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Evaluatingthe Performance of MPLS Technology Using Voice and DataType Traffic over Conventional Network

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Abstract: **MPLS (Multiprotocol Label Switching) is a new technology for increasing the network speed, Quality of service, scalability and performance. This paper describes the advantage of MPLS over conventional network and also analyzes the impact of MPLS over conventional network using NS-2. MPLS used to combine the advantages of layer 3 and layer 2 of OSI model, it transmits the packet on the basis of label. MPLS supports the traffic engineering and fast re-routing. The paper shows that MPLS performs better on the basis of some essential parameter.**

Keywords:MPLS, NS-2, LDP, IP, FTP, voice, data.

I. Introduction

MPLS termed as Multi-Protocol label switching introduced by IETF. MPLS refers to the group of packet switching network and basically designed for gain control to the drawback of conventional IP forwarding [2]. There is a several drawbacks in Conventional IP network that every node has take an independent routing decisions for every incoming packet, this task increases the network complexity. IP network does not consider capacity constraints and also does not consider the traffic characteristics so that congestion increases in the network. Each router of Conventional network must process every packet to determine the next hop that the packet must take to reach its final destination. There is a poor support of traffic engineering in this network. MPLS overcome the all such drawbacks it supports the concept of traffic engineering also the routing decision is very simple i.e. in MPLS only edge routers fully process each packet and also it uses the label for forwarding the packet. Label switches within the network simply forwards packet based on the label. This decreases latency experienced by conventional routed network performing standard IP routing. MPLS is work between layer 2 and layer 3 of OSI reference model [3].

II. Overview of MPLS

The MPLS header contains the four fields which are shown in the figure:

20 bits	3 bits	1 bit	8 bits
Label	COS	S	TTL

Figure 1: MPLS Header Format

1. LABEL: The actual value of MPLS label is in label field which is of 20 bits.
2. CLASS OF SERVICE (COS): COS is a 3 bit field, it affects the discard algorithm and queuing algorithm which is applied on the packet when it is transmitted to the network.
3. STACK FIELD (S): It is a one bit field supports a hierarchical label stack. Packet with empty label stack is treated as unlabeled packet. Bottom level packet is labeled as label 1.
4. TIME TO LIVE (TTL): It provides the conventional IP TTL functionality. The packet is discarded when the TTL of the packet is 0; it prevents the looping of unwanted packets in the network. When any labeled packet traverses a LSR the label TTL value is decremented by one [4].

MPLS has two main parts known as Control Plane and Data Plane. Control plane responsible for IP Routing Protocols, IP routing table (RIB) and Label information base (LIB) while data plane is responsible for Forwarding Information Base (FIB) and Label Forwarding Information Base (LFIB). All the routing decisions are made by label distribution protocol (LDP), Resource Reservation protocol (RSVP) and constrained based LDP (CR-LDP). A LDP is a set of procedures by which one LSR informs other to the label binding it has made [1]. The MPLS domain is created via Label Switch Routers (LSRs) and Label Edge Routers (LERs). The starting node (LER) of MPLS is called as Ingress node and the last node (LER) of PLS is termed as Egress node. The node between the MPLS domain is called as Label Switch Routers (LSRs) [5].

III. EXPERIMENTAL SETUP

This research proposed an environment to evaluate the impact of MPLS technology on voice and text then compare it with conventional network. The parameter used in this research is Average throughput, total number of packet loss and packet loss rate. The design used in this research includes 12 nodes which are treated as network. Two subtests have been applied on both the network with the help of two applications. Firstly the same subtest with same application has been applied over conventional network, after that imposed the MPLS technology and then again performs the same subtest with same application and measures the average throughput, total number of packet received and packet loss rate to evaluate the impact of MPLS technology over conventional network.

IV. SIMULATION TOOL

Network simulator (NS) version 2.35 is used for this research which is open source software, freely available on the internet. It came out in 1989.It is an event driven simulation tool; provide support for simulation of protocols (TCP, UDP), routing and multicast protocol over wired and wireless network. It helps to analyze the dynamic nature of communication network. Basically provide the way for specifying protocols and simulating their corresponding behavior. For the reason of flexibity and modular nature of NS2 it gains a big popularity in the field of networking research.

A. NS-2 ARCHITECTURE: The network simulator 2 is a discrete event network simulator developed at UC Berkeley that focuses on the simulation of IP networks on the packet level. The NS project (the project that drives the development of NS) is now part of the Virtual Inter Network Testbed (VINT) project that develops tools for network simulation research. The simulator consist of two main languages i.e. C++ and Object oriented Tool Command Language (OTCL). Both languages are linked using TCL command language (TclCL). Figure 2 describes the architecture of NS-2.

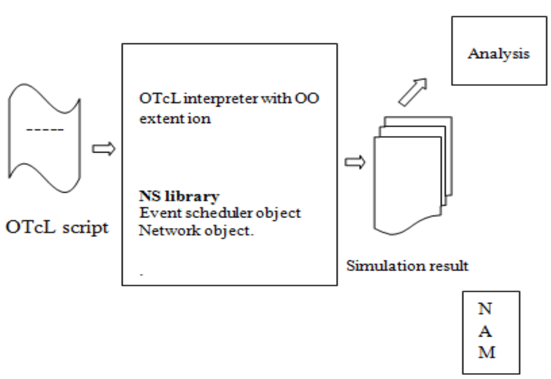

Figure 2: Architecture of NS-2.

C++ defines the internal mechanism (backend) of the simulation object while OTcL sets up simulation by configuring as well as assembling the objects and also scheduling discrete events (frontend). NS-2 provides users with executable command NS, which takes an input argument. Users are feeding the name of a TCL simulation script as an input argument of NS-2 executable command ns. To plot a graph and for creating an animation a simulation trace file is created. The output is either a text based or an animation based. To interpret these result graphically such tools are also available i.e. Network Animator (NAM) and XGraph.

V. TOPOLOGY USED

The network topology which is used here is shown in figure 3. In conventional network all links are setup as duplex manner with 10 ms propagation delay also use a drop tail queuing system that serve packets on a First Come First Serve (FCFS) basis. While applying the MPLS technology every links are configured as duplex with the same propagation delay i.e. 10 ms. Two types of bandwidth are set, some links are set to 2 mbps and some are set to 4 mbps as shown in figure 3.

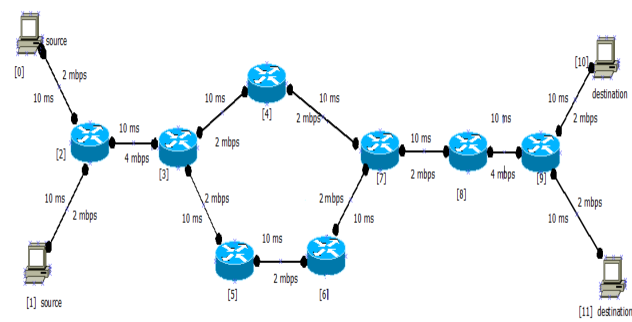

Figure 3: Network Topology

VI. METHODOLOGY & RESULT

A. For Simulating the Voice: In this research, we have simulate the voice traffic using the Pareto On/Off Traffic Generator (POO Traffic) it is a traffic generator integrated in the Object oriented Tool command language class (OTcL) Application/Traffic/Pareto of NS-2. The important point which is to be mentioned here are all the traffic is generated randomly. All the packets are sent on ON period at a fixed rate and also no packets are sent on OFF period. With the help of Pareto distribution both on and off times are taken. Here, two POO traffic generators are used on two User Datagram Protocol (UDP) connections. The first Pareto generator's source is attached to Node 0 and its destination is Node 11; and the second Pareto generator's is attached to Node 1 and its destination is Node 10.

Performance of Conventional network and MPLS network in voice scenario on basis of Average throughput is shown in figure 4.MPLS network performed better than Conventional network due to the functionality of MPLS is to utilize all the paths which move towards destination. Conventional network reached its steady state, at when the path (2_3_4_7_8_9) is saturated and after that it starts to drop the packet. While MPLS network reached its steady state when both the path (2_3_5_6_7_8_9) and (2_3_4_7_8_9) are saturated thus it performs better as compared to conventional network. Packet loss rate for both MPLS network and Conventional network for voice is shown in table 1.It seems that packet loss rate is less in MPLS scenario.

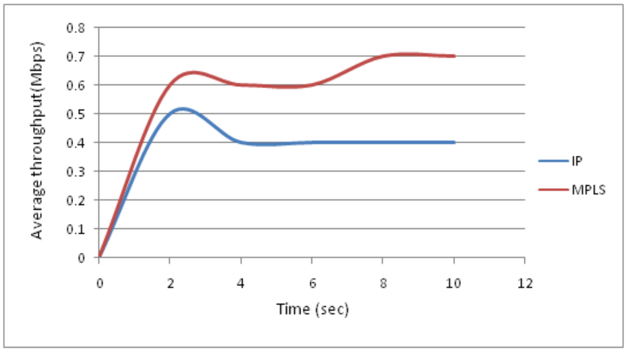

Figure4: Performance of IP and MPLS network in voice scenario

Table 1: Packet loss rate for conventional network and MPLS network in voice scenario

NETWORK	IP	MPLS
Simulation time	20 sec	20 sec
No. of packet send	20362	26630
No. of packet drop	780	530
No. of packet received	19582	26100
Packet loss rate	3.83	1.99

B. For Simulating the Data: In this research, for evaluating the impact of MPLS and Conventional network over the text, two FTP traffic generators is used on two TCP connections. All the traffics are generated randomly. The first FTP traffic generator source is attached to Node 0 and its destination was Node 11; whether the second was attached to Node 1 and its destination was Node 10.

Performance of Conventional network and MPLS network in this scenario is shown in on the basis of Average throughput is shown in figure 5,MPLS network performed better than Conventional network due to the functionality of MPLS is to utilize all the paths which move towards destination, figure 5 describes conventional network starts dropping the packet at 0.6 Mbps whereas MPLS drops the packet at 1.0 Mbps. Conventional network reached its steady state, at when the path (2_3_4_7_8_9) is saturated or congested and after that it starts to drop the packet. While the MPLS network reached its steady state when both the paths (2_3_5_6_7_8_9) and (2_3_4_7_8_9) are saturated so that it performs better as compared to conventional network. Packet loss rate for both MPLS network and Conventional network for text is shown in table 2. It is clearly visible that packet loss rate in MPLS network is less as compared to conventional network.

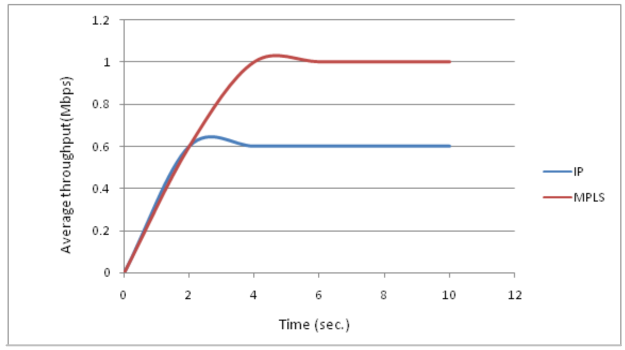

Figure 5: Performance of IP and MPLS network for data

Table 2: Packet loss rate for conventional network and MPLS network in text scenario

Network Type	IP	MPLS
Simulation time	20 sec.	20 sec.
Total no. of packet sent	7212	14343
Total no. of packet received	7112	14283
Total no. of packet dropped	100	60
Packet loss rate	1.38	0.41

VII. Conclusion

The paper performs the analysis of conventional and MPLS network and also shows the importance of MPLS technology for voice and data traffic, Network topology and all the parameters which is necessary for simulation is same. The final results have been obtained after the simulation of NS-2. The graphs clearly examine the average throughput for both the scenarios and the table indicates the behavior of packet which is obtained for examine the trace file and hence calculates the packet loss rate. After study the all results it is clearly stated that MPLS performs better than conventional network.

Reference

[1] E. Rosen, A. Viswanathan, and R. Callon ,*Multiprotocol Label Switching Architecture*, RFC 3031, January 2001.
[2] R.N.Pise et. al., " Packet Forwarding with Multiprotocol Label Switching" World Academy of Science, Engineering and Technology 12 2007.
[3] Abinaiya N, Mrs J Jayageetha" A survey on MPLS" IJTEEE 01, 2015.
[4] Ahn, Gaeil, and Woojik Chun. "Design and implementation of MPLS network simulator supporting LDP and CR-LDP." Proceedings.IEEE International Conference on.IEEE, 2000.
[5] Liwen He, SM IEEE, Paul. Botham, "Pure MPLS Technology", © 2008 IEEE.

