CS 361 Computer Networks Lab

Assignment 2

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Questions:

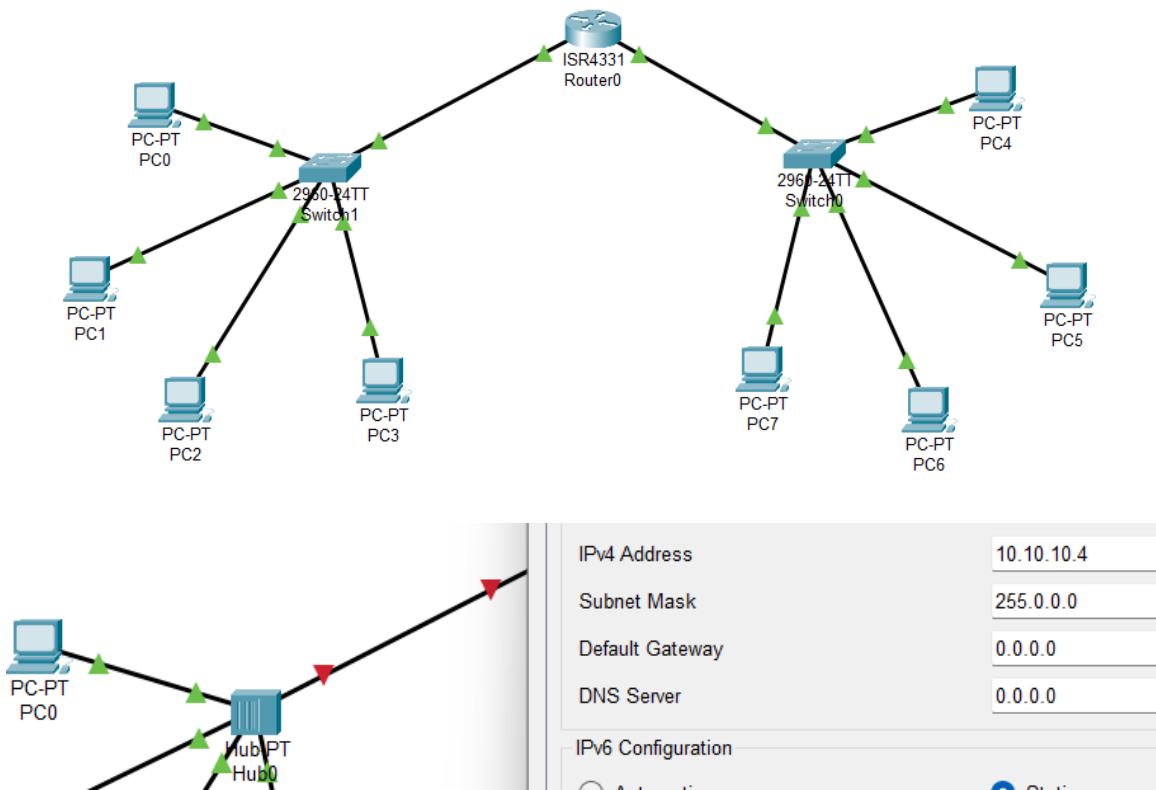### 1. What is a router and how does it function?

A router is a networking device that plays a crucial role in connecting different networks together and directing data traffic between them. It operates at the network layer (Layer 3) of the OSI model and is commonly used in home and enterprise networks as well as on the internet.

Routers maintain a routing table that contains information about the best paths to reach different networks. When a data packet arrives at the router, it examines the destination IP address and consults this routing table to determine the next hop, which is the next router or network segment the packet should be forwarded to reach its destination. Routers make these forwarding decisions based on various routing protocols and algorithms. Once the router has determined the next hop for a packet, it forwards the packet to the appropriate interface, whether it's a physical or virtual network connection, that leads to the next router or network segment. Routers operate at both the LAN and WAN (Wide Area Network) levels, enabling them to connect local networks to the broader internet.
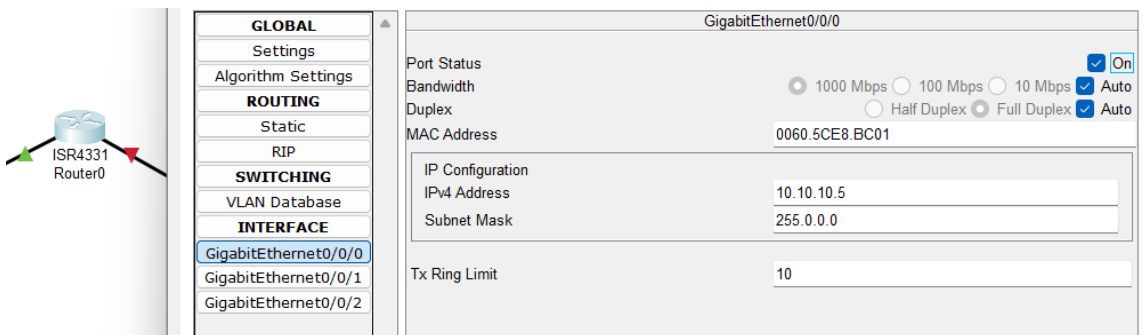
2. Make a small network using router and switches as demonstrated in lab. Show that message transferred from one end device in first network to another end device in second network is successful.
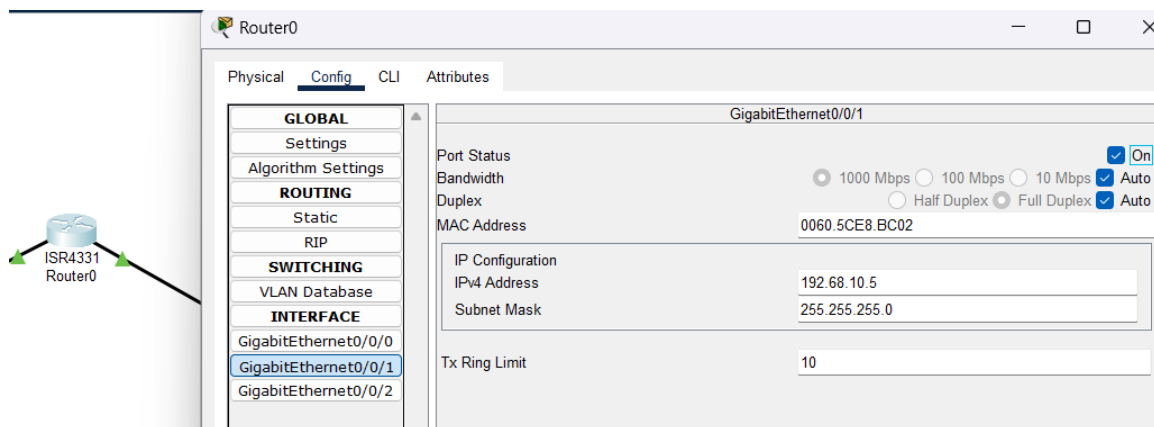
Components: End devices (PC), Switch (2960)

PC-PT
PC2

2960-24TT
Switch1

IPv4 Address	10.10.10.4
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

IPv6 Configuration

The IP addresses (IPV4) need to be set before setting up any kind of communication.

GigabitEthernet0/0/0	
Port Status	☑ On
Bandwidth	◯ 1000 Mbps ◯ 100 Mbps ◯ 10 Mbps ☑ Auto
Duplex	◯ Half Duplex ◉ Full Duplex ☑ Auto
MAC Address	0060.5CE8.BC01

IP Configuration

IPv4 Address	10.10.10.5
Subnet Mask	255.0.0.0

Tx Ring Limit   10

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/2

The routers GigabitEthernet 0/0 port serves as a gateway for the PCs connected with the switch on the left side. All data sent to the second network must be sent from this port.

Interface	FastEthernet0
IP Configuration	
○ DHCP	● Static
IPv4 Address	10.10.10.1
Subnet Mask	255.0.0.0
Default Gateway	10.10.10.5
DNS Server	0.0.0.0

Router0 — □ ×

Physical   Config   CLI   Attributes

GLOBAL	GigabitEthernet0/0/1
Settings	
Algorithm Settings	
ROUTING	
Static	
RIP	
SWITCHING	
VLAN Database	
INTERFACE	
GigabitEthernet0/0/0	
GigabitEthernet0/0/1	
GigabitEthernet0/0/2	

ISR4331
Router0

Port Status   ☑ On
Bandwidth   ○ 1000 Mbps ○ 100 Mbps ○ 10 Mbps ☑ Auto
Duplex   ○ Half Duplex ● Full Duplex ☑ Auto
MAC Address   0060.5CE8.BC02

IP Configuration
IPv4 Address   192.68.10.5
Subnet Mask   255.255.255.0

Tx Ring Limit   10

The routers GigabitEthernet 0/0 port serves as a gateway for the PCs connected with the switch on the right side. All data sent to the first network must be sent from this port.
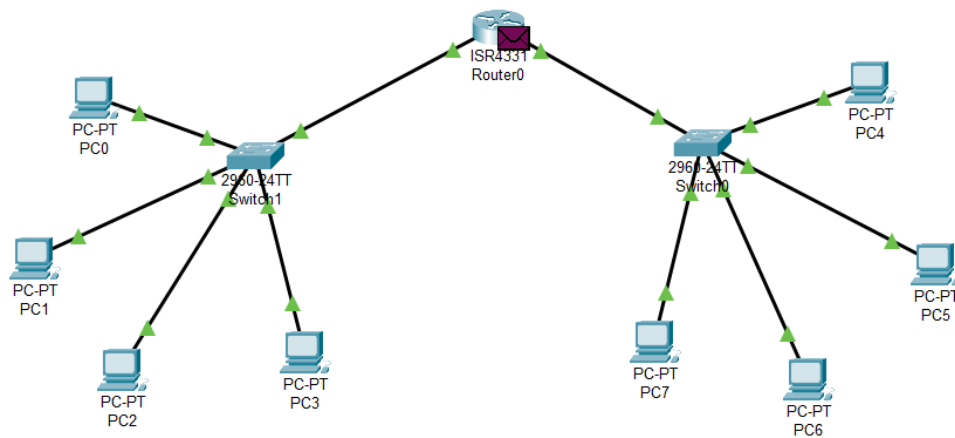
Now we need to test a packet to be sent from PC1 to PC5. Packet is generated at PC1.
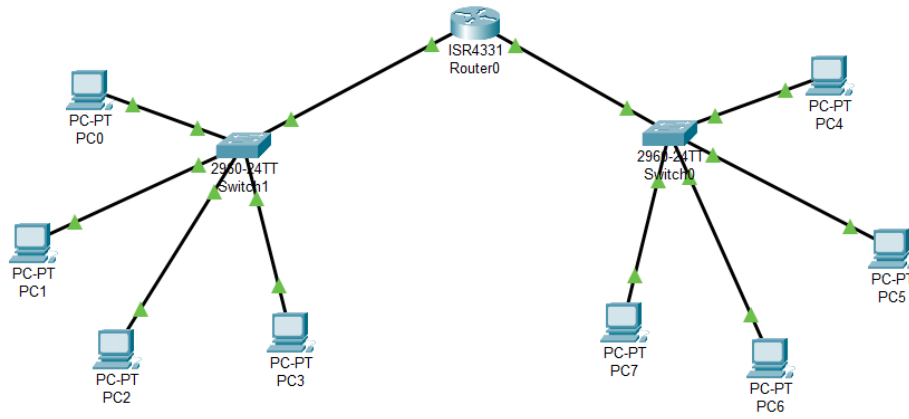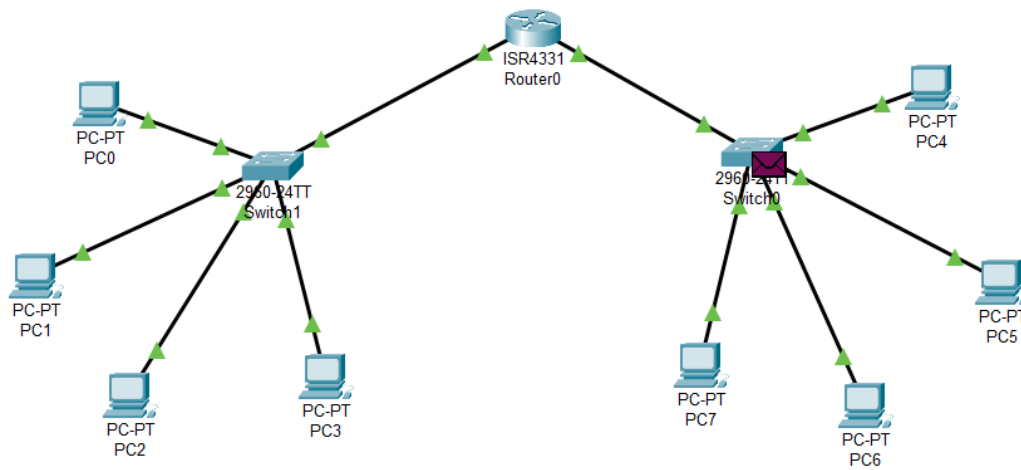

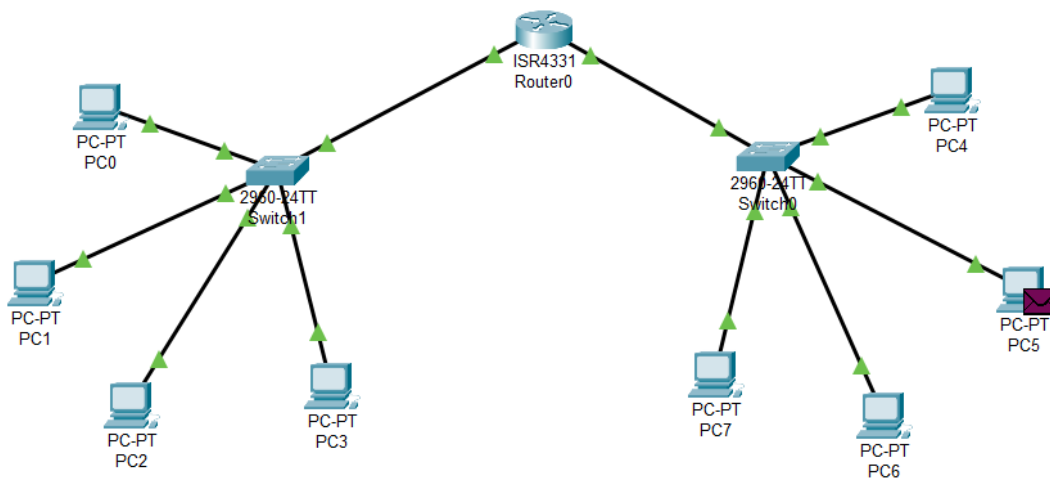Next it reaches the switch.
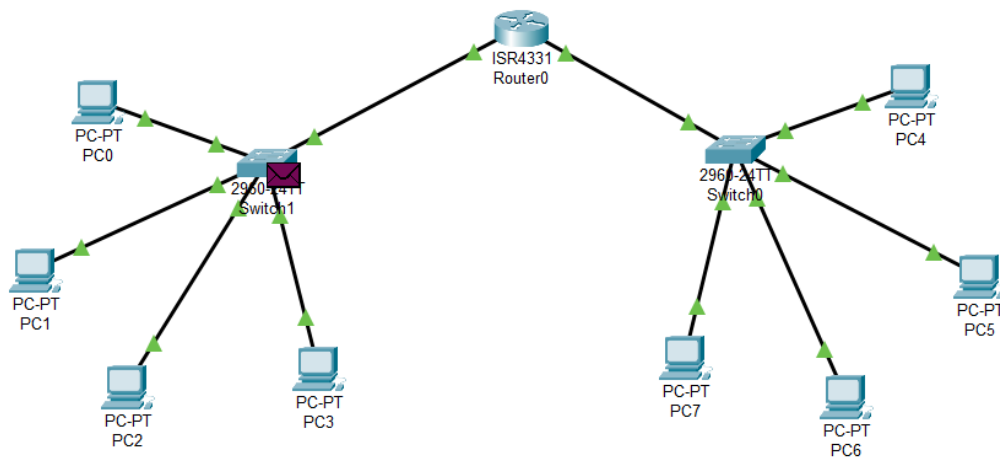
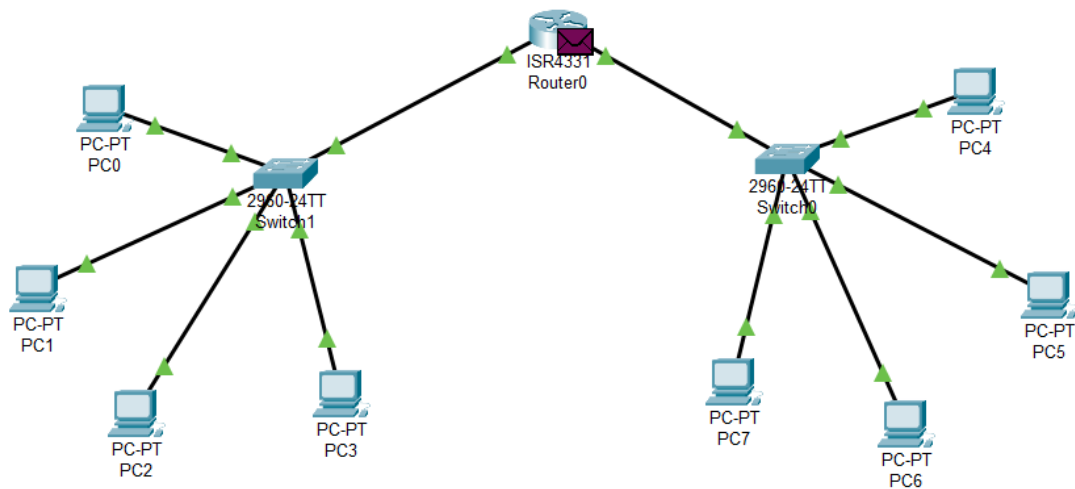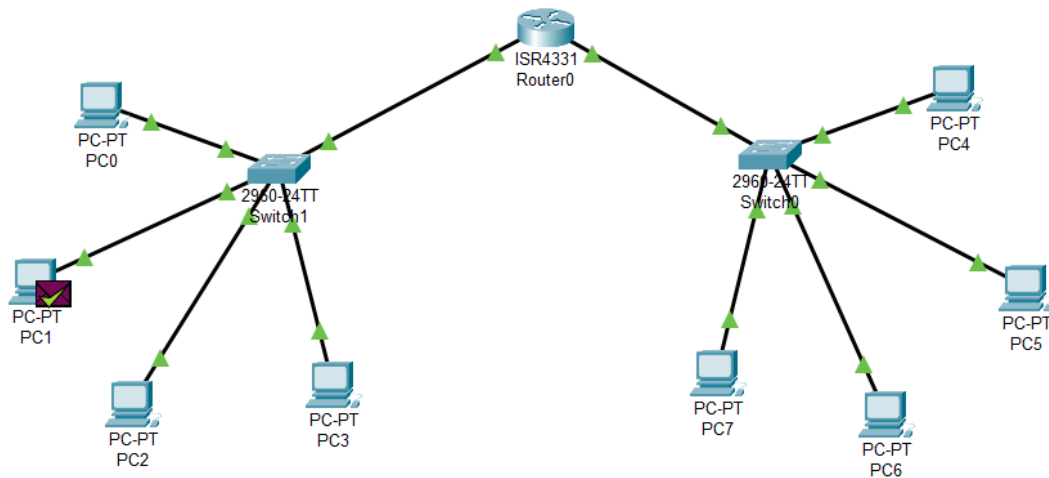Switch unicasts to target end device. It reaches the router, therefore.

From the router, the packet reaches the switch.

The switch's unicast nature sends the data to the target only.

The receiving message is sent to the router through the switch back to the sender PC1, to confirm the process.

The sender accepts the message, this shows successful connection.

| Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC1	PC5	ICMP	■	0.000	N	0	(edit)	

3. **Make a small network using router and switches as demonstrated in lab. Show that message transferred from one end device in first network to another end device in second network is successful.**

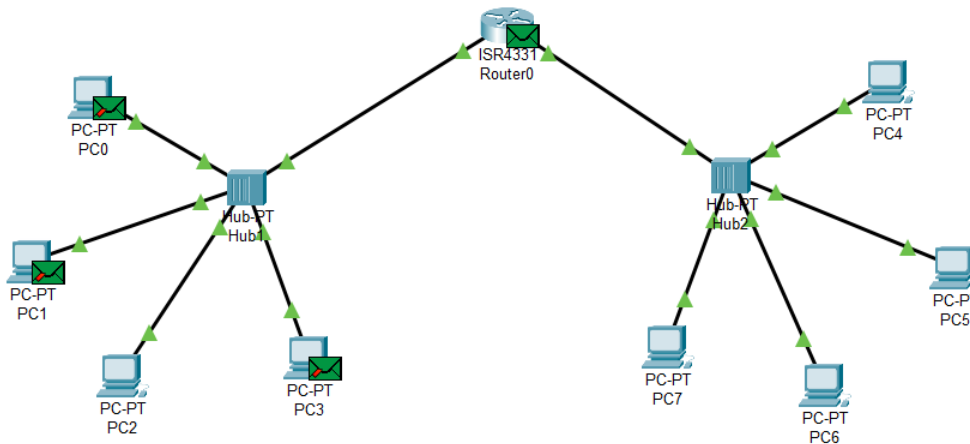Components: End devices (PC), Switch (2960)

PC-PT
PC2

Hub-PT
Hub3
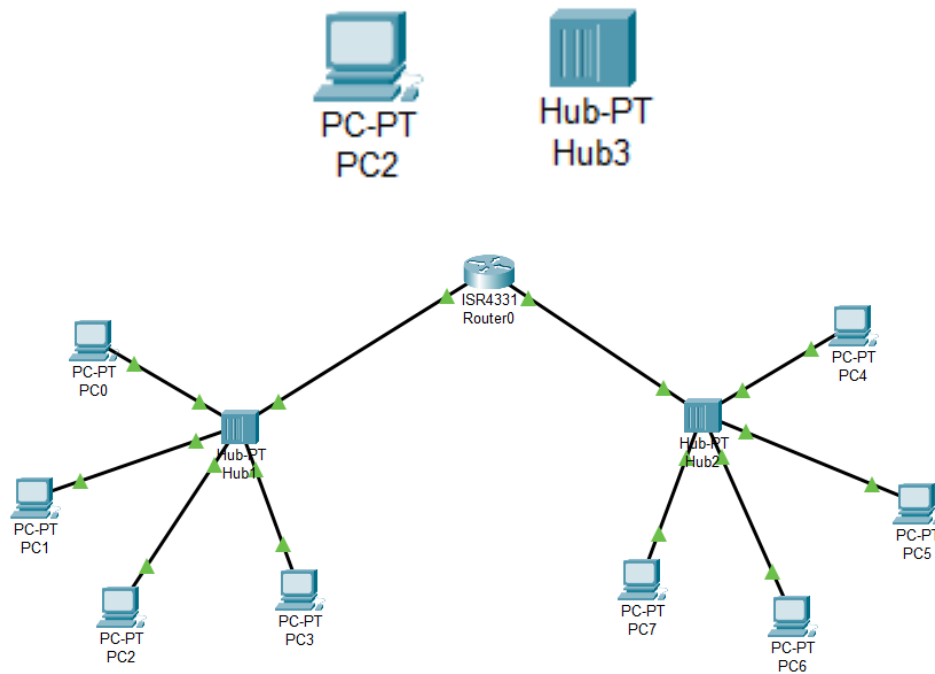
Now we need to test a packet to be sent from PC2 to PC7. Packet is generated at PC2.
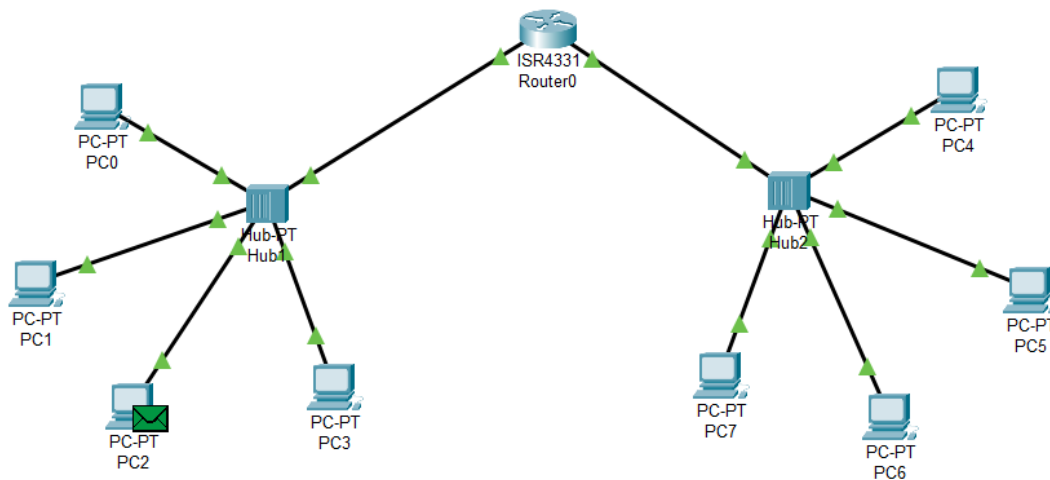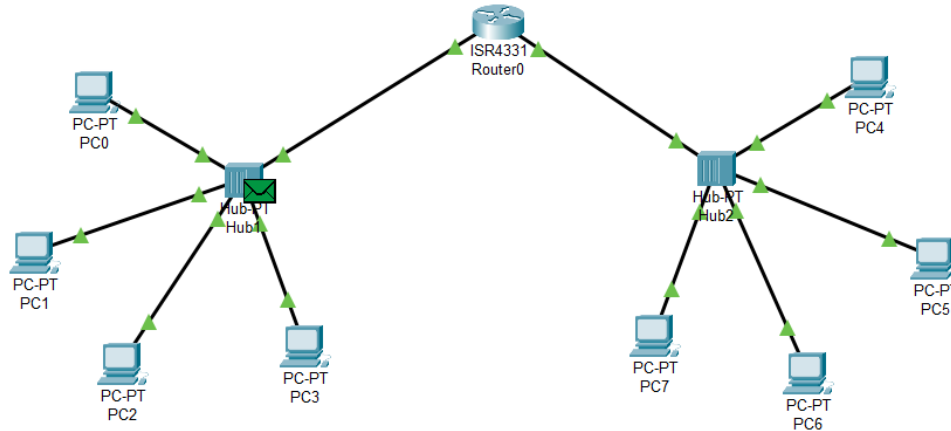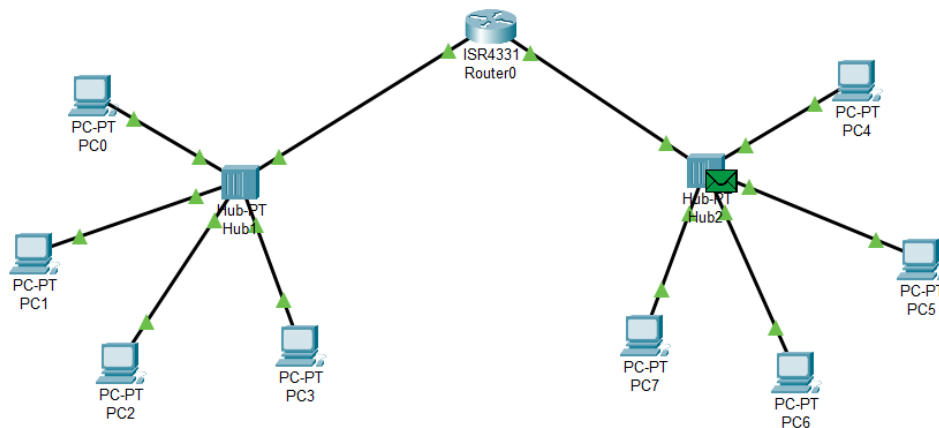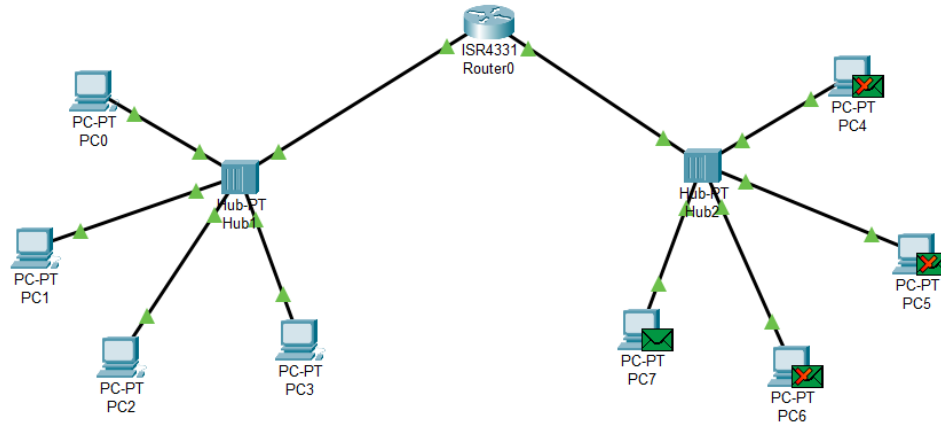
Packets reach the hub from PC2.

From the Hub, packets go towards all the end devices in accordance with the properties of the Hub, i.e., broadcasting. It doesn't send packets to the target location only, rather all the end devices. Packets reach the router. And from there to the next hub.
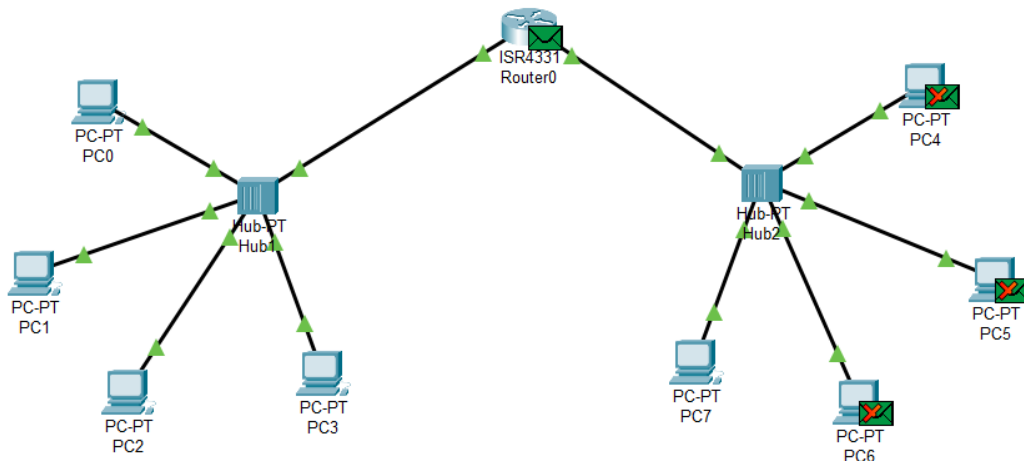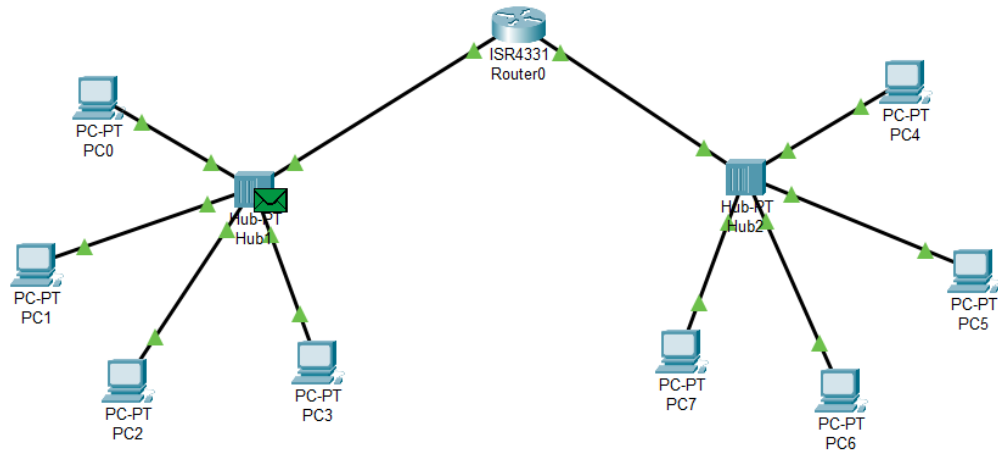
From the Hub, packets go towards all the end devices. The receiver accepts it whereas the others deny it. Now the receiver sends a confirmation back to the sender which reaches the hub first.
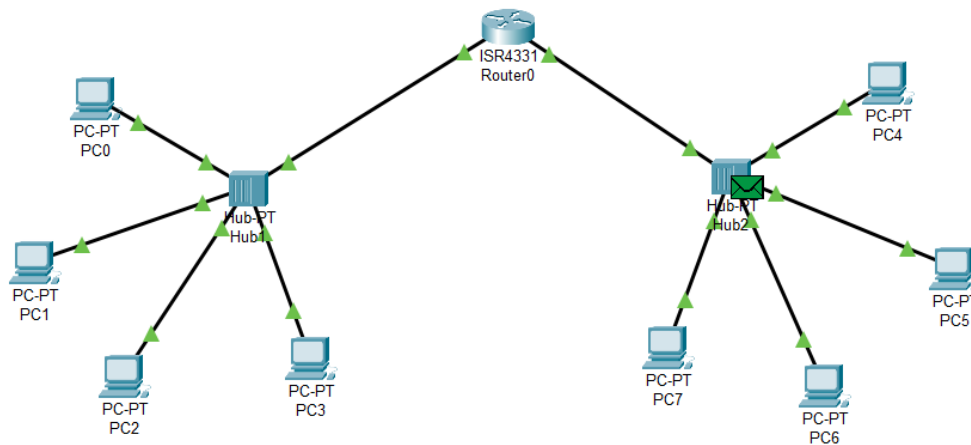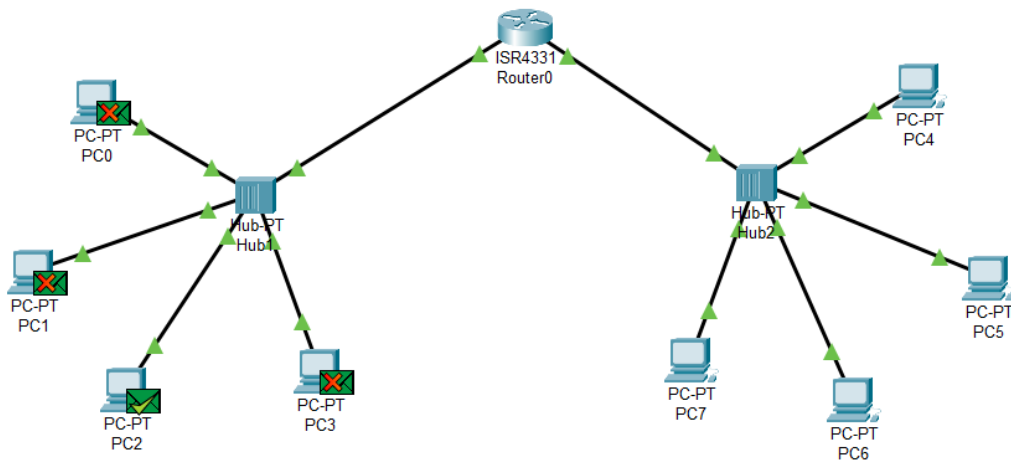

Again, the confirmation message will reach all the end points due to Hub's broadcasting nature. The message reaches the router as well.

From the router it goes to the hub.

And as expected, from the hub, the message reaches all the end points, but since it is destined for the sender, i.e., P1, only it accepts, and others reject it.


The acceptance of confirmation by P1 proves successful connection between the sender and receiver.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC2	PC7	ICMP	■	0.000	N	0	(edit)	

Observations:

Hubs (Broadcasting Nature): Hubs operate with a broadcasting nature, where they indiscriminately broadcast incoming data to all connected devices. When a device sends data to the hub, the hub simply amplifies the signal and sends it to every port, regardless of whether the data is intended for a specific device or not. This broadcasting approach leads to network congestion, as all devices on the hub must process and filter out data that is not meant for them. Consequently, hubs are inefficient for modern networks where efficient data transmission and network segmentation are essential.
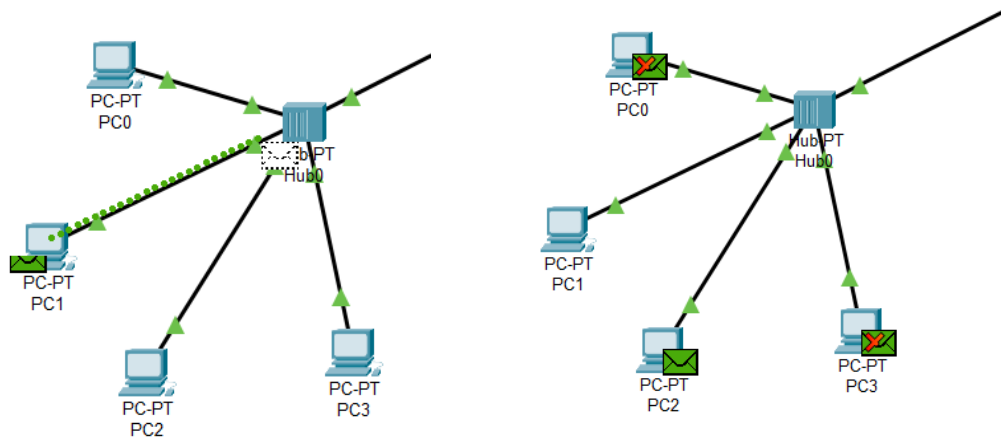
Switches (Unicasting Nature): Switches, in contrast, operate with a unicasting nature. They intelligently forward data based on the destination MAC addresses of devices connected to their ports. When a device sends data to the switch, the switch examines the destination MAC address and forwards the data only to the port where the intended recipient device is connected. This targeted approach eliminates unnecessary traffic, reduces network congestion, and ensures that data reaches its intended destination efficiently. Switches play a crucial role in modern networks by enabling unicast communication that is essential for efficient and secure data transmission.