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A. Davey
N. Neate
Data Connection Ltd (DCL)

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Signalling Unnumbered Links in Resource ReSerVation Protocol -
Traffic Engineering (RSVP-TE) in an IPv6 Network
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Abstract

Currently, RSVP-TE signalling over unnumbered links identifies routers using 32-bit Router IDs [[RFC3477](#)]. Traffic engineering extensions to IGP protocols for use in IPv6 networks use 128-bit IPv6 addresses to identify routers [[OSPFv3-TE](#)], [[ISIS-TE](#)]. This document specifies extensions for RSVP-TE signalling over unnumbered links to use 128-bit Router IDs in an IPv6 network.

1. Terms

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 [RFC 2119](#).

2. Overview

Supporting RSVP-TE over unnumbered links in an IPv6 network (that is, links that do not have global-scope IPv6 addresses) involves two components: (a) the ability to carry (TE) information about unnumbered links in IGP TE extensions (ISIS or OSPFv3), and (b) the ability to specify unnumbered links in RSVP-TE signalling. The former is covered in [\[OSPFv3-TE\]](#) and [\[ISIS-TE\]](#). The focus of this document is on the latter.

Currently, RSVP-TE signalling for unnumbered links does not support unnumbered links in an IPv6 network because it does not provide a way to identify a router using a 128-bit IPv6 address in its LSP_TUNNEL_INTERFACE_ID, Explicit Route and Record Route Objects. This document proposes simple extensions that allow RSVP-TE signalling over unnumbered links [\[RFC3477\]](#) to be used in an IPv6 network.

3. Definition of Terms

3.1 IPv6 Router IDs

In the context of this document, the term "IPv6 Router ID" means a stable IPv6 address of an LSR that is always reachable if there is any connectivity to the LSR. If OSPFv3 is being used as the IGP then the IPv6 Router ID SHOULD be set to the "Router IPv6 Address" as defined in [\[OSPFv3-TE\]](#). If IS-IS is being used as the IGP then the IPv6 Router ID SHOULD be set to the "IPv6 TE Router ID" as defined in [\[ISIS-TE\]](#).

3.2 Interface IDs

In this document, Interface IDs are as defined in [[RFC3477](#)].

4. Definition of Objects and Subobjects

4.1 LSP_TUNNEL_INTERFACE_ID Object

[RFC3477] states that if an LSR that originates an LSP advertises this LSP as an unnumbered Forwarding Adjacency in IS-IS or OSPF (see [LSP-HIER]), or the LSR uses the Forwarding Adjacency formed by this LSP as an unnumbered component link of a bundled link (see [LINK-BUNDLE]), the LSR MUST allocate an identifier to that Forwarding Adjacency (just like for any other unnumbered link). Moreover, the path message used for establishing the LSP that forms a Forwarding Adjacency MUST contain the LSP_TUNNEL_INTERFACE_ID object, as described in [RFC3477].

For IPv6 networks, the LSP_TUNNEL_INTERFACE_ID object has a class number of 193, C-Type of 2 (suggested value; to be assigned by IANA) and length of 24. The format is given below.

[illegible]

```

|                                     IPv6 Router ID (continued)                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Interface ID (32 bits)                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

[4.2](#) Explicit Route Object

A new subobject of the Explicit Route Object (ERO) is used to specify unnumbered links in an IPv6 network. This subobject has the following format.

```

      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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|L|   Type   |   Length   |   Reserved (MUST be zero)   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     IPv6 Router ID                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     IPv6 Router ID (continued)                         |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     IPv6 Router ID (continued)                         |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

IPv6 Router ID (continued)																							
Interface ID (32 bits)																							

The Type is 5, Unnumbered Interface ID for IPv6 network (suggested value; to be assigned by IANA). The Length is 24.

The Interface ID is the identifier assigned to the link by the LSR specified by the IPv6 Router ID.

4.3 Record Router Object

A new subobject of the Record Route Object (RRO) is used to record that the LSP path traversed an unnumbered link in an IPv6 network. This subobject has the following format.

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								
Type										Length										Flags										Reserved (MBZ)									
IPv6 Router ID																																							
IPv6 Router ID (continued)																																							
IPv6 Router ID (continued)																																							
IPv6 Router ID (continued)																																							
Interface ID (32 bits)																																							

The Type is 5, Unnumbered Interface ID for IPv6 network (suggested value; to be assigned by IANA); the Length is 24. Flags are as defined in [[RFC3477](#)].

5. Processing of objects

The processing of the objects and subobjects defined above is the same as the processing for the equivalent objects and subobjects defined in [[RFC3477](#)].

[6.](#) Security Considerations

This document raises no new security considerations.

[7.](#) IANA Considerations

This document defines a new C-type of 2, forward/reverse interface ID for IPv6 networks, for the LSP_TUNNEL_INTERFACE_ID object.

This document also defines the new subobject type of 5, unnumbered interface ID for IPv6 network, for the EXPLICIT_ROUTE object and the ROUTE_RECORD object.

[8.](#) References

[8.1](#) Normative References

[RFC3477] K.Kompella and Y.Rekhter, "Signalling Unnumbered Links in Resource ReSerVation Protocol - Traffic Engineering (RSVP-TE)", [RFC3477](#), January 2003.

[OSPFv3-TE] K. Ishiguro and T. Takada, "Traffic Engineering Extensions to OSPF version 3", [draft-ietf-ospf-ospfv3-traffic-02.txt](#), July 2004 (work in progress).

[ISIS-TE] J. Harrison, J. Berger and M. Bartlett, "IPv6 Traffic Engineering in IS-IS", [draft-ietf-isis-ipv6-te-00.txt](#), January 2005 (work in progress).

[8.2](#) Informative References

[LSP-HIER] Kompella, K. and Y. Rekhter, "LSP Hierarchy with Generalized MPLS TE" (work in progress).

[LINK-BUNDLE] Kompella, K., Rekhter, Y. and L. Berger, "Link Bundling in MPLS Traffic Engineering" (work in progress).

9. Authors' Address

Alan Davey
Data Connection Ltd
100 Church Street
EN2 6BQ
U.K.
Phone: +44 20 8366 1177
Email: alan.davey@dataconnection.com

Nic Neate
Data Connection Ltd
100 Church Street
EN2 6BQ
U.K.
Phone: +44 20 8366 1177
Email: nic.neate@dataconnection.com

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