Linux

Linux Course

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وزارة الاتصالات
وتكنولوجيا المعلومات

MANNING

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DAY 1 CONTENTS

- Free/Open-Source Software and Licenses.
- Linux History.
- Linux Components.
- Installation
- Basic Commands
- Linux Documentation
- General Purpose commands

WHAT IS FOSS?

- Free/Open-Source Software (FOSS) where anyone is freely licensed to:
  - Use,
  - Copy,
  - Change the software in any way
- The source code is openly shared so that people are encouraged to voluntarily improve the design of the software.
- Most FOSS is covered under a public license. The most common public license is the GNU General Public License (GPL).

FOSS LICENSES

- An open-source license is a type of license for computer software and other products that allows the source code, blueprint or design to be used, modified and/or shared under defined terms and conditions.
- Examples:

  GNU GPL, QPL, Apache, MIT and BSD.

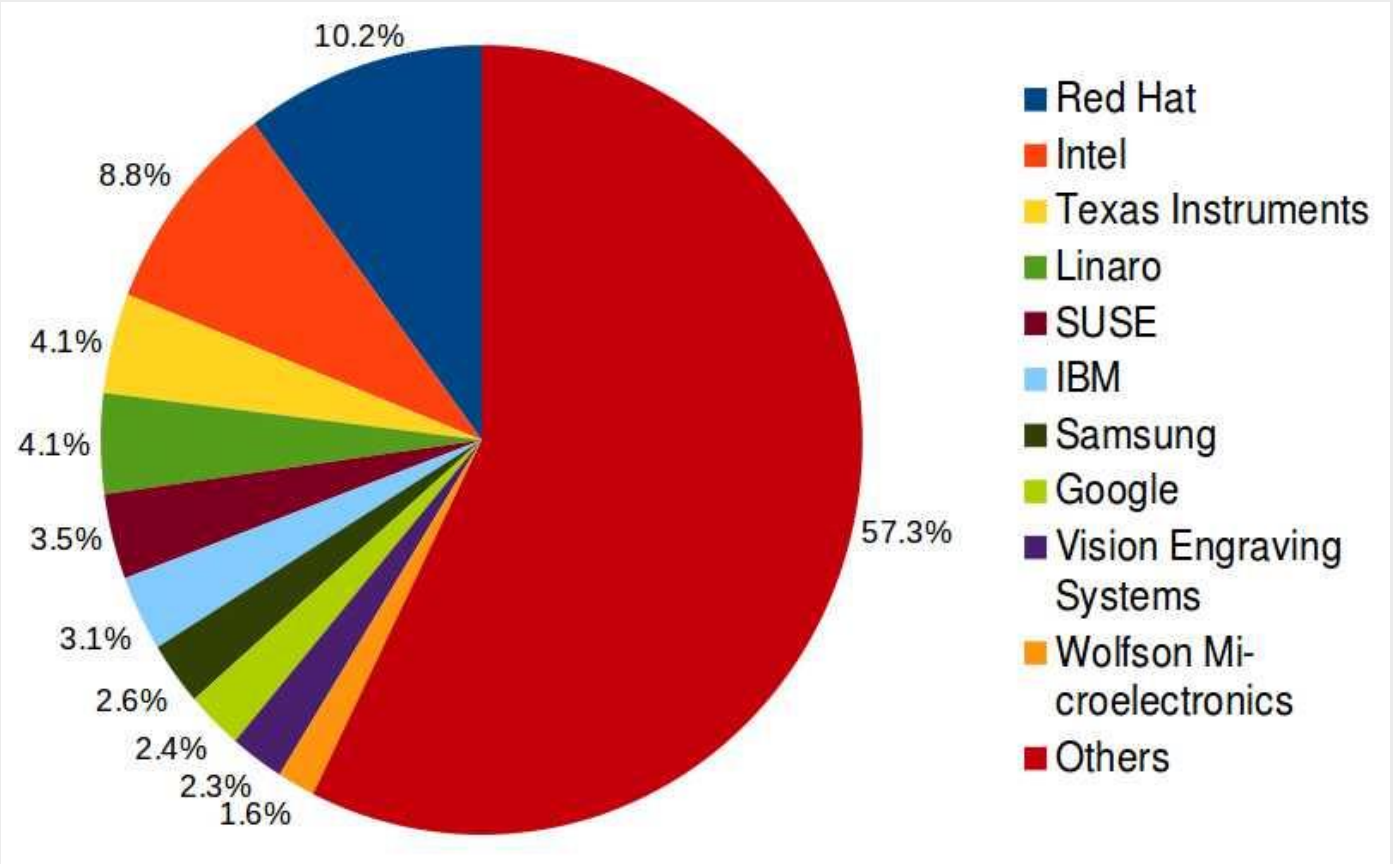
LINUX HISTORY

- UNIX began as a small research project at AT&T Bell Labs in 1969
- This version of UNIX(version 1) was written in the B language (which became the C programming language).
- In 1972, UNIX(version 2) was rewritten in the newly created C language.
- The BSD (Berkeley Software Distribution) operating system was created as a fork of UNIX in 1976.
- Linux was released on September 17, 1991

Linux Flavors

Linux Flavors

CONTRIBUTORS

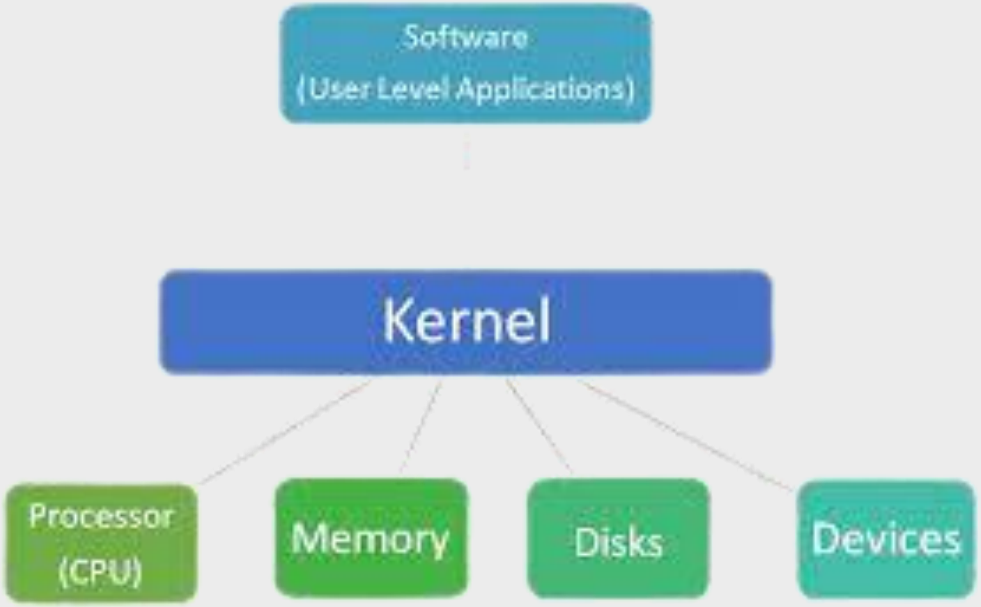


WHY LINUX?

- Linux ought to be adopted by home users, educational institutes and businesses.
  - High security
  - High stability
  - Ease of maintenance
  - Runs on any hardware
  - Free
  - Open-Source
  - Ease of use
  - Industry needed

LINUX COMPONENTS

- **Kernel**
  - Is the core of the operating system.
  - It is responsible for all major activities of this operating system.
  - Generally, has complete control over everything in the system.

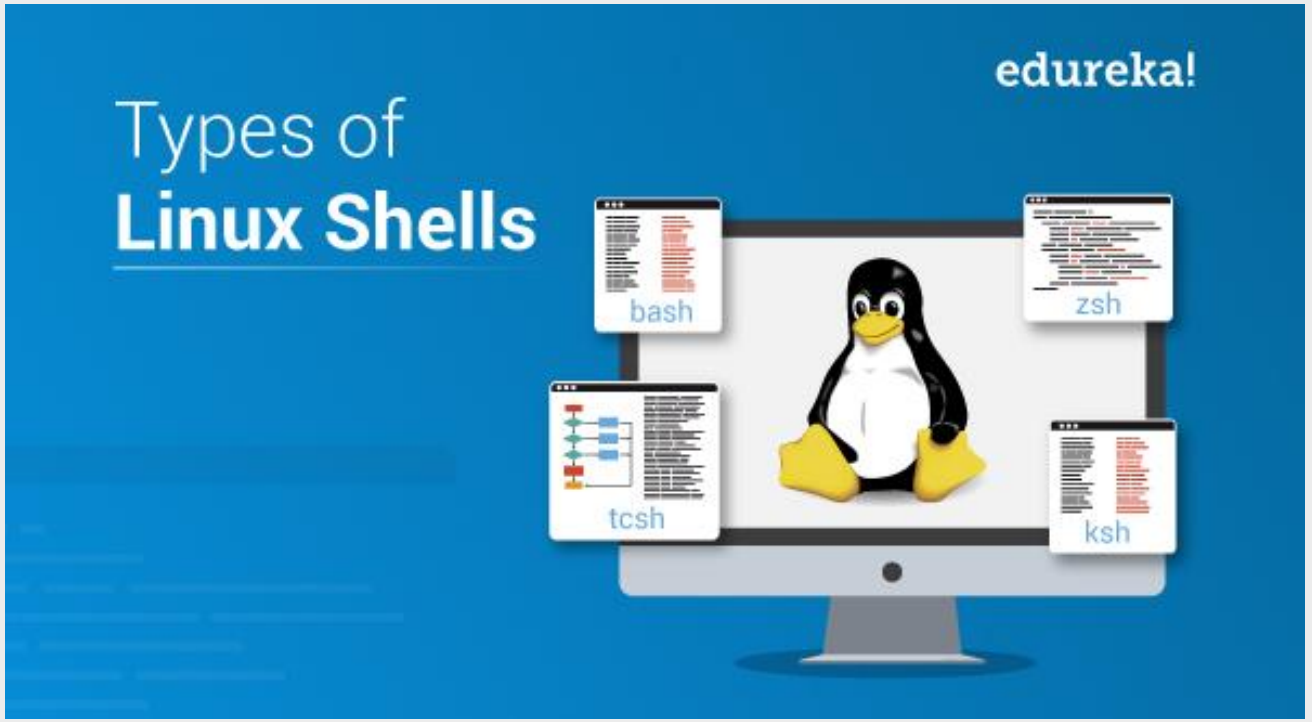


LINUX COMPONENTS

- **Shell**
  - User interface for running commands
  - “Bash” is the most used shell on Linux.
  - It translates commands entered by the user and converts them into a language that is understood by the Kernel.

Shell Types

- There are lot of shells as :
  - Bourn Shell (sh),
  - Korn Shell (ksh),
  - C Shell (csh) and
  - Bourn Again Shell (bash).



RUNNING COMMANDS

- Commands have the following syntax:
  - `command [options] [arguments]`
- Each item is separated by a space.
- Options modify the command's behavior.
- Arguments are files name or other information needed by the command.
- Separate commands with semicolon (;).

Shell command applications

- Getting information
- Navigating and working with files and directories
- Printing file and string contents
- Compression and archiving
- Performing network operations
- Monitoring performance and status
- Running batch jobs

Getting information

- Some common shell commands for getting information include:
  - whoami - username
  - id - user ID and group ID
  - uname - operating system name
  - ps - running processes
  - top - resource usage
  - df - mounted file systems
  - man - reference manual
  - date - today's date

Navigating & working with directories

- Very common shell commands for navigating and working with directories include:
  - ls - list files and directories
  - find - find files in directory tree
  - pwd - get present working directory
  - mkdir - make directory
  - cd - change directory
  - rmdir - remove directory

Printing file and string contents

- For printing file contents or strings, common commands include:
  - cat - print file contents
  - more - print file contents page-by-page
  - head - print first N lines of file
  - tail - print last N lines of file
  - echo - print string or variable value

Compression and archiving

- Shell commands related to file compression and archiving applications include:
  - tar - archive a set of files
  - zip - compress a set of files 'unzip - extract files from a compressed zip archive

Networking

- Networking applications include the following:
  - hostname - print hostname
  - ping - send packets to URL and print response
  - ifconfig - display or configure system network interfaces
  - curl - display contents of file at a URL
  - wget - download file from URL

Running Linux on a Windows machine

- Dual boot with a partition
- Install Linux on a virtual machine
- Use a Linux emulator
- Windows Subsystem for Linux (WSL)

INTERRUPTING EXECUTION

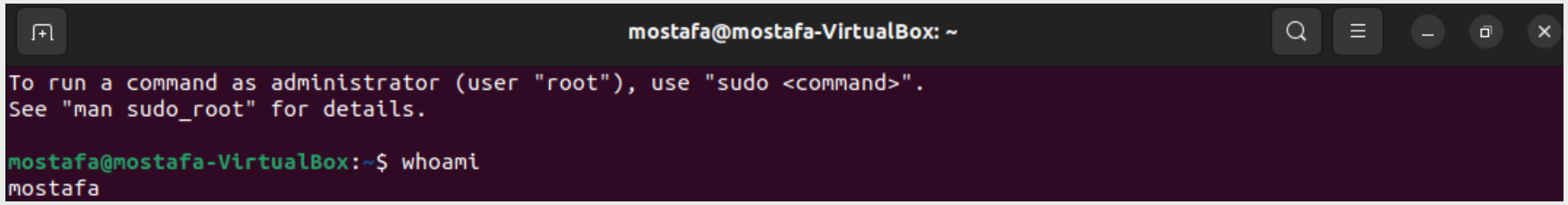
- To interrupt a command that's taking too long to execute, use **[Ctrl]-c**.
- Occasionally, you might enter a command without an argument that expects input to come from the keyboard. In this case, use **[Ctrl]-d** to terminate the command.

General purpose commands

- Display the name of the current user

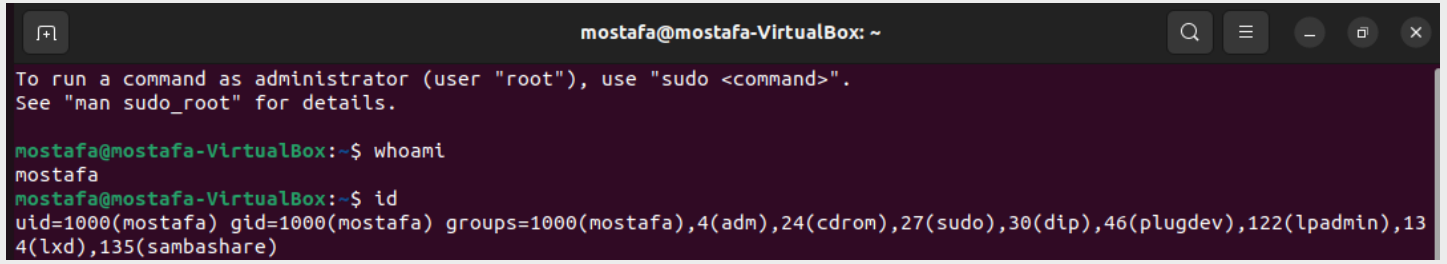
Whoami

It will display the username as Mostafa.



Id

It will display the uid(user id) and gid(group id) for the user Mostafa.



General purpose commands

- Display date and time

Date

It has several options which help you get date in your favourite format.

```
mostafa@mostafa-VirtualBox:~$ date
17 2022 ,أك EET 02:12:17 ص
```

Date "+%D"

Displays abbreviated month name (Jan to Dec)

```
mostafa@mostafa-VirtualBox:~$ date "+%h"
أك
```


Date command

- List of Format specifiers used with date command:

%FORMAT String	Description
%%	a literal %
%a	locale's abbreviated weekday name (e.g., Sun)
%A	locale's full weekday name (e.g., Sunday)
%b	locale's abbreviated month name (e.g., Jan)
%B	locale's full month name (e.g., January)
%c	locale's date and time (e.g., Thu Mar 3 23:05:25 2005)
%C	century; like %Y, except omit last two digits (e.g., 21)
%d	day of month (e.g, 01)
%D	date; same as %m/%d/%y
%e	day of month, space padded; same as %_d
%F	full date; same as %Y-%m-%d
%g	last two digits of year of ISO week number (see %G)
%G	year of ISO week number (see %V); normally useful only w
%h	same as %b
%H	hour (00..23)
%I	hour (01..12)
%j	day of year (001..366)
%k	hour (0..23)
%l	hour (1..12)
%m	month (01..12)

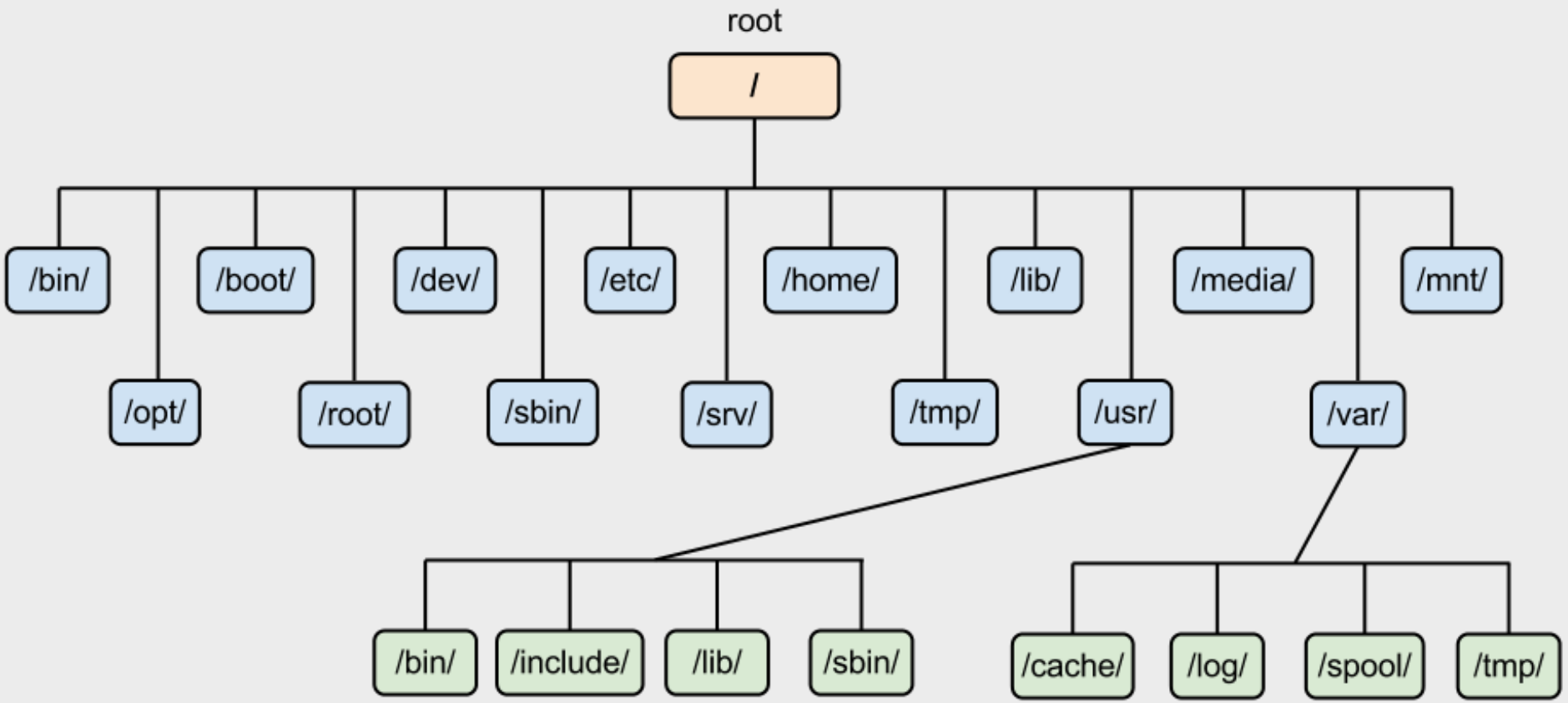
DIRECTORIES

- Think of
  - File system as a building
  - Directory is a room
  - File is a desk
- The current working directory is the room you are.
- To find out where you are at any time

pwd

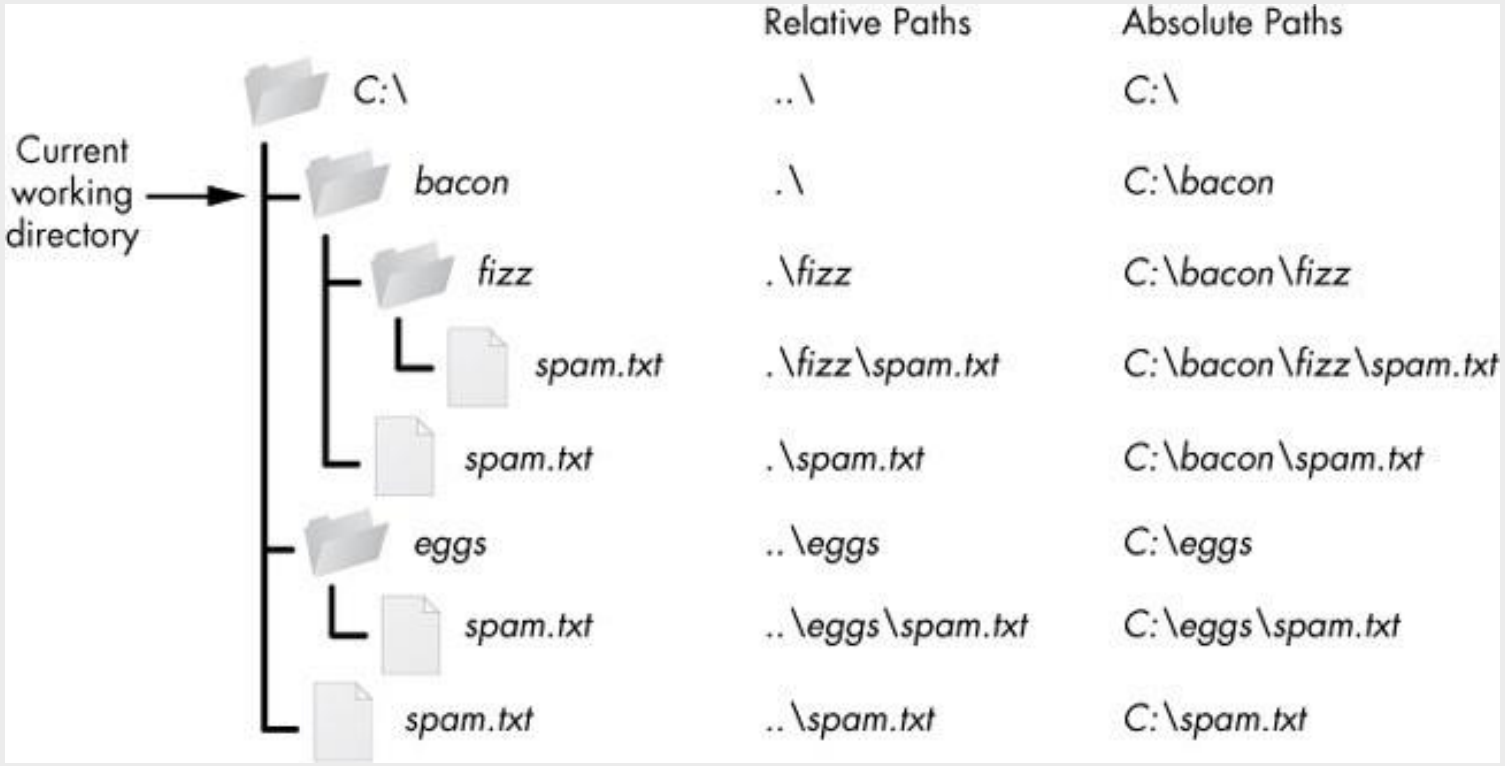
```
/home/guest
```


DIRECTORIES TREE



DIRECTORIES

- Pathnames
  - Absolute pathname
  - Relative pathname



CHANGING DIRECTORIES

- To move from directory to directory on the system
- `cd /home/user1/work cd ..`
- `cd ~`
- `cd -`

LISTING DIRECTORY CONTENTS

ls

List the files and directories in the current directory.

```
mostafa@mostafa-VirtualBox:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  snap  Templates  Videos
```

ls bin/

The following command will list all the files in the /bin directory.

```
mostafa@mostafa-VirtualBox:~$ ls /bin
'['                          gtk4-launch                  pw-mon
 aa-enabled                  gtk4-query-settings          pw-play
 aa-exec                     gtk4-update-icon-cache       pw-profiler
 aa-features-abi             gtk-builder-tool             pw-record
 aconnect                    gtk-encode-symbolic-svg      pw-reserve
 acpi_listen                 gtk-launch                   pw-top
 add-apt-repository          gtk-query-settings           pw-v4l2
 addpart                     gtk-update-icon-cache        py3clean
 airscan-discover            gunzip                       py3compile
 alsabat                     gzexe                        py3versions
 alsaloop                    gzip                         pydoc3
 alsamixer                   h2ph                         pydoc3.10
 alsatplg                    h2xs                         pygettext3
 alsaucm                     hardlink                     pygettext3.10
 amidi                       hbpldecode                   python3
 amixer                      hciattach                    python3.10
 apg                         hciconfig                    python3-futurize
 apgbfm                      hcitool                      python3-pasteurize
 aplay                       hd                           pzstd
 aplaymidi                   head                         qpdldecode
 apport-bug                  HEAD                         quirks-handler
 apport-cli                  helpztags                    rbash
 apport-collect              hex2hcd                      rcp
 apport-unpack               hexdump                      rctest
 appres                      hipercdecode                 rdiffdir
 appstreamcli                host                         rdma
 apropos                     hostid                       readlink
 apt                         hostname                     realpath
 apt-add-repository          hostnamectl                  red
```


LISTING DIRECTORY CONTENTS

ls bin/b*

List all files starting with b in the /bin directory.

```
mostafa@mostafa-VirtualBox:~$ ls /bin/b*
/bin/b2sum      /bin/bashbug        /bin/bluetooth-sendto  /bin/brltty-ttb  /bin/busctl   /bin/bzexe
/bin/baobab     /bin/bc             /bin/bmtoa             /bin/broadwayd   /bin/busybox  /bin/bzfgrep
/bin/base32     /bin/bdftopcf       /bin/boltctl           /bin/browse      /bin/bwrap    /bin/bzgrep
/bin/base64     /bin/bdftruncate    /bin/bootctl           /bin/btattach    /bin/bzcat    /bin/bzip2
/bin/basename   /bin/bitmap         /bin/brltty            /bin/btmgmt      /bin/bzcmp    /bin/bzip2recover
/bin/basenc     /bin/bluemoon       /bin/brltty-ctb        /bin/btmon       /bin/bzdiff   /bin/bzless
/bin/bash       /bin/bluetoothctl   /bin/brltty-trtxt      /bin/bunzip2     /bin/bzegrep  /bin/bzmore
```

ls bin/*r

List all files ending with r in the /bin directory.

```
mostafa@mostafa-VirtualBox:~$ ls /bin/*r
/bin/airscan-discover          /bin/foo2slx-wrapper          /bin/logger                /bin/remmina-file-wrapper
/bin/alsamixer                 /bin/foo2xqx-wrapper          /bin/lowriter              /bin/rmdir
/bin/amixer                    /bin/foo2zjs-wrapper          /bin/lpr                   /bin/sane-find-scanner
/bin/axfer                     /bin/fuser                    /bin/lsattr                /bin/select-editor
/bin/bzip2recover              /bin/fwupdmgr                 /bin/lwp-mirror            /bin/sensible-browser
/bin/cautious-launcher         /bin/gcr-viewer               /bin/m2300w-wrapper        /bin/sensible-editor
/bin/chattr                    /bin/gdk-pixbuf-thumbnailer   /bin/mako-render           /bin/sensible-pager
/bin/clear                     /bin/gdmflexiserver           /bin/mkdir                 /bin/spa-monitor
/bin/colormgr                  /bin/gnome-calculator         /bin/mkfontdir             /bin/speech-dispatcher
/bin/dbus-monitor              /bin/gnome-calendar           /bin/monitor-sensor        /bin/sqfstar
/bin/deb-systemd-helper        /bin/gnome-control-center     /bin/mtr                   /bin/system-config-printer
/bin/dir                       /bin/gnome-disk-image-mounter /bin/networkd-dispatcher   /bin/tar
/bin/dirmngr                   /bin/gnome-font-viewer        /bin/nm-connection-editor  /bin/totem-video-thumbnailer
/bin/dpkg-maintscript-helper   /bin/gnome-language-selector  /bin/nsenter              /bin/tr
/bin/dpkg-trigger              /bin/gnome-system-monitor     /bin/ntfscluster           /bin/ubuntu-core-launcher
/bin/editor                    /bin/gnome-terminal.wrapper   /bin/ntfsrecover          /bin/ucfr
/bin/efibootmgr                /bin/gnome-text-editor        /bin/nvidia-detector       /bin/unity-scope-loader
/bin/evince-previewer          /bin/gpgtar                   /bin/on_ac_power           /bin/update-manager
/bin/evince-thumbnailer        /bin/gpg-wks-server           /bin/orca-dm-wrapper       /bin/update-notifier
/bin/expr                      /bin/gpu-manager              /bin/os-prober             /bin/upower
/bin/factor                    /bin/grub-mknetdir            /bin/pager                 /bin/vdir
/bin/file-roller               /bin/hp-config_usb_printer    /bin/pasuspender           /bin/xdg-screensaver
/bin/foo2ddst-wrapper          /bin/hp-doctor                /bin/podchecker            /bin/xdg-user-dir
/bin/foo2hbpl2-wrapper         /bin/ijs_pxljr                /bin/pr                    /bin/Xephyr
/bin/foo2hiperc-wrapper        /bin/infobrowser              /bin/ps2pdfwr              /bin/xrandr
/bin/foo2hp2600-wrapper        /bin/install-printerdriver    /bin/ptar                  /bin/x-session-manager
/bin/foo2lava-wrapper          /bin/isdv4-serial-debugger    /bin/pw-profiler           /bin/xsetpointer
/bin/foo2oak-wrapper           /bin/ispell-wrapper           /bin/quirks-handler        /bin/x-terminal-emulator
/bin/foo2qpdl-wrapper          /bin/linux-boot-prober        /bin/rdiffdir
```


Get information about the operating system

uname

By default, the command prints the kernel name.

```
mostafa@mostafa-VirtualBox:~$ uname
Linux
```

uname –a

Using the -a option prints all the system information in the following order:

- Kernel name,
- network node hostname,
- kernel release date,
- kernel version,
- machine hardware name,
- hardware platform, operating system.

```
mostafa@mostafa-VirtualBox:~$ uname -a
Linux mostafa-VirtualBox 5.15.0-50-generic #56-Ubuntu SMP Tue Sep 20 13:23:26 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
```


Get information about active processes

ps

Ps lists the processes that are currently running and their PIDs (process ids).

```
mostafa@mostafa-VirtualBox:~$ ps
    PID TTY          TIME CMD
   1919 pts/0    00:00:00 bash
   3269 pts/0    00:00:00 ps
```

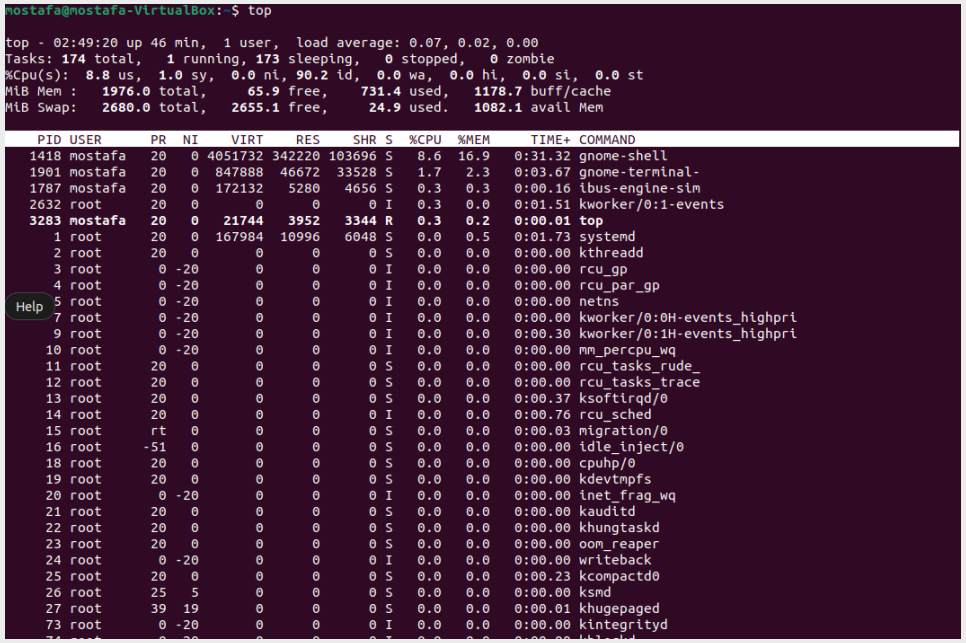
ps -e

The -e option displays all the processes running on the system. The includes processes owned by other users also.

```
mostafa@mostafa-VirtualBox:~$ ps -e
    PID TTY          TIME CMD
      1 ?        00:00:01 systemd
      2 ?        00:00:00 kthreadd
      3 ?        00:00:00 rcu_gp
      4 ?        00:00:00 rcu_par_gp
      5 ?        00:00:00 netns
      7 ?        00:00:00 kworker/0:0H-events_highpri
      9 ?        00:00:00 kworker/0:1H-events_highpri
     10 ?        00:00:00 mm_percpu_wq
     11 ?        00:00:00 rcu_tasks_rude_
     12 ?        00:00:00 rcu_tasks_trace
     13 ?        00:00:00 ksoftirqd/0
     14 ?        00:00:00 rcu_sched
     15 ?        00:00:00 migration/0
     16 ?        00:00:00 idle_inject/0
     18 ?        00:00:00 cpuhp/0
     19 ?        00:00:00 kdevtmpfs
     20 ?        00:00:00 inet_frag_wq
     21 ?        00:00:00 kauditd
     22 ?        00:00:00 khungtaskd
     23 ?        00:00:00 oom_reaper
     24 ?        00:00:00 writeback
     25 ?        00:00:00 kcompactd0
     26 ?        00:00:00 ksmd
```


Get information on the running processes and system resources

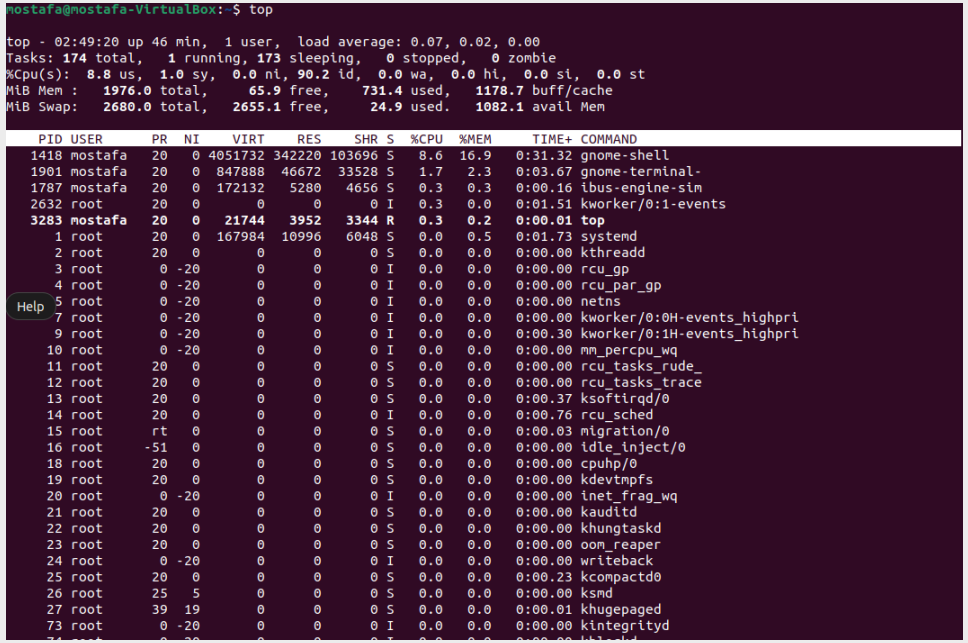
- **top**
  - Command provides a dynamic real-time view of the running system.
  - It shows the summary information of the system and the list of processes or threads which are currently managed by the Kernel.
  - It gives information related to CPU and memory usage per process.



The output keeps refreshing until you press 'q' or Ctrl+c

Get information on the running processes and system resources

- **top -n 10**
- If you want to exit automatically after a specified number of repetitions, use the -n option as in the following example:
  - M - sort by memory usage
  - P - sort by CPU usage
  - N - sort by process ID
  - T - sort by the running time



Display Messages

echo

echo command displays the given text on the screen.

echo "Welcome to the linux lab“

```
mostafa@mostafa-VirtualBox:~$ echo 'Welcome'
Welcome
```

- \n
  Represents a newline character
- \t
  A tab character

Use the -e option of the echo command when working with special characters.

```
mostafa@mostafa-VirtualBox:~$ echo -e 'Hello\n world'
Hello
 world
```

```
mostafa@mostafa-VirtualBox:~$ echo -e 'Hello\t world'
Hello    world
```


Download a file from the internet.

wget

- wget command helps you to donwload a file at a given url.
- This command download the file anaconda from the given url.

```
mostafa@mostafa-VirtualBox:~$ wget https://repo.anaconda.com/archive/Anaconda3-2022.05-MacOSX-arm64.sh
--2022-10-17 03:06:36--  https://repo.anaconda.com/archive/Anaconda3-2022.05-MacOSX-arm64.sh
Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.130.3, 104.16.131.3, 2606:4700::6810:8203, ...
Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.130.3|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 319634866 (305M) [application/x-sh]
Saving to: ‘Anaconda3-2022.05-MacOSX-arm64.sh’

Anaconda3-2022.05-MacOSX-arm6   1%[                                                  ]   4.08M  1.97MB/s
```


View the Reference Manual

man

- man command displays the user manual of the command given as argument.
- For example, to see the manual page of wget' command, use:

```
WGET(1)                                    GNU Wget                                    WGET(1)

NAME
       Wget - The non-interactive network downloader.

SYNOPSIS
       wget [option]... [URL]...

DESCRIPTION
       GNU Wget is a free utility for non-interactive download of files from the Web.  It supports HTTP, HTTPS, and
       FTP protocols, as well as retrieval through HTTP proxies.

       Wget is non-interactive, meaning that it can work in the background, while the user is not logged on.  This
       allows you to start a retrieval and disconnect from the system, letting Wget finish the work.  By contrast,
       most of the Web browsers require constant user's presence, which can be a great hindrance when transferring
       a lot of data.

       Wget can follow links in HTML, XHTML, and CSS pages, to create local versions of remote web sites, fully
       recreating the directory structure of the original site.  This is sometimes referred to as "recursive
       downloading."  While doing that, Wget respects the Robot Exclusion Standard (/robots.txt).  Wget can be
       instructed to convert the links in downloaded files to point at the local files, for offline viewing.

       Wget has been designed for robustness over slow or unstable network connections; if a download fails due to
       a network problem, it will keep retrying until the whole file has been retrieved.  If the server supports
       regetting, it will instruct the server to continue the download from where it left off.

OPTIONS
   Option Syntax
       Since Wget uses GNU getopt to process command-line arguments, every option has a long form along with the
       short one.  Long options are more convenient to remember, but take time to type.  You may freely mix
       different option styles, or specify options after the command-line arguments.  Thus you may write:

               wget -r --tries=10 http://fly.srk.fer.hr/ -o log

       The space between the option accepting an argument and the argument may be omitted.  Instead of -o log you
       can write -olog.

       You may put several options that do not require arguments together, like:
```



Thank
you