Smart Mall Network Design

Jawad Ahmad Khan

22I – 0791

Section C

Table of Contents

Contents

Objectives

The primary purpose of this project is to design and implement a robust IPv6-enabled network infrastructure within a multi-segment topology, ensuring efficient communication between various departments, small stalls, and shops of different sizes in a secure, scalable, and optimized manner. The project aims to utilize modern routing protocols like **EIGRP** and **RIP** to facilitate dynamic routing, ensuring fault tolerance and minimal manual configuration. Additionally, the project incorporates key networking concepts such as **subnetting, VLSM**, and **IPv6 NAT** to accommodate both IPv4 and IPv6 devices seamlessly.

This project mirrors real-world networking challenges where multiple departments and vendors with varying requirements coexist in a shared environment. By implementing advanced IPv6 features and dynamic routing, it not only ensures efficient operation today but also positions the network for future technological upgrades. The blend of security, scalability, and performance optimization makes this project a comprehensive solution for modern network design.

Technologies Used

- ➔ Cisco Packet Tracer
- ➔ Dynamic Routing Protocols
    - EIGRP
    - RIP (Routing Information Protocol)
    - OSPF
- ➔ Subnetting
- ➔ VLSM (Variable Length Subnet Masking)
- ➔ NAT (Network Address Translation)
- ➔ ACL
- ➔ DHCP (Dynamic Host Configuration Protocol)
- ➔ Firewall
- ➔ Domain Name service
- ➔ VLANs

Implementation Details

This Cisco Packet Tracer simulation represents a complex network topology, featuring a structured approach to subnetting and efficient resource management. The network is segmented into various functional clusters, such as "Apartment," "Food Cravings," and "Budget Junction," each marked with distinct colour codes to signify unique zones or purposes. Each segment is interconnected through routers and switches, with specific IP address ranges assigned, demonstrating a well-thought-out subnetting strategy. Devices like PCs, servers (including a DNS server), and routers are configured to ensure seamless communication between the zones, while protocols like RIP, EIGRP, VLANs, and VLSM are likely used to optimize routing and scalability. Key troubleshooting areas, such as "Cannot access after the first router," highlight the focus on identifying and addressing potential connectivity issues. The inclusion of features like DHCP for automatic IP assignment, NAT for network security, and wireless networking ensures the design is robust, scalable, and adaptable to real-world smart mall requirements.

RIP:

ROUTER1

enable

configure terminal

router rip

version 2

network 192.168.1.0

network 192.168.2.0

no auto-summary

exit

ROUTER2

enable

configure terminal

router rip

version 2

network 192.168.2.0

network 192.168.3.0

no auto-summary

exit

EIGRP:

ROUTER1

enable

configure terminal

router eigrp 100

network 192.168.1.0 0.0.0.255

network 10.1.1.0 0.0.0.3

no auto-summary

exit

ROUTER2

enable

configure terminal

router eigrp 100

network 192.168.2.0 0.0.0.255

network 10.1.1.0 0.0.0.3

no auto-summary

exit

OSPF:

ROUTER1

enable

configure terminal

router ospf 1

network 192.168.1.0 0.0.0.255 area 0

network 10.1.1.0 0.0.0.3 area 0

exit

ROUTER2

enable

configure terminal

router ospf 1

network 192.168.2.0 0.0.0.255 area 0

network 10.1.1.0 0.0.0.3 area 0

exit

Redistribution between RIP and EIGRP:

router eigrp 100

redistribute rip metric 10000 100 255 1 1500

router rip

version 2

redistribute eigrp 100 metric 2

Redistribution between OSPF and EIGRP:

router eigrp 100

redistribute ospf 1 metric 10000 100 255 1 1500

router ospf 1

redistribute eigrp 100 subnets

Standard ACL:

access-list 1 permit 192.168.1.0 0.0.0.255

access-list 1 deny any

interface Fa0/0

ip access-group 1 in

Extended ACL:

access-list 100 permit tcp 192.168.1.0 0.0.0.255 10.1.1.0 0.0.0.255 eq 80

access-list 100 deny ip any any

interface Fa0/1

ip access-group 100 out

NAT:

ip nat inside source static 192.168.1.10 203.0.113.2

interface fa0/0

ip nat inside

interface fa0/1

ip nat outside

Results and Testing

```
Router>en
Router#show ip nat translations
Router#show ip nat translations
Pro  Inside global      Inside local       Outside local      Outside
global
icmp 200.100.50.1:1     192.91.13.11:1     8.8.8.2:1          8.8.8.2:1

Router#show ip nat translations
Pro  Inside global      Inside local       Outside local      Outside
global
icmp 200.100.50.1:1     192.91.13.11:1     8.8.8.2:1          8.8.8.2:1
icmp 200.100.50.1:2     192.91.13.11:2     8.8.8.2:2          8.8.8.2:2
icmp 200.100.50.2:10    192.91.13.13:10    8.8.8.2:10         8.8.8.2:10
icmp 200.100.50.2:1     192.91.13.13:1     8.8.8.2:1          8.8.8.2:1
icmp 200.100.50.2:2     192.91.13.13:2     8.8.8.2:2          8.8.8.2:2
icmp 200.100.50.2:3     192.91.13.13:3     8.8.8.2:3          8.8.8.2:3
icmp 200.100.50.2:4     192.91.13.13:4     8.8.8.2:4          8.8.8.2:4
icmp 200.100.50.2:5     192.91.13.13:5     8.8.8.2:5          8.8.8.2:5
icmp 200.100.50.2:6     192.91.13.13:6     8.8.8.2:6          8.8.8.2:6
icmp 200.100.50.2:7     192.91.13.13:7     8.8.8.2:7          8.8.8.2:7
icmp 200.100.50.2:8     192.91.13.13:8     8.8.8.2:8          8.8.8.2:8
icmp 200.100.50.2:9     192.91.13.13:9     8.8.8.2:9          8.8.8.2:9

Router#
```

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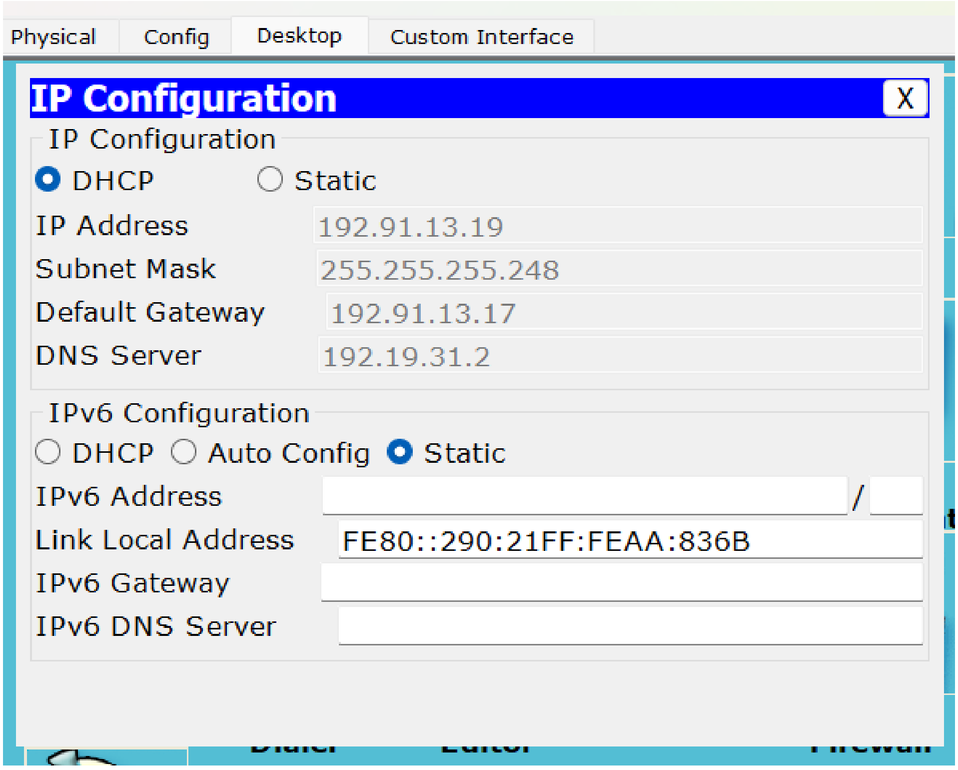
- ➔ **Could not ping a PC on firewall**

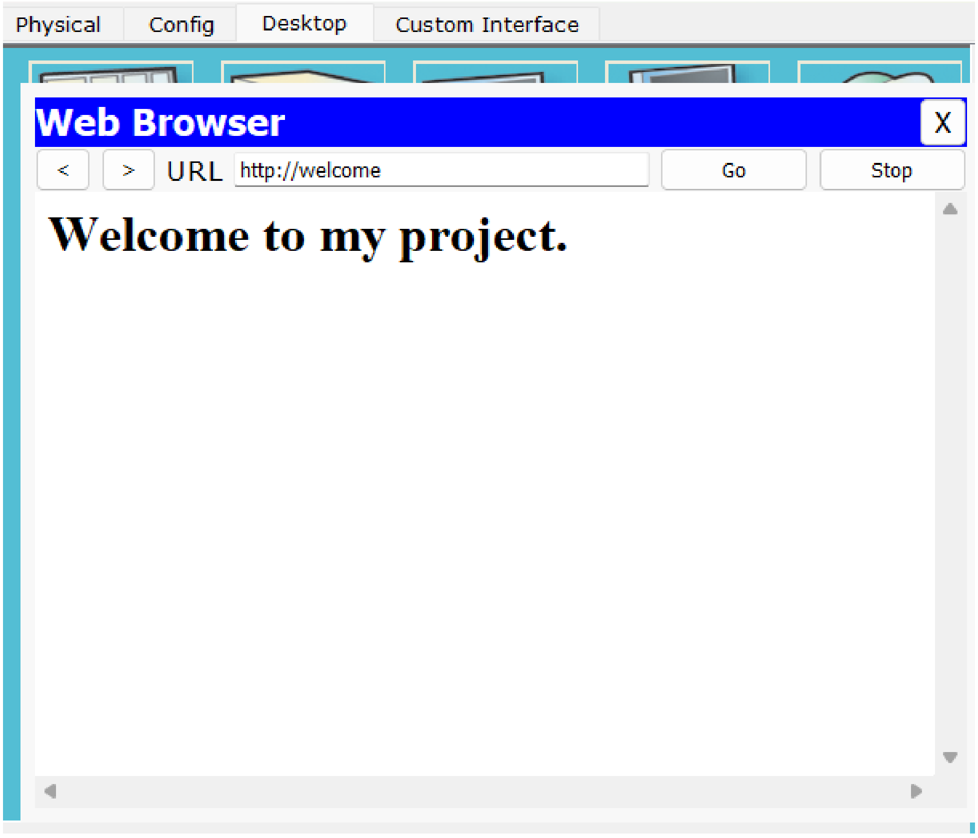
Command Prompt X

```
Packet Tracer PC Command Line 1.0
PC>ping 192.91.2.3

Pinging 192.91.2.3 with 32 bytes of data:

Request timed out.
```

→ DHCP configured



→ DNS



→

Challenges and Learnings

RIP Version 2: For subnetting only version 2 supports subnetting. I spent 4 days trying to find errors in my DHCP when the issue was in RIP as I was using default version.

Redistribution between static routing and EIGRP: I had initially created a part and done static routing, however when the time came for redistribution, it was extremely hard and had to change the topology.

Concept of tunnelling and IPv6: I had initially created a part using IPv6 with the aim of using tunnelling to connect with the rest of the IPv4 technology. However, when the time came for connecting them and despite trying multiple times, it wasn't working.

Redistribution between EIGRP and RIP: Took me multiple days and still couldn't solve the error properly, recreated the topology and it started working.

Conclusion

In conclusion, the **Smart Mall Network Design** project demonstrates the integration of advanced networking principles, dynamic routing protocols like EIGRP, RIP, and OSPF, as well as critical technologies such as VLANs, NAT, ACLs, and DHCP. This design effectively addresses real-world challenges in a shared environment by optimizing security, scalability, and performance. Despite encountering challenges like redistribution between protocols, IPv6 tunnelling, and configuration errors, the project highlights the importance of iterative problem-solving and adaptability in network design. Overall, this robust and future-ready infrastructure lays the groundwork for seamless communication and technological upgrades in a modern smart mall setup.