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COMPARITATIVE ANLAYSIS OF IPV6 BASED RIPng, IS-IS AND OSPF-V3 PROTOCOLS

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ABSTRACT

Today internet has become integral part of our life. In modern internet era, communication networks are growing very rapidly. For good communication network routing protocols play an important role. Routing play an important role to deliver data from source to destination in the network, and how a routing protocol works it depends on his algorithm. Having a network efficient routing protocols means better response to user in every aspect of networking term like Delay ,Packet drop and Throughput .There are many protocols are lying in Internet Protocol Network version 4, like OSPF ,EIGRP, IS-IS, RIP and many more . This proposed work focuses on evaluating of OSPFV3, IS-IS and RIPng IPV6 based protocol in various applications like VIDEO, VOICE, E-MAIL and HTTP Servers. In near future we will simulate the given IPV6 based protocols in OPNET Tool.

KEYWORD: OPNET, IPV6, LINK STATE ROUTING, OSPF V3, IS-IS.RIPng.

1. INTRODUCTION

In modern era, we cannot assume human life without internet or communication network daily life people are using many service like video, voice, http and many more according to their needs. These things are so important and all depend on packet data. But Routing protocols play an important role for successful communication network. Routing protocols provide the mechanism to deliver the data from source to destination .in the area of ipv4 and ipv6 there are many protocols that exist. Each protocol working behaviour is different from another. But we can differentiate with the following type.

Three classes are common on IP networks as follows:

- Interior gateway routing over link state routing protocols, such as IS-IS and OSPF.
- Interior gateway routing over distance vector protocols, such as RIP, IGRP and EIGRP.
- Exterior gateway routing, such as BGP v4 routing protocol.

1.1 LINK STATE ROUTING (LSR) protocols are also known as Shortest Path First (SPF) protocol where each router determines the shortest path to each network. In LSR, each router maintains a database which is known as link state database. This database describes the topology of the AS. In Link State Routing information among the nodes are Exchange through the Link State Advertisements (LSA) because each LSA of a node contains all the information of its neighbours node .In Link State Routing Dijkstra's algorithm is used to calculate the cost and path for each link. The price of each link can also be represented as the weight or length of that link and is set by the network operator. By suitably assigning link costs, it is possible to achieve load balancing. If this is accomplished, congested links and inefficient usage of the network resources can be avoided.

Advantages of Link State–Based Routing Protocols

- Smaller routing tables.
  Only a single optimal route for each network ID is stored in the routing table.
- Low network overhead.
  Link state–based routers do not exchange any routing information when the internetwork has converged.

- Ability to scale.
  Between the smaller routing tables and low overhead, link state–based routing protocols scale well to large and very large internetworks.
- Lower convergence time.
  Link state–based routing protocols have a much lower convergence time and the internetwork is converged without routing loops.
- Complex.
  Link state–based routing protocols are much more complex and difficult to understand than distance vector–based routing protocols.
- More difficult to configure.
  A link state–based routing protocol implementation requires additional planning and configuration.

1.2 DISTACNE-VECTOR PROTOCOLS

Distance-vector protocols are based on calculating the direction and distance to any link in a network. "Direction" usually means the next hop address and the exit interface. "Distance" is a measure of the cost to reach a certain node. The least cost route between any two nodes is the route with minimum distance. Each node maintains a vector (table) of minimum distance to every node. The cost of reaching a destination is calculated using various route metrics. RIP uses the hop count of the destination whereas IGRP takes into account other information such as node delay and available bandwidth

2. RIPng

RIPNG is the higher version of RIP. RIP is one of the oldest protocols. There are three versions of the Routing Information Protocol: RIPv1, RIPv2, and RIPng.RIPng uses a simpler mechanism than other routing protocols to determine the metric (cost) of a route, which is that it just counts the number of hops (routers) to the destination. Routes with a distance greater than or equal to 16 are considered to be unreachable, and each router counts as 1 hop. The router periodically distributes information about its routes to its directly connected neighbours using RIPng response messages. The router adds the distance between the neighbour and itself to the metric of each route received after receiving the RIPng response messages from its neighbours. When the routers are first initialized, they only know of their directly connected routes, which is passed to all neighbours, processed, and then distributed to their neighbours .Some afterward, all IPv6 routes are known by all routers, and they keep sending response messages periodically to prevent valid routes from expiring. Like previous versions of RIP, RIPng has a diameter limitation, where the longest path to any IPv6 route is limited to a metric of 15 when propagated. The protocol allows for larger costs to be assigned to any link, limiting the number of hops even further, but a metric of 16 or greater are unreachable. Routing loops can also cause high convergence time when IPv6 routes that are no longer valid are being propagated in a looped environment, where RIPng will continue to increase the metric by one. The mechanism of limiting the metric of 16 prevents the routes from being passed around indefinitely, since the routes will circle until they reach the maximum metric and are eventually eliminated. Another limitation of RIPng is that the metric does not reflect the line speed, since it uses a fixed metric normally set to one for each link crossed. A route cannot be chosen based on bandwidth or real-time parameters such as measured delay, load, or reliability.

RIPng TIMERS

Timer	Description	Default
Update	Amount of time (in seconds) between Ripng routing updates.	30 seconds.
Timeout	Amount of time (in seconds) after which a route is considered unreachable.	180 seconds.
Hold-down	Amount of time (in seconds) during which information about other paths is ignored.	180 seconds.
Garbage-collection	Amount of time (in seconds) after which a route is removed from the routing table.	120 seconds.

3. OSPFV3

OSPF for IPv6 modifies the existing OSPF for IPv4 to support IPv6, but the fundamentals of OSPF for IPv4 remain unchanged. One of the main difference between OSPF for IPv4 and OSPF for IPv6 is that the protocol processing is now done per-link, and not per-subnet.

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This is because multiple IP subnets can be assigned to a single link, and 2 nodes can talk directly over a single link even if they do not share a common IP subnet.

3.1 OSPF AREAS

Two levels of hierarchy are provided by OSPF throughout the concept of Areas. An Area is a 32-bit number denoted in an IP address format 0.0.0.0 or in decimal number format like Area 0. If there is more than one Area used in the network, Area 0 is assigned to the backbone of the network. All other Areas should be connected to the backbone. If the Areas cannot be connected to the backbone then, with the help of virtual links, that Area should be connected to the backbone. Depending upon the requirements of the network, OSPF has several types of Areas These are

3.2 NORMAL AREAS

Areas defined by default are known as normal or regular Area.

3.3 STUB AREAS

Areas which do not receive route advertisements and are external to the AS are known as stub Areas. Following features are associated with Stub Areas.

4. IS-IS

IS-IS is a link-state interior gateway routing protocol. Like OSPF, IS-IS runs the Dijkstra shortest-path first (SPF) algorithm to create a database of the network's topology and, from that database, to determine the best (that is, shortest) path to a destination. IS-IS uses a slightly different terminology than OSPF for naming its protocol packets. Because it was developed as part of the OSI network protocols and not part of TCP/IP, IS-IS doesn't use IP addresses. IS-IS addresses are called NETs, or network entity titles. While IP addresses are 32 bits long and are normally written in dotted quad notation (such as 192.168.1.2), NETs can be 8 to 20 bytes long, but are generally 10 bytes long and are written as shown in this example:

47.0001.1921.6800.1002.00

The IS-IS address consists of three parts:

- Area identifier: The first three bytes are the area ID. The first byte of this example -47 -is the address family identifier (AFI) of the authority, which is equivalent to the IP address space that is assigned to an autonomous system. The AFI value 47 is what IS-IS uses for private addressing, which is the equivalent of RFC 1918 address space for IP protocols. The second two bytes of the area ID — 0001 — represent the IS-IS area number. In this example, the area number is 1.
- System identifier: The next six bytes identify the node (that is, the router) on the network. The system identifier is equivalent to the host or address portion on an IP address.
- NET selector: The final two bytes are the NET selector (NSEL). For IS-IS, they must always be 00, to indicate "this system."

ROUTING PROTOCOL CAMPARISON

	RIPng	OSPFv3	IS-IS
Interior/Exterior?	Interior	Interior	Interior
Type	Distance Vector	Link-state	Link-state
Default Metric	Hop count	Cost	Cost
AD	120	110	115
Hop count Limit	15	None	None
Convergence	Slow	Fast	Fast
Update timers	30 seconds	Only when changes occur;	Only when changes occur
Updates	Full table	Only Changes	Only changes
Classless	No	Yes	Yes
Algorithm	Bellman-Ford	Dijkstra	Dijkstra

5. LITERATURE SURVEY

We have got through seven different papers thoroughly which we thought can help us to reach up to specific conclusion. all the papers were having great research. in these papers we have concluded that a Dynamic routing protocol is responsible for path determination, routing updates and choosing the best path in a network (host node to destination node). Performance analysis of different routing protocols has been done based on different performance metrics. in the paper titled "simulation based EIGRP over OSPF performance analysis" EIGRP and OSPF routing protocols have been taken and performance of protocols is checked by performance metric like convergence time, jitter, end to end delay, throughput, packet loss. The evaluation results show that EIGRP routing protocols provides a better performance than OSPF routing protocol for real time video application and voice application. in the paper titled " performance comparison of EIGRP and IS-IS/RIP protocols" EIGRP and combination of IS-IS/RIP protocols have been taken and performance of protocol is checked by performance metric like terms of convergence time, throughput and end-to-end delay. the evaluation results show that the combination of IS-IS/RIP protocol shows better performance compared to EIGRP protocol in terms of throughput and end-to-end delay. Whereas, the network convergence of EIGRP protocol is better than IS-IS/RIP protocol. in the paper titled "a comparative study of IS-IS and IGRP protocols for real- time application based on OPNET " IS-IS and IGRP routing protocols have been taken and performance of protocols is checked by performance metric like convergence duration time, throughput, packet delay variation, packet end-to-end delay and traffic sent the evaluation results show that show that the best results in the combination of two protocols of IGRP and IS-IS, achieved in traffic sent and received for videoconferencing, throughput, jitter, packet delay variation for voice and convergence activity time parameters. Whereas, packet end-to-end delay and packet delay variation for videoconferencing of IS-IS protocol is better than IS-IS/IGRP protocol. in the paper titled" simulation based performance analyses on RIPv2,EIGRP, and OSPF using OPNET" RIPv2 , EIGRP, and OSPF routing protocols have been taken . and performance of protocols is checked by performance metric like convergence time, scalability, end-to-end delay, and throughput the evaluation results show that show that RIPv2 has better performance than others in small and condensed networks. OSPF and EIGRP have better performance for medium-sized and scattered networks. Overall EIGRP is more stable and consistent in both small and relatively large networks. in the paper titled "final project OSPF, EIGRP and RIP performance analysis based on OPNET" EIGRP , OSPF and RIP protocols have been taken and performance of protocols is checked by performance metric like network convergence, Ethernet delay, email upload response time, http page response time, video conferencing packet end-to-end delay, voice packet delay the evaluation results show that EIGRP compared to RIP and OSPF performs better in terms of network convergence activity and routing protocol traffic and Ethernet delay. OSPF performs better in terms of http page response time and video conferencing packet end-to-end delay. RIP performs better in terms of voice packet delay. in the paper titled "performance comparison of EIGRP/ IS-IS and OSPF/ IS-IS" EIGRP , OSPF and IS-IS protocols have been taken and performance of protocols is checked by performance metrics like throughput, http object response time, database response time and e-mail download response time. the evaluation results show that IS-IS convergence time in EIGRP/IS-IS network is much faster than OSPF/IS-IS . in the comparison of these protocols in database query response time, EIGRP/IS-IS shows a better database query response time than of the other protocols at the whole time. The EIGRP/IS-IS protocol performs very well in email download performance metric for the whole simulation time. in the http page response time IS-IS become better than other protocols.

6. CONCLUSION AND FUTURE WORK

This paper deals with the critical issues of RIPng, OSPF V3 & IS-IS in IPV6. As IPV6 is becoming popular day by day; due to its wide range of applications; and great hierarchy of IPs. Before it lot of work has been done with ipv4 .but this paper shows all the aspects of RIPng, OSPF V3 & IS-IS. We can build and manage better network with the help of these protocols and can get better results as compared to ipv4. In near future we will simulate the given IPV6 based protocols in OPNET Tool.

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