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IS-IS Extensions in Support of Generalized MPLS

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1. Status of this Memo

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2. Abstract

This document specifies encoding of extensions to the IS-IS routing protocol in support of Generalized Multi-Protocol Label Switching (GMPLS). The description of the extensions is specified in [GMPLS-ROUTING].

3. Summary for Sub-IP Area

3.1. Summary

This document specifies encoding of extensions to the IS-IS routing protocol in support of Generalized Multi-Protocol Label Switching (GMPLS). The description of the extensions is specified in [GMPLS-ROUTING].

3.2. Where does it fit in the Picture of the Sub-IP Work

This work fits squarely in either CCAMP or IS-IS boxes.

3.3. Why is it Targeted at this WG

This draft is targeted at either the CCAMP or IS-IS WGs, because this draft specifies the extensions to the IS-IS routing protocols in support of GMPLS, because GMPLS is within the scope of CCAMP WG, and because IS-IS is within the scope of the IS-IS WG.

3.4. Justification

The WG should consider this document as it specifies the extensions to the IS-IS routing protocols in support of GMPLS.

4. Introduction

This document specifies extensions to the IS-IS routing protocol in support of carrying link state information for Generalized Multi-Protocol Label Switching (GMPLS). The set of required enhancements to IS-IS are outlined in [GMPLS-ROUTING].

5. IS-IS Routing Enhancements

In this section we define the enhancements to the TE properties of GMPLS TE links that can be announced in IS-IS TE LSAs.

In this document, we enhance the sub-TLVs for the extended IS reachability TLV (see [ISIS-TE]) in support of GMPLS. Specifically, we add the following sub-TLVs:

1. Link Local Identifier
2. Remote Interface Identifier
3. Link Protection Type
4. Interface Switching Capability Descriptor

The following defines the Type and Length of these sub-TLVs:

Sub-TLV Type	Length	Name
4	4	Link Local Identifier
5	4	Link Remote Identifier
20	2	Link Protection Type
21	variable	Interface Switching Capability Descriptor

We further add one new TLV to the TE LSAs.

TLV Type	Length	Name
138	variable	Shared Risk Link Group

5.1. Link Local Identifier

A Link Local Interface Identifier is a sub-TLV of the extended IS reachability TLV with type 4, and length 4.

5.2. Link Remote Identifier

A Link Remote Identifier is a sub-TLV of the extended IS reachability TLV with type 5, and length 4.

5.3. Link Protection Type

The Link Protection Type is is a sub-TLV (of type 20) of the extended IS reachability TLV, with length two octets, the first of which is a bit vector describing the protection capabilities of the link. They are:

0x01 Extra Traffic

0x02 Unprotected

0x04 Shared

0x08 Dedicated 1:1

0x10 Dedicated 1+1

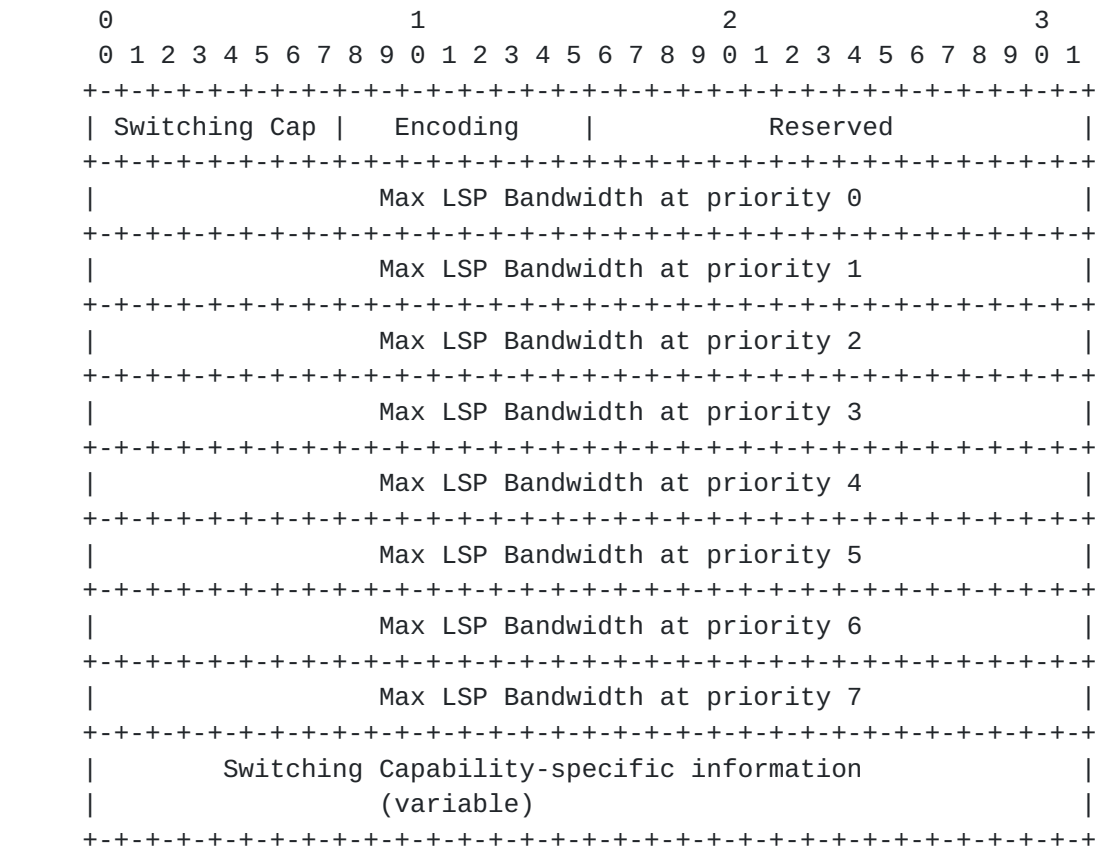
0x20 Enhanced

0x40 Reserved

0x80 Reserved

5.4. Interface Switching Capability Descriptor

The Interface Switching Capability Descriptor is a sub-TLV (of type 21) of the extended IS reachability TLV. The length is the length of value field in octets. The format of the value field is as shown below:



The Switching Capability (Switching Cap) field contains one of the following values:

1	Packet-Switch Capable-1 (PSC-1)
2	Packet-Switch Capable-2 (PSC-2)
3	Packet-Switch Capable-3 (PSC-3)
4	Packet-Switch Capable-4 (PSC-4)
51	Layer-2 Switch Capable (L2SC)
100	Time-Division-Multiplex Capable (TDM)
150	Lambda-Switch Capable (LSC)
200	Fiber-Switch Capable (FSC)

The Encoding field contains one of the values specified in Section 3.1.1 of [GMPLS-SIG].

Maximum LSP Bandwidth is encoded as a list of eight 4 octet fields in the IEEE floating point format, with priority 0 first and priority 7 last. The units are bytes (not bits!) per second.

The content of the Switching Capability specific information field

depends on the value of the Switching Capability field.

When the Switching Capability field is PSC-1, PSC-2, PSC-3, or PSC-4, the specific information includes Interface MTU and Minimum LSP Bandwidth. The Interface MTU is encoded as a 2 octets integer. The Minimum LSP Bandwidth is is encoded in a 4 octets field in the IEEE floating point format. The units are bytes (not bits!) per second.

When the Switching Capability field is L2SC, there is no specific information.

When the Switching Capability field is TDM, the specific information includes Minimum LSP Bandwidth, and an indication whether the interface supports Standard or Arbitrary SONET/SDH. The Minimum LSP Bandwidth is encoded in a 4 octets field in the IEEE floating point format. The units are bytes (not bits!) per second. The indication whether the interface supports Standard or Arbitrary SONET/SDH is encoded as 1 octet. The value of this octet is 0 if the interface supports Standard SONET/SDH, and 1 if the interface supports Arbitrary SONET/SDH.

When the Switching Capability field is LSC, there is no specific information.

The Interface Switching Capability Descriptor sub-TLV may occur more than once within the extended IS reachability TLV.

5.5. Shared Risk Link Group TLV

The proposed SRLG (of type 138 TBD) contains a new data structure consisting of:

- 7 octets of System ID and Pseudonode Number
- 1 octet Flag
- 4 octets of IPv4 interface address or 4 octets of a Link Local Identifier
- 4 octets of IPv4 neighbor address or 4 octets of a Link Remote Identifier

and a list of SRLG values, where each element in the list has 4 octets. The length of this TLV is 16 + 4 * (number of SRLG values). The Least Significant Bit of the Flag octet indicates whether the interface is numbered (set to 1), or unnumbered (set to 0). All other bits are reserved and should be set to 0.

5.6. Link Identifier for Unnumbered Interfaces

Link Identifies are exchanged in the Extended Local Circuit ID field of the "Point-to-Point Three-Way Adjacency" IS-IS Option type [ISIS-3way].

6. Implications on Graceful Restart

The restarting node should follow the ISIS restart procedures [ISIS-RESTART], and the RSVP-TE restart procedures [GMPLS-RSVP].

When the restarting node is going to originate its TE LSAs, these LSAs should be originated with 0 unreserved bandwidth, and if the Link has LSC or FSC as its Switching Capability then also with 0 as Max LSP Bandwidth, until the node is able to determine the amount of unreserved resources taking into account the resources reserved by the already established LSPs that have been preserved across the restart. Once the restarting node determines the amount of unreserved resources, taking into account the resources reserved by the already established LSPs that have been preserved across the restart, the node should advertise these resources in its TE LSAs.

In addition in the case of a planned restart prior to restarting, the restarting node SHOULD originate the TE LSAs with 0 as unreserved bandwidth, and if the Link has LSC or FSC as its Switching Capability then also with 0 as Max LSP Bandwidth.

Neighbors of the restarting node should continue advertise the actual unreserved bandwidth on the TE links from the neighbors to that node.

Regular graceful restart should not be aborted if a TE LSA or TE topology changes. TE graceful restart need not be aborted if a TE LSA or TE topology changes.

7. Security Considerations

The extensions proposed in this document does not raise any new security concerns.

8. Acknowledgements

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9. References

[ISIS-TE] Smit, H., Li, T., "IS-IS Extensions for Traffic Engineering",
draft-ietf-isis-traffic-03.txt (work in progress)

[GMPLS-SIG] Generalized MPLS Group, "Generalized MPLS - Signaling Functional
Description", draft-ietf-mpls-generalized-signaling-04.txt (work in progress)

[GMPLS-ROUTING] "Routing Extensions in Support of Generalized MPLS",
draft-many-ccamp-gmpls-routing-01.txt (work in progress)

[ISIS-3way] "Three-Way Handshake for IS-IS Point-to-Point Adjacencies",
draft-ietf-isis-3way-05.txt (work in progress)

[ISIS-RESTART] "Restart signaling for ISIS", draft-ietf-isis-restart-00.txt
(work in progress)

[GMPLS-RSVP] "Generalized MPLS Signaling - RSVP-TE Extensions",
draft-ietf-mpls-generalized-rsvp-te-06.txt (work in progress)

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