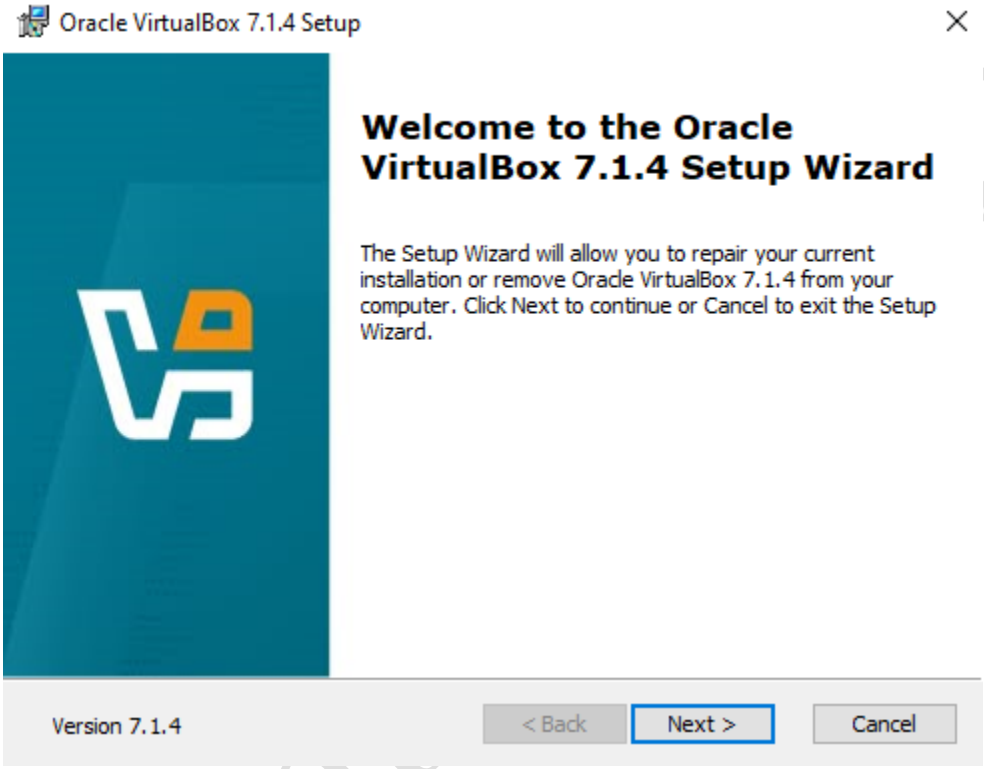
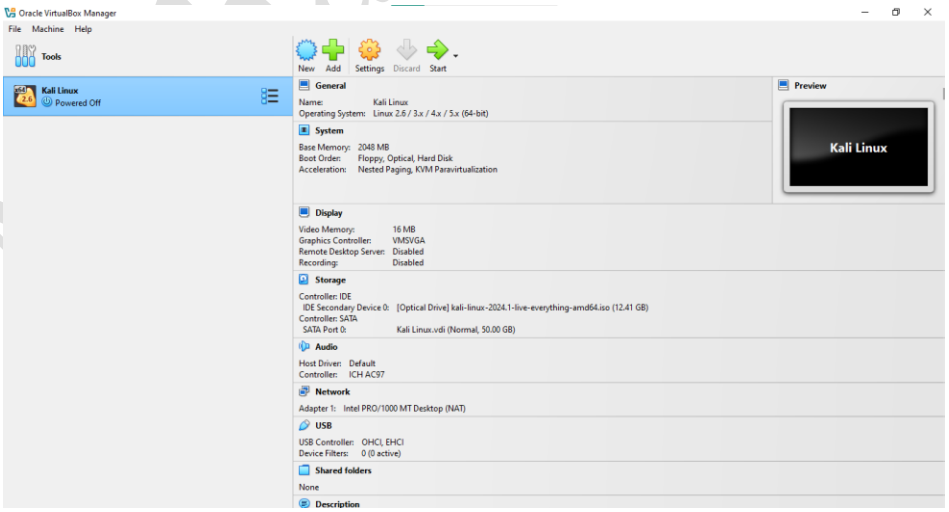
CYBER SECURITY
Practical Work

Installation of Virtual Box:

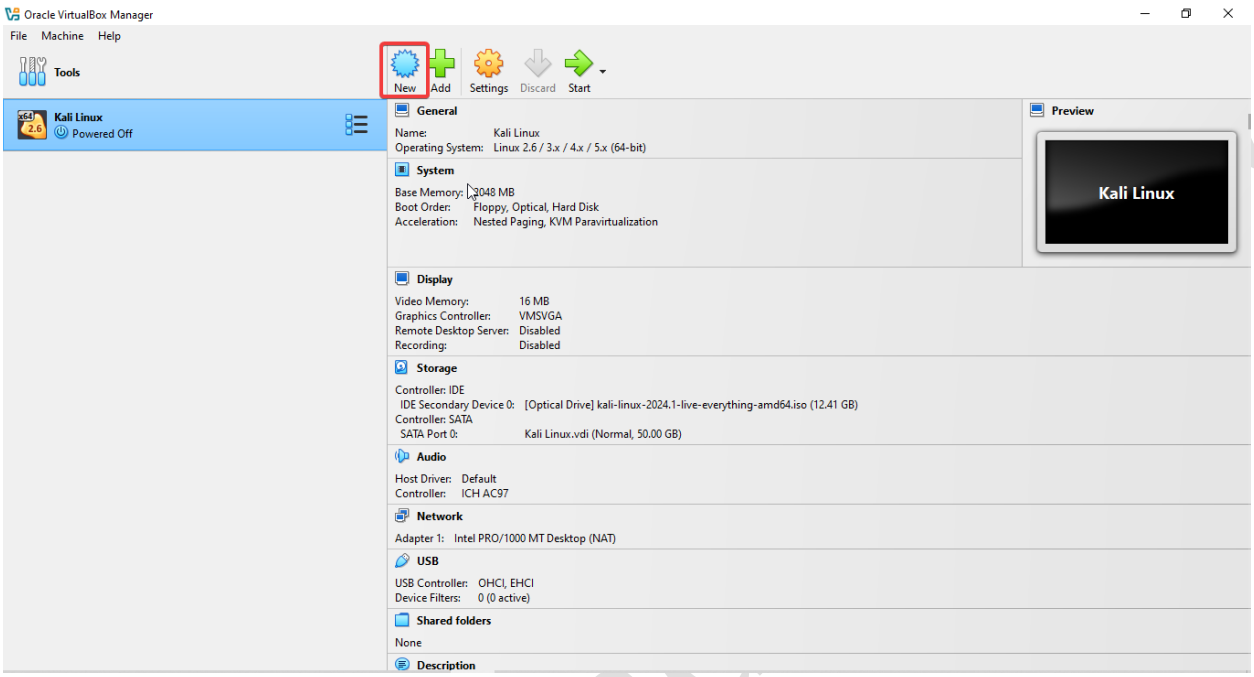


After Installation:

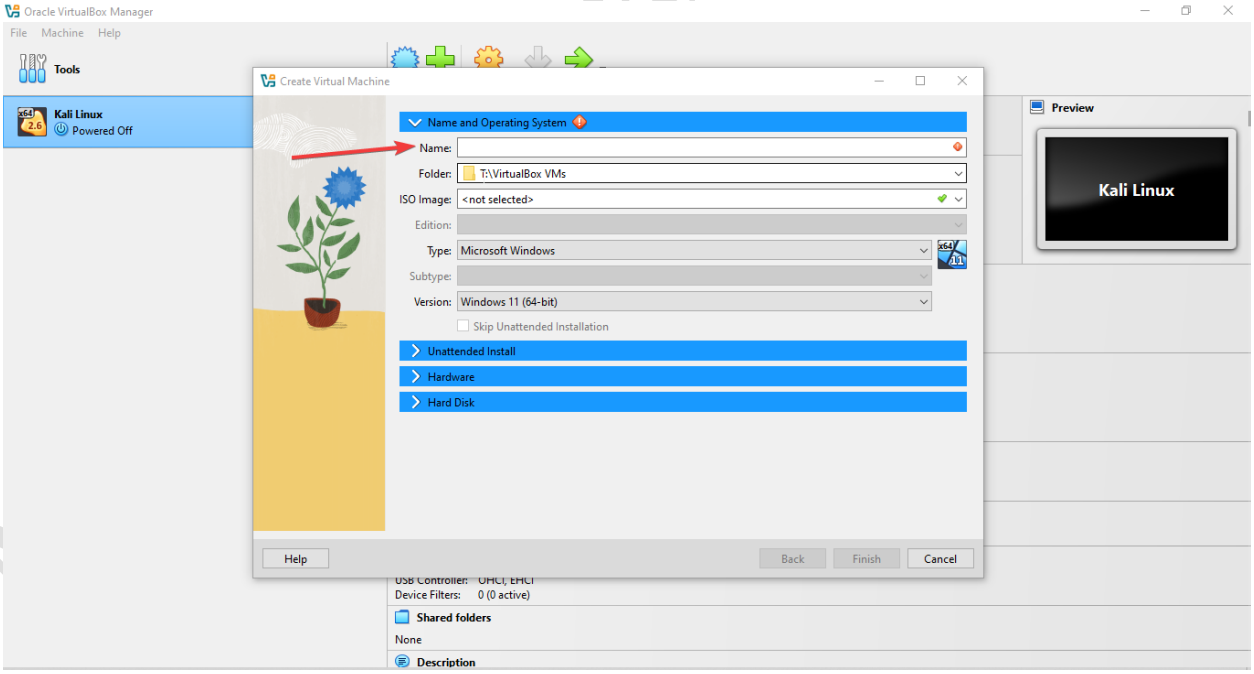


Installing Kali Linux:

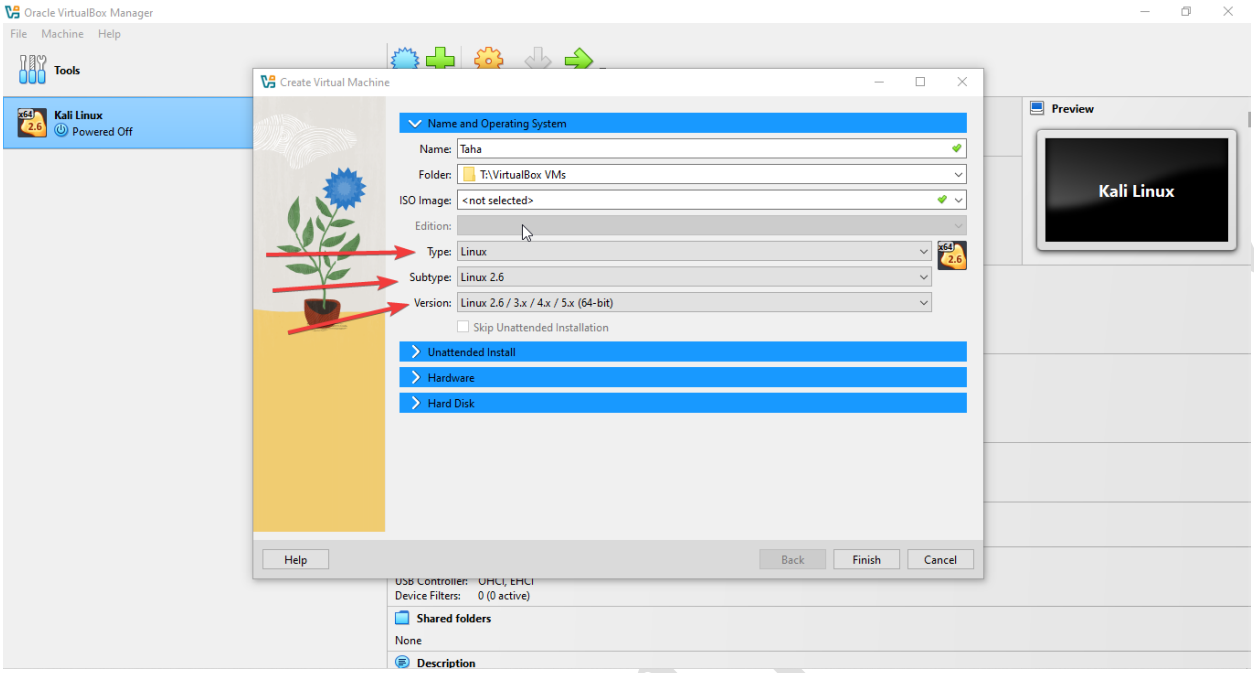
Click the new Button



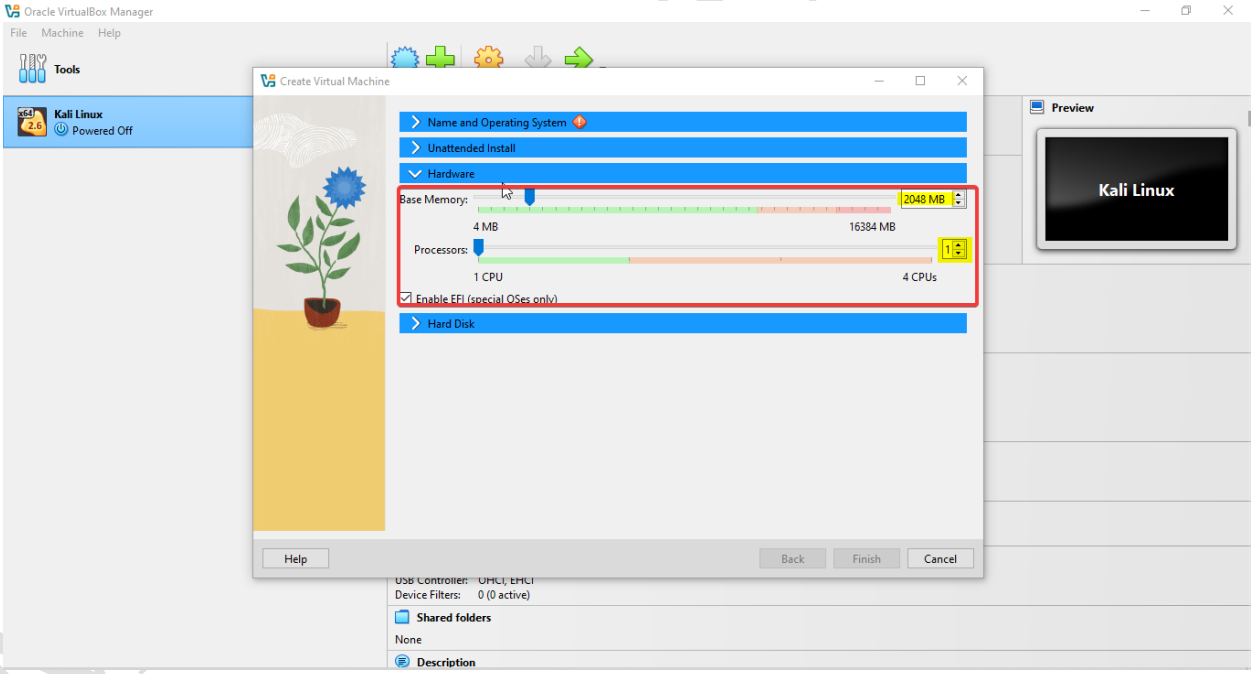
Give name anything you want:



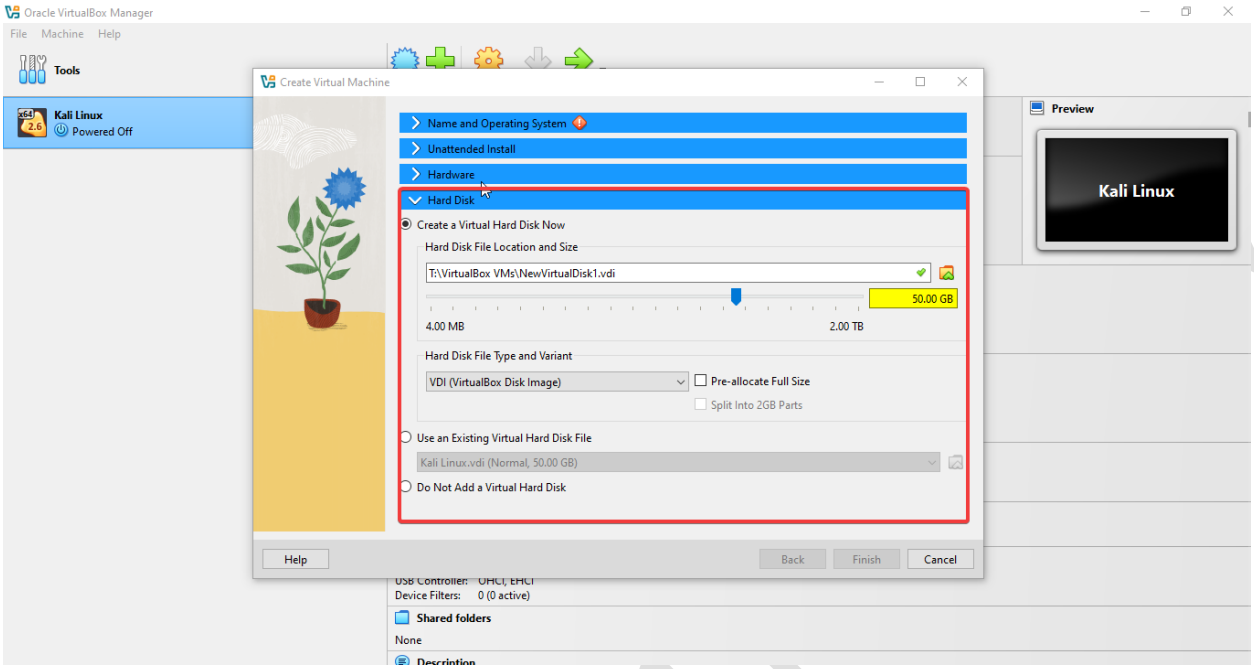
Select these options:



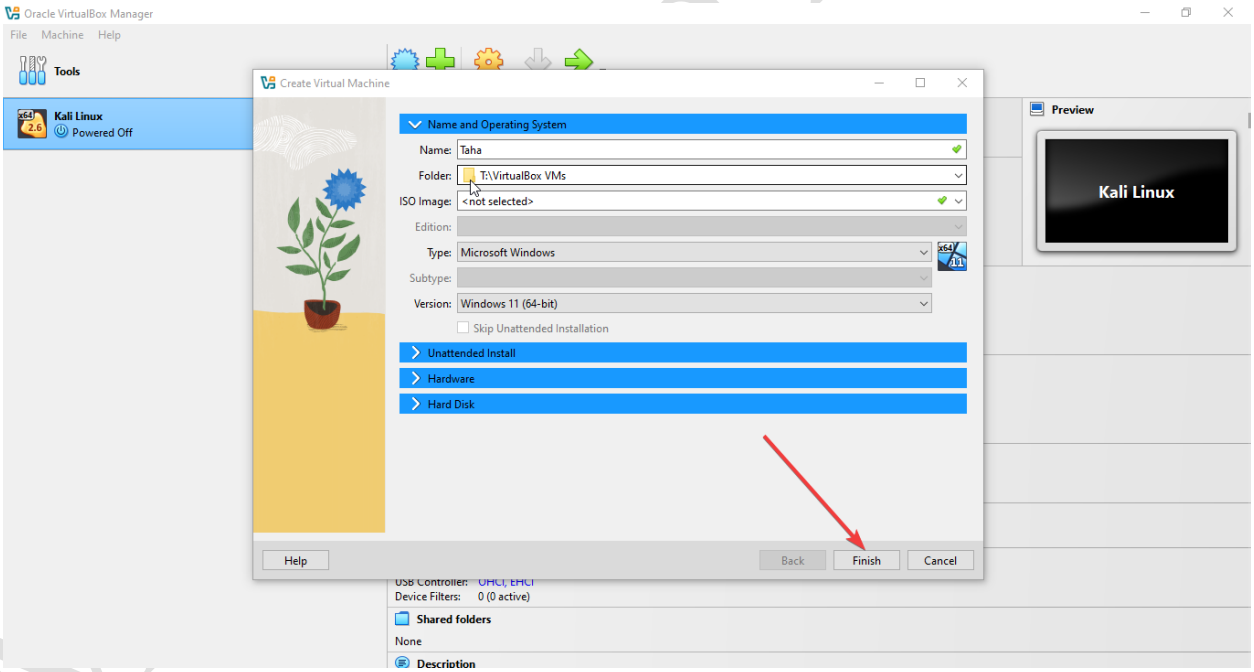
Give Ram and CPU as follows:



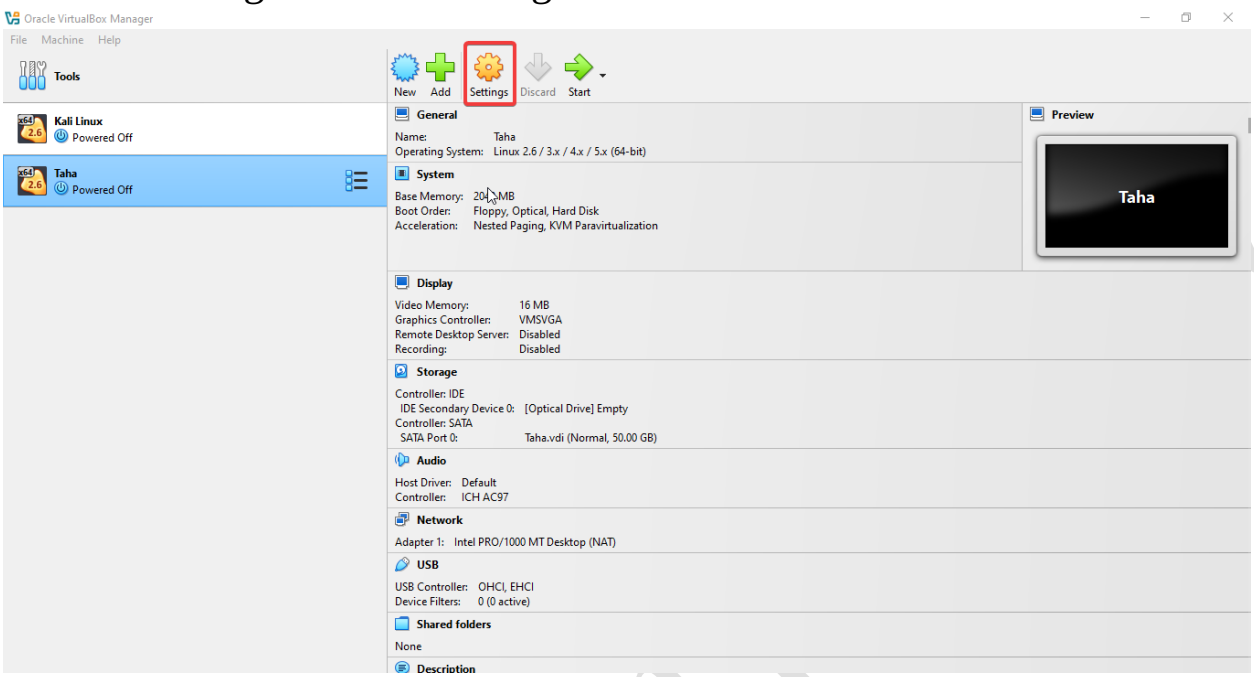
Allocate This much space:



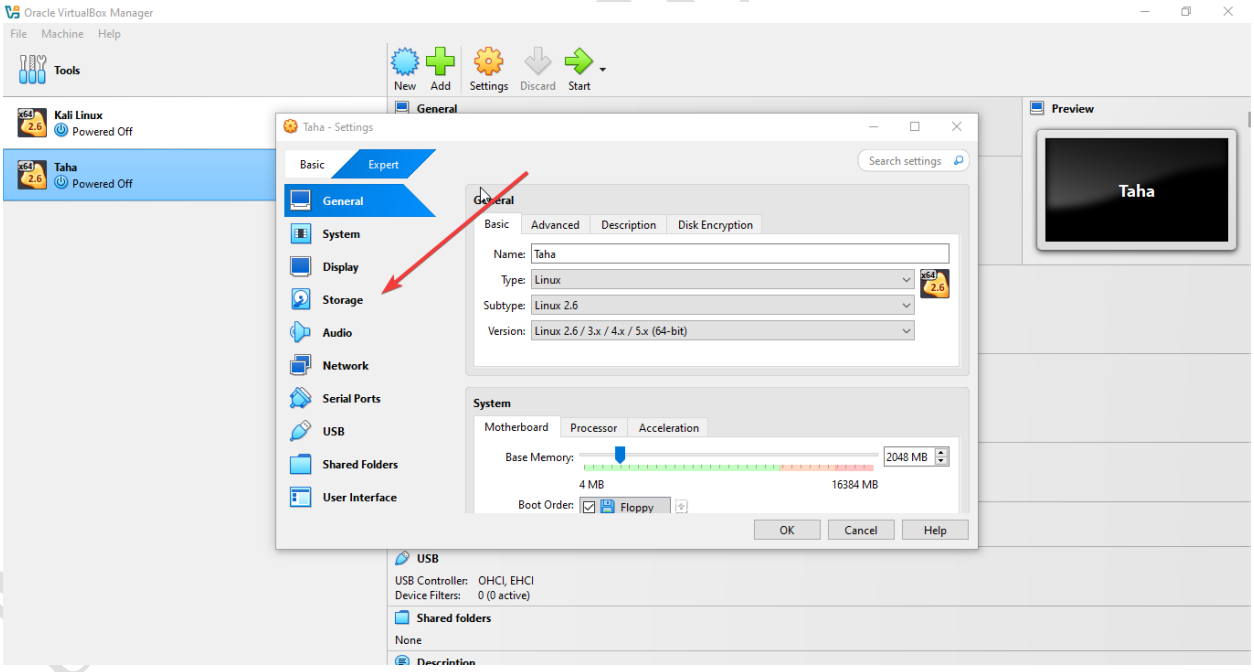
After following these steps click on finish:



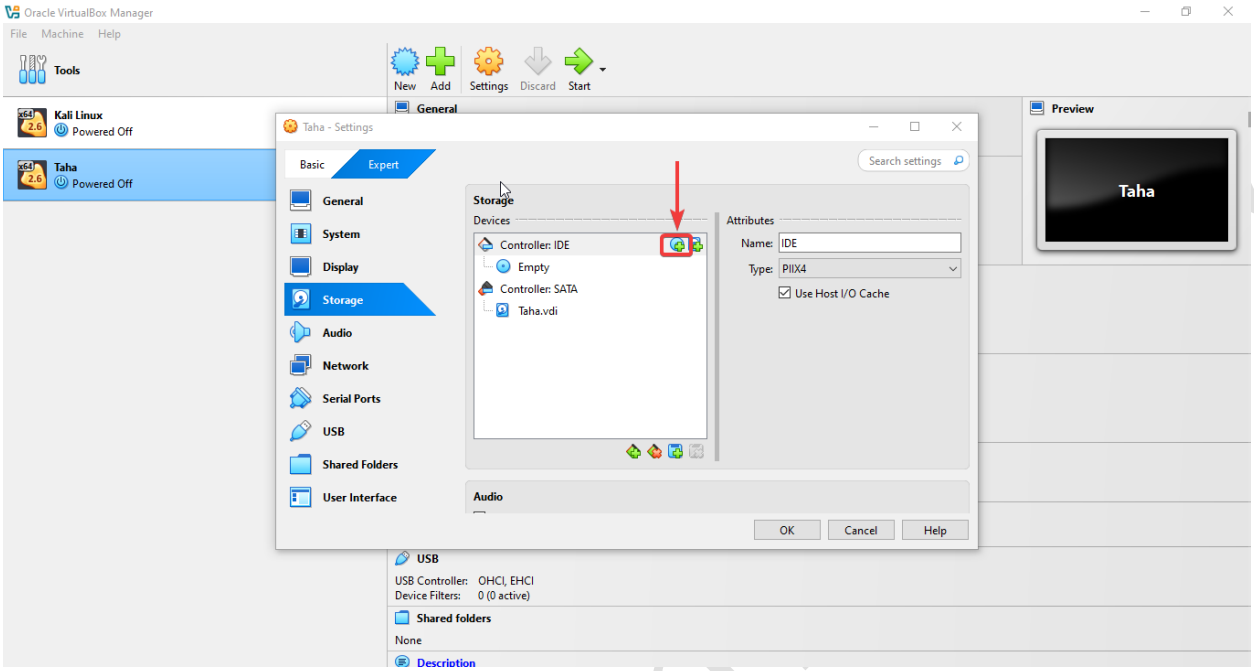
After Finishing click the Settings:



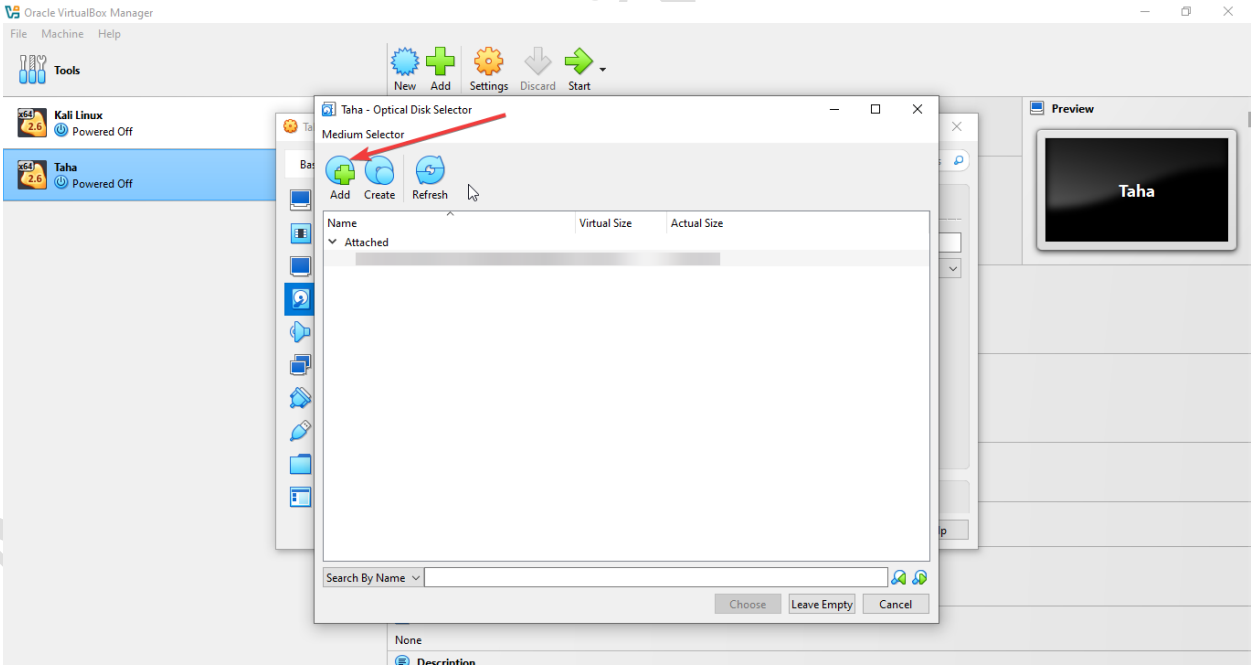
Go to the Storage Tab:



Select This Controller IDE and click this:

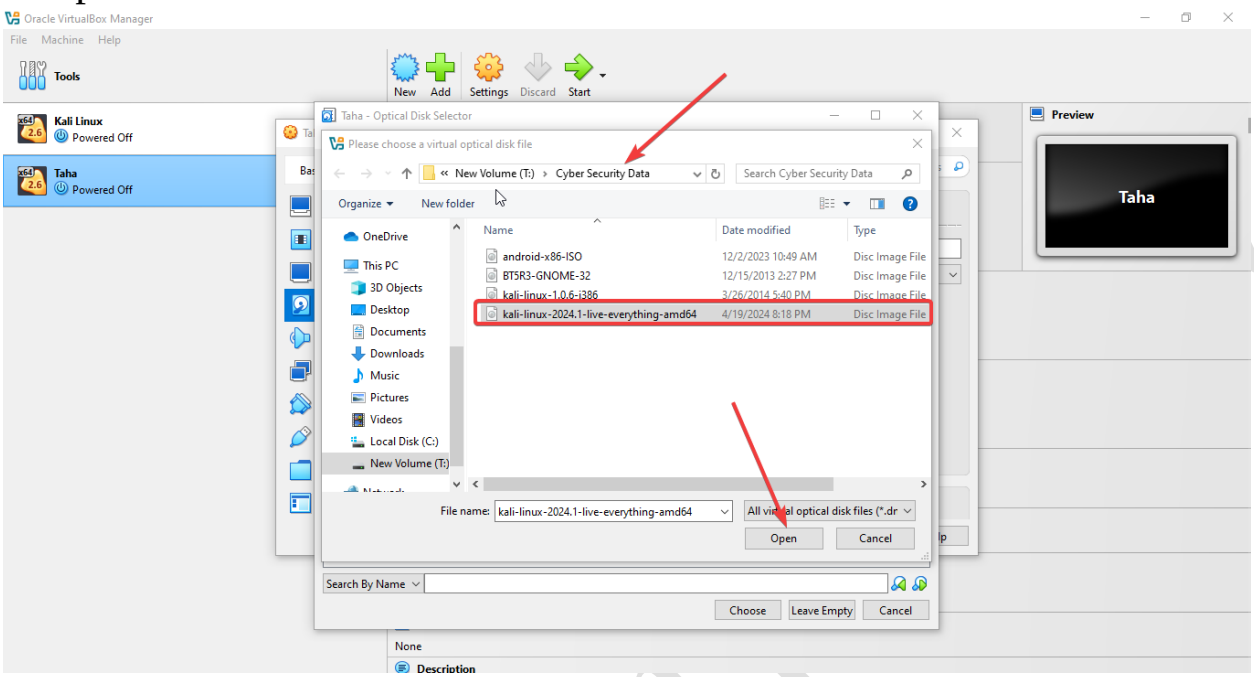


Click on this Add Button:

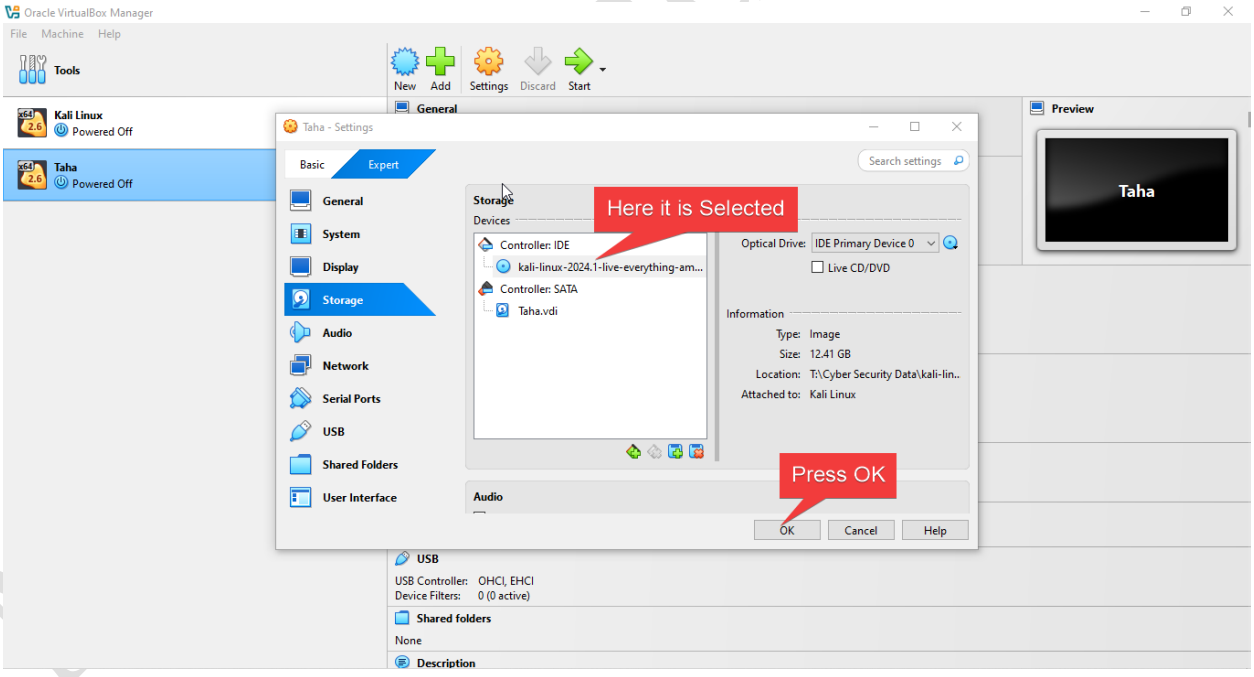


Go to where you put the cyber security data and select kali linux 2024

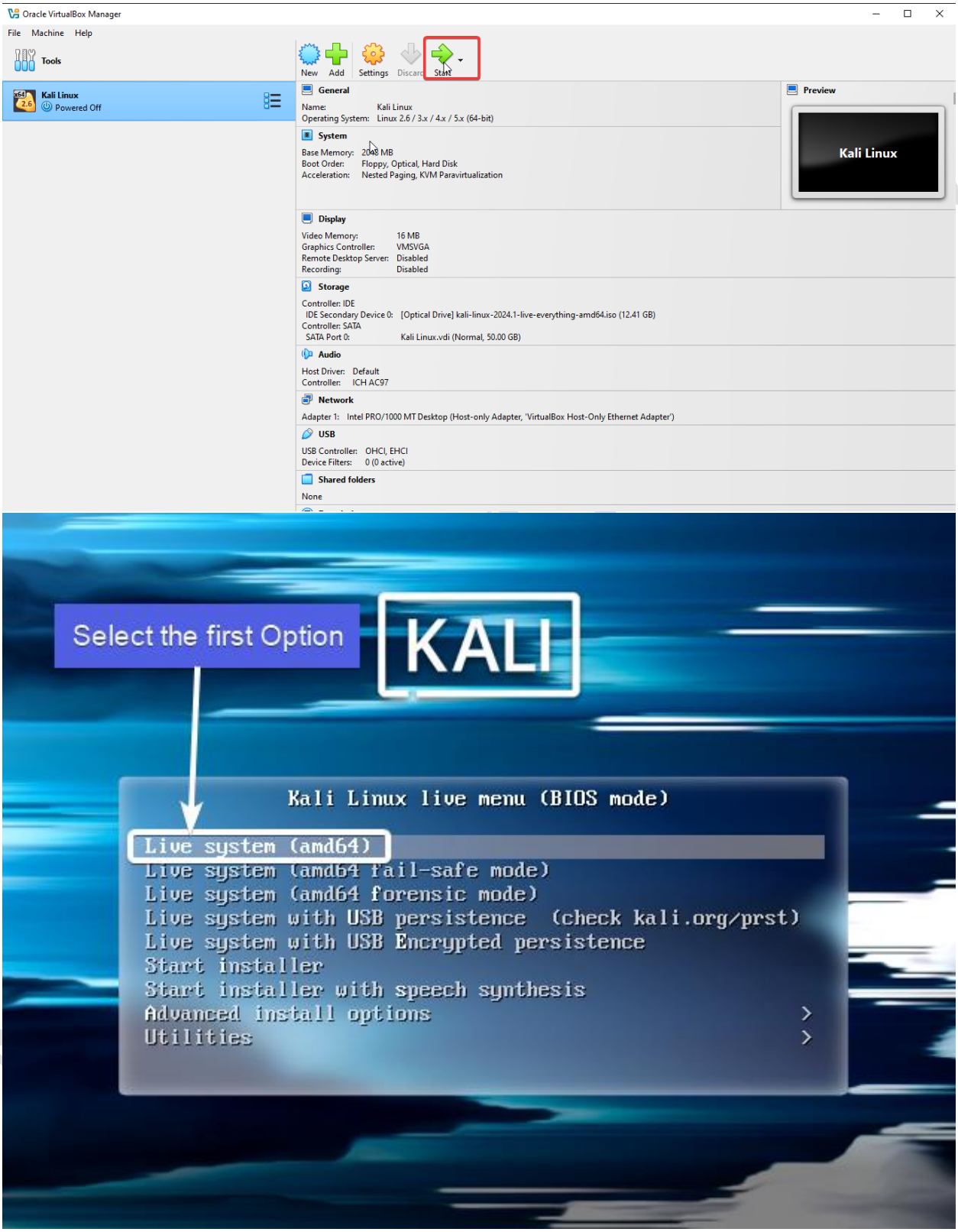
and press choose:



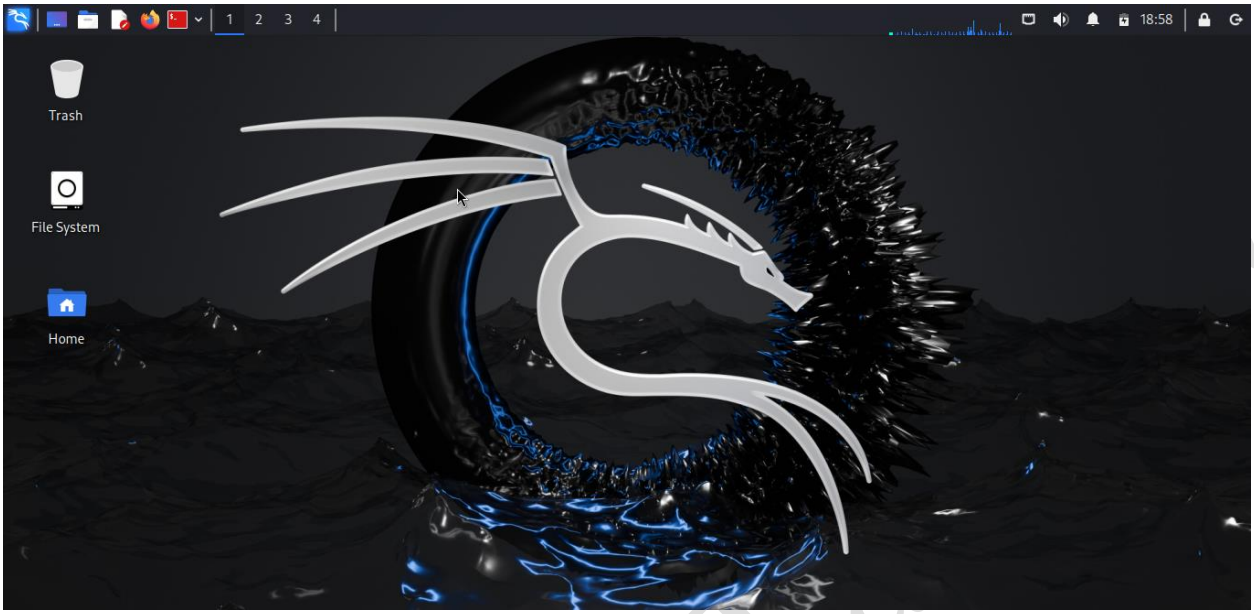
Now it will be installed:



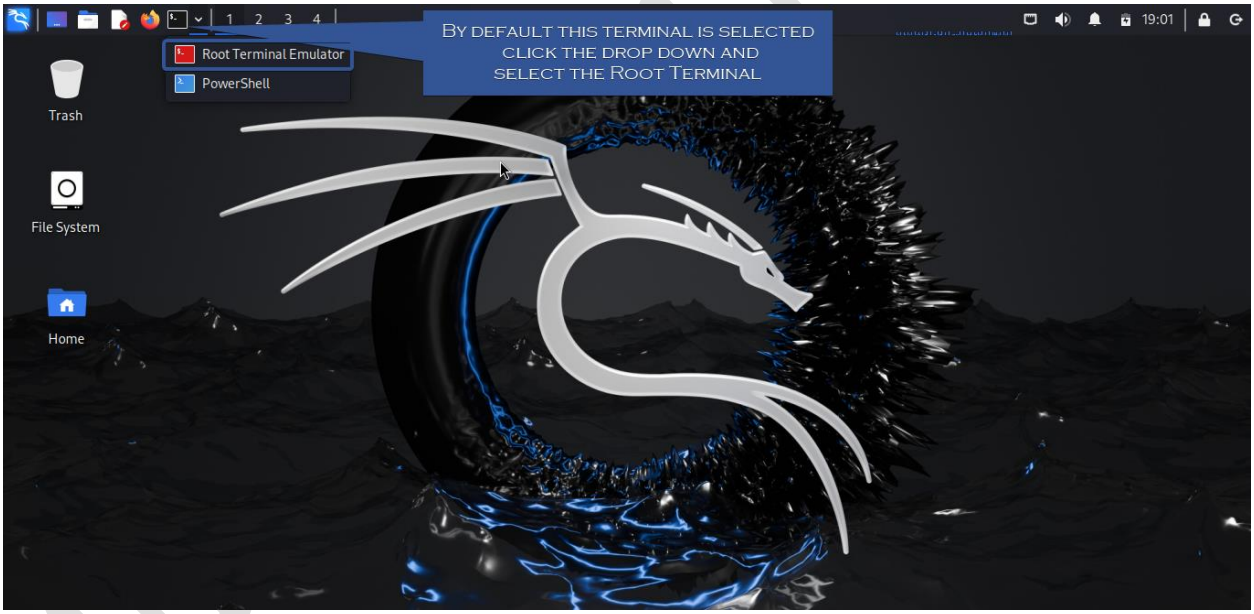
After That click on this start button to start kali linux:



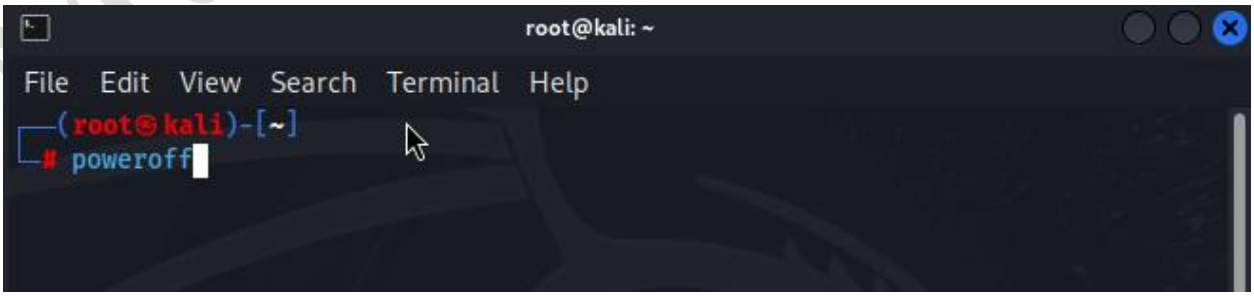
This is the Home Screen of the Kali Linux:



Select the Root Terminal Emulator



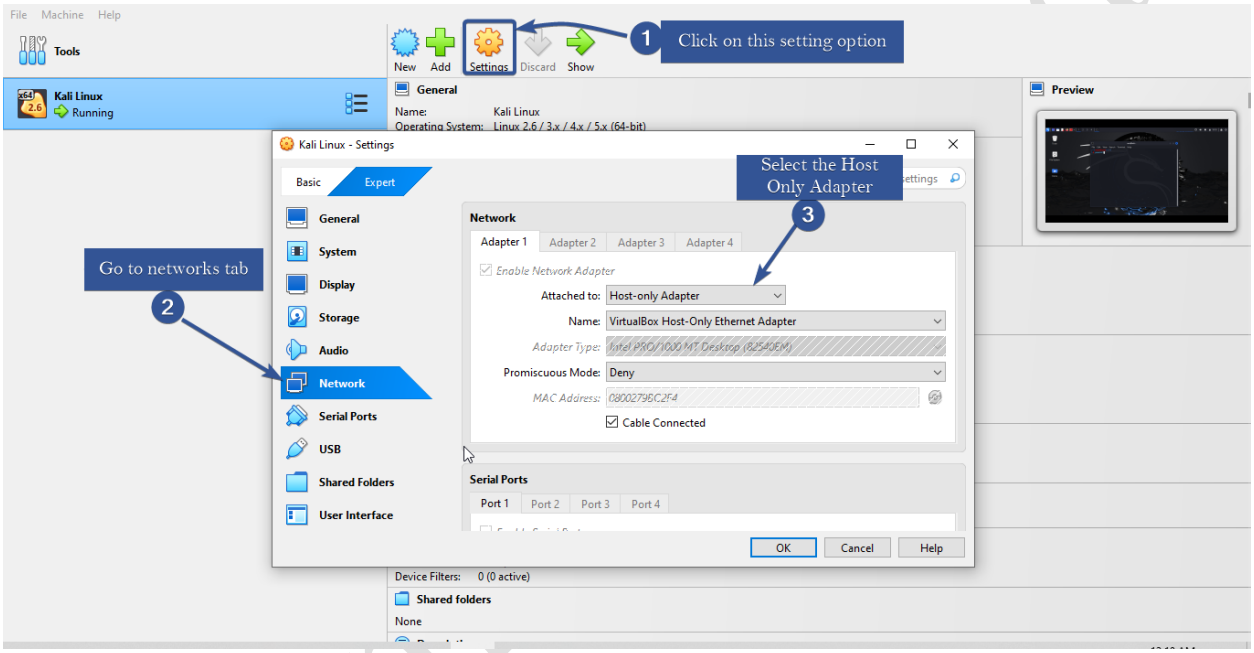
Run this command to Power off the VM:



➢ Host – only Adapter:-

If we select **Host-only Adapter** for networking in VirtualBox/VMware, then all the machines (VMs) that have chosen **Host-only Adapter** will be able to communicate with each other.

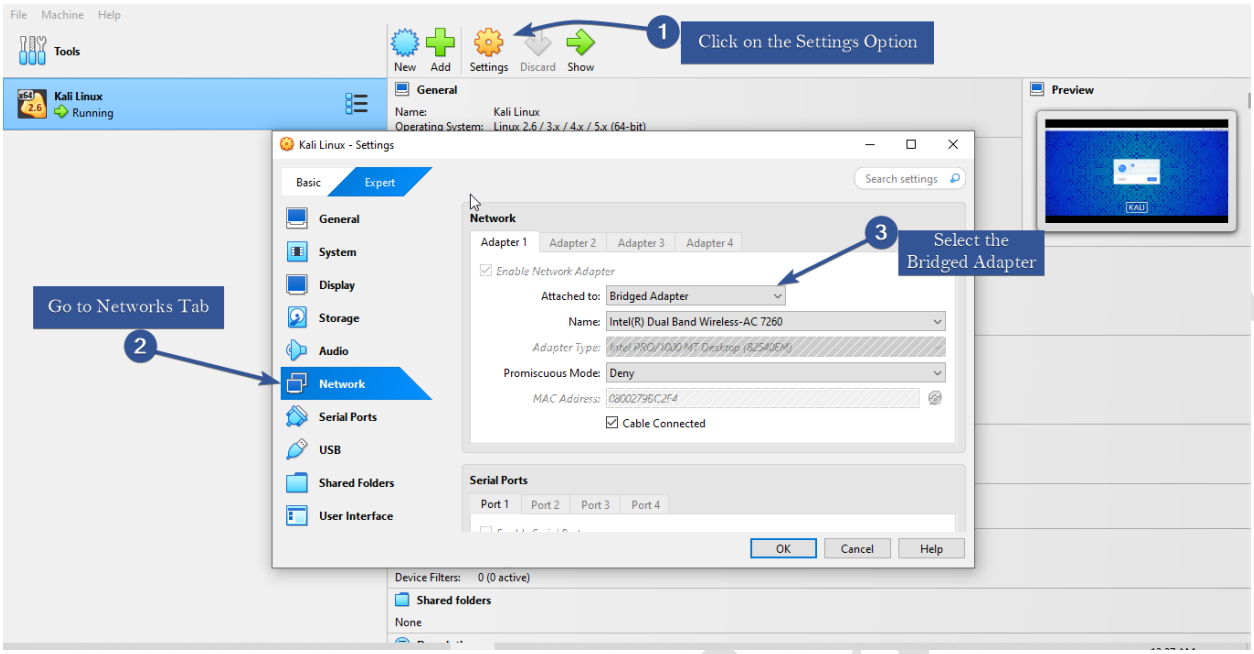
- **Key Point:-**
  These machines **can only talk to each other** but will **not have internet access** through this adapter.



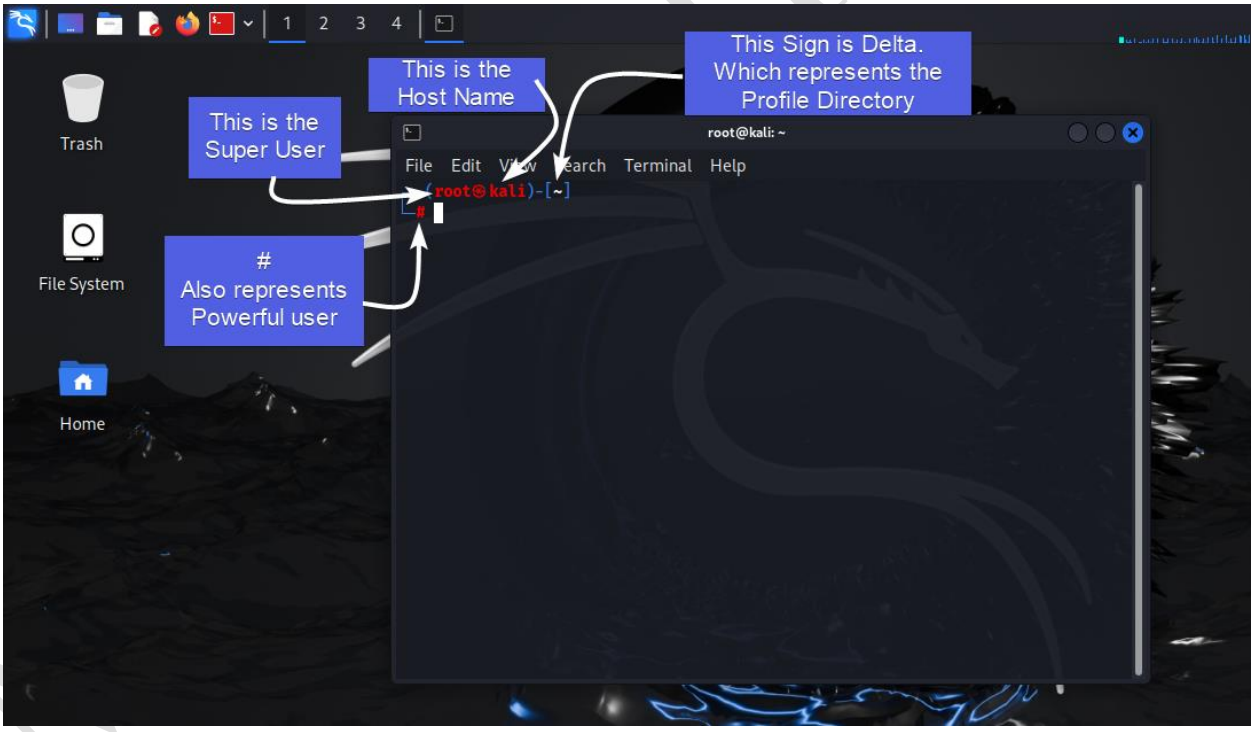
➢ Bridged Adapter:

If we select **Bridged Adapter**, then all the machines (VMs) that have chosen **Bridged Adapter** will be connected to each other **and** they will also connect to the **same physical network as the host machine**.

- **Key Points:-**
  - If the **physical machine has internet access**, then all the connected VMs will also have internet access.
  - If the **physical machine loses internet**, then the VMs will also lose internet.



Kali Linux Shell Prompt Explained:



➢ Commands Learned:-

1. whoami → Shows the currently logged-in user (Linux is **case sensitive**).
2. hostname → Shows the host name of the system

Navigating in root Terminal:-

3. cd /etc
4. cd /tmp
5. cd /opt

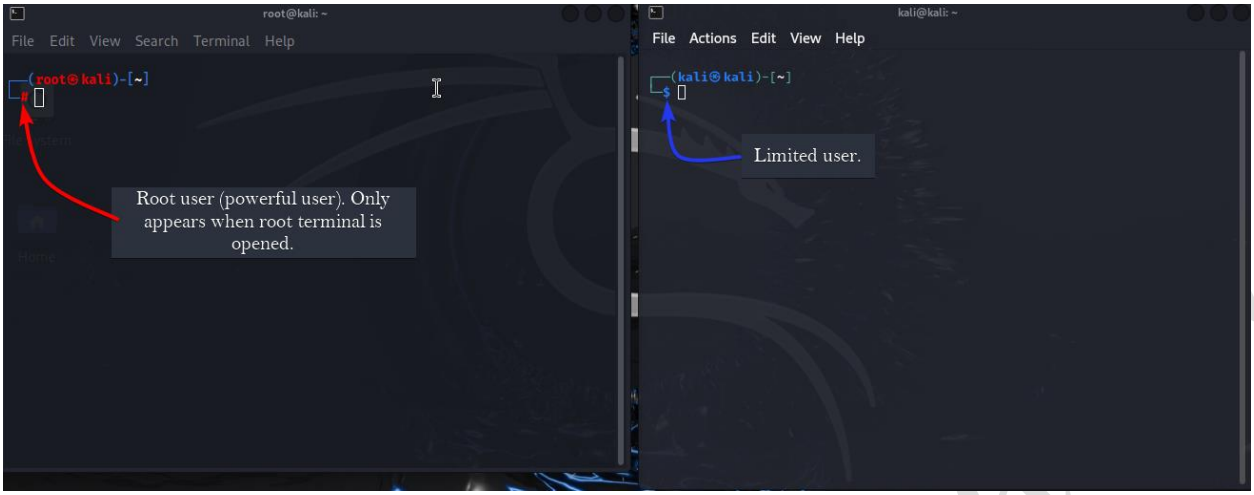
➢ When in the root Terminal:-

- ~ changes to the folder name when moving, e.g., cd /etc replaces ~ with /etc.
- pwd → Shows the **present working directory**.

➢ Symbols in Linux:-

→ Root user (powerful user). Only appears when root terminal is opened.
$ → Limited User

- In Windows: you can create any user and give **administrator rights**.
- In Linux: **only root** has administrator rights.

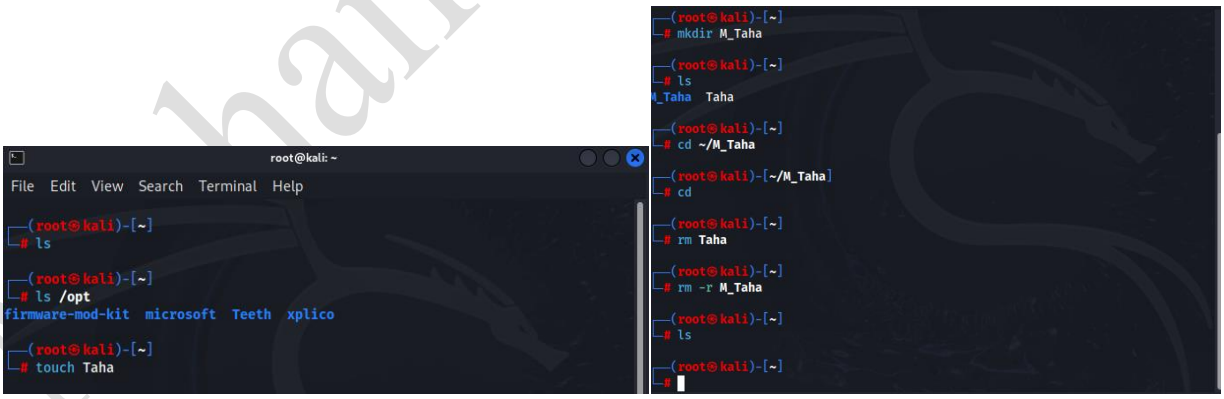


➢ User Privileges:-

1. **Root User:** Can perform administrative tasks, no limitations.
2. **Normal User:** Can only perform basic tasks, not everything is possible.

➢ File & Directory Commands

- ls → Lists contents of the current directory.
- ls /tmp → Lists contents of /tmp without entering it.
- touch [filename] → Creates a file.
- mkdir [foldername] → Creates a folder (e.g., mkdir M_Taha).
- cd ~/M_Taha → Access the created folder.
- rm [filename] → Removes a file.
- rm –r [foldername] → Removes a folder.



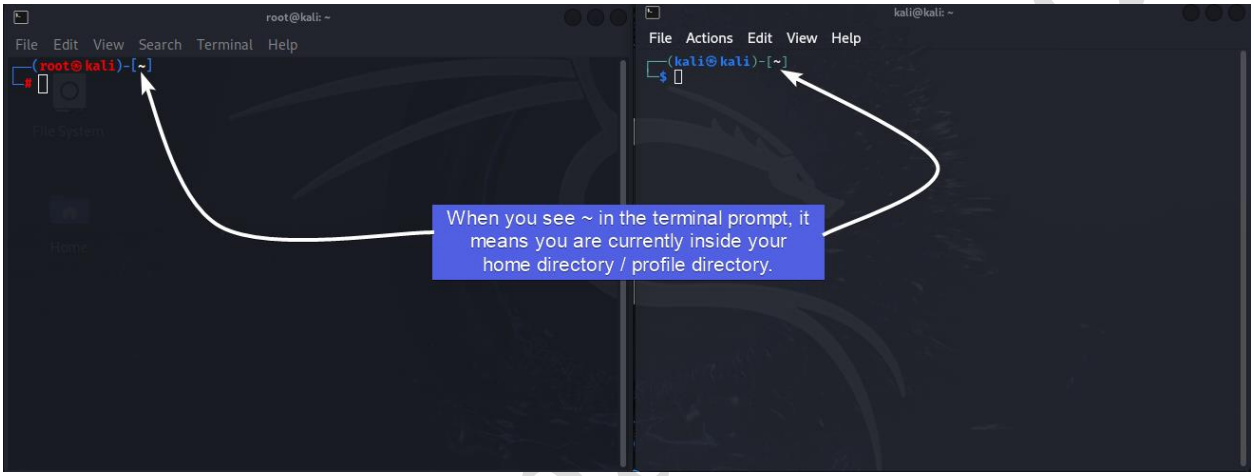
- Files appear in white and folders appear in blue

➢ History:-

history → Shows the list of previously used commands.

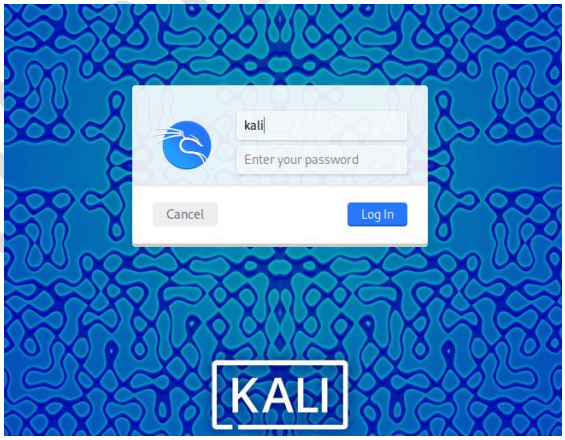
➢ Home Directory (~):

- In Linux, the **tilde symbol (~)** represents the **home directory / profile directory** of the currently logged-in user.
- Example: If you're logged in as user kali, then ~ points to /home/kali. If you're logged in as root, ~ points to /root.
- When you see ~ in the terminal prompt, it means you are currently inside your **home directory / profile directory**.

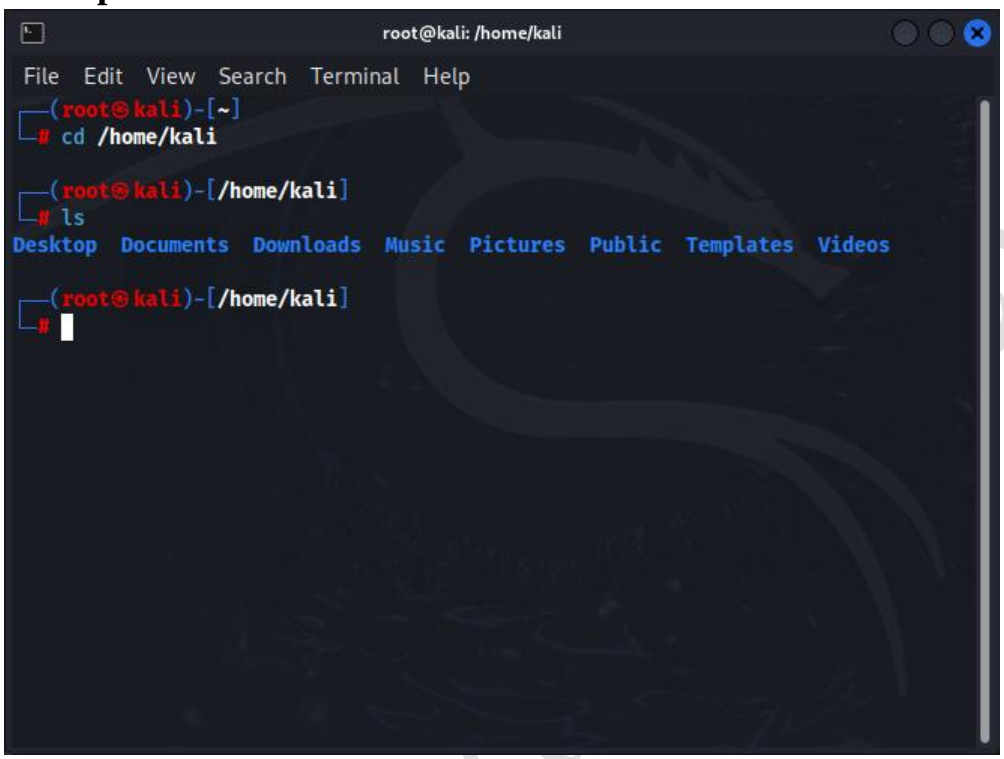


➢ Automatic Folders:

- When a user logs in graphically for the first time, Linux automatically creates some default folders (like **Desktop, Downloads, Documents, Music, Pictures, Videos**) in their **home directory**.

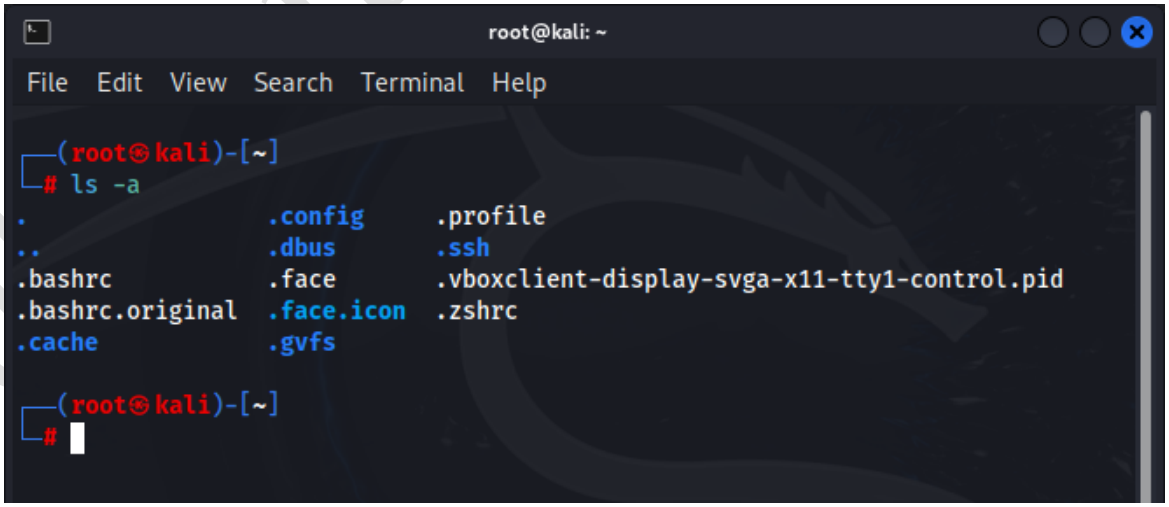


- **Example: Run:**



➢ Hidden Files:

- To view **hidden files**, use:



- The -a option means **all**, including hidden files.
- InLinux (and UNIX-like systems), hidden files and folders start with a **dot (.)**.
  Example: .bashrc, .profile, .config/

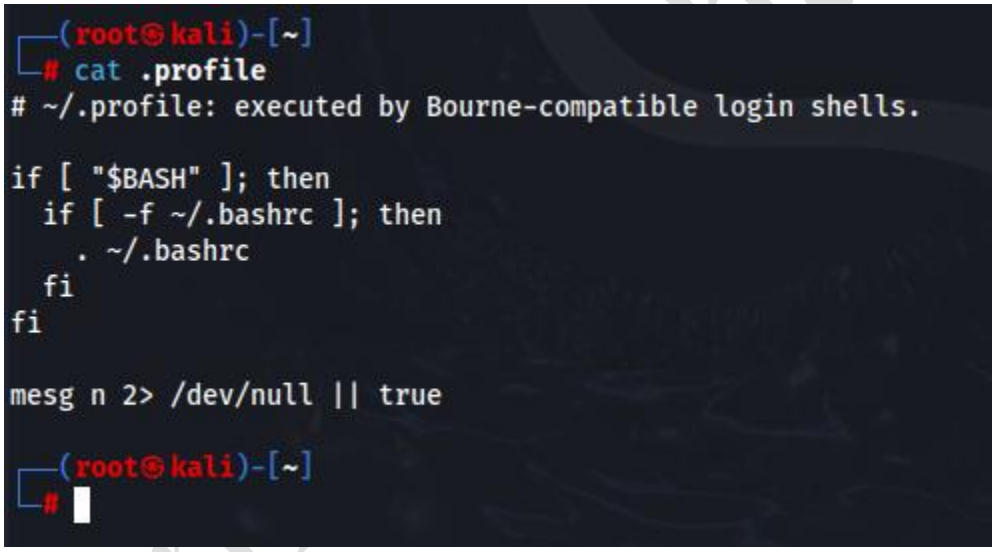
➢ **In Windows**, hidden files are controlled by system attributes, not by starting the name with a dot.

➢ File Extensions:

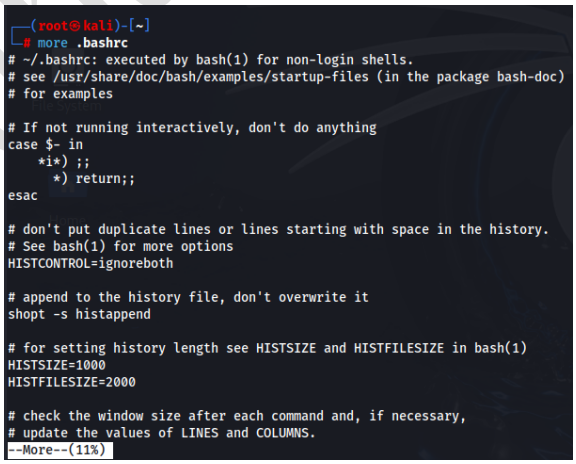
- In **Windows**, file extensions are important (.txt, .zip, .exe, etc.).
- In **Linux**, file extensions are **optional**. Files are recognized by their **content**, not extension.
- Example: A shell script may not have .sh extension but can still be executed if it has executable permissions.
- In **Linux** the color **White** represents a **text file** and the color **Blue** represents a **directory**.

➢ Viewing File Contents:

- To view contents of a file use:
  cat filename



- **Only use cat for small files** (otherwise the output will overflow).
- To view large files use page by page using this command:
  more filename



- Press **Enter** to move line by line.

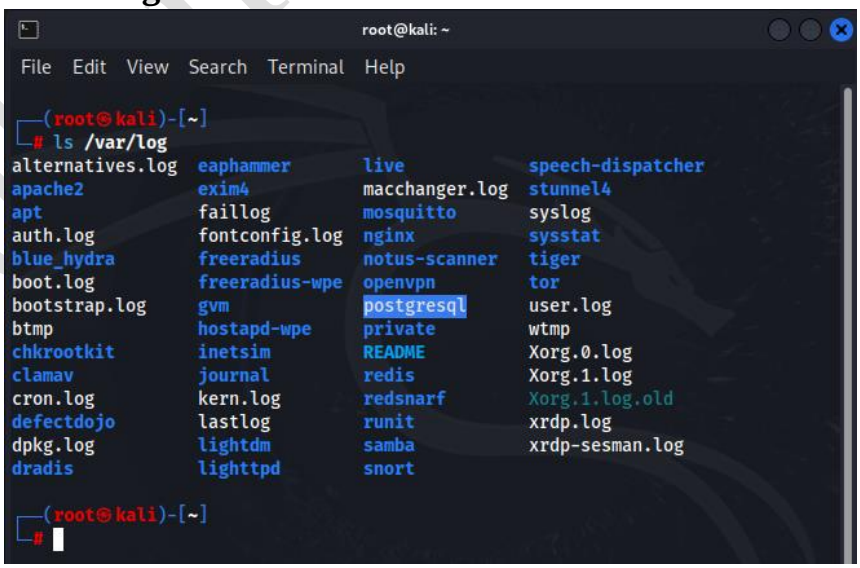
- Press **Spacebar** to move page by page.
- To view first 10 lines of a file use this command:
  head filename
- To view the last 10 lines of a file use this command:
  tail filename
- Custom Number of lines let's say first 15 lines:
  head –n 15 filename
- Custom number of lines let's say last 15 lines:
  tail –n 15 filename
- Get the first line of the file only:
  head –n 1 filename
- Get the last line of the file only:
  tail –n 1 filename

➢ System Information:

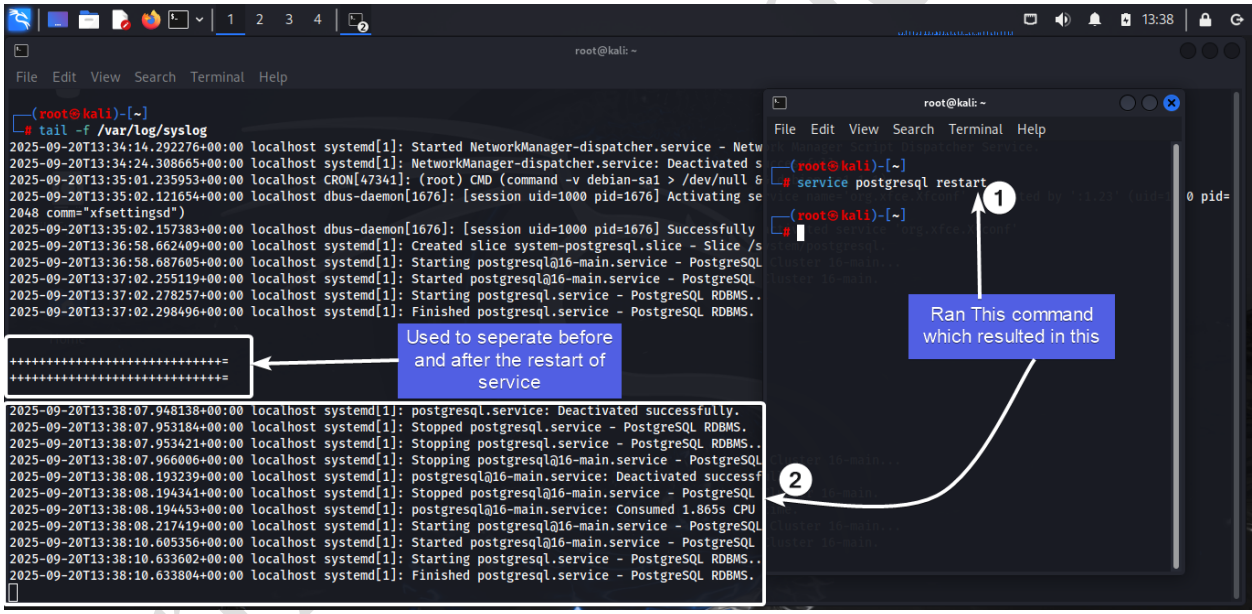
- To check CPU details:
  cat /proc/cpuinfo
- To check ram details:
  cat /proc/meminfo

➢ Logs

- Linux System logs are stored in ***/var/log*** To see them:
  ls /var/log



- To monitor a log file continuously (live updates)
  tail -f /var/log/syslog
- **Example:**
  - Run in one Terminal:
    tail -f /var/log/syslog (This will keep new logs as they are added)
  - In another terminal restart a service like PostgreSQL
    service postgresql restart
  - You will immediately see the related logs in the first terminal



- You can check the history of the commands you've run using:
  history

```
┌──(root㉿kali)-[~]
└─# history
    1  pwd
    2  cd /home/kali
    3  cd
    4  cd /home/kali
    5  ls
    6  cd
    7  cd /home/kali
    8  mkdir M_Taha
    9  rm -r M_Taha
   10  ls
   11  cd
   12  ls -a
   13  clear
   14  ls
   15  touch .Taha
   16  mkdir M_Taha
   17  ls -a
   18  rm -r M_Taha
   19  mkdir .M_Taha
   20  ls
   21  ls -a
   22  rm -r M_Taha
   23  rm .Taha
   24  ls
   25  ls -a
   26  rm -r .M_Taha
   27  ls -a
   28  clear
   29  ls -a
   30  cat .bashrc
   31  clear
   32  touch .Taha
   33  cat .Taha
   34  ls -a
   35  cat .vboxclient-display-svga-x11-tty1-control.pid
   36  cat .face
   37  clear
   38  ls -a
   39  cat /proc/cpuinfo
   40  cat /proc/meminfo
   41  more /proc/cpuinfo
   42  clear
   43  history
   44  clear
   45  head /proc/cpuinfo
   46  tail /proc/meminfo
   47  head -n 1 /proc/meminfo
   48  ls
   49  ls -a
   50  head -n 1 .face
   51  tail -n 1 .face
   52  ls -a
   53  head -n 1 .bashrc
   54  clear
   55  ls /var/log
   56  head -n 1 /var/log/syslog
   57  tail -f /var/log/syslog
   58  clear
```

➢ Getting Help in Linux:

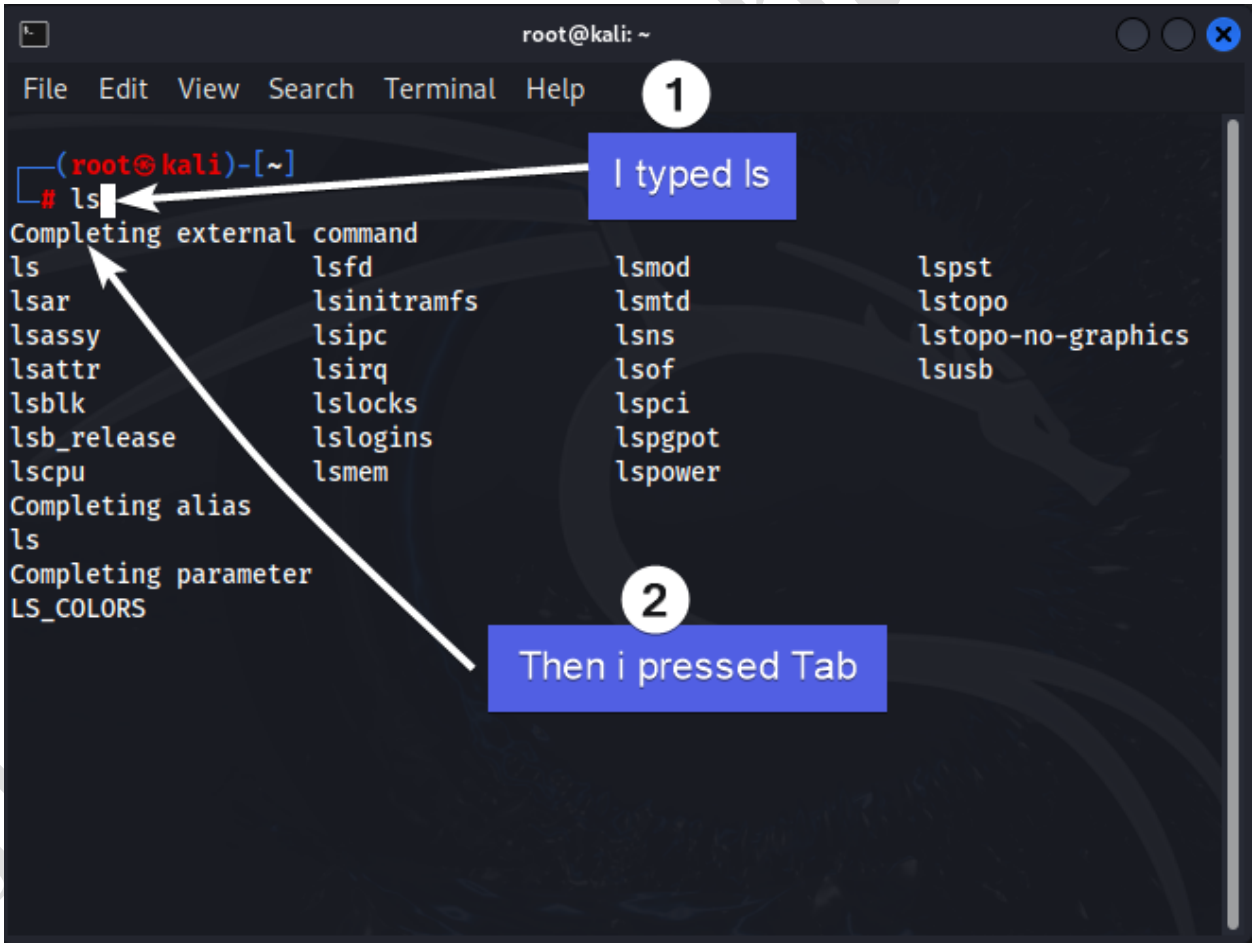
- If you need technical help, you can use **Google** or **ChatGPT** but **Linux** itself provide multiple ways to get help about commands.

➢ Command Line vs GUI:

- **Command line** is the **professional approach.**
- A **Cybersecurity professional** mainly works on the command line, since most powerful tools and administrative tasks are handled there.

➢ Tab Completion:

- If you type the **first few letters** of a command and then press **Tab**, Linux will try to auto-complete the command or list all the possible commands related to that specific command.



➢ Where Commands Are Stored:

- Linux Commands are stored in specific directories:
  - ls /bin
  - ls /usr/bin
  - ls /usr/local/bin
  - ls /sbin
  - ls /usr/sbin
  - ls /usr/local/sbin

➢ bin vs sbin:

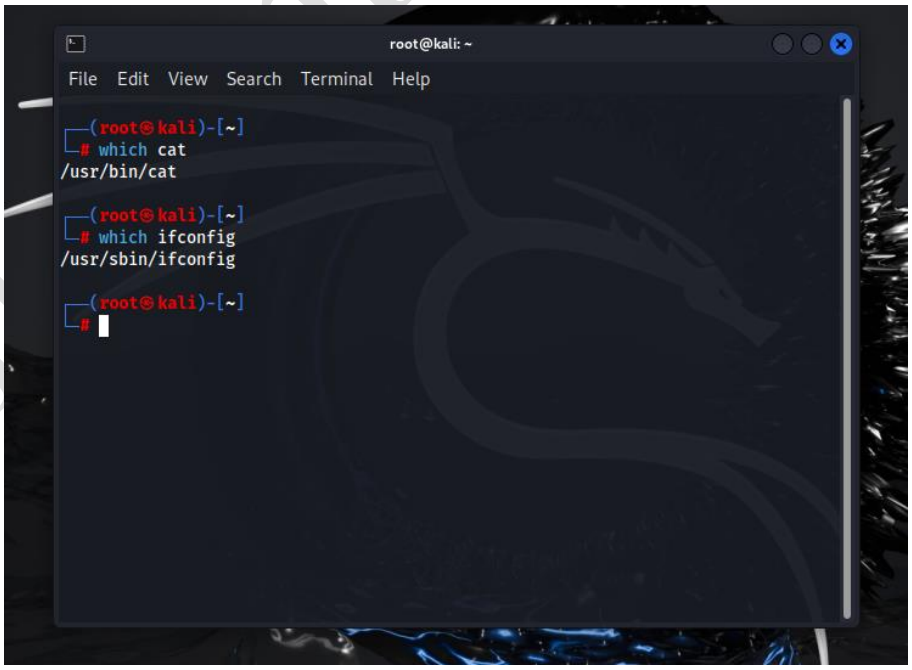
bin	sbin
Contains **basic commands** that all users can run.	Contains **administrative commands**, usually only run by the root user

Even if you use sudo, not every command in sbin will be accessible unless your account has the required privillages.

Administrative commands affect the **whole system.**

➢ Finding Where a Command Lives:

- To check whether a command is basic or administrative use:
  - **which [command name]**
  - **Example:**

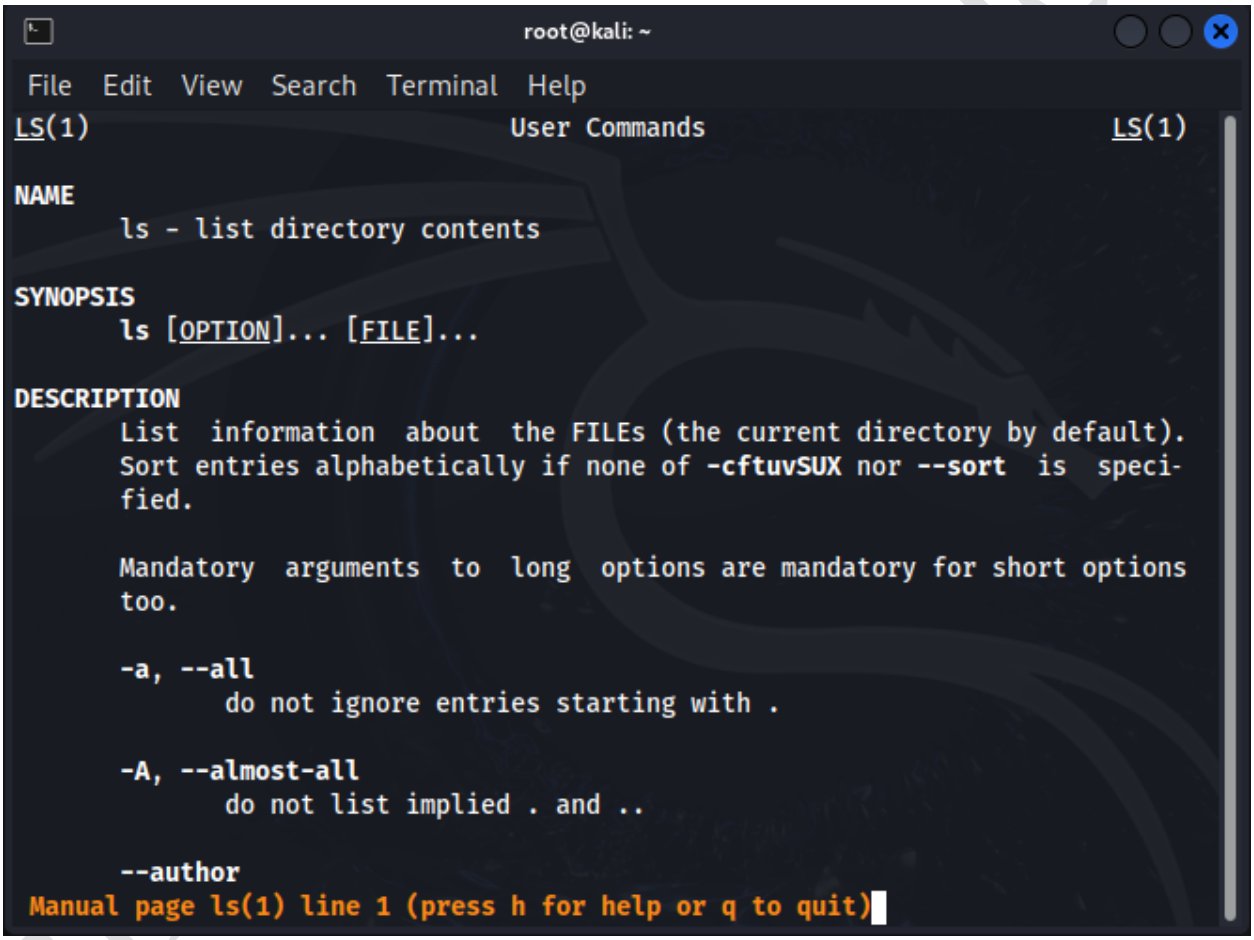


➢ Sudo & Root:

- **Sudo** is used to run commands with administrative permissions.
- Root can run all commands in /sbin.
- A non-root user can run them only if root has granted permission.

➢ Manual Pages (man):

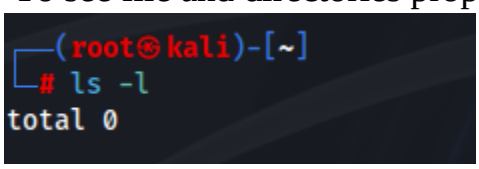
- Every command in linux has a **manual page** (documentation).
- **Example: man ls**



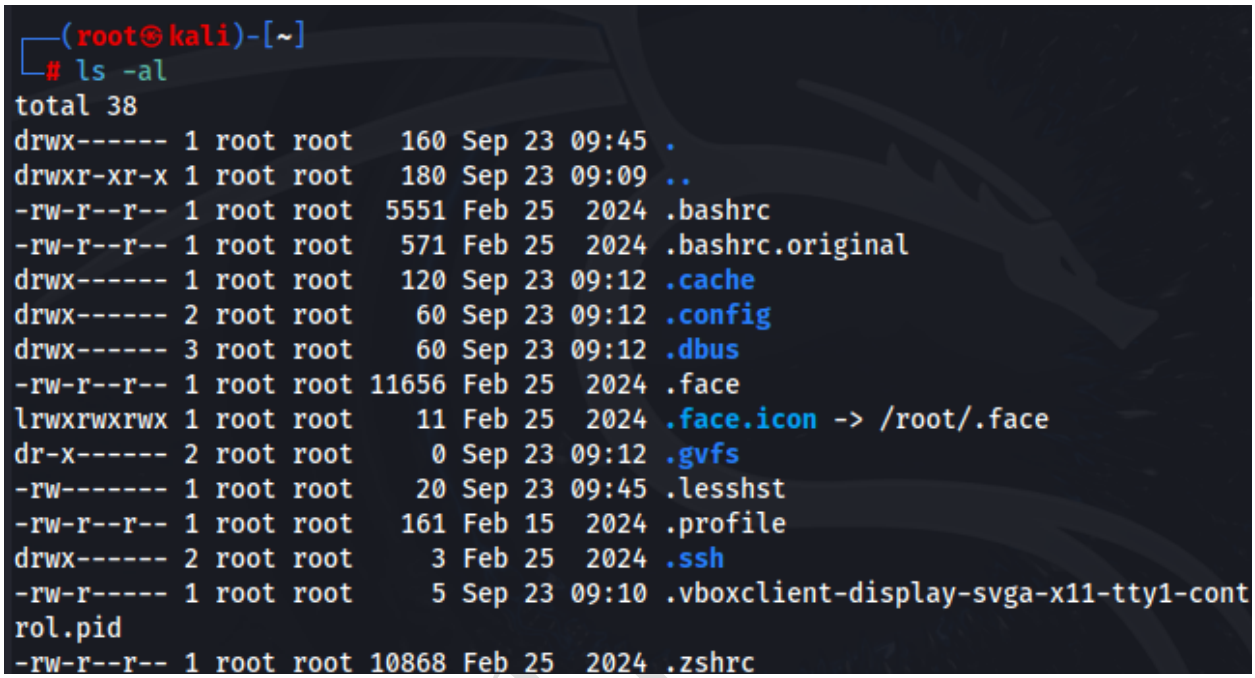
- In the **Synopsis** section of the manual, the **bold text means mandatory arguments.**

➢ File Properties:

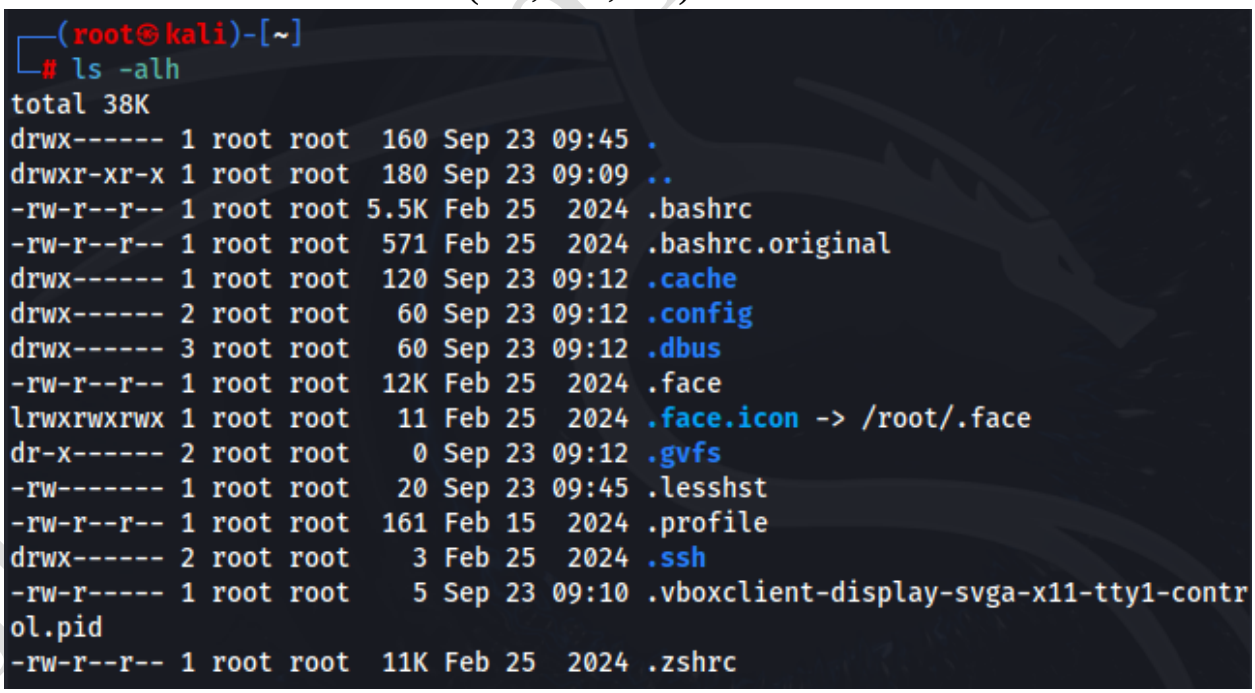
- To see file and directories properties **ls –l:**



- To include hidden files **ls –al:**



- To see **human-readable sizes** (KB, MB, GB) **ls –alh:**



-rw-r--r-- 1 root root 10868 Feb 25 2024 .zshrc						
-rw-r--r--	**1**	**root**	**root**	**10868**	**Feb 25 2024**	**.zshrc**
File Permissions	Number of links	Owner	Group Member Ship	File size (bytes)	Last Modified Date and Time	File Name

➢ Word Count (wc):

- To count lines, words, and characters in a file **wc filename:**

```
┌──(root㉿kali)-[~]
└─# wc .zshrc
  258   932 10868 .zshrc
```

258 932 10868 .zshrc		
258	**932**	**10868**
Lines	Words	Characters

➢ Quick Help:

- To see a quick summary of options (instead of full manual) **ls –help:**

```
┌──(root㉿kali)-[~]
└─# ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILEs (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

Mandatory arguments to long options are mandatory for short options too.
  -a, --all                  do not ignore entries starting with .
  -A, --almost-all           do not list implied . and ..
      --author               with -l, print the author of each file
  -b, --escape               print C-style escapes for nongraphic characters
      --block-size=SIZE      with -l, scale sizes by SIZE when printing them;
                             e.g., '--block-size=M'; see SIZE format below

  -B, --ignore-backups       do not list implied entries ending with ~
  -c                         with -lt: sort by, and show, ctime (time of last
                             change of file status information);
                             with -l: show ctime and sort by name;
                             otherwise: sort by ctime, newest first
```

More Downwards

➢ Processes and Services:

- To list running services/processes:
  - **Ps -aux**
- To view output **page by page:**
  - **Ps -aux | more**
- To monitor system performance in real time:
  - **top**
  - This shows processes sorted by **CPU** and **memory usage.**
  - To quit **top,** press **q.**

➢ Zombie Process:

- A **zombie process** is a child process whose **parent process has already terminated.**
- Since it has no parent to clean it up, it lingers until the system reclaims it.

➢ Quit Commands:

- In most Linux help/manual/programs (like man, more, top), you can quit by pressing:
  - **q**

➢ Permissions Overview:

- In Linux file and directory permissions are represented like this:
  - **-rw-r--r--**
- This string has a total of 10 characters:
  - The **first character** is the **file type (nature)**, not part of permissions.

-	**d**	**l**
regular file	directory	symbolic link

  - The next **9 characters** represent permissions.

➢ Permission Types:

r	**w**	**x**	**-**
Read	Write	Execute	No Permission

The order is always the same: **read → write → execute**

➢ Permission Groups:

- Permissions are divided into three sets:
  - **Owner (user)** → the user who owns the file.
  - **Group** → other users in the same group.
  - **Others** → all other users.
- **Example:**

rw-	r--	r--
Owner can read and write	Group can only read	Other users can only read

➢ Checking Permissions:

- To see file and directories permissions **ls –l:**

```
┌──(root㉿kali)-[~]
└─# ls -l
total 0
drwxr-xr-x 2 root root 40 Sep 24 09:40 M_Taha
-rw-r--r-- 1 root root  0 Sep 24 09:39 Taha
```

- To see file permissions **ls –l [filename].**

```
┌──(root㉿kali)-[~]
└─# ls -l Taha
-rw-r--r-- 1 root root 0 Sep 24 09:39 Taha
```

- To see directory permissions (not contents) **ls -ld [dirname].**

```
┌──(root㉿kali)-[~]
└─# ls -ld M_Taha
drwxr-xr-x 2 root root 40 Sep 24 09:40 M_Taha
```

➢ Groups in Linux:

- In **Windows,** new users are added to predefined groups.
- In **Linux,** when new user is created, a **new group with the same name** is also created by default.
- To check which group a user belongs to:
  - **id username**

```
┌──(root㉿kali)-[~]
└─# id kali
uid=1000(kali) gid=1000(kali) groups=1000(kali),4(adm),20(dialout),24(cdrom),
floppy),27(sudo),29(audio),30(dip),44(video),46(plugdev),100(users),101(netde
108(debian-tor),121(wireshark),126(bluetooth),127(vboxsf),142(scanner),152(ka
er)
```

➢ Changing Permissions:

- Permissions can be represented by numbers:

Read(r)	Write(w)	Execute(x)	No Permission(-)
4	2	1	0

- Add the values together for each group.
- **Example:**
  1. **Create a file:**
     - **touch Taha**
     - Default Permissions are: **-rw-r--r—**

```
┌──(root㉿kali)-[~]
└─# touch Taha

┌──(root㉿kali)-[~]
└─# ls -l Taha
-rw-r--r-- 1 root root 0 Sep 24 10:02 Taha
```

  2. If we want **owner, group, and others to have read + write (rw- rw- rw-):**

Owner	Group	Others
r(4)+w(2)	r(4)+w(2)	r(4)+w(2)
6	6	6

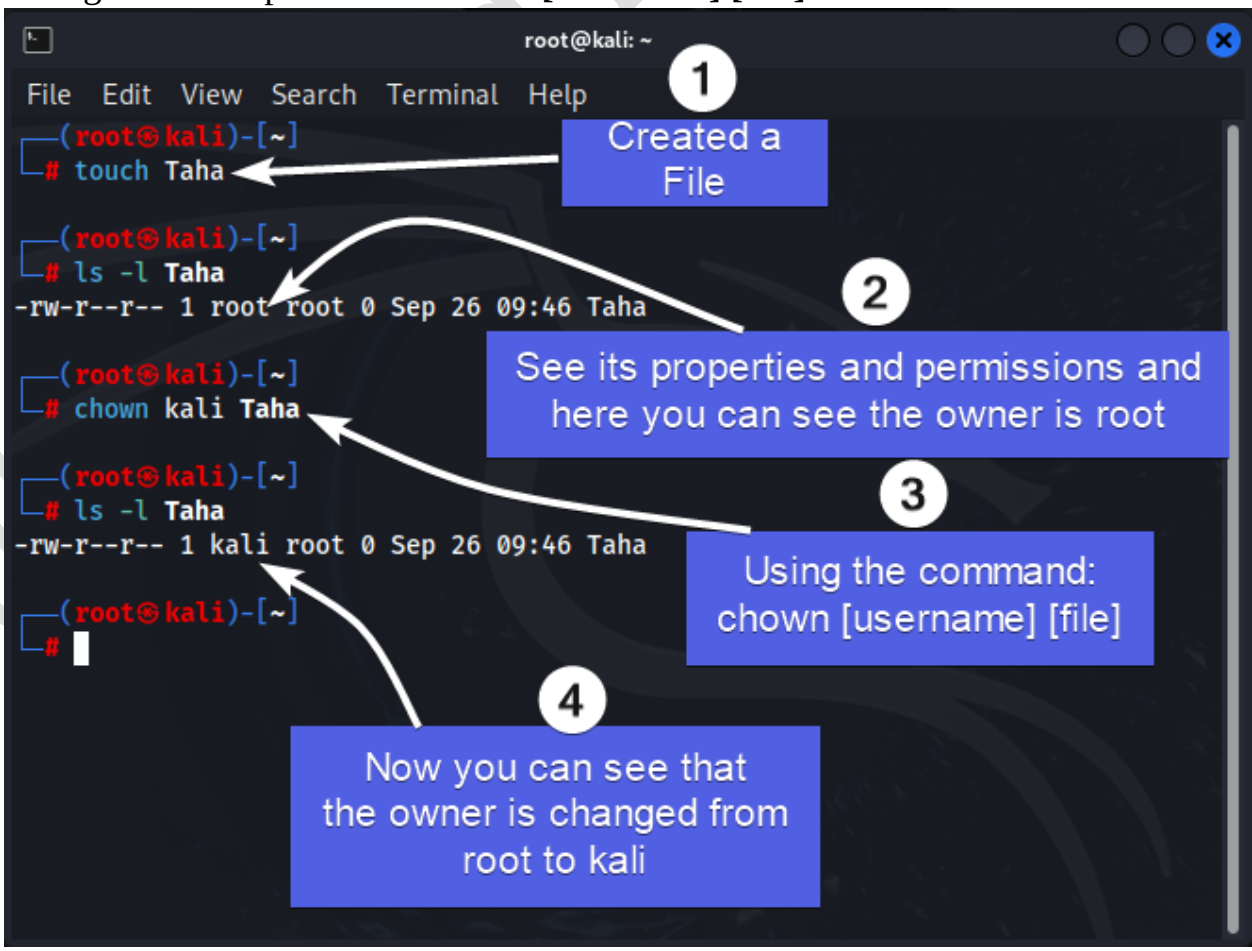
  3. **Change Permissions:**
     - **chmod 666 Taha**

- New Permissions: **-rw-rw-rw-**

```
┌──(root㉿kali)-[~]
└─# touch Taha

┌──(root㉿kali)-[~]
└─# ls -l Taha
-rw-r--r-- 1 root root 0 Sep 24 10:02 Taha

┌──(root㉿kali)-[~]
└─# chmod 666 Taha

┌──(root㉿kali)-[~]
└─# ls -l Taha
-rw-rw-rw- 1 root root 0 Sep 24 10:02 Taha
```

➢ File and User Management:

- Change ownership of a file: **chown [username] [file]**



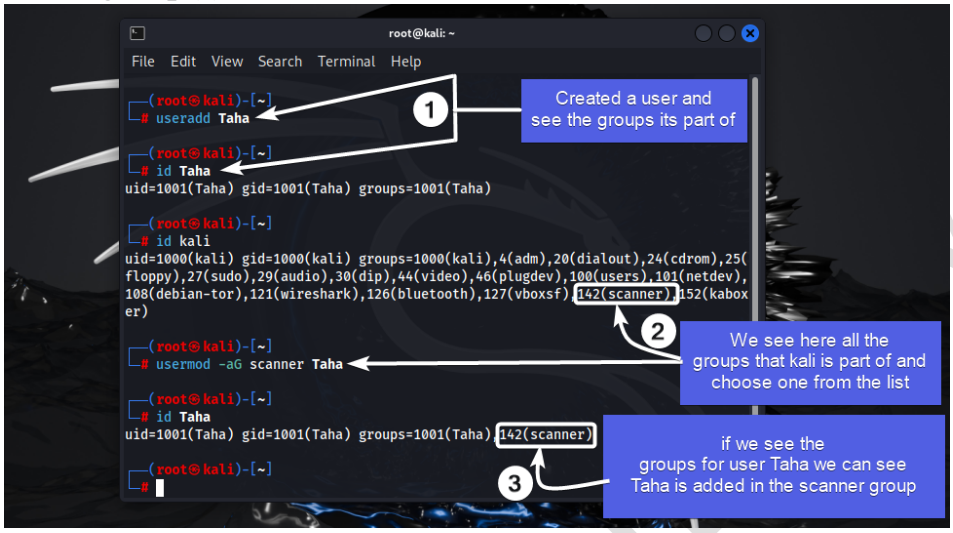
- The user must already exist for this to work. If the user does not exist we can add the user using the command: **useradd [username].**

```
┌──(root㉿kali)-[~]
└─# useradd Taha
```

- To change group of a file we can use the command:
  chgrp [groupname] [file]

- To add a user to a group we can use: **usermod -aG [groupname] [username]**
  - -a → append (don't remove existing groups)

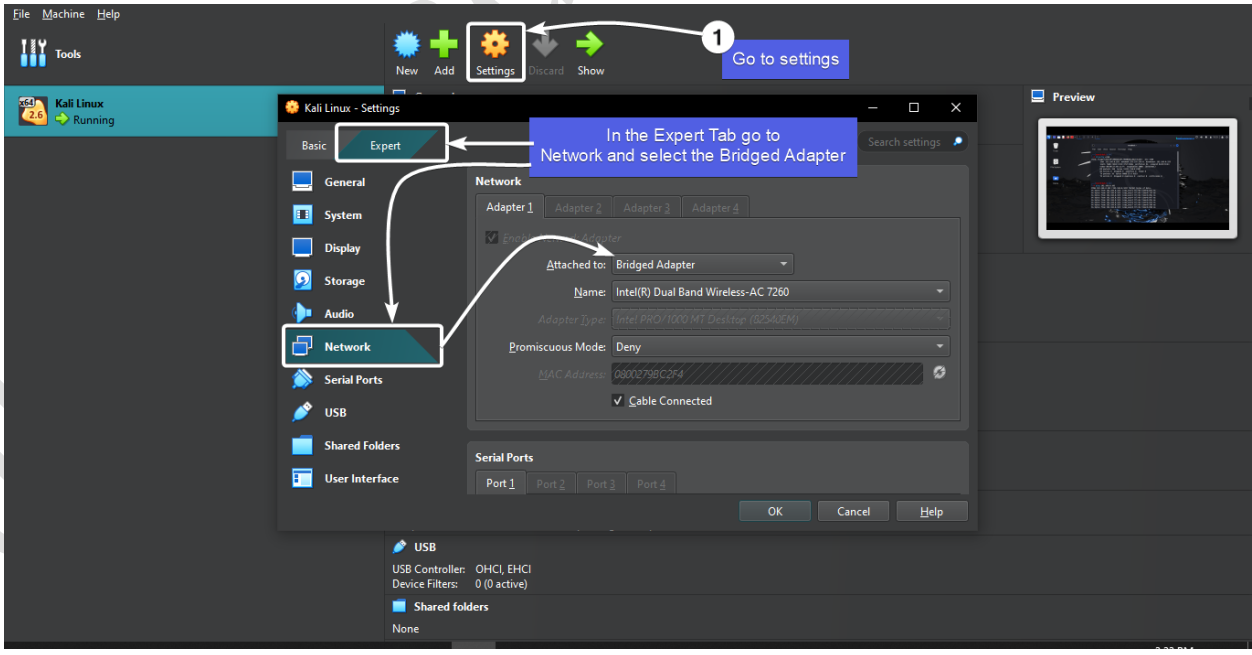
- -G → group(s) to add the user into



⚠ If you use a **small -g** instead of -G, the user will be removed from all their other groups and only added to the one you specify.

➢ Network Settings:

- In the vm setting select the bridged adapter if not previously selected and restart the virtual machine:



- We know that in Bridged Adapter setting the virtual machine will have the internet connection that the physical machine have so after selecting and restarting the virtual machine type the command **ifconfig eth0** to check the Network Settings.

- **Look for:**
  - inet → IPv4 Address
  - inet6 → IPv6 Address
  - ether → MAC Address

    ⚠ If you don't see an inet line → no IPv4 is assigned.

    ⚠ If you don't see an inet6 line → no IPv6 is assigned.

- **Test Connectivity with ping:**
  - **ping -c 4 [ip-address]**

  ⚠ If you ping **from your Virtual Machine (VM) to your Physical Machine (Windows)**, you might see:
  - Destination Host Unreachable
  - 100% Packet Loss.
- This usually happens because **Windows Firewall blocks ICMP (ping) requests by default**. It doesn't mean your network is broken — just that your VM can't get a reply from the host until you allow ICMP in the firewall.

  🔎 **What is ICMP:**

  - ICMP = *Internet Control Message Protocol*.
  - It's used by network devices (like routers, servers, and PCs) to send error messages and operational information.
  - ping is the most common use of ICMP — it sends an **ICMP Echo Request** and expects an **ICMP Echo Reply**.
  - If ICMP is blocked (like by Windows Firewall), ping will always fail, even if the network itself is fine.