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Module 7

Introduction to Linux and Ubuntu

cybertaipan.csiro.au

Learning objectives

Participants will understand the basics of Linux, including the nature, architecture, and differences/similarities with Windows OS.

- *Linux overview*
- *Common Linux terms and definitions*
- *Linux system architecture*
- *Differences and similarities with Windows*

Participants will gain an introduction to the Linux commandline.

- *The ‘sudo’ command*

Section 1

What is Linux?

A family of operating systems

Linux refers to a family of operating systems modelled off of Unix.

Can perform many of the same functions as Windows or OSX.

Built in a collaborative, open-source environment.

Anyone may use, modify, or distribute the Linux kernel.

Anyone can develop software to run on the Linux kernel.

Many programmers collaborate to develop or improve Linux programs.

Many Linux operating systems and add-on programs are free.

Source:
http://www.linuxfederation.com/linux-everywhere/
http://techland.time.com/2012/06/19/what-exactly-is-a-supercomputer/
http://www.unixmen.com/why-do-super-computers-use-linux/

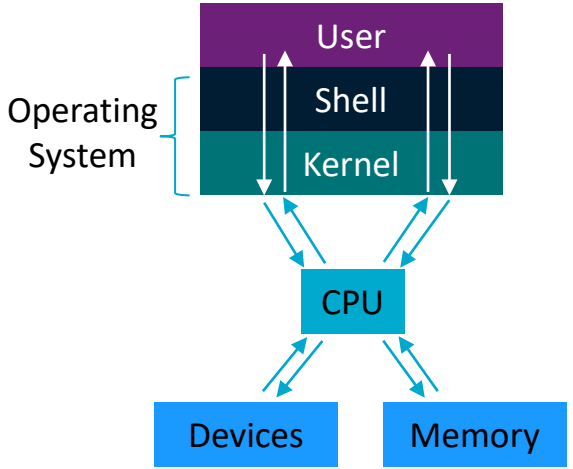
Linux kernel

A kernel is the core component of an OS.

Windows operating systems have kernels, but since they are not open-source or packaged separately for programmers to build off, they are less-often discussed.

Manages system resources (Memory, Processes, Input and Output Devices).

When a user does something in the shell (the OS's user interface and applications), the kernel translates the command and prioritises it against other requests for resources, so that it can be understood and executed by the CPU.



Source: https://help.ubuntu.com/8.04/serverguide/C/user-management.htm

Different Linux operating systems

There are many different flavours (OSs) built off the Linux kernel.

Ubuntu: *Most popular flavour. It is free and is very user-friendly.*

Mint: *A popular variation of Linux, similar in feel to Windows environment.*

Red Hat: *Designed by a company that develops specialised flavours for government and big business.*

Fedora: *An open-source, free version of Red Hat. Used frequently as a test bed for Red Hat programs.*

These flavours are similar at the basic level, but can have very different interfaces and specialised commands.

Source: http://www.ubuntu.com/

Source: http://www.linuxmint.com/

Source: https://fedoraproject.org/

Source: http://www.redhat.com/

Sources: http://distrowatch.com/dwres.php?resource=major
http://www.sitepoint.com/unix-style-operating-systems/

Differences between Linux flavours

Different default desktop environments (DEs).

- *DEs change the feel of the environment (like button positions and window behaviours).*
- *Ubuntu uses Unity (version 18 switched to GNOME 3).*
- *Debian uses GNOME.*

Different purposes and target audiences.

- *Ubuntu and Debian are for general audiences.*
- *Kali used for security, auditing, and forensics.*

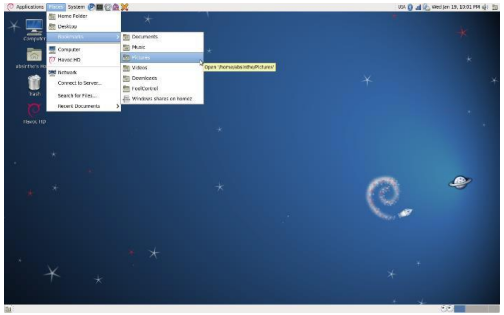
Different file systems and architecture support (32-bit or 64-bit).

- *Ubuntu and Debian have the same file system and have both 32-bit and 64-bit versions.*

Different package management and installation.

- *Ubuntu and Debian both use the APT package management tools.*
- *Fedora and Red Hat use yum.*

Ubuntu with Unity Environment



Debian with GNOME Environment

Differences compared to Windows

Often free or less expensive.

Desktop environment and GUI elements change.

Some tasks can only be run in the command line.

Generally less malware on Linux Oss.

Certain hardware cannot work with Linux.

http://news.softpedia.com/newsImage/How-To-Install-KDE-4-1-On-Ubuntu-8-04-2.jpg/

https://tekdrops.files.wordpress.com/2012/06/unity.jpeg

Similarities to Windows

Can be servers and workstations.

Linux servers and workstations are more similar than Windows ones.

Linux servers come pre-installed with server applications.

Can complete similar tasks.

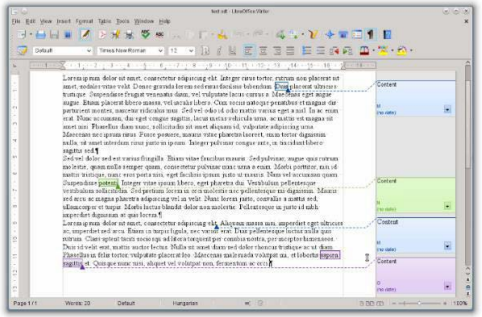
There are Linux programs that function like to Microsoft Office (LibreOffice), Outlook (Thunderbird), etc.

Are stable and have significant support.

Subject to very similar vulnerabilities.

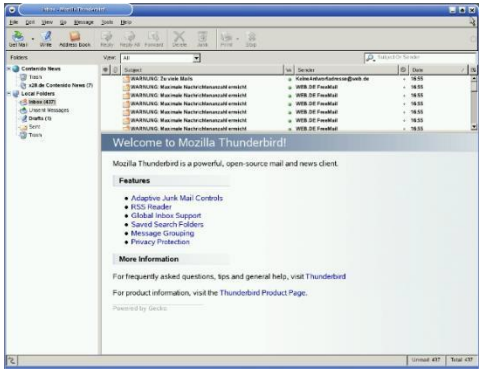
Linux systems are targeted less frequently by malware, but still have many of the same vulnerabilities and patches (firewalls, password policy, etc).

LibreOffice



Source: http://es.libreoffice.org/assets/Uploads/EN-Project_images/4.0NewFeatures/Writer/Comment-text-range.png?r=45758

Mozilla Thunderbird



Source:http://commons.wikimedia.org/wiki/File:Mozilla_thunderbird_empty_screenshot.png

Section 2

Ubuntu terminology and concepts

The Root account

Account types: User and Root

Root – the Linux Administrator account.

Like the built-in Administrator in Windows, Linux comes with a built-in root account.

A system can have multiple root accounts.

Users can switch whether their actions are carried out as a user or root.

When someone enacts root permissions, they can access all of the files and run all commands on a system, as well as set policies for other users.

Root actions require a password in both GUI and command line.

Authentication vs. Authorisation

Root users are authorised to do many different tasks, but they must first authenticate their identity by entering their password.

Source: http://www.cyberciti.biz/faq/authentication-vs-authorization/

Source: https://www.wallpaperfool.com/linux-tux-i-am-root/

Ubuntu file system

Different from the Windows file system.

Does not specify on which drive a folder is stored and uses forward slashes (/) to identify root directories.

Examples

Windows *C:\Documents\hello.txt*

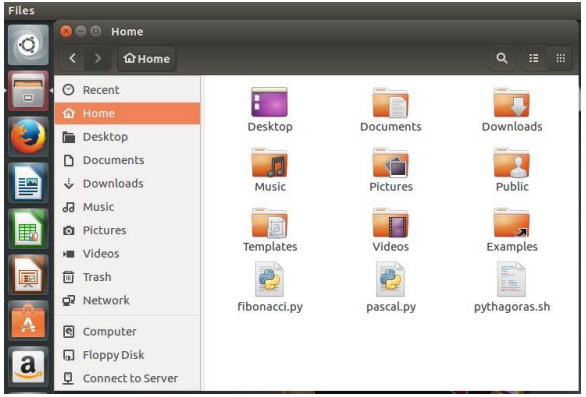
Linux */home/CyberTaipan/hello.txt*

Important folders

/home: *stores each users' documents, media files, etc. Users can only access their own folders, unless they have enacted root permissions.*

/boot: *contains startup files and kernel files. Should* ***not be modified unless you are an expert user.***

The file system can be accessed by clicking the file cabinet on your Ubuntu menu bar.



Adding and removing software

Linux software is bundled into packages.

Packages are managed by package managers.

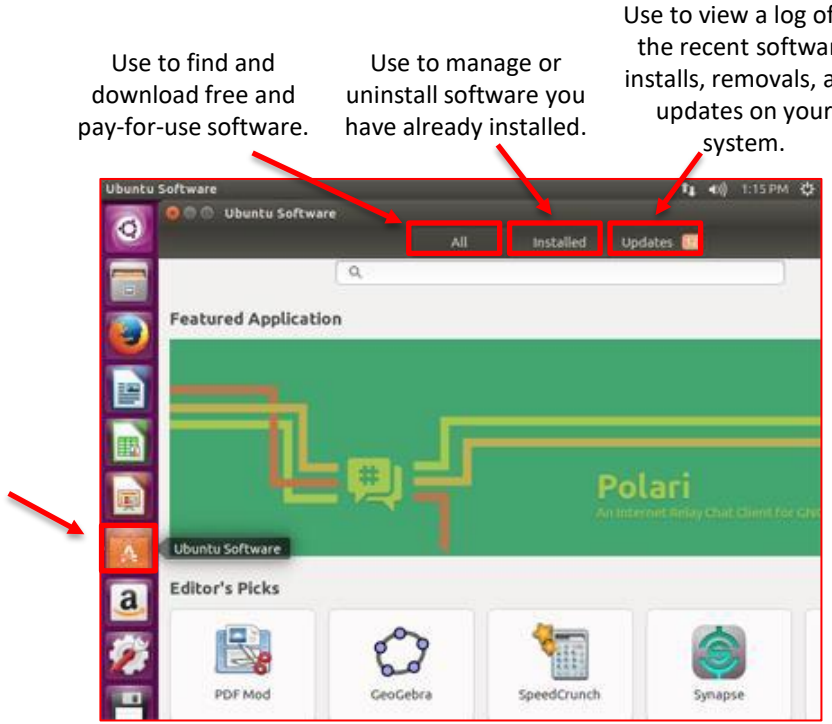
In Ubuntu, the package manager is called 'Ubuntu Software Centre'.

It looks and functions a lot like an App Store.

Many programs are free.

To access Ubuntu Software Centre, click the shopping bag on your Ubuntu menu bar.

Users must enact root permissions to install, uninstall, or modify software.



Section 3

Introduction to Ubuntu Command Line

Linux Filesystem

Linux files are stored in directories, which are the same as folders in windows.

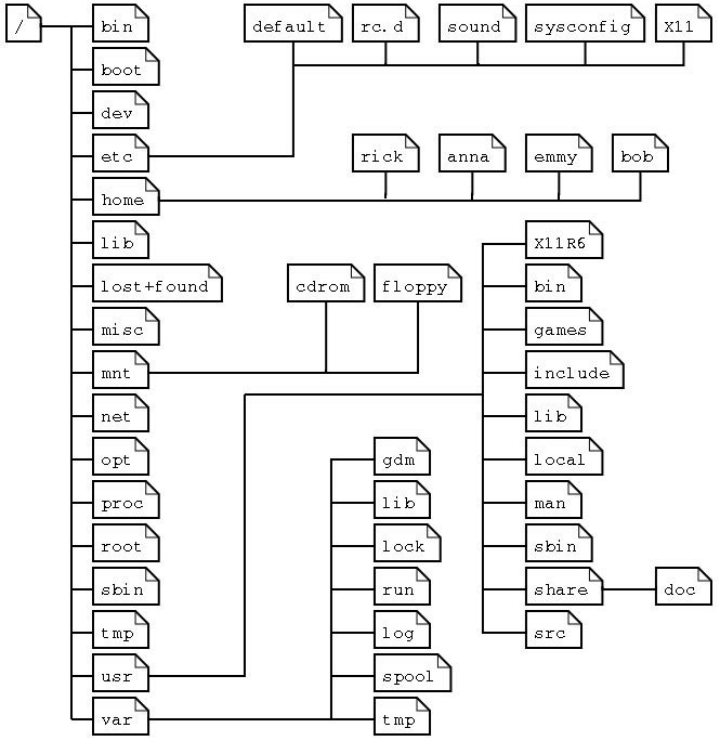
Linux filesystem tree

Base or trunk of the tree is the root directory (/).

Branches of the tree are directories.

Leaves of the tree are files.

Linux commands, files, and directory names are case sensitive.



Command Line pros and cons

PROS

Provides the user more control.

Unlike the GUI, which pre-programs certain tasks, command line allows you to send more detailed and customised commands.

Only option for some tasks in Ubuntu.

Saves clicking time because it just requires a keyboard.

Uses less of the computer's processing power than the GUI (no animations or graphical processing).

Can be made easier with scripting.

Scripts are sequenced lists of commands that allow users to send multiple commands at once.

Can be used for routine tasks like backing up files, monitoring a system, and quickly gathering information about memory and processes.

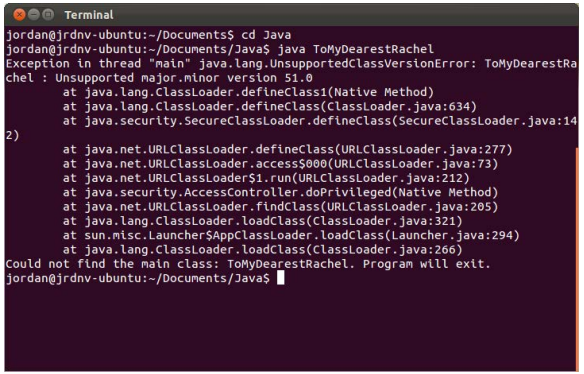
CONS

Not as user-friendly as GUI.

Requires memorising commands or using a reference.

Harder to multitask.

Having multiple command line windows open at once can be confusing, since they look nearly identical.



Sources: http://www.computerhope.com/issues/ch000619.htm
http://i.stack.imgur.com/2hBJf.png

Accessing the Command Line

Terminal is the tool used to access the Ubuntu Command Line.

Click the Ubuntu button.

Type terminal.

Press Enter or click the icon labelled Terminal.

OR

Press Ctrl-Alt-T.

Using Terminal

When typing commands in Terminal, it is very important to pay attention to capitalisation and spaces.

Hitting Enter will execute your command and hitting Ctrl+D will close any commands you have running or exit the Terminal.

There are numerous Ubuntu command databases and command line tutorials online.

Here are a few sites:

https://help.ubuntu.com/community/UsingTheTerminal

http://ryanstutorials.net/linuxtutorial/

http://manpages.ubuntu.com/

http://ubuntu-manual.org/

Command syntax

Command tells computer what you want it to do.

All other components of the syntax depend on what the command is.

The 'cat' command creates, displays, or copies files.

Option customises the output of the command.

'-n' told the computer to add a number to each line of text in the file you created.

The effect an option has varies by command.

Not required for all commands.

Operator directs the output of the command.

Not required for all commands.

File Name/Location tells the OS to which file you want the command and options to happen.

Like English sentences, Command Syntax can get very complex.

Source: http://www.linfo.org/cat.html

Basic navigation commands

pwd

'Present Working Directory'

Prints out your current working directory.

ls [FILE]…

'List Segments'

Optional file/directory paths as an argument.

cd [dir]

'Change Directory'

Optional directory path as an argument.

Absolute paths

Starts from the root directory (/)

cd /home/cyberpatriot/Music

Relative paths

Start from the current directory (.)

cd ./Music or just cd Music.

One dot (.) indicates the current directory.

Two dots (..) indicates the parent directory.

Command manuals and usage

man [section] page

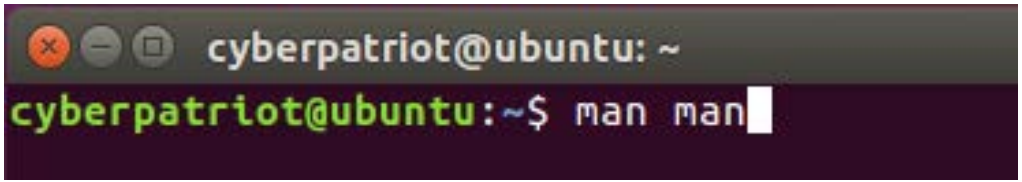
‘Manual’

Displays the manual for a command.

Type man man and press Enter

Displays the manual for the command “man”.

Use the arrow keys or PgUp/PgDn to scroll up and down.



Type q

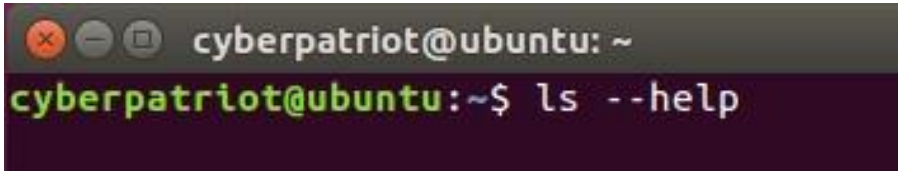
Exits man

Command manuals and usage

Many commands have a --help or –h option.

Type ls --help and press Enter.

Displays help for the command ls.



File contents and output redirection

cat [FILE]...

'Concatenate'

Concatenate files and prints to standard output.

Commonly used to print the contents of a single file.

file [FILE]...

Determines the type of a file.

echo [STRING]...

Displays a line of text in the command line.

[command] > [FILE]

The standard output of any command can be redirected to a file with a 'greater than' symbol.

This will create a new file or overwrite an existing file.

Sample command

Note: If the Linux Operating System does not have a CyberTaipan Directory, use another directory.

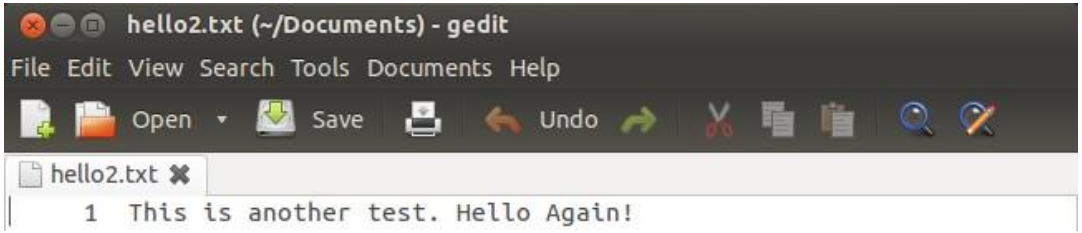
1. In Terminal, type:
   cat –n > /home/cyberpatriot/Documents/hello2.txt
   *Make sure to capitalize Documents and to put the spaces before –n, >, and /home.

2. Hit Enter to execute the command.
3. Type: This is another test. Hello Again!

4. Hit Enter to execute the command.
5. Type Ctrl+D to close your commands.

Sample command (cont.)

1. Close Terminal and open the Home Folder by clicking the orange folder on the Ubuntu menu bar.
2. Navigate to the Documents folder.
3. Double-click the hello2.txt file.



The commands you just entered created this text document.

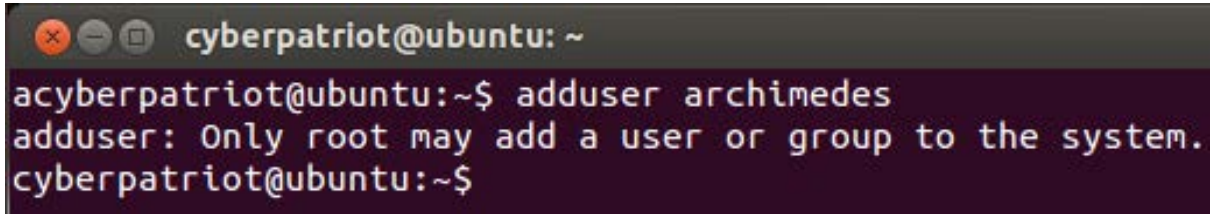
It includes the file name you selected, the text typed, and a '1' at the beginning of the line of text.

The next few slides will examine why.

The sudo command

Allows an authorised user (one with root permissions) to temporarily elevate their privileges using their own password instead of having to know the password belonging to the built-in root account.

This command must be used to perform administrative tasks (e.g. adding a user account).
Example: To add ‘Archimedes’ as a user on your system, type adduser archimedes and hit Enter.
You will get the error message below because you have not authenticated yourself.
Note: user names must be lower case.



The sudo command (cont.)

Now try adding ‘Archimedes’ as a user by entering the sudo command first:

Type sudo adduser archimedes

Hit Enter

When prompted, type in your password and hit Enter.

Note: Your password will not be visible when you type. This is an Ubuntu security feature.

Remember, the sudo command will only work if your are using an account with root permissions.

When prompted, type a password and any other details you wish to add to the user account.

Hit Enter.

The sudo su command

The sudo su command is a variation of the sudo command.

It tells the command line that you want to run all of the subsequent commands in your current session as root, so that you do not have to enter the sudo command and your password each time.

Try adding ‘Riemann’ as a user on your system using the sudo su command:

Exit the Terminal and then restart it.

Type sudo su

Hit Enter

When prompted, type in your password.

Type adduser riemann

Hit Enter

Type a password and any other details you want to add to the user’s account.

Hit Enter

Confirm creation of user accounts

To check that accounts for ‘Archimedes’ and ‘Riemann’ were created when you entered your commands, click the gear icon on your Ubuntu menu bar and click the User Accounts button.