Distribution of Dynamic Routing Protocols (Is-Is, EIGRP, OSPF) in IPv6 Network and Their Performance Analysis

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***Abstract* – In a network topology, it's very usual to use different kinds of routing protocol for forwarding packets. A routing table is employed within the in the memory of a router that keeps the track of routes to particular network destination and the most popular routing algorithms used to forward packets are Intermediate system-Intermediate system (IS-IS), Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF). The ultimatum of this research work is to depict the performance analysis comparison of those three dynamic routing protocols and redistribution among the protocols. 3 Personal computer, Nine Cisco c7200 routers and Four switch are employed in our simulated network topology where three sets of routers with different protocols directly connected with the switch take the responsibility for the redistribution algorithm.The performance of the three different protocols are analyzed using parameters like latency , throughput and packet loss.**

Keywords- RIPv2, EIGRP, OSPF, redistribution, dynamic routing protocols etc.

I. INTRODUCTION

It is always possible to exchange the routing information between routers through the routing protocols. Routing protocols allows routers to share information about networks that are dynamical and adds information to their respective routing tables automatically.

To identify the simplest path to every networks, routing protocols are used and are then added to the routing table. The rudimentary advantage of using dynamic routing protocol is that whenever there's a change in topology , routers exchange routing information which allows routers to greatly study about new networks and also find alternate paths if there's a link- failure to a running network.

In comparison with static routing, less administrative overhead is required in dynamic routing protocols. However, the expense of using dynamic routing protocols is dedicating a part of router's resources for protocol operation including CPU time and network link bandwidth. Besides, to satisfy the stress of adjusting network requirements dynamic routing protocols have evolved over several years. Though several organizations have shifted towards newer routing protocols like Enhanced Interior Gateway Routing Protocol (EIGRP),Intermediate system-Intermediate system (IS-IS) and Open Shortest Path First (OSPF), many of the earlier routing protocols, such as Routing Information Protocol (RIP), are still in use today.

Since the fist 1980s dynamic routing protocols have been used. Sheela Ganesh Thorenoor [1] used OPNET modeler for dynamic routing protocol implementation decision between EIGRP, OSPF and RIP. Multipath routing supported OSPF routing protocol [2] are developed. Alex Hinds [3] did the evaluation for (OSPFv3) and (EIGRPv6) and compare the changes these protocols have undergone to support IPv6. Reference [4] worked on link recovery comparison between OSPF and EIGRP. Besides Is-Is routing protocol discussed by Li Xiaohua [5], which might effectively prevent the router from receiving unauthorized or malicious routing updates, thereby improving network safety. Several investigation and research works also are conducting now-a-days by laureate researchers.

In our research work we are going to investigate comparative performance analysis of selected interior gateway dynamic routing protocols like IS-IS, EIGRP and OSPF. Gns3 simulation software is used here to show how to transmit data among different networks running different routing protocols by using route redistribution systems. Each of those dynamic routing protocols has different strengths and weaknesses- one protocol may have fast convergence, while another could also be very reliable. General dynamic routing has better scalability, robustness, and convergence. However, the price of those added benefits include more complexity and some overhead -bandwidth that's employed by used by the routing protocol for its own administration and route redistribution allows routes from one routing protocol to be advertised into another routing protocol.

II. REDISTRIBUTION OF DYNAMIC ROUTING PROTCOLS

Even from the moment of the creation of the first computers, the need of their inter-linkage became a major interest in order to share the outputs obtained after the execution of various tasks they were originally programmed for. As the time passed by, some of the manufacturers began to develop their own systems of interlining for their computers. Afterwards, even though the necessity of Inter-linkage became a major issue among the users, this matter was still unable to be solved due to the diverse protocols that were used in order to intercommunicate in various geographical areas. Internet Protocol (IP) is the best-known Layer 3 or Network layer protocol. Presently two versions of IP are assigned by Internet Assigned Number Authority (IANA).

The designers of IPv4 did not envision the explosive growth of its use. 4.3 billion Addresses seemed more than enough. The IPv4 protocol is not particularly efficient in its use of the available space, with many addresses being wasted. The internet authorities started to predict address exhaustion in the late 1980s and IPv6 was developed in the 1990s as the long-term solution. It is possible to exchange the routing information between routers through the routing protocols. Routing protocols allow routers to share information about remote networks dynamically and add this information to their routing tables automatically.

To recognize the best path to each network routing protocols are used and added to the routing table. 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. In comparison with static routing, less administrative overhead is required in dynamic routing protocols. However, the expense of using dynamic routing protocols is dedicating part of a router's resources for protocol operation including CPU time and network link bandwidth. Besides, to meet the demands of changing network requirements dynamic routing

Protocols have evolved over several years. Though several organizations have shifted towards more recent routing protocols such as Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF), many of the earlier routing protocols, such as Routing Information Protocol (RIP), are still in use today.

III. DYNAMIC ROUTING

Routing protocols allow routers to dynamically learn information about remote networks and automatically add this information to their own routing tables. Routing protocols determine the best path to each network, which is then added to the routing table. One of the primary benefits of using a dynamic routing protocol is that routers exchange routing information whenever there is a topology change. This exchange allows routers to automatically learn about new networks and also to find alternate paths if there is a link failure to a current network. Compared to static routing, dynamic routing protocols require less administrative overhead. However, the expense of using dynamic routing protocols is dedicating part of a router's resources for protocol operation, including CPU time and network link bandwidth.

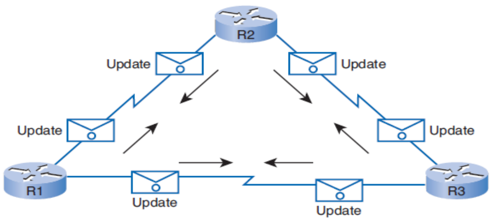

Fig. 1 Dynamic routing

The most commonly used routing protocols are as follows:
A.RIP: Routing Information Protocol.
B.EIGRP: Enhanced Interior Gateway Routing Protocol.
C.OSPF: Open Shortest Path First.
D.IS-IS: Intermediate System to Intermediate System

IV. REDISTRIBUTION

The adaptation of a routing protocol to announce routes that are accomplished by another means, As an example by another routing protocol, static routes, or directly connected routes, is termed redistribution [5]. Multi-protocol routing is common for a number of reasons, like company mergers, multiple departments managed by different network administrators and multi-vendor environments though running one routing protocol throughout your entire IP internet work is desirable. Running multiple routing protocols is often part of a network design. Redistribution is required for the environment of having multiple protocols.Through the router redistribution [12], routes from one unique routing protocol are revealed into another routing protocol. Received redistributed routes are marked as external within the routing protocol. Logically-originated routes are usually more preferred than external routes.

V.INTERMEDIATE-SYSTEM TO INTERMEDIATE SYSTEM (IS-IS)

IS-IS stands for Intermediate - System to Intermediate - System which uses link-state routing algorithm for high speed data transmission. The protocol was defined in ISO/IEC 10589:2002 as an international standard within the Open Systems Interconnection (OSI) reference design.

VI.OPEN SHORTEST PATH FIRST

Open Shortest Path First (OSPF) is a link-state routing protocol which is used to find the best path between the source and the destination router using its own Shortest Path First). OSPF is developed by Internet Engineering Task Force (IETF) as one of the Interior Gateway Protocol (IGP), i.e., the protocol which aims at moving the packet within a large autonomous system or routing domain. It is a network layer protocol which works on the protocol number 89 and uses AD value 110. OSPF uses multicast address 224.0.0.5 for normal communication and 224.0.0.6 for update to designated router (DR)/Backup Designated Router (BDR).

VII.ENHANCED INTERIOR GATEWAY PROTOCOL

Dynamic routing Protocol performs the same function as static routing Protocol does. In dynamic routing Protocol, if the destination is unreachable then an entry, in the routing table, to the same destination can be used. One of the routing Protocols is EIGRP.Enhanced Interior Gateway Routing Protocol (EIGRP) is a dynamic routing Protocol which is used to find the best path between any two layers 3 device to deliver the packet. EIGRP works on network layer Protocol of OSI model and uses the protocol number 88.It uses metric to find out best path between two layer 3 device (router or layer 3 switch) operating EIGRP.

VIII. EXISTING SYSTEM

Network plays a vital role that helps to share information and resources and implement centralized management system. To enable the network features, all organizations and ISPs have design and implemented IPv4 network to share their voice/data/video applications. IP is internet protocol and works on third layer of OSI model and forward packet from one node to another. IPv4 enables encapsulation and add more information that helps for efficient transmission of data.IPv4 address is 32bit addresss and have maximum of 2^32combination address

IPv4 address configured in devices either manually or automatically (DHCP).Used subnetting, VLSM and supernetting,concepts to increase, Network performance. IP enables encapsulation and add information for error control and fragmentation that support to transport the data error free. Router has memory and stores routing more information due to expansion of network. NAT is used to better utilization of IPv4 address. Used ACL, firewall and check point to ensure the security for data in IPV4 network.IPv4 network supports mobility butt generates O/H information.IPv4 network supports dynamic routing by enabling Protocol such as RIP, OSPF, and IS-IS.

IX. PROPOSED SYSTEM

Routers within one routing instance typically run the same routing protocol to fully share reachability information and by default do not exchange routing information with routers in other routing instances. For instance, Routers in the RIP instance do not have visibility of the addresses and subnet prefixes in the OSPF instance and vice versa. Similarly, Routers in the EIGRP instance do not have visibility of the addresses and subnet prefixes in the IGRP instance and vice versa. To allow the exchange of routing information between different routing instances, we use a concept called as Route redistribution.

Route Redistribution has become an integral part of IP network design. A router that runs multiple routing protocols actually instantiates a separate routing process for each protocol. Each instantiated routing process has its own Routing Information Base (RIB) to store routing information. And the router does not by default redistribute routes among these processes. We have explicitly configure the system according to the scope and measured the overall performance of the system. Parameters that will describe good functioning of a system like Latency, Throughput, Packet loss and Convergence time are measured.

X. SYSTEM ARCHITECTURE OF INTERCONNECTING ROUTING INSTANCES

The systems architecture is the conceptual model that defines the structure, behaviour, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system. The architecture of this approach shows system components, the externally visible properties of those components, the relationships (behaviour) between them. It can provide a plan from which products can be procured, and systems developed, that will work together to implement the overall system.

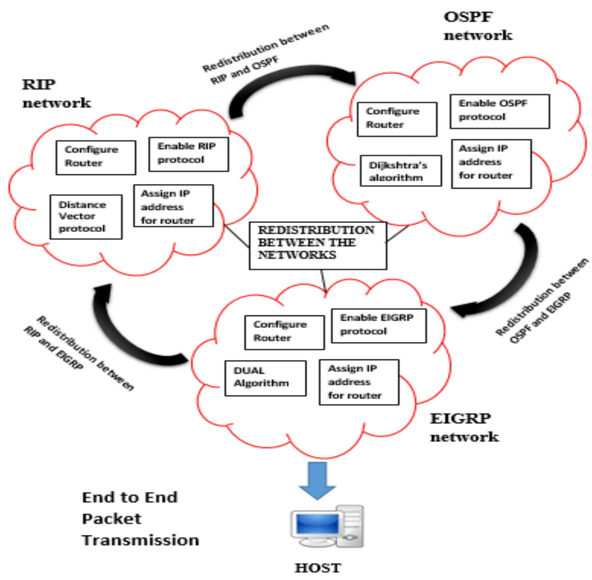

Fig. 2 System Architecture of interconnecting routing instances

XI. INTRODUCTION TO GNS3 (GRAPHICAL NETWORK SIMULATOR)

GNS3 is a Graphical Network Simulator that allows emulation of complex networks. We may be familiar with VM ware or Virtual PC that are used to emulate various operating systems in a virtual environment. These programs allow the user to run operating systems such as Windows XP Professional or Ubuntu Linux in a virtual environment on our computer. GNS3 allows the same type of Emulation using Cisco Internetwork Operating Systems. It allows us to run a Cisco IOS in a virtual environment on our computer. GNS3 is a graphical front end to a product called Dynagen. Dynamips is the Core program that allows IOS emulation. Dynagen runs on top of Dynamips to create a more user friendly, text-based environment. A user may create network topologies using simple Windows in-type files with dynagen running on top of Dynamips. GNS3 takes this a step further by providing a graphical environment.

To allow complete simulations, GNS3 is strongly linked with:

1. Dynamips, the core program that allows Cisco IOS emulation.
2. Dynagen, a text-based front-end for Dynamips.
3. Qemu,a generic and open source machine emulator and virtualizes.

GNS3 allows the emulation of Cisco on our Windows or Linux based Computer. Emulation is possible for a long list of router platforms and PIX Firewalls. GNS3 is an invaluable tool for preparing for Cisco certifications such as CCNA and CCNP. There are a number of router simulators on the market, but they are limited to the commands that the developer chooses to include. Almost always there are commands or parameters that are not supported when working on a practice

In these simulators we are only seeing are presentation of the output of a simulated router. The accuracy of that representation is only as good as the developer makes it. However, due to licensing restrictions, we will have provided our own C is coiostouse with GNS3.

Also, GNS3 will provide around 1,000 packets per second throughput in a virtual environment. A normal router will provide a hundred to thousand times' greater throughput. GNS3 does not take the place of area router, but is mean to tool for learning and test in lab environment. Using GNS3 in any other way would be consider proper. GNS3 was developed primarily by Jeremy Grossmann. Additional developers involved in creating GNS3 are David Ruiz, Romain Lamaison, Aurelian Levesque, and Xavier Alt. Dynamips was developed by Christophe Fillot. Dynagen' sprimary developer was Greg Anuzelli. There are a lot of other people that have assisted various ways in the development of these products.

Features of GNS3

1. Design of high quality and complex network topologies.
2. Emulation of many Cisco IOS router platforms, IPS, PIX and ASA firewalls.
3. Simulation of simple Ethernet and Frame Relay switches.
4. Connection of the simulated network to the real world.
5. Simulated switches: daisy chaining support.
6. Dialog to display an Ethernet switch MAC address table.
7. Improved directory selection for new projects.
8. Frame Relay capture option for all serial links.
9. New translations: Bulgarian, Italian and Ukrainian.

XII. SIMULATION WORK

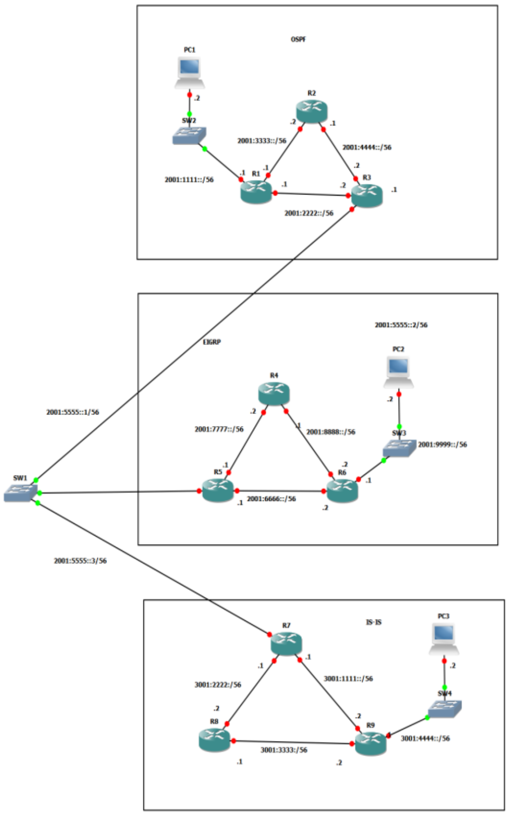

Fig.3 Simulated topology

In our simulated work we have used total nine routers where router 1, router 3, router 5, router 6,router 7,router 9 were directly connected with a switch.The network A consists of router 1, router 2, router 3 with network address 2001:1111::/56 , 2001:3333::/56 , 2001:4444::/56 performing OSPF routing protocol in IPv6 network. Network B consisting of router4 ,router 5, router 6 with network address 2001:7777::/56 , 2001:8888::/56 , 2001:6666::/56 performing EIGRP protocol in IPv6 network . Network C containing routers 7 , router 8 ,router 9 with network address 3001:1111::/56 ,3001:3333::/56 , 3001:2222::/56 performing IS-IS routing protocol where Within each individual network every end user can communicate with one another an end users of two different networks can transmit data among them. As for example- PC1 of network A can ping PC2 and PC3 of other networks and the other way around Now for successful communication between end users of different networks, running different networking protocol , route redistribution is employed among router 3, router 5, router7 .

A. Redistributing into IS-IS to EIGRP

IS-IS stands for Intermediate - System to Intermediate - System which uses link-state routing algorithm for increased speed data transmission.Following command shows how a IS-IS router 7 in figure3 redistributing EIGRP and IS-IS.

```
config t
router isis
net 49.0123.0000.0000.0006.00
address-family ipv6
redistribute eigrp 1 metric 1 include-connected
exit address-family
ipv6 router eigrp 1
eigrp router-id 7.7.7.7
redistribute isis 123 level-1-2 metric 1 1 1 1 1 include-connected
exit
exit
Wr
```

The protocol was defined in ISO/IEC 10589:2002 as a global standard within the Open Systems Interconnection (OSI) reference design . By defining a metric of 1, we are able to enable a route to travel the highest number of hops within the domain of a IS-IS.Though doing this raise the chances of routing loops if there are several redistribution points and a router acquire knowledge about the network with a preferable metric from the redistribution point than from the original source.

B. Redistributing into OSPF to EIGRP

EIGRP is a hybrid routing protocol that, by default, uses a composite of bandwidth and delay as its distance metric. EIGRP can additionally consider Reliability, Load, and MTU for its metric. An OSPF router3 in the figure-3 redistributing Open Shortest Path First (OSPF) and Enhanced interior gateway protocol EIGRP through the commands

```
config t
ipv6 router ospf 100
redistribute eigrp 1 include-connected
exit
ipv6 router eigrp 1
redistribute ospf 100 include-connected
default-metric 1000000 1 255 1 1500
exit
ipv6 router ospf 100
router-id 3.3.3.3
```

redistribute eigrp 1
exit
exit
wr

OSPF is a standardized Link-State routing protocol that uses cost ,based on bandwidth, as its link-state metric. To show an OSPF router 3 in the figure-3 redistributing RIP [13] and EIGRP we need - router OSPF 1 network 1000000 1 255 1 1500 area 0 redistribute rip metric 200 subnet redistribute EIGRP 1 metric 100 subnet .The OSPF metric is a cost value based on 108/ bandwidth of the link in bits/sec. For example, the OSPF cost of Ethernet is 10: 108 11 07 = 10. If a metric is not specified, OSPF puts a default value of 20 when redistributing routes from all protocols except Border Gateway Protocol (BGP) routes, which get a metric of 1.

XIII. PERFORMANCE ANALYSIS

The performance of the network as a whole is measured by analyzing the following parameters:

A . Latency

Latency is calculated using the following formula:

$$\text{Latency} = \frac{\text{Round Trip Time}}{2}$$

B . Round-trip time

Round-trip time is also called round-trip delay, is the time required for a signal pulse or packet to travel from a specific source to a specific destination and back again.

C . Throughput

Throughput is calculated using the following formula:

$$\text{Throughput} = \frac{\text{Latency}}{\text{Packet size}}$$

Throughput is the amount of data moved successfully from one place to another in a given time period, and typically measured in bits per second (bps), as in megabits per second (Mbps) or gigabits per second (Gbps).

D . Packet Loss

Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is typically caused by network congestion. Packet loss is measured as a percentage of packets lost with respect to packets sent.

E . Convergence time

Convergence is the state of a set of routers that have the same topological information about the internet work in which they operate.Convergence time is measure of how fast a group of routers reach the state of convergence. It is one of the main design goals and an important performance indicator for routing protocols to implement a mechanism that allows all routers running this protocol to quickly and reliably converge.

Module 1: Creation of network

The entire ipv6 network is created using three protocols. This module includes assigning IP address and enabling the protocols in the interfaces for particular routers.

IS-IS

IS-IS protocol is enabled in the network A with router7, router8,router 9which is connected to switch 1 in ipv6 network. Thus IS-IS is enabled in the network A.

```
R7#enable
R7#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)#router isis area2
R7(config-router)#net 49.0001.0000.0000.0006.00
R7(config-router)#exit
R7(config)#int f0/0
R7(config-if)#ipv6 add 2001:1111::1/56
R7(config-if)#exit
R7(config)#int f0/0
R7(config-if)#ipv6 add 2001:5555::3/56
R7(config-if)#ipv6 router isis area 2
```

Fig.4 Enabling IS-IS protocol

OSPF

OSPF protocol is enabled in the network A with router1, router2,router 3which is connected to switch 1 in ipv6 network. Thus OSPF is enabled in the network A.OSPF detects changes in the topology, such as link failures, very quickly and converges on a new loop-free routing structure within seconds.The topology determines the routing table presented to the Internet Layer which makes routing decisions based solely on the destination IP address found in IP packets.The OSPF routing policies to construct a route table are governed by link cost factors (external metrics) associated with each routing interface.

```
R10#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R10(config)#ipv6 unicast-routing
R10(config)#ipv6 router ospf 100
R10(config-rtr)#router-id 10.10.10.10
R10(config-rtr)#exit
R10(config)#int f1/0
R10(config-if)#ipv6 ospf 100 area 0
R10(config-if)#exit
R10(config)#
*Mar 26 16:01:09.023: %OSPFv3-5-ADJCHG: Process 100, Nbr 9.9.9.9 on FastEthernet1/0
R10(config)#exit
R10#
*Mar 26 16:01:12.555: %SYS-5-CONFIG_I: Configured from console by console
R10#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
```

Fig.5 Enabling OSPF protocol

EIGRP

EIGRP protocol is enabled in the network A with router4, router5,router6 which is connected to switch 1 in ipv6 network. Thus EIGRP is enabled in the network A.

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 unicast-routing
R2(config)#int f0/0
R2(config-if)#ipv6 enable
R2(config-if)#ipv6 eigrp 1
R2(config-if)#ipv6 router eigrp 1
R2(config-rtr)#router-id 2.2.2.2
R2(config-rtr)#exit
R2(config)#exit
R2#wr
Building configuration...
*Mar 26 19:13:45.663: %SYS-5-CONFIG_I: Configured from console by console
[OK]
```

Fig.6 Enabling EIGRP protocol

Module 2: Redistribution between IS-IS and EIGRP

This module is associated with establishing connection between two different protocols, IS-IS and OSPF.

```
R7#ping ipv6
Target IPv6 address: 2001:5555::1
Repeat count [5]:
Datagram size [100]: 400
Timeout in seconds [2]:
Extended commands? [no]:
Sweep range of sizes? [no]:
Type escape sequence to abort.
Sending 5, 400-byte ICMP Echos to 2001:5555::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/50/144 ms
R7#ping ipv6
Target IPv6 address: 2001:5555::1
Repeat count [5]:
Datagram size [100]: 800
Timeout in seconds [2]:
Extended commands? [no]:
Sweep range of sizes? [no]:
Type escape sequence to abort.
Sending 5, 800-byte ICMP Echos to 2001:5555::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/32/44 ms
R7#ping ipv6
Target IPv6 address: 2001:5555::1
Repeat count [5]:
Datagram size [100]: 1200
Timeout in seconds [2]:
Extended commands? [no]:
Sweep range of sizes? [no]:
Type escape sequence to abort.
Sending 5, 1200-byte ICMP Echos to 2001:5555::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/28/40 ms
```

Fig.7 Packet transmission between IS-IS and EIGRP

Module 3: Redistribution between OSPF and EIGRP

This module is associated with establishing connection between two different protocols, OSPF and EIGRP.Through our survey, we can conclude that this approach in ipv6 network is highly secured and also it has high address space which enables an individual to use approximately 3.6 million IP address

```
R1#ping 2001:1111::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:1111::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/8 ms
R1#ping 2001:3333::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:3333::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 468/716/1596 ms
R1#
```

Fig.8 Packet transmission between OSPF and EIGRP

Module 4: Redistribution between IS-IS and OSPF

This module is associated with establishing connection between two different protocols, EIGRP and OSPF.

```
R3#ping 2001:2222::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:2222::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/8 ms
R3#ping 2001:3333::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:3333::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 420/489/564 ms
R3#
```

Fig.9 Packet transmission between IS-IS and EIGRP.

Module 5: Performance Evaluation

The performance of the network as a whole is measured by analyzing certain parameters.By giving the packet size of the data in the datagram size command we can find the average RTT by which latency is calculated and the performance of the system is analysed. This performance evaluation is common for all the networks.A hop count of 'n' means that n gateways separate the source host from the destination host. By itself, this metric is, however, not useful for determining the optimum network path, as it does not take into consideration the speed, load, reliability, or latency of any particular hop, but merely the total count routing protocols.

```
router isis
 net 49.0001.0000.0000.0006.00
 !
 address-family ipv6
  redistribute eigrp 1 metric 1 include-connected
 exit-address-family
!
router isis area2
 net 49.0001.0000.0000.0006.00
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
!
ipv6 router eigrp 1
 eigrp router-id 7.7.7.7
 redistribute isis level-1-2 metric 1 1 1 1 1 include-connected
!
!
```

Fig.10 Packet transfer with varying packet size and datagram size (IS-IS)

XIV. RESULT AND DISCUSSION

A . Latency and Throughput in OSPF to EIGRP

As shown in fig 3 it illustrates that the network convergence time in EIGRP is faster than OSPF networks, because EIGRP network can learn the topology information and update it more rapidly. As a result, data packets in EIGRP network reach faster to the destination compared to OSPF network. The packet loss in the EIGRP network is less than that of found in OSPF network. In addition, the simulation results have shown that the throughput of EIGRP network is higher than that of OSPF network due to high congestion in the link.Round-trip time (RTT), also called round-trip delay, is the time required for a signal pulse or packet to travel from a specific source to a specific destination and back again.

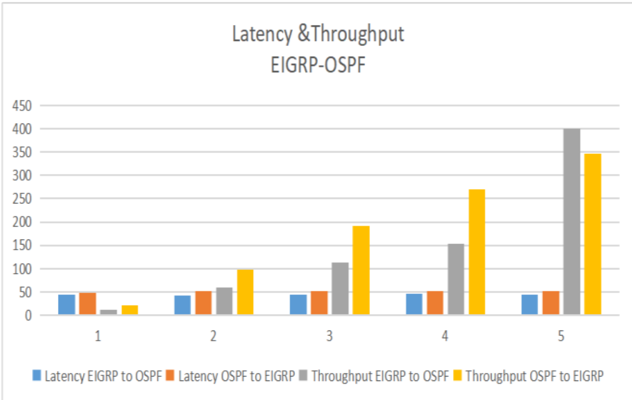

Fig .11 Latency and throughput in EIGRP -OSPF

B . Latency and throughput in OSPF to ISIS

As fig 4 illustrates latency for OSPF to ISIS is much higher , it is clear that the performance is good when the data are transferred from ISIS to OSPF. And also throughput required is found to be high, which shows that the data transfer is maximum. The data transferred from ISIS to OSPF has a reduced packet losses. Overall performance of ISIS is much better than the OSPF. In ISIS all the routing information can be remotely to be transmitted using TLVs (type,length,value), ensuring simple structure and providing easy scalability. Additionally ISIS also supports protocols such as IPX. OSPF is developed to support IP and provides two independent versions OSPFv2 and OSPFv3 to support IPv4 and IPv6.

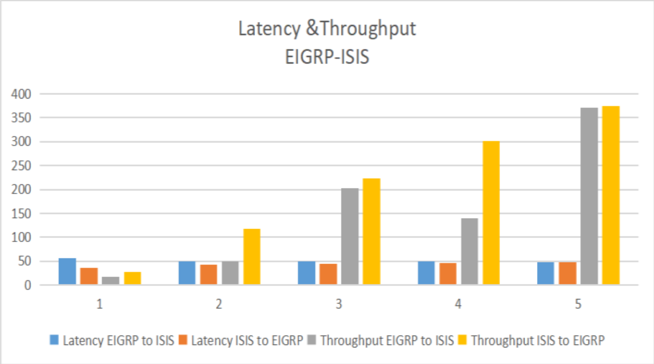

Fig .12 Latency and throughput in OSPF – ISIS

C. Latency and throughput in EIGRP to ISIS

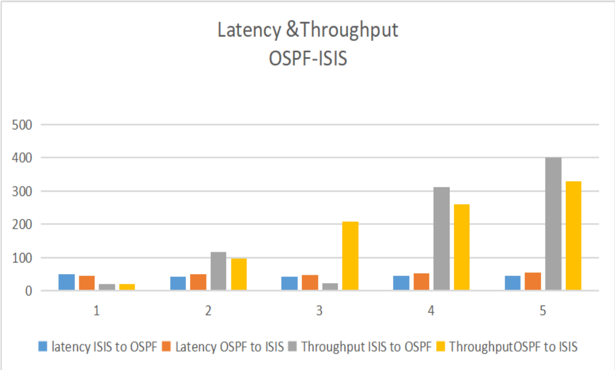

Fig 5 . Latency and Throughput in EIGRP - ISIS

As shown in the figure 5 it is illustrated that the latency for EIGRP to ISIS is much higher,on contrary the latency for ISIS to EIGRP is lower, since the latency is time delay we require a minimum value, thus the performance is good when the data are transferred from ISIS to EIGRP. And also the throughput required is high for ISIS to EIGRP, which shows that the data transfer is high, Overall performance of ISIS is much better than the EIGRP since packet lost are low , latency in minimum and throughput is maximum.

XV. CONCLUSION

Performance analysis of selected interior gateway dynamic routing protocols such as IS-IS, EIGRP and OSPF and their different performance issues have been investigated in this article. We have also presented a simulated work and the performance of redistribution command to establish communication between end users of different networks with different routing protocol. Route redistribution technology between diverse routing protocols has significant importance. Route redistribution is certainly easily realized and cost effective technique. Through using it we can also settle Tactical Internet Communication. Besides, comparative analysis among several routing protocol shows that the IS-IS protocol is better than the OSPF and EIGRP routing protocol. But sometime EIGRP is held back by its proprietary features and costs. OSPF is better than other in large networks where its hierarchical nature increases scalability. And IS-IS is useful in both large and local small area network. The redistribution command shows the way to communicate with different routing protocols.

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