Department of Computer Engineering TE Computer-A (2020-21 Sem I) Computer Networks Assignment 1 [Max Marks: 40]

Submitted by : Himanshu Shekhar Padhi (3325)

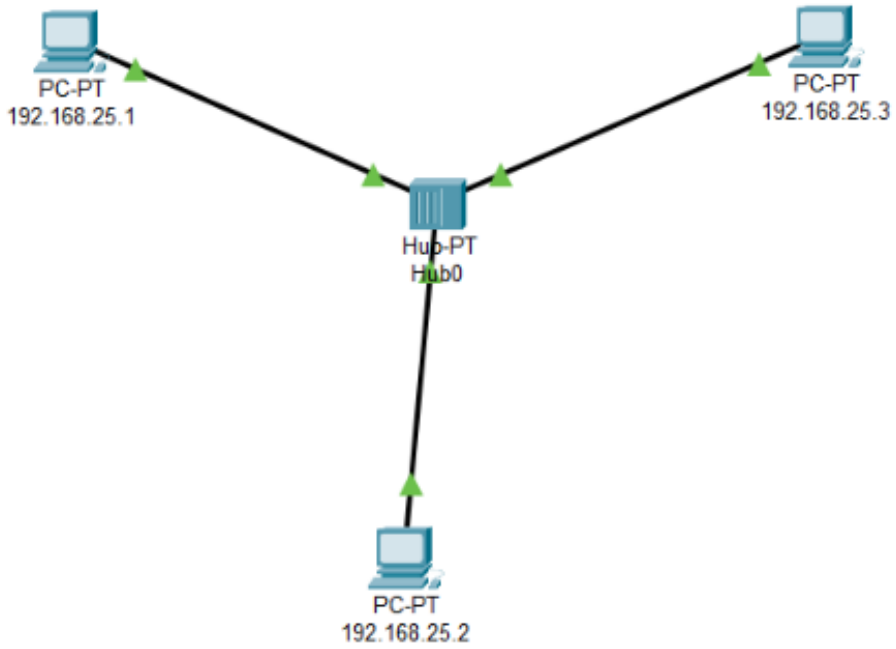
➢ STAR TOPOLOGY

In star topology, all the cables run from the computers to a central location where they are all connected by a device called a hub/switch. It is a concentrated network, where the end points are directly reachable from a central location when network is expanded. Ethernet 10 base T is a popular network based on the star topology. For star topology we build network using five generic pc which are centrally connected to single switch 2950-24 using copper straight through cable.

HUB

Network Topology (Hub)

1. Drag and drop PC from End Devices.
2. Connect them with Copper Straight through cable.
3. Change display name with their IP addresses.



Ip Address Configuration (Hub)

1. Click on the device.
2. Go to Desktop ->IP configuration.

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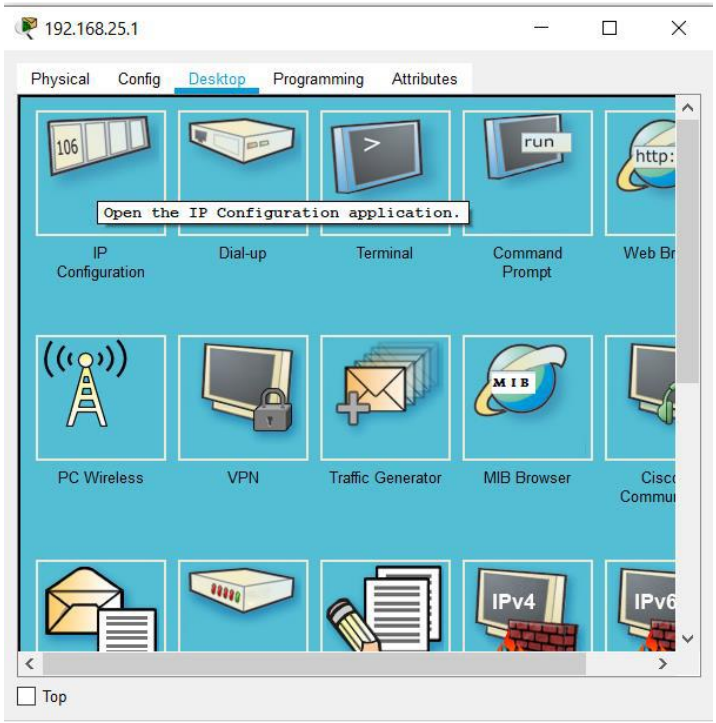
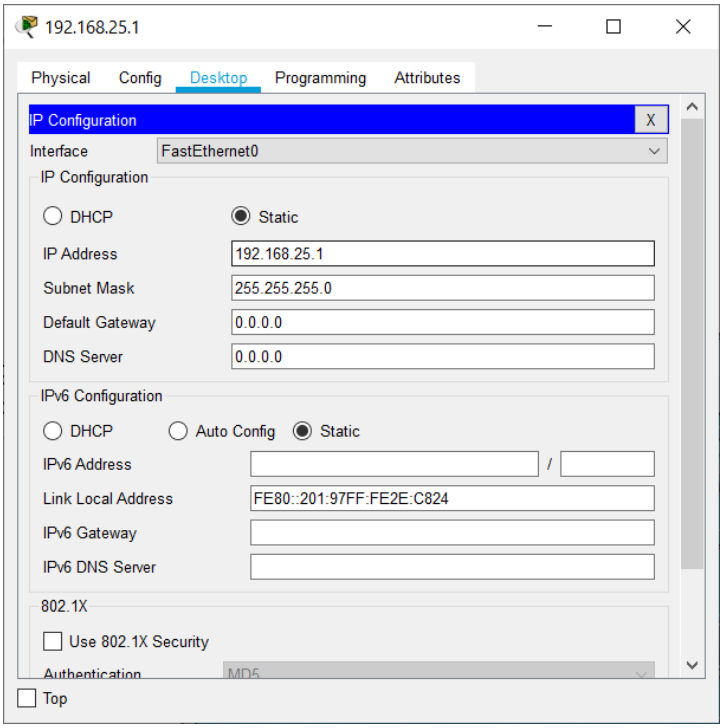
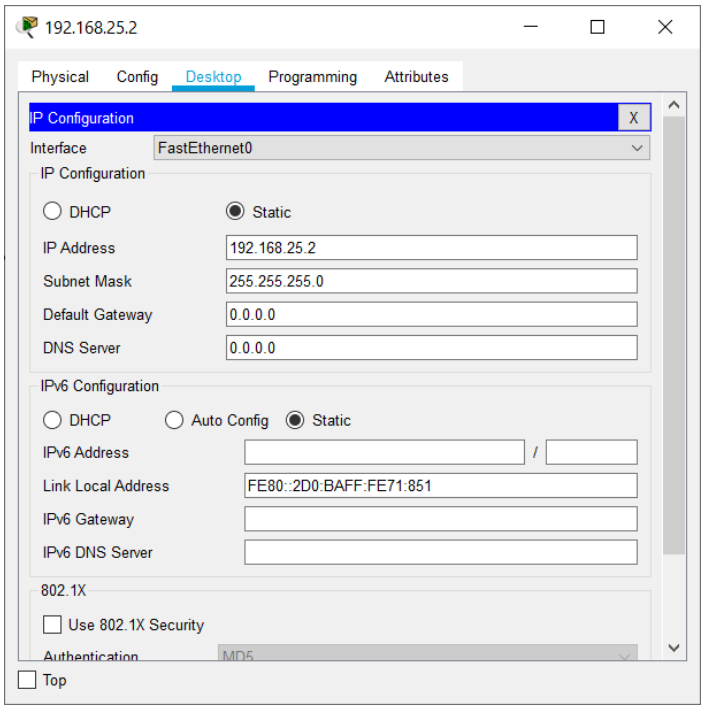
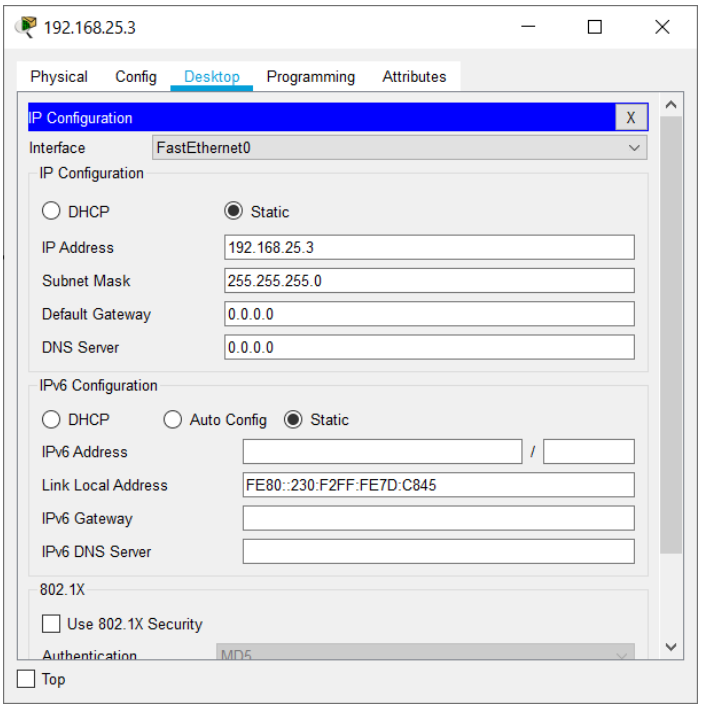
3. Set static IPs of all devices. No gateway required (same network).



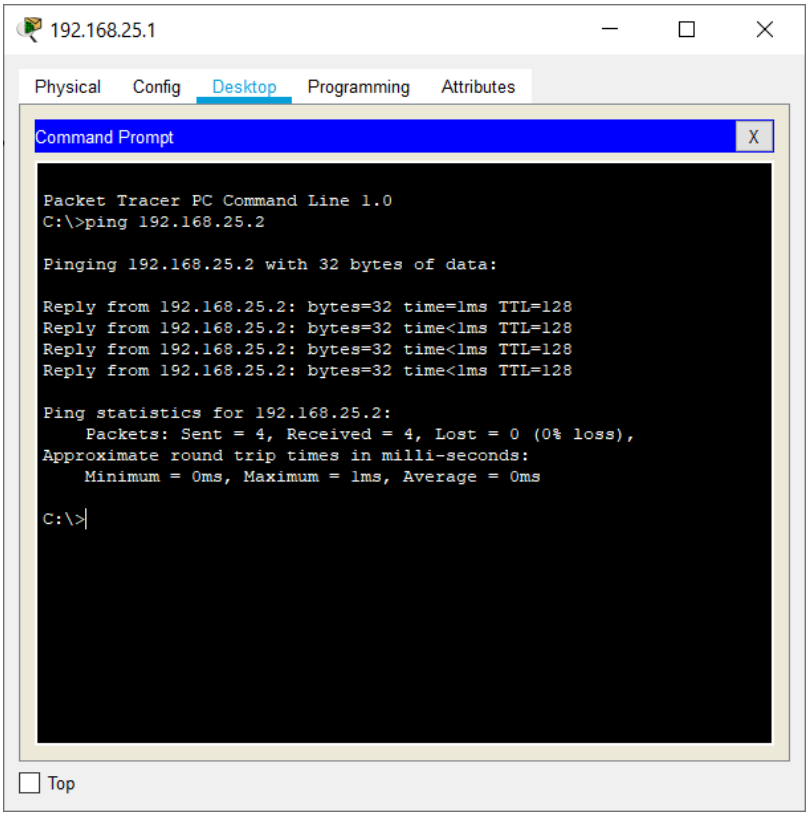






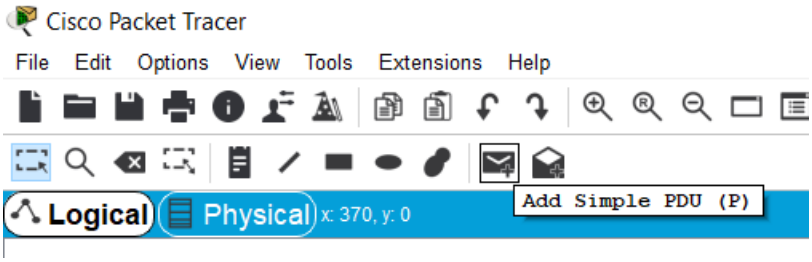
Ping Command (Hub)

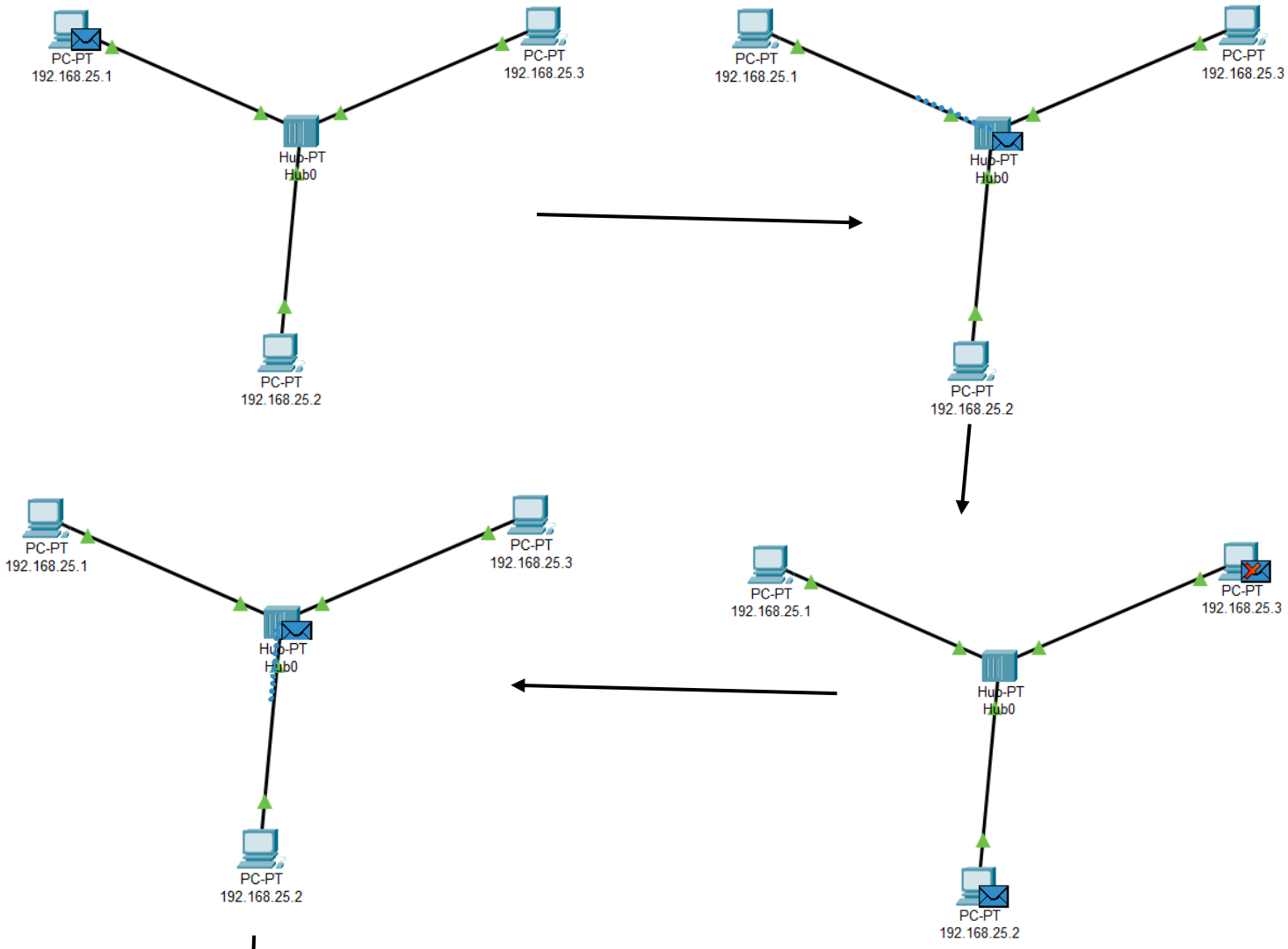
1. Click on the device.
2. Go to Desktop -> Command Prompt.
3. Type ping ip_address.



Real Mode Simulation (Hub)

1. Click on simulation tab on bottom right corner.
2. Drop Simple PDU (P) on the source and destination.
3. Then click on the play button in the simulation window.





Simulation Panel

Event List

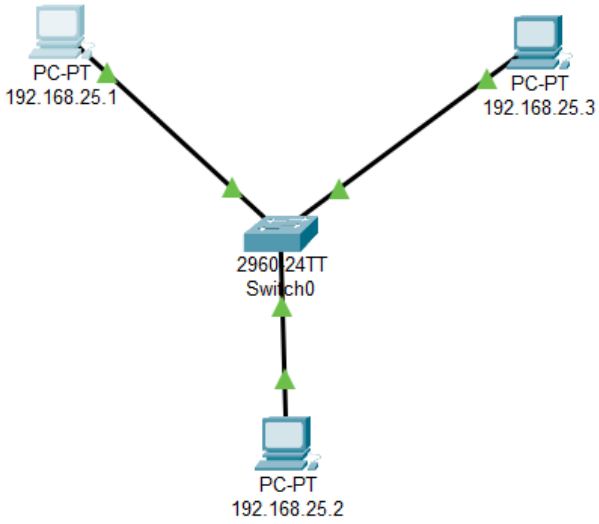
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	192.168.2...	ICMP
	0.001	192.168.25.1	Hub0	ICMP
	0.002	Hub0	192.168.2...	ICMP
	0.002	Hub0	192.168.2...	ICMP
	0.003	192.168.25.2	Hub0	ICMP
	0.004	Hub0	192.168.2...	ICMP
	0.004	Hub0	192.168.2...	ICMP

Reset Simulation | Constant Delay | Captured to: 364.716 s

SWITCH

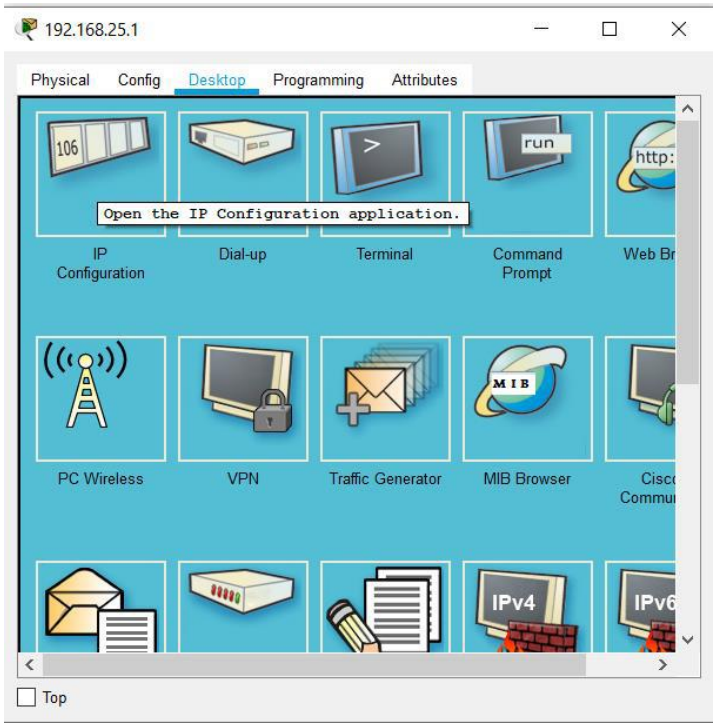
Network Topology (Switch)

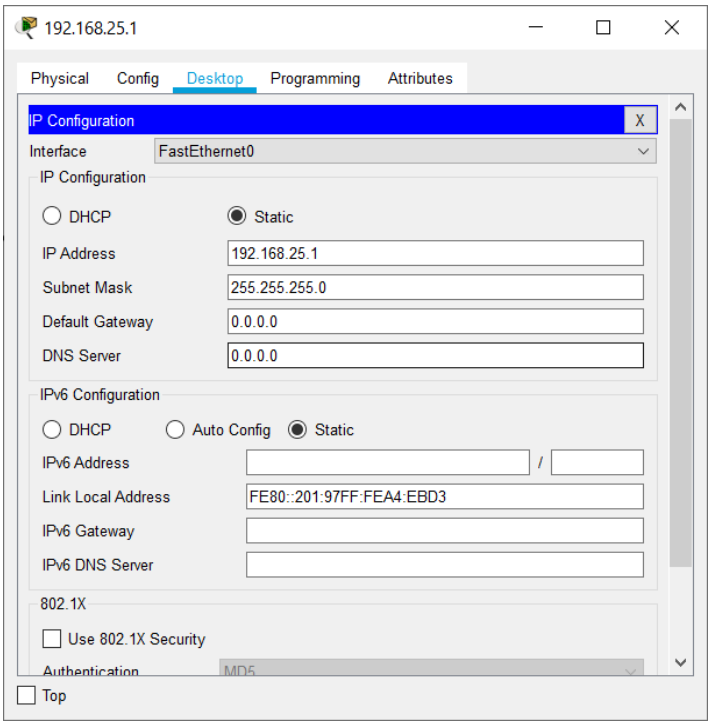
1. Drag and drop PC from End Devices.
2. Connect them with Copper Straight through cable.
3. Change display name with their IP addresses.

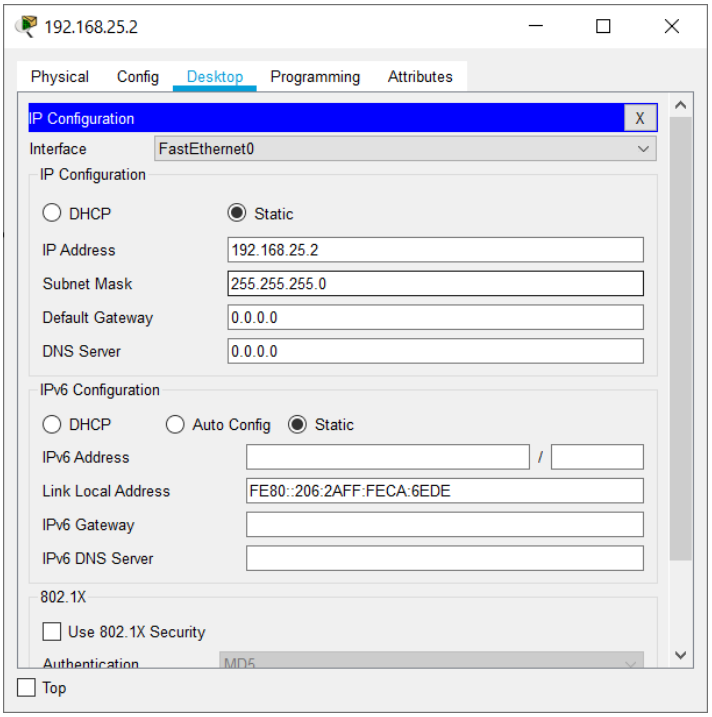


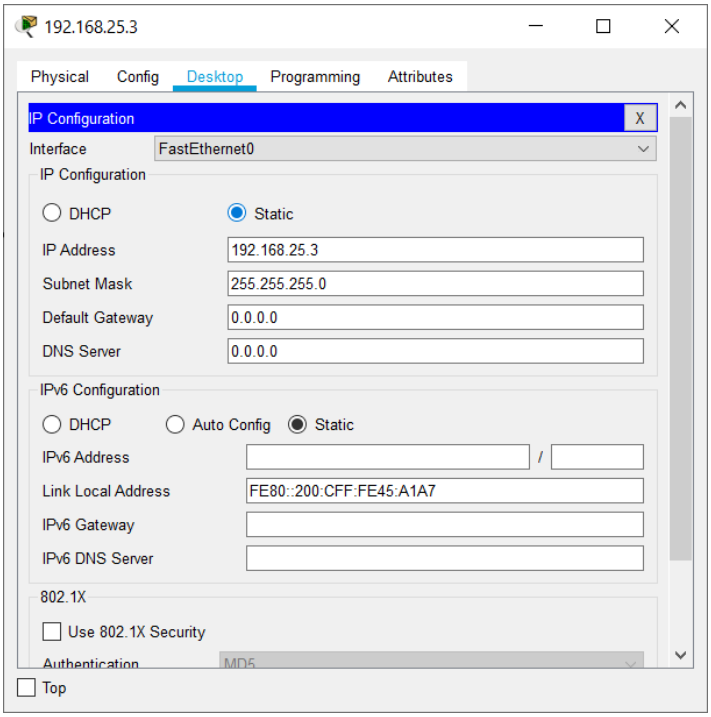
Ip Address Configuration (Switch)

1. Click on the device.
2. Go to Desktop ->IP configuration.
3. Set static IPs of all devices. No gateway required (same network).









Ping Command (Switch)

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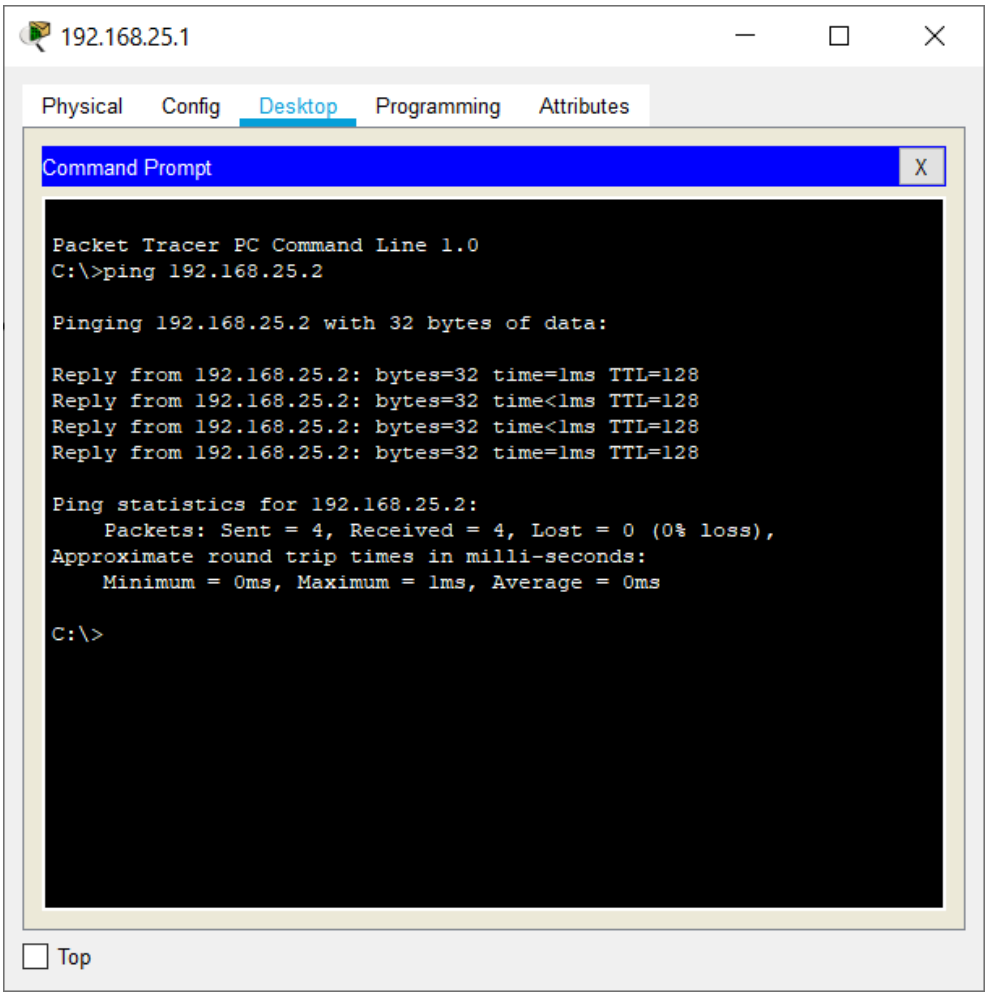
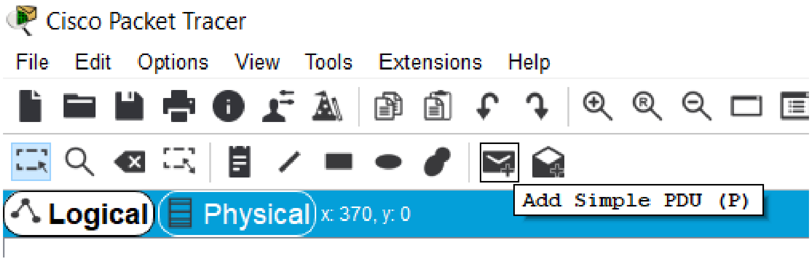
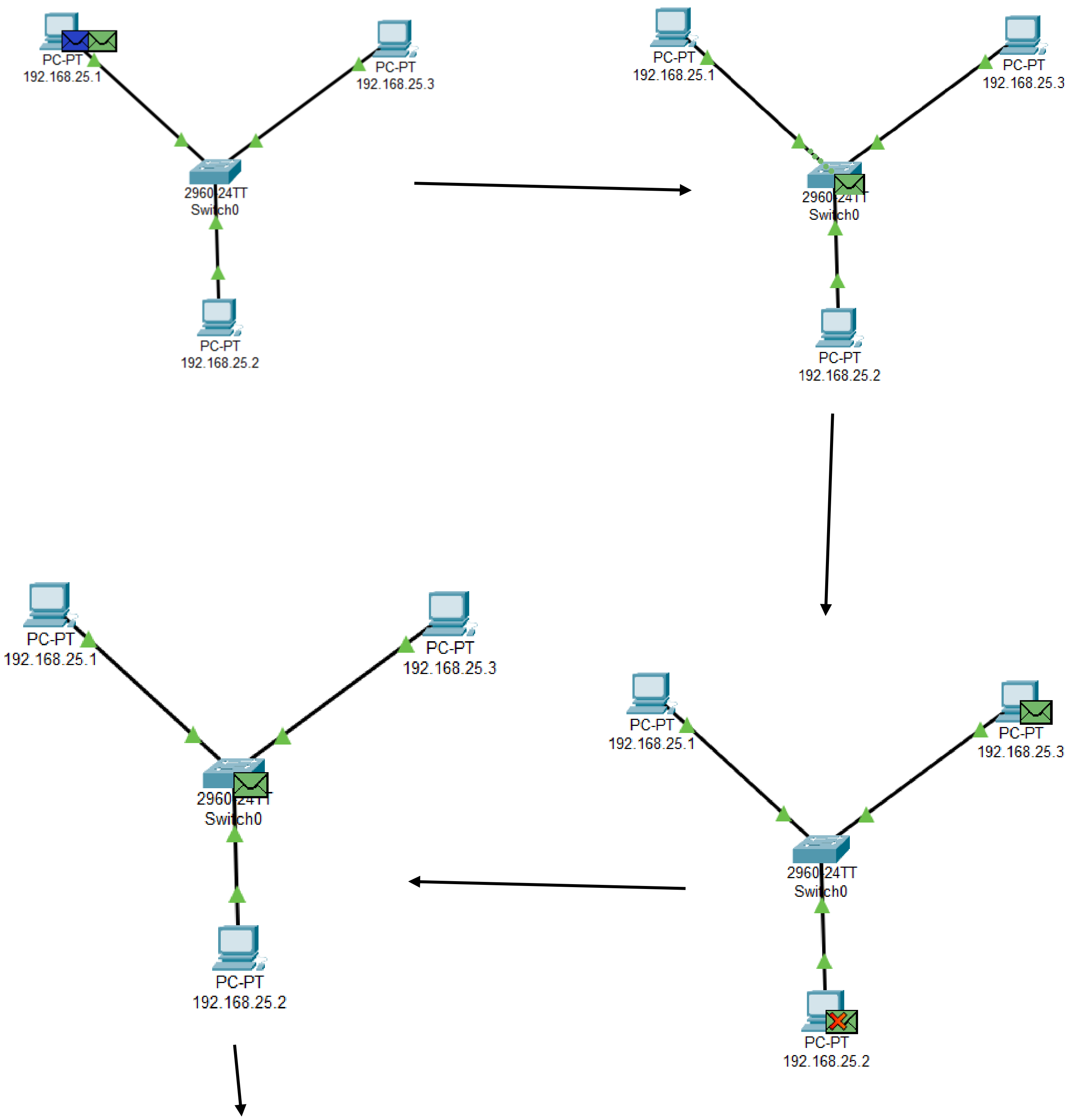
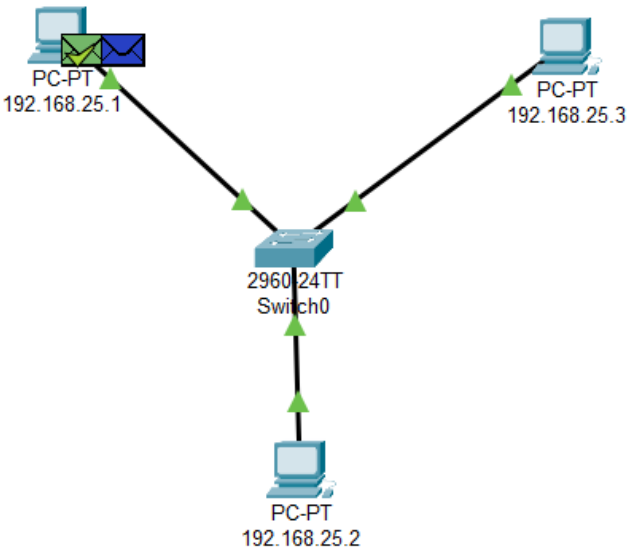


Real Mode Simulation (Switch)

1. Click on simulation tab on bottom right corner.
2. Drop Simple PDU (P) on the source and destination.
3. Then click on the play button in the simulation window.







Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	192.168.2...	ICMP
	0.000	--	192.168.2...	ARP
	0.001	192.168.25.1	Switch0	ARP
	0.002	Switch0	192.168.2...	ARP
	0.002	Switch0	192.168.2...	ARP
	0.003	192.168.25.3	Switch0	ARP
	0.004	Switch0	192.168.2...	ARP
	0.004	--	192.168.2...	ICMP

Reset Simulation | Constant Delay | Captured to: 0.004 s

Comparing Hub and Switch

Hub	Switch
A hub operates on the physical layer.	A switch operates on the data link layer.
Hubs perform frame flooding that can be unicast, multicast, or broadcast.	It performs broadcast, then the unicast and multicast as needed.
Just a singular domain of collision is present in a hub.	Varied ports have separate collision domains.
Transmission mode is Half-duplex	Transmission mode is Full duplex
Hubs operates as a Layer 1 devices per the OSI model.	Network switches help you to operate at Layer 2 of the OSI model.

To connect a network of personal computers should be joined through a central hub.	Allow connecting multiple devices and ports.
Uses electrical signal orbits	Uses frame & packet
Does not offer Spanning-Tree	Multiple Spanning-Tree is possible
Collisions occur mostly in setups using hubs.	No collisions occur in a full-duplex switch.
Hub is a passive device	A switch is an active device
A network hub can't store MAC addresses.	Switches use CAM (Content Accessible Memory) that can be accessed by ASIC (Application Specific Integrated Chips).
Not an intelligent device	Intelligent device
Its speed is up to 10 Mbps	10/100 Mbps, 1 Gbps, 10 Gbps
Does not use software	Has software for administration

Advantages of Star Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

Disadvantages of Star Topology

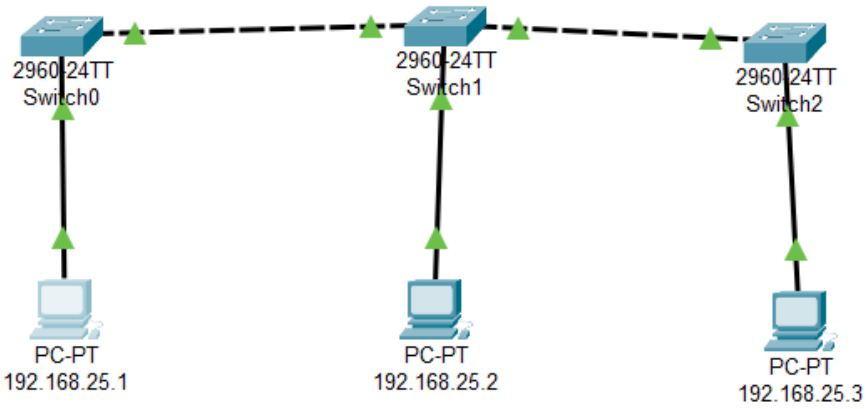
- Requires more cable length than a linear bus topology.
- If the connecting network device (network switch) fails, nodes attached are disabled and cannot participate in computer network communication.
- More expensive than linear bus topology because of the cost of the connecting devices (network switches).

➢ BUS TOPOLOGY

In local area network, it is a single network cable runs in the building or campus and all nodes are connected along with this communication line with two endpoints called the bus or backbone. In other words, it is a multipoint data communication circuit that is easily control data flow between the computers because this configuration allows all stations to receive every transmission over the network.

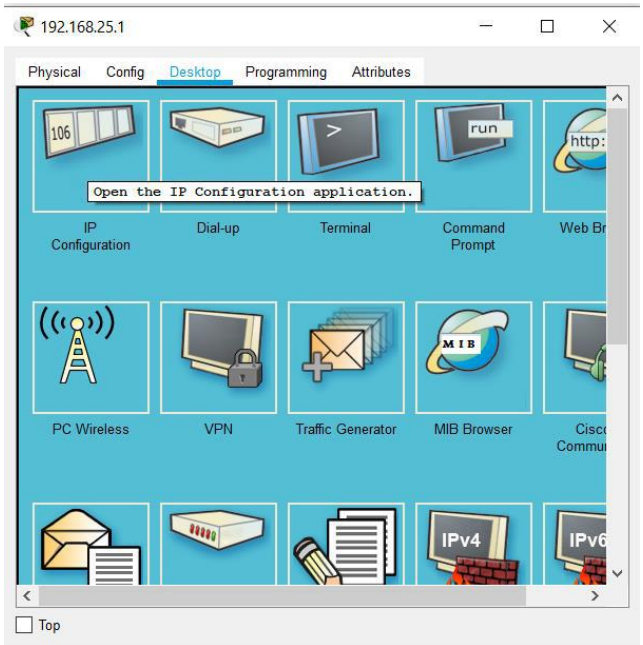
Network Topology

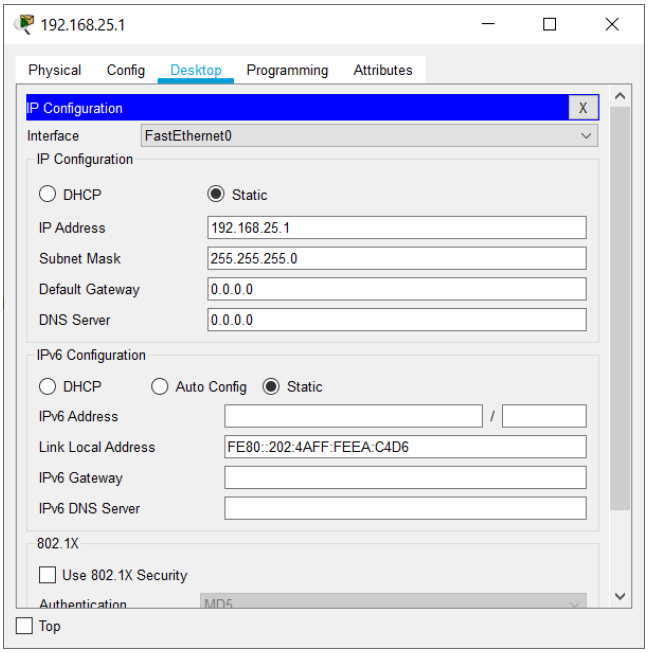
1. Drag and drop PC from End Devices.
2. Connect them with Copper Straight through cable.
3. Change display name with their IP addresses.

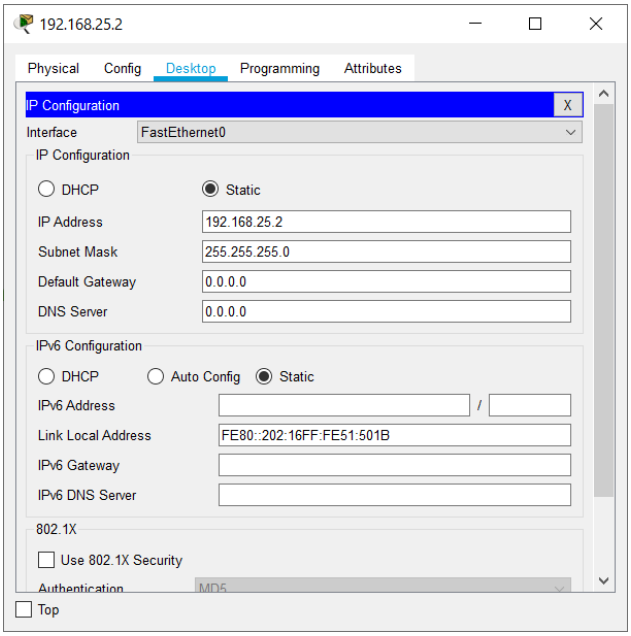


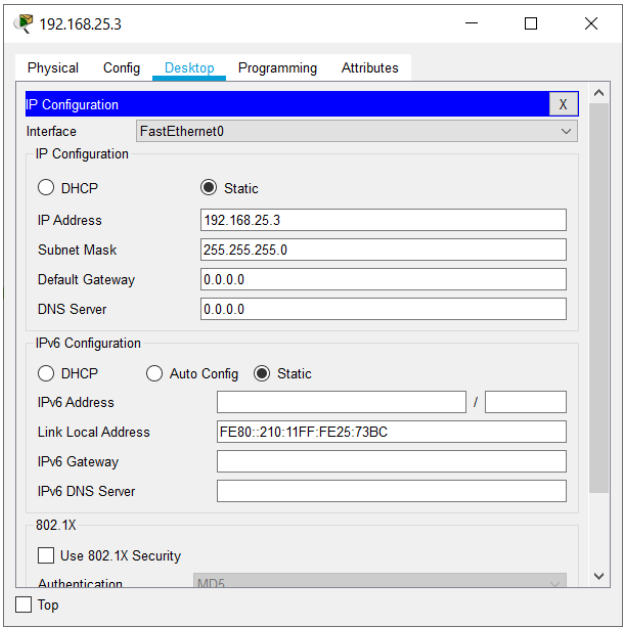
Ip Address Configuration

1. Click on the device.
2. Go to Desktop ->IP configuration.
3. Set static IPs of all devices. No gateway required (same network).









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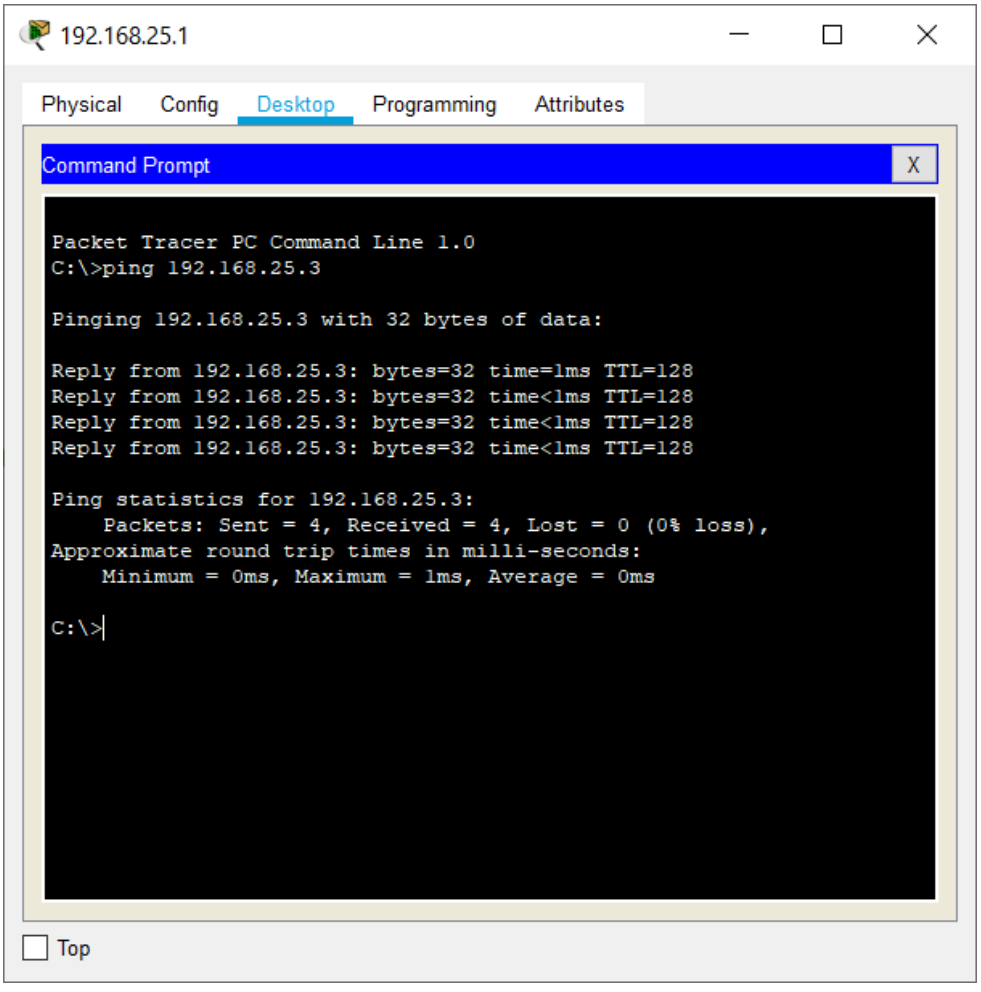

Real Mode Simulation

1. Click on simulation tab on bottom right corner.
2. Drop Simple PDU (P) on the source and destination.
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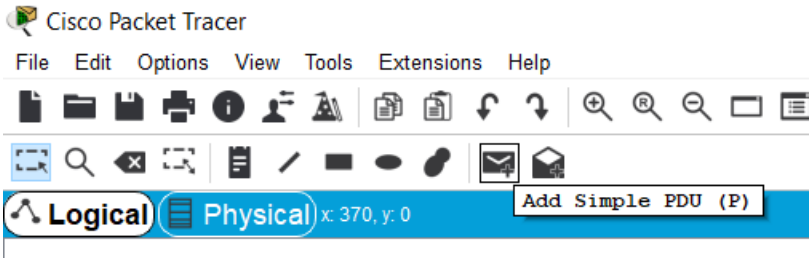
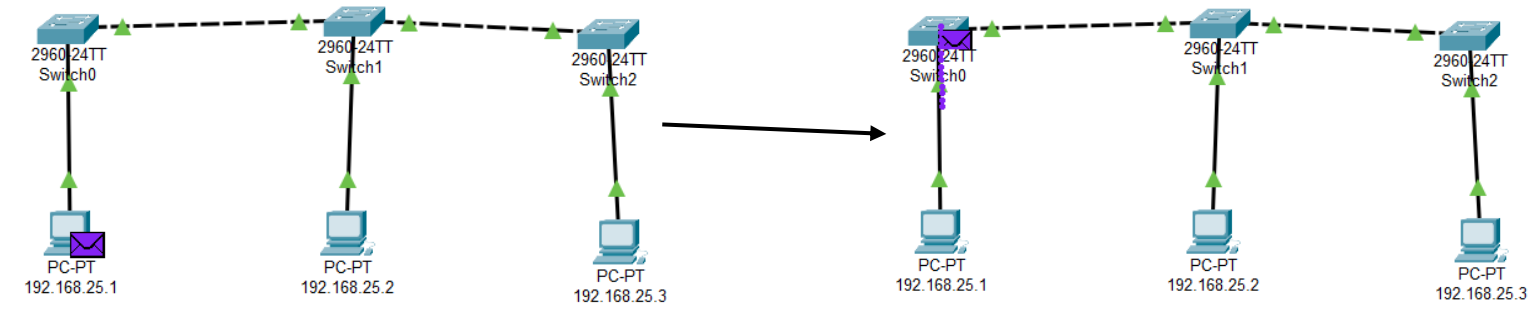
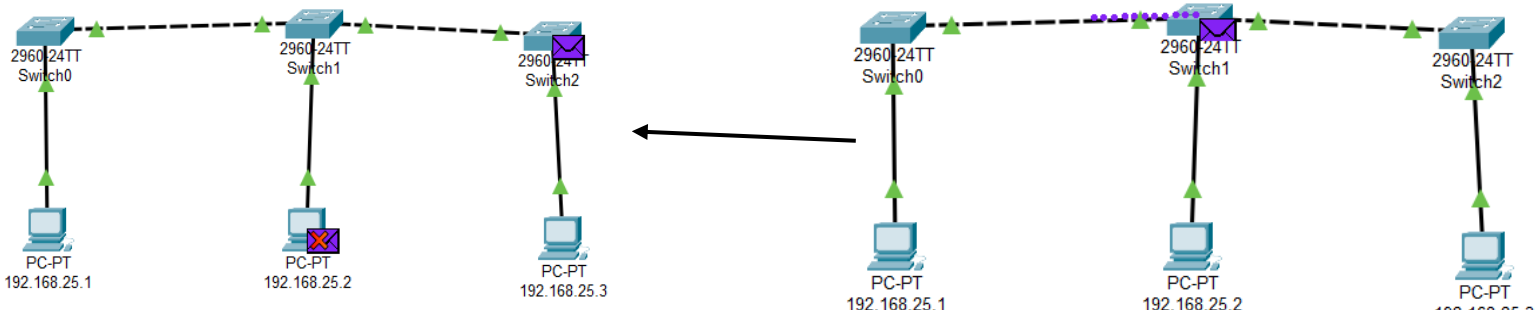
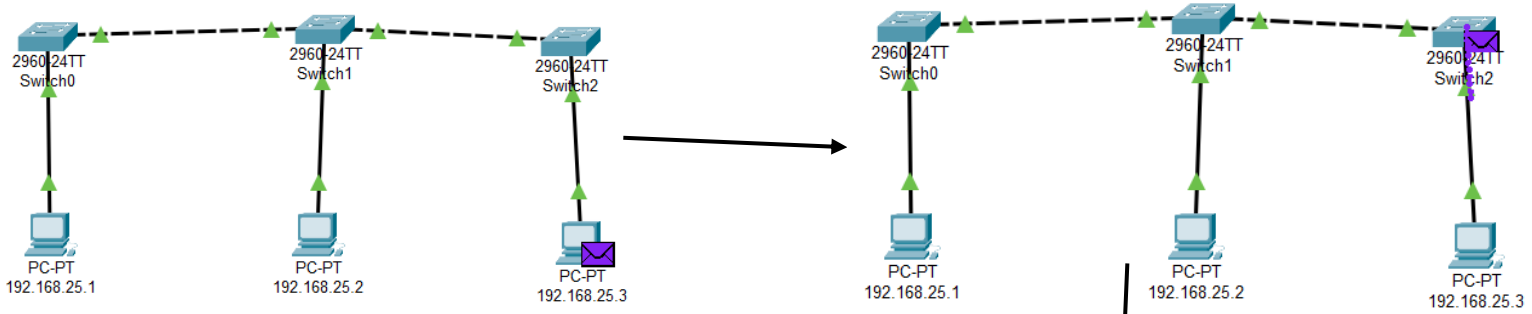
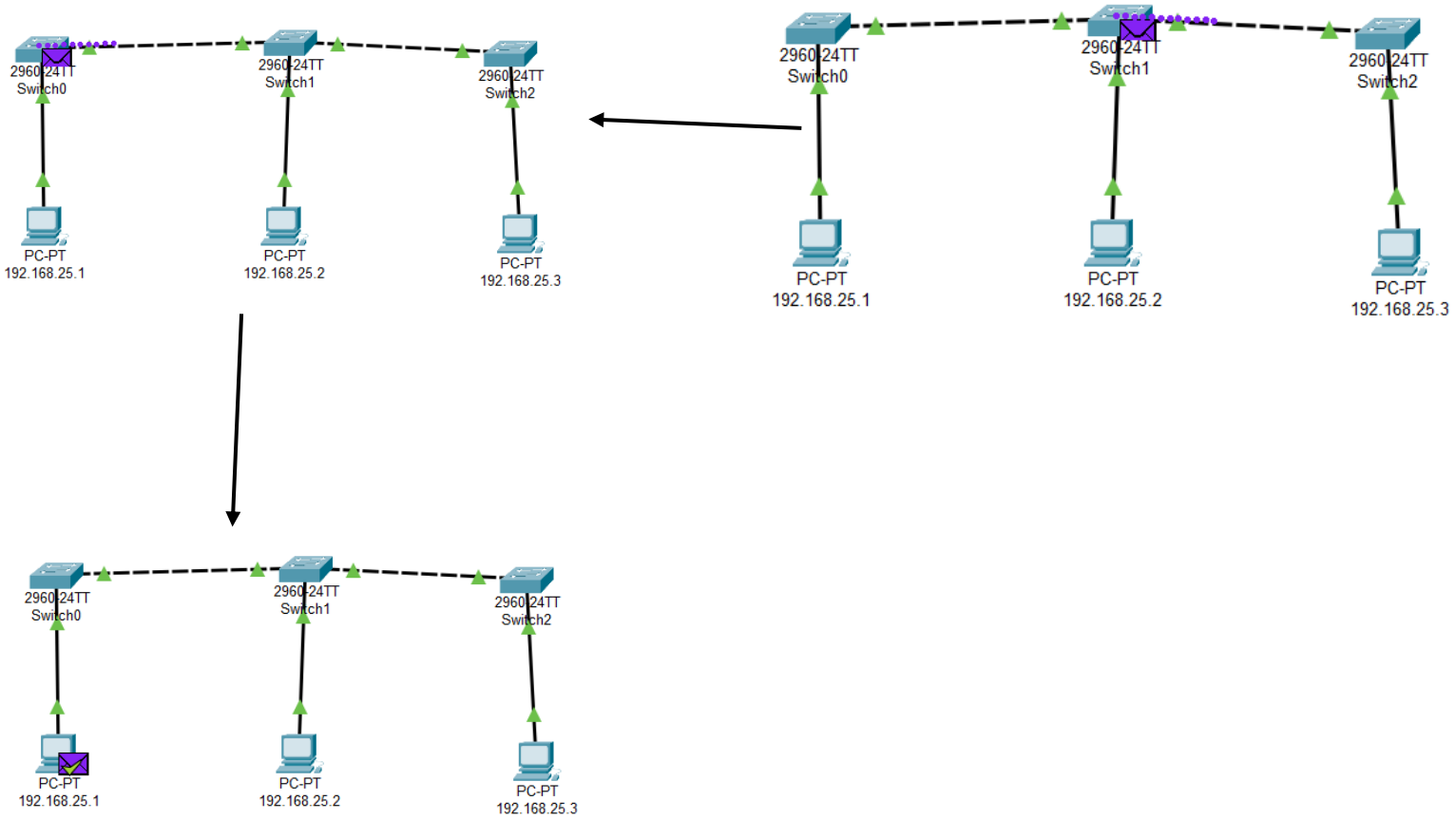










Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	192.168.25.1	ICMP
	0.001	192.168.25.1	Switch0	ICMP
	0.002	Switch0	Switch1	ICMP
	0.003	Switch1	Switch2	ICMP
	0.004	Switch2	192.168.25.3	ICMP
	0.005	192.168.25.3	Switch2	ICMP
	0.006	Switch2	Switch1	ICMP
	0.007	Switch1	Switch0	ICMP
	0.008	Switch0	192.168.25.1	ICMP

Reset Simulation | Constant Delay | Captured to: 0.008 s

Advantages of Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

Disadvantages of Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution.

➢ RING TOPOLOGY

Ring topology, also known as Ring network, is a **type of network topology** where each node is exactly connected to two other nodes, forward and backward, thus forming a single continuous path for signal transmission.

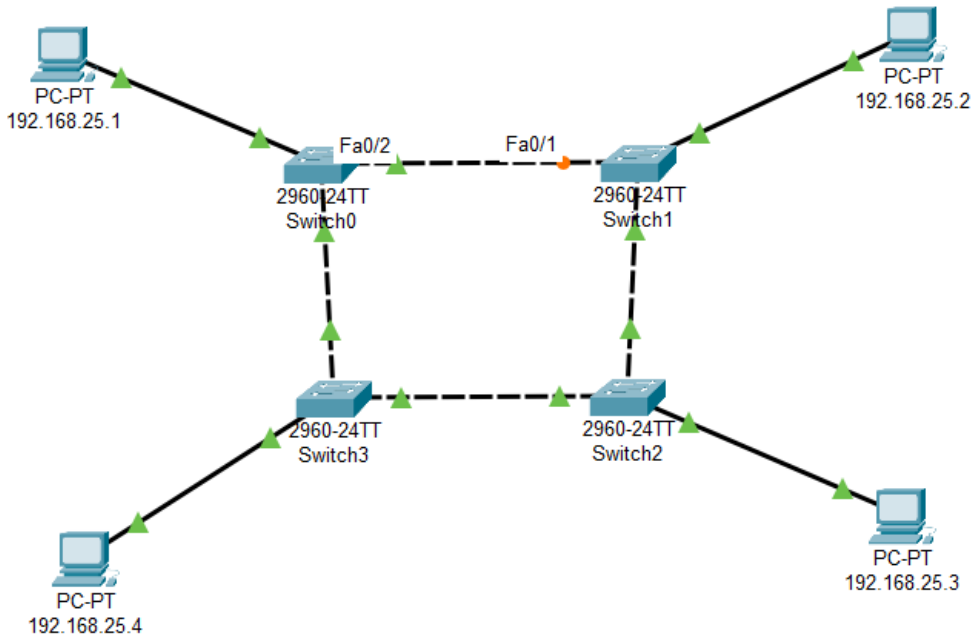
There are two types of the Ring Topology based on the data flow:

- Unidirectional and,
- Bidirectional

A Unidirectional ring topology handles data traffic in either clockwise or anticlockwise direction. This data network, thus, can also be called as a half-duplex network. A Unidirectional ring topology is thus easy to maintain compared to the bidirectional ring topology.

Network Topology

1. Drag and drop PC from End Devices.
2. Connect them with Copper Straight through cable.
3. Change display name with their IP addresses.



Ip Address Configuration

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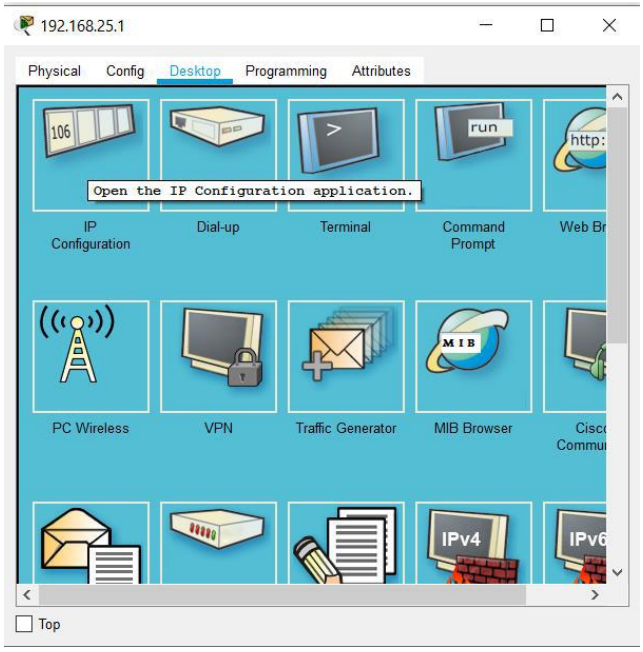
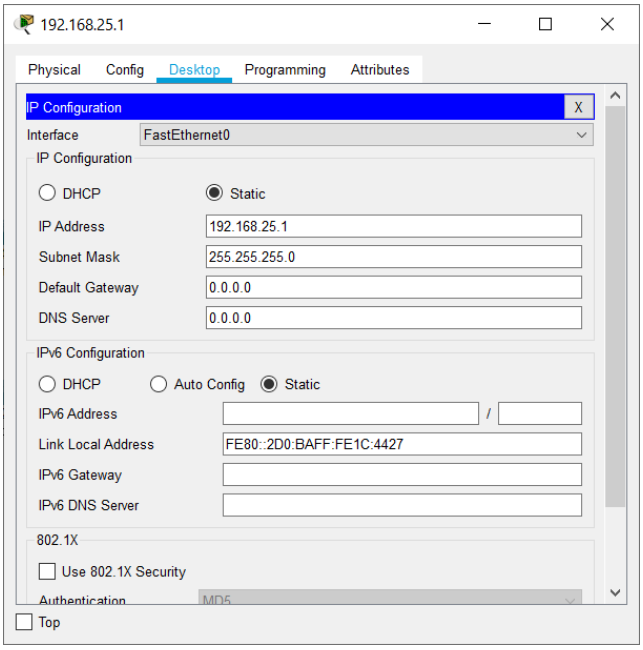
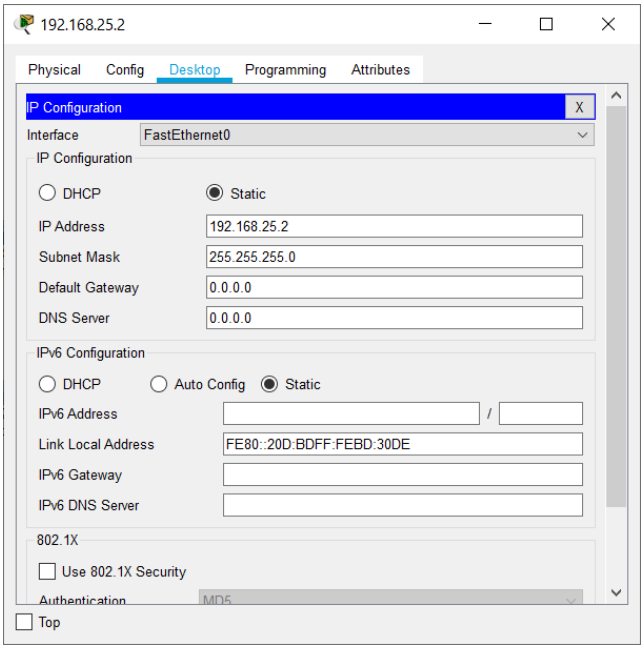

192.168.25.1
Physical
Config
Desktop
Programming
Attributes
Open the IP Configuration application.
IP Configuration
Dial-up
Terminal
Command Prompt
PC Wireless
VPN
Traffic Generator
MIB Browser
IPv4
Top


192.168.25.1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.25.1
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2D0:BAFF:FE1C:4427
IPv6 Gateway
IPv6 DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top


192.168.25.2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.25.2
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::20D:BDFF:FEBD:30DE
IPv6 Gateway
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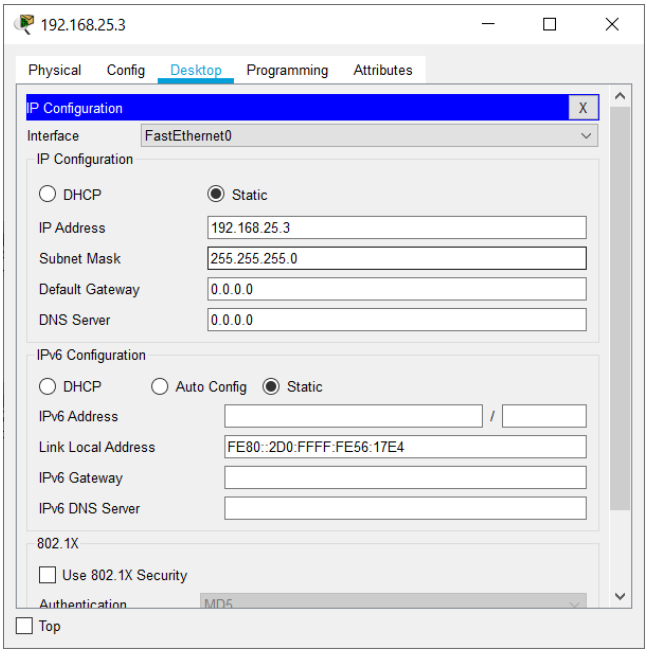
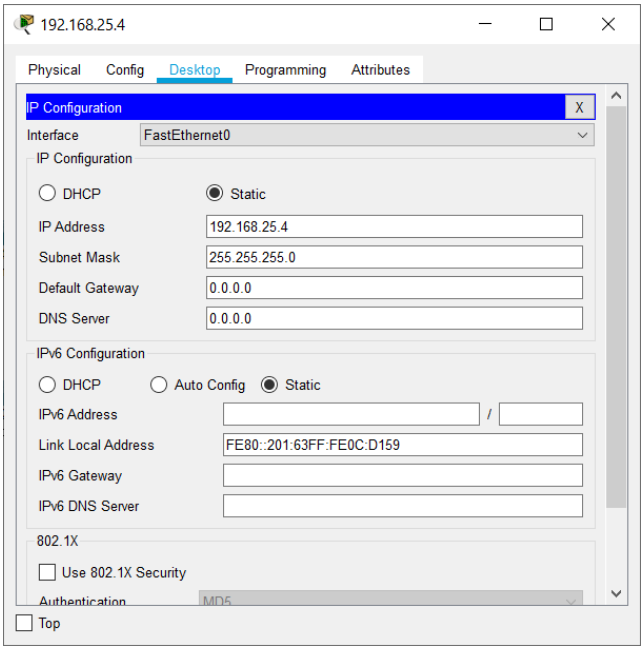
802.1X
Use 802.1X Security
Authentication
MD5
Top


192.168.25.3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.25.3
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2D0:FFFF:FE56:17E4
IPv6 Gateway
IPv6 DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top


192.168.25.4
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.25.4
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::201:63FF:FE0C:D159
IPv6 Gateway
IPv6 DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top

Ping Command

1. Click on the device.
2. Go to Desktop -> Command Prompt.
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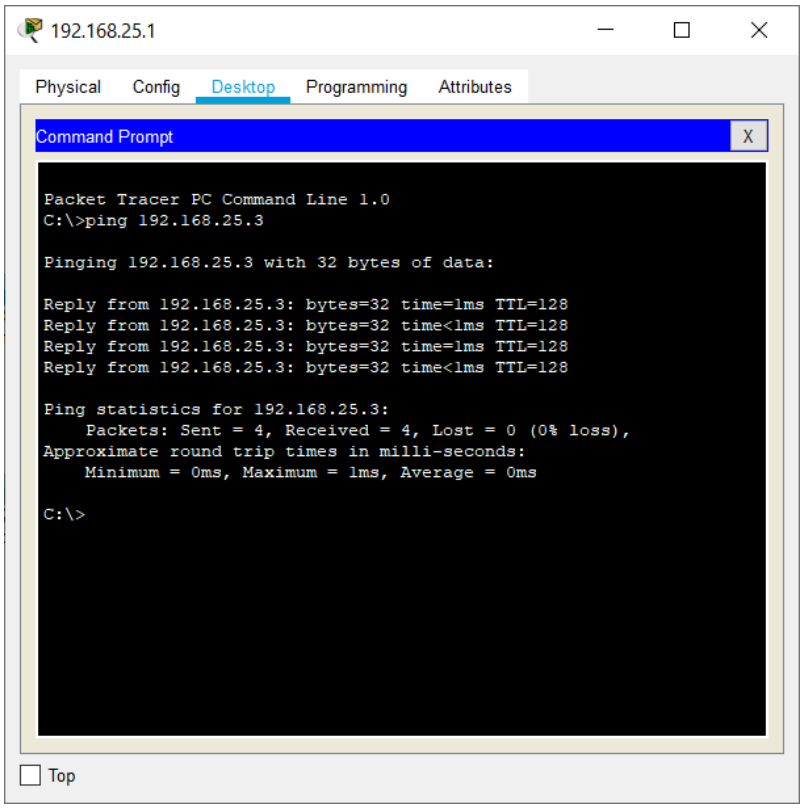

Real Mode Simulation (Switch)

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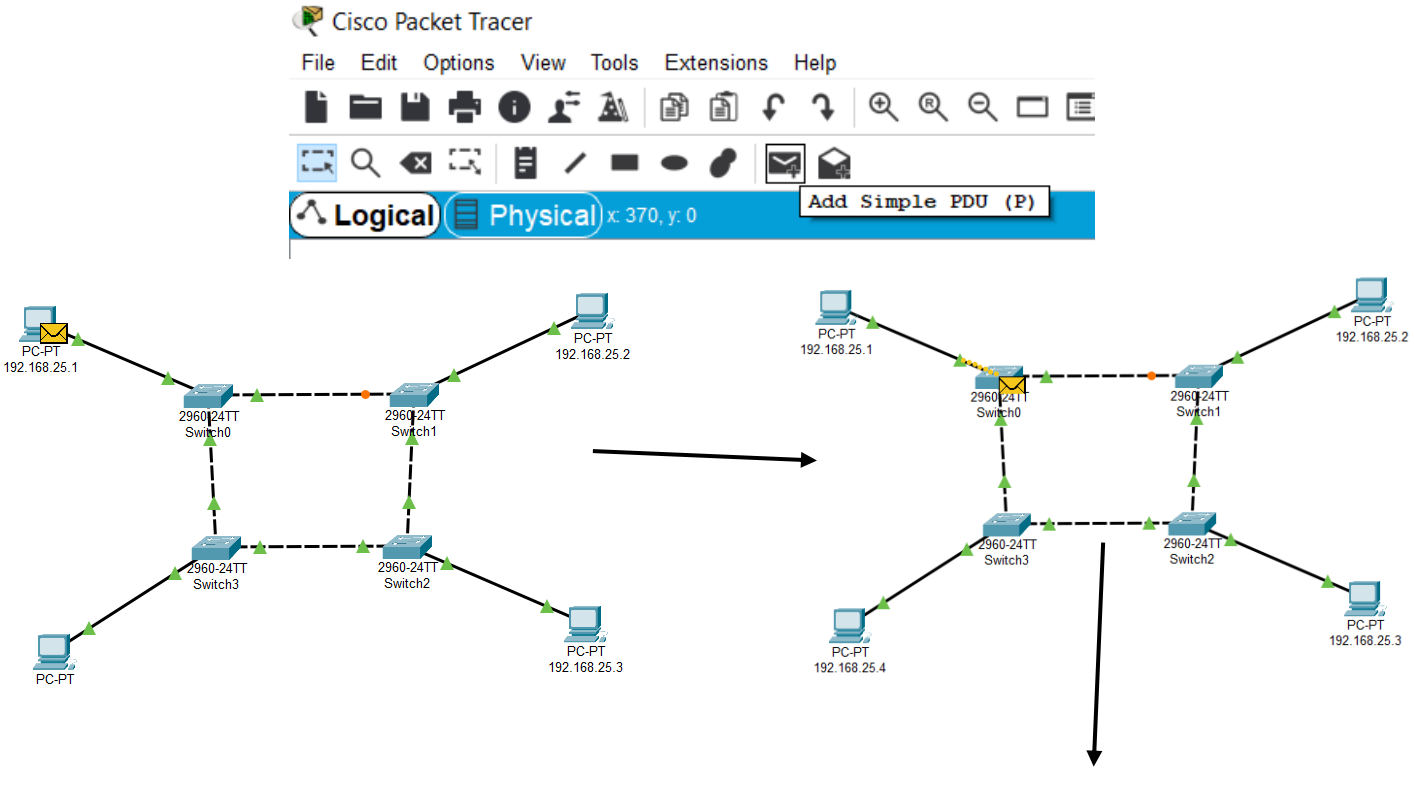
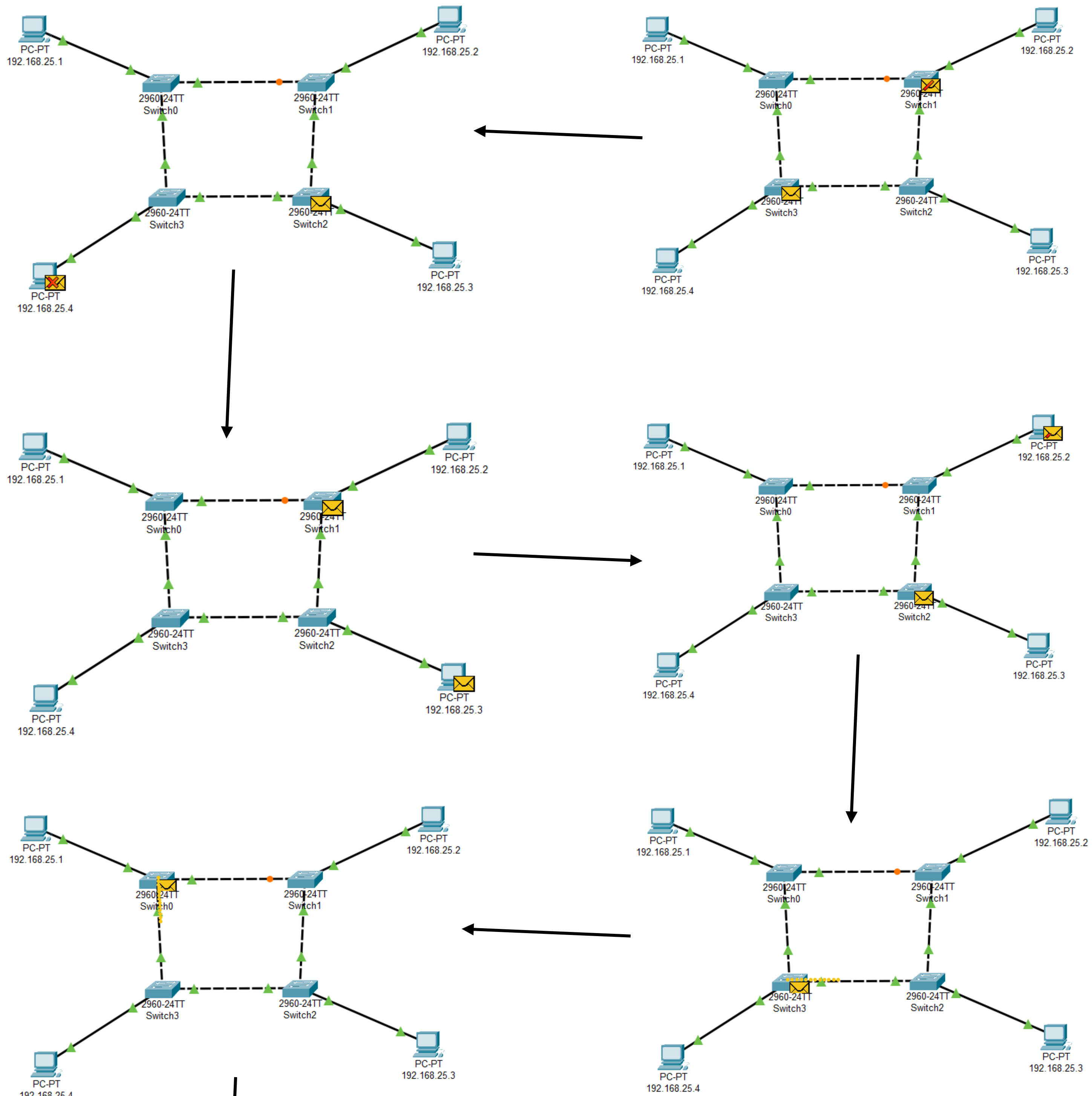
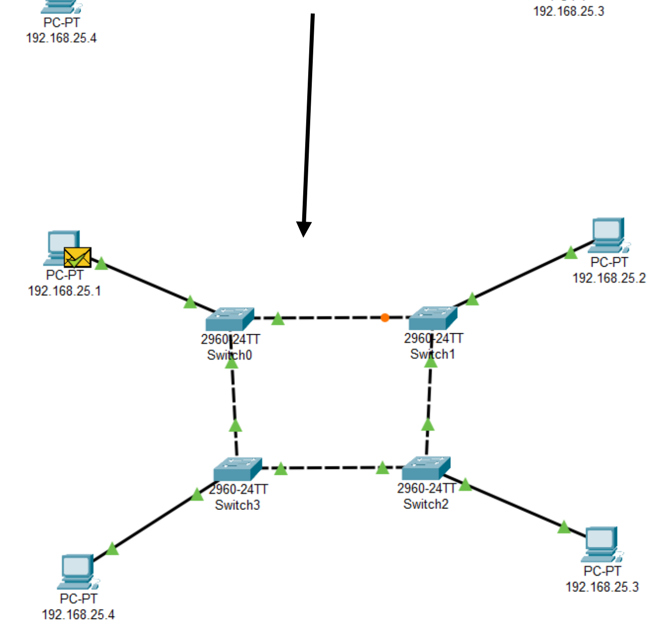
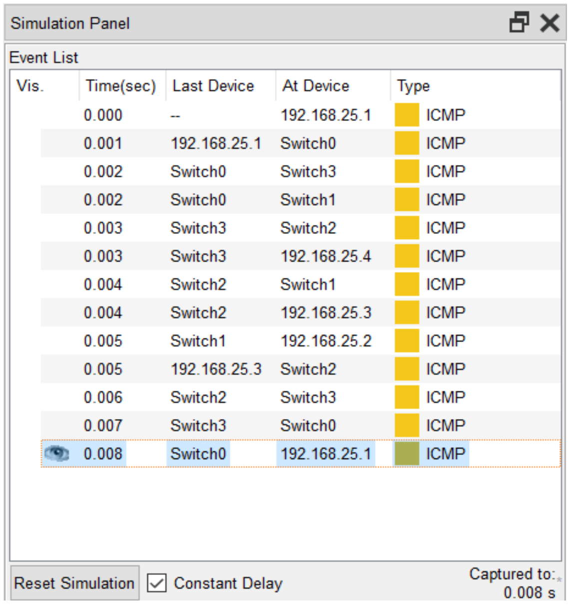








Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	192.168.25.1	ICMP
	0.001	192.168.25.1	Switch0	ICMP
	0.002	Switch0	Switch3	ICMP
	0.002	Switch0	Switch1	ICMP
	0.003	Switch3	Switch2	ICMP
	0.003	Switch3	192.168.25.4	ICMP
	0.004	Switch2	Switch1	ICMP
	0.004	Switch2	192.168.25.3	ICMP
	0.005	Switch1	192.168.25.2	ICMP
	0.005	192.168.25.3	Switch2	ICMP
	0.006	Switch2	Switch3	ICMP
	0.007	Switch3	Switch0	ICMP
	0.008	Switch0	192.168.25.1	ICMP

Advantages of Ring Topology

- Reduced chances of data collision as each node release a data packet after receiving the token.
- Token passing makes ring topology perform better than bus topology under heavy traffic
- No need of server to control connectivity among the nodes
- Equal access to the resources

Disadvantages of Ring Topology

- In Unidirectional Ring, a data packet must pass through all the nodes.

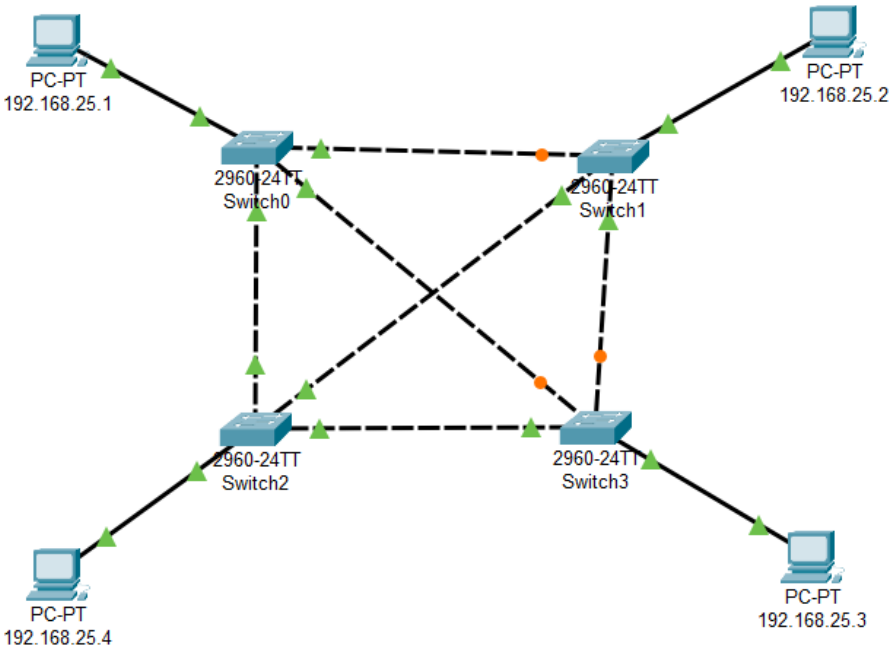
  Ex: Let's say A, B, C, D, and E are a part of the ring network. The data flow is from A towards B and henceforth. In this condition, if E wants to send a packet to D, the packet must traverse the entire network to reach D.
- Single point of failure, that means if a node goes down entire network goes down.

➢ MESH TOPOLOGY

In mesh topology every device has a dedicated point to point link to every other device. The term dedicated stand for link carries traffic only between two devices it connects. It is a well-connected topology; in this every node has a connection to every other node in the network. The cable requirements are high and it can include multiple topologies. Failure in one of the computers does not cause the network to break down, as they have alternative paths to other computers star topology, all the cables run from the computers to a central location.

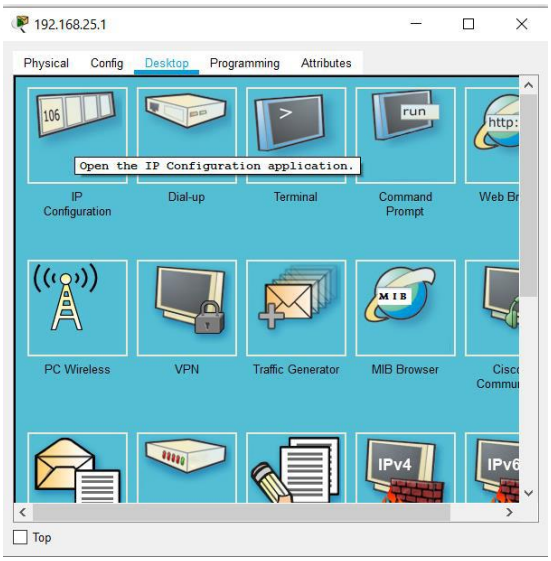
Network Topology

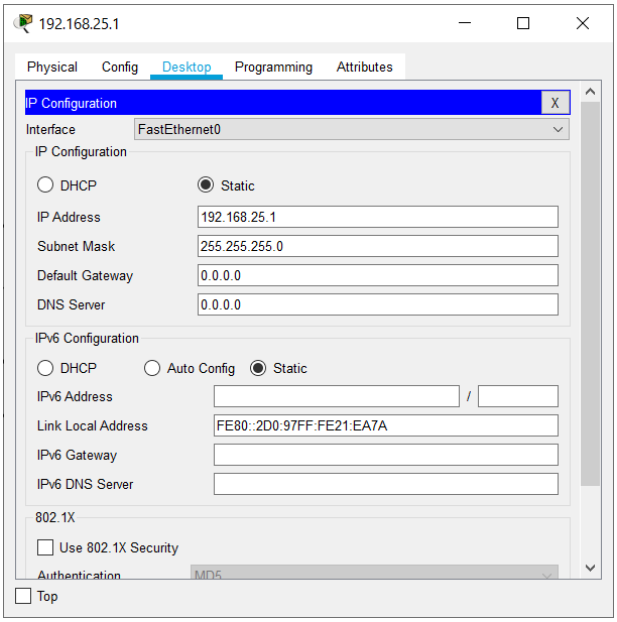
1. Drag and drop PC from End Devices.
2. Connect them with Copper Straight through cable.
3. Change display name with their IP addresses.

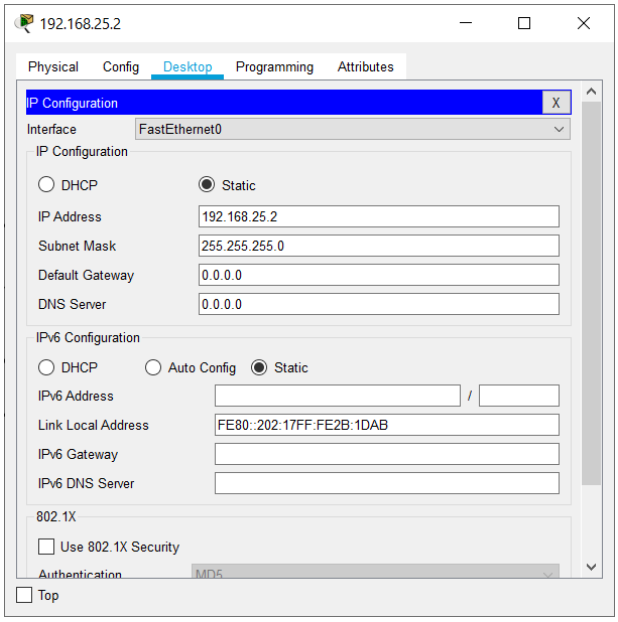


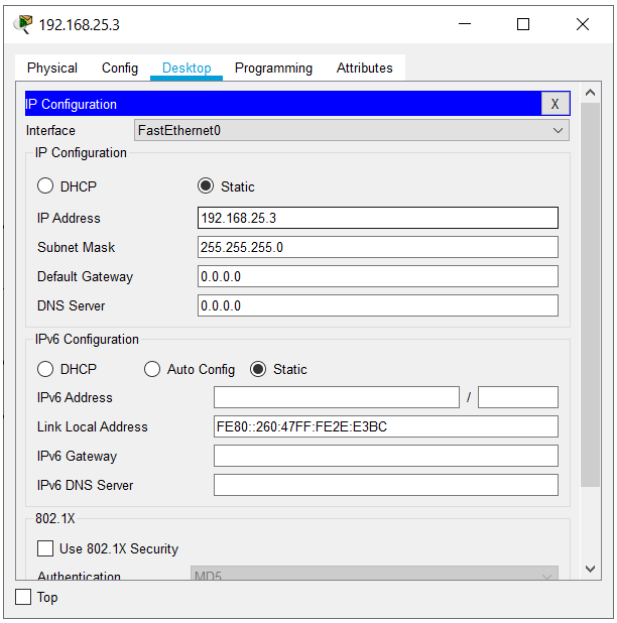
Ip Address Configuration

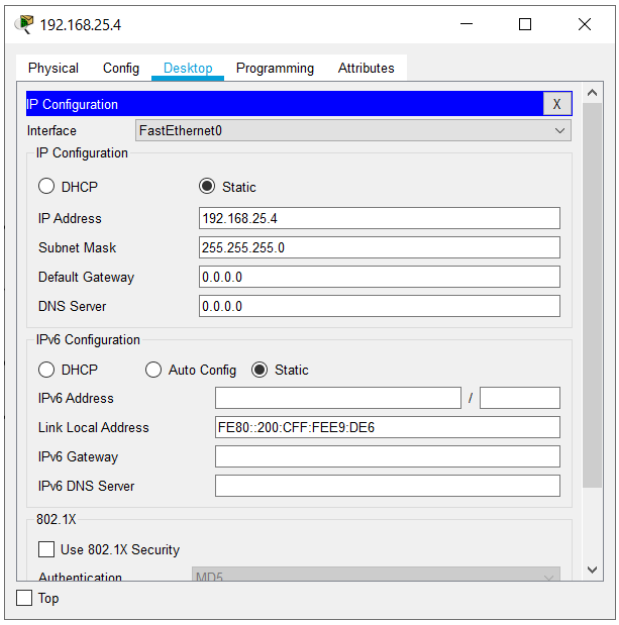
1. Click on the device.
2. Go to Desktop ->IP configuration.
3. Set static IPs of all devices. No gateway required (same network).





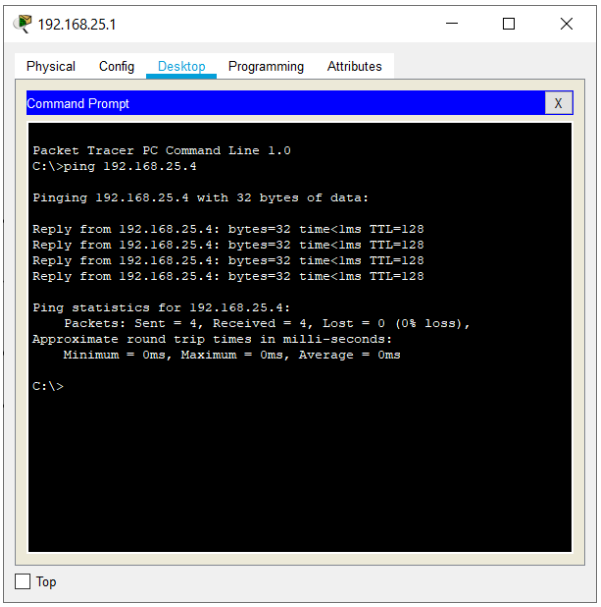






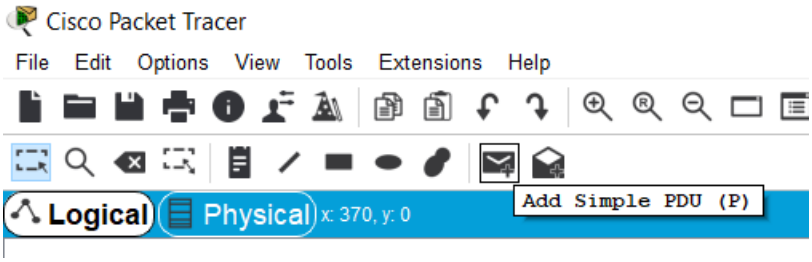
Ping Command

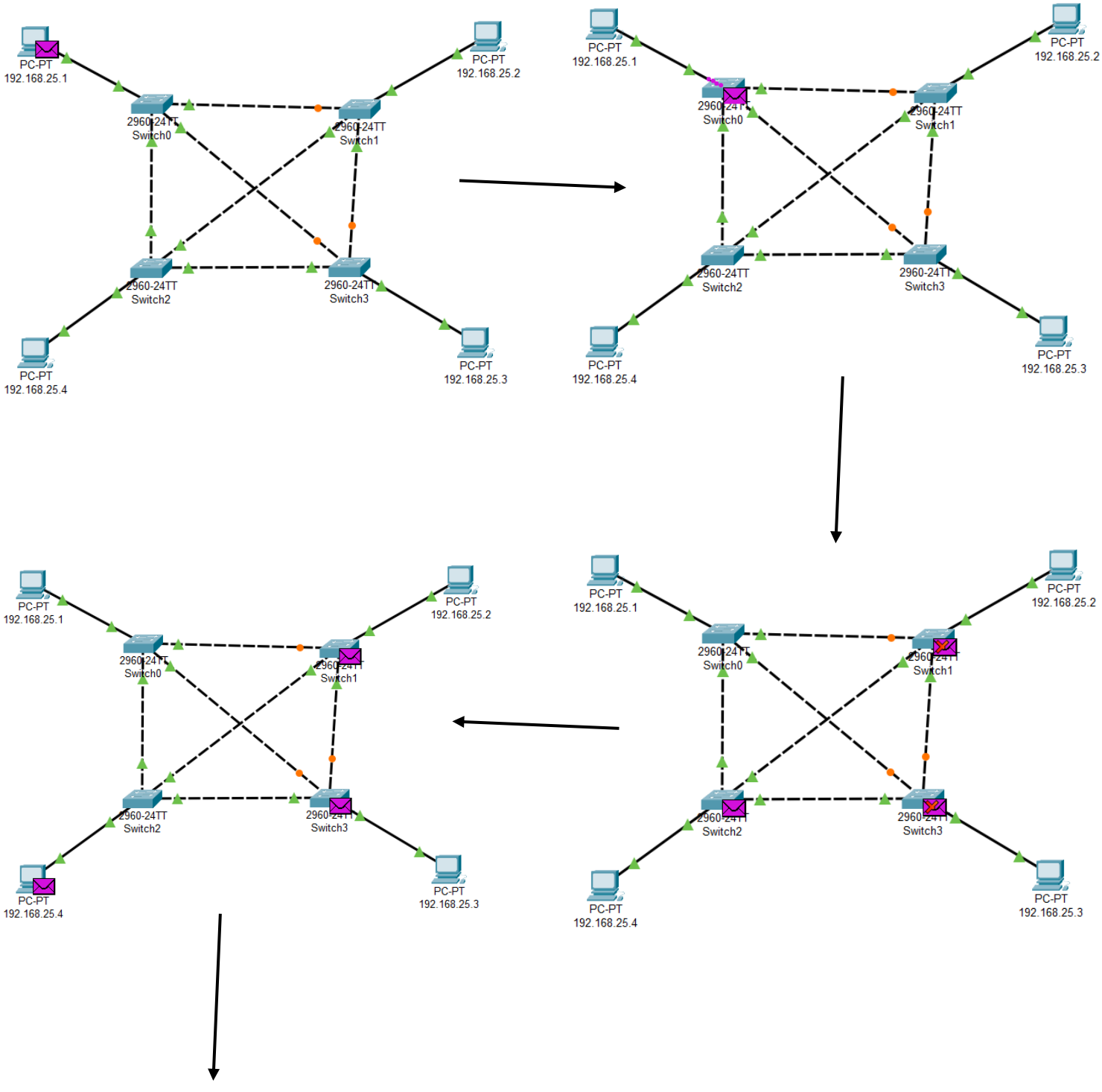
1. Click on the device.
2. Go to Desktop -> Command Prompt.
3. Type ping ip_address.

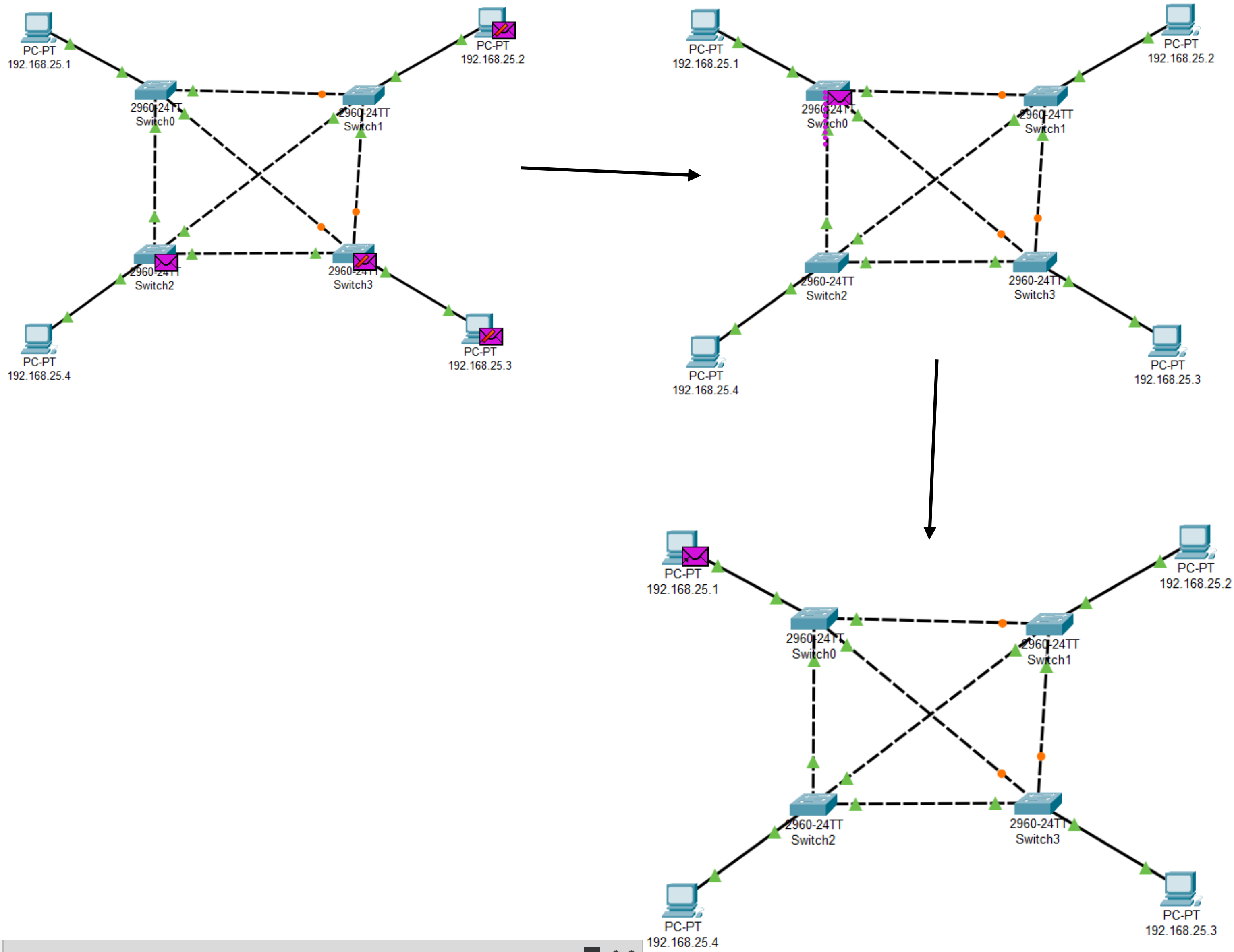


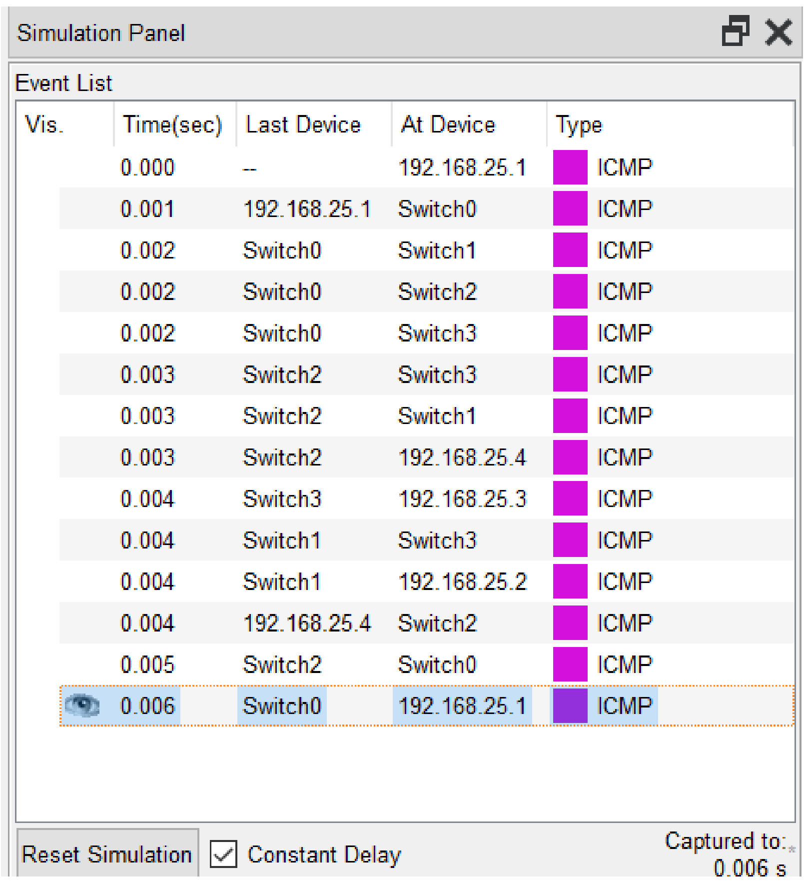
Real Mode Simulation (Switch)

1. Click on simulation tab on bottom right corner.
2. Drop Simple PDU (P) on the source and destination.
3. Then click on the play button in the simulation window.









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	0.002	Switch0	Switch2	ICMP
	0.002	Switch0	Switch3	ICMP
	0.003	Switch2	Switch3	ICMP
	0.003	Switch2	Switch1	ICMP
	0.003	Switch2	192.168.25.4	ICMP
	0.004	Switch3	192.168.25.3	ICMP
	0.004	Switch1	Switch3	ICMP
	0.004	Switch1	192.168.25.2	ICMP
	0.004	192.168.25.4	Switch2	ICMP
	0.005	Switch2	Switch0	ICMP
	0.006	Switch0	192.168.25.1	ICMP

Advantages of Mesh Topology

- Each connection can carry its own data load
- It is robust
- A fault is diagnosed easily
- Provides security and privacy

Disadvantages of Mesh Topology

- Installation and configuration are difficult if the connectivity gets more
- Cabling cost is more and the most in case of a fully connected mesh topology
- Bulk wiring is required