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SIMULATION BASED PERFORMANCE ANALYSIS OF IPV6 BASED IS_IS,OSPFV3 AND OSPFV3_IS-IS PROTOCOLS

Author(s): Jagmeet Kaur; Er.Prabhdeep Singh
M.TECH STUDENT, ASSISTANT PROFESSOR

ABSTRACT:

As per new era of routing protocol techniques, comprehensive rate of growth in communication and network technologies, it shows tremendous great demand of IPv6 addressing scheme. It removes the limitations imposed by IPv4 and provides the large number of address space. According to this paper, authors includeIntermediate System To intermediate System (IS-IS) and Open Shortest Path First V3(OSPFV3) Protocol and mentioned IPv6 network's performance evaluation, On the basis of E-mail Download ResponseTime , E-mail Upload Response Time , Http Page Response Time. In this paper, to get the results, three different scenarios are desigined, in first scenario Intermediate System To intermediate System (IS-IS) has to be implemented. In second scenario,Open Shortest Path First V3(OSPFV3) protocol has to be implemented. In third scenario, combination of both protocol need to be implemented in one network. To analyze the performance of both routing protocol, we use the OPNET simulator.

***Keywords**: OPNET, IPV6, LINK STATE ROUTING, OSPF V3, IS-IS.*

1. INTRODUCTION:

Today internet has become integral part of our life. We are using many services like video streaming, email and file transfer. These are all based on packet data and routing protocol has important role to deliver packet across the internet. There are many protocols existing in IP network. We takeOpen Shortest Path First V3 (OSPFV3) and Intermediate System to intermediate System (IS-IS) .Both protocols comes fromlink state. The router has prior knowledge about the adjacent networks which can assist in selecting the routes between two nodes.There are different types of routing protocols in the 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 vectorProtocols, such as RIP, IGRP and EIGRP.
- Exterior gateway routing, such as BGP v4 routing protocol.

Most of the routing protocols we've learned in IPv4 had been modified to be used for longer IPv6 addresses and different header structures. IPv6 routing protocols are similar to their IPv4 counterparts, but since an IPv6 prefix is four times larger than an IPv4 prefix, routing updates have to carry more information. IPv4 routing protocols functions and configurations still possess some similarities. The IPv6 routing protocols includes IS-IS,RIPng, EIGRPV6 and OSPFV3.

2. ROUTING PROTOCOL:

In IP networks, the main task of a routing protocol is to carry packets forwarded from one node to another. In a network, routing can be defined as transmitting information from a source to a destination by hopping one-hop or multi hop. Routing protocols should provide at least two facilities: selecting routes for different pairs of source/destination nodes and, successfully transmitting data to a given destination. Routing protocols are used to describe how routers communicate to each other, learn available routes, build routing tables, and make routing decision sand share information among neighbours. Routers are used to connect multiple network sand to provide packet forwarding for different types of networks. The main objective of routing protocols is to determine the best path from a source to a destination. A routing algorithm uses different metrics based on a single or on several properties of the path in order to determine the best way to reach a given network. Conventional routing protocols used in interior gateway networks are classified as Link State Routing Protocols and Distance Vector Routing Protocols.

3.OSPFV3:

Open Shortest Path First (OSPF) is a routing protocol for Internet Protocol (IP) networks. It uses a link state routing algorithm and falls into the group of interior routing protocols, operating within a single autonomous system (AS). It is defined as OSPF Version 2 in RFC 2328 (1998) for IPv4. The updates for IPv6 are specified as OSPF Version 3 in RFC 5340

(2008). OSPF is perhaps the most widely used interior gateway protocol (IGP) in large enterprise networks. OSPF is an interior gateway protocol (IGP) for routing Internet Protocol (IP) packets solely within a single routing domain, such as an autonomous system. It gathers link state information from available routers and constructs a topology map of the network. The topology is presented as a routing table to the Internet Layer which routes datagram based solely on the destination IP address found in IP packets. OSPFV3 supports Internet Protocol Version 4 (IPv4) and Internet Protocol Version 6 (IPv6) networks and features variable-length subnet masking (VLSM) and Classless Inter-Domain Routing (CIDR) addressing models. The advantages of OSPF are:

- OSPF is not a Cisco proprietary protocol.
- OSPF always determine the loop free routes.
- If any changes occur in the network it updates fast.
- OSPF minimizes the routes and reduces the size of routing table by configuring area.
- Low bandwidth utilization.
- Multiple routes are supported.
- Support variable length subnet masking.
- It is suitable for large network.

The disadvantages of OSPF are:

- Difficult to configure.
- Link state scaling problem.
- More memory requirements

4.IS-IS: Intermediate System to Intermediate System (IS-IS) is a routing protocol designed to move information efficiently within a computer network, a group of physically connected computers or similar devices. It accomplishes this by determining the best route for datagram's through a packet-switched network. IS-IS is a link-state routing protocol, operating by reliably flooding link state information throughout a network of routers. Each IS-IS router independently builds a database of the network's topology, aggregating the flooded network information. Like the OSPF protocol, IS-IS uses Dijkstra's algorithm for computing the best path through the network. Packets (datagram's) are then forwarded, based on the computed ideal path, through the network to the destination. IS-IS uses a single routing algorithm to support several network address families, such as IPv6, IPv4. The IS-IS protocol was developed by Digital Equipment Corporation as part of DECnet Phase V. It was standardized by the ISO in 1992 as ISO 10589 for communication between network devices which are termed Intermediate Systems (as opposed to end systems or hosts) by the ISO. The purpose of IS-IS was to make possible the routing of datagrams using the ISO-developed OSIprotocol stack called CLNS.IS-IS was developed at roughly the same time that the Internet Engineering Task Force IETF was developing a similar protocol called OSPF. IS-IS was later extended to support routing of datagrams in the Internet Protocol (IP), the Network Layer protocol of the global Internet. This version of the IS-IS routing protocol was then called Integrated IS-IS (RFC 1195).

5.SIMULATOR: In this paper, network simulator, Optimized Network Engineering Tools (OPNET) modeler 14.5 has been used as a simulation environment. OPNET is a simulator built on top of discrete event system (DES) and it simulates the system behaviour by modelling each event in the system and processes it through user defined processes. OPNET is very powerful software to simulate heterogeneous network with various protocols. The protocols used in this thesis are OSPFV3 and IS-IS routing protocol. The proposed routing protocols and its combination are compared and evaluated based on some quantitative metrics such asE-mail Download Response Time , E-mail Upload Response Time, Http Page Response Time. .In this paper, three scenarios are created. The network topology composed of the following network devices and configuration utilities:

- Routers
- Ethernet Server
- Switch
- PPP_DS3 Duplex Link
- PPP_DS1 Duplex Link
- Ethernet 100 BaseT Duplex Link
- Ethernet Workstation
- Application Configuration
- Profile Configuration

The network topology design is based on the geographical layout of Punjab Districts. We considered TwelveRouters in accordance with the name of districts of Punjab those are interconnected to each other.

5.1 IS-IS Scenario

In this scenario, IS-IS routing protocol is enabled first for all routers on the network. After configuring routing protocols, individual DES statistics was chosen to select performance metrics and to measure the behavior of this routing protocol. Then simulation run time was set to 5 minutes.

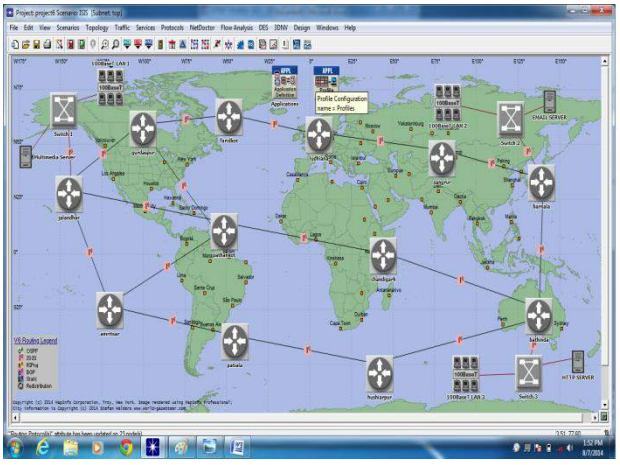

Fig 1: IS-IS Scenario

5.2 OSPFV3 Scenario

In this scenario, OSPFV3 routing protocol is enabled first for all routers on the network. After configuring routing protocols, individual DES statistics was chosen to select performance metrics and to measure the behavior of this routing protocol. Then simulation run time was set to 5 minutes.

Fig 2: OSPFV3 Scenario

5.3 OSPFV3_IS-IS Scenario

A key issue of this scenario is to analyze the performance of the network where both IS-IS and OSPFV3 are running concurrently. This scenario is different from other two scenarios. In this Scenario half network is configured with IS-IS and rest of the part of this scenario is configured with OSPFV3.

Fig 3: OSPFV3_IS-IS Scenario

6. METRICS:

6.1 EMAIL UPLOAD RESPONSE TIME: Response time refers to time lagged between the input signal and output signal which depends upon the value of passing components used. Upload response time means time taken to upload Email to the Server.

6.2 EMAIL DOWNLOAD RESPONSE TIME: Download response time refers to time taken to download Email from the Server.

6.3 PAGE RESPONSE TIME: The time it takes for each web page to load. At highest level of abstraction, time it takes for a web page to be completely displayed on a user's browser. Heavy HTTP application is used by the users in the network and the application service is supported by the server.

7. RESULTS:

7.1 EMAIL DOWNLOAD RESPONSE TIME:
In the performance metrics of E-mail Download Response time, IS-IS protocol is better than the OSPFV3 and OSPFV3_ISIS.

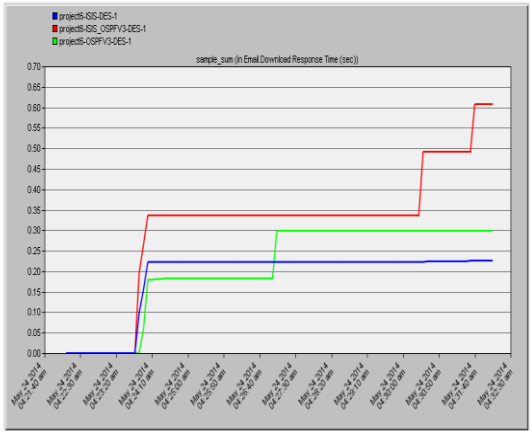

Fig 4: Email Download Response Time

7.2 EMAIL UPLOAD RESPONSE TIME: In the performance metrics of E-mail Upload Response time,OSPF V3protocol is giving us better performance than the IS-IS and OSPFV3_ISIS.

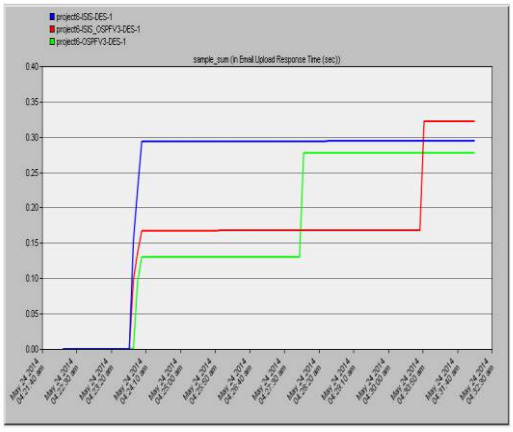

Fig 5: Email Upload Response Time

7.3 HTTP PAGE RESPONSE TIME: In the performance metrics of HTTP PageResponse time, IS-IS protocol is better than the OSPFV3 and OSPFV3_ISIS.

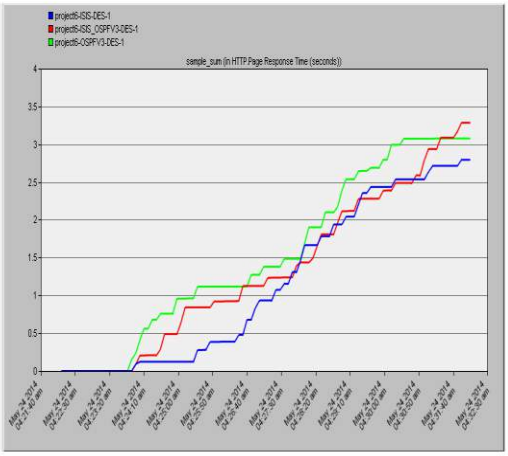

Fig 6: HTTP Page Response Time

8. CONCLUSION AND FUTURE WORK

In this paper, we have presented a comparative analysis of selected routing protocols such as IS-IS, OSPFV3 and the combination of IS-IS and OSPFV3. The comparative analysis has been done in the same network with different protocols for real time applications. Performance has been measured on the basis of some parameters that aimed to figure out the effects of routing protocols. In our paper work, The simulation result has shown that In E-mail download response time and http page response time, IS-IS Protocol is better than two others. .In Email upload response time, OSPFV3 has much better than others two. In future, a research work can be done on the explicit features of both OSPFV3 and IS-IS protocols in the IPv6 environment with other server like Telnet, Data Base Query Response Time and Security analysis for both OSPFV3 and IS-IS can be done.

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