Knowledge
Academy

Linux (From 0s to 1s)

- Prabesh Thapa

I would like to request everyone to drop any questions in the chat and we will address them in Q & A.

```
[192-168-1-106% whoami                                                    ]

Background:
        DevOps Engineer at Audinate (ad8)
        Previously ESA, Versik, Help Nepal (LTSP), Karma Mobility

Education:
        Master of Computer Networking - MIT (2017)
        Bachelors in Computer Engineering - KU (2012)
        PhD ( Soon )

Area of Interest:
        Distributed system design
        Performance and Reliability Engineering

Preferred Linux Distro:
        Debian (Workstation)
        CentOS (Servers)
```

Topics

- What is open source software (OSS) ?
- What makes a software open source ?
- What is FOSS / FLOSS ?
- Open source governing bodies.
- Open source licensing
- Choosing an open source license
- GNU Linux History
- Different Linux distributions
- How Linux is different from other OS ?
- Applications of Linux
- Q/A

What is **Open Source Software or OSS**?

- *"**Open source** is a term that originally referred to **open source** software (OSS). **Open source** software is code that is designed to be publicly accessible—anyone can see, modify, and distribute the code as they see fit" - red hat*

Open source philosophy

Compliance to following things makes any software open source:

- **Free Redistribution** - The license shall not restrict any party from selling or giving away the software as a component of a larger software distribution containing programs from multiple sources.
- **Source Code** - The program must include source code, and must allow distribution in source code as well as compiled form.
- **Derived Works** - The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.
- **Integrity of The Author's Source Code** - The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time.
- **No Discrimination Against Persons or Groups** - The license must not discriminate against any person or group of persons.
- **No Discrimination Against Fields of Endeavor** - The license must not restrict anyone from making use of the program in a specific field of endeavor.
- **Distribution of License** - The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.
- **License Must Not Be Specific to a Product** - The rights attached to the program must not depend on the program's being part of a particular software distribution.
- **License Must Not Restrict Other Software** - The license must not place restrictions on other software that is distributed along with the licensed software.
- **License Must Be Technology-Neutral** - No provision of the license may be predicated on any individual technology or style of interface.

FOSS and FLOSS

- **Free and open-source software** (**FOSS**) or FLOSS (Free Libre/OSS) is software that can be classified as both free software and open-source software. That is, anyone is freely licensed to use, copy, study, and change the software in any way, and the source code is openly shared so that people are encouraged to voluntarily improve the design of the software.
- This focuses on social movement whereas OSS focuses on development moment.

What does "Free" mean in FOSS?

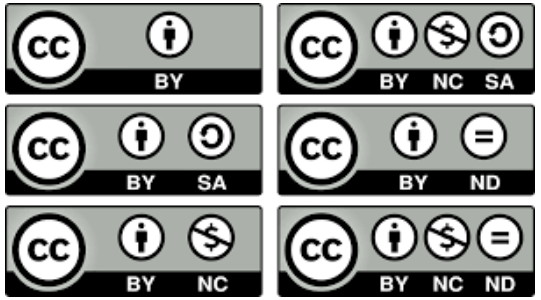
- 4 Freedoms
  - The freedom to run the program as you wish, for any purpose (**freedom 0**).
  - The freedom to study how the program works, and change it so it does your computing as you wish (**freedom 1**). Access to the source code is a precondition for this.
  - The freedom to redistribute copies so you can help others (**freedom 2**).
  - The freedom to distribute copies of your modified versions to others (**freedom 3**). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Governing bodies in open source

- **FSF (Free Software Foundation)** - Advocates free software
- **OSI (Open Source Initiative)** - Advocates open source software
- **POSIX (Portable Operating System Interface)** - Governing body to maintain standard in OS so that they are inter-compatible with each other.

Open source licensing

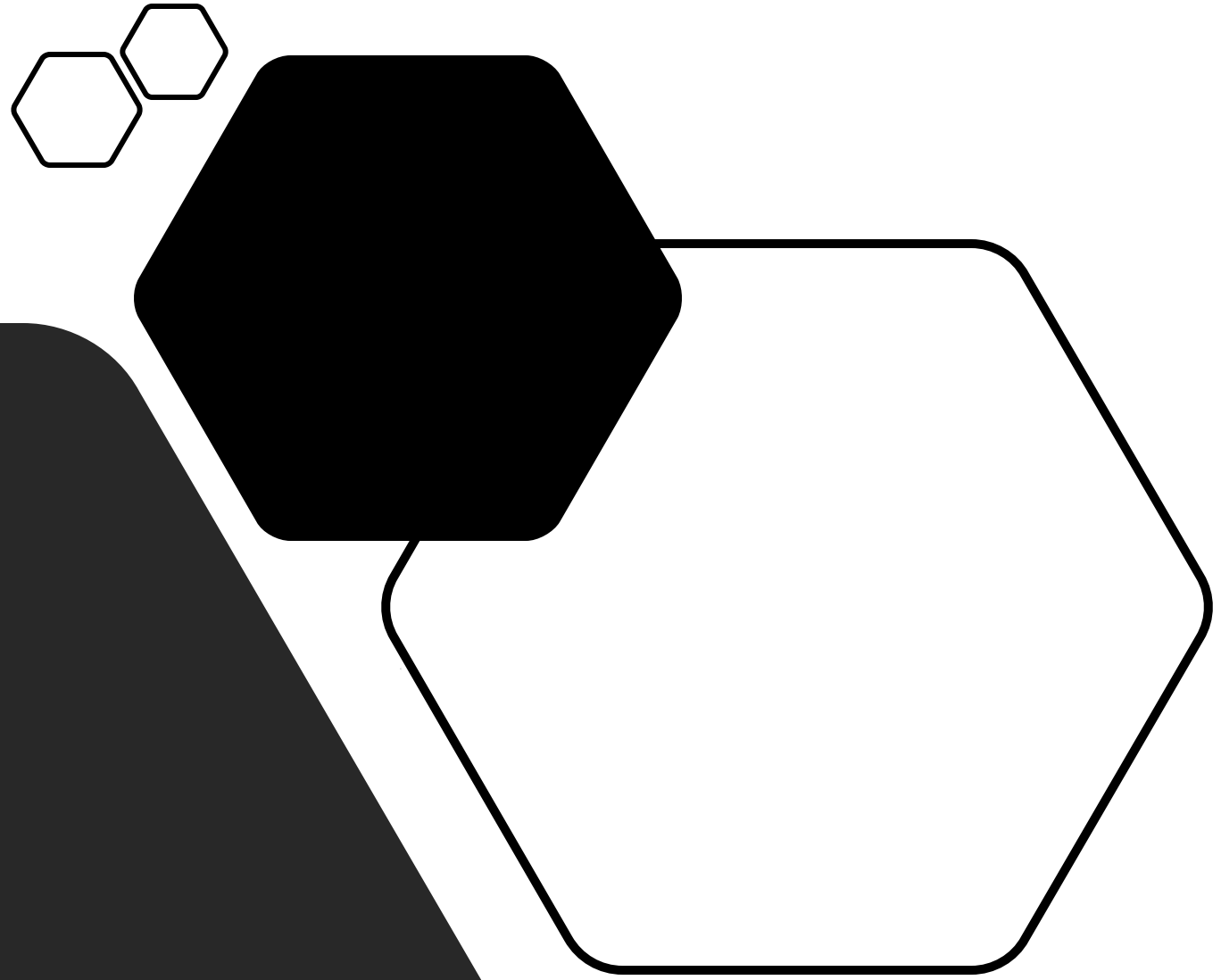
- Permissive – Apache, MIT, BSD
- Copyleft (GPL)
- Proprietary (Copyright) - Trademark, Trade secret
- Creative Commons



Choosing an open source license

- Situations:
  - Small software or libraries ***[Note: If library you used does not had its license specified, you need to ask the creator to add license to it. Otherwise you cannot use it.]***
    - Apache
  - I want it simple and permissive
    - MIT
  - I care about sharing and improvements made to it to be shared.
    - GPL
  - Documentation (Tutorials, reference manuals)
    - GFDL (GNU Free Documentation License)
  - Music, Photography, Courseware, Websites
    - Creative Commons (cc)

History of GNU Linux



Linux Benedict Torvalds

" Hello everybody out there using minix - I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons, among other things)…Any suggestions are welcome, but I won't promise I'll implement them :-)

Linus (torvalds@kruuna.helsinki.fi)

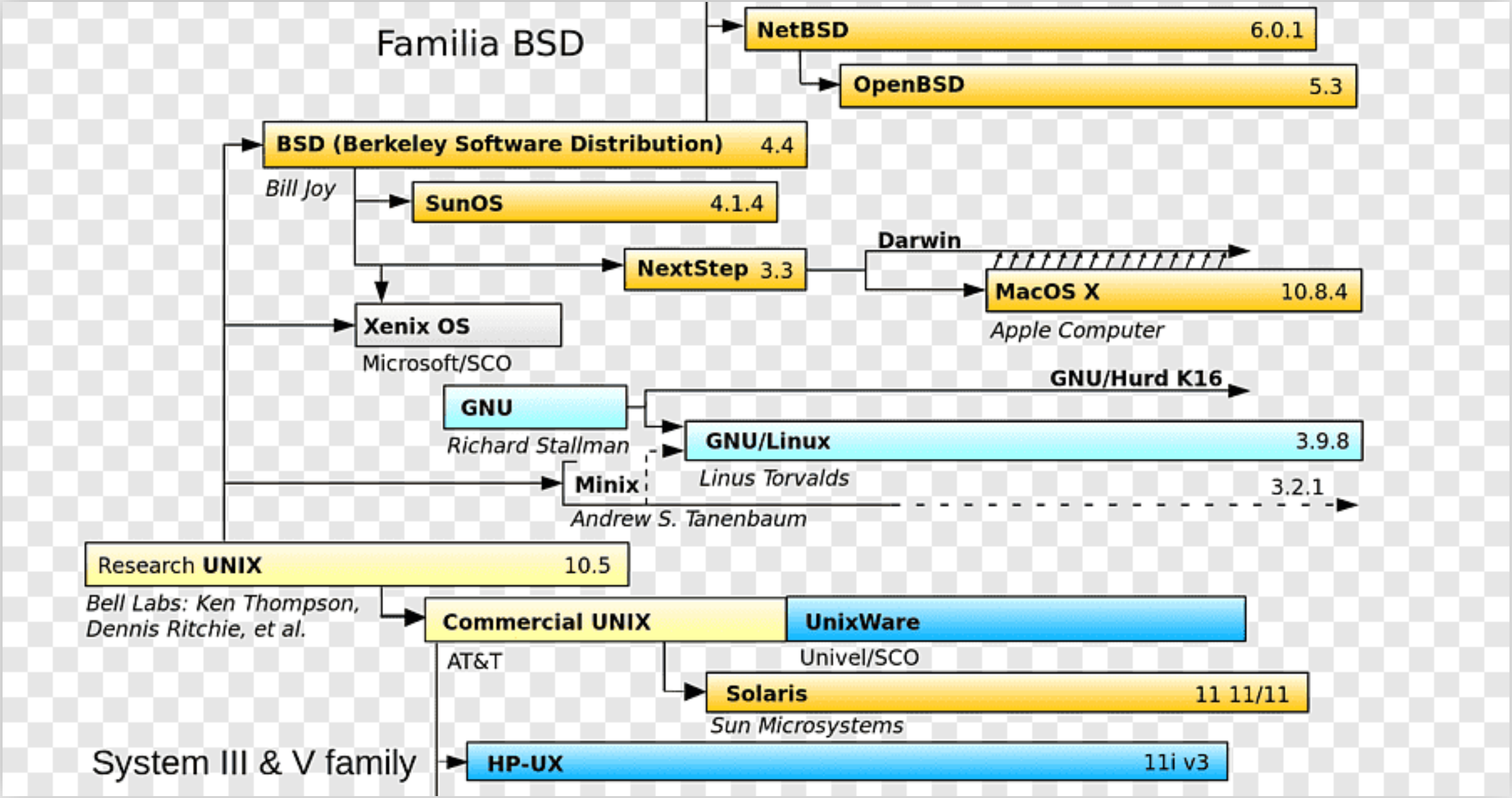
PS. Yes — it's free of any minix code, and it has a multi-threaded fs. It is NOT protable [sic] (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-(."

- At first there was system called MULTICS (Multiplexed Information and Computing Service) developed in Bell Labs (aka AT&T).
- Ken Thompson and Dennis Ritchie set off on their own to create an operating system that would offer an improved environment for developing software.
- So they developed UNiplexed Information Computing System (UNICS) or UNIX
- Written using punch cards later it was re-written using C after Dennis Ritche and Brian Kernighan created C programming language.
- 3 Foundations that UNIX was built:
  - UNIX file system
  - I/O Redirection
  - Portability

- Dennis was teaching at UC Berkeley during that time and he used to show the work done on UNIX to his students
- AT&T was not allowed to sell software's, it only provided education institutions at a small cost.
- Students on UC Berkeley started working on UNIX, re-writing most of it, which was later renamed as BSD (Berkeley Standard Distribution)
- This is where UNIX branched to UNIX that we know and BSD versions.
- Richard Stallman started GNU project, he wanted OS to be free hence started FSF. He developed user space application which could be freely distributable.

Linus build the missing piece

- Linus Torvalds stared working on UNIX-like OS so that the system he worked on would be same across all different platforms.
- This is how Linux that we know today merged with GNU to become GNU Linux.
- Distros like Debian still refer themselves as GNU Linux.
- So if someone asks you Ubuntu / Debian , then they are not Linux, its GNU Linux.


Familia BSD
NetBSD 6.0.1
OpenBSD 5.3
BSD (Berkeley Software Distribution) 4.4
Bill Joy
SunOS 4.1.4
NextStep 3.3
Darwin
MacOS X 10.8.4
Apple Computer
Xenix OS
Microsoft/SCO
GNU/Hurd K16
GNU
Richard Stallman
GNU/Linux 3.9.8
Linus Torvalds
Minix 3.2.1
Andrew S. Tanenbaum
Research UNIX 10.5
Bell Labs: Ken Thompson, Dennis Ritchie, et al.
Commercial UNIX
UnixWare
Univel/SCO
AT&T
Solaris 11 11/11
Sun Microsystems
System III & V family
HP-UX 11i v3

Linux Distros

- **Slackware** (Oldest)
- **Ubuntu / Mint** (easy to learn)
- **Centos** (Open source version of RHEL from red hat currently owned by IBM)
- **Red Hat** (Enterprise grade server, Charges for support not the OS)
- **BSD** (FreeBSD, NetBSD, OpenBSD (Most secure Linux distribution))
- **Debian / Fedora** – Close to the source, Supports multiple architectures
- **Arch Linux** (Need to install everything yourself – Refer Arch wiki)
- **Gentoo** (Build and Compile packages specifically for your computer)
- **Kali Linux** (Security)

How are they different ?

Package manager

- Ubuntu / Debian uses apt (aptitude)
- Fedora users DNF
- Centos / Red Hat uses – YUM or DNF
- Gentoo uses Portage
- Arch uses Pacman

Update policy

- Ubuntu releases LTS every six months
- Centos / Red Hat updates when its ready.
- Debian similar to Ubuntu
- Gentoo and Arch has "rolling release"

Desktop Environment

- Ubuntu / CentOS - GNOME
- Fedora and OpenSUSE - KDE
- Arch and Gentoo – Your Choice, I prefer XFCE

Linux compared to other OS (Windows and Mac)

- Access to source code
- Flavors
- Licensing
- Command line
- Freedom
- Support
- Different file systems
- Run levels

Applications of Linux

- **Trackpoint**: Linux powered gun for auto-aim.
- **NASA**: International Space Station uses Linux (Debian).
- **Google**: Phone (Android).
- **Tesla**: Cars (Modified version of Ubuntu)
- **SpaceX**: Rocket (Debian)

Q & A

Let's connect

- **LinkedIn**: https://www.linkedin.com/in/prabeshthapa/
- **Twitter**: https://www.twitter.com/pgaijin66

Thank you