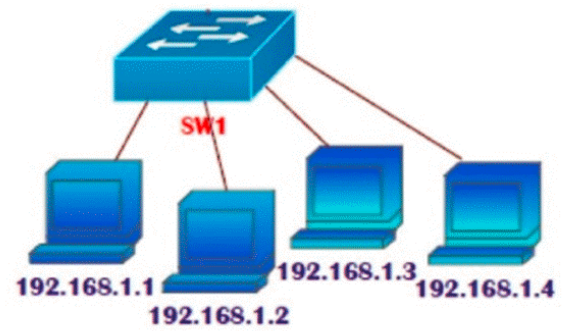


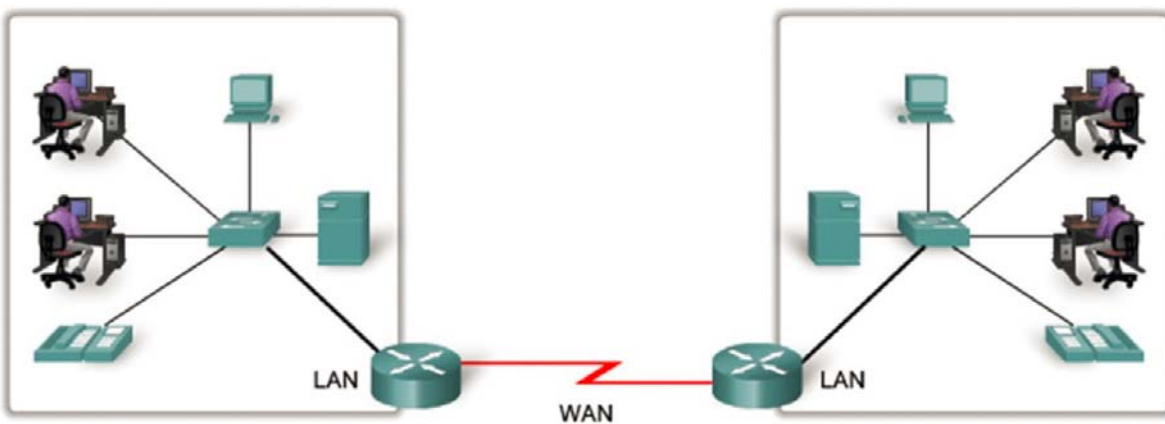
Basic LAN setup



- ▶ Connect 4 computers in the LAN using Switch
- ▶ Configure IP addressing on all PC using 192.168.1.0/24 network.
- ▶ Check Connectivity between all the PC using Ping command

Cisco Routers

Device connecting two or more LAN



Router Classification

FIXED ROUTER

- All ports are integrated on motherboard (no Slots)
- Non Upgradable cannot add and remove the interfaces
- 2500, 800 series routers



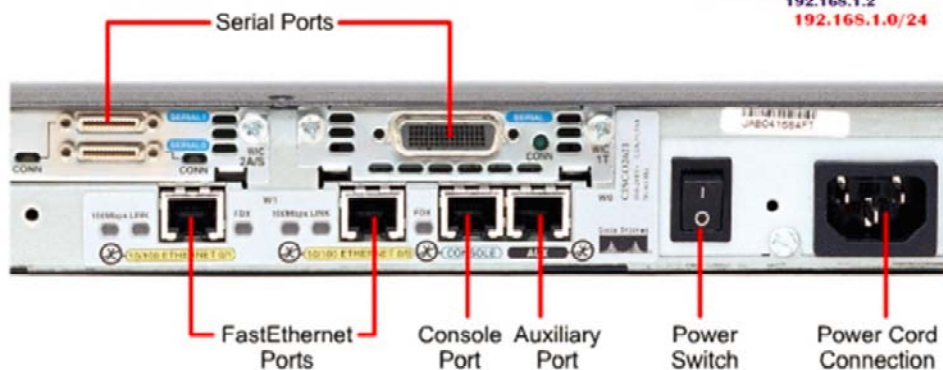
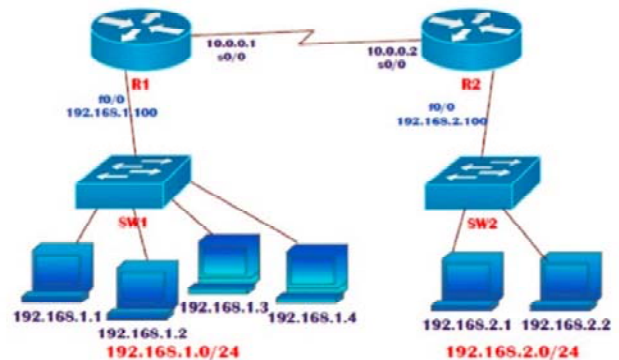
MODULAR ROUTER

- Have Slots where you can add or remove cards
- Distribution and Core Layer Routers
example of Modular Router
- 1600, 1700, 1800, 2600, 2800, 3600, 3700



External Ports of Router

LAN , WAN , admin ports

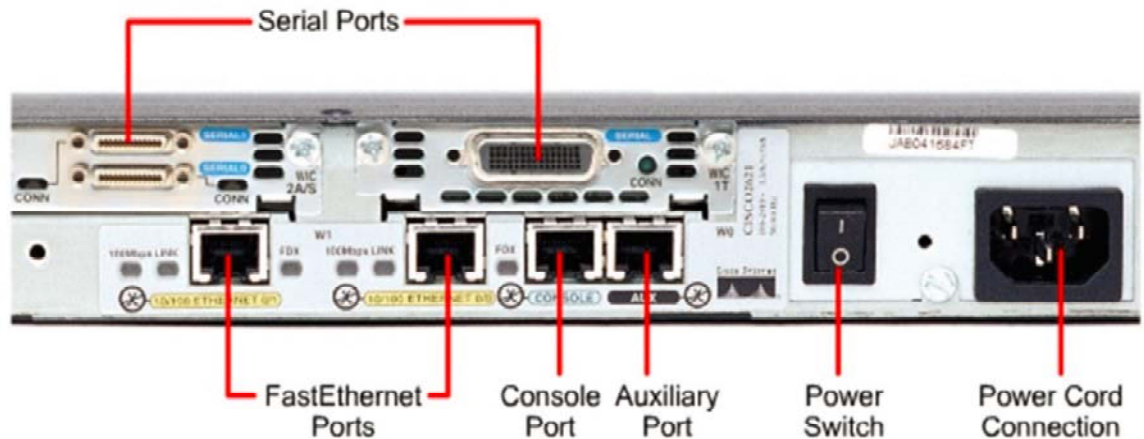


LAN Ports: (RJ45)

- Ethernet 10 Mbps
- Fast Ethernet 100 Mbps
- Gig Ethernet 1000 Mbps

WAN ports

- Serial ports
- 60 pin or 26 pin smart serial

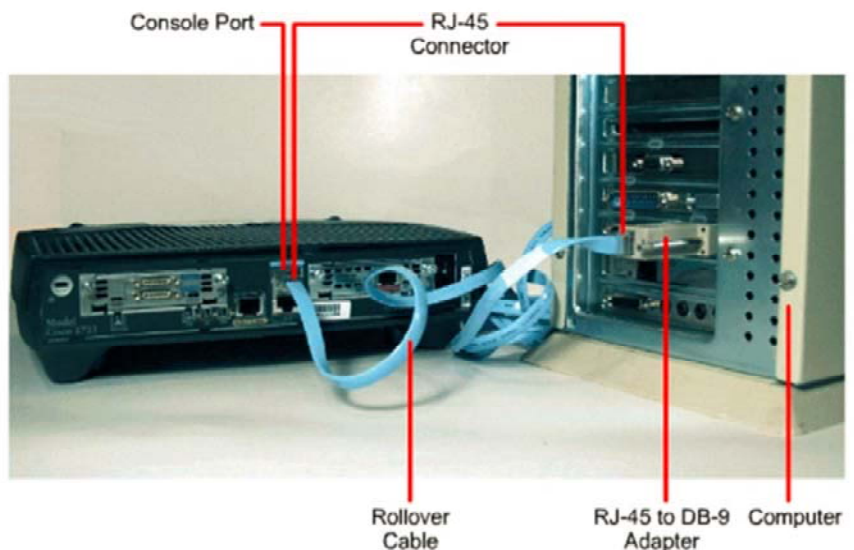


Console Port

- ▶ It is RJ45 Port
- ▶ Used for local administration ,Initial Configuration, Password Recovery.

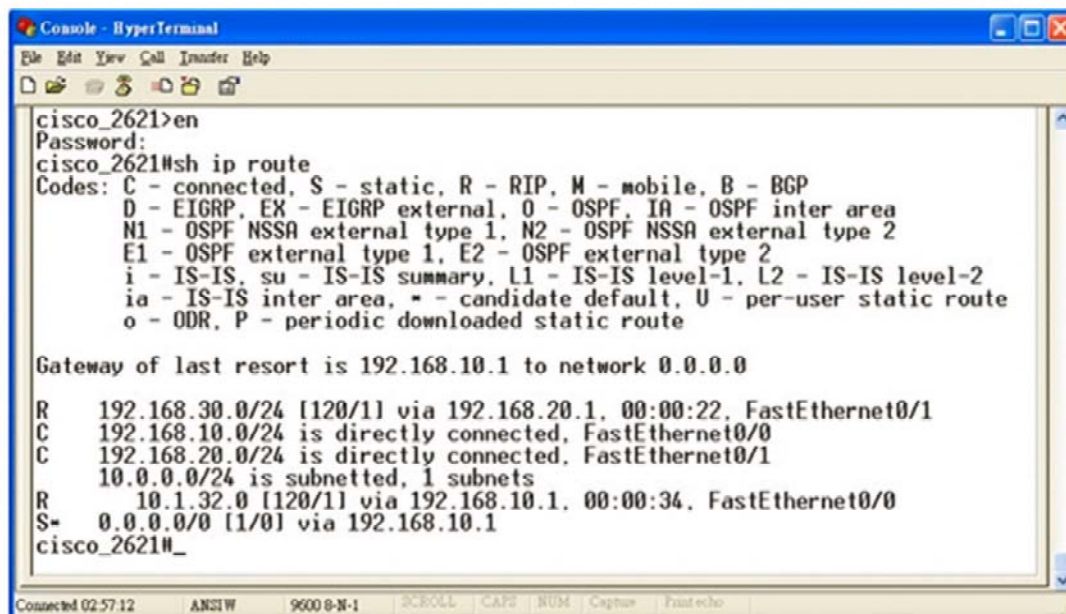


Console Cable



HyperTerminal

Application used to see the Command line of a router via console



The screenshot shows a HyperTerminal window titled "Console - HyperTerminal". The command prompt is "cisco_2621>en", followed by "Password:". The user then enters "cisco_2621#sh ip route". The output displays various routing codes and their meanings: C - connected, S - static, R - RIP, M - mobile, B - BGP, D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area, N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2, E1 - OSPF external type 1, E2 - OSPF external type 2, i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area, * - candidate default, U - per-user static route, o - ODR, P - periodic downloaded static route. Below this, it states "Gateway of last resort is 192.168.10.1 to network 0.0.0.0". The routing table shows several entries, including "R 192.168.30.0/24 [120/1] via 192.168.20.1, 00:00:22, FastEthernet0/1", "C 192.168.10.0/24 is directly connected, FastEthernet0/0", "C 192.168.20.0/24 is directly connected, FastEthernet0/1", "10.0.0.0/24 is subnetted, 1 subnets", "R 10.1.32.0 [120/1] via 192.168.10.1, 00:00:34, FastEthernet0/0", and "S* 0.0.0.0/0 [1/0] via 192.168.10.1". The prompt returns to "cisco_2621#".

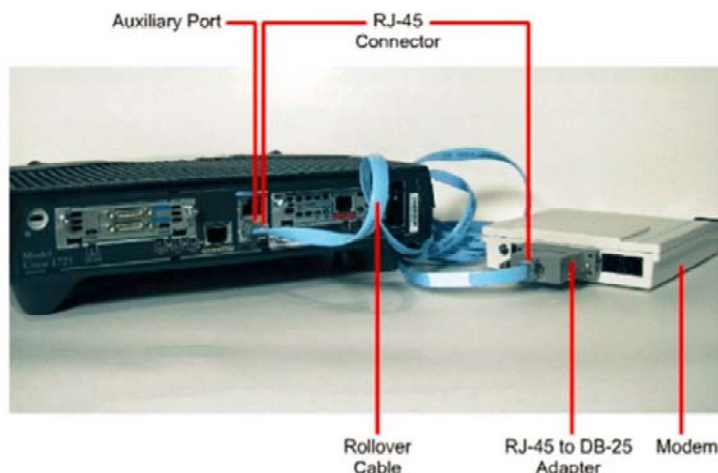
```
cisco_2621>en
Password:
cisco_2621#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.10.1 to network 0.0.0.0

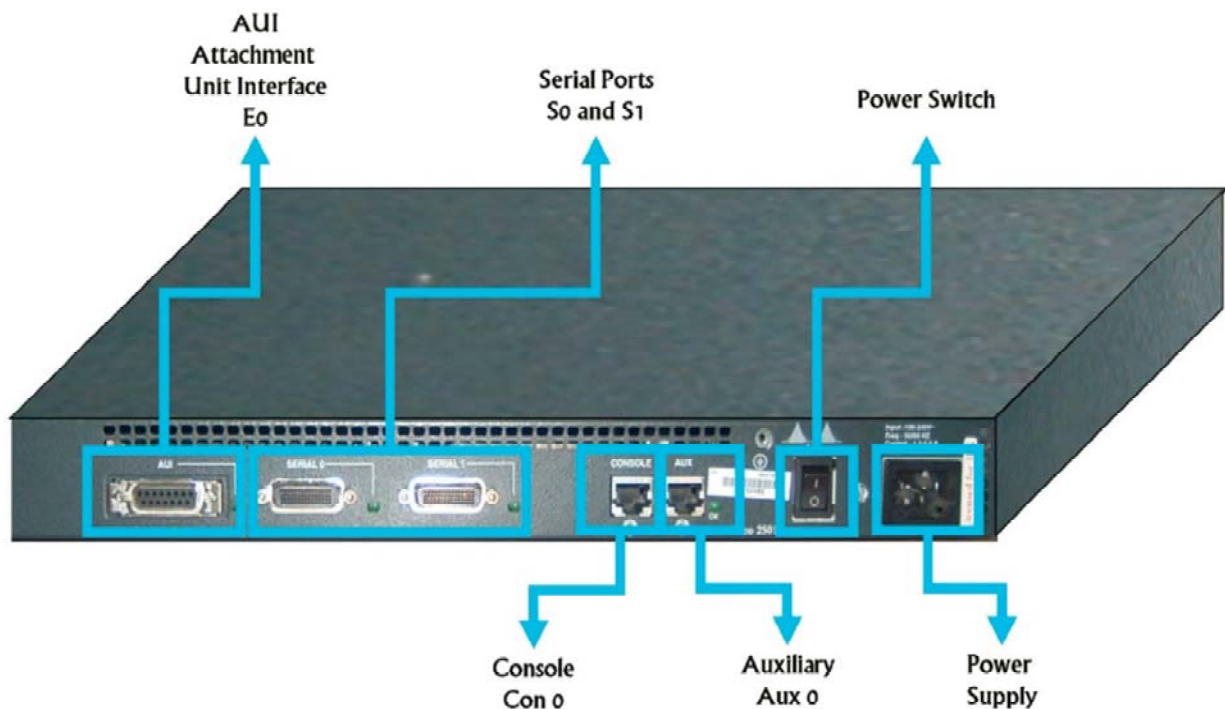
R    192.168.30.0/24 [120/1] via 192.168.20.1, 00:00:22, FastEthernet0/1
C    192.168.10.0/24 is directly connected, FastEthernet0/0
C    192.168.20.0/24 is directly connected, FastEthernet0/1
     10.0.0.0/24 is subnetted, 1 subnets
R      10.1.32.0 [120/1] via 192.168.10.1, 00:00:34, FastEthernet0/0
S*    0.0.0.0/0 [1/0] via 192.168.10.1
cisco_2621#
```

Auxiliary Port

- ▶ Its an RJ-45 port
- ▶ Used for remote administration.
- ▶ Uses the console cable connecting to modem



2500 Cisco router

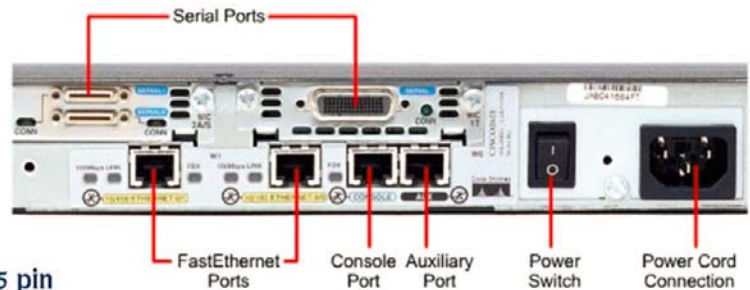


Attachment Unit Interface

- ▶ Commonly found on some old platforms (2500)
- ▶ AUI pin configuration is 15 pin port (Ethernet LAN using 15 Pin instead of RJ45)
- ▶ Transceiver is used for converting 8 wires to 15 wires. i.e. RJ45 to 15 pin converter.



Summary - External Ports of a Cisco Router



LAN interfaces - Ethernet

- AUI (Attachment Unit Interface) (E0)– 15 pin
- 10baseT – RJ45

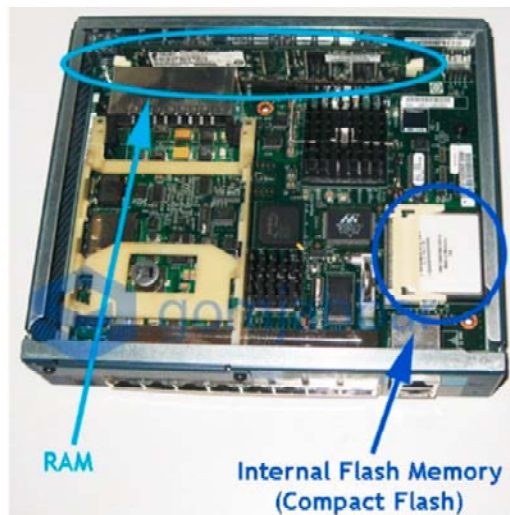
WAN interfaces

- Serial interface (S0, S1, s0/0, s0/1 , s0/0/0) – 60 pin/26 pin (smart serial)
- ISDN interface (BRI) – RJ45 (used for ISDN wan connections)

Administration interfaces

- Console – RJ45 – Local Administration
- Auxiliary – RJ45 – Remote Administration

Internal Components



ROM

loads the bootstrap programs and searches for the IOS (Flash/TFTP/ROM)

FLASH

Stores IOS

NVRAM

Stores configurations (permanent)
Startup-config

RAM

Stores Configurations (temporary)
Running-config



Booting process of cisco router



POST

power on self test Checks the hardware

ROM

loads the bootstrap programs and searches for the IOS (Flash/TFTP/ROM)

FLASH

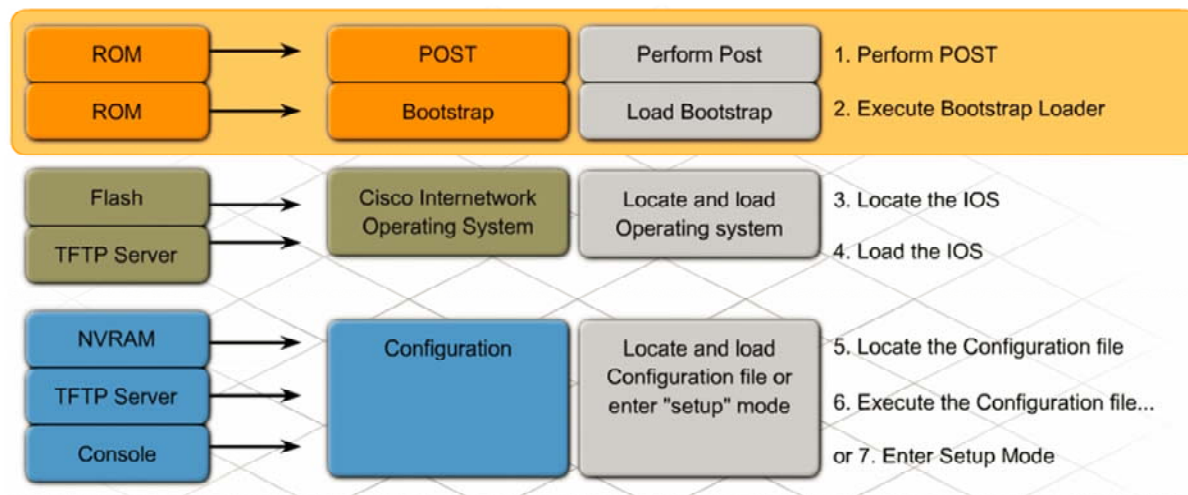
Stores IOS

NVRAM

Stores configurations (permanent)
Startup-config

RAM

Stores Configurations (temporary)
Running-config



1. Performing the POST and Loading the Bootstrap Program

- The power-on self test (POST) is a process that occurs on almost every computer when it boots. The POST is used to test the router hardware.
- After the POST, the bootstrap program is loaded. The bootstrap program locates the Cisco IOS and loads it into RAM.

2. Locating and Loading the IOS Software

- The location of the IOS file is specified by the value of the configuration register setting. The bits in this setting can instruct the device to load the IOS file from the following locations:

- Flash memory
- A TFTP server

- To load the IOS normally from flash, the configuration register setting should be set to 0x2102.

3. Locating and Executing the Startup Configuration File or Entering Setup Mode

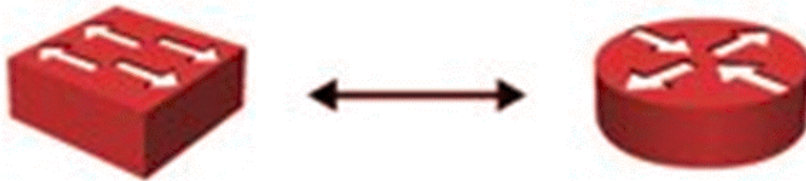
- After the IOS is loaded, the bootstrap program searches for the startup configuration file (startup-config) in NVRAM.
- This file contains the previously saved configuration commands and parameters, including Interface addresses, Routing information, Passwords, other configuration parameters
- If no configuration file is located, the router prompts the user to enter setup mode to begin the configuration process.
- If a startup configuration file is found, a prompt containing a hostname will display. The router has successfully loaded the IOS and the configuration file.

Integrated Services Router (ISR).

- It gets its name because many of the services, like security, are built into it. It's a modular device like the 2600,
- but it's much faster and a lot more sleek—it's elegantly designed to support a broad new range of interface options.
- 800,1800,2800,3800, 1900,2900,3900,

Test your skills:

- What is the color –coding for straight and cross cables.
- Identify the correct cable used for physical connections in the LAN.

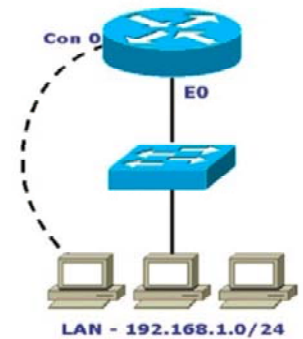
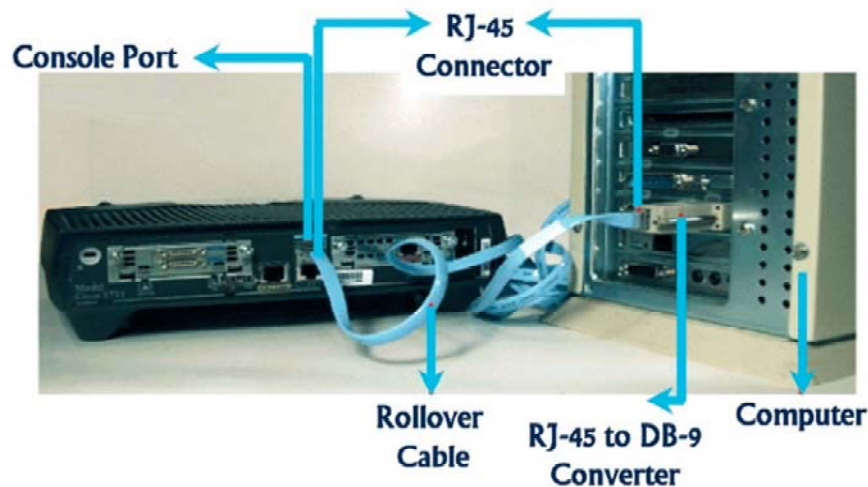




Password Reverting & backup Restore

Password Reverting on Cisco Routers

console connection



Open hyper-terminal /putty software for console access.
HyperTerminal for console access

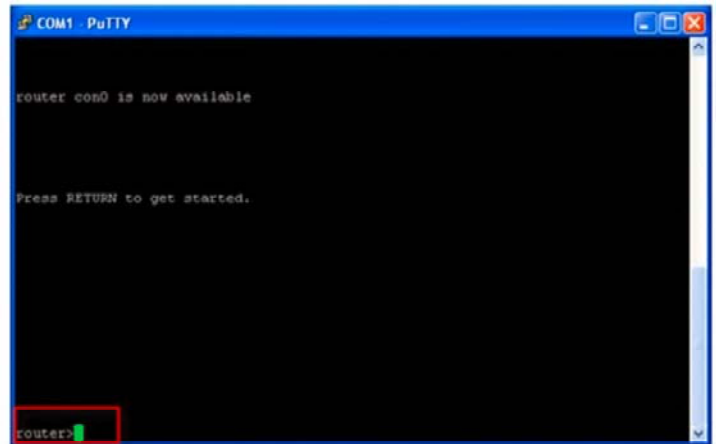
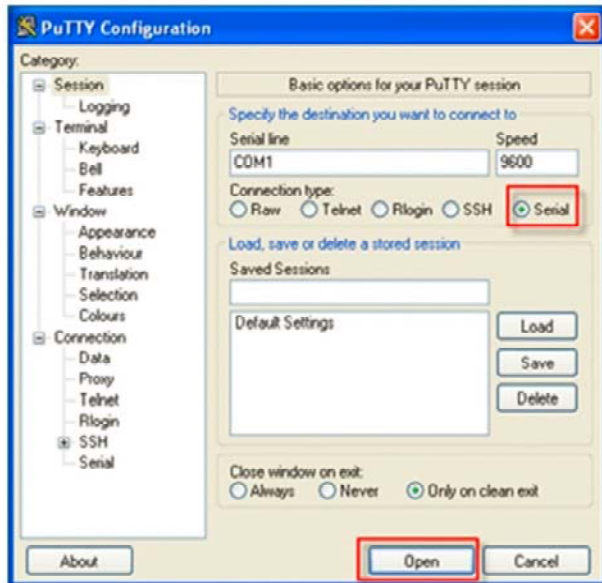
```
Console - HyperTerminal
File Edit View Call Transfer Help
[Icons]
cisco_2621>en
Password:
cisco_2621#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.10.1 to network 0.0.0.0

R    192.168.30.0/24 [120/1] via 192.168.20.1, 00:00:22, FastEthernet0/1
C    192.168.10.0/24 is directly connected, FastEthernet0/0
C    192.168.20.0/24 is directly connected, FastEthernet0/1
     10.0.0.0/24 is subnetted, 1 subnets
R       10.1.32.0 [120/1] via 192.168.10.1, 00:00:34, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 192.168.10.1
cisco_2621#_

Connected 02:57:12  ANSIW  9600 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Open hyper-terminal /putty software for console access.



Putty Software for Console access of router

- power on the router.
- press **CTRL+ SHIFT + BREAK** to enter in to Rommon mode (with in seconds)



We need to change the config-register file from 0x2012 - 0x2142 in order to skip NVRAM loading in to RAM.

NE

Modular routers

```
Rommon1> confreg 0x2142  
Rommon2> reset
```

Or

On fixed routers

```
> o/r 0x2142  
> i
```

Now the router boots without any passwords (as its skips NVRAM loading in to RAM) and enters in to setup mode .Skip setup mode with NO command.

Router> enable

Router #**copy startup-config running-config**

(Very important if u dont want to loose the configs in the NVRAM)

Router # **config terminal**

Change the passwords (overwrite with new passwords)

```
Router(config)#line console 0
```

```
Router(config-line)#password cisco123
```

```
Router(config-line)#login
```

```
Router(config-line)#end
```

```
ROUTER(config)# line vty 0 4
```

```
ROUTER(config-line)# password ccna123
```

```
ROUTER(config-line)# login
```

```
ROUTER(config-line)# exit
```

```
ROUTER(config)# enable secret ccnp123
```

```
ROUTER(config)# exit
```

- Change the config-register file back to 0x2012
- so that it should not skip NVRAM loading at the next reload

Router (config) # **config-register 0x2012**

Router (config) # **end**

Router #**write**

Router #**reload**

After reloading check for configurations are same and you are able to login with new passwords.

Backup & Restore (IOS/configs)

Reachability (between PC & Router)

R-1#sh ip int brief

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	192.168.1.100	YES	manual	up	up

R-1#ping 192.168.1.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/7/17 ms

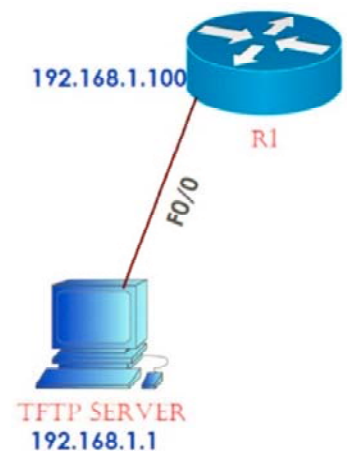
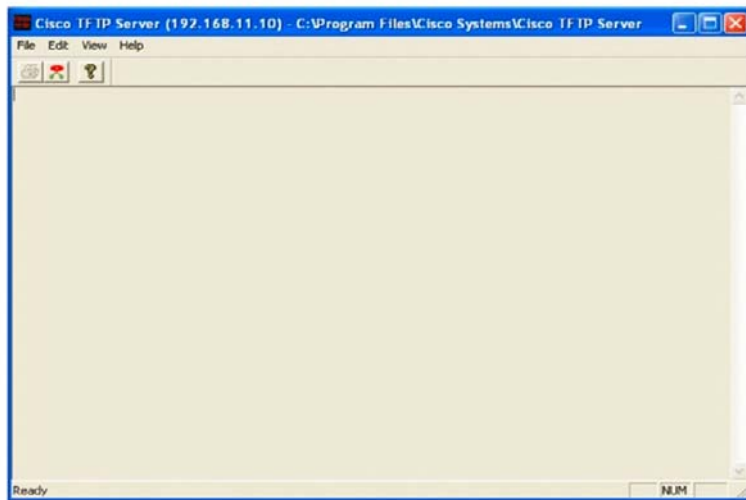
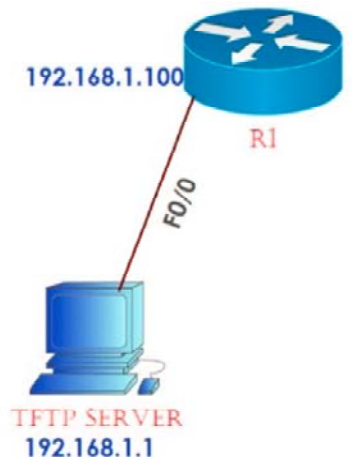


Diagram illustrating the connection between the TFTF SERVER (192.168.1.1) and the router (R1, 192.168.1.100) via a serial link (F0/0).

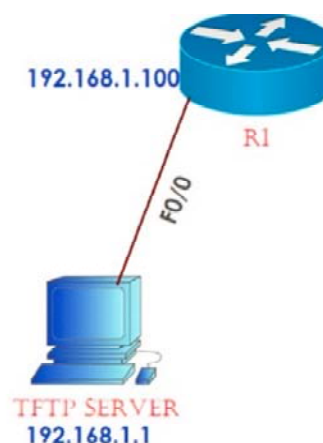


Backup of IOS : # copy flash tftp



```
Source filename []? c2600-i-mz.122-28.bin
Address or name of remote host []? 192.168.1.1
Destination filename [c2600-i-mz.122-28.bin]?
Writing c2600-i-mz.122-
28.bin.....!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 5571584 bytes]
5571584 bytes copied in 0.433 secs (12867000 bytes/sec)
```

Restore/upgrade IOS - # copy flash tftp



R-1#copy tftp flash:

Address or name of remote host []? 192.168.1.1

Source filename []? **c2600-i-mz.122-28.bin**

Destination filename [c2600-i-mz.122-28.bin)?

```
%Warning: There is a file already existing with this name
```

Do you want to over write? [confirm]

Erase flash: before copying? [confirm]

Erasing the flash filesystem will remove all files! Continue? [confirm]

Erasing device...

=====

.....erased

Erase of flash: complete

Accessing tftp://192.168.1.1/c2600-i-mz.122-28.bin...

Loading c2600-i-mz.122-28.bin from 192.168.1.1:

[illegible]

[OK - 5571584 bytes]

5571584 bytes copied in 0.41 secs (3113699 bytes/sec)

Backup configs - # copy startup-config tftp

R-1# copy startup-config tftp:

Address or name of remote host []? 192.168.1.1

Destination filename [R-1-config]?

Writing startup-config...!!

[OK - 537 bytes]

537 bytes copied in 0.006 secs (89000 bytes/sec)

Restore configs - # copy tftp running-config

```
ROUTER# copy tftp running-config
```

Address or name of remote host []? 192.168.1.1

Source filename []? **R-1-config**

Destination filename [running-config]?

Accessing tftp://192.168.1.1/R-1-config...

Loading R-1-config from 192.168.1.1: !

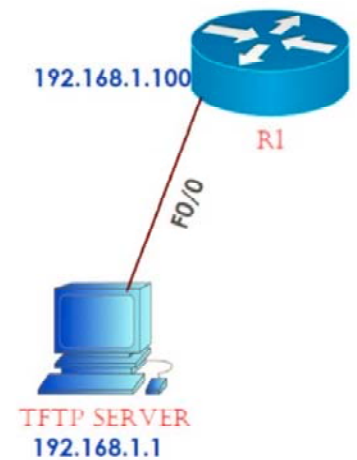
[OK - 537 bytes]

537 bytes copied in 0.002 secs (268500 bytes/sec)

Restoring IOS via TFTP

(In case if there is no IOS present in the flash)

```
rommon 1 > tftpdnld
rommon 2 > IP_ADDRESS=192.168.1.100
rommon 3 > IP_SUBNET_MASK=255.255.255.0
rommon 4 > DEFAULT_GATEWAY=192.168.1.100
rommon 5 > TFTP_SERVER=192.168.1.1
rommon 6 > TFTP_FILE=c2600-i-mz.122-28.bin
rommon 7 > tftpdnld
```



SUMMARY

- **BACKUP OF IOS :**
 - # copy flash tftp
- **RESTORE or UPGRADE IOS**
 - # copy TFTP Flash
- **BACKUP OF CONFIGS**
 - # copy startup-config TFTP
- **RESTORE CONFIGS**
 - # copy TFTP running-config