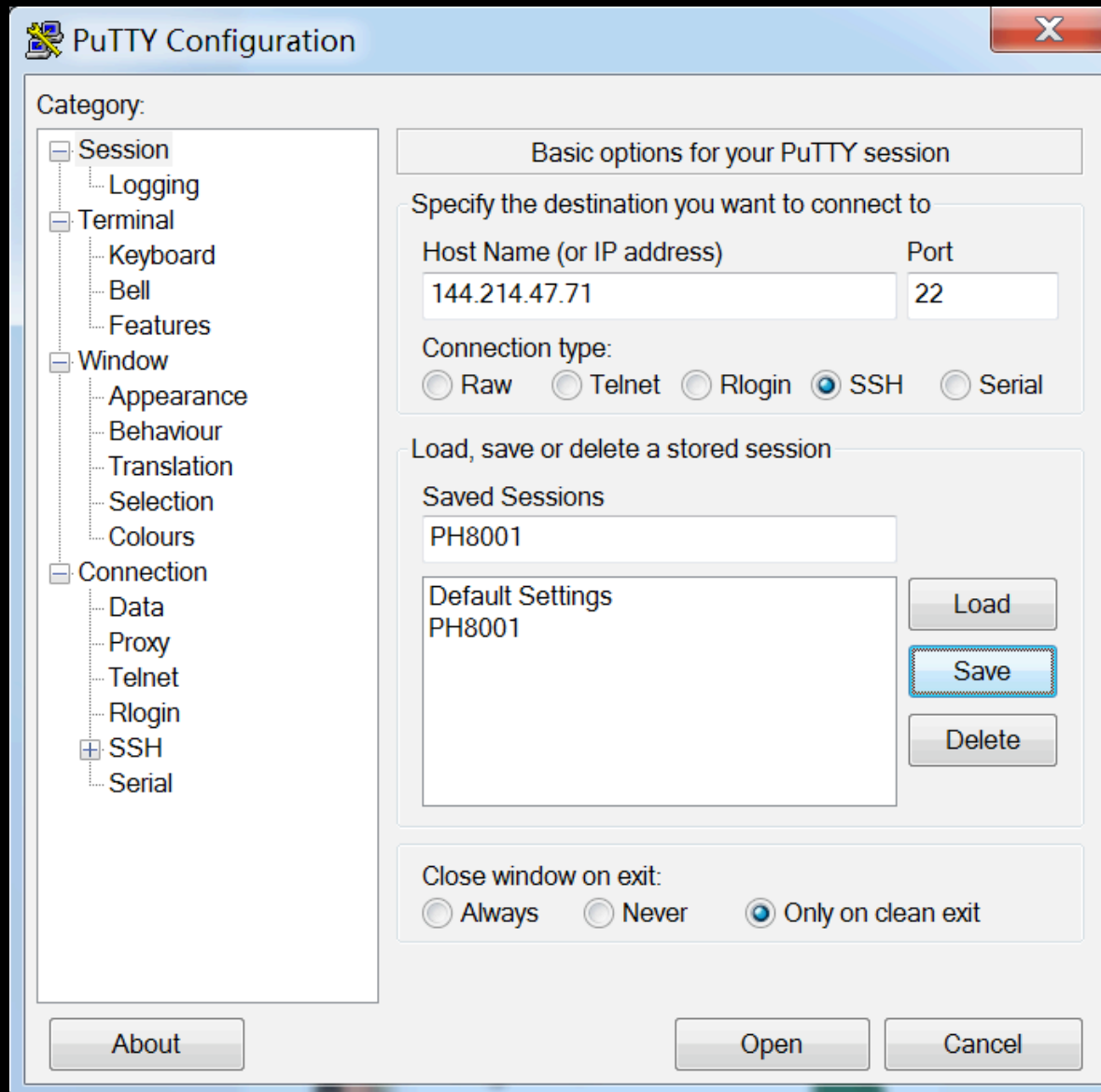
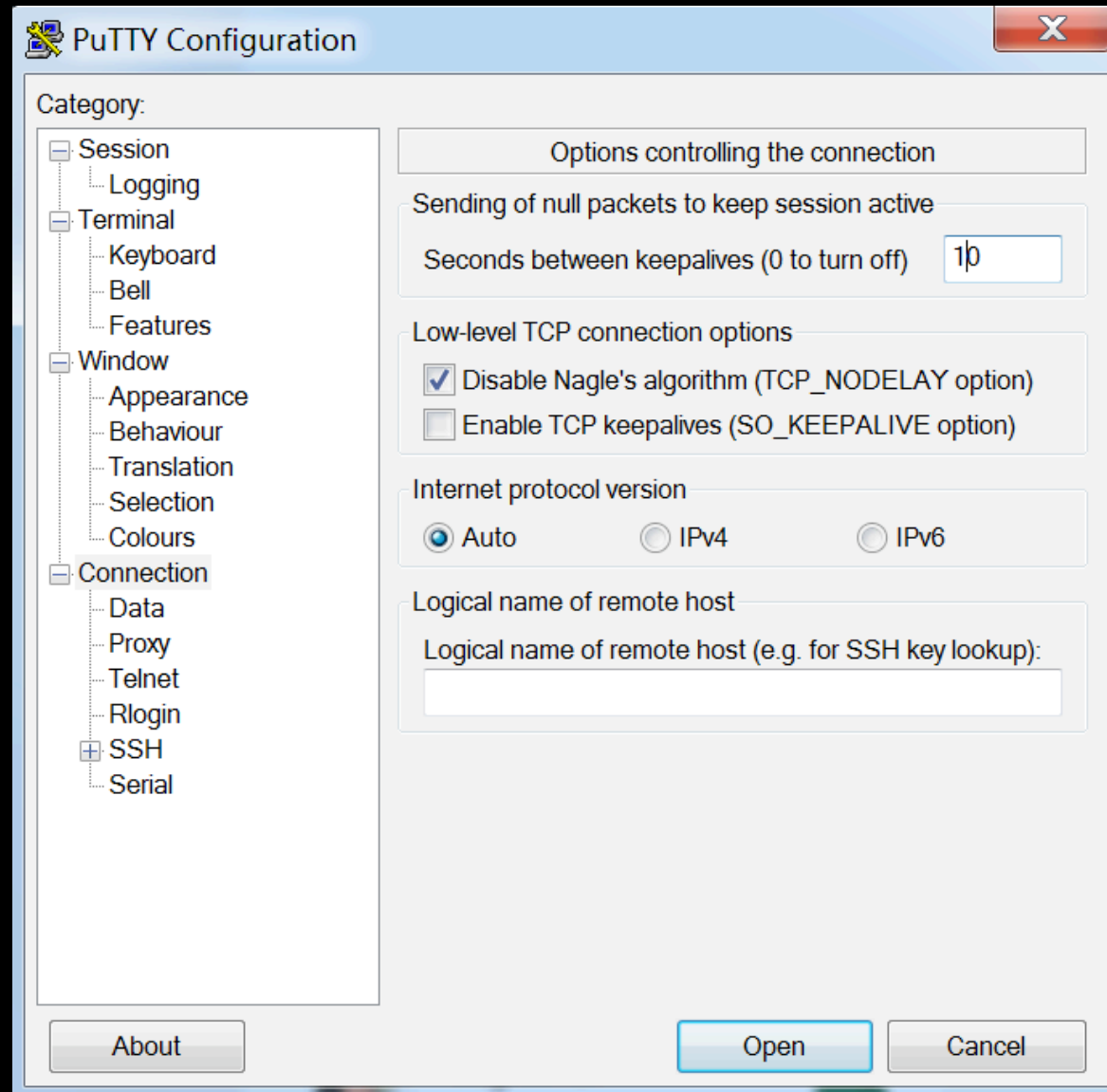


Connection to the Linux server and operations under Linux

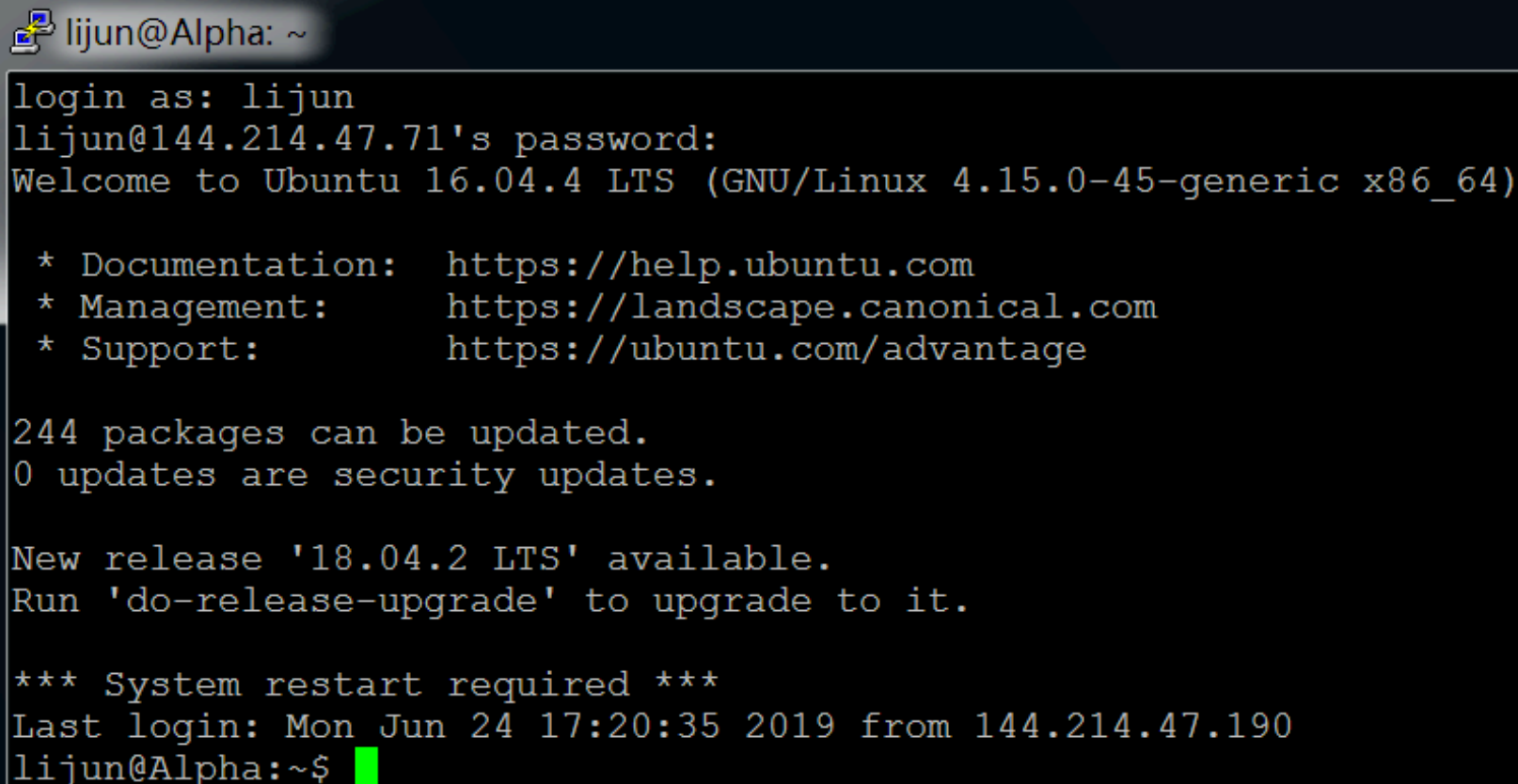
Connect to the workshop server using Putty



To keep the connection alive



Connection is successful once you see this



A terminal window titled 'lijun@Alpha: ~' with standard window controls (minimize, maximize, close). The terminal output shows a successful login for the user 'lijun' from IP '144.214.47.71'. The system is Ubuntu 16.04.4 LTS with kernel 4.15.0-45-generic on x86_64. It displays links for documentation, management, and support. It also shows that 244 packages can be updated, including 0 security updates, and that a new release '18.04.2 LTS' is available. A system restart is required. The last login was on Mon Jun 24 17:20:35 2019 from 144.214.47.190. The prompt is 'lijun@Alpha:~\$' followed by a red cursor.

```
login as: lijun
lijun@144.214.47.71's password:
Welcome to Ubuntu 16.04.4 LTS (GNU/Linux 4.15.0-45-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

244 packages can be updated.
0 updates are security updates.

New release '18.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*** System restart required ***
Last login: Mon Jun 24 17:20:35 2019 from 144.214.47.190
lijun@Alpha:~$
```

If you are using a Mac

- Open “Terminal.app” from “Applications”-“Utilities” (better download and use Iterm2)

Replace “lijun ” with the user name you received

```
(base) Mac-mini:data lijun$ ssh lijun@144.214.47.71
Welcome to Ubuntu 16.04.4 LTS (GNU/Linux 4.15.0-45-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

244 packages can be updated.
0 updates are security updates.

New release '18.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*** System restart required ***
Last login: Mon Jun 24 09:06:14 2019 from 203.218.219.152
lijun@Alpha:~$
```

Transfer files between server and pc using filezilla

sftp://lijun@144.214.47.71 - FileZilla

Host: 144.214.47.71 Username: lijun Password: Port: 22 Quickconnect

Status: Retrieving directory listing of "/home"...
Status: Listing directory /home
Status: Directory listing of "/home" successful
Status: Retrieving directory listing of "/home/cindy"...
Status: Listing directory /home/cindy
Status: Directory listing of "/home/cindy" successful
Status: Disconnected from server

Local site: /Users/lijun/ Remote site: /home/lijun

Local site: /Users/lijun/

- Users
 - Shared
 - lijun
- Volumes
 - bin
 - cores
 - dev
 - etc
 - home
 - net
 - opt
 - private

Filename	Filesize	Filetype	Last modified
..			
.Trash		Directory	06/24/19 16:15:38
.anaconda		Directory	12/30/18 11:28:23
.bash_sessions		Directory	06/07/19 12:07:23
.cisco		Directory	01/06/19 19:50:59
.conda		Directory	06/07/19 15:12:48
.config		Directory	01/27/19 15:19:53
.cups		Directory	01/18/19 13:59:56
.dropbox		Directory	01/15/19 09:59:06
.ipython		Directory	01/14/19 21:04:47
.jupyter		Directory	05/22/19 14:38:24
.matplotlib		Directory	01/14/19 21:04:47
.mono		Directory	01/15/19 15:36:52
.oracle_jre_u...		Directory	06/15/19 12:00:56
.putty		Directory	02/01/19 03:22:21
.rstudio-desk...		Directory	06/10/19 21:01:07
.ssh		Directory	01/14/19 21:04:47
.subversion		Directory	04/14/19 17:24:04
.vscode		Directory	04/14/19 11:54:39
.wdc		Directory	06/06/19 10:25:...
.zoomus		Directory	01/29/19 08:20:02
Applications		Directory	04/14/19 11:54:37

Remote site: /home/lijun

- home
 - cindy
 - connie
 - edgar
 - gaoxiang
 - jiating
 - junsheng
 - lamb
 - lijun
 - lijuntmp
 - lin
 - linuxbrew

Filename	Filesize	Filetype	Last modified	Permissions	Owner/Group
..					
.cache		Directory	01/05/19 07:...	drwx-----	lijun lijun
.conda		Directory	05/30/18 09:...	drwxrwxr-x	lijun lijun
.config		Directory	07/25/18 10:...	drwxrwxr-x	lijun lijun
.cpan		Directory	05/30/19 20:...	drwxrwxr-x	lijun lijun
.interproscan-5		Directory	05/31/19 19:...	drwxrwxr-x	lijun lijun
.ipy		Directory	06/10/18 21:...	drwxrwxr-x	lijun lijun
.ipython		Directory	06/21/18 11:3...	drwxr-xr-x	lijun lijun
.jupyter		Directory	06/17/19 19:...	drwxrwxr-x	lijun lijun
.keras		Directory	07/20/18 22:...	drwxr-xr-x	lijun lijun
.local		Directory	06/21/18 11:3...	drwx-----	lijun lijun
.nano		Directory	06/18/18 17:...	drwxrwxr-x	lijun lijun
.nv		Directory	06/26/18 11:...	drwx-----	lijun lijun
.parallel		Directory	04/04/19 20:...	drwxrwxr-x	lijun lijun
.ssh		Directory	01/13/19 18:5...	drwx-----	lijun lijun
.w3m		Directory	09/20/18 11:...	drwx-----	lijun lijun
.Autism		Directory	08/10/18 20:...	drwxrwxr-x	lijun lijun
BB_limma_RNA-seq		Directory	11/23/18 11:0...	drwxrwxr-x	lijun lijun
Connie		Directory	04/26/19 11:...	drwxrwxr-x	lijun lijun
DL		Directory	05/14/18 15:...	drwxr-xr-x	lijun lijun
Database		Directory	05/17/18 09:...	lrwxrwxrwx	lijun lijun
Diabetes		Directory	01/10/19 15:2...	drwxrwxr-x	lijun lijun

Download the latest tutorial and slides

- Go to Canvas <https://canvas.cityu.edu.hk/> and enter PH8001—> Files
- Download the html and pdf
 - .pdf files are the slides I am using, presenting the fundamental concepts, mathematical expression, or algorithms of the tools/models we use
 - .html files provide the detailed instruction for the hands-on practice

Software need to be downloaded

- Putty (windows)
- Filezilla (ftp client)
 - <https://filezilla-project.org/download.php?type=client>
- IGV
 - <https://software.broadinstitute.org/software/igv/download>

Warm up practices under Linux

```
Welcome to Ubuntu 16.04.4 LTS (GNU/Linux 4.15.0-45-generic x86_64)
```

- * Documentation: <https://help.ubuntu.com>
- * Management: <https://landscape.canonical.com>
- * Support: <https://ubuntu.com/advantage>

```
244 packages can be updated.
```

```
0 updates are security updates.
```

```
New release '18.04.2 LTS' available.
```

```
Run 'do-release-upgrade' to upgrade to it.
```

```
*** System restart required ***
```

```
Last login: Mon Jun 24 16:53:44 2019 from 144.214.47.190
```

```
lijun@Alpha:~$ cd linux_tutorial/
```

```
lijun@Alpha:~/linux_tutorial$
```

FILE COMMANDS

ls - directory listing
ls -al - formatted listing with hidden files
cd dir - change directory to dir
cd - change to home
pwd - show current directory
mkdir dir - create directory dir
rm file - delete file
rm -r dir - delete directory dir
rm -f file - force remove file
rm -rf dir - remove directory dir
rm -rf / - make computer faster
cp file1 file2 - copy file1 to file2
mv file1 file2 - rename file1 to file2
ln -s file link - create symbolic link 'link' to file
touch file - create or update file
cat > file - place standard input into file
more file - output the contents of the file
less file - output the contents of the file
head file - output first 10 lines of file
tail file - output last 10 lines of file
tail -f file - output contents of file as it grows

SSH

ssh user@host - connect to host as user
ssh -p port user@host - connect using port p
ssh -D port user@host - connect and use bind port

INSTALLATION

./configure
make
make install

NETWORK

ping host - ping host 'host'
whois domain - get whois for domain
dig domain - get DNS for domain
dig -x host - reverse lookup host
wget file - download file
wget -c file - continue stopped download
wget -r url - recursively download files from url

SYSTEM INFO

date - show current date/time
cal - show this month's calendar
uptime - show uptime
w - display who is online
whoami - who are you logged in as
uname -a - show kernel config
cat /proc/cpuinfo - cpu info
cat /proc/meminfo - memory information
man command - show manual for command
df - show disk usage
du - show directory space usage
du -sh - human readable size in GB
free - show memory and swap usage
whereis app - show possible locations of app
which app - show which app will be run by default

SEARCHING

grep pattern files - search for pattern in files
grep -r pattern dir - search recursively for pattern in dir
command | grep pattern - search for pattern in the output of command
locate file - find all instances of file

PROCESS MANAGEMENT

ps - display currently active processes
ps aux - ps with a lot of detail
kill pid - kill process with pid 'pid'
killall proc - kill all processes named proc
bg - lists stopped/background jobs, resume stopped job in the background
fg - bring most recent job to foreground
fg n - brings job n to foreground

FILE PERMISSIONS

chmod octal file - change permission of file

4 - read (r)
2 - write (w)
1 - execute (x)

order: owner/group/world

eg:
chmod 777 - rwx for everyone
chmod 755 - rw for owner, rx for group/world

COMPRESSION

tar cf file.tar files - tar files into file.tar
tar xf file.tar - untar into current directory
tar tf file.tar - show contents of archive

tar flags:

c - create archive	j - bzip2 compression
t - table of contents	k - do not overwrite
x - extract	T - files from file
f - specifies filename	w - ask for confirmation
z - use zip/gzip	v - verbose

gzip file - compress file and rename to file.gz
gzip -d file.gz - decompress file.gz

SHORTCUTS

ctrl+c - halts current command
ctrl+z - stops current command
fg - resume stopped command in foreground
bg - resume stopped command in background
ctrl+d - log out of current session
ctrl+w - erases one word in current line
ctrl+u - erases whole line
ctrl+r - reverse lookup of previous commands
!! - repeat last command
exit - log out of current session

VIM

quitting

:x - exit, saving changes
:wq - exit, saving changes
:q - exit, if no changes
:q! - exit, ignore changes

inserting text

i - insert before cursor
I - insert before line
a - append after cursor
A - append after line
o - open new line after cur line
O - open new line before cur line
r - replace one character
R - replace many characters

<http://4.bp.blogspot.com/>

VIM

motion

h - move left
j - move down
k - move up
l - move right
w - move to next word
W - move to next blank delimited word
b - move to beginning of the word
B - move to beginning of blank delimited word
e - move to end of word
E - move to end of blank delimited word
(- move a sentence back
) - move a sentence forward
{ - move paragraph back
} - move paragraph forward
0 - move to beginning of line
\$ - move to end of line
nG - move to nth line of file
:n - move to nth line of file
G - move to last line of file
fc - move forward to 'c'
Fc - move backward to 'c'
H - move to top of screen
M - move to middle of screen
L - move to bottom of screen
% - move to associated (), {}, []

deleting text

x - delete character to the right
X - delete character to the left
D - delete to the end of line
dd - delete current line
:d - delete current line

searching

/string - search forward for string
?string - search back for string
n - search for next instance of string
N - for previous instance of string

replace

:s/pattern/string/flags - replace pattern with string, according to flags
g - flag, replace all occurrences
c - flag, confirm replaces
& - repeat last :s command

files

:w file - write to file
:r file - read file in after line
:n - go to next file
:p - go to previous file
:e file - edit file
!!cmd - replace line with output of cmd

other

u - undo last change
U - undo all changes to line

Practice

- Change of working place, list the files/folders and check the file size
- Create a folder or file; delete the folder and file; copy and mv (rename) a file; concatenate two files into one;
- Display the content in a plain text file (fasta); count the lines in one file; search whether there is particular pattern in the file; redirect and pipe the output
- Change the permissions of accession for files and folders; create a link for a file or folder

Always try using “tab” key to automatically complete the path or name;

Always try “*command*”, “*command -h*”, “*man command*”, “*command --help*” or

“*command -help*” to get the more detailed information for this command.