

TECHNOLOGY



Ubuntu Fundamentals

File System Organization



Learning Objectives

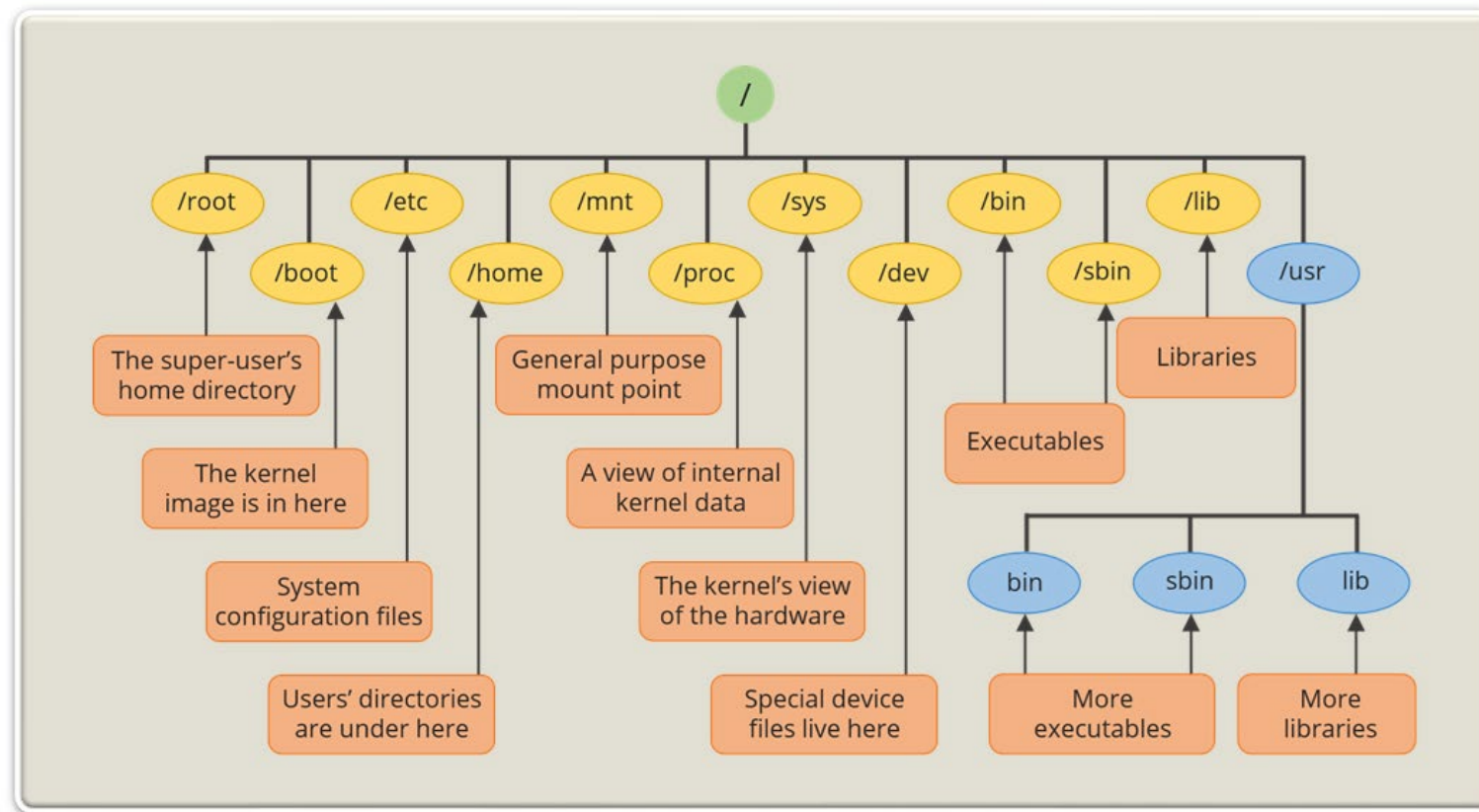
By the end of this lesson, you will be able to:

- 🕒 Illustrate the file system hierarchy in Ubuntu
- 🕒 Explore the functions of important directories
- 🕒 Mount and unmount file systems
- 🕒 Evaluate configuration files and its uses
- 🕒 Analyze the permissions of files and directories
- 🕒 Add and delete users and groups



File System Organization

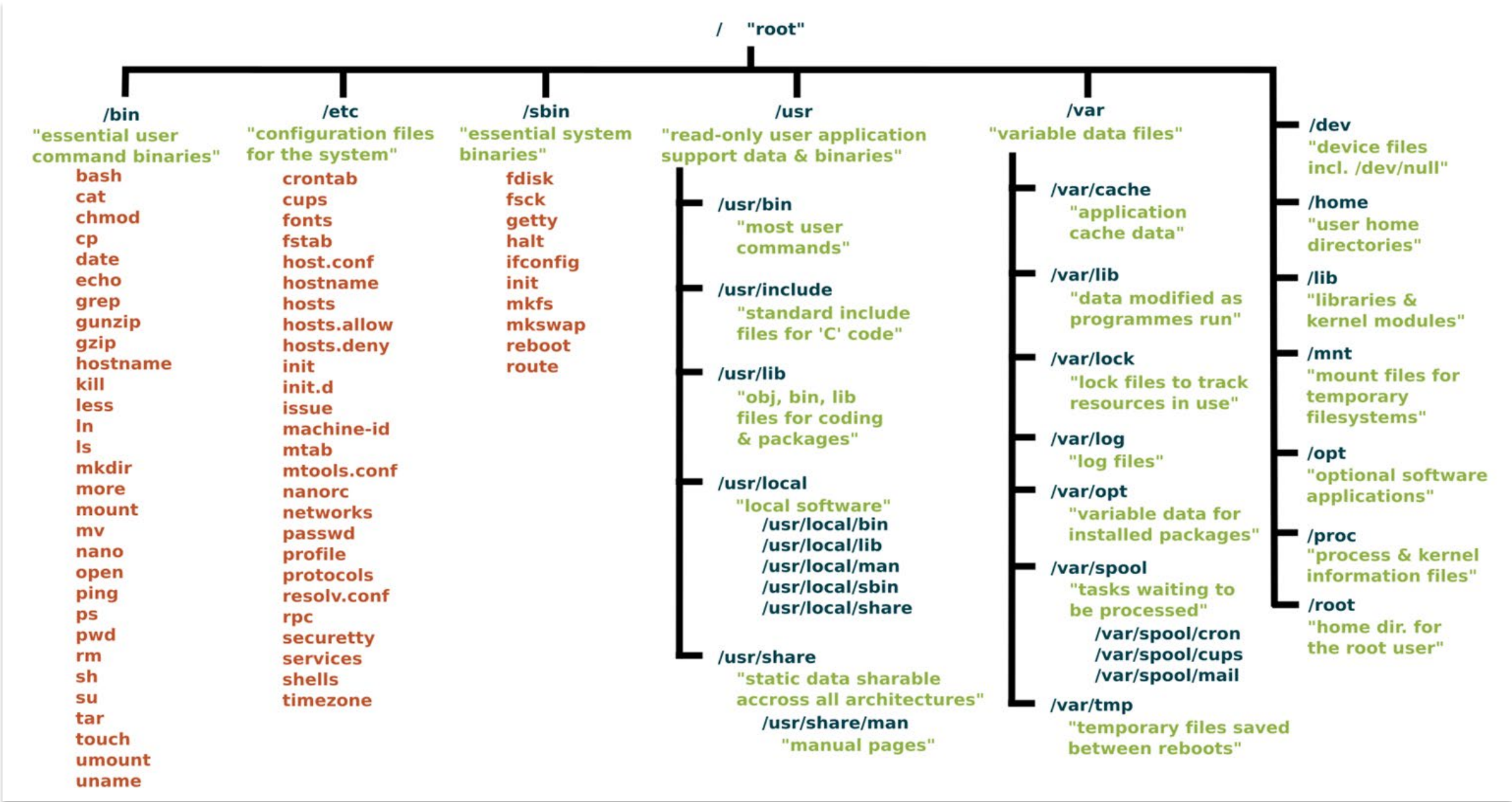
File system is the method of organizing and managing your data in files and directories.



- The File system hierarchy begins with the root directory '/'.
- It is also known as the mount point for the whole system through which your data flows and occupies space in files.

Important Directories and Their Functions

The various system directories in Ubuntu are:



Important Directories and Their Functions

Some of the important directories are:

bin: Contains all the user commands in binary format

etc: Contains the system configuration files that manage your application's behavior

sbin: Contains all the commands used by the administrator. These commands are also known as privilege commands

usr: Contains the kernel header files required for the kernel operations

var: Stores all the logs and email messages

dev: Contains the names of the connected devices. In Linux, devices are treated like files

home: Saves the user's work. It also saves the user's profile settings

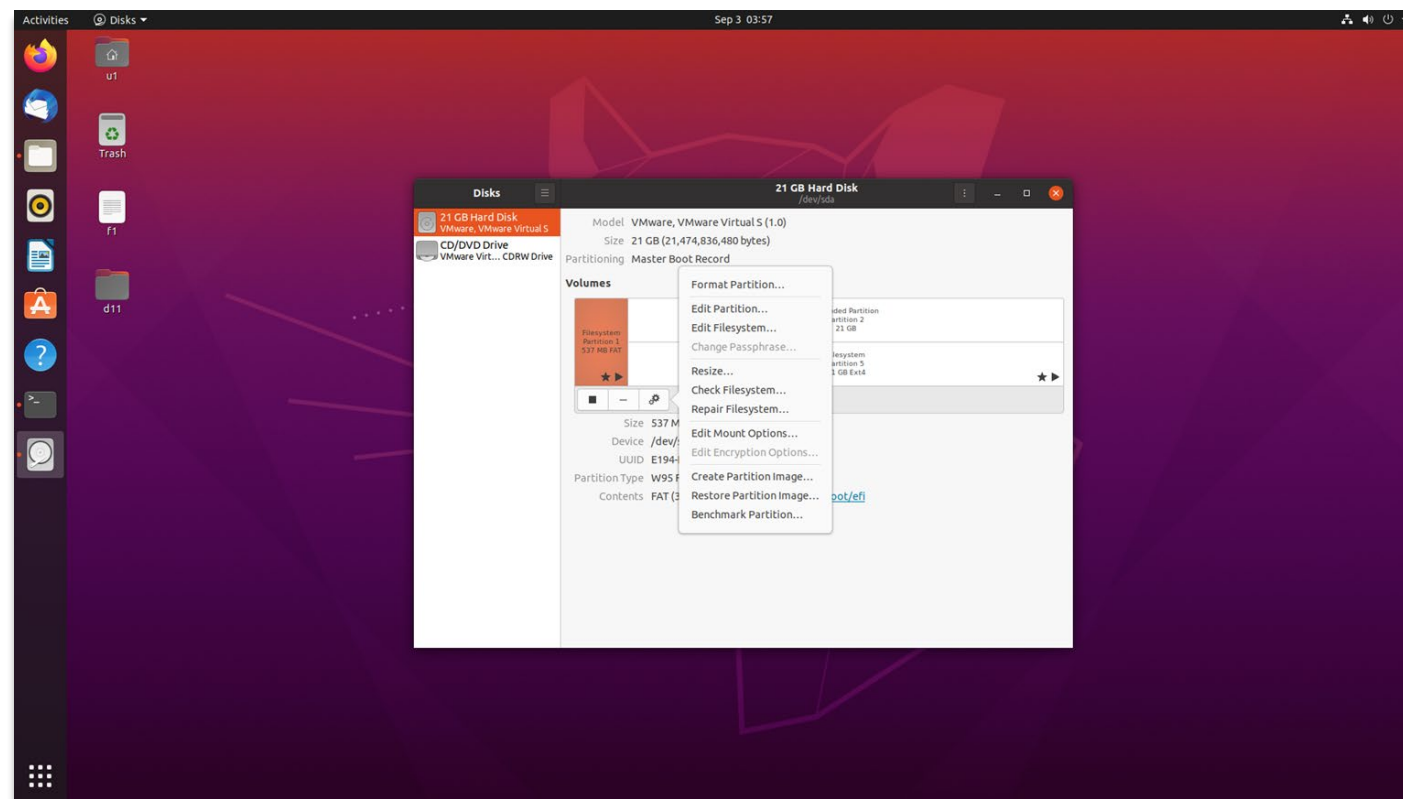
lib: Saves the pre-compiled apps, frequently used by the OS apps

proc: Contains the current state of the kernel and its settings used in current context

root: It is the home directory for the administrator whose name is root. The administrator is also known as super user

Mount and Unmount

Mounting refers to the process of attaching the file system to root.



- The file system for all practical purposes can be considered partitions on the hard disk.
- Unmounting refers to the process of detaching the file system from the root directory.

Configuration Files in Linux (Ubuntu)

- The behavior of systems and applications is controlled by the configuration file settings.
- The files that contain these settings are known as configuration files.
- Every application or service has the configuration followed by its name.



Configuration Files in Linux (Ubuntu)

```
[root@server ~]# cat /etc/sysconfig/network-scripts/ifcfg-eno16777736
TYPE="Ethernet"
BOOTPROTO=dhcp
DEFROUTE="yes"
IPV4_FAILURE_FATAL="no"
IPV6INIT="yes"
IPV6_AUTOCONF="yes"
IPV6_DEFROUTE="yes"
IPV6_FAILURE_FATAL="no"
NAME="eno16777736"
UUID="c88398c7-d188-41ec-8266-6585f0e41d1a"
DEVICE="eno16777736"
ONBOOT="yes"
PEERDNS=yes
PEERROUTES=yes
IPV6_PEERDNS=yes
IPV6_PEERROUTES=yes
IPV6_PRIVACY=no
[root@server ~]#
```

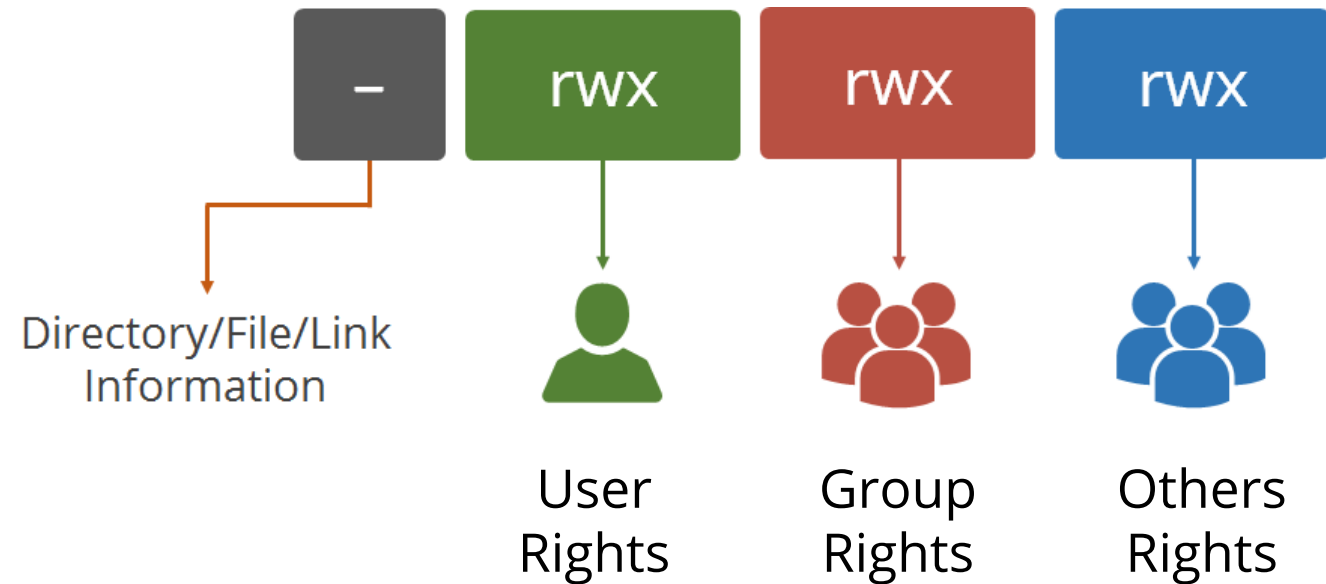
Example:

In the given screenshot, you can see the network card configuration as required by the network service application.

Network service application's job is to provide network connectivity based on the configuration described in the file.

Permissions for Files and Directories

In Linux, there are primarily two types of resources, files and directories, and there are three stakeholders present. They are **user**, **group**, and **others**.



- The person who created the file is considered the user or owner.
- People who like to access this file frequently are called group.
- Remaining set of people forms the others category.

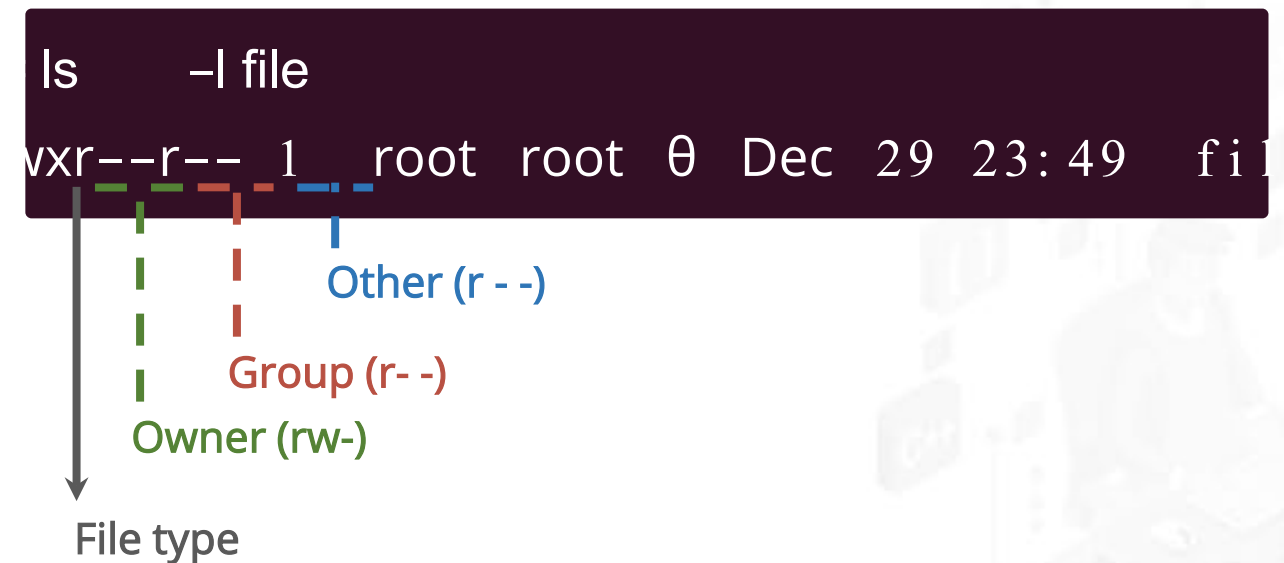
Permissions for Files and Directories

There are mainly three permissions given in Linux:

- **r** stands for read, and it allows you to open the file.
- **w** stands for write and allows you to edit the file.
- **x** stands for execute, and it allows you to execute the program present in the file or directory.

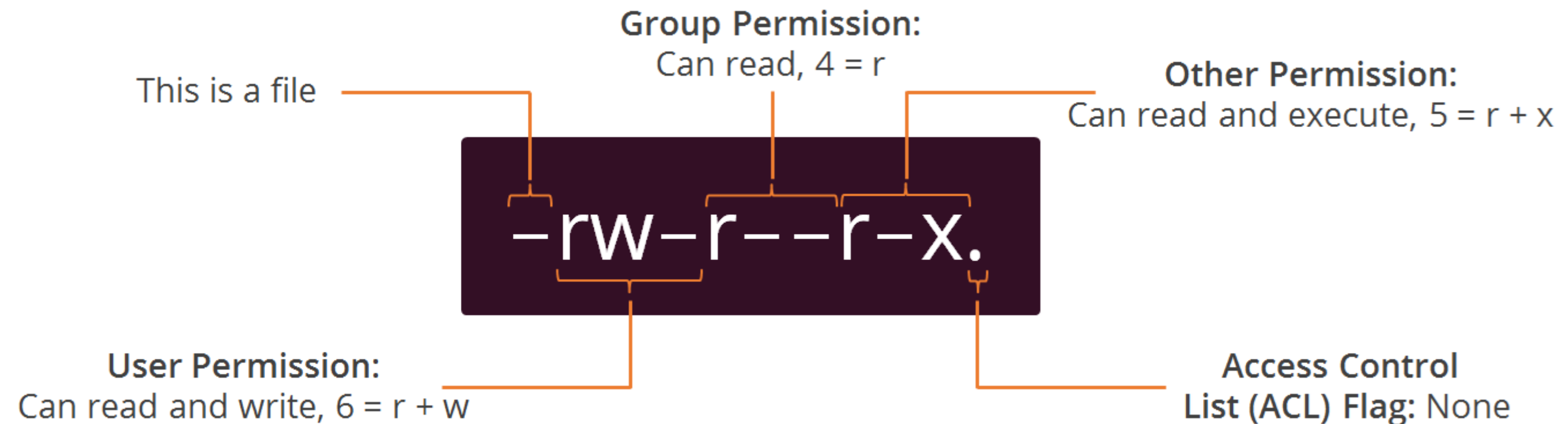
If none of the three permissions are assigned, then deny will be the default permission for that file or directory.

- **-** stands for deny option



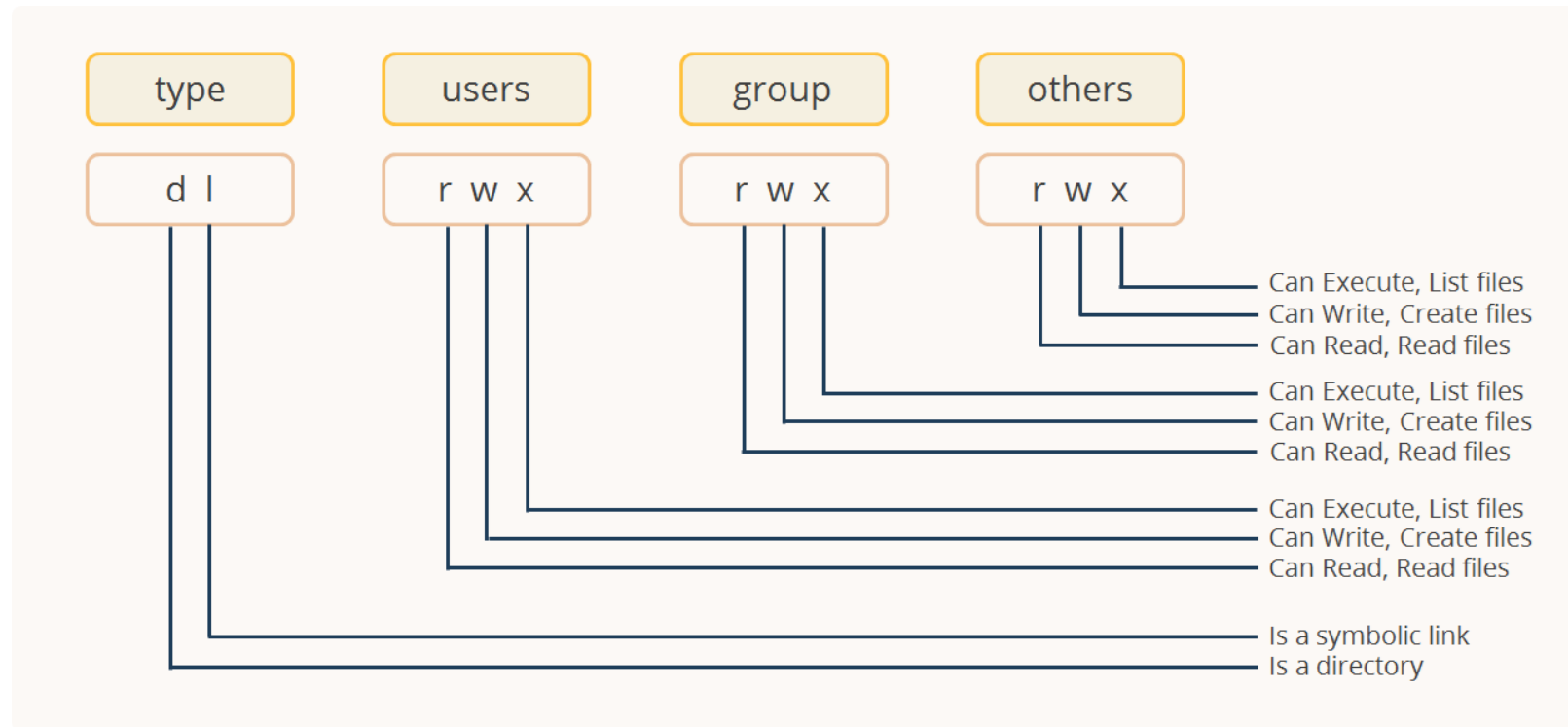
Permissions for Files and Directories

Permissions can also be set by octal method. Here, numerical values are used instead of symbols.
 $r = 4$, $w = 2$, and $x = 1$



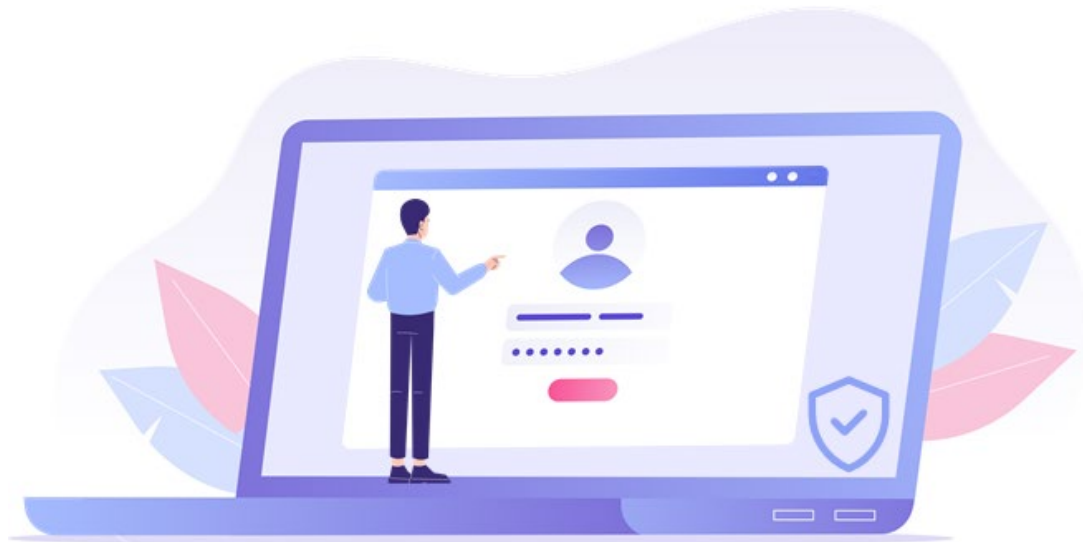
Permissions for Files and Directories

Same permissions can be used for files in directories.



- **r** indicates that you can go to the directory and read the files.
- **w** indicates that you can create files in the folder.
- **x** indicates that you can use the **ls** command to list the files in the folder.

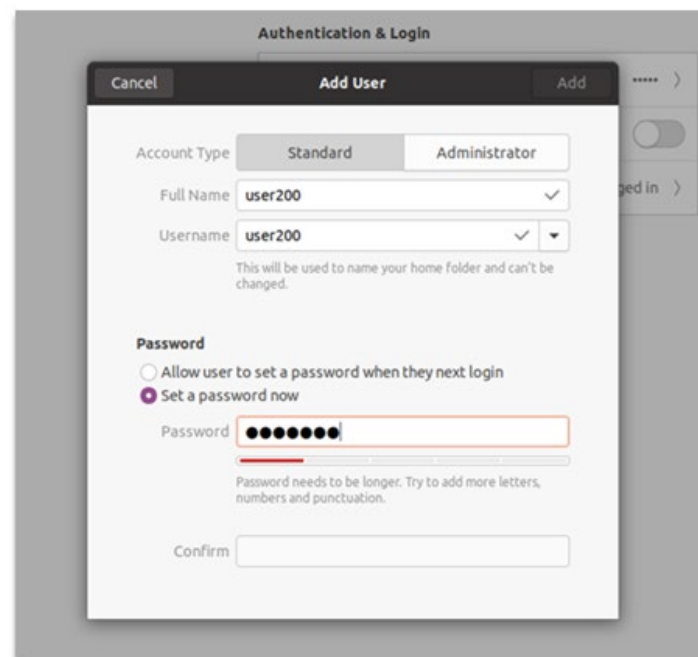
User Administration



- Users interact with computer systems to accomplish their tasks by using system resources.
- To accomplish these tasks, users require a user account to log into the system with the respective credentials.
- Every user who sets up an account has a valid name, password for authentication, and a user identity number assigned by the system.
- For more than one person, we have the group identity number for authorization.
- Home directory is used to store the user's profile, files, and other belongings followed by a default shell.

User Administration

Users can be added to the system by two methods: GUI and CLI



GUI

```
Ubuntu 16.04 LTS ubuntu tty1
ubuntu login: techonthenet
Password:
Last login: Mon May  2 07:53:50 PDT 2016 on tty1
Welcome to Ubuntu 16.04 LTS (GNU/Linux 4.4.0-21-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

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

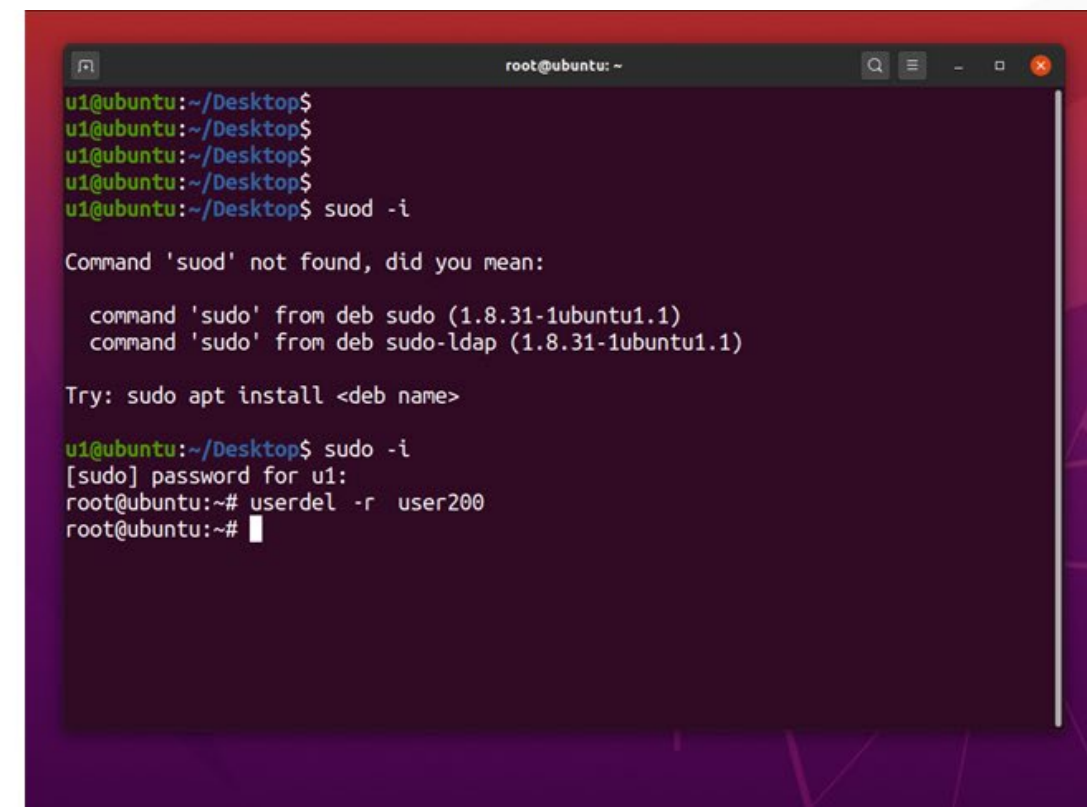
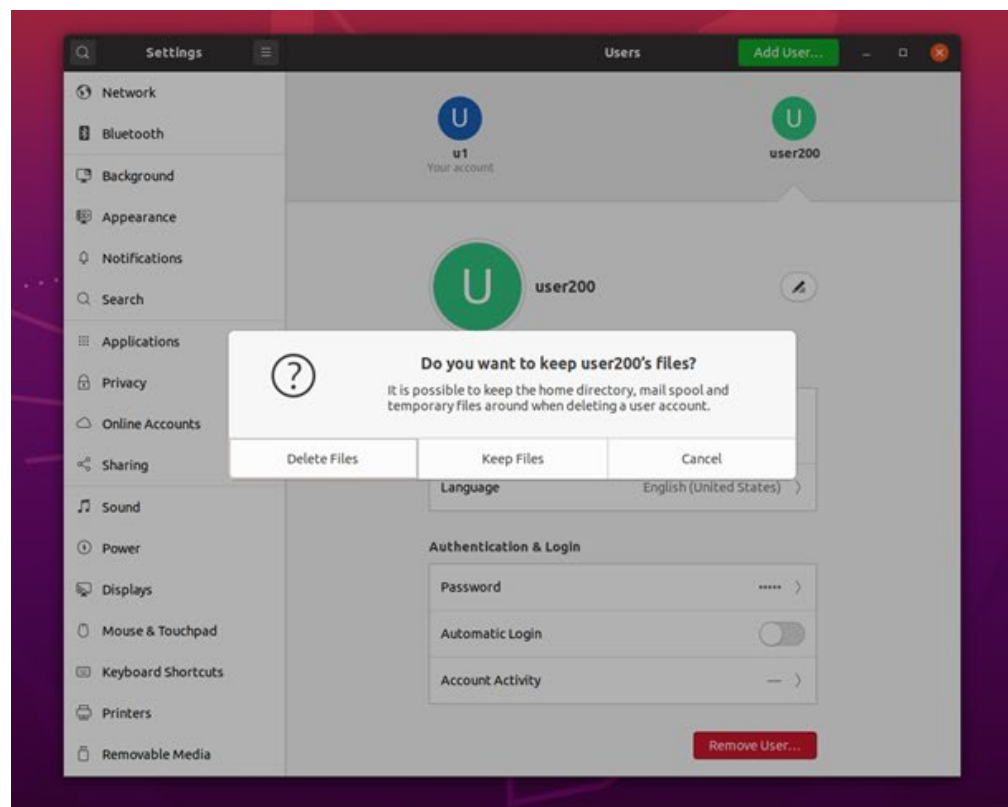
techonthenet@ubuntu:~$ sudo useradd -u 20000 -g 11000 -m -c "Tom Smith" tsmith_
```

CLI

- The minimum information required to perform this task are the name and password.
- Both GUI or CLI method can be used to customize any attribute, but the CLI method is preferred most of the time.

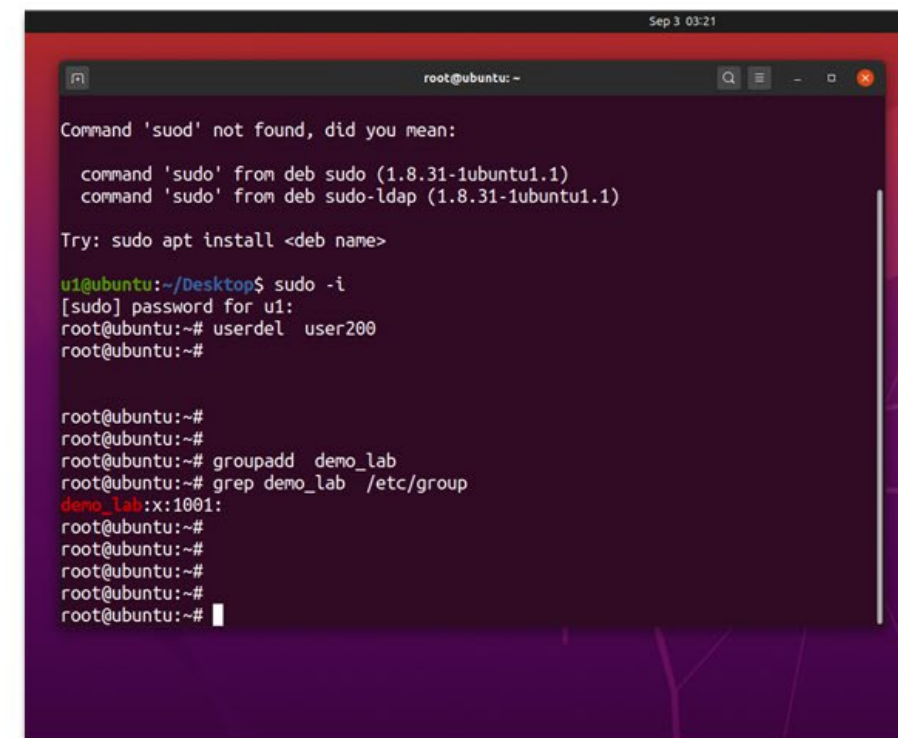
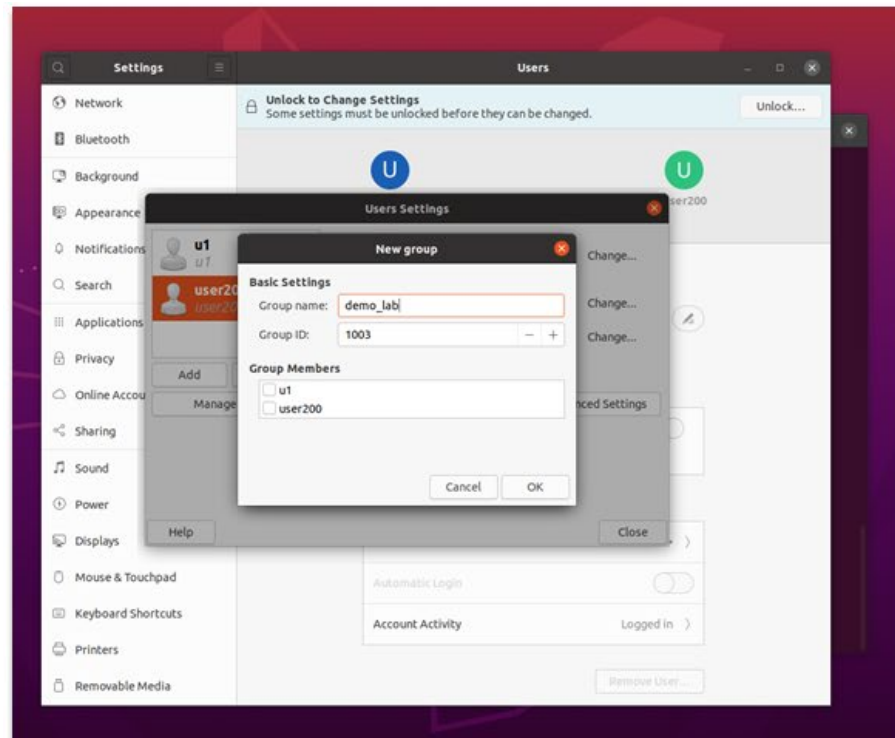
User Administration

- Like addition, deletion of users can also be done using GUI and CLI methods.
- The command `# userdel <username>` or `# userdel -r <username>` is used to remove or delete users from the system.
 - `-r` refers to the home directory.
- Therefore, even the home directory is deleted along with the user details.



User Administration

- Groups are used when the ownership is required for more than one person.
- Like user addition, groups can be added either by the GUI or CLI method.
- There are two types of groups:
 - Primary group
 - Secondary group



User Administration

Primary group:

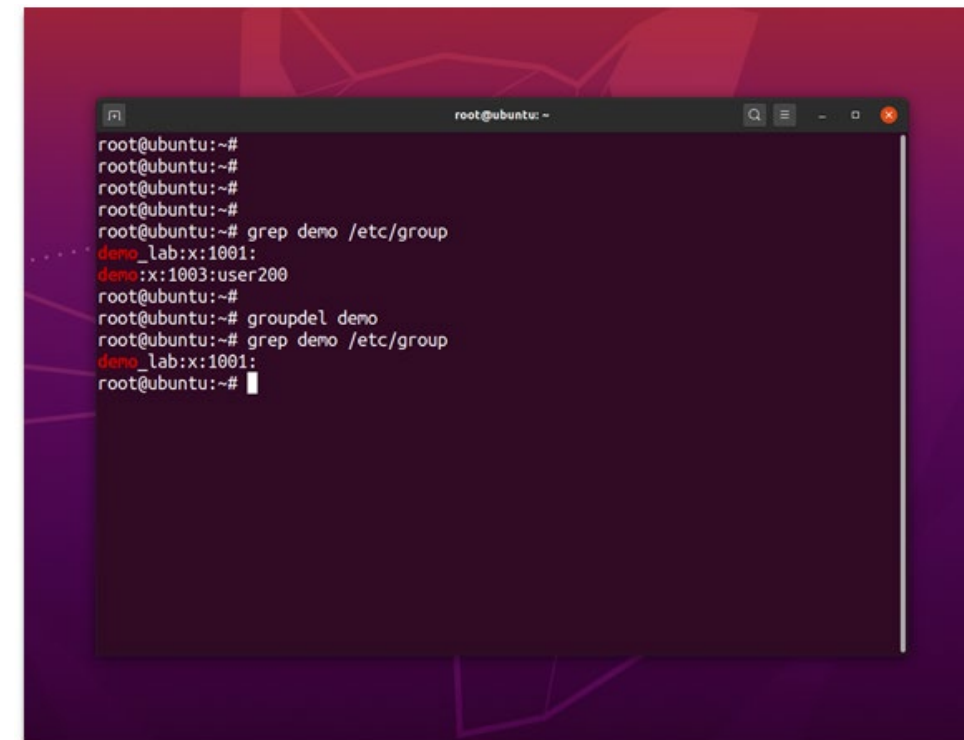
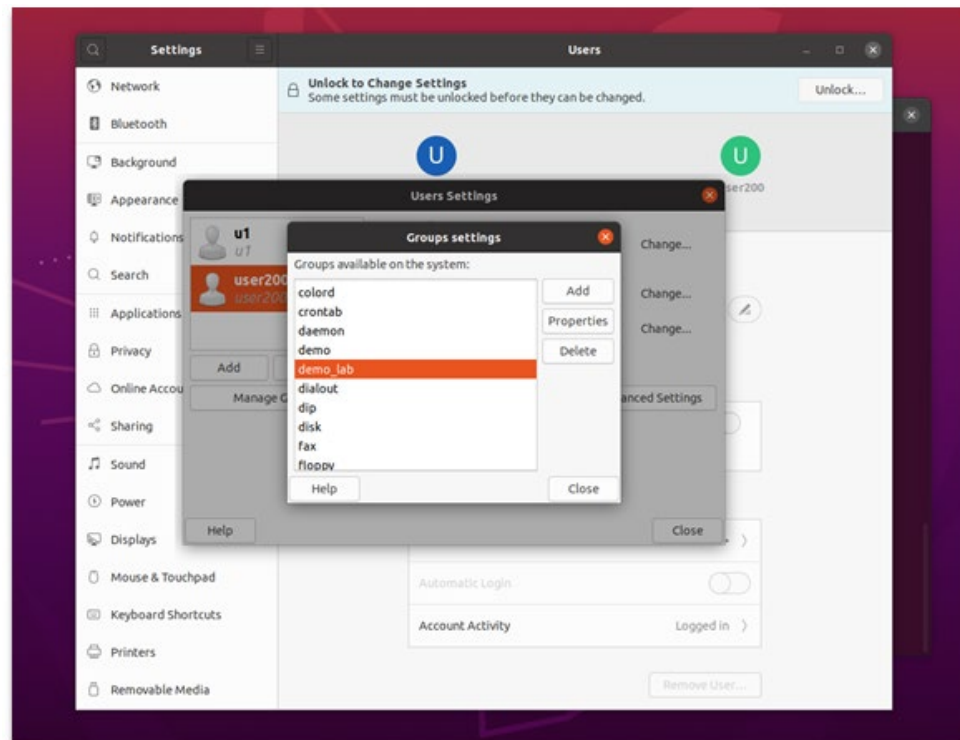
- When a user is created by default, then the user is grouped under the primary group.
- The name of this primary group follows the name of the user.
- The command `# groupadd <group_name>` is used to add a group.

Secondary group:

- If a user wants to join an already present group, then the user is grouped under the secondary group.
- The command `# useradd -g <group_name> <username>` is used to add a user to a secondary group.

User Administration

Like addition, deletion of groups can be done either by the GUI or CLI method.



The command `# groupdel <group_name>` is used to delete the group.

Key Takeaways

- File system is the method of organizing and managing your data in files and directories.
- sbin directory contains all the commands used by the administrator. They are also known as privilege commands.
- The behavior of systems and applications is controlled by the configuration files settings.
- Files and directories are the two types of resources in Ubuntu.





Knowledge Check

Knowledge Check

1

Who are the three stakeholders in Linux?

- A. Administrator, standard user, others
- B. User, standard user, others
- C. User, group, others
- D. Administrator, group, others



Knowledge Check

1

Who are the three stakeholders in Linux?

- A. Administrator, standard user, others
- B. User, standard user, others
- C. User, group, others
- D. Administrator, group, others



The correct answer is **C**

The three stakeholders in Linux are user, group, and others.

Knowledge
Check

2

Which is the most used filesystem in the Linux distributions?

- A. ext4
- B. FAT32
- C. NTFS
- D. POSIX



Knowledge
Check

2

Which is the most used filesystem in the Linux distributions?

- A. ext4
- B. FAT32
- C. NTFS
- D. POSIX



The correct answer is **A**

ext4 is the most used file system in Linux distributions. Others are used by non-Linux OS.

Knowledge
Check

3

Which directory saves the current kernel parameters?

- A. sbin
- B. bin
- C. var
- D. proc



Knowledge
Check

3

Which directory saves the current kernel parameters?

- A. sbin
- B. bin
- C. var
- D. proc



The correct answer is **D**

proc directory saves the current kernel parameters.

Knowledge
Check

4

Which directory stores the user commands?

- A. sbin
- B. bin
- C. var
- D. proc



Knowledge
Check

4

Which directory stores the user commands?

- A. sbin
- B. bin
- C. var
- D. proc



The correct answer is **B**

bin directory saves all the user commands.