Lab *01* – Virtualizing Your Machine

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Course Section:
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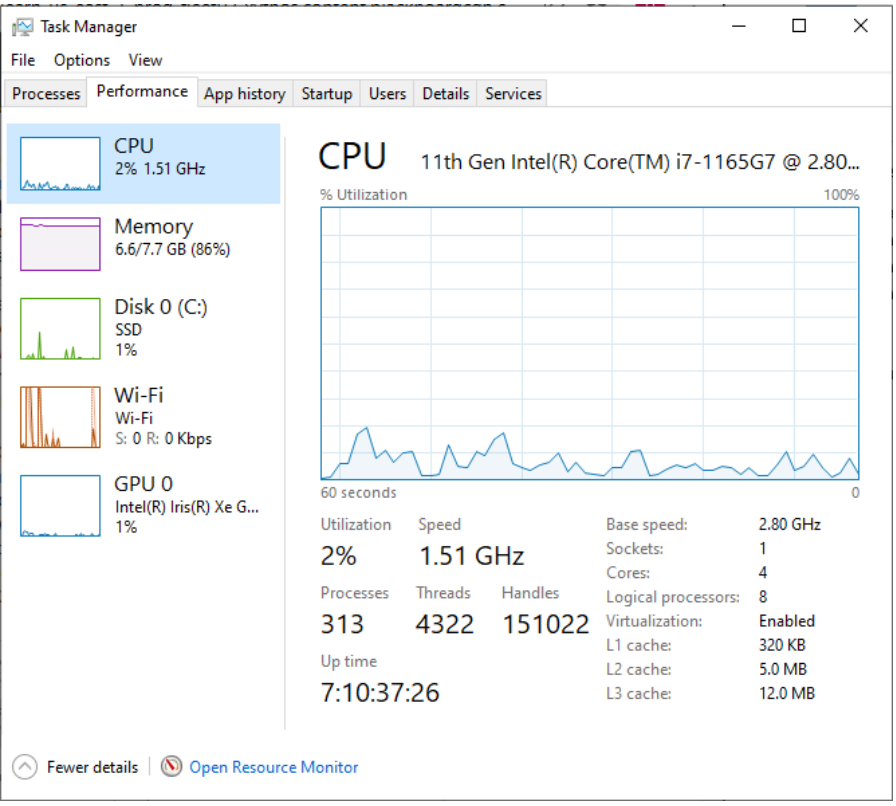
INTRODUCTION

The purpose of this lab is to perform basic commands in my Ubuntu Terminal. For me to do it however, I need to learn how to enable virtualization on my host computer, download/install VirtualBox and Ubuntu (Ubuntu will be downloaded on the VirtualBox).

PROCESS

Step 1: Check Your BIOS Settings



How I found my BIOS setting is by going down to my windows search bar and typing “Task Manager”. From there, I clicked under performance and saw “virtualization” on CPU. From our current work I learned that BIOS is the basic input/output system. It is a system setup program that the processor uses to boot up a system when powered on, and to manage data flow between the computer’s Operating System. Enabling CPU virtualization allows an operating system to utilize the CPU power more effectively and efficiently. This will allow the computer to run faster. It is a hardware feature found in all Intel CPUs which allows a single processor to act as if it is multiple individual CPUs. This feature is also a requirement for many virtual machine software and required to be enabled for the virtual machines to run properly or even at all. Virtualization will not make your computer run slower since it does not consume major resources. However, when you run a virtual machine (which uses virtualization) then you begin to consume resources, this is where the 16 gb of ram will come in handy since it won’t overly utilize ram when you have only 8gb.

Step 2: Research, Read, and Watch

(ProgrammingKnowledge2. (January 20,2020). How to Install VirtualBox on Windows 10. youtube.com)
https://www.youtube.com/watch?v=8mns5yqMfZk

(Microsoft. (04/25/2019). Create a Virtual Machine with Hyper-V. docs.microsoft.com)
https://docs.microsoft.com/en-us/virtualization/hyper-v-on-windows/quick-start/quick-create-virtual-machine

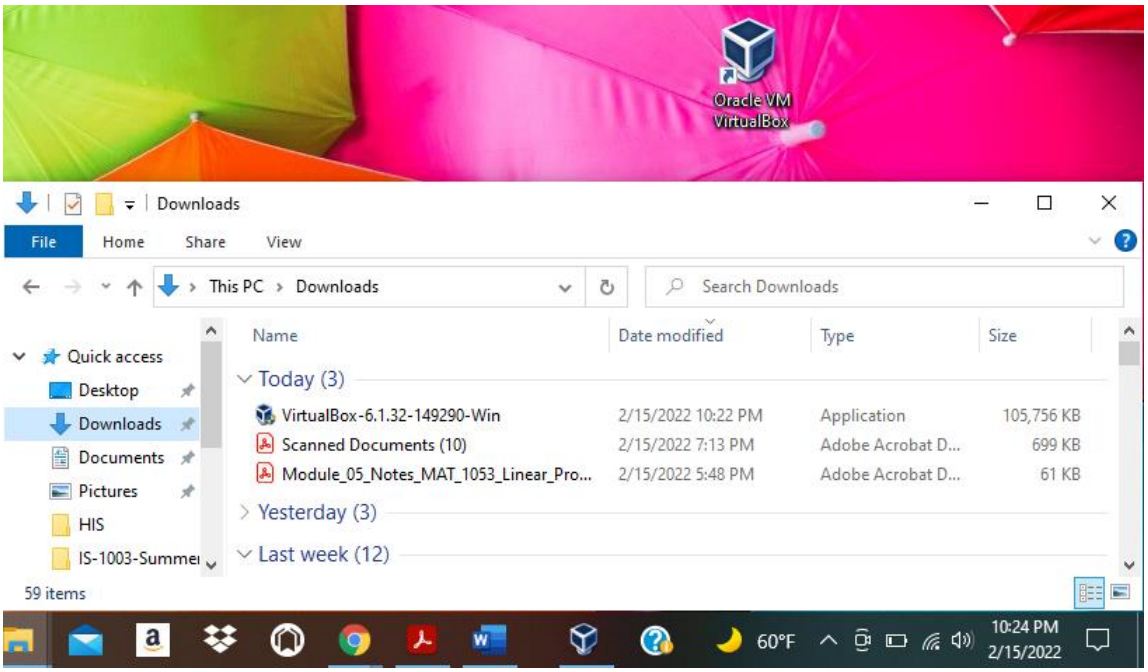
(ProgrammingKnowledge. (Apr 28, 2020). Install Ubuntu 20.04 on Virtual Box. Youtube.com)
https://www.youtube.com/watch?v=CrmHoSG8zSU

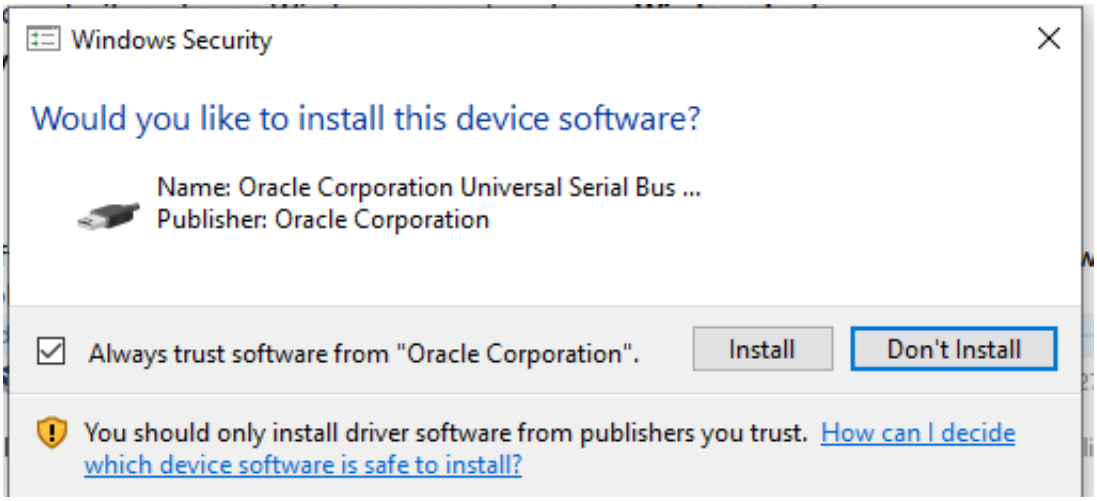
(its's FOSS -Linux Portal. (Feb 23, 2018). How To Install Linux Inside Windows [Virtual Box]. Youtube.com)
https://www.youtube.com/watch?v=vBSSGmZU7Bc

(Jasmin Kahriman. (March 25,2021). How to Install Oracle VM VirtualBox on Windows 10. Appuals.com)
https://appuals.com/oracle-vm-vbox-w10/

Here is my screenshot of the research links that I had put in the reference section of my lab, with the appropriate format. What I saw during my research were many ways to install a Virtual Machine on my laptop and some were giving me different files to download. This was an important concept we learned that we can't just download anything off the internet just because it looks safe. On those files could contain viruses. The links I provided all have similar concepts with one another and uses the same oracle download or Ubuntu services. Instead of downloading files directly off the site, these sites directed me to the official website, where I can download it safely. Just like Browning had done in his videos we can use virus checkers to analyze the files to determine if they are safe/not safe to download.

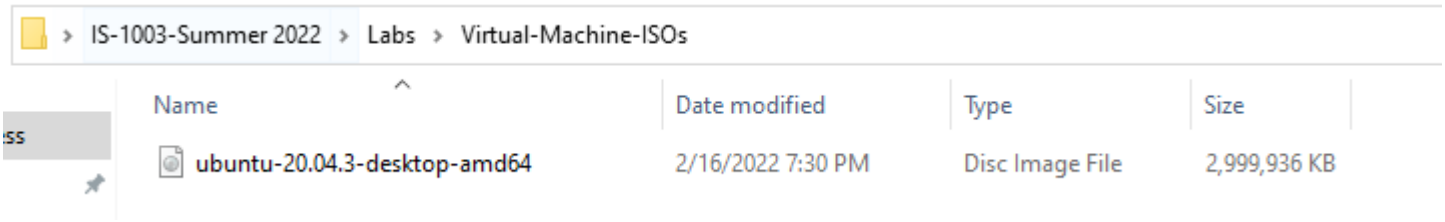
Step 3: Download Your Virtual Machine Manager





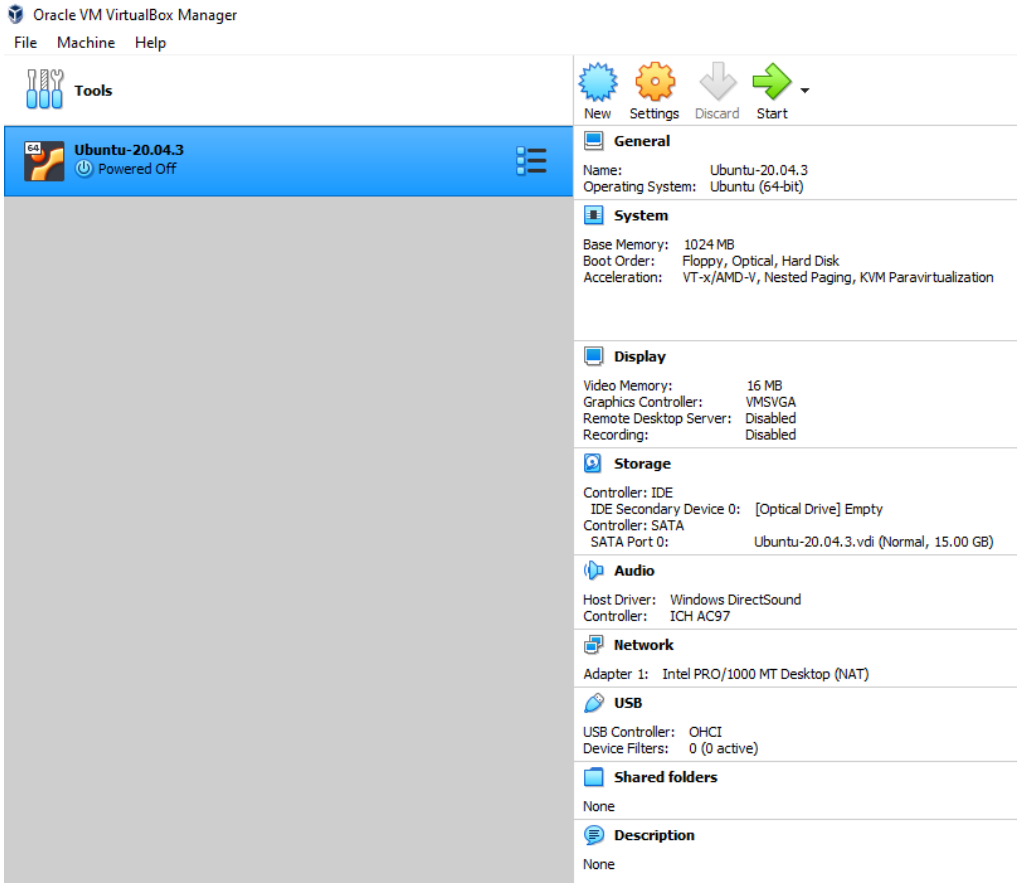
In this screenshot, is timestamp with my downloaded VirtualBox, along with the app icon. When installing this app, I ran into this screen down below. At first, I was skeptical about downloading this device software and pressed "Don't Install". After, the Virtual Machine had said that it had prematurely downloaded and that it could not go any further in the process. Doing some research, I found that this supports a wide variety of peripherals such as speakers, modems, printers, and cameras, as well as keyboards and mouse devices. Overall, it was safe to Install. Downloading the Virtual Machine again and pressing install on this pop up, allowed the downloading process to be fully completed.

Step 4: Select and Download a Linux Distribution



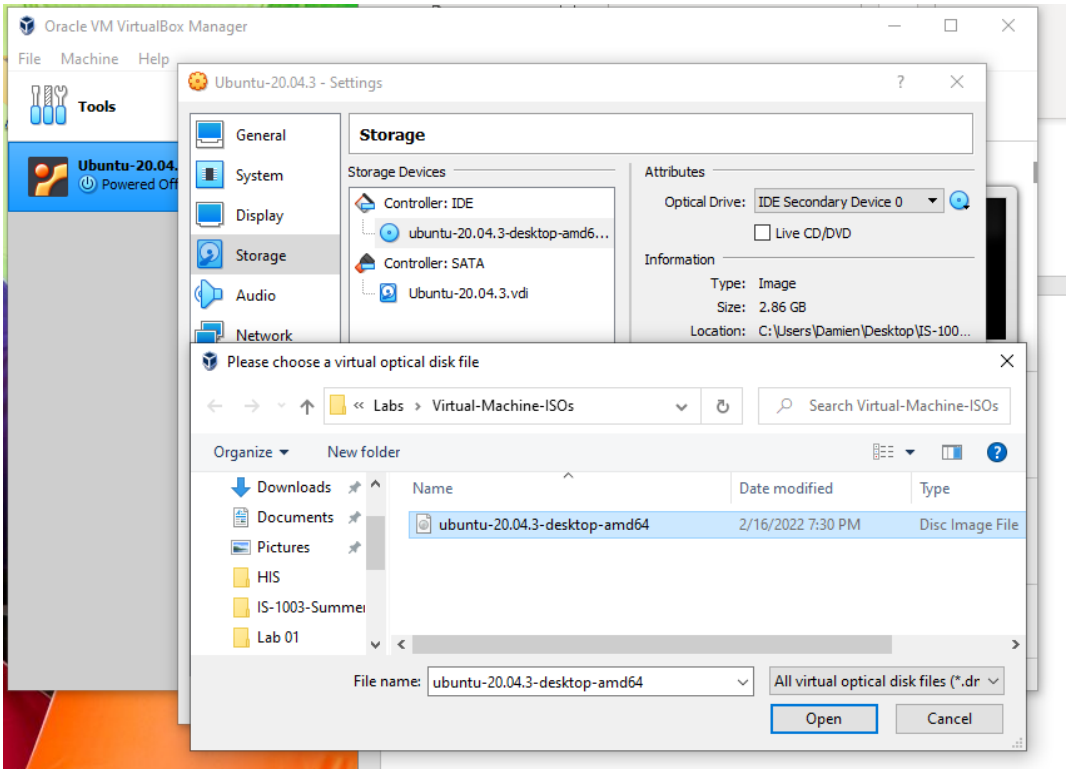
This screenshot is of the downloaded ubuntu that is saved in a file under Labs and then under Virtual-Machine-ISOs. When I saw the size was almost three million KB I was shocked, but converting it back to GB it is only turned out to be 3 GB or 3000 MB. The LTS stands for Long-Term Support which means that it is guaranteed for maintenance updates and free security for 5 years while Ubuntu only has around 9 months. However, Ubuntu comes out with new versions every 6 months and traditionally, users stick with the every 6-month release. The reason for different Linux distros is for its different uses for different users. There are community or enterprise Linux distros. The Community Linux distros are free and are primarily supported/maintained by the open-source community. Open source software is developed in a decentralized (controlled by several local offices or authorities rather than one single one) and collaborative way. Enterprise (commercial Linux) Linux distros are available through subscription from a vendor and does not rely solely on community support. This is considered a community Linux distro and is a great option for people who are new to Linux and don't have much experience with the command line, or who just want to play around and experiment.

Step 5: Install and Setup VirtualBox



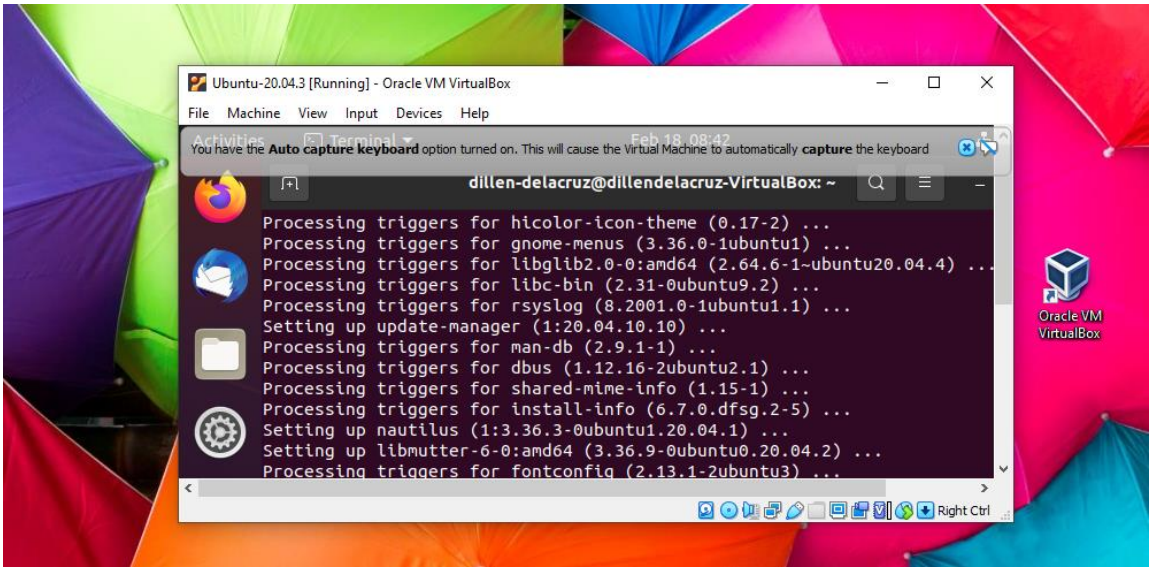
This is a screenshot of my VirtualBox interface and its settings. Since I had 8 GB of ram installed in my computer, I had used 1048 MB or about 1.048 GB. This is good enough to run Virtual Machine and a guest operating system. This also shows why it is important to get more ram on your computer so that virtual machines can run smoother and do more heavy work. 1 GB of ram is good enough for light work. Looking at the directions I was confused about what a frame was but after viewing the video I learned the frame is what's created after you input your settings (the highlighted blue rectangle). I learned that a virtual disk image (VDI) is the default disk format used by Virtual Box. It is portable and can be run using other virtualization programs. VMDK (Virtual Machine Disk) is VMWare's disk file format. This allows for cloning of a physical hard disk and backup of VMs off-site. Lastly VHD (Virtual Hard Disk) is a standard virtual disk format used by Microsoft. You can easily browse and restore files using the operating system.

Step 6: Import Your Linux Distro into VirtualBox

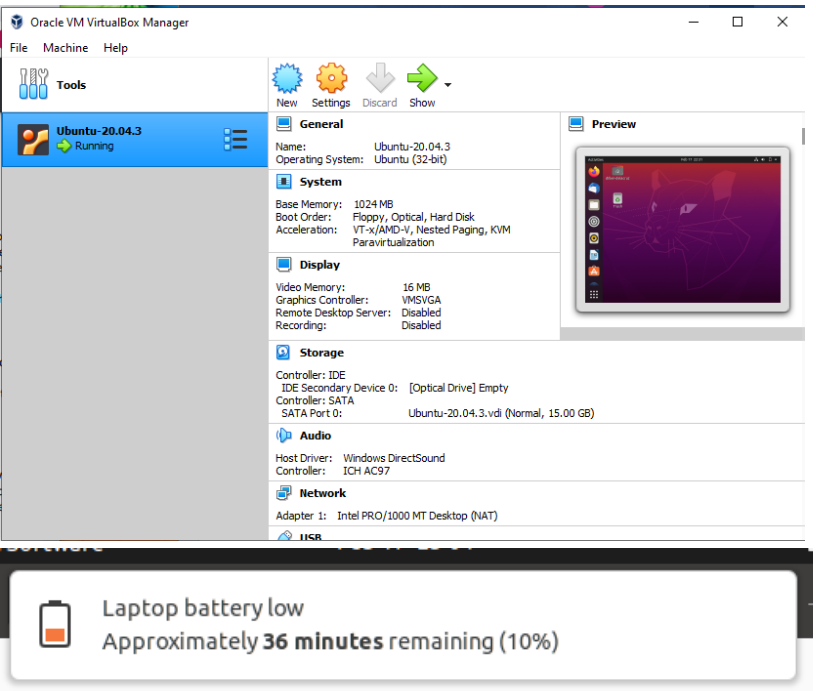


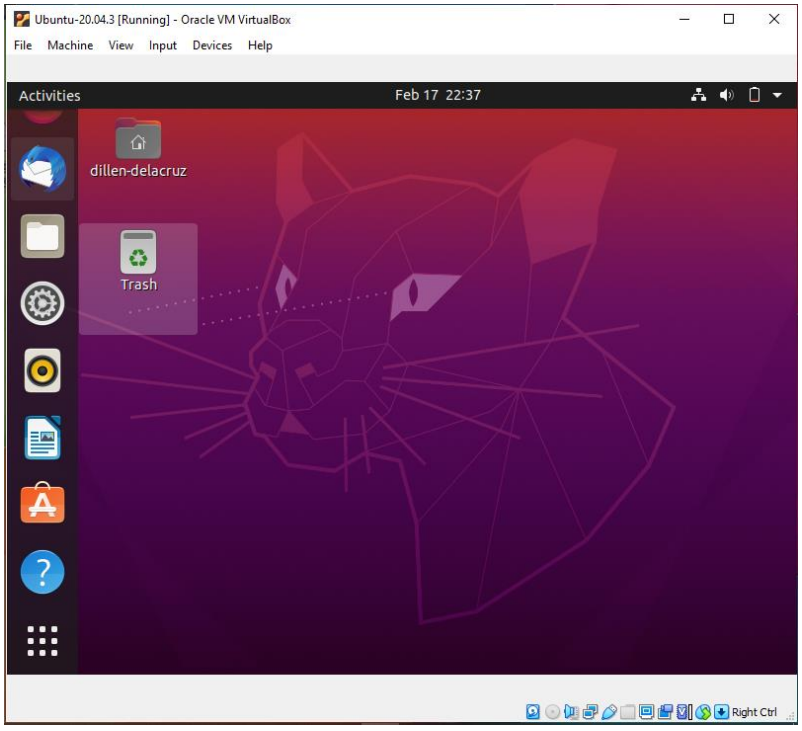
This is a screenshot of the VirtualBox storage display with the secondary disk icon displayed with my loaded disk file. There is no maximum limit of operating systems that can be installed in VirtualBox since all virtual machines are separated from each other. The useful thing about Oracle VM VirtualBox is that it enables you to run more than one OS at a time. However, the same cannot be said with Virtual Machines.

Step 7: Rev Up Your Machine

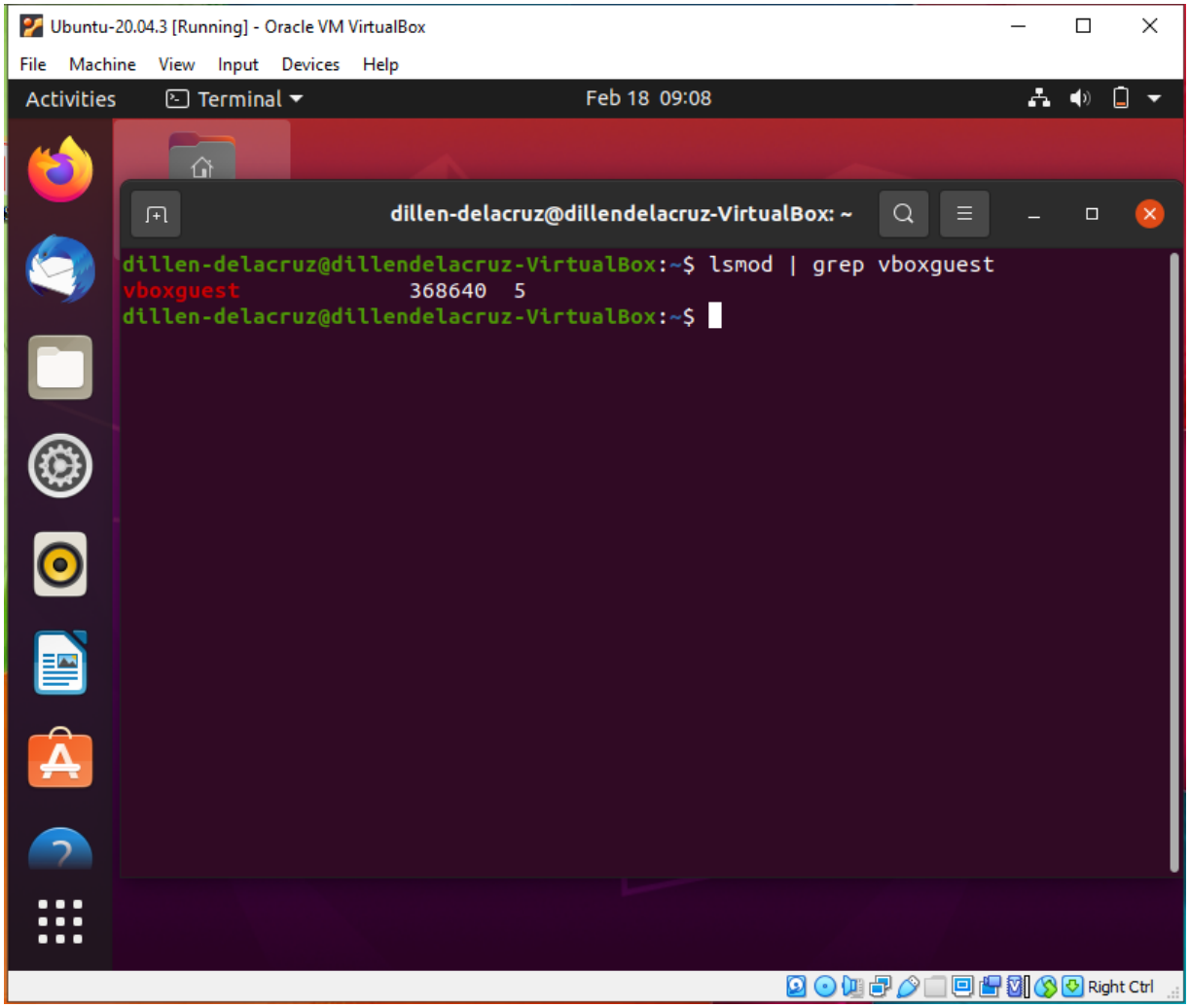


At first it took about thirty minutes to set up due to the downloads that occurred. After I was able to get it to start up, it has been smooth. On my VirtualBox Interface it shows running instead of powered off. I had a page pop up that said “please remove the installation medium. then press ENTER.” I learned that we will need that for the next piece of software, the guest addition. This is an additional piece of software that can’t be used with the boot process of the operating system but can be installed once the operating system is in place to provide some additional functionality. This includes giving a full screen, allowing you to share files between my host, physical machine, and my virtual machine. I also was waiting for something to happen before I pressed entered and luckily, I watched the walkthrough. If I hadn’t, I would have waited until something occurred instead of pressing enter. An aspect that I thought was unique about the virtual machine is that it gave me a pop-up warning that my computer was almost dead and gave me the approximate minutes I had left.

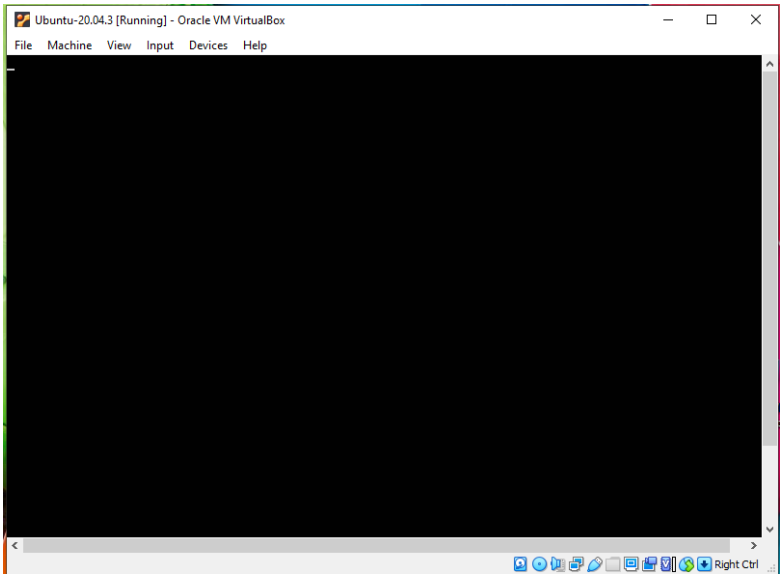




Step 8: Rev Up Your Machine



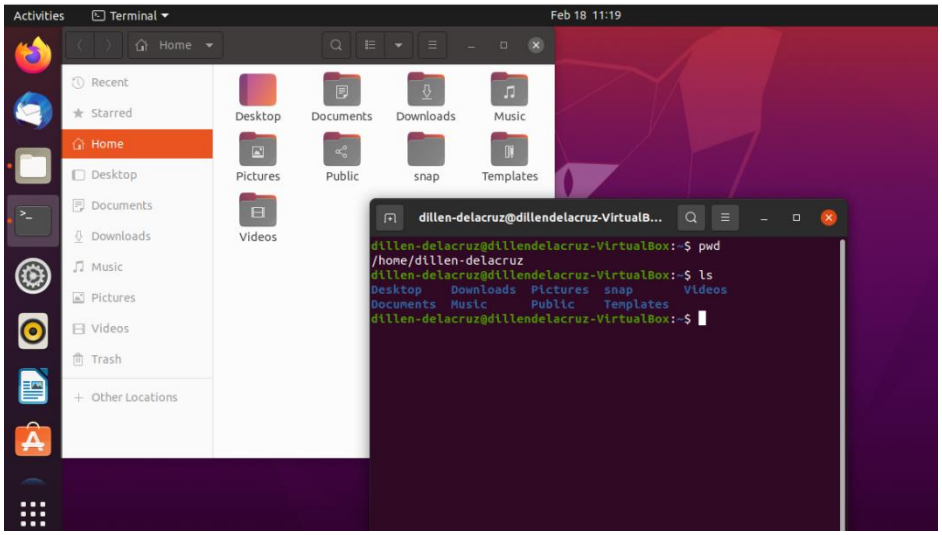
this was an exciting experience learning about Linux's terminal where you can manually do updates/upgrades or even install guest operating systems. On the left you will see a screenshot of the terminal on and showing that the vboxguest is installed on my guest machine. The code "sudo" gives me administrative privileges. Using the code sudo… and pressing enter gives a prompt that tells you to input your password. What it doesn't show is your password or even the marker moving to indicate that you are typing something. At first trying to do it myself I was very confused on how to get it to work and thought something was wrong with the machine. You just need to trust yourself and type your password in carefully and correctly. I learned that lsmod is a command-line utility that displays information about the loaded Linux kernel modules. Each line has 3 columns (Module | Size | Used by). Above we see that the name of the module is vboxguest, the size of the module is 368640 bytes, and there are 5 instances of the module that are currently being used (value of 0 = module is not used). Another thing I learned is that a GUI means graphical user interface. This displays objects that covey information and represents actions that can be taken by the user.



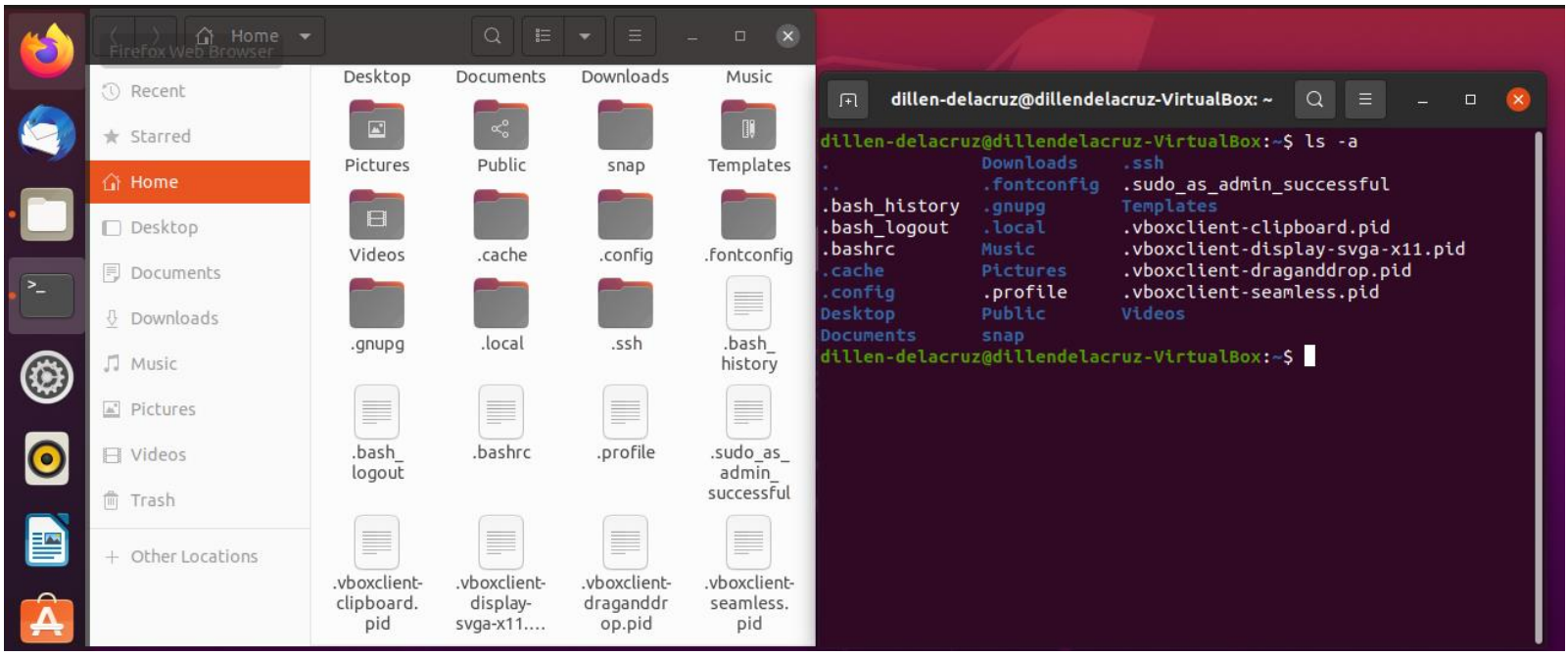
When I rebooted my Linux and logged back on it gave me this screen, what I did to show my home display was maximize the screen in which it eventually loaded or if it doesn't, you'll have to press "Machine" and then reset.

Step 9: Explore Your New Operating System and Terminal!

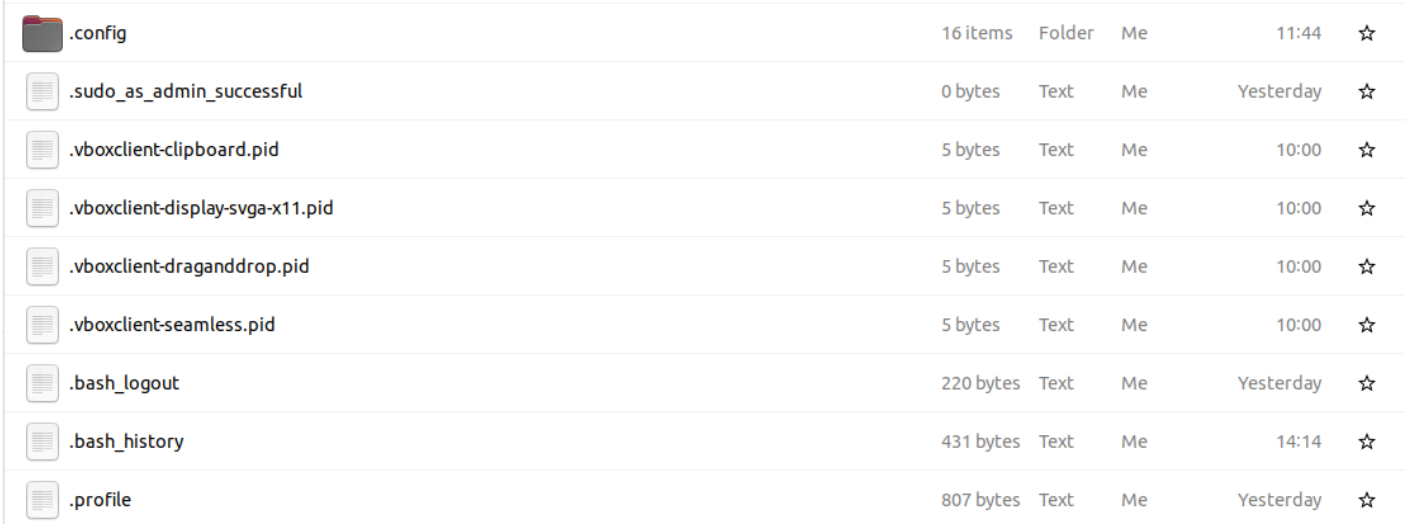
The icons that are currently on my desktop is Firefox web browser (my default browser), Thunderbird Mail, Files, Terminal, Settings, Rhythmbox, LibreOffice Writer, Ubuntu Software, and Help respectively.

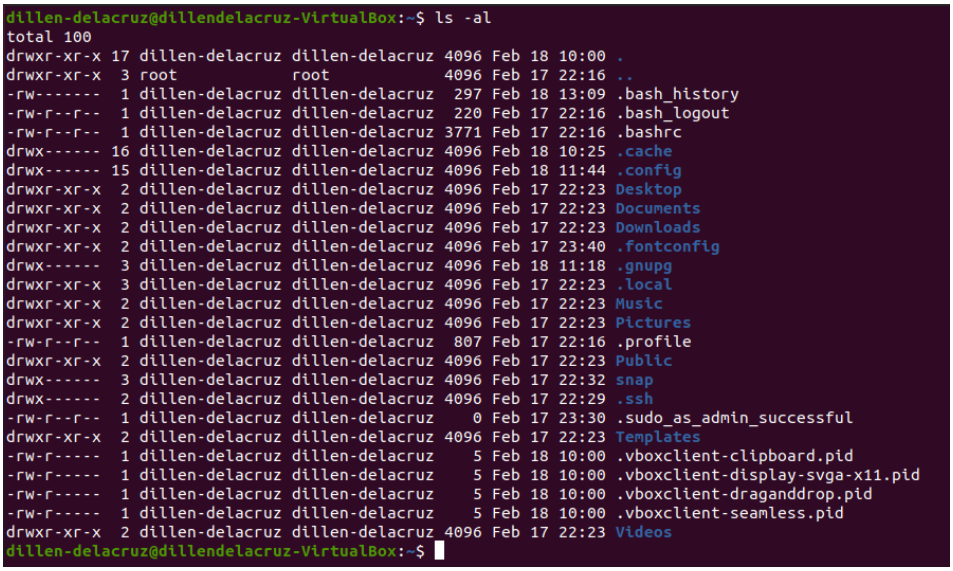


Here I practiced using the commands pwd and ls. The command pwd is used to locate the home directory. It is found at /home/username and this case it's /home/dillen-delacruz. The ls command gives a sorted list of the directories in my home file, as you can see the GUI contents and the ls contents are the same. The only difference is that I can't interact with the different directories by pressing and clicking each individual one like I can with the GUI. All you must do to get into the GUI version of your home directory is press the file icon and it will directly take you to the home file and the contents within it



Next up we have the command ls -a. This command will give us a list of all hidden files and directories. Hidden files are files that you don't necessarily want to see all the time. Unless specifically requested, they are not shown with a directory listing. You can also view this from the GUI. You must click on the 3 horizontal lines icon on the header of the file page and click on the box "Show Hidden Files". In the command line we see that it doesn't match up with the GUI. In the command line the hidden files are underneath the directories listed using the ls command instead of one listing at the bottom which GUI provides.



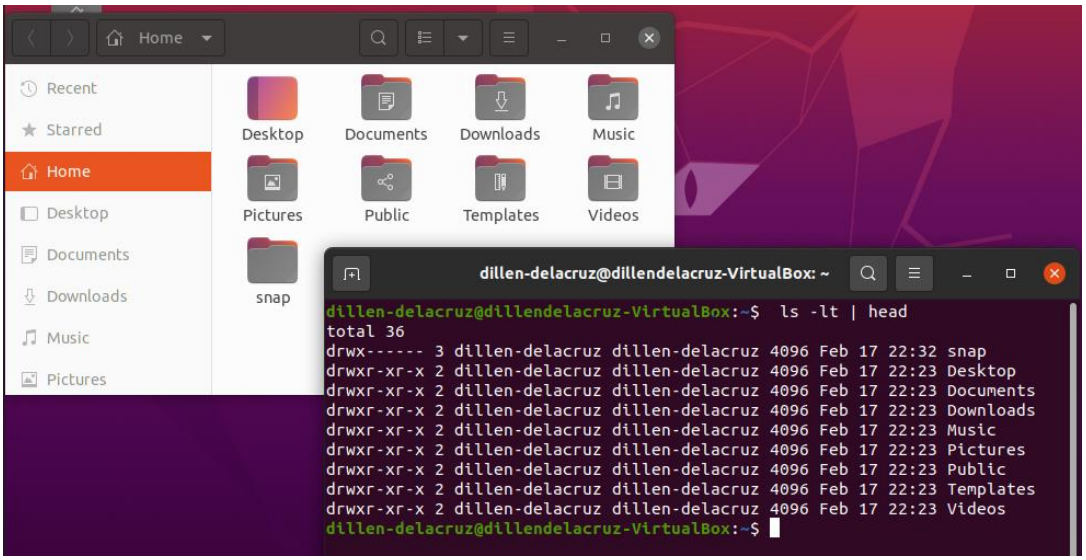


The ls -al command was used in this screenshot. This displays the owner and the size of the directories. Similarly, the GUI has the same display. Both GUI and Command line do have the date of when the file was last modified. To get to this screen above, all you have to do it press the toggle view or the icon that looks like four squares (2 by 2) on the header of the page. To get the owner press the 3 stacked horizontal lines icon, then you will press “Preferences”. Once you are there, press the “List Columns” tab. Finally, there should be a box that you can click that says “owner”

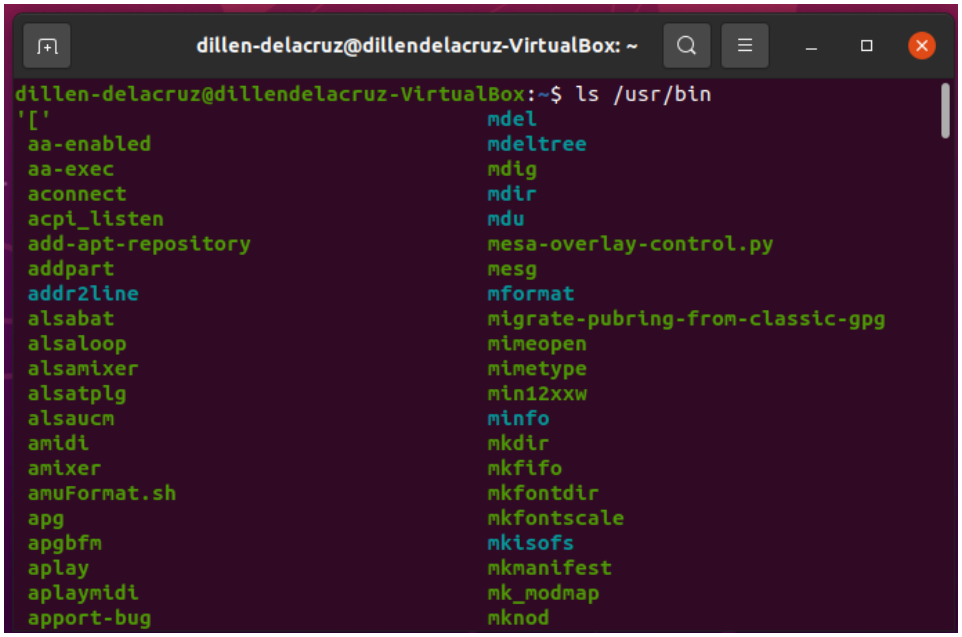
```
dillen-delacruz@dillendelacruz-VirtualBox:~$ ls -l
total 36
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Desktop
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Documents
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Downloads
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Music
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Pictures
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Public
drwx------ 3 dillen-delacruz dillen-delacruz 4096 Feb 17 22:32 snap
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Templates
drwxr-xr-x 2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Videos
dillen-delacruz@dillendelacruz-VirtualBox:~$
```

```
dillen-delacruz@dillendelacruz-VirtualBox:~$ ll
total 100
drwxr-xr-x 17 dillen-delacruz dillen-delacruz 4096 Feb 18 10:00 ./
drwxr-xr-x  3 root            root            4096 Feb 17 22:16 ../
-rw-------  1 dillen-delacruz dillen-delacruz  406 Feb 18 13:53 .bash_history
-rw-r--r--  1 dillen-delacruz dillen-delacruz  220 Feb 17 22:16 .bash_logout
-rw-r--r--  1 dillen-delacruz dillen-delacruz 3771 Feb 17 22:16 .bashrc
drwx------ 16 dillen-delacruz dillen-delacruz 4096 Feb 18 10:25 .cache/
drwx------ 15 dillen-delacruz dillen-delacruz 4096 Feb 18 11:44 .config/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Desktop/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Documents/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Downloads/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 23:40 .fontconfig/
drwx------  3 dillen-delacruz dillen-delacruz 4096 Feb 18 11:18 .gnupg/
drwxr-xr-x  3 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 .local/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Music/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Pictures/
-rw-r--r--  1 dillen-delacruz dillen-delacruz  807 Feb 17 22:16 .profile
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Public/
drwx------  3 dillen-delacruz dillen-delacruz 4096 Feb 17 22:32 snap/
drwx------  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:29 .ssh/
-rw-r--r--  1 dillen-delacruz dillen-delacruz    0 Feb 17 23:30 .sudo_as_admin_successful
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Templates/
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-clipboard.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-display-svga-x11.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-draganddrop.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-seamless.pid
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Videos/
dillen-delacruz@dillendelacruz-VirtualBox:~$
```

Trying commands ll and ls -l, I saw that it produced different outputs. For command ls -l it showed current directories without the hidden files but still with the owner and size of the directory. On the other hand, command ll displayed the similar outputs as to command ls -al. The only difference between ll and ls -al is that there are slashes at the end of files. These slashes are used for file path and directory separators. I tried this multiple times and still got the same outputs. It seems as if the shortcut ll is best for command ls -al rather than ls -l which outputs do not contain hidden files. You can get the top one in GUI If you follow the steps for the command ls -al and then press the icon with the three stacked horizontal lines. From there you want to make sure that the box “Show Hidden Files” is unchecked



This screenshot is of the command ls -lt | head, which the head command outputs the 10 newest files in the current directory. Since we only have 9 all nine are listed. The GUI can give similar results if you press the drop-down arrow and press the box “First Modified”. The only difference is that snap is at the end and on the command-line snap is the first.



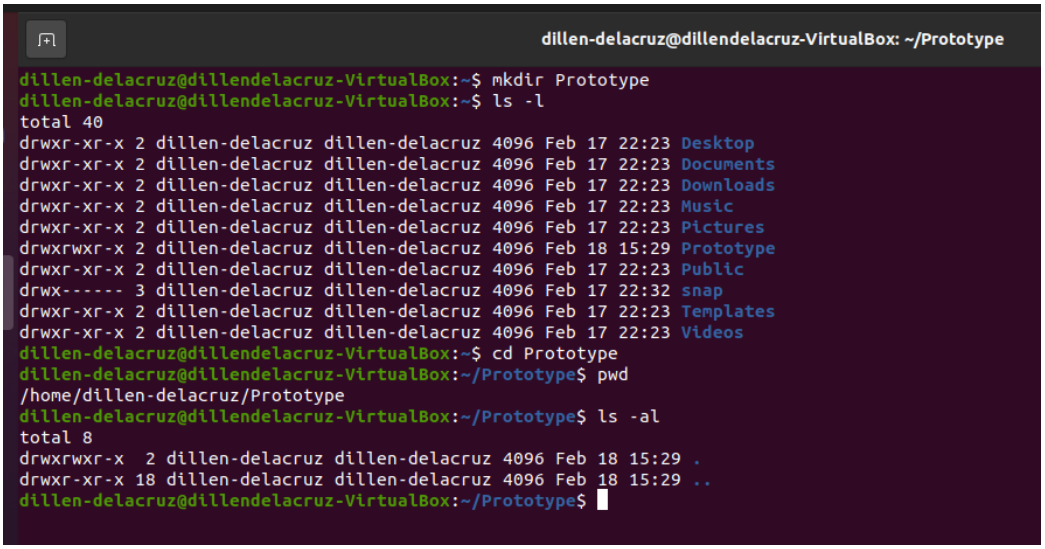
The command ls /usr/bin, gives a list of the contents in the bin (binary) directory

Ls = list

/usr/bin = primary directory for executable files that are not needed for booting or repairing the system.

Step 10: Create and Navigate Your Directories

This screenshot is of the commands I tried from steps 1-3. First, I used the mkdir command which allowed me to create a new directory using the command-line. This command can create multiple directories at once. It is also important that the user executing this must have enough permissions to create a file in the parent directory, or you may receive an error, “permission denied”. Prototype is the name I gave this new folder. Once I pressed enter, we can see it displayed on the GUI.



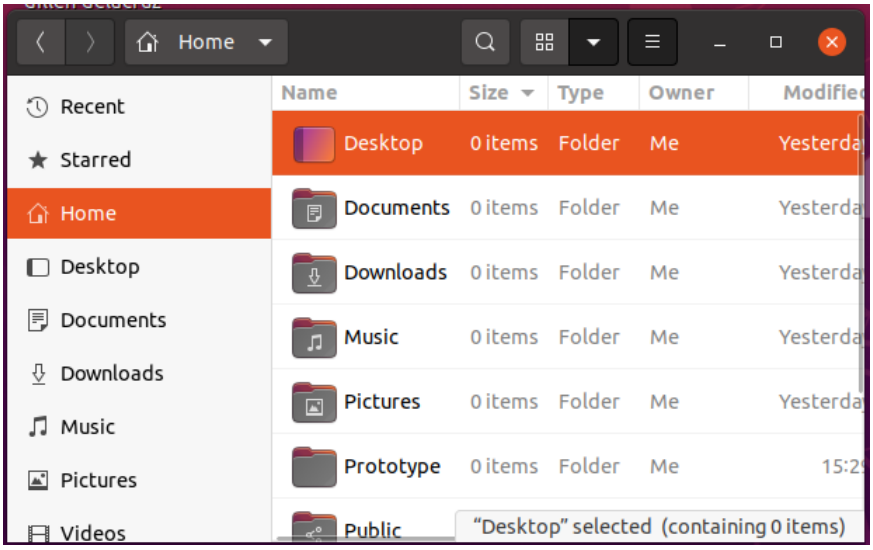
Then I used the command ls -l to list the directories within the home file.

The command cd, Change Directory, allowed me to change my current working directory (home) to the new file I created, Prototype.

The pwd command shows the location of my new home directory instead of the old one.

Lastly the ls-al showed a list of hidden files, including its owner and size, of Prototype. We have 2 files which are dot and dotdot

From the GUI you can create a file by going to the icon of the 3 stacked lines and pressing the folder with the plus symbol on it.



This is the output of the contents within the parent file. I got this by using ll .. (dotdot). Dotdot is a shortcut to the parent file.

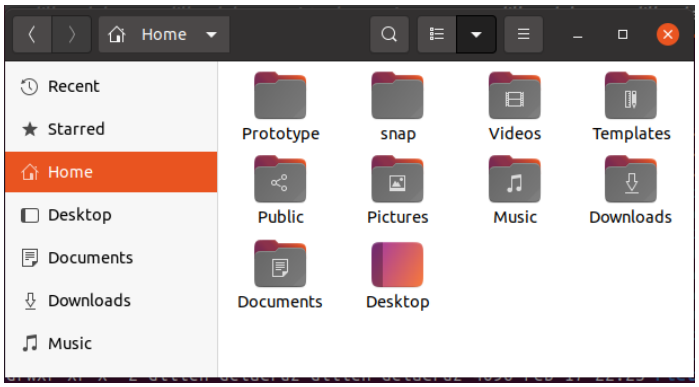
```
dillen-delacruz@dillendelacruz-VirtualBox:~/Prototype$ ll ..
total 104
drwxr-xr-x 18 dillen-delacruz dillen-delacruz 4096 Feb 18 15:29 ./
drwxr-xr-x  3 root            root            4096 Feb 17 22:16 ../
-rw-------  1 dillen-delacruz dillen-delacruz  633 Feb 18 18:08 .bash_history
-rw-r--r--  1 dillen-delacruz dillen-delacruz  220 Feb 17 22:16 .bash_logout
-rw-r--r--  1 dillen-delacruz dillen-delacruz 3771 Feb 17 22:16 .bashrc
drwx------ 16 dillen-delacruz dillen-delacruz 4096 Feb 18 10:25 .cache/
drwx------ 15 dillen-delacruz dillen-delacruz 4096 Feb 18 11:44 .config/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Desktop/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Documents/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Downloads/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 23:40 .fontconfig/
drwx------  3 dillen-delacruz dillen-delacruz 4096 Feb 18 11:18 .gnupg/
drwxr-xr-x  3 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 .local/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Music/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Pictures/
-rw-r--r--  1 dillen-delacruz dillen-delacruz  807 Feb 17 22:16 .profile
drwxrwxr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 18 15:29 Prototype/
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Public/
drwx------  3 dillen-delacruz dillen-delacruz 4096 Feb 17 22:32 snap/
drwx------  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:29 .ssh/
-rw-r--r--  1 dillen-delacruz dillen-delacruz    0 Feb 17 23:30 .sudo_as_admin_successful
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Templates/
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-clipboard.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-display-svga-x11.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-draganddrop.pid
-rw-r-----  1 dillen-delacruz dillen-delacruz    5 Feb 18 10:00 .vboxclient-seamless.pid
drwxr-xr-x  2 dillen-delacruz dillen-delacruz 4096 Feb 17 22:23 Videos/
dillen-delacruz@dillendelacruz-VirtualBox:~/Prototype$
```

GUI explanation:

We created a new file called “Prototype” within the “home” file. The “home” file is the parent file. “Prototype” is the kid file or the sub directory. Within Prototype is 2 hidden files which we covered from the command line, dot and dotdot.

```
dillen-delacruz@dillendelacruz-VirtualBox:~/Prototype$ cd ..
dillen-delacruz@dillendelacruz-VirtualBox:~$ pwd
/home/dillen-delacruz
dillen-delacruz@dillendelacruz-VirtualBox:~$
```

cd = change directory .. = shortcut to parent file
cd .. = change directory to parent file

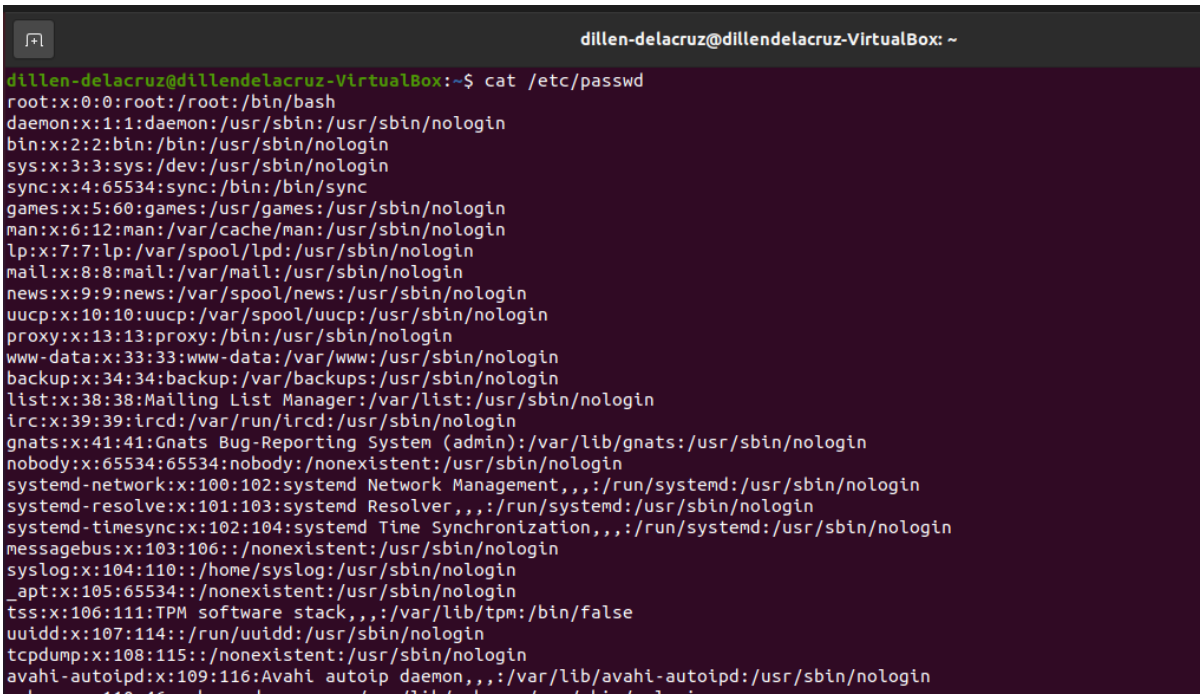


In this I again changed my currently working directory (Prototype) to the parent file of Prototype, which is “home”. The command pwd once again shows me the location of the file.

Clarification:

My currently working directory was originally “home” (parent file) but then using cd I changed it to “Prototype” (sub directory). Then I changed it again back to “home”.

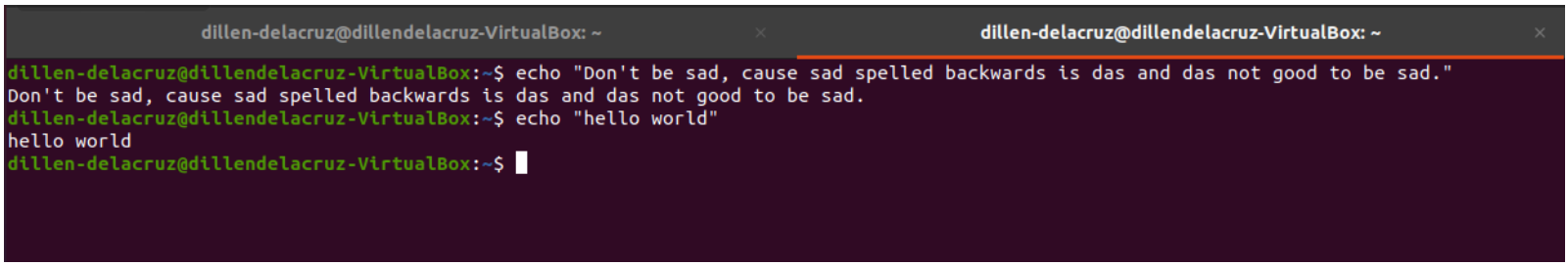
Step 11: Look at and Create a file



cat = print the content of a file onto the standard output stream

/etc/passwd = stores user account info. Is a plain text file

Here the command cat /etc/passwd will display contents of the password file in the etc directory. The /etc directory is where a Linux system's configuration files live. It is contained in the root directory and can generally be edited by hand in a text editor.



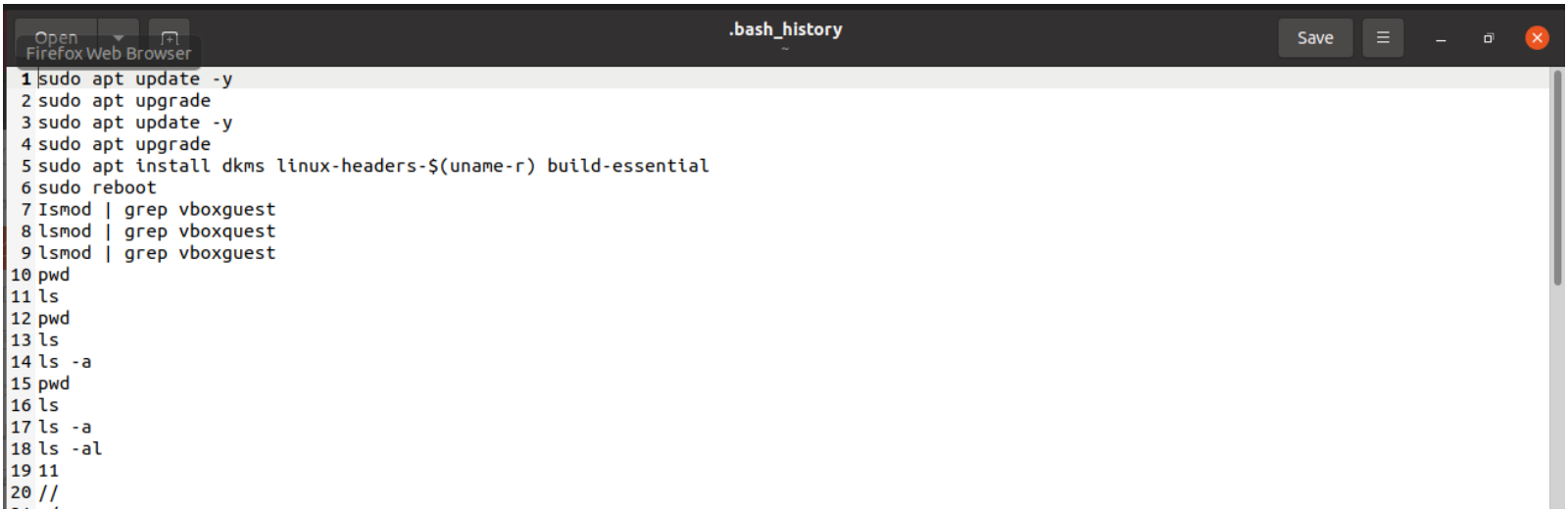
With the command echo you can display text on the screen. This comes in handy when writing scripts. The echo command is a built-in command that is used mostly in shell scripts and batch files to output status text to the screen or a file. A shell script is a list of commands in a computer program that is run by a UNIX (multiuser, multitasking OS)- based operating system. A batch file is a plain text file that contains a bunch (hence "batch") of commands to run.

Step 12: Use Shortcuts

```
dillen-delacruz@dillendelacruz-VirtualBox:~$ history
    1  sudo apt update -y
    2  sudo apt upgrade
    3  sudo apt update -y
    4  sudo apt upgrade
    5  sudo apt install dkms linux-headers-$(uname-r) build-essential
    6  sudo reboot
    7  Ismod | grep vboxguest
    8  lsmod | grep vboxquest
    9  lsmod | grep vboxguest
   10  pwd
   11  ls
   12  pwd
   13  ls
   14  ls -a
   15  pwd
   16  ls
   17  ls -a
   18  ls -al
   19  11
   20  //
   21  -/
   22  -1
   23  //
   24  ls -/t |head
```

The history command is a shortcut command that displays all the commands you have entered. By using up and down arrows you can go through the list and choose a command you want to reuse before you press enter. In the bottom picture I had pressed the up arrow 4 times to get the exit command. Once I press enter the terminal will be exited. You can also view this history on GUI. If you enable hidden files there is a document called ".bash_history" that will give you the same display.

```
   86  cat /etc/passwd
   87  echo "hello world"
   88  echo "Don't be sad, cause sad spelled backwards is das and das not good to be sad."
   89  echo "hello world"
   90  history
   91  pwd
   92  clear
   93  history
   94  clear
   95  exit
   96  history
   97  clear
   98  history
llen-delacruz@dillendelacruz-VirtualBox:~$ exit
```



LIMITATIONS/CONCLUSION

After finishing the lab, I had no issues, everything was running smoothly. I was able complete the entire lab however the only limitations that I had was that I lacked the language needed to understand the concepts. I had to constantly research the different files and drives. For the virtual lab set up, I spent days understanding the settings and how they are important to the running of the machine. Also, the coding language of the terminal. On some of the steps I broke down what each code did individually and what they meant together. The goal was to understand virtual machines: how to use them, how to set them up, and start playing with the terminal to access files and info about them. The goal was also to prepare us on future labs such as script writing. This is relevant to my degree in that virtual machines will be the basis of our learning in cyber security. With virtual machines they will allow us to experiment with different systems and code our own system; protect/attack it. It is also as what the directions had said, that as cybersecurity professionals we need to do more than the average user such as stepping away from GUI and learning how to use the terminal. These techniques and tools are very effective. With the command history it will allow us to reuse code that we have previously used, saving us time when writing long scripts. Even the virtual machine is useful. Instead of experimenting on our host machine and potentially damaging it, we can damage virtual ones. Then when we can delete it and make more machines to run. What I really want to learn is how to access a system when hacking or how to fight against an intrusion.

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Please cite any sources you used, including any listed in the lab itself. Include the title with the hyperlink, site, author, and date in APA 7 format or similar. For example, APA 7 format:

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COLLABORATION

I did not rely on my peers for this lab. I focused on independent research and learning.