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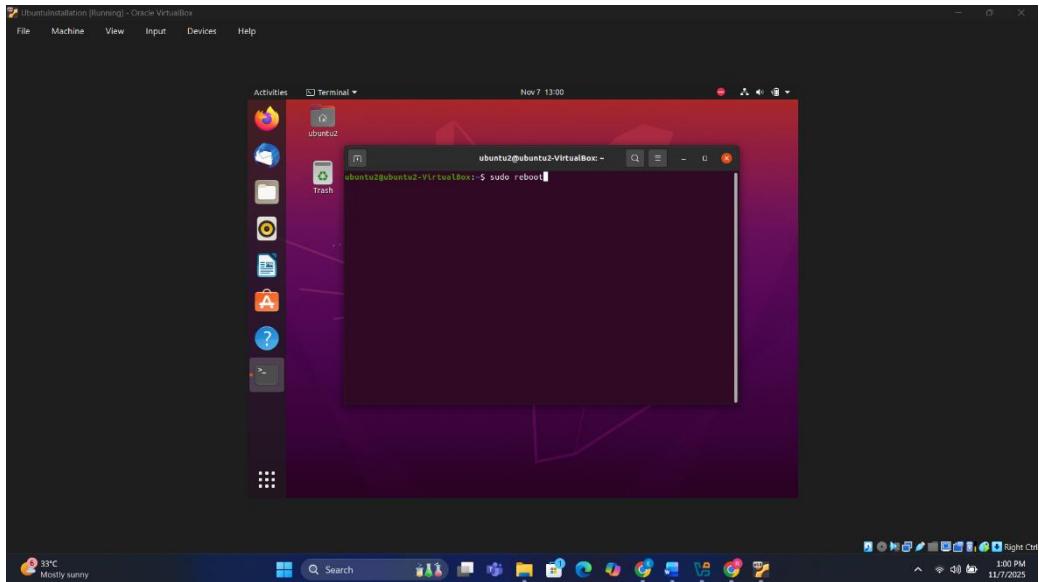
November 7, 2025

IT414 – Systems Administration and Maintenance

FTA2: Exploring Linux Boot Process and System Startup

## Part 1: Observing the Boot Process

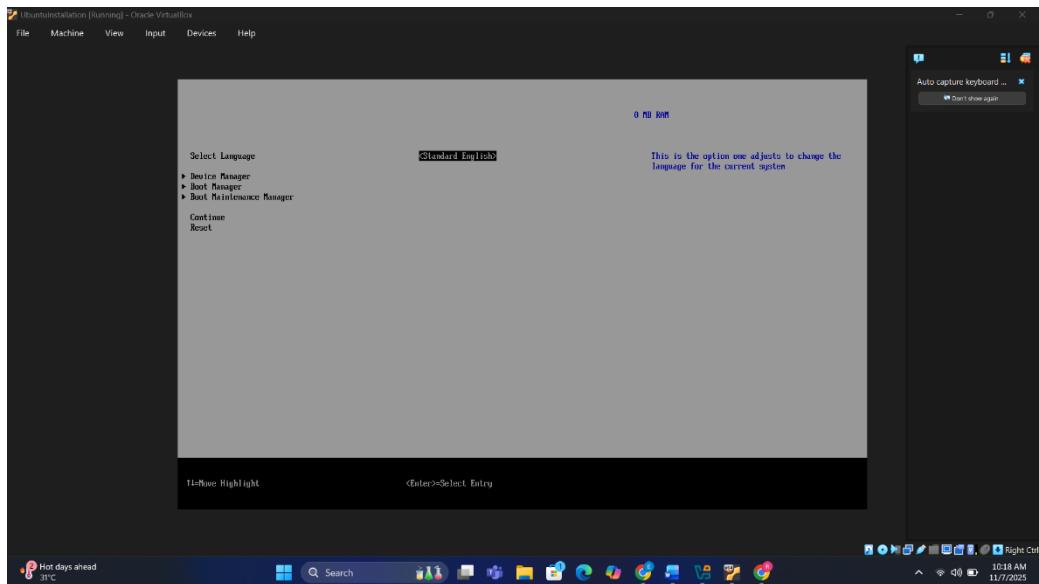
1. Reboot your Linux virtual machine.



**Figure 1:** Restart or Reboot command in Linux Terminal

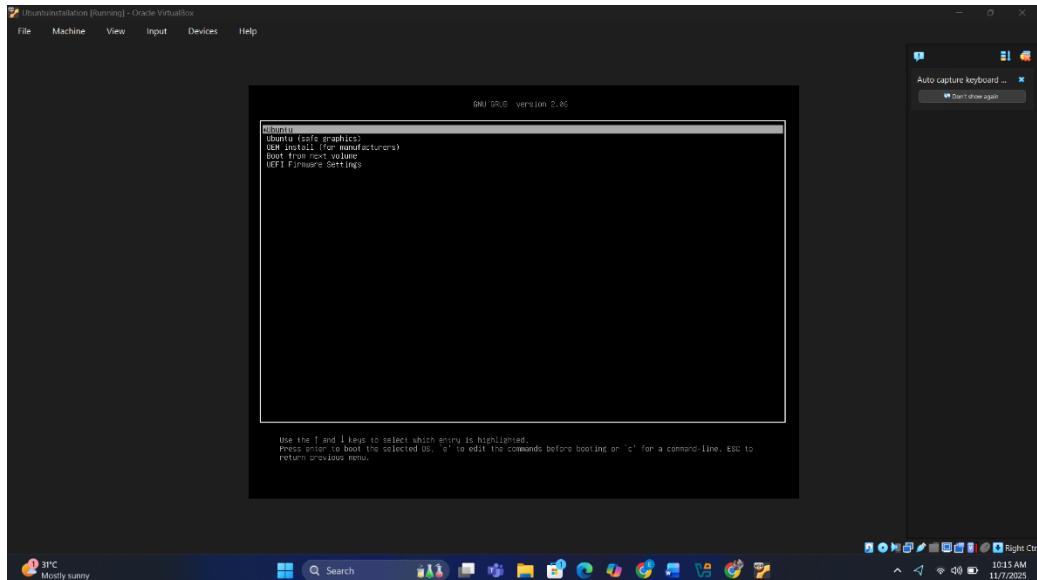
2. While the system starts, observe and note:

- The appearance of the **BIOS/UEFI** screen.



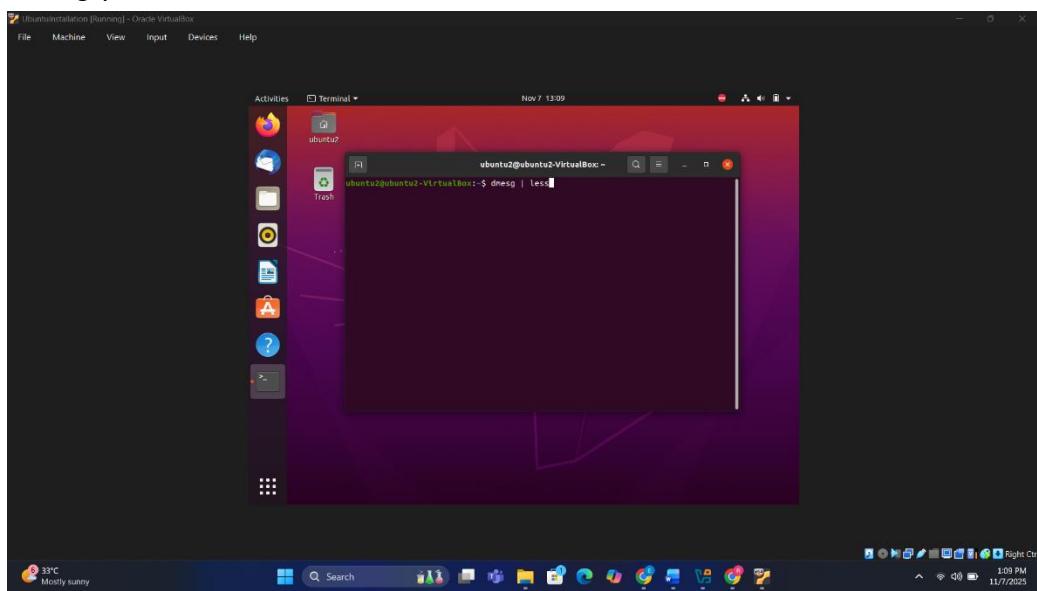
**Figure 2:** BIOS / UEFI Screen

- The **GRUB menu** (boot loader screen).



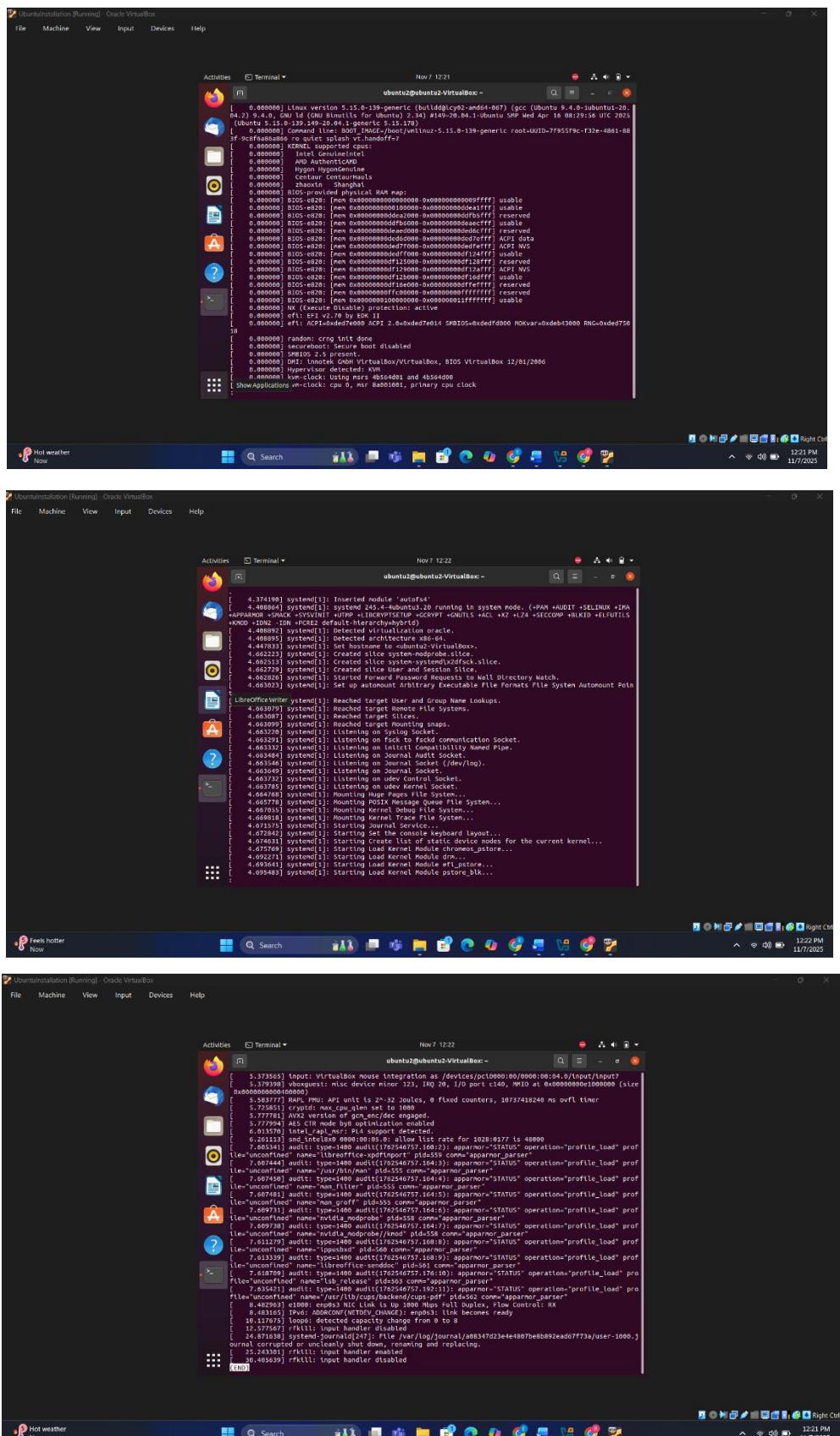
**Figure 3:** GRUB menu

3. After logging in, open the terminal and run:
4. `dmesg | less`



**Figure 4:** `dmesg | less` command in Linux Terminal

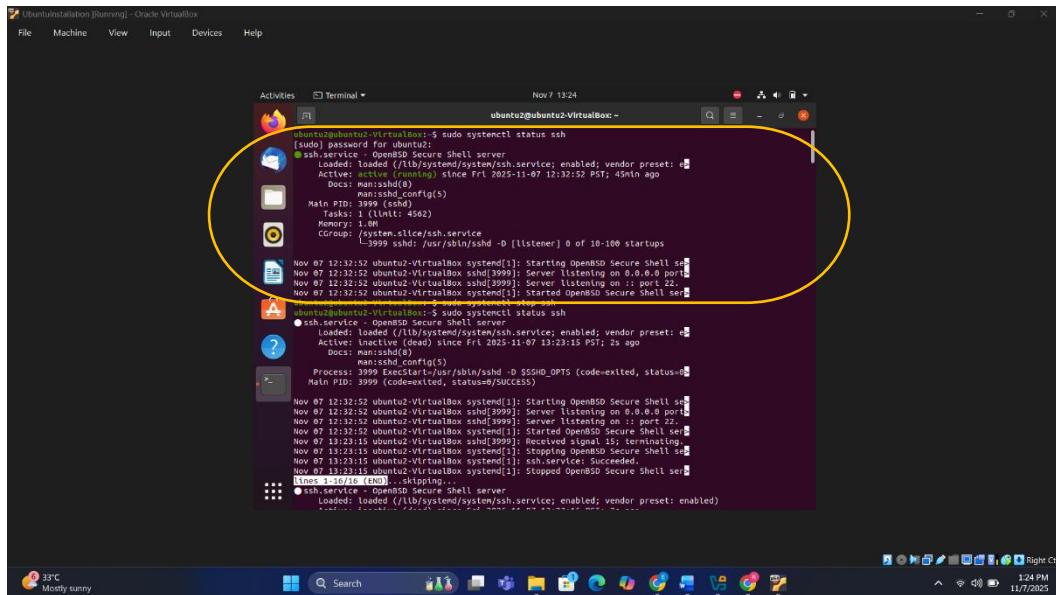
- Identify messages related to the **kernel** loading process.



**Figure 5:** Messages in the Kernel Loading Process

## Part 2: Managing Services Using systemctl

1. Check the status of a service (example: SSH or Network Manager):
2. sudo systemctl status ssh



```
ubuntu@ubuntu2:~$ sudo systemctl status ssh
[sudo] password for ubuntu:
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2025-11-07 12:32:52 PST; 45min ago
     Docs: man:ssh(8)
           man:ssh_config(5)
       Main PID: 3999 (sshd)
      Tasks: 1 (lwn(4:4962)
        Memory: 1.0M
      CGroup: /system.slice/ssh.service
              └─3999 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Nov 07 12:32:52 ubuntu2-VirtualBox systemd[1]: Starting openbsd Secure Shell server...
Nov 07 12:32:52 ubuntu2-VirtualBox sshd[3999]: Server listening on 0.0.0.0 port 22.
Nov 07 12:32:52 ubuntu2-VirtualBox sshd[3999]: Server listening on :: port 22.
Nov 07 12:32:52 ubuntu2-VirtualBox systemd[1]: Started openbsd Secure Shell server.

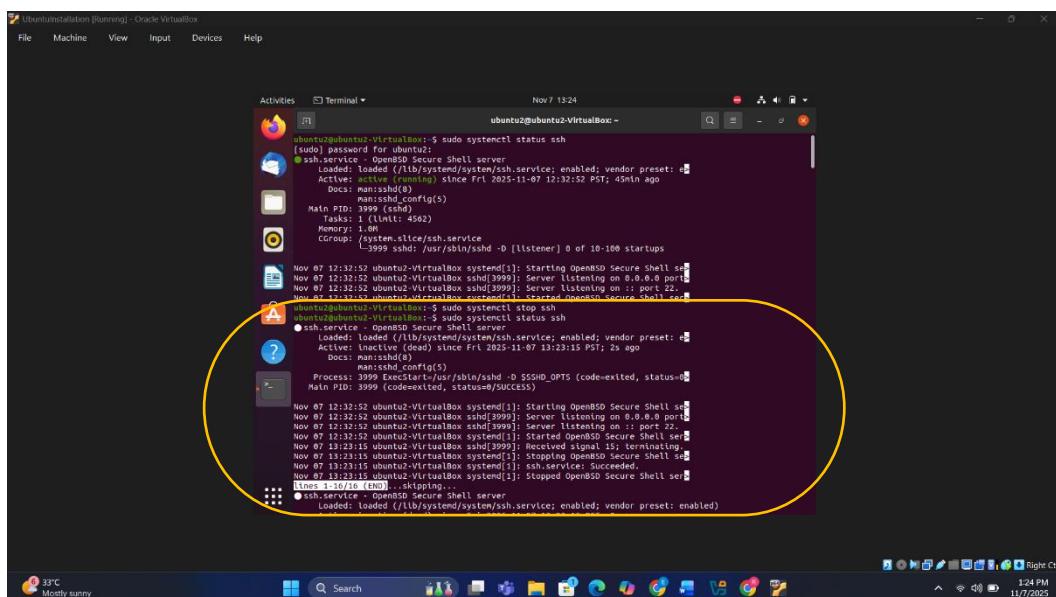
A ubuntu@ubuntu2:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: inactive (dead) since Fri 2025-11-07 13:23:15 PST; 2s ago
     Docs: man:ssh(8)
           man:ssh_config(5)
       Process: 3999 ExecStart=/usr/sbin/sshd -D $SSH_OPTS (code-exited, status=0)
      Main PID: 3999 (code-exited, status=0/SUCCESS)

Nov 07 12:32:52 ubuntu2-VirtualBox systemd[1]: Starting OpenBSD Secure Shell server...
Nov 07 12:32:52 ubuntu2-VirtualBox sshd[3999]: Server listening on 0.0.0.0 port 22.
Nov 07 12:32:52 ubuntu2-VirtualBox sshd[3999]: Server listening on :: port 22.
Nov 07 12:32:52 ubuntu2-VirtualBox systemd[1]: Started OpenBSD Secure Shell server.
Nov 07 13:23:15 ubuntu2-VirtualBox sshd[3999]: Received signal 15; terminating.
Nov 07 13:23:15 ubuntu2-VirtualBox sshd[3999]: Stopping OpenBSD Secure Shell server...
Nov 07 13:23:15 ubuntu2-VirtualBox systemd[1]: ssh.service: Succeeded.
Nov 07 13:23:15 ubuntu2-VirtualBox systemd[1]: Stopped OpenBSD Secure Shell server.

● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
```

Figure 6: Output using sudo systemctl status ssh in Linux Terminal

3. Stop the service, then restart it:
4. sudo systemctl stop ssh



```
ubuntu@ubuntu2:~$ sudo systemctl status ssh
[sudo] password for ubuntu:
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2025-11-07 12:32:52 PST; 45min ago
     Docs: man:ssh(8)
           man:ssh_config(5)
       Main PID: 3999 (sshd)
      Tasks: 1 (lwn(4:4962)
        Memory: 1.0M
      CGroup: /system.slice/ssh.service
              └─3999 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

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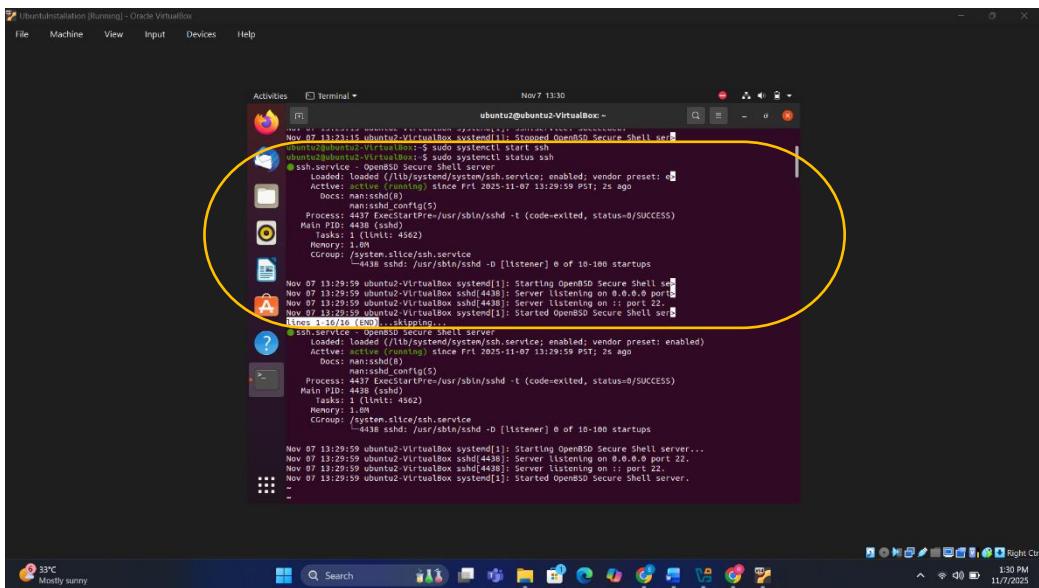
A ubuntu@ubuntu2:~$ sudo systemctl stop ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: inactive (dead) since Fri 2025-11-07 13:23:15 PST; 2s ago
     Docs: man:ssh(8)
           man:ssh_config(5)
       Process: 3999 ExecStart=/usr/sbin/sshd -D $SSH_OPTS (code-exited, status=0)
      Main PID: 3999 (code-exited, status=0/SUCCESS)

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Nov 07 13:23:15 ubuntu2-VirtualBox systemd[1]: ssh.service: Succeeded.
Nov 07 13:23:15 ubuntu2-VirtualBox systemd[1]: Stopped OpenBSD Secure Shell server.

● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
```

Figure 7: Output using sudo systemctl stop ssh in Linux Terminal

## 5. sudo systemctl start ssh

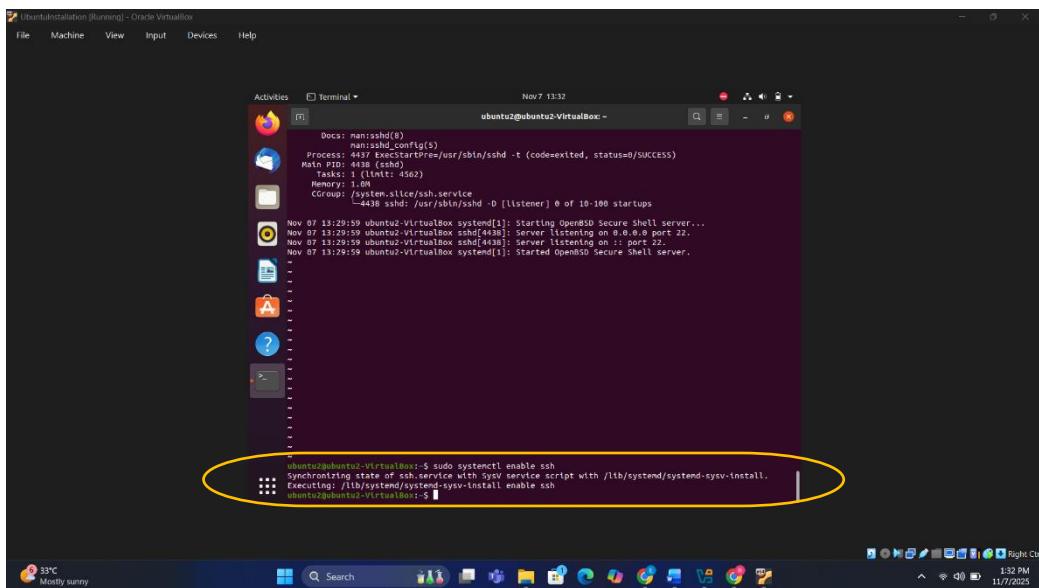


```
Nov 07 13:23:15 ubuntu2@ubuntu2-VirtualBox:~$ sudo systemctl start ssh
[...]
Nov 07 13:29:59 ubuntu2@ubuntu2-VirtualBox:~$ sudo systemctl status ssh
[...]
Nov 07 13:29:59 ubuntu2@ubuntu2-VirtualBox:~$
```

**Figure 8: Output using `sudo systemctl start ssh` in Linux Terminal**

## 6. Enable the service to start at boot:

## 7. sudo systemctl enable ssh



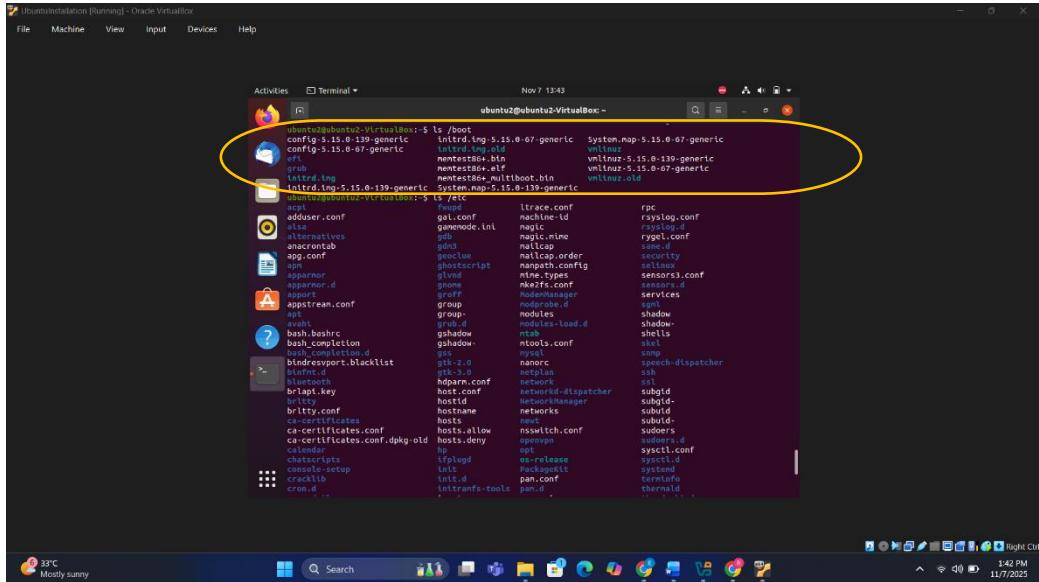
```
Nov 07 13:29:59 ubuntu2@ubuntu2-VirtualBox:~$ sudo systemctl enable ssh
[...]
Nov 07 13:29:59 ubuntu2@ubuntu2-VirtualBox:~$
```

**Figure 9: Output using `sudo systemctl enable ssh` in Linux Terminal**

## Part 3: Exploring the Linux Filesystem Hierarchy

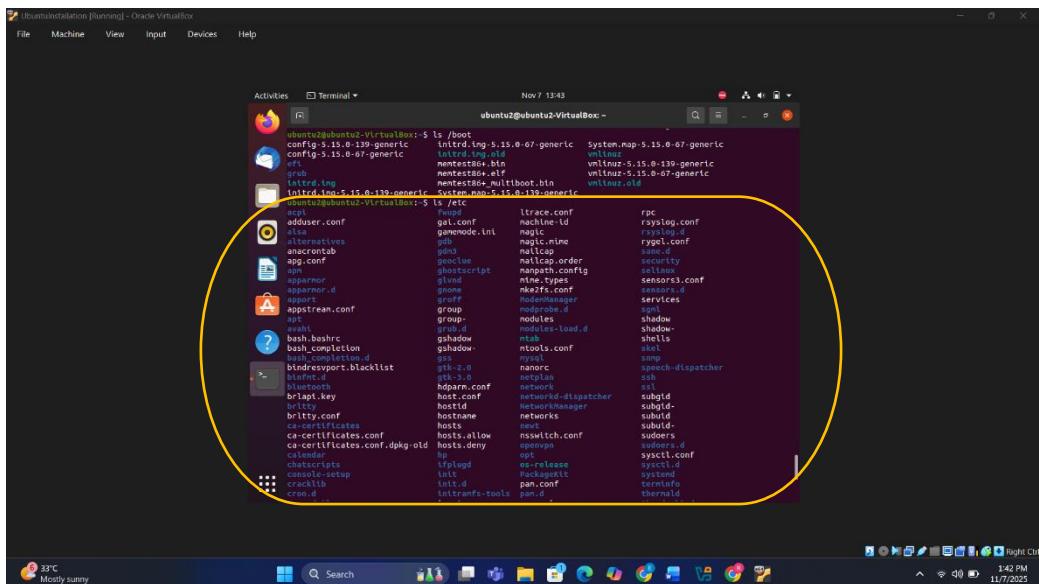
1. Using the terminal, explore the following directories:

- /boot



**Figure 10:** Output using /boot command in Linux Terminal

- /etc



**Figure 11:** Output using /etc command in Linux Terminal

- /usr

A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "UbuntuInstallation [Running] - Oracle VirtualBox". The terminal content shows the output of the "/usr" command, which lists numerous files and directories under the /usr directory. A yellow oval highlights the terminal window. The desktop background shows icons for various applications like Dash, Home, and System Settings. The system tray at the bottom indicates it's 53°C and mostly sunny.

```
ubuntu2@ubuntu2-VirtualBox:~$ ls /usr
bin games include lib libexec libx32 local skin share src
backups cache lib local lock log mail metrics opt run snap spool tmp
ubuntu2@ubuntu2-VirtualBox:~$ /home
ubuntu2@ubuntu2-VirtualBox:~$
```

**Figure 12:** Output using /usr command in Linux Terminal

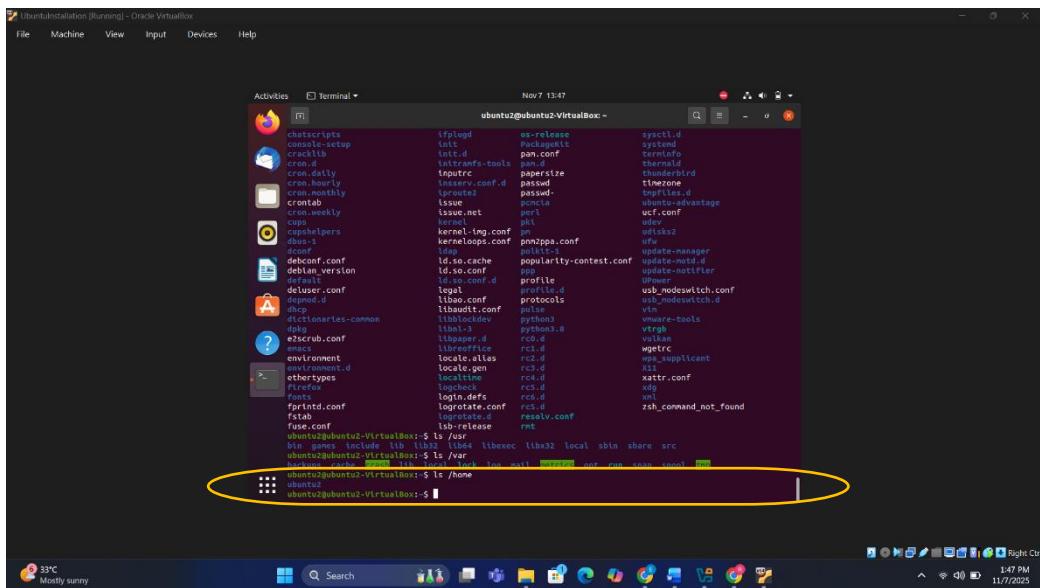
- /var

A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "UbuntuInstallation [Running] - Oracle VirtualBox". The terminal content shows the output of the "/var" command, which lists numerous files and directories under the /var directory. A yellow oval highlights the terminal window. The desktop background shows icons for various applications like Dash, Home, and System Settings. The system tray at the bottom indicates it's 53°C and mostly sunny.

```
ubuntu2@ubuntu2-VirtualBox:~$ ls /var
backups cache lib local lock log mail metrics opt run snap spool tmp
ubuntu2@ubuntu2-VirtualBox:~$ /home
ubuntu2@ubuntu2-VirtualBox:~$
```

**Figure 13:** Output using /var command in Linux Terminal

- o /home



**Figure 14:** Output using `/home` command in Linux Terminal

2. For each directory, describe its purpose and list **two subdirectories or files** it contains.
  3. Present your findings in a simple table (Directory | Description | Example Contents).

Directory	Description	Example Contents
/boot	Hosts vital files required to boot the system including the Linux kernel and bootloader settings.	vmlinuz-5.15.0-122-generic, grub/
/etc	Contain the system-wide configuration files which regulate the operation of the system and services.	hostname, network/
/usr	Includes applications installed by the user, common libraries and documentation utilized by every user.	bin/, share/
/var	Stores variable data files like logs, mail spools and caches, which are changed as long as the store operates.	log/, cache/
/home	The personal directories of every user are inside it; each user gets their files, documents and settings in them.	ubuntu2, Documents/

## **Part 4: Reflection**

Write a short paragraph (5–8 sentences) reflecting on:

- What you learned about the Linux boot process.
- How systemctl helps in managing system services.
- Why understanding the filesystem structure is essential for system administrators.

### **Answer:**

In this lab activity, we came to know that the process of boot in Linux occurs in a series of steps with the first step being the BIOS/UEFI, the second step being the GRUB bootloader, the third step is the Kernel loading, and the last step is the Init system which launches necessary services. The following stages assisted us in the realization of how the system gets started and gets ready to allow user access. We also got to know that systemctl is an efficient service in controlling system services whereby administrators can control startup, stop, or enable of the services upon booting to ensure the system operates smoothly. Visiting the Linux file system search revealed the structure of the hierarchy of directories, which are structured to serve a certain purpose. The /etc command used by the system to store configuration, /var used by the system to store logs and the /home used by the system to store user information. This structure is important to system administrators to trouble shoot, configure software and ensure the safety of the systems effectively. On the whole, the exercise increased our practical literacy on the management of Linux systems and emphasized the relevance of system booting processes as well as systematized file systems.