

# Before We Begin Unix Shell Programming

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# Worth knowing...

- The first Unix system was developed in 1969 by a programmer at AT&T's Bell Labs so that he could run a program called Space Travel.
- Before Unix, there existed Multics (Multiplex Information and Computing Service), a joint effort of MIT, Bell Labs (AT&T) and General Electric (GE).
- Ken Thompson wanted to give his system the name "Unics".
- There are many types of Unix: some are Linux; some aren't.
- There are two types of people – one, who do not know that they are using Unix e.g. Macintosh users; second, who do know they are using Unix.

# Why Unix?

- **Choice.** With Unix, you will decide how you want to use your computer and how deep you want to get into the details.
- Using Unix will ***change how you think***, and for the better.
- You will become a member of the global Unix community, ***possess the Unix culture***.
- ***Unlimited number of programming tools*** are available for a programmer to develop, test and run programs as well as to document them.

# Use Unix, if you

- are smarter than average,
- are both lazy and industrious,
- like to read,
- want to be in control of the experience; don't want to feel as if the computer is controlling you.

# Let's begin !

- It is impossible to learn everything about Unix. Concentrate on what you need and what you think, you will enjoy.
- Unix is easy to use, but difficult to learn.
- Start by learning the basics. Then learn whatever you want, in whatever order you want.
- Practice the Unix culture - RTFM !

# Unix = Kernel + Utilities

- The kernel is the central part of the operating system. It is always running, and its job is to perform the essential tasks.
- The most important programs/utilities/tools are the ones that provide an interface for you to use the computer viz. **shells** and **GUIs**.
- A shell is a program that ***provides a text-based interface***.
- The other programs are called the Utilities. ***Each program is a separate tool***.
- Unix is a type of operating system that uses ***a Unix kernel*** and comes with ***the Unix utilities*** and ***a Unix shell***.

# UNIX is a trademark

- The AT&T lawyers specified that “The **trademark UNIX** must always appear in a form that is **typographically distinct**.”
- In 1990, AT&T formed a new organization **Unix Systems Laboratory** (USL) to take over Unix.
- In June 1993, AT&T sold USL to **Novell Corporation**.
- In October 1993, Novell **transferred the rights** to the name “UNIX” to an international standards organization called **X/Open**.
- Finally, in 1996, X/Open merged with the Open Software Foundation to form **The Open Group**.
- The Open Group says that “UNIX” is **a brand** that refers to any operating system that has been certified by them as complying with their “**Single UNIX Specification**”.

# What is Linux, then ?

Well! Hang on...

Let me talk about few things first.



# Free Software Foundation

- Richard Stallman, the **creator of the Emacs** text editor, left MIT AI Lab and started an organization called the **Free Software Foundation** (FSF) in 1985.
- Stallman says,
  - a **proprietary-software** social system, in which you are not allowed to share or change software, was not only **antisocial**, it was **unethical** and **wrong**.
  - Such systems create unhealthy **power struggles** between programmers and software companies.
- A major goal for the FSF was to create an operating system that could be **shared freely and modified** by anyone.
- FSF decided that the new OS should be **compatible with Unix**. (It should look just like Unix and should run Unix programs.)
- FSF gave that as-yet unbuilt OS the name **GNU**.

# GNU

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GNU
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- GNU is the name Richard Stallman chose to describe the Free Software Foundation's project to develop a full Unix-like operating system.
- The name itself is an acronym meaning "GNU's Not Unix" and is pronounced "ga-new".
- Within the expression "GNU's Not Unix", the word GNU can be expanded indefinitely i.e. GNU is actually a recursive acronym.
- GNU project delivered C compiler (***gcc***), a C++ compiler (***g++***), a powerful debugger (***gdb***), a Unix shell (***Bash***), and many other tools including the ***GNU version of Emacs*** text editor.

# Copyleft — all rights reversed.

- The central idea of copyleft is that we ***give everyone permission*** to run the program, copy the program, modify the program, and distribute modified versions – but ***not permission to add restrictions*** of their own.
- ***GPL*** (General Public License) was released in 1989 to implement the idea of copyleft.

# BSD

- In 1974, a professor at Berkeley, Bob Fabry, ***procured a copy of AT&T's UNIX*** version 4, and Berkeley students started making major enhancements.
- In 1975, ***Ken Thompson went to Berkeley*** for a one-year sabbatical, which acted as a catalyst for Berkeley's Unix development.
- In 1977, ***Bill Joy***, the creator of ***vi***, shipped the first version of Berkeley's Unix, and the system was referred to as the ***Berkeley Software Distribution*** (BSD).
- By 1979, all BSD users were required to ***buy a license from AT&T*** and, every year, AT&T increased the price.

# Back to Linux...

Linux was developed only in 1991.

Let's see what happened to Unix in 1980s?

# BSD and System V

- By 1980, East Coast Unix (AT&T UNIX) and West Coast Unix (BSD) were growing.
- In 1980, Bob Fabry, the Berkeley professor, ***received a large contract from DARPA*** to develop Unix.
- DARPA wanted an OS that could ***run on different types of hardware*** so that their nationwide research centers could ***be connected***.
- A task-force named Computer Systems Research Group (CSRG) was formed and began developing BSD.
- By 1982, ***4.1BSD supported TCP/IP***.
- On the other side, AT&T's goal was ***to commercialize UNIX***. They developed System V and began selling with ***the first-ever official support***. By 1984, there were in total ***100,000 UNIX installations***.

# Outcry for Free Unix

- In 1987, **Andrew Tanenbaum**, a professor at Vrije Universiteit in Amsterdam, released **Minix** (“Minimal Unix”), a much smaller Unix like OS.
- People liked Minix and wanted to enhance but Tanenbaum insisted it **should remain a simple OS**, suitable for teaching.
- Till 1991,
  - DOS (for PCs) was simple and unsatisfying;
  - the Apple Macintosh OS was better, but too expensive;
  - commercial versions of Unix were expensive, too.
  - FSF's GNU kernel named Hurd was far from ready.
  - **BSD was partially controlled by AT&T** and also (as yet) didn't run on a PC;
- Berkeley programmers worked in replacing the UNIX parts of BSD to **produce completely independent Unix**, but that would not happen until 1992.

# Now, finally, here comes Linux !

- In September 1991, **Linus Torvalds**, a second-year computer science student at the University of Helsinki, made the first version of his kernel, which he called **Linux**.
- Early on, Linus made a strategic decision to release the Linux kernel ***under the auspices of the GNU GPL***.
- Linus's Law: ***“Given enough eyeballs, all bugs are shallow.”***
- He released new versions of the kernel very often and ***bugs were identified and fixed quickly***.
- Linux progressed faster and better than any major software project.



# Linux Distributions

- What Linus Torvalds and the Linux project created was a kernel (a ***monolithic kernel***), not a complete OS.
- Within 5 months of Linus' first kernel release, other people were offering free OSs based on the Linux kernel. Such an offering is called a ***Linux Distribution*** (or distro).
- The first successful Linux distro was ***Slackware***, offered by a programmer Patrick Volkerding.
- Today's modern Linux distributions ***offer a complete product***: the kernel, the utilities, programming tools, and at least one GUI.

# So, what is Linux?

- “Linux” has two meanings:
  - First, “Linux” refers to a kernel, the product of the countless programmers who work on the Linux project.
  - Second, “Linux” is the name of any operating system that is based upon the Linux kernel.
- Linux also is Unix
  - Unix is a multiuser, multitasking operating system that consists of a Unix-like kernel, Unix-like utilities and a Unix-like shell.
  - Linux is the name given to any Unix that uses the Linux kernel.

# And, What happened to BSD?

- Berkely programmers, finally in 1992, replaced all AT&T components of AT&T UNIX from BSD and began to distribute it over the Internet.
- It was named **386/BSD** and soon was renamed as **FreeBSD**.
- Initially, FreeBSD runs only on PC hardware. Later a version was made to run in other hardwares too, it was called **NetBSD**.
- The version of BSD that ***focused on security and cryptography*** was also developed and that was named **OpenBSD**.

# Linux vs. FreeBSD

- The BSD license is far less restrictive than the GPL. Under the BSD license, it is allowable to use parts of BSD to create a new product without having to share it.
- If you want to learn how Unix works, how to customize your environment, how to program, or you just want to have fun, then use Linux.
- FreeBSD is very stable and reliable, and tends to work just out of the box. So, if you are working at a company, and you are looking for a system that needs as little attention as possible, use FreeBSD.