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RSVP-TE Extensions for Associated Bidirectional Label Switched Paths (LSPs)

Abstract

This document describes Resource Reservation Protocol (RSVP) extensions to bind two point-to-point unidirectional Label Switched Paths (LSPs) into an associated bidirectional LSP. The association is achieved by defining new Association Types for use in ASSOCIATION and in Extended ASSOCIATION Objects. One of these types enables independent provisioning of the associated bidirectional LSPs on both sides, while the other enables single-sided provisioning. The REVERSE_LSP Object is also defined to enable a single endpoint to trigger creation of the reverse LSP and to specify parameters of the reverse LSP in the single-sided provisioning case.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7551.

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1. Introduction

The MPLS Transport Profile (MPLS-TP) requirements document [RFC5654] specifies that MPLS-TP MUST support associated bidirectional point-to-point Label Switched Paths (LSPs). These requirements are given in Section 2.1 ("General Requirements") of that document and are partially rephrased below:

7. MPLS-TP MUST support associated bidirectional point-to-point LSPs.

11. The end points of an associated bidirectional LSP MUST be aware of the pairing relationship of the forward and reverse LSPs used to support the bidirectional service.

12. Nodes on the LSP of an associated bidirectional LSP where both the forward and backward directions transit the same node in the same (sub)layer as the LSP SHOULD be aware of the pairing relationship of the forward and the backward directions of the LSP.

50. The MPLS-TP control plane MUST support establishing associated bidirectional P2P LSP including configuration of protection functions and any associated maintenance functions.

The above requirements are also repeated in [RFC6373].

Furthermore, an associated bidirectional LSP is also useful for protection-switching for Operations, Administration, and Maintenance (OAM) messages that require a return path.

A variety of applications, such as Internet services and the return paths of OAM messages, exist and may have different upstream and downstream bandwidth requirements. [RFC5654] specifies an asymmetric bandwidth requirement in Section 2.1 ("General Requirements"), and it is repeated below:

14. MPLS-TP MUST support bidirectional LSPs with asymmetric bandwidth requirements, i.e., the amount of reserved bandwidth differs between the forward and backward directions.

The approach for supporting asymmetric bandwidth co-routed bidirectional LSPs is defined in [RFC6387].

The method of association and the corresponding Resource Reservation Protocol (RSVP) ASSOCIATION Object are defined in [RFC4872], [RFC4873], and [RFC6689]. In that context, the ASSOCIATION Object is used to associate a recovery LSP with the LSP it is protecting. This

object also has broader applicability as a mechanism to associate RSVP states. [RFC6780] defines the Extended ASSOCIATION Objects that can be more generally applied for this purpose. This document uses the term "(Extended) ASSOCIATION Objects" to refer collectively to the ASSOCIATION Objects defined in [RFC4872] and the Extended ASSOCIATION Objects defined in [RFC6780].

This document specifies mechanisms for binding two reverse unidirectional LSPs into an associated bidirectional LSP. The association is achieved by defining new Association Types for use in (Extended) ASSOCIATION Objects. One of these types enables independent provisioning of the associated bidirectional LSPs, while the other enables single-sided provisioning. The REVERSE_LSP Object is also defined to enable a single endpoint to trigger creation of the reverse LSP and to specify parameters of the reverse LSP in the single-sided provisioning case. For example, the REVERSE_LSP Object allow asymmetric upstream and downstream bandwidths for the associated bidirectional LSP.

2. Conventions Used in This Document

2.1. Key Word Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2.2. Reverse Unidirectional LSPs

Two reverse unidirectional LSPs are setup in the opposite directions between a pair of source and destination nodes to form an associated bidirectional LSP. A reverse unidirectional LSP originates on the same node where the forward unidirectional LSP terminates, and it terminates on the same node where the forward unidirectional LSP originates.

2.3. Message Formats

This document uses the Routing Backus-Naur Form (RBNF) to define message formats as defined in [RFC5511].

3. Overview

3.1. Provisioning Model Overview

This section provides an overview and definition of the models for provisioning associated bidirectional LSPs.

The associated bidirectional LSP's forward and reverse unidirectional LSPs are established, monitored, and protected independently as specified by [RFC5654]. Configuration information regarding the LSPs can be provided at one or both endpoints of the associated bidirectional LSP. Depending on the method chosen, there are two models of creating an associated bidirectional LSP -- single-sided provisioning and double-sided provisioning.

3.1.1. Single-Sided Provisioning

For the single-sided provisioning, the Traffic Engineering (TE) tunnel is configured only on one endpoint. An LSP for this tunnel is initiated by the initiating endpoint with the (Extended) ASSOCIATION and REVERSE_LSP Objects inserted in the Path message. The other endpoint then creates the corresponding reverse TE tunnel and signals the reverse LSP in response using information from the REVERSE_LSP Object and other objects present in the received Path message.

3.1.2. Double-Sided Provisioning

For the double-sided provisioning, two unidirectional TE tunnels are configured independently, one on each endpoint. The LSPs for the tunnels are signaled with (Extended) ASSOCIATION Objects inserted in the Path message by both endpoints to indicate that the two LSPs are to be associated to form a bidirectional LSP.

3.2. Association Signaling Overview

This section provides an overview of the association signaling methods for the associated bidirectional LSPs.

Three scenarios exist for binding two unidirectional LSPs together to form an associated bidirectional LSP. These are:

1) Neither unidirectional LSP exists, and both must be established.

2) Both unidirectional LSPs exist, but the association must be established.

3) One LSP exists, but the reverse associated LSP must be established.

The following sections describe the applicable provisioning models for each of these scenarios.

Path Computation Element (PCE)-based approaches [RFC4655] may be used for path computation of an associated bidirectional LSP. However, these approaches are outside the scope of this document.

Consider the topology described in Figure 1. LSP1 from node A to B, takes the path A,D,B, and LSP2 from node B to A takes the path B,D,C,A. These two LSPs, once established and associated, form an associated bidirectional LSP between nodes A and B.

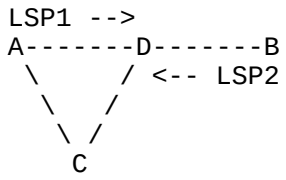


Figure 1: An Example of Associated Bidirectional LSP

3.2.1. Single-Sided Provisioning

For the single-sided provisioning model, creation of reverse LSP1 shown in Figure 1 is triggered by LSP2, or creation of reverse LSP2 is triggered by LSP1. When creation of reverse LSP2 is triggered by LSP1, LSP1 is provisioned first (or refreshed, if LSP1 already exists) at node A. LSP1 is then signaled with an (Extended) ASSOCIATION, and REVERSE_LSP Objects are inserted in the Path message. The Association Type indicates single-sided provisioning. Upon receiving this Path message for LSP1, node B establishes reverse LSP2. The (Extended) ASSOCIATION Object inserted in LSP2's Path message is the same as that received in LSP1's Path message.

A similar procedure is used if LSP2 is provisioned first at node B, and the creation of reverse LSP1 at node A is triggered by LSP2. In both scenarios, the two unidirectional LSPs are bound together to form an associated bidirectional LSP based on identical (Extended) ASSOCIATION Objects in the two LSPs' Path messages.

3.2.2. Double-Sided Provisioning

For the double-sided provisioning model, both LSP1 and LSP2 shown in Figure 1 are signaled independently with (Extended) ASSOCIATION Objects inserted in the Path messages, in which the Association Type indicating double-sided provisioning is included. In this case, the two unidirectional LSPs are bound together to form an associated bidirectional LSP based on identical (Extended) ASSOCIATION Objects

in the two LSPs' Path messages. In all three scenarios described in Section 3.2, the LSPs to be selected for the association are provisioned by the management action applied at both endpoints.

3.3. Asymmetric Bandwidth Signaling Overview

This section provides an overview of the methods for signaling asymmetric upstream and downstream bandwidths for the associated bidirectional LSPs.

3.3.1. Single-Sided Provisioning

A new REVERSE_LSP Object for use in the single-sided provisioning model is defined in this document, in Section 4.4. The REVERSE_LSP Object allows the initiating node of the single-sided provisioned LSP to trigger creation of the reverse LSP on the remote node. When the single-sided provisioning model is used, a SENDER_TSPEC Object can be added in the REVERSE_LSP Object as a subobject in the initiating LSP's Path message to specify a different bandwidth for the reverse LSP. As described in Section 4.4, addition of the REVERSE_LSP Object also allows the initiating node to control other aspects of the reverse LSP (such as its path) by including other objects in a REVERSE_LSP Object.

Consider again the topology described in Figure 1, where the creation of reverse LSP2 is triggered by LSP1. Node A signals LSP1 with the (Extended) ASSOCIATION Object with Association Type indicating single-sided provisioning and inserts a SENDER_TSPEC subobject for use by LSP2 in the REVERSE_LSP Object in the Path message. Node B then establishes the LSP2 in the reverse direction using the asymmetric bandwidth thus specified by LSP1 and allows node A to control the reverse LSP2.

3.3.2. Double-Sided Provisioning

When the double-sided provisioning model is used, the two unidirectional LSPs are established with separate bandwidths, which may or may not be identical. However, these LSPs are associated purely based on the identical contents of their (Extended) ASSOCIATION Objects.

3.4. Recovery LSP Overview

Recovery of each unidirectional LSP forming the bidirectional LSP is independent [RFC5654] and is based on the parameters signaled in their respective RSVP Path messages.

Recovery LSP association is based on the identical content of the (Extended) ASSOCIATION Objects signaled in their Path messages during the initial LSP setup for both single-sided and double-sided provisioning. As defined in [RFC6780], multiple ASSOCIATION Objects may be present in the signaling of a single LSP.

4. Message and Object Definitions

4.1. RSVP Message Formats

This section presents the RSVP message-related formats as modified by this document. Unmodified RSVP message formats are not listed.

The format of a Path message is as follows:

```
<Path Message> ::= <Common Header> [ <INTEGRITY> ]
                   [ [<MESSAGE_ID_ACK> | <MESSAGE_ID_NACK>] ... ]
                   [ <MESSAGE_ID> ]
                   <SESSION> <RSVP_HOP>
                   <TIME_VALUES>
                   [ <EXPLICIT_ROUTE> ]
                   <LABEL_REQUEST>
                   [ <PROTECTION> ]
                   [ <LABEL_SET> ... ]
                   [ <SESSION_ATTRIBUTE> ]
                   [ <NOTIFY_REQUEST> ... ]
                   [ <ADMIN_STATUS> ]
                   [ <ASSOCIATION> ... ]
                   [ <REVERSE_LSP> ... ]
                   [ <POLICY_DATA> ... ]
                   <sender descriptor>
```

The format of the <sender descriptor> is not modified by this document.

4.2. ASSOCIATION Object

The ASSOCIATION Object is populated using the rules defined below for associating two reverse unidirectional LSPs to form an associated bidirectional LSP.

Association Types:

In order to bind two reverse unidirectional LSPs to be an associated bidirectional LSP, the Association Type MUST be set to indicate either single-sided or double-sided LSPs.

The new Association Types are defined as follows:

Value	Type
3	Double-Sided Associated Bidirectional LSP (D)
4	Single-Sided Associated Bidirectional LSP (A)

Association ID:

For both single-sided and double-sided provisioning, Association ID MUST be set to a value assigned by the node that originates the association for the bidirectional LSP.

Association Source:

Association Source MUST be set to an address selected by the node that originates the association for the bidirectional LSP. For example, this may be a management entity or, in the case of single-sided provisioning, an address assigned to the node that originates the LSP.

4.3. Extended ASSOCIATION Object

The Extended ASSOCIATION Object is populated using the rules defined below for associating two reverse unidirectional LSPs to form a bidirectional LSP.

The Association Type, Association ID, and Association Source MUST be set as defined for the ASSOCIATION Object in Section 4.1.

Global Association Source:

For both single-sided and double-sided provisioning, Global Association Source, when used, MUST be set to the Global_ID [RFC6370] of the node that originates the association for the bidirectional LSP.

Extended Association ID:

For both single-sided and double-sided provisioning, Extended Association ID, when used, MUST be set to a value selected by the node that originates the association for the bidirectional LSP.

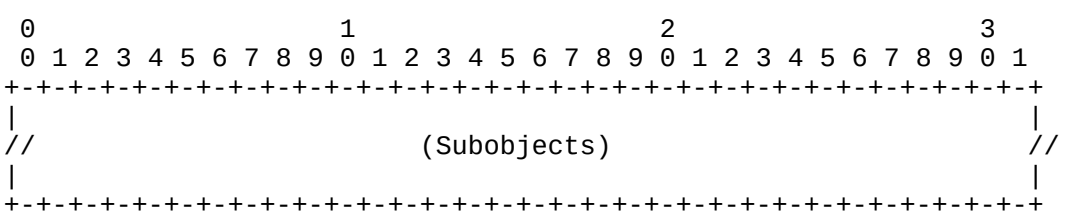
4.4. REVERSE_LSP Object Definition

4.4.1. REVERSE_LSP Object Format

The REVERSE_LSP Object is carried in the Path message of a forward LSP to provide information to be used by the reverse LSP. The object also indicates that the LSP is the forward LSP of a single-sided associated bidirectional LSP.

The Object has the following format:

Class_Num = 203, C_Type = 1.



4.4.2. REVERSE_LSP Subobjects

Subobjects are used to override the default contents of a Path message of a reverse LSP; see Section 5.2. The contents of a REVERSE_LSP Object is zero or more variable-length subobjects that have the same format as RSVP Objects; see Section 3.1.2 of [RFC2205]. Any object that may be carried in a Path message MAY be carried in the REVERSE_LSP Object. Subobject ordering MUST follow any Path message Object ordering requirements.

Examples of the Path message Objects that can be carried in the REVERSE_LSP Object are (but not limited to):

- SENDER_TSPEC [RFC2205]
- EXPLICIT_ROUTE Object (ERO) [RFC3209]
- SESSION_ATTRIBUTE Object [RFC3209]
- ADMIN_STATUS Object [RFC3473]
- LSP_REQUIRED_ATTRIBUTES Object [RFC5420]
- PROTECTION Object [RFC3473] [RFC4872]

5. Processing Rules

In general, the processing rules for the ASSOCIATION Object are as specified in [RFC4872], and those for the Extended ASSOCIATION Object are as specified in [RFC6780]. The following sections describe the rules for processing (Extended) ASSOCIATION Objects for both double-sided and single-sided associated bidirectional LSPs and REVERSE_LSP Objects for single-sided associated bidirectional LSPs.

5.1. Rules for ASSOCIATION Object

This section defines the processing for the association of two unidirectional LSPs to form an associated bidirectional LSP. Such association is based on the use of an (Extended) ASSOCIATION Object.

The procedures related to the actual identification of associations between LSPs based on (Extended) ASSOCIATION Objects are defined in [RFC6780]. [RFC6780] specifies that in the absence of rules for identifying the association that are specific to the Association Type, the included (Extended) ASSOCIATION Objects in the LSPs MUST be identical in order for an association to exist. This document adds no specific rules for the new Association Types defined, and the identification of an LSP association therefore proceeds as specified in [RFC6780].

As described in [RFC6780], association of LSPs can be upstream or downstream initiated, as indicated by (Extended) ASSOCIATION Objects in Path or Resv Messages. The association of bidirectional LSPs is always upstream initiated; therefore, the Association Types defined in this document are only to be interpreted in Path Messages. These types SHOULD NOT be used in ASSOCIATION Objects carried in Resv messages and SHOULD be ignored if present.

To indicate an associated bidirectional LSP, an ingress node MUST insert an (Extended) ASSOCIATION Object into the Path message of the unidirectional LSP that is part of the associated bidirectional LSP it initiates. If either Global Association Source or Extended Association Address is required, then an Extended ASSOCIATION Object [RFC6780] MUST be inserted in the Path message. Otherwise, an ASSOCIATION Object MAY be used. (Extended) ASSOCIATION Objects with both single-sided and double-sided Association Types MUST NOT be added or sent in the same Path message.

The ingress node MUST set the Association Type field in the (Extended) ASSOCIATION Object to "Single-Sided Associated Bidirectional LSP" when single-sided provisioning is used, and to "Double-Sided Associated Bidirectional LSP" when double-sided provisioning is used.

A transit node MAY identify the unidirectional LSPs of an associated bidirectional LSP based on (Extended) ASSOCIATION Objects, with the Association Type values defined in this document, carried in Path messages. Clearly, such associations are only possible when the LSPs transit the node. As mentioned above, such associations are made per the rules defined in [RFC6780].

Egress nodes that support the Association Types defined in this document identify the unidirectional LSPs of an associated bidirectional LSP based on (Extended) ASSOCIATION Objects carried in Path messages. Note that an ingress node will normally be the ingress for one of the unidirectional LSPs that make up an associated bidirectional LSP. When an egress node receives a Path message containing an (Extended) ASSOCIATION Object with one of the Association Types defined in this document, it MUST attempt to identify other LSPs (including ones for which it is an ingress node) with which the LSP being processed is associated. As defined above, such associations are made per the rules defined in [RFC6780]. An LSP not being associated at the time of signaling (for example, during rerouting or re-optimization) on an egress node is not necessarily considered an error condition.

Associated bidirectional LSP teardown follows the standard procedures defined in [RFC3209] and [RFC3473] either without or with the administrative status. Generally, the teardown procedures of the unidirectional LSPs forming an associated bidirectional LSP are independent of each other, so it is possible that while one LSP follows graceful teardown with administrative status, the reverse LSP is torn down without administrative status (using PathTear/ResvTear/PathErr with state removal). See Section 5.2 for additional rules related to LSPs established using single-sided provisioning.

When an LSP signaled with a Path message containing an (Extended) ASSOCIATION Object with an Association Type defined in this document is torn down, the processing node SHALL remove the binding of the LSP to any previously identified associated bidirectional LSP.

No additional processing is needed for Path messages with an (Extended) ASSOCIATION Object containing an Association Type field set to "Double-Sided Associated Bidirectional LSP".

5.1.1. Compatibility for ASSOCIATION Object

The ASSOCIATION Object has been defined in [RFC4872] and the Extended ASSOCIATION Object has been defined in [RFC6780], both with class numbers in the form 11bbbbbb, which ensures compatibility with non-supporting nodes. Per [RFC2205], such nodes will ignore the object but forward it without modification.

Operators wishing to use a function supported by a particular Association Type SHOULD ensure that the type is supported on any node that is expected to act on the association [RFC6780].

An egress node that does not support the Association Types defined in this document is expected to return a PathErr with Error Code "Admission Control Failure" (1) [RFC2205] and Sub-code "Bad Association Type" (5) [RFC4872].

LSP recovery as defined in [RFC4872] and [RFC4873] is not impacted by this document. The recovery mechanisms defined in [RFC4872] and [RFC4873] rely on the use of the (Extended) ASSOCIATION Objects, but they use a different value for Association Type; multiple ASSOCIATION Objects can be present in the LSP Path message and can coexist with the procedures defined in this document.

5.2. Rules for REVERSE_LSP Object

When a node initiates setup of an LSP using a Path message containing an ASSOCIATION or Extended ASSOCIATION Object, and the Association Type set to "Single-Sided Associated Bidirectional LSP", the Path message MUST carry the REVERSE_LSP Object to trigger creation of a reverse LSP on the egress node.

The REVERSE_LSP subobject MAY contain any of the objects that the initiating node desires to have included in the Path message for the associated reverse LSP. The REVERSE_LSP Object SHOULD NOT be included in a REVERSE_LSP Object.

A transit node receiving a valid Path message containing a REVERSE_LSP Object MUST forward the REVERSE_LSP Object unchanged in the outgoing Path message.

An egress node, upon receiving a Path message containing an REVERSE_LSP Object MUST verify that the Path message contains an ASSOCIATION or Extended ASSOCIATION Object with the Association Type set to "Single-Sided Associated Bidirectional LSP". If it does not, the Path message MUST NOT trigger a reverse LSP. This verification failure SHOULD NOT trigger any RSVP message but can be logged locally, and perhaps reported through network management mechanisms.

Once validated, the egress node MUST create an LSP in the reverse direction or reject the Path message. If the creation of a reverse LSP fails, the egress node MUST return a PathErr with Error Code "Admission Control Failure" (1) [RFC2205] and Sub-code "Reverse LSP Failure" (6) defined in this document. Note that normal Resv processing SHOULD NOT be impacted by the presence of an ASSOCIATION Object with an Association Type set to "Single-Sided Associated Bidirectional LSP".

The egress node MUST use the subobjects contained in the REVERSE_LSP Object for initiating the reverse LSP. When a subobject is not present in the received REVERSE_LSP Object, the egress node SHOULD initiate the reverse LSP based on the information contained in the received Path message of the forward LSP as follows:

- The egress node SHOULD copy the information from the received SESSION_ATTRIBUTE, CLASS_TYPE, LABEL_REQUEST, ASSOCIATION, ADMIN_STATUS, and PROTECTION Objects in the forward LSP Path message to form the Path message of the reverse LSP when the object is not present in the received REVERSE_LSP Object.

- The IP address in the reverse LSP's SESSION Object SHOULD be set to the IP address carried in the received SENDER_TEMPLATE Object; and conversely, the IP address in the SENDER_TEMPLATE Object SHOULD be set to the IP address carried in the received SESSION Object. There are no additional requirements related to the IDs carried in the SESSION and SENDER_TEMPLATE Objects.

- When the forward LSP Path message contains a RECORD_ROUTE Object, the egress node SHOULD include the received RECORD_ROUTE Object in the reverse LSP Path message. Local node information SHOULD also be recorded per standard Path message processing.

- There are no specific requirements related to other objects.

The resulting Path message is used to create the reverse LSP. From this point on, standard Path message processing is used in processing the resulting Path message.

Note that the contents of a forward LSP, including a carried REVERSE_LSP Object, may change over the life of an LSP, and such changes MUST result in corresponding changes in the reverse LSP. In particular, any object or subobject that was copied during the creation of the initial reverse LSP's Path message MUST be copied when modified in the forward LSP, and a trigger Path message MUST be processed.

The removal of the REVERSE_LSP Object in the received Path message SHOULD cause the egress node to tear down any previously established reverse LSP.

When the egress node receives a PathTear message for the forward LSP or whenever the forward LSP is torn down, the node MUST remove the associated reverse LSP using standard PathTear message processing. Teardown of the reverse LSP for other reasons SHOULD NOT trigger removal of the initiating LSP, but it SHOULD result in the egress node sending a PathErr with Error Code "Admission Control Failure" (1) [RFC2205] and Sub-code "Reverse LSP Failure" (6) defined in this document.

5.2.1. Compatibility for REVERSE_LSP Object

The REVERSE_LSP Object is defined with class numbers in the form 11bbbbbb, which ensures compatibility with non-supporting nodes. Per [RFC2205], such nodes will ignore the object but forward it without modification.

6. IANA Considerations

IANA has registered values for the namespace defined in this document and summarized in this section.

6.1. Association Types

IANA maintains the "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Parameters" registry (see <http://www.iana.org/assignments/gmpls-sig-parameters>). The "Association Type" subregistry is included in this registry.

This registry has been updated by new Association Types for ASSOCIATION and Extended ASSOCIATION Objects defined in this document as follows:

Value	Name	Reference
3	Double-Sided Associated Bidirectional LSP (D)	Section 4.2
4	Single-Sided Associated Bidirectional LSP (A)	Section 4.2

6.2. REVERSE_LSP Object

IANA maintains the "Resource Reservation Protocol (RSVP) Parameters" registry (see <http://www.iana.org/assignments/rsvp-parameters>). The "Class Names, Class Numbers, and Class Types" subregistry is included in this registry.

This registry has been extended for new Class Number (Class-Num) and Class Type (C-type) for RSVP REVERSE_LSP Object requested in the 11bbbbbb range defined in this document as follows:

Class Number	Class Name	Reference
203	REVERSE_LSP	Section 4.4

- REVERSE_LSP : Class Type or C-type = 1

6.3. Reverse LSP Failure PathErr Sub-code

IANA maintains the "Resource Reservation Protocol (RSVP) Parameters" registry (see <http://www.iana.org/assignments/rsvp-parameters>). The "Error Codes and Globally-Defined Error Value Sub-Codes" subregistry is included in this registry.

This registry has been extended for the new PathErr Sub-code defined in this document as follows:

Error Code = 01: "Admission Control Failure" (see [RFC2205])

- "Reverse LSP Failure" (6)

7. Security Considerations

This document introduces two new Association Types for the (Extended) ASSOCIATION Object, Double-Sided Associated Bidirectional LSP and Single-Sided Associated Bidirectional LSP. These types, by themselves, introduce no additional information to signaling. Related security considerations are already covered for this in RFC 6780.

The REVERSE_LSP Object is carried in the Path message of a forward LSP of the single-sided associated bidirectional LSP. It can carry parameters for the reverse LSP. This does allow for additional information to be conveyed, but this information is not fundamentally different from the information that is already carried in a bidirectional LSP message. The processing of such messages is already subject to local policy as well as security considerations discussions. For a general discussion on MPLS- and GMPLS-related security issues, see the MPLS/GMPLS security framework [RFC5920].

8. References

8.1. Normative References

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8.2. Informative References

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