Basics of Linux

Digital Terrain

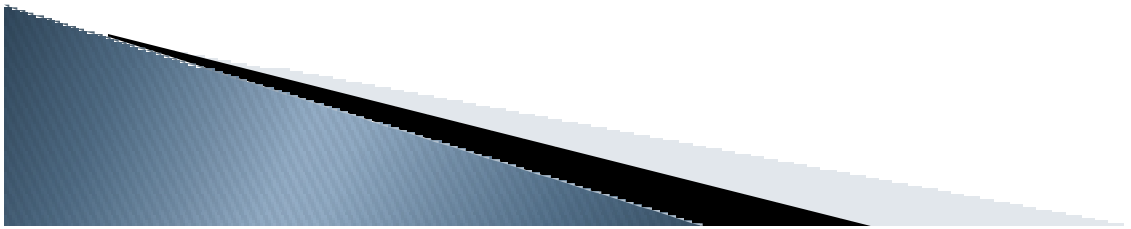
Prasad Potluri

02/28/2012

Version-2.0

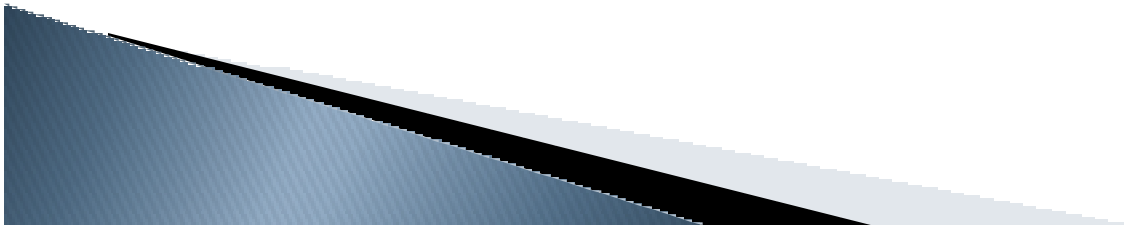
What is Linux ?

- Linux is a name given to set of distributions of Operating System. Technically there is no Operating System called “Linux”.
- Linux is designed in early 90’s by a Finnish student named Linus Torvalds, who wasn't too happy with Minix, the educational version of the UNIX operating system. (Linus Torvalds still leads the Linux Kernel Development to-date).
- Linux is a Open Source Kernel that is used by many Linux Distributors to make their own version of “Linux”.



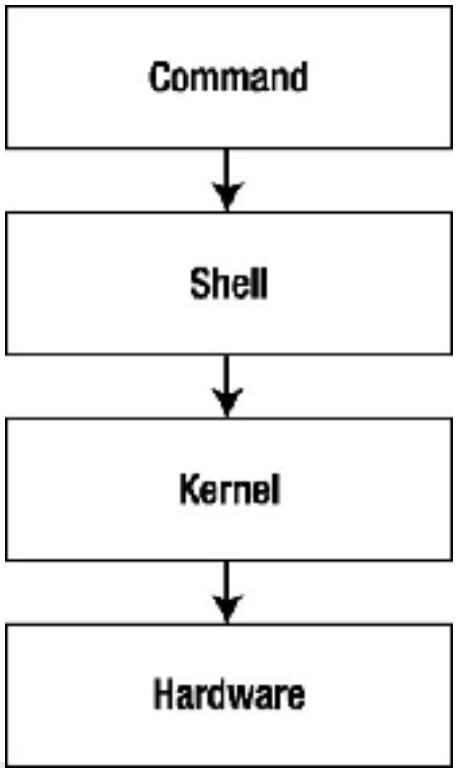
Various Linux Distros…

- Red Hat Enterprise Linux (RHEL)
- Oracle Enterprise Linux (OEL)
- Ubuntu
- SUSE Enterprise Linux
- Mandriva
- CentOS based on Red Hat Enterprise Linux
- Sabayon
- Slackware
- Gentoo
- FreeBSD (Berkley Software Distribution, and Mac OSX is based off of BSD)



What is a Shell?

- The *shell* is a command-line interpreter that lets you access some of the most critical Linux tools.
- Shell is a interpreter between what a user enters in the command line to the kernel of the operating system. Kernel also acts a interpreter between user and hardware.

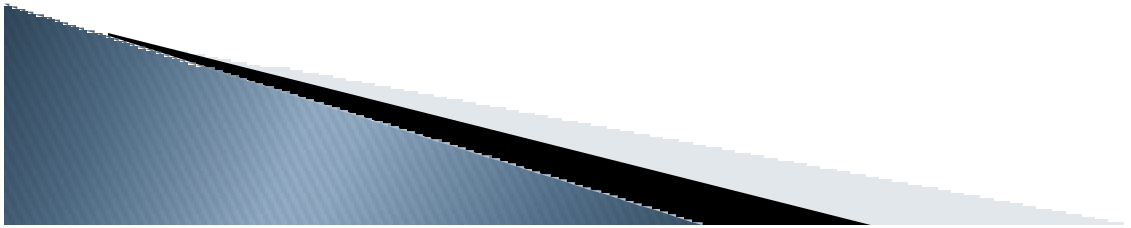


Types of Shells Part: 1

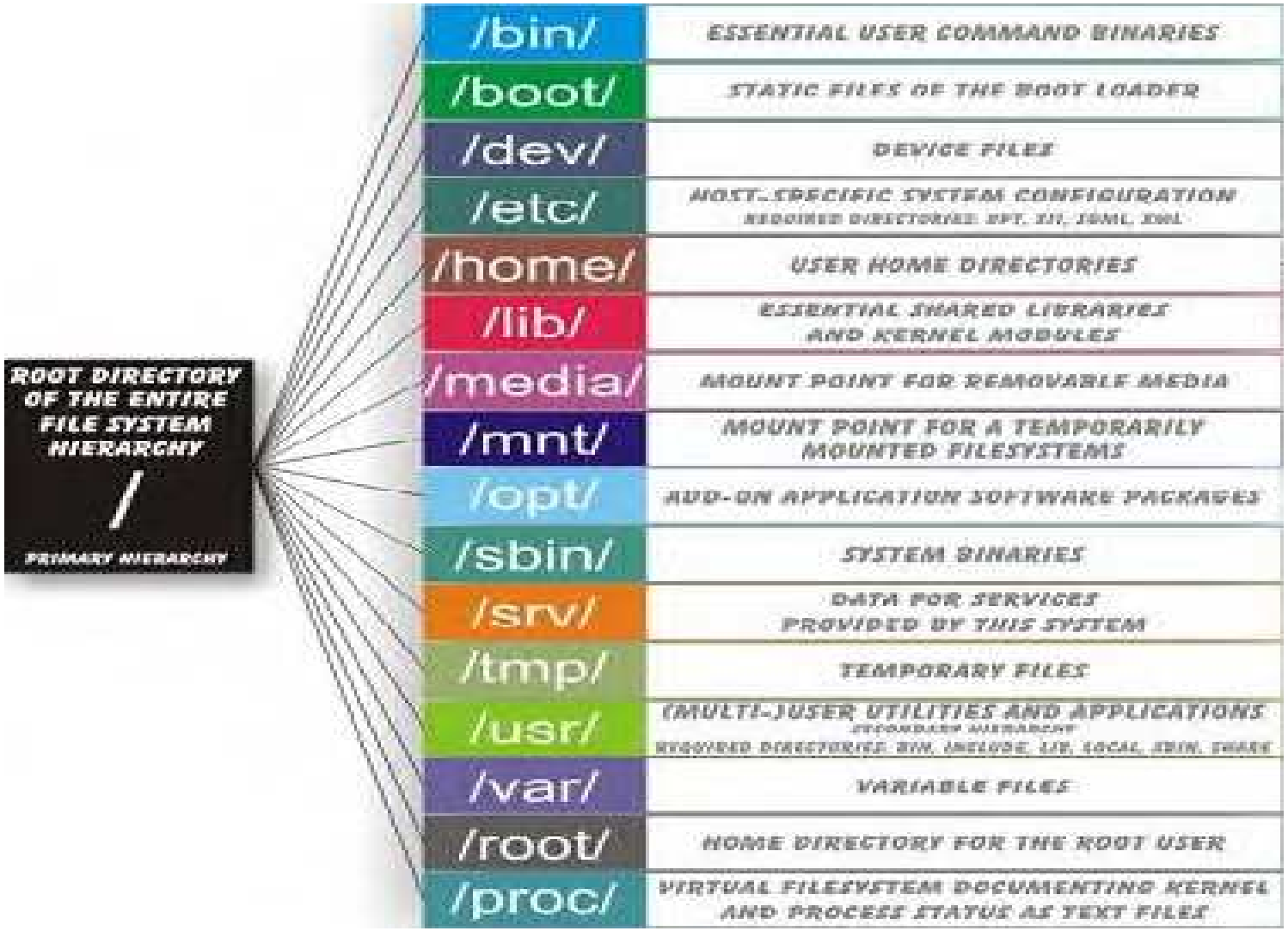
- SH: Bourne Shell, designed in 1977 by Stephen Bourne. This shell lacked a lot of features such as command line history and job control which were there by default in C (C programming language) shell.
- CSH: C Shell, designed in 1978 by a berkley student allowed users to even execute their C programming language written scripts. This shell had a huge popularity till the late 90's because the kernels in UNIX and LINUX are written using C programming language.
- KSH: Korn Shell, designed by David Korn to be a middle of road design for sh (Bourne Shell) and csh (C Shell). Korn shell is used till date as a default shell in UNIX operating systems such as AIX and HP-UX.

Types of Shells Part: 2

- BASH: Bourne Again Shell, BASH is the most common used shell in Linux.
- BASH is shipped as a default shell to most of the Linux Distros.
- The name BASH is also descriptive of what it did, *bashing together* the features of sh, csh and ksh.
- BASH is designed to run any scripts that are written in SH, KSH, and CSH.



Linux Files and Directory Structure…

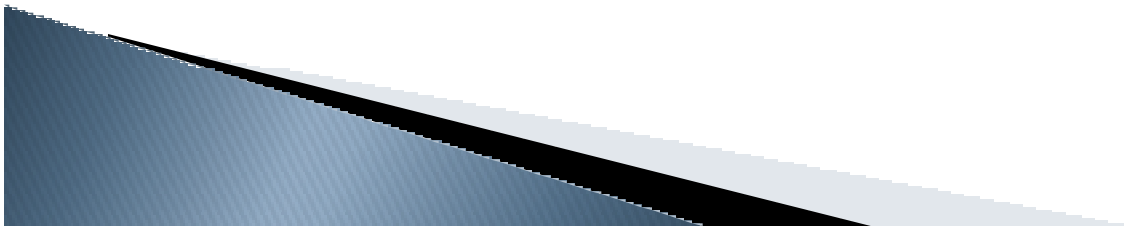


\\argos\Books\Linux_Directory_Reference.docx

Refer to the above link for more Information:

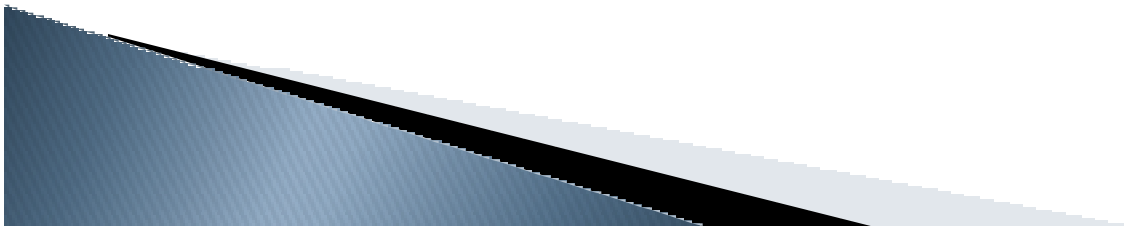
Linux & File Extensions…

- File Extensions are used very commoly in windows world, for example “.doc”, “.xls”, “.ppt”, “.dll”, and etc…
- In Linux there is no concept of File Extensions, because Linux refers to everything as either a human readable language file or a binary file.
- There are file extensions in Linux although they only pertain to applications running on Linux



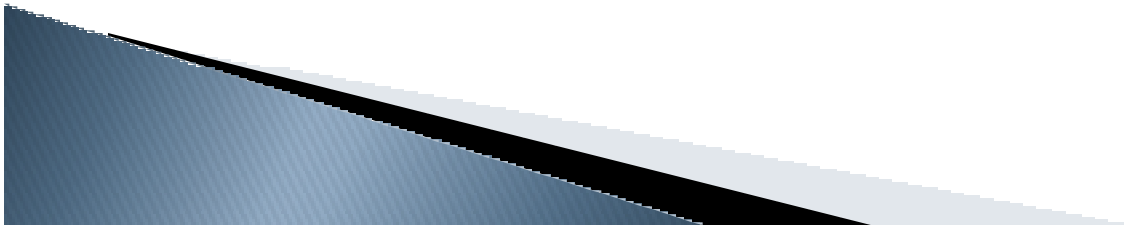
Common Linux File Extensions Part: 1

.bz2	A file compressed using bzip2 .
.c	A file written in the C programming language.
.conf	A configuration file. In some cases, "conf" is used in a file name, but not as an extension.
.lock	A lock file that prevents the use of another file.
.rpm	A Red Hat package file.
.so	A shared object (a library or module).
.tar	A single file made of a collection of files archived using the tar command.
.tar.gz	A single file made of a collection of files archived using the tar command, then compressed used the gzip command.
.tgz	A single file made of a collection of files archived using the tar command, then compressed used the gzip command.
.gz	A file compressed using the gzip command.
.txt	a plain ASCII text file
.ps	a PostScript file; formatted for printing



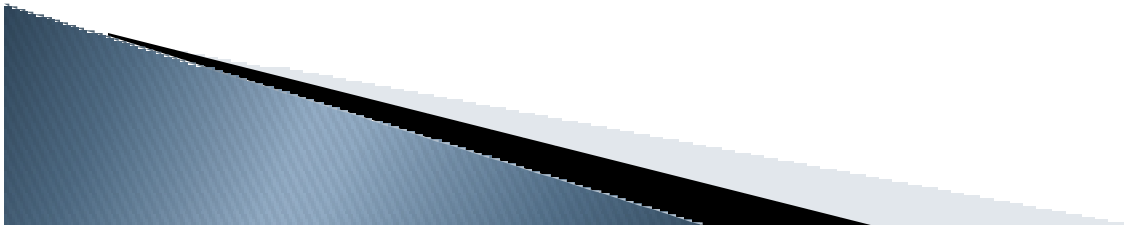
Common Linux File Extensions Part: 2

.au	an audio file
.wav	an audio file
.xpm	an image file
.jpg	a graphical or image file, such as a photo or artwork
.gif	a graphical or image file
.pdf	an electronic image of a document
.a	an archive file
.h	a C or C++ program language header file
.cpp	a C++ program language source code file
.o	a program object file
.php	a PHP Script
.sh	a Shell Script
.png	a graphical or image file
.tcl	a TCL script
.pl	a Perl script
.html	an HTML file



Red Hat Enterprise Linux Versions

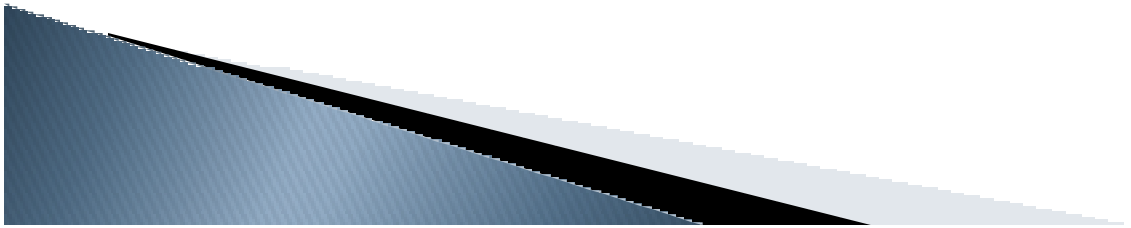
- RHEL is shipped in various releases.
- 5.X (5 is the version, X is the release)
- The latest release of RHEL is 6.2 and the most common versions used are:
  - 5.4
  - 5.5
  - 5.6
  - 5.7
  - 5.8 (latest release in version 5)
  - 6.1



Red Hat Installation Methods

- Install from CDROM
- Install from Red Hat Satellite Server
- Install from Custom PXE/DHCP/NFS/Kickstart/TFTP setup.
- Install from ISO using HP ILO Virtual Media

- Install to/Boot from Local Disk
- Install to/Boot from USB
- Install to/Boot from SAN



Red Hat Installation

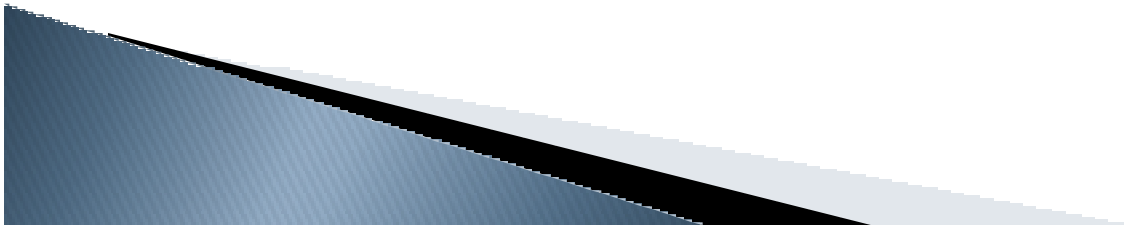
- Install from Satellite Server
- Configure NetApp
- How to use HP Onboard Administrator.
- How to use HP ILO
- How to configure Boot From SAN.
- How to PXE Boot
- Post Installation Steps
  - eXbYlxZZ
    - e: enclosure
      - X: Enclosure # (5)
        - b: blade
          - Y: Blade # in the enclosure
            - lx: Linux
              - ZZ: Blade # out of the total number of blades (80)

Install from Satellite Server

- When you install Microsoft Windows products one of the required steps is to activate the Windows product to Microsoft.
- When you install a Red Hat Enterprise Linux product you will have to Register the server (Post-Install) to the Red Hat Network as a part of the Registration Process.
- RHEL is not free (technically its free). The Operating System is free but you are charged around $3000 a year for the delivery of support and patches and as a surprising news… Windows Server 2008 R2 is cheaper than Red Hat Enterprise Linux. If you are looking for a open source alternative with no support you may use CentOS.

Install from Satellite Server

- To register a RHEL server to Red Hat Network what is the minimum access you would need ?
  - You must have a RHN Account
  - You must have purchased an entitlement (licenses) for your RHEL server.
  - You must have WAN access to your RHEL server during the registration process.
  - To install patches or download new packages your RHEL server must have access to the RHN.

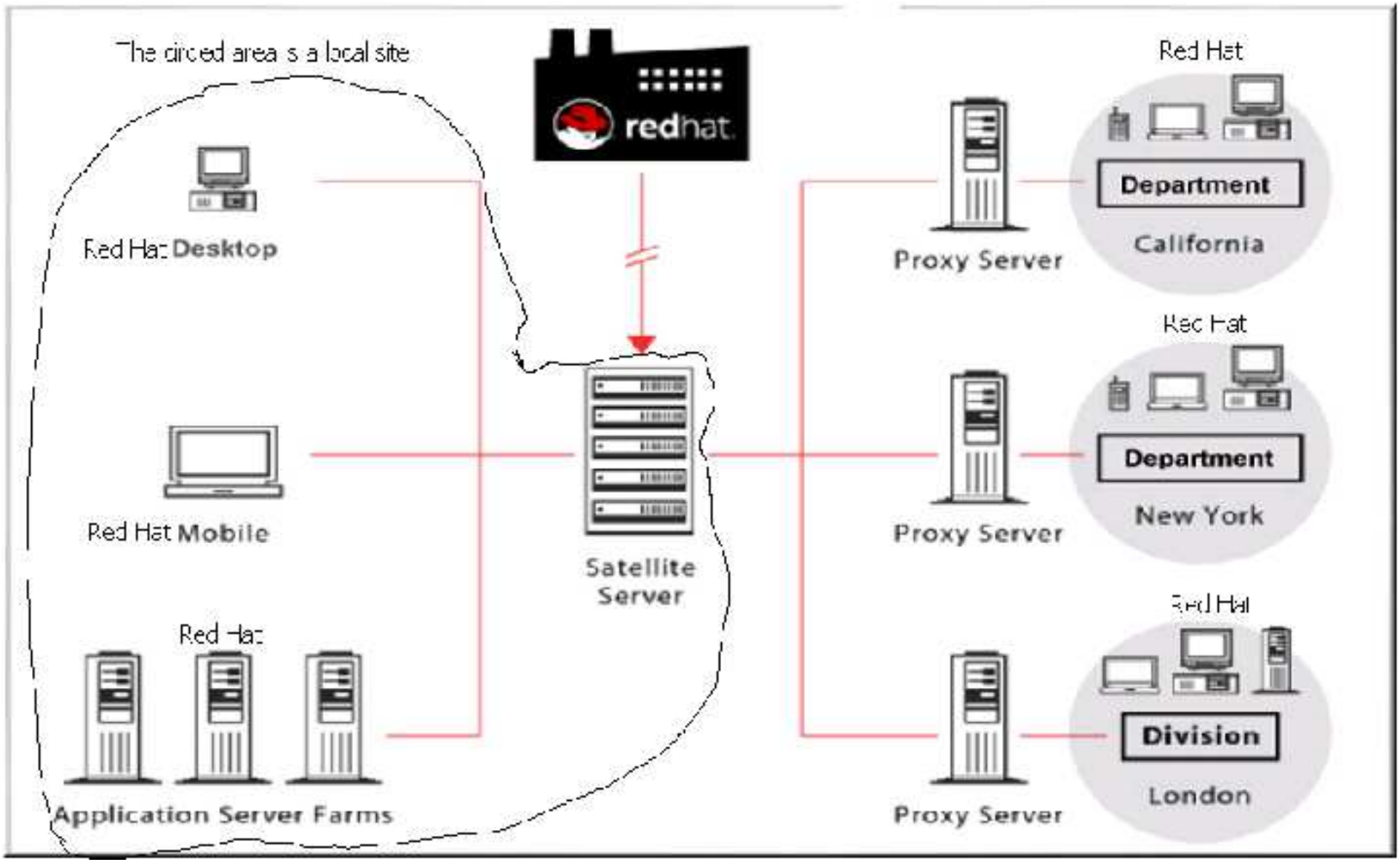


Install from Satellite Server

- Satellite Server acts as a middle layer between your RHEL Server and RHN.
- Satellite Server is installed in a server (Physical/Virtual) in your LAN.
- Satellite Server downloads the configured RHN channel (The entire RHN is over 20TB).
- What is a channel ?
  - A channel consists of all the packages for a Red Hat Enterprise Version (5/6) and Architecture (x86_64).
  - A channel also consists of all the releases based on the version
    - For example: A channel for Version 5 will contain all the releases of 5 and also the updates and patches.

Install from Satellite Server

The entire environment below other than RHN is interconnected via VPN.



Install from Satellite Server

- To install from the Satellite Server you will need to configure/use a existing DHCP server.
- The DHCP server will assign an IP address to the Host that is booting using the PXE (Pre-Execution Boot Environment).
- PXE is very old designed in the mid nineties and it has not been updated to add features such as assigning static IP. So a DHCP server is required to assign an IP Address while PXE booting.

Install from Satellite Server

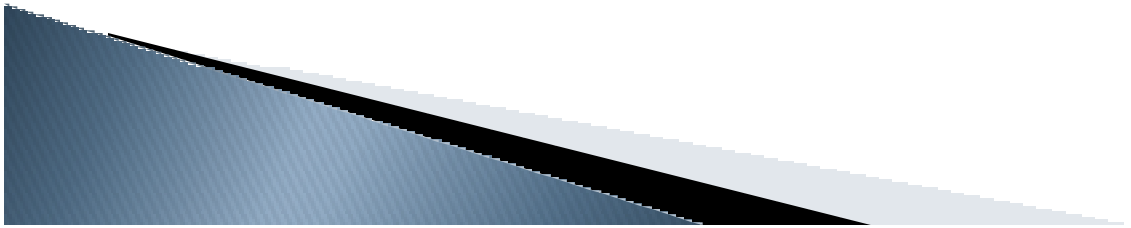
- Watch the following video to configure dhcp in windows. \\argos\labwork\videos\linux\Configuring Windows DHCP - Satellite.html
- Configure the following options in DHCP Scope → Scope Options in Microsoft Windows:
  - 60: PXEClient and String Value is "Support"
  - 66: Boot Server Host Name and String Value is "IP_ADDRESS_OF_SATELLITE"
  - 67: Bootfile Name and String Value is pxelinux.0

Install from Satellite Server

- Kickstart profile needs to be created
- Kickstart profile identifies which Operating System, Version, Release, Language, Installation Options, Packages, Volume Configuration, Root Password, Firewall (Enabled/Disabled), and SELinux.
- Activation Key: Activation Key is required by any new or existing RHEL server to Join the Satellite Server.
- Activation Key will allow the RHEL server to Join and also will add it to a group of servers and define the Default base channel

Install from Satellite Server

- System Groups and Default Base Channel.
- System Groups are nothing but a group of Systems.
- Default Base Channel is the Channel the RHEL server is assigned to…
- When you patch your RHEL server or install a package, the patch and the package are searched in the Default Base Channel.

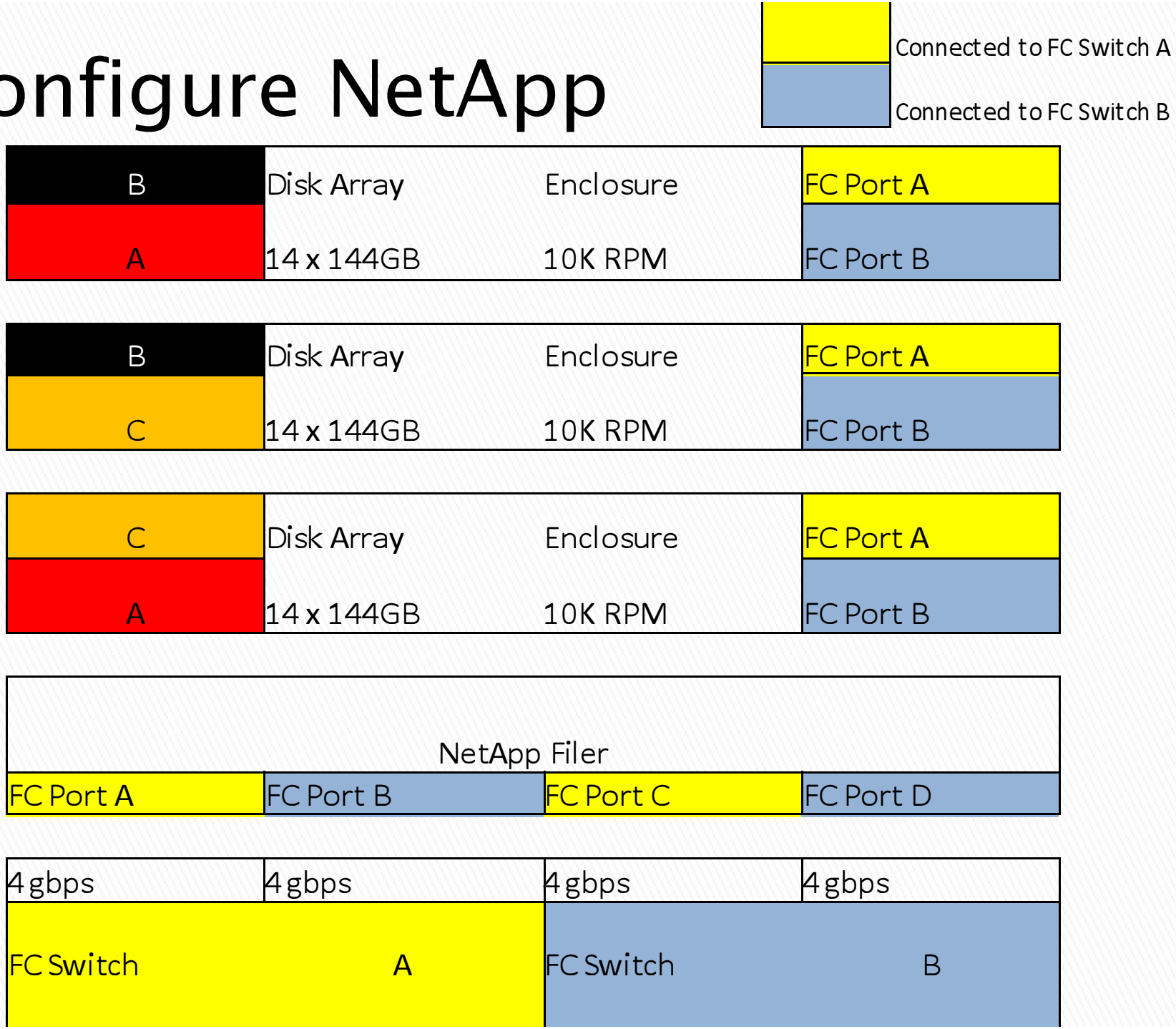


Install from Satellite Server

Summary to Configure Satellite Server

- Create a System Group
- Create a Activation Key, Define Default Base Channel and Add/Join the Group
- Create a Kickstart profile and Define the Activation Key in the Kickstart profile.
- *Note* In the last class every body missed the step on defining the activation key in the kickstart profile. Select the Activation key in your kickstart profile and click on “Update Activation Key” or else it will not attach your Activation key to the Kickstart Profile.

Configure NetApp



Digital Terrain

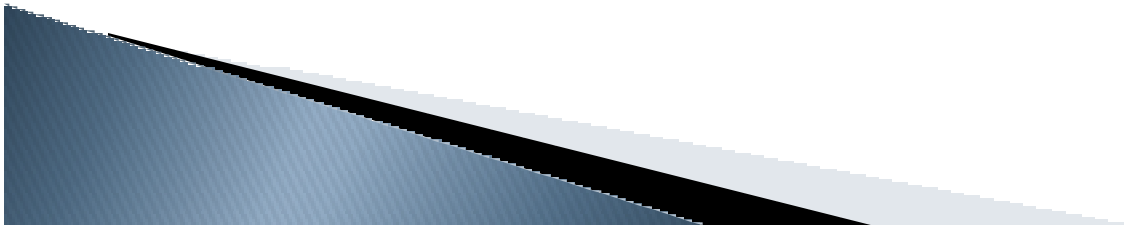
Configure NetApp

Download NetApp OnCommand Manager from \\argos\labvideos\sysmgr-setup-2-0R1-win.exe
Install NetApp OnCommand Manager
Configure NetApp OnCommand Manager with the HostName "netapp"
username: root --- password: rootusa1
Click on Volumes
Click on Create inside the Volumes tab
Define the Volume name as “eXbYlxZZ_vol01” and the storage type is SAN.
Total Size = 50GB
Snap Shot Reserve 0 %
Click on “Thin Provisioned” and Click Create
Click on LUNs, click on Create, Click Next
Type in the Name of the LUN: “eXbYlxZZ_bootlun”, select “linux” O.S. Type
Configure size at 20GB and check the “Thin Provision” box

Configure NetApp

Click Next, Select an existing volume or qtree for this LUN.
Click browse, find and select your respective volume and click next
You will need the WWPN to create a initiator group.
To find your WWPN for both FC ports on your blade please click on the below video.
“\\argos\labwork\videos\linux\Configuring LUN - WWPN - Onboard Administrator.htm”
Select the initiator group and click next and finish.

- ls -l /
- Command Flag argument
- ls -ltr /
- The above command will print the output of folder / in long list format, sorted by time and recursive.



- **cd** command is used to change directory
- **cd /**
- **cd** command used alone will take you back to your home directory
- **cd** – (will take you back to the previous working directory)
- You have a directory structure as follows : /root/.gconfd/apps
- Your pwd reports .gconfd
- what is the parent directory for .gconfd ?
  /root [..]
- what is the current directory for .gconfd ?
  /root/.gconfd [.]
- what is the sub directory/child directory for .gconfd ?
  /root/.gconfd/apps

Digital Terrain

- **Nslookup**: can be used in dos or linux, the command is used to look up an ip address of a dns entry.
- **Setup**: This command is used to configure your server.
  - IP Address, DNS, Gateway and Hostname
- **cat /etc/issue** --> This command will display the current version and type of linux.
- **cat /etc/redhat-release** --> Verify similar to the output of /etc/issue
- **dmidecode** --> Prints all the servers hardware information.
  "dmidecode | grep Product" → Prints the Product Model and Blade Info
- **ifdown**: if in ifdown means Interface and down means to disable the network adapter.
  - vlan 0 :- eth0 and eth1
  - vlan 10 :- eth2 and eth3

ifdown ethX

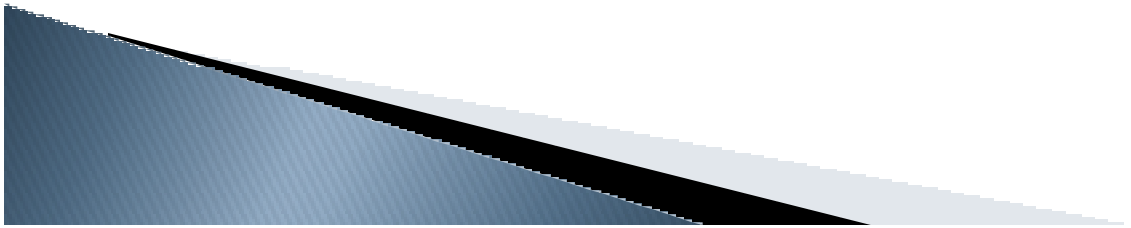
- **ifup**: if in ifup means interface and up means to enable the network adapter

  ifup ethX

  Uptime: Displays how long the system is up and running , the current system time, system status, the duration server has been in up status, # of users logged in, cpu usage.

- **ethtool ethX**

  Supported link modes: 10000baseT/Full (10 Gbe)
  Speed: 1000Mb/s
  Link detected: yes
  What is incorrect in the above scenario ?



- **ls**: Lists all files in a folder
- **ls –l** (Displays folder structure in a long list format)
- –rw–––––––1rootroot901Sep 24 16:47 anaconda–ks.cfg

  Permissions of the File

  # of inodes

  Owner of the file

  Group Owner of the file

  File size in bytes

  Date last modified

  Filename
- ls –a (Hidden files in the folder, A file in linux can be hidden by putting a "." In front of the filename)
- ls –t (Sort by time)
- ls –r (Recursive/Reverse)

Inode

- **inode** is a very simple concept, the concept is that every file has a file.
- All inodes are stored in the superblock of the file system and cannot be accessed by a admin.
- All inodes are 4KB by default and store the following attributes "stat FILENAME":

- File: `install.log'
- Size: 25629 Blocks: 64 IO Block: 4096 regular file
- Device: 6802h/26626d Inode: 327682 Links: 1
- Access: (0644/-rw-r--r--) Uid: (0/ root) Gid: (0/ root)
- Access: 2011-09-25 14:50:41.000000000 -0400
- Modify: 2011-09-24 16:47:26.000000000 -0400
- Change: 2011-09-24 16:47:29.000000000 -0400

If a inode is gone and a file ends up in lost+found, the file is considered orphaned. If a file is gone the inode is also considered orphaned and ends up in lost+found.

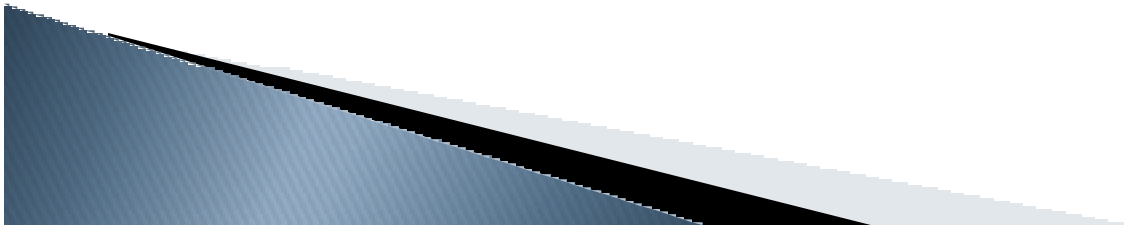
- **touch** command creates a blank file.

touch FILENAME → creates a blank file, and can also be used to test the status of the boot from san. (read-only means bad)

- **date** command prints the current date & time on your server
  - date +%H:%M → will print date in a hour:minute format.
- **cp** command is used to copy a file
- cp ORIGFILE NEWFILE → will copy the file and paste it to a location of your choice, if you do not specify a location it will copy to the same folder.
- **cp -p** (the -p flag is used to preserve attributes such as time stamp)
- **cp -r** (the -r flag is used to copy folders or recursively copy every single file from folder)
- You can also use cp -pr to copy the entire folder and to another folder and maintain/save the attributes of all the files in the orig folder.
- **mv** command is used to move a file or rename a file. The move command is also similar to cut and paste in windows. The move command can cut, paste, and rename at the same time.

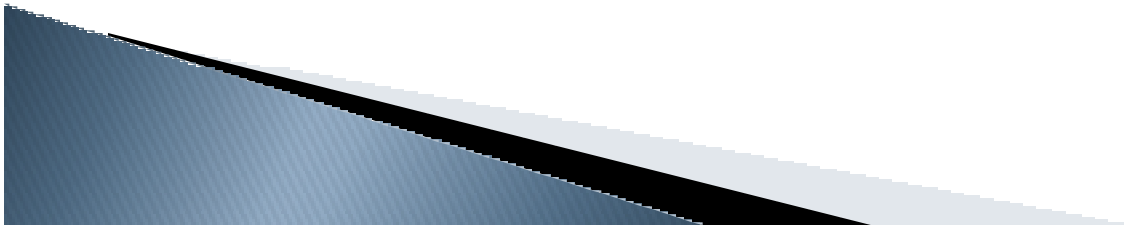
- **history** command is used to print past historical commands and the history information is stored in /root/.bash_history
  - history # → the # can be replaced with a number which will the last # of commands.
  - history -c → the -c flag will clear the history (DON'T DO THIS YOU WILL BREAK AUDITING POLICIES IN MAJOR CORPORATIONS AND COULD GET YOU IN TROUBLE)
- **pwd** command is used to find out your Present Working Directory (PWD)
- **rm** command is used to remove a file
- **rm -r** (remove folders recursively)
- **rm -f** (Remove with Force)
- **ln** command is used to link a file or shortcut
- **ln -s** (Creates a shortcut **ln -s** /root/install.log /root/install.log.shortcut)
- **unlink** command is used to delete or break a shortcut
- **unlink** /root/install.log.shortcut

- **mkdir** command is used to create a directory
- **mkdir /root/1**
- **mkdir –p** (this flag is used to create the missing parent directories)
- mkdir /root/1/2/3/4/5/6
- Will the above work ?
- mkdir –p /root/1/2/3/4/5/6
- Will the above work ?



- **wc** command is used to count number of lines, words and characters.
- **wc -c** (Characters only)
- **wc -l** (Lines only)
- **wc -w** (Words only)
- **wc** (Lines, Words, Characters)
- **du** (disk usage) command is used to display size of an entire folder
- **du -sh** (Display the entire folder size and displays it in human readable format)
- **-k**
- **-m**
- **-h**

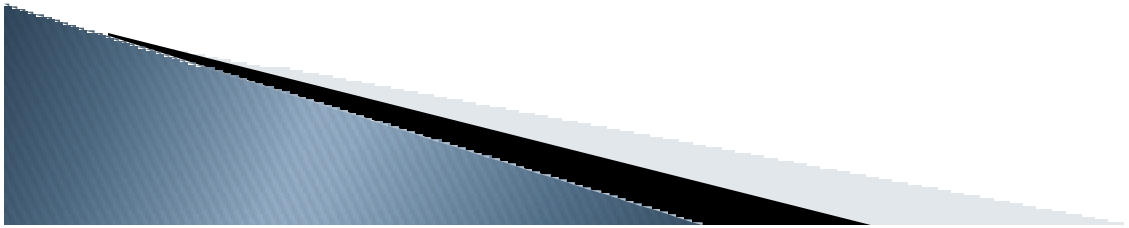
- **chown** command is used to change ownership (user & group) of a file.
- **touch file1 file2 file3**
- **chown games:games** file1 (changes both owner and group)
- **chown** root file1 (changes only owner)
- **chgrp** root file1 (changes only group)
- **chown –R** (have to use upper case R to modify the entire folder)
- **chmod** command is used to change file permissions of a file.
- **chmod –R** (have to use upper case R to modify the entire folder or recursively changes all the files and folders when u use this flag against a folder)



Digital Terrain

R	W	X
Read only	Modify & Delete	Execute allows you to run the program/application

r	4	
w	2	
x	1	
no perm	0	
owner	4	r
group owner	2	w
others	5	r-x



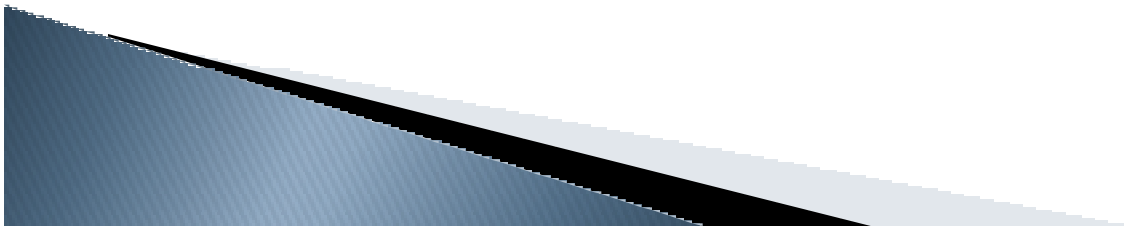
- **cat** command is used to view the contents of a file
- **cat filename**
- **head** command displays the first 10 lines
- **head -15** (displays the first 15 lines)
- **tail** commands displays the last 10 lines
- **tail -15** (displays the last 15 lines)
- **tail -f** (follows a file will not MODIFY anything in the space, and it allows you to view any changes made to the file. VERY IMPORTANT WENT TRACKING LOGS IN LINUX)
  - tail -f /var/log/secure (open another ssh window and login)
- **find** command is used to find files and folders
- **find** / (location to search) -name (search by name) FILENAME/FOLDERNAME&WILDCARDS
- **find / -size +10M**
  - **More info**: http://www.cyberciti.biz/faq/find-large-files-linux/

Digital Terrain

vi editor:	
Edit Mode	shift + g → EOF (End of File)
i→ insert	shift + 4 ($) → EOL (End of Line)
u→ undo	yy→ Copy a line where your cursor is at:
. →redo	p → paste the line that you have copied.
a→ append	d$ → delete till end of line from cursor
x→ Delete	dd→ delete line
	dw→ delete word
Nyy→ Replace N with the number of Lines. This will copy the number of lines including your current line.	

- **Command Mode**
- / → Search for where your cursor is at for a string in your vi editor
- ? → Reverse Search for where your cursor is at for a string in your vi editor
- : → command mode
  - w→ write means to save to a file and not "insert"
  - q →quit
  - q! →force quit with out saving
  - wq! →write and force quit
- :%s/ORIGINAL/REPLACEMENT
- :%s/WORD1/WORD2

- Exercise:
- echo "I store all my scripts in /usr/local/scripts"
- echo "I store all my personal files in /home/prasad/files“
- SED → Search and Replace
- cat sedexample.sh
- /usr/local/scripts/today
- sed –i 's/\/usr\/local\/scripts\/today/\/root\/scripts/g' sedexample.sh
- cat sedexample.sh
- /root/scripts
- SED will replace everything that is WORD1 with WORD2.
- Using **VI** editor replace the following:
- store --> save
- /usr/local/scripts --> /home/prasad/scripts
-
- Using sed command replace the following:
- personal --> non sensitive
- /home/prasad/files --> /tmp/files



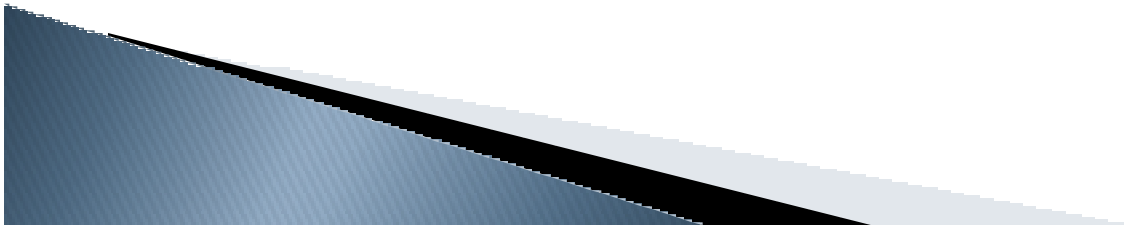
- **tar** command is used to compress a file(s) or folder(s) in to a tar ball.

- **-c** → Compress
- **-x** → Extract
- **-t** → View/Test
- **-v** → Verbose
- **-f** → File
- **-z** → Compress using gzip algorithm.

- **tar -czvf tarfile.tar.gz file(s)/folders(s)** → Compress

- **tar -tzvf tarfile.tar.gz** → View files/folders inside tar file

- **tar -xzvf tarfile.tar.gz** → Extract tar file



Digital Terrain

User and Group Administration

- **/etc/passwd**: This file is where all the users and the default shell assigned to a user is stored.
- Entries in /etc/passwd are as follows:
  - root:x:0:0:root:/root:/bin/bash
- The user account or the username
- The password which is encrypted and now stored in **/etc/shadow**
- The uid or the userid this is a numeric number which defines the userid or uid
- The gid or the groupid this is a numeric number which defines which group or gid the user belongs to.
- The group which the user belongs to by default or in linux its called primary group.
- The home directory or the default directory for the user root
- The default shell the user gets when he logs in.

- **/etc/group**: This file is where all the groups and the information regarding the users belonging to groups is stored.
- Entries in **/etc/group** are as follows:

root:x:0:root

- Group Name
- Whether the group is activate or deactivated
- The group ID
- The users who belong to the group

- **useradd**: This command is used to add user in to linux **(useradd -u (uid) NUM -g GROUPNAME username)**
- **groupadd**: This command is used to add groups in to linux (groupadd -g GID groupname)
- **passwd**: This command is used to change the current user password**.**
- **usermod**: This command is used to modify attributes of a user (usermod -G group1,group2,group3, group4 user)
- **groupmod**: This command is used to modify attributes of a group
- **userdel**: This command is used to delete a user
- **groupdel**: This command is used to delete a group

Digital Terrain

Environmental Variables, Standard Input, Output and Pipes

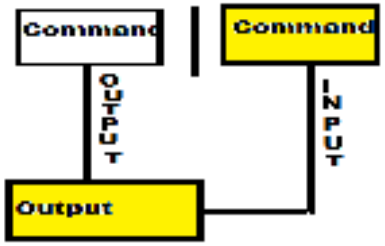
- **Variable**: A variable has a value.
- **env**: This command displays all the environmental variables for your shell in Linux.
- **set**: Very similar to env displays all your system/kernel environmental variables
- **echo**: Displays the value of the variable.
- **export**: This command is used to create any new environmental variables.
  → variables can be set without export but if you set a variable without export the variable will only be local (shell) and with export command the variable is global and will last till the system or os reboots.
- **unset**: Removes a environmental Variable in memory.
- PATH variable stores information regarding directories where all your commands reside for your shell.

- **Standard Input and Output**: Both Standard output and Input are used to redirect
- Standard Input is to redirect an input to a file or a command. >
- cat emailmessage

  Hello from Linux
  If you can read this I am contacting from the Death Star in Star Wars. Darth Vader is a really cool Guy.
  Prasad Out

- **mail –s "Hello from Linux" ppotluri@vmpro.com** < emailmessage
- Standard input is used to redirect an output from a file or command. <
- echo 100 > numbers
- echo 200 >> numbers
- Pipe is to redirect the output as an input to another command (Its stdin and stdout together).
- Pipe is used when you want to pass the output from a command to another command in memory, unlike standard output the output is passed to the storage

Digital Terrain



- **Resource Monitoring:**
- Processes: Task Manager
- CPU: Task Manager
- MEMORY: Task Manager – Performance Tab
- I/O (Disk): Task Manager –- Performance Tab –- Resource Monitor (Only Available Win 7)
- NETWORK: Task Manager – Networking

Digital Terrain

- Processes: ps –ef
- UID PID PPID C STIME TTY TIME CMD
- UID: User ID or Username the process is running under.
- PID: Process ID for the process
- PPID: Parent Process ID
- C: Priority of the process (–19 to 19)
- STIME: Start Time of the process
- TTY: if it's a ?then its running on the local server, if it has a TTY entry then its running on a shell.
- CMD: The actual command or process or script

- CPU: top, vmstat, sar
- *ANY OF THE BELOW COMMANDS USE "* -d X -c Y" X = # OF SECONDS and Y = # OF TIMES or COUNT"
- top:
- If you would like to view top information more frequently use "top -d X" X = # of seconds.
- Hit the "1" key in top to view all the cpu's and cpu resource utilization.
- vmstat: vmstat is used to list and resource monitor CPU, Memory and I/O statistics in a server

Digital Terrain

Procs	Procs
r b	r: The number of processes waiting for run time.
0 0	b: The number of processes in uninterruptible sleep.
----------memory----------	**Memory**
swpd free buff cache	swpd: the amount of virtual memory used.
0 15911940 87152 281252	free: the amount of idle memory in kilobytes
	buff: the amount of memory used as buffers or any data written to disk is first written here then written to the storage to act as a buffer
	cache: the amount of memory used as cache or the amount of memory used to store the most commonly accessed files. This cache really helps because the CPU can get the files from memory than from storage. If the data on the file changes in memory it is immediately sent to the buffer. When a kernel detects a inode being constantly accessed (read) it copies the file from the storage space in to memory space for fast access.

Digital Terrain

Procs	Procs
	inact: the amount of inactive memory. (-a option)
	active: the amount of active memory. (-a option)
---swap--	**Swap**
si so	si: Amount of memory swapped in from disk (/s).
0 0	so: Amount of memory swapped out to disk (/s).

Digital Terrain

Procs	Procs
---io---	**IO**
bi bo	bi: Blocks received from a block device (blocks/s).
0 0	bo: Blocks sent to a block device (blocks/s).
--system--	**System**
in cs	in: The number of interrupts per second, including the clock.
7 7	cs: The number of context switches per second.
-----cpu------	**CPU**
us sy id wa st	These are percentages of total CPU time.
0 0 100 0 0	us: Time spent running non-kernel code. (user time, including nice time)
	sy: Time spent running kernel code. (system time)
	id: Time spent idle.
	wa: Time spent waiting for IO.
	st: Startup Defaults

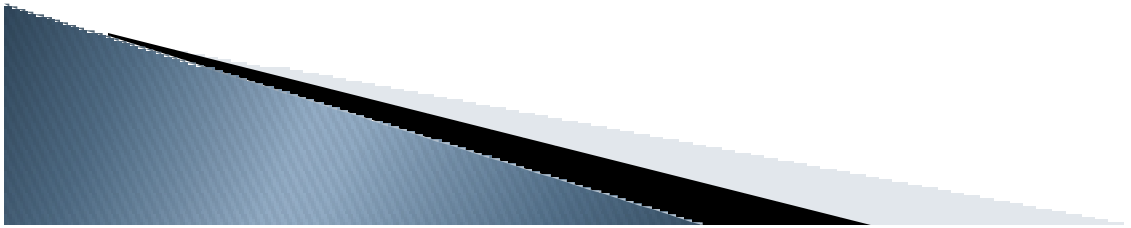
Digital Terrain

- **MEMORY:** vmstat, **free -m**
- Free: This command is used to display the free memory on your Linux servers you can use the -k (KB), -m (MB), -g (GB)
- I/O (Disk): **iostat (each blk = 4KB)**
- Device: Which Device ?
- tps: Transaction per second.
- **Blk_read/s**: Blocks read per second
- **Blk_wrtn/s**: Blocks written per second
- **Blk_read**: Blocks read in total since the server is up
- **Blk_wrtn**: Blocks written in total since the server is up

Digital Terrain

- *BY DEFAULT IOSTAT IS NOT AVAILABLE IN LINUX, YOU HAVE TO INSTALL sysstat*

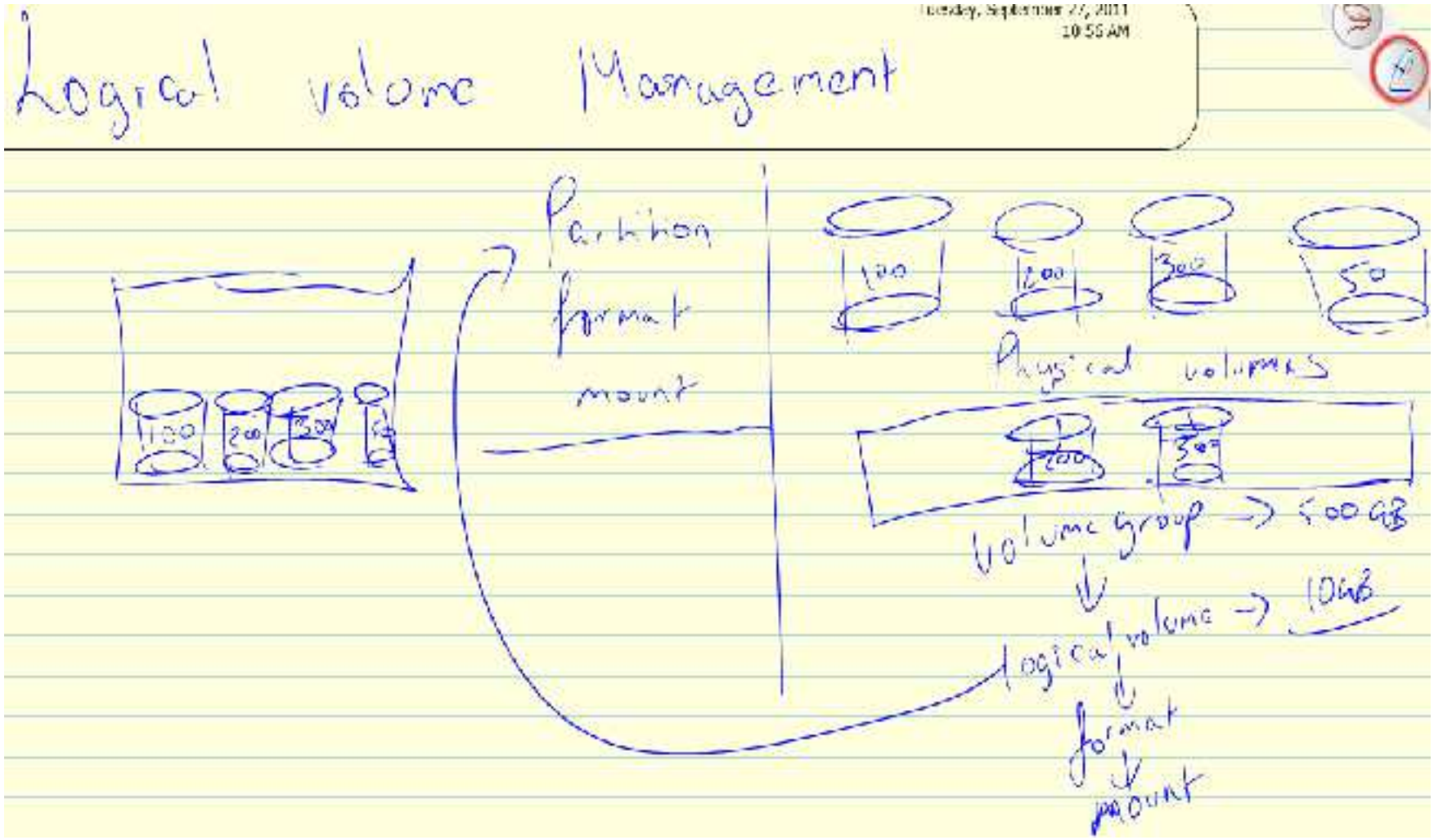
- **Iostat**: This command is used to display I/O statistics or Read and Write blocks per sec.
- NETWORK: **netstat-in**
- **Netstat -in**: This command is used to display
- Network/Interface Statistics in RX (Receive) and TX (Transmit)
- **netstat -tnlp**: This command with tnlp flags prints just the listen ports so you can see the command pre service start and post service start.
- watch: This command is used to a task repeatedly in a terminal session window every 2.0 secs by default. (watch vmstat)



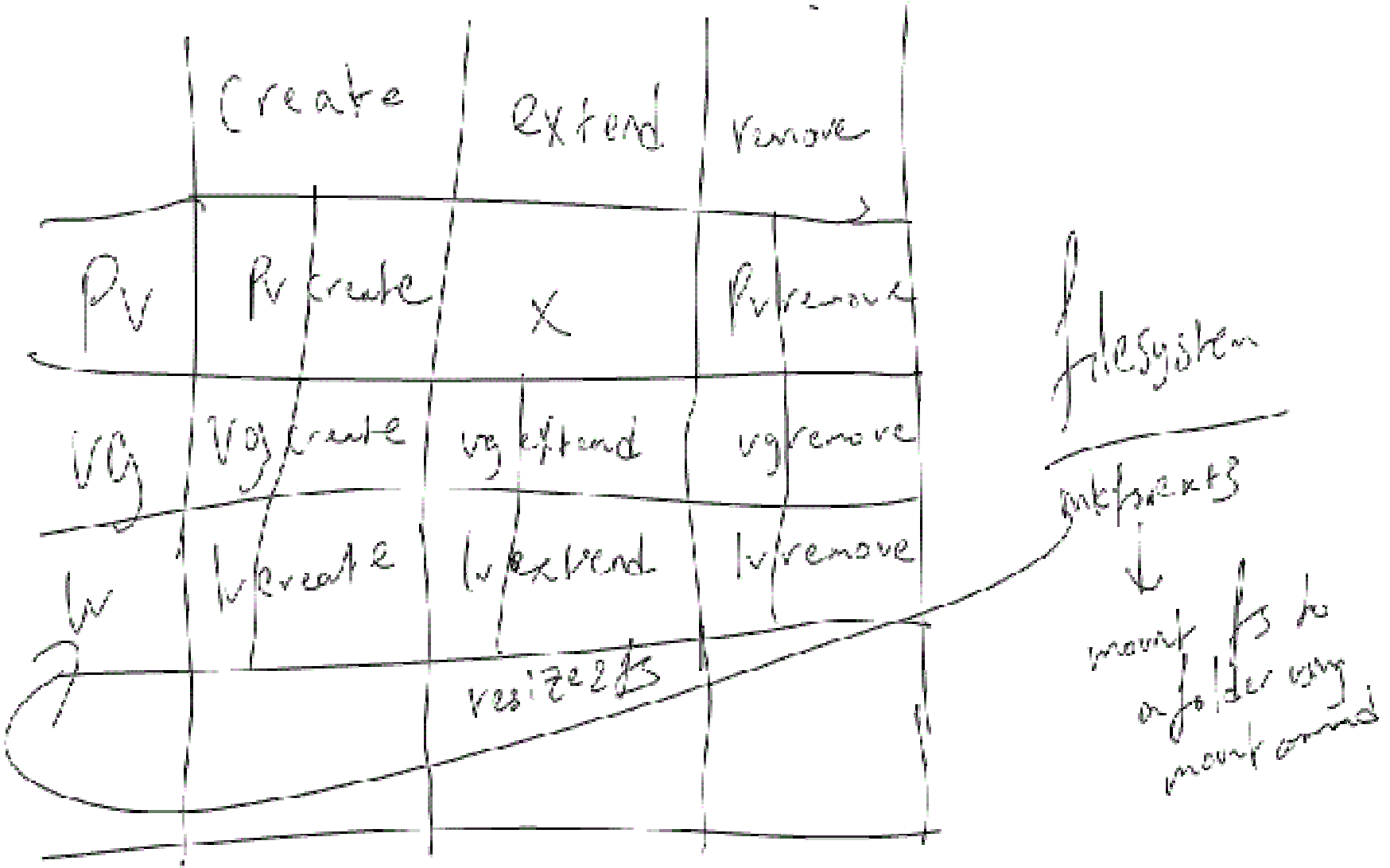
Digital Terrain

- **Disks and Filesystems**

- **Windows Partition example:**
- Add a new hard drive in your computer (possibly from best buy)
- Bring the disk online
- Initialize the Disk (assists windows to understand the type of disk and the size of disk)
- Partition the drive (Allows you to allocate a part of the disk to Windows)
- Assign a drive letter (Assigning drive letter allows a user to store files easily)
- Format the Partition with NTFS (Will allow windows to manage the Filesystem and Journal)
  - Video: "\\argos\labvideos\Videos\Linux\Basics of Linux\Windows-Partition-Example.html"
- **df**: This command prints the Disk/Partition Free space that is mounted on your linux system.
- -k (kb) -m (mb) -h (human readable)
- **mount**: This command prints all the mounted file systems in your linux server.
- **LVM**: Logical Volume Management


Logical volume Management
Partition
format
mount
100
200
300
50
Physical volumes
volume group -> 500 GB
logical volume -> 10GB
format
mount

Digital Terrain



Digital Terrain

1) fdisk /dev/mapper/ALIASNAME	14) enter
2) u --> convert cylinders to sectors	15) q --> quit
3) enter	16) pv
4) n --> new partition	17) vg
5) enter	18) lv
6) p --> primary partition	19) mkfs.ext3
7) enter	20) resize2fs
8) 1024 --> leave 1 MB of data	21) /etc/fstab
9) behind	22) /dev/vg10/lvol1
10) enter	23) /firstfs ext3 defaults 0 0
11) enter	24) fsck: Filesystem Check, checks for any corruption or bad inodes on your filesystem. The command is fsck -fy(-f = force, -y = auto yes). FSCK SHOULD ONLY BE RAN ON AN UNMOUNTED FILESYSTEM.
12) w --> write changes to the	
13) partition table	

Digital Terrain

pvcreate /dev/cciss/c0d0p4	umount /firstfs
vgcreate vg10 /dev/cciss/c0d0p4	rm -rf /firstfs
lvcreate -l 100%FREE --name=lvol1 vg10	lvremove -f /dev/vg10/lvol1
mkfs.ext3 /dev/vg10/lvol1	vgremove vg10
mkdir /firstfs	pvremove /dev/cciss/c0d0p4
mount /dev/vg10/lvol1 /firstfs	
df -h	

/etc/fstab

Digital Terrain

Device	Mount Point	FS Type	Mount Point Options	Mount Order	Mount Verification
/dev/DBVG/lvol0	/opt/oracledb	ext3	defaults	1	1
				Lower the number the higher the priority	Mount Verification Set it to 0 if you want to ignore the mount verification.

The Mount Verification will allow the OS to boot only if the mount actually happens.

If the mount fails due to the device or san issues the OS will enter a maintenance mode (safe mode) and you will have to resolve the issue and reboot the O/S from maintenance mode

Homework: put a bad entry (any characters or words that make no sense at the end in /etc/fstab)

If your server is in maintenance mode, login, run “mount –o remount,rw /” and then vi /etc/fstab and remove the bad entry. Save and Force Quit and reboot the server.

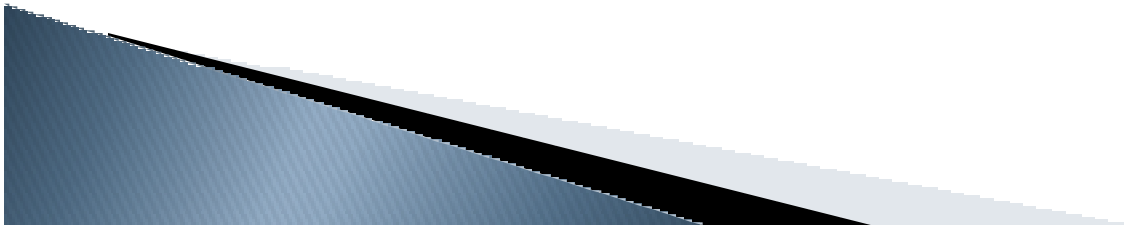
- Grep command: Grep command is used to search contents in a file by string
- **grep -i** (-i flag means ignore case)
- **nice**: Nice command assigns a priority to a process before it begins.
- Priorities in Linux range from: -19 to 19… The lower the priority number the higher the CPU priority.
- **nice -n** "PRI" command
- time nice -n -19 tar -cvf usrbackup.tar /usr
- **renice**: Renice commands assigns a priority to a process while its running.
- **renice -"PRI" PID**
- **ifconfig**: Interface Configuration, prints the ip address of the Linux Network Interfaces.
- **ifconfig -a** (-a = all interfaces)

Digital Terrain

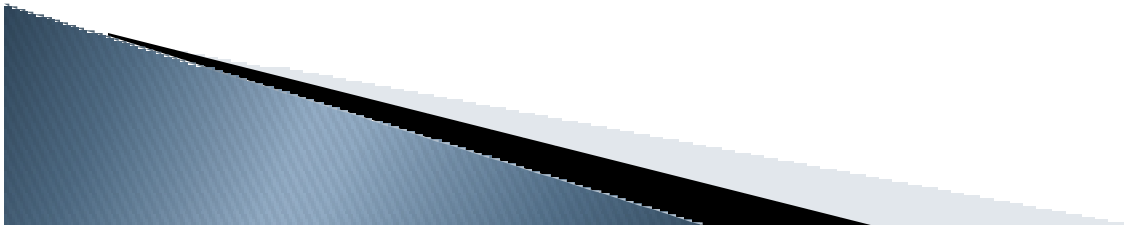
Link encapsulation	Type of Network
Hwaddr	MAC Address of the NIC PORT
inetaddr:	IP Address of the Interface
Bcast (Broadcast)	Broadcast address of Interface
UP BROADCAST RUNNING MULTICAST	Connection is UP Connection is Broadcasting Connection is RUNNING Connection can also Multicast for monitoring
MTU	Maximum Transmission Unit
RX Packets	Receive Packets, or the # of Packets received
TX Packets	Transmit Packets, or the # of Packets sent
RX Bytes	Receive Bytes, or the # of Bytes Received
TX Bytes	Transmit Bytes, or the # of Bytes Transmitted

- **Diff: Diff command is used to check for differences between the content of two files.**
  - **Diff file1 file2**

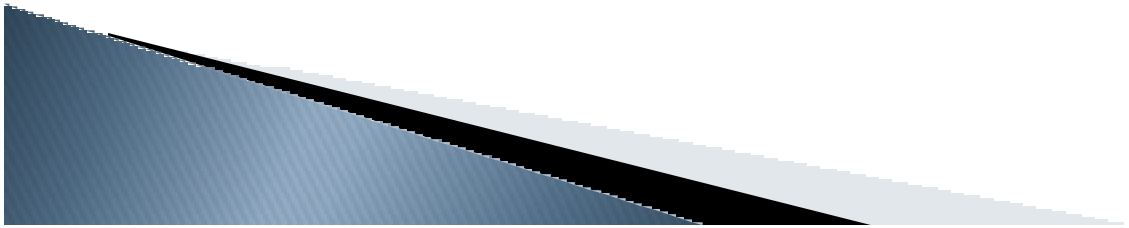
[root@c1b14lx14 ~]# cat file1	[root@c1b14lx14 ~]# cat file2	[root@c1b14lx14 ~]# diff file1 file2
1	3	1,2d0
2	4	< 1
3	5	< 2
4	6	5a4,5
5	7	> 6
		> 7



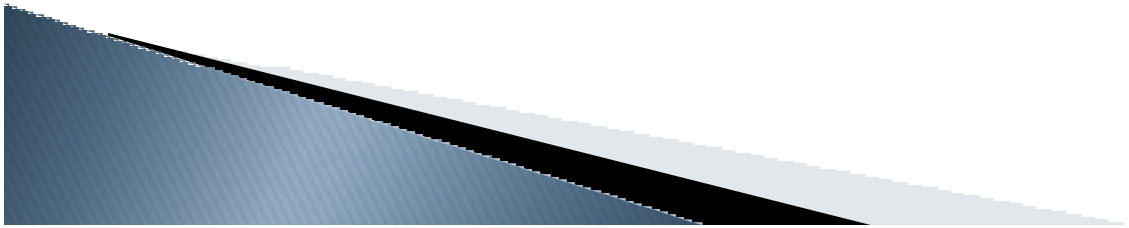
- **bc**: Calculator
- **w**: w displays all the users that are currently logged in
- **whoami**: whoami displays the user account which you are logged in as…
- **last**: last displays the last users that were logged in to your server
- **kill**: Kill command is used to destroy a process for example "kill PID" or "kill -9 PID". -9 is a SIGKILL to the CPU which means instant kill.
- **ssh**: ssh is used to Remotely login from one server to another.
- ssh hostname
- **scp**: secure copy is used to transfer a file from one server to another
- **scp localfile hostname:/remotedir/remotefile**
- **scp /root/usrbackup.tar c1b1lx1:/root/usrbackup.tar**
- -p and -r can be used here just like cp command.
- **sort**: sort command is used to sort an output or the contents of file.



# cat file1	# sort file1
5	1
3	2
4	3
2	4
1	5
e	a
c	b
d	c
a	d
b	e



- **cal**: Prints the calendar of this month
- **cal 1752 – sep**
- **&**: If you run a command and place a & at the end of the command, the command is then ran in the background.
- jobs: Jobs command will bring up all the jobs in the background
- **fg**: Will place the job in the foreground and press ctrl + z to send the process back to background in a stopped state
- **bg**: will start the process that is in a stopped state.
- **&&**: If you place && after command 1 and type in a command 2, the post event will be that command 1 will execute. If command 1 is successful with no errors it will continue and run command 2.
- ; : very similar to && but it will run command 2 regardless whether command 1 error'ed out or not.
- **nohup**: nohup command is used to run a command or task post exit or when you close your putty if you have nohup in front of the command such as tar, the command will continue to run till it completes.
- Example: **rm –rf usrbackup.tar**
- **nohup tar –cvf usrbackup.tar / &**
- **exit**



- **yum**: yum command is used to install/upgrade packages or software on your linux server.
- Example: **yum install PACKAGENAM**
- **yum install firefox**
- login to remote console and run firefox.
- If you want to see all the packages available through yum “yum list”
- **yum groupinstall “X Window System”**
- **startx**
- **yum remove firefox**
- **yum groupremove "X Window System"**

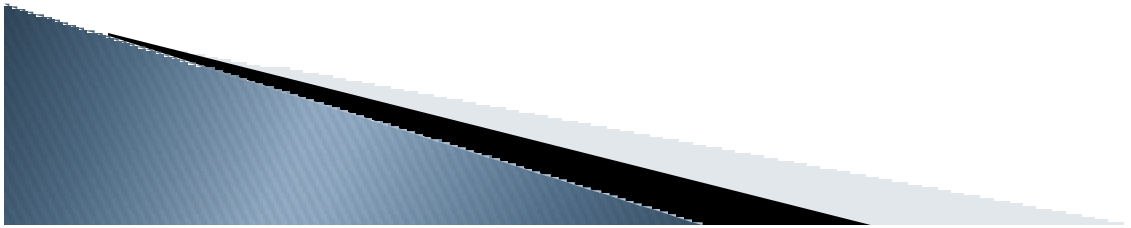
Digital Terrain

- **wget**: Is a text based download utility or command, its objective is the ability to download from the internet.
- **rpm -ivh webmin-1.560-1.noarch.rpm**
- **rpm -qa | grepwebmin**
- **rpm -e webmin-1.560-1**
- **webmin**: in a nutshell it is nothing but a Web Interface to administer linux.
- **RPM**: Red Hat Package Manager is a Red Hat based Installer Utility.
- IF YOUR WEBMIN DOES NOT WORK RUN "service iptables stop" <-- stops firewall in linux.

rpm flags		
	I	install
	U	Upgrade
	E	erase
	V	Verbose
	H	hash
to install	rpm -ivh filename.rpm	
to upgrade	rpm -Uvh filename.rpm	
to erase	rpm -e rpmname	
To view installed rpms	rpm -qa	| grep RPM

- To view the change log of a RPM **rpm -q webmin-1.560-1 --changelog** and to view the rpm details PRE-INSTALL rpm -qpilwebmin-1.560-1.noarch.rpm
- **/proc filesystem**: /proc filesystem is proc and it stores all the kernel runtime information in user readable language.
- **cat /proc/cpuinfo | more**
- The above command displays all the CPU information, including the number of processors and cores.
- **cat /proc/meminfo | more**
- The above command displays all the memory information, including total physical memory.

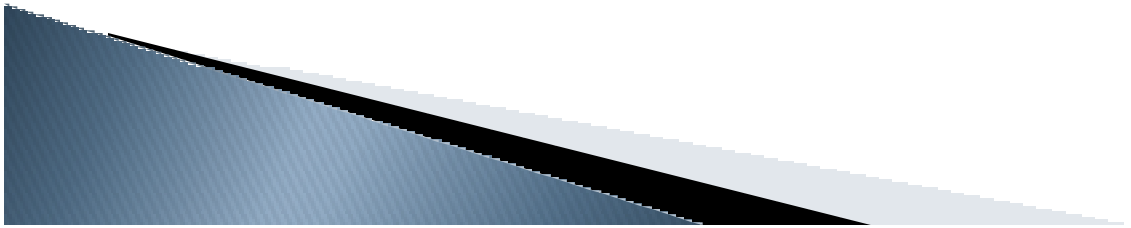
- **runlevel**: Run Levels determine whether your system will be in rescue mode, maintenance mode or running normally with or without X
- runlevel command display the current and post reboot runlevel.
- Init command is used to change the run level on the fly but the runlevel is lost and goes back to default after a reboot.
- **vi /etc/inittab** file needs to be modified to change the runlevel permanently and the changes will only take effect after a reboot
- **id:5:initdefault**: (Replace 5 with 3)
- **init 5**



Windows	Runlevel
Repair mode	1
safe mode	2
safe mode with networking	3
safe mode with command prompt	3
Disable VGA Driver	4
Normal	5
Linux	
X = graphical session in Linux	
Shutdown	0
Single User (reset root password)	1
Multi User with no networking	2
Multi User with networking but no X	3
Unused	4
Multi User with networking with X	5
Reboot	6

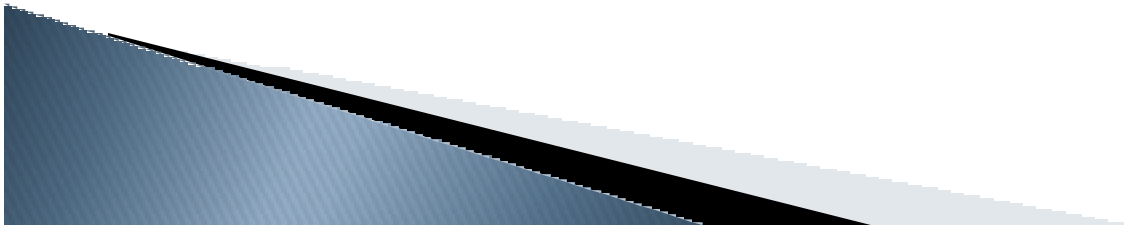
Digital Terrain

- How do you boot in to run level 1?
- **init 1**
- **vi /etc/inittab**
- Bootloader (MBR, NTLDR) in linux is called Grub. Grub configuration file is in /etc/grub.conf.
- Install flash adobe flash player
- **install swiff player**
- Open File with Mozilla Firefox



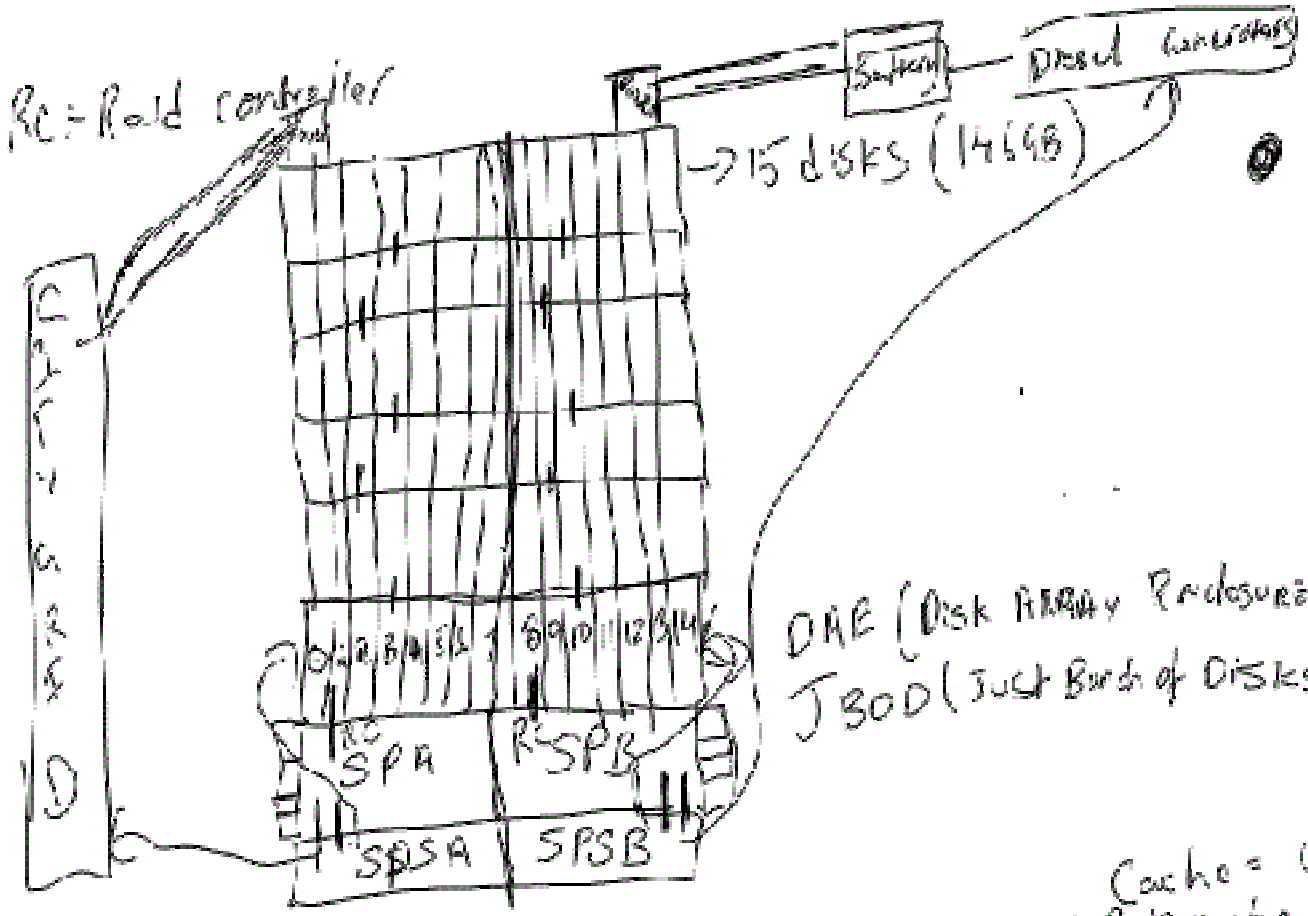
Boot to runlevel 1

- Access remote console
- Hit the arrow key (any) when you see the Red Hat Enterprise Linux Booting up.
- Hit e to edit the grub entry
- Arrow down to the kernel line and hit e again to edit the kernel line.
- In the kernel grub window append a “1” and hit enter
- Press b to boot in to run level 1



Digital Terrain

STORAGE MANAGEMENT



● = vault drives/ Enclosures

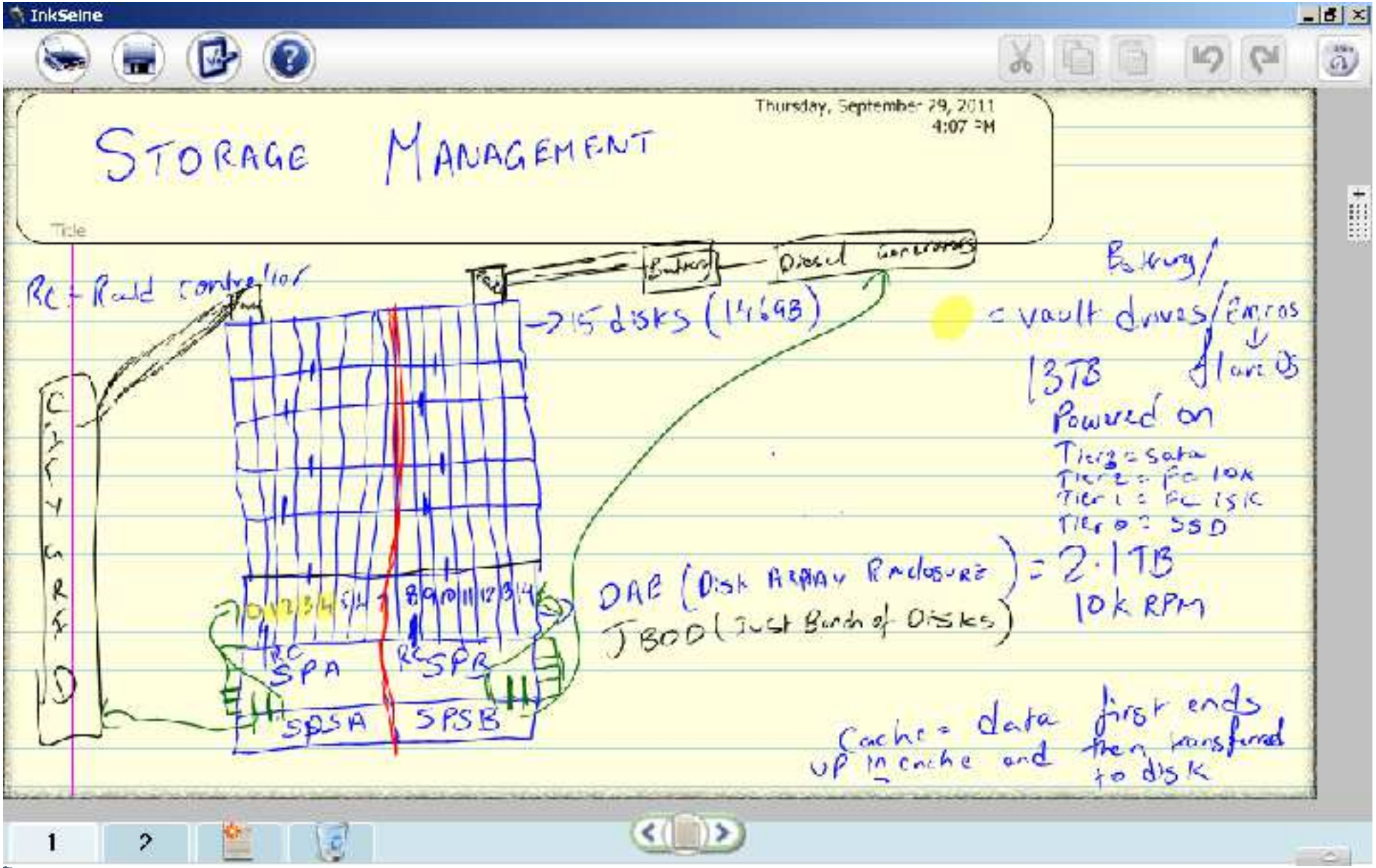
13TB

Powered on

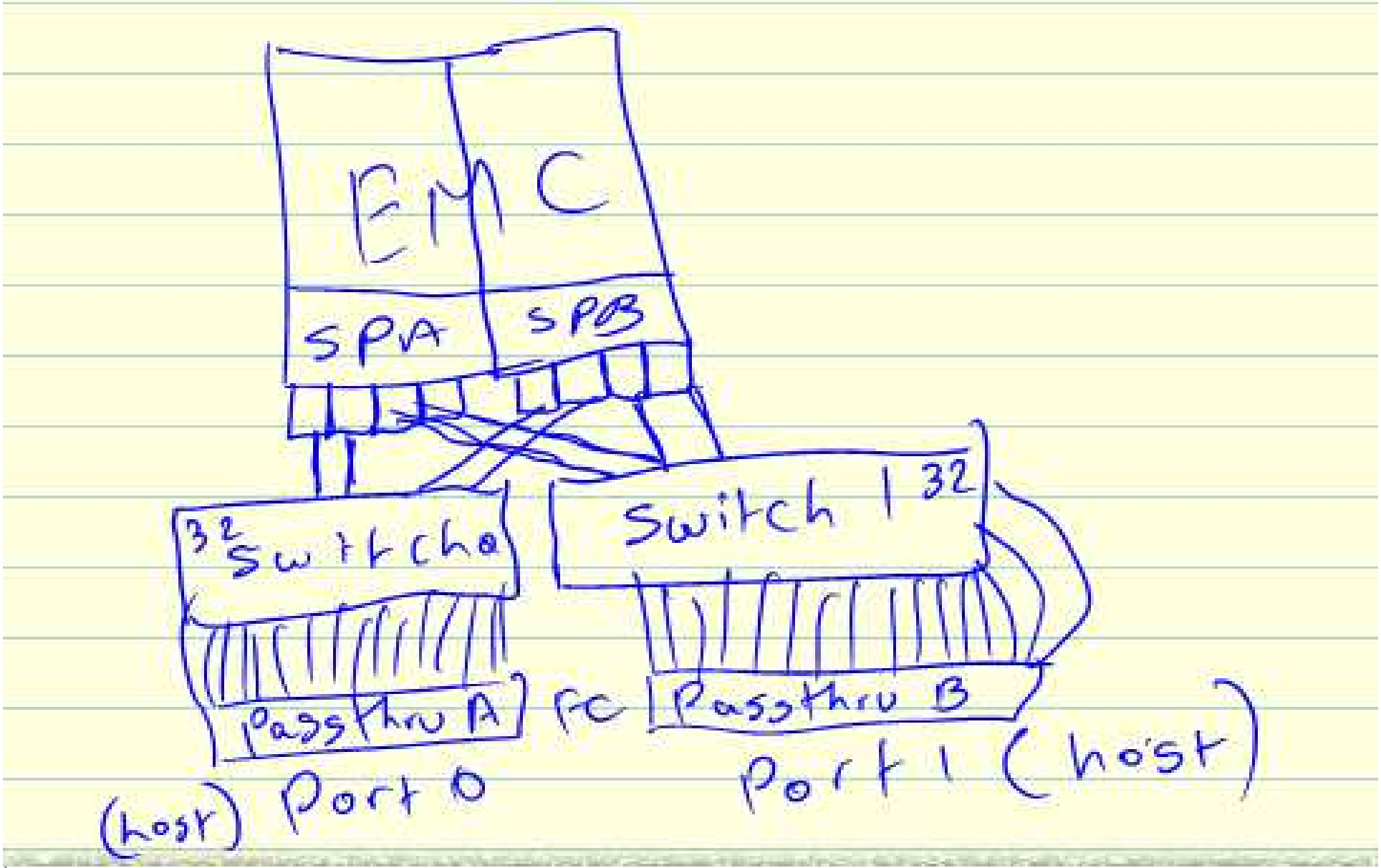
Tier 3 = Sata
Tier 2 = FC 10K
Tier 1 = FC 15K
Tier 0 = SSD

DAE (Disk Array Enclosure) = 2.1TB
JBOD (Just Bunch of Disks) 10K RPM

Cache = data first ends up in cache and then transfered to disk

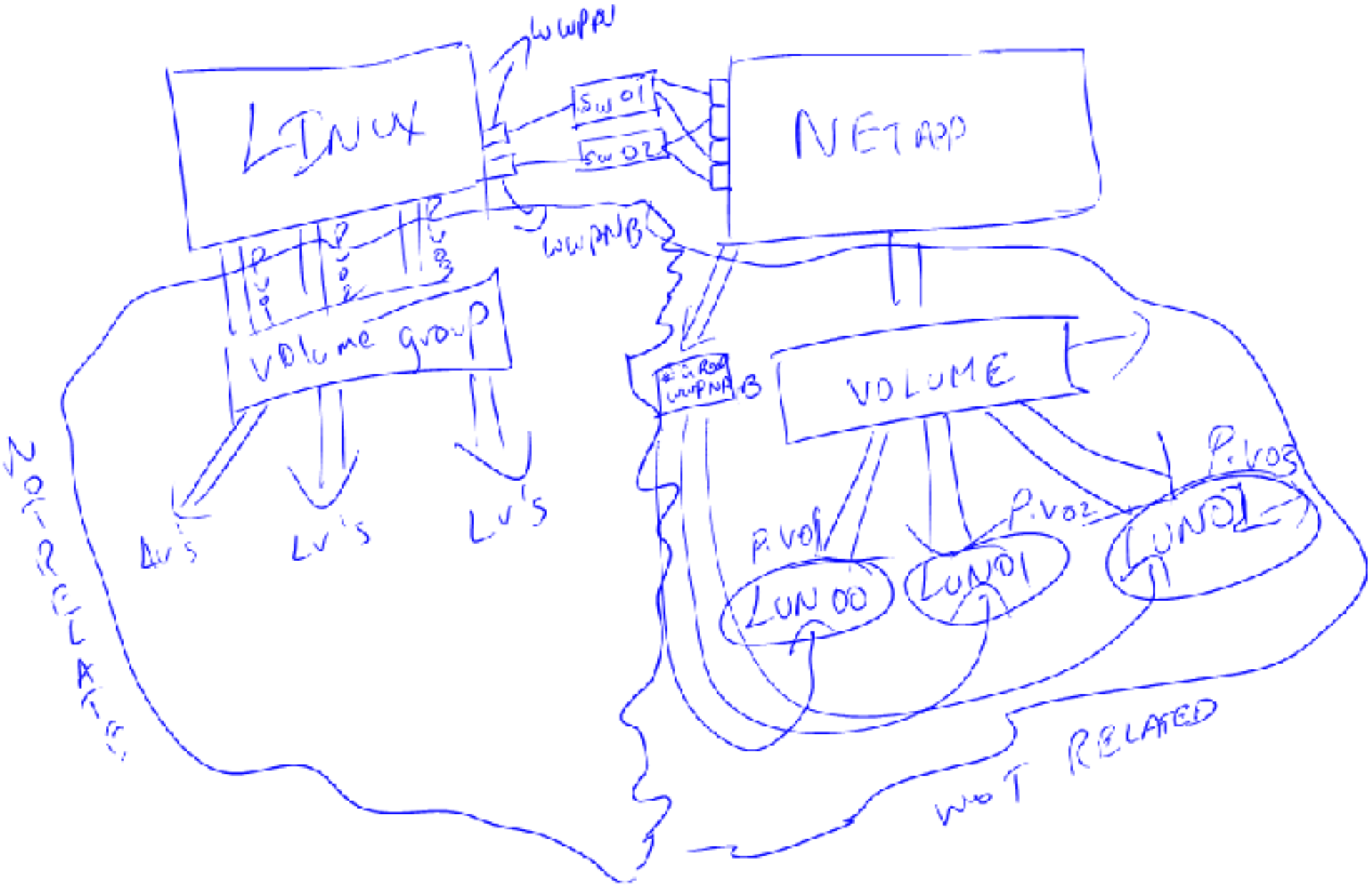


Digital Terrain



Digital Terrain

Storage Area Network



Digital Terrain

- **Multipath**: Multipath allows you to take devices coming from multiple paths (2 PORTS to 2 FILER PORTS).
- Multipath notifies the linux kernel multiple paths to a single storage device for ex: sdX and it will display the device with an alias instead of sdX (as sdX deems that its only using a single path)
- Opensource: Multipath (multipath is a service, service name: multipathd)
- PaidSource: EMC PowerPath, NetApp MPIO
- **/etc/multipath.conf and multipath –ll (list)**

- If you want to rescan for a new lun that you attached, configure multipath and then "**echo 1 > /sys/class/fc_host/hostX/issue_lip**"
- services & chkconfig
- service: the service can be used to start, stop and restart a service.
- **service servicename start** (stop/restart)
- **Windows Services**: A service is nothing but an application that runs in the background of the operating system. A Service can restarted, stopped, started, enabled and/or disabled. (services.msc)

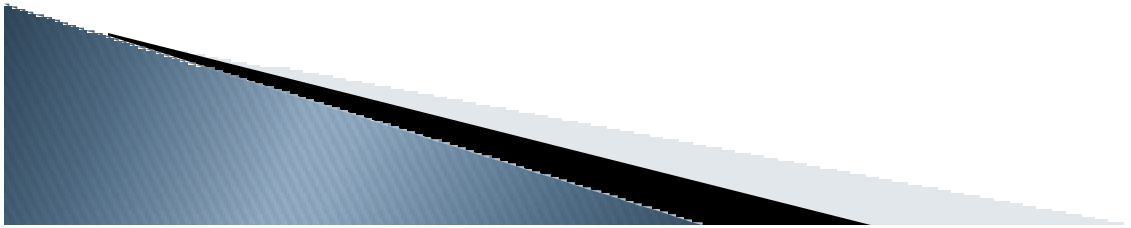
- Any custom applications (weblogic, websphere, databases, http server/webserver, backup agents, monitoring agents) running your server will always be created as services. One of the good things about using/creating services is that it enables you to start a service when a systems starts up.
- **chkconfig**: the chkconfig command can be used to enable/disable a service during a system startup/reboot.
- **chkconfig --list** (is used to list all services)
- **chkconfig servicename on** (off to disable at reboot).
- **chkconfig sendmail --level X on**
- **chkconfig network off (homework)**
- **Reboot**

Digital Terrain

- Remote console →chkconfig network on → service network start→ and test ssh in to your server from your laptop using putty
- **chkconfig --list**
- **chkconfig SERVICENAME off**
- **chkconfig SERVICENAME on**
- **service SERVICENAME stop**
- **service SERVICENAME start**
- **service SERVICENAME restart**
- **service SERVICENAME status**

- **NFS** (Network File System):
- Network File System, is a UNIX/Linux/Windows based common file system and is used to share files/folders across a Network Path. It is based off of TCP/IP and NFS is also the name of the protocol.
- NFS is file-based file system and NOT like a block-based file system (ext3, ntfs, jfs)
- NFS is very similar to CIFS but NOT CIFS (Windows File sharing protocol, for example argos).
- NFS is a service in linux (nfs).
- NFS is based off of Server – Client Relationship.

- mkdir /opt/backup
- Edit /etc/exports and add the entry to share a folder on the NFS server
- /opt/backup *(rw,no_root_squash) #The * means all hosts, rw means read and write permissions, no_root_squash means that client can have root permissions to the share folder
- service nfs start (restart) (DO NOT RUN THIS AT WORK)
- IF YOU NEED TO ADD ANOTHER SHARED FOLDER THAN THE ONE YOU ADDED PREVIOUSLY FOLLOW THE STEPS BELOW DO NOT RESTART THE NFS SERVICE. IF YOU RESTART/STOP NFS ALL CLIENTS WILL GET DISCONNECTED.
- mkdir /opt/backup1
- Add a second entry (/opt/backup1) to share a folder on the NFS server in /etc/exports and run "exportfs -a"
- The exportfs command allows you to share the folders without restarting NFS daemon, if you restart NFS daemon constantly for every new addition of share you will cause the older shares to freeze. To get around this problem you run exportfs-a
- mkdir /LOCALMOUNTPOINT
- mount -t nfs SERVERNAME:/REMOTEMOUNTLOCATION /LOCALMOUNTPOINT



- Bonding (Networking), traceroute
- traceroute: traceroute command can be used to display hops from your server to the destination.
- traceroute can also be used to resolve network issues such as switch issues and gateway issues.
- Networking:
  /etc/hosts:
- This file contains IP Address and Host Name for Local Name Resolution, it is better to put the IP Address and the hostname of the server you connect to the most because it avoids your server contacting DNS every time it has to contact the server that was supposed to be in /etc/hosts.
- c:\Windows\System32\drivers\etc\hosts < -- WINDOWS

IPADDRESS	FQDN	ALIAS
10.10.3.100	sonicwall.vmpro.com	sonicwall

FQDN = Fully Qualified Domain Name

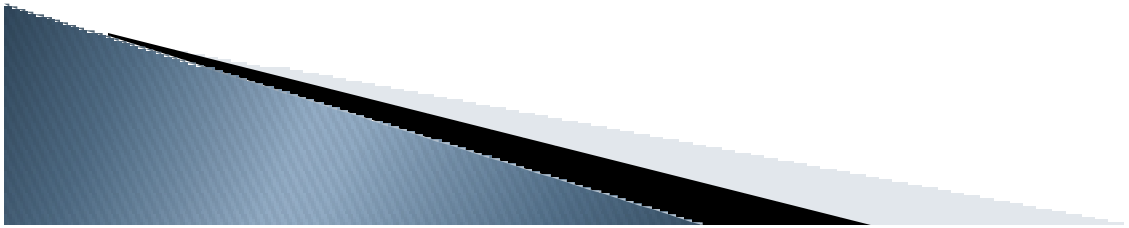
/etc/resolv.conf: All the dns servers are entered in to the /etc/resolv.conf

This file is used to configure your name servers (ie: DNS Servers). The changes are LIVE no need to restart network.

search vmpro.com
nameserver 10.30.1.5

Networking in Linux

Physical	Virtual
You would need to setup redundancy or bonding	Virtual Redundancy is not required as the physical adapters are bonded by Vmware



/etc/sysconfig/network-scripts/ifcfg-ethX

Digital Terrain

DEVICE=ethX → Device Name

BOOTPROTO=none → BOOTPROTO = dhcp, static, none (none is preferred as you don't pxe boot repeatedly)

HWADDR=MAC_ADDRESS → HWADDR = Hardware Address or Mac Address of the Interface

ONBOOT=yes → ONBOOT = yes or no (yes is preferred because it will not enable the adapter if it is set to no during BOOT).

NETMASK=255.0.0.0 → NETMASK = Subnet Mask of your network

IPADDR= IPADDRESS → IP ADDR = IP Address of the interface.

GATEWAY=10.10.3.100 → Gateway = Gateway address of the interface

TYPE=Ethernet

Digital Terrain

Network Settings	Filename	
IP	cat /etc/sysconfig/network-scripts/ifcfg-ethX	
SUBNET MASK	cat /etc/sysconfig/network-scripts/ifcfg-ethX	
GATEWAY	cat /etc/sysconfig/network-scripts/ifcfg-ethX	
DNS	cat /etc/resolv.conf	
HOSTNAME	cat /etc/sysconfig/network	

Digital Terrain

- **ethtool eth2** (Record the Link Detected Status)
- **ifconfig eth2** (Note that there is no IP)
- **vi /etc/sysconfig/network-scripts/ifcfg-eth2**
- Edit the following lines:
- BOOTPROTO=dhcp (change to none)
- ONBOOT=no (change to yes)
- Add the following lines:
- NETMASK=255.255.0.0
- IPADDR=172.35.1.X

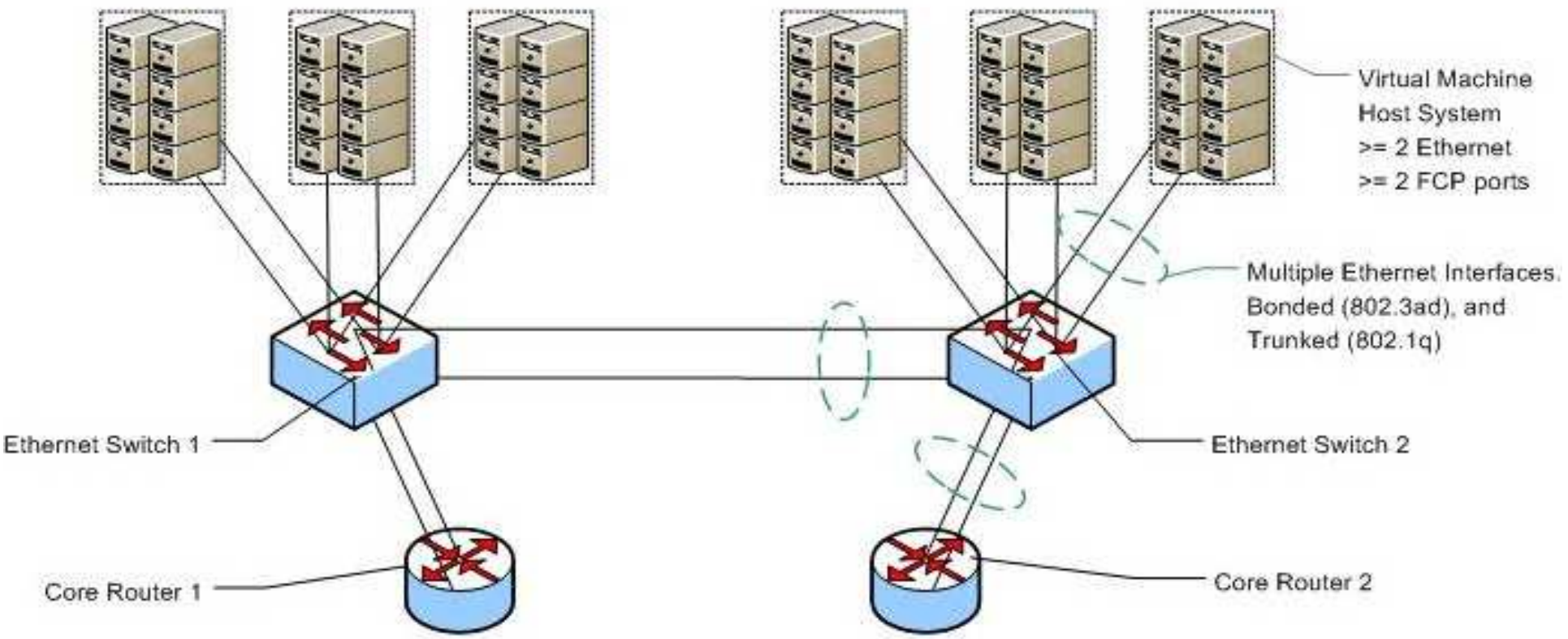
Digital Terrain

- **ifup eth2**
- **ifconfig eth2** (Note now the new ip takes effect)
- **ethtool eth2** (Record the Link Detected Status)
- ssh using the new ip of your clients address.
- **/etc/sysconfig/network**
- This file is used to configure the hostname for your linux server. (CHANGE AFFECTIVE INSTANTENOUSLY)
- **cat /proc/sys/kernel/hostname**
- **/etc/nsswitch.conf**
- /etc/nsswitch.conf can be modified to ensure the system uses either /etc/hosts as **primary**/secondary and DNS (BIND) as primary/**secondary**.
- **hosts files dns**

Digital Terrain

- **Bonding**:
- What are the four types of bonding?
- Mode 1 - Mode 4
- Either in **/etc/modprobe.conf**
- **/etc/sysconfig/network-scripts/ifcfg-bondX**
- MTU: Maximum Transmission Unit - 1490 - 1500
- <1501 -- Multicast Broadcast Storm.
- Mode 1 is Active / Standby
- Mode 2 is XoR (Tx and Rx)
- Mode 3 is broadcast (mostly used in UDP configurations)
- Mode 4 it switches the MAC Address (Mac Address Spoofing) or also Active / Active.

Digital Terrain



- **Configure Networking**

- **WARNING**: Beware of Baseboard Management Controllers (BMCs)

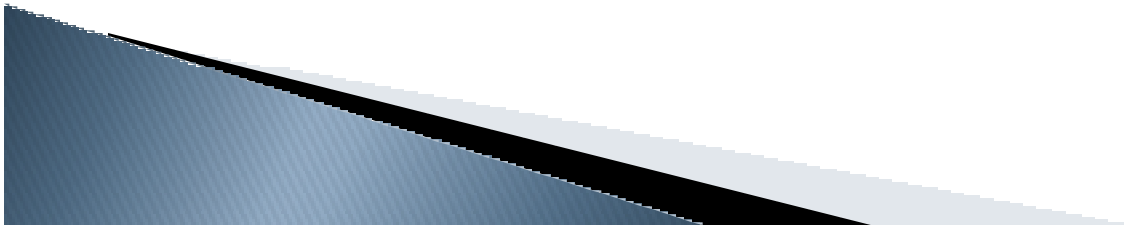
- Baseboard Management Controllers (BMC) are increasingly shipped on rackmount servers. While these can be a great management tool, the versions that share the system's ethernet ports often don't react well with bonded interfaces.
  With the Broadcom NetXtreme II, you **must** disable the management firmware in order to enable bonding, less a broadcast storm occur on the connected switch.

  In the Broadcom case, a DOS utility "xdiag" is provided on the firmware update disk which can disable the management firmware (MF) code. If "xdiag -ver" shows "MF" active on a controller, you need to run "xdiag -c <controller#> -mfw 0" to disable it.

- see: Network Switch Configuration- bonding and trunking

With the switch configured, the VM host systems can now be configured. These steps are valid for all RHEL derivatives (Oracle EL, Oracle VM Server, CentOS, etc). All relevant files are in the **/etc/sysconfig/network-scripts/** directory.

Debian Linux and derivative (Ubuntu) users will want to look into the format of their distribution's /etc/network/interfaces file.



- The end result is that the system will end up with a large group of interfaces: the physical interfaces (ethX: eth0, eth1, …) bonding interfaces to aggregate the physical interfaces (bondX: bond0, bond1, …) – also a VLAN trunk!. interfaces for each individual VLAN on the bonded trunk (bondX.**vlan#**: bond0.1, bond0.50) per-vlan bridges, these are the bridges that virtual machines will attach their native virtual interfaces (vifs) to, I have used the vlan# convention for the bridge names (vlan1, vlan50, vlan51…) where interface vlan50 participates in vlan ID 50 placed on the trunk.

Digital Terrain

- **Load Bonding Module**

- By default, the bonding module only supports the creation of one bonding interface. The "options bonding max_bonds=#" is used to increase this value to whatever # is required, which will generally be between 1 and 4 depending on your site and needs.

  Add the bonding module or Append the below lines to /etc/modprobe.conf

  alias bond0 bonding
  alias bond1 bonding
  options bonding max_bonds=2

Digital Terrain

- **Configure the bonding interface**
- bond0 via **/etc/sysconfig/network-scripts/ifcfg-bond0**

  # 802.3ad bonded link

  # switch po1: Gi1/1, Gi1/2

  DEVICE=bond0

  BOOTPROTO=none

  ONBOOT=yes

  BONDING_OPTS="mode=4 miimon=100"

  IPADDR=*IPADDR_SAME_AS_INTERFACE_ETH0*

  NETMASK=255.0.0.0

  GATEWAY=10.10.3.100

Digital Terrain

- **Configure the physical interfaces (eth0 and eth1) that are part of bond0:**

- **/etc/sysconfig/network-scripts/ifcfg-eth0**

- When you are done the the ifcfg-eth0 needs to look EXACTLY like below

```
# First interface in bond0
DEVICE=eth0
BOOTPROTO=static
HWADDR=INTERFACE MAC ADDRESS
TYPE=Ethernet
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

Digital Terrain

- /etc/sysconfig/network-scripts/ifcfg-eth1

```
# Second interface in bond0
DEVICE=eth1
BOOTPROTO=static
HWADDR=INTERFACE MAC ADDRESS
TYPE=Ethernet
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

- **Configuration Complete once completed DO NOT "service network restart", to activate the bond0 reboot the server.**

- A series of "ifup" commands will bring the above configuration into production without a reboot. Nevertheless, a reboot is strongly recommended to ensure that the network configuration restores itself properly

Digital Terrain

- **The following interfaces should be seen when running an "ifconfig":**

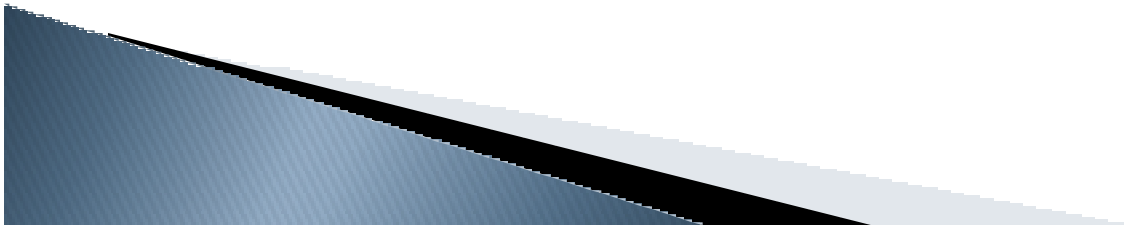
```
bond0 Link encap:EthernetHWaddr 00:14:5E:C0:FF:EE
UP BROADCAST RUNNING MASTER MULTICAST MTU:1500 Metric:1
RX packets:33617546 errors:0 dropped:0 overruns:0 frame:0
TX packets:12192931 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:4023299390 (3.7 GiB) TX bytes:1022184796 (974.8 MiB)

eth0 Link encap:EthernetHWaddr 00:14:5E:C0:FF:EE
UP BROADCAST RUNNING SLAVE MULTICAST MTU:1500 Metric:1
RX packets:6783365 errors:0 dropped:0 overruns:0 frame:0
TX packets:2132508 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:731753941 (697.8 MiB) TX bytes:226889202 (216.3 MiB)
Interrupt:23 Memory:ce000000-ce011100

eth1 Link encap:EthernetHWaddr 00:14:5E:C0:FF:EE
UP BROADCAST RUNNING SLAVE MULTICAST MTU:1500 Metric:1
RX packets:26834181 errors:0 dropped:0 overruns:0 frame:0
TX packets:10060423 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:3291545449 (3.0 GiB) TX bytes:795295594 (758.4 MiB)
Interrupt:16 Memory:ca000000-ca011100

lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:59021 errors:0 dropped:0 overruns:0 frame:0
TX packets:59021 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:14567768 (13.8 MiB) TX bytes:14567768 (13.8 MiB)
```

- The status of the bonded interface can be seen by using the procfs and sysfs:
- /proc/net/bonding/bond0
- /sys/class/net/bonding_masters
- the /sys/class/net/bond0/ directory
- **cat /proc/net/bonding/bond0**



- Ethernet Channel Bonding Driver: v3.0.3 (March 23, 2006)

  Bonding Mode: IEEE 802.3ad Dynamic link aggregation
  Transmit Hash Policy: layer2 (0)
  MII Status: up
  MII Polling Interval (ms): 100
  Up Delay (ms): 0
  Down Delay (ms): 0

  802.3ad info
  LACP rate: slow
  Active Aggregator Info:
  Aggregator ID: 1
  Number of ports: 2
  Actor Key: 17
  Partner Key: 101

- Partner Mac Address: C0:FF:EE:25:60:00

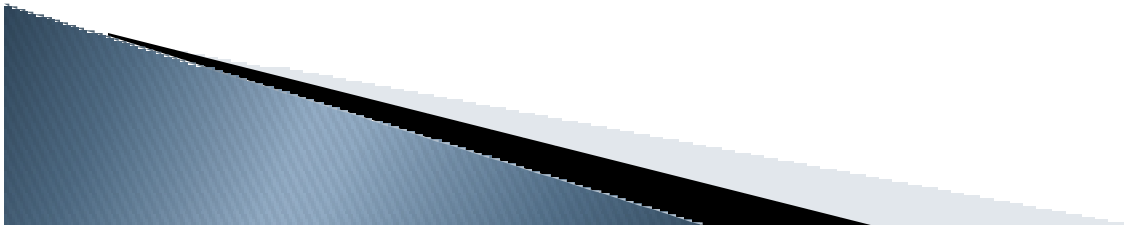
Slave Interface: eth0
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:14:5e:C0:FF:EE
Aggregator ID: 1

Slave Interface: eth1
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:14:5e:C0:FF:EF
Aggregator ID: 1

Digital Terrain

- **cat /sys/class/net/bonding_masters**
- bond0 bond1
- **cat /sys/class/net/bond0/operstate**
- up

- /etc/sysconfig/network-scripts/ifcfg-ethX
- /etc/sysconfig/network-scripts/ifcfg-bondX
- /etc/modprobe.conf

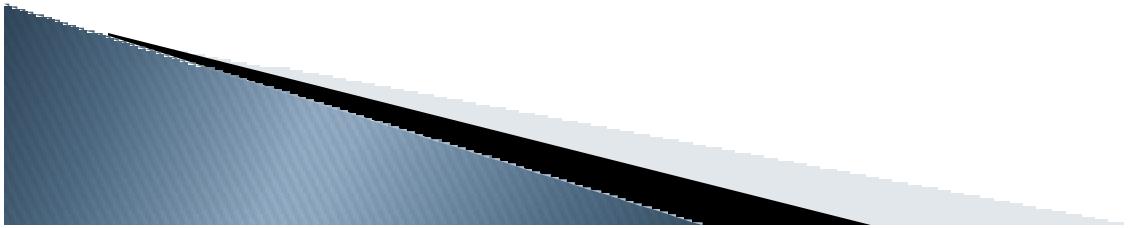


Digital Terrain

- **NTP:**
- Modify **/etc/ntp.conf** and add the Time Servers in the following scenario
- COMMENT THREE SERVER ENTRIES RELATED TO CENTOS POOL
- server SERVERNAME
- server SERVERNAME
- **chkconfig ntpd on**
- **service ntpd start**
- **ntpq–p**
- **yum install ntp**
- To test the time server:
- Run date command Run date 01011330 command

Digital Terrain

- **ntpdate -u TIMESERVER**
- Run date command again and record the time.
- **At** command example:
- [root@c1b14lx14 ~]# at 1314
- **at> vmstat | mail -s "vmstat output at `date`" xxxxxxxxxx@vtext.com**
- **at> <EOT> or CTRL+D**
- job 9 at 2011-10-04 13:14

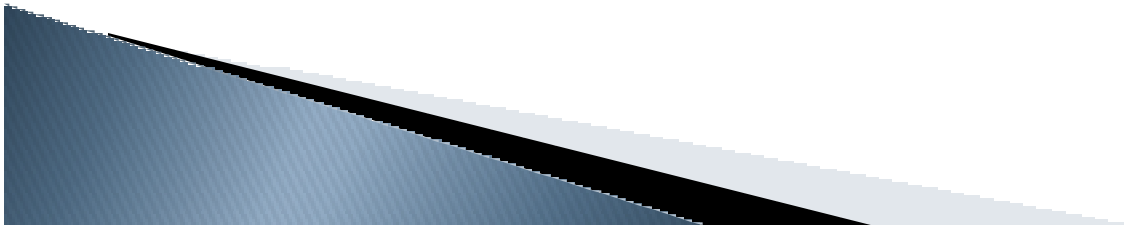


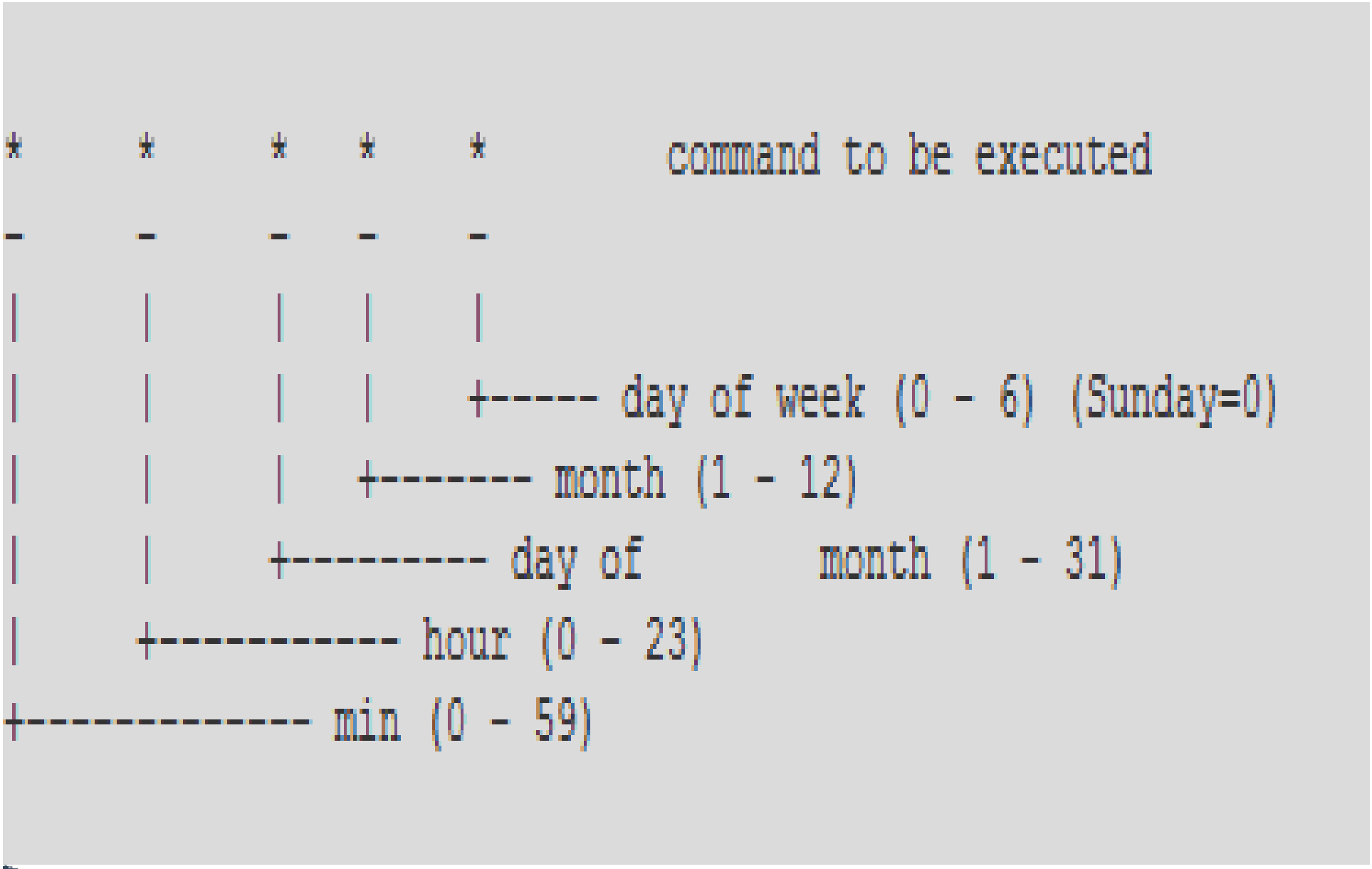
- **Crontab:**

- Crontab is used to schedule tasks like the at command, unlike the at command which only runs at single instance of time, crontab is used to repeat multiple instances in different periods of time.

- The file to configure or to edit crontab is

- **"crontab –e"**




* * * * * command to be executed
- - - - -
| | | | |
| | | | +----- day of week (0 - 6) (Sunday=0)
| | | +------- month (1 - 12)
| | +--------- day of month (1 - 31)
| +----------- hour (0 - 23)
+------------- min (0 - 59)

- I want to run a backup script to backup /home every saturday at 6:30 PM in the month of January.
- 30 18 * 1 6 /bin/tar -czvf /opt/backup/homebackup.tar.gz /home
- I want to run a backup script to backup /usr monday, wednesday, saturday at 8:30 PM from the months of July through December.
- 30 20 * 7-12 1,3,6 /bin/tar -czvf /opt/backup/usrbackup.tar.gz /usr
- I want you to run a backup script to backup /etc every hour of the day on the 2nd day of any month.
- 59 * 2 * * /bin/tar -czvf /opt/backup/etcbackup.tar.gz /etc
- #The below entry will backup /etc/ every hour on the 2nd day of the month
- 59 * 2 * * /bin/tar -czvf /opt/backup/etcbackup.tar.gz /etc
- #The below entry will email you every 15 minutes with annoying message
- */15 * * * * /bin/mail -s "Annoying email every 15 minutes" ppotluri@vmpro.com < /tmp/emailmessage

Digital Terrain

- Send your self a email or text message every 5 minutes between the hours 1:00 PM – 2:00 PM on the second day of the month

- */5 12-13 2 * * /bin/mail -s "Text Message" 2484444918@vmpro < /tmp/message

- Backup /etc or compress /etc file to /opt/backup every 20 minutes between the hours of 8:00 AM – 5:00 PM on the second day of the month and also only on Monday.

- */20 8-17 2 * 1 /bin/tar -czvf /opt/backup/etcbackup.tar /etc

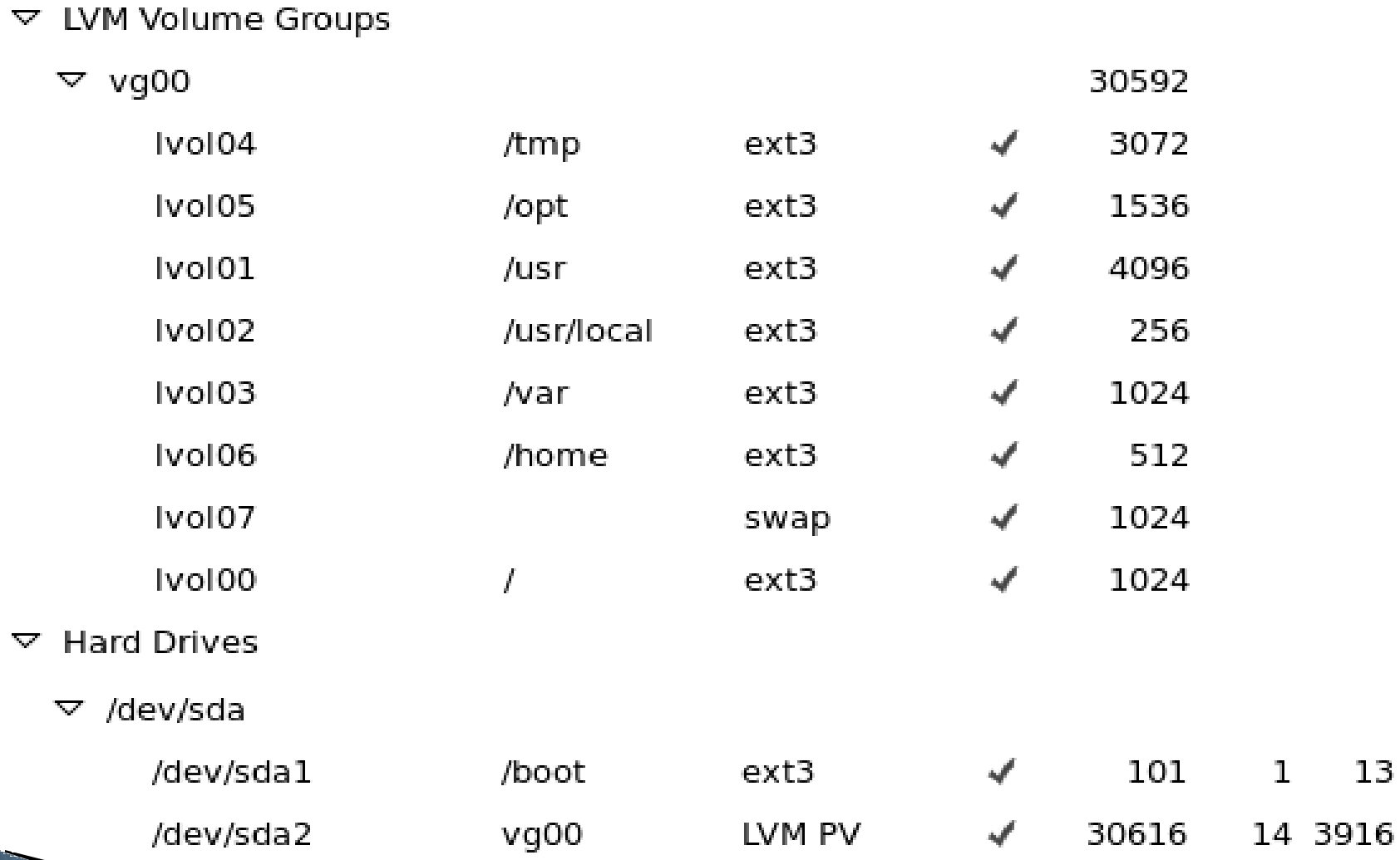
Digital Terrain

- find command by size example:
- **find -size +10M -exec mv {} largerthan10MB \;**
- **dd if=/dev/zero of=ddfile3 bs=4k count=10000**
- **sambacifs:**
- **yum install samba-client**
- **mkdir /labvideos**
- **mount -t cifs //argos/backup /labvideos**
- **umount /labvideos**

Digital Terrain

- SSH KEYGEN and authentication
- **ssh-keygen -t *rsaORdsa*<enter>**
- **Enter file in which to save the key: <enter>**
- **password: <enter>**
- **reenter password: <enter>**
- **scp /root/.ssh/id_*rsaORdsa*.pub**
- ***client*:/root/.ssh/authorized_keys**
- **ssh *client***

- **Boot from SAN:–**
- and configure the LVM at boot using the following image:

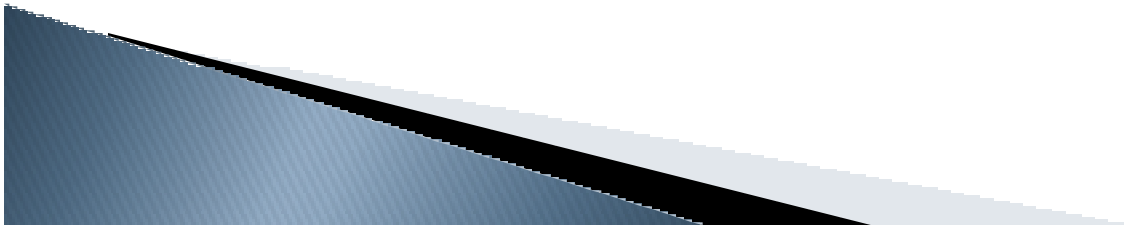


Digital Terrain

Digital Terrain

HTTPD Install

- **yum install httpd**
- **vi /var/www/html/index.html** → Server name is c1b14lx14
- **vi /etc/hosts** → Add entry for your host
- **service httpd restart**
- Open a web browser and access your server by entering your
- host name



Digital Terrain

SUDO

ALL	=(ALL)	ALL
Execute	Execute	Execute
in all	as any	any commands
Terminals	User	

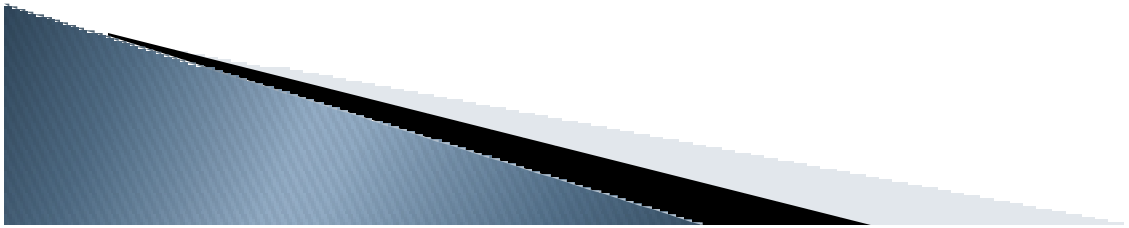
useradd dcadmin01

useradd dcadmin02

groupadd datacenteradmins

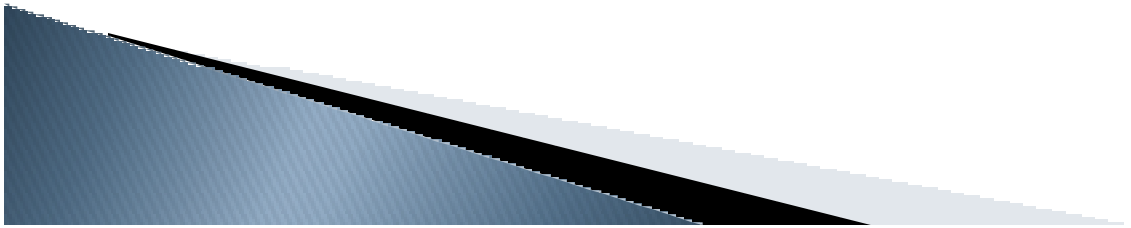
Add both the users to the group datacenteradmins

Change password for dcadmin**



Digital Terrain

- **scp /etc/sudoers YOURSERVER:/etc/sudoers**
- **visudo**
- Users are represented with their name
- Groups are represented with "%" in front of them
- dcadmin01 $ sudo wall system shutting down in 30 seconds
- && sleep 30 &&sudo wall `date` &&sudo reboot



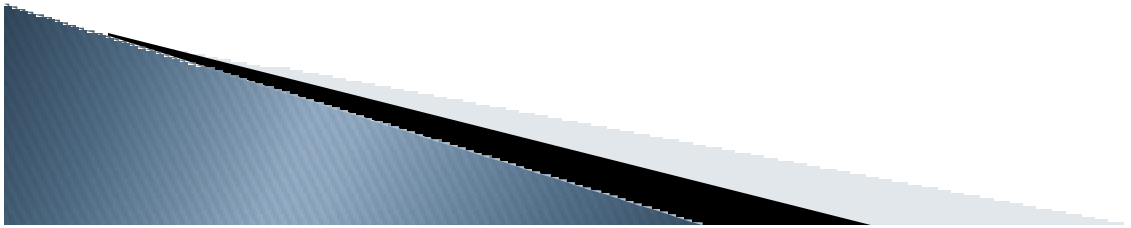
Digital Terrain

- For those who are completed with the above lab please create two help desk users and a helpdesk group which allows them to change passwords of any user and create any new user accounts.

- export PATH=$PATH:/usr/sbin
- Syslogd: Controls which type of log entries end up in log files
- Klogd: Captures kernel messages from Syslogd
- Logrotated: Controls the size and # of iterations of log files
- The entries in /etc/logrotate.conf are used by default if the minsize and rotate are not defined in the
- **/etc/logrotate.d/syslog**

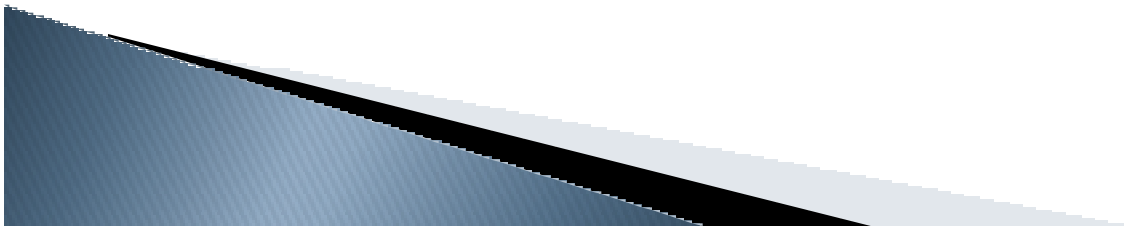
Digital Terrain

- /etc/syslog.conf
- /var/log/secure
- /var/log/messages
- dmesg vs /var/log/dmesg
- /etc/logrotate.conf
- /etc/logrotate.d/syslog



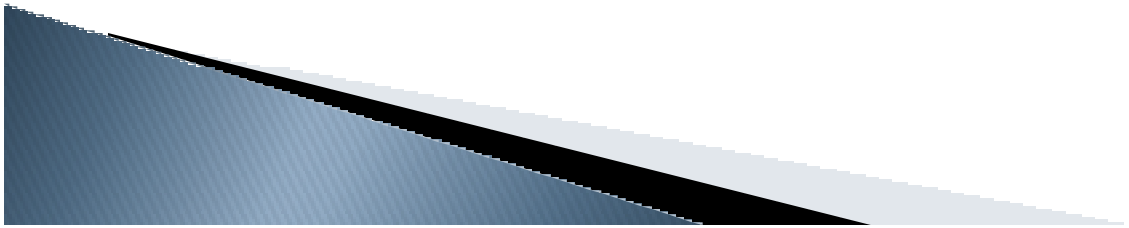
Digital Terrain

- title CentOS (2.6.18-274.3.1.el5)
- root (hd0,0) # Master Boot Device or where /boot is located at
- kernel /vmlinuz-2.6.18-274.3.1.el5 ro root=/dev/vg00/lvol00 rhgb quiet # This is the actual kernel line which loads the kernel
- initrd /initrd-2.6.18-274.3.1.el5.img # Initialize the RAMDISK, or create a small space in RAM so kernel can go reside there.



Digital Terrain

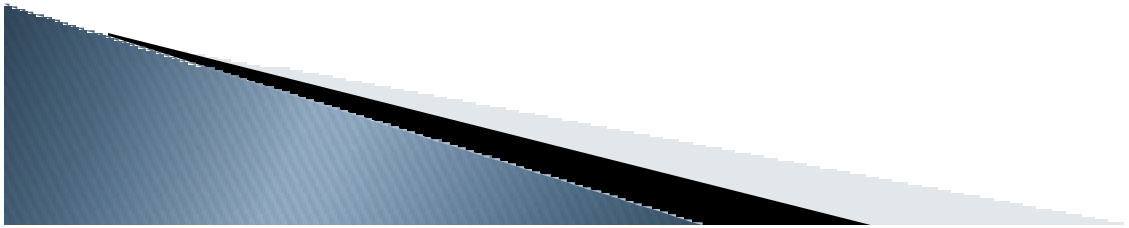
- **SWAP Space:**
- To create a swap file or extend your system swap use the commands below
- **dd if=/dev/zero of=swapfilebs=1024k count=2000** # Creates a 2GB swap file
- **mkswap /tmp/swapfile** #Lets the linux know there is a 2GB swap space for your use
- **swapon /tmp/swapfile** # Activates the swap space in the linux kernel
- To figure out the process
- **ps –ef**
- **To figure out the network port**
- **netstat –an**
- **To figure out both**
- **netstat–atnp**



- **SYSCTL (/etc/sysctl.conf): sysctl or system control is used to tune and control kernel parameters.**
- **Sysctl is used to tune kernel for applications such as databases, middleware, webservers running on your linux server**
- **sysctl -a (Displays all current kernel parameters)**
- Verify that the below parameters are already not created in /etc/sysctl.conf
- Kernel Tuning for Oracle 11G Enterprise Database for Linux.
- kernel.shmall = 2097152
- kernel.shmmax = 2147483648
- kernel.shmmni = 4096
- #semaphores: semmsl, semmns, semopm, semmni
- kernel.sem = 250 32000 100 128
- net.ipv4.ip_local_port_range = 1024 65000
- net.core.rmem_default=4194304
- net.core.rmem_max=4194304
- net.core.wmem_default=262144
- net.core.wmem_max=262144
- **sysctl -p** (Tells the kernel to read the new /etc/sysctl.conf and acknowledges the new changes)
- Only some parameters will activate with out a reboot, 90% of the a time a reboot is required.
- **reboot** (activates all the new kernel changes at boot)

Digital Terrain

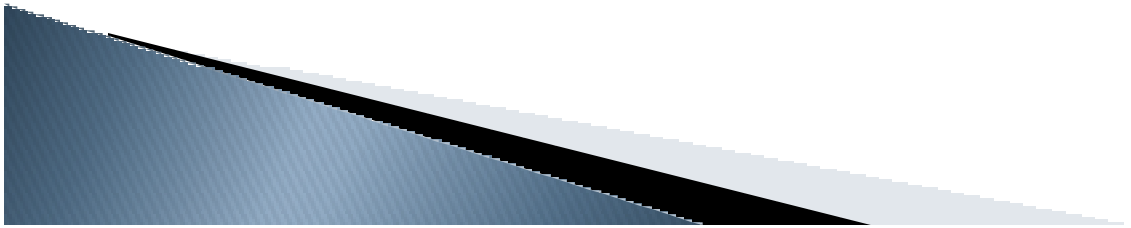
- **IPTABLES (LINUX FIREWALL)**
- iptabes controls or filters network traffic, very similar to your windows firewall.
- packet, packet filtering, packet direction.
- *Traffic (Packets) is determined in three formats:*
- MAC Address
- IP Address
- Port No.
- *Traffic (Packets) can be filter in three formats as well:*
- Accept
- Reject: Notifies the client that the packet was rejected
- Drop: Client is notified the packet is dropped so the client will assume there is a network
- loss or total silence.
- *Traffic (Packets) Direction:*



Digital Terrain

- INPUT (RX)
- FORWARD
- OUTPUT (TX)
- vi /etc/sysconfig/iptables
- serviceiptables start
- Sample IPTABLES:
- # Generated by iptables-save v1.3.5 on Wed Oct 12 06:55:49 2011
- *filter
- :INPUT ACCEPT [0:0]
- :FORWARD ACCEPT [0:0]
- :OUTPUT ACCEPT [198:23220]

- :RH-Firewall-1-INPUT - [0:0]
- -A INPUT -j RH-Firewall-1-INPUT
- -A FORWARD -j RH-Firewall-1-INPUT
- -A RH-Firewall-1-INPUT -i lo -j ACCEPT
- -A RH-Firewall-1-INPUT -p icmp -m icmp --icmp-type any -j ACCEPT
- -A RH-Firewall-1-INPUT -p esp -j ACCEPT
- -A RH-Firewall-1-INPUT -p ah -j ACCEPT
- -A RH-Firewall-1-INPUT -s 10.40.40.40 -p tcp --dport 80 -j ACCEPT
- #-A RH-Firewall-1-OUTPUT -d 10.40.40.40 -p tcp -j ACCEPT
- -A RH-Firewall-1-INPUT -d 224.0.0.251 -p udp -m udp --dport 5353 -j ACCEPT
- -A RH-Firewall-1-INPUT -p udp -m udp --dport 631 -j ACCEPT
- -A RH-Firewall-1-INPUT -p tcp -m tcp --dport 631 -j ACCEPT
- -A RH-Firewall-1-INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
- -A RH-Firewall-1-INPUT -p tcp -m state --state NEW -m tcp --dport 22 -j ACCEPT
- -A RH-Firewall-1-INPUT -j REJECT --reject-with icmp-host-prohibited
- COMMIT



Digital Terrain

- # Completed on Wed Oct 12 06:55:49 2011
- Please install Webmin and get webmin to work on your browser for all users.
- Verify whether firewall is up and running: service iptables status
- Verify rules of firewall: service iptables status
- iptables –l
- Turn off firewall: service iptables stop
- Turn on firewall: service iptables start
- Restart firewall: service iptables restart

Digital Terrain

- **TCPDUMP**

- TCPDUMP dumps TCP Packet information based on interval and/or a certain port, you can use the dump and import it in to Wireshark which will let you analyze the TCP Packet Data. So you can see when the packet was either sent or received, what type of packet and what is inside the packet.

- **tcpdump –vvs 65535 –w /tmp/tcpdump.pcap**

- **press ctrl+c** if the above command does not stop after 2 minutes.

- Download Filezilla client on your view machine

- sftp to your host using filezilla, browse to /tmp and copy and paste the tcpdump.pcap on to your view machine.

- Download Wireshark its free on your view machine.

- In Wireshark click on file --> open --> select the tcpdump.pcap

Digital Terrain

- Vgdisplay: command output
- VG Name vg10
- VG Name: Volume Group Name
- System ID
- System ID: If the VG is being shared you would have a defined System ID for ex:
- GFS (Global File System)
- Format lvm2
- Format: Since the VG is based out of LVM family, and lvm family is divided in to
- lvm and lvm2 we are using the latest version of lvm which is lvm2.
- Metadata Areas 1
- Metadata: This is an area used for iNodes to avoid Double writes.
- Metadata Sequence No 1
- Read Above related to Metadata

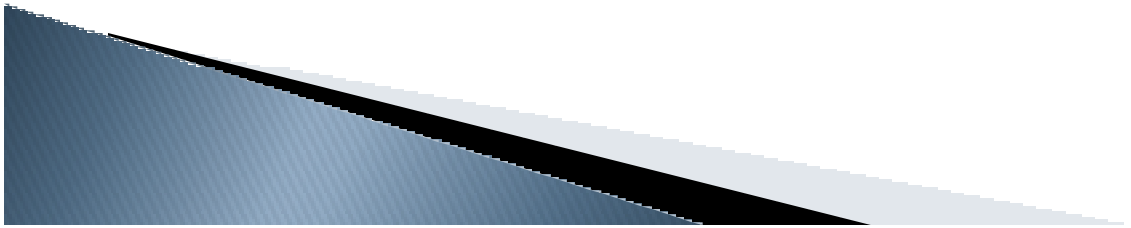
Digital Terrain

- VG Access read/write
- VG Access: Can you read only or can you read and write.
- VG Status resizable
- VG Status: It defines whether you can add more PVs to the current VG if it is not resizable only the PVs used during the VG creation get used
- MAX LV 0
- Cur LV 0
- Open LV 0
- Max PV 0
- The above underlined are predefined set rules to prevent admins from creating
- more than set limit LVs.

- Cur PV 1
- Act PV 1
- The PV defines how many PVs or Partitions are residing inside the VG. Current means how many added to the VG and Active means how many are being used by the VG.
- VG Size 10.00 GB
- The size of all the PVs put together defines the VG size
- PE Size 4.00 MB
- Physical Extent size which describes the smallest Logical Volume you can create, so in the value above that means you can create Logical Volume with as little as 4MB in size.
- Total PE 2559
- VG Size = PE Size X Total PE
- Alloc PE / Size 0 / 0
- Alloc PE = How many PEs are currently in use or allocated
- Free PE / Size 2559 / 10.00 GB
- Free PE = How many PEs are still available for you to create a LV.
- VG UUID fmc7Bj-2Y2A-tYEd-XIdU-9UAL-2SeE-kgUOP2
- VG UUID = Kernel refers to this UUID as the Volume Group, VG Name variable above is just
- for you to understand or to make it easily human readable.

Digital Terrain

- E2label
- e2label /dev/mapper/T2_LXLUN02p1 T2_LXLUN02
- entry in /etc/fstab: LABEL=T2_LXLUN02 /emclun ext3 defaults 0 0
- SWAP Entry in /etc/fstab:
- /emclun/ddfile1 swap swap defaults 0 0



Digital Terrain

- Tunnel X sessions or X based application on to your desktop:
- yum install firefox
- install xming from \\argos\labvideos on your vmware view machine
- make sure xming is not running, open xlaunch or search for xlaunch on your windows machine.
- click next, next, select or check no access control
- on your linux machine run "export DISPLAY=YOUR_VMWARE_VIEW_MACHINE_IP:0.0"
- firefox

- SUDO Scenario: You have over 2000 servers in a datacenter and you need to provide your data center admins the ability to shutdown the server so that they can perform maintenance at 3 A.M. without distrubing you or other system administrators.

- Create a Data Center Group Admins

- groupadd dcadmin

- Create users called Prasad and Asif and add them to the Data Center Admins Group.

- useradd -g dcadmin Prasad

- useradd -g dcadmin Asif

- passwd Prasad/Asif

Digital Terrain

- visudo and add permissions for the Data Center Admins Group to execute shutdown command as root.
- visudo, and Setup Cmnd_Alias (is like a variable which holds values/commands that other users can run)
- or Add the below entries in visudo:
- *Cmnd_Alias SHUTDOWN = /sbin/shutdown, /sbin/init*
- *%dcadmin ALL=(root) NOPASSWD: SHUTDOWN*
- Provide access to the Cmnd_Alias with the dcadmin group
- Login as Prasad/Asif and Test sudo.

Digital Terrain

- Private Yum Repository:
- NFS mount e3b3lx35:/mnt/centos5.7/media to /mnt folder.
- mount e3b3lx35:/mnt/centos5.7/media /mnt
- remove all files in /etc/yum.repos.d
- rm –rf /etc/yum.repos.d/*
- yum install xclock
- create a new file with a extension of .repo under /etc/yum.repos.d and add the below information:

- [CentOS5.7] ### This the section or the category that print when you run yum list
- name=CentOS5.7 ##This is name of the repository
- baseurl=file:///mnt ### This is the location where the media is stored
- enabled=1 ### 0 = no and 1 = yes
- gpgcheck=0 ### if you are a strict organization this is required it performs a GNU Privacy Guard check.
- yum install xclock
- :wq /etc/yum.repos.d/FILENAME.repo
- To verify selinux
- getenforce
- to disable selinux modify /etc/selinux/config and change the enforced to disabled and reboot.