Activity based

Project Report on

Computer Network

Project Module - I

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By

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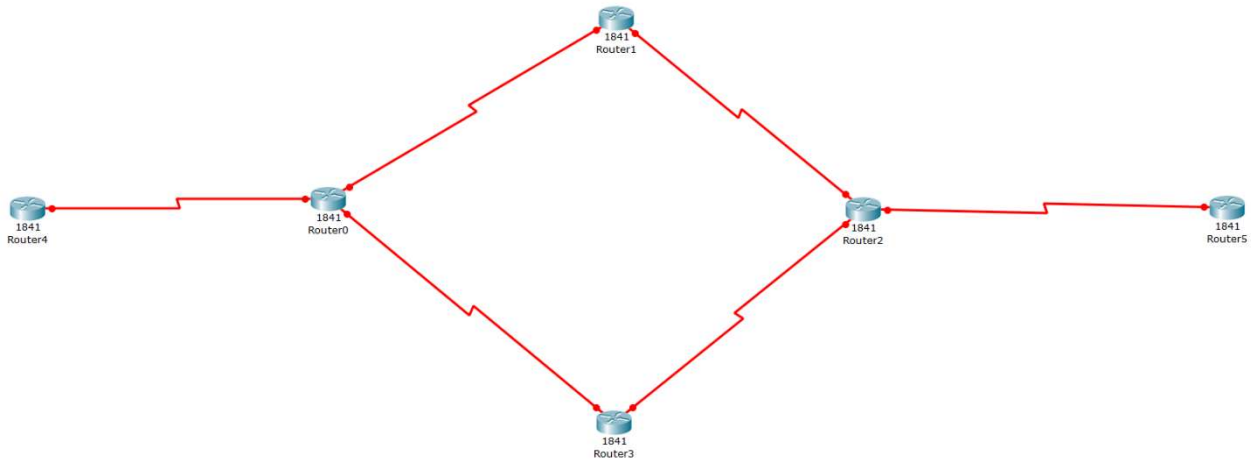
Design and develop a LAN & WAN network and implement OSPF protocol

Project Statement:

Implement OSPF Routing with single area for following network.

Select Class A IP addresses.



Problem Description:

I. Develop a LAN and WAN network for above mentioned diagram.
II. Implement OSPF routing.
III. Show successful communication in between different Network.

Project Module I

I. Give detail information about Physical infrastructure which include different types of hardware interfaces used in it. Give detail information about which cable is used.

1. Serial Interfaces:

- Serial interfaces are used for point-to-point connections in wide area networks (WANs).
- These interfaces are typically used for connecting routers or other networking equipment over dedicated lines.
- Serial interfaces have specific characteristics, including data rate (bandwidth), clock rate, and encapsulation methods.

2. Serial0/0/0:

- This interface is present in Router 5.
- It is configured with an IP address of 60.0.0.3 with a subnet mask of 255.0.0.0.
- The interface is enabled with the "no shutdown" command.
- It is used for OSPF configuration and advertises the network 60.0.0.2/8 into OSPF area 1.

3. Serial0/0/1:

- This interface is present in Router 0, Router 1, and Router 2.
- The configurations for this interface are missing in the provided information, but they might be part of the network setup.

4. Serial0/1/0:

- This interface is present in Router 2 and Router 3.
- Router 2's Serial0/1/0 is configured with an IP address of 10.0.0.3.
- Router 3's Serial0/1/0 is used for OSPF configuration.

5. Serial0/1/1:

- This interface is present in Router 2.
- Router 2's Serial0/1/1 is configured with an IP address of 30.0.0.2.

These interfaces are part of the physical infrastructure that connects the routers. The routers use these interfaces to communicate with each other over various WAN links, forming the network infrastructure.

II. **Give detail information of Which IP addresses is used. How many bits allocated for network address and host addresses. Connect computers to the routers. What is the IP address of default gateway in computer. What is the subnet mask**.

The specific cable used for connecting routers depends on the type of physical interface and the network technology in use. the primary interfaces used are serial interfaces, which typically require serial cables for connection. The most common types of serial cables used in networking are:

1. Serial DCE/DTE Cable (V.35 Cable):

- DCE (Data Communications Equipment) and DTE (Data Terminal Equipment) cables are often used with serial interfaces.
- These cables are used for synchronous serial connections and often have a male (DTE) and female (DCE) connector.
- The cable type (DCE or DTE) and the pinout of the connectors can vary depending on the specific interface and the devices being connected.
- These cables are often used for connecting routers to CSU/DSU (Channel Service Unit/Data Service Unit) devices or other networking equipment over leased lines or T1/E1 circuits.

Router 1:

- IP Address: Serial0/0/0 is configured with IP address 30.0.0.3, and Serial0/0/1 is configured with IP address 50.0.0.2.
- Both interfaces use a subnet mask of 255.0.0.0, which means that 8 bits are allocated for the network and 24 bits for host addresses.

Router 2:

- IP Address: Serial0/1/0 is configured with IP address 10.0.0.3, Serial0/0/0 with IP address 20.0.0.2, and Serial0/1/1 with IP address 30.0.0.2.
- All interfaces use a subnet mask of 255.0.0.0, allocating 8 bits for the network and 24 bits for host addresses.

Router 3:

- IP Address: Serial0/1/0 is configured with IP address 40.0.0.3, Serial0/0/0 with IP address 50.0.0.3, and Serial0/1/1 with IP address 60.0.0.2.
- Like the previous routers, all interfaces use a subnet mask of 255.0.0.0, with 8 bits for the network and 24 bits for host addresses.

Router 4:

- IP Address: Serial0/0/0 is configured with IP address 10.0.0.2.
- This router uses a subnet mask of 255.0.0.0, allocating 8 bits for the network and 24 bits for host addresses.

Router 5:

- IP Address: Serial0/0/0 is configured with IP address 60.0.0.3.
- Similar to the other routers, this one also uses a subnet mask of 255.0.0.0, reserving 8 bits for the network and 24 bits for host addresses.

In this setup, the routers are using a Class A IP address range (8 bits for the network and 24 bits for hosts) for their serial interfaces.

Connecting Computers to the Routers:

- To connect computers to the routers, you should configure the computers with IP addresses within the same IP address range (e.g., 30.0.0.0/8 for Router 1). Use IP addresses with the same subnet mask (255.0.0.0) and configure the default gateway on the computers to be the IP address of the respective router's serial interface that they are connected to. For example, for Router 1, the default gateway on connected computers would be 30.0.0.3.
- Be sure that the computers and routers share the same IP address range and subnet mask so they can communicate within the same network.

Default Gateway and Subnet Mask:

- The default gateway for the connected computers would be the IP address of the router they are directly connected to.
- The subnet mask for the connected computers should match the one used by the routers (255.0.0.0), ensuring they are part of the same network segment.

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III. Give detail information about following hardware with its role in network

Router,

Switches

Cables

WIC interface

Fast Ethernet

Router:

- Role: Routers are key devices in a network responsible for routing data packets between different networks or subnetworks. They determine the best path for data to travel based on routing tables, network protocols (such as OSPF in your provided configurations), and logical addressing (like IP addresses).
- Additional Information: Routers often connect different IP networks, enforce security policies, perform Network Address Translation (NAT), and ensure efficient data flow within a network.

Switches:

- Role: Switches are network devices that operate at Layer 2 (Data Link Layer) of the OSI model. They provide network connectivity by forwarding data frames based on MAC addresses. Switches are used to create local area networks (LANs) and segment network traffic, improving network efficiency.
- Additional Information: Switches are commonly used in local networks to connect devices like computers, printers, and IP phones, allowing them to communicate with each other within the same network segment.

Cables:

- Role: Cables are physical transmission media that carry data signals between network devices. The choice of cables depends on factors like network speed, distance, and environmental conditions. In your provided configuration, serial cables are used to connect routers.
- Additional Information: Different types of cables include Ethernet cables (Cat5e, Cat6, etc.), fiber-optic cables (single-mode and multi-mode), and serial cables (used in WAN connections).

WIC Interface (WAN Interface Card):

- Role: A WIC interface, or WAN Interface Card, is a hardware component in a router that provides physical connectivity for wide-area network (WAN) technologies. WAN interfaces can support various technologies like T1/E1, T3/E3, ISDN, and DSL, enabling routers to connect to external networks.
- Additional Information: WICs allow routers to extend their functionality to different types of WAN connections, making them versatile devices for connecting to remote networks and the internet.

Fast Ethernet:

- Role: Fast Ethernet is a network technology that operates at 100 Mbps (megabits per second) and is an improvement over standard Ethernet (10 Mbps). Fast Ethernet is commonly used for high-speed LAN connections, connecting devices within the same network segment.
- Additional Information: Fast Ethernet provides faster data transfer compared to traditional Ethernet, making it suitable for modern network applications. It uses standard Ethernet frames but operates at higher speeds, often using Cat5e or better cabling.

These components work together to create a functional network infrastructure that allows data to flow efficiently and securely between devices and networks.

Conclusion :

In the provided network configurations, we have learned about the setup and configuration of multiple routers, their interfaces, and the establishment of OSPF (Open Shortest Path First) routing. This configuration demonstrates the creation of a network infrastructure using routers, WAN interfaces, and routing protocols to enable data communication between different network segments.

Key takeaways from the configurations include:

1. The configuration of routers: Routers play a crucial role in connecting and directing data traffic between different network segments. The routers in this setup are configured with various interfaces and IP addresses to facilitate communication.

2. Use of OSPF: OSPF is used as the routing protocol to determine the best paths for data within the network. It ensures efficient and dynamic routing by exchanging information about network topology.

3. WAN interfaces (WIC): WAN Interface Cards are used to connect routers to external networks and the internet. These interfaces support different WAN technologies, allowing the routers to establish wide-area network connections.

4. IP Addressing: The configurations include the allocation of IP addresses to router interfaces, which determine the network and host addresses. These addresses are essential for routing and communication within the network.

5. Network hardware: The configurations mention the use of various hardware components such as routers, cables, and WAN interfaces, each serving a specific purpose in the network infrastructure.

Overall, the provided network configurations demonstrate the setup of a functional network that can facilitate data transfer between multiple network segments. This configuration aligns with best practices in networking, emphasizing the importance of IP addressing, routing protocols, and hardware components to create a robust network infrastructure.