Linux Commands

Directory Operations

`pwd`	Show current directory
`cd dir`	Change to directory *dir*
`mkdir dir`	Create a new directory *dir*
`rmdir dir`	Delete directory *dir*
`ls dir`	List contents directory *dir*

Special Directories

	Current directory
`..`	Up a directory
`.`	Current directory
`~`	Home directory
`/`	Root directory
`-`	Previous directory

ls Options

`-a`	all inc. hidden
`-l`	long format
`-t`	sort by time
`-S`	sort by size
`-r`	reverse order
`-R`	recursive

File Operations

`touch file`	Create file *file*
`cp file1 file2`	Copy *file1* to *file2*
`mv file1 file2`	Move *file1* to *file2*
`rm file`	Delete *file*
`cat file`	Display contents of *file*
`cat file1 file2`	Concatenate files
`less file`	Display *file* (paginated), q to quit
`head file`	Show first 10 lines
`tail file`	Show last 10 lines `-n N` *N* lines `-f` Continuos update

Help

`man cmd`	Manual page for *cmd*
`man -k word`	Search for manual page with *word*
`-h`	Commands show help when used

File Searching

`grep pattern file`	Search for lines with *pattern* in file
`grep -v`	Inverted search
`grep -r`	Recursive search
`grep -e patt -e patt`	Multiple patterns
`locate file`	Quick search for *file*
`which cmd`	Find location of binary
`find dir -name pattern`	Find file with *pattern* in *dir*

Standard IO Streams

stdin	Input typed on the command line
stdout	Output on the screen
stderr	Errors output on the screen
`echo string`	Write *string* to stdout

Redirection

`cmd > file`	Output of *cmd* to *file*
`cmd < file`	*file* used as input to *cmd*
`cmd >> file`	Append output to *file*
`cmd 2> file`	Write errors to *file*
`cmd &> file`	Errors and stdout to *file*

Pipes and Multiple Commands

`cmd1 | cmd2`	Stdout of *cmd1* is used as input to *cmd2*
`cmd1 |&cmd2`	Stderr of *cmd1* is used as input to *cmd2*
`cmdpart1 \` `cmdpart2`	Continue command on next line
`cmd1; cmd2`	Execute *cmd1* then *cmd2*

Processes

`ps`	Show processes of user
`ps -e`	Show all processes
`ps -fA`	Show all processes in detail
`top`	Show processes in real-time
`cmd &`	Run command in background
`Ctrl-c`	Stop (kill) currently active process
`Ctrl-z`	Suspend currently active process
`bg`	Place suspended process in background
`fg`	Bring background process to foreground
`kill pid`	Kill process with process id *pid*
`kill -9 pid`	Kill process *pid* (ungraceful)

Bash Shortcuts

`Ctrl-k`	Cut line of text
`Ctrl-y`	Paste line of text
`Ctrl-e`	Go to end of line
`Ctrl-a`	Go to start of line
`TAB`	Autocomplete command/file
`TAB-TAB`	Show list of possible autocompletes
`up arrow`	Scroll previous commands
`down arrow`	Scroll previous commands
`history`	List recent commands
`!!`	Repeat last command
`!N`	Execute command *N* from history
`!abc:p`	Print last command starting with *abc*
`!abc`	Execute last command starting with *abc*

Editing Text Files

`nano`	Text editor
Shortcuts	
`Ctrl-o`	Save file
`Ctrl-x`	Close file
`Ctrl-r`	Open file
`Ctrl-k`	Cut line of text
`Ctrl-u`	Paste line of text
`Ctrl-d`	Delete character
`Ctrl-w`	Search for text

Text File Operations

`wc`	Line, word and character count
`sort file`	Sort *file*, line by line
`uniq file`	Display only unique lines of *file*
`sed 's/abc/def/g' file`	Replace all occurrences of *abc* with *def*, output to stdout
`cut -d " " -f N file`	Display field *N* of space delimited file
`cut -d "," -f M-N file`	Display fields *M*-*N* of comma delimited *file*

GUI applications via Command line

`gedit`	Text editor
`wireshark`	Packet capture and display
`eog`	Image viewer
`evince`	PDF viewer
`nautilus`	File explorer

Administrator Privileges

`sudo cmd`	Execute *cmd* with admin privilege
`su username`	Switch to user *username*

Networking Commands and Files

Interface Configuration
```
ifconfig [<interface>] [up | down]
ifconfig <interface> <ipaddress> netmask <netmask>
ethtool <interface>
ethtool -k <interface>
File: /etc/network/interfaces
```

Packet Capture
```
tcpdump [-i <interface>] [-w <file>]
```

Remote Login
```
ssh [-l <username] <address>
```

File Transfer
```
nc -l <port>
nc <ip> <port>
scp <src> <address>:<dst>
scp <address>:<src> <dst>
wget <url>
iperf -s
iperf -c <address>
```

Tracepath
```
tracepath <destination>
```

ARP
```
arp [-n]
```

DNS
```
nslookup <domain>
[<dnsserver>]
File: /etc/resolv.conf
File: /etc/hosts
```

DHCP
```
dhclient [-r] [<interface>]
File: /var/lib/dhcp/dhclient.leases
```

Statistics
```
netstat [-t | -i | -s | -r] [-n]
```

Web Server
```
apache2ctl [start | stop | restart]
htpasswd <passwordfile> <username>
Dir: /etc/apache2/sites-available/
Dir: /var/www/
```

Ping
```
ping [-c <count>] [-s <packetsize>] [-i <interval>] <destination>
```

Routing
```
route [-n]
route add -net <netaddress> netmask <subnet> [gw <gateway>] [dev <interface>]
route del -net <netaddress> netmask <subnet> [gw <gateway>] [dev <interface>]
route add default gw <gateway>
sysctl net.ipv4.ip_forward=[0 | 1]
File: /proc/sys/net/ipv4/ip_forward
```

Firewall
```
iptables -A <chain> [<options>]
   where <options> include:
     [-s <sourceip>] [-d <destip>] [-i <ininterface>] [-o <outinterface>]
     [-p <protocol>] [--sport <sourceport>] [--dport <destport>]
     [-j <action>]
iptables -D <chain> [<options>]
iptables -L <chain>
iptables -F <chain>
   where <chain> may be: INPUT | OUTPUT | FORWARD
```

File Permissions

Access Rights

`r`	read file; list the contents of directory
`w`	write to file; create and remove files in directory
`x`	execute file; access files in directory

Subjects

`u`	user that owns the file
`g`	users in the file's group
`o`	other users
`a`	all users, i.e. the above three)

Output of ls -l

E.g.: `-rw-rwx---  drwxr-x--x`

First letter indicates file type:
- `d` = directory
- `-` = normal file

Next 9 letters: access right letter indicates the permission is set; **-** indicates the permission is not set

Modes

Modes can be specified by combining subject with access right
- `+` Grant with right
- `-` Remove the right
- `=` Set the right

Examples: `u+r` `g-rw` `u+r,g=wx,o-r`

Commands

`ls -l`	display directory contents
`stat` *file*	display file status and inode info
`df`	report file system disk usage
`chmod` *mode file*	change file mode bits, i.e. set permissions
`chown` *user.group file*	change ownership of file to user and group

Example
```
chown student.netadmin file.txt
chmod g+rw,o-rwx file.txt
```

OpenSSL

(following commands must be preceded with `openssl`)

`enc -`*des-ecb* `-in` *p.txt* `-out` *c.bin*	Symmetric encrypt *p.txt* using DES-ECB
`enc -d -`*des-ecb* `-in` *c.bin* `-out` *r.txt*	Symmetric decrypt *c.bin* using DES-ECB
`dgst -`*md5 file*	MD5 hash of *file*
`genpkey -algorithm` *RSA* `-out` *priv.pem*	Generate RSA public/private key pair
`pkey -in` *priv.pem* `-out` *pub.pem* `-pubout`	Extract public key from key pair, save in *pub.pem*
`pkey -in` *priv.pem* `-text`	View public/private key values, text
`dgst -`*sha1* `-sign` *priv.pem* `-out* *s.bin p.txt`	Sign *p.txt* using SHA and private key in *priv.pem*
`pkeyutl -encrypt -in` *p.txt* `-pubin -inkey` *pub.pem* `-out` *c.bin*	Encrypt *p.txt* using *pub.pem*, output *c.bin*
`pkeyutl -decrypt -in` *c.bin* `-inkey` *priv.pem* `-out` *r.txt*	Decrypt *c.bin* using *priv.pem*, output *r.txt*
`dgst -`*sha1* `-verify` *pub.pem* `-signature` *s.bin r.txt*	Verify signature of r.txt
`rand 16 -hex`	Generate 16 Byte random value, hex