

Network Working Group
Request for Comments: 3496
Category: Informational

A. G. Malis
T. Hsiao
Vivace Networks
March 2003

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

Status of this Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

Copyright Notice

Copyright (C) The Internet Society (2003). All Rights Reserved.

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.

Table of Contents

1. Overview.....	2
2. Extended RSVP-TE Path Message Format.....	2
2.1 PATH Message Format.....	3
3. ATM_SERVICECLASS Object.....	3
4. Handling the ATM_SERVICECLASS Object.....	4
5. Non-support of the ATM_SERVICECLASS Object.....	4
6. Security Considerations.....	4
7. IANA Considerations.....	5
8. References.....	5
9. Authors' Addresses.....	5
10. Full Copyright Statement.....	6

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.

9. Authors' Addresses

Andrew G. Malis
Vivace Networks, Inc.
2730 Orchard Parkway
San Jose, CA 95134

EMail: Andy.Malis@vivacenetworks.com

Tony Hsiao
Vivace Networks, Inc.
2730 Orchard Parkway
San Jose, CA 95134

EMail: Tony.Hsiao@VivaceNetworks.com

10. Full Copyright Statement

Copyright (C) The Internet Society (2003). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

