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Computer Network Lab
Experiment 7

Aim: To design and implement WAN in cisco packet tracer

Theory

Wide Area Network (WAN)

A Wide Area Network (WAN) is a type of computer network that spans a large geographical area, often covering cities, countries, or even continents. Unlike a Local Area Network (LAN), which is restricted to a smaller area like a home, office, or campus, WANs are designed to connect multiple LANs together over long distances.

Characteristics of WAN:

1. Large Coverage – Covers broad geographic regions, often through leased telecommunication lines or satellite links.
2. High Cost – Typically more expensive than LANs due to the need for infrastructure like leased lines, ISPs, and dedicated hardware. 3. Lower Data Transfer Speeds – Compared to LAN, WAN speeds are relatively lower due to distance and complexity.
4. Public and Private Networks – WANs can use public networks (like the internet) or private dedicated lines.
5. Heterogeneous Technology – WANs integrate different types of networks, devices, and communication technologies.

Examples of WAN:

- The Internet (largest WAN).
- Banking networks connecting ATMs worldwide.
- Corporate networks linking offices across different countries.

Router

A Router is a networking device that forwards data packets between computer networks. It acts as an intermediary between networks, deciding the best path for data to travel from the source to the destination. Routers work primarily at Layer 3 (Network Layer) of the OSI model.

Functions of a Router:

1. Packet Forwarding – Determines the best route for data packets using routing tables.
2. Inter-network Communication – Connects different networks such as LANs and WANs.
3. Routing Protocols – Uses protocols like RIP, OSPF, or BGP to exchange routing information.
4. Traffic Management – Prevents congestion by directing data efficiently.
5. Security – Can filter traffic using Access Control Lists (ACLs) and provide firewall functionalities.

Types of Routers:

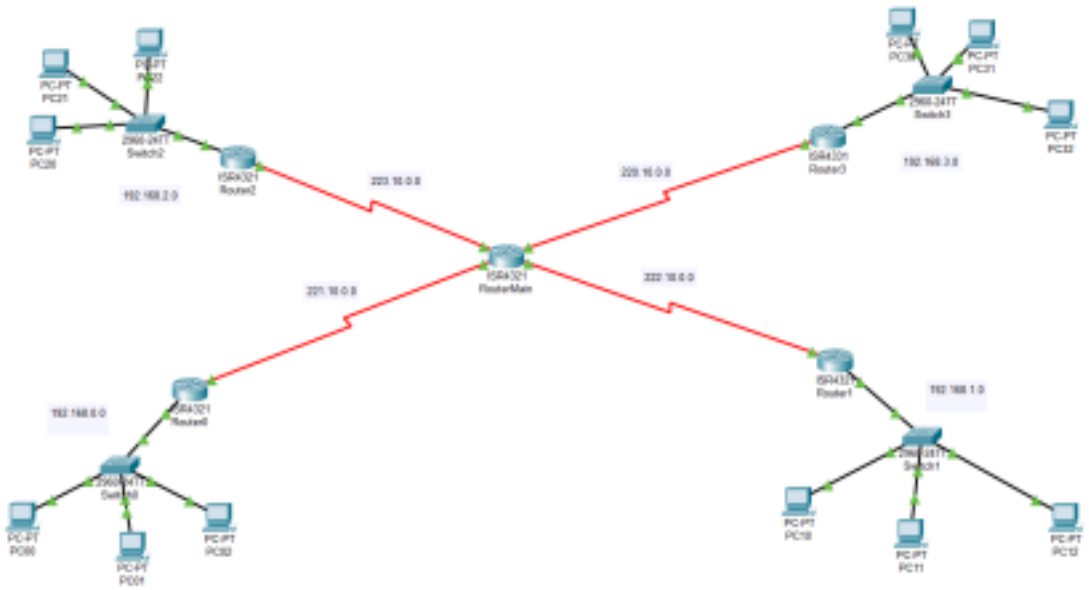
1. Wired Router – Connects devices via Ethernet cables. 2. Wireless Router – Provides both routing and Wi-Fi capabilities. 3. Core Router – High-capacity router used in the backbone of large networks.
4. Edge Router – Connects internal networks to external networks (e.g., to an ISP).

Example:

- In a home network, the router connects the LAN (devices like PCs, mobiles) to the WAN (internet provided by the ISP).
- In enterprises, routers interconnect multiple LANs across different branches through WAN links.

Network Design

The network consists of 4 LANs. Each LAN has 3 PCs connected by a switch, which also connects a router. A main router connects all 4 routers of the LANs for communication across LANs. Routers and PCs are connected to the Switch in the LAN via copper straight through wires. Routers are connected via serial DCE cables, in a star topology.



IP addresses of devices

LAN0

Device	IP address	Port
Router0	192.168.0.1	Gig0/0/0
Router0	221.10.0.1	Se0/1/0
PC00	192.168.0.2	FastEthernet0/0
PC01	192.168.0.3	FastEthernet0/0
PC02	192.168.0.4	FastEthernet0/0

LAN1

Device	IP address	Port
Router1	192.168.1.1	Gig0/0/0
Router1	222.10.0.2	Se0/1/1

PC10	192.168.1.2	FastEthernet0/0
PC11	192.168.1.3	FastEthernet0/0
PC12	192.168.1.4	FastEthernet0/0

LAN2

Device	IP address	Port
Router2	192.168.2.1	Gig0/0/0
Router2	223.10.0.2	Se0/2/0
PC20	192.168.2.2	FastEthernet0/0
PC21	192.168.2.3	FastEthernet0/0
PC22	192.168.2.4	FastEthernet0/0

LAN3

Device	IP address	Port
Router3	192.168.3.1	Gig0/0/0
Router3	220.10.0.2	Se0/2/1
PC30	192.168.3.2	FastEthernet0/0
PC31	192.168.3.3	FastEthernet0/0
PC32	192.168.3.4	FastEthernet0/0

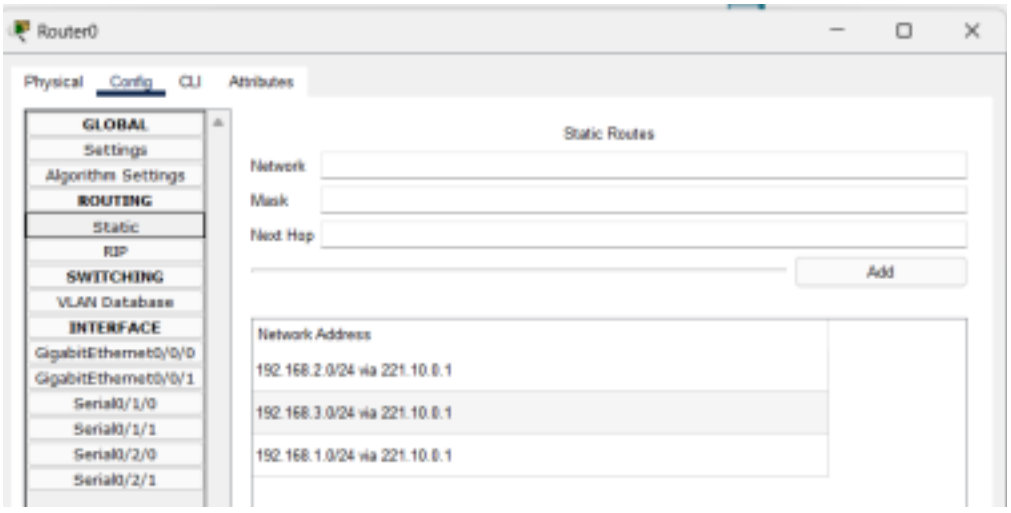
Central Router

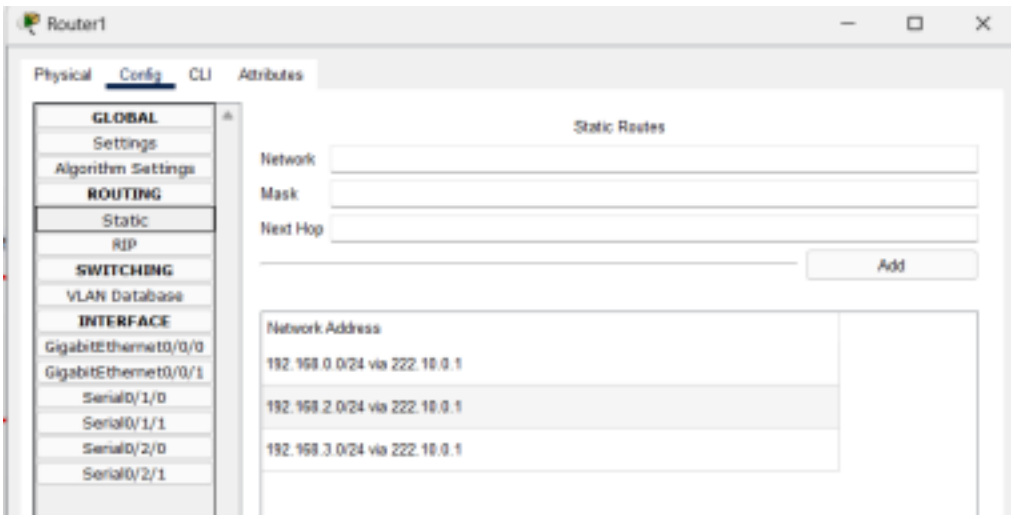
IP Address	Port
221.10.0.1	Se0/1/0
222.10.0.1	Se0/1/1
223.10.0.1	Se0/2/0
224.10.0.1	Se0/2/1

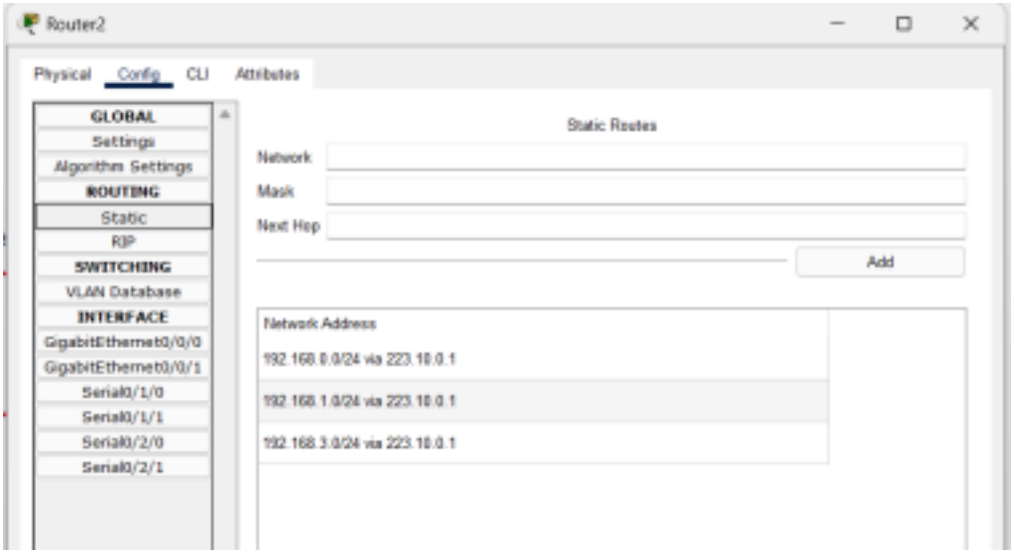
Network and Broadcast addresses

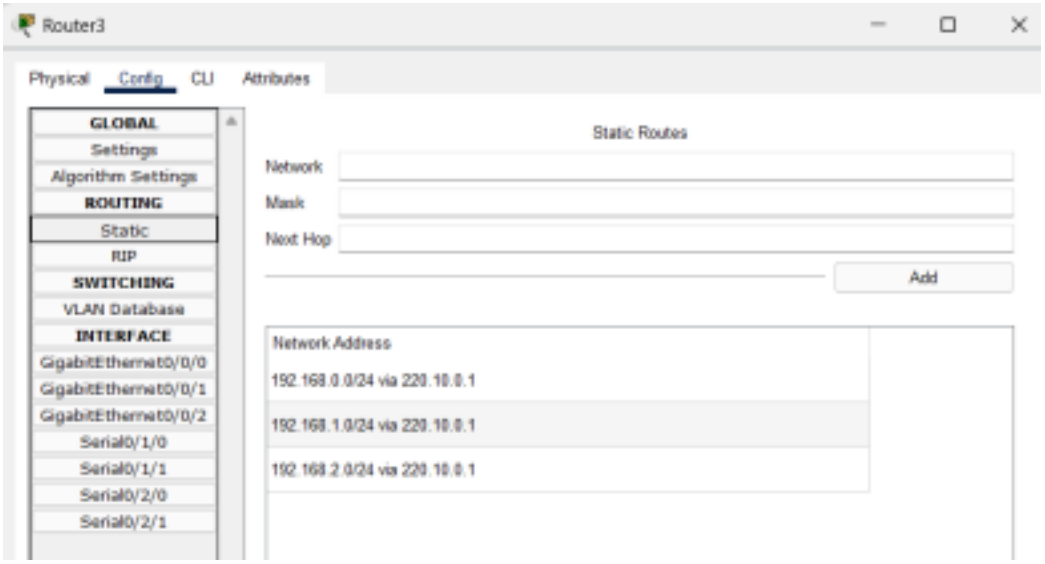
LAN	Network Address	Broadcast Address
LAN0	192.168.0.0/24	192.168.0.255
LAN1	192.168.1.0/24	192.168.1.255
LAN2	192.168.2.0/24	192.168.2.255
LAN3	192.168.3.0/24	192.168.3.255

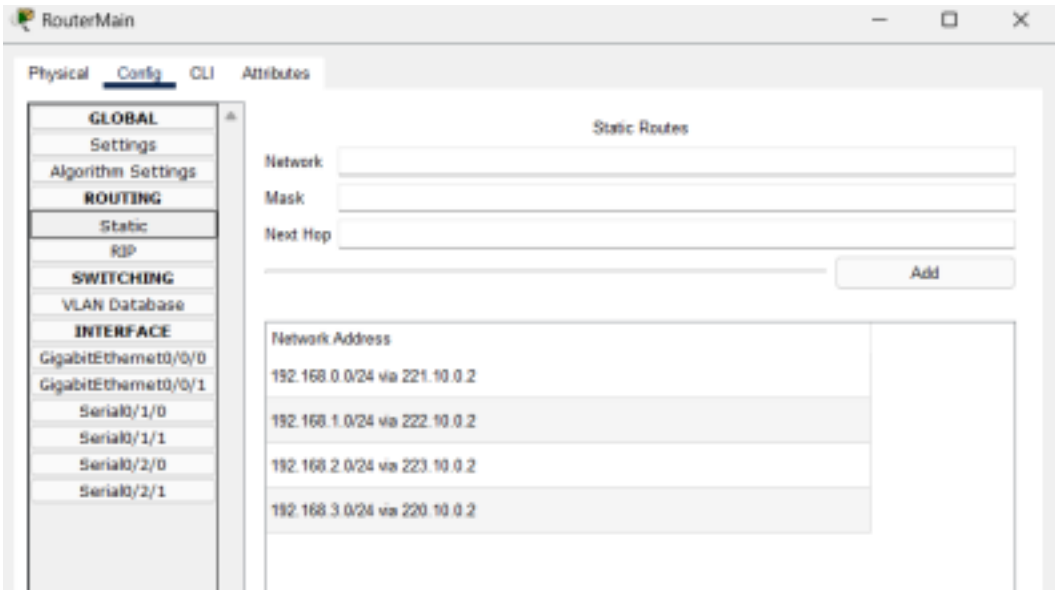
Static Routing





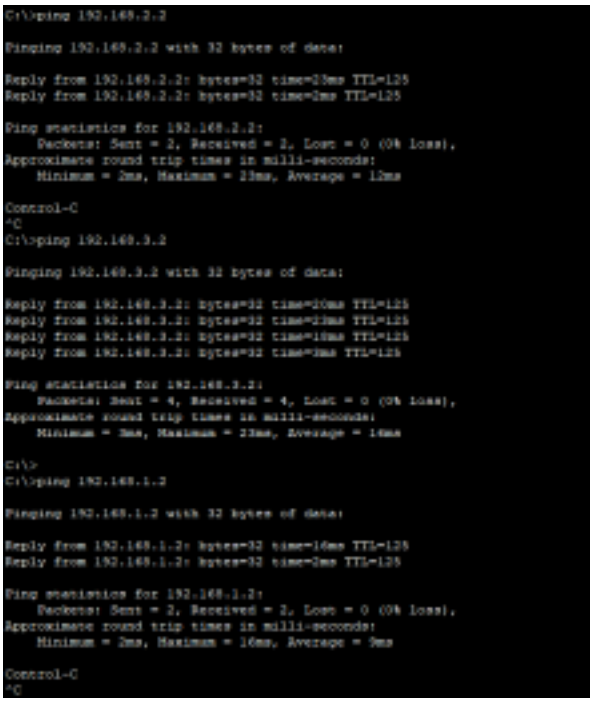




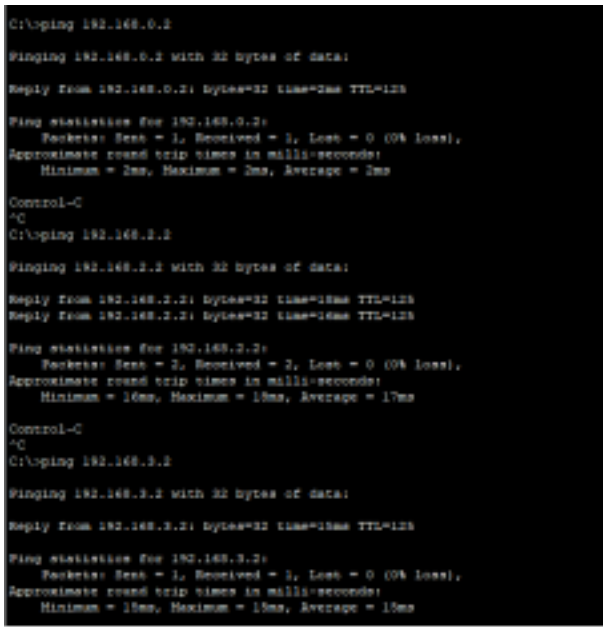


Output

Pinging from PC on LAN0 (192.168.0.0 network)

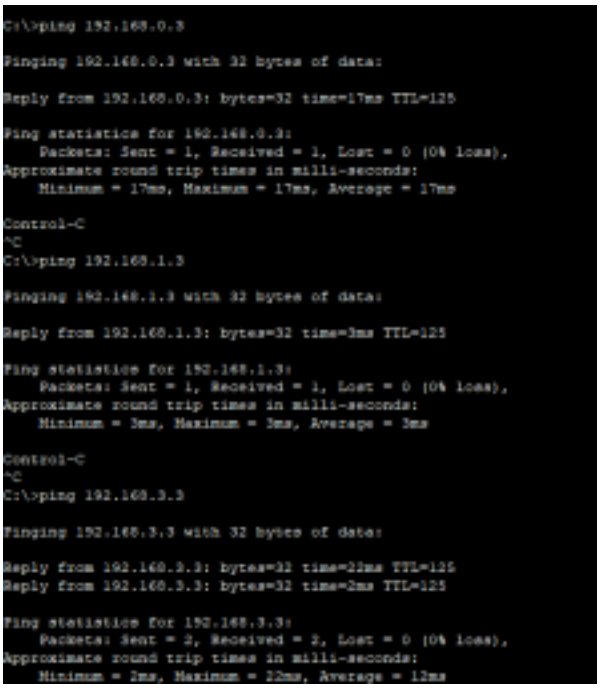


Pinging from PC on LAN1 (192.168.1.0

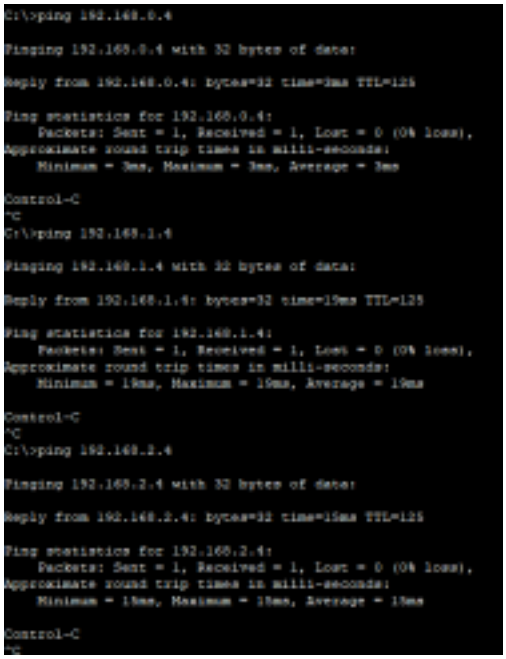


network)

Pinging from PC on LAN2 (192.168.2.0 network)



Pinging from PC on LAN3 (192.168.3.0 network)



Conclusion

In this experiment, a Wide Area Network (WAN) was successfully implemented in Cisco Packet Tracer, connecting four separate LANs through a central main router. Each LAN, consisting of three PCs connected via a switch and a local router, was able to communicate internally as well as with devices in other LANs through the WAN. The use of copper straight-through cables for LAN connections and serial DCE

cables for inter-router links ensured proper physical layer connectivity. The star topology of the WAN facilitated centralized communication management and simplified routing. Overall, the experiment demonstrated the design, configuration, and testing of a multi-LAN WAN, highlighting key networking concepts such as IP addressing, routing, and inter-network communication.