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Signalling Unnumbered Links in CR-LDP

[draft-ietf-mpls-crldp-unnum-01.txt](#)

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2. Abstract

Current signalling used by MPLS TE doesn't provide support for unnumbered links. This document defines procedures and extensions to CR-LDP, one of the MPLS TE signalling protocols, that are needed in order to support unnumbered links.

3. Overview

Supporting MPLS TE over unnumbered links (i.e., links that do not have IP addresses) involves two components: (a) the ability to carry (TE) information about unnumbered links in IGP TE extensions (ISIS or OSPF), and (b) the ability to specify unnumbered links in MPLS TE signalling. The former is covered in [[ISIS-TE](#), [OSPF-TE](#)]. The focus of this document is on the latter.

Current signalling used by MPLS TE doesn't provide support for unnumbered links because the current signalling doesn't provide a way to indicate an unnumbered link in its Explicit Route Objects. This document proposes simple procedures and extensions that allow CR-LDP signalling [[CR-LDP](#)] to be used with unnumbered links.

4. Interface Identifiers

Since unnumbered links are not identified by an IP address, then for the purpose of MPLS TE they need some other identifier. We assume that each unnumbered link on a Label Switched Router (LSR) is given a unique 32-bit identifier. The scope of this identifier is the LSR to which the link belongs; moreover, the IS-IS and/or OSPF and CR-LDP modules on an LSR must agree on interface identifiers.

Note that links are directed, i.e., a link *l* is from some LSR *A* to some other LSR *B*. LSR *A* chooses the interface identifier for link *l*. To be completely clear, we call this the "outgoing interface identifier from LSR *A*'s point of view". If there is a reverse link from LSR *B* to LSR *A* (for example, a point-to-point SONET interface connecting LSRs *A* and *B* would be represented as two links, one from *A* to *B*, and another from *B* to *A*), *B* chooses the outgoing interface identifier for the reverse link; we call this the link's "incoming interface identifier from *A*'s point of view". There is no a priori relationship between the two interface identifiers.

5. Unnumbered Forwarding Adjacencies

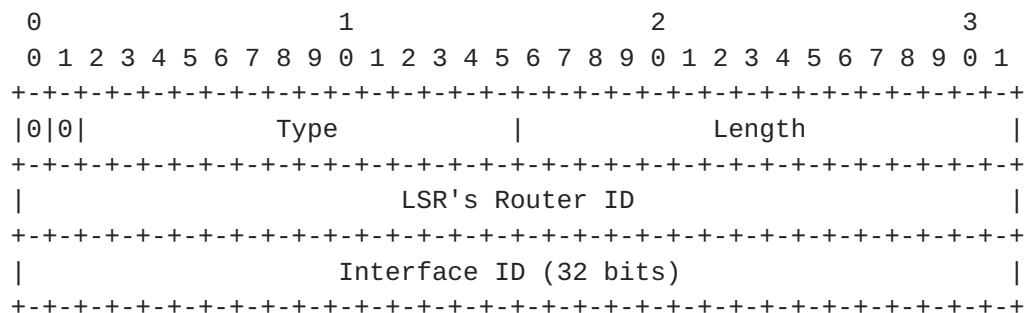
If an LSR that originates an LSP advertises this LSP as an unnumbered Forwarding Adjacency in IS-IS or OSPF [[LSP-HIER](#)], the LSR MUST allocate an interface ID to that Forwarding Adjacency. Moreover, the REQUEST message for the LSP MUST contain an INTERFACE ID object (described below), with the LSR's Router ID set to the head end's router ID, and the Interface ID set to the LSP's interface ID. If the LSP is part of a bundled link (see [[BUNDLE](#)]), the Interface ID is set to the component interface ID of the LSP.

If the LSP is bidirectional, and the tail-end LSR (of the forward LSP) advertises the reverse LSP as an unnumbered Forwarding Adjacency, the tail-end LSR MUST allocate an interface ID to the reverse Forwarding Adjacency. Furthermore, the MAPPING message for the LSP MUST contain an INTERFACE ID object, with the LSR's Router ID set to the tail end's router ID, and the Interface ID set to the reverse LSP's interface ID. If the LSP is part of a bundled link (see [BUNDLE]), the Component Interface ID is set to the component interface ID of the LSP; otherwise, it is set to zero.

5.1. INTERFACE ID Object

The INTERFACE ID object has Type to be determined by IETF consensus and length 8. The format is given below.

Figure 1: Interface ID TLV



This object can optionally appear in either a REQUEST message or a MAPPING message. In the former case, we call it the "Forward Interface ID" for that LSP; in the latter case, we call it the "Reverse Interface ID" for the LSP.

A new subobject of the Explicit Route Object (ERO) is used to specify unnumbered links. 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
+-+-+--+-----+-----+-----+-----+-----+-----+-----+
|0|0|                                     Type                               | Length                                   |
+-+-+--+-----+-----+-----+-----+-----+-----+-----+
|                                         Router ID                                           |
+-+-+--+-----+-----+-----+-----+-----+-----+-----+
|                         Interface ID (32 bits)                          |
+-+-+--+-----+-----+-----+-----+-----+-----+-----+

```

6.1. Interpreting the Unnumbered Interface ID Subobject

6.2. Validating the Unnumbered Interface ID Subobject

For other types of ER0 subobjects, the rules in [CR-LDP] apply.

6.3. Determining the Link Identified by the ERO

Determining the link for which label allocation must be done depends on whether a Component Interface Identifier object [BUNDLE] is present in the Request message or not. If so, set ID to the Component Interface ID; otherwise, set ID to I (the Interface ID in the ERO subobject). X is (as above) the router ID in the Unnumbered ERO subobject.

First, R checks whether the tuple <X, ID> matches the tuple <LSR's Router ID, Forward Interface ID> of any of the LSPs for which the node is a tail-end. If a match is found, the match identifies the Forwarding Adjacency for which the node has to perform label allocation.

Otherwise, the node MUST check whether the tuple <X, ID> matches the tuple <LSR's Router ID, Reverse Interface ID> of any of the bidirectional LSPs for which the node is the head-end. If a match is found, the match identifies the Forwarding Adjacency for which the node has to perform label allocation, namely, the reverse Forwarding Adjacency for the LSP identified by the match.

Otherwise, R must have information about Interface IDs and Component Interface IDs assigned by its neighbors for the unnumbered links between R and its neighbors (i.e., incoming interface identifiers from R's point of view).

If the Request message does not contain a Component Interface Identifier object, R determines the link by looking up <X, I> in the Traffic Engineering database. If the Request message contains a Component Interface Identifier object, R determines the link as described in [BUNDLE].

Otherwise, it is assumed that the node has to perform label allocation for the link over which the Request message was received.

6.4. Selecting the Next Hop

Once the link has been determined, the initial subobject is removed, and the next hop should be computed. The next hop for an Unnumbered Interface ID subobject is determined as follows. The Interface ID MUST refer to an outgoing interface identifier that this node allocated; if not, the node SHOULD return a "Bad Strict Node" error. The next hop is the node at the other end of the link that the Interface ID refers to. If this node is R itself, the subobject is removed, and the process repeated. If the next node is not R, say N, this is the next hop to which a Request message must be sent.

Furthermore, when sending a Request message to N, the ERO to be used is the remaining ERO (i.e., starting with the subobject that refers to a node different from the receiving node); the PHOP object is R's router ID.

7. Security Considerations

This document raises no new security concerns for CR-LDP.

8. Acknowledgments

Thanks to Rahul Aggarwal for his comments on the text. Thanks too to Bora Akyol and Vach Kompella.

9. References

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[ISIS-TE] Smit, H., and Li, T., "IS-IS extensions for Traffic Engineering", [draft-ietf-isis-traffic-02.txt](#) (work in progress)

[LSP-HIER] Kompella, K., and Rekhter, Y., "LSP Hierarchy with MPLS TE", [draft-ietf-mpls-lsp-hierarchy-01.txt](#) (work in progress)

[OSPF-TE] Katz, D., and Yeung, D., "Traffic Engineering Extensions to OSPF", [draft-katz-yeung-ospf-traffic-02.txt](#) (work in progress)

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