

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 a file `server_config.txt` using Nano:

```
nano server_config.txt
```

-

Add the following content:

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

-

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

2. Using Vi

Edit the same file with Vi:

```
vi server_config.txt
```

-

Append the following text:

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

-

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

3. Using Vim

Further edit the file with Vim:

```
vim server_config.txt
```

-

Add the following text:

```
Configuration Complete: Yes
```

- Save and exit (Esc, :wq).

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
```

```
einfochips@PUNELPT0436:~/DevopsTraining$ ls
server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ vi server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ vim server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ sudo adduser developer
[sudo] password for einfochips:
Adding user `developer' ...
Adding new group `developer' (1000) ...
Adding new user `developer' (1000) with group `developer' ...
Creating home directory `/home/developer' ...
Copying files 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 []:
  Room Number []:
  Work Phone []:
  Home Phone []:
  Other []:
Is the information correct? [Y/n] y
einfochips@PUNELPT0436:~/DevopsTraining$
```

Remove the user **developer**:

```
sudo deluser developer
```

2. Managing Groups

Create a group **devteam**:

```
sudo groupadd devteam
```

Add the user **developer** to the **devteam** group:

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

Remove the user **developer** from the **devteam** group:

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

○

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--**).

2. Changing Permissions and Ownership

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

```
chmod 644 server_config.txt
```

Verify the change:

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

○

Change the owner to **developer** and the group to **devteam**:

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

○

Verify the change:

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

```
einfochips@PUNELPT0436:~/DevopsTraining$ sudo groupadd devteam
[sudo] password for einfochips:
einfochips@PUNELPT0436:~/DevopsTraining$ sudo usermod -aG devteam developer
einfochips@PUNELPT0436:~/DevopsTraining$ sudo gpasswd -d developer devteam
Removing user developer from group devteam
einfochips@PUNELPT0436:~/DevopsTraining$ ls -l server_config.txt
-rw-rw-r-- 1 einfochips einfochips 135 Jul  9 10:31 server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ sudo chmod 644 server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ ls -l server_config.txt
-rw-r--r-- 1 einfochips einfochips 135 Jul  9 10:31 server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ sudo chown developer:devteam server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$ ls -l server_config.txt
-rw-r--r-- 1 developer devteam 135 Jul  9 10:31 server_config.txt
einfochips@PUNELPT0436:~/DevopsTraining$
```

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

Start the Apache service:

```
sudo systemctl start apache2
```

○

Stop the Apache service:

```
sudo systemctl stop apache2
```

○

Enable the Apache service to start on boot:

```
sudo systemctl enable apache2
```

○

Disable the Apache service:

```
sudo systemctl disable apache2
```

○

Check the status of the Apache service:

```
sudo systemctl status apache2
```

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

List all running processes:

```
ps aux
```

```
einfochips@PUNELPT0436:~/DevopsTraining$ ps aux
USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.0  0.0 173512 15112 ?        Ss   Jul05   1:17 /sbin/init splash
root           2  0.0  0.0      0     0 ?        S    Jul05   0:00 [kthreadd]
root           3  0.0  0.0      0     0 ?        I<   Jul05   0:00 [rcu_gp]
root           4  0.0  0.0      0     0 ?        I<   Jul05   0:00 [rcu_par_gp]
root           5  0.0  0.0      0     0 ?        I<   Jul05   0:00 [slub_flushwq]
root           6  0.0  0.0      0     0 ?        I<   Jul05   0:00 [netns]
root           8  0.0  0.0      0     0 ?        I<   Jul05   0:00 [kworker/0:0H-events_hi
root          10  0.0  0.0      0     0 ?        I<   Jul05   0:00 [mm_percpu_wq]
root          11  0.0  0.0      0     0 ?        S    Jul05   0:00 [rcu_tasks_rude_]
root          12  0.0  0.0      0     0 ?        S    Jul05   0:00 [rcu_tasks_trace]
root          13  0.0  0.0      0     0 ?        S    Jul05   0:01 [ksoftirqd/0]
root          14  0.0  0.0      0     0 ?        I    Jul05   0:20 [rcu_sched]
root          15  0.0  0.0      0     0 ?        S    Jul05   0:00 [migration/0]
root          16  0.0  0.0      0     0 ?        S    Jul05   0:00 [idle_inject/0]
root          18  0.0  0.0      0     0 ?        S    Jul05   0:00 [cpuhp/0]
root          19  0.0  0.0      0     0 ?        S    Jul05   0:00 [cpuhp/1]
root          20  0.0  0.0      0     0 ?        S    Jul05   0:00 [idle_inject/1]
root          21  0.0  0.0      0     0 ?        S    Jul05   0:00 [migration/1]
root          22  0.0  0.0      0     0 ?        S    Jul05   0:00 [ksoftirqd/1]
root          24  0.0  0.0      0     0 ?        I<   Jul05   0:00 [kworker/1:0H-events_hi
root          25  0.0  0.0      0     0 ?        S    Jul05   0:00 [cpuhp/2]
root          26  0.0  0.0      0     0 ?        S    Jul05   0:00 [idle_inject/2]
```

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

```
top
```

```
top - 11:01:10 up 3 days, 17:58, 1 user, load average: 0.55, 0.53, 0.46
Tasks: 333 total, 1 running, 332 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1.8 us, 0.8 sy, 0.0 ni, 97.5 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 15802.6 total, 2158.2 free, 5135.0 used, 8509.3 buff/cache
MiB Swap: 2048.0 total, 2048.0 free, 0.0 used. 9816.7 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
4052	einloch+	20	0	4798632	341504	106112	S	9.0	2.1	15:00.09	gnome-shell
3904	einloch+	20	0	530080	92512	53844	S	3.3	0.6	7:27.95	Xorg
237	root	-51	0	0	0	0	S	1.3	0.0	0:37.78	irq/51-DELL08B8
291863	root	20	0	772836	22032	18912	S	0.7	0.1	0:07.81	TaniumCX
373814	einloch+	20	0	12128	4208	3260	R	0.7	0.0	0:00.42	top
14	root	20	0	0	0	0	I	0.3	0.0	0:20.20	rcu_sched
1226	root	20	0	273768	10680	9668	S	0.3	0.1	1:14.65	thermald
1280	jenkins	20	0	9830.6m	1.8g	26608	S	0.3	11.5	2:59.03	java
1315	root	20	0	2022744	44456	31816	S	0.3	0.3	0:32.58	containerd
2936	grafana	20	0	1596860	149512	107504	S	0.3	0.9	1:04.27	grafana
7133	einloch+	20	0	3611024	481524	129980	S	0.3	3.0	1:58.45	PanGPUI
28466	einloch+	20	0	1135.5g	461500	145084	S	0.3	2.9	37:44.93	teams-for-linux
261050	einloch+	20	0	32.7g	291236	219564	S	0.3	1.8	3:31.50	chrome
291788	root	20	0	3639476	32644	17684	S	0.3	0.2	0:31.66	TaniumCX
291808	root	20	0	773268	21144	18660	S	0.3	0.1	0:07.53	TaniumCX
291819	root	20	0	857856	28140	22472	S	0.3	0.2	0:08.18	TaniumCX
291874	root	20	0	778852	29036	24848	S	0.3	0.2	0:08.61	TaniumCX
334654	root	20	0	1333724	48148	17264	S	0.3	0.3	0:16.02	TaniumClient
1	root	20	0	173512	15112	8296	S	0.0	0.1	1:17.13	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.04	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
5	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	slub_flushwq

2. Managing Processes

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

`kill <PID>`

```

1226 root      20    0  273768 10680   9668 S   0.3   0.1   1:14.67 thermald
3885 einfoch+   9  -11 3318352 23260  17612 S   0.3   0.1   2:40.51 pulseaudio
3906 einfoch+  20    0   8868   5952   3840 S   0.3   0.0   0:08.42 dbus-daemon
4126 einfoch+  20    0  162848  7484   6704 S   0.3   0.0   0:03.35 at-spi2-registr
4413 einfoch+  20    0  340976 24016  17580 S   0.3   0.1   0:00.53 gsd-wacom
18527 einfoch+  20    0 1124.2g 163312 120388 S   0.3   1.0   1:43.49 outlook-for-lin
19946 einfoch+  20    0   32.5g  81464  64992 S   0.3   0.5   1:26.65 outlook-for-lin
27174 einfoch+  20    0 1131.5g 191372 125028 S   0.3   1.2   2:02.73 teams-for-linux
291819 root      20    0  857856 28140  22472 S   0.3   0.2   0:08.19 TaniumCX
291874 root      20    0  778852 29036  24848 S   0.3   0.2   0:08.63 TaniumCX
291885 root      20    0  771608 20884  17916 S   0.3   0.1   0:09.15 TaniumCX
291900 root      20    0 2079860 50936  25024 S   0.3   0.3   0:07.96 TaniumCX
334209 einfoch+  20    0 1074504 81920  49088 S   0.3   0.5   0:33.54 nautilus
364681 root      20    0         0         0         0 I   0.3   0.0   0:01.12 kworker/4:2-events
   1 root      20    0  173512 15112   8296 S   0.0   0.1   1:17.13 systemd
   2 root      20    0         0         0         0 S   0.0   0.0   0:00.04 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
   5 root      0  -20         0         0         0 I   0.0   0.0   0:00.00 slub_flushwq
   6 root      0  -20         0         0         0 I   0.0   0.0   0:00.00 netns
   8 root      0  -20         0         0         0 I   0.0   0.0   0:00.00 kworker/0:0H-even+
  10 root      0  -20         0         0         0 I   0.0   0.0   0:00.00 mm_percpu_wq
  11 root      20    0         0         0         0 S   0.0   0.0   0:00.00 rcu_tasks_rude_
  12 root      20    0         0         0         0 S   0.0   0.0   0:00.00 rcu_tasks_trace

einfochips@PUNELPT0436:~/DevopsTraining$
einfochips@PUNELPT0436:~/DevopsTraining$ kill 27174

```

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

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

Change the priority of the process using `renice`:

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

Creating and Deploying a Static Website with Apache2

Preparation (5 minutes)

- Ensure you have access to a Linux environment (e.g., virtual machines, EC2 instances, or local installations) with `sudo` privileges.

Activity Breakdown

Part 1: Installing Apache2 (5 minutes)

1. Update Package Lists

Open the terminal and run:

```
sudo apt update
```

○

2. Install Apache2

Install Apache2 by running:

```
sudo apt install apache2
```

```
einfochips@PUNELPT0436:~/DevopsTraining$ sudo systemctl start apache2
Failed to start apache2.service: Unit apache2.service not found.
einfochips@PUNELPT0436:~/DevopsTraining$ apache2 --version

Command 'apache2' not found, but can be installed with:

sudo apt install apache2-bin

einfochips@PUNELPT0436:~/DevopsTraining$ sudo apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  bridge-utils linux-headers-5.15.0-105-generic linux-hwe-5.15-headers-5.15.0-105
  linux-image-5.15.0-105-generic linux-modules-5.15.0-105-generic
  linux-modules-extra-5.15.0-105-generic ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3
  libaprutil1-ldap liblua5.2-0
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
0 upgraded, 9 newly installed, 0 to remove and 1 not upgraded.
Need to get 1,827 kB of archives.
After this operation, 7,973 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu focal/main amd64 libapr1 amd64 1.6.5-1ubuntu1 [91.4
kB]
Get:2 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1 amd64 1.6.1-4u
buntu2.2 [85.1 kB]
Get:3 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-dbd-sqlite3 am
d64 1.6.1-4ubuntu2.2 [10.5 kB]
Get:4 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-ldap amd64 1.6
.1-4ubuntu2.2 [8,752 B]
```

3. Start and Enable Apache2

Start the Apache2 service:

```
sudo systemctl start apache2
```

○

Enable Apache2 to start on boot:

```
sudo systemctl enable apache2
```



```
einfochips@PUNELPT0436:~/DevopsTraining$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2024-07-09 10:55:20 IST; 1min 57s ago
     Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 371791 (apache2)
    Tasks: 55 (limit: 18810)
   Memory: 5.0M
   CGroup: /system.slice/apache2.service
           └─371791 /usr/sbin/apache2 -k start
             └─371792 /usr/sbin/apache2 -k start
               └─371793 /usr/sbin/apache2 -k start

Jul 09 10:55:20 PUNELPT0436 systemd[1]: Starting The Apache HTTP Server...
Jul 09 10:55:20 PUNELPT0436 apachectl[371790]: AH00558: apache2: Could not reliably deter
Jul 09 10:55:20 PUNELPT0436 systemd[1]: Started The Apache HTTP Server.
einfochips@PUNELPT0436:~/DevopsTraining$
```

4. Verify Installation

- Open a web browser and navigate to http://your_server_ip. You should see the Apache2 default page.

Part 2: Creating the Website (10 minutes)

1. Navigate to the Web Directory

Change to the web root directory:

```
cd /var/www/html
```

2. Create a New Directory for the Website

Create a directory named `mystaticwebsite`:

```
sudo mkdir mystaticwebsite
```

Change ownership of the directory:

```
sudo chown -R $USER:$USER /var/www/html/mystaticwebsite
```

3. Create HTML File

Create and edit the `index.html` file:

```
nano /var/www/html/mystaticwebsite/index.html
```

Add the following content:

```
<!DOCTYPE html>
```

```
<html>

<head>

  <title>My Static Website</title>

  <link rel="stylesheet" type="text/css" href="styles.css">

</head>

<body>

  <h1>Welcome to My Static Website</h1>

  <p>This is a simple static website using Apache2.</p>

  <script src="script.js"></script>

</body>

</html>
```

- - Save and exit (Ctrl+O, Enter, Ctrl+X).
4. **Create CSS File**

Create and edit the `styles.css` file:

```
nano /var/www/html/mystaticwebsite/styles.css
```

○

Add the following content:

```
body {

  font-family: Arial, sans-serif;

  background-color: #f0f0f0;

  text-align: center;

  margin: 0;

  padding: 20px;

}

h1 {
```

```
color: #333;  
}
```

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

5. Create JavaScript File

Create and edit the `script.js` file:

```
nano /var/www/html/mystaticwebsite/script.js
```

-

Add the following content:

```
document.addEventListener('DOMContentLoaded', function() {  
    console.log('Hello, World!');  
});
```

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

6. Add an Image

Download or copy an image file (e.g., `logo.png`) to the website directory:

```
cp /path/to/your/logo.png /var/www/html/mystaticwebsite/logo.png
```

-

Update `index.html` to include the image:

```
<body>  
    <h1>Welcome to My Static Website</h1>  
      
    <p>This is a simple static website using Apache2.</p>  
    <script src="script.js"></script>  
</body>
```

-

Part 3: Configuring Apache2 to Serve the Website (10 minutes)

1. Create a Virtual Host File

Create and edit the virtual host configuration file:

```
sudo nano /etc/apache2/sites-available/mystaticwebsite.conf
```

○

Add the following content:

```
<VirtualHost *:80>

    ServerAdmin webmaster@localhost

    DocumentRoot /var/www/html/mystaticwebsite

    ErrorLog ${APACHE_LOG_DIR}/error.log

    CustomLog ${APACHE_LOG_DIR}/access.log combined

</VirtualHost>
```

○

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

2. **Enable the New Virtual Host**

Enable the virtual host configuration:

```
sudo a2ensite mystaticwebsite.conf
```

○

3. **Disable the Default Site**

Disable the default site configuration:

```
sudo a2dissite 000-default.conf
```

○

4. **Reload Apache2**

Reload the Apache2 service to apply the changes:

```
sudo systemctl reload apache2
```

```
Activities Terminal Jul 9 11:39
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite

rm: cannot remove 'my-app/src/logo.svg': Permission denied
rm: cannot remove 'my-app/src/reportWebVitals.js': Permission denied
rm: cannot remove 'my-app/src/setupTests.js': Permission denied
rm: cannot remove 'my-app/.gitignore': Permission denied
rm: cannot remove 'my-app/package.json': Permission denied
elnfochips@PUNELPT0436: /var/www/html$
elnfochips@PUNELPT0436: /var/www/html$ sudo rm -rf my-app/
elnfochips@PUNELPT0436: /var/www/html$ ls
index.html index.nginx-debian.html
elnfochips@PUNELPT0436: /var/www/html$ sudo mkdir mystaticwebsite
elnfochips@PUNELPT0436: /var/www/html$ sudo chown -R $USER:$USER /var/www/html/mystaticwebsite/
elnfochips@PUNELPT0436: /var/www/html$ ls -la
total 28
drwxr-xr-x 3 root root 4096 Jul 9 11:24 .
drwxr-xr-x 3 root root 4096 Apr 8 15:29 ..
-rw-r--r-- 1 root root 10918 Jul 9 10:55 index.html
-rw-r--r-- 1 root root 612 Apr 8 15:29 index.nginx-debian.html
drwxr-xr-x 2 elnfochips elnfochips 4096 Jul 9 11:24 mystaticwebsite
elnfochips@PUNELPT0436: /var/www/html$ cd mystaticwebsite/
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim index.html
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim styles.css
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim script.js
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ cp /home/elnfochips/Downloads/peakpx.jpg ./logo.png
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ ks
ks: command not found
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ ls
index.html logo.png script.js styles.css
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim index.html
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim index.html
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ sudo vim /etc/apache2/sites-available/mystaticwebsite.conf
000-default.conf default-ssl.conf mystaticwebsite.conf
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ sudo a2ensite mystaticwebsite.conf
Enabling site mystaticwebsite.
To activate the new configuration, you need to run:
  systemctl reload apache2
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ sudo a2dissite 000-default.conf
Site 000-default disabled.
To activate the new configuration, you need to run:
  systemctl reload apache2
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ sudo systemctl reload apache2.service
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim index.html
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$ vim index.html
elnfochips@PUNELPT0436: /var/www/html/mystaticwebsite$
```

5. Test the Configuration

- Open a web browser and navigate to http://your_server_ip. You should see the static website with the HTML, CSS, JS, and image.

