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NETWORKING ASSIGNMENT.

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INTRODUCTION OF NETWORKING

Computer networks are systems that connect multiple computers and devices to share resources and communicate. These networks can vary in size and complexity, ranging from small local area networks (LANs) to large wide area networks (WANs) that span geographical distances. Key components of computer networks include:

1. **Nodes:** Devices such as computers, servers, printers, and routers that are connected to the network.
2. **Transmission Media:** The physical or wireless pathways through which data is transmitted, such as cables (Ethernet, fiber optic) or wireless signals (Wi-Fi, cellular).
3. **Protocols:** Rules and conventions for communication between devices, ensuring data is transmitted and received correctly (e.g., TCP/IP).
4. **Network Topology:** The arrangement of various elements (nodes and connections) in a network, such as star, ring, or mesh.

Computer networks facilitate resource sharing, communication, and data transfer, enabling collaboration and connectivity in various settings, from homes to businesses and the internet.

BUS TOPOLOGY

Definition of Bus Topology

Bus topology is a network configuration where all devices (nodes) are connected to a single central cable, called the "bus." Data is transmitted along this cable in both directions, and each device checks the data packets to see if they are addressed to it.

Advantages of Bus Topology

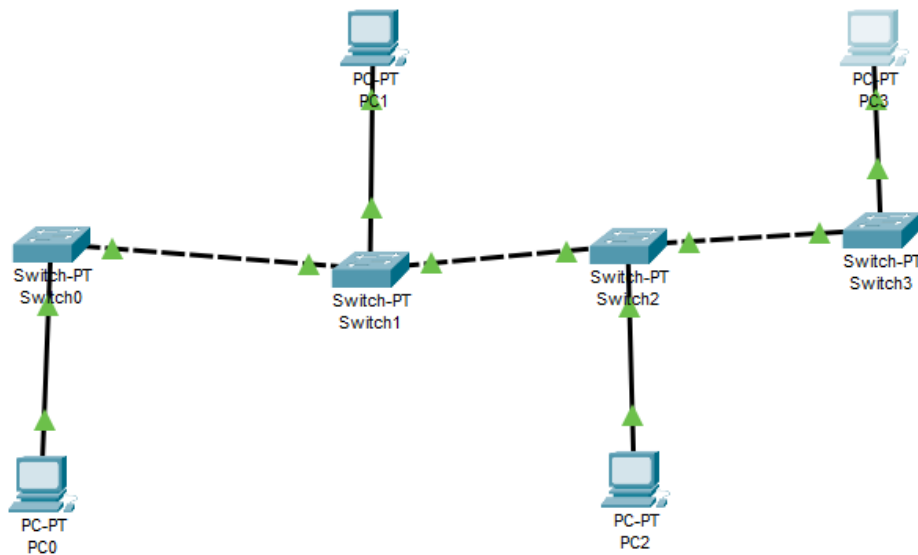
1. *Simplicity*: Easy to set up and requires less cabling compared to other topologies, making it cost-effective, especially for small networks.
2. *Cost-Effective*: Lower cost for installation and materials, as fewer cables are needed.
3. *Easy to Understand*: Straightforward structure that is simple to design and implement, making it suitable for smaller networks.
4. *Flexible*: Adding new devices can be done easily without disrupting the entire network, as long as there is space on the bus.

Disadvantages of Bus Topology

1. *Limited Cable Length*: The total length of the bus limits the number of devices and the distance over which the network can operate effectively.
2. *Data Collisions*: Since multiple devices share the same bus, data collisions can occur when two devices transmit simultaneously, which can slow down the network.
3. *Difficult Troubleshooting*: Identifying faults in the bus can be challenging, as a failure in the main cable can bring down the entire network.
4. *Network Performance*: As more devices are added, the performance can degrade due to increased traffic and the possibility of collisions.
5. ****Single Point of Failure****: If the central bus cable fails, the entire network goes down, making it less reliable than other topologies.

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STRUCTURE OF BUS TOPOLOGY



PROCESS:

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 4 pc from the software.
- 3; Then we take 4 routers from the software also.
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.
- 8; The gateway address will same.
- 9 ; After we will go to command line to give ping address.
- 10: message will go to his destination .

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.3

Pinging 192.168.0.3 with 32 bytes of data:

Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time=1ms TTL=128
Reply from 192.168.0.3: bytes=32 time=2ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>|
```

This will show that there will be no loss in the network and message will send to his destination with 0 percent loss.

Introduction of star topology

Star topology. is a network configuration in which all devices (nodes) are connected to a central hub or switch. This central device acts as a mediator for data transmission between nodes, allowing them to communicate with each other.

Key Characteristics of Star Topology:

1. **Centralized Management:** The central hub or switch manages data traffic, making it easier to control and monitor network activity.
2. **Point-to-Point Connections:** Each node has a direct connection to the central hub, which simplifies the layout and organization of the network.
3. **Flexible and Scalable:** New nodes can be easily added or removed without disrupting the entire network.

Advantages of Star Topology:

1. **Reliability:** If one connection fails, it does not affect the entire network; only the affected device is impacted.
2. **Easy Troubleshooting:** Issues can be quickly identified by isolating connections to the central hub, making maintenance easier.
3. **High Performance:** The centralized nature allows for efficient data handling and reduces the chances of data collisions.
4. **Scalability:** The network can be expanded by adding more nodes to the central hub without significant reconfiguration.

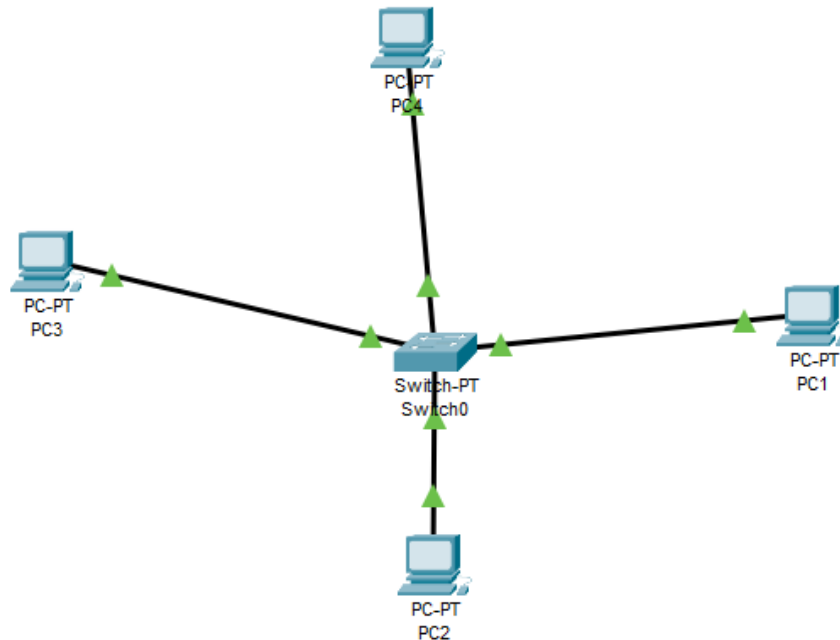
Disadvantages of Star Topology:

1. **Dependency on Central Device:** If the central hub fails, the entire network goes down, creating a single point of failure.
2. **Cost:** Requires more cabling and a central device, which can increase installation and maintenance costs compared to simpler topologies.

3. Limited Cable Length: The length of cables connecting nodes to the central hub can limit the overall size of the network.

Star topology is widely used in local area networks (LANs) due to its reliability and ease of management, making it suitable for both small and large networks.

Structure of star topology



process

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 4 pc from the software.
- 3 Then we take 1 switches from the software also
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.

8; The gateway address will same.

9 ; After we will go to command line to give ping address.

10: message will go to his destination .

RESULT

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Reply from 192.168.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

This result show that there will be zero percent loss and message will send to his destination .

INTRODUCTION OF TREE TOPOLOGY

Tree topology is a hierarchical network structure that combines characteristics of both star and bus topologies. It features a central root node (or main hub) that branches out to multiple levels of nodes, forming a tree-like structure. Each node can act as a parent to other nodes, creating a branching system of connections.

Key Characteristics of Tree Topology:

1. **Hierarchical Structure:** Nodes are organized in a parent-child relationship, allowing for a clear hierarchy within the network.
2. **Central Node:** The root node serves as the primary connection point and can be a server or main hub that manages data flow.
3. **Multiple Levels:** Nodes can have multiple child nodes, allowing for scalability and organization across various levels.

Advantages of Tree Topology:

1. **Scalability:** Easy to expand by adding new nodes to various branches without disrupting the entire network.
2. **Hierarchical Organization:** Facilitates a structured approach to managing network resources and devices, making it easier to manage.
3. **Isolation of Segments:** Issues in one branch of the tree do not necessarily affect other branches, which can enhance reliability.
4. **Flexible and Versatile:** Can accommodate a variety of network types and sizes, making it suitable for larger networks.

Disadvantages of Tree Topology:

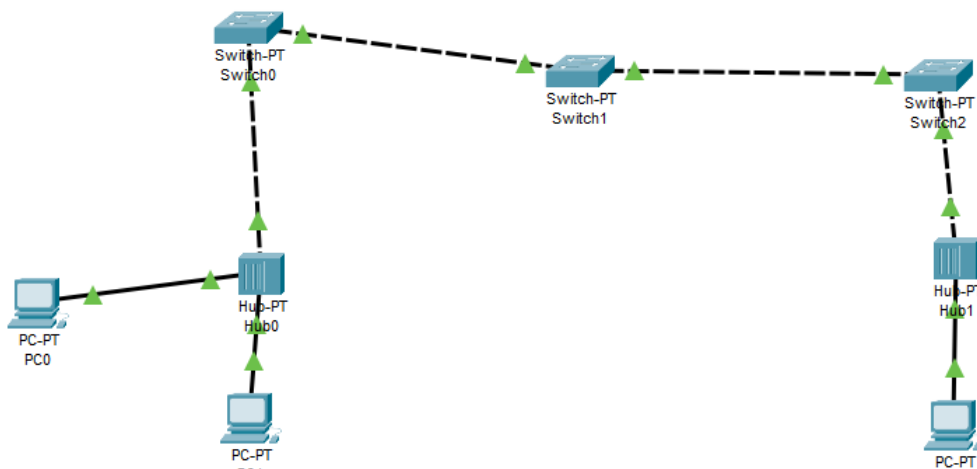
1. **Complexity:** More complex to design and implement than simpler topologies, requiring careful planning.
2. **Dependency on Central Node:** If the central root node fails, the entire network can be impacted, leading to a single point of failure.

3. Cost: Generally requires more cabling and hardware than simpler topologies, which can increase installation costs.

4. Maintenance: More complicated to maintain and troubleshoot due to its hierarchical nature, especially in larger networks.

Tree topology is commonly used in large organizations and campuses where a structured and scalable network is essential.

STRUCTURE



process

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 3 pc from the software and 2 hubs.
- 3 Then we take 3 switches from the software also
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.
- 8; The gateway address will same.

9 ; After we will go to command line to give ping address.

10: message will go to his destination .

RESULT

```
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Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

This will show that the network is pure and message will send to his destination

INTRODUCTION OF RING TOPOLOGY

Definition of Ring Topology

A ring topology is a type of network configuration where each device (or node) is connected to exactly two other devices, forming a circular pathway for signals. Data travels in one direction (or sometimes in both directions) around the ring. Each node acts as a repeater, regenerating the signal to ensure it can reach its destination.

Advantages of Ring Topology

1. Simplicity: The design and setup of a ring topology are relatively straightforward.

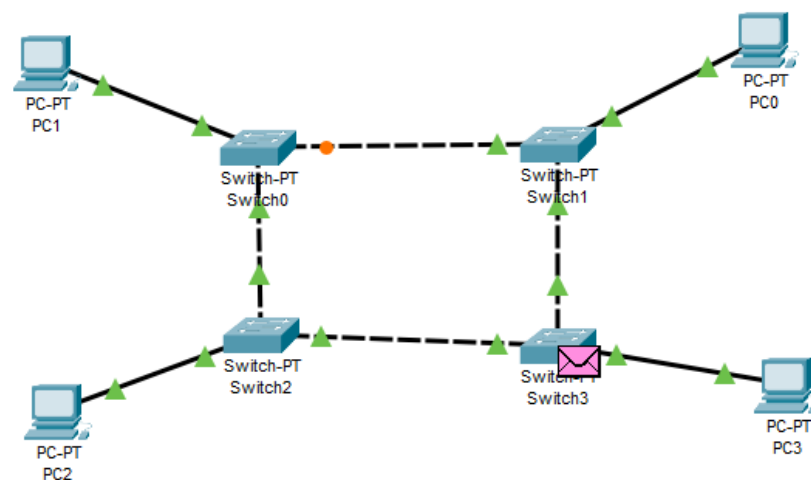
2. Predictable Performance: In a well-functioning ring, data packets travel in a consistent path, which can lead to predictable latency.
3. No Data Collisions: Since data travels in one direction, there are minimal chances of packet collisions.
4. Easy to Add Devices: Adding new devices can be done easily by breaking the ring and connecting the new device.

Disadvantages of Ring Topology

1. Single Point of Failure: If one node or connection fails, it can disrupt the entire network.
2. Difficult Troubleshooting: Identifying faults in a ring can be more complex compared to other topologies.
3. Limited Scalability: As more devices are added, the performance can degrade due to increased traffic and delays.
4. Dependency on Each Node: Each node's functionality is crucial, making the network dependent on the performance of every device.

Overall, while ring topology has its benefits, particularly in small networks, its limitations can make it less suitable for larger or more critical systems.

Structure of ring topology



PROCESS

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 4 pc from the software.
- 3 Then we take 4 switches from the software also
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.
- 8; The gateway address will same.
- 9 ; After we will go to command line to give ping address.
- 10: message will go to his destination .

RESULT

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Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

c:\>
```

This will show our network accuracy is hundred percent and zero percent loss of data .

INTRODUCTION OF MESH TOPOLOGY

Definition of Mesh Topology

Mesh topology is a network configuration in which each device (or node) is connected to multiple other devices. This creates a web-like structure that allows for multiple pathways for data to travel. There are two types of mesh topology:

-Full Mesh: Every node is connected to every other node.

Partial Mesh: Some nodes are connected to all others, while some are only connected to a few.

Advantages of Mesh Topology

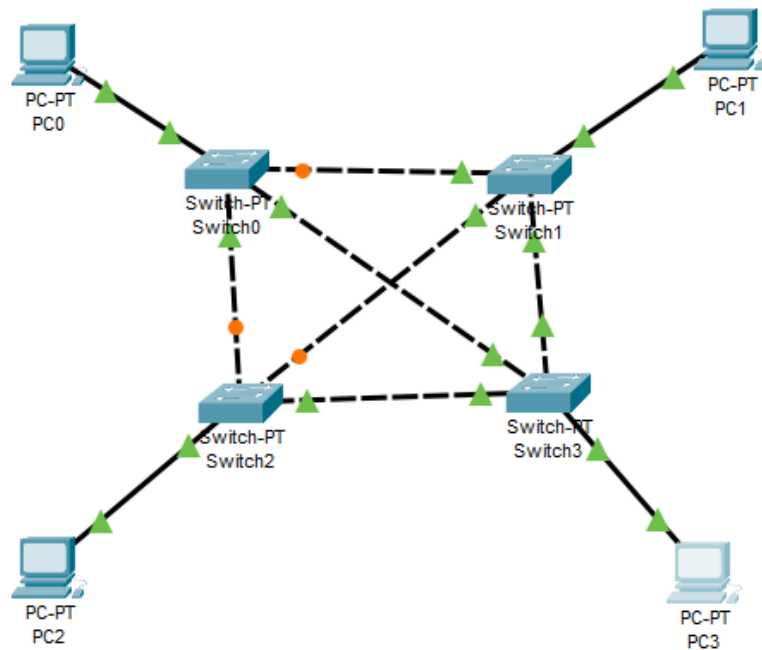
1. Redundancy: Multiple connections ensure that if one link fails, data can take an alternative route, enhancing reliability.
2. Fault Tolerance: The network can continue to operate even if one or more nodes fail, making it highly resilient.
3. Improved Performance: Since multiple paths exist for data transmission, the network can handle higher traffic loads efficiently.
4. Scalability: New nodes can be added without significantly disrupting the network.

Disadvantages of Mesh Topology

1. Complexity: The setup and maintenance can be complicated, especially in a full mesh, due to the large number of connections.
2. Cost: The need for more cabling and network interfaces can lead to higher costs compared to simpler topologies.
3. Difficult Troubleshooting: Identifying and resolving issues can be challenging because of the multiple interconnections.
4. Space Requirements: The physical space required for numerous connections can be significant, making it less suitable for smaller environments.

Overall, while mesh topology offers high reliability and performance, its complexity and cost can be drawbacks in certain applications.

Structure of mesh topology



Process

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 4 pc from the software.
- 3 Then we take 4 switches from the software also
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.
- 8; The gateway address will same.
- 9 ; After we will go to command line to give ping address.

10 all the switches are connected to each other

11: message will go to his destination

RESULT

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.3

Pinging 192.168.0.3 with 32 bytes of data:

Reply from 192.168.0.3: bytes=32 time=16ms TTL=128
Reply from 192.168.0.3: bytes=32 time=1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 16ms, Average = 4ms

C:\>
```

This will show that the result is pure and the loss is zero percent .

Introduction of hybrid topology

Definition of Hybrid Topology

Hybrid topology is a network architecture that combines two or more different types of topologies, such as star, ring, bus, or mesh. This allows for flexibility in network design, accommodating various requirements and optimizing performance based on the specific needs of different segments within the same network.

Advantages of Hybrid Topology

1. **Flexibility:** The ability to mix different topologies allows for tailored solutions that can better meet specific needs and requirements.
2. **Scalability:** Hybrid networks can easily expand by adding new nodes or segments without disrupting the entire network.

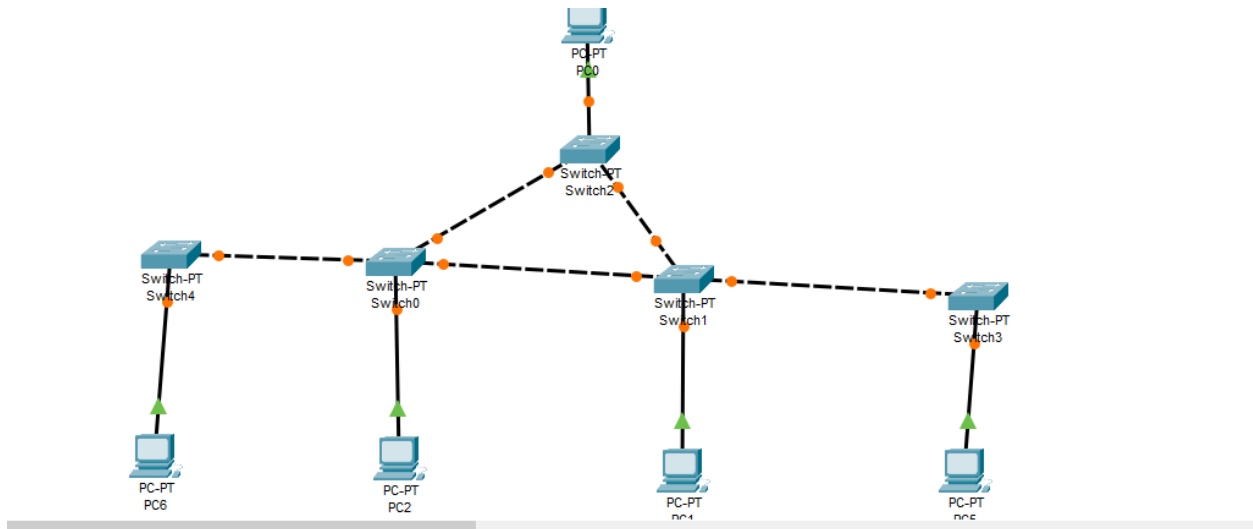
3. Reliability: By incorporating different topologies, the network can maintain performance even if one segment fails.
4. Optimized Performance: Different topologies can be used in different areas, allowing for optimal performance based on usage (e.g., using a star topology for high-traffic areas).

Disadvantages of Hybrid Topology

1. Complexity: The integration of various topologies can make design, implementation, and maintenance more complex.
2. Cost: The initial setup can be more expensive due to the need for varied equipment and infrastructure.
3. Difficult Troubleshooting: Issues may arise in specific segments, making it harder to pinpoint problems and resolve them.
4. Management Challenges: Managing a hybrid network requires more sophisticated network management tools and strategies to ensure all components work well together.

Overall, hybrid topology provides a versatile approach to networking, suitable for diverse environments, but it also introduces complexities that need to be managed effectively.

Structure of hybrid topology



Process

- 1; first we open a new file on cisco packet tracer then
- 2; Then we take 5 pc from the software.
- 3 Then we take 5 switches from the software also
- 4; then we take a wires and connected all the computers with switches
- 5: computers cannot connected with each others.
- 6; Then we click on pc icon and go to desktop icon and give IP address.
- 7; All the computers have different address.
- 8; The gateway address will same.
- 9 ; After we will go to command line to give ping address.
- 10: message will go to his destination .

Result

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.3

Pinging 192.168.0.3 with 32 bytes of data:

Reply from 192.168.0.3: bytes=32 time=16ms TTL=128
Reply from 192.168.0.3: bytes=32 time=1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128
Reply from 192.168.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 16ms, Average = 4ms

C:\>
```

This will show that the result is true and lost is zero percent.

These are the all topologies with their structure process and and result with their merits and demerits

The End