UNIVERSITY OF DELHI

Ramanujan College

DSC 12 : Computer Network

Semester-04

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I would like to take this opportunity to acknowledge everyone who has helped us in every stage of this project.

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Practical 1 : To Study Basic Network Command And Network Configuration Commands

1.netstat

```
C:\Users\user>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49680        kubernetes:49681       ESTABLISHED
  TCP    127.0.0.1:49681        kubernetes:49680       ESTABLISHED
  TCP    127.0.0.1:49682        kubernetes:49683       ESTABLISHED
  TCP    127.0.0.1:49683        kubernetes:49682       ESTABLISHED
  TCP    127.0.0.1:49749        kubernetes:49752       ESTABLISHED
  TCP    127.0.0.1:49750        kubernetes:54982       ESTABLISHED
  TCP    127.0.0.1:49752        kubernetes:49749       ESTABLISHED
  TCP    127.0.0.1:49754        kubernetes:49756       ESTABLISHED
  TCP    127.0.0.1:49756        kubernetes:49754       ESTABLISHED
  TCP    127.0.0.1:54942        kubernetes:49750       TIME_WAIT
  TCP    127.0.0.1:54955        kubernetes:49750       TIME_WAIT
  TCP    127.0.0.1:54966        kubernetes:49750       TIME_WAIT
  TCP    127.0.0.1:54967        kubernetes:49750       TIME_WAIT
  TCP    127.0.0.1:54982        kubernetes:49750       ESTABLISHED
  TCP    [::1]:49763            RATNESH-KUMAR:50051    ESTABLISHED
^C
C:\Users\user>netstat -h

Displays protocol statistics and current TCP/IP network connections.

NETSTAT [-a] [-b] [-e] [-f] [-n] [-o] [-p proto] [-r] [-s] [-t] [-x] [-y] [interval]

  -a            Displays all connections and listening ports.
  -b            Displays the executable involved in creating each connection or
                listening port. In some cases well-known executables host
                multiple independent components, and in these cases the
                sequence of components involved in creating the connection
                or listening port is displayed. In this case the executable
                name is in [] at the bottom, on top is the component it called,
                and so forth until TCP/IP was reached. Note that this option
                can be time-consuming and will fail unless you have sufficient
                permissions.
  -e            Displays Ethernet statistics. This may be combined with the -s
                option.
  -f            Displays Fully Qualified Domain Names (FQDN) for foreign
                addresses.
  -n            Displays addresses and port numbers in numerical form.
```

2.nslookup

```
C:\Users\user>nslookup google.com
Server:  UnKnown
Address:  192.168.66.177

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4002:826::200e
          142.250.195.14
```

3.ping

```
C:\Users\user>ping www.google.com

Pinging www.google.com [2404:6800:4002:81c::2004] with 32 bytes of data:
Reply from 2404:6800:4002:81c::2004: time=25ms
Reply from 2404:6800:4002:81c::2004: time=46ms
Reply from 2404:6800:4002:81c::2004: time=54ms
Reply from 2404:6800:4002:81c::2004: time=56ms

Ping statistics for 2404:6800:4002:81c::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 25ms, Maximum = 56ms, Average = 45ms
```

4.route

```
C:\Users\user>route print
===========================================================================
Interface List
 19...e4 b3 18 b6 49 f1 ......Microsoft Wi-Fi Direct Virtual Adapter #3
  9...e6 b3 18 b6 49 f0 ......Microsoft Wi-Fi Direct Virtual Adapter #4
  5...a0 8c fd a2 fd 89 ......Intel(R) Ethernet Connection I219-V
 11...e4 b3 18 b6 49 f0 ......Intel(R) Dual Band Wireless-AC 8260
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0    192.168.66.177    192.168.66.158      55
        127.0.0.0        255.0.0.0         On-link         127.0.0.1     331
        127.0.0.1  255.255.255.255         On-link         127.0.0.1     331
  127.255.255.255  255.255.255.255         On-link         127.0.0.1     331
      169.254.0.0      255.255.0.0         On-link     169.254.22.148     291
   169.254.22.148  255.255.255.255         On-link     169.254.22.148     291
  169.254.255.255  255.255.255.255         On-link     169.254.22.148     291
     192.168.66.0    255.255.255.0         On-link     192.168.66.158     311
   192.168.66.158  255.255.255.255         On-link     192.168.66.158     311
   192.168.66.255  255.255.255.255         On-link     192.168.66.158     311
        224.0.0.0        240.0.0.0         On-link         127.0.0.1     331
        224.0.0.0        240.0.0.0         On-link     169.254.22.148     291
        224.0.0.0        240.0.0.0         On-link     192.168.66.158     311
  255.255.255.255  255.255.255.255         On-link         127.0.0.1     331
  255.255.255.255  255.255.255.255         On-link     169.254.22.148     291
  255.255.255.255  255.255.255.255         On-link     192.168.66.158     311
===========================================================================
Persistent Routes:
  None
```

5.arp

```
C:\Users\user>arp -a

Interface: 169.254.22.148 --- 0x5
  Internet Address      Physical Address      Type
  169.254.255.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.66.158 --- 0xb
  Internet Address      Physical Address      Type
  192.168.66.177        22-04-02-25-aa-fc     dynamic
  192.168.66.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

6.tracert

```
C:\Users\user>tracert google.com

Tracing route to google.com [2404:6800:4002:82d::200e]
over a maximum of 30 hops:

  1     2 ms     3 ms     1 ms  2409:40d0:12d2:b44a::ff
  2    43 ms    36 ms    32 ms  2405:200:5202:28:3924:110:3:207
  3    54 ms    58 ms   102 ms  2405:200:5202:28:3925::ff02
  4     *        *        *     Request timed out.
```

7.hostname

```
C:\Users\user>hostname
RATNESH-KUMAR
```

8.ipconfig

```
C:\Users\user>ipconfig

Windows IP Configuration


Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::85b9:5fb3:f9c8:773d%5
   Autoconfiguration IPv4 Address. . : 169.254.22.148
   Subnet Mask . . . . . . . . . . . : 255.255.0.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2409:40d0:12d2:b44a:a9fb:460b:74a1:4585
   Temporary IPv6 Address. . . . . . : 2409:40d0:12d2:b44a:90df:76eb:e0bf:42a6
   Link-local IPv6 Address . . . . . : fe80::a6c7:f18c:5de4:912f%11
   IPv4 Address. . . . . . . . . . . : 192.168.66.158
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::2004:2ff:fe25:aafc%11
                                       192.168.66.177
```

9.systeminfo

```
C:\Users\user>systeminfo

Host Name:                 RATNESH-KUMAR
OS Name:                   Microsoft Windows 10 Pro
OS Version:                10.0.19045 N/A Build 19045
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          user
Registered Organization:
Product ID:                00331-10000-00001-AA293
Original Install Date:     09-03-2024, 08:57:15 PM
System Boot Time:          03-05-2025, 09:57:51 AM
System Manufacturer:       HP
System Model:              HP EliteBook 850 G3
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 78 Stepping 3 GenuineIntel ~2300 Mhz
BIOS Version:              HP N75 Ver. 01.18, 17-10-2017
Windows Directory:         C:\WINDOWS
System Directory:          C:\WINDOWS\system32
Boot Device:               \Device\HarddiskVolume2
System Locale:             en-us;English (United States)
Input Locale:              00004009
Time Zone:                 (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:     8,073 MB
Available Physical Memory: 2,992 MB
Virtual Memory: Max Size:  12,937 MB
Virtual Memory: Available: 5,185 MB
Virtual Memory: In Use:    7,752 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\RATNESH-KUMAR
Hotfix(s):                 19 Hotfix(s) Installed.
```

10.telnet

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.1.3
Trying 192.168.1.3 ...Open


User Access Verification

Username:
```

Practical 2 : To Study And Perform PC To PC Communication Using Ethernet.

Objective:

- **To connect two PCs and ensure they can communicate using IP addresses.**

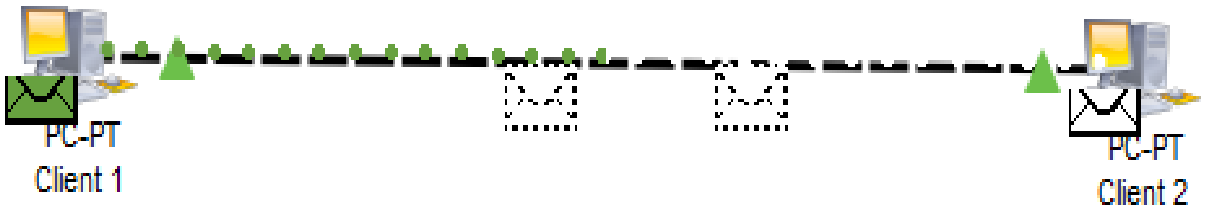
Requirements:

- **Two PCs**

Procedure:

Step 1 : Drag **two PCs** onto the workspace.
Step 2 : Use a **Copper Cross-Over Cable** to connect them.
Step 3 : Click on each PC:
- Desktop > IP Configuration.
- Assign IPs like 192.168.1.1 and 192.168.1.2 with subnet mask 255.255.255.0.

Step 4 : Open **Command Prompt** and ping the other PC to check communication.



Practical 3 : To Create Star Topology Using Hub And Switch.

Objective:

- **To create Star topology using Hub and Switch**

Requirements:

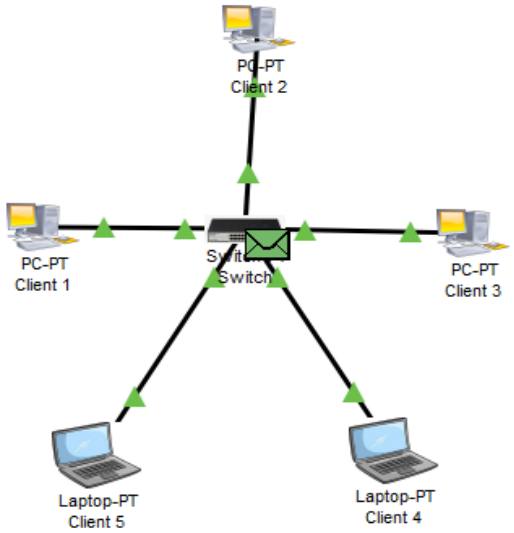
- **PCs (3 or more)**
- **Hub/Switch**

Procedure:

Step 1 : Drag the required number of PCs onto the workspace.
Step 2 : Add a Hub and/or Switch to the center of the topology.
Step 3 : Use Copper Straight-Through Cables to connect each PC to the Hub/Switch.
Step 4 : Assign IP addresses to each PC (e.g., 192.168.1.x) using:

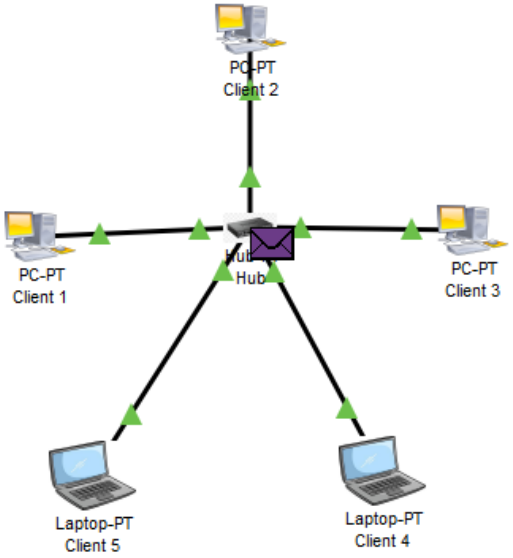
- Desktop > IP Configuration.

Step 5 : Ping between PCs to verify connectivity.



Star Topology Using Switch

Star Topology Using Hub



Practical 4 : To Create Bus, Ring, Tree, Hybrid, Mesh Topologies.

Objective:

- To create Bus, Ring, Tree, Hybrid, and Mesh topologies

Requirements:

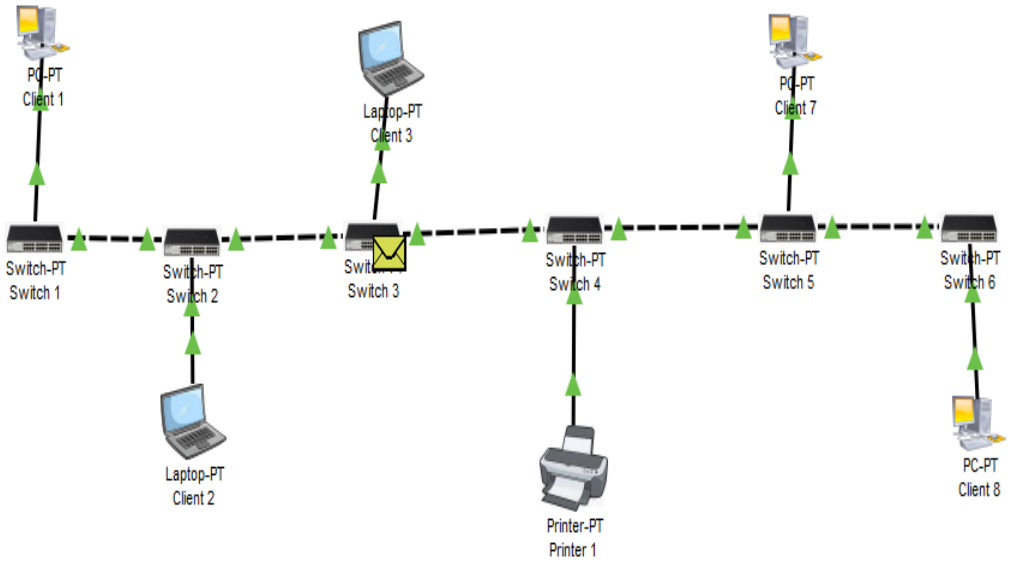
- Multiple PCs
- Appropriate networking devices (Hubs, Switches, Routers)
- Copper Cables
- Cisco Packet Tracer

Procedure:

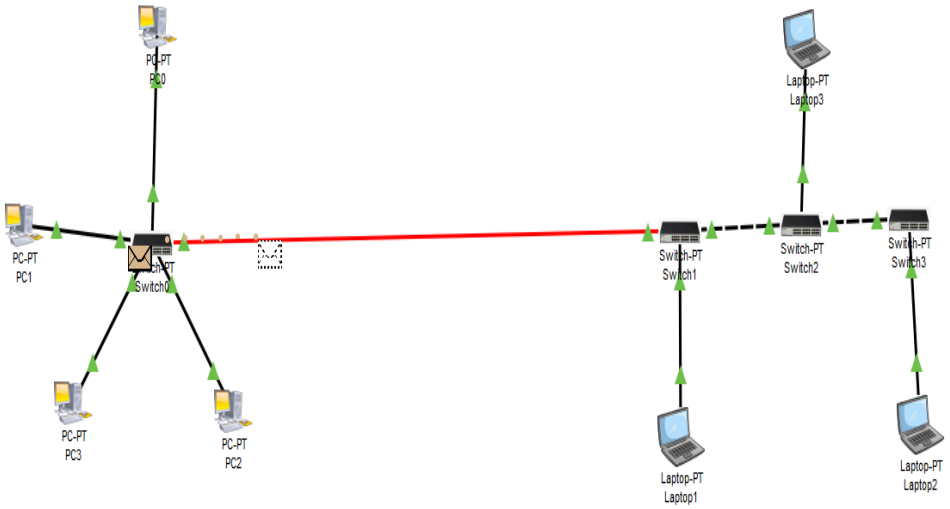
Step 1: Drag the required devices (PCs, Switches, Routers) onto the workspace.
Step 2: Connect the devices using appropriate cables (Copper Straight-Through or Copper Cross-Over).
Step 3: Arrange the devices to create different topologies:

- **Bus:** Connect all devices to a single backbone cable.
- **Ring:** Connect devices in a circular loop.
- **Tree:** Connect multiple switches in a hierarchical fashion.
- **Hybrid:** Combine two or more topologies to form a hybrid structure.
- **Mesh:** Connect every device to every other device.

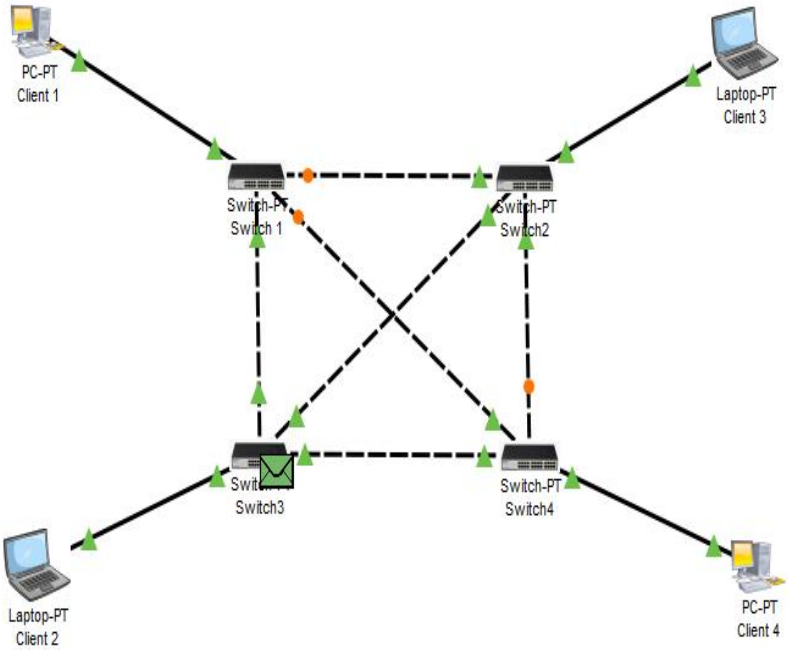
Step 4: Configure IP addresses on each device in the network and verify communication.



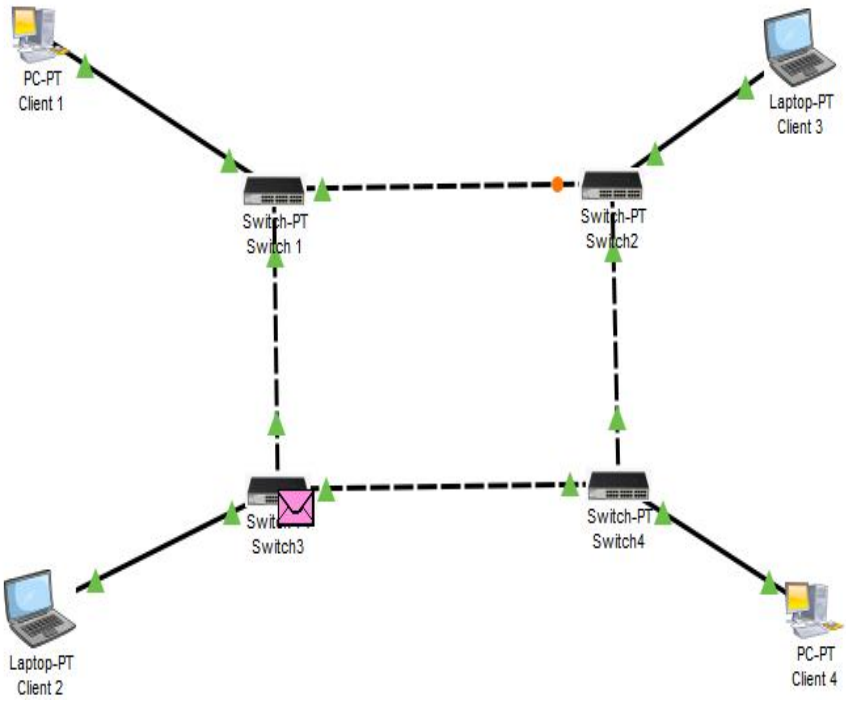
Bus Topology



Hybrid Topology



Bus Topology



Ring Topology

Practical 5 : Perform An Initial Switch Configuration.

Objective:

- To perform basic initial configuration of a Cisco switch.

Requirements:

- Switch
- Multiple PCs
- Copper Cables
- Cisco Packet Tracer

Procedure:

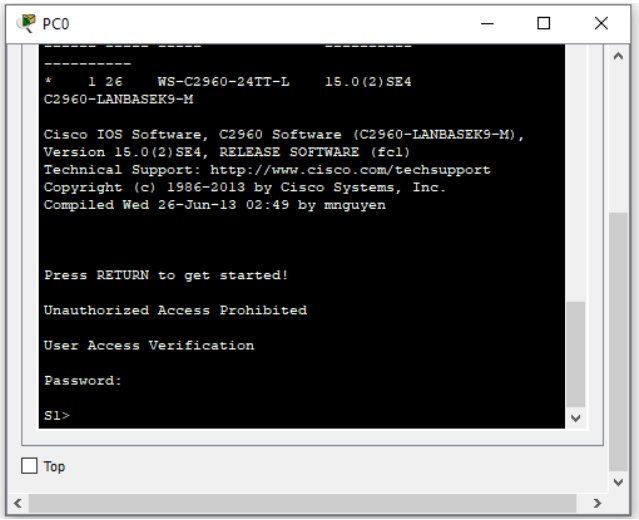
1. **Drag a Switch** onto the workspace.
2. **Connect PCs** to the Switch using Copper Straight-Through cables.
3. **Access the Switch CLI** and configure the basic settings:

```
Switch> enable
Switch# configure terminal
Switch(config)# hostname S1
S1(config)# enable secret class123
S1(config)# line console 0
S1(config-line)# password cisco
S1(config-line)# login
S1(config-line)# exit
S1(config)# line vty 0 15
S1(config-line)# password cisco
S1(config-line)# login
S1(config-line)# exit
S1(config)# banner motd #Unauthorized Access Prohibited#
S1(config)# interface vlan 1
S1(config-if)# ip address 192.168.1.2 255.255.255.0
S1(config-if)# no shutdown
S1(config-if)# exit
S1(config)# exit
```

4. **Save the configuration**:

```
S1# copy running-config startup-config
```

5. **Test connectivity** by pinging from a PC to the Switch's IP address.



Practical 6 : Perform An Initial Router Configuration.

Objective:

- To configure a basic Cisco router with an interface IP address and enable the interface.

Requirements:

- Router
- Switch
- PC
- Copper Cables
- Cisco Packet Tracer

Procedure:

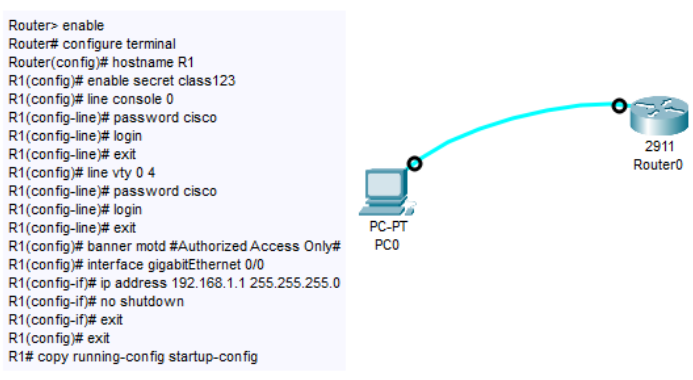
1. **Drag a Router** onto the workspace.
2. **Connect the Router** to a Switch and PC using Copper Straight-Through cables.
3. **Access the Router CLI** and perform the configuration:

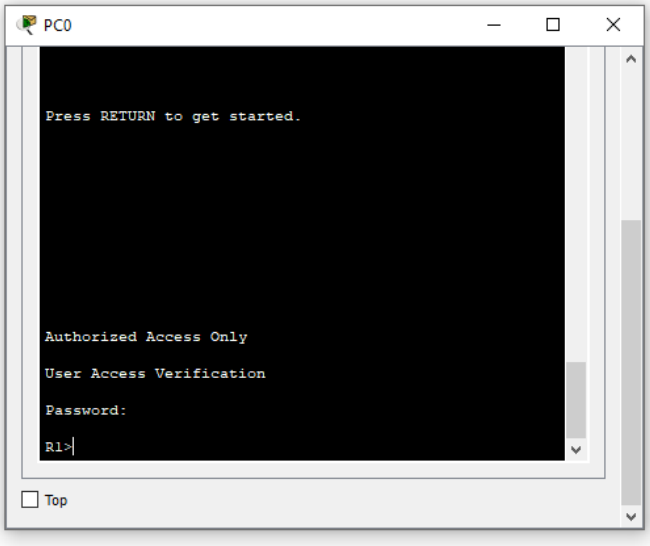
```
Router> enable
Router# configure terminal
Router(config)# hostname R1
R1(config)# enable secret class123
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# exit
R1(config)# line vty 0 15
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# exit
R1(config)# banner motd #Authorized Access Only#
R1(config)# interface gigabitEthernet 0/0
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# exit
```

4. **Save the configuration**:

```
S1# copy running-config startup-config
```

5. **Test connectivity** by pinging from a PC to the Router's IP address.





Practical 7 : To Implement Client Server Network.

Objective:

- To set up a client-server network and ensure communication between a client PC and a server.

Requirements:

- Multiple PCs
- Server
- Switch
- Copper Cables
- Cisco Packet Tracer

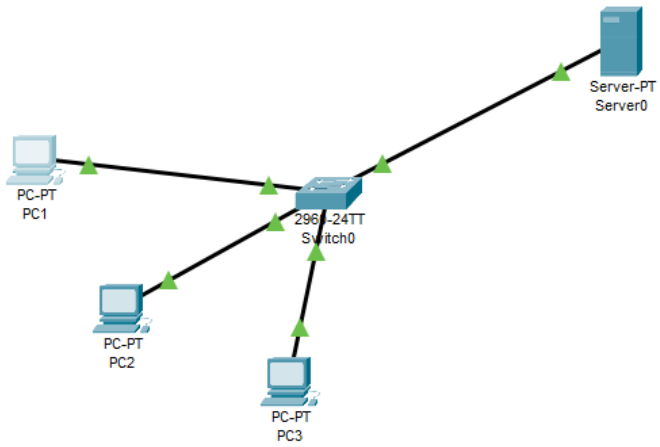
Procedure:

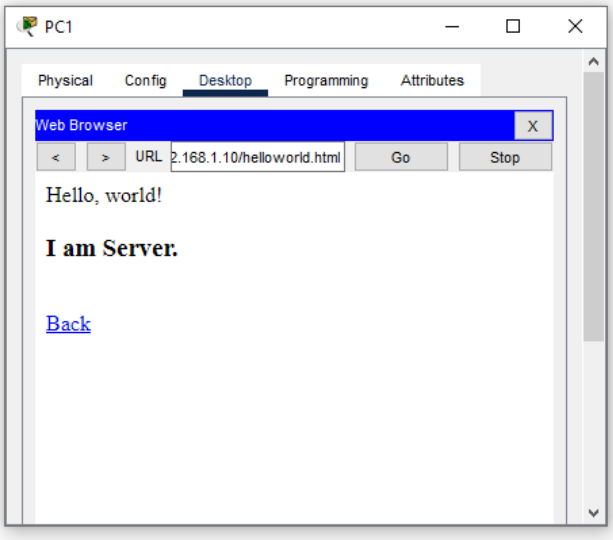
1. **Drag two PCs and a Server** onto the workspace.
2. **Connect devices** using Copper Straight-Through cables to a Switch.
3. **Configure static IP addresses** on the Client and Server:
   - For the Client:
     ```
     1. PC1: IP = 192.168.1.11, Mask = 255.255.255.0
     2. PC2: IP = 192.168.1.12, Mask = 255.255.255.0
     3. PC3: IP = 192.168.1.13, Mask = 255.255.255.0
     ```
   - For the Server:

     ```
     IP Address: 192.168.1.10
     Subnet Mask: 255.255.255.0
     ```

4. **Test communication** by pinging the Server from the Client:

   ```
   ping 192.168.1.10
   ```





Practical 8 : To Implement Connection Between Devices Using Router.

Objective:

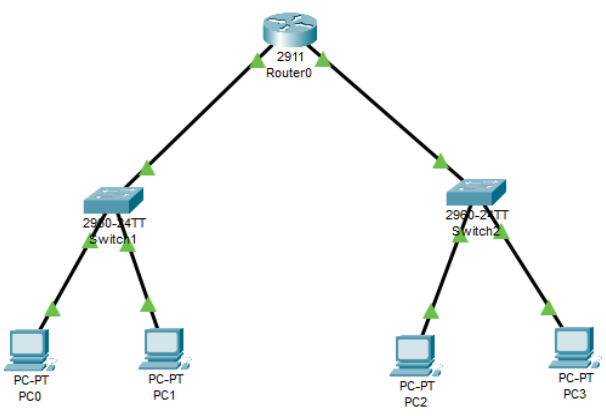
- To configure a router to enable communication between devices on different networks.

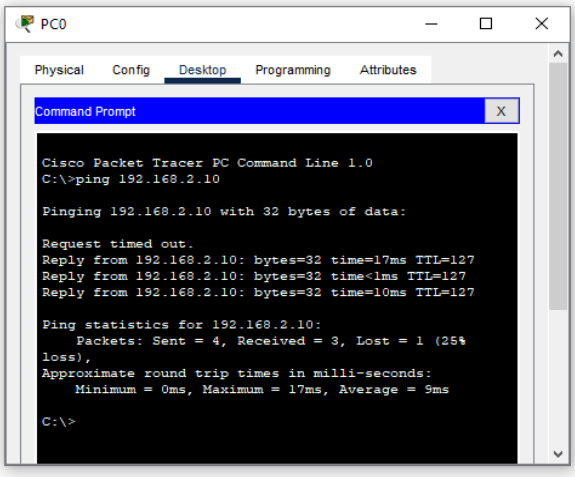
Requirements:

- Routers
- Switch
- Multiple PCs
- Serial cables
- Copper Cables
- Cisco Packet Tracer

Procedure:

1. **Drag two Routers** onto the workspace and connect them using Serial cables.
2. **Connect PCs** to the Routers using Copper Straight-Through cables.
3. **Configure Router interfaces** with IP addresses and enable them:
    - For Router1 (`gigabitEthernet 0/0`):
      ```
      Router(config)# interface g0/0
      Router(config-if)# ip address 192.168.1.1 255.255.255.0
      Router(config-if)# no shutdown
      Router(config-if)# exit
      ```
    - For Router2 (`gigabitEthernet 0/1`):
      ```
      Router(config)# interface g0/1
      Router(config-if)# ip address 192.168.2.1 255.255.255.0
      Router(config-if)# no shutdown
      Router(config-if)# exit
      ```
4. **Set up IP Address** between PCs:
    - Configure Network 1 PCs:
        1. `PC0: 192.168.1.10, Gateway: 192.168.1.1`
        2. `PC1: 192.168.1.11, Gateway: 192.168.1.1`
    - Configure Network 2 PCs:
        1. `PC2: 192.168.2.10, Gateway: 192.168.2.1`
        2. `PC3: 192.168.2.11, Gateway: 192.168.2.1`
5. **Test communication** by pinging a PC in Router1's network from Router2's network.





Practical 9 : To Perform Remote Desktop Sharing Within LAN Connection.

Objective:

- To set up and test Remote Desktop access between two PCs within the same LAN.

Requirements:

- Multiple PCs
- Switch
- Copper Cables
- Cisco Packet Tracer

Procedure:

1. **Drag two PCs** onto the workspace and connect them using Copper Straight-Through cables to a Switch.
2. **Configure static IP addresses** on both PCs:
    - For PC1:
      ```
      IP Address: 192.168.1.10
      Subnet Mask: 255.255.255.0
      ```
    - For PC2:
      ```
      IP Address: 192.168.1.20
      Subnet Mask: 255.255.255.0
      ```

3. **Test the connection** by logging into PC1 from PC2 via the Remote Desktop application.