

## What is Linux?

Linux is a Unix-like computer operating system assembled under the model of free and open source software development and distribution. The defining component of Linux is the Linux kernel, an operating system kernel first released October 5, 1991 by Linus Torvalds.

Linux was originally developed as a free operating system for Intel x86-based personal computers. It has since been ported to more computer hardware platforms than any other operating system. It is a leading operating system on servers and other big iron systems such as mainframe computers and supercomputers: more than 90% of today's top 500 supercomputers run some variant of Linux, including the 10 fastest. Linux also runs on embedded systems (devices where the operating system is typically built into the firmware and highly tailored to the system) such as mobile phones, tablet computers, network routers, televisions and video game consoles; the Android system in wide use on mobile devices is built on the Linux kernel.

The development of Linux is one of the most prominent examples of free and open source software collaboration: the underlying source code may be used, modified, and distributed—commercially or non-commercially—by anyone under licenses such as the GNU General Public License. Typically Linux is packaged in a format known as a Linux distribution for desktop and server use. Some popular mainstream Linux distributions include Debian (and its derivatives such as Ubuntu), Fedora and openSUSE

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## What is the difference between UNIX and LINUX?

Linux is an operating system kernel, and UNIX is a certification for operating systems. The UNIX standard evolved from the original Unix system developed at Bell Labs. After Unix System V, it ceased to be developed as a single operating system, and was instead developed by various competing companies, such as Solaris (from Sun Microsystems), AIX (from IBM), HP-UX (from Hewlett-Packard), and IRIX (from Silicon Graphics). UNIX is a specification for baseline interoperability between these systems, even though there are many major architectural differences between them. Linux has never been certified as being a version of UNIX, so it is described as being "Unix-like." A comprehensive list of differences between Linux and "UNIX" isn't possible, because there are several completely different "UNIX" systems.

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## Why Linux is so popular?

Linux is a multiuser, multitask GUI based open source operating system developed by Linus Torvalds. Torvalds has invited the community to enhance the Linux kernel and thousands of system programmers worked on to enhance.

Prior to Linux, there is UNIX. The desktop work stations from various companies were based on UNIX. Later a numerous companies entered and each one of them had their own UNIX version. As the proprietary authority is owned by each company and the lack of central authority weaken UNIX. As Linux is free and runs on any PC platform it gained the popularity very quickly. The following are few more reasons for its popularity:

- People who are familiar with UNIX can work on Linux with ease and comfort.
- People who want great control over network security and on operating system

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## What is LILO?

LILO stands for Linux Loader which is a bootstrap program. LILO is a code snippet which loads PC BIOS into the main memory at the time of starting the computer system. LILO handles the following tasks:

- Locating Linux kernel
- Identifying other supporting programs and loading them in the memory

-Starting Kernel

The selection of various kernel images and boot routines is supported by LILO. For this reason, LILO is known as boot manager.

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[What is the difference between home directory and working directory?](#)

Home Directory: Every user will have one home directory and will have complete control over it. On login, home is the default working directory for the user. It contains the configuration files and responsible for login and logout of the user.

Working directory: The directory in which the user is working currently is known as working directory. The home may also be the working directory, if the user is working in it.

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[What is the difference between internal and external commands?](#)

he commands that are directly executed by the shell are known as internal commands. No separate process is there to run these commands.

The commands that are executed by the kernel are known as external commands. Each command has its unique process id.

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[Explain the difference between static library and dynamic library?](#)

Static library has functionality that bound to a static program at compile time. Every static program has its own copy of library.

Dynamic libraries are loaded into the memory and binds at run time. The external functionality is accessed at runtime. This process reduces the overall footprint of memory.

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[What is LD\\_LIBRARY\\_PATH?](#)

LD\_LIBRARY\_PATH is an environment variable. This is used to search for the shared objects / dynamic libraries by the operating system for extendable functionality at runtime.

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[What is the file server in Linux server?](#)

A file server is dedicated for persisting files in a location from which the networked systems can access. Certain access privileges can be set for files. Linux has software named as 'samba' which allows the files to be shared, viewed and edited on any remote system which may have Windows 9x/NT/2000 or Macintosh computer systems. These files on the file server are backed up from time to time. If a file is deleted inadvertently, the file can be recovered from the backup tape.

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[What is NFS? What is its purpose?](#)

NFS stands for Network File System. NFS is used to partition a disk on a remote machine disk. NFS allows a quick way of file sharing.

The unwanted people access potential is provided by NFS to access hard drive in a network. So that an unauthorized user can not access one's email, delete the files. File services from windows can be accessed. In other words files from one operating system can be shared by another using NFS.

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#### How do I send email with Linux?

Linux supports to work with sending mails using a set of commands called as mail commands. The command to send email is 'mail'. The 'mail' command is used to send and receive emails.

Syntax:

mail [options] [users]

Options are: -s, -c, -b

Where -s for subject, -c for copy and -b for blind carbon copy

Ex: mail username -s "Reports are needed"

It prompts displays the subject as "Reports are needed".

Similarly if -c and -b is given the mail will be sent to the corresponding recipients.

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#### What is RPM (Red Hat Package Manager) features?

RPM is a powerful software management tool for installing, uninstalling, verifying, querying and updating software packages. RPM is a straight forward program to perform the above software management tasks. It is available with Fedora, Suse, CentOS, Mandriva Linux and other version of Linux.

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#### What is Kernel? Explain the task it performs.

Kernel is used in UNIX like systems and is considered to be the heart of the operating system. It is responsible for communication between hardware and software components. It is primarily used for managing the systems resources as well.

Kernel Activities:

The Kernel task manager allows tasks to run concurrently.

Managing the computer resources: Kernel allows the other programs to run and use the resources. Resources include i/o devices, CPU, memory.

Kernel is responsible for Process management. It allows multiple processes to run simultaneously allowing user to multitask.

Kernel has an access to the systems memory and allows the processes to access the memory when required.

Processes may also need to access the devices attached to the system. Kernel assists the processes in doing so.

For the processes to access and make use of these services, system calls are used.

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#### What is Linux Shell? What is Shell Script?

**Ans1:**

Linux shell is a user interface used for executing the commands. Shell is a program the user uses for executing the commands. In UNIX, any program can be the users shell. Shell categories in Linux are:

Bourne shell compatible, C shell compatible, nontraditional, and historical.

A shell script, as the name suggests, is a script written for the shell. Script here means a programming language used to control the application. The shell script allows different commands entered in the shell to be executed. Shell script is easy to debug, quicker as compared to writing big programs. However the execution speed is slow because it launches a new process for every shell command executed. Examples of commands are cp, cn, cd.

#### **Ans2:**

Linux shell is the user interface to communicate with Linux operating system. Shell interprets the user requests, executes them. Shell may use kernel to execute certain programs. Shell Script: A shell script is a program file in which certain Linux commands are placed to execute one after another. A shell script is a flat text file. Shell scripts are useful to accept inputs and provide output to the user. Everyday automation process can be simplified by a shell script.

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#### What are Pipes? Explain use of pipes.

A pipe is a chain of processes so that output of one process (stdout) is fed an input (stdin) to another. UNIX shell has a special syntax for creation of pipelines. The commands are written in sequence separated by |. Different filters are used for Pipes like AWK, GREP.

e.g. sort file | lpr ( sort the file and send it to printer)

Uses of Pipe

- Several powerful functions can be in a single statement
- Streams of processes can be redirected to user specified locations using

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#### Explain trap command, shift Command, getopt command of linux.

Trap command: controls the action to be taken by the shell when a signal is received.

Trap [OPTIONS] [ [arg] signspec..]

Arg is the action to be taken or executed on receiving a signal specified in signspec.

e.g. trap "rm \$FILE; exit" // exit (signal) and remove file (action)

Shift Command: Using shift command, command line arguments can be accessed. The command causes the positional parameters shift to the left. Shift [n] where n defaults to 1. It is useful when several parameters need to be tested.

Getopts command: this command is used to parse arguments passed. It examines the next command line argument and determines whether it is a valid option

Getopts {optstring} {variable1}. Here, optstring contains letters to be recognized if a letter is followed by a colon, an argument should be specified. E.g (whether the argument begins with a minus sign and is followed by any single letter contained inside options ) If not, diagnostic messages are shown. It is usually executed inside a loop.

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#### What Stateless Linux server? What feature it offers?

A stateless Linux server is a centralized server in which no state exists on the single workstations. There may be scenarios when a state of a particular system is meaningful (A snap shot is taken then) and the user wants all the other machines to be in that state. This is where the stateless Linux server comes into picture.

Features:

- It stores the prototypes of every machine
  - It stores snapshots taken for those systems
  - It stores home directories for those systems
  - Uses LDAP containing information of all systems to assist in finding out which snapshot (of state) should be running on which system.
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[What does nslookup do? Explain its two modes.](#)

Nslookup is used to find details related to a Domain name server. Details like IP addresses of a machine, MX records, servers etc. It sends a domain name query packet to the corresponding DNS.

Nslookup has two modes. Interactive and non interactive. Interactive mode allows the user to interact by querying information about different hosts and domains.

Non interactive mode is used to fetch information about the specified host or domain.

Interactive mode:

Nslookup [options] [server]

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[What is Bash Shell?](#)

Bash is a free shell for UNIX. It is the default shell for most UNIX systems. It has a combination of the C and Korn shell features. Bash shell is not portable. any Bash-specific feature will not function on a system using the Bourne shell or one of its replacements, unless bash is installed as a secondary shell and the script begins with #!/bin/bash. It supports regular and expressions. When bash script starts, it executes commands of different scripts.

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[Explain some Network-Monitoring Tools in Linux: ping, traceroute, tcpdump, ntop](#)

Network monitoring tools are used to monitor the network, systems present on the network, traffic etc.

**Ping:** Ping command is used to check if the system is in the network or not. To check if the host is operating.

e.g. ping ip\_address

When the command is executed, it returns a detailed summary of the host. Packets sent, received, lost by estimating the round trip time.

**Traceroute:** the command is used to trace the path taken by the packet across a network. Tracing the path here means finding out the hosts visited by the packet to reach its destination. This information is useful in debugging. Roundtrip time in ms is shown for every visit to a host.

**Tcpdump:** commonly used to monitor network traffic. Tedump captures and displays packet headers and matching them against criteria or all. It interprets Boolean operators and accepts host names, ip address, network names as arguments.

**Ntop:** Network top shows the network usage. It displays summary of network usage by machines on the network in a format as of UNIX top utility. It can also be run in web mode, which allows the display to be browsed with a web browser. It can display network traffic statistics, identify host etc. Interfaces are available to view such information.

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## How does the linux file system work?

Linux file structure is a tree like structure. It starts from the root directory, represented by '/', and then expands into sub-directories. All the partitions are under the root directory. If a partition is mounted (The mount point defines the place of a particular data set in the file system) anywhere apart from a "device", the system is not aware of the existence of that partition or device. Directories that are only one level below the root directory are often preceded by a slash, to indicate their position.

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Explain file system of linux. The root "/" filesystem, /usr filesystem, /var filesystem, /home filesystem, /proc filesystem.

**Root "/" file system:** The kernel needs a root file system to mount at start up. The root file system is generally small and should not be changed often as it may interrupt in booting. The root directory usually does not have the critical files. Instead sub directories are created. E.g. /bin (commands needed during bootstrap), /etc (config files), /lib(shared libraries).

**/usr filesystem :** this file system is generally large as it contains the executable files to be shared amongst different machines. Files are usually the ones installed while installing Linux. This makes it possible to update the system from a new version of the distribution, or even a completely new distribution, without having to install all programs again. Sub directories include /bin, /include, /lib, /local (for local executables)

**/var filesystem :** this file system is specific to local systems. It is called as var because the data keeps changing. The sub directories include /cache/man (A cache for man pages), /games (any variable data belong to games), /lib (files that change), /log (log from different programs), /tmp (for temporary files)

**/home filesystem:** - this file system differs from host to host. User specific configuration files for applications are stored in the user's home directory in a file. UNIX creates directories for all users directory. E.g /home/my\_name. Once the user is logged in ; he is placed in his home directory.

**/proc filesystem :** this file system does not exist on the hard disk. It is created by the kernel in its memory to provide information about the system. This information is usually about the processes. Contains a hierarchy of special files which represent the current state of the kernel .Few of the Directories include /1 (directory with information about process num 1, where 1 is the identification number), /cpuinfo (information about cpu), /devices (information about devices installed), /filesystem (file systems configured), /net (information about network protocols), /mem (memory usage)

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## What are the process states in Linux?

Process states in Linux:

**Running:** Process is either running or ready to run

**Interruptible:** a Blocked state of a process and waiting for an event or signal from another process

**Uninterruptible:** a blocked state. Process waits for a hardware condition and cannot handle any signal

**Stopped:** Process is stopped or halted and can be restarted by some other process

**Zombie:** process terminated, but information is still there in the process table.

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## What is a zombie?

Zombie is a process state when the child dies before the parent process. In this case the structural information of the process is still in the process table. Since this process is not alive, it cannot react to signals. Zombie state can finish when the parent dies. All resources of the zombie state process are cleared by the kernel

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Explain each system calls used for process management in linux.

System calls used for Process management:

Fork () :- Used to create a new process

Exec() :- Execute a new program

Wait():- wait until the process finishes execution

Exit():- Exit from the process

Getpid():- get the unique process id of the process

Getppid():- get the parent process unique id

Nice():- to bias the existing property of process

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Which command is used to check the number of files and disk space used and the each user's defined quota?

repquota command is used to check the status of the user's quota along with the disk space and number of files used. This command gives a summary of the user's quota that how much space and files are left for the user. Every user has a defined quota in Linux. This is done mainly for the security, as some users have only limited access to files. This provides a security to the files from unwanted access. The quota can be given to a single user or to a group of users.

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What is the name and path of the main system log?

By default the main system log is /var/log/messages. This file contains all the messages and the script written by the user. By default all scripts are saved in this file. This is the standard system log file, which contains messages from all system software, non-kernel boot issues, and messages that go to 'dmesg'. dmesg is a system file that is written upon system boot.

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How secured is Linux? Explain.

Security is the most important aspect of an operating system. Due to its unique authentication module, Linux is considered as more secured than other operating systems. Linux consists of PAM. PAM is Pluggable Authentication Modules. It provides a layer between applications and actual authentication mechanism. It is a library of loadable modules which are called by the application for authentication. It also allows the administrator to control when a user can log in. All PAM applications are configured in the directory "/etc/pam.d" or in a file "/etc/pam.conf". PAM is controlled using the configuration file or the configuration directory.

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Can Linux computer be made a router so that several machines may share a single Internet connection? How?

Yes a Linux machine can be made a router. This is called "IP Masquerade." IP Masquerade is a networking function in Linux similar to the one-to-many (1: Many) NAT (Network Address Translation) servers found in many commercial firewalls and network routers. The IP Masquerade feature allows other "internal" computers connected to this Linux box (via PPP, Ethernet, etc.) to also reach the Internet as well. Linux IP Masquerading allows this functionality even if the internal computers do not have IP addresses.

The IP masquerading can be done by the following steps:

1. The Linux PC must have an internet connection and a connection to LAN. Typically, the Linux PC has two network interfaces-an Ethernet card for the LAN and a dial-up PPP connection to the Internet (through an ISP).

2. All other systems on your LAN use the Linux PC as the default gateway for TCP/IP networking. Use the same ISP-provided DNS addresses on all systems.
  3. Enable IP forwarding in the kernel. By default the IP forwarding is not enabled. To ensure that IP forwarding is enabled when you reboot your system, place this command in the `/etc/rc.d/rc.local` file.
  4. Run `/sbin/iptables`-the IP packet filter administration program-to set up the rules that enable the Linux PC to masquerade for your LAN.
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#### What is the minimum number of partitions you need to install Linux?

Minimum 2 partitions are needed for installing Linux. The one is `/` or root which contains all the files and the other is swap. Linux file system is function specific which means that files and folders are organized according to their functionality. For example, all executables are in one folder, all devices in another, all libraries in another and so on. `/` or 'root' is the base of this file system. All the other folders are under this one. `/` can be consider as C: .Swap is a partition that will be used as virtual memory. If there is no more available RAM a Linux computer will use an area of the hard disk, called swap, to temporarily store data. In other words it is a way of expanding your computers RAM.

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#### Which command is used to review boot messages?

`dmesg` command is used to review boot messages. This command will display system messages contained in the kernel ring buffer. We can use this command immediately after booting to see boot messages. A ring buffer is a buffer of fixed size for which any new data added to it overwrites the oldest data in it. Its basic syntax is

```
dmesg [options]
```

Invoking `dmesg` without any of its options causes it to write all the kernel messages to standard output. This usually produces far too many lines to fit into the display screen all at once, and thus only the final messages are visible. However, the output can be redirected to the `less` command through the use of a pipe, thereby allowing the startup messages to be viewed on one screen at a time

```
dmesg | less
```

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#### Which utility is used to make automate rotation of a log?

`logrotate` command is used to make automate rotation of log.

Syntax of the command is:

```
logrotate [-dv] [-f] [-s] config_file+
```

It allows automatic rotation, compression, removal, and mailing of log files. This command is mainly used for rotating and compressing log files.

This job is done every day when a log file becomes too large. This command can also be run by giving on command line. We can done force rotation by giving `-f` option with this command in command line. This command is also used for mailing. We can give `-m` option for mailing with this command. This option takes two arguments one is subject and other is recipient name.

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#### What are the partitions created on the mail server hard drive?

The main partitions are done firstly which are root, swap and boot partition. But for the mail server three different partitions are also done which are as follows:

1. `/var/spool`- This is done so that if something goes wrong with the mail server or spool than the output cannot overrun the file system.



2. /tmp- putting this on its own partition prevents any user item or software from overrunning the system files.
  3. /home- putting this on its own is useful for system upgrades or reinstalls. It allow not to wipe off the /home hierarchy along with other areas.
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#### What are the fields in the/etc/passwd file?

It contains all the information of the users who log into the system. It contains a list of the system's accounts, giving for each account some useful information like user ID, group ID, home directory, shell, etc. It should have general read permission as many utilities, like ls use it to map user IDs to user names, but write access only for the superuser (root). The main fields of /etc/passwd file are:

1. Username: It is used when user logs in. It should be between 1 and 32 characters in length.
  2. Password: An x character indicates that encrypted password is stored in /etc/shadow file.
  3. User ID (UID): Each user must be assigned a user ID (UID). UID 0 (zero) is reserved for root and UIDs 1-99 are reserved for other predefined accounts. Further UID 100-999 are reserved by system for administrative and system accounts/groups.
  4. Group ID (GID): The primary group ID (stored in /etc/group file)
  5. User ID Info: The comment field. It allow you to add extra information about the users such as user's full name, phone number etc. This field use by finger command.
  6. Home directory: The absolute path to the directory the user will be in when they log in. If this directory does not exists then users directory becomes /
  7. Command/shell: The absolute path of a command or shell (/bin/bash). Typically, this is a shell.
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#### Which commands are used to set a processor-intensive job to use less CPU time?

nice command is used for changing priority of the jobs.

Syntax: nice [OPTION] [COMMAND [ARG]...]

Range of priority goes from -20 (highest priority) to 19 (lowest). Priority is given to a job so that the most important job is executed first by the kernel and then the other least important jobs. This takes less CPU times as the jobs are scheduled and are given priorities so the CPU executes fast. The priority is given by numbers like -20 describe the highest priority and 19 describe the least priority.

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#### How to change window manager by editing your home directory?

/.xinitrc file allows changing the window manager we want to use when logging into X from that account. The dot in the file name shows you that the file is a hidden file and doesn't show when you do a normal directory listing. For setting a window manager we have to save a command in this file. The syntax of command is: exec windowmanager. After this, save the file. Next time when you run a startx a new window manager will open and become default. The commands for starting some popular window managers and desktop environments are:

- KDE = startkde
  - Gnome = gnome-session
  - Blackbox = blackbox
  - FVWM = fvwm
  - Window Maker = wmaker
  - IceWM = icewm
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#### How documentation of an application is stored?

When a new application is installed its documentation is also installed. This documentation is stored under the directory named for application. For example if my application name is App1 then the path of the documentation will be /user/doc/App1. It contains all the information about the application. It contains date of creating application, name of application and other important module of the application. We can get the basic information of application from the documentation.

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#### How shadow passwords are given?

pwconv command is used for giving shadow passwords. Shadow passwords are given for better system security. The pwconv command creates the file /etc/shadow and changes all passwords to 'x' in the /etc/passwd file. First, entries in the shadowed file which don't exist in the main file are removed. Then, shadowed entries which don't have 'x' as the password in the main file are updated. Any missing shadowed entries are added. Finally, passwords in the main file are replaced with 'x'. These programs can be used for initial conversion as well to update the shadowed file if the main file is edited by hand.

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#### How do you create a new user account?

useradd command is used for creating a new user account. When invoked without the -D option, the useradd command creates a new user account using the values specified on the command line and the default values from the system. The new user account will be entered into the system files as needed, and initial files copied, depending on the command line options. This command uses the system default as home directory. If -m option is given then the home directory is made.

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#### Which password package is installed for the security of central password?

Shadow password packages are used for security of central passwords. Security is the most important aspect of every operating system. When this package is not installed the user information including passwords is stored in the /etc/passwd file. The password is stored in an encoded format. These encoded forms can be easily identified by the System crackers by randomly encoding the passwords from dictionaries. The Shadow Package solves the problem by relocating the passwords to another file (usually /etc/shadow). The /etc/shadow file is set so that it cannot be read by just anyone. Only root will be able to read and write to the /etc/shadow file.

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#### Which shell do you assign to a POP3 mail-only account?

POP3 mail only account is assigned to the /bin/false shell. However, assigning bash shell to a POP3 mail only gives user login access, which is avoided. /bin/nologin can also be used. This shell is provided to the user when we don't want to give shell access to the user. The user cannot access the shell and it reject shell login on the server like on telnet. It is mainly for the security of the shells. POP3 is basically used for downloading mail to mail program. So for illegal downloading of emails on the shell this account is assigned to the /bin/false shell or /bin/nologin. These both shells are same they both do the same work of rejecting the user login to the shell. The main difference between these two shells is that false shell shows the incorrect code and any unusual coding when user login with it. But the nologin shell simply tells that no such account is available. So nologin shell is used mostly in Linux.

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#### Which daemon is responsible for tracking events on Linux system?

syslogd is responsible for tracking system information and save it to the desired log files. It provides two system utilities which provide system logging and kernel message trapping. Internet and UNIX domain sockets support enable this utility package to support both local and remote logging. Every logged message contains at least a time and a hostname field, normally a program name field, too. So to track these information this daemon is used. syslogd mainly reacts to the set of signals given by the user. These are the signals given to syslogd: SIGHUP: This lets syslogd perform a re-initialization. All open files are closed, the configuration file (default is /etc/syslog.conf) will be reread and the syslog facility is started again. SIGTERM: The syslogd will die. SIGINT, SIGQUIT: If debugging is enabled these are ignored, otherwise syslogd will die. SIGUSR1: Switch debugging on/off. This option can only be used if syslogd is started with the -d debug option. SIGCHLD: Wait for Childs if some were born, because of waiting messages.

Which daemon is used for scheduling of the commands?

The crontab command is used for scheduling of the commands to run at a later time. SYNTAX

```
crontab [-u user] file
```

```
crontab [-u user] { -l | -r | -e }
```

Options

-l List - display the current crontab entries.

-r Remove the current crontab.

-e Edit the current crontab using the editor specified by the VISUAL or EDITOR environment variables.

When user exits from the editor, the modified crontab will be installed automatically. Each user can have their own crontab, and though these are files in /var, they are not intended to be edited directly. If the -u option is given than the crontab gives the name of the user whose crontab is to be tweaked. If it is given without this then it will display the crontab of the user who is executing the command.

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[How environment variable is set so that the file permission can be automatically set to the newly created files?](#)

umask command is used to set file permission on newly created files automatically.

Syntax

```
umask [-p] [-S] [mode]
```

It is represented in octal numbers. We can simply use this command without arguments to see the current file permissions. To change the permissions, mode is given in the arguments. The default umask used for normal user is 0002. The default umask for the root user is 0022. For calculating the original values, the values shown by the umask must be subtracted by the default values. It is mainly used for masking of the file and directory permission. The /etc/profile script is where the umask command is usually set for all users. The -S option can be used to see the current default permissions displayed in the alpha symbolic format.

For example, umask 022 ensures that new files will have at most 755 permissions (777 NAND 022).

The permissions can be calculated by taking the NAND of original value with the default values of files and directories.

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