

Q2

a. ssh - Connect to a remove host using the ssh protocol

File Machine View Input Devices Help

Activities Terminal Tue 17:16

justin@justin-VirtualBox: ~

File Edit View Search Terminal Help

justin@justin-VirtualBox2:~\$ ssh 10.0.2.4

Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.15.0-58-generic x86_64)

* Documentation: <https://help.ubuntu.com>
* Management: <https://landscape.canonical.com>
* Support: <https://ubuntu.com/advantage>

0 packages can be updated.
0 updates are security updates.

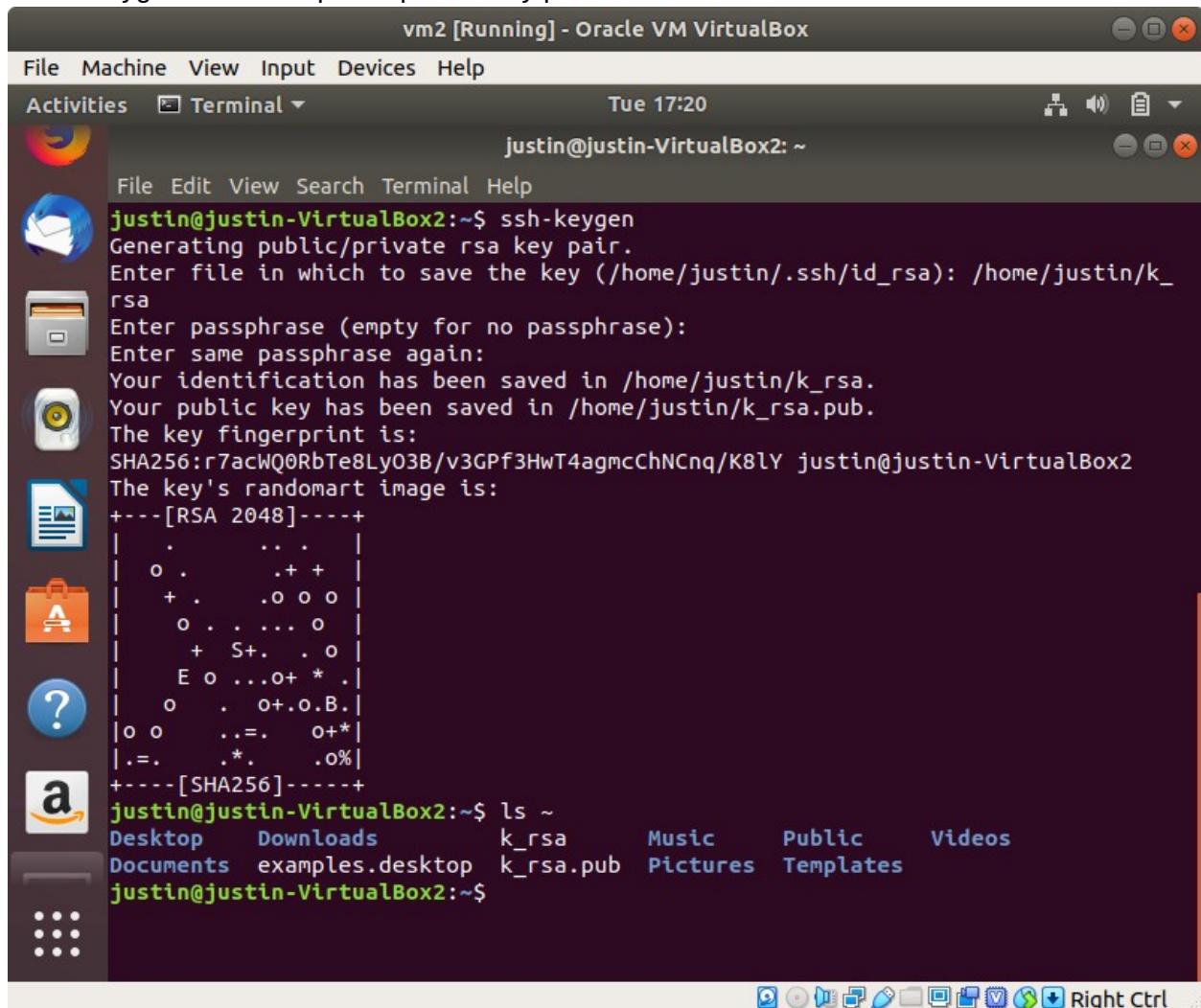
Failed to connect to <https://changelogs.ubuntu.com/meta-release-lts>. Check your Internet connection or proxy settings

Last login: Tue Aug 27 17:01:32 2019 from 10.0.2.5
justin@justin-VirtualBox:~\$

Right Ctrl

t

b. ssh-keygen - create a public-private key pair for ssh authentication



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal session is as follows:

```
justin@justin-VirtualBox2:~$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/justin/.ssh/id_rsa): /home/justin/k_
rsa
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/justin/k_rsa.
Your public key has been saved in /home/justin/k_rsa.pub.
The key fingerprint is:
SHA256:r7acWQ0RbTe8Ly03B/v3GPf3HwT4agmcChNCnq/K8lY justin@justin-VirtualBox2
The key's randomart image is:
+---[RSA 2048]---+
| .   ... |
| o .   .+ + |
| + .   .o o o |
| o . . . . o |
| + S+.. . o |
| E o ...o+ * .|
| o   . o+.o.B.|
| o o   ... o+* |
| ..=.. *. .0% |
+---[SHA256]---+
justin@justin-VirtualBox2:~$ ls ~
Desktop  Downloads  k_rsa      Music      Public    Videos
Documents examples.desktop k_rsa.pub  Pictures  Templates
justin@justin-VirtualBox2:~$
```

c. scp - copy files from remote to local, and vice versa

```
vm2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 17:22
justin@justin-VirtualBox: ~
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~$ echo "from vm2" > note.txt
justin@justin-VirtualBox2:~$ cat note.txt
from vm2
justin@justin-VirtualBox2:~$ scp /home/justin/note.txt justin@10.0.2.4:note.txt
note.txt                                100%    9      5.1KB/s   00:00
justin@justin-VirtualBox2:~$ ssh justin@10.0.2.4
Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.15.0-58-generic x86_64)

 * Documentation: https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

0 packages can be updated.
0 updates are security updates.

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Last login: Tue Aug 27 17:16:20 2019 from 10.0.2.5
justin@justin-VirtualBox:~$ ls
Desktop  Downloads  id_rsa.pub  note.txt  Public  Videos
Documents examples.desktop  Music  Pictures  Templates
justin@justin-VirtualBox:~$ cat note.txt
from vm2
justin@justin-VirtualBox:~$
```

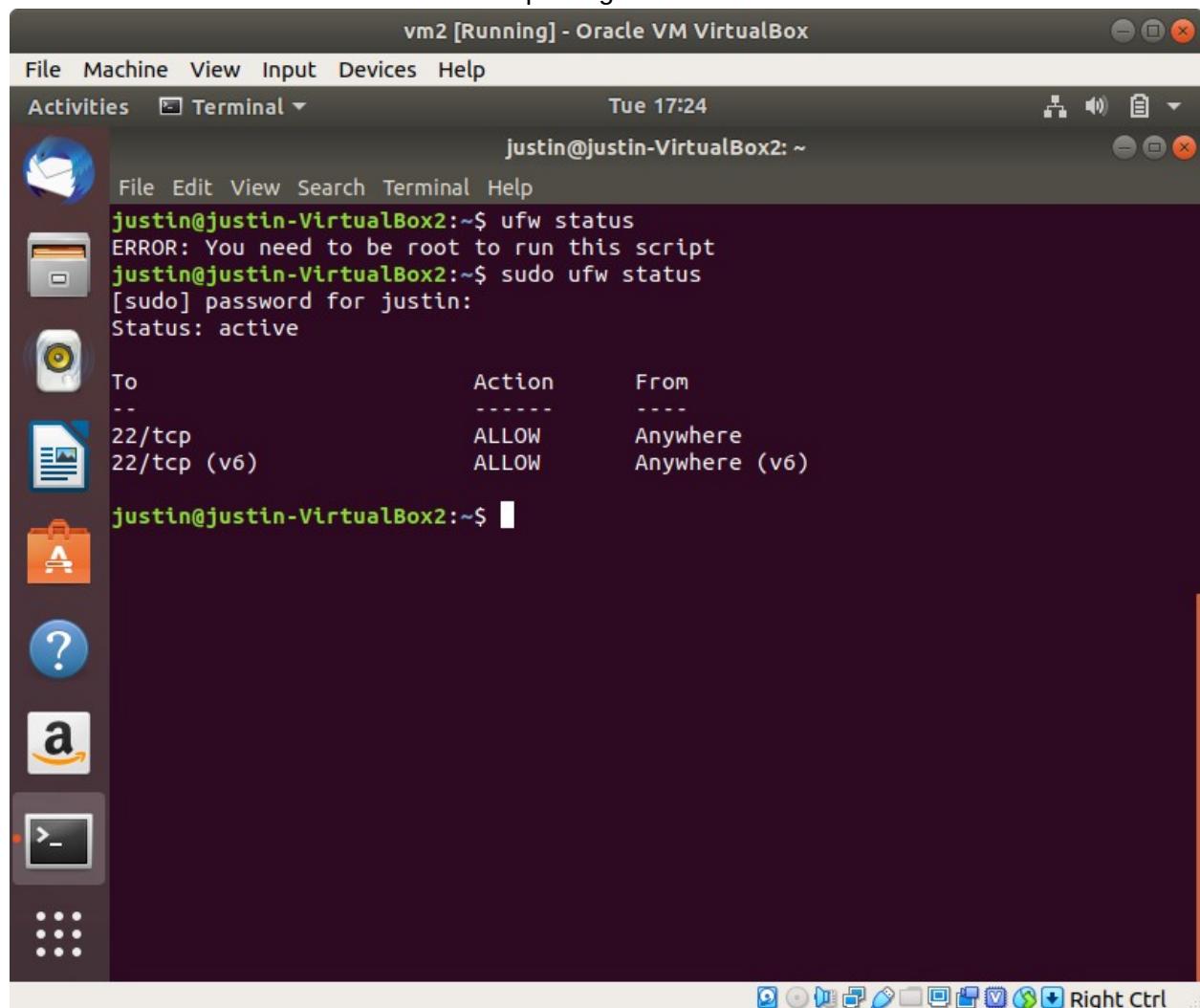
d. history - display previously inputted commands

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal window shows a command-line session with the following history:

```
148 clear
149 ssh-keygen
150 clear
151 ssh-keygen
152 clear
153 ssh-keygen
154 ls -l ~/
155 clear
156 ssh-keygen
157 clear
158 rm ~/id_rsa
159 rm ~/id_rsa.pub
160 clear
161 ssh-keygen
162 clear
163 ssh-keygen
164 ls ~
165 clear
166 Help rm k_rsa*
167 ls
168 clear
169 echo "from vm2" > note.txt
170 cat note.txt
171 scp /home/justin/note.txt justin@10.0.2.4:note.txt
172 ssh justin@10.0.2.4
173 clear
174 history
```

The terminal prompt is "justin@justin-VirtualBox2:~\$". The desktop environment includes a dock with various icons and a system tray at the bottom.

e. sudo - Execute commands at elevated privilege user

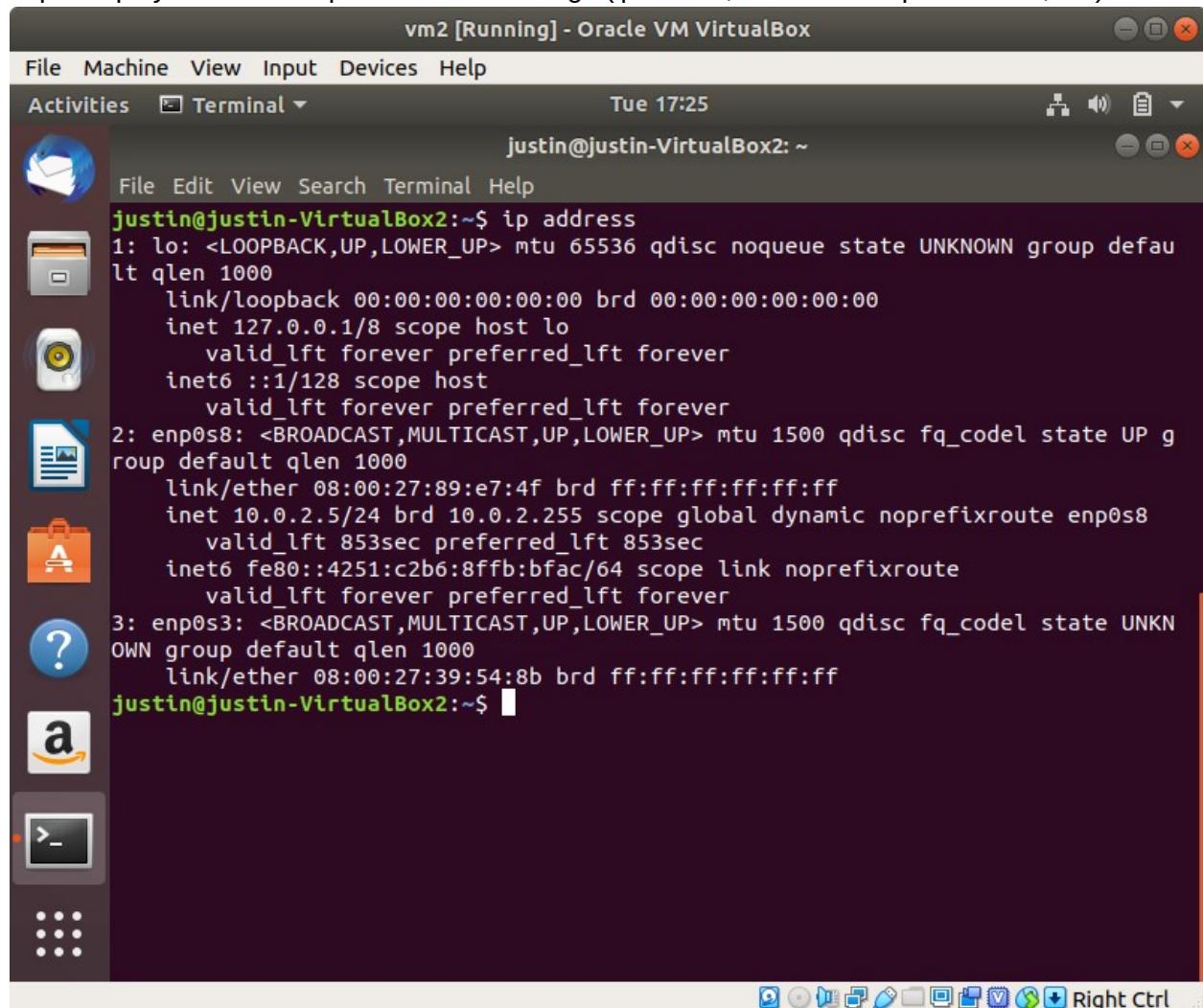


```
File Machine View Input Devices Help
Activities Terminal Tue 17:24
justin@justin-VirtualBox2: ~
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~$ ufw status
ERROR: You need to be root to run this script
justin@justin-VirtualBox2:~$ sudo ufw status
[sudo] password for justin:
Status: active

To                         Action      From
--                         --          --
22/tcp                      ALLOW      Anywhere
22/tcp (v6)                 ALLOW      Anywhere (v6)

justin@justin-VirtualBox2:~$
```

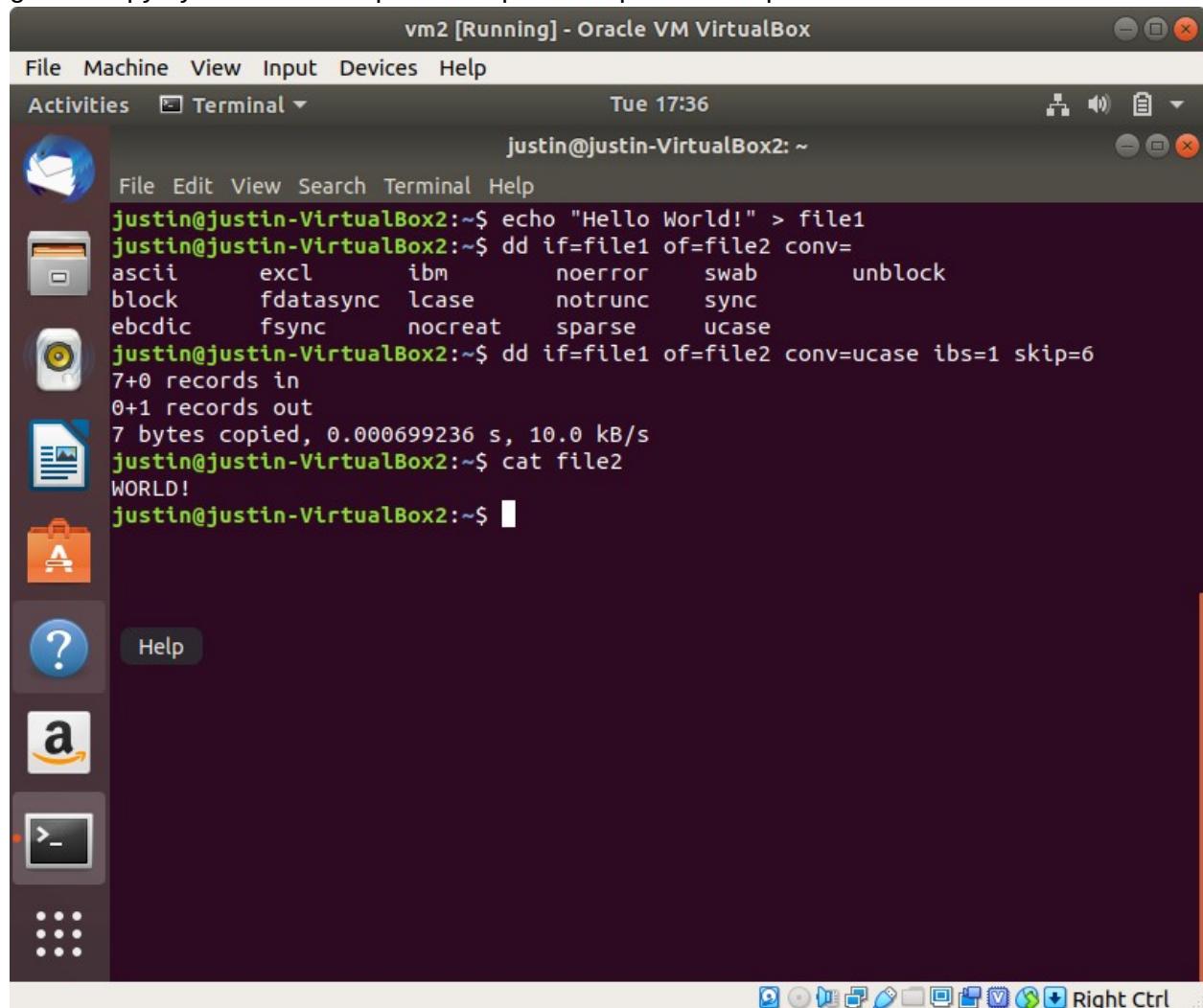
f. ip - display network adapter interface settings (ip masks, addresses - ip and MAC, etc)



The image shows a screenshot of an Ubuntu desktop environment running inside Oracle VM VirtualBox. The terminal window is titled "vm2 [Running] - Oracle VM VirtualBox". The terminal session shows the command "ip address" being run, displaying network interface configurations for "lo", "enp0s8", and "enp0s3".

```
justin@justin-VirtualBox2:~$ ip address
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: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:89:e7:4f brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.5/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s8
        valid_lft 853sec preferred_lft 853sec
    inet6 fe80::4251:c2b6:8ffb:bfac/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 08:00:27:39:54:8b brd ff:ff:ff:ff:ff:ff
justin@justin-VirtualBox2:~$
```

g. dd - copy bytes files from specified input to output. Shows performance.



The screenshot shows a Linux desktop environment with a terminal window open in a window titled "vm2 [Running] - Oracle VM VirtualBox". The terminal window has a dark background and displays the following command-line session:

```
justin@justin-VirtualBox2:~$ echo "Hello World!" > file1
justin@justin-VirtualBox2:~$ dd if=file1 of=file2 conv=
    ascii    excl    ibm    noerror    swab    unblock
    block    fdatasync    lcase    notrunc    sync
    ebdic    fsync    nocreat    sparse    ucase
justin@justin-VirtualBox2:~$ dd if=file1 of=file2 conv=ucase ibs=1 skip=6
7+0 records in
0+1 records out
7 bytes copied, 0.000699236 s, 10.0 kB/s
justin@justin-VirtualBox2:~$ cat file2
WORLD!
justin@justin-VirtualBox2:~$
```

The terminal window includes a menu bar with File, Machine, View, Input, Devices, Help, and Activities. The Activities button is highlighted. The status bar shows the date and time as "Tue 17:36". The desktop interface features a dock on the left with icons for Mail, Files, Terminal, Help, Amazon, and a terminal icon. A toolbar at the bottom contains icons for various applications like a browser, file manager, and system tools. The desktop background is a solid dark color.

h. fdisk - Manage the partition of a disk device

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal session starts with the command `justin@justin-VirtualBox2:~$ sudo fdisk /dev/sda`. The output of the fdisk command is as follows:

```
Welcome to fdisk (util-linux 2.31.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

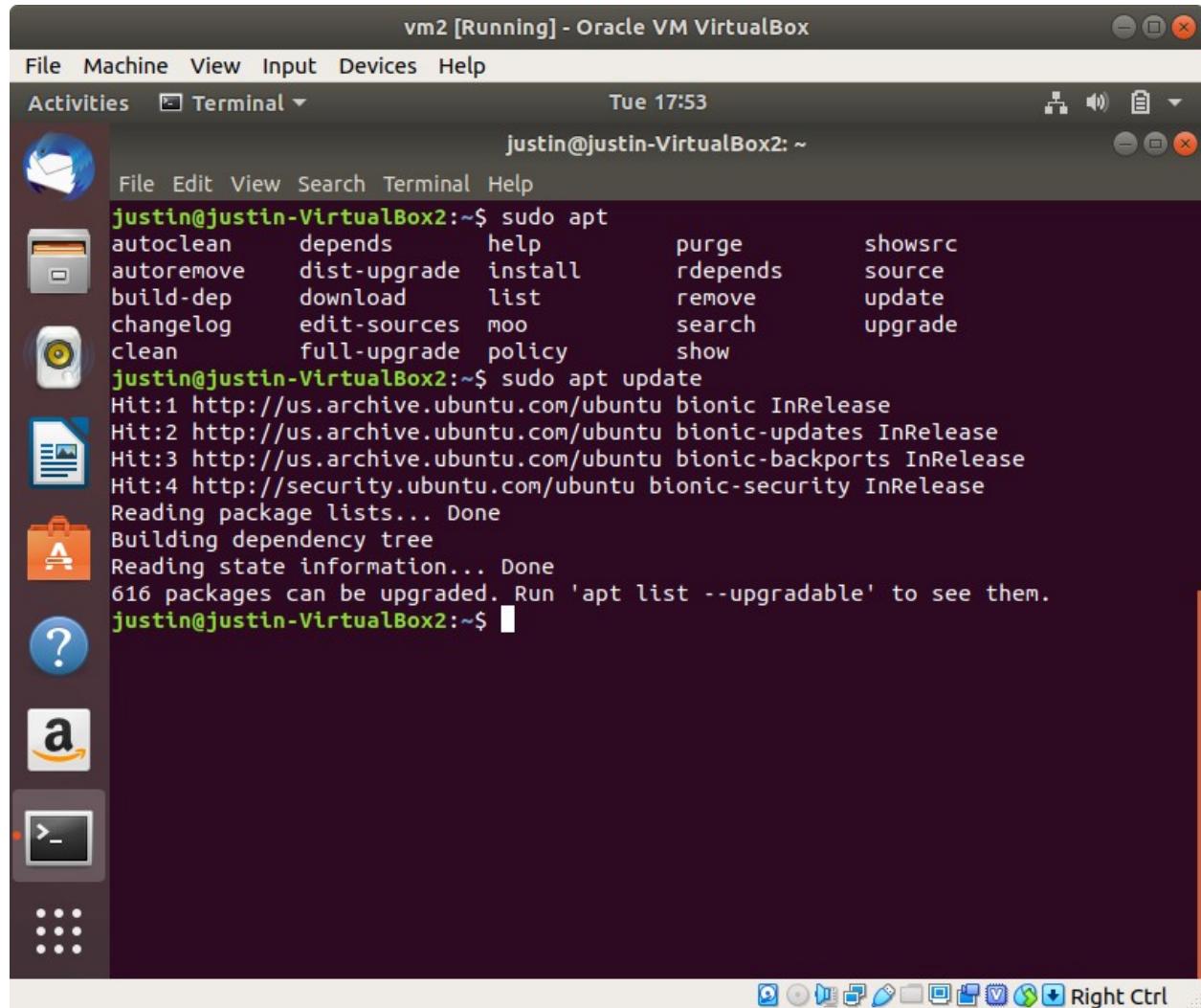
Command (m for help): p
Disk /dev/sda: 25 GiB, 26843545600 bytes, 52428800 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x935b26e1

Device      Boot Start      End  Sectors Size Id Type
/dev/sda1    *     2048 52426751 52424704 25G 83 Linux

Command (m for help): q
```

The terminal window is part of the Unity interface, with a docked application menu on the left containing icons for Mail, Files, Dash, Activities, Terminal, Home, Help, and a search bar.

i. apt - the command line interface for the package manager in ubuntu. Use to install and remove packages.



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal content shows the user running apt commands:

```
justin@justin-VirtualBox2:~$ sudo apt
auto-clean depends help purge showsrc
autoremove dist-upgrade install rdepends source
build-dep download list remove update
changelog edit-sources moo search upgrade
clean full-upgrade policy show
justin@justin-VirtualBox2:~$ sudo apt update
Hit:1 http://us.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://us.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu bionic-security InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
616 packages can be upgraded. Run 'apt list --upgradable' to see them.
justin@justin-VirtualBox2:~$
```

The desktop environment includes a dock with various icons (file manager, terminal, browser, etc.) and a system tray at the bottom.

j. vi - lightweight text editor

The screenshot shows a Linux desktop environment with a dark theme. At the top is a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu bar is a header bar with "Activities", "Terminal", the date "Tue 17:58", and the user "justin@justin-VirtualBox2: ~". The main window is a terminal window titled "File Edit View Search Terminal Help". Inside the terminal, the following Python code is running:

```
from vm2
hello world!
```

The terminal window has a scrollback history with several entries starting with a tilde (~). At the bottom of the terminal window, there is a command prompt with the text ":wq".

The screenshot shows a Linux desktop environment within a virtual machine. The desktop is a dark blue color. On the left, there's a vertical dock with several icons: a mail icon, a folder icon, a system tray icon, a file icon, a folder with an 'A' icon, a question mark icon, an 'a' icon, and a terminal icon. The main window title is "vm2 [Running] - Oracle VM VirtualBox". The menu bar includes "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu is a "Activities" button and a "Terminal" dropdown. The date and time "Tue 17:59" are displayed. The terminal window has a title "justin@justin-VirtualBox2: ~" and a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". It shows the command "vi note.txt" run, followed by "cat note.txt" and its output "from vm2" and "hello world!". The bottom of the screen features a dock with various application icons.

k. time - show the execution time of a program

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, displaying the following command-line session:

```
justin@justin-VirtualBox2:~$ cat hello.py
#!/usr/bin/env python3

print('hello world!')
justin@justin-VirtualBox2:~$ chmod a+x hello.py
justin@justin-VirtualBox2:~$ ls -l hello.py
-rwxr-xr-x 1 justin justin 46 Aug 27 18:03 hello.py
justin@justin-VirtualBox2:~$ time ./hello.py
hello world!

real    0m0.056s
user    0m0.046s
sys     0m0.009s
justin@justin-VirtualBox2:~$
```

The desktop interface includes a docked application menu on the left with icons for Mail, Files, Terminal, Help, and others. A "Show Applications" button is visible at the bottom of the dock. The bottom bar features a row of icons for various system functions like network, file manager, and system settings.

I. tar - archive and compress files and directories, and also extracts created archives

```
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~$ ls dir1
file1 file2 hello.py note.txt
justin@justin-VirtualBox2:~$ tar cf archive1.tar dir1
justin@justin-VirtualBox2:~$ ls
archive1.tar dir1 Downloads Music Public Videos
Desktop Documents examples.desktop Pictures Templates
justin@justin-VirtualBox2:~$ rm -r dir1
justin@justin-VirtualBox2:~$ ls
archive1.tar Documents examples.desktop Pictures Templates
Desktop Downloads Music Public Videos
justin@justin-VirtualBox2:~$ tar xf archive1.tar
justin@justin-VirtualBox2:~$ ls
archive1.tar dir1 Downloads Music Public Videos
Desktop Documents examples.desktop Pictures Templates
justin@justin-VirtualBox2:~$
```

m. cat - print contents of file to standard output

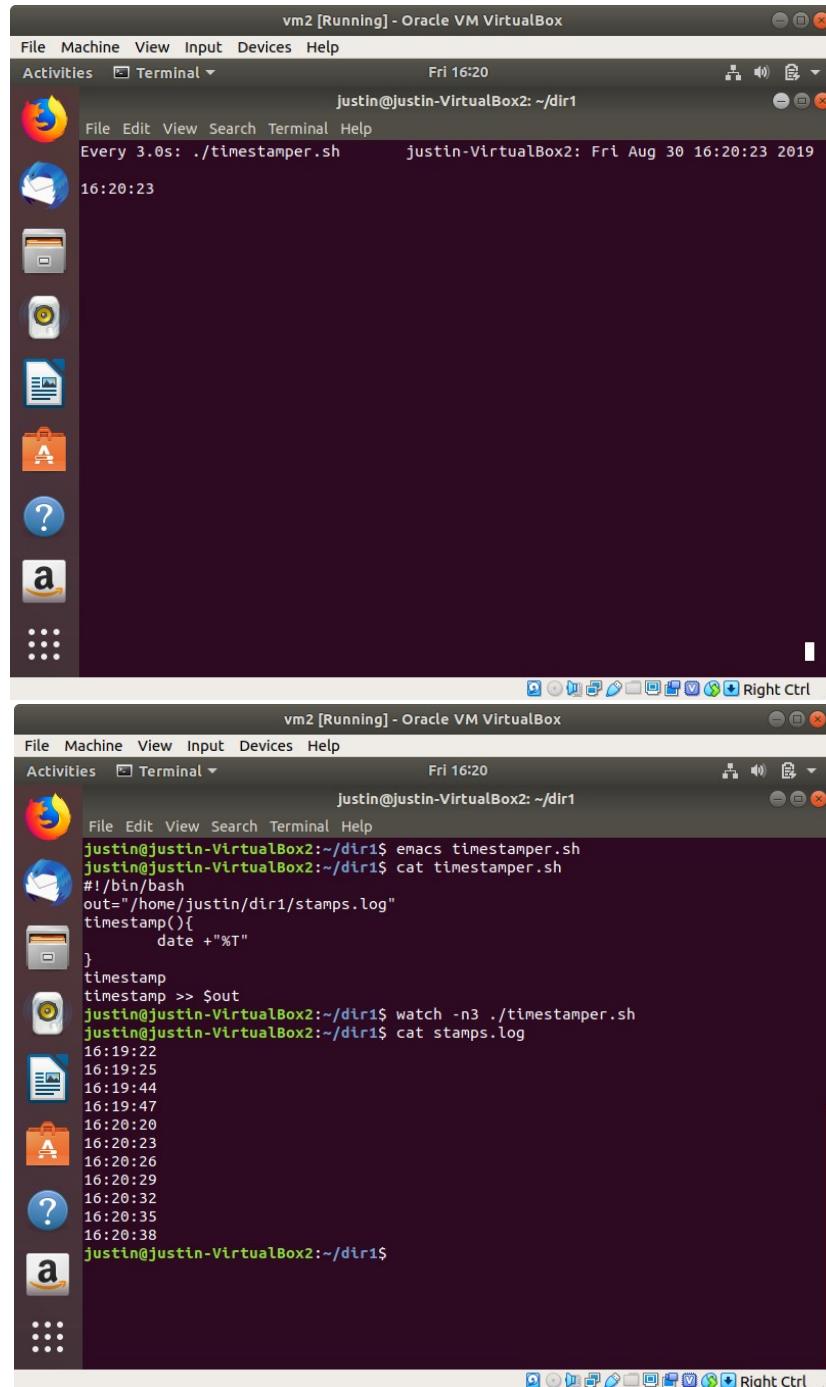
The screenshot shows a Linux desktop environment with a terminal window open in a virtual machine named "vm2 [Running]". The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The desktop interface includes a docked panel on the left containing icons for various applications like Mail, Files, Terminal, Activities, Dash, Help, and a search bar. The terminal window displays the following command-line session:

```
justin@justin-VirtualBox2:~$ cat ~/dir1/
file1    file2    hello.py  note.txt
justin@justin-VirtualBox2:~$ cat ~/dir1/
file1    file2    hello.py  note.txt
justin@justin-VirtualBox2:~$ cat ~/dir1/
file1    file2    hello.py  note.txt
justin@justin-VirtualBox2:~$ cat ~/dir1/hello.py
#!/usr/bin/env python3

print('hello world!')
justin@justin-VirtualBox2:~$
```

The terminal window also shows the date and time as "Tue 18:15" and the user as "justin@justin-VirtualBox2: ~". The desktop interface has a dark theme with orange and grey accents.

n. watch - periodically execute a command in the shell, while displaying the output on every execution.

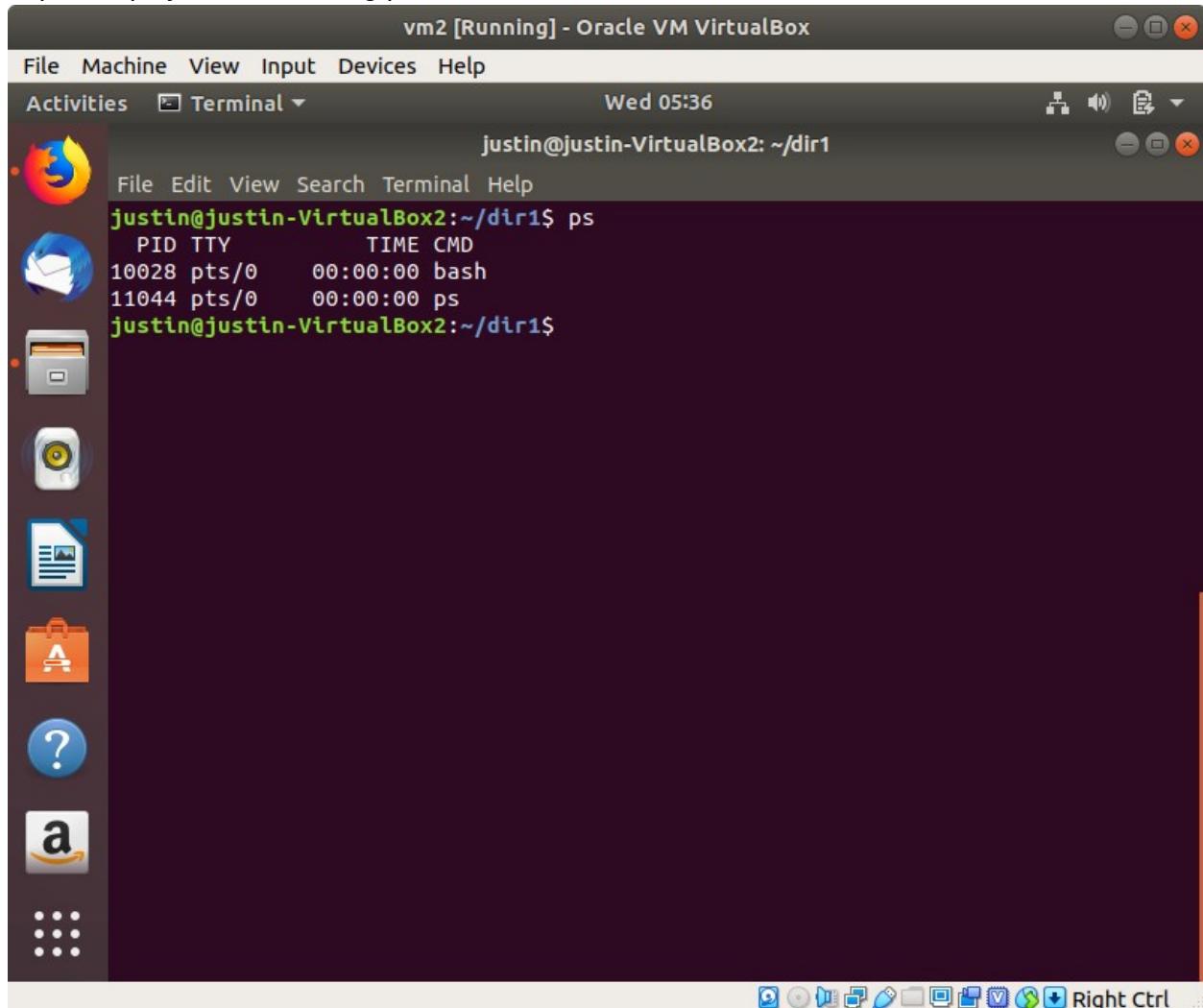


The image shows a Linux desktop environment with two terminal windows running on an Oracle VM VirtualBox machine. The desktop has a dark theme with a vertical dock on the left containing icons for various applications like a browser, file manager, terminal, and system settings. The top window is titled "vm2 [Running] - Oracle VM VirtualBox" and shows the command "Every 3.0s: ./timestamper.sh" being run in a terminal window. The output shows the current date and time (Fri Aug 30 16:20:23 2019) followed by the timestamp from the script. The bottom window is also titled "vm2 [Running] - Oracle VM VirtualBox" and shows the user navigating to a directory (~/.dir1), running "emacs timestamper.sh" to edit the script, and then running "watch -n3 ./timestamper.sh" to start the periodic execution. The output of the watch command shows the timestamp from the script being printed every 3 seconds, starting from 16:19:22 and continuing up to 16:20:38.

```
Every 3.0s: ./timestamper.sh      justin@justin-VirtualBox2: Fri Aug 30 16:20:23 2019
16:20:23

justin@justin-VirtualBox2:~/dir1$ emacs timestamper.sh
justin@justin-VirtualBox2:~/dir1$ cat timestamper.sh
#!/bin/bash
out="/home/justin/dir1/stamps.log"
timestamp(){
    date +"%T"
}
timestamp
timestamp >> $out
justin@justin-VirtualBox2:~/dir1$ watch -n3 ./timestamper.sh
justin@justin-VirtualBox2:~/dir1$ cat stamps.log
16:19:22
16:19:25
16:19:44
16:19:47
16:20:20
16:20:23
16:20:26
16:20:29
16:20:32
16:20:35
16:20:38
justin@justin-VirtualBox2:~/dir1$
```

o. ps - display current running processes



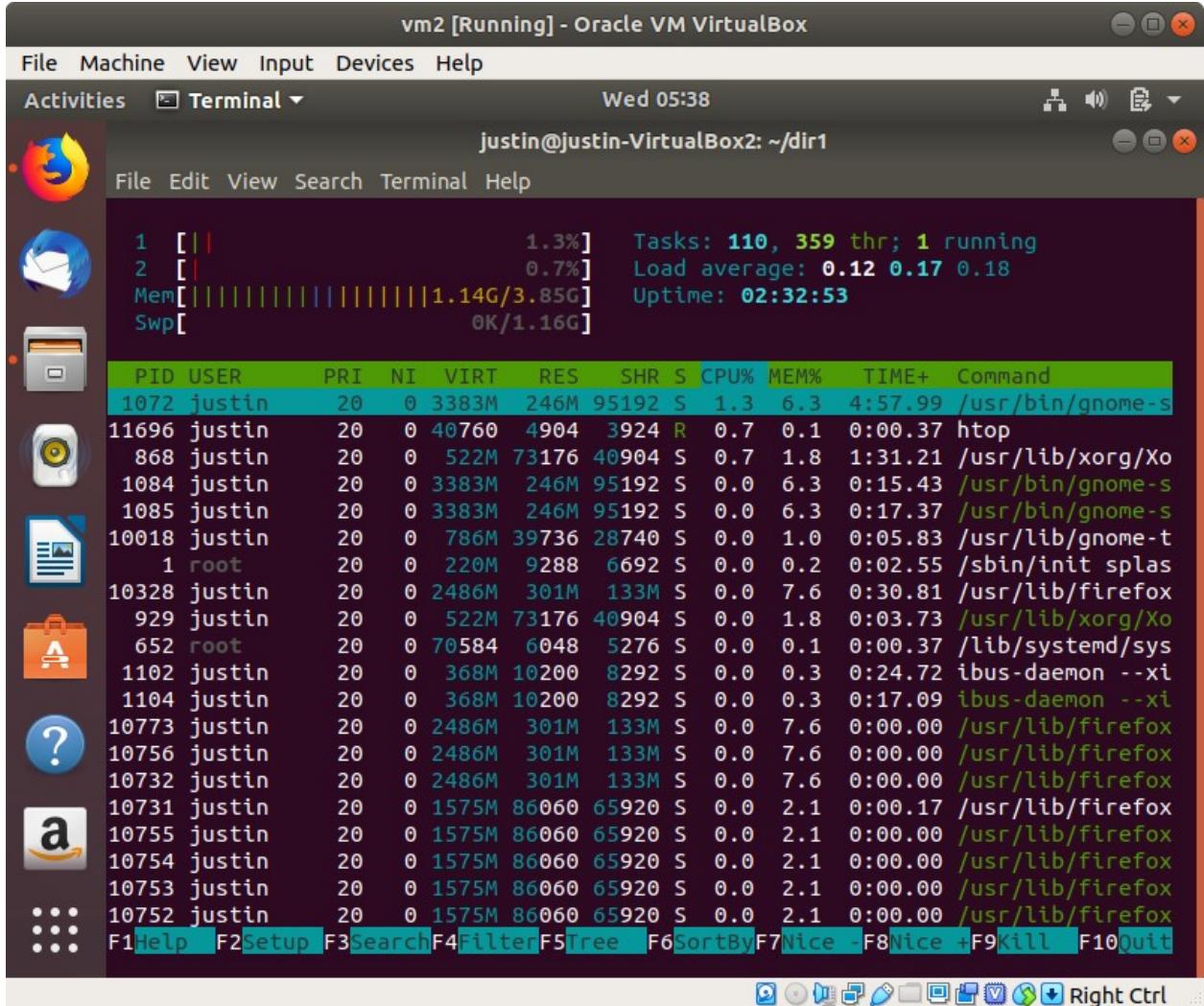
p. top - Display all running linux processes, dynamically

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal command "top" is running, displaying system statistics and a list of processes. The desktop interface includes a dock at the bottom with various icons.

```
justin@justin-VirtualBox2: ~/dir1
top - 05:37:00 up 2:31, 1 user, load average: 0.09, 0.17, 0.18
Tasks: 178 total, 1 running, 141 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1.7 us, 0.2 sy, 0.0 ni, 98.0 id, 0.0 hi, 0.2 si, 0.0 st
KiB Mem : 4039564 total, 694724 free, 1168660 used, 2176180 buff/cache
KiB Swap: 1214880 total, 1214880 free, 0 used. 2747400 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1072 justin 20 0 3454420 252196 95192 S 3.0 6.2 4:54.45 gnome-she+
11048 justin 20 0 51188 4040 3408 R 1.0 0.1 0:00.05 top
868 justin 20 0 534804 73176 40904 S 0.3 1.8 1:30.32 Xorg
5416 root 20 0 0 0 0 I 0.3 0.0 0:03.25 kworker/0+
10328 justin 20 0 2546268 308832 136360 S 0.3 7.6 0:30.66 firefox
1 root 20 0 225536 9288 6692 S 0.0 0.2 0:02.54 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
4 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/0+
6 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 mm_percpu+
7 root 20 0 0 0 0 S 0.0 0.0 0:00.48 ksoftirqd+
8 root 20 0 0 0 0 I 0.0 0.0 0:02.04 rcu_sched
9 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_bh
10 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration+
11 root rt 0 0 0 0 S 0.0 0.0 0:00.06 watchdog/0
12 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
13 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/1
14 root rt 0 0 0 0 S 0.0 0.0 0:00.05 watchdog/1
15 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration+
16 root 20 0 0 0 0 S 0.0 0.0 0:00.37 ksoftirqd+
18 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/1+
19 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kdevtmpfs
```

q. htop - A “prettier” top, with more functionalities (e.g. select multiple processes at once)



r. gcc - GNU C compiler

vm2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal ▾

Wed 05:43

justin@justin-VirtualBox2: ~/dir1

File Edit View Search Terminal Help

```
justin@justin-VirtualBox2:~/dir1$ cat hello.c
#include <stdio.h>
int main(){
    printf("Hello World!\n");
    return 0;
}

justin@justin-VirtualBox2:~/dir1$ gcc -Wall -o hello hello.c
justin@justin-VirtualBox2:~/dir1$ ./hello
Hello World!
justin@justin-VirtualBox2:~/dir1$
```

The screenshot shows a Linux desktop environment, likely Ubuntu, running inside a VirtualBox virtual machine. The desktop has a dark theme with a dock at the bottom containing icons for various applications like Dash, Home, Applications, Help, and Amazon. A terminal window is open in the center, showing the command-line process of creating a 'hello.c' file, compiling it with 'gcc', and running the resulting executable, all producing the expected 'Hello World!' output. The system tray at the bottom includes icons for network, battery, and system status.

s. tail - print the last lines of a file to stdout

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm1 [Running] - Oracle VM VirtualBox" is open, displaying the command "tail happy_free_market_log.txt". The terminal output includes:

```
justin@justin-VirtualBox:~$ tail happy_free_market_log.txt
thankyoucomeagain
Timestamp 17675901
  Files
A purchase! COIN ALGORITHM FAILED This is not purchase. This is another forged
Neocredit trick.

The hot summer sun
Sears hunger into your throat;
Eat a bag of dirt.
justin@justin-VirtualBox:~$
```

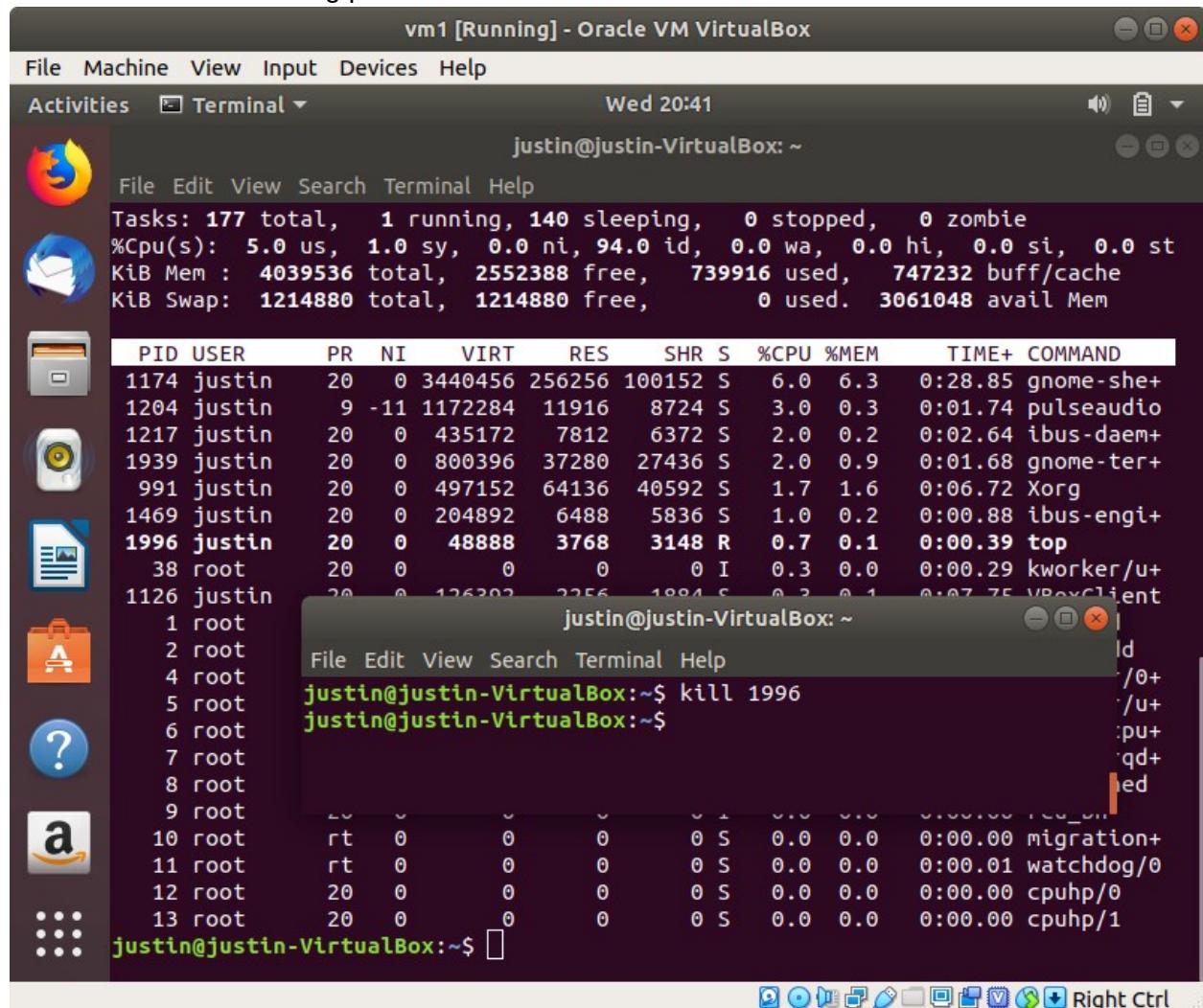
The desktop interface features a dock at the bottom with various icons, including a file manager, a browser, and system tools. A vertical dock on the left contains icons for a file browser, terminal, applications, help, and a search function.

t. grep - a text filter program that finds matches from input files using regex.

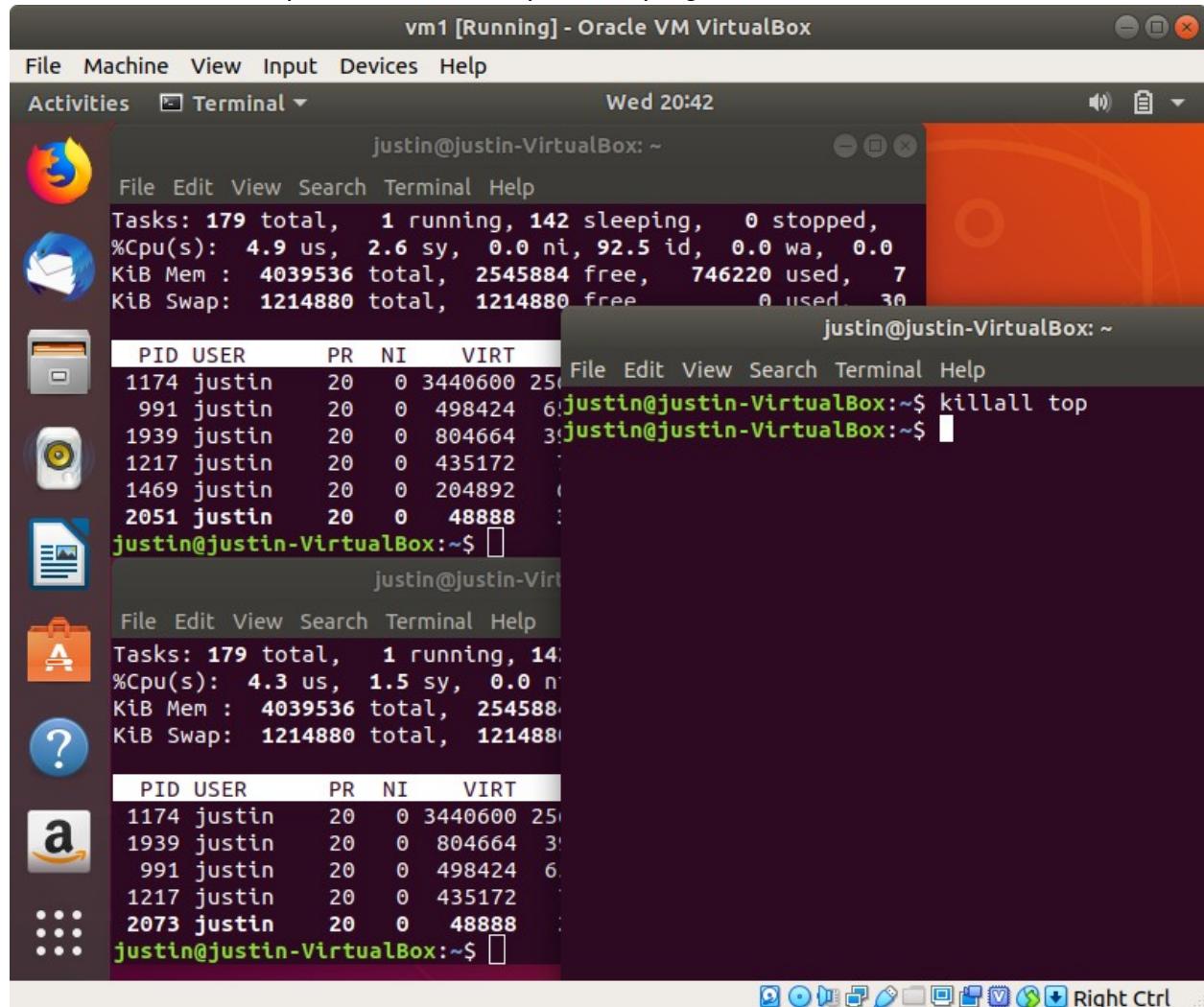
The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm1 [Running] - Oracle VM VirtualBox" is open, displaying the output of a grep command. The terminal window includes a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu is an "Activities" button and a "Terminal" button. The status bar shows the date and time as "Wed 20:37" and the user as "justin@justin-VirtualBox: ~". The terminal itself has a scrollback buffer containing multiple lines of timestamped log entries. The desktop background features a grid of application icons on the left side of the screen.

```
justin@justin-VirtualBox:~$ cat happy_free_market_log.txt | grep '[tT]imestamp'
Timestamp 17643390
Timestamp 17646520
Timestamp 17648990
Timestamp 17649001
Timestamp 17649136
Timestamp 17649259
Timestamp 17649385
Timestamp 17649511
Timestamp 17649639
Timestamp 17656901
Timestamp 17657230
Timestamp 17659861
Timestamp 17659873
Timestamp 17659999
Timestamp 17675799
Timestamp 17675901
justin@justin-VirtualBox:~$
```

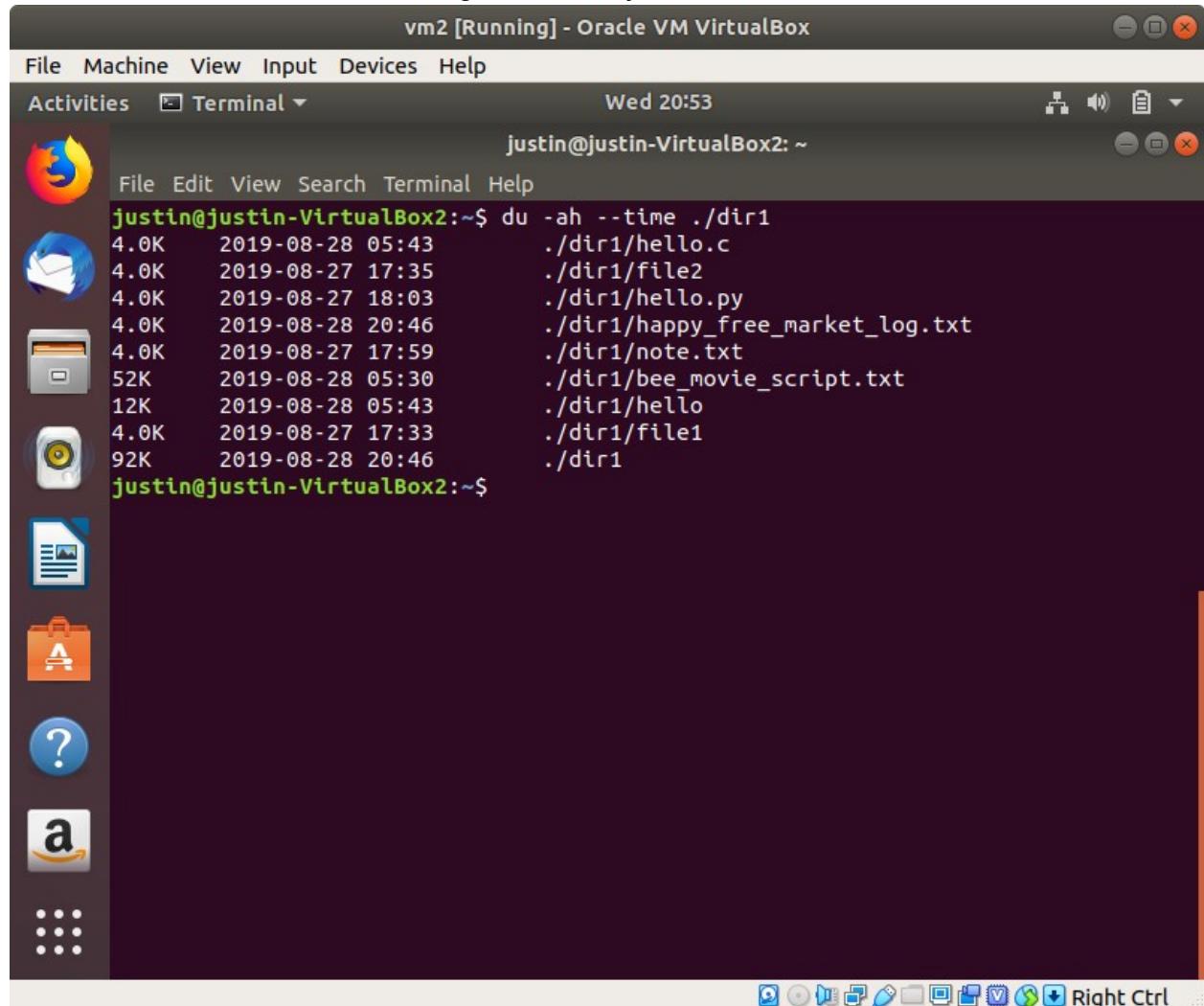
u. kill - terminate a running process



v. killall - terminate all processes with the provided program name



w. du - Estimate the file sizes in the given directory



The image shows a screenshot of an Ubuntu desktop environment running inside Oracle VM VirtualBox. The terminal window is titled "vm2 [Running] - Oracle VM VirtualBox". The terminal session shows the command "du -ah --time ./dir1" being run, listing file sizes and modification times for files in the directory "dir1". The desktop interface includes a dock with icons for various applications like Firefox, Mail, and Files.

```
justin@justin-VirtualBox2:~$ du -ah --time ./dir1
4.0K    2019-08-28 05:43      ./dir1/hello.c
4.0K    2019-08-27 17:35      ./dir1/file2
4.0K    2019-08-27 18:03      ./dir1/hello.py
4.0K    2019-08-28 20:46      ./dir1/happy_free_market_log.txt
4.0K    2019-08-27 17:59      ./dir1/note.txt
52K    2019-08-28 05:30      ./dir1/bee_movie_script.txt
12K    2019-08-28 05:43      ./dir1/hello
4.0K    2019-08-27 17:33      ./dir1/file1
92K    2019-08-28 20:46      ./dir1
justin@justin-VirtualBox2:~$
```

x. df - Display the filesystem usage and disk availability

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal content displays the output of the "df -h" command, showing disk usage statistics. The desktop background is dark, and there are various icons in the dock at the bottom.

```
justin@justin-VirtualBox2:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            1.9G   0    1.9G  0% /dev
tmpfs           395M  1.3M  394M  1% /run
/dev/sda1        25G  6.3G  18G  27% /
tmpfs           2.0G   0    2.0G  0% /dev/shm
tmpfs           5.0M  4.0K  5.0M  1% /run/lock
tmpfs           2.0G   0    2.0G  0% /sys/fs/cgroup
/dev/loop0       21M   21M   0 100% /snap/gnome-logs/25
/dev/loop5       13M   13M   0 100% /snap/gnome-characters/69
/dev/loop2       141M  141M   0 100% /snap/gnome-3-26-1604/59
/dev/loop1       3.4M  3.4M   0 100% /snap/gnome-system-monitor/36
/dev/loop3       1.7M  1.7M   0 100% /snap/gnome-calculator/154
/dev/loop4       89M   89M   0 100% /snap/core/7396
/dev/loop6       141M  141M   0 100% /snap/gnome-3-26-1604/90
/dev/loop7       87M   87M   0 100% /snap/core/4486
tmpfs           395M  28K  395M  1% /run/user/1000
/dev/loop8       55M   55M   0 100% /snap/core18/1074
/dev/loop9       1.0M  1.0M   0 100% /snap/gnome-logs/61
/dev/loop10      3.8M  3.8M   0 100% /snap/gnome-system-monitor/100
/dev/loop11      4.2M  4.2M   0 100% /snap/gnome-calculator/406
/dev/loop12      15M   15M   0 100% /snap/gnome-characters/296
/dev/loop13      150M  150M   0 100% /snap/gnome-3-28-1804/71
/dev/loop14      43M   43M   0 100% /snap/gtk-common-themes/1313
justin@justin-VirtualBox2:~$ df -h /
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda1        25G  6.3G  18G  27% /
justin@justin-VirtualBox2:~$
```

y. screen - run processes in the background, with command logging functionalities

vm2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal ▾ Wed 21:06

justin@justin-VirtualBox2: ~

File Edit View Search Terminal Help

```
justin@justin-VirtualBox2:~$ cat screenlog.0
echo hello
hello

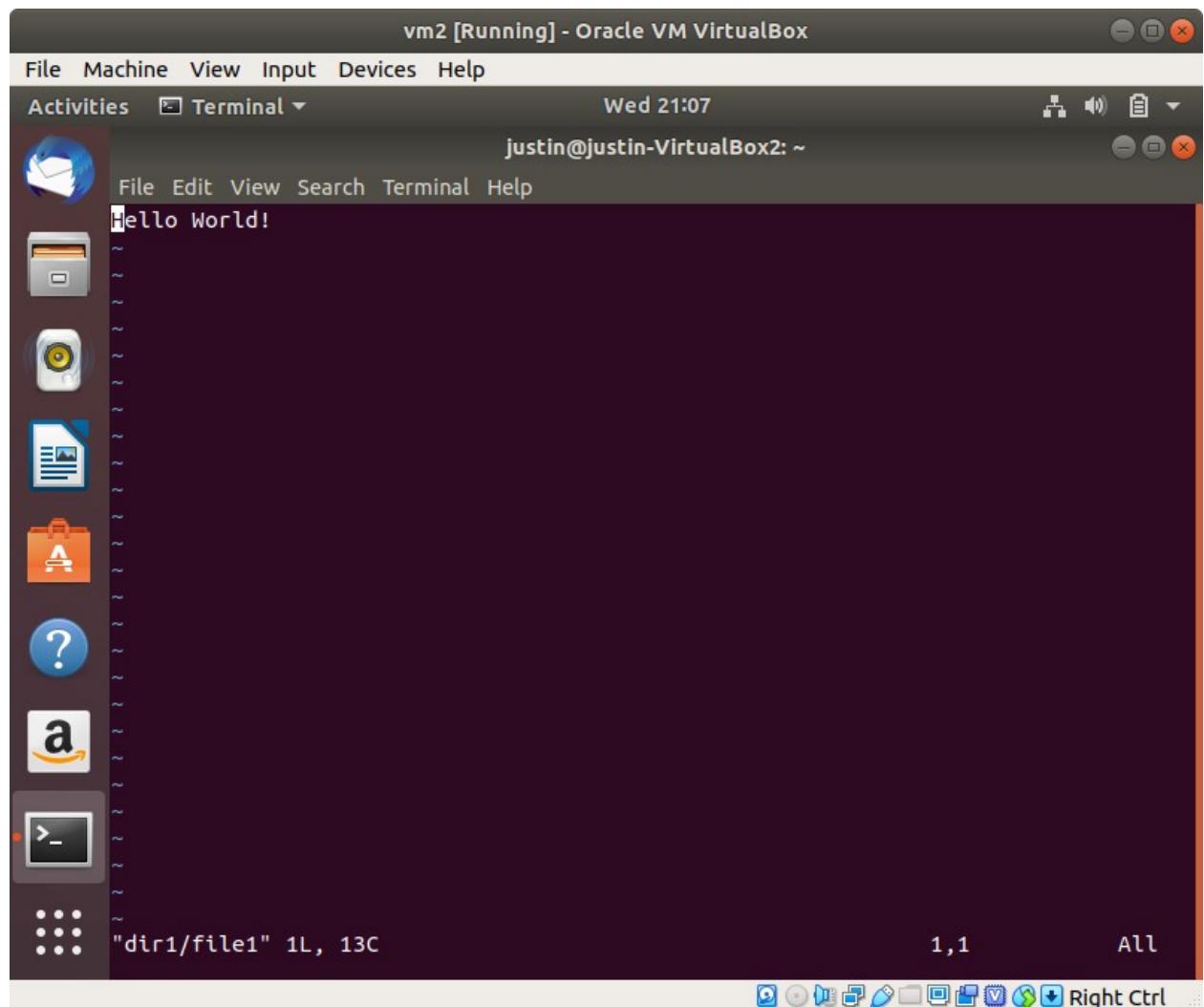
justin@justin-VirtualBox2:~$ ls
archive1.tar  Documents      hardcopy.0  Public       Videos
Desktop       Downloads      Music        screenlog.0
dir1          examples.desktop Pictures    Templates
justin@justin-VirtualBox2:~$ ls
archive1.tar  dir1          Downloads     Music       Public      Templates
Desktop       Documents     examples.desktop Pictures  screenlog.0  Videos
justin@justin-VirtualBox2:~$ tail dir1/happy_free_market_log.txt

thankyoucomeagain
Timestamp 17675901

A purchase! COIN ALGORITHM FAILED This is not purchase. This is another forged
Neocredit trick.

The hot summer sun
Sears hunger into your throat;
Eat a bag of dirt.
justin@justin-VirtualBox2:~$ screen -ls
There is a screen on:
            3525.pts-0.justin-VirtualBox2  (08/28/2019 09:04:04 PM)  (Attached)
ed)
1 Socket in /run/screen/S-justin.
justin@justin-VirtualBox2:~$ justin@justin-VirtualBox2:~$
```

z. vim - Text editor, VI iMproved



aa. chmod - change the permissions of a file

vm2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal ▾ Wed 21:08

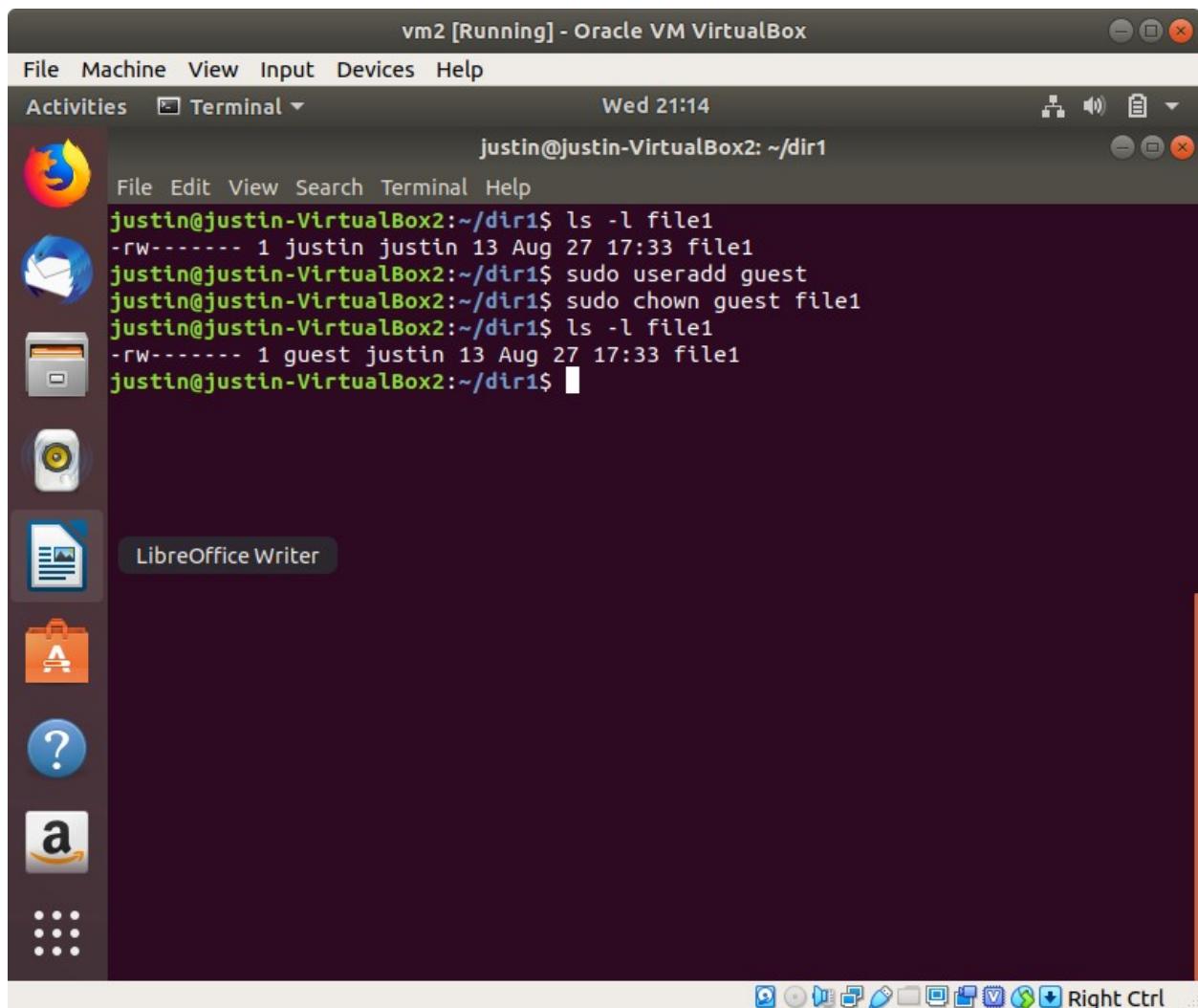
justin@justin-VirtualBox2: ~/dir1

File Edit View Search Terminal Help

```
justin@justin-VirtualBox2:~/dir1$ ls -l
total 88
-rw-r--r-- 1 justin justin 50140 Aug 28 05:30 bee_movie_script.txt
-rw-r--r-- 1 justin justin     13 Aug 27 17:33 file1
-rw-r--r-- 1 justin justin      7 Aug 27 17:35 file2
-rw-r--r-- 1 justin justin  3696 Aug 28 20:46 happy_free_market_log.txt
-rwxr-xr-x 1 justin justin  8304 Aug 28 05:43 hello
-rw-r--r-- 1 justin justin    72 Aug 28 05:43 hello.c
-rwxr-xr-x 1 justin justin    46 Aug 27 18:03 hello.py
-rw-r--r-- 1 justin justin   23 Aug 27 17:59 note.txt
justin@justin-VirtualBox2:~/dir1$ chmod 600 file1
justin@justin-VirtualBox2:~/dir1$ ls -l file1
-rw----- 1 justin justin 13 Aug 27 17:33 file1
justin@justin-VirtualBox2:~/dir1$
```

bb. chown - change the owner of a file

cc. useradd - add a user to the system



dd. man - show the manual of a command

vm2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal justin@justin-VirtualBox2: ~

Firefox Web Browser File Edit View Search Terminal Help

MAN(1) Manual pager utils MAN(1)

NAME
man - an interface to the on-line reference manuals

SYNOPSIS

```
man [-C file] [-d] [-D] [--warnings[=warnings]] [-R encoding] [-L locale] [-m system[,...]] [-M path] [-S list] [-e extension] [-i|-I] [--regex|--wildcard] [--names-only] [-a] [-u] [--no-subpages] [-P pager] [-r prompt] [-7] [-E encoding] [--no-hyphenation] [--no-justification] [-p string] [-t] [-T[device]] [-H[browser]] [-X[dpi]] [-Z] [[section] page[.section] ...] ...
man -k [apropos options] regexp ...
man -K [-w|-W] [-S list] [-i|-I] [--regex] [section] term ...
man -f [whatis options] page ...
man -l [-C file] [-d] [-D] [--warnings[=warnings]] [-R encoding] [-L locale] [-P pager] [-r prompt] [-7] [-E encoding] [-p string] [-t] [-T[device]] [-H[browser]] [-X[dpi]] [-Z] file ...
man -w|-W [-C file] [-d] [-D] page ...
man -c [-C file] [-d] [-D] page ...
man [-?V]
```

DESCRIPTION

man is the system's manual pager. Each page argument given to **man** is normally the name of a program, utility or function. The manual page associated with each of these arguments is then found and displayed. A section, if provided, will direct **man** to look only in that section

Manual page man(1) line 1 (press h for help or q to quit)

Right Ctrl

ee. locate - find a file by name, in the given directory

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, displaying a command-line session. The session starts with the user "justin" at their home directory (~). They run the command "ls dir1", which lists several files: "bee_movie_script.txt", "file2", "file1", "happy_free_market_log.txt", "hello", "hello.py", and "note.txt". Then, they run "locate note.txt", which finds the file in "/home/justin/dir1/note.txt". The terminal window has a standard Linux window title bar with icons for minimize, maximize, and close. To the left of the terminal is a vertical dock containing icons for various applications like a browser, file manager, and system tools. The desktop background is a solid color.

ff. find - find a file with the given filename, display all matches.

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, showing the command-line interface. The terminal window has a dark background with light-colored text. The window title bar includes the window name, application name ("Terminal"), and system status ("Wed 21:24"). The terminal window contains the following text:

```
File Edit View Search Terminal Help  
justin@justin-VirtualBox2:~$ find . -name happy*  
. ./dir1/happy_free_market_log.txt  
justin@justin-VirtualBox2:~$
```

To the left of the terminal window is a vertical dock containing icons for various applications: Firefox, Nautilus (file manager), System Settings, Dash (application menu), Help, Amazon, and a terminal icon. The dock has a dark background with light-colored icons. At the bottom of the screen is a horizontal dock with various icons for system functions like network, volume, and brightness control, along with a "Right Ctrl" key indicator.

gg. sed - Match and replace text from a provided text stream

The screenshot shows a Linux desktop environment with a terminal window open in a virtual machine named "vm2 [Running]". The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal window contains the following text:

```
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~/dir1$ cat happy.txt
thankyoucomeagain
thankyoucomeagain
thankyoucomeagain
thankyoucomEagain
thaNkucomEaGaiN
thankucumegin
thanksucuumagain
thankyoucomeagain
thankyoucomeagain
justin@justin-VirtualBox2:~/dir1$ sed 's/thank/Thank/g' happy.txt
Thankyoucomeagain
ThankyoucomEagain
thaNkucomEaGaiN
thankucumegin
Thanksucuumagain
Thankyoucomeagain
Thankyoucomeagain
justin@justin-VirtualBox2:~/dir1$
```

The desktop interface includes a dock with various icons for applications like Firefox, LibreOffice Writer, and Amazon. The system tray at the bottom shows icons for network, battery, and system status.

hh. awk - an interpreted programming language for text processing (matching, formatting, etc)

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, displaying the command "awk '/thank/ {print NR,\$0}' happy_free_market_log.txt". The output of the command is shown in green text:

```
justin@justin-VirtualBox2:~/dir1$ awk '/thank/ {print NR,$0}' happy_free_market_log.txt
13 thankyoucomeagain
27 thankyoucomeagain
33 thankyoucomeagain
43 thankyoucomEagain
55 thankucumegin
61 thanksucuumagain
71 thankyoucomeagain
89 thankyoucomeagain
justin@justin-VirtualBox2:~/dir1$
```

The desktop interface includes a dock at the bottom with various icons, a vertical application menu on the left, and a system tray at the bottom right.

ii. diff - compare two files, line by line, and display the differences

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "vm2 [Running] - Oracle VM VirtualBox". The terminal window contains the following text:

```
justin@justin-VirtualBox2: ~/dir1$ diff item1 item2
3d2
< bananas
5,6c4,5
< butter
< bacon
---
> potatoes
> eggs
justin@justin-VirtualBox2:~/dir1$ diff -c item1 item2
*** item1      2019-08-28 21:48:11.832032713 -0500
--- item2      2019-08-28 21:48:47.816147508 -0500
*****
*** 1,6 ****
    apples
    oranges
- bananas
    milk
! butter
! bacon
--- 1,5 ----
    apples
    oranges
    milk
! potatoes
! eggs
justin@justin-VirtualBox2:~/dir1$
```

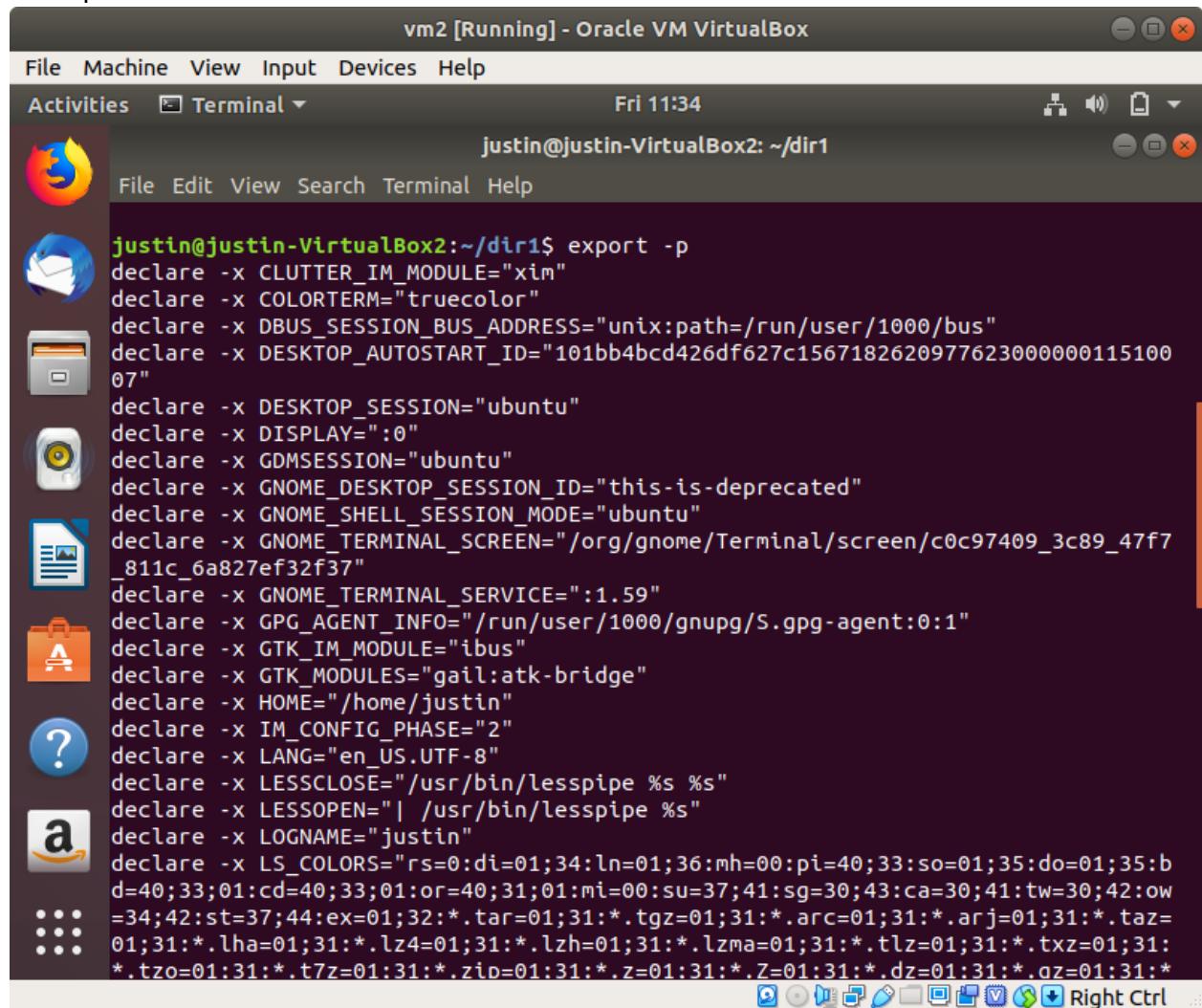
The terminal window is part of a desktop environment with a dark theme. A vertical dock on the left side contains icons for various applications: Firefox, Evolution, Nautilus, GIMP, LibreOffice, Help, and Amazon. The desktop bar at the bottom has icons for network, volume, brightness, and system status.

jj. sort - sort the file by line (alphabetically/numerically)

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, displaying the output of a "sort" command. The terminal window includes a menu bar with File, Machine, View, Input, Devices, Help, and Activities. The Activities menu is currently active. The desktop background features a vertical dock on the left side with icons for various applications: Firefox, Evolution, Files, Dash, Help, Amazon, and a terminal icon. The system tray at the bottom shows several icons, including a network connection, battery status, and system notifications. The terminal window shows the command "sort -k1 -r happy_1.txt" being run, and its output, which consists of several lines of text starting with numbers 89, 71, 61, 55, 43, 33, 27, and 13, all followed by the string "thankyoucomeagain".

```
justin@justin-VirtualBox2:~/dir1$ sort -k1 -r happy_1.txt
89 thankyoucomeagain
71 thankyoucomeagain
61 thankscuoomagain
55 thankucumegin
43 thankyoucomEagain
33 thankyoucomeagain
27 thankyoucomeagain
13 thankyoucomeagain
justin@justin-VirtualBox2:~/dir1$
```

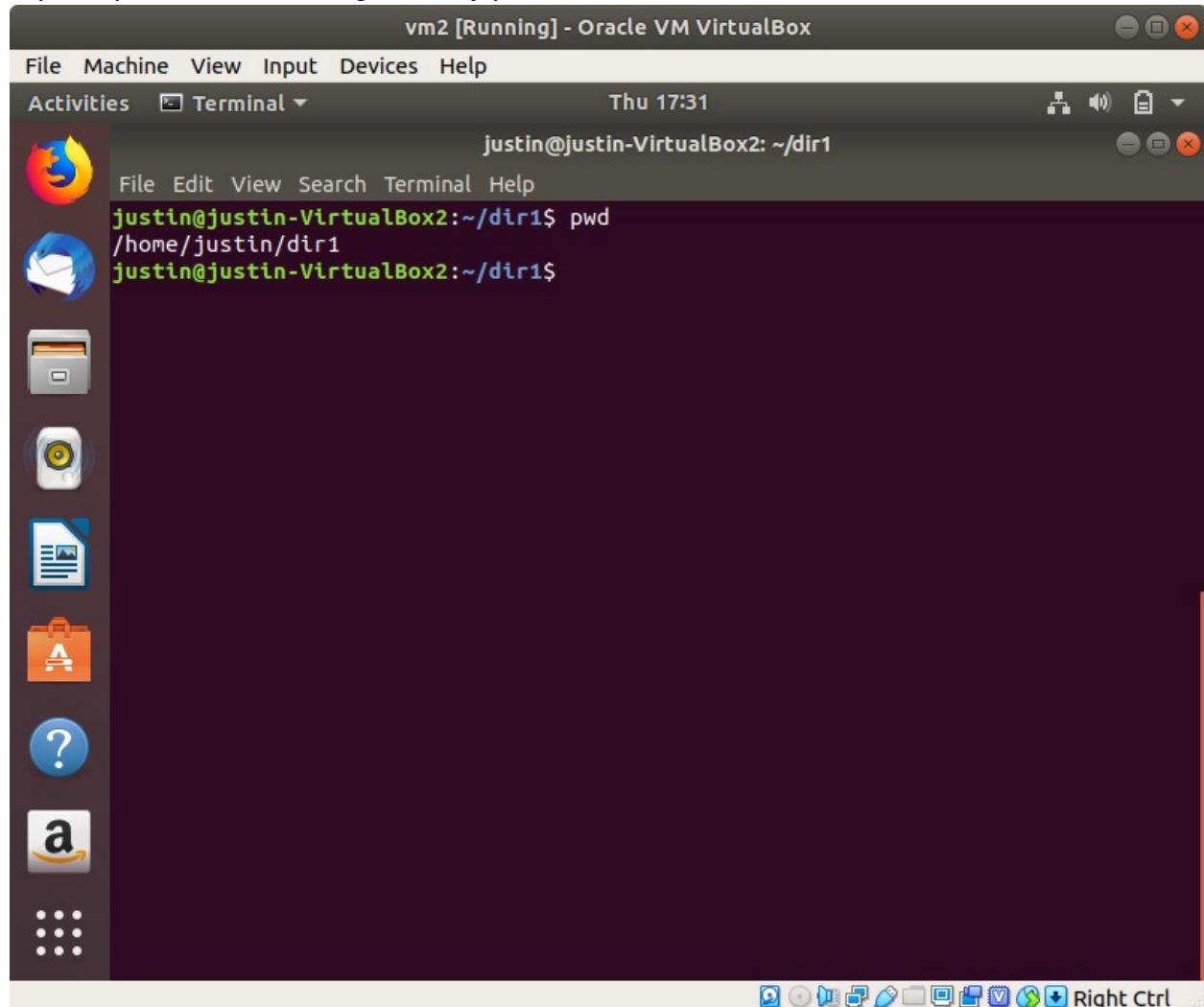
kk. export - Show all bash environment variables



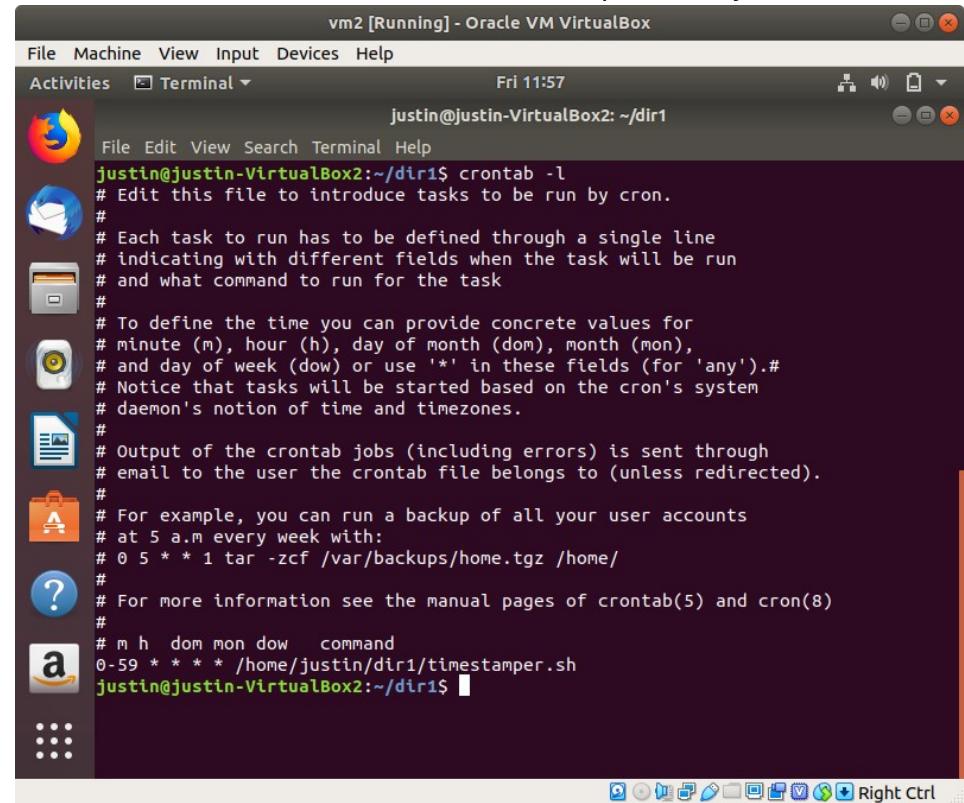
The screenshot shows a Linux desktop environment within a VirtualBox window titled "vm2 [Running] - Oracle VM VirtualBox". The desktop has a dark theme with icons for various applications like Firefox, Evolution, Nautilus, GDM, and others. A terminal window is open, displaying the command "justin@justin-VirtualBox2:~/dir1\$ export -p" followed by a long list of environment variable declarations. The terminal window has a dark background and light-colored text.

```
justin@justin-VirtualBox2:~/dir1$ export -p
declare -x CLUTTER_IM_MODULE="xim"
declare -x COLORTERM="truecolor"
declare -x DBUS_SESSION_BUS_ADDRESS="unix:path=/run/user/1000/bus"
declare -x DESKTOP_AUTOSTART_ID="101bb4bcd426df627c1567182620977623000000115100
07"
declare -x DESKTOP_SESSION="ubuntu"
declare -x DISPLAY=":0"
declare -x GDMSESSION="ubuntu"
declare -x GNOME_DESKTOP_SESSION_ID="this-is-deprecated"
declare -x GNOME_SHELL_SESSION_MODE="ubuntu"
declare -x GNOME_TERMINAL_SCREEN="/org/gnome/Terminal/screen/c0c97409_3c89_47f7
_811c_6a827ef32f37"
declare -x GNOME_TERMINAL_SERVICE=:1.59"
declare -x GPG_AGENT_INFO="/run/user/1000/gnupg/S.gpg-agent:0:1"
declare -x GTK_IM_MODULE="ibus"
declare -x GTK_MODULES="gail:atk-bridge"
declare -x HOME="/home/justin"
declare -x IM_CONFIG_PHASE="2"
declare -x LANG="en_US.UTF-8"
declare -x LESSCLOSE="/usr/bin/lesspipe %s %s"
declare -x LESSOPEN="| /usr/bin/lesspipe %s"
declare -x LOGNAME="justin"
declare -x LS_COLORS="rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:b
d=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow
=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=
01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:
*.tzo=01:31:*.t7z=01:31:*.zip=01:31:*.z=01:31:*.Z=01:31:*.dz=01:31:*.qz=01:31:*
```

II. pwd - print current working directory path

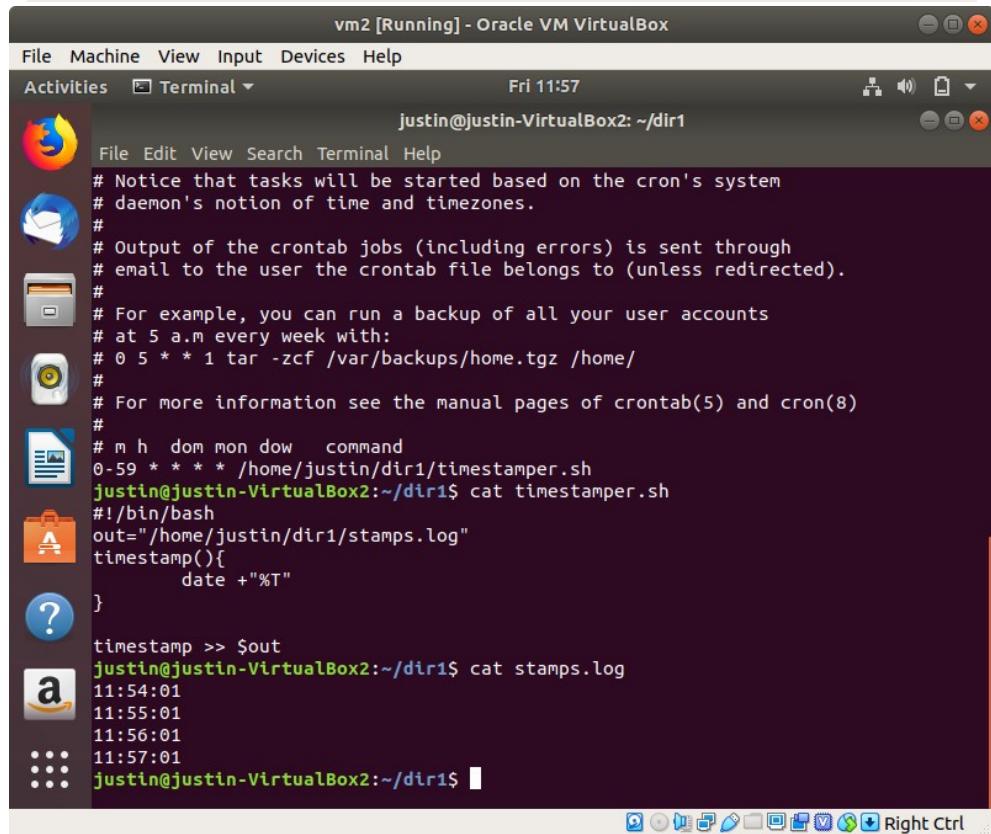


mm. crontab - schedule tasks to the cron daemon to run periodically.



A screenshot of a Ubuntu desktop environment. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open. The terminal shows the user "justin" at "justin-VirtualBox2" in their home directory (~). The user has run the command "crontab -l" to view the current cron jobs. The output shows a single cron entry:

```
justin@justin-VirtualBox2:~/dir1$ crontab -l
# Edit this file to introduce tasks to be run by cron.
#
# Each task to run has to be defined through a single line
# indicating with different fields when the task will be run
# and what command to run for the task
#
# To define the time you can provide concrete values for
# minute (m), hour (h), day of month (dom), month (mon),
# and day of week (dow) or use '*' in these fields (for 'any').#
# Notice that tasks will be started based on the cron's system
# daemon's notion of time and timezones.
#
# Output of the crontab jobs (including errors) is sent through
# email to the user the crontab file belongs to (unless redirected).
#
# For example, you can run a backup of all your user accounts
# at 5 a.m every week with:
# 0 5 * * 1 tar -zcf /var/backups/home.tgz /home/
#
# For more information see the manual pages of crontab(5) and cron(8)
#
# m h dom mon dow   command
0-59 * * * * /home/justin/dir1/timestamper.sh
```



A screenshot of a Ubuntu desktop environment. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open. The terminal shows the user "justin" at "justin-VirtualBox2" in their home directory (~). The user has run the command "cat timestamper.sh" to view the contents of the script. The script is a simple Bash script that prints the current timestamp to a log file:

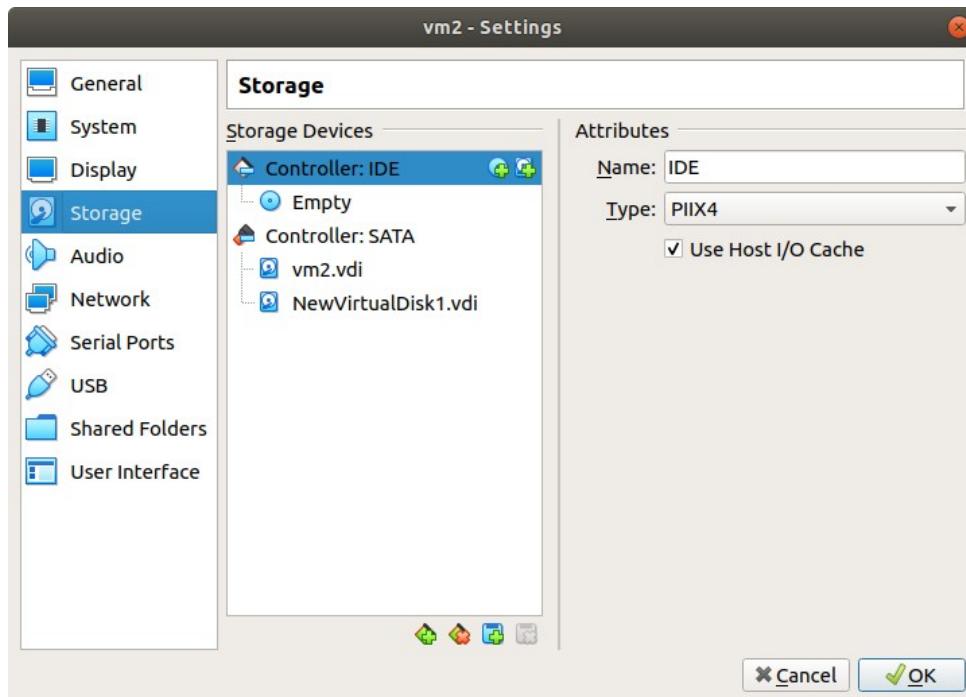
```
#!/bin/bash
out="/home/justin/dir1/stamps.log"
timestamp(){
    date +"%T"
}

timestamp >> $out
```

The user then runs "cat stamps.log" to verify the contents of the log file, which shows the following timestamps:

```
justin@justin-VirtualBox2:~/dir1$ cat stamps.log
11:54:01
11:55:01
11:56:01
11:57:01
```

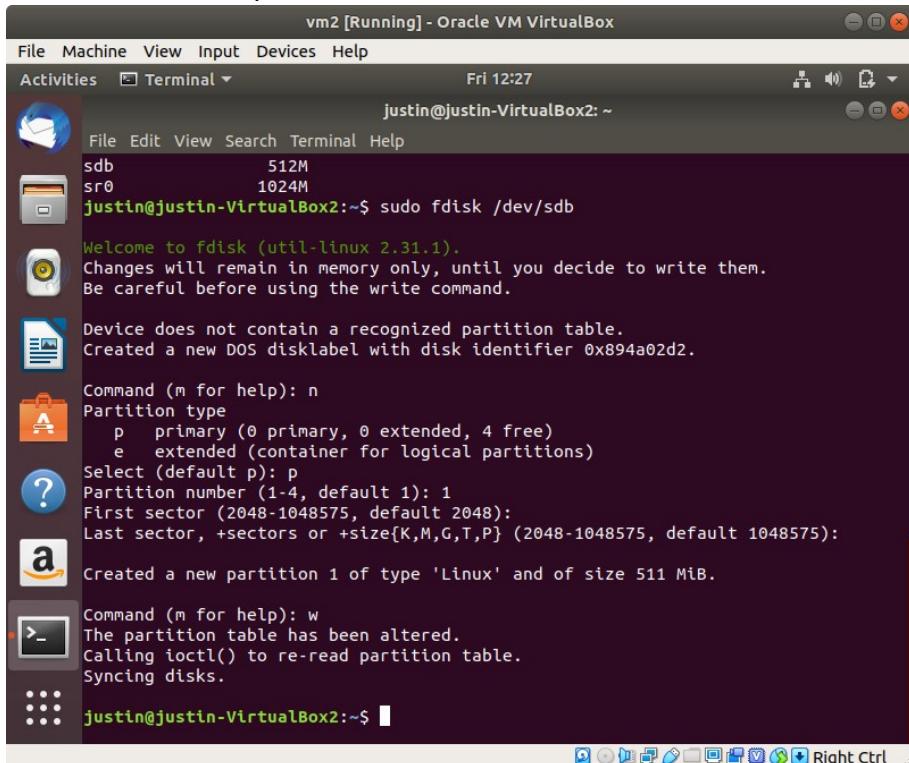
nn1. Create a disk in VirtualBox



nn2. List the available devices with lsblk

```
justin@justin-VirtualBox2:~$ sudo lsblk -o NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL
NAME   FSTYPE      SIZE MOUNTPOINT          LABEL
loop0   squashfs    1.6M /snap/gnome-calculator/154
loop1   squashfs    54.4M /snap/core18/1074
loop2   squashfs    21M  /snap/gnome-logs/25
loop3   squashfs    86.6M /snap/core/4486
loop4   squashfs    140.7M /snap/gnome-3-26-1604/90
loop5   squashfs    88.7M /snap/core/7396
loop6   squashfs    3.3M  /snap/gnome-system-monitor/36
loop7   squashfs    81.7M /snap/emacs/67
loop8   squashfs    140M  /snap/gnome-3-26-1604/59
loop9   squashfs    14.8M /snap/gnome-characters/296
loop10  squashfs    149.9M /snap/gnome-3-28-1804/71
loop11  squashfs    3.7M  /snap/gnome-system-monitor/100
loop12  squashfs    42.8M /snap/gtk-common-themes/1313
loop13  squashfs    1008K /snap/gnome-logs/61
loop14  squashfs    14.8M /snap/gnome-characters/317
loop15  squashfs    4M    /snap/gnome-calculator/406
sda
└─sda1 ext4       25G /
sdb
sr0           1024M
```

nn3. Create a new partition with fdisk



```
File Machine View Input Devices Help
Activities Terminal Fri 12:27
justin@justin-VirtualBox2: ~
File Edit View Search Terminal Help
sdb      512M
sr0     1024M
justin@justin-VirtualBox2:~$ sudo fdisk /dev/sdb

Welcome to fdisk (util-linux 2.31.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x894a02d2.

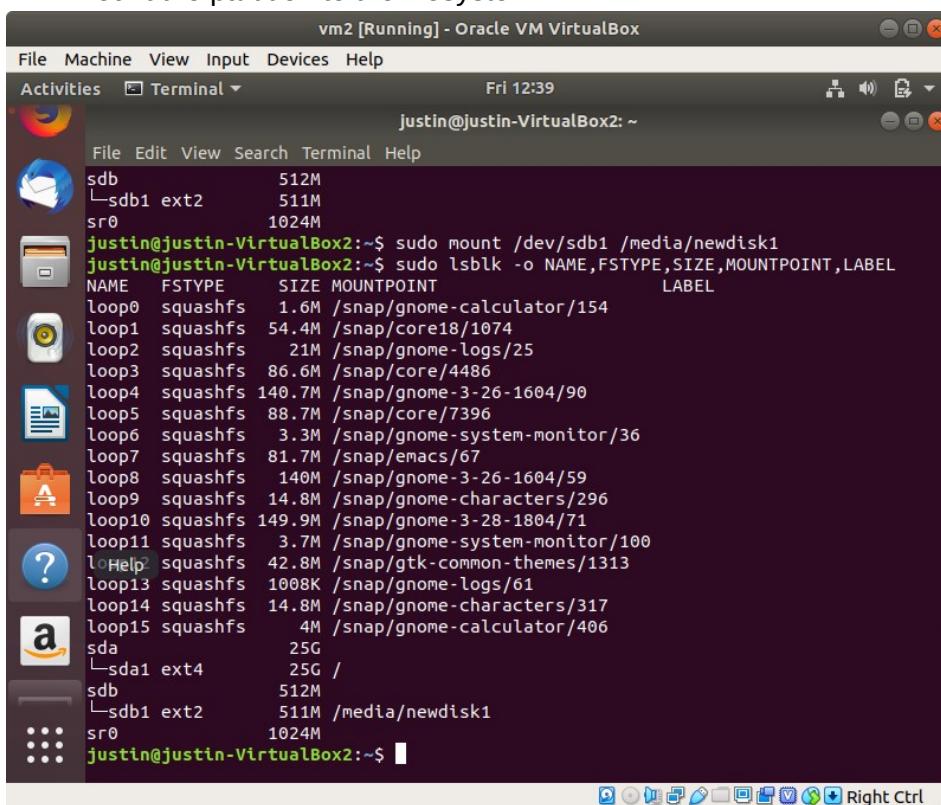
Command (m for help): n
Partition type
  p  primary (0 primary, 0 extended, 4 free)
  e  extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-1048575, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-1048575, default 1048575):

Created a new partition 1 of type 'Linux' and of size 511 MiB.

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

justin@justin-VirtualBox2:~$
```

nn4. Mount the partition to the filesystem



```
File Machine View Input Devices Help
Activities Terminal Fri 12:39
justin@justin-VirtualBox2: ~
File Edit View Search Terminal Help
sdb      512M
└─sdb1 ext2    511M
sr0     1024M
justin@justin-VirtualBox2:~$ sudo mount /dev/sdb1 /media/newdisk1
justin@justin-VirtualBox2:~$ sudo lsblk -o NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL
NAME   FSTYPE   SIZE MOUNTPOINT           LABEL
loop0  squashfs  1.6M /snap/gnome-calculator/154
loop1  squashfs  54.4M /snap/core18/1074
loop2  squashfs  21M  /snap/gnome-logs/25
loop3  squashfs  86.6M /snap/core/4486
loop4  squashfs  140.7M /snap/gnome-3-26-1604/90
loop5  squashfs  88.7M /snap/core/7396
loop6  squashfs  3.3M /snap/gnome-system-monitor/36
loop7  squashfs  81.7M /snap/emacs/67
loop8  squashfs  140M /snap/gnome-3-26-1604/59
loop9  squashfs  14.8M /snap/gnome-characters/296
loop10 squashfs  149.9M /snap/gnome-3-28-1804/71
loop11 squashfs  3.7M /snap/gnome-system-monitor/100
loop12 squashfs  42.8M /snap/gtk-common-themes/1313
loop13 squashfs  1008K /snap/gnome-logs/61
loop14 squashfs  14.8M /snap/gnome-characters/317
loop15 squashfs  4M  /snap/gnome-calculator/406
sda      25G
└─sda1 ext4    25G /
sdb      512M
└─sdb1 ext2    511M /media/newdisk1
sr0     1024M
justin@justin-VirtualBox2:~$
```

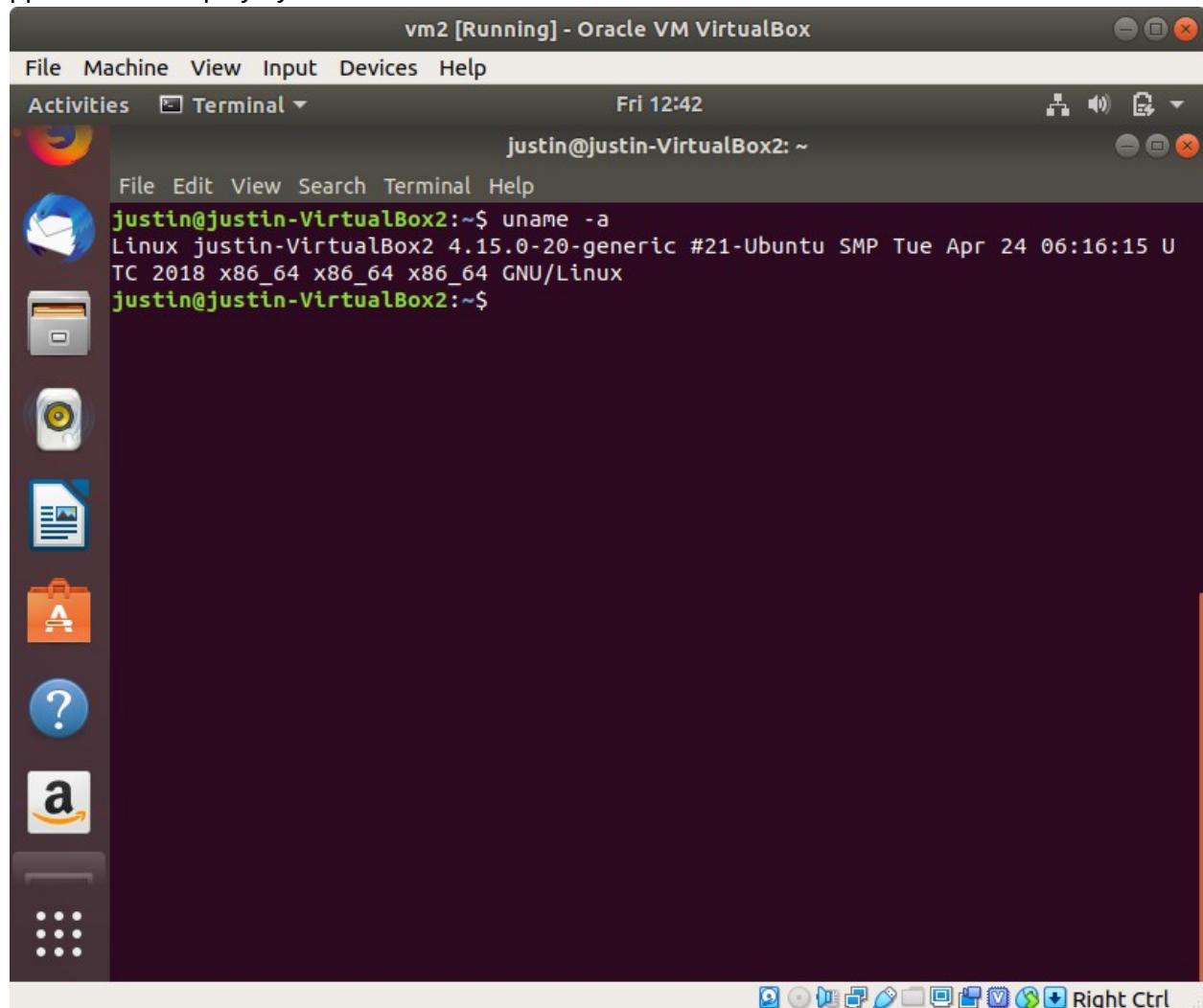
oo. passwd - change the password for a user

The screenshot shows a Linux desktop environment with a dark theme. At the top, the window title is "vm2 [Running] - Oracle VM VirtualBox". The menu bar includes "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu is a docked panel titled "Activities" with a "Terminal" icon. The main workspace shows a terminal window with the following content:

```
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~$ sudo passwd guest
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
justin@justin-VirtualBox2:~$
```

The desktop background is a solid dark color. A vertical dock on the left contains icons for various applications: a browser, email, file manager, system settings, a camera, a document, a briefcase, help, and Amazon. The bottom of the screen features a dock with icons for a camera, file manager, terminal, and other system tools.

pp. uname - display system information of the current machine



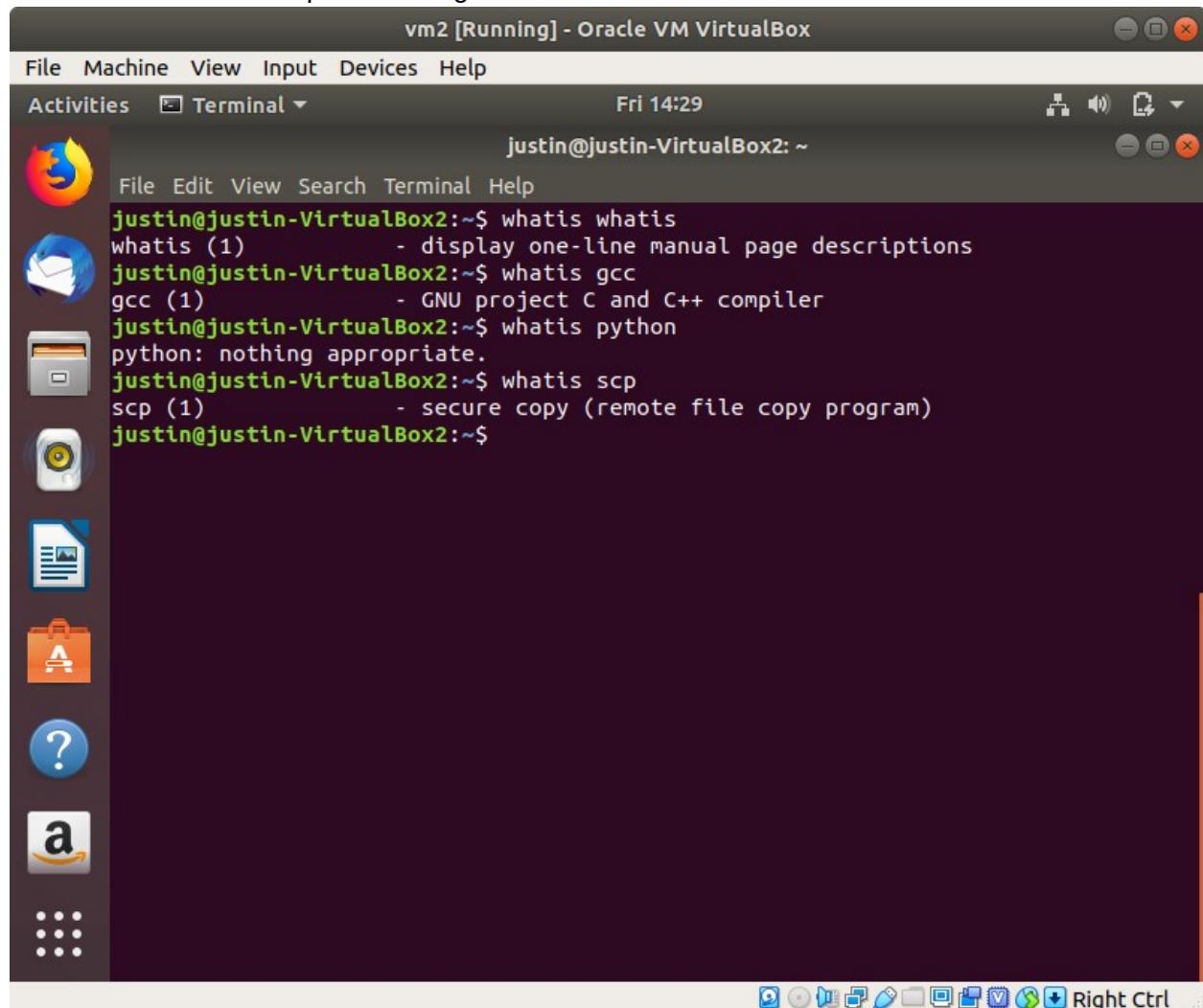
qq. whereis - Show the path of the executable of the given command

The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "vm2 [Running] - Oracle VM VirtualBox" is open, displaying the output of the "whereis" command. The terminal window includes a menu bar with File, Machine, View, Input, Devices, Help, and Activities. The Activities menu is currently selected. The terminal itself has a title bar showing "justin@justin-VirtualBox2: ~" and a status bar indicating the date and time as "Fri 14:29". The terminal content shows the following command-line session:

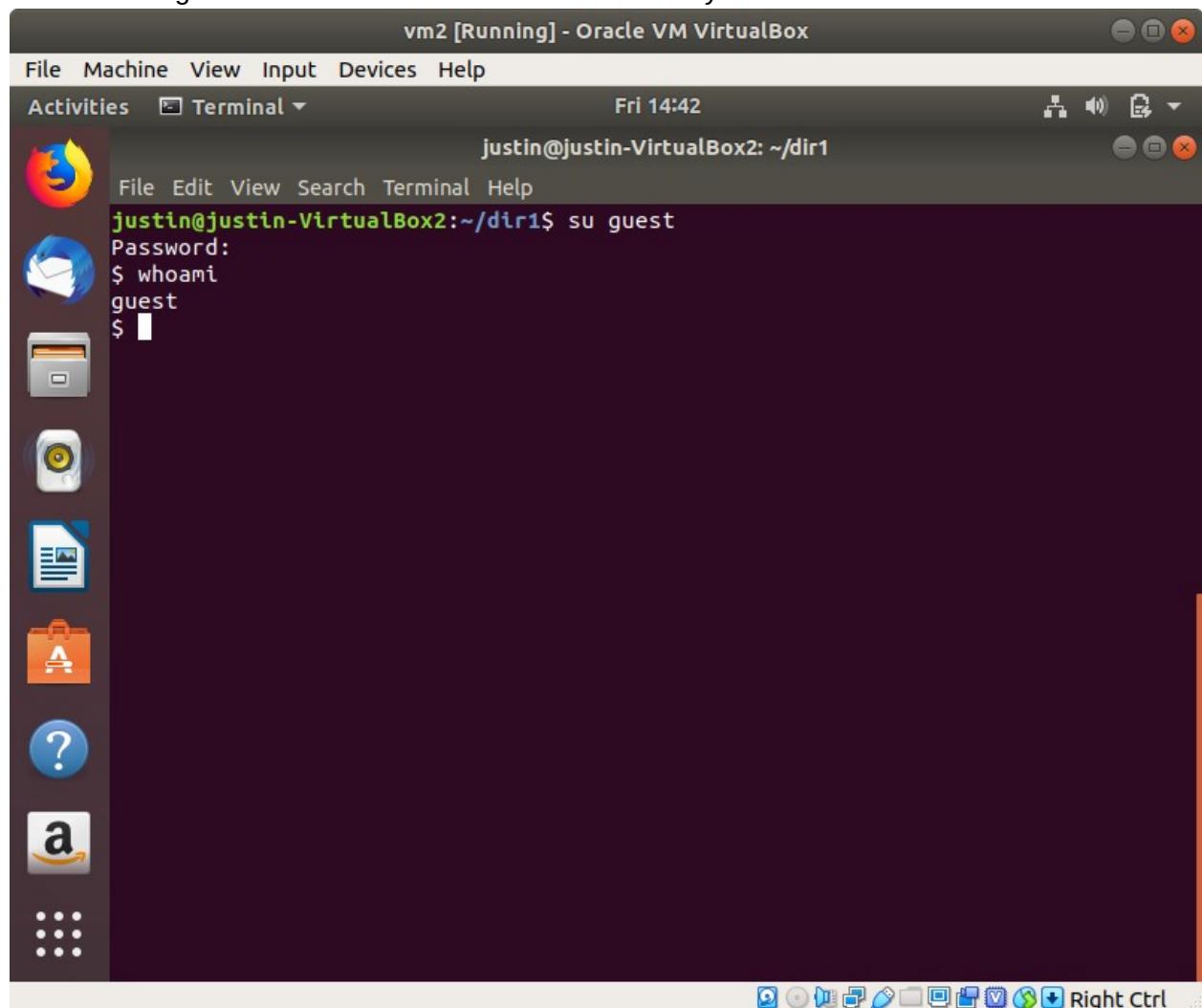
```
justin@justin-VirtualBox2:~$ whereis gcc
gcc: /usr/bin/gcc /usr/lib/gcc /usr/share/man/man1/gcc.1.gz
justin@justin-VirtualBox2:~$ whereis ip
ip: /bin/ip /sbin/ip /usr/share/man/man8/ip.8.gz /usr/share/man/man7/ip.7.gz
justin@justin-VirtualBox2:~$ whereis ssh
ssh: /usr/bin/ssh /etc/ssh /usr/share/man/man1/ssh.1.gz
justin@justin-VirtualBox2:~$
```

To the left of the terminal window is a vertical dock containing icons for various applications: Firefox, Evolution, Nautilus, GIMP, LibreOffice, Help, Amazon, and a terminal icon. At the bottom of the screen is a dock bar with several icons, including a clock, a file manager, a terminal, a browser, and other system utilities. The overall interface is characteristic of the Unity desktop environment.

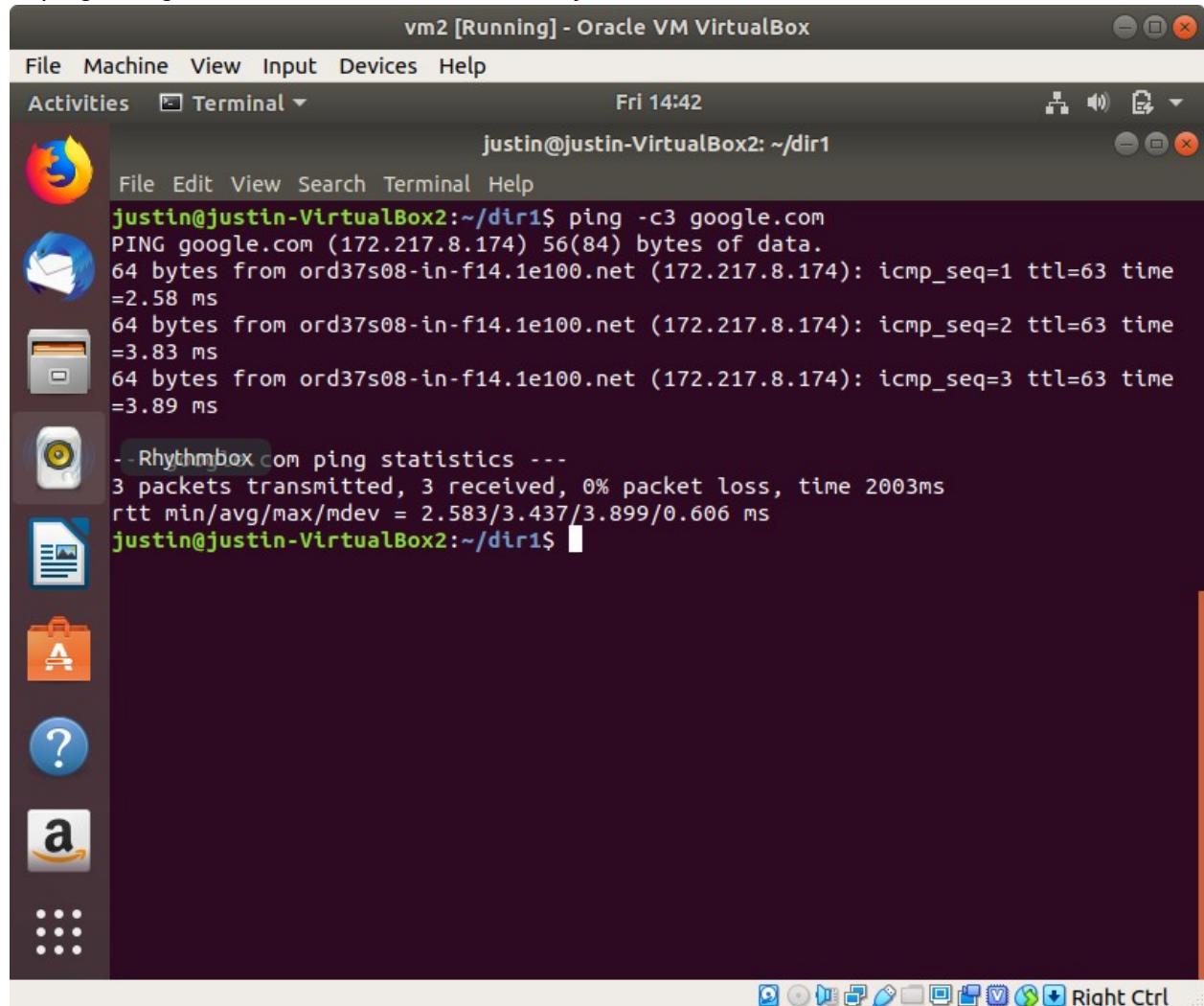
rr. whatis - Short description of the given command



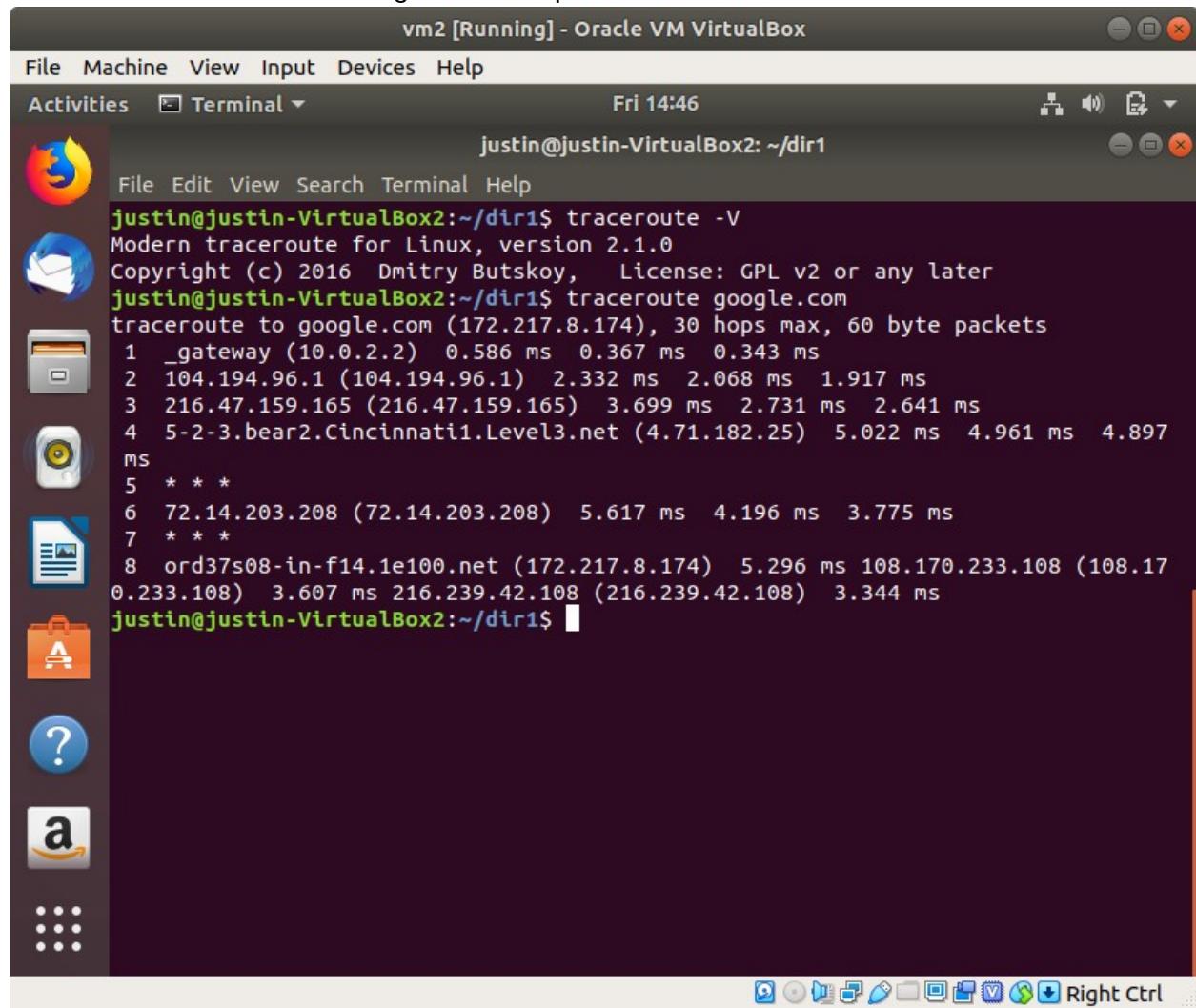
ss. su - Change the current user to another user in the system



tt. ping - Ping a remote host, and show latency statistics



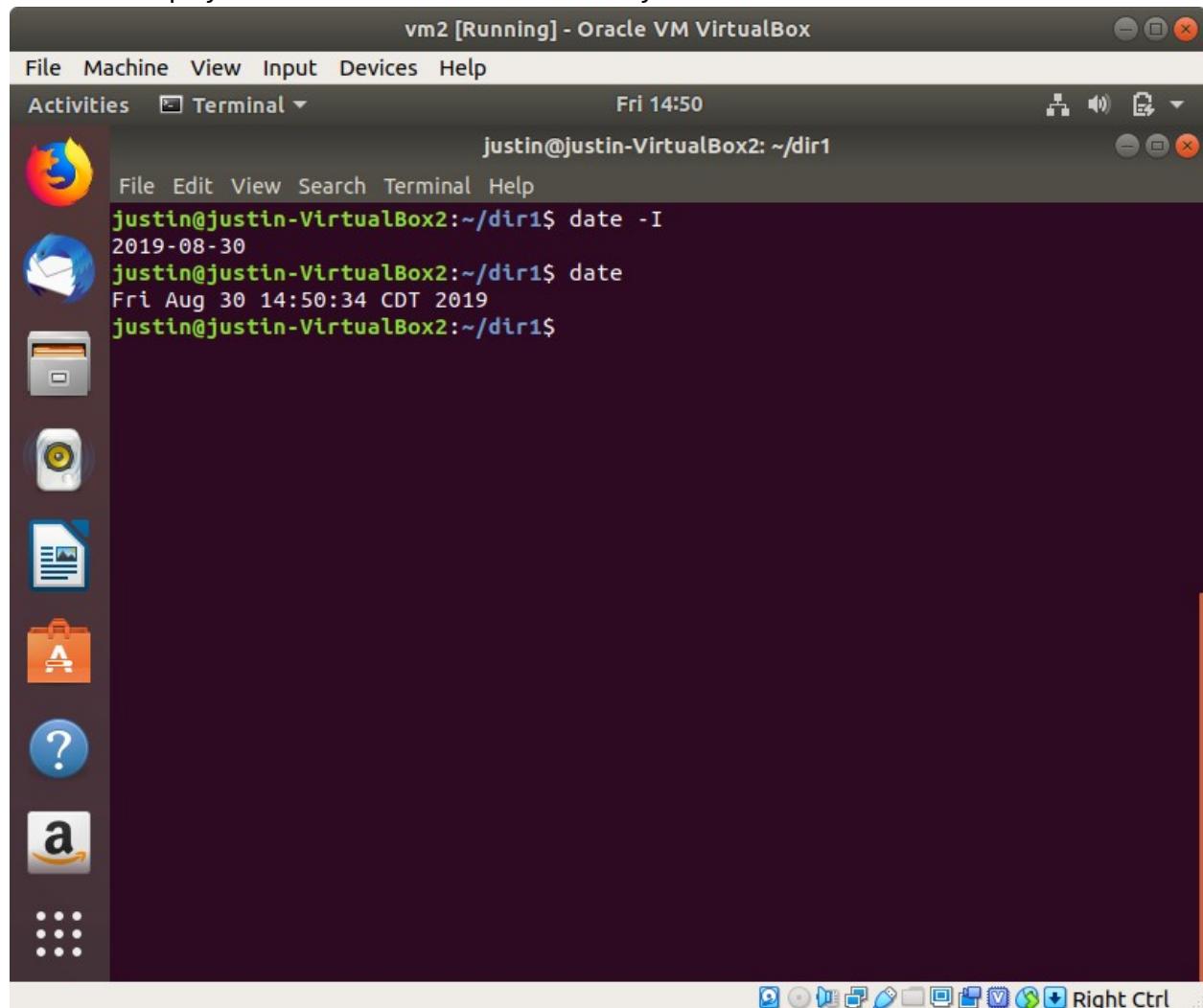
uu. traceroute - trace the routing of the sent packets



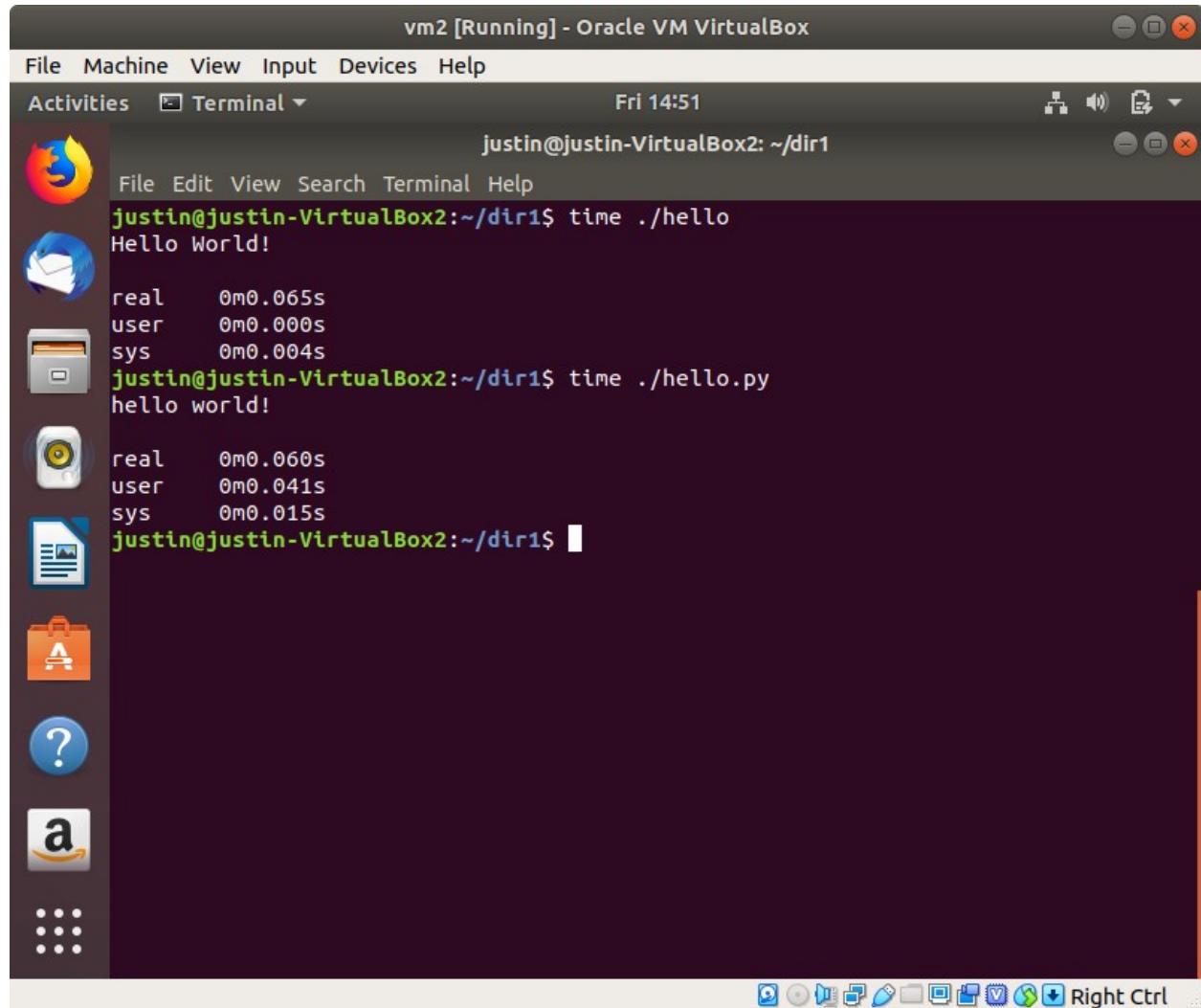
The image shows a screenshot of an Ubuntu desktop environment running inside Oracle VM VirtualBox. The terminal window is titled "vm2 [Running] - Oracle VM VirtualBox". The terminal session shows the user executing the "traceroute" command with the "-V" option to trace the route to "google.com". The output of the command is displayed in the terminal window.

```
justin@justin-VirtualBox2:~/dir1$ traceroute -V
Modern traceroute for Linux, version 2.1.0
Copyright (c) 2016 Dmitry Butskoy, License: GPL v2 or any later
justin@justin-VirtualBox2:~/dir1$ traceroute google.com
traceroute to google.com (172.217.8.174), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  0.586 ms  0.367 ms  0.343 ms
 2 104.194.96.1 (104.194.96.1)  2.332 ms  2.068 ms  1.917 ms
 3 216.47.159.165 (216.47.159.165)  3.699 ms  2.731 ms  2.641 ms
 4 5-2-3.bear2.Cincinnati1.Level3.net (4.71.182.25)  5.022 ms  4.961 ms  4.897
ms
 5 * * *
 6 72.14.203.208 (72.14.203.208)  5.617 ms  4.196 ms  3.775 ms
 7 * * *
 8 ord37s08-in-f14.1e100.net (172.217.8.174)  5.296 ms 108.170.233.108 (108.17
0.233.108)  3.607 ms 216.239.42.108 (216.239.42.108)  3.344 ms
justin@justin-VirtualBox2:~/dir1$
```

vv. date - display the current date and time of the system



ww. time - show the execution time of a program (Real - start to finish, user - user-mode time, sys - kernel-mode time)

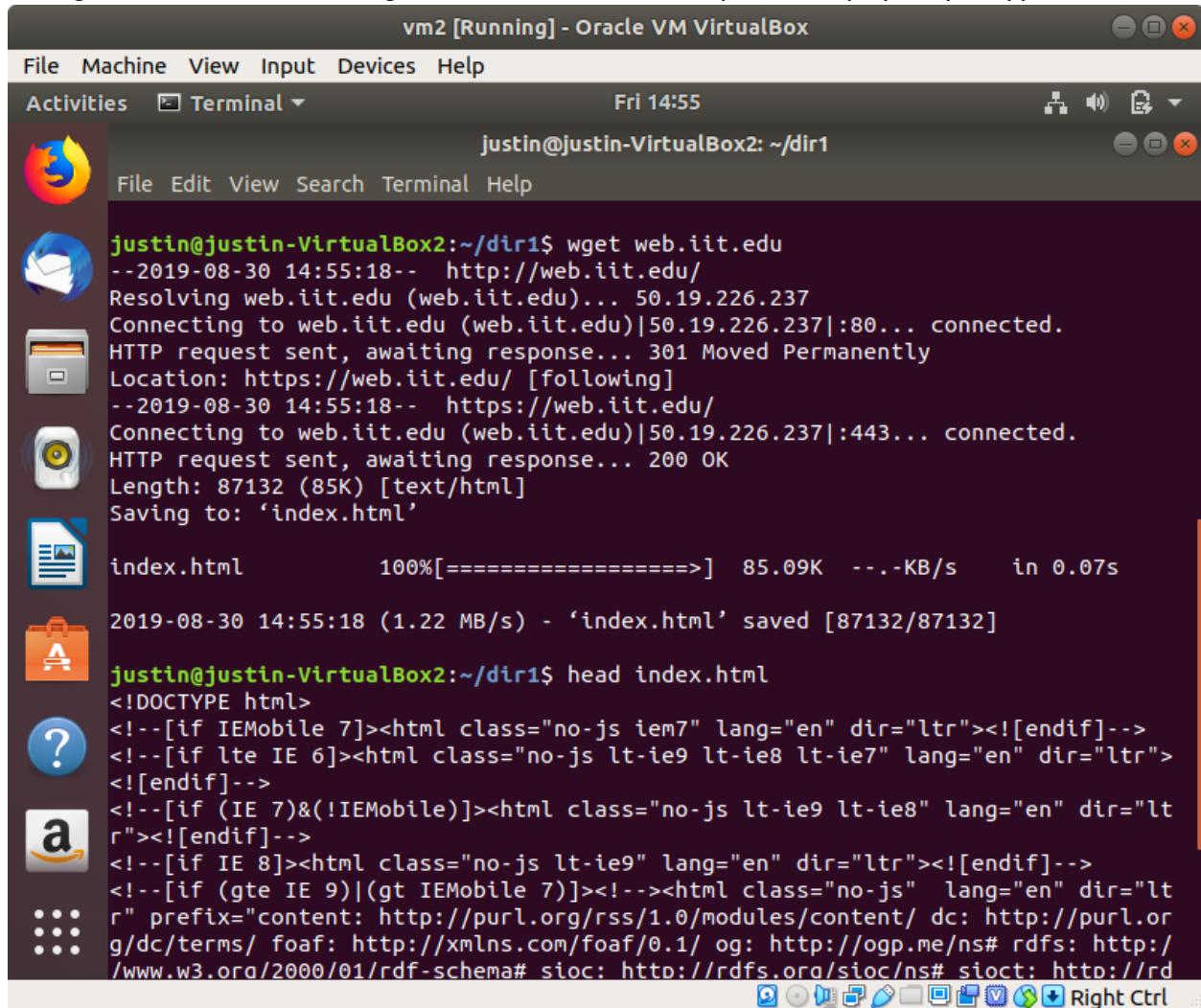


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window is titled "vm2 [Running] - Oracle VM VirtualBox". The desktop interface includes a docked application menu on the left and a dock at the bottom.

Terminal Output:

```
justin@justin-VirtualBox2:~/dir1$ time ./hello
Hello World!
real    0m0.065s
user    0m0.000s
sys     0m0.004s
justin@justin-VirtualBox2:~/dir1$ time ./hello.py
hello world!
real    0m0.060s
user    0m0.041s
sys     0m0.015s
justin@justin-VirtualBox2:~/dir1$
```

xx. wget - download a file using standard communication protocols (http, https, ftp)



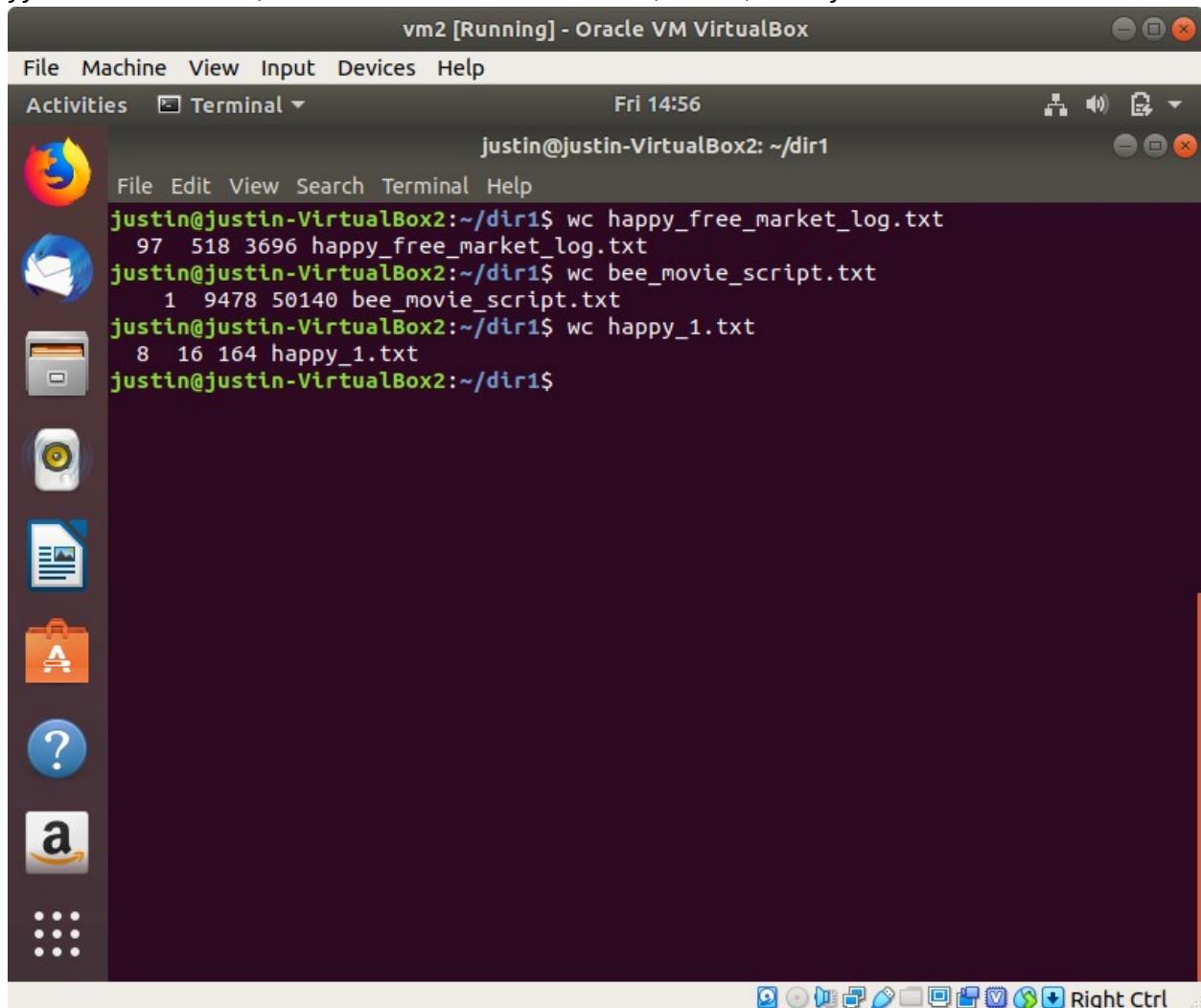
```
justin@justin-VirtualBox2:~/dir1$ wget web.iit.edu
--2019-08-30 14:55:18-- http://web.iit.edu/
Resolving web.iit.edu (web.iit.edu)... 50.19.226.237
Connecting to web.iit.edu (web.iit.edu)|50.19.226.237|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://web.iit.edu/ [following]
--2019-08-30 14:55:18-- https://web.iit.edu/
Connecting to web.iit.edu (web.iit.edu)|50.19.226.237|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 87132 (85K) [text/html]
Saving to: 'index.html'

index.html          100%[=====] 85.09K  ---KB/s   in 0.07s

2019-08-30 14:55:18 (1.22 MB/s) - 'index.html' saved [87132/87132]

justin@justin-VirtualBox2:~/dir1$ head index.html
<!DOCTYPE html>
<!--[if IEMobile 7]><html class="no-js iem7" lang="en" dir="ltr"><![endif]-->
<!--[if lte IE 6]><html class="no-js lt-ie9 lt-ie8 lt-ie7" lang="en" dir="ltr">
<![endif]-->
<!--[if (IE 7)&(!IEMobile)]><html class="no-js lt-ie9 lt-ie8" lang="en" dir="lt
r"><![endif]-->
<!--[if IE 8]><html class="no-js lt-ie9" lang="en" dir="ltr"><![endif]-->
<!--[if (gte IE 9)|(gt IEMobile 7)]><!--><html class="no-js" lang="en" dir="lt
r" prefix="content: http://purl.org/rss/1.0/modules/content/ dc: http://purl.or
g/dc/terms/ foaf: http://xmlns.com/foaf/0.1/ og: http://ogp.me/ns# rdfs: http://
www.w3.org/2000/01/rdf-schema# sioc: http://rdfs.org/sioc/ns# sioc: http://rd
```

yy. wc - word count, counts the number of newlines, words, and bytes in a file



The image shows a screenshot of an Ubuntu desktop environment running in a virtual machine. The title bar of the window says "vm2 [Running] - Oracle VM VirtualBox". The window contains a terminal session with the following commands and output:

```
justin@justin-VirtualBox2: ~/dir1
File Edit View Search Terminal Help
justin@justin-VirtualBox2:~/dir1$ wc happy_free_market_log.txt
 97 518 3696 happy_free_market_log.txt
justin@justin-VirtualBox2:~/dir1$ wc bee_movie_script.txt
 1 9478 50140 bee_movie_script.txt
justin@justin-VirtualBox2:~/dir1$ wc happy_1.txt
 8 16 164 happy_1.txt
justin@justin-VirtualBox2:~/dir1$
```

The terminal window has a dark background and light-colored text. The window is part of the Unity interface, with a dock of icons on the left and a dock of system status icons at the bottom.

zz. pwgen - generate pronounceable passwords

```
justin@LT480: ~
File Edit View Search Terminal Help
(base) justin@LT480:~$ pwgen -s -y -v
h=8kCB&S {*Fs6hph z+HF97`g $3(ls>5P /D-:X4(t hT&Fbr9- ;p'9s`W7 ?X7#HZPP
$;_T5x2_ _\SF84L, Z#zZ<;7> .=c!j4wB &R69bMf} ?R^D[5pr )fJz.d4B ;!5m=`<Q
2w]mHqLB (& ,]8tB w4Td&p?m Nd9W3ZF' ;4L'f^'B *WV2^CHf PsX^r42J 3~D)w+-+
DJ5D("x> -2TMRKgp =l5\VRFs XGXB]8H; <hR>t3$B L[3`\Tnm +3$>+Q)m ]42L7F$<
M#f8J]D" /{D8C(P? }>$67)D, f[B)f'N9 k5]`$G3] qL4d-!/< Jmp/}5gS Ztr8;Ck~
4'Q.&g9^ >}L~q4j$ ;`2TB#{t *fSzH`m6 3gwQgL,, c&d3xGDm F-qq;94S %PK635zw
3z[,:_M, "w-k`~8L b'kDD~^5 x2bc"CnX -.7*B}FS **"$6B'j >7.~BQ3> Rc[*^L9w
pJZ~9wWR 3-gR[wM- tXc\ Cf9% m4-k:DHG cvqR('4t nd+d6(WP <KGK*5(\ <ZV9p~dZ
9BG{&|$, Mt;|DH*2 xGF.Zsw8 b-f8Sq<l ]rr8H6>" 4]_{sJ99 w^+_`*X6 d=F:354d
}4@bHjN- pR{>S49B BQ#T8,'t dH&d8f~x 2l6QgL`r D7>?dLz& Hk'c"J7k :8GC~SrH
mj~9p]'H vR5:DMRF lg6*WLJ- vF8C|R*N S2j86/h( qSzM/2T- 9Gs'2[~j c7:^B|v<
Gj5/\]]` |9^ddLpM J-kjxb;2 ;(tN.>9x &!k6Rw|$ ."L7j([c ~]6![!Mr R*"N2+)(
j- "KRM?9 :N/2d; ` - =?fNw{2: qGCSR9<r q2Bx.'`b vhDb,5Q= 2N!`w.Wc 5wf7C'nX
f]/>~5)G mnG7~|,f sn4Q;>{} PvMfRm3* 2!)^GDGc N`}{>>3^ l,+NzN95 @X8R[PT=
Wx$V$Q5h 7w?"HwX# CJpp~p(5 2W- "[]Mx $=9L<*Rj :wR6@=zd bNhR8K=S ~}[?!F9;
mt8P/G{J %s~N5mLQ 2NPqsz:& X/>[@=C5 <<Jp`l2+ PD&j^Pl3 nz74R%z) }tM4r&` .
L(pLqS$6 RpXx6@SM \2@l[|BB Sp29;mD: -<c49`SG /k}v8c=P 6!'S6*4~ mIM"_9_8
$Mq})N69 KB$r>9J' pw:3@T.3 ]/4NBXkP 'f5M]\", BN=9~:Cq 2!GrZ898 f23\@P/!
b-2fT[S* }#F52_q( ~6=8XH3_ s.sg?P!6 KxJwp'3# 3jL#Z[PD r)J98Wjk &FRt@6J)
K]\R4vHw FLv'rqr4 BGM:4P\c ;Bk73Hvr $2~s!j3Z xfS7v3h" #!3qPsDq Mjq#{7m3
(base) justin@LT480:~$ pwgen -s -y -v -N1
gQ-.%),2
(base) justin@LT480:~$
```