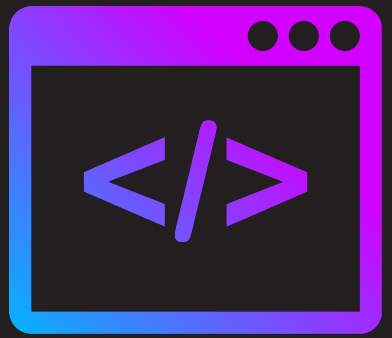
Linux Essentials



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LEARNING OBJECTIVES

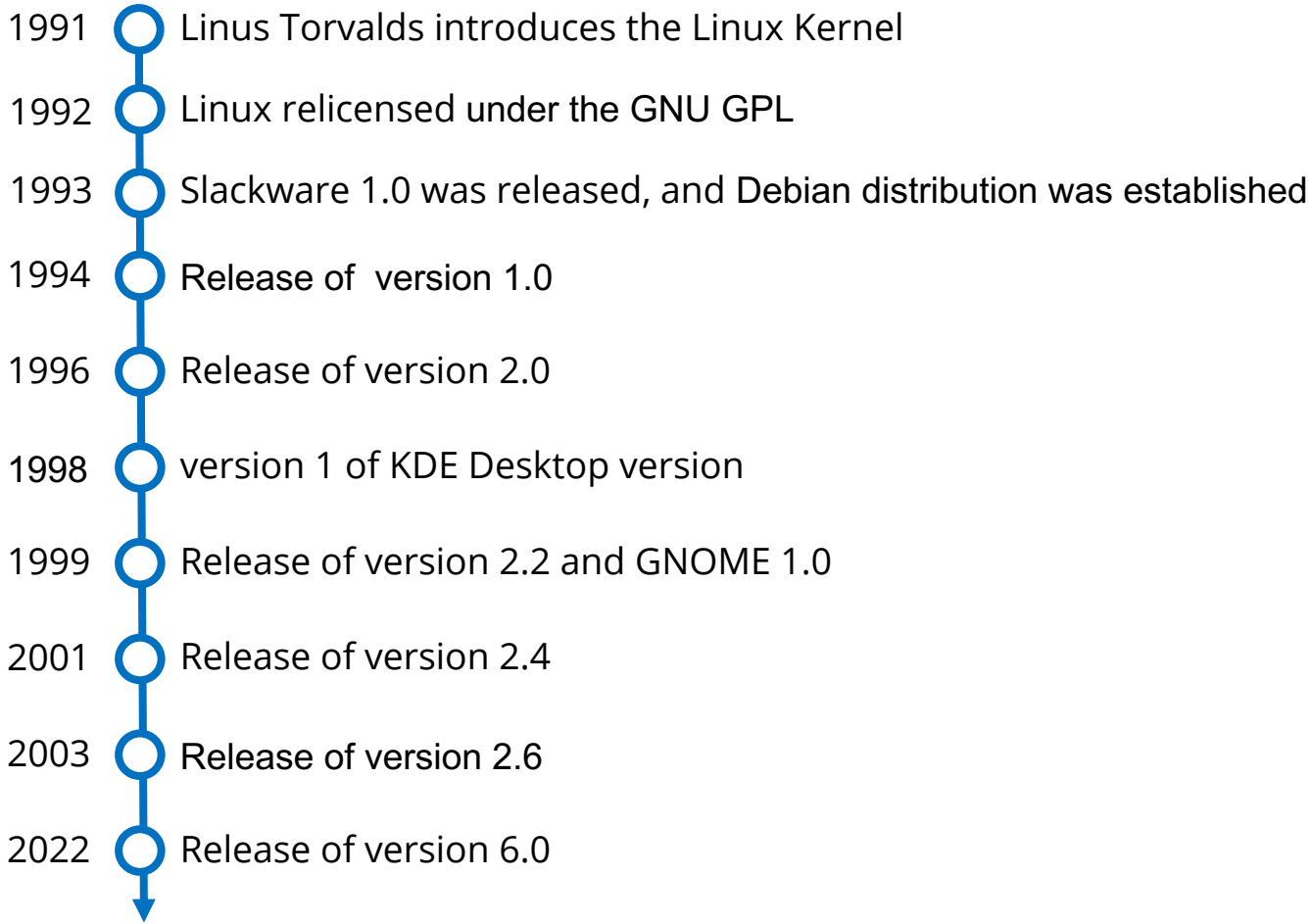
- What is Linux?
- Why should you learn Linux?
- Ubuntu - Installation
- Introduction to the command line interface
- Understand file and directories in Linux
- Understand the commands for basic file operations
- Understand the user management commands
- Understand the file permissions in Linux

What is Linux?

What is Linux?

- Linux is an open-source operating system which is like Unix
- It was first released on 17th September 1991 by Linus Trovalds
- Offers a command-line interface as well as a Graphical User Interface (GUI)
- Linux powers servers, personal computers, embedded systems, smart TVs and other devices
- Android is based on Linux
- Linux is open source - Its source code can be used, modified and distributed by anyone
- Since it is free, it is extremely popular across all industries and sectors

Brief History : Linux



Why should you learn Linux?

Why should you learn Linux?

- Linux powers most of the web infrastructure on the Internet
- A software developer will almost always cross paths with a Linux command-line based environment
- Knowledge of Linux commands will help you work efficiently with development and deployment
- When working with remote servers, you have to work with Linux commands on a terminal/console
- It is easy to learn Linux by installing Ubuntu or similar distributions using a virtual machine

Ubuntu - Installation

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MAC USERS

If you're on a Mac, you do not need to install Ubuntu as MacOS is a *-nix based Os which means that most (if not all) commands that work on Ubuntu will work natively on a MacOS terminal. Just open the terminal and get typing.

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If you're on Windows, use VirtualBox to setup Ubuntu as demonstrated in the **Week 2 > Introduction to Linux > Setting up Environment** video on PRISM

VirtualBox lets you setup a virtual computer (a virtual machine) which co-exists with your Windows environment and let's you configure it the way you want. Once setup, you will have an Ubuntu machine running natively inside a VirtualBox VM.

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Pre-Requisites:

- A Windows Computer with 8Gb RAM (preferred)
- ~ 20 - 30 GB of free hard disk space
- A processor that supports Intel VT-x or AMD-v hardware virtualization enabled in the BIOS

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Commonly Faced Errors & Solutions:

- **Error**: Failed to open a session for the virtual machine Ubuntu
- **Solution Video**: https://bit.ly/sessionfail01

- **Error**: VirtualBox failed to open session for the virtual machine, E_FAIL (0x80004005)
- **Solution Video:** https://bit.ly/sessionfail02

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Alternative Solutions (If you do not want to use Ubuntu on VirtualBox)

Use the Windows Subsystem for Linux
https://docs.microsoft.com/en-us/windows/wsl/about

Introduction to Linux commands

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Shell & Command Line

The **command-line** is a text-based interface, using which we give “commands” to our system to perform certain activities for us. In the early 70s, the only way one could interact with a computer was the command line or the SHELL.

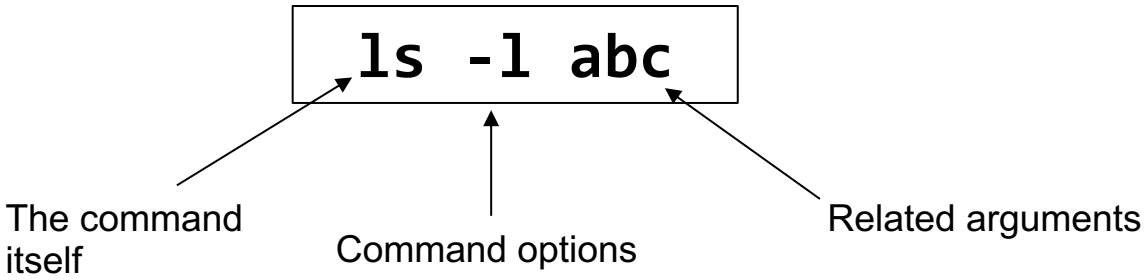
Writing commands in Linux

To execute a command in Linux command prompt, type the command and the related arguments on the shell.

For example :

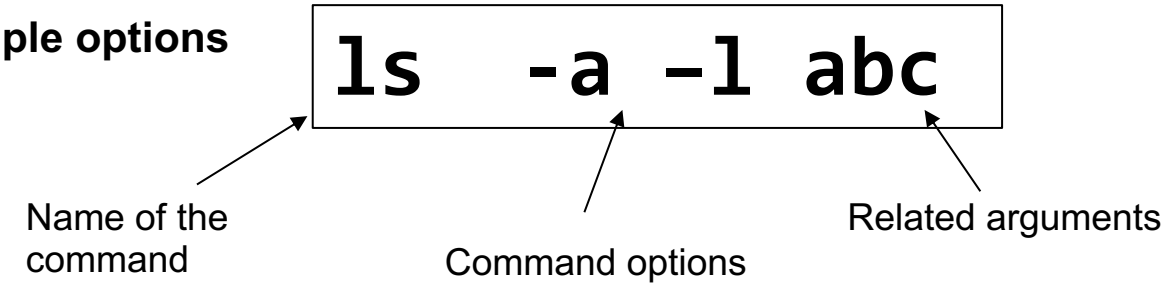
ls command to see a list of all the files & folders in the current directory.

ls with an option, hyphen l (or dash l). The hyphen l option stands for long listing, which gives more amount of information.

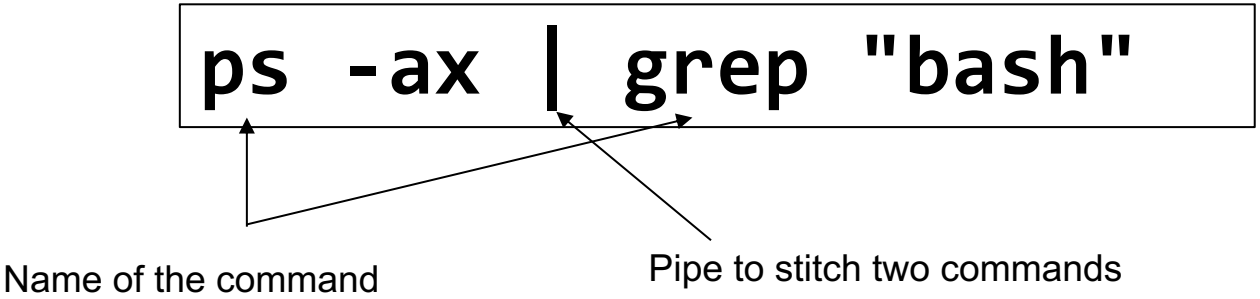


Writing commands in Linux

A command can have multiple options
ls – a is user to show all files



Multiple commands can be written in a single line
ps command is used to find all the processes instead of using show processes or list processes command.



File and Directories in Linux

- Files are collections of information that represent text data, photos, documents, source code, databases, and all kinds of other things.
- Linux files are stored in a single rooted, hierarchical file system.
- Files are stored in the different directories (folders) that can be nested inside other directories.
- Irrespective of what type of files are stored, users can create, delete, modify or compress files from the command line.

Types of Files:

Internally the files are segregated into two major kinds:

1. Text files
2. Binary files

Basic Linux commands

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Commands	Description
`date`	Current date, day of the wee, time zone etc.
`cal`	Shows the Calander
`clear`	Clears the screen
`bc`	Launches a calculator
`pwd`	Shows the name of the current working directory
`cd`	Helps to change directory
`..`	Used with cd, takes to the parent directory
`mkdir`	Make a new directory

Navigate between directories using "cd"

Irrespective of where we start, we can navigate through various directories. To navigate through the directory:

1. List down the directories within our current directory by typing **`ls.`**
2. Move to any of these directories by typing **`cd`**. This command stands for change directory.

Navigate between directories using "cd"

For example, to go to the Music directory type **cd** followed by the name of the destination directory which is **Music**:

```
cd Music
```

Now, to go back to the immediate parent directory:

```
cd ..
```

So, this command **cd** becomes vital in navigating to different directories.

NOTE: The command **cd** is followed by name of the directory as an argument.

Basic commands

Basic file operations and commands in Linux

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Create a file :

Most Linux distributions have a graphical editor named **gedit**. Some of the command-based editors are vi or vim editor and nano editor.

To create a file using the graphical **"gedit"**, type **:**

```
gedit Hogwarts.txt
```

This launches the **gedit editor** in a separate graphical window.

TIP

If the file doesn't exist already, you can also type **`touch <filename>`** to create a new file. e.g., **`touch myScript.js`**

Basic file operations and commands in Linux

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Create a directory:

- Command used to make a new directory in Linux is **`mkdir.`** For example:

`mkdir my-website :` This command will create a new directory named **"my-website"**

- Some commonly used options with this command are:

`-p:` with this command, you can create many directories by specifying a path.

`mkdir -p x/y` will create directory x if it doesn't exist, then will create directory y inside directory x

`-m :` Mode option is used to create directories with specific permissions (read, write or execute)

Basic file operation commands in Linux

Copy files and directories :

cp command is used to copy one or multiple files/folders from a source to a destination.

Syntax: **`cp [option] [source] [destination]`**

Some of the commonly used options with cp are - b, -i, -f.

`cp –b`: backup of the existing files in the destination directory with the same name is created, for retention.

Example:

```
cp -b a.txt b.txt
```

Basic file operation commands in Linux

Copy files and directories :

`cp -i` : Interactive mode means that it will ask the user to before copying overwrite the file by prompt.

Example

```
$ cp -i a.txt b.txt
cp: overwrite 'b.txt'? y
```

Basic file operation commands in Linux

Copy files and directories :

`cp -f:` Forcefully copy the files. This command can be used only if the file is already in use.

If the user, group and others doesn't have writing permission. Without **-f** option, the following command is not executed.

```
$ cp a.txt b.txt
cp: cannot create regular file 'b.txt': Permission denied

With -f option, command executed successfully

$ cp -f a.txt b.txt
```

Basic file operation commands in Linux

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Move or rename a file:

mv command is used to move any file from a source directory to a destination directory. It can also be used to rename a file or folder.

Syntax : `mv [option] [source] [destination]`

Example:

```
mv sample.txt dir1
mv oldname.txt  newname.txt
```

Some commonly used options with this command are:

```
mv –f : forcefully move
mv -i : interactive mode
mv –n : prevent overriding of an existing folder
```

Basic file operation commands in Linux

Remove a file or a directory:

rm command is used to remove any file from a source directory.

Syntax : `rm [option] file`

Example:

```
rm sample.txt
rm dir1
```

Some commonly used options with this command are:

```
rm –f : forcefully delete
rm -i : interactive mode
rm -r : recursive deletion deletes all the files as well as directories
from the parent directory
```

User management commands

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User management commands

Linux is a multi-user operating system, several people may be logged in and actively working on a given machine at the same time.

To create users "**useradd**" command is used.
Syntax: `useradd [options] username`

Example :
`sudo useradd jane`

This command will create a user jane so that she has a home directory and can log in. Some commonly used options with this command are:

`-d` : option along with the location of the new home directory, creates a user in the new home directory
`-u` : create users with custom userid
`-g` : create users with specific groupid

User management commands

To create the user Jane with a home directory and login, use the command:

```
sudo useradd -m jane
```

When this command is executed, it will ask for a password to create the user. Once done this command creates the user and the user's home directory to match the username.

To update the password for user jane, type:

```
sudo passwd jane
```

Creating a Group

To create the group "training" use the command

```
sudo groupadd training
```

Now we want to add a new user, Jane, to the group training. For this, type:

```
sudo usermod -a -G training jane
```

The -a option tells **usermod** that we are *appending* and the **-G** option tells usermod that we are *appending to the group* name that follows the option.

To ensure user "jane" is part of training group, type:

```
sudo usermod -g training jane
```

Change users

To switch users the terminal way, then the command **su** is used.

Example:
su jane

Root is the superuser, it is more like the administrator with super privileges. Only root has the ability to create users and groups.
sudo is a command that provides any user with superuser's privileges.

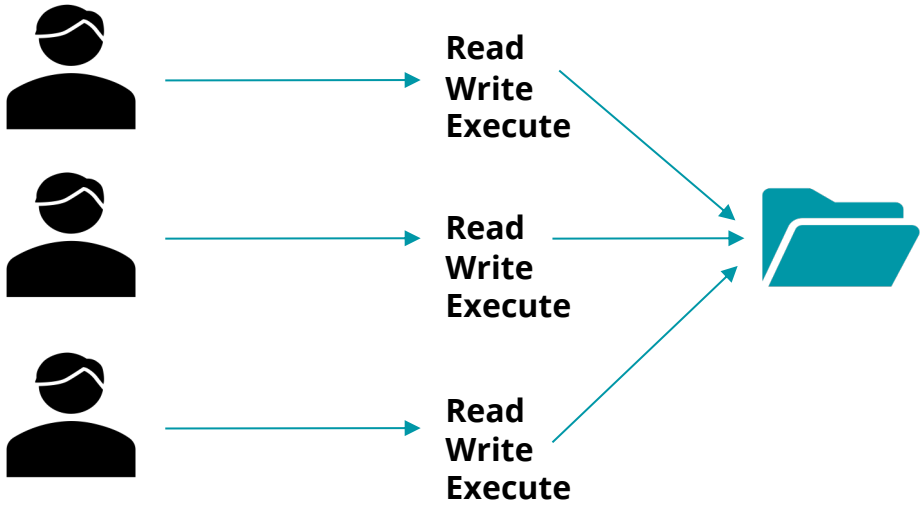
Example:
sudo su root

File Permissions

Permissions

There are three different permissions you can have in Linux:

1. Read: Allows someone to read the content of a file or a directory.
2. Write: Allows someone to write to the content of a file.
3. Execute: Allows someone to execute the program.



Permissions

To find the permissions on a file, type the command **`ls -l.`**

```
john@khut:~/wizard$ ls -l
total 16
-rw-rw-r-- 1 john john   57 Feb 19 00:46 characters.txt
-rw-rw-r-- 1 john john   57 Feb 19 00:46 hogwarts.txt
-rw-r--r-- 1 john john 4566 Feb 19 00:46 spells.txt
john@khut:~/wizard$
```

From the right. **`r--`** are the permissions for **`others`**. It means only read permissions for this file & no write or execute permissions.

The next set is for a **group,** read and write for group members but no execution permission which makes sense as this is not really an executable file.

Finally, the first set of permissions for the **`user`** John himself, John also has read and write permissions.

Permissions

To change permission of a file: command **chmod** is used.

Use this command to set permissions (read, write, execute) on a file/directory for the owner, group and others.

Syntax:

```
chmod permissions filename
```

Example :

- **chmod o+w filename.txt** to add write permissions for others
- **chmod -w filename.txt** to remove write permissions for everyone
- **chmod g+w filename.txt** to add write permissions for group
- **chmod o-r filename.txt** to remove read permissions for others
- **chmod +x filename.txt** to add execute permissions for all

Thank you