

Differentiated Services in MPLS Networks
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Abstract

This document discusses how Differentiated Services can be provided in MPLS networks according to diffserv's native per-hop model, where aggregate forwarding resources are allocated in each LSRs for each supported diffserv forwarding class.

1. Introduction

Differentiated Services are based on a per-hop model where aggregate forwarding resources (buffer space, bandwidth, scheduling policy) are allocated in each LSR for each diffserv forwarding class (for example AFi or EF). This is in contrast with the traditional circuit switching model, where resources are allocated individually for each circuit on an end-to-end basis.

In order to support the per-hop model, an MPLS network operator needs to allocate a set of aggregate forwarding resources for each supported diffserv forwarding class in each LSR. In addition, the LSP setup message needs to indicate which diffserv forwarding class(es) an LSP belongs to. This information can be used as a constraint in the LSP route selection process and also in verifying that packets sent along an LSP belong to correct forwarding classes.

2. Single or Multi-Class LSPs

If all MPLS packets that are sent along an LSP always belong to a single diffserv forwarding class, the LSP is a Single-Class LSP. In this case there is no need to indicate in the Exp field of the MPLS packet header the forwarding class of each packet, because it can be derived from the label information. The MPLS packet header may, however, indicate the drop precedence (if any) of the packet. All packets of such a Single-Class LSP are at each hop assigned forwarding resources from the aggregate allocated to that particular forwarding class.

If MPLS packets that are sent along an LSP may belong to more than one diffserv forwarding class, the LSP is a Multi-Class LSP. In this case the service class of each packet (along with the possible drop precedence) needs to be indicated in the Exp field of the MPLS packet header. Each MPLS packet of such a Multi-Class LSP is at each hop assigned forwarding resources from the aggregate that corresponds to the service class information in the MPLS packet header. If the forwarding class of an MPLS packet is not among those listed in the corresponding LSP setup message, the packet is discarded.

Each MPLS network decides which diffserv forwarding classes it wants to support and to how many forwarding classes a single LSP may belong to. It may be possible to map at an MPLS network or at an underlying subnetwork boundary a Multi-Class LSP to more than one Single or Multi-Class LSP and vice versa, but details of such mappings are outside the scope of this document.

3. Mapping MPLS Packets to Forwarding Classes

When an LSR receives an MPLS packet, it needs to be able to associate the packet with a particular diffserv forwarding class and/or drop precedence. For that purpose, each LSR needs to be configured for each LSP with a list of supported

Exp field value => (FCI value, DPI value)

mappings, where the FCI (Forwarding Class Indicator) value indicates a diffserv forwarding class and the DPI (Drop Precedence Indicator)

value indicates a level of drop precedence. The Exp field values are likely to be MPLS network specific, whereas the FCI and DPI values could be either globally unique or MPLS network specific.

4. Signaling Requirements

As indicated above, signaling support for Multi-Class LSPs requires that LSP setup messages contain a list of diffserv FCIs. If the FCI values are MPLS network specific, they need to be mapped at MPLS network boundaries.

5. Security Concerns

Security concerns are not discussed in this version of the document.

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