

What is Linux?

Sungwook Lee

University of Southern Mississippi

NSF-HBCU Summer School on Computational Modeling of
Disordered Solids, June 3, 2019

Outline

- 1 Linux
- 2 Linux Basics

What is Linux?

- *Linux* is a unix-like operating system (OS) made and introduced by a Finnish computer scientist Linus Torvalds in 1991.
- Linux behaves in a manner similar to Unix, an operating system mainly for mainframe computers, which was originally introduced by Bell Lab. Linux runs on PCs (including laptops), workstations and supercomputers. In fact, Linux is the only OS used on TOP500 supercomputers since November 2017.
- Unlike Unix which is closed source, Linux is open source. Linux OS is available for free under General Public License (GPL) by the *GNU project*.

What is Linux?

- *Linux* is a unix-like operating system (OS) made and introduced by a Finnish computer scientist Linus Torvalds in 1991.
- Linux behaves in a manner similar to Unix, an operating system mainly for mainframe computers, which was originally introduced by Bell Lab. Linux runs on PCs (including laptops), workstations and supercomputers. In fact, Linux is the only OS used on TOP500 supercomputers since November 2017.
- Unlike Unix which is closed source, Linux is open source. Linux OS is available for free under General Public License (GPL) by the *GNU project*.

What is Linux?

- *Linux* is a unix-like operating system (OS) made and introduced by a Finnish computer scientist Linus Torvalds in 1991.
- Linux behaves in a manner similar to Unix, an operating system mainly for mainframe computers, which was originally introduced by Bell Lab. Linux runs on PCs (including laptops), workstations and supercomputers. In fact, Linux is the only OS used on TOP500 supercomputers since November 2017.
- Unlike Unix which is closed source, Linux is open source. Linux OS is available for free under General Public License (GPL) by the *GNU project*.



Figure: Gnu, GNU mascot

- The GNU project is a free-software, mass-collaboration project initiated by Richard Stallman at MIT in 1983.
- The aim of the GNU project is to give computer users freedom and control in the use of their computers and computing devices.
- GNU software legally guarantees through GPL the following freedom-rights: users are free to run the software, share it (copy and distribute), study it, and modify it.
- The word *free* is always being taken to refer to *freedom*.



Figure: Gnu, GNU mascot

- The GNU project is a free-software, mass-collaboration project initiated by Richard Stallman at MIT in 1983.
- The aim of the GNU project is to give computer users freedom and control in the use of their computers and computing devices.
- GNU software legally guarantees through GPL the following freedom-rights: users are free to run the software, share it (copy and distribute), study it, and modify it.
- The word *free* is always being taken to refer to *freedom*.



Figure: Gnu, GNU mascot

- The GNU project is a free-software, mass-collaboration project initiated by Richard Stallman at MIT in 1983.
- The aim of the GNU project is to give computer users freedom and control in the use of their computers and computing devices.
- GNU software legally guarantees through GPL the following freedom-rights: users are free to run the software, share it (copy and distribute), study it, and modify it.
- The word *free* is always being taken to refer to *freedom*.



Figure: Gnu, GNU mascot

- The GNU project is a free-software, mass-collaboration project initiated by Richard Stallman at MIT in 1983.
- The aim of the GNU project is to give computer users freedom and control in the use of their computers and computing devices.
- GNU software legally guarantees through GPL the following freedom-rights: users are free to run the software, share it (copy and distribute), study it, and modify it.
- The word *free* is always being taken to refer to *freedom*.

Hackers versus Crackers

- People like Richard Stallman and Linus Torvalds are examples of real *hackers*.
- Hackers are builders and creators. Richard Stallman explains about Hackers in a 1985 documentary: *What they had in common was mainly love of excellence and programing. They wanted to make them do neat things. They wanted to be able to do something in a more exciting way than anyone believed possible and show "Look how wonderful this is. I bet you didn't believe this could be true."*
- Those folks like Anonymous and Guccifer are breakers and they should not be called hackers. They used to be called *crackers*.

Hackers versus Crackers

- People like Richard Stallman and Linus Torvalds are examples of real *hackers*.
- Hackers are builders and creators. Richard Stallman explains about Hackers in a 1985 documentary: *What they had in common was mainly love of excellence and programing. They wanted to make them do neat things. They wanted to be able to do something in a more exciting way than anyone believed possible and show "Look how wonderful this is. I bet you didn't believe this could be true."*
- Those folks like Anonymous and Guccifer are breakers and they should not be called hackers. They used to be called *crackers*.

Hackers versus Crackers

- People like Richard Stallman and Linus Torvalds are examples of real *hackers*.
- Hackers are builders and creators. Richard Stallman explains about Hackers in a 1985 documentary: *What they had in common was mainly love of excellence and programing. They wanted to make them do neat things. They wanted to be able to do something in a more exciting way than anyone believed possible and show "Look how wonderful this is. I bet you didn't believe this could be true."*
- Those folks like Anonymous and Guccifer are breakers and they should not be called hackers. They used to be called *crackers*.

Why do we want to use Linux?

Just to list a few:

- You gain complete freedom over your machine.
- It cost you nothing to use Linux OS along with thousands of software packages.
- Linux is extremely reliable. It can run for years without a single failure or a situation that requires a restart. That is the reason Linux is an ideal OS for running servers.
- Linux consumes considerably fewer system resources when compared to Microsoft Windows. This is one of the reasons why Linux is an ideal OS for *scientific computing*.

Why do we want to use Linux?

Just to list a few:

- You gain complete freedom over your machine.
- It cost you nothing to use Linux OS along with thousands of software packages.
- Linux is extremely reliable. It can run for years without a single failure or a situation that requires a restart. That is the reason Linux is an ideal OS for running servers.
- Linux consumes considerably fewer system resources when compared to Microsoft Windows. This is one of the reasons why Linux is an ideal OS for *scientific computing*.

Why do we want to use Linux?

Just to list a few:

- You gain complete freedom over your machine.
- It cost you nothing to use Linux OS along with thousands of software packages.
- Linux is extremely reliable. It can run for years without a single failure or a situation that requires a restart. That is the reason Linux is an ideal OS for running servers.
- Linux consumes considerably fewer system resources when compared to Microsoft Windows. This is one of the reasons why Linux is an ideal OS for *scientific computing*.

Why do we want to use Linux?

Just to list a few:

- You gain complete freedom over your machine.
- It cost you nothing to use Linux OS along with thousands of software packages.
- Linux is extremely reliable. It can run for years without a single failure or a situation that requires a restart. That is the reason Linux is an ideal OS for running servers.
- Linux consumes considerably fewer system resources when compared to Microsoft Windows. This is one of the reasons why Linux is an ideal OS for *scientific computing*.

Why do we want to use Linux?

Continued

- Microsoft Windows has been infested with security vulnerabilities that were exploited by crackers. It is also notoriously vulnerable to malware, trojans and viruses. Linux is almost no such security vulnerability due to its inherent design.
- You should be wary of Windows privacy policy. Unlike Windows Linux does not generated logs of your personal information and activities and upload the data from your machine. With Linux your privacy is protected.
- And many more ...

Why do we want to use Linux?

Continued

- Microsoft Windows has been infested with security vulnerabilities that were exploited by crackers. It is also notoriously vulnerable to malware, trojans and viruses. Linux is almost no such security vulnerability due to its inherent design.
- You should be wary of Windows privacy policy. Unlike Windows Linux does not generated logs of your personal information and activities and upload the data from your machine. With Linux your privacy is protected.
- And many more ...

Why do we want to use Linux?

Continued

- Microsoft Windows has been infested with security vulnerabilities that were exploited by crackers. It is also notoriously vulnerable to malware, trojans and viruses. Linux is almost no such security vulnerability due to its inherent design.
- You should be wary of Windows privacy policy. Unlike Windows Linux does not generated logs of your personal information and activities and upload the data from your machine. With Linux your privacy is protected.
- And many more ...

Linux Distributions

- There are almost 600 Linux distributions exist to this day.
- Debian, CentOS, Fedora, Mint, openSUSE, Ubuntu are among the most popular all purpose Linux distributions. There are also open source Unix distributions, notably FreeBSD.
- There are also Linux distributions with special purposes. To name a few BlackBox (penetration test, security assessment), Fermi Linux (scientific computing, developed by Fermilab), Kali Linux (security, hacking, computer forensics, penetration testing), OpenBSD (missing security features for research purpose), Parrot Linux (computer security), Poseidon Linux (scientific computing), Scientific Linux (scientific computing, developed by CERN), TrustedBSD (FreeBSD with security-related features including FLASK-Flux Advanced Security Kernel developed by NSA)

Linux Distributions

- There are almost 600 Linux distributions exist to this day.
- Debian, CentOS, Fedora, Mint, openSUSE, Ubuntu are among the most popular all purpose Linux distributions. There are also open source Unix distributions, notably FreeBSD.
- There are also Linux distributions with special purposes. To name a few BlackBox (penetration test, security assessment), Fermi Linux (scientific computing, developed by Fermilab), Kali Linux (security, hacking, computer forensics, penetration testing), OpenBSD (missing security features for research purpose), Parrot Linux (computer security), Poseidon Linux (scientific computing), Scientific Linux (scientific computing, developed by CERN), TrustedBSD (FreeBSD with security-related features including FLASK-Flux Advanced Security Kernel developed by NSA)

Linux Distributions

- There are almost 600 Linux distributions exist to this day.
- Debian, CentOS, Fedora, Mint, openSUSE, Ubuntu are among the most popular all purpose Linux distributions. There are also open source Unix distributions, notably FreeBSD.
- There are also Linux distributions with special purposes. To name a few BlackBox (penetration test, security assessment), Fermi Linux (scientific computing, developed by Fermilab), Kali Linux (security, hacking, computer forensics, penetration testing), OpenBSD (missing security features for research purpose), Parrot Linux (computer security), Poseidon Linux (scientific computing), Scientific Linux (scientific computing, developed by CERN), TrustedBSD (FreeBSD with security-related features including FLASK-Flux Advanced Security Kernel developed by NSA)

Ubuntu

- Ubuntu is one of the most popular Linux distributions and is based on Debian.
- Ubuntu is user-friendly and it comes with a wonderful software repository.
- Ubuntu is released every six months, with long term support (LTS) releases every two years. The most recent LTS release is 18.04 LTS (Bionic Beaver). It is supported until 2028.
- Ubuntu is released in three editions: Desktop, Server, and Core (for internet of things devices and robots).
- Ubuntu is a Nguni Bantu term. It can be translated as *the belief in a universal bond of sharing that connects all humanity*.

Ubuntu

- Ubuntu is one of the most popular Linux distributions and is based on Debian.
- Ubuntu is user-friendly and it comes with a wonderful software repository.
- Ubuntu is released every six months, with long term support (LTS) releases every two years. The most recent LTS release is 18.04 LTS (Bionic Beaver). It is supported until 2028.
- Ubuntu is released in three editions: Desktop, Server, and Core (for internet of things devices and robots).
- Ubuntu is a Nguni Bantu term. It can be translated as *the belief in a universal bond of sharing that connects all humanity*.

Ubuntu

- Ubuntu is one of the most popular Linux distributions and is based on Debian.
- Ubuntu is user-friendly and it comes with a wonderful software repository.
- Ubuntu is released every six months, with long term support (LTS) releases every two years. The most recent LTS release is 18.04 LTS (Bionic Beaver). It is supported until 2028.
- Ubuntu is released in three editions: Desktop, Server, and Core (for internet of things devices and robots).
- Ubuntu is a Nguni Bantu term. It can be translated as *the belief in a universal bond of sharing that connects all humanity*.

Ubuntu

- Ubuntu is one of the most popular Linux distributions and is based on Debian.
- Ubuntu is user-friendly and it comes with a wonderful software repository.
- Ubuntu is released every six months, with long term support (LTS) releases every two years. The most recent LTS release is 18.04 LTS (Bionic Beaver). It is supported until 2028.
- Ubuntu is released in three editions: Desktop, Server, and Core (for internet of things devices and robots).
- Ubuntu is a Nguni Bantu term. It can be translated as *the belief in a universal bond of sharing that connects all humanity.*

Ubuntu

- Ubuntu is one of the most popular Linux distributions and is based on Debian.
- Ubuntu is user-friendly and it comes with a wonderful software repository.
- Ubuntu is released every six months, with long term support (LTS) releases every two years. The most recent LTS release is 18.04 LTS (Bionic Beaver). It is supported until 2028.
- Ubuntu is released in three editions: Desktop, Server, and Core (for internet of things devices and robots).
- Ubuntu is a Nguni Bantu term. It can be translated as *the belief in a universal bond of sharing that connects all humanity*.

Logging-in and getting connected to the internet

- Your username is shown on the log-in screen. It is like, for example, *hbcu-guest08*.
- Your default password is *hbcu2019*.
- To get connected to the internet choose USM Public. Your computer will be asking you soduser's password. It is ...

Desktops

- There are different desktops available in Linux. They include Cinnamon, GNOME (currently GNOME3), KDE, LXDE, MATE (the continued fork of GNOME2), Unity, and Xfce. The default desktop for Ubuntu 18.04 LTS is GNOME3.
- GNOME3 does not have pull-down menu. To find applications click on the icon located at the bottom of the side bar.

Sudo

- sudo is a program for Unix-like operating systems that allows users to run programs with security privileges of the superuser. The name sudo was derived from *superuser do*.
- In Ubuntu users with security privileges of the superuser (called *sudoers*) can run sudo.
- We made you a sudoer.
- To run sudo you need to use a command shell.

Command Shell

- In Unix-like operating systems including Ubuntu, a *command-line interface shell (CLI)* or shortly a *command shell* or *text shell* is a crucial user interface for access to the operating system's services.
- Let us practice some basic Linux commands: ls, touch, rm, mkdir, rmdir, chmod, adduser, deluser, addgroup, delgroup, chown, passwd

Software Update

- Using Software Updater
- Using a comand shell: `sudo apt update && sudo apt upgrade`

Installing and Removing Packages

- Using a package manager. I recommend *synaptic*.
- Using a command shell: `apt install`, `apt remove`, `apt purge`, `apt autoremove`

LaTeX

- LaTeX (a shortning of Lamport Tex named after its creator Leslie Lamport) is a document preparation system (wordprocessor).
- It is clearly distinguished from WYSIWYG (*What You See Is What You Get*) wordprocessors such as Microsoft Word, LibreOffice etc.
- LaTeX is widely used in academia. In particular in mathematics and physics LaTeX is the standard wordprocessor for writing papers and books. It is also becoming a popular wordprocessor in theoretical computer science.

LaTeX

Continued

- In Ubuntu LaTeX is available through *Texlive*.
- To use LaTeX one needs an editor. Old-time favorite editors include *vi* (new name *vim*) or *emacs*. For beginners I recommend *kile*. *kile* is more than an editor. It is a LaTeX interface. You also compile and build LaTeX documents within *kile*. Other popular LaTeX interfaces include *Texmaker* and *Texstudio*.
- The format to write a math expression in LaTeX is $\$your-LaTeX-code-here\$$ (inline) or $\$\$your-LaTeX-code-here\$\$$ (display). For example $\$\int_a^b f(x)dx\$$ will produce

$$\int_a^b f(x)dx$$

after compiling.

Dell Recovery USB

- Plug your accompanied USB memory stick into a USB slot and restart your computer.
- As soon as you see a big Dell logo on start-up screen press F12 key. It will then show you boot options. Choose *UEFI: Centon*.
- There are two options for Dell Recovery Media:
 - 1 *Restore entire hard drive:* You may use this option but before you do you must back up the data in your account. This option will delete all your personal files.
 - 2 *Restore only Linux OS partition:* Don't choose this option unless you know what you are doing.