



KISS LINUX COMMANDS

BY SHARATH KUMAR

KISS Linux Commands

Keep it Short and Simple Series

Sharath Kumar R

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Kiss - Linux commands

Overview

This book will teach you :

- History of the Linux commands,
- Linux distributions
- Working of terminal, shell and Linux kernel
- Basic commands:
 - Help commands
 - * System commands
 - * Hardware commands
 - * File commands
 - * Network commands
 - * Process commands

We have a cheat sheet at the end of the book for the easy learning and recall. It contains the lists of commands categorized with a brief description all in a single page. We'll assume no prior knowledge, but by the end we hope you'll feel a bit more comfortable the next time you're use the terminal to run the commands.

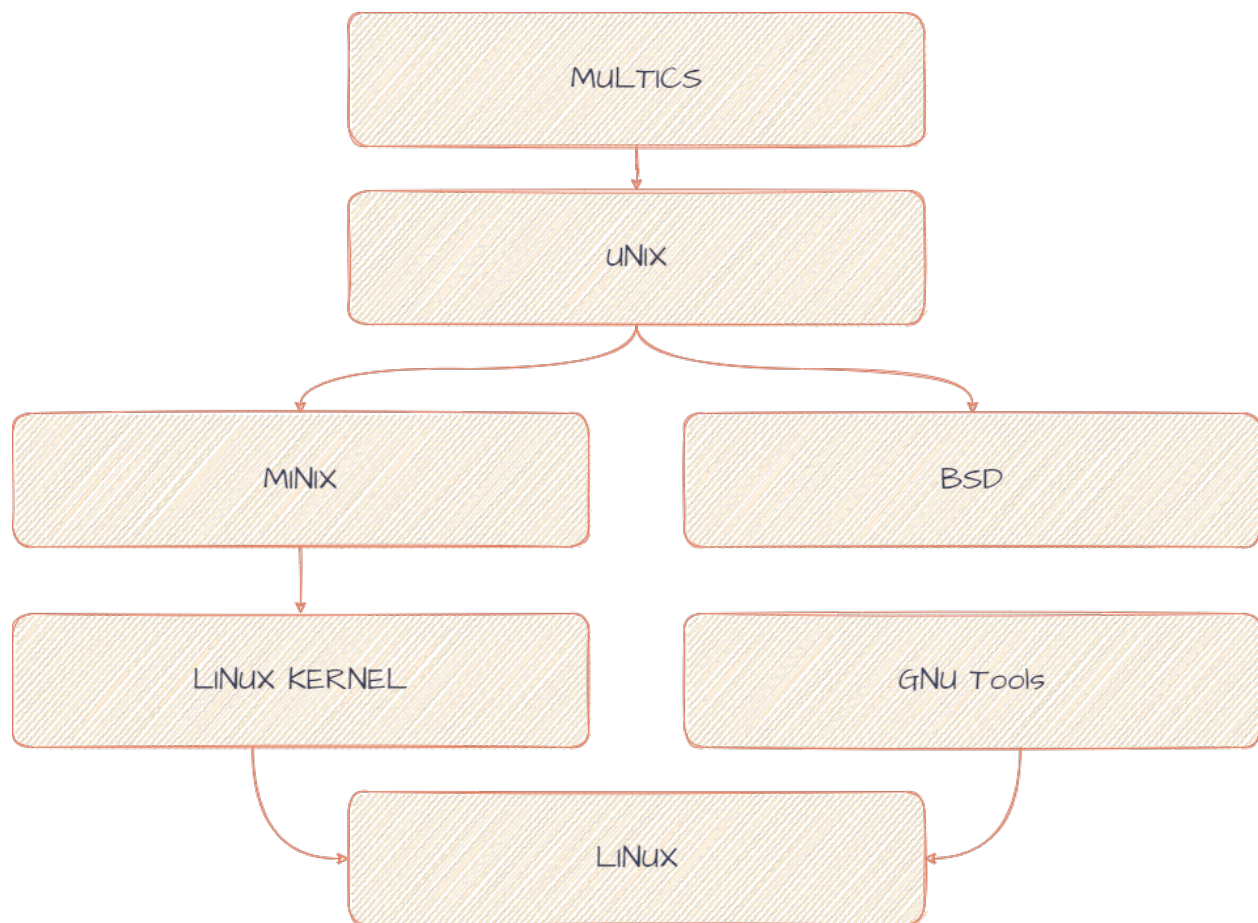
What you'll need

A computer running any distribution of Linux

Every Linux system has a terminal. This book includes specific steps for Ubuntu version 12.04 but most of the content should work regardless of your Linux distribution.

A module is dedicated to get you started with a Ubuntu.

History of Linux



Why was it created?

After AT&T had dropped out of the Multics project, the Unix operating system was created by Ken Thompson and Dennis Ritchie (both of AT&T Bell Laboratories) in 1969 and first released in 1970. Later they rewrote it in a new programming language, C, to make it portable.

In 1977, the Berkeley Software Distribution (BSD) was developed by the Computer Systems Research Group (CSRG) from UC Berkeley, based on the 6th edition of Unix from AT&T.

In 1987, MINIX, a Unix-like system intended for academic use, was released by Andrew S. Tanenbaum to exemplify the principles conveyed in his textbook, Operating Systems: Design and Implementation.

While source code for the system was available, modification and redistribution were restricted. Back then, a commercial UNIX operating system for Intel 386 PCs was too expensive for private users.

Thus, Linux began in 1991 as a personal project by Linus Torvalds: to create a new free operating

system kernel. Linus Torvalds had wanted to call his operating system Freax, (“free”, “freak”, and “x” (as an allusion to Unix))

The designation “Linux” was initially used only for the Linux kernel. The kernel was, however, frequently used together with other software, especially that of the GNU project. The combination of GNU and Linux kernel is called “GNU/Linux”.

The GNU Project wanted to develop a complete free Unix-like system: GNU.

By the early 90s GNU had put together the whole system except the kernel. They had started working on creating a kernel, the GNU Hurd. The kernel took a lot longer to develop. Fortunately, they didn’t have to wait for the Hurd, because of Linux which was freed in 1992. They combined Linux kernel with the GNU system to make a complete free system—The GNU/Linux system.

Linux Distributions

Linux kernel + auxiliary software = distributions

Linux distribution comprises of:

- Linux kernel,
- GNU tools and libraries,
- additional software,
- documentation,
- a window system,
- a window manager, and
- a desktop environment

Linux is the kernel: the program in the system that allocates the machine’s resources to the other programs that you run. It can useful with the addition of the above components.

Linux kernel based operating systems

So if we were to remove the GNU tools then they become kernel based operating system like android. Google’s open-source chief, agree that Android is a Linux distribution; others, such as Google engineer Patrick Brady, disagree by noting the lack of support for many GNU tools in Android, including glibc.

Creation of Linux distributions influenced by the following factors:

- Commercial or non-commercial

- Types of users: enterprise or home users
- Hardware support
- Device Types: server, desktop or embedded device.
- General purpose or specialized toward specific functionalities (firewall, routing))

Linux distributions:

- Debian with deb packages developed by the community-supported Debian Project, which was established by [Ian Murdock](https://en.wikipedia.org/wiki/Ian_Murdock)* on August 16, 1993“Debian“ was formed as a combination of the first name of his then-girlfriend (later ex-wife) Debra Lynn and his own first name.
 - Ubuntu Linux distribution based on Debian. Ubuntu is developed by British company Canonical. - There are several distributions based on Ubuntu that mainly replace the [GNOME](https://en.wikipedia.org/wiki/GNOME)† stock desktop environment, like: - [Kubuntu](https://en.wikipedia.org/wiki/Kubuntu)‡ based on [KDE](https://en.wikipedia.org/wiki/KDE)§, - [Lubuntu](https://en.wikipedia.org/wiki/Lubuntu)¶ based on [LXQT](https://en.wikipedia.org/wiki/LXQT)||, - [Xubuntu](https://en.wikipedia.org/wiki/Xubuntu)** based on [XFCE](https://en.wikipedia.org/wiki/XFCE)††, - [Linux Mint](https://en.wikipedia.org/wiki/Linux_Mint)‡‡, a distribution based on Ubuntu.
- [Fedora Linux](https://en.wikipedia.org/wiki/Fedora_Linux)§§, a community distribution sponsored by [Red Hat](https://en.wikipedia.org/wiki/Red_Hat)¶¶.
 - [Red Hat Enterprise Linux](https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux)*** (RHEL), a derivative of Fedora Linux, maintained and supported by Red Hat.
- [openSUSE](https://en.wikipedia.org/wiki/openSUSE)†††, a community distribution mainly sponsored by German company [SUSE](https://en.wikipedia.org/wiki/SUSE)‡‡‡.
 - [SUSE Linux Enterprise](https://en.wikipedia.org/wiki/SUSE_Linux_Enterprise)§§§, derived from openSUSE, maintained and supported by SUSE.
- [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux)¶¶¶, distribution targeted at experienced Linux users and maintained by a volunteer community.
 - [Manjaro Linux](https://en.wikipedia.org/wiki/Manjaro_Linux)¹⁷, a derivative of Arch Linux that includes a graphical installer and other ease-of-use features for less experienced Linux users.

*https://en.wikipedia.org/wiki/Ian_Murdock

†<https://en.wikipedia.org/wiki/GNOME>

‡<https://en.wikipedia.org/wiki/Kubuntu>

§<https://en.wikipedia.org/wiki/KDE>

¶<https://en.wikipedia.org/wiki/Lubuntu>

||<https://en.wikipedia.org/wiki/LXQT>

**<https://en.wikipedia.org/wiki/Xubuntu>

††<https://en.wikipedia.org/wiki/XFCE>

‡‡https://en.wikipedia.org/wiki/Linux_Mint

§§https://en.wikipedia.org/wiki/Fedora_Linux

¶¶https://en.wikipedia.org/wiki/Red_Hat

***https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux

†††<https://en.wikipedia.org/wiki/OpenSUSE>

‡‡‡<https://en.wikipedia.org/wiki/SUSE>

§§§https://en.wikipedia.org/wiki/SUSE_Linux

¶¶¶https://en.wikipedia.org/wiki/Arch_Linux

¹⁷https://en.wikipedia.org/wiki/Manjaro_Linux

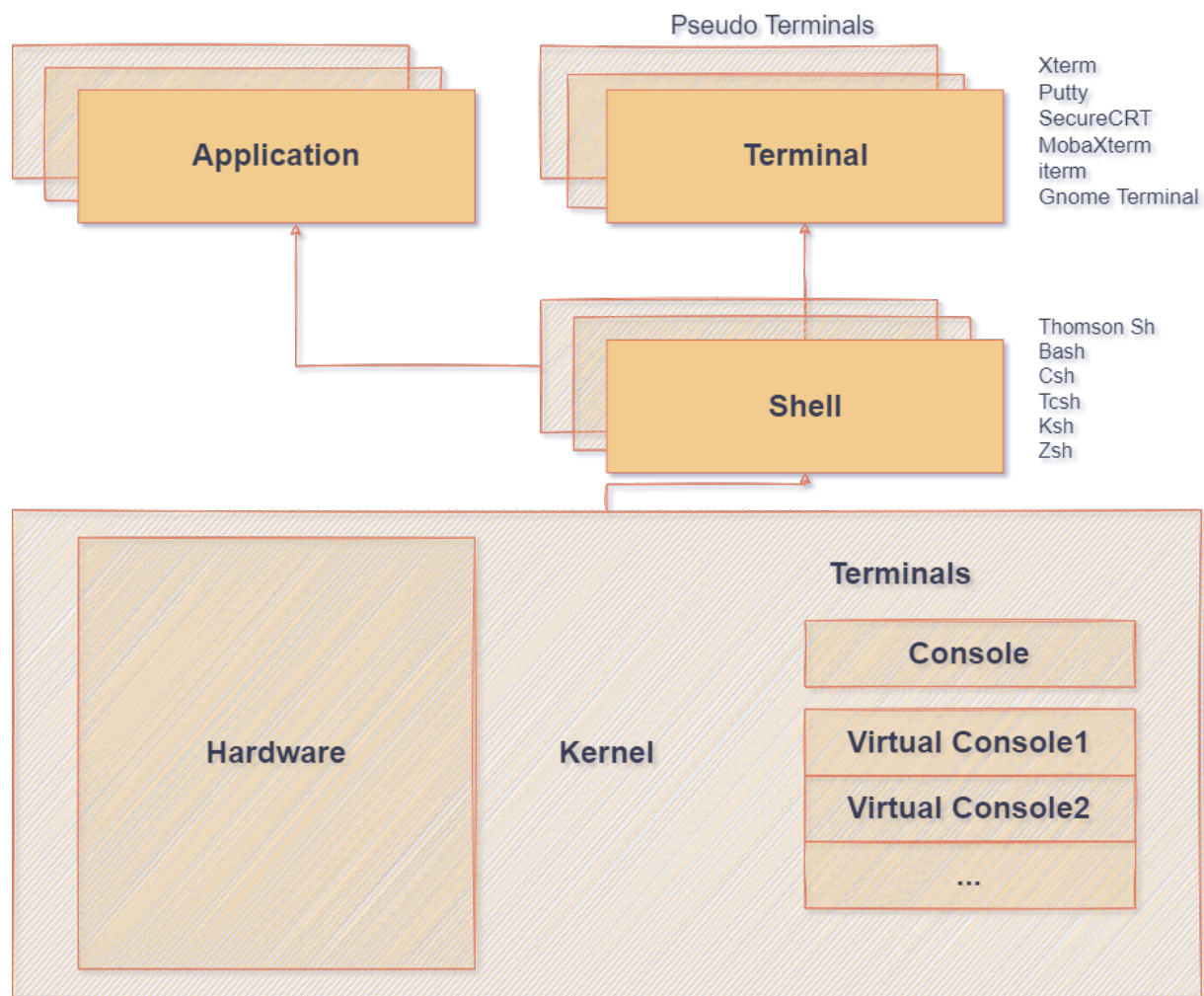
Command line interface

The OS or operating system is an interface between user and the hardware components of a device. To interface with the OS there are only two ways:

A command line interface (CLI) uses a terminal or to interact with an operating system. User responds to a visual prompt by typing a command and receives a response back from the system.

A graphical user interface (GUI) uses graphics, along with a keyboard and a mouse, to provide an interface to a program. A GUI provides graphical components such as:

- windows,
- menus,
- buttons,
- scrollbars,
- icons, and
- the mouse to enable users to interact with the operating system.



Terminal

A terminal emulator is a program that emulates a video terminal. Now what is a video terminal? TTY or “teletypewriter” was the first kind of terminal. Rather than a screen we would have typewriter. When you type on it, you’re seeing the text on a piece of paper AND inputting that text into a computer. When that computer replies, you’ll see the typewriter automatically type on the same paper. Now that the physical terminal’s job can be created by a program, the program came to be called a terminal emulator.

A shell is a user interface for access to an operating system’s services. The user interacts with the shell using a terminal**. It is a program that opens a graphical window and lets you interact with the shell**.

Terminal vs Pseudo terminal

Terminals(tty) are devices that provide enhanced input/output capabilities. These features are designed to make it easier for humans to interact with computers, and are useless for programs trying to talk to each other. Some of the characteristics of a terminal:

- The terminal receives all keystrokes and mouse input, and also has exclusive access to what is shown on the monitor.
- Terminals also have job control, which lets you to interrupt a process(Ctrl-C) or to suspend a process(Ctrl-Z).

Linux has different user modes. Single-user mode is a mode in which a multiuser computer operating system boots into a single superuser. When you are in single-user mode, the console is always terminal. The console differs from ordinary terminals. It lacks job control.

Pseudoterminals (ptys) a pair of devices; one master, one slave. ****The files `/dev/ptya0` and `/dev/ttya0` form a master/slave pair. The slave end of a pty behaves just like a real terminal. A pty has job control and other features, just like a tty, but it does not directly have access to the keyboard and display.

How are ptys useful?

Ptys are used by terminal emulators such as xterm. The xterm process opens the master end, and launches a shell that initially has the slave end as its stdin, stdout, and stderr. xterm will write the keystrokes you enter in the xterm window directly into the master end; that data goes through the kernel pty, which removes job control characters and acts on them, and translates newlines and so on; then the shell gets as input.

Another example is ssh. The ssh daemon (sshd) listens to a port (usually TCP 22) on the remote server. sshd obtains a master/slave pseudoterminal pair, and runs a shell on the slave end, while keeping the master. Whatever it receives on the master end, it sends through the network back to you; whatever keystrokes arrive for it from the network, it writes into the master end.

Console

Sometimes, terminal emulators are called “virtual terminals”, and terminal emulators which have the role of a console(single user mode) are thus called “virtual consoles”. “virtual console” refers to the terminal emulators that are built in in the kernel and that can be accessed at any time by pressing Ctrl+Alt+F1 .. F12 at the console’s keyboard. Consoles are terminal emulators running in the kernel space. use the `/dev/console` device which is sym link to the `/dev/tty`. Pseudo terminal emulators are terminal emulators running in the user space which use the `/dev/ptmx[number]` for master and `/dev/pts` for the slave.

Shell

Every Linux distribution includes tools and libraries. One of the tools is the shell tool. The shell tool provides an interface between the user and the kernel and executes programs called commands.

Different shells

There are multiples shells as follows:

Bourne shell (sh)

The **Bourne shell** (**sh**) is a [shell* command-line interpreter†](https://en.wikipedia.org/wiki/Shell_(computing)) for computer [operating systems‡](https://en.wikipedia.org/wiki/Operating_system). The Bourne shell was the default [shell§](https://en.wikipedia.org/wiki/Unix_shell) for [Version 7 Unix¶](https://en.wikipedia.org/wiki/Version_7_Unix) developed by Stephen Bourne, which was a replacement of the Thompson shell. The Thompson shell was the first Unix shell and was written by Ken Thompson.

Bash shell (bash)

Bash (Bourne Again Shell) is a Unix shell and command language written by Brian Fox for the GNU Project as a replacement for the Bourne shell.

Almquist shell (ash)

BSD-licensed replacement for the Bourne Shell. Used in resource-constrained environments.

Debian Almquist shell (dash):

A modern replacement for ash in Debian and Ubuntu

Tenex C shell (Tcsh):

Tcsh is a better version of the C shell (csh), which was developed in the UNIX era. tcsh added a few concepts borrowed from the TENEX operating system, which is the source of the “t”. It is favored by programmers because its syntax is very similar to the C programming language. They can use its scripting features without having to learn bash. It is also the default shell in operating systems from the BSD family.

*[https://en.wikipedia.org/wiki/Shell_\(computing\)](https://en.wikipedia.org/wiki/Shell_(computing))

†https://en.wikipedia.org/wiki/Command-line_interface#Command-line_interpreter

‡https://en.wikipedia.org/wiki/Operating_system

§https://en.wikipedia.org/wiki/Unix_shell

¶https://en.wikipedia.org/wiki/Version_7_Unix

Korn shell (ksh):

KornShell (ksh) is a Unix shell which was developed by David Korn at Bell Labs in the early 1980s. The initial development was based on Bourne shell source code.

Z shell (zsh):

The ZSH is based on ksh and also includes some features of bash and tcsh. Paul Falstad wrote the first version of Zsh in 1990 while a student at Princeton University. The name zsh derives from the name of Yale professor Zhong Shao. Paul Falstad regarded Shao's login-id, "zsh", as a good name for a shell.

Bash, or the Bourne-Again Shell, is by far the most widely used choice and it comes installed as the default shell in the most popular Linux distributions.

Kernel

The Linux Kernel

Every operating system (OS) has a **kernel**. The kernel is the layer that bridges the hardware with the main programs that run on a computer. The kernel is the core of the OS and is the first to load when the computer boots up. It remains in the computer's memory throughout a session. It is responsible for providing an interface for all applications, controlling the hardware and allowing processes to get information from each other. There are five types of kernels:

- A micro-kernel, which only contains basic functionality;
- A monolithic kernel, which contains many [device drivers](https://simple.wikipedia.org/wiki/Device_driver)*.
- Hybrid Kernel
- Exo Kernel
- Nano Kernel

Linux uses a **monolithic** kernel, so called because it includes device drivers and the file management system and therefore requires more memory. On the opposite end of the spectrum, a **microkernel** aims to occupy the smallest amount of memory by managing only the necessities such as the CPU, memory and **inter-process communication (IPC)**.

Lab setup

This module walks your through the steps to install Ubuntu so that you can try out the commands.

Steps:

*https://simple.wikipedia.org/wiki/Device_driver

- Install virtual box
- Download ubuntu image
- Create a VM using the image
- Start the VM

1. Install the virtual box using the link: <https://www.virtualbox.org/wiki/Downloads>



VirtualBox

Download VirtualBox

Here you will find links to VirtualBox binaries and its source code.

VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 6.1 packages, see [VirtualBox 6.1 builds](#). Version 6.1

VirtualBox 7.0.2 platform packages

- [Windows hosts](#)
- [macOS / Intel hosts](#)
- [Developer preview for macOS / Arm64 \(M1/M2\) hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)
- [Solaris 11 IPS hosts](#)

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 [Technical docs](#)
[Contribute](#)
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1. download ubuntu image.

Use the link <https://www.osboxes.org/ubuntu/> to download the Ubuntu image.

Ubuntu 22.04 Jammy Jellyfish

[VirtualBox](#) [VMware](#) [Info](#)

- VirtualBox (VDI) 64bit [Download](#) Size: 2.59GB

SHA256: 7c7641bdb3f3dfa1beaa76b4edd7d3a2a95a4aa27c88b21cb569e8b40cd8e9

Ubuntu 21.10 Impish Indri

[VirtualBox](#) [VMware](#) [Info](#)

- VirtualBox (VDI) 64bit [Download](#) Size: 2.58GB

SHA256: 7731C3339CF799CE6106FB18F6D813CD832081538577319965F71B4C96B1F1

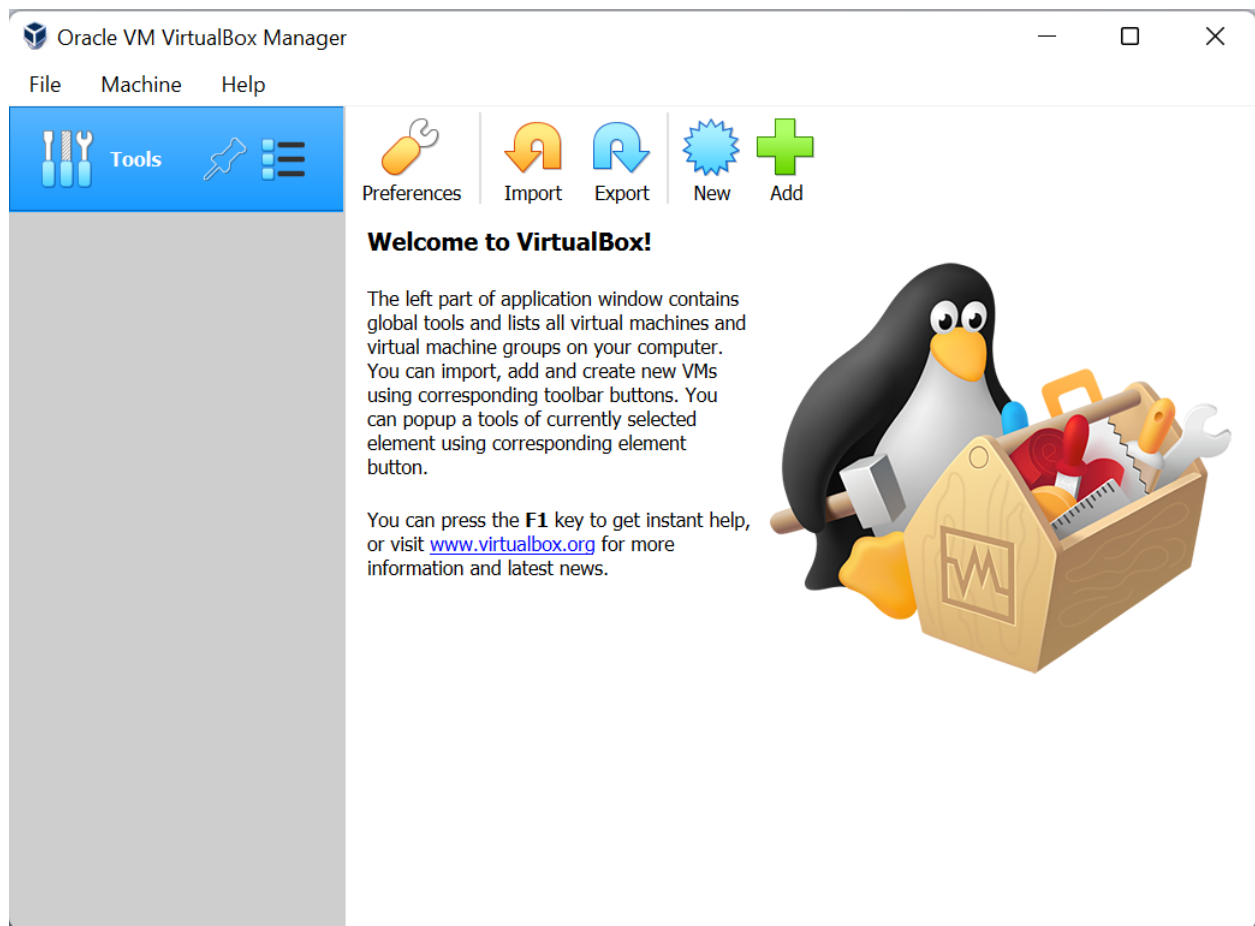
Ubuntu 20.04.4 Focal Fossa

[VirtualBox](#) [VMware](#) [Info](#)

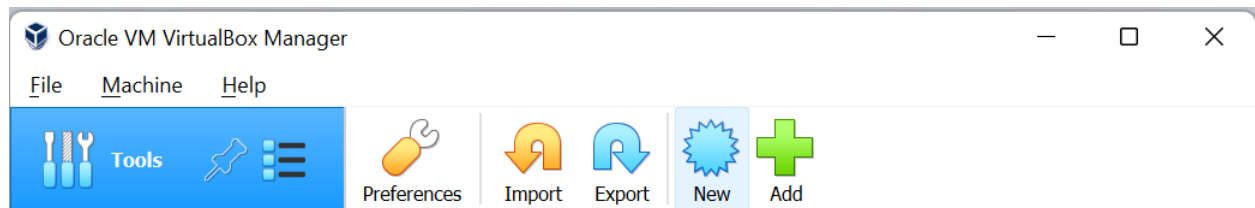
- VirtualBox (VDI) 64bit [Download](#) Size: 2.10GB

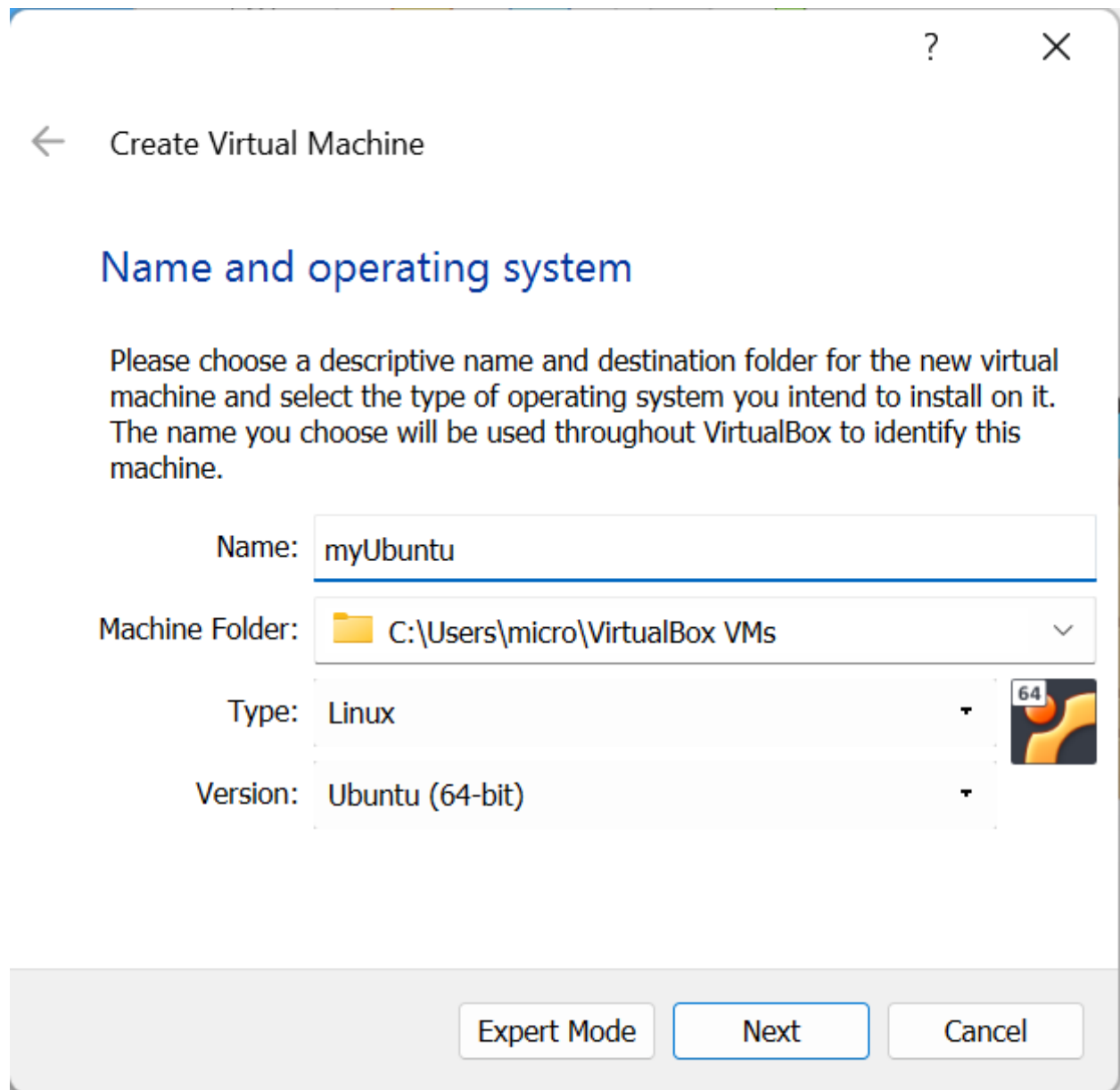
SHA256: 4d21babcba4e4de9be85fb7d34f1838a55e05ac2003d6deaefdb1f9ddc6b55

2. Create a VM using the image.
Launch the virtual box application.



Click on the blue new icon to add a new virtual machine.





← Create Virtual Machine

Name and operating system

Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

Name: myUbuntu

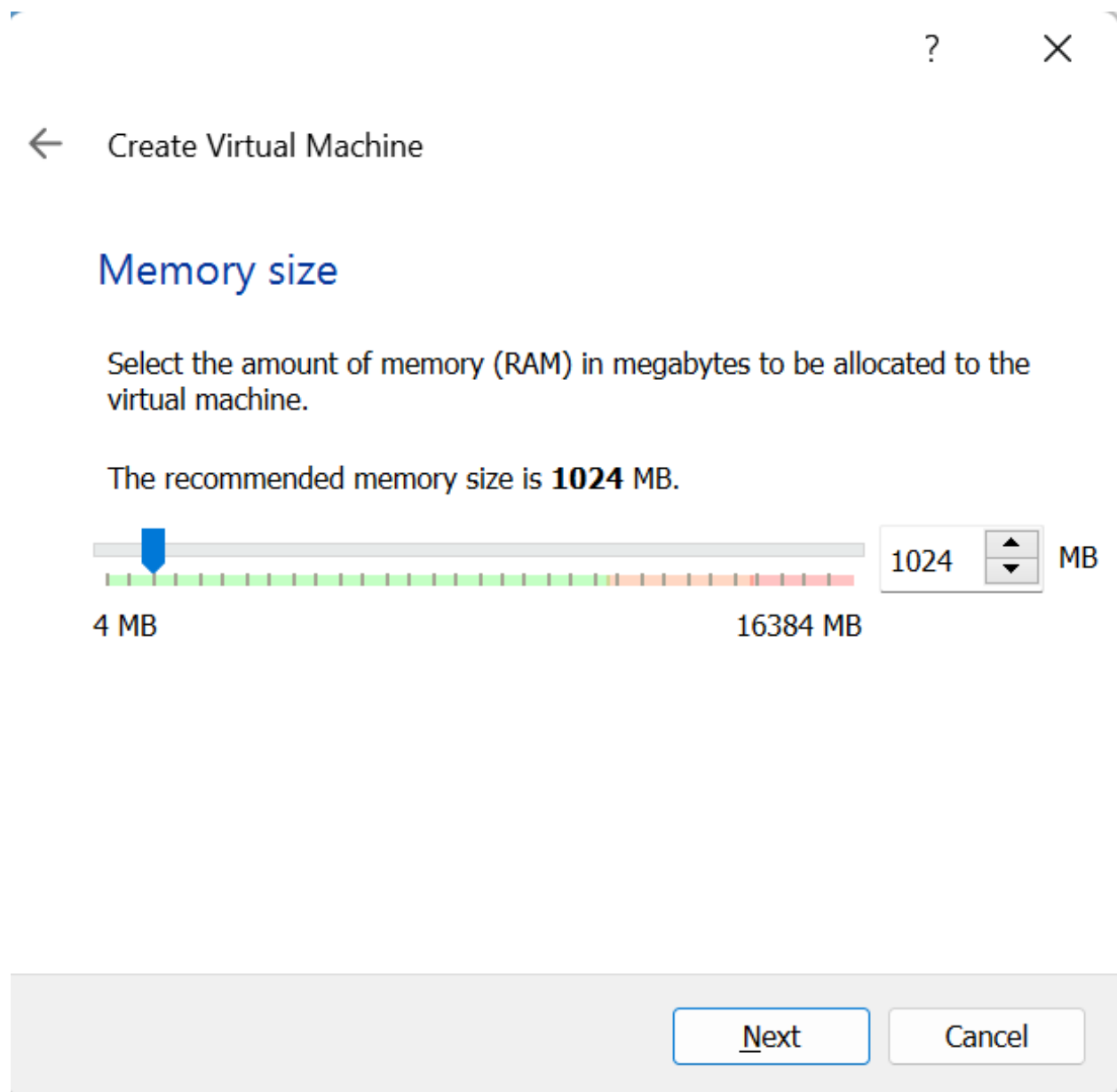
Machine Folder: C:\Users\micro\VirtualBox VMs

Type: Linux

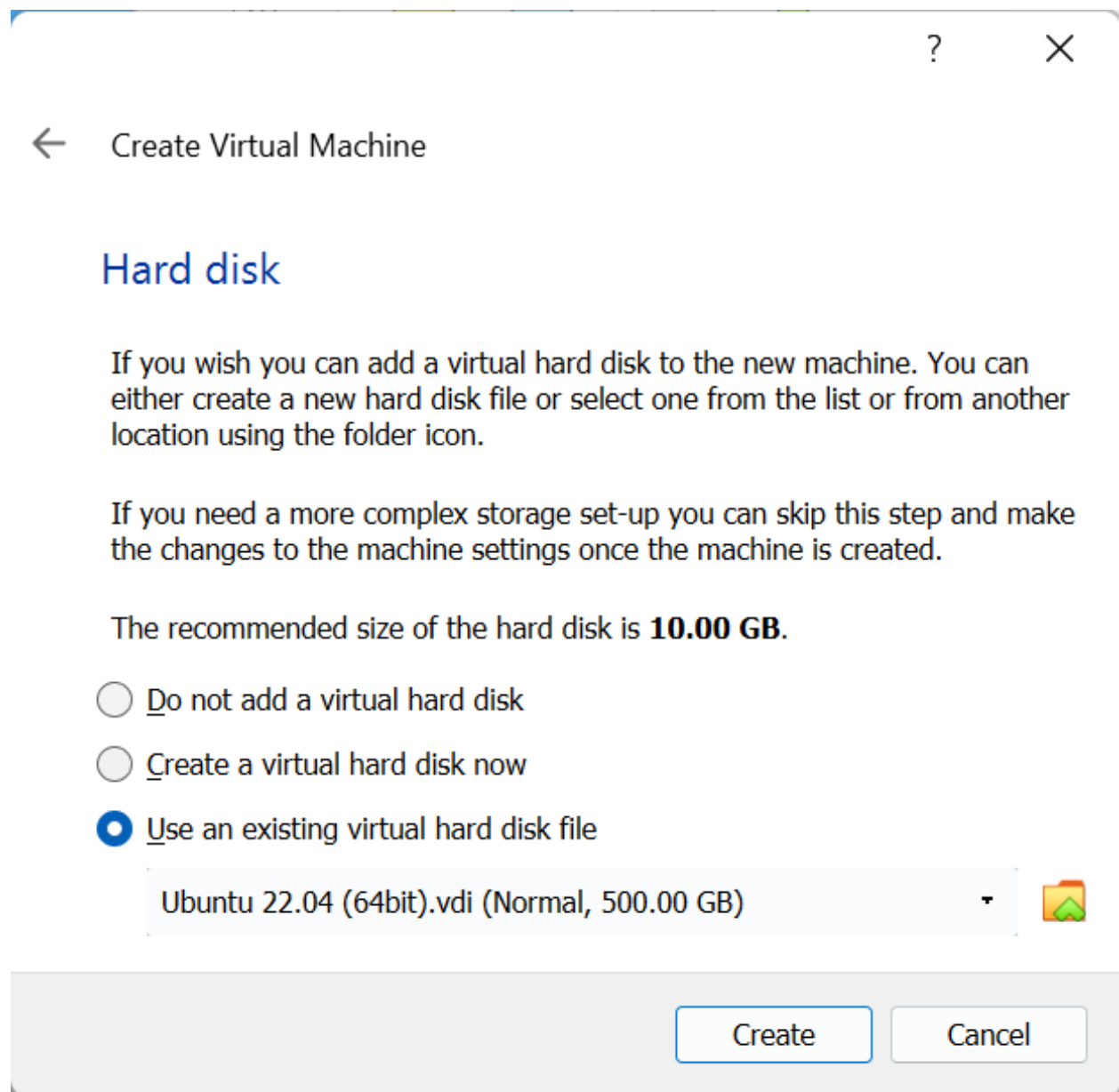
Version: Ubuntu (64-bit)

Expert Mode Next Cancel

Enter an appropriate name for the virtual machine. Here we have name the VM myUbuntu. Choose the defaults for the rest of the options and click on the next.

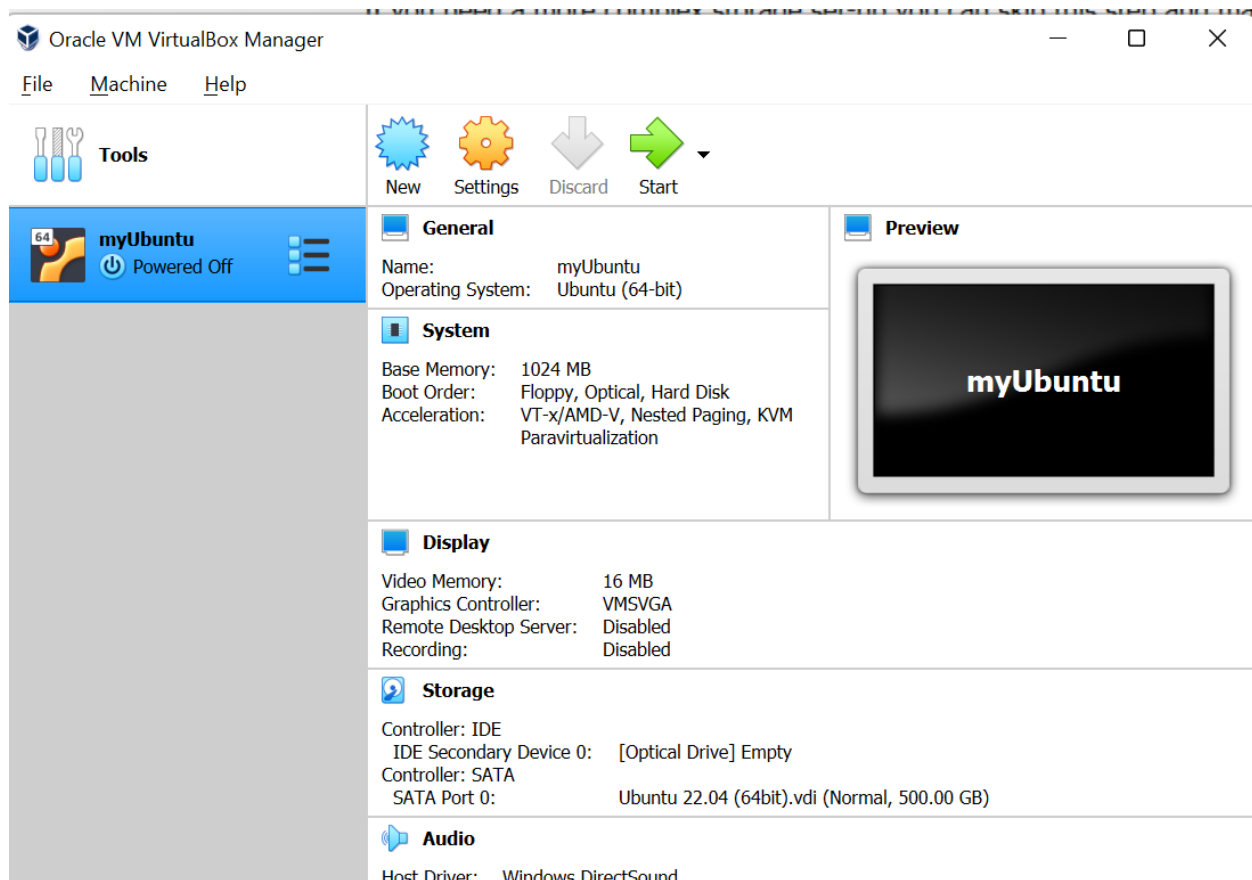


Click on the 'Next' button. Choose the virtual hard disk file downloaded earlier. Click on 'Create' button.



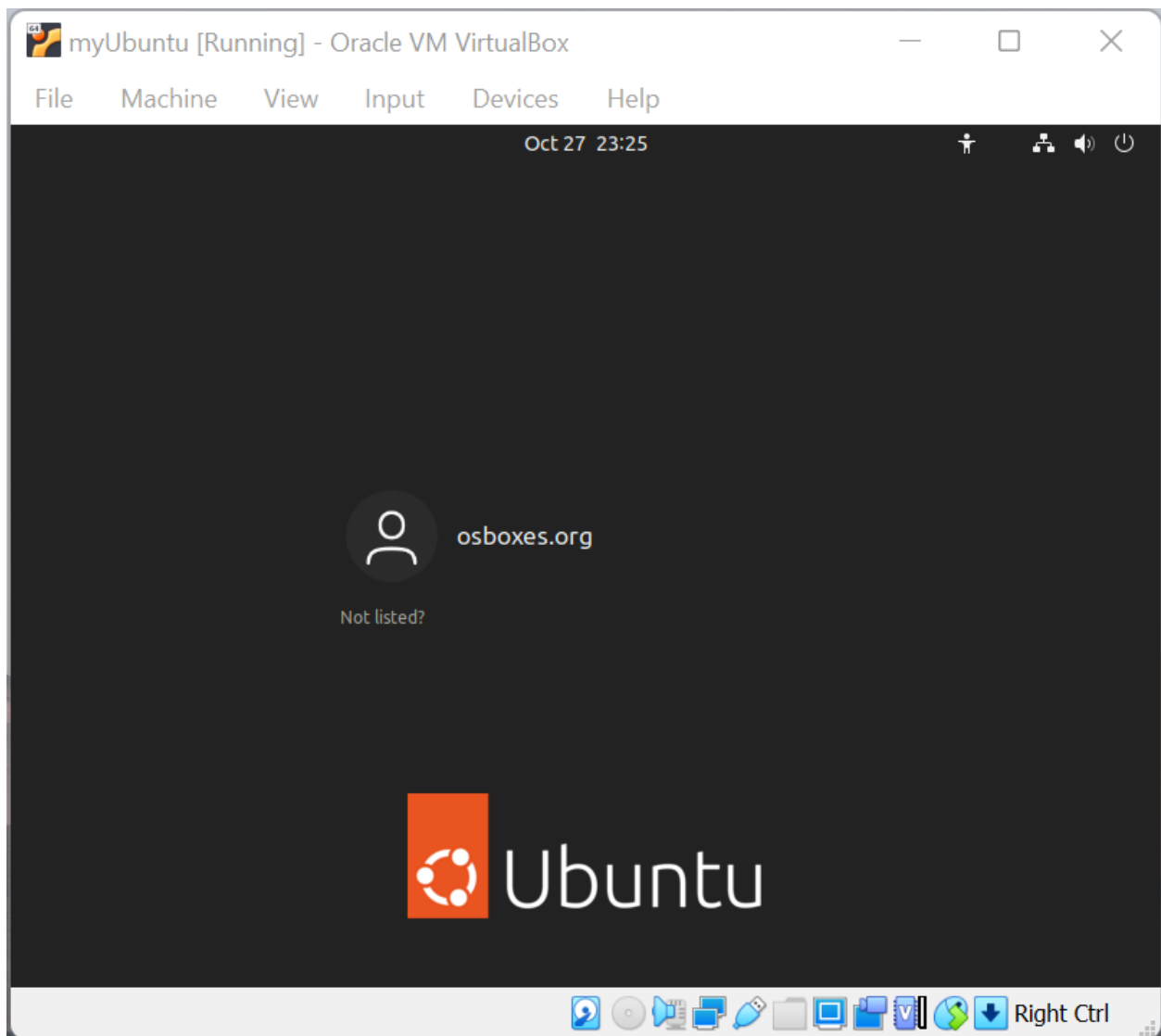
1. Start the VM

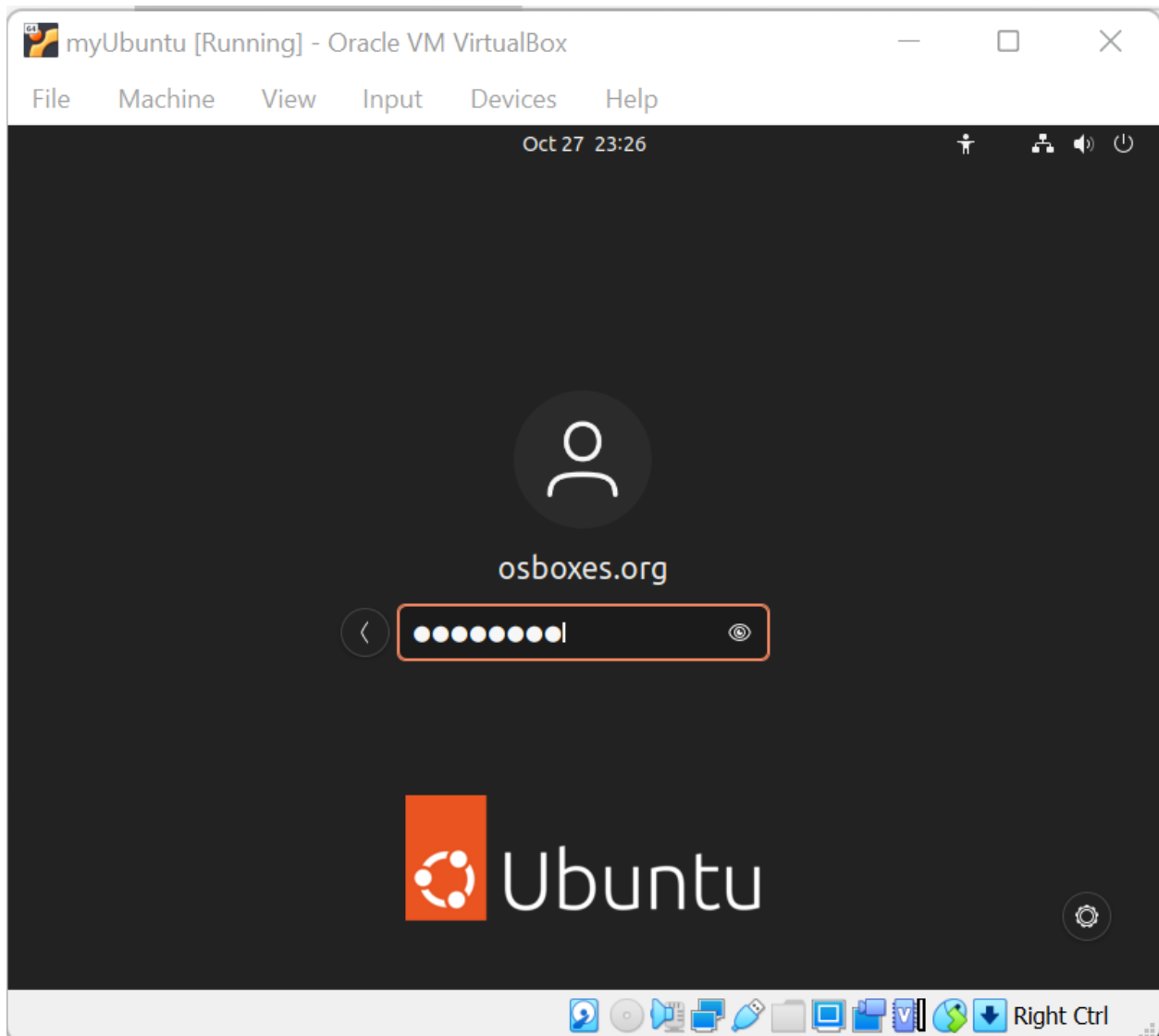
Click on the green 'Start' button to launch the VM.



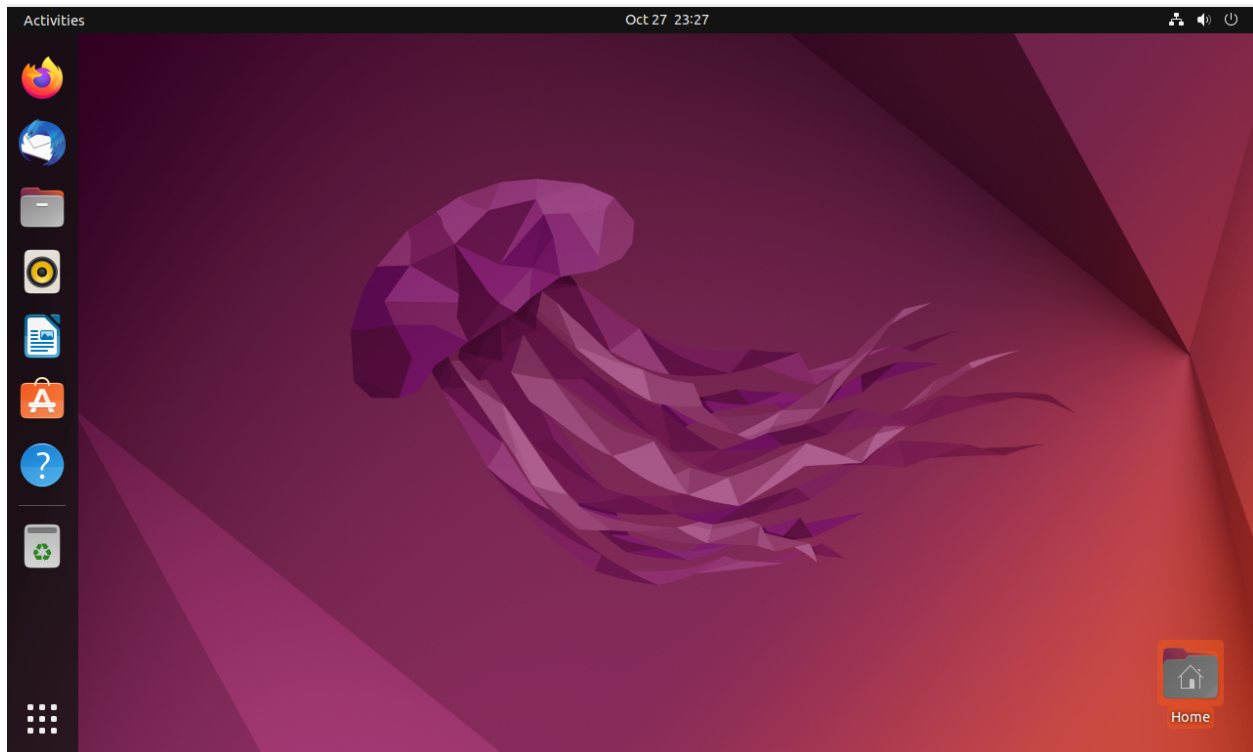
Click on the osboxes.org* user icon and use the password 'osboxes.org'

*<http://osboxes.org>





This will log you into the Ubuntu GUI. Congratulation on setting up the lab.

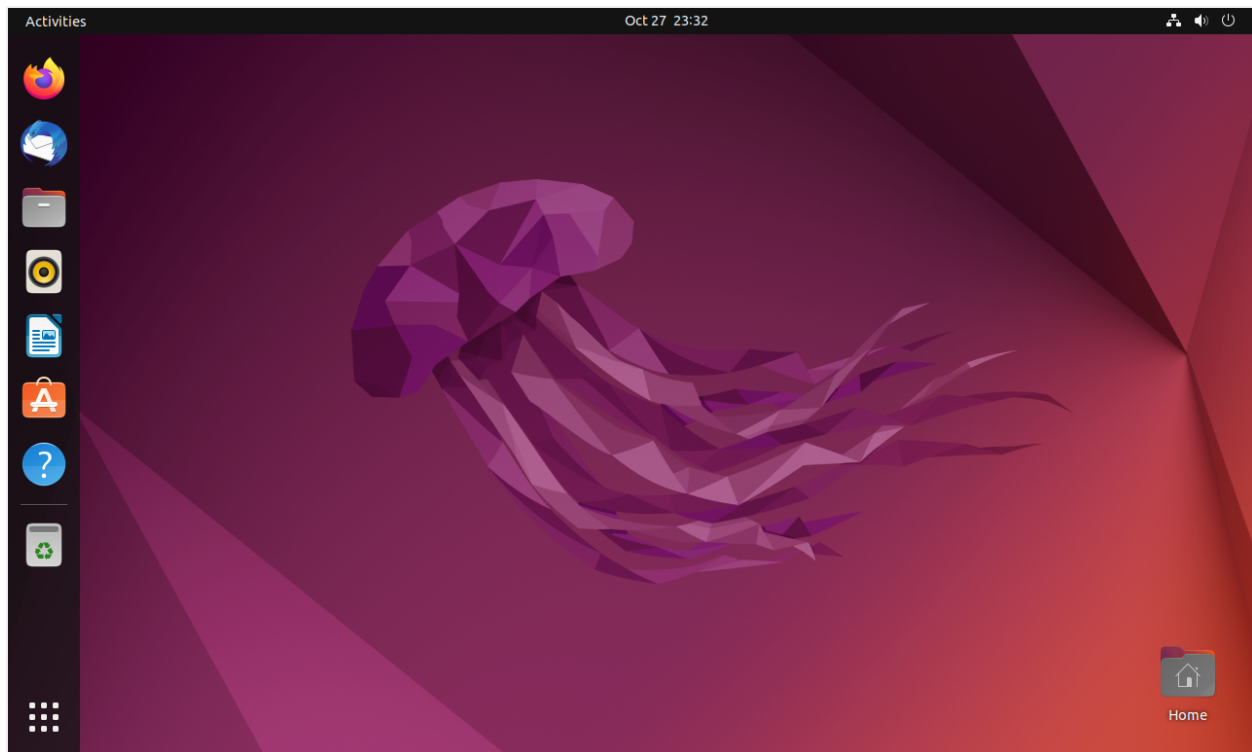


Linux Commands

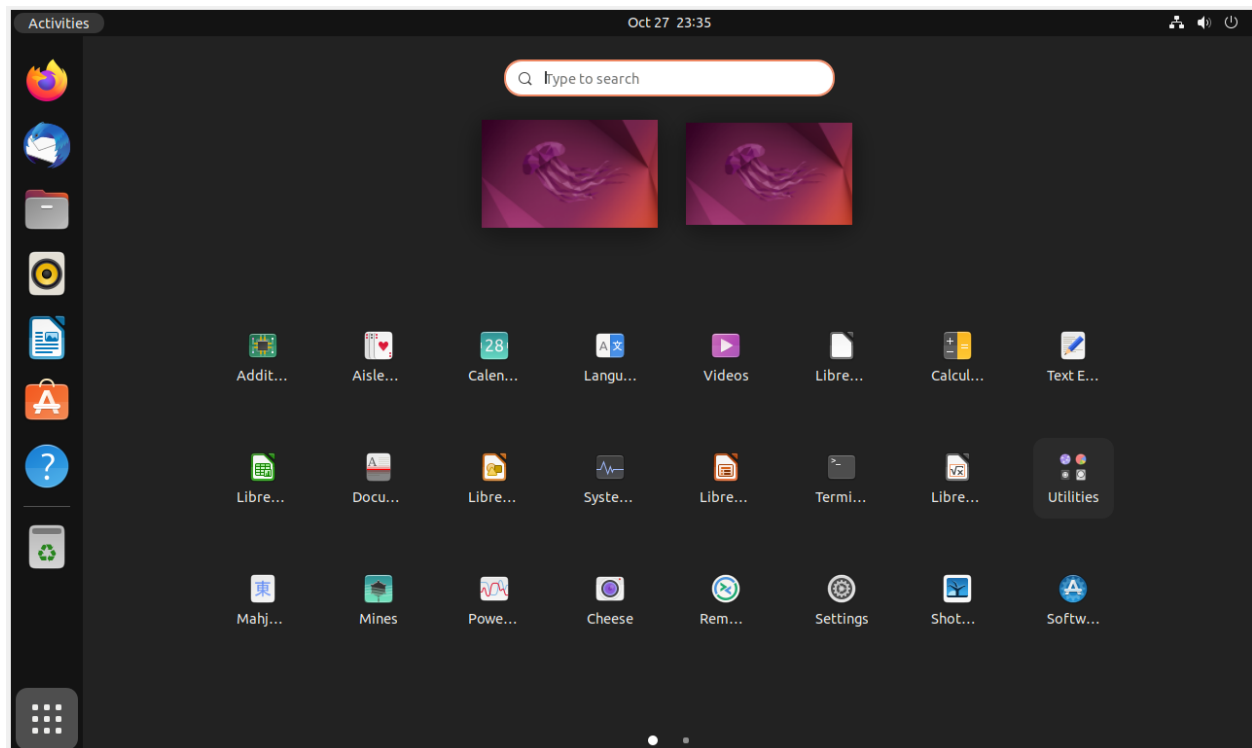
Linux terminal

Lets's see how to launch a terminal to enter the linux commands.

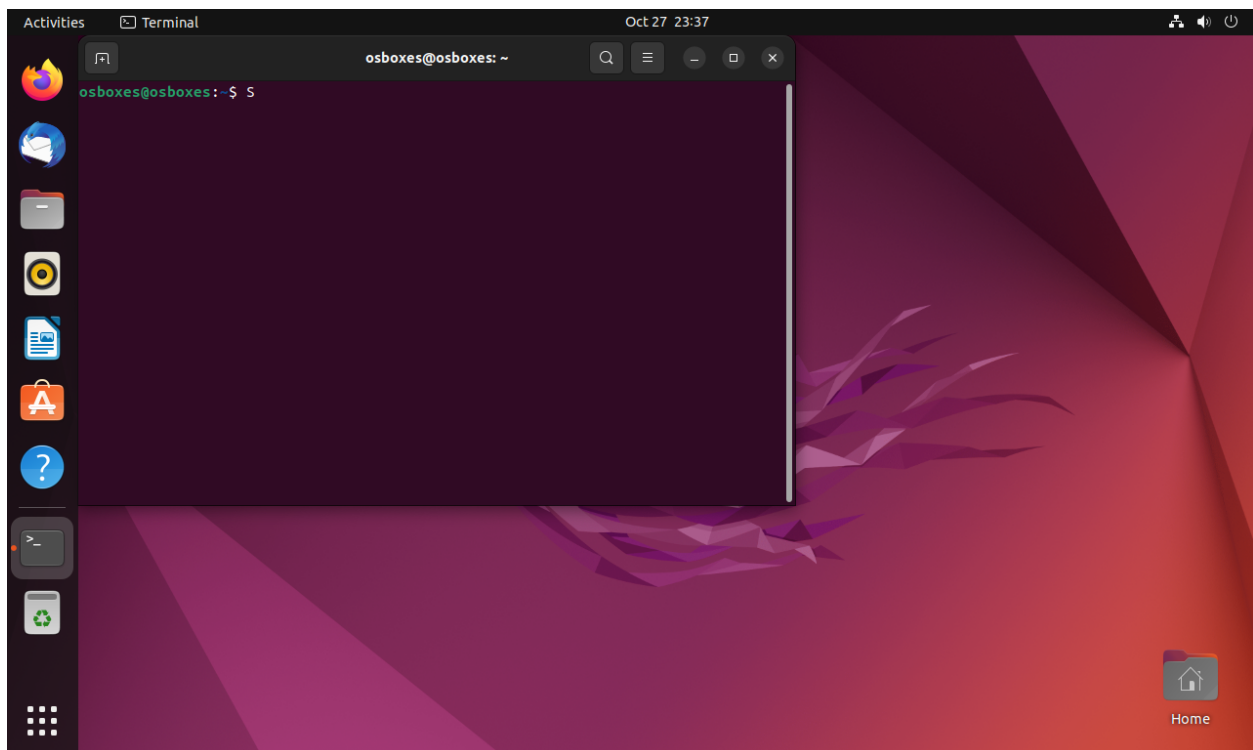
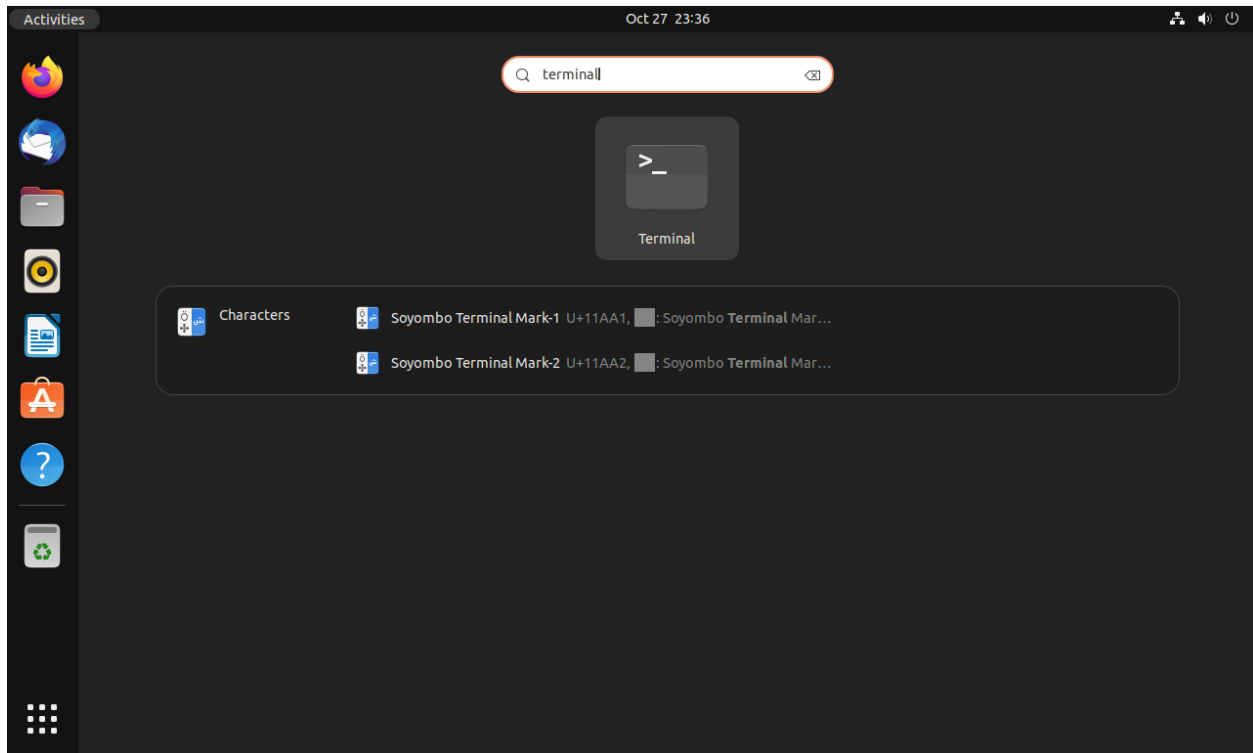
Switch back to the Ubuntu VM and click on the 9 dot icon on the botton left.



Enter terminal in the search bar on the top



Click on the terminal to launch it.



Command Structure

Linux commands share the common form:

```
1 command option(s) argument(s)
```

The *command* identifies the command you want Linux to execute. The name of a Linux command almost always consists of lowercase letters and digits.

*options** modify the way that a command works. Most options consist of a single letter, prefixed by a dash. Often, you can specify more than one option; when you do so, you separate each option with a space or tab.

Linux commands

Before we get started with Linux commands, Let's have a birds eye view of what all the command categories we will be looking at:

- Help commands
- System commands
- Hardware commands
- File commands
- Network commands
- Process commands

Help commands

There are many ways to get help on the Linux commands. Some of the most popular ways are :

- man command
- info command
- help command
- Use the `--help` option
- tldr command

man command

man provides short reference manuals (pages) organized in sections.

That's the traditional Unix documentation system.

The manual is generally split into eight numbered sections, organized as follows:

Section	Description
1	General commands
2	System calls
3	Library functions, covering in particular the C standard library
4	Special files (usually devices, those found in /dev) and drivers
5	File formats and conventions
6	Games and screensavers
7	Miscellaneous
8	System administration commands and daemons

Some of the variations of the **man** command:

```

1 $man man           specifically for the "man" command
2 $man -k man        keyword search for "man"-related entries
3 $apropos man        same as above

```

Let's try out these commands

```

1 osboxes@osboxes:~$ man man
2 MAN(1)
3 ual pager utils
4     MAN(1)
5
6 NAME
7     man - an interface to the system reference manuals
8
9 SYNOPSIS
10     man [man options] [[section] page ...] ...
11     man -k [apropos options] regexp ...
12     man -K [man options] [section] term ...
13     man -f [whatis options] page ...
14     man -l [man options] file ...
15     man -w|-W [man options] page ...

```

Man\

info command

info is another documentation system originating in the GNU project.

A newer form of online help is the **info** command, which replaces the boring, linear output of the **man** with a navigable, hierarchical set of documentation.

Let try to get some info on the info command:

```

1  $info info
2  Next: Stand-alone Info, Up: (dir)
3
4  Stand-alone GNU Info
5  *****
6
7  This documentation describes the stand-alone Info reader which you can
8  use to read Info documentation.
9
10  If you are new to the Info reader, then you can get started by typing
11  'H' for a list of basic key bindings. You can read through the rest of
12  this manual by typing <SPC> and <DEL> (or <Space> and <Backspace>) to
13  move forwards and backwards in it.
14
15  * Menu:
16
17  * Stand-alone Info::          What is Info?
18  * Invoking Info::            Options you can pass on the command line.
19  * Cursor Commands::          Commands which move the cursor within a node.
20  * Scrolling Commands::        Commands for reading the text within a node.
21  * Node Commands::            Commands for selecting a new node.
22  * Searching Commands::        Commands for searching an Info file.
23  * Index Commands::           Commands for looking up in indices.
24  * Xref Commands::            Commands for selecting cross-references.
25  * Window Commands::          Commands which manipulate multiple windows.
26  * Printing Nodes::           How to print out the contents of a node.
27  * Miscellaneous Commands::    A few commands that defy categorization.
28  * Variables::                How to change the default behavior of Info.
29  * Colors and Styles::         Customize the colors used by Info.
30  * Custom Key Bindings::       How to define your own key-to-command bindings.  \
31
32  * Index::                    Global index.

```

Once you get into the info system, navigate using the following keys:

- TAB: go to the next sub-menu on this page
- n: go to the next sibling documentation node (go to the right)
- p: go to the previous sibling documentation node (go to the left)
- u: go to the parent documentation node (go up)
- q: quit out of **info**

help command

help is a built-in command in the bash shell (and that shell only) that documents some of the built-in commands and keywords of that shell. That's an internal documentation system of the bash shell. We will look at what a shell does a little later.

Let try out the help command

[illegible]

✓

```

36
37  exec [-cl] [-a name] [command [argument > true
38  exit [n] type [-afptP] name [name ...]
39  export [-fn] [name[=value] ...] or expor> typeset [-aAfGiIlNrtux] [-p] name[=val>\
40
41  false ulimit [-SHabcdefiklmnpqrstuvxPT] [limi>\
42
43  fc [-e ename] [-lnr] [first] [last] or f> umask [-p] [-S] [mode]
44  fg [job_spec] unalias [-a] name [name ...]
45  for NAME [in WORDS ... ] ; do COMMANDS; > unset [-f] [-v] [-n] [name ...]
46  for (( exp1; exp2; exp3 )); do COMMANDS;> until COMMANDS; do COMMANDS; done
47  function name { COMMANDS ; } or name () > variables - Names and meanings of some >\
48
49  getopts optstring name [arg ...] wait [-fn] [-p var] [id ...]
50  hash [-lr] [-p pathname] [-dt] [name ...> while COMMANDS; do COMMANDS; done
51  help [-dms] [pattern ...] { COMMANDS ; }
52 osboxes@osboxes:~$

```

Use the —help option

Many Linux commands respond to the option —help by printing a short help message. Let try with the info command Try:

```

1 osboxes@osboxes:~$ info --help
2 Usage: info [OPTION]... [MENU-ITEM...]
3
4 Read documentation in Info format.
5
6 Frequently-used options:
7   -a, --all                use all matching manuals
8   -k, --apropos=STRING     look up STRING in indices of all manuals
9   -d, --directory=DIR     add DIR to INFOPATH
10  -f, --file=MANUAL        specify Info manual to visit
11  -h, --help               display this help and exit
12      --index-search=STRING go to node pointed by index entry STRING
13  -n, --node=NODENAME      specify nodes in first visited Info file
14  -o, --output=FILE        output selected nodes to FILE
15  -O, --show-options, --usage go to command-line options node
16      --subnodes            recursively output menu items
17  -v, --variable VAR=VALUE assign VALUE to Info variable VAR
18      --version             display version information and exit
19  -w, --where, --location  print physical location of Info file

```

```

20
21 The first non-option argument, if present, is the menu entry to start from;
22 it is searched for in all 'dir' files along INFOPATH.
23 If it is not present, info merges all 'dir' files and shows the result.
24 Any remaining arguments are treated as the names of menu
25 items relative to the initial node visited.
26
27 For a summary of key bindings, type H within Info.
28
29 Examples:
30     info                                show top-level dir menu
31     info info-stdn                      show the manual for this Info program
32     info emacs                          start at emacs node from top-level dir
33     info emacs buffers                  select buffers menu entry in emacs manual
34     info emacs -n Files                 start at Files node within emacs manual
35     info '(emacs)Files'                 alternative way to start at Files node
36     info --show-options emacs           start at node with emacs' command line options
37     info --subnodes -o out.txt emacs
38                                     dump entire emacs manual to out.txt
39     info -f ./foo.info                  show file ./foo.info, not searching dir
40
41 Email bug reports to bug-texinfo@gnu.org,
42 general questions and discussion to help-texinfo@gnu.org.
43 Texinfo home page: http://www.gnu.org/software/texinfo/
44 osboxes@osboxes:~$

```

Tldr command

community driven man pages. The man command gives a detailed description of other Linux commands. However, if you don't want to read long details, you can use the tldr (*too long; didn't read*) command. For example, let's get information about the info command:

```

1 osboxes@osboxes:~$ tldr info
2 info
3 Reads documentation stored in the info format. More information: https://en.wikipedia\
4 .org/wiki/Info\_\(Unix\).
5
6 - Start reading top-level directory menu:
7     info
8
9 - Start reading at given menu item node from top-level directory:
10    info {{menu_item}}

```

```

11
12 - Start reading at second menu item within first menu item manual:
13     info {{first_menu_item}} {{second_menu_item}}
14 osboxes@osboxes:~$

1 osboxes@osboxes:~$ tldr -u
2 Cloning into 'tldr'...
3 remote: Enumerating objects: 69874, done.
4 remote: Total 69874 (delta 0), reused 0 (delta 0), pack-reused 69874
5 Receiving objects: 100% (69874/69874), 17.45 MiB | 8.37 MiB/s, done.
6 Resolving deltas: 100% (42645/42645), don

```

System information

we shall look at some commands that can help you to extract information about your Linux system. Lets look at the most common sys temcommands. Here is the list of all the command we will look at:

1. uname
2. uptime
3. hostname
4. reboot
5. date
6. timedatectl
7. cal
8. w
9. whoami
10. uname : Print details about the current machine and the operating system running on it. More information: <https://www.gnu.org/software/coreutils/uname>.
 - Print kernel name: `uname`
 - Print system architecture and processor information: `uname --machine --processor`
 - Print kernel name, kernel release and kernel version: `uname --kernel-name --kernel-release --kernel-version`
 - Print system hostname: `uname --nodename`
 - Print all available system information: `uname --all`

Let try out all these commands:

Print system architecture and processor information:

```
1 osboxes@osboxes:~$ uname --machine --processor
2 x86_64 x86_64
3 osboxes@osboxes:~$
```

Print kernel name, kernel release and kernel version:

```
1 osboxes@osboxes:~$ uname --kernel-name --kernel-release --kernel-version
2 Linux 5.15.0-25-generic #25-Ubuntu SMP Wed Mar 30 15:54:22 UTC 2022
3 osboxes@osboxes:~$
```

Print system hostname:

```
1 osboxes@osboxes:~$ uname --nodename
2 osboxes
3 osboxes@osboxes:~$
```

Print all available system information:

```
1 osboxes@osboxes:~$ uname --all
2 Linux osboxes 5.15.0-25-generic #25-Ubuntu SMP Wed Mar 30 15:54:22 UTC 2022 x86_64 x\
3 86_64 x86_64 GNU/Linux
4 osboxes@osboxes:~$
```

b. uptime:

Displays how long the system has been running including load average.

- Print current time, uptime, number of logged-in users and other information: `uptime`
- Show only the amount of time the system has been booted for: `uptime --pretty`
- Print the date and time the system booted up at: `uptime --since`
- Show version information: `uptime --version`

Lets try out all these command:

Print current time, uptime, number of logged-in users and other information:

```
1 osboxes@osboxes:~$ uptime
2 09:13:16 up 22 min,  2 users,  load average: 0.00, 0.01, 0.03
3 osboxes@osboxes:~$
```

Show only the amount of time the system has been booted for:

```
1 osboxes@osboxes:~$ uptime --pretty
2 up 23 minutes
3 osboxes@osboxes:~$
```

Print the date and time the system booted up at:

```
1 osboxes@osboxes:~$ uptime --since
2 2022-10-29 08:50:28
3 osboxes@osboxes:~$
```

Show version information:

```
1 osboxes@osboxes:~$ uptime --version
2 uptime from procps-ng 3.3.17
3 osboxes@osboxes:~$
```

c. hostname : Show or set the system's host name.

- Show current host name: hostname
- Show the network address of the host name: hostname -i
- Show all network addresses of the host: hostname -I
- Show the FQDN (Fully Qualified Domain Name): hostname --fqdn
- Set current host name: hostname {{new_hostname}}

Lets try out all these commands:

Show current host name:

```
1 osboxes@osboxes:~$ hostname
2 osboxes
3 osboxes@osboxes:~$
```

Show the network address of the host name:

```
1 osboxes@osboxes:~$ hostname -i
2 127.0.1.1
3 osboxes@osboxes:~$
```

Show all network addresses of the host:

```
1 osboxes@osboxes:~$ hostname -I
2 192.168.0.180
3 osboxes@osboxes:~$
```

Show the FQDN (Fully Qualified Domain Name):

```
1 osboxes@osboxes:~$ hostname --fqdn
2 osboxes
3 osboxes@osboxes:~$
```

Set current host name:

```
1 osboxes@osboxes:~$ sudo hostname myubuntu
2 [sudo] password for osboxes:
3 Sorry, try again.
4 [sudo] password for osboxes:
5 osboxes@osboxes:~$ hostname
6 myubuntu
7 osboxes@osboxes:~$
```

d. reboot :

Reboot the system.

- Reboot the system: `reboot`
- Power off the system (same as `poweroff`): `reboot --poweroff`
- Halt the system (same as `halt`): `reboot --halt`
- Reboot immediately without contacting the system manager: `reboot --force`

e. date :

Sets or displays the system date.

- Display the current date using the default locale's format: `date +%c`
- Display the current date in UTC, using the ISO 8601 format: `date -u +%Y-%m-%dT%H:%M:%SZ`
- Display the current date as a Unix timestamp (seconds since the Unix epoch): `date +%s`
- Display the current date using the RFC-3339 format (YYYY-MM-DD hh:mm:ss TZ): `date --rfc-3339=s`
- Display the current ISO week number: `date +%V`

Let try out the commands:

Display the current date using the default locale's format:

```
1 osboxes@osboxes:~$ date +%c
2 Sat 29 Oct 2022 09:24:41 AM EDT
3 osboxes@osboxes:~$
```

Display the current date in UTC, using the ISO 8601 format:

```
1 osboxes@osboxes:~$ date -u +%Y-%m-%dT%H:%M:%SZ
2 2022-10-29T13:24:50UTC
3 osboxes@osboxes:~$
```

Display the current date as a Unix timestamp (seconds since the Unix epoch):

```
1 osboxes@osboxes:~$ date +%s
2 1667049910
3 osboxes@osboxes:~$
```

Display the current date using the RFC-3339 format (YYYY-MM-DD hh:mm:ss TZ):

```
1 osboxes@osboxes:~$ date --rfc-3339=s
2 2022-10-29 09:26:45-04:00
3 osboxes@osboxes:~$
```

Display the current ISO week number:

```
1 osboxes@osboxes:~$ date +%V
2 43
3 osboxes@osboxes:~$
```

f.timedatectl :

Control the system time and date.

- Check the current system clock time: `timedatectl`
- List available timezones: `timedatectl list-timezones`
- Enable Network Time Protocol (NTP) synchronization: `timedatectl set-ntp on`
- Change the hardware clock time standard to localtime: `timedatectl set-local-rtc 1`

Lets try out these commands:

Check the current system clock time:

```
1 osboxes@osboxes:~$ timedatectl
2           Local time: Sat 2022-10-29 09:30:14 EDT
3           Universal time: Sat 2022-10-29 13:30:14 UTC
4           RTC time: Sat 2022-10-29 13:30:15
5           Time zone: America/New_York (EDT, -0400)
6 System clock synchronized: yes
7           NTP service: active
8           RTC in local TZ: no
9 osboxes@osboxes:~$
```

List available timezones:

```
1 osboxes@osboxes:~$ timedatectl list-timezones
2 Africa/Abidjan
3 Africa/Accra
4 Africa/Addis_Ababa
5 Africa/Algiers
6 Africa/Asmara
7 Africa/Asmera
8 Africa/Bamako
9 Africa/Bangui
10 Africa/Banjul
11 Africa/Bissau
12 Africa/Blantyre
13 Africa/Brazzaville
14 Africa/Bujumbura
15 Africa/Cairo
16 Africa/Casablanca
17 Africa/Ceuta
18 Africa/Conakry
19 Africa/Dakar
20 Africa/Dar_es_Salaam
21 Africa/Djibouti
22 Africa/Douala
23 Africa/El_Aaiun
24 Africa/Freetown
25 Africa/Gaborone
26 Africa/Harare
27 Africa/Johannesburg
28 Africa/Juba
29 Africa/Kampala
30 Africa/Khartoum
31 Africa/Kigali
```

```

32 Africa/Kinshasa
33 Africa/Lagos
34 Africa/Libreville
35 Africa/Lome
36 Africa/Luanda
37 Africa/Lubumbas
38 ...
39 osboxes@osboxes:~$

```

Enable Network Time Protocol (NTP) synchronization:

```

1 osboxes@osboxes:~$ timedatectl set-ntp on
2 ==== AUTHENTICATING FOR org.freedesktop.timedate1.set-ntp ====
3 Authentication is required to control whether network time synchronization shall be \
4 enabled.
5 Authenticating as: osboxes.org,,, (osboxes)
6 Password:
7 ==== AUTHENTICATION COMPLETE ====
8 osboxes@osboxes:~$

```

Change the hardware clock time standard to localtime:

```

1 osboxes@osboxes:~$ timedatectl set-local-rtc 1
2 ==== AUTHENTICATING FOR org.freedesktop.timedate1.set-local-rtc ====
3 Authentication is required to control whether the RTC stores the local or UTC time. \
4
5 Authenticating as: osboxes.org,,, (osboxes)
6 Password:
7 ==== AUTHENTICATION COMPLETE ====
8 osboxes@osboxes:~$

```

g. cal :

Prints calendar information, with the current day highlighted.

- Display a calendar for the current month: cal
- Display previous, current and next month: cal -3
- Display a calendar for a specific year (4 digits): cal {{year}}
- Display a calendar for a specific month and year: cal {{month}} {{year}}

Lets try out these commands:

Display a calendar for the current month:

```

1 osboxes@osboxes:~$ cal
2      October 2022
3 Su Mo Tu We Th Fr Sa
4
5  2  3  4  5  6  7  8
6  9 10 11 12 13 14 15
7 16 17 18 19 20 21 22
8 23 24 25 26 27 28 29
9 30 31
10 osboxes@osboxes:~$

```

Display previous, current and next month:

```

1 osboxes@osboxes:~$ cal -3
2      September 2022      October 2022      November 2022
3 Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
4
5  4  5  6  7  8  9 10  2  3  4  5  6  7  8  6  7  8  9 10 11 12
6 11 12 13 14 15 16 17  9 10 11 12 13 14 15 13 14 15 16 17 18 19
7 18 19 20 21 22 23 24 16 17 18 19 20 21 22 20 21 22 23 24 25 26
8 25 26 27 28 29 30  23 24 25 26 27 28 29 27 28 29 30
9
10 30 31
10 osboxes@osboxes:~$

```

Display a calendar for a specific year (4 digits):

```

1 osboxes@osboxes:~$ cal 2022
2
3      2022
4      January      February      March
5 Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
6
7  2  3  4  5  6  7  8  6  7  8  9 10 11 12  6  7  8  9 10 11 12
8  9 10 11 12 13 14 15 13 14 15 16 17 18 19 13 14 15 16 17 18 19
9 16 17 18 19 20 21 22 20 21 22 23 24 25 26 20 21 22 23 24 25 26
10 23 24 25 26 27 28 29 27 28  27 28 29 30 31
11 30 31
12
13      April      May      June
14 Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
15
16  3  4  5  6  7  8  9  8  9 10 11 12 13 14  5  6  7  8  9 10 11
17 10 11 12 13 14 15 16 15 16 17 18 19 20 21 12 13 14 15 16 17 18

```

```

17 17 18 19 20 21 22 23 22 23 24 25 26 27 28 19 20 21 22 23 24 25
18 24 25 26 27 28 29 30 29 30 31 26 27 28 29 30
19
20          July                August                September
21  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa
22                1  2          1  2  3  4  5  6                1  2  3
23    3  4  5  6  7  8  9    7  8  9 10 11 12 13    4  5  6  7  8  9 10
24  10 11 12 13 14 15 16  14 15 16 17 18 19 20  11 12 13 14 15 16 17
25  17 18 19 20 21 22 23  21 22 23 24 25 26 27  18 19 20 21 22 23 24
26  24 25 26 27 28 29 30  28 29 30 31          25 26 27 28 29 30
27  31
28
29          October                November                December
30  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa
31                1          1  2  3  4  5                1  2  3
32    2  3  4  5  6  7  8    6  7  8  9 10 11 12    4  5  6  7  8  9 10
33    9 10 11 12 13 14 15  13 14 15 16 17 18 19  11 12 13 14 15 16 17
34  16 17 18 19 20 21 22  20 21 22 23 24 25 26  18 19 20 21 22 23 24
35  23 24 25 26 27 28 29  27 28 29 30          25 26 27 28 29 30 31
36  30 31
37 osboxes@osboxes:~$

```

Display a calendar for a specific month and year:

```

1 osboxes@osboxes:~$ cal 12 2022
2   December 2022
3  Su Mo Tu We Th Fr Sa
4                1  2  3
5    4  5  6  7  8  9 10
6  11 12 13 14 15 16 17
7  18 19 20 21 22 23 24
8  25 26 27 28 29 30 31
9
10 osboxes@osboxes:~$

```

osboxes@osboxes:\$ `cal` Command 'cal' not found, but can be installed with: `sudo apt install ncal` osboxes@osboxes:\$ `sudo apt install ncal`

h. w:

Show who is logged on and what they are doing. Print user login, TTY, remote host, login time, idle time, current process.

- Show logged-in users info: w

- Show logged-in users info without a header: `w -h`

Lets try out these commands:

Show logged-in users info:

```
1 osboxes@osboxes:~$ w
2  09:56:56 up 36 min,  1 user,  load average: 0.00, 0.01, 0.00
3 USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
4 osboxes   pts/0    192.168.0.225  09:20    0.00s  0.03s  0.00s w
5 osboxes@osboxes:~$
```

Show logged-in users info without a header:

```
1 osboxes@osboxes:~$ w -h
2 osboxes pts/0    192.168.0.225  09:20    0.00s  0.05s  0.00s w -h
3 osboxes@osboxes:~$
```

i. `whoami`:

Print the username associated with the current effective user ID.

- Display currently logged username: `whoami`
- Display the username after a change in the user ID: `sudo whoami`

Lets try out these commands

Display currently logged username:

```
1 osboxes@osboxes:~$ whoami
2 osboxes
3 osboxes@osboxes:~$
```

Display the username after a change in the user ID:

```
1 osboxes@osboxes:~$ sudo whoami
2 root
3 osboxes@osboxes:~$
```

Hardware information

There are plenty of commands to check information about the hardware of a Linux system. Let us take a quick look at some of the most commonly used commands to check information and configuration details about various hardware peripherals and devices.

Lets look at the most common hardware commands. Here is the list of all the command we will look at:

1. lscpu
2. lshw
3. lsblk
4. df
5. du
6. free
7. lscpu

Displays information about the CPU architecture.

- Display information about all CPUs: lscpu
- Display information in a table: lscpu --extended
- Display only information about offline CPUs in a table: lscpu --extended --offline

Lets try out these commands:

Display information about all CPUs:

```

1  osboxes@osboxes:~$ lscpu
2  Architecture:          x86_64
3  CPU op-mode(s):       32-bit, 64-bit
4  Address sizes:         48 bits physical, 48 bits virtual
5  Byte Order:            Little Endian
6  CPU(s):                1
7  On-line CPU(s) list:   0
8  Vendor ID:             AuthenticAMD
9  Model name:            AMD Ryzen 5 5600G with Radeon Graphics
10  CPU family:            25
11  Model:                 80
12  Thread(s) per core:    1
13  Core(s) per socket:    1
14  Socket(s):             1
15  Stepping:              0
16  BogomIPS:              7785.37
17  Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca c\
18  mov
```

```

19          pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext \
20  fxs
21          r_opt rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpu\
22  id
23          extd_apicid tsc_known_freq pni pclmulqdq monitor ssse3 cx1\
24  6 s
25          se4_1 sse4_2 x2apic movbe popcnt aes xsave avx rdrand hype\
26  rvi
27          sor lahf_lm cr8_legacy abm sse4a misalignsse 3dnowprefetch\
28  vm
29          mcall fsgsbase avx2 invpcid rdseed clflushopt arat
30  Virtualization features:
31    Hypervisor vendor:    KVM
32    Virtualization type:  full
33  Caches (sum of all):
34    L1d:                  32 KiB (1 instance)
35    L1i:                  32 KiB (1 instance)
36    L2:                   512 KiB (1 instance)
37    L3:                   16 MiB (1 instance)
38  NUMA:
39    NUMA node(s):         1
40    NUMA node0 CPU(s):    0
41  Vulnerabilities:
42    Itlb multihit:        Not affected
43    L1tf:                 Not affected
44    Mds:                  Not affected
45    Meltdown:             Not affected
46    Spec store bypass:    Not affected
47    Spectre v1:           Mitigation; usercopy/swapgs barriers and __user pointer sa\
48  nit
49          ization
50    Spectre v2:           Mitigation; Retpolines, STIBP disabled, RSB filling
51    Srbds:                Not affected
52    Tsx async abort:      Not affected
53  osboxes@osboxes:~$

```

Display information in a table:

```

1  osboxes@osboxes:~$ lscpu --extended
2  CPU NODE SOCKET CORE L1d:L1i:L2:L3 ONLINE
3    0    0      0     0 0:0:0:0          yes
4  osboxes@osboxes:~$

```

Display only information about offline CPUs in a table:

```
1 osboxes@osboxes:~$ lscpu --extended --offline
2 osboxes@osboxes:~$
```

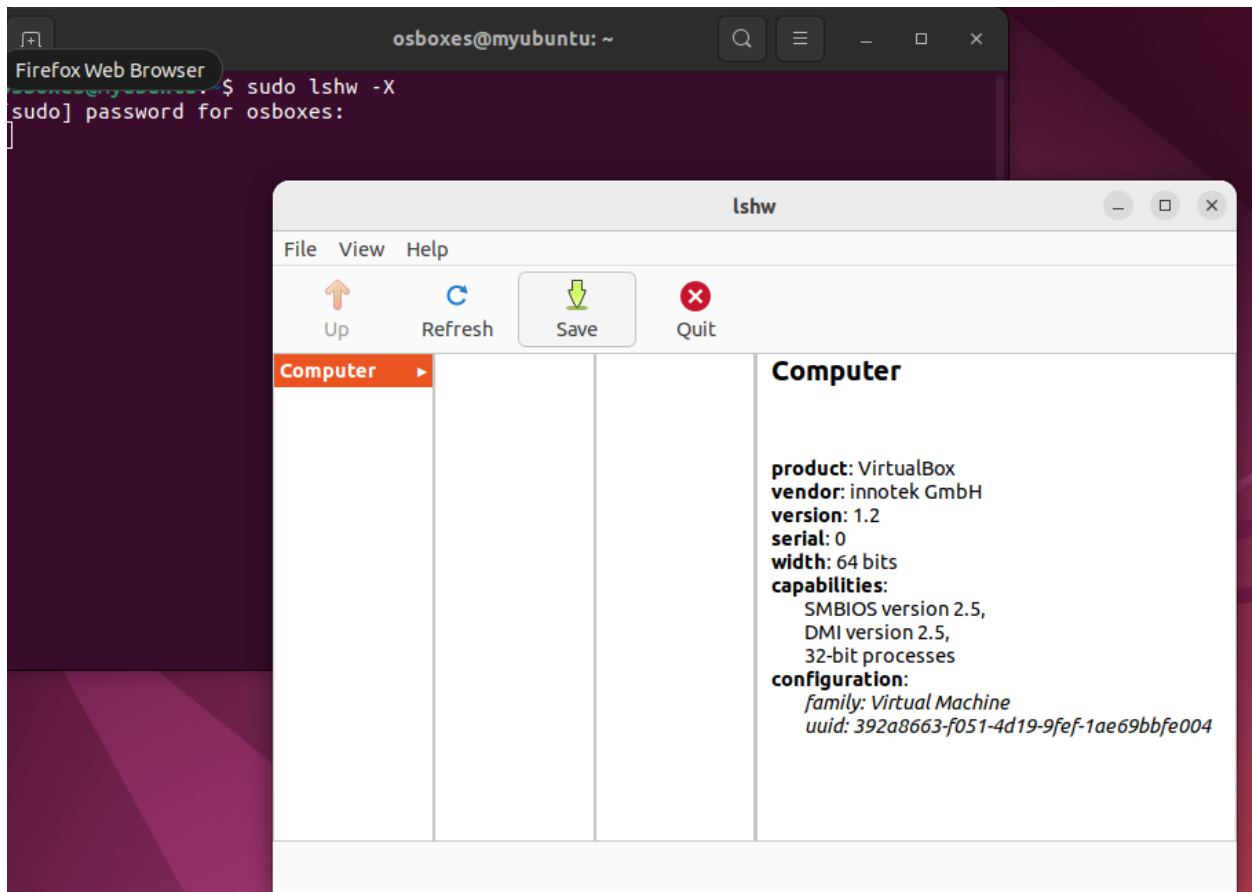
8. ****lshw - List Hardware**

List detailed information about hardware configurations as root user.

- Launch the GUI: `sudo lshw -X`
- List all hardware in tabular format: `sudo lshw -short`
- List all disks and storage controllers in tabular format: `sudo lshw -class disk -class storage -short`
- Save all network interfaces to an HTML file: `sudo lshw -class network -html > {{interfaces.html}}`

Let try out these commands:

Launch the GUI:



List all hardware in tabular format:

```

1  osboxes@osboxes:~$ sudo lshw -short
2  H/W path          Device          Class          Description
3  =====
4                      system          VirtualBox
5  /0                 bus             VirtualBox
6  /0/0               memory          128KiB BIOS
7  /0/1               memory          1GiB System memory
8  /0/2               processor       AMD Ryzen 5 5600G with Radeon Graphics \
9
10 /0/100              bridge          440FX - 82441FX PMC [Natoma]
11 /0/100/1            bridge          82371SB PIIX3 ISA [Natoma/Triton II] \
12
13 /0/100/1/0          input           PnP device PNP0303
14 /0/100/1/1          input           PnP device PNP0f03
15 /0/100/1.1          scsi1           storage         82371AB/EB/MB PIIX4 IDE
16 /0/100/1.1/0.0.0    /dev/cdrom      disk            CD-ROM
17 /0/100/2            /dev/fb0        display         SVGA II Adapter
18 /0/100/3            enp0s3          network         82540EM Gigabit Ethernet Controller
19 /0/100/4            input7          input           VirtualBox mouse integration
20 /0/100/5            card0           multimedia      82801AA AC'97 Audio Controller
21 /0/100/6            bus             KeyLargo/Intrepid USB
22 /0/100/6/1          usb1            bus             OHCI PCI host controller
23 /0/100/6/1/1        input6          input           VirtualBox USB Tablet
24 /0/100/7            bridge          82371AB/EB/MB PIIX4 ACPI
25 /0/100/d            scsi2           storage         82801HM/HEM (ICH8M/ICH8M-E) SATA Controll\
26 er
27 /0/100/d/0.0.0      /dev/sda        disk            536GB VBOX HARDDISK
28 /0/100/d/0.0.0/1    /dev/sda1       volume          220GiB EXT4 volume
29 /0/100/d/0.0.0/2    /dev/sda2       volume          286MiB EXT4 volume
30 /0/100/d/0.0.0/3    /dev/sda3       volume          94MiB BIOS Boot partition
31 /0/100/d/0.0.0/4    /dev/sda4       volume          9154MiB Linux swap volume
32 /0/100/d/0.0.0/5    /dev/sda5       volume          270GiB EXT4 volume
33 /1                  input0          input           Power Button
34 /2                  input1          input           Sleep Button
35 /3                  input2          input           AT Translated Set 2 keyboard
36 /4                  input4          input           ImExPS/2 Generic Explorer Mouse
37 /5                  input5          input           Video Bus
38  osboxes@osboxes:~$

```

List all disks and storage controllers in tabular format:

```

1  osboxes@osboxes:~$ sudo lshw -class disk -class storage -short
2  H/W path          Device          Class          Description
3  =====
4  /0/100/1.1        scsi1           storage         82371AB/EB/MB PIIX4 IDE
5  /0/100/1.1/0.0.0  /dev/cdrom      disk            CD-ROM
6  /0/100/d           scsi2           storage         82801HM/HEM (ICH8M/ICH8M-E) SATA Controller
7  er
8  /0/100/d/0.0.0    /dev/sda        disk            536GB VBOX HARDDISK
9  osboxes@osboxes:~$

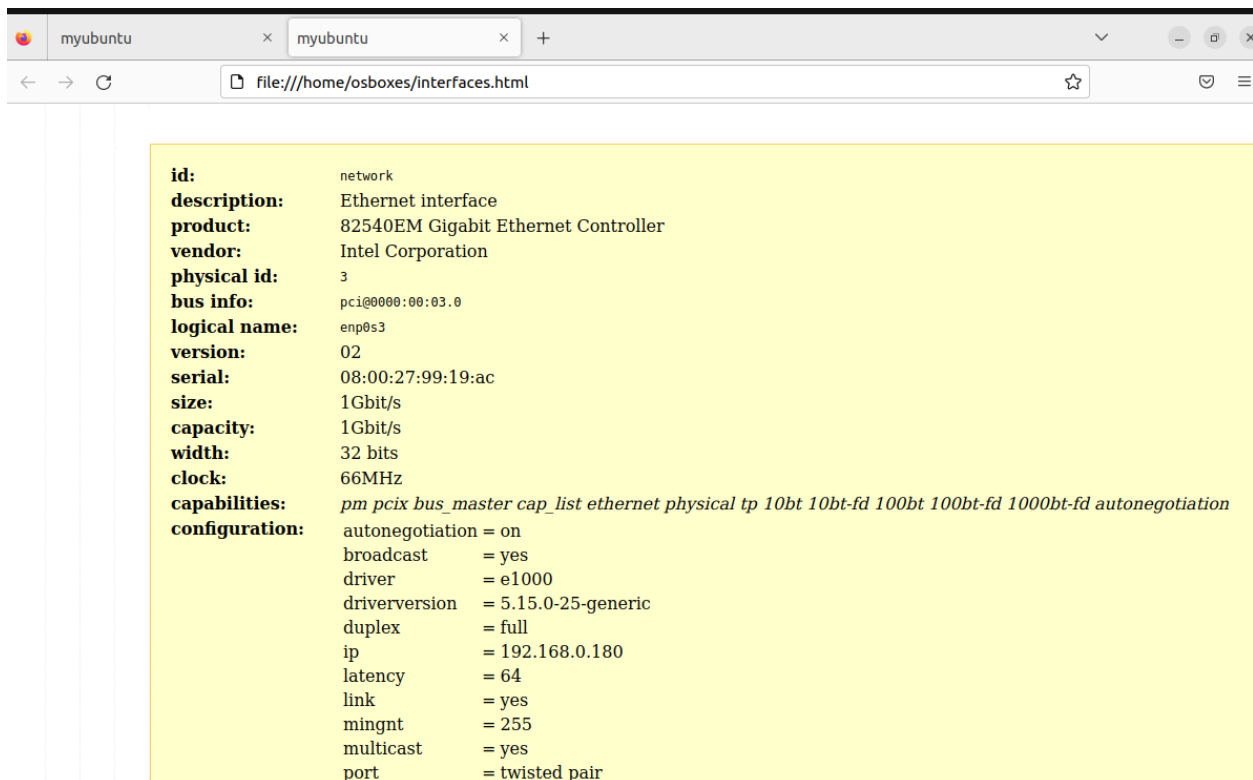
```

Save all network interfaces to an HTML file:

```

1  osboxes@osboxes:~$ sudo lshw -class network -html > interfaces.html
2  osboxes@osboxes:~$ ls
3  Desktop  Downloads  Music      Public  Templates
4  Documents interfaces.html Pictures  snap    Videos
5  osboxes@osboxes:~$ firefox interfaces.html

```



9. `lsblk` Lists information about devices.

- List all storage devices in a tree-like format: `lsblk`
- Also list empty devices: `lsblk -a`
- Print the SIZE column in bytes rather than in a human-readable format: `lsblk -b`

- Output info about filesystems: `lsblk -f`
- Use ASCII characters for tree formatting: `lsblk -i`
- Output info about block-device topology: `lsblk -t`
- Exclude the devices specified by the comma-separated list of major device numbers: `lsblk -e {{1,7}}`
- Display a customized summary using a comma-separated list of columns: `lsblk --output {{NAME}},{{SERIAL}},{{MODEL}},{{TRAN}},{{TYPE}},{{SIZE}},{{FSTYPE}},{{MOUNTPOINT}}`

Lets try out these commands:

List all storage devices in a tree-like format:

```

1  osboxes@osboxes:~$ lsblk
2  NAME      MAJ:MIN RM   SIZE RO TYPE MOUNTPOINTS
3  loop0      7:0      0    4K  1 loop /snap/bare/5
4  loop1      7:1      0 155.6M  1 loop /snap/firefox/1232
5  loop2      7:2      0  63.2M  1 loop /snap/core20/1623
6  loop3      7:3      0  61.9M  1 loop /snap/core20/1405
7  loop4      7:4      0 238.5M  1 loop /snap/firefox/2015
8  loop5      7:5      0 346.3M  1 loop /snap/gnome-3-38-2004/119
9  loop6      7:6      0 248.8M  1 loop /snap/gnome-3-38-2004/99
10 loop7      7:7      0  81.3M  1 loop /snap/gtk-common-themes/1534
11 loop8      7:8      0  91.7M  1 loop /snap/gtk-common-themes/1535
12 loop9      7:9      0  45.9M  1 loop /snap/snap-store/599
13 loop10     7:10     0  45.9M  1 loop /snap/snap-store/575
14 loop11     7:11     0  43.6M  1 loop /snap/snapd/15177
15 loop12     7:12     0   48M   1 loop /snap/snapd/17336
16 loop13     7:13     0   284K  1 loop /snap/snapd-desktop-integration/10
17 loop14     7:14     0   284K  1 loop /snap/snapd-desktop-integration/14
18 sda        8:0      0   500G  0 disk
19 └sda1     8:1      0 220.6G  0 part /var/snap/firefox/common/host-hunspell
20 |
21 └sda2     8:2      0   286M  0 part /boot
22 └sda3     8:3      0    95M  0 part
23 └sda4     8:4      0    8.9G  0 part [SWAP]
24 └sda5     8:5      0 270.1G  0 part /home
25 sr0       11:0     1 1024M  0 rom
26 osboxes@osboxes:~$

```

Also list empty devices:

```

1 osboxes@osboxes:~$ lsblk -a
2 NAME      MAJ:MIN RM   SIZE RO TYPE MOUNTPOINTS
3 loop0      7:0      0    4K  1 loop /snap/bare/5
4 loop1      7:1      0 155.6M  1 loop /snap/firefox/1232
5 loop2      7:2      0  63.2M  1 loop /snap/core20/1623
6 loop3      7:3      0  61.9M  1 loop /snap/core20/1405
7 loop4      7:4      0 238.5M  1 loop /snap/firefox/2015
8 loop5      7:5      0 346.3M  1 loop /snap/gnome-3-38-2004/119
9 loop6      7:6      0 248.8M  1 loop /snap/gnome-3-38-2004/99
10 loop7      7:7      0  81.3M  1 loop /snap/gtk-common-themes/1534
11 loop8      7:8      0  91.7M  1 loop /snap/gtk-common-themes/1535
12 loop9      7:9      0  45.9M  1 loop /snap/snap-store/599
13 loop10     7:10     0  45.9M  1 loop /snap/snap-store/575
14 loop11     7:11     0  43.6M  1 loop /snap/snapd/15177
15 loop12     7:12     0   48M  1 loop /snap/snapd/17336
16 loop13     7:13     0   284K  1 loop /snap/snapd-desktop-integration/10
17 loop14     7:14     0   284K  1 loop /snap/snapd-desktop-integration/14
18 loop15     7:15     0    0B  0 loop
19 sda        8:0      0 500G  0 disk
20 └sda1      8:1      0 220.6G  0 part /var/snap/firefox/common/host-hunspell
21 |
22 └sda2      8:2      0   286M  0 part /boot
23 └sda3      8:3      0    95M  0 part
24 └sda4      8:4      0   8.9G  0 part [SWAP]
25 └sda5      8:5      0 270.1G  0 part /home
26 sr0       11:0     1 1024M  0 rom
27 osboxes@osboxes:~$

```

Print the SIZE column in bytes rather than in a human-readable format:

```

1 osboxes@osboxes:~$ lsblk -b
2 NAME      MAJ:MIN RM   SIZE RO TYPE MOUNTPOINTS
3 loop0      7:0      0    4096  1 loop /snap/bare/5
4 loop1      7:1      0 163188736  1 loop /snap/firefox/1232
5 loop2      7:2      0  66293760  1 loop /snap/core20/1623
6 loop3      7:3      0  64901120  1 loop /snap/core20/1405
7 loop4      7:4      0 250085376  1 loop /snap/firefox/2015
8 loop5      7:5      0 363151360  1 loop /snap/gnome-3-38-2004/119
9 loop6      7:6      0 260841472  1 loop /snap/gnome-3-38-2004/99
10 loop7      7:7      0  85209088  1 loop /snap/gtk-common-themes/1534
11 loop8      7:8      0  96141312  1 loop /snap/gtk-common-themes/1535
12 loop9      7:9      0  48156672  1 loop /snap/snap-store/599
13 loop10     7:10     0 48087040  1 loop /snap/snap-store/575

```

```

14     loop11    7:11    0      45748224 1 loop /snap/snapd/15177
15     loop12    7:12    0      50319360 1 loop /snap/snapd/17336
16     loop13    7:13    0        290816 1 loop /snap/snapd-desktop-integration/10
17     loop14    7:14    0        290816 1 loop /snap/snapd-desktop-integration/14
18     sda       8:0     0 536870912000 0 disk
19     └sda1     8:1     0 236870172672 0 part /var/snap/firefox/common/host-hunspell
20     |
21     └sda2     8:2     0   299892736 0 part /boot
22     └sda3     8:3     0    99614720 0 part
23     └sda4     8:4     0   9599713280 0 part [SWAP]
24     └sda5     8:5     0 289999421440 0 part /home
25     sr0      11:0    1   1073741312 0 rom
26     osboxes@osboxes:~$

```

Output info about filesystems:

```

1     osboxes@osboxes:~$ lsblk -f
2     NAME FSTYPE FSVER LABEL UUID                                FSAVAIL FSUSE% MOUNTPOINT
3     INTS
4     loop0
5         squash 4.0                                0    100% /snap/b\
6     are/5
7     loop1
8         squash 4.0                                0    100% /snap/f\
9     irefox/1232
10    loop2
11        squash 4.0                                0    100% /snap/c\
12    ore20/1623
13    loop3
14        squash 4.0                                0    100% /snap/c\
15    ore20/1405
16    loop4
17        squash 4.0                                0    100% /snap/f\
18    irefox/2015
19    loop5
20        squash 4.0                                0    100% /snap/g\
21    nome-3-38-2004/119
22    loop6
23        squash 4.0                                0    100% /snap/g\
24    nome-3-38-2004/99
25    loop7
26        squash 4.0                                0    100% /snap/g\
27    tk-common-themes/1534

```

```

28     loop8
29         squash 4.0                                0   100% /snap/g\
30 tk-common-themes/1535
31     loop9
32         squash 4.0                                0   100% /snap/s\
33 nap-store/599
34     loop10
35         squash 4.0                                0   100% /snap/s\
36 nap-store/575
37     loop11
38         squash 4.0                                0   100% /snap/s\
39 napd/15177
40     loop12
41         squash 4.0                                0   100% /snap/s\
42 napd/17336
43     loop13
44         squash 4.0                                0   100% /snap/s\
45 napd-desktop-integration/10
46     loop14
47         squash 4.0                                0   100% /snap/s\
48 napd-desktop-integration/14
49     sda
50     └sda1
51     |   ext4   1.0                b67edd03-5aa9-4826-add9-3de240b4c108 197.9G      3% /var/sn\
52 ap/firefox/common/host-hunspell
53     |
54     └sda2
55     |   ext4   1.0                ae89c631-fbfd-4464-bd2a-f044d6f289fe 148.2M     33% /boot  \
56
57     └sda3
58     |
59     └sda4
60     |   swap   1                fea6d28a-87d8-4e12-90f8-127fb098d3ce          [SWAP]
61     └sda5
62         ext4   1.0                16686029-ab4c-435d-b85a-282985baefda 251.1G     0% /home  \
63
64     sr0
65     osboxes@osboxes:~$

```

Use ASCII characters for tree formatting:

```

1 osboxes@osboxes:~$ lsblk -i
2 NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
3 loop0 7:0 0 4K 1 loop /snap/bare/5
4 loop1 7:1 0 155.6M 1 loop /snap/firefox/1232
5 loop2 7:2 0 63.2M 1 loop /snap/core20/1623
6 loop3 7:3 0 61.9M 1 loop /snap/core20/1405
7 loop4 7:4 0 238.5M 1 loop /snap/firefox/2015
8 loop5 7:5 0 346.3M 1 loop /snap/gnome-3-38-2004/119
9 loop6 7:6 0 248.8M 1 loop /snap/gnome-3-38-2004/99
10 loop7 7:7 0 81.3M 1 loop /snap/gtk-common-themes/1534
11 loop8 7:8 0 91.7M 1 loop /snap/gtk-common-themes/1535
12 loop9 7:9 0 45.9M 1 loop /snap/snap-store/599
13 loop10 7:10 0 45.9M 1 loop /snap/snap-store/575
14 loop11 7:11 0 43.6M 1 loop /snap/snapd/15177
15 loop12 7:12 0 48M 1 loop /snap/snapd/17336
16 loop13 7:13 0 284K 1 loop /snap/snapd-desktop-integration/10
17 loop14 7:14 0 284K 1 loop /snap/snapd-desktop-integration/14
18 sda 8:0 0 500G 0 disk
19 |-sda1 8:1 0 220.6G 0 part /var/snap/firefox/common/host-hunspell
20 | /
21 |-sda2 8:2 0 286M 0 part /boot
22 |-sda3 8:3 0 95M 0 part
23 |-sda4 8:4 0 8.9G 0 part [SWAP]
24 |-sda5 8:5 0 270.1G 0 part /home
25 sr0 11:0 1 1024M 0 rom
26 osboxes@osboxes:~$

```

Output info about block-device topology:

```

1 osboxes@osboxes:~$ lsblk -t
2 NAME ALIGNMENT MIN-IO OPT-IO PHY-SEC LOG-SEC ROTA SCHED RQ-SIZE RA WSAME \
3
4 loop0 0 512 0 512 512 1 none 128 128 0B \
5
6 loop1 0 512 0 512 512 1 none 128 128 0B \
7
8 loop2 0 512 0 512 512 1 none 128 128 0B \
9
10 loop3 0 512 0 512 512 1 none 128 128 0B \
11
12 loop4 0 512 0 512 512 1 none 128 128 0B \
13
14 loop5 0 512 0 512 512 1 none 128 128 0B \

```

```

15
16     loop6          0    512    0    512    512    1 none          128 128    0B \
17
18     loop7          0    512    0    512    512    1 none          128 128    0B \
19
20     loop8          0    512    0    512    512    1 none          128 128    0B \
21
22     loop9          0    512    0    512    512    1 none          128 128    0B \
23
24     loop10         0    512    0    512    512    1 none          128 128    0B \
25
26     loop11         0    512    0    512    512    1 none          128 128    0B \
27
28     loop12         0    512    0    512    512    1 none          128 128    0B \
29
30     loop13         0    512    0    512    512    1 none          128 128    0B \
31
32     loop14         0    512    0    512    512    1 none          128 128    0B \
33
34     sda            0    512    0    512    512    1 mq-deadline    64 128    0B \
35
36     └sda1          0    512    0    512    512    1 mq-deadline    64 128    0B \
37
38     └sda2          0    512    0    512    512    1 mq-deadline    64 128    0B \
39
40     └sda3          0    512    0    512    512    1 mq-deadline    64 128    0B \
41
42     └sda4          0    512    0    512    512    1 mq-deadline    64 128    0B \
43
44     └sda5          0    512    0    512    512    1 mq-deadline    64 128    0B \
45
46     sr0            0    512    0    512    512    1 mq-deadline     2 128    0B \
47
48     osboxes@osboxes:~$

```

Exclude the devices specified by the comma-separated list of major device numbers:

```

1 osboxes@osboxes:~$ lsblk -e 7
2 NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
3 sda 8:0 0 500G 0 disk
4 └sda1 8:1 0 220.6G 0 part /var/snap/firefox/common/host-hunspell
5 | /
6 └sda2 8:2 0 286M 0 part /boot
7 └sda3 8:3 0 95M 0 part
8 └sda4 8:4 0 8.9G 0 part [SWAP]
9 └sda5 8:5 0 270.1G 0 part /home
10 sr0 11:0 1 1024M 0 rom
11 osboxes@osboxes:~$

```

Display a customized summary using a comma-separated list of columns:

```

1 osboxes@osboxes:~$ lsblk --output NAME,SERIAL,MODEL,TRAN,TYPE,SIZE,FSTYPE,MOUNTPOINT\
2 T
3 NAME SERIAL MODEL TRAN TYPE SIZE FSTYPE MOUNTPOINT
4 loop0 loop 4K squashf /snap/bare/5
5 loop1 loop 155.6M squashf /snap/firefox/1232
6 loop2 loop 63.2M squashf /snap/core20/1623
7 loop3 loop 61.9M squashf /snap/core20/1405
8 loop4 loop 238.5M squashf /snap/firefox/2015
9 loop5 loop 346.3M squashf /snap/gnome-3-38-2004/119 \
10
11 loop6 loop 248.8M squashf /snap/gnome-3-38-2004/99 \
12
13 loop7 loop 81.3M squashf /snap/gtk-common-themes/15\
14 34
15 loop8 loop 91.7M squashf /snap/gtk-common-themes/15\
16 35
17 loop9 loop 45.9M squashf /snap/snap-store/599
18 loop10 loop 45.9M squashf /snap/snap-store/575
19 loop11 loop 43.6M squashf /snap/snapd/15177
20 loop12 loop 48M squashf /snap/snapd/17336
21 loop13 loop 284K squashf /snap/snapd-desktop-integr\
22 ati
23 loop14 loop 284K squashf /snap/snapd-desktop-integr\
24 ati
25 sda VB7698eb95-52 VBOX HAR sata disk 500G
26 └sda1 part 220.6G ext4 /
27 └sda2 part 286M ext4 /boot
28 └sda3 part 95M
29 └sda4 part 8.9G swap [SWAP]

```

```

30      └─sda5                                part 270.1G ext4    /home
31      sr0      VB2-01700376  VBOX CD- ata    rom    1024M
32      osboxes@osboxes:~$

```

10. **df** - disk space of file systems

Gives an overview of the filesystem disk space usage.

- Display all filesystems and their disk usage: `df`
- Display all filesystems and their disk usage in human-readable form: `df -h`
- Display the filesystem and its disk usage containing the given file or directory: `df {{path/to/file_or_directory}}`
- Display statistics on the number of free inodes: `df -i`
- Display filesystems but exclude the specified types: `df -x {{squashfs}} -x {{tmpfs}}`

Lets try out the commands:

Display all filesystems and their disk usage:

```

1      osboxes@osboxes:~$ df
2      Filesystem      1K-blocks    Used Available Use% Mounted on
3      tmpfs             99460      1472    97988    2% /run
4      /dev/sda1        226577932 7463936 207531688    4% /
5      tmpfs             497296         0    497296    0% /dev/shm
6      tmpfs             5120         4      5116    1% /run/lock
7      /dev/sda5        277647428 147000 263323916    1% /home
8      /dev/sda2         257848     85612   151740   37% /boot
9      tmpfs             99456      2404    97052    3% /run/user/1000
10     osboxes@osboxes:~$

```

Display all filesystems and their disk usage in human-readable form:

```

1      osboxes@osboxes:~$ df -h
2      Filesystem      Size  Used Avail Use% Mounted on
3      tmpfs            98M   1.5M   96M   2% /run
4      /dev/sda1        217G   7.2G  198G   4% /
5      tmpfs            486M     0   486M   0% /dev/shm
6      tmpfs            5.0M   4.0K   5.0M   1% /run/lock
7      /dev/sda5        265G  144M  252G   1% /home
8      /dev/sda2        252M   84M  149M  37% /boot
9      tmpfs            98M   2.4M   95M   3% /run/user/1000
10     osboxes@osboxes:~$

```

Display the filesystem and its disk usage containing the given file or directory:

```

1 osboxes@osboxes:~$ df /dev/sda1
2 Filesystem      1K-blocks    Used Available Use% Mounted on
3 /dev/sda1      226577932 7463940 207531684   4% /
4 osboxes@osboxes:~$

```

Display statistics on the number of free inodes:

```

1 osboxes@osboxes:~$ df -i
2 Filesystem      Inodes    IUsed    IFree IUse% Mounted on
3 tmpfs           124324     994    123330   1% /run
4 /dev/sda1       14458880 181332 14277548   2% /
5 tmpfs           124324      1    124323   1% /dev/shm
6 tmpfs           124324      4    124320   1% /run/lock
7 /dev/sda5       17702912 10361 17692551   1% /home
8 /dev/sda2        73248     322     72926   1% /boot
9 tmpfs           24864     144     24720   1% /run/user/1000
10 osboxes@osboxes:~$

```

Display filesystems but exclude the specified types:

```

1 osboxes@osboxes:~$ df -x tmpfs
2 Filesystem      1K-blocks    Used Available Use% Mounted on
3 /dev/sda1      226577932 7463940 207531684   4% /
4 /dev/sda5      277647428 147036 263323880   1% /home
5 /dev/sda2       257848     85612    151740  37% /boot
6 osboxes@osboxes:~$

```

11. du Disk usage: estimate and summarize file and directory space usage.

- List the sizes of a directory and any subdirectories, in the given unit (B/KiB/MiB):

`du -{{b|k|m}} {{path/to/directory}}`

- List the sizes of a directory and any subdirectories, in human-readable form (i.e. auto-selecting the appropriate unit for each size): `du -h {{path/to/directory}}`
- Show the size of a single directory, in human-readable units: `du -sh {{path/to/directory}}`
- List the human-readable sizes of a directory and of all the files and directories within it: `du -ah {{path/to/directory}}`
- List the human-readable sizes of a directory and any subdirectories, up to N levels deep: `du -h --max-depth=N {{path/to/directory}}`
- List the human-readable size of all .jpg files in subdirectories of the current directory, and show a cumulative total at the end: `du -ch {/}.jpg}`

Lets try out the commands.

List the sizes of a directory and any subdirectories, in the given unit (B/KiB/MiB):

```
1 osboxes@osboxes:~$ sudo du -b /root
2 [sudo] password for osboxes:
3 4096 /root/snap/snapd-desktop-integration/10
4 4096 /root/snap/snapd-desktop-integration/14
5 4096 /root/snap/snapd-desktop-integration/common
6 16386 /root/snap/snapd-desktop-integration
7 4096 /root/snap/firefox/2015
8 4096 /root/snap/firefox/common
9 4096 /root/snap/firefox/2042
10 16388 /root/snap/firefox
11 4096 /root/snap/snap-store/575
12 4096 /root/snap/snap-store/common
13 4096 /root/snap/snap-store/599
14 16387 /root/snap/snap-store
15 53257 /root/snap
16 4119 /root/.config/pulse
17 4096 /root/.config/ibus/bus
18 8192 /root/.config/ibus
19 16407 /root/.config
20 4096 /root/.cache
21 81123 /root
22 osboxes@osboxes:~$ sudo du -k /root
23 4 /root/snap/snapd-desktop-integration/10
24 4 /root/snap/snapd-desktop-integration/14
25 4 /root/snap/snapd-desktop-integration/common
26 16 /root/snap/snapd-desktop-integration
27 4 /root/snap/firefox/2015
28 4 /root/snap/firefox/common
29 4 /root/snap/firefox/2042
30 16 /root/snap/firefox
31 4 /root/snap/snap-store/575
32 4 /root/snap/snap-store/common
33 4 /root/snap/snap-store/599
34 16 /root/snap/snap-store
35 52 /root/snap
36 4 /root/.config/pulse
37 4 /root/.config/ibus/bus
38 8 /root/.config/ibus
39 16 /root/.config
40 4 /root/.cache
41 84 /root
42 osboxes@osboxes:~$ sudo du -m /root
43 1 /root/snap/snapd-desktop-integration/10
```

```

44      1      /root/snap/snapd-desktop-integration/14
45      1      /root/snap/snapd-desktop-integration/common
46      1      /root/snap/snapd-desktop-integration
47      1      /root/snap/firefox/2015
48      1      /root/snap/firefox/common
49      1      /root/snap/firefox/2042
50      1      /root/snap/firefox
51      1      /root/snap/snap-store/575
52      1      /root/snap/snap-store/common
53      1      /root/snap/snap-store/599
54      1      /root/snap/snap-store
55      1      /root/snap
56      1      /root/.config/pulse
57      1      /root/.config/ibus/bus
58      1      /root/.config/ibus
59      1      /root/.config
60      1      /root/.cache
61      1      /root
62  osboxes@osboxes:~$

```

List the sizes of a directory and any subdirectories, in human-readable form (i.e. auto-selecting the appropriate unit for each size):

```

1  osboxes@osboxes:~$ sudo du -h /root
2  4.0K    /root/snap/snapd-desktop-integration/10
3  4.0K    /root/snap/snapd-desktop-integration/14
4  4.0K    /root/snap/snapd-desktop-integration/common
5  16K     /root/snap/snapd-desktop-integration
6  4.0K    /root/snap/firefox/2015
7  4.0K    /root/snap/firefox/common
8  4.0K    /root/snap/firefox/2042
9  16K     /root/snap/firefox
10 4.0K     /root/snap/snap-store/575
11 4.0K     /root/snap/snap-store/common
12 4.0K     /root/snap/snap-store/599
13 16K     /root/snap/snap-store
14 52K     /root/snap
15 4.0K    /root/.config/pulse
16 4.0K    /root/.config/ibus/bus
17 8.0K    /root/.config/ibus
18 16K     /root/.config
19 4.0K    /root/.cache
20 84K     /root
21 osboxes@osboxes:~$

```

Show the size of a single directory, in human-readable units:

```
1 osboxes@osboxes:~$ sudo du -sh /root
2 84K    /root
3 osboxes@osboxes:~$
```

List the human-readable sizes of a directory and of all the files and directories within it:

```
1 osboxes@osboxes:~$ sudo du -ah /root
2 [sudo] password for osboxes:
3 4.0K    /root/snap/snapd-desktop-integration/10
4 0       /root/snap/snapd-desktop-integration/current
5 4.0K    /root/snap/snapd-desktop-integration/14
6 4.0K    /root/snap/snapd-desktop-integration/common
7 16K     /root/snap/snapd-desktop-integration
8 0       /root/snap/firefox/current
9 4.0K    /root/snap/firefox/2015
10 4.0K    /root/snap/firefox/common
11 4.0K    /root/snap/firefox/2042
12 16K     /root/snap/firefox
13 4.0K    /root/snap/snap-store/575
14 0       /root/snap/snap-store/current
15 4.0K    /root/snap/snap-store/common
16 4.0K    /root/snap/snap-store/599
17 16K     /root/snap/snap-store
18 52K     /root/snap
19 4.0K    /root/.bashrc
20 0       /root/.config/pulse/99e625cfc17348078889e61898a6a36c-runtime
21 4.0K    /root/.config/pulse
22 4.0K    /root/.config/ibus/bus
23 8.0K    /root/.config/ibus
24 16K     /root/.config
25 4.0K    /root/.cache
26 4.0K    /root/.profile
27 84K     /root
28 osboxes@osboxes:~$
```

List the human-readable sizes of a directory and any subdirectories, up to N levels deep:

```

1  osboxes@osboxes:~$ sudo du -h --max-depth=2 /root
2  16K      /root/snap/snapd-desktop-integration
3  16K      /root/snap/firefox
4  16K      /root/snap/snap-store
5  52K      /root/snap
6  4.0K     /root/.config/pulse
7  8.0K     /root/.config/ibus
8  16K      /root/.config
9  4.0K     /root/.cache
10 84K       /root
11 osboxes@osboxes:~$ sudo du -h --max-depth=3 /root
12 4.0K      /root/snap/snapd-desktop-integration/10
13 4.0K      /root/snap/snapd-desktop-integration/14
14 4.0K      /root/snap/snapd-desktop-integration/common
15 16K      /root/snap/snapd-desktop-integration
16 4.0K      /root/snap/firefox/2015
17 4.0K      /root/snap/firefox/common
18 4.0K      /root/snap/firefox/2042
19 16K      /root/snap/firefox
20 4.0K      /root/snap/snap-store/575
21 4.0K      /root/snap/snap-store/common
22 4.0K      /root/snap/snap-store/599
23 16K      /root/snap/snap-store
24 52K      /root/snap
25 4.0K      /root/.config/pulse
26 4.0K      /root/.config/ibus/bus
27 8.0K      /root/.config/ibus
28 16K      /root/.config
29 4.0K      /root/.cache
30 84K       /root
31 osboxes@osboxes:~$

```

List the human-readable size of all .jpg files in subdirectories of the current directory, and show a cumulative total at the end:

```

1  osboxes@osboxes:~$ du -ch /.jpg
2  du: cannot access './.jpg': No such file or directory
3  0          total
4  osboxes@osboxes:~$

```

12. ****free** - Check RAM

Display amount of free and used memory in the system.

- Display system memory: free

- Display memory in Bytes/KB/MB/GB:

```
free -{{b|k|m|g}}
```

- Display memory in human-readable units: `free -h`
- Refresh the output every 2 seconds: `free -s {{2}}`

Let's try out these commands:

Display system memory:

```
1  osboxes@osboxes:~$ free
2              total        used        free      shared  buff/cache   available
3  Mem:          994596      374920      453764        2532       165912       475760  \
4
5  Swap:          9374716      320232      9054484
6  osboxes@osboxes:~$
```

Display memory in Bytes/KB/MB/GB:

```
1  osboxes@osboxes:~$ free
2              total        used        free      shared  buff/cache   available
3  Mem:          994596      374920      453764        2532       165912       475760  \
4
5  Swap:          9374716      320232      9054484
6  osboxes@osboxes:~$ free -b
7              total        used        free      shared  buff/cache   available
8  Mem:      1018466304      383909888      464654336      2592768      169902080      487211008  \
9
10 Swap:      9599709184      327655424      9272053760
11 osboxes@osboxes:~$ free -k
12              total        used        free      shared  buff/cache   available
13 Mem:          994596      374912      453764        2532       165920       475800  \
14
15 Swap:          9374716      319976      9054740
16 osboxes@osboxes:~$ free -m
17              total        used        free      shared  buff/cache   available
18 Mem:             971          366           443           2           162           464  \
19
20 Swap:             9154           312          8842
21 osboxes@osboxes:~$ free -g
22              total        used        free      shared  buff/cache   available
23 Mem:              0            0            0            0            0            0  \
24
25 Swap:              8            0            8
26 osboxes@osboxes:~$
```

Display memory in human-readable units:

```

1  osboxes@osboxes:~$ free -h
2              total        used        free      shared  buff/cache   available
3
4  Mem:          971Mi       366Mi       443Mi        2.0Mi        162Mi        464Mi
5
6  Swap:          8.9Gi       312Mi       8.6Gi
7  osboxes@osboxes:~$

```

Refresh the output every 2 seconds:

```

1  osboxes@osboxes:~$ free -s 2
2              total        used        free      shared  buff/cache   available
3
4  Mem:          994596       374912       453764        2532        165920        475800
5
6  Swap:        9374716       319976       9054740
7
8              total        used        free      shared  buff/cache   available
9  Mem:          994596       374912       453764        2532        165920        475800
10
11 Swap:        9374716       319976       9054740
12
13              total        used        free      shared  buff/cache   available
14 Mem:          994596       374912       453764        2532        165920        475800
15
16 Swap:        9374716       319976       9054740
17
18              total        used        free      shared  buff/cache   available
19 Mem:          994596       374912       453764        2532        165920        475800
20
21 Swap:        9374716       319976       9054740
22
23 ^C
24 osboxes@osboxes:~$

```

file commands

Lets look at the most common file commands. Here is the list of all the command we will look at:

1. ls
2. pwd

3. touch
4. cp
5. mkdir
6. mv
7. rm
8. chown
9. chmod
10. wc
11. tr
12. uniq
13. split
14. head
15. tail
16. more
17. less
18. cat
19. ls :

List directory contents.

- List files one per line: `ls -1`
- List all files, including hidden files: `ls -a`
- List all files, with trailing / added to directory names: `ls -F`
- Long format list (permissions, ownership, size, and modification date) of all files: `ls -la`
- Long format list with size displayed using human-readable units (KiB, MiB, GiB): `ls -lh`
- Long format list sorted by size (descending): `ls -ls`
- Long format list of all files, sorted by modification date (oldest first): `ls -ltr`
- Only list directories: `ls -d */`

Let try out the commands:

List files one per line:

```
1 osboxes@osboxes:~$ ls -1
2 Desktop
3 Documents
4 Downloads
5 interfaces.html
6 Music
7 Pictures
8 Public
9 snap
10 Templates
11 Videos
12 osboxes@osboxes:~$
```

List all files, including hidden files:

```

1 osboxes@osboxes:~$ ls -a
2 .                  .cache             .gnupg             Pictures            .sudo_as_admin_successful
3
4 ..                 .config            interfaces.html     .profile           Templates
5 .bash_history      Desktop            .lessht            Public             Videos
6 .bash_logout       Documents          .local             snap
7 .bashrc            Downloads          Music              .ssh
8 osboxes@osboxes:~$

```

List all files, with trailing / added to directory names:

```

1 osboxes@osboxes:~$ ls -F
2 Desktop/    Downloads/    Music/    Public/    Templates/
3 Documents/  interfaces.html Pictures/  snap/    Videos/
4 osboxes@osboxes:~$

```

Long format list (permissions, ownership, size, and modification date) of all files:

```

1 osboxes@osboxes:~$ ls -la
2 total 92
3 drwxr-x--- 16 osboxes osboxes 4096 Oct 29 10:12 .
4 drwxr-xr-x  4 root    root   4096 Apr 22  2022 ..
5 -rw-----  1 osboxes osboxes 2376 Oct 31 09:10 .bash_history
6 -rw-r--r--  1 osboxes osboxes  220 Apr 22  2022 .bash_logout
7 -rw-r--r--  1 osboxes osboxes 3771 Apr 22  2022 .bashrc
8 drwx----- 10 osboxes osboxes 4096 Oct 29 08:53 .cache
9 drwx----- 11 osboxes osboxes 4096 Apr 22  2022 .config
10 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Desktop
11 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Documents
12 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Downloads
13 drwx-----  2 osboxes osboxes 4096 Oct 29 10:10 .gnupg
14 -rw-rw-r--  1 osboxes osboxes 5027 Oct 29 10:12 interfaces.html
15 -rw-----  1 osboxes osboxes  20 Oct 29 09:50 .lessht
16 drwx-----  3 osboxes osboxes 4096 Apr 22  2022 .local
17 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Music
18 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Pictures
19 -rw-r--r--  1 osboxes osboxes  807 Apr 22  2022 .profile
20 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Public
21 drwx-----  4 osboxes osboxes 4096 Oct 29 10:12 snap
22 drwx-----  2 osboxes osboxes 4096 Apr 22  2022 .ssh
23 -rw-r--r--  1 osboxes osboxes   0 Apr 22  2022 .sudo_as_admin_successful
24 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Templates
25 drwxr-xr-x  2 osboxes osboxes 4096 Apr 22  2022 Videos
26 osboxes@osboxes:~$

```

Long format list with size displayed using human-readable units (KiB, MiB, GiB):

```

1  osboxes@osboxes:~$ ls -lh
2  total 44K
3  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Desktop
4  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Documents
5  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Downloads
6  -rw-rw-r-- 1 osboxes osboxes 5.0K Oct 29 10:12 interfaces.html
7  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Music
8  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Pictures
9  drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Public
10 drwx----- 4 osboxes osboxes 4.0K Oct 29 10:12 snap
11 drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Templates
12 drwxr-xr-x 2 osboxes osboxes 4.0K Apr 22 2022 Videos
13 osboxes@osboxes:~$

```

Long format list sorted by size (descending):

```

1  osboxes@osboxes:~$ ls -lS
2  total 44
3  -rw-rw-r-- 1 osboxes osboxes 5027 Oct 29 10:12 interfaces.html
4  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Desktop
5  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Documents
6  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Downloads
7  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Music
8  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Pictures
9  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Public
10 drwx----- 4 osboxes osboxes 4096 Oct 29 10:12 snap
11 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Templates
12 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Videos
13 osboxes@osboxes:~$

```

Long format list of all files, sorted by modification date (oldest first):

```

1  osboxes@osboxes:~$ ls -ltr
2  total 44
3  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Templates
4  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Public
5  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Pictures
6  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Music
7  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Downloads
8  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Documents
9  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Desktop
10 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Videos

```

```

11  -rw-rw-r-- 1 osboxes osboxes 5027 Oct 29 10:12 interfaces.html
12  drwx----- 4 osboxes osboxes 4096 Oct 29 10:12 snap
13  osboxes@osboxes:~$

```

Only list directories:

```

1  osboxes@osboxes:~$ ls -d */
2  Desktop/   Downloads/  Pictures/   snap/       Videos/
3  Documents/ Music/      Public/     Templates/
4  osboxes@osboxes:~$

```

20. pwd :

Print name of current/working directory.

- Print the current directory: `pwd`
- Print the current directory, and resolve all symlinks (i.e. show the “physical” path): `pwd -P`

Lets try out the command:

Print the current directory:

```

1  osboxes@osboxes:~$ pwd
2  /home/osboxes
3  osboxes@osboxes:~$

```

Print the current directory, and resolve all symlinks (i.e. show the “physical” path):

```

1  osboxes@osboxes:~$ pwd
2  /home/osboxes
3  osboxes@osboxes:~$

```

21. touch :

Change a file access and modification times (atime, mtime).

- Create a new empty file(s) or change the times for existing file(s) to current time: `touch {{path/to/file}}`
- Set the times on a file to a specific date and time: `touch -t {{YYYYMMDDHHMM.SS}} {{path/to/file}}`
- Set the time on a file to one hour in the past: `touch -d “{-1 hour}” {{path/to/file}}`
- Use the times from a file to set the times on a second file: `touch -r {{path/to/file1}} {{path/to/file2}}`
- Create multiple files: `touch {{path/to/file}{1,2,3}.txt}}`

Lets try out the commands:

Create a new empty file(s) or change the times for existing file(s) to current time:

```

1 osboxes@osboxes:~$ touch test{1,2,3}.txt
2 osboxes@osboxes:~$ ls
3 Desktop Downloads Music Public Templates test2.txt Videos
4 Documents interfaces.html Pictures snap test1.txt test3.txt
5 osboxes@osboxes:~$

```

Set the times on a file to a specific date and time:

```

1 osboxes@osboxes:~$ touch -t 202212311212.12 test1.txt
2 osboxes@osboxes:~$ ls -l test1.txt
3 -rw-rw-r-- 1 osboxes osboxes 0 Dec 31 2022 test1.txt
4 osboxes@osboxes:~$

```

Set the time on a file to one hour in the past:

```

1 osboxes@osboxes:~$ touch -d "-1 hour" test1.txt
2 osboxes@osboxes:~$ ls -l test1.txt
3 -rw-rw-r-- 1 osboxes osboxes 0 Oct 31 08:33 test1.txt
4 osboxes@osboxes:~$

```

Use the times from a file to set the times on a second file:

```

1 osboxes@osboxes:~$ touch -r test1.txt test2.txt
2 osboxes@osboxes:~$ ls -l test1.txt test2.txt
3 -rw-rw-r-- 1 osboxes osboxes 0 Oct 31 08:33 test1.txt
4 -rw-rw-r-- 1 osboxes osboxes 0 Oct 31 08:33 test2.txt
5 osboxes@osboxes:~$

```

Create multiple files:

```

1 osboxes@osboxes:~$ touch file{1,2,3}.txt
2 osboxes@osboxes:~$ ls file*
3 file1.txt file2.txt file3.txt
4 osboxes@osboxes:~$

```

22. cp :

Copy files and directories.

- Copy a file to another location: `cp {{path/to/source_file.ext}} {{path/to/target_file.ext}}`
- Copy a file into another directory, keeping the filename: `cp {{path/to/source_file.ext}} {{path/to/target_parent_directory}}`
- Recursively copy a directory's contents to another location (if the destination exists, the directory is copied inside it): `cp -R {{path/to/source_directory}} {{path/to/target_directory}}`
- Copy a directory recursively, in verbose mode (shows files as they are copied): `cp -vR {{path/to/source_directory}} {{path/to/target_directory}}`

- Copy text files to another location, in interactive mode (prompts user before overwriting):
`cp -i {{*.txt}} {{path/to/target_directory}}`
- Follow symbolic links before copying: `cp -L {{link}} {{path/to/target_directory}}`

Let's try out the commands:

Copy a file to another location:

```
1 osboxes@osboxes:~$ cp file1.txt dest1.txt
2 osboxes@osboxes:~$ ls *.txt
3 dest1.txt  file1.txt  file2.txt  file3.txt  test1.txt  test2.txt  test3.txt
4 osboxes@osboxes:~$
```

Copy a file into another directory, keeping the filename:

```
1 osboxes@osboxes:~$ cp file1.txt Desktop/file1.txt
2 osboxes@osboxes:~$ ls
3 Desktop  Downloads  file3.txt  Pictures  Templates  test3.txt
4 dest1.txt  file1.txt  interfaces.html  Public  test1.txt  Videos
5 Documents  file2.txt  Music  snap  test2.txt
6 osboxes@osboxes:~$ ls Desktop/
7 file1.txt
8 osboxes@osboxes:~$
```

Recursively copy a directory's contents to another location (if the destination exists, the directory is copied inside it):

```
1 osboxes@osboxes:~$ cp -R Desktop/ Documents/
2 osboxes@osboxes:~$ ls Desktop/
3 osboxes@osboxes:~$ ls Documents/
4 Desktop
5 osboxes@osboxes:~$
```

Copy a directory recursively, in verbose mode (shows files as they are copied):

```
1 osboxes@osboxes:~$ cp -vR Desktop/ Documents/ | more
2 'Desktop/.bashrc' -> 'Documents/Desktop/.bashrc'
3 'Desktop/.bash_logout' -> 'Documents/Desktop/.bash_logout'
4 'Desktop/.profile' -> 'Documents/Desktop/.profile'
5 'Desktop/.cache/tracker3/files/meta.db-wal' -> 'Documents/Desktop/.cache/tracker3/f\
6 ile
7 s/meta.db-wal'
8 'Desktop/.cache/tracker3/files/meta.db-shm' -> 'Documents/Desktop/.cache/tracker3/f\
9 ile
10 s/meta.db-shm'
```

```

11     'Desktop/.cache/tracker3/files/meta.db' -> 'Documents/Desktop/.cache/tracker3/files\
12     /me
13     ta.db'
14     'Desktop/.cache/tracker3/files/.meta.isrunning' -> 'Documents/Desktop/.cache/tracker\
15     r3/
16     files/.meta.isrunning'
17     'Desktop/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2\
18     Ftr
19     acker%23Documents.db-wal' -> 'Documents/Desktop/.cache/tracker3/files/http%3A%2F%2F\
20     tra
21     cker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Documents.db-wal'
22     ...

```

Copy text files to another location, in interactive mode (prompts user before overwriting):

```

1     osboxes@osboxes:~$ cp -i *.txt Documents/
2     osboxes@osboxes:~$ ls Documents/
3     Desktop dest1.txt file1.txt file2.txt file3.txt test1.txt test2.txt test3.txt
4     osboxes@osboxes:~$

```

23. mkdir :

Creates a directory.

- Create a directory in current directory or given path: `mkdir {{directory}}`
- Create multiple directories in the current directory: `mkdir {{directory_1 directory_2 ...}}`
- Create directories recursively (useful for creating nested dirs): `mkdir -p {{path/to/directory}}`

Let try out the commands:

Create a directory in current directory or given path:

```

1     osboxes@osboxes:~$ mkdir directory_name
2     osboxes@osboxes:~$ ls
3     Desktop      Documents  file2.txt      Music      snap        test2.txt
4     dest1.txt     Downloads  file3.txt      Pictures   Templates   test3.txt
5     directory_name  file1.txt  interfaces.html Public      test1.txt   Videos
6     osboxes@osboxes:~$

```

Create multiple directories in the current directory:

```

1  osboxes@osboxes:~$ mkdir directory_1 directory_2
2  osboxes@osboxes:~$ ls
3  Desktop      directory_name  file2.txt      Pictures  test1.txt
4  dest1.txt     Documents      file3.txt      Public    test2.txt
5  directory_1  Downloads      interfaces.html snap      test3.txt
6  directory_2  file1.txt      Music          Templates Videos
7  osboxes@osboxes:~$

```

Create directories recursively (useful for creating nested dirs):

```

1  osboxes@osboxes:~$ mkdir -p path/to/directory
2  osboxes@osboxes:~$ ls
3  Desktop      directory_name  file2.txt      path      Templates  Videos
4  dest1.txt     Documents      file3.txt      Pictures  test1.txt
5  directory_1  Downloads      interfaces.html Public    test2.txt
6  directory_2  file1.txt      Music          snap      test3.txt
7  osboxes@osboxes:~$ cd path/
8  osboxes@osboxes:~/path$ cd to/
9  osboxes@osboxes:~/path/to$ cd directory/
10 osboxes@osboxes:~/path/to/directory$ pwd
11 /home/osboxes/path/to/directory
12 osboxes@osboxes:~/path/to/directory$

```

24. mv :

Move or rename files and directories.

- Move a file to an arbitrary location: `mv {{source}} {{target}}`
- Move files into another directory, keeping the filenames: `mv {{source1}} {{source2}} {{source3}} {{target_directory}}`
- Do not prompt for confirmation before overwriting existing files: `mv -f {{source}} {{target}}`
- Prompt for confirmation before overwriting existing files, regardless of file permissions: `mv -i {{source}} {{target}}`
- Do not overwrite existing files at the target: `mv -n {{source}} {{target}}`
- Move files in verbose mode, showing files after they are moved: `mv -v {{source}} {{target}}`

Let's try out these commands:

Move a file to an arbitrary location:

```

1  osboxes@osboxes:~$ mv file1.txt Documents/file10.txt
2  osboxes@osboxes:~$ ls Documents/
3  Desktop    file10.txt  file2.txt  test1.txt  test3.txt
4  dest1.txt  file1.txt  file3.txt  test2.txt
5  osboxes@osboxes:~$

```

Move files into another directory, keeping the filenames:

```

1  osboxes@osboxes:~$ mkdir temp
2  osboxes@osboxes:~$ mv file1.
3  mv: missing destination file operand after 'file1.'
4  Try 'mv --help' for more information.
5  osboxes@osboxes:~$ ls
6  Desktop      directory_name  file3.txt      Pictures  Templates  Videos
7  dest1.txt    Documents      interfaces.html Public    test1.txt
8  directory_1  Downloads      Music          snap     test2.txt
9  directory_2  file2.txt      path           temp     test3.txt
10 osboxes@osboxes:~$ mv test1.txt test2.txt test3.txt temp/
11 osboxes@osboxes:~$ ls temp/
12 test1.txt test2.txt test3.txt
13 osboxes@osboxes:~$

```

Do not prompt for confirmation before overwriting existing files:

```

1  osboxes@osboxes:~$ ls
2  Desktop      directory_2    Downloads  interfaces.html Pictures  temp
3  dest1.txt    directory_name file2.txt  Music      Public   Templates
4  directory_1  Documents     file3.txt path       snap     Videos
5  osboxes@osboxes:~$ mv -f file2.txt temp/
6  osboxes@osboxes:~$ ls
7  Desktop      directory_2    Downloads      Music      Public  Templates
8  dest1.txt    directory_name file3.txt      path       snap    Videos
9  directory_1  Documents     interfaces.html Pictures  temp
10 osboxes@osboxes:~$ ls temp/
11 file2.txt test1.txt test2.txt test3.txt
12 osboxes@osboxes:~$

```

Prompt for confirmation before overwriting existing files, regardless of file permissions:

```

1 osboxes@osboxes:~$ touch file2.txt
2 osboxes@osboxes:~$ mv -i file2.txt temp/
3 mv: overwrite 'temp/file2.txt'? y
4 osboxes@osboxes:~$ ls temp/
5 file2.txt test1.txt test2.txt test3.txt
6 osboxes@osboxes:~$

```

Do not overwrite existing files at the target:

```

1 osboxes@osboxes:~$ touch file2.txt
2 osboxes@osboxes:~$ mv -n file2.txt temp/
3 osboxes@osboxes:~$ ls
4 Desktop      directory_2    Downloads  interfaces.html Pictures    temp
5 dest1.txt     directory_name file2.txt   Music      Public     Templates
6 directory_1 Documents      file3.txt  path       snap       Videos
7 osboxes@osboxes:~$

```

Move files in verbose mode, showing files after they are moved:

```

1 osboxes@osboxes:~$ ls
2 Desktop      directory_2    Downloads  interfaces.html Pictures    temp
3 dest1.txt     directory_name file2.txt   Music      Public     Templates
4 directory_1 Documents      file3.txt  path       snap       Videos
5 osboxes@osboxes:~$ mv -v file2.txt temp/
6 renamed 'file2.txt' -> 'temp/file2.txt'
7 osboxes@osboxes:~$

```

25. rm :

Remove files or directories.

- Remove files from arbitrary locations: `rm {{path/to/file}} {{path/to/another/file}}`
- Recursively remove a directory and all its subdirectories: `rm -r {{path/to/directory}}`
- Forcibly remove a directory, without prompting for confirmation or showing error messages: `rm -rf {{path/to/directory}}`
- Interactively remove multiple files, with a prompt before every removal: `rm -i {{file(s)}}`
- Remove files in verbose mode, printing a message for each removed file: `rm -v {{path/to/directory/*}}`

Lets try out the commands:

Remove files from arbitrary locations:

```

1 osboxes@osboxes:~$ rm temp/file2.txt
2 osboxes@osboxes:~$ ls
3 Desktop      directory_2    Downloads      Music      Public  Templates
4 dest1.txt     directory_name file3.txt       path       snap    Videos
5 directory_1  Documents      interfaces.html Pictures     temp
6 osboxes@osboxes:~$

```

Recursively remove a directory and all its subdirectories:

```

1 osboxes@osboxes:~$ rm -r temp/
2 osboxes@osboxes:~$ ls
3 Desktop      directory_2    Downloads      Music      Public  Videos
4 dest1.txt     directory_name file3.txt       path       snap
5 directory_1  Documents      interfaces.html Pictures     Templates
6 osboxes@osboxes:~$

```

Forcibly remove a directory, without prompting for confirmation or showing error messages:

```

1 osboxes@osboxes:~$ ls
2 Desktop      directory_2    Downloads      Music      snap
3 dest1.txt     directory_name file3.txt       Pictures    Templates
4 directory_1  Documents      interfaces.html Public       Videos
5 osboxes@osboxes:~$

```

Interactively remove multiple files, with a prompt before every removal:

```

1 osboxes@osboxes:~$ ls
2 Desktop      directory_2    Downloads      Music      snap
3 dest1.txt     directory_name file3.txt       Pictures    Templates
4 directory_1  Documents      interfaces.html Public       Videos
5 osboxes@osboxes:~$ rm -i *.txt
6 rm: remove regular empty file 'dest1.txt'? y
7 rm: remove regular empty file 'file3.txt'? y
8 osboxes@osboxes:~$ ls
9 Desktop      directory_2    Documents      interfaces.html Pictures    snap      Video\
10 s
11 directory_1  directory_name Downloads      Music              Public      Templates

```

Remove files in verbose mode, printing a message for each removed file:

```

1  osboxes@osboxes:~$ rm -v Documents/*
2  rm: cannot remove 'Documents/Desktop': Is a directory
3  removed 'Documents/dest1.txt'
4  removed 'Documents/file10.txt'
5  removed 'Documents/file1.txt'
6  removed 'Documents/file2.txt'
7  removed 'Documents/file3.txt'
8  removed 'Documents/test1.txt'
9  removed 'Documents/test2.txt'
10 removed 'Documents/test3.txt'
11 osboxes@osboxes:~$

```

26. chown :

Change user and group ownership of files and directories.

- Change the owner user of a file/directory: `chown {{user}} {{path/to/file_or_directory}}`
- Change the owner user and group of a file/directory: `chown {{user}}:{{group}} {{path/to/-file_or_directory}}`

Lets try out these commands.

Change the owner user of a file/directory:

```

1  osboxes@osboxes:~$ sudo chown root interfaces.html
2  [sudo] password for osboxes:
3  osboxes@osboxes:~$ ls -l
4  total 56
5  drwxr-xr-x 5 osboxes osboxes 4096 Oct 31 09:40 Desktop
6  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_1
7  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_2
8  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_name
9  drwxr-xr-x 3 osboxes osboxes 4096 Oct 31 10:09 Documents
10 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Downloads
11 -rw-rw-r-- 1 root    osboxes 5027 Oct 29 10:12 interfaces.html
12 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Music
13 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Pictures
14 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Public
15 drwx----- 4 osboxes osboxes 4096 Oct 29 10:12 snap
16 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Templates
17 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Videos
18 osboxes@osboxes:~$
19

```

Change the owner user and group of a file/directory:

```

1  osboxes@osboxes:~$ sudo chown root:root interfaces.html
2  osboxes@osboxes:~$ ls -l
3  total 56
4  drwxr-xr-x 5 osboxes osboxes 4096 Oct 31 09:40 Desktop
5  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_1
6  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_2
7  drwxrwxr-x 2 osboxes osboxes 4096 Oct 31 09:45 directory_name
8  drwxr-xr-x 3 osboxes osboxes 4096 Oct 31 10:09 Documents
9  drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Downloads
10 -rw-rw-r-- 1 root    root    5027 Oct 29 10:12 interfaces.html
11 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Music
12 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Pictures
13 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Public
14 drwx----- 4 osboxes osboxes 4096 Oct 29 10:12 snap
15 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Templates
16 drwxr-xr-x 2 osboxes osboxes 4096 Apr 22 2022 Vide

```

27. `chmod` :

Change the access permissions of a file or directory.

- Give the [u]ser who owns a file the right to e[x]ecute it: `chmod u+x {{path/to/file}}`
- Give the [u]ser rights to [r]ead and [w]rite to a file/directory: `chmod u+rw {{path/to/file}_-or_directory}}`
- Remove e[x]ecutable rights from the [g]roup: `chmod g-x {{path/to/file}}`
- Give [a]ll users rights to [r]ead and e[x]ecute: `chmod a+rx {{path/to/file}}`
- Give [o]thers (not in the file owner's group) the same rights as the [g]roup: `chmod o=g {{path/to/file}}`
- Remove all rights from [o]thers: `chmod o= {{path/to/file}}`
- Change permissions recursively giving [g]roup and [o]thers the ability to [w]rite: `chmod -R g+w,o+w {{path/to/directory}}`
- Recursively give [a]ll users [r]ead permissions to files and e[X]ecute permissions to sub-directories within a directory: `chmod -R a+rX {{path/to/directory}}`

Lets try out the commands:

Give the [u]ser who owns a file the right to e[x]ecute it:

```
1 osboxes@osboxes:~$ ls -l interfaces.html
2 -rw-rw-r-- 1 root root 5027 Oct 29 10:12 interfaces.html
3
4 osboxes@osboxes:~$ sudo chmod u+x interfaces.html
5 [sudo] password for osboxes:
6 osboxes@osboxes:~$ ls -l interfaces.html
7 -rwxrw-r-- 1 root root 5027 Oct 29 10:12 interfaces.html
8 osboxes@osboxes:~$
```

Give the [u]ser rights to [r]ead and [w]rite to a file/directory:

```
1 osboxes@osboxes:~$ sudo chmod u+rw interfaces.html
2 osboxes@osboxes:~$ ls -l interfaces.html
3 -rwxrw-r-- 1 root root 5027 Oct 29 10:12 interfaces.html
4 osboxes@osboxes:~$
```

Add e[x]ecutable rights from the [g]roup:

```
1 osboxes@osboxes:~$ ls -l interfaces.html
2 -rwxrwxr-- 1 root root 5027 Oct 29 10:12 interfaces.html
3 osboxes@osboxes:~$
```

Give [a]ll users rights to [r]ead and e[x]ecute:

```
1 osboxes@osboxes:~$ sudo chmod a+rx interfaces.html
2 osboxes@osboxes:~$ ls -l interfaces.html
3 -rwxrwxr-x 1 root root 5027 Oct 29 10:12 interfaces.html
4 osboxes@osboxes:~$
```

Give [o]thers (not in the file owner's group) the same rights as the [g]roup:

```
1 osboxes@osboxes:~$ sudo chmod o=g interfaces.html
2 osboxes@osboxes:~$ ls -l interfaces.html
3 -rwxrwxrwx 1 root root 5027 Oct 29 10:12 interfaces.html
4 osboxes@osboxes:~$
```

Remove all rights from [o]thers:

```
1 osboxes@osboxes:~$ sudo chmod o= interfaces.html
2 osboxes@osboxes:~$ ls -l interfaces.html
3 -rwxrwx--- 1 root root 5027 Oct 29 10:12 interfaces.html
4 osboxes@osboxes:~$
```

Change permissions recursively giving [g]roup and [o]thers the ability to [w]rite:

```

1 osboxes@osboxes:~$ mkdir temp
2 osboxes@osboxes:~$ touch temp/test1.txt
3 osboxes@osboxes:~$ ls -l temp/test1.txt
4 -rw-rw-r-- 1 osboxes osboxes 0 Nov  2 08:25 temp/test1.txt
5 osboxes@osboxes:~$
6
7 osboxes@osboxes:~$ sudo chmod -R g+w,o+w temp/test1.txt
8 osboxes@osboxes:~$ ls -l temp/test1.txt
9 -rw-rw-rw- 1 osboxes osboxes 0 Nov  2 08:25 temp/test1.txt
10 osboxes@osboxes:~$

```

Recursively give [a]ll users [r]ead permissions to files and e[X]ecute permissions to sub-directories within a directory:

```

1 osboxes@osboxes:~$ mkdir temp/temp
2 osboxes@osboxes:~$ sudo chmod -R a+rX temp/
3 osboxes@osboxes:~$ ls -l temp
4 total 4
5 drwxrwxr-x 2 osboxes osboxes 4096 Nov  2 08:26 temp
6 -rw-rw-rw- 1 osboxes osboxes  0 Nov  2 08:25 test1.txt
7 osboxes@osboxes:~$

```

28. wc :

Count lines, words, and bytes.

- Count all lines in a file: `wc --lines {{path/to/file}}`
- Count all words in a file: `wc --words {{path/to/file}}`
- Count all bytes in a file: `wc --bytes {{path/to/file}}`
- Count all characters in a file (taking multi-byte characters into account): `wc --chars {{path/to/file}}`
- Count all lines, words and bytes from stdin:
- Count the length of the longest line in number of characters: `wc --max-line-length {{path/to/file}}`

Lets try out these commands:

Count all lines in a file:

```

1 osboxes@osboxes:~$ echo "KISS linux commands" > temp/test1.txt
2 osboxes@osboxes:~$ wc --lines temp/test1.txt
3 1 temp/test1.txt
4 osboxes@osboxes:~$

```

Count all words in a file:

```

1  osboxes@osboxes:~$ wc --words temp/test1.txt
2  3 temp/test1.txt
3  osboxes@osboxes:~$

```

Count all bytes in a file:

```

1  osboxes@osboxes:~$ wc --bytes temp/test1.txt
2  20 temp/test1.txt
3  osboxes@osboxes:~$

```

Count all characters in a file (taking multi-byte characters into account):

```

1  osboxes@osboxes:~$ wc --chars temp/test1.txt
2  20 temp/test1.txt
3  osboxes@osboxes:~$

```

Count all lines, words and bytes from stdin:

```

1  osboxes@osboxes:~$ find . | wc
2  29215  29223 1946476
3  osboxes@osboxes:~$

```

Count the length of the longest line in number of characters:

```

1  osboxes@osboxes:~$ wc --max-line-length temp/test1.txt
2  19 temp/test1.txt
3  osboxes@osboxes:~$

```

29. tr :

Translate characters: run replacements based on single characters and character sets.

- Replace all occurrences of a character in a file, and print the result: `tr {{find_character}} {{replace_character}} < {{filename}}`
- Replace all occurrences of a character from another command's output:

```
echo {{text}} | tr {{find_character}} {{replace_character}}
```

- Map each character of the first set to the corresponding character of the second set: `tr '{{abcd}}' '{{jkmn}}' < {{filename}}`
- Delete all occurrences of the specified set of characters from the input: `tr -d '{{input_characters}}' < {{filename}}`
- Compress a series of identical characters to a single character: `tr -s '{{input_characters}}' < {{filename}}`
- Translate the contents of a file to upper-case: `tr "[:lower:]" "[:upper:]" < {{filename}}`
- Strip out non-printable characters from a file: `tr -cd "[:print:]" < {{filename}}`

Lets try out these commands:

Replace all occurrences of a character in a file, and print the result:

```

1  osboxes@osboxes:~$ cat temp/test1.txt
2  KISS linux commands
3  osboxes@osboxes:~$ tr K m < temp/test1.txt
4  mISS linux commands

```

Replace all occurrences of a character from another command's output:

```

1  osboxes@osboxes:~$ echo "I love Linux" | tr o i
2  I live Linux
3  osboxes@osboxes:~$

```

Map each character of the first set to the corresponding character of the second set:

```

1  osboxes@osboxes:~$ tr '{{ilov}}' '{{jklv}}' < temp/test1.txt
2  KISS kjnux clmmands
3  osboxes@osboxes:~$

```

Delete all occurrences of the specified set of characters from the input:

```

1  osboxes@osboxes:~$ tr -d 'l' < temp/test1.txt
2  KISS inux commands
3  osboxes@osboxes:~$

```

Compress a series of identical characters to a single character:

```

1  osboxes@osboxes:~$ tr -s 'S' < temp/test1.txt
2  KIS linux commands
3  osboxes@osboxes:~$

```

Translate the contents of a file to upper-case:

```

1  osboxes@osboxes:~$ tr "[:lower:]" "[:upper:]" < temp/test1.txt
2  KISS LINUX COMMANDS
3  osboxes@osboxes:~$

```

Strip out non-printable characters from a file:

```

1  osboxes@osboxes:~$ tr -cd "[:print:]" < temp/test1.txt
2  KISS linux commandsosboxes@osboxes:~$

```

30. uniq :

Output the unique lines from the given input or file.

- Display each line once:

```
sort {{file}} | uniq
```

- Display only unique lines:

```
sort {{file}} | uniq -u
```

- Display only duplicate lines:

```
sort {{file}} | uniq -d
```

- Display number of occurrences of each line along with that line:

```
sort {{file}} | uniq -c
```

- Display number of occurrences of each line, sorted by the most frequent:

```
sort {{file}} | uniq -c | sort -nr
```

Lets try out the commands:

Display each line once:

```
1  osboxes@osboxes:~$ cat temp/test1.txt
2  KISS linux commands
3  I live for Linux
4  osboxes@osboxes:~$ sort temp/test1.txt | uniq
5  I live for Linux
6  KISS linux commands
7  osboxes@osboxes:~$
```

Display only unique lines:

```
1  osboxes@osboxes:~$ cat temp/test1.txt
2  KISS linux commands
3  I live for Linux
4  I live for Linux
5  osboxes@osboxes:~$ sort temp/test1.txt | uniq -u
6  KISS linux commands
7  osboxes@osboxes:~$
```

Display only duplicate lines:

```
1  osboxes@osboxes:~$ sort temp/test1.txt | uniq -d
2  I live for Linux
3  osboxes@osboxes:~$
```

Display number of occurrences of each line along with that line:

```

1  osboxes@osboxes:~$ sort temp/test1.txt | uniq -c
2      2 I live for Linux
3      1 KISS linux commands
4  osboxes@osboxes:~$

```

Display number of occurrences of each line, sorted by the most frequent:

```

1  osboxes@osboxes:~$ cat temp/test1.txt
2  KISS linux commands
3  I live for Linux
4  I live for Linux
5  I die for Linux
6  osboxes@osboxes:~$ sort temp/test1.txt | uniq -c | sort -nr
7      2 I live for Linux
8      1 KISS linux commands
9      1 I die for Linux
10 osboxes@osboxes:~$

```

31. split :

Split a file into pieces.

- Split a file, each split having 10 lines (except the last split): `split -l {{10}} {{filename}}`
- Split a file into 5 files. File is split such that each split has same size (except the last split): `split -n {{5}} {{filename}}`
- Split a file with 512 bytes in each split (except the last split; use 512k for kilobytes and 512m for megabytes): `split -b {{512}} {{filename}}`

Lets try out the commands:

Split a file, each split having 2 lines (except the last split):

```

1  osboxes@osboxes:~$ split -l 2 temp/test1.txt
2  osboxes@osboxes:~$ ls x*
3  xaa xab xac xad xae
4  osboxes@osboxes:~$
5  osboxes@osboxes:~$ cat xaa
6  Line 1
7  Line 2
8  osboxes@osboxes:~$ cat xab
9  Line 3
10 Line 4
11 osboxes@osboxes:~$ cat xac
12 Line 4
13 Line 5
14 osboxes@osboxes:~$ cat xad

```

```

15   Line 6
16   Line 7
17   osboxes@osboxes:~$ cat xae
18   Line 8
19   osboxes@osboxes:~$

```

Split a file into 3 files. File is split such that each split has same size (except the last split):

```

1   osboxes@osboxes:~$ split -n 3 temp/test1.txt temp/
2   osboxes@osboxes:~$ ls temp/
3   aa  ab  ac  temp  test1.txt
4   osboxes@osboxes:~$
5   osboxes@osboxes:~$ ls -l temp/
6   total 20
7   -rw-rw-r-- 1 osboxes osboxes  21 Nov  2 08:49 aa
8   -rw-rw-r-- 1 osboxes osboxes  21 Nov  2 08:49 ab
9   -rw-rw-r-- 1 osboxes osboxes  21 Nov  2 08:49 ac
10  drwxrwxr-x 2 osboxes osboxes 4096 Nov  2 08:26 temp
11  -rw-rw-rw- 1 osboxes osboxes  63 Nov  2 08:46 test1.txt

```

Split a file with 20 bytes in each split (except the last split; use 512k for kilobytes and 512m for megabytes):

```

1   osboxes@osboxes:~$ split -b 20 temp/test1.txt temp/
2   osboxes@osboxes:~$ ls -l temp/
3   total 24
4   -rw-rw-r-- 1 osboxes osboxes  20 Nov  2 08:50 aa
5   -rw-rw-r-- 1 osboxes osboxes  20 Nov  2 08:50 ab
6   -rw-rw-r-- 1 osboxes osboxes  20 Nov  2 08:50 ac
7   -rw-rw-r-- 1 osboxes osboxes   3 Nov  2 08:50 ad
8   drwxrwxr-x 2 osboxes osboxes 4096 Nov  2 08:26 temp
9   -rw-rw-rw- 1 osboxes osboxes  63 Nov  2 08:46 test1.txt
10  osboxes@osboxes:~$

```

32. head :

Output the first part of files.

- Output the first few lines of a file: `head --lines {{count}} {{path/to/file}}`
- Output the first few bytes of a file: `head --bytes {{count}} {{path/to/file}}`
- Output everything but the last few lines of a file: `head --lines -{{count}} {{path/to/file}}`
- Output everything but the last few bytes of a file: `head --bytes -{{count}} {{path/to/file}}`

Lets try out these command:

Output the first few lines of a file:

```
1  osboxes@osboxes:~$ head --lines 2 temp/test1.txt
2  Line 1
3  Line 2
4  osboxes@osboxes:~$
```

Output the first few bytes of a file:

```
1  osboxes@osboxes:~$ head --bytes 2 temp/test1.txt
2  Liosboxes@osboxes:~$
```

Output everything but the last few lines of a file:

```
1  osboxes@osboxes:~$ cat temp/test1.txt
2  Line 1
3  Line 2
4  Line 3
5  Line 4
6  Line 4
7  Line 5
8  Line 6
9  Line 7
10 Line 8
11 osboxes@osboxes:~$
12 osboxes@osboxes:~$ head --bytes 2 temp/test1.txt
13 Liosboxes@osboxes:~$ head --lines -2 temp/test1.txt
14 Line 1
15 Line 2
16 Line 3
17 Line 4
18 Line 4
19 Line 5
20 Line 6
21 osboxes@osboxes:~$
```

Output everything but the last few bytes of a file:

```
1  osboxes@osboxes:~$ head --bytes -2 temp/test1.txt
2  Line 1
3  Line 2
4  Line 3
5  Line 4
6  Line 4
7  Line 5
8  Line 6
9  Line 7
10 Line osboxes@osboxes:~$
```

33. tail :

Display the last part of a file.

- Show last 'count' lines in file: `tail --lines {{count}} {{path/to/file}}`
- Print a file from a specific line number: `tail --lines +{{count}} {{path/to/file}}`
- Print a specific count of bytes from the end of a given file: `tail --bytes {{count}} {{path/to/-file}}`
- Print the last lines of a given file and keep reading file until Ctrl + C: `tail --follow {{path/to/file}}`
- Keep reading file until Ctrl + C, even if the file is inaccessible: `tail --retry --follow {{path/to/file}}`
- Show last 'num' lines in 'file' and refresh every 'n' seconds: `tail --lines {{count}} --sleep-interval {{seconds}} --follow {{path/to/file}}`

Lets try out these commands:

Show last 'count' lines in file:

```
1  osboxes@osboxes:~$ tail --lines 2 temp/test1.txt
2  Line 7
3  Line 8
4  osboxes@osboxes:~$
```

Print a file from a specific line number:

```
1  osboxes@osboxes:~$ tail --lines +2 temp/test1.txt
2  Line 2
3  Line 3
4  Line 4
5  Line 4
6  Line 5
7  Line 6
8  Line 7
9  Line 8
10 osboxes@osboxes:~$
```

Print a specific count of bytes from the end of a given file:

```
1  osboxes@osboxes:~$ tail --bytes 2 temp/test1.txt
2  8
3  osboxes@osboxes:~$
```

Print the last lines of a given file and keep reading file until Ctrl + C:

```
1  osboxes@osboxes:~$ tail --follow temp/test1.txt
2  Line 1
3  Line 2
4  Line 3
5  Line 4
6  Line 4
7  Line 5
8  Line 6
9  Line 7
10 Line 8
11 ^C
12 osboxes@osboxes:~$
```

Keep reading file until Ctrl + C, even if the file is inaccessible:

```
1  osboxes@osboxes:~$ tail --retry --follow temp/test1.txtt
2  tail: warning: --retry only effective for the initial open
3  tail: cannot open 'temp/test1.txtt' for reading: No such file or directory
4  ^C
5  osboxes@osboxes:~$
```

Show last 'num' lines in 'file' and refresh every 'n' seconds:

```
1 osboxes@osboxes:~$ tail --lines 2 --sleep-interval 2 --follow temp/test1.txt
2 Line 7
3 Line 8
4 ^C
5 osboxes@osboxes:~$
```

34. more :

Open a file for interactive reading, allowing scrolling and search.

- Open a file: `more {{path/to/file}}`
- Open a file displaying from a specific line: `more +{{line_number}} {{path/to/file}}`
- Display help: `more --help`
- Go to the next page:

Lets try out these commands:

Open a file:

```
1 osboxes@osboxes:~$ more temp/test1.txt
2 Line 1
3 Line 2
4 Line 3
5 Line 4
6 Line 4
7 Line 5
8 Line 6
9 Line 7
10 Line 8
11 osboxes@osboxes:~$
```

Open a file displaying from a specific line:

```
1 osboxes@osboxes:~$ more +2 temp/test1.txt
2 Line 2
3 Line 3
4 Line 4
5 Line 4
6 Line 5
7 Line 6
8 Line 7
9 Line 8
10 osboxes@osboxes:~$
```

Display help:

```

1  osboxes@osboxes:~$ more --help
2
3  Usage:
4    more [options] <file>...
5
6  A file perusal filter for CRT viewing.
7
8  Options:
9    -d, --silent          display help instead of ringing bell
10   -f, --logical          count logical rather than screen lines
11   -l, --no-pause         suppress pause after form feed
12   -c, --print-over       do not scroll, display text and clean line ends
13   -p, --clean-print      do not scroll, clean screen and display text
14   -s, --squeeze          squeeze multiple blank lines into one
15   -u, --plain            suppress underlining and bold
16   -n, --lines <number>  the number of lines per screenful
17   -<number>              same as --lines
18   +<number>              display file beginning from line number
19   +/<pattern>            display file beginning from pattern match
20
21   -h, --help             display this help
22   -V, --version          display version
23
24   For more details see more(1).
25  osboxes@osboxes:~$

```

Go to the next page:

```

1  osboxes@osboxes:~$ man more | more
2  MORE(1)                                User Commands                                MORE(1)
3
4  NAME
5      more - file perusal filter for crt viewing
6
7  SYNOPSIS
8      more [options] file ...
9
10 DESCRIPTION
11      more is a filter for paging through text one screenful at a time. This
12      version is especially primitive. Users should realize that less(1) provides \
13
14      more(1) emulation plus extensive enhancements.
15

```

16 OPTIONS

17 Options are also taken from the environment variable MORE (make sure to \

18

19 precede them with a dash (-)) but command-line options will override those. \

20

21

22 -d, --silent

23 Prompt with "[Press space to continue, 'q' to quit.]", and display

24 "[Press 'h' for instructions.]" instead of ringing the bell when an \

25

26 illegal key is pressed.

27

28 -l, --logical

29 Do not pause after any line containing a ^L (form feed).

30

31 -f, --no-pause

32 Count logical lines, rather than screen lines (i.e., long lines are not \

33

34 folded).

35

36 -p, --print-over

37 Do not scroll. Instead, clear the whole screen and then display the \

38

39 text. Notice that this option is switched on automatically if the

40 executable is named page.

41

42 -c, --clean-print

43 Do not scroll. Instead, paint each screen from the top, clearing the \

44

45 remainder of each line as it is displayed.

46

47 -s, --squeeze

48 Squeeze multiple blank lines into one.

49

50 -u, --plain

51 Suppress underlining. This option is silently ignored as backwards

52 compatibility.

53

54 -n, --lines number

55 Specify the number of lines per screenful. The number argument is a \

56

57 positive decimal integer. The --lines option shall override any values \

58

```

59         obtained from any other source, such as number of lines reported by
60
61         terminal.
62
63     -number
64         A numeric option means the same as --lines option argument.
65
66     +number
67         Start displaying each file at line number.
68
69     +/string
70         The string to be searched in each file before starting to display it.
71
72
73     --help
74         Display help text and exit.
75
76     -V, --version
77         Display version information and exit.

```

Search for a string (press n to go to the next match):

```
1  /{{something}}
```

Exit:

```
1  q
```

Display help about interactive commands:

```

1  h
2
3  -----
4
5  <space>      Display next k lines of text [current screen size]
6  z           Display next k lines of text [current screen size]*
7  <return>     Display next k lines of text [1]*
8  d or ctrl-D Scroll k lines [current scroll size, initially 11]*
9  q or Q or <interrupt> Exit from more
10 s          Skip forward k lines of text [1]
11 f          Skip forward k screenfuls of text [1]
12 b or ctrl-B Skip backwards k screenfuls of text [1]
13 '          Go to place where previous search started
14 =          Display current line number

```

15	<code>/<regular expression></code>	Search for kth occurrence of regular expression [1]
16	<code>n</code>	Search for kth occurrence of last r.e [1]
17	<code>!<cmd> or :!<cmd></code>	Execute <cmd> in a subshell
18	<code>v</code>	Start up '/usr/bin/vi' at current line
19	<code>ctrl-L</code>	Redraw screen
20	<code>:n</code>	Go to kth next file [1]
21	<code>:p</code>	Go to kth previous file [1]
22	<code>:f</code>	Display current file name and line number
23	<code>.</code>	Repeat previous <code>command</code>

35. less :

Open a file for interactive reading, allowing scrolling and search.

- Open a file: `less {{source_file}}`
- Page down / up: (down), b (up)
- Go to end / start of file: G (end), g (start)
- Forward search for a string (press n/N to go to next/previous match): `/{{something}}`
- Backward search for a string (press n/N to go to next/previous match): `?{{something}}`
- Follow the output of the currently opened file: F
- Open the current file in an editor: v
- Exit: q

Lets try out the commands:

Open a file:

```

1   Line 1
2   Line 2
3   Line 3
4   Line 4
5   Line 4
6   Line 5
7   Line 6
8   Line 7
9   Line 8
10  temp/test1.txt (END)

```

Page down / up:

```
1   <Space> (down), b (up)
```

Go to end / start of file:

```
1   G (end), g (start)
```

Forward search for a string (press n/N to go to next/previous match):

```
1    /{{something}}
```

Backward search for a string (press n/N to go to next/previous match):

```
1    ?{{something}}
```

Follow the output of the currently opened file:

```
1    F
```

Open the current file in an editor:

```
1    v
```

Exit:

```
1    q
```

36. cat :

Print and concatenate files.

- Print the contents of a file to the standard output: `cat {{path/to/file}}`
- Concatenate several files into an output file: `cat {{path/to/file1}} {{path/to/file2}} > {{path/-to/output_file}}`
- Append several files into an output file: `cat {{path/to/file1}} {{path/to/file2}} >> {{path/-to/output_file}}`
- Number all output lines: `cat -n {{path/to/file}}`
- Display non-printable and whitespace characters (with M- prefix if non-ASCII): `cat -v -t -e {{path/to/file}}`

Lets try out the commands:

Print the contents of a file to the standard output:

```
1    osboxes@osboxes:~$ cat temp/test1.txt
2    Line 1
3    Line 2
4    Line 3
5    Line 4
6    Line 4
7    Line 5
8    Line 6
9    Line 7
10   Line 8
11   osboxes@osboxes:~$
```

Concatenate several files into an output file:

```
1  osboxes@osboxes:~$ cat temp/test1.txt temp/test1.txt > test2.txt
2  osboxes@osboxes:~$ cat test2.txt
3  Line 1
4  Line 2
5  Line 3
6  Line 4
7  Line 4
8  Line 5
9  Line 6
10 Line 7
11 Line 8
12 Line 1
13 Line 2
14 Line 3
15 Line 4
16 Line 4
17 Line 5
18 Line 6
19 Line 7
20 Line 8
21 osboxes@osboxes:~$
```

Append several files into an output file:

```
1  osboxes@osboxes:~$ cat temp/test1.txt temp/test1.txt >> test2.txt
2  osboxes@osboxes:~$ cat test2.txt
3  Line 1
4  Line 2
5  Line 3
6  Line 4
7  Line 4
8  Line 5
9  Line 6
10 Line 7
11 Line 8
12 Line 1
13 Line 2
14 Line 3
15 Line 4
16 Line 4
17 Line 5
18 Line 6
19 Line 7
```

```
20    Line 8
21    Line 1
22    Line 2
23    Line 3
24    Line 4
25    Line 4
26    Line 5
27    Line 6
28    Line 7
29    Line 8
30    Line 1
31    Line 2
32    Line 3
33    Line 4
34    Line 4
35    Line 5
36    Line 6
37    Line 7
38    Line 8
39    osboxes@osboxes:~$
```

Number all output lines:

```
1    osboxes@osboxes:~$ cat -n test2.txt
2         1  Line 1
3         2  Line 2
4         3  Line 3
5         4  Line 4
6         5  Line 4
7         6  Line 5
8         7  Line 6
9         8  Line 7
10        9  Line 8
11       10  Line 1
12       11  Line 2
13       12  Line 3
14       13  Line 4
15       14  Line 4
16       15  Line 5
17       16  Line 6
18       17  Line 7
19       18  Line 8
20       19  Line 1
```

```
21      20 Line 2
22      21 Line 3
23      22 Line 4
24      23 Line 4
25      24 Line 5
26      25 Line 6
27      26 Line 7
28      27 Line 8
29      28 Line 1
30      29 Line 2
31      30 Line 3
32      31 Line 4
33      32 Line 4
34      33 Line 5
35      34 Line 6
36      35 Line 7
37      36 Line 8
38 osboxes@osboxes:~$
```

Display non-printable and whitespace characters (with M- prefix if non-ASCII):

```
1 osboxes@osboxes:~$ cat -v -t -e test2.txt
2 Line 1$
3 Line 2$
4 Line 3$
5 Line 4$
6 Line 4$
7 Line 5$
8 Line 6$
9 Line 7$
10 Line 8$
11 Line 1$
12 Line 2$
13 Line 3$
14 Line 4$
15 Line 4$
16 Line 5$
17 Line 6$
18 Line 7$
19 Line 8$
20 Line 1$
21 Line 2$
22 Line 3$
```

```
23 Line 4$
24 Line 4$
25 Line 5$
26 Line 6$
27 Line 7$
28 Line 8$
29 Line 1$
30 Line 2$
31 Line 3$
32 Line 4$
33 Line 4$
34 Line 5$
35 Line 6$
36 Line 7$
37 Line 8$
38 osboxes@osboxes:~$
```

Network

Lets look at the most common network commands. Here is the list of all the command we will look at:

1. ip
2. ifconfig
3. netstat
4. whois
5. dig
6. nslookup
7. host
8. hostname
9. ip

Show / manipulate routing, devices, policy routing and tunnels.

- List interfaces with detailed info: ip address
- List interfaces with brief network layer info: ip -brief address
- List interfaces with brief link layer info: ip -brief link
- Display the routing table: ip route
- Show neighbors (ARP table): ip neighbour
- Make an interface up/down: ip link set {{interface}} up/down
- Add/Delete an IP address to an interface: ip addr add/del {{ip}}/{{mask}} dev {{interface}}
- Add a default route: ip route add default via {{ip}} dev {{interface}}

Lets us try out these command:

List interfaces with detailed info:

```

1  osboxes@osboxes:~$ ip address
2  1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
3  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
4  inet 127.0.0.1/8 scope host lo
5      valid_lft forever preferred_lft forever
6  inet6 ::1/128 scope host
7      valid_lft forever preferred_lft forever
8  2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
9  link/ether 08:00:27:99:19:ac brd ff:ff:ff:ff:ff:ff
10 inet 192.168.0.180/24 brd 192.168.0.255 scope global dynamic noprefixroute enp0s3
11     valid_lft 6409sec preferred_lft 6409sec
12 inet6 fe80::d7d8:fc77:b814:5901/64 scope link noprefixroute
13     valid_lft forever preferred_lft forever
14 osboxes@osboxes:~$

```

List interfaces with brief network layer info:

```

1  osboxes@osboxes:~$ ip -brief address
2  lo                UNKNOWN          127.0.0.1/8 ::1/128
3  enp0s3            UP                192.168.0.180/24 fe80::d7d8:fc77:b814:5901/64
4  osboxes@osboxes:~$

```

List interfaces with brief link layer info:

```

1  osboxes@osboxes:~$ ip -brief link
2  lo                UNKNOWN          00:00:00:00:00:00 <LOOPBACK,UP,LOWER_UP>
3  enp0s3            UP                08:00:27:99:19:ac <BROADCAST,MULTICAST,UP,LOWER_UP>
4
5  osboxes@osboxes:~$

```

Display the routing table:

```

1  osboxes@osboxes:~$ ip route
2  default via 192.168.0.1 dev enp0s3 proto dhcp metric 100
3  169.254.0.0/16 dev enp0s3 scope link metric 1000
4  192.168.0.0/24 dev enp0s3 proto kernel scope link src 192.168.0.180 metric 100
5
6  osboxes@osboxes:~$

```

Show neighbors (ARP table):

```

1  osboxes@osboxes:~$ ip neighbour
2  192.168.0.1 dev enp0s3 lladdr 90:9a:4a:3f:c4:55 REACHABLE
3  192.168.0.225 dev enp0s3 lladdr 20:2b:20:08:ce:f7 REACHABLE
4  osboxes@osboxes:~$

```

Make an interface up/down:

```

1  osboxes@osboxes:~$ sudo ip link set enp0s3 up
2  [sudo] password for osboxes:
3  osboxes@osboxes:~$

```

Add/Delete an IP address to an interface:

```

1  osboxes@osboxes:~$ sudo ip addr add 175.25.25.25/255.255.255.0 dev enp0s3
2  osboxes@osboxes:~$ ip -brief address
3  lo                UNKNOWN          127.0.0.1/8 ::1/128
4  enp0s3            UP                192.168.0.180/24 175.25.25.25/24 fe80::d7d8:fc77:b8\
5  14:5901/64
6  osboxes@osboxes:~$
7  osboxes@osboxes:~$ sudo ip addr del 175.25.25.25/255.255.255.0 dev enp0s3
8  osboxes@osboxes:~$ ip -brief address
9  lo                UNKNOWN          127.0.0.1/8 ::1/128
10 enp0s3            UP                192.168.0.180/24 fe80::d7d8:fc77:b814:5901/64
11 osboxes@osboxes:~$

```

Add a default route:

```

1  osboxes@osboxes:~$ sudo ip route add default via 192.168.0.1 dev enp0s3
2  osboxes@osboxes:~$ ip route
3  default via 192.168.0.1 dev enp0s3
4  default via 192.168.0.1 dev enp0s3 proto dhcp metric 100
5  169.254.0.0/16 dev enp0s3 scope link metric 1000
6  192.168.0.0/24 dev enp0s3 proto kernel scope link src 192.168.0.180 metric 100 \
7
8  osboxes@osboxes:~$ sudo ip route del default via 192.168.0.1 dev enp0s3
9  osboxes@osboxes:~$ ip route
10 default via 192.168.0.1 dev enp0s3 proto dhcp metric 100
11 169.254.0.0/16 dev enp0s3 scope link metric 1000
12 192.168.0.0/24 dev enp0s3 proto kernel scope link src 192.168.0.180 metric 100 \
13
14 osboxes@osboxes:~$

```

10. ifconfig :

Network Interface Configurator.

- View network settings of an Ethernet adapter: `ifconfig eth0`
- Display details of all interfaces, including disabled interfaces: `ifconfig -a`
- Disable `eth0` interface: `ifconfig eth0 down`
- Enable `eth0` interface: `ifconfig eth0 up`
- Assign IP address to `eth0` interface: `ifconfig eth0 {{ip_address}}`

Lets us try out these commands:

View network settings of an Ethernet adapter:

```

1  osboxes@osboxes:~$ ifconfig enp0s3
2  enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
3          inet 192.168.0.180  netmask 255.255.255.0  broadcast 192.168.0.255
4          inet6 fe80::d7d8:fc77:b814:5901  prefixlen 64  scopeid 0x20<link>
5          ether 08:00:27:99:19:ac  txqueuelen 1000  (Ethernet)
6          RX packets 37304  bytes 41025818 (41.0 MB)
7          RX errors 0  dropped 0  overruns 0  frame 0
8          TX packets 13593  bytes 1219558 (1.2 MB)
9          TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

```

Display details of all interfaces, including disabled interfaces:

```

1  osboxes@osboxes:~$ ifconfig -a
2  enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
3          inet 192.168.0.180  netmask 255.255.255.0  broadcast 192.168.0.255
4          inet6 fe80::d7d8:fc77:b814:5901  prefixlen 64  scopeid 0x20<link>
5          ether 08:00:27:99:19:ac  txqueuelen 1000  (Ethernet)
6          RX packets 37330  bytes 41028332 (41.0 MB)
7          RX errors 0  dropped 0  overruns 0  frame 0
8          TX packets 13612  bytes 1221926 (1.2 MB)
9          TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
10
11  lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
12          inet 127.0.0.1  netmask 255.0.0.0
13          inet6 ::1  prefixlen 128  scopeid 0x10<host>
14          loop txqueuelen 1000  (Local Loopback)
15          RX packets 334  bytes 29835 (29.8 KB)
16          RX errors 0  dropped 0  overruns 0  frame 0
17          TX packets 334  bytes 29835 (29.8 KB)
18          TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
19
20  osboxes@osboxes:~$

```

Disable `enp0s3` interface:

```

1  osboxes@osboxes:~$ sudo ifconfig enp0s3 down
2  osboxes@osboxes:~$ ifconfig -a
3  enp0s3: flags=4163<DOWN,BROADCAST,RUNNING,MULTICAST>  mtu 1500
4          inet 192.168.0.180  netmask 255.255.255.0  broadcast 192.168.0.255
5          inet6 fe80::d7d8:fc77:b814:5901  prefixlen 64  scopeid 0x20<link>
6          ether 08:00:27:99:19:ac  txqueuelen 1000  (Ethernet)
7          RX packets 37425  bytes 41035845 (41.0 MB)
8          RX errors 0  dropped 0  overruns 0  frame 0
9          TX packets 13665  bytes 1228536 (1.2 MB)
10         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
11
12  lo: flags=8<LOOPBACK>  mtu 65536
13         inet 127.0.0.1  netmask 255.0.0.0
14         loop txqueuelen 1000  (Local Loopback)
15         RX packets 334  bytes 29835 (29.8 KB)
16         RX errors 0  dropped 0  overruns 0  frame 0
17         TX packets 334  bytes 29835 (29.8 KB)
18         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

```

Enable eth0 interface:

```

1  osboxes@osboxes:~$ sudo ifconfig enp0s3 up
2  osboxes@osboxes:~$ ifconfig -a
3  enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
4          inet 192.168.0.180  netmask 255.255.255.0  broadcast 192.168.0.255
5          inet6 fe80::d7d8:fc77:b814:5901  prefixlen 64  scopeid 0x20<link>
6          ether 08:00:27:99:19:ac  txqueuelen 1000  (Ethernet)
7          RX packets 37425  bytes 41035845 (41.0 MB)
8          RX errors 0  dropped 0  overruns 0  frame 0
9          TX packets 13665  bytes 1228536 (1.2 MB)
10         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
11
12  lo: flags=8<LOOPBACK>  mtu 65536
13         inet 127.0.0.1  netmask 255.0.0.0
14         loop txqueuelen 1000  (Local Loopback)
15         RX packets 334  bytes 29835 (29.8 KB)
16         RX errors 0  dropped 0  overruns 0  frame 0
17         TX packets 334  bytes 29835 (29.8 KB)
18         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

```

osboxes@osboxes:~\$ ifconfig enp0s3 Command 'ifconfig' not found, but can be installed with:
sudo apt install net-tools

11. netstat :

Displays network-related information such as open connections, open socket ports, etc.

- List all ports: `netstat --all`
- List all listening ports: `netstat --listening`
- List listening TCP ports: `netstat --tcp`
- Display PID and program names: `netstat --program`
- List information continuously: `netstat --continuous`
- List routes and do not resolve IP addresses to hostnames: `netstat --route --numeric`
- List listening TCP and UDP ports (+ user and process if you're root): `netstat --listening --program --numeric --tcp --udp --extend`

Lets try out the commands:

List all ports:

```

1  osboxes@osboxes:~$ netstat --all
2  Active Internet connections (servers and established)
3  Proto Recv-Q Send-Q Local Address           Foreign Address         State
4  tcp      0      0 0.0.0.0:ssh              0.0.0.0:*               LISTEN
5  tcp      0      0 localhost:ipp            0.0.0.0:*               LISTEN
6  tcp      0      0 localhost:domain         0.0.0.0:*               LISTEN
7  tcp      0 356  osboxes:ssh              DESKTOP-JLD6RNQ:53340    ESTABLISHED
8  tcp      0      0 osboxes:53950            84.170.224.35.bc.g:http TIME_WAIT
9  tcp6     0      0 ip6-localhost:ipp       [::]:*                  LISTEN
10 tcp6     0      0 [::]:ssh                 [::]:*                  LISTEN
11 udp      0      0 localhost:domain         0.0.0.0:*
12 udp      0      0 osboxes:bootpc           Archer:bootps            ESTABLISHED
13
14 udp      0      0 0.0.0.0:58437            0.0.0.0:*
15 udp      0      0 0.0.0.0:631              0.0.0.0:*
16 udp      0      0 0.0.0.0:mdns              0.0.0.0:*
17 udp6     0      0 [::]:40990               [::]:*
18 udp6     0      0 [::]:mdns                 [::]:*
19 raw6     0      0 [::]:ipv6-icmp           [::]:*                   7
20 Active UNIX domain sockets (servers and established)
21 Proto RefCnt Flags       Type        State        I-Node  Path
22 unix  2      [ ACC ]    STREAM     LISTENING   20235    /tmp/.ICE-unix/874
23 unix  2      [ ACC ]    STREAM     LISTENING   20754    /tmp/.X11-unix/X1024
24
25 unix  2      [ ACC ]    STREAM     LISTENING   20756    /tmp/.X11-unix/X1025
26
27 unix  2      [ ]      DGRAM      22298      /run/user/1000/systemd/n\
28otify
29 unix  3      [ ]      STREAM     CONNECTED   19914
30 ...
31 osboxes@osboxes:~

```

List all listening ports:

```

1  osboxes@osboxes:~$ netstat --listening
2  Active Internet connections (only servers)
3  Proto Recv-Q Send-Q Local Address           Foreign Address         State
4  tcp      0      0 0.0.0.0:ssh              0.0.0.0:*               LISTEN
5  tcp      0      0 localhost:ipp           0.0.0.0:*               LISTEN
6  tcp      0      0 localhost:domain        0.0.0.0:*               LISTEN
7  tcp6     0      0 ip6-localhost:ipp      [::]:*                  LISTEN
8  tcp6     0      0 [::]:ssh                [::]:*                  LISTEN
9  udp      0      0 localhost:domain        0.0.0.0:*
10 udp      0      0 0.0.0.0:58437           0.0.0.0:*
11 udp      0      0 0.0.0.0:631             0.0.0.0:*
12 udp      0      0 0.0.0.0:mdns            0.0.0.0:*
13 udp6     0      0 [::]:40990              [::]:*
14 udp6     0      0 [::]:mdns                [::]:*
15 raw6     0      0 [::]:ipv6-icmp          [::]:*                  7
16 Active UNIX domain sockets (only servers)
17 Proto RefCnt Flags      Type       State       I-Node  Path
18 unix  2      [ ACC ]    STREAM    LISTENING   20235    /tmp/.ICE-unix/874
19 unix  2      [ ACC ]    STREAM    LISTENING   20754    /tmp/.X11-unix/X1024 \
20
21 unix  2      [ ACC ]    STREAM    LISTENING   20756    /tmp/.X11-unix/X1025 \
22
23 unix  2      [ ACC ]    STREAM    LISTENING   22301    /run/user/1000/systemd/p\
24 rivate
25 unix  2      [ ACC ]    STREAM    LISTENING   19925    /run/user/127/systemd/pr\
26 ivate
27 unix  2      [ ACC ]    STREAM    LISTENING   22308    /run/user/1000/bus
28 unix  2      [ ACC ]    STREAM    LISTENING   19932    /run/user/127/bus
29 unix  2      [ ACC ]    STREAM    LISTENING   18055    /run/acpid.socket
30 unix  2      [ ACC ]    STREAM    LISTENING   18065    /run/avahi-daemon/socket\
31
32 unix  2      [ ACC ]    STREAM    LISTENING   22311    /run/user/1000/gnupg/S.d\
33 irmngr
34 unix  2      [ ACC ]    STREAM    LISTENING   19934    /run/user/127/gnupg/S.di\
35  rmngr
36 unix  2      [ ACC ]    STREAM    LISTENING   22313    /run/user/1000/gnupg/S.g\
37  pg-agent.browser
38 unix  2      [ ACC ]    STREAM    LISTENING   19936    /run/user/127/gnupg/S.gp\
39  g-agent.browser
40 unix  2      [ ACC ]    STREAM    LISTENING   22315    /run/user/1000/gnupg/S.g\
41  pg-agent.extra
42 unix  2      [ ACC ]    STREAM    LISTENING   19938    /run/user/127/gnupg/S.gp\
43  g-agent.extra

```

```

44  unix 2      [ ACC ]    STREAM    LISTENING   22317      /run/user/1000/gnupg/S.g\
45  pg-agent.ssh
46  unix 2      [ ACC ]    STREAM    LISTENING   19940      /run/user/127/gnupg/S.gp\
47  g-agent.ssh
48  unix 2      [ ACC ]    STREAM    LISTENING   18077      /run/dbus/system_bus_soc\
49  ket
50  unix 2      [ ACC ]    STREAM    LISTENING   22319      /run/user/1000/gnupg/S.g\
51  pg-agent
52  unix 2      [ ACC ]    STREAM    LISTENING   19942      /run/user/127/gnupg/S.gp\
53  g-agent
54  unix 2      [ ACC ]    STREAM    LISTENING   18092      /run/snapd.socket
55  unix 2      [ ACC ]    STREAM    LISTENING   22321      /run/user/1000/pipewire-\
56  0
57  unix 2      [ ACC ]    STREAM    LISTENING   19944      /run/user/127/pipewire-0\
58
59  unix 2      [ ACC ]    STREAM    LISTENING   18094      /run/snapd-snap.socket  \
60
61  unix 2      [ ACC ]    STREAM    LISTENING   22323      /run/user/1000/pk-debcon\
62  f-socket
63  unix 2      [ ACC ]    STREAM    LISTENING   19946      /run/user/127/pk-debconf\
64  -socket
65  unix 2      [ ACC ]    STREAM    LISTENING   22325      /run/user/1000/pulse/nat\
66  ive
67  unix 2      [ ACC ]    STREAM    LISTENING   19948      /run/user/127/pulse/nati\
68  ve
69  unix 2      [ ACC ]    STREAM    LISTENING   22327      /run/user/1000/snapd-ses\
70  sion-agent.socket
71  unix 2      [ ACC ]    STREAM    LISTENING   19950      /run/user/127/snapd-sess\
72  ion-agent.socket
73  unix 2      [ ACC ]    STREAM    LISTENING   18100      /run/uidd/request
74  unix 2      [ ACC ]    STREAM    LISTENING   20234      @/tmp/.ICE-unix/874      \
75
76  unix 2      [ ACC ]    STREAM    LISTENING   19520      @/tmp/dbus-EaQDlXhQ      \
77
78  unix 2      [ ACC ]    STREAM    LISTENING   20629      /run/user/127/at-spi/bus\
79
80  unix 2      [ ACC ]    STREAM    LISTENING   20757      /run/user/127/wayland-0  \
81
82  unix 2      [ ACC ]    STREAM    LISTENING   20111      @/tmp/dbus-wFjuWYwz1e    \
83
84  unix 2      [ ACC ]    STREAM    LISTENING   19521      @/tmp/dbus-pfwkYEUI      \
85
86  unix 2      [ ACC ]    STREAM    LISTENING   15595      /run/systemd/private      \

```

```

87
88   unix  2      [ ACC ]     STREAM  LISTENING  15597    /run/systemd/userdb/io.s\
89   systemd.DynamicUser
90   unix  2      [ ACC ]     STREAM  LISTENING  15598    /run/systemd/io.system.M\
91   anagedOOM
92   unix  2      [ ACC ]     STREAM  LISTENING  19253    /run/cups/cups.sock      \
93
94   unix  2      [ ACC ]     STREAM  LISTENING  15610    /run/systemd/fsck.progre\
95   ss
96   unix  2      [ ACC ]     STREAM  LISTENING  15621    /run/systemd/journal/std\
97   out
98   unix  2      [ ACC ]     SEQPACKET LISTENING  15623    /run/udev/control
99   unix  2      [ ACC ]     STREAM  LISTENING  15683    /run/systemd/journal/io.\
100  systemd.journal
101   unix  2      [ ACC ]     STREAM  LISTENING  20755    @/tmp/.X11-unix/X1025   \
102
103   unix  2      [ ACC ]     STREAM  LISTENING  20753    @/tmp/.X11-unix/X1024   \
104
105   unix  2      [ ACC ]     STREAM  LISTENING  19518    @/tmp/dbus-q5jXW2FK     \
106
107   unix  2      [ ACC ]     STREAM  LISTENING  19519    @/tmp/dbus-W0SogK48     \
108
109   unix  2      [ ACC ]     STREAM  LISTENING  17241    /run/systemd/resolve/io.\
110  systemd.Resolve
111  osboxes@osboxes:~$

```

List listening TCP ports:

```

1  osboxes@osboxes:~$ netstat --tcp
2  Active Internet connections (w/o servers)
3  Proto Recv-Q Send-Q Local Address           Foreign Address         State
4  tcp        0      0 osboxes:ssh             DESKTOP-JLD6RNQ:53340   ESTABLISHED
5  osboxes@osboxes:~$

```

Display PID and program names:

List information continuously:

```

1  osboxes@osboxes:~$ netstat --all
2  Active Internet connections (servers and established)
3  Proto Recv-Q Send-Q Local Address           Foreign Address         State
4  tcp      0      0 0.0.0.0:ssh              0.0.0.0:*               LISTEN
5  tcp      0      0 localhost:ipp            0.0.0.0:*               LISTEN
6  tcp      0      0 localhost:domain        0.0.0.0:*               LISTEN
7  tcp      0 356 osboxes:ssh              DESKTOP-JLD6RNQ:53340    ESTABLISHED
8  tcp      0      0 osboxes:53950            84.170.224.35.bc.g:http TIME_WAIT
9  tcp6     0      0 ip6-localhost:ipp       [::]:*                  LISTEN
10 tcp6     0      0 [::]:ssh                 [::]:*                  LISTEN
11 udp      0      0 localhost:domain        0.0.0.0:*
12 udp      0      0 osboxes:bootpc          Archer:bootps            ESTABLISHED
13
14 udp      0      0 0.0.0.0:58437            0.0.0.0:*
15 udp      0      0 0.0.0.0:631              0.0.0.0:*
16 udp      0      0 0.0.0.0:mdns              0.0.0.0:*
17 udp6     0      0 [::]:40990                [::]:*
18 udp6     0      0 [::]:mdns                  [::]:*
19 raw6     0      0 [::]:ipv6-icmp            [::]:*                   7
20 Active UNIX domain sockets (servers and established)
21 Proto RefCnt Flags      Type       State       I-Node  Path
22 unix  2      [ ACC ]    STREAM    LISTENING   20235    /tmp/.ICE-unix/874
23 unix  2      [ ACC ]    STREAM    LISTENING   20754    /tmp/.X11-unix/X1024
24
25 unix  2      [ ACC ]    STREAM    LISTENING   20756    /tmp/.X11-unix/X1025
26
27 unix  2      [ ]      DGRAM      22298      /run/user/1000/systemd/n\
28otify
29 unix  3      [ ]      STREAM    CONNECTED   19914
30 ...
31 ^C
32 osboxes@osboxes:~

```

List routes and do not resolve IP addresses to hostnames:

```

1  osboxes@osboxes:~$ netstat --route --numeric
2  Kernel IP routing table
3  Destination      Gateway            Genmask           Flags   MSS Window  irtt Iface
4
5  0.0.0.0            192.168.0.1        0.0.0.0           UG        0 0          0 enp0s3
6
7  169.254.0.0        0.0.0.0            255.255.0.0       U          0 0          0 enp0s3
8

```

```

9      192.168.0.0      0.0.0.0      255.255.255.0    U          0 0          0 enp0s3      \
10
11      osboxes@osboxes:~$

```

List listening TCP and UDP ports (+ user and process if you're root):

```

1      osboxes@osboxes:~$ netstat --listening --program --numeric --tcp --udp --extend
2      (Not all processes could be identified, non-owned process info
3      will not be shown, you would have to be root to see it all.)
4      Active Internet connections (only servers)
5      Proto Recv-Q Send-Q Local Address           Foreign Address         State       User\
6      r      Inode      PID/Program name
7      tcp      0        0 0.0.0.0:22             0.0.0.0:*               LISTEN      0 \
8      19171      -
9      tcp      0        0 127.0.0.1:631          0.0.0.0:*               LISTEN      0 \
10     19500      -
11     tcp      0        0 127.0.0.53:53          0.0.0.0:*               LISTEN      101\
12     17240      -
13     tcp6     0        0 :::1:631               :::*                    LISTEN      0 \
14     19499      -
15     tcp6     0        0 :::22                  :::*                    LISTEN      0 \
16     19173      -
17     udp      0        0 127.0.0.53:53          0.0.0.0:*               101\
18     17239      -
19     udp      0        0 0.0.0.0:58437          0.0.0.0:*               114\
20     18661      -
21     udp      0        0 0.0.0.0:631            0.0.0.0:*               0 \
22     19913      -
23     udp      0        0 0.0.0.0:5353           0.0.0.0:*               114\
24     18659      -
25     udp6     0        0 :::40990               :::*                    114\
26     18662      -
27     udp6     0        0 :::5353                :::*                    114\
28     18660      -
29     osboxes@osboxes:~$

```

12. whois :

Command-line client for the WHOIS (RFC 3912) protocol.

- Get information about a domain name: `whois {{example.com*}}`
- Get information about an IP address: `whois {{8.8.8.8}}`
- Get abuse contact for an IP address: `whois -b {{8.8.8.8}}`

*<http://example.com/>

Lets try out the commands:

Get information about a domain name:

```

1      osboxes@osboxes:~$ whois google.com
2      Domain Name: GOOGLE.COM
3      Registry Domain ID: 2138514_DOMAIN_COM-VRSN
4      Registrar WHOIS Server: whois.markmonitor.com
5      Registrar URL: http://www.markmonitor.com
6      Updated Date: 2019-09-09T15:39:04Z
7      Creation Date: 1997-09-15T04:00:00Z
8      Registry Expiry Date: 2028-09-14T04:00:00Z
9      Registrar: MarkMonitor Inc.
10     Registrar IANA ID: 292
11     Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
12     Registrar Abuse Contact Phone: +1.2086851750
13     Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibit\
14     ed
15     Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProh\
16     ibited
17     Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibit\
18     ed
19     Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhibit\
20     ed
21     Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferProh\
22     ibited
23     Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhibit\
24     ed
25     Name Server: NS1.GOOGLE.COM
26     Name Server: NS2.GOOGLE.COM
27     Name Server: NS3.GOOGLE.COM
28     Name Server: NS4.GOOGLE.COM
29     DNSSEC: unsigned
30     URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/  \
31
32     >>> Last update of whois database: 2022-11-03T02:36:00Z <<<
33
34     For more information on Whois status codes, please visit https://icann.org/epp  \
35
36
37     NOTICE: The expiration date displayed in this record is the date the
38     registrar's sponsorship of the domain name registration in the registry is
39     currently set to expire. This date does not necessarily reflect the expiration  \
40

```

```
41     date of the domain name registrant's agreement with the sponsoring
42     registrar. Users may consult the sponsoring registrar's Whois database to
43     view the registrar's reported date of expiration for this registration.
44
45     TERMS OF USE: You are not authorized to access or query our Whois
46     database through the use of electronic processes that are high-volume and
47     automated except as reasonably necessary to register domain names or
48     modify existing registrations; the Data in VeriSign Global Registry
49     Services' ("VeriSign") Whois database is provided by VeriSign for
50     information purposes only, and to assist persons in obtaining information
51     about or related to a domain name registration record. VeriSign does not
52     guarantee its accuracy. By submitting a Whois query, you agree to abide
53     by the following terms of use: You agree that you may use this Data only
54     for lawful purposes and that under no circumstances will you use this Data
55     to: (1) allow, enable, or otherwise support the transmission of mass
56     unsolicited, commercial advertising or solicitations via e-mail, telephone,
57     or facsimile; or (2) enable high volume, automated, electronic processes
58     that apply to VeriSign (or its computer systems). The compilation,
59     repackaging, dissemination or other use of this Data is expressly
60     prohibited without the prior written consent of VeriSign. You agree not to
61     use electronic processes that are automated and high-volume to access or
62     query the Whois database except as reasonably necessary to register
63     domain names or modify existing registrations. VeriSign reserves the right
64     to restrict your access to the Whois database in its sole discretion to ensure
65
66     operational stability. VeriSign may restrict or terminate your access to the
67     Whois database for failure to abide by these terms of use. VeriSign
68     reserves the right to modify these terms at any time.
69
70     The Registry database contains ONLY .COM, .NET, .EDU domains and
71     Registrars.
72     Domain Name: google.com
73     Registry Domain ID: 2138514_DOMAIN_COM-VRSN
74     Registrar WHOIS Server: whois.markmonitor.com
75     Registrar URL: http://www.markmonitor.com
76     Updated Date: 2019-09-09T15:39:04+0000
77     Creation Date: 1997-09-15T07:00:00+0000
78     Registrar Registration Expiration Date: 2028-09-13T07:00:00+0000
79     Registrar: MarkMonitor, Inc.
80     Registrar IANA ID: 292
81     Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
82     Registrar Abuse Contact Phone: +1.2086851750
83     Domain Status: clientUpdateProhibited (https://www.icann.org/epp#clientUpdateProhib\
```

```
84      ited)
85      Domain Status: clientTransferProhibited (https://www.icann.org/epp#clientTransferPr\
86      ohibited)
87      Domain Status: clientDeleteProhibited (https://www.icann.org/epp#clientDeleteProhib\
88      ited)
89      Domain Status: serverUpdateProhibited (https://www.icann.org/epp#serverUpdateProhib\
90      ited)
91      Domain Status: serverTransferProhibited (https://www.icann.org/epp#serverTransferPr\
92      ohibited)
93      Domain Status: serverDeleteProhibited (https://www.icann.org/epp#serverDeleteProhib\
94      ited)
95      Registrant Organization: Google LLC
96      Registrant State/Province: CA
97      Registrant Country: US
98      Registrant Email: Select Request Email Form at https://domains.markmonitor.com/whoi\
99      s/google.com
100     Admin Organization: Google LLC
101     Admin State/Province: CA
102     Admin Country: US
103     Admin Email: Select Request Email Form at https://domains.markmonitor.com/whois/goo\
104     gle.com
105     Tech Organization: Google LLC
106     Tech State/Province: CA
107     Tech Country: US
108     Tech Email: Select Request Email Form at https://domains.markmonitor.com/whois/goog\
109     le.com
110     Name Server: ns1.google.com
111     Name Server: ns3.google.com
112     Name Server: ns2.google.com
113     Name Server: ns4.google.com
114     DNSSEC: unsigned
115     URL of the ICANN WHOIS Data Problem Reporting System: http://wdprs.internic.net/  \
116
117     >>> Last update of WHOIS database: 2022-11-03T02:29:34+0000 <<<
118
119     For more information on WHOIS status codes, please visit:
120     https://www.icann.org/resources/pages/epp-status-codes
121
122     If you wish to contact this domain's Registrant, Administrative, or Technical
123     contact, and such email address is not visible above, you may do so via our web  \
124
125     form, pursuant to ICANN's Temporary Specification. To verify that you are not a  \
126
```

```
127     robot, please enter your email address to receive a link to a page that
128     facilitates email communication with the relevant contact(s).
129
130     Web-based WHOIS:
131         https://domains.markmonitor.com/whois
132
133     If you have a legitimate interest in viewing the non-public WHOIS details, send \
134
135     your request and the reasons for your request to whoisrequest@markmonitor.com
136     and specify the domain name in the subject line. We will review that request and \
137
138     may ask for supporting documentation and explanation.
139
140     The data in MarkMonitor's WHOIS database is provided for information purposes, \
141
142     and to assist persons in obtaining information about or related to a domain
143     name's registration record. While MarkMonitor believes the data to be accurate, \
144
145     the data is provided "as is" with no guarantee or warranties regarding its
146     accuracy.
147
148     By submitting a WHOIS query, you agree that you will use this data only for
149     lawful purposes and that, under no circumstances will you use this data to:
150         (1) allow, enable, or otherwise support the transmission by email, telephone, \
151
152     or facsimile of mass, unsolicited, commercial advertising, or spam; or
153         (2) enable high volume, automated, or electronic processes that send queries, \
154
155     data, or email to MarkMonitor (or its systems) or the domain name contacts (or \
156
157     its systems).
158
159     MarkMonitor reserves the right to modify these terms at any time.
160
161     By submitting this query, you agree to abide by this policy.
162
163     MarkMonitor Domain Management(TM)
164     Protecting companies and consumers in a digital world.
165
166     Visit MarkMonitor at https://www.markmonitor.com
167     Contact us at +1.8007459229
168     In Europe, at +44.02032062220
169     --
```

170 osboxes@osboxes:~\$

Get information about an IP address:

```
1 osboxes@osboxes:~$ whois 8.8.8.8
2
3 #
4 # ARIN WHOIS data and services are subject to the Terms of Use
5 # available at: https://www.arin.net/resources/registry/whois/tou/
6 #
7 # If you see inaccuracies in the results, please report at
8 # https://www.arin.net/resources/registry/whois/inaccuracy\_reporting/
9 #
10 # Copyright 1997-2022, American Registry for Internet Numbers, Ltd.
11 #
12
13 # start
14
15 NetRange:      8.0.0.0 - 8.127.255.255
16 CIDR:          8.0.0.0/9
17 NetName:       LVLT-ORG-8-8
18 NetHandle:     NET-8-0-0-0-1
19 Parent:        NET8 (NET-8-0-0-0-0)
20 NetType:       Direct Allocation
21 OriginAS:
22 Organization:  Level 3 Parent, LLC (LPL-141)
23 RegDate:       1992-12-01
24 Updated:       2018-04-23
25 Ref:           https://rdap.arin.net/registry/ip/8.0.0.0
26
27 OrgName:       Level 3 Parent, LLC
28 OrgId:         LPL-141
29 Address:       100 CenturyLink Drive
30 City:          Monroe
31 StateProv:     LA
32 PostalCode:    71203
33 Country:       US
34 RegDate:       2018-02-06
35 Updated:       2021-09-23
36 Comment:       ADDRESSES WITHIN THIS BLOCK ARE NON-PORTABLE ANY ISP ANNOUNCING OR \
37 TRANSITING PORTIONS WITHIN OUR RANGES SHOULD NOT RELY ON PRESENTED LOA'S UNLESS THOS
38 E RANGES ARE ALSO ANNOUNCED TO A LUMEN ASN.
39 Comment:
```

```
40     Comment:          Our looking glass is located at: https://lookingglass.centurylink.c\
41     om/
42     Comment:
43     Comment:          For subpoena or court order please fax 844.254.5800 or refer to our\
44     Trust & Safety page:
45     Comment:          https://www.lumen.com/en-us/about/legal/trust-center/trust-and-safe\
46     ty.html
47     Comment:
48     Comment:          For abuse issues, please email abuse@aup.lumen.com
49     Comment:          All abuse reports MUST include:
50     Comment:          * src IP
51     Comment:          * dest IP (your IP)
52     Comment:          * dest port
53     Comment:          * Accurate date/timestamp and timezone of activity
54     Comment:          * Intensity/frequency (short log extracts)
55     Comment:          * Your contact details (phone and email)
56     Comment:          Without these we will be unable to identify the correct owner of th\
57     e IP address at that point in time.
58     Ref:              https://rdap.arin.net/registry/entity/LPL-141
59
60     OrgTechHandle: IPADD5-ARIN
61     OrgTechName:      ipaddressing
62     OrgTechPhone:     +1-877-453-8353
63     OrgTechEmail:     ipaddressing@level3.com
64     OrgTechRef:       https://rdap.arin.net/registry/entity/IPADD5-ARIN
65
66     OrgAbuseHandle: LAC56-ARIN
67     OrgAbuseName:     L3 Abuse Contact
68     OrgAbusePhone:    +1-877-453-8353
69     OrgAbuseEmail:    abuse@level3.com
70     OrgAbuseRef:      https://rdap.arin.net/registry/entity/LAC56-ARIN
71
72     # end
73
74     # start
75
76     NetRange:         8.8.8.0 - 8.8.8.255
77     CIDR:              8.8.8.0/24
78     NetName:          LVLT-GOGL-8-8-8
79     NetHandle:        NET-8-8-8-0-1
80     Parent:           LVLT-ORG-8-8 (NET-8-0-0-0-1)
81     NetType:          Reallocated
82     OriginAS:
```

```
83      Organization:  Google LLC (GOGL)
84      RegDate:       2014-03-14
85      Updated:       2014-03-14
86      Ref:           https://rdap.arin.net/registry/ip/8.8.8.0
87
88      OrgName:       Google LLC
89      OrgId:         GOGL
90      Address:       1600 Amphitheatre Parkway
91      City:          Mountain View
92      StateProv:     CA
93      PostalCode:    94043
94      Country:       US
95      RegDate:       2000-03-30
96      Updated:       2019-10-31
97      Comment:       Please note that the recommended way to file abuse complaints are l\
98 oated in the following links.
99      Comment:
100     Comment:       To report abuse and illegal activity: https://www.google.com/contac\
101 t/
102     Comment:
103     Comment:       For legal requests: http://support.google.com/legal
104     Comment:
105     Comment:       Regards,
106     Comment:       The Google Team
107     Ref:           https://rdap.arin.net/registry/entity/GOGL
108
109     OrgTechHandle:  ZG39-ARIN
110     OrgTechName:    Google LLC
111     OrgTechPhone:   +1-650-253-0000
112     OrgTechEmail:   arin-contact@google.com
113     OrgTechRef:     https://rdap.arin.net/registry/entity/ZG39-ARIN
114
115     OrgAbuseHandle: ABUSE5250-ARIN
116     OrgAbuseName:   Abuse
117     OrgAbusePhone:  +1-650-253-0000
118     OrgAbuseEmail:  network-abuse@google.com
119     OrgAbuseRef:    https://rdap.arin.net/registry/entity/ABUSE5250-ARIN
120
121     # end
122
123     #
124     # ARIN WHOIS data and services are subject to the Terms of Use
125     # available at: https://www.arin.net/resources/registry/whois/tou/
```

```

126      #
127      # If you see inaccuracies in the results, please report at
128      # https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
129      #
130      # Copyright 1997-2022, American Registry for Internet Numbers, Ltd.
131      #

```

Get abuse contact for an IP address:

```

1  osboxes@osboxes:~$ whois -b 8.8.8.8
2  % This is the RIPE Database query service.
3  % The objects are in RPSL format.
4  %
5  % The RIPE Database is subject to Terms and Conditions.
6  % See http://www.ripe.net/db/support/db-terms-conditions.pdf
7
8  inetnum:          6.0.0.0 - 13.115.255.255
9
10 % This query was served by the RIPE Database Query Service version 1.104 (WAGYU)
11
12
13 osboxes@osboxes:~$

```

Command 'whois' not found, but can be installed with: `sudo apt install whois`

13. dig :

DNS lookup utility.

- Lookup the IP(s) associated with a hostname (A records): `dig +short {{example.com*}}`
- Get a detailed answer for a given domain (A records): `dig +noall +answer {{example.com†}}`
- Query a specific DNS record type associated with a given domain name:

`dig +short {{example.com‡}} {{A|MX|TXT|CNAME|NS}}`

- Get all types of records for a given domain name: `dig {{example.com$}} ANY`
- Specify an alternate DNS server to query: `dig @{{8.8.8.8}} {{example.com¶}}`
- Perform a reverse DNS lookup on an IP address (PTR record): `dig -x {{8.8.8.8}}`
- Find authoritative name servers for the zone and display SOA records: `dig +nssearch {{example.com||}}`

```

*http://example.com/
†http://example.com/
‡http://example.com/
$http://example.com/
¶http://example.com/
||http://example.com/

```

- Perform iterative queries and display the entire trace path to resolve a domain name: dig +trace {{example.com*}}

Lets try out the commands.

Lookup the IP(s) associated with a hostname (A records):

```
1 osboxes@osboxes:~$ dig +short google.com
2 142.250.195.110
3 osboxes@osboxes:~$
```

Get a detailed answer for a given domain (A records):

```
1 osboxes@osboxes:~$ dig +noall +answer google.com
2 google.com.          172      IN      A       142.250.195.110
3 osboxes@osboxes:~$
```

Query a specific DNS record type associated with a given domain name:

```
1 osboxes@osboxes:~$ dig +short google.com A
2 142.250.195.110
3
4 osboxes@osboxes:~$ dig +short google.com MX
5 10 smtp.google.com.
6
7 osboxes@osboxes:~$ dig +short google.com TXT
8 "docusign=1b0a6754-49b1-4db5-8540-d2c12664b289"
9 "atlassian-domain-verification=5YjTmWmjI92ewqkx2oXmBaD60Td9zWon9r6eakvHX6B77zzkFQto\
10 8PQ9QsKnbf4I"
11 "facebook-domain-verification=22rm551cu4k0ab0bxsw536tlds4h95"
12 "webexdomainverification.8YX6G=6e6922db-e3e6-4a36-904e-a805c28087fa"
13 "docusign=05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
14 "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb89cf4ef"
15 "google-site-verification=wD8N7i1JTNTkezJ49swvWW48f8_9xveREV4oB-0Hf5o"
16 "v=spf1 include:_spf.google.com ~all"
17 "apple-domain-verification=30afIBcvSuDV2PLX"
18 "globalsign-smime-dv=CDYX+XFHUw2wm16/Gb8+59BsH31KzUr6c1l2BPvqKX8="
19 "MS=E4A68B9AB2BB9670BCE15412F62916164C0B20BB"
20 "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0JM0nikft0jAgjmsQ"
21
22 osboxes@osboxes:~$ dig +short google.com NS
23 ns4.google.com.
24 ns2.google.com.
25 ns3.google.com.
```

*<http://example.com/>

```

26 ns1.google.com.
27
28 osboxes@osboxes:~$ dig +short google.com CNAME
29 osboxes@osboxes:~$

```

Get all types of records for a given domain name:

```

1 osboxes@osboxes:~$ dig google.com ANY
2
3 ; <<>> DiG 9.18.1-1ubuntu1.2-Ubuntu <<>> google.com ANY
4 ;; global options: +cmd
5 ;; Got answer:
6 ;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53177
7 ;; flags: qr rd ra; QUERY: 1, ANSWER: 21, AUTHORITY: 0, ADDITIONAL: 9
8
9 ;; OPT PSEUDOSECTION:
10 ; EDNS: version: 0, flags:; udp: 65494
11 ;; QUESTION SECTION:
12 ;google.com. IN ANY
13
14 ;; ANSWER SECTION:
15 google.com. 600 IN TXT "google-site-verification=wD8N7i1JT\
16 NTkezJ49swvWw48f8_9xveREV4oB-0Hf5o"
17 google.com. 600 IN TXT "v=spf1 include:_spf.google.com ~all\
18 l"
19 google.com. 600 IN TXT "apple-domain-verification=30afIBcv\
20 SuDV2PLX"
21 google.com. 600 IN TXT "globalsign-smime-dv=CDYX+XFHUw2wml\
22 6/Gb8+59BsH31KzUr6c112BPvqkX8="
23 google.com. 600 IN TXT "MS=E4A68B9AB2BB9670BCE15412F629161\
24 64C0B20BB"
25 google.com. 600 IN TXT "google-site-verification=TV9-DBe4R\
26 80X4v0M4U_bd_J9cp0JM0nikft0jAgjmsQ"
27 google.com. 600 IN TXT "docuSign=1b0a6754-49b1-4db5-8540-d\
28 2c12664b289"
29 google.com. 600 IN TXT "atlassian-domain-verification=5YjT\
30 mWmjI92ewqkx2oXmBaD60Td9zWon9r6eakvHX6B77zzkFQto8PQ9QsKnbf4I"
31 google.com. 600 IN TXT "facebook-domain-verification=22rm5\
32 51cu4k0ab0bxsw536tlds4h95"
33 google.com. 600 IN TXT "webexdomainverification.8YX6G=6e69\
34 22db-e3e6-4a36-904e-a805c28087fa"
35 google.com. 600 IN TXT "docuSign=05958488-4752-4ef2-95eb-a\
36 a7ba8a3bd0e"

```

```

37  google.com.          600    IN      TXT      "onetrust-domain-verification=de01e\
38  d21f2fa4d8781cbc3ffb89cf4ef"
39  google.com.          69     IN      AAAA     2404:6800:4007:824::200e
40  google.com.          600    IN      NS       ns3.google.com.
41  google.com.          600    IN      NS       ns1.google.com.
42  google.com.          600    IN      NS       ns4.google.com.
43  google.com.          600    IN      NS       ns2.google.com.
44  google.com.          58     IN      SOA      ns1.google.com. dns-admin.google.co\
45  m. 485648864 900 900 1800 60
46  google.com.          81     IN      A        142.250.195.110
47  google.com.          600    IN      HTTPS    1 . alpn="h2,h3"
48  google.com.          242    IN      MX       10 smtp.google.com.
49
50  ;; ADDITIONAL SECTION:
51  ns4.google.com.      600    IN      A        216.239.38.10
52  ns4.google.com.      600    IN      AAAA     2001:4860:4802:38::a
53  ns2.google.com.      600    IN      A        216.239.34.10
54  ns2.google.com.      600    IN      AAAA     2001:4860:4802:34::a
55  ns3.google.com.      600    IN      A        216.239.36.10
56  ns3.google.com.      600    IN      AAAA     2001:4860:4802:36::a
57  ns1.google.com.      600    IN      A        216.239.32.10
58  ns1.google.com.      600    IN      AAAA     2001:4860:4802:32::a
59
60  ;; Query time: 11 msec
61  ;; SERVER: 127.0.0.53#53(127.0.0.53) (TCP)
62  ;; WHEN: Wed Nov 02 22:41:29 EDT 2022
63  ;; MSG SIZE rcvd: 1269
64
65  osboxes@osboxes:~$

```

Specify an alternate DNS server to query:

```

1  osboxes@osboxes:~$ dig @1.1.1.1 google.com
2
3  ; <<>> DiG 9.18.1-1ubuntu1.2-Ubuntu <<>> @1.1.1.1 google.com
4  ; (1 server found)
5  ;; global options: +cmd
6  ;; Got answer:
7  ;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 11690
8  ;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
9
10 ;; OPT PSEUDOSECTION:
11 ; EDNS: version: 0, flags:; udp: 1232

```

```

12      ;; QUESTION SECTION:
13      ;google.com.                IN      A
14
15      ;; ANSWER SECTION:
16      google.com.                243     IN      A      142.250.193.110
17
18      ;; Query time: 3 msec
19      ;; SERVER: 1.1.1.1#53(1.1.1.1) (UDP)
20      ;; WHEN: Wed Nov 02 22:42:26 EDT 2022
21      ;; MSG SIZE rcvd: 55
22
23      osboxes@osboxes:~$

```

Perform a reverse DNS lookup on an IP address (PTR record):

```

1      osboxes@osboxes:~$ dig -x {{8.8.8.8}}
2
3      ; <<>> DiG 9.18.1-1ubuntu1.2-Ubuntu <<>> -x {{8.8.8.8}}
4      ;; global options: +cmd
5      ;; Got answer:
6      ;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 18281
7      ;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 1
8
9      ;; OPT PSEUDOSECTION:
10     ; EDNS: version: 0, flags:; udp: 65494
11     ;; QUESTION SECTION:
12     ;8}.8.8.{{8.in-addr.arpa.      IN      PTR
13
14     ;; AUTHORITY SECTION:
15     in-addr.arpa.                600     IN      SOA      b.in-addr-servers.arpa. nstld.iana.\
16     org. 2022090415 1800 900 604800 3600
17
18     ;; Query time: 111 msec
19     ;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
20     ;; WHEN: Wed Nov 02 22:42:46 EDT 2022
21     ;; MSG SIZE rcvd: 121
22
23     osboxes@osboxes:~$

```

Find authoritative name servers for the zone and display SOA records:

```

1  osboxes@osboxes:~$ dig +nssearch google.com
2  SOA ns1.google.com. dns-admin.google.com. 485648864 900 900 1800 60 from server 216\
3  .239.34.10 in 39 ms.
4  dighost.c:1517: INSIST((uint_fast32_t) __extension__ ({ __auto_type __atomic_load_p\
5  tr = ((&recvcount)); __typeof__ ((void)0, *__atomic_load_ptr) __atomic_load_tmp; __a
6  tomic_load (__atomic_load_ptr, &__atomic_load_tmp, (memory_order_acquire)); __atomic
7  _load_tmp; }) == 0) failed, back trace
8  /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(+0x32073)[0x7f45f393a073] \
9
10 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(isc_assertion_failed+0x10)\
11 [0x7f45f3939560]
12 dig(+0x11de1)[0x5555e59dbde1]
13 dig(+0xc7cd)[0x5555e59d67cd]
14 dig(+0xfdc2)[0x5555e59d9dc2]
15 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(isc__nm_async_readcb+0xb1)\
16 [0x7f45f3928c31]
17 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(isc__nm_readcb+0x9b)[0x7f4\
18 5f3928d6b]
19 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(+0x2b0c0)[0x7f45f39330c0] \
20
21 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(isc__nm_udp_read_cb+0x4a)[\
22 0x7f45f393325a]
23 /lib/x86_64-linux-gnu/libuv.so.1(+0x23e6b)[0x7f45f3450e6b]
24 /lib/x86_64-linux-gnu/libuv.so.1(+0x2511e)[0x7f45f345211e]
25 /lib/x86_64-linux-gnu/libuv.so.1(uv_run+0x678)[0x7f45f343bc88]
26 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(+0x25e9e)[0x7f45f392de9e] \
27
28 /lib/x86_64-linux-gnu/libisc-9.18.1-1ubuntu1.2-Ubuntu.so(isc__trampoline_run+0x1a)[\
29 0x7f45f395d86a]
30 /lib/x86_64-linux-gnu/libc.so.6(+0x94b43)[0x7f45f34f3b43]
31 /lib/x86_64-linux-gnu/libc.so.6(+0x126a00)[0x7f45f3585a00]
32 Aborted (core dumped)
33 osboxes@osboxes:~$

```

Perform iterative queries and display the entire trace path to resolve a domain name:

```

1  osboxes@osboxes:~$ dig +trace apple.com
2
3  ; <<>> DiG 9.18.1-1ubuntu1.2-Ubuntu <<>> +trace apple.com
4  ;; global options: +cmd
5      .                574      IN      NS      j.root-servers.net.
6      .                574      IN      NS      c.root-servers.net.
7      .                574      IN      NS      k.root-servers.net.
8      .                574      IN      NS      f.root-servers.net.
9      .                574      IN      NS      l.root-servers.net.
10     .                574      IN      NS      e.root-servers.net.
11     .                574      IN      NS      d.root-servers.net.
12     .                574      IN      NS      m.root-servers.net.
13     .                574      IN      NS      g.root-servers.net.
14     .                574      IN      NS      b.root-servers.net.
15     .                574      IN      NS      h.root-servers.net.
16     .                574      IN      NS      i.root-servers.net.
17     .                574      IN      NS      a.root-servers.net.
18  ;; Received 519 bytes from 127.0.0.53#53(127.0.0.53) in 0 ms
19
20  com.                172800  IN      NS      e.gtld-servers.net.
21  com.                172800  IN      NS      b.gtld-servers.net.
22  com.                172800  IN      NS      a.gtld-servers.net.
23  com.                172800  IN      NS      d.gtld-servers.net.
24  com.                172800  IN      NS      i.gtld-servers.net.
25  com.                172800  IN      NS      f.gtld-servers.net.
26  com.                172800  IN      NS      j.gtld-servers.net.
27  com.                172800  IN      NS      k.gtld-servers.net.
28  com.                172800  IN      NS      c.gtld-servers.net.
29  com.                172800  IN      NS      g.gtld-servers.net.
30  com.                172800  IN      NS      h.gtld-servers.net.
31  com.                172800  IN      NS      l.gtld-servers.net.
32  com.                172800  IN      NS      m.gtld-servers.net.
33  com.                86400   IN      DS      30909 8 2 E2D3C916F6DEEAC73294E8268\
34  FB5885044A833FC5459588F4A9184CF C41A5766
35  com.                86400   IN      RRSIG   DS 8 1 86400 20221115200000 2022110\
36  2190000 18733 . F10m+pouJH1s0RLay7hOpC742N0ABdDmA419IaL8ZBmrZcKj5akayaZL vHIb2inpXYv
37  mX/C7vj6XeW6xvX4e0mbfVzyW4odcuFI94GMabfe61c0b r+afLJSQgcUlN9jQ5xteCojRB5x2LOTBKopK5
38  4d3Gk7u5Wu0EhXx3R6 vQv13edzAphufyZDV7upI9HmwgDoFt1M+dAvTUe4e0NwE186chqWn5XU jac+Tc6r
39  i5J3zV4ynJoG1Gz5j0CfRNvQhZZCY4jOCPN2od5dMyQh/AHz vWBbUNGHZ/7VGTHBt3bXlSMFe1NibKC01h
40  KbIX+Fnep43sg7BafZB5W qDjmnQ==
41  ;; Received 1169 bytes from 192.203.230.10#53(e.root-servers.net) in 3 ms
42
43  osboxes@osboxes:~$

```

14. nslookup :

Query name server(s) for various domain records.

- Query your system's default name server for an IP address (A record) of the domain: nslookup {{example.com*}}
- Query a given name server for a NS record of the domain: nslookup -type=NS {{example.com†}} {{8.8.8.8}}
- Query for a reverse lookup (PTR record) of an IP address: nslookup -type=PTR {{54.240.162.118}}
- Query for a mail server (MX record) of the domain, showing details of the transaction: nslookup -type=MX -debug {{example.com‡}}
- Query a given name server on a specific port number for a TXT record of the domain: nslookup -port={{port_number}} -type=TXT {{example.com§}} {{name_server}}

Lets try out these commands:

Query your system's default name server for an IP address (A record) of the domain:

```

1  osboxes@osboxes:~$ nslookup google.com
2  Server:          127.0.0.53
3  Address:         127.0.0.53#53
4
5  Non-authoritative answer:
6  Name:   google.com
7  Address: 142.250.195.78
8  Name:   google.com
9  Address: 2404:6800:4007:824::200e
10
11 osboxes@osboxes:~$
```

Query a given name server for a NS record of the domain:

```

1  osboxes@osboxes:~$ nslookup -type=NS google.com 8.8.8.8
2  Server:          8.8.8.8
3  Address:         8.8.8.8#53
4
5  Non-authoritative answer:
6  google.com      nameserver = ns3.google.com.
7  google.com      nameserver = ns1.google.com.
8  google.com      nameserver = ns4.google.com.
9  google.com      nameserver = ns2.google.com.
```

*<http://example.com/>

†<http://example.com/>

‡<http://example.com/>

§<http://example.com/>

```

10
11     Authoritative answers can be found from:
12
13     osboxes@osboxes:~$

```

Query for a reverse lookup (PTR record) of an IP address:

```

1     osboxes@osboxes:~$ nslookup -type=PTR 1.1.1.1
2     Server:             127.0.0.53
3     Address:            127.0.0.53#53
4
5     Non-authoritative answer:
6     1.1.1.1.in-addr.arpa    name = one.one.one.one.
7
8     Authoritative answers can be found from:
9
10    osboxes@osboxes:~$

```

Query for ANY available records using TCP protocol:

```

1     osboxes@osboxes:~$ nslookup -vc -type=ANY google.com
2     Server:             127.0.0.53
3     Address:            127.0.0.53#53
4
5     Non-authoritative answer:
6     google.com          text = "facebook-domain-verification=22rm551cu4k0ab0bxsw536tlds4h95\
7     "
8     google.com          text = "webexdomainverification.8YX6G=6e6922db-e3e6-4a36-904e-a805c\
9     28087fa"
10    google.com          text = "docuSign=05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
11    google.com          text = "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb89cf4\
12    ef"
13    google.com          text = "google-site-verification=wD8N7i1JTNTkezJ49swvW48f8_9xveREV\
14    4oB-0Hf5o"
15    google.com          text = "v=spf1 include:_spf.google.com ~all"
16    google.com          text = "apple-domain-verification=30afIBcvSuDV2PLX"
17    google.com          text = "globalsign-smime-dv=CDYX+XFHUw2wm16/Gb8+59BsH31KzUr6c1l2BPv\
18    qKX8="
19    google.com          text = "MS=E4A68B9AB2BB9670BCE15412F62916164C0B20BB"
20    google.com          text = "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0JM0nikf\
21    t0jAgjmsQ"
22    google.com          text = "docuSign=1b0a6754-49b1-4db5-8540-d2c12664b289"
23    google.com          text = "atlassian-domain-verification=5YjTmWmji92ewqkx2oXmBaD60Td9z\
24    Won9r6eakvHX6B77zzkFQto8PQ9QsKnbf4I"

```

```

25     Name:    google.com
26     Address: 2404:6800:4007:824::200e
27     google.com      nameserver = ns1.google.com.
28     google.com      nameserver = ns4.google.com.
29     google.com      nameserver = ns2.google.com.
30     google.com      nameserver = ns3.google.com.
31     google.com
32         origin = ns1.google.com
33         mail addr = dns-admin.google.com
34         serial = 485648864
35         refresh = 900
36         retry = 900
37         expire = 1800
38         minimum = 60
39     Name:    google.com
40     Address: 142.250.195.78
41     google.com      rdata_65 = 1 . alpn="h2,h3"
42
43     Authoritative answers can be found from:
44     ns4.google.com  internet address = 216.239.38.10
45     ns4.google.com  has AAAA address 2001:4860:4802:38::a
46     ns2.google.com  internet address = 216.239.34.10
47     ns2.google.com  has AAAA address 2001:4860:4802:34::a
48     ns3.google.com  internet address = 216.239.36.10
49     ns3.google.com  has AAAA address 2001:4860:4802:36::a
50     ns1.google.com  internet address = 216.239.32.10
51     ns1.google.com  has AAAA address 2001:4860:4802:32::a
52
53     osboxes@osboxes:~$

```

Query for a mail server (MX record) of the domain, showing details of the transaction:

```

1     osboxes@osboxes:~$ nslookup -type=MX -debug google.com
2     Server:          127.0.0.53
3     Address:         127.0.0.53#53
4
5     -----
6     QUESTIONS:
7         google.com, type = MX, class = IN
8     ANSWERS:
9     -> google.com
10        mail exchanger = 10 smtp.google.com.
11        ttl = 300

```

```

12      AUTHORITY RECORDS:
13      ADDITIONAL RECORDS:
14      -----
15      Non-authoritative answer:
16      google.com      mail exchanger = 10 smtp.google.com.
17
18      Authoritative answers can be found from:
19
20      osboxes@osboxes:~$nslookup -type=MX -debug {[example.com](http://example.com/)}

```

Query a given name server on a specific port number for a TXT record of the domain:

```

1      osboxes@osboxes:~$ nslookup -port=53 -type=TXT google.com 8.8.8.8
2      ;; Truncated, retrying in TCP mode.
3      Server:          8.8.8.8
4      Address:         8.8.8.8#53
5
6      Non-authoritative answer:
7      google.com      text = "docuSign=1b0a6754-49b1-4db5-8540-d2c12664b289"
8      google.com      text = "facebook-domain-verification=22rm551cu4k0ab0bxsw536tlds4h95\
9      "
10     google.com      text = "google-site-verification=wD8N7i1JTNTkezJ49swvWW48f8_9xveREV\
11     4oB-0Hf5o"
12     google.com      text = "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0JM0nikf\
13     t0jAgjmsQ"
14     google.com      text = "globalsign-smime-dv=CDYX+XFHUw2wm16/Gb8+59BsH31KzUr6c1l2BPv\
15     qKX8="
16     google.com      text = "v=spf1 include:_spf.google.com ~all"
17     google.com      text = "MS=E4A68B9AB2BB9670BCE15412F62916164C0B20BB"
18     google.com      text = "docuSign=05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
19     google.com      text = "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb89cf4\
20     ef"
21     google.com      text = "atlassian-domain-verification=5YjTmWmjI92ewqkx2oXmBaD60Td9z\
22     Won9r6eakvHX6B77zzkFQto8PQ9QsKbnf4I"
23     google.com      text = "apple-domain-verification=30afIBcvSuDV2PLX"
24     google.com      text = "webexdomainverification.8YX6G=6e6922db-e3e6-4a36-904e-a805c\
25     28087fa"
26
27     Authoritative answers can be found from:
28
29     osboxes@osboxes:~$

```

15. host :

Lookup Domain Name Server.

- Lookup A, AAAA, and MX records of a domain: `host {{domain}}`
- Lookup a field (CNAME, TXT,...) of a domain: `host -t {{field}} {{domain}}`
- Reverse lookup an IP: `host {{ip_address}}`
- Specify an alternate DNS server to query: `host {{domain}} {{8.8.8.8}}`

Lets try out the commands.

Lookup A, AAAA, and MX records of a domain:

```
1 osboxes@osboxes:~$ host google.com
2 google.com has address 142.250.195.110
3 google.com has IPv6 address 2404:6800:4007:823::200e
4 google.com mail is handled by 10 smtp.google.com.
5 osboxes@osboxes:~$
```

Lookup a field (CNAME, TXT,...) of a domain:

```
1 osboxes@osboxes:~$ host -t TXT google.com
2 google.com descriptive text "docuSign=1b0a6754-49b1-4db5-8540-d2c12664b289"
3 google.com descriptive text "atlassian-domain-verification=5YjTmWmjI92ewqkx2oXmBaD6\
4 0Td9zWon9r6eakvHX6B77zzkFQto8PQ9QsKnbf4I"
5 google.com descriptive text "docuSign=05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
6 google.com descriptive text "apple-domain-verification=30afIBcvSuDV2PLX"
7 google.com descriptive text "globalsign-smime-dv=CDYX+XFHUw2wml6/Gb8+59BsH31KzUr6c1\
8 12BPvqKX8="
9 google.com descriptive text "webexdomainverification.8YX6G=6e6922db-e3e6-4a36-904e-\
10 a805c28087fa"
11 google.com descriptive text "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb\
12 89cf4ef"
13 google.com descriptive text "facebook-domain-verification=22rm551cu4k0ab0bxsw536tld\
14 s4h95"
15 google.com descriptive text "google-site-verification=wD8N7i1JTNTkezJ49swvWW48f8_9x\
16 veREV4oB-0Hf5o"
17 google.com descriptive text "MS=E4A68B9AB2BB9670BCE15412F62916164C0B20BB"
18 google.com descriptive text "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0JM\
19 0nikft0jAgjmsQ"
20 google.com descriptive text "v=spf1 include:_spf.google.com ~all"
21 osboxes@osboxes:~$
```

Reverse lookup an IP:

```
1 osboxes@osboxes:~$ host 8.8.8.8
2 8.8.8.8.in-addr.arpa domain name pointer dns.google.
3 osboxes@osboxes:~$
```

Specify an alternate DNS server to query:

```
1 osboxes@osboxes:~$ host google.com 1.1.1.1
2 Using domain server:
3 Name: 1.1.1.1
4 Address: 1.1.1.1#53
5 Aliases:
6
7 google.com has address 142.250.193.110
8 google.com has IPv6 address 2404:6800:4007:81f::200e
9 google.com mail is handled by 10 smtp.google.com.
10 osboxes@osboxes:~$
```

16. hostname :

Show or set the system's host name.

- Show current host name: `hostname`
- Show the network address of the host name: `hostname -i`
- Show all network addresses of the host: `hostname -I`
- Show the FQDN (Fully Qualified Domain Name): `hostname --fqdn`
- Set current host name: `hostname {{new_hostname}}`

Lets try out the commands:

Show current host name:

```
1 osboxes@osboxes:~$ hostname
2 osboxes
3 osboxes@osboxes:~$
```

Show the network address of the host name:

```
1 osboxes@osboxes:~$ hostname -i
2 127.0.1.1
3 osboxes@osboxes:~$
```

Show all network addresses of the host:

```
1 osboxes@osboxes:~$ hostname -I
2 192.168.0.180
3 osboxes@osboxes:~$
```

Show the FQDN (Fully Qualified Domain Name):

```
1 osboxes@osboxes:~$ hostname --fqdn
2 osboxes
3 osboxes@osboxes:~
```

Set current host name:

```
1 osboxes@osboxes:~$ sudo hostname mynewname
2 [sudo] password for osboxes:
3 osboxes@osboxes:~$ hostname
4 mynewname
5 osboxes@osboxes:~$
```

Process

A **process** in Linux is nothing but a program in execution. It's a running instance of a program. Any command that you execute starts a process.

Lets look at the most common process commands. Here is the list of all the command we will look at:

1. top
2. ps
3. kill
4. top :

Display dynamic real-time information about running processes.

- Start top: top
- Do not show any idle or zombie processes: top -i
- Show only processes owned by given user: top -u {{username}}
- Sort processes by a field: top -o {{field_name}}

Lets try out these commands:

Start top:

```

1  osboxes@osboxes:~$ top
2  top - 23:15:06 up 50 min,  1 user,  load average: 0.00, 0.00, 0.00
3  Tasks: 177 total,  1 running, 176 sleeping,  0 stopped,  0 zombie
4  %Cpu(s):  0.0 us,  0.0 sy,  0.0 ni, 99.7 id,  0.0 wa,  0.0 hi,  0.3 si,  0.0 st   \
5
6  MiB Mem :   969.5 total,    74.7 free,   385.1 used,   509.7 buff/cache
7  MiB Swap:  9155.0 total,  9082.1 free,    72.9 used.  435.9 avail Mem
8
9      PID USER      PR  NI   VIRT   RES   SHR S  %CPU  %MEM    TIME+  COMMAND   \
10
11      386 systemd+  20   0  14776   5968   5224 S   0.3   0.6   0:02.19 systemd-oomd\
12
13     3134 osboxes    20   0  21752   4068   3348 R   0.3   0.4   0:00.01 top        \
14
15         1 root      20   0 167928  12604   7720 S   0.0   1.3   0:00.97 systemd   \
16
17         2 root      20   0         0         0         0 S   0.0   0.0   0:00.00 kthreadd   \
18
19         3 root        0 -20         0         0         0 I   0.0   0.0   0:00.00 rcu_gp
20         4 root        0 -20         0         0         0 I   0.0   0.0   0:00.00 rcu_par_gp \
21
22         5 root        0 -20         0         0         0 I   0.0   0.0   0:00.00 netns
23         7 root        0 -20         0         0         0 I   0.0   0.0   0:00.00 kworker/0:0H\
24  -+
25         9 root        0 -20         0         0         0 I   0.0   0.0   0:00.16 kworker/0:1H\
26  -+
27        10 root        0 -20         0         0         0 I   0.0   0.0   0:00.00 mm_percpu_wq\
28
29        11 root      20   0         0         0         0 S   0.0   0.0   0:00.00 rcu_tasks_ru\
30  d+
31        12 root      20   0         0         0         0 S   0.0   0.0   0:00.00 rcu_tasks_tr\
32  a+
33        13 root      20   0         0         0         0 S   0.0   0.0   0:00.14 ksoftirqd/0 \
34
35        14 root      20   0         0         0         0 I   0.0   0.0   0:00.64 rcu_sched   \
36
37        15 root      rt    0         0         0         0 S   0.0   0.0   0:00.01 migration/0 \
38
39        16 root     -51   0         0         0         0 S   0.0   0.0   0:00.00 idle_inject/\
40  0
41        18 root      20   0         0         0         0 S   0.0   0.0   0:00.00 cpuhp/0     \
42
43        19 root      20   0         0         0         0 S   0.0   0.0   0:00.00 kdevtmpfs   \

```

```

44
45      20 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 inet_frag_wq\
46
47      21 root      20   0      0      0      0 S   0.0   0.0   0:00.00 kauditd      \
48
49      22 root      20   0      0      0      0 S   0.0   0.0   0:00.00 khungtaskd   \
50
51      23 root      20   0      0      0      0 S   0.0   0.0   0:00.00 oom_reaper   \
52
53      24 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 writeback    \
54
55      25 root      20   0      0      0      0 S   0.0   0.0   0:00.11 kcompactd0   \
56
57      26 root      25   5      0      0      0 S   0.0   0.0   0:00.00 ksm
58      27 root      39  19      0      0      0 S   0.0   0.0   0:00.00 khugepaged   \
59
60      73 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 kintegrityd  \
61
62      74 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 kblockd      \
63
64      75 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 blkcg_punt_b\
65  io
66      76 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 tpm_dev_wq   \
67
68      77 root      0 -20      0      0      0 I   0.0   0.0   0:00.00 ata_sff

```

Do not show any idle or zombie processes:

```

1  osboxes@osboxes:~$ top -i
2  top - 23:15:33 up 50 min,  1 user,  load average: 0.00, 0.00, 0.00
3  Tasks: 177 total,  1 running, 176 sleeping,  0 stopped,  0 zombie
4  %Cpu(s):  0.0 us,  0.0 sy,  0.0 ni,100.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st  \
5
6  MiB Mem :   969.5 total,    74.7 free,   385.1 used,   509.7 buff/cache
7  MiB Swap:  9155.0 total,  9082.1 free,    72.9 used.  435.9 avail Mem
8
9      PID USER      PR  NI   VIRT   RES    SHR S  %CPU  %MEM    TIME+  COMMAND  \
10
11      610 root      20   0  343184  14212  12004 S   0.7   1.4   0:00.21 NetworkManag\
12  er
13      902 gdm       20   0 3345080 101124  46112 S   0.3  10.2   0:04.56 gnome-shell
14  ^C

```

Show only processes owned by given user:

```

1  osboxes@osboxes:~$ top -u osboxes
2  top - 23:16:14 up 51 min,  1 user,  load average: 0.00, 0.00, 0.00
3  Tasks: 180 total,  1 running, 179 sleeping,  0 stopped,  0 zombie
4  %Cpu(s):  0.3 us,  0.0 sy,  0.0 ni, 99.7 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st  \
5
6  MiB Mem :   969.5 total,    74.2 free,   384.9 used,   510.4 buff/cache
7  MiB Swap:  9155.0 total,  9082.4 free,    72.6 used.  436.0 avail Mem
8
9      PID USER      PR  NI   VIRT   RES   SHR S  %CPU  %MEM    TIME+  COMMAND  \
10
11      1357 osboxes  20   0   17820   9560   7172 S   0.0   1.0   0:00.20 systemd  \
12
13      1358 osboxes  20   0  170020   1972     0 S   0.0   0.2   0:00.00 (sd-pam)  \
14
15      1364 osboxes  20   0   48088   5932   4804 S   0.0   0.6   0:00.00 pipewire  \
16
17      1365 osboxes  20   0   32116   5900   4800 S   0.0   0.6   0:00.00 pipewire-med\
18  i+
19      1366 osboxes  20   0  305692  16060  12368 S   0.0   1.6   0:00.02 pulseaudio \
20
21      1393 osboxes  20   0    8568   4372   4048 S   0.0   0.4   0:00.01 dbus-daemon \
22
23      1397 osboxes  20   0  249288   7776   6916 S   0.0   0.8   0:00.00 gvfsd
24      1405 osboxes  20   0  380884   6180   5580 S   0.0   0.6   0:00.00 gvfsd-fuse  \
25
26      1503 osboxes  20   0   17552   6456   4684 S   0.0   0.7   0:00.41 sshd
27      1504 osboxes  39  19  642124  15744  10656 S   0.0   1.6   0:00.32 tracker-mine\
28  r+
29      1505 osboxes  20   0   20044   4440   3368 S   0.0   0.4   0:00.11 bash
30      1518 osboxes  20   0  324568   8704   7076 S   0.0   0.9   0:00.04 gvfs-udisks2\
31  -+
32      1524 osboxes  20   0  245280   6592   6080 S   0.0   0.7   0:00.00 gvfs-go-a-vol\
33  u+
34      1528 osboxes  20   0  643660  23492  17144 S   0.0   2.4   0:00.02 goa-daemon  \
35
36      1541 osboxes  20   0  347048  11128   9212 S   0.0   1.1   0:00.01 goa-identity\
37  -+
38      1543 osboxes  20   0  323852   8180   7128 S   0.0   0.8   0:00.07 gvfs-afc-vol\
39  u+
40      1548 osboxes  20   0  246060   6800   6100 S   0.0   0.7   0:00.00 gvfs-gphoto2\
41  -+
42      1552 osboxes  20   0  245104   6428   5844 S   0.0   0.6   0:00.00 gvfs-mtp-vol\
43  u+

```

```

44      1567 osboxes   20   0 471820   7260   6572 S   0.0   0.7   0:00.00 xdg-document\
45  -+
46      1570 osboxes   20   0 244800   5408   4992 S   0.0   0.5   0:00.00 xdg-permissi\
47  o+
48      3146 osboxes   20   0  21752   4068   3348 R   0.0   0.4   0:00.00 top

```

Sort processes by a field:

```

1  osboxes@osboxes:~$ top -o %MEM
2  top - 23:17:08 up 52 min,  1 user,  load average: 0.00, 0.00, 0.00
3  Tasks: 180 total,  1 running, 179 sleeping,  0 stopped,  0 zombie
4  %Cpu(s):  0.0 us,  0.0 sy,  0.0 ni, 99.7 id,  0.3 wa,  0.0 hi,  0.0 si,  0.0 st   \
5
6  MiB Mem :   969.5 total,    74.2 free,   384.8 used,   510.5 buff/cache
7  MiB Swap:  9155.0 total,  9082.4 free,    72.6 used.  436.1 avail Mem
8
9      PID USER      PR  NI   VIRT   RES    SHR S  %CPU  %MEM    TIME+  COMMAND   \
10
11      902 gdm        20   0 3345080 101132 46112 S   0.0  10.2   0:04.67 gnome-shell \
12
13      645 root       20   0  735292  27388  10012 S   0.0   2.8   0:01.47 snapd
14      1528 osboxes    20   0  643660  23492  17144 S   0.0   2.4   0:00.02 goa-daemon \
15
16      935 gdm        20   0  643656  21064  16808 S   0.0   2.1   0:00.05 goa-daemon \
17
18     1310 gdm        20   0 2608168  17548  12704 S   0.0   1.8   0:00.05 gjs
19     1101 gdm        20   0 2608036  17428  12636 S   0.0   1.8   0:00.03 gjs
20      783 root       20   0  126784  17064  11148 S   0.0   1.7   0:00.06 unattended-u\
21  p+
22      860 gdm         9 -11  906360  16840  12620 S   0.0   1.7   0:00.15 pulseaudio \
23
24      633 root       20   0   49684  16248   9776 S   0.0   1.6   0:00.09 networkd-dis\
25  p+
26     1137 gdm        20   0  651784  16192  10608 S   0.0   1.6   0:00.08 gsd-media-ke\
27  ys
28     1095 root       20   0  306836  16116  13676 S   0.0   1.6   0:00.03 packagekitd \
29
30     1366 osboxes    20   0  305692  16060  12368 S   0.0   1.6   0:00.02 pulseaudio  \
31
32     1504 osboxes    39  19  642124  15744  10656 S   0.0   1.6   0:00.32 tracker-mine\
33  r+
34      905 gdm        39  19  715876  15556  10344 S   0.0   1.6   0:00.37 tracker-mine\
35  r+

```

```

36      1157 gdm      20   0  459244  15244  9760 S   0.0   1.5   0:00.09 gsd-power  \
37
38      1118 gdm      20   0  460000  14996  9452 S   0.0   1.5   0:00.10 gsd-color  \
39
40      1113 gdm      20   0  423216  14348  9244 S   0.0   1.4   0:00.09 gsd-wacom  \
41
42      610 root      20   0  343184  14212  12004 S   0.0   1.4   0:00.21 NetworkManag\
43 er
44      1121 gdm      20   0  348904  13776  9008 S   0.0   1.4   0:00.07 gsd-keyboard\
45
46      228 root      19  -1   64552  13752  12436 S   0.0   1.4   0:00.18 systemd-jour\
47 n+
48      1 root       20   0  167928  12608  7720 S   0.0   1.3   0:00.99 systemd    \
49
50      387 systemd+  20   0   25480  11460  8380 S   0.0   1.2   0:00.10 systemd-reso\
51 l+
52      1541 osboxes  20   0  347048  11128  9212 S   0.0   1.1   0:00.01 goa-identity\
53 -+
54      660 root      20   0  393156  10992  8804 S   0.0   1.1   0:00.13 udisksd    \
55
56      950 gdm       20   0  420780  10968  9040 S   0.0   1.1   0:00.01 goa-identity\
57 -+
58      1292 colord   20   0  253936  10808  7928 S   0.0   1.1   0:00.07 colord
59      1130 gdm      20   0  384300  10460  8460 S   0.0   1.1   0:00.00 gsd-datetime\
60
61      1201 gdm      20   0  351004  10256  8452 S   0.0   1.0   0:00.00 gsd-printer \
62
63      874 gdm       20   0  667424  10228  8932 S   0.0   1.0   0:00.06 gnome-sessio\
64 n+
65      1126 gdm      20   0  258500  10048  8628 S   0.0   1.0   0:00.00 gsd-print-no\
66 t+
67      1354 root      20   0   17420   9996   7824 S   0.0   1.0   0:00.02 sshd

```

5. ps :

Information about running processes.

- List all running processes: `ps aux`
- List all running processes including the full command string: `ps auxww`
- Search for a process that matches a string:

```
ps aux | grep {{string}}
```

- List all processes of the current user in extra full format: `ps -u $(id -u) -F`

- List all processes of the current user as a tree: `ps -user $(id -u) f`
- Get the parent PID of a process: `ps -o ppid= -p {{pid}}`
- Sort processes by memory consumption: `ps --sort size`

Lets try out these commands:

List all running processes:

```

1  osboxes@osboxes:~$ ps aux
2  USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
3  root             1  0.0  1.2 167928 12608 ?        Ss   22:24   0:00 /sbin/init splas\
4  h
5  root             2  0.0  0.0      0     0 ?        S    22:24   0:00 [kthreadd]
6  root             3  0.0  0.0      0     0 ?        I<   22:24   0:00 [rcu_gp]
7  root             4  0.0  0.0      0     0 ?        I<   22:24   0:00 [rcu_par_gp]      \
8
9  root             5  0.0  0.0      0     0 ?        I<   22:24   0:00 [netns]
10 root             7  0.0  0.0      0     0 ?        I<   22:24   0:00 [kworker/0:0H-ev\
11 ent
12 root             9  0.0  0.0      0     0 ?        I<   22:24   0:00 [kworker/0:1H-ev\
13 ent
14 root            10  0.0  0.0      0     0 ?        I<   22:24   0:00 [mm_percpu_wq]    \
15
16 root            11  0.0  0.0      0     0 ?        S    22:24   0:00 [rcu_tasks_rude_\
17 ]
18 root            12  0.0  0.0      0     0 ?        S    22:24   0:00 [rcu_tasks_trace\
19 ]
20 root            13  0.0  0.0      0     0 ?        S    22:24   0:00 [ksoftirqd/0]     \
21
22 root            14  0.0  0.0      0     0 ?        I    22:24   0:00 [rcu_sched]       \
23
24 root            15  0.0  0.0      0     0 ?        S    22:24   0:00 [migration/0]     \
25
26 root            16  0.0  0.0      0     0 ?        S    22:24   0:00 [idle_inject/0]   \
27
28 root            18  0.0  0.0      0     0 ?        S    22:24   0:00 [cpuhp/0]
29 root            19  0.0  0.0      0     0 ?        S    22:24   0:00 [kdevtmpfs]       \
30
31 root            20  0.0  0.0      0     0 ?        I<   22:24   0:00 [inet_frag_wq]    \
32
33 root            21  0.0  0.0      0     0 ?        S    22:24   0:00 [kauditd]
34 root            22  0.0  0.0      0     0 ?        S    22:24   0:00 [khungtaskd]      \
35
36 root            23  0.0  0.0      0     0 ?        S    22:24   0:00 [oom_reaper]      \

```

```

37
38     root          24  0.0  0.0      0      0 ?      I<   22:24   0:00 [writeback]      \
39
40     root          25  0.0  0.0      0      0 ?      S    22:24   0:00 [kcompactd0]     \
41
42     root          26  0.0  0.0      0      0 ?      SN   22:24   0:00 [ksmd]
43     root          27  0.0  0.0      0      0 ?      SN   22:24   0:00 [khugepaged]     \
44
45     root          73  0.0  0.0      0      0 ?      I<   22:24   0:00 [kintegrityd]    \
46
47     root          74  0.0  0.0      0      0 ?      I<   22:24   0:00 [kblockd]
48     root          75  0.0  0.0      0      0 ?      I<   22:24   0:00 [blkcg_punt_bio]\
49
50     root          76  0.0  0.0      0      0 ?      I<   22:24   0:00 [tpm_dev_wq]     \
51
52     root          77  0.0  0.0      0      0 ?      I<   22:24   0:00 [ata_sff]
53     root          78  0.0  0.0      0      0 ?      I<   22:24   0:00 [md]
54     root          79  0.0  0.0      0      0 ?      I<   22:24   0:00 [edac-poller]
55     root          80  0.0  0.0      0      0 ?      I<   22:24   0:00 [devfreq_wq]     \
56
57     root          81  0.0  0.0      0      0 ?      S    22:24   0:00 [watchdogd]      \
58
59     root          84  0.0  0.0      0      0 ?      S    22:24   0:00 [kswapd0]
60     root          85  0.0  0.0      0      0 ?      S    22:24   0:00 [ecryptfs-kthrea\
61 ]
62     root          87  0.0  0.0      0      0 ?      I<   22:24   0:00 [kthrotld]
63     root          88  0.0  0.0      0      0 ?      I<   22:24   0:00 [acpi_thermal_pm\
64 ]
65     root          90  0.0  0.0      0      0 ?      S    22:24   0:00 [scsi_eh_0]      \
66
67     root          91  0.0  0.0      0      0 ?      I<   22:24   0:00 [scsi_tmf_0]     \
68
69     root          92  0.0  0.0      0      0 ?      S    22:24   0:00 [scsi_eh_1]      \
70
71     root          93  0.0  0.0      0      0 ?      I<   22:24   0:00 [scsi_tmf_1]     \
72
73     root          95  0.0  0.0      0      0 ?      I<   22:24   0:00 [vfio-irqfd-clea\
74 ]
75     root          98  0.0  0.0      0      0 ?      I<   22:24   0:00 [mld]
76     root          99  0.0  0.0      0      0 ?      I<   22:24   0:00 [ipv6_addrconf]  \
77
78     root         109  0.0  0.0      0      0 ?      I<   22:24   0:00 [kstrp]
79     root         112  0.0  0.0      0      0 ?      I<   22:24   0:00 [zswap-shrink]   \

```

```

80
81     root          113  0.0  0.0      0      0 ?      I<   22:24   0:00 [kworker/u3:0]  \
82
83     root          118  0.0  0.0      0      0 ?      I<   22:24   0:00 [charger_manager\
84 ]
85     root          152  0.0  0.0      0      0 ?      S    22:24   0:00 [scsi_eh_2]      \
86
87     root          153  0.0  0.0      0      0 ?      I    22:24   0:00 [kworker/0:3-cgr\
88 oup
89     root          154  0.0  0.0      0      0 ?      I<   22:24   0:00 [scsi_tmf_2]     \
90
91     root          187  0.0  0.0      0      0 ?      S    22:24   0:00 [jbd2/sda1-8]    \
92
93     root          188  0.0  0.0      0      0 ?      I<   22:24   0:00 [ext4-rsv-conver\
94 ]
95     root          228  0.0  1.3  64552 13752 ?      S<s  22:24   0:00 /lib/systemd/sys\
96 tem
97     root          249  0.0  0.0      0      0 ?      I<   22:24   0:00 [ipmi-msghandler\
98 ]
99     root          256  0.0  0.5  26608 5452 ?      Ss   22:24   0:00 /lib/systemd/sys\
100 tem
101     root          304  0.0  0.0      0      0 ?      I<   22:24   0:00 [ttm_swap]
102     root          306  0.0  0.0      0      0 ?      S    22:24   0:00 [irq/18-vmwgfx]  \
103
104     root          308  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc0]    \
105
106     root          309  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc1]    \
107
108     root          310  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc2]    \
109
110     root          311  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc3]    \
111
112     root          313  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc4]    \
113
114     root          314  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc5]    \
115
116     root          315  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc6]    \
117
118     root          317  0.0  0.0      0      0 ?      S    22:24   0:00 [card0-crtc7]    \
119
120     root          321  0.0  0.0      0      0 ?      I<   22:24   0:00 [cryptd]
121     root          364  0.0  0.0      0      0 ?      S    22:24   0:00 [jbd2/sda2-8]    \
122

```

```

123   root          365  0.0  0.0      0      0 ?      I<  22:24  0:00 [ext4-rsv-conver\
124   ]
125   root          368  0.0  0.0      0      0 ?      S   22:24  0:00 [jbd2/sda5-8]    \
126
127   root          369  0.0  0.0      0      0 ?      I<  22:24  0:00 [ext4-rsv-conver\
128   ]
129   systemd+      386  0.0  0.6  14776  5968 ?      Ss  22:24  0:02 /lib/systemd/sys\
130   tem
131   systemd+      387  0.0  1.1  25480 11460 ?      Ss  22:24  0:00 /lib/systemd/sys\
132   tem
133   systemd+      511  0.0  0.6  89324  6324 ?      Ssl 22:24  0:00 /lib/systemd/sys\
134   tem
135   root          589  0.0  0.7 248636  7300 ?      Ssl 22:24  0:00 /usr/libexec/acc\
136   oun
137   root          592  0.0  0.1   2812  1128 ?      Ss  22:24  0:00 /usr/sbin/acpid  \
138
139   root          595  0.0  0.2  17028  2624 ?      Ss  22:24  0:00 /usr/sbin/anacro\
140   n -
141   avahi         599  0.0  0.3   7628  3192 ?      Ss  22:24  0:00 avahi-daemon: re\
142   gis
143   root          600  0.0  0.2  18148  2864 ?      Ss  22:24  0:00 /usr/sbin/cron -\
144   f -
145   message+      604  0.0  0.5  10036  5508 ?      Ss  22:24  0:00 @dbus-daemon --s\
146   yst
147   root          610  0.0  1.4 343184 14212 ?      Ssl 22:24  0:00 /usr/sbin/Networ\
148   kMa
149   root          633  0.0  1.6  49684 16248 ?      Ss  22:24  0:00 /usr/bin/python3\
150   /u
151   root          636  0.0  0.8 236984  8892 ?      Ssl 22:24  0:00 /usr/libexec/pol\
152   kit
153   root          639  0.0  0.7 248708  7056 ?      Ssl 22:24  0:00 /usr/libexec/pow\
154   er-
155   syslog        642  0.0  0.4 222400  4592 ?      Ssl 22:24  0:00 /usr/sbin/rsyslo\
156   gd
157   root          645  0.0  2.7 735292 27388 ?      Ssl 22:24  0:01 /usr/lib/snapd/s\
158   nap
159   root          648  0.0  0.6 245024  6524 ?      Ssl 22:24  0:00 /usr/libexec/swi\
160   tch
161   root          653  0.0  0.6   23596  6796 ?      Ss  22:24  0:00 /lib/systemd/sys\
162   tem
163   root          660  0.0  1.1 393156 10992 ?      Ssl 22:24  0:00 /usr/libexec/udi\
164   sks
165   root          669  0.0  0.4  16492  4416 ?      Ss  22:24  0:00 /sbin/wpa_suppli\

```

166	can											
167	avahi	691	0.0	0.0	7440	276	?	S	22:24	0:00	avahi-daemon: ch\	
168	roo											
169	root	711	0.0	0.8	317012	8320	?	Ssl	22:24	0:00	/usr/sbin/ModemM\	
170	ana											
171	root	753	0.0	0.6	15420	6124	?	Ss	22:24	0:00	sshd: /usr/sbin/\	
172	ssh											
173	root	763	0.0	0.2	371088	2752	?	Sl	22:24	0:00	/usr/sbin/VBoxSe\	
174	rvi											
175	root	783	0.0	1.7	126784	17064	?	Ssl	22:24	0:00	/usr/bin/python3\	
176	/u											
177	root	785	0.0	0.9	81652	9596	?	Ss	22:24	0:00	/usr/sbin/cupsd \	
178	-l											
179	root	786	0.0	0.8	249860	8204	?	Ssl	22:24	0:00	/usr/sbin/gdm3 \	
180												
181	root	798	0.0	0.9	178892	9008	?	Sl	22:24	0:00	gdm-session-work\	
182	er											
183	gdm	809	0.0	0.9	17812	9784	?	Ss	22:24	0:00	/lib/systemd/sys\	
184	tem											
185	gdm	815	0.0	0.1	104412	1256	?	S	22:24	0:00	(sd-pam)	
186	root	827	0.0	0.9	172612	9576	?	Ssl	22:24	0:00	/usr/sbin/cups-b\	
187	row											
188	kernoops	833	0.0	0.0	13080	128	?	Ss	22:24	0:00	/usr/sbin/kernel\	
189	oop											
190	kernoops	835	0.0	0.0	13080	448	?	Ss	22:24	0:00	/usr/sbin/kernel\	
191	oop											
192	gdm	856	0.0	0.5	48084	5520	?	S<sl	22:24	0:00	/usr/bin/pipewir\	
193	e											
194	gdm	857	0.0	0.5	32108	5332	?	Ssl	22:24	0:00	/usr/bin/pipewir\	
195	e-m											
196	gdm	858	0.0	0.5	171036	5444	tty1	Ssl+	22:24	0:00	/usr/libexec/gdm\	
197	-wa											
198	gdm	860	0.0	1.6	906360	16840	?	S<sl	22:24	0:00	/usr/bin/pulseau\	
199	dio											
200	gdm	863	0.0	0.4	8564	4048	?	Ss	22:24	0:00	/usr/bin/dbus-da\	
201	emo											
202	rtkit	867	0.0	0.1	154000	1448	?	SNsl	22:24	0:00	/usr/libexec/rtk\	
203	it-											
204	gdm	872	0.0	0.1	6492	1256	tty1	S+	22:24	0:00	dbus-run-session\	
205	--											
206	gdm	873	0.0	0.4	8748	4232	tty1	S+	22:24	0:00	dbus-daemon --no\	
207	for											
208	gdm	874	0.0	1.0	667424	10228	tty1	Sl+	22:24	0:00	/usr/libexec/gno\	

```

209 me-
210 gdm 877 0.0 0.7 249288 7436 ? Ssl 22:24 0:00 /usr/libexec/gvf\
211 sd
212 gdm 882 0.0 0.6 380884 6204 ? Sl 22:24 0:00 /usr/libexec/gvf\
213 sd-
214 gdm 902 0.1 10.1 3345080 101132 tty1 Sl+ 22:24 0:04 /usr/bin/gnome-s\
215 hel
216 gdm 905 0.0 1.5 715876 15556 ? SNsl 22:24 0:00 /usr/libexec/tra\
217 cke
218 gdm 914 0.0 0.8 324560 8400 ? Ssl 22:24 0:00 /usr/libexec/gvf\
219 s-u
220 gdm 930 0.0 0.6 245280 6636 ? Ssl 22:24 0:00 /usr/libexec/gvf\
221 s-g
222 gdm 935 0.0 2.1 643656 21064 ? Sl 22:24 0:00 /usr/libexec/goa\
223 -da
224 gdm 950 0.0 1.1 420780 10968 ? Sl 22:24 0:00 /usr/libexec/goa\
225 -id
226 gdm 953 0.0 0.7 323852 7892 ? Ssl 22:24 0:00 /usr/libexec/gvf\
227 s-a
228 gdm 959 0.0 0.6 246060 6712 ? Ssl 22:24 0:00 /usr/libexec/gvf\
229 s-g
230 gdm 964 0.0 0.6 245104 6316 ? Ssl 22:24 0:00 /usr/libexec/gvf\
231 s-m
232 root 971 0.0 0.7 250872 7812 ? Ssl 22:24 0:00 /usr/libexec/upo\
233 wer
234 gdm 1002 0.0 0.6 309808 6720 tty1 Sl+ 22:24 0:00 /usr/libexec/at-\
235 spi
236 gdm 1007 0.0 0.3 8296 3464 tty1 S+ 22:24 0:00 /usr/bin/dbus-da\
237 emo
238 gdm 1018 0.0 0.7 471820 7344 ? Ssl 22:24 0:00 /usr/libexec/xdg\
239 -do
240 gdm 1021 0.0 0.5 244800 5348 ? Ssl 22:24 0:00 /usr/libexec/xdg\
241 -pe
242 root 1027 0.0 0.1 2792 1004 ? Ss 22:24 0:00 fusermount3 -o r\
243 w,n
244 gdm 1037 0.0 0.9 183180 9332 tty1 S+ 22:24 0:00 /usr/bin/Xwaylan\
245 d :
246 gdm 1070 0.0 0.5 244796 5332 tty1 Sl+ 22:24 0:00 /usr/libexec/xdg\
247 -pe
248 root 1095 0.0 1.6 306836 16116 ? Ssl 22:24 0:00 /usr/libexec/pac\
249 kag
250 gdm 1101 0.0 1.7 2608036 17428 tty1 Sl+ 22:24 0:00 /usr/bin/gjs /us\
251 r/s

```

[illegible]

295	osboxes	1365	0.0	0.5	32116	5900 ?	Ssl	22:28	0:00 /usr/bin/pipewir\
296	e-m								
297	osboxes	1366	0.0	1.6	305692	16060 ?	Ssl	22:28	0:00 /usr/bin/pulseau\
298	dio								
299	osboxes	1393	0.0	0.4	8568	4372 ?	Ss	22:28	0:00 /usr/bin/dbus-da\
300	emo								
301	osboxes	1397	0.0	0.7	249288	7776 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
302	sd								
303	osboxes	1405	0.0	0.6	380884	6180 ?	Sl	22:28	0:00 /usr/libexec/gvf\
304	sd-								
305	osboxes	1503	0.0	0.6	17552	6456 ?	S	22:28	0:00 sshd: osboxes@pt\
306	s/0								
307	osboxes	1504	0.0	1.5	642124	15744 ?	SNsl	22:28	0:00 /usr/libexec/tra\
308	cke								
309	osboxes	1505	0.0	0.4	20044	4440 pts/0	Ss	22:28	0:00 -bash
310	osboxes	1518	0.0	0.8	324568	8704 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
311	s-u								
312	osboxes	1524	0.0	0.6	245280	6592 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
313	s-g								
314	osboxes	1528	0.0	2.3	643660	23492 ?	Sl	22:28	0:00 /usr/libexec/goa\
315	-da								
316	osboxes	1541	0.0	1.1	347048	11128 ?	Sl	22:28	0:00 /usr/libexec/goa\
317	-id								
318	osboxes	1543	0.0	0.8	323852	8180 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
319	s-a								
320	osboxes	1548	0.0	0.6	246060	6800 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
321	s-g								
322	osboxes	1552	0.0	0.6	245104	6428 ?	Ssl	22:28	0:00 /usr/libexec/gvf\
323	s-m								
324	osboxes	1567	0.0	0.7	471820	7260 ?	Ssl	22:28	0:00 /usr/libexec/xdg\
325	-do								
326	osboxes	1570	0.0	0.5	244800	5408 ?	Ssl	22:28	0:00 /usr/libexec/xdg\
327	-pe								
328	root	1576	0.0	0.1	2792	1024 ?	Ss	22:28	0:00 fusermount3 -o r\
329	w,n								
330	root	2753	0.0	0.0	0	0 ?	I	22:51	0:00 [kworker/u2:5-ev\
331	ent								
332	root	3004	0.0	0.0	0	0 ?	I	22:52	0:00 [kworker/0:0-cgr\
333	oup								
334	root	3118	0.0	0.0	0	0 ?	I	23:07	0:00 [kworker/u2:1-fl\
335	ush								
336	root	3144	0.0	0.0	0	0 ?	I	23:16	0:00 [kworker/0:1-eve\
337	nts								

```

338   root          3145  0.0  0.0      0      0 ?      I   23:16   0:00 [kworker/u2:0-fl\
339   ush
340   root          3149  0.0  0.0      0      0 ?      I   23:16   0:00 [kworker/0:2-eve\
341   nts
342   osboxes       3161  0.0  0.3  21324  3512 pts/0    R+  23:20   0:00 ps aux
343   osboxes@osboxes:~$

```

List all running processes including the full command string:

```

1   osboxes@osboxes:~$ ps auxww
2   USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
3   root           1  0.0  1.2 167928 12608 ?        Ss   22:24   0:00 /sbin/init splas\
4   h
5   root           2  0.0  0.0      0      0 ?        S    22:24   0:00 [kthreadd]
6   root           3  0.0  0.0      0      0 ?        I<   22:24   0:00 [rcu_gp]
7   root           4  0.0  0.0      0      0 ?        I<   22:24   0:00 [rcu_par_gp]      \
8
9   root           5  0.0  0.0      0      0 ?        I<   22:24   0:00 [netns]
10  root           7  0.0  0.0      0      0 ?        I<   22:24   0:00 [kworker/0:0H-ev\
11  ents_highpri]
12  root           9  0.0  0.0      0      0 ?        I<   22:24   0:00 [kworker/0:1H-ev\
13  ents_highpri]
14  root          10  0.0  0.0      0      0 ?        I<   22:24   0:00 [mm_percpu_wq]    \
15
16  root          11  0.0  0.0      0      0 ?        S    22:24   0:00 [rcu_tasks_rude_\
17  ]
18  root          12  0.0  0.0      0      0 ?        S    22:24   0:00 [rcu_tasks_trace\
19  ]
20  root          13  0.0  0.0      0      0 ?        S    22:24   0:00 [ksoftirqd/0]     \
21
22  root          14  0.0  0.0      0      0 ?        I    22:24   0:00 [rcu_sched]        \
23
24  root          15  0.0  0.0      0      0 ?        S    22:24   0:00 [migration/0]     \
25
26  root          16  0.0  0.0      0      0 ?        S    22:24   0:00 [idle_inject/0]   \
27
28  root          18  0.0  0.0      0      0 ?        S    22:24   0:00 [cpuhp/0]
29  root          19  0.0  0.0      0      0 ?        S    22:24   0:00 [kdevtmpfs]        \
30
31  root          20  0.0  0.0      0      0 ?        I<   22:24   0:00 [inet_frag_wq]     \
32
33  root          21  0.0  0.0      0      0 ?        S    22:24   0:00 [kauditd]
34  root          22  0.0  0.0      0      0 ?        S    22:24   0:00 [khungtaskd]       \

```

```

35
36     root          23  0.0  0.0      0    0 ?      S   22:24   0:00 [oom_reaper]      \
37
38     root          24  0.0  0.0      0    0 ?      I<  22:24   0:00 [writeback]       \
39
40     root          25  0.0  0.0      0    0 ?      S   22:24   0:00 [kcompactd0]      \
41
42     root          26  0.0  0.0      0    0 ?      SN  22:24   0:00 [ksmd]
43     root          27  0.0  0.0      0    0 ?      SN  22:24   0:00 [khugepaged]      \
44
45     root          73  0.0  0.0      0    0 ?      I<  22:24   0:00 [kintegrityd]     \
46
47     root          74  0.0  0.0      0    0 ?      I<  22:24   0:00 [kblockd]
48     root          75  0.0  0.0      0    0 ?      I<  22:24   0:00 [blkcg_punt_bio]\
49
50     root          76  0.0  0.0      0    0 ?      I<  22:24   0:00 [tpm_dev_wq]      \
51
52     root          77  0.0  0.0      0    0 ?      I<  22:24   0:00 [ata_sff]
53     root          78  0.0  0.0      0    0 ?      I<  22:24   0:00 [md]
54     root          79  0.0  0.0      0    0 ?      I<  22:24   0:00 [edac-poller]     \
55
56     root          80  0.0  0.0      0    0 ?      I<  22:24   0:00 [devfreq_wq]      \
57
58     root          81  0.0  0.0      0    0 ?      S   22:24   0:00 [watchdogd]       \
59
60     root          84  0.0  0.0      0    0 ?      S   22:24   0:00 [kswapd0]
61     root          85  0.0  0.0      0    0 ?      S   22:24   0:00 [ecryptfs-kthrea\
62 ]
63     root          87  0.0  0.0      0    0 ?      I<  22:24   0:00 [kthrotld]
64     root          88  0.0  0.0      0    0 ?      I<  22:24   0:00 [acpi_thermal_pm\
65 ]
66     root          90  0.0  0.0      0    0 ?      S   22:24   0:00 [scsi_eh_0]       \
67
68     root          91  0.0  0.0      0    0 ?      I<  22:24   0:00 [scsi_tmf_0]      \
69
70     root          92  0.0  0.0      0    0 ?      S   22:24   0:00 [scsi_eh_1]       \
71
72     root          93  0.0  0.0      0    0 ?      I<  22:24   0:00 [scsi_tmf_1]      \
73
74     root          95  0.0  0.0      0    0 ?      I<  22:24   0:00 [vfio-irqfd-clea\
75 ]
76     root          98  0.0  0.0      0    0 ?      I<  22:24   0:00 [mld]
77     root          99  0.0  0.0      0    0 ?      I<  22:24   0:00 [ipv6_addrconf]   \

```

```

78
79     root          109  0.0  0.0      0      0 ?      I<  22:24  0:00 [kstrp]
80     root          112  0.0  0.0      0      0 ?      I<  22:24  0:00 [zswap-shrink] \
81
82     root          113  0.0  0.0      0      0 ?      I<  22:24  0:00 [kworker/u3:0] \
83
84     root          118  0.0  0.0      0      0 ?      I<  22:24  0:00 [charger_manager\
85 ]
86     root          152  0.0  0.0      0      0 ?      S   22:24  0:00 [scsi_eh_2]
87     root          153  0.0  0.0      0      0 ?      I   22:24  0:00 [kworker/0:3-cgr\
88 oup_destroy]
89     root          154  0.0  0.0      0      0 ?      I<  22:24  0:00 [scsi_tmf_2] \
90
91     root          187  0.0  0.0      0      0 ?      S   22:24  0:00 [jbd2/sda1-8] \
92
93     root          188  0.0  0.0      0      0 ?      I<  22:24  0:00 [ext4-rsv-conver\
94 ]
95     root          228  0.0  1.3  64552 13752 ?      S<s  22:24  0:00 /lib/systemd/sys\
96 temd-journald
97     root          249  0.0  0.0      0      0 ?      I<  22:24  0:00 [ipmi-msghandler\
98 ]
99     root          256  0.0  0.5  26608  5452 ?      Ss   22:24  0:00 /lib/systemd/sys\
100 temd-udev
101     root          304  0.0  0.0      0      0 ?      I<  22:24  0:00 [ttm_swap]
102     root          306  0.0  0.0      0      0 ?      S   22:24  0:00 [irq/18-vmwgfx] \
103
104     root          308  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc0] \
105
106     root          309  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc1] \
107
108     root          310  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc2] \
109
110     root          311  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc3] \
111
112     root          313  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc4] \
113
114     root          314  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc5] \
115
116     root          315  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc6] \
117
118     root          317  0.0  0.0      0      0 ?      S   22:24  0:00 [card0-crtc7] \
119
120     root          321  0.0  0.0      0      0 ?      I<  22:24  0:00 [cryptd]

```

```

121 root 364 0.0 0.0 0 0 ? S 22:24 0:00 [jbd2/sda2-8] \
122
123 root 365 0.0 0.0 0 0 ? I< 22:24 0:00 [ext4-rsv-conver\
124 ]
125 root 368 0.0 0.0 0 0 ? S 22:24 0:00 [jbd2/sda5-8] \
126
127 root 369 0.0 0.0 0 0 ? I< 22:24 0:00 [ext4-rsv-conver\
128 ]
129 systemd+ 386 0.0 0.6 14776 5968 ? Ss 22:24 0:02 /lib/systemd/sys\
130 temd-oond
131 systemd+ 387 0.0 1.1 25480 11460 ? Ss 22:24 0:00 /lib/systemd/sys\
132 temd-resolved
133 systemd+ 511 0.0 0.6 89324 6324 ? Ssl 22:24 0:00 /lib/systemd/sys\
134 temd-timesyncd
135 root 589 0.0 0.7 248636 7300 ? Ssl 22:24 0:00 /usr/libexec/acc\
136 ounts-daemon
137 root 592 0.0 0.1 2812 1128 ? Ss 22:24 0:00 /usr/sbin/acpid \
138
139 root 595 0.0 0.2 17028 2624 ? Ss 22:24 0:00 /usr/sbin/anacro\
140 n -d -q -s
141 avahi 599 0.0 0.3 7628 3192 ? Ss 22:24 0:00 avahi-daemon: re\
142 gistering [osboxes.local]
143 root 600 0.0 0.2 18148 2864 ? Ss 22:24 0:00 /usr/sbin/cron -\
144 f -P
145 message+ 604 0.0 0.5 10036 5508 ? Ss 22:24 0:00 @dbus-daemon --s\
146 ystem --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
147 root 610 0.0 1.4 343184 14212 ? Ssl 22:24 0:00 /usr/sbin/Networ\
148 kManager --no-daemon
149 root 633 0.0 1.6 49684 16248 ? Ss 22:24 0:00 /usr/bin/python3\
150 /usr/bin/networkd-dispatcher --run-startup-triggers
151 root 636 0.0 0.8 236984 8892 ? Ssl 22:24 0:00 /usr/libexec/pol\
152 kitd --no-debug
153 root 639 0.0 0.7 248708 7056 ? Ssl 22:24 0:00 /usr/libexec/pow\
154 er-profiles-daemon
155 syslog 642 0.0 0.4 222400 4592 ? Ssl 22:24 0:00 /usr/sbin/rsyslo\
156 gd -n -iNONE
157 root 645 0.0 2.7 735292 27388 ? Ssl 22:24 0:01 /usr/lib/snapd/s\
158 napd
159 root 648 0.0 0.6 245024 6524 ? Ssl 22:24 0:00 /usr/libexec/swi\
160 tcheroo-control
161 root 653 0.0 0.6 23596 6796 ? Ss 22:24 0:00 /lib/systemd/sys\
162 temd-logind
163 root 660 0.0 1.1 393156 10992 ? Ssl 22:24 0:00 /usr/libexec/udi\

```

```

164     sks2/udisksd
165     root          669  0.0  0.4  16492  4416 ?          Ss   22:24   0:00 /sbin/wpa_suppli\
166     cant -u -s -O /run/wpa_supplicant
167     avahi         691  0.0  0.0   7440   276 ?          S    22:24   0:00 avahi-daemon: ch\
168     root helper
169     root          711  0.0  0.8 317012  8320 ?          Ssl  22:24   0:00 /usr/sbin/ModemM\
170     anager
171     root          753  0.0  0.6  15420  6124 ?          Ss   22:24   0:00 sshd: /usr/sbin/\
172     sshd -D [listener] 0 of 10-100 startups
173     root          763  0.0  0.2 371088  2752 ?          Sl   22:24   0:00 /usr/sbin/VBoxSe\
174     rvice
175     root          783  0.0  1.7 126784 17064 ?          Ssl  22:24   0:00 /usr/bin/python3\
176     /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
177     root          785  0.0  0.9  81652  9596 ?          Ss   22:24   0:00 /usr/sbin/cupsd \
178     -l
179     root          786  0.0  0.8 249860  8204 ?          Ssl  22:24   0:00 /usr/sbin/gdm3  \
180
181     root          798  0.0  0.9 178892  9008 ?          Sl   22:24   0:00 gdm-session-work\
182     er [pam/gdm-launch-environment]
183     gdm           809  0.0  0.9  17812  9784 ?          Ss   22:24   0:00 /lib/systemd/sys\
184     temd --user
185     gdm           815  0.0  0.1 104412  1256 ?          S    22:24   0:00 (sd-pam)
186     root          827  0.0  0.9 172612  9576 ?          Ssl  22:24   0:00 /usr/sbin/cups-b\
187     rowsed
188     kernoops      833  0.0  0.0  13080   128 ?          Ss   22:24   0:00 /usr/sbin/kernel\
189     oops --test
190     kernoops      835  0.0  0.0  13080   448 ?          Ss   22:24   0:00 /usr/sbin/kernel\
191     oops
192     gdm           856  0.0  0.5  48084  5520 ?          S<sl 22:24   0:00 /usr/bin/pipewir\
193     e
194     gdm           857  0.0  0.5  32108  5332 ?          Ssl  22:24   0:00 /usr/bin/pipewir\
195     e-media-session
196     gdm           858  0.0  0.5 171036  5444 tty1      Ssl+ 22:24   0:00 /usr/libexec/gdm\
197     -wayland-session dbus-run-session -- gnome-session --autostart /usr/share/gdm/greete
198     r/autostart
199     gdm           860  0.0  1.6 906360 16840 ?          S<sl 22:24   0:00 /usr/bin/pulseau\
200     dio --daemonize=no --log-target=journal
201     gdm           863  0.0  0.4   8564  4048 ?          Ss   22:24   0:00 /usr/bin/dbus-da\
202     mon --session --address=systemd: --nofork --nopidfile --systemd-activation --syslog
203     -only
204     rtkit          867  0.0  0.1 154000  1448 ?          SNsl 22:24   0:00 /usr/libexec/rtk\
205     it-daemon
206     gdm           872  0.0  0.1   6492  1256 tty1      S+    22:24   0:00 dbus-run-session\

```

```

207 -- gnome-session --autostart /usr/share/gdm/greeter/autostart
208 gdm      873  0.0  0.4  8748 4232 tty1      S+   22:24  0:00 dbus-daemon --no\
209 fork --print-address 4 --session
210 gdm      874  0.0  1.0 667424 10228 tty1      Sl+  22:24  0:00 /usr/libexec/gno\
211 me-session-binary --autostart /usr/share/gdm/greeter/autostart
212 gdm      877  0.0  0.7 249288 7436 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
213 sd
214 gdm      882  0.0  0.6 380884 6204 ?          Sl   22:24  0:00 /usr/libexec/gvf\
215 sd-fuse /run/user/127/gvfs -f
216 gdm      902  0.1 10.1 3345080 101132 tty1    Sl+  22:24  0:04 /usr/bin/gnome-s\
217 hell
218 gdm      905  0.0  1.5 715876 15556 ?          SNsl 22:24  0:00 /usr/libexec/tra\
219 cker-miner-fs-3
220 gdm      914  0.0  0.8 324560 8400 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
221 s-udisks2-volume-monitor
222 gdm      930  0.0  0.6 245280 6636 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
223 s-goa-volume-monitor
224 gdm      935  0.0  2.1 643656 21064 ?         Sl   22:24  0:00 /usr/libexec/goa\
225 -daemon
226 gdm      950  0.0  1.1 420780 10968 ?         Sl   22:24  0:00 /usr/libexec/goa\
227 -identity-service
228 gdm      953  0.0  0.7 323852 7892 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
229 s-afc-volume-monitor
230 gdm      959  0.0  0.6 246060 6712 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
231 s-gphoto2-volume-monitor
232 gdm      964  0.0  0.6 245104 6316 ?          Ssl  22:24  0:00 /usr/libexec/gvf\
233 s-mtp-volume-monitor
234 root     971  0.0  0.7 250872 7812 ?          Ssl  22:24  0:00 /usr/libexec/upo\
235 werd
236 gdm     1002  0.0  0.6 309808 6720 tty1      Sl+  22:24  0:00 /usr/libexec/at-\
237 spi-bus-launcher
238 gdm     1007  0.0  0.3 8296 3464 tty1      S+   22:24  0:00 /usr/bin/dbus-da\
239 emon --config-file=/usr/share/defaults/at-spi2/accessibility.conf --nofork --print-a
240 ddress 11 --address=unix:path=/run/user/127/at-spi/bus
241 gdm     1018  0.0  0.7 471820 7344 ?          Ssl  22:24  0:00 /usr/libexec/xdg\
242 -document-portal
243 gdm     1021  0.0  0.5 244800 5348 ?          Ssl  22:24  0:00 /usr/libexec/xdg\
244 -permission-store
245 root     1027  0.0  0.1 2792 1004 ?          Ss   22:24  0:00 fusermount3 -o r\
246 w,nosuid,nodev,fsname=portal,auto_unmount,subtype=portal -- /run/user/127/doc
247 gdm     1037  0.0  0.9 183180 9332 tty1      S+   22:24  0:00 /usr/bin/Xwaylan\
248 d :1024 -rootless -noreset -accessx -core -auth /run/user/127/.mutter-Xwaylandauth.X
249 EZ4U1 -listen 4 -listen 5 -displayfd 6 -initfd 7

```

```

250     gdm          1070  0.0  0.5 244796  5332 tty1      Sl+  22:24  0:00 /usr/libexec/xdg\
251 -permission-store
252     root          1095  0.0  1.6 306836 16116 ?          Ssl  22:24  0:00 /usr/libexec/pac\
253 kagekitd
254     gdm          1101  0.0  1.7 2608036 17428 tty1      Sl+  22:24  0:00 /usr/bin/gjs /us\
255 r/share/gnome-shell/org.gnome.Shell.Notifications
256     gdm          1103  0.0  0.6 162676  6696 tty1      Sl+  22:24  0:00 /usr/libexec/at-\
257 spi2-registryd --use-gnome-session
258     gdm          1110  0.0  0.8 474776  8888 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
259 -sharing
260     gdm          1113  0.0  1.4 423216 14348 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
261 -wacom
262     gdm          1118  0.0  1.5 460000 14996 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
263 -color
264     gdm          1121  0.0  1.3 348904 13776 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
265 -keyboard
266     gdm          1126  0.0  1.0 258500 10048 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
267 -print-notifications
268     gdm          1127  0.0  0.6 466500  6468 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
269 -rfkill
270     gdm          1129  0.0  0.7 468608  7216 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
271 -smartcard
272     gdm          1130  0.0  1.0 384300 10460 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
273 -datetime
274     gdm          1137  0.0  1.6 651784 16192 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
275 -media-keys
276     gdm          1139  0.0  0.6 244936  6384 tty1      Sl+  22:24  0:00 /usr/libexec/gsd\
277 -screensaver-proxy
278     gdm          1145  0.0  0.8 328184  8252 tty1      Sl+  22:25  0:00 /usr/libexec/gsd\
279 -sound
280     gdm          1150  0.0  0.6 319264  6452 tty1      Sl+  22:25  0:00 /usr/libexec/gsd\
281 -a11y-settings
282     gdm          1153  0.0  0.6 320764  6588 tty1      Sl+  22:25  0:00 /usr/libexec/gsd\
283 -housekeeping
284     gdm          1157  0.0  1.5 459244 15244 tty1      Sl+  22:25  0:00 /usr/libexec/gsd\
285 -power
286     gdm          1201  0.0  1.0 351004 10256 tty1      Sl+  22:25  0:00 /usr/libexec/gsd\
287 -printer
288     colord        1292  0.0  1.0 253936 10808 ?          Ssl  22:25  0:00 /usr/libexec/col\
289 ord
290     gdm          1310  0.0  1.7 2608168 17548 tty1      Sl+  22:25  0:00 /usr/bin/gjs /us\
291 r/share/gnome-shell/org.gnome.ScreenSaver
292     root          1354  0.0  1.0  17420  9996 ?          Ss   22:28  0:00 sshd: osboxes [p\

```

```

293 riv]
294 osboxes 1357 0.0 0.9 17820 9560 ? Ss 22:28 0:00 /lib/systemd/sys\
295 temd --user
296 osboxes 1358 0.0 0.1 170020 1972 ? S 22:28 0:00 (sd-pam)
297 osboxes 1364 0.0 0.5 48088 5932 ? Ssl 22:28 0:00 /usr/bin/pipewir\
298 e
299 osboxes 1365 0.0 0.5 32116 5900 ? Ssl 22:28 0:00 /usr/bin/pipewir\
300 e-media-session
301 osboxes 1366 0.0 1.6 305692 16060 ? Ssl 22:28 0:00 /usr/bin/pulseau\
302 dio --daemonize=no --log-target=journal
303 osboxes 1393 0.0 0.4 8568 4372 ? Ss 22:28 0:00 /usr/bin/dbus-da\
304 mon --session --address=systemd: --nofork --nopidfile --systemd-activation --syslog
305 -only
306 osboxes 1397 0.0 0.7 249288 7776 ? Ssl 22:28 0:00 /usr/libexec/gvf\
307 sd
308 osboxes 1405 0.0 0.6 380884 6180 ? Sl 22:28 0:00 /usr/libexec/gvf\
309 sd-fuse /run/user/1000/gvfs -f
310 osboxes 1503 0.0 0.6 17552 6460 ? S 22:28 0:00 sshd: osboxes@pt\
311 s/0
312 osboxes 1504 0.0 1.5 642124 15744 ? SNsl 22:28 0:00 /usr/libexec/tra\
313 cker-miner-fs-3
314 osboxes 1505 0.0 0.4 20044 4440 pts/0 Ss 22:28 0:00 -bash
315 osboxes 1518 0.0 0.8 324568 8704 ? Ssl 22:28 0:00 /usr/libexec/gvf\
316 s-udisks2-volume-monitor
317 osboxes 1524 0.0 0.6 245280 6592 ? Ssl 22:28 0:00 /usr/libexec/gvf\
318 s-goa-volume-monitor
319 osboxes 1528 0.0 2.3 643660 23492 ? Sl 22:28 0:00 /usr/libexec/goa\
320 -daemon
321 osboxes 1541 0.0 1.1 347048 11128 ? Sl 22:28 0:00 /usr/libexec/goa\
322 -identity-service
323 osboxes 1543 0.0 0.8 323852 8180 ? Ssl 22:28 0:00 /usr/libexec/gvf\
324 s-afc-volume-monitor
325 osboxes 1548 0.0 0.6 246060 6800 ? Ssl 22:28 0:00 /usr/libexec/gvf\
326 s-gphoto2-volume-monitor
327 osboxes 1552 0.0 0.6 245104 6428 ? Ssl 22:28 0:00 /usr/libexec/gvf\
328 s-mtp-volume-monitor
329 osboxes 1567 0.0 0.7 471820 7260 ? Ssl 22:28 0:00 /usr/libexec/xdg\
330 -document-portal
331 osboxes 1570 0.0 0.5 244800 5408 ? Ssl 22:28 0:00 /usr/libexec/xdg\
332 -permission-store
333 root 1576 0.0 0.1 2792 1024 ? Ss 22:28 0:00 fusermount3 -o r\
334 w,nosuid,nodev,fsname=portal,auto_unmount,subtype=portal -- /run/user/1000/doc
335 root 2753 0.0 0.0 0 0 ? I 22:51 0:00 [kworker/u2:5-fl\

```

```

336  ush-8:0]
337  root          3004  0.0  0.0      0      0 ?          I   22:52   0:00 [kworker/0:0-cgr\
338  oup_destroy]
339  root          3118  0.0  0.0      0      0 ?          I   23:07   0:00 [kworker/u2:1-ev\
340  ents_unbound]
341  root          3144  0.0  0.0      0      0 ?          I   23:16   0:00 [kworker/0:1-eve\
342  nts]
343  root          3145  0.0  0.0      0      0 ?          I   23:16   0:00 [kworker/u2:0-fl\
344  ush-8:0]
345  root          3149  0.0  0.0      0      0 ?          I   23:16   0:00 [kworker/0:2-ata\
346  _sff]
347  osboxes       3162  0.0  0.1  21324  1552 pts/0      R+  23:20   0:00 ps auxww
348  osboxes@osboxes:~$

```

Search for a process that matches a string:

```

1  osboxes@osboxes:~$ ps aux | grep shell
2  gdm          902  0.1 10.1 3345080 101132 tty1    Sl+  22:24   0:04 /usr/bin/gnome-s\
3  hell
4  gdm         1101  0.0  1.7 2608036 17428 tty1    Sl+  22:24   0:00 /usr/bin/gjs /us\
5  r/share/gnome-shell/org.gnome.Shell.Notifications
6  gdm         1310  0.0  1.7 2608168 17548 tty1    Sl+  22:25   0:00 /usr/bin/gjs /us\
7  r/share/gnome-shell/org.gnome.ScreenSaver
8  osboxes     3165  0.0  0.2  17864   2252 pts/0      S+  23:21   0:00 grep --color=aut\
9  o shell
10 osboxes@osboxes:~$

```

List all processes of the current user in extra full format:

```

1  osboxes@osboxes:~$ ps --user $(id -u) -F
2  UID          PID     PPID  C   SZ   RSS  PSR  STIME  TTY          TIME CMD
3  osboxes     1357        1   0  4455  9560   0  22:28 ?           00:00:00 /lib/systemd/sy\
4  ste
5  osboxes     1358     1357   0 42505  1972   0  22:28 ?           00:00:00 (sd-pam)
6  osboxes     1364     1357   0 12022  5932   0  22:28 ?           00:00:00 /usr/bin/pipewi\
7  re
8  osboxes     1365     1357   0  8029  5900   0  22:28 ?           00:00:00 /usr/bin/pipewi\
9  re-
10 osboxes     1366     1357   0 76423 16060   0  22:28 ?           00:00:00 /usr/bin/pulsea\
11 udi
12 osboxes     1393     1357   0  2142  4372   0  22:28 ?           00:00:00 /usr/bin/dbus-d\
13 aem
14 osboxes     1397     1357   0 62322  7776   0  22:28 ?           00:00:00 /usr/libexec/gv\
15 fsd

```

```

16  osboxes      1405      1357    0 95221   6180    0 22:28 ?          00:00:00 /usr/libexec/gv\
17  fsd
18  osboxes      1503      1354    0  4388   6460    0 22:28 ?          00:00:00 sshd: osboxes@p\
19  ts/
20  osboxes      1504      1357    0 160531  15744    0 22:28 ?          00:00:00 /usr/libexec/tr\
21  ack
22  osboxes      1505      1503    0  5011   4444    0 22:28 pts/0        00:00:00 -bash
23  osboxes      1518      1357    0  81142   8704    0 22:28 ?          00:00:00 /usr/libexec/gv\
24  fs-
25  osboxes      1524      1357    0  61320   6592    0 22:28 ?          00:00:00 /usr/libexec/gv\
26  fs-
27  osboxes      1528      1357    0 160915  23492    0 22:28 ?          00:00:00 /usr/libexec/go\
28  a-d
29  osboxes      1541      1357    0  86762  11128    0 22:28 ?          00:00:00 /usr/libexec/go\
30  a-i
31  osboxes      1543      1357    0  80963   8180    0 22:28 ?          00:00:00 /usr/libexec/gv\
32  fs-
33  osboxes      1548      1357    0  61515   6800    0 22:28 ?          00:00:00 /usr/libexec/gv\
34  fs-
35  osboxes      1552      1357    0  61276   6428    0 22:28 ?          00:00:00 /usr/libexec/gv\
36  fs-
37  osboxes      1567      1357    0 117955   7260    0 22:28 ?          00:00:00 /usr/libexec/xd\
38  g-d
39  osboxes      1570      1357    0  61200   5408    0 22:28 ?          00:00:00 /usr/libexec/xd\
40  g-p
41  osboxes      3167      1505    0  5331   1552    0 23:21 pts/0        00:00:00 ps --user 1000 \
42  -F
43  osboxes@osboxes:~$

```

List all processes of the current user as a tree:

```

1  osboxes@osboxes:~$ ps --user $(id -u) f
2      PID TTY          STAT       TIME COMMAND
3      1503 ?            S           0:00 sshd: osboxes@pts/0
4      1505 pts/0        Ss          0:00  \_ -bash
5      3169 pts/0        R+          0:00      \_ ps --user 1000 f
6      1357 ?            Ss          0:00 /lib/systemd/systemd --user
7      1358 ?            S           0:00  \_ (sd-pam)
8      1364 ?            Ss1         0:00  \_ /usr/bin/pipewire
9      1365 ?            Ss1         0:00  \_ /usr/bin/pipewire-media-session
10     1366 ?            Ss1         0:00  \_ /usr/bin/pulseaudio --daemonize=no --log-target=jo\
11  urn
12     1393 ?            Ss          0:00  \_ /usr/bin/dbus-daemon --session --address=systemd: \

```

```

13  --n
14      1397 ?      Ssl  0:00  \_ /usr/libexec/gvfsd
15      1405 ?      Sl   0:00  \_ /usr/libexec/gvfsd-fuse /run/user/1000/gvfs -f  \
16
17      1504 ?      SNsl  0:00  \_ /usr/libexec/tracker-miner-fs-3
18      1518 ?      Ssl  0:00  \_ /usr/libexec/gvfs-udisks2-volume-monitor
19      1524 ?      Ssl  0:00  \_ /usr/libexec/gvfs-goa-volume-monitor
20      1528 ?      Sl   0:00  \_ /usr/libexec/goa-daemon
21      1541 ?      Sl   0:00  \_ /usr/libexec/goa-identity-service
22      1543 ?      Ssl  0:00  \_ /usr/libexec/gvfs-afc-volume-monitor
23      1548 ?      Ssl  0:00  \_ /usr/libexec/gvfs-gphoto2-volume-monitor
24      1552 ?      Ssl  0:00  \_ /usr/libexec/gvfs-mtp-volume-monitor
25      1567 ?      Ssl  0:00  \_ /usr/libexec/xdg-document-portal
26      1570 ?      Ssl  0:00  \_ /usr/libexec/xdg-permission-store
27  osboxes@osboxes:~$

```

Get the parent PID of a process:

```

1  osboxes@osboxes:~$ ps -o ppid= -p 1505
2      1503
3  osboxes@osboxes:~$

```

Sort processes by memory consumption:

```

1  osboxes@osboxes:~$ ps --sort size
2      PID TTY          TIME CMD
3      3172 pts/0    00:00:00 ps
4      1505 pts/0    00:00:00 bash
5  osboxes@osboxes:~$
6
7  osboxes@osboxes:~$ ps --sort size -F
8  UID          PID    PPID  C   SZ   RSS PSR STIME TTY          TIME CMD
9  osboxes      3173    1505  0  5331  1600   0  23:22 pts/0    00:00:00 ps --sort size \
10 -F
11  osboxes      1505    1503  0  5011  4444   0  22:28 pts/0    00:00:00 -bash
12  osboxes@osboxes:~$

```

6. kill :

Sends a signal to a process, usually related to stopping the process.

- To kill a process gracefully: kill -15
- To kill a process forcefully: kill -9

Lets try out these commands:

To kill a process gracefully:

```
1 osboxes@osboxes:~$ bash
2 osboxes@osboxes:~$ ps
3      PID TTY          TIME CMD
4      1505 pts/0        00:00:00 bash
5      3205 pts/0        00:00:00 bash
6      3211 pts/0        00:00:00 ps
7 osboxes@osboxes:~$
8 osboxes@osboxes:~$ kill -15 3205
9 osboxes@osboxes:~$ ps
10     PID TTY          TIME CMD
11     1505 pts/0        00:00:00 bash
12     3205 pts/0        00:00:00 bash
13     3220 pts/0        00:00:00 ps
14 osboxes@osboxes:~$
```

To kill a process forcefully:

```
1 osboxes@osboxes:~$ kill -9 3205
2 Killed
3 osboxes@osboxes:~$ ps
4      PID TTY          TIME CMD
5      1505 pts/0        00:00:00 bash
6      3222 pts/0        00:00:00 ps
7 osboxes@osboxes:~$
```

Conclusion

This book has a brief introduction to the Linux commands. We've looked at a few common commands for

- Help commands
- System commands
- Hardware commands
- File commands
- Network commands
- Process commands

But does not provide a comprehensive guide to every available command. You've learnt the aspects of working with the shell. You've been introduced to some widely used terminology, and have gained an insight into key parts of a shell command.

With these key concepts you should be able to make more sense of any command line instructions.

Further Learning

Where do you go from here?. Now that you have the fundamentals of a shell commands, you can build your knowledge on top of that with the following recommended topics:

- Bash scripting
- Virtual machine orchestration
- Containerization
- Container orchestration.

I am glad to share that I am in the process of writing a book on each of the above mentioned topics.

Linux command cheat sheet

HELP Commands	
man	man provides short reference manuals
info	A newer form of online help is the info command
help	help is a built-in command in the bash shell
tldr	community driven man pages

SYSTEM Commands	
uname	details about the current machine and the operating system
uptime	how long the system has been running
hostname	Show or set the system's host name
reboot	Reboot the system
date	Sets or displays the system date
timedatectl	Control the system time and date
cal	Prints calendar information
w	Show who is logged on
whoami	Print the username

HARDWARE Commands	
lscpu	Displays information about the CPU architecture
lshw	Detailed information about hardware configurations
lsblk	Lists information about devices
df	Gives an overview of the filesystem disk space usage
du	estimate and summarize file and directory space usage
free	Display amount of free and used memory in the system

FILE Commands	
ls	List directory contents
pwd	Print name of current/working directory
touch	Change a file access and modification times (atime, mtime)
cp	Copy files and directories
mkdir	Creates a directory
mv	Move or rename files and directories
rm	Remove files or directories
chown	Change user and group ownership of files and directories
chmod	Change the access permissions of a file or directory
wc	Count lines, words, and bytes
tr	Translate characters: run replacements based on single characters and character sets
uniq	Output the unique lines from the given input or file
split	Split a file into pieces
head	Output the first part of files
tail	Display the last part of a file
more	Open a file for interactive reading, allowing scrolling and search
less	Open a file for interactive reading, allowing scrolling and search
cat	Print and concatenate files

NETWORK Commands	
ip	Show / manipulate routing, devices, policy routing and tunnels
ifconfig	Network Interface Configurator
netstat	Displays network-related information such as open connections, open socket ports, etc
whois	Command-line client for the WHOIS (RFC 3912) protocol
dig	DNS lookup utility
nslookup	Query name server(s) for various domain records
host	Lookup Domain Name Server
hostname	Show or set the system's host name

PROCESS Commands	
top	Display dynamic real-time information about running processes
ps	Information about running processes
kill	Sends a signal to a process, usually related to stopping the process