Introduction to Linux

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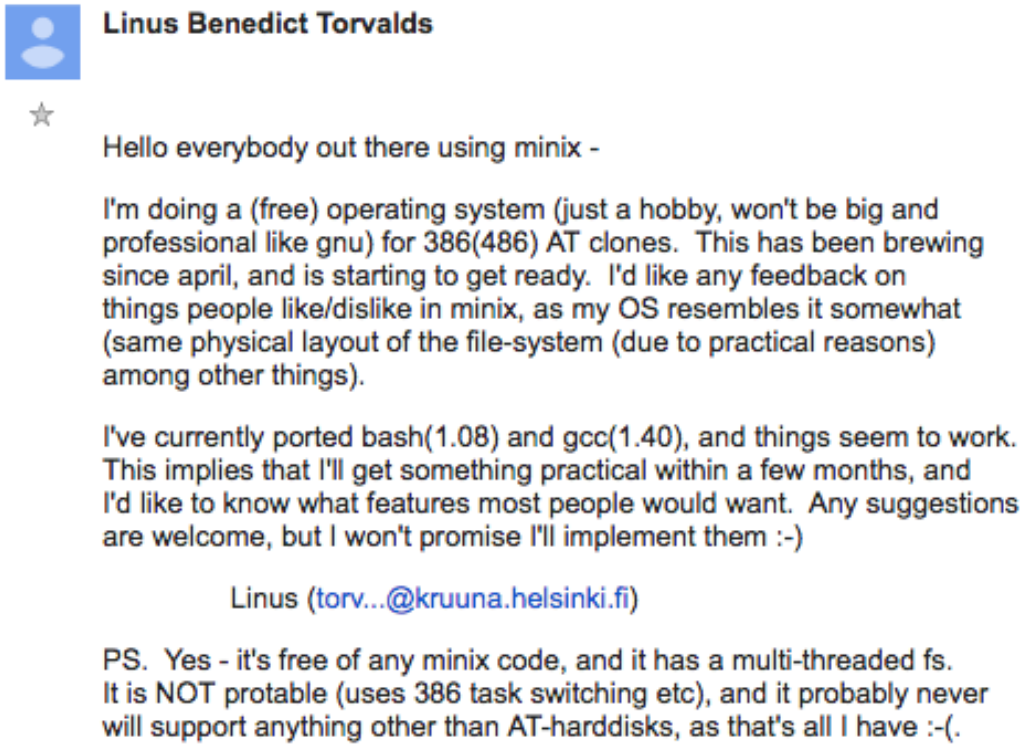
History of Unix

- The UNIX operating system was developed by Ken Thompson and Dennis Ritchie of AT&T Bell labs in 1969 and was first released in 1970
- In 1977 the University of California at Berkeley released a free Unix like system, called Berkeley Software Distribution (BSD). BSD contained some Unix code. So AT&T sued
- In 1983, Richard Stallman started GNU project to create a free Unix like operating system. Hurd (GNU kernel) failed to attract enough developers, leaving it incomplete
- In 1987, Andrew S Tannenbaum released MINIX, a Unix like system intended for academic use. While source code was available, modification and redistribution were restricted

History of Linux

- On 25th August 1991, Linux Torvalds announced a new operating system, which became known as Linux, through a post in Usenet group



Linus 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).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)

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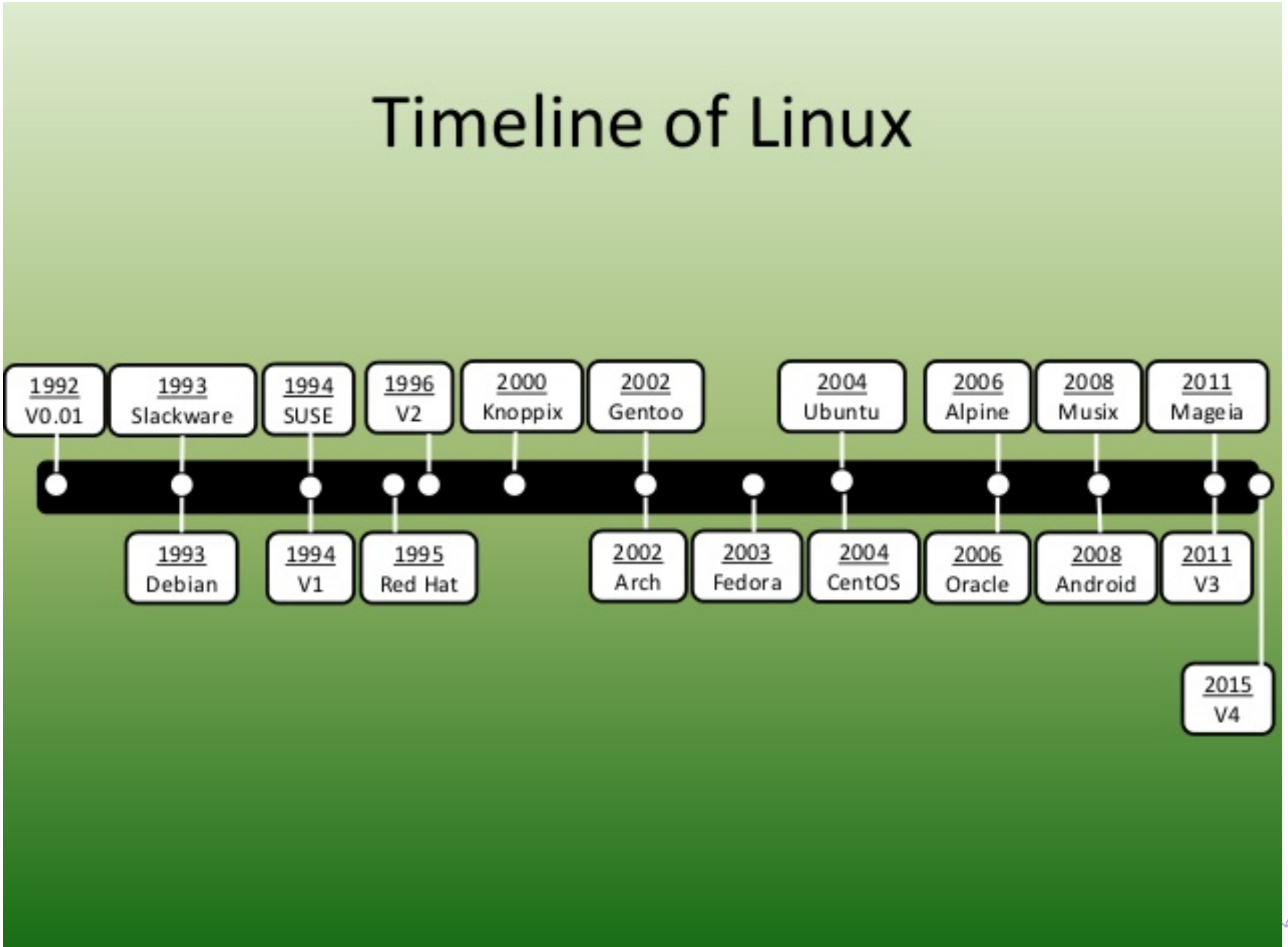
PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT protable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-(.

History of Linux

- Torvalds made Linux freely available to everyone on the internet. And therefore lot of people created their own versions of Linux.
- The license under which Linux is available, makes it open-source and the copyright holder provides the right to study, modify and redistribute to anyone. It allows the software development to happen in a public and collaborative manner
- It is also called copylefted software

History of Linux



Some Linux Distributions

- **Slackware**
- **Debian**
- **SUSE**
- **Fedora, CentOS, Red Hat Enterprise**
- **Knoppix, Gentoo, Arch**
- **Ubuntu, LinuxMint**
- **Android**

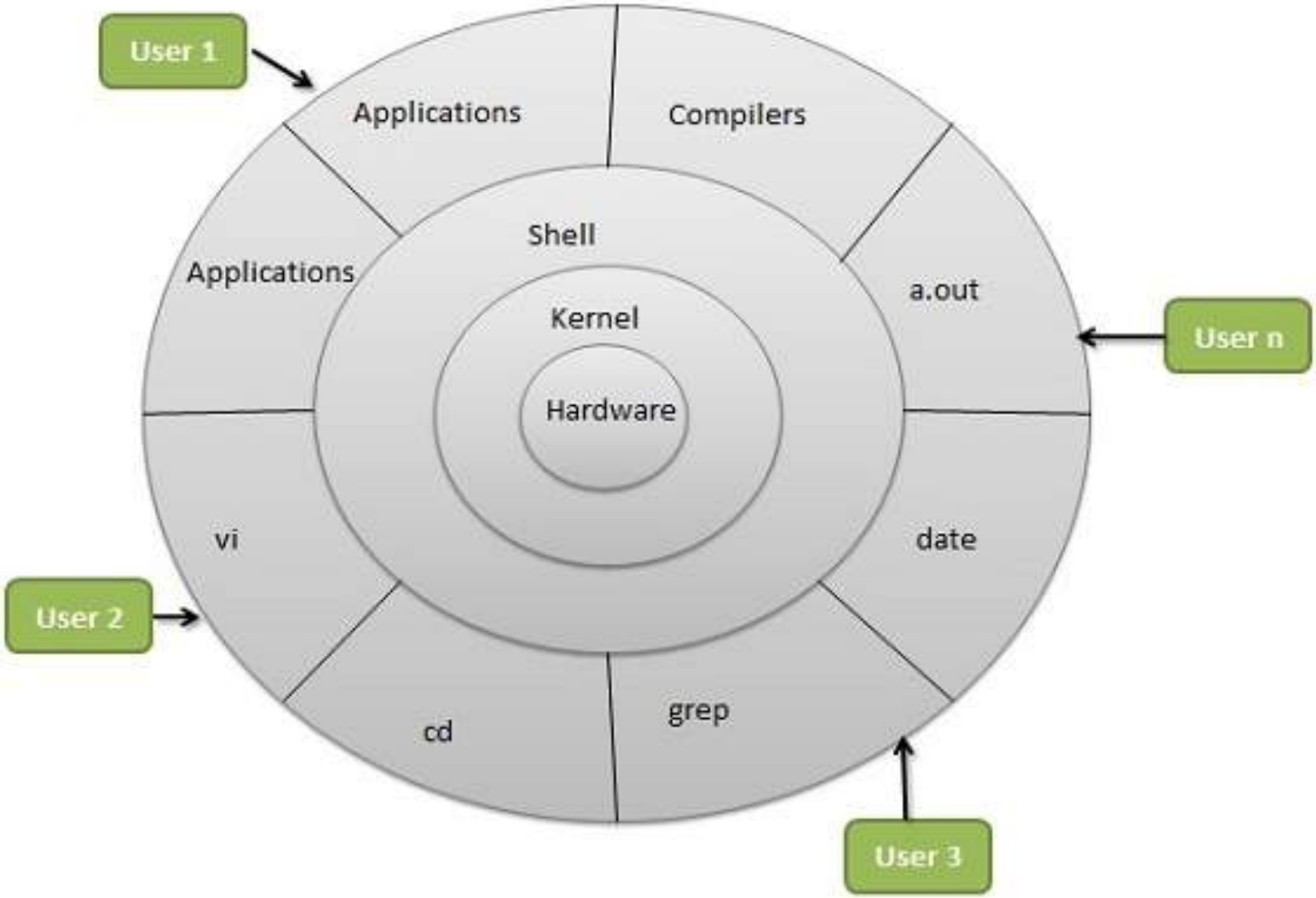
Some Desktop Environments

- **Xfce**, **LXDE** - fast and light weight
- **Enlightenment** - original eye candy window manager
- **KDE** - based on QT library
- **GNOME** - based on GTK widget library
- **MATE**, **Cinnamon**

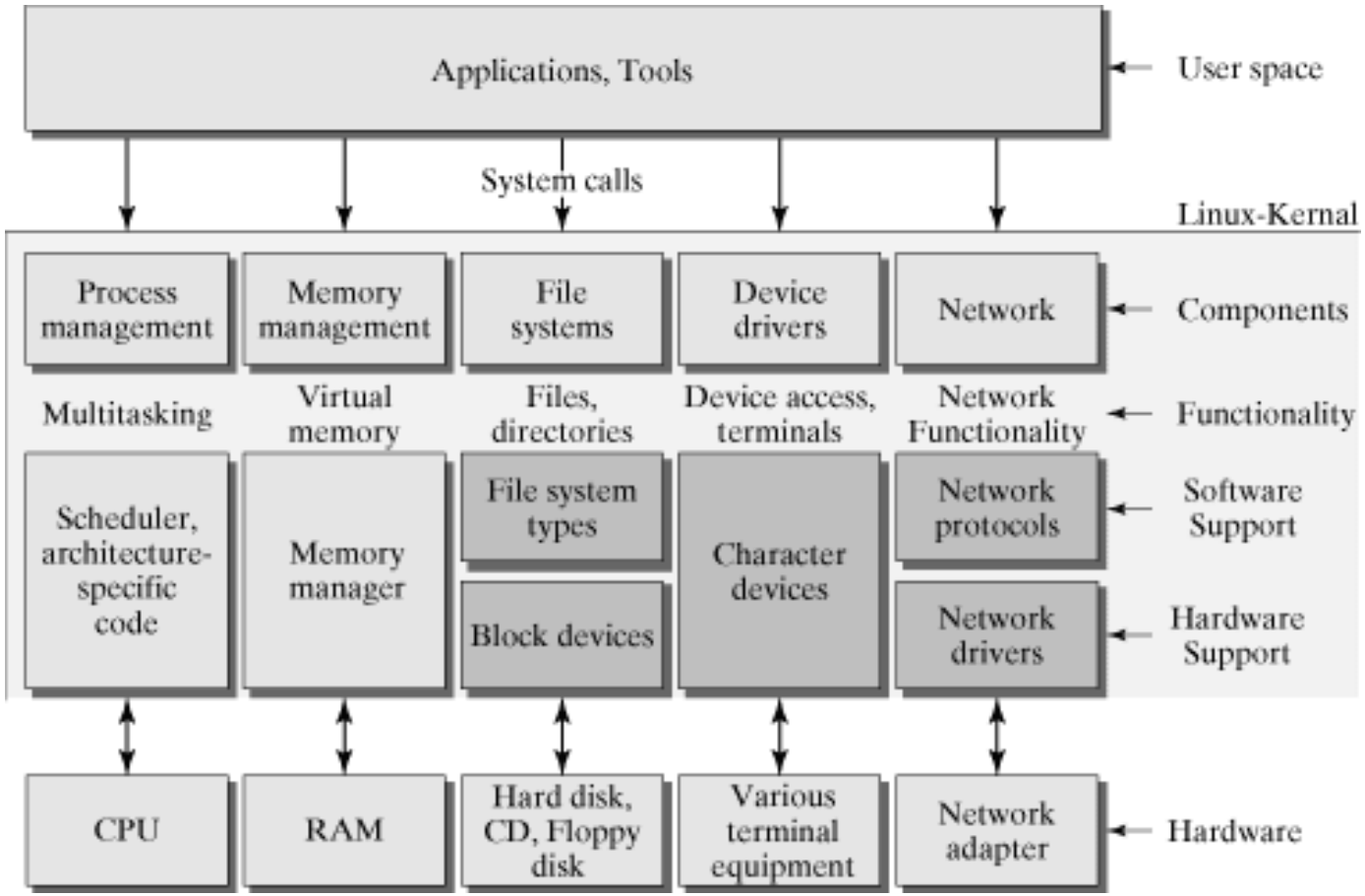
Features of Linux

- It is a Unix like operating system, but not Unix
- It supports 32 bit and 64 bit processors
- It is free
- Supports multiple processors
- Muti-tasking and Multi-user
- Hierarchical file system
- Shell
- Security

Architecture of Linux



Linux Kernel Architecture



Linux shells

- A shell is a program which reads commands from the user and hands them over to the OS to execute
- A shell is also a programming language, with programming constructs for conditional execution, looping, variables, and functions
- BASH is the default shell in Ubuntu and other Linux distributions
- Some of the other popular shells are CSH, KSH, ZSH

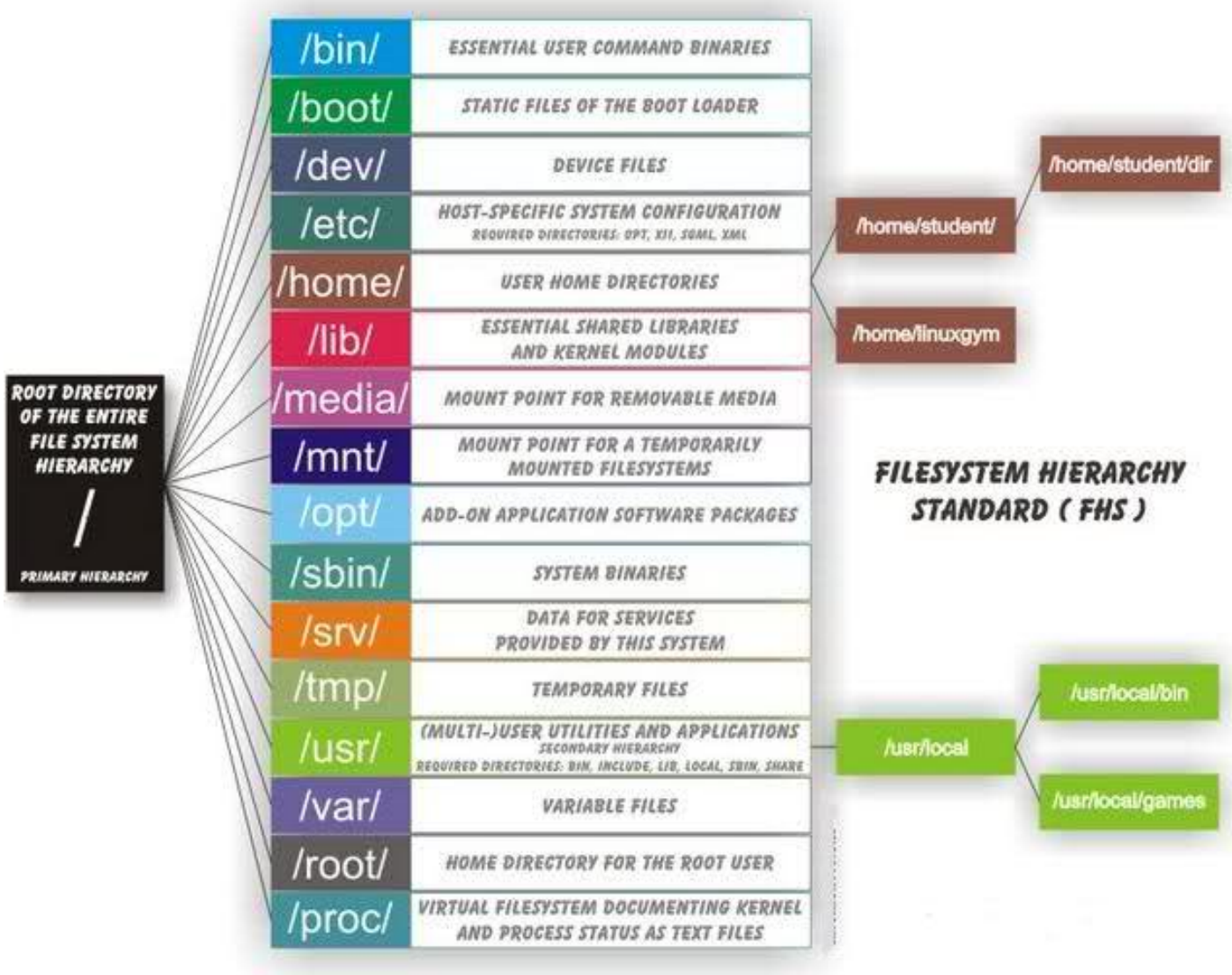
Linux file system

- Linux can be thought of containing two parts, namely, process subsystem, and file subsystem
- A file system is a way of storing data on hard drive, flash drive, or any other storage device
- Formatting is the process of creating an empty file system on a storage device
- Distinguishing features of a file system are, speed of accessing data, security, support for large storage devices, resistance to corruption, so on.
- Some common files systems are FAT32, NTFS, HFS+, EXT2/EXT3/EXT4, ZFS, XFS, JFS,and SWAP

Linux file system

- The default file system in many Linux distributions including Ubuntu is EXT4
- It is a journaling file system

Linux file system



Linux file system

- Parent directory, child directory, sibling directory
- ‘.’, ‘..’, ‘~’
- Absolute path to a file
- Relative path to a file

Common linux commands

- ‘pwd’, ‘cd’, ‘ls’, ‘mkdir’, ‘rmdir’
- ‘cp’, ‘mv’, ‘rm’, ‘touch’, ‘locate’
- ‘grep’, ‘cat’, ‘sudo’, ‘man’

File permissions

- ‘user’, ‘group’, ‘others’
- ‘read’, ‘write’, ‘execute’
- ‘chmod’, ‘chown’

Process system

- ‘ps’, ‘kill’, ‘uname’
- I/O redirection: ‘<’, ‘>’, ‘»’
- Pipes: ‘|’

Starting vim

- If you type **vim** at the shell rompt and press 'Enter', a window will open with a helpful text in the center
- If you type **vim <filename>** at the shell prompt and press 'Enter'
  - If the <filename> does not exist, it will be created and opened for editing. This is indicated by a series of tilde characters (~) in the first column
  - If the <filename> exists, it will be opened for editing

Vim modes

- Vim has three modes, namely, **command mode**, **input mode** and **last line mode**
- When vim opens, by default, it will be in command mode.
- It can be put into input mode by various commands.
- You can exit the input mode by pressing the 'Esc' key
- You can go into last line mode by pressing the colon character (:)

Exiting vim

- Press ':q<enter>' to exit vim if you have not made any changes to the file
- Press ':wq<enter>' to save the file and exit
- Press ':q!<enter>' to discard changes and exit
- ':x' is same as ':wq'
- 'ZZ' is same as above

Moving around

- You can use arrow keys to move around
- In command mode you can also use ‘h’ for left, ‘j’ for down, ‘k’ for up and ‘l’ for right movements
- Press ‘0’ or ‘^’ to go to the begining of a line
- Press ‘$’ to go to the end of a line

Moving around

- 'b' moves to the beginning of the word
- 'e' moves to the end of the word
- 'H' moves to the begining of the current screen
- 'L' moves to the end of the current screen
- 'M' moves to the middle of the screen
- 'f' find character forward. For example: fa
- 'F' find character backward.

Moving around

- '{' move back one paragraph
- '}' move forward one paragraph
- '(' move back one sentence
- ')' move forward one sentence
- 'gg' move to the begining of the file
- 'G' move to the end of the file

Entering text

- ‘i’ insert before the current character
- ‘I’ insert before the first character of the current line
- ’a’ insert after the current character
- ‘A’ insert after last character of the current line
- ‘r’ replace the current character
- ‘nr’ replace n characters
- ’R’ replacement mode

Entering text

- ‘o’ open a new line below the current line and enter input mode
- ‘O’ open a new line above the current line and enter input mode
- ‘ns’ delete n characters and enter input mode
- ‘nS’ delete n lines and enter input mode
- ‘cw’ change the current word
- ‘cc’ change the current line

Deleting text

- ‘nx’ delete n characters
- ‘ndw’ delete n words
- ‘ndd’ delete n lines
- ‘d0’ delete to the begining of the line
- ‘d$’ delete to the end of the line

Copy & paste

- ‘nyy’ copy n lines to the buffer
- ‘p’ paste the copied lines below the current line
- ‘P’ paste the copied lines above the current line

Undo and redo

- 'u' undo the previous actions
- '.' repeat the previous actions

Search and replace

- '/string' search and highlight all occurences of the string and place the cursor at the first occurence
- 'n' move to the next occurence of the string forward
- 'N' move to the next occurence of the string backaward
- ':%s/string/replstr/g' search for string and replace it replstr globally
- ':noh' remove the highlights

Miscellaneous commands

- ':n' move to the next file among list of files opened with vim
- ':r <file>' read <file> in to the current file
- ':e <file>' close the current file and open the <file> for editing

vimrc and plugins

Ubuntu package manager

- 'apt' is the package manager in Debian based distributions
- 'rpm' is the package manager in Red Hat based distributions
- 'sudo apt install <package>' to install a package
- 'sudo apt update' to update the package index
- 'sudo apt upgrade' to upgrade the installed packages
- 'sudo apt full-upgrade'
- 'sudo apt dist-upgrade'
- 'sudo apt list –installed' to all installed packages
- 'sudo apt remove' to remove a package
- 'sudo apt purge' to remove and purge all details about the package
- 'sudo apt autoremove' to clean apt cache