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CS:3620 Operating Systems

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Tutorial: Linux Shell

Intro

- Linux has a graphical interface, but we will focus mostly on the textual one
- It allows to fully control your machine and automate tasks
- Basic interactions:
 - You should setup your system so that you can easily open a shell
 - Default shortcut: Ctrl+Alt(option)+t
 - I suggest installing and using terminator
 - Arrows Up/Down: scroll history
 - Ctrl+R: search in history
 - history: show last commands
 - Ctrl + Left/Right: move fast

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Prompt

- `user_name@machine_name:current_path$`

(It is possible to personalize this)

- `user_name`: it is the name of your user,
Linux supports multiple users on the same machine

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- `machine_name`: you set this when you installed Linux

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- `current_path`: also called current working directory
 - As in Windows, files are organized in a tree structure
 - But everything is CASE SENSITIVE

Paths

- Absolute paths: they start with /
- Relative paths “relative to the current location”:
 - `current_location + relative_path = absolute path`
 - `current_location` is in the prompt (or use `pwd`)
- Shortcuts
 - `.` → current directory
 - `..` → parent directory
 - `~` → home directory (typically `/home/<user_name>`)
- `cd`: move from a directory to another
(formally, it changes the current working directory)
- `ls`: list the current directory (many options available)

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Commands

- Run a command
- `<command> <arg1> <arg2> <arg3> <...>`
 - Separated by spaces
 - Escaped using `'...'`

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- Commands are executable already present in default directories
 - Specified by the `$PATH` environment variable
 - `echo $PATH`
 - You can check using the command `which`

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Executables

- Run an executable
- `<executable> <arg1> <arg2> <arg3> <...>`
 - Separated by spaces
 - Escaped using `'...'`

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- `<executable>`: is an absolute or relative path
- If the executable is in the current directory use `./<executable>`

(formally, “.” is not in the `$PATH`)

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More about arguments

- `<command/executable> <arg1> <arg2> <arg3> <...>`

A command/executable can take an arbitrary number of arguments

Typically, they have a short form (-h) and a long form (--help)

Sometimes the short form can be condensed: `-P -E -H -R -Ei`

Use `man <command>` to get more info (or Google)

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Programs can also access environment variables (e.g., \$PATH)

Set with: `export VAR="value"`

More on navigation

- Ctrl+c: exit (can be overridden)
- Ctrl+d: exit (can also be overridden)
- Tab (twice): auto-complete
- Shift+Ctrl+c/v: copy/paste (you can change this)
- reset: Reset the shell graphical layout

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Useful basic commands

- cp: copy files/folders
- mv: move files/folders
- ls: list folder
- find: find files/folders with specific names/attributes/...
- cat: print file
- xxd: print binary file
- echo "something": print "something"
- edit files vim/emacs/nano

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Each of these commands has tens of options...

Graphical commands

You can use the shell to open graphical programs

For instance:

firefox <url>

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gedit <file>

nautilus <folder>

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Sudo

Some commands require more privileges than the standard user

Use `sudo <command>` to execute a command as the root user

It requires to insert your user's password

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For instance

`sudo apt update` <https://powcoder.com>

`sudo apt upgrade` Add WeChat powcoder

`sudo apt install <package>`

`sudo apt purge <package>`

Suggested packages

`sudo apt update`

`sudo apt upgrade`

`sudo apt install apt-file aptitude arandr cmake colordiff dconf-editor emacs
expect gdebi gimp git gksu gnuplot htop inotify-tools iotop iperf ipython meld nload
okteta openjdk-8-jdk parallel pigz python2.7-dev python-dev python-pip python-
virtualenv screen sl sshfs subversion terminator tmux vim virtualenvwrapper vlc
wmctrl xclip xdotool psmisc psutils time iputils-ping net-tools build-essential ssh
bash-completion rsync stress ipython pypy gdb make`

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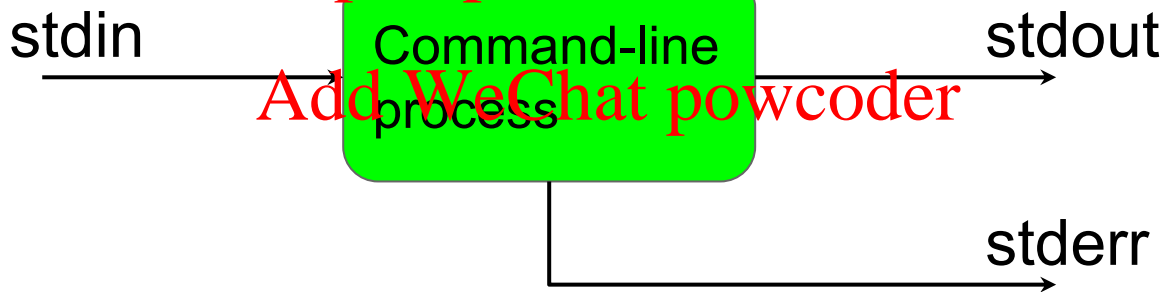
Stdin - Stdout - Stderr

Every command-line process has access to (at least) 3 streams of data:

- Standard In (stdin)
- Standard Out (stdout)
- Standard Err (stderr)

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File Redirection

You can “redirect” stdin/stdout/stderr from/to files

Use:

> (overwrite)

>> (append)

Examples:

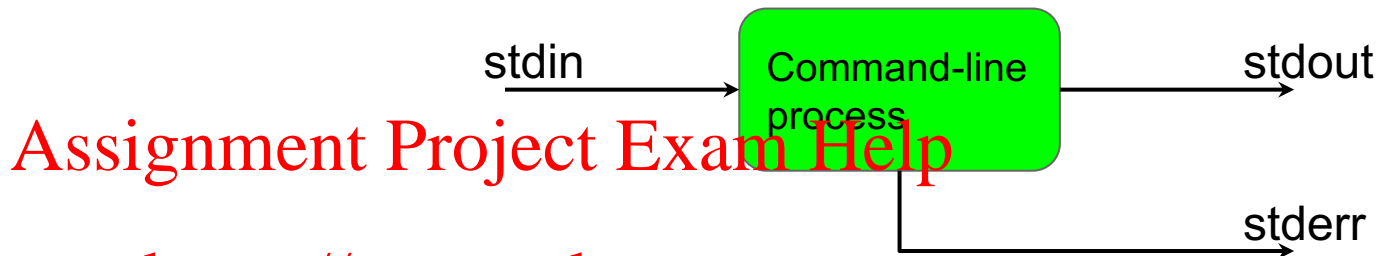
ls > listings

”cat a.txt

echo thanks for studying >> a.txt

cat a.txt”

Mail -s "Subject" to-address < Filename



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Useful to filter text

grep <string> <filename>

grep boo /etc/passwd

grep -i "boo" /etc/passwd (ignore cases)

grep -r "192.168.1.5" /etc/ (search recursively in all directories) grep boo

egrep -w 'word1|word2' /path/to/file

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-v option: invert

grep -v bar /path/to/file

-E option: regular expression

grep -E 'word1|word2' /path/to/file

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pipes

Commands like grep are typically used with pipes: “|”

<command1> | <command2>

It connects stdout of command1 to stdin of command2

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tar

Pack/Unpack many files/folders into one

`tar -cf <archive.tar> <folder>`

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`tar -xf <archive.tar>`

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Many many options, you can also compress the archive.

Scripting

You can create a script, consisting of multiple shell commands

It has to start with: `#!/bin/bash`

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It needs to be executable: `chmod +x <script>`

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It can access arguments using variables: `"$1", "$2", "$3", ...`

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It supports programming constructs (variables, if, for, functions, ...)

Read: <https://ryanstutorials.net/bash-scripting-tutorial/>

Intro to Git

Managing code

Install git: `sudo apt install git-all`

Initialize Git repository: `git init`

Create new test file: `touch test.txt`

Check status of new/old files: `git status`

Git add `readme.txt`

`git commit -m "This is my first commit!"`

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Your first commit

git config --global user.email EMAIL

git config --global user.name "FULL NAME"

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git commit -m "Descriptive Message"

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git checkout -b BRANCH

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Remote Repository

Create new private/public repo

git remote add origin URL

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git push -u origin master

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git pull origin master

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Be careful about conflicts