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A Comparative Study of Application Traffic over MPLS Communication Networks and Traditional IP Model

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Abstract: ***Due the rapid revolutions in the network technology IP applications one of this MPLS (Multiprotocol Label Switching) is a new mechanism forward packet MPLS provides faster data streaming in the network, The one of the feature of MPLS is called Traffic Engineering, its which plays a primary role for reduce the congestion by effective by find the alternative paths and management of the network resources. MPLS technology provides it more suitable for design real-time applications such as video Conferencing and VoIP.***

Keywords: MPLS, IP, OSPF, VOIP, TE

1. Introduction

Multi-Protocol Label Switching (MPLS) is a switching technology that regulates data traffic and packet forwarding in a complex network [1]. A connection-oriented methodology that traverses packets from source to destination node across networks is what it does for fast packet transmission. It has the feature of encompassing packets in the presence different network protocols. [5], MPLS supports many of Internet Protocol versions (IPv6 and IPv4), AppleTalk at Layer3, IPX, Ethernet, Asynchronous Transfer Mode (ATM), Fiber Distributed Data Interface (FDDI), and PPP (Point to Point Protocol) at Layer 2, Frame Relay, it is referred as "Layer 2.5 protocol".[2]

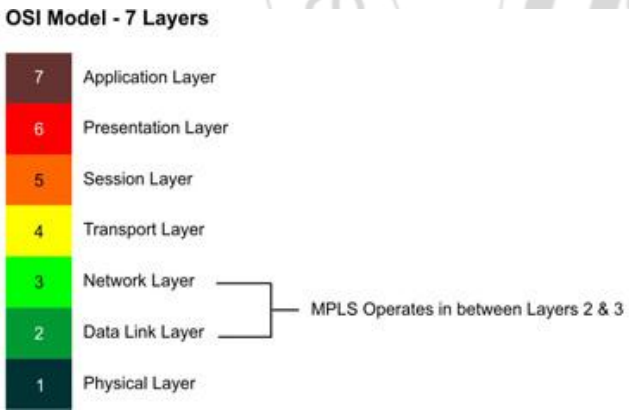

Figure 1: Show MPLS in OSI Model

1.1 Multiprotocol Label Switching Architecture

MPLS it has two main major element have to be introduced:

- **Control plane**: responsible from the label exchange and routing information exchange between routers.[3]
- **Data plane:** responsible from forwarding information based on destination label or address. MPLS Support different routing protocols such as IGRP, EIGRP, OSPF, BGP that can be used in the control plane.[3]

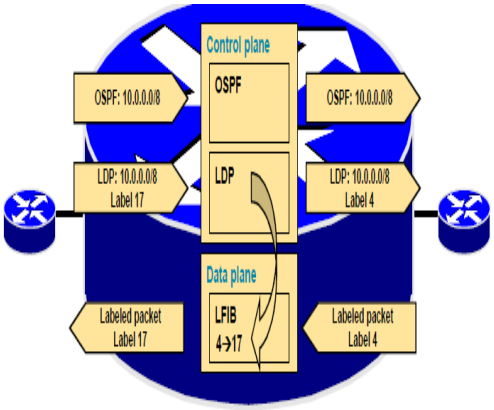

Figure 2: Show MPLS architecture

1.2 Traditional IP Routing

IP (Internet Protocol)allows a global network among to connect different system transmission media [2].The IP was created as a connectionless network layer protocol that makes no attempt to discriminate between various application types [5]. The main function of IP is to send the data from the source to destination. Data is constructed as a series of packets. All the packets are routed through a chain of routers and multiple networks to reach the destination. In the Internet, router takes independent decision on each incoming packet. When a packet arrives at a router, the router has to consult its routing table to find the next hop for that packet based on the packets destination address in the packets IP header (longest match prefix lookup)[1][2].To build routing tables each router runs IP routing protocols like Border Gateway Protocol (BGP), Open Shortest Path First (OSPF) or Intermediate System-to-Intermediate System (EGRP). When a packet traverses through the network, each router performs the same steps of finding the next hop for the packet until it reach the destination [4].

2. Methodology

We are use OPNET 14.0 to design the network as shown in Fig.3 and Fig. 4 for both MPLS and traditional networks. The simulations content of two scenarios with consider the same network design. Scenario A on the basic of IP network. Scenario B content the basic of MPLS configuration

network. The results from those simulation we are used for compare between the two networks and each client use FTP and VOIP

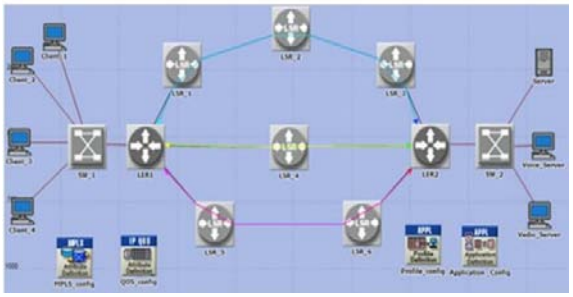

Figure 3: Scenario A

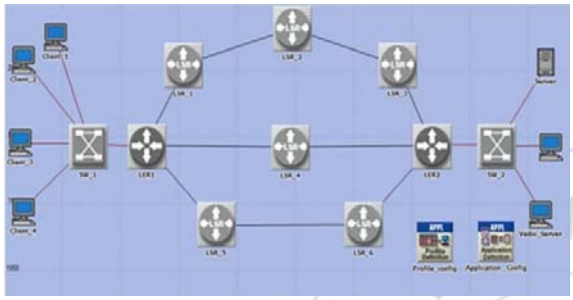

Figure 4: Scenario B

For any scenario the duration of the simulation running is 400 seconds. The data stream and traffic starts at the 150th second and ends at the 400 second of the simulation time.The FTP (File Transfer Protocol) and VOIP (Voice over IP) traffic is created in a path that each flow of the traffic can be aggregated.

3. Result

We are compare performance of IP model networks and MPLS. We used in both network Different variables, End-to-End Delay, FTP Response Time, Packet Send and Receive. For all the above parameters,traditional IP network model worse than MPLS performance. In the case of network congestion, the better performance for MPLS is more stable with network heavy load.

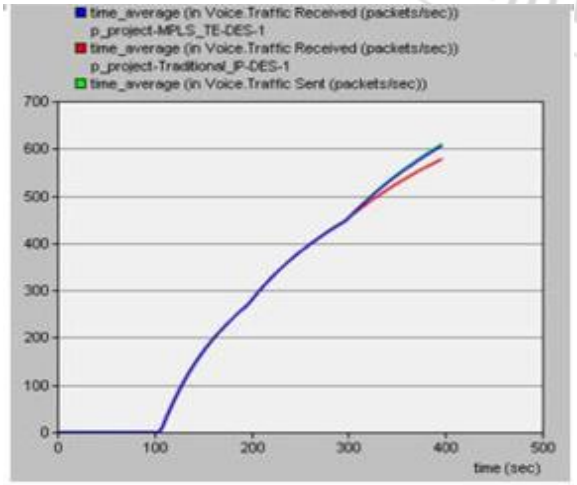

Figure 4: Voice Packet Send and Received

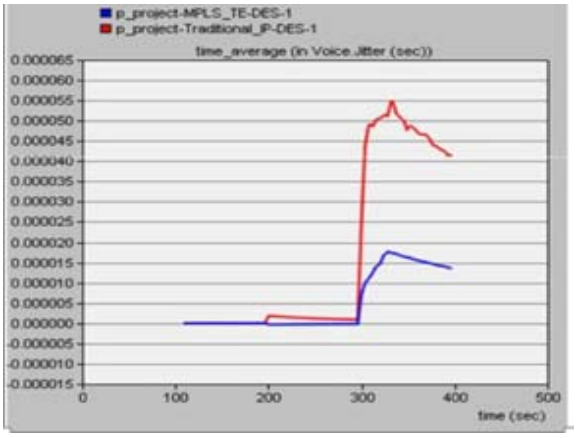

Figure 5: Voice Jitter

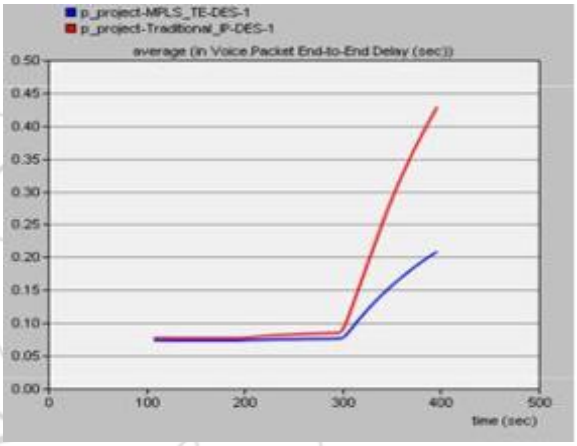

Figure 6: voice packet end to end

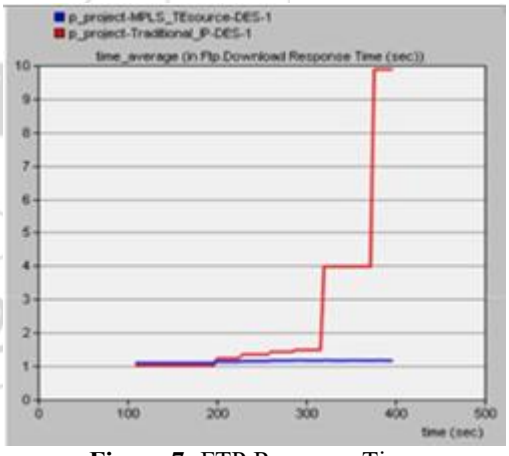

Figure 7: FTP Response Time

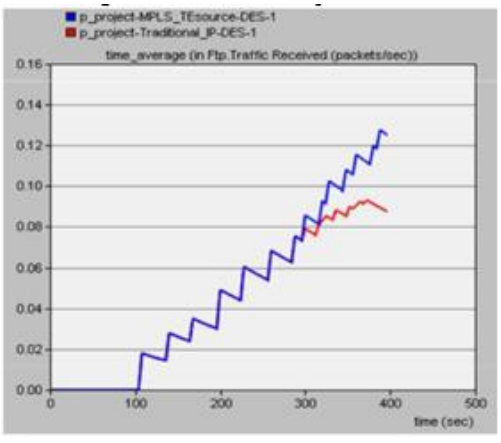

Figure 8: FTP Data receive

Figure.4 give the average number of packets sent and received in both traditional IP and MPLS and networks for voice. The end to end delay of voice traffics are given in Fig. 6. The IP model in the case of worst network load (heavy) MPLS had lower delay and it is clear the Standard delay variation was around (30-50) MSIn ITU[3].The FTP response time in figure 7 traditional IP network model higher than MPLS, the average of packet received in figure 8the traditional IP worse than MPLS is more better.

4. Conclusion

The aim of this study was to examine performance analysis of MPLS and traditional IP network respect network of non-real-time application as FTP (file transfer protocol) and real-time application like VoIP (voice over IP) Based on the results from the simulation it can be concluded MPLS is provide best solutions with congestion network or heavy load compared with traditional IP networks, MPLS It represents the best solution for ISPs provide flexibility to reroute traffic around link or node failures Bottlenecks ,congestion high speed networking. However, integrity, origin authentication data confidentiality, in MPLS networks are still primary security issues under study by many research groups.

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