

Assignment Completion Report:

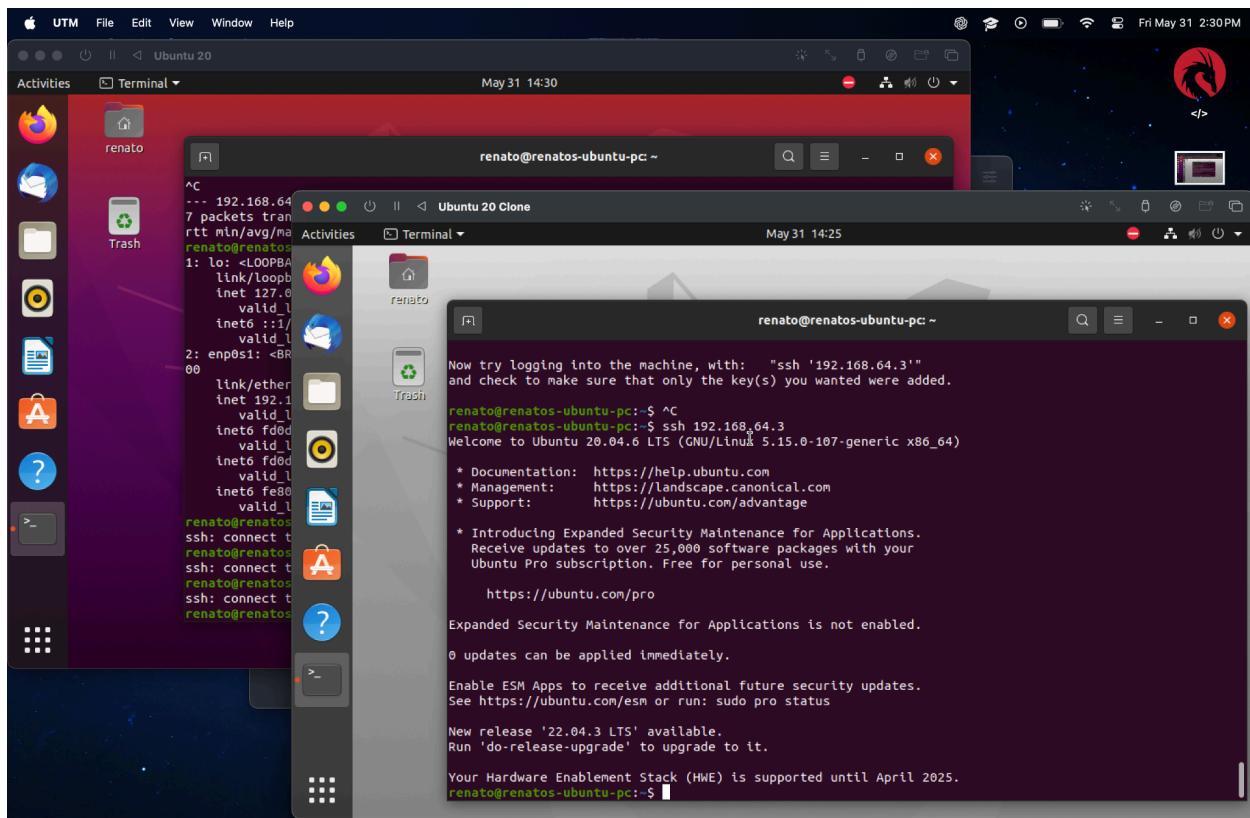
In this Linux & Tools assignment, we were tasked to set up our own virtual machines on our local systems and to go through and learn all the various commands that Linux provides. Each command plays an important role in Linux and will most likely be used for the research that lies ahead of me.

To set up my virtual machine, I installed UTM on Macbook Air (M2). I created a virtual machine of Ubuntu 20 with 2 cores, 4GB of RAM, and 25GB of storage. The setup process was lengthier than expected, but when Ubuntu was ready for me to use, the rest was a straightforward process. I setup my public and private keys as well as opened the SSH port for communication among machines.

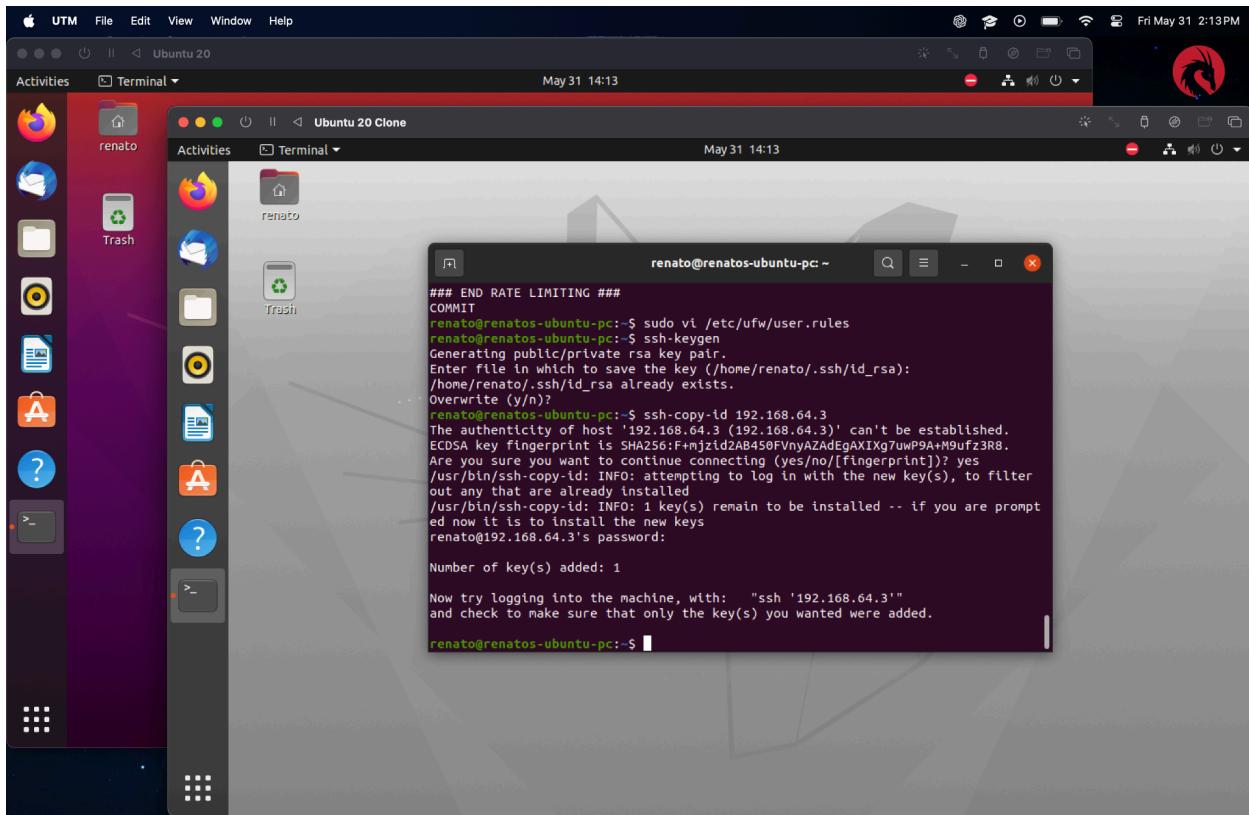
Linux Commands

The next step involved utilizing each of the Linux commands:

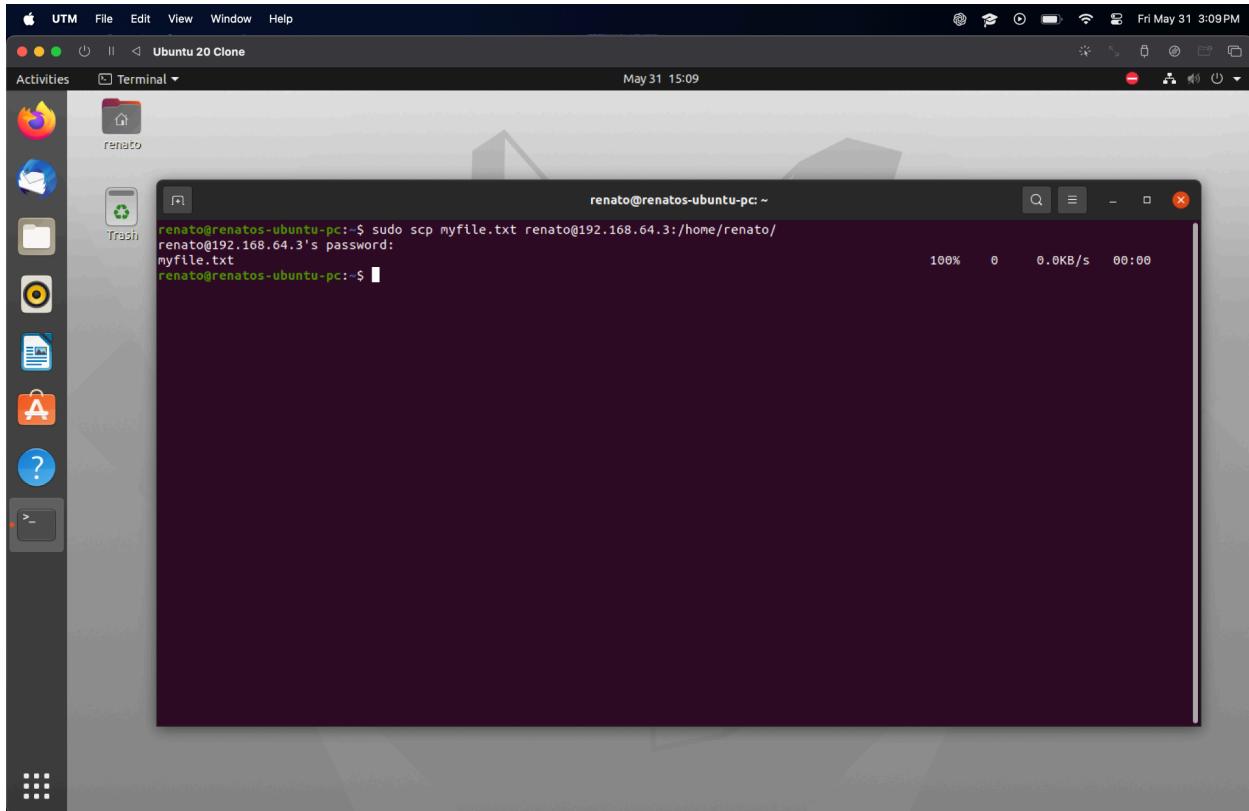
a. ssh: Securely connects to a remote server over a network.



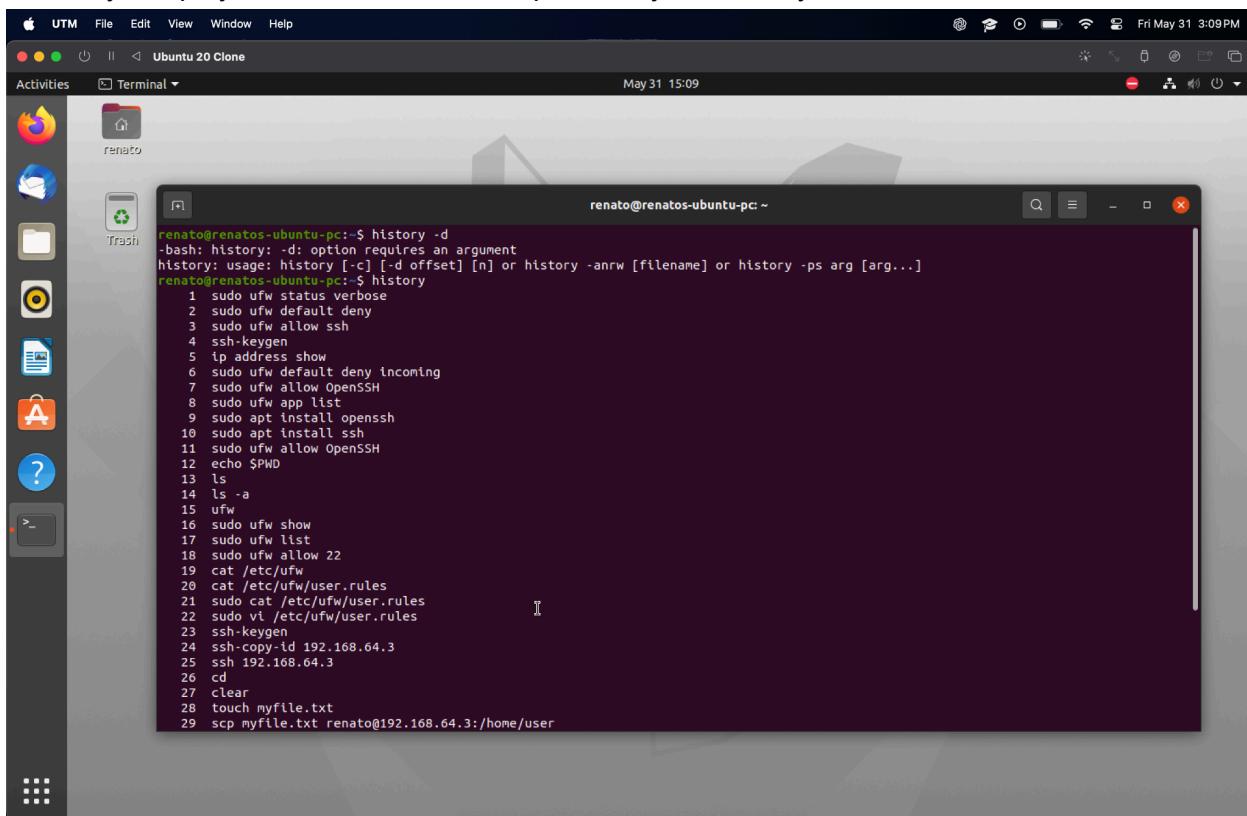
b. ssh-keygen: Generates, manages, and converts authentication keys for ssh.



c. scp: Copies files between hosts on a network using SSH for security.



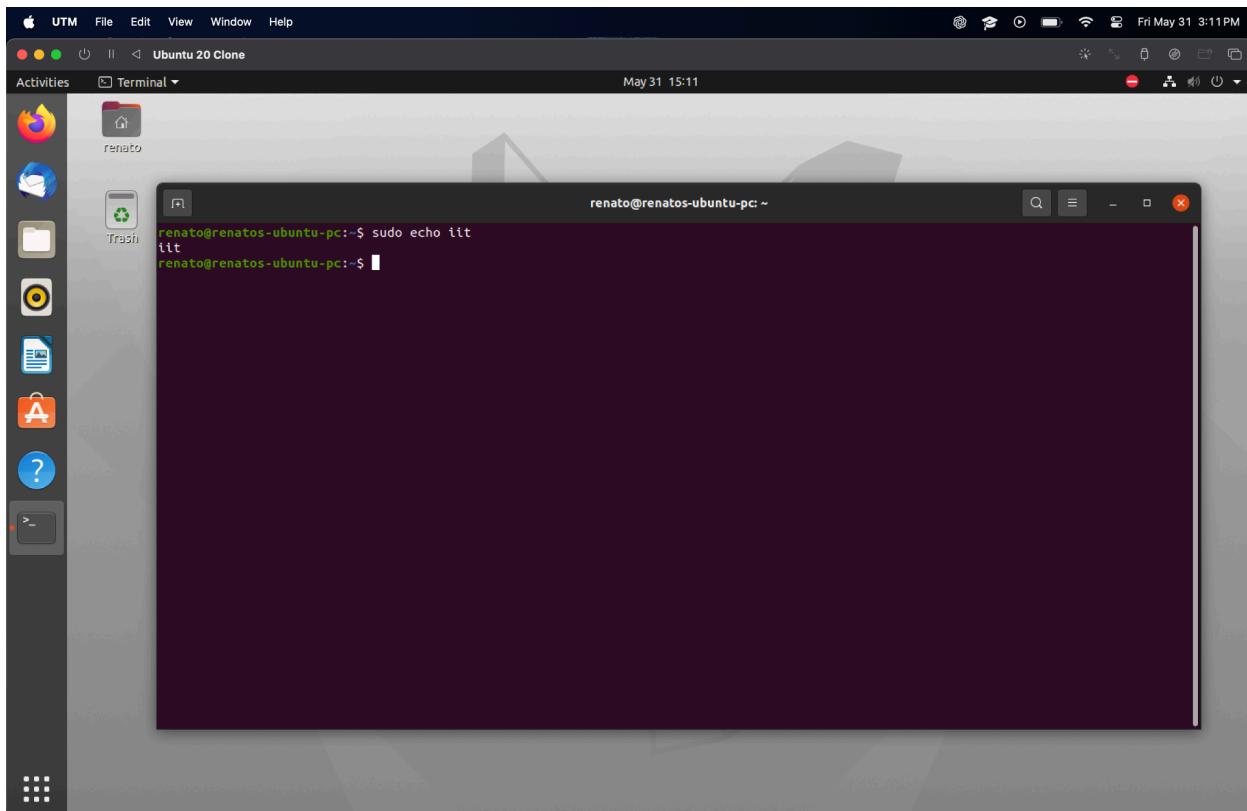
d. history: Displays the list of commands previously entered by the user in the current shell.



A screenshot of a Linux desktop environment. The terminal window shows the command history for the user 'renato'. The history includes various system configuration and file manipulation commands such as sudo ufw status verbose, sudo ufw default deny, sudo ufw allow ssh, ssh-keygen, ip address show, sudo ufw default deny incoming, sudo ufw allow OpenSSH, sudo ufw app list, sudo apt install openssh, sudo apt install ssh, echo \$PWD, ls, ls -a, ufw, sudo ufw show, sudo ufw list, sudo ufw allow 22, cat /etc/ufw, cat /etc/ufw/user.rules, sudo cat /etc/ufw/user.rules, sudo vi /etc/ufw/user.rules, ssh-keygen, ssh-copy-id 192.168.64.3, ssh 192.168.64.3, cd, clear, touch myfile.txt, and scp myfile.txt renato@192.168.64.3:/home/user.

```
renato@renatos-ubuntu-pc:~$ history -d
-bash: history: -d: option requires an argument
history: usage: history [-c] [-d offset] [n] or history -anrw [filename] or history -ps arg [arg...]
renato@renatos-ubuntu-pc:~$ history
 1 sudo ufw status verbose
 2 sudo ufw default deny
 3 sudo ufw allow ssh
 4 ssh-keygen
 5 ip address show
 6 sudo ufw default deny incoming
 7 sudo ufw allow OpenSSH
 8 sudo ufw app list
 9 sudo apt install openssh
10 sudo apt install ssh
11 sudo ufw allow OpenSSH
12 echo $PWD
13 ls
14 ls -a
15 ufw
16 sudo ufw show
17 sudo ufw list
18 sudo ufw allow 22
19 cat /etc/ufw
20 cat /etc/ufw/user.rules
21 sudo cat /etc/ufw/user.rules
22 sudo vi /etc/ufw/user.rules
23 ssh-keygen
24 ssh-copy-id 192.168.64.3
25 ssh 192.168.64.3
26 cd
27 clear
28 touch myfile.txt
29 scp myfile.txt renato@192.168.64.3:/home/user
```

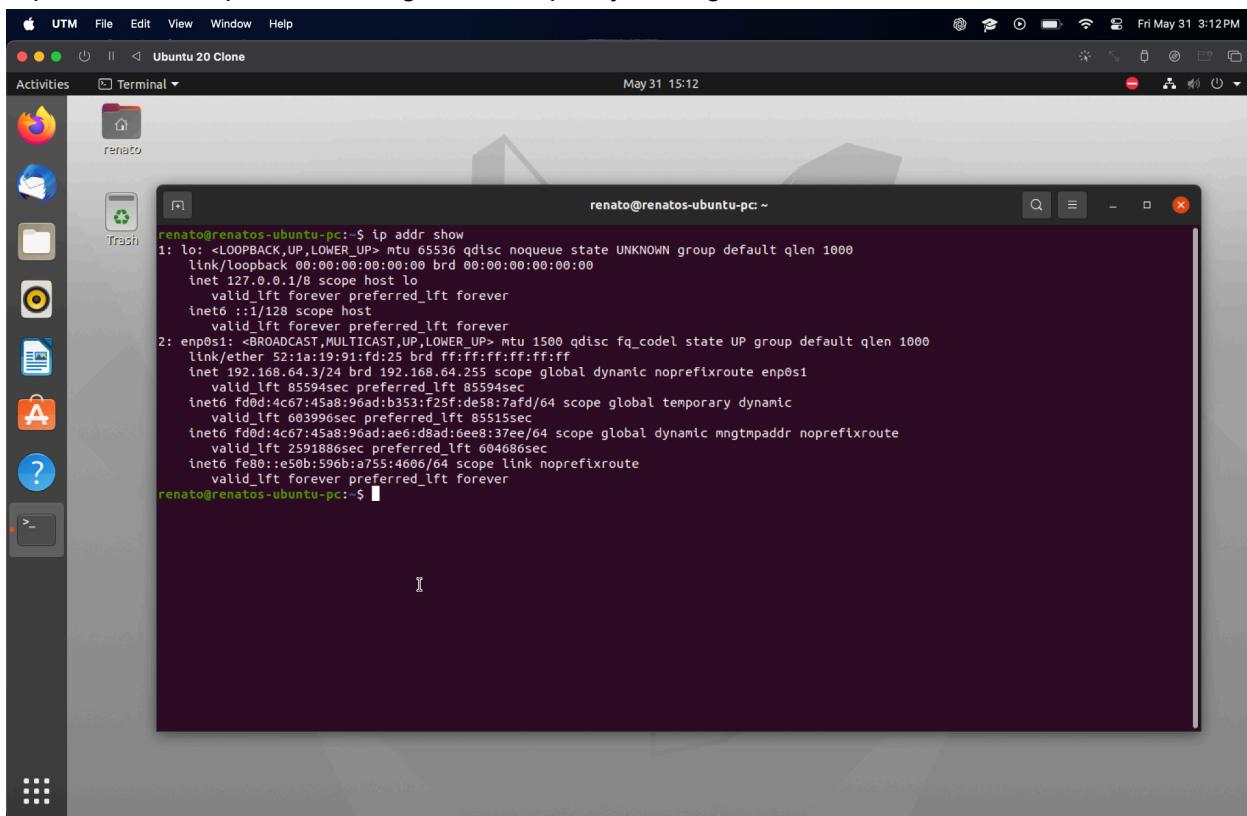
e. sudo: Executes a command with root (administrator) privileges.



A screenshot of a Linux desktop environment. The terminal window shows the user 'renato' executing a sudo command. The command 'sudo echo iit' is run, and the output 'iit' is displayed. The user then presses the enter key again, which is shown as a blank line in the terminal.

```
renato@renatos-ubuntu-pc:~$ sudo echo iit
iit
renato@renatos-ubuntu-pc:~$
```

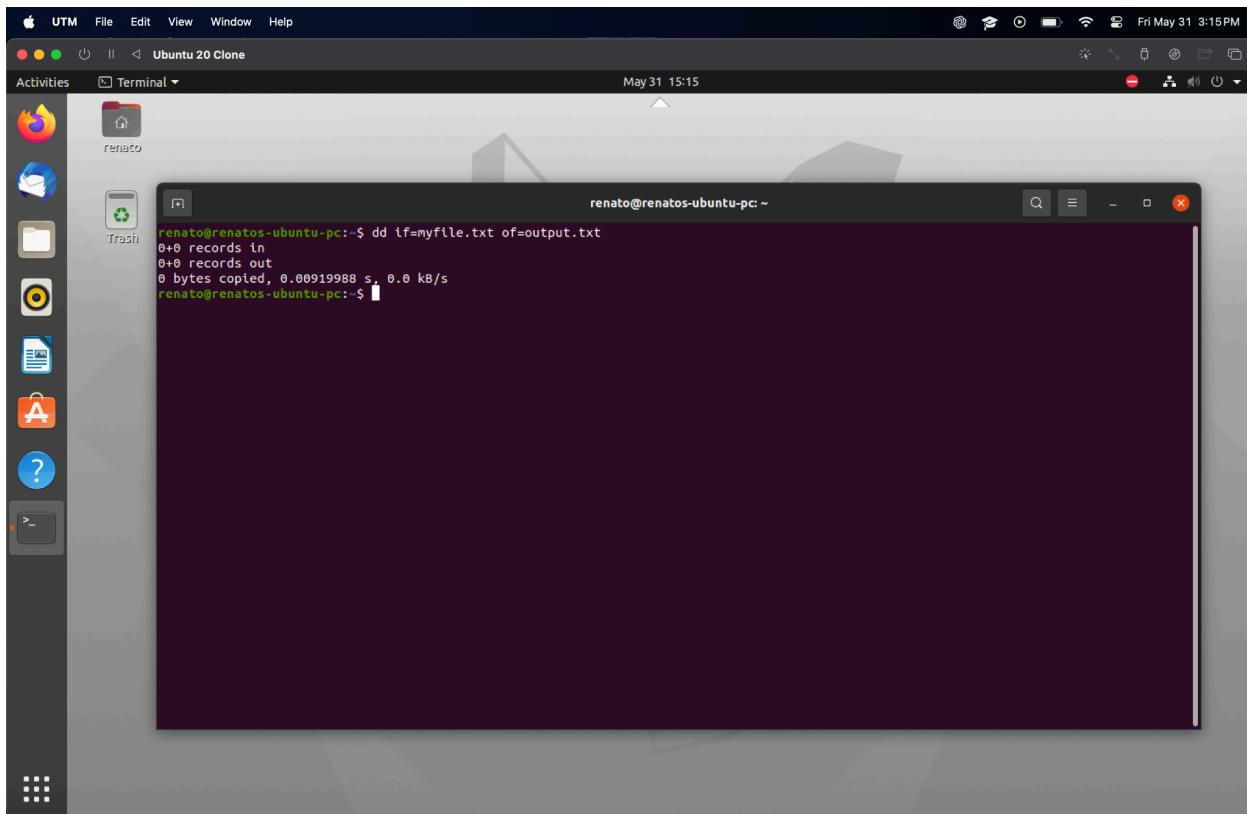
f. ip: Shows/manipulates routing, devices, policy routing, and tunnels.



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the output of the command "ip addr show". The output shows network interfaces lo, enp0s1, and enet6. The interface enp0s1 is connected to an IP address 192.168.64.3/24. The interface enet6 is connected to an IP address fe80::e50b:596b:a755:4606/64. The terminal window has a dark background and white text. The desktop environment includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and Terminal. The status bar at the top right shows the date and time as "Fri May 31 3:12PM".

```
renato@renatos-ubuntu-pc:~$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 52:1a:91:fd:25 brd ff:ff:ff:ff:ff:ff
        inet 192.168.64.3/24 brd 192.168.64.255 scope global dynamic noprefixroute enp0s1
            valid_lft 85594sec preferred_lft 85594sec
        inet6 fd00:4c67:45a8:96ad:b353:f25f:de58:7af8/64 scope global temporary dynamic
            valid_lft 603996sec preferred_lft 85515sec
        inet6 fd00:4c67:45a8:96ad:ae6:d8ad:6e8:37ee/64 scope global dynamic mngtmpaddr noprefixroute
            valid_lft 2591886sec preferred_lft 604686sec
        inet6 fe80::e50b:596b:a755:4606/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
renato@renatos-ubuntu-pc:~$
```

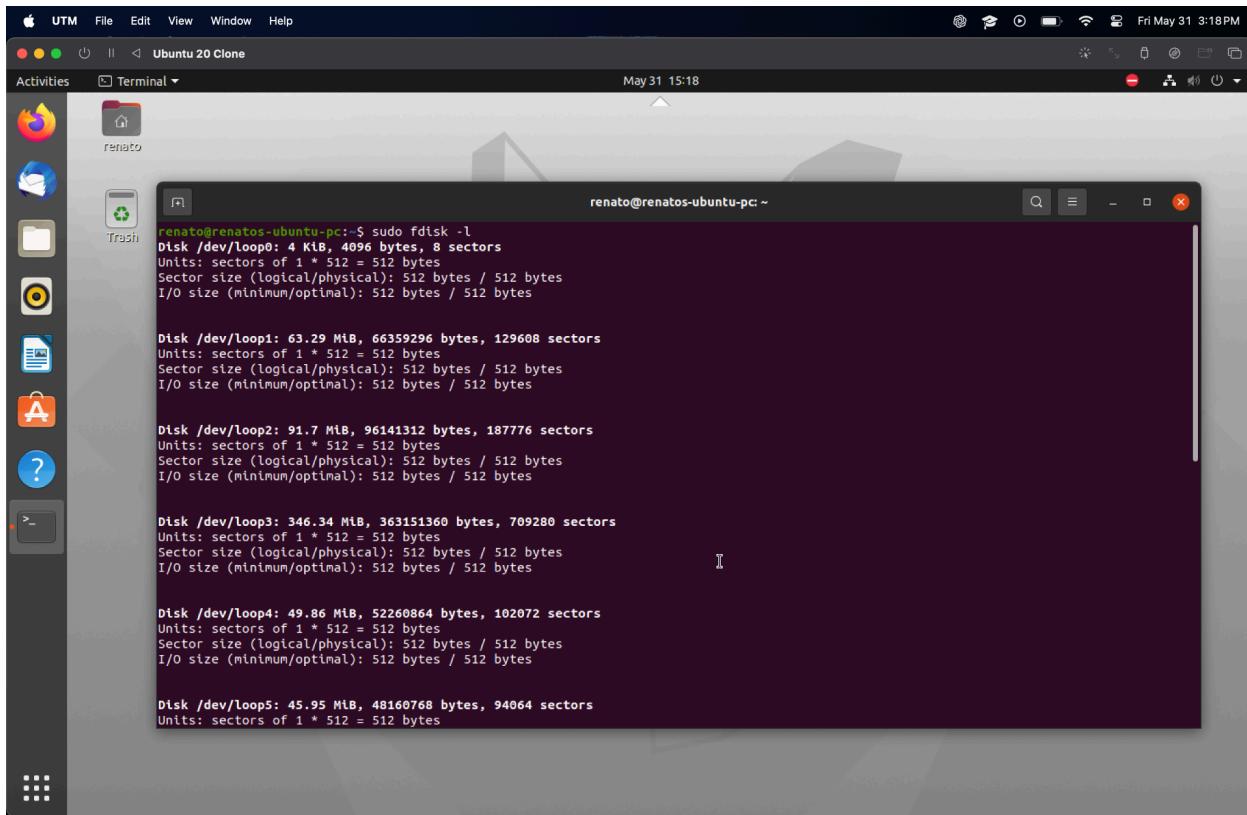
g. dd: Copies and converts a file, block by block.



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the output of the command "dd if=myfile.txt of=output.txt". The output shows that 0+0 records were copied from the input file myfile.txt to the output file output.txt. The terminal window has a dark background and white text. The desktop environment includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and Terminal. The status bar at the top right shows the date and time as "Fri May 31 3:15PM".

```
renato@renatos-ubuntu-pc:~$ dd if=myfile.txt of=output.txt
0+0 records in
0+0 records out
0 bytes copied, 0.00919988 s, 0.0 kB/s
renato@renatos-ubuntu-pc:~$
```

h. fdisk: Manipulates disk partition table.



A screenshot of a Linux desktop environment (Ubuntu 20.04 LTS) showing a terminal window. The terminal window title is "Terminal" and the command run is "renato@renatos-ubuntu-pc:~\$ sudo fdisk -l". The output lists several disk devices with their sizes and sector counts:

```
Disk /dev/loop0: 4 KB, 4096 bytes, 8 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/loop1: 63.29 MiB, 66359296 bytes, 129608 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

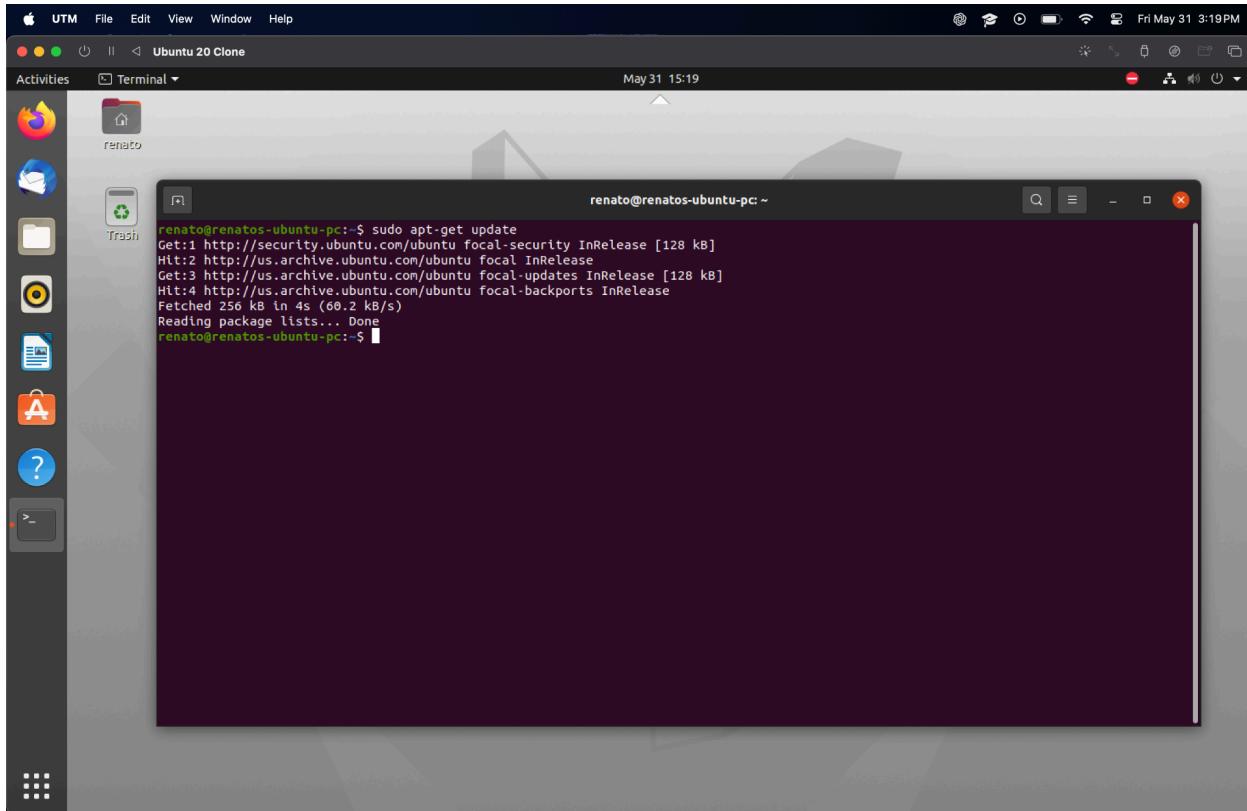
Disk /dev/loop2: 91.7 MiB, 96141312 bytes, 187776 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/loop3: 346.34 MiB, 363151360 bytes, 709280 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/loop4: 49.86 MiB, 52260864 bytes, 102072 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/loop5: 45.95 MiB, 48160768 bytes, 94064 sectors
Units: sectors of 1 * 512 = 512 bytes
```

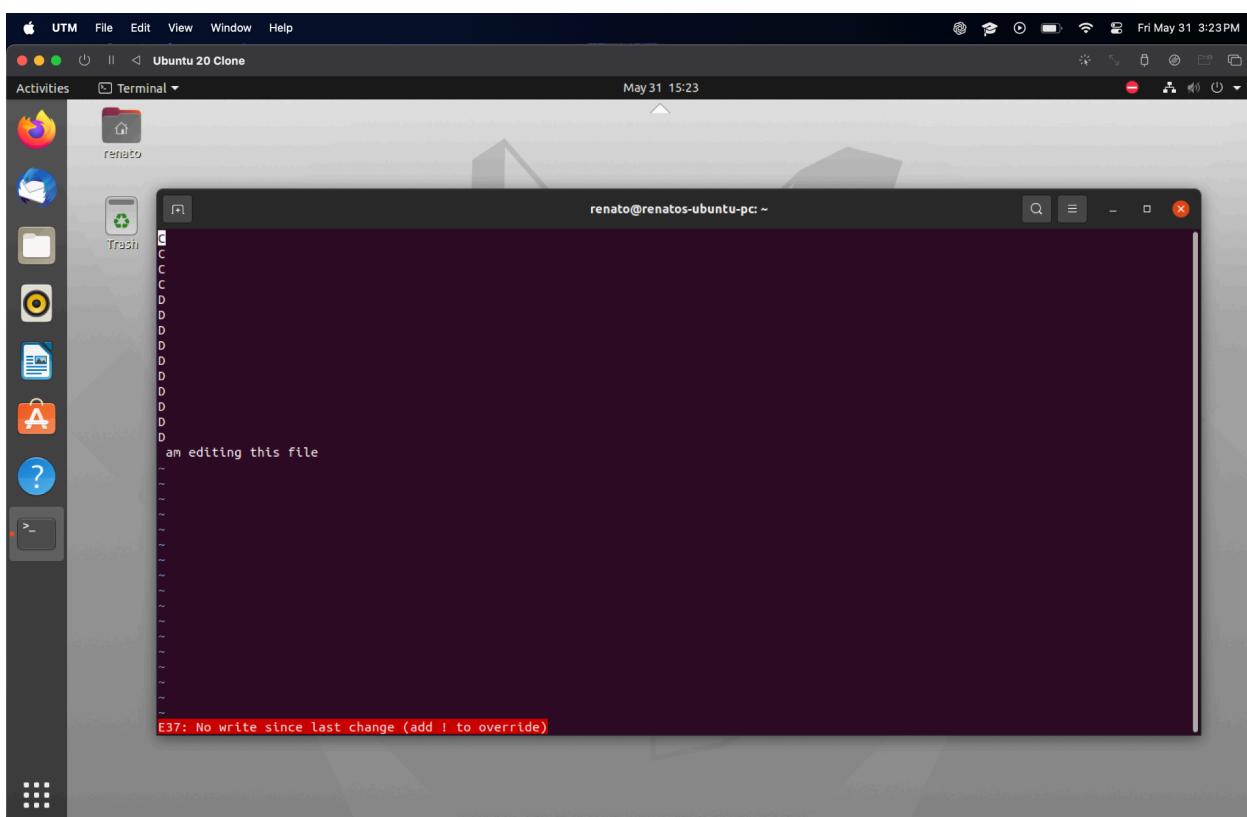
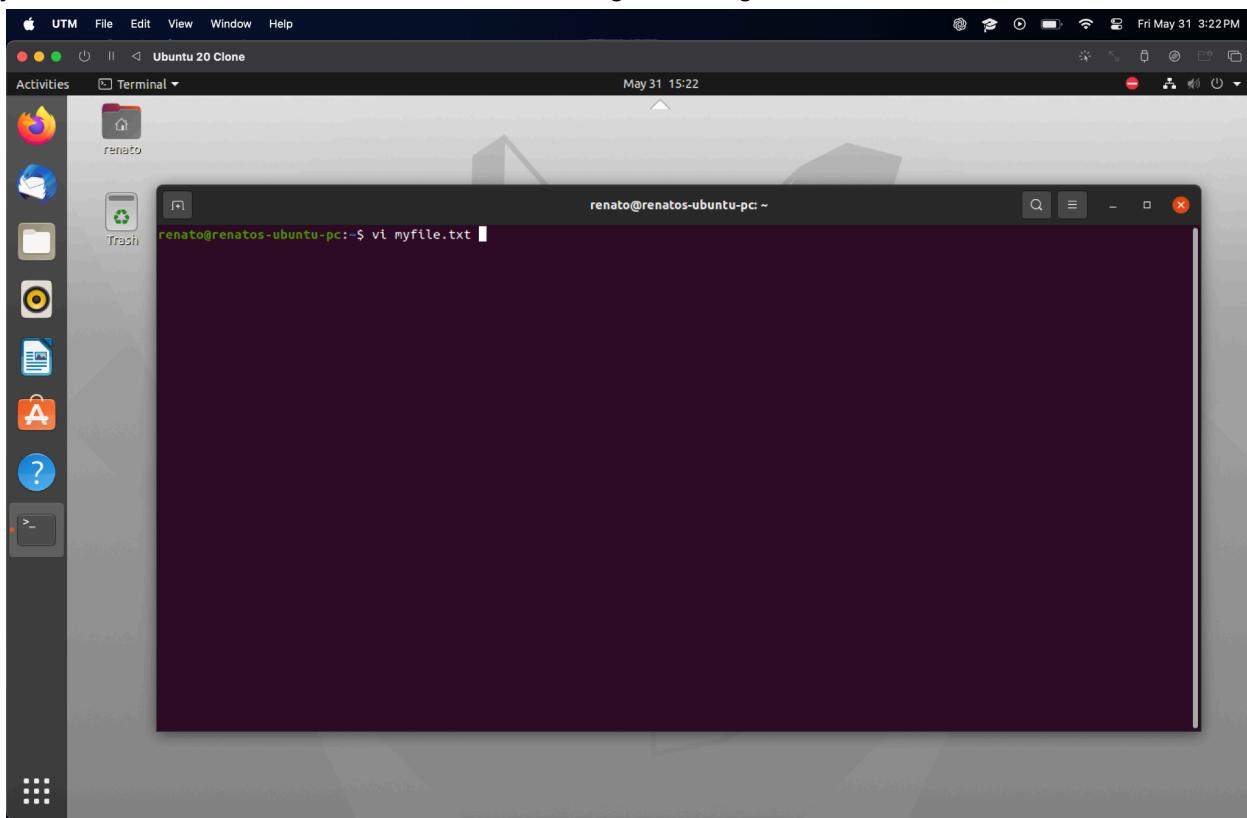
i. apt: Handles the installation and removal of software on Debian based systems.



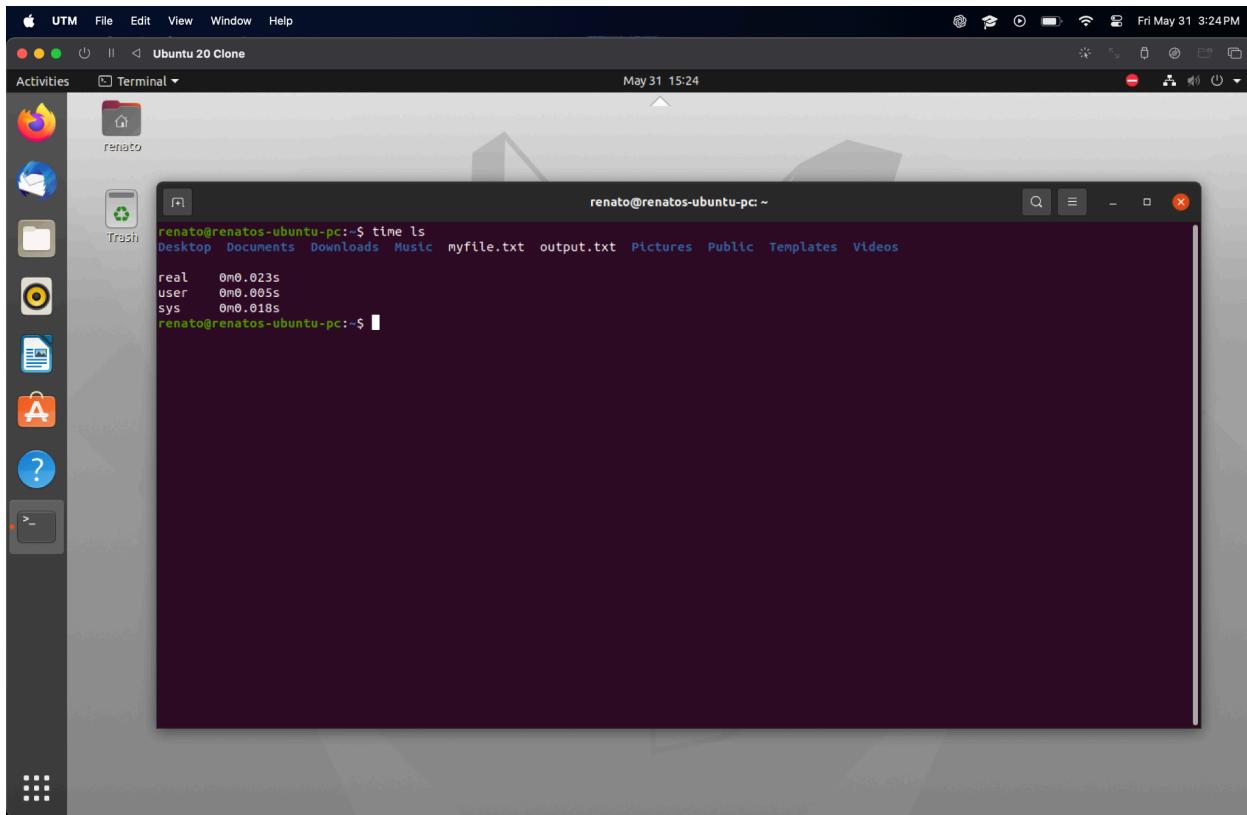
A screenshot of a Linux desktop environment (Ubuntu 20.04 LTS) showing a terminal window. The terminal window title is "Terminal" and the command run is "renato@renatos-ubuntu-pc:~\$ sudo apt-get update". The output shows the process of updating package lists from the internet:

```
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [128 kB]
Hit:2 http://us.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [128 kB]
Hit:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 256 kB in 4s (60.2 kB/s)
Reading package lists... Done
renato@renatos-ubuntu-pc:~$
```

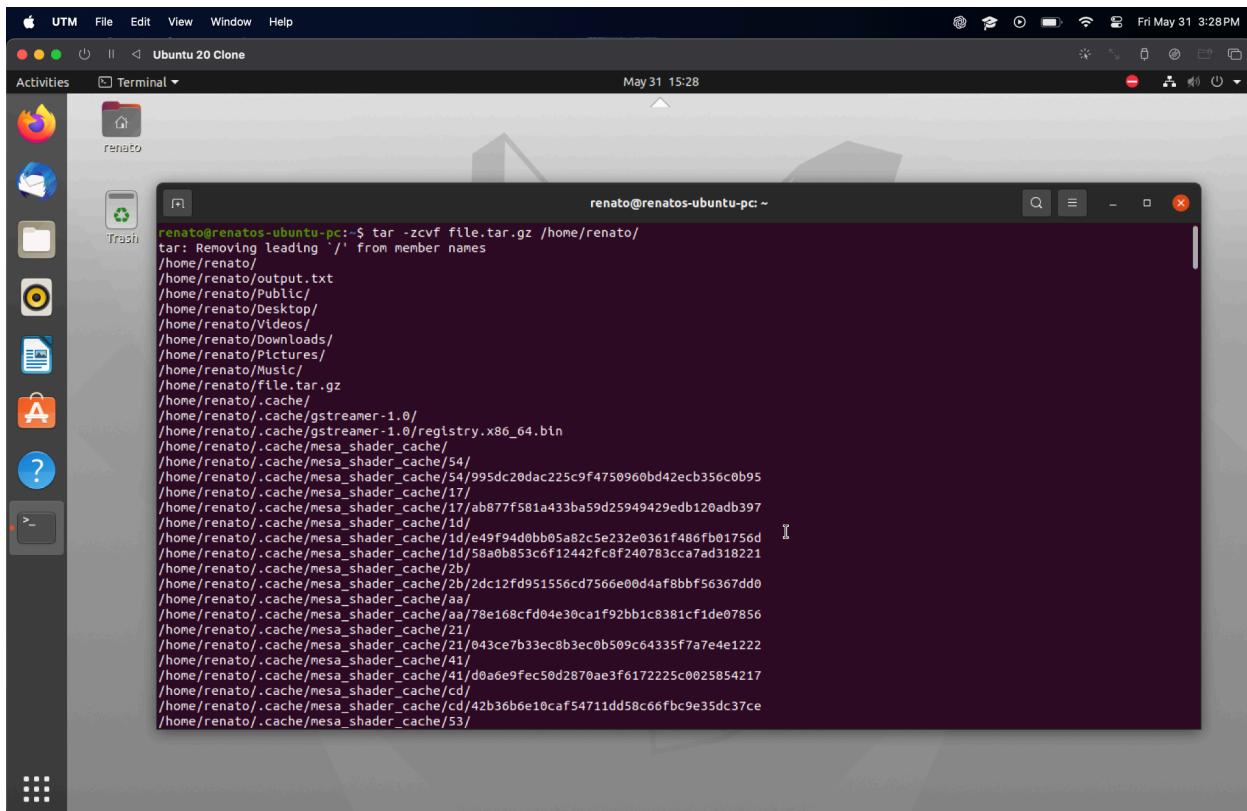
j. vi: Starts the Vi editor, a text editor for creating or editing files.



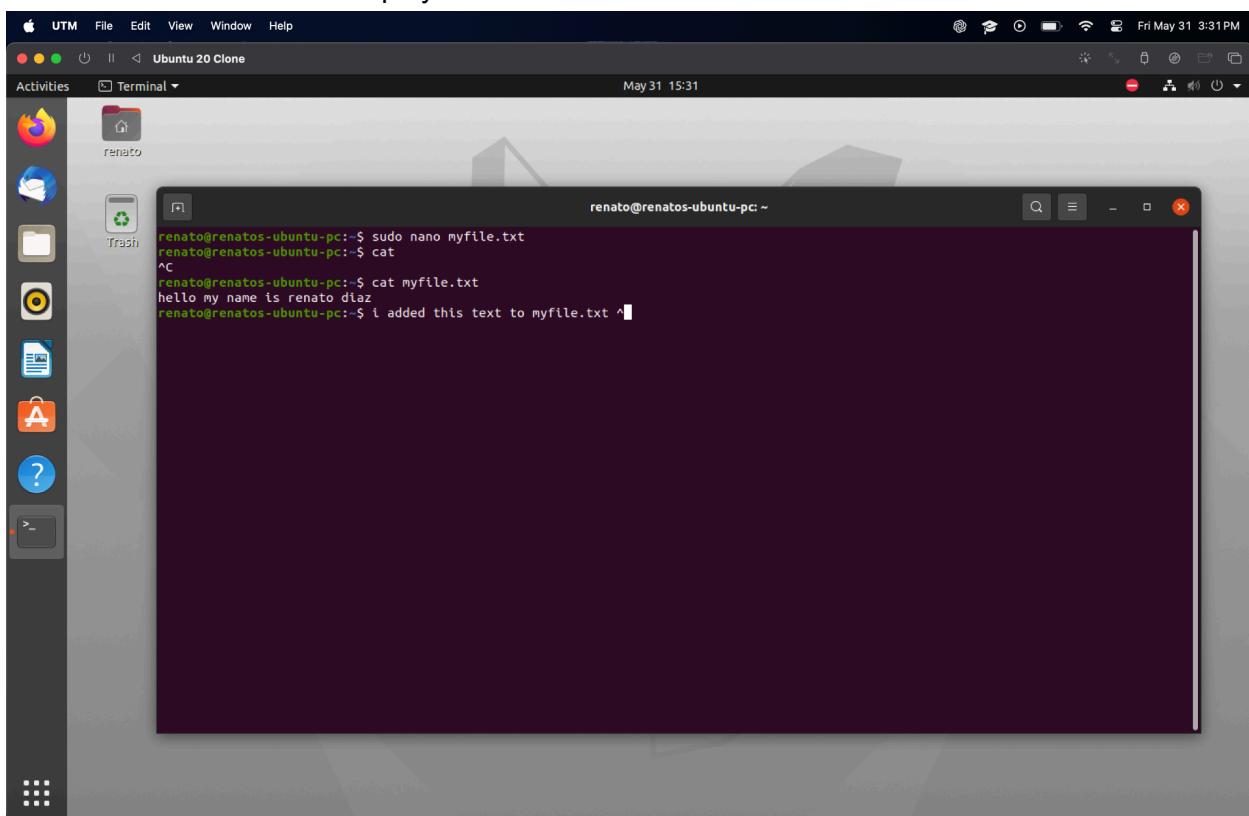
k. time: Measures the time taken by a command to execute.



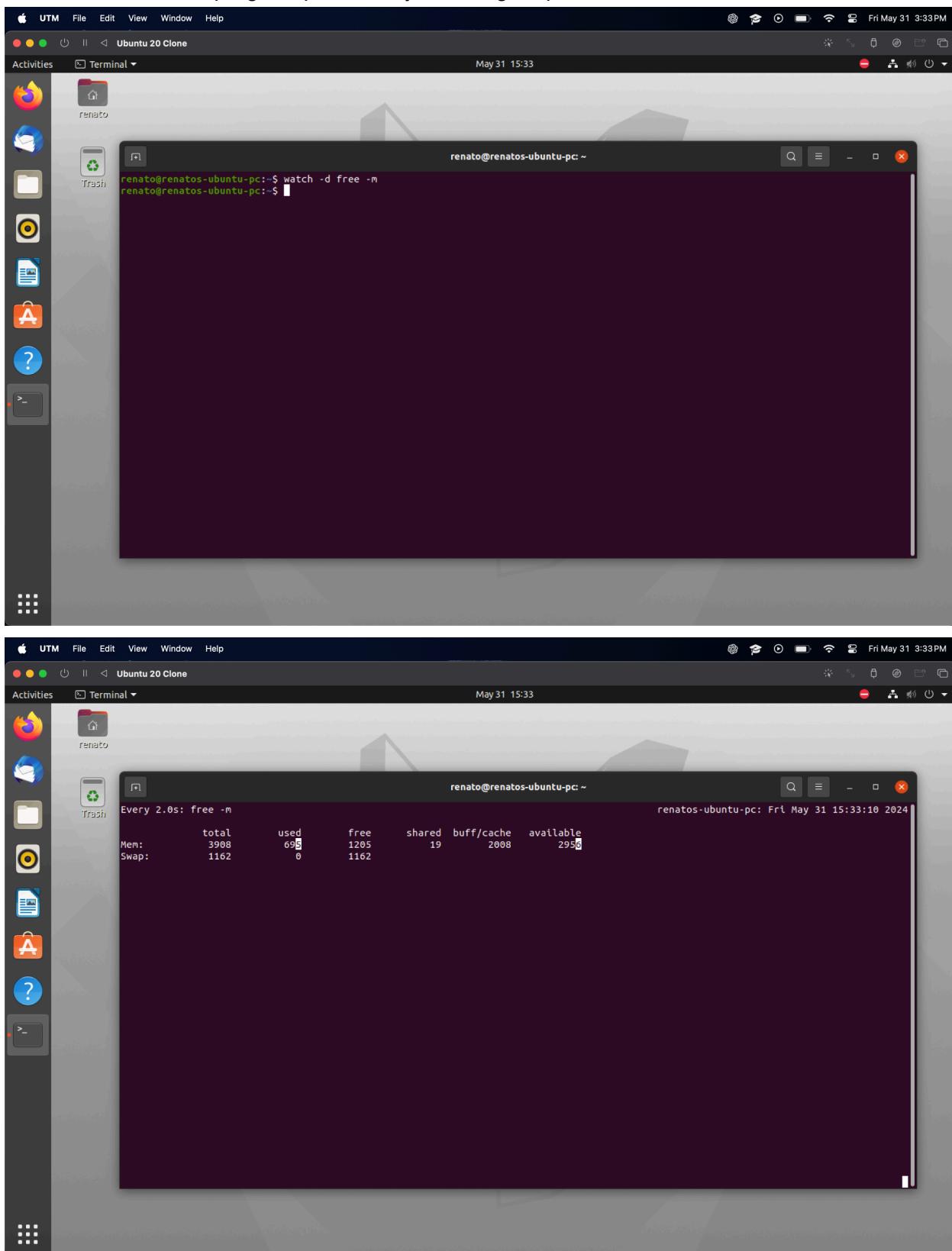
l. tar: Archives files into a single file or extracts from an archive.



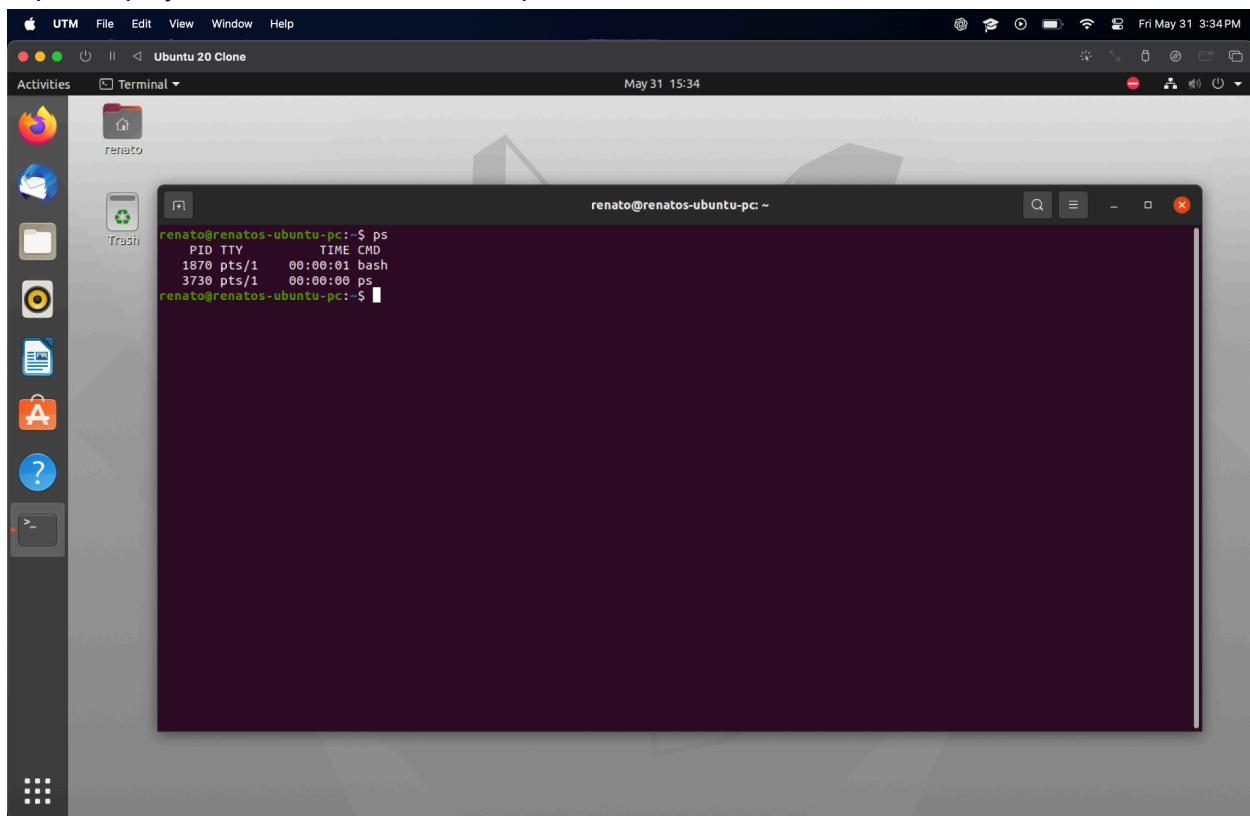
m. cat: Concatenates and displays contents of files.



n. watch: Executes a program periodically, showing output fullscreen.



o. ps: Displays information about active processes.



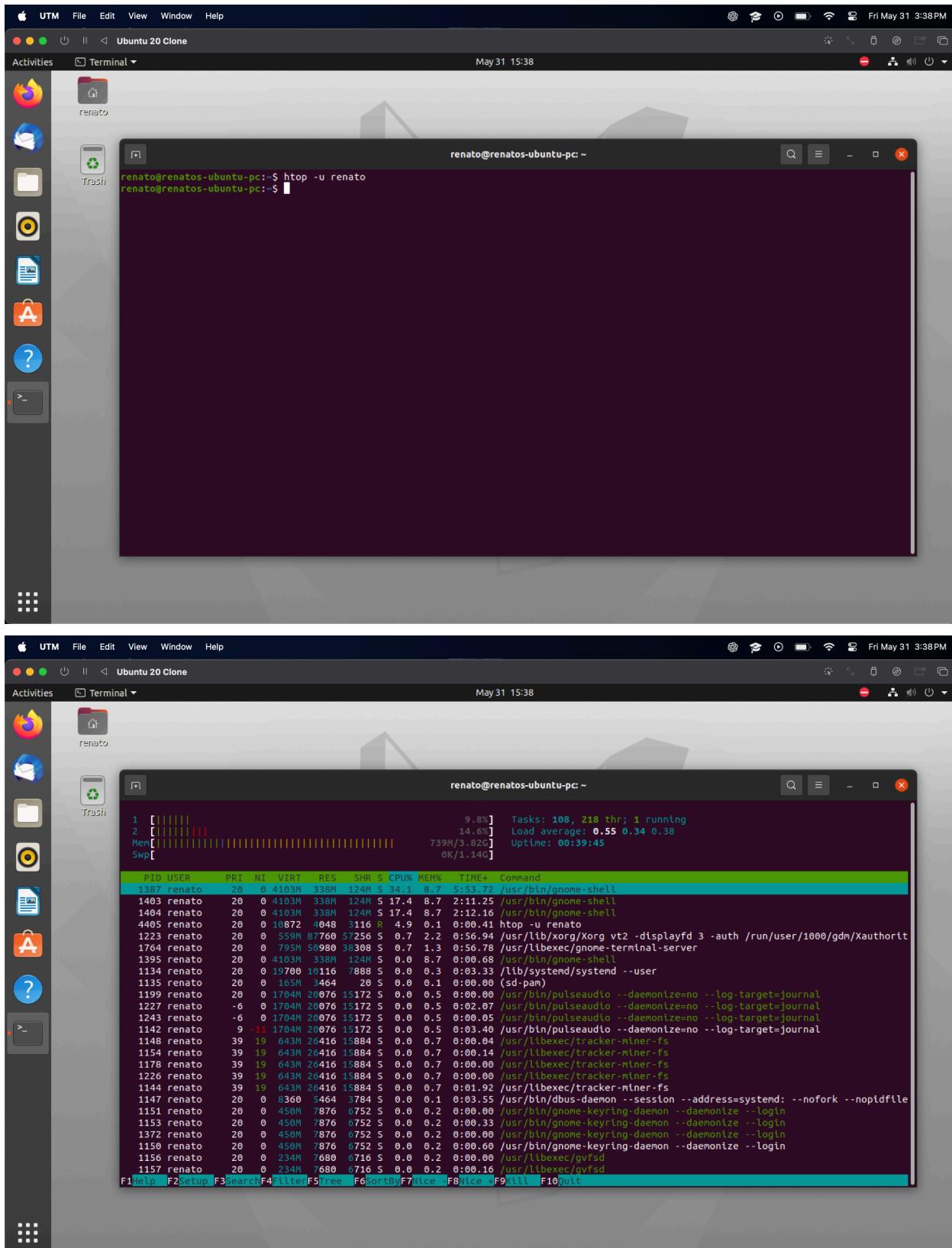
p. top: Displays an ongoing view of process activity.

The image shows a Linux desktop environment with two terminal windows open. Both terminals are running the 'top' command to monitor system processes. The top window has a dark background and displays a sparse list of processes. The bottom window has a light background and displays a detailed list of processes, including their PID, USER, PR, NI, VIRT, RES, SHR, %CPU, %MEM, TIME+, and COMMAND. The detailed list includes many system processes like gnome-shell, Xorg, ghome-terminal, top, spice-vdagentd, kworker, NetworkManager, systemd, and various rcu_* and migration processes.

```
renato@renatos-ubuntu-pc:~$ top -n 10
top - 15:35:11 up 36 min,  2 users,  load average: 0.31, 0.27, 0.38
Tasks: 180 total,   1 running, 179 sleeping,   0 stopped,   0 zombie
%Cpu(s): 54.6 us,  8.7 sy,  0.0 ni, 36.7 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem : 3908.8 total, 1205.5 free, 694.8 used, 2008.5 buff/cache
MiB Swap: 1162.5 total, 1162.5 free,   0.0 used. 2957.2 avail Mem

PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM TIME+ COMMAND
1387 renato    20   0 4201516 345684 127940 S 127.4  8.6 5:34.78 gnome-shell
1223 renato    20   0 572548 87760 57256 S 9.4  2.2 0:54.37 Xorg
1764 renato    20   0 814764 50988 38308 S 3.3  1.3 0:54.41 ghome-terminal-
3732 renato    20   0 11868 3684 3164 R  1.6  0.1 0:00.30 top
1106 root      20   0 7148 2552 2292 S 1.3  0.1 0:02.98 spice-vdagentd
2496 root      20   0     0  0 I  0.7  0.0 0:02.83 kworker/1:0-events
499 root      20   0 264876 21336 18412 S 0.3  0.5 0:05.37 NetworkManager
1528 renato    20   0 468908 12260 10812 S 0.3  0.3 0:00.43 gsd-sharing
 1 root      20   0 1694000 12720 8236 S 0.0  0.3 0:19.80 systemd
 2 root      20   0     0  0 S  0.0  0.0 0:00.02 kthreadd
 3 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 rcu_gp
 4 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 rcu_par_gp
 5 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 slub_flushwq
 6 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 netns
 8 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 kworker/0:0H-events_highpri
10 root      0 -20  0     0  0 I  0.0  0.0 0:00.00 mm_percpu_wq
11 root      20   0     0  0 S  0.0  0.0 0:00.00 rcu_tasks_rude_
12 root      20   0     0  0 S  0.0  0.0 0:00.00 rcu_tasks_trace
13 root      20   0     0  0 S  0.0  0.0 0:00.76 ksoftirqd/0
14 root      20   0     0  0 I  0.0  0.0 0:02.71 rcu_sched
15 root      rt   0     0  0 S  0.0  0.0 0:00.14 migration/0
16 root      -51   0     0  0 S  0.0  0.0 0:00.00 idle_inject/0
18 root      20   0     0  0 S  0.0  0.0 0:00.00 cpuhp/0
19 root      20   0     0  0 S  0.0  0.0 0:00.00 cpuhp/1
20 root      -51   0     0  0 S  0.0  0.0 0:00.00 idle_inject/1
21 root      rt   0     0  0 S  0.0  0.0 0:00.63 migration/1
```

q. htop: An interactive process viewer, similar to top but more feature-rich.



The image shows two screenshots of a Ubuntu 20.04 desktop environment. Both screenshots feature a dark-themed interface with a dock on the left containing icons for UTM, Home, Activities, Terminal, and others. The top bar includes standard system icons and the date/time (Fri May 31 3:38PM).

Screenshot 1: A single terminal window titled "Terminal" is open. It displays the command "renato@renatos-ubuntu-pc:~\$ htop -u renato" followed by a blank screen. This indicates that the process list has been captured and is being displayed in another window.

```
renato@renatos-ubuntu-pc:~$ htop -u renato
renato@renatos-ubuntu-pc:~$
```

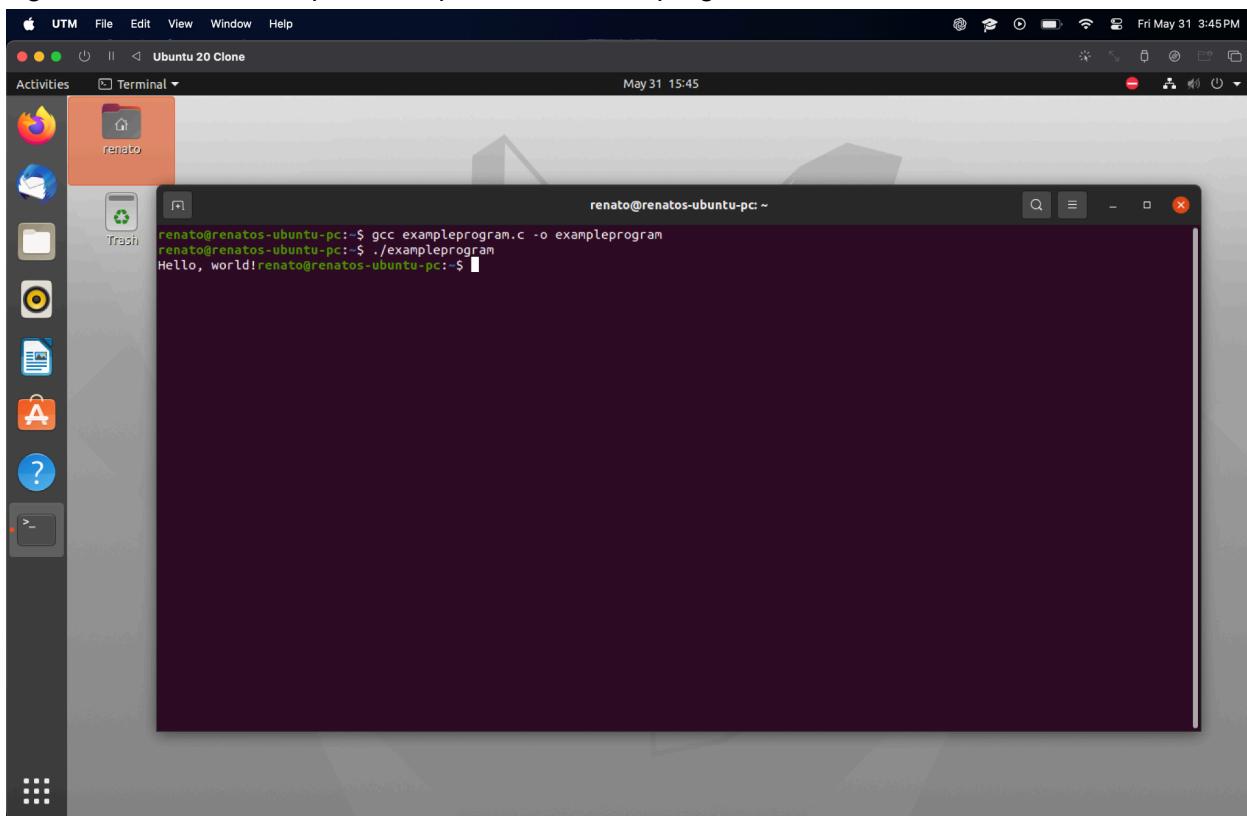
Screenshot 2: A second terminal window titled "Terminal" is open, showing the output of the htop command. The output provides system statistics and a detailed list of processes. The statistics include CPU usage (Tasks: 108, 218 thr; 1 running, 14.6% load average), memory usage (739M/3.82G), and uptime (00:39:45). The process list is sorted by CPU usage (PID, USER, PR, NI, VIRT, RES, SHR, S, CPU%, TIME+, Command). Many processes are listed under the user "renato", including various instances of gnome-shell, pulseaudio, and libexec/tracker-miner-fs.

```
9.8% Tasks: 108, 218 thr; 1 running
14.6% Load average: 0.55 0.34 0.38
739M/3.82G Uptime: 00:39:45
OK/1.14G

PID USER PR NI VIRT RES SHR S CPU% TIME+ Command
1397 renato 20 0 4103M 338M 124M S 34.1 8.7 5:53.72 /usr/bin/gnome-shell
1403 renato 20 0 4103M 338M 124M S 17.4 8.7 2:11.25 /usr/bin/gnome-shell
1404 renato 20 0 4103M 338M 124M S 17.4 8.7 2:12.16 /usr/bin/gnome-shell
4405 renato 20 0 10872 4048 316 R 4.9 0.1 0:00.41 htop -u renato
1223 renato 20 0 559M 87760 57256 S 0.7 2.2 0:56.94 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/1000/gdm/Xauthority
1764 renato 20 0 795M 56988 38308 S 0.7 1.3 0:56.78 /usr/libexec/gnome-terminal-server
1395 renato 20 0 4103M 338M 124M S 0.0 8.7 0:00.68 /usr/bin/gnome-shell
1134 renato 20 0 19704 16116 7888 S 0.0 0.3 0:03.33 /lib/systemd/systemd --user
1135 renato 20 0 165M 3464 28 S 0.0 0.1 0:00.00 (sd-pam)
1199 renato 20 0 1794M 20076 15172 S 0.0 0.5 0:00.00 /usr/bin/pulseaudio --daemonize=no --log-target=journal
1227 renato -6 0 1794M 20076 15172 S 0.0 0.5 0:02.07 /usr/bin/pulseaudio --daemonize=no --log-target=journal
1243 renato -6 0 1794M 20076 15172 S 0.0 0.5 0:00.05 /usr/bin/pulseaudio --daemonize=no --log-target=journal
1142 renato 9 11 1794M 20076 15172 S 0.0 0.5 0:03.40 /usr/bin/pulseaudio --daemonize=no --log-target=journal
1148 renato 39 19 643M 26416 15884 S 0.0 0.7 0:00.04 /usr/libexec/tracker-miner-fs
1154 renato 39 19 643M 26416 15884 S 0.0 0.7 0:00.14 /usr/libexec/tracker-miner-fs
1178 renato 39 19 643M 26416 15884 S 0.0 0.7 0:00.00 /usr/libexec/tracker-miner-fs
1226 renato 39 19 643M 26416 15884 S 0.0 0.7 0:00.00 /usr/libexec/tracker-miner-fs
1144 renato 39 19 643M 26416 15884 S 0.0 0.7 0:01.92 /usr/libexec/tracker-miner-fs
1147 renato 20 0 8360 5464 3784 S 0.0 0.1 0:03.55 /usr/bin/dbus-daemon --session --address=/system: --nofork --nopidfile
1151 renato 20 0 450M 7876 6752 S 0.0 0.2 0:00.00 /usr/bin/gnome-keyring-daemon --daemons --login
1153 renato 20 0 450M 7876 6752 S 0.0 0.2 0:00.33 /usr/bin/gnome-keyring-daemon --daemons --login
1372 renato 20 0 450M 7876 6752 S 0.0 0.2 0:00.00 /usr/bin/gnome-keyring-daemon --daemons --login
1150 renato 20 0 450M 7876 6752 S 0.0 0.2 0:00.60 /usr/bin/gnome-keyring-daemon --daemons --login
1156 renato 20 0 234M 7688 6716 S 0.0 0.2 0:00.00 /usr/libexec/gvfsd
1157 renato 20 0 234M 7688 6716 S 0.0 0.2 0:00.16 /usr/libexec/gvfsd
```

F1 Help F2 Setup F3 Search F4 Filter F5 Tree F6 Contby F7 Nice - F8 Nice + F9 Kill F10 Exit

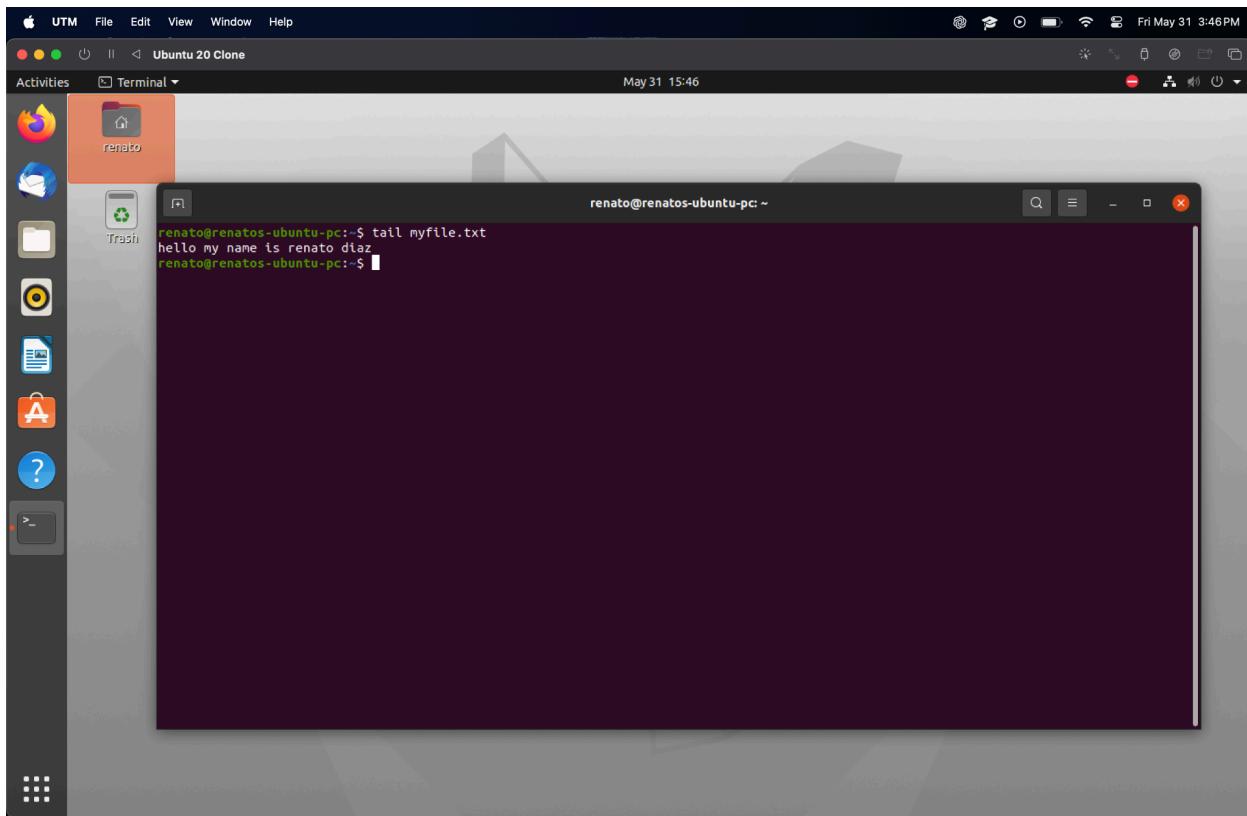
r. gcc: The GNU C Compiler; compiles C and C++ programs.



A screenshot of a Linux desktop environment, specifically Ubuntu 20.04 LTS, running on a Mac. The desktop has a dark theme. A terminal window titled "Terminal" is open, showing the command line interface. The terminal window title bar says "renato@renatos-ubuntu-pc: ~". The terminal content shows:

```
renato@renatos-ubuntu-pc:~$ gcc exampleprogram.c -o exampleprogram
renato@renatos-ubuntu-pc:~$ ./exampleprogram
Hello, world!renato@renatos-ubuntu-pc:~$
```

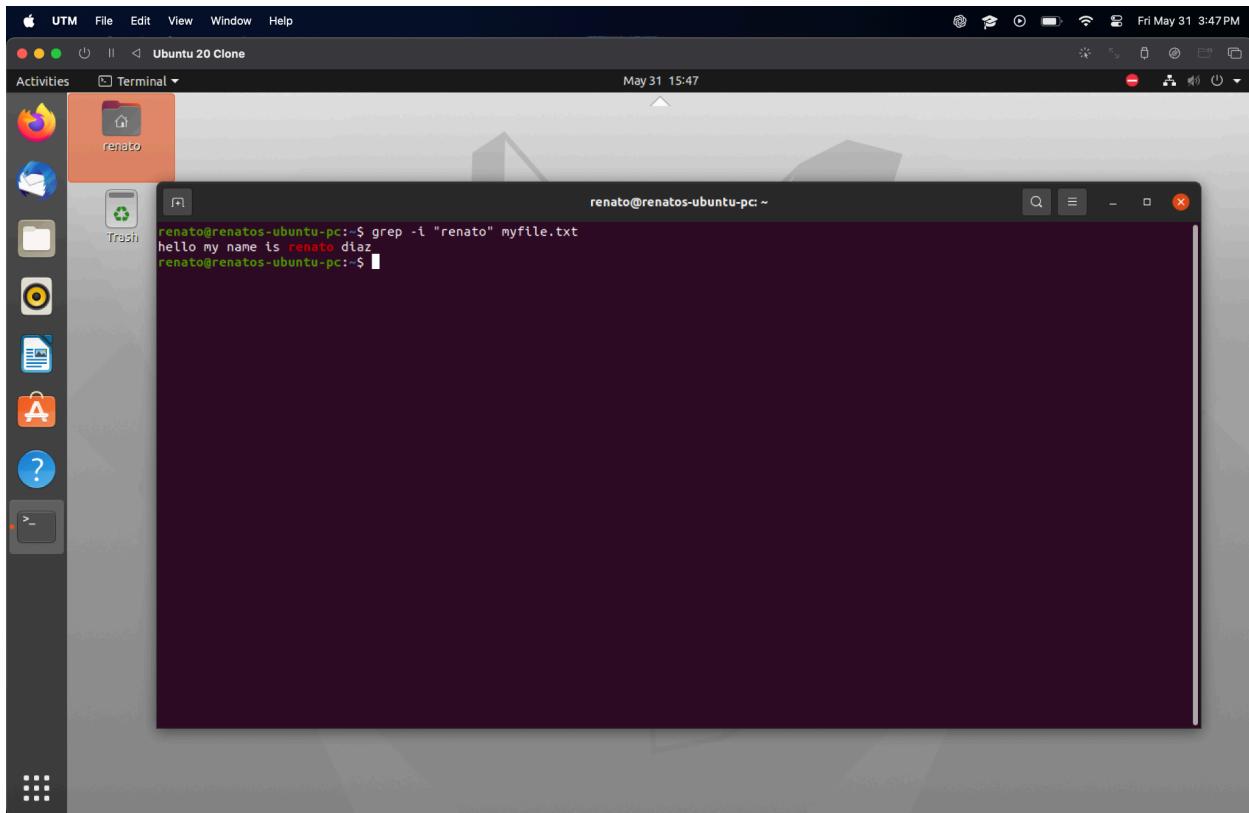
s. tail: Displays the last part of a file.



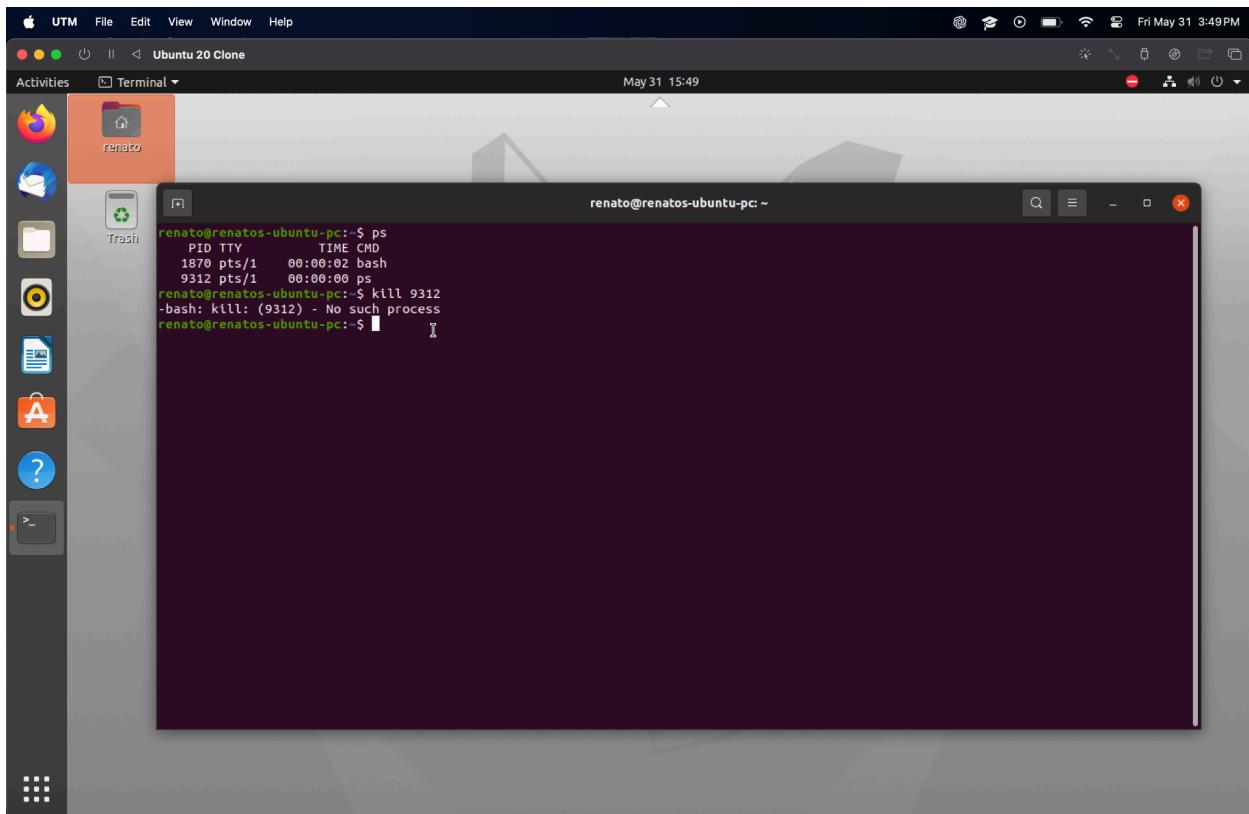
A screenshot of a Linux desktop environment, specifically Ubuntu 20.04 LTS, running on a Mac. The desktop has a dark theme. A terminal window titled "Terminal" is open, showing the command line interface. The terminal window title bar says "renato@renatos-ubuntu-pc: ~". The terminal content shows:

```
renato@renatos-ubuntu-pc:~$ tail myfile.txt
hello my name is renato diaz
renato@renatos-ubuntu-pc:~$
```

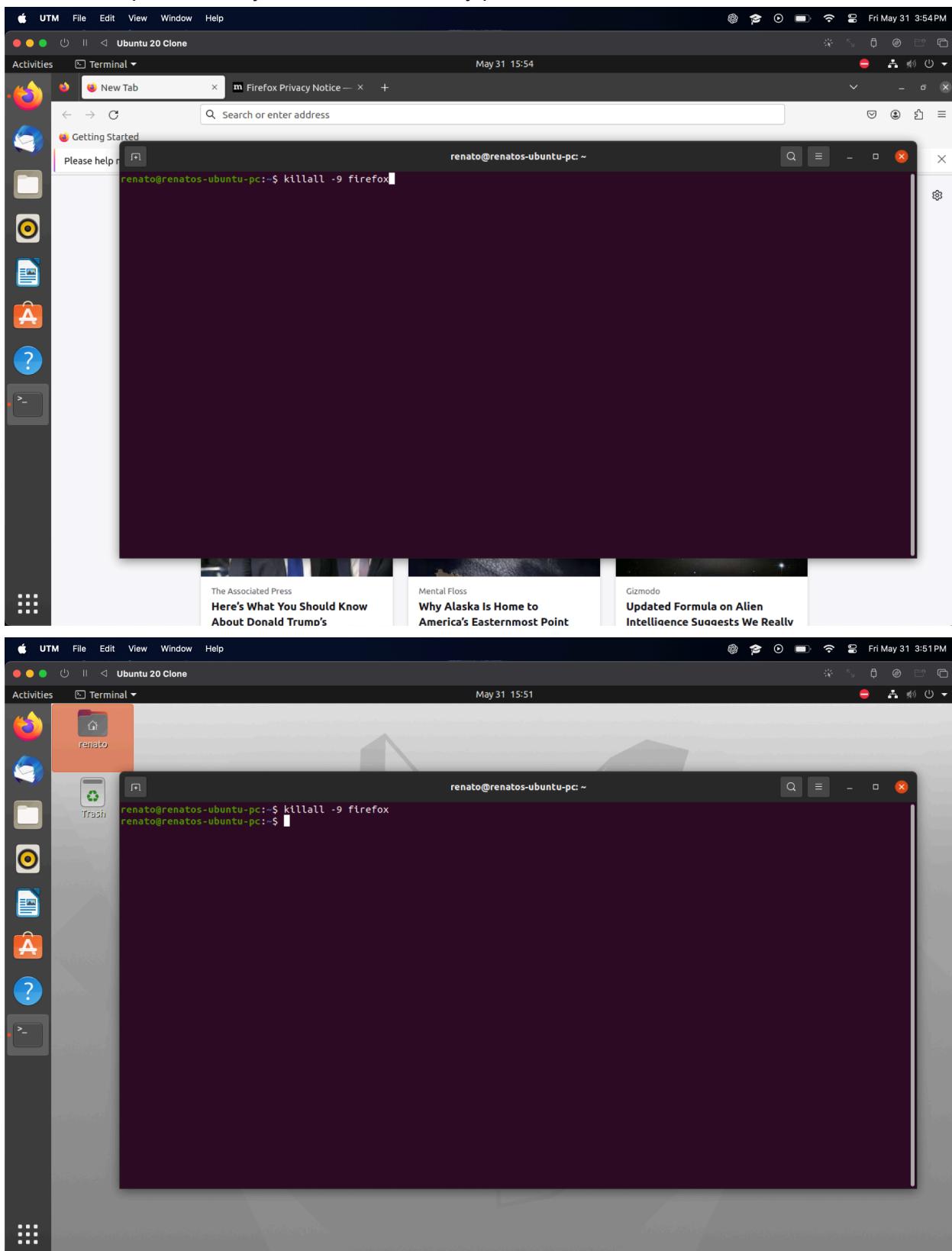
t. grep: Searches for patterns in files using regular expressions.



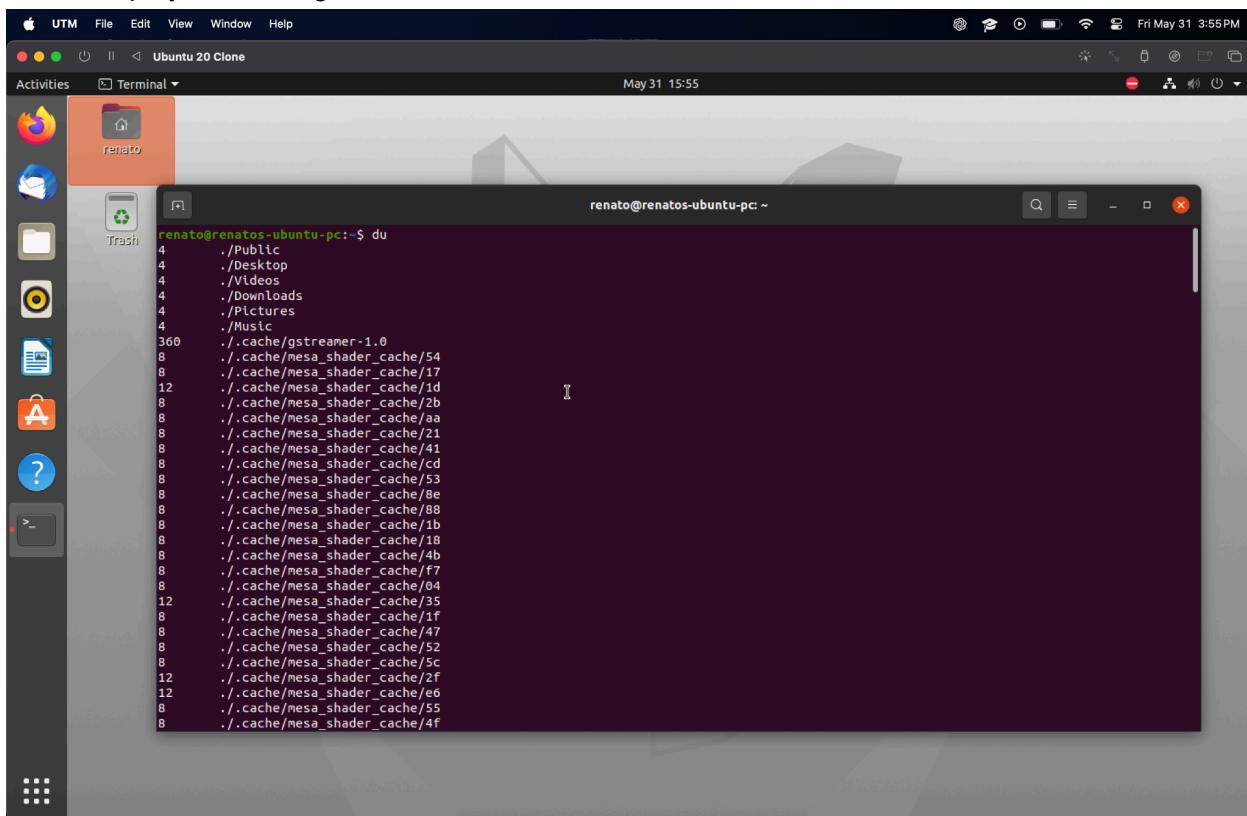
u. kill: Sends a signal to a specified process, often to stop the process.



v. killall: Kills processes by name, rather than by process ID.



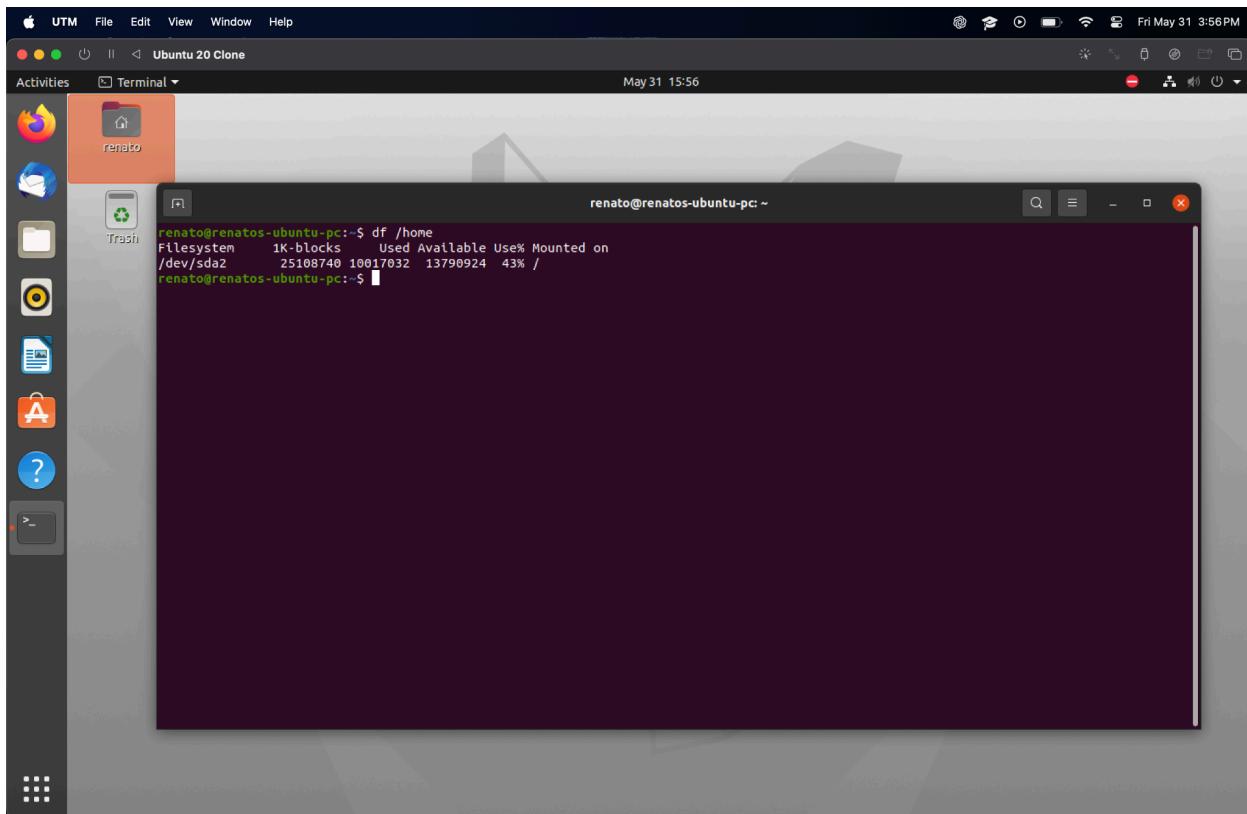
w. du: Displays disk usage for directories.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "du" being run. The output of the command shows disk usage for various directories, including "/Public", ".cache/gstreamer-1.0", and numerous ".cache/mesa_shader_cache" entries. The desktop background is a dark grey gradient, and the taskbar at the top shows the date and time as "Fri May 31 3:55PM".

```
renato@renatos-ubuntu-pc:~$ du
4      ./Public
4      ./Desktop
4      ./Videos
4      ./Downloads
4      ./Pictures
4      ./Music
360    ./cache/gstreamer-1.0
8      ./cache/mesa_shader_cache/54
8      ./cache/mesa_shader_cache/17
12     ./cache/mesa_shader_cache/1d
8      ./cache/mesa_shader_cache/2b
8      ./cache/mesa_shader_cache/aa
8      ./cache/mesa_shader_cache/21
8      ./cache/mesa_shader_cache/21
8      ./cache/mesa_shader_cache/41
8      ./cache/mesa_shader_cache/cd
8      ./cache/mesa_shader_cache/53
8      ./cache/mesa_shader_cache/8e
8      ./cache/mesa_shader_cache/88
8      ./cache/mesa_shader_cache/1b
8      ./cache/mesa_shader_cache/18
8      ./cache/mesa_shader_cache/4b
8      ./cache/mesa_shader_cache/f7
8      ./cache/mesa_shader_cache/04
12     ./cache/mesa_shader_cache/35
8      ./cache/mesa_shader_cache/1f
8      ./cache/mesa_shader_cache/47
8      ./cache/mesa_shader_cache/52
8      ./cache/mesa_shader_cache/5c
12     ./cache/mesa_shader_cache/2f
12     ./cache/mesa_shader_cache/e6
8      ./cache/mesa_shader_cache/55
8      ./cache/mesa_shader_cache/4f
```

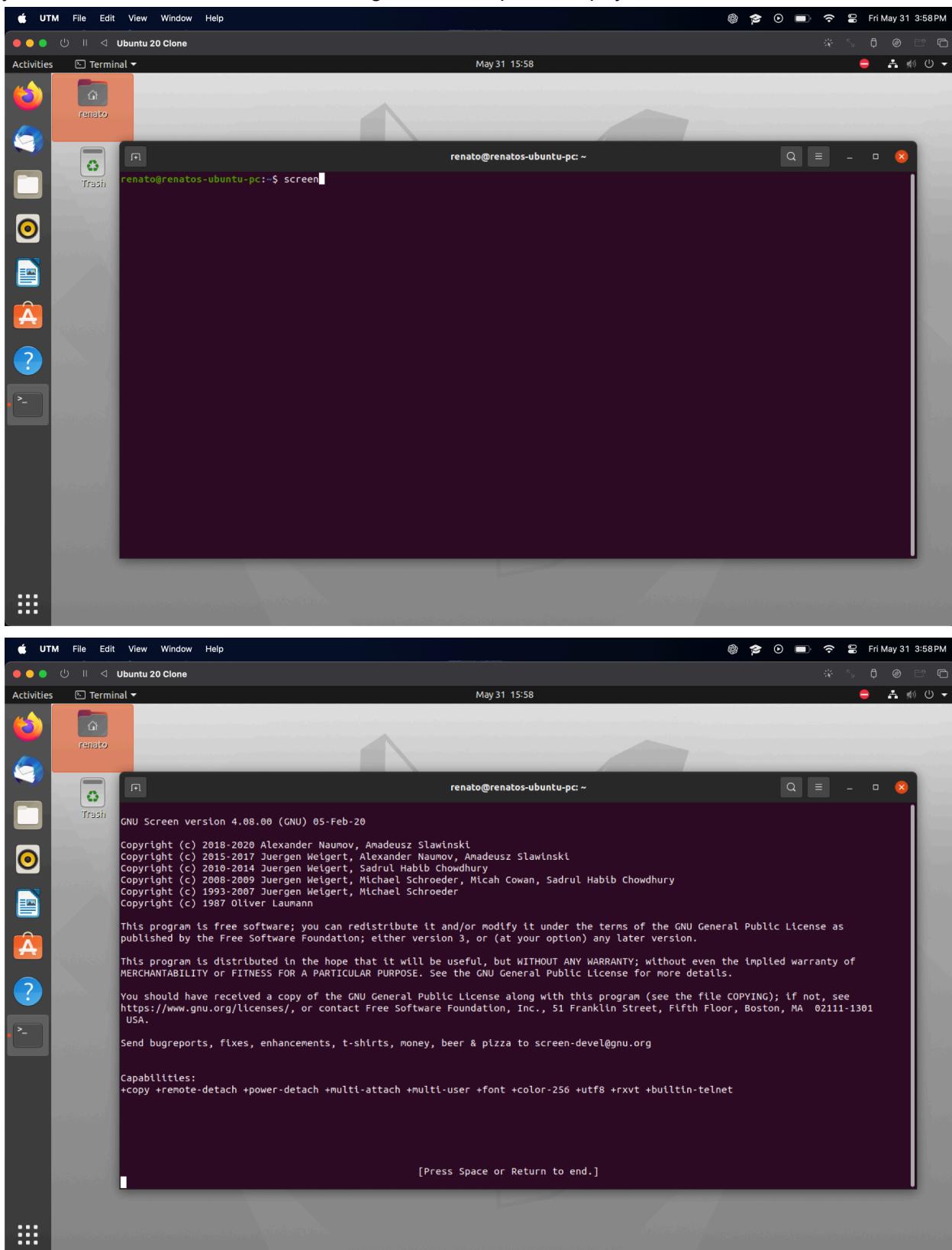
x. df: Reports file system disk space usage.



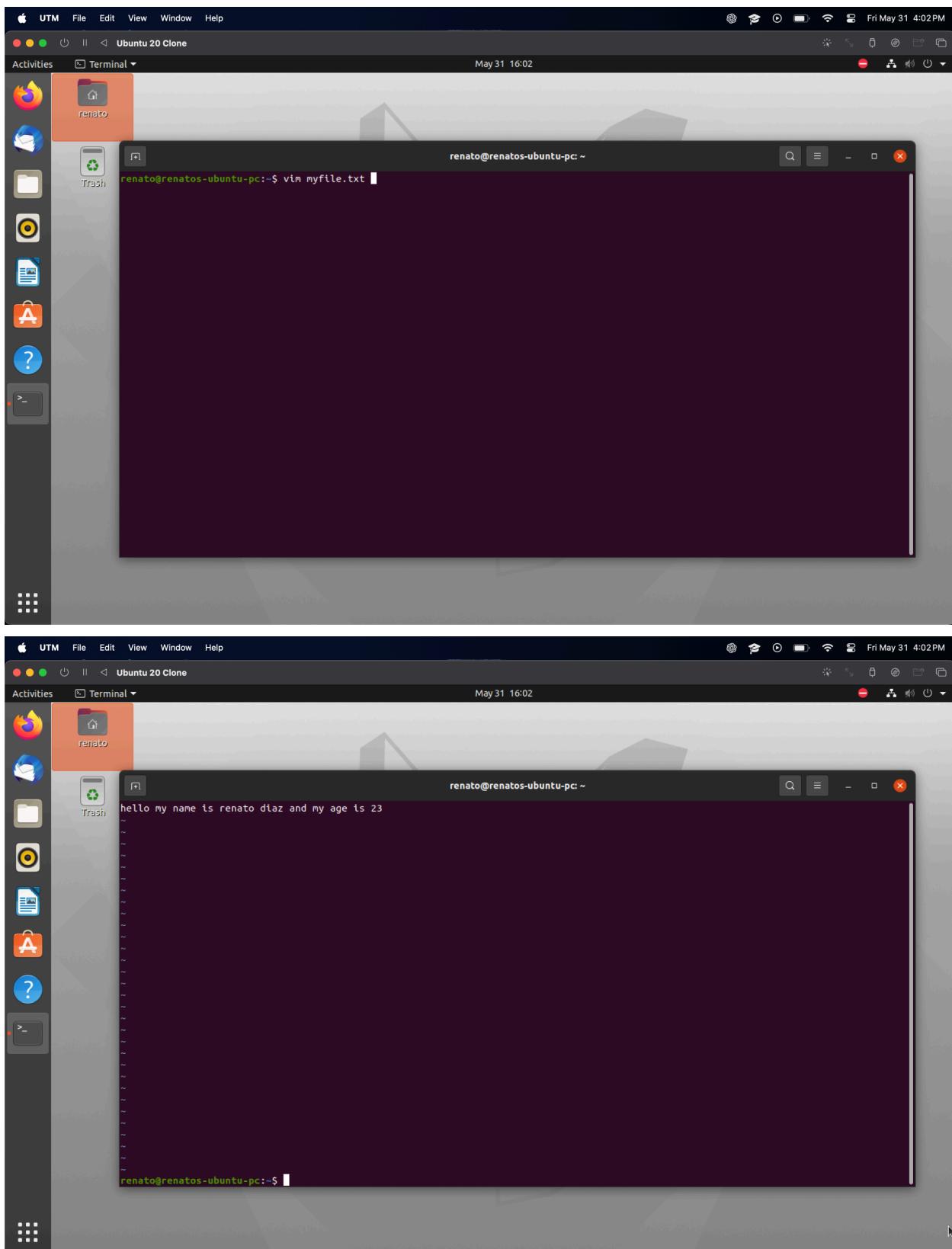
A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "df /home" being run. The output of the command shows disk usage for the "/home" file system, which is mounted on the "/dev/sda2" device. The desktop background is a dark grey gradient, and the taskbar at the top shows the date and time as "Fri May 31 3:56PM".

```
renato@renatos-ubuntu-pc:~$ df /home
Filesystem  1K-blocks  Used Available Use% Mounted on
/dev/sda2    25108740 10017032 13790924  43% /
renato@renatos-ubuntu-pc:~$
```

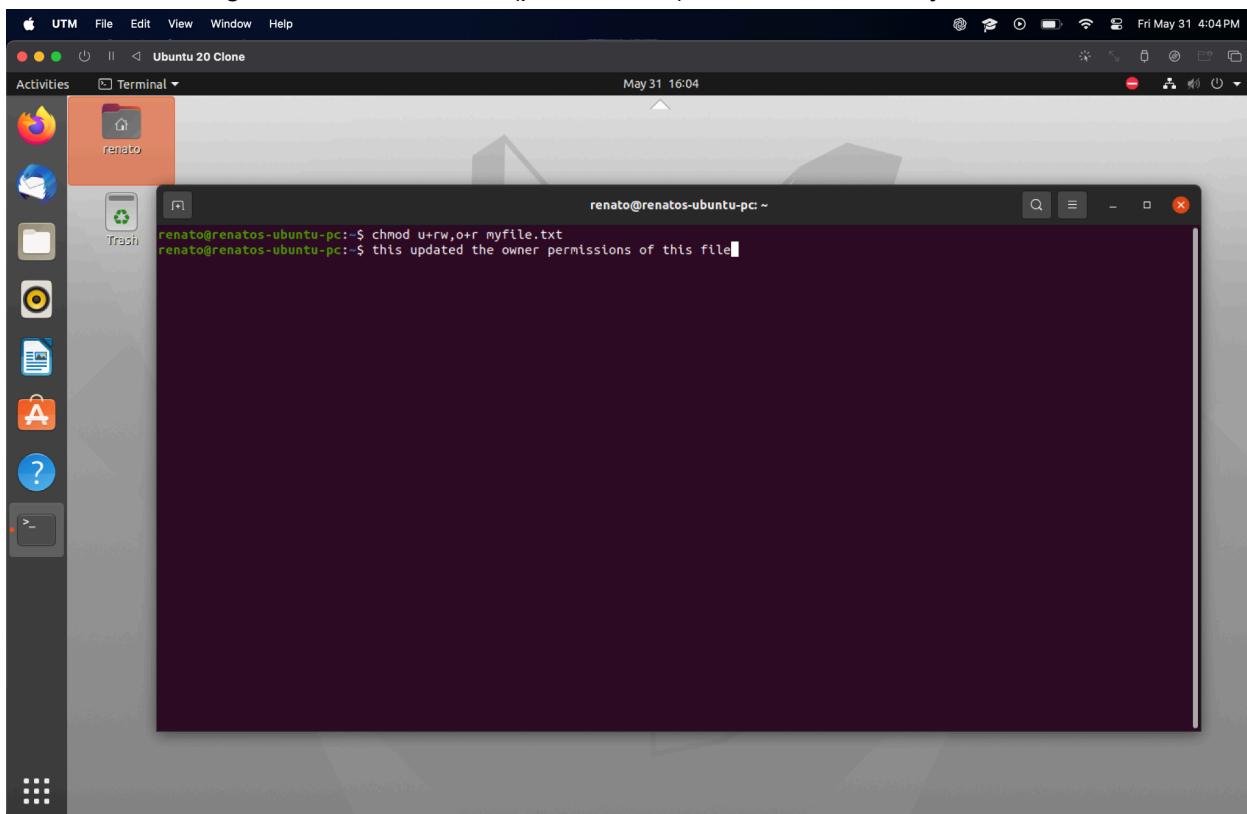
y. screen: A full-screen window manager that multiplexes a physical terminal.



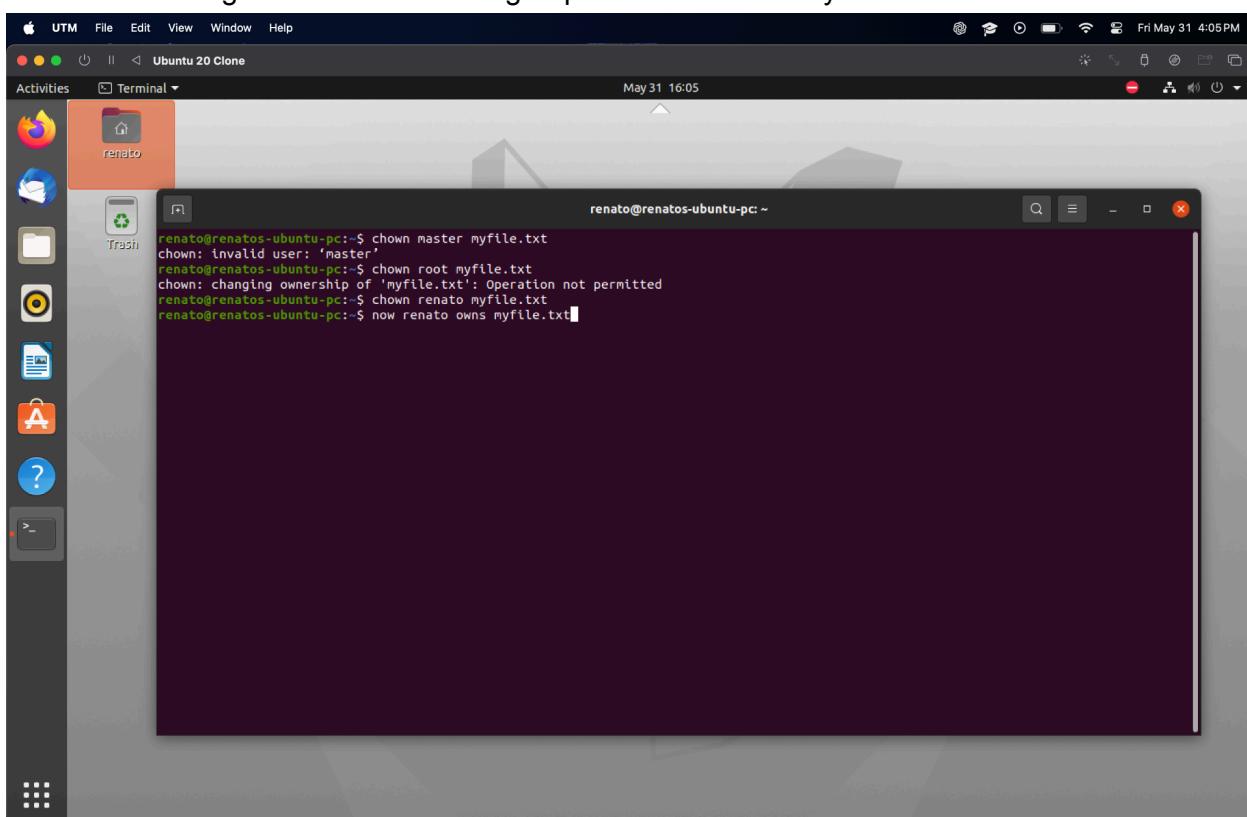
z. vim: An enhanced version of the Vi editor, with additional features.



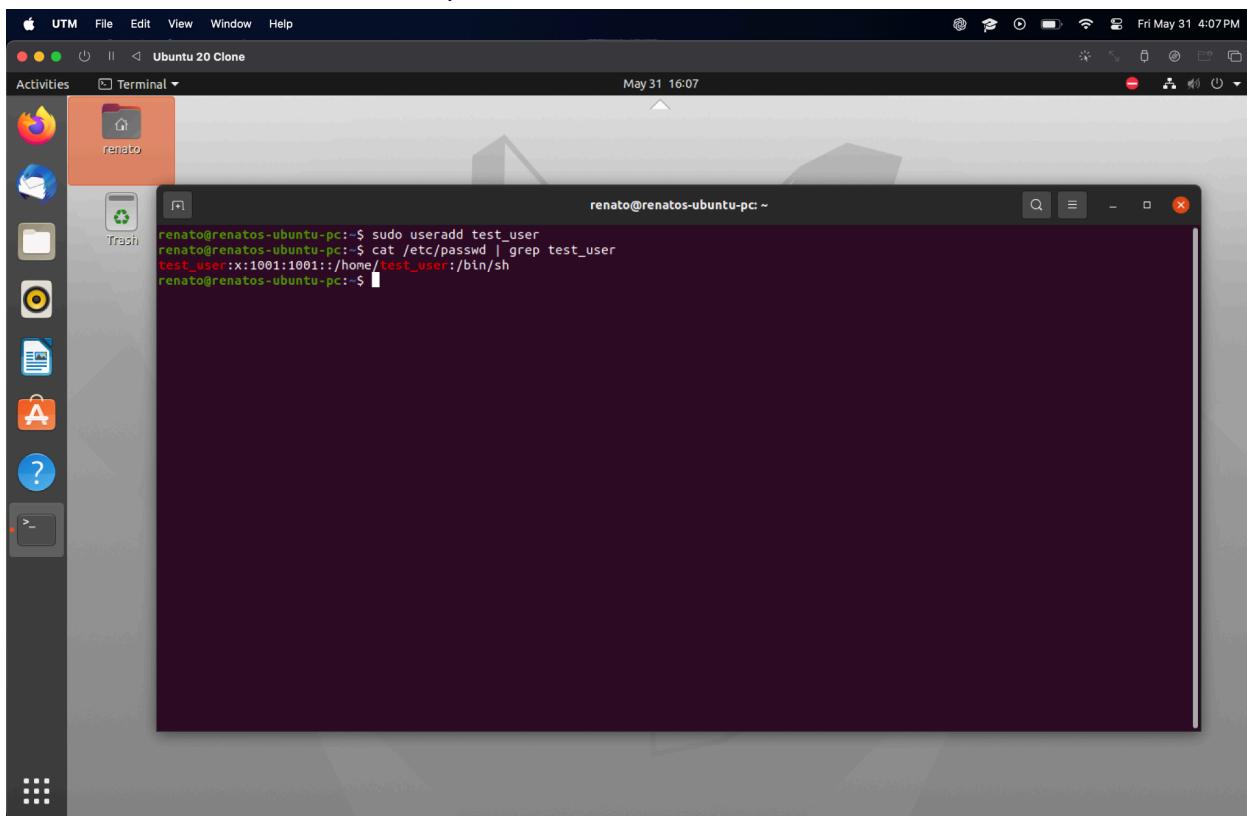
aa. chmod: Changes the file mode bits (permissions) of a file or directory.



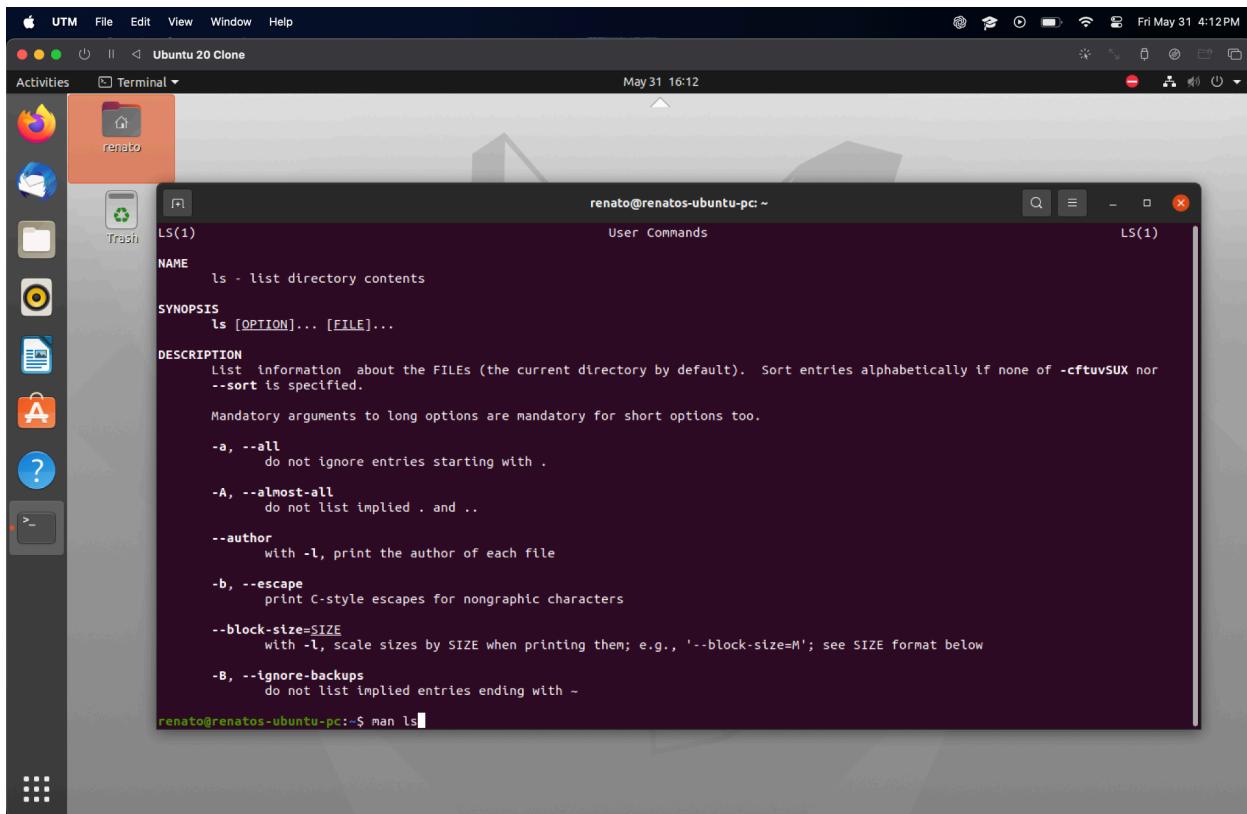
bb. chown: Changes the owner and/or group of a file or directory.



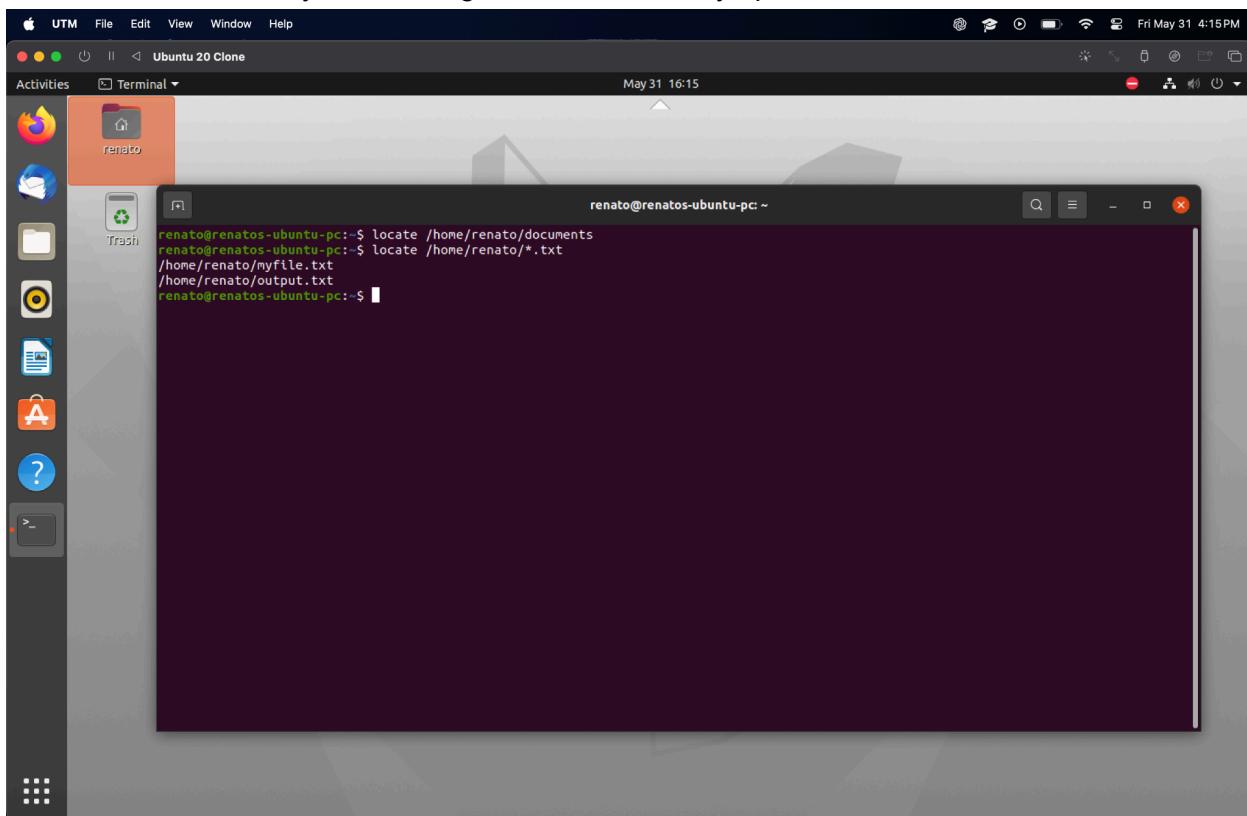
cc. useradd: Adds a new user or updates default new user information.



dd. man: Displays the manual page for other commands.



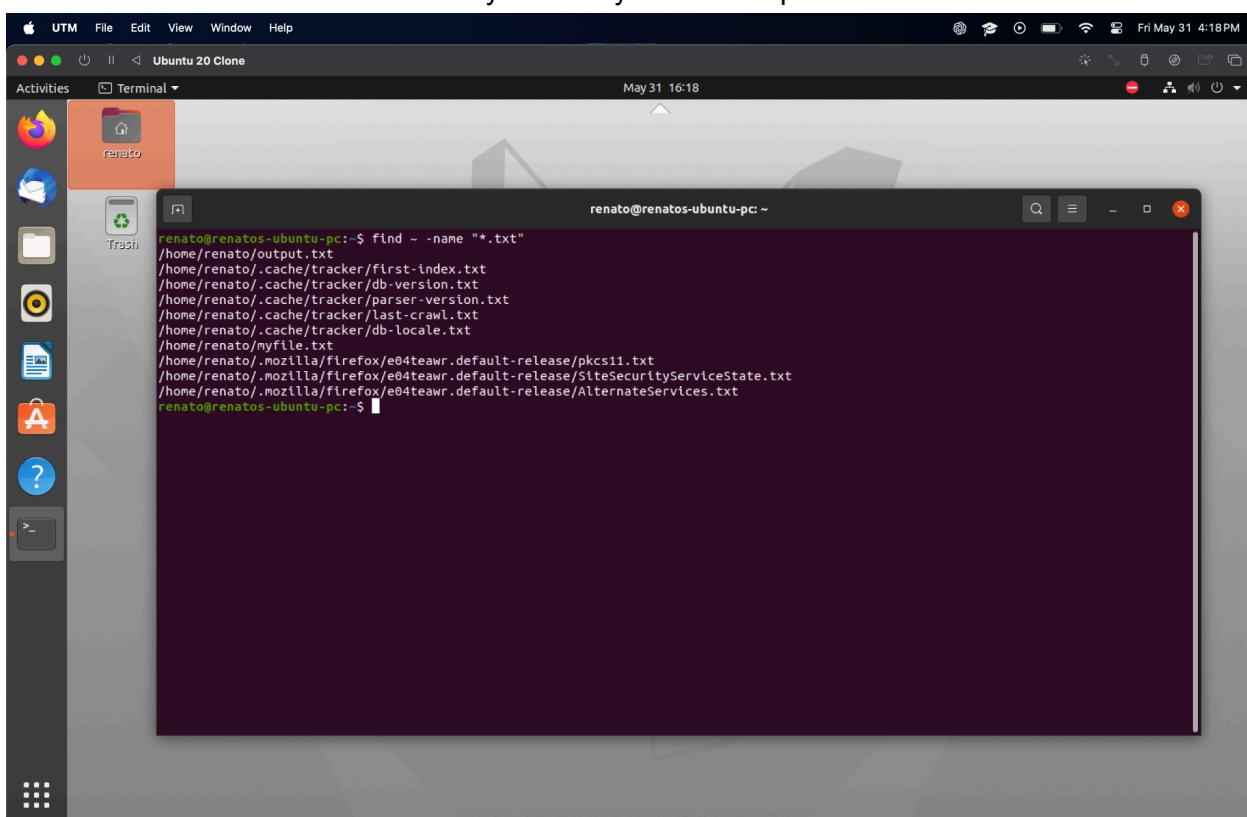
ee. locate: Finds files by name using a database built by updatedb.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command-line interface. The terminal window has a dark background with white text. The command entered is "locate /home/renato/documents". The output shows two files: "/home/renato/myfile.txt" and "/home/renato/output.txt". The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, Terminal, and a date/time indicator. The desktop background is a light grey with a subtle geometric pattern.

```
renato@renatos-ubuntu-pc:~$ locate /home/renato/documents
renato@renatos-ubuntu-pc:~$ locate /home/renato/*.txt
/home/renato/myfile.txt
/home/renato/output.txt
renato@renatos-ubuntu-pc:~$
```

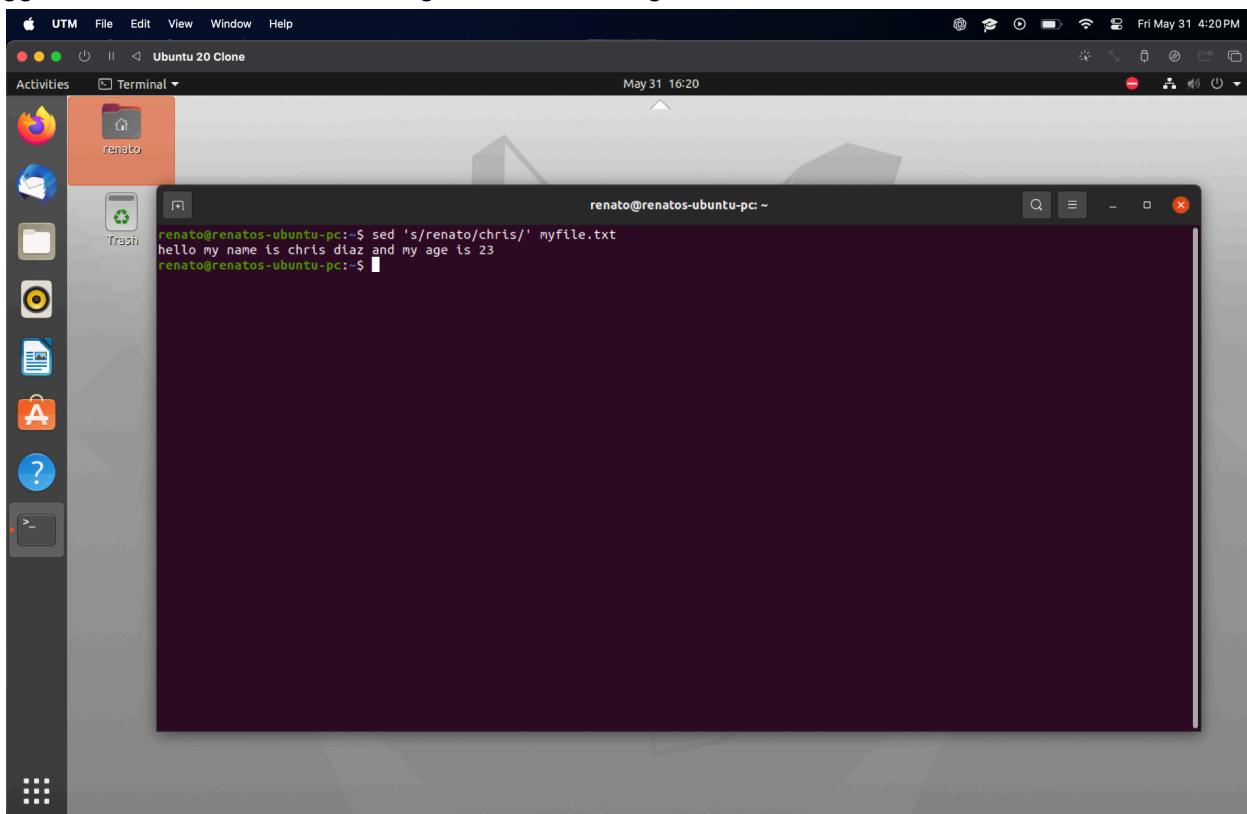
ff. find: Searches for files in a directory hierarchy based on specified criteria.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command-line interface. The terminal window has a dark background with white text. The command entered is "find ~ -name \"*.txt\"". The output lists several text files from the user's home directory and its subdirectories, including "/home/renato/output.txt", "/home/renato/.cache/tracker/first-index.txt", and "/home/renato/.cache/tracker/db-version.txt". The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, Terminal, and a date/time indicator. The desktop background is a light grey with a subtle geometric pattern.

```
renato@renatos-ubuntu-pc:~$ find ~ -name "*.txt"
/home/renato/output.txt
/home/renato/.cache/tracker/first-index.txt
/home/renato/.cache/tracker/db-version.txt
/home/renato/.cache/tracker/parser-version.txt
/home/renato/.cache/tracker/last-crawl.txt
/home/renato/.cache/tracker/db-locale.txt
/home/renato/myfile.txt
/home/renato/.mozilla/firefox/e04teawr.default-release/pkcs11.txt
/home/renato/.mozilla/firefox/e04teawr.default-release/SiteSecurityServiceState.txt
/home/renato/.mozilla/firefox/e04teawr.default-release/AlternateServices.txt
renato@renatos-ubuntu-pc:~$
```

gg. sed: Stream editor for filtering and transforming text.

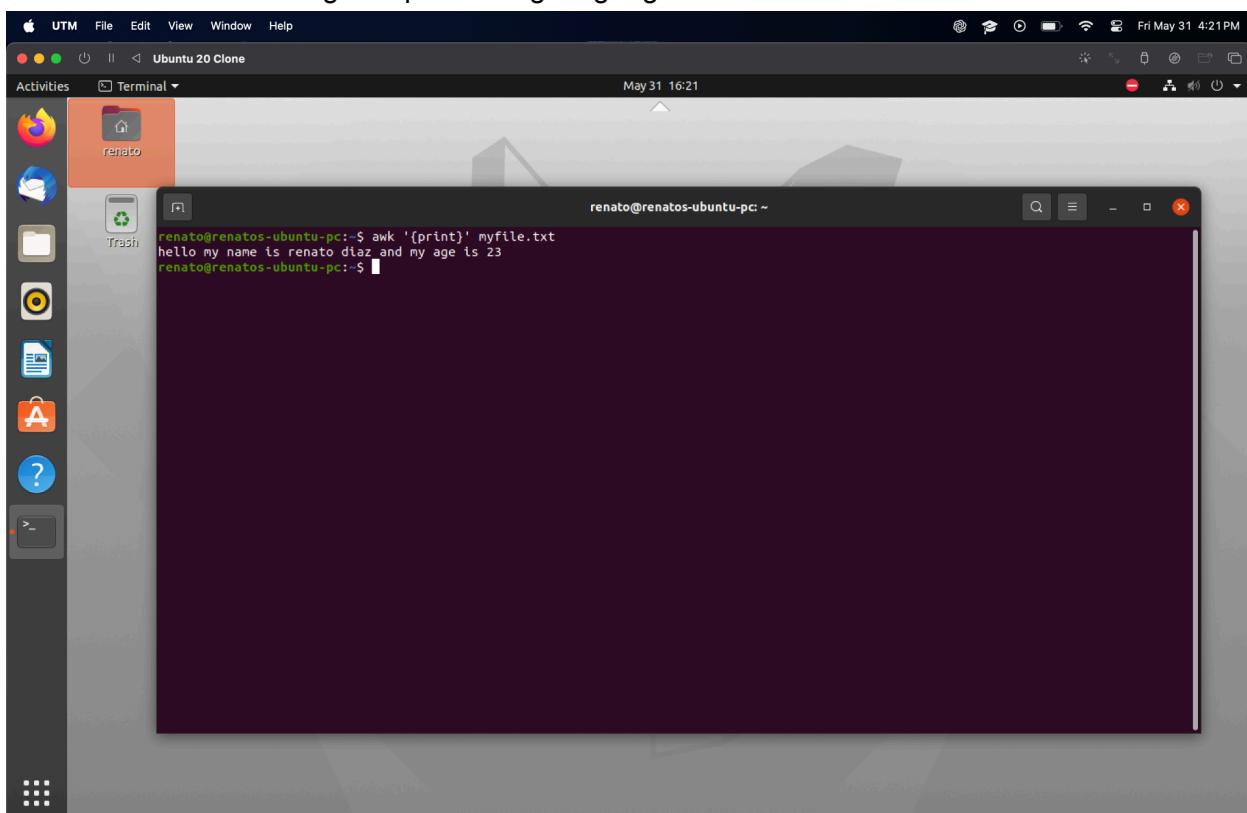


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is dark-themed and displays the following command and output:

```
renato@renatos-ubuntu-pc:~$ sed 's/renato/chris/' myfile.txt
hello my name is chris diaz and my age is 23
renato@renatos-ubuntu-pc:~$
```

The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and a Terminal icon. The date and time in the top right corner are Fri May 31 4:20PM.

hh. awk: Pattern scanning and processing language.

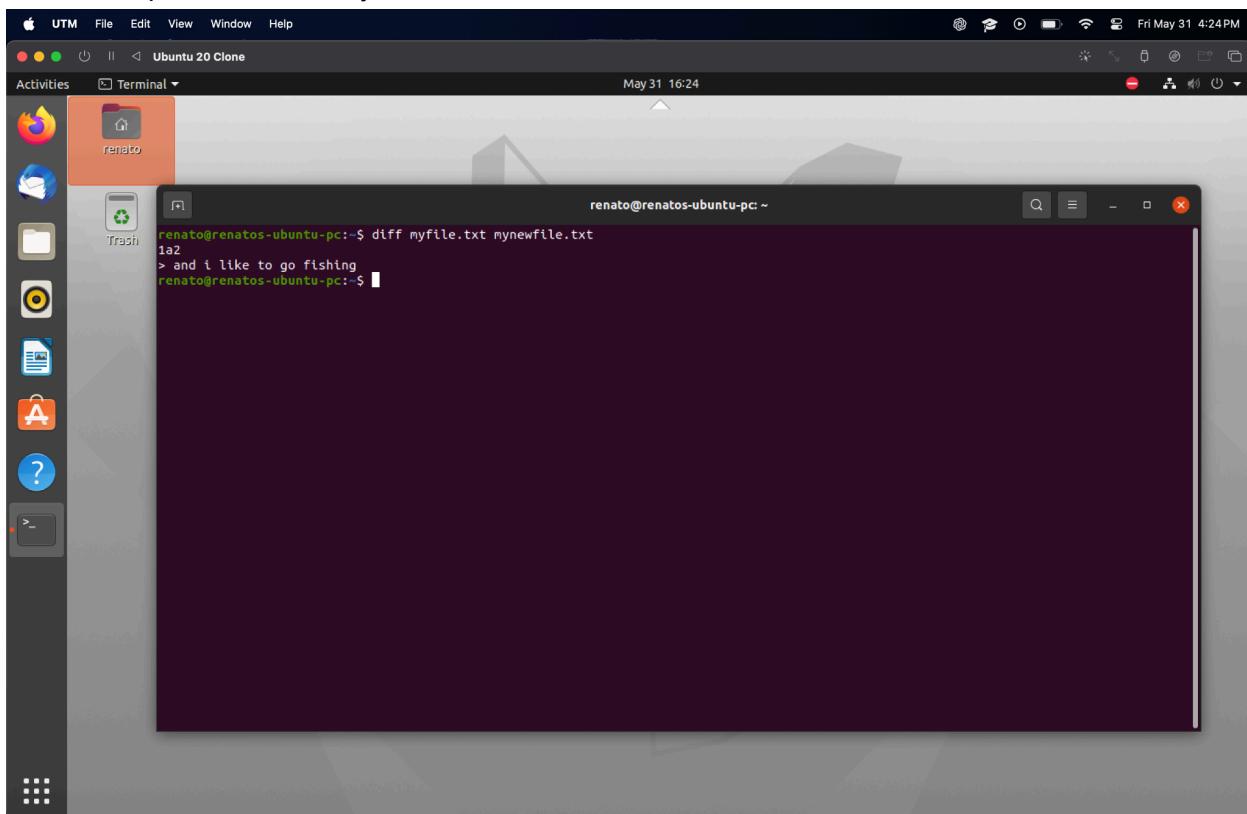


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is dark-themed and displays the following command and output:

```
renato@renatos-ubuntu-pc:~$ awk '{print}' myfile.txt
hello my name is renato diaz and my age is 23
renato@renatos-ubuntu-pc:~$
```

The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and a Terminal icon. The date and time in the top right corner are Fri May 31 4:21PM.

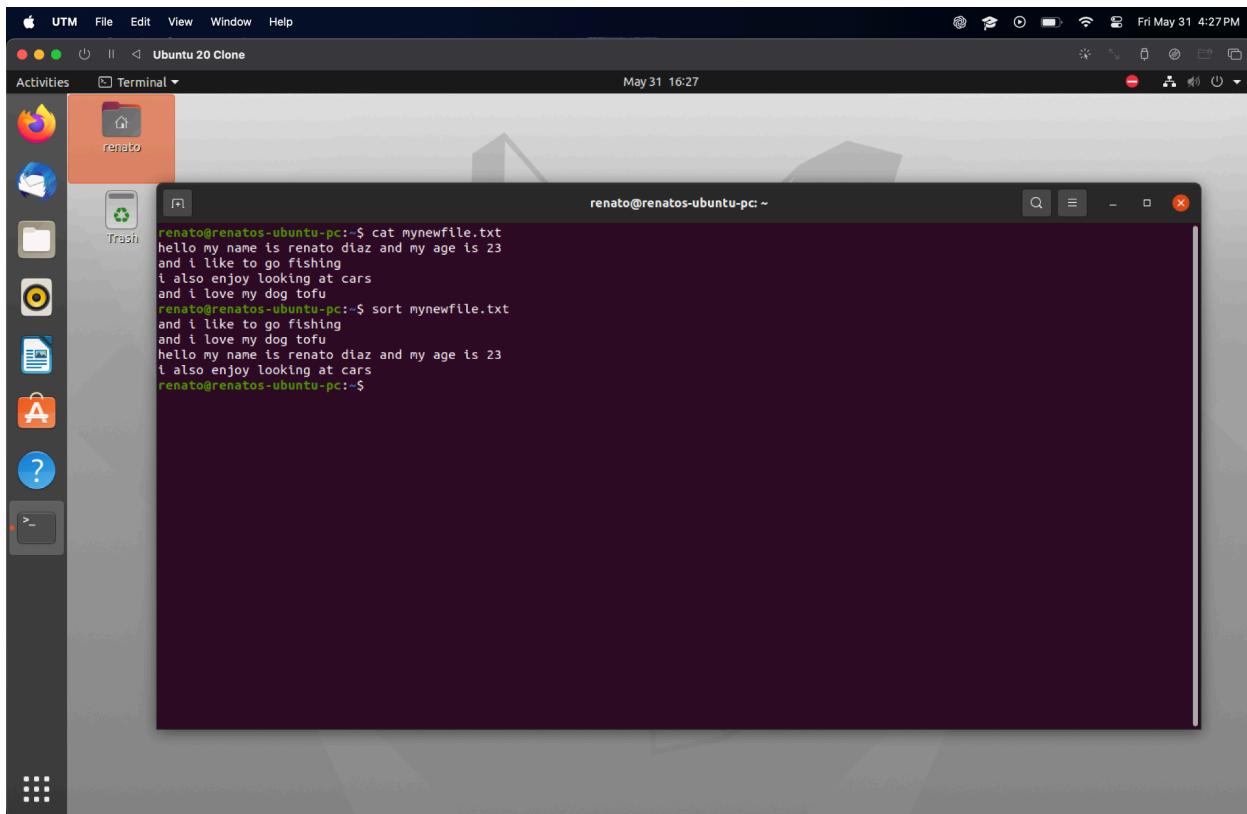
ii. diff: Compares files line by line.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "diff myfile.txt mynewfile.txt". The output of the command shows a single line difference:

```
renato@renatos-ubuntu-pc:~$ diff myfile.txt mynewfile.txt
1a2
> and i like to go fishing
renato@renatos-ubuntu-pc:~$
```

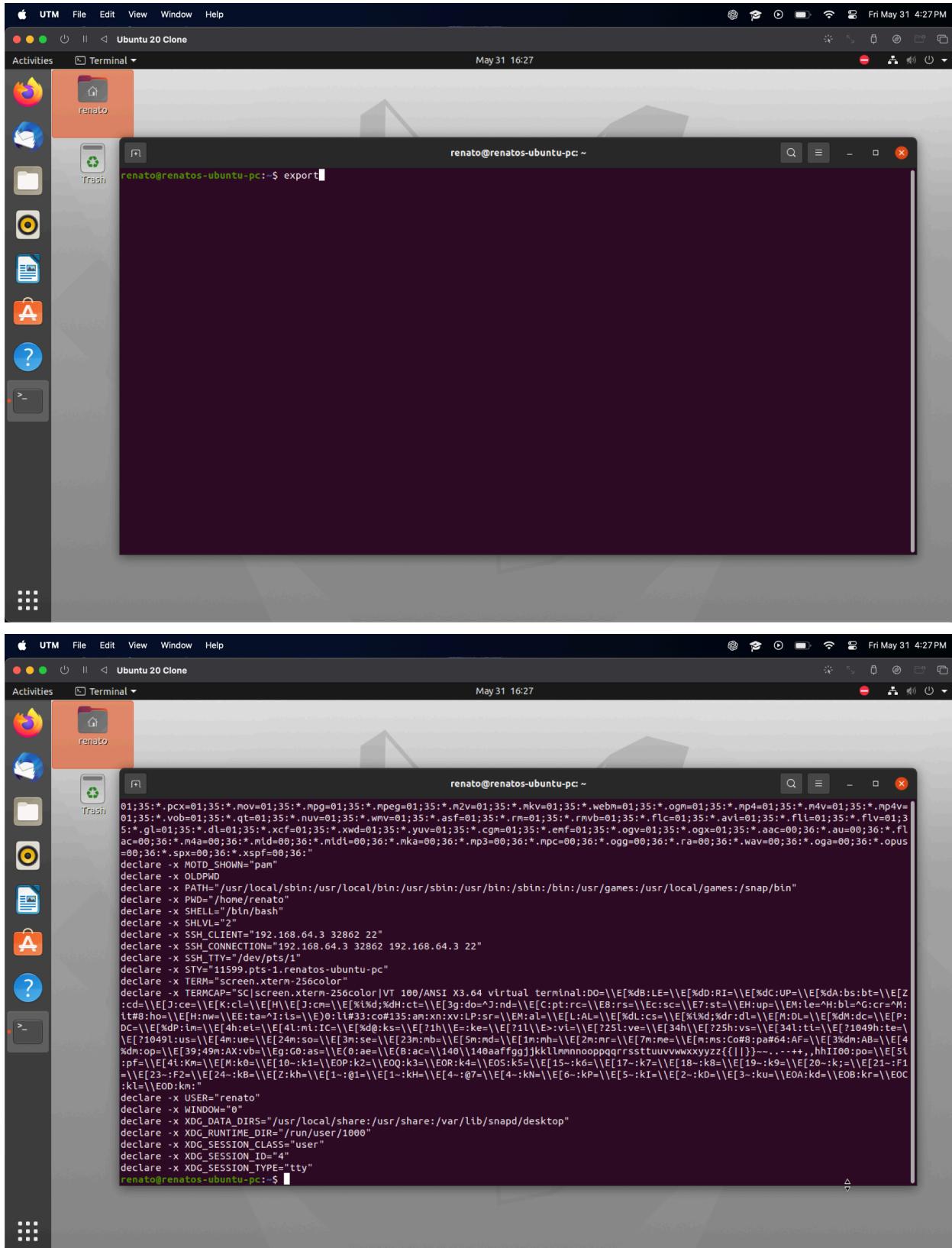
jj. sort: Sorts lines of text in specified files.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "cat mynewfile.txt" followed by "sort mynewfile.txt". The output shows the contents of the file being sorted:

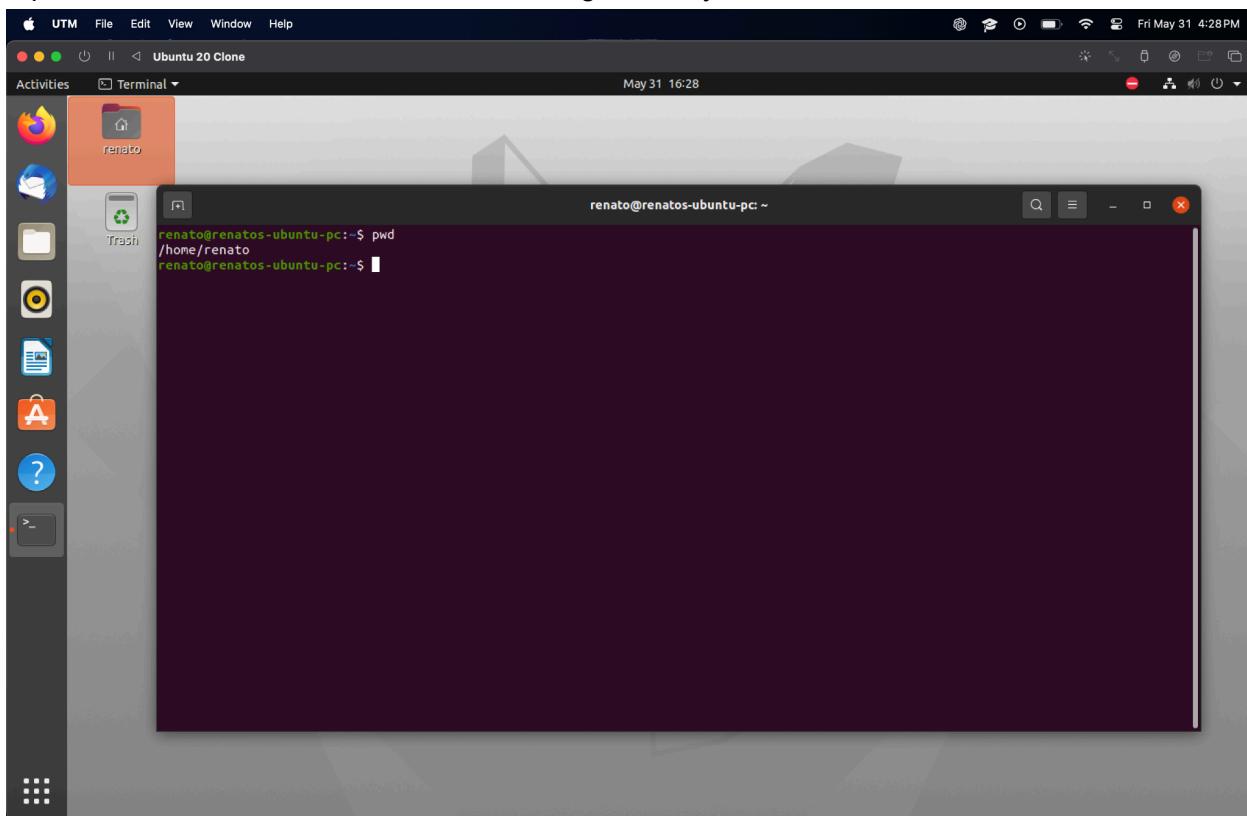
```
renato@renatos-ubuntu-pc:~$ cat mynewfile.txt
hello my name is renato diaz and my age is 23
and i like to go fishing
i also enjoy looking at cars
and i love my dog tofu
renato@renatos-ubuntu-pc:~$ sort mynewfile.txt
and i like to go fishing
i also enjoy looking at cars
and i love my dog tofu
hello my name is renato diaz and my age is 23
renato@renatos-ubuntu-pc:~$
```

kk. export: Sets or exports the environment variable.

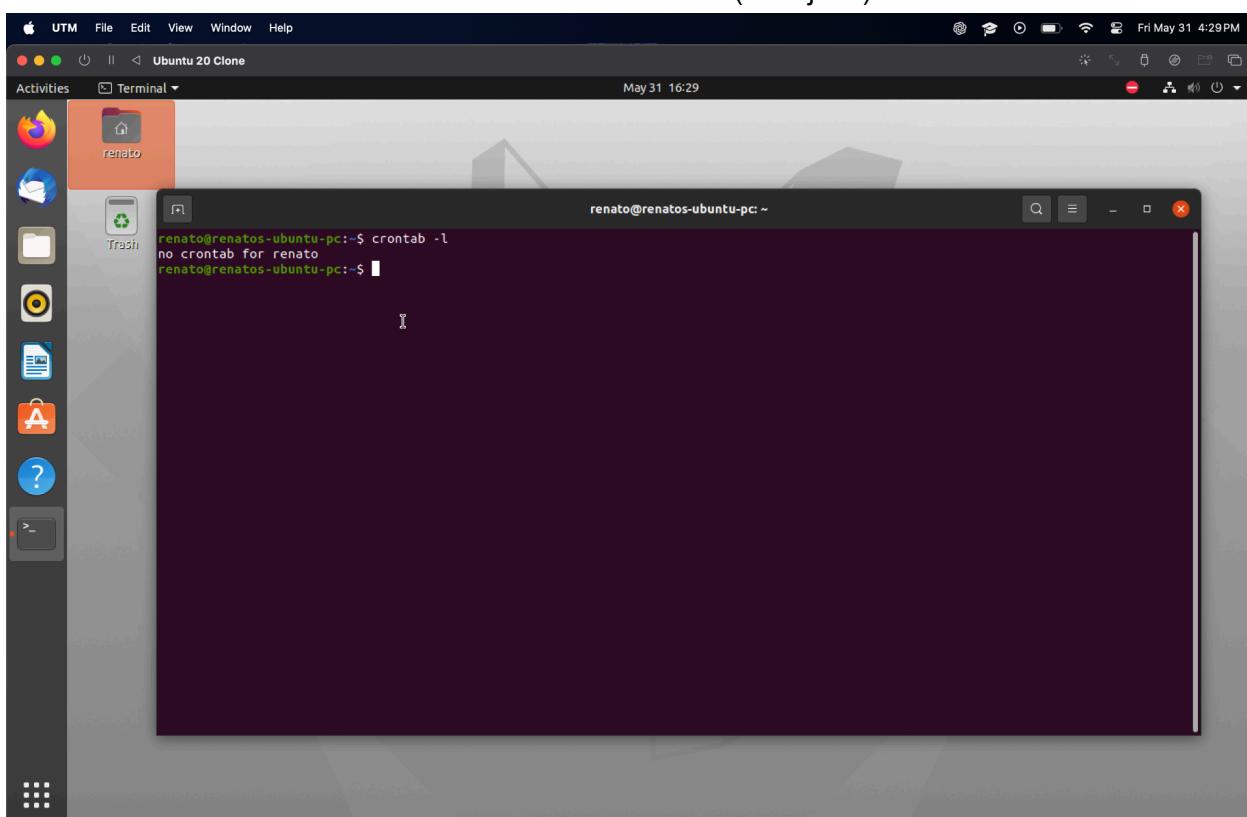


```
renato@renatos-ubuntu-pc:~$ export
renato@renatos-ubuntu-pc:~$ env
01;35*:pcx=01;35*:mov=01;35*:mpg=01;35*:mpeg=01;35*:m2v=01;35*:mkv=01;35*:webm=01;35*:ogm=01;35*:mp4=01;35*:m4v=01;35*:mp4v=01;35*:vob=01;35*:qt=01;35*:nuv=01;35*:wmv=01;35*:asf=01;35*:rmvb=01;35*:flc=01;35*:avt=01;35*:fli=01;35*:flv=01;35*:gl=01;35*:dl=01;35*:xcf=01;35*:xwd=01;35*:yuu=01;35*:cgm=01;35*:emf=01;35*:ov=01;35*:ogg=01;35*:aac=00;30*:au=00;30*:flac=00;36*:nra=00;36*:mid=00;36*:nidi=00;36*:nka=00;36*:mp3=00;36*:npc=00;36*:ogg=00;36*:ra=00;36*:wav=00;36*:oga=00;36*:opus=00;36*:spx=00;36*:xspf=00;36:" declare -x MOTD_SHOWN="pam" declare -x OLDPWD declare -x PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin" declare -x PWD="/home/renato" declare -x SHELL="/bin/bash" declare -x SHLVL="2" declare -x SSH_CLIENT="192.168.64.3 32862 22" declare -x SSH_CONNECTION="192.168.64.3 32862 192.168.64.3 22" declare -x SSH_TTY="/dev/pts/1" declare -x STY="1599 pts-1.renatos-ubuntu-pc" declare -x TERM="screen.xterm-256color" declare -x TERMCAP="SC[screen.xterm-256color|VT 100/ANSI X3.64 virtual terminal:DO=\E[%dB:LE=\E[%dD:RI=\E[%dC:UP=\E[%dA:bs:bt=\E[Z:cde\J:ce=\E[K:cI=\E[H:\E[Z:cm=\E[%l%h:\%H;cI=\E[3g:do=\^J:nd=\E[C:p:t=c=\E8:rs=\E:c:s:c=\E7:s:t=\E:H:up=\E:M:le=\M:bl=\^G:cr=\^M:it#8:ho=\E[H:nw=\E:E:t=\^I:is=\E:O:li\#33:co\#135:am:xn:xv:LP:s=r=\E[M:al=\E[L:AL=\E[%dL:cs=\E[%l%h:\%dr:dI=\E[M:Dl=\E[%dM:dc=\E[P:DC=\E[%dp:lm=\E[4h:eI=\E[4l:m:I=\E[%d@:ks=\E[21h:\E=k=\E[21l)\E=v=\E[225:\E[25h:\E[25h:vs=\E[34h:\E[34l:ti=\E[21049h:te=\E[?1049l:us=\E[4n:ue=\E[24m:so=\E[3n:se=\E[23m:rb=\E[5n:md=\E[1m:rh=\E[2m:mr=\E[7m:ne=\E[m:Co#8:#Af=\E[3%dm:AB=\E[4%dm:op=\E[39;49m:AX:vb=\E[g:O:as=\E(O:ae=\E(B:ac=\E(46\140affggjjklmnoppqrsssttuuvwwxyz{{}})~--+++,hhiI0:po=\E[5t:pf=\E[4f:k=\E[M:k=\E[10:-k1=\EOP:k2=\EQQ:k3=\EOR:k4=\EO5:k5=\E15:-k6=\E[17:-k7=\E[18:-k8=\E[19:-k9=\E[20:-k=\E[21:-F1:k=\E[23:-F2=\E[24:-kB=\E[Z:kh=\E[1-:t=\E[1-:k=\E[4-:t=\E[4-:kN=\E[6-:kP=\E[5-:kI=\E[2-:kD=\E[3-:ku=\E0A:kd=\E0B:kr=\EOC:kl=\EOD:kn=" declare -x USER="renato" declare -x WINDOW="0" declare -x XDG_DATA_DIRS="/usr/local/share:/usr/share:/var/lib/snapd/desktop" declare -x XDG_RUNTIME_DIR="/run/user/1000" declare -x XDG_SESSION_CLASS="user" declare -x XDG_SESSION_ID="4" declare -x XDG_SESSION_TYPE="tty"
```

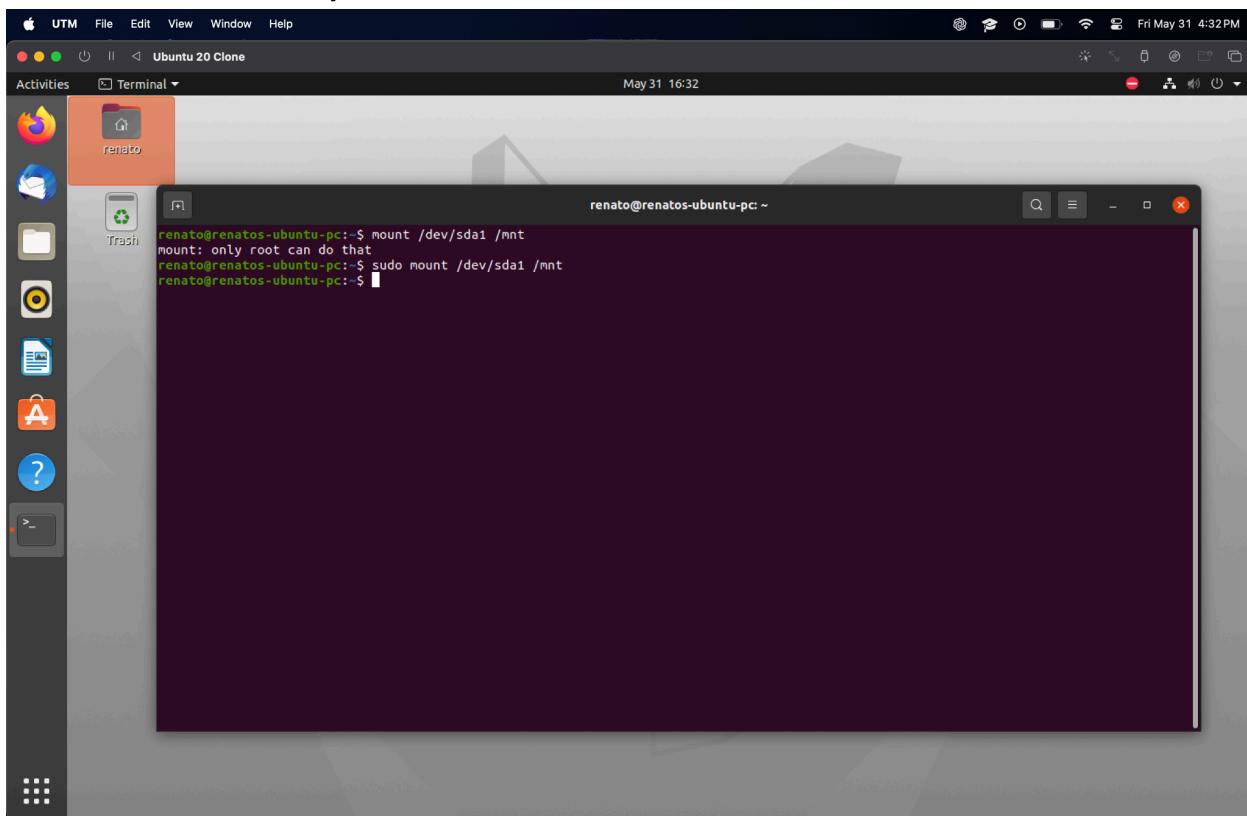
II. `pwd`: Prints the name of the current working directory.



mm. `crontab`: Maintains crontab files for individual users (cron jobs).



nn. mount: Mounts a filesystem.

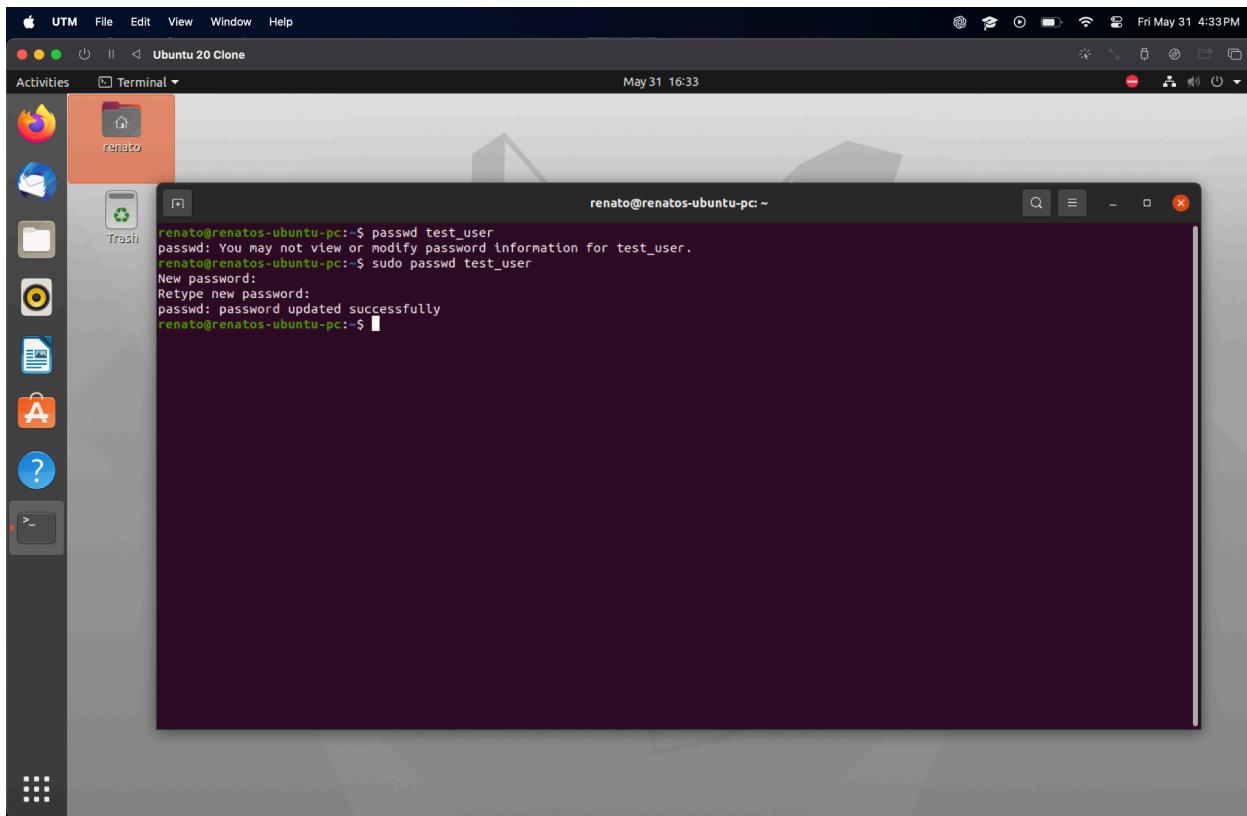


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the following command and its output:

```
renato@renatos-ubuntu-pc:~$ mount /dev/sda1 /mnt
mount: only root can do that
renato@renatos-ubuntu-pc:~$ sudo mount /dev/sda1 /mnt
renato@renatos-ubuntu-pc:~$
```

The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, Terminal, and a system tray at the top right showing the date and time.

oo. passwd: Changes user password.

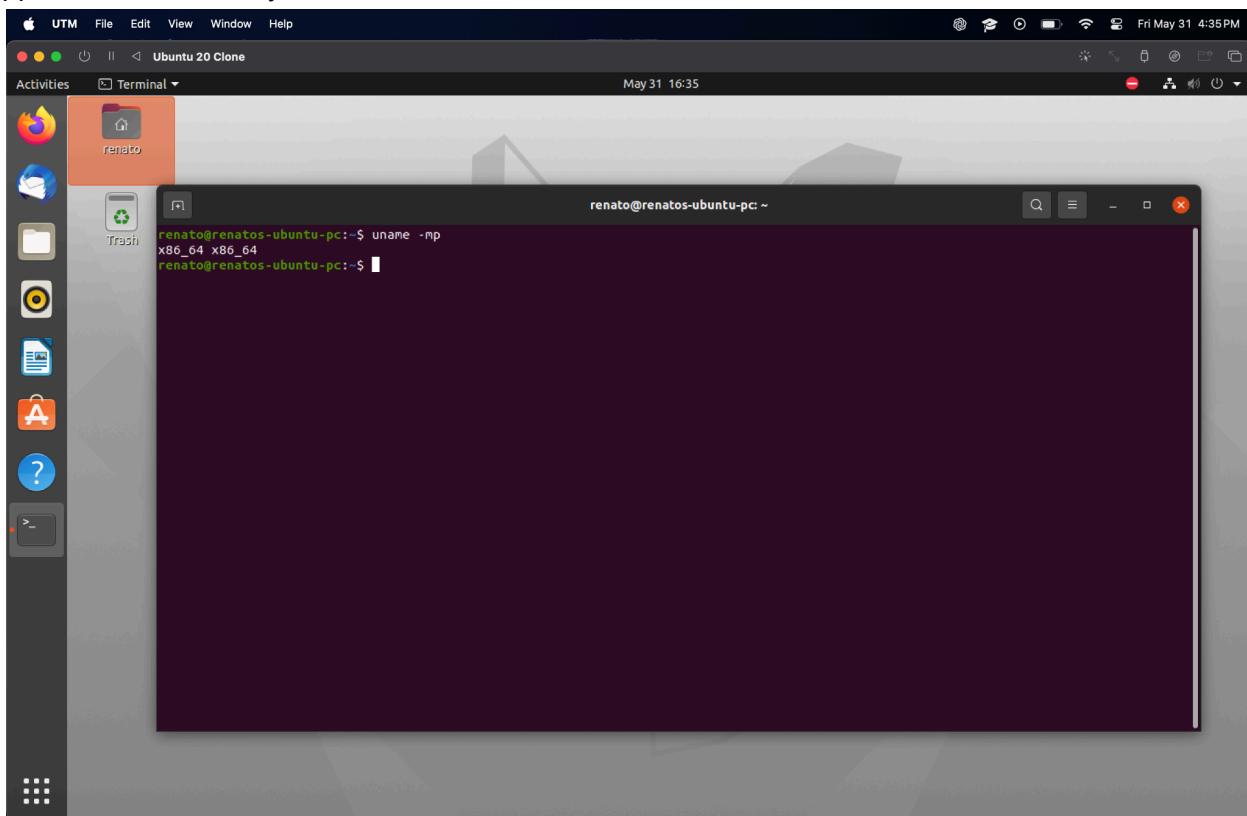


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the following command and its output:

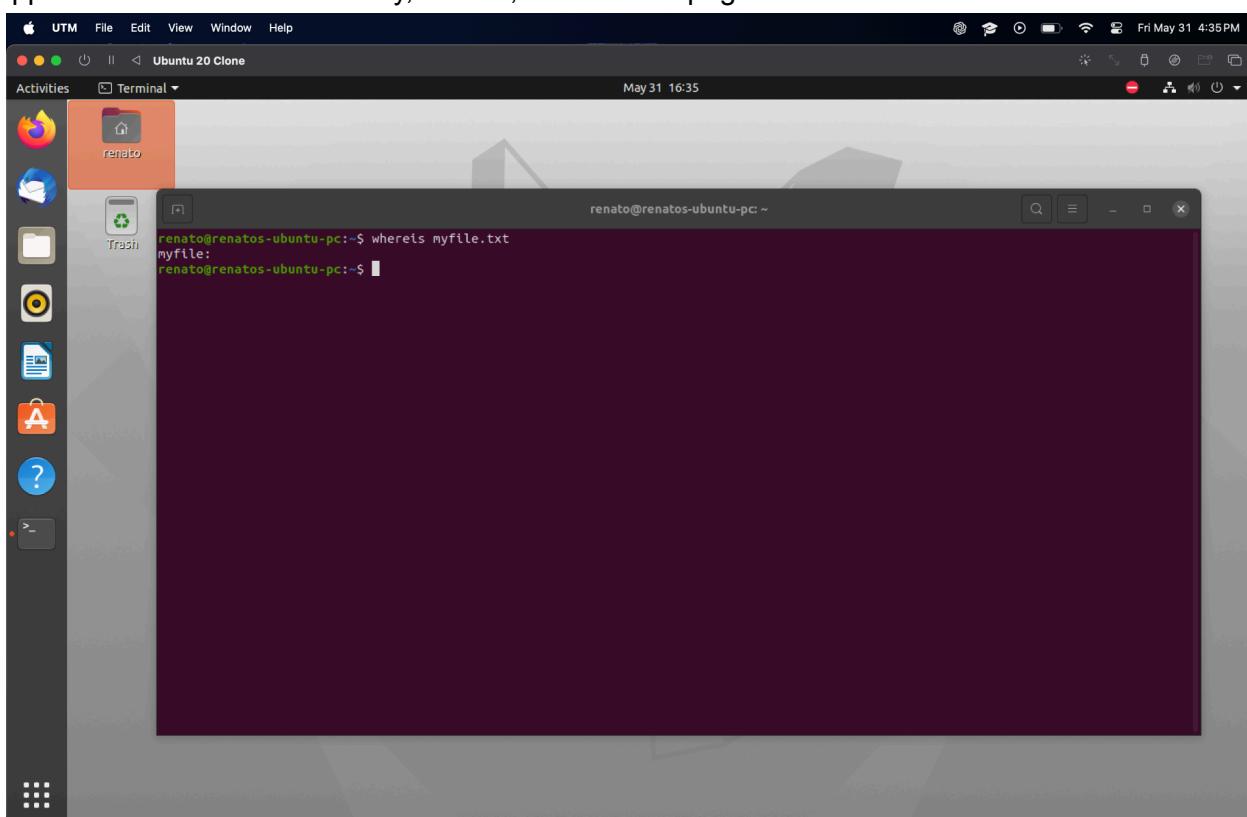
```
renato@renatos-ubuntu-pc:~$ passwd test_user
passwd: You may not view or modify password information for test_user.
renato@renatos-ubuntu-pc:~$ sudo passwd test_user
New password:
Retype new password:
passwd: password updated successfully
renato@renatos-ubuntu-pc:~$
```

The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, Terminal, and a system tray at the top right showing the date and time.

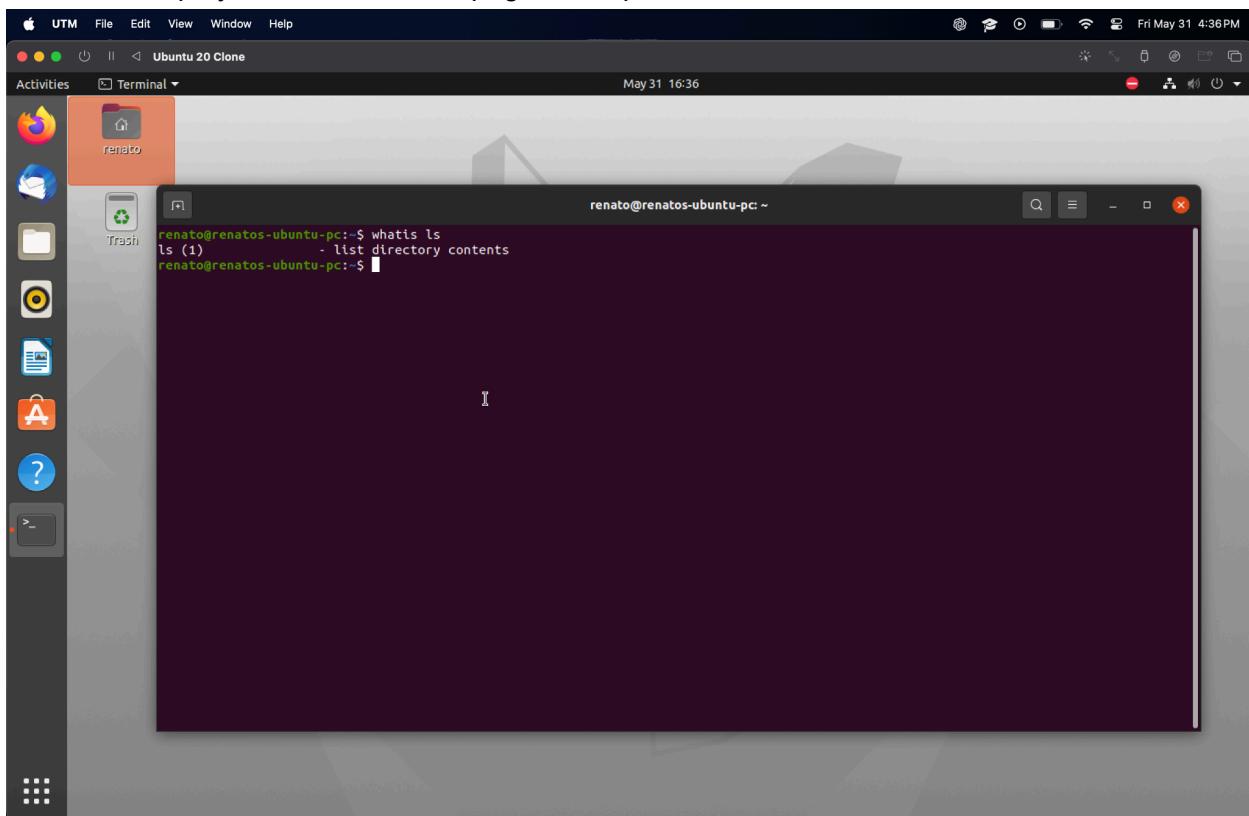
pp. uname: Shows system information.



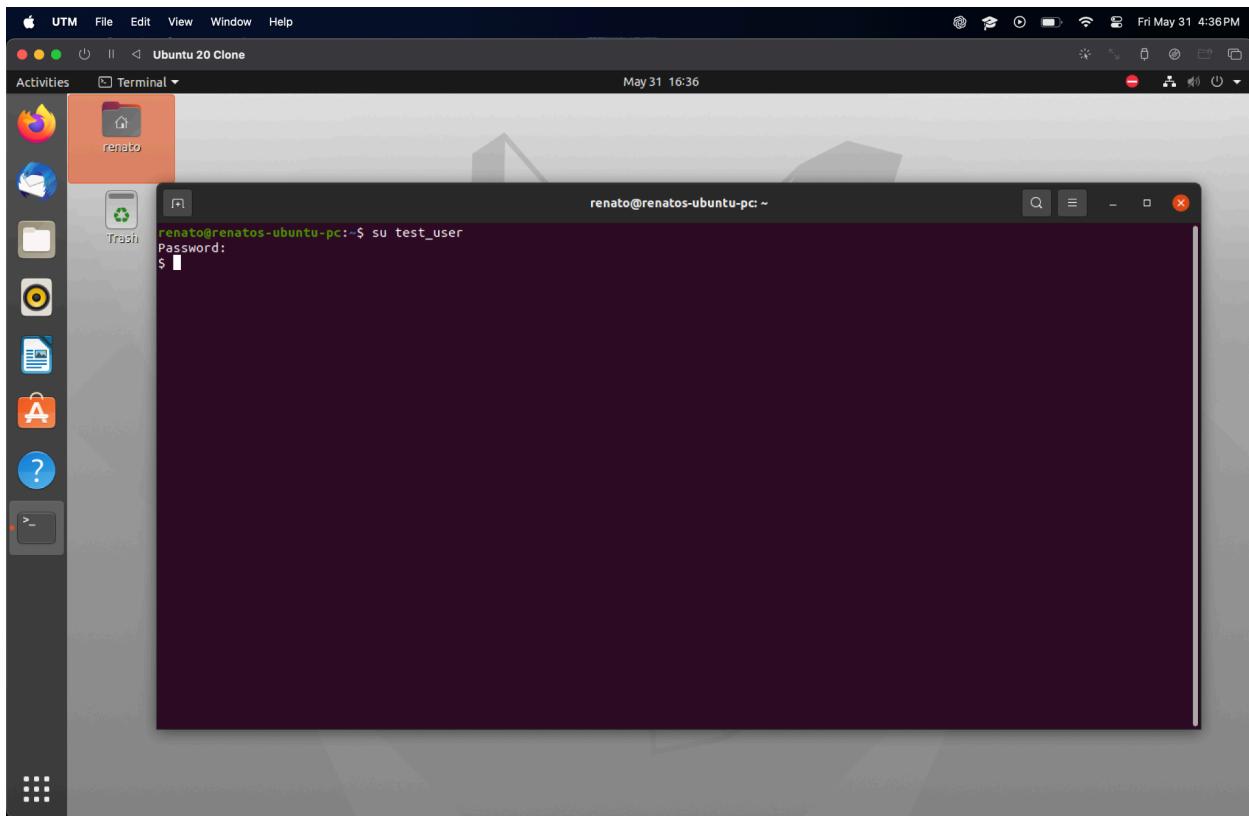
qq. whereis: Locates the binary, source, and manual pages for a command.



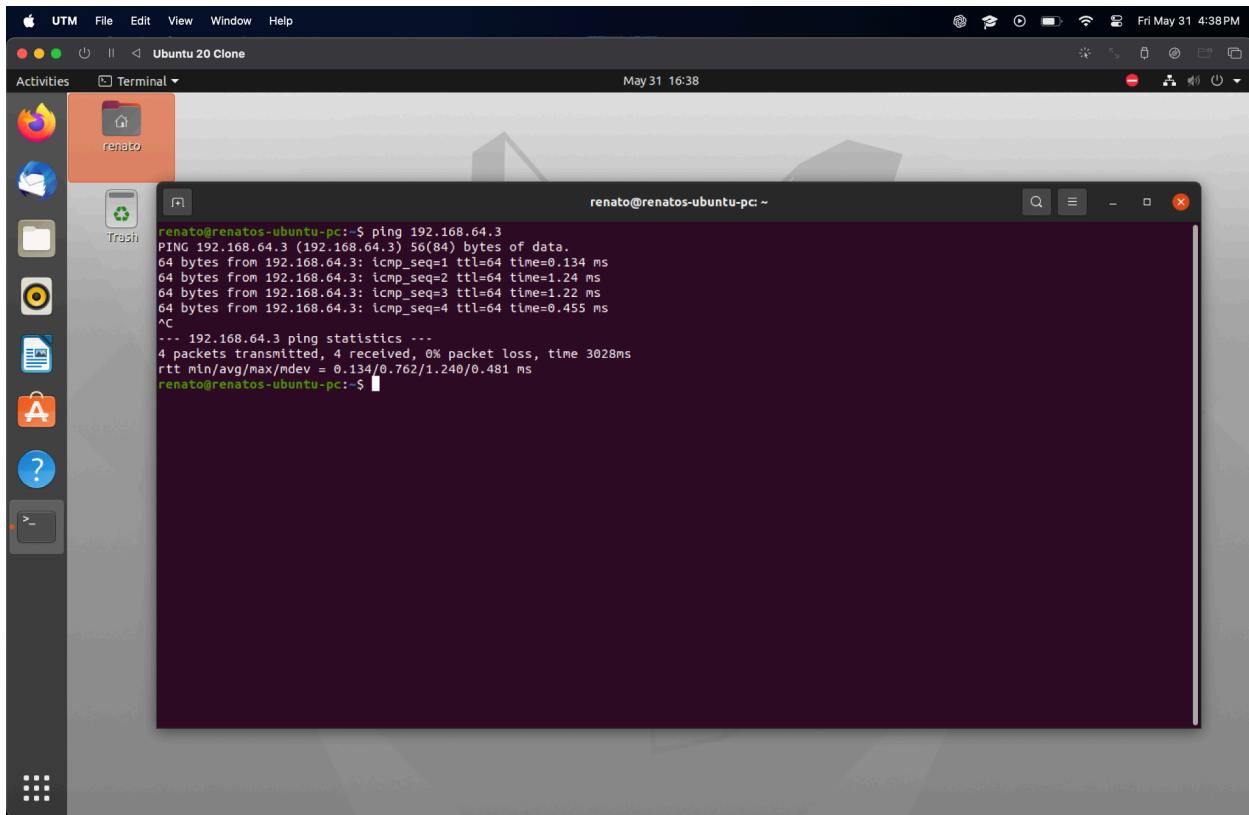
rr. whatis: Displays one-line manual page descriptions.



ss. su: Switches the current user to another user.



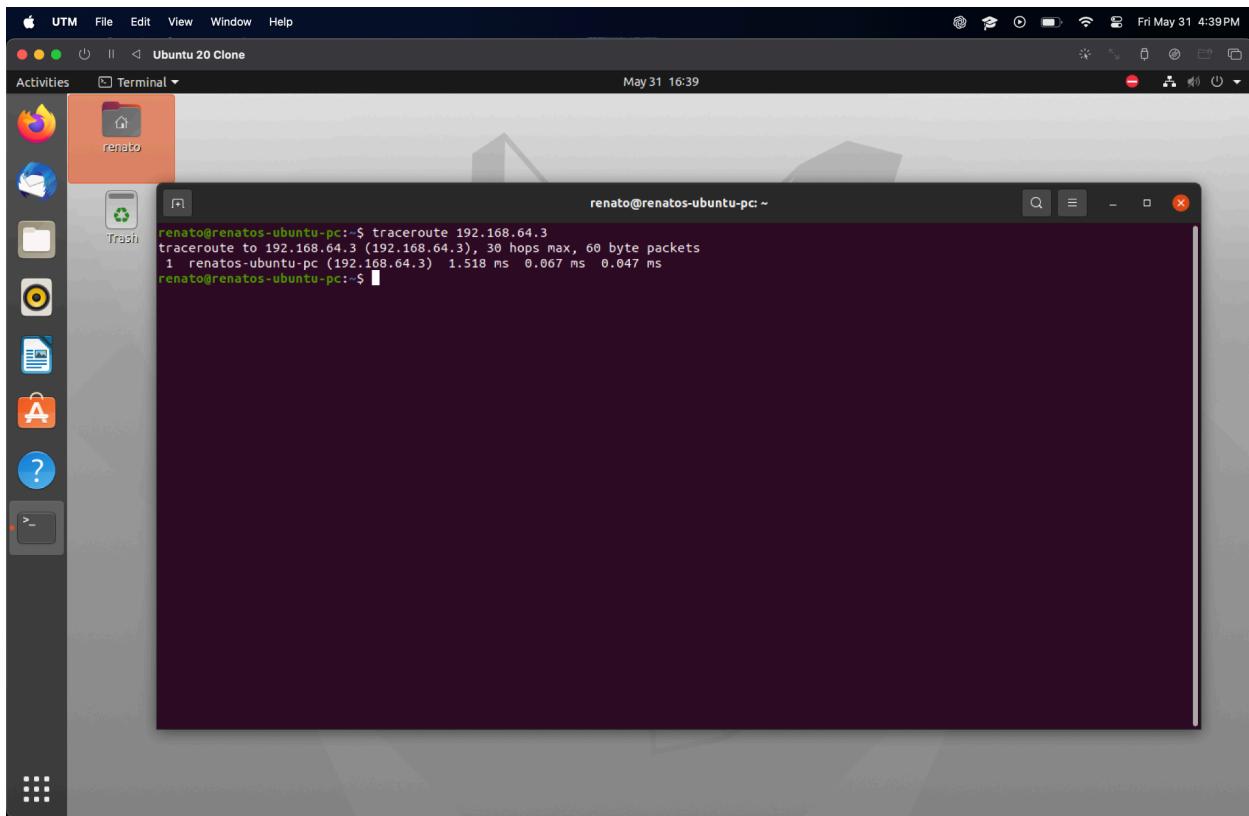
tt. ping: Checks network connectivity to another host.



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the output of the "ping" command. The command "ping 192.168.64.3" was run, and the terminal shows the following output:

```
renato@renatos-ubuntu-pc:~$ ping 192.168.64.3
PING 192.168.64.3 (192.168.64.3) 56(84) bytes of data.
64 bytes from 192.168.64.3: icmp_seq=1 ttl=64 time=0.134 ms
64 bytes from 192.168.64.3: icmp_seq=2 ttl=64 time=1.24 ms
64 bytes from 192.168.64.3: icmp_seq=3 ttl=64 time=1.22 ms
64 bytes from 192.168.64.3: icmp_seq=4 ttl=64 time=0.455 ms
^C
--- 192.168.64.3 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3028ms
rtt min/avg/max/mdev = 0.134/0.762/1.240/0.481 ms
renato@renatos-ubuntu-pc:~$
```

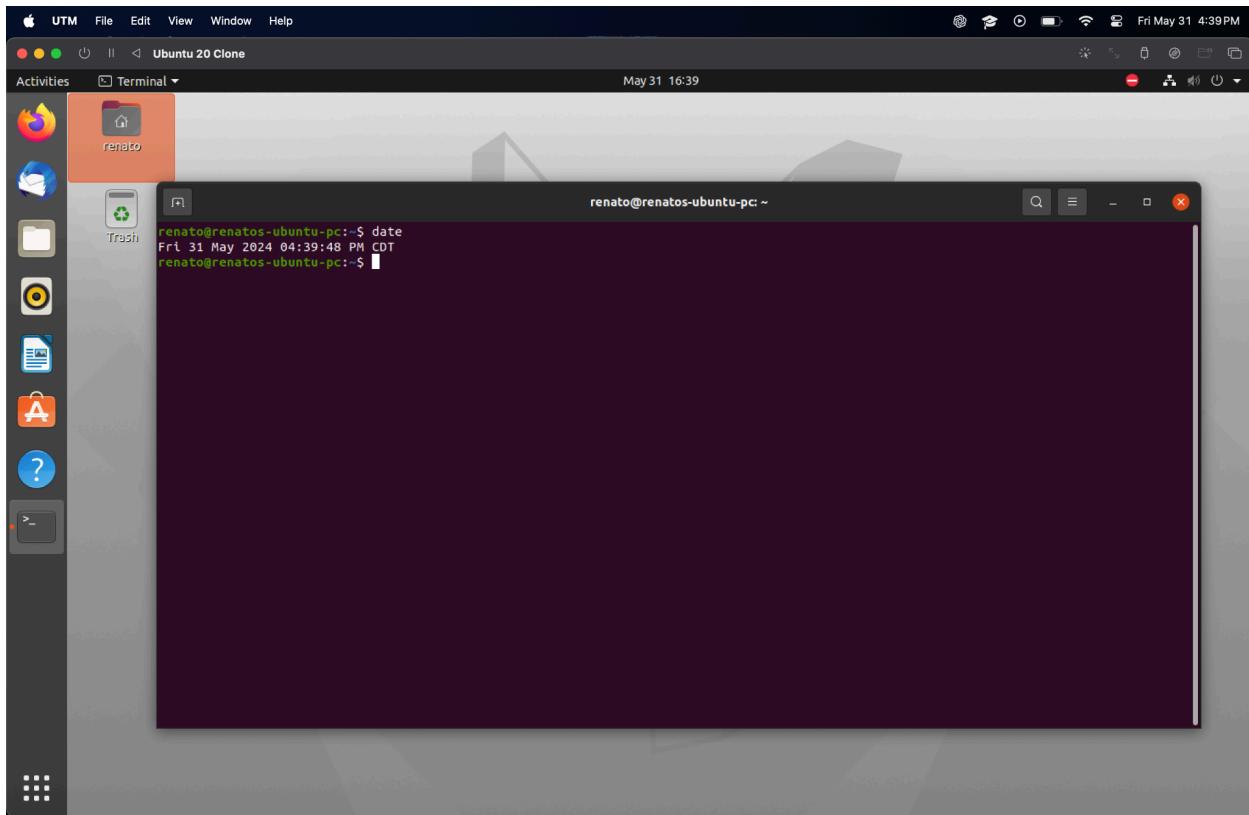
uu. traceroute: Traces the route packets take to a network host.



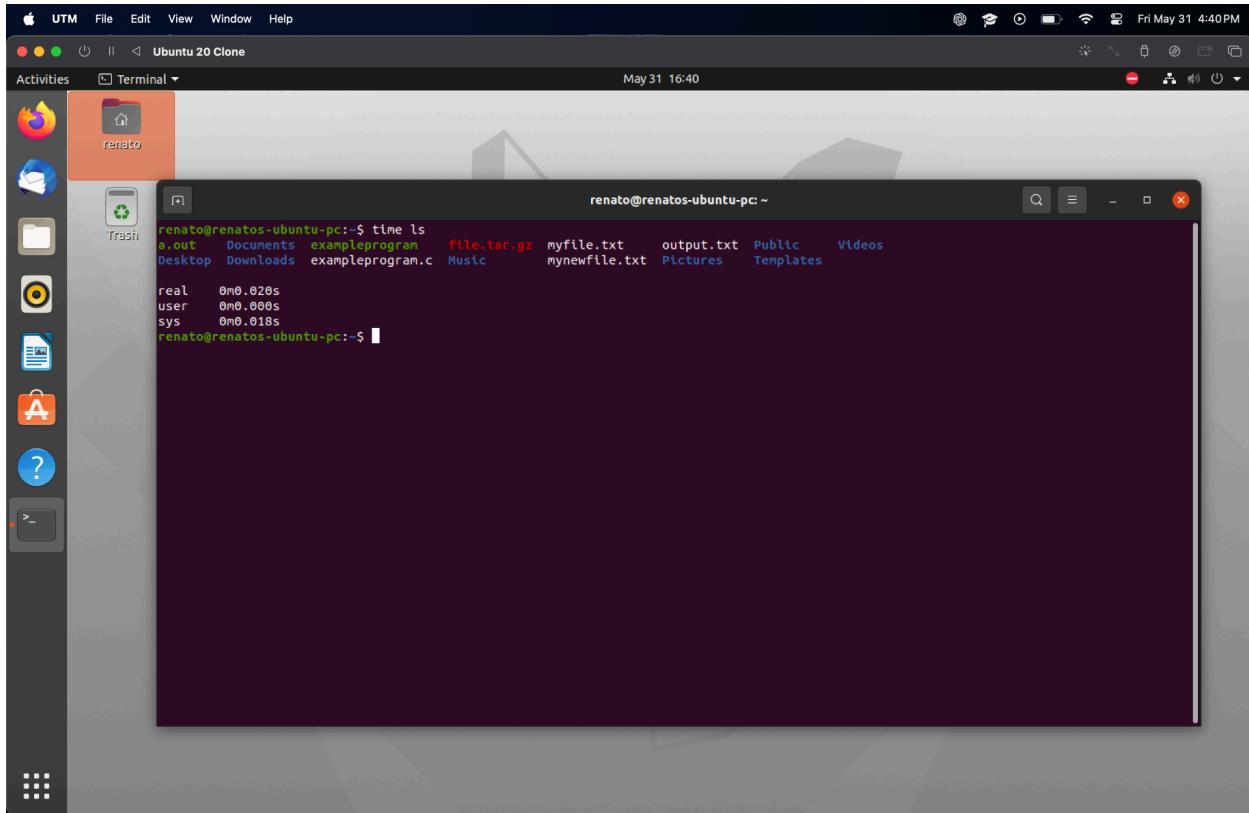
A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window is active and displays the output of the "traceroute" command. The command "traceroute 192.168.64.3" was run, and the terminal shows the following output:

```
renato@renatos-ubuntu-pc:~$ traceroute 192.168.64.3
traceroute to 192.168.64.3 (192.168.64.3), 30 hops max, 60 byte packets
 1  renatos-ubuntu-pc (192.168.64.3)  1.518 ms  0.867 ms  0.047 ms
renato@renatos-ubuntu-pc:~$
```

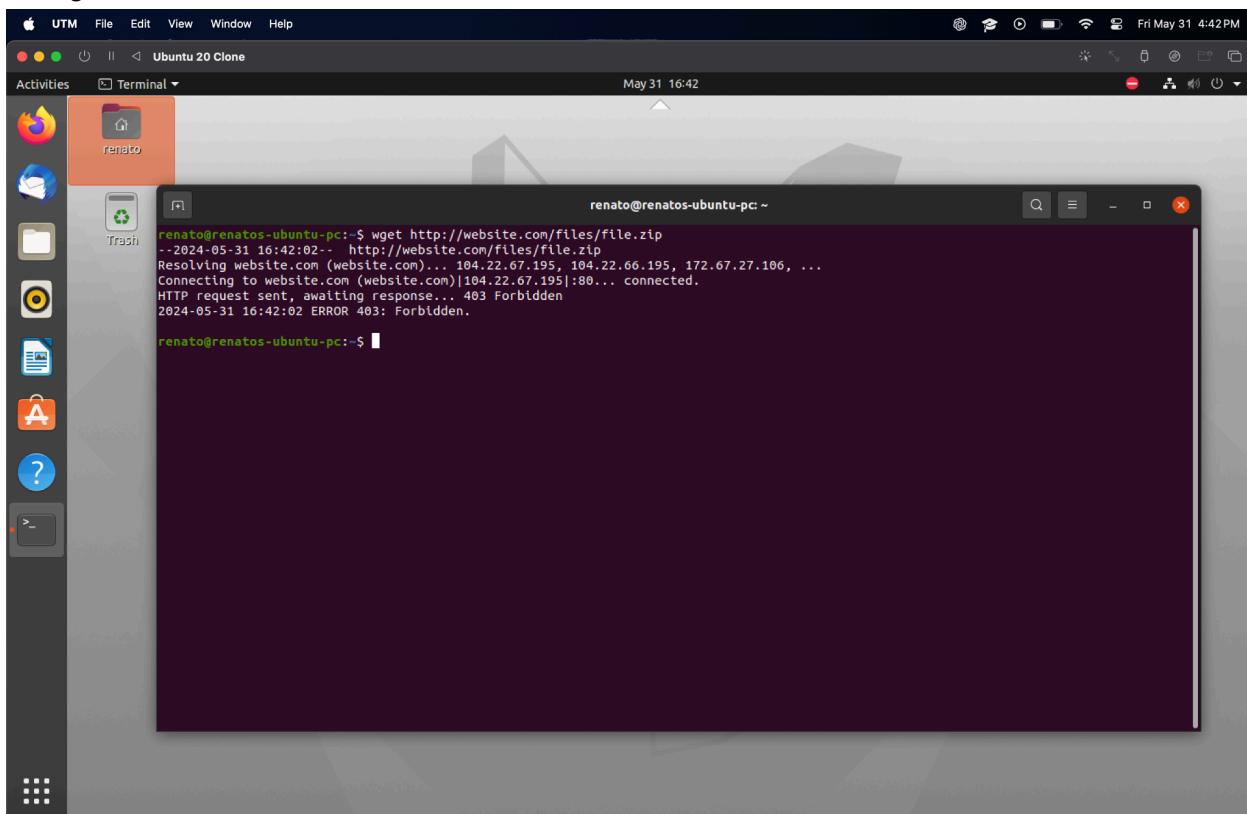
vv. date: Displays or sets the system date and time.



ww. time: Reports time consumed by program execution.



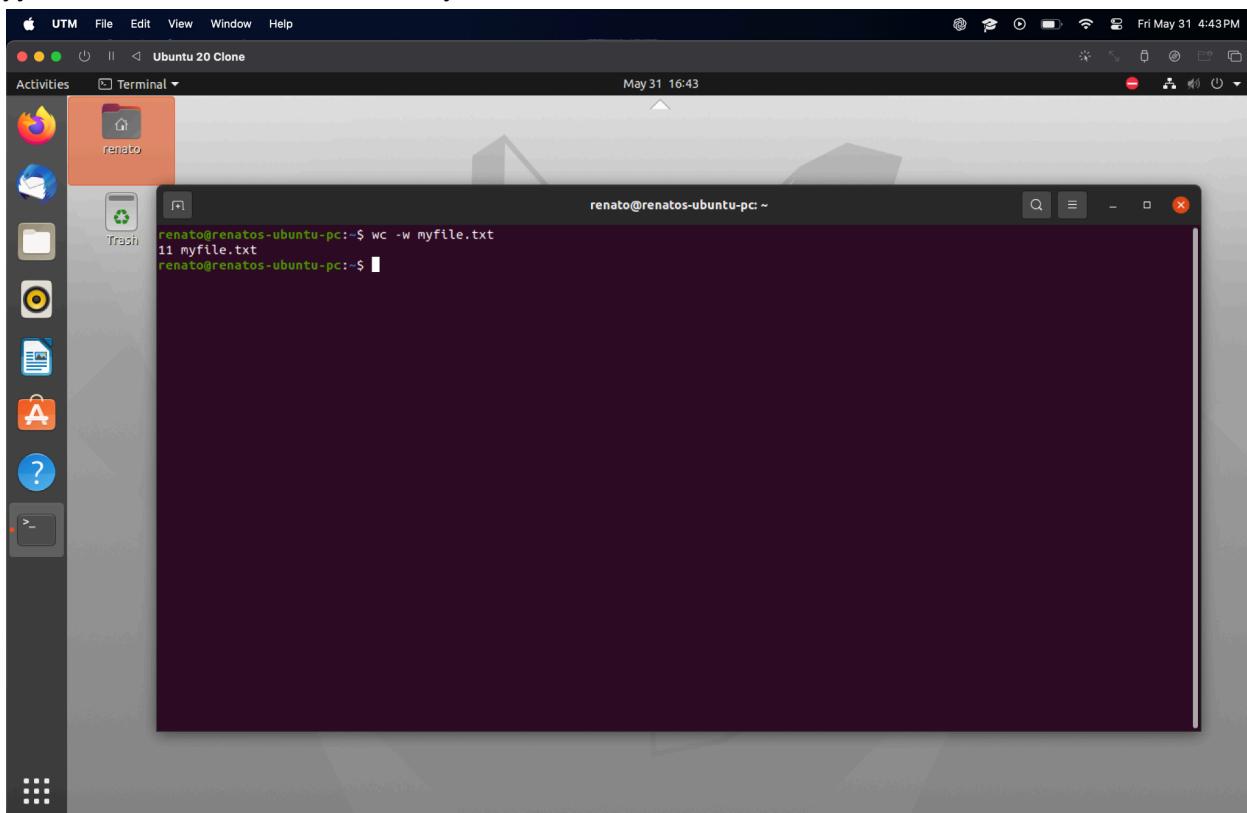
xx. wget: Retrieves files from the web.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "wget http://website.com/files/file.zip" being run. The output indicates a 403 Forbidden error. The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and Terminal. The date and time in the top right corner are Fri May 31 4:42PM.

```
renato@renatos-ubuntu-pc:~$ wget http://website.com/files/file.zip
--2024-05-31 16:42:02--  http://website.com/files/file.zip
Resolving website.com (website.com)... 104.22.67.195, 104.22.66.195, 172.67.27.106, ...
Connecting to website.com (website.com)|104.22.67.195|:80... connected.
HTTP request sent, awaiting response... 403 Forbidden
2024-05-31 16:42:02 ERROR 403: Forbidden.
```

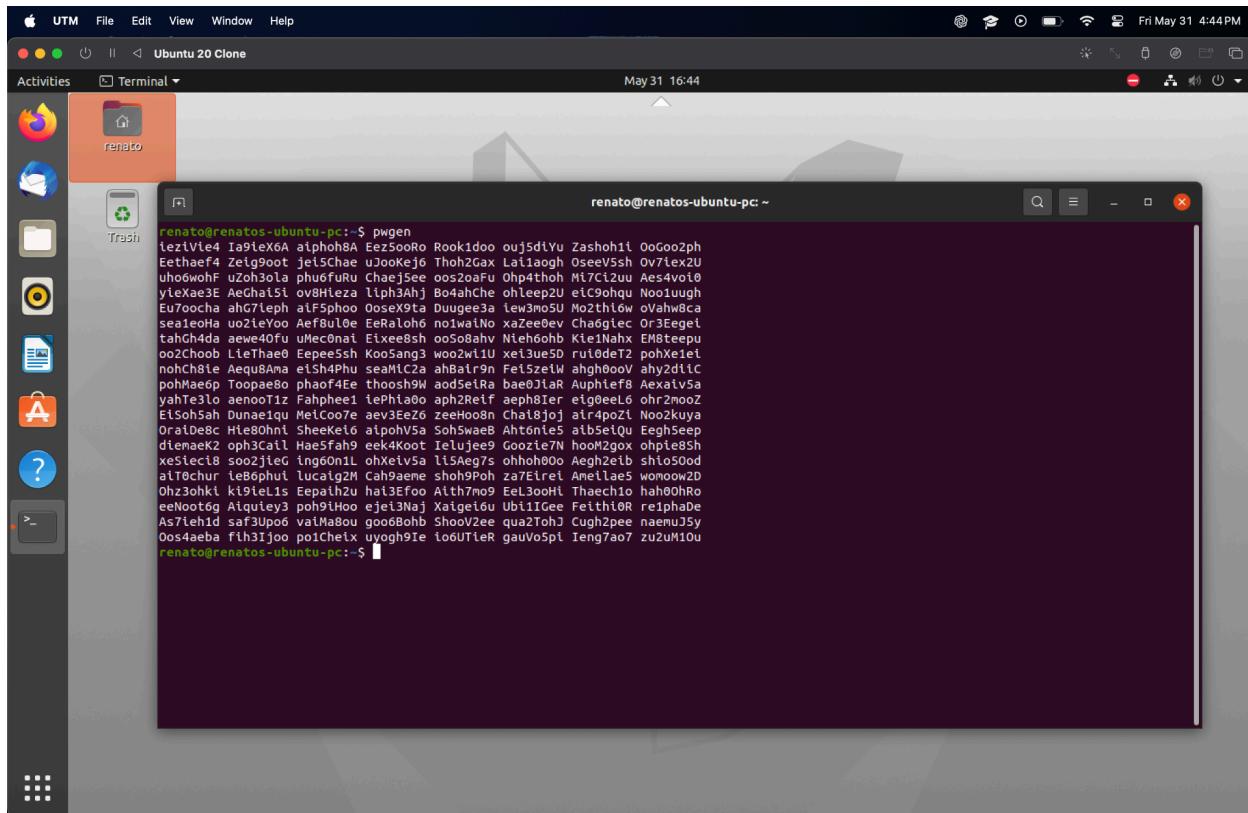
yy. wc: Counts lines, words, and bytes in files.



A screenshot of a Linux desktop environment. A terminal window titled "Terminal" is open, showing the command "wc -w myfile.txt" being run. The output shows the word count for the file "myfile.txt". The desktop interface includes a dock with icons for UTM, File, Edit, View, Window, Help, Activities, and Terminal. The date and time in the top right corner are Fri May 31 4:43PM.

```
renato@renatos-ubuntu-pc:~$ wc -w myfile.txt
11 myfile.txt
renato@renatos-ubuntu-pc:~$
```

zz. pwgen: Generates random, cryptographically secure passwords.



A screenshot of a Mac desktop environment. The desktop background is a dark grey with abstract white shapes. In the top right corner, there's a system tray with icons for battery, signal, and date/time (Fri May 31 4:44PM). The top menu bar is for "UTM" with options: File, Edit, View, Window, Help. Below the menu bar is a dock with several icons: UTM, File, Edit, View, Window, Help, Activities, Terminal, and a Home icon which is highlighted with an orange rectangle. The main window is a terminal window titled "renato@renatos-ubuntu-pc: ~". It shows the command "pwgen" being run, followed by a long string of randomly generated characters consisting of lowercase letters, numbers, and symbols. The terminal window has a standard OS X look with a title bar, scroll bar, and close/minimize buttons.

```
renato@renatos-ubuntu-pc:~$ pwgen
lezIVtLe4 Ia9lex6A aiphoh8A Eez5ooRo Rookidoou uj5dlyu Zashohil OoGoo2ph
EethaeF4 Zeig9oot je15chae uJookej6 Thoh2Gax Laiaoghs Oseevssh ov71ex2U
uhoo6whf uZoh3oIa phu6fuRu Chaej5ee oos2oafu Ohp4thoh M17Ci2uu Aes4avo0
yleXae3E AeGhai5i ov8Hleza liph3Ahj Bo4ahChe ohleep2U elC9ohqu Nooiuugh
Eu7oocha ahG7leph alf5phoo OoseX9ta Duugee3a lew3mo5u Mozthi6w oVahwca
sealeoHa uo2ieYoo Aef8ul0e EErAloh6 noiwalNo xaZeedev Chaogtec Or3Eegel
tanGN4da aeweo4ru uMecona Exxee8sh oo5obahv Nien6ohh Kte1Nahh EM8teepu
oo2choob LteThae0 Eepee5sh Koo5ang3 woo2wiU xei3ue5d ruitodeT2 pohxieel
nohCh8le AeQu8ana elsh4Phu seamC2a ahBa1rn Fei5zeW ahgh0oo0 ahyzdic
pohMaed6 ToopaeB0 phao4Fte thoshs9W aod5e1ra bae0Jla8 Auphitef8 Aexalv5a
yahTe3lo aenooTiz Fahpheee1 lePhiaod aph2Re1f aeph81er eigoeeL6 ohr2mooZ
EtSoh5ah Dunae1qu Me1Coo7e ave3eeZ6 zeeHoobN Chat8joj alr4pozl Noozkuya
OrainDe8c Hie80hni Sheekel6 aiphov5a SohSwaeB Aht6ne5 atbSelQn Eegh5eep
diemaeK2 op3Ca1l Haes5fahg eek4Kno1 Ielujee9 GoozieN hooh2zou obpie8Sh
xe5leci8 soos2j1ec ing60n1L ohxelv5a l15Aeg7s ohhohe00 Aegh2eib shio50od
aiTochur leB6phui lucalg2M Cah9aeme shon9Poh za7Eirei Amellae5 womoow2D
Ohz3ohok1 kt9te1is Eepathzu ha13Ef0o Alth7m09 EeL3ooMi Thaeclio had0Hro
eehNoot6 Aiguley3 poh9tHoo ejeliNaj Xaigelu UbiliGee Feithl0R reiphaDe
As7lehd saf3Upo6 valMa8ou goo6boh ShooVzee qua2TohJ Cugh2pee naemu5y
Oos4aeba fih3ijoo poiChlx uyogh9te lo6Utlre gauvo5pl Ieng7ao7 zuzuM1oU
renato@renatos-ubuntu-pc:~$
```

Virtual Machine Questions

1. In the system configuration of the VM, explain how changing the number of processors changes the behavior of your VM. Explain a scenario where you want to set this to the minimum, and a scenario where you want to set it to the maximum. Why is setting it to the maximum potentially a bad idea? **Changing the number of cores (processors) in the virtual machine can be compared to what more cores when building a computer will be. It will perform better since it can handle more processes at one time. If you were to set the cores to the absolute minimum, 1, then it could handle simple web surfing and lightweight applications, but if you were to set it to the max, say over 100, then it would be able to handle complex tasks such as heavy 3D modeling software. If you were to overdo it with the cores, then not only could you make the virtual machine slow, but you also risk making our own local machine very slow as well. It would have to take a super computer to do so.**
2. In the system configuration of the VM, under the Acceleration Tab, explain the difference between the paravirtualization options: None, Legacy, Minimal, HyperV, and KVM.

Explain which one would be best to use with Ubuntu Linux, and why. For the 'None' option, this means that the VM would use full hardware virtualization, meaning it could be slower overall. As for the 'Legacy' option, this is the basic approach for older OS's. For the 'Minimal' option, this is a tiny step up from 'None' in terms of performance. The 'HyperV' option is best for Windows users, and finally the 'KVM' option is best for Linux users. Since I am running Ubuntu 22 with Linux, 'KVM' would be the best option since it is already compatible and highly reliable and stable.

3. In storage devices when configuring the VM, there are multiple types of storage controllers: explain the difference between the IDE, SATA, and NVMe controller. Give an example for each type of storage controller of a scenario where you may want to use this type of controller. For the 'IDE' (Integrated Drive Electronics) controller, it is old & slow, but it is compatible with most older OS's that don't require high-speed storage. An example of this could be for Windows 95 (which hopefully you don't need to use anymore soon). On the other hand, 'SATA' (Serial ATA), is widely used because of its balance with speed and compatibility, and it is relatively standard for running Ubuntu and/or Windows and may help with everyday tasks. Finally, 'NVME' (Non-Volatile Memory Express) is the fastest out of all options, since it is designed for demanding applications such as databases, gaming, or pretty much anything that requires a lot of computing and performance.
4. In the network configuration of the VM, there are multiple types of network adapters: explain the difference between NAT, Bridged Adapter, Internal Network, and Host-only Network. Give an example for each type of network of a scenario where you may want to use this type of network. The 'NAT' (Network Address Translation) will share the host's IP address and keep the VM isolated from any other devices on the network, and an example of this is if the VM is casually browsing the internet, where network exposure isn't crucial. On the other hand, a 'Bridged Adapter' takes a further step by providing the VM with its own IP address, and an example of this could be in the case that you need the VM to act as a separate server to connect to. For the 'Internal Network', this would be the instance where an isolated virtual network is created among all other VMs, such as the simulation of a private network for testing. Finally, the 'Host-only' network is similar to the previous one, except it also allows communication among VMs as well as the local system you are running the VM from (so it is one extra step). This is useful for when you need a VM running a database that can be accessed by your local machine as well.
5. For the USB configuration of the VM, explain the difference between USB 1.1, 2.0, and 3.0 controllers. This one is rather straightforward as the same physical hardware rules apply to the VM options. USB 1.1 is the oldest & slowest port that really only would be useful for mice, keyboard, and maybe webcams. USB 2.0 steps it up with the addition of hard drives, flash drives, and printers. Whereas, USB 3.0 is a big jump in performance and now allows external SSDs and high resolution capturing and video devices.