CS3003D: OPERATING SYSTEMS

(ASSIGNMENT-1)

Details:

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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:

- Dual booting can be directly done with the host OS but if something goes wrong then OS could be corrupted. Hence, it is highly important to load the code accurately and load them.
- Obtain the kernel source code from kernel.org
- Install the development dependencies
- Compile the kernel
- Install the compiled kernel, add grub entry.
- Reboot the system.

3. EXPLANATION:

Introduction:

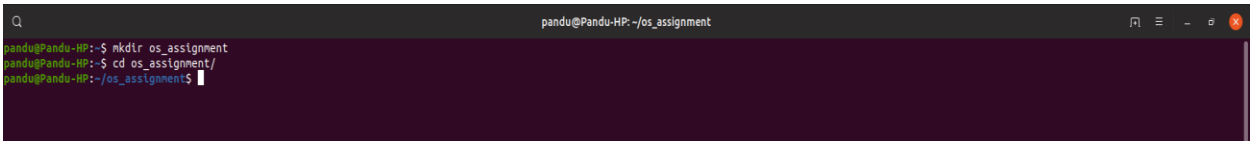
A kernel is a piece of software that controls the hardware and does some basic functions like file management. Every operating system has one. The Linux kernel is open source, implying a wide variety of coders together contribute to building it rather than just one company or developer team. In this report, we'll be showing the steps taken to upgrade to the latest stable kernel (which is 5.8.14 at the time of writing this report).

Commands and their explanation:

STEP 1) $mkdir os_assignment

$ cd os_assignment/

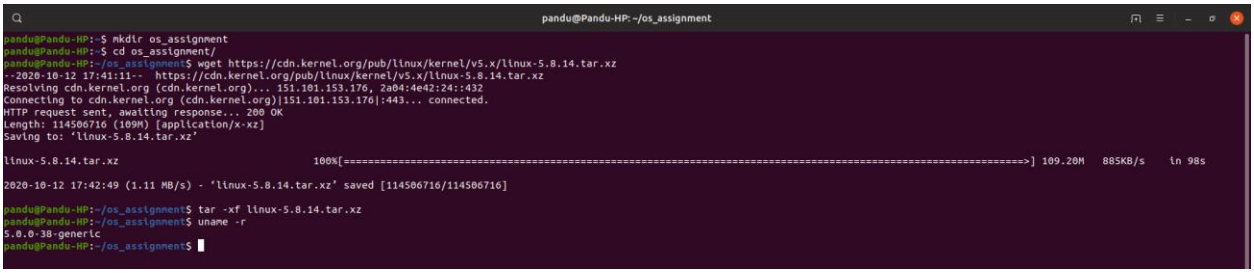
We are creating a directory in HOME so that we could download, extract files and install the various modules at a single place.



STEP 2) $wget https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.8.14.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. It would take around a minute or something and would be saved in the directory we made for the assignment.

STEP 3) $tar -xf linux-5.8.14.tar.xz



This will extract the downloaded tar file into the folder linux-5.8.14 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)

STEP 4) $cd linux-5.8.13/

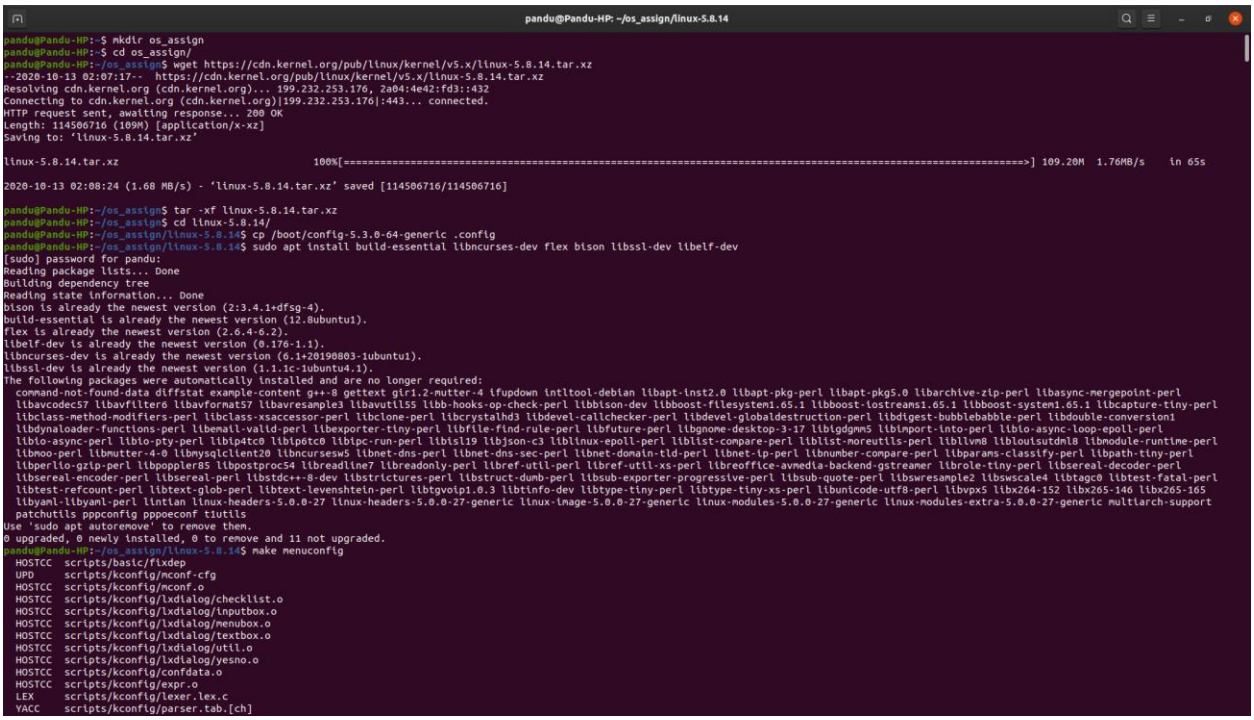
$cp /boot/config-4.15.0-0-generic .config

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

The first command in the above commands takes us to the inner directory linux-5.8.13/

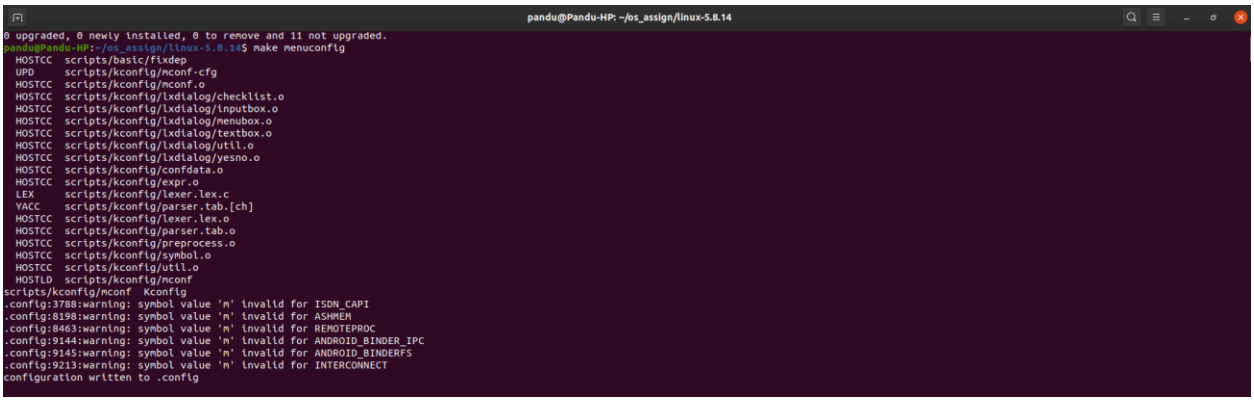
Before we compiled the Kernel source, we needed to set up our configuration file. The configuration file tells the compiler what features, drivers, filesystems, etc. are to be included. One option was to create a new config file, while the other was to simply use the one that came with our Linux , the second command helps us to achieve this.

The above command will install all the required dependencies for the kernel compilation. Now get the kernel code using wget command. As you can see in the following image, we can see the dependencies.

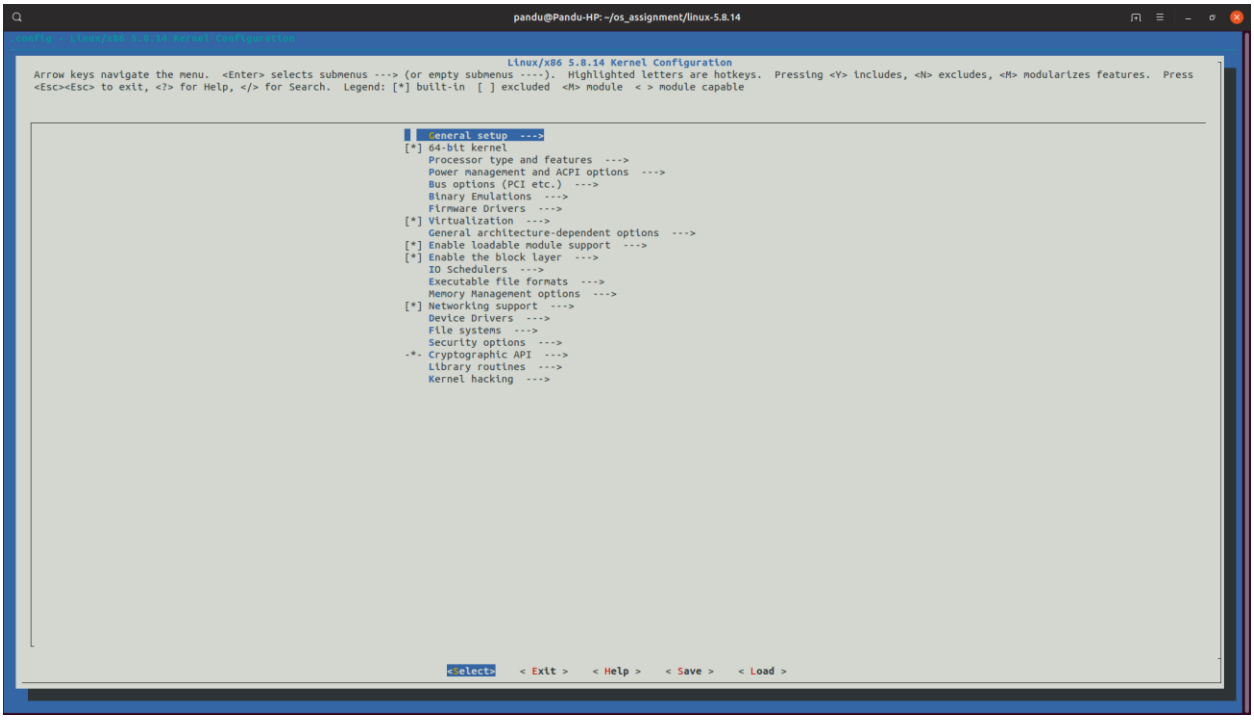


5) $make menuconfig

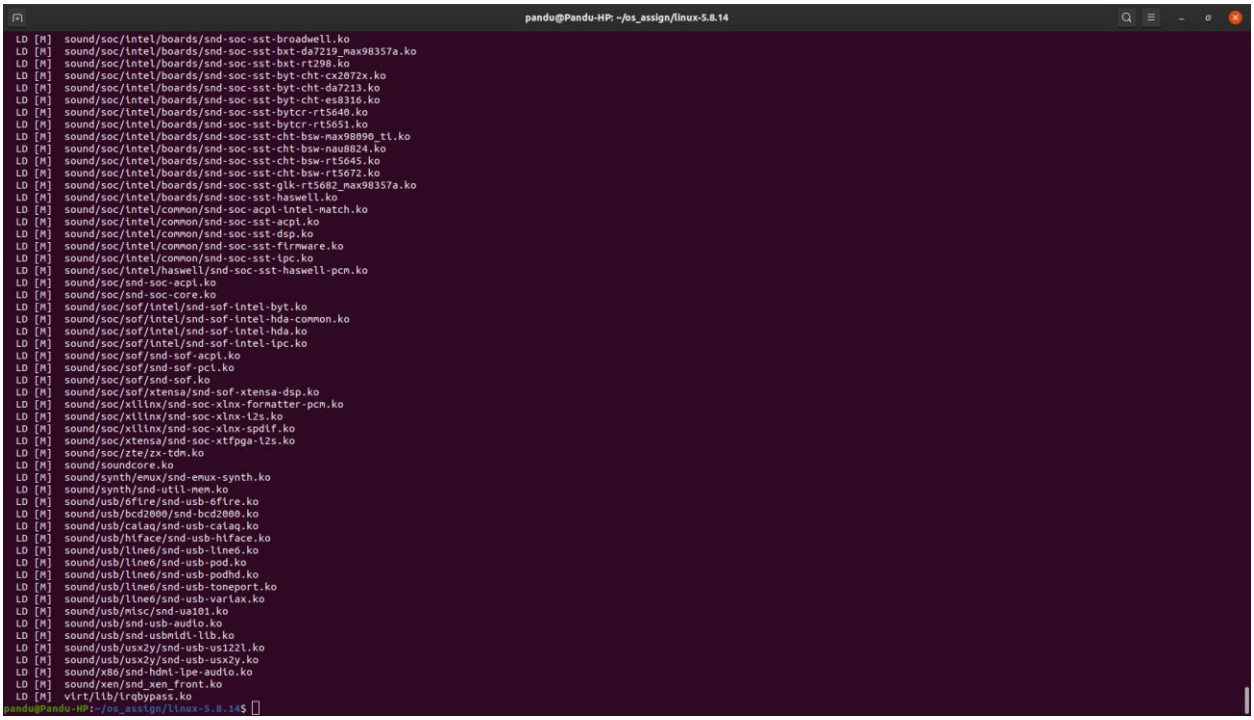
Just to make sure you have all the required files in this directory and you are good to compile the code check the menuconfig. I'm not making any changes so the configuration will be default configuration. Now save it as it is and run the following command to compile the kernel code.



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.



STEP 6) $make -j5



This command use above will start compiling the kernel code and at end would look like this.

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)

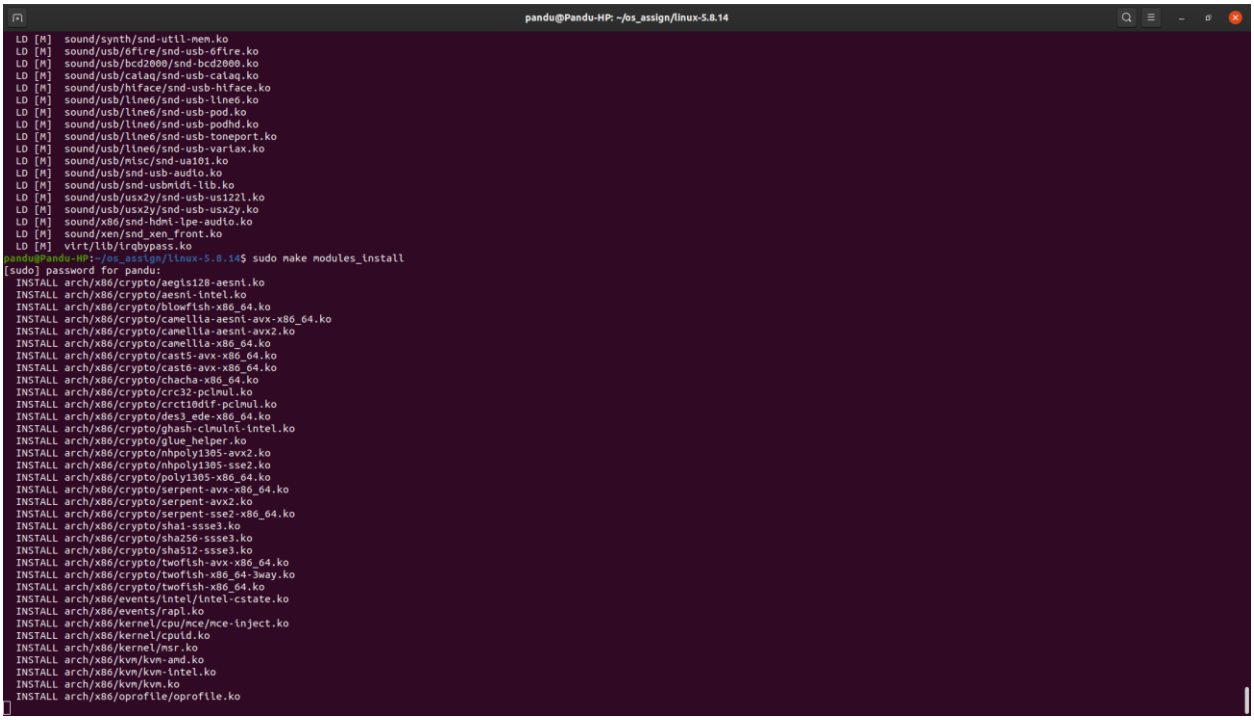
After the compilation is over check the directory size which should be around 21 GB. Now run make install command which will install kernel modules to the /, and kernel image to /boot and start grub update to add new entry to boot.

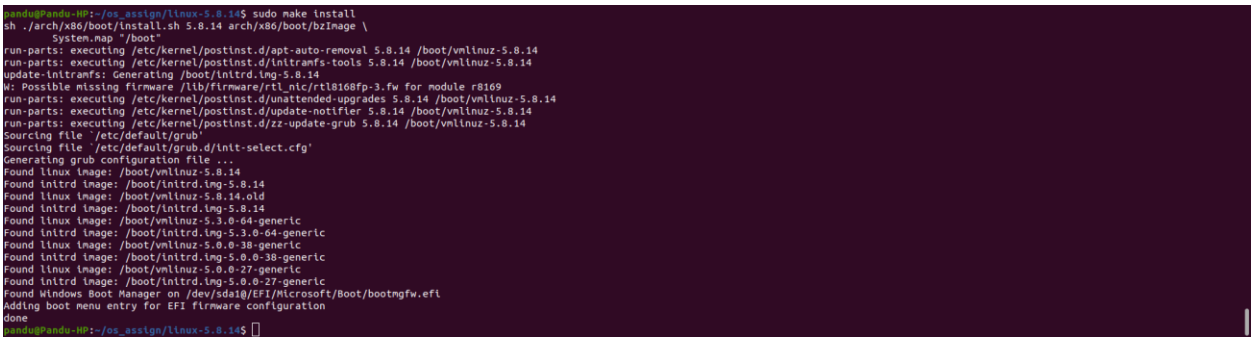
STEP 7) $sudo make modules_install

$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





STEP 8) $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

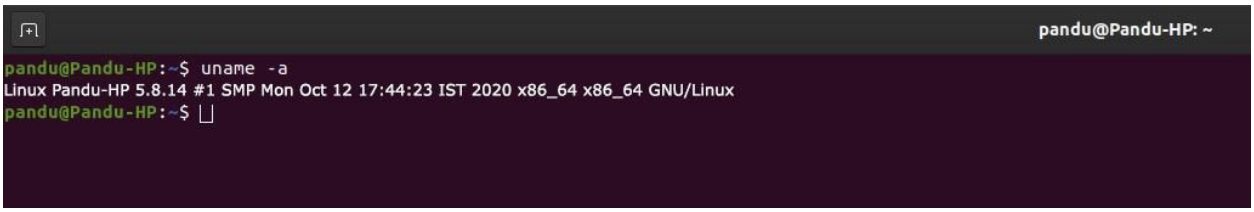
NOTE: $uname -a

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

4. CONCLUSION:

Now that it is done, we can see options to select the Kernel module from the grub menu in advanced options. Since, it is latest version, it will run in default.

To show that the latest kernel is installed, use the command in the note given above, this will print a more specific string with the actual release.



5. FLOW-CHART: