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Performance Analysis of Distance Vector and Link State Routing Protocols

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ABSTRACT

This paper explains the distance vector and link state routing protocols used for internal routing purposes in enterprise or service provider networks. Link state and Distance Vector protocols uses different algorithms. These paper includes the differences between various link state and distance vector routing protocols. This paper compares the performance of all the distance vector and link state routing protocols with both IPv4 and IPv6 with default parameters.
Keywords:- OSPF, IS-IS, EIGRP, RIP, IP Routing, Link State Routing Protocols, Distance Vector Routing Protocols, SPF, DUAL

I. INTRODUCTION

When we send a packet from source to destination which are on different networks, that process is known as routing. Routers and Layer 3 Switches are mainly used for this process. Routing Protocols are configured on routers which choose the path from source to destination based on Metrics. A routing table is created with the help of static routing or dynamic routing protocols which holds the network addresses to which we can reach and also the next-hop address, the device's address through which we can reach destination.

Static vs Dynamic Routing:

Routing in IP Networks can be done in either statically or dynamically:

Static Routing - In Static routing, network engineer creates, maintains and update a routing table statically. A static route to every network is needed to be configured for full connectivity. It has some advantages like it reduces CPU and memory overhead because it does not share static route information with other routers. It provides a total control over Routing, but static routing becomes impractical on large networks, also static routing is not fault-tolerant, it requires network engineer to manually change the route information if some link goes down.

***Dynamic Routing* - In** dynamic routing, routing table is created, maintained, and updated by a routing protocol. A routing protocol selects the path from source to destination dynamically. Routing protocols shares routing information with its neighbor routers. This process is done throughout the network and make every router gain the knowledge of the routes by adding the route information in the routing table. Using Routing protocols increases CPU, memory, and bandwidth usage because of route information sharing between neighbor routers, but the best thing about using a routing protocol is its ability to dynamically choose a better path, if there is any change in the routing infrastructure. Also it can provide load balancing between multiple links.

II. DYNAMIC ROUTING PROTOCOLS

There are two types of dynamic routing protocols in IP based networks:

Interior gateway protocols - IGPs are used for IP routing with an Autonomous System. It is also known as Intra-

AS routing. Enterprises, service providers use IGP in their internal networks. Various IGPs include Routing Information Protocol (RIP), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First(OSPF), and Intermediate System to Intermediate System(IS-IS).

Exterior gateway protocols - EGP is used for routing between autonomous systems. It is also known as Inter-AS routing. Service providers and large enterprises interconnect using EGP. Only protocol that comes under this category is Border Gateway Protocol(BGP). It is also the protocol that makes Internet work or we can say that it is the official protocol of the Internet.

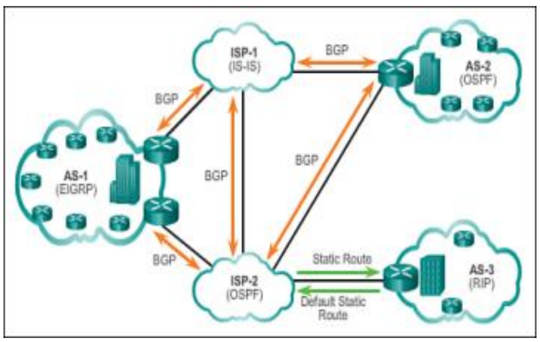

Figure 2.1 IGPs and EGP usage in network industry.

2.1**.)** ***Distance Vector Routing Protocols* -** Based on distance and direction. Distance Vector protocols are limited with number of routers we can use. Protocols under Distance Vector Routing Protocols are -

2.1.1) ***Routing Information Protocol(RIP)* -** It is kind of a traditional routing protocol. It uses UDP port 520 as source and destination port while sending updates to the adjacent device, RIP also has three versions - RIPv1 is first version of RIP, which uses broadcast to send messages, classful and does lack features like authentication. RIPv1 is obsolete in current netwoeks. RIP v2 is the current version used for IPv4 networks. It uses multicast address 224.0.0.9 to send messages. It also has feature like classless support, route-tags, authentication etc. RIPng is the third version of RIP. It is used for IPv6 networks. It uses multicast address FF02::9 and also preserve all the features of RIPv2. RIP sends periodic updates as well as triggered updates. Maximum routers that a packet can travel over RIP is 15 , while 16 is termed as unreachable.

2.1.2) ***Enhanced Interior Gateway Routing Protocol (EIGRP)*** **-** EIGRP was created by Cisco and was Cisco proprietary. But in February 2013, Cisco published a draft making it as Open Standard. EIGRP is advance form of distance vector routing protocol. It uses multicast address 224.0.0.10 to transport packets. Maximum routers that can be travelled by a packet by using EIGRP is 255, with 100 as default on every Cisco device. EIGRP does not send periodic updates like RIP. EIGRP only sends triggered updates when some updation is made. It uses Diffusing Update Algorithm(DUAL).

2.2.) ***Link State Routing Protocols***

Link State protocols, also known as shortest path first or distributed database protocols, are built around a well-known algorithm of graph theory, E.W. Dijkstra's shortest path first algorithm. Link State protocols behave like a road map. Each router shares its link information in the form of Link State Advertisement(LSA), or Link State PDU(LSP). A link state router uses link state information to create a topology map and to select the best path to the destination in the topology. LSAs propagates to every neighbor router using protocol specific multicast address, each router that receives the LSA, updates its Link-State-Database(LSDB) and forwards the LSA to its neighbor routers within an area. SPF tree is then applied to the LSDB to find the best path to reach the destination and the best path is then added to the routing table. A example illustration showing link state routing protocols and distance vector protocol is shown below :

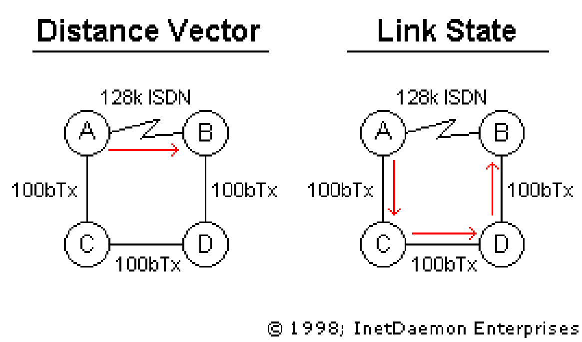

Figure 2.2 - Example of SPF within Link State Protocols

Link State Routing Protocol includes -

- **Open Shortest Path First(OSPF)**
- **Intermediate-System-to-Intermediate-System(IS-IS)**

An overview of both these protocols is given below :

2.2.1)*IS-IS(Intermediate System to Intermediate System)*

It is a link state protocol used in core of SP networks. It was originally not an IP protocol, and is a part of CLNS stack, It was later adopted by IETF for IP based networks. It is highly scalable. . It supports both IPv4 and IPv6. IS-IS also use Dijkstra's SPF algorithm just like OSPF to find the best path. IS-IS also uses a different addressing format than of OSPF for identification of the ISIS router.. It uses ISO NSAP Addressing format, whose maximum size is 20 bytes and minimum size of 8 bytes. It uses two "levels" of adjacency - Level 2(L2) and Level 1(L1).

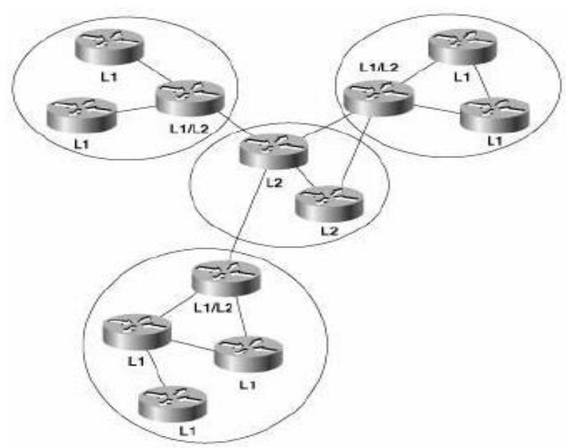

Figure 2.3 - A basic IS-IS network design

2.2.2*) OSPF(Open Shortest Path First)* - OSPF is a link state routing protocol. It uses Dijkstra's Algorithm to find the shortest path to reach destination. Network is divided in areas in OSPF and Area 0 or Area 0.0.0.0 is termed as backbone area. For every non backbone to share routes with any other non backbone area, there should have to be a Area 0(Backbone Area) as a transit area. OSPF uses multicast address 224.0.0.5 and 224.0.0.6 to transport updates. There is no limit of hops in OSPF like in RIP and EIGRP. OSPF share route information in the form of Link State Advertisement(LSA). All the routers in the same area have a similar Link State Database(LSDB).

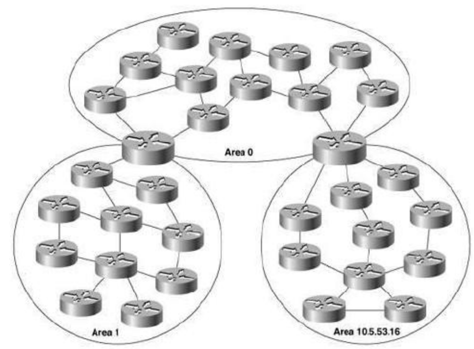

Figure 2.4 - Basic OSPF Network Area Design

III. BRIEF LITERATURE SURVEY

Performance Analysis of Routing Protocols for Real Time Application [1] by Archana Kudtarkar, Reena Sonkusare, and Dayanand Ambawade of SPIT, Mumbai in International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 1, January 2014 did the performance analysis between Interior Gateway Routing Protocols comparing the performance between EIGRP, OSPF, IGRP protocols on the basis of real time and non-real time applications. In this paper, OSPF and IGRP is said to be the best protocol in case of real-time applications like VoIP, while EIGRP works best with non-real time applications like FTP, Email Servers etc.

Compare OSPF Routing Protocol with other Interior Gateway Routing Protocols[2] by Anuj Gupta of RIMT-IET and Neha Grang of RIMT-IET in IJEBEA compares a link state routing protocol(OSPF/ISIS) with distance vector routing protocols(RIP/EIGRP)

Routing Information Protocol(RIP)[3] by C. Hedrick of Rutgers University in Internet Engineering Task Force(IETF) RFC 1058 - This RFC describes RIP in its early days. This algorithm has been used for routing computations in computer networks since the early days of ARPANET. This document describes how RIP deals with the changes in the topology, its loop prevention mechanism, its message formats, and timers etc.

Routing Information Protocol Next Generation(RIPng) [4] by G. Malkin of Xylogics and R. Minnear of Ipsilon Networks proposed in IETF RFC 2080, RIP's version for IPv6 networks known as RIPng. This document is a modified version of RFC 1058, written by Chuck Hedrick. The modifications reflect RIP-2 and IPv6 enhancements, but the original wording is his.

Routing Information Protocol Version 2(RIPv2)[5] by G. Malkin of Bay Networks described in IETF RFC 2453 an extension of RIP version 1, expands the amount of useful information that is carried in RIP messages and to add a measure of security with MD5 based authentication and route-tags. Some of the enhancements made are the use of multicast address instead of broadcasts to send updates, classless based capabilities etc.

EIGRP - A FAST ROUTING PROTOCOL BASED ON DISTANCE VECTORS[6] by Bob Albrightson and Joanne Boyle of Cisco Systems, and J.J. Garcia-Luna-Aceves of University of California - This paper describes the limitation of early distance vector routing protocols and presented a new routing protocol which is fast and advanced that other distance vector routing protocols.

Enhanced Interior Gateway Routing Protocol(EIGRP)[9] IETF draft by D. Savage, D. Slice, J. Ng, S. Moore, and R. White of Cisco Systems describes Diffusing Update Algorithm(DUAL) used to obtain loop-freedom at every instant throughout a route computation. This document also describes EIGRP Packet types, metric calculation formula, IANA Consideration on EIGRP. It also is the first paper published on EIGRP after it was declared as an open standard routing protocol in February 2013 by Cisco. Formerly, it was a Cisco proprietary protocol and worked only on Cisco devices.

OSI IS-IS Intradomain Routing Protocol[11] BY David Oran of Digital Equipment Corp. under IETF RFC 1142 describes the procedures for the transmission of configuration and routing information between network entities residing in Intermediate Systems within a single routing domain. This RFC document is a republication of ISO DP 10589 as a service to the Internet community.

Use of OSI IS-IS for Routing in TCP/IP and Dual Environments[12] by R. Callon of Digital Equipment Corporation(DEC) in IETF RFC 1195 specifies an integrated routing protocol, based on the OSI Intra-Domain IS-IS Routing Protocol, which may be used as an Interior gateway protocol(IGP) to support TCP/IP as well as OSI. It can make a single routing protocol to support pure IP environments, pure OSI environments, and dual environments. This specification was developed by the IS-IS working group of the Internet Engineering Task Force. This RFC also describes advantages of using Integrated IS-IS, its subnetwork Independent and dependent functions, Dijkstra Computation, Authentication and other security considerations for the protocol.

Routing IPv6 with IS-IS [13] by C. Hopps of Cisco Systems under IETF RFC 5308 specifies a method for exchanging IPv6 routing information using the IS-IS routing protocol. The method used here describes two new TLVs - a reachability TLV and an interface TLV to distribute a necessary IPv6 information throughout the routing domain. One can route IPv6 along with IPv4 and OSI using a single intra-domain routing protocol.

Open Shortest Path First - Version 2 [14] by John Moy of Ascend Communications, Inc. in IETF RFC 2328 documents version 2 of the OSPF protocol. OSPF is a link-state routing protocol like IS-IS. It is designed to run internal to a single autonomous system. Each OSPF router maintains an identical database describing the autonomous system's topology. From this database, a routing table is calculated by constructing a shortest path tree. OSPF recalculates routes quickly in the face of topological changes, utilizing a minimum of routing protocol traffic. OSPF provides support for equal-cost multipath. An area routing capability is also provided, which enables an additional level of routing protection and a reduction in routing protocol traffic. This RFC also specifies all types of Link State Advertisement(LSAs), cryptographic authentication between OSPF neighbors, Virtual Links.

The OSPF Not-So-Stubby Area (NSSA) Option[15] by P. Murphy of US Geological Survey under IETF RFC 3101, specifies an optional type of Open Shortest Path First(OSPF) area, that is referred to as a "not-so-stubby" area(NSSA). NSSAs are similar to existing OSPF stub area configuration option, but have the additional capability of importing AS external routes in a limited fashion. OSPF NSSA option was originally defined in RFC 1587. This RFC is an enhanced and an improved version of OSPF NSSA area with current recommendation's default behavior is to import summary routes(Type-3). We can import OSPF's summary routes into an NSSA as a Type-3 summary LSAs optionally. When summary routes are not imported into an NSSA, the default LSA originated by its border routers must be a Type-3 summary-LSA.

OSPF for IPv6 [16] by R. Coltun of Siara Systems, D. Ferguson of Juniper Networks and J. Moy of Sycamore Networks under IETF RFC 2740 specifies the modifications to OSPF to support version 6 of the Internet Protocol(IPv6). The fundamental mechanisms of OSPF(flooding, DR Election, area support, SPF calculations, etc.) remain unchanged. But, some changes are necessary and are made due to protocol semantics between IPv4 and IPv6, simply to handle the increased address size of IPv6. New LSAs have been created to carry IPv6 addresses and prefixes. OSPF now runs on a per-link basis, instead of on a per-IP-subnet basis. Flooding scope of LSAs has been generalized. Authentication has been removed from the OSPF protocol itself, instead relying on IPv6's authentication header and Encapsulating security payload. Most packets in OSPF for IPv6 are almost as compact as those in OSPF for IPv4, even with larger IPv6 addresses.

OSPFv3 as a Provider Edge to Customer Edge (PE-CE) Routing Protocol[17] by P. Pillay- Esnault of Cisco Systems, P. Moyer of Pollere, Inc. , Jeff Doyle of Jeff Doyle and Associates, E. Ertekin of Booz Allen Hamilton in IETF RFC 6565 specifies OSPF as a routing protocol between Customer Edge(CE) and Provider Edge(PE) in Multiprotocol Label Switching VPNs environment. Almost all Service Providers(SPs) offer Virtual Private Network(VPN) services to their customers using a technique in which Customer Edge(CE) routers are routing peers of Provider Edge(PE) routers. The Border Gateway Protocol(BGP) is used to distribute the customer's routes across the provider's IP Backbone network, and Multiprotocol Label Switching (MPLS) is used to tunnel customer packets across the providers backbone. This document OSPFv3 as a PE-CE routing protocol. The OSPFv3 PE-CE functionality is identical to that of OSPFv2 except for the differences described in this document.

IV. OBJECTIVES

- To find the best intra-domain routing protocol for Enterprise and Service Provider based networks on the basis of various parameters like CPU resource usage, performance, security, scalability.
- To find the best routing protocol for traffic engineering purposes
- Comparison will be done in both IPv4 and IPv6 variants.

V. METHODOLOGY

- To study standard and informational papers of RIP, EIGRP, OSPF and ISIS.
- Design a network in GNS3 simulation environment and real Cisco Devices.
- Implementation of distance vector and link state routing protocols.
- Implementation of Simple Network Management Protocol(SNMP) for monitoring purposes.
- For result graphs, Paessler Router Traffic Graph(PRTG) will be used.
- Wireshark Packet analyzer will be used for traffic analysis and packet capturing to check security in routing protocols.

VI. RESULTS AND DISCUSSIONS

Performance Analysis of Interior Gateway Routing Protocols

Every protocol whether it is Link State routing protocol or Distance Vector routing protocol needs to have great performance in the core network of the Enterprise or Service provider network, as the switching of packets from one router to other router is done using Forwarding Information Base i.e. Data Plane and Data Plane of the network is built using the Control Plane which is created with the help of Routing Protocols. We have checked the performance of all the IGPs(Link State and Distance Vector)at their default values for both IPv4 and IPv6. Comparison is made between RIP, EIGRP, OSPF and ISIS protocol. For analysis of all the routing protocols, topology shown below is used. Every link in the topology has the bandwidth of 10Mb per second.

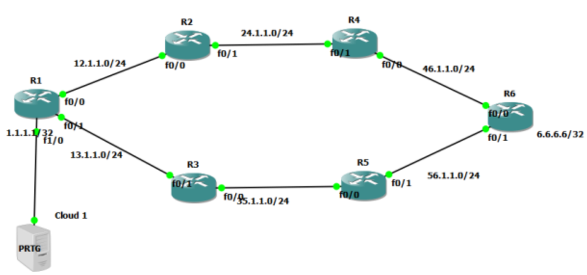

Figure 6.1 - Topology used for all the IGPs for performance analysis

RIP is the very first protocol that i have used in the topology. RIP is a distance vector routing protocol which is kind of traditional in todays network industry. PRTG is used as the monitoring tool and i have connected PRTG with GNS3 to gather results as a graph. Cisco Routers 2600 Series are used in the topology with Cisco IOS 12.4 used as the operating system on every router. In the above topology, when Rip Version 2 is configured, following are the results gathered with the PRTG, when continuous traffic is sent from PRTG server towards Router 6's loopback address 6.6.6.6

Figure 6.2 - Maximum, Minimum and Convergence Time with RIP

Above topology shows the minimum, maximum and convergence time when traffic is sent from PRTG server towards R6's 6.6.6.6. Minimum Time for a simple ping reply on PRTG server towards 6.6.6.6 is 40 msec, maximum time taken is 252 msec, while if the primary link goes down, time taken in shifting the traffic from primary to backup link is 5-6 seconds. Convergence can be faster by using faster convergence technologies, but in my thesis, i am comparing protocols on the basis of their default parameters. As stated before, i am using both IPv4 and IPv6 for my thesis work. For IPv6, i have used the same topology, and PRTG server is sending data traffic at R6's 6666::6 IPv6 address. Graph showing maximum, minimum, and convergence time results is shown below :

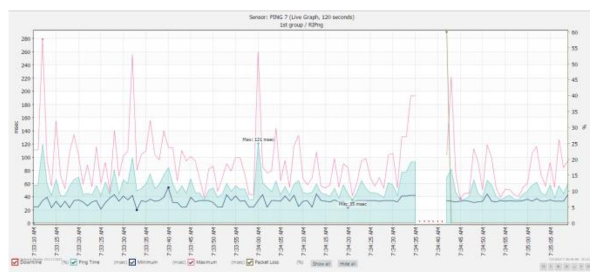

Figure 6.3 - Minimum, Maximum and Convergence Time in RIPng

Above graph easily shows that RIPng took minimum 35 msec to complete a ping packet request-reply from PRTG Server towards 6666::6 and maximum time taken is 121 msec, while the convergence time taken is 6 - 7 seconds. Now if we compare both RIPv2 for IPv4 and RIPng for IPv6, following table shows everything :

Protocol	Maximum Time	Minimum Time	Convergence Time
RIPv2	252msec	40msec	6-7 seconds

RIPng	121msec	35msec	6-7seconds

Table 6.1 - RIPv2 and RIPng Comparison with default timers and parameters

One thing to be noted is that i am using RIP with default parameters and the convergence time can be much better if faster convergence technologies can be used.

Next protocol that i used in my thesis work is EIGRP, as stated before in the explanation of routing protocols, EIGRP is an advance distance vector routing protocol and created by Cisco Systems which Cisco made it open standard in February 2013. Topology that is used in EIGRP is same as used in RIP and traffic is analyzed as it is sent from PRTG Monitoring server towards R6's 6.6.6.6 IP address. When continuous traffic is sent from PRTG server towards 6.6.6.6, we have two links from R1, which is our default-gateway router, one of the link is acting as the primary link towards 6.6.6.6 while other link is acting as a backup link. We intentionally break the primary link to check the convergence time taken by EIGRP when the best path goes down, the backup link is in the topology table already and acting as a feasible successor to the successor. Graph showing the minimum, maximum and convergence times is shown below :

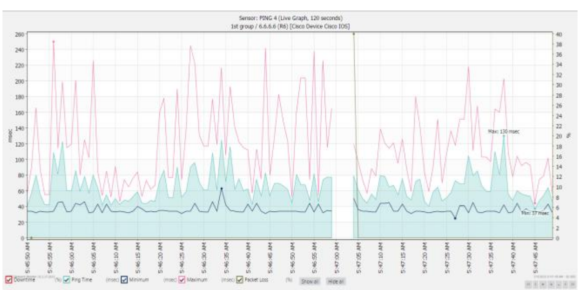

Figure 6.4 - Minimum, Maximum and convergence times in EIGRP IPv4 network

Above graph shows that EIGRP with IPv4 networks provides minimum time of 37msec in completetion of a ping packet from PRTG server towards R6's 6.6.6.6 address, maximum time taken is 130 msec and convergence time with default parameters is 4.5 - 5 seconds. EIGRP with IPv6 is also implemented in the same topology with continuous data traffic is sent from PRTG server towards 6666::6 ipv6 address at R6 router. EIGRP uses the same algorithm that it uses in IPv4 based EIGRP. Below is the graph taken from PRTG by sending continuous traffic to 6666::6 and then intentionally take the primary link down to check the convergence time.

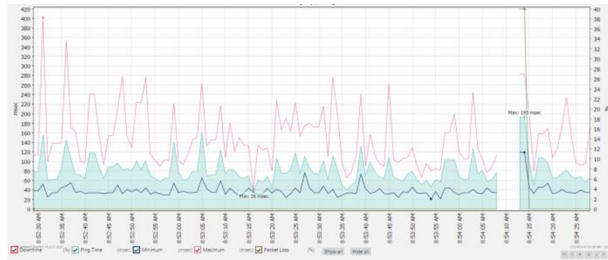

Figure 6.5- PRTG graph showing Minimum, Maximum and Convergence time in EIGRPv6 networks

Above graph shows that EIGRPv6 takes 36 msec as minimum time to complete a ping packet from PRTG server towards R6's 6666::6 address, maximum time taken by ping packet completion is 193 msec and the convergence time taken with default parameters is 4.5 - 5 seconds. A table showing comparison between EIGRP with IPv4 and EIGRPv6 is given below :

Protocol	**Maximum Time**	**Minimum Time**	**Convergence Time**
EIGRP with IPv4	130msec	37msec	4.5 - 5 seconds
EIGRPv6	193msec	36msec	4.5 - 5 seconds

Table 6.2 - Performance comparison table of EIGRPv4 and EIGRPv6

Table shows that there is not much difference when we compare EIGRP (IPv4) with EIGRPv6.

Now that Distance-Vector routing protocols comparison is done with both IPv4 and IPv6, lets start with Link State routing protocols. Two protocols that i have analyzed here for performance are Open Shortest Path First(OSPF) and Intermediate-System to Intermediate-System(IS-IS). As stated before, both protocols use Dijkstra's Shortest Path First(SPF) Algorithm. Firstly, OSPF will be analyzed. Topology used for OSPF is same as in RIP and EIGRP and PRTG server will send traffic towards R6's 6.6.6.6 IP address. Control plane is built using OSPF in the topology and data plane or in our case Forwarding Information Base table is made using control plane. R1 has two paths towards 6.6.6.6, one is acting as primary and other one is acting as a backup link. Firstly data traffic is sent to R6's 6.6.6.6 address which will follow the primary path towards 6.6.6.6 and then with continuous traffic, link will be intentionally taken down to check the convergence time. Below is the graph taken from PRTG Monitoring tool showing maximum, minimum and convergence time with default parameters :

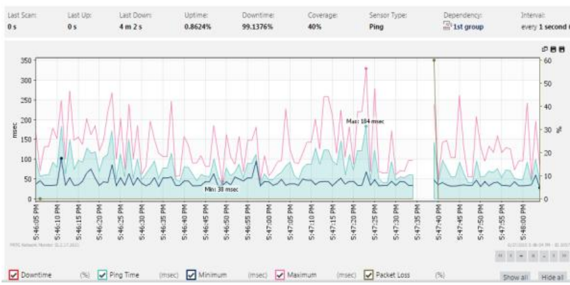

Figure 6.6 - PRTG Graph showing maximum , minimum and convergence times in OSPFv2

As shown above in PRTG generated graph, OPSFv2 took 184 msec as maximum time to complete a simple ping packet between PRTG and destination device R6's 6.6.6.6, minimum time taken is 38msec, while the convergence time with default parameters is 4-5 seconds. OSPFv3 or OSPF with IPv6 is quite different from OSPF v2, although same SPF algorithm is used between both the protocol versions, but OSPFv2 and OSPFv3 have few different LSA types. Same topology is used in OSPFv3 with all the routers are in same area making it a single area topology. Continuous data traffic is sent from PRTG server towards R6's 6666::6 address and intentionally the primary link is taken down to check the convergence time that is achieved using the default parameters. Graph showing all the timer details taken in PRTG is shown below:

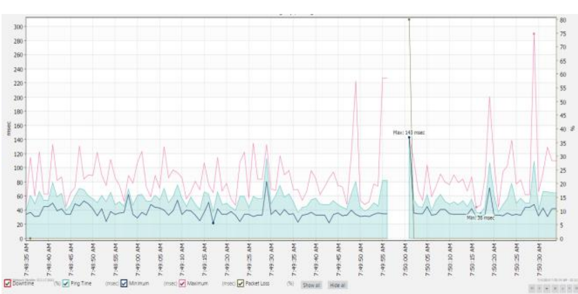

Figure 6.7- PRTG Graph showing minimum, maximum and Convergence Time in OSPFv3 network

Above graph shows the minimum, maximum time taken for a completion of simple ping packet. Minimum Time taken is 36msec and maximum time is 143 msec, while the convergence time is around 4-5 seconds. Table showing comparison of maximum, minimum and convergence times in OPSFv2 and OSPFv3 is given below :

Protocol	Maximum Time	Minimum Time	Convergence Time
OSPFv2	184msec	38msec	4-5seconds
OSPFv3	143msec	36msec	4-5seconds

Table 6.3 - Comparison table between OSPFv2 and OSPFv3 performance

IS-IS is also a link-state routing protocol, using the same algorithm as the OSPF uses, but IS-IS is mostly used in service provider environment rather than in other networks like data center or enterprise networks. I have also used IS-IS with the same topology and tried to draw a conclusion based on results presented to me by the PRTG graph using the IS-IS routing protocol to build the routing table or control plane. Graph taken from PRTG with IS-IS for IPv4 is given below :

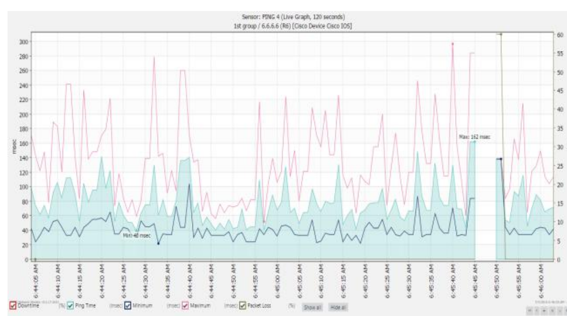

Figure 6.8 - PRTG Graph showing Maximum, Minimum, and convergence time in IS-IS

As shown above in the graph convergence time with IS-IS routing protocol is around 4-5 seconds, while maximum and minimum time in completion of a single ping packet is 162 msec and 40 msec. ISIS also provides IPv6 routing, which i have also done in order to compare ISIS v4 with ISIS v6. The need of a NET address remains in IPv6 based ISIS routing. We need to have a unique NET address for every ISIS router in both IPv4 and IPv6 based routing. Same topology is used in IPv6 with same media and same number of routers, and the graph that is created using PRTG is shown below :

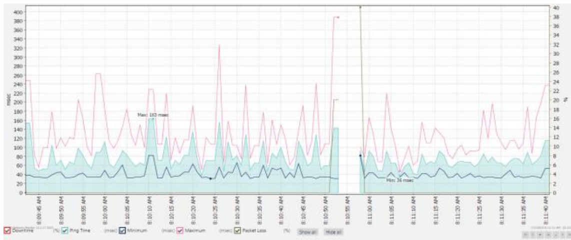

Figure 6.9 - Minimum, Maximum and Convergence time graph with IPv6 based IS-IS

A comparison table between IPv4 based ISIS and IPv6 based ISIS is shown below :

Protocol	**Maximum Time**	**Minimum Time**	**Convergence Time**
IPv4 based ISIS	162msec	40msec	4-5 seconds
IPv6 based ISIS	163msec	36msec	5-5.5 seconds

Table 6.4 - Performance comparison chart between IPv4 based ISIS and IPv6 based ISIS

So performance analysis is finished with all the interior gateway routing protocols and a full table of comparison between all the protocols with IPv4 and IPv6 is given below :

Protocol	**Maximum Time**	**Minimum Time**	**Convergence Time**
RIPv2	252msec	40msec	6-7 seconds
RIPng	121msec	35msec	6-7seconds
EIGRP with IPv4	130msec	37msec	4.5 - 5 seconds
EIGRPv6	193msec	36msec	4.5 - 5 seconds
OSPFv2	184msec	38msec	4-5seconds
OSPFv3	143msec	36msec	4-5seconds
IPv4 based ISIS	162msec	40msec	4-5 seconds
IPv6 based ISIS	163msec	36msec	5-5.5 seconds

Table 6.5 - IGP comparison table in terms of performance

VII. CONCLUSION

Comparison is made with around 100 routes in the routing table with IP traffic is passing over 10Mbps links between all the routers. From the above comparison its clear that with all the routing protocols gives better convergence time than RIP with default parameters. Although we get a convergence time in seconds, it is not good for VoIP based traffic, to make convergence up to the mark to carry VoIP traffic smoothly, we can implement faster convergence technologies with IP routing which can help our network converge within sub-second, and with that our VoIP traffic will not get disrupted. Talking about Link State Routing and Distance Vector Routing protocols, EIGRP rises as the best performance routing protocol under Distance Vector category of Routing Protocols, while OSPF is marginally better than ISIS routing protocol under Link State Routing Category. EIGRP on the other hand gives almost same convergence time as OSPF with default parameters, although OSPF has edge over EIGRP, if EIGRP does not have any Feasible Succesor(Backup Path).

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