PERFORMANCE ANALYSIS AND IMPROVEMENT IN QOS OF MPLS NETWORKS

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***ABSTRACT*-**Multi-Protocol Label Switching (MPLS) is andeveloping network technology that has been used to provide Traffic Engineering and high speed networking. There has been current demand on internet service provider, which supports MPLS technology, to provide better Quality of Service (QoS) and security. Fault tolerance is an important QoS factor that needs to be considered to sustain network survivability. The network users require QoS, not only guaranteed bandwith and delay but also with high availability. So our objective is to develop such type of routing algorithms which can maintain improved availability and minimum failure impact while satisfying bandwidth constraints and also minimizing network resource consumption. We have to propose improved techniques for better QoS and to compare them with existing techniques for reliable MPLS backbone networks.

Keywords: Multiprotocol Label Switching (MPLS), Quality of Service (QoS), Routing, Survivability

I. INTRODUCTION

Multiprotocol Label Switching (MPLS) is a versatile solution to address the problem faced by present day network speed, scalability, Quality of Service (QoS) management and traffic engineering. MPLS has emerged as an elegant solution to meet the bandwidth management and service requirement for next generation Internet protocol (IP) based backbone networks. MPLS is an Internet Engineering Task Force (IETF) specified framework that provides for the efficient designation, routing, forwarding and switching of traffic flows through the network. In MPLS [1], packets are encapsulated, at ingress points, with labels that are then used to forward the packets along label switched paths (LSPs). Service providers can use bandwidth guaranteed LSPs as components of an IP virtual private network (VPN) service, the bandwidth guarantees being used to satisfy customer service-level agreements (SLAs).the network survivability, which refers to the ability of a network to maintain uninterrupted service regardless of the scale, magnitude, duration and type of failures, is an important issue. We examine survivability in Multi- Protocol Label Switching (MPLS) networks. Many MPLS survivability methods have been proposed [2]. A fundamental consideration in the design of an MPLS survivable network is the creation of backup paths toprotect the primary paths from failure while preserving the required QoS as has been considered in proposals [2].

II. RELATED WORK

Kar et al. [3] proposed new algorithms for dynamic routing of bandwidth guaranteed tunnels based on the minimum interference. The newly developed algorithms were on-line algorithms and were based on the idea that a newly routed tunnel must follow a route that does not “interfere too much” with a route that may be critical to satisfy a future demand.They developed path selection heuristics which were based on the idea of deferred loading of certain “critical” links**.**The max-flow values between ingress–egress pairs calculated by the algorithm can be used as a measure of available bandwidth for aggregation.

Ho et al. [4] had presented a novel approach, called Short Leap Shared Protection with Spare capacity Reallocation (SLSP-R), to deal with dynamic reconfiguration of spare capacity for MPLS-based recovery. They introduced and verified three grouping policies for the working paths, namely, Most Overlapped (MO), Most Diverse (MD), and Randomly Distributed (RD), and compared their effects on the performance with numerical experiments. The results showed that the InP (integer programming) formulation with MD as the grouping strategy yields the best results.

Li et al. [5] introduced the concept of “backtracking” to bound the restoration latency in MPLS networks. This routing algorithm computed primary and backup paths to optimize the restoration latency and the amount of bandwidth used. They considered three different cases characterized by a parameter called backtracking distance : 1) no backtracking ($D = 0$); 2) limited backtracking ($D = k$); and 3) unlimited backtracking ($D = \infty$). Simulation study showed that ($D=1$) provided best tradeoff between bandwidth usage and restoration latency.

Zhang et al. [6] presented a QoS control system that combined the service admission control (SAC) and the rate feedback control together to maintain the preset QoS parameter, packet loss probability in MPLS VPN services in the provider’s backbone network**.** The system tries to maintain the preset packet loss probability in the core network toward avoiding the congestion and providing a long term statistical QoS for customers. The experimental results showed that the proposed controller could maintain the loss value within a range of the preset target, if appropriate parameters are selected.

Sohn et al. [7] presented a distributed label switched path (D-LSP) scheme to reduce the amount of spare bandwidth required for protecting against network faults in MPLS networks. The main idea of the proposed D-LSP scheme was to partition traffic into multiple LSPs, each of which is established on a distinct link-disjoint route. Traffic partitioning in the D-LSP scheme can decrease the statistical multiplexing gain (SMG) obtained by aggregating IP packet flows into an LSP. The numerical results showed that the proposed D-LSP scheme yields the network cost-reduction ratio (NCRR) of at least 29%, 27%, and 15% for the networks where average node degrees are 4.6, 4.4, and 3.2, respectively.

Bhatia et al. [8] proposed a fast combinatorial approximation algorithm for maximizing throughput in MPLS networks when the routed traffic was required to be locally restorable. This was the first combinatorial algorithm for the problem with a performance guarantee. This algorithm was a Fully Polynomial Time Approximation Scheme (FPTAS), i.e., for any given $\varepsilon > 0$, it guaranteed $(1+\varepsilon)$ factors closeness to the optimal solution. They compared the throughput of locally restorable routing with that of unprotected routing.

Solano et al. [9] presented an efficient algorithm to reduce the label space in MPLS networks by stacking an additional label onto the packet header**.** This type of reduction was called Asymmetric Merged Tunnels (AMT). A fast framework for computing the optimal reduction using AMTs was proposed. The simulation results showed that the label space can be reduced by up to 20% more than when label merging was used.

Wang et al. [10] proposed an efficient distributed bandwidth management solution which allowed bandwidth sharing among backup paths of the same and different service LSPs i.e., both intra-sharing and inter-sharing, with a guarantee of bandwidth protection for any single node/link failure. The simulation results showed that using this scheme, the restoration overbuild can be reduced from about 250% to about 100%, and optimized backup path selection can further reduce restoration overbuild to about 60%.

III. CONCLUSION

There are so many algorithms which work on QoS improvement in MPLS networks but they don't yield better results. So we can improve the QoS parameters by implementing enhanced techniques. We can also maintain better survivability with the help of advanced algorithms for better efficiency. At the end, we have to compare these results with the existing conventional techniques with the help of simulation results.

REFERENCE

[1] E. Rosen, A. Viswanathan, and R. Callon, "Multiprotocollabel switching architecture," work in progress, Internet Draftdraft-ietf-mpls-arch-02.txt, July 1998

[2] C. Huang et al., "Building Reliable MPLS Networks using a path protection mechanism", *IEEECommunication Magazine*, vol. 40, no. 3, March 2002.

[3] Kar et al, 2000," Minimum Interference Routing of Bandwidth Guaranteed Tunnels with MPLS Traffic Engineering Applications", *IEEE Journal on SelectedAreas in Communications*, Vol. 18, No. 12.

[4] Ho et al, 2004,"Reconfiguration of Spare Capacity for MPLS-Based Recovery in the Internet Backbone Networks", *IEEE/ACM Transactions onNetworking*, Vol. 12, No. 1.

[5] Li et al, 2005,"Routing Bandwidth Guaranteed Paths With Local Restoration in Label Switched Networks", *IEEE Journal on Selected Areas inCommunications*, Vol. 23, No. 2.

[6] Zhang et al, 2006,"Measurement and Control of Packet Loss Probability for MPLS VPN Services", *IEEE Transactions on Instrumentation and Measurement*, Vol. 55, No. 5.

[7] Sohn et al,2006," A Distributed LSP Scheme to Reduce Spare Bandwidth Demand in MPLS Networks", *IEEE Transactions onCommunications*, Vol. 54, No. 7.

[8] Bhatia et al, 2008,"Bandwidth Guaranteed Routing With Fast Restoration Against Link and Node Failures", *IEEE/ACM Transactions on Networking*, Vol. 16, No. 6.

[9] Solano et al, 2008," Label Space Reduction in MPLS Networks", *IEEE/ACMTransactions on Networking*, Vol. 16, No. 6.

[10] Wang et al, 2008,"Efficient Distributed Bandwidth Management for MPLS Fast Reroute", *IEEE/ACM Transactions on Networking*, Vol. 16, No. 2.