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Signaling MSD (Maximum SID Depth) using IS-IS
draft-ietf-isis-segment-routing-msd-08

Abstract

This document proposes a way to signal Maximum SID Depth (MSD) supported by a node and/or link granularity by an IS-IS 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 impose 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

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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 SID's 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.ietf-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 all the nodes and links in the network MSD is relevant, MSD capabilites should be advertised 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 impose SID's stack of a particular depth.

MSD of type 1 (IANA Registry), called Base MSD, is used to signal the total number of SID's a node is capable of imposing, to be used by a path computation element/controller. In case, there are additional SID's (e.g. service) that are to be imposed to the stack - this would be signaled with an another MSD type (TBD), no adjustment to the Base MSD should be made. In the future, new MSD types could be defined to signal additional capabilities: entropy labels, SID's that can be imposed thru recirculation, or another dataplane e.g IPv6.

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 - a number of SID's a node or a link on a node is capable of imposing

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. Node MSD Advertisement

A new sub-TLV "Node MSD sub-TLV" is defined within the body of IS-IS Router Capability TLV [RFC7981], 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 if not known throught an API, can be provisioned in IS-IS instance.

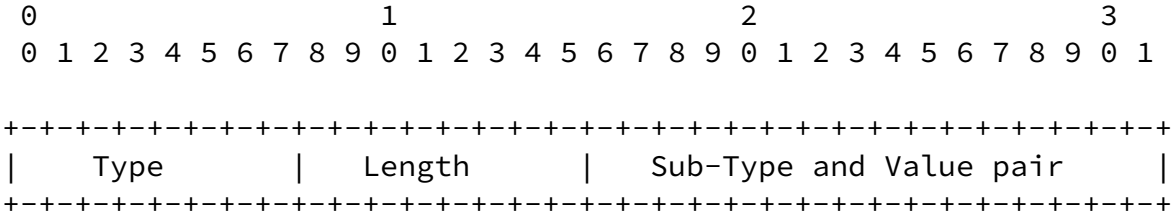

Figure 1: Node MSD Sub-TLV

The Type (1 byte) of this sub-TLV has value of 23.

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. There could be one or more of the Sub-Type/Value pairs.

Sub-Type 1 (IANA Section), MSD and the Value field associated with the Sub-Type contains maximum MSD of the router originating the Router Capability TLV.

Node MSD value is a number in the range of 0-254. 0 represents lack of the ability to impose SID stack 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.

3. 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.

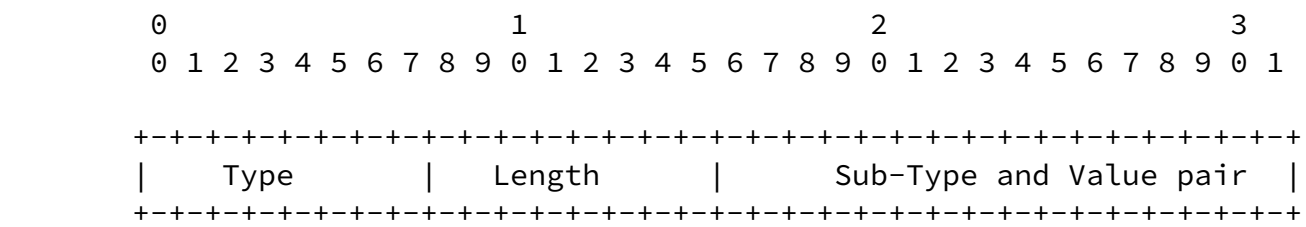

Figure 2: Link MSD Sub-TLV

The Type (1 byte) of this sub-TLV has value of 15.

Length is variable and similar to what is defined in Section 2.

Value field consists of a 1 octet sub-type (IANA Registry) and 1 octet value. There could be one or more of the Sub-Type/Value pairs.

Sub-Type 1 (IANA Section), MSD and the Value field associated with the Sub-Type contains Link MSD of the router originating the corresponding TLV's 22, 23, 141, 222, and 223.

The value of Link MSD represents MSD on the outgoing link. Link MSD

is a number in the range of 0-254. 0 represents lack of the ability to impose SID stack of any depth; any other value represents that of the particular link MSD value.

4. Node MSD vs Link MSD conflict resolution

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

5. IANA Considerations

This document includes a request to IANA to allocate sub-TLV type codes for the new sub TLV proposed in Section 2 of this document from IS-IS Router Capability TLV Registry as defined by [RFC7981].

Following values have been allocated by IANA:

Value	Description	Reference
23	Node MSD	This document

Figure 3: Node MSD

For the Link MSD, we request IANA to allocate new sub-TLV codes as defined in Section 3 from Sub-TLVs for TLVs 22, 23, 141, 222 and 223 registry.

Value	Description	Reference
15	Link MSD	This document

Figure 4: Link MSD

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

TLV 22 23 25 141 222 223

```
---  --------------------
     y  y  y  y   y   y
```

Figure 5: TLVs where LINK MSD Sub-TLV can be present

This document requests creation of a new IANA managed registry under a new category of "Interior Gateway Protocol (IGP) Parameters" IANA registries to identify MSD types as proposed in Section 2, Section 3. The registration procedure is "Expert Review" as defined in [RFC8126]. 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	Base MSD	This document
2-250	Unassigned	This document
251-254	Experimental	This document
255	Reserved	This document

Figure 6: MSD Sub-type Codepoints Registry

6. Security Considerations

Security considerations, as specified by [RFC7981] are applicable to this document

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8. Acknowledgements

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