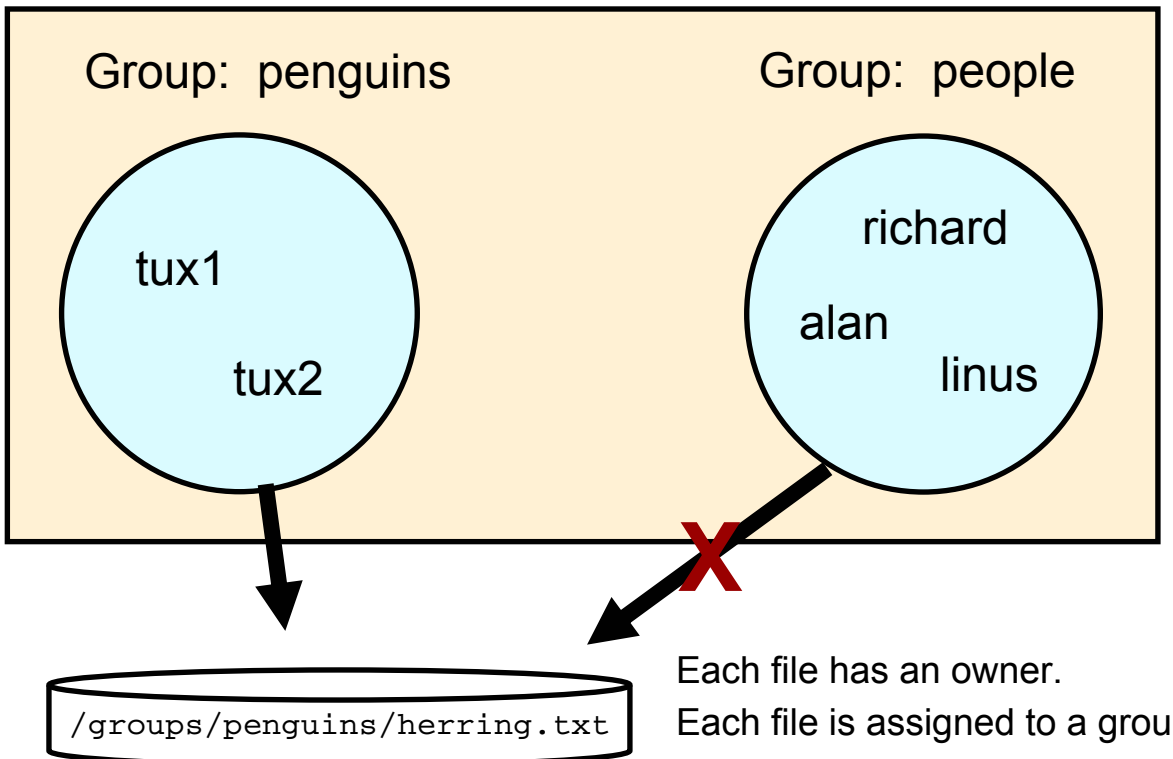
File and directory permissions

Unit objectives

After completing this unit, you should be able to:

- Describe how permissions are used
- List the permissions required to perform several common commands
- Change permissions using symbolic and octal notation
- Describe how default permissions are calculated

Users and groups



Each file has an owner.

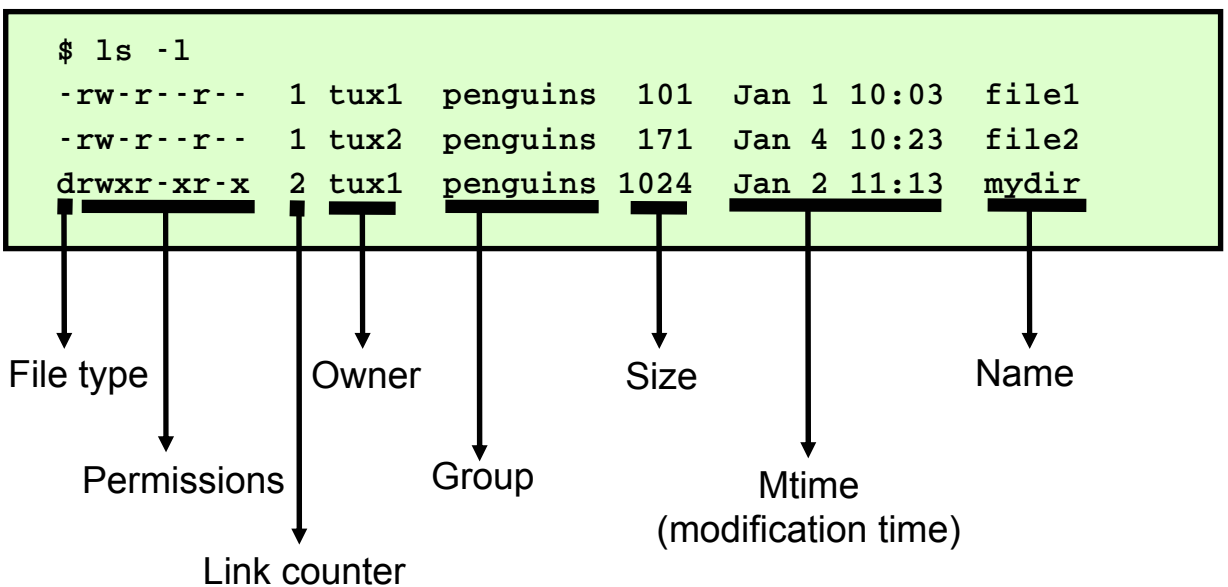
Each file is assigned to a group.

Permissions

- File permissions are assigned to:
  - The owner of a file
  - The members of the group the file is assigned to
  - All other users
- Permissions can only be changed by the owner and root!

Viewing permissions (command line)

- To show the permissions of a file, use the **ls** command with the -l option.



Permissions notation

rwxrwxrwx

owner group other

r	Read
w	Write
x	Execute

Regular files

r	File is readable.
w	File is writeable.
x	File is executable (if in an executable format).

Directories

r	Contents of directory can be listed (**ls**).
w	Contents can be modified add/delete files).
x	Change into directory is possible (**cd**).

Required permissions

Command	Source directory	Source file	Target directory
cd	x	N/A	N/A
ls	x, r	N/A	N/A
mkdir, rmdir	x, w	N/A	N/A
cat, less	x	r	N/A
cp	x	r	x, w
cp –r	x, r	r	x, w
mv	x, w	**None**	x, w
vi	x, r	r, w	N/A
rm	x, w	**None**	N/A

Who can change permissions?

- The owner of the file or directory
- The root user

```
$ ls -ld /home/tux1
drwx------ 4   tux1  penguins  1024  Jan 5  12:43 /home/tux1
```

Changing permissions (1 of 2)

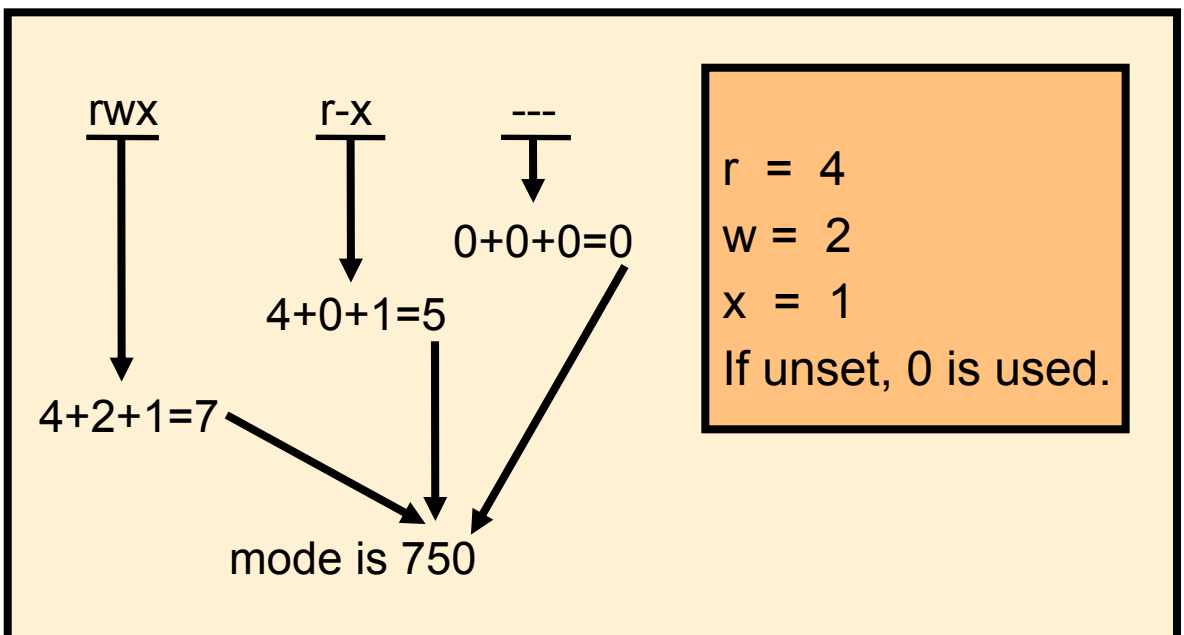
- To change the permission of a file use the **chmod** command
- Syntax: `chmod <MODE> <FILE[S]>`
- Mode can be symbolic.

```
$ chmod go-rx /home/tux1
$ ls -ld /home/tux1
drwx------ 4 tux1   penguins 1024 Jan 5 12:43 /home/tux1
```

- Mode can also be octal.

```
$ chmod 700 /home/tux1
$ ls -ld /home/tux1
drwx------ 4 tux1     penguins    1024 Jan 5 12:43 /home/tux1
```

Changing permissions (2 of 2)



umask

- New files should not be created with 666! To avoid this problem, a permission mask exists.

Regular files:

Default permissions	rw-rw-rw	666
umask (-)	----w--w-	022
Resulting permissions	rw-r--r--	644

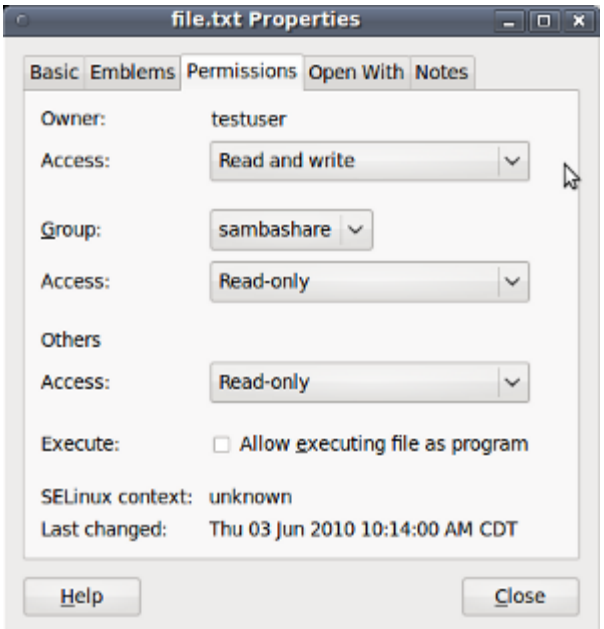
Directories:

Default permissions	rwxrwxrwx	777
umask (-)	----w--w-	022
Resulting permissions	rwxr-xr-x	755

Syntax: `umask 022`

Permissions in the GUI

- You can also check file permissions using the GUI.
- The Properties tab allows you to check permissions, set permissions, and modify group and execution privileges all in one window.



Unit review

- Permissions determine whether a user is able to do something with a file or directory.
- Permissions can be set for the user, the group, and all others.
- Three base permissions exist: read, write, and execute.
- To view the permissions, use `ls -l`.
- Permissions can be changed only by the owner of the file or directory and by root.
- The umask determines the default permissions on a file.

Checkpoint


```
$ pwd
/groups/
$ ls -l
drwxrwxr-x   2  root  penguins 1024  Jan 1 10:03  penguins
$ ls -l penguins
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  hello.c
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  task.c
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  zip.c
```

- Can tux2 (who is also a member of the penguins group) successfully execute the following commands?

1. `cd /groups/penguins`
2. `mkdir /groups/penguins/mydir`
3. `cp /groups/penguins/task.c ~/task.c`
4. `vi /groups/penguins/zip.c`
5. `vi /groups/penguins/newfile.c`
6. `rm /groups/penguins/hello.c`

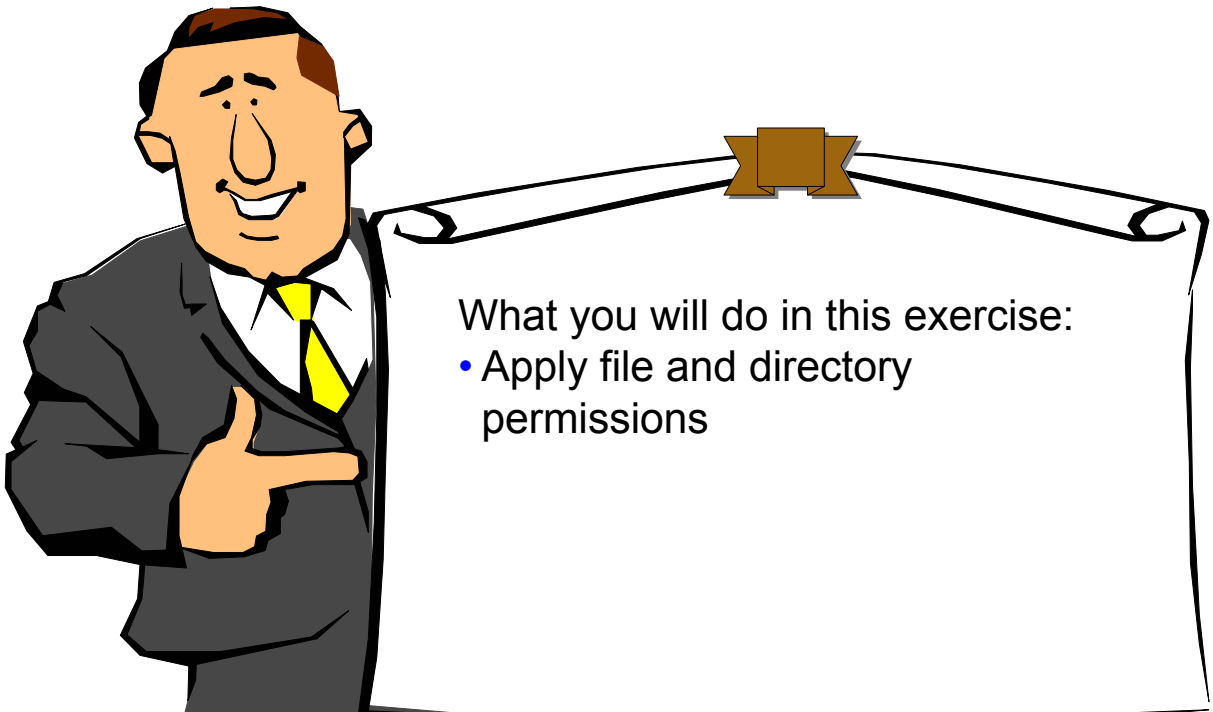
Checkpoint solutions


```
$ pwd
/groups/
$ ls -l
drwxrwxr-x   2  root  penguins 1024  Jan 1 10:03  penguins
$ ls -l penguins
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  hello.c
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  task.c
-rw-r--r--   1  tux1  penguins  544  Jan 1 10:15  zip.c
```

- Can tux2 (who is also a member of the penguins group) successfully execute the following commands?

1. `cd /groups/penguins`
   The answer is yes.
2. `mkdir /groups/penguins/mydir`
   The answer is yes.
3. `cp /groups/penguins/task.c ~/task.c`
   The answer is yes.
4. `vi /groups/penguins/zip.c`
   The answer is no.
5. `vi /groups/penguins/newfile.c`
   The answer is yes.
6. `rm /groups/penguins/hello.c`
   The answer is yes.

Exercise: File and directory permissions



Unit summary

Having completed this unit, you should be able to:

- Describe how permissions are used
- List the permissions required to perform several common commands
- Change permissions using symbolic and octal notation
- Describe how default permissions are calculated