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BEHAVIOUR OF IS-IS AND RIPNG PROTOCOLS WITH SEVERAL PERFORMANCE MATRICS

REVIEW PAPER

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Abstract: ***The Internet is a global system of interconnected computernetworks use the Internet protocol suite to link several billion devices worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks of local to global scope. All the functionality of internet is depended on Routing Protocols .Routing Protocols is responsible to deliver data packets from one end to another end ,in other way Routing Protocols carry data packets from source to destination, Routing Protocols plays vital role in internet system, the main objective of any Routing Protocol is choose optimal path means choose best path from source to destination in the network so that data packets can reach with minimum time at source end There are many protocols are lying in Internet Protocol Network version 4and as well as 6 like OSPF ,EIGRP, IS-IS, RIP ,OSPFV3,RIPng . This proposed work focuses on evaluating of IS-IS and RIPng IPV6 based protocol in various applications like Remote login, video, voice E-mail and Http servers. In near future we will simulate the given IPV6 based protocols in OPNET tool.***

Index terms: OPNET, IPV6, EIGRP, OSPF V3, IS-IS,RIP

1. Introduction

A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. Routing algorithms determine the specific choice of route. Each router has a prior knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network. Although there are many types of routing protocols, three major classes are in widespread use on IP networks: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.

1.2 link state Routing

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 other nodes areExchange through the Link State Advertisements (LSA) because each LSA of a node contains all the information of its neighbors node .In Link State Routing Dijkstra'salgorithm 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.

1.2.1 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.

1.3 Distance-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.RIPnguses 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.

RipngTimers

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. 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."

3.1 Routing protocol comparison

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

4. Literature survey

We have got through different papers thoroughly which we thought can help us to reach up to specific conclusion. Performance analysis of different routing protocols has been done based on different performance metrics. in the paper titled "Evaluation of OSPF and EIGRP Routing Protocols forIPv6",Described IPv4 address size that is very small. Almost all organizations are changing and they start using new version IPv6. Traditional IPv4 routing protocols must be replaced with new IPv6 compatible protocols to ensure systems continue to operate more effectively. However these protocols have significant changes in order to support IPv6. Knowledge of these changes is important when choosing a routing protocol for a system, in order to get better results. A study and comparison of two popular routing protocols OSPF and EIGRP has been undertaken. The major changes between the IPv4 and IPv6 versions have been evaluated and defined. The two protocols have been compared against a number of criteria.in the paper titled "Performance Analysis of Routing Protocols forReal Time Application" Presented that routing protocols are used to find the shortest path to the destination. Interior routing protocols like RIP, OSPF, EIGRP and IGRP are used to transfer the information .There should be knowledge for selection of right protocol to experience better performance on network services like VOIP, Video Conferencing, HTTP and FTP. Using OPNET (Optimized Network Engineering Tool) as a simulation tool Comparison among Interior Gateway Protocols (IGP) protocols is done with weighted-faired queuing (WFQ) technique on different scenarios .It provides guidelines to network engineers to decide which protocol should be deployed for a custom specific application as per individual's choices. Graphs showed that EIGRP is the best choice for FTP, Email and DB access as compared to other protocols for non real time applications whereas OSPF and IGRP gives better results for real time application. in the paper titled "Simulation Based Comparative Study of RIP, OSPF and EIGRP", Described that the performance of three Intra-domain routing protocols EIGRP, RIP and OSPF for LAN network of 7 routers by using OPNET simulator and performed simulations to examine the behavior of these routing protocols. Results reveal out that EIGRP protocol behaves well in terms of point-to-point link utilization, throughput, Queuing delay and HTTP page response time but by considering other important network parameters, it performs poor for Email download and upload response time and DB query response time. While RIP performs well where EIGRP performs poor. On the other hand OSPF and combination of OSPF, RIP and EIGRP are moderate in

all cases.in the paper titled "Simulation Based EIGRP over OSPF Performance Analysis", Describeda simulation based comparative performance analysis between OSPF and EIGRP for real time applications by using OPNET. In order to evaluate OSPF and EIGRP's performance, we have designed three network models where 1st, 2nd and 3rd network model are configured respectively with OSPF, EIGRP and combination of EIGRP and OSPF. Our evaluation of proposed routing protocols is performed based on the quantitative metrics such as Convergence Time, Jitter, End-to-End delay, Throughput and Packet Loss through the simulated network models. The evaluation results show that EIGRP routing protocol provides a better performance than OSPF routing protocol for real time applications. in the paper titled "Performance Comparison of Mixed Protocols Based on EIGRP, IS-IS and OSPF for Real-time Applications" Defined internet routing protocols and real-time applications, such as voice, video conferencing and routing algorithms which are in demands of many organizations that play important roles in the real network in recent years. In the proposed work considering rate and type of the demanding traffic, choosing of the routing protocol can cause the best performance in function of a network. Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF) protocols have been evaluated. Better performance for real-time are based on dynamic routing algorithms. Intermediate Systems-Intermediate Systems (IS-IS) Protocol is main interior gateway routing protocol designed to operate in large network topologies. In the proposed work, they demonstrated that with combination of protocols better results rather than single protocol configuration can be obtained. They showed that combination of three protocols EIGRP, OSPF and IS-IS and applying these mixed protocols to a semi-mesh topology propose better results in performance of end-to-end delay ,packet delay variation, Voice Jitter and Link throughput parameters. To design and implement of their proposed algorithm, they have employed OPNET software.in the paper titled "Simulation Based Performance Analyses on RIPv2, EIGRP, and OSPF Using OPNET" , Described different routing protocols, such as RIPv2, EIGRP, and OSPF by using sophisticated simulation software called OPNET. The characteristics include convergence time, scalability, end-to-end delay, and throughput. Different network topologies, such as the star, ring, and mesh, are being tested in the experiments. The experimental results 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.

5. Conclusion and Future work

In this paper we have go through every aspect of related Routing Protocols Ripng and IS-IS. In near future we will simulate the given IPV6 based protocols in OPNET tool. 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. 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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