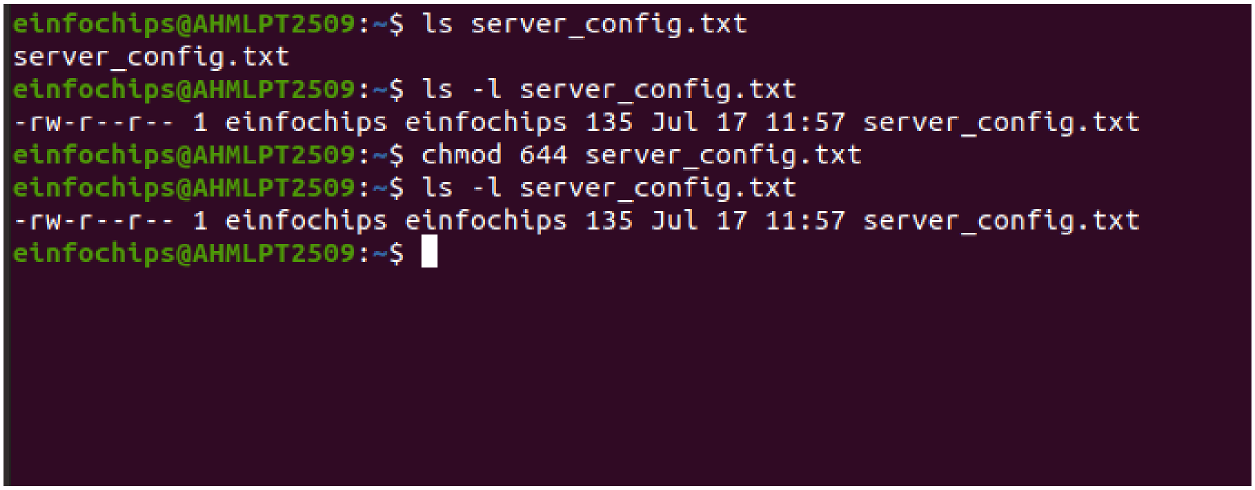
```
chmod 644 server_config.txt
```



```
einfochips@AHMLPT2509:~$ ls server_config.txt
server_config.txt
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 einfochips einfochips 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$ chmod 644 server_config.txt
einfochips@AHMLPT2509:~$ 
```

2.Verify the change:

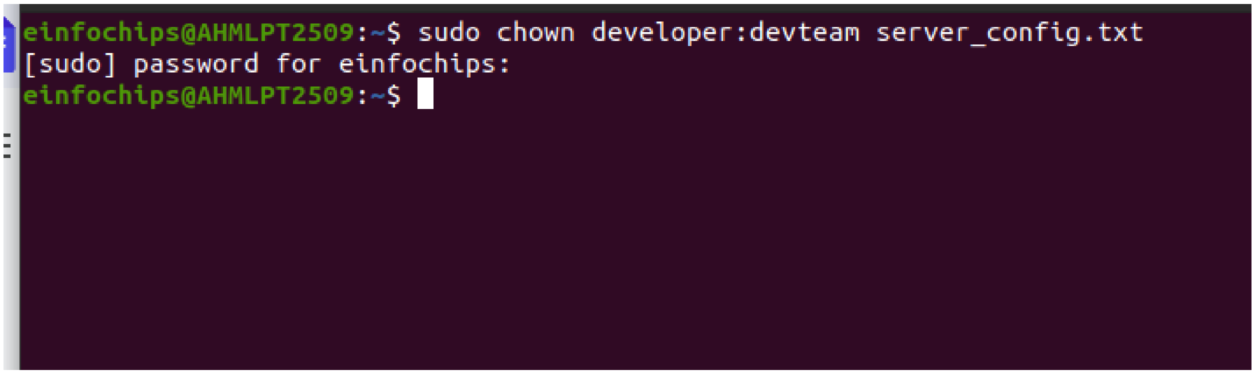
```
ls -l server_config.txt
```



```
einfochips@AHMLPT2509:~$ ls server_config.txt
server_config.txt
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 einfochips einfochips 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$ chmod 644 server_config.txt
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 einfochips einfochips 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$ 
```

3. Change the owner to `developer` and the group to `devteam`:

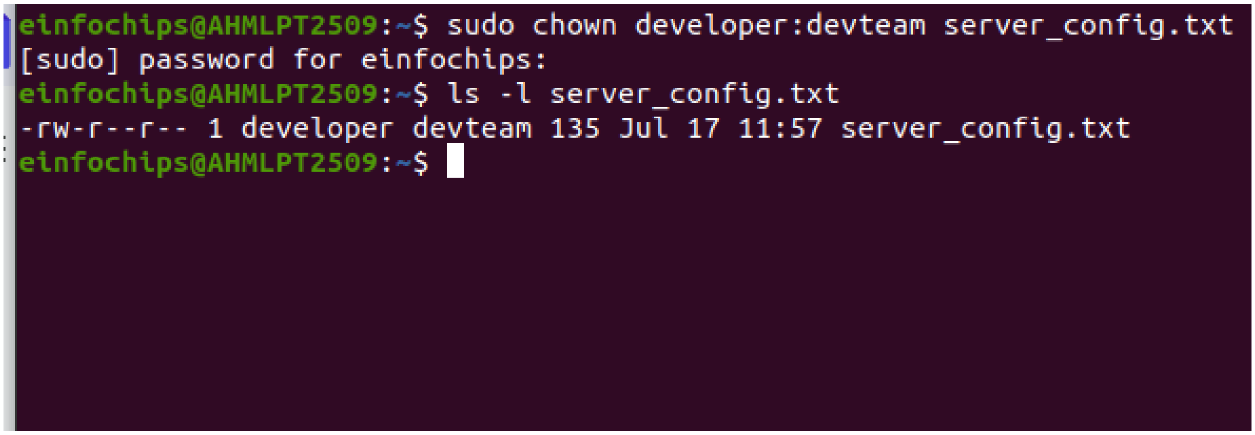
```
sudo chown developer:devteam server_config.txt
```



```
einfochips@AHMLPT2509:~$ sudo chown developer:devteam server_config.txt
[sudo] password for einfochips:
einfochips@AHMLPT2509:~$ 
```

4. Verify the change:

```
ls -l server_config.txt
```



```
einfochips@AHMLPT2509:~$ sudo chown developer:devteam server_config.txt
[sudo] password for einfochips:
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 developer devteam 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$ 
```

# Part 4: Controlling Services and Daemons (20 minutes):

Scenario: Manage the web server service to ensure it is running correctly and starts on boot.

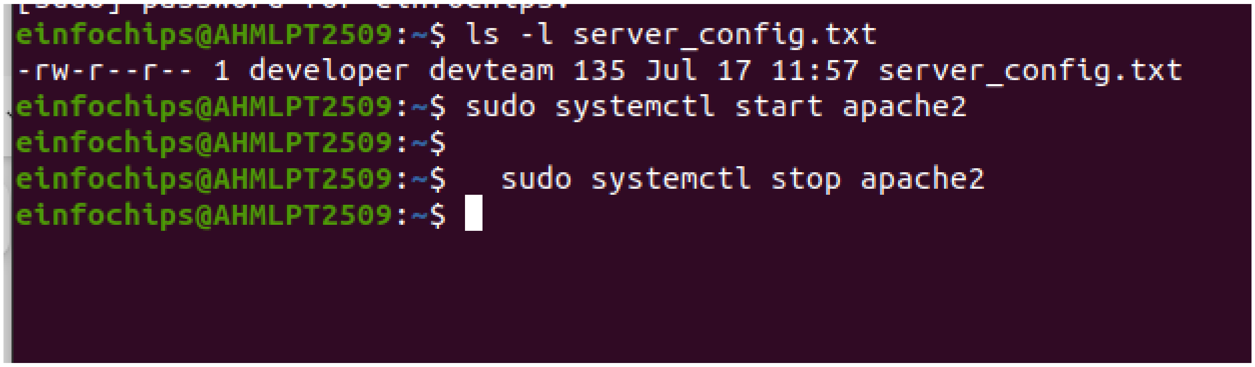
1. Managing Services with systemctl:

1.Start the Apache service:

```
sudo systemctl start apache2
```

2. Stop the Apache service:

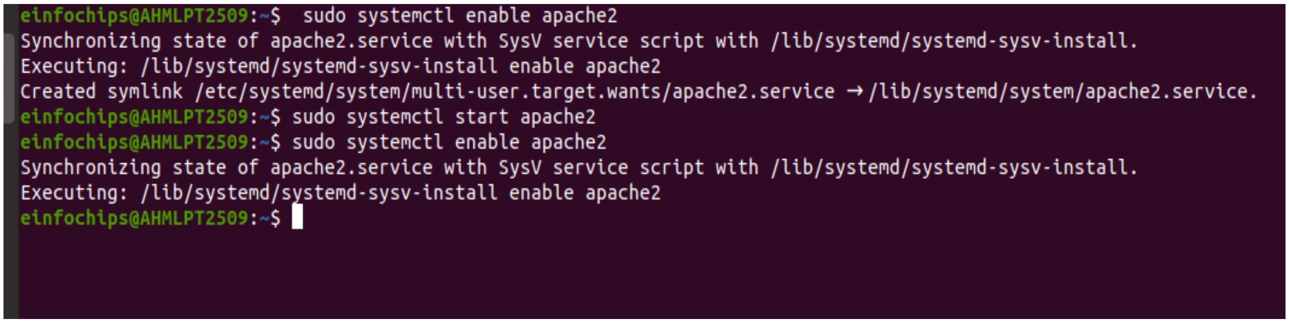
```
sudo systemctl stop apache2
```



```
[sudo] password for einfochips:
einfochips@AHMLPT2509:~$ ls -l server_config.txt
-rw-r--r-- 1 developer devteam 135 Jul 17 11:57 server_config.txt
einfochips@AHMLPT2509:~$ sudo systemctl start apache2
einfochips@AHMLPT2509:~$
einfochips@AHMLPT2509:~$   sudo systemctl stop apache2
einfochips@AHMLPT2509:~$ 
```

3. **Enable the Apache service to start on boot:**

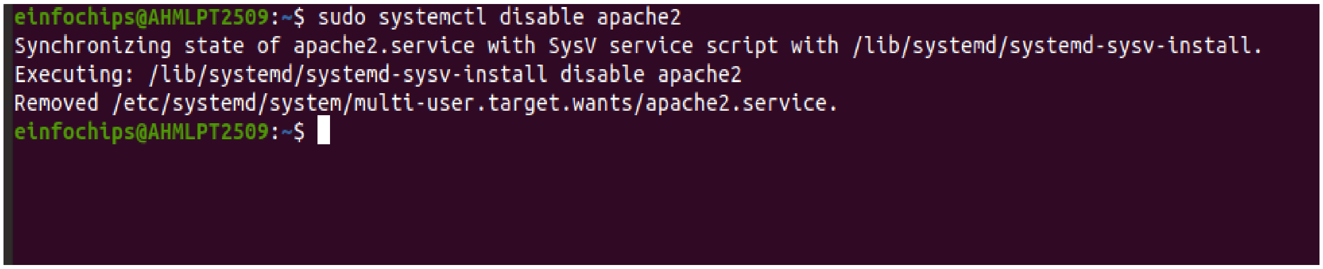
```
sudo systemctl enable apache2
```



```
einfochips@AHMLPT2509:~$  sudo systemctl enable apache2
Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable apache2
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.
einfochips@AHMLPT2509:~$ sudo systemctl start apache2
einfochips@AHMLPT2509:~$ sudo systemctl enable apache2
Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable apache2
einfochips@AHMLPT2509:~$ 
```

4. **Disable the Apache service:**

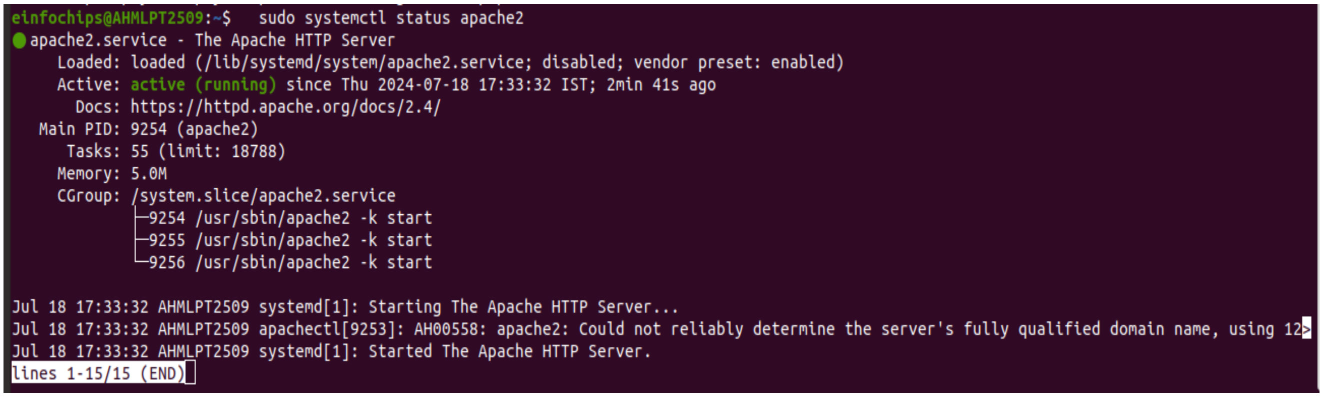
```
sudo systemctl disable apache2
```



```
einfochips@AHMLPT2509:~$ sudo systemctl disable apache2
Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install disable apache2
Removed /etc/systemd/system/multi-user.target.wants/apache2.service.
einfochips@AHMLPT2509:~$ 
```

5. **Check the status of the Apache service:**

```
sudo systemctl status apache2
```



```
einfochips@AHMLPT2509:~$   sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; disabled; vendor preset: enabled)
     Active: active (running) since Thu 2024-07-18 17:33:32 IST; 2min 41s ago
       Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 9254 (apache2)
      Tasks: 55 (limit: 18788)
     Memory: 5.0M
     CGroup: /system.slice/apache2.service
             ├─9254 /usr/sbin/apache2 -k start
             ├─9255 /usr/sbin/apache2 -k start
             └─9256 /usr/sbin/apache2 -k start

Jul 18 17:33:32 AHMLPT2509 systemd[1]: Starting The Apache HTTP Server...
Jul 18 17:33:32 AHMLPT2509 apachectl[9253]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 12>
Jul 18 17:33:32 AHMLPT2509 systemd[1]: Started The Apache HTTP Server.
lines 1-15/15 (END)
```

2. Understanding Daemons:

- Discuss the role of the `sshd` daemon in providing SSH access to the server.

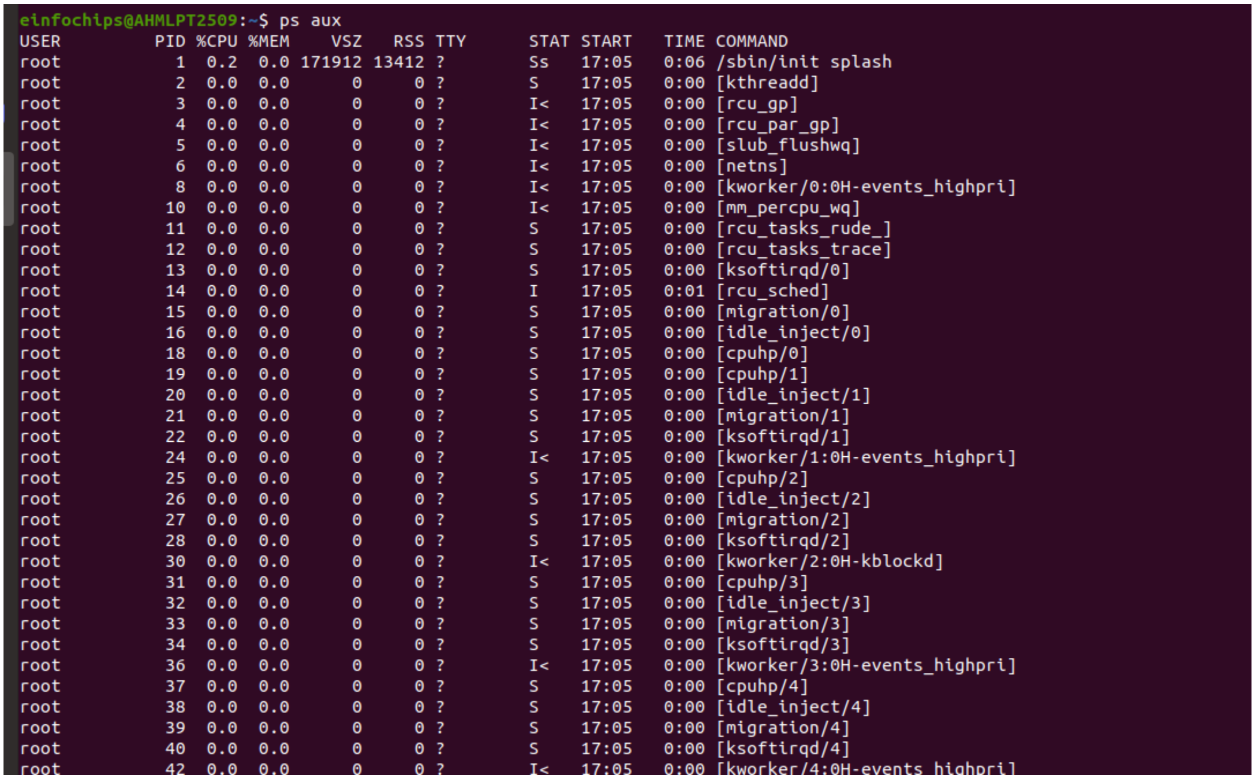
# Part 5: Process Handling (20 minutes):

Scenario: Monitor and manage processes to ensure the server is performing optimally.

1. Viewing Processes:

1. List all running processes:

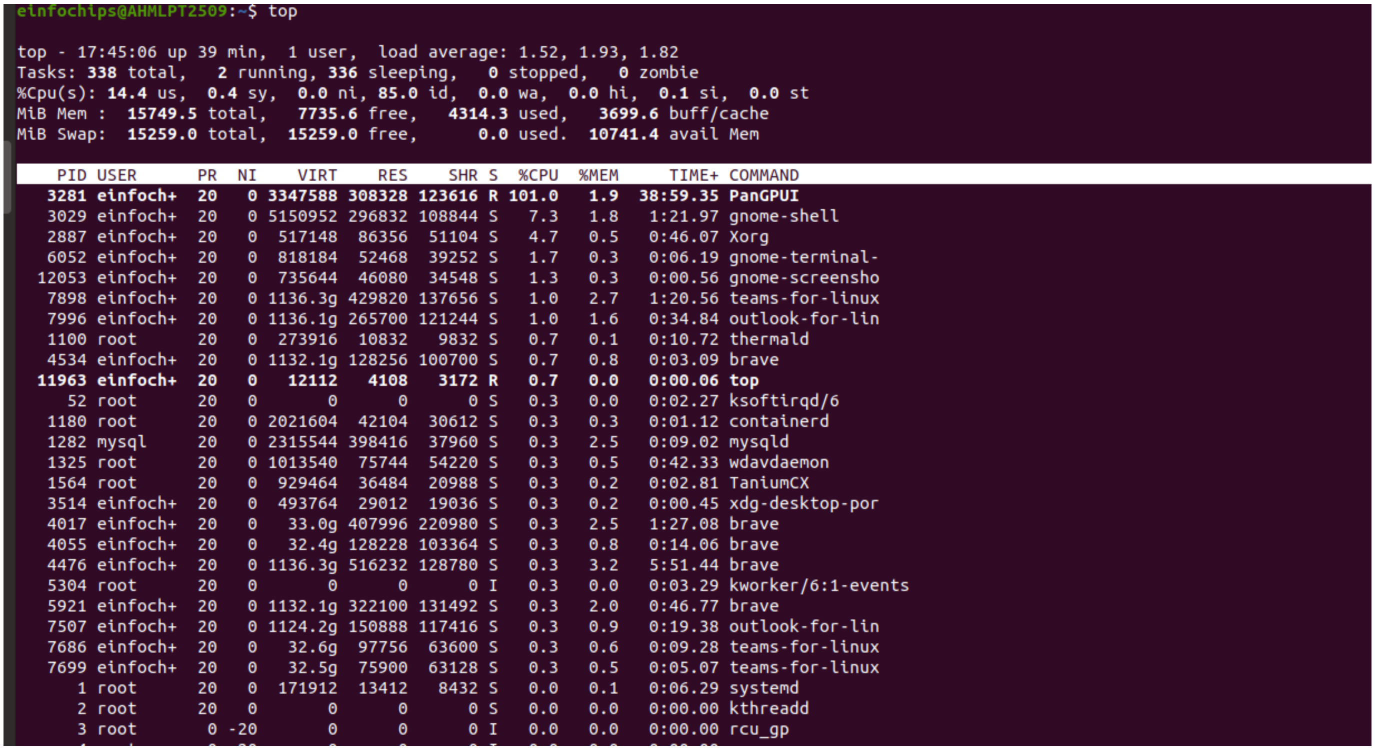
```
ps aux
```



```
einfochips@AHMLPT2509:~$ ps aux
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.2  0.0 171912 13412 ?        Ss   17:05   0:06 /sbin/init splash
root           2  0.0  0.0      0     0 ?        S    17:05   0:00 [kthreadd]
root           3  0.0  0.0      0     0 ?        I<   17:05   0:00 [rcu_gp]
root           4  0.0  0.0      0     0 ?        I<   17:05   0:00 [rcu_par_gp]
root           5  0.0  0.0      0     0 ?        I<   17:05   0:00 [slub_flushwq]
root           6  0.0  0.0      0     0 ?        I<   17:05   0:00 [netns]
root           8  0.0  0.0      0     0 ?        I<   17:05   0:00 [kworker/0:0H-events_highpri]
root          10  0.0  0.0      0     0 ?        I<   17:05   0:00 [mm_percpu_wq]
root          11  0.0  0.0      0     0 ?        S    17:05   0:00 [rcu_tasks_rude_]
root          12  0.0  0.0      0     0 ?        S    17:05   0:00 [rcu_tasks_trace]
root          13  0.0  0.0      0     0 ?        S    17:05   0:00 [ksoftirqd/0]
root          14  0.0  0.0      0     0 ?        I    17:05   0:01 [rcu_sched]
root          15  0.0  0.0      0     0 ?        S    17:05   0:00 [migration/0]
root          16  0.0  0.0      0     0 ?        S    17:05   0:00 [idle_inject/0]
root          18  0.0  0.0      0     0 ?        S    17:05   0:00 [cpuhp/0]
root          19  0.0  0.0      0     0 ?        S    17:05   0:00 [cpuhp/1]
root          20  0.0  0.0      0     0 ?        S    17:05   0:00 [idle_inject/1]
root          21  0.0  0.0      0     0 ?        S    17:05   0:00 [migration/1]
root          22  0.0  0.0      0     0 ?        S    17:05   0:00 [ksoftirqd/1]
root          24  0.0  0.0      0     0 ?        I<   17:05   0:00 [kworker/1:0H-events_highpri]
root          25  0.0  0.0      0     0 ?        S    17:05   0:00 [cpuhp/2]
root          26  0.0  0.0      0     0 ?        S    17:05   0:00 [idle_inject/2]
root          27  0.0  0.0      0     0 ?        S    17:05   0:00 [migration/2]
root          28  0.0  0.0      0     0 ?        S    17:05   0:00 [ksoftirqd/2]
root          30  0.0  0.0      0     0 ?        I<   17:05   0:00 [kworker/2:0H-kblockd]
root          31  0.0  0.0      0     0 ?        S    17:05   0:00 [cpuhp/3]
root          32  0.0  0.0      0     0 ?        S    17:05   0:00 [idle_inject/3]
root          33  0.0  0.0      0     0 ?        S    17:05   0:00 [migration/3]
root          34  0.0  0.0      0     0 ?        S    17:05   0:00 [ksoftirqd/3]
root          36  0.0  0.0      0     0 ?        I<   17:05   0:00 [kworker/3:0H-events_highpri]
root          37  0.0  0.0      0     0 ?        S    17:05   0:00 [cpuhp/4]
root          38  0.0  0.0      0     0 ?        S    17:05   0:00 [idle_inject/4]
root          39  0.0  0.0      0     0 ?        S    17:05   0:00 [migration/4]
root          40  0.0  0.0      0     0 ?        S    17:05   0:00 [ksoftirqd/4]
root          42  0.0  0.0      0     0 ?        I<   17:05   0:00 [kworker/4:0H-events_highpri]
```

2. Use `top` to view processes in real-time:

```
top
```

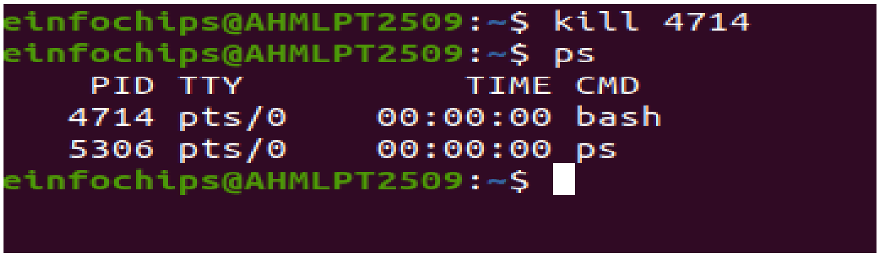


```
einfochips@AHMLPT2509:~$ top

top - 17:45:06 up 39 min,  1 user,  load average: 1.52, 1.93, 1.82
Tasks: 338 total,   2 running, 336 sleeping,   0 stopped,   0 zombie
%Cpu(s): 14.4 us,  0.4 sy,  0.0 ni, 85.0 id,  0.0 wa,  0.0 hi,  0.1 si,  0.0 st
MiB Mem :  15749.5 total,   7735.6 free,   4314.3 used,   3699.6 buff/cache
MiB Swap:  15259.0 total,  15259.0 free,      0.0 used.  10741.4 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3281 einfoch+  20   0 3347588 308328 123616 R 101.0   1.9  38:59.35 PanGPUI
   3029 einfoch+  20   0 5150952 296832 108844 S   7.3   1.8   1:21.97 gnome-shell
   2887 einfoch+  20   0  517148  86356  51104 S   4.7   0.5   0:46.07 Xorg
   6052 einfoch+  20   0  818184  52468  39252 S   1.7   0.3   0:06.19 gnome-terminal-
  12053 einfoch+  20   0  735644  46080  34548 S   1.3   0.3   0:00.56 gnome-screensho
   7898 einfoch+  20   0 1136.3g 429820 137656 S   1.0   2.7   1:20.56 teams-for-linux
   7996 einfoch+  20   0 1136.1g 265700 121244 S   1.0   1.6   0:34.84 outlook-for-lin
   1100 root      20   0  273916  10832   9832 S   0.7   0.1   0:10.72 thermald
   4534 einfoch+  20   0 1132.1g 128256 100700 S   0.7   0.8   0:03.09 brave
  11963 einfoch+  20   0   12112   4108   3172 R   0.7   0.0   0:00.06 top
     52 root      20   0       0      0      0 S   0.3   0.0   0:02.27 ksoftirqd/6
   1180 root      20   0 2021604  42104  30612 S   0.3   0.3   0:01.12 containerd
   1282 mysql     20   0 2315544 398416  37960 S   0.3   2.5   0:09.02 mysqld
   1325 root      20   0 1013540  75744  54220 S   0.3   0.5   0:42.33 wdavdaemon
   1564 root      20   0  929464  36484  20988 S   0.3   0.2   0:02.81 TaniumCX
   3514 einfoch+  20   0  493764  29012  19036 S   0.3   0.2   0:00.45 xdg-desktop-por
   4017 einfoch+  20   0   33.0g 407996 220980 S   0.3   2.5   1:27.08 brave
   4055 einfoch+  20   0   32.4g 128228 103364 S   0.3   0.8   0:14.06 brave
   4476 einfoch+  20   0 1136.3g 516232 128780 S   0.3   3.2   5:51.44 brave
   5304 root      20   0       0      0      0 I   0.3   0.0   0:03.29 kworker/6:1-events
   5921 einfoch+  20   0 1132.1g 322100 131492 S   0.3   2.0   0:46.77 brave
   7507 einfoch+  20   0 1124.2g 150888 117416 S   0.3   0.9   0:19.38 outlook-for-lin
   7686 einfoch+  20   0   32.6g  97756  63600 S   0.3   0.6   0:09.28 teams-for-linux
   7699 einfoch+  20   0   32.5g  75900  63128 S   0.3   0.5   0:05.07 teams-for-linux
      1 root      20   0  171912  13412   8432 S   0.0   0.1   0:06.29 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
      3 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 rcu_gp
```

2. Managing Processes:

1. **Identify a process to kill using `ps` or `top`, then kill it:**

```
kill <PID>
```



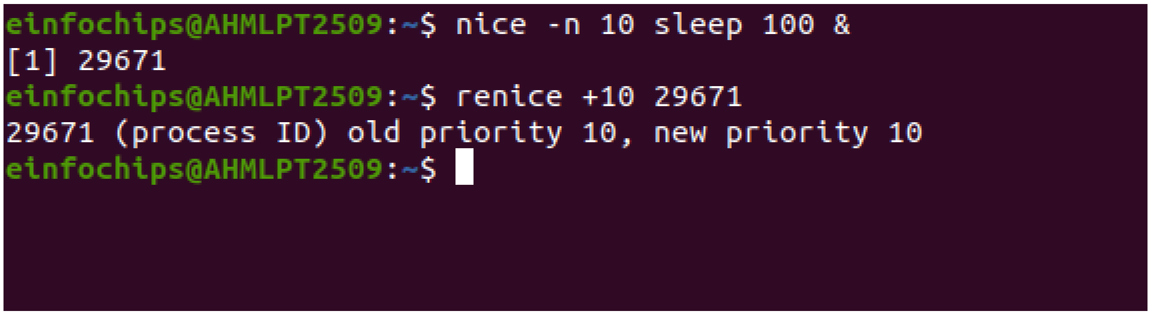
```
einfochips@AHMLPT2509:~$ kill 4714
einfochips@AHMLPT2509:~$ ps
    PID TTY          TIME CMD
   4714 pts/0    00:00:00 bash
   5306 pts/0    00:00:00 ps
einfochips@AHMLPT2509:~$ 
```

3. Change the priority of a process (e.g., running `sleep` with a lower priority):

```
nice -n 10 sleep 100 &
```

4.Change the priority of the process using renice:

```
renice +10 <PID>
```



```
einfochips@AHMLPT2509:~$ nice -n 10 sleep 100 &
[1] 29671
einfochips@AHMLPT2509:~$ renice +10 29671
29671 (process ID) old priority 10, new priority 10
einfochips@AHMLPT2509:~$
```