

Welcome to LUG!



Please check in: sh.lug.umbc.edu/checkin

Introduction to Linux and the CLI

A Brief overview for new users (CS421)

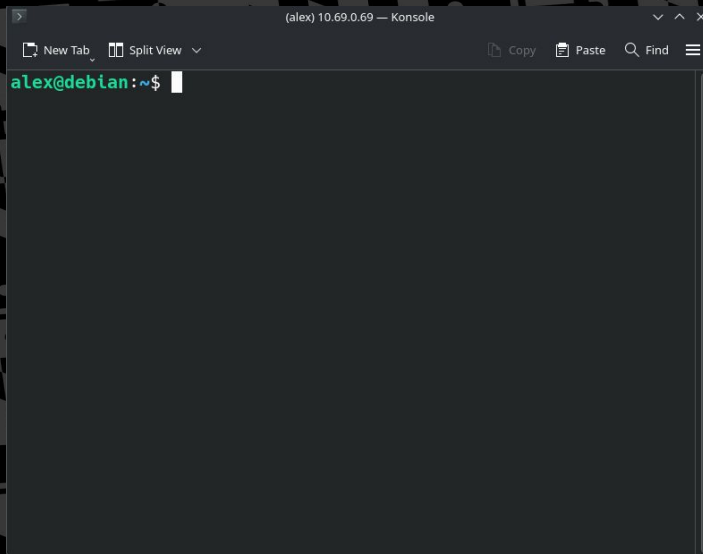
Today's Agenda

- Verifying VM setup
- Terminal / Shell Introduction
- Filesystem Navigation
- Users, Groups and Permissions
- Basic Package Management
- Text Editors

Getting to a Shell

Open a Terminal Emulator

Or connect to your system
with SSH



Terminal vs. Shell

Terminal (Visual Interface) - The interactive window/application you type into

Shell (Command Interpreter) - The actual engine you are interacting with that allows you to interface with the system

Run `echo $SHELL` to see what shell you are using

Absolute vs. Relative Paths

Absolute Paths

Provides the complete, exact coordinates starting from the root directory.

Always starts with a forward slash (/).

Starts directly from root (/)

/home/user/Documents

Relative Paths

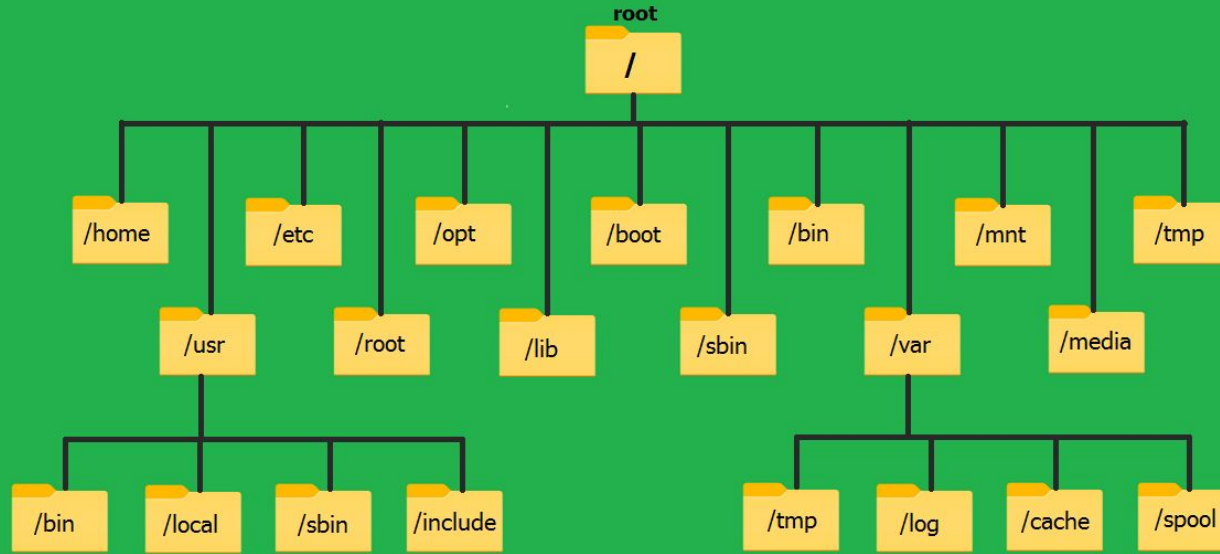
Provides directions starting from your current location in the file system hierarchy.

Uses special dot notation to navigate:

. current directory

.. parent directory (up one level)

Filesystem Hierarchy



File System Hierarchy(FHS) of Linux

Some Important Directories

/ - The root directory, your whole filesystem is contained within.

/etc/ - Contains system-wide configuration files

/home/ - Contains user personal files and documents

/tmp/ - Contains temporary files (wiped on reboot)

/var/ - Contains system and application logs

Where am I?

- `pwd` - Prints current working dir
- `ls -la` - Lists files and folders within your current directory
 - Command flags allow you to specify options when running a command
 - `"-l"` long format list
 - `"-a"` lists all files (Including hidden files that begin with a `.`)

```
alex@debian:~$ pwd
/home/alex
alex@debian:~$ ls -la
total 24
drwx----- 2 alex alex 4096 Sep  9 00:09 .
drwxr-xr-x 3 root root 4096 Sep 11 2024 ..
-rw----- 1 alex alex   5 Sep  9 00:09 .bash_history
-rw-r--r-- 1 alex alex  220 Sep 11 2024 .bash_logout
-rw-r--r-- 1 alex alex 3526 Sep 11 2024 .bashrc
-rw-r--r-- 1 alex alex  807 Sep 11 2024 .profile
alex@debian:~$
```


Navigating the filesystem

The 'cd' (Change Directory) command moves you through the filesystem.

cd ~ - returns you to your personal home dir (~)

cd .. - moves you one directory level "up"

cd [path] - jump directly to any location with an absolute or relative path



File Creation and Deletion

`touch newfile.txt` - creates an empty file with the name `newfile.txt` in your current dir

`mkdir new_folder` - creates a directory "new_folder" within your current dir

`rm newfile.txt` - deletes `newfile.txt`

`rm -r newfile.txt` - '-r' flag allows you to recursively delete files within a directory



File Permissions

Linux secures files using a strict, robust permission system. A standard file listing shows ten characters, such as `'-rwxr-xr--'`.

The first character denotes the file type. The remaining nine characters are split into three groups of three: Owner, Group, and Others. Each of these three groups can be assigned Read (r), Write (w), and Execute (x) privileges.

rwX

Owner (rwX)

r-X

Group (r-X)

r--

Others (r--)

Modifying Permissions & Ownership

`chmod [options] mode file`

Modify access rights using symbolic operators or absolute octal numbers.

Symbolic Mode

Uses letters to add/remove executable rights.

`chmod +x script.sh`

Makes a script runnable for users.

Octal Mode

Uses absolute 3-digit numeric permissions.

`chmod 755 script.sh`

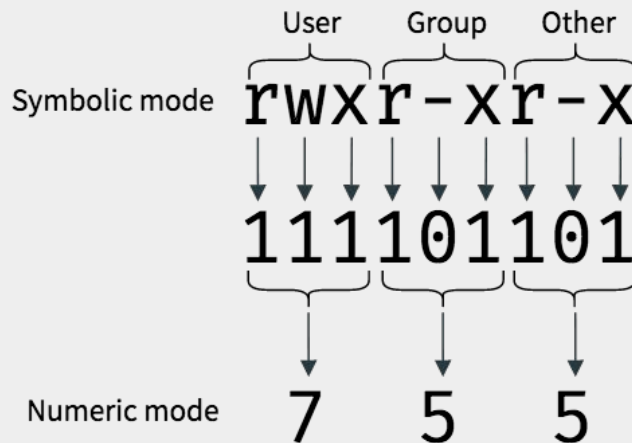
Owner: Full (7) | Others: Read/Execute (5).

`chown [owner] file`

Transfer official ownership of a file/directory to a different user account.

`chown admin report.txt`

Shifts administrative ownership.



Viewing Files

`cat [file]` - outputs entire file contents

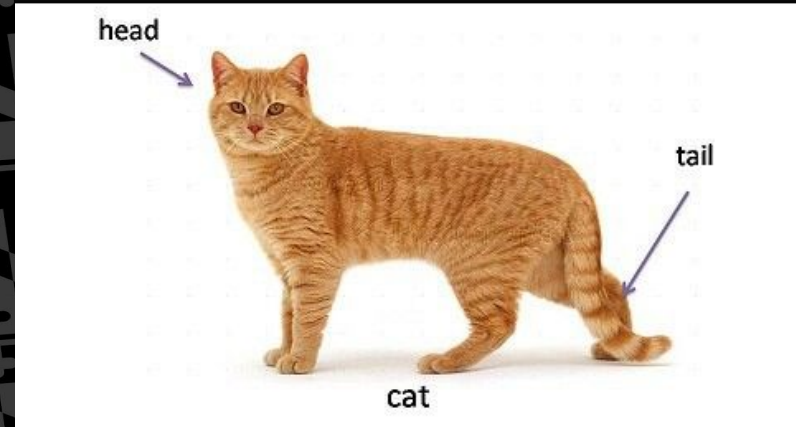
`less [file]` - View file contents in a paginator

`head [file]` - outputs beginning of the file

`tail [file]` - outputs end of the file

`grep "pattern" [file]` - allows you to search for a pattern in a file.

LINUX TERMINAL FOR BEGINNERS



Input/Output Redirection

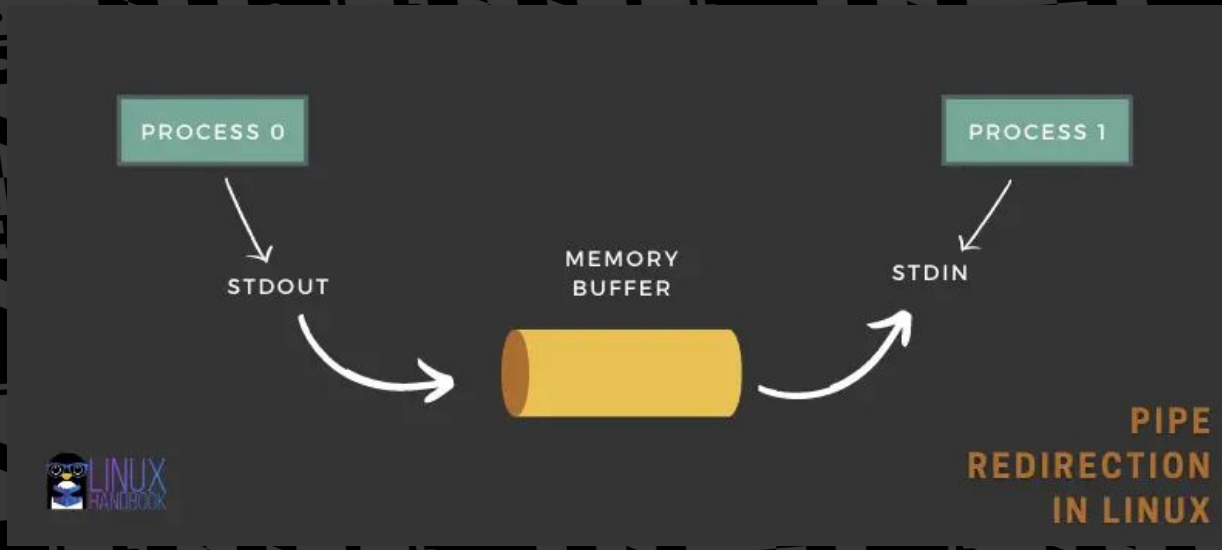
- stdin (Standard Input)
- stdout (Standard Output)
- stderr (Standard Error)

Operator	Action	Example
>	Overwrite / Create: Sends standard output to a file, replacing existing text.	<code>echo "Hello World" > file.txt</code>
>>	Append / Create: Adds standard output to the end of a file without erasing it.	<code>date >> log.txt</code>
2>	Redirect Errors Only: Captures stderr and saves it to a file.	<code>ls /fake_dir 2> error.txt</code>
&>	Redirect All Output: Merges and sends both stdout and stderr to the same file.	<code>command &> all_output.txt</code>
<	Read File: Passes the contents of a file into a command as input.	<code>wc -l < file.txt</code>

Piping

Using the `"|"` character after a command passes the `stdout` into the `stdin` of the next.

```
cat names.txt | sort | uniq
```



Editing Files

Nano

Intuitive and simple to use

```
nano [filename]
```

Uses keyboard shortcuts outlined at the bottom of the display

CTRL + O - Write out changes

CTRL + X - Exit the editor

Vim

Powerful, quick and advanced

```
nano [filename]
```

Press 'i' to enter insert mode and begin editing.

Press 'ESC' to return to normal mode.

Begin commands with ':'

':wq' - save and quit

':q!' - force quit without saving

Root and the Power of Sudo

Sudo is not installed by default on Debian

`su root` - (Switch User) changes to root user

`apt install sudo` - Installs sudo

`usermod -aG sudo [user]` - installs sudo

`sudo [command]` - (SUpouser DO) Allows you to run a command as root

Package Management

Linux distributions utilize package managers to retrieve software from centralized, servers called repositories.

Packages distributed via (HTTP(s), RSYNC and FTP)

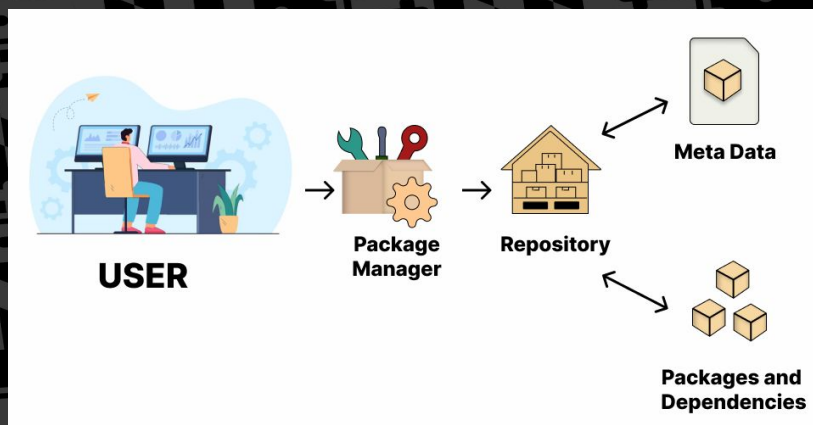
Package Manager - Software on your system that manages installed software and retrieves and installs packages from repositories.

mirror.lug.umbc.edu/debian

^ Debian Package Repo

More about Debian pkg management:

lug.umbc.edu/blog/04-22-2026-meeting/



Updating and Installing Packages (apt)

Debian-based systems use Advanced Package Tool (apt).

apt update - fetch latest list of available packages from repositories

apt upgrade - install newer versions of currently installed packages

apt install [package] - Downloads and installs specified package

Want to
learn more?



sh.lug.umbc.edu/discord



Questions?