Network:

What is a network Interface?
A network interface is the point of interconnection between a computer and a private or public network. A network interface is generally a physical network interface card (NIC)
A network interface card (NIC) is a circuit board or card that is installed in a computer so that it can be connected to a network.
A network interface card provides the computer with a dedicated, full-time connection to a network. Personal computers and workstations on network typically contain a network interface card specifically designed for the LAN transmission technology

What is an IP address?
The IP stands for internet protocol address
An Internet Protocol address is a numerical label assigned to each device participating in a computer network that uses the Internet Protocol for communication. Wikipedia
In simple word a computer needs and IP address to connect to another computer and the other computer must also have an IP to listen to our communication

What is Subnet mask?
When you configure the TCP/IP protocol, an IP address, **subnet mask**, and usually a default gateway are required in the TCP/IP configuration settings. To configure TCP/IP correctly, it is necessary to understand how networks are addressed and divided into networks and subnetworks.
A complete article on subnet mask can be viewed from the following link:
http://www.iplocation.net/tools/netmask.php

What is Network Gateway?
In computer networking, a gateway is a node (a router) on a TCP/IP network that serves as an access point to another network. A default gateway is the node on the computer network that the network software uses when an IP address does not match any other routes in the routing table.

What is MAC address?
The MAC address is a unique value associated with a network adapter. MAC addresses are also known as hardware addresses or physical addresses. They uniquely identify an adapter on a LAN. MAC addresses are 12-digit hexadecimal numbers (48 bits in length). By convention, MAC addresses are usually written in one of the following two formats:
`MM:MM:MM:SS:SS:SS`

What is Static and DHCP IP?
Static as it sounds stays permanent where DHCP IP is a floating IP and changes every time the system reboots. For more information on difference between Status and DHCP visit the following link:
http://www.differencebetween.net/technology/difference-between-dhcp-and-static-ip/
LAN, MAN and WAN?
Local Area Network = Computer connected with one physical location
Metropolitan Area Network = Computers connected with one region to another (or state to state)
Wide Area Network = Country to country

Interface Status or Configuration:

To display current interface MAC address
```
ifconfig –a
```

To display current interfaces
```
ifconfig –a
```

To assign an IP address to interfaces
```
ifconfig eth0 192.168.1.2
```

To bring an interface down
```
ifconfig eth0 down
```

To bring an interface down
```
ifconfig eth0 up
```

Network Configuration Files:

Interface, Netmask and defaultgateway files
```
/etc/sysconfig/network-scripts/ifcfg-eth0 (Linux)
/etc/hosts
/etc/modprobe.conf (Linux)

/etc/resolv.conf (Both OS)
/etc/nsswitch.conf (Both OS)
```

Network Commands

ping = ping command allows to check the network status of another computer
ifconfig = This command allows you to check or assign IP address to an interface
netstat = Print network connections, routing tables, interface statistics, gateway information etc.
tcpdump = To view the incoming and outgoing on the system `(tcpdump –i eth0)`

Routes Setup:

Linux Machine

Adding a route
```
/sbin/route add -net 192.168.1.2 netmask 255.255.255.0 gw 192.168.1.1
```

Deleting a route
```
/sbin/route del -net 192.168.1.2 netmask 255.255.255.0 gw 192.168.1.1
```

Add a new interface
```
/sbin/ifconfig interface plumb
```

Bring up the new interface
```
/sbin/ifconfig interface up
```

Configure a new interface
```
/sbin/ifconfig interface 192.168.1.2
```

Network Related Utilities

ping

- The ping command sends an echo request to a network host. It is useful for:
  - Determining the status of the network and various foreign hosts.
  - Tracking and isolating hardware and software problems.
  - Testing, measuring, and managing networks.
- The ping command sends one datagram per second and prints one line of output for every response received. Round-trip times and packet loss statistics are calculated and displayed.
  Example:

```
% ping kanaha or 164.122.27.33
PING kanaha.mhpcc.edu: (164.122.27.33): 56 data bytes
64 bytes from 164.122.27.33: icmp_seq=0 ttl=254 time=3 ms
64 bytes from 164.122.27.33: icmp_seq=1 ttl=254 time=2 ms
64 bytes from 164.122.27.33: icmp_seq=2 ttl=254 time=2 ms
64 bytes from 164.122.27.33: icmp_seq=3 ttl=254 time=2 ms
^C
----kanaha.mhpcc.edu PING Statistics----
6 packets transmitted, 6 packets received, 0% packet loss
round-trip min/avg/max = 2/2/3 ms
```

traceroute

- The traceroute command prints the route that IP packets take to a network host. It is intended for use in network testing, measurement, and management.
  Example:

```
% traceroute  archie.rutgers.edu
traceroute to dorm.Rutgers.EDU (128.6.18.15), 30 hops max, 40 byte
packets
1  B2_IGSL_01 (129.24.96.1)  2 ms  2 ms  2 ms
2  FZ00_rtr_01 (129.24.56.1)  3 ms  2 ms  7 ms
3  msh (129.24.8.193)  5 ms  7 ms  4 ms
4  198.83.5.5 (198.83.5.5)  7 ms  4 ms  7 ms
5  hssi3-0.cnss116.Albuquerque.t3.ans.net (192.103.74.41)  5 ms 4
ms  6 ms
6  mf-0.cnss112.Albuquerque.t3.ans.net (140.222.112.222)  4 ms  4
ms  4 ms
7  t3-0.cnss64.Houston.t3.ans.net (140.222.64.1)  30 ms  30 ms  30
ms
8  t3-0.cnss80.St-Louis.t3.ans.net (140.222.80.1)  47 ms  47 ms
46 ms
9  t3-1.cnss25.Chicago.t3.ans.net (140.222.25.2)  54 ms  52 ms  53
ms
```

```
10  t3-0.cnss40.Cleveland.t3.ans.net (140.222.40.1)  60 ms  59 ms
59 ms
11  t3-1.cnss48.Hartford.t3.ans.net (140.222.48.2)  73 ms  78 ms
74 ms
12  t3-2.cnss32.New-York.t3.ans.net (140.222.32.3)  78 ms  76 ms
76 ms
13  t3-0.enss137.t3.ans.net (140.222.137.1)  79 ms  80 ms  86 ms
14  fenchurch-gateway.jvnc.net (192.12.211.65)  83 ms  80 ms  84
ms
15  airport2-gateway.jvnc.net (130.94.9.250)  84 ms  86 ms  88 ms
16  airport1-gateway.jvnc.net (130.94.7.1)  85 ms  92 ms  84 ms
17  rutgers-gateway.jvnc.net (130.94.7.10)  89 ms  86 ms  90 ms
18  rucs-gw.rutgers.edu (128.6.21.7)  94 ms  104 ms  95 ms
19  dorm.rutgers.edu (128.6.18.15)  92 ms  93 ms  91 ms
```

- Warning: Because of the load traceroute imposes on the network, the traceroute command should not be used during normal operations or from automated scripts.
- The traceroute utility may not be available on all systems.

ftp

- ftp stands for File Transfer Protocol. File transfer provides a means for you to obtain computer files (text, image, sound, etc.) from other computers over the network.
- ftp can also be used to send (upload) files from your computer to another computer, providing you have write permission or a real account on the machine you are uploading.
- The ftp utility has its own set of UNIX like commands which allow you to perform tasks such as:
    - Connect and login to a remote host
    - Navigate directories
    - List directory contents
    - Put and get files
    - Transfer files as ascii, ebcdic or binary
- A sample ftp session appears below. The commands which are entered by the user are in bold type.

```
kanaha% ftp makena.mhpcc.edu
Connected to makena.mhpcc.edu.
220 makena.mhpcc.edu FTP server (Version 4.9 Thu Sep 2 20:35:07
CDT 1993)
Name (makena.mhpcc.edu:jsmith): jsmith
331 Password required for jsmith.
Password:
230 User jsmith logged in.
ftp> dir
200 PORT command successful.
150 Opening data connection for /bin/ls.
total 1464
drwxr-sr-x   3 jsmith   staff       1024 Mar 11 20:04 Mail
drwxr-sr-x   2 jsmith   staff       1536 Mar  3 18:07 Misc
drwxr-sr-x   5 jsmith   staff        512 Dec  7 10:59 OldStuff
drwxr-sr-x   2 jsmith   staff       1024 Mar 11 15:24 bin
drwxr-sr-x   5 jsmith   staff       3072 Mar 13 16:10 mpl
-rw-r--r--   1 jsmith   staff     209671 Mar 15 10:57 myfile.out
drwxr-sr-x   3 jsmith   staff        512 Jan  5 13:32 public
```

```
drwxr-sr-x   3 jsmith   staff        512 Feb 10 10:17 pvm3
226 Transfer complete.
ftp> cd mpl
250 CWD command successful.
ftp> dir
200 PORT command successful.
150 Opening data connection for /bin/ls.
total 7320
-rw-r--r--   1 jsmith   staff       1630 Aug  8 1994  dboard.f
-rw-r-----   1 jsmith   staff       4340 Jul 17 1994  vttest.c
-rwxr-xr-x   1 jsmith   staff     525574 Feb 15 11:52 wave_shift
-rw-r--r--   1 jsmith   staff       1648 Aug  5 1994  wide.list
-rwxr-xr-x   1 jsmith   staff       4019 Feb 14 16:26 fix.c
226 Transfer complete.
ftp> get wave_shift
200 PORT command successful.
150 Opening data connection for wave_shift (525574 bytes).
226 Transfer complete.
528454 bytes received in 1.296 seconds (398.1 Kbytes/s)
ftp> quit
221 Goodbye.
```

- Many computers on the Internet permit *anonymous ftp* . You can login to these machines without a real account, to obtain files which have been made publicly available. Typically, the user name **anonymous** is used, coupled with your email address as the password.
- Anonymous ftp is usually restricted so that users can only see what the server permits them to see. Anonymous users do not have full privileges as would a user with a real computer account.

telnet

- Telnet is a utility that allows a computer user at one site to make a connection, login and then conduct work on a computer at another site. For example, you can use the telnet command to run a program in your directory on a supercomputer thousands of miles away.
- Telnet is used to access many of the Internet resources, such as databases, libraries and computers
  Example telnet session:

```
% telnet makena
Trying...
Connected to makena.mhpcc.edu.
Escape character is '^]'.


AIX Version 3
(C) Copyrights by IBM and by others 1982, 1993.
login: jsmith
jsmith's Password:
*******************************************************************
********
*
*
```

```
*
*
*    WELCOME TO THE Maui High Performance Computing Center
*
*
*
*
*
*****************************************************************
********

Last unsuccessful login: Fri Mar  3 12:01:09 HST 1995 on pts/0
from kanaha.mhpcc.edu
Last login: Wed Mar  8 18:33:27 HST 1995 on pts/10

   {  do some work }

makena% logout
Connection closed.
```

rlogin
rsh
rcp

- rlogin (remote login), rsh (remote shell) and rcp (remote copy) are three utilities which allow you to perform tasks on other machines without requiring the usual login authentication.
- All three utilities depend upon a *.rhosts* located in your home directory. The .rhosts file contains the names of your "trusted" hosts and your userid on each of those hosts. An example appears below:

```
apache.unm.edu  jsmith
zeus.mit.edu    jsmith
athena.com      smith
fox.eeco.org    smithj
```

- rlogin: Allows you to login to a remote machine. It is nearly identical to telnet in function and appearance, however if your .rhosts file is setup accordingly, you will be able to login to your account on another machine wihout having to enter a userid and password.
- rsh: The remote shell command can be used to execute a command on remote host or log into remote host. With the proper .rhosts file, authentication is not required.
  Examples:

```
rsh host2                          - will connect to host2 for
                                     login
rsh host2 df                       - check the amount of free
                                     disk space on remote host2
rsh host2 ps aux |grep jsmith      - check for processes owned
                                     by jsmith on host2
rsh host2 rm /tmp/myfile.old       - remove a file in host2
rsh host2 cat test1 ">>" test2     - append test1 file on remote
                                     host to test2 file on remote
                                     host
rsh host2 cat test1 >> test2       - append test1 file on remote
                                     host to test2 file on local
```

- rcp: Remote copy enables you to copy files between different systems. With the proper .rhosts file, authentication is not required.
  Example:

```
rcp localfile host2:/home/eng/journal
```