Implement a QoS Algorithm for Real-Time Applications in the DiffServ-aware MPLS Network

Zuo-Po Huang, *Ji-Feng Chiu, Wen-Shyang Hwang and *Ce-Kuen Shieh
adrian@wshlab2.ee.kuas.edu.tw, gary@hpds.ee.ncku.edu.tw,
wshwang@mail.ee.kuas.edu.tw, shieh@eembox.ee.ncku.edu.tw
Department of Electrical Engineering,
National Kaohsiung University of Applied Sciences, Taiwan R.O.C.
*Department of Electrical Engineering,
National Cheng Kung University, Taiwan R.O.C.

Abstract

This paper presents an implementation of QoS algorithm (PPA, Preempted Probability Algorithm) for DiffServ-aware MPLS network under Linux platform. The algorithm, which comprises of optimal LSPs (Label Switching Paths) selection and the network resource allocation, is injected into the ingress router to verify the feasibility. The experimental results show that this approach can optimize network resources efficiently and distribute the traffic through the MPLS network.

Keywords: MPLS, Traffic Engineering, DiffServ-aware MPLS Network, and Real-Time Applications

1. Introduction

The network resources have to be managed efficiently due to the exponential growth of the bandwidth demand of new real-time Internet applications over the last years. The Internet technologies have to adapt new demands for increased bandwidth. These real-time Internet applications such as streaming, videoconference, interactive distance learning which impose throughput and delay constraints expected to get better delivery service through the Internet. The Internet architecture only offers the best-effort delivery service model, however, all customer packets are treated equally. These real-time applications are sensitive to the Quality of Service (QoS). The Internet Engineering Task Force (IETF) had proposed two fundamental techniques for supporting network QoS. These techniques are either Integrated Service (IntServ) [1] or Differentiated Service (DiffServ) [2]. IntServ is an architecture that associates and allocates resources to individual flow. It will lead to scalability problem when hundreds or thousands of flows are delivered through the backbone network. DiffServ is based on a simple model where traffic entering a network is classified at the boundaries of the network and assigned to different Behavior Aggregates (BAs) that are a collection of packets with the same Differentiated Service Code Point (DSCP) [3]. Per-flow state does not need to be maintained in the core routers, which leads to increase scalability.

The Multi-Protocol Label Switching (MPLS) integrates the label swapping of layer-2 technology with scalability. In MPLS network, the traffic is delivered through Label Switched Paths (LSPs). MPLS is also used to create LSPs for specific purposes, such as Traffic Engineering (TE). The objective of TE is to optimize network resources efficiency and improve network performance. Therefore, DiffServ and MPLS are viewed as complementary in the pursuit of end-to-end QoS provisioning at present. In the architecture, DiffServ provides the scalable end-to-end QoS, while MPLS performs TE to evenly distribute traffic load on available links and fast rerouting to route through nodes. Currently, the combination of DiffServ and MPLS is a promising technique to provide QoS, while efficiently exploiting network resources [10-11].

In traditional IP network, the shortest path is used to forward packets. This may cause congestion on a specific link.