Lab 2

- Interface cabling and configuration
- Managing configuration files

Configuring routing interfaces

All interfaces are accessed by issuing the `interface` command at the global configuration prompt.

In the following commands, the *`type`* argument includes serial, ethernet, fastethernet, and others:

```
Router(config)#interface type port
Router(config)#interface type slot/port
Router(config)#interface type slot/subslot/port
```

The following command is used to administratively turn off the interface:

```
Router(config-if)#shutdown
```

The following command is used to turn on an interface that has been shutdown:

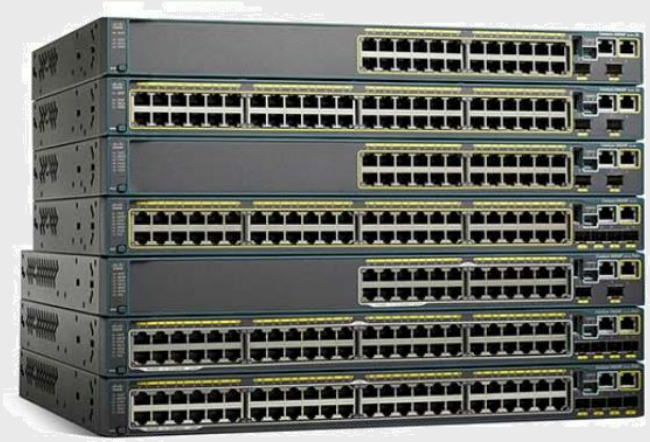
```
Router(config-if)#no shutdown
```

The following command is used to quit the current interface configuration mode:

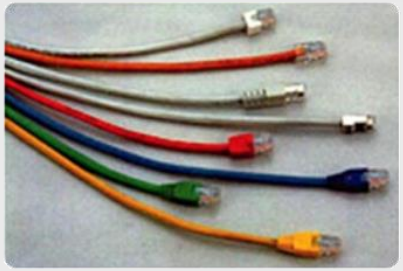
```
Router(config-if)#exit
```

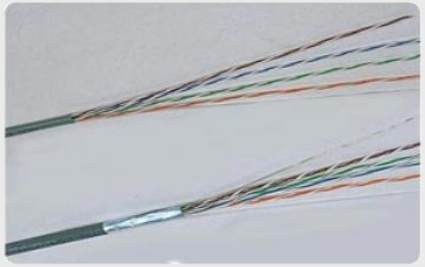
When the configuration is complete, the interface is enabled and interface configuration mode is exited.

Interfaces and ports



copper twisted-pair

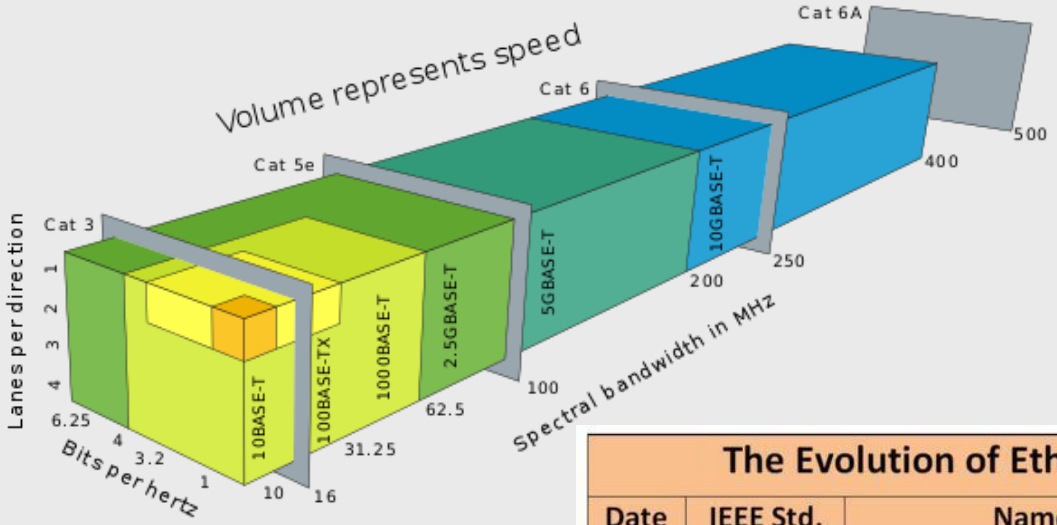




fiber-optical

wireless

Ethernet LAN standards



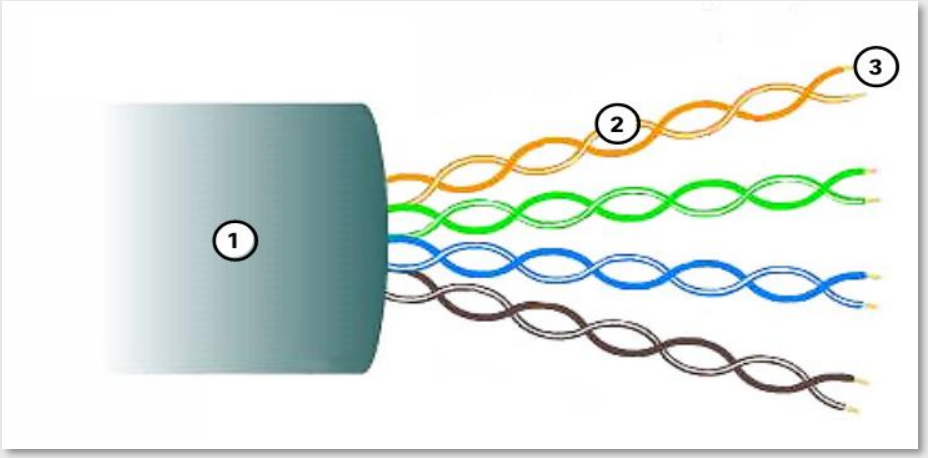
The Evolution of Ethernet Standards to Meet Higher Speeds				
Date	**IEEE Std.**	**Name**	**Data Rate**	**Type of Cabling**
1990	802.3i	10BASE-T	10 Mb/s	Category 3 cabling
1995	802.3u	100BASE-TX	100 Mb/s*	Category 5 cabling
1998	802.3z	1000BASE-SX	1 Gb/s	Multimode fiber
	802.3z	1000BASE-LX/EX		Single mode fiber
1999	802.3ab	1000BASE-T	1 Gb/s*	Category 5e or higher Category
2003	802.3ae	10GBASE-SR	10 Gb/s	Laser-Optimized MMF
	802.3ae	10GBASE-LR/ER		Single mode fiber
2006	802.3an	10GBASE-T	10 Gb/s*	Category 6A cabling
2015	802.3bq	40GBASE-T	40 Gb/s*	Category 8 (Class I & II) Cabling
2010	802.3ba	40GBASE-SR4/LR4	40 Gb/s	Laser-Optimized MMF or SMF
	802.3ba	100GBASE-SR10/LR4/ER4	100 Gb/s	Laser-Optimized MMF or SMF
2015	802.3bm	100GBASE-SR4	100 Gb/s	Laser-Optimized MMF
2016	SG	Under development	400 Gb/s	Laser-Optimized MMF or SMF
Note: *with auto negotiation				

EmbeddedGeeKs - IEEE Ethernet Standards
Ethernet physical layer - Wikipedia

Ethernet LAN cabling (Copper TP)

- Interconnects hosts with intermediary network devices
- Terminated with RJ-45 connectors

Unshielded Twisted Pair (UTP)



1. The outer jacket protects the copper wires from physical damage
2. Twisted pairs protect the signal from interference
3. Color-coded plastic insulation electrically isolates the wires from each other and identifies each pair

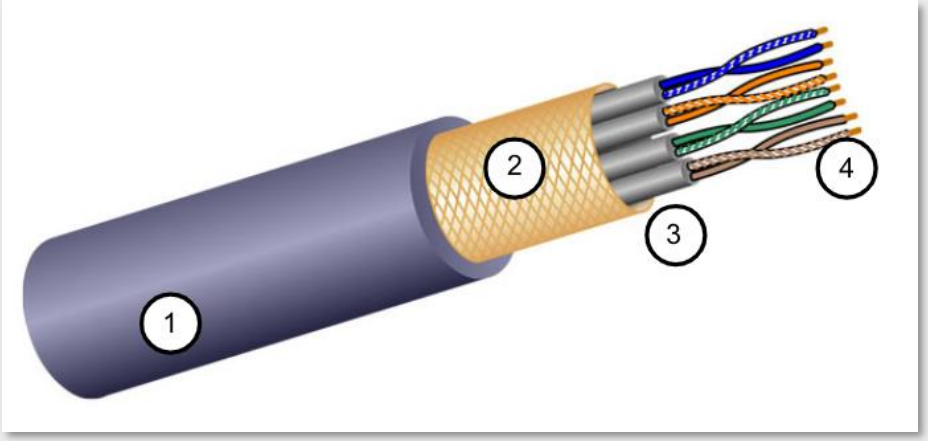
Ethernet LAN cabling (Copper TP)

- Interconnects hosts with intermediary network devices
- Terminated with RJ-45 connectors

- Better noise protection than UTP
- More expensive than UTP
- Harder to install than UTP

1. The outer jacket protects the copper wires from physical damage
2. Braided or foil shield provides EMI/RFI protection
3. Foil shield for each pair of wires provides EMI/RFI protection
4. Color-coded plastic insulation electrically isolates the wires from each other and identifies each pair

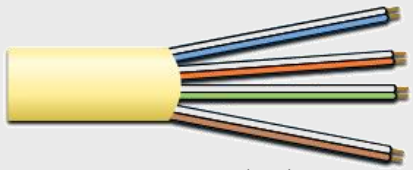
Shielded Twisted Pair (STP)



Ethernet LAN cabling (Copper TP)

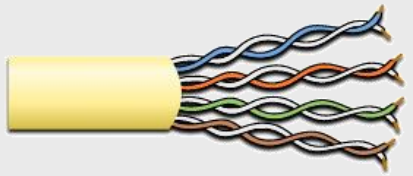
- Four pairs of color-coded copper wires twisted together and encased in a flexible plastic sheath

- Standards for UTP are established by the TIA/EIA. TIA/EIA-568 standardizes elements like:
  - Cable Types
  - Cable Lengths
  - Connectors
  - Cable Termination
  - Testing Methods

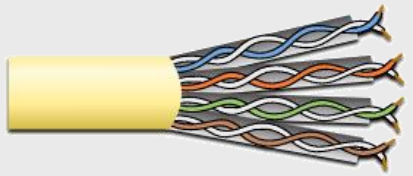


Category 3 Cable (UTP)

- Electrical standards for copper cabling are established by the IEEE, which rates cable according to its performance. Examples include:
  - Category 3
  - Category 5 and 5e
  - Category 6

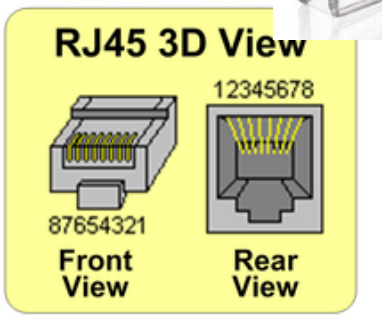


Category 5 and 5e Cable (UTP)



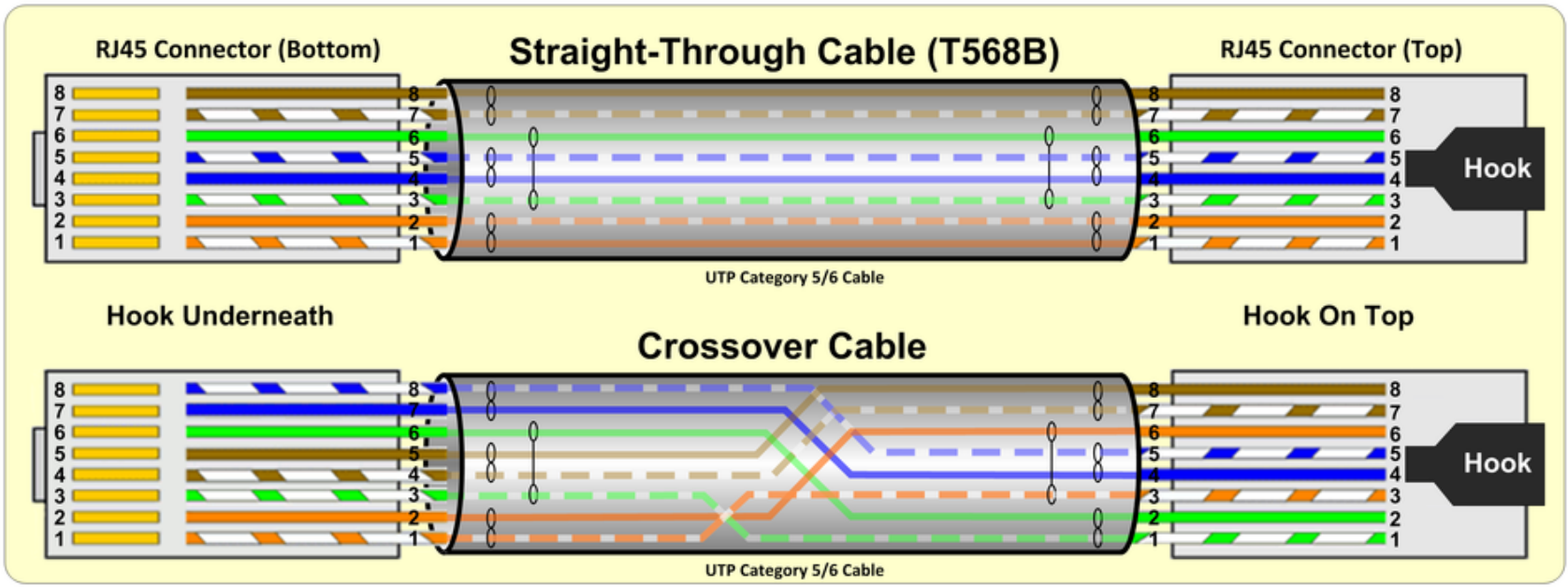
Category 6 Cable (UTP)

Ethernet LAN cabling (Copper TP)



RJ45 - Pinout, Wire Pair Color Coding, and Signal Identification

Pin	T568A	T568B	Signal 10/100BaseTx	Signal 1000BaseT
1	Wht/Grn	Wht/Org	Tx+	TP1+
2	Grn	Org	Tx-	TP1-
3	Wht/Org	Wht/Grn	Rx+	TP2+
4	Blu	Blu	Unused	TP3-
5	Wht/Blu	Wht/Blu	Unused	TP3+
6	Org	Grn	Rx-	TP2-
7	Wht/Brn	Wht/Brn	Unused	TP4+
8	Brn	Brn	Unused	TP4-

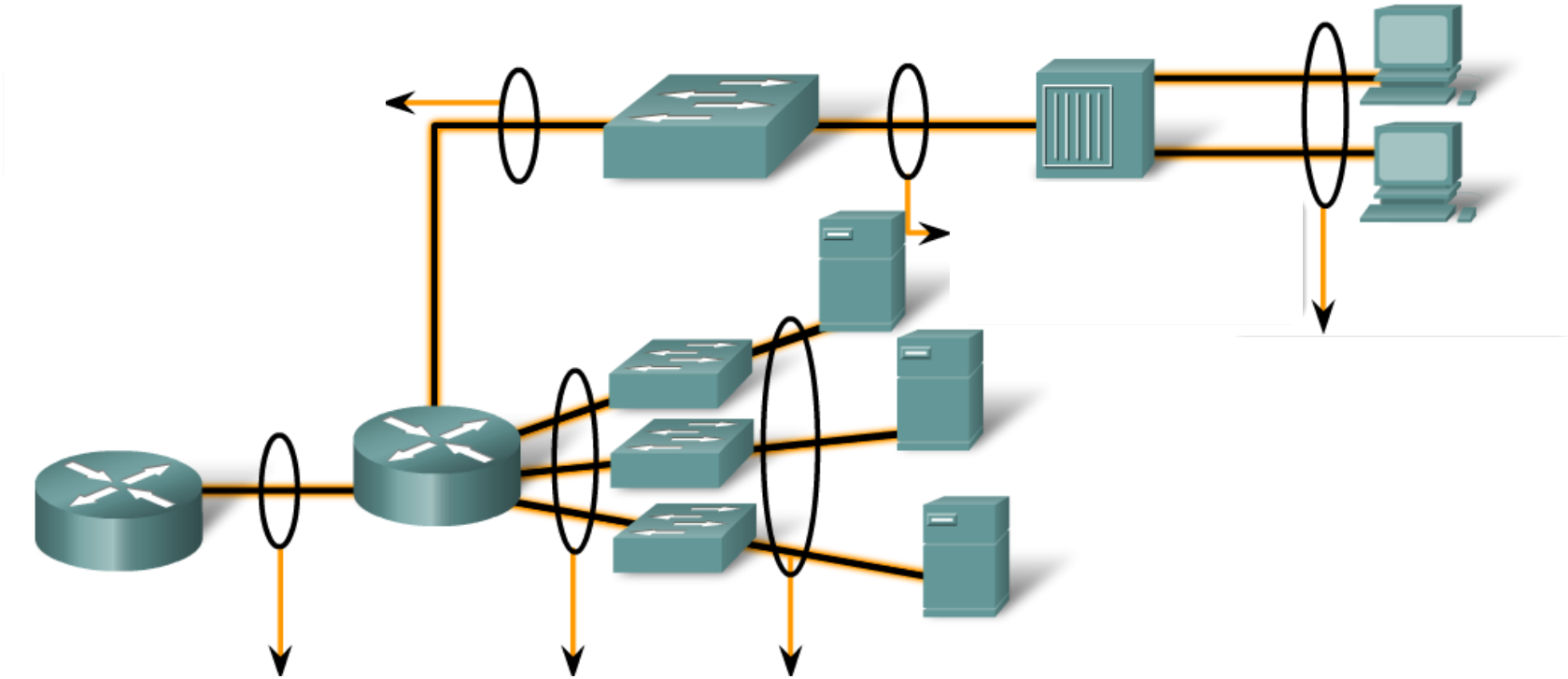


LAN Ethernet Network Cable - NST Wiki (networksecuritytoolkit.org)

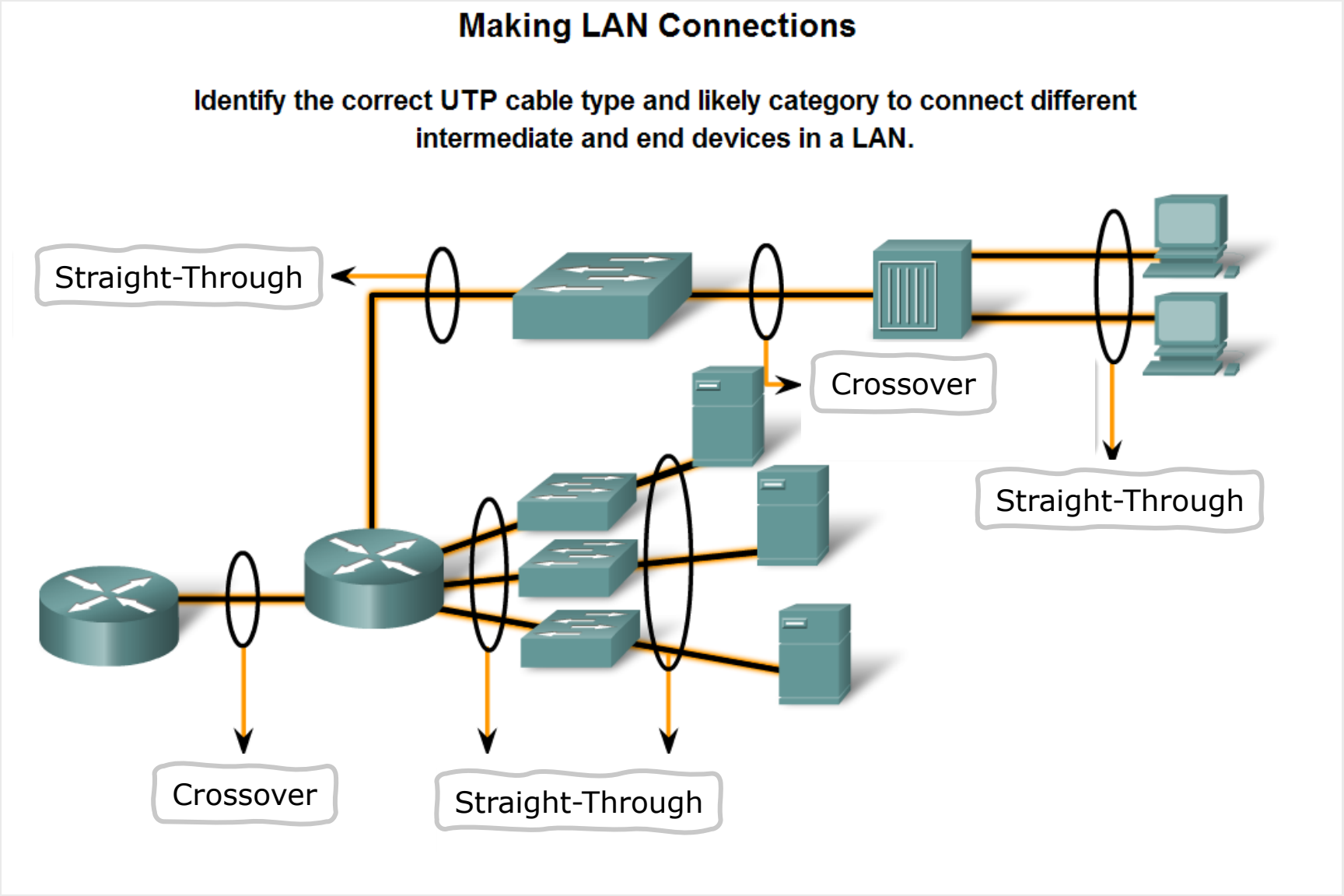
Ethernet LAN cabling (Copper TP)

Making LAN Connections

Identify the correct UTP cable type and likely category to connect different intermediate and end devices in a LAN.



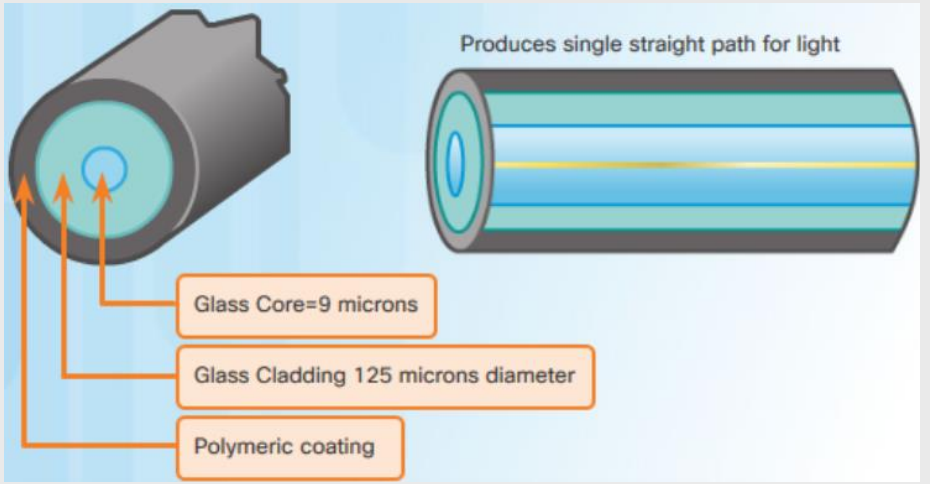
Ethernet LAN cabling (Copper TP)



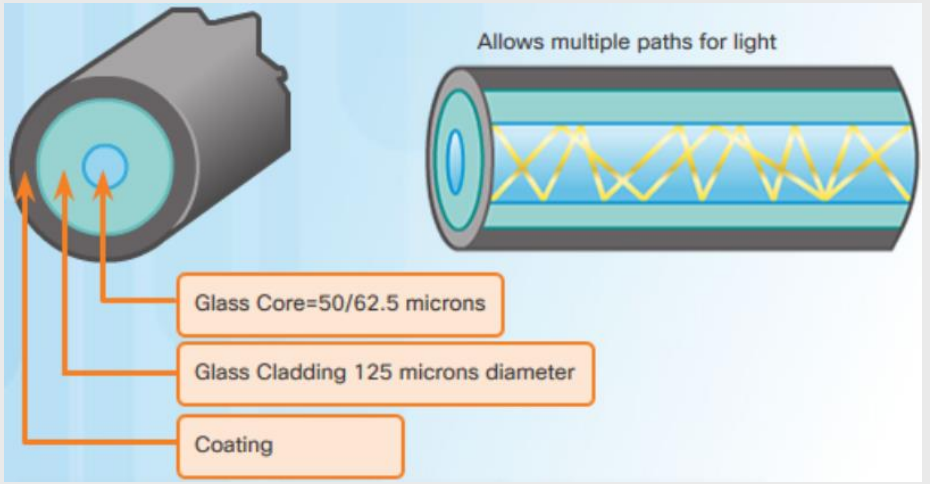
Ethernet LAN cabling (Fiber optics)

- Not as common as UTP because of the expense involved
- Made of flexible, extremely thin strands of very pure glass
- Uses a laser or LED to encode bits as pulses of light
- The fiber-optic cable acts as a wave guide to transmit light between the two ends with minimal signal loss
- Transmits data over longer distances at higher bandwidth than any other networking media
- Less susceptible to attenuation, and completely immune to EMI/RFI

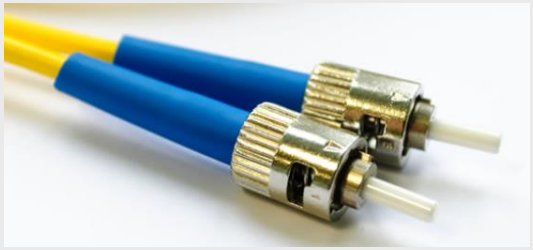
Single-Mode Fiber



Multimode Fiber



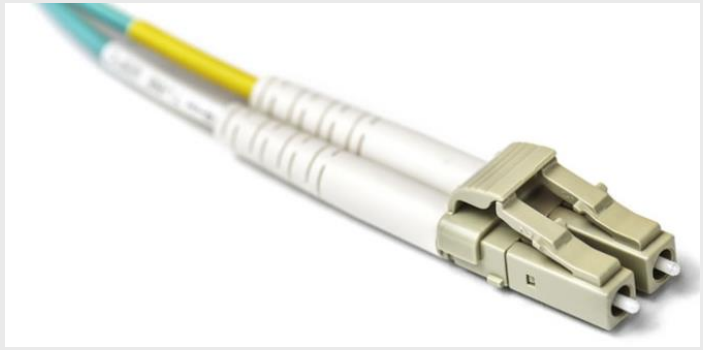
Ethernet LAN cabling (Fiber optics)



Straight-Tip (ST) Connectors

Lucent Connector (LC) Simplex Connectors

Subscriber Connector (SC) Connectors



Duplex Multimode LC Connectors

Ethernet LAN cabling (Fiber optics)

SC-SC MM Patch Cord

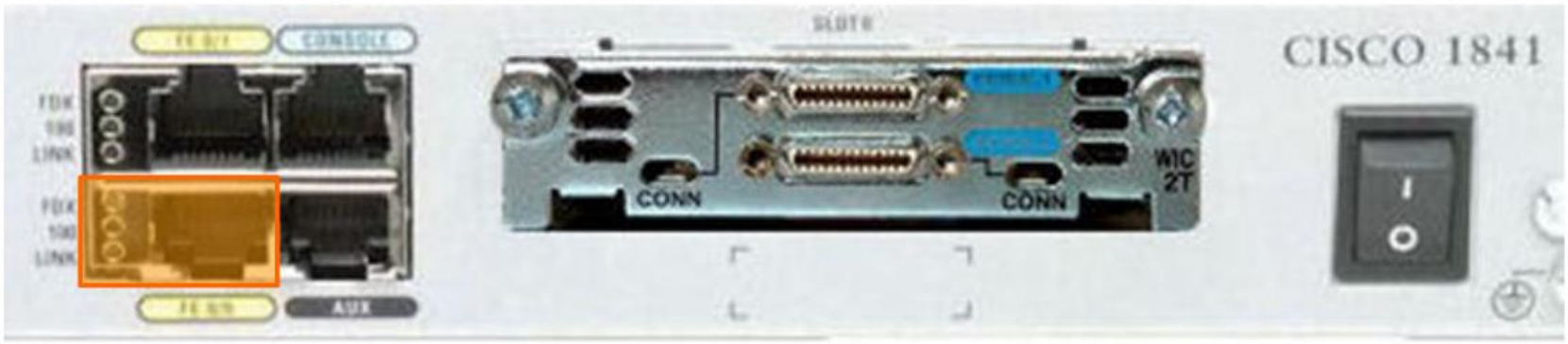
LC-LC SM Patch Cord

ST-LC MM Patch Cord

ST-SC SM Patch Cord

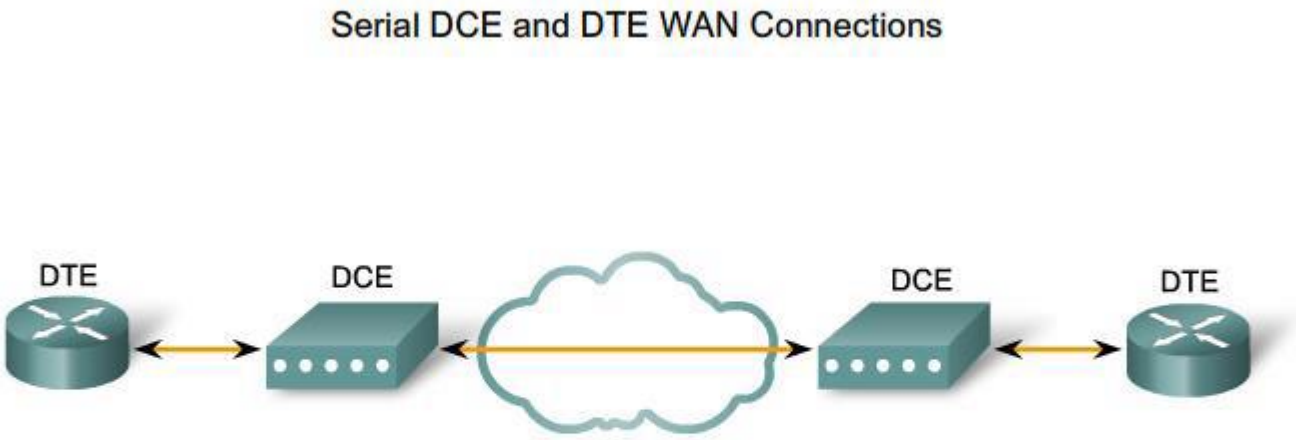
A yellow jacket is for single-mode fiber cables and orange (or aqua) for multimode fiber cables.

Configuring Ethernet interfaces




```
Router(config)#interface FastEthernet 0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

WAN connections



Data Terminal Equipment:

- End of the user's device on the WAN Link

Data Communications Equipment:

- End of the WAN provider's side of the communication facility
- Responsible for providing clocking signal.

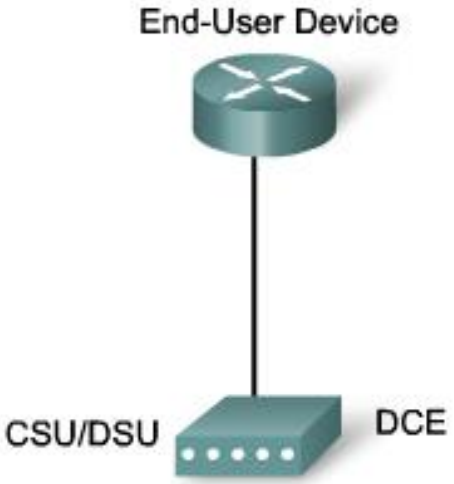
Digital Local Loop

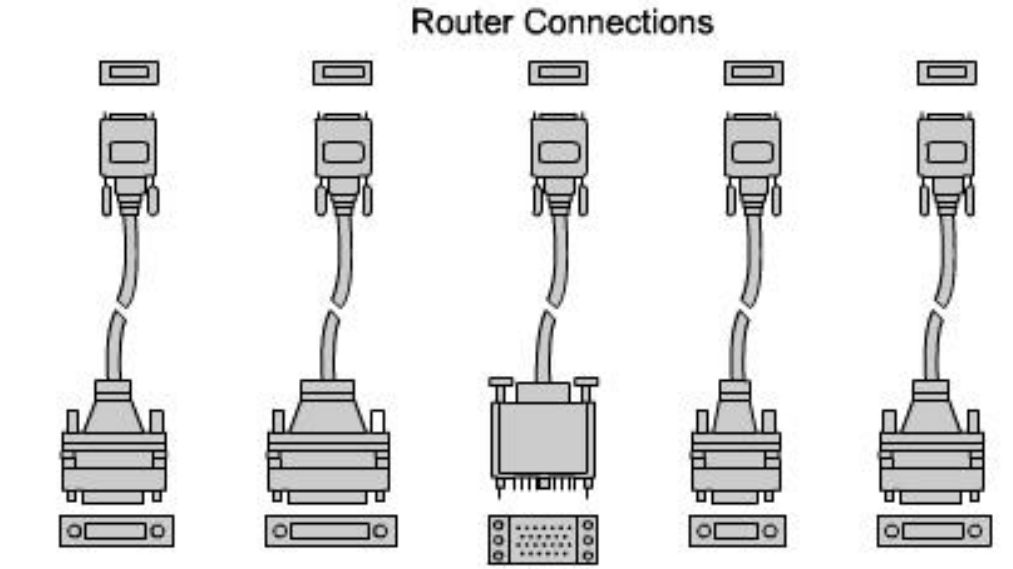
To WAN line

To the router

- Channel Service Unit (CSU) and Data Service Unit (DSU)
  - Often combined into a single piece of equipment, called the CSU/DSU

WAN connections





Network Connections at the CSU/DSU

WAN connections

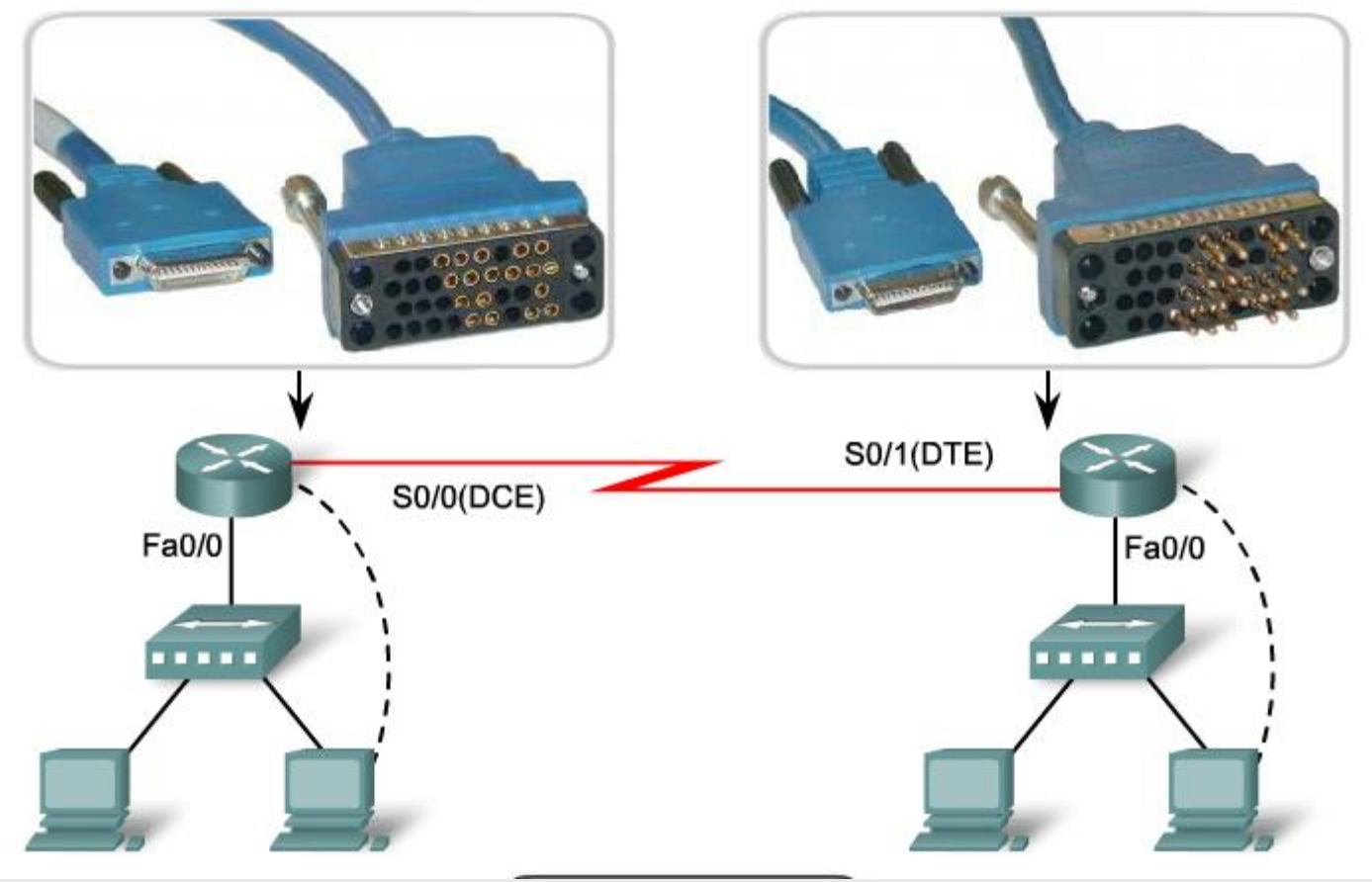
Types of WAN Connections

Cisco HDLC	PPP	Frame Relay	DSL Modem	Cable Modem
EIA/TIA-232 EIA/TIA-449 X.21V.24 V.35 High Speed Serial Interface (HSSI)			RJ-11 Note: Works over telephone line	F Note: Works over Cable TV line

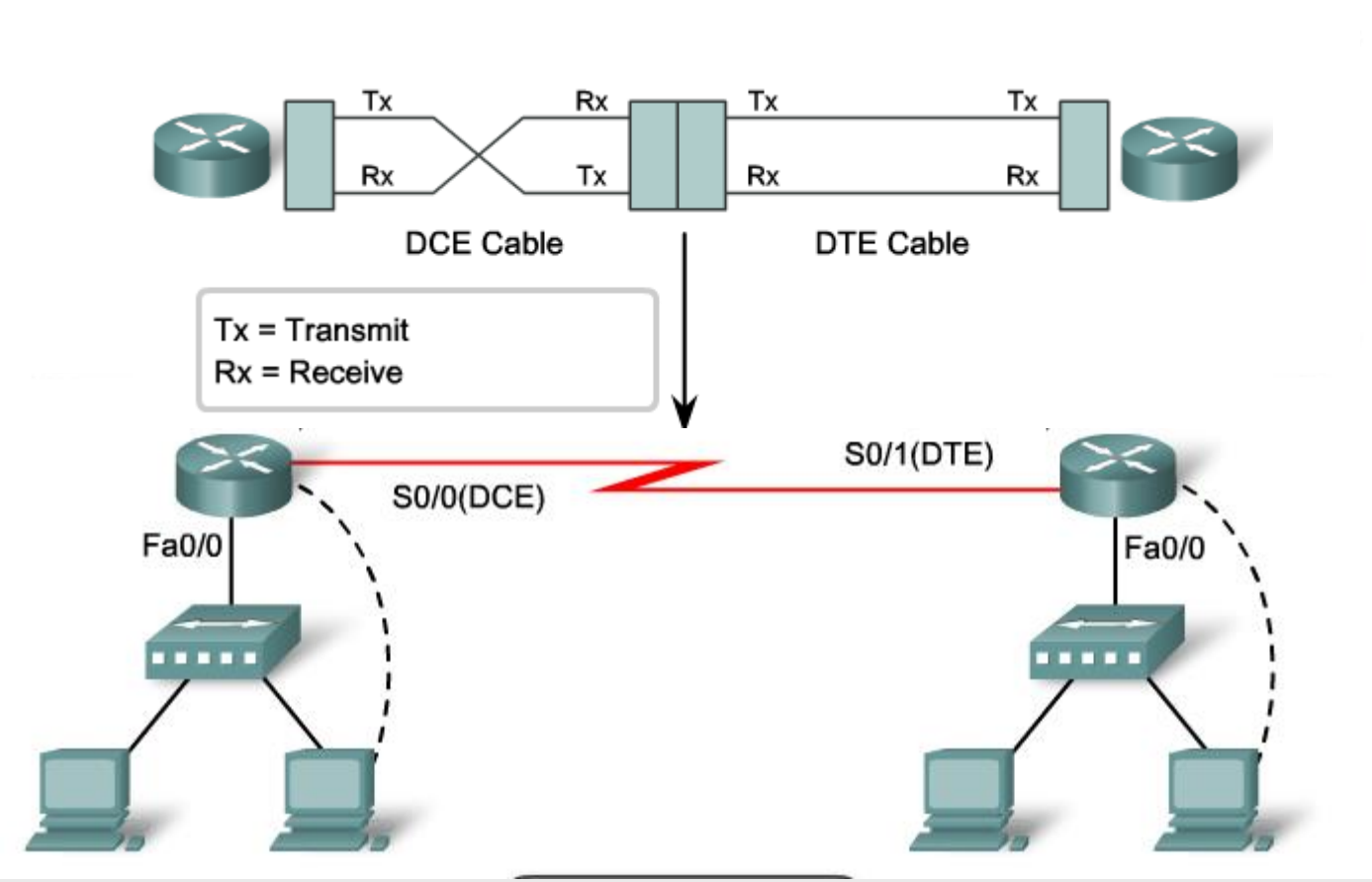
Router: Male Smart Serial

Network: Male Winchester Block Type

WAN connections



WAN connections



Configuring serial interfaces


```
Router(config)#interface Serial 0/0/0
Router(config-if)#ip address 192.168.11.1 255.255.255.252
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

Configuring interfaces

Router Interfaces Descriptions

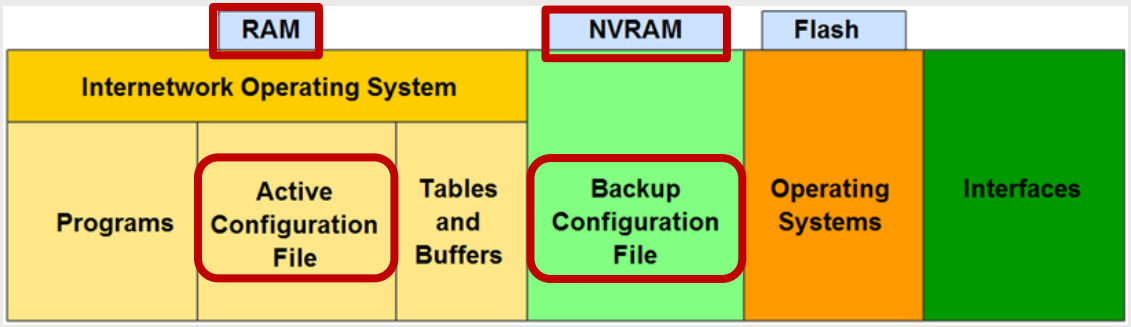

```
Router(config)#interface fa0/0
Router(config-if)#description  Building B Sales LAN
Router(config-if)#exit
```

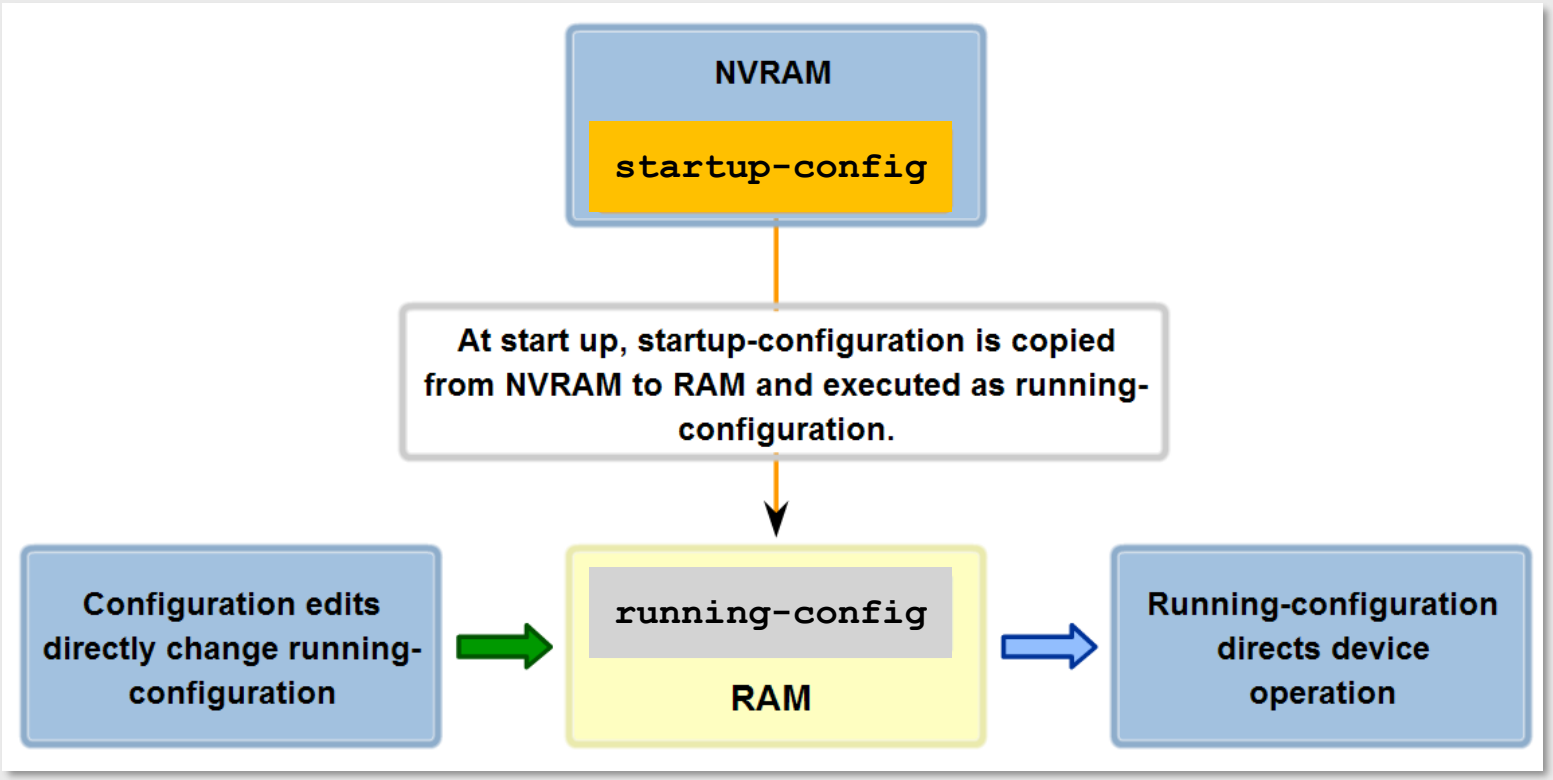
Description is all text after this space

Interface description used for internal network documentation

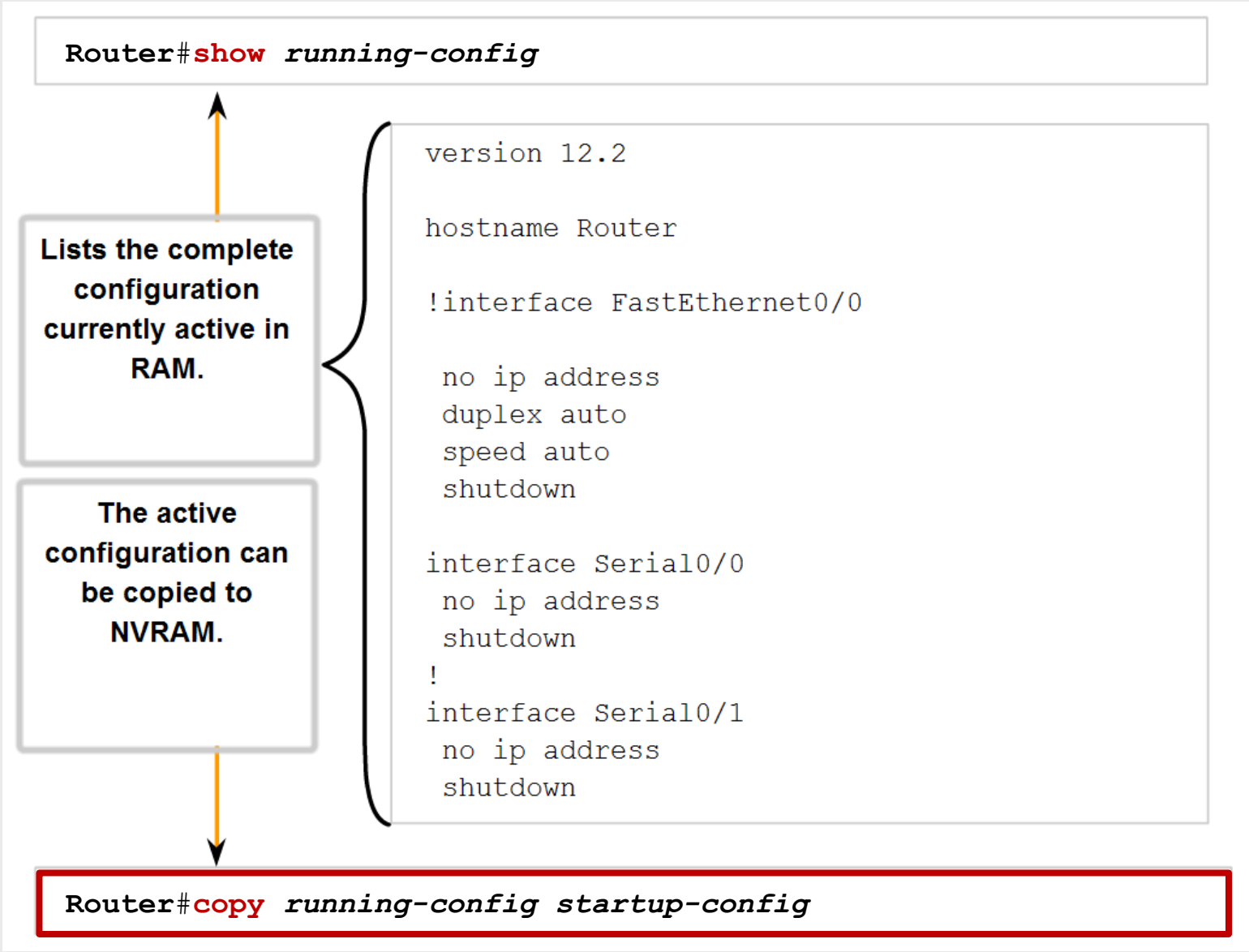
```
Router(config)#interface s0/0/0
Router(config-if)#description  To Perth CKT-PT27834365-01
Router(config-if)#exit
```

Configuration files





Managing configuration files



Managing configuration files

- Backup and restore configurations locally

```
RT-lab#copy running-config startup-config
```

```
RT-lab#copy startup-config flash:
Destination filename [startup-config]? startup-config.bak

551 bytes copied in 0.416 secs (1324 bytes/sec)
```

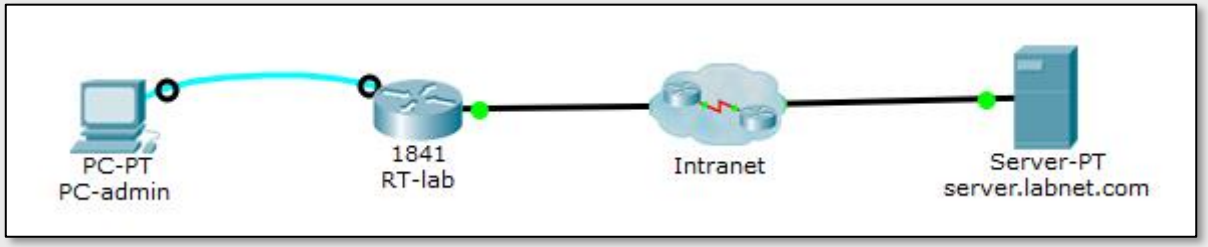
```
RT-lab#copy running-config flash:
Destination filename [running-config]? running-config.bak
Building configuration...
[OK]
```

```
RT-lab#copy flash: startup-config
Source filename []? startup-config.bak
Destination filename [startup-config]?
[OK]

551 bytes copied in 0.416 secs (1324 bytes/sec)
```

```
RT-lab#reload
Proceed with reload? [confirm]
```

Managing configuration files

- Backup and restore on a TFTP server




```
RT-lab#copy running-config tftp:
Address or name of remote host []? server.labnet.com
Destination filename [RT-lab-confg]?
Writing running-config...Translating "server.labnet.com"...!!
[OK - 604 bytes]
604 bytes copied in 0 secs
RT-lab#copy startup-config tftp:
```

```
RT-lab#copy startup-config tftp:
```

```
RT-lab#copy tftp: startup-config
...
```

```
RT-lab#copy tftp: running-config
```

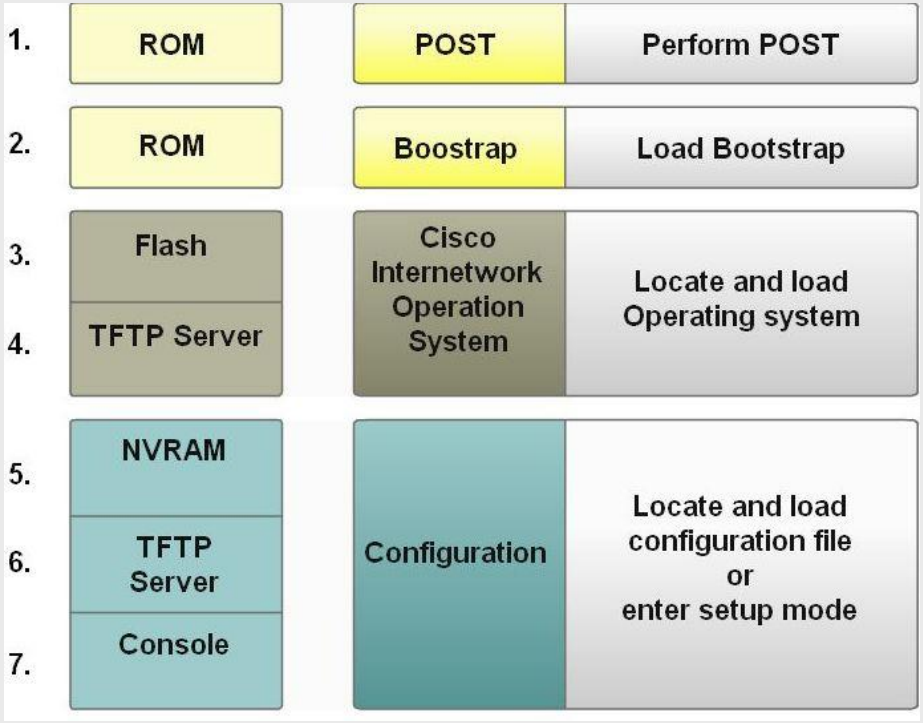
Attenzione!!!

- Clearing configuration

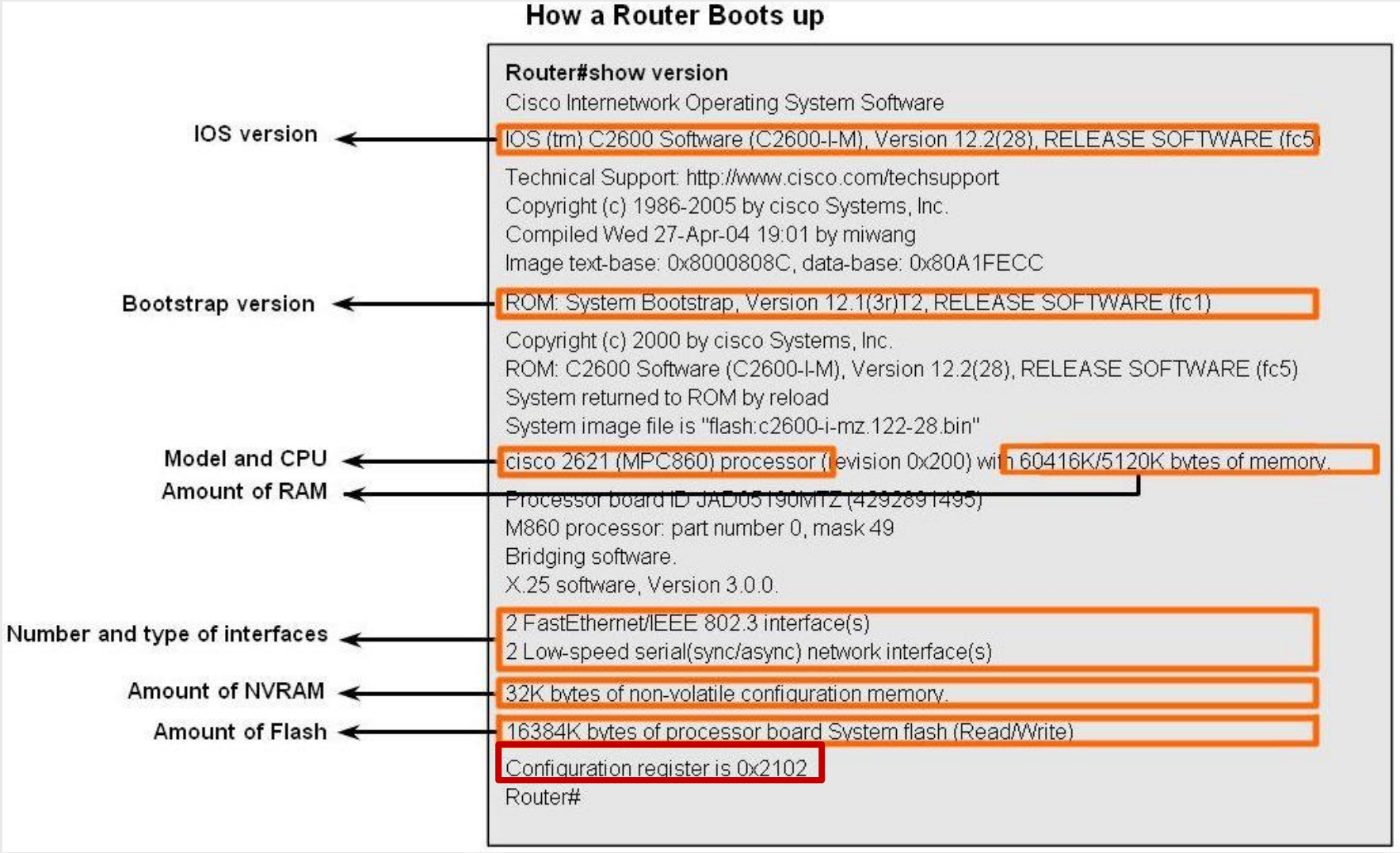
```
RT-lab#erase startup-config

RT-lab#delete flash:
Delete filename []?
```

Router boot-up process

- Test router hardware
  - Power-On Self Test (POST)
  - Execute bootstrap loader
- Locate & load Cisco IOS software
  - Locate IOS
  - Load IOS
- Locate & load startup configuration file or enter setup mode
  - Bootstrap program looks for configuration file



Router boot-up process

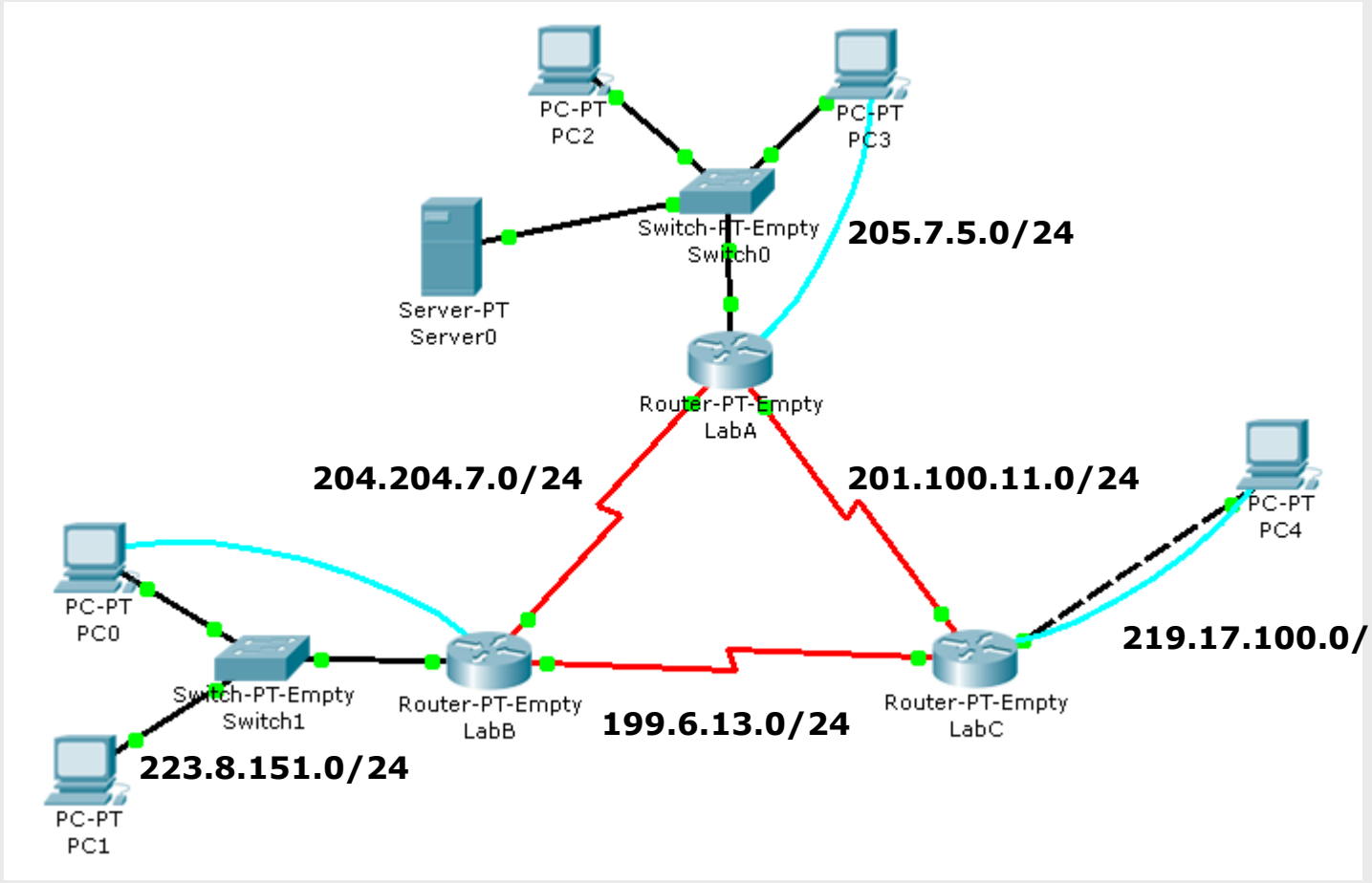


Lab 2.1: Router configuration

- Cable the network according to the given topology
- Configure interfaces according to the given network address allocation
- Verify end-to-end connectivity
- Backup the configuration in a file
- Erase & reload, restore configuration, verify configuration
- Modify the Privileged EXEC mode password
- Add a TFTP server
- Backup the configuration on the TFTP server
- Reload the router
- Restore the configuration from the TFTP server and verify

Lab 2.1: Router configuration

- Address assignment



Lab 2.1: Router configuration

- Addressing table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0			
	S1/0			
	S2/0			
R2	Fa0/0			
	S1/0			
	S2/0			
R3	Fa0/0			
	S1/0			
	S2/0			
PC1				
…				