EIGRP Dynamic Routing

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1. Introduction

This lab focuses on the implementation of **EIGRP (Enhanced Interior Gateway Routing Protocol)** in an enterprise-level network. The network is designed to represent a **National Government Core Network (NGCN)** that interconnects multiple government departments using dynamic routing.

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2. Objective of the Network:

• Created a **government network model**
• Allow departments to **share data and communicate efficiently**
• Use EIGRP to **automatically manage routing**
• Maintain **network stability and reliability**
• Validate the network through **practical testing**

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3. Network Description

This project represents a **National Government Core Network (NGCN)** where different national institutions are connected through a central core router.

Connected Departments

- Supreme Court

- National Assembly

- Election Commission of Pakistan (ECP)

- Prime Minister House

- National Accountability Bureau (NAB)

- High Court

Each department includes:

- Its own Local Area Network (LAN)

- One switch

- Multiple end devices

- One router connected to the core network

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4. Network Topology Design

- **Topology Type:** Star-Based Core Architecture

- **Core Component:** Central Core Router acting as the backbone

- **Access Layer:** Each department connected using a Cisco 2911 router

- **Switches:** Cisco 2960 switches used for LAN connectivity

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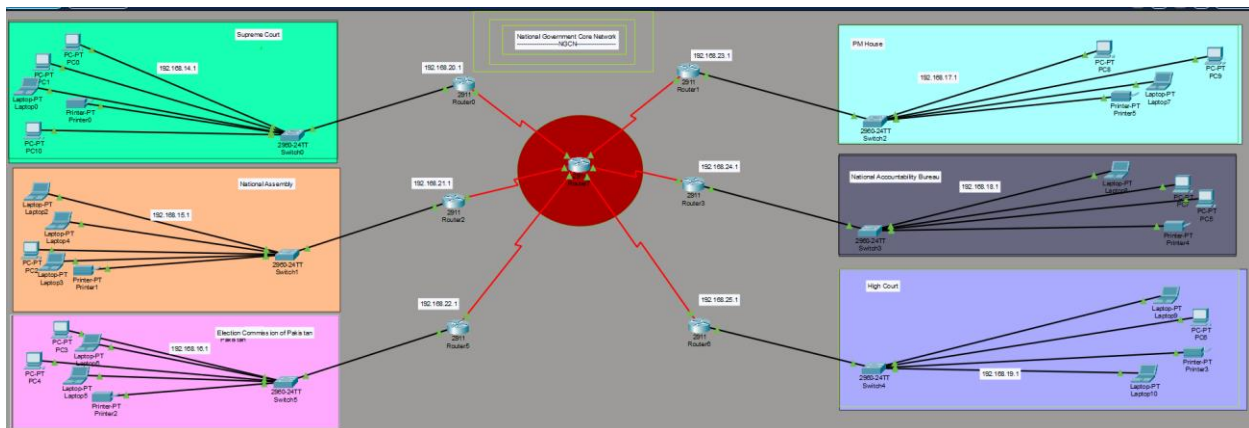
5. Devices Used

Device Type	Quantity
Routers (Cisco 2911)	Multiple
Switches (Cisco 2960)	Multiple
PCs	Multiple
Laptops	Multiple
Printers	Multiple

6. IP Addressing Scheme

LAN Addressing (/24)

Department	Network
Supreme Court	192.168.14.0/24
National Assembly	192.168.15.0/24
ECP	192.168.16.0/24
PM House	192.168.17.0/24
NAB	192.168.18.0/24
High Court	192.168.19.0/24

WAN / Serial Links (/30)

Link	Network
Core ↔ Router 0	192.168.20.0/30
Core ↔ Router 1	192.168.23.0/30
Core ↔ Router 2	192.168.21.0/30
Core ↔ Router 3	192.168.24.0/30
Core ↔ Router 5	192.168.22.0/30
Core ↔ Router 8	192.168.25.0/30

7. Routing Protocol Used – EIGRP

What is EIGRP?

Enhanced Interior Gateway Routing Protocol (EIGRP) is a Cisco proprietary dynamic routing protocol used in enterprise networks.

Why EIGRP is Used

- Automatically learns routes

- Fast convergence

- Easy to configure

- Suitable for large enterprise and government networks

EIGRP Characteristics

- Uses an Autonomous System (AS) number

- Sends updates only when needed

- Uses the DUAL algorithm to select the best and loop-free path.

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8. Router Configuration (Sample)

Supreme Court Router Configuration

Router(config)# router eigrp 100

Router(config-router)# network 192.168.14.0

Router(config-router)# network 192.168.20.0

Router(config-router)# no auto-summary

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router eigrp 5000
Router(config-router)#network 192.168.24.0
```

On core router:

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface Serial0/3/0
Router(config-if)#
Router(config-if)#conf t
%Invalid hex value
Router(config)#
Router(config)#router eigrp 5000
Router(config-router)#network 192.168.66.1
Router(config-router)#
Router(config-router)#network 192.168.92.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 5000: Neighbor 192.168.92.2 (Serial0/3/0) is up: new adjacency
```

All details of routers and interfaces:

```
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip eigrp neighbors
IP-EIGRP neighbors for process 5000
H   Address          Interface       Hold Uptime     SRTT    RTO   Q    Seq
                                     (sec)           (ms)          Cnt  Num
0   192.168.22.1     Se0/1/0         11   00:22:18   40      1000  0    67
1   192.168.21.1     Se0/1/1         13   00:22:18   40      1000  0    67
2   192.168.24.1     Se0/2/1         13   00:22:18   40      1000  0    67
3   192.168.25.1     Se0/0/0         11   00:22:18   40      1000  0    67
4   192.168.23.1     Se0/0/1         12   00:22:18   40      1000  0    67
5   192.168.20.1     Se0/2/0         10   00:22:18   40      1000  0    67
6   192.168.92.2     Se0/3/0         12   00:00:26   40      1000  0    25

Router#show ip route eigrp
D    192.168.14.0/24 [90/2172416] via 192.168.20.1, 00:22:19, Serial0/2/0
D    192.168.15.0/24 [90/2172416] via 192.168.21.1, 00:22:19, Serial0/1/1
D    192.168.16.0/24 [90/2172416] via 192.168.22.1, 00:22:19, Serial0/1/0
D    192.168.17.0/24 [90/2172416] via 192.168.23.1, 00:22:19, Serial0/0/1
D    192.168.18.0/24 [90/2172416] via 192.168.24.1, 00:22:19, Serial0/2/1
D    192.168.19.0/24 [90/2172416] via 192.168.25.1, 00:22:19, Serial0/0/0
     192.168.25.0/24 is variably subnetted, 2 subnets, 2 masks
D    192.168.66.0/24 [90/2172416] via 192.168.92.2, 00:00:27, Serial0/3/0

Router#
%LINK-3-UPDOWN: Interface Serial0/3/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/3/0, changed state to down

%DUAL-5-NBRCHANGE: IP-EIGRP 5000: Neighbor 192.168.92.2 (Serial0/3/0) is down: interface down
```
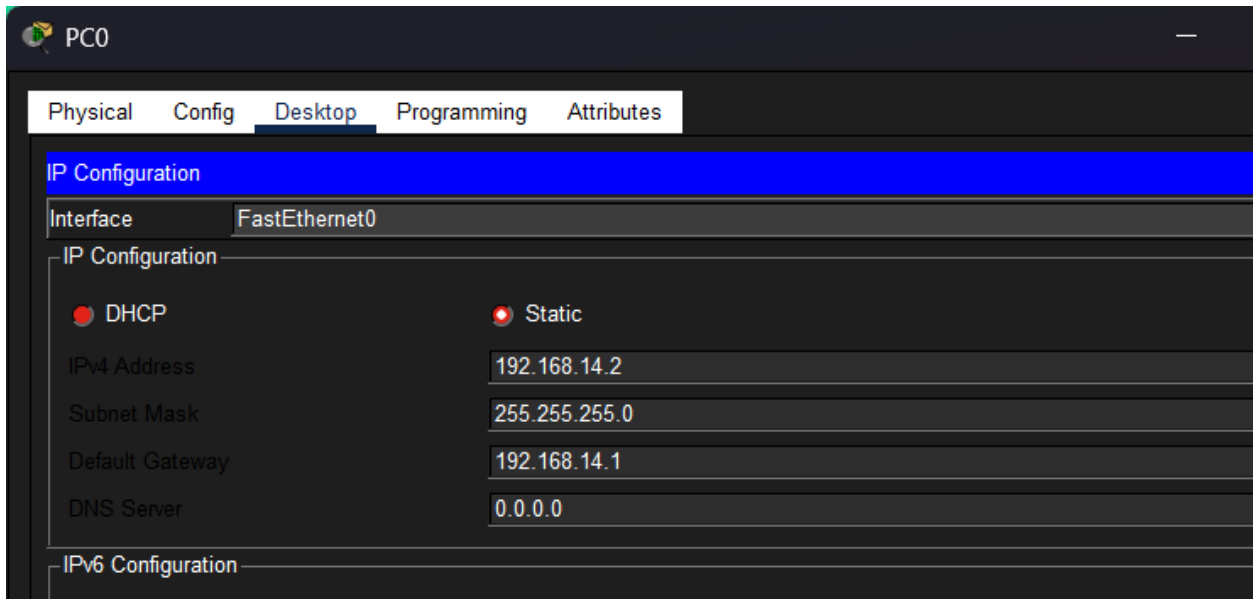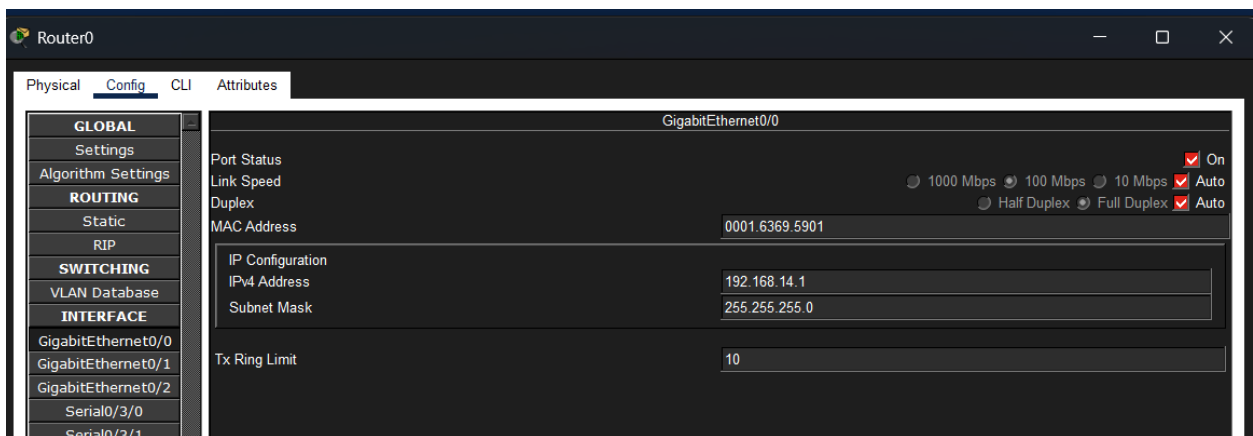
9. End Device Configuration

Each PC and Laptop is configured with:

- IP Address

- Subnet Mask

- Default Gateway (Router LAN IP)

. Connectivity Testing (Ping)

Ping Tests Performed

- **10**Supreme Court → PM House

- ECP → NAB

- High Court → National Assembly

11. Observations

- All routers dynamically learned routes via EIGRP

- No static routing was required

- Network converged quickly

- End-to-end communication was successfully achieved

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12. Benefits of This Network

- **Scalable:** Easy to add new departments

- **Reliable:** Dynamic routing adapts automatically

- **Efficient:** Proper subnetting reduces IP wastage

- **Centralized Management:** Core router simplifies control

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13. Conclusion

This lab successfully demonstrates the design and implementation of a practical enterprise-level network using **EIGRP dynamic routing** in Cisco Packet Tracer. All configurations were performed individually, and successful connectivity was verified through ping tests.

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14. Tools Used

- Cisco Packet Tracer

- Cisco IOS Commands