

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).

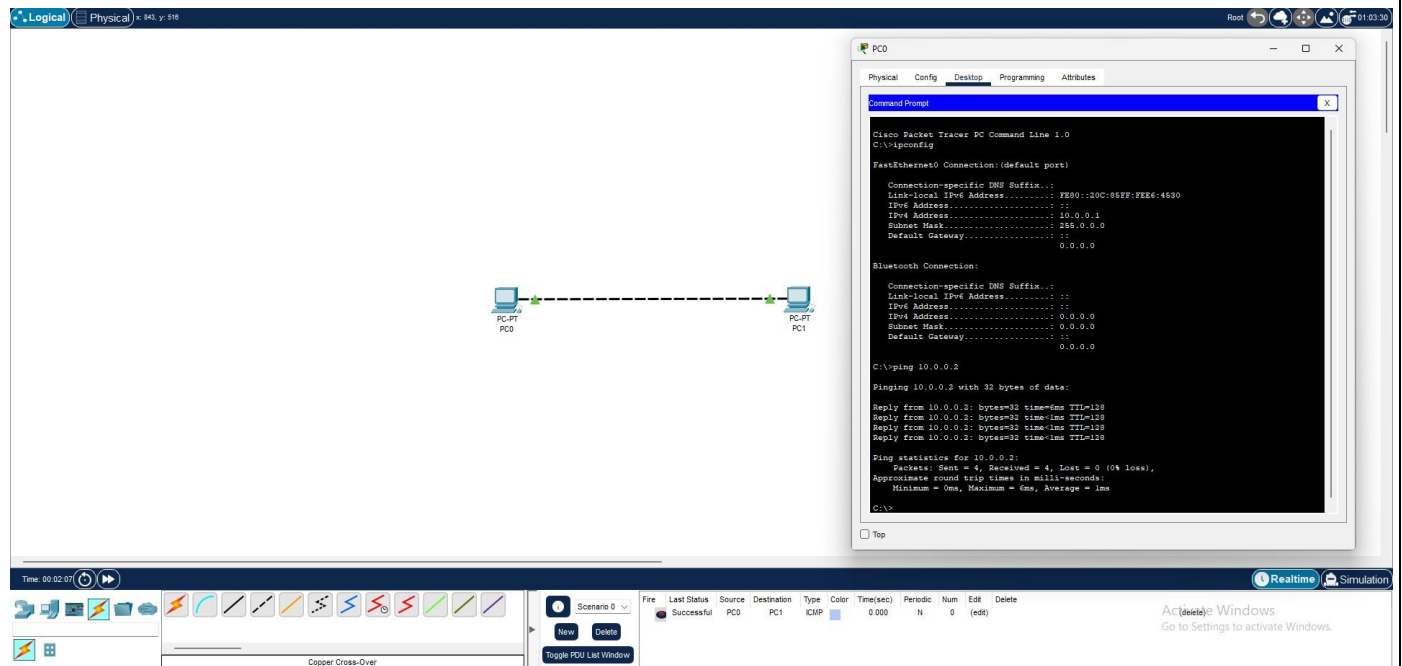
- 4. Test Peer-to-Peer Communication:**

- 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:



The screenshot shows the Cisco Packet Tracer interface. The main workspace displays a network diagram with two PCs, PC0 and PC1, connected by a dashed line representing a network connection. The interface includes a top menu bar with 'Logical' and 'Physical' tabs, and a bottom toolbar with various simulation controls. A command prompt window is open on PC0, showing the following output:

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

FastEthernet0 Connection: (default port)

Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: FE80::20C:86FF:FE86:4530
IPv6 Address. . . . .: ::
IPv4 Address. . . . .: 10.0.0.1
Subnet Mask . . . . .: 255.0.0.0
Default Gateway . . . . .: ::

Bluetooth Connection:

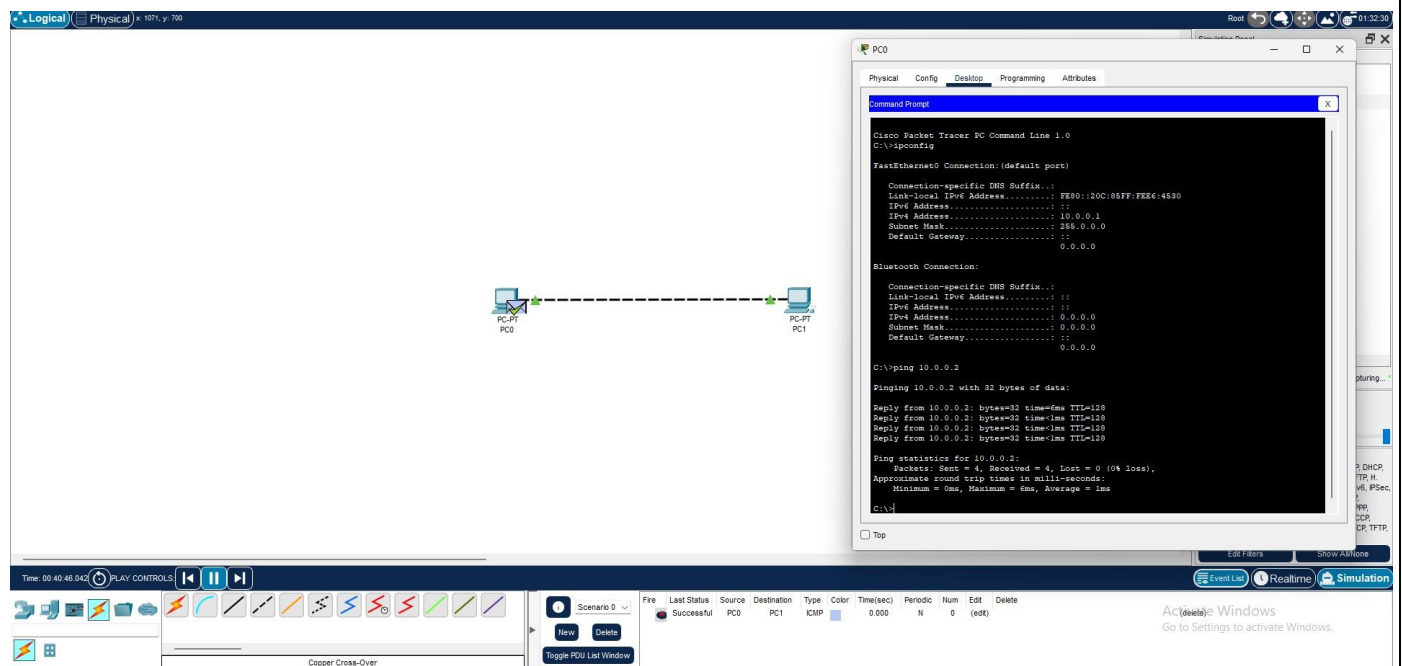
Connection-specific DNS Suffix...:
Link-local IPv6 Address . . . . .: ::
IPv6 Address. . . . .: ::
IPv4 Address. . . . .: 0.0.0.0
Subnet Mask . . . . .: 0.0.0.0
Default Gateway . . . . .: ::

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:
Reply from 10.0.0.2: bytes=32 time=6ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 6ms, Average = 1ms

C:\>
```



This screenshot shows the same Cisco Packet Tracer interface as the first one, but with a different time displayed in the top right corner (01:32:30). The network diagram and command prompt output are identical. The bottom toolbar now includes a 'PLAY CONTROLS' section with buttons for 'Time', '00:40:46.042', 'PLAY CONTROLS', and 'PAUSE'. The command prompt window on PC0 shows the same output as the first screenshot.

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 mesh-like structure with five PCs (PC7, PC9, PC8, PC4, PC5) connected to five 2960 24TT switches (Switch4, Switch5, Switch6, Switch7, Switch8). 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:

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

Logical Physical x: 302, 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::205:5EFF:FEBC:3D80
IPv6 Address...: ::
IPv6 Address...: ::
Subnet Mask...: 255.0.0.0
Default Gateway...: ::

Bluetooth Connection:

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

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
2950-24TT 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
2950-24TT Switch12
2950-24TT Switch13
2950-24TT Switch14
2950-24TT Switch15

Time: 00:56:10

Scenario 0

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

Successful PC3 PC1 ICMP 0.000 N 0 (edit)

Activate Windows
Go to Settings to activate Windows.

Logical Physical x: 041, y: 993

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:FECL:D395
IPv6 Address...: ::
IPv6 Address...: ::
Subnet Mask...: 255.0.0.0
Default Gateway...: ::

Bluetooth Connection:

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

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:
Reply from 10.1.1.4: bytes=32 time=1ms TTL=128
Reply from 10.1.1.4: bytes=32 time=1ms TTL=128
Reply from 10.1.1.4: bytes=32 time=1ms TTL=128
Reply from 10.1.1.4: bytes=32 time=1ms TTL=128

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

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
2950-24TT Switch4
2950-24TT Switch5
2950-24TT Switch6
2950-24TT Switch7

RING TOPOLOGY

Time: 00:58:04

Scenario 0

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

Successful PC8 PC3 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

2960-24TT
Switch12

2960-24TT
Switch13

10.0.1.2
PC-PT
PC14

2960-24TT
Switch14

2960-24TT
Switch15

10.0.1.3
PC-PT
PC13

10.0.1.4
PC-PT
PC15

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 shows a network diagram in Packet Tracer. A central switch is connected to two PCs (PC0 and PC1) and a router (Router0). The router is connected to a cloud representing the Internet. The IP addresses are as follows:

- Router0: 192.168.20.2 (G0/0/0), 255.255.255.252
- Switch: 192.168.30.0 (G0/0/0), 255.255.255.240
- PC0: 192.168.30.2, 255.255.255.240
- PC1: 192.168.30.3, 255.255.255.240
- Internet: 192.168.20.0, 255.255.255.252

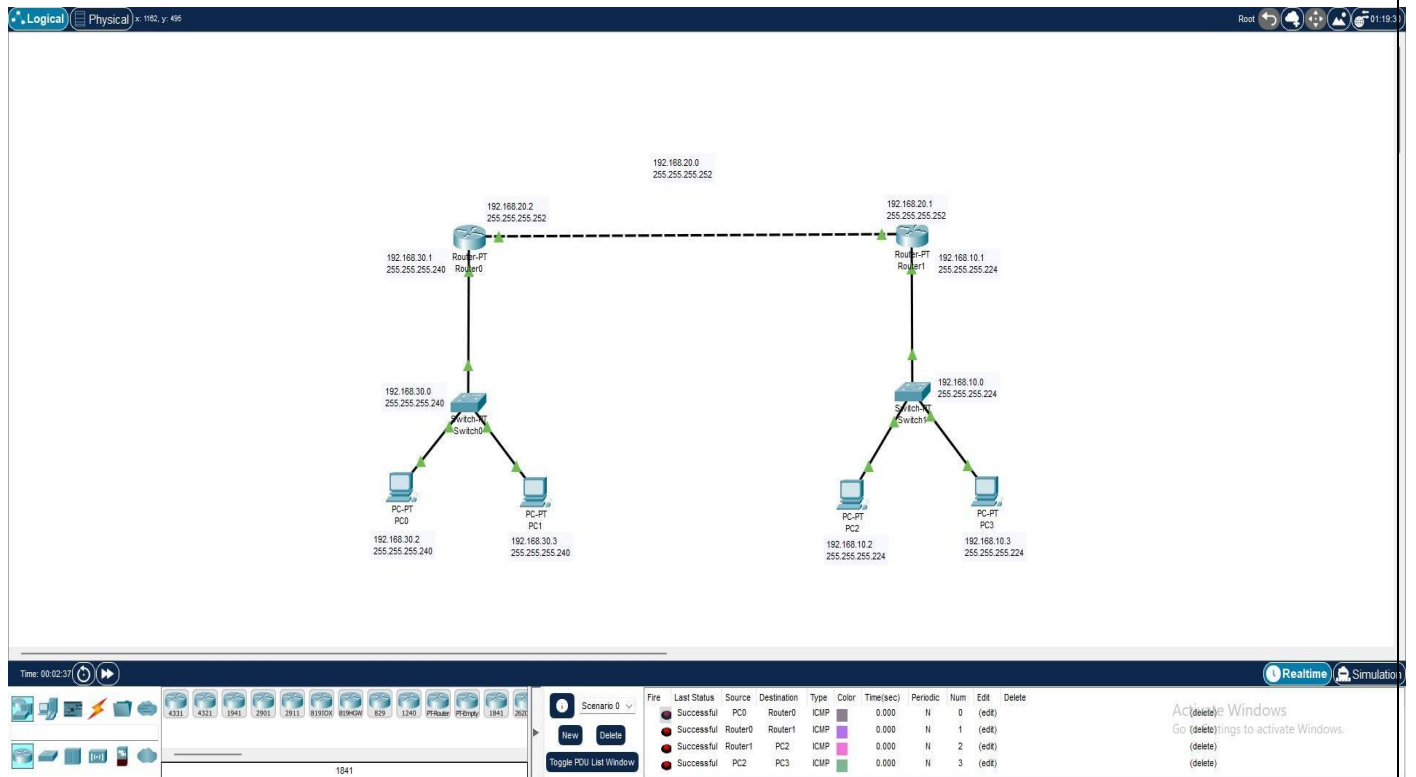
The CLI of Router0 shows the following configuration:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#enable secret cisco123
Router(config)#exit
Router#
$SYS-$-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.aG47qBtKX0G0lus1fxa/
!
!
!
!
ip cef
no ip6 cef
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4 cisco 123
* Invalid input detected at '^' marker.
Router(config)#line vty 0 4
Router(config-line)#password cisco123
Router(config-line)#login
Router(config-line)#exit
Router(config)#exit
Router#
$SYS-$-CONFIG_1: Configured from console by console
Router#exit
```

The screenshot shows the same network diagram as the previous one. The CLI of Router0 shows 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 192.168.20.1 255.255.255.0
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)#2
Router#
$SYS-$-CONFIG_1: Configured from console by console
Router#
```

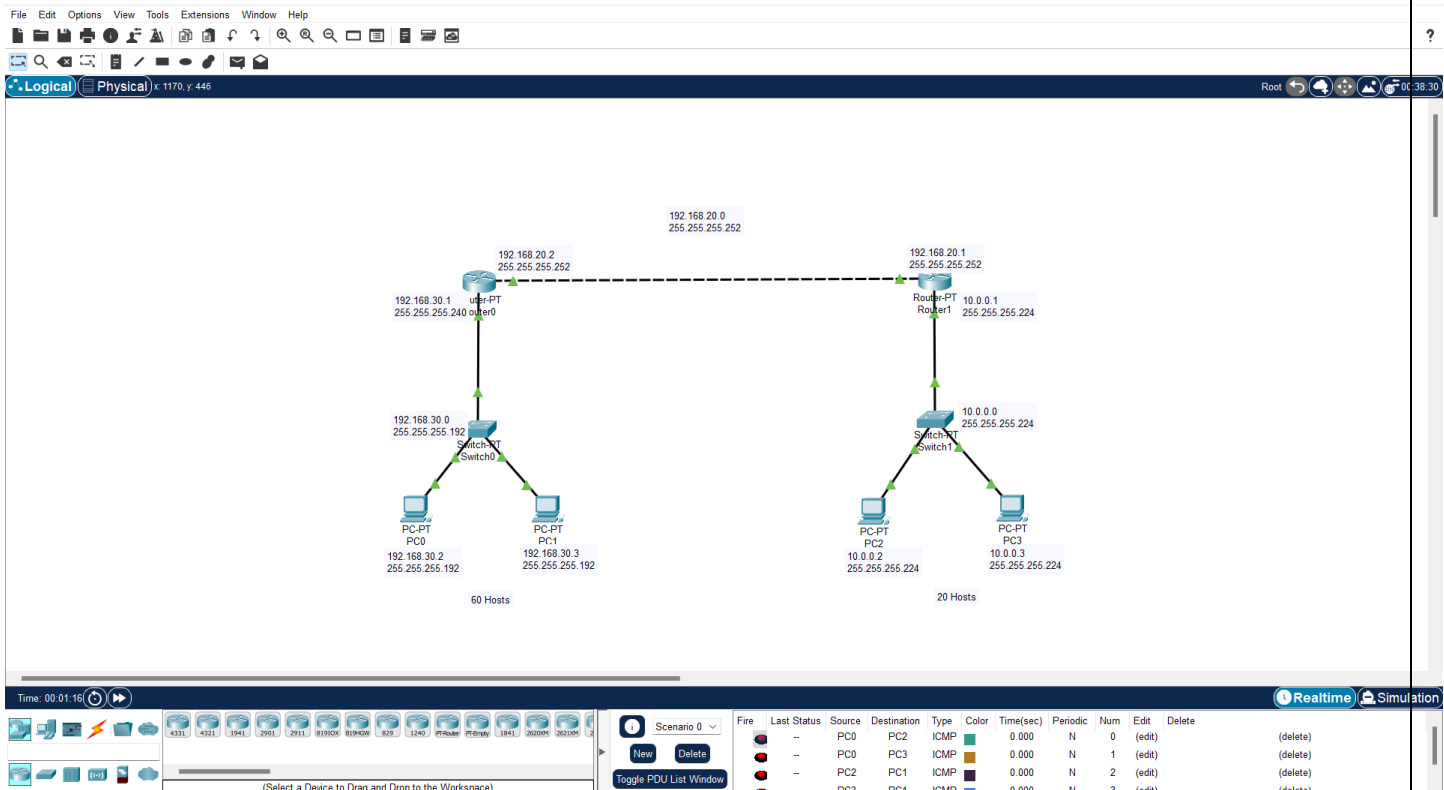


Lab 4: IP Addressing and Subnetting (VLSM)

• 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:



File Edit Options View Tools Extensions Window Help

Logical Physical x72, y1

Time: 00:04:02

Scenario 0

Fire Last Status

Device	Interface	Protocol	Source	Destination	Count	Loss	Time	Loss	Time
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)		

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

PC3

Physical Config Desktop Programming Attributes

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:\>
```

File Edit Options View Tools Extensions Window Help

Logical Physical x1443, y1

Time: 00:04:37

Scenario 0

Fire Last Status

Device	Interface	Protocol	Source	Destination	Count	Loss	Time	Loss	Time
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)		

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

PC0

Physical Config Desktop Programming Attributes

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<1ms 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 = 1ms, Average = 1ms

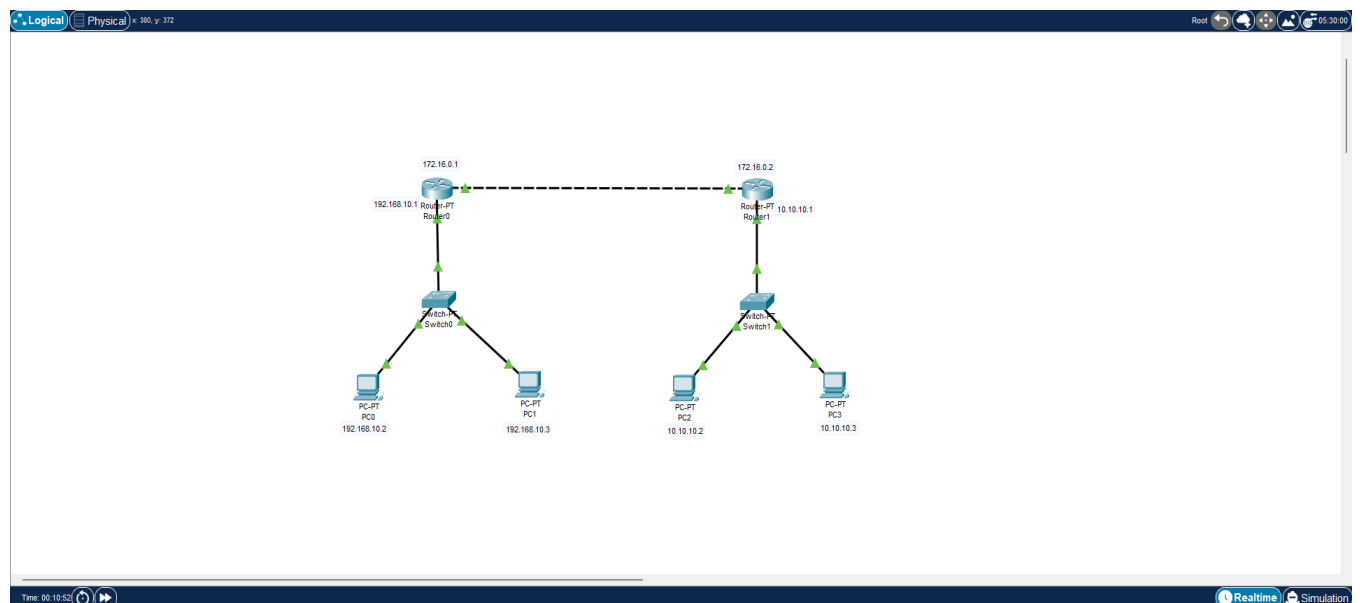
C:\>
```

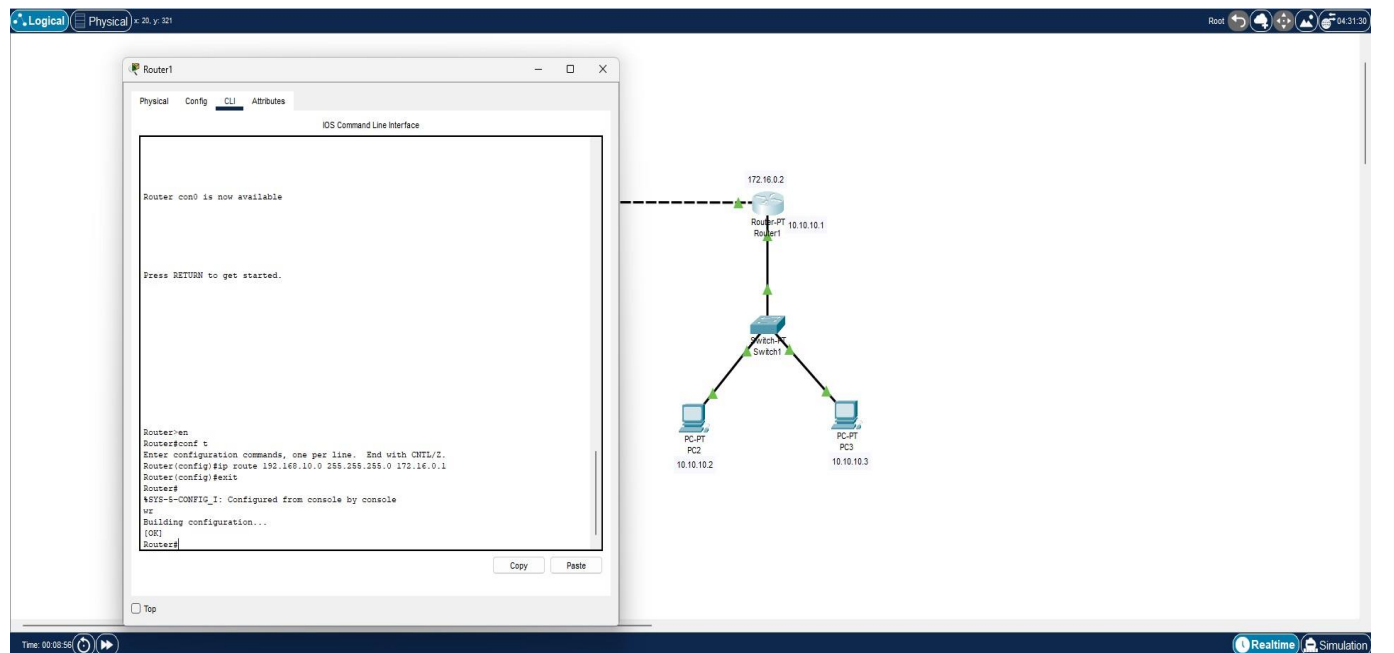
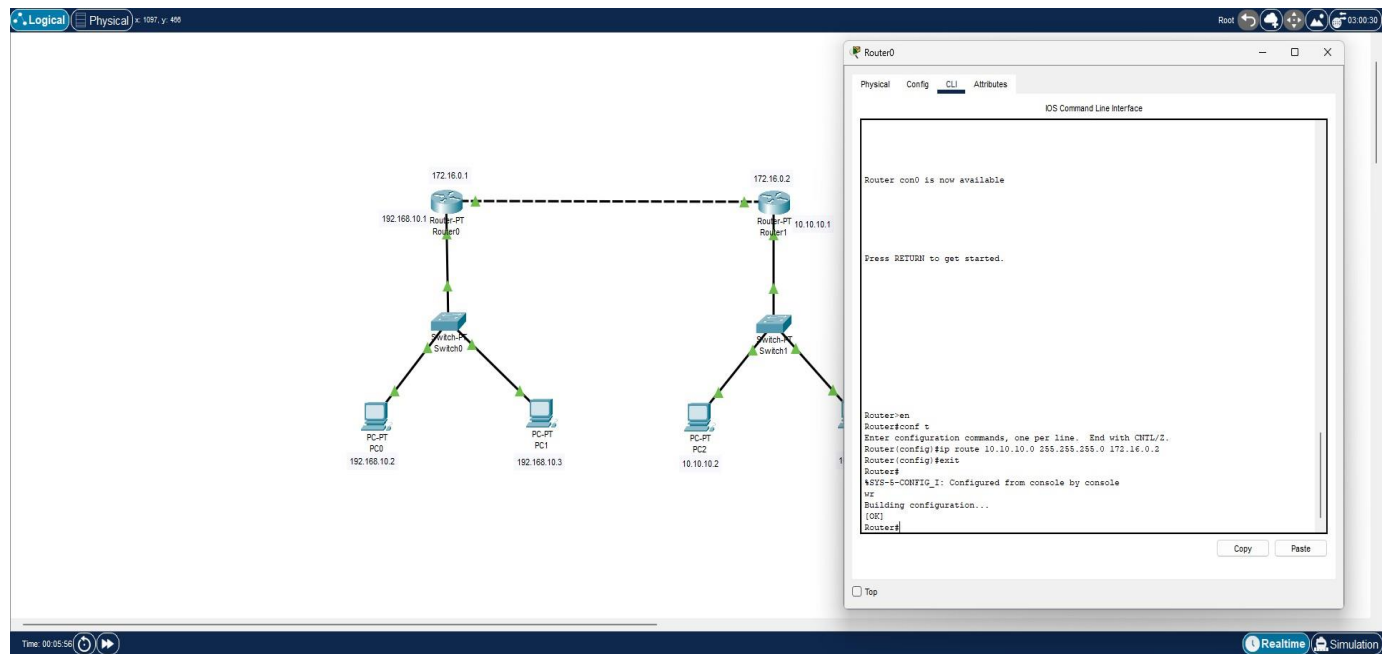
Lab 5: Static and Default Routing

• 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:





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:

