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BGP-LS Extensions for Network Resource Partition identifier
draft-chen-idr-bgp-ls-transport-slice-04

Abstract

This draft defines extensions to BGP-LS protocol in order to advertise Network Resource Partition SR segments that share the same IGP computed forwarding path but offer a forwarding treatment (e.g. scheduling and drop policy) that is associated with a specific Network Resource. The draft is applicable to both SR-MPLS and SRv6 dataplanes

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[1.](#) Introduction

Network slicing allows a Service Provider to create independent and logical networks on top of a common or shared physical network infrastructure. [\[I-D.ietf-teas-ietf-network-slices\]](#) provides the definition of a network slice for use within the IETF and discusses the general framework for requesting and operating IETF Network Slices, their characteristics, and the necessary system components and interfaces. It also defines the term "network resource partition(NRP)", which means a set of network resources that are available to carry traffic and meet the SLOs and SLEs.

[\[I-D.bestbar-teas-ns-packet\]](#) proposes the solution to realize network slicing in IP/MPLS networks. It introduces the notion of a slice aggregate which comprises of one or more IETF network slice traffic streams and use network resource partition identifier (NRP-ID) to

distinguish slice aggregation.

[[I-D.bestbar-lsr-spring-sa](#)] describes extensions to the IS-IS that enable advertising Network Resource Partition identifier (NRPID) SR segments that share the same IGP computed forwarding path but offer a forwarding treatment (e.g. scheduling and drop policy) that is associated with a specific Slice Aggregate.

In order to satisfy the need for applications that require topological visibility across one area or Autonomous System (AS). This document specifies extensions to the BGP Link-state address-family in order to advertise the information of Network Resource Partition SIDs. An external component (e.g., a controller) then can collect Network Resource Partition SIDs in the "northbound" direction. The draft is applicable to both SR-MPLS and SRv6 dataplanes.

[2.](#) Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

cloud transport network: It is usually a national or province backbone network to achieve interconnection between multiple regional clouds/core clouds deployed in the country/province.

[2.1.](#) Terminology

Slice Aggregate: a collection of packets that match a slice policy selection criteria and are given the same forwarding treatment; a slice aggregate comprises of one or more IETF network slice traffic streams; the mapping of one or more IETF network slices to a slice aggregate is maintained by the IETF Network Slice Controller.

Network Resource Partition: the collection of resources that are used to support a slice aggregate.

2.2. Acronyms and Abbreviations

NRPID: Network Resource Partition identifier.

3. NRPID SID for SR-MPLS

BGP-LS[[RFC7752]] defines the link-state NLRI that can be a Node NLRI, a Link NLRI or a Prefix NLRI. The link-state information is mapped to BGP link-state NLRI within the BGP-LS Attribute. In addition, [I-D.ietf-idr-bgpls-inter-as-topology-ext] defines Stub Link NLRI that is used to describe the inter-as link. This document adds additional BGP-LS Attribute TLVs in order to encode Network Resource Partition

information. It does not introduce any changes to the encoding of the BGP-LS NLRIs.

3.1. Node Attributes TLV

The Network Resource attribute TLV is used in order to advertise which Network Resource a router wants to take part in. The NRPID sub-TLV is a new TLV of the optional BGP-LS Attribute that is associated with the node NLRI.

The NRPID TLV has the following format:

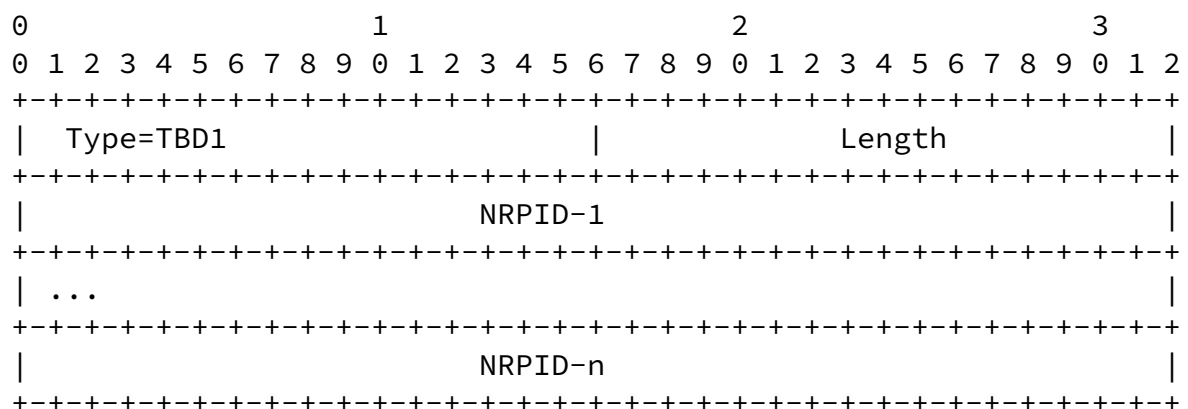


Figure 1

where:

Type: TBD1 (Suggested value to be assigned by IANA)

Length: variable.

NRPID: Network Resource Partition ID is used to indication the resources on specific link(s)/node(s) that will be traversed by a slice-aggregate.

3.2. Link Attribute TLVs

The following Link Attribute TLVs are are defined:

Type	Description
TBD2	NRPID list TLV
TBD3	L2 Bundle Member NRPID TLV
TBD4	NRPID Adjacency-SID TLV
TBD5	NRPID LAN-Adj-SID TLV

Figure 2: xml_happy2

These TLVs should only be added to the BGP-LS Attribute associated with the Link NLRI or Stub Link NLRI.

3.2.1. NRPID list sub-TLV

The NRPID list sub-TLV has the following format:

0

1

2

3

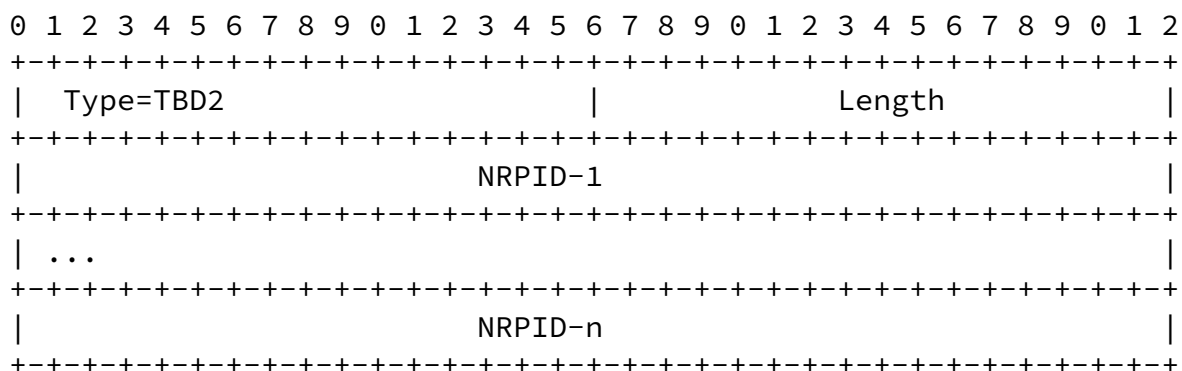


Figure 3

Type: TBD2 (Suggested value to be assigned by IANA)

Length: variable.

NRPID: Network Resource Partition ID is used to indicate the resources on specific link(s)/node(s) that will be traversed by a slice-aggregate.

[3.2.2.](#) L2 Bundle Member NRPID TLV

This TLV is used to advertise NRSP for L2 Bundle Member associated with a parent L3 adjacency which is Point-to-Point. The following format is defined for this sub-TLV:

Type: TBD3.

Length: variable.

L2 Bundle Member NRPID. There MUST be one NRPID for each of the L2 Bundle Members advertised under the preceding L2 Bundle Member Attribute Descriptor. The parent link can be configured to an IGP instance, or as an inter-as link.

[3.2.3.](#) NRPID Adjacency-SID TLV

This TLV is used to advertise multiple NRPID Adj-SIDs to the controller, Adjacency-SID need to be allocated per NRPID. This information is derived from IS-IS Slice Aggregate Adjacency-SID Sub-TLV of IS-IS (section 3.2 of [[I-D.bestbar-lsr-spring-sa](#)]).

The following format is defined for this sub-TLV:

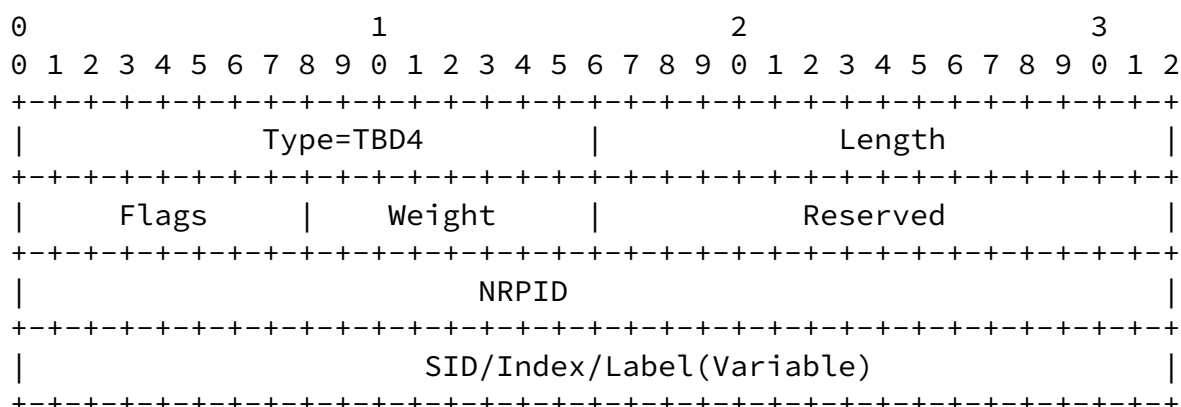


Figure 4

where:

Type:TBD4(Suggested value to be assigned by IANA)

Length: Variable. Depending on the size of the SID.

Weight: Variable. 1 octet carrying the weight used for load-balancing purposes. The use of weight is described in [section 3.4 of \[RFC8402\]](#).

NRPID: Identifies the Network Resource Partition information corresponding to the Adjacency-SID.

The "Flags" and "SID/Index/Label" fields are the same as the Adjacency-SID sub-TLV [\[RFC8667\]](#).

[3.2.4](#). NRPID LAN-Adj-SID TLV

In LAN subnetworks, [\[RFC8667\]](#) defines the LAN-Adj-SID sub-TLV for a router to advertise the Adj-SID of each of its neighbors.

NRPID LAN-Adj-SID TLV is used to advertise multiple SA LAN-Adj-SIDs, Adjacency-SID need to be allocated per NRPID. This information is derived from the IS-IS Slice Aggregate LAN Adjacency-SIDs of IS-IS

([section 3.3](#) of I-D. [[I-D.bestbar-lsr-spring-sa](#)]).

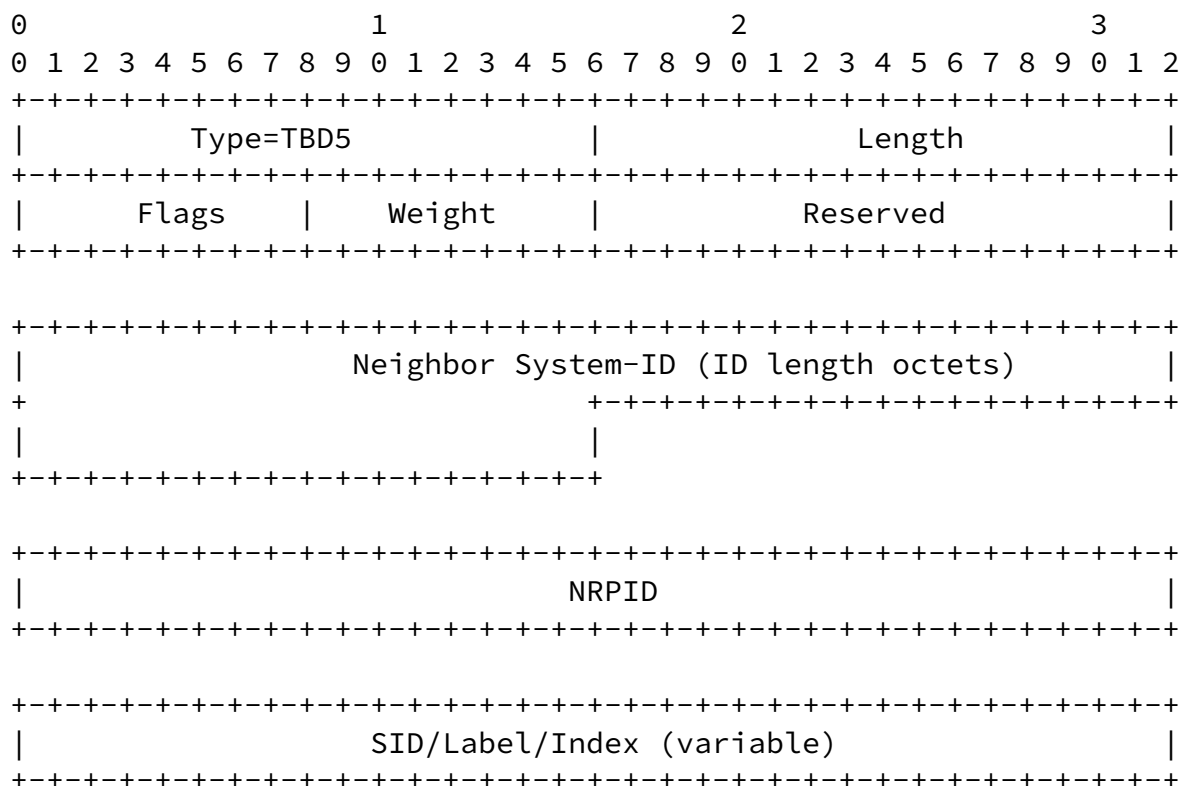


Figure 5

where:

Type:TBD5 (Suggested value to be assigned by IANA)

Length: Variable. Depending on the size of the SID.

The "Flags" and "SID/Index/Label" fields are the same as the Adjacency-SID sub-TLV [[RFC8667](#)].

NRPID: Identifies the Network Resource Partition information corresponding to the LAN-Adjacency-SID.

NRPID Prefix-SID TLV should only be added to the BGP-LS Attribute associated with the Prefix NLRI describing the prefix of the IGP node. This TLV is used to advertising multiple NRPID Prefix-SIDs. This information is derived from IS-IS Slice Aggregate Prefix-SID Sub-TLV of IS-IS (section 3.1 of [[I-D.bestbar-lsr-spring-sa](#)]).

The Prefix-SID for NRPID TLV has the following format:

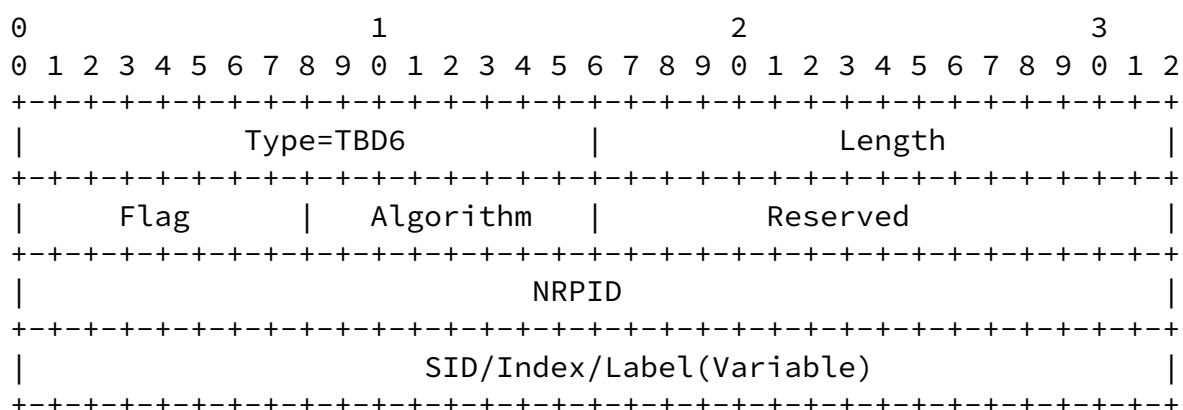


Figure 6

where:

Type:TBD6 (Suggested value to be assigned by IANA)

Length: Variable. Depending on the size of the SID.

The "Flags" and "SID/Index/Label" fields are the same as the Prefix-SID sub-TLV [[RFC8667](#)].

Algorithm: Accoridng to section "3.2. SR-Algorithm Sub-TLV" of [[RFC8667](#)], two values can be set in this field.

- * 0: Shortest Path First (SPF) algorithm based on link metric.
- * 1: Strict Shortest Path First (SPF) algorithm based on link metric.

Note that[I-D.ietf-lsr-flex-algo]also allows user to define other algorithm values, i.e., FA-id within [128, 255], for the purpose of constraint based path computation.However, an FA-id algorithm value MUST not be set in this field, the reason is that FA-id has not semantic local within AII.

NRPID: Identifies the NRPID information corresponding to the Prefix-SID.

4. NRPID SID for SRv6

SRv6 attributes with an IPv6 prefix are advertised using the new BGP-LS Attribute TLVs defined in this section and associated with the BGP-LS Prefix NLRI.

4.1. Router Capabilities for NRPID

This BGP-LS Attribute TLV is used to announce which NRPID a router wants to take part in.

The Router Capabilities for NRPID has the following format:

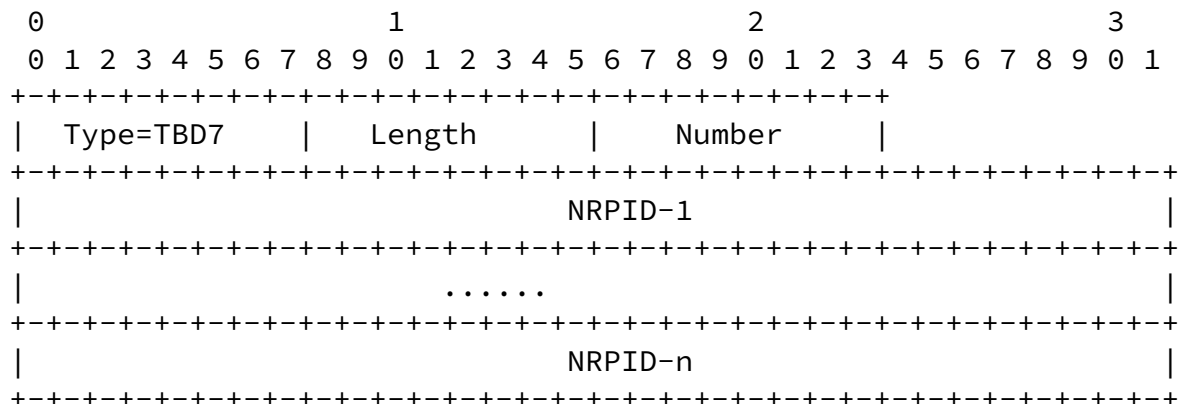


Figure 7

where:

Type: TBD7.

Length: variable.

Number: Number of slice-aggregate which share the same topology.

NRPID: Network Resource Partition ID is used to indication the resources on specific link(s)/node(s) that will be traversed by a slice-aggregate.

[4.2.](#) NRPID SID sub-TLV

The SRv6 Locator TLV was introduced in [[I-D.ietf-idr-bgpls-srv6-ext](#)] to advertise SRv6 Locators and additional attributes for the given SRv6 Locator. A new NRPID SID sub-TLV under the SRv6 Locator TLV is defined to advertise an Locator that is associated with a specific NRPID.

The NRPID SRv6 Locator has the following format:

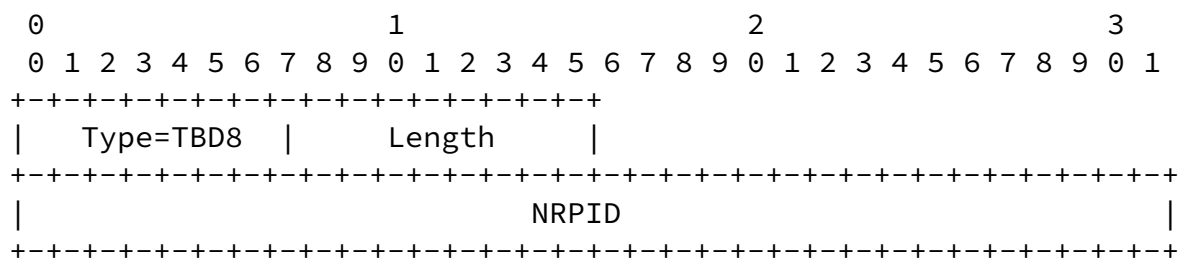


Figure 8

where:

Type: TBD8

Length: 4 octets.

NRPID: Identifies the NRPID information corresponding to an Locator.

The new NRPID SID sub-TLV is an optional Sub-TLV of:

SRv6 End.X SID TLV (Section 4.1 of [[I-D.ietf-idr-bgpls-srv6-ext](#)]).

SRv6 LAN End.X SID TLV (Section 4.2 of [[I-D.ietf-idr-bgpls-srv6-ext](#)]).

[5.](#) Acknowledgements

TBD.

6. IANA Considerations

This document makes no request of IANA.

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7. Security Considerations

Procedures and protocol extensions defined in this document do not affect the BGP security model. See the "Security Considerations" section of [RFC4271] for a discussion of BGP security. Also, refer to [RFC4272] and [RFC6952] for analyses of security issues for BGP. Security considerations for acquiring and distributing BGP-LS information are discussed in [RFC7752].

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