

**SSBT's College of Engineering & Technology, Bambhori, Jalgaon**  
**Department of Computer Applications**

**Practical: 03**

**DOP:**

**DOC:**

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**Title: System Administration**

**Objective : To Demonstrate and know basics of system administration tasks, installation of required packages in open source system(Linux or Ubuntu)**

**1. Theory and Lab Task:**

System administrators—also known as sysadmins—are **information technology (IT) professionals who make sure an organization's computer systems are functioning and meet the needs of the organization**. Sysadmins support, troubleshoot, and maintain computer servers and networks.

**Roles and Responsibility of System administrators**

Installs, configure and deploy server hardware and software, including operating systems, applications, and patches to support and maintain effective network service operations throughout the District.

1. Supports, troubleshoots, repairs and maintains server issues and security for enterprise and large scale applications.
2. Provides Activity Directory Management assistance to District staff in managing user and computer accounts.
3. Troubleshoots, reviews and resolves blocked websites; performs a variety of duties related to filter management.
4. Manages, deploys, configures, and maintains servers in a virtualized and traditional environment.
5. Assists in creating scripts to monitor systems, diagnostics, resolve issues, and automate routine tasks.
6. Provides support for device management including image development, mobile device management, application packaging and deployment.
7. Configures systems for high availability including strategies for back-up and recovery, failover, load balancing, and full redundancy.
8. Installs server hardware and components such as disks, memory, and other components; models and tests changes to production systems.
9. Analyzes and resolves issues, gathers information to identify needs, evaluates systems and network requirements, and Diagnoses and resolves complex software, server, and networking issues.
10. Supports the District's directory services infrastructure, including hardware configuration and upgrades, group architecture, account maintenance, and authentication for authentication and network access.
11. Creates, and maintains written and verbal procedures; prepares written technical documentation, training material, standards, reports, and other documents as assigned.

12. Evaluates systems and alternate solutions; develops functional specifications, standards, and requirements for hardware and software purchase and design to ensure optimum system and end-user performance; makes recommendations for changes and additional services.
13. Trains and provides guidance to District personnel.
14. Provides general networking, computer, and other technology support as needed.
15. Prepares and maintains a variety of records and reports related to assigned activities; provide special reports as requested by various departments.
16. Operates a variety of office equipment including a computer and assigned software.

### **Installing and Removing Packages**

A package manager is a tool that allows you to install, update, remove, and otherwise manage distro-specific software packages.

Different Linux distributions have different package managers and package formats.

Only root or user with sudo privileges can install and remove packages.

Ubuntu and Debian (apt command)

Advanced Package Tool or APT is a package management system used by Debian-based distributions.

There are several command-line package management tools in Debian distributions, with apt and apt-get being the most used ones.

Before installing a new package first, you need to update the APT package index:

```
apt update
```

The APT index is a database that holds records of available packages from the repositories enabled in your system.

To upgrade the installed packages to their latest versions, run:

```
apt upgrade
```

Installing packages is as simple as running:

```
apt install package_name
```

To remove an installed package , enter:

```
apt remove package_name
```

### **File Ownership and Permission**

In Linux, access to the files is managed through file permission , attributed and ownership. This ensures that only authorized users and processes can access files and directories.

In Linux, each file is associated with an owner and a group and assigned with permission access rights for three different classes of users:

The file owner

The group members

Everybody else.

Three permission types to each class:

The read permission

The writepermission

The execute permission

To view the file owner and permission use the **ls -l** command

### Changing permission (chmod command)

The chmod command allows you change the file permissions. It works in two modes, symbolic and numeric.

When using the numeric mode, you can set the permission for the owner, group, and all other. Each write, read and execute permission have the following number value:

**r (read) = 4**

**w (write)=2**

**x(execute)=1**

**No permission = 0**

The permission number of a specific user class is represented by the sum of the values of the permissions for that group

For example, to give the file's owner read and write permissions and only read permissions to group members and all other users, you would run :

**chmod 644 abc**

```
newuser@student:~$ chmod 644 abc
newuser@student:~$
```

Only root, the file owner, or use with sudo privileges can change the permissions of the a file.

**chmod -R 755 abc**

```
newuser@student:~$ chmod -R 755 abc
newuser@student:~$
```

### Changing ownership (chown command)

The chown command allows you to change the user and group ownership of a given file, directory, or symbolic link

To change the owner of a file, use the chown command followed by the user name of the new owner and the target file:

**chown username filename**

```
newuser@student:~$ chown newuser abc
```

To change both the owner and the group of a file, invoke the chown command followed by the new owner and group separated by a colon (:) with no intervening spaces and the target file

**Chownusername: filename**

```
newuser@student:~$ chown mohit:mohit ospract2
newuser@student:~$
```

Use the -R (--recursive) option, to recursively operate on all files and directories under the given directory:

**chown -R username:groupname dirname**

```
newuser@student:~$ chown -R mohit:mohit ospract2
newuser@student:~$
```

### Elevate privileges (sudo command)

The sudo command allows you to run programs as another user, by default the root user. If you spend a lot of time on the command line, sudo is one of the commands that you will be using quite frequently.

Using sudo instead of login in as root is more secure because you can grant limited administrative privileges to individual users without them knowing the root password.

**To use sudo, simply prefix the command with sudo:**

**sudo command**

```
newuser@student:~$ sudo -h
sudo - execute a command as another user

usage: sudo -h | -K | -k | -V
usage: sudo -v [-ABkns] [-g group] [-h host] [-p prompt] [-u user]
usage: sudo -l [-ABkns] [-g group] [-h host] [-p prompt] [-U user] [-u user] [command]
usage: sudo [-ABbEHknPS] [-r role] [-t type] [-C num] [-D directory] [-g group] [-h host] [-p prompt]
           [-R directory] [-T timeout] [-u user] [VAR=value] [-i|-s] [<command>]
usage: sudo -e [-ABkns] [-r role] [-t type] [-C num] [-D directory] [-g group] [-h host] [-p prompt]
           [-R directory] [-T timeout] [-u user] file ...

Options:
-A, --askpass           use a helper program for password prompting
-b, --background       run command in the background
-B, --bell             ring bell when prompting
-C, --close-from=num   close all file descriptors >= num
-D, --chdir=directory  change the working directory before running command
-E, --preserve-env     preserve user environment when running command
--preserve-env=list    preserve specific environment variables
-e, --edit            edit files instead of running a command
-g, --group=group     run command as the specified group name or ID
-H, --set-home        set HOME variable to target user's home dir
-h, --help            display help message and exit
-k, --host=host       run command on host (if supported by plugin)
Terminal login        run login shell as the target user; a command may also be specified
-K, --remove-timestamp remove timestamp file completely
-k, --reset-timestamp invalidate timestamp file
-l, --list            list user's privileges or check a specific command; use twice for longer format
-n, --non-interactive non-interactive mode, no prompts are used
-P, --preserve-groups preserve group vector instead of setting to target's
-p, --prompt=prompt   use the specified password prompt
-R, --chroot=directory change the root directory before running command
-r, --role=role       create SELinux security context with specified role
-S, --stdin          read password from standard input
-s, --shell          run shell as the target user; a command may also be specified
-t, --type=type      create SELinux security context with specified type
```

### Managing Users and Groups

Linux is a multi-user system, which means that more than one person can interact with the same system at the same time. Groups are used to organize and administer user accounts. The primary purpose of groups is to define a set of privileges such as reading, writing, or executing permission for a given resource shared among the users within the group.

#### Creating users (useradd and passwd Commands)

The useradd command allows you can create new users.

To create a new user account, invoke the useradd command followed by the username:

**Useraddnewuser**

```
newuser@student:~$ sudo useradd student1 passwd Mohit@9595
[sudo] password for mohit:
Usage: useradd [options] LOGIN
       useradd -D
       useradd -D [options]

Options:
  --badnames           do not check for bad names
  -b, --base-dir BASE_DIR  base directory for the home directory of the
                          new account
  --btrfs-subvolume-home  use BTRFS subvolume for home directory
  -c, --comment COMMENT   GECOS field of the new account
  -d, --home-dir HOME_DIR  home directory of the new account
  -D, --defaults          print or change default useradd configuration
  -e, --expiredate EXPIRE_DATE  expiration date of the new account
  -f, --inactive INACTIVE  password inactivity period of the new account
  -g, --gid GROUP          name or ID of the primary group of the new
                          account
  -G, --groups GROUPS      list of supplementary groups of the new
                          account
  -h, --help              display this help message and exit
  -k, --skel SKEL_DIR      use this alternative skeleton directory
  -K, --key KEY=VALUE      override /etc/login.defs defaults
  -l, --no-log-init        do not add the user to the lastlog and
                          faillog databases
  -m, --create-home        create the user's home directory
  -M, --no-create-home     do not create the user's home directory
  -N, --no-user-group       do not create a group with the same name as
                          the user
  -o, --non-unique         allow to create users with duplicate
                          (non-unique) UID
  -p, --password PASSWORD  encrypted password of the new account
  -r, --system             create a system account
  -R, --root CHROOT_DIR    directory to chroot into
  -P, --prefix PREFIX_DIR  prefix directory where are located the /etc/* files
  -s, --shell SHELL        login shell of the new account
  -u, --uid UID            user ID of the new account
  -U, --user-group         create a group with the same name as the user
                          (useradd -g 545 545 for the 545th user added)
```

Once the user is created, set the user password by running the passwd command:  
**passwd newuser**

```
newuser@student:~$ sudo useradd student1 passwd Mohit@9595
[sudo] password for mohit:
Usage: useradd [options] LOGIN
       useradd -D
       useradd -D [options]

Options:
  --badnames           do not check for bad names
  -b, --base-dir BASE_DIR  base directory for the home directory of the
                          new account
  --btrfs-subvolume-home  use BTRFS subvolume for home directory
  -c, --comment COMMENT   GECOS field of the new account
  -d, --home-dir HOME_DIR  home directory of the new account
  -D, --defaults          print or change default useradd configuration
  -e, --expiredate EXPIRE_DATE  expiration date of the new account
  -f, --inactive INACTIVE  password inactivity period of the new account
  -g, --gid GROUP          name or ID of the primary group of the new
                          account
  -G, --groups GROUPS      list of supplementary groups of the new
                          account
  -h, --help              display this help message and exit
  -k, --skel SKEL_DIR      use this alternative skeleton directory
  -K, --key KEY=VALUE      override /etc/login.defs defaults
  -l, --no-log-init        do not add the user to the lastlog and
                          faillog databases
  -m, --create-home        create the user's home directory
  -M, --no-create-home     do not create the user's home directory
  -N, --no-user-group       do not create a group with the same name as
                          the user
  -o, --non-unique         allow to create users with duplicate
                          (non-unique) UID
  -p, --password PASSWORD  encrypted password of the new account
  -r, --system             create a system account
  -R, --root CHROOT_DIR    directory to chroot into
  -P, --prefix PREFIX_DIR  prefix directory where are located the /etc/* files
  -s, --shell SHELL        login shell of the new account
  -u, --uid UID            user ID of the new account
  -U, --user-group         create a group with the same name as the user
                          (useradd -g 545 545 for the 545th user added)
```

## Removing users (userdel Command)

In Linux, you can delete a user account using the userdel command.

To delete a user account named pass the user name to the userdel command:

**Userdelnewuser**

```
newuser@student:~$ sudo userdel student1
newuser@student:~$
```

Use the -r (-remove) option to remove the user's home directory and mail spool:

**userdel -r newuser**

```
newuser@student:~$ sudo userdel -R student1
```

## Managing groups (groupadd and groupdel Command)

To create a new group, invoke the groupadd command followed by the group name:

**Groupaddmygroup**

```
newuser@student:~$ sudo groupadd newgroup
newuser@student:~$
```

To remove a group, use the groupdel command with the group name as argument:  
Groupdelmygroup

```
newuser@student:~$ sudo groupadd newgroup
newuser@student:~$ sudo groupdel newgroup
newuser@student:~$
```

The following tables shows linux command and their function. This Linux commands is used frequently by system administrators.

Command	Function
man	Display information about all commands
uptime	Show how long system is running
users	Show username who are currently logged in
service	Call and execute script
pkill	Kill a process
pmap	Memory map of a process
wget	Download file from network
ftp or sftp	Connect remote ftp host
free	Show memory status
top	Display processor activity of system
last	Display user's activity in the system

ps	Display about processes running on the system
Shutdown commands	Shutdown and reboot system
info	Display information about given command
env	Display environment variable for currently logged-in user
netstat	Display network status
arp	Check ethernet connectivity and IP address
df	Display filesystem information
du	Display usage
init	Allow to change server bootup
nano	A command line editor
nslookup	Check domain name and IP information
shred	Delete a file by over writing its content
cat	Display, copy or combine text files
pwd>	Print path of current working directory
locate	Finding files by name on system
chown	Change ownership of a file
>alias	To short a command
echo	Display text
cmp	Compare two files byte by byte
mount	Mount a filesystem

ifconfig	Display configuration
traceroute>	Trace existing network
sudo	Run a command as a root user
route	List routing table for your server
ping	Check connection by sending packet test packet
find	Find location of files/directories
users	Show current logged in user
who	Same as w but doesn't show current process
ls	List all the files
tar	Compress directories
grep	Search for a string in a file
su	Switch from one to another user
awk	Search lines for a given pattern

### **Conclusion :**

In this practical, we learn the system administrations task and responsibility using Linux commands which is mentioned in table.