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B180427CS Batch-A

CS3003D: Operating Systems

Assignment 1 October 12, 2020

1. 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.

2. Methodology:

1. Dual booting can be directly done with the host OS but if some thing goes wrong then OS could be corrupted. Hence it's recommended to use a Virtual Machine. Install VMWare and load pop-OS into it.(Note: pop-OS is linux based on Ubuntu)
2. Download the kernel source code from kernel.org and extract the corresponding tar file.
3. Get all the required dependencies using apt
4. Compile the kernel
5. Install the compiled kernel and add it to grub entry.
6. Reboot the system

3. Process and Explanation:

Install VMware and get pop-OS stable version from the pop-OS official website. I'm using Pop-Os 20.04 LTS for this purpose. Give at least 80 to 100 GB memory space since the kernel compilation itself will be 21 GB. After installing ubuntu. Open terminal to get all the required dependencies.

```
$wget https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.8.13.tar.xz
```

This will download the kernel code published on https://cdn.kernel.org as a tar file. This file is of 107 mb around.

```
$tar -xf linux-5.8.13.tar.xz
```

This will extract the downloaded tar file into the folder linux-5.8.13 folder which contain all the source code. The kernel compilation options (like which modules should be included, which all drivers to be added) are managed through '.config' file located in the same folder. We are provided with 'make menuconfig' option to configure them with a TUI, I needed to install the following dependencies. (To get those work)

```
$sudo apt install build-essential libncurses-dev flex bison libssl-dev libelf-dev
```

The above command will install all the required dependencies for the kernel compilation. Now get the kernel code using wget command.

```
$cd linux-5.8.13/
$cp /boot/config-4.15.0-0-generic .config
sudo menuconfig
```

Just to make sure you have all the required files in this directory and you are good to compile the code check the menuconfig. I'm not making any changes so the configuration will be default configuration. Now save it as it is and run the following command to compile the kernel code.

```
$make -j5
```

This command will start compiling the kernel code. Here 5 describes no. of threads or parallel GCC instances taken to compile . If your system is good you can give 6 too. This compilation took two and half hours for me. Again it depends on your system. So maintain patience while executing and make sure you turn off screenoff and sleep mode. That can sometimes stop the process and os hangs. (Make sure for both host OS and vm)

After the compilation is over check the directory size which should be around 21 GB. Now run make install command which will install kernel modules to the /, and kernel image to /boot and start grub update to add new entry to boot.

```
$sudo make modules_install
$sudo make install
```

sudo make modules_install is not required if you are using Ubuntu but if you are using other linux you must include this command for proper execution.

The newer Pop-OS installations by default hide the GRUB boot menu by setting the ‘GRUB TIMEOUT='0‘, we need to update this, so that the menu remains visible. The GRUB config file is located in ‘/etc/default/grub‘, we can update the ‘GRUB TIMEOUT‘ there, and run grub update so that new configuration is loaded. Update ‘GRUB TIMEOUT’ to 5 or 10. Then comment the command GRUB MENU VISIBILITY so that Grub Menu Remains Visible.

```
$sudo vim /etc/default/grub
$sudo update-grub
```

If you get an error while executing vim command it means that you haven’t installed it in your OS. For this use the command “sudo apt install vim” to install the latest vim application into your OS. Now we are good to go and can reboot the system.

```
$sudo reboot
```

You can also directly restart or type the above command in the terminal. Now once the system starts it will open GRUB menu. Open advanced settings and select our newly booted kernel i.e. version 5.8.14

```
$uname -a
```

This above command will give the current version of the kernel which should be 5.8.14

4. Screenshots

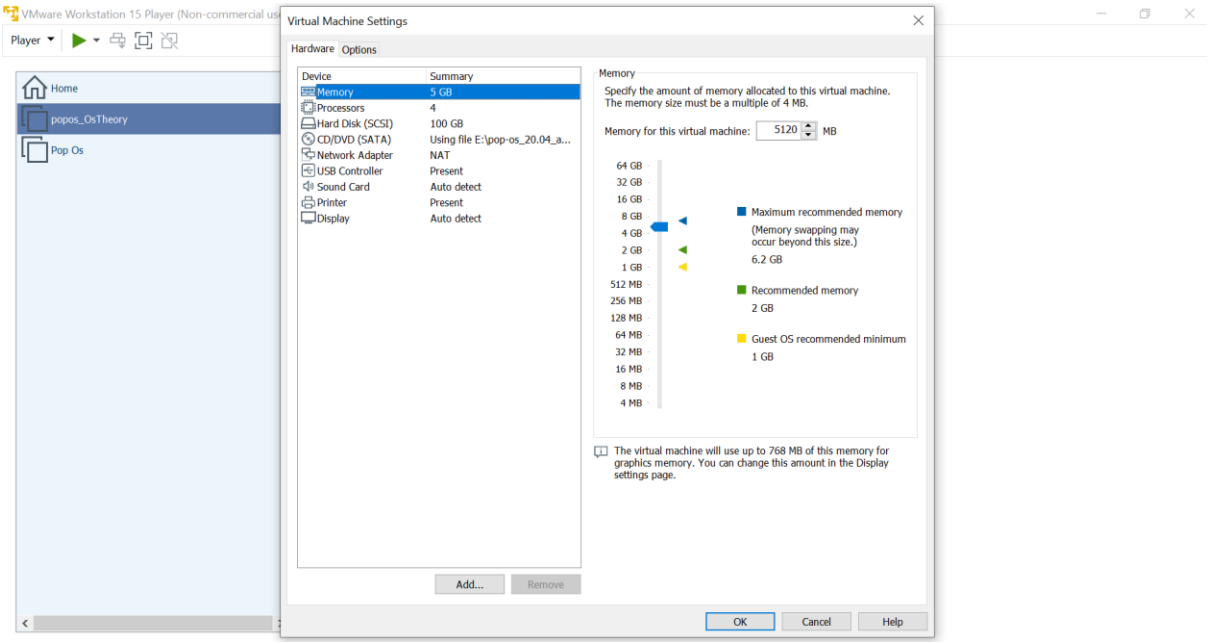

Figure 1.1 Specifications of Pop-OS

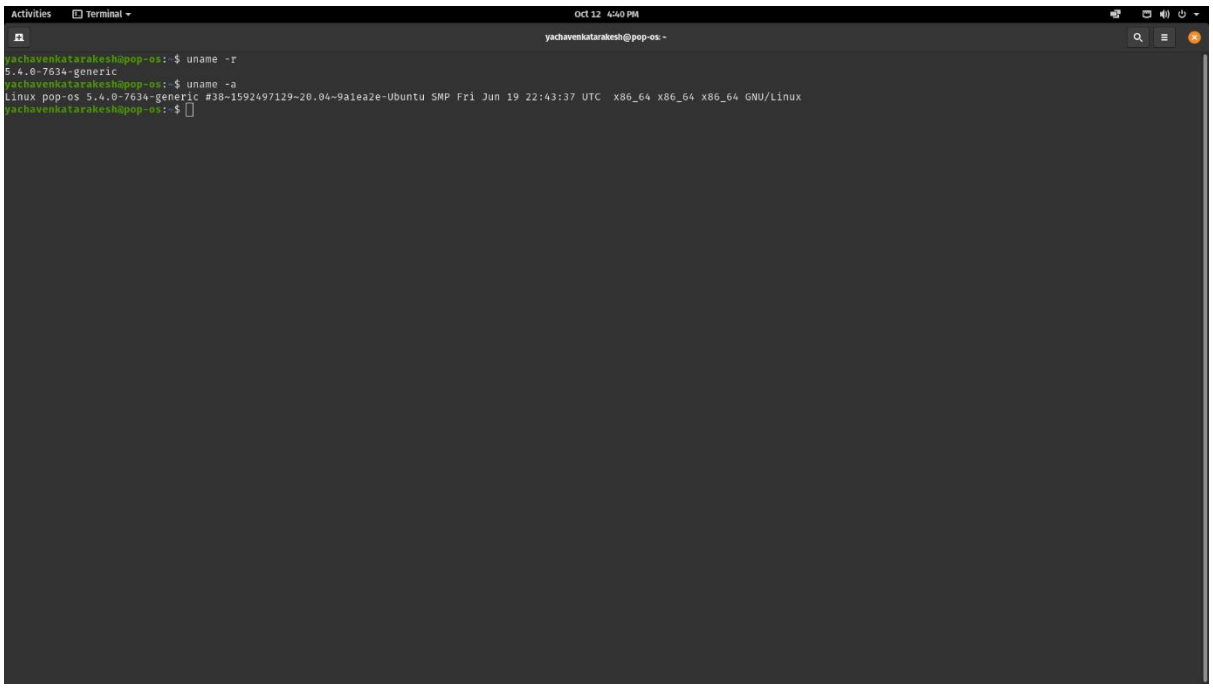

Figure 1.2 Initial kernel version

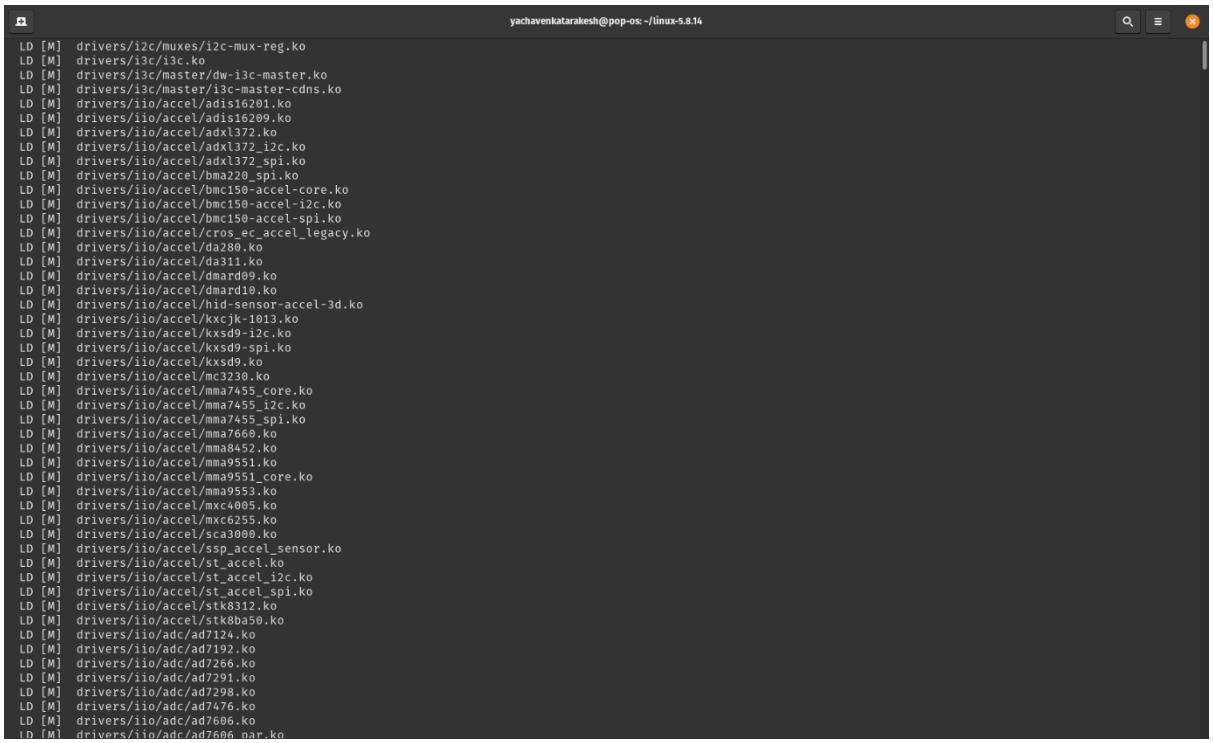

fig 1.3 compiling the kernel code

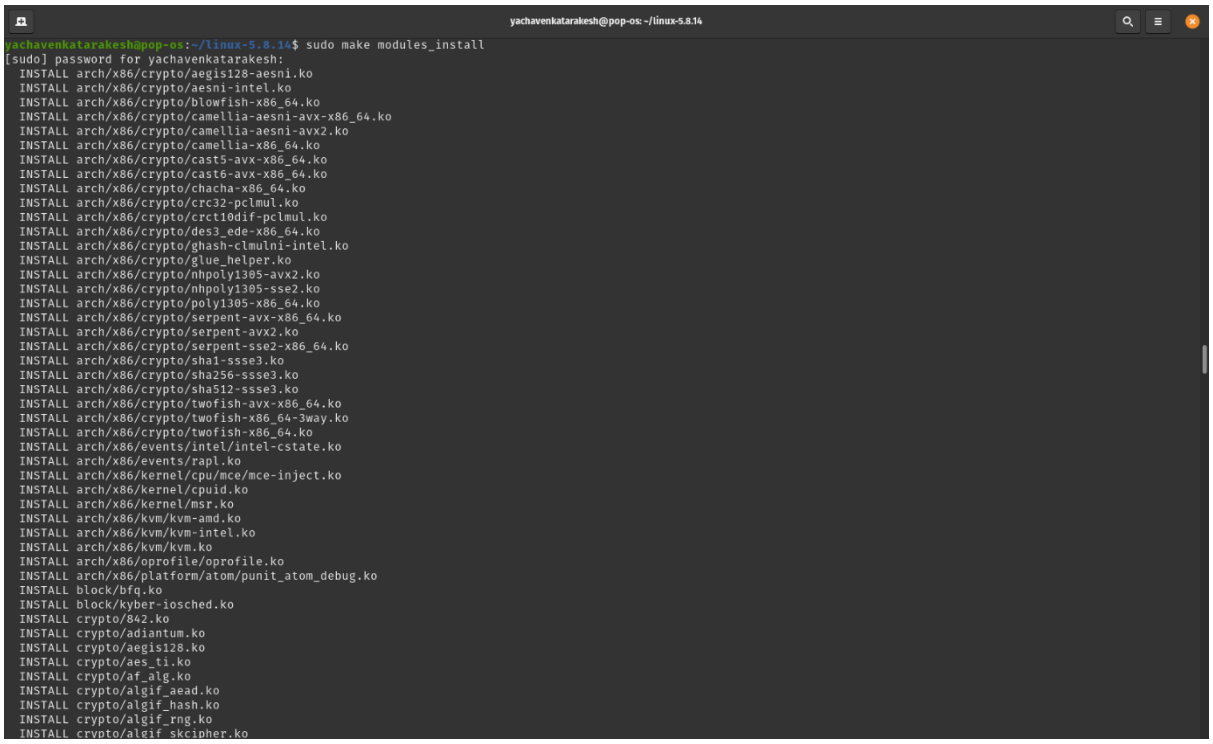

fig 1.4 Executing make modules_install command

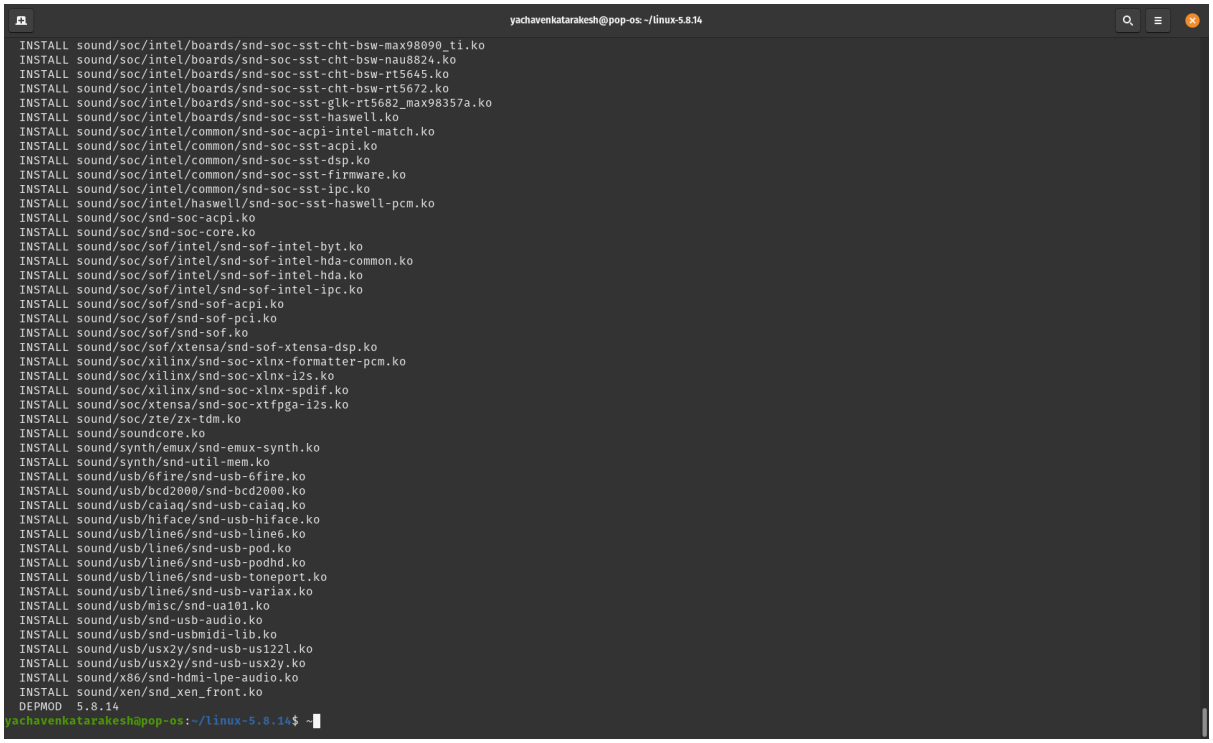

fig 1.5 Executed make module_install successfully

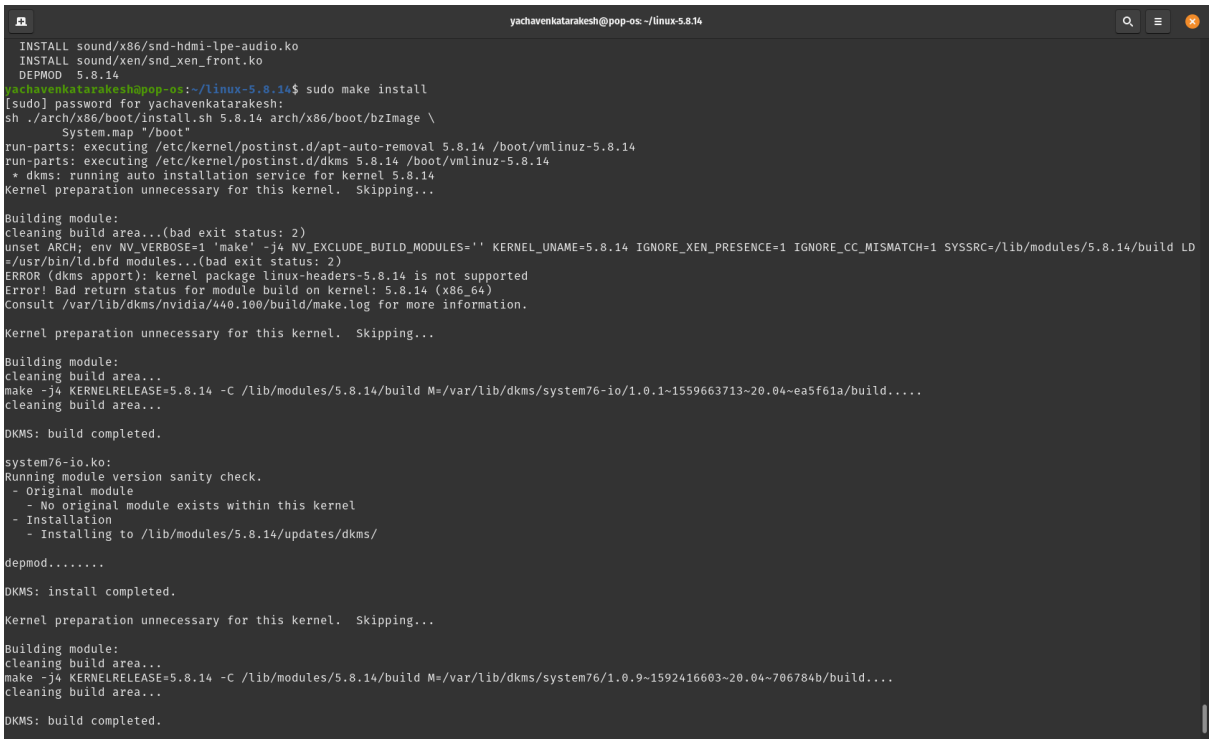

fig 1.6 Executing sudo make install command

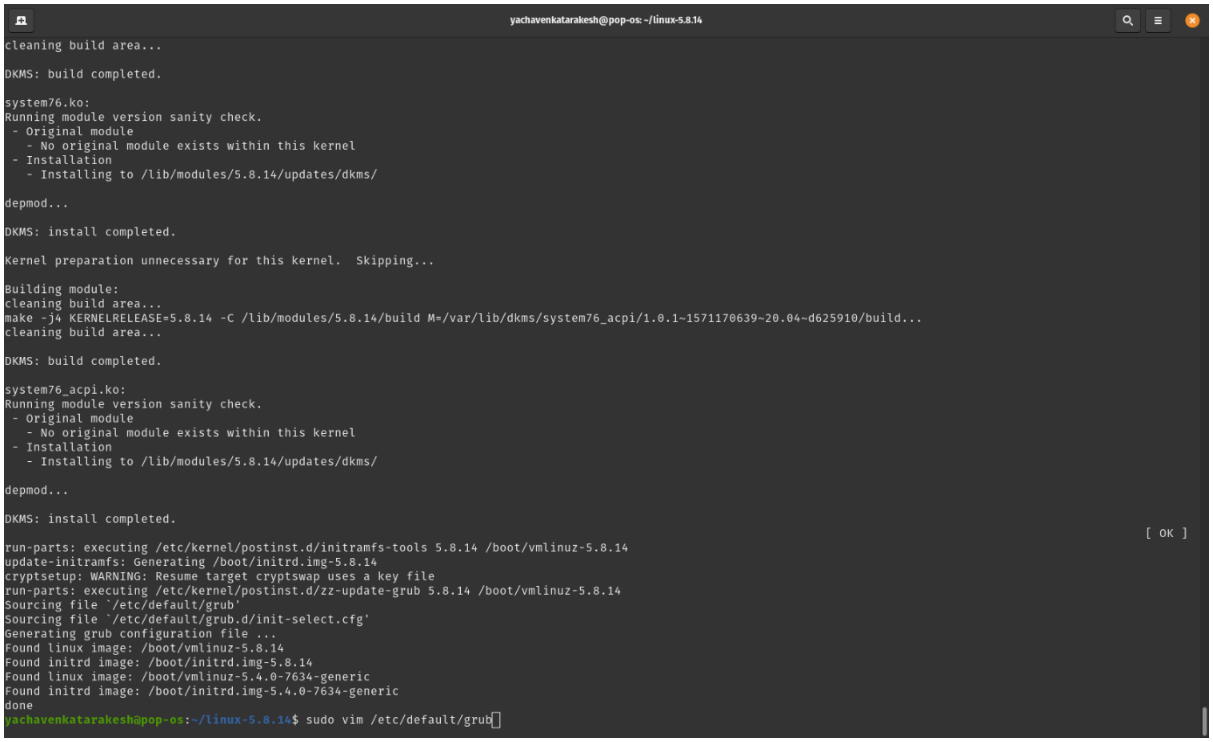

fig 1.7 Executed sudo make install command successfully

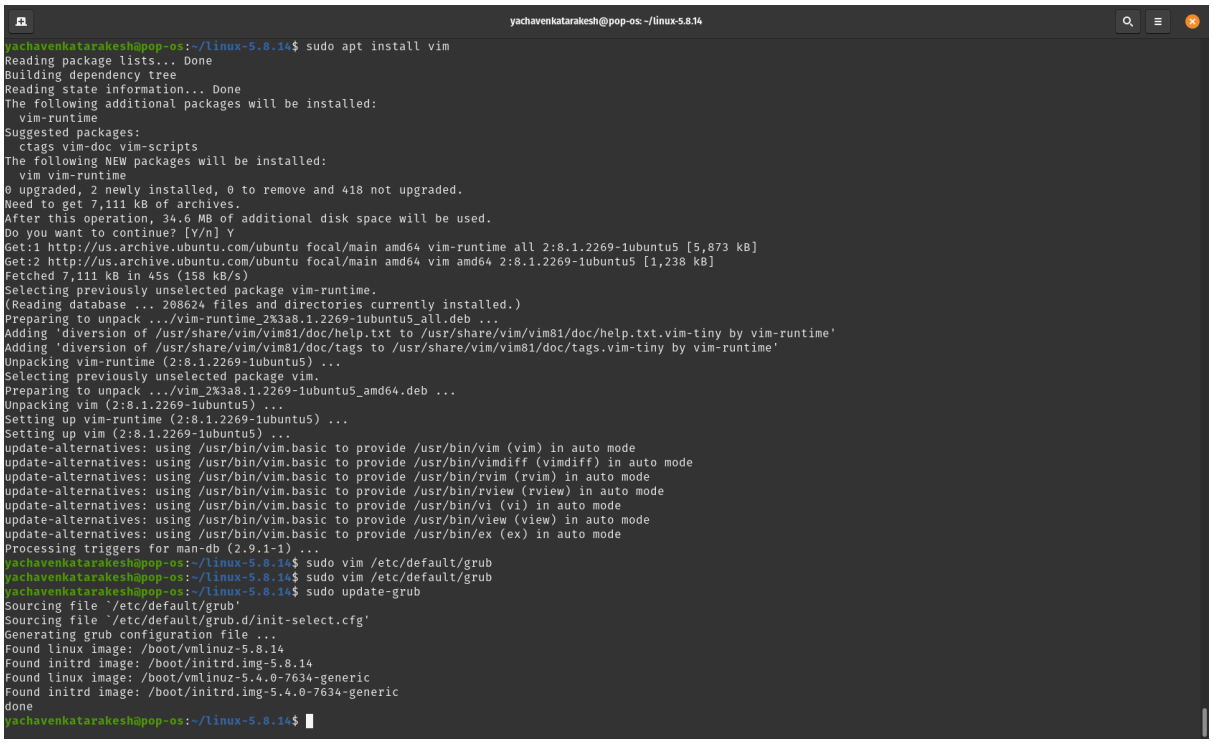

fig 1.8 Installed vim and updated Grub

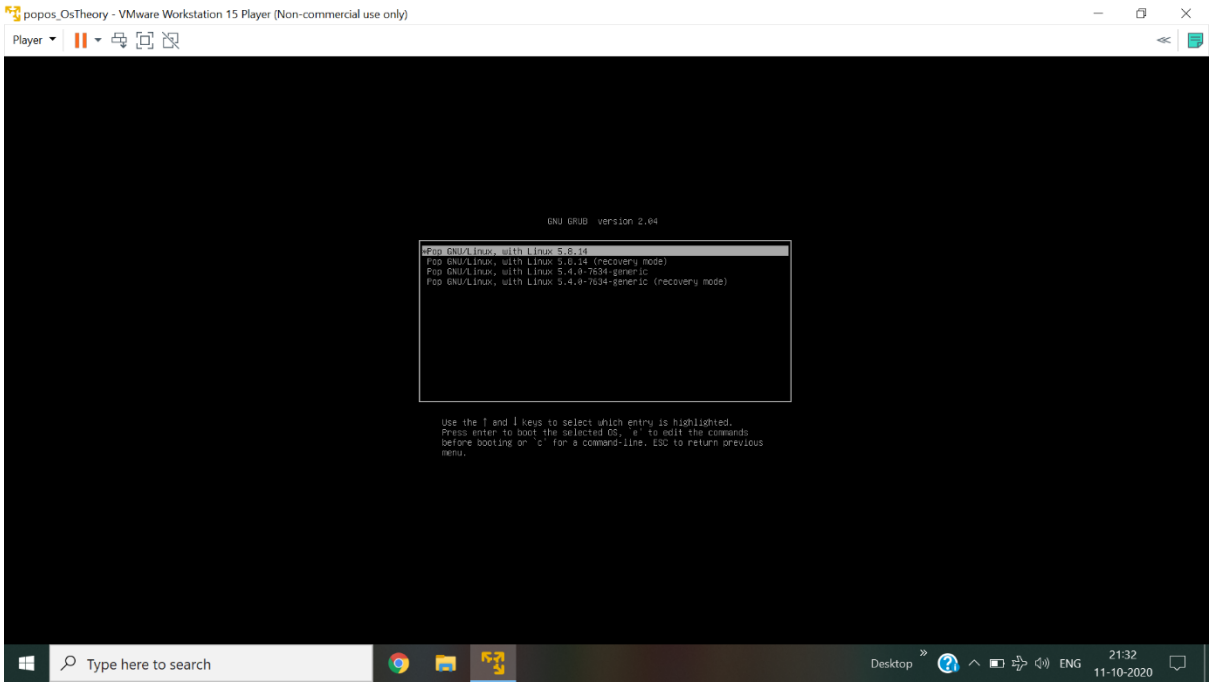

Fig 1.9 Grub Boot Menu with newly installed 5.8.14 kernel

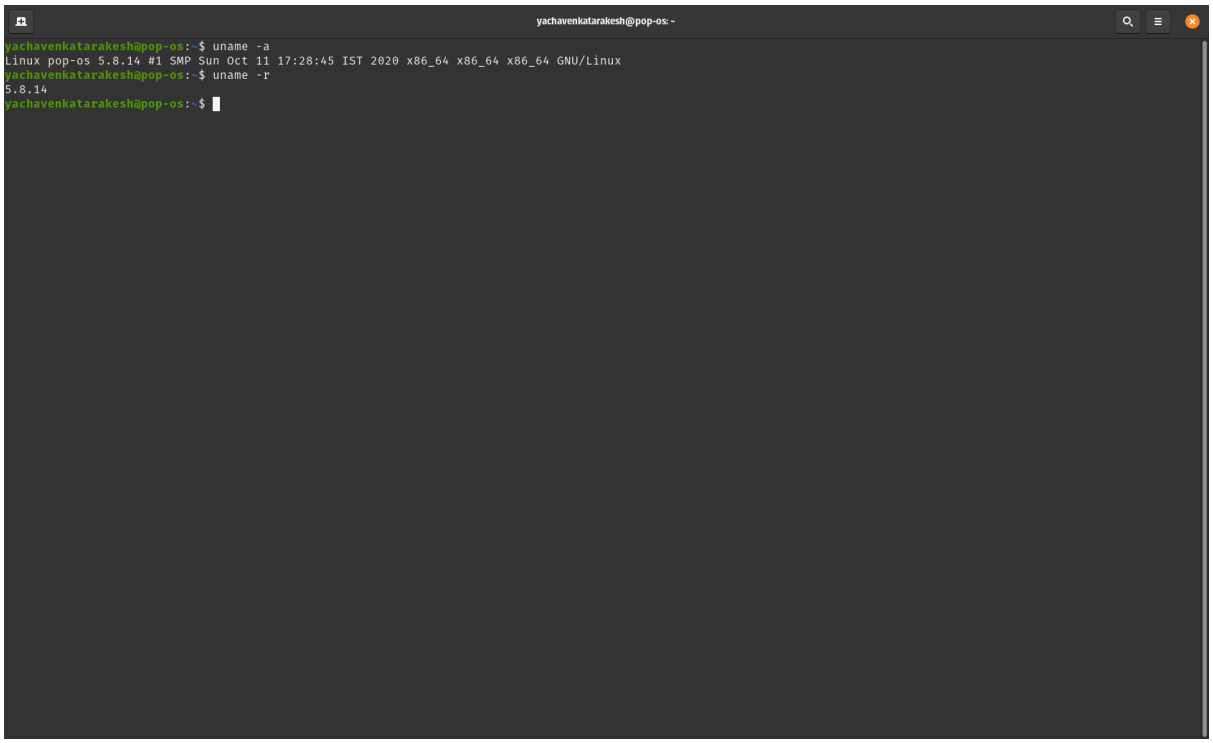

Fig 1.10 Final Kernel version

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References :

Medium Blogs
Kernel.org
Linux Documentation
Compiling Linux Kernel