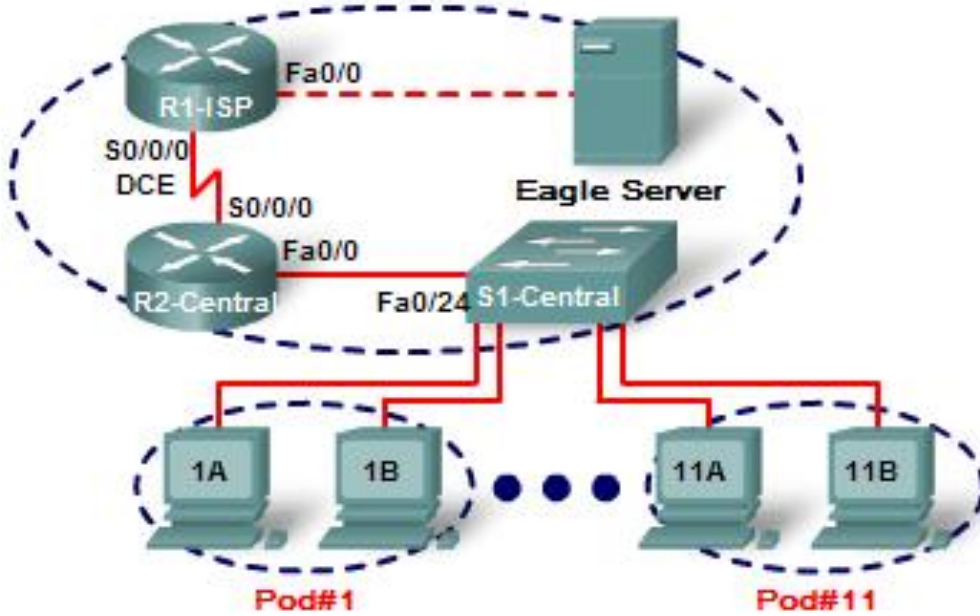


# 10.0.0 Planning & Cabling a Network - Introduction

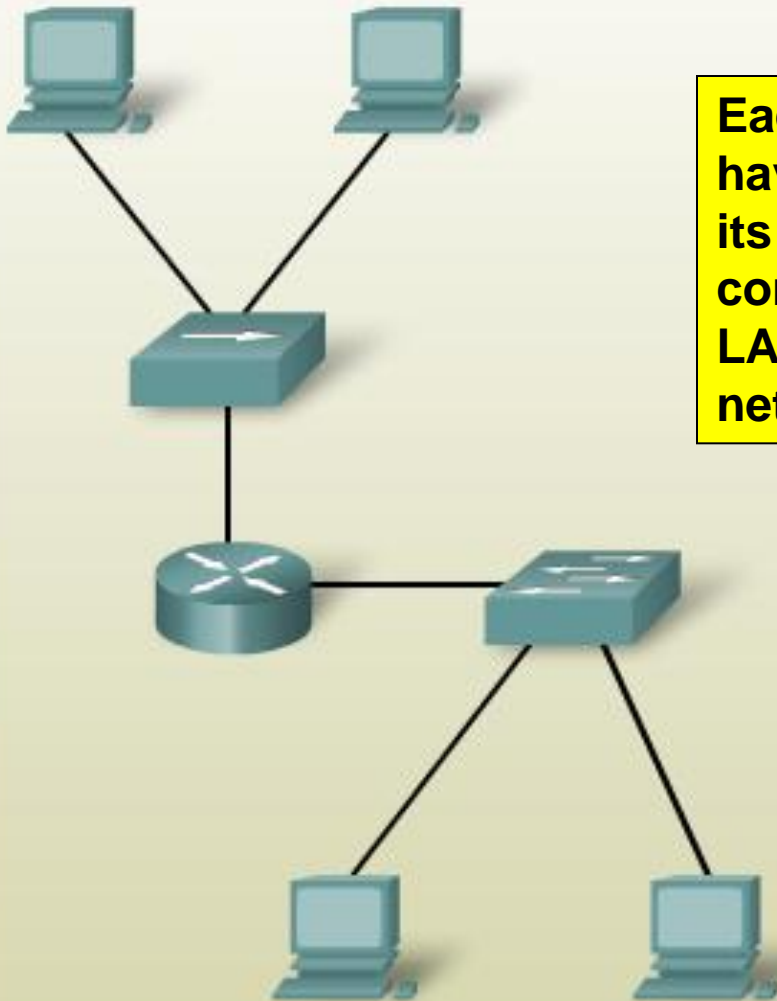


Planning & Cabling a Network

# 10.1.1 Choosing the Appropriate LAN Devices

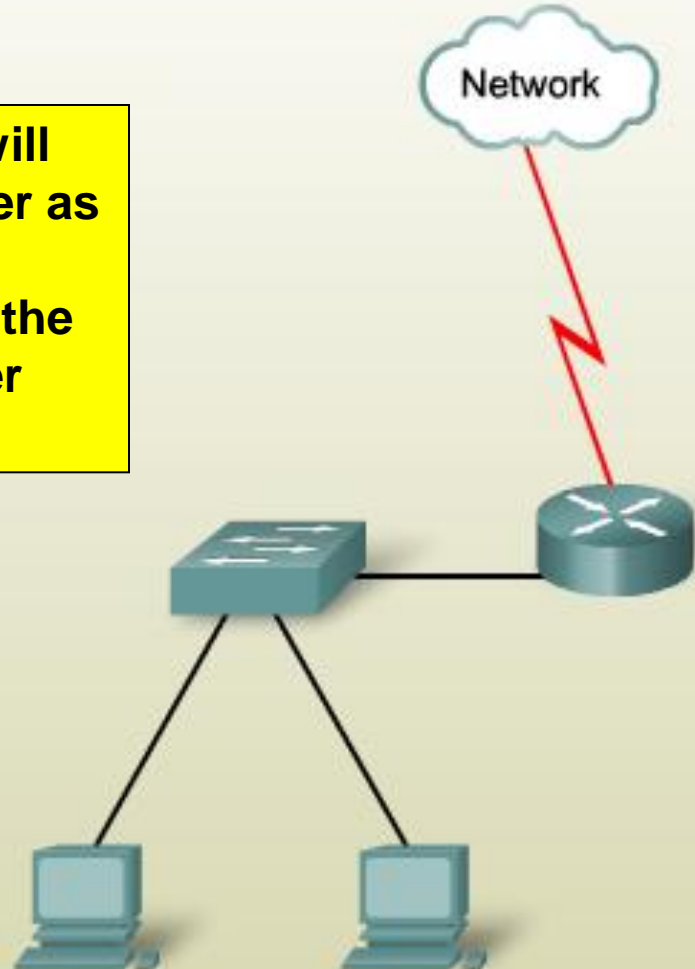
## Internetwork Connections with a Router

Router interconnecting two LANs



**Each LAN will have a router as its gateway connecting the LAN to other networks**

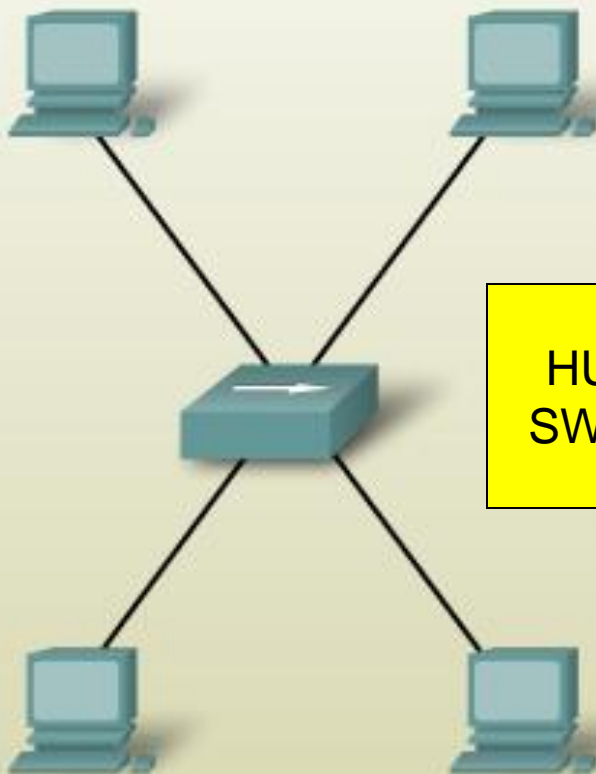
Router interconnecting a LAN and a WAN



# 10.1.1 Choosing the Appropriate LAN Devices

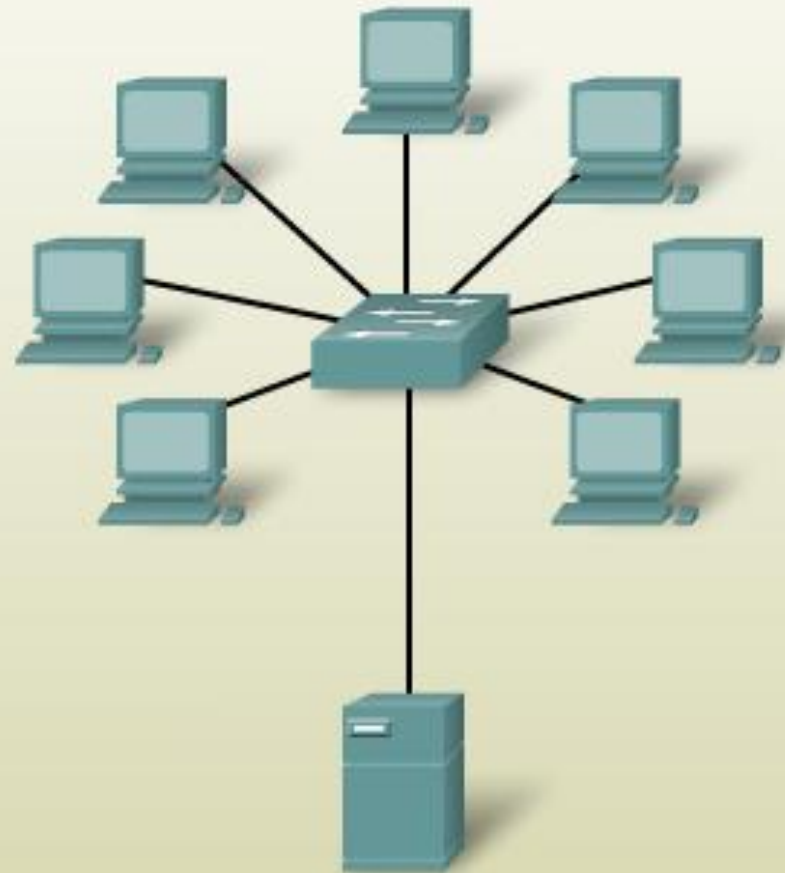
## Intranetwork Connections

Small LAN using a hub



HUBS OR  
SWITCHES

LAN using a switch



# 10.1.2 Device Selection Factors

## Factors to Consider in Choosing a Device



**COST**



**PORTS**



**SPEED**



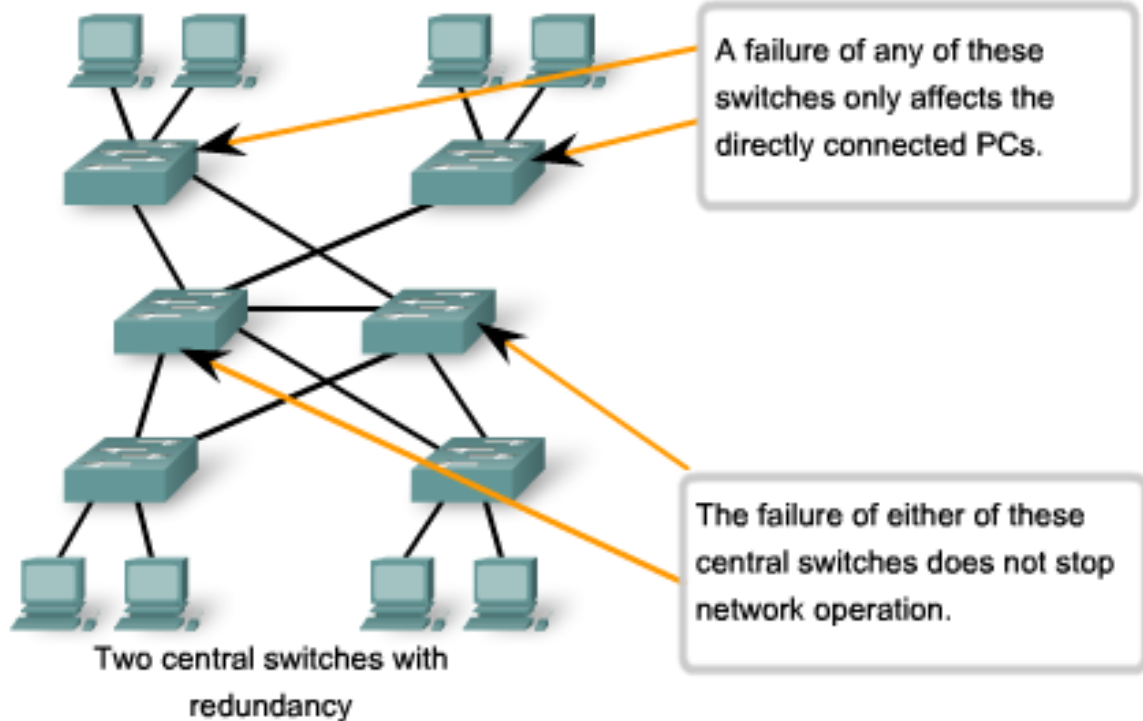
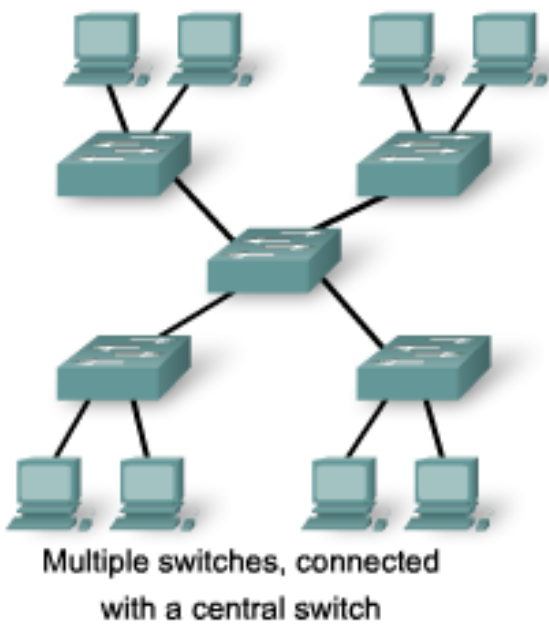
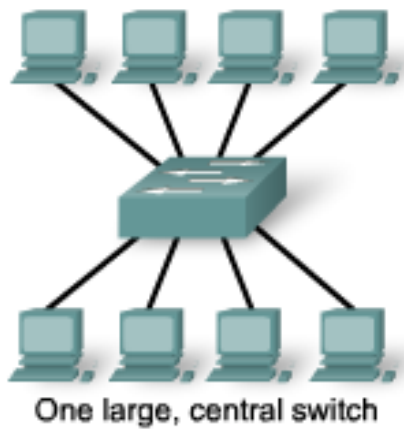
**EXPANDABLE/ MODULAR**



**MANAGEABLE**

# 10.1.2 Device Selection

## Factors Determining LAN Switch Selection

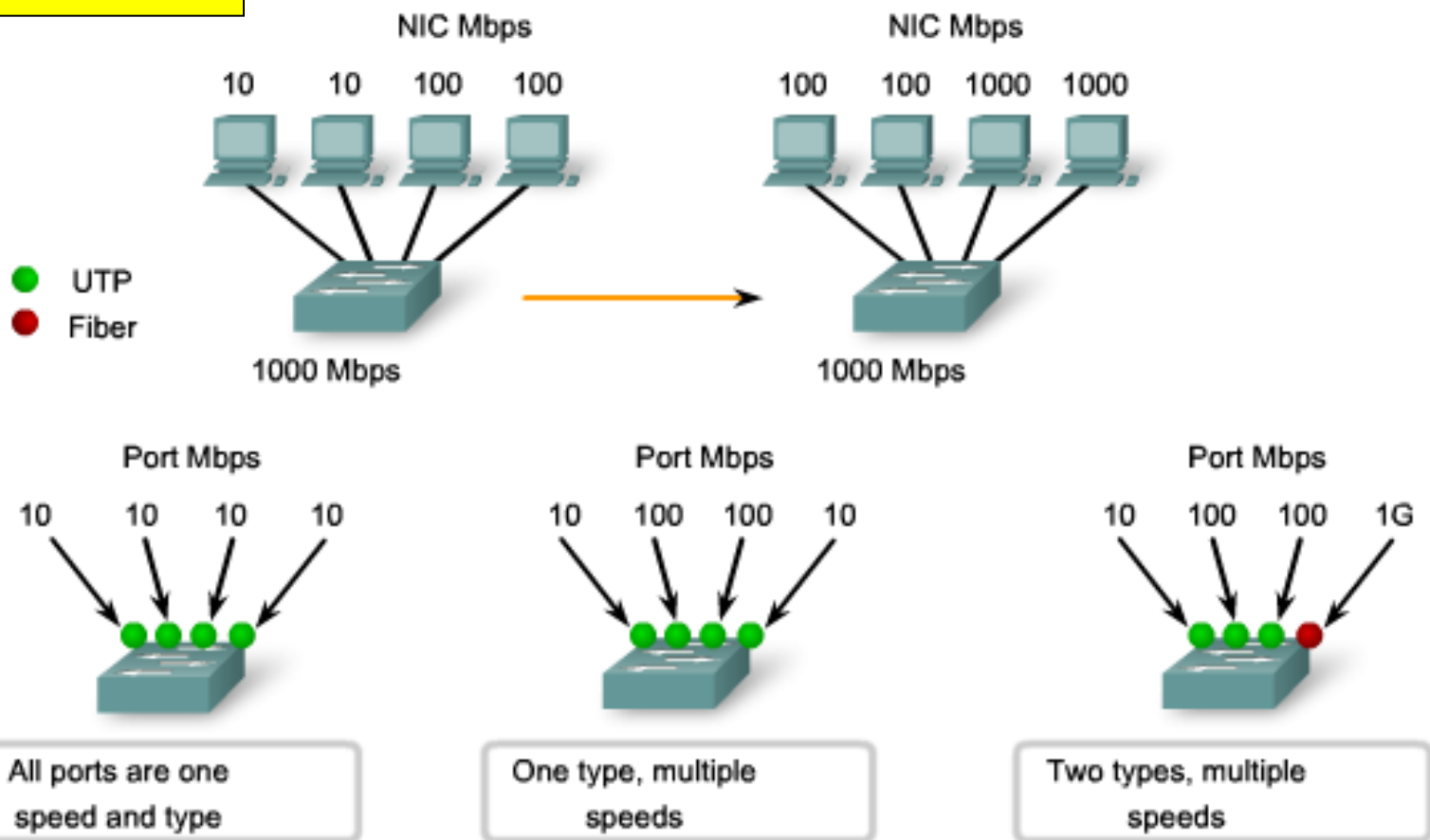


**Cost vs Redundancy**

# 10.1.2 Device Selection

**Future Expectations**

## Factors Determining LAN Switch Selection Port Speeds, Types and Expandability



Some switches can be expanded to meet new requirements with additional modules.

## 10.1.2 Device Selection

Cisco Routers



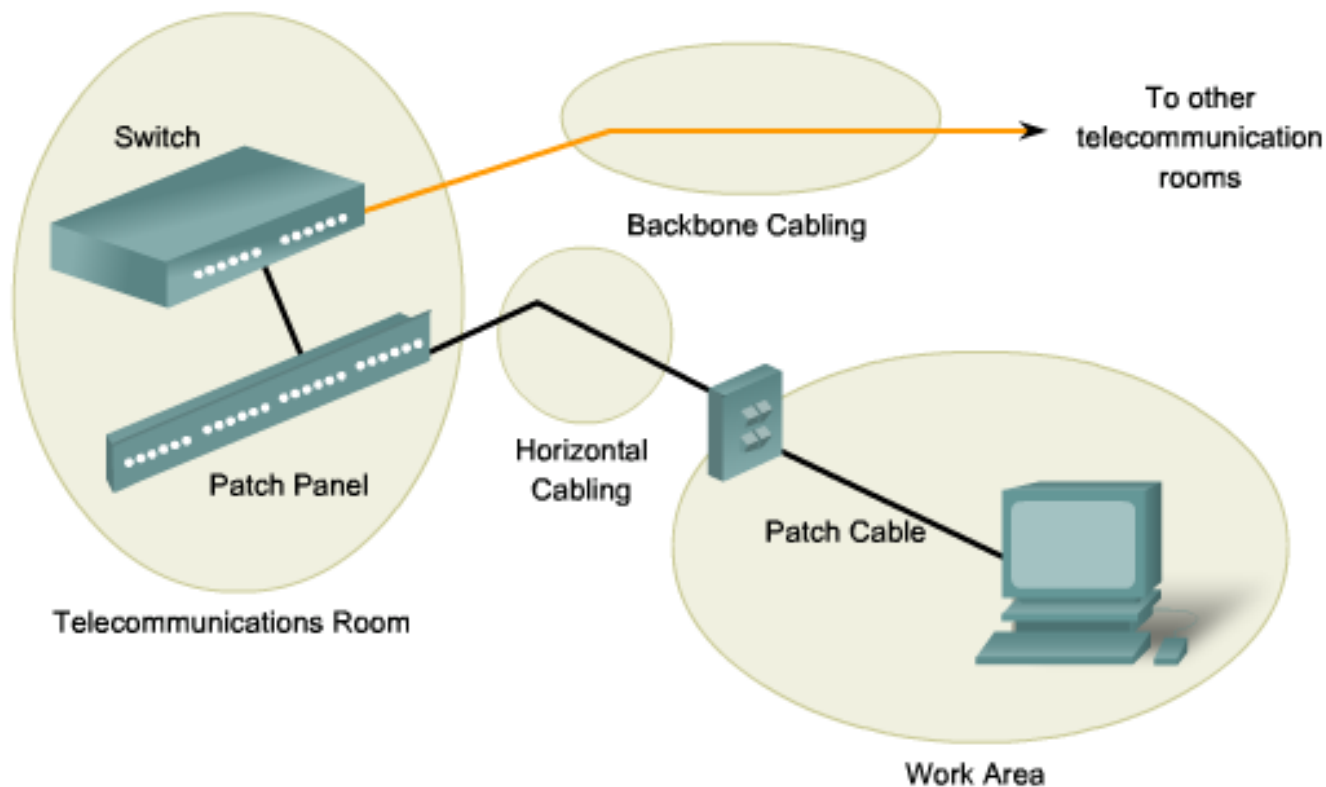
**Factors for choosing a router include:**

- **Expandability**
- **Media**
- **Operating System Features**

Each series of Cisco router provides expandability, support for multiple media types, and various system features and services.

## 10.2.1 LAN and WAN Getting Connected

### LAN Cabling Areas



Four physical areas to consider:

- Work area
- MDF's and IDF's
- Backbone cabling, also known as vertical cabling
- Distribution cabling, also known as horizontal cabling

## 10.2.1 LAN and WAN Getting Connected

### Types of Device Interconnection



Fiber



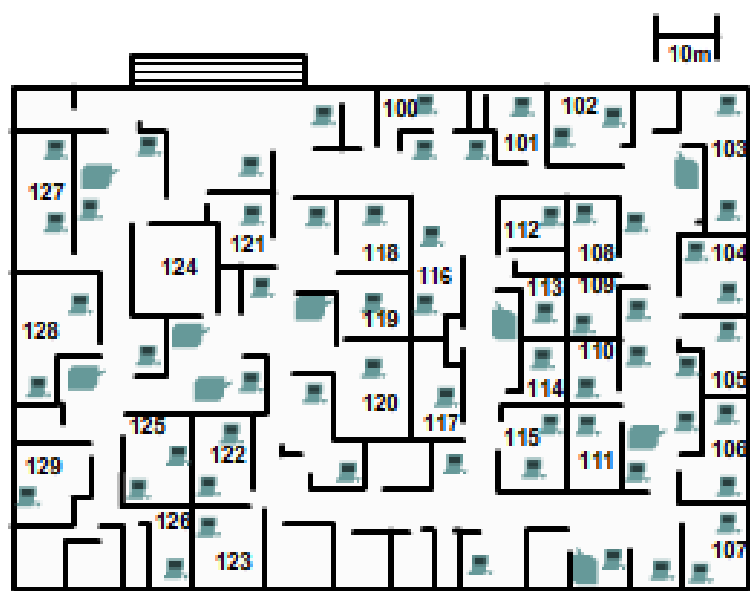
UTP



Wireless

# 10.2.1 LAN and WAN Getting Connected

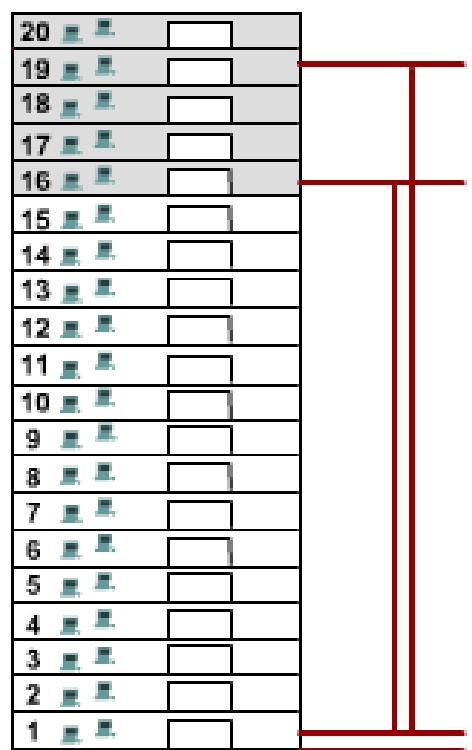
## Cable Length and Cost



Floor Plan

Cable lengths need to be determined and matched with the technology used.

## Multi-Floor Building

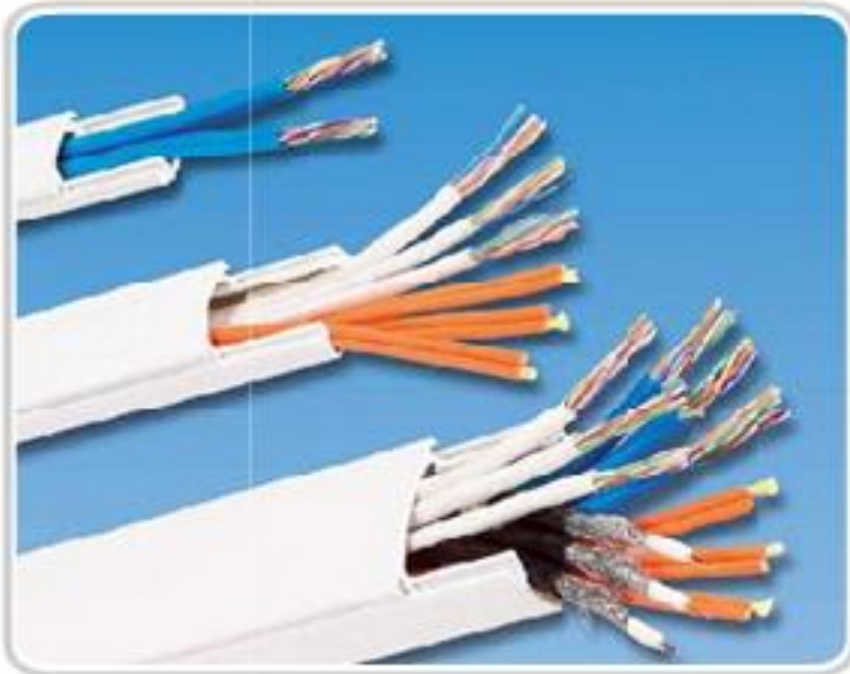


Ethernet Type	Bandwidth	Cable Type	Maximum Distance
10Base-T	10Mbps	Cat3/Cat5 UTP	100m
100Base-TX	100Mbps	Cat5 UTP	100m
100Base-TX	200Mbps	Cat5 UTP	100m
100Base-FX	100Mbps	Multi-Mode Fiber	400m
100Base-FX	200Mbps	Multi-Mode Fiber	2Km
1000Base-T	1Gbps	Cat5e UTP	100m
1000Base-TX	1Gbps	Cat6 UTP	100m

## 10.2.1 LAN and WAN Getting Connected

### Ease of Installation

UTP and fiber have different installation requirements.

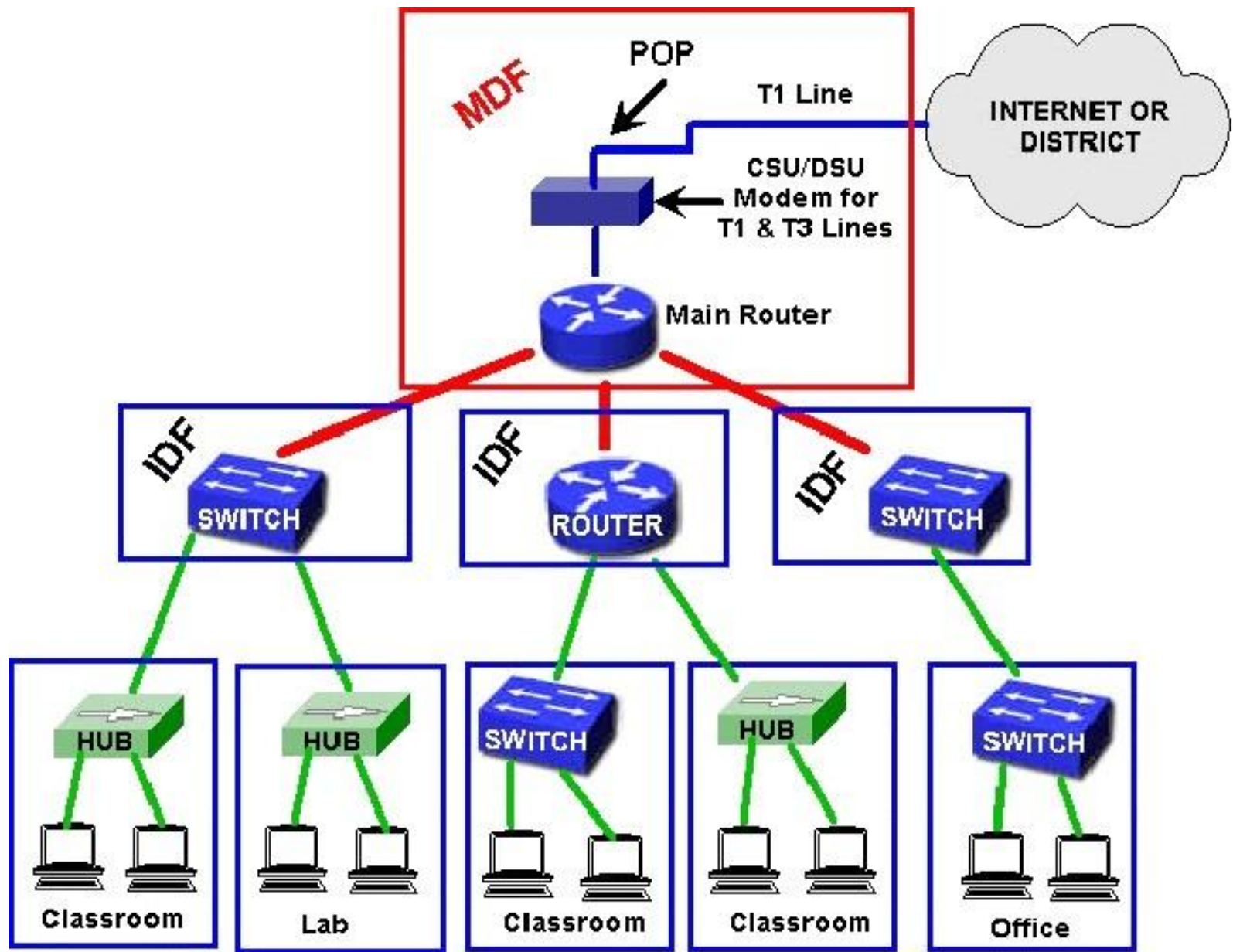


UTP Cable Raceway

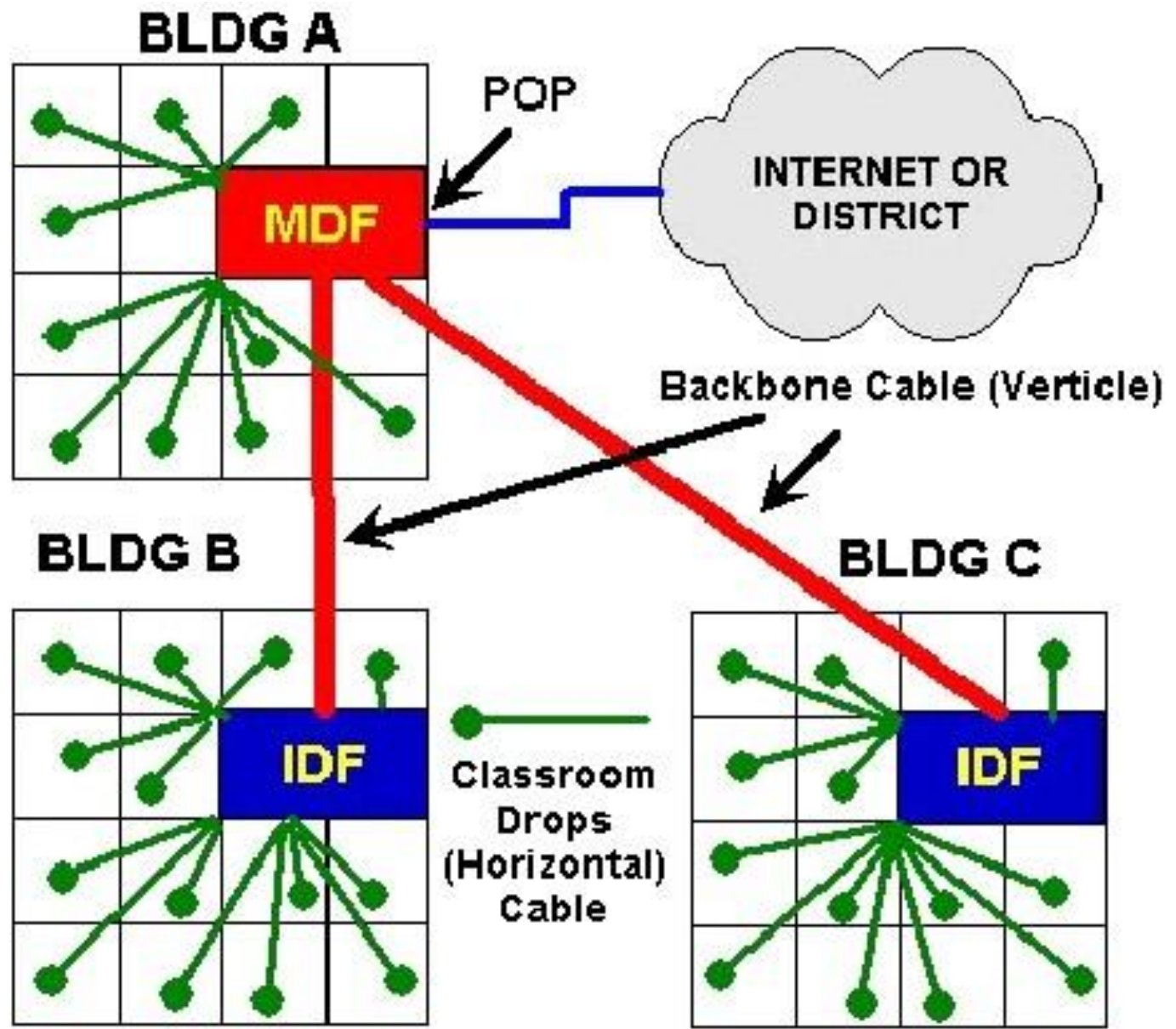


Fiber Cable Raceway

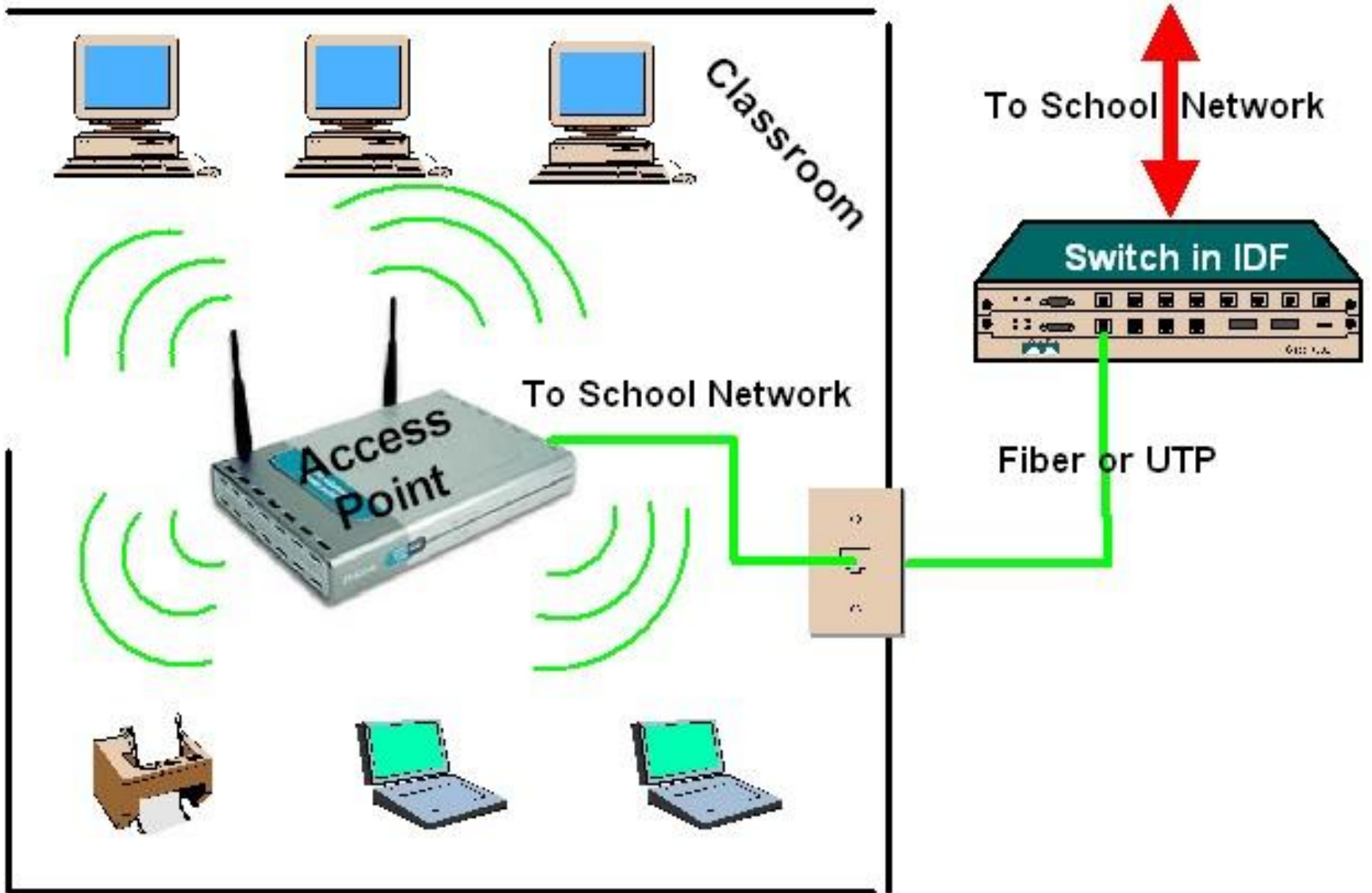
# 10.2.1 LAN and WAN Getting Connected



# 10.2.1 LAN and WAN Getting Connected

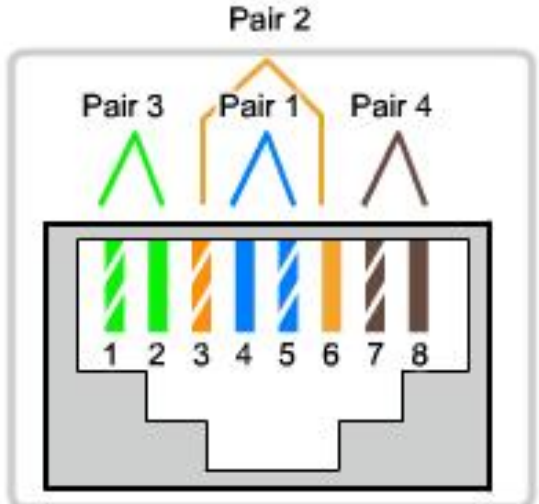


# 10.2.1 LAN and WAN Getting Connected

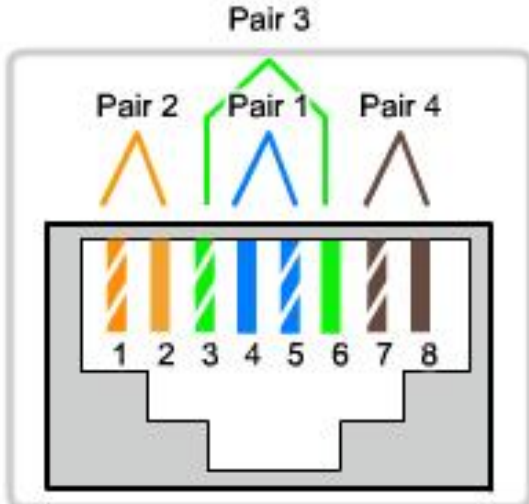


# 10.2.2 Making LAN Connections

## RJ-45 T568A & T568B Termination



T568A



T568B



T568A  
(Top View)

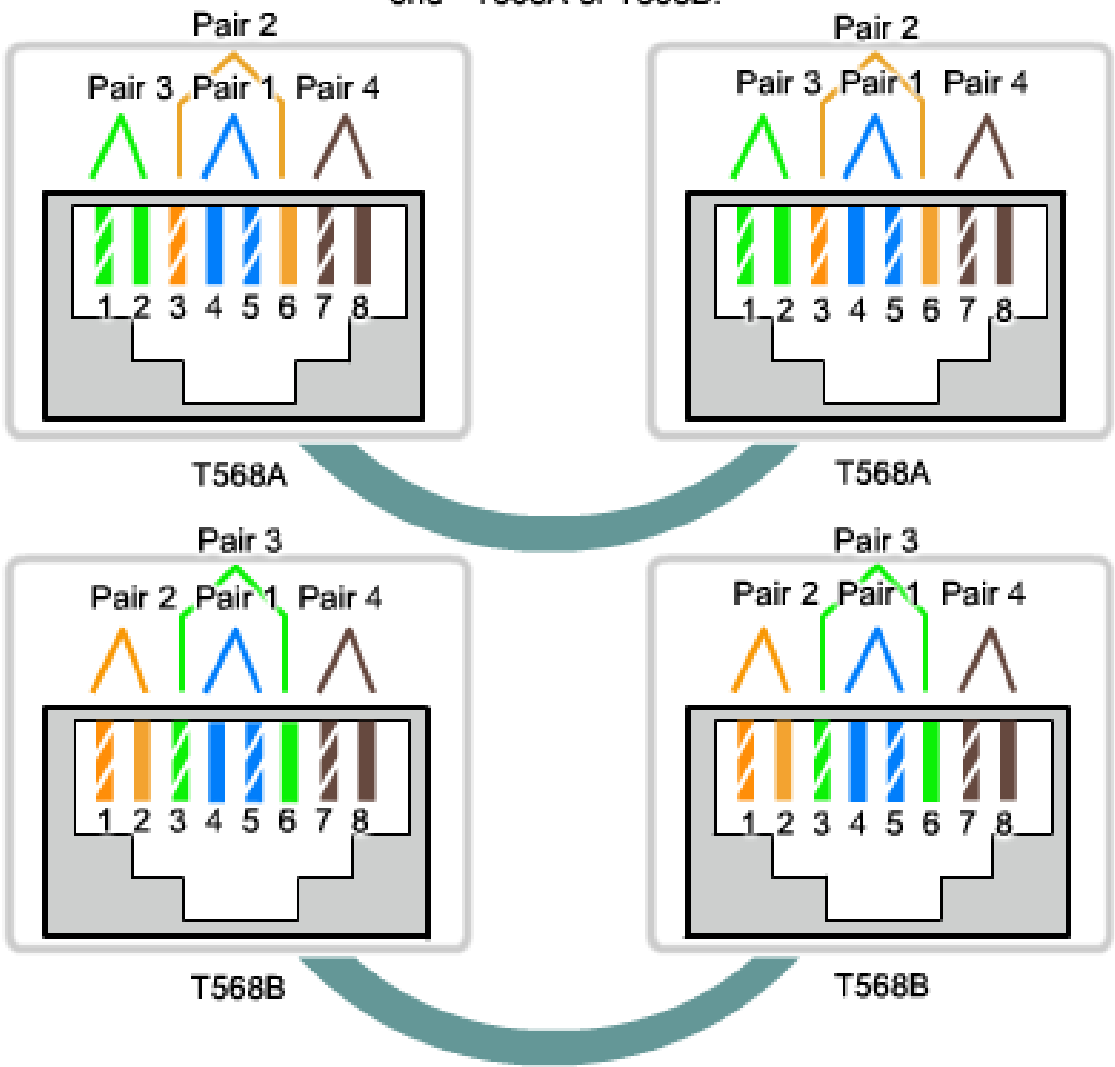


T568B  
(Top View)

# 10.2.2 Making LAN Connections

## Straight-Through Cable

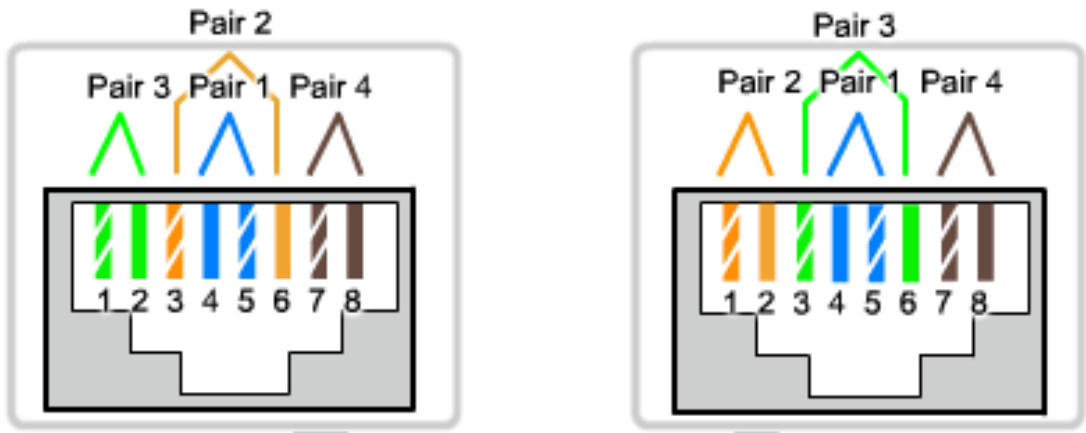
Straight-through cables have the same termination at each end - T568A or T568B.



# 10.2.2 Making LAN Connections

## Crossover Cable

Crossover cables have a T568A termination at one end and a T568B termination at the other end.

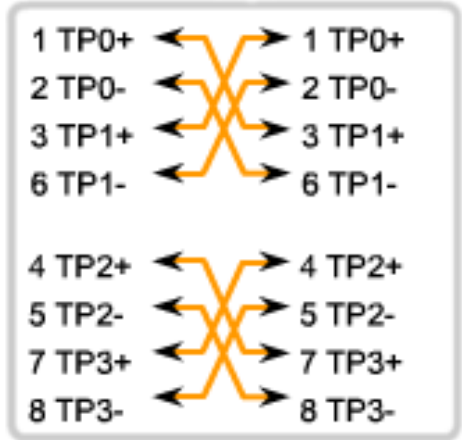
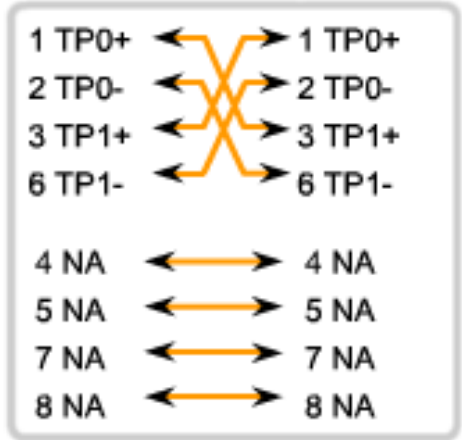


T568A

T568B

10/100 Mbps

1 Gbps

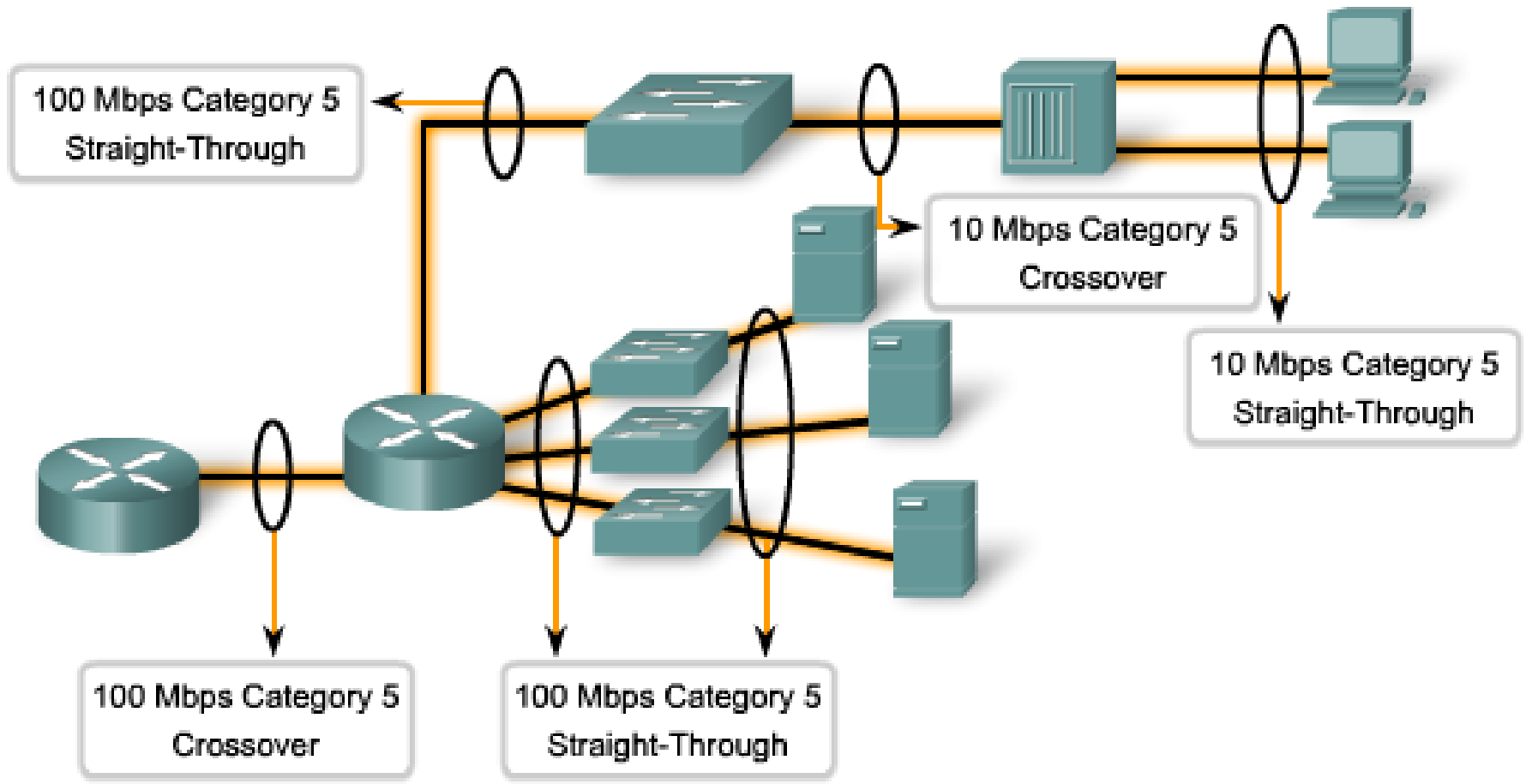


- Crossover cables directly connect the following devices on a LAN:
- Switch to switch
- Switch to hub
- Hub to hub
- Router to router Ethernet port connection
- Computer to computer
- Computer to a router Ethernet port

# 10.2.2 Making LAN Connections

## Making LAN Connections

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



## 10.2.2 Making LAN Connections

**Use straight-through cables for connecting:**

**Switch to router**

**Computer to switch**

**Computer to hub**

**Use crossover cables for connecting:**

**Switch to switch**

**Switch to hub**

**Hub to hub**

**Router to router**

**Computer to computer**

**Computer to router**

# 10.2.3 Making WAN Connections

**HIGH LEVEL  
DATA LINK  
CONTROL**

**POINT TO  
POINT  
PROTOCOL**

## 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



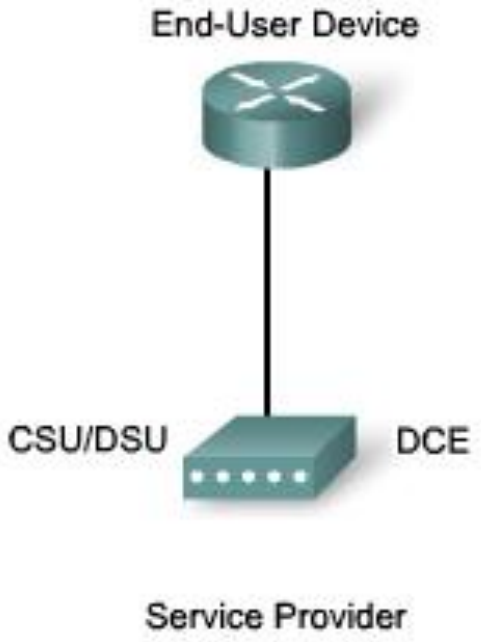
Router: Male Smart Serial



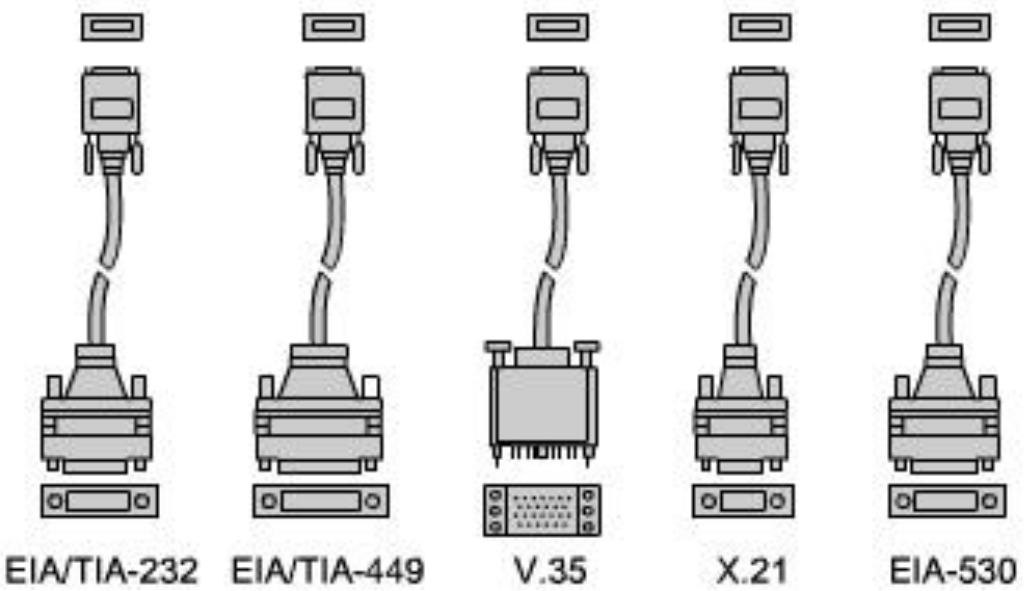
Network: Male Winchester Block Type

# 10.2.3 Making WAN Connections

## Types of WAN Connections - Serial



### Router Connections

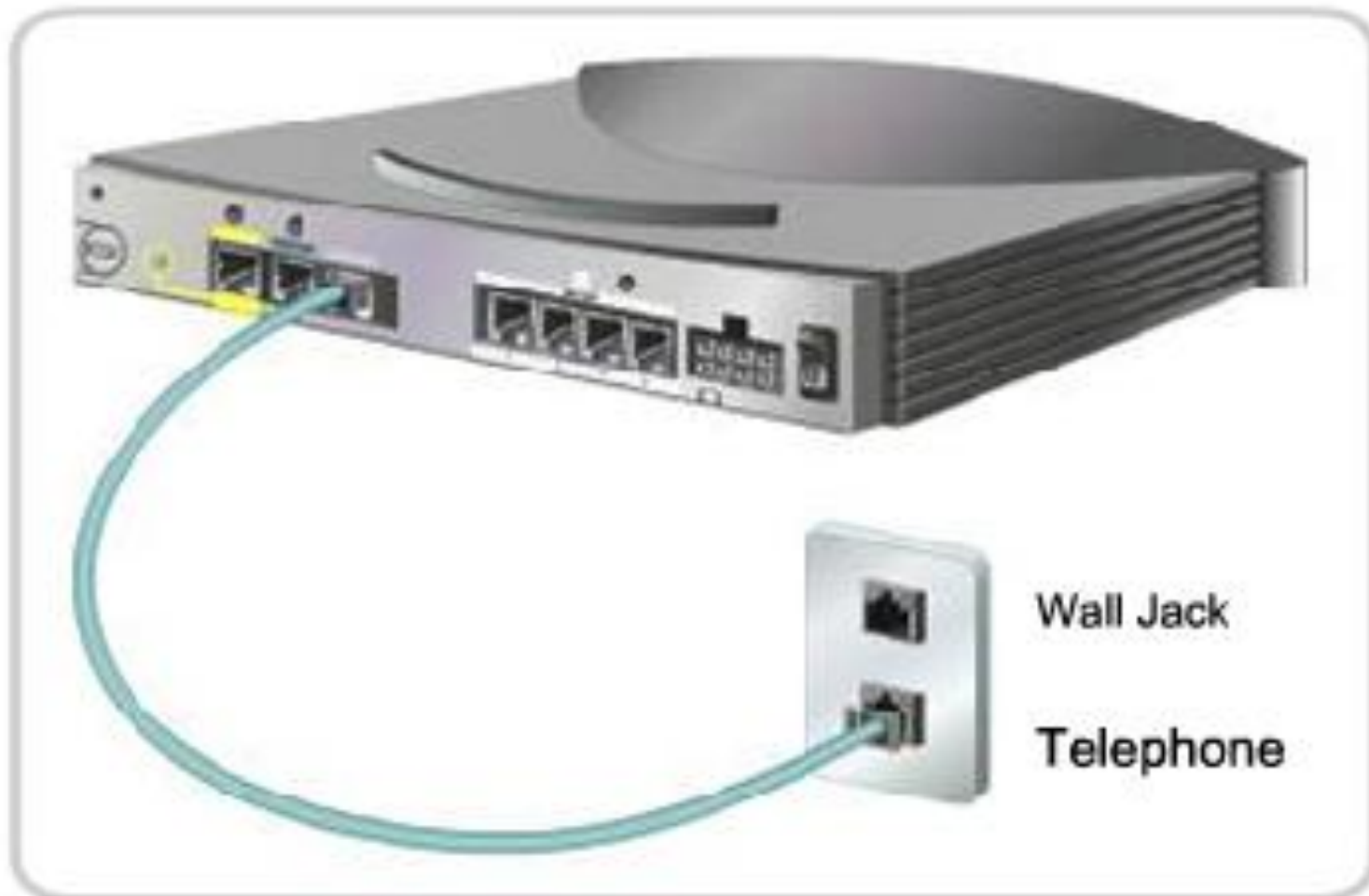


Network Connections at the CSU/DSU

## 10.2.3 Making WAN Connections

### Types of WAN Connections - DSL

Cisco 827-4v router



## 10.2.3 Making WAN Connections

**Data Communications Equipment (DCE)**

**Data Terminal Equipment (DTE)**

Serial DCE and DTE WAN Connections



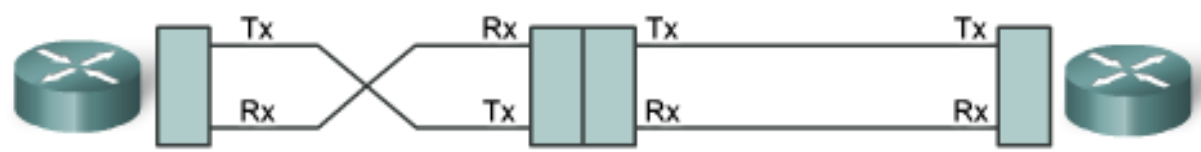
### Data Terminal Equipment:

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

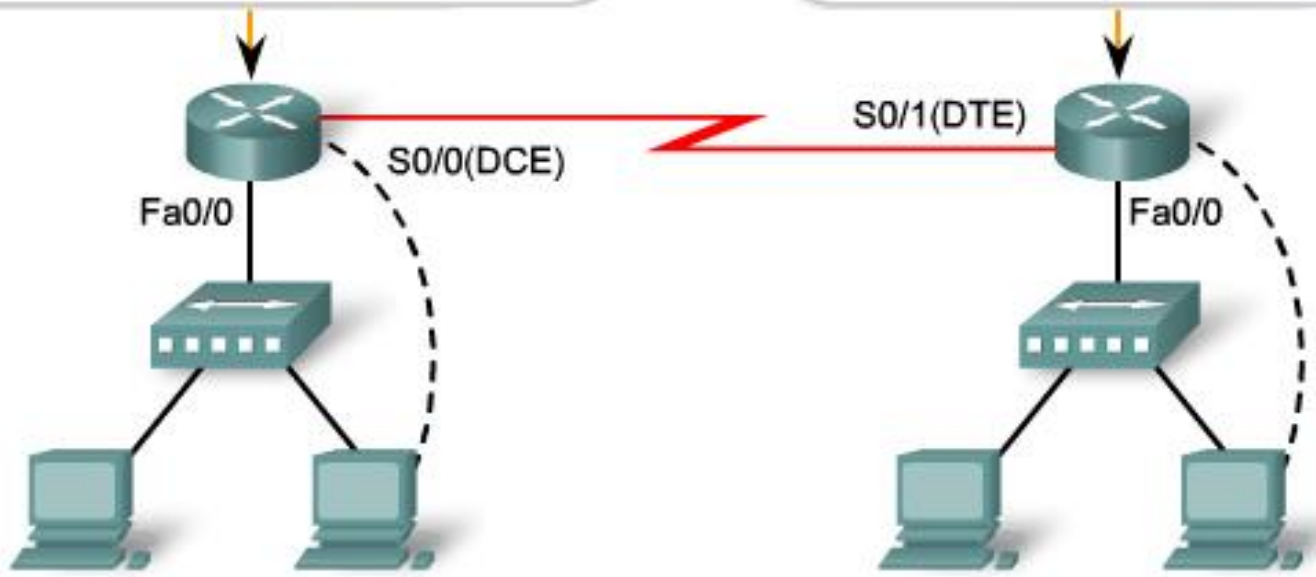
### Data Communications Equipment:

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

# 10.2.3 Making WAN Connections



Serial WAN Connections in the Lab

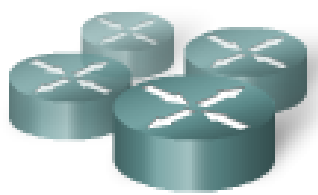


# 10.3.1 How Many Hosts on the Network

## Determining the Number of Hosts in the Network

Include these devices in the count:

Additional Subnets???

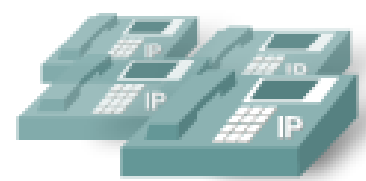


### Router Interfaces

Count the number of interfaces, and not the number of routers

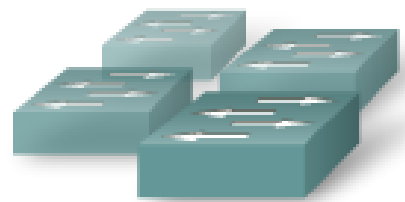


### Printers



### IP Phones

Count other specialty IP devices as well



### Switch Management



### Administration Users



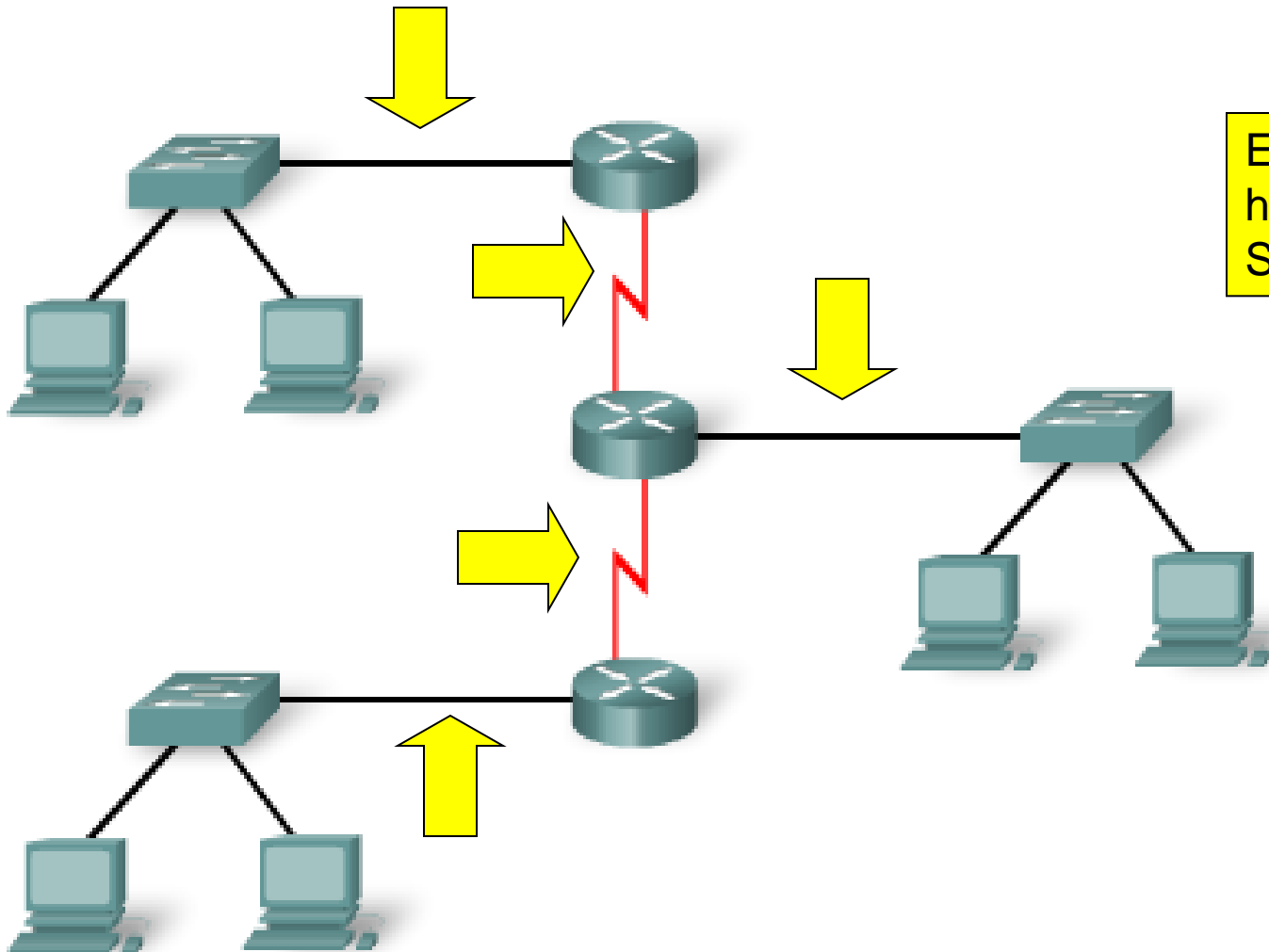
### General Users



### Servers

## 1.3.2 How Many Networks

### Counting Subnets

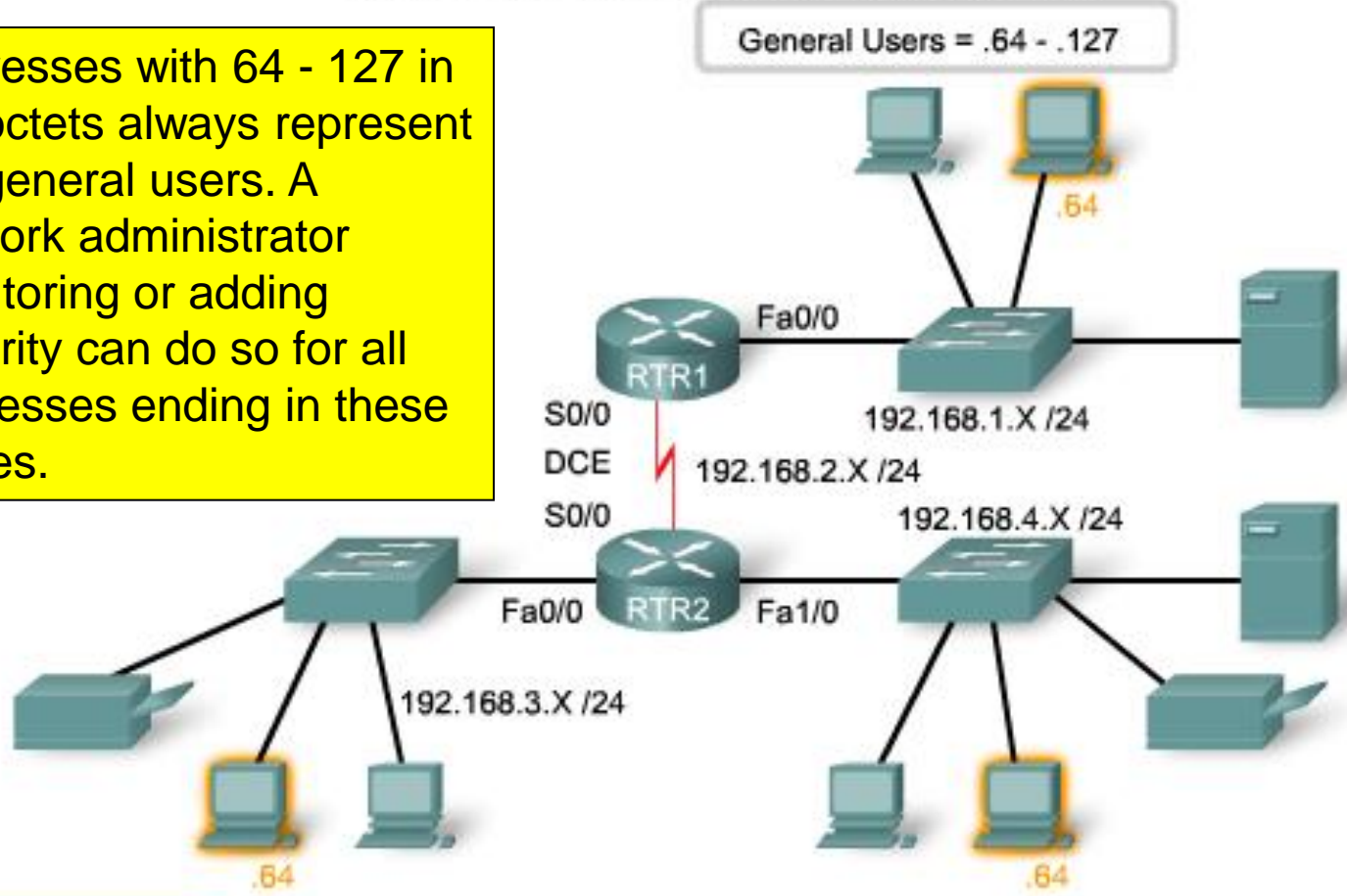


Each Subnet will have the same Subnet Mask

# 10.3.3 Designing the Address Standard for the Internetwork

## Designing an Internetwork Address Standard

Addresses with 64 - 127 in the octets always represent the general users. A network administrator monitoring or adding security can do so for all addresses ending in these values.



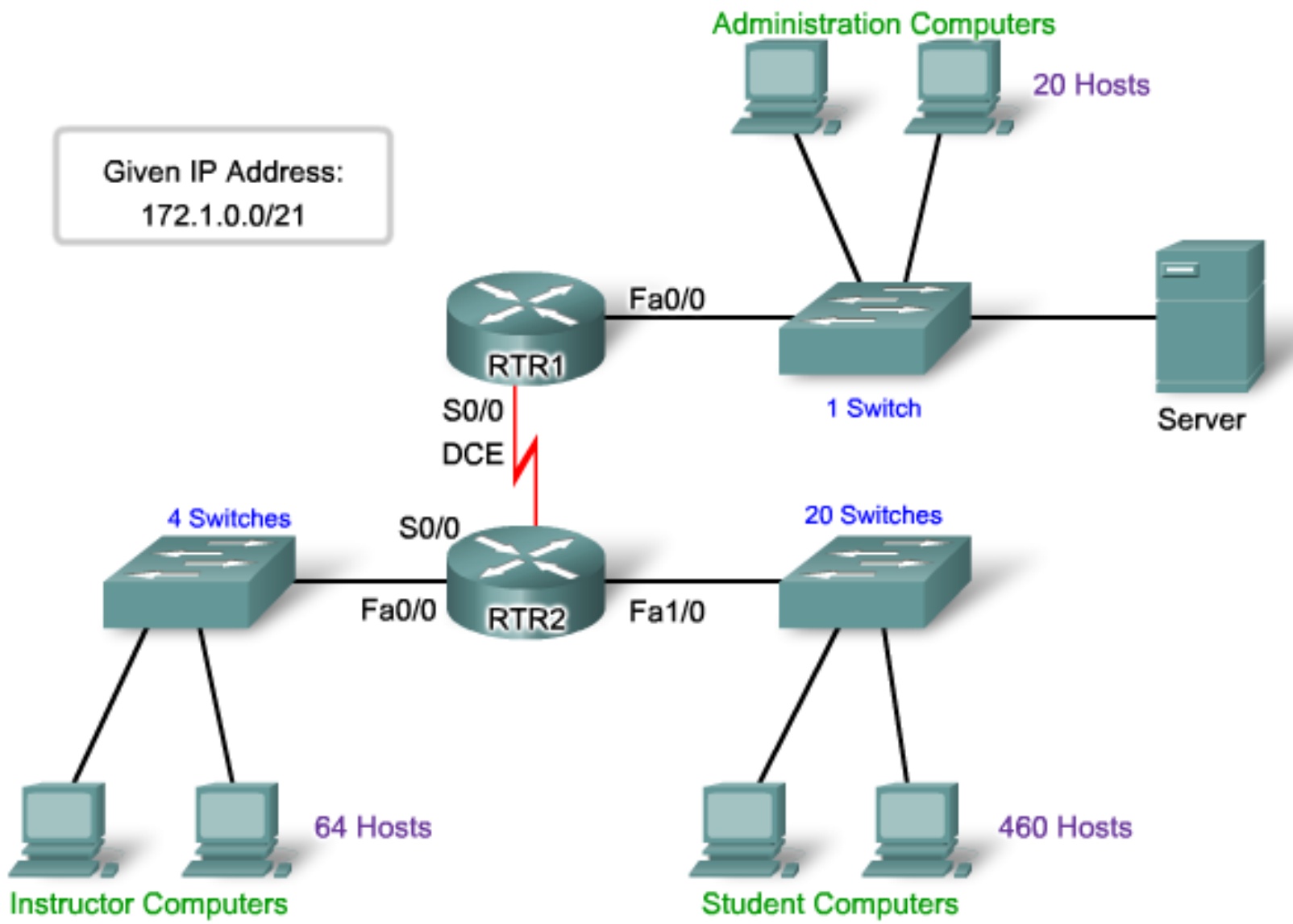
General Users Special Users Network Resources Router LAN Interfaces

Management Access Router WAN Links

# 10.4.1 Calculating Addresses

Network Topology

Given IP Address:  
172.1.0.0/21



# 10.4.1 Calculating Addresses

## Calculating Addresses **without** VLSM Address Ranges for Subnets

Case 1

Network	Subnet Address	Host Address Range		Broadcast Address
Student	172.16.0.0/23	172.16.0.1	172.16.1.254	172.16.1.255
Instructor	172.16.2.0/23	172.16.2.1	172.16.3.254	172.16.3.255
Administration	172.16.4.0/23	172.16.4.1	172.16.5.254	172.16.5.255
WAN	172.16.6.0/23	172.16.6.1	172.16.7.254	172.16.7.255

172.16.0.0 - 172.16.1.255

510 host addresses available in each subnet

481 Addresses used



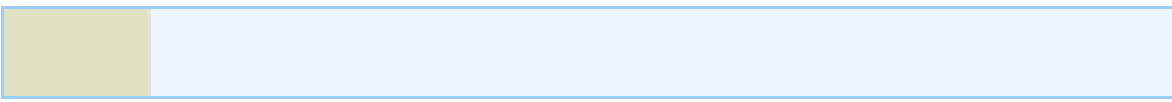
172.16.2.0 - 172.16.3.255

69 Addresses used



172.16.4.0 - 172.16.5.255

23 Addresses used



172.16.6.0 - 172.16.7.255

2 Addresses used

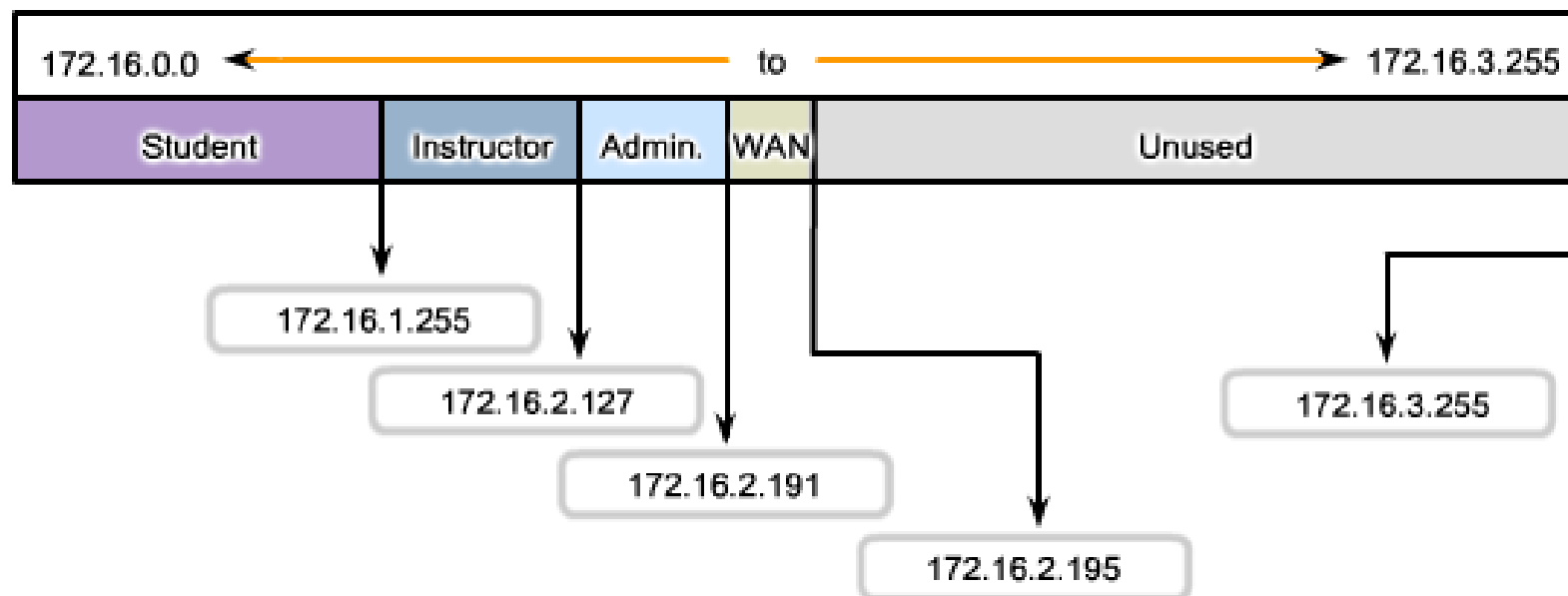


# 10.4.1 Calculating Addresses

## Calculating Addresses with VLSM Address Ranges for Subnets

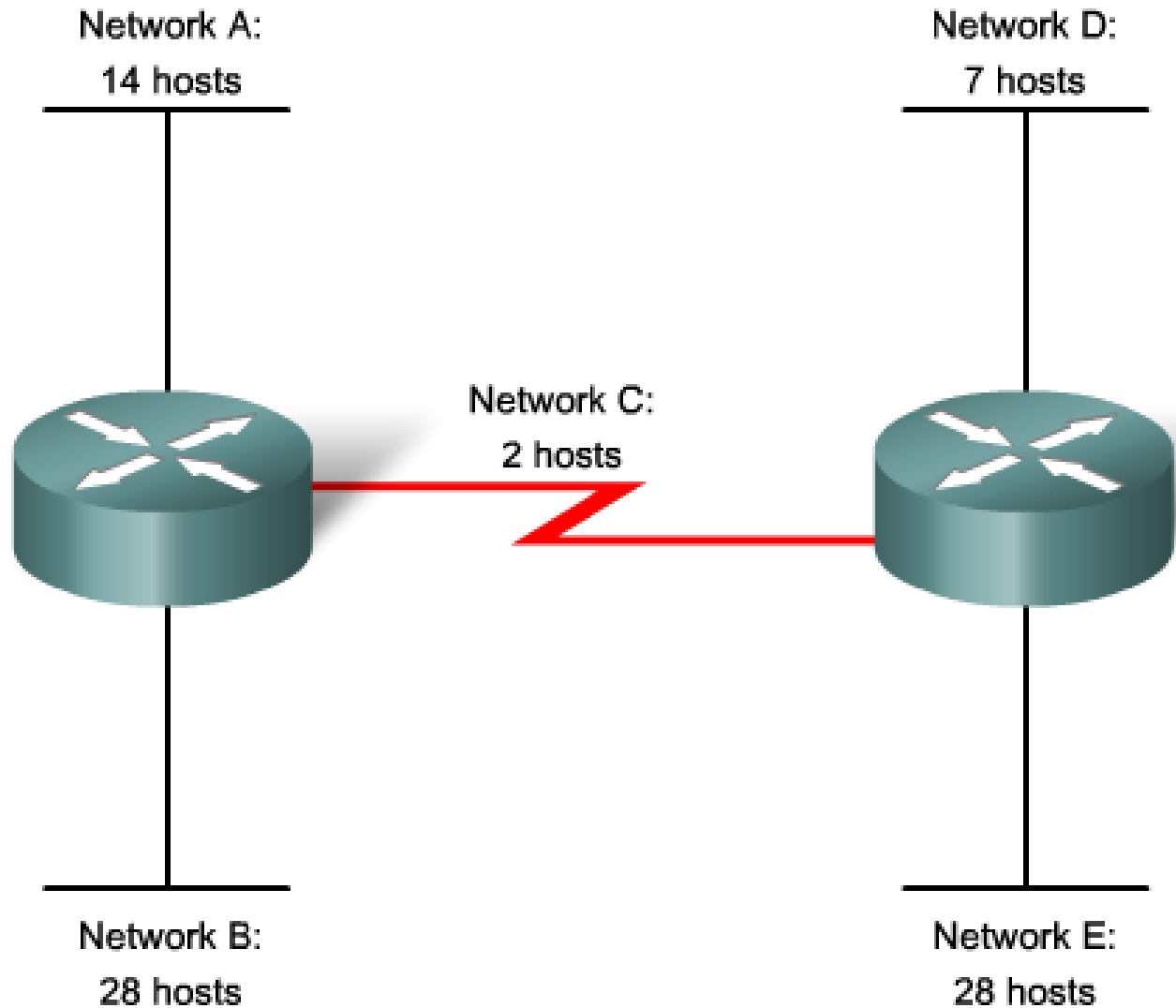
Case 1

Network	Subnet Address	Host Address Range		Broadcast Address
Student	172.16.0.0/23	172.16.0.1	172.16.1.254	172.16.1.255
Instructor	172.16.2.0/25	172.16.2.1	172.16.2.126	172.16.2.127
Administration	172.16.2.128/26	172.16.2.129	172.16.2.190	172.16.2.191
WAN	172.16.2.192/30	172.16.2.193	172.16.2.194	172.16.2.195
Unused	na	172.16.2.197	172.16.3.254	na



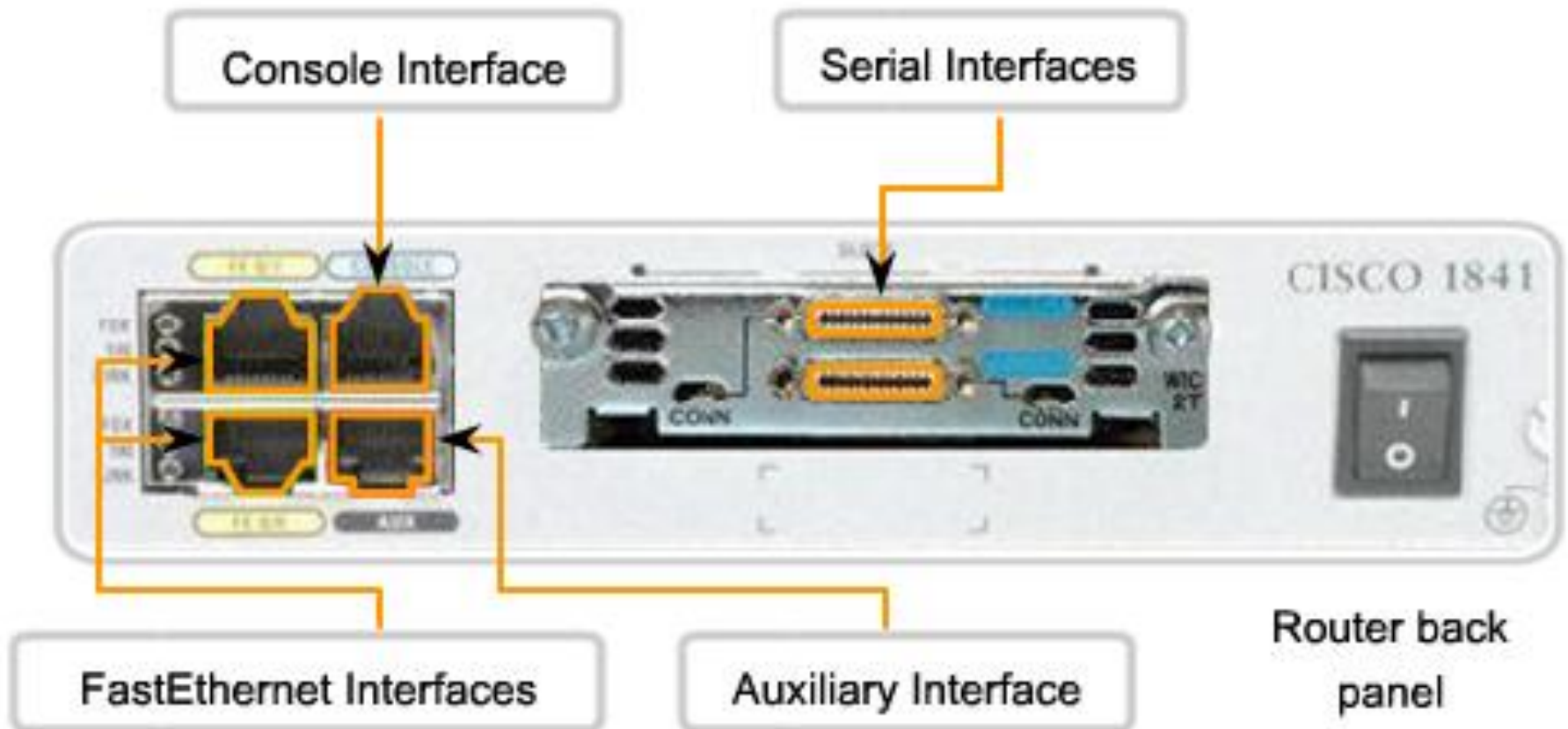
## 10.4.2 Calculating Addresses

### Calculating Addresses for Host Requirements



## 10.5.1 Device Interfaces

### Example Device Interfaces



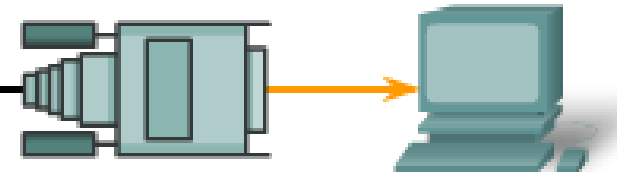
## 10.5.2 Making the Device Management Connection

### The Device Management Connection

Device with Console



RJ-45-to-RJ-45  
Rollover Cable



RJ-45-to-DB-9 Adapter  
labeled TERMINAL

- PCs require an RJ-45 to DB-9 or RJ-45 to DB-25 adapter.
- COM port settings are 9600 bps, 8 data bits, no parity, 1 stop bit, no flow control.
- This provides out-of-band console access.
- AUX switch port may be used for a modem-connected console.

## 10.7.1 Summary and Review

In this chapter, you learned to:

- Identify the basic network media required to make a LAN connection.
- Identify the types of connections for intermediate and end device connections in a LAN.
- Identify the pinout configurations for straight-through and crossover cables.
- Identify the different cabling types, standards, and ports used for WAN connections.
- Define the role of device management connections when using Cisco equipment.
- Design an addressing scheme for an internetwork and assign ranges for hosts, network devices, and the router interface.
- Compare and contrast the importance of network designs.



