

Protocol Extension for Support of Asynchronous Transfer Mode (ATM)  
Service Class-aware Multiprotocol Label Switching (MPLS)  
Traffic Engineering

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Abstract

This document specifies a Resource ReSerVation Protocol-Traffic Engineering (RSVP-TE) signaling extension for support of Asynchronous Transfer Mode (ATM) Service Class-aware Multiprotocol Label Switching (MPLS) Traffic Engineering.

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## 1. Overview

This document defines a Resource ReSerVation Protocol-Traffic Engineering (RSVP-TE) protocol addition to support ATM (Asynchronous Transfer Mode) Service Class-aware MPLS (MultiProtocol Label Switching) Traffic Engineering.

This protocol addition is used with all MPLS Label Switched Routers (LSRs) and link types (including, but not restricted to, Packet over SONET, Ethernet, and ATM links) to signal traffic engineered paths that can support the ATM service classes as defined by the ATM Forum [TM]. This document does not specify HOW to actually implement the functionality in the MPLS LSRs to emulate the ATM Forum service classes (such as necessary queuing and scheduling mechanisms), only how to signal that the TE path must support the ATM Forum service classes. A useful application for such paths is the carriage of ATM cells encapsulated in IP or MPLS packets in order to use MPLS networks as functional replacements for ATM networks.

## 2. Extended RSVP-TE Path Message Format

One new RSVP-TE Object is defined in this document: the ATM\_SERVICECLASS Object. Detailed description of this Object is provided below. This new Object is applicable to PATH messages. This specification only defines the use of the ATM\_SERVICECLASS Object in PATH messages used to establish LSP (Label Switched Path) Tunnels in accordance with [RSVP-TE]. Such PATH messages contain a Session Object with a C-Type equal to LSP\_TUNNEL\_IPv4 and a LABEL\_REQUEST object.

Restrictions defined in [RSVP-TE] for support of establishment of LSP Tunnels via RSVP-TE are also applicable to the establishment of LSP Tunnels supporting ATM Service Class-aware traffic engineering. For instance, only unicast LSPs are supported and Multicast LSPs are for further study.

This new ATM\_SERVICECLASS object is optional with respect to RSVP-TE so that general RSVP-TE implementations not concerned with ATM Service Class-aware traffic engineering MPLS LSP setup do not have to support this object.

### 2.1 PATH Message Format

The format of the extended PATH message is as follows:

```

<PATH Message> ::=      <Common Header> [ <INTEGRITY> ]
                        <SESSION> <RSVP_HOP>
                        <TIME_VALUES>
                        [ <EXPLICIT_ROUTE> ]
                        <LABEL_REQUEST>
                        [ <SESSION_ATTRIBUTE> ]
                        [ <DIFFSERV> ]
                        [ <ATM_SERVICECLASS> ]
                        [ <POLICY_DATA> ... ]
                        [ <sender descriptor> ]

<sender descriptor> ::= <SENDER_TEMPLATE> [ <SENDER_TSPEC> ]
                        [ <ADSPEC> ]
                        [ <RECORD_ROUTE> ]
    
```

### 3. ATM\_SERVICECLASS Object

The ATM\_SERVICECLASS object format is as follows:

Class Number = 227, C\_Type = 1

```

      0                1                2                3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                               Reserved                                               | SC |
+-----+-----+-----+-----+-----+-----+-----+-----+
    
```

Reserved : 29 bits

This field is reserved. It must be set to zero on transmission and must be ignored on receipt.

SC : 3 bits

Indicates the ATM Service Class. Values currently allowed are:

- 0: UBR (Unspecified Bit Rate)
- 1: VBR-NRT (Variable Bit Rate, Non-Real Time)
- 2: VBR-RT (Variable Bit Rate, Real Time)
- 3: CBR (Constant Bit Rate)
- 4-7: reserved

#### 4. Handling the ATM\_SERVICECLASS Object

To establish an LSP tunnel with RSVP-TE, the sender LSR creates a PATH message with a session type of LSP\_Tunnel\_IPv4 and with a LABEL\_REQUEST object as per [RSVP-TE]. The sender LSR may also include the DIFFSERV object as per [DIFF-MPLS].

If the LSP is associated with an ATM Service Class, the sender LSR must include the ATM\_SERVICECLASS object in the PATH message with the Service-Class (SC) field set to signify the desired ATM Service Class.

If a path message contains multiple ATM\_SERVICECLASS objects, only the first one is meaningful; subsequent ATM\_SERVICECLASS object(s) must be ignored and must not be forwarded.

Each LSR along the path that is ATM\_SERVICECLASS-aware records the ATM\_SERVICECLASS object, when present, in its path state block.

The destination LSR responds to the PATH message by sending a RESV message without an ATM\_SERVICECLASS object (whether the PATH message contained an ATM\_SERVICECLASS object or not).

#### 5. Non-support of the ATM\_SERVICECLASS Object

An LSR that does not recognize the ATM\_SERVICECLASS object Class Number must behave in accordance with the procedures specified in [RSVP] for an unknown Class Number with the binary format 1lbbbbbb, where b=0 or 1 (i.e., RSVP will ignore the object but forward it unexamined and unmodified).

An LSR that recognizes the ATM\_SERVICECLASS object Class Number but does not recognize the ATM\_SERVICECLASS object C-Type, must behave in accordance with the procedures specified in [RSVP] for an unknown C-type (i.e., it must send a PathErr with the error code 'Unknown object C-Type' toward the sender).

In both situations, this causes the path setup to fail. The sender should notify management that a LSP cannot be established and possibly might take action to retry reservation establishment without the ATM\_SERVICECLASS object.

#### 6. Security Considerations

The solution is not expected to add specific security requirements beyond those of Diff-Serv and existing TE. The security mechanisms currently used with Diff-Serv and existing TE can be used with this solution.

## 7. IANA Considerations

The IANA has registered a new RSVP Class Number for ATM\_SERVICECLASS (227). (See <http://www.iana.org/assignments/rsvp-parameters>).

## 8. References

[DIFF-MPLS] Le Faucheur, F., Wu, L., Davie, B., Davari, S., Vaananen, P., Krishnan, R., Cheval, P. and J. Heinanen, "Multi-Protocol Label Switching (MPLS) Support of Differentiated Services", RFC 3270, May 2002.

[RSVP] Braden, R., Ed., Zhang, L., Berson, S., Herzog, S. and S. Jazmin, "Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification", RFC 2205, September 1997.

[RSVP-TE] Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V. and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", RFC 3209, December 2001.

[TM] ATM Forum Traffic Management Specification Version 4.0, af-tm-0056.000, April 1996.

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