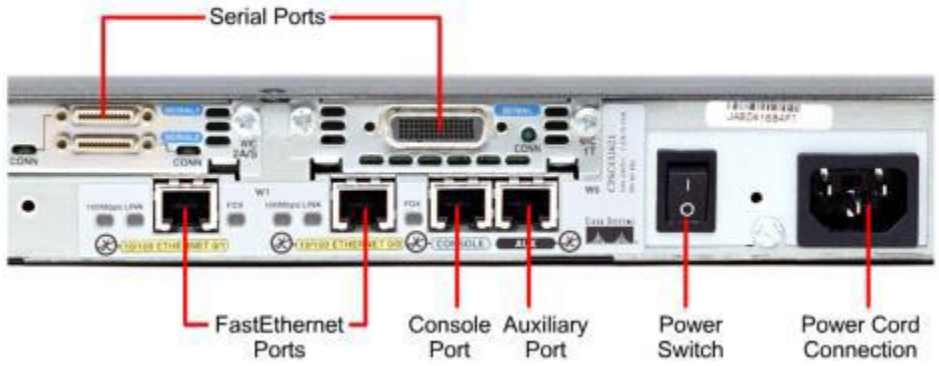
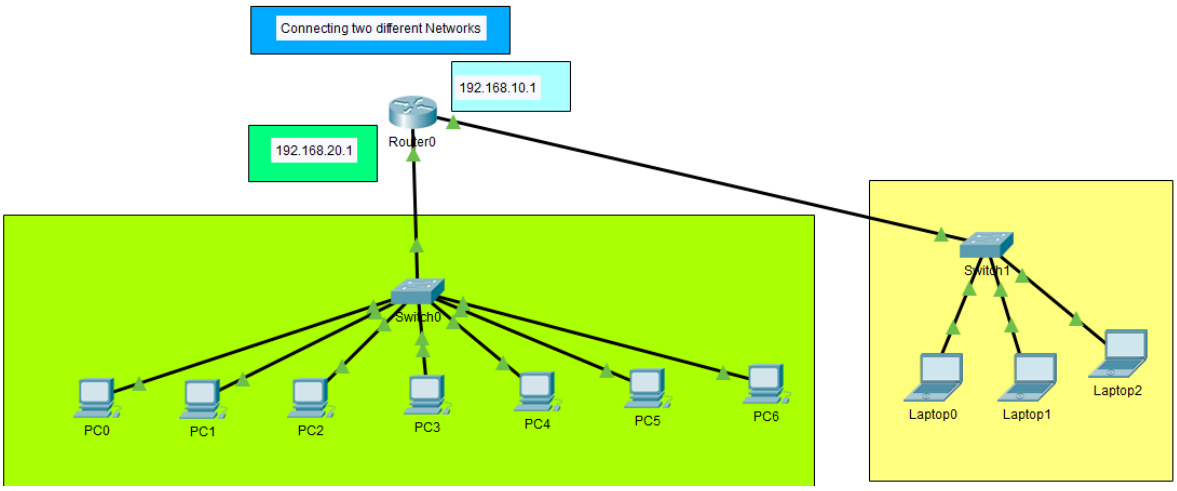
CISCO Router:

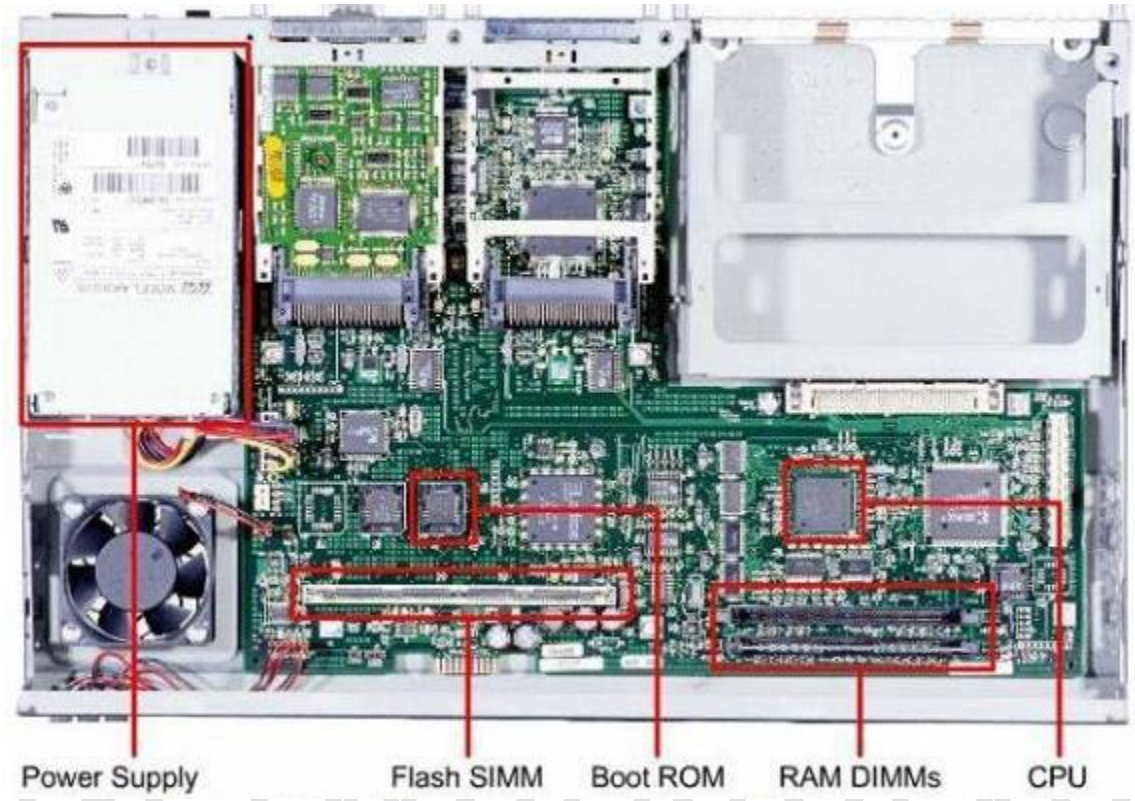
- Router is a device work on Layer 3 or Network layer of OSI Model.
- Router is use to make communication between two or more different network.
- Router is use to control broadcast and it is use to connect LAN network with WAN.
- Router is a device which select best path on the basis of routing protocol.
- Router perform routing that is static or dynamic and also other various function such as NAT, ACL and Intervlan routing etc.
- Router is a device which makes communication between two or more different network.
- Routers interconnect different networks or in simple way we can say switch is use to connect devices with a network whereas router is use to connect different networks.
- It works on Layer 3 (Network Layer).
- It chooses the best path for packet transfer.
- It performs Routing.





A Router consists of the following major components:

- CPU
- ROM
- RAM
- NVRAM
- Flash Memory.
- RXBOOT Image
- Interfaces
- Buses
- Power Supply
- Configuration Register



CPU: The CPU executes the instructions of the operating system. Also Perform functions such as system initialization, routing functions, and network interface control etc.

We can check:

Router#sh processes

CPU utilization for five seconds: 0%/0%; one minute: 0%; five minutes: 0%

PID QTy PC Runtime (ms) Invoked uSecs Stacks TTY Process

1 Csp 602F3AF0 0 1627 0 2600/3000 0 Load Meter

2 Lwe 60C5BE00 4 136 29 5572/6000 0 CEF Scanner

3 Lst 602D90F8 1676 837 2002 5740/6000 0 Check heaps

4 Cwe 602D08F8 0 1 0 5568/6000 0 Chunk Manager

5 Cwe 602DF0E8 0 1 0 5592/6000 0 Pool Manager

6 Mst 60251E38 0 2 0 5560/6000 0 Timers

7 Mwe 600D4940 0 2 0 5568/6000 0 Serial Backgrou

8 Mwe 6034B718 0 1 0 2584/3000 0 OIR Handler

9 Mwe 603FA3C8 0 1 0 5612/6000 0 IPC Zone Manage

10 Mwe 603FA1A0 0 8124 0 5488/6000 0 IPC Periodic Ti

11 Mwe 603FA220 0 9 0 4884/6000 0 IPC Seat Manage

12 Lwe 60406818 124 2003 61 5300/6000 0 ARP Input

13 Mwe 60581638 0 1 0 5760/6000 0 HC Counter Time

14 Mwe 605E3D00 0 2 0 5564/6000 0 DDR Timers

15 Msp 80164A38 0 79543 0 5608/6000 0 GraphIt

16 Mwe 802DB0FC 0 2 011576/12000 0 Dialer event

17 Cwe 801E74BC 0 1 0 5808/6000 0 Critical Bkgnd

18 Mwe 80194D20 4 9549 010428/12000 0 Net Background

19 Lwe 8011E9CC 0 20 011096/12000 0 Logger

20 Mwe 80140160 8 79539 0 5108/6000 0 TTY Background

21 Msp 80194114 0 95409 0 8680/9000 0 Per-Second Job

22 Mwe 8047E960 0 2 0 5544/6000 0 dot1x

23 Mwe 80222C8C 4 2 2000 5360/6000 0 DHCPD Receive

24 Mwe 800844A0 0 1 0 5796/6000 0 HTTP Timer

25 Mwe 80099378 0 1 0 5612/6000 0 RARP Input

26 Mst 8022F178 0 1 011796/12000 0 TCP Timer

27 Lwe 802344C8 0 1 011804/12000 0 TCP Protocols

28 Hwe 802870E8 0 1 0 5784/6000 0 Socket Timers

29 Mwe 80426048 64 3 21333 4488/6000 0 L2MM

30 Mwe 80420010 4 1 4000 5592/6000 0 MRD

31 Mwe 8041E570 0 1 0 5584/6000 0 IGMPSN

32 Hwe 80429B40 0 1 0 2604/3000 0 IGMP Snooping P

33 Mwe 804F43B0 0 5 0 5472/6000 0 Cluster L2

34 Mwe 804F18D0 0 17 0 5520/6000 0 Cluster RARP

35 Mwe 804EA650 0 23 0 5440/6000 0 Cluster Base

36 Lwe 802A1158 4 1 4000 5592/6000 0 Router Autoconf

37 Mwe 80022058 0 1 0 5624/6000 0 Syslog Traps

38 Mwe 8031CE88 0 1 0 5788/6000 0 AggMgr Process

39 Mwe 8035EF88 0 407 0 5592/6000 0 PM Callback

40 Mwe 80437B58 0 3 0 5556/6000 0 VTP Trap Proces

41 Mwe 80027D40 0 2 0 5676/6000 0 DHCPD Timer

42 Mwe 8040D3B0 0 2 0 2560/3000 0 STP STACK TOPOL

43 Hwe 8040E338 0 2 0 2560/3000 0 STP FAST TRANSI

ROM: This maintains the instructions for POST (Power on Self-Test) for diagnosis and also stores the bootstrap program and basic OS Software.

RAM: It stores the routing tables and the configuration file while the router is powered ON. The running - configuration is stored here. The contents of the RAM are lost when the router is restarted or powered OFF.

NVRAM: It stores the startup configuration. NVRAM configuration remain even after the router is power off or reboot.

Flash Memory: In Flash Memory CISCO IOS Image (i.e. OS of router) store. The configuration of Flash memory remains even after reboot or shut down.

RXBOOT Image: This is a cut down version of the IOS located in the router's ROM

Buses: We have system and CPU Buses in routers to move bits among the different components of the router. System bus communicates between the CPU and the Interfaces.

Interfaces: They are physical connectors that connect the router to the network for IP packet entry and exit.

Power Supply: The power supplies can be internal or external to the router. Some routers have multiple power supply for redundancy.

Configuration Register: Routers use a 16-bit software configuration register with which you can set specific system parameters. And It will store in NVRAM.

Example: The Factory-default setting of the configuration register is 0*2102.

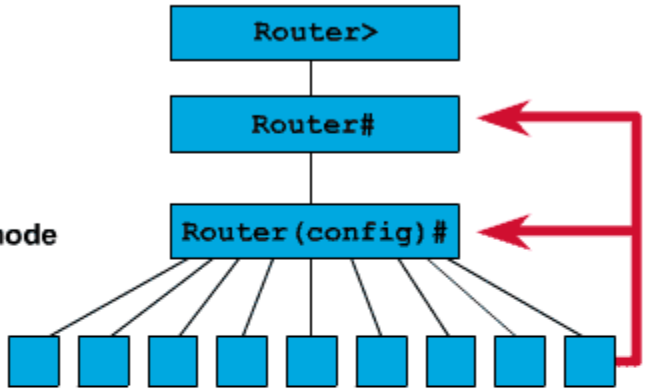
Console Cable:

USB to Serial Port:

Router Modes:

Overview of Router Modes

- User Exec mode
- Privileged Exec mode
- Global configuration mode
- Specific Configuration modes



Configuration Mode	Prompt
Interface	`Router(config-if)#`
Subinterface	`Router(config-subif)#`
Controller	`Router(config-controller)#`
Map-list	`Router(config-map-list)#`
Map-class	`Router(config-map-class)#`
Line	`Router(config-line)#`
Router	`Router(config-router)#`
IPX-router	`Router(config-ipx-router)#`
Route-map	`Router(config-route-map)#`

User Mode (Default Mode): In this mode we can do some basic monitoring.

Router>

We can run some cmds such as ping, telnet, Ver etc.

Privileged Mode: In this mode we can do monitoring and some troubleshooting.

Router#

We can run some cmds such as clock, ping, Telnet, Save, Show, history etc.

Global Configuration Mode: In this mode we can do All configuration that effect the router globally.

Router(config)#

Interface Mode: In this Mode configurations done on the specific interface.

- Router(config)#int f0/0
- Look like this when we are in Int mode.
- Router(config-if)#
- Router(config-if)#ip add 10.1.1.1 255.0.0.0
- Router(config-if)# no sh

Rommon Mode: We use this mode Generally when we want password recovery.

- How to go in Rommon mode?
- Power ON router and press Ctrl+Break
- Then you will enter in Rommon mode.

CISCO Operating Systems:

IOS (Internetwork Operating System):

- IOS is an Operating System used on CISCO Devices, such as router and switches.
- CISCO IOS is a family of Software.
- To Configure a CISCO device running IOS, the Command-Line Interface (CLI) is used.
- The CLI is usually accessed from local or remote device running Telnet or SSH.

- The CLI comes with predefined number of commands to configure routing and switching.
- The IOS is usually stored as a system image within a router or switch flash memory.

```
R1#
R1#sh ver
Cisco IOS Software, 3600 Software (C3640-JK9S-M), Version 12.4(16), RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 20-Jun-07 11:43 by prod_rel_team

ROM: ROMMON Emulation Microcode
ROM: 3600 Software (C3640-JK9S-M), Version 12.4(16), RELEASE SOFTWARE (fc1)

R1 uptime is 0 minutes
System returned to ROM by unknown reload cause - suspect boot_data[BOOT_COUNT] 0x0, BOOT_COUNT 0,
 BOOTDATA 19
```

Basic Commands:

User mode:

Router> enable

Privilege mode:

Router# show running-config
Router# show startup-config
Router# show flash
Router# show version
Router# show ip int br

Basic Configuration for Routers:

Configuring Enable Mode Password in Router	
Description	**Commands**
Set Enable mode password	Enable password 12345
Set Enable encrypted password	Enable secret cisco123
Telnet Configuration in Router	
Go to line VTY	Line vty 0 4
Set vty password	Password 123
Enables password checking at login	Login
SSH Configuration in Router	
Create local user and password	Username admin password admin
Set domain name	Ip domain-name Networkforyou.com crypto key generate rsa ip ssh version 2
Go to line VTY	Line vty 0 4
To enable checking in local database user	Login local
Incoming traffic	Transport input ssh
Basic Commands	
To Set time in Router or Switch	clock set 14:05:00 september 9 2020
To Check Clock in Router or Switch	Sh Clock
To copy our running configuration to the startup configuration	SW1#copy running-config startup-config