

# Computer Networks Lab

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## Lab 1: Introduction to Packet Tracer, Peer-to-Peer Communication, Study of Cables and its Color Codes

- **Procedure:**

- 1. Open Packet Tracer:**

- Launch Cisco Packet Tracer on your computer.
- Familiarize yourself with the interface, including the workspace, device selection, and tools.

- 2. Create a Simple Network:**

- Drag two computers (PC-PT) onto the workspace.
- Drag a switch (Switch-PT) onto the workspace.
- Connect each computer to the switch using straight-through Ethernet cables.

- 3. Configure IP Addresses:**

- Click on the first computer, go to the Desktop tab, and select IP Configuration.
- Assign an IP address (e.g., 192.168.1.1) and a subnet mask (e.g., 255.255.255.0).
- Click on the second computer, go to the Desktop tab, and select IP Configuration.
- Assign an IP address (e.g., 192.168.1.2) and a subnet mask (e.g., 255.255.255.0).

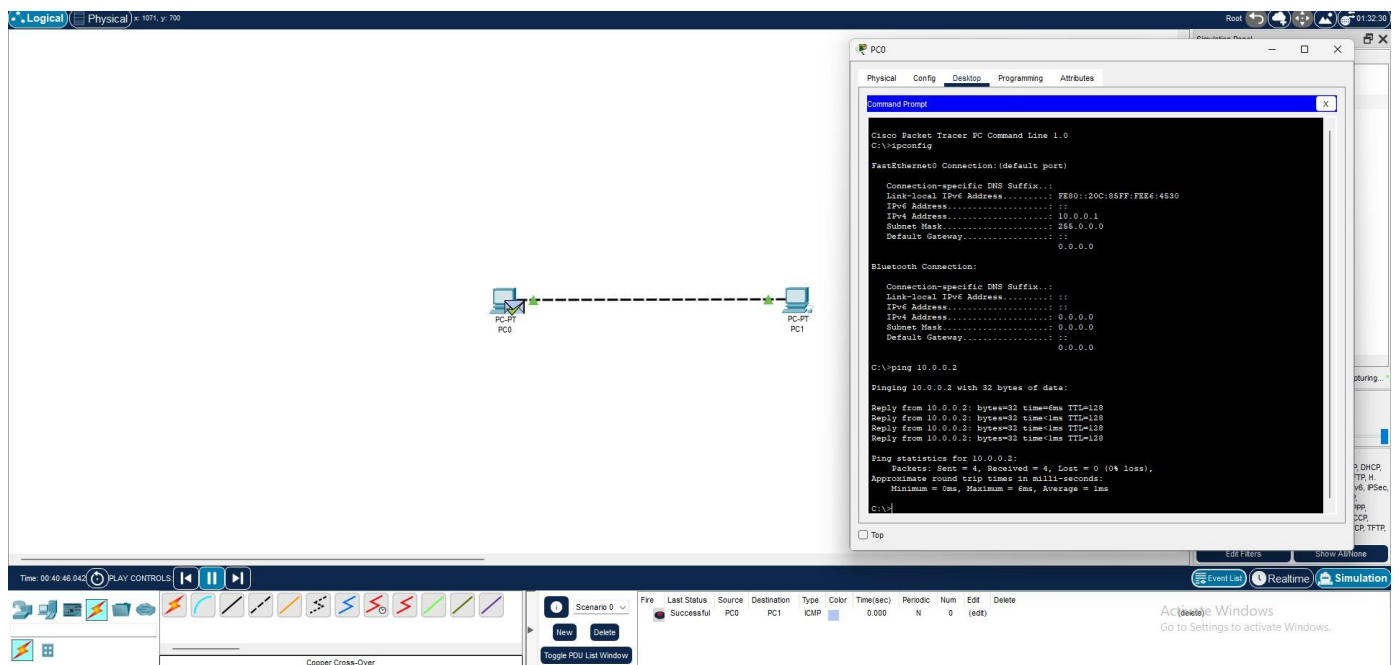
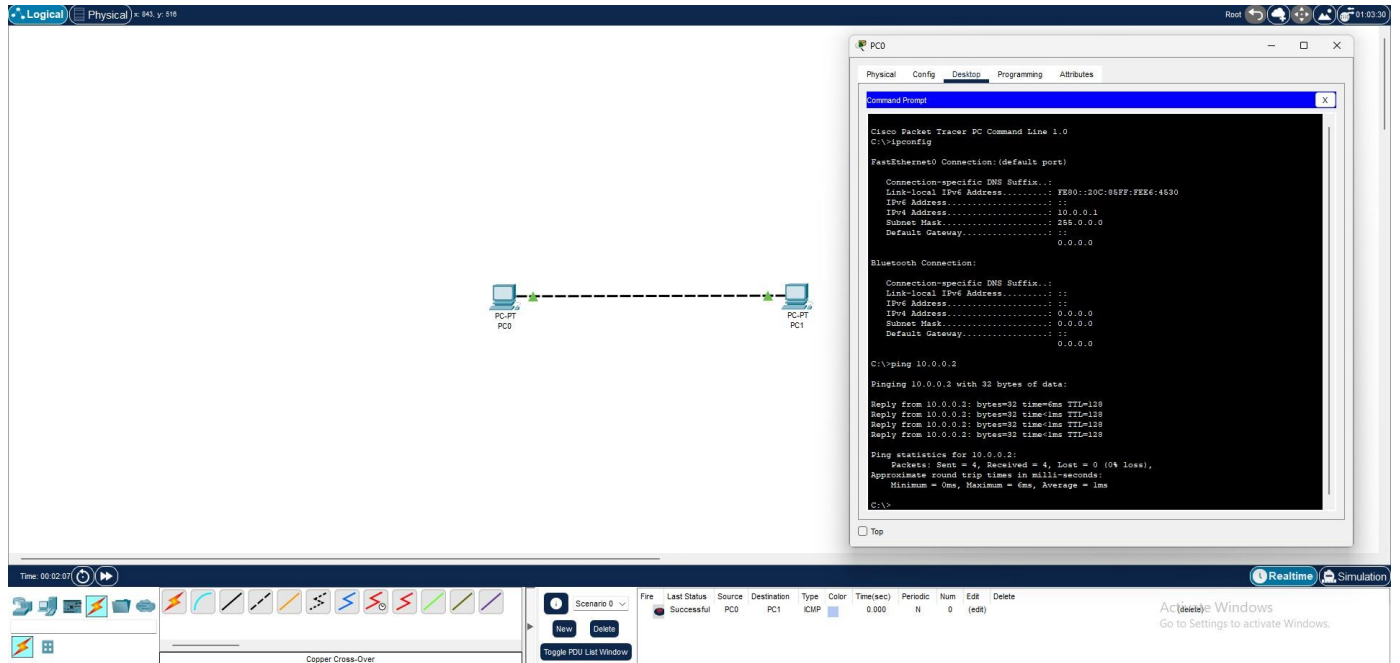
- 4. Test Peer-to-Peer Communication:**

- On the first computer, open the Command Prompt from the Desktop tab.
- Use the `ping` command to test connectivity to the second computer (e.g., `ping 192.168.1.2`).
- Observe the response to ensure the computers can communicate.

- 5. Study Cables and Color Codes:**

- Examine different types of network cables provided (Ethernet, crossover).
- Note the color codes for each wire in the cables:
  - Straight-through cable (used to connect different devices like a computer to a switch).
  - Crossover cable (used to connect similar devices like computer to computer).

# Output:



## Lab 2: Implementation of Network Topologies

### • Procedure:

#### 1. Open Packet Tracer:

- Launch Cisco Packet Tracer on your computer.

#### 2. Implement a Bus Topology:

- Drag three computers onto the workspace.
- Connect them using a single backbone cable (Coaxial Cable).

#### 3. Implement a Star Topology:

- Drag three computers and a switch onto the workspace.
- Connect each computer to the switch using straight-through Ethernet cables.

#### 4. Implement a Ring Topology:

- Drag three computers onto the workspace.
- Connect them in a circular manner using crossover cables.

#### 5. Implement a Mesh Topology:

- Drag three computers onto the workspace.
- Connect each computer to every other computer using crossover cables.

#### 6. Test Connectivity:

- For each topology, assign IP addresses to the computers.
- Use the `ping` command to test connectivity between all computers.

## Output:

The screenshot displays the Cisco Packet Tracer interface. On the left, two network topologies are shown. The top topology, labeled 'BUS TOPOLOGY', features three PCs (PC0, PC2, PC1) connected to a central backbone via three 2960-24TT switches (Switch0, Switch1, Switch2). The bottom topology shows a more complex setup with three PCs (PC7, PC9, PC12) connected to three 2960-24TT switches (Switch4, Switch5, Switch6), which are then connected to a central 2960-24TT switch (Switch7). On the right, a 'PC0' window is open, showing a 'Command Prompt' with the following output:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
Reply from 10.0.0.3: bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>
```

The bottom status bar of the Packet Tracer window shows a table with network details:

Fr	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
PC0	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	

Logical Physical x: 982, y: 31

PC3

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>IPCONFIG

FastEthernet0 Connection (default port)

Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: FE80::205:FEFF:FECD:3D80
IPv6 Address. . . . .: ::
IPv6 Address. . . . .: ::
Subnet Mask . . . . .: 255.0.0.0
Default Gateway . . . . .: 0.0.0.0

Bluetooth Connection:
Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: ::
IPv6 Address. . . . .: ::
IPv6 Address. . . . .: ::
Subnet Mask . . . . .: 0.0.0.0
Default Gateway . . . . .: 0.0.0.0

C:\>PING 10.1.0.3

Pinging 10.1.0.3 with 32 bytes of data:
Reply from 10.1.0.3: bytes=32 time=6ms TTL=128
Reply from 10.1.0.3: bytes=32 time=1ms TTL=128
Reply from 10.1.0.3: bytes=32 time=1ms TTL=128
Reply from 10.1.0.3: bytes=32 time=1ms TTL=128

Ping statistics for 10.1.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 6ms, Average = 2ms
C:\>
```

STAR TOPOLOGY

10.1.0.1 PC-PT PC3  
10.1.0.2 PC-PT PC4  
10.1.0.3 PC-PT PC5  
2950-24T1 Switch3

10.0.1.1 PC-PT PC12  
10.0.1.2 PC-PT PC14  
10.0.1.3 PC-PT PC13  
10.0.1.4 PC-PT PC15  
2950-24T2 Switch12  
2950-24T3 Switch13  
2950-24T4 Switch14  
2950-24T5 Switch15

Time: 00:56:10

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete

Successful PC0 PC1 ICMP 0.000 N 0 (edit)

Activate Windows  
Go to Settings to activate Windows.

Logical Physical x: 982, y: 31

PC8

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>IPCONFIG

FastEthernet0 Connection (default port)

Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: FE80::20A:41FF:FECD:D395
IPv6 Address. . . . .: ::
IPv6 Address. . . . .: ::
Subnet Mask . . . . .: 255.0.0.0
Default Gateway . . . . .: 0.0.0.0

Bluetooth Connection:
Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: ::
IPv6 Address. . . . .: ::
IPv6 Address. . . . .: ::
Subnet Mask . . . . .: 0.0.0.0
Default Gateway . . . . .: 0.0.0.0

C:\>PING 10.1.1.2

Pinging 10.1.1.2 with 32 bytes of data:
Reply from 10.1.1.2: bytes=32 time=1ms TTL=128
Reply from 10.1.1.2: bytes=32 time=1ms TTL=128
Reply from 10.1.1.2: bytes=32 time=1ms TTL=128
Reply from 10.1.1.2: bytes=32 time=1ms TTL=128

Ping statistics for 10.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>PING 10.1.1.4

Pinging 10.1.1.4 with 32 bytes of data:
```

BUS TOPOLOGY

10.0.0.1 PC-PT PC1  
10.0.0.2 PC-PT PC2  
10.0.0.3 PC-PT PC3  
10.1.1.1 PC-PT PC7  
10.1.1.2 PC-PT PC9  
10.1.1.3 PC-PT PC8  
10.1.1.4 PC-PT PC11  
2950-24T1 Switch4  
2950-24T2 Switch5  
2950-24T3 Switch6  
2950-24T4 Switch7

RING TOPOLOGY

Time: 00:58:04

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete

Successful PC0 PC1 ICMP 0.000 N 0 (edit)

Activate Windows  
Go to Settings to activate Windows.

File Edit Options View Tools Extensions Window Help

PC12

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.1.2

Pinging 10.0.1.2 with 32 bytes of data:

Reply from 10.0.1.2: bytes=32 time<1ms TTL=128
Reply from 10.0.1.2: bytes=32 time<1ms TTL=128
Reply from 10.0.1.2: bytes=32 time<1ms TTL=128
Reply from 10.0.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

10.1.0.3  
PC-PT  
PC5

10.0.1.1  
PC-PT  
PC12

10.0.1.2  
PC-PT  
PC14

10.0.1.3  
PC-PT  
PC13

10.0.1.4  
PC-PT  
PC15

2960-24TT  
Switch12

2960-24TT  
Switch13

2960-24TT  
Switch14

2960-24TT  
Switch15

MESH TOPOLOGY

Time: 00:00:51

Scenario 0

New Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete

(Select a Device to Drag and Drop to the Workspace)

Realtime Simulation

## Lab 3: Router Configuration (Creating Passwords, Configuring Interfaces)

- **Procedure:**

1. **Open Packet Tracer:**

- Launch Cisco Packet Tracer on your computer.

2. **Create a Simple Network:**

- Drag a router and two computers onto the workspace.
- Connect each computer to the router using straight-through Ethernet cables.

3. **Access Router CLI:**

- Click on the router, go to the CLI tab.

4. **Set Up Passwords:**

- Enter global configuration mode: `enable, configure terminal`.
- Set the console password: `line console 0, password cisco, login`.
- Set the enable password: `enable password cisco`.
- Set the VTY password: `line vty 0 4, password cisco, login`.

5. **Configure Router Interfaces:**

- Go to interface configuration mode for the first interface: `interface gig0/0`.
- Assign an IP address: `ip address 192.168.1.1 255.255.255.0`.
- Enable the interface: `no shutdown`.
- Repeat for the second interface: `interface gig0/1, ip address 192.168.2.1 255.255.255.0, no shutdown`.

6. **Configure IP Addresses on Computers:**

- Assign IP address 192.168.1.2 and 192.168.2.2 to the first and second computer, respectively.

7. **Test Connectivity:**

- Use the `ping` command to test connectivity between the computers through the router.

# Output:

The screenshot displays a network simulation environment. On the left, a topology diagram shows a central 'Switch' connected to two 'PC-PT' devices (PC0 and PC1). A 'Router0' is connected to the switch. IP addresses are assigned to each device: Router0 (192.168.20.2), Switch (192.168.30.0), PC0 (192.168.30.2), and PC1 (192.168.30.3). A dashed line indicates a connection to a remote host with IP 192.168.20.0. On the right, the 'Router0' CLI window is open, showing the following configuration:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#enable secret cisco123
Router(config)#exit
Router#
$SYS-S-CONFIG_1: Configured from console by console
$0 run
Building configuration...

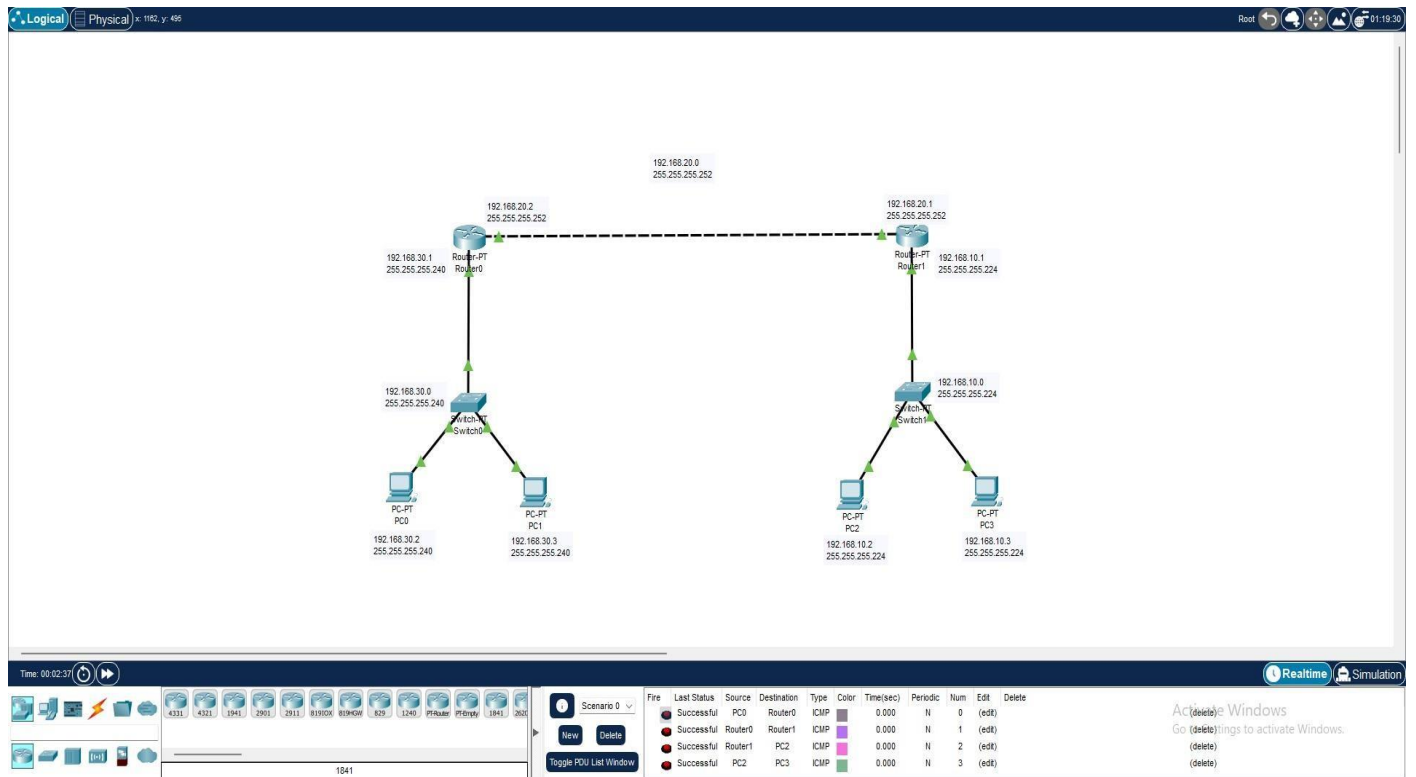
Current configuration : 807 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
enable secret 5 $1mE3Rr5t.aG247qBtKX0LusIfxa/
!
!
!
!
ip cef
no ip6 cef
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4
Router(config-line)#password cisco123
Router(config-line)#login
Router(config-line)#exit
Router(config)#exit
Router#
$SYS-S-CONFIG_1: Configured from console by console
Router#exit
```

The bottom of the interface shows a toolbar with various icons and a 'Scenario 0' dropdown menu.

This screenshot shows the same network simulation environment as the first, but with a different configuration in the 'Router0' CLI window. The topology and IP addresses remain the same. The CLI window now displays the following configuration:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip address 192.168.30.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#int fa1/0
Router(config-if)#ip address 192.168.20.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#^Z
Router#
$SYS-S-CONFIG_1: Configured from console by console
Router#
```

The bottom of the interface shows a toolbar with various icons and a 'Realtime' button.



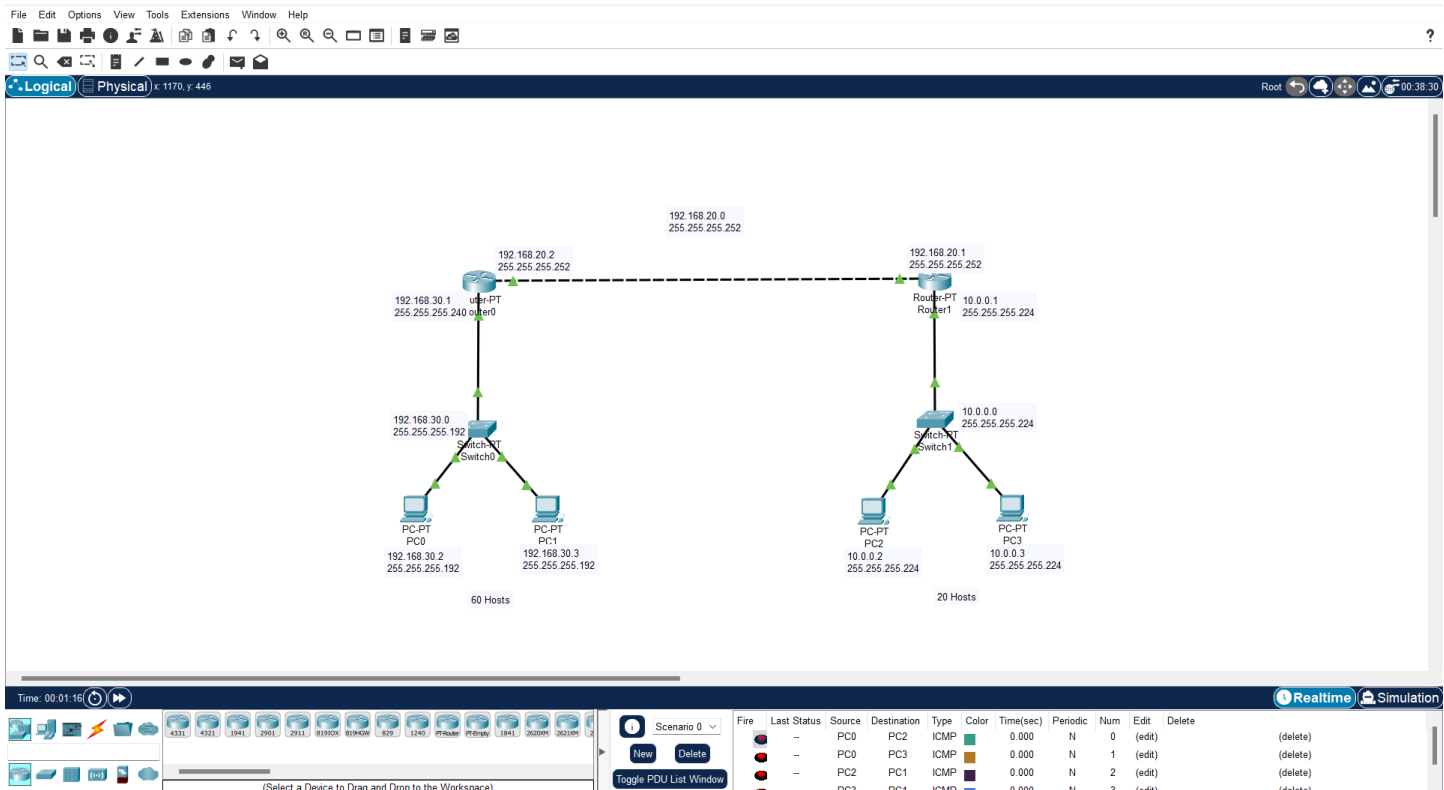


## Lab 4: IP Addressing and Subnetting (VLSM)

### • Procedure:

1. **Open Packet Tracer:**
  - Launch Cisco Packet Tracer on your computer.
2. **Design Network Topology:**
  - Create a network with three routers connected in a triangular fashion.
3. **Calculate Subnets Using VLSM:**
  - Determine the number of required subnets and host addresses.
  - Divide the network into subnets using VLSM.
4. **Assign IP Addresses:**
  - Configure the interfaces of each router with the calculated IP addresses.
  - Example:
    - Router 1 to Router 2: 192.168.1.0/30
    - Router 1 to Router 3: 192.168.1.4/30
    - Router 2 to Router 3: 192.168.1.8/30
5. **Configure Interfaces:**
  - Access the CLI of each router.
  - Configure the IP addresses on each interface.
6. **Test Connectivity:**
  - Use the `ping` command to test connectivity between the routers.

## Output:



FileEditOptionsViewToolsExtensionsWindowHelp

LogicalPhysical

72x1

192.168.30.1  
255.255.255.240  
Switch0

192.168.30.2  
255.255.255.252  
Router0

192.168.30.0  
255.255.255.192  
PC0  
192.168.30.2  
255.255.255.192  
PC1  
192.168.30.3  
255.255.255.192  
PC2  
192.168.30.4  
255.255.255.192  
PC3  
192.168.30.5  
255.255.255.192  
PC4

60 Hosts

192.168.20.1  
255.255.255.252  
Router1

192.168.20.0  
255.255.255.224  
Switch1

10.0.0.1  
255.255.255.224  
PC5  
10.0.0.2  
255.255.255.224  
PC6  
10.0.0.3  
255.255.255.224  
PC7  
10.0.0.4  
255.255.255.224  
PC8  
10.0.0.5  
255.255.255.224  
PC9

20 Hosts

Time: 00:04:02

Scenario 0

NewDelete

Toggle PDU List Window

433143213941290129113193281932815211240176481764811841262081262081

(Select a Device to Drag and Drop to the Workspace)

PC3

PhysicalConfigDesktopProgrammingAttributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0  
C:\>ping 192.168.30.2  
  
Pinging 192.168.30.2 with 32 bytes of data:  
Reply from 192.168.30.2: bytes=32 time=1ms TTL=126  
Reply from 192.168.30.2: bytes=32 time=1ms TTL=126  
Reply from 192.168.30.2: bytes=32 time=1ms TTL=126  
Reply from 192.168.30.2: bytes=32 time=1ms TTL=126  
  
Ping statistics for 192.168.30.2:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 0ms, Maximum = 0ms, Average = 0ms  
  
C:\>

Top

PC0	PC2	ICMP	0.000	N	0	(edit)	(delete)
PC0	PC3	ICMP	0.000	N	1	(edit)	(delete)
PC2	PC1	ICMP	0.000	N	2	(edit)	(delete)
PC3	PC1	ICMP	0.000	N	3	(edit)	(delete)

FileEditOptionsViewToolsExtensionsWindowHelp

LogicalPhysicalx 1443, y 1

```
graph LR
    R1[Router 1: 192.168.20.2] --- S1[Serial 1/0/0: 255.255.255.252]
    R2[Router 2: 192.168.20.1] --- S2[Serial 1/0/1: 255.255.255.252]
    S1 --- S2
    R1 --- S0[Switch0: 192.168.30.0]
    R2 --- S1[Switch1: 10.0.0.0]
    S0 --- PC0[PC0: 192.168.30.2]
    S0 --- PC1[PC1: 192.168.30.3]
    S1 --- PC2[PC2: 10.0.0.2]
    S1 --- PC3[PC3: 10.0.0.3]
```

Time: 00:04:37

Scenario 0

Toggle PDU List Window

(Select a Device to Drag and Drop to the Workspace)

PC0

PhysicalConfigDesktopProgrammingAttributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0  
C:\>ping 10.0.0.3  
  
Pinging 10.0.0.3 with 32 bytes of data:  
  
Request timed out.  
Reply from 10.0.0.3: bytes=32 time<1ms TTL=126  
Reply from 10.0.0.3: bytes=32 time=4ms TTL=126  
Reply from 10.0.0.3: bytes=32 time<1ms TTL=126  
  
Ping statistics for 10.0.0.3:  
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 0ms, Maximum = 4ms, Average = 1ms  
  
C:\>

Top

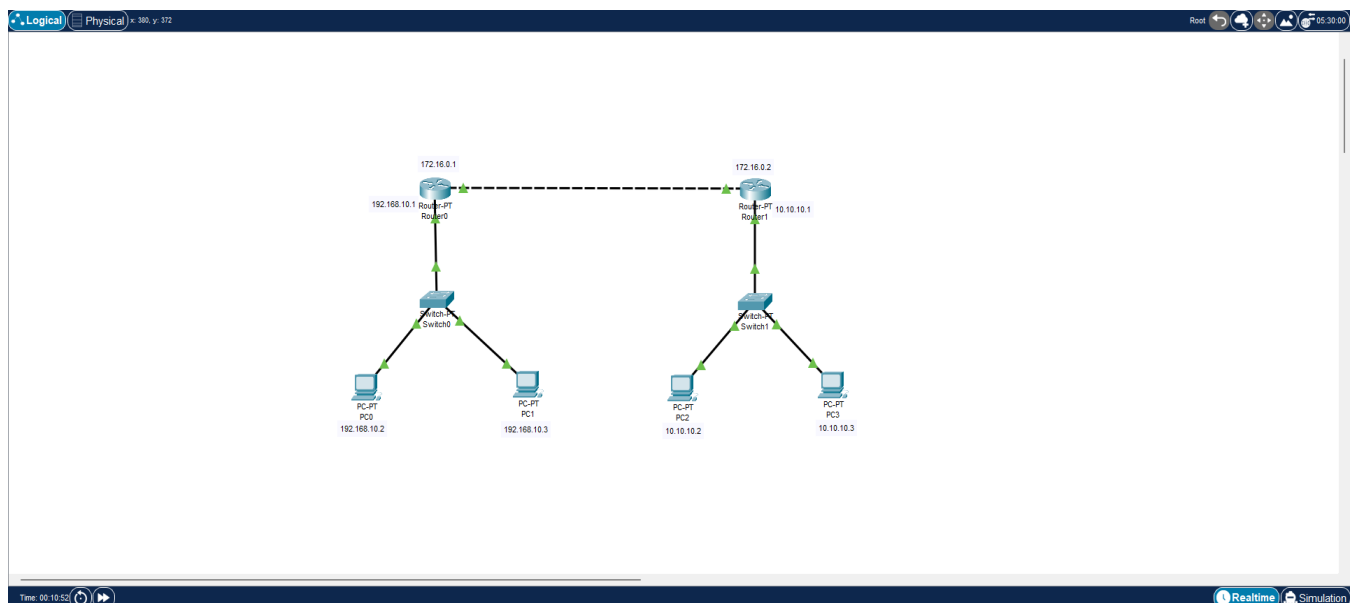
Fire	Last Status										
--	--	PC0	PC2	ICMP	0.000	N	0	(edit)	(delete)		
--	--	PC0	PC3	ICMP	0.000	N	1	(edit)	(delete)		
--	--	PC2	PC1	ICMP	0.000	N	2	(edit)	(delete)		
--	--	PC3	PC1	ICMP	0.000	N	3	(edit)	(delete)		

## Lab 5: Static and Default Routing

### • Procedure:

1. **Open Packet Tracer:**
  - Launch Cisco Packet Tracer on your computer.
2. **Create a Network:**
  - Drag required routers and computers onto the workspace.
  - Connect the routers using a serial connection.
  - Connect each computer to a router using Ethernet cables.
3. **Configure IP Addresses:**
  - Assign IP addresses to each interface on the routers and computers.
4. **Configure Static Routes:**
  - Example: On Router 1: `ip route 192.168.2.0 255.255.255.0 <Router 2Serial IP>`
  - Example: On Router 2: `ip route 192.168.1.0 255.255.255.0 <Router 1Serial IP>`
5. **Configure Default Route:**
  - Example: On Router 1: `ip route 0.0.0.0 0.0.0.0 <Router 2 SerialIP>`
  - Example: On Router 2: `ip route 0.0.0.0 0.0.0.0 <Router 1 SerialIP>`
6. **Test Connectivity:**
  - Use the `ping` command to test connectivity between the computers.

## Output:

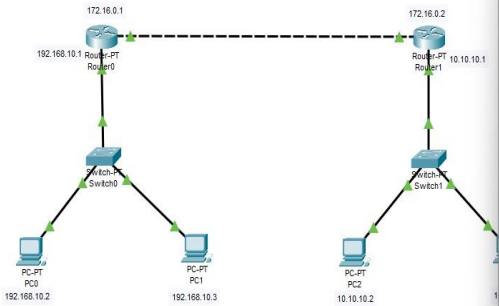


Logical Physical x: 1007, y: 400

Root

Time: 00:05:56

Realtime Simulation



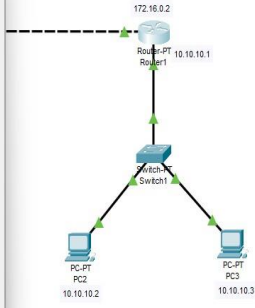
```
Router0
Router0#
Router0#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router0(config)#ip route 10.10.10.0 255.255.255.0 172.16.0.2
Router0(config)#exit
Router0#
%SYS-5-CONFIG_I: Configured from console by console
vr
Building configuration...
[OK]
Router0#
```

Logical Physical x: 25, y: 400

Root

Time: 00:08:58

Realtime Simulation



```
Router1
Router1#
Router1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#ip route 192.168.10.0 255.255.255.0 172.16.0.1
Router1(config)#exit
Router1#
%SYS-5-CONFIG_I: Configured from console by console
vr
Building configuration...
[OK]
Router1#
```

---

## Lab 6: NAT Configuration

- **Procedure:**

1. **Open Packet Tracer:**

- Launch Cisco Packet Tracer on your computer.

2. **Create a Network:**

- Drag a router, a switch, and two computers onto the workspace.
- Connect the computers to the switch and the switch to the router.

3. **Configure IP Addresses:**

- Assign private IP addresses to the computers.
- Assign a public IP address to the router's external interface.

4. **Configure NAT:**

- Access the router's CLI.
- Define an access list to match the private IP addresses: `access-list 1 permit 192.168.1.0 0.0.0.255.`
- Configure NAT overload: `ip nat inside source list 1 interface <external interface> overload.`
- Designate interfaces as inside or outside: `interface <internal interface>, ip nat inside; interface <external interface>, ip nat outside.`

5. **Test Connectivity:**

- Use the `ping` command to test connectivity from the internal network to an external network.

## Output:

