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Conference Paper · October 2018

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Design and Performance Investigation of Campus Area Network (CAN) Based on Different Routing Protocols

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Abstract

A Campus Area Network (CAN) can be characterized as a Local Area Network (LAN). Generally, it is a network which connects various entities of an office e.g. various infrastructural entities of a university campus. In this paper, it is designed a new CAN topology and analyzed the performance of CAN by considering Routing Information Protocol (RIP), Enhanced Interior Gateway Routing Protocol (EIGRP), and Open Shortest Path First (OSPF) routing protocols. The simulation results were analyzed with a performance comparison among these three routing protocols. It is found that the proposed design model reduces the cost from bandwidth perspective and also provides values for various network parameters which lead to better Quality of Service (QoS) in the CAN.

Keyword: Campus Area Network (CAN), Routing Information Protocol (RIP), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First (OSPF) and Quality of Service (QoS).

1. Introduction

Communication through the net has turn out to be the primary section of life. Transmission control protocol (TCP/IP) plays a vital role for the internet to connect with the worldwide network infrastructure [1]. The primary purpose of the TCP/IP is to set interconnection through specific networks. The massive advantage of interconnection of the system was to build communication links between hosts of different networks, even divided by significant geographic areas as in [1] Protocol loads has normally based on OSI model for TCP/IP version. In network layer, the internet can have seen as a collection of sub networks. The Internet link has accomplished by using Internet Protocol. Routing Protocols invent the mechanism by which routers find the information on the state of the network topology [1] Routing is a process to find out the best route for transmission of data packets to the destination and main aim of routing protocol is to share network information between participated routers.

Campus area network is a computer based network created by interconnection of Local area network in limited area. Now a day's rapid advancement happens in recent technology, like that campus area network is one of them. Purpose of campus area network is to share the information of one network with other network and working with together. Infrastructure of CAN is based on the technologies of Local area networks but interconnected between the multiple buildings at the particular location. [1] In university campus there are various departments and they follow same infrastructure. As a result when one message has sent by one department, can be accessed by other departments. Campus Area Network is a lucrative, profitable and easily accomplish in the locality. It can play an emergent role for the campus area to get better data speed [3]

2. Protocol Concept

2.1 Routing Information Protocol (RIP)

RIP is a dynamic routing protocol. It is also known as the distance-vector routing protocol. By using distance-vector routing protocol routers can maintain a routing table. This routing table helps to find the distance of the destination. When router updates routing table, then it sends information towards the adjacent router. In this protocol routing loop prevented by implementing the limit in the hop counting. [2] Traffic consumption of RIP routing protocol is more that's why it has used a small system [4].

2.2 Enhanced Interior Gateway Routing Protocol (EIGRP)

EIGRP is a distance vector routing protocol which has used in the network topology for automating routing decisions and configuration purposes. It is used on the router to share packets with other routers through the autonomous system. In the topology, router contains a routing table which helps to forward the traffic into the network. Hop counting of the EIGRP routing protocol is 255 which constraint the size of the system under this number [2].

2.3 Open Shortest Path Fast (OSPF)

OSPF is another routing protocol which also used network topology. This routing protocol always updates its routing table that's why it is called link state routing algorithm. The central principle of OSPF is to find out the shortest path to reach the packets into destinations. To find the quickest way it follows an algorithm which known as Dijkstra's algorithm. OSPF uses a data table to update its routing table. When OSPF is deployed in a network, it can define a number which is called process id. It does not use transport protocol but encapsulates its data in packets [2].

2.4 Quality of Service (QOS)

It is the assessment of the overall performance of a computer network. In here assessment seen the user particularly. Some prospects are related to this assessment process such as packet loss, bit rate, transmission delay, etc. In networking point of view quality of service refers to traffic prioritization rather than the achieved quality of service. QOS provides different precedence to the mixed petition. [5]

3. Simulated Network Topology

In this paper, we have used GNS3 Simulator and Wire shark a real-time simulator specifically designed for network design and analysis.[4] Here we compare this model when we have established a new campus network efficient protocol. In this model whole campus network connected by only one optical connection and here we are using the router for routing. We are also Ethernet switch for this entire connecting network each other

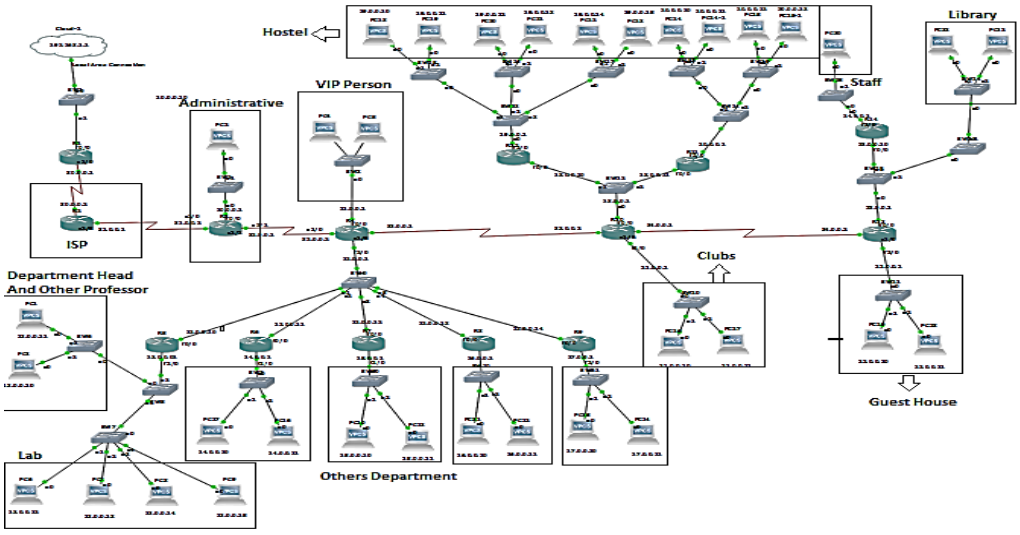

Fig. 1. Campus Area Network (CAN) topology (GNS3).

4. Results and Discussion

On this network, system separated by different section look like Administrative, different department, Hostel and guest house, etc. Here we are using Quality of Service in this network that why campus authority and another essential person always get speedy internet connection and communication each other without lagging.

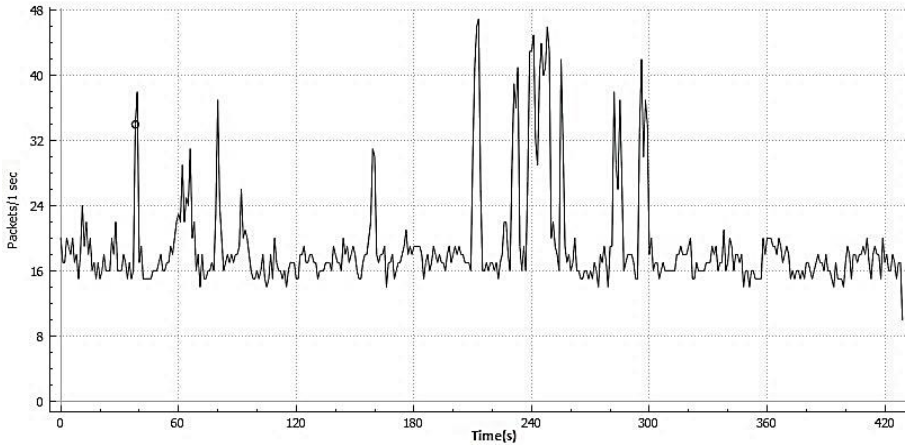

Fig 2: Packets/1sec VS Time for RIP (Wireshark).

Simulated time set to five minutes for transferring packets between LAN's and server RIP, EIGRP and OSPF scenarios. Average data end to end delay for routing information protocol shown in Fig. 2. Here we see that for RIP protocol it take too much delay for sending data/packets. It less efficient compared with OSPF and EIGRP. OSPF and EIGRP both have batter route.

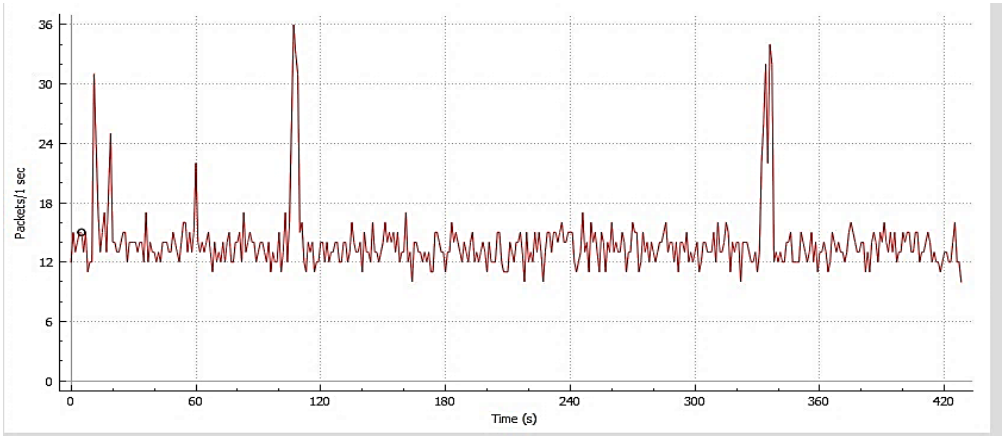

Fig 3: Packets/1sec VS Time for OSPF (Wireshark).

On the others hand, OSPF is better than RIP because OSPF takes less end to end delay in sending data/packets. But OSPF packet/1sec lower than RIP. Average data end to end delay for OSPF show in Fig.3.

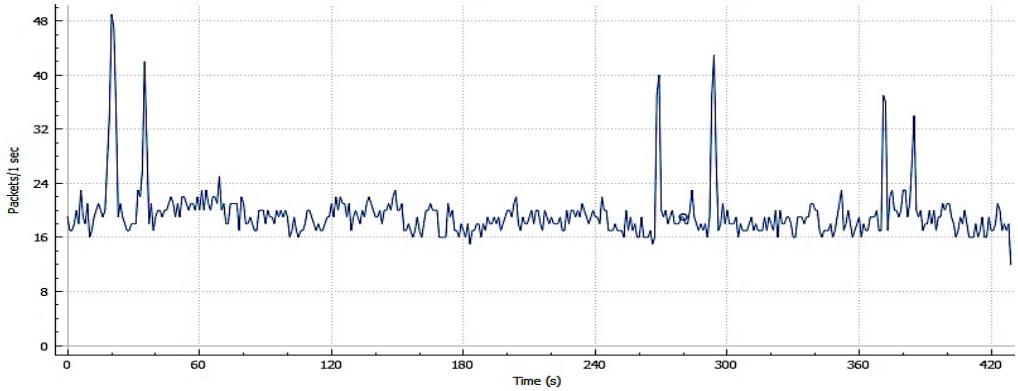

Fig. 4. Packets/1sec VS Time for EIGRP (Wireshark).

EIGRP Performance better than RIP and OSPF Protocol. EIGRP has the characteristics of distance vector, and it has link state protocol. For using DUAL mechanism and hello packets send for discovering the neighbor. So EIGRP takes less end to end delay time than RIP and OSPF routing protocol, and another advantage is EIGRP has is low packets/1sec. Comparison of RIP, OSPF and EIGRP routing protocol shown in Fig.5.

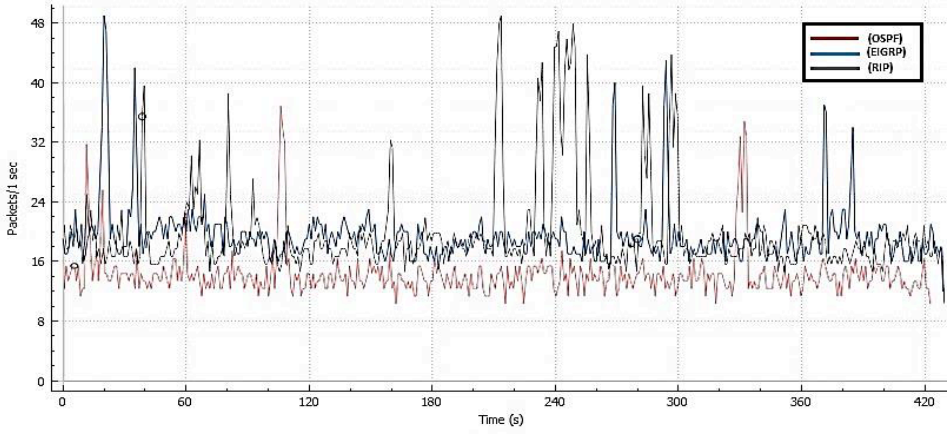

Fig 5: Packets/1sec VS Time for (RIP, OSPF & EIGRP) (Wireshark)

Different types of routing protocol time response were analyzed. Here we see that EIGRP take less time to sending data. But RIP and OSPF both of them make too much for transmitting data that why for RIP and OSPF data speed lower than EIGRP. Here Different types of router time response in table 1.

Table 1: Comparison of time responses among RIP, OSPF and EIGRP Protocols (ms)

Data Sample	RIP (ms)	OSPF (ms)	EIGRP (ms)
Sending data -1	0	0	0
Sending data -2	58.003	59.005	59.003
Sending data -3	69.004	70.003	59.004
Sending data -4	69.004	70.005	49.003
Sending data -5	60.004	70.005	69.004

5. Conclusion

The limitation of Distance Vector algorithm is that it relies on the network size in case of deciding the best path of the given topology. On the contrary, the RIP has some benefits which are consists of simplicity and flexibility. We have demonstrated that in network convergence performance, EIGRP provides the best convergence duration. EIGRP also provides better recovery performance when the link failure occurs. In addition EIGRP is more reliable for real-time applications. On the other hand, OSPF provides better security and multipath facilities. But OSPF convergence duration is not better than EIGRP. This reflects that OSPF protocol is not well suited for CAN. Quality of service (QoS) is also employed in the CAN which results in better service for network systems due to the better performance of EIGRP.

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