QoS Based Protection Scheme in MPLS Networks

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Abstract - *Since the real time and high priority traffic is growing explosively on Internet, Multi- protocol label switching (MPLS) plays a key role by delivering QoS and traffic engineering in next generation Internet, which supports the requirements of real time application. Links failure incurs delay and packet losses in the connection passing through the failed link. Recently MPLS fast reroute has attracted lots of attention as it was designed to meet the needs of real-time applications, such as voice over IP. MPLS fast reroute achieves rapid restoration by computing and signaling backup label switched path (LSP) tunnels in advance and re-directing traffic as close to failure point as possible. Several recovery schemes will be discussed in this paper. Generally, two recovery models used to redirect the traffic in case of failure are rerouting and protection switching. Protection switching is faster than rerouting. On the other hand, rerouting is generally slow, and cannot offer QoS guaranties upon failure, but can use resources in a more efficient way. Our proposed recovery scheme will redirect the traffic in case of failure based on available capacity and the required bandwidth. The simulation results show that the proposed approach introduces an improvement in network performances compared with previous schemes.*

1 Introduction

In recent years, quality of service (QoS) consideration has attracted renewed attention from the research community mainly due to the growing use of real-time and high-priority applications. However, traffic engineering is the process to optimize the network to maximize the performance and efficiency of the networks. Multi protocol label switching (MPLS) allows the flexibility in the delivery new routing services, combining functions of link layer (layer two) and network layer (layer three). Therefore, MPLS enables some sophisticated features such QoS and traffic engineering to be implemented effectively.

MPLS forwards packets through pre-established path based on fixed size labels. Labels of incoming packets are examined to determine the next hop, and then the old label is swapped with a new one to be forwarded to next hop. Label distribution protocol (LDP) is used to setup the label switching path (LSP). Moreover, two signaling protocols have been established to provide the network reservation. Constraint based routing label distribution protocol (CR-LDP), and reservation protocol traffic engineering extension (RSVP-TE). These protocols allow network to provide a specific treatment in terms of different traffic flows.

The main point of providing QoS is the capability of a network to carry data reliability and efficiently. When failure occurs MPLS recovery mechanisms [1] aim at reducing the recovery time. Although IP routing protocols are robust and survivable, the amount of time to recover can be high (in order of seconds) which cause unacceptable service degradation for some application. On the other hand, MPLS based recovery schemes improves the reliability of the network by enabling faster response to faults than traditional IP layer approaches, while still providing visibility of the network afforded by IP layer.

Besides reducing recovery time, MPLS recovery schemes, achieves other objectives, such as optimal use of network resource utilization, applicability of traffic protection at various granularities. Therefore, a network service provider must apply different recovery schemes according to the QoS characteristics of the carried traffic flow (service class), satisfying service-level agreements while consuming minimum resource.

Section 2 introduces classification of MPLS recovery schemes and their concepts, section 3 presents some related work of previous schemes. Section 4 introduces the proposed scheme and simulation and result discussion are presented in section 5, and closing section gives the conclusion of this study.