Configure and Troubleshoot OSPF and EIGRP

Submitted By:

1. Mohamed Ezzat Elsheikh
2. Farag Mohamed GadAllah
3. Mahmoud Ashraf Mohamed (Team Leader)
4. Ahmed Mahmoud Hegazy
5. Ahmed ELsayed Kolaib

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Instructor: AbdelRahman Raslan

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1. Introduction

In this project, we focused on setting up, configuring, and troubleshooting two critical dynamic routing protocols: **OSPF (Open Shortest Path First)** and **EIGRP (Enhanced Interior Gateway Routing Protocol)**. These protocols are widely used in enterprise networks for efficient routing of data. Proper configuration and troubleshooting of OSPF and EIGRP are essential for network reliability and performance. The project was carried out over three weeks, with each week dedicated to a specific task.

2. Project Objectives

- Learn how to configure OSPF and EIGRP on routers.
- Understand the importance of router IDs, areas, path metrics, and network stability.
- Perform verifications to ensure correct protocol operations.
- Troubleshoot OSPF and EIGRP issues using diagnostic tools and commands.

3. Network Setup Overview

The project was performed on a simulated network environment using Cisco Packet Tracer, which included multiple routers and hosts connected across different network segments. The setup involved the following:

- **Total Routers:** 5
- **IP Addressing Scheme:** IPv4
- **Routing Protocols Used:** OSPF and EIGRP
- **Router Models Used:** Cisco 2900 Series

Network Topology

- OSPF was implemented in a multi-area environment (Area 0 and Area 1).
- EIGRP was configured with different path metrics to test load balancing.
- Each router had a unique Router ID assigned for OSPF and EIGRP operations.

4. Week 1: OSPF Configuration

In the first week, we focused on configuring **OSPF** on the network. OSPF is a link-state routing protocol that operates based on areas and uses the Dijkstra algorithm to calculate the shortest path.

Tasks Completed

- Assigned **Router IDs** to each router (e.g., 1.1.1.1 for Router 1, 2.2.2.2 for Router 2).
- Configured **Area 0** as the backbone area and **Area 1** for a remote segment.
- Assigned networks to OSPF processes using the `network` command.
- Verified OSPF operation with the following commands:
  - `show ip ospf`
  - `show ip ospf neighbor`
  - `show ip route ospf`

Sample Configuration

```arduino
Copy code
Router(config)# router ospf 1
Router(config-router)# router-id 1.1.1.1
Router(config-router)# network 192.168.1.0
0.0.0.255 area 0
Router(config-router)# network 10.0.0.0
0.0.0.255 area 1
```

5. Week 2: EIGRP Configuration

In the second week, we implemented **EIGRP**. Unlike OSPF, EIGRP is a distance-vector protocol that uses metrics such as bandwidth and delay for route calculation.

Tasks Completed

- Enabled EIGRP on all routers and assigned an **Autonomous System (AS) Number**.
- Configured **path metrics** (bandwidth, delay) to influence routing decisions.
- Verified EIGRP operation using the following commands:
  - `show ip eigrp neighbors`
  - `show ip route eigrp`
  - `show ip protocols`

Sample Configuration

```scss
Copy code
Router(config)# router eigrp 100
Router(config-router)# network 192.168.2.0 0.0.0.255
Router(config-router)# network 10.0.1.0 0.0.0.255
Router(config-router)# no auto-summary
```

6. Week 3: Troubleshooting OSPF and EIGRP

In the third week, we focused on **troubleshooting** common OSPF and EIGRP issues using diagnostic commands and network monitoring tools.

Common Issues Encountered

- **OSPF**:
    - Incorrect area assignments.
    - Router ID conflicts.
    - Neighbor adjacency failures.
- **EIGRP**:
    - Mismatched AS numbers.
    - Inaccurate metric settings.

Diagnostic Commands Used

- `ping` and `traceroute` to check connectivity.
- `show ip ospf database` to check OSPF routes.
- `show ip eigrp topology` to view EIGRP paths.

7. Challenges Faced

- **OSPF Area Misconfigurations:** Some routers were initially placed in the wrong areas, causing neighbor relationships to fail.
- **AS Number Mismatch in EIGRP:** Misconfigured AS numbers prevented routers from forming EIGRP adjacencies.
- **Router ID Conflicts:** Some routers had the same Router ID, causing OSPF issues that required reconfiguration.

8. Tools and Commands Used

- **Cisco Packet Tracer**: Simulated network environment.
- **Show Commands**:
  - `show ip route`
  - `show ip protocols`
  - `show ip ospf neighbor`
  - `show ip eigrp neighbors`
- **Ping and Traceroute**: Tested connectivity between routers and hosts.

9. Conclusion

The project allowed us to gain hands-on experience with configuring and troubleshooting **OSPF** and **EIGRP** protocols. By working through the configuration process and addressing common issues, we developed a deeper understanding of how these protocols operate and their importance in real-world networks. This project also enhanced our troubleshooting skills, which are critical for maintaining network reliability and efficiency.

10. References

1. Cisco Systems. *Configuring OSPF*. Cisco Documentation.
2. Cisco Systems. *Configuring EIGRP*. Cisco Documentation.
3. Todd Lammle. *CCNA Routing and Switching Study Guide*.