Basic Shell Commands

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Focusing on Linux Commands

- These days, many important tasks in Linux can be done from both graphical interfaces and from commands.
- However, the command line has always been, and still remains, the interface of choice for Linux power users.

Focusing on Linux Commands (Cont.)

- For the following cases, Will probably need to rely on the command line:
  - Almost any time something goes wrong
  - Remote systems administration
  - Features not supported by GUI
  - GUI is broken or not installed

Finding Commands

- `$ echo $PATH`
  - Show the current `PATH`
- `$ which`
  - Locate a command
- `$ find`
  - Search for files in a directory hierarchy.
- `$ whereis`
  - Locate the binary, source, and manual page files for a command.

Finding Commands (Cont.)

- `$ locate`
  - List files in databases that match a pattern.
- `$ apropos`
  - Search the manual page names and descriptions.
- `$ man 8 umount`
  - View section 8 of the `man` page for `umount` (type `q` to quit)

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`which` Command

- Shows the full path of commands.
- Syntax
  - **`which [OPTION] command`**
- Options
  - **`-a`**, **`--all`** : Print all matching executables in **`PATH`**
- Examples
  - **`$ which ls`**

`find` Command

- Search for files in a directory hierarchy.
- Syntax
  - `find [PATH][OPTION] filename [EXPRESSION]`

Searching Files with `find`

- Searches the root file system (`/`) recursively for files named *stat:

```
$ find / -name '*stat' -print
```

- Can find files based on timestamps.
- Finds files in `/usr/bin/` that have been accessed in the past 2 minutes:

```
$ find /usr/bin/ -amin -2 -print
```

- Finds files that have not been accessed in `/home/chris` for more than 60 days:

```
$ find /home/chris/ -atime +60
```

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Searching Files with `find` (Cont.)

- Use the `-type d` option to find directories.
- Finds all directories under `/etc`:

```
$ find /etc -type d -print
```

- Finds files in `/sbin` with permissions that match 750:

```
$ find /sbin/ -perm 750 -print
```

- The `xargs` option lets act on the files found:

```
$ find . -perm 644 -print | xargs ls -l
```

Searching Files with `find` (Cont.)

- Finds all files that are greater than 8 KB (+8k), lists those files from largest to smallest (ls -lS) and directs that list to a file (/tmp/bigfiles.txt):

```
$ find . -size +8k -print | xargs ls -lS >
 /tmp/bigfiles.txt
$ head -5 /tmp/bigfiles.txt
```

- Examples
  - `$ find / -name passwd`
  - `$ find / -name passwd 2> /dev/null`
  - `$ find ~ -name 'core*' -exec rm {} \;`

Lab. Using `find` command

`find` command

1. $ `find /bin -name ls`
2. $ `find /home -user instructor`

1. $ `cd temp`
2. $ `touch doc1 doc2 doc3 doc4`
3. $ `find . -user instructor`
4. $ `find . -user instructor -exec rm {} \;`

1. $ `touch doc1 doc2 doc3 doc4`
2. $ `find . -user instructor -ok rm {} \;`

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`whereis` Command

- Locate the binary, source, and manual page files for a command.
- Syntax
  - `whereis [OPTION] filename`
- Options
  - `-b` : Search only for binaries.
  - `-m` : Search only for manual sections.
  - `-s` : Search only for sources.
  - `-B` : Change or limit the place for binaries.
  - `-M` : Change or limit the place for manual secs.
  - `-S` : Change or limit the place for sources.

Lab. Using `whereis` command

`whereis` Command

- `$ whereis find`
- `$ whereis perl`
- `$ whereis -b find`
- `$ whereis -m find`

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`apropos` Command

- Search the manual page names and descriptions.
- Syntax
  - `apropos keyword …`
- Examples
  - `$ apropos zip`

`locate` Command

- List files in databases that match a pattern.
- Print out the complete path along with the filename containing the string.
- Before use, must build the index used by locate.
  - `$ sudo apt install -y mlocate`
- This index makes it possible to find files quickly.
- The command to build this index is : `updatedb`
- Syntax
  - `$ sudo updatedb`
- The locate database is saved in the following directory in Ubuntu :

  `/var/lib/mlocate/mlocate.db`

`locate` Command (Cont.)

- Syntax
  - `locate filename or pattern`
- Pattern (with `-r` option)
  - `^` : beginning of line
  - `$` : end of line
  - `[]` : match on a class of characters
- Examples
  - `$ locate passwd`
  - `$ locate -r /passwd$`

`grep` Command

- Prints the matching lines.
- Syntax
  - grep [options] pattern [filename]
  - *-i*, *--ignore-case*
  - *-l*, *--files-with-match*
  - *-n*, *--line-number*
- Examples
  - $ `grep root /etc/passwd`
  - $ `grep -n unix ~/*.txt`
  - $ `grep -l hello*.c`

Lab. Using `grep` command

`grep` Command

- $ `cd temp`
- $ `cp /etc/services data`
- $ `grep SSL data`
- $ `grep -n SSL data`

Using `help` Messages

- Nearly all commands on a Linux system print some form of brief usage information if asked to.
- Frequently, the way to ask for this usage info is by way of the `-h` or `--help` argument to the command, and nothing more.

```
$ ls --help
```

- Since there is so much information printed by the `--help` flag, you can again use a pager to limit the output to one screen at a time.

```
$ ls --help | more
```

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Using `man` Pages

- Can use the **`apropos`** command to search the **`man`** page database for any keyword or group of characters.
- The output will show **`man`** page sections which contain the word you supply to **`apropos`**.

```
$ apropos crontab
```

```
$ man man
```

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`man` Page Sections

Number	Types of Pages
1	Executable programs or shell commands
2	System calls (functions provided by the kernel)
3	Library calls (functions within program libraries)
4	Special files (usually found in `/dev`)
5	File formats and conventions such as `/etc/passwd`
6	Games
7	Miscellaneous (including macro packages and conventions), such as man(7), groff(7)
8	System administration commands (usually only for `root`)
9	Kernel routines [Non standard]

Using `man` Pages (Cont.)

- Can view the `man` pages from those sections by passing the section number as an argument to the `man` command.

```
$ man 5 crontab
```

- If we omit the section number, `man` will return the `man` page from the first section it finds.

```
$ man crontab
```

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man Command Options

Option	Description
`man -a crontab`	Shows all `man` page sections, in succession, for `crontab`
`man 5 crontab`	Shows the section 5 `man` page for `crontab`
`man crontab -P more`	Uses the pager program `more` for paging through the `crontab man` page
`man -f crontab`	Equivalent to the `whatis` command
`man -k crontab`	Equivalent to the `apropos` command

`whatis` Command

- Is another **`man`** page searching utility.
- It is different from **`apropos`** in that it only prints **`man`** page descriptions that match the keyword you type in.
- Running the **`apropos`** command for the **`route`** command returns three different **`man`** pages where a reference to the word **`route`** was found:

```
$ apropos route
```

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`whatis` Command (Cont.)

- In running `whatis` for the `route` command, only the section 8 `man` page for the `route` command is returned.

```
$ whatis route
```

Using `info` Documents

- Read documentation in Info format.
- Can enter the info database by simply typing the **`info`** command or by opening a particular component (use the **`q`** key to quit the info utility).

```
$ info ls
```

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`shutdown` Command

- Bring the system down.
- Syntax
  - **`shutdown [OPTION] … TIME [MESSAGE]`**
- Options
  - **`-k`** : Don't really shutdown; only send the warning messages to everybody.
  - **`-r`** : Reboot after shutdown.
  - **`-h`** : Halt after shutdown.
  - **`-H`** : Requests that the system be halted after it has been brought down.

`shutdown` Command (Cont.)

- Options
  - `-P` : Requests that the system be powered off after it has been brought down.
  - `-c` : Cancel an already running shutdown.
- Example
  - `$ sudo shutdown -h +10`
  - `$ sudo shutdown +3 "System is going down"`
  - `$ sudo shutdown -r now`
  - `$ sudo shutdown -h 20:30 System will be halted`

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`halt` Command

- Halt system.
- Syntax
  - `halt [OPTION]`
- Options
  - `-p` : When halting the system, do a poweroff. This is the default when halt is called as `poweroff`.
  - `-w` : Don't actually halt but only write the wtmp record (in the `/var/log/wtmp` file).
- Example
  - `$ sudo halt -p`

`poweroff` Command

- System power off.
- Syntax
  - `poweroff [OPTION]`
- Options
  - `-p` : When halting the system, do a poweroff.
  - `-w` : Don't actually halt but only write the wtmp record (in the `/var/log/wtmp` file).
- Example
  - `$ sudo poweroff -p`

`reboot` Command

- Reboot system.
- Syntax
  - `reboot`
- Example
  - `$ sudo reboot`

`init` Command

- Is the parent of all processes.
- Refer to https://askubuntu.com/questions/1090882/where-is-the-default-runlevel-on-ubuntu-18-04
- $ `systemctl list-units --type=target --all | cat`

```
instructor@Ubuntu-Desktop:~$ systemctl list-units --type=target --all | cat
  UNIT                   LOAD      ACTIVE   SUB    DESCRIPTION
● all.target             not-found inactive dead   all.target
  basic.target           loaded    active   active Basic System
  cryptsetup.target      loaded    active   active Local Encrypted Volumes
  emergency.target       loaded    inactive dead   Emergency Mode
  getty-pre.target       loaded    inactive dead   Login Prompts (Pre)
  getty.target           loaded    active   active Login Prompts
  graphical.target       loaded    active   active Graphical Interface
  local-fs-pre.target    loaded    active   active Local File Systems (Pre)
  local-fs.target        loaded    active   active Local File Systems
  multi-user.target      loaded    active   active Multi-User System
  network-online.target  loaded    active   active Network is Online
  network-pre.target     loaded    inactive dead   Network (Pre)
  network.target         loaded    active   active Network
  nss-lookup.target      loaded    active   active Host and Network Name Lookups
  nss-user-lookup.target loaded    active   active User and Group Name Lookups
  paths.target           loaded    active   active Paths
  remote-fs-pre.target   loaded    inactive dead   Remote File Systems (Pre)
```

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`init` Command (Cont.)

- Default runlevel

runlevel	Description
0	System halt ; no activity, the system can be safely powered down.
1	Single user; rarely used.
2	Multiple users, no NFS
3	Multiple users, command line interface; the standard runlevel for most Linux-based server hardware.
4	Unused.
5	Multiple users, GUI; the standard runlevel for most Linux-based desktop systems.
6	Reboot; used when restarting the system.

- `$ sudo init 0` : System shutdown
- `$ sudo init 6` : System reboot

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`init` Command (Cont.)

- For desktop systems the default is *graphical.target* :
  - $ `systemctl get-default`
- Can switch the target whenever you want with *systemctl isolate* comm and.
- The example below will switch to text-based *multi-user.target*
  - $ `sudo systemctl isolate multi-user.target`
- Default target can be changed the following way :
  - $ `sudo systemctl set-default multi-user.target`

More info : https://wiki.ubuntu.com/SystemdForUpstartUsers

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`who` Command

- Show who is logged on.
- Syntax
  - **`who [OPTION]`**
- Options
  - **`-a`**, **`--all`**: Same as **`-b -d --login -p -r -t -T -u`**
  - **`-b`**, **`--boot`** : Time of last system boot.
  - **`-d`**, **`--dead`** : Print dead processes
  - **`--login`** : Print system login processes.

Refer to http://devanix.tistory.com/227

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`who` Command (Cont.)

- Options
  - **`-p`**, **`--process`**: Print active processes spawned by init
  - **`-r`**, **`--runlevel`** : Print current runlevel.
  - **`-t`**, **`--time`** : Print last system clock change
  - **`-u`**, **`--users`** : List users logged in.
  - **`-H`**, **`--heading`** : Print line of column headings
  - **`-q`**, **`--count`** : All login names and number of users logged on

Lab. Using `who` command

`who` Command

- `$ who`
- `$ who -H`
- `$ who -b`
- `$ who -r`
- `$ who -a`

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`uname` Command

- Print system information, print information about the machine and operating system it is run on.
- Refer to `/proc/version`
- Syntax
  - `uname [OPTION]`
- Options
  - `-a`, `--all` : Print all information, in the following order :

KERNEL-NAME NODENAME KERNEL-RELEASE
KERNEL-VERSION MACHINE PROCESSOR
HARDWARE-PLATFORM OERATING-SYSTEM

`uname` Command

- Options
  - `-s` : Print the kernel name
  - `-n` : Print the network node hostname
  - `-r` : Print the kernel release
  - `-v` : Print the kernel version
  - `-m` : Print the machine hardware name
  - `-p` : Print the processor type
  - `-i` : Print the hardware platform
  - `-o` : Print the operating system

`last` Command

- Show listing of last logged in users.
- By default it shows a log of the file `/var/log/btmp`
- Syntax
  - `last [OPTION]`
- Options
  - `-n` : This is a count telling **last** how many lines to show.
  - `-t YYYYMMDDHHMMSS`: Display the state of logins as of the specified time.

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`date` Command

- Display the current time in the given FORMAT, or set the system date.
- Syntax
  - `date [OPTION]... [+FORMAT`[1]`]`
    `date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]`
- Options
  - `-s,--set=STRING` : Set time described by STRING.
  - `-u,--utc, --universal` : Print or set Coordinated Universal Time

1. FORMAT refer to http://linux.die.net/man/1/date

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Lab. Using `date` command

`date` Command

- `$ date`
- `$ date '+%A %B %d %G'`
- `$ date '+The date today is %F.'`
- `$ date --date='4 weeks'`
- `$ date --date='8 months 3 days'`
- `$ date 052112452016`
- `$ date -s '2016-10-20 23:34:21'`

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`cal` Command

- Displays a simple calendar.
- Syntax
  - **`cal [-smjy13 ] [[ month ] year ]`**
- Options
  - **`-1`** : Display single month output. (This is the default.)
  - **`-3`** : Display prev/current/next month output.
  - **`-s`** : Display Sunday as the first day of the week. (This is the default.)
  - **`-m`** : Display Monday as the first day of the week.
  - **`-j`** : Display Julian dates (days one-based, numbered from January 1).
  - **`-y`** : Display a calendar for the current year.

`whoami` Command

- Print effective userid.
- Syntax
  - `whoami`

`pwd` Command

- Print the full filename of the current working directory.
- Syntax
  - `pwd`

`clear` Command

- Clear the terminal screen.
- Syntax
  - `clear`

Lab. Linux Command Line