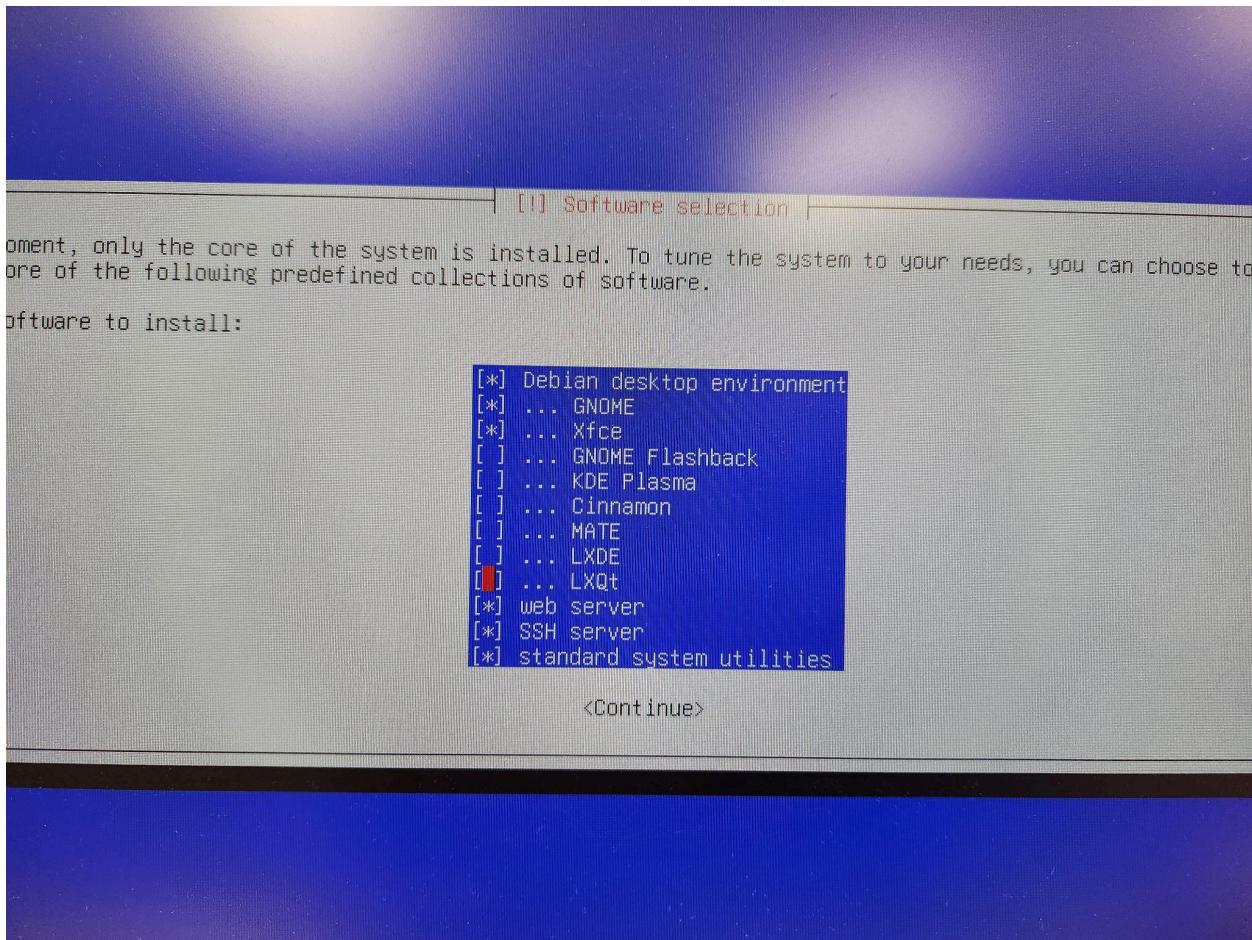


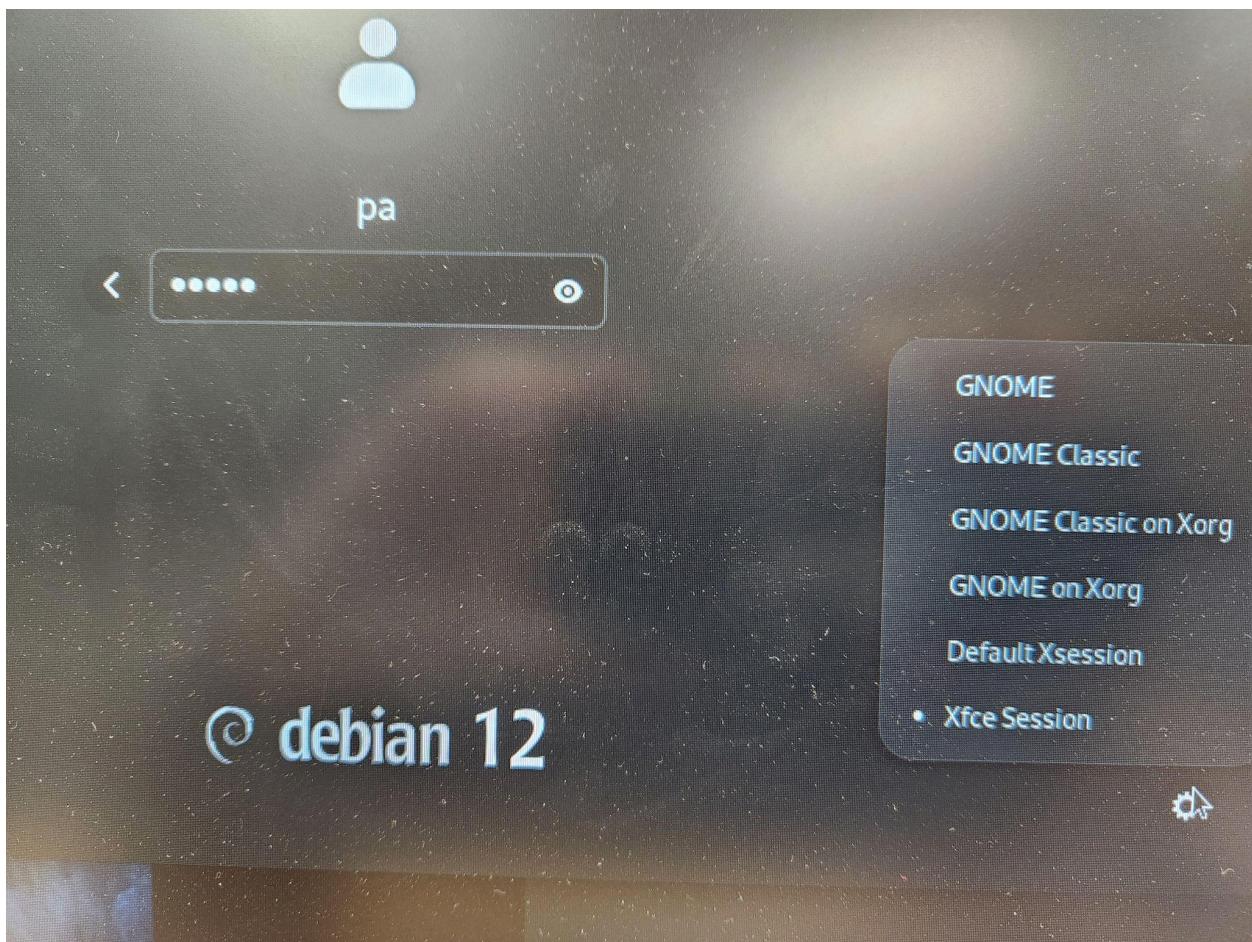
To start, we begin our vm build by downloading the debian12 iso, choosing 2 CPUs with 8096 of memory, and 20.0 GiB of disk for the vm.

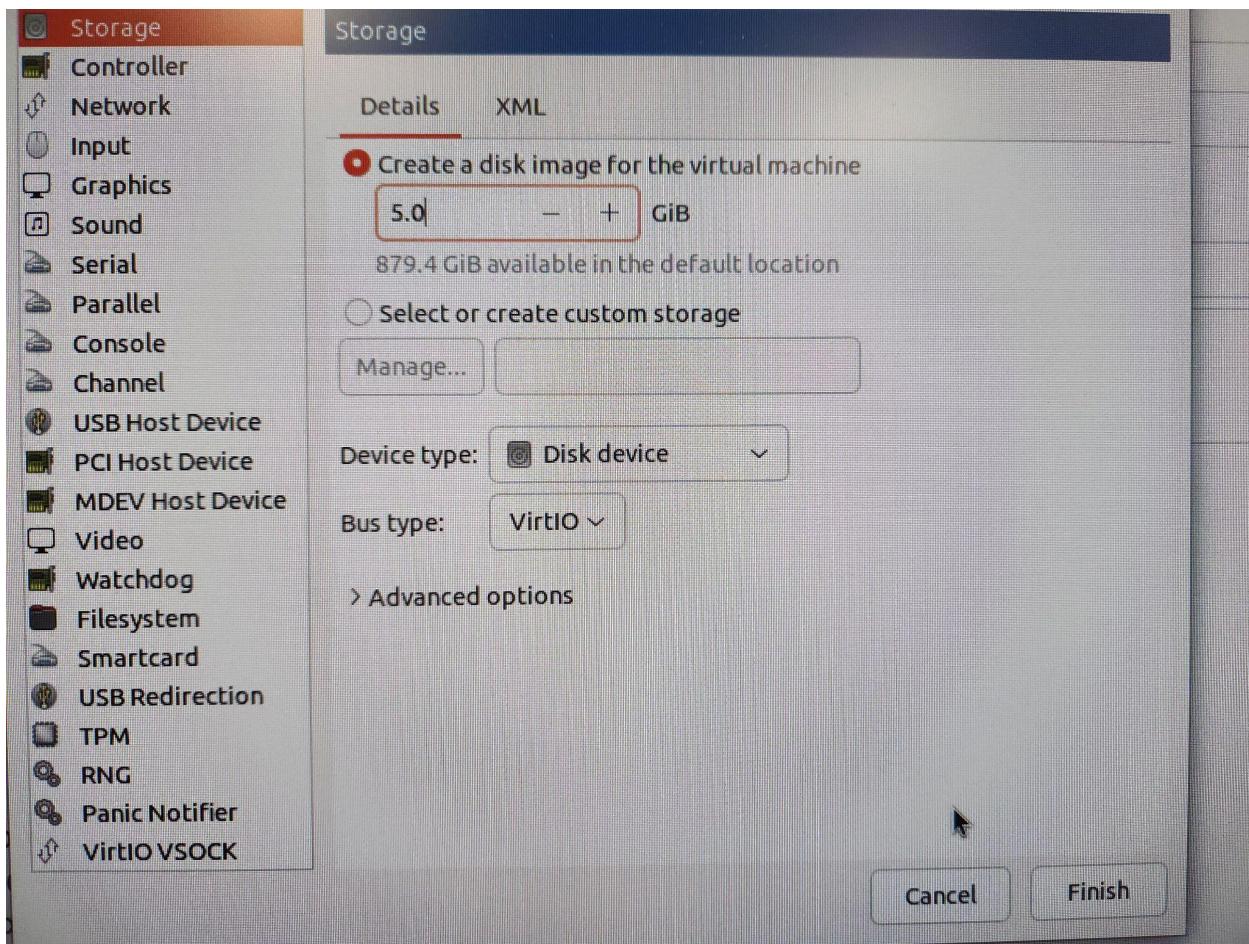


This introduction is fairly basic so there aren't images of these steps, but I did include an image of what software we selected to install into our vm.

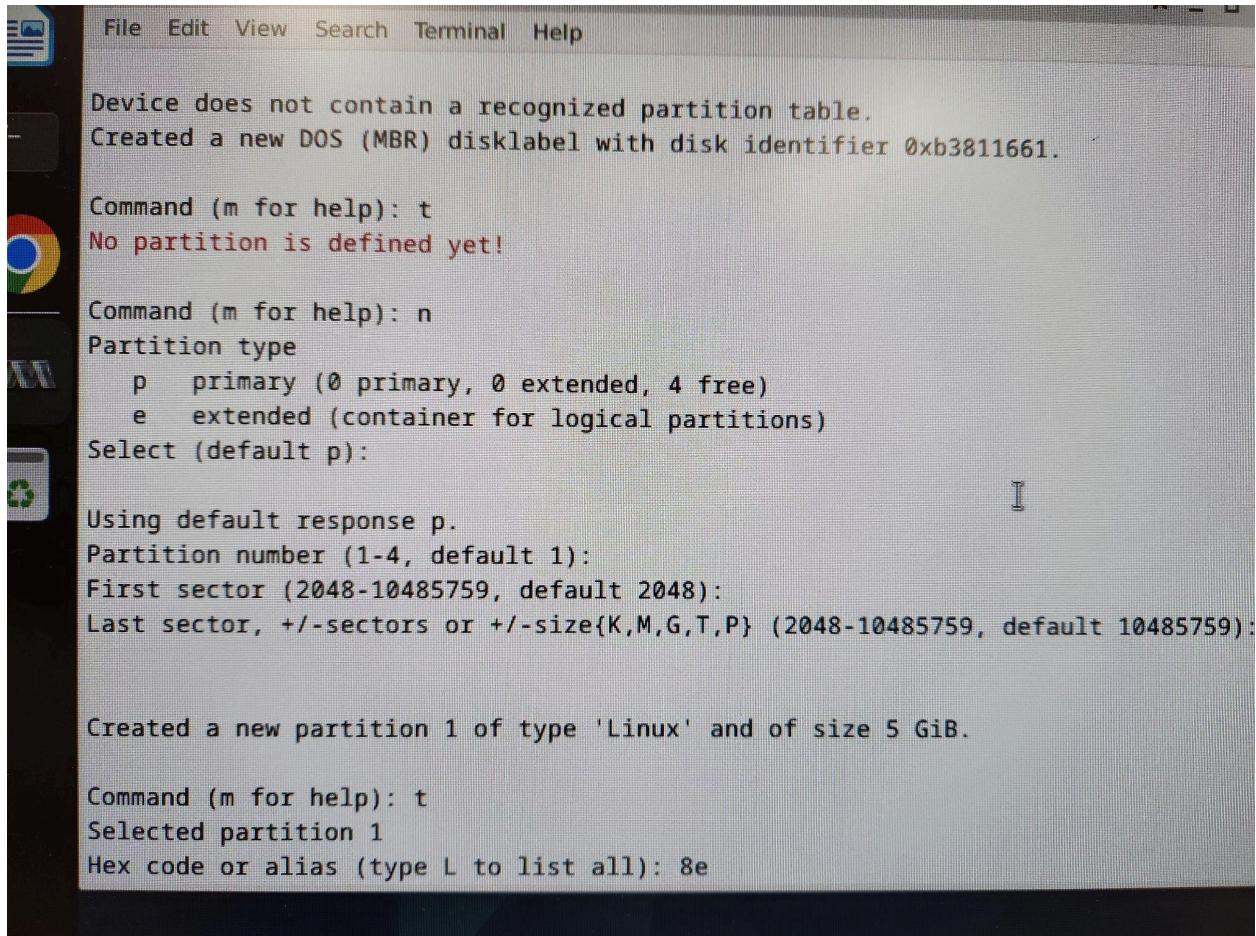
The ones we went with; GNOME, Xfce, web server, SSH server, and the default settings will help us later down the line like making our own SSH server to connect our desktop terminal with the vm terminal or making our own web server to modify the localhost web page.

After the vm finishes installing, I go ahead and log in but before I do that, I change my desktop appearance to Xfce Session. This doesn't affect much other than how our desktop will look but I prefer how Xfce lays everything out compared to the other options.



Disks and Mount Point:

The first step to adding more disk space to our vm is to go into the vm ware settings and adding a new device, Disk. I added 5.0 GBs and added two more disk devices as well for a total of 15.0 GBs. This lets us have more storage for our vm ware and we can use this storage to mount onto our vm and add/remove files from it.



Device does not contain a recognized partition table.
Created a new DOS (MBR) disklabel with disk identifier 0xb3811661.

```
Command (m for help): t  
No partition is defined yet!
```

```
Command (m for help): n  
Partition type  
  p  primary (0 primary, 0 extended, 4 free)  
  e  extended (container for logical partitions)  
Select (default p):
```

```
Using default response p.  
Partition number (1-4, default 1):  
First sector (2048-10485759, default 2048):  
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-10485759, default 10485759):
```

```
Created a new partition 1 of type 'Linux' and of size 5 GiB.
```

```
Command (m for help): t  
Selected partition 1  
Hex code or alias (type L to list all): 8e
```

After creating our disks, we head to the terminal to install lvm2 which lets us create a mount point for our disks. In order to do so we type the command `fdisk /dev/vdb` and create new settings by typing `n`. We go with the default settings but change the hex code to `8e` (8 echo), which changes the partition type to Linux LVM.

```
debian12pa@debian:~$ 
File Edit View Search Terminal Help
Changed type of partition 'Linux' to 'Linux LVM'.

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

root@debian:~# mkfs.fat32
-bash: mkfs.fat32: command not found
root@debian:~# pvcreate /dev/vdb1 /dev/vdc1
Physical volume "/dev/vdb1" successfully created.
Physical volume "/dev/vdc1" successfully created.
root@debian:~# pvs
PV          VG Fmt Attr PSize  PFree
/dev/vdb1    lvm2 --- <5.00g <5.00g
/dev/vdc1    lvm2 --- <5.00g <5.00g
root@debian:~# pvdisk
"/dev/vdb1" is a new physical volume of "<5.00 GiB"
--- NEW Physical volume ---
PV Name           /dev/vdb1
VG Name
PV Size          <5.00 GiB
Allocatable      NO
PE Size          0

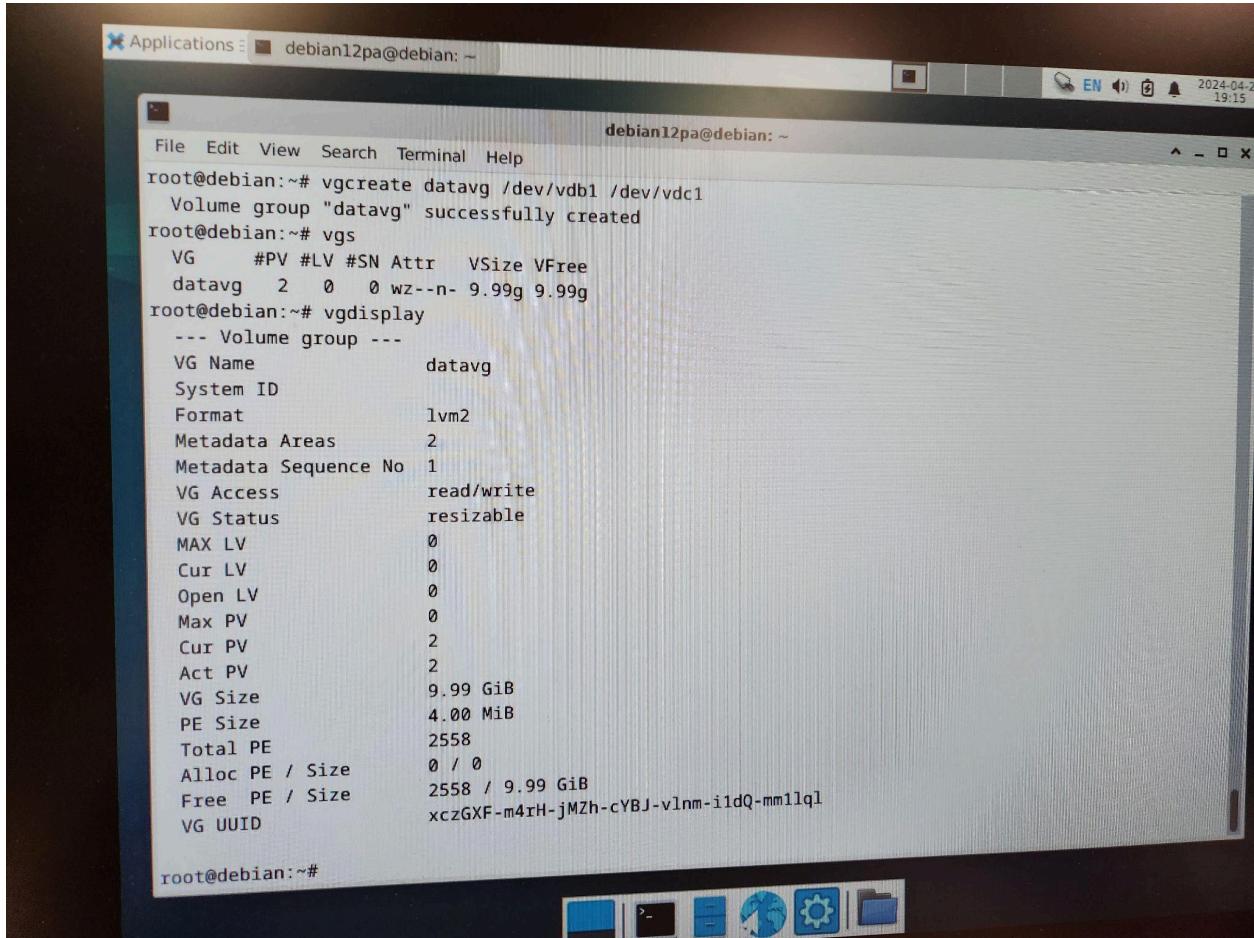
```

```
debian12pa@debian:~$ 
File Edit View Search Terminal Help
--- NEW Physical volume ---
PV Name           /dev/vdb1
VG Name
PV Size          <5.00 GiB
Allocatable      NO
PE Size          0
Total PE         0
Free PE          0
Allocated PE     0
PV UUID          dyZlKM-bl29-VGMy-kThk-hXYX-iCGe-FdWyMR

"/dev/vdc1" is a new physical volume of "<5.00 GiB"
--- NEW Physical volume ---
PV Name           /dev/vdc1
VG Name
PV Size          <5.00 GiB
Allocatable      NO
PE Size          0
Total PE         0
Free PE          0
Allocated PE     0
PV UUID          Glixj8-ZT8U-AyJ1-b9oV-ct6j-5q8M-BYjE9c

root@debian:~# 
```

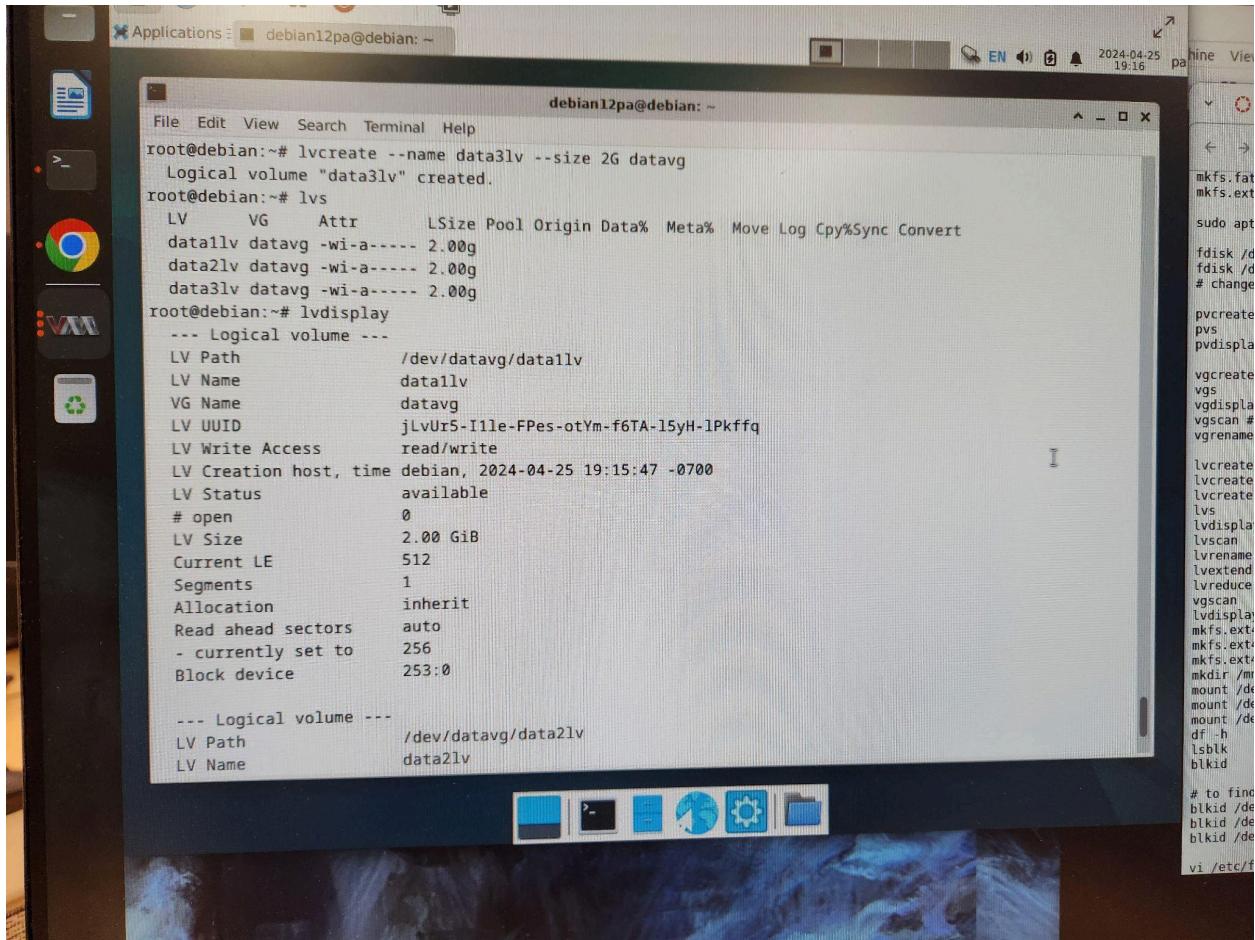
Using the command `pvcreate /dev/vdb1 /dev/vdc1`, we create a block of storage space that is to be used by the vm terminal. On the last page, I scan the physical volumes using `pvs` to check if they were created successfully then go to `pvdisplay` to check each block with more detailed information.



The screenshot shows a terminal window titled "Applications" with the command prompt "debian12pa@debian: ~". The terminal displays the following commands and output:

```
root@debian:~# vgcreate datavg /dev/vdb1 /dev/vdc1
  Volume group "datavg" successfully created
root@debian:~# vgs
  VG     #PV #LV #SN Attr   VSize  VFree
  datavg  2   0   0 wz--n- 9.99g 9.99g
root@debian:~# vgdisplay
--- Volume group ---
  VG Name           datavg
  System ID
  Format            lvm2
  Metadata Areas    2
  Metadata Sequence No  1
  VG Access         read/write
  VG Status          resizable
  MAX LV             0
  Cur LV              0
  Open LV             0
  Max PV              0
  Cur PV              2
  Act PV              2
  VG Size            9.99 GiB
  PE Size             4.00 MiB
  Total PE            2558
  Alloc PE / Size    0 / 0
  Free PE / Size     2558 / 9.99 GiB
  VG UUID             xczGXF-m4rH-jMZh-cYBJ-vlnm-i1dQ-mm1lql
root@debian:~#
```

Here I create a volume group, `datavg`, which will be used for `vdb1` and `vdc1` and scan it using `vgs`. Then I type `vgdisplay` to show me the detailed information for `datavg`.



The screenshot shows a terminal window titled "debian12pa@debian: ~" running on a Debian 12 system. The user is root. The terminal displays the following commands and output:

```

root@debian:~# lvcreate --name data3lv --size 2G datavg
Logical volume "data3lv" created.
root@debian:~# lvs
  LV   VG Attr       LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  data1lv datavg -wi-a---- 2.00g
  data2lv datavg -wi-a---- 2.00g
  data3lv datavg -wi-a---- 2.00g
root@debian:~# lvdisplay
--- Logical volume ---
LV Path          /dev/datavg/data1lv
LV Name          data1lv
VG Name          datavg
LV UUID          jLvUr5-I1le-FPes-otYm-f6TA-15yH-1Pkffq
LV Write Access  read/write
LV Creation host, time debian, 2024-04-25 19:15:47 -0700
LV Status        available
# open           0
LV Size          2.00 GiB
Current LE      512
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 256
Block device    253:0

--- Logical volume ---
LV Path          /dev/datavg/data2lv
LV Name          data2lv

```

The terminal window has a dark blue header bar with icons for file, edit, view, search, terminal, and help. The main area is white with black text. A vertical scroll bar is on the right. The bottom of the window features a dark blue footer bar with several small icons.

After creating my volume group, datavg, I create a mount point for each disk using the lvcreate command. I specify what their name and size should be by using --name and --size and following it up by said specification. Just like the other steps in this procedure, I scan my mount points by using lvs and check their detailed information by using the lvdisplay command.

```
File Edit View Search Terminal Help
Read ahead sectors      auto
- currently set to      256
Block device            253:2

root@debian:~# mkfs.ext4 /dev/datavg/data1lv
mke2fs 1.47.0 (5-Feb-2023)
Discarding device blocks: done
Creating filesystem with 524288 4k blocks and 131072 inodes
Filesystem UUID: 81fffea8-4fbb-48ae-b415-5e0bb95871bb
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376, 294912

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@debian:~# mkfs.ext4 /dev/datavg/data2lv
mke2fs 1.47.0 (5-Feb-2023)
Discarding device blocks: done
Creating filesystem with 524288 4k blocks and 131072 inodes
Filesystem UUID: fac36ec4-6076-4a47-af38-643d6d021172
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376, 294912

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done

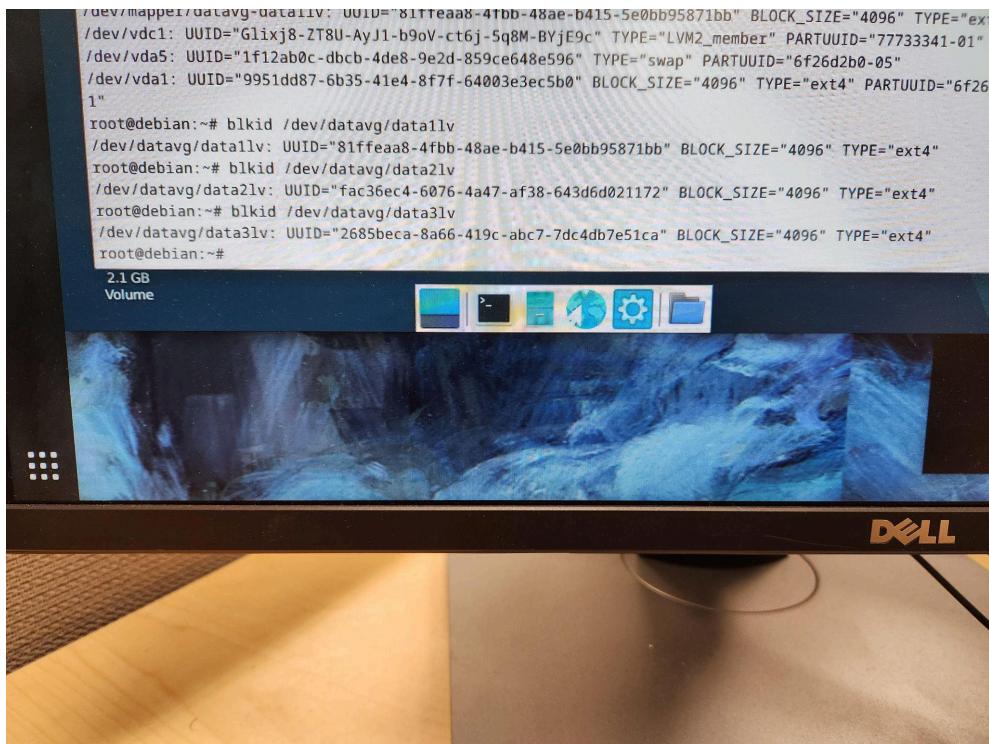
2.1 GB
Volume
```

I use the mkfs.ext4 command for each datalv to give them their appropriate data structures.

```
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@debian:~# mkdir /mnt/data1 /mnt/data2 mnt/data3
mkdir: cannot create directory 'mnt/data3': No such file or directory
root@debian:~# exit
logout
debian12pa@debian:~$ mkdir /mnt/data1 /mnt/data2 /mnt/data3
mkdir: cannot create directory '/mnt/data1': File exists
mkdir: cannot create directory '/mnt/data2': File exists
mkdir: cannot create directory '/mnt/data3': Permission denied
debian12pa@debian:~$ ls
bin      Documents  inclass  Pictures  sp24_mkstuff.txt  Videos
Desktop  Downloads  Music    Public    Templates
debian12pa@debian:~$ mount /dev/datavg/data1lv /mnt/data1
mount: /mnt/data1: must be superuser to use mount.
        dmesg(1) may have more information after failed mount system call.
debian12pa@debian:~$ su -
Password:
root@debian:~# mount /dev/datavg/data1lv /mnt/data1
root@debian:~# mount /dev/datavg/data2lv /mnt/data2
root@debian:~# mount /dev/datavg/data3lv /mnt/data3
mount: /mnt/data3: mount point does not exist.
        dmesg(1) may have more information after failed mount system call.
root@debian:~# df -h
```

Here I mount the datalv's onto our mnt (mount) folders. There was an error with the 3rd data but this got fixed later on, I believe the folder/directory wasn't created or I had not created the mount point for data3lv yet; data3lv.



```

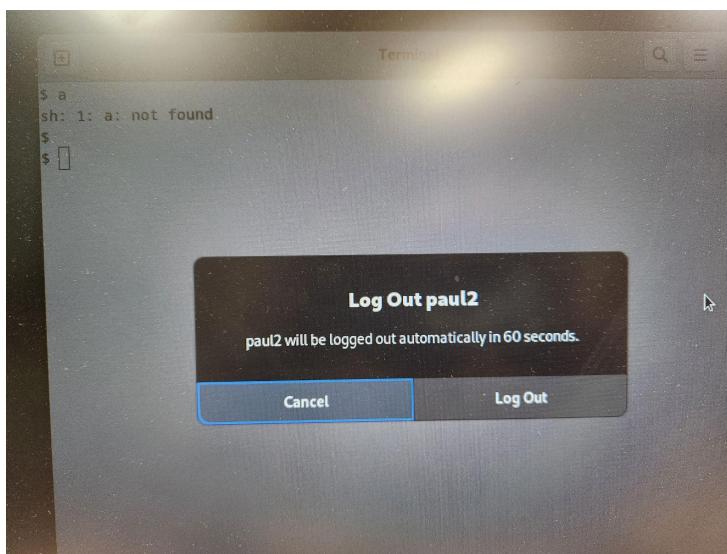
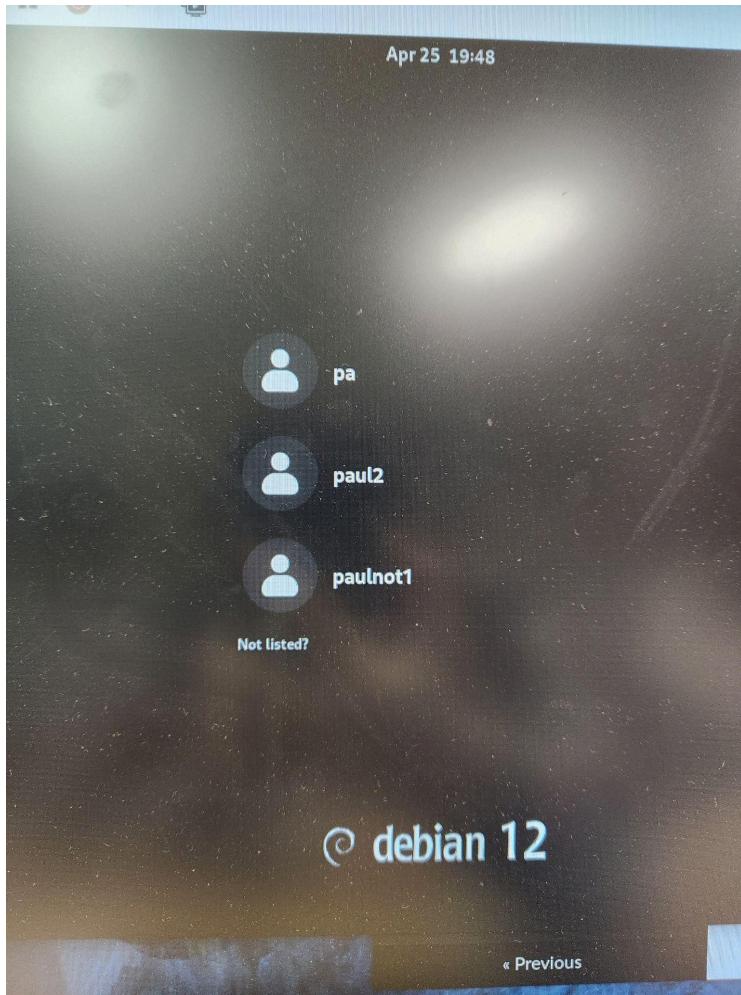
56 blkid /dev/datavg/data1lv
57 blkid /dev/datavg/data2lv
58 blkid /dev/datavg/data3lv
59 blkid /dev/datavg/data3lv
60 vi /etc/fstab
61 sudo apt install vim
62 vi /etc/fstab
63 vi /etc/fstab
64 vi /etc/fstab
65 blkid /dev/datavg/data1lv
66 blkid /dev/datavg/data2lv
67 blkid /dev/datavg/data3lv
68 vi /etc/fstab
69 df
70 cd /mnt
71 ls
72 mkdir data3
73 history
ot@debian:~# █

```

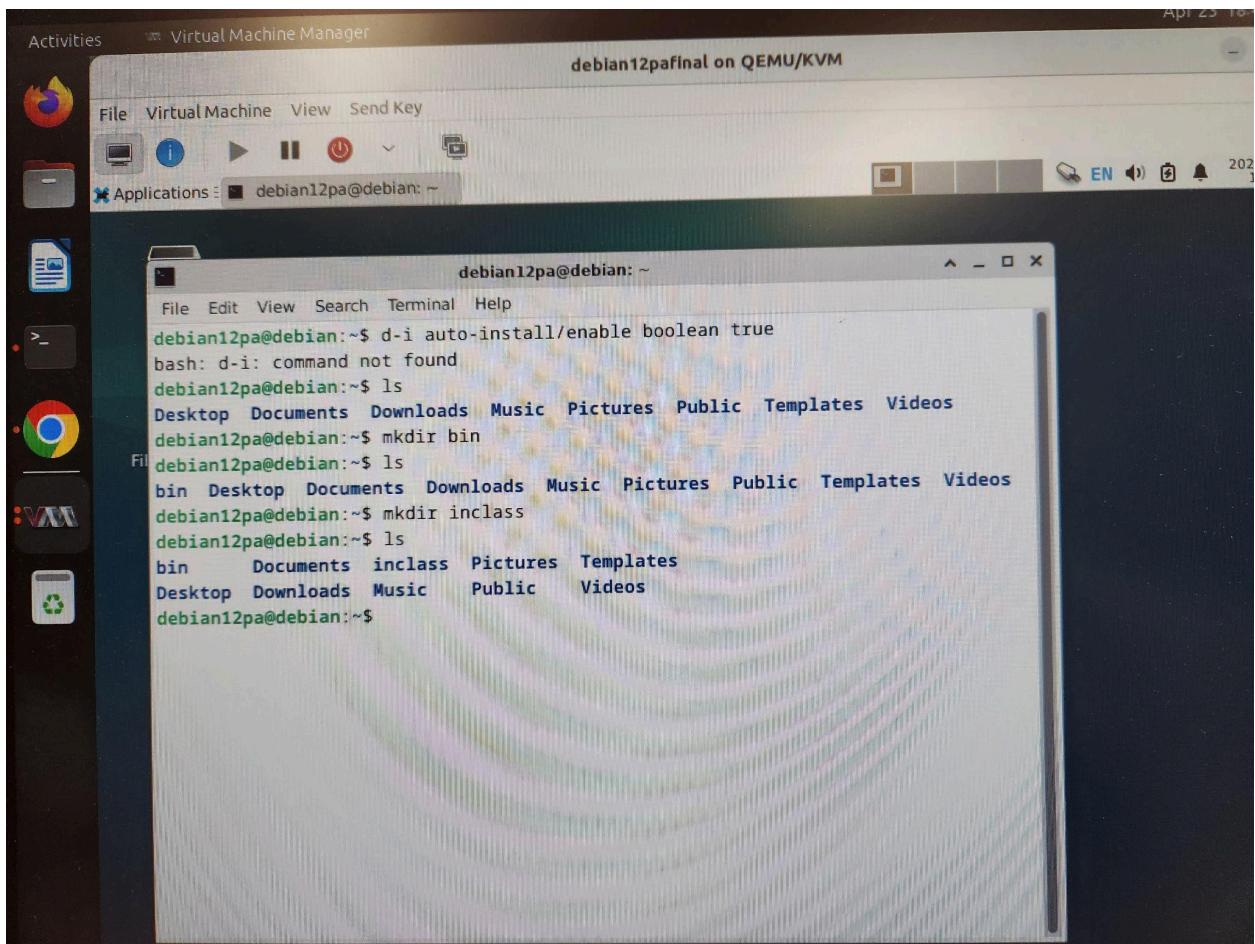
The last page has the blkid's for each disk so they can be read from the fstab file in the etc directory. In addition, my history of what commands I used shortly after finding each datalv's blkid is shown.

Adding Users and Making Directories:

```
117 vgs
118 sudo dmesg
119 sudo apt install -y lvm2
120 fdisk /dev/vdb
121 vgs
122 pvs
123 apt install sudo lvm2
124 sudo useradd paul2
125 sudo passwd paul2
126 sudo useradd paulnot1
127 sudo passwd paulnot1
128 pvs
129 su -
130 mkdir /mnt/data1 /mnt/data2 /mnt/data3
131 ls
132 mount /dev/datavg/data1lv /mnt/data1
133 su -
134 df
135 history
debian12pa@debian:~$
```

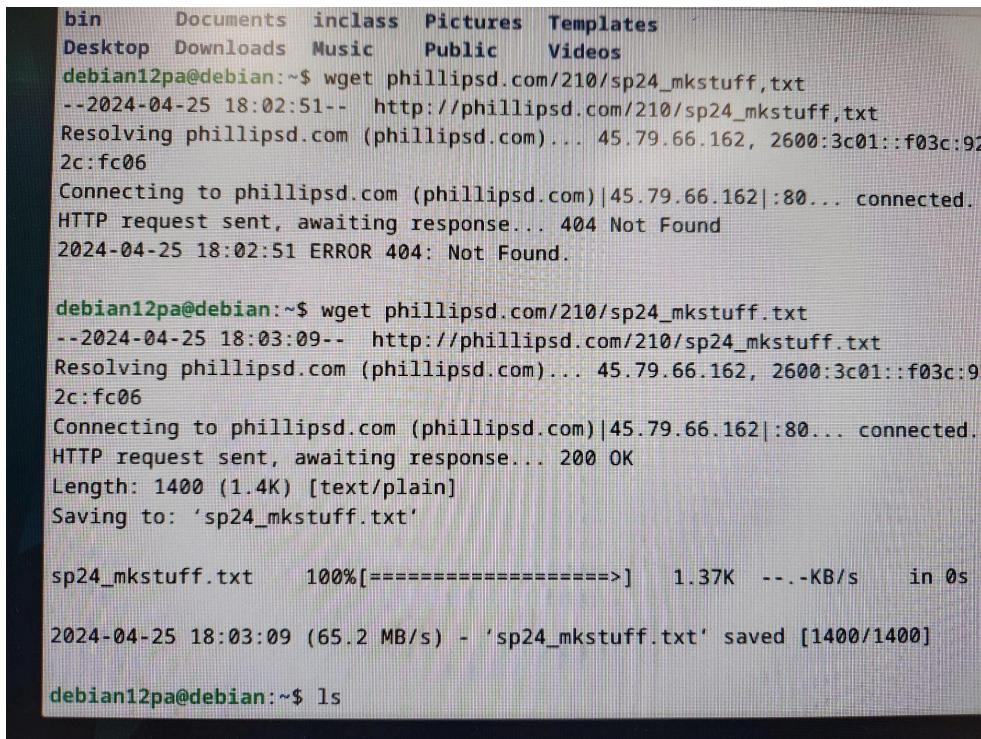


These two images show new users getting added to our vm with the past page showing the commands I used to create said users.



Here I make the directories bin and inclass.

Make Stuff Functions and Localhost Webpage:



```

bin      Documents  inclass  Pictures  Templates
Desktop  Downloads  Music    Public    Videos
debian12pa@debian:~$ wget phillipsd.com/210/sp24_mkstuff.txt
--2024-04-25 18:02:51-- http://phillipsd.com/210/sp24_mkstuff.txt
Resolving phillipsd.com (phillipsd.com)... 45.79.66.162, 2600:3c01::f03c:92
2c:fc06
Connecting to phillipsd.com (phillipsd.com)|45.79.66.162|:80... connected.
HTTP request sent, awaiting response... 404 Not Found
2024-04-25 18:02:51 ERROR 404: Not Found.

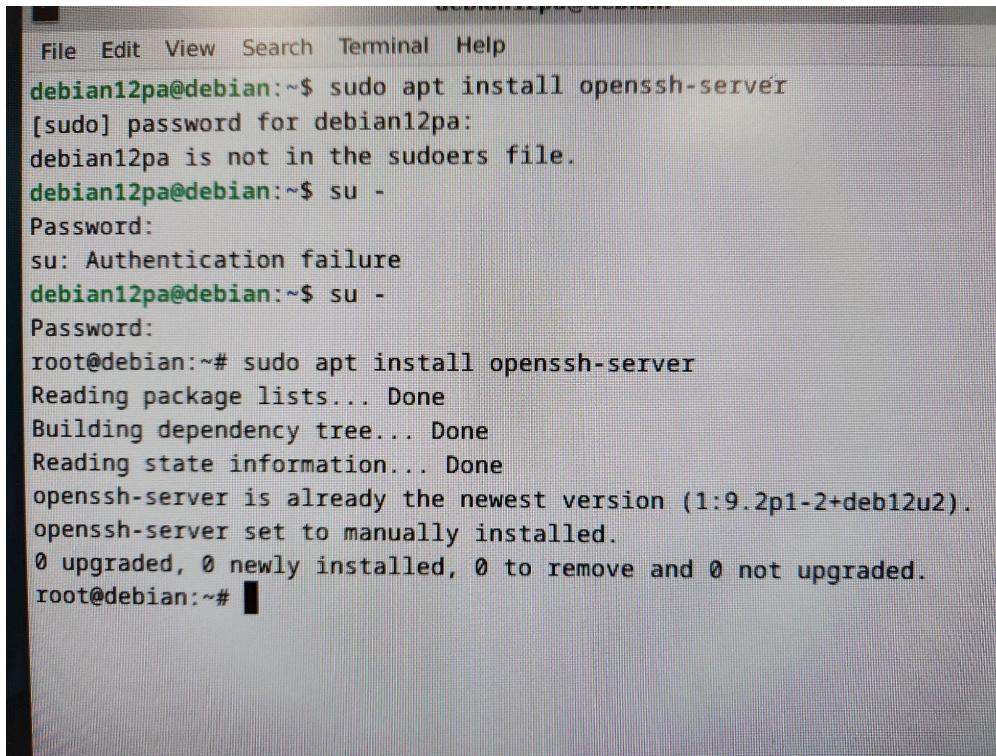
debian12pa@debian:~$ wget phillipsd.com/210/sp24_mkstuff.txt
--2024-04-25 18:03:09-- http://phillipsd.com/210/sp24_mkstuff.txt
Resolving phillipsd.com (phillipsd.com)... 45.79.66.162, 2600:3c01::f03c:92
2c:fc06
Connecting to phillipsd.com (phillipsd.com)|45.79.66.162|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1400 (1.4K) [text/plain]
Saving to: 'sp24_mkstuff.txt'

sp24_mkstuff.txt    100%[=====] 1.37K --.-KB/s   in 0s

2024-04-25 18:03:09 (65.2 MB/s) - 'sp24_mkstuff.txt' saved [1400/1400]

debian12pa@debian:~$ ls

```

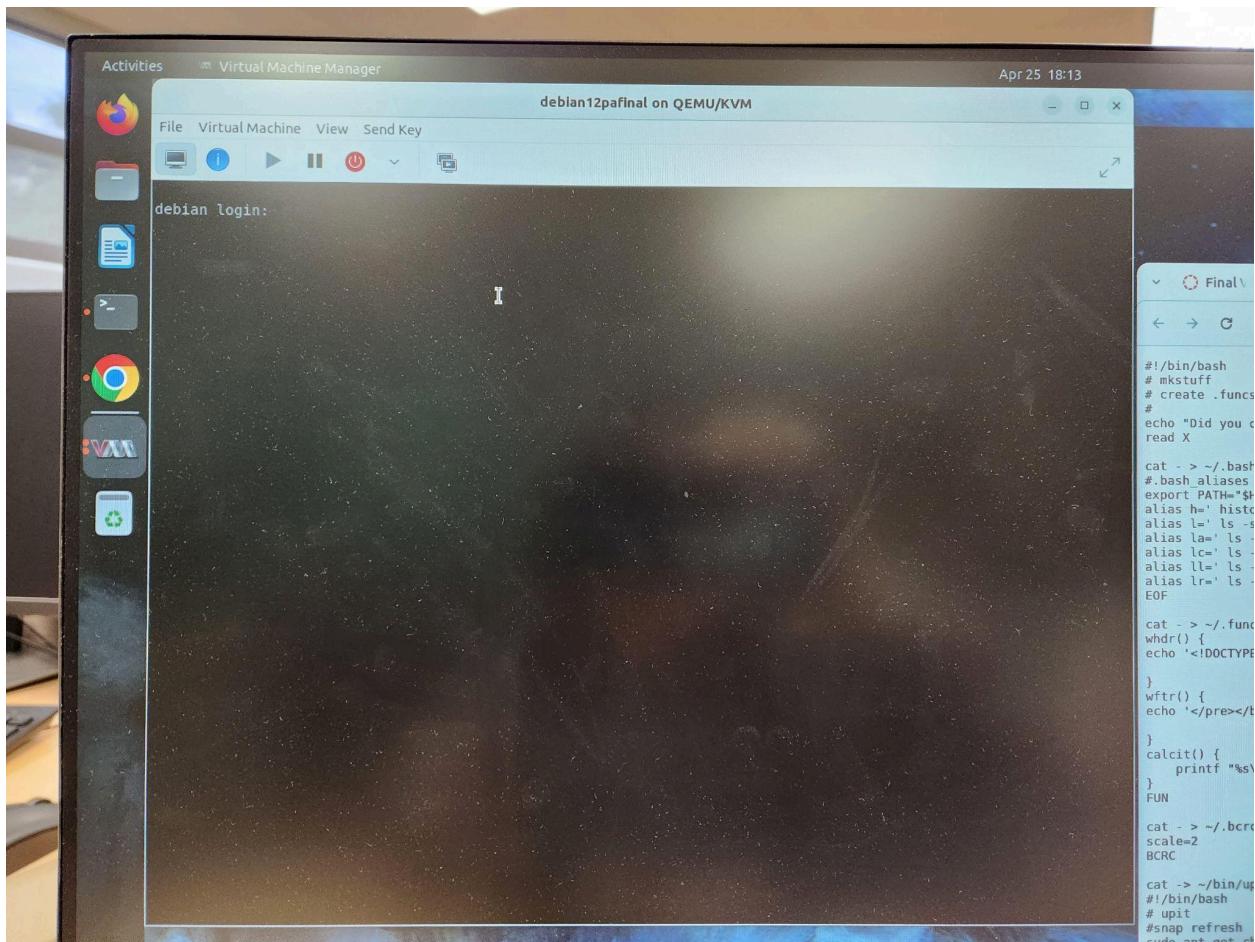


```

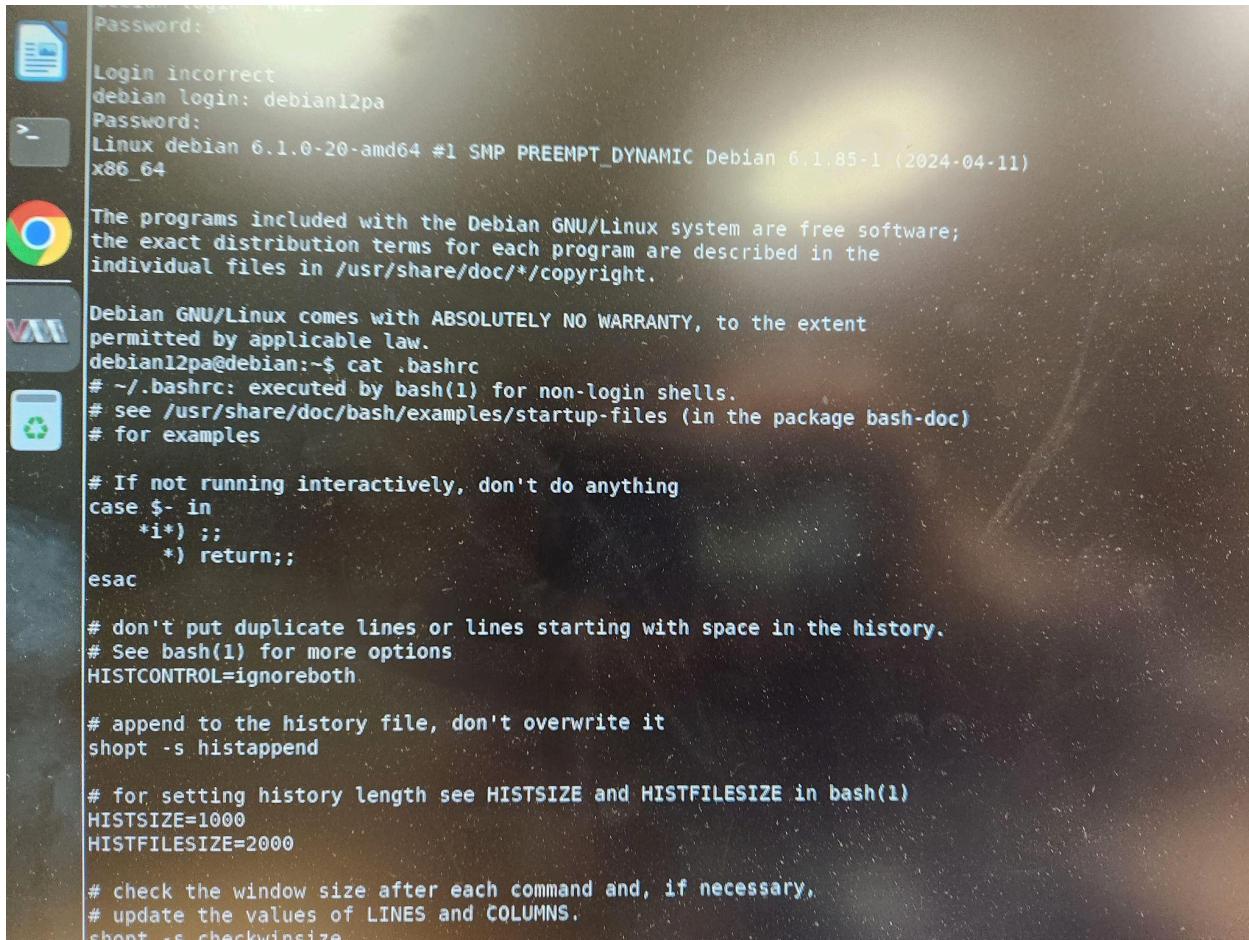
File Edit View Search Terminal Help
debian12pa@debian:~$ sudo apt install openssh-server
[sudo] password for debian12pa:
debian12pa is not in the sudoers file.
debian12pa@debian:~$ su -
Password:
su: Authentication failure
debian12pa@debian:~$ su -
Password:
root@debian:~# sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:9.2p1-2+deb12u2).
openssh-server set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
root@debian:~#

```

In the first image I get the sp24_mkstuff.txt file from the web, which I believe has bin and inclass included into the \$PATH path, and then install the openssh-server tool through root user.



Using the serial console through the openssh-server tool and switching to it through the View dropdown menu.



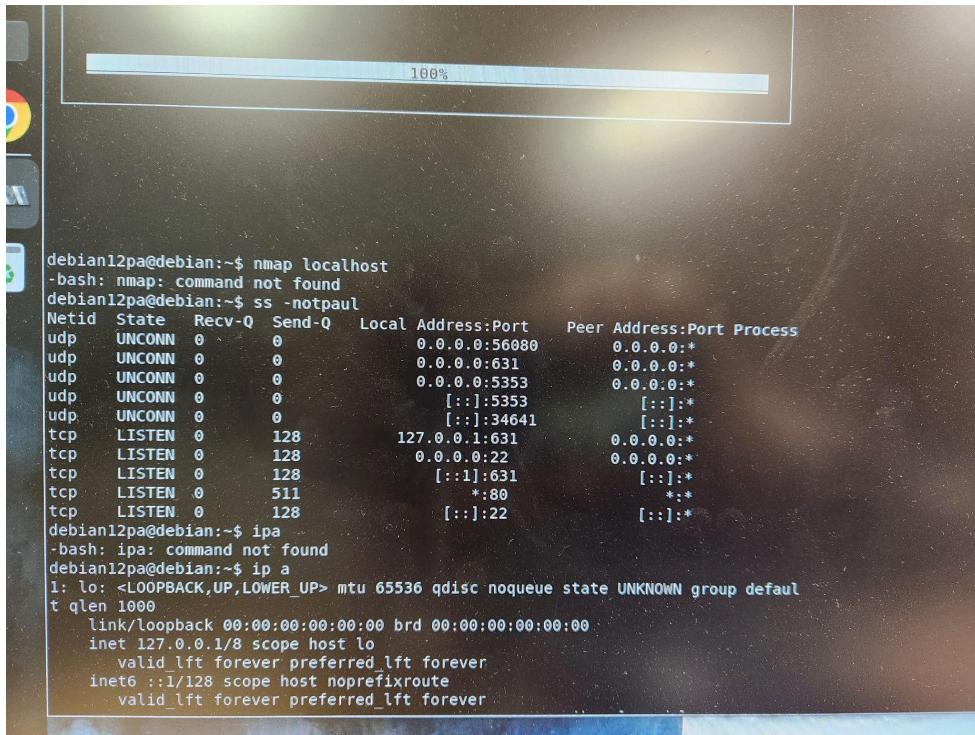
The screenshot shows a terminal window on a Linux system. The window title is "Terminal". The terminal displays the following text:

```
root@debian:~# Password:  
Login incorrect  
debian login: debian12pa  
Password:  
Linux debian 6.1.0-20-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.1.85-1 (2024-04-11)  
x86_64  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
debian12pa@debian:~$ cat .bashrc  
# ~/.bashrc: executed by bash(1) for non-login shells.  
# see /usr/share/doc/bash/examples/startup-files (in the package bash-doc)  
# for examples  
  
# If not running interactively, don't do anything  
case $- in  
    *i*) ;;  
    *) return;;  
esac  
  
# don't put duplicate lines or lines starting with space in the history.  
# See bash(1) for more options  
HISTCONTROL=ignoreboth  
  
# append to the history file, don't overwrite it  
shopt -s histappend  
  
# for setting history length see HISTSIZE and HISTFILESIZE in bash(1)  
HISTSIZE=1000  
HISTFILESIZE=2000  
  
# check the window size after each command and, if necessary,  
# update the values of LINES and COLUMNS.  
shopt -s checkwinsize
```

Logging into the serial console and looking at .bashrc using the cat command. I believe I used source .bashrc after this but it is offscreen.

```
# sources /etc/bash.bashrc and /etc/profile
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi
if [ -f ~/.funcs ]; then
  . ~/.funcs
fi
#..
debian12pa@debian:~$ whdr
<!DOCTYPE html><head><title>bash web</title></head><body><pre>
debian12pa@debian:~$ wftr
</pre></body></html>
debian12pa@debian:~$ catcit "3 * 4"
-bash: catcit: command not found
debian12pa@debian:~$ calcit "3 * 4"
12
debian12pa@debian:~$ upit
[sudo] password for debian12pa:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Reading package lists... Done
Building dependency tree... Done
Package configuration
```

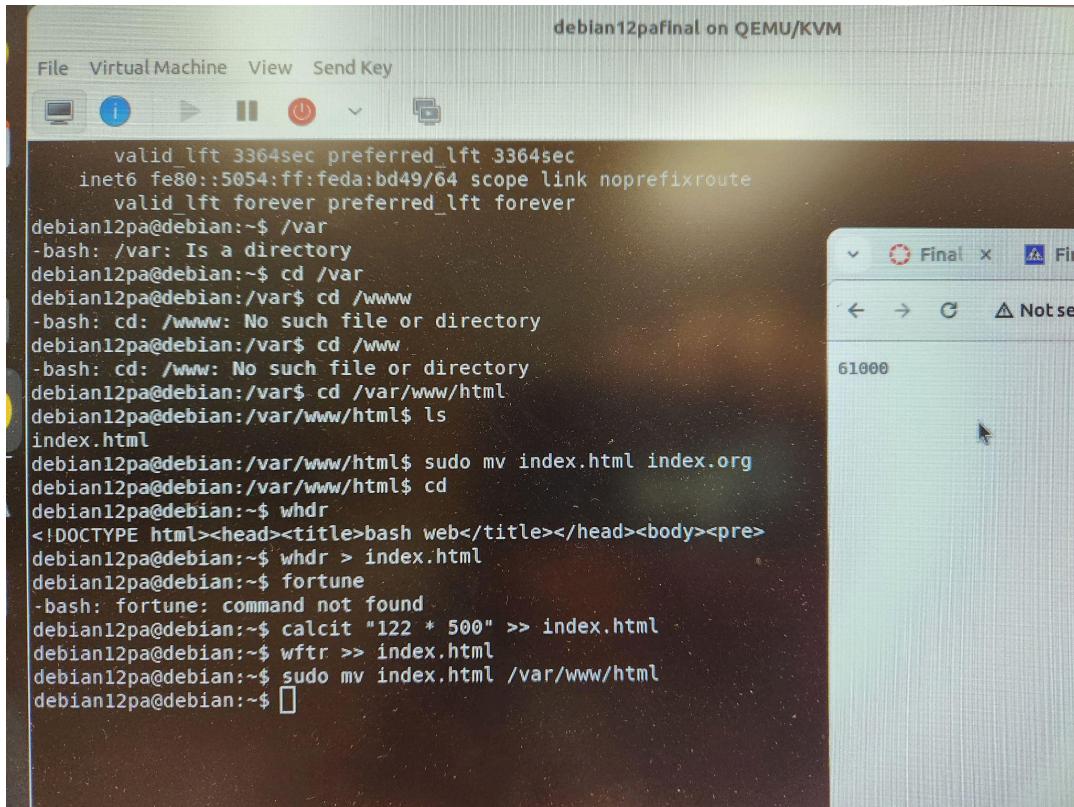
Using whdr, wftr, calcit, and upit commands. Get to look at beginning html header code and the end of html header code; as well as a calculator for simple math and updating our vm with upit.



```

debian12pa@debian:~$ nmap localhost
-bash: nmap: command not found
debian12pa@debian:~$ ss -notpaul
Netid State Recv-Q Send-Q Local Address:Port Peer Address:Port Process
udp UNCONN 0 0 0.0.0.0:56080 0.0.0.0:*
udp UNCONN 0 0 0.0.0.0:631 0.0.0.0:*
udp UNCONN 0 0 0.0.0.0:5353 0.0.0.0:*
udp UNCONN 0 0 [:]:5353 [:]:*
udp UNCONN 0 0 [:]:34641 [:]:*
tcp LISTEN 0 128 127.0.0.1:631 0.0.0.0:*
tcp LISTEN 0 128 0.0.0.0:22 0.0.0.0:*
tcp LISTEN 0 128 [:1]:631 [:]:*
tcp LISTEN 0 511 *:80 *:*
tcp LISTEN 0 128 [:1]:22 [:]:*
debian12pa@debian:~$ ipa
-bash: ipa: command not found
debian12pa@debian:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
qdisc mq 0: [0:0]
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 brd 00:00:00:00:00:00 scope host lo
        valid_lft forever preferred_lft forever
    inetc6 ::1/128 brd 00:00:00:00:00:00 scope host noprefixroute
        valid_lft forever preferred_lft forever

```



```

File VirtualMachine View Send Key
File VirtualMachine View Send Key
valid_lft 3364sec preferred_lft 3364sec
inet6 fe80::5054:ff:feda:bd49/64 brd 00:00:00:00:00:00 scope link noprefixroute
    valid_lft forever preferred_lft forever
debian12pa@debian:~$ /var
-bash: /var: Is a directory
debian12pa@debian:~$ cd /var
debian12pa@debian:/var$ cd /www
-bash: cd: /www: No such file or directory
debian12pa@debian:/var$ cd /www
-bash: cd: /www: No such file or directory
debian12pa@debian:/var$ cd /var/www/html
debian12pa@debian:/var/www/html$ ls
index.html
debian12pa@debian:/var/www/html$ sudo mv index.html index.org
debian12pa@debian:/var/www/html$ cd
debian12pa@debian:~$ whdr
<!DOCTYPE html><head><title>bash web</title></head><body><pre>
debian12pa@debian:~$ whdr > index.html
debian12pa@debian:~$ fortune
-bash: fortune: command not found
debian12pa@debian:~$ calcit "122 * 500" >> index.html
debian12pa@debian:~$ wftr >> index.html
debian12pa@debian:~$ sudo mv index.html /var/www/html
debian12pa@debian:~$ 

```

First image: Using nmap localhost and ss - command to look at IP address.

Second image: Using cd to change to the appropriate directory to move the index.html and changing the webpage to display our calculation using the calcit command.