

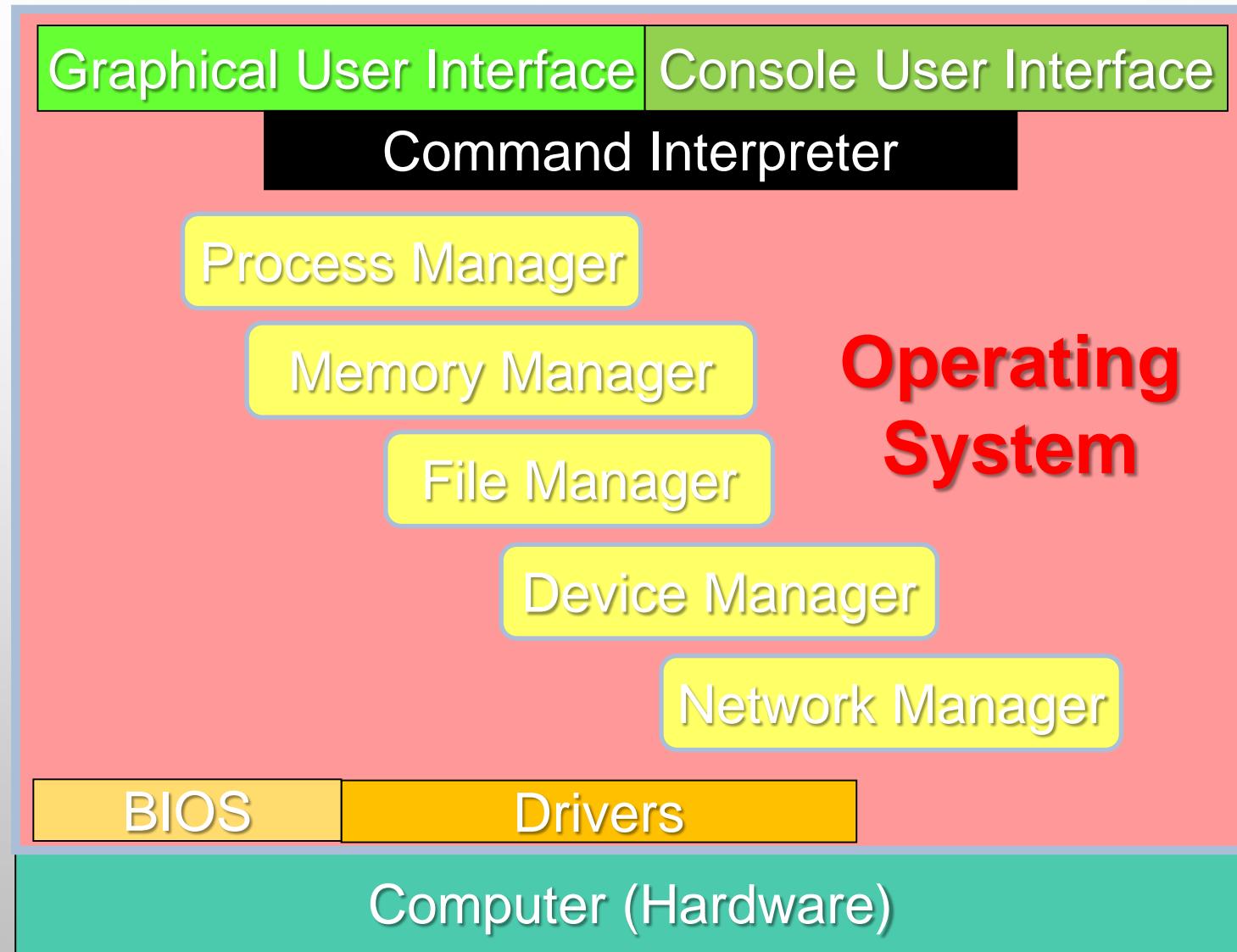
# **BASIC SYSTEM ADMINISTRATION (LINUX)**

IT2758 OPERATING SYSTEMS

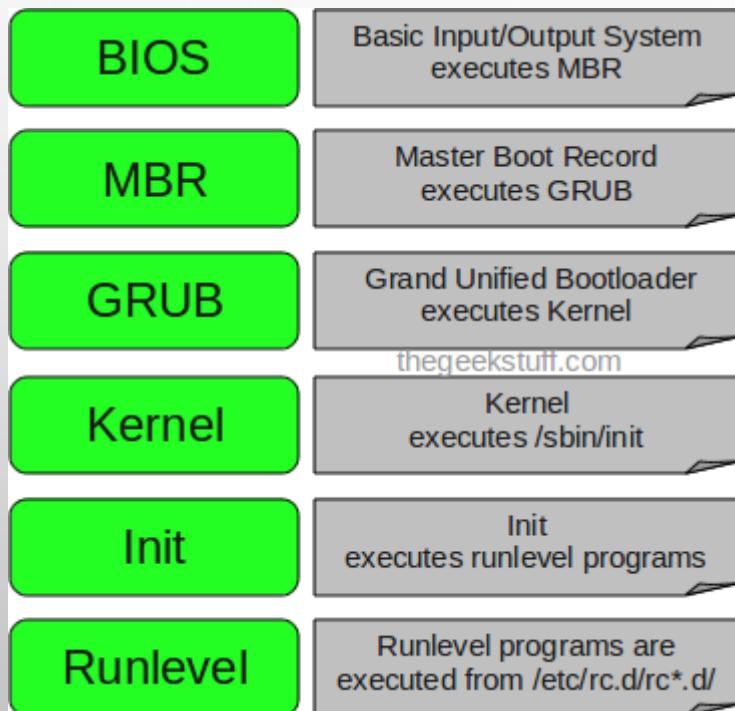
# CONTENT

- PROCESS MANAGEMENT
- DISK MANAGEMENT
- FILE MANAGEMENT
- ACCOUNT MANAGEMENT
- NETWORK MANAGEMENT

# OS ARCHITECTURE



# LINUX BOOT PROCESS



**BIOS** – Load and execute the MBR bootloader

**MBR** – Located in the 1st sector of the bootable disk.  
Loads and executes the GRUB boot loader.

**GRUB** - Stands for Grand Unified Bootloader. Choose which kernel images to be executed.

**Kernel** - Mounts the root file system. Execute the /sbin/init program

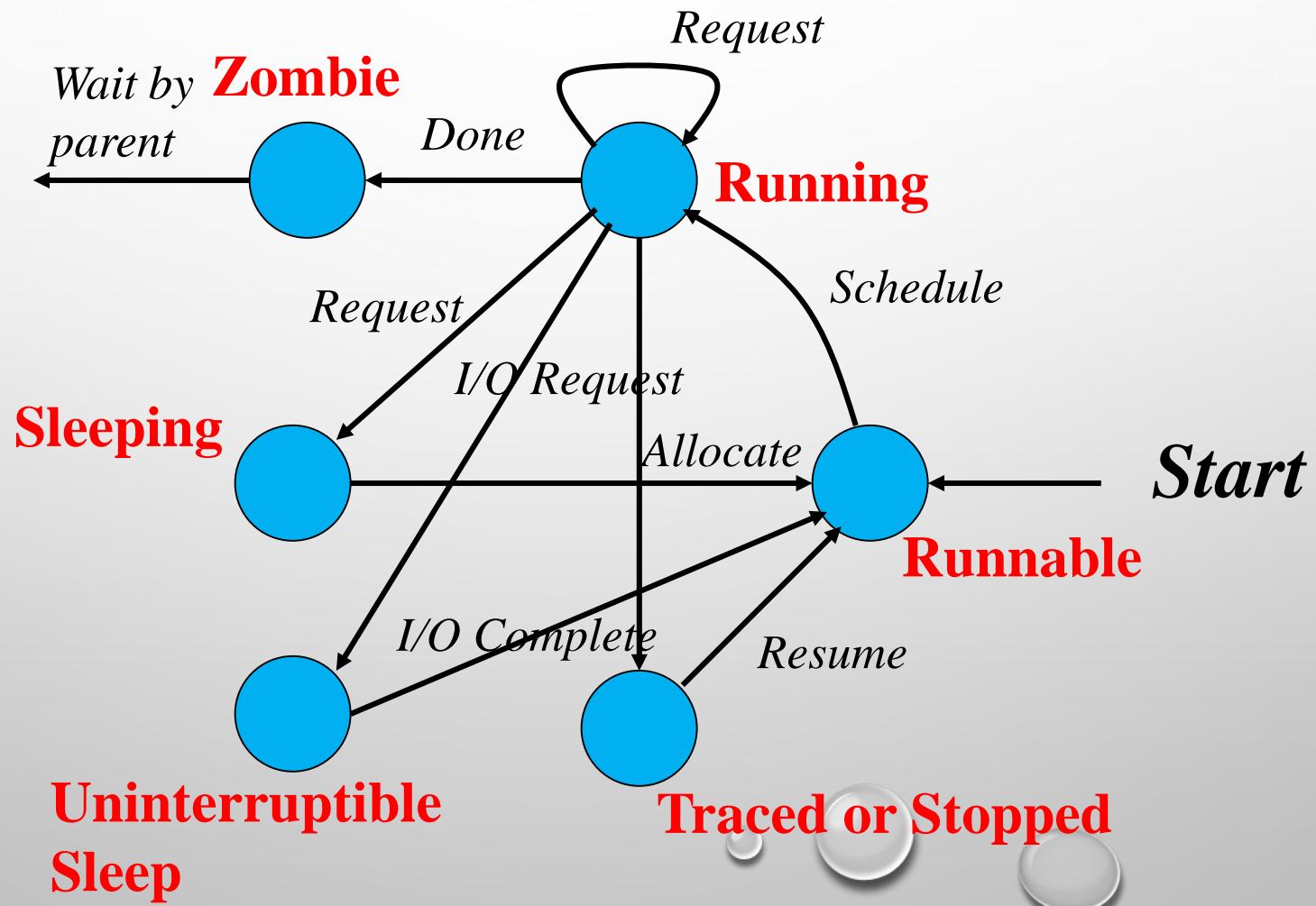
**Init** - Init identifies the default initlevel from /etc/inittab and uses that to load all appropriate programs.

**Runlevel** – Execute runlevel programs from the run level directory

# LINUX BOOT PROCESS

Run Level	Mode	Action
0	Halt	Shuts down system
1	Single-User Mode	Does not configure network interfaces, start daemons, or allow non-root logins
2	Multi-User Mode	Does not configure network interfaces or start daemons.
3	Multi-User Mode with Networking	Starts the system normally.
4	Undefined	Not used/User-definable
5	X11	As runlevel 3 + display manager(X)
6	Reboot	Reboots the system

# PROCESS MANAGEMENT



# PROCESS MANAGEMENT

**Running:** this is a state where a process is either in running or ready to run.

**Interruptible:** this state is a blocked state of a process which awaits for an event or a signal from another process

**Uninterruptible:** it is also a blocked state. The process is forced to halt for certain condition that a hardware status is waited and a signal could not be handled.

**Stopped:** once the process is completed, this state occurs. This process can be restarted

**Zombie:** in this state, the process will be terminated and the information will still be available in the process table.

# PROCESS MANAGEMENT

What is a zombie?

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

# PROCESS MANAGEMENT

The following are the system calls:

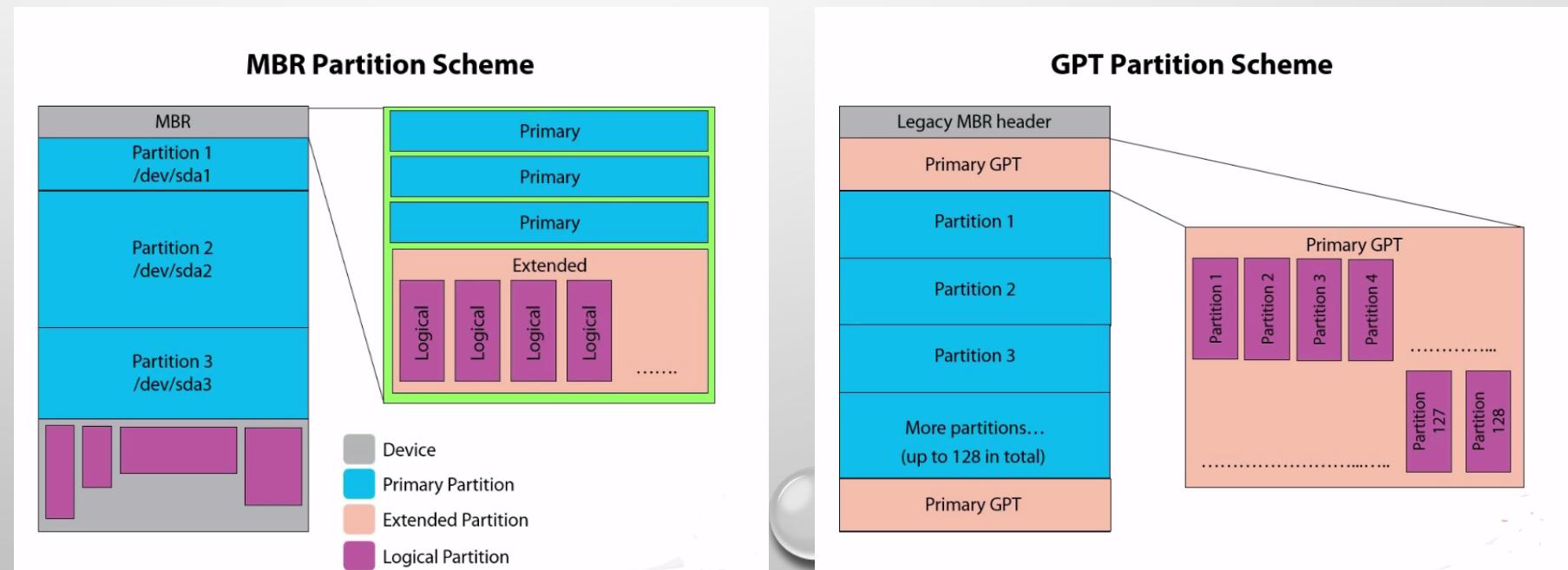
- `fork()` - for creating child process
- `vfork()` - for creating child process only to copy-on-write
- `exec()` - for performing a different task.
- `Wait()` - to make a process to wait for completion of execution.
- `Kill()` - for sending a signal to a process
- `signal()` - for handling a signal.
- `Exit()` - to exit out of execution of a process
- `_exit()` - to exit out of execution of a process without clean up.

# PROCESS MANAGEMENT

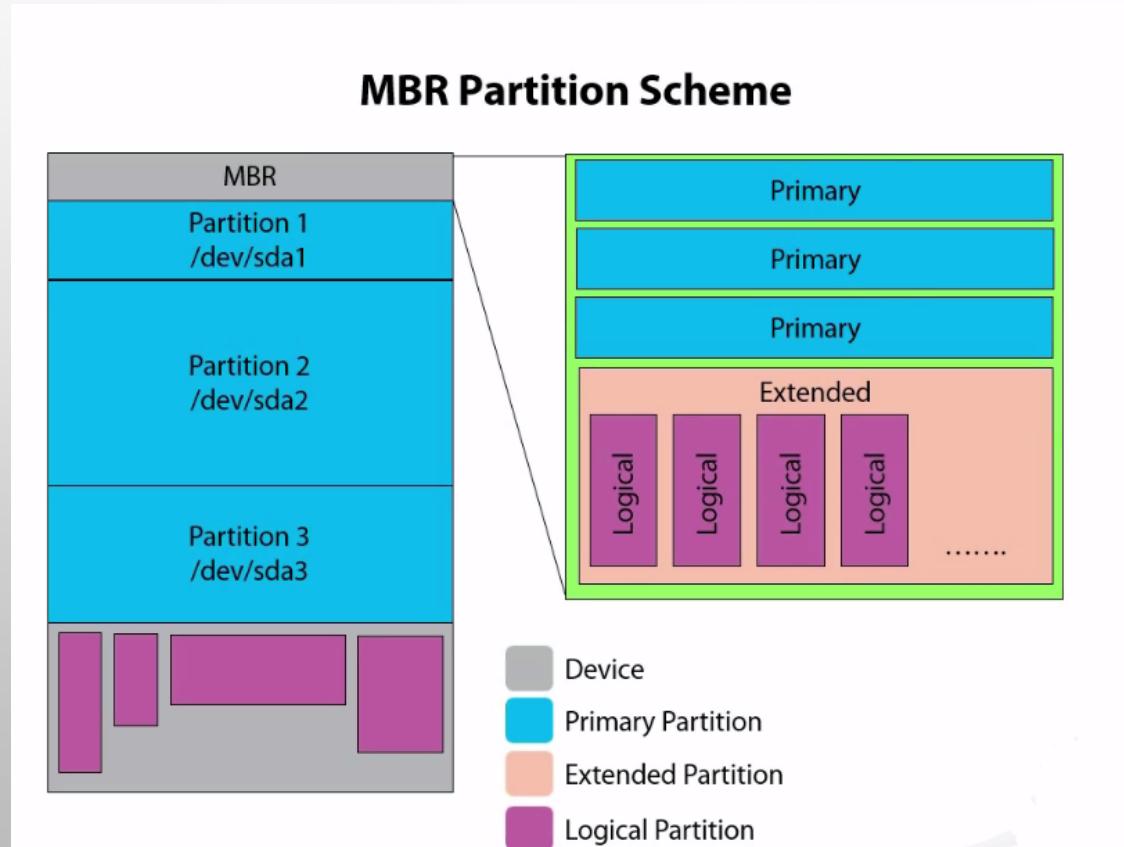
- ps - view the processes on the system
- pstree - displaying a tree diagram of parent and child processes
- top/htop - shows the system resources used by different processes. it gives a snapshot of the situation that the system is currently in.
- nice/renice - users can set or change the priorities of processes in linux. higher the priority of a process, more is the cpu time allocated by the kernel for it. values of process priority range from -20 to 19. lower the nice value, higher the priority
- kill - terminate processes by sending signals
- w - gives us information about the users who have currently logged in and the processes that they are running.
- fg , bg - push the jobs to be executed in the background using 'bg' command and can be brought to the foreground with the 'fg' command.

# DISK MANAGEMENT

- The physical disk can be divided into several partitions
- Each partition is an independent logical disk within the physical disk
- 2 types of partitioning scheme
  - MBR
  - GPT



# DISK MANAGEMENT



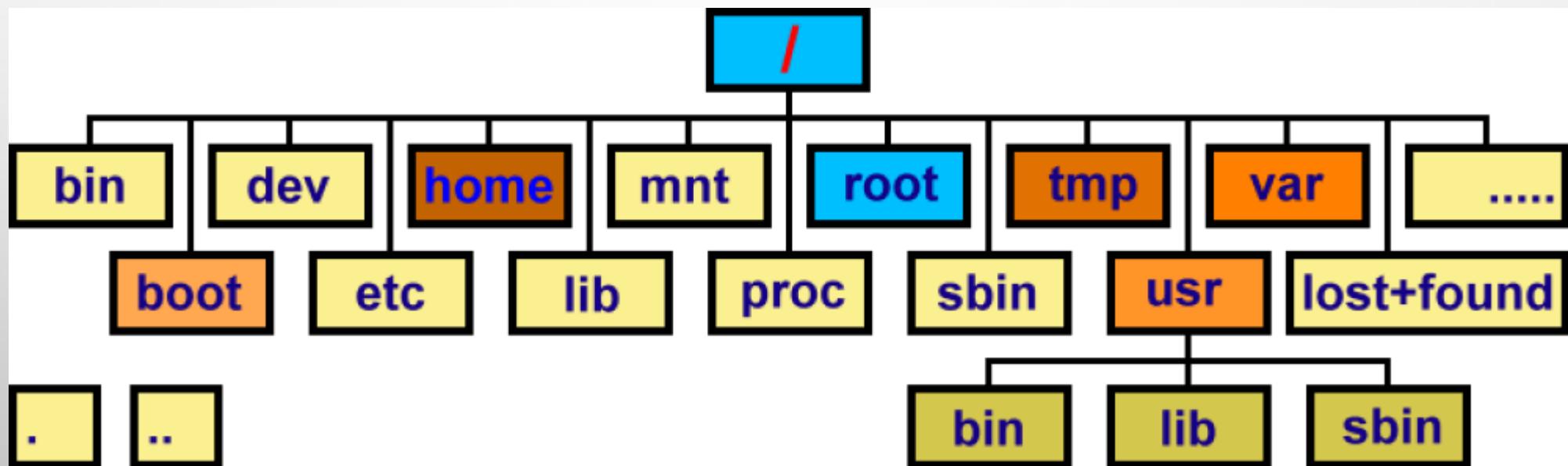
### Types of partitions

- MBR
  - Holds the information on how the logical partitions, containing file systems, are organized on that medium.
- Primary
  - Up to 4 primary partition
  - One of them active to boot the system
- Extended
  - Used to create additional partitions
- Logical
  - Up to 15 logical partitions per disk
  - Cannot boot the system from there
- Support up to 2TB disk size

# DISK MANAGEMENT

- **fdisk** – view/create/modify/delete hard disk partitions
- **parted** - add, delete, shrink and extend disk partitions along with the file systems located on them
- **mkfs** - build a linux file system on a device, usually a hard disk partition.
- **mount** - serves to attach the filesystem found on some device to the big file tree.
- **umount** - detaches the file system from the file hierarchy.

# FILE MANAGEMENT



# FILE MANAGEMENT

## **/ – > root**

every single file and directory starts from the root directory.

## **/bin – > user binaries**

common linux commands you need to use in single-user modes are located under this directory.

## **/dev – > device files**

contains the special device files for all the devices. the device files are created during installation

## **/home – home directories**

home directories for all users to store their personal files.

# FILE MANAGEMENT

## **/mnt – mount directory**

temporary mount directory where sysadmins can mount filesystems.

## **/root – root home directory**

## **/var – variable files**

system log files (/var/log); packages and database files (/var/lib); emails (/var/mail); print queues (/var/spool); lock files (/var/lock); temp files needed across reboots (/var/tmp);

## **/boot – boot loader files**

contains boot loader related files.

# FILE MANAGEMENT

## **lib – system libraries**

contains library files that supports the binaries located under /bin and /sbin

## **/proc – process information**

contains information about system process.

## **/sbin – system binaries**

the linux commands located under this directory are used typically by system administrator, for system maintenance purpose.

## **/usr – user programs**

contains binaries, libraries, documentation, and source-code for second level programs.

# FILE MANAGEMENT

## **/etc – configuration files**

contains configuration files required by all programs.

## **/opt – optional add-on applications**

contains add-on applications from individual vendors.

## **/srv – service data**

contains server specific services related data.

# FILE MANAGEMENT

pwd - print or list the working directory with full path (present working directory).

find - how to find files quickly using the find command:

ls - list files

cd - change the current directory. with no arguments "cd" changes to the users home directory.

mkdir - make a directory.

touch - change file timestamps to the current time. make the file if it doesn't exist.

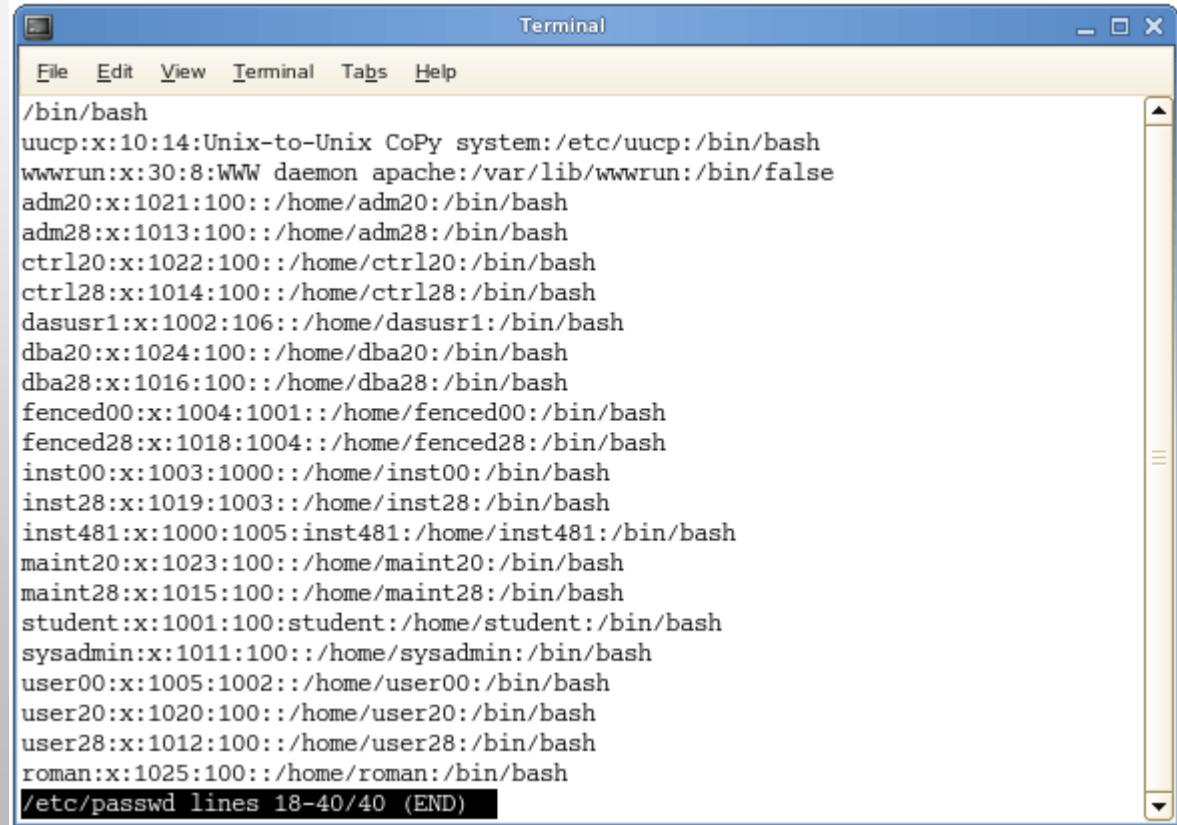
chown - chown <owner1> <filename> effect: change ownership of a file to owner1.

chgrp - chgrp <group1> <filename> effect: change group.

cp - cp <source> <destination> copy a file from one location to another.

mv - move or rename a file.

# ACCOUNT MANAGEMENT



```
Terminal
File Edit View Terminal Tabs Help
/bin/bash
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
adm20:x:1021:100::/home/adm20:/bin/bash
adm28:x:1013:100::/home/adm28:/bin/bash
ctrl20:x:1022:100::/home/ctrl20:/bin/bash
ctrl28:x:1014:100::/home/ctrl28:/bin/bash
dasusr1:x:1002:106::/home/dasusr1:/bin/bash
dba20:x:1024:100::/home/dba20:/bin/bash
dba28:x:1016:100::/home/dba28:/bin/bash
fenced00:x:1004:1001::/home/fenced00:/bin/bash
fenced28:x:1018:1004::/home/fenced28:/bin/bash
inst00:x:1003:1000::/home/inst00:/bin/bash
inst28:x:1019:1003::/home/inst28:/bin/bash
inst481:x:1000:1005:inst481:/home/inst481:/bin/bash
maint20:x:1023:100::/home/maint20:/bin/bash
maint28:x:1015:100::/home/maint28:/bin/bash
student:x:1001:100:student:/home/student:/bin/bash
sysadmin:x:1011:100::/home/sysadmin:/bin/bash
user00:x:1005:1002::/home/user00:/bin/bash
user20:x:1020:100::/home/user20:/bin/bash
user28:x:1012:100::/home/user28:/bin/bash
roman:x:1025:100::/home/roman:/bin/bash
/etc/passwd lines 18-40/40 (END)
```

File containing user accounts - /etc/passwd

roman:x:1025:100::/home/roman:/bin/bash

x indicates an  
encrypted password is  
stored in the  
/etc/shadow file

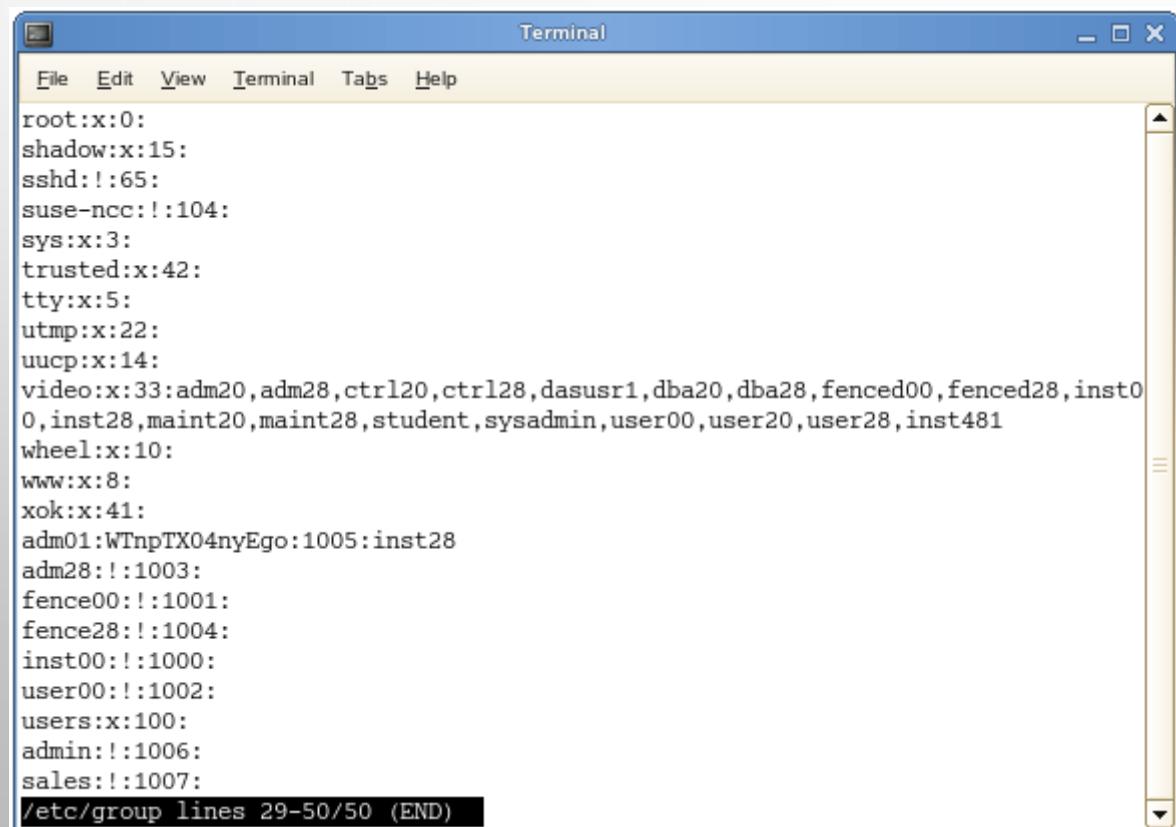
User ID (UID) - User  
identification number

Group ID (GID) – is the  
primary group ID,  
found in the  
/etc/group file

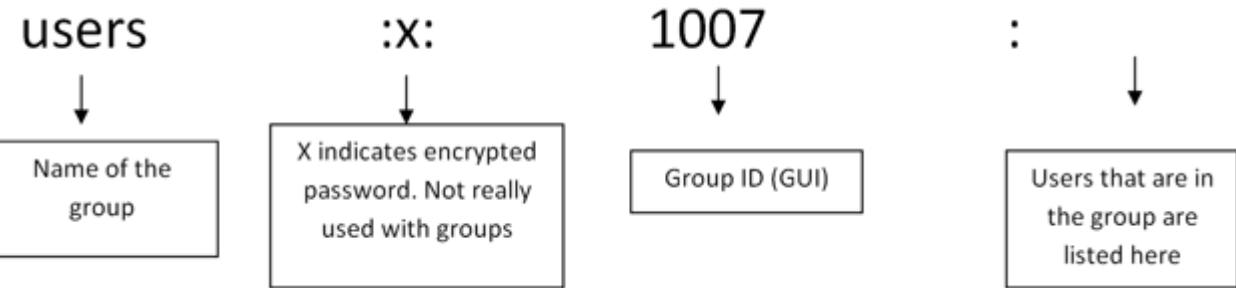
Home Directory of the  
user.

The shell used for  
executing commands

# ACCOUNT MANAGEMENT



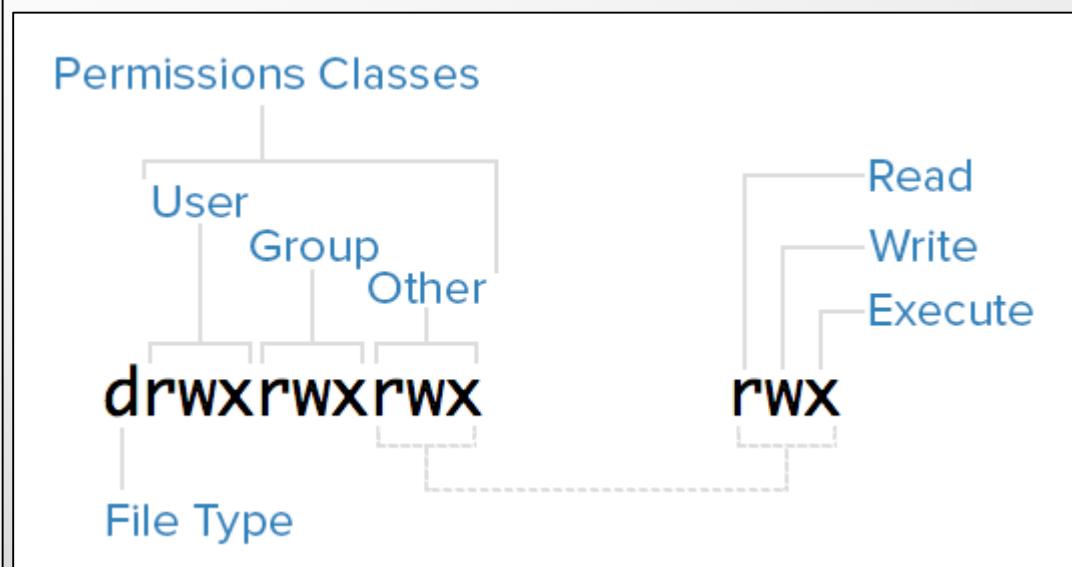
```
Terminal
File Edit View Terminal Tabs Help
root:x:0:
shadow:x:15:
sshd!:65:
suse-ncc!:104:
sys:x:3:
trusted:x:42:
tty:x:5:
utmp:x:22:
uucp:x:14:
video:x:33:adm20,adm28,ctrl20,ctrl28,dasusr1,dba20,dba28,fenced00,fenced28,inst0
0,inst28,maint20,maint28,student,sysadmin,user00,user20,user28,inst481
wheel:x:10:
www:x:8:
xok:x:41:
adm01:WTnpTX04nyEgo:1005:inst28
adm28!:1003:
fence00!:1001:
fence28!:1004:
inst00!:1000:
user00!:1002:
users:x:100:
admin!:1006:
sales!:1007:
/etc/group lines 29-50/50 (END)
```



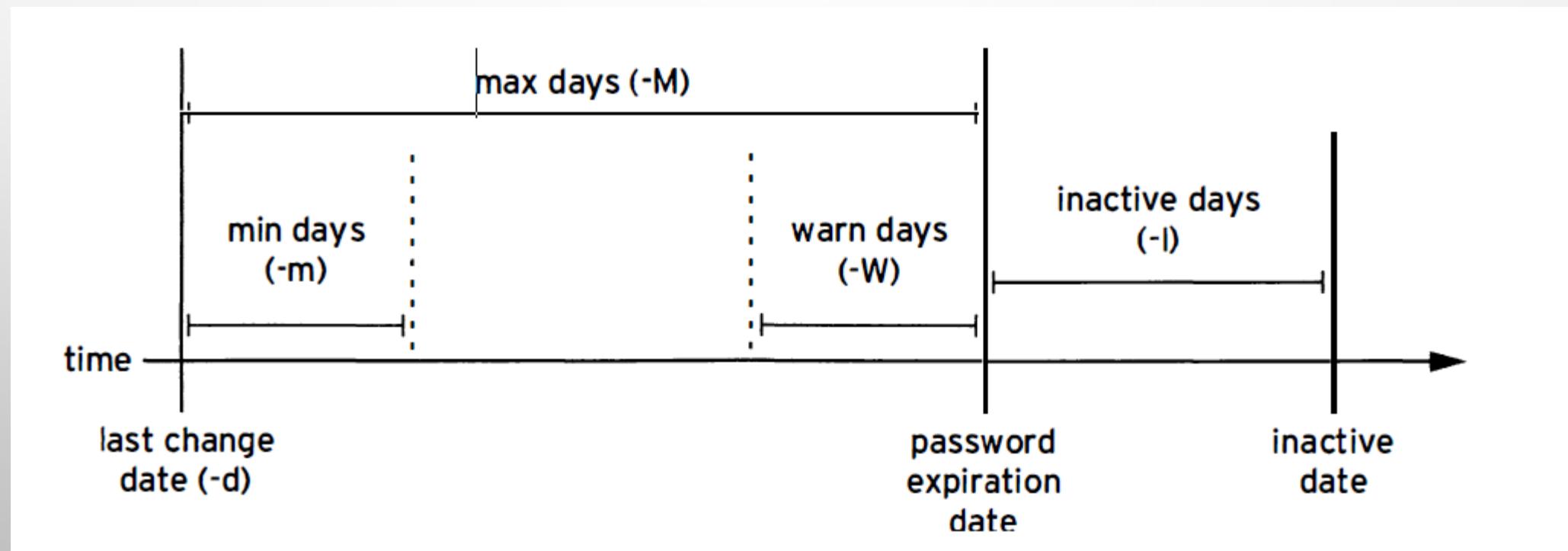
File containing group accounts - /etc/group

# ACCOUNT MANAGEMENT

Mode	Owner	Group	File Size	Last Modified	Filename
drwxrwxrwx	2 sammy	sammy	4096	Nov 10 12:15	everyone_directory
drwxrwx---	2 root	developers	4096	Nov 10 12:15	group_directory
-rw-rw----	1 sammy	sammy	15	Nov 10 17:07	group_modifiable
drwx-----	2 sammy	sammy	4096	Nov 10 12:15	private_directory
-rw-----	1 sammy	sammy	269	Nov 10 16:57	private_file
-rwxr-xr-x	1 sammy	sammy	46357	Nov 10 17:07	public_executable
-rw-rw-rw-	1 sammy	sammy	2697	Nov 10 17:06	public_file
drwxr-xr-x	2 sammy	sammy	4096	Nov 10 16:49	publicly_accessible_directory
-rw-r--r--	1 sammy	sammy	7718	Nov 10 16:58	publicly_readable_file
drwx-----	2 root	root	4096	Nov 10 17:05	root_private_directory



# ACCOUNT MANAGEMENT



change parameters

# ACCOUNT MANAGEMENT

groupadd - create a new group.

groupdel - delete a group.

groupmod - modify a group.

useradd - create a new user or update default new user information.

userdel - delete a user account and related files.

usermod - modify a user account.

chgrp - changes the group ownership of files.

chown - change the owner of file(s ) to another user.

passwd - set a user's pass word.

chage - used to change the time the user's password will expire.

# NETWORK MANAGEMENT

arp - this program lets the user read or modify their arp cache.

ifconfig - configure a network interface.

ifdown - shutdown a network interface.

ifup - brings a network interface up. ex: ifup eth0

netstat -displays information about the systems network connections, including port connections, routing tables, and more. the command "netstar -r" will display the routing table.

nslookup - used to query dns servers for information about hosts.

ping - send icmp echo\_request packets to network hosts.