LSR Working Group
Internet-Draft
Intended status: Standards Track
Expires: January 11, 2021

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July 10, 2020

IGP Extensions for Segment Routing Service Segment
draft-lz-lsr-igp-sr-service-segments-02

Abstract

This document defines extensions to the link-state routing protocols (IS-IS and OSPF) in order to carry service segment information via IGP.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on January 11, 2021.

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1. Introduction

Segments are introduced in the SR architecture [RFC8402]. Segment Routing (SR) allows for a flexible definition of end-to-end paths by encoding paths as sequences of topological sub-paths, called "segments".

Service Function Chaining (SFC) [RFC7665] provides support for the creation of composite services that consist of an ordered set of Service Functions (SF) that are to be applied to packets and/or frames selected as a result of classification.

[I-D.ietf-spring-sr-service-programming] describes how a service can be associated with a SID and how to achieve service funtion chaining in SR-enabled MPLS and IPv6 networks. It also defines SR-aware and SR-unaware services. For a SR-unaware service ,there has to be a SR proxy handling the SR processing on behalf of the service .

[I-D.dawra-idr-bgp-ls-sr-service-segments] propose extensions to BGP-LS for Service Chaining to distribute the service segment information to SR Controller.

The network topology is shown in figure 1.

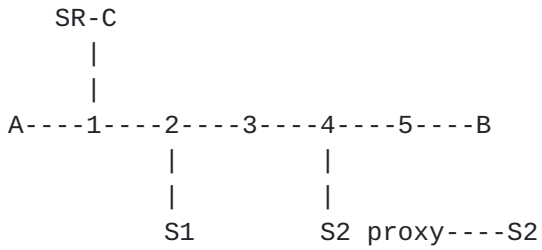

Figure 1: Network with Services

Node 1-5 are nodes capital of segment routing. A and B are two end hosts. S1 is an SR-aware Service. S2 is an SR-unaware Service.

SR Controller (SR-C) is connected to node 1, but may be attached to any node 1-5 in the network.

SR-C is capable of receiving BGP-LS updates to discover topology, and calculating constrained paths between 1 and 5.

Node 1 can use the BGP-LS extensions [I-D.ietf-spring-sr-service-programming] to advertise the service segment information to the SR-C, but it must get the information from other nodes at first.

This document proposes extensions for IGP to advertise service segment information so that there is only one SR node needed per Autonomous System to be connected with the SR-C through BGP-LS to advertise the information to it.

This extension works for both SR-MPLS and SRv6.

2. IGP Extensions for Service Segments

After an SFF like node 2 or node 4 get the service segment information, it needs to advertise the information to other SR nodes in the domain through IGP.

How can SFFs like node 2 and node 4 get the service segment information from S1 and S2 proxy will be discussed further.

There may be other alternate mechanisms and are outside of scope of this document.

2.1. IS-IS Extensions

This document introduces new sub-sub-TLVs for SRv6 End SID sub-TLV [I-D.ietf-lsr-isis-srv6-extensions] and Prefix Segment Identifier (Prefix-SID) Sub-TLV [RFC8667] for SR-MPLS to associate the Service SID Value with Service-related Information.

One of the new TLVs is Service Chaining (SC) TLV, the TLV is defined as follows :

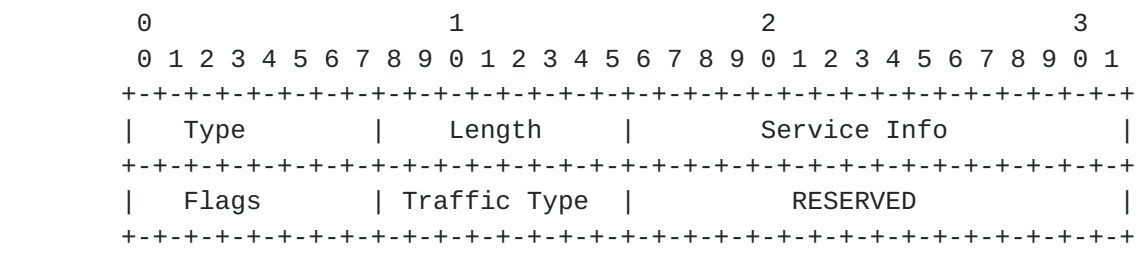

Figure 2:Service Chaining (SC) TLV

where:

Type: 8 bit field. TBD

Length: 8 bit field indicating the length of the remainder of the TLV

The Flags, Traffic Type and RESERVED fields are the same as in the SC TLV defined in [I-D.dawra-idr-bgp-ls-sr-service-segments] chapter 2.

Flags: 8 bit field. Bits SHOULD be 0 on transmission and MUST be ignored on reception.

Traffic Type: 8 Bit field. A bit to identify if Service is IPv4 OR IPv6 OR L2 Ethernet Capable.

Bit 0(LSB): Set to 1 if Service is IPv4 Capable

Bit 1: Set to 1 if Service is IPv6 Capable

Bit 2: Set to 1 if Service is Ethernet Capable

RESERVED: 16bit field. SHOULD be 0 on transmission and MUST be ignored on reception.

Service Info: 16-bits field. The right most 12 bits categorize the Service Type: (such as "Firewall", "Classifier" etc).

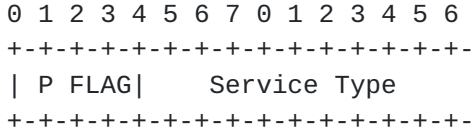

Figure 3: Service Info Field

The first 4 bits are P FLAG which is used to indicate the SR proxy type with the following values:

0000:SR-aware function.

0001:Static proxy.

0010:Dynamic proxy.

0011:Masquerading proxy(for SRv6 only).

0100:Shared memory proxy.

Other values are reserved.

The P FLAG is mainly defined for SR-MPLS.

In SRv6, although the SR proxy type can be represented by the END functions[I-D.ietf-spring-sr-service-programming] which can be advertised in Endpoint Behavior field of End SID sub-TLV [I-D.ietf-lsr-isis-srv6-extensions], there may be situations that the proxy with certain type cannot be associated with a network programming function(for example, Shared memory proxy),or an user want to define a new type of proxy for private use, or the SR proxy node does not support network programming, so the P flag is still useful.

In the IS-IS notification message, when both SR proxy END function and P FLAG exist, the proxy type represented by P FLAG shall prevail.

Another Optional Opaque Metadata(OM) TLV is defined in figure 4. The definition and structure are the same as the OM TLV defined in [I-D.dawra-idr-bgp-ls-sr-service-segments] chapter 2.

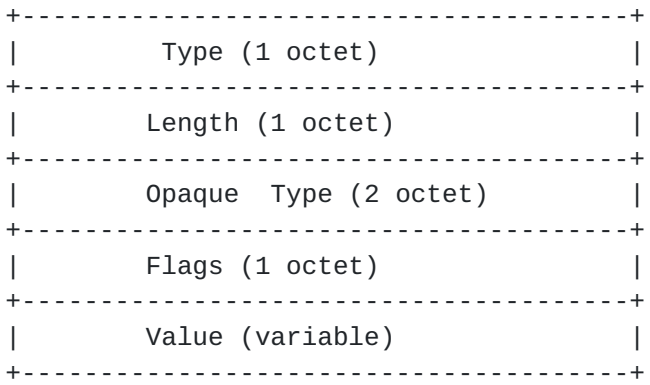

Figure 4:Opaque Metadata(OM) TLV

2.2. OSPFv2 and OSPFv3 Extensions

This document introduces new sub-sub-TLVs for SRv6 End SID sub-TLV [I-D.li-ospf-ospfv3-srv6-extensions] and Prefix-SID Sub-TLV [RFC8665] [RFC8665] for SR-MPLS to associate the Service SID Value with Service-related Information.

One of the new TLVs is Service Chaining (SC) TLV,

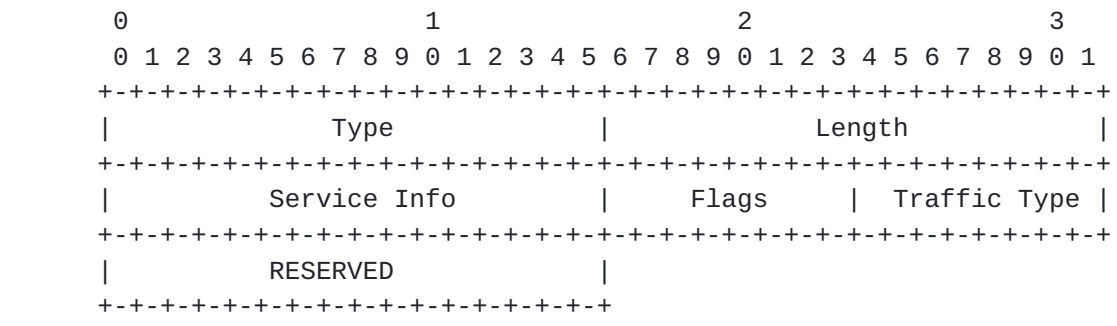

Figure 5:Service Chaining (SC) TLV

where:

Type: 16 bit field. TBD

Length: 16 bit field indicating the length of the remainder of the TLV

Flags, Traffic Type and RESERVED are the same as that in SC TLV defined in [I-D.dawra-idr-bgp-ls-sr-service-segments] chapter 2.

The definition and use principle of the Service Type field is the same as that defined in the IS-IS extension above.

Another Optional Opaque Metadata(OM) TLV is defined in figure 6. The definition and structure are the same as the OM TLV defined in [I-D.dawra-idr-bgp-ls-sr-service-segments] chapter 2.

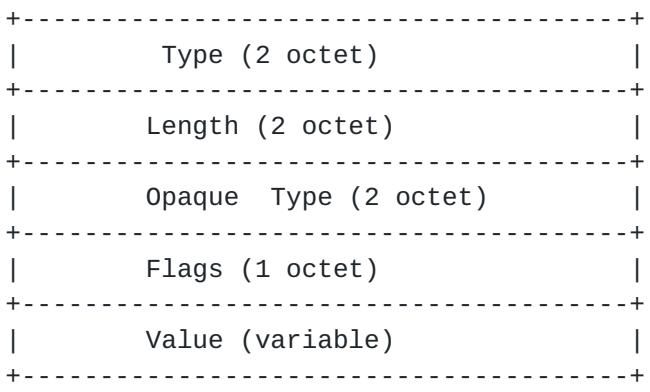

Figure 6:Opaque Metadata(OM) TLV

3. Security Considerations

Procedures and protocol extensions defined in this document do not affect the IS-IS and OSPF security model

4. IANA Considerations

TBD

5. References

5.1. Normative References

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[RFC8665] Psenak, P., Ed., Previdi, S., Ed., Filsfils, C., Gredler, H., Shakir, R., Henderickx, W., and J. Tantsura, "OSPF Extensions for Segment Routing", RFC 8665, DOI 10.17487/RFC8665, December 2019, <https://www.rfc-editor.org/info/rfc8665>.

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5.2. Informative References

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