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            Signaling MSD (Maximum SID Depth) using IS-IS
                draft-ietf-isis-segment-routing-msd-02

Abstract

   This document proposes a way to signal Maximum SID Depth (MSD)
   supported by a node at node and/or link granularity by an ISIS
   Router. In a Segment Routing (SR) enabled network a centralized
   controller that programs SR tunnels needs to know the MSD supported
   by the head-end at node and/or link granularity to push the SID stack
   of an appropriate depth. MSD is relevant to the head-end of a SR
   tunnel or Binding-SID anchor node where Binding-SID expansions might
   result in creation of a new SID stack.

Status of This Memo

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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[1](#). Introduction

   When Segment Routing tunnels are computed by a centralized
   controller, it is critical that the controller learns the MSD
   "Maximum SID Depth" of the node or link SR tunnel exits over, so the
   SID stack depth of a path computed doesn't exceed the number of SIDs
   the node is capable of imposing. This document describes how to use
   IS-IS to signal the MSD of a node or link to a centralized
   controller.

   PCEP SR extensions draft [[I-D.ietf-pce-segment-routing](#)] signals MSD
   in SR PCE Capability TLV and METRIC Object. However, if PCEP is not
   supported/configured on the head-end of a SR tunnel or a Binding-SID
   anchor node and controller does not participate in IGP routing, it
   has no way to learn the MSD of nodes and links which has been
   configured. BGP-LS [[RFC7752](#)] defines a way to expose topology and
   associated attributes and capabilities of the nodes in that topology
   to a centralized controller. MSD signaling by BGP-LS has been
   defined in [[I-D.tantsura-idr-bgp-ls-segment-routing-msd](#)]. Typically,

BGP-LS is configured on a small number of nodes, that do not
necessarily act as head-ends. In order, for BGP-LS to signal MSD for
the all nodes and links in the network MSD is relevant, MSD
capabilites SHOULD be distributed to every IS-IS router in the
network.

[I-D.ietf-isis-mpls-elc] defines Readable Label Depth Capability
(RLDC) that is used by a head-end to insert Entropy Label (EL) at
appropriate depth, so it could be read by transit nodes. MSD in
contrary signals ability to push SID's stack of a particular depth.

MSD of type 1 (IANA Registry) is used to signal the number of SIDs a
node is capable of imposing, to be used by a path computation
element/controller and is only relevant to the part of the stack
created as the result of the computation. In case, there are
additional labels (e.g. service) that are to be pushed to the stack -
MSD SHOULD be adjusted to reflect that. In the future, new MSD types
could be defined to signal additional capabilities: entropy labels,
labels that can be pushed thru recirculation, etc.

1.1. Conventions used in this document

1.1.1. Terminology

BGP-LS: Distribution of Link-State and TE Information using Border
Gateway Protocol

IS-IS: Intermediate System to Intermediate System

MSD: Maximum SID Depth

PCC: Path Computation Client

PCE: Path Computation Element

PCEP: Path Computation Element Protocol

SID: Segment Identifier

SR: Segment Routing

1.2. Requirements Language

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 [RFC2119].

2. Terminology

This memo makes use of the terms defined in [RFC7981].

3. Node MSD Advertisement

A new sub-TLV within the body of IS-IS Router Capability TLV
[RFC7981], Node MSD sub-TLV is defined to carry the provisioned MSD
of the router originating the Router Capability TLV. Node MSD is the
lowest MSD supported by the node of any interface and can be
provisioned in IS-IS instance.

```
    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     |    Sub-Type and Value        |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
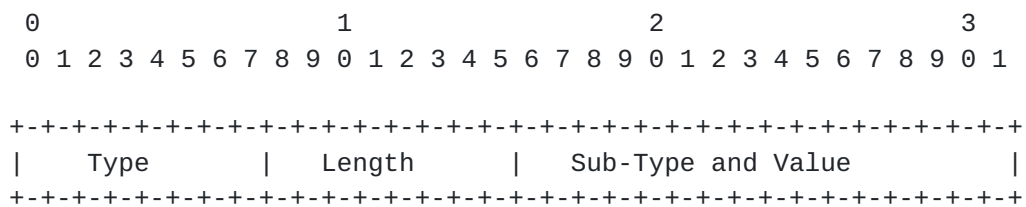
Figure 1: Node MSD Sub-TLV

The Type (1 byte) of this sub-TLV is 23 (Suggested value - to be
assigned by IANA).

Length is variable (minimum of 2, multiple of 2 octets) and
represents the total length of value field.

Value field consists of a 1 octet sub-type (IANA Registry) and 1
octet value.

Sub-Type 1 (IANA Section), MSD and the Value field contains maximum
MSD of the router originating the Router Capability TLV. Node
Maximum MSD is a number in the range of 0-254. 0 represents lack of
the ability to push MSD of any depth; any other value represents that
of the node. This value SHOULD represent the lowest value supported
by node.

Other Sub-types other than defined above are reserved for future
extensions. This sub-TLV is optional. The scope of the
advertisement is specific to the deployment.

4. LINK MSD Advertisement

A new sub-TLV - Link MSD sub-TLV is defined for TLVs 22, 23, 141,
222, and 223 to carry the provisioned MSD of the interface associated
with the link.

```
  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       |     Sub-Type and Value       |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
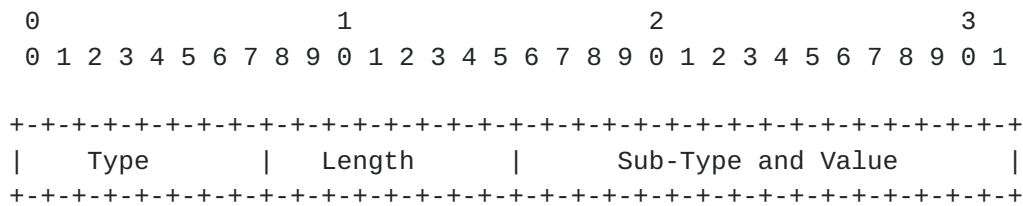
Figure 2: Link MSD Sub-TLV

The Type (1 byte) of this sub-TLV is 15 (Suggested value - to be assigned by IANA).

Length is variable and similar to what is defined in Section 3.

Value field consists of a 1 octet sub-type (IANA Registry) and 1 octet value.

Sub-Type 1 (IANA Section), MSD and the Value field contains Link MSD of the router originating the corresponding TLV's 22, 23, 141, 222, and 223. Link MSD is a number in the range of 0-254. 0 represents lack of the ability to push MSD of any depth; any other value represents that of the particular link MSD value.

5. Node MSD vs Link MSD conflict resolution

When both Node MSD and Link MSD are present, the value in the Link MSD MUST be used.

6. IANA Considerations

This document includes a request to IANA to allocate sub-TLV type codes for the new sub TLV proposed in Section 3 of this document from IS-IS Router Capability TLV Registry as defined by [RFC7981].

Type: 23 (suggested - to be assigned by IANA)

Description: Node MSD

Also for link MSD, we request IANA to allocate new sub-TLV codes as defined in Section 4 from Sub-TLVs for TLVs 22, 23, 141, 222 and 223 registry.

Type: 15 (suggested - to be assigned by IANA)

Description: Link MSD

Per TLV information where LINK MSD sub-TLV can be part of:

```
           TLV  22 23 141 222 223
                ----------------------
                 y  y   y   y   y
```

Figure 3: TLVs where LINK MSD Sub-TLV can be present

This document requests the creation of a new IANA managed registry to identify MSD types as proposed in Section 3, Section 4. The registration procedure is "Expert Review" as defined in [RFC5226]. Suggested registry name is "MSD Sub-types". Types are an unsigned 8 bit number. The following values are defined by this document

Value	Name	Reference
0	Reserved	This document
1	MSD	This document
2-250	Unassigned	This document
251-254	Experimental	This document
255	Reserved	This document

Figure 4: MSD Sub-type Codepoints Registry

7. Security Considerations

This document describes a mechanism to signal Segment Routing MSD supported at node and/or link granularity through IS-IS LSPs and does not introduce any new security issues.

8. Contributors

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9. Acknowledgements

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