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EDITION

AUTHOR
SYED TAIMOOR NAWAZ

Ultimate Linux 

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"You primarily write your code to communicate with other coders, and, to a lesser expert, to impose your will on the computer."

S. TAIMOOR

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Preface

The Linux Commands Handbook follows the 80/20 rule: learn in 20% of the time the 80% of a topic. I find this approach gives a well-rounded overview. This book does not try to cover everything under the sun related to Linux and its commands. It focuses on the small core commands that you will use the 80% or 90% of the time, trying to simplify the usage of the

more complex ones.

All those commands work on Linux Distros, macOS, WSL, and anywhere you have a Linux environment.

I hope the contents of this book will help you achieve what you want: **get comfortable with Linux**. This book is written by Taimoor. I **publish programming tutorials** every day on my website CodeWithTaimoor.com. and subscribe my YouTube

channel CodeWithTaimoor You can reach me on Twitter @taimoor.

Enjoy!

Introduction to Linux and shells

Linux is an operating system, like macOS or Windows. It is also the most popular Open Source and free, as in freedom, operating system. It powers the vast majority of the servers that compose the Internet. It's the base upon which

everything is built upon. But not just that. Android is based on (a modified version of) Linux. The Linux "core" (called kernel) Kernel basically a core component for a computer was born in 1991 in Finland, and it went a really long way from its humble beginnings. It went on to be the kernel of the GNU Operating System, creating the duo GNU/Linux. There's one thing about Linux that corporations like Microsoft and Apple, or Google, will never be able to offer: the freedom to do whatever you want with your computer. They're actually going in the opposite direction, building walled gardens, especially on the mobile side. Linux is the ultimate freedom. It is developed by volunteers, some paid by companies that rely on it, some independently, but there's no single commercial company that can dictate what goes into Linux, or the project priorities. Linux can also be used as your day-to-day computer. I use WindowsOS because I really enjoy the applications, the design and I also used

to be a Mac and Windows apps developer, but before using it I used Linux as my main computer

Operating System. No one can dictate which apps you can run, or "call home" with apps that track you, your position, and more. Linux is also special because there's not just "one Linux", like it happens on Windows or macOS. Instead, we have distributions. A "distro" is made by a company or organization and packages the Linux core with additional programs and tooling. For example, you have Debian, Red Hat, and Ubuntu, mint, probably the most popular. Many, many more exist. You can create your own distribution, too. But most likely you'll use a popular one, one that has lots of users and a community of people around it, so you can do what you need to do without losing too much time reinventing the wheel and figuring out answers to common problems.

Some desktop computers and laptops ship with Linux preinstalled. Or you can

install it on your Windows-based computer, or on a Mac. But you don't need to disrupt your existing computer just to get an idea of how Linux works. I don't have a Linux computer. If you use a Mac or Windows you need to know that under the hood macOS is a Linux Operating System, and it shares a lot of the same ideas and software that a GNU/Linux system uses, because GNU/Linux is a free alternative to UNIX. UNIX is an umbrella term that groups many operating systems used in big corporations and institutions, starting from the 70's

Some more information The macOS terminal gives you access to the same exact commands I'll describe in the rest of this handbook. Microsoft has an official Windows Subsystem for Linux which you can (and should!) install on Windows. This will give you the ability to run Linux in a very easy way on your PC. But the vast majority of the time you will run a Linux computer in the cloud via a VPS (Virtual Private Server) like Digital Ocean.

A shell is a command interpreter that exposes to the user an interface to work with the underlying operating system. It allows you to execute operations using text and commands, and it provides users advanced features like being able to create scripts.
This is important: shells let you perform things in a more optimized way than a GUI (Graphical User Interface) could ever possibly let you do. Command line tools can offer many different configuration options without being too complex to use. There are many different kinds of shells. This post focuses on Unix shells, the ones that you will find
commonly on Linux Windows and macOS computers. Many different kind of shells were created for those systems over time, and a few of them dominate the space: Bash, Csh, Zsh, Fish and many more! All shells originate from the Bourne Shell (Bash), called sh.

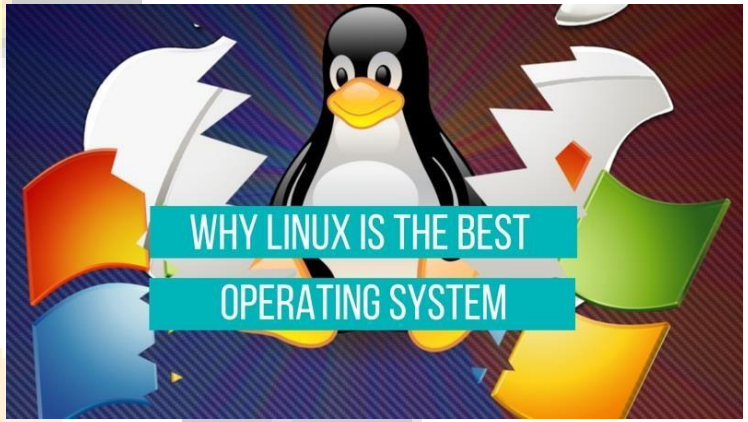
"Bourne" because its creator was Steve Bourne. Bash means Bourne-again shell. sh was proprietary and not open source, and Bash was created in 1989 to create a free alternative for the GNU project and the Free Software Foundation. Since projects had to pay
to use the Bourne shell, Bash became very popular. If you use a Mac and Windows, try opening your Mac terminal. That by default is running ZSH. (Or, pre-Catalina, Bash)
You can set up your system to run any kind of shell, for example I use the Fish shell. Each single shell has its own unique features and advanced usage, but they all share a common
functionality: they can let you execute programs, and they can be programmed. And You I will use bash in windows so you will open-source download git. Git like a bash use.

In the rest of this handbook, we'll see in detail the most common commands you will use.

Get Started

Why Linux

- Its Secure
- Can revive older computers
- Perfect for Programmers
- Faster Updates
- Customization
- Variety of Distributions
- Free to Use
- Its Open Source means its free
- Better Community Support



- Reliability
- Privacy

How does Linux differ from other operating systems?

Comparison

Linux	Windows
Open Source	Closed Source
Free	Cost 150-320
Free Software	Cost Software
Live CD Distribution	NO
Secure	Insecure
NO	Virus, Malware
Low Hardware Cost	High Hardware Cost
Customizable add features	Not Customizable

What is the difference between Unix and Linux?

Difference between Unix and Linux

Unix

1. It is an operating system which *can be only used by its copyrighters*.
2. It was developed mainly for servers, workstations and mainframes.
3. Unix copyright vendors decide different costs for their respective Unix Operating systems.

Linux

1. It is an open-source operating system which is *freely available to everyone*.
2. Nowadays, Linux is in great demand. Anyone can use Linux whether a home user, developer or a student.
3. Linux is freely distributed, downloaded, and distributed through magazines also. And priced distros of Linux are also cheaper than Windows.

Who uses Linux?

Who uses Linux? continued

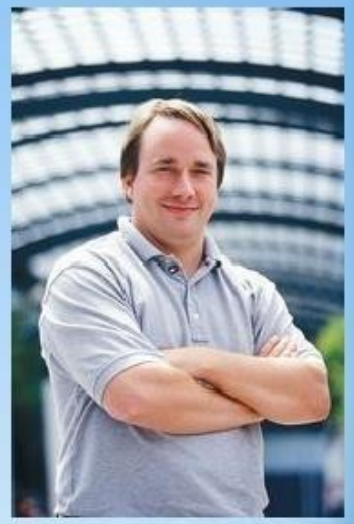
Who “owns” Linux?

- Linus Benedict Torvalds

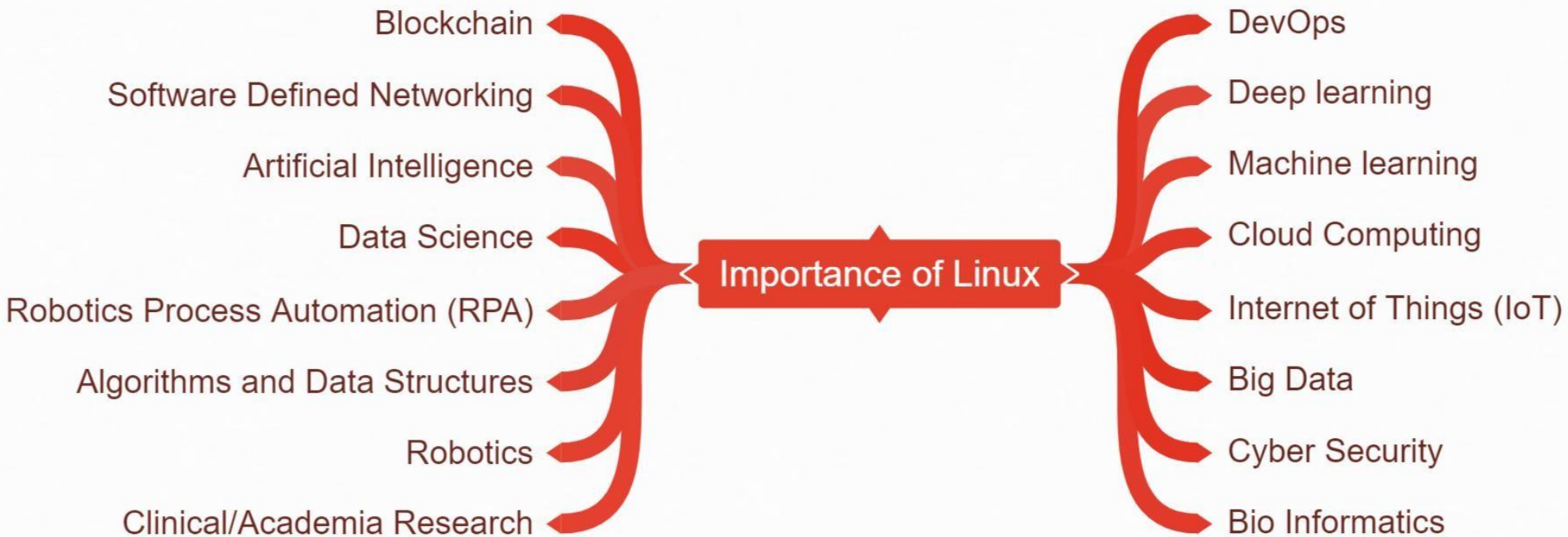
How was Linux created?

Who created Linux ?

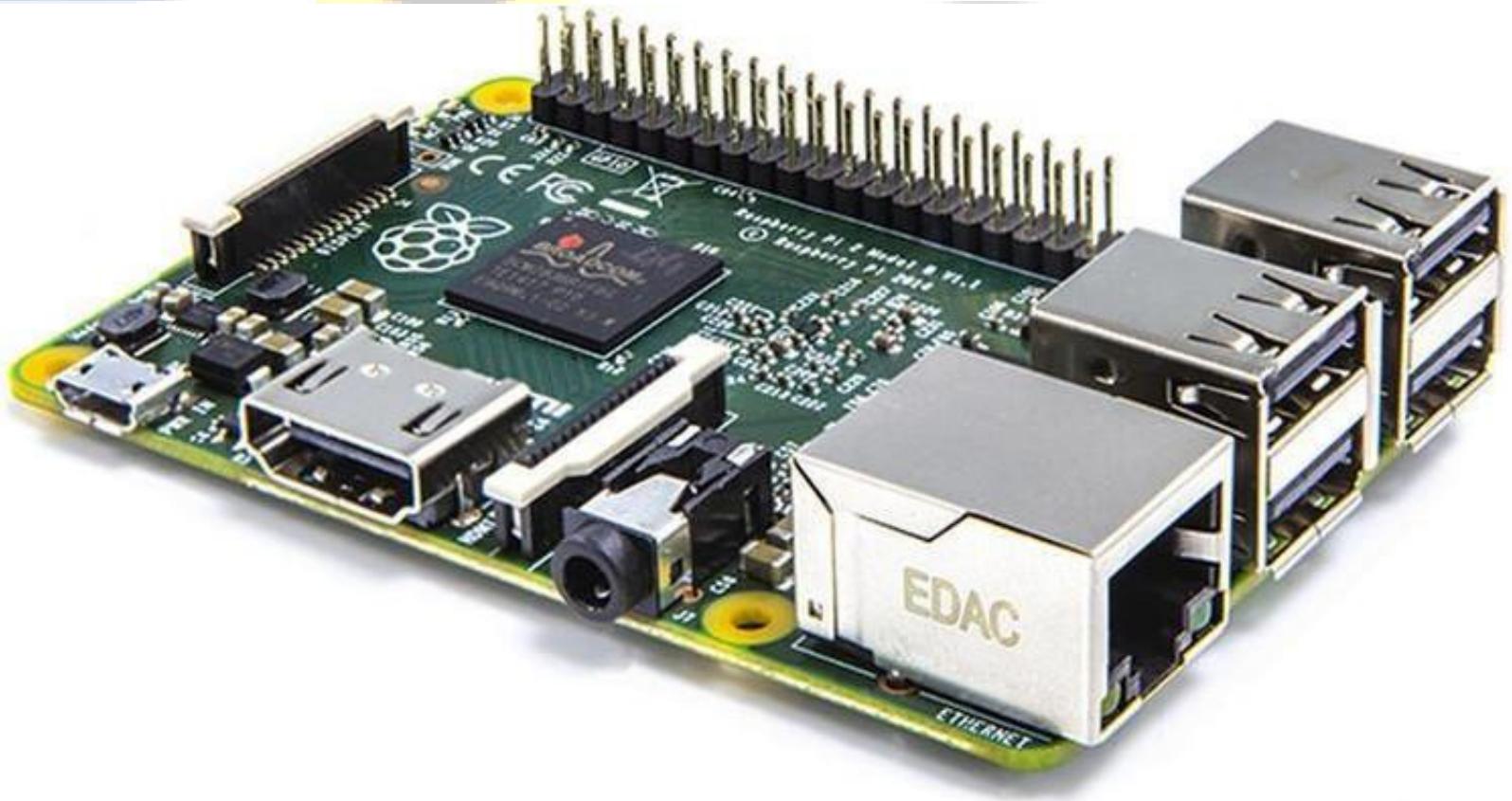
- The Linux kernel was initially written by **Linus Torvalds** a student at the University of Helsinki, Finland.
- Based on **Minix**, a simplified kernel used for teaching OS design.
- Linux was originally written in Intel 386 assembly and C, booted from floppy to run outside OS
- First version released to the Internet in September 1991.



Importance of Linux

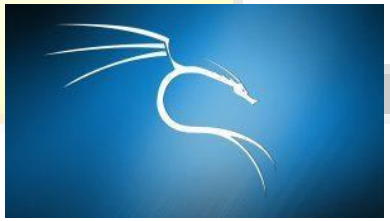


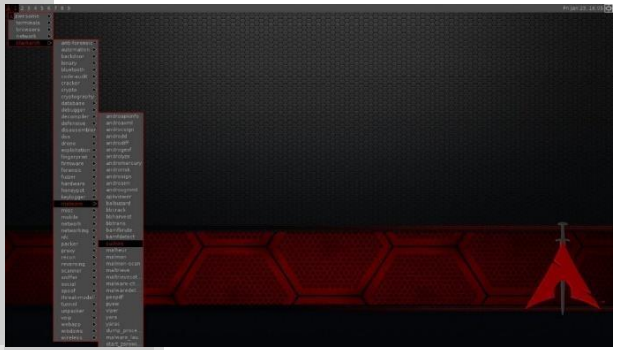
Linux Importance IoT (internet of things)

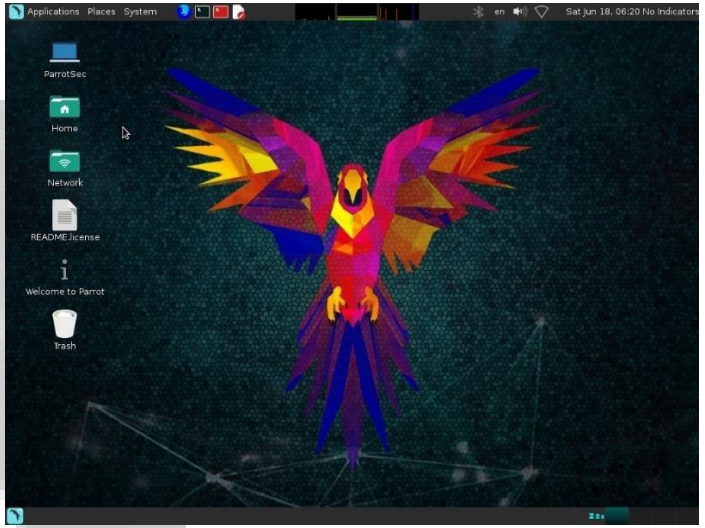


Linux Hacking Distros

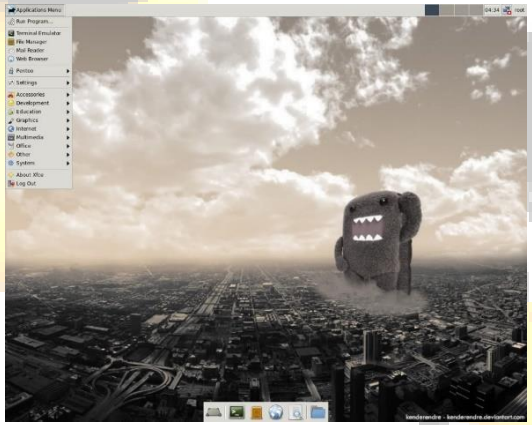
- https://itsfoss.com/linux-hacking-penetration-testing/



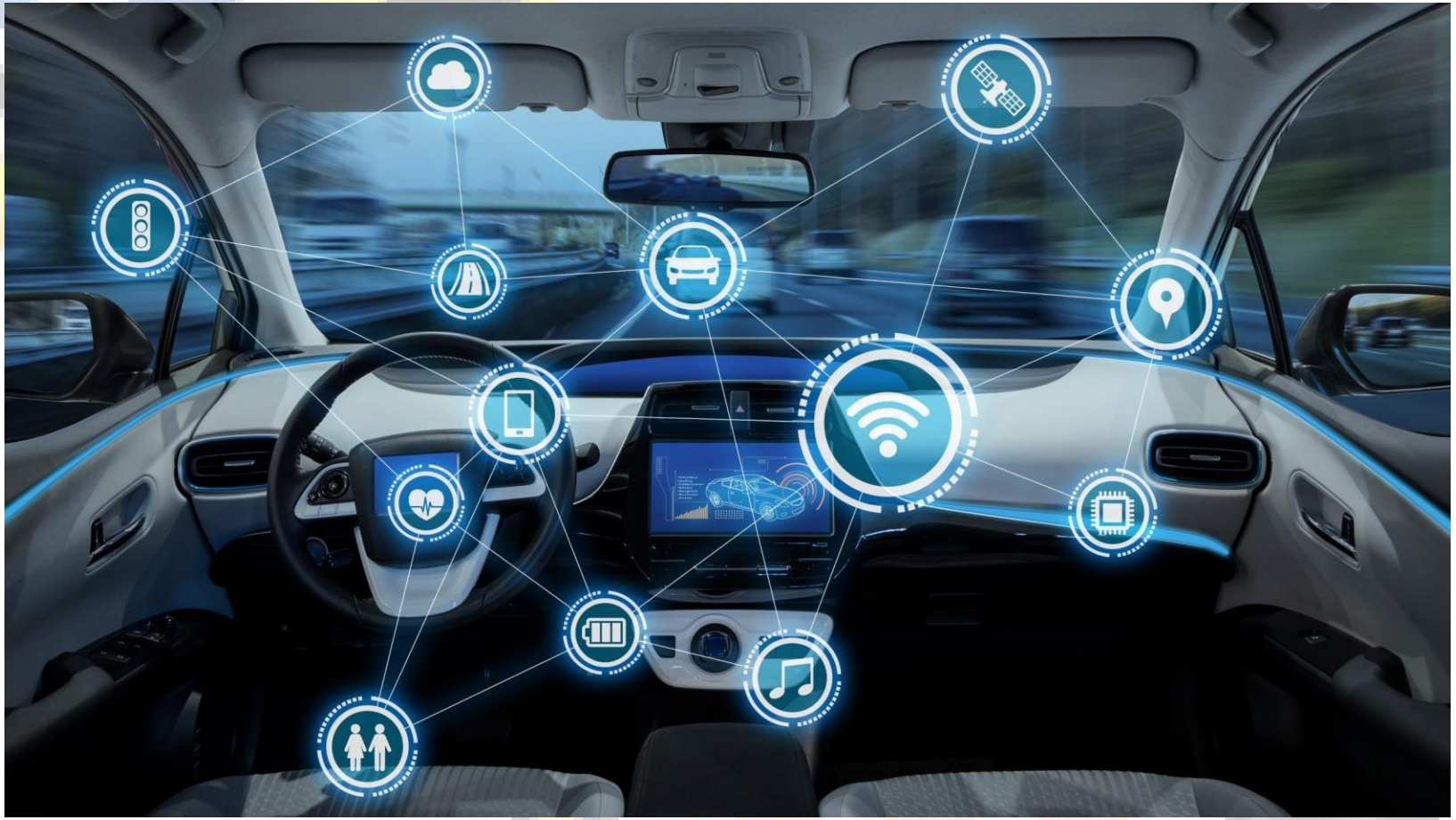




Linux Hacking continued!!

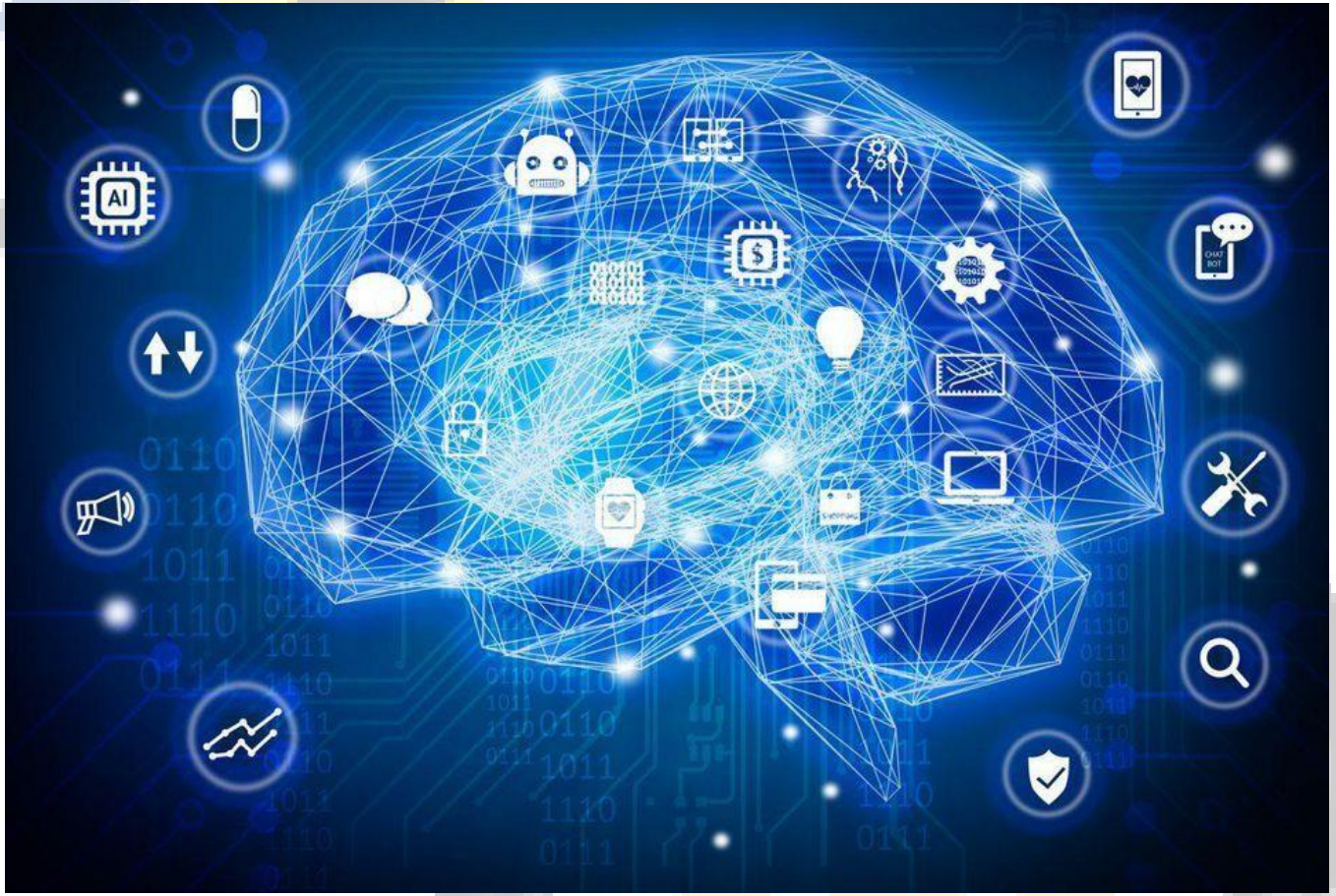


Linux and Autonomous Driving

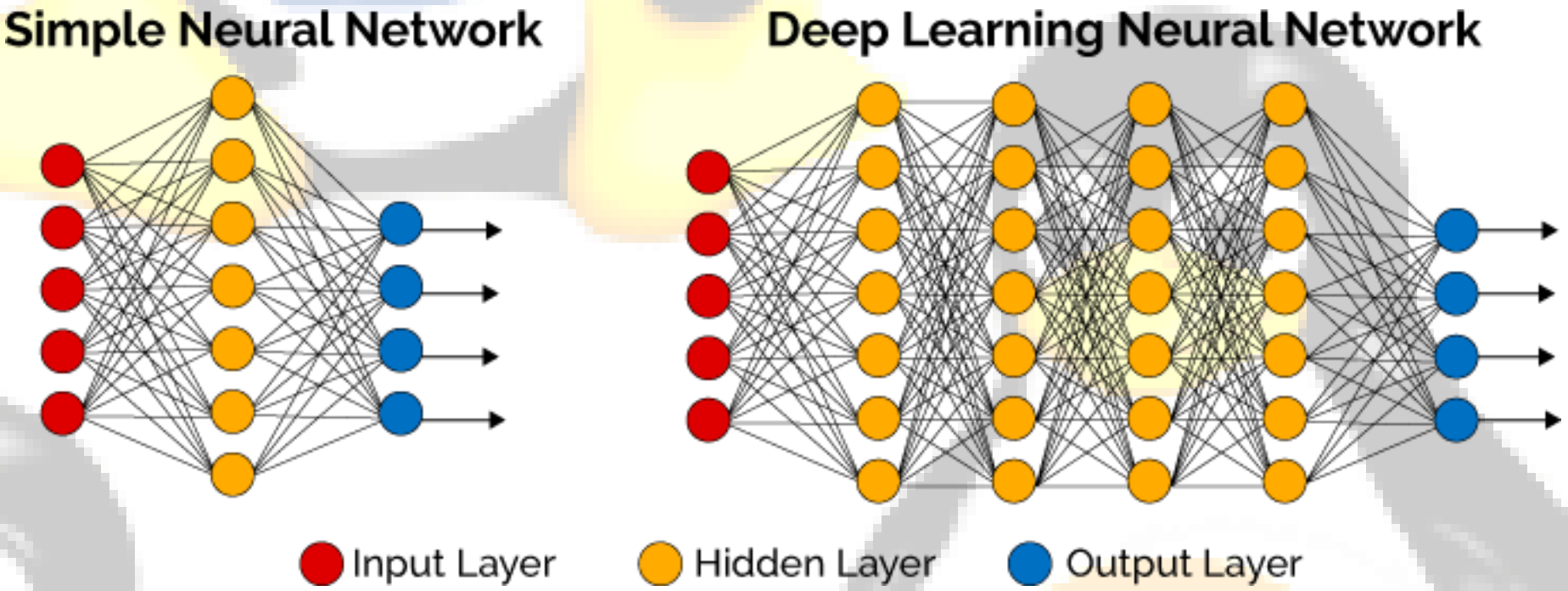


Internet of Things (IoT)

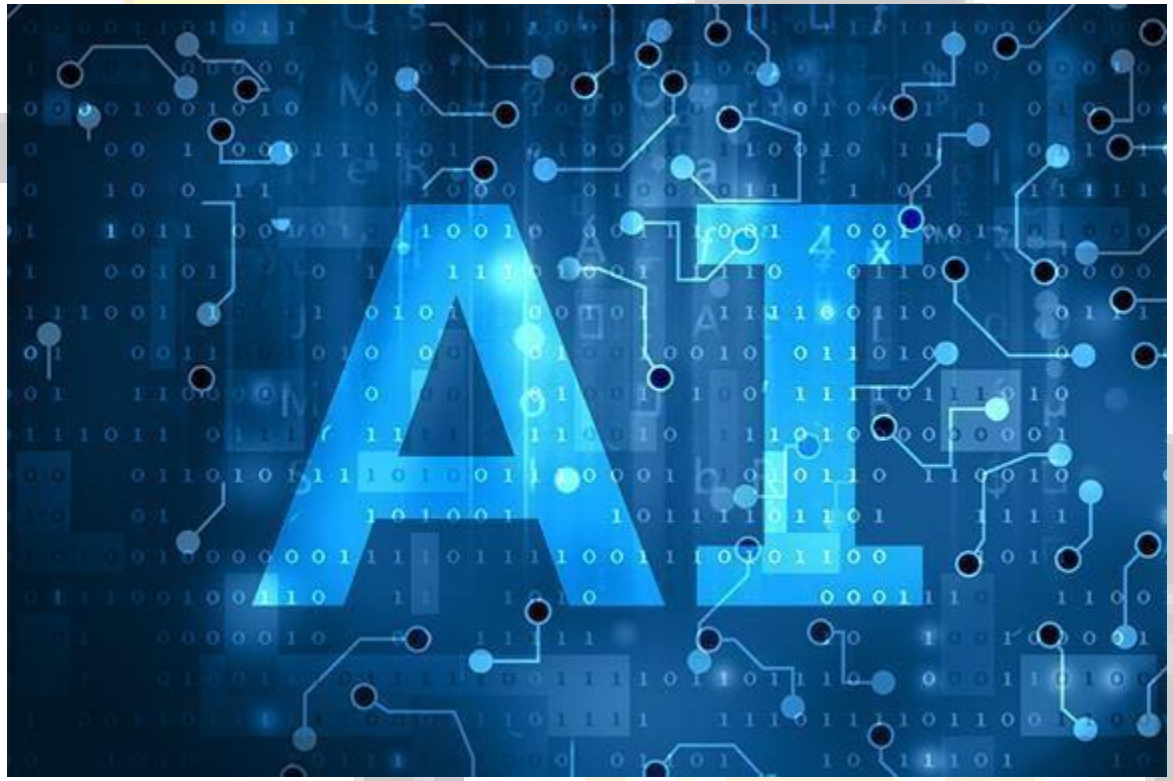
Machine Learning



Deep learning



AI and Linux

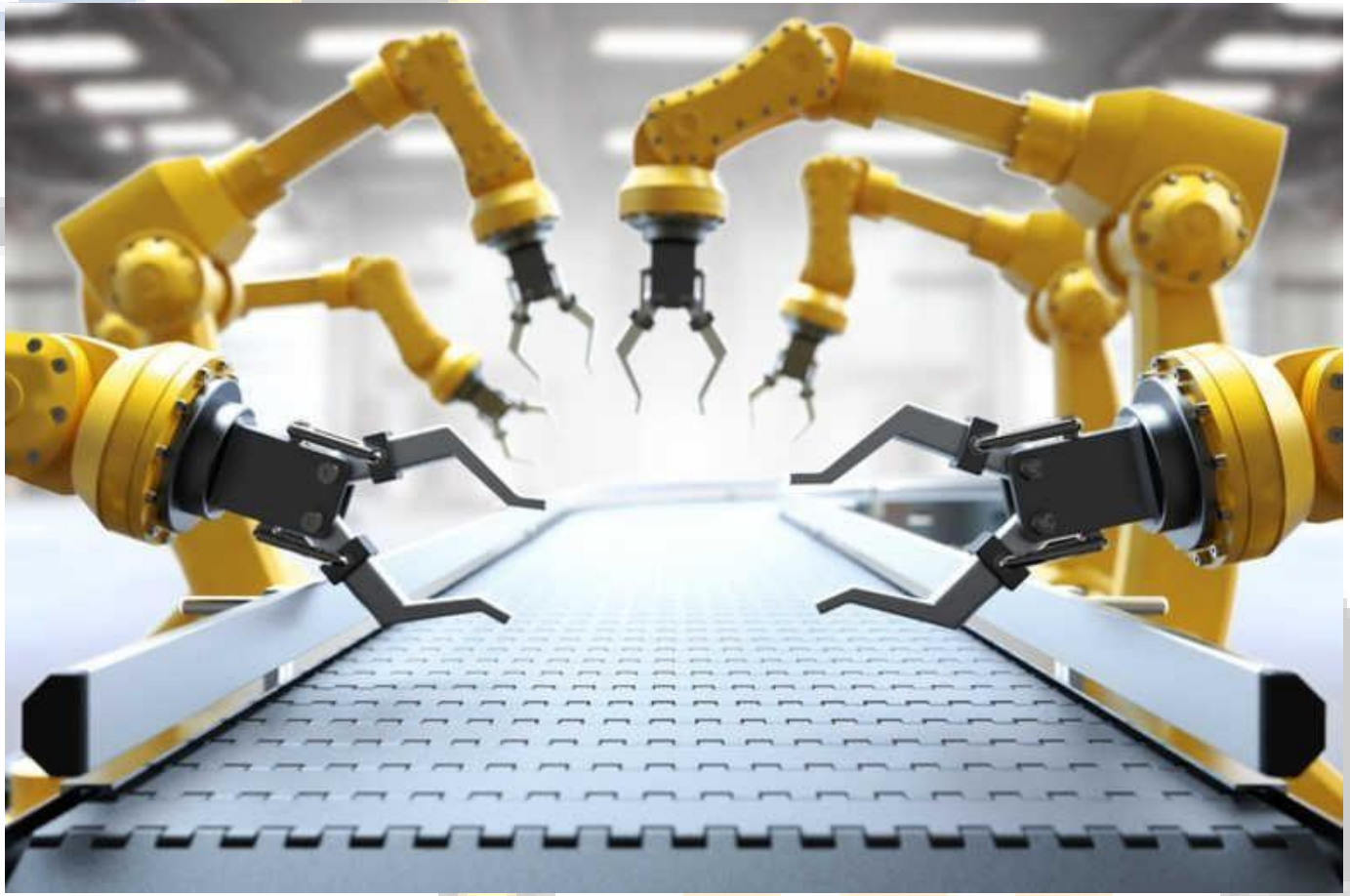


Cloud Computing and Linux

Satellite and Linux

Next Gen Rockets

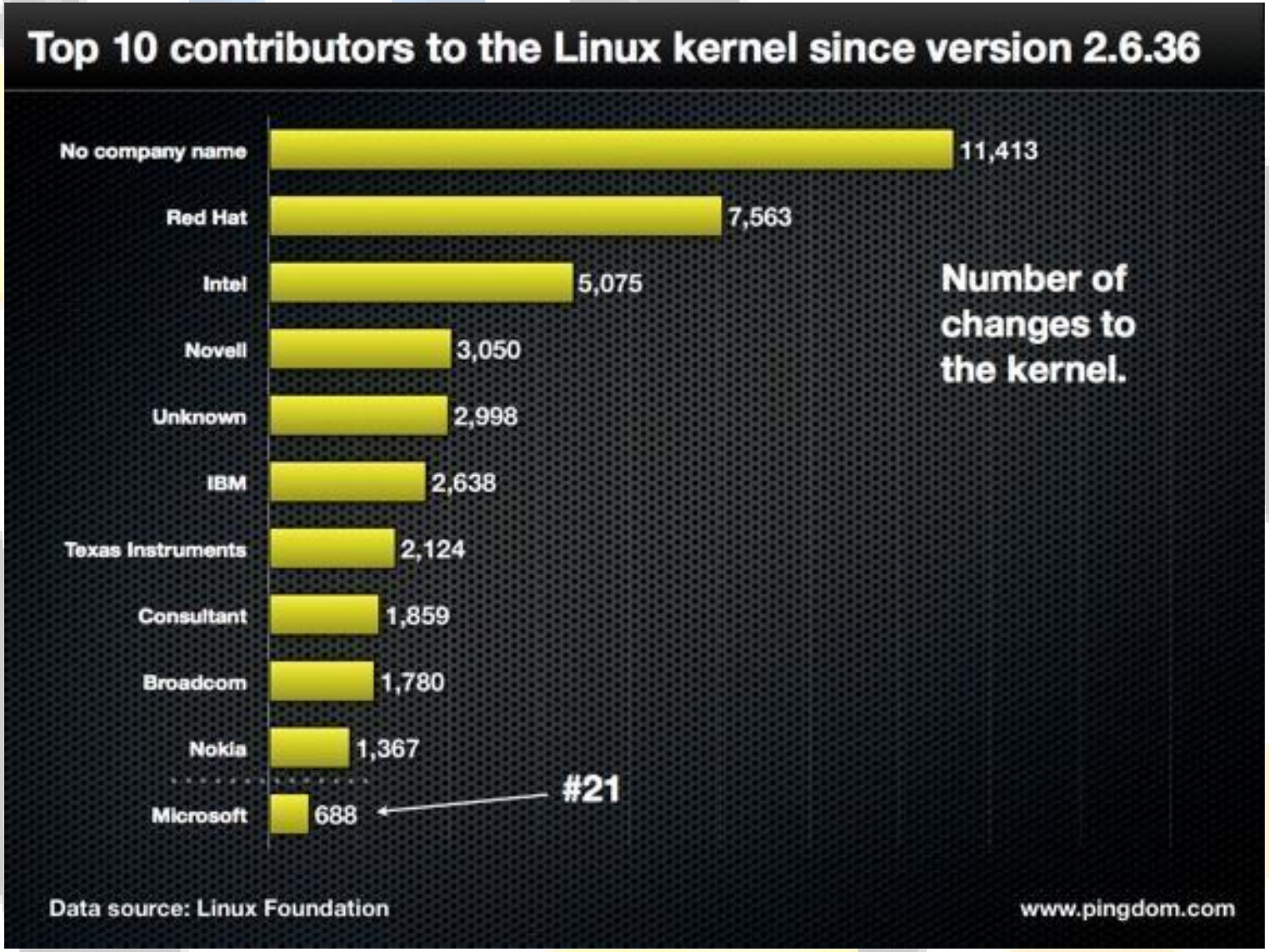
Robotics Process Automation



Robots and Linux

Drones

How can I contribute to Linux?



Linux kernel??

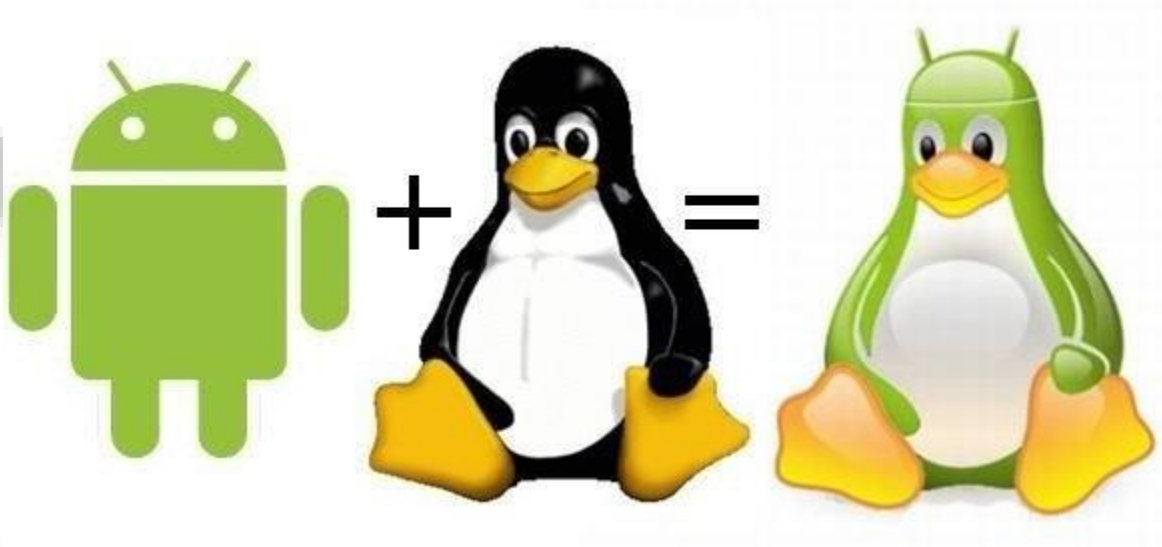
- A Linux Kernel is freely available, both to download and modify, anyOS system that runs off the Linux kernel can call itself a Linux OS.
- Basically, Linux is a core component for a computer.

- Since its free, the users have the right to modify as they please.

- Linux as shown in the previous lectures is used practically everywhere in the world ☺. From smart phones, PC's, embedded devices, IOT devices, networking switches, servers, pretty much anything you can think off ☺ is using Linux one way or the other.
- Even devices like amazon kindles, run on Linux.

Smart phones and Linux

- Android is a mobile operating system developed by Google. It is based on a modified version of the Linux kernel and other open source software, and is designed primarily for touchscreen mobile devices such as smartphones and tablets.



More on Distros

- Anyone can create a Linux Distro. But they have to be supported commercially or through a community of users who are willing to put their time and effort in developing, maintaining, and testing a given Linux version.
- Like Red Hat is a commercial version of Linux or SuSE linux
- Knoppix or Fedora, are free and community supported. Some like Ubuntu, fall in the middle and are offered free to the public while supported commercially by an organization.

So, what is command line

- Linux is all about command line!!
- Command line is shorthand for command line interface or CLI.
- Most modern computers use Graphical user interface or GUI
- The command line eschews graphical elements entirely.
- Users only see a prompt to launch programs. If GUI breaks, then CLI always works ☺ pretty much 99.99% of the time

What is OS OR Distros:

Some Linux Distros:

Zorin OS is the alternative to Windows and macOS designed to make your computer faster, more powerful, secure, and privacy-respecting.

Zorin OS is **an Ubuntu-based Linux distribution** designed especially for newcomers to Linux. It has a Windows-like graphical user interface and many programs similar to those found in Windows.

Elementary OS is a Linux distribution based on Ubuntu LTS. It promotes itself as a "fast, open, and privacy-respecting" replacement to macOS and Windows.

CentOS, or the Community Enterprise Operating System, is a **popular Linux distribution**. It's derived from, and is fully compatible, with Red Hat Enterprise Linux. And while Red Hat is only available to use commercially through a subscription service, CentOS is available freely.

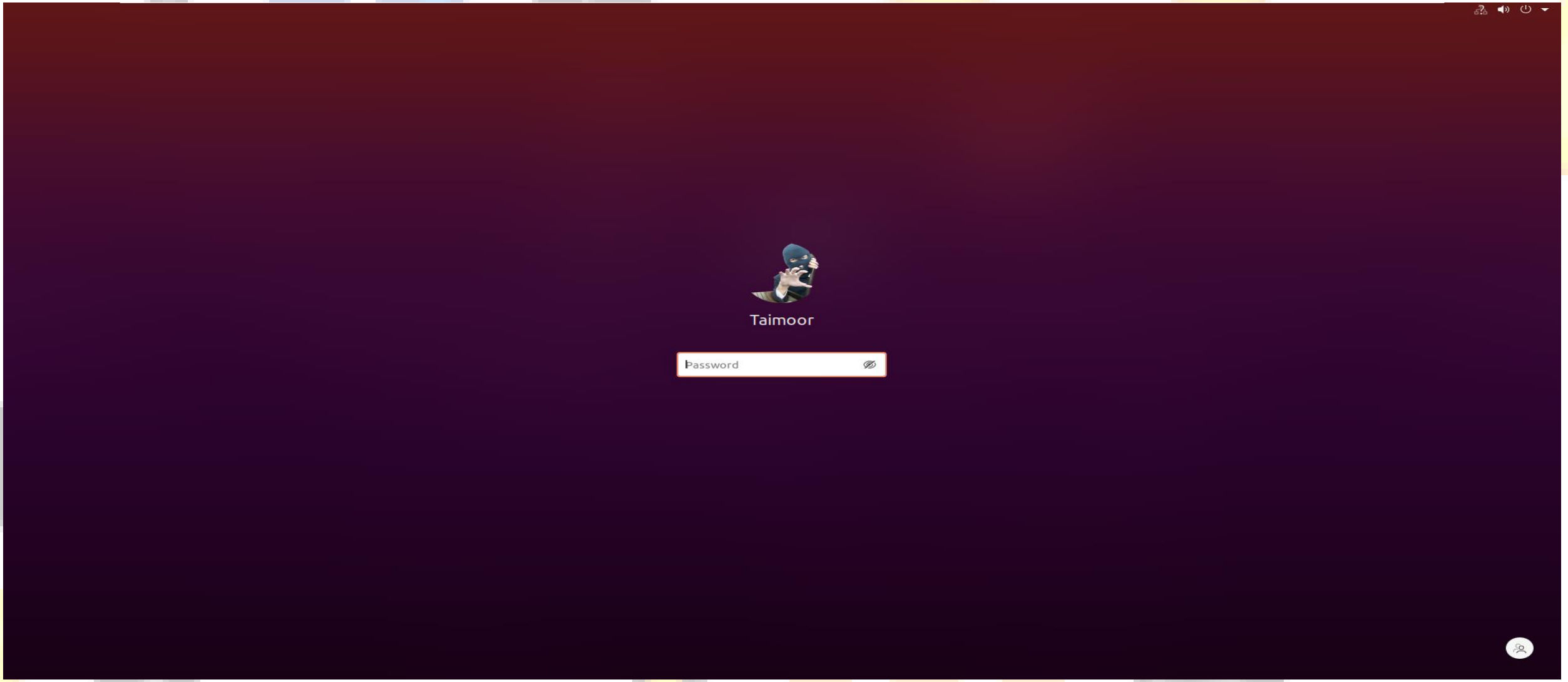
Ubuntu is a Linux distribution based on Debian and composed mostly of free and open-source software. Ubuntu is officially released in three editions: Desktop, Server, and Core for Internet of things devices and robots. All the editions can run on the computer alone, or in a virtual machine

and more distros ….

Windows11 OS

It not a Linux distro it is a windows OS

WELCOME TO LINUX UBATNU DISTRO:



COMMANDS

Bash/CLI Work:

NOTE:

All commands Linux bash you will use case-sensitive commands not you will use capital commands in terminal only use case-sensitive.

For e.g.

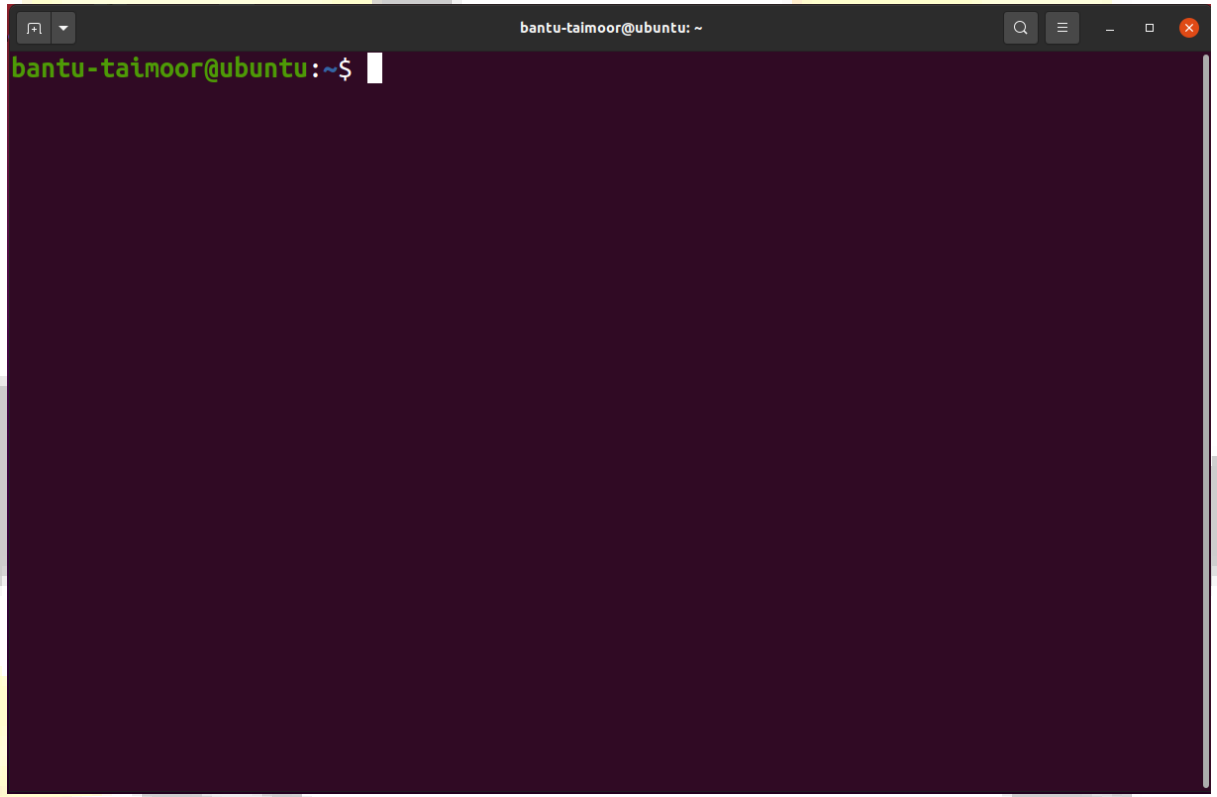
- If you type Date, DATE, DaTe..... (Then you will have an error, that is because in Linux, the commands are case sensitive).

- But don't worry about this issue, because all the commands consist of all lower-case letter.

← It uses only in bash it shows your description or comments but it not executes in

terminal. Only show you comment or description.
For e.g. ($date #it shows your present date, time, month, year).

INTRODUCTION TO CLI/BASH/TERMINAL:



INTRODUCTION TO COMMAND LINE FROM BASIC:

DATE AND CALENDER:

THE date COMMAND:

$date # If you want to view the date, you just have to type "date". too yai ap ki actual time, date, month, year sab bta daiga.

THE cal COMMAND:

$cal #cal means calendar. If you want to view the calendar of the current month, then just type cal.

$cal -y #If you want to view the calendar of the current year, then just type cal -y.

$cal 2021 #If you want to view the calendar of the year 2021 or any other year past year, present year or future years, then just type cal 2021(any year).

$cal 5 2002 #If you want to view the calendar of MAY 2002, then just type cal 5

2002.
$cal -3 #If you want to view the calendar of the previous, current and future months, then just type cal -3.

THE clear COMMAND:

You would have probably noticed by now that your terminal screen gets filled up very quickly and you may like to clear it up.

$clear #You can achieve that by just typing clear.

OR

Ctrl+l #Is a shortcut that achieves the same result as clear.

THE exit COMMAND:

$exit #If you want to close your terminal session then you can just type exit.

<**********>

TRAVERSE ONE DIRECTORY TO ANOTHER DIRECTORY/ NAVIGATING THE FILE SYSTEM:

Directory means folder. We will now learn how to navigate the file system through our terminal because we all know how to do it using GUI (Graphical User Interface).

But first, we need to learn few things.

/ ← The root directory is represented as (/) (forward slash).
~ ← The home directory is represented as (~) (tiled).
. ← The current directory is represented as . (dot).
.. ← The parent directory is represented as .. (double dot).
-- ← The previous directory is represented as -- (double hyphen).

Note: Terminal mai commands jab ap likhn gai directory ki navigation kai liya to ap koo directory kai some different colors ki directory ap koo naazr ayn gi for e.g., terminal mai app ko blue color sy ak directory kaa name lika waah ai so blue

directory hoti hai folder. lsi tara white color ki directory jis ka matlab yai file hai.

Navigation Commands:

$pwd #it stands for print working directory, it simply prints the absolute path name of your current working directory.

$cd thisDirctory #it stands for change directory, and simply change your currently directory to thisDirectory.

Note For cd:

cd(change directory) kai liya ap doo path use kerty hai one is absolute path and second is relative path. so "absolute" path means ap ko root sy dety hoyn chalna hai. for example abhi ap home per hai or ab app koo desktop per jana hai so you will use (cd /home/bantu-taimoor/Desktop/).

And ager haam baat kerty hai "relative" path ki so I will use (cd ./Desktop)---> yha per ap ko sary path deny ki zarurat nahi pari. ap apny home mai rhty hoy hi direct Desktop per aa gayn. ager haam simply iss tara likhy home mai rhty hoyn (cd Desktop) too yai bhi desktop per phoxha daiga q kai joo app ka reletive path hota hai woo dot slash ./ ker kai bhi chala jayn ga or simple bhi app use ker skhty hai.

Tab ← If you can complete command fast way so you will use any command half latter and press tab. So auto complete your command.

so ab mai ls karonga desktop per rha ker or apni list check karonga or app ko phir jis folder mai bhi jana hai simple cd thora sa word likh kai tab daba di yai auto-complete hoo jayn ga.

$cd /# changes to your root directory.
$cd ~#changes to your home directory.
$cd .. #Changes to your parent directory.
$cd . #Does not do anything!
$cd -- #changes to your previous directory.
$ls # stands for list. It simply shows list all the files on your current working directory.
<**********>

Linux Links:

Linux ki links kiya hoti hai? and iss ki types kiya kiya hoti hai?

Linux ki links kai liya saab sy phly app ko yaad rkhana hai 'INODE'

iNode:

- Every file in the system has an inode (Index Node) {means her ak file joo hai system mai uss ka ak inode hoo ga. bhaaly woo directory hoo yaa koi file hoo saab kaa inode hoo ga.}

- Contains all the file information except the file contents & name. {means iss mai kiya kiya nahi hota iss mai file ka name nahi hota or file kaa content nahi hota baki sari information mill jati hai.}

- Just like a personal ID or a passport (Without a name!)

so kiya kiya information hoo skhti hai.
They contain the following -

- Inode number
- File size
- Owner information
- Permissions
- File type
- Number of links etc.

so, or bhi bhoth sari information hoti hai inode mai soo woo ap search ker kai dekh skhty hai.

simple words mai ager mai smjhao too inode ak personal id or password hota hai jiss ka kuxh name nahi hota.

another simple words I will explain you kai app log programming too janty hi hongay? so programming mai kiya hota hai jaab app ak variable create kerty hai

too memory mai ak jaga allocate ho jati hai jis ka ak address hota hai same wohi concept iss inode kaa app lai skhty hai. jasy ak memory mai address hota hai same address inode lai skhty hoo. bass ak example kai tor par ap isy lai skhty ho but yai actual main inode or memory wala address same nahi hota.

Types of links:
1) Soft Link. 2) Hard Links.

1. Soft Links:
"jasy ap winodws kai under ak shortcut bnaty hai. so same is Linux mai bhi ker skhty hai jisy soft link khty hai Linux mai. so, windows mai haam usy shortcut bolty hai and Linux mai ham usy soft link bolty hai."

- Just like a shortcut in Window (so soft link ak tariky ka shortcut hota hai)

- It is a pointer to the original file (yai to app ko pata hi hoga kai yai ak pointer hota hai. pointer mai uss ka address hota hai. jo point ker rha hota hai orignal file ki location ko. so same asy hi windows mai bhi hota hai and same asy hi Linux mai bhi

hota hai. woo pointer location koo orignal file ko locate ker rha hota hai).

- Different iNode number (soft link mai different inode hota hai joo kai app practical video mai dekhy gai. Jis kaa link conclusion mai hai.)

- Smaller file size (and iss mai smaller file size hota hai. ager app nay kisi bhi file ka shortcut bnana hai. too same short cut jo bany ga woo ap ka file ka size kam hoga ager ap ka jasy e.g lai laity hai. jsy koi ap nay file bnai hai 1mb ki us ka ap shortcut bnaty hai. too woo hoskhta hai 8byte ki bny ya phir 12byte ki bny is 1mb ya is sy kam hi hogi. matlab choti file size bnti hai. joo main original file ko refer ker rahi hoti hai.)

Note: - If we delete the original file then soft link will become useless! (Ager ap nay original file ko hi delete ker diya too ap ka soft link ya ap kha skhty hai shortcut woo kisi kam kaa nahi rahy ga. Na wo open hogi na kisi kam mai ap usy use lai skhty hai).

2. Hard Links:

- Different name of the same file (is ko ap is tariky sy smjh skty hai jasy windows mai ap copy past krty hai ksi bhi kai same file ko ap copy krty hai phir past kerty hai. puri information file ki wohi copy past ho jati hai but ap us ka name badal dety hai. same wasy hi hai kai "different name of the same file" sari information ap ki original file ki ak past file mai a jayn gi. ya kisi ko locate nhi ker rha hota pointer nahi hota yai puri information hi la ker dai deta hai. so puri information la kai deta hai to file ka size bhi same hoga. "Same file size same is ka inode number ho ga" so you remember kai soft link mai different inode hota hai and hard link mai same inode number ho ga.)

- Same file size (sab upr waly point mai bta diya hai is ka bhi so must read!)

- Same iNode number (sab uper waly point mai bta diya hai is ka bhi so must read!)

Note: - If the original File is deleted, the Hard link will still contain the data that were in the original file. (Ap log jab Kisi file Ko copy paste krte hai windows mai too original file ko app delete ker dety hai too copied wala phir bhi open ho jata hai. same wasy hi hard link mai bhi hota hai kai ap ny kisi file ka hard link bnaya to ap nay original file bhi delete ker di tab bhi woo hard link ka data kahi bhi nahi jata or wo open ho jati hai).

Now I moved practically work! So Watched My Videos Carefully.

cd ./Desktop/

$ls

$ls -i (I means inode)

$ln Original Copy1 (jis tara list kai liys ls use kerty hai same ham link kai liya 'ln' use krty hai so 'ln' means link. so first I will create copy file kis ki? ham iss orignal wali file ki copy1 kai name sy bna rahy hai. so yai copy pate wala kaam ker raha hai ham apni file ka koi bhi name rkh skhty hai.)

$ls -i (so yai dobara likny sy kiya hoga? basically hamy joo soft or hard link mai different dekhna hai woo ham apny inode sy dekhy gai jasy hard link mai mainy ap ko btya tha kai copied file ka inode same ho ga. or soft ka different).

$ln Original Original (iss koo type kerny sy app ka yai error ay ga ln: failed to create hard link 'Original': File exists "is ka mtlab hai jasy windows kai ander ap ak hi jaga per matlab jo ap ki original file hai us ka name or is file ka jo ap copy past ker rahy hai iss ka ager same ho ga too yai error dainga because hamri file ka name same jasy windows usi tara Linux mai same nahi hona chiyan. jaab ap ak hi directory mai hoo")

so multiple file ki bhi ap copy bna skhty hai.
$ln Original Copy2

$ln Original Copy3

Next step:
jasy mainy ap koo ak chiz or btai thi kai ham hard link kai under ager apni original file ko delete ker dety hai too hamri copied file ko kuxh nahi ho ga woo easily open hongi. jab kai soft link mai asa nahi hota joo kai ham agy dekhy gai or abhi ham manually delete kary gai files ko baki agy haam is ko bhi kai kasy ham apni file ko bash/cli kai zariya delete ker skhty hai.

$ln -s original copy1 (so -s means soft and ln -s original shortcut1 means kai hamy link bnani hai ak soft ki jo hamri original hai is ki soft link bna do. yai shortcut bna doo.)

ls -i (so yai dobara likny sy kiya hoga? basically hamy jo soft or hard link mai different dkhna hai wo ham apny inode sy dekhy gai jasy soft link mai mainy ap ko btya tha kai shortcut file ka inode different ho ga. or hard ka same).

$ln -s Original Original (is ko type kerny sy ap ka yai error ay ga ln: failed to create symbolic link 'Original': File exists "is a matlab hai jasy windows kai ander ap ak hi jaga per matlab jo ap ki original file hai us ka name or is file ka jo ap shortcut bna rahy hai is ka ager same ho ga too yai error dainga because hamri file ka name same jasy window usi tara Linux mai same nahi hona chiyan. jab ap ak hi directory mai ho" but ak or problem yai hai soft Links mai kai ager ap is original file ka same name sy shortcut bny gai or is shortcut ko ksi dosri directory mai rakhy gai too yai open nhi ho gi).

So multiple file ki bhi ap copy bna skhty hai.
$ln -s Original Shortcut2

$ln -s Original Shortcut3

Next step:
jasy mainy ap ko ak chiz or btai thi kai ham soft link kai under ager apni original file ko delete ker dety hai to hamri Shortcut file kam nahi kerti. jab kai hard link mai asa nahi hota or abhi ham manually delete kary gai files ko baki agy ham yai bhi dkhyn gai kasy ham apni file ko cli kai zariya delete ker skhty hai.

NOW isi tara ham directory ka bhi soft or hard link create ker skhty hai?

So how?
$ls

$ln Directory1/ Copy1 (it shows error ---> ln: Directory1/: hard link not allowed for directory, so phly ho jya kerta tha but yai bhoth problem kerta tha isi liya new versions mai is chiz ko hata diya gya kai ap sirf files ki hard bna skhty hai but kisi folder means directory ki nahi. so ap yai error khud search ker kai or mazid information lai shty hai).

So now check soft link:

$ln -s Directory1/ Copy1 (it not shows error ---> because jasy ap window mai bhi directory ki shortcut bna skhty hai same isi tara Linux main bhi shortcut folders mean directory ki bhi bna skhty hai. or kiya yai jasy ham nay dekha tha kai soft link ka files kai liya inode number change tha to kiya is directory ka bhi ho ga? so yes and or kya jasy ham nay soft link mai original file ko delete kiya tha or phir shortcut wali files hamri bekar ho jati ho to kiya iss mai bhi asa hi hota hai kai ham apni original directory ko ager delete kry to kiya shortcut wali open nahi ho gi? so answer is "yes". Nai hogi.)

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A Directory Loop:

Let's have some fun with links
Creating loops

- Imagine the following scenario

- We have a directory named a on your desktop.

Inside directory a, we have a directory named b.
And inside b we have a short link (Directory) named c that points to a.
(means ham nay ak directory create ki a name sy and phir is a mai ak or directory create ki b kai name sy) abhi yai creating ka work manualy dekhyn gai then agy mai app ko yai wala work kai kasy ham kisi directory ko bnaty hai by using terminal wo dekhy gai. so ab b directory kai under mujhy soft link bnani hai c directory ki jo refer kary gi a ki directory ko means yai asy chaly ga a open kiya phir b open kiya b kai under hai c jo direct kary ga a ka matlab a direct matlab wo b kai under a gaya to asy ker kai b phir c. matlab ak directory loop ki tara chalyn gai ham. jasy ap nay

for loop para hoga wasy hi ham ak directory bna ker dkhyn gai kai kasy ham soft link ko loop ki tara use ker skty hai is ma.

- That's a loop

a ----------> b ----------> c (and c point to a)

Now we moved practically work!

$pwd

$ls

$cd a/b

$ls (so iss a/b mai abhi kuxh bhi nahi hai)

$ln -s a c (ab mujhy soft link bnanae hai b kai under c ko jo refer kary gi a ko,
so phly wo likhy gai kai kis ka bnana hai jasy mujhy a ka bnana hai or kis name sy

bnana hai wo likhy gai jasy mujhy c name sy bnana hai. main jo problem hai wo yahi per hai kai hamy kasy alag alag tariky sy a koo refer kerskhty hai? ab q kai ham a and b kai under aa chucky hai or hamy a ko refer kerna hai. so is kai three ways hai one is absolute path jasy mainy phly btaya tha kai absolute path mai pura path dena perta hai soo dekhy nixhy kis tara dety hai.)

Absolute Way:

$ls -s /home/bantu-taimoor(user name)/Desktop/a c (kis ka bnana hai a ka. kis name sy dena tha so wo c sy so c aa gya yha. so yai mera absolute path sy ak soft link bn jayn ga jo refer kary ga a ko).

$ls (so ak tarika to yai ho gya. hamara directory loop bnanay ka absolute path kai through)

$cd c (so ab hamny c ko access ker kai dekhana hai. so mai ab c kai under aa chuka hu)

$ls (ab c kai ander kiya hai ‘b’ q kai mainy a ko refer kiya tha or a kai ander kiya tha b)

$cd b (to asy hi mai b kai ander ja skhta hu.)

$cd c (phir is kai baad doabara c kai under ja skhta hu.)

$cd b (phir b)

$cd c (phir c)
so asy ap dekhty rahy gai to yai ak tree bnta bnta jayn ga. yai directory loop per tree bnta ja rha hai. kai a nay b ko refer kiya b nay c ko c nay a ko kiya phir a ka b, b ka c asy ker kai yai refer hota rha. so yai ak directory tree bn gaie. so, ap manually apni is first make directory ko kholy gai to a kai under b, b kai under c, ca kai under b isi tara ka ap ko tree dekhy ga.
so, ab I will remove c directory and mai ab dosry way sy bna ker dekhata ho kai directory tree kasy bnaty hai. so second way is relative path sy.

Relative Way:

$ln -s ~/Desktop/a c (kis ka bnana hai a ka. kis name sy dena tha so wo c sy so c aa gya yha. so yai mera relative path sy ak soft link bn jayn ga jo refer kary ga a ko.)

$cd c (phir wohi kam cd c kary gai)

$cd b (cd b kary gai. yai asy hi ak tree bnta chala jayn ga jis ka bhi ap ko bnana ho.)

$cd ~

$ls

Now Third Way:

(Or yai wala sab sy best way hai soft link bnany ka or yai ap logo ko use kerna chiyan).

$ln -s (ab hamy kiya kerna hai kai hamy jo hm kerty howy aa rhay ha kai hamy parent directory mai jana hai us ka link hamy child kai under dena hai means hamy a ka link hi to dena hai so b ka parent kiya hai? a or jasy kai hamny sekha tha kai parent mai jany kai liya haam basically kiya kerty tha cd .. yai use kerty tha jasy for example ham Directory2 per thay or hamy Directory1 per jana hai jo Directory 2 ka parent tha so isi tara ham is mai bhi yai concept use ker skhty hai so ham nay bnana hai parent directory ka yha per to nixhy wali command dikiyan.)

$ln -s .. c (jis name sy dena hai wo aa gya two dots kai baad so ap ko koi relative ya absolute nahi dena para yha)

$ls (so ab ham is a/b wali directory mai check kary gai to c ka short link aa gya hoga.)
so again same jo uper kerty way ayn hai ham.

$cd c
$cd b

wohi loop ap ka chalta rahy ga.

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Ls commands options:

(jasy mainy ap ko ls btya tha kai ls means list or list kon si hogi ap ki present directory ki jis mai ap hongy)

$ls -l That's a long listing that we saw before, it shows many important information about a file. (so ls -l means long listing so jasy hamny ls lika tha to wo sirf ap ki directory mai mojud files and folder show kerta hai yani jo ap ki working directory mai hoga wo. so ls -l yai kerta hai kai ager ap ko check krna ho kai ap directory mai folder wagara mai kon kon si permissions hai, kis group ka access hai, or yai ap ki file or folder kitna storage lai rha hai, memory kitni lai rha hai or ap dehkh skhty hai kai kab modify hoya tha.)
'Permissions, Number of Links, Owner, Group, File size, Modification Date, File name'

so jasy hi ap ls -l likh ker enter kary gai so iss tara sy ap kai pas ayn ga. thora bhoth different bhi ho skhta hai but meaning same hi hai.

"drwxrwxr-x 2 bantu-taimoor bantu-taimoor 4096 Aug 11 15:18 dir1" (so idher d means its represents directory and jo 2 likha wa hai ya ap kai pass koi bhi digit show ho rha hai it means this is a number of hard links jo is kai under hai total and is kai ba joo yai mera idher bantu-taimoor hai yai hai user ka hai jo second bantu-taimoor hai yai hai group ka, group kai baad 4096 yai hamara size aa gya or baki Aug 11 15:18 yai hamri modified date ho gi kai kb modified howa tha. dir1 or yai name aa gya directory kaa)

axha abhi jo ham nay dekha hai woo hai direcory ka ager maae is mai sy ls -l mai sy ager ap ki directory mai koi file hogi too let see kai kiss tara yai sab size wagra show hota hai.
"-rw-rw-r-- 1 bantu-taimoor bantu-taimoor 27662 Aug 11 15:25 'Ultimate Linux By Taimoor Nawaz'" (to ap dekhy kai wha first d tha jo yai show kerwa rha tha kai yai ak directory ka sab size wegera show ho rha hai and yai jo yha per hai yha directory wegera nahi dekhy ga yai -rw-rw-r-- yai ak permission hai. jasy us nay uper directory kai sat permision show kerwai thi but file mai as nahi hota. baki sab wohi hai number of hard links jasy yha 1 hai phir user name phir group name then file size

and modified date and file name).

$ls -lh That's same command as long listing but this command show size of file unit e.g. K means kilo bytes etc. that we saw before, It shows many important information about a file. (so ls -l means long listing so jasy hamnay ls lika tha to wo sirf ap ki directory mai mojud files and folder show kerta hai yani jo ap ki working directory mai hoga woo so ls -l yai kerta hai kai ager ap ko check kerna ho kai ap directory mai folder wagara mai kon kon si permisions hai, kis group ko access hai, or yai ap ki file or folder kitna storage lai rha hai, memory kitni lai rha hai or ap dekha skhty hai kai kab modify hoya tha.)
'Permissions, Number of Links, Owner, Group, File size, Modification, Date, File name'

$ls -a This will list all the files in your current working directories including hidden files that start with. (ls -a a means all means sari chizy is mai dkha dena kuxh bhi hidden na rahy sab show ho. axha jab ap yai command likhy gai to ak jiz hamisha sab sy phly ayn gi single dot . and dobule .. jis ka matlab mainy phly btya tha kai single . ap ki current directory ko represent kerta hai or double ap ki parent directory ko.)

(ager ap ko ksi file ko hidden bnana hai to file name sy phly dot laga dai e.g. .filename ab yai hidden hai or ap isy check ker skhty hai) .

$ls -t This will list the files sorted by modification date. Newest first
(Ab bat ker laity hai time ki ordering kai bary mai. so t means time and so ap jab bhi ls lkthy hai to yai alphabetical order mai ata hai jasy alphabetical mai A phly ata phir B waly so same. but jab ham time ki basis per means ham jab ls -t likhy gai to yai time ki basis per ayn ga for example mainy phaly directory z bnai phir ak or directory a bnai phir c bnai to iss mai ls -t likhny per yai last modified ki time kai basis per show ho gi matlab phly fresh time per bni hogi wo show kerwayn ga? jasy phly c show then phir a phir z is tara yai order koo follow kerta hai).

$ls -r This will list the files in reversed Order. (r means reverse hai yai joo command hai ls -r yai kis ki basis per ay ga? jab bhi ap ls likhty hai to wo jasy mainy btya kai alphabetic order mai hota hai jasy a phly phir b and so on but is mai r means reverse hai so alphabetic ka reverse means z waly phly phir y waly isi tara and so on).

$ls -i This will list the index node number of each file in the current working directory.

$ls -R (so ab jo batany ja rha hu yai command bhoth interesting chiz hai. so saab sy phly ap log three directories bnay gai. yai is liya kai ap ko is command ko axhi tara smjh aa jayn. so, first directory kai under second directory ho gi and isi kai sat ak file bhi bna lai. this second directory ko open kary or us kai under ak or directory 3 and ak file bna lai.)
NOW
(ab ap ls likhy to ap ki bnai hoi directory show ho jayn gi. mera main objective kai jab mai dir1 kai under gya so mujhy ab sirf dir1 kai under jitni bhi recursive file hai wo sari show ho jayn. kiya files hai kitni directories hai sab mujhy dekhna hai.)

(to mai kiya krskhta hu? to ham kiya kerty thy kai long method kerty thy matlab ham cd dir1 kiya is kai under aa gyn phir listing kiya ls sy taky pata chal jay kai is kai under kiya kiya hai phir ham cd dir2 kerty phir listing kiya ls sy taky pata chal jay kai is kai under kiya kiya hai. phir dir2 mai aa jaty tha phir listing kiys ls sy taky pata chal jay kai is kai under kiya kiya hai.

phir ham dobara cd dir3 kery to dir3 mai aa jaty phir listing kiys ls sy taky pata chal jay kai is kai under kiya kiya hai. to yai bhoth long method hai. yai bhoth time consuming process hai. to yai sab kerna axha nahi lagy ga).

(to ham phly cd ~ main per aa gayn phir cd Desktop per aa gayn.)

(ab mai ap ko ak axhi chizz btany wala ho jo hai Recursive or Yai ap ny para hoga kai "Recursive : When a function calls itself" matlab joo apny ap kai function ko call kerty rehna hai bar bar. so isy ham khty hai recursive method.)

(so is mai hamy kiya kerna hain? ham dir1 ko call kary gai or dir1 kiya kary ga iss kai under jitni bhi iss ki directories wegara hongi woo un koo call kerta jayn gaa jaab taak kerta jayn gaa jaab taak sari directory complete nahi ho jati or sari files hamy display nahi ho jati. so is ki yai command hai ls -R capital R yai bhoth important hai kai capital R not small so small r ham nay dekha tha reverse kai liya or R hai Recursive kai liya so ls -R dir1(so kis ka dekhna hai hamy? dir1 ka. wo yha aa jayn ga. soo ab sari chizy aa jayn gi.))

(ager ap ko sary per kerwana ho to sirf ap ls -R lihy gai. and ager ap ki directories bhoth zada hai jasy root mai aa ker ap ls -R likhy too yai chalata jay chlta jayn ga or ager ap koo beich mai rokhna ho kai is recursiveness sy bahir nikly too ap simple ctrl+c daba daingy to out of the recursive loop).

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The recusrive option:

(so ab taak ham nay jitni bhi ls ki commands dekhi hai jasy ls -l, -l, -a, -t, -r, -R, too yai sab btai thi to ab ham in sab ko "permutations and combinations" ki basis per bna ker dekhty hai matlab kisi ka kisi kai sat merge ker kai kuxh naya result bn ker aa rha hai ya phir nahi aa rha. too wohi chiz ham ker kai dekhy gai.)

(Sab sy phly mainy lai liya: $ls -i -l is kaa matlab hamy inode number bhi chiyan or long listing bhi chiyan and fark nahi perta kai ap -i phly likhy or -l likhy same hi result ayn ga yai phly inode number dkhyga then long listing. q kai is mai order mater nahi kerta. hamy itny - pasand nahi too ap kahy gai hamy ak hi mai ker kai dekha dain. so, you will write $ls -li)

(so ab dekhty hai $ls -t -r. ab is ko bhi merge ker skhty hai $ls -rt ya -tr baat ak hi hai. order in mai matter nahi kerta)
($ls -ali too is mai ager ap kahy gai kai mujhy all dekhao, long listing bhi chahiay saat mai and index number bhi.)

($ls -ltr)
and so-on ap isi tara ya dash dash ker kai jo ap ko asan lagy or jo ap ko chiyan wo ap ls likh ker agy ap ko jo chiyan wo dai kr ker skhty hai.

so, $ls -latR (ap is ko later kai name sy yad rkh skhty hai so mujhy is mai long listing bhi chahiay. all bhi, time ki basis per, and recursive bhi kisi directory ko agy likh dai taky eaisly samjh aa jayn jasy. $ls -latR dir1/)

Now All Recursive Option Summaries In English:

- The recursive option is of special importance and is not very easy to understand. That's why we present here alone.

- So if you want to list the contents of a directory and all its subdirectories you use $ls --R

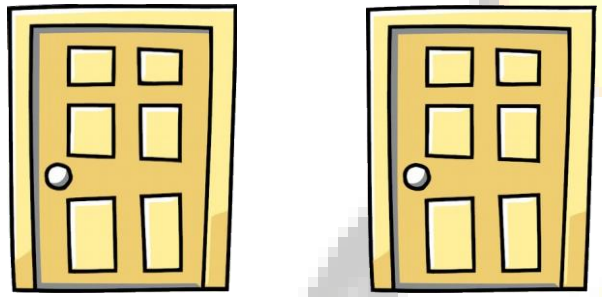
- For example, imagine if you have a directory named dir1 on your desktop, and inside dir1 you have a subdirectory named dir2.

Now, if you type ls --R dir1, then this will list the contents of dir1 and dir2.

- Notice that if dir2 has another subdirectory dir3 then ls --R dir1 will also list the files of dir3 and so on ... got it now?

- Here comes the interesting part, if you executed ls --R / then this will list all the files (non hidden) on your system

An Analogy



- First, we will divide all the files in Linux into two categories.
- (1) Directories and (2) everything else (Items)

- A directory is just like a room door and everything's else is just normal items (book, clothes, watches, ...)
- Now when you execute $ls -R dir1
- You open the door of dir1 and then you collect all the items inside the room, now if you find another door in this room, you open it and do the same thing again and so on! After you are done then you just list all the items that you collected

Just like factorial!

- Just like in programming, A recursive function is a function that call itself.
- For example, the factorial functiondefined as f(n) = n x f(n-1)
- And so, 5! = 5 x 4 x 3 x 2 x 1 = 12

$ls -R lists all the files under a givendirectory and it will then list all thefiles underneath any subdirectory of that given directory and so on !

Combining command options:

- What if you want to list all the files including hidden files on your system?
- You can just combine the -a option with the -R option as follows.
- $ls -R -a
- An easier way is $ls -Ra

The order doesn't matter and so $ls -a -R and $ls -aR will have the same results.

- Now $ls -Ra / will list all the files on your system, It will take long time!
- Now $ls -latR / will make a long listing of all the files on your system sortedby modification date (newest first).
- Be careful, The command options are case sensitive, $ls -R (Recursive) is not the same as $ls -r (reverse listing)
- If you want to list the files in reverse order based on time

Then we can combine -r and -t so, $ls -tr will list the files sorted bymodification date (Oldest first)

- That's good for now. SEE YOU -latR ! :D

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Conclusion

Thanks a lot for reading this book.
I hope it will inspire you to know more about Linux and its capabilities.
To learn more, check out my blog CodeWithTaimoor.com.
Send any feedback, errata or opinions at
mrtaimoor.pk@gmail.com

THANK YOU