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LAN Network Topologies Implementation using Cisco Packet Tracer

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Introduction

This report shows the implementation of four different Local Area Network (LAN) topologies using CISCO Packet Tracer. The topologies include Bus, Ring, Tree, and Star. Each topology is connected to a router and consists of a specified number of switches. The report also covers the IP addressing and subnetting for each building, ensuring the use of class C IPs (Internet Protocol) only in networks 193.168.1.0 and 193.168.2.0.

-Network Topologies

1-Bus Topology:(Building B)

Routers: 1 router

Switches: 4 switches

Devices: PCs connected to each switch, totaling 36 hosts.

Reason: The bus topology is simple to implement and cost-effective for a small number of hosts, like the 36 hosts in Building B. It requires less cabling and is easier to set up.

IP subnetting:

-Subnet mask: 255.255.255.192

- Network Ip: 193.168.2.0

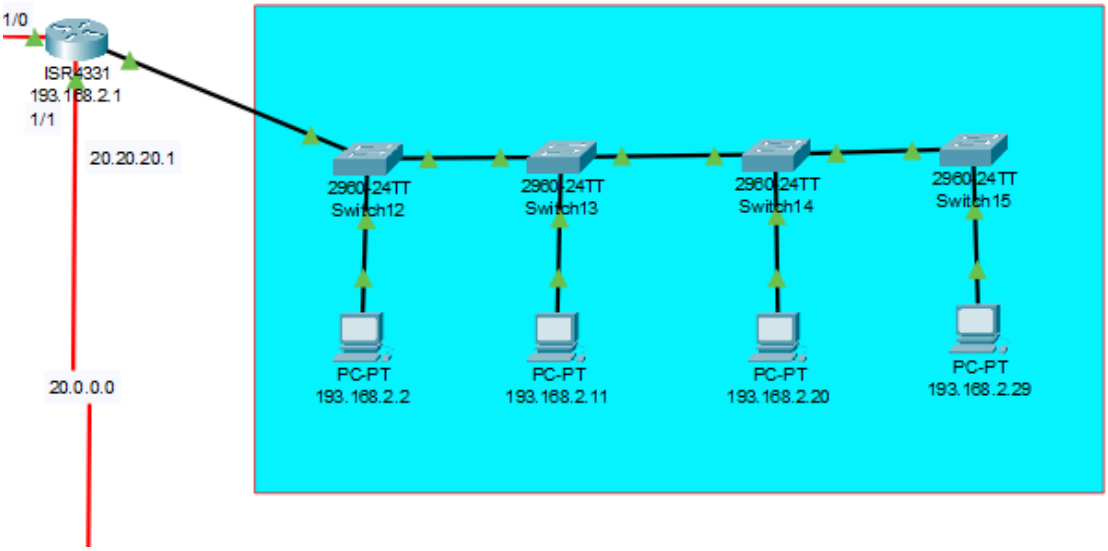
- Broadcast Ip: 2^6+0 - 1 = 193.168.1.63

- First valid: 193.168.2.2

- Last valid: 193.168.2.62

- Default gateway: 193.168.2.1 (ROUTER)

-Wildcard mask: 0.0.0.63



2-Star topology:(Building C)

Routers: 1 router

Switches: 1 switch

Devices: PCs connected to one switch, totaling 47 hosts.

Reason: The ring topology ensures equal access to the network for all hosts and can handle moderate traffic well. This is suitable for Building C, which has 47 hosts. It also simplifies troubleshooting and network management by having a predictable data path.

IP subnetting:

1-Subnet mask: 255.255.255.192

- Network Ip: 193.168.2.64

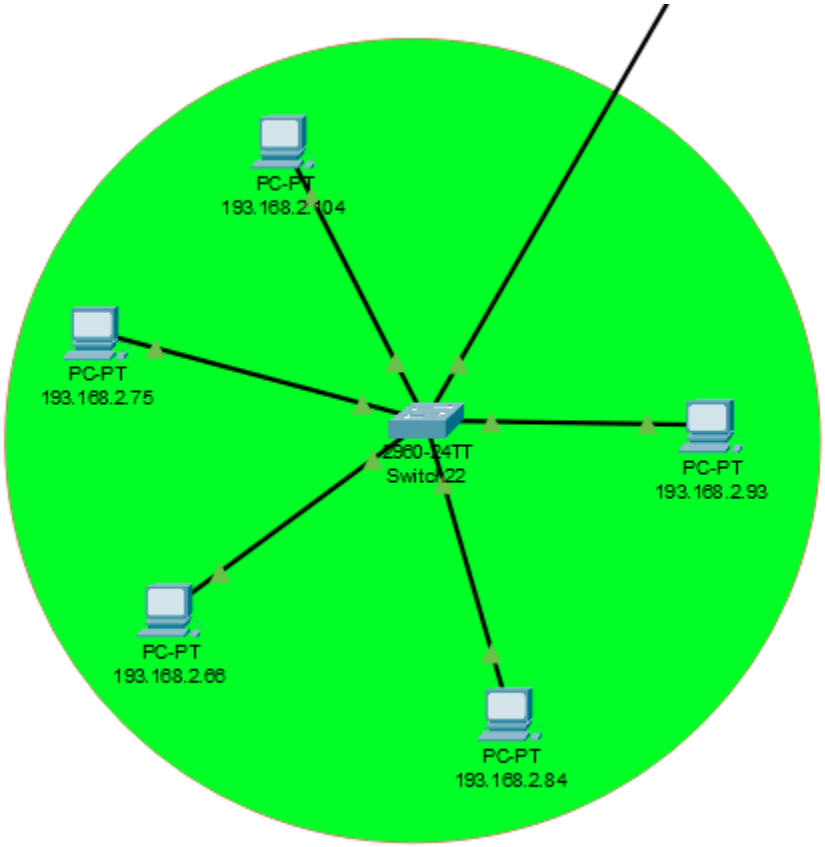
- Broadcast Ip: 2^6+ 64 - 1 = 193.168.1.127

- First valid: 193.168.2.66

- Last valid: 193.168.2.126

- Default gateway: 193.168.2.65 (ROUTER)

-Wildcard mask: 0.0.0.63



3-Tree topology:(Building A)

Routers: 1 router

Switches: 11 switches

Devices: PCs connected to each switch, totaling 212 hosts.

Reason: The tree topology is ideal for Building A due to its hierarchical structure, which allows for efficient management and scalability. With 212 hosts, the tree topology ensures that the network can be expanded easily while maintaining organized traffic flow and reducing congestion.

Ip subnetting:

-Subnet mask: 255.255.255.0

- Network Ip: 193.168.1.0

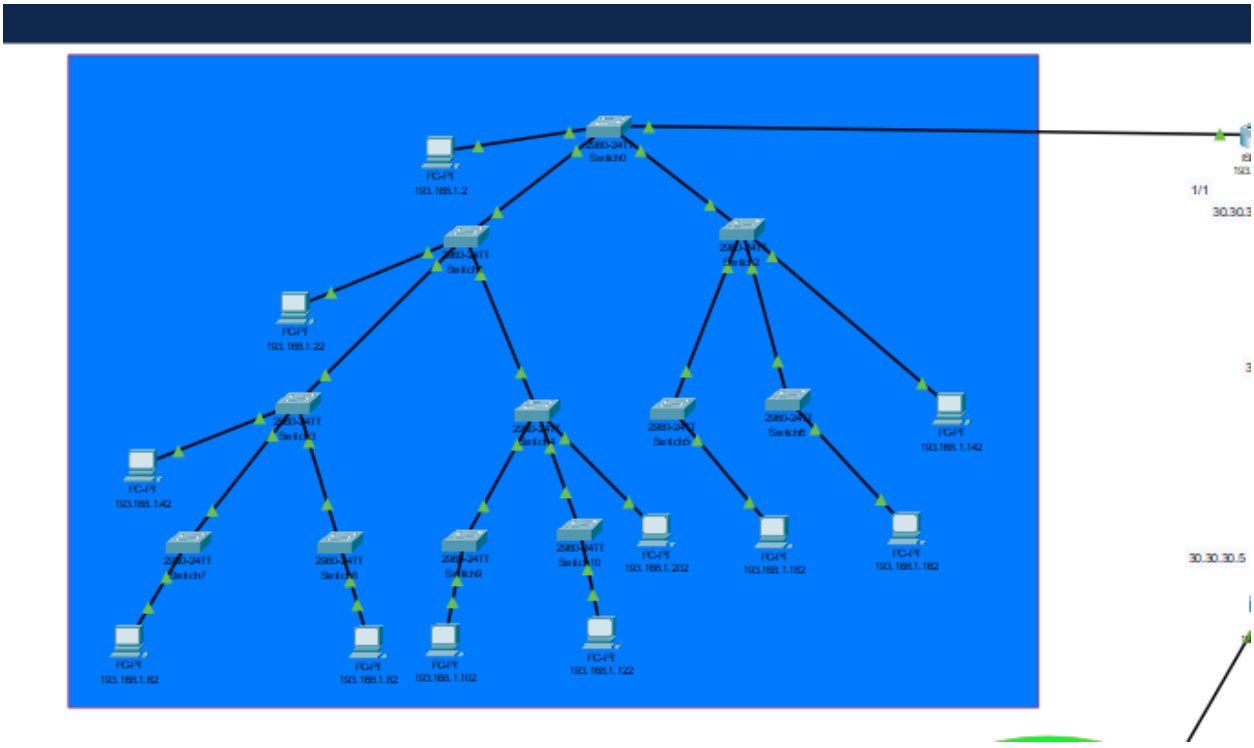
- Broadcast Ip: 2^8+0-1 = 193.168.1.255

- First valid: 193.168.1.2

- Last valid: 193.168.1.254

- Default gateway: 193.168.1.1 (ROUTER)

-Wildcard mask: 0.0.0.255



4-Ring topology:(Building D)

Routers: 1 router

Switches: 5 switches

Devices: PCs connected to each switch, totaling 125 hosts.

Reason: The ring topology is chosen for Building D because it provides equal access to the network for all hosts, which is beneficial for a moderate number of hosts like 125. It also helps to maintain network performance and reliability, as data travels in a circular path and can be rerouted in case of a failure.

Ip subnetting:

-Subnet mask: 255.255.255.128

- Network Ip: 193.168.2.128

- Broadcast Ip: 2^7+ 128 - 1 =193.168.1.255

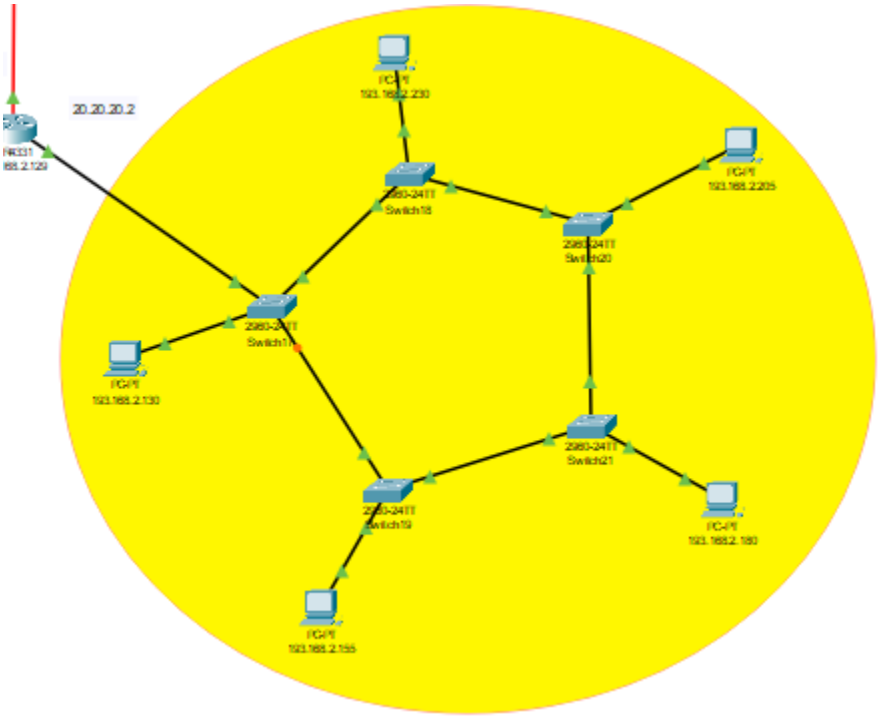
- First valid: 193.168.2.130

- Last valid: 193.168.2.254

- Default gateway: 193.168.2.129 (ROUTER)

-Wildcard mask: 0.0.0.127

-Wildcard mask: 0.0.0.255



4.Ospf:

193.168.1.1 route to ALAN and to 193.168.2.65 bin 30.0.0.0

193.168.2.1 route to 60.0.0.0 VLAN

.193.168.65 route to 30.0.0.0 and 50.0.0.0

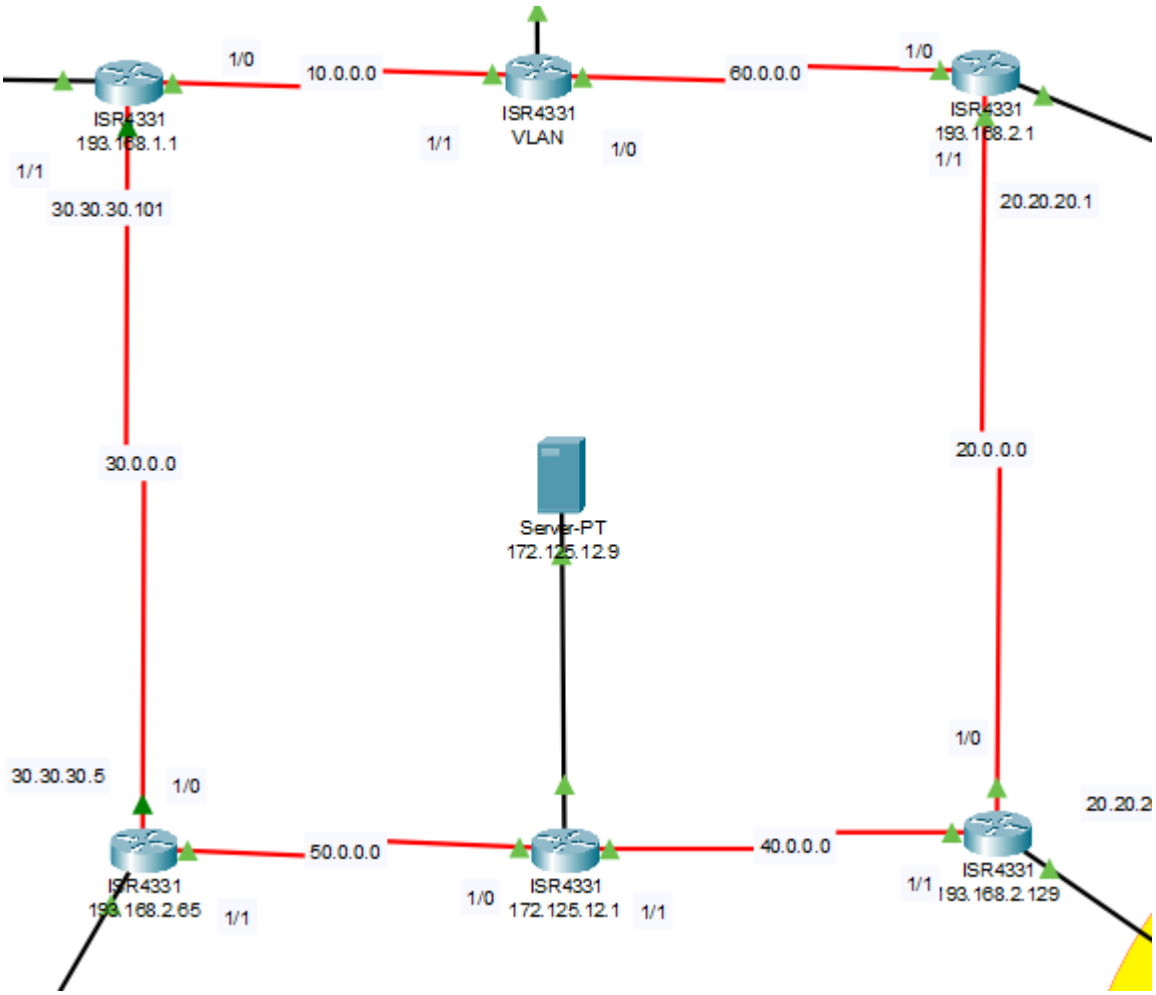
172.125.12.1 route to 50.0.0.0 and route to 40.0.0.0

193.168.2.129 route to 20.0.0.0 and 40.0.0.0

O 10.0.0.0/8 [110/192] via 50.50.50.1, 00:16:14, Serial0/1/0
O 20.0.0.0/8 [110/128] via 40.40.40.1, 00:16:14, Serial0/1/1
O 30.0.0.0/8 [110/128] via 50.50.50.1, 00:16:14, Serial0/1/0
40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 40.0.0.0/8 is directly connected, Serial0/1/1
L 40.40.40.2/32 is directly connected, Serial0/1/1
50.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 50.0.0.0/8 is directly connected, Serial0/1/0
L 50.50.50.2/32 is directly connected, Serial0/1/0

O 60.0.0.0/8 [110/192] via 40.40.40.1, 00:16:14, Serial0/1/1
172.125.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 172.125.0.0/16 is directly connected, GigabitEthernet0/0/0
L 172.125.12.1/32 is directly connected, GigabitEthernet0/0/0
O IA 193.168.1.0/24 [110/129] via 50.50.50.1, 00:16:14, Serial0/1/0
193.168.2.0/24 is variably subnetted, 3 subnets, 2 masks
O IA 193.168.2.0/26 [110/129] via 40.40.40.1, 00:16:14, Serial0/1/1
O IA 193.168.2.64/26 [110/65] via 50.50.50.1, 00:16:14, Serial0/1/0
O IA 193.168.2.128/25 [110/65] via 40.40.40.1, 00:16:14, Serial0/1/1

and all like image:



5. Virtual LANs (VLANs)

Implementation:

I made one extra topology (Star) with one switch, here I made 3 networks

Isolated

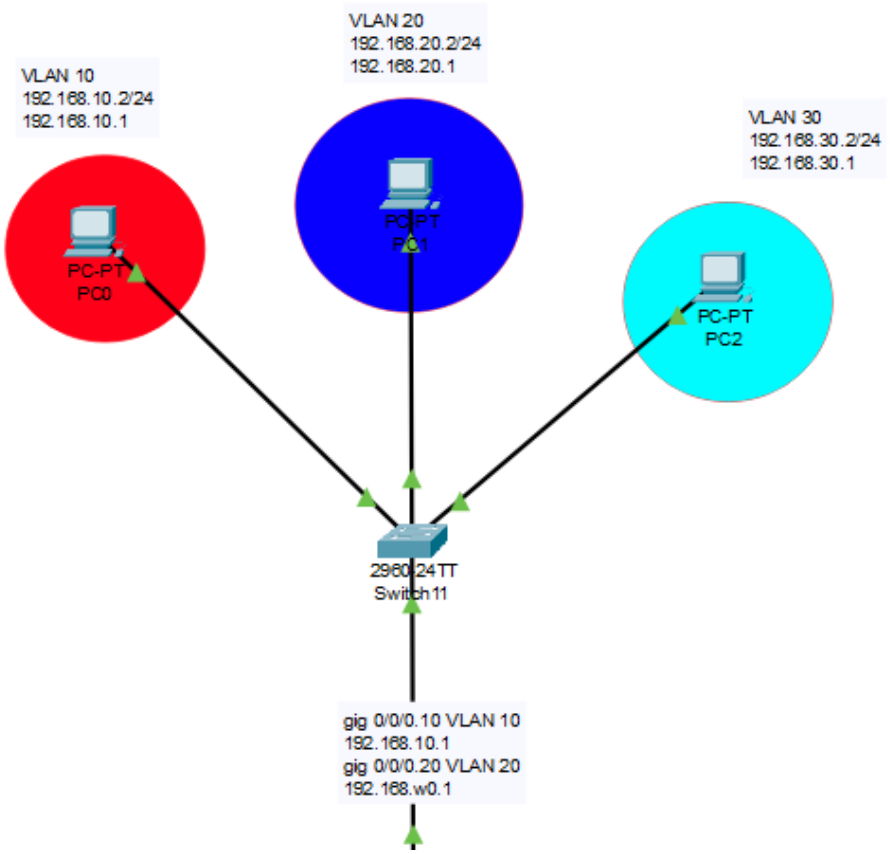
VLAN 10
192.168.10.2/24
192.168.10.1

VLAN 20
192.168.20.2/24
192.168.20.1

VLAN 30
192.168.30.2/24
192.168.30.1

gig 0/0/0.10 VLAN 10
192.168.10.1
gig 0/0/0.20 VLAN 20

Connected to the main network



6.PAT

In server router I made insider global ip 50.50.50.2

Theat is public key that I use in server router when I ping from any device to server

```
Router#
Router#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 50.50.50.2:10     172.125.12.9:10    193.168.2.75:10    193.168.2.75:10
icmp 50.50.50.2:11     172.125.12.9:11    193.168.2.75:11    193.168.2.75:11
icmp 50.50.50.2:12     172.125.12.9:12    193.168.2.75:12    193.168.2.75:12

Router#
```

```
Router#show running-config | include ip nat
 ip nat inside
 ip nat outside
 ip nat outside
ip nat inside source list 1 interface Serial0/1/0 overload
ip nat inside source list 2 interface Serial0/1/1 overload
```

7. Telnet

telnet it's make a remote access in any router in our case w make telnet in star router and pass =1234 and router pass = 1234

8. NAT

We make NAT between bus router and ring router with internal global 20.20.20.1

Here we have an error in nating because it makes overla[interface overlab because ospf

show ip nat translations

9. FTP

In FTP, we work in an isolation server because it makes errors because we need static Nat in the main network

10. DNS

We made DNS server in new network with ip 10.10.10.2 which refers to the bedo.com website

```
<Html>
<Head>
<title>
Example of Header-levels
</title>
</Head>
<Body>
<h1> hello dr Mohamed Hatem </h1>
</Body>
</Html>
```

11. Configuration and Testing

Configuration Steps:

Assign IP addresses and subnet masks to each device.

Configure switches with VLANs where applicable.

Connect each LAN to a router.

Test connectivity between devices within each LAN.

Testing:

All is work and all is ping to each other's

Ping tests between devices to ensure proper IP configuration and connectivity.

Verify VLAN functionality by restricting traffic between VLANs.

Ensure all routers and switches are configured correctly for their respective topologies.

12. Conclusion

This report covered the implementation of four distinct LAN topologies using CISCO Packet Tracer. Each topology was configured with appropriate IP addressing and subnetting schemes. VLANs were utilized to enhance network segmentation and management. The implementation was tested to ensure all configurations were correct and that connectivity was established across the networks.