



An Efficient Routing Model for Single and Multiple Faults in MPLS Network

A Thesis Submitted by

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To

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Abstract

The ever increasing demands for the performance improvement in MPLS network have motivated the development of resistant MPLS network to failures at link, node and software of MPLS network devices. The MPLS is a connection-oriented network and hence it is prone to failure. Fault tolerance is an important QoS factor that needs to be considered to maintain network survivability. It is the property of a system that continues to operate the network properly in the event of failure for some of its parts. Failures are of different types: link failure, node failure, and software and hardware failures. This thesis presents an efficient model for rerouting traffic in MPLS network when a fault occurs in the working link. The proposed model has been developed to handle single and multiple faults based on existing protection switching and rerouting algorithms and approaches for fault recovery consists of three algorithms in MPLS network.

In this thesis, an efficient model have been developed three algorithms for fault recovery in the MPLS networks. The first algorithm uses a pre-established alternative path called First Alternative Path (FAP) in order to restore traffic when a fault occurs in the Primary Working Path (PWP). In addition, a second alternative path (SAP) is established to restore traffic when the second fault occurs in the FAP. In the second algorithm a Temporary Alternative Path (TAP) is established by the alert LSR (ALSR) that detects the fault on the working LSP. This TAP has been established between ALSR and Egress LSR (destination) to carry packets, which are in transit between Ingress LSR and ALSR. In addition, the core LSR algorithm is working after TAP established.

The proposed model has been simulated using the Network Simulator (NS2) version 2.34 and the performance were measured compared to other existing works

based on performance metrics lost packet, disordering packet, packet delivery ratio (PDR), end-to-end delay and throughput. The simulation results have shown that the proposed model significantly improves the network performance in comparison to similar existing methods when single fault occurred at link such that throughput of proposed model is measured up to 5.100 kbps with low data rate and increased to 5.769 kbps when the data rate increased, another advantage the packet delivery ratio (PDR) of the proposed model increased to 98.42% packets with low data rate and decreased to 94.92% packets when the data rate is increased. The proposed model outperforms other methods in terms of throughput and packet delivery ratio (PDR) due to decreasing the packet loss number that reached to 26 packets with low data rate and 72 packets with high data rate. In addition, simulation results show that the proposed model outperforms Chandana method when multi-fault occurs. Throughput of the proposed model increased to 180000 bps while reached to 160000 bps in the Chandana's method and when a fault occurs, the packet loss number reached to 20% of the total number of packets while the packet loss number in Chandana's method reached to 40% of the total packets. Moreover, the proposed model eliminates packet disorder and decreased end-to-end delay to 10% in comparison to the existing methods.

In addition to the network performance enhancement, the proposed model has less space complexity compared to other methods so that it reduced to 13.33% in single faults and 33.33% in multiple faults.