Linux is a UNIX-base operating system. Its original creator was a Finnish student name [Linus Torvalds](http://en.wikipedia.org/wiki/Linus_Torvalds" \o "Linus Torvalds Wiki Page" \t "_blank), although being ‘open source’ it has changed a great deal since its original conception. It belongs to nobody and is free to download and use. Any changes to it are open for all to adopt, and as a result, it has developed into a very powerful OS that is rapidly gaining in popularity worldwide, particularly among those seeking an alternative to Windows.

In 1991, hardware was expanding rapidly, and DOS was the king of operating systems. Software development was slower, and Macs, while better, were also much pricier than PCs. UNIX was growing, but at that time in its history, the source code was jealously guarded and expensive to use.

Linus Torvalds was a Helsinki university student who liked playing around with software and computers, and in 1991 he announced the creation of a new core operating system that he had named Linux.

**What is Linux?**

Just like Windows XP, Windows 7, Windows 8, and Mac OS X, Linux is an operating system. An operating system is software that manages all of the hardware resources associated with your desktop or laptop. To put it simply – the operating system manages the communication between your software and your hardware. Without the operating system (often referred to as the “OS”), the software wouldn’t function.

The OS is comprised of a number of pieces:

* **The Bootloader:** The software that manages the boot process of your computer. For most users, this will simply be a splash screen that pops up and eventually goes away to boot into the operating system.
* **The kernel:** This is the one piece of the whole that is actually called “Linux”. The kernel is the core of the system and manages the CPU, memory, and peripheral devices. The kernel is the “lowest” level of the OS.
* **Daemons:** These are background services (printing, sound, scheduling, etc) that either start up during boot, or after you log into the desktop.
* **The Shell:** You’ve probably heard mention of the Linux command line. This is the shell – a command process that allows you to control the computer via commands typed into a text interface. This is what, at one time, scared people away from Linux the most (assuming they had to learn a seemingly archaic command line structure to make Linux work). This is no longer the case. With modern desktop Linux, there is no need to ever touch the command line.
* **Graphical Server:** This is the sub-system that displays the graphics on your monitor. It is commonly referred to as the X server or just “X”.
* **Desktop Environment:** This is the piece of the puzzle that the users actually interact with. There are many desktop environments to choose from (Unity, GNOME, Cinnamon, Enlightenment, KDE, XFCE, etc). Each desktop environment includes built-in applications (such as file managers, configuration tools, web browsers, games, etc).

**Advantage Of Linux**

**Low cost:**

You don’t need to spend time and money to obtain licenses since Linux and much of its software come with the GNU General Public License. You can start to work immediately without worrying that your software may stop working anytime because the free trial version expires

**Stability:**

Linux doesn’t need to be rebooted periodically to maintain performance levels. It doesn’t freeze up or slow down over time due to memory leaks and such. Continuous up-times of hundreds of days (up to a year or more) are not uncommon.

**Performance:**

Linux provides persistent high performance on workstations and on networks. It can handle unusually large numbers of users simultaneously, and can make old computers sufficiently responsive to be useful again.

**Network friendliness:**

Linux was developed by a group of programmers over the Internet and has therefore strong support for network functionality; client and server systems can be easily set up on any computer running Linux. It can perform tasks such as network backups faster and more reliably than alternative systems

**Flexibility:**

Linux can be used for high performance server applications, desktop applications, and embedded systems. You can save disk space by only installing the components needed for a particular use. You can restrict the use of specific computers by installing for example only selected office applications instead of the whole suite

**Compatibility:**

It runs all common Unix software packages and can process all common file formats.

**Security:**

Linux is one of the most secure operating systems. “Walls” and flexible file access permission systems prevent access by unwanted visitors or viruses. Linux users have to option to select and safely download software, free of charge, from online repositories containing thousands of high quality packages.

**Open Source:**

If you develop software that requires knowledge or modification of the operating system code, Linux’s source code is at your fingertips. Most Linux applications are Open Source as well.

As an Operating System, some of Linux features are:

* Portable(Multiplatform)
* Multitasking
* Multi User
* Virtual Memory
* Hierarchical File System
* Multiple Virtual Consoles
* Multitple Filesystem Support
* Multiple Networking Protocols (TCP/IP, IPX/SPX, Appletalk, AX.25)

**Disadvantages of Linux**

Linux has patchier support for drivers (the software which coordinates your hardware and your operating system). This means you’ll sometimes find it trickier to get a new device set up.

Linux is, for new users at least, not as easy to use as Windows. That’s largely because Linux gives you more control, but does mean you’ll have to spend some time getting used to the way it works.

Because Linux is neither as popular as Windows, nor a commercial product, support works in a different way. You may have to look harder to find the answer to a problem and, while Linux supporters are more likely to offer help, it may not always match your own level of technical understanding.

## File system Support

Linux use Ext2, Ext3, Ext4, Jfs, ReiserFS, FAT format.

## Linux Distribution Names

A few popular names:  
Redhat Enterprise Linux, Fedora Linux, Debian Linux, Suse Enterprise Linux, Ubuntu Linux

1. / – Root

* Every single file and directory starts from the root directory.
* Only root user has write privilege under this directory.
* Please note that /root is root user’s home directory, which is not same as /.

2. /bin – User Binaries

* Contains binary executables.
* Common linux commands you need to use in single-user modes are located under this directory.
* Commands used by all the users of the system are located here.
* For example: ps, ls, ping, grep, cp.

3. /sbin – System Binaries

* Just like /bin, /sbin also contains binary executables.
* But, the linux commands located under this directory are used typically by system aministrator, for system maintenance purpose.
* For example: iptables, reboot, fdisk, ifconfig, swapon

4. /etc – Configuration Files

* Contains configuration files required by all programs.
* This also contains startup and shutdown shell scripts used to start/stop individual programs.
* For example: /etc/resolv.conf, /etc/logrotate.conf

5. /dev – Device Files

* Contains device files.
* These include terminal devices, usb, or any device attached to the system.
* For example: /dev/tty1, /dev/usbmon0

6. /proc – Process Information

* Contains information about system process.
* This is a pseudo filesystem contains information about running process. For example: /proc/{pid} directory contains information about the process with that particular pid.
* This is a virtual filesystem with text information about system resources. For example: /proc/uptime

7. /var – Variable Files

* var stands for variable files.
* Content of the files that are expected to grow can be found under this directory.
* This includes — system log files (/var/log); packages and database files (/var/lib); emails (/var/mail); print queues (/var/spool); lock files (/var/lock); temp files needed across reboots (/var/tmp);

8. /tmp – Temporary Files

* Directory that contains temporary files created by system and users.
* Files under this directory are deleted when system is rebooted.

9. /usr – User Programs

* Contains binaries, libraries, documentation, and source-code for second level programs.
* /usr/bin contains binary files for user programs. If you can’t find a user binary under /bin, look under /usr/bin. For example: at, awk, cc, less, scp
* /usr/sbin contains binary files for system administrators. If you can’t find a system binary under /sbin, look under /usr/sbin. For example: atd, cron, sshd, useradd, userdel
* /usr/lib contains libraries for /usr/bin and /usr/sbin
* /usr/local contains users programs that you install from source. For example, when you install apache from source, it goes under /usr/local/apache2

10. /home – Home Directories

* Home directories for all users to store their personal files.
* For example: /home/john, /home/nikita

11. /boot – Boot Loader Files

* Contains boot loader related files.
* Kernel initrd, vmlinux, grub files are located under /boot
* For example: initrd.img-2.6.32-24-generic, vmlinuz-2.6.32-24-generic

12. /lib – System Libraries

* Contains library files that supports the binaries located under /bin and /sbin
* Library filenames are either ld\* or lib\*.so.\*
* For example: ld-2.11.1.so, libncurses.so.5.7

13. /opt – Optional add-on Applications

* opt stands for optional.
* Contains add-on applications from individual vendors.
* add-on applications should be installed under either /opt/ or /opt/ sub-directory.

14. /mnt – Mount Directory

* Temporary mount directory where sysadmins can mount filesystems.

15. /media – Removable Media Devices

* Temporary mount directory for removable devices.
* For examples, /media/cdrom for CD-ROM; /media/floppy for floppy drives; /media/cdrecorder for CD writer

16. /srv – Service Data

* srv stands for service.
* Contains server specific services related data.
* For example, /srv/cvs contains CVS related data.

**Redhat Enterprises Linux-2.1:-**

|  |  |
| --- | --- |
| **Release/Update** | **General Availability Date** |
| RHEL 2.1 Update 7 | 28-04-2005 |
| RHEL 2.1 Update 6 | 13-12-2004 |
| RHEL 2.1 Update 5 | 18-08-2004 |
| RHEL 2.1 Update 4 | 21-04-2004 |
| RHEL 2.1 Update 3 | 19-12-2004 |
| RHEL 2.1 Update 2 | 29-03-2003 |
| RHEL 2.1 Update 1 | 14-02-2003 |
| RHEL 2.1 GA | 23-03-2002 |

**Redhat Enterprises Linux-3:-**

|  |  |
| --- | --- |
| **Release/Update** | **General Availability Date** |
| RHEL 3 Update 9 | 20-06-2007 |
| RHEL 3 Update 8 | 20-07-2006 |
| RHEL 3 Update 7 | 17-03-2006 |
| RHEL 3 Update 6 | 28-09-2005 |
| RHEL 3 Update 5 | 18-05-2005 |
| RHEL 3 Update 4 | 12-12-2004 |
| RHEL 3 Update 3 | 03-09-2004 |
| RHEL 3 Update 2 | 12-05-2004 |
| RHEL 3 Update 1 | 16-01-2004 |
| RHEL 3 GA | 22-10-2003 |

**Redhat Enterprises Linux-4:-**

|  |  |
| --- | --- |
| **Release/Update** | **General Availability Date** |
| RHEL 4 Update 9 | 16-02-2011 |
| RHEL 4 Update 8 | 19-05-2009 |
| RHEL 4 Update 7 | 29-07-2008 |
| RHEL 4 Update 6 | 15-11-2007 |
| RHEL 4 Update 5 | 01-05-2007 |
| RHEL 4 Update 4 | 10-08-2006 |
| RHEL 4 Update 3 | 12-03-2006 |
| RHEL 4 Update 2 | 05-10-2005 |
| RHEL 4 Update 1 | 08-06-2005 |
| RHEL 4 GA | 15-02-2005 |

**Redhat Enterprises Linux-5:-**

|  |  |
| --- | --- |
| **Release** | **General Availability Date** |
| RHEL 5.11 | 16-09-2014 |
| RHEL 5.10 | 01-10-2013 |
| RHEL 5.9 | 07-01-2013 |
| RHEL 5.8 | 20-02-2012 |
| RHEL 5.7 | 21-07-2011 |
| RHEL 5.6 | 13-01-2011 |
| RHEL 5.5 | 30-03-2010 |
| RHEL 5.4 | 02-09-2009 |
| RHEL 5.3 | 20-01-2009 |
| RHEL 5.2 | 21-05-2008 |
| RHEL 5. 1 | 07-11-2007 |
| RHEL 5.0 | 15-03-2007 |

Codename: Tikanga (based on Fedora Core 6)

**Redhat Enterprises Linux-6:-**

|  |  |
| --- | --- |
| **Release** | **General Availability Date** |
| RHEL 6.10 | 19-06-2018 |
| RHEL 6.9 | 21-03-2017 |
| RHEL 6.8 | 10-05-2016 |
| RHEL 6.7 | 22-07-2015 |
| RHEL 6.6 | 14-10-2014 |
| RHEL 6.5 | 21-11-2013 |
| RHEL 6.4 | 21-02-2013 |
| RHEL 6.3 | 20-06-2012 |
| RHEL 6.2 | 06-12-2011 |
| RHEL 6.1 | 19-05-2011 |
| RHEL 6.0 | 09-11-2010 |

Codename: Santiago (based on a mix of Fedora 12, Fedora 13, and several modifications)

**Redhat Enterprises Linux-7:-**

|  |  |  |
| --- | --- | --- |
| **Release** | **General Availability Date** | **Kernel Version** |
| RHEL 7.6 | 30-10-2018 | 3.10.0-957 |
| RHEL 7.5 | 10-04-2018 | 3.10.0-862 |
| RHEL 7.4 | 31-07-2017 | 3.10.0-693 |
| RHEL 7.3 | 03-11-2016 | 3.10.0-514 |
| RHEL 7.2 | 19-11-2015 | 3.10.0-327 |
| RHEL 7.1 | 05-03-2015 | 3.10.0-229 |
| RHEL 7.0 GA | 09-06-2014 | 3.10.0-123 |
| RHEL 7.0 Beta | 11-12-2013 | 3.10.0-54.0.1 |

Codename: Maipo (based on a mix of Fedora 19, Fedora 20, and several modifications)

**Linux File Systems: Ext2 vs Ext3 vs Ext4 vs Xfs**

**ext2, ext3 and ext4 are all filesystems created for Linux. This article explains the following:**

* **High level difference between these filesystems.**
* **How to create these filesystems.**
* **How to convert from one filesystem type to another.**

### Ext2

* **Ext2 stands for second extended file system.**
* **It was introduced in 1993. Developed by Rémy Card.**
* **This was developed to overcome the limitation of the original ext file system.**
* **Ext2 does not have journaling feature.**
* **On flash drives, usb drives, ext2 is recommended, as it doesn’t need to do the over head of journaling.**
* **Maximum individual file size can be from 16 GB to 2 TB**
* **Overall ext2 file system size can be from 2 TB to 32 TB**

**How to create an ext2 filesystem**

**# mke2fs /dev/sda1**

### Ext3

* **Ext3 stands for third extended file system.**
* **It was introduced in 2001. Developed by Stephen Tweedie.**
* **Starting from Linux Kernel 2.4.15 ext3 was available.**
* **The main benefit of ext3 is that it allows journaling.**
* **Journaling has a dedicated area in the file system, where all the changes are tracked. When the system crashes, the possibility of file system corruption is less because of journaling.**
* **Maximum individual file size can be from 16 GB to 2 TB**
* **Overall ext3 file system size can be from 2 TB to 32 TB**
* **You can convert a ext2 file system to ext3 file system directly (without backup/restore).**

**How to create ext3 file system :-**

**# mkfs.ext3 /dev/sda1**

**(or)**

**# mke2fs –j /dev/sda1**

**( -j for adding journaling capability )**

**How to  convert  ext2 to ext3 :-**

**# umount /dev/sda2**

**# tune2fs -j /dev/sda2**

**# mount /dev/sda2  /var**

### Ext4

* **Ext4 stands for fourth extended file system.**
* **It was introduced in 2008.**
* **Starting from Linux Kernel 2.6.19 ext4 was available.**
* **Supports huge individual file size and overall file system size.**
* **Maximum individual file size can be from 16 GB to 16 TB**
* **Overall maximum ext4 file system size is 1 EB (exabyte). 1 EB = 1024 PB (petabyte). 1 PB = 1024 TB (terabyte).**
* **Directory can contain a maximum of 64,000 subdirectories (as opposed to 32,000 in ext3)**
* **You can also mount an existing ext3 fs as ext4 fs (without having to upgrade it).**
* **Several other new features are introduced in ext4: multiblock allocation, delayed allocation, journal checksum. fast fsck, etc. All you need to know is that these new features have improved the performance and reliability of the filesystem when compared to ext3.**
* **In ext4, you also have the option of turning the journaling feature “off”.**

**Creating ext4 file system :-**

**# mkfs.ext4 /dev/sda1**

**(or)**

**# mke2fs -t ext4 /dev/sda1**

**Converting ext3 to ext4**

**( Warning :- Never try this live or production servers )**

**# umount /dev/sda2**

**# tune2fs -O extents,uninit\_bg,dir\_index  /dev/sda2**

**# e2fsck -pf /dev/sda2**

**# mount /dev/sda2 /var**

**Find your servers filesystem type**

**We can find the filesystem type used in our servers using any one of the following commands**

**# mount**

**/dev/sda3 on / type ext3 (rw)**

**proc on /proc type proc (rw)**

**/dev/sda1 on /boot type ext3 (rw)**

**tmpfs on /dev/shm type tmpfs (rw)**

**# file -sL /dev/sda1**

**/dev/sda1: Linux rev 1.0 ext3 filesystem data (needs journal recovery)**

**# df -T | awk ‘{print $1,$2,$7}’ | grep “^/dev”**

**/dev/sda3 ext3 /**

**/dev/sda1 ext3 /boot**

**XFS**

**The XFS file system is an extension of the extent file system .XFS is a high performance 64 bit journaling file system .Support of XFS  
was merged into the linux kernel in around 2002 and In 2009 Red Hat Enterprise Linux version 5.4 usage of XFS file system .  
Now RHEL 7.0 uses XFS as the default file system .**  
**XFS supports maximum file system size of 8 exbibytes for 64 bit file system .Some comparison of XFS file system is XFS file system cannot be shrunk and poor performance with  
deletions of large numbers of files.**  
**32-bit system 64-bit system  
File size: 16 Terabytes 16 Exabytes  
File system: 16 Terabytes 18 Exabytes**  
 **Creating Xfs file system**

**#fdisk /dev/sdb** <-create font="" partition="" the="">

**#mkfs.xfs -f /dev/sdb1**

**#mount -t xfs /dev/sdb1 /storage**

**#df -Th /storage**  
**#############################################################**

**GRUB**

GRUB is a [boot loader](https://searchdatacenter.techtarget.com/definition/boot-loader-boot-manager) package that supports multiple operating systems on a computer. During [boot](https://searchwindowsserver.techtarget.com/definition/boot)-up, the user can select the operating system to run. GNU GRUB is based on an earlier multiboot package, [GRUB (GRand Unified Bootloader)](https://whatis.techtarget.com/definition/GRUB-GRand-Unified-Bootloader). GRUB is most often used on [Unix](https://searchdatacenter.techtarget.com/definition/Unix)-like systems, including GNU, [Linux](https://searchdatacenter.techtarget.com/definition/Linux-operating-system) and [Solaris](https://searchoracle.techtarget.com/definition/Solaris).

Some features of GRUB:

* It can support an unlimited number of boot entries.
* GRUB is dynamically configurable, which means that users can make changes during boot-up.
* GRUB can install to and run from any device, including hard drives, floppy disks, [DVD](https://searchstorage.techtarget.com/definition/DVD)s, [CD-ROM](https://whatis.techtarget.com/definition/CD-ROM)s and [USB drive](https://searchstorage.techtarget.com/definition/USB-drive)s.
* It can decompress operating systems before launching them.
* It can load operating systems from various locations, including networks.
* It doesn't need to be re-written each time a configuration file is changed.

## The GRUB2 configuration file /boot/grub2/grub.cfg

– Starting RHEL 7 GRUB 2 is the bootloader. The GRUB 2 configuration file is **/boot/grub2/grub.cfg**.  
– Do not edit this file directly. Use the **grub2-mkconfig** command to generate grub.cfg. This command uses the template scripts in **/etc/grub.d** and menu-configuration settings taken from **/etc/default/grub** when generating grub.cfg.  
– The **/etc/grub2.cfg** file is a symbolic link to /boot/grub2/grub.cfg.

# grub2-mkconfig –o /boot/grub2/grub.cfg

# What is LILO (Linux Loader)?

LILO stands for Linux Loader that is used to load Linux into memory. It can boot operating systems from floppy disks, hard disks, and it does not depend on a specific file system. Lilo handles some tasks such as locate the kernel, identify other supporting programs, load memory and starts the kernel. The configuration file of lilo is located at “/etc/lilo.conf”.

**Anaconda**

Anaconda is the installation program used by Fedora, Red Hat Enterprise Linux and [some other distributions](https://fedoraproject.org/wiki/Anaconda/Distros).

During installation, a target computer's hardware is identified and configured, and the appropriate file systems for the system's architecture are created. Finally, anaconda allows the user to install the operating system software on the target computer. anaconda can also upgrade existing installations of earlier versions of the same distribution. After the installation is complete, you can reboot into your installed system and continue doing customization using [initial setup](https://fedoraproject.org/wiki/InitialSetup).

anaconda is a fairly sophisticated installer. It supports installation from local and remote sources such as CDs and DVDs, images stored on a hard drive, NFS, HTTP, and FTP. Installation can be scripted with [kickstart](https://fedoraproject.org/wiki/Anaconda/Kickstart" \o "Anaconda/Kickstart) to provide a fully unattended installation that can be duplicated on scores of machines. It can also be run over VNC on headless machines. A variety of advanced storage devices including LVM, RAID, iSCSI, and multipath are supported from the partitioning program. anaconda provides advanced debugging features such as remote logging, access to the python interactive debugger, and remote saving of exception dumps.

The standard **LINUX kernel** supports these seven different runlevels :

* 0 – System halt *i.e* the system can be safely powered off with no activity.
* 1 – Single user mode.
* 2 – Multiple user mode with no NFS(network file system).
* 3 – Multiple user mode under the command line interface and not under the graphical user interface.
* 4 – User-definable.
* 5 – Multiple user mode under GUI (graphical user interface) and this is the standard runlevel for most of the LINUX based systems.
* 6 – Reboot which is used to restart the system.
* **TTY Definition:**  
  Teletypewriter originally and now also means any terminal on Linux/Unix systems. It also means any serial port on Unix/Linux systems.
* **PTS Definition:**  
  Stands for pseudo terminal slave.
* The difference between TTY and PTS is the type of connection to the computer. TTY ports are direct connections to the computer such as a keyboard/mouse or a serial connection to the device. PTS connections are SSH connections or telnet connections. All of these connections can connect to a shell which will allow you to issue commands to the computer. X Window and screen



Adding User Accounts

# adduser

#useradd

When a new user account is added to the system, the following operations are performed.

**1.** His/her home directory is created (/home/username by default).

**2.** The following hidden files are copied into the user’s home directory, and will be used to provide environment variables for his/her user session.

.bash\_logout

.bash\_profile

.bashrc

**3.** A mail spool is created for the user at /var/spool/mail/username.

**4.** A group is created and given the same name as the new user account.

##### **Understanding /etc/passwd**

The full account information is stored in the /etc/passwd file. This file contains a record per system user account

[username]:[x]:[UID]:[GID]:[Comment]:[Home directory]:[Default shell]

1. Fields [username] and [Comment] are self explanatory.
2. The x in the second field indicates that the account is protected by a shadowed password (in /etc/shadow), which is needed to logon as [username].
3. The [UID] and [GID] fields are integers that represent the User IDentification and the primary Group IDentification to which [username] belongs, respectively.
4. The [Home directory] indicates the absolute path to [username]’s home directory, and
5. The [Default shell] is the shell that will be made available to this user when he or she logins the system.

##### **Understanding /etc/group**

Group information is stored in the /etc/group file.

[Group name]:[Group password]:[GID]:[Group members]

1. [Group name] is the name of group.
2. An x in [Group password] indicates group passwords are not being used.
3. [GID]: same as in /etc/passwd.
4. [Group members]: a comma separated list of users who are members of [Group name].
5. # usermod --expiredate 2014-10-30 tecmint  
   #finger username  
   #chage username  
   #chage –l username
6. #userdel username
7. # usermod --append --groups root tecmint
8. # usermod --home /tmp tecmint
9. # usermod --shell /bin/sh tecmint
10. # usermod --lock tecmint
11. # usermod --unlock tecmint
12. # groupadd common\_group
13. # groupdel [group\_name]

###### Deleting user accounts

You can delete an account (along with its home directory, if it’s owned by the user, and all the files residing therein, and also the mail spool) using the userdel command with the –remove option.

# userdel --remove [username]

#### Group Management

Every time a new user account is added to the system, a group with the same name is created with the username as its only member. Other users can be added to the group later.