Linux stuff

Why use linux?

The main reasons to use linux are:

- Most linux distros are free
- You have control over everything on your system
- Very low memory usage (RAM)
- Takes up very little space on disk drives/SSD
- Has many security advantages
- Allows you to do anything you want including hacking into anything u want

What is a Kernel?

The kernels main function is to connect the systems hardware to applications such as software etc. Kernel also changes the user inputs to machine code so the computer can do the function the user requested.

What are distros?

A linux distribution (distro) is like an OS such as windows. These come with a kernel, package manager, window manager, desktop enviorment, Libraries and Packages such as Python, GNU GCC compiler and other tools.

Which distro to use?

This comes down to personal preference as the main differences are commands to install packages, size, security and memory (RAM) usage.

The most common distros are:

- Ubuntu
- Arch Linux
- Debian
- Void linux
- Gentoo
- Fedora (debian based)
- Mint (ubuntu based)
- PopOS (Ubuntu based)
- Manjaro (Arch Based)

Once you picked your linux distro you will need to usually install a few things to allow your computer to connect to the internet (network manager), a way to open windows (window manager) and a way to show a desktop (Desktop enviorment).

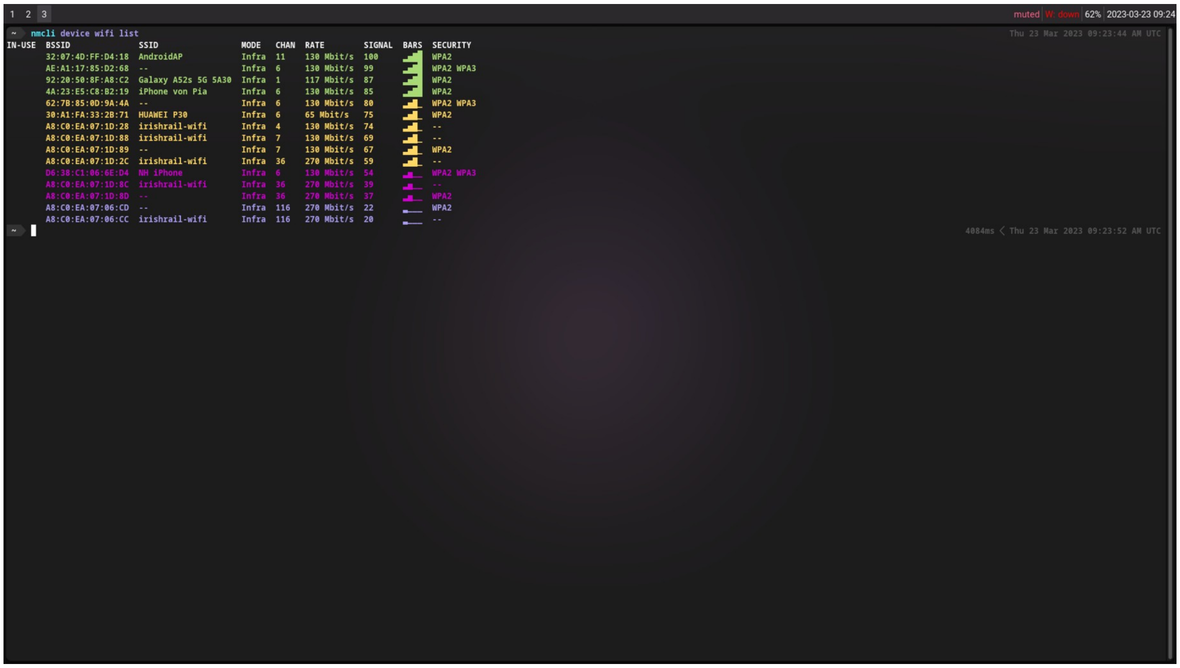
Network Manager

First we need to install a network manager to allow us to connect to the internet and install packages. Most distros will have network-manager pre installed and all you have to do is connect to the internet using the terminal. (Some will have a windows style way of doing it using nmapplet but distros such as Arch linux will require you to do it manually) If your distro doesn't use nmapplet (an app to connect to the internet with a GUI like on windows) you will need to manually connect to the internet using the terminal. Below are the steps to do it using network-manager package. Ethernet will auto connect without any setup usually.

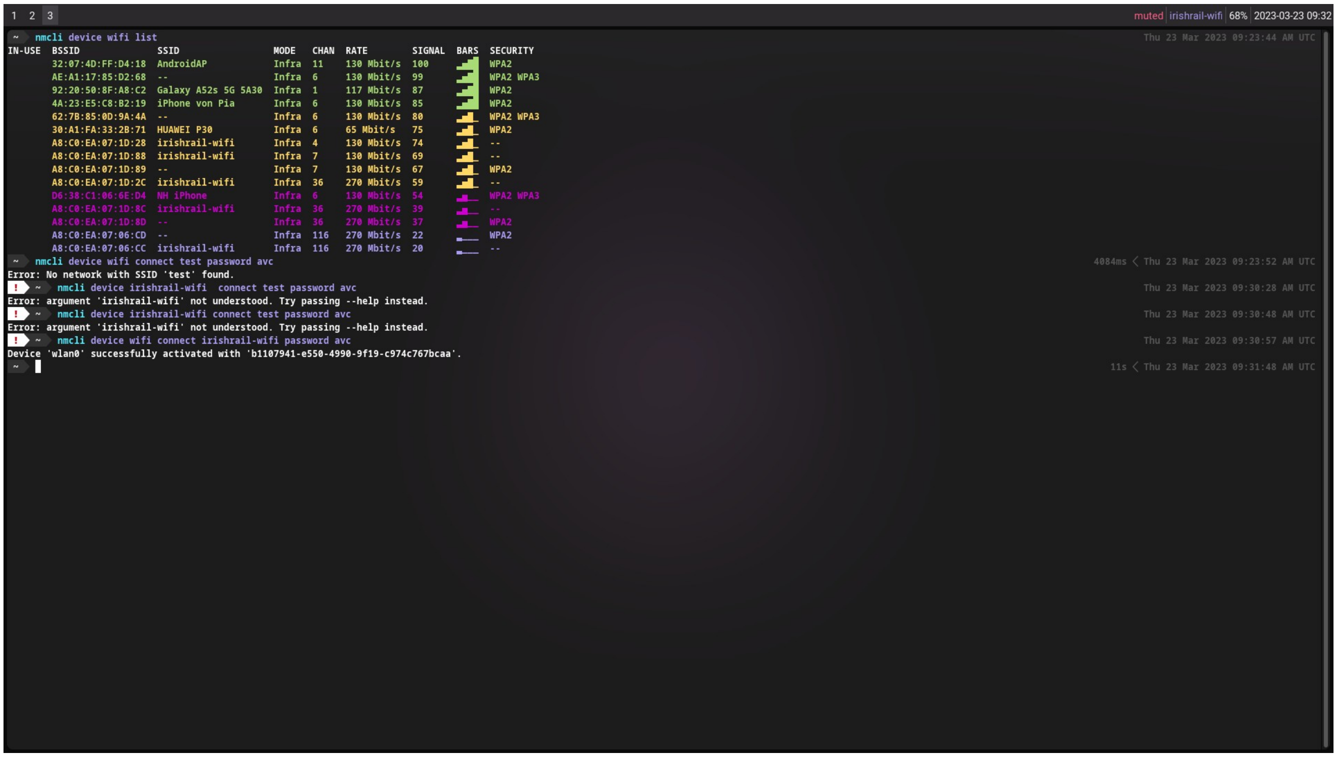
First we use `systemctl status NetworkManager` to check if the network manager is running after installing.

For WIFI we use `ncmli device wifi list` to show all the WIFI networks your laptop can connect to. To connect to one we use:
`nmcli device wifi connect YOUR_WIFI(SSID) password YOUR_PASSWORD`

Below is an example of what it would look like and it will tell you if you connected succesfully or not.



```
~  nmcli device wifi list                                                    Thu 23 Mar 2023 09:23:44 AM UTC
IN-USE  BSSID              SSID                MODE   CHAN  RATE        SIGNAL  BARS  SECURITY
        32:07:4D:FF:D4:18  AndroidAP           Infra  11    130 Mbit/s  100     ▂▄▆█  WPA2
        AE:A1:17:85:D2:68  --                  Infra  6     130 Mbit/s  99      ▂▄▆█  WPA2 WPA3
        92:20:50:8F:A8:C2  Galaxy A52s 5G 5A30 Infra  1     117 Mbit/s  87      ▂▄▆█  WPA2
        4A:23:E5:C8:B2:19  iPhone von Pia      Infra  6     130 Mbit/s  85      ▂▄▆█  WPA2
        62:7B:85:0D:9A:4A  --                  Infra  6     130 Mbit/s  80      ▂▄▆_  WPA2 WPA3
        30:A1:FA:33:2B:71  HUAWEI P30          Infra  6     65 Mbit/s   75      ▂▄▆_  WPA2
        A8:C0:EA:07:1D:28  irishrail-wifi      Infra  4     130 Mbit/s  74      ▂▄▆_  --
        A8:C0:EA:07:1D:88  irishrail-wifi      Infra  7     130 Mbit/s  69      ▂▄▆_  --
        A8:C0:EA:07:1D:89  --                  Infra  7     130 Mbit/s  67      ▂▄▆_  WPA2
        A8:C0:EA:07:1D:2C  irishrail-wifi      Infra  36    270 Mbit/s  59      ▂▄▆_  --
        D6:38:C1:06:6E:D4  NH iPhone           Infra  6     130 Mbit/s  54      ▂▄__  WPA2 WPA3
        A8:C0:EA:07:1D:8C  irishrail-wifi      Infra  36    270 Mbit/s  39      ▂▄__  --
        A8:C0:EA:07:1D:8D  --                  Infra  36    270 Mbit/s  37      ▂▄__  WPA2
        A8:C0:EA:07:06:CD  --                  Infra  116   270 Mbit/s  22      ▂___  WPA2
        A8:C0:EA:07:06:CC  irishrail-wifi      Infra  116   270 Mbit/s  20      ▂___  --
~                                                                 4084ms < Thu 23 Mar 2023 09:23:52 AM UTC
```



```
~ nmcli device wifi list                                                                          Thu 23 Mar 2023 09:23:44 AM UTC
IN-USE  BSSID              SSID                MODE   CHAN  RATE        SIGNAL  BARS  SECURITY
        32:07:4D:FF:D4:18  AndroidAP           Infra  11    130 Mbit/s  100     ▂▄▆█  WPA2
        AE:A1:17:85:D2:68  --                  Infra  6     130 Mbit/s  99      ▂▄▆█  WPA2 WPA3
        92:20:50:8F:A8:C2  Galaxy A52s 5G 5A30 Infra  1     117 Mbit/s  87      ▂▄▆█  WPA2
        4A:23:E5:C8:B2:19  iPhone von Pia      Infra  6     130 Mbit/s  85      ▂▄▆█  WPA2
        62:7B:85:0D:9A:4A  --                  Infra  6     130 Mbit/s  80      ▂▄▆_  WPA2 WPA3
        30:A1:FA:33:2B:71  HUAWEI P30          Infra  6     65 Mbit/s   75      ▂▄▆_  WPA2
        A8:C0:EA:07:1D:28  irishrail-wifi      Infra  4     130 Mbit/s  74      ▂▄▆_  --
        A8:C0:EA:07:1D:88  irishrail-wifi      Infra  7     130 Mbit/s  69      ▂▄▆_  --
        A8:C0:EA:07:1D:89  --                  Infra  7     130 Mbit/s  67      ▂▄▆_  WPA2
        A8:C0:EA:07:1D:2C  irishrail-wifi      Infra  36    270 Mbit/s  59      ▂▄▆_  --
        D6:38:C1:06:6E:D4  NH iPhone           Infra  6     130 Mbit/s  54      ▂▄__  WPA2 WPA3
        A8:C0:EA:07:1D:8C  irishrail-wifi      Infra  36    270 Mbit/s  39      ▂▄__  --
        A8:C0:EA:07:1D:8D  --                  Infra  36    270 Mbit/s  37      ▂▄__  WPA2
        A8:C0:EA:07:06:CD  --                  Infra  116   270 Mbit/s  22      ▂___  WPA2
        A8:C0:EA:07:06:CC  irishrail-wifi      Infra  116   270 Mbit/s  20      ▂___  --
~ nmcli device wifi connect test password avc                                   4084ms < Thu 23 Mar 2023 09:23:52 AM UTC
Error: No network with SSID 'test' found.
! ~ nmcli device irishrail-wifi  connect test password avc                                Thu 23 Mar 2023 09:30:28 AM UTC
Error: argument 'irishrail-wifi' not understood. Try passing --help instead.
! ~ nmcli device irishrail-wifi connect test password avc                                 Thu 23 Mar 2023 09:30:48 AM UTC
Error: argument 'irishrail-wifi' not understood. Try passing --help instead.
! ~ nmcli device wifi connect irishrail-wifi password avc                                 Thu 23 Mar 2023 09:30:57 AM UTC
Device 'wlan0' successfully activated with 'b1107941-e550-4990-9f19-c974c767bcaa'.
~                                                                                   11s < Thu 23 Mar 2023 09:31:48 AM UTC
```

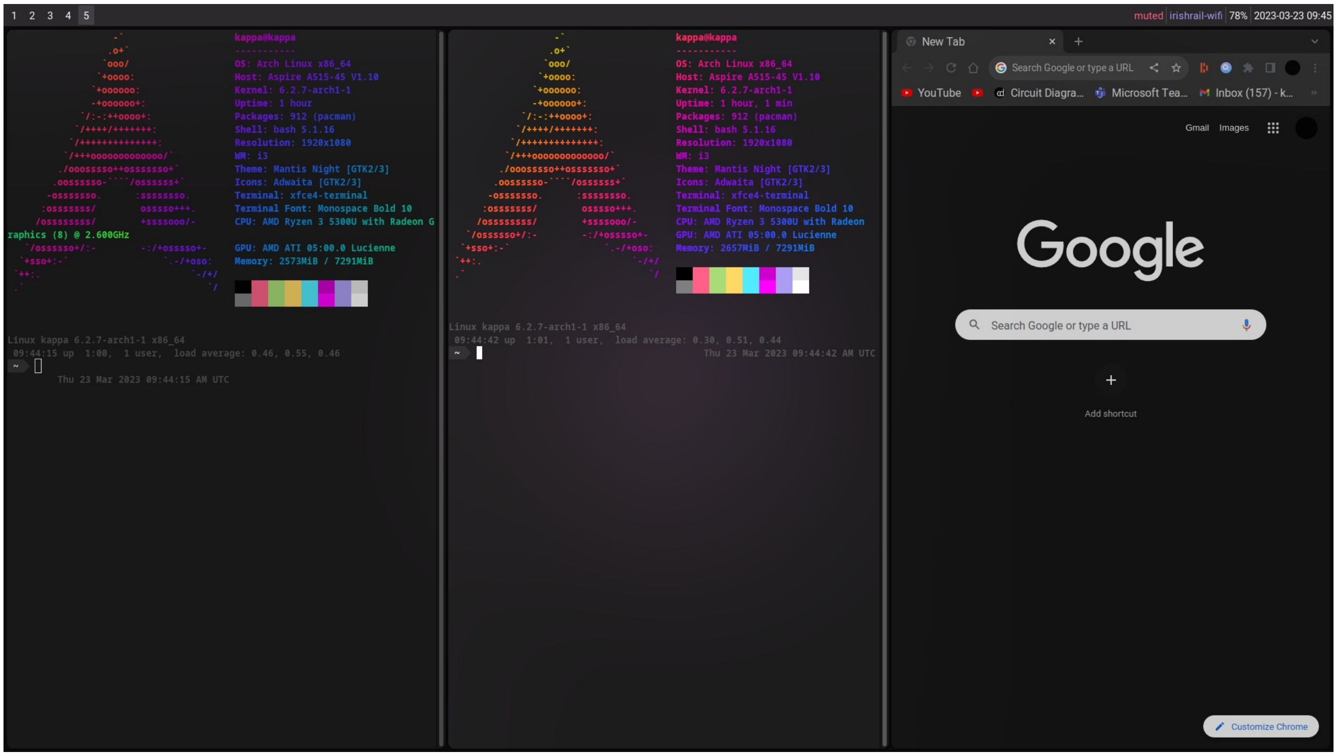
Window Manager

A window manager (WM) is used to show windows and change the appearance of them such as themes, buttons and behaviour of the window. These usually come paired with a desktop enviorment(DE) but some can be sperate usually ones that are used for auto tiling.

Popular window managers are:

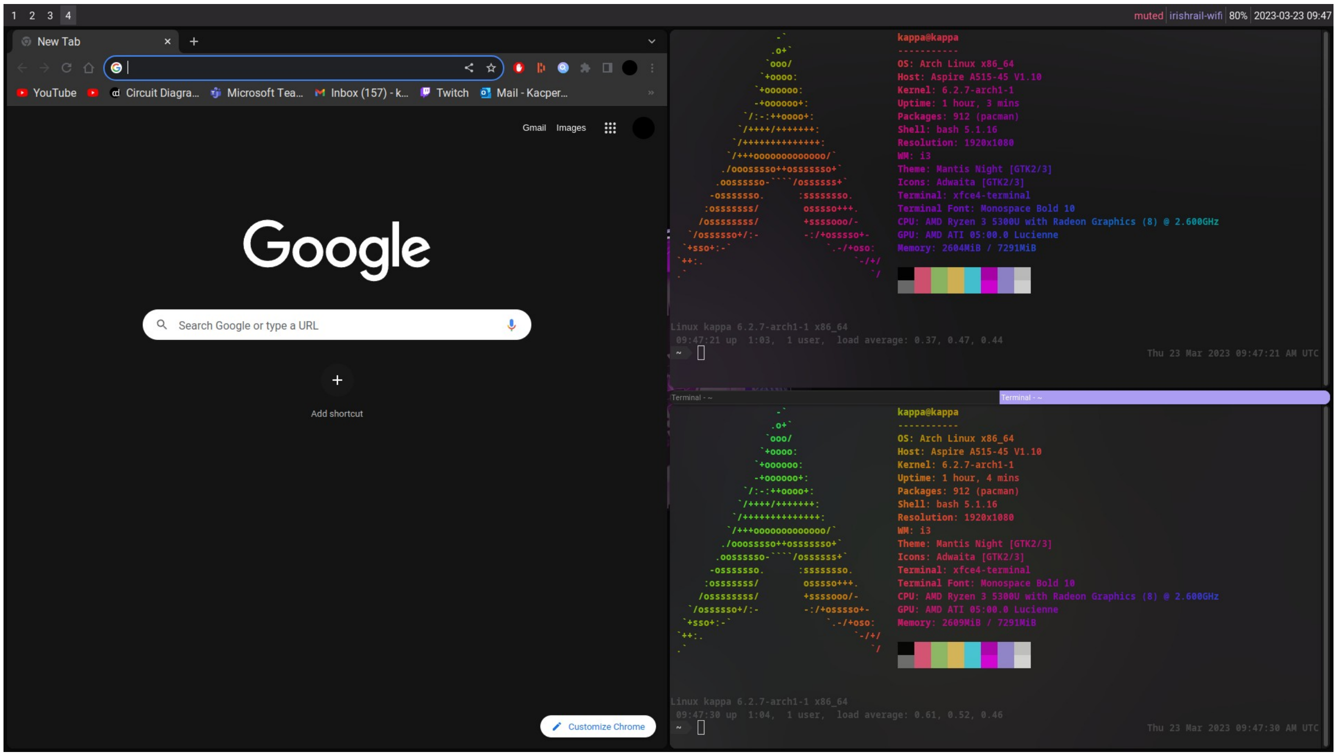
- i3WM/i3 Gaps
- XFCE
- DWM
- Awesome
- Xnomad
- bspwm
- sway
- Qtile
- Gnome

Below is an example of i3-gaps WM which has almost every tiling feature possible.



```
                   -`                 kappa@kappa
                  .o+`                -----------
                 `ooo/                OS: Arch Linux x86_64
                `+oooo:               Host: Aspire A515-45 V1.10
               `+oooooo:              Kernel: 6.2.7-arch1-1
               -+oooooo+:             Uptime: 1 hour
             `/:-:++oooo+:            Packages: 912 (pacman)
            `/++++/+++++++:           Shell: bash 5.1.16
           `/++++++++++++++:          Resolution: 1920x1080
          `/+++ooooooooooooo/`        WM: i3
         ./ooosssso++osssssso+`       Theme: Mantis Night [GTK2/3]
        .oossssso-````/ossssss+`      Icons: Adwaita [GTK2/3]
       -osssssso.      :ssssssso.     Terminal: xfce4-terminal
      :osssssss/        osssso+++.    Terminal Font: Monospace Bold 10
     /ossssssss/        +ssssooo/-    CPU: AMD Ryzen 3 5300U with Radeon G
raphics (8) @ 2.600GHz
   `/ossssso+/:-        -:/+osssso+-  GPU: AMD ATI 05:00.0 Lucienne
  `+sso+:-`                 `.-/+oso: Memory: 2573MiB / 7291MiB
 `++:.                           `-/+/
 .`                                 `/


Linux kappa 6.2.7-arch1-1 x86_64
 09:44:15 up  1:00,  1 user,  load average: 0.46, 0.55, 0.46
 ~ 
        Thu 23 Mar 2023 09:44:15 AM UTC
```

```
                   -`                 kappa@kappa
                  .o+`                -----------
                 `ooo/                OS: Arch Linux x86_64
                `+oooo:               Host: Aspire A515-45 V1.10
               `+oooooo:              Kernel: 6.2.7-arch1-1
               -+oooooo+:             Uptime: 1 hour, 1 min
             `/:-:++oooo+:            Packages: 912 (pacman)
            `/++++/+++++++:           Shell: bash 5.1.16
           `/++++++++++++++:          Resolution: 1920x1080
          `/+++ooooooooooooo/`        WM: i3
         ./ooosssso++osssssso+`       Theme: Mantis Night [GTK2/3]
        .oossssso-````/ossssss+`      Icons: Adwaita [GTK2/3]
       -osssssso.      :ssssssso.     Terminal: xfce4-terminal
      :osssssss/        osssso+++.    Terminal Font: Monospace Bold 10
     /ossssssss/        +ssssooo/-    CPU: AMD Ryzen 3 5300U with Radeon
   `/ossssso+/:-        -:/+osssso+-  GPU: AMD ATI 05:00.0 Lucienne
  `+sso+:-`                 `.-/+oso: Memory: 2657MiB / 7291MiB
 `++:.                           `-/+/
 .`                                 `/


Linux kappa 6.2.7-arch1-1 x86_64
 09:44:42 up  1:01,  1 user,  load average: 0.30, 0.51, 0.44
 ~                                          Thu 23 Mar 2023 09:44:42 AM UTC
```



```
                   -`                 kappa@kappa
                  .o+`                -----------
                 `ooo/                OS: Arch Linux x86_64
                `+oooo:               Host: Aspire A515-45 V1.10
               `+oooooo:              Kernel: 6.2.7-arch1-1
               -+oooooo+:             Uptime: 1 hour, 3 mins
             `/:-:++oooo+:            Packages: 912 (pacman)
            `/++++/+++++++:           Shell: bash 5.1.16
           `/++++++++++++++:          Resolution: 1920x1080
          `/+++ooooooooooooo/`        WM: i3
         ./ooosssso++osssssso+`       Theme: Mantis Night [GTK2/3]
        .oossssso-````/ossssss+`      Icons: Adwaita [GTK2/3]
       -osssssso.      :ssssssso.     Terminal: xfce4-terminal
      :osssssss/        osssso+++.    Terminal Font: Monospace Bold 10
     /ossssssss/        +ssssooo/-    CPU: AMD Ryzen 3 5300U with Radeon Graphics (8) @ 2.600GHz
   `/ossssso+/:-        -:/+osssso+-  GPU: AMD ATI 05:00.0 Lucienne
  `+sso+:-`                 `.-/+oso: Memory: 2604MiB / 7291MiB
 `++:.                           `-/+/
 .`                                 `/


Linux kappa 6.2.7-arch1-1 x86_64
 09:47:21 up  1:03,  1 user,  load average: 0.37, 0.47, 0.44
 ~                                                                        Thu 23 Mar 2023 09:47:21 AM UTC
```

```
                   -`                 kappa@kappa
                  .o+`                -----------
                 `ooo/                OS: Arch Linux x86_64
                `+oooo:               Host: Aspire A515-45 V1.10
               `+oooooo:              Kernel: 6.2.7-arch1-1
               -+oooooo+:             Uptime: 1 hour, 4 mins
             `/:-:++oooo+:            Packages: 912 (pacman)
            `/++++/+++++++:           Shell: bash 5.1.16
           `/++++++++++++++:          Resolution: 1920x1080
          `/+++ooooooooooooo/`        WM: i3
         ./ooosssso++osssssso+`       Theme: Mantis Night [GTK2/3]
        .oossssso-````/ossssss+`      Icons: Adwaita [GTK2/3]
       -osssssso.      :ssssssso.     Terminal: xfce4-terminal
      :osssssss/        osssso+++.    Terminal Font: Monospace Bold 10
     /ossssssss/        +ssssooo/-    CPU: AMD Ryzen 3 5300U with Radeon Graphics (8) @ 2.600GHz
   `/ossssso+/:-        -:/+osssso+-  GPU: AMD ATI 05:00.0 Lucienne
  `+sso+:-`                 `.-/+oso: Memory: 2609MiB / 7291MiB
 `++:.                           `-/+/
 .`                                 `/


Linux kappa 6.2.7-arch1-1 x86_64
 09:47:30 up  1:04,  1 user,  load average: 0.61, 0.52, 0.46
 ~                                                                        Thu 23 Mar 2023 09:47:30 AM UTC
```

Desktop Enviorment

This allows the user to have a desktop like on windows. This includes having a toolbar, windows, desktop background etc instead of just having a terminal.
Common DE are:

- i3
- XFCE
- Awesome
- Gnome
- bspwm
- DWM
- Sway

Linux terminal/Commands

Moving on from how to setup most linux distros the terminal CLI (command line interface) is very important to us as most servers will not have a GUI (graphical user interface).

What is a Shell?

A shell is what allows the user to input commands into the systems kernel to allow the computer to execute functions. You can change your terminal emulator to whatever shell you want as all shells work the same except some help you with auto complete and colours such as fish,zsh.

If you see a $ in your shell this means you have user permissions meaning you cannot edited system files unless you use the sudo command.

If you see a # in your shell it means you are running as superuser (sudo) which is a bad idea as you can delete your entire system by accident.

Every shell will run bash as thats what linux systems use. All fish and zsh do is change colour if there is an error and auto completes your command.

What is a text editor?

A text editor is like notepad in windows, you can write whatever you want into a file. The most commonly used ones on linux are nano and Vim and Nvim. The difference between vim and Nvim is Nvim (neovim) is a community made one that uses lua for scripts instead of vim. Vim and nvim both use the same keybinds and a cheat sheet will be linked at the end of this document.

Compiling and running code in the terminal

The terminal is able to compile and run all code on linux. Due to most linux distros coming with a GNU GCC compiler,python etc you don’t need to install them.

Common commands for code(Search specific ones you might need):
Gcc <file-name> to complile C code

g++ <file-name> to compile C++ code

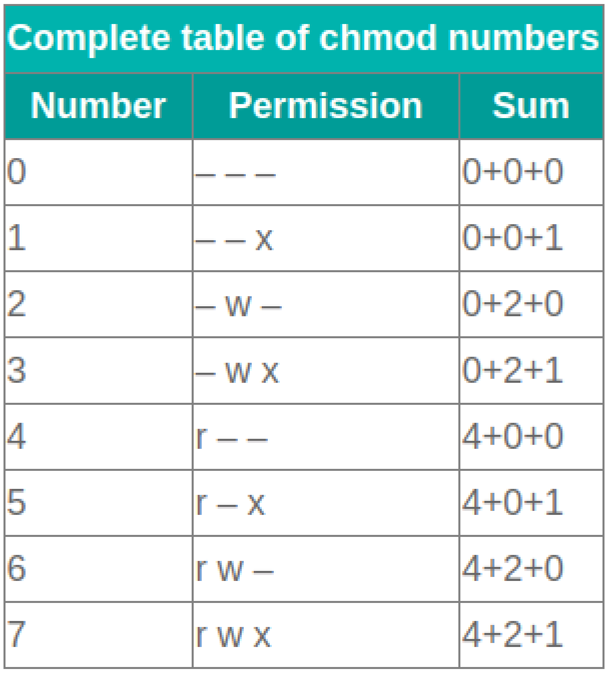
python <file-name> to run a python file

node <file-name> to run node javascript files

./<file-name> to execute a file such as a C or C++ file after compiling it or a Bash file

Changing permissions

To change permissions in linux we use chmod command.



Complete table of chmod numbers		
Number	**Permission**	**Sum**
0	– – –	0+0+0
1	– – x	0+0+1
2	– w –	0+2+0
3	– w x	0+2+1
4	r – –	4+0+0
5	r – x	4+0+1
6	r w –	4+2+0
7	r w x	4+2+1

We can either use the numbers such as

```
chmod 777 <file-name>
```

where the first is user, second is group, third is other
or

```
chmod a+rwx <file-name>
```

a or ugo = all (everyone)
u = user (just the user of the computer)
g = group (you pick multiple users)
o = other (others)

r = read
w = write
x = execute

4 is “read”,
2 is “write”,
1 is “execute”
0 is “no permissions”

4+2+1 = 7 thats how we calculate thes

Directories

To move through directories we use `cd` (change directory).

The format is `cd folder/folder1/folder2`

To go back only 1 directory we use `cd ..`

To go back to the last opened directory we use `cd -`

To make a new directory we use `mkdir <directory-name>`
To make multiple directories we use `mkdir -p <directory-name>`

The options for mkdir are:

- -m (permissions like chmod) mkdir -m777 <directory-name>
- -p (parent folder allows you to make multiple) mkdir -p <folder/folder1>
- -v (prints a message in terminal for every sucessfully made folder)
- -Z (sets security context) not important

We can also use vim or neovim to make a directory if we want a file already to be made in it.

```
vim folder/folder1/folder2/test.txt
```

Instead of writing home/YOURUSERNAME/ we can use the ~ symbol

```
~/whatever/file/thats/in/your/home/directory
```

List directory (ls)

In linux we use the command ls to list all non hidden files and folders in a directory. ls has many options which can be found with man ls. The main ones are:

- -a (lists everything even hidden files and dotfiles)
- -R (list all subdirectories)
- -S (sorts by file size)
- -s (prints the size of each file, in blocks)

Making Files

Most text editors make the file but the default way of making a file is using the command touch.

```
Touch <file-name>
```

Outputting into the Terminal

For printing text in the terminal we use the echo or printf command

```
echo “Your Text”
```

```
printf “Your Text”
```

For printing text from a file into the terminal we use the cat command

```
cat <file_name>
```

Redirecting Outputs and Pipes

In linux we can redirect outputs and use them as another input. This is done using pipe (|). Multiple pipes can be used. We also use redirects > and >> to put text into other files or copy files over

Example of using redirects

```
echo “some text here” > <file-name>
```

Redirecting text from one file to another

```
cat <file-name> > <file-name2>
```

> Is used to replace and write text in the file
>> appends the new text to the end of the file (puts it at the end)

To add lines of text into a file using redirects we use:

```
echo -e “Line1\nLine2\nLine3” >> <file-name>
```

The -e allows the computer to read the \n in the echo

Example of using pipe

```
cat file2.txt | head -4
```

This shows the first 4 lines from the text in the terminal.

Copying and Moving files using Terminal

In linux we can use the command line to copy and move files and directories over to another place.

For copying files we use cp command (copy)

```
cp -r <SourceFile> <Destination>
```

And for moving files we use the mv command

```
mv -r <SourceFile> <Destination>
```

We use -r to copy everything inside folders etc but many other options can be used such as:

- -b (creates a backup)
- -f (forces the operation to be done)
- -v (prints a message in the terminal)

Deleting files

In linux there is multiple ways of deleting files but the easiest way to do it is:

```
rm -rf <file-name or folder>
```

This removes everything because of -r and forces the system to delete all because of -f.

We can also delete empty directories using rmdir

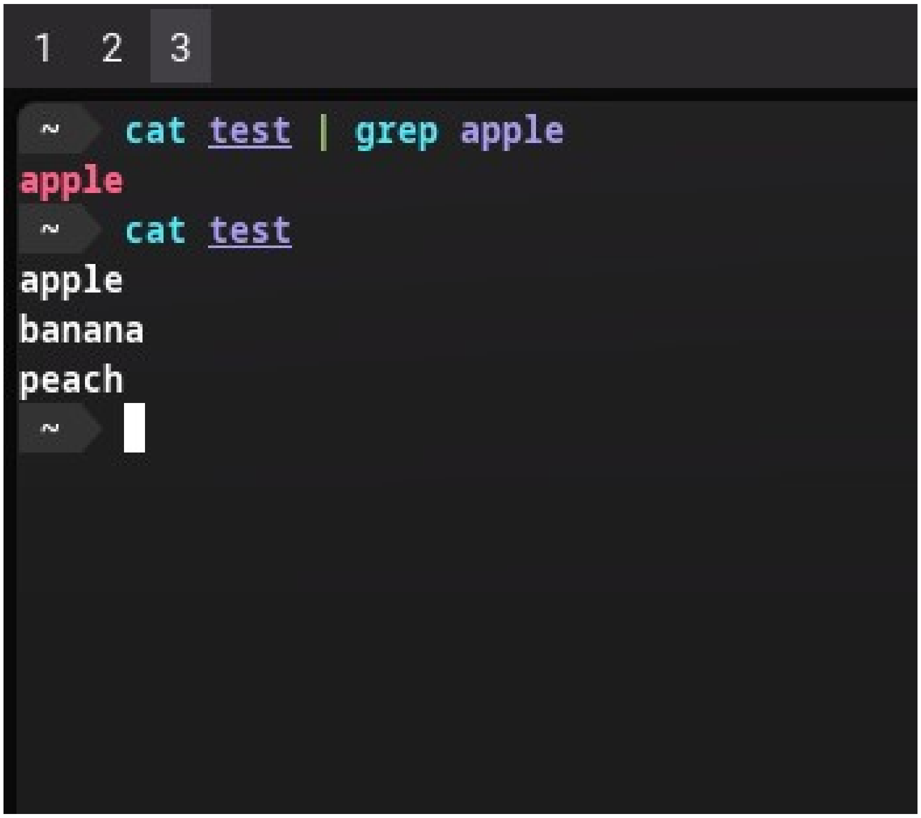
```
rmdir <folder-name>
```

but that requires the folder to be empty.

Grep and Man

grep command is used to find specific words in text files etc. Imagine the file text.txt has this inside it

test.txt = apple banana orange peach sunflower



```
~ cat test | grep apple
apple
~ cat test
apple
banana
peach
~
```

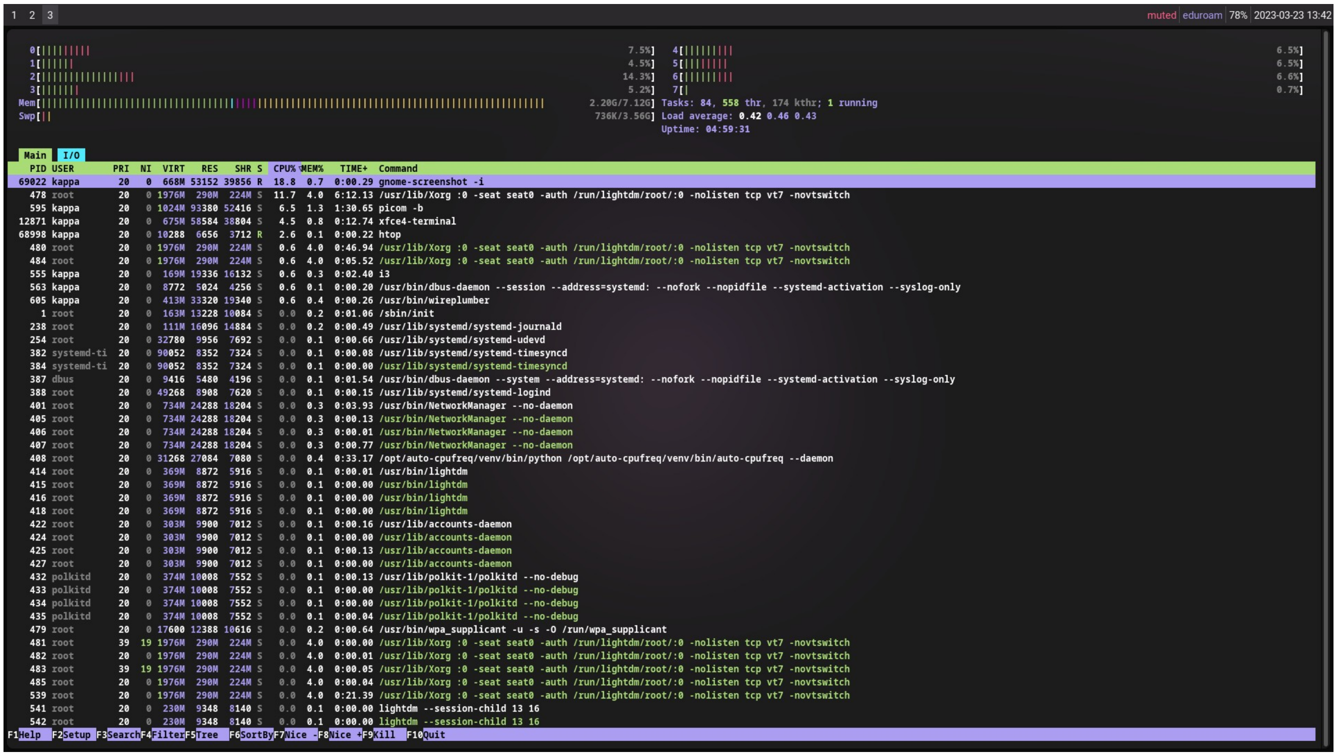
cat text.txt | grep apple
This will only display the word apple from the file.

Man is for the manual to commands. The syntax to use man is:

man ls (Shows manual for ls)
man cat (Shows manual for cat)

Monitoring Proccess on Linux

To monitor proccess, ram usage, cpu usage we can use 2 commands either top or htop. These are like task manager on windows. Below is an example of htop which the difference between this and top is that it has colour added.



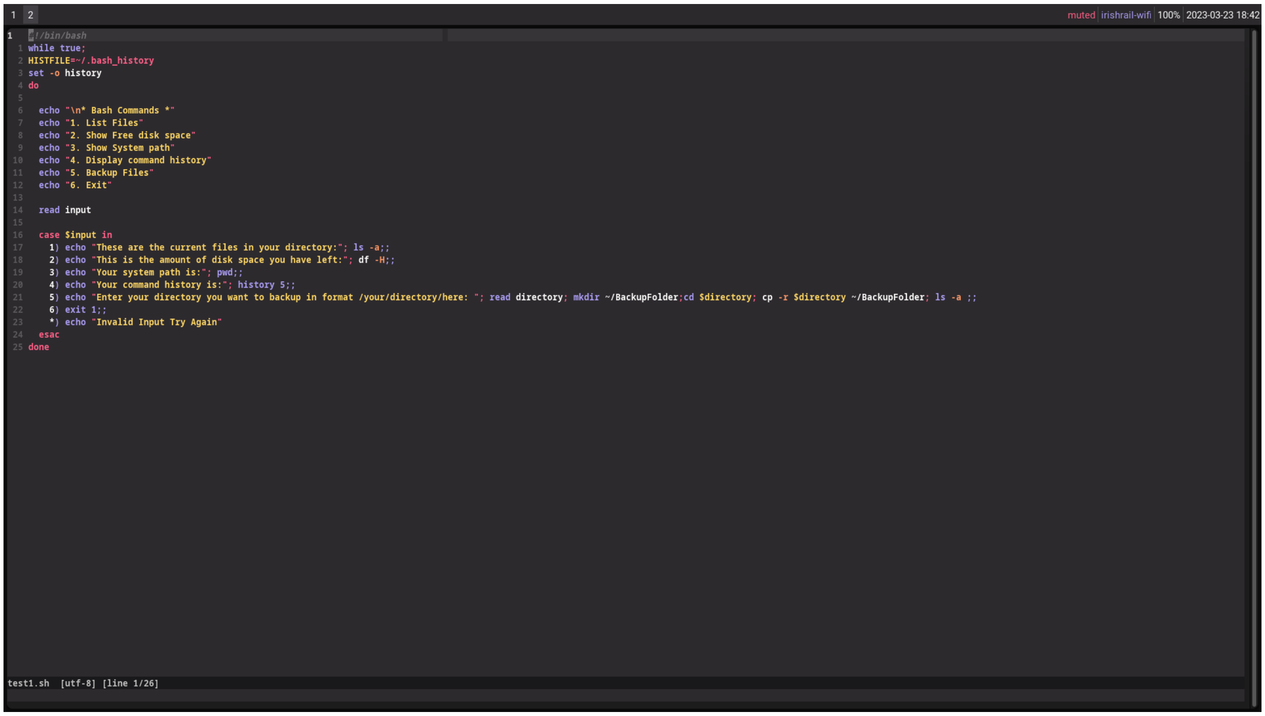
```
1  2  3                                                                          muted | eduroam | 78% | 2023-03-23 13:42

    0[|||||||||                                             7.5%]   4[|||||||||                                     6.5%]
    1[||||||                                                4.5%]   5[||||||||                                      6.5%]
    2[||||||||||||||||||                                   14.3%]   6[|||||||||                                     6.6%]
    3[|||||||                                               5.2%]   7[|                                             0.7%]
  Mem[|||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||   2.20G/7.12G] Tasks: 84, 558 thr, 174 kthr; 1 running
  Swp[||                                              736K/3.56G] Load average: 0.42 0.46 0.43
                                                                  Uptime: 04:59:31

 Main  I/O
    PID USER       PRI  NI  VIRT   RES   SHR S  CPU% MEM%   TIME+  Command
  69022 kappa       20   0  668M 53152 39856 R  18.8  0.7  0:00.29 gnome-screenshot -i
    478 root        20   0 1976M  290M  224M S  11.7  4.0  6:12.13 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    595 kappa       20   0 1024M 93380 52416 S   6.5  1.3  1:30.65 picom -b
  12871 kappa       20   0  675M 58584 38804 S   4.5  0.8  0:12.74 xfce4-terminal
  68998 kappa       20   0 10288  6656  3712 R   2.6  0.1  0:00.22 htop
    480 root        20   0 1976M  290M  224M S   0.6  4.0  0:46.94 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    484 root        20   0 1976M  290M  224M S   0.6  4.0  0:05.52 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    555 kappa       20   0  169M 19336 16132 S   0.6  0.3  0:02.40 i3
    563 kappa       20   0  8772  5024  4256 S   0.6  0.1  0:00.20 /usr/bin/dbus-daemon --session --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
    605 kappa       20   0  413M 33320 19340 S   0.6  0.4  0:00.26 /usr/bin/wireplumber
      1 root        20   0  163M 13228 10084 S   0.0  0.2  0:01.06 /sbin/init
    238 root        20   0  111M 16096 14884 S   0.0  0.2  0:00.49 /usr/lib/systemd/systemd-journald
    254 root        20   0 32780  9956  7692 S   0.0  0.1  0:00.66 /usr/lib/systemd/systemd-udevd
    382 systemd-ti  20   0 90052  8352  7324 S   0.0  0.1  0:00.08 /usr/lib/systemd/systemd-timesyncd
    384 systemd-ti  20   0 90052  8352  7324 S   0.0  0.1  0:00.00 /usr/lib/systemd/systemd-timesyncd
    387 dbus        20   0  9416  5480  4196 S   0.0  0.1  0:01.54 /usr/bin/dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
    388 root        20   0 49268  8908  7620 S   0.0  0.1  0:00.15 /usr/lib/systemd/systemd-logind
    401 root        20   0  734M 24288 18204 S   0.0  0.3  0:03.93 /usr/bin/NetworkManager --no-daemon
    405 root        20   0  734M 24288 18204 S   0.0  0.3  0:00.13 /usr/bin/NetworkManager --no-daemon
    406 root        20   0  734M 24288 18204 S   0.0  0.3  0:00.01 /usr/bin/NetworkManager --no-daemon
    407 root        20   0  734M 24288 18204 S   0.0  0.3  0:00.77 /usr/bin/NetworkManager --no-daemon
    408 root        20   0 31268 27084  7080 S   0.0  0.4  0:33.17 /opt/auto-cpufreq/venv/bin/python /opt/auto-cpufreq/venv/bin/auto-cpufreq --daemon
    414 root        20   0  369M  8872  5916 S   0.0  0.1  0:00.01 /usr/bin/lightdm
    415 root        20   0  369M  8872  5916 S   0.0  0.1  0:00.00 /usr/bin/lightdm
    416 root        20   0  369M  8872  5916 S   0.0  0.1  0:00.00 /usr/bin/lightdm
    418 root        20   0  369M  8872  5916 S   0.0  0.1  0:00.00 /usr/bin/lightdm
    422 root        20   0  303M  9900  7012 S   0.0  0.1  0:00.16 /usr/lib/accounts-daemon
    424 root        20   0  303M  9900  7012 S   0.0  0.1  0:00.00 /usr/lib/accounts-daemon
    425 root        20   0  303M  9900  7012 S   0.0  0.1  0:00.13 /usr/lib/accounts-daemon
    427 root        20   0  303M  9900  7012 S   0.0  0.1  0:00.00 /usr/lib/accounts-daemon
    432 polkitd     20   0  374M 10008  7552 S   0.0  0.1  0:00.13 /usr/lib/polkit-1/polkitd --no-debug
    433 polkitd     20   0  374M 10008  7552 S   0.0  0.1  0:00.00 /usr/lib/polkit-1/polkitd --no-debug
    434 polkitd     20   0  374M 10008  7552 S   0.0  0.1  0:00.00 /usr/lib/polkit-1/polkitd --no-debug
    435 polkitd     20   0  374M 10008  7552 S   0.0  0.1  0:00.04 /usr/lib/polkit-1/polkitd --no-debug
    479 root        20   0 17600 12388 10616 S   0.0  0.2  0:00.64 /usr/bin/wpa_supplicant -u -s -O /run/wpa_supplicant
    481 root        39  19 1976M  290M  224M S   0.0  4.0  0:00.00 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    482 root        20   0 1976M  290M  224M S   0.0  4.0  0:00.01 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    483 root        39  19 1976M  290M  224M S   0.0  4.0  0:00.05 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    485 root        20   0 1976M  290M  224M S   0.0  4.0  0:00.04 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    539 root        20   0 1976M  290M  224M S   0.0  4.0  0:21.39 /usr/lib/Xorg :0 -seat seat0 -auth /run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
    541 root        20   0  230M  9348  8140 S   0.0  0.1  0:00.00 lightdm --session-child 13 16
    542 root        20   0  230M  9348  8140 S   0.0  0.1  0:00.00 lightdm --session-child 13 16
F1Help  F2Setup F3SearchF4FilterF5Tree  F6SortByF7Nice -F8Nice +F9Kill  F10Quit
```

Bash Scripting

What is a bash script?

A bash script is like a C program, its code that executes commands when ran. Bash scripts use the exact same commands that you use in the terminal except that we can add if statements, switch statements, loops etc. Its is very important to have a path to your bash and use a shebang (#!) at the top of the script for it to function. There is no \n in bash, instead there is multiple methods but the easiest is to just use echo.

In the code below there is a loop for a menu, and multiple options to chose from by the user. We can run many commands in 1 case statement using ; and we use ;; to indicate the finish of the command.



```
#!/bin/bash
while true;
HISTFILE=~/.bash_history
set -o history
do

  echo "\n* Bash Commands *"
  echo "1. List Files"
  echo "2. Show Free disk space"
  echo "3. Show System path"
  echo "4. Display command history"
  echo "5. Backup Files"
  echo "6. Exit"

  read input

  case $input in
    1) echo "These are the current files in your directory:"; ls -a;;
    2) echo "This is the amount of disk space you have left:"; df -H;;
    3) echo "Your system path is:"; pwd;;
    4) echo "Your command history is:"; history 5;;
    5) echo "Enter your directory you want to backup in format /your/directory/here: "; read directory; mkdir ~/BackupFolder;cd $directory; cp -r $directory ~/BackupFolder; ls -a ;;
    6) exit 1;;
    *) echo "Invalid Input Try Again"
  esac
done
```

Vim / NeoVim Cheat sheet

https://vim.rtorr.com/

The link gives every single command that is included by standard in vim.

Below are some useful ones that you need to know:

- j – moves up
- k – moves down
- h – moves left
- l – moves right
- dd – deletes the line
- d – deletes selected
- I – insert mode (allows you to write)
- v – visual mode (allows you to select text)
- r – replace mode (replaces whatever text you selected)
- esc – exits whatever mode you are in and clears your commands
- : - opens command window
- :w – saves the file
- :q – quits the file
- :! - forces and action (q! Force quits)

- ctrl + v – selects an enitre line
- e – jumps to end of word
- b – jumps backwards to end of word
- u – undo (ctrl + z)
- ctrl + r – redo
- y – yank (copy)
- p - paste

Git Commands

Git commands are commonly used to post files onto github using the command line and taking files from github.

Cheat sheet - https://github.com/joshnh/Git-Commands

Some Needed commands are:

- git clone <github-link> - clones a repository onto your pc
- git init – initializes a local git repository
- git status – checks status
- git add -A or git add .. - adds all files to staging area
- git rm -r <file-name> - removes a file
- git commit -m “message” – commits changes with a message
- git push orgin <bran-name-such-as-main> - pushes changes
- git pull – updates the repository on your pc from the web

Some Downsides of Linux

On linux you cannot open .exe files like on windows, instead we need to use repositories made by other people such as AUR for arch linux. Most distros have their own commands to allow you to install packages such as yay, pacman, paru for arch based linux distros and apt-get and apt-get-install for debian based distros. On linux we also clone repositories from github and run files which install what we need. There is many more ways of installing files but you don’t need to know this unless u actually want to use linux. It also takes a lot more time to get everything up and running as every single thing you want is customizable on almost every distro, desktop enviorment, window manager etc.

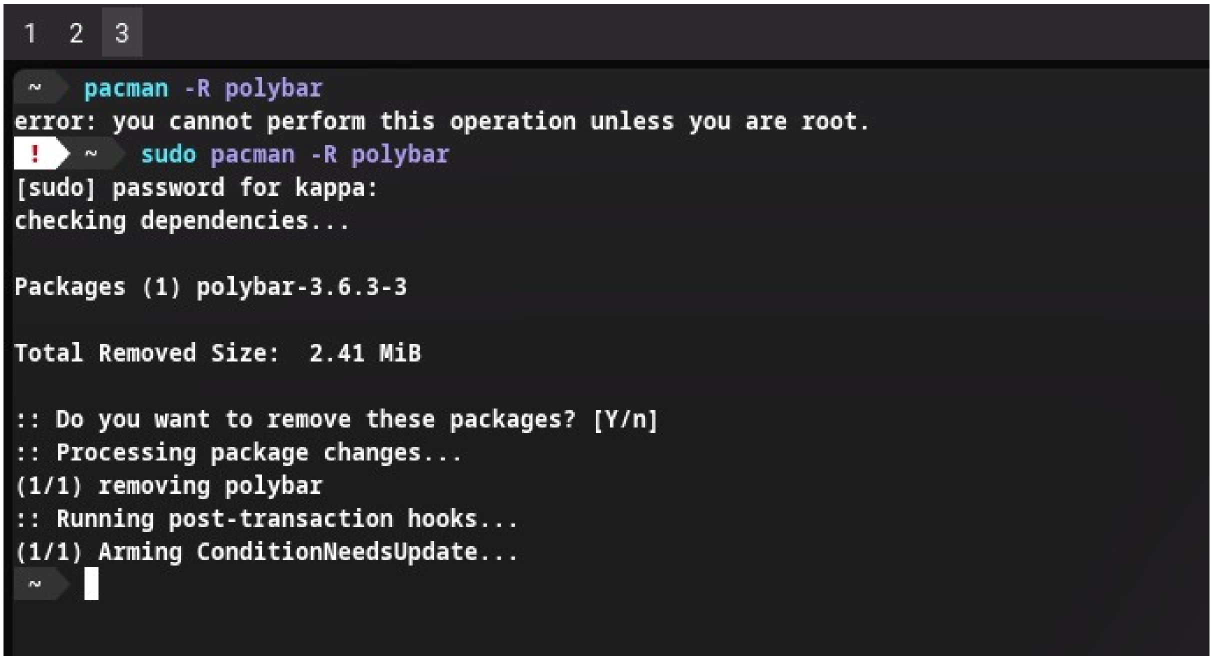
Extra Information

Most linux distros are purely written in C, this means if u wanna practice making stuff in linux u can also practice your C for programming. There is some window managers etc that are written in python,lua,C++ such as qtile which is written in python.

But if you want to learn linux fully and quickly I recommend downloading arch linux and then running arch install which will install basic things such as a window manager, desktop manager and network manager for you. Then you can run anything and everything you want as you can change everything. Most solution and installation guides for arch linux are found on the Arch Wiki. You can also just mess around in your codespace, you can use apt-get to install some packages to make your terminal look cooler.

Every linux machine also has the sudo command which allows the user to have access to everything on the system including system files. This does mean you can delete the entire os if you wanted.

Sudo pacman -R <app you downloaded using AUR>



```
~  pacman -R polybar
error: you cannot perform this operation unless you are root.
 !  ~  sudo pacman -R polybar
[sudo] password for kappa:
checking dependencies...

Packages (1) polybar-3.6.3-3

Total Removed Size:  2.41 MiB

:: Do you want to remove these packages? [Y/n]
:: Processing package changes...
(1/1) removing polybar
:: Running post-transaction hooks...
(1/1) Arming ConditionNeedsUpdate...
~
```

In the example above we use pacman -R to unistall an app. You can see the system doesn’t allow us to do it unless we have superuser (admin) permissions which we use sudo for

Where do I find commands?

Every command you might want to use can be found in either the manual (man) or by searching for it on google.

Index to Easily Find Shit