

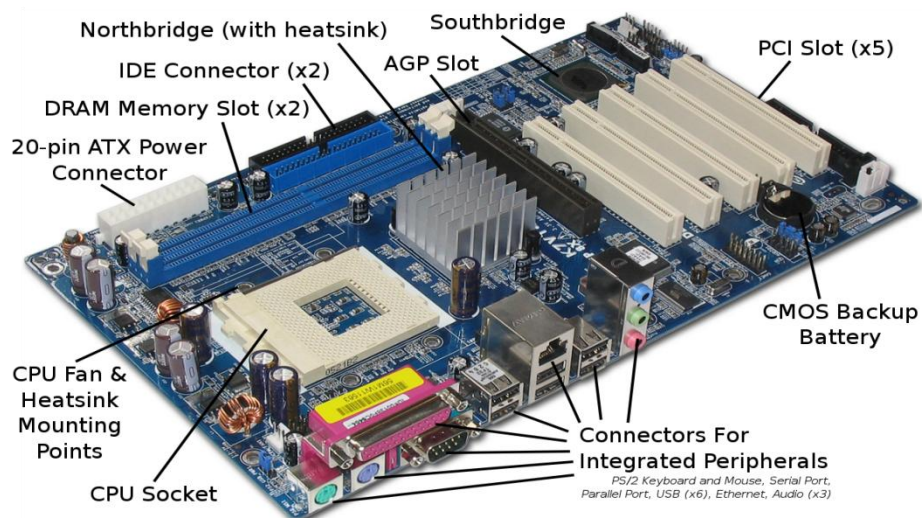
INTRODUCTION TO COMPUTER HARDWARES

Physical identification of major components of a computer system such as motherboard, RAM modules, daughter cards, bus slots, SMPS, internal storage devices, interfacing ports. Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use. (Students may be asked to formulate specification for computer to be used as Desktop, Web server)

MOTHERBOARD

A motherboard (also called mainboard, main circuit board, or mobo) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Motherboard means specifically a PCB with expansion capabilities. As the name suggests, this board is often referred to as the "mother" of all components attached to it, which often include peripherals, interface cards, and daughterboards: sound cards, video cards, network cards, host bus adapters, TV tuner cards, IEEE 1394 cards; and a variety of other custom components.



RAM MODULES

In computing, a memory module or RAM (random-access memory) stick is a printed circuit board on which memory integrated circuits are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer. Later, memory modules were standardized by organizations such as JEDEC and could be used in any system designed to use them.

Types of memory module include:

- TransFlash Memory Module
- SIMM, a single in-line memory module
- DIMM, dual in-line memory module
- Rambus memory modules are a subset of DIMMs, but are normally referred to as RIMMs
- SO-DIMM, small outline DIMM, a smaller version of the DIMM, used in laptops

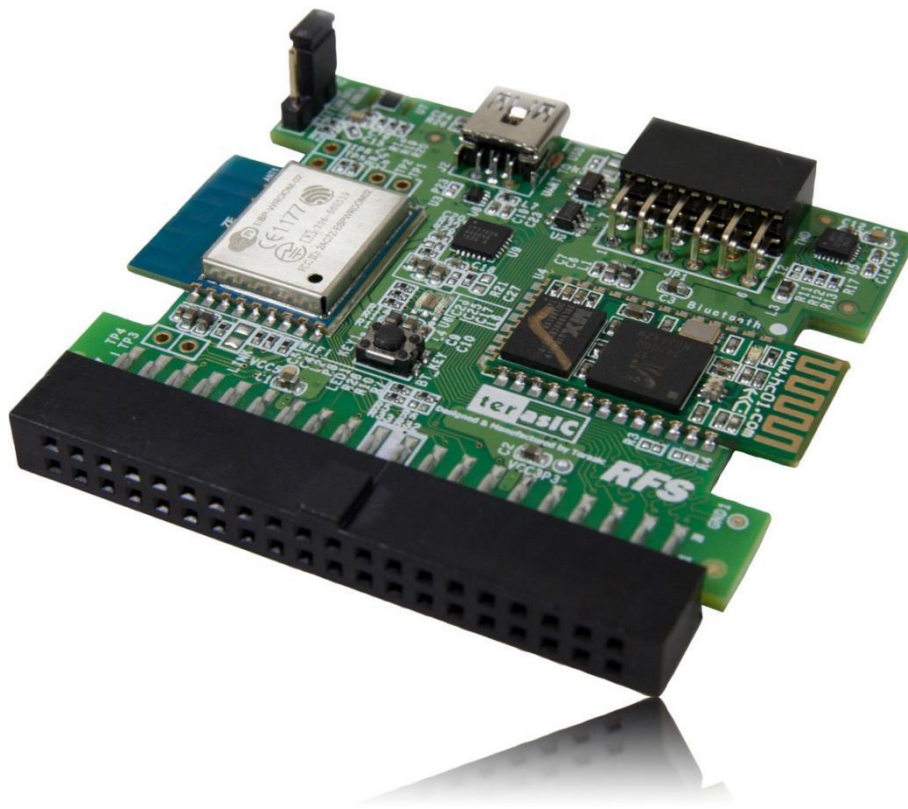
Distinguishing characteristics of computer memory modules include voltage, capacity, speed (i.e, bit rate), and form factor. For economic reasons, the large (main) memories found in personal computers, workstations, and non-handheld game-consoles (such as PlayStation and Xbox) normally consist of dynamic RAM (DRAM). Other parts of the computer, such as cache memories normally use static RAM (SRAM). Small amounts of SRAM are sometimes used in the same package as DRAM. [2] However, since SRAM has high leakage power and low density, die-stacked DRAM has recently been used for designing multi-megabyte sized processor caches.



DAUGHTER BOARD

The daughter board is a computer hardware. It is also known as the piggyback board, riser card, daughter board, daughtercard or daughter card. A daughter board is a printed circuit board which is connected to the motherboard or expansion card. As compared to the motherboard, it is smaller in size. A daughter board does not act as an expansion card. An expansion card adds extra new functions to the computer. But a daughter board that is connected to the motherboard adds or supports the main functions of the motherboard.

Daughter boards are directly connected to the motherboards. You know that expansion cards are connected to the motherboard by using the bus and other serial interfaces. But the daughter board is directly connected to the board by soldering. As an update of the motherboard or expansion card, daughter boards are released to extend the features and services of the motherboard or expansion cards.



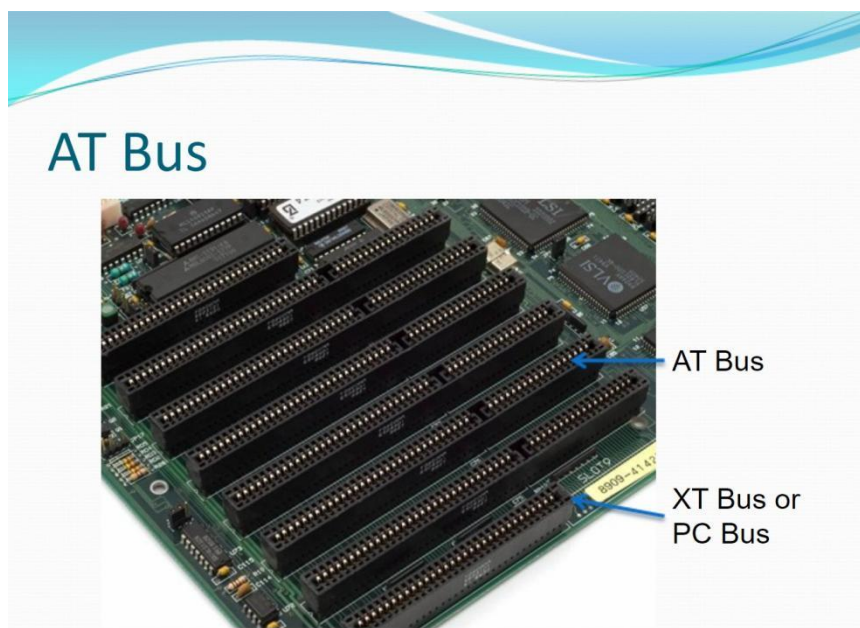
BUS SLOTS

Alternatively known as a bus slot or expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected, which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory.

The expansion card has an edge connector that fits precisely into the expansion slot as well as a row of contacts that is designed to establish an electrical connection between the motherboard and the electronics on the card, which are mostly integrated circuits. Depending on the formfactor of the case and motherboard, a computer system generally can have anywhere from one to seven expansion slots. With a backplane system, up to 19 expansion cards can be installed.

Expansion cards can provide various functions including

- Sound
- Modems
- Network
- Interface adapters
- TV and radio tuning
- Video processing
- Host adapting such as redundantarray of independent disks or
- small computer system interface
- Solid-state drive
- Power-on self-test
- Advanced multi rate codec
- Basic input/output system
- (BIOS)
- Expansion read-only memory
- (ROM)
- Security devices
- RAM memory



SMPS

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non- conduction state.

Switching power supplies have high efficiency and are widely used in a variety of electronic equipment, including computers and other sensitive equipment requiring stable and efficient power supply.

A switched-mode power supply is also known as a switch-mode power supply or switching-mode power supply.

Switched-mode power supplies are classified according to the type of input and output voltages.

The four major categories are

- AC to DC
- DC to DC
- DC to AC
- AC to AC

A basic isolated AC to DC switched-mode power supply consists of:

- Input rectifier and filter
- Inverter consisting of switching devices such as MOSFETS
- Transformer
- Output rectifier and filter
- Feedback and control circuit



INTERNAL STORAGE DEVICES

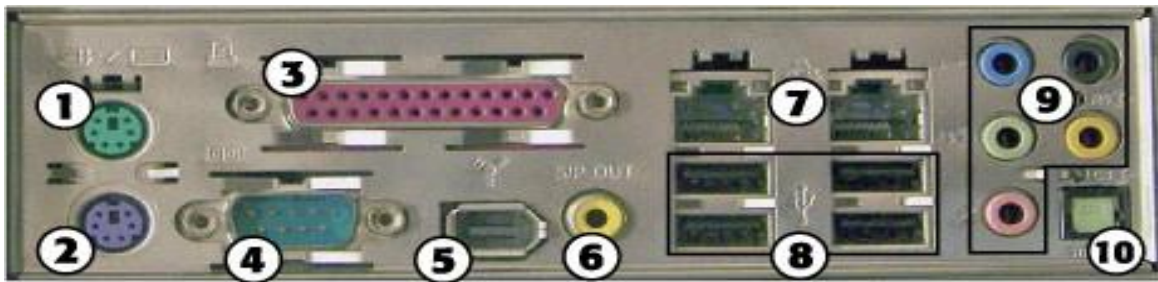


A storage unit is a part of the computer system which is employed to store the information and instructions to be processed. A storage device is an integral part of the computer hardware which stores information/data to process the result of any computational work. Without a storage device, a computer would not be able to run or even boot up. Or in other words, we can say that a storage device is hardware that is used for storing, porting, or extracting data files. It can also store information/data both temporarily and permanently. Computer storage is of two types:

Primary Storage Devices: It is also known as internal memory and main memory. This is a section of the CPU that holds program instructions, input data, and intermediate results. It is generally smaller in size. RAM (Random Access Memory) and ROM (Read Only Memory) are examples of primary storage.

Secondary Storage Devices: Secondary storage is a memory that is stored external to the computer. It is mainly used for the permanent and long-term storage of programs and data. Hard Disk, CD, DVD, Pen/Flash drive, SSD, etc., are examples of secondary storage.

INTERFACING PORTS



- | | |
|-----------------------|--------------------------------------|
| 1. PS/2 mouse port | 6. SPDIF coaxial digital audio port |
| 2. PS/2 keyboard port | 7. Ethernet ports |
| 3. Parallel port | 8. USB ports |
| 4. Serial port | 9. 1/8-inch mini-jack audio ports |
| 5. IEEE 1394a port | 10. SPDIF optical digital audio port |

A port is basically a physical docking point which is basically used to connect the external devices to the computer, or we can say that A port acts as an interface between the computer and the external devices, e.g., we can connect hard drives, printers to the computer with the help of ports.

Characteristics of Ports

- A port has the following characteristics -
- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of an external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.

LAMP INSTALLATION PROCEDURE

1. Install Apache

- Updating the local package index to reflect the latest upstream changes:

sudo apt update && sudo apt install ufw

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo apt update && sudo apt install ufw
[sudo] password for mits:
Get:1 https://packages.microsoft.com/repos/code stable InRelease [3,590 B]
Get:2 https://packages.microsoft.com/repos/code stable/main arm64 Packages [17.0 kB]
Get:3 https://packages.microsoft.com/repos/code stable/main armhf Packages [16.8 kB]
Get:4 https://packages.microsoft.com/repos/code stable/main amd64 Packages [16.8 kB]
Hit:5 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Get:6 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Hit:8 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:9 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1,343 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1,562 kB]
Get:11 http://security.ubuntu.com/ubuntu jammy-security/main i386 Packages [444 kB]
Get:12 http://in.archive.ubuntu.com/ubuntu jammy-updates/main i386 Packages [610 kB]
Get:13 http://in.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [297 kB]
Get:14 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [237 kB]
Get:15 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted i386 Packages [36.5 kB]
Get:16 http://security.ubuntu.com/ubuntu jammy-security/restricted i386 Packages [33.6 kB]
Get:17 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1,706 kB]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [1,662 kB]
Get:19 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [286 kB]
Get:20 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [280 kB]
Get:21 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1,060 kB]
Get:22 http://security.ubuntu.com/ubuntu jammy-security/universe i386 Packages [599 kB]
Get:23 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe i386 Packages [698 kB]
Get:24 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [852 kB]
Get:25 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [37.2 kB]
Get:26 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [7,588 B]
Get:27 http://in.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [49.7 kB]
Get:28 http://in.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [12.1 kB]
Fetched 12.1 MB in 8s (1,462 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
292 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ufw is already the newest version (0.36.1-4ubuntu0.1).
0 upgraded, 0 newly installed, 0 to remove and 292 not upgraded.
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- Then, install the apache2 package:

sudo apt install apache2

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
apache2 is already the newest version (2.4.52-1ubuntu4.8).
0 upgraded, 0 newly installed, 0 to remove and 292 not upgraded.
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```


- Install Apache using apt: It is recommended that you enable the most restrictive profile that will still allow the traffic You have configured. Since we haven't configured SSL for our server yet in this guide, we will only need to allow traffic on port 80:

sudo ufw allow 'Apache'

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo ufw allow 'Apache'
Skipping adding existing rule
Skipping adding existing rule (v6)
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- You can verify the change by typing: **sudo ufw status**. The output will provide a list of allowed HTTP traffic.

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo ufw status
Status: active

To Action From
--
Apache ALLOW Anywhere
80 ALLOW Anywhere
Apache (v6) ALLOW Anywhere (v6)
80 (v6) ALLOW Anywhere (v6)

mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

Checking your Web Server

- At the end of the installation process, Ubuntu 20.04 starts Apache. The web server should already be up and running. Check with the systemd init system to make sure the service is running by typing:

sudo systemctl status apache2

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor prese
   Active: active (running) since Thu 2024-04-11 13:32:12 IST; 5h 16min left
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 916 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUC
   Main PID: 986 (apache2)
    Tasks: 55 (limit: 9038)
   Memory: 7.8M
      CPU: 61ms
   CGroup: /system.slice/apache2.service
           └─986 /usr/sbin/apache2 -k start
             └─988 /usr/sbin/apache2 -k start
               └─989 /usr/sbin/apache2 -k start

Apr 11 13:32:12 mits-ThinkCentre-neo-50t-Gen-3 systemd[1]: Starting The Apache
Apr 11 13:32:12 mits-ThinkCentre-neo-50t-Gen-3 apachectl[942]: AH00558: apache2
Apr 11 13:32:12 mits-ThinkCentre-neo-50t-Gen-3 systemd[1]: Started The Apache H
lines 1-17/17 (END)
```

- We can access the default Apache landing page to confirm that the software is running properly through your IP address. If you do not know your server's IP address, you can get it a few different ways from the command line.
- Try typing this at your server's command prompt:

hostname -I.

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ hostname -l
hostname: invalid option -- 'l'
Usage: hostname [-b] {hostname|-F file}          set host name (from file)
          hostname [-a|-A|-d|-f|-i|-I|-s|-y]      display formatted name
          hostname                                display host name

          {yp,nis,}domainname {nisdomain|-F file} set NIS domain name (from file)
          {yp,nis,}domainname                    display NIS domain name

          dnsdomainname                          display dns domain name

          hostname -V|--version|-h|--help        print info and exit

Program name:
  {yp,nis,}domainname=hostname -y
  dnsdomainname=hostname -d

Program options:
  -a, --alias                alias names
  -A, --all-fqdns            all long host names (FQDNs)
  -b, --boot                 set default hostname if none available
  -d, --domain               DNS domain name
  -f, --fqdn, --long         long host name (FQDN)
  -F, --file                 read host name or NIS domain name from given file
  -i, --ip-address           addresses for the host name
  -I, --all-ip-addresses     all addresses for the host
  -s, --short                short host name
  -y, --yp, --nis            NIS/YP domain name

Description:
  This command can get or set the host name or the NIS domain name. You can
  also get the DNS domain or the FQDN (fully qualified domain name).
  Unless you are using bind or NIS for host lookups you can change the
  FQDN (Fully Qualified Domain Name) and the DNS domain name (which is
  part of the FQDN) in the /etc/hosts file.
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- We will get back a few addresses separated by spaces. You can try each in your web browser to determine if they work.
- Another option is to use the Icanhazip tool, which should give you your public IP address as read from another location on the internet:

curl -4 icanhazip.com

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ curl -4 icanhazip.com
103.214.233.56
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- When you have your server's IP address, enter it into your browser's address bar: http://your_server_ip and you should see the default Ubuntu 20.04 Apache web page.

2. Install mariadb

- Install MariaDB

sudo apt install mariadb-server mariadb-client

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo apt install phpmyadmin
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
phpmyadmin is already the newest version (4:5.1.1+dfsg1-5ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 292 not upgraded.
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- Check MariaDB Installation
- `sudo systemctl status mysql` (if it is not working `sudo systemctl start mysql`)

3. Install PHP

- Install phpmyadmin

sudo apt install phpmyadmin

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo apt install phpmyadmin
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
phpmyadmin is already the newest version (4:5.1.1+dfsg1-5ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 292 not upgraded.
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```

- (It will ask for web server select apache2, select db configuration and set password)

- Restart apache2

sudo systemctl restart apache2

```
mits@mits-ThinkCentre-neo-50t-Gen-3:~$ sudo systemctl restart apache2
mits@mits-ThinkCentre-neo-50t-Gen-3:~$
```


NETWORK COMMANDS

Network commands in windows - ping, route, nslookup, tracert, ipconfig, arp, nbstat, hostname, pathping, getmac.

1. Ping

Ping is an old Unix tool that has been around for a long time but many PC users are unfamiliar with the Windows version. Ping sends out a packet to a designated internet host or network computer and measures its response time.

```
C:\Users\mutho>ping -a google.com

Pinging google.com [142.250.196.14] with 32 bytes of data:
Reply from 142.250.196.14: bytes=32 time=16ms TTL=58
Reply from 142.250.196.14: bytes=32 time=15ms TTL=58
Reply from 142.250.196.14: bytes=32 time=15ms TTL=58
Reply from 142.250.196.14: bytes=32 time=21ms TTL=58

Ping statistics for 142.250.196.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 15ms, Maximum = 21ms, Average = 16ms
```

```
C:\Users\mutho>ping -f google.com

Pinging google.com [142.250.195.142] with 32 bytes of data:
Reply from 142.250.195.142: bytes=32 time=14ms TTL=117
Reply from 142.250.195.142: bytes=32 time=19ms TTL=117
Reply from 142.250.195.142: bytes=32 time=15ms TTL=117
Reply from 142.250.195.142: bytes=32 time=16ms TTL=117

Ping statistics for 142.250.195.142:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 14ms, Maximum = 19ms, Average = 16ms
```

2.Route

In computing, route is a command used to view and manipulate the IP routing table in Unix-like and Microsoft Windows[1] operating systems and also in IBM OS/2 and ReactOS.[2] Manual manipulation of the routing table is characteristic of static routing.

```
C:\Users\mutho>route print -4
=====
Interface List
12...e0 be 03 93 e3 7b .....Intel(R) Ethernet Connection (17) I219-V
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
0.0.0.0                    0.0.0.0          10.76.0.1        10.76.8.44        281
10.76.0.0                  255.255.224.0    On-link          10.76.8.44        281
10.76.8.44                  255.255.255.255  On-link          10.76.8.44        281
10.76.31.255                255.255.255.255  On-link          10.76.8.44        281
127.0.0.0                   255.0.0.0        On-link          127.0.0.1         331
127.0.0.1                   255.255.255.255  On-link          127.0.0.1         331
127.255.255.255             255.255.255.255  On-link          127.0.0.1         331
224.0.0.0                   240.0.0.0        On-link          127.0.0.1         331
224.0.0.0                   240.0.0.0        On-link          10.76.8.44        281
255.255.255.255             255.255.255.255  On-link          127.0.0.1         331
255.255.255.255             255.255.255.255  On-link          10.76.8.44        281
=====
Persistent Routes:
Network Address            Netmask          Gateway Address  Metric
0.0.0.0                    0.0.0.0          10.76.0.1        Default
=====
```

```
C:\Users\mutho>route print 157*
=====
Interface List
12...e0 be 03 93 e3 7b .....Intel(R) Ethernet Connection (17) I219-V
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
None
Persistent Routes:
None

IPv6 Route Table
=====
Active Routes:
None
Persistent Routes:
None
```

3.Nslookup

This command helps diagnose the Domain Name System (DNS) infrastructure and comes with a number of sub-commands. These are mainly for systems administrators. The primary interest for average PC users is its use to find the computer name corresponding to a numeric IP. For example, if you want to know who is "216.109.112.135" , enter "nslookup 216.109.112.135" and you will find that it is (or was anyway) a Yahoo computer. My firewall keeps a log of the IPs involved in the attempts to probe my computer and I sometimes look a few up to see who they are. (There are also Whois search sites available on the Web as mentioned in the Ipconfig section.)

```
C:\Users\mutho>nslookup google.com
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
Name:     google.com
Addresses: 2404:6800:4007:81b::200e
          142.250.196.14
```

4.Ipconfig

The Windows IP Configuration tool (ip config) is the command-line equivalent of the accessory "Winipcfg" that was present in Windows 9X/Me. It is used to display the TCP/IP network configuration values. To open it, enter "ipconfig" in the command prompt. If you are connected directly to the Internet, you will obtain your IP address.

```
C:\Users\MTS>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::f066:d6ee:b9a1:4121%13
    IPv4 Address. . . . . : 10.76.8.29
    Subnet Mask . . . . . : 255.255.224.0
    Default Gateway . . . . . : 10.76.0.1
```

```

C:\Users\MITS>ipconfig yahoo.com

Error: unrecognized or incomplete command line.

USAGE:
    ipconfig [/allcompartments] [/? | /all |
        /renew [adapter] | /release [adapter] |
        /renew6 [adapter] | /release6 [adapter] |
        /flushdns | /displaydns | /registerdns |
        /showclassid adapter |
        /setclassid adapter [classid] |
        /showclassid6 adapter |
        /setclassid6 adapter [classid] ]

where
    adapter          Connection name
                      (wildcard characters * and ? allowed, see examples)

```

5.Tracert

Tracert (tracert) is another old tool borrowed from Unix. The actual path between two computers on the Internet is not a straight line but consists of numerous segments or "hops" from one intermediate computer to another. Tracert shows each step of the path taken. It can be interesting to see just how convoluted it is. The times for each hop and the IP addresses for each intermediate computer are displayed. Tracert shows up to 30 hops. It is convenient for finding if there is one particular segment that is causing a slow or bad connection. A typical c

ommand might be "tracert dell.com"

```

C:\Users\MITS>tracert

Usage: tracert [-d] [-h maximum_hops] [-j host-list] [-w timeout]
              [-R] [-S srcaddr] [-4] [-6] target_name

Options:
    -d          Do not resolve addresses to hostnames.
    -h maximum_hops  Maximum number of hops to search for target.
    -j host-list  Loose source route along host-list (IPv4-only).
    -w timeout    Wait timeout milliseconds for each reply.
    -R          Trace round-trip path (IPv6-only).
    -S srcaddr    Source address to use (IPv6-only).
    -4          Force using IPv4.
    -6          Force using IPv6.

```



```

C:\Users\MIT5>tracert -4 googlr.com

Tracing route to googlr.com [142.250.182.36]
over a maximum of 30 hops:

  1  <1 ms    <1 ms    <1 ms    10.76.0.1
  2  15 ms    29 ms    26 ms    103.214.233.1
  3  16 ms     7 ms    10 ms    103.214.235.243
  4   6 ms    14 ms    7 ms    114.134.16.50.static-kerala.powertel.in [114.134.16.50]
  5  24 ms    25 ms    24 ms    172.20.10.113
  6   *       *       *       Request timed out.
  7  39 ms    28 ms    30 ms    172.20.5.26
  8  25 ms    30 ms    25 ms    172.253.69.51
  9  21 ms    28 ms    39 ms    142.251.55.237
 10  23 ms    24 ms    22 ms    maa05s19-in-f4.1e100.net [142.250.182.36]

Trace complete.

```

6.arp

The ARP command corresponds to the Address Resolution Protocol. Although it is easy to think of network communications in terms of IP addressing, packet delivery is ultimately dependent on the Media Access Control (MAC) address of the device's network adapter. This is where the Address Resolution Protocol comes into play. Its job is to map IP addresses to MAC addresses. Windows devices maintain an ARP cache, which contains the results of recent ARP queries. You can see the contents of this cache by using the ARP -A command. If you are having problems communicating with one specific host, you can append the remote host's IP address to the ARP -A command.

```

C:\Users\MIT5>arp -n

Displays and modifies the IP-to-Physical address translation tables used by
address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr]
ARP -d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr] [-v]

-a          Displays current ARP entries by interrogating the current
            protocol data. If inet_addr is specified, the IP and Physical
            addresses for only the specified computer are displayed. If
            more than one network interface uses ARP, entries for each ARP
            table are displayed.
-g          Same as -a.
-v          Displays current ARP entries in verbose mode. All invalid
            entries and entries on the loop-back interface will be shown.
inet_addr  Specifies an internet address.
-N if_addr Displays the ARP entries for the network interface specified
            by if_addr.

```

```
C:\Users\MITS>arp -a

Interface: 10.76.8.29 --- 0xd
Internet Address      Physical Address      Type
10.76.0.1             70-4c-a5-36-de-7e    dynamic
10.76.22.18           b8-ca-3a-e0-84-36    dynamic
10.76.31.255          ff-ff-ff-ff-ff-ff    static
224.0.0.2             01-00-5e-00-00-02    static
224.0.0.22            01-00-5e-00-00-16    static
224.0.0.251           01-00-5e-00-00-fb    static
224.0.0.252           01-00-5e-00-00-fc    static
239.255.255.250       01-00-5e-7f-ff-fa    static
```

7. Nbtstat

In Linux, the **nmblookup** command serves a similar purpose to the Windows **nbtstat** command. It is used to query and resolve NetBIOS names to IP addresses, helping diagnose and troubleshoot network connectivity issues involving NetBIOS.

```
C:\Users\MITS>nbtstat -r

NetBIOS Names Resolution and Registration Statistics
-----

Resolved By Broadcast      = 0
Resolved By Name Server    = 0

Registered By Broadcast    = 24
Registered By Name Server  = 0
```

```
C:\Users\MITS>nbtstat -a

Displays protocol statistics and current TCP/IP connections using NBT
(NetBIOS over TCP/IP).

NBTSTAT [ [-a RemoteName] [-A IP address] [-c] [-n]
          [-r] [-R] [-RR] [-s] [-S] [interval] ]

-a (adapter status) Lists the remote machine's name table given its name
-A (Adapter status) Lists the remote machine's name table given its
                      IP address.
-c (cache)           Lists NBT's cache of remote [machine] names and their IP addresses
-n (names)           Lists local NetBIOS names.
-r (resolved)        Lists names resolved by broadcast and via WINS
-R (Reload)          Purges and reloads the remote cache name table
-S (Sessions)        Lists sessions table with the destination IP addresses
-s (sessions)        Lists sessions table converting destination IP
                      addresses to computer NETBIOS names.
-RR (ReleaseRefresh) Sends Name Release packets to WINS and then, starts Refresh
```

8.hostname

The previously discussed NbtStat command can provide you with the host name that has been assigned to a Windows device, if you know which switch to use with the command. However, if you're just looking for a fast and easy way of verifying a computer's name, then try using the Hostname command. Typing Hostname at the command prompt returns the local computer name.

```
C:\Users\mutho>hostname
DESKTOP-1AS008S
```

9. pathping

PathPing command is a combination of ping and tracert command. It sends request to each routers that comes between source and destination and compute result based on response from each router. It provide continuous monitoring of the network path which allow network administrator to observe changes in performance. It is considered an alternative to tracert and it combines ping and tracert commands. This means that, like tracert, pathping traces all the intermediate hops between a source and a destination, and like ping, it gives you latency and packet loss data. However, pathping will show more detailed results as it can detect which routers are having problems and where they are located.

```
C:\Users\MITS>pathping -g google.com

Tracing route to google.com [142.250.195.142]
over a maximum of 30 hops:
  0  DESKTOP-8AK1V09 [10.76.8.29]
  1  * * *
Computing statistics for 0 seconds...
    Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct   Lost/Sent = Pct   Address
  0                          DESKTOP-8AK1V09 [10.76.8.29]

Trace complete.
```

```

C:\Users\mutho>pathping -4 google.com

Tracing route to google.com [142.250.196.14]
over a maximum of 30 hops:
  0  DESKTOP-1AS0085 [10.76.8.44]
  1  10.76.0.1
  2  103.214.233.1
  3  103.214.235.243
  4  undefined.hostname.localhost [103.179.111.177]
  5  10.200.150.2
  6  72.14.222.8
  7  216.239.43.133
  8  142.251.55.43
  9  maa03s44-in-f14.1e100.net [142.250.196.14]

Computing statistics for 225 seconds...
^C
C:\Users\mutho>pathping www.google.com

Tracing route to www.google.com [216.58.196.164]
over a maximum of 30 hops:
  0  DESKTOP-1AS0085 [10.76.8.44]
  1  10.76.0.1
  2  103.214.233.1
  3  103.214.235.243
  4  117.213.205.6
  5  117.216.207.122
  6  72.14.218.250
  7  216.239.43.133
  8  216.239.43.239
  9  maa03s31-in-f4.1e100.net [216.58.196.164]

```

10.getmac

Another very simple command that shows the MAC address of your network interfaces.

```

C:\Users\mutho>getmac

Physical Address      Transport Name
=====
E0-BE-03-93-E3-7B    \Device\Tcpip_{9EE2D01E-7E52-4A4B-A68E-A467F4E5F04D}

```