A Comparative study of efficiency evaluation between EIGRP and OSPF routing protocols in case of data transmission using GNS3

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Abstract: Graphical network simulator 3 (GNS3) is a network software emulator first released in 2008. In this study I present a simulation based comparative evaluation between EIGRP and OSPF for real time data transmission by using GNS3. Router images are simulated on GNS3 and by console application. In this compare data transmission via bits verses time taken by routers. Wireshark is effectively used in capturing and analyzing the packets in the networks. This helps in monitoring accurate time response for the various packets. The evaluation result show that EIGRP routing protocol provides best efficiency than OSPF in case of data transmission using GNS3**.**

Keywords: OSPF (Open Shortest Path First); EIGRP (Enhanced Interior Gateway Routing Protocol); routing; protocol; network; convergence; topology; routers; Wireshark.

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[1] INTRODUCTION

The routing protocol presents the way to transfer the messages from point to point over the network. So, the main purpose of the routing protocol is to transfer the data packets over the network .

There are many routing protocols such as DSR routing protocol, Wireless Mesh Network WMN routing, protocol RIP routing protocol, BGP routing protocol and also OSPF protocol which is presented in this study comparing with EIGRP protocol.

Open Shortest Path First (OSPF) is an adaptive tool to transfer routing information within a single autonomous system . The main purpose of using OSPF protocol is done where this protocol divide the domain of the network into two levels of areas where the root presents a level which is connected with the rest areas in the second level. OSPF protocol is a dynamic protocol that gives the network more stability and compatibility.

The second protocol which is used in this study is the Enhanced Interior Gateway Routing Protocol (EIGRP), it is a classless protocol. This protocol is widely used in enterprise networks considering that this protocol has many advantages; this protocol is IPv6 ready and it is provide a quick convergence times. there is an affective algorithm in EIGRP which is called Diffusing Update Algorithm (DUAL). This protocol controls the routing process by finding an alternative path for routers without waiting.

GNS3 simulator is a tool to obtain the results of the analysis by getting graphs for various network elements such as: time and no. of bit sent, switches, links and also the routers.

To make the simulation of EIGRP routers' efficiency has been considered main objective of research. There is the requirement to make simulation of details of source, destination, protocol, length of packet along with information part in case of cisco EIGRP. The other objective is that simulation must be efficient to indicate the packet steaming at several routers. Furthermore there is also the requirement to represent the details of source, destination, protocol, length of packet along with information part.

[2] BACKGROUND

A. Routing Information Protocol (RIP)

RIP is the first routing protocol implemented in the TCP/IP and uses the variants of the Bellman-Ford algorithm that was designed by Richard Bellman and Lester Ford in 1958. They perform three functions, discovering the neighbor router addresses, downloading of the routes, and updating the routing table and the cost associated with each route. The first RIP was designed in 1969; it has three versions RIPv1, RIPv2, and RIPng. The latest version of RIPv2 and RIPng works in IPV6 autonomous based systems. The implementation of the exchange of information through the User Datagram Protocol (UDP) and each router is limited to several routers in the network around it. The RIP applies a hop count mechanism to determine the optimal path for packet routing and a maximum of 16 hops is applied to avoid routing loops in the network.

B. Open Shortest Path First (OSPF)

OSPF is one of the widely used link state routing protocols. It operates by routing network packets by gathering link state information from neighboring routers thus, computing a map of the network. OSPF sends different messages, which include the hello messages, link state request, updates, and database description packets. OSPF operates with Dijkstra's algorithm, which focuses on the distribution of routing information in a

single autonomous system. There are different versions of OSPF; the first version was designed in 1989, which is known as OSPFv1 [published] in RFC 1131, in 1998 the second version OSPFv2 published in RFC 2328 and in 1999, the OSPFv3 is designed specifically to accommodate the IPv6 published in RFC 5340. OSPF calculations are computed periodically on the link state advertisement (LSA) received in the network and protocol information. A change in the topology is detected quickly; hence, it is fast, flexible, and scalable in terms of configuration parameters.

C. Enhanced Gateway Routing Protocol (EIGRP)

The Enhanced Gateway Routing Protocol is a hybrid routing protocol developed in 1994. EIGRP focuses on Classless Inter-Domain Routing/Variable length Subnet Mask, route summarization with discontinuous networks and supports load balancing across six routes to a single destination. The EIGRP is designed based on the DUAL (Diffusing Update Algorithm) algorithm and uses multicast for routing updates. The DUAL algorithm is used in obtaining route freedom every time throughout different routing computation and uses the reliable transport protocol to ensure the successful delivery of each packet .

[3] METHODOLOGY

A. GRAPHICAL NETWORK SIMULATOR 3 TOPOLOGY:

After the integration of new virtual machine with Graphical Network Simulator 3, the user will be capable to create the topologies. These topologies consist of recent virtual machine. Drag and drop the selected node or device to the Graphical Network Simulator 3 **Workspace**. After that an instance of the node has been made available in the **Workspace**. Drag and drop another node into the Graphical Network Simulator 3 **Workspace**. Here, a router has been added to Graphical Network Simulator 3 workspace. The availability of devices will rely on configuration of Graphical Network Simulator 3:
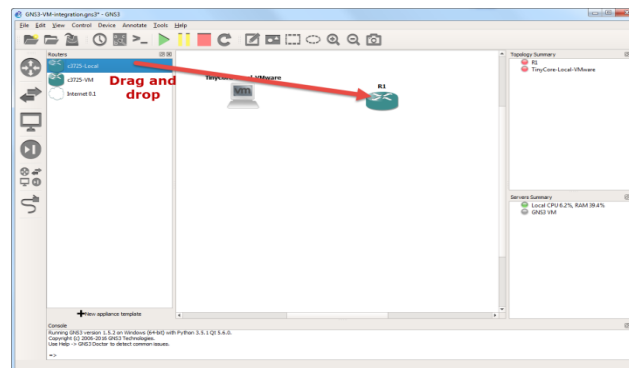

Fig1: drag and drop

The Add a Link button has been clicked in order to add the links to the topology. There will be changes in mouse cursor. The changes in mouse cursor indicate that the links are added. The click on VM device is made in the topology. This click is made to display the available interfaces. The user clicks on the interface. After that he chooses another device in the topology. It has been done to establish the connection of interface to Ethernet on Local-VMware. Along with this the link is also attached to Router. The user is ready to power on the network devices. So the user clicks the Start/Resume button on the Graphical Network Simulator 3 Toolbar. It has been done to start the network devices:
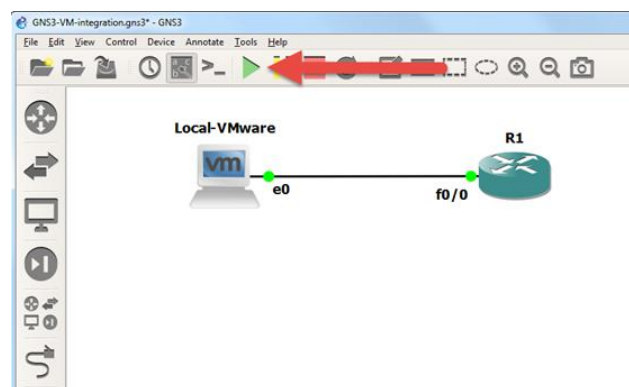

Fig 2 : Interface connectors

Graphical Network Simulator 3 indicates that the devices have been powered on. It has been done to turn the interface connectors from red to green:
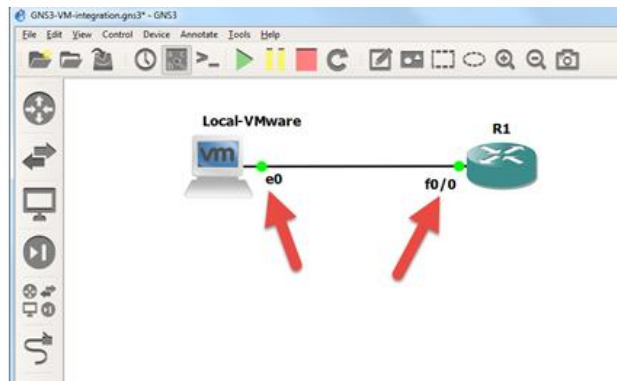

Fig 3: Console connect to all devices

If the user is ready to make configuration of his devices, he click on the Console connect to all devices button. This button is available on Graphical Network Simulator 3 Toolbar. This button is used to establish a connection to each device in topology:

In wireshark the simulation represent the details of source. It also indicates the destination, protocol and the length of packet along with information part in case of cisco EIGRP. The Simulation work represents the wireshark simulation of packet steaming at several routers. This work also indicates the details of source, destination, protocol, length of packet along with information part.

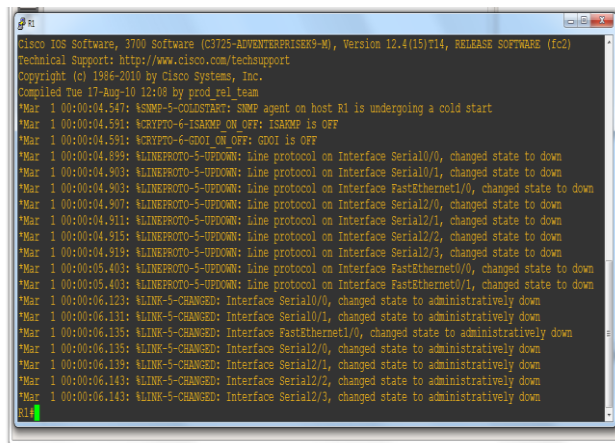A console connection has been established to router in topology:

Fig 4 : Wireshark

A Connection of router to the cloud has been made by proposed work. It has been done applying fast Ethernet connection. It has been indicated by below given figure.
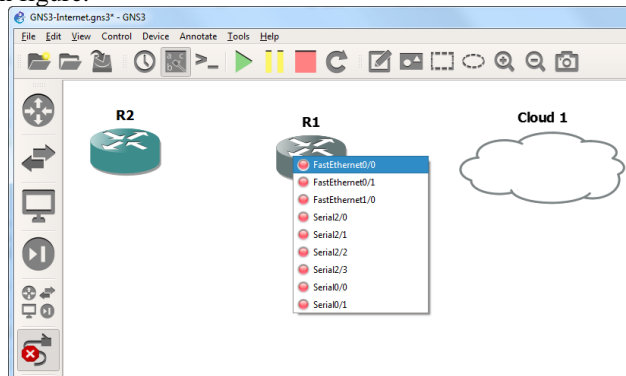

Fig 5 : router connected to the cloud

[4] RESULT AND DISCUSSION

A. Graphical Network Simulator (GNS3)

GNS3 is an open source software with no limitation of the number of devices that will be used in the environment. It mimics a real-time network scenario simulation for pre-deployment without the need for hardware. GNS3 comes with an inbuilt Wireshark for packet capturing and monitoring.

B. WIRESHARK

Wireshark is a powerful computer software used for network packet analyzer. The network packet analyzer verifies and captures network packets and displays comprehensive information of the packet data. Some useful features include capturing live packet data, displaying packets with detailed information, filter packets, search, and create various statistics about the packet data. In this work, Wireshark comes inbuilt with GNS3, making the capture of the packet data to be more realistic and effective than using extra hardware to capture the information of the packets. Wireshark is proposed ahead of other monitoring devices because it captures network failures, recovery, and jitter performance of the two protocols. Therefore, Wireshark is used in the hardware implementation and importantly, Wireshark does not require any external component for the capturing of packets

C. TOPOLOGY

The arrangement in following diagram is representing the connectivity of routers in GNS environment. The PC device is connected to switch and switch are connected to router. Multiple routers have been configured in multiple areas and these routers are connected to cloud.

The following Topology consist of following components

1. Switch
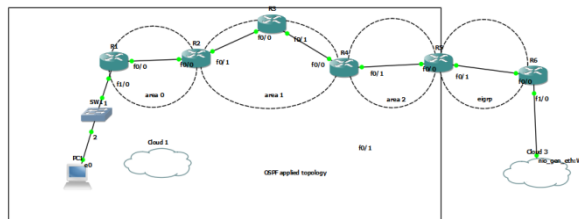2. Pc
3. Router
4. Cloud

Fig 6: Topology of router and cloud configuration

EIGRP tested with loopback adaptor

In wireshark the simulation represent the details of source, destination, protocol, length of packet along with information part in case of cisco EIGRP .
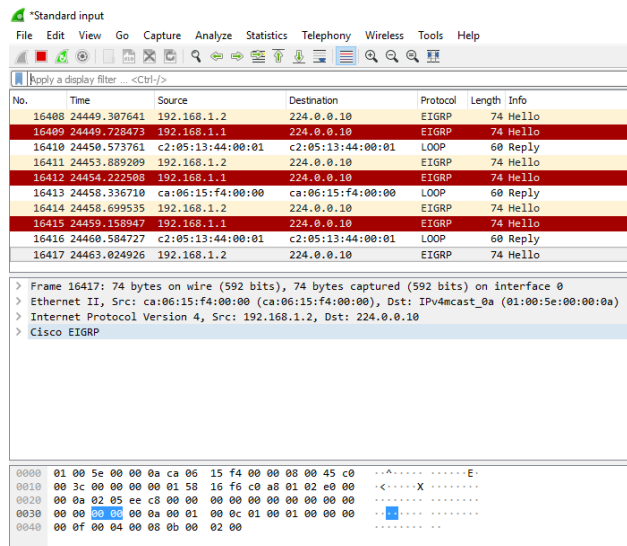

Fig 7: Wireshark simulation in case of EIGRP tested with loopback adaptor

D. **PACKET STREAMING**

Packet streaming at router1 to LAN topology

Following simulation is representing the wireshark simulation of packet steaming at router 1. In wireshark the simulation represent the details of source, destination, protocol, length of packet along with information part.
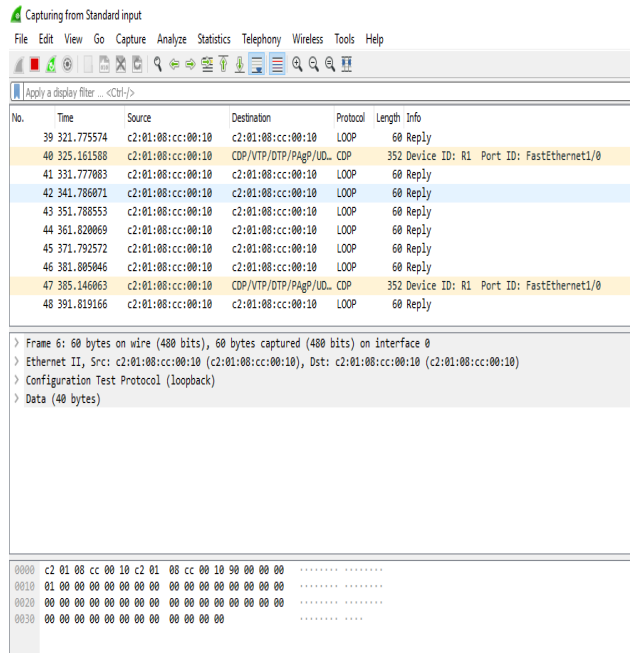

Fig 8: Packet streaming at router1 to LAN topology

E. **BIT SENT IN CASE OF OSPF AND EIGRP**

Number of bit sent	OSPF (per sec)	EIGRP (per sec)
5	0.042	0.025
10	0.044	0.027
15	0.046	0.029
20	0.048	0.031

Table 1 :In this table compare number of bit or data sent in which time from source node to target node.data flow in form of packets.

F. **Comparison of time taken in case of OSPF and EIGRP**

 In this graph comparison between the in which time ,number of bit sent or data transmission from sender workstation to receiver workstation.
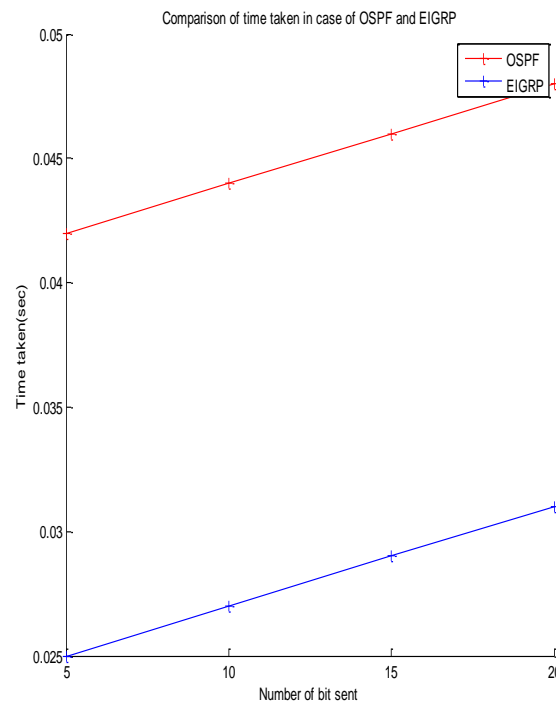
Fig 9: Time Taken(sec) ,Number of bit sent

[5] CONCLUSION

The simulation of network router is made in proposed work. It has been done in GNS3 environment. The Cisco site is used to download the router files. The topology has been formulated that considers the several fields. In every field, there are multiple routers and PC has been connected to the router. The router has been connected to cloud on other side. The configuration of Router has been made with IP configure command. The transmission of packets has been made among separate router. In wire shark, the data transmission is simulated. Arrangement has been made to represent the connectivity of routers in GNS environment. The PC device has been connected to switch and switch are connected to router. Multiple routers are configured in multiple areas and these routers are connected to cloud. Topology is consisting of components such as switch, Pc, Router, Cloud. This research would reduce the cost of simulation in networked environment. It would be easy to predict the cost of setup and the simulation would be capable to handle the technical issues related to research.

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