

IS-IS Working Group  
Internet-Draft  
Intended status: Standards Track  
Expires: November 11, 2018

J. Tantsura  
Nuage Networks  
U. Chunduri  
Huawei Technologies  
S. Aldrin  
Google, Inc  
L. Ginsberg  
Cisco Systems  
May 10, 2018

Signaling MSD (Maximum SID Depth) using IS-IS  
draft-ietf-isis-segment-routing-msd-11

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.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on November 11, 2018.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents

Internet-Draft

May 2018

(<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">1.1.</a>	Conventions used in this document . . . . .	<a href="#">3</a>
<a href="#">1.1.1.</a>	Terminology . . . . .	<a href="#">3</a>
<a href="#">1.2.</a>	Requirements Language . . . . .	<a href="#">3</a>
<a href="#">2.</a>	Node MSD Advertisement . . . . .	<a href="#">4</a>
<a href="#">3.</a>	Link MSD Advertisement . . . . .	<a href="#">4</a>
<a href="#">4.</a>	Using Node and Link MSD Advertisements . . . . .	<a href="#">5</a>
<a href="#">5.</a>	Base MPLS Imposition MSD . . . . .	<a href="#">6</a>
<a href="#">6.</a>	IANA Considerations . . . . .	<a href="#">6</a>
<a href="#">7.</a>	Security Considerations . . . . .	<a href="#">7</a>
<a href="#">8.</a>	Contributors . . . . .	<a href="#">7</a>
<a href="#">9.</a>	Acknowledgements . . . . .	<a href="#">8</a>
<a href="#">10.</a>	References . . . . .	<a href="#">8</a>
<a href="#">10.1.</a>	Normative References . . . . .	<a href="#">8</a>
<a href="#">10.2.</a>	Informative References . . . . .	<a href="#">8</a>
	Authors' Addresses . . . . .	<a href="#">9</a>

[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 an 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. 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 capabilities should be advertised by 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. Although MSD advertisements are associated with Segment Routing, the advertisements MAY be present even if Segment Routing itself is not enabled.

## [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 all service/transport/special 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 [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here .

## 2. 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 smallest MSD supported by the node on the set of interfaces configured for use by the advertising IGP instance. MSD values may be learned via a hardware API or may be provisioned.

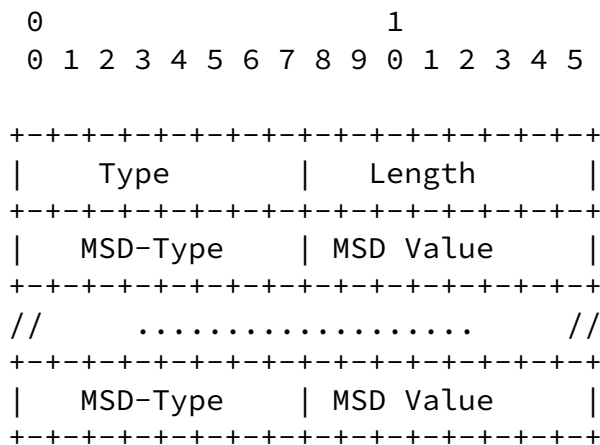


Figure 1: Node MSD Sub-TLV

Type: 23 (allocated by IANA via the early assignment process)

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 configured for use by the advertising IS-IS instance.

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

### 3. Link MSD Advertisement

The link MSD sub-TLV is defined for TLVs 22, 23, 25, 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.

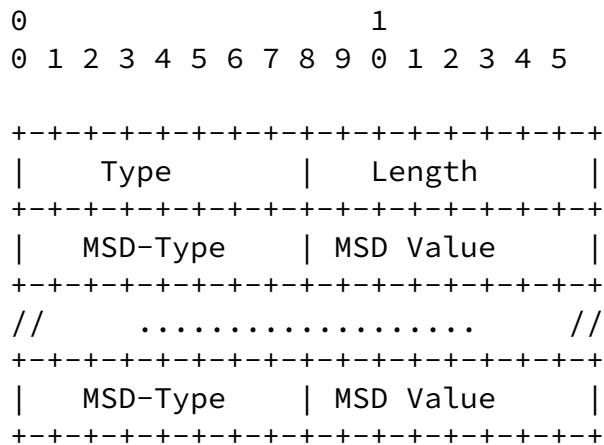


Figure 2: Link MSD Sub-TLV

Type: 15 (allocated by IANA via the early assignment process)

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.

#### [4.](#) 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. When a Link MSD type is not signalled but the Node MSD type is, then the Node MSD type value MUST be considered as the MSD value for that link.

In order to increase flooding efficiency, it is RECOMMENDED that routers with homogenous link MSD values advertise just the Node MSD value.

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.

#### [5.](#) Base MPLS Imposition MSD

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

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

#### [6.](#) IANA Considerations

This document requests IANA to allocate a sub-TLV type for the new

sub TLV proposed in [Section 2](#) 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 as defined in [Section 3](#) from Sub-TLVs for TLVs 22, 23, 25, 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:

Tantsura, et al. Expires November 11, 2018 [Page 6]

---

Internet-Draft May 2018

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 2](#) and [Section 3](#). 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

## [7.](#) Security Considerations

Security considerations as specified by [\[RFC7981\]](#) are applicable to this document.

Advertisement of the additional information defined in this document that is false, e.g., an MSD that is incorrect, may result in a path computation failing, having a service unavailable, or instantiation of a path that can't be supported by the head-end (the node performing the imposition).

## [8.](#) Contributors

The following people contributed to this document:

Peter Psenak

Email: [ppsenak@cisco.com](mailto:ppsenak@cisco.com)

## [9.](#) Acknowledgements



The authors would like to thank Acee Lindem, Ketan Talaulikar, Stephane Litkowski and Bruno Decraene for their reviews and valuable comments.

## 10. References

### 10.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC7981] Ginsberg, L., Previdi, S., and M. Chen, "IS-IS Extensions for Advertising Router Information", [RFC 7981](#), DOI 10.17487/RFC7981, October 2016, <<https://www.rfc-editor.org/info/rfc7981>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

### 10.2. Informative References

- [I-D.ietf-idr-bgp-ls-segment-routing-msd]  
Tantsura, J., Chunduri, U., Mirsky, G., and S. Sivabalan, "Signaling Maximum SID Depth using Border Gateway Protocol Link-State", [draft-ietf-idr-bgp-ls-segment-routing-msd-01](#) (work in progress), October 2017.
- [I-D.ietf-isis-mpls-elc]  
Xu, X., Kini, S., Sivabalan, S., Filsfils, C., and S. Litkowski, "Signaling Entropy Label Capability and Readable Label-stack Depth Using IS-IS", [draft-ietf-isis-mpls-elc-03](#) (work in progress), January 2018.
- [I-D.ietf-pce-segment-routing]  
Sivabalan, S., Filsfils, C., Tantsura, J., Henderickx, W., and J. Hardwick, "PCEP Extensions for Segment Routing", [draft-ietf-pce-segment-routing-11](#) (work in progress), November 2017.

- [RFC7752] Gredler, H., Ed., Medved, J., Previdi, S., Farrel, A., and S. Ray, "North-Bound Distribution of Link-State and Traffic Engineering (TE) Information Using BGP", [RFC 7752](#), DOI 10.17487/RFC7752, March 2016, <<https://www.rfc-editor.org/info/rfc7752>>.
- [RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 8126](#), DOI 10.17487/RFC8126, June 2017, <<https://www.rfc-editor.org/info/rfc8126>>.

#### Authors' Addresses

Jeff Tantsura  
Nuage Networks

Email: [jefftant.ietf@gmail.com](mailto:jefftant.ietf@gmail.com)

Uma Chunduri  
Huawei Technologies

Email: [uma.chunduri@huawei.com](mailto:uma.chunduri@huawei.com)

Sam Aldrin  
Google, Inc

Email: [aldrin.ietf@gmail.com](mailto:aldrin.ietf@gmail.com)

Les Ginsberg  
Cisco Systems

Email: [ginsberg@cisco.com](mailto:ginsberg@cisco.com)

