

# Implementation of Traffic Engineering In MPLS Using Resource Reservation Protocol

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**ABSTRACT:** Multiprotocol Label Switching (MPLS) has evolved from being a buzzword in the networking industry to a widely deployed technology in service provider (SP) networks. MPLS is a contemporary solution to address a multitude of problems faced by present-day networks: speed, scalability, quality of service (QoS) management, and traffic engineering. Service providers are realizing larger revenues by the implementation of service models based on the flexibility and value added services provided by MPLS solutions. MPLS also provides an elegant solution to satisfy the bandwidth management and service requirements for next-generation IP-based backbone networks. Traffic Engineering is the process of steering traffic across to the backbone to facilitate efficient use of available bandwidth between a pair of routers. TE with IP was mostly implemented by manipulation of interface cost when multiple paths existed between two endpoints in the network. MPLS uses extensions to a link-state based Interior Gateway Protocol (IGP), such as Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF). MPLS calculates TE tunnels at the LSP head based on required and available resources (constraint-based routing MPLS TE automatically establishes and maintains the LSPs across the MPLS network by using the Resource Reservation Protocol (RSVP).

**KEYWORDS:** traffic engineering, MPLS, resource reservation protocol, service providers.

## I. INTRODUCTION

The modern networks are compact networks; they carry voice, video and normal data by using the same network resources. Since some user data traffics such as voice, video or bank transactions are more important and are less tolerant to delay; they are treated based on their delivery requirements such as bandwidth and maximum affordable delay. As per the large number of internet users and various data traffic types, Internet Service Providers (ISP) face a challenge in the form of Traffic Engineering. MPLS Traffic Engineering is an application of MPLS which gives network to use all the available links in the network comfortably. MPLS provides a proper approach to divert network traffic from a crowded part of the network to a non-crowded part. In traditional IP networks, Links which are less used was a major issue in which one best route was over used for heavy network traffic and the other routes were less used which results in wastage of bandwidth. MPLS TE lets us to manage the traffic the way we want not the way the routing protocol wants. It was not possible with traditional IP networks. Since Traditional IP network forwards all the traffic on the shortest path calculated by the SPF algorithm; it doesn't consider non-shortest paths for sending traffic apart from the availability of bandwidth links. MPLS TE lets us create LSP (Label Switching Path) tunnels at the non-shortest paths that satisfy the bandwidth requirements in such a way that we can map traffic to these LSP tunnels to gain the bandwidth. Multi-Protocol: Masks a data packet and put an MPLS header in front of the packet. Label Switching: MPLS header includes a label and switches Labels between MPLS capable routers. Multiprotocol Label Switching (MPLS) directs data from one node to the next based on labels rather than long IP addresses, which avoids complex lookups in a routing table.

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## II. PROPOSED WORK

WAN connections are an expensive item in an ISP budget. Traffic engineering enables ISPs to route network traffic to offer the best service to their users in terms of throughput and delay. By making the service provider more efficient, traffic engineering reduces the cost of the network.

Currently, some ISPs base their services on an overlay model. In the overlay model, transmission facilities are managed by Layer 2 switching. The routers see only a fully meshed virtual topology, making most destinations appear one hop away.

If you use the explicit Layer 2 transit layer, you can precisely control the ways in which traffic uses available bandwidth. However, the overlay model

has a number of disadvantages. MPLS traffic engineering provides a way to achieve the same traffic engineering benefits of the overlay model without needing to run a separate network, and without needing a non-scalable, full mesh of router interconnects.

Existing Cisco IOS software releases contains a set of features that enable elementary traffic engineering capabilities. Specifically, you can create static routes and control dynamic routes through the manipulation of link state metrics. This functionality is useful in some tactical situations, but is insufficient for all the traffic engineering needs of ISPs.

MPLS is an integration of Layer 2 and Layer 3 technologies. By making traditional Layer 2 features available to Layer 3, MPLS enables traffic engineering. Thus, you can offer in a one-tier network what now can be achieved only by overlaying a Layer 3 network on a Layer 2 network.

MPLS traffic engineering automatically establishes and maintains LSPs across the backbone, using RSVP. The path used by a given LSP at any point in time is determined based on the LSP resource requirements and network resources, such as bandwidth. Available resources are flooded via extensions to a link-state based Interior Gateway Protocol (IGP).

Paths for LSPs are calculated at the LSP head based on a fit between required and available resources (constraint-based routing). The IGP automatically routes the traffic onto these LSPs.

Typically, a packet crossing the MPLS traffic engineering backbone travels on a single LSP that connects the ingress point to the egress point

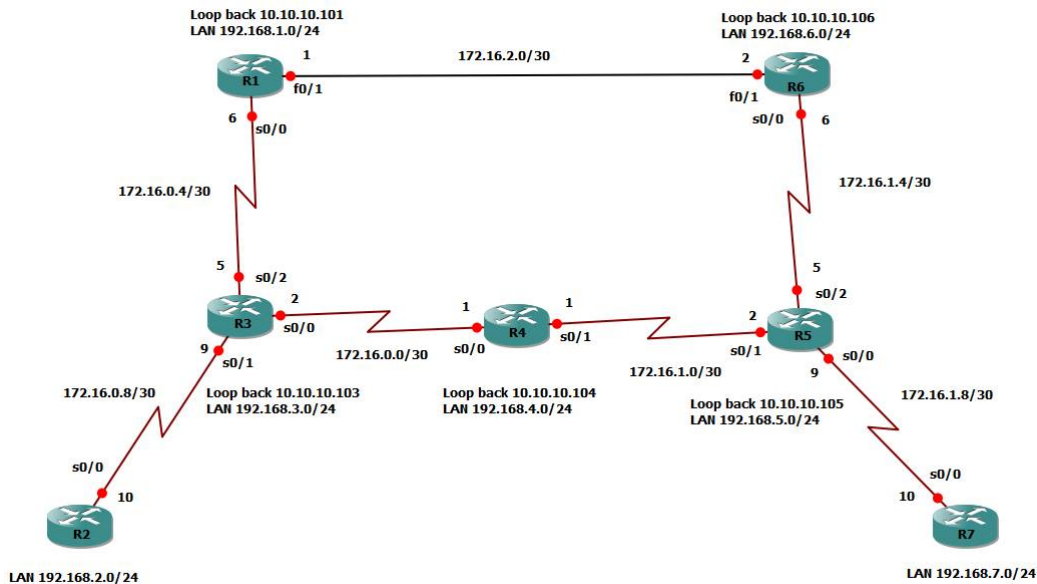


Fig 1: MPLS Routing with RSVP

### III. SOFTWARE USED

GNS3 is Graphical Network Simulator. The software is used to define the bandwidth, latency and lose of wide-area networks to test the performance of applications in the lab. It is a network software emulator first released in 2008. It allows the combination of virtual and real devices, used to simulate complex networks. It uses dynamics emulation software to simulate Cisco IOS .

This software is used by many large companies including Exxon, WALMART, AT&T and NASA and also popular for preparation of network professional certification exams.

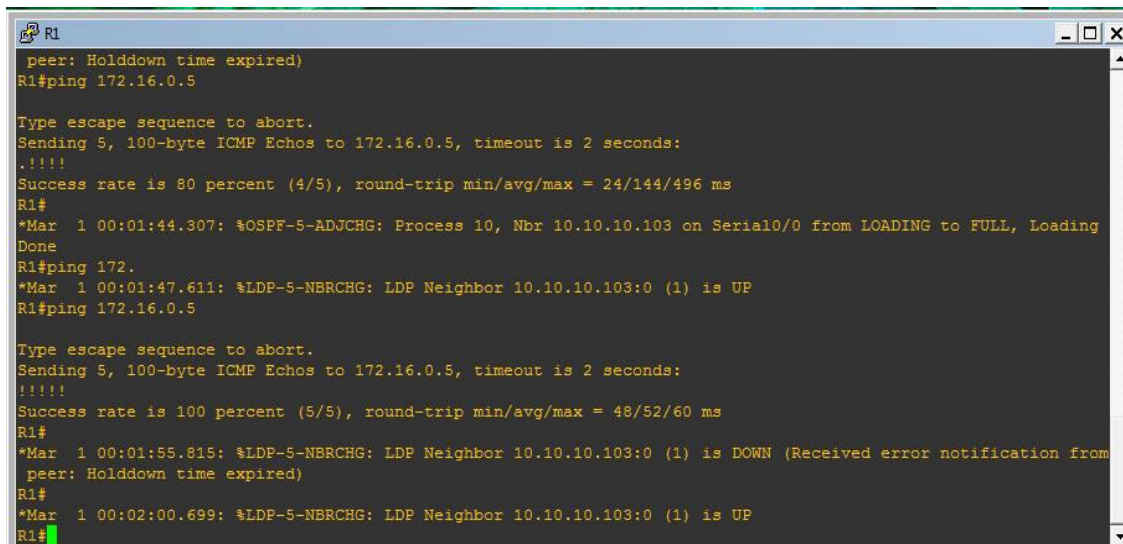
This allows to visualize, plan, test and troubleshoot network environments across any vendor platform at scale. They join world’s largest community of network professionals who rely on GNS# to build better networks, share ideas and make connections. This makes it possible for anyone to quickly and easily spin up network hardware for testing and educational purposes without the heavy expense of physical hardware.

Almost always there are commands or parameters that are not supported when working on a practice lab. In these simulators you are only seeing a representation of the output of a simulator router. The accuracy of the representation is as only as good as the developer makes it. The GNS3 you are running a actual cisco IOS so you will see exactly what the IOS produces and will have access to any command or parameter supported by the IOS.

In addition,GNS3 is an open source free program to use .However to licensing restrictions ,using there is a need to provide CISCO IOS to use with GNS3.

Also GNS3 will provide around thousand packets per seconds,throughput ia a virtual environment .A normal router will provide a hundred to thousand time greater throughput .Through GNS3 does not take the place of the real router,its not meant to be a tool for learning and testing in a LAB environment.Using GNS3 in anyother way would be considered improper.

#### IV. RESULTS



```
R1
peer: Holddown time expired)
R1#ping 172.16.0.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.5, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 24/144/496 ms
R1#
*Mar 1 00:01:44.307: %OSPF-5-ADJCHG: Process 10, Nbr 10.10.10.103 on Serial0/0 from LOADING to FULL, Loading Done
R1#ping 172.
*Mar 1 00:01:47.611: %LDP-5-NBRCHG: LDP Neighbor 10.10.10.103:0 (1) is UP
R1#ping 172.16.0.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.5, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 48/52/60 ms
R1#
*Mar 1 00:01:55.815: %LDP-5-NBRCHG: LDP Neighbor 10.10.10.103:0 (1) is DOWN (Received error notification from
peer: Holddown time expired)
R1#
*Mar 1 00:02:00.699: %LDP-5-NBRCHG: LDP Neighbor 10.10.10.103:0 (1) is UP
R1#
```

Pinging from routers to routers for the purpose of transmission of messages through the frame packets present in the IPV6.

These processes is repeated for all the routers present in the method.

They are present to transmit the certain messages and information from routers to routers or from the frame packets to frame packets.

#### V. CONCLUSION

MPLS simplifies the network infrastructure by allowing the improvement of multiple technologies and applications such as voice, video and data. MPLS provides enhanced security & high availability through the above-mentioned theories & analysis we can see that the MPLS is faster than traditional routing technique. If we can improve hardware facilities and software platform by real-time routers then we can notice the significant difference. Also in a certain event of a network link failure when recovery mechanisms are in use at the IP layer, reinstallation takes several seconds which are unacceptable for real-time application. So Fast Reroute concept in MPLS meets the requirements of real-time application with fast recovery.

Continuing advances in technology will result in changes in the way traffic engineering is performed in the Internet. For example, the emergence of intelligent optical internetworking systems in the future, with sophisticated bandwidth provisioning capabilities and dynamic wavelength routing based on MPLS will have a significant impact on traffic engineering in core IP networks. Coupled with these are fundamental research and development issues that remain unexplored in constraint-based routing, policy-based management of MPLS networks, CNM, and IP over optical architectures and interconnection models utilizing MPLS.

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