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J. Tantsura
Nuage Networks
U. Chunduri
Huawei Technologies
S. Aldrin
Google, Inc
L. Ginsberg
Cisco Systems

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Signaling MSD (Maximum SID Depth) using IS-IS
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Abstract

This document defines a way for an IS-IS Router to advertise multiple types of supported Maximum SID Depths (MSDs) at node and/or link granularity. Such advertisements allow entities (e.g., centralized controllers) to determine whether a particular SID stack can be supported in a given network. This document only defines one type of MSD maximum label imposition, but defines an encoding that can support other MSD types.

Table of Contents

1. Introduction

When Segment Routing(SR) paths are computed by a centralized controller, it is critical that the controller learns the Maximum SID Depth(MSD) that can be imposed at each node/link a given SR path to insure that the SID stack depth of a computed path doesn't exceed the number of SIDs the node is capable of imposing.

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.

Other types of MSD are known to be useful. For example, [I-D.ietf-isis-mpls-elc] defines Readable Label Depth Capability (RLDC) that is used by a head-end to insert an Entropy Label (EL) at a depth, that could be read by transit nodes.

This document defines an extension to IS-IS used to advertise one or more types of MSD at node and/or link granularity. It also creates an IANA registry for assigning MSD type identifiers. It also defines the Base MPLS Imposition MSD type. In the future it is expected, that new MSD types will be defined to signal additional capabilities e.g., entropy labels, SIDs that can be imposed through recirculation, or SIDs associated with 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

BMI: Base MPLS Imposition is the number of MPLS labels which can be imposed inclusive of any service/transport labels

IS-IS: Intermediate System to Intermediate System

MSD: Maximum SID Depth - the number of SIDs a node or a link on a node can support

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", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP14 [RFC2119], [RFC8174] when, and only when they appear in all capitals, as shown here .

2. Terminology

This memo makes use of the terms defined in [RFC4970].

3. Node MSD Advertisement

The node MSD sub-TLV is defined within the body of the IS-IS Router Capability TLV [RFC7981], to carry the provisioned SID depth of the router originating the Router Capability TLV. Node MSD is the minimum MSD supported by the node on any interface. MSD values may be learned via a hardware API or may be provisioned.

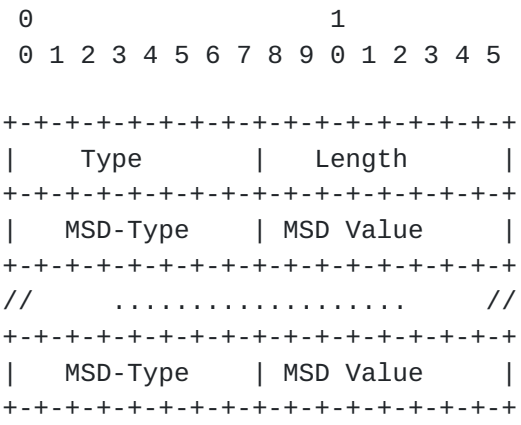

Figure 1: Node MSD Sub-TLV

The Type: TBD1

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

Value: field consists of one or more pairs of a 1 octet MSD-Type (IANA Registry) and 1 octet Value.

Node MSD value is a number in the range of 0-255. 0 represents lack of the ability to support SID stack of any depth; any other value represents that of the node. This value MUST represent the lowest value supported by any link associated with the node.

This sub-TLV is optional. The scope of the advertisement is specific to the deployment.

4. Link MSD Advertisement

The link MSD sub-TLV is defined for TLVs 22, 23, 141, 222, and 223 to carry the MSD of the interface associated with the link. MSD values may be learned via a hardware API or may be provisioned.

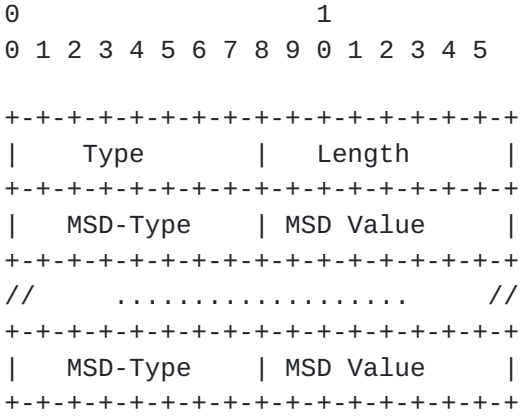

Figure 2: Link MSD Sub-TLV

The Type: TBD2

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

Value: consists of one or more pairs of a 1 octet MSD-Type (IANA Registry) and 1 octet Value.

Link MSD value is a number in the range of 0-255. 0 represents lack of the ability to support SID stack of any depth; any other value represents that of the link when used as an outgoing link.

This sub-TLV is optional. The scope of the advertisement is specific to the deployment.

5. Using Node and Link MSD Advertisements

When Link MSD is present for a given MSD type, the value of the Link MSD MUST take preference over the Node MSD.

The meaning of the absence of both Node and Link MSD advertisements for a given MSD type is specific to the MSD type. Generally it can only be inferred that the advertising node does not support advertisement of that MSD type. However, in some cases the lack of advertisement might imply that the functionality associated with the

MSD type is not supported. The correct interpretation MUST be specified when an MSD type is defined.

6. Base MPLS Imposition MSD

Base MPLS Imposition MSD (BMI-MSD) signals the total number of MPLS labels a node is capable of imposing, including any service/transport labels.

Absence of BMI-MSD advertisements indicates solely that the advertising node does not support advertisement of this capability.

7. IANA Considerations

This document requests IANA to allocate a sub-TLV type (TBD1) for the new sub TLV proposed in Section 3 of this document from IS-IS Router Capability TLV Registry as defined by [RFC7981].

IANA has allocated the following value through the early assignment process:

Value	Description	Reference
23	Node MSD	This document

Figure 3: Node MSD

This document requests IANA to allocate a sub-TLV type (TBD2) as defined in Section 4 from Sub-TLVs for TLVs 22, 23, 141, 222 and 223 registry.

IANA has allocated the following value through the early assignment process:

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 an IANA managed registry under a new category of "Interior Gateway Protocol (IGP) Parameters" IANA registries to identify MSD types as proposed in Section 3 and Section 4. The registration procedure is "Expert Review" as defined in [RFC8126]. Suggested registry name is "MSD 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 MPLS Imposition MSD	This document
2-250	Unassigned	This document
251-254	Experimental	This document
255	Reserved	This document

Figure 6: MSD Types Codepoints Registry

8. Security Considerations

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

9. Contributors

The following people contributed to this document:

Peter Psenak

Email: ppsenak@cisco.com

10. Acknowledgements

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Authors' Addresses

Jeff Tantsura
Nuage Networks

Email: jefftant.ietf@gmail.com

Uma Chunduri
Huawei Technologies

Email: uma.chunduri@huawei.com

Sam Aldrin
Google, Inc

Email: aldrin.ietf@gmail.com

Les Ginsberg
Cisco Systems

Email: ginsberg@cisco.com