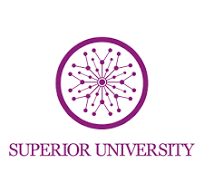
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**Multi-Network Communication System**

## **1. Introduction**

The "Multi-Network Communication System" is designed to interconnect multiple sub-networks, enabling efficient communication across diverse devices and ensuring scalability, security, and reliability. This project illustrates how routers, switches, and endpoints can collaborate within different IP subnets to share resources and facilitate seamless data exchange.

### ****Objective****

* To create a robust communication framework connecting multiple networks.
* To facilitate the exchange of data between systems in different subnets.
* To ensure efficient routing and switching operations.

## **2. Network Design Overview**

### ****2.1 Topology****

The project is based on a hybrid topology integrating both hierarchical and point-to-point connections. The topology consists of routers, switches, PCs, and servers interconnected to demonstrate network communication.

### ****2.2 Components****

* **End Devices:** PCs (clients), Server(s)
* **Networking Devices:** Routers, Switches
* **Protocols Used:** Static routing, Dynamic routing (e.g., RIP, OSPF, or EIGRP), VLANs (if applicable)
* **IP Addressing:** IPv4 addressing with subnets (detailed in the IP Addressing Scheme section)

## **3. IP Addressing Scheme**

| **Device** | **IP Address/Subnet** | **Interface** | **Notes** |
| --- | --- | --- | --- |
| Router1 (R1) | 10.0.0.1/24 | G0/0 | Connected to Router4 |
| Router2 (R2) | 10.0.0.2/24 | G0/1 | Interconnects with Router4 |
| Router3 (R3) | 192.168.1.1/24 | G0/1 | Connects to clients via Switch |
| Switch1 (S1) | Layer 2 | Multiple ports | Connects PCs and Server |
| Server (Srv1) | 192.168.1.2/24 | NIC1 | Resource Server |
| PCs (Multiple) | Assigned dynamically | Ethernet Ports | End devices in various subnets |

## **4. Features and Configuration Details**

### ****4.1 Subnetting****

The network is divided into multiple subnets to segregate traffic and enhance security. Each router connects specific subnets. Subnet masks and IP ranges are carefully allocated to ensure no overlaps.

### ****4.2 Routing Protocol****

* Static or dynamic routing (such as OSPF or RIP) is implemented for efficient inter-subnet communication.
* Routes are defined to ensure packets travel correctly between subnets.

### ****4.3 Switch Configuration****

* Switches are configured for basic Layer 2 functionality.
* If VLANs are implemented, they isolate broadcast domains and enhance network segmentation.

### ****4.4 Server Setup****

* The server provides shared resources or services (e.g., file sharing, web hosting).
* Configuration involves assigning a static IP, enabling necessary protocols, and ensuring reachability.

### ****4.5 Security Measures****

* Access Control Lists (ACLs) are configured on routers to restrict unauthorized access.
* VLANs or private subnets may be used to secure sensitive parts of the network.

## **5. Implementation Steps**

### ****5.1 Hardware Setup****

* Connect routers, switches, and PCs as per the topology.
* Ensure all devices are powered and configured to factory settings.

### ****5.2 Basic Configurations****

1. Assign IP addresses to router interfaces.
2. Configure switches with appropriate VLANs (if applicable).
3. Test basic connectivity (ping tests within each subnet).

### ****5.3 Routing Configuration****

* Configure static routes or a dynamic routing protocol on routers.
* Verify inter-subnet connectivity using tools like ping and traceroute.

### ****5.4 Server Configuration****

* Assign a static IP to the server.
* Test server accessibility from all subnets.

## **6. Testing and Validation**

### ****6.1 Connectivity Tests****

* Ping between devices in the same subnet.
* Ping between devices across different subnets.

### ****6.2 Performance Tests****

* Measure latency and bandwidth between endpoints.
* Simulate traffic to test stability under load.

### ****6.3 Troubleshooting****

* Verify cable connections and port statuses.
* Check routing table entries and ACL rules.
* Use diagnostic commands (e.g., show ip route, show interfaces).

## **7. Results and Analysis**

The "Multi-Network Communication System" successfully enables communication between multiple subnets, demonstrating:

* Seamless routing and switching.
* Scalability for adding new devices and subnets.
* Secure access to shared resources.

## **8. Conclusion and Future Enhancements**

This project showcases the design and implementation of a scalable and efficient communication system. Future improvements may include:

* Incorporating IPv6 for modernized addressing.
* Implementing advanced security protocols (e.g., IPSec, VPN).
* Exploring software-defined networking (SDN) for greater flexibility.