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Abstract

The Segment Routing (SR) architecture allows flexible definition of the end-to-end path by encoding it as a sequence of topological elements called "segments". It can be implemented over the MPLS or the IPv6 data plane. This document describes the OSPFv3 extensions required to support Segment Routing over the IPv6 data plane (SRv6).

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[1.](#) Introduction

Segment Routing (SR) architecture [[RFC8402](#)] specifies how a node can steer a packet through an ordered list of instructions, called

segments. These segments are identified through Segment Identifiers (SIDs).

Segment Routing can be instantiated on the IPv6 data plane through the use of the Segment Routing Header (SRH) defined in [\[RFC8754\]](#). SRv6 refers to this SR instantiation on the IPv6 dataplane.

The network programming paradigm for SRv6 is specified in [\[RFC8986\]](#). It describes how any behavior can be bound to a SID and how any network program can be expressed as a combination of SIDs. It also describes several well-known behaviors that can be bound to SRv6 SIDs.

This document specifies extensions to OSPFv3 in order to support SRv6 as defined in [\[RFC8986\]](#) by signaling the SRv6 capabilities of the node and some of the SRv6 SIDs with their endpoint behaviors that are instantiated on an SRv6 capable router. Familiarity with [\[RFC8986\]](#) is necessary to understand the extensions specified in this document.

At a high level, the extensions to OSPFv3 are comprised of the following:

1. SRv6 Capabilities TLV to advertise the SRv6 features and SRH operations supported by the router
2. Several new sub-TLVs are defined to advertise various SRv6 Maximum SID Depths.
3. SRv6 Locator TLV to advertise the SRv6 Locator – a form of summary address for the algorithm specific SIDs instantiated on the router
4. TLVs and Sub-TLVs to advertise the SRv6 SIDs instantiated on the router along with their endpoint behaviors

[1.1](#). Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and

Where:

- o Type: TBD.
- o Length: 4 + sum of the lengths of Sub-TLVs in terms of octets
- o Reserved : 16 bit field. SHOULD be set to 0 and MUST be ignored on receipt.
- o Flags: 16 bit field. The following flags are defined and others SHOULD be set to 0 and MUST be ignored on receipt:

```

      0                                     1
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
  +-+-+-+-+-+-+-+-+
  | 0|                                     |
  +-+-+-+-+-+-+-+-+
```

where:

- * 0-flag: If set, then the router is capable of supporting the 0-bit in the SRH flags, as specified in [\[I-D.ietf-6man-spring-srv6-oam\]](#).

The SRv6 Capabilities TLV may contain optional Sub-TLVs. No Sub-TLVs are currently defined.

[3.](#) Advertisement of Supported Algorithms

SRv6 enabled OSPFv3 router advertises its algorithm support using the SR Algorithm TLV defined in [\[RFC8665\]](#) as described in [\[RFC8666\]](#).

[4.](#) Advertisement of SRH Operation Limits

An SRv6 enabled router may have different capabilities and limits when it comes to SRH processing and this needs to be advertised to other routers in the SRv6 domain.

[RFC8476] defines the means to advertise node and link specific values for Maximum SID Depth (MSD) types. Node MSDs are advertised

using the Node MSD TLV in the OSPFv3 Router Information LSA [[RFC7770](#)] while Link MSDs are advertised using the Link MSD Sub-TLV of the Router-Link TLV [[RFC8362](#)]. The format of the MSD types for OSPFv3 is defined in [[RFC8476](#)].

The MSD types for SRv6 that are defined in section 4 of [[I-D.ietf-lsr-isis-srv6-extensions](#)] for IS-IS are also used by OSPFv3. These MSD Types are allocated under the IGP MSD Types registry maintained by IANA that are shared by IS-IS and OSPF. They are described below:

[4.1.](#) Maximum Segments Left MSD Type

The Maximum Segments Left MSD Type signals the maximum value of the "Segments Left" field of the SRH of a received packet before applying the Endpoint behavior associated with a SID. If no value is advertised, the supported value is assumed to be 0.

[4.2.](#) Maximum End Pop MSD Type

The Maximum End Pop MSD Type signals the maximum number of SIDs in the SRH to which the router can apply "Penultimate Segment Pop (PSP) of the SRH" or "Ultimate Segment Pop (USP) of the SRH", as defined in [[RFC8986](#)] flavors. If the advertised value is zero or no value is advertised, then the router cannot apply PSP or USP flavors.

[4.3.](#) Maximum H.Encaps MSD Type

The Maximum H.Encaps MSD Type signals the maximum number of SIDs that can be added as part of the "H.Encaps" behavior as defined in [[RFC8986](#)]. If the advertised value is zero or no value is advertised then the headend can apply an SR Policy that only contains one segment, without inserting any SRH. A non-zero SRH Max H.encaps MSD indicates that the headend can insert an SRH up to the advertised value.

[4.4.](#) Maximum End D MSD Type

The Maximum End D MSD Type specifies the maximum number of SIDs present in an SRH when performing decapsulation. These includes, but not limited to, End.DX6, End.DT4, End.DT46, End with USD, End.X with

USD as defined in [\[RFC8986\]](#). If the advertised value is zero or no value is advertised then the router cannot apply any behavior that results in decapsulation and forwarding of the inner packet if the other IPv6 header contains an SRH.

5. SRv6 SIDs and Reachability

An SRv6 Segment Identifier (SID) is 128 bits and comprises of Locator, Function and Argument parts as described in [\[RFC8986\]](#).

A node is provisioned with algorithm specific locators for each algorithm supported by that node. Each locator is a covering prefix for all SIDs provisioned on that node which have the matching algorithm.

Locators MUST be advertised in the SRv6 Locator TLV (see [Section 6.1](#)). Forwarding entries for the locators advertised in the SRv6 Locator TLV MUST be installed in the forwarding plane of receiving SRv6 capable routers when the associated algorithm is supported by the receiving node. Locators can be of different route types similar to existing OSPFv3 route types - Intra-Area, Inter-Area, External, and NSSA. The processing of the prefix advertised in the SRv6 Locator TLV, the calculation of its reachability and the installation in the forwarding plane follows the process defined for the respective route types in base OSPFv3 [\[RFC5340\]](#).

Locators associated with algorithm 0 and 1 SHOULD be advertised using the respective OSPFv3 Extended LSA types with extended TLVs [\[RFC8362\]](#) based on the OSPFv3 route of the locators so that legacy routers (i.e., routers which do not support SRv6) will install a forwarding entry for algorithm 0 and 1 SRv6 traffic. When operating in "sparse-mode" of compatibility [\[RFC8362\]](#) these locators SHOULD be also advertised using the respective base OSPFv3 LSAs [\[RFC5340\]](#).

In cases where a locator advertisement is received via in both in a prefix reachability advertisement (i.e. via base OSPFv3 LSAs and/or Extended Prefix TLVs using OSPFv3 Extended LSAs) and an SRv6 Locator TLV, the prefix reachability advertisement in OSPFv3 MUST be preferred over the advertisement in the SRv6 Locator TLV when installing entries in the forwarding plane. This is to prevent inconsistent forwarding entries between SRv6 capable and SRv6 incapable routers. Such preference of prefix reachability

advertisement does not have any impact on the rest of the data advertised in the SRv6 Locator TLV.

SRv6 SIDs are advertised as Sub-TLVs in the SRv6 Locator TLV except for SRv6 End.X SIDs/LAN End.X SIDs which are associated with a specific Neighbor/Link and are therefore advertised as Sub-TLVs of E-Router-Link TLV.

SRv6 SIDs received from other nodes are not directly routable and MUST NOT be installed in the forwarding plane. Reachability to SRv6 SIDs depends upon the existence of a covering locator.

Adherence to the rules defined in this section will assure that SRv6 SIDs associated with a supported algorithm will be forwarded correctly, while SRv6 SIDs associated with an unsupported algorithm will be dropped. NOTE: The drop behavior depends on the absence of a default/summary route covering a given locator.

In order for forwarding to work correctly, the locator associated with SRv6 SID advertisements must be the longest match prefix installed in the forwarding plane for those SIDs. In order to ensure correct forwarding, network operators should take steps to make sure that this requirement is not compromised. For example, the following situations should be avoided:

- o Another locator associated with a different topology/algorithm is the longest match
- o Another base OSPFv3 prefix advertisement is the longest match

[5.1.](#) SRv6 Flexible Algorithm

[I-D.ietf-lsr-flex-algo] specifies IGP Flexible Algorithm mechanisms for OSPFv3. Section 14.2 of [[I-D.ietf-lsr-flex-algo](#)] explains SRv6 forwarding for Flex-Algorithm and the same apply for supporting SRv6 Flexi-Algorithm using OSPFv3. When the algorithm value that is carried in the SRv6 Locator TLV (refer [Section 6.1](#)) represents a Flex-Algorithm, the procedures described in section 14.2 of [[I-D.ietf-lsr-flex-algo](#)] are followed for the programming of those specific SRv6 Locators. Locators associated with Flexible Algorithms

advertisements. Advertising the Flexible Algorithm locator as regular prefix reachability advertisements would make the forwarding for it to follow algo 0 path.

The procedures like ASBR reachability advertisements and the procedures for inter-area, external and NSSA route advertisement and computation as specified in [[I-D.ietf-lsr-flex-algo](#)] for OSPFv3 Flex-Algorithm for SR-MPLS also apply for SRv6.

6. SRv6 Locator LSA

The SRv6 Locator LSA has a function code of TBD while the S1/S2 bits are dependent on the desired flooding scope for the LSA. The flooding scope of the SRv6 Locator LSA depends on the scope of the advertised SRv6 Locator and is under the control of the advertising router. The U bit will be set indicating that the LSA should be flooded even if it is not understood.

Multiple SRv6 Locator LSAs can be advertised by an OSPFv3 router and they are distinguished by their Link State IDs (which are chosen arbitrarily by the originating router).

The format of SRv6 Locator LSA is shown below:

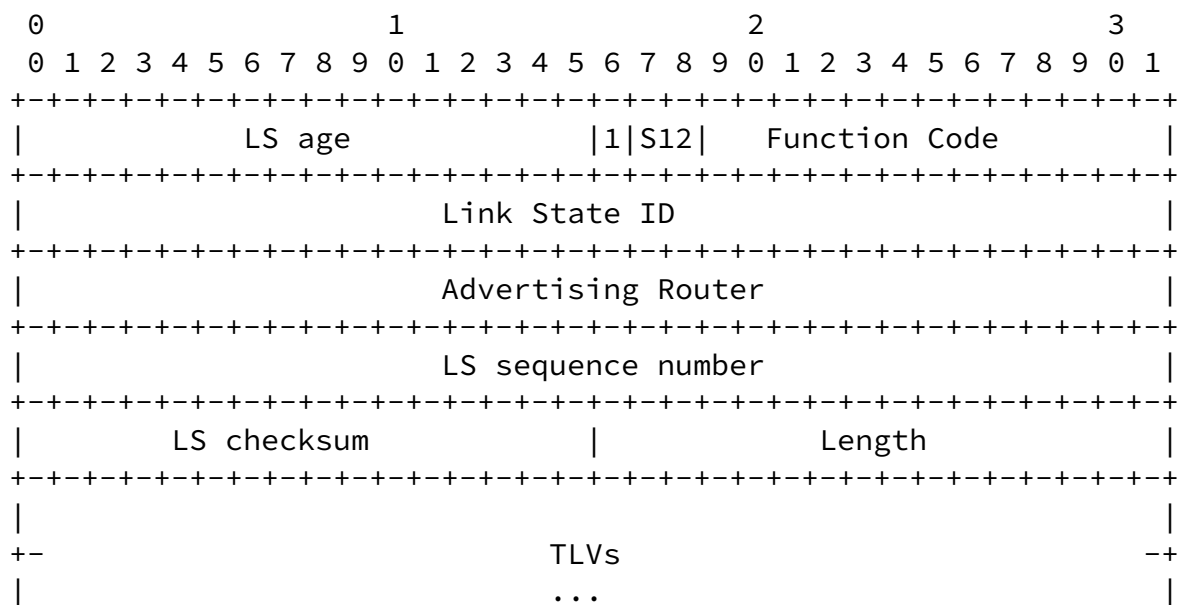


Figure 1: SRv6 Locator LSA

The format of the TLVs within the body of the SRv6 Locator LSA is the same as the format used by [[RFC3630](#)]. The variable TLV section

consists of one or more nested TLV tuples. Nested TLVs are also referred to as Sub-TLVs. The format of each TLV is:

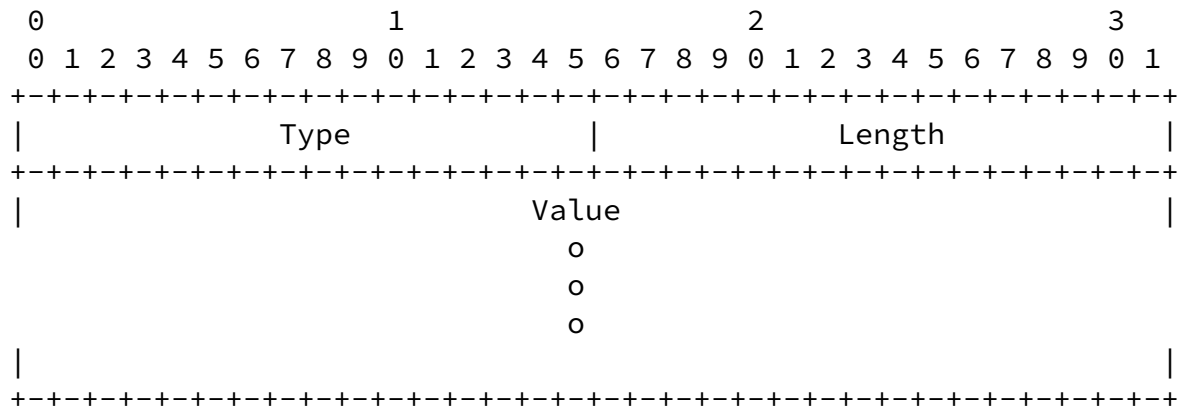


Figure 2: SRv6 Locator LSA TLV Format

The Length field defines the length of the value portion in octets (thus, a TLV with no value portion would have a length of 0). The TLV is padded to 4-octet alignment; padding is not included in the Length field (so a 3-octet value would have a length of 3, but the total size of the TLV would be 8 octets). Nested TLVs are also 32-bit aligned. For example, a 1-byte value would have the Length field set to 1, and 3 octets of padding would be added to the end of the value portion of the TLV. The padding is composed of zeros.

6.1. SRv6 Locator TLV

The SRv6 Locator TLV is a top-level TLV of the SRv6 Locator LSA that is used to advertise an SRv6 Locator, its attributes, and SIDs associated with it. Multiple SRv6 Locator TLVs MAY be advertised in each SRv6 Locator LSA. However, since the S12 bits define the flooding scope, the LSA flooding scope MUST satisfy the application-specific requirements for all the locators included in a single SRv6 Locator LSA.

When multiple SRv6 Locator TLVs are received from a given router in an SRv6 Locator LSA for the same Locator, the receiver MUST use the first occurrence of the TLV in the LSA. If the SRv6 Locator TLV for the same Locator appears in multiple SRv6 Locator LSAs that have different flooding scopes, the TLV in the SRv6 Locator LSA with the area-scoped flooding scope MUST be used. If the SRv6 Locator TLV for the same Locator appears in multiple SRv6 Locator LSAs that have the same flooding scope, the TLV in the SRv6 Locator LSA with the numerically smallest Link-State ID MUST be used and subsequent

instances of the TLV MUST be ignored.

The format of SRv6 Locator TLV is shown below:

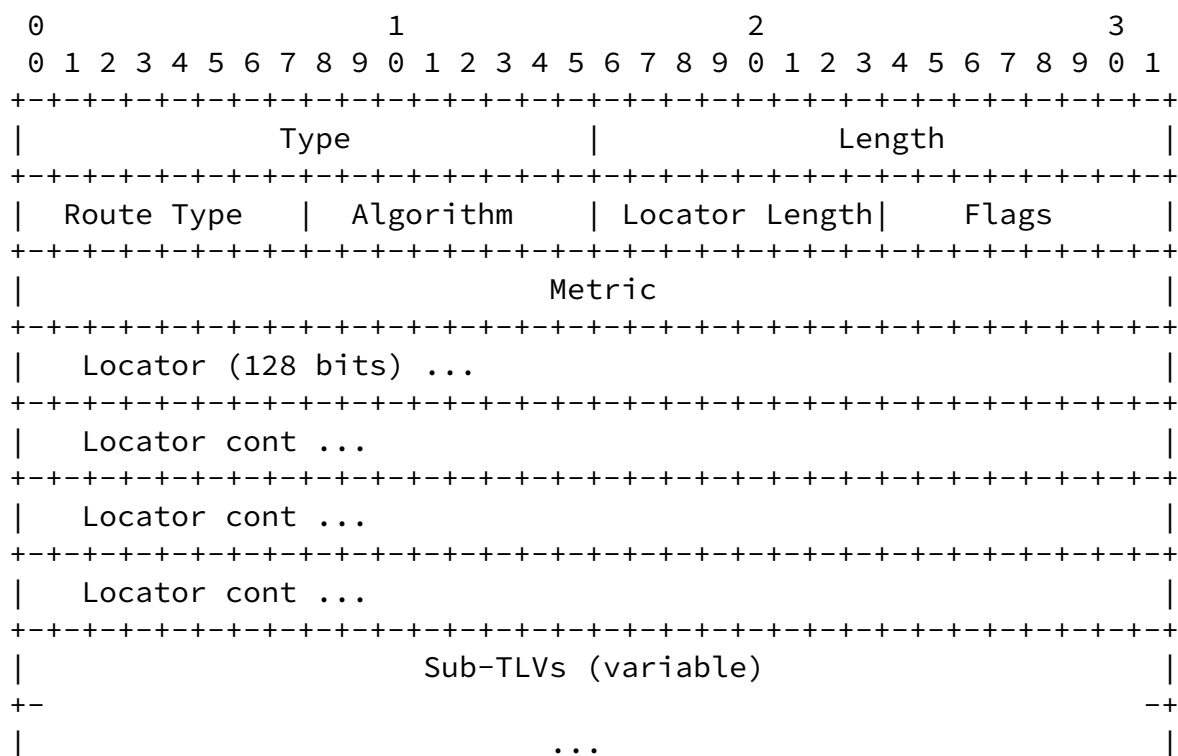


Figure 3: SRv6 Locator TLV

Where:

Type: 16 bit field. The value is 1 for this type.

Length: 16 bit field. The total length of the value portion of the TLV including Sub-TLVs in terms of octets.

Route Type : 8 bit field. The type of the locator route.
Supported types are the ones listed below and any other types MUST be ignored on receipt.

- 1 - Intra-Area
- 2 - Inter-Area

- 3 - AS External
- 4 - NSSA External

Figure 4

Algorithm: 8 bit field. Associated algorithm. Algorithm values are defined in the IGP Algorithm Type registry.

Locator Length: 8 bit field. Carries the length of the Locator prefix as the number of locator bits (1-128).

Flags: 8 bit field. The following flags are defined

```

  0 1 2 3 4 5 6 7
+---+---+---+---+
|N|A| Reserved |
+---+---+---+---+
```

Figure 5

- * N bit : When the locator uniquely identifies a node in the network (i.e., it is provisioned on one and only one node), the N bit MUST be set. Otherwise, this bit MUST be clear.
- * A bit : When the Locator is configured as anycast, the A bit SHOULD be set. Otherwise, this bit MUST be clear. If both the N and A bits are set, then the receiving routers MUST ignore the N bit (i.e., consider it as not set).
- * Other flags are not defined and SHOULD be set to 0 and MUST be ignored on receipt.

Metric : One octet field. The metric value associated with the locator.

Locator : 6 octet field. This field encodes the advertised SRv6 Locator.

Sub-TLVs : Used to advertise Sub-TLVs that provide additional attributes for the given SRv6 Locator and SRv6 SIDs associated

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	2	3	4	5	6	7	8	9																								
Type																Length																																															
Flags																Reserved																Endpoint Behavior																															
SID (128 bits) ...																																																															
SID cont ...																																																															
SID cont ...																																																															
SID cont ...																																																															
Sub-TLVs (variable) . . .																																																															

+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

Figure 6: SRv6 End SID Sub-TLV

Where:

Type: 16 bit field. Value is 1 for this type.

Length: 16 bit field. The total length of the value portion of the Sub-TLVs.

Reserved : 8 bit field. Should be set to 0 and MUST be ignored on receipt.

Flags: 8 bit field which define the flags associated with the SID. No flags are currently defined and SHOULD be set to 0 and MUST be ignored on receipt.

Endpoint Behavior: 16 bit field. The endpoint behavior code point for this SRv6 SID as defined in [section 9.2 of \[RFC8986\]](#).

SID : 6 octet field. This field encodes the advertised SRv6 SID.

Sub-TLVs : Used to advertise Sub-TLVs that provide additional attributes for the given SRv6 SID.

[8.](#) Advertisement of SRv6 SIDs Associated with Adjacencies

The SRv6 endpoint behaviors are defined in [\[RFC8986\]](#) include certain behaviors which are specific to links or adjacencies. The most basic of these which is critical for link state routing protocols like OSPFv3 is the End.X behavior that is an instruction to forward to a specific neighbor on a specific link. These SRv6 SIDs along with others that are defined in [\[RFC8986\]](#) which are specific to links or adjacencies need to be advertised by OSPFv3 so that this information is available to all routers in the area to influence the packet path via these SRv6 SIDs over the specific adjacencies.

The advertisement of SRv6 SIDs and their behaviors that are specific to a particular neighbor is done via two different optional Sub-TLVs of the E-Router-Link TLV defined in [\[RFC8362\]](#) as follows:

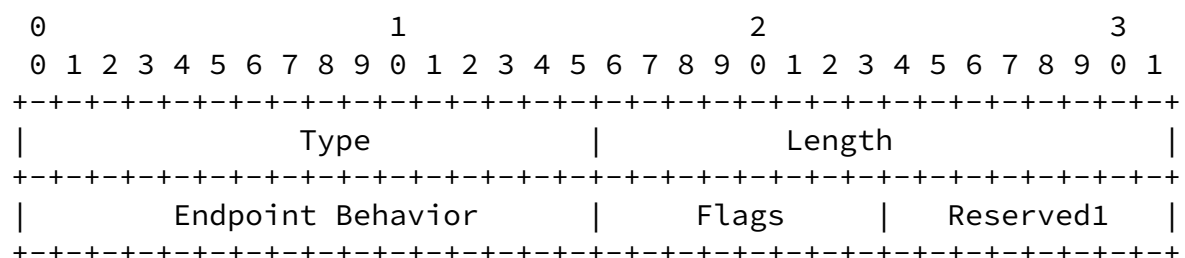
- o SRv6 End.X SID Sub-TLV: For OSPFv3 adjacencies over point-to-point or point-to-multipoint links and the adjacency to the Designated Router (DR) over broadcast and non-broadcast-multi-access (NBMA) links.
- o SRv6 LAN End.X SID Sub-TLV: For OSPFv3 adjacencies on broadcast and NBMA links to the Backup DR and DR-Other neighbors. This Sub-TLV includes the OSPFv3 router-id of the neighbor and thus allows for an instance of this Sub-TLV for each neighbor to be explicitly advertised under the E-Router-Link TLV for the same link.

Every SRv6 enabled OSPFv3 router SHOULD instantiate at least one unique SRv6 End.X SID corresponding to each of its neighbor. A router MAY instantiate more than one SRv6 End.X SID for for a single neighbor. The same SRv6 End.X SID MAY be advertised for more than one neighbor. Thus multiple instances of the SRv6 End.X SID and SRv6 LAN End.X SID Sub-TLVs MAY be advertised within the E-Router-Link TLV for a single link.

All End.X and LAN End.X SIDs MUST be subsumed by the subnet of a Locator with the matching algorithm which is advertised by the same node in an SRv6 Locator TLV. End.X SIDs which do not meet this requirement MUST be ignored. This ensures that the node advertising the End.X or LAN End.X SID is also advertising its corresponding Locator with the algorithm that will be used for computing paths destined to the SID.

[8.1.](#) SRv6 End.X SID Sub-TLV

The format of the SRv6 End.X SID Sub-TLV is shown below



Algorithm	Weight	Reserved2
SID (128 bits) ...		
SID cont ...		
SID cont ...		
SID cont ...		
Sub-TLVs (variable) . . .		

Where:

Type: 16 bit field. Value is TBD.

Length: 16 bit field. The total length of the value portion of the TLV.

Endpoint Behavior: 16 bit field. The code point for the endpoint behavior for this SRv6 SID as defined in [section 9.2 of \[RFC8986\]](#).

Flags: 8 bit field with the following definition:

0	1	2	3	4	5	6	7
B	S	P	Reserved				

- * B-Flag: Backup Flag. If set, the SID refers to a path that is eligible for protection.

- * S-Flag: Set Flag. When set, the S-Flag indicates that the End.X SID refers to a set of adjacencies (and therefore MAY be assigned to other adjacencies as well).

- * P-Flag: Persistent Flag: If set, the SID is persistently allocated, i.e., the SID value remains consistent across router restart and session/interface flap.
- * Reserved bits: Reserved for future use and MUST be zero when originated and ignored on receipt.

Reserved1 : 8 bit field. Should be set to 0 and MUST be ignored on receipt.

Algorithm : 8 bit field. Associated algorithm. Algorithm values are defined in the IGP Algorithm Type registry.

Weight: 8 bit field whose value represents the weight of the End.X SID for the purpose of load-balancing. The use of the weight is defined in [[RFC8402](#)].

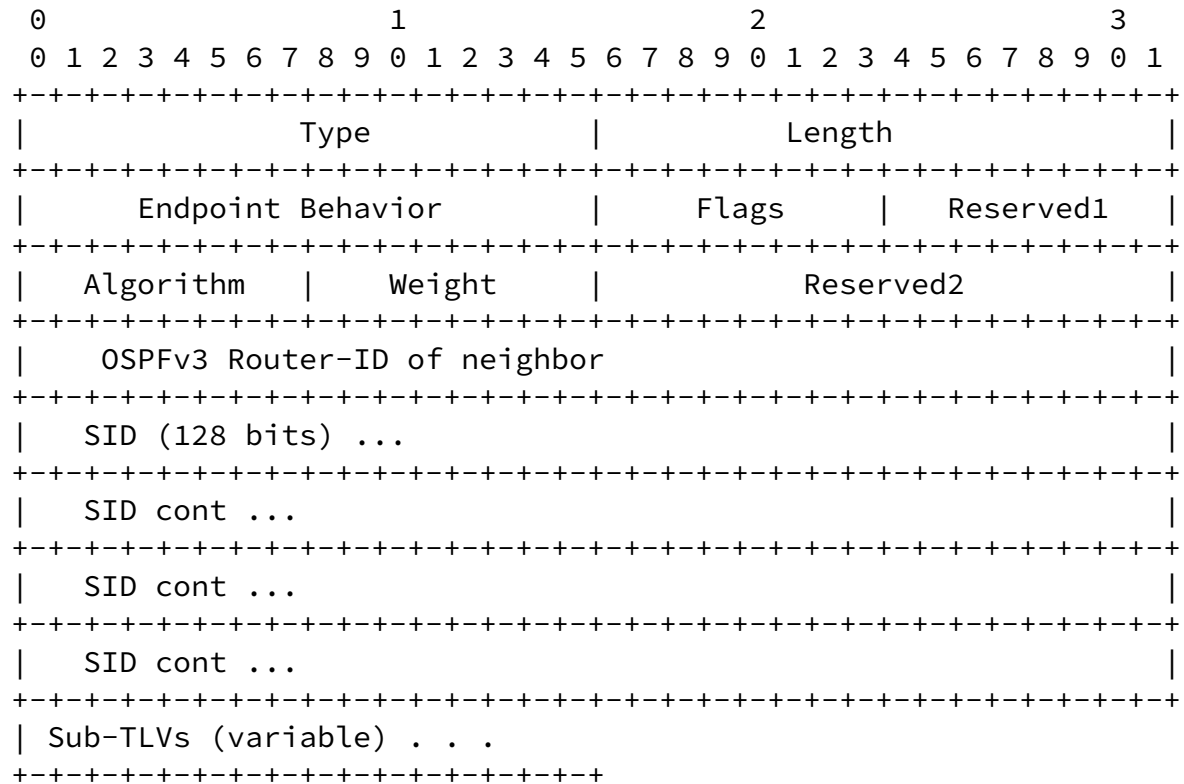
Reserved2 : 16 bit field. Should be set to 0 and MUST be ignored on receipt.

SID: 128 bit field. This field encodes the advertised SRv6 SID.

Sub-TLVs : Used to advertise Sub-TLVs that provide additional attributes for the given SRv6 End.X SID.

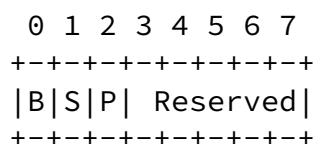
[8.2.](#) SRv6 LAN End.X SID Sub-TLV

The format of the SRv6 LAN End.X SID Sub-TLV is as shown below



Where

- o Type: 16 bit field. Value is TBD.
- o Length: 16 bit field. Variable
- o Endpoint Behavior: 16 bit field. The code point for the endpoint behavior for this SRv6 SID as defined in [section 9.2 of \[RFC8986\]](#).
- o SID Flags: 8 bit field which define the flags associated with the SID. No flags are currently defined and SHOULD be set to 0 and MUST be ignored on receipt.
- o Flags: 8 bit field with the following definition:



- * B-Flag: Backup Flag. If set, the SID refers to a path that is eligible for protection.

- * S-Flag: Set Flag. When set, the S-Flag indicates that the End.X SID refers to a set of adjacencies (and therefore MAY be assigned to other adjacencies as well).
- * P-Flag: Persistent Flag: If set, the SID is persistently allocated, i.e., the SID value remains consistent across router restart and session/interface flap.
- * Reserved bits: Reserved for future use and MUST be zero when originated and ignored on receipt.
- o Reserved1 : 8 bit field. Should be set to 0 and MUST be ignored on receipt.
- o Algorithm : 8 bit field. Associated algorithm. Algorithm values are defined in the IGP Algorithm Type registry.
- o Weight: 8 bit field whose value represents the weight of the End.X SID for the purpose of load balancing. The use of the weight is defined in [\[RFC8402\]](#).
- o Reserved2 : 16 bit field. Should be set to 0 and MUST be ignored on receipt.
- o Neighbor ID : 32 bits of OSPFv3 Router-id of the neighbor
- o SID: 128 bit field. This field encodes the advertised SRv6 SID.
- o Sub-TLVs : Used to advertise Sub-TLVs that provide additional attributes for the given SRv6 SID.

[9.](#) SRv6 SID Structure Sub-TLV

SRv6 SID Structure Sub-TLV is used to advertise the structure of the SRv6 SID as defined in [\[RFC8986\]](#). It is used as an optional Sub-TLV of the following:

- o SRv6 End SID Sub-TLV (refer [Section 7](#))
- o SRv6 End.X SID Sub-TLV (refer [Section 8.1](#))

- o SRv6 LAN End.X SID Sub-TLV (refer [Section 8.2](#))

The Sub-TLV has the following format:

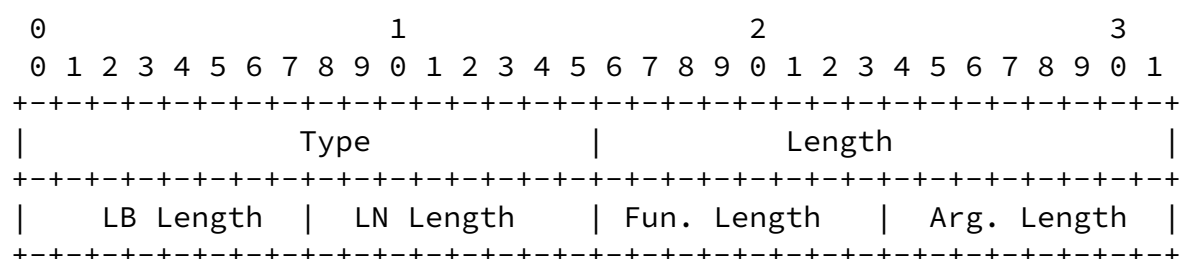


Figure 7: SRv6 SID Structure Sub-TLV

Where:

Type: 16 bit field with value TBD, see [Section 12](#).

Length: 16 bit field with the value 4.

LB Length: 8 bit field. SRv6 SID Locator Block length in bits.

LN Length: 8 bit field. SRv6 SID Locator Node length in bits.

Function Length: 8 bit field. SRv6 SID Function length in bits.

Argument Length: 8 bit field. SRv6 SID Argument length in bits.

The SRv6 SID Structure Sub-TLV MUST NOT appear more than once in its parent TLV/Sub-TLV. If it appears more than once in its parent TLV/Sub-TLV, the parent TLV/Sub-TLV MUST be ignored by the receiver.

The sum of all four sizes advertised in SRv6 SID Structure Sub-TLV MUST be less than or equal to 128 bits. If the sum of all four sizes advertised in the SRv6 SID Structure Sub-Sub-TLV is larger than 128 bits, the parent TLV/Sub-TLV MUST be ignored by the receiver.

The SRv6 SID Structure Sub-TLV is intended for informational use by the control and management planes. It MUST NOT be used at a transit node (as defined in [\[RFC8754\]](#)) for forwarding packets. As an example, this information could be used for:

- o validation of SRv6 SIDs being instantiated in the network and advertised via OSPFv3. These can be learnt by controllers via BGP-LS and then be monitored for conformance to the SRv6 SID allocation scheme chosen by the operator as described in [Section 3.2 of \[RFC8986\]](#).
- o verification and the automation for securing the SRv6 domain by provisioning filtering rules at SR domain boundaries as described in [Section 5 of \[RFC8754\]](#).

The details of these potential applications are outside the scope of this document.

[10.](#) Advertising Endpoint Behaviors

Endpoint behaviors are defined in [\[RFC8986\]](#) and [\[I-D.ietf-6man-spring-srv6-oam\]](#). The codepoints for the Endpoint behaviors are defined in the [section 9.2 of \[RFC8986\]](#). This section lists the Endpoint behaviors and their codepoints, which MAY be advertised by OSPFv3 and the Sub-TLVs in which each type MAY appear.

Endpoint Behavior	Endpoint Behavior Codepoint	End SID	End.X SID	LAN End.X SID
End (PSP, USP, USD)	1-4, 28-31	Y	N	N
End.X (PSP, USP, USD)	5-8, 32-35	N	Y	Y
End.DX6	16	N	Y	Y
End.DX4	17	N	Y	Y
End.DT6	18	Y	N	N
End.DT4	19	Y	N	N

-----	-----	----	-----	-----
End.DT64	20	Y	N	N
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Figure 8: SRv6 Endpoint Behaviors in OSPFv3

11. Security Considerations

Existing security extensions as described in [[RFC5340](#)] and [[RFC8362](#)] apply to these SRv6 extensions. While OSPFv3 is under a single administrative domain, there can be deployments where potential attackers have access to one or more networks in the OSPFv3 routing domain. In these deployments, stronger authentication mechanisms such as those specified in [[RFC4552](#)] or [[RFC7166](#)] SHOULD be used.

Implementations MUST assure that malformed TLV and Sub-TLV defined in this document are detected and do not provide a vulnerability for attackers to crash the OSPFv3 router or routing process. Reception of malformed TLV or Sub-TLV SHOULD be counted and/or logged for further analysis. Logging of malformed TLVs and Sub-TLVs SHOULD be

rate-limited to prevent a Denial of Service (DoS) attack (distributed or otherwise) from overloading the OSPFv3 control plane.

This document describes the OSPFv3 extensions required to support Segment Routing over an IPv6 data plane. The security considerations for Segment Routing are discussed in [[RFC8402](#)]. [[RFC8986](#)] defines the SRv6 Network Programming concept and specifies the main Segment Routing behaviors to enable the creation of interoperable overlays; the security considerations from that document apply too.

The advertisement for an incorrect MSD value may have negative consequences, see [[RFC8476](#)] for additional considerations.

Security concerns associated with the setting of the 0-flag are described in [[I-D.ietf-6man-spring-srv6-oam](#)].

Security concerns associated with the usage of Flex-Algorithms are described in [[I-D.ietf-lsr-flex-algo](#)].

[12.](#) IANA Considerations

This document specifies updates to multiple OSPF and OSPFv3 related IANA registries as follows.

[12.1.](#) OSPF Router Information TLVs

This document proposes the following new code point in the "OSPF Router Information (RI) TLVs" registry under the "OSPF Parameters" registry for the new TLVs:

Type TBD (suggested 20): SRv6-Capabilities TLV: Refer to [Section 2](#).

[12.2.](#) OSPFv3 LSA Function Codes

This document proposes the following new code point in the "OSPFv3 LSA Function Codes" registry under the "OSPFv3 Parameters" registry for the new SRv6 Locator LSA:

- o Type TBD (suggested 42): SRv6 Locator LSA: Refer to [Section 6](#).

[12.3.](#) OSPFv3 Extended-LSA Sub-TLVs

This document proposes the following new code points in the "OSPFv3 Extended-LSA Sub-TLVs" registry under the "OSPFv3 Parameters" registry for the new Sub-TLVs:

- o Type TBD (suggested 10): SRv6 SID Structure Sub-TLV : Refer to [Section 9](#).
- o Type TBD (suggested 11): SRv6 End.X SID Sub-TLV : Refer to [Section 8.1](#).
- o Type TBD (suggested 12): SRv6 LAN End.X SID Sub-TLV : Refer to [Section 8.2](#).

[12.4.](#) OSPFv3 Locator LSA TLVs

This document proposes setting up of a new "OSPFv3 Locator LSA TLVs"

registry that defines top-level TLVs for the OSPFv3 SRv6 Locator LSA to be added under the "OSPFv3 Parameters" registry. The initial code-points assignment is as below:

- o Type 0: Reserved.
- o Type 1: SRv6 Locator TLV : Refer to [Section 6.1](#).

Types in the range 2-32767 are allocated via IETF Review or IESG Approval [[RFC8126](#)].

Types in the range 32768-33023 are Reserved for Experimental Use; these will not be registered with IANA and MUST NOT be mentioned by RFCs.

Types in the range 33024-45055 are to be assigned on a First Come First Served (FCFS) basis.

Types in the range 45056-65535 are not to be assigned at this time. Before any assignments can be made in the 33024-65535 range, there MUST be an IETF specification that specifies IANA Considerations that cover the range being assigned.

[12.5](#). OSPFv3 Locator LSA Sub-TLVs

This document proposes setting up of a new "OSPFv3 Locator LSA Sub-TLVs" registry that defines Sub-TLVs at any level of nesting for the SRv6 Locator TLVs to be added under the "OSPFv3 Parameters" registry. The initial code-points assignment is as below:

- o Type 0: Reserved.
- o Type 1: SRv6 End SID Sub-TLV : Refer to [Section 7](#).
- o Type 10: SRv6 SID Structure Sub-TLV : Refer to [Section 9](#).

Types in the range 2-9 and 11-32767 are allocated via IETF Review or IESG Approval [[RFC8126](#)].

Types in the range 32768-33023 are Reserved for Experimental Use; these will not be registered with IANA and MUST NOT be mentioned by

RFCs.

Types in the range 33024–45055 are to be assigned on a First Come First Served (FCFS) basis.

Types in the range 45056–65535 are not to be assigned at this time. Before any assignments can be made in the 33024–65535 range, there MUST be an IETF specification that specifies IANA Considerations that cover the range being assigned.

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