**DVS Technologies Aws & Devops**

Compiled and Scrutinized by

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(Senior DevOps Lead)

Words To The Students

Though we have taken utmost efforts to present you this book error free, but still it may contain some errors or mistakes. Students are encouraged to bring, if there are any mistakes or errors in this document to our notice. So that it may be rectified in the next edition of this document.

“Suppressing your doubts is Hindering your growth”.

We urge you to work hard and make use of the facilities we are providing to you, because there is no substitute for hard work. We wish you all the best for your future.

“The grass isn’t greener on the other side; the grass is greener where you water it.”

You and your suggestions are valuable to us; Help us to serve you better. In case of any suggestions, grievance, or complaints, please feel free to write us your suggestions, grievance and feedback on the following

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Linux Administration

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Introduction to Linux

Linux is a Unix clone written from scratch by Linus Torvalds with assistance from a loosely-knit team of hackers across the Net. From the start, it was Linus' goal to have a free system that was completely compliant with the original UNIX. The Linux operating system is written in the C programming language. Unix is a multitasking, multi-user computer operating system originally developed in 1969 by a group of AT&T employees at Bell Labs. Linux and Unix strive to be POSIX compliant. 64% of the world’s servers run some variant of Unix or Linux. The Android phone and the Kindle run Linux. Linux is available (also via internet) in different distributions (Suse, Fedora, Debian, Centos, Redhat etc.).It is also worth to note that modern Linux not only runs on workstations, mid- and high-end servers, but also on "gadgets" like PDA's, mobiles, a shipload of embedded applications and even on experimental wristwatches. This makes Linux the only operating system in the world covering such a wide range of hardware.

Linux is an ideal operating system for power-users and programmers, because it has been and is being developed by such people. Everything a good programmer can wish for is available: compilers, libraries, development and debugging tools. These packages come with every standard Linux distribution. The C-compiler is included for free – as opposed to many UNIX distributions demanding licensing fees for this tool. All the documentation and manuals are there, and examples are often included to help you get started in no time. It feels like UNIX and switching between UNIX and Linux is a natural thing.

Linux Pros

• Linux is free

• Linux is portable to any hardware platform

• Linux was made to keep on running

• Linux is secure and versatile

• Linux is scalable

• The Linux OS and most Linux applications have very short debug times

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Linux Cons

• There are far too many different distributions like RedHat for servers and SuSE for workstations

• Linux is not very user friendly and confusing for beginners

Differences between Linux & Unix

|  | Linux | Unix |
| --- | --- | --- |
| Introduction | Linux is an open source, free to use operating system widely used for computer hardware and software, game development, tablet PCS, mainframes etc. | Unix is an operating system commonly used  in internet servers,  workstations and PCs by Solaris, Intel, HP etc. |
| Cost | Linux can be freely distributed, downloaded freely, distributed through magazines, Books etc. There are priced versions for Linux also, but they are normally cheaper than Windows | Different flavors of Unix have different cost  structures according to vendors |
| Development and  Distribution | Linux is developed by Open Source development i.e. through sharing and collaboration of code and features through forums etc and it is distributed by various vendors. | Unix systems are divided into various other flavors, mostly developed by AT&T as well as various  commercial vendors and non-profit organizations |
| Manufacturer | Linux kernel is developed by the community. Linus Torvalds oversees things. | Three bigest distributions are Solaris (Oracle), AIX (IBM) & HP-UX Hewlett Packard. And Apple Makes OSX, an unix based os.. |

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| User | Everyone. From home users to developers and computer  enthusiasts alike. | Unix operating systems were developed mainly for  mainframes, servers and workstations except OSX, Which is designed for  everyone. The Unix  environment and the client server program model were essential elements in the development of the Internet |
| --- | --- | --- |
| Usage | Linux can be installed on a wide variety of computer hardware, ranging from mobile phones, tablet computers and video game consoles, to mainframes and supercomputers. | The UNIX operating system is used in internet servers, workstations & PCs.  Backbone of the majority of finance infrastructure and many 24x365 high  availability solutions. |
| File system  support | Ext2, Ext3, Ext4, Jfs, ReiserFS, Xfs, Btrfs, FAT, FAT32, NTFS | jfs, gpfs, hfs, hfs+, ufs, xfs, zfs format |
| Text mode  interface | BASH (Bourne Again SHell) is the Linux default shell. It can support multiple command interpreters. | Originally the Bourne Shell. Now it's compatible with many others including  BASH, Korn & C. |
| What is it? | Linux is an example of Open Source software development and Free Operating System (OS). | Unix is an operating system that is very popular in  universities, companies, big enterprises etc. |
| GUI | Linux typically provides two  GUIs, KDE and Gnome. But there are millions of alternatives such as LXDE, Xfce, Unity, Mate, twm, ect. | Initially Unix was a  command based OS, but later a GUI was created called Common Desktop Environment. Most  distributions now ship with Gnome. |
| Price | Free but support is available for a price. | Some free for development use (Solaris) but support is available for a price. |

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| Security | Linux has had about 60-100 viruses listed till date. None of them actively spreading nowadays. | A rough estimate of UNIX viruses is between 85 -120 viruses reported till date. |
| --- | --- | --- |
| Processors | Dozens of different kinds. | x86/x64, Sparc, Power,  Itanium, PA-RISC, PowerPC and many others. |
| Examples | Ubuntu, Fedora, Red Hat, Debian, Archlinux, Android etc. | OS X, Solaris, All Linux |

Why we are going for Unix Than windows

Please find the below reasons:

• Linux/Unix is more flexible and can be installed on many different types of machines, including main-frame computers, supercomputers and micro-computers.

• Linux/Unix is more stable and does not go down as often as Windows does, therefore requires less administration and maintenance.

• Linux/Unix has greater built-in security and permissions features than Windows.

• Linux/Unix possesses much greater processing power than Windows.

• Linux/Unix is the leader in serving the Web. About 90% of the Internet relies on Linux/Unix operating systems running on Apache, the world's most widely used Web server.

• Software upgrades from Microsoft often require the user to purchase new or more hardware or prerequisite software. That is not the case with Linux/Unix.

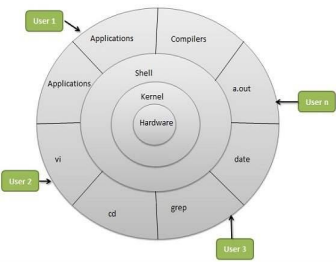
• The mostly free or inexpensive open-source operating systems, such as Linux and BSD, with their flexibility and control, are very attractive to (aspiring) computer wizards. Many of the smartest programmers are developing state-of-the-art software free of charge for the fast growing "open-source movement”.

• Linux/Unix also inspires novel approaches to software design, such as solving problems by interconnecting simpler tools instead of creating large monolithic application programs.

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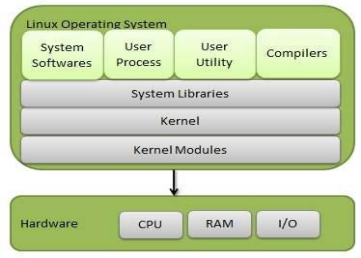
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Basic Kernel & Shell Architecture



Kernel − It is the core component of Operating System, interacts directly with hardware, provides low level services to upper layer components. Shell − An interface to kernel, hiding complexity of kernel's functions from users. The shell takes commands from the user and executes kernel's functions

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The architecture of a Linux System consists of the following layers

• Hardware layer − Hardware consists of all peripheral devices (RAM/ HDD/ CPU etc).

• Kernel − It is the core component of Operating System, interacts directly with hardware, provides low level services to upper layer components.

• Shell − An interface to kernel, hiding complexity of kernel's functions from users. The shell takes commands from the user and executes kernel's functions.

• Utilities − Utility programs that provide the user most of the functionalities of an operating systems.

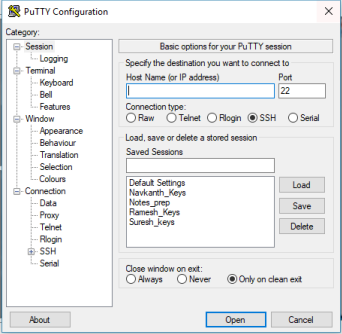
Software’s used to reach the servers

Download putty software from below site

https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

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• Install using the default settings on your computer.

• Double-click the PuTTY icon.

• Enter the UNIX/Linux server hostname in the 'Host Name' box, and press the 'Open' button at the bottom of the dialog box.

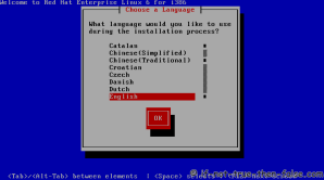
• Enter your username and password when prompted.

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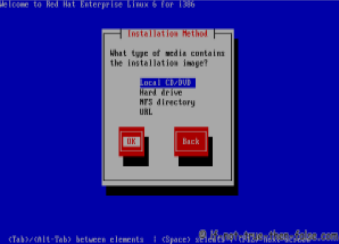
RHEL 6 Installation & Configuration

1. Select Install or upgrade an existing system option on Grub Menu 2. Choose a language

3. Choose a keyboard type

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4. Choose a installation media 

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5. Skip DVD media test (or select media test, if you want to test installation media before )

6. Red Hat 6 graphical installer starts, select next



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7. Accept Pre-Release Installation

8. Select storage devices

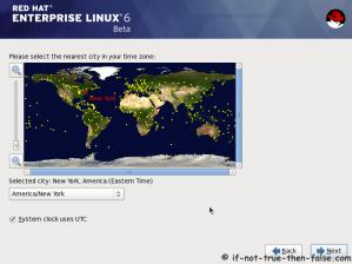
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9. Insert computer name

10. Select time zone

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11. Enter a password for root user



12. Select type of installation Read every options info carefully. And select encrypting if eeded and option to review and modify partition layout.

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13. Review partition layout

Modify if needed. Default setup with ext4 and LVM looks good for desktop machine.



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**DVS Technologies Aws & Devops** 14. Accept write changes to disc

15. Writing changes (creating partitions) to disc



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16. Configure boot loader options

Select device to install bootloader and check/create boot loader operating system list.



17. Select software’s to install and enable repositories. This case we select Software Development Workstation and enable Red Hat Enterprise Linux 6.0 Beta Repository and select Customize now.

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18. Customize package selection, Select PHP and Web Server to installation.(Optional)

Select MySQL and PostgreSQL Databases. (optional)

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Select set of Development tools like Eclipse IDE.

19. Checking dependencies for installation

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20. Starting installation process

21. Installing packages

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22. Installation is complete. Click reboot computer and remove installation media.

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Red Hat 6 RHEL Finishing Installation

23. Selecting RHEL 6 from grub



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**DVS Technologies Aws & Devops** 24. Booting Red Hat 6



25. Red Hat 6 Welcome screen



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**DVS Technologies Aws & Devops** 26. Create normal user



27. Setup date and time and keep up-to-date with NTP



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28. Login Red Hat 6 Gnome Desktop



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29. Red Hat (RHEL) 6 Gnome Desktop, empty and default look File system Hierarchy

Definition

The Linux File Hierarchy Structure or the Filesystem Hierarchy Standard (FHS) defines the directory structure and directory contents in Unix-like operating systems.It is maintained by the Linux Foundation.

• In the FHS, all files and directories appear under the root directory /, even if they are stored on different

Physical or virtual devices.

• Some of these directories only exist on a particular system if certain subsystems, such as the X Window

System, are installed.

• Most of these directories exist in all UNIX operating systems and are generally used in much the same way;

However, the descriptions here are those used specifically for the FHS, and are not considered authoritative for platforms other than Linux.

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1. / (Root) : Primary hierarchy root and root directory of the entire file system hierarchy.

• Every single file and directory starts from the root directory

• Only root user has the right to write under this directory

• /root is root user’s home directory, which is not same as /

2. /bin : Essential command binaries that need to be available in single user mode;

for all users, e.g., cat, ls, cp.

• 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 e.g. ps, ls, ping, grep,

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• Following commands are the part of this directory.



3. /boot/:

This directory contains everything required for the boot process except for configuration files not needed at boot time (the most notable of those being those that belong to the GRUB boot-loader) and the map installer. Thus, the /boot directory stores data that is used before the kernel begins executing user-mode programs.

4. /dev/:

It is the location of special or device files. It is a very interesting directory that highlights one important aspect of the Linux filesystem - everything is a file or a directory. The /dev/ directory contains file system entries which represent devices that are attached to the system. These files are essential for the system to function properly.

5. /etc :

This is the nerve center of Linux system, it contains all system related configuration files in here or in its sub-directories. A "configuration file" is defined as a local file used to control the operation of a program; it must be static and cannot be an executable binary. For this reason, it's a good idea to backup this directory regularly. It will definitely save a lot of re-configuration later if one re-installs or lose current installation. Normally, no binaries should be or are located here.

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6. /home:

Linux is a multi-user environment so each user is also assigned a specific directory that is accessible only to them and the system administrator. These are the user home directories, which can be found under '/home/$USER' (~/). It is your playground: everything is at your command, you can write files, delete them, install programs, etc.... Your home directory contains your personal configuration files, the so-called dot files (their name is preceded by a dot). Personal configuration files are usually 'hidden', if you want to see them, you either have to turn on the appropriate option in your file manager or run ls with the -a switch. If there is a conflict between personal and system wide configuration files, the settings in the personal file will prevail.

7. /initrd:

initrd provides the capability to load a RAM disk by the boot loader. This RAM disk can then be mounted as the root file system and programs can be run from it. Afterwards, a new root file system can be mounted from a different device. The previous root (from initrd) is then moved to a directory and can be subsequently unmounted. initrd is mainly designed to allow system startup to occur in two phases, where the kernel comes up with a minimum set of compiled-in drivers, and where additional modules are loaded from initrd.

8. /lib:

The /lib directory contains kernel modules and those shared library images (the C programming code library) needed to boot the system and run the commands in the root filesystem, ie. by binaries in /bin and /sbin. Libraries are readily identifiable through their filename extension of \*.so. Windows equivalent to a shared library would be a DLL (dynamically linked library) file. They are essential for basic system functionality. Kernel modules (drivers) are in the subdirectory /lib/modules/'kernel-version'. To ensure proper module compilation you should ensure that /lib/modules/'kernel version'/kernel/build points to /usr/src/'kernel-version' or ensure that the Makefile knows where the kernel source itself are located.

9. /mnt/:

The /mnt/ directory is for temporarily mounted file systems, such as CD ROMs and 3.5 diskettes.

10./opt/:

The /opt/ directory provides storage for large, static application software packages. A package placing files in the /opt/ directory creates a directory

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bearing the same name as the package. This directory, in turn, holds files that otherwise would be scattered throughout the file system, giving the system administrator an easy way to determine the role of each file within a particular package.

11./proc :

The /proc/ directory contains special files that either extract information from or send information to the kernel.

12./sbin/:

The /sbin/ directory stores executables used by the root user. The executables in /sbin/ are only used at boot time and perform system recovery operations. Of this directory, the FHS says:

/sbin contains binaries essential for booting, restoring, recovering, and/or repairing the system in addition to the binaries in /bin. Programs executed after /usr/ is known to be mounted (when there are no problems) are generally placed into

/usr/sbin. Locally-installed system administration programs should be placed into/usr/local/sbin

13./usr/ :

The /usr/ directory is for files that can be shared across multiple machines. The /usr/ directory is often on its own partition and is mounted read-only.

Working with directories

In this session, we have covered an overview of the most common commands to work with directories : pwd, cd, ls, mkdir, rmdir. These commands are available on any Linux (or Unix) system.

How to create a directory

The mkdir command in UNIX allows users to create directories or folders as they are referred to in some OS’s.The mkdir command can create multiple directories at once and also set permissions when creating the directory. To create a directory in UNIX or Linux using the mkdir command pass the name of directory to the mkdir command.

Syntax: mkdir <directoryname>

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**** How to create multiple directories

To create multiple directories in UNIX or Linux using the mkdir command pass the names of directories to be created to the mkdir command. The names of directories should be separated by spaces.

Syntax: mkdir <directoryname1> <directoryname2> <directoryname3>



How to create parent directories

To create parent directories using the mkdir command pass the -p option. Suppose directory path /foo/bar/baz is to be created even if /foo/bar directory is not existing then you can use the below.

How to remove a directory

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To remove an empty directory (folder), you can use the “rmdir” command. Syntax:

rmdir directoryname

So if you had an empty directory named “mydirectory”, you can remove it with:

But, if the directory had files in it, you would not be able to remove it with “rmdir”. If you tried removing a directory with files, you would get an error like this:



Instead, you should use a different command

So, if we had a directory with subdirectories and files in it, we would use this syntax:

To remove a single file, you can use the “rm” command with no additional options:

Syntax: rm filename

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• When using the “rm” command, you should not always use the “-f” (force) option. By using that option, you won’t get any warnings or prompts when removing something.

• If you get a “permission denied” error or any other similar error, then you are probably using a non-root user. You should either use the root user or use sudo to run the commands. So just append “sudo” to each command and enter your sudo password when prompt:

Syntax: sudo rm -r directoryname

Warning- once you delete something with rm, it’s gone. Linux assumes you are smart and you know what you are doing.

Permissions and rights

As Linux is a multi-user operating system which can be accessed by many users simultaneously. Hence this raises security concerns as an unsolicited or malign user can corrupt, change or remove crucial data. For effective security, Linux divides authorization into 2 levels.

1. Ownership

2. Permission

How to change the owner ship

The chown command changes ownership of files and directories in a Linux filesystem.

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To change the owner of a file/directory

Syntax: chown <ownername> <filename>

To change the group of a file

“chown” command is also used to change group name of a file, like “chgrp” command.

Syntax: chown <:groupname> <filename>

To recursively change ownership of directories and their contents Syntax: chown –R root <filename>



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How to change the permission

Unix-like systems, including the Linux systems that run on the inode platform, have an incredibly robust access control system that allows systems administrators to effectively permit multiple users access to a single system without giving every user access to every file on the file system. The chmod command is the best and easiest way to modify these files permissions.

All file system objects on Unix-like systems have three main types of permissions: read, write, and execute access. Permissions are based upon three possible classes: the user, the usergroup, and all system users.

To view the file permissions of a set of files, use:

Syntax : ls -lha

In the first column of the output, there are 10 characters that represent the permission bits.

To view permissions for a file we use the long listing option for the command ls. Syntax: ls –l <path of file>



The first character represents the type whether it is a file or directory or symbolic link file. In The remaining nine bits first three represent the permissions for the user, rest 3 bits represents permissions for group, and other three for all system users. Each stands for:

• r: Read → 4

• w: Write → 2

• x: Execute → 1

Read will have a value of 4, Write will have 2 & execute will have 1

Examples

column lets divide the permissions

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d rwx r – x r –x

(User) (Group) (Others)

Setting 442 permissions for the file test.txt. Here first 4 value if for User, the second 4 represents for Group & final 2 is for all other machine users.



How to change the permissions & owner ships recursively

To change file access permissions you need to use the chmod command. It has - R or –recursive option that change files and directories recursively.

Syntax : chmod –R <Directory name>

Example chmod –R 755 sample1.txt

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**Unix/Linux Command Reference**

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Vim Editor

Vim is a powerful text editor used in CLI (command line interface). Linux uses a lot of configuration files, you'll often need to edit them and vim is a great tool to do so. Alternatives to vim are the command line editors such as vi, nano and joe.

VI: Visual display editor.

VIM: Visual display editor improved.

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It has 3 modes:

1. Command Mode

2. Insert Mode (edit mode)

3. Extended Command Mode

Note: When you open the vim editor, it will be in the command mode by default.

In the command mode, the cursor’s can be used as: h/l/k/j to move cursor left/right/up/down.

Inset Mode

| i | To begin insert mode at the cursor position |
| --- | --- |
| I | To insert at the beginning of line |
| a | To append to the next word’s letter |
| A | To Append at the end of the line |

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| o | To insert a new line below the cursor position |
| --- | --- |
| O | To insert a new line above the cursor position |

Command Mode

| gg | To go to the beginning of the page |
| --- | --- |
| Shift+g | To go to end of the page |
| w | To move the cursor forward, word by word |
| b | To move the cursor backward, word by word |
| nw | To move the cursor forward to n words (5W) |
| nb | To move the cursor backward to n words (5B) |
| u | To undo last change (word) |
| Ctrl+u | To undo the previous changes (entire line) |
| Ctrl+r | To redo the changes |
| yy | To copy a line |
| nyy | To copy n lines (5yy or 4yy) |
| p | To paste line below the cursor position |
| P | To paste line above the cursor position |
| dw | To delete the word letter by letter (like Backspace) |
| x | To delete the world letter by letter (like DEL Key) |
| dd | To delete entire line |
| ndd | To delete n no. of lines from cursor  position(5dd) |
| / | To search a word in the file |

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Extended Mode (Colon Mode)

Extended Mode is used for save and quit or save without quit using “Esc” Key with ‘:’ symbol.

| Esc+:w | To Save the changes |
| --- | --- |
| Esc+:q | To quit (Without saving) |
| Esc+:wq | To save and quit |
| Esc+:w! | To save forcefully |
| Esc+wq! | To save and quit forcefully |
| Esc+:x | To save and quit |
| Esc+:X | To give password to the file and remove password |
| Esc+:20(n) | To go to line no 20 or n |
| Esc+: se nu | To set the line numbers to the file |
| Esc+:se nonu | To Remove the set line numbers |

To open multiple files in vim editor:

#vim –o file1 file2

To switch between files use, Ctrl +w.

**Monitoring**

Top command

• When you need to see the running processes on your Linux in real time, you have top as your tool for that.

• ‘top’ also displays other information besides the running processes, like free memory both physical and swap.

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Monitoring all process using Top command

To monitor all processes in the system use the following command #top :



First Line of top command



• “016:43:01″ is the current time; “up 2 mins” shows how long the system has been up for; “1 user” how many users are logged in; “load average: 0.00, 0.00, 0.00″ the load average of the system (1minute, 5 minutes, 15 minutes).

Second Line of top command

Shows the number of processes and their current state.

Third Line of top command

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Shows CPU utilization details. “10.2%us” user processes are using, “0.4%sy” system processes are using, 88.2% of system idle cpu.

Fourth and fifth Lines of top command



“1011176k total” is total memory in the system; “243932K used” is the part of the RAM that currently contains information; “767244k free” is the part of RAM that contains no information; “11912K buffers and 172112k cached” is the buffered and cached data for IO.

By default, top starts by showing the following task's property:

| Field | Description |
| --- | --- |
| PID | Process ID |
| USER | Effective User ID |
| PR | Dynamic priority |
| NI | Nice value, also known as base priority |
| VIRT | Virtual Size of the task. This includes the size of process's executable binary, the data area and all the loaded shared libraries. |
| RES | The size of RAM currently consumed by the task. Swapped out portion of the task is not included. |
| SHR | Some memory areas could be shared between two or more task, this field reflects that shared areas. The example of shared area are shared library and SysV shared memory. |
| S | Task status |
| %CPU | The percentage of CPU time dedicated to run the task since the last top's screen update. |
| %MEM | The percentage of RAM currently consumed by the task. |
| TIME+ | The total CPU time the task has been used since it started. "+" sign means it is displayed with hundredth of a second granularity. By default, TIME/TIME+ doesn't account the CPU time used by the task's dead children. |
| Command | Showing program names. |

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Interacting with TOP:

Now that we are able to understand the output from TOP lets learn how to change the way the output is displayed.

Just press the following key while running top and the output will be sorted in real time.

• M – Sort by memory usage

• P – Sort by CPU usage

• T – Sort by cumulative time

• z – Color display

• k – Kill a process

• q – quit

• r – to renice a process

• h – help

Ping Command

Ping (Packet Internet Groper) command is used to check the network connectivity between host and server/host. Ping is generally measured in millisecond every modern operating system has this ping pre-installed.

ICMP (Internet Control Message Protocol) to send an ICMP echo message to the specified host if that host is available then it sends ICMP reply message.

TTL (Time To Live) It is maximum hop a packet can travel before getting discarded. A value 0 will restrict packet to same host.

Now, try to ping with hostname both server and client:

Syntax: # ping <Servername/Ipaddress>

#ping –c2 google.com

#ping –c2 anyclient

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Note: Here “c” represents no.of hops you want as output. In our case we gave 2, hence we are getting hops and then its getting exited.

Vmstat command

vmstat (virtual memory statistics) is a valuable monitoring utility, which also provides information about block IO and CPU activity in addition to memory.

Vmstat basics

vmstat provides a number of values and will typically be called using two numerical parameters.

Example: vmstat 1 5

1 -> the values will be re-mesured and reported every second

5 -> the values will be reported five times and then the program will stop

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The first line of the report will contain the average values since the last time the computer was rebooted. All other lines in the report will represent their respective current values. Vmstat does not need any special user rights. It can run as a normal user.



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User administration

User management is an important part of Linux system administration. We need to perform different operations such as adding, deleting, managing the accounts which are part of the servers.

Type of User in Linux OS

• Super User: This account is nothing but “root” account who is holding super power in doing anything as part of the machine. Super user has all the privileges in Linux operating system. So, Super user does all the administration tasks such as stop or starts any service, grant or revokes permissions, open ports especially less than 1024 ports, user management and much more.

• System User: System users are created by system such as bin, games, ftp, name, mail, daemon, apache etc. These types of user are different service user and required for running different services. System user cannot login to the system because by default their login shell is nologin.

• Regular User: These users are created by super user. Regular user can login to the system but has access limitations. Regular user cannot do administration tasks. If super user provides permission, regular user can do permitted administration tasks. A regular user may be an ftp user, a samba user or a mail user.

“/etc/passwd” is the file which is holding all the information about the system users in the machine.

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How to Add/Create User in Linux (useradd)

Inorder to create a user in linux we have to use a command called “useradd”. It accepts many arguments some of them are below.



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So based up on the requirement you can start using these options, for suppose if you want to use the shell you need to use “ -s” option, similary if you want to write the comments then you can use “-c”. Please check the below execution of create a user in the machine.

Explanation:

Here if you are observing before our “useradd” command execution we don’t

have our user “dvsmaterial” but once we created the user we could see the entries in the file /etc/passwd. What happens when we executed “useradd” command .

• It adds a new entry in both /etc/passwd file and /etc/shadow file.

• It also adds a new entry in /etc/group file and /etc/gshadow file.

• A home directory is created in /home directory for the new user.

• Permissions and ownership are also set to home directory by this command.

Now lets try to understand the output, here each and every coloumn in the

/etc/passwd file has its own identity. They are as follows.



| **Field**  **No** | **Field**  **Name** |  | **Field Value Explanation** |
| --- | --- | --- | --- |
| 1 |  | Username dvsmaterial | This is the username that is provided while creating a user. It is used to login into the system and it should be between 1to 32 characters as well as unique. |
| 2 | Password | x | An ‘x’ character indicates that encrypted password is stored in /etc/shadow file. If we put ‘\*’ inplace of x, the user cannot login. If we keep second field blank, the user can login without password. |

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| 3 | User ID | 1000 | Every user must have a User Identification Number (UID). Generally, UID = 0 is reserved for the super user that is root. UID 1 to 99 are reserved for other predefined user accounts. Further UID 100 to 999 is reserved for the system users. Regular user’s UID starts from 1000. As dvsmaterial is a regular user here, The UID is showing 1000. If UID of any regular user is changed to 0, the user is considered as a super user in your system. |
| --- | --- | --- | --- |
| 4 | Group ID | 500 | This is the primary Group Identification Number (GID) of this user. Whenever a user is created a primary group is also created for that user. Every user has its own primary group but it can also have supplementary groups. |
| 5 | Comments or User  Info | Hi Team  this how  our  material  looks like | This is an optional field and only used for  informational purpose. Usually it contains the full name of the user or any user comment can be put. This field is filled by finger command. |
| 6 | Home  Directory | /home/  dvsmaterial | This is the absolute path of the user’s home directory. If this field value is not present, the ‘/’ root directory becomes the home directory of the user. |
| 7 | User Shell /bin/bash |  | This is the absolute path of the user command shell. |

User attribute modifications (usermod)

If you want to change the user related permissions in the Linux then you can use “usermod” option. For suppose I want to change the comments of user “dvsmaterial” then it will looks like below.



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Explanation

If you observe properly previous comment for the user dvsmaterial user is been changed to “Hi Everyone this is Linux”. Hence we can use “usermod” command to change the attributes of a user on the fly. We have different options to use for changing the user attributes they are like below.



Checking the user status & modification (chage)

Users some time face issues with the access, in such cases we need to check the below things for his/her account.

If you want to check the details of an account then you can use chage option like below.



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If you observe above output we can see that its convyeing different information about the user like when its going to expire, minimum no.of days between password change, max no.of days and etc ., If you wan to change these options for any user based up on the requirement then you can use the below options.



Now I want to change the warning days from 7 to 10 then I will be using the option “-W” then my output will be like below.



So finally I have changed the no.of warning days before to 10 from 7 days. Like this what ever the attribute you want to change you can simply specify the option and execute the command.

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User & Group Management

Till now we have gone through the different things about user administration but apart from this sometimes there will be a requirement that the user should be part and parcel of different groups, hence he should be having access for all those groups.

If you want to check the groups details of a user to which he belongs then you can use the below.



From the above we can convey that user dvsmaterial is having a primary group as “ec2-user”. If you want to see the entire groups which are part of the machine then we have a file called “/etc/group” which holds information about the groups.



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How to create a group

If you want to create a group then you can simply execute the below. 

Now we are having a group called “mygroup”. Now I would like to add my user “dvsmaterial” to this group. Then I can do the below.



From the above output we can observe that myuser “dvsmaterial” is part and parcel of two groups “ec2-user” & “mygroup”. In this way you can add a single user to multiple groups. Here “gpasswd” helps me to do the changes for my user. Similarly if you want to delete the user from the group, then you can execute the below.



From the above we can observe that the user dvsmaterial is now having only one group called ec2-user.

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Removing users

If you want to remove the users then you can use “userdel” command. Make sure that you are using “-r” option for removing the content associated with that user during the execution otherwise his home directory will not get removed.



If you observe above we could see that soon after we removed the user dvsmaterial his home directory got deleted. This is how we work with our user administartion in Linux.

There are few important configuration files related to the user administration they are below.

/var/log/wtmp, /etc/passwd, /etc/group, /etc/shadow, /etc/login.defs

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Filesystem Management

Linux plays a crucial role in full filing the file system management. Before entering deep lets understand the basic difference between a folder and a filesystem.

Folder:



If you are observing above output here /test is the directory which is residing under /. Which means the size of test folder depends on the “/” filesystem. In simple max data which you can store under /test directory is max size of “/” filesystem. Let’s understand bit more on this.



From the above output we can convey that the size of “/” partition is 7.8G in simple our “test” directory max it can save a data of size 7.8G. Here your “test” is a directory which is residing in the filesystem called “/”. In simple words a filesystem is nothing but a drive in your machine like C,D,E,F (in windows). Where directories are nothing but the folders inside these drives.

Working with Filesystem

There are two types of approaches which we use to achieve Filesystem management in Linux. They are as follows

1. Standard Partition

2. Logical Volume Management

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Standard partition

This type of partition is same as our windows drive creation. For suppose I have 100GB disk where I need to create 4 partitions each with 25GB then I can create them. Under standard type of partition you will get different terminologies such as

• Primary Partition (P)

• Extended Partition (E)

• Logical Partition (L)

In this type of partition max you can create 4 Primary partitions.

P P

P P

For suppose if I want to create 5 partitions with each 20GB I can’t create it using this method. But in order to archive this what I can do it I can opt for 3 Primary partitions, and 1 extended partition. Once you created a extended partition from this partition you can create again “N” no.of logical partitions. Hence we create 3

Primary partitions with 20GB each and extended partition with 40GB from which we will start creating two Logical partitions with each 20GB.

Note: When you are creating an extended partition you need to reboot the machine. So you picture will look like below.

P P

P E

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L L

So here we are goanna have 3 – P \* 20 GB & 1 – E \* 40 GB out of which we are gonna have

2 – L \* 20GB.

Creating Filesystem using Standard partition

Make sure that you are having proper disk exists (free) in the machine. If you want to check the disk information in the linux machine then you can use the below.

You can use “fdisk - l” command or “lsblk” command it will give you the output of disk information .



From the above output we can see that there is only one disk available in the machine and its size is 8GB. Now lets try to add the disk (EBS) to the machine. In our case we are gonad choose AWS-EBS for our instance. Go to the AWS console and add the disk to the machine. In our example I want to have 4GB filesystem “/data1” hence I am gonna add 5GB disk to the machine.

Once I attached the disk now I can able to see the newly attached disk to the machine.

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Here “XVDF” is my new disk with 5G size. Let’s create the filesystem. Explanation

Fdisk is the utility which we use in standard partition for creating the partitions. Here we will have different options such as

n → helps to create a new partition

p → helps to print the partition table

d → helps to delete the partition

w → helps to save the changes and quit.

h → will display all the options associated with fdisk

From the lsblk output make a note of the disk name, in our case disk name is “/dev/xvdf”. Hence we are using fdisk /dev/xvdf option and creating a filesystem of size 4GB.

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Follow the above instructions carefully once you are done with the creation you can check the partition status using below.

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From the above output we can able to see that /dev/xvdf1 got created and its size is 4GB. Now we have created the partition but this is the raw disk we cannot directly use this in order to make this usable we need to format it. In Linux we have different filesystem types such as ext2, ext3, ext4, xfs. Now lets format the disk with type “ext4”. It looks like below.



Once you are done with formating now we need to mount disk to a folder in our case the folder name is “/data1”. Lets do it



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If you are observing the above output now we can able to see that “/data1” mount point is visbile and its size is 4GB.

Note: If you restart the machine now you won’t able to see the “/data1” mount point as part of the output of “df –hT”. Because this is only temporary, but if you want to make it permanent then you need to add the entires to a file called “/etc/fstab”. It looks like below.

Drawbacks

Though we have standard partition why we have one more type of partition is because of below.

o We cannot increase the filesystem size dynamically in standard partition

o We cannot extend the disk size on-fly it requires downtime.

Hence we are opting for one more type of partition which is nothing but your Logical Volume Management.

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Logical Volume Management

Using LVM you can overcome all the drawbacks of standard partition. Here again you will come across different terminologies like Physical volume(PV’s), Logical Volumes(LV’s), Physical extends(PE’s), Volume Groups(VG’s).



Creating the filesystem in LVM

Make sure that you are having atleast one disk for creating the volume group. Once you have one free disk you can start following the below procedure.

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Here if you are observing we could see that /app1 mount point got created with 4GB but this time its under LVM. To see more information about the lv,vg,pv then you can issue below commands.

1. lvs

2. vgs

3. pvs

4. lvdisplay –v

5. pvdisplay –v

6. vgdisplay –v

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Filesystem size increase

Now lets try to increase the size of our filesystem in our case it is /app1 

If you are observing the above commands I can able to see that /app1 mount point size got increased from 3.9G to 4.4GB dynamically with out any downtime. But here you should make sure that the volume group (myvg) should have free space in order to increase the size. In our case I can able to see that 1020M is free hence I increased the size of 512M to my filesystem. If in case your volume group is not having free space simply add the new disk to the machine & add the disk to the volumegroup. Once you found space in the volume group you can increase the size of your filesystem.

Note: Make sure that you are giving the entires in to “/etc/fstab” in order to make it permanent like above standard partition.

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Removing File system

In this you need to follow the steps from down to top. PFB steps. 

In this way we will work with our Filesystem management in our Linux environment.

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Software Management

Unlike windows linux plays an important role in installing and configuring the software’s. There are two approaches via which we can install a software/package in linux they are

1. Redhat package manager (rpm)

2. Yellow dog update manager (yum)

RPM – Redhat Package Manager

RPM is a package managing system (collection of tools to manage software packages). 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.

Features:

• RPM can verify software packages

• RPM can be served as a powerful search engine to search for software’s • Components, software’s etc can be upgraded using RPM without having to reinstall them

• Installing, reinstalling can be done with ease using RPM

• During updates RPM handles configuration files carefully, so that the customization is not lost

To check all the installed packages in the system,

syntax

#rpm –qa (where q stands for query, and a stands for all)

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Note: - The output of above command will be very lengthier.

To check whether a package is installed or not out of the list of installed package,

Syntax

#rpm –qa <package name> or

#rpm –q < package name>

#rpm –qa python



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One more method of checking the installed package, when you are not sure about the package name, like whether it starts with capital letter and full name etc.

#rpm –qa | grep –i < package name>



To install any package in linux you can use the below

# rpm –ivh <package name>

To delete the package you can use

# rpm –e <package name>

To update the package you can use

# rpm –Uvh <package name>

To see the details about a package then

# rpm –qi <package name>

To install any package with out dependencies then

# rpm –ivh <package name> --nodeps

Explanation

Everything looks fine right, you can perform all the operations what ever you want on software but why should we opt for YUM. The main problem with RPM based installation is it can’t handle the package dependencies, which mean during your installation time if it failed to retrieve the dependicies then it wont allow you to install it.

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You have to install the dependencies then only it will allow you to install the software as per your requirement. For example in the below I am trying to install a package called “finger”. But if you observe properly, it’s getting failed as its unable figure it out the package dependencies.



In order to overcome this issue, we are opting for one more utility which is nothing but YUM.

YUM – Yellow Dog Update Manager

• The Yellow dog Updater Modified (YUM) is a package management application for computers running Linux operating systems.

• Yum is a standard method of managing the installation and removal of software. Several graphical applications exist to allow users to easily add and remove packages; however, many are simply friendly interfaces with yum running underneath. These programs present the user with a list of available software and pass the user's selection on for processing. It is yum that actually downloads the packages and installs them in the background.

• Packages are downloaded from collections called repositories, which may be online, on a network, and/or on installation media. If one package due to be installed relies on another being present, this dependency can usually be resolved without the user needing to know the details. For example, a game being installed may depend on specific software to play its music. The problem of solving such dependencies can be handled by yum because it knows about all the other packages that are available in the repository.

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• Yum will work only from Centos 5 / Red hat 5 and latest versions of fedora. For Old releases like RHEL 4 you need to use up2date command to update your rpm based packages.

• Yum uses a configuration file at /etc/yum.conf and configuration directory as /etc/yum.repos.d

In order to achieve this, we are going to use our VMWare virtual machine. Our goal is very simple we need to install the package “httpd”. Let’s start our journey!!!

1. Lets add the iso image to the server in our VMWare like below.

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Now you can select the ISO image in our case its centos 6.8. Once you added the image you should be able to see it like below in your VmWare



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Now once you are done with above go and login to your machine, you could able to see a new mount point under your /media like below.

Now lets start creating our repository.



Once you done with above now do the below things

From the above output I can convey that our repository “mysoftwares” got create.

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Working with YUM Utility

Listing Packages

# yum list all

 Viewing Installed Packages

# yum list installed



To install any package

# yum install <package name>

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**** To delete any package

# yum remove <package name>

 To update any package

# yum update <package name>



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To check the information of a package

# yum info <pakcagename>



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Network Configuration & Trouble Shooting

Networking

It is a connection between two or more machines to communicate with each other.

The basic requirements for Networking are

1. NIC (Network Interface Controller or Card)

2. Media

3. Topology

4. Protocol

5. IP Addresses

1. NIC (Network Interface Controller or Card)

A network interface controller (also known as a network interface card, network adapter, LAN adapter and by similar terms) is a computer hardware component that connects a computer to a computer network. Each NIC will be having a unique MAC addresses (Media Access Control address) to avoid conflicts between same NIC adapters. In Linux these NIC adapter is represented by the word “eth”. Example if there are two Ethernet adapters in the system then it will be denoted as eth0, eth1, etc.

2. Media

Media is the medium via which two different computer’s NIC card will be connected. The best example for media is Cable. Example RJ 45, CAT 5 etc.

3. Topology

Topology is the scheme or design in which the computers in the network will be connected to each other. Example for topology is Bus, Ring, star, mesh, tree topologies. The following pictures explain it better.

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