

Router

A **router** is a networking device, commonly specialized hardware, that forwards data packets between computer networks. This creates an overlay internetwork, as a router is connected to two or more data lines from different networks. When a data packet comes in one of the lines, the router reads the address information in the packet to determine its ultimate destination.

FUNCTIONS OF A ROUTER

- Restrict broadcasts to the LAN
- Act as the default gateway.
- Perform Protocol Translation (Wired Ethernet to Wireless/WiFi, or Ethernet to CATV)
- Move (route) data between networks
- Learn and advertise loop free paths
- Calculate 'best paths' to reach network destinations.

Router Components & Parts

Since routers are just specialized computers, they have the same "parts" as other computers:

- Central Processing Unit (CPU)
- Flash Memory
- Non-Volatile RAM
- RAM
- Network Interfaces
- Console

Central Processing Unit: Runs special software called an "operating system" such as JunOS on Juniper routers, or Cisco IOS (Nexus OS) for Cisco routers. The operating system manages the router's components and provides all the logical networking functions of the router.

Flash Memory is where the operating system is stored, and in this respect, is like the hard disk drive in your computer. If you use a Solid State Disk Drive (SSD), then your computer uses Flash RAM, just like the router does.

Non-Volatile RAM: This is additional memory for storing the backup or startup version of the operating system being used. The router will boot from this memory and load all its programs from here.

RAM: When the router starts up, the operating system is loaded into RAM. Once the router finishes starting up, it begins to calculate its own routes and, if configured to do so, learns network routes from other routers via RIP (v1 and v2), OSPF, EIGRP, IS-IS or BGP. RAM is also used for caching ARP tables, routing tables, routing metrics and other data that can speed up the process of forwarding of packets.

Network Interfaces: Routers always have lots of network interfaces. The operating system contains 'drivers' that allow the operating system to access the network hardware in the interface modules. Routers will learn which networks are configured on which ports as they start up. After that, they will 'learn' routes from other routers they are connected to, and learn which interface to transmit packets on to reach a remote network destination.

Console: Last, but not least, is the console. In "Ye Olden Days" managing and configuring a router was performed at the console of individual devices, as was most troubleshooting and diagnostics. Network certification exams will contain a large selection of questions on the configuration and troubleshooting commands you can issue from the console. However, manufacturers are rapidly doing away with a console on each device and building management systems for managing large numbers of network devices from a centralized location.

Different Types of Router Memory

ROM

ROM is read-only memory available on a router's processor board. The initial bootstrap software that runs on a Cisco router is usually stored in ROM. ROM also maintains instructions for Power-on Self Test (POST) diagnostics. For ROM Software upgrades, the pluggable chips on the motherboard should be replaced. The bootstrap program is responsible for locating and loading the router's IOS.

Flash Memory

Flash memory is an Electronically Erasable and Re-Programmable memory chip. The Flash memory contains the full Operating System Image (IOS, Internetwork Operating System). This allows you to upgrade the OS without removing chips. Flash memory retains content when router is powered down or restarted.

RAM

RAM is very fast memory that loses its information when the router is shutdown or restarted. On a router, RAM is used to hold running Cisco IOS Operating System, IOS system tables and

buffers RAM is also used to store routing tables, keep ARP cache, Performs packet buffering (shared RAM). RAM Provides temporary memory for the router configuration file of the router while the router is powered on.

RAM Stores running Cisco IOS Operating System, Active program and operating system instructions, the Running Configuration File, ARP (Address Resolution Protocol) cache, routing tables and buffered IP Packets.

NVRAM (Non-volatile Random Access Memory)

NVRAM is used to store the Startup Configuration File. This is the configuration file that IOS reads when the router boots up. It is extremely fast memory and retains its content when the router is restarted.

Cisco Router Show Commands

Requirement	Cisco Command
View version information	show version
View current configuration (DRAM)	show running-config
View startup configuration (NVRAM)	show startup-config
Show IOS file and flash space	show flash
Shows all logs that the router has in its memory	show log
View the interface status of interface e0	show interface e0
Overview all interfaces on the router	show ip interfaces brief
View type of serial cable on s0	show controllers 0 (note the space between the 's' and the '0')
Display a summary of connected cdp devices	show cdp neighbor
Display detailed information on all devices	show cdp entry *

Display current routing protocols	show ip protocols
Display IP routing table	show ip route
Display access lists, this includes the number of displayed matches	show access-lists
Check the router can see the ISDN switch	show isdn status
Check a Frame Relay PVC connections	show frame-relay pvc
show lmi traffic stats	show frame-relay lmi
Display the frame inverse ARP table	show frame-relay map