LINUX COMMANDS

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CONTENTS

REDIRECTION

- Method of directing data between files or programs in useful ways

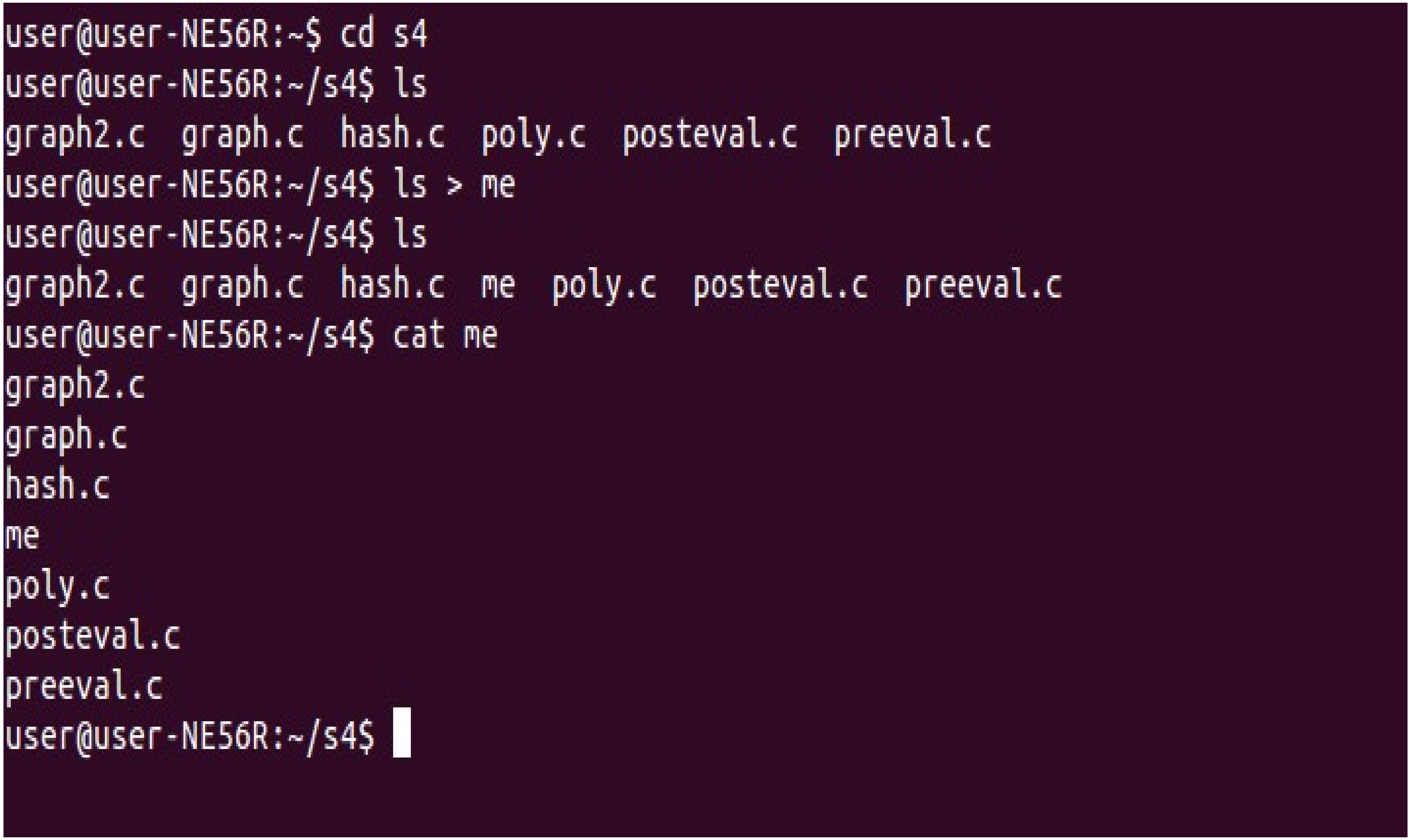
- **Output redirection**:

  The o/p of a program is saved in another file using > operator

- **Input redirection**:

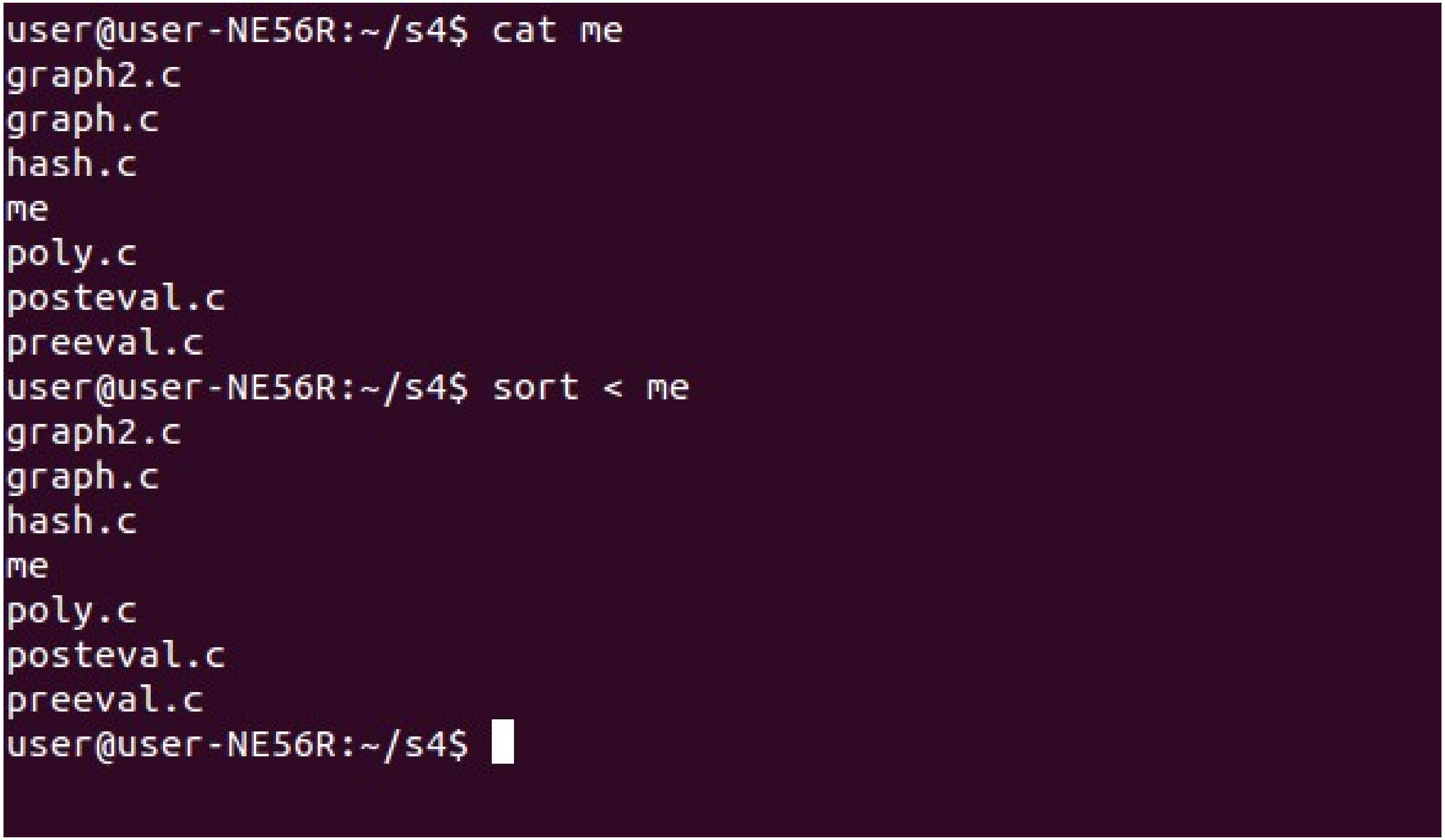
  We can read data from a file and give it to another file using < operator

O/p redirection



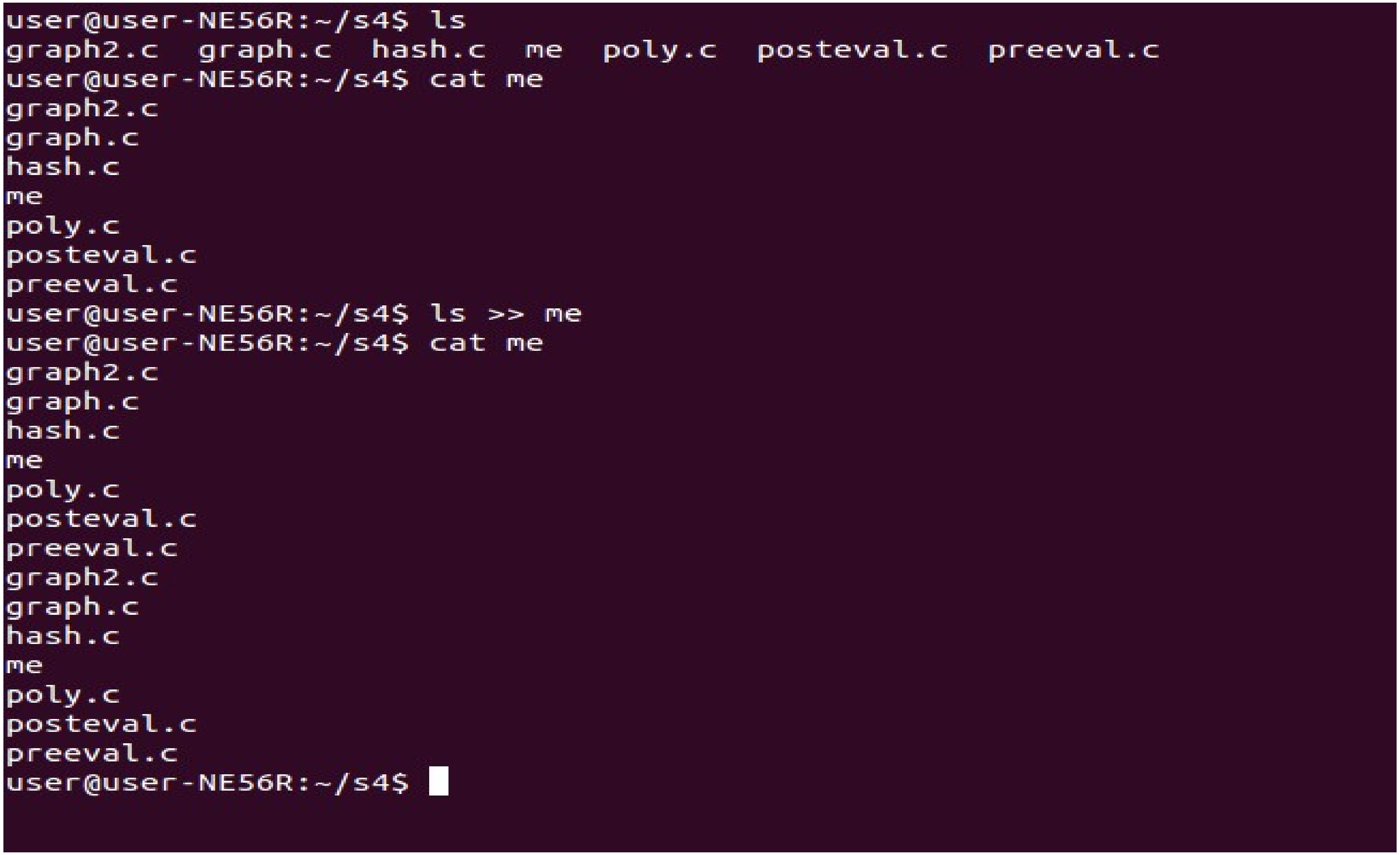
```
user@user-NE56R:~$ cd s4
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ ls > me
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ cat me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ 
```

I/p redirection



```
user@user-NE56R:~/s4$ cat me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ sort < me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ 
```

Append (use >>)



```
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ cat me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ ls >> me
user@user-NE56R:~/s4$ cat me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ 
```

PIPING

- The output from the program on the left is fed as input to the program on the right
- The operator we use is |
- Eg :

```
      $who                         #shows no of logged in users
user        :0                2017-02-15  16:45 (:0)
user        pts/0             2017-02-15  21:38 (:0)
      $who | wc -l                 #shows no of lines of output generated by who
2
```

FILTERS

A filter is a program that accepts textual data and then transforms it in a particular way. They take raw data, either produced by another program, or stored in a file, and manipulate it to be displayed in a more suitable way.

- Eg:

```
          $ ls
   barry.txt    bob   example.png   firstfile   first1
          $ ls  |  head  -3

  barry.txt
  bob
  example.png
```

Filter commands

- **head**

  view the first n lines of data.
- **tail**

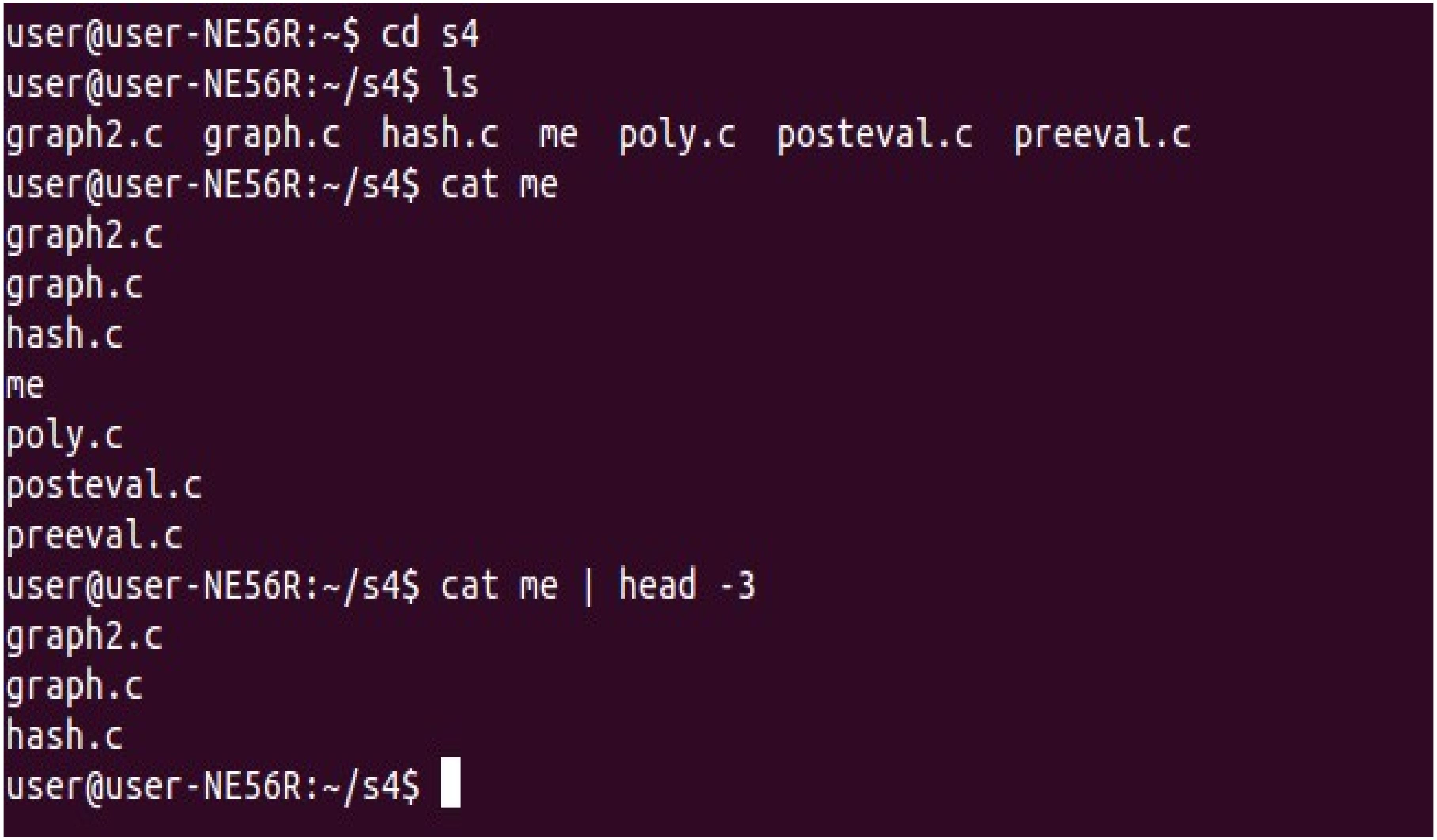
  view the last n lines of data.
- **sort**

  organise the data into order.
- **nl**

  print line numbers before data.
- **wc**

  print a count of lines, words and characters.

Filter command

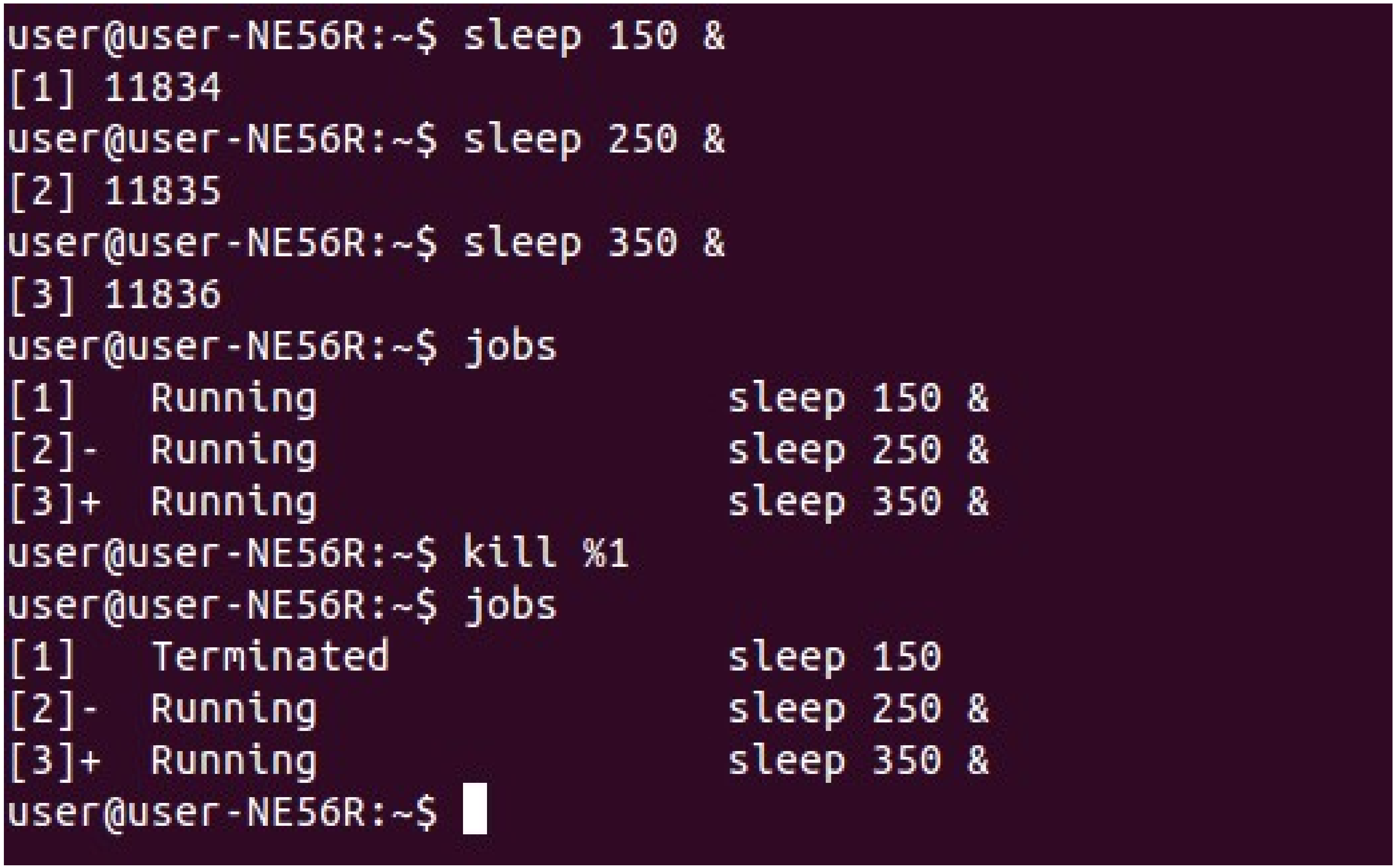


```
user@user-NE56R:~$ cd s4
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ cat me
graph2.c
graph.c
hash.c
me
poly.c
posteval.c
preeval.c
user@user-NE56R:~/s4$ cat me | head -3
graph2.c
graph.c
hash.c
user@user-NE56R:~/s4$ 
```

JOB CONTROL

A job is defined as a task or command that has started running but not yet finished what it is doing.

- jobs - List all the jobs that are running or suspended.
- fg - Bring the job to the foreground.
- bg - Send the job to the background.
- stop or Ctrl + z - Suspend the job.
- kill or Ctrl + c - Terminate the job.



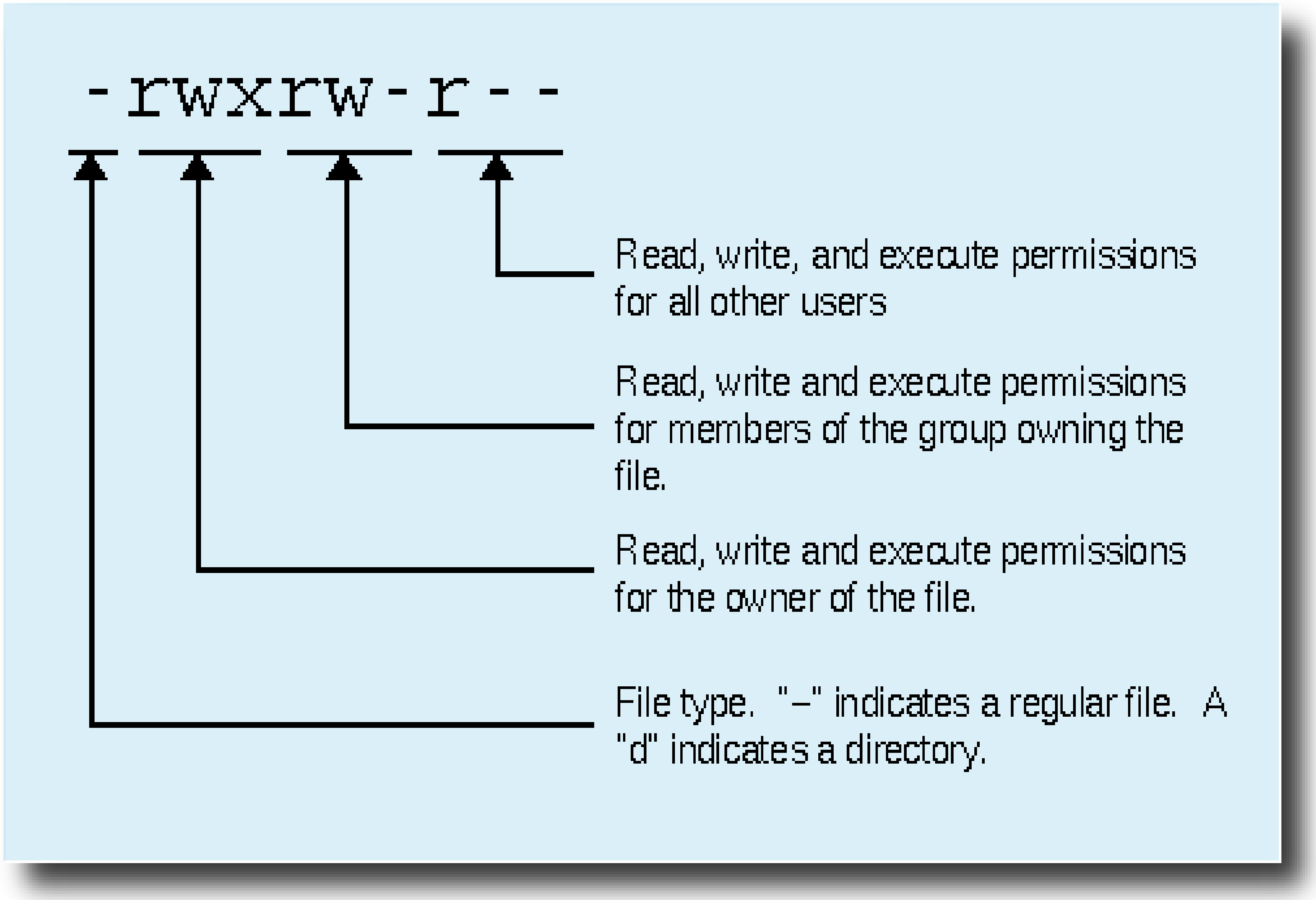
```
user@user-NE56R:~$ sleep 150 &
[1] 11834
user@user-NE56R:~$ sleep 250 &
[2] 11835
user@user-NE56R:~$ sleep 350 &
[3] 11836
user@user-NE56R:~$ jobs
[1]   Running                 sleep 150 &
[2]-  Running                 sleep 250 &
[3]+  Running                 sleep 350 &
user@user-NE56R:~$ kill %1
user@user-NE56R:~$ jobs
[1]   Terminated              sleep 150
[2]-  Running                 sleep 250 &
[3]+  Running                 sleep 350 &
user@user-NE56R:~$
```

FILE PERMISSION

- Linux is a multiuser OS
- For example, if your computer is attached to a network, or the Internet, remote users can log in via telnet or ssh (secure shell) and operate the computer

Chmod

The chmod command is used to change the permissions of a file or directory


-rwxrw-r--
Read, write, and execute permissions for all other users
Read, write and execute permissions for members of the group owning the file.
Read, write and execute permissions for the owner of the file.
File type. "–" indicates a regular file. A "d" indicates a directory.

It is easy to think of the permission settings as a series of bits (which is how the computer thinks about them). Here's how it works:

rwx rwx rwx = 111 111 111

rw- rw- rw- = 110 110 110

rwx --- --- = 111 000 000

and so on...

rwx = 111 in binary = 7

rw- = 110 in binary = 6

r-x = 101 in binary = 5

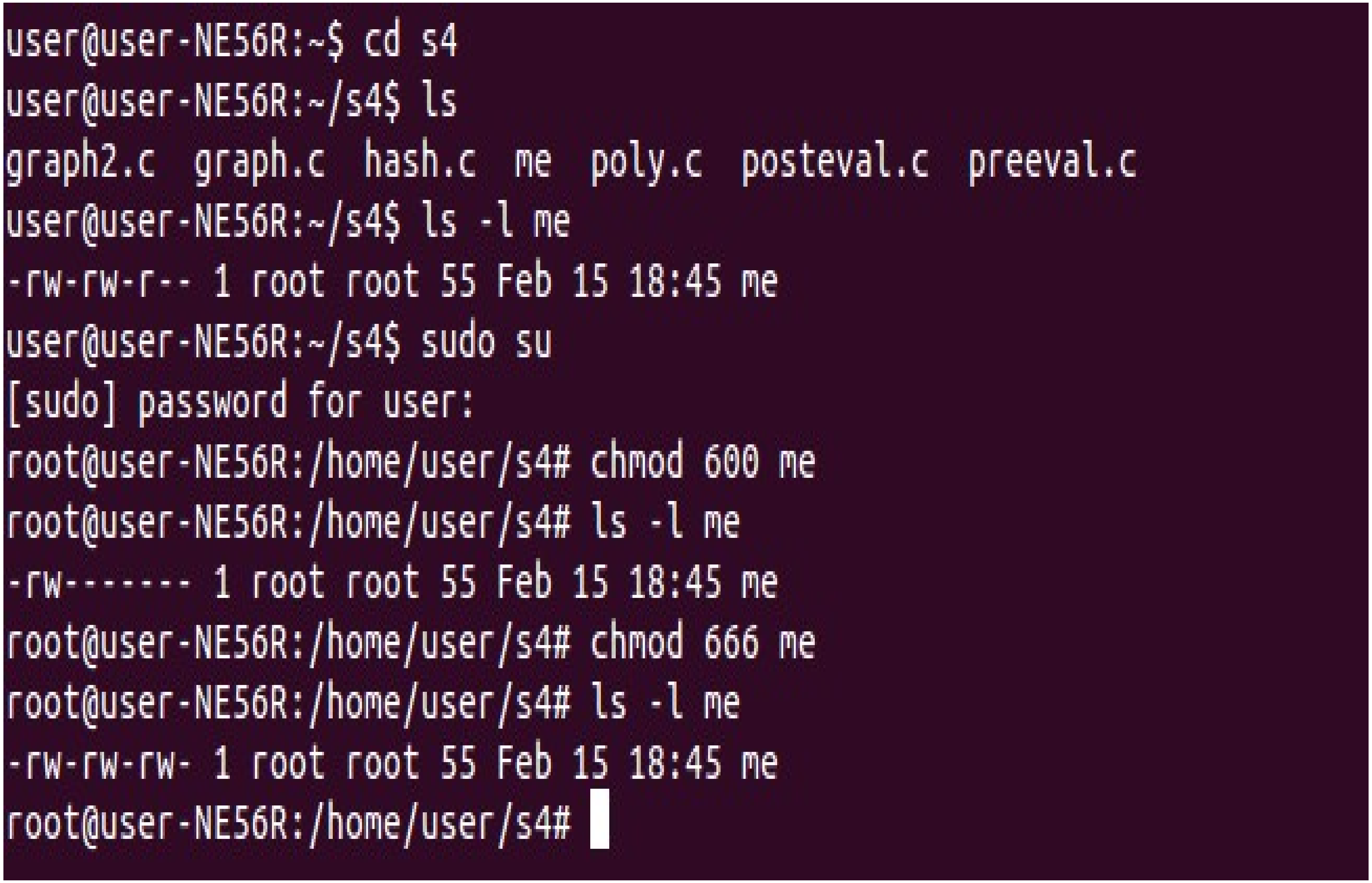
r-- = 100 in binary = 4

777 (rwxrwxrwx) : No restrictions on permissions.

755 (rwxr-xr-x)   :The directory owner has full access. All others may list the directory, but cannot create files nor delete them.

eg: $ chmod 600 some_file

(600 stands for rw-------)



```
user@user-NE56R:~$ cd s4
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ ls -l me
-rw-rw-r-- 1 root root 55 Feb 15 18:45 me
user@user-NE56R:~/s4$ sudo su
[sudo] password for user:
root@user-NE56R:/home/user/s4# chmod 600 me
root@user-NE56R:/home/user/s4# ls -l me
-rw------- 1 root root 55 Feb 15 18:45 me
root@user-NE56R:/home/user/s4# chmod 666 me
root@user-NE56R:/home/user/s4# ls -l me
-rw-rw-rw- 1 root root 55 Feb 15 18:45 me
root@user-NE56R:/home/user/s4#
```

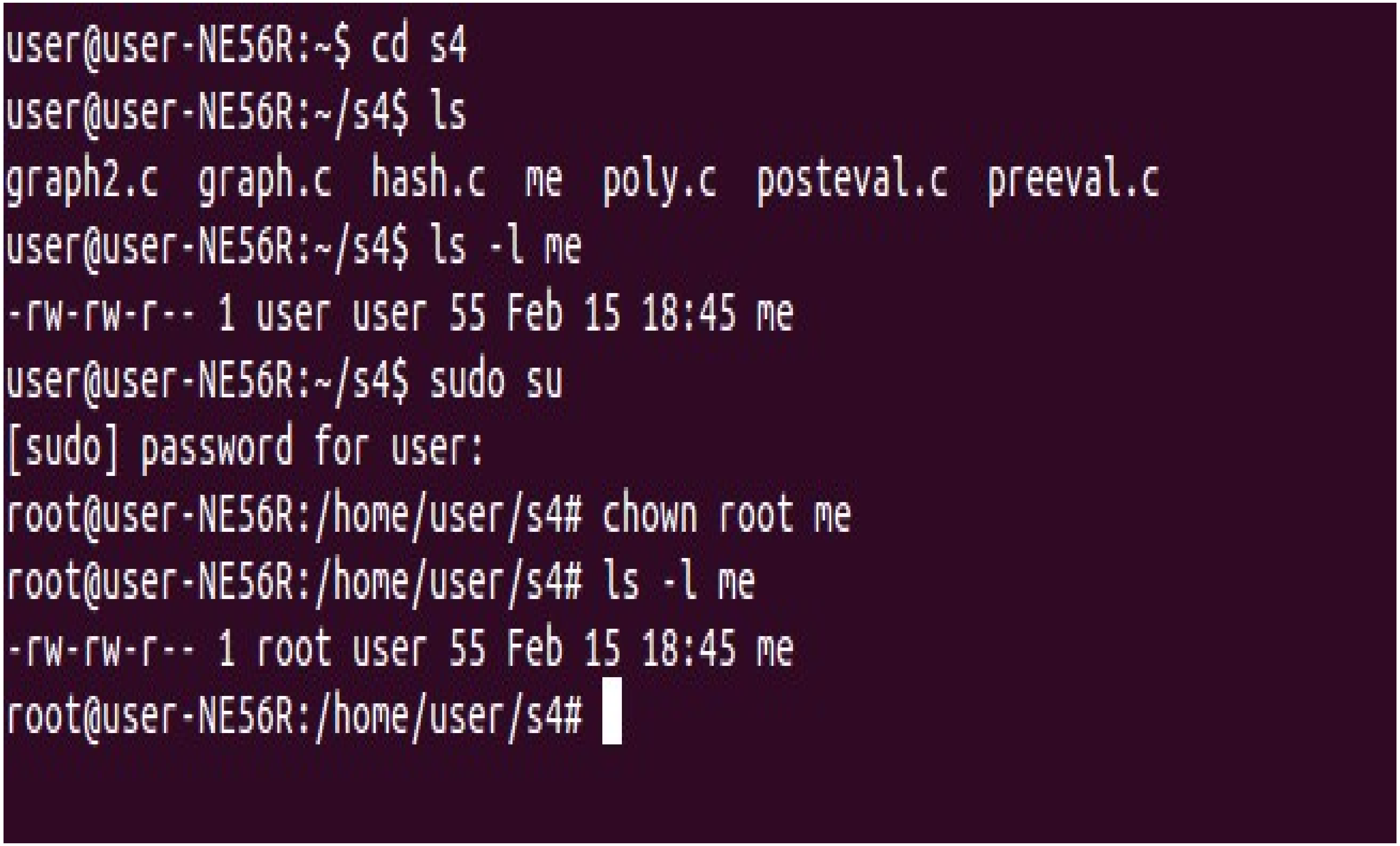
FILE OWNERSHIP

You can change the owner of a file by using the chown command

eg:
```
$ su
      Password:
      $ chown new some_file
```

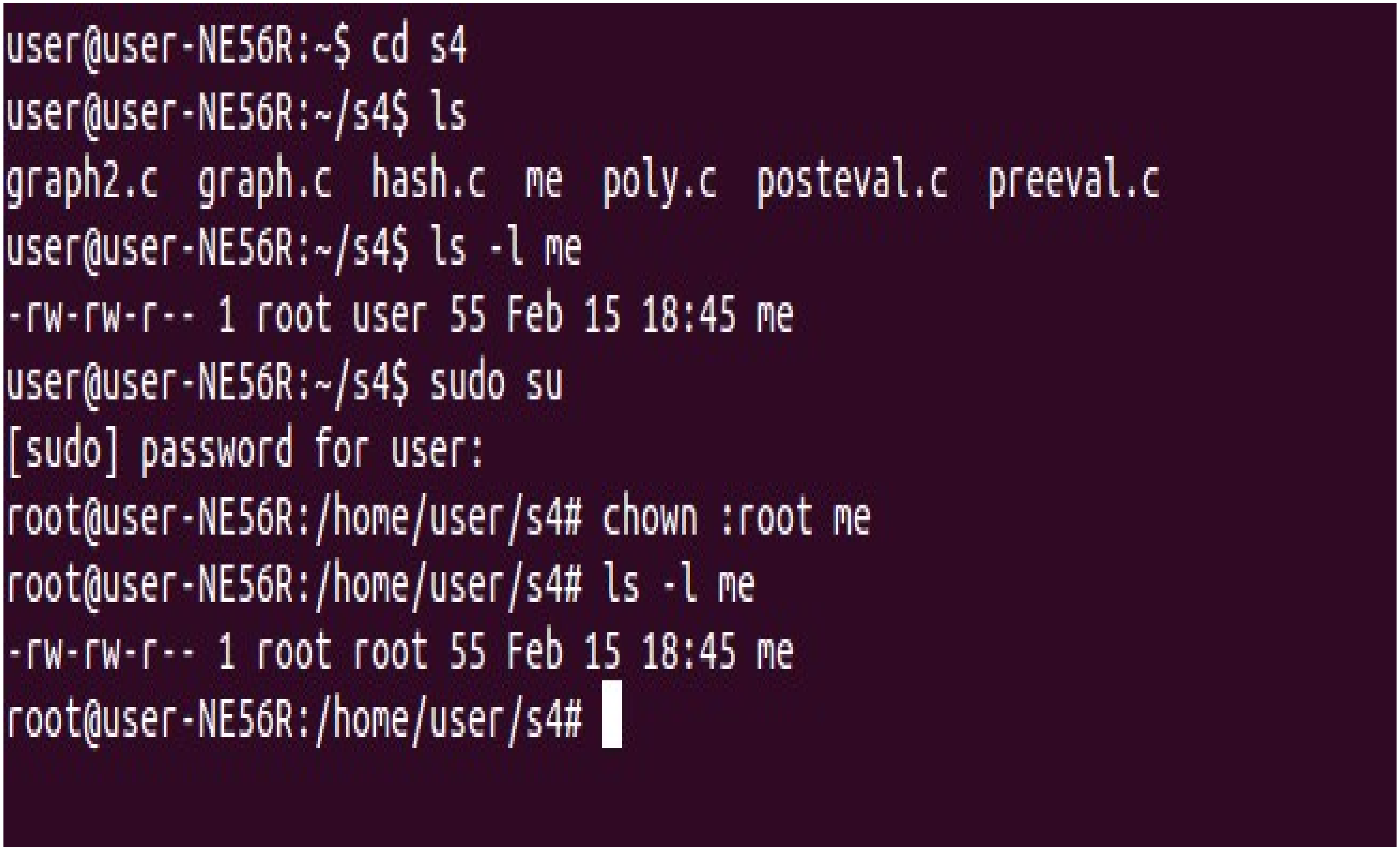
(suppose new stands for the new owner)

(changing owner)



```
user@user-NE56R:~$ cd s4
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ ls -l me
-rw-rw-r-- 1 user user 55 Feb 15 18:45 me
user@user-NE56R:~/s4$ sudo su
[sudo] password for user:
root@user-NE56R:/home/user/s4# chown root me
root@user-NE56R:/home/user/s4# ls -l me
-rw-rw-r-- 1 root user 55 Feb 15 18:45 me
root@user-NE56R:/home/user/s4#
```

(changing group)



```
user@user-NE56R:~$ cd s4
user@user-NE56R:~/s4$ ls
graph2.c  graph.c  hash.c  me  poly.c  posteval.c  preeval.c
user@user-NE56R:~/s4$ ls -l me
-rw-rw-r-- 1 root user 55 Feb 15 18:45 me
user@user-NE56R:~/s4$ sudo su
[sudo] password for user:
root@user-NE56R:/home/user/s4# chown :root me
root@user-NE56R:/home/user/s4# ls -l me
-rw-rw-r-- 1 root root 55 Feb 15 18:45 me
root@user-NE56R:/home/user/s4# 
```

FILE LINKS

- A link is a connection between a file name and the actual data on the disk,ie we can have access to file using multiple names by creating a link.
- Two types of links

  symbolic links: Refer to a symbolic path indicating the abstract location of another file

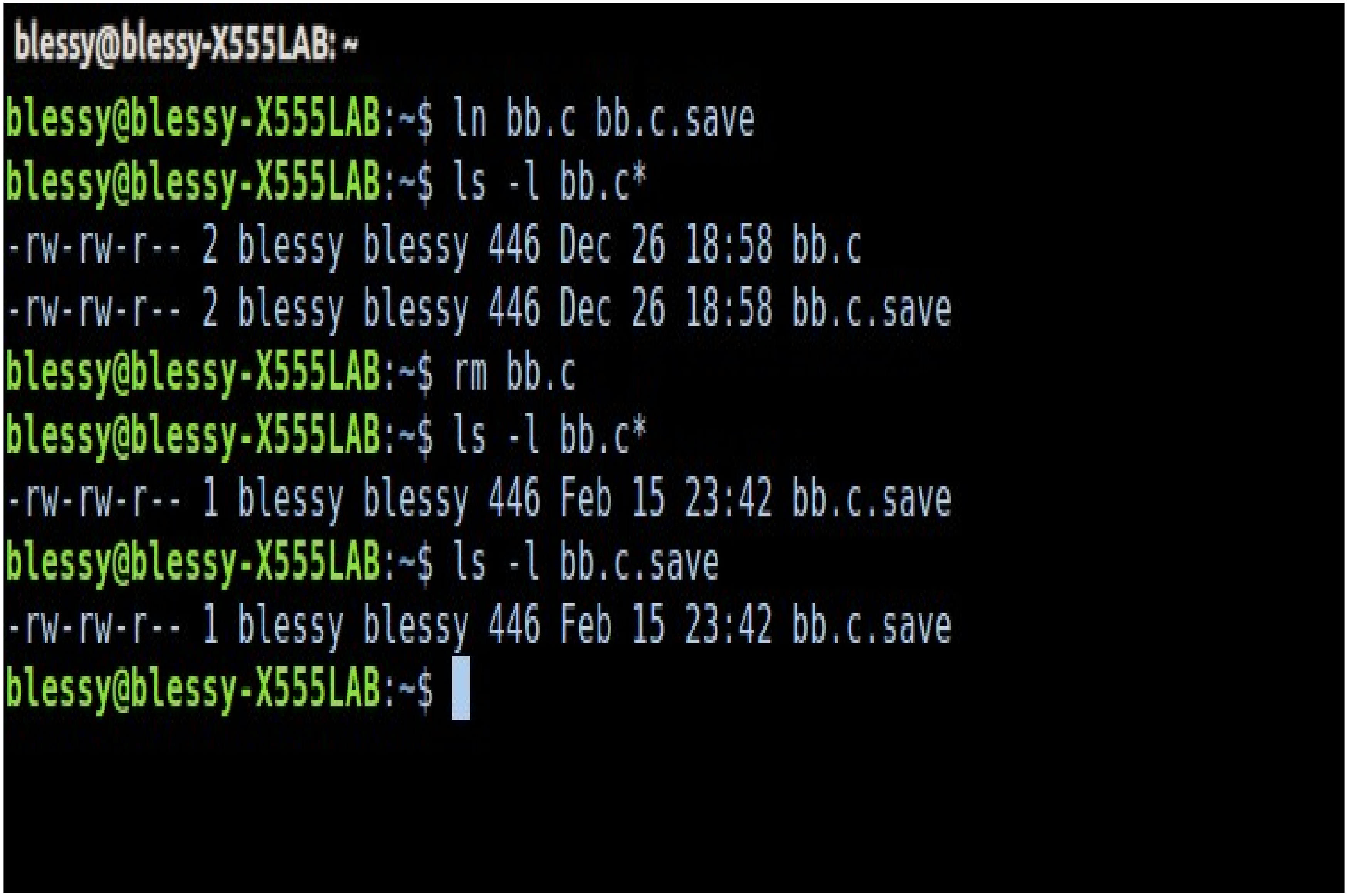
  hard links : Refer to the specific location of physical data

Hard links

- Hard link to a file named test.sh is given by command

```
$ln test.sh  test.sh.save
```

- The file test.sh.save is the hard link to the file test.sh. This means if we change the content of anyone of the file then the other one will also change.
- If we accidently delete test.sh file then other file test.sh.save still exists , ie only one of the links is cut off. The data on the disk is removed only if no links remain to that file.
- Hard links cannot be made to directories.
- Even if original file is moved or deleted, the link exists.



```
blessy@blessy-X555LAB: ~
blessy@blessy-X555LAB:~$ ln bb.c bb.c.save
blessy@blessy-X555LAB:~$ ls -l bb.c*
-rw-rw-r-- 2 blessy blessy 446 Dec 26 18:58 bb.c
-rw-rw-r-- 2 blessy blessy 446 Dec 26 18:58 bb.c.save
blessy@blessy-X555LAB:~$ rm bb.c
blessy@blessy-X555LAB:~$ ls -l bb.c*
-rw-rw-r-- 1 blessy blessy 446 Feb 15 23:42 bb.c.save
blessy@blessy-X555LAB:~$ ls -l bb.c.save
-rw-rw-r-- 1 blessy blessy 446 Feb 15 23:42 bb.c.save
blessy@blessy-X555LAB:~$
```

Symbolic links

- Hard links cannot be used for directories. So we use symbolic links. It can be used for files as well.
- Here if you delete or move the original file, the link will break.
- It acts as a shortcut or pointer to original file.
- Symbolic link to a file named test.sh is given by

  $ **ln -s test.sh direc** , where direc is a directory to which the link is made.

File System Hierarchy

- The linux file system is structured as a tree. The leaf of the tree are ordinary files. The internal nodes of the tree are directories. A subdirectory is the child of another directory.
- File system break files down into two logical categories.

    shareable vs unshareable files

    - Shareable files are those that can be accessed locally and by remoter hosts, while unsharable files are only available locally.

    variable vs static files

    - Variable files like documents can be changed at any time; while static files like binaries do not change without an action from the system administrator.

File System Hierarchy Standard Organisation

- The /boot/ directory
  - Contains static files required to boot the system.
- The /dev/ directory
  - Contains file system entries which represent devices that are attached to the system. These files are essential for the system to function properly.
- The /etc/ directory
  - Reserved for configuration files that are local to the machine.
  - The X11/ and skel/ are subdirectories of this directory.
- The /lib/ directory
  - Contain only those libraries needed to execute the binaries in /bin/ and /sbin/.
  - These shared library images are important for booting the system and executing the commands within the root file system.

- The /mnt/ directory
  - This directory is for temporarily mounted file systems, such as CD-ROMs
- The /opt/ directory
  - Provides storage for large, static application software packages.
- The /proc/ directory
  - Contains special files that either extract information from or send information to the kernel
  - This directory can be used to communicate with the kernel
- The /sbin/ directory
  - Stores executables used by the root user, which are only used at boot time and perform system recovery operations.
- The /usr/ directory
  - This directory is for files that can be shared across mulltiple machines.It is read only.Often on its own parititition.
  - There are many subdirectories like |- bin/ ,|-doc/ ,|-tmp →/var/tmp

- The /usr/local directory
  - It is for use by the system administrator when installing software locally.
  - It have many subdirectories like |-bin/ ,|-doc/ ,|-games/ etc similar to /usr/ directory.
- The /var/ directory
  - Any program that write log files or need spool/ or /lock should write them to /var/ directory.
  - /var/ is for variable data files.
  - The are many subdirectories found within this directory

```
/var
     |- accout/
     |- arpwatch/
     +- spool/
                    |- at/
                    |- news/
     |- tmp/
```

- The /usr/local directory
  - It is for use by the system administrator when installing software locally.
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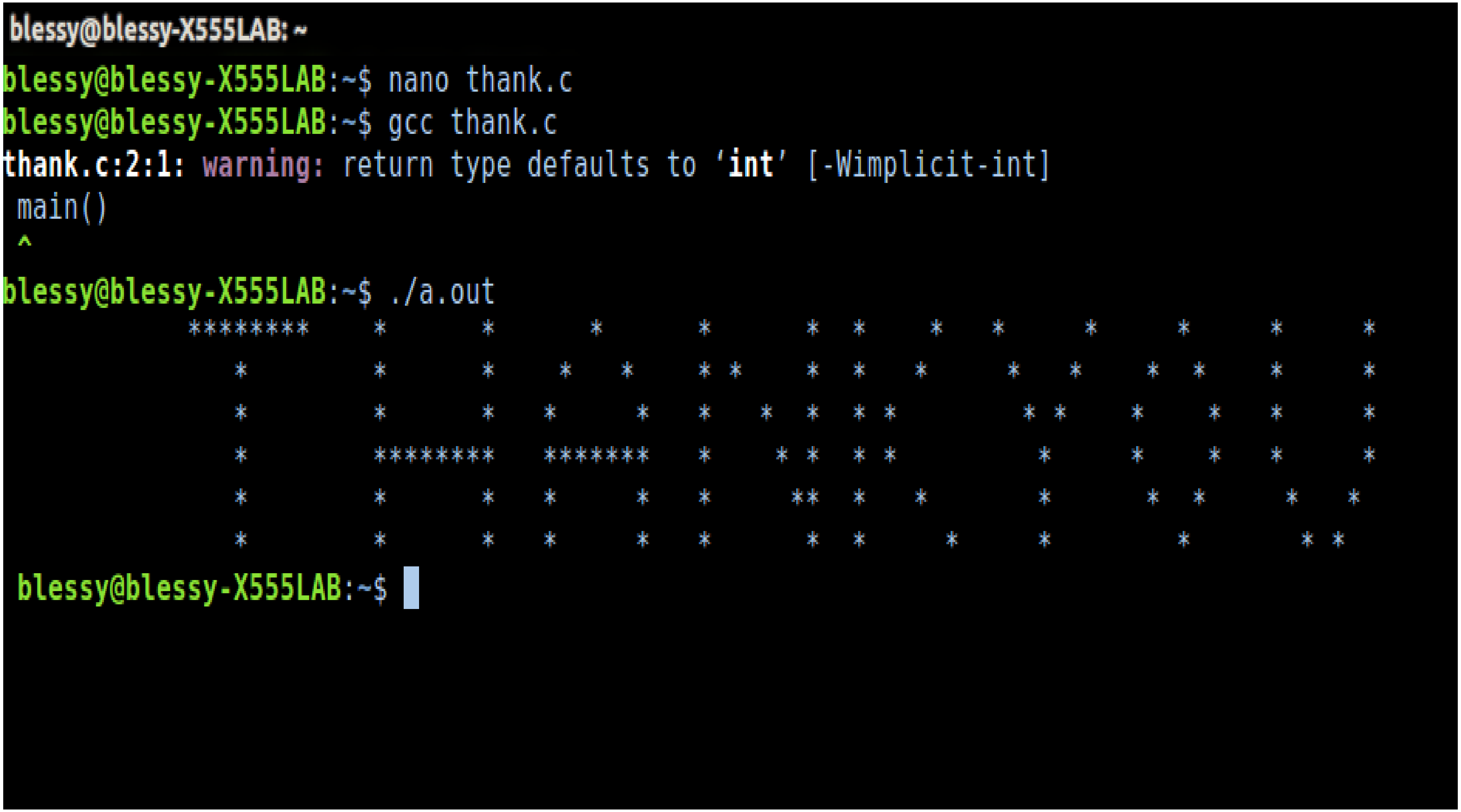
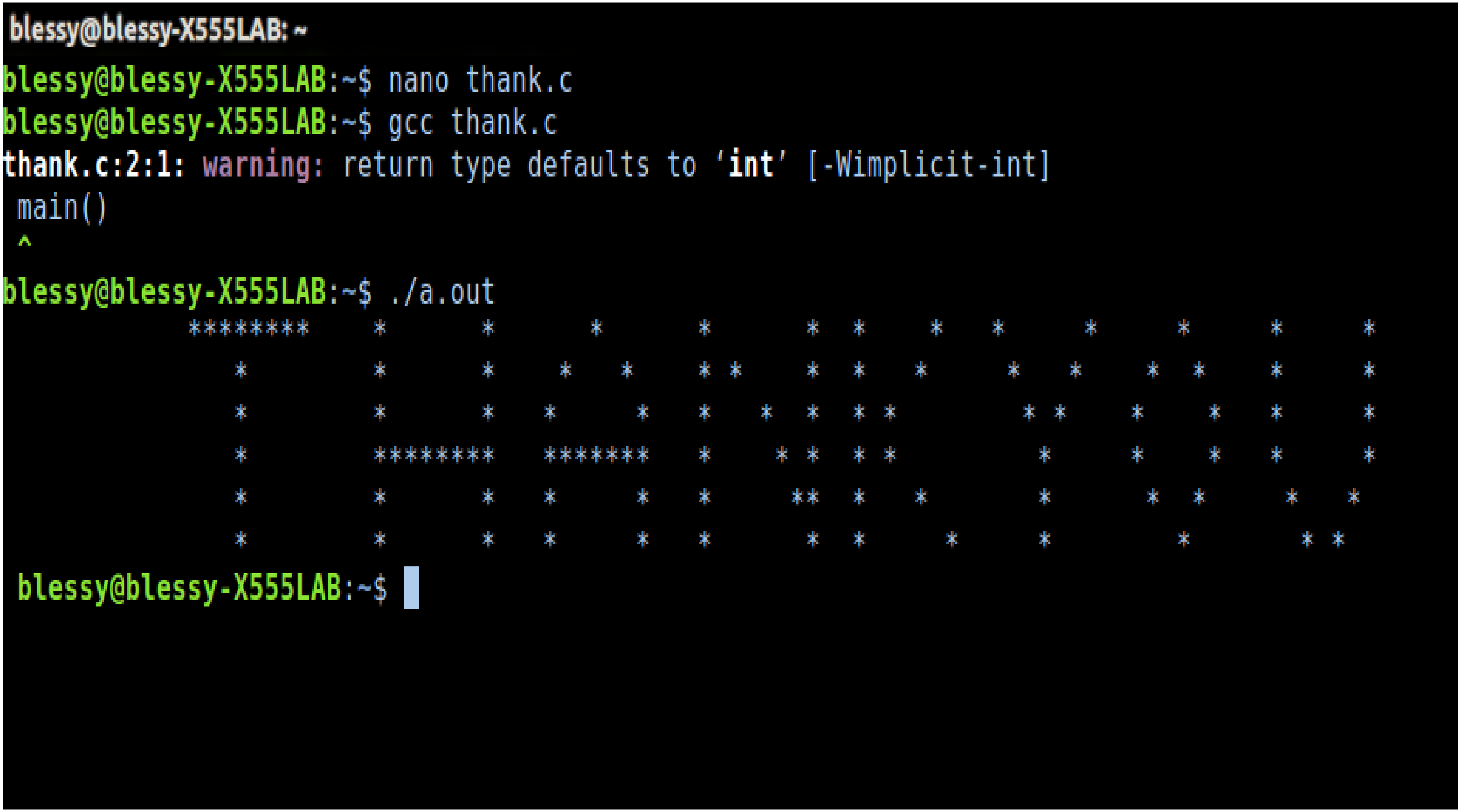
```
/var
     |- accout/
     |- arpwatch/
     +- spool/
                    |- at/
                    |- news/
     |- tmp/
```



blessy@blessy-X555LAB: ~

```
blessy@blessy-X555LAB:~$ nano thank.c
blessy@blessy-X555LAB:~$ gcc thank.c
thank.c:2:1: warning: return type defaults to ‘int’ [-Wimplicit-int]
 main()
 ^
blessy@blessy-X555LAB:~$ ./a.out
            ********    *      *      *      *      *  *    *   *     *     *     *     *
               *        *      *    *   *    * *    *  *   *     *   *    *  *    *     *
               *        *      *   *     *   *   *  *  * *        * *    *    *   *     *
               *        ********   *******   *    * *  * *         *     *    *   *     *
               *        *      *   *     *   *     **  *   *       *      *  *     *   *
               *        *      *   *     *   *      *  *     *     *        *       *  *
 blessy@blessy-X555LAB:~$ 
```



```
blessy@blessy-X555LAB: ~
blessy@blessy-X555LAB:~$ nano thank.c
blessy@blessy-X555LAB:~$ gcc thank.c
thank.c:2:1: warning: return type defaults to ‘int’ [-Wimplicit-int]
 main()
 ^
blessy@blessy-X555LAB:~$ ./a.out
            ********    *      *      *      *      *  *    *   *     *     *     *     *
               *        *      *    *   *    * *    *  *   *     *   *    *  *    *     *
               *        *      *   *     *   *   *  *  * *        * *    *    *   *     *
               *        ********   *******   *    * *  * *         *     *    *   *     *
               *        *      *   *     *   *     **  *   *       *      *  *     *   *
               *        *      *   *     *   *      *  *     *     *        *       * *
 blessy@blessy-X555LAB:~$ 
```