



LINUX 101

Brought to you by: /vit_acm/foss
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Overview

- What is Linux?
- History of Linux
- How does it matter to you?
- What makes it different from Windows
- Power of the Linux Terminal
- Distros of Linux – Which one to use?
- The Linux Community

What is Linux



- To understand what Linux stands for, we need to read a bit of history.
- In the 1980s, three OS dominated the computer environment.
 - DOS
 - Mac
 - Unix
- DOS was the dominant system for PCs
- Mac, even then, was expensive but popular!
- UNIX was the most advanced OS which supported a number of features which are used in modern OS too.
- Commercialization killed UNIX.

What is Linux

- Enter Richard Stallman, the messiah of Open Source.
- Founder of GNU (**GNU's Not Unix**) project at MIT in 1983.
- GNU = kernel + compiler + UNIX programs (ls, grep, awk, make).
- GNU General Public License (GPL) - software and the future generations of code derived from it to remain free for public use.
- "Good computing for everyone."



Effect of GNU

- GNU was a revolution to reckon with.
- Encouraged independent operating systems like Berkeley's BSD, Tannenbaum's MINIX.
- These OS came to be called "*Unix-like*" or **nix*.



Linus Torvalds

- Second year engineering student at U. of Helsinki and a badass, in general.
- Frustrated by restrictive policies.
- GNU had Unix packages, but still lacked a kernel.
- Necessity is the mother of invention.



The Arnold Schwarzenegger of computing

Linus Torvalds

- Linus used MINIX to create his own kernel in 1991.
- Originally it was named **Freax** but his friend gave him some good advice.
- He released it under the GNU GPL which made it freely available to anyone.
- Perfect marriage of packages (GNU) and kernel (Linux).



GNU <3 Linux



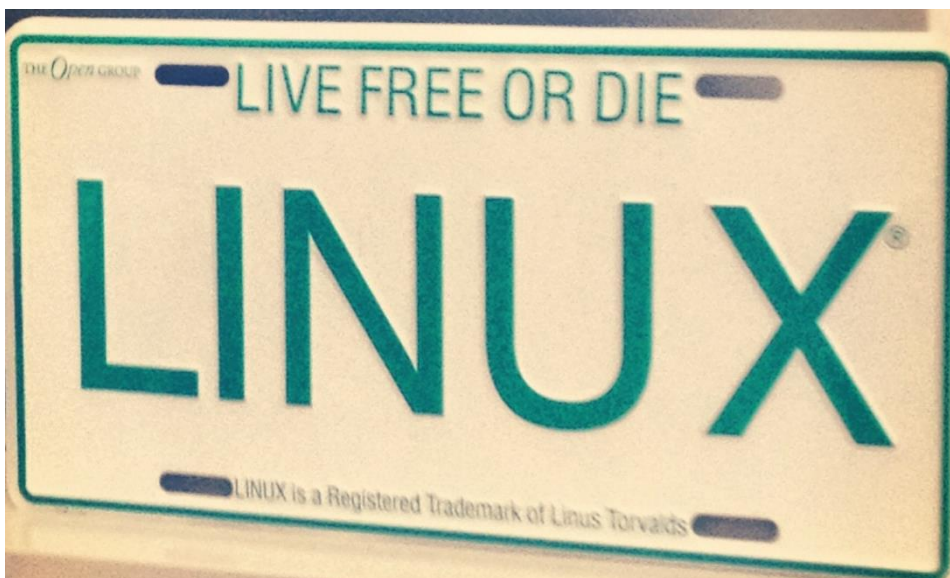
How Does All This Matter To You?

So you know how Linux came into being, and what sets it apart from other proprietary OS.

But why should that change anything, why should you install it right away?

FREE FREE FREE!

- It's totally 100% free.
- Free not just as in free beer, or ek ke saath ek free.
- Freedom to change the OS as per your needs.



Secure, flexible, beautiful

- Dozen different desktop managers



- Runs well on old/slow hardware.
- Most viruses are designed for Windows. Linux is immune to these bat/exe files. They just won't run!

A fine-tuner's dream

- There is a reason why man is master and machine is slave.
- Windows reverses the above roles, on a regular basis 😊
- Linux users also run into problems, but there's always an explainable, logical fix.
- Right-clicking doesn't display superficial menus.
- Editing conf files wisely can overhaul your entire system – like transforming a Maruti800 into a Limo



Best Way to Learn Deeper Computer Knowledge

- Getting familiar with the terminal gives you fuller control over your computer.
- Learning commands teaches you the fundas of how an OS works.
- Most of this learning will come out of fixing something you don't like/doesn't work.
- Superb community support from developers and users who are always ready to help. Just ask nicely (good grammar helps).

Linux




Windows



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Linux is
a powerful
operating system..



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Linux is
not an
operating system



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Huh?




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Yes,
Linux \neq OS.
It is a kernel.
A very specialised,
powerful Kernel.





Linux Kernel
+
Shell
(Desktop Environment, Package
Manager)
=
Linux Based Distribution





Linux Kernel + (Gnome, Debian Package Manager) == Debian

Linux Kernel + (Unity, Debian Package Manager) == Ubuntu

Linux Kernel + (Gnome, Yellowdog Updater, Modified) == Fedora

Linux Kernel + (none, Pacman) == Arch Linux



Linux Based Operating Systems are Powerful.

Ubuntu - Most Used Linux Based Desktop O.S with 20 million users.

Fedora – Preferred for productivity.

Arch OS – Popular for customisation.

Backtrack -- Hackers' paradise, famous for Penetration Testing.

Android - Most Used Mobile Operating System

And many others running on supercomputers, servers and clouds.





Free & Open Source.

- * Full access to the source code.
- * Provides high level of customization



Close Source.

- * No access to the source code.
(Except some Elite groups e.g
MSDN)
- * Very less scope for customization





Unix-like

- * Inspired by the aim of providing Unix functionality for free, because Unix is a proprietary OS.
- * Developed on MINIX. (A small free derivative of Unix used for educational purposes)



DOS-Based

- * Based on the DOS (Disk Operating System)
- * Windows 1.0 was a DOS with a Windows desktop shell.





Licensing Freedom

- * Unrestricted GNU-GPL license.
 - i.e one can distribute, modify, redistribute the programs released under this license.
- * 1 license == multiple users.



Licensing Restrictions

- * END-USER license agreement.
 - i.e only vendor has a copyright of program. only he/she has a right to modify or distribute the program.
- * 1 license == 1 user.





Monolithic Kernel

- * Provides large number of functionalities irrespective of user requirements.
- * Serves Multiple purposes.



Micro-kernel

- * Provides limited number of functionalities which are needed by users.
- * Serves limited purposes for which it was created.





- Contains approximately 2.8 millions of lines of code mainly in C.
- Provides massive support for various drivers, memory systems
- File-systems, Architectures, and IO devices.
- Due to this high level support , this kernel is a part of variety of devices.
- Mobiles and many other embedded systems.





Hierarchical File-System

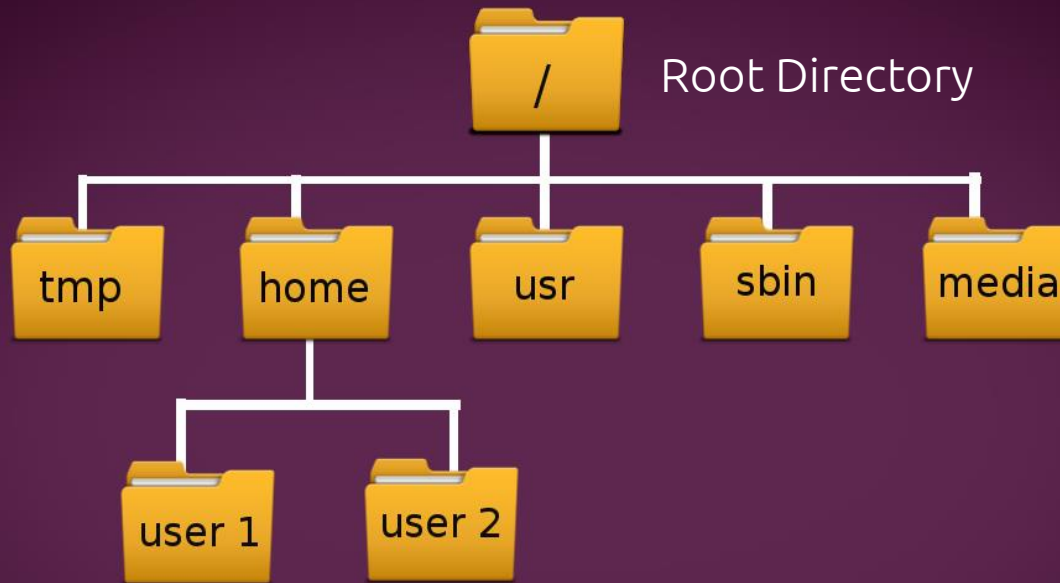
- * Tree Structured file-system.
- * Everything is stored under root "/" directory
- * Supports ext,FAT,NTFS,JFS, XFS,ReiserFS,minix etc.



Volume Based File-System

- * File-system is divided into volumes.
- * Data is stored into drives.
Eg:C:,D:,E: etc
- * Supports NTFS,FAT,ReFS.





Separate Directory
for Each user.

Linux File-system



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Highly Compatible

- * Support for various architectures.
- * Suitable for old hardware.



Limited Compatibility

- * Support for IA-32, Itanium, x-86-64, ARM.
- * Not suitable for old hardware.





Command Line + GUI

- * Provides various Desktop Environments.
 - | GNOME, KDE, Unity, Cinnamon,
 - | XFCEetc.
- * Along with command line interface.
 - | Mostly Bash shell by default.



GUI+DOS Shell

- * Windows Desktop Environment.
- * DOS prompt for executing DOS commands.





Centralized Apps Install

All packages are available at one place.
Software Center / AUR etc.

Other Third Party package managers
are also available.



Non-Centralized Apps Install

* All software programs are managed
by their vendors.

* No third party manager is available
till date.



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Reliable

Less vulnerable.

Provides robust, inbuilt security mechanism.

Total Threats: 50 - 60 approximately



Insecure

* More Vulnerable

* Requires Third Party Security mechanism.

* Total Threats- billions.
(200 millions gets added daily)



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Google Chrome OS remained unhackable in Google's hacking contest of 2013.

Several Linux based OS are being used at LHC, Geneva for computational purposes because of its reliability and speed.

NASA, Google makes use of Debian based computation engines.

Linux runs on more than 90% of supercomputers.



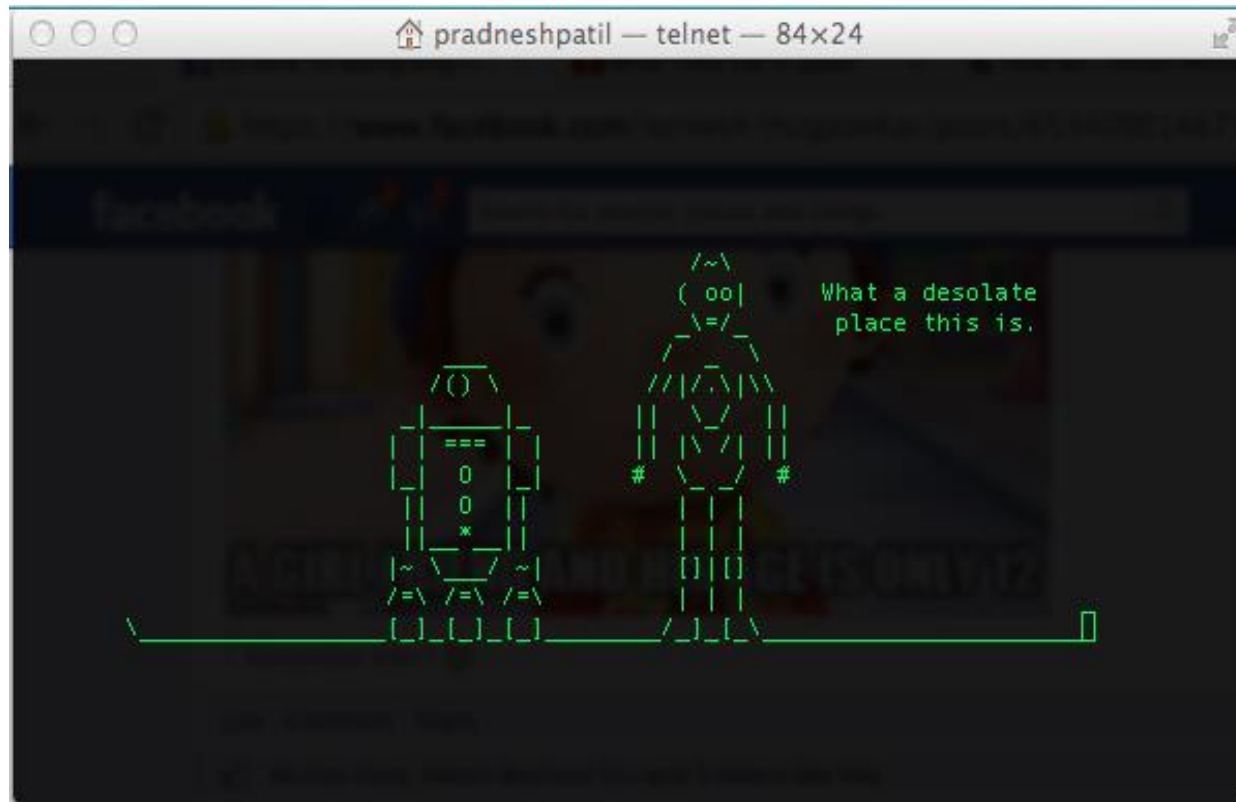
So give Linux
a try.



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Power of Terminal



Use of Terminal

- User → Terminal → Shell → Kernel
- Everything that you do through a program has a command line syntax to that
- Linux command = executable file stored in directories like /usr/bin and /bin
- Few simple Linux commands below:
 - uptime → Outputs current uptime
 - date → Outputs current date
 - cal → Outputs calendar easily
 - modprobe <module> → activates a module (driver)
 - ssh/telnet → Connecting to remote client

Scripting with terminal

- BASH stands for **B**ourne **A**gain **S**hell.
- The codes include the directory of bash as first line and further codes are written in the line ahead. As simple hello world program will be


```
#!/bin/bash
echo "Hello World!"
```
- The above will simply print Hello World on the screen, if we write *cal* on the next line, it will print calender after the Hello World line. Files need to be saved as `<name>.sh` and execution should be done using `./<name>.sh`

```
Pradneshs-MacBook-Pro:Documents pradneshpatil$ ./test.sh
Hello World!
    September 2013
Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6  7
 8  9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30
```

Simplicity of the Terminal

- “*man <cmd>*” shows you all the details of a command.
- Running apps is never difficult. If you want to start a session of firefox all you need to do is, open terminal and simply type in *'firefox'*
- **Flags:** They are options that give you extra control over the command execution. *'ls'* gives a list of all directories and files but *'ls -a'* gives a list of all directories and files, those hidden too.
- Simple commands like reboot, shutdown, copy, clear, cd, mkdir, ssh, telnet, are used to do basic commands and they take in simple flags and inputs.

Tips/Tricks with Terminal

- Adding a simple “-v” as flag to ‘**ANY**’ command will give you a feel of a pro coder.
- Verbose mode is particularly helpful in debugging. There’s a -vv mode too (very verbose) in some commands.
- Using ‘**sudo**’ before using any command will execute that command as a root user, the one with all permissions.
- ‘**javac**’ and ‘**java**’ is inbuilt into most of the Linux Distro’s so compiling and executing java programs is easy.
- ‘**ssh**’-ing or ‘**telnet**’ to a server is as easy as typing

`'ssh pradnesh@myserver.com'`

Unlike Windows where you have to download client like PuTTY.

Tips/Tricks with Terminal

- **apt-get install firefox** (Ubuntu)
or **yum install firefox** (Fedora/CentOS)
is what will download and install firefox on your computer in a very nice CLI that shows you what is being done.
- **wget**
["http://vitmumbai.acm.org/res/e1/PHP%20Workshop.pdf"](http://vitmumbai.acm.org/res/e1/PHP%20Workshop.pdf)
will download the pdf file from the url that is mentioned above. It allows resuming paused downloads, making it possible to download efficiently.
- **'apt-get update'** or **'yum update'** will update all the applications installed on your machine.
- Want to watch Star Wars but not running in a nearby cinema or TV? No problem, the terminal can show you the movie in ASCII, type **'telnet towel.blinkenlights.nl'**

More Random Tips/Tricks with Terminal

- **'banner <text>'** will make you a neat banner in ASCII, and remember its all inbuilt, don't need any fancy apps for it.



Neat eh?

- **'say My name is Pradnesh'** reads out that sentence for me on my Mac. On Ubuntu its done as **'echo "My name is Pradnesh"|espeak'**



Which Distro?

- 300+ different distros, each targeted at a specific kind of user or particular functions.
- How to choose your distro?
- Which one is “better” for you, and which one is “too tough”?



Ubuntu

- Ubuntu == Linux today
- Based on Debian
- A new version every six months
- Comes pre-packed with essential packages
- Easy to migrate to from Windows
- Suggested for total beginners to Linux, understand the philosophy of Linux



Fedora/CentOS

- Both are derivatives of Red Hat Enterprise Linux
- Fedora -> desktops
CentOS -> servers
- Fedora uses the latest packages, for the "Linux hobbyist".



ArchLinux

- Primarily meant for relatively experienced users.
- Arch offers immense scope for tweaking.
- ISOs ship with just the kernel and package manager (to install packages from the internet).
- Perfect for the CLI enthusiast.
- Can teach more than a standard Linux course.

Linux Community

- **For the people, by the people, of the people**
- A ton of forums, groups, mailing lists on the Internet.
- Extensive documentation prepared by users and developers
- IRC chatrooms dedicated to a particular distro, and even versions of a distro!
- Possibly every answer/query/doubt/problem has a solution here.





Thank you!

- Thank you for your patience.
- We hope this seminar has helped you decide to try Linux.
- We have uploaded this slideshow on **vitmumbai.acm.org/download.php**
- Feel free to ask us anything about Linux, we shall try to answer as best as we can 😊

