CS3003D: OPERATING SYSTEMS

ASSIGNMENT-1

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Batch: A

PROBLEM STATEMENT

Download the latest stable Linux kernel from kernel.org, compile it, and dual boot it with your current Linux version. Your current version as well as the new version should be present in the grub-menu.

METHODOLOGY

1. Ensure that you have a Linux version on your system.
2. Obtain the latest stable Linux kernel from kernel.org.
3. Install all development dependencies.
4. Configure and compile the kernel.
5. Install the compiled kernel and add grub entry.
6. Reboot the system.

EXPLANATION

The kernel is the essential centre of a computer operating system (OS). It is the core that provides basic services for all other parts of the OS. It is the main layer between the OS and hardware, and it helps with process and memory management, file systems, device control and networking.

In this report steps to upgrade to the latest stable Linux kernel (**5.14.1**) is explained.

COMMANDS:

Step 1: $uname -r

Get the current kernel version of your Linux distribution.

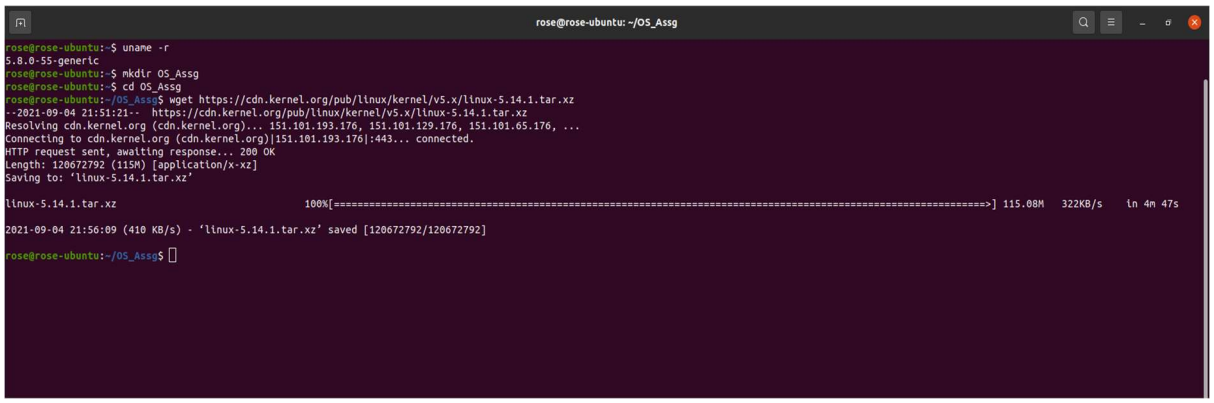
Step 2: $mkdir OS_Assg

$cd OS_Assg

We are creating a directory name OS_Assg in HOME and change directory to OS_Assg so that all files downloaded and extracted is in a single place.

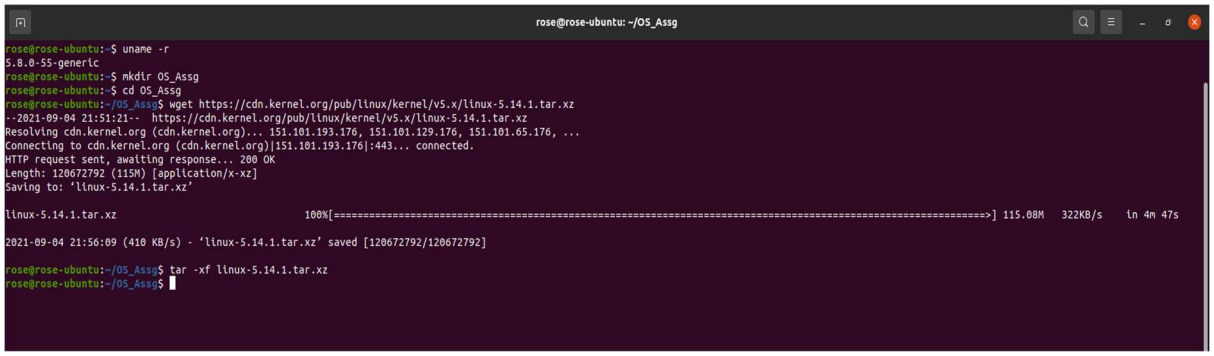
Step 3: $wget https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.14.1.tar.xz

This will download the Linux-5.14.1 kernel code published on kernel.org as a tar file which is latest stable Linux kernel. The tar file is about 120.7mb.



Step 4: $tar -xf linux-5.14.1.tar.xz

This will extract files from the tarball archive into the folder linux-5.14.1.



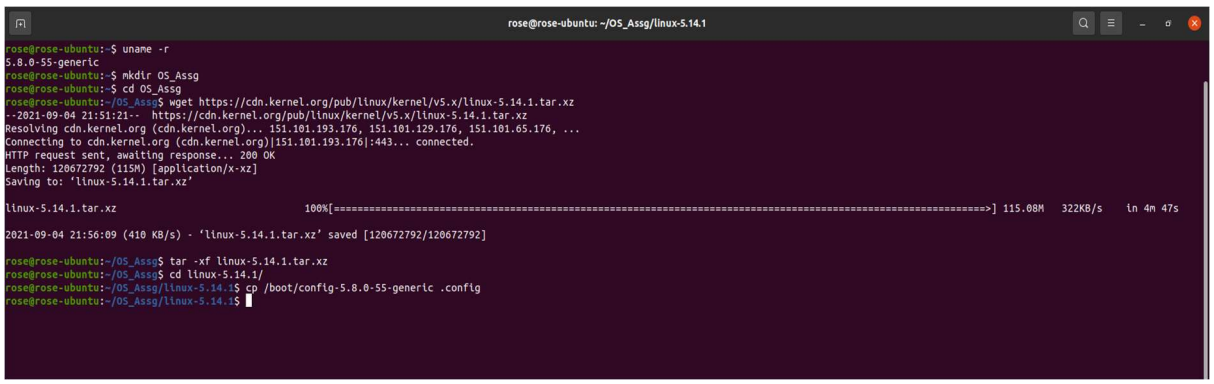
Step 5: $cd linux-5.14.1

Once done extracting the archive, the directory is changed to the extracted folder.

Step 6: $cp /boot/config-5.8.0-55-generic .config

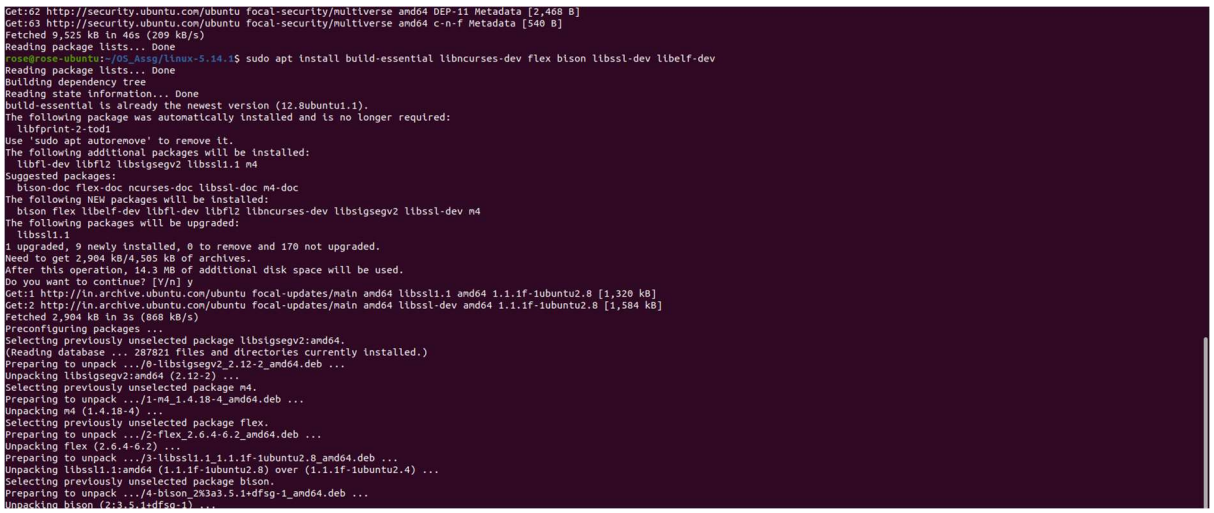
Before we compile the kernel, we need to make sure we configure it to specify which modules we want to be installed and which not to. Either we can configure the kernel from scratch using **make config** that starts a configure script which will ask you many questions regarding enabling or disabling modules and installing drivers or simply use the one that came with our Linux.

The command copies the config file of the existing Linux to the new config file.



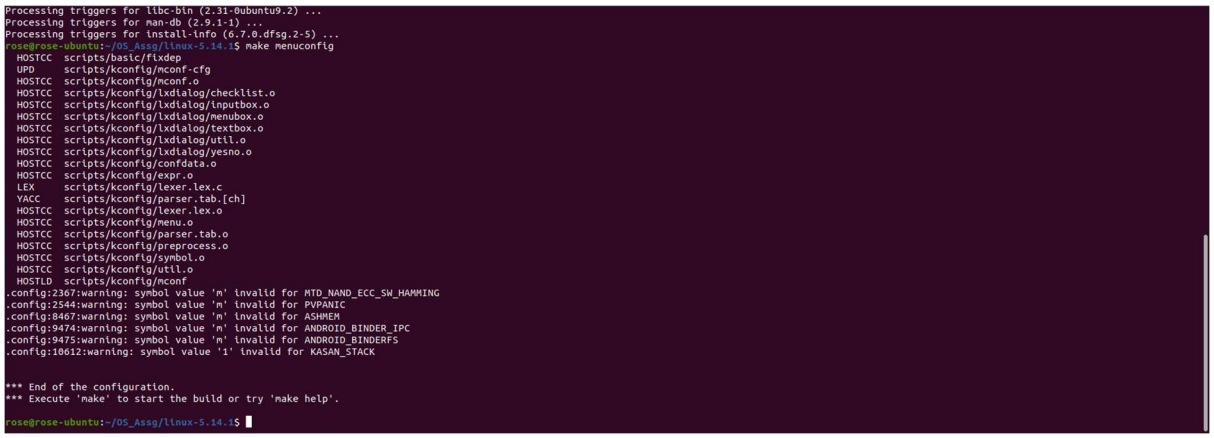
Step 7: $sudo apt install build-essential libncurses-dev flex bison libssl-dev libelf-dev

The command will install all the required dependencies for the kernel compilation.

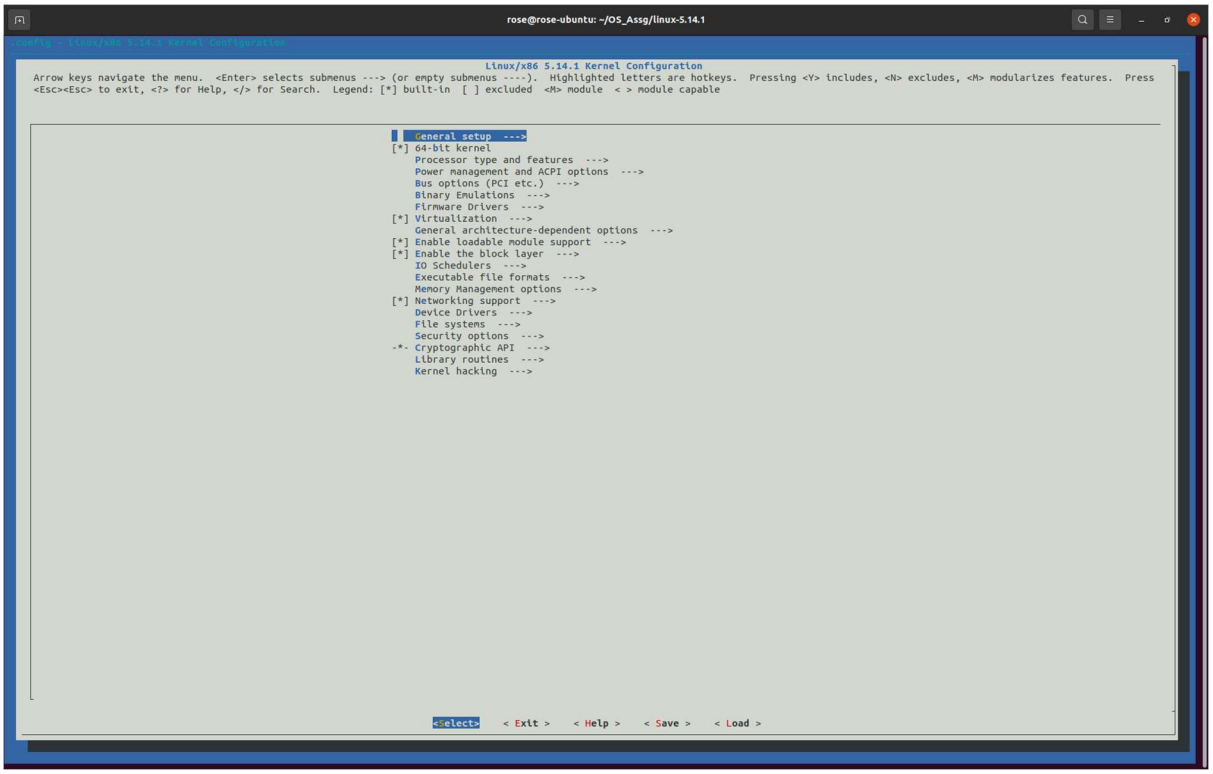


Step 8: $make menuconfig

Just to make sure that you have all the required files in the directory and you are good to compile the code check the menuconfig.



This command will open up a configuration tool that allows you to go through every module available and enable or disable what you need or don't need.



You can either choose to edit the given configuration or just save and exit.

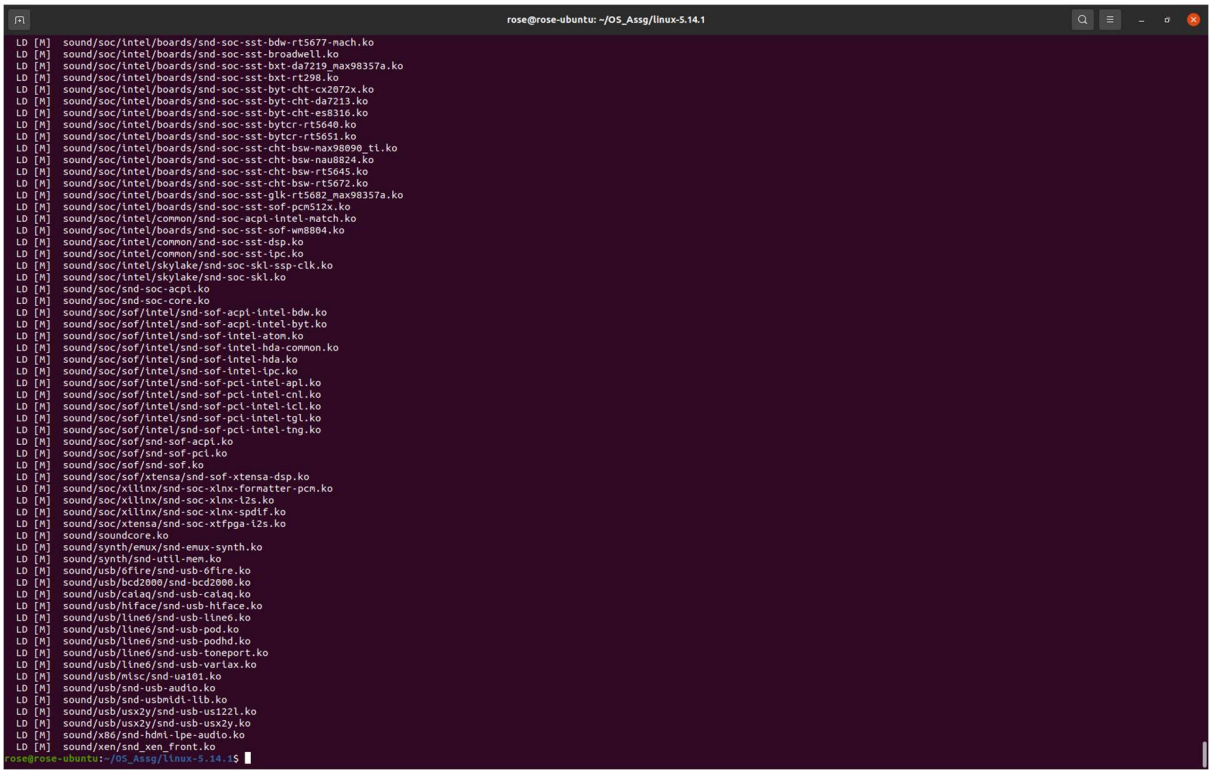
Step 9: $make -j4

This command will start compiling the kernel code.

Before compiling you need to make sure that you have enough disk space allotted as this took me around 25GB of space.

The -j parameter is to customize the number of threads you are allocating for the compiling process. In this case, it is 4. You can have 5 or 6 depending on your systems performance.

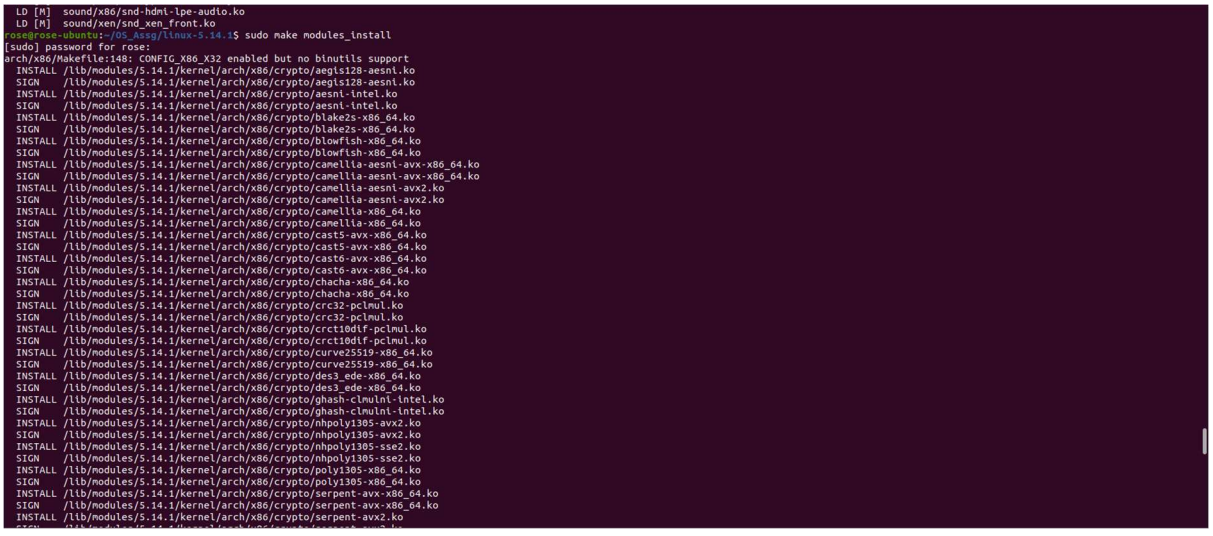
It almost 2 hours for the compilation. Make sure that you don't turn off your system or let it sleep during the process.



Step 10: $sudo make modules_install

$sudo make install

The above process updates the initramfs, which is responsible to look for kerels in the /boot folder and add them to the grub's configuration file. The command make install will also update the grub.cfg by default. So, we don't need to manually edit the grub.cfg file. GRUB is a multi-boot bootloader for most Linux distributions.



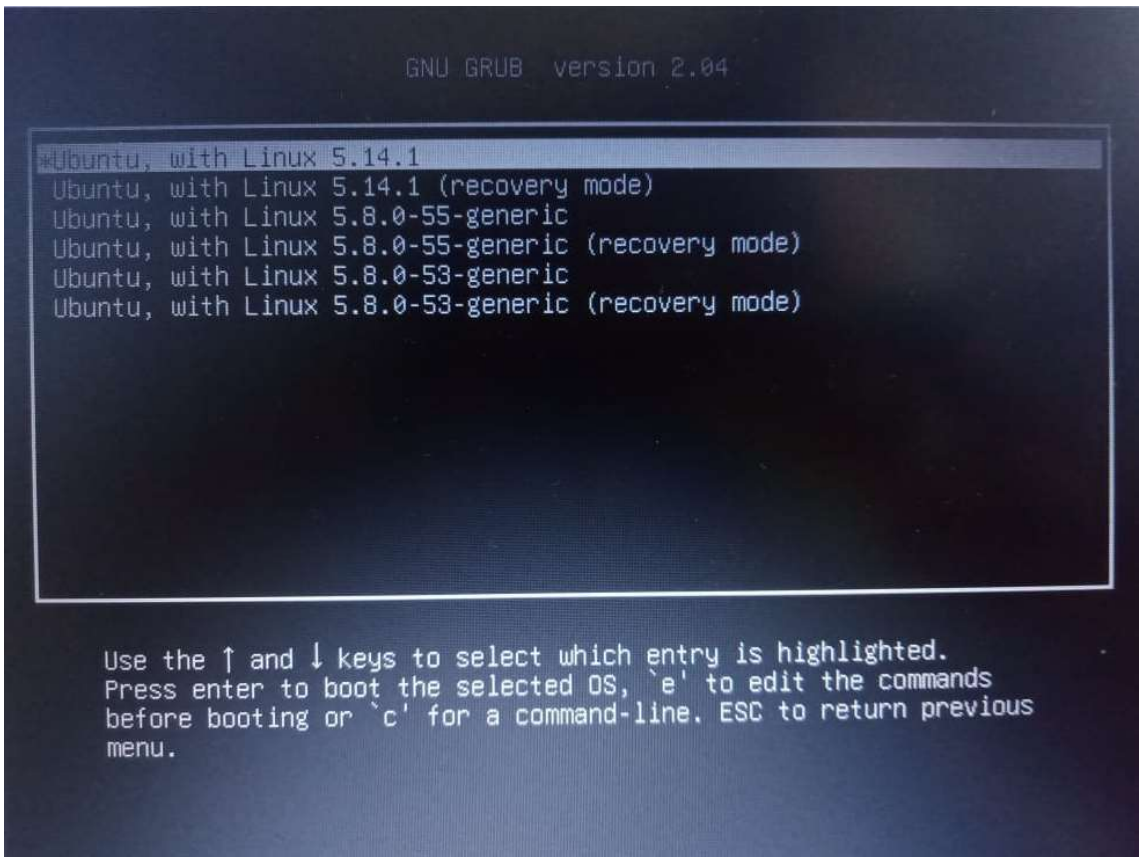
```
  SIGN    /lib/modules/5.14.1/kernel/sound/usb/usx2y/snd-usb-usx2y.ko
  INSTALL /lib/modules/5.14.1/kernel/sound/x86/snd-hdmi-lpe-audio.ko
  SIGN    /lib/modules/5.14.1/kernel/sound/x86/snd-hdmi-lpe-audio.ko
  INSTALL /lib/modules/5.14.1/kernel/sound/xen/snd_xen_front.ko
  SIGN    /lib/modules/5.14.1/kernel/sound/xen/snd_xen_front.ko
  DEPMOD  /lib/modules/5.14.1
rose@rose-ubuntu:~/OS_Assg/linux-5.14.1$ sudo make install
arch/x86/Makefile:148: CONFIG_X86_X32 enabled but no binutils support
sh ./arch/x86/boot/install.sh \
      5.14.1 arch/x86/boot/bzImage \
      System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 5.14.1 /boot/vmlinuz-5.14.1
run-parts: executing /etc/kernel/postinst.d/dkms 5.14.1 /boot/vmlinuz-5.14.1
 * dkms: running auto installation service for kernel 5.14.1                                                    [ OK ]
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 5.14.1 /boot/vmlinuz-5.14.1
update-initramfs: Generating /boot/initrd.img-5.14.1
run-parts: executing /etc/kernel/postinst.d/unattended-upgrades 5.14.1 /boot/vmlinuz-5.14.1
run-parts: executing /etc/kernel/postinst.d/update-notifier 5.14.1 /boot/vmlinuz-5.14.1
run-parts: executing /etc/kernel/postinst.d/vboxadd 5.14.1 /boot/vmlinuz-5.14.1
VirtualBox Guest Additions: Building the modules for kernel 5.14.1.

VirtualBox Guest Additions: Look at /var/log/vboxadd-setup.log to find out what
went wrong
run-parts: executing /etc/kernel/postinst.d/zz-update-grub 5.14.1 /boot/vmlinuz-5.14.1
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.14.1
Found initrd image: /boot/initrd.img-5.14.1
Found linux image: /boot/vmlinuz-5.8.0-55-generic
Found initrd image: /boot/initrd.img-5.8.0-55-generic
Found linux image: /boot/vmlinuz-5.8.0-53-generic
Found initrd image: /boot/initrd.img-5.8.0-53-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
rose@rose-ubuntu:~/OS_Assg/linux-5.14.1$
```

Step 11: $sudo reboot

You can directly restart or type the above command in the terminal. Once the system starts it will open CRUB menu. Open advanced settings and select the newly booted kernel i.e. version 5.14.1

CONCLUSION

When we restart the system we can see option to select the kernel module from GRUB menu in advanced options. Since it is the lasted version (5.14.1), it will be selected by default.



$uname -a

This command will give the current version of the kernel which should be 5.14.1