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## CEL 51, DCCN, Monsoon 2020

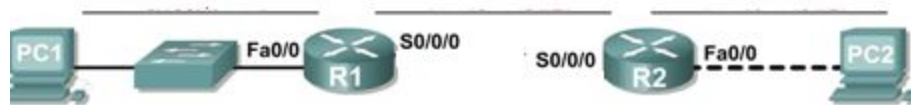
### Lab 6: Subnet and Router Configuration

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#### Topology Diagram

NID for subnets :

- 192.168.1.0/26
- 192.168.1.64/26
- 192.168.1.128/26



#### Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.1	255.255.255.192	N/A
	S0/0/0	192.168.1.65	255.255.255.192	N/A
R2	Fa0/0	192.168.1.129	255.255.255.192	N/A
	S0/0/0	192.168.1.126	255.255.255.192	N/A
PC1	NIC	192.168.1.62	255.255.255.192	192.168.1.1
PC2	NIC	192.168.1.190	255.255.255.192	192.168.1.129

#### Learning Objectives

Upon completion of this lab, you will be able to:

- Subnet an address space given requirements.
- Assign appropriate addresses to interfaces and document.
- Configure and activate Serial and FastEthernet interfaces.
- Test and verify configurations.
- Reflect upon and document the network implementation.

## Scenario

In this lab activity, you will design and apply an IP addressing scheme for the topology shown in the Topology Diagram. You will be given one address block that you must subnet to provide a logical addressing scheme for the network. The routers will then be ready for interface address configuration according to your IP addressing scheme. When the configuration is complete, verify that the network is working properly.

### Task 1: Subnet the Address Space.

#### Step 1: Examine the network requirements.

You have been given the 192.168.1.0/24 address space to use in your network design. The network consists of the following segments:

- The network connected to router R1 will require enough IP addresses to support 15 hosts.
- The network connected to router R2 will require enough IP addresses to support 30 hosts.
- The link between router R1 and router R2 will require IP addresses at each end of the link.

#### Step 2: Consider the following questions when creating your network design.

##### How many subnets are needed for this network?

**3 subnets** will be required. As there are 3 small networks we'll need 3 subnets.

We'll take subnet of minimum capacity of **32 hosts**.

As 2 address are reserved address then available address are  **$32 - 2 = 30$** .

For this we'll have **5 bit** for host IP i.e  **$2^5$**  hosts.

##### What is the subnet mask for this network in dotted decimal format?

We'll require subnet of minimum capacity of **32 hosts**.

As 2 address are reserved address then available address are  **$32 - 2 = 30$** .

For this we'll have **5 bit** for host IP i.e  **$2^5$**  hosts.

So we'll need minimum 30 host that's minimum 5 host bits

i.e  **$n \leq 5$**

Other point is that we'll need subnet which will support **3** subnetworks

i.e  **$n \geq 2$**

from above conditions

**$2 \leq n \leq 5$**

**Here  $n = 5$  will be optimal choice as it's always good to have more hosts.**

CIDR : **26**

Subnet Mask: **11111111.11111111.11111111.11000000**

Subnet Mask: **255.255.255.192**

##### What is the subnet mask for the network in slash format?

**255.255.255.192 - /26**

### **How many usable hosts are there per subnet?**

$$\text{Usable hosts} = 2^6 - 2 = 64 - 2 = 62$$

### **Step 3: Assign sub-network addresses to the Topology Diagram.**

1. Assign subnet 1 to the network attached to R1.
2. Assign subnet 2 to the link between R1 and R2.
3. Assign subnet 3 to the network attached to R2.

### **Task 2: Determine Interface Addresses.**

#### **Step 1: Assign appropriate addresses to the device interfaces.**

1. Assign the first valid host address in subnet 1 to the LAN interface on R1.  
**192.168.1.1**
2. Assign the last valid host address in subnet 1 to PC1.  
**192.168.1.62**
3. Assign the first valid host address in subnet 2 to the WAN interface on R1.  
**192.168.1.65**
4. Assign the last valid host address in subnet 2 to the WAN interface on R2.  
**192.168.1.126**
5. Assign the first valid host address in subnet 3 to the LAN interface of R2.  
**192.168.1.129**
6. Assign the last valid host address in subnet 3 to PC2.  
**192.168.1.190**

#### **Step 2: Document the addresses to be used in the table provide under the Topology Diagram**

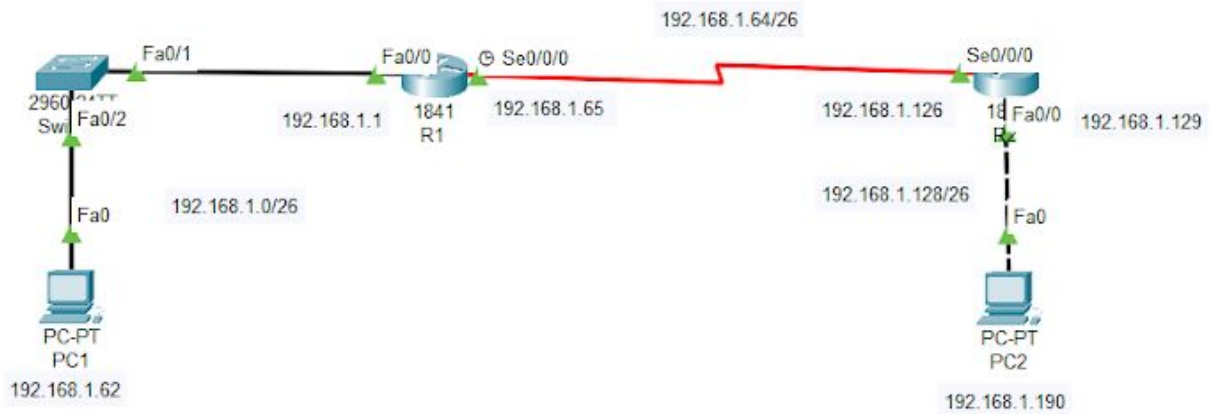
### **Task 3: Configure the Serial and FastEthernet Addresses.**

#### **Step 1: Configure the router interfaces.**

Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

#### **Step 2: Configure the PC interfaces.**

Configure the Ethernet interfaces of PC1 and PC2 with the IP addresses and default gateways from your network design.



#### Task 4: Verify the Configurations.

Answer the following questions to verify that the network is operating as expected.

From the host attached to R1, is it possible to ping the default gateway? **YES**

```

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1

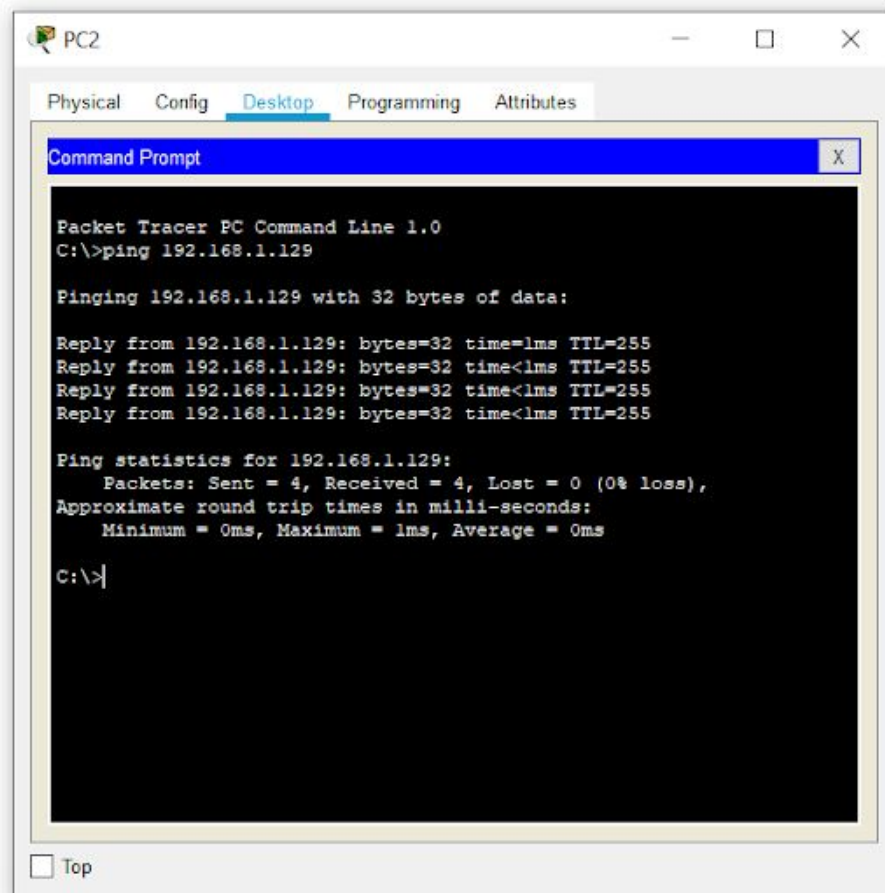
Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time=214ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 214ms, Average = 53ms

C:\>
  
```

From the host attached to R2, is it possible to ping the default gateway? **YES**



The screenshot shows a Packet Tracer PC window titled "PC2" with tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, displaying a "Command Prompt" window. The command prompt shows the execution of the command "ping 192.168.1.129". The output indicates that the ping was successful, with four replies received from 192.168.1.129, each with a time of less than 1ms and a TTL of 255. The ping statistics show that all four packets were sent and received, with 0% loss. The approximate round trip times are also shown: Minimum = 0ms, Maximum = 1ms, and Average = 0ms.

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.129

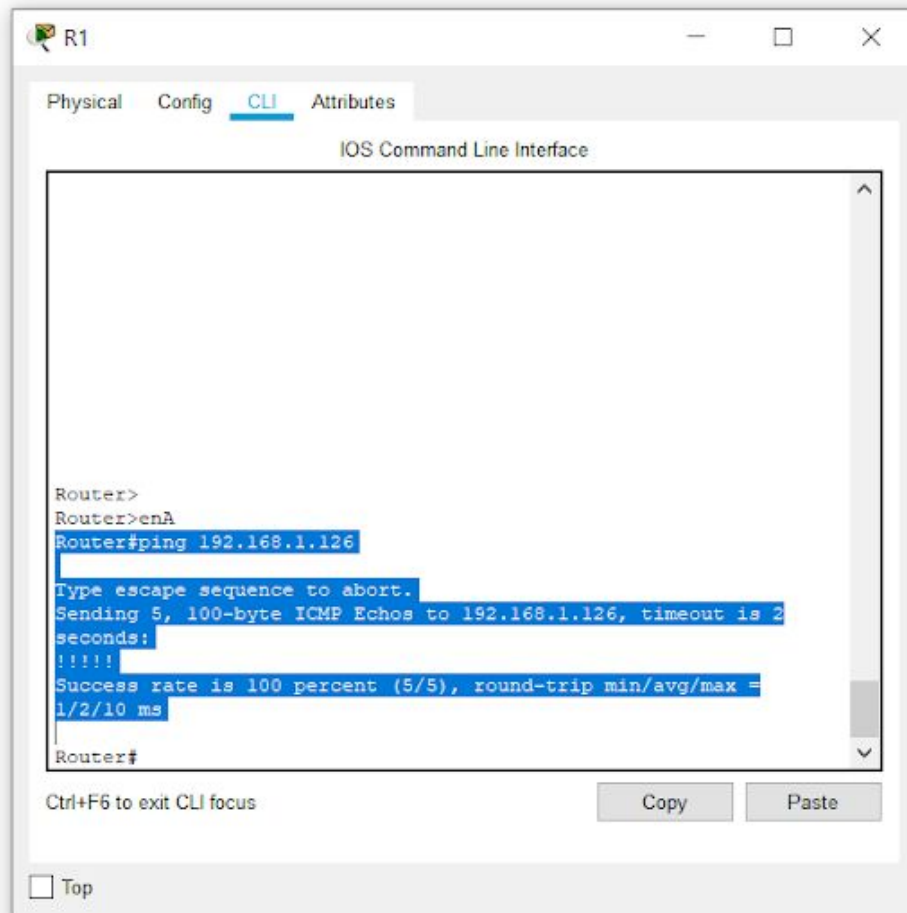
Pinging 192.168.1.129 with 32 bytes of data:

Reply from 192.168.1.129: bytes=32 time<1ms TTL=255
Reply from 192.168.1.129: bytes=32 time<1ms TTL=255
Reply from 192.168.1.129: bytes=32 time<1ms TTL=255
Reply from 192.168.1.129: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.129:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

From the router R1, is it possible to ping the Serial 0/0/0 interface of R2? **YES**



The screenshot shows a window titled 'R1' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The command history shows the user entering 'Router>', 'Router>ena', and 'Router#ping 192.168.1.126'. The output of the ping command is displayed in blue text: 'Type escape sequence to abort.', 'Sending 5, 100-byte ICMP Echos to 192.168.1.126, timeout is 2 seconds:', '!!!!', and 'Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms'. The prompt 'Router#' is visible at the bottom of the CLI window. Below the CLI window, there is a 'Ctrl+F6 to exit CLI focus' message and 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

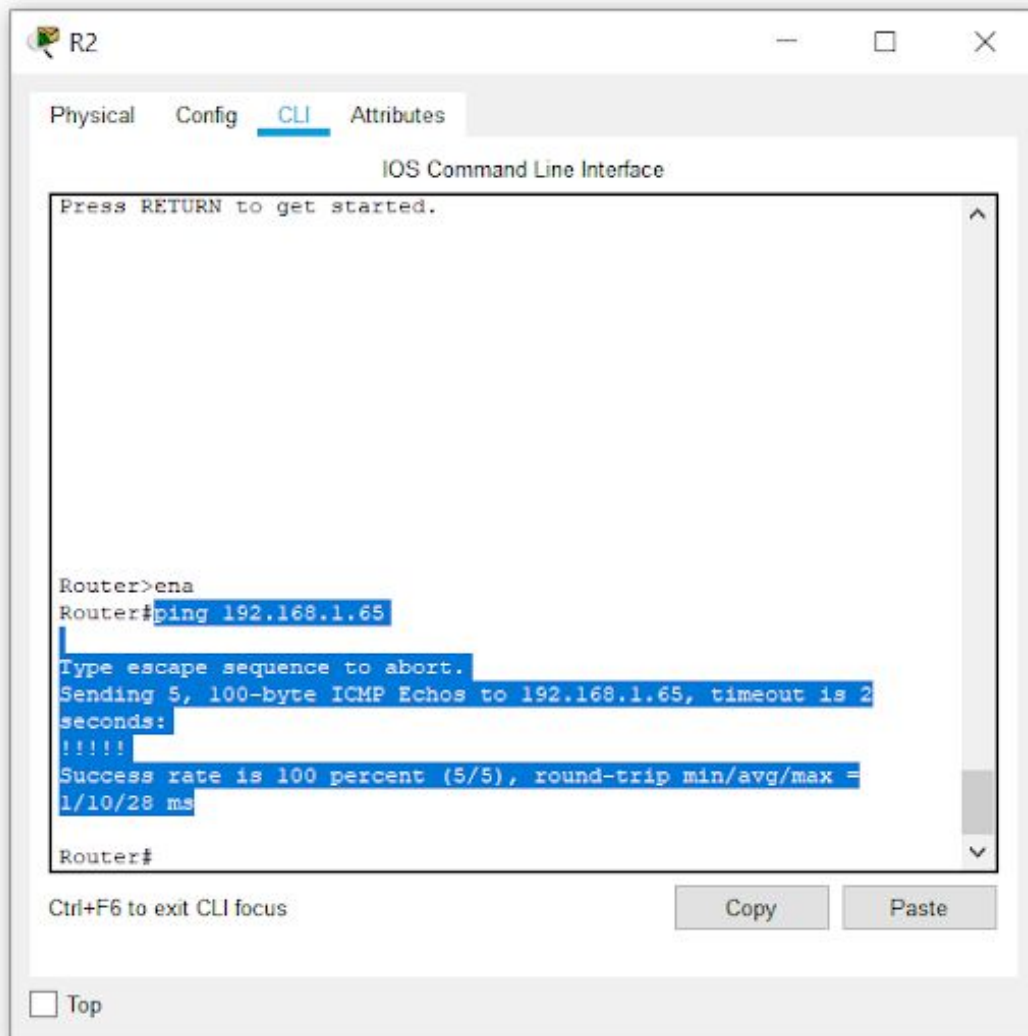
```
Router>
Router>ena
Router#ping 192.168.1.126
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.126, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
1/2/10 ms
Router#
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

From the router R2, is it possible to ping the Serial 0/0/0 interface of R1? **YES**



The screenshot shows a window titled 'R2' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The text inside the terminal window is as follows:

```
Press RETURN to get started.  
  
Router>ena  
Router#ping 192.168.1.65  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.1.65, timeout is 2  
seconds:  
!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max =  
1/10/28 ms  
Router#
```

Below the terminal window, there is a text label 'Ctrl+F6 to exit CLI focus' and two buttons labeled 'Copy' and 'Paste'. At the bottom left, there is a checkbox labeled 'Top'.

The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

## Task 5: Reflection

**Are there any devices on the network that cannot ping each other?**

**Yes.**

Device cannot ping other device outside of it's sub network.

**P1 can ping R1 and R1 can ping PC1**

**R1 can ping R2 and R2 can ping R1**

**R2 can ping PC2 and PC2 can ping R2**

Only this connections are possible.

**What is missing from the network that is preventing communication between these devices?**

Each device can ping the device which is in it's sub network, because it doesn't have route to the device outside it's network. By default, static routes have an [administrative distance](#) of one. So Routing protocol is required to connect the devices outside of the network.

### CONCLUSION :

We learnt how to choose and set up subnets, how masking works in serverless routing, and also how to debug such networks briefly.

### References:

<https://networkengineering.stackexchange.com/questions/40597/computer-unable-to-ping-another-over-two-routers>

<https://www.cisco.com/c/en/us/support/docs/dial-access/floating-static-route/118263-technote-nexthop-00.html>