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Simulation of Route Redistribution among RIP, EIGRP & OSPF Routing Protocols

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ABSTRACT

The major role of routing protocol is to find the best route from source to destination. A routing protocol operates by creating a routing table which contains the routes between the source and the destination network. In computing environment routing protocol like RIP, EIGRP and OSPF are generally used to transfer IP packet from source to destination. EIGRP is a Cisco Proprietary protocol that runs only Cisco router and OSPF is non Cisco Proprietary protocol. Hence the communication between different networks where different routing protocols are employed is not possible. The concentration of this research paper lies in depicting the route distribution among the protocols. In today's era route distribution has become an integral part when it comes to designing of routes. Redistribution helps in advertising route of one routing protocol in another.

Keywords: EIGRP, OSPF, RIP, Redistribution, ASBR, Routing Protocols.

1. INTRODUCTION

Routing is the process of sending a packet of information from one network to another network. Thus, routes are usually based on the destination network, and not the destination host. Router works at network layer of the OSI model and is used to route IP packets to destination networks using any of static, default or dynamic routing techniques. Routing protocols are used and added to recognize the best path to each network. The fundamental advantage of using dynamic routing protocol is that whenever there is topology change routers exchange routing information which permits routers to certainly learn about new networks as well as to find alternate paths if there is a link failure to a running network. Less administrative overhead is required in dynamic routing protocols.

2. CLASSIFICATION

Routing is classified broadly into two types to create a routing table.

2.1 STATIC ROUTING*:* A static routing table is created, maintained, and updated by a network administrator, manually. A static route to every network must be configured on every router to ensure full connectivity. Routers will not share static routes with each other, thus reducing CPU/RAM overhead and saving bandwidth. Static routes have an Administrative Distance (AD) of 1, and thus are always preferred over dynamic routes, unless the default AD is changed.

2.2 DYNAMIC ROUTING: A dynamic routing table is created, maintained, and updated by a routing protocol running on the router. Examples of routing protocols include RIP (Routing Information Protocol), EIGRP (Enhanced Interior Gateway Routing Protocol), and OSPF (Open Shortest Path First). Routers do share dynamic routing information with each other, which increases CPU, RAM, and bandwidth usage. However, routing protocols are capable of dynamically choosing a different (or better) path when there is a change to the routing infrastructure. The advantage of using this routing is ability to load balance between multiple links.

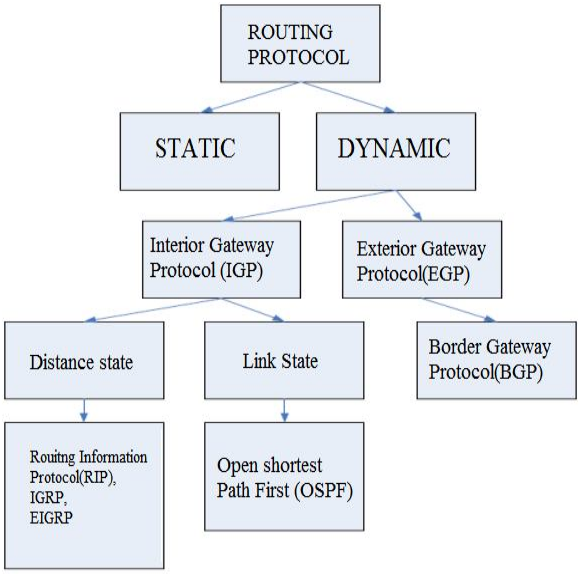

Figure 1 Classification of Routing Protocols

If multiple routing protocols are running on the router, Administrative Distance is used to determine which routing protocol to select the route. The Administrative Distance of OSPF is 110. AD for RIP is 120. For internal & external EIGRP Administrative Distance is 90 & 170 respectively. RIP routes contain the following field: [120/1]. Here 120 is the AD, and the 1 is the hop-count metric.

3 .TOPOLOGY CONSIDERED FOR REDISTRIBUTION

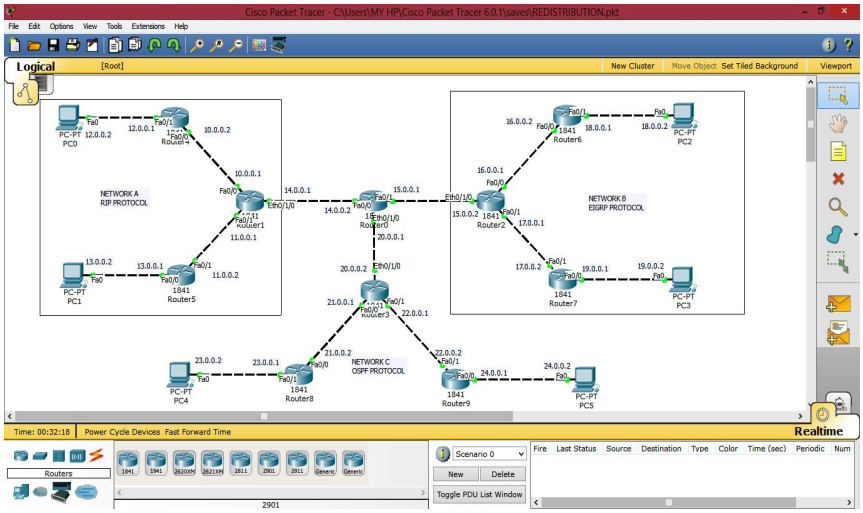

Figure 2 Topology for Redistribution

We will use a total of nine routers and six pc's to create network along with connecting wires. A total of three networks will be created. The network A consists of Router1, Router4, Router5 along with two pc's with network address of class A performing RIP routing protocol. The network B consists of Router2, Router6, Router7 along with two pc's with network address of class A performing EIGRP routing protocol. The network C consists of Router3, Router8, Router9 along with two pc's with network address of class A performing OSPF routing protocol. End users can communicate with each other within a network but the end users of two different networks can't transmit the data among them. For successful communication between end users of different network, running different networking protocols, route redistribution is used among router 0, router 1, router 2, and router 3.

4 METHOD OF CONFIGURING ROUTERS FOR THE CONSIDERED TOPOLOGY

After constructing the network and making connections as described in the above figure, ip addresses will be assigned to the pc's (end devices). After assigning ip addresses to pc's routers for each network will configured. The process is as follows:

4.1 NETWORK A SIMULATION

A. Router 1 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 11.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int eth 0/1/0
Router(config-if)#ip address 14.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet0/1/0, changed state to up
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 11.0.0.0
Router(config-router)#network 14.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
```

B. Router 5 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 13.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```

```
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 11.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 11.0.0.0
Router(config-router)#network 13.0.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
```

C. Router 4 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 12.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 12.0.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
```

4.2 NETWORK B SIMULATION

A.Router 2 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 16.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 17.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int eth 0/1/0
Router(config-if)#ip address 15.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet0/1/0, changed state to up
Router(config-if)#exit
Router(config)#router eigrp 1
Router(config-router)#network 15.0.0.0
Router(config-router)#network 16.0.0.0
Router(config-router)#network 17.0.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
```

B.Router 6 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 16.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 18.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router eigrp 1
Router(config-router)#network 16.0.0.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 16.0.0.1 (FastEthernet0/0) is up: new adjacency
Router(config-router)#network 18.0.0.0
Router(config-router)#^Z
Router#
```

%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]

C.Router 7 Configuration:
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 19.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 17.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router eigrp 1
Router(config-router)#network 17.0.0.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 17.0.0.1 (FastEthernet0/1) is up: new adjacency
Router(config-router)#network 19.0.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]

4.3 NETWORK C SIMULATION

A.Router 3 Configuration:
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 21.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 22.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

```
Router(config-if)#exit
Router(config)#int eth 0/1/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet0/1/0, changed state to up
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#network 21.0.0.0 0.255.255.255 area 1
Router(config-router)#network 22.0.0.0 0.255.255.255 area 1
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
```

B.Router 8 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 21.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 23.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router ospf 2
Router(config-router)#network 21.0.0.0 0.255.255.255 area 1
Router(config-router)#network 23.0.0.0 0.255.255.255 area 1
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
00:12:15: %OSPF-5-ADJCHG: Process 2, Nbr 22.0.0.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
Building configuration...
[OK]
Router#write
Building configuration...
[OK]
```

C.Router 9 Configuration:

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 24.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 22.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#router ospf 3
Router(config-router)#network 22.0.0.0 0.255.255.255 area 1
Router(config-router)#network 24.0.0.0 0.255.255.255 area 1
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
Router#
00:19:23: %OSPF-5-ADJCHG: Process 3, Nbr 22.0.0.1 on FastEthernet0/1 from LOADING to FULL, Loading Done

5.OPTIMIZATION OF ROUTE USING ROUTE REDISTRIBUTION

For simplicity and ease of management a single routing protocol is employed in an internetwork environment. Redistribution is the adaptation of a routing protocol to announce routes that are accomplished by some other means, for instance by another routing protocol, static routes, or directly connected routes. Running one routing protocol throughout your entire IP internetwork is desirable, multi-protocol routing is common for variety of reasons, such as company mergers, multiple departments managed by multiple network administrators and multi-vendor environments. Redistribution is required for the environment of having multiple protocols. Through the router redistribution routes from one routing protocol will be revealed into another routing protocol. Received redistributed routes are marked as external in the routing protocol. Logically-originated routes are usually more preferred than external routes. Route redistribution can be one-way (that is, one protocol receives the routes from another) or two-way (that is, both protocols receive routes from each other). Routers that perform redistribution are called boundary routers.

5.1 Router 0 Configuration

--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 14.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 15.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int eth 0/1/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1/0, changed state to up
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 14.0.0.0
Router(config-router)#exit
Router(config)#router eigrp 1
Router(config-router)#network 15.0.0.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 15.0.0.2 (FastEthernet0/1) is up: new adjacency
Router(config-router)#exit
Router(config)#router ospf 1
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#write
Building configuration...
[OK]
Router#
00:28:28: %OSPF-5-ADJCHG: Process 1, Nbr 22.0.0.1 on Ethernet0/1/0 from LOADING to FULL, Loading Done

A.Redistributing In RIP

RIP is redistributed in OSPF and EIGRP using following commands:
router rip
redistribute eigrp 1 metric 2
redistribute ospf 1 metric 2

The RIP metric is composed of hop count, and the maximum valid metric for RIPv2 is 15. Metric of 2 is defined. It is necessary that the metric is neither too high, restraining it from being advertised to all the routers, or too low, guiding to routing loops when multiple redistribution points are presented.

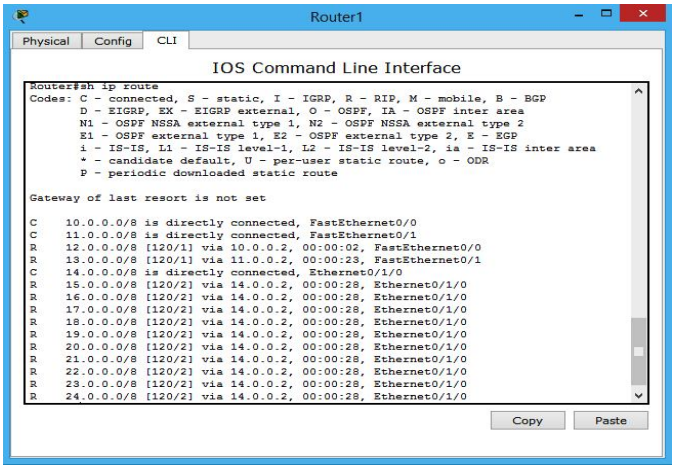

Figure 3 Route Redistribution of RIP in EIGRP & OSPF Networks

The value [120/2] shows that RIP routes are successfully distributed in EIGRP & OSPF as AD of RIP is 120 and we have given metric 2.

B.Redistributing In EIGRP

EIGRP is redistributed in RIP and OSPF using following commands:

router eigrp 1
redistribute rip metric 1 1 1 1 1
redistribute ospf 1 metric 1 1 1 1 1

EIGRP is a hybrid routing protocol that, by default, uses a composite of bandwidth and delay as its distance metric in addition to reliability, load and MTU.

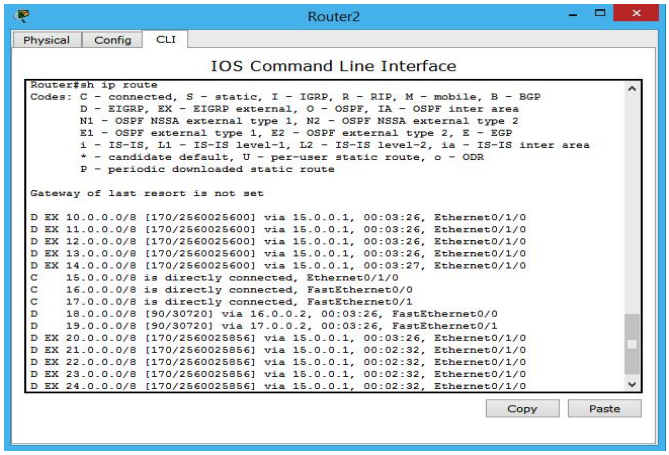

Figure 4 Route Redistribution of EIGRP in RIP & OSPF Networks

AD of External EIGRP is 170. EX shows that external EIGRP routes are redistributed in RIP and OSPF networks.

C.Redistributing In OSPF

OSPF is redistributed in RIP and EIGRP using following commands:

router ospf 1
redistribute rip subnets
redistribute eigrp subnets

OSPF is a standardized Link-State routing protocol that uses cost, based on bandwidth, as its link-state metric. The OSPF metric is a cost value based on 108 / bandwidth of the link in bits/sec. If a metric is not specified, OSPF puts a default value of 20 when redistributing routes from all protocols.

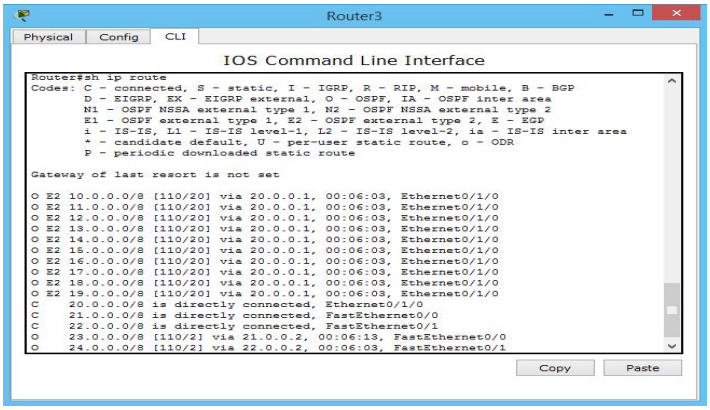

Figure 5 Route Redistribution of OSPF in RIP & EIGRP Networks

AD of OSPF is 110. E2 shows that External OSPF routes are redistributed in RIP and EIGRP.

6. CONCLUSION

Performance analysis of various interior gateway dynamic routing protocols which are vendor proprietary (RIP, EIGRP) and non-vendor proprietary (OSPF) when routing between them is provided. Route Redistribution technology between diverse routing protocols has significant importance. Through using it we can also settle Tactical Internet Communication. So Route redistribution has become an integral part of IP network design. Route redistribution provide important role to redistributed one route to another network. OSPF is better than other in large networks where its hierarchical nature increases scalability. And RIPv2 is useful in local and small area network.

REFERENCES

[1] Rick Graziani , Allan Jonson, "Routing protocols and concepts: CCNA exploration companion guide" Pearson Education. London,2008.

[2] S. G. Thorenoor, "Dynamic routing protocol implementation decision between EIGRP, OSPF and RIP based on technical background using OPNET Modeller," Proceedings of Second International Conference on Computer and Network Technology, China, pp. 191-195,2010.

[3] Z. Z Wei, F. Wang, " Achieving Resilient Routing through Redistributing Routing Protocols", Communications (ICC), IEEE International Conference, pp 1-5, 2011.

[4] Ittiphon Krinpayorm , Suwat Pattaramalai," Link Recovery Comparison Between OSPF & EIGRP", International Proceedings of Computer Science & Information Technology, Vol. 27,pp.192-197, 2012.

[5] Jagdeep Singh, Dr. Rajiv Mahajan, "Simulation Based Comparative Study of RIP, OSPF and EIGRP" International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 8, August 2013.

[6] Shalley Bakshi, Ms. Suman, "Opnet Based simulation for route redistribution in EIGRP, BGP and OSPF network protocols" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), ISSN: 2278-8735. Volume 9, Issue 1, (Jan. 2014), pp.47-52

[7] Navita Komal, Rajan Vohra and Ravinder Singh Sawhney, "Behavioral Analysis of Dynamic Routing Protocols under Incrementing Workstations" Int. J. on Recent Trends in Engineering and Technology, Vol. 11, No. 1, July 2014.

[8] Jaswinder Kumar, Samiksha, Amandeep Kaur, Harsukhpreet Singh "Performance Analysis of RIPv2 protocol in Wired Network Using Cisco Packet Tracer" International Journal of Computer Applications, ISSN 2229-6093 Vol 6 (1),1-6 Jan-Feb 2015.

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