



Jordan University of Science and Technology

Assignment 1

CS375 Operating System

July 20, 2020

Group Member

No.	Student Name	Student ID
1	Mohammad salah altawil	118256
2	Ahmad nazeh quraan	108055

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- screen for 3 command inside steps when installing the machine

```
mohdtawil@ubuntu:~$ sudo apt-get update
[sudo] password for mohdtawil:
Sorry, try again.
[sudo] password for mohdtawil:
[mohdtawil@ubuntu:~]$ 
File Edit View Search Terminal Help
To run a command as administrator (user "root"), use "sudo <command>". See "man sudo_root" for details.

mohdtawil@ubuntu:~$ sudo apt-get update
[sudo] password for mohdtawil:
Sorry, try again.
[sudo] password for mohdtawil:
[mohdtawil@ubuntu:~]$ 
File Edit View Search Terminal Help
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Building state information... Done
The following additional packages will be installed:
  cpp cpp-7 dkpg-dev fakeroot g++ g++-7 gcc gcc-7-base gcc-8-base
  libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl
  libasan4 libatomic1 libc-dev-bin libc6 libc6-dbg libc6-dev libcc1-0
  libcilkrtss5 libdpkg-perl libfakeroot libgcc-7-dev libgcc1 libgomp1 libitm1
  liblsan0 libmpx2 libquadmath0 libstdc++-7-dev libstdc++6 libtsan0 libubsan0
  linux-libc-dev make manpages-dev
Suggested packages:
  cpp-doc gcc-7-locales debian-keyring g++-multilib g++-7-multilib gcc-7-doc
  libstdc++-6-7-dbg gcc-multilib autoconf automake libtool flex bison gcc-doc
  gcc-7-multilib libgcc1-dbg libgomp1-dbg libitm1-dbg libatomic1-dbg
  libasan4-dbg liblsan0-dbg libtsan0-dbg libubsan0-dbg libcilkrtss5-dbg
  libmpx2-dbg libquadmath0-dbg q1lbc-doc git bzr libstdc++-7-doc make-doc
The following NEW packages will be installed:
  build-essential dkpg-dev fakeroot g++ g++-7 gcc gcc-7-base libalgorithm-diff-perl
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan4 libatomic1
  libc-dev-bin libc6-dev libcilkrtss5 libfakeroot libgcc-7-dev libitm1 liblsan0
  libmpx2 libquadmath0 libstdc++-7-dev libtsan0 libubsan0 linux-libc-dev make
  manpages-dev
The following packages will be upgraded:
  cpp cpp-7 gcc-7-base gcc-8-base libc6 libc6-dbg libcc1-0 libdpkg-perl
  libgcc1 libgomp1 libstdc++6
11 upgraded, 27 newly installed, 0 to remove and 538 not upgraded.
Need to get 39.7 MB/48.3 MB of archives.
After this operation, 122 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libc-dev-bin amd64 2.27-3ubuntu1.2 [71.8 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 linux-libc-dev amd64 4.15.0-111.112 [997 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libc6-dev amd64 2.27-3ubuntu1.2 [2,585 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 cpp-7 amd64 7.5.0-3ubuntu1-18.04 [8,591 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 gcc-7-base amd64 7.5.0-3ubuntu1-18.04 [18.3 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 cpp amd64 4.7.4-0-ubuntu2.3 [27.7 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libitm1 amd64 8.4.0-1ubuntu1-18.04 [27.9 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libatomic1 amd64 8.4.0-1ubuntu1-18.04 [9,192 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libasan0 amd64 7.5.0-3ubuntu1-18.04 [358 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libtsan0 amd64 8.4.0-1ubuntu1-18.04 [133 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libubsan0 amd64 8.4.0-1ubuntu1-18.04 [288 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libgcc1 amd64 7.5.0-3ubuntu1-18.04 [126 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcilkrtss5 amd64 7.5.0-3ubuntu1-18.04 [42.5 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libmpx2 amd64 8.4.0-1ubuntu1-18.04 [11.6 kB]
```



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```
Player ▾ || ▾ └ Terminal ▾
Activities ▾ Terminal ▾
Sun 15:17
mohdtawil@ubuntu: ~

Setting up libitm1:amd64 (8.4.0-1ubuntu1~18.04) ...
Setting up libasan4:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up liblilkrtss1:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up fakeroot (1.22-2ubuntu1)
update-alternatives: using /usr/bin/fakeroot-sysv to provide /usr/bin/fakeroot (fakeroot) in auto mode
Setting up libgcc-7-dev:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up cpp-7 (7.5.0-3ubuntu1~18.04) ...
Setting up libstdc++-7-dev:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up libalgorithm-merge-perl (0.08-3) ...
Setting up libalgorithm-diff-xs-perl (0.04-5) ...
Setting up cpp (4:7.4.0-ubuntu2.3) ...
Setting up gcc-7 (7.5.0-3ubuntu1~18.04) ...
Setting up g++-7 (7.5.0-3ubuntu1~18.04) ...
Setting up gcc (4:7.4.0-ubuntu2.3) ...
Setting up g++ (4:7.4.0-ubuntu2.3) ...
update-alternatives: using /usr/bin/g++ to provide /usr/bin/c++ (c++) in auto mode
Processing triggers for libc-bin (2.27-3ubuntu1) ...
mohdtawil@ubuntu:~$ sudo apt install libmpich-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
gfortran gfortran-7 hwloc-nox libcr-dev libcr0 libgfortran-7-dev libgfortran4 libhwloc-plugins libhwloc5 libmpich12 mpich ocl-icd-libopencl1
Suggested packages:
gfortran-multilib gfortran-doc gfortran-7-multilib gfortran-7-doc libgfortran4-dbg libcoarrays-dev blcr-dkms libhwloc-contrib-plugins blcr-util mpich-doc opencl-icd
The following NEW packages will be installed:
gfortran gfortran-7 hwloc-nox libcr-dev libcr0 libgfortran-7-dev libgfortran4 libhwloc-plugins libhwloc5 libmpich-dev libmpich12 mpich ocl-icd-libopencl1
0 upgraded, 13 newly installed, 0 to remove and 538 not upgraded.
Need to get 12.9 MB of archives.
After this operation, 45.9 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

Phase 1 solution

* each command in phase 1 shaded in green color *

- command

```
ahmed95@ahmed95-VirtualBox: ~/Desktop
File Edit View Search Terminal Help
Mon 03:40
ahmed95@ahmed95:~/Desktop
drwxr-x 2 ahmed95 ahmed95 4096 Jul 20 01:37 Desktop
drwxr-x 2 ahmed95 ahmed95 4096 Jul 17 23:58 dir
drwxr-x 2 ahmed95 ahmed95 4096 Jul 17 23:58 Downloads
drwxr-x 3 ahmed95 ahmed95 4096 Jul 17 23:28 Documents
drwxr-x 3 ahmed95 ahmed95 4096 Jul 17 23:14 Downloads
drwxr-x 3 ahmed95 ahmed95 4096 Jul 17 23:14 Desktop
drwxr-x 3 ahmed95 ahmed95 4096 Jul 10 21:00 .gnupg
drwxr-x 3 ahmed95 ahmed95 4096 Jul 10 21:00 .ICEauthority
drwxr-x 5 ahmed95 ahmed95 4096 Jul 17 23:18 .mozilla
-rw-r--r-- 1 ahmed95 ahmed95 373 Jul 18 08:38 out.txt
drwxr-x 2 ahmed95 ahmed95 4096 Jul 10 21:09 Pictures
drwxr-x 2 ahmed95 ahmed95 4096 Jul 10 21:09 Public
drwxr-x 2 ahmed95 ahmed95 4096 Jul 10 21:09 Templates
drwxr-x 2 ahmed95 ahmed95 4096 Jul 10 21:09 Templates
ahmed95@ahmed95:~$ cd Desktop
ahmed95@ahmed95:~/Desktop$ cd
ahmed95@ahmed95:~$ pwd
/home/ahmed95
ahmed95@ahmed95:~$ cd Desktop
ahmed95@ahmed95:~/Desktop$
```



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```
ahmed96@ubuntu:~$ ls
Desktop Documents nano.txt Public
cpc.txt dir Downloads out.txt Templates
Desktop.dit examples.desktop Pictures Videos
ahmed96@ubuntu:~$ ls -al
total 116
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 17 22:21 .
drwxr-xr-x 18 ahmed96 ahmed96 4096 Jul 26 03:26 ..
drwxr-xr-x 3 root root 4096 Jul 16 20:55 .
-rw------- 1 ahmed96 ahmed96 3928 Jul 26 03:09 .bash_history
-rw-r--r-- 1 ahmed96 ahmed96 228 Jul 16 20:55 .bash_logout
drwxr-xr-x 1 ahmed96 ahmed96 3771 Jul 16 20:55 .bashrc
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 20:55 .config
drwxr-xr-x 18 ahmed96 ahmed96 4096 Jul 26 02:32 .config
-rw-r--r-- 1 ahmed96 ahmed96 4096 Jul 18 08:33 cpc.txt
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 26 03:37 Desktop
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 18 06:02 Desktops
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 17 23:58 dfr
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 17 23:58 Documents
drwxr-xr-x 3 ahmed96 ahmed96 4096 Jul 17 23:28 Documents
drwxr-xr-x 1 ahmed96 ahmed96 8988 Jul 16 20:55 examples.desktop
drwxr-xr-x 3 ahmed96 ahmed96 4096 Jul 16 21:08 .gnupg
-rw----- 1 ahmed96 ahmed96 1598 Jul 26 03:26 .ICEauthority
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 20:55 .local
drwxr-xr-x 3 ahmed96 ahmed96 4096 Jul 17 23:10 .mozilla
-rw-r--r-- 1 ahmed96 ahmed96 12 Jul 18 08:34 nano.txt
-rw-r--r-- 1 ahmed96 ahmed96 836 Jul 18 08:38 out.txt
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 20:55 Pictures
-rw-r--r-- 1 ahmed96 ahmed96 807 Jul 16 20:55 .profile
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 20:55 Public
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 20:55 Templates
drwxr-xr-x 2 ahmed96 ahmed96 4096 Jul 16 21:09 Videos
ahmed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:/Desktop$ cd
ahmed96@ubuntu:~$ pwd
/home/ahmed96/Desktop
ahmed96@ubuntu:~$
```

sl >> Browse the basic files inside the device

Such as: desktop document as shown in picture 1

sl -al >> This shows the hidden files as shown in the picture



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• Command

```
ahmed96@ubuntu:~/Desktop
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 18 00:02 Desktops
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 17 23:58 dlr
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 17 23:22 docs
drwxr-xr-x 3 ahmed96 ahmed96 4996 Jul 17 23:14 Downloads
-rw-r--r-- 1 ahmed96 ahmed96 8980 Jul 16 20:55 examples.desktop
drwx----- 3 ahmed96 ahmed96 4995 Jul 16 21:08 .gnupg
-rw----- 1 ahmed96 ahmed96 1598 Jul 20 03:26 .ICEauthority
drwx----- 5 ahmed96 ahmed96 4996 Jul 16 23:10 .local
drwxr--r-- 1 ahmed96 ahmed96 12 Jul 18 08:34 nano.tgt
-rw-r--r-- 1 ahmed96 ahmed96 836 Jul 18 08:38 out.txt
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 21:09 Pictures
drwxr-xr-x 1 ahmed96 ahmed96 807 Jul 16 20:55 .profile
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 22:09 Public
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 22:09 Templates
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 21:09 Videos
ahmed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:~/Desktop$ cd
ahmed96@ubuntu:~$ pwd
/homed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:~/Desktop$ mkdir ahmed
ahmed96@ubuntu:~/Desktop$
```

cd dir >> like cd desktop to go directly to be able to create, delete or make some commands on it

• Command

```
ahmed96@ubuntu:~/Desktop
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 18 00:02 Desktops
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 17 23:58 dlr
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 17 23:22 docs
drwxr-xr-x 3 ahmed96 ahmed96 4996 Jul 17 23:14 Downloads
-rw-r--r-- 1 ahmed96 ahmed96 8980 Jul 16 20:55 examples.desktop
drwx----- 3 ahmed96 ahmed96 4995 Jul 16 21:08 .gnupg
-rw----- 1 ahmed96 ahmed96 1598 Jul 20 03:26 .ICEauthority
drwx----- 5 ahmed96 ahmed96 4996 Jul 16 23:10 .local
drwxr--r-- 1 ahmed96 ahmed96 12 Jul 18 08:34 nano.tgt
-rw-r--r-- 1 ahmed96 ahmed96 836 Jul 18 08:38 out.txt
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 21:09 Pictures
drwxr-xr-x 1 ahmed96 ahmed96 807 Jul 16 20:55 .profile
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 22:09 Public
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 22:09 Templates
drwxr-xr-x 2 ahmed96 ahmed96 4996 Jul 16 21:09 Videos
ahmed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:~/Desktop$ cd
ahmed96@ubuntu:~$ pwd
/homed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:~/Desktop$ rm -rf *
ahmed96@ubuntu:~/Desktop$
```

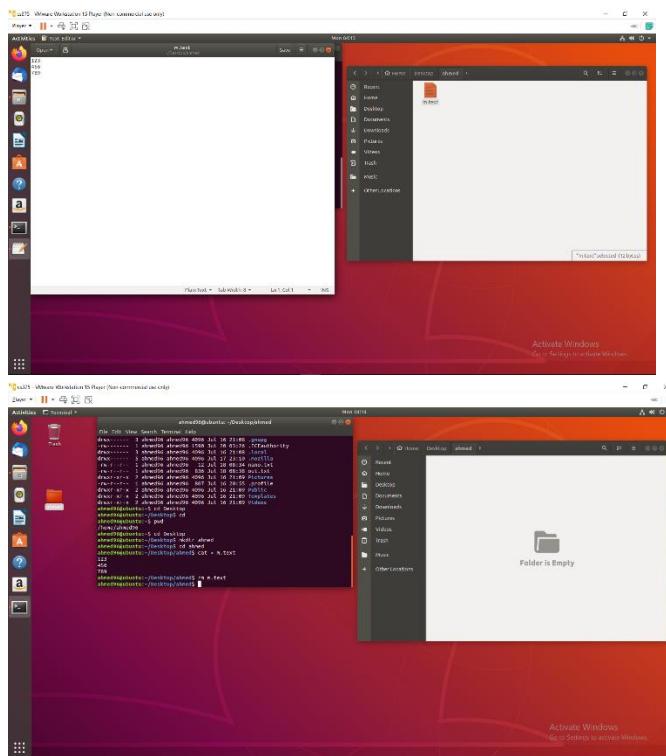


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pwd Moves to home log in

mkdir >> I created a file named ahmed on desktop

cat>: we created file.text on folder ahmed

As it is shown in the picture

rm -r to delete the .text file found within the folder ahmed

To delete a multi-file within a file and to unlink files



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• Command

A screenshot of a Linux desktop environment. On the left is a terminal window titled 'ahmed@ahmed-OptiPlex-5070: ~'. The user has run several commands to demonstrate directory creation and deletion. The commands include 'mkdir -p ahmed/nazih/qurran', 'rm -f nazih.txt', 'rm -rf ahmed/nazih', 'rmdir ahmed/nazih', and 'rm -rf ahmed/nazih/qurran'. To the right of the terminal is a file browser window titled 'Main (44124)' showing the contents of the user's home directory.

```
ahmed@ahmed-OptiPlex-5070: ~$ mkdir -p ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$ rm -f nazih.txt
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rmdir ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$ cd ..
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
rmdir: failed to remove 'ahmed': Directory not empty
rmdir: failed to remove 'ahmed/nazih': Directory not empty
rmdir: failed to remove 'ahmed/nazih/qurran': Directory not empty
rmdir: failed to remove directory 'ahmed/nazih/qurran': Directory not empty
ahmed@ahmed-OptiPlex-5070: ~$ cd ..
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rmdir ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$ cd ..
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rmdir ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$
```

A second screenshot of a Linux desktop environment, similar to the first. It shows a terminal window with the same command history as the first screenshot, demonstrating the creation and deletion of directories and files within the 'ahmed' directory.

```
ahmed@ahmed-OptiPlex-5070: ~$ mkdir -p ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$ rm -f nazih.txt
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rmdir ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$ cd ..
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
rmdir: failed to remove 'ahmed': Directory not empty
rmdir: failed to remove 'ahmed/nazih': Directory not empty
rmdir: failed to remove 'ahmed/nazih/qurran': Directory not empty
ahmed@ahmed-OptiPlex-5070: ~$ cd ..
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rmdir ahmed/nazih
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf ahmed/nazih/qurran
ahmed@ahmed-OptiPlex-5070: ~$
```

Then we created a nazih file inside the ahmed file and inside it the quraan file

mkdir -p ahmed / nazih / qurran

rm f Use to delete an existing file in the home

rm -f Use to delete the nano.txt file



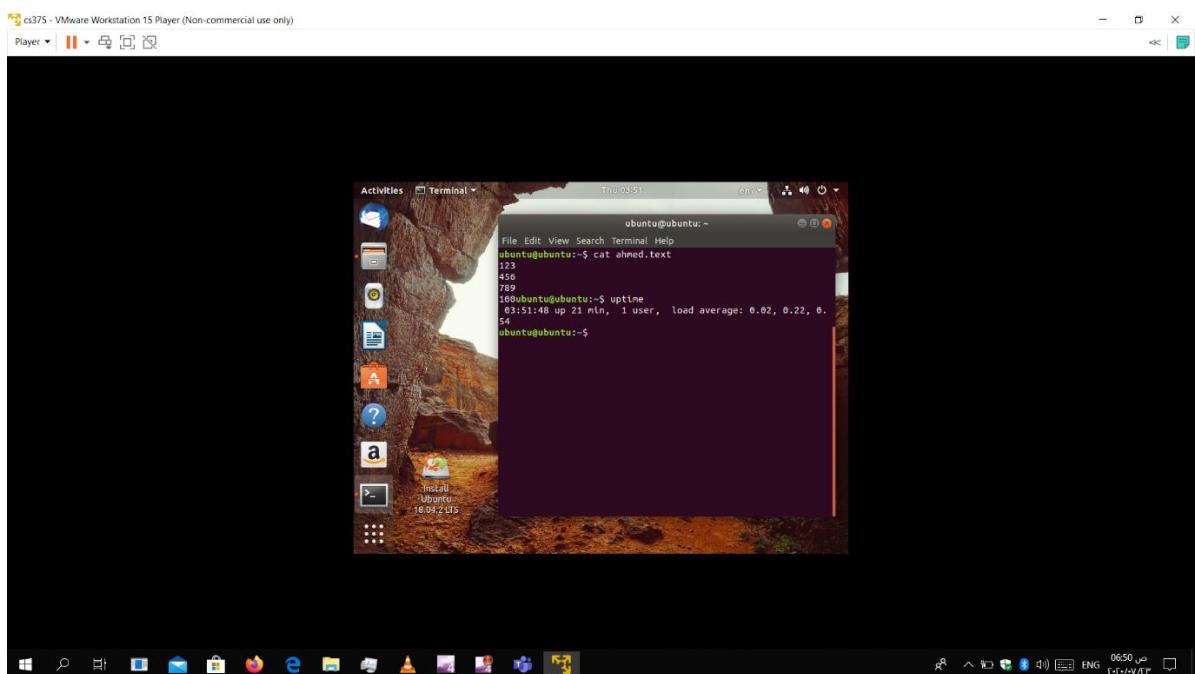
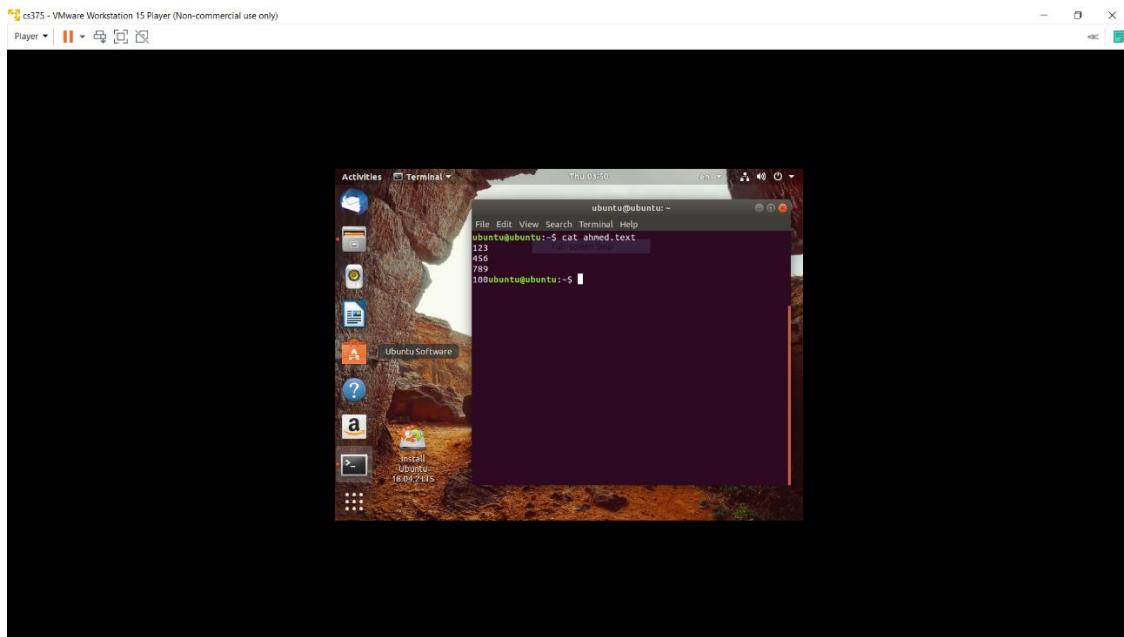
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• Command



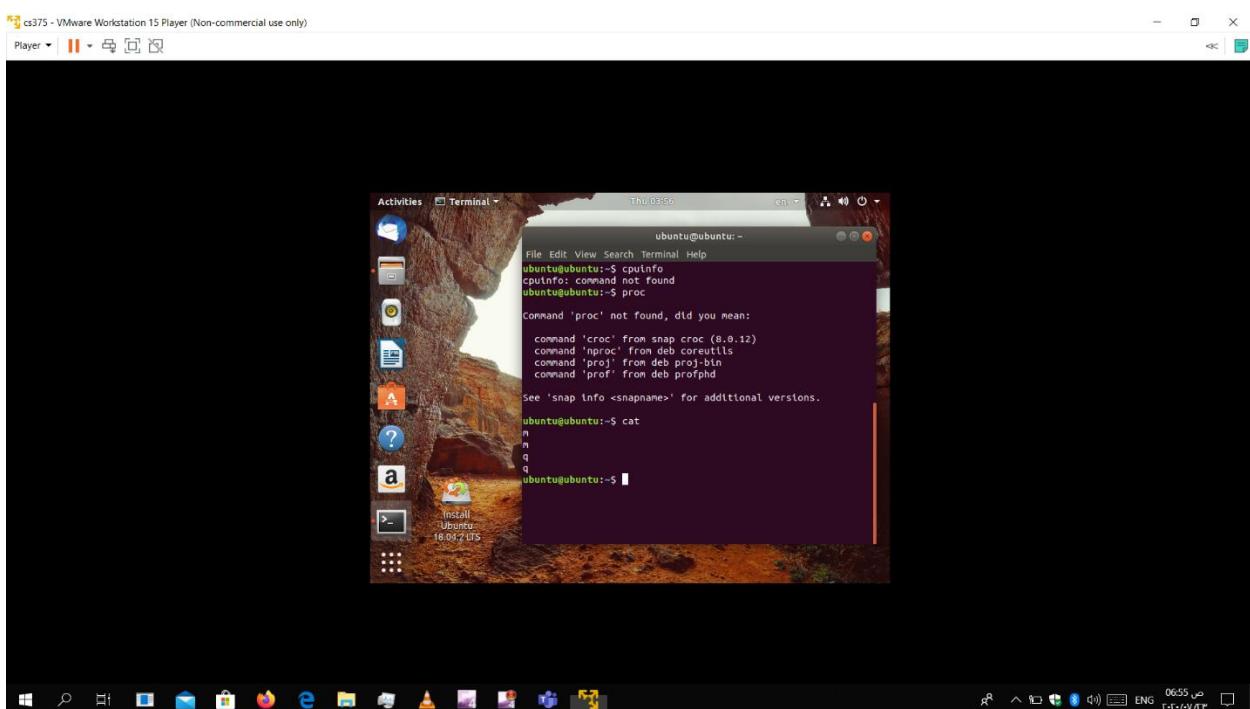
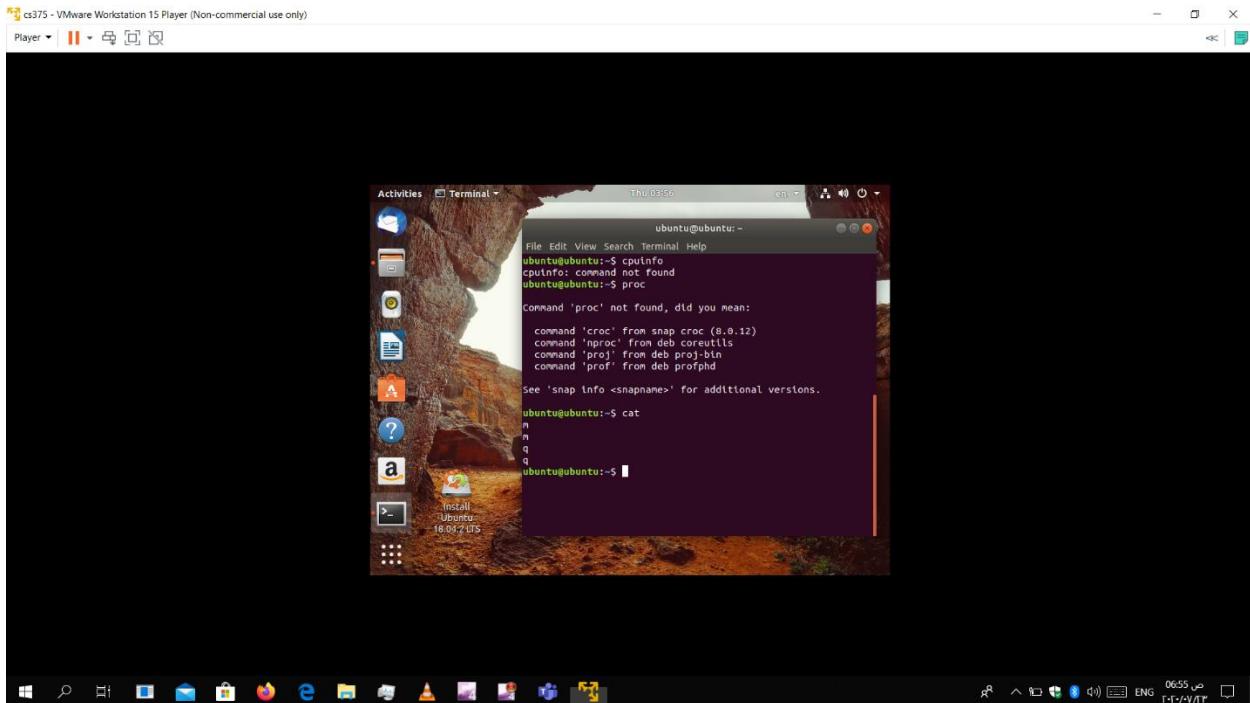


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```
File Edit View Search Terminal Help
ahmed96@ubuntu:~/Desktop$ cd Desktop
ahmed96@ubuntu:~/Desktop$ cat > sum.text
^[[F^[[B^[[6~
^[[D^[[E^[[C
^[[H^[[A^[[5~
^[[F^[[2~^[[2~
^[[F^[[B^[[E
^[[F^[[D^[[H
123
456
789
3214
ahmed96@ubuntu:~/Desktop$ chmod octal sum.text
chmod: invalid mode: 'octal'
Try 'chmod --help' for more information.
ahmed96@ubuntu:~/Desktop$ chmod octal sum.text
chmod: invalid mode: 'octal'
Try 'chmod --help' for more information.
ahmed96@ubuntu:~/Desktop$ chmod 123 sum.text
ahmed96@ubuntu:~/Desktop$
```

Cat shows file .text information

Uptime

The number of the user, the date and time the user entered

Cat / cpuinfo

Cpu information

Cat command snap info that inside file.text

As shown in the picture

Chmod octal file

The file becomes read and write

Available to everyone



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• Command

A screenshot of a Linux desktop environment (Ubuntu) running in a VMware Player window. The desktop has a red gradient background. On the left is a dock with icons for Dash, Home, Activities, and Files. A terminal window titled 'ahmed96@ubuntu: ~/Pictures/all' is open, displaying a command-line session:

```
456
789
ahmed96@ubuntu:~/Desktop/ahmed/nazih$ cd ..
ahmed96@ubuntu:~/Desktop/ahmed$ cd ..
ahmed96@ubuntu:~/Desktop$ rm -r ahmed
rm: failed to remove 'ahmed': Directory not empty
ahmed96@ubuntu:~/Desktop$ rm -r ahmed/nazih/quran
rm: removing directory, 'ahmed/nazih/quran'
rm: removing directory, 'ahmed/nazih'
rm: failed to remove 'ahmed/nazih/nazih': Directory not empty
ahmed96@ubuntu:~/Desktop$ cd ahmed/nazih
ahmed96@ubuntu:~/Desktop/ahmed/nazih$ cd ..
ahmed96@ubuntu:~/Desktop/ahmed$ cd ..
ahmed96@ubuntu:~/Desktop$ rm -r ahmed/nazih
ahmed96@ubuntu:~/Desktop$ cd ..
ahmed96@ubuntu:~/Desktop$ rm -r out.txt
ahmed96@ubuntu:~/Desktop$ nano.txt
ahmed96@ubuntu:~/Desktop$ nano.txt
ahmed96@ubuntu:~/Desktop$ mkdir all
ahmed96@ubuntu:~/Pictures$ cd all
ahmed96@ubuntu:~/Pictures$ cat > mm.text
789
456
ahmed96@ubuntu:~/Pictures/all$ 
```

To the right of the terminal is a file browser window titled 'Pictures'. It shows a folder named 'all' containing a single file named 'mm.text'. The status bar at the bottom of the desktop indicates 'Mon 04:30'.

A second screenshot of the same Linux desktop environment (Ubuntu) in VMware Player. The desktop background is red. The terminal window titled 'ahmed96@ubuntu: ~/Pictures/all' shows the same command-line session as the first screenshot. The file browser window titled 'Pictures' shows the 'all' folder with the 'mm.text' file. The status bar at the bottom of the desktop indicates 'Mon 04:30'.

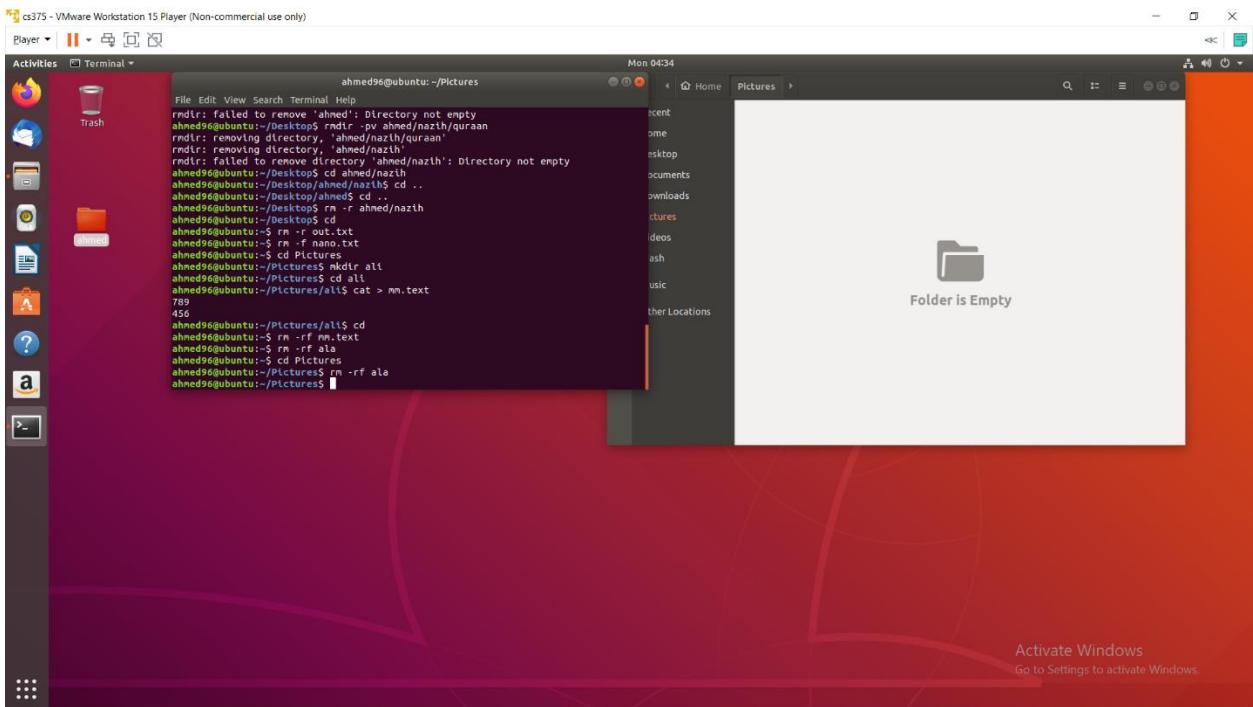


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I created folder ali on pictuers

Inside ali file I created file.txt

To use the rm -rf dir command

Which deletes folder ali and delete mm.txt together



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- **Command**

The screenshot shows a Linux desktop environment with a terminal window open in the foreground and a file manager window in the background.

Terminal Window:

```
file gollime Search terminal: help
ahmed@ahmed-OptiPlex-5070: ~
ahmed@ahmed-OptiPlex-5070: ~$ cd
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf test.txt
ahmed@ahmed-OptiPlex-5070: ~$ cd Pictures
ahmed@ahmed-OptiPlex-5070: ~/Pictures$ rm -rf a1
ahmed@ahmed-OptiPlex-5070: ~/Pictures$ cd a1
ahmed@ahmed-OptiPlex-5070: ~/Pictures/a1$ cat > m1.txt
09
45
ahmed@ahmed-OptiPlex-5070: ~/Pictures/a1$ cd
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf m1.txt
ahmed@ahmed-OptiPlex-5070: ~$ cd Pictures
ahmed@ahmed-OptiPlex-5070: ~/Pictures$ rm -rf a1
ahmed@ahmed-OptiPlex-5070: ~$ rm -rf test.txt
ahmed@ahmed-OptiPlex-5070: ~$ cat > m1.txt
call a1/text: No such file or directory
ahmed@ahmed-OptiPlex-5070: ~$ cd ~
123
456
789
ahmed@ahmed-OptiPlex-5070: ~$ cat > bb.txt
ahmed@ahmed-OptiPlex-5070: ~$
```

File Manager Window:

The file manager shows a sidebar with "Recent", "Home", "Desktop", "Documents", "Downloads", "Pictures", "Public", "Templates", "Videos", "dir", "bb", "Documents", and "Downloads". The main area displays icons for "Pictures", "Desktop", "Desktops", "dir", "bb", "bb-test", and "Rumpelstiltskin".

A screenshot of a Linux desktop environment, likely Ubuntu, featuring a dark red and black theme. On the left is a vertical dock with icons for various applications like the Dash, Home, Dash, and System Settings. The main window is a file manager showing a list of recent locations and a preview pane with several files. A terminal window titled 'Text Editor' is open at the bottom, displaying some text. The status bar at the bottom shows the date and time as 'Mon 04:42'. A watermark for 'Activate Windows' is visible in the bottom right corner.

The screenshot shows a Linux desktop environment with a terminal window and a file manager window.

Terminal Window:

```
Administrator: ~$ ls
Administrator: ~$ rm -r out.txt
Administrator: ~$ rm -f memo.txt
Administrator: ~$ rm -f all
Administrator: ~$ rm -r Pictures/cd Ali
Administrator: ~$ rm -r Pictures/cd Ali> mv .text
Administrator: ~$ cd Ali
Administrator: ~$ ls
Administrator: ~$ ll
Administrator: ~$ cat > bb.txt
Administrator: ~$ cp aa.txt bb.txt
Administrator: ~$
```

File Manager Window:

The file manager shows the following contents in the current directory:

- Desktop
- Documents
- Downloads
- Pictures

Sub-directories shown in the sidebar include:

- Desktop
- Documents
- Downloads
- Public
- Templates
- Videos

Icons for various file types are visible, such as documents, images, and folders.

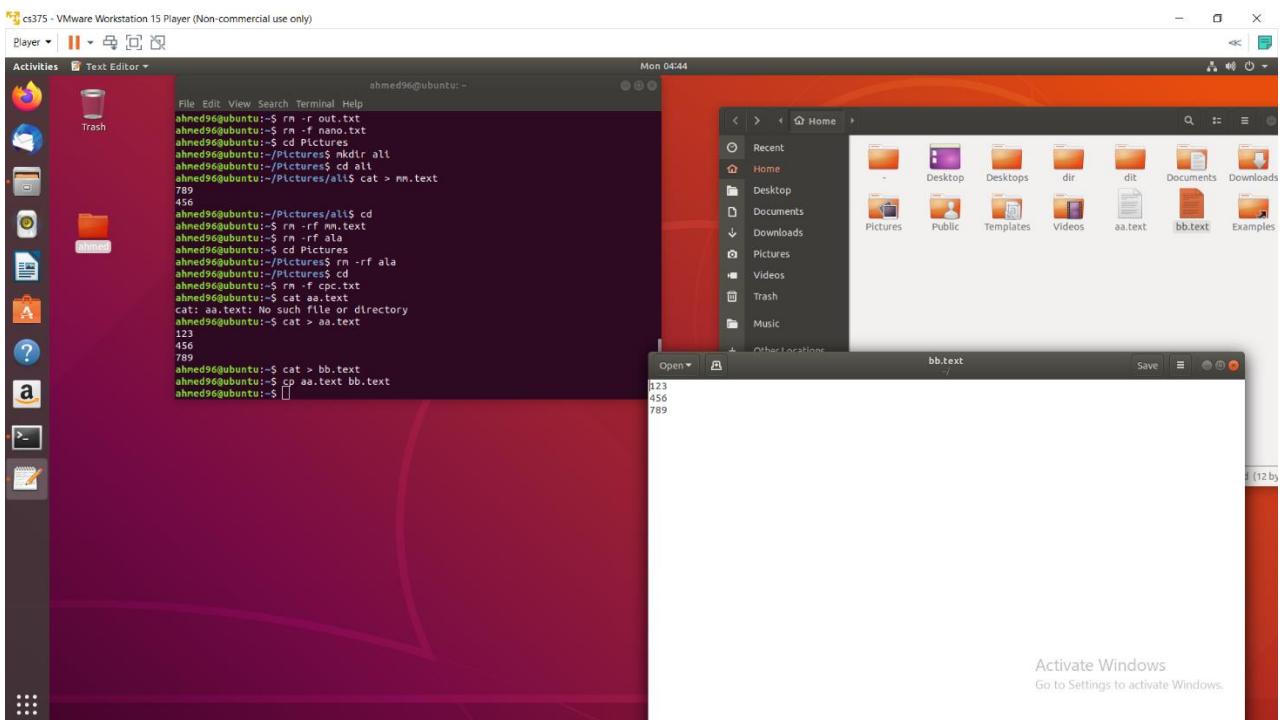


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We have created

aa.text

bb.text

And we tired them with numbers

Then we copied aa.text on bb.text

cp aa.text bb.text

As it is shown in the picture



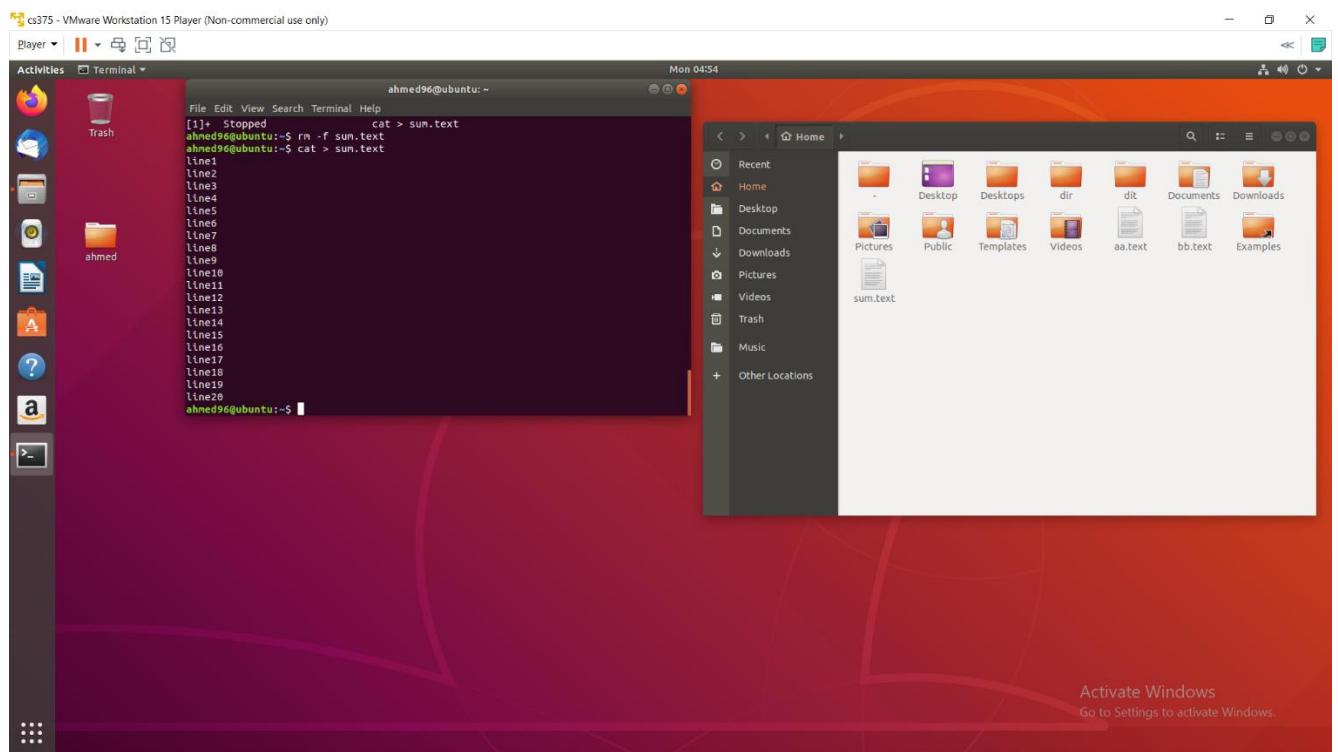
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• Command



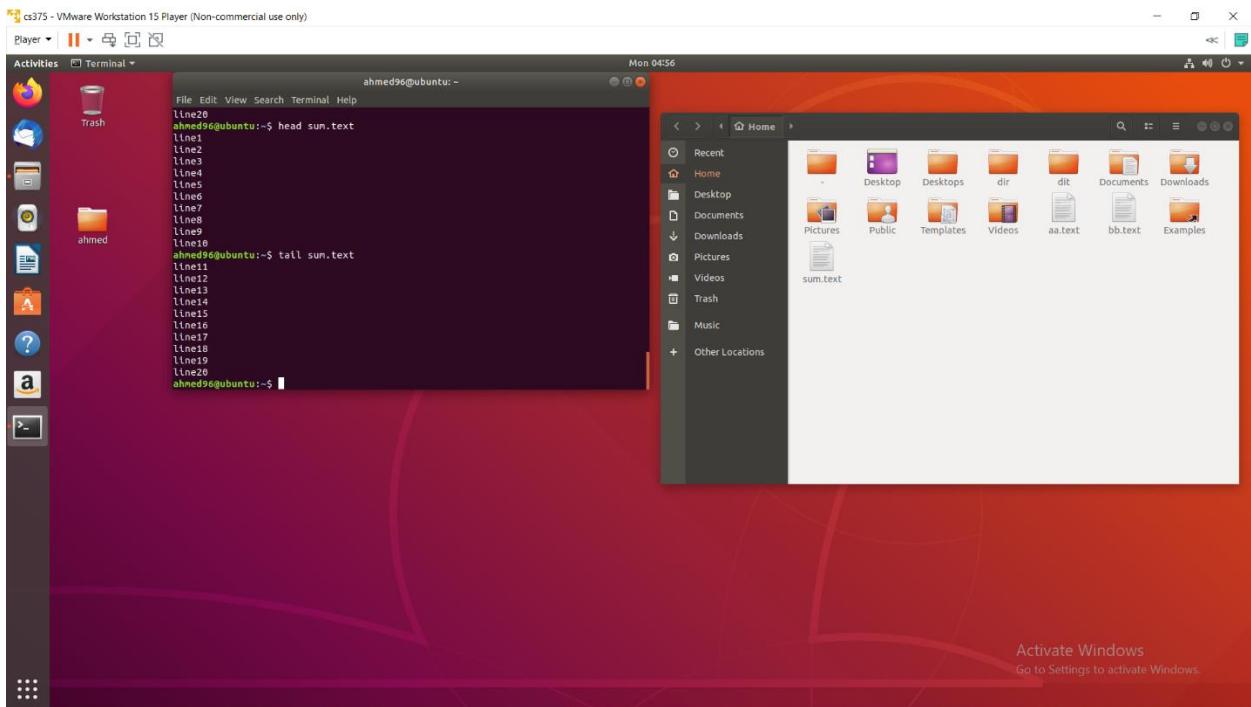


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We created a sum.text file

And enter us

20 line

head sum .text

Print or nest lines

tail sum.text

Printed the last ten lines



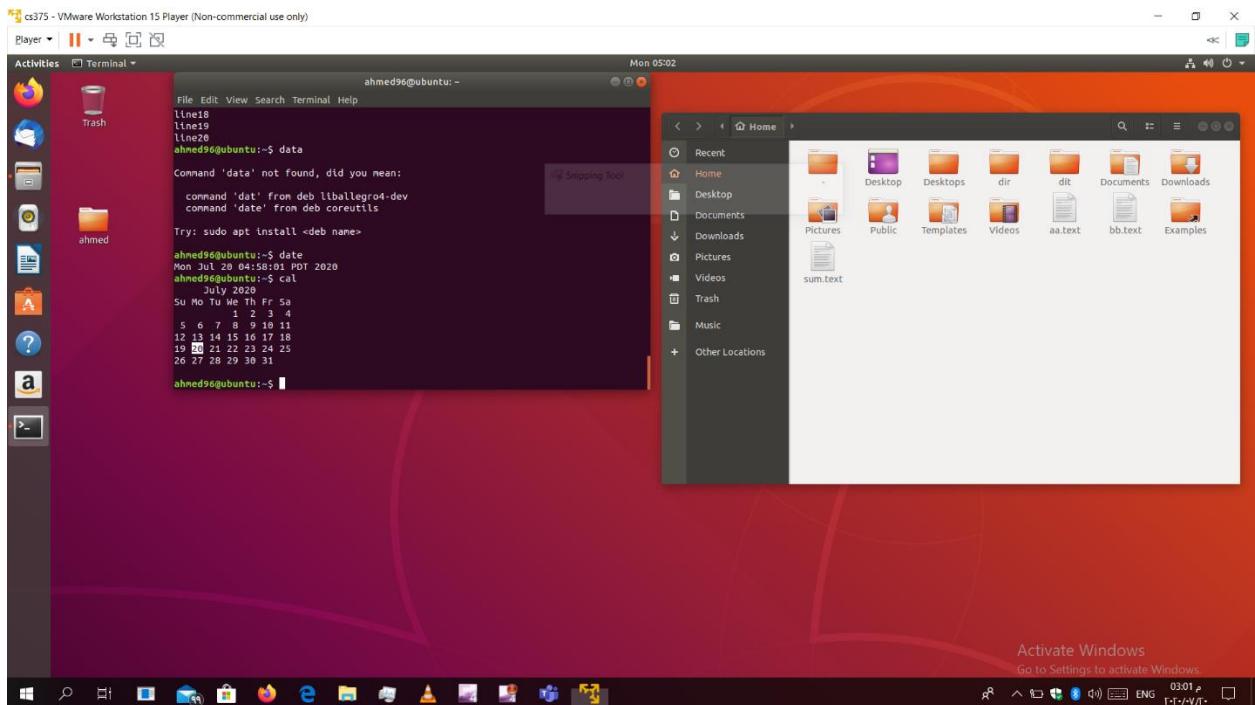
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• Command



cal && date

It is shown in the picture that it prints the date and day differently



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Assignment 1

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• Command

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ahmed96@ubuntu: ~". The window displays the man page for the "ls" command. The text in the terminal is as follows:

```
File Edit View Search Terminal Help
LS(1) User Commands LS(1)
ahmed96@ubuntu: ~
NAME
    ls - list directory contents
SYNOPSIS
    ls [OPTION]... [FILE]...
DESCRIPTION
    List information about the FILES (the current directory by default).
    Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

    Mandatory arguments to long options are mandatory for short options too.

    -a, --all
        do not ignore entries starting with .

    -A, --almost-all
        do not list implied . and ..

    --author
    Manual page ls(1) line 1 (press h for help or q to quit)
```

The terminal window has a dark background and light-colored text. The desktop environment includes a dock with icons for various applications like a browser, file manager, and system tools. A watermark for "Activate Windows" is visible in the bottom right corner of the desktop.

Use man ls

Show minimum all the command that we can use in ls

As it is shown in the picture



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• Command

```
ahmed96@ubuntu: ~
ahmed96@ubuntu: ~
ahmed96@ubuntu: ~ whoami
ahmed96
ahmed96@ubuntu: ~ whoami
ahmed96@ubuntu: ~ cat/proc/cpuinfo
bash: cat/proc/cpuinfo: No such file or directory
ahmed96@ubuntu: ~ man command
No manual page found
ahmed96@ubuntu: ~ man
What manual page do you want?
ahmed96@ubuntu: ~ man ls
ahmed96@ubuntu: ~ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev            937072      0    937072  0% /dev
tmpfs           203716   1792   199924  1% /run
/dev/sda1        20509264 6607000 12837408 34% /
tmpfs           1008568      0   1008568  0% /dev/shm
tmpfs            5120       4    5116  1% /run/lock
tmpfs           1008568      0   1008568  0% /sys/fs/cgroup
/dev/loop0        2304      0    2304  0% /snap/gnome-calculator/260
/dev/loop1        93184    93184     0 100% /snap/core/6350
/dev/loop2        56320    56320     0 100% /snap/core18/1886
/dev/loop3        35456    35456     0 100% /snap/core18/2010
```

df command

Acronym for hard disk

He reviewed the total and available fringe



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• Command

```
almed@ubuntu:~$ df
Filesystem      1K-blocks   Used   Available  Mounted on
udev            16778448    0     16778448  /dev
tmpfs           3285440     0     3285440   /run
/dev/sda1        20509248  607872  19891376  /
tmpfs           1665600     0     1665600   /run/lock
tmpfs           1665600     0     1665600   /sys/fs/cgroup
tmpfs           1665600     0     1665600   /tmp
/dev/loop0       2304       0     2304     /snap/gnome-calculator/250
/dev/loop1       9248       0     9248     /snap/gnome-calculator/260
/dev/loop2       9248       0     9248     /snap/gnome-calculator/260
/dev/loop3       9248       0     9248     /snap/gnome-calculator/260
tmpfs           1665600     0     1665600   /var/run/lock
almed@ubuntu:~$
```

```
almed@ubuntu:~$ whoami
almed@ubuntu:~$
```

command whoami username

commamnd uptime Browse for how many days you use the program with the number and number of users

average



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• Command

The screenshot shows a Linux desktop environment (Ubuntu 18.04 LTS) running in a VMware Workstation window. A terminal window is open, displaying the following command-line session:

```
ahmed96@ubuntu:~$ whoami
ahmed96
ahmed96@ubuntu:~$ uname -a
Linux ubuntu 4.18.0-15-generic #16~18.04.1-Ubuntu SMP Thu Feb 7 14:06:04 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux
ahmed96@ubuntu:~$ cat/proc/cpuinfo
bash: cat/proc/cpuinfo: No such file or directory
ahmed96@ubuntu:~$ man command
No manual entry for command
ahmed96@ubuntu:~$ man
What manual page do you want?
ahmed96@ubuntu:~$ man ls
ahmed96@ubuntu:~$ df
Filesystem      1K-blocks   Used   Available Use% Mounted on
udev             976672     0    976672  0% /dev
tmpfs            281716    179    281716  1% /run
/dev/sda1        2058564 6007000 12837468  0% /
tmpfs            1088560     0   1088560  0% /dev/shm
tmpfs             5120      4    5116  1% /run/lock
tmpfs            1088560     0   1088560  0% /sys/fs/cgroup
/dev/loop0         2304    2304     0  100% /snap/gnome-calculator/260
/dev/loop1         93184   93184     0  100% /snap/core/6358
/dev/loop2         56320   56320     0  100% /snap/gnome-calculator/260
/dev/fusectl       32465   32465     0  100% /run/ctt-connection-thomas/2019
```

The desktop background features a red and orange abstract design. A watermark for "Activate Windows" is visible in the bottom right corner.

command uname -a

It gives us basic computer information

Like core operating system

And cat proc cpuinfo show information



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Assignment 1

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• Command

A screenshot of a Linux desktop environment (Ubuntu) running in a VMware Player window. The terminal window shows the following command-line session:

```
ahmed96@ubuntu: ~
ahmed96@ubuntu: ~$ ls -l
ahmed96@ubuntu: ~$ cd Desktop
ahmed96@ubuntu: ~/Desktop$ whereis app
app:
ahmed96@ubuntu: ~/Desktop$ cd
ahmed96@ubuntu: ~$ chmod octal sum.text
chmod: invalid mode: 'octal'
Try 'chmod --help' for more information.
ahmed96@ubuntu: ~$ grep pattern sum.text
ahmed96@ubuntu: ~$ grep line18 sum.text
line18
ahmed96@ubuntu: ~$ whereis app
app:
ahmed96@ubuntu: ~$ cd Desktop
ahmed96@ubuntu: ~/Desktop$ whereis app
app:
ahmed96@ubuntu: ~/Desktop$ cd
ahmed96@ubuntu: ~$ chmod octal sum.text
chmod: invalid mode: 'octal'
Try 'chmod --help' for more information.
ahmed96@ubuntu: ~$ grep pattern sum.text
ahmed96@ubuntu: ~$ grep line18 sum.text
line18
ahmed96@ubuntu: ~$
```

The desktop interface includes a file browser showing a folder named "sum.text" and a terminal window with the same name.

A screenshot of a Linux desktop environment (Ubuntu) running in a VMware Player window. The terminal window shows the following command-line session:

```
ahmed96@ubuntu: ~
ahmed96@ubuntu: ~$ grep line18 sum.text
line18
ahmed96@ubuntu: ~$
```

commmaand grep patterm file

We searched for line18 on sum.text



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Assignment 1

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• Command

A screenshot of a Linux desktop environment, likely Ubuntu, running in a VMware Player window. The desktop has a red/orange gradient background. A terminal window titled 'ahmed96@ubuntu:' is open, displaying the output of a 'grep' command. The command is searching for the pattern 'na' in files under the directory '/home/ahmed96/Desktop'. The output shows multiple matches across several XML files, primarily from the Mozilla Firefox profile directory.

```
ahmed96@ubuntu: ~
/home/ahmed96/Desktop/.mozilla/firefox/y8aum43.default/blocklist.xml: <emItem blockID="l431" id="chl
na.escapeonefacebook.com">
/home/ahmed96/Desktop/.mozilla/firefox/y8aum43.default/blocklist.xml: <emItem blockID="l467" id="plu
gl@analytic-s.com">
/home/ahmed96/Desktop/.mozilla/firefox/y8aum43.default/blocklist.xml: <pref>browser.search.defau
ltenginem&ltenginem</pref>
```

command grep -r pattern dir

We searched for two letters (na) on folder desktop



Assignment 1

CS375 Operating System

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● Command

A screenshot of a Linux desktop environment (Ubuntu) showing a terminal window. The terminal window title is "ahmed@ahmedubutu: ~". The window displays a command-line session where the user has typed several commands, including navigating through a directory structure and listing files. The terminal has a dark background with white text. The desktop environment includes a dock with icons for various applications like a browser, file manager, and terminal.

```
ahmed@ahmedubutu: ~
ahmed@ahmedubutu: ~$ ls
Desktop Documents Downloads Pictures Public Templates Videos
ahmed@ahmedubutu: ~$ cd Desktop
ahmed@ahmedubutu: ~/Desktop$ ls
Desktop dir1 dir2
ahmed@ahmedubutu: ~/Desktop$ cp -r dir1 dir2
ahmed@ahmedubutu: ~/Desktop$ ls
dir1 dir2
ahmed@ahmedubutu: ~/Desktop$
```

A screenshot of a Linux desktop environment (Ubuntu) showing a terminal window and a file dialog. The terminal window title is "ahmed@ahmedubutu: ~". The user has run the command "cp -r dir1 dir2", which resulted in an error message: "cp: cannot access 'dir1': No such file or directory". A file dialog titled "Sharing Tool" is open, showing the contents of the "dir2" folder, which contains the "dir1" folder. The desktop environment features a red and orange gradient background with a dock at the bottom.

```
ahmed@ahmedubutu: ~
ahmed@ahmedubutu: ~$ cp -r dir1 dir2
cp: cannot access 'dir1': No such file or directory
ahmed@ahmedubutu: ~$ ls
Desktop Documents Downloads Pictures Public Templates Videos
ahmed@ahmedubutu: ~$ cd Desktop
ahmed@ahmedubutu: ~/Desktop$ ls
Desktop dir1 dir2
ahmed@ahmedubutu: ~/Desktop$ cp -r dir1 dir2
ahmed@ahmedubutu: ~/Desktop$ ls
dir1 dir2
ahmed@ahmedubutu: ~/Desktop$
```

cp -r dir1 dir2

We have copied folder dir1 on dir2



Assignment 1

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• Command

A screenshot of a Linux desktop environment (Ubuntu) running in a VMware Player window. The desktop has a red and purple gradient background. On the left is a vertical dock with icons for various applications. In the center, there's a terminal window showing a user's bash session with some configuration code. To the right of the terminal is a file manager window showing a folder structure with files like 'aa.text' and 'bb.text'. Below the file manager is a text editor window titled 'aa.text' containing the text 'aa'. At the bottom right of the desktop, there's a watermark that says 'Activate Windows Go to Settings to activate Windows.'

```
ahmed96@ubuntu:~$ Binary file .config/libreoffice/4/user/config/autotbl.fnt matches
Binary file .config/libreoffice/4/user/pack/basic/standard/Module1.pack matches
Binary file ./config/evolution/sources/system-proxy.source:Displayname[cs]=vychol nstavenv proxy
Binary file ./config/evolution/sources/system-proxy.source:Displayname[s1]=Prizvete nastavite posrednika streznika
Binary file ./config/evolution/sources/system-proxy.source:Enabled=true
.bashrc # If set, the pattern "*" used in a pathname expansion context will
.bashrc # uncomment for a colored prompt, if the terminal has the capability; turn
.ed
.bashrc. # off by default to not distract the user: the focus in a terminal window
.bashrc # enable color support of ls and also add handy aliases
.bashrc alias alerts='notify-send --urgency=low -l "$([ $? = 0 ] && echo terminal | ) echo error"' $(history|tail -n+sed -e '\''$s/[<*>]*[0-9]'\''; sed -e 's/[<*>]*/&/g')*alerts/
.bashrc # this, if it's already enabled in /etc/bash.bashrc and /etc/profile
ahmed96@ubuntu:~$ ^C
ahmed96@ubuntu:~$ cd Desktop
ahmed96@ubuntu:~/Desktop$ grep -r na
ahmed96@ubuntu:~/Desktop$ grep -r ahme
ahmed96@ubuntu:~/Desktop$ cd
ahmed96@ubuntu:~$ mv sum.text aa.text
ahmed96@ubuntu:~$ 
```

mv sum.text aa.text

We have copied and transmitted the information in sum.text on aa.text

As shown in the pictures



Assignment 1

CS375 Operating System

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Phase 2 solution

Part I – Creating Kernel Modules

- Point number 1

```
mohdtawil@ubuntu:~$ lsmod
Module           Size  Used by
vmw_vsock_vmci_transport 28672  1
vsock            36864  2 vmw_vsock_vmci_transport
crc32_pclmul    16384  0
ghash_clmulni_intel 16384  0
pcbc             16384  0
snd_ens1371     28672  4
aesni_intel     200704  0
snd_ac97_codec  131072  1 snd_ens1371
gameport         16384  1 snd_ens1371
ac97_bus         16384  1 snd_ac97_codec
aes_x86_64      20480  1 aesni_intel
snd_pcm          98304  2 snd_ac97_codec,snd_ens1371
crypto_simd     16384  1 aesni_intel
cryptd           24576  3 crypto_simd,ghash_clmulni_intel,aesni_intel
snd_seq_midi     16384  0
vmw_balloon     20480  0
glue_helper      16384  1 aesni_intel
snd_seq_midi_event 16384  1 snd_seq_midi
intel_rapl_perf  16384  0
input_leds       16384  0
snd_rawmidi      32768  2 snd_seq_midi,snd_ens1371
joydev           24576  0
snd_seq           65536  2 snd_seq_midi,snd_seq_midi_event
snd_seq_device   16384  3 snd_seq,snd_seq_midi,snd_rawmidi
serio_raw        16384  0
snd_timer        32768  2 snd_seq,snd_pcm
snd              81920  15 snd_seq,snd_seq_device,snd_timer,snd_ac97_codec,snd_pcm,snd_rawmidi,snd_
soundcore        16384  1 snd
vmw_vnci         69632  2 vmw_balloon,vmw_vsock_vmci_transport
mac_hid          16384  0
sch_fq_codel     20480  2
parport_pc       36864  0
ppdev            20480  0
lp               20480  0
parport          49152  3 parport_pc,lp,ppdev
ip_tables        28672  0
x_tables         40960  1 ip_tables
autofs4          40960  2
vmwgfx          278528  14
ttm              110592  1 vmwgfx
drm_kms_helper  172032  1 vmwgfx
```

lsmod command is used to display the status of modules in the Linux kernel. It results in a list of loaded modules.



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- Point number 2

```
mohdtawil@ubuntu:~$ gedit
```

gedit is a command to open a new file.

- Point number 3

- Create file with gedit and named thi simple.c

```
mohdtawil@ubuntu:~$ lsmod
vmwgfx      278528  14
ttm       110592  1 vmwgfx
drm_kms_helper 172032  1 vmwgfx
psmouse     151572  0
syscopyarea 16384   1 drm_kms_helper
sysfillrect 16384   1 drm_kms_helper
sysimgblt   16384   1 drm_kms_helper
ahci      40960   0
mptspi     24576   1
fb_sys_fops 16384   1 drm_kms_helper
lfbacml    32768   1 ahci
mptscslih  40960   1 mptspi
drm      458752  17 vmwgfx,drm_kms_helper,ttm
e1000     143360  0
mptbase    102400  2 mptspi,mptscslih
scsi_transport_spi 32768   1 mptspi
i2c_piix4  24576  0
pata_acpi  16384  0
floppy     77824  0
hid_generic 16384  0
usbhid     49152  0
hid      122880  2 usbhid,hid_generic

mohdtawil@ubuntu:~$ gedit
```

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
/* This function is called when the module is loaded. */
int simple_init(void)
{
    printk(KERN_INFO "Loading Module\n");
    return 0;
}
/* This function is called when the module is removed. */
void simple_exit(void)
{
    printk(KERN_INFO "Removing Module\n");
}
/* Macros for registering module entry and exit points. */
MODULE_INIT( simple_init );
MODULE_EXIT( simple_exit );
MODULE_LICENSE("GPL");
MODULE_DESCRIPTION("Simple Module");
MODULE_AUTHOR("SGG");
```



Assignment 1

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- Use make to compile this file

```
mohdtawil@ubuntu:~$ make
make -C /lib/modules/4.18.0-15-generic/build M=/home/mohdtawil modules
make[1]: Entering directory '/usr/src/linux-headers-4.18.0-15-generic'
Makefile:970: "Cannot use CONFIG_STACK_VALIDATION=y, please install libelf-dev,
libelf-devel or elfutils-libelf-devel"
  CC [M]  /home/mohdtawil/simple.o
  Building modules, stage 2.
  MODPOST 1 modules
  CC      /home/mohdtawil/simple.mod.o
  LD [M]  /home/mohdtawil/simple.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.18.0-15-generic'
mohdtawil@ubuntu:~$
```

make used to build executable programs.

- when i used make to compile the file, make some source files iam used ls command to show this files

```
mohdtawil@ubuntu:~$ ls
Desktop  examples.desktop  modules.order  Pictures  simple.ko  simple.o
Documents  ker            Module.symvers  Public    simple.mod.c  Templates
Downloads  Makefile        Music          simple.c  simple.mod.o  Videos
mohdtawil@ubuntu:~$
```

- Point number 4



Assignment 1

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```
mohdtawil@ubuntu:~$ 
mohdtawil@ubuntu:~$ 
mohdtawil@ubuntu:~$ sudo insmod simple.ko
[sudo] password for mohdtawil:
mohdtawil@ubuntu:~$ dmesg
[    0.000000] Linux version 4.18.0-15-generic (buildd@lcy01-amd64-029) (gcc version 7.3.0 (Ubuntu 7.3.0-16ubuntu3)) #16-18.04.1-Ubuntu SMP Thu Feb 7 14:06:04 UTC 2019 (Ubuntu 4.18.0-15.16-18.04.1-generic
4.18.20)
[    0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-4.18.0-15-generic root=UUID=2cde1e88-e7f6-4dfb-be0b-49dbdd197532 ro find_preset=/preseed.cfg auto noprompt priority=critical locale=en_US quiet
[    0.000000] KERNEL supported cpus:
[    0.000000]   Intel GenuineIntel
[    0.000000]   AMD AuthenticAMD
[    0.000000]   Centaur CentaurHauls
[    0.000000] Disabled fast string operations
[    0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
[    0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
[    0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'compacted' format.
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x00000000009eff] usable
[    0.000000] BIOS-e820: [mem 0x00000000009e800-0x00000000009ffff] reserved
[    0.000000] BIOS-e820: [mem 0x00000000000dc000-0x00000000000ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000100000-0x0000000007fedffff] usable
[    0.000000] BIOS-e820: [mem 0x0000000007fee0000-0x0000000007fefeff] ACPI data
[    0.000000] BIOS-e820: [mem 0x0000000007feff000-0x0000000007feffff] ACPI NVS
[    0.000000] BIOS-e820: [mem 0x0000000007ff0000-0x0000000007fffff] usable
[    0.000000] BIOS-e820: [mem 0x000000000f00000-0x000000000fffffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000fec00000-0x000000000fec0ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000fee00000-0x000000000fee0ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000ffe0000-0x000000000fffffff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000007feff000-0x0000000007feffff] ACPI protection: active
[    0.000000] SMBIOS 2.7 present.
[    0.000000] DMI: VMware, Inc. VMware Virtual Platform/440BX Desktop Reference Platform, BIOS 6.00 02/27/2020
[    0.000000] Hypervisor detected: VMware
[    0.000000] vmware: TSC freq read from hypervisor : 2984.004 MHz
[    0.000000] vmware: Host bus clock speed read from hypervisor : 66000000 Hz
[    0.000000] vmware: using sched offset of 41449848613 ns
```

sudo insmod simple.ko (Check out contents in kernel log buffer)

dmesg (dmesg command retrieve its data by reading the kernel ring buffer)

- Point number 5

```
[10712.979826] simple: loading out-of-tree module taints kernel.
[10712.985508] simple: module verification failed: signature and/or required key missing - tainting kernel
[10713.005965] Loading Module
mohdtawil@ubuntu:~$ sudo rmmod simple
mohdtawil@ubuntu:~$ dmesg
[    0.000000] Linux version 4.18.0-15-generic (buildd@lcy01-amd64-029) (gcc version 7.3.0 (Ubuntu 7.3.0-16ubuntu3))
4.18.20)
[    0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-4.18.0-15-generic root=UUID=2cde1e88-e7f6-4dfb-be0b-49dbdd197532 ro find_preset=/preseed.cfg auto noprompt priority=critical locale=en_US quiet
[    0.000000] KERNEL supported cpus:
[    0.000000]   Intel GenuineIntel
[    0.000000]   AMD AuthenticAMD
[    0.000000]   Centaur CentaurHauls
[    0.000000] Disabled fast string operations
[    0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
[    0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
[    0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'compacted' format.
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x00000000009eff] usable
[    0.000000] BIOS-e820: [mem 0x00000000009e800-0x00000000009ffff] reserved
[    0.000000] BIOS-e820: [mem 0x00000000000dc000-0x00000000000ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000100000-0x0000000007fedffff] usable
[    0.000000] BIOS-e820: [mem 0x0000000007fee0000-0x0000000007fefeff] ACPI data
[    0.000000] BIOS-e820: [mem 0x0000000007feff000-0x0000000007feffff] ACPI NVS
```

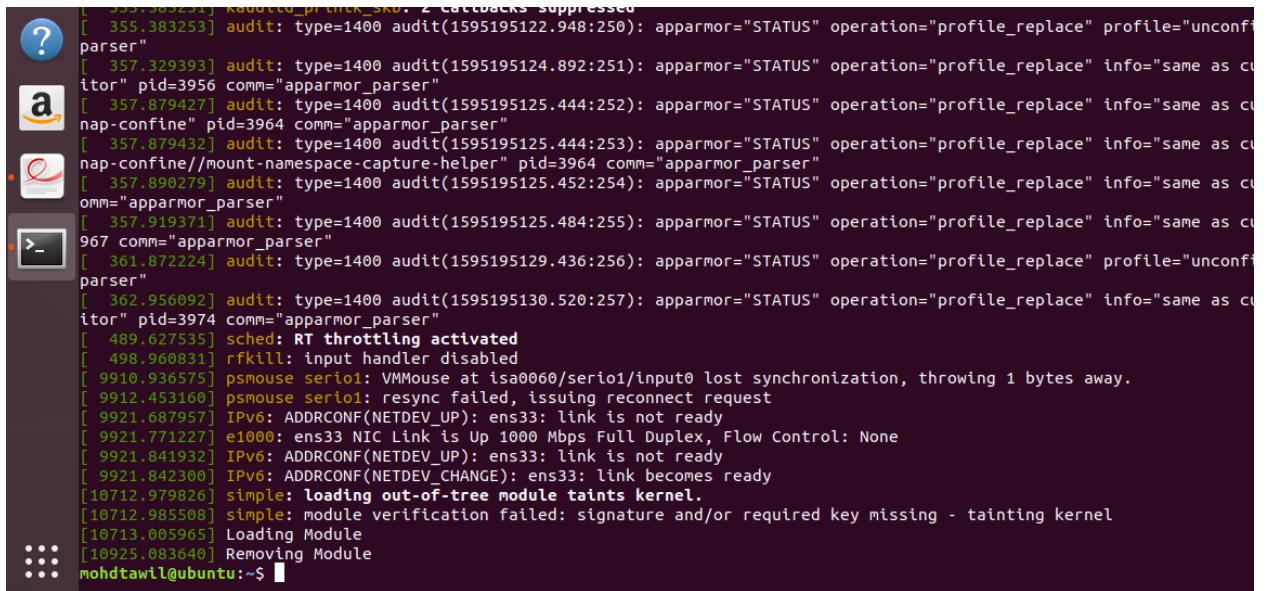
Long output this image bellow end of the output.



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```
[ 355.383251] Radvd0_prlck_sk0: 2 callbacks suppressed
[ 355.383253] audit: type=1400 audit(1595195122.948:250): apparmor="STATUS" operation="profile_replace" profile="unconfined" parser"
[ 357.329393] audit: type=1400 audit(1595195124.892:251): apparmor="STATUS" operation="profile_replace" info="same as current" pid=3956 comm="apparmor_parser"
[ 357.879427] audit: type=1400 audit(1595195125.444:252): apparmor="STATUS" operation="profile_replace" info="same as current" pid=3964 comm="apparmor_parser"
[ 357.879432] audit: type=1400 audit(1595195125.444:253): apparmor="STATUS" operation="profile_replace" info="same as current" pid=3964 comm="apparmor_parser"
[ 357.890279] audit: type=1400 audit(1595195125.452:254): apparmor="STATUS" operation="profile_replace" info="same as current" comm="apparmor_parser"
[ 357.919371] audit: type=1400 audit(1595195125.484:255): apparmor="STATUS" operation="profile_replace" info="same as current" pid=3967 comm="apparmor_parser"
[ 361.872224] audit: type=1400 audit(1595195129.436:256): apparmor="STATUS" operation="profile_replace" profile="unconfined" parser"
[ 362.956092] audit: type=1400 audit(1595195130.520:257): apparmor="STATUS" operation="profile_replace" info="same as current" pid=3974 comm="apparmor_parser"
[ 489.627535] sched: RT throttling activated
[ 498.960831] rfkill: input handler disabled
[ 9910.936575] psmouse serio1: VMMouse at isa0060/serio1/input0 lost synchronization, throwing 1 bytes away.
[ 9912.453160] psmouse serio1: resync failed, issuing reconnect request
[ 9921.687957] IPv6: ADDRCONF(NETDEV_UP): ens33: link is not ready
[ 9921.771227] e1000: ens33 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: None
[ 9921.841932] IPv6: ADDRCONF(NETDEV_UP): ens33: link is not ready
[ 9921.842300] IPv6: ADDRCONF(NETDEV_CHANGE): ens33: link becomes ready
[10712.979826] simple: loading out-of-tree module taints kernel.
[10712.985508] simple: module verification failed: signature and/or required key missing - tainting kernel
[10713.005965] Loading Module
[10925.083640] Removing Module
mohdtawil@ubuntu:~$
```

sudo rmmod simple (rmmod is a simple program which removes (unloads) a module from the Linux kernel.)

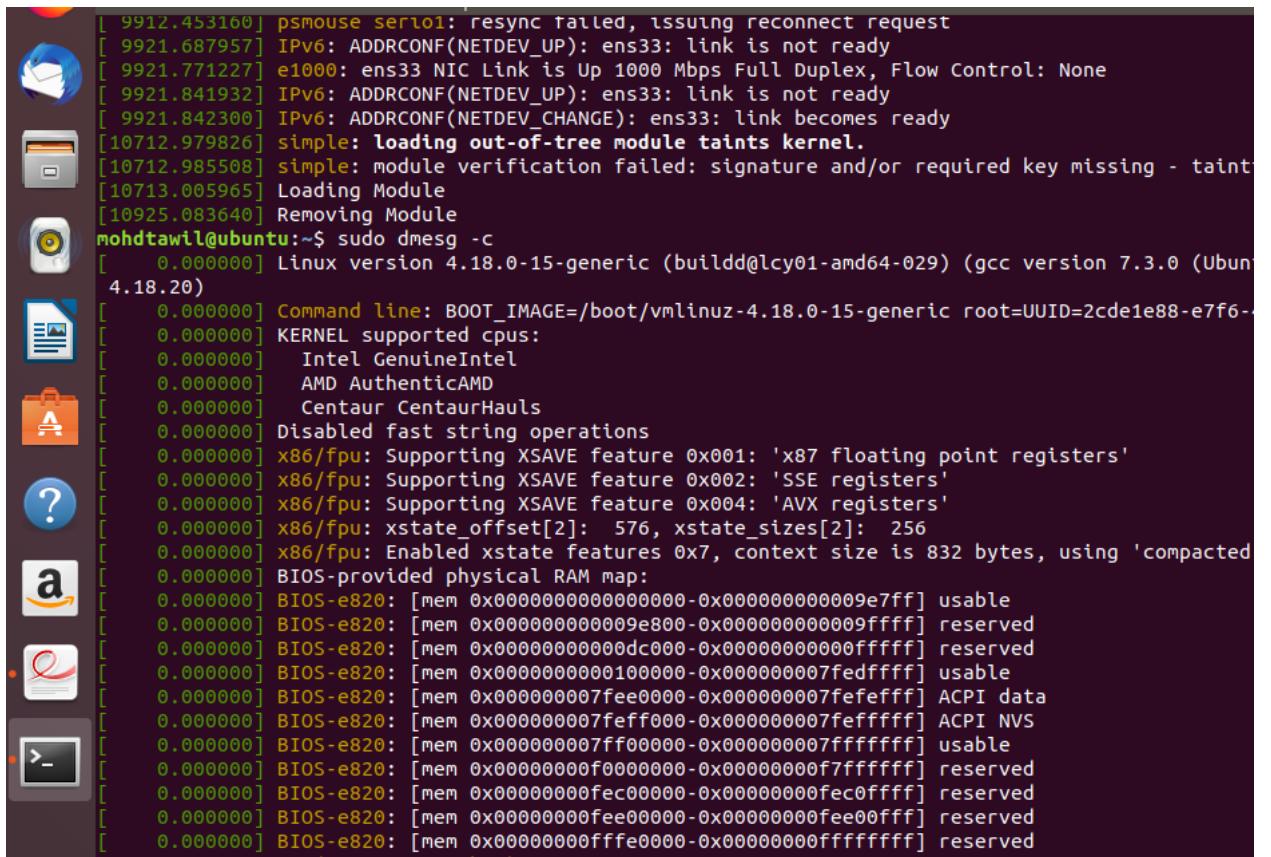
- Point number 6



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```
[ 9912.453160] psmouse serio1: resync failed, issuing reconnect request
[ 9921.687957] IPv6: ADDRCONF(NETDEV_UP): ens3: link is not ready
[ 9921.771227] e1000: ens3 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: None
[ 9921.841932] IPv6: ADDRCONF(NETDEV_UP): ens3: link is not ready
[ 9921.842300] IPv6: ADDRCONF(NETDEV_CHANGE): ens3: link becomes ready
[10712.979826] simple: loading out-of-tree module taints kernel.
[10712.985508] simple: module verification failed: signature and/or required key missing - taint=1
[10713.005965] Loading Module
[10925.083640] Removing Module
mohdtawil@ubuntu:~$ sudo dmesg -c
[ 0.000000] Linux version 4.18.0-15-generic (buildd@lcy01-amd64-029) (gcc version 7.3.0 (Ubuntu 7.3.0-16ubuntu3) )
[ 0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-4.18.0-15-generic root=UUID=2cde1e88-e7f6-418.20)
[ 0.000000] KERNEL supported cpus:
[ 0.000000]   Intel GenuineIntel
[ 0.000000]   AMD AuthenticAMD
[ 0.000000]   Centaur CentaurHauls
[ 0.000000] Disabled fast string operations
[ 0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
[ 0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
[ 0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
[ 0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
[ 0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'compacted'
[ 0.000000] BIOS-provided physical RAM map:
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x0000000000009e7ff] usable
[ 0.000000] BIOS-e820: [mem 0x000000000000e800-0x0000000000009ffff] reserved
[ 0.000000] BIOS-e820: [mem 0x00000000000dc000-0x00000000000ffff] reserved
[ 0.000000] BIOS-e820: [mem 0x0000000000100000-0x000000007fedffff] usable
[ 0.000000] BIOS-e820: [mem 0x000000007fee0000-0x000000007feffff] ACPI data
[ 0.000000] BIOS-e820: [mem 0x000000007fefff000-0x000000007feffff] ACPI NVS
[ 0.000000] BIOS-e820: [mem 0x000000007ff00000-0x000000007fffffff] usable
[ 0.000000] BIOS-e820: [mem 0x00000000f0000000-0x00000000f7fffff] reserved
[ 0.000000] BIOS-e820: [mem 0x00000000fec00000-0x00000000fec0ffff] reserved
[ 0.000000] BIOS-e820: [mem 0x00000000fec00000-0x00000000fec00fff] reserved
[ 0.000000] BIOS-e820: [mem 0x00000000fffe0000-0x00000000fffffe] reserved
```

clear the kernel log buffer.

Part II – Creating Kernel Modules

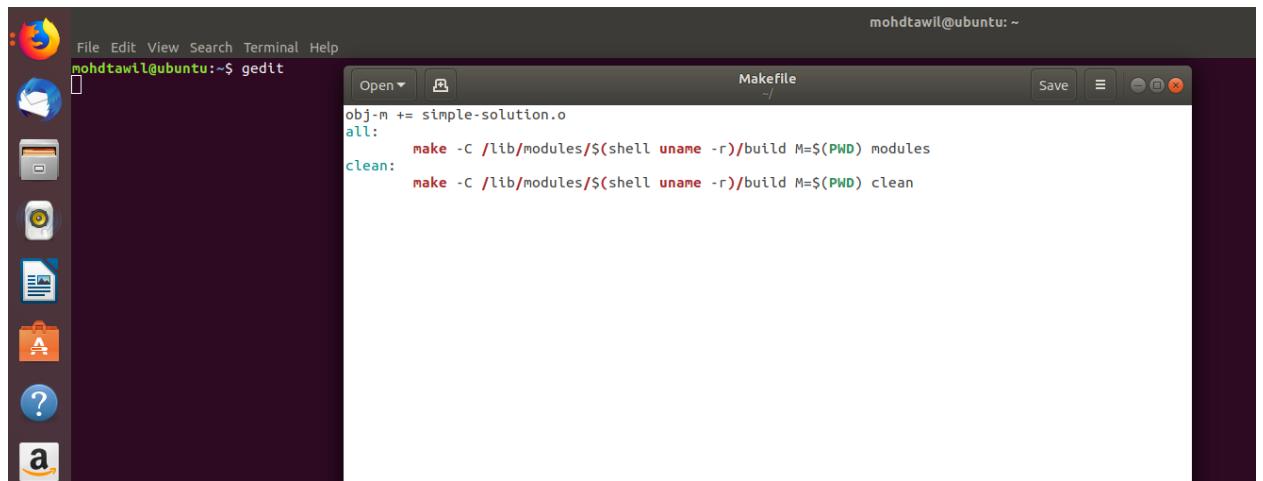
- Point number 7
 - Create file with gedit and named this Makefile



Assignment 1

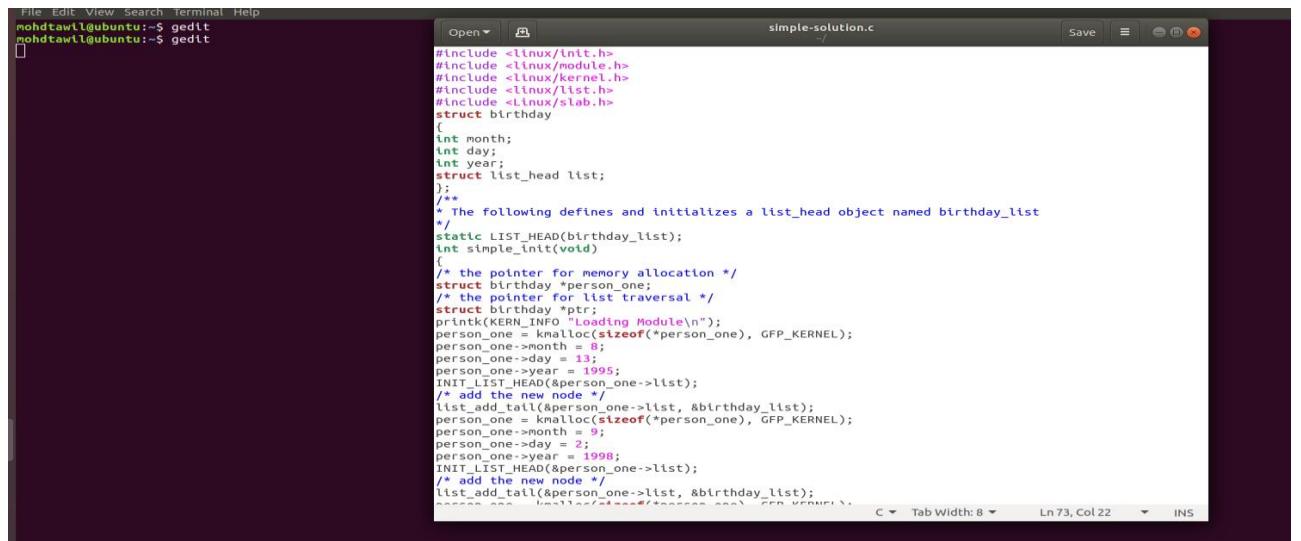
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```
mohdtawil@ubuntu:~$ gedit
mohdtawil@ubuntu:~$ gedit
obj-m += simple-solution.o
all:    make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
clean:   make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
```

- Point number 8
 - Create file with gedit and named thi simple.c



```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/list.h>
#include <linux/slab.h>
struct birthday
{
    int month;
    int day;
    int year;
    struct list_head list;
};
*/
/* The following defines and initializes a list_head object named birthday_list */
static LIST_HEAD(birthday_list);
int simple_init(void)
{
    /* the pointer for memory allocation */
    struct birthday *person_one;
    /* the pointer for list traversal */
    struct birthday *ptr;
    printk(KERN_INFO "Loading Module\n");
    person_one = kmalloc(sizeof(*person_one), GFP_KERNEL);
    person_one->month = 8;
    person_one->day = 13;
    person_one->year = 1995;
    INIT_LIST_HEAD(&person_one->list);
    /* add the new node */
    list_add_tail(&person_one->list, &birthday_list);
    person_one = kmalloc(sizeof(*person_one), GFP_KERNEL);
    person_one->month = 9;
    person_one->day = 2;
    person_one->year = 1998;
    INIT_LIST_HEAD(&person_one->list);
    /* add the new node */
    list_add_tail(&person_one->list, &birthday_list);
```

- Point number 9
 - when type **make** first time (error)



Assignment 1

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```
mohdtawil@ubuntu:~$ make
make -C /lib/modules/4.18.0-15-generic/build M=/home/mohdtawil modules
make[1]: Entering directory '/usr/src/linux-headers-4.18.0-15-generic'
Makefile:970: "Cannot use CONFIG_STACK_VALIDATION=y, please install libelf-dev, libelf-devel or elfutils-libelf-devel"
  CC [M] /home/mohdtawil/simple-solution.o
/home/mohdtawil/simple-solution.c:5:10: fatal error: Linux/slab.h: No such file or directory
#include <Linux/slab.h>
           ^
compilation terminated.
scripts/Makefile.build:332: recipe for target '/home/mohdtawil/simple-solution.o' failed
make[2]: *** [/home/mohdtawil/simple-solution.o] Error 1
Makefile:1534: recipe for target '_module_/home/mohdtawil' failed
make[1]: *** [_module_/home/mohdtawil] Error 2
make[1]: Leaving directory '/usr/src/linux-headers-4.18.0-15-generic'
Makefile:3: recipe for target 'all' failed
make: *** [all] Error 2
mohdtawil@ubuntu:~$
```

- fix that error and type of the error in the screen inside comment tag

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/list.h>
#include <Linux/slab.h> /* error capitalize linux fix that */
struct birthday
{
    int month;
    int day;
    int year;
    struct list_head list;
};
/**
 * The following defines and initializes a list_head object named birthday_list
```

- where run **make** again the error is gone.

```
mohdtawil@ubuntu:~$ make
make -C /lib/modules/4.18.0-15-generic/build M=/home/mohdtawil modules
make[1]: Entering directory '/usr/src/linux-headers-4.18.0-15-generic'
Makefile:970: "Cannot use CONFIG_STACK_VALIDATION=y, please install libelf-dev, libelf-devel or elfutils-libelf-devel"
  CC [M] /home/mohdtawil/simple-solution.o
Building modules, stage 2.
MODPOST 1 modules
CC      /home/mohdtawil/simple-solution.mod.o
LD [M]  /home/mohdtawil/simple-solution.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.18.0-15-generic'
mohdtawil@ubuntu:~$
```

- when run **sudo insmod simple-solution.ko** and **dmesg** the output just like this



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```
LD [M] /home/mohdtawil/simple-solution.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.18.0-15-generic'
mohdtawil@ubuntu:~$ sudo insmod simple-solution.ko
mohdtawil@ubuntu:~$ dmesg
[12519.484751] Loading Module
[12519.484755] Birthday: Month 10 Day 22 Year 1963
[12519.484756] Birthday: Month 8 Day 13 Year 1995
[12519.484757] Birthday: Month 9 Day 2 Year 1998
[12519.484759] Birthday: Month 8 Day 12 Year 1963
mohdtawil@ubuntu:~$
```

- Point number 10

```
mohdtawil@ubuntu:~$ sudo rmmod simple-solution
mohdtawil@ubuntu:~$ dmesg
[12519.484751] Loading Module
[12519.484755] Birthday: Month 10 Day 22 Year 1963
[12519.484756] Birthday: Month 8 Day 13 Year 1995
[12519.484757] Birthday: Month 9 Day 2 Year 1998
[12519.484759] Birthday: Month 8 Day 12 Year 1963
[12625.286868] Removing Module
[12625.286871] Removing 10 22 1963
[12625.286874] Removing 8 13 1995
[12625.286876] Removing 9 2 1998
[12625.286877] Removing 8 12 1963
mohdtawil@ubuntu:~$
```

sudo rmmod simple (rmmod is a simple program which removes (unloads) a module from the Linux kernel.)

- Point number 11

```
mohdtawil@ubuntu:~$ sudo dmesg -c
[12519.484751] Loading Module
[12519.484755] Birthday: Month 10 Day 22 Year 1963
[12519.484756] Birthday: Month 8 Day 13 Year 1995
[12519.484757] Birthday: Month 9 Day 2 Year 1998
[12519.484759] Birthday: Month 8 Day 12 Year 1963
[12625.286868] Removing Module
[12625.286871] Removing 10 22 1963
[12625.286874] Removing 8 13 1995
[12625.286876] Removing 9 2 1998
[12625.286877] Removing 8 12 1963
mohdtawil@ubuntu:~$
```

clear the kernel log buffer.



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**The code (text file & source file) for phase 2 will be
in the directory named Assignment 1 , ../ back**