LAB TITLE: SIMULATION OF NETWORK DEVICES USING CISCO PACKET TRACER

OBJECTIVE

The main objectives of this lab are:

1. To understand the working of basic network devices such as Hub, Switch, Bridge, Router, and Repeater.
2. To design and simulate a small computer network using Cisco Packet Tracer.
3. To assign IP addresses and verify communication between different devices.
4. To analyze data flow within the same network and between different networks.

TOOLS USED

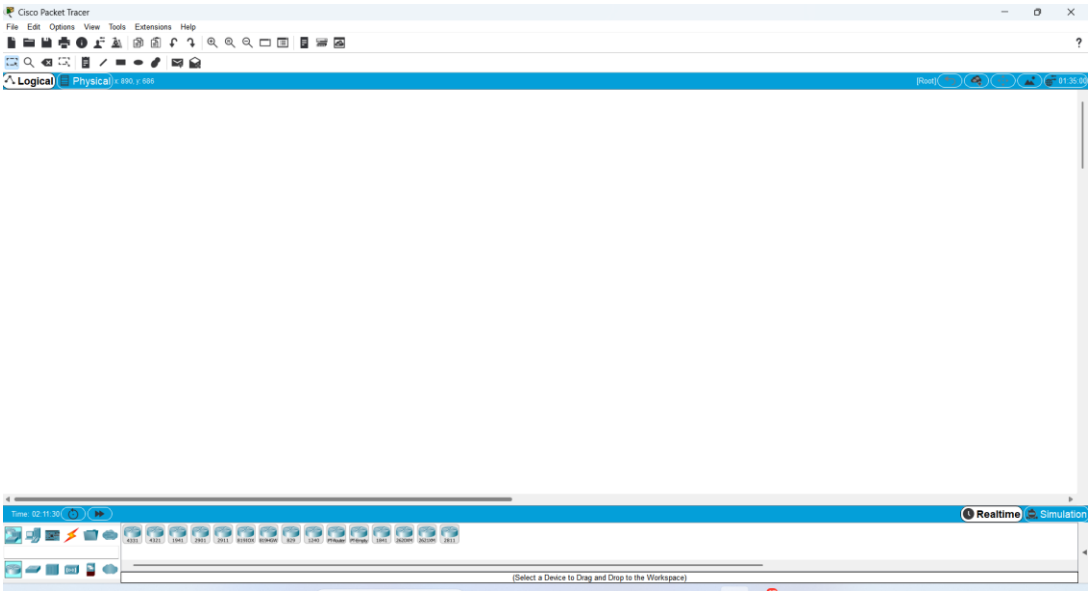
- Cisco Packet Tracer
- Computer System

THEORY

Cisco Packet Tracer

Cisco Packet Tracer is a network simulation and visualization tool developed by Cisco Systems. It is used to design, configure, and test computer networks in a virtual environment without using real hardware.

It allows students to practice networking concepts such as IP addressing, routing, switching, and device configuration.



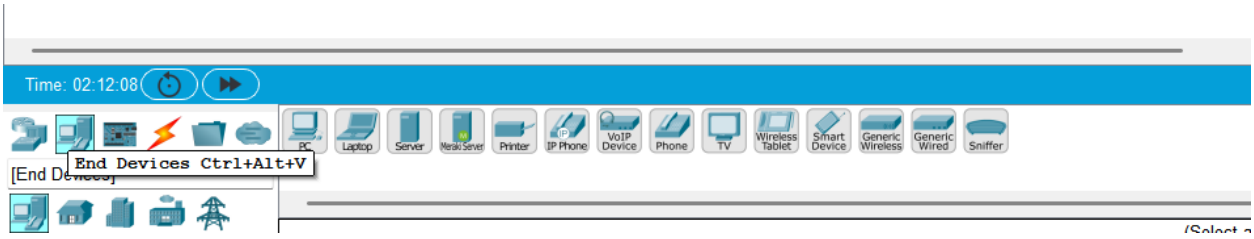
Components Used in Cisco Packet Tracer

1. End Devices

End devices are the devices that generate or receive data.

Examples Used:

- PC (Personal Computer)
- Laptop



Function:

- Used to send and receive data
- Assigned IP address, subnet mask, and default gateway
- Used to test connectivity using ping

2. Network Devices

a) Hub

- A basic device that connects multiple PCs
- Sends data to all connected devices
- Works at Physical Layer

b) Switch

- Connects multiple devices in a LAN
- Forwards data using MAC address
- Reduces collisions
- Works at Data Link Layer

c) Bridge

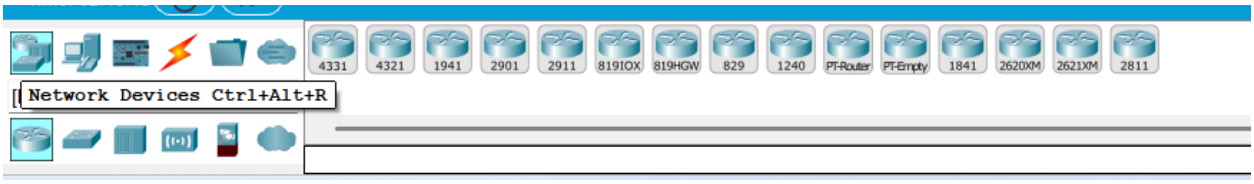
- Connects two LAN segments
- Filters traffic using MAC address
- Reduces network congestion

d) Router

- Connects different networks
- Routes data using IP address
- Works at Network Layer
- Enables inter-network communication

e) Repeater

- Regenerates weak signals
- Extends network distance
- Works at Physical Layer

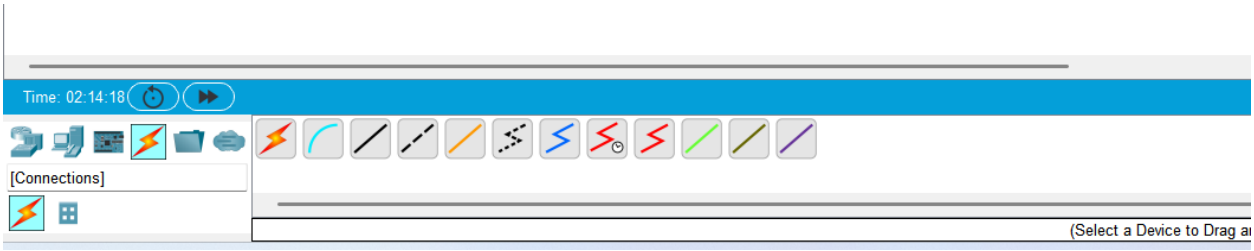


3. Cables and Connections

Cisco Packet Tracer provides virtual cables.

Used Cables:

- Straight-through cable (PC to Switch)
- Crossover cable (Switch to Router)
- Console cable (for device configuration)



4. IP Addressing

Each device is configured with:

- IP Address
- Subnet Mask
- Default Gateway

This helps in proper communication between devices.

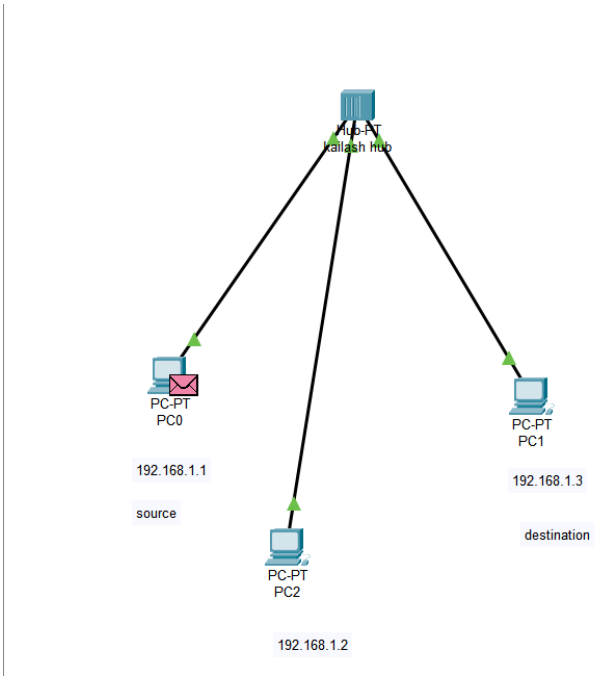
PROCEDURE

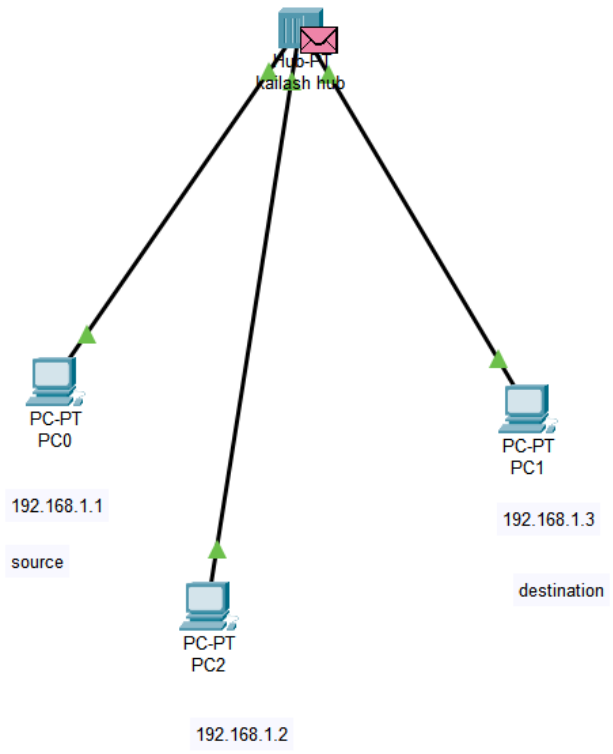
1. Open Cisco Packet Tracer on the computer.
2. Drag and place the required network devices (PC, Hub, Switch, Router, etc.) into the workspace.
3. Connect the devices using appropriate network cables.
4. Click on each PC and assign an IP address, Subnet Mask, and Default Gateway.
5. Configure the router interfaces with proper IP addresses.
6. Save the network configuration.
7. Use the Ping command to test communication between devices.
8. Observe whether the data is successfully transmitted.

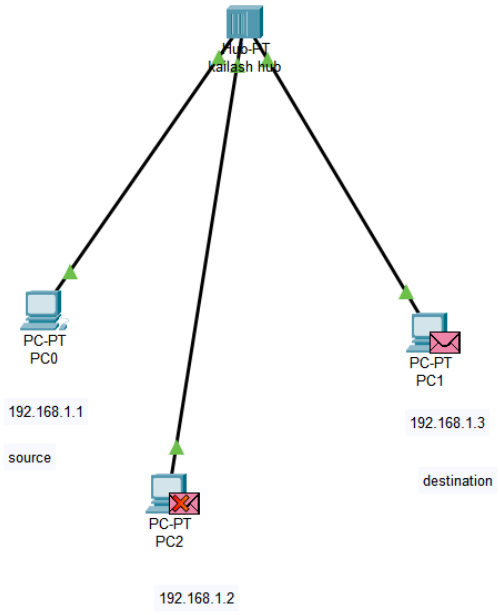
OBSERVATION

HUB SIMULATION:

Here PC0 (192.168.1.1) acts as the source and sends data to the hub. The hub does not check the destination address; instead, it broadcasts the data to all connected devices. As a result, both PC2(192.168.1.2) and PC1 (192.168.1.3) receive the data. However, only PC1, which is the intended destination, accepts and processes the data, while PC1 ignores it. This shows that a hub sends data to all ports without filtering.



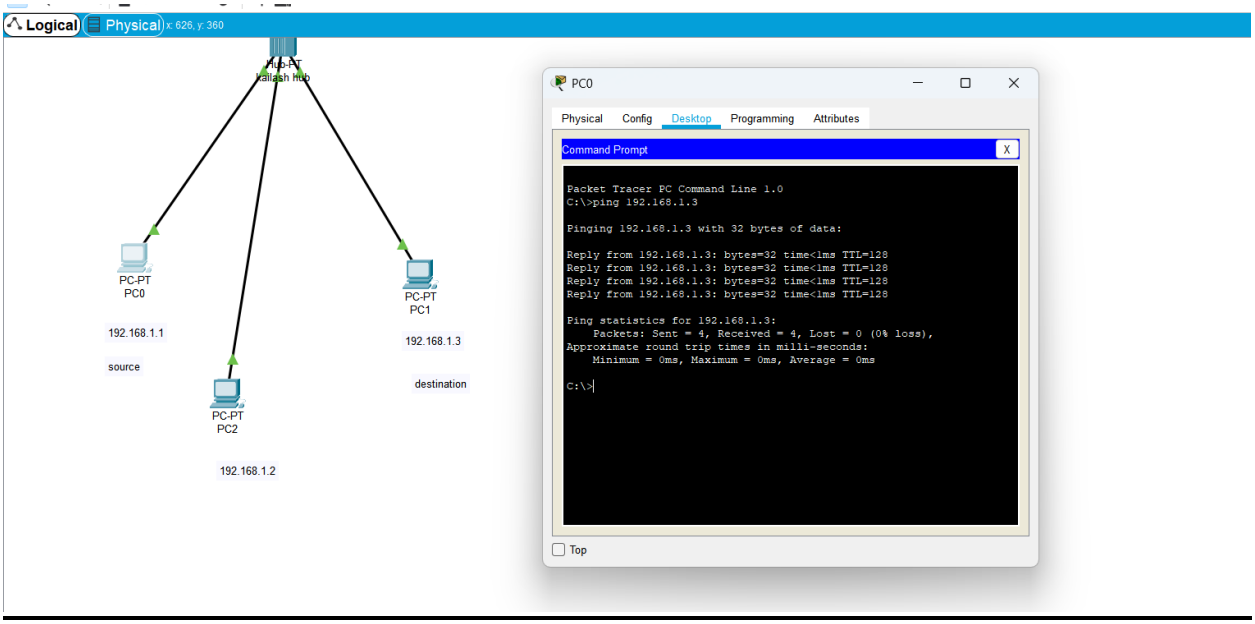

Hub-PT
kailash hub
PC-PT
PC0
192.168.1.1
source
PC-PT
PC1
192.168.1.3
destination
PC-PT
PC2
192.168.1.2


Hub-PT
kailash hub
PC-PT
PC0
192.168.1.1
source
PC-PT
PC1
192.168.1.3
destination
PC-PT
PC2
192.168.1.2

Configuration Table

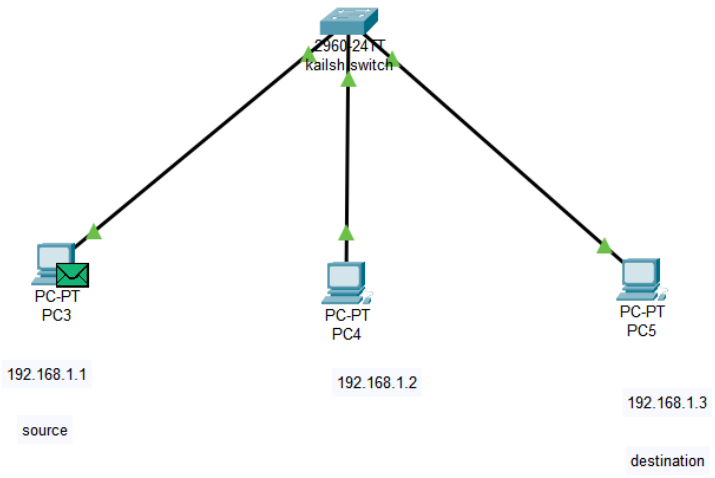
Device name	Interface	IP address	Subnet mask
PC0	Fast enthernet0	192.168.1.1	255.255.255.0
PC1	Fast enthernet0	192.168.1.3	255.255.255.0
PC2	Fast enthernet0	192.168.1.2	255.255.255.0

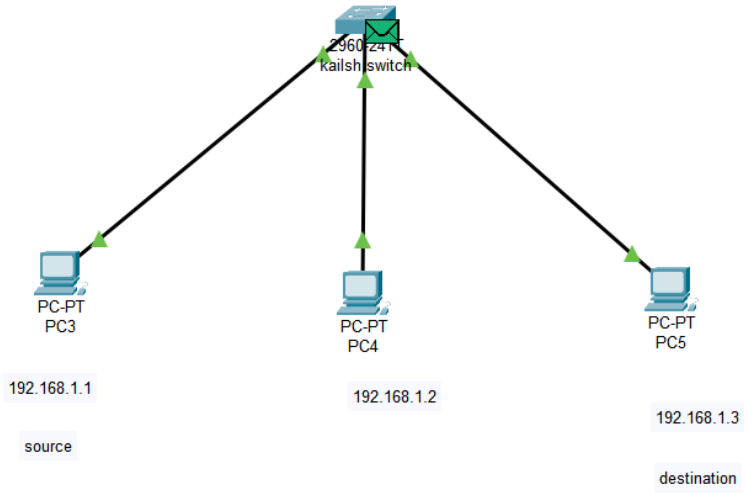
Ping from pc0 to Pc1

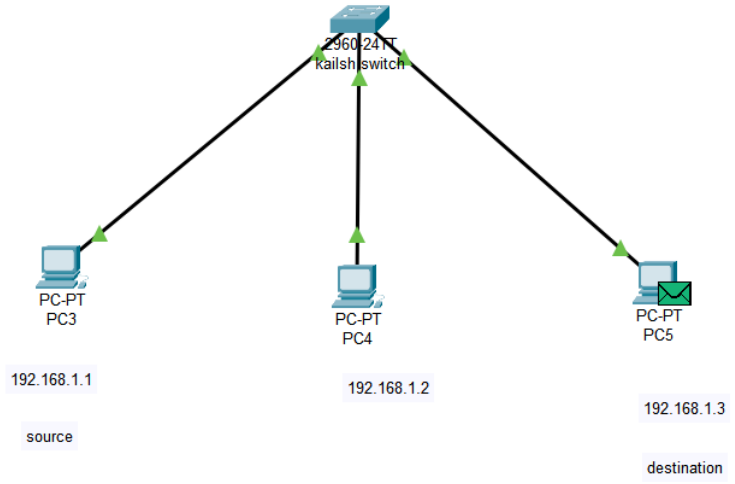


SWITCH SIMULATION

PC3 (192.168.1.1) sends data to the switch. The switch checks its MAC address table and forwards the data only to PC5 (192.168.1.3). Other PCs like PC4 (192.168.1.2) do not receive the data. This shows that a switch sends data only to the intended device, reducing unnecessary traffic.


2960-24TT
kailshiswitch
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
source
192.168.1.2
192.168.1.3
destination

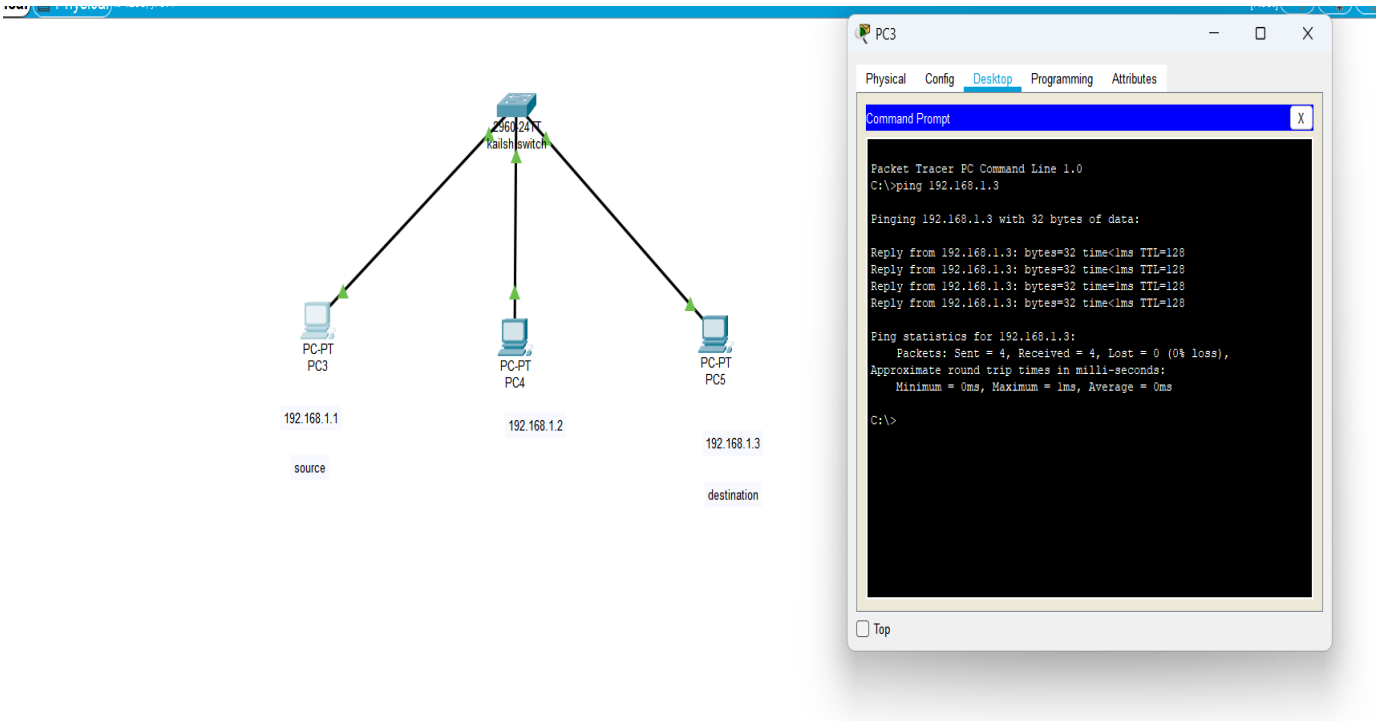

2960-24TT
kailshiswitch
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
source
192.168.1.2
192.168.1.3
destination



Configuration Table

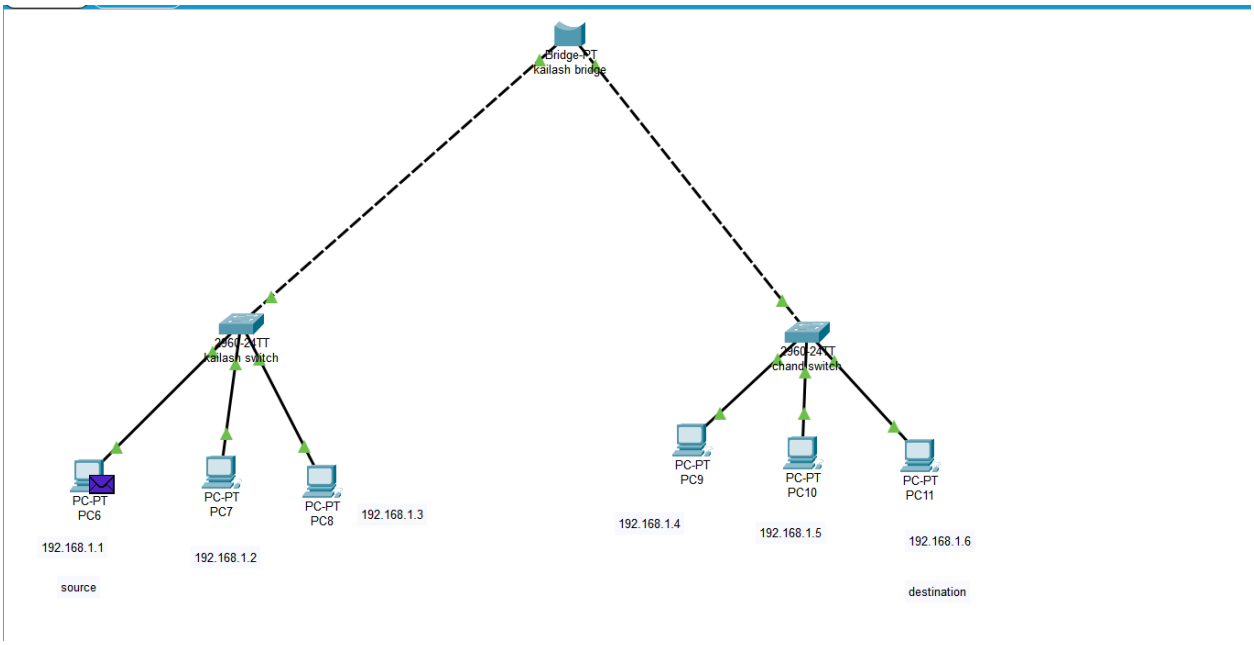
Device name	Interface	IP address	Subnet mask
PC3	Fast enthernet0	192.168.1.1	255.255.255.0
PC4	Fast enthernet0	192.168.1.2	255.255.255.0
PC5	Fast enthernet0	192.168.1.3	255.255.255.0

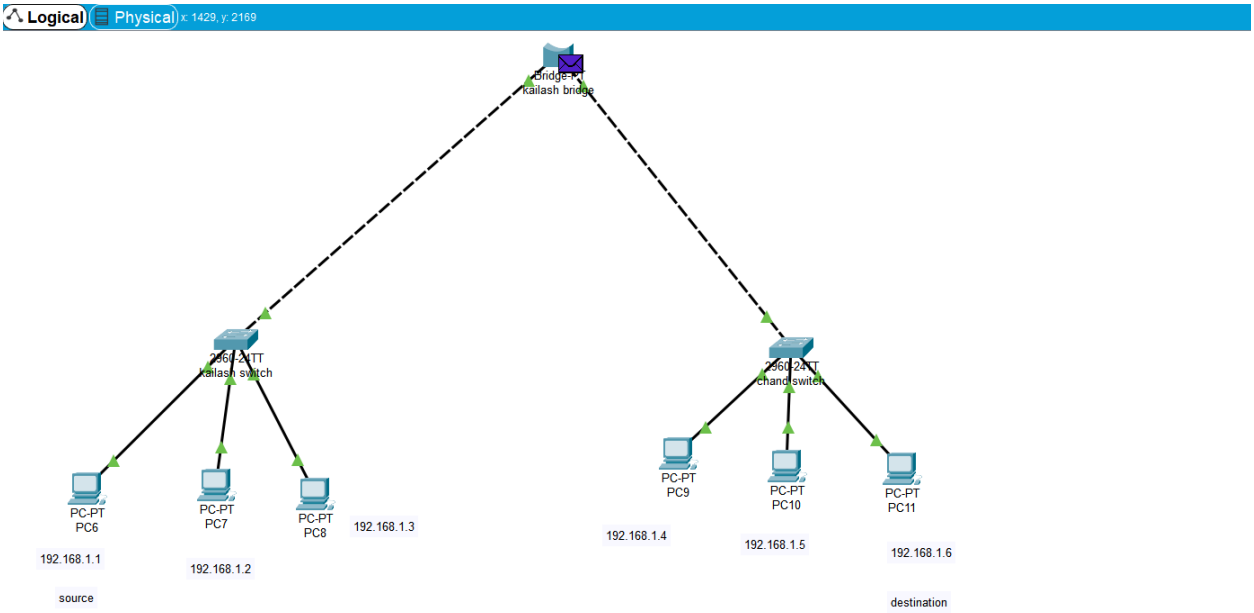
Ping from Pc3 to pc5

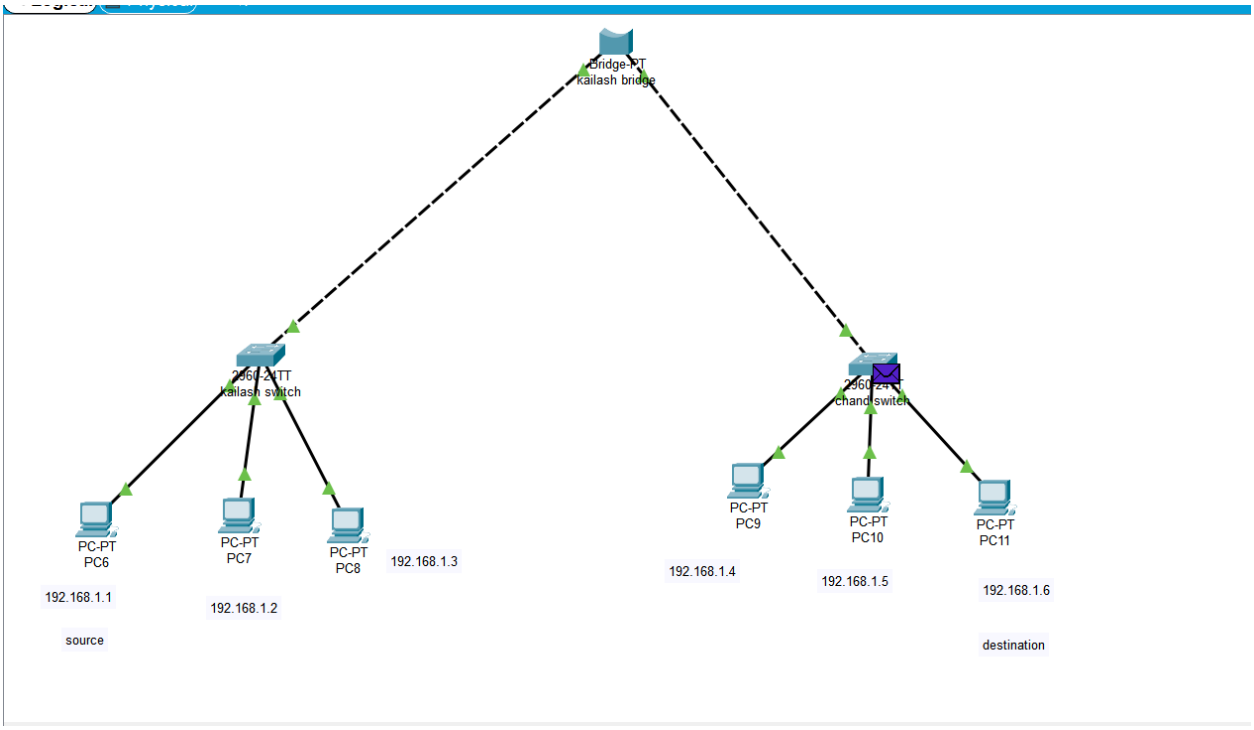


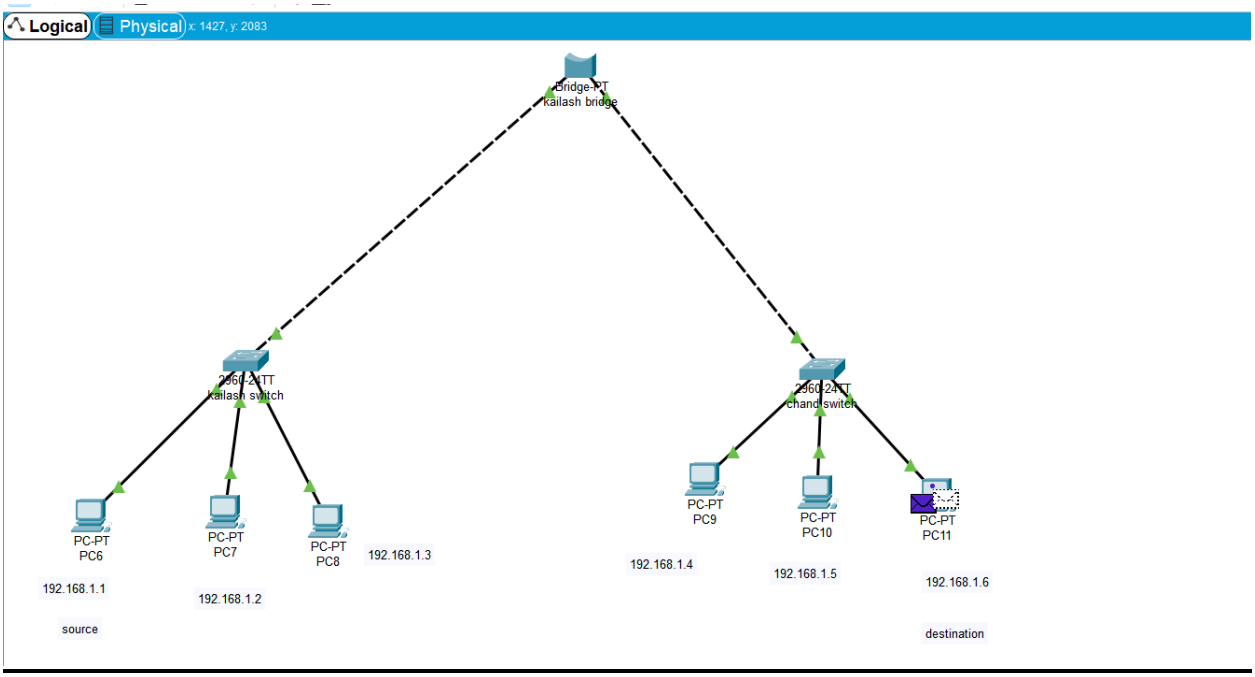
BRIDGE SIMULATION

According to the figure, PC6 (192.168.1.1) is the source and sends data to the left switch. The data then reaches the bridge, which examines the destination MAC address. The bridge forwards the data only to the right network segment where the destination exists. After that, the right-side switch sends the data to PC11 (192.168.1.6), which is the destination. Other PC do not receive the data. This explains that a bridge connects two LAN segments and reduces network traffic by filtering frames.




Logical
Physical
x: 1429, y: 2169
Bridge-PT
kailash bridge
2960-24TT
kailash switch
2960-24TT
chand switch
PC-PT
PC6
PC-PT
PC7
PC-PT
PC8
PC-PT
PC9
PC-PT
PC10
PC-PT
PC11
192.168.1.1
source
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
destination

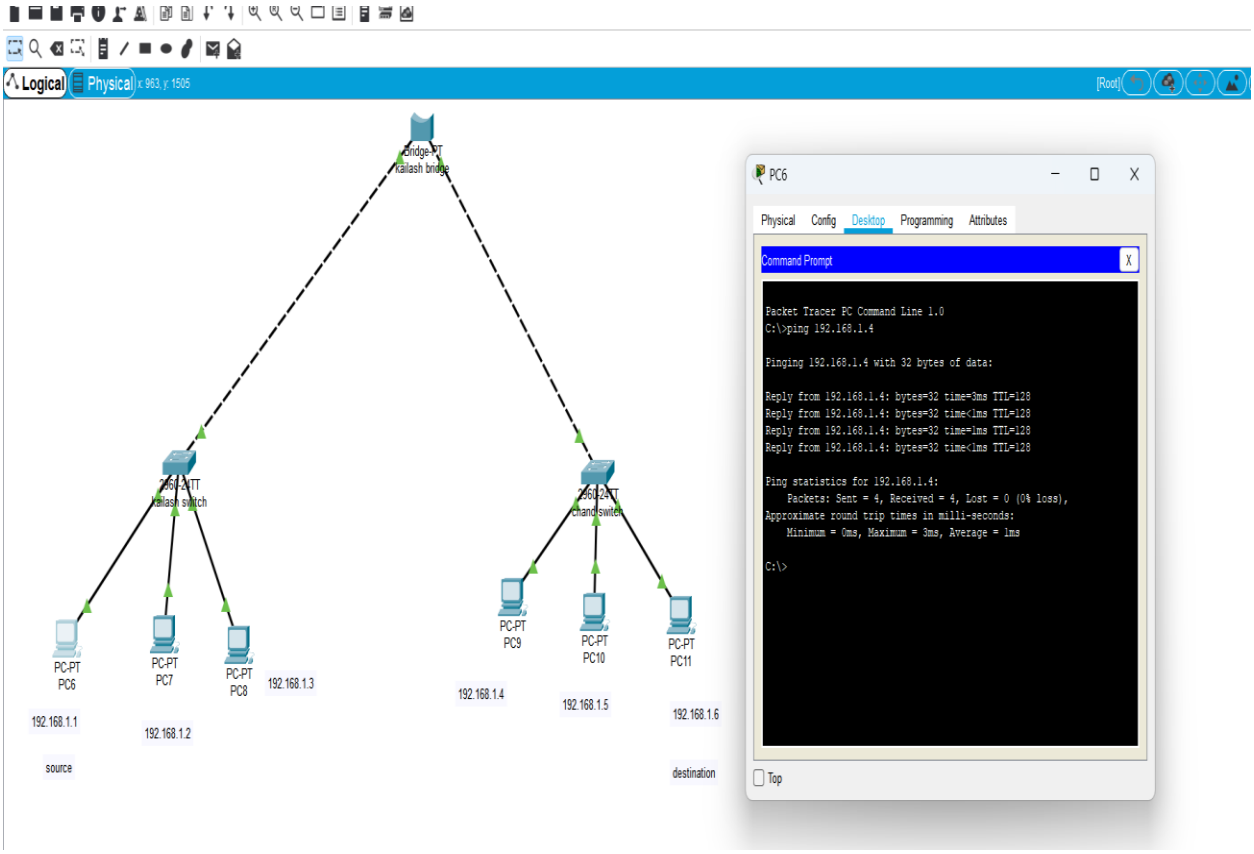

Bridge-PT
kailash bridge
2960-24TT
kailash switch
PC-PT
PC6
PC-PT
PC7
PC-PT
PC8
PC-PT
PC9
PC-PT
PC10
PC-PT
PC11
192.168.1.1
source
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
destination



Configuration Table

Device name		IP address	Subnet mask
PC6		192.168.1.1	255.255.255.0
PC7		192.168.1.2	255.255.255.0
PC8		192.168.1.3	255.255.255.0
PC9		192.168.1.4	255.255.255.0
PC10		192.168.1.5	255.255.255.0
PC11		192.168.1.6	255.255.255.0

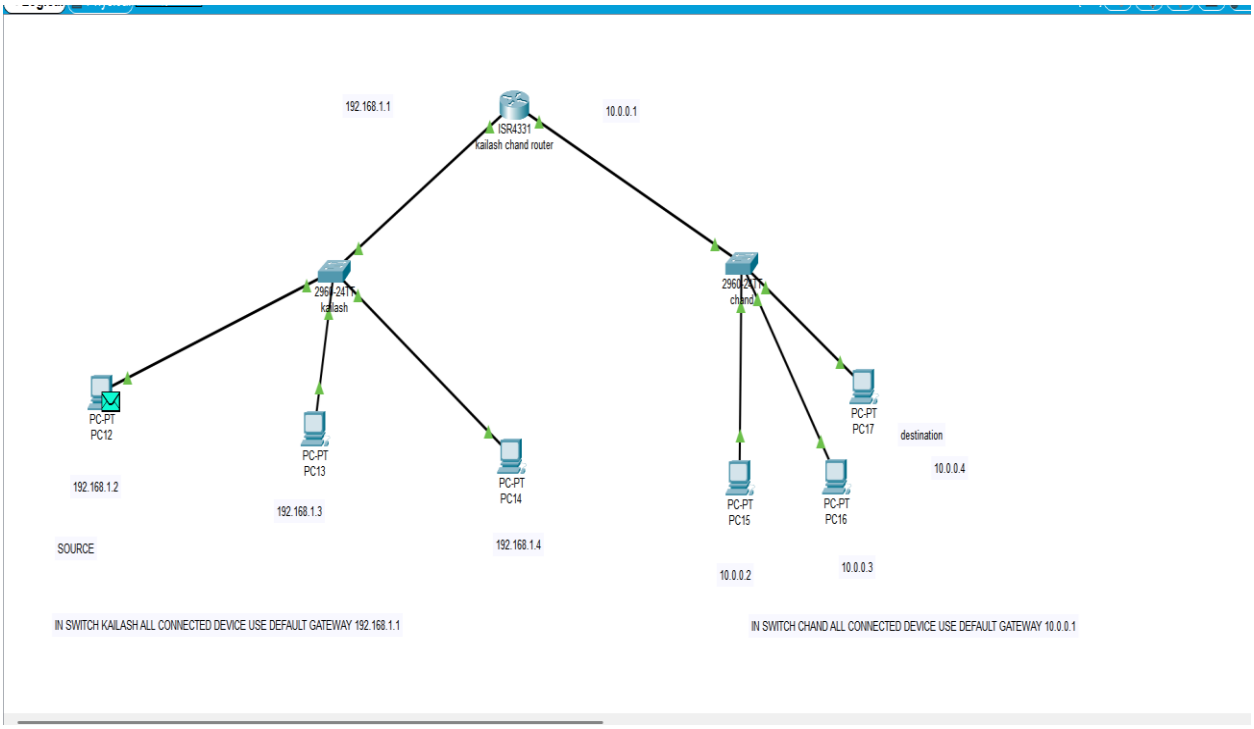
Ping from Pc6 to pc9

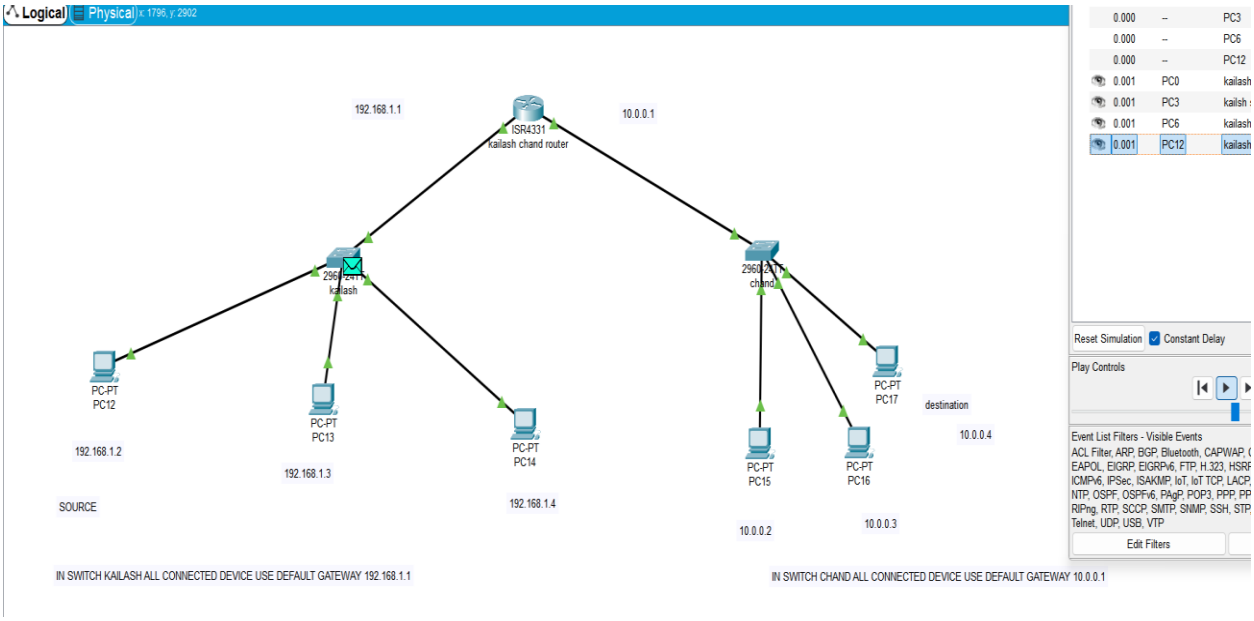


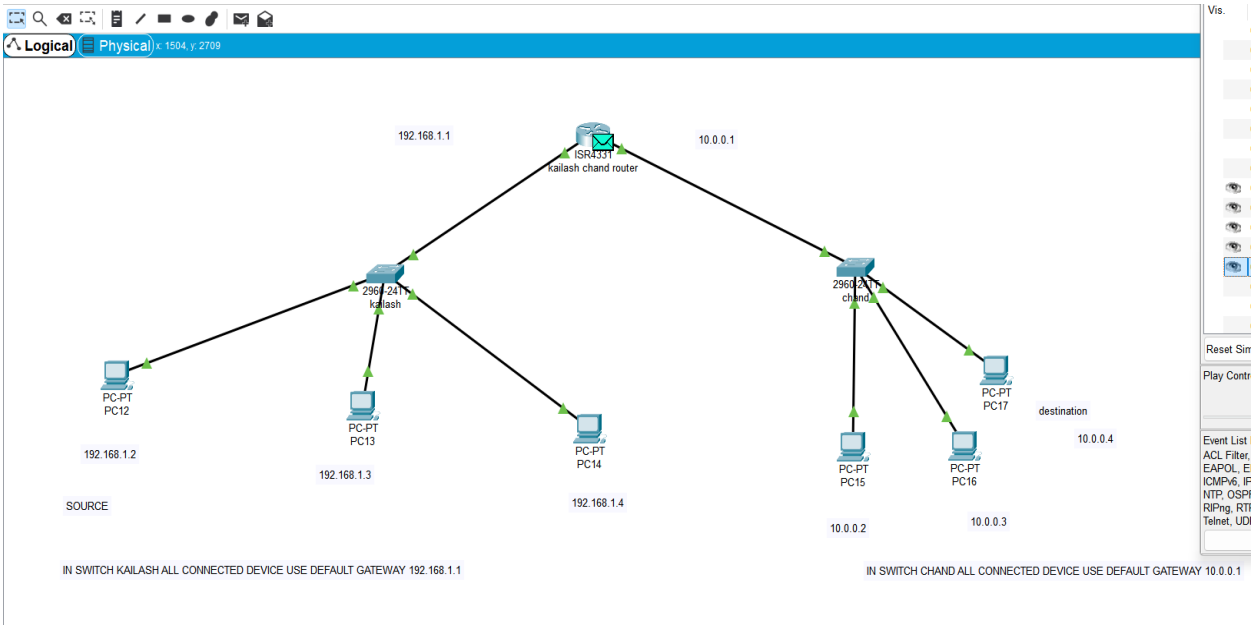
ROUTER SIMULATION

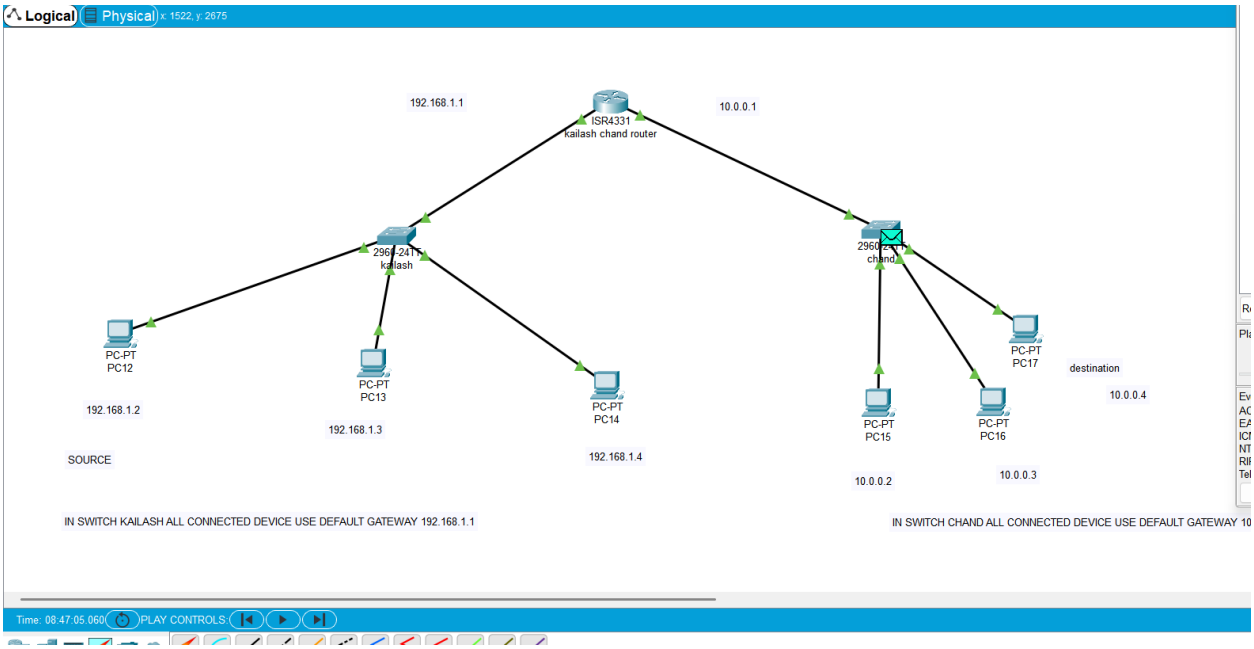
PC12 (192.168.1.1) sends data to PC17 (10.0.0.4). Since the destination is on a different network, the data is sent to the default gateway (router 192.168.1.1). The router checks its routing table and forwards the data to the 10.0.0.0 network via interface 10.0.0.1, delivering it to PC17. This shows that a router forwards data between different networks.

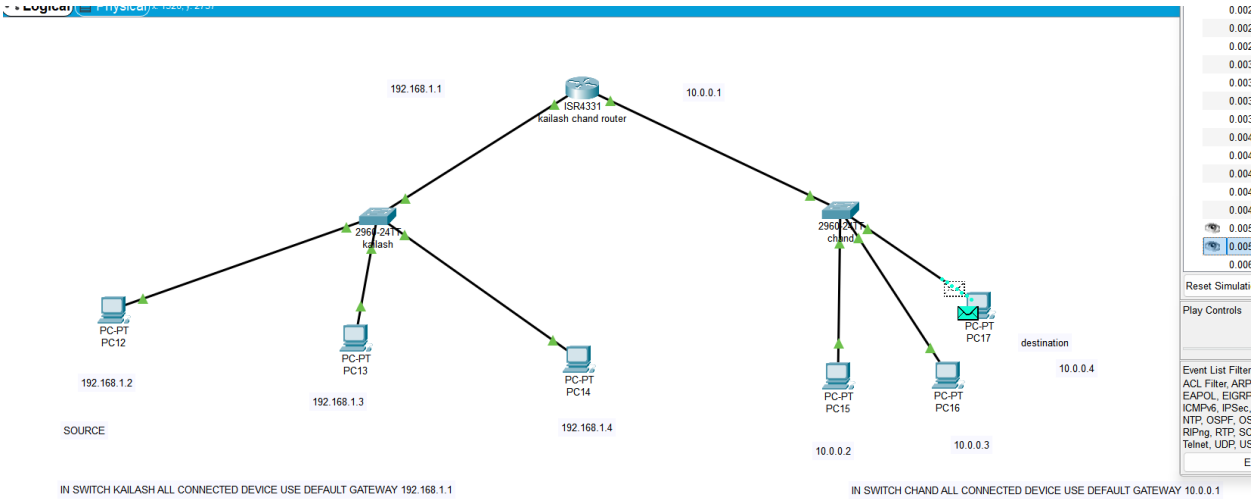
.


192.168.1.1
ISR4331
kailash chand router
10.0.0.1
2960-24TT
kailash
2960-24TT
chand
PC-PT
PC12
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15
PC-PT
PC16
PC-PT
PC17
destination
10.0.0.4
192.168.1.2
192.168.1.3
192.168.1.4
10.0.0.2
10.0.0.3
SOURCE
IN SWITCH KAILASH ALL CONNECTED DEVICE USE DEFAULT GATEWAY 192.168.1.1
IN SWITCH CHAND ALL CONNECTED DEVICE USE DEFAULT GATEWAY 10.0.0.1


Logical
Physical
x: 1796, y: 2902
192.168.1.1
ISR4331
kailash chand router
10.0.0.1
2960-24TT
kailash
2960-24TT
chand
PC-PT
PC12
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15
PC-PT
PC16
PC-PT
PC17
destination
10.0.0.4
192.168.1.2
192.168.1.3
192.168.1.4
10.0.0.2
10.0.0.3
SOURCE
IN SWITCH KAILASH ALL CONNECTED DEVICE USE DEFAULT GATEWAY 192.168.1.1
IN SWITCH CHAND ALL CONNECTED DEVICE USE DEFAULT GATEWAY 10.0.0.1
0.000 -- PC3
0.000 -- PC6
0.000 -- PC12
0.001 PC0 kailash
0.001 PC3 kailsh
0.001 PC6 kailash
0.001 PC12 kailash
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
ACL Filter, ARP, BGP, Bluetooth, CAPWAP,
EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP
ICMPv6, IPSec, ISAKMP, IoT, IoT TCP, LACP,
NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PP
RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP
Telnet, UDP, USB, VTP
Edit Filters

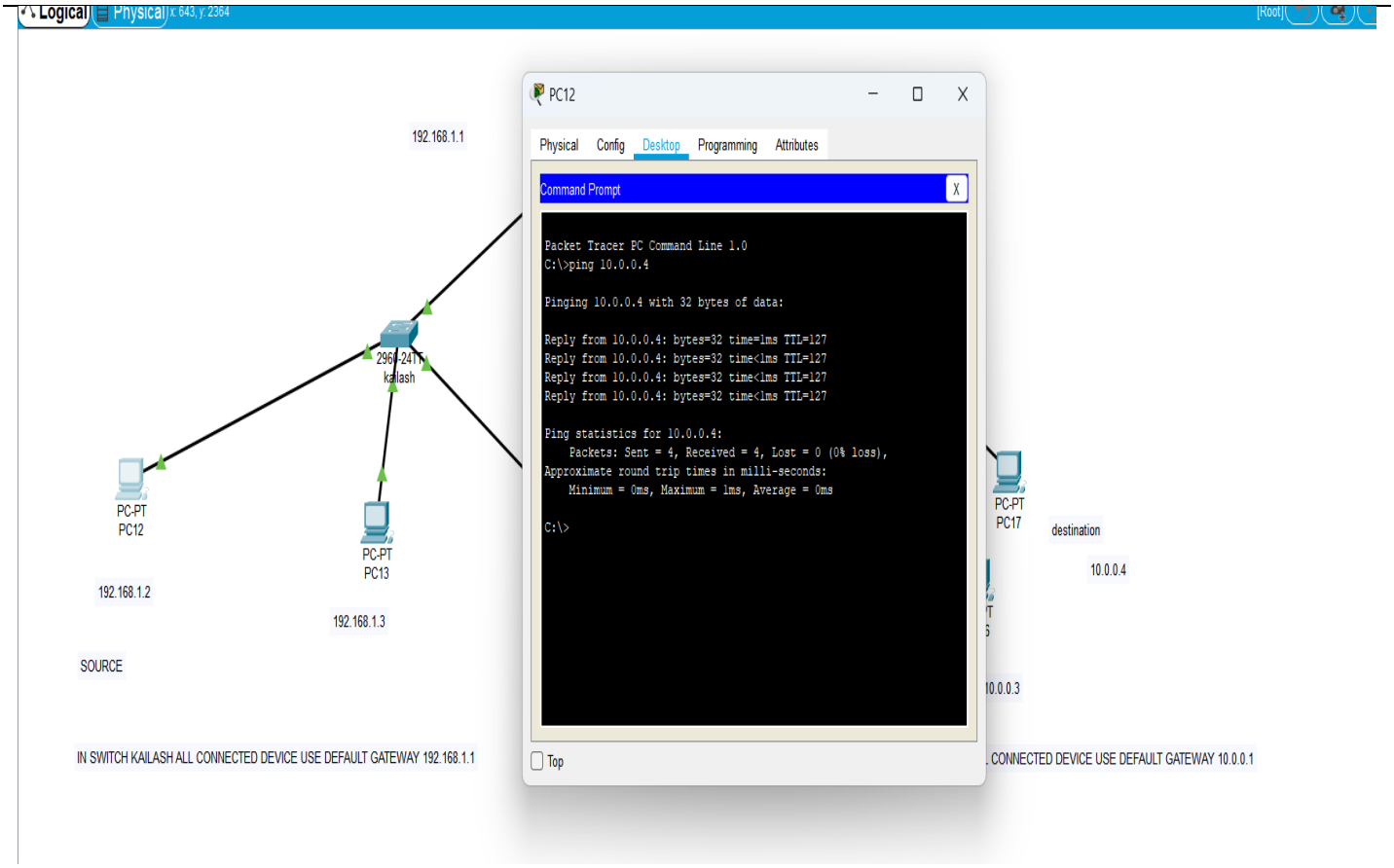

Logical
Physical
x: 1504, y: 2709
192.168.1.1
ISR4331
kailash chand router
10.0.0.1
2960-24TT
kailash
2960-24TT
chand
PC-PT
PC12
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15
PC-PT
PC16
PC-PT
PC17
destination
10.0.0.4
192.168.1.2
192.168.1.3
192.168.1.4
10.0.0.2
10.0.0.3
SOURCE
IN SWITCH KAILASH ALL CONNECTED DEVICE USE DEFAULT GATEWAY 192.168.1.1
IN SWITCH CHAND ALL CONNECTED DEVICE USE DEFAULT GATEWAY 10.0.0.1


Logical
Physical
x: 1522, y: 2675
192.168.1.1
ISR4331
kailash chand router
10.0.0.1
2960-24TT
kailash
2960-24TT
chand
PC-PT
PC12
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15
PC-PT
PC16
PC-PT
PC17
destination
10.0.0.4
192.168.1.2
192.168.1.3
192.168.1.4
10.0.0.2
10.0.0.3
SOURCE
IN SWITCH KAILASH ALL CONNECTED DEVICE USE DEFAULT GATEWAY 192.168.1.1
IN SWITCH CHAND ALL CONNECTED DEVICE USE DEFAULT GATEWAY 10
Time: 08:47:05.060
PLAY CONTROLS:



Configuration Table

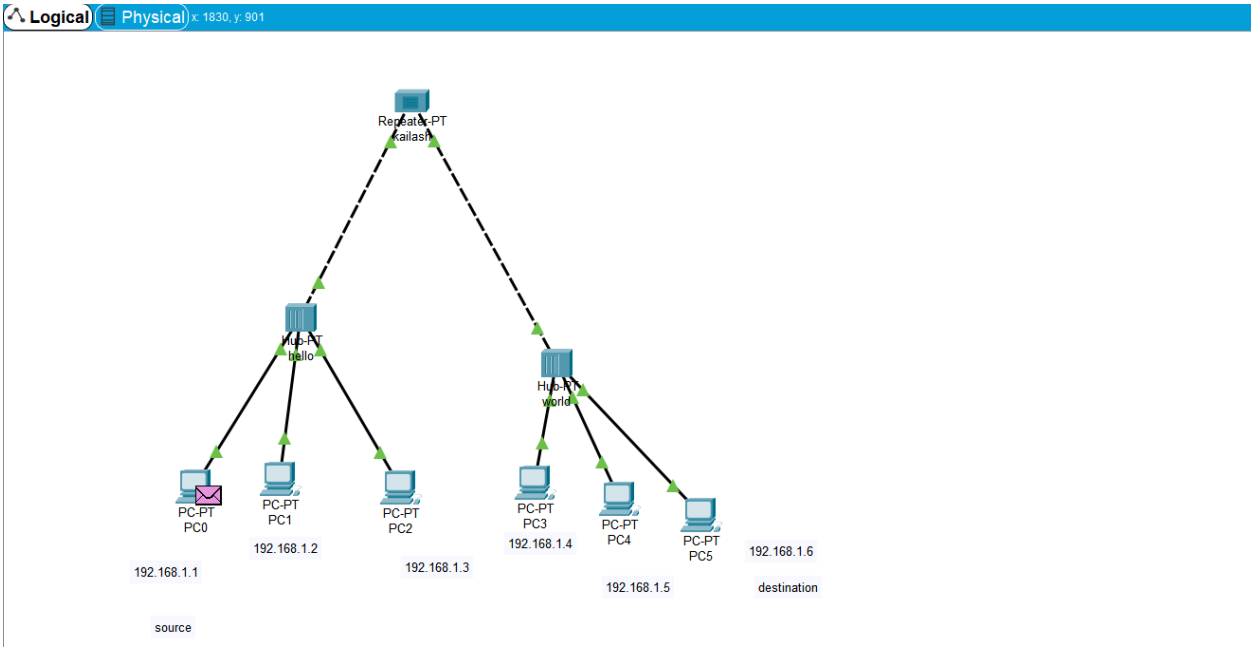
Device name	Default gateway	IP address	Subnet mask
PC12	192.168.1.1	192.168.1.2	255.255.255.0
PC13	192.168.1.1	192.168.1.3	255.255.255.0
PC14	192.168.1.1	192.168.1.4	255.255.255.0
PC15	10.0.0.1	10.0.0.2	255.0.0.0
PC16	10.0.0.1	10.0.0.3	255.0.0.0
PC17	10.0.0.1	10.0.0.4	255.0.0.0

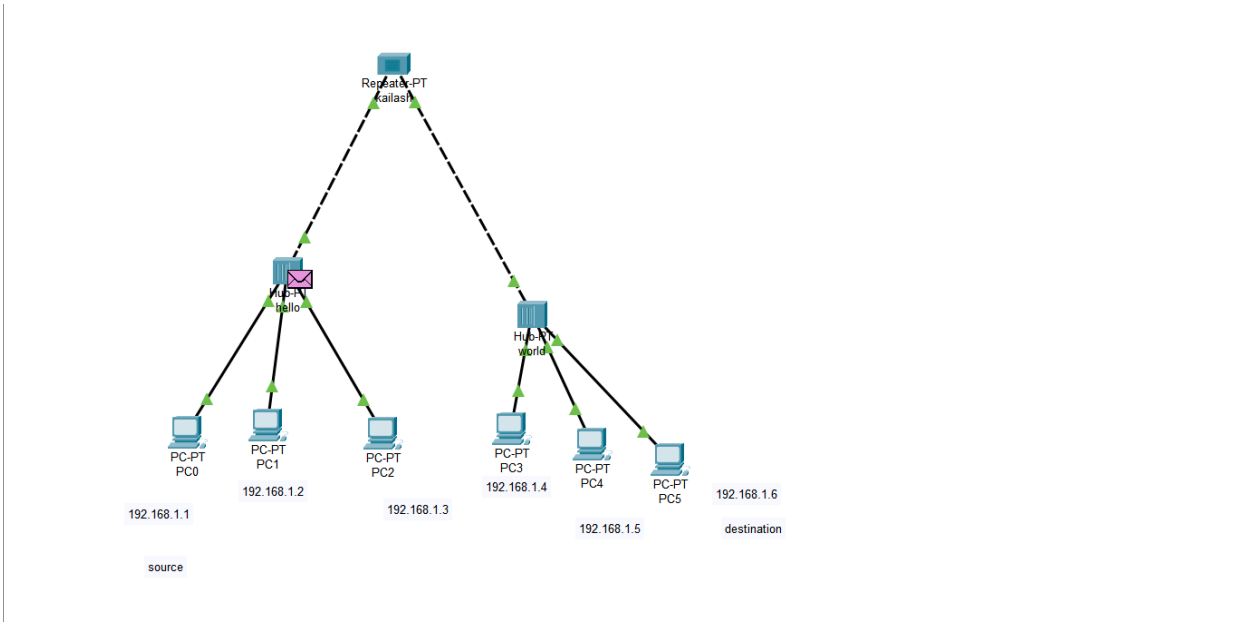


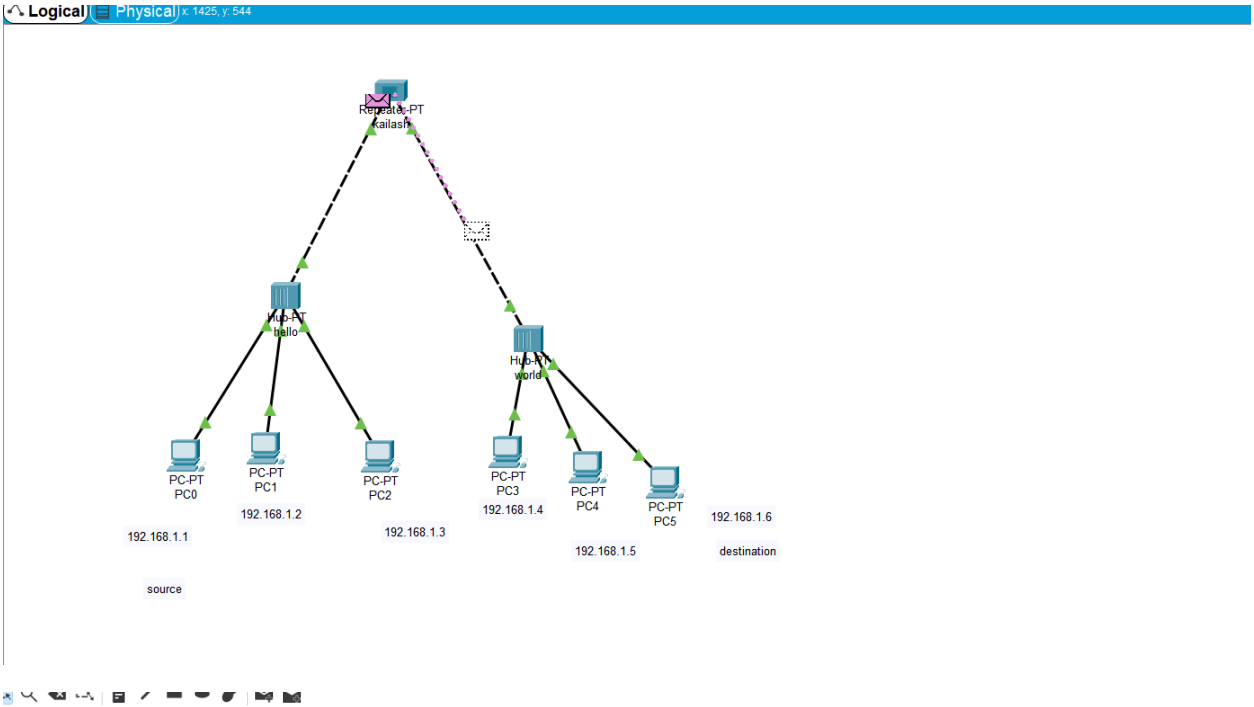
Ping from PC12 to PC17

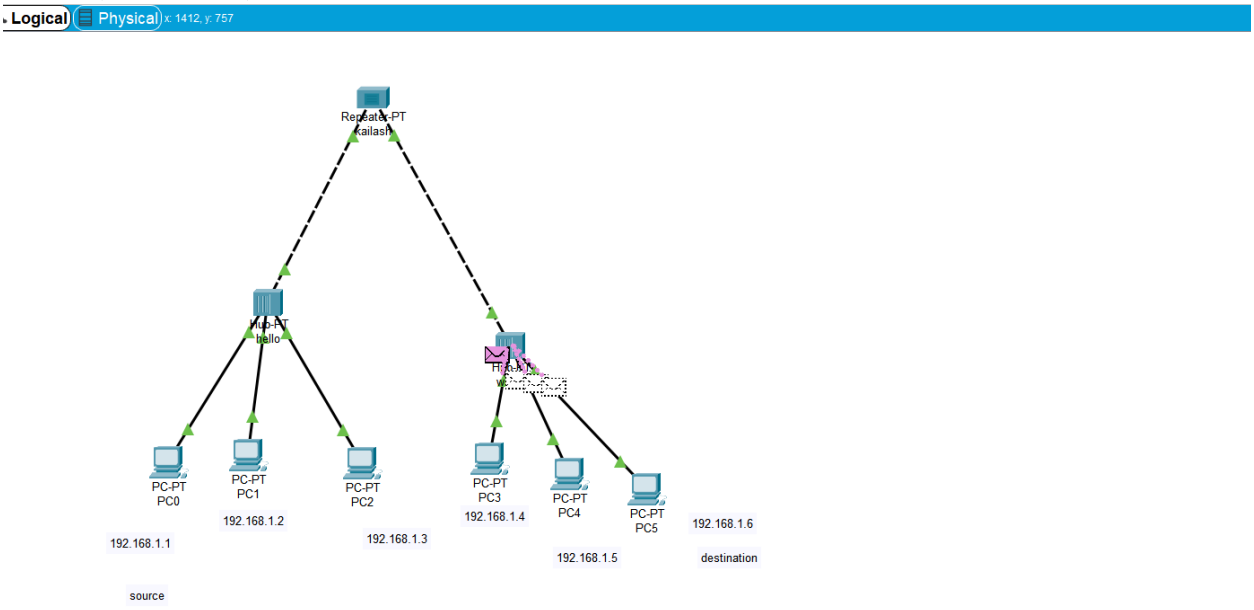
REPEATER SIMULATION

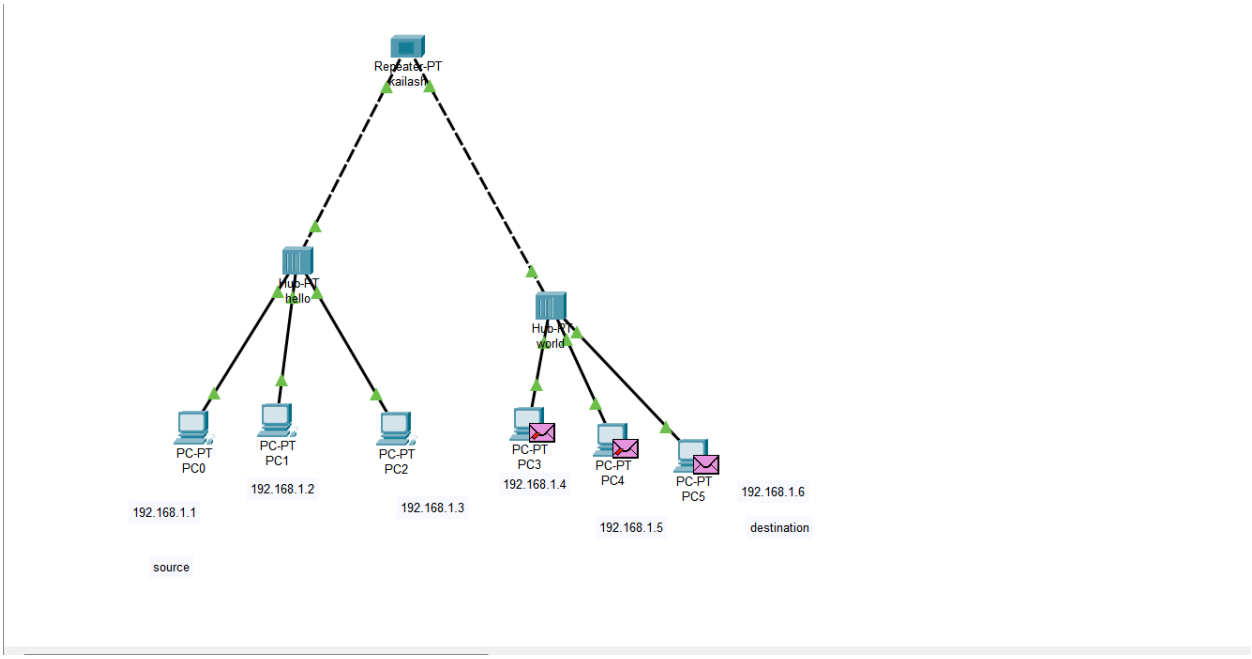
According to the figure, PC0 (192.168.1.1) sends data through Hub1 to the Repeater. The repeater simply regenerates and amplifies the signal and forwards it to Hub2 without checking addresses. Hub2 then broadcasts the data to all connected devices, and PC5 (10.10.10.4) receives it as the destination. This shows that a repeater works at the physical layer, extends network distance, and forwards signals to all devices without filtering.


Logical
Physical
x: 1830, y: 901
Repeater-PT
kailash
Hub-PT
hello
Hub-PT
world
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
source
destination


Repeater-PT
kailash
Hub-PT
hello
Hub-PT
world
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
source
destination


Logical
Physical
x: 1425, y: 544
Repeater-PT
kailash
Hub-PT
hello
Hub-PT
world
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
source
destination

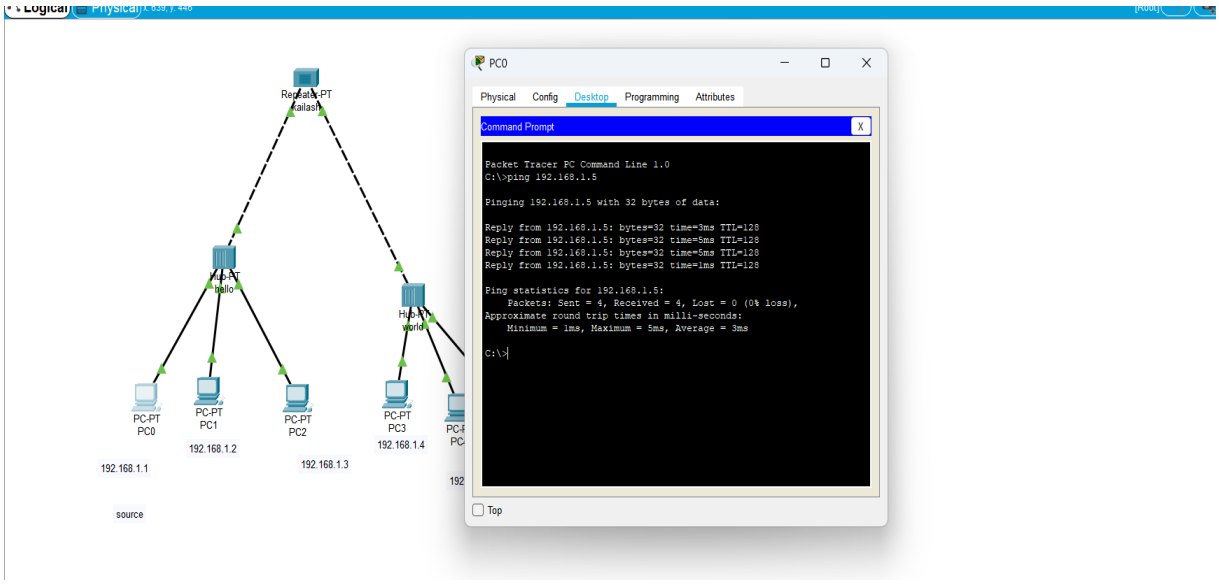

Logical
Physical
x: 1412, y: 757
Repeater-PT
kailash
Hub-PT
hello
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
192.168.1.1
192.168.1.2
192.168.1.3
192.168.1.4
192.168.1.5
192.168.1.6
source
destination



Configuration Table

Device name		IP address	Subnet mask
PC0		192.168.1.1	255.255.255.0
PC1		192.168.1.2	255.255.255.0
PC2		192.168.1.3	255.255.255.0
PC3		192.168.1.4	255.255.255.0
PC4		192.168.1.5	255.255.255.0
PC5		192.168.1.6	255.255.255.0

Ping from PC0 to PC5



DISCUSSION

During the simulation of network devices using Cisco Packet Tracer, it was observed that PCs within the same network communicated successfully, and PCs from different networks were also able to communicate through the router. The switch forwarded data only to the intended devices, which reduced collisions and improved network performance. The router successfully routed packets between different networks, and the repeater helped in maintaining signal strength. Overall, the network simulation worked correctly without packet loss. This experiment clearly demonstrated the functions and importance of network devices, and it proved that proper IP addressing and routing are essential for successful and efficient network communication.

CONCLUSION

In this lab, the simulation of network devices using Cisco Packet Tracer was successfully performed. Communication within the same network and between different networks was achieved without packet loss. The experiment helped in understanding the working of switches, routers, and repeaters, and highlighted the importance of proper network configuration. Thus, the objectives of the experiment were successfully achieved.