

### Command Redirection

<	Gets input from somewhere other than stdin (keyboard)
>	Sends output somewhere other than stdout (monitor)
1>	Alternative to ">" (not really used)
>>	Redirects stdout; <b>appends</b> it to existing content (instead of overwriting it)
2>	Redirects only error messages (stderr)
&>	Redirects both stdout and stderr
<code>cmd1   cmd2</code>	Pipes <code>cmd1</code> into <code>cmd2</code> (uses the <b>output</b> of <code>cmd1</code> as the <b>input</b> for <code>cmd2</code> )

### Basic File/Directory Commands

`ls dir1` List contents of dir1

`-l` additional info (owner, perms, etc.)

`-a` lists all, including hidden files

`-i` adds file inode to info displayed

`-h` adds file size in human-readable format (e.g. MB instead of bytes)

`-d` info for directory itself (rather than its contents)

`mkdir dir1` Create a new directory

`-p` creates full path (multiple directories if needed)

`-v` verbose (output shows action taken)

`cp dir1 dir2` Copy dir1 into dir2

`-r` recursively ("and its contents")

`rm dir1` Removes (deletes) an empty directory

### Basic File/Directory Commands (cont)

`-r` recursively ("and it's contents"), including special files

`-i` interactively delete files (ask before deleting)

`mv file1 dir1` Move file1 into dir1

`-v` verbose (output shows action taken)

`ln target link` Creates a hard link from file "link" to file "target"

`-s` makes a symbolic link instead of a hard link

### Locating Files

`locate pattern` Search for file names with specified pattern (via "locate" database)

`updatedb` Update the "locate" database

`find /dir -how what` Recursive search starting at "/dir" for pattern ("what") of specified type ("how")

`-name name` **case-sensitive** search for file name

`-iname name` case-insensitive search for file name

`-user name` files owned by user with specified username

`-uid 1002`



### Locating Files (cont)

<b>-size</b> 100M	files that are <b>exactly</b> 100 MB in size
<b>-size</b> [+/-] 100M	files that are <b>[larger/smaller]</b> than 100 MB
<b>-type f</b>	specifically files (not directories)
<b>-perm /o=w</b>	files where at least "other" has <b>w</b> rite perms
<b>inum</b> inode	file names associated with specified inode (i.e. including linked files)
<b>-mmin</b> -5	
<b>-ctime</b>	creation time

```
<find /usr -size +100M -exec ls -lh {} \; >
```

shows `ls -l` output AND actual file size of search results (essentially "pipes" results of `find` into `ls -lh`)

### Users & Groups

Command	Options
<b>id</b> user1	Show UID, GID, & secondary groups (current user if not specified)
<b>getent passwd</b> usr1	Find out if usr1 is known to the system
<b>useradd</b> user1	Add a new user
<b>-u</b> #	set a specific UID
<b>-s</b> /sbin/nologin	create a user without a login shell
<b>usermod</b> user1	Change properties of existing user
<b>-c</b> "text"	adds text to comment field

### Users & Groups (cont)

<b>-g</b> group1	changes <b>primary group</b> to group1
<b>-G</b> group1	<b>replaces</b> supplementary group with group1
<b>-aG</b> group1	<b>appends</b> group1 to supplementary groups
<b>-L</b> user1	locks user1's account (instead of deleting)
<b>newgrp</b> group1	Change current user's primary group ( <b>temporary</b> ; current session only)
<b>userdel</b> user1	Deletes user1 but <b>not</b> their home directory
<b>-r</b>	deletes both user <b>and</b> home directory
	Displays simple list of groups user1 is a member of
<b>passwd</b> user1	Set password for user1
<b>chage</b> user1	Change password aging properties for user
<b>-m</b> days	minimum # of days between password changes
<b>-M</b> days	
<b>-W</b> days	warning period before password expires
<b>-I</b> days	inactivity period (password usable after expiration)
<b>-d</b> 0	require password change on next login



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Not published yet.  
Last updated 7th July, 2025.  
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### Users & Groups (cont)

<code>-E date</code>	date when <b>account</b> expires
<code>getent group grp1</code>	Find out if grp1 is known to the system
<code>groupadd group1</code>	Create a new group
<code>-g #</code>	set a specific GID
<code>-r</code>	create a <b>system</b> group
<code>groupmod group1</code>	Change properties of existing group
<code>-g #</code>	change GID to specified number

To set the number of days from today when user's **account** expires:

```
chage -E $(date +days %Y-%m-%d)
```

To give full admin privileges to a user or group:

```
echo "[user1|group1] ALL=(ALL) ALL" >> /etc/sudoers.d/name
```

### Ownership & Permissions

<code>chown user:group</code>	Change owning user <b>and</b> owning group
<code>chown :group</code>	Change only owning group
<code>chgrp group file</code>	Alternate way to change owning group

`chmod [perms] file` Change file/directory permissions

`-R` recursive; applies to directory and all contents

`g+r`

`a-x` removes **execute** perms for all parties (without changing other perms)

### Ownership & Permissions (cont)

`-R a=rwX` recursively set perms for **all** parties to **rw**, with **x** perms on directory **only**

`770` octally set rwx perms for owning user & group, 0 for other

`chmod [perms] file` (cont'd) Change special permissions

`o+t dir` set Sticky bit (in other)  
\* For directories only\*

`1xxx`

`g+s dir/file`

`2xxx` set SetGID bit – octal form

`3xxx`

`u+s file`

`4xxx`

`umask` Displays currently set umask (when used by itself)

`077` removes default perms (0 from user, 7 from group/other)



### Ownership & Permissions (cont)

`0077` preserves any special perms when removing defaults

Octal Expression Values: `r=4` | `w=2` | `x=1`

Default permissions (on vanilla Linux):

`directories=777` | `files=666`



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### Jobs & Load Handling

**w** Displays currently logged-in users, login method, time, & resource usage info

**--from**

**-u** *username*

**command &** Starts a new job in the background

**jobs** Displays jobs running in the background ("+" = default job)

**fg** *%1* Brings job 1 to the foreground

**bg** *%1* Sends job 1 to the background

**pidof** *command* Returns the PID(s) of a currently running job

**systemctl status** *cmd* Shows main PID of a process, among other things (can use if **pidof** returns multiple)

### --- CPU Load Handling ---

**uptime** Displays the load average for the last 1, 5, and 15 mins

**lscpu** Displays number of CPUs in the system, among other things

### Jobs & Load Handling (cont)

**-p** simplified output (each row of numbers = 1 CPU)

Process Priority Values: -20 to 19 (default = 0)  
(*negative* = *higher* priority | *positive* = *lower* priority)

### Viewing & Managing Processes

**ps** Shows info about processes; pipe to **head/grep/etc** for less output (Note: "[*output*]" = kernel thread)

**--forest** shows output in visual "tree" format

Shows processes in visual tree format  
(*may not always be installed*)

**-P**

Linux terminal equivalent of Task Manager  
(Also shows load average)

**Keyboard Controls:**

**k**

**Shift+M**

**Shift+P**

**l / t / m**

**kill** *PID* Sends signal 15 to specified process  
\* *Must use process ID* \*



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### Viewing & Managing Processes (cont)

<code>-l</code>	
<code>killall process</code>	Kills processes by name instead of PID
<code>pkill</code>	Look up & manage processes by name or other attributes (default is signal 15)
<code>-signal</code>	specify signal to send
<code>-u username</code>	sends signal to user's account (forces logout & shuts down their processes)
<code>-t pts/22</code>	kills specified terminal session (TTY)
<code>nice -n x command</code>	Starts a <b>new</b> process with an adjusted priority value (x)
<code>renice -n x -p PID</code>	Change the priority value (x) of an <b>existing</b> process

### Managing Services & Daemons

#### --- System Commands ---

<code>systemctl reboot</code>	reboots the system
<code>systemctl daemon -reload</code>	tells systemd you've made changes to a unit file & it needs to reinitialize those unit files
<code>systemctl get-default</code>	shows which target is the default target that the system summons whenever it starts up
<code>systemctl set-default graphical.target</code>	sets default target to "graphical.target"

#### --- Unit Commands ---

<code>systemctl list-units</code>	shows all the active & loaded units on the system
-----------------------------------	---

### Managing Services & Daemons (cont)

<code>-t type</code>	filters output by specified type of unit
<code>-a</code>	shows all units known to systemd (including "inactive" & "not-found")
<code>systemctl status unit</code>	shows status & details of specified unit (including location of unit files)
<code>systemctl is-enabled unit.service</code>	shows whether the service is enabled (i.e. will start automatically on system boot)
<code>systemctl is-active unit.service</code>	shows whether the service is active
<code>systemctl enable --now unit.service</code>	enables the service & start it immediately (sets "enable" persistently)
<code>systemctl disable --now unit</code>	stops service immediately & sets to "disabled" persistently
<code>systemctl reload unit</code>	sends the "hang up" signal; drops config file loaded in memory & reload it from file system
<code>systemctl restart unit</code>	kills the process & starts it up again fresh (main PID will change)
<code>systemctl reload -or -restart unit</code>	reloads if possible, otherwise restart (for when you don't know if unit supports reload)
<code>systemctl list-dependencies unit.service</code>	shows list of units required by <i>unit.service</i> for it to work
<code>--reverse</code>	shows units that call <i>unit.service</i>
<code>systemctl mask unit</code>	prevents unit from being started automatically or manually (not even via <code>enable --now</code> command)
<code>systemctl unmask unit</code>	undoes masking on a service



### File Systems & Block Devices

**findmnt -s**

**lsblk** Lists block devices in tree format (incl. size, mountpoint, etc.)

**-f / --fs**

**-p** shows full device paths

**blkid /dev/file** Shows info about block device & filesystem, including partition UUID (non-partition devices must have a filesystem to show output)

**df location** Shows data (storage) utilization of filesystem, device, & mountpoint (Shows info for **whole** filesystem, even if *location* is a subdirectory)

human-readable format  
(converts bytes to MB, GB, etc.)

**du /dir** Shows data (storage) utilization of a specific directory

**-s**

### File Systems & Block Devices (cont)

**-h** human-readable format  
(converts bytes to MB, GB, etc.)

**mkfs.type /dev/file** Creates filesystem of specified type on specified block device (e.g. **mkfs.ext4 /dev/vdc1**)

**mount /dev/file /dest** Takes filesystem on specified block device & mounts it in specified directory

**umount mountpoint** Unmount the filesystem at the specified mountpoint

**lsdf mountpoint** List open files; shows which files are open in that filesystem

**fuser mountpoint** Similar info as **lsdf**, but less detailed

**-m** shows only the PID associated with the open file

### RPM Software Packages

**rpm -qa** Query **all**; shows all software packages installed on the system

**rpm -qf /file** Query **file**; asks RPM database which software package owns */file*

**rpm -qp** Query **package**; runs command against the .rpm file itself



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Not published yet.  
Last updated 7th July, 2025.  
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### RPM Software Packages (cont)

**-qp1** list of files in the .rpm package

**-qpc**

**-qpd**

**-qpi** information about the package file (metadata, summary, software description, etc.)

### Managing Software Packages (DNF)

#### Info Commands:

**dnf info *package*** Shows package metadata, summary, description, etc.  
(same as `rpm -qpi`, but package doesn't have to be installed)

**dnf provides */file*** Shows what software package provides the file  
(same as `rpm -qf`, but package doesn't have to be installed)

**dnf search *'gui'*** Searches for "*gui*" based on package name & metadata

**dnf search all *'gui'*** Includes package description when searching for "*gui*"

**dnf list *'x\*'*** Lists all available and/or installed software packages that begin with "*x*"

### Managing Software Packages (DNF) (cont)

**dnf group list** Shows list of available software groups  
("Environment Groups" = logical groupings of regular groups from "Available" list)

**dnf group info *"Name"*** Lists software packages included in specified group

**dnf history** Displays history of DNF commands/-actions

**dnf history undo *3*** Undoes number *3* from DNF history (e.g. if it installed something, "undo" will uninstall it)

#### Download/Install Commands:

**dnf download** Downloads software package & its dependencies **without** installing them

**dnf install *package*** Installs package & automatically resolves dependencies

**-y**

**dnf remove *package*** Uninstalls package & any dependencies (if they aren't being used elsewhere)

**-y** auto-yes (for non-interactive)



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### Managing Software Packages (DNF) (cont)

**dnf update *package*** Redownloads .rpm file & reinstalls newer version

-y



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### Network Info Commands

`ip -br addr`

`ip link show` Link-level properties of all interfaces (MAC addresses, etc.)

`ip address show` Equivalent of `ipconfig` (same info as `link show`, plus IP addresses)

`ip a s`

`ip route show` Shows default route

`ip r s`

`ping | ping6` IPv4 ping | IPv6 ping

`tracpath` Equivalent of `tracert`/`tracert`

`tracpath6` IPv6 version

`mtr address`

`nmap -sS host` Scans ports on host; shows port number/type, open state, associated service, etc.

`ss` Sockets state information

`-p` processes responsible for opening ports

`-l`

`-u`

### Network Info Commands (cont)

`-n` translates names to numbers (e.g. process name + PID)

`-t` TCP sockets

`nmcli connection show` Shows configured connection profiles

`nmcli c s` abbreviated form

`--active` only show currently active profiles

`nmcli dev status` Status of interfaces (devices), incl. type & profile name

`nmcli dev show int` Shows settings applied to the specified interface (device)

### Network Configuration Commands (NMCLI)

`nmcli con add <specs> [options]` Create a new connection profile  
**<specs>** = required configs  
**[options]** = other optional configs

`<con-name "Name">`

`<type ethernet>`

`<ifname eth0>` interface to associate with profile

`[ipv4.method manual]`

`[ipv4.a ddr esses address/cidr]`

`[ipv4.dns x.x.x.x]` specify DNS server address

`nmcli con mod "Name"` Modify properties of a connection profile



### Network Configuration Commands (NMCLI) (cont)

**ipv4.g ateway** *x.x.x.x*  
*x*

**+property.attribute**  
*value*

**-property.attribute** *value* remove a value from an array of values

**nmcli con up "Name"** Activates specified profile on whatever interface it's configured for

**nmcli con reload "Name"** Reloads profile after config changes  
**Note:** Must re-up profile before new config will be applied to interface!

### SSH

**ssh** *user@ip.addr* Start ssh connection

**-v** verbose; shows in detail what's happening while establishing connection

**-Y** enables graphical application support

**-p** *port#* connect to ssh service not listening on default port 22

**-i** *keyfile* reads private key from identity file for public key authentication  
(not part of lecture; added from Google search when it came up in the quiz)

### SSH (cont)

**-o** *option dest\_server* configures options when connecting to specified destination

Example:

**PreferredAuthentications=password**

(Example: require a password; can use commas to specify multiple)

### ssh-keygen

Generates a public/private key pair

**-N '' -f** *filename*

generates key pair without extra prompts

( '' = no passphrase; -f specifies non-default file location)

**ssh-copy-id** *user@ip*

Installs public key on destination server

**-i** *filepath*

### Misc. Commands

**whatis** *command* Displays a short, one-line summary of what the command does

**file** *something* Tells you what kind of file "*something*" is  
(More reliable than file extension)

**echo** Creates output (**print** = Python equivalent)

**date** Displaying, setting, calculating...  
basically all things date-related



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### Misc. Commands (cont)

**+%F** display current date in international format (YYYY-mm-dd)

**+%R** display current time (24-hr clock)

**+%s** display # of seconds since epoch

**hostname** Shows the hostname of the current system. That is all.

**host *hostname*** Shows IP address associated with specified hostname

**hostn *mectl*** Shows properties of current system (hostname, OS, kernel, etc.)

**set-ho *stname*** sets hostname to "*new\_name*"

*new\_name*

**sos report** Generates an SOS report

**-l** lists available plugins for SOS (recommended to pipe to `less`)

**--upload** automatically associates generated report with your Red Hat account (enables browsing the data via the web portal)

**sleep *seconds*** Does nothing for specified time (used for scripting)

**tmux** Splits terminal window into multiple separate panes (*I think*)

### Misc. Commands (cont)

**gnome-cha *racter*** Opens window of gnome icons/emotes *s*

**gnome-cal *culato*** Opens built-in calculator (like Windows) *r*



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