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BGP-LS Extensions for Shorter SRv6 SID
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Abstract

This document describes the BGP-LS extensions required to support the Shorter SRv6 SIDs(Compressing SRv6 SIDs).

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[1.](#) Introduction

Segment Routing [[RFC8402](#)] leverages the source routing paradigm. An ingress node steers a packet through an ordered list of instructions, called segments.

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

However, the size of the SRv6 SID presents a scalability challenge to use topological instructions that define a strict explicitly routed path in combination with service-based instructions. At the same time, the size of the SRH/SID may be a challenge for some data plane processors and traffic overhead.

[[I-D.cheng-spring-shorter-srv6-sid-requirement](#)] describes a list of requirements for the use of a shortened identifier in a segment routing network with the IPv6 data plane.

[[I-D.mirsky-6man-unified-id-sr](#)] proposed an extension of SRH that enables the use of a shorter segment identifier in dataplane, such as 32-bits Label format SID or 32-bits IP address format SID.

This document defines extensions to BGP-LS in order to support the advertisement of Shorter SRv6 SIDs contained in SID list that installed in dataplane.

[2.](#) Advertising Shorter SRv6 SIDs capabilities

A node indicates that it supports the SR Segment Endpoint Node functionality as specified in [[RFC8754](#)] by advertising a SRv6 Capabilities TLV [[I-D.ietf-idr-bgppls-srv6-ext](#)] of the node NLRI.

This document extends the flags field in the SRv6 Capabilities TLV [[I-D.ietf-idr-bgppls-srv6-ext](#)] to indicate that the node supports the Shorter SRv6 SIDs, where,

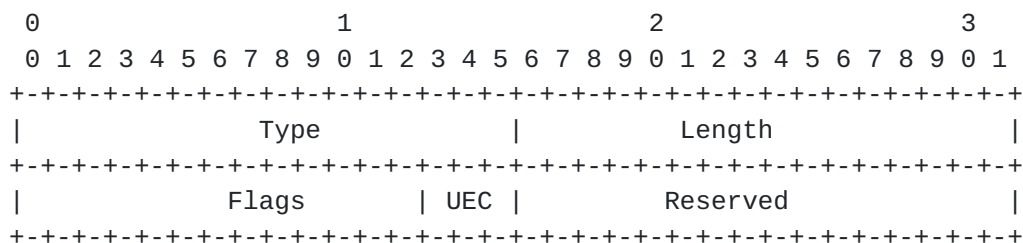


Figure 1: UEC-Flag in SRv6 Capabilities TLV

UEC: Unified-SID Encapsulation Capability, 3-bits field, refers to [\[I-D.mirsky-6man-unified-id-sr\]](#), it indicates the U-SID capabilities which the node support. A node advertised a specific UEC also means the node belongs to the related UET domain, so it will have capability to install a local SID entry with behavior to get next UET related U-SID from SRH. The value of UEC could be:

0b000: The node only support to use classical 128-bits SRv6 SID. It only belongs to UET-128 domain, and has capability only to get next classical 128-bits SID from SRH.

0b001: The node support to use both classical 128-bits SRv6 SID and 32-bits IPv4 U-SID. It can belongs to both UET-128 domain and UET-32 IPv4 domain, and has capability both to get next classical 128-bits SID and 32-bits IPv4 U-SID from SRH.

0b010: The node support to use both classical 128-bits SRv6 SID and 32-bits MPLS U-SID. It can belongs to both UET-128 domain and UET-32 MPLS domain, and has capability both to get next classical 128-bits SID and 32-bits MPLS U-SID from SRH.

0b011: The node support to use both classical 128-bits SRv6 SID, 32-bits IPv4 U-SID, and 32-bits MPLS U-SID. It can belongs to both UET-128 domain, UET-32 IPv4 domain, and UET-32 MPLS domain, and has capability both to get next classical 128-bits SID, 32-bits IPv4 U-SID, and 32-bits MPLS U-SID from SRH.

0b100: The node support to use both classical 128-bits SRv6 SID and 16-bits U-SID. It can belongs to both UET-128 domain and UET-16 domain, and has capability both to get next classical 128-bits SID and 32-bits U-SID from SRH.

0b101: The node support to use both classical 128-bits SRv6 SID, 32-bits IPv4 U-SID, and 16-bits U-SID. It can belongs to both UET-128 domain, UET-32 IPv4 domain, and UET-16 domain, and has capability both to get next classical 128-bits SID, 32-bits IPv4 U-SID, and 16-bits U-SID from SRH.

others: For later defined.

For typical 32-bits based compression scenario, 0b001 UEC is enough.

Note that UEC has two meanings. First, it indicates which UET domain does the advertised node belongs to, this will help to outline which UET domains the SR path crosses. The second meaning, it indicates the advertised node has capability to install a local SID entry with UET related behavior, to get next UET related U-SID from SRH, this will help to select appropriate SID with specific UET related behavior for an segment list during compression.

3. Advertising SRv6 SID Structure TLV

SRv6 SID Structure TLV is an optional TLV use in the BGP-LS Attribute for an SRv6 SID NLRI defined in [[I-D.ietf-idr-bgpls-srv6-ext](#)].

As discussed in [[I-D.ietf-spring-srv6-network-programming](#)], the node with the SRv6 capability will maintain its local SID table. A Local SID is generally composed of two parts, that is, LOC:FUNCT, or may carry arguments at the same time, that is, LOC:FUNCT:ARGS. The controller plane protocol can also use B:N to represent an LOC, where B is SRv6 SID Locator Block and N to represent node N. In other words, the structure of a complete SID is B:N:FUNCT:ARGS.

SRv6 SID Structure TLV is used to advertise the length of each individual part of the SRv6 SID as defined in [[I-D.ietf-spring-srv6-network-programming](#)].

If a node advertised an UEC-FLAG with 0b001/0b011/0b100/0b101, it SHOULD advertise the related SIDs with structure information, i.e., contained SRv6 SID Structure TLV in the BGP-LS Attribute for an SRv6 SID NLRI, otherwise the result optimized SID list will have to contain related classical 128-bits SRv6 SID.

4. Advertising SRv6 SID Endpoint Behaviors with UET-Flavor

Endpoint behaviors are defined in [[I-D.ietf-spring-srv6-network-programming](#)]. The codepoints for the Endpoint behaviors are defined in the "SRv6 Endpoint Behaviors" registry defined in [[I-D.ietf-spring-srv6-network-programming](#)]. For End, End.X and End.T behaviors, they can also have PSP, USP and USD variants. This document continues to extend the following new flavors for End and End.X behaviors:

UET-32-IPv4 Flavor: indicate the next SID is 32-bits IP address, termed as UET-1 flavor.

UET-32-MPLS Flavor: indicate the next SID is 32-bits MPLS Label, termed as UET-2 flavor.

UET-16-IP Flavor: indicate the next SID is 16-bits IP address, termed as UET-3 flavor.

Other flavors are for later defined.

We can take regard the traditional behaviors that has not any indication of next SID type as behaviors with UET-128-IPv6 flavor, termed as UET-0 flavor.

How to extend the above UET related flavors for other endpoint behaviors, such as VPN related SID and SFC related SID, is out the scope of this document.

Note that a SID MUST NOT set two or more of the above flavors at the same time, because these flavors is used to indicate the next SID type in SRH, that is, the local SID entry must provide exact indication for this purpose.

Each of the above UET related flavors can be used combined with existing PSP/USP/USD flavors.

If a node supports an UEC, it SHOULD also allocate related SIDs for this UEC, otherwise the result optimized SID list will have to contain related classical 128-bits SRv6 SID.

For example, a node X advertised UCE 0b001, it can allocate a classical END SID X1 with endpoint behavior "End (no PSP, no USP)", it can also allocate an END SID X2 with endpoint behavior "End (no PSP, no USP, UET-32-IPv4)".

Endpoint Behavior information of SRv6 SID could be advertised within SRv6 End.X SID TLV, SRv6 LAN End.X SID TLV, and SRv6 Endpoint Behavior TLV that defined in [[I-D.ietf-idr-bgpls-srv6-ext](#)].

5. Operations

Based on the BGP-LS database which contains UEC capabilities and SID(s) per UET related flavors, a headend or controller can firstly check which UET domains a computed SR path crossed, then selects UET related SID to construct an optimized E2E SID list.

The detailed description can refer to [[I-D.mirsky-6man-unified-id-sr](#)] and [[I-D.liu-idr-segment-routing-te-policy-complement](#)].

6. Security Considerations

Procedures and protocol extensions defined in this document do not affect the security considerations discussed in [\[I-D.ietf-idr-bgppls-srv6-ext\]](#).

7. IANA Considerations

TBD

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