



Make Your Own Summit



# Routing

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## *Session 5*

- Subnetting.
- Introduction Routing.
- How to config Router.
- What is Routing Table and config routing.
- How to connect to network difference.
- Labs Cisco.

# • Subnetting

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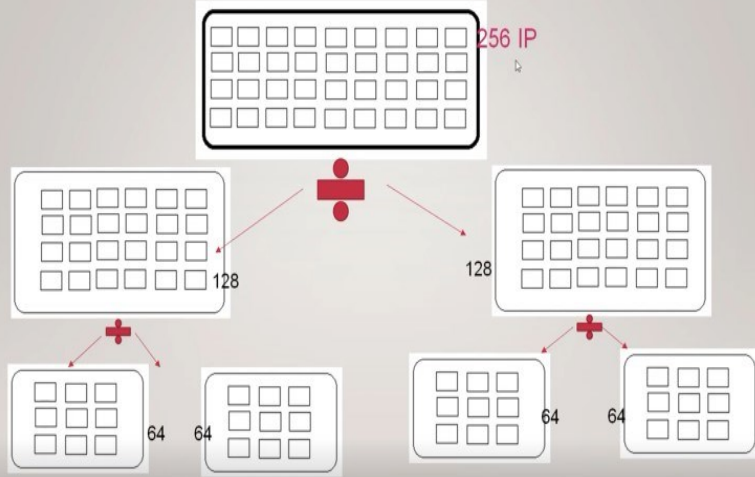
# Subnetting

## تقسيم الشبكات

هي عملية تقسيم شبكة كبيرة الي شبكات اصغر.  
هي عملية تقسيم الشبكات الرئيسية الي شبكات فرعية

**والغرض من ذلك :**

- 1- هو التقليل من خسارة في اي بي في الشبكة الرئيسية.
- 2- التقليل من حركة المرور والازدحام علي الشبكة
- 3- تحسين اداء الشبكة
- 4- تسهيل ادارة الشبكة وتسهيل حل مشاكلها



# Ipv4 Subnetting

تقسيم الشبكات

1

Classes Subnetting (Classful)

2

Classless Inter-Domain Routing (CIDR)

3

Variable Length Subnet Mask (VLSM)

# IPv4 Subnetting

## 1-Classes Subnetting (Classful)

مثال

افترض لديك IP = 192.168.0.5 استخراج مايلي:

1. Class → C
2. SM → 255.255.255.0
3. NID عنوان الشبكة → 192.168.0.0
4. First host IP → 192.168.0.1
5. Last host IP → 192.168.0.254
6. BID IP → 192.168.0.255
7. # of hosts عدد الاجهزة في الشبكة →  $2^x - 2 = 2^8 - 2 = 254$  IP
8. # of networks عدد الشبكات الفرعية →  $2^y = 2^0 = 1$  Network

0000 0000

# IPv4 Subnetting

## 1-Classes Subnetting (Classful)

مثال

IP = 192.168.0.125

1. Class → C
2. SM → 255.255.255.0
3. NID عنوان الشبكة → 192.168.0.0
4. First host IP → 192.168.0.1
5. Last host IP → 192.168.0.254
6. BID IP → 192.168.0.255
7. # of hosts عدد الاجهزة في الشبكة →  $2^x - 2 = 2^8 - 2 = 254$  IP
8. # of networks عدد الشبكات الفرعية →  $2^y = 2^0 = 1$  Network

0000 0000

# IPv4 Subnetting

## 2- Classless Inter- Domain Routing (CIDR)

IP = 192.168.0.0 / 25

مثال

1. Class → C
2. SM → 255.255.255.0
3. New SM → 255.255.255.128

1111	1111.1111	1111.1111	1111.0000	0000
1111	1111.1111	1111.1111	1111.1000	0000

7. # of hosts  $\xrightarrow{\text{عدد الاجهزة في الشبكة}} 2^x - 2 = 2^7 - 2 = 126$  IP  $x$  عدد الازهار في SM
8. # of networks  $\xrightarrow{\text{عدد الشبكات الفرعية}} 2^y = 2^1 = 2$  Network  $y$  عدد الواحيد في SM
9. Hop (▲) =  $256 - 128 = 128$  = قيمة التغير من الشبكة A الي الشبكة B



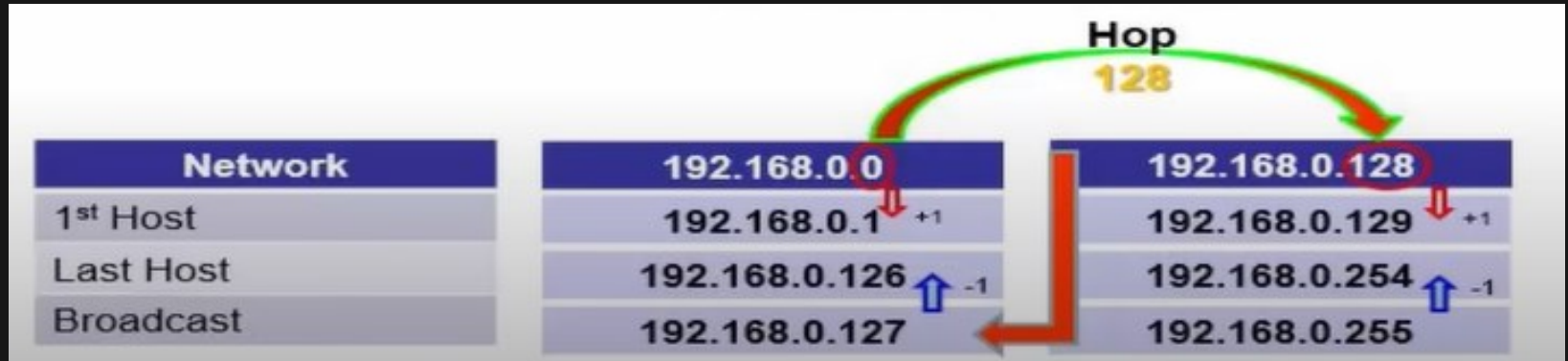
# IPv4 Subnetting

## 2- Classless Inter- Domain Routing (CIDR)

IP = 192.168.0.0 / 25

مثال

قيمة التغير من الشبكة A الي الشبكة B  
 $\text{Hop} (\blacktriangle) = 256 - 128 = 128$



# IPv4 Subnetting

## 2- Classless Inter- Domain Routing (CIDR)

IP = 192.168.0.0 / 26

مثال

1. Class → C
2. SM → 255.255.255.0
3. New SM → 255.255.255.192

1111	1111.1111	1111.1111	1111.0000	0000
1111	1111.1111	1111.1111	1111.1100	0000

7. # of hosts  $\text{عدد الاجهزة في الشبكة} \rightarrow 2^x - 2 = 2^6 - 2 = 62 \text{ IP}$  SM  $\text{عدد الازهار في}$
8. # of networks  $\text{عدد الشبكات الفرعية} \rightarrow 2^y = 2^2 = 4 \text{ Network}$  SM  $\text{عدد الواحد في}$

# IPv4 Subnetting

## 2- Classless Inter- Domain Routing (CIDR)

IP = 192.168.0.0 / 26

مثال

قيمة التغير من الشبكة A الي الشبكة B  
 $\text{Hop} = 256 - 192 = 64$

	Hop 64			Hop 64			Hop 64		
Network	192.168.0.0	192.168.0.64	192.168.0.128	192.168.0.192					
1 <sup>st</sup> Host	192.168.0.1 <sup>+1</sup>	192.168.0.65 <sup>+1</sup>	192.168.0.129 <sup>+1</sup>	192.168.0.193 <sup>+</sup>					
Last Host	192.168.0.62 <sup>-1</sup>	192.168.0.126 <sup>-1</sup>	192.168.0.190 <sup>-1</sup>	192.168.0.254 <sup>↑</sup>					
Broadcast	192.168.0.63	192.168.0.127	192.168.0.191	192.168.0.255					

# IPv4 Subnetting

## 2- Classless Inter- Domain Routing (CIDR)

IP = 192.168.0.0 / 27

مثال

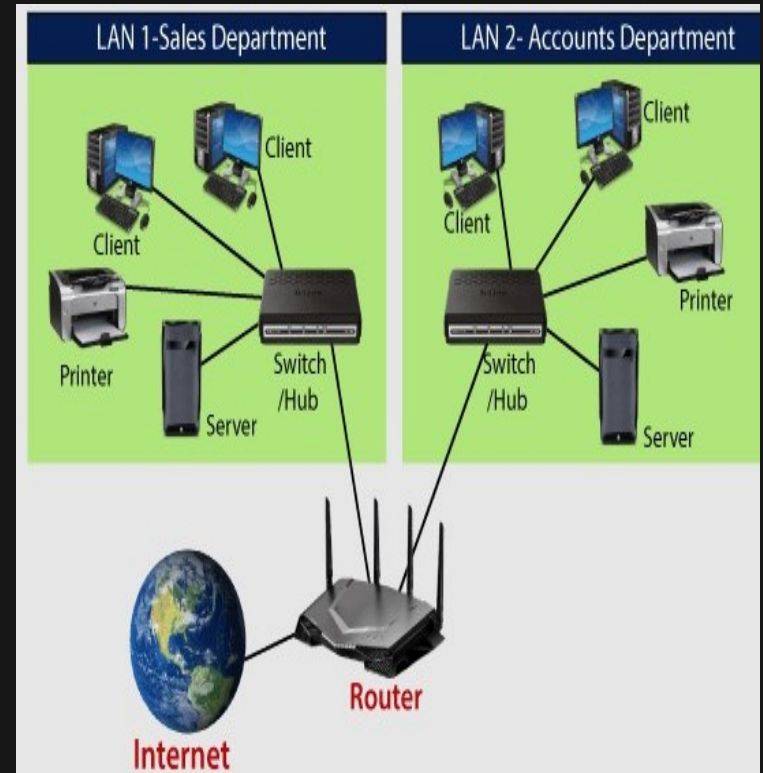
1. Class → C
2. SM → 255.255.255.0
3. New SM → 255.255.255.224

1111 1111.1111 1111.1111 1111.0000 0000
1111 1111.1111 1111.1111 1111.1110 0000

7. # of hosts  $\text{عدد الاجهزة في الشبكة} \rightarrow 2^x - 2 = 2^5 - 2 = 30$  IP SM  $x$  عدد الازفار في
8. # of networks  $\text{عدد الشبكات الفرعية} \rightarrow 2^y = 2^3 = 8$  Network SM  $y$  عدد الوحايد في
9. Hop (▲) =  $256 - 224 = 32$

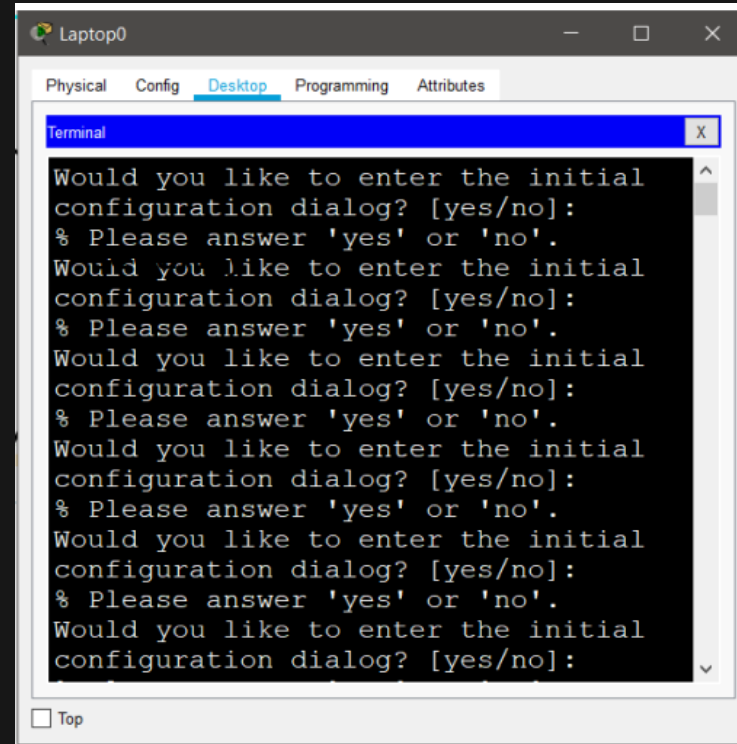
## What is Router??

- A router is a device that connects two or more packet-switched networks or subnetworks.
- It serves two primary functions:
  1. managing traffic between these networks by forwarding **data packets** to their intended **IP addresses**.
  2. allowing multiple devices to use the same Internet connection.



# Router Modes

- 1 -Setup mode(initial configuration )  
To exit from setup press ctrl+C

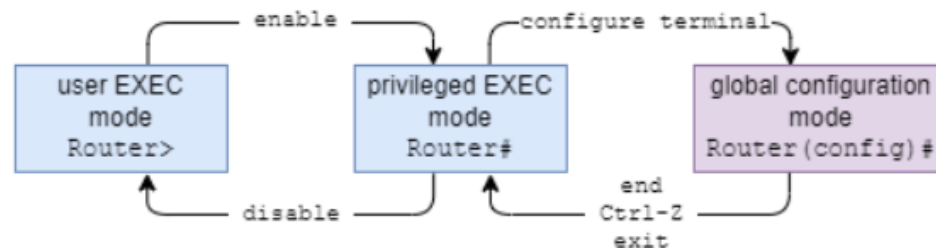


# Router Modes

2. User mode **> enable**

3. Privileged mode **# config t**  
📎 Show , copy, erase, debug

4. Configuration mode



# Configure and Verify the Initial Router Configuration

## 🔑 Change hostname for the router

🔑 Router#config t

🔑 Router(config)#hostname FA

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname FA
FA(config)#
```

## 🔑 Change enable password

🔑 FA(config)#enable password 123

🔑 FA(config)#exit

🔑 FA#

🔑 FA#exit

🔑 shkh>enable

```
FA>enable
Password:
FA#
```

## 🔑 To remove password run

🔑 shkh(config)#no enable password



# Configure and Verify the Initial Router Configuration

## **Run**

 **FA#show running-config**

## **Create encrypted password**

 **FA#config t**

 **FA(config)#enable secret 12345**

## **Encrypt all passwords**

 **FA(config)#service passwordencryption**

 **FA#show running-config**

# Configure and Verify the Initial Router Configuration

## 🔧 Console password

- 🔧 FA(config)#line console 0
- 🔧 FA(config-line)#password 123
- 🔧 FA(config-line)#login
- 🔧 FA(config-line)#exit
- 🔧 FA(config)#exit
- 🔧 FA #
- 🔧 FA #exit

## 🔧 To save the current configuration run

- 🔧 FA#copy running-config startupconfig
- 🔧 Run
- 🔧 FA#show startup-config

```
Press RETURN to get started!
```

```
User Access Verification
```

```
Password: |
```

# Network structure

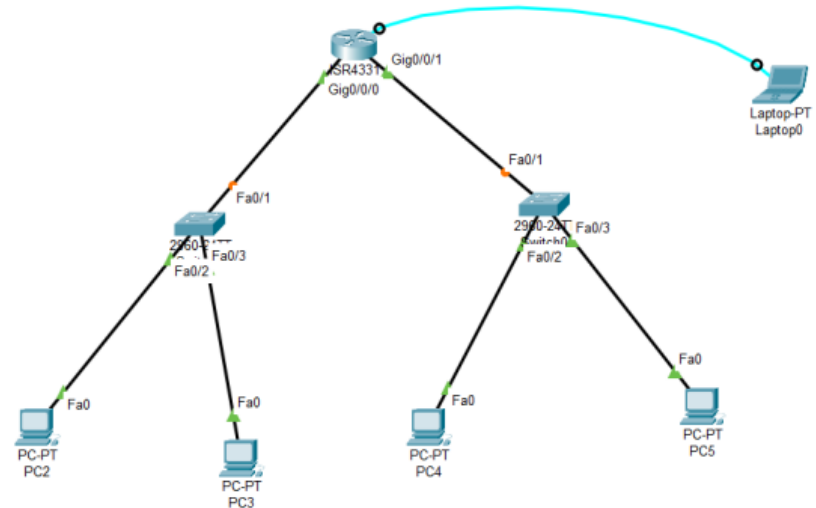
## Add IP for devices

📌 For first LAN use

📌 10.0.0.2 and 10.0.0.3 for IP and  
10.0.0.1 for default gateway

📌 For second LAN use:

📌 20.0.0.2 and 20.0.0.3 for IP and  
20.0.0.1 for default gateway



# Add router IPs (Activate ports and assign them Ips)

🔑 FA(config)#int g0/0

🔑 FA(config-if)#no shutdown

🔑 FA(config-if)#ip address 10.0.0.1  
255.0.0.0

🔑 FA(config)#int g0/1

🔑 FA(config-if)#no shutdown

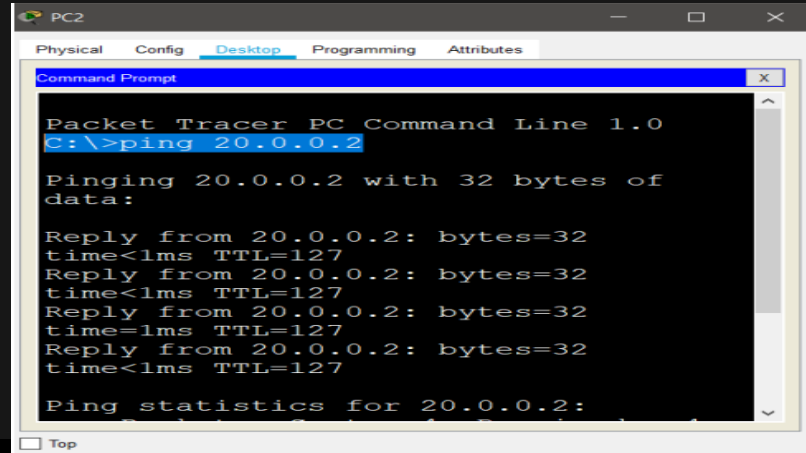
🔑 FA(config-if)#ip address 20.0.0.1  
255.0.0.0

## Test connection

🔑 Using ping command to test connection

🔑 From pc2 run C:\>ping 20.0.0.2

🔑 From pc4 run C:\>ping 10.0.0.3



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2

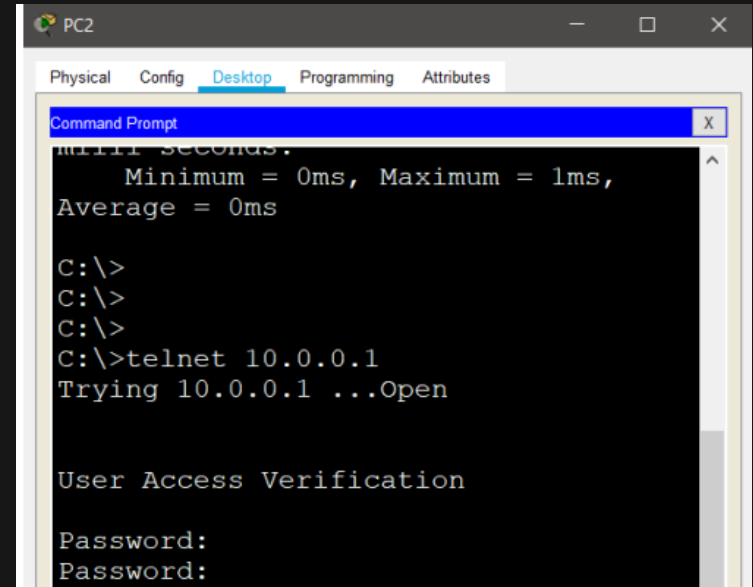
Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32
time<1ms TTL=127
Reply from 20.0.0.2: bytes=32
time<1ms TTL=127
Reply from 20.0.0.2: bytes=32
time=1ms TTL=127
Reply from 20.0.0.2: bytes=32
time<1ms TTL=127

Ping statistics for 20.0.0.2:
```

# Access router remotely

- ❑ Add password to virtual terminal
- ❑ FA(config-if)#line vty 0 4
- ❑ FA(config-line)#password 2468
- ❑ FA(config-line)#login
- ❑ FA(config-line)#
- ❑ From any pc open desktop then terminal run command
- ❑ C:\>telnet 10.0.0.1
- ❑ Trying 10.0.0.1 ...Open
- ❑ User Access Verification
- ❑ Password: (enter vty password)
- ❑ FA>en
- ❑ Password: (enter enable secret password)



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Minimum = 0ms, Maximum = 1ms,
Average = 0ms
C:\>
C:\>
C:\>
C:\>telnet 10.0.0.1
Trying 10.0.0.1 ...Open

User Access Verification

Password:
Password:
```

## Remotely telnet & create username and password

R1>

R1>enable

R1#config

R1(config)#username Farida pass 12345

R1(config)#line vty 0 4

R1(config-line)#login local

R1(config-line)#exit

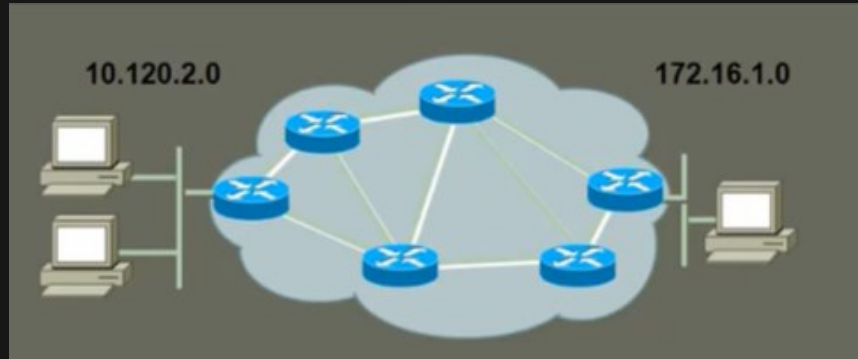
R1(config-if)#exit

R1(config)#

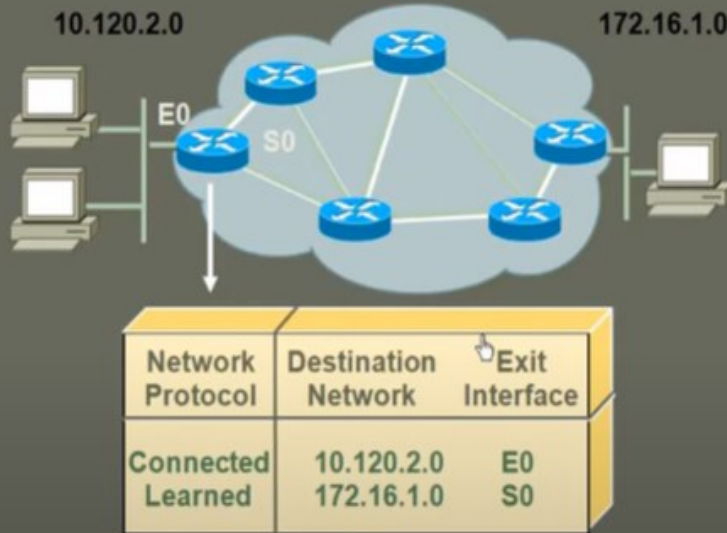
# What's routing !?

To route a router need to know:

- Destination addresses
- Possible routes
- Best route
- Maintain and verify routing information



# Routing table



**Routing table** ببينقا مسجل الشبكات ال عندي وال **best route** بتاعها (اروح لها منين)

**By default** هو ببينقا مسجل جوا **routing table** دا الناس ال هما **Direct connected** بي

اما الناس ال هما **Not directly** عشان يعرفهم ف انا لازم اعمل **Routing**



# Types of routing:

## **Static Route:**

Uses a route that a network administrator enters into the router manually

## **Dynamic Route:**

Uses a route that a network routing protocol adjusts automatically for topology or traffic changes

# Static Routes

**R1:**

**R1(config)#int F0/0**

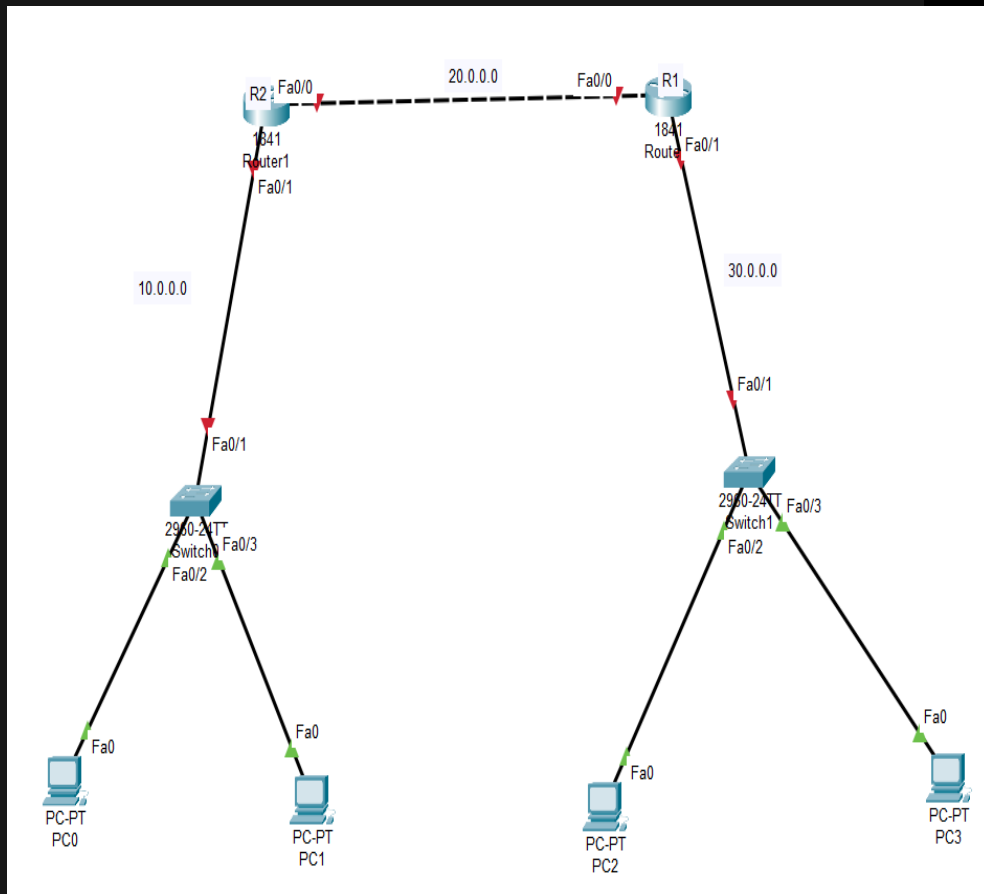
**R1(config-if)#no shutdown**

**R1(config-if)#ip address 20.0.0.1  
255.0.0.0**

**R1(config)#int F0/1**

**R1(config-if)#no shutdown**

**R1(config-if)#ip address 30.0.0.1  
255.0.0.0**



**R2:**

**R3(config)#int F0/0**

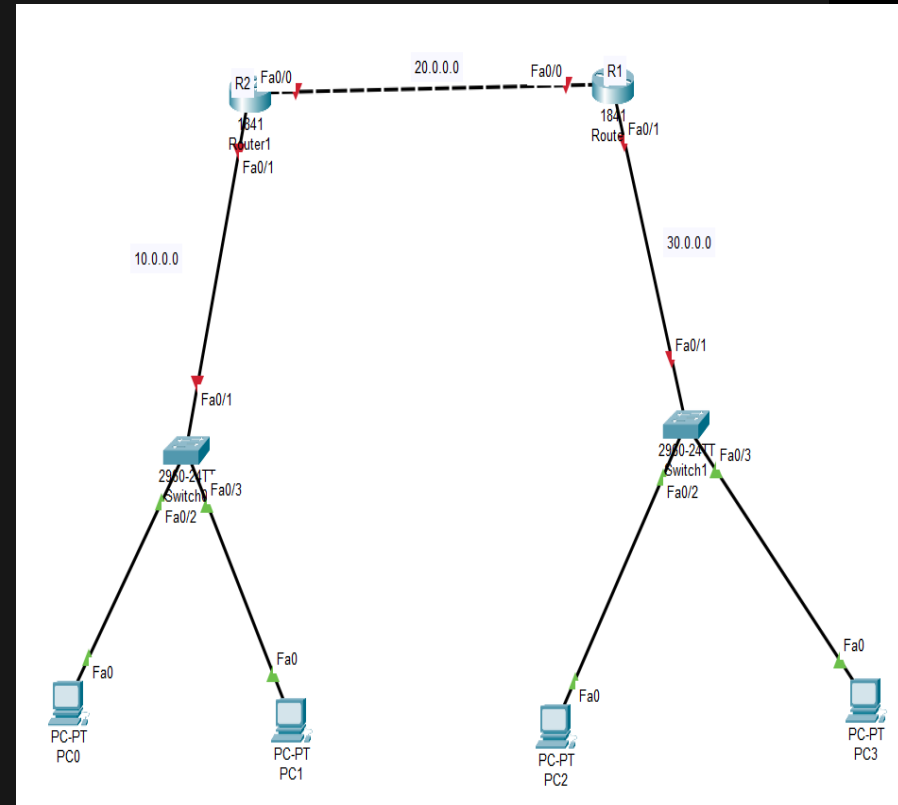
**R3(config-if)#no shutdown**

**R3(config-if)#ip address 20.0.0.2  
255.0.0.0**

**R3(config)#int F0/1**

**R3(config-if)#no shutdown**

**R3(config-if)#ip address 10.0.0.1  
255.0.0.0**



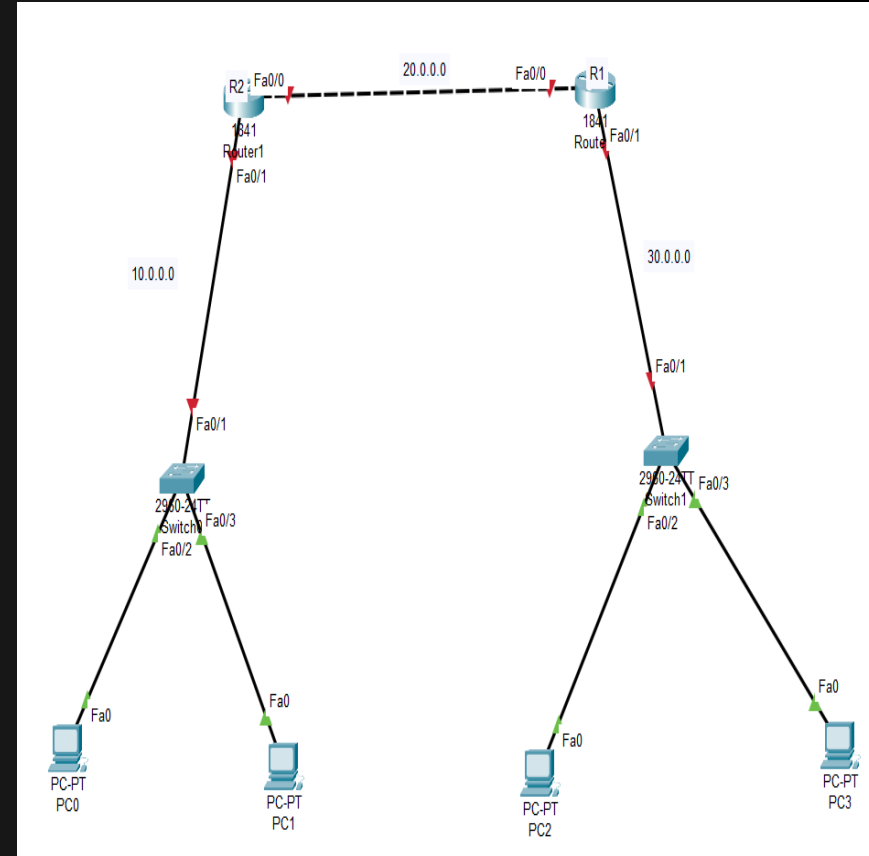
# Static Routes:

**R1:**

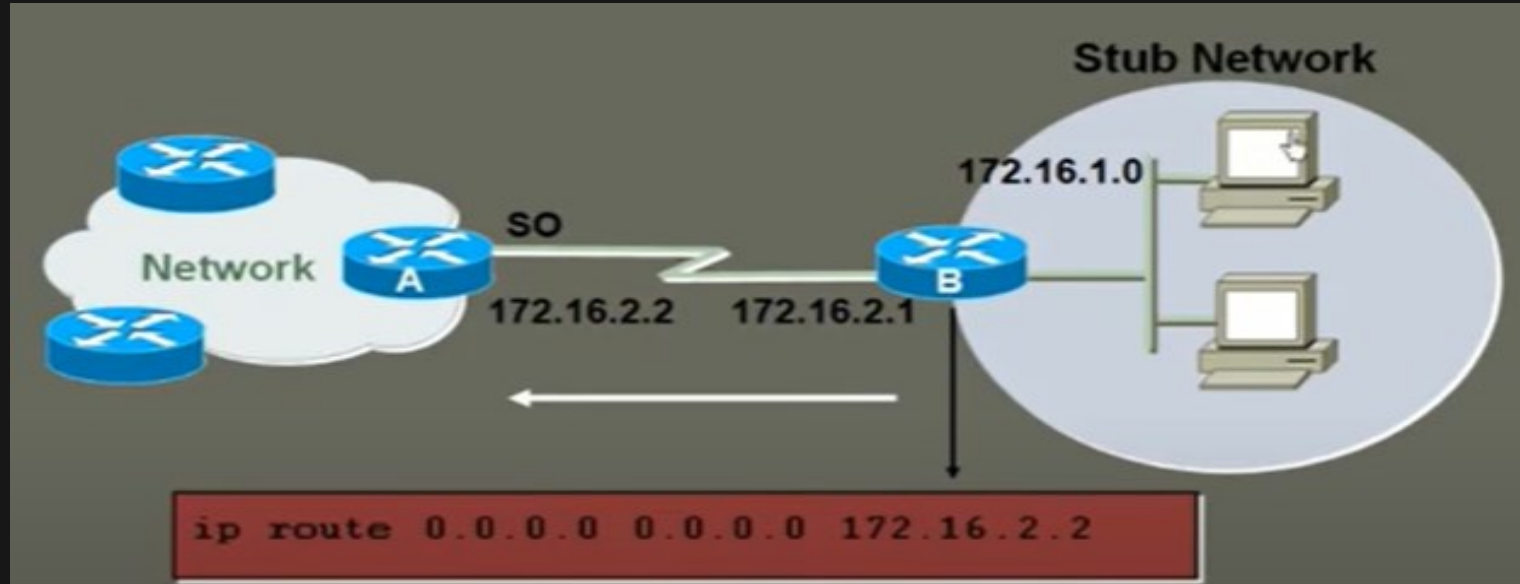
- R1(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.2

**R2:**

- R2(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.1



# Default Routes



- Router(config)#ip route 0.0.0.0 0.0.0.0 172.16.2.2

**Any Question ..?!**



يلا قوموا  
امشوا