    IS-IS Extensions to Support Packet Network Slicing using Segment Routing
                 draft-zch-lsr-isis-network-slicing-00

Abstract

   [I-D.peng-lsr-network-slicing] defines a unified administrative
   instance identifier to distinguish different virtual network
   resources for both intra-domain and inter-domain network slicing
   scenarios. This draft describes the IS-IS extensions required to
   support Packet Network Slicing using Segment Routing.

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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   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 January 5, 2020.

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1. Introduction

For a packet network, network slicing requires the underlying network
to support partitioning of the network resources to provide the
client with dedicated (private) networking, computing, and storage
resources drawn from a shared pool. The slices may be seen as
virtual networks. [I-D.ietf-teas-enhanced-vpn] described a framework
to create virtual networks in a packet network.
[I-D.peng-lsr-network-slicing] specifies a detailed mechanism to
signal association of shared resources required to create and manage
an NSI called "Administrative Instance Identifier" (AII).

This draft describes the IS-IS extensions required to distribute AII
information in an AS.

2. Conventions used in this document

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 RFC2119.

3. Advertising AII information as a new TE parameter of a link

[RFC5305] describes extensions to the Intermediate System to
Intermediate System (IS-IS) protocol to support Traffic Engineering
(TE).

AII can be used to color links to partition underlay resource. This
document defines a new extension of the existing IGP-TE
mechanisms[RFC5305] to distribute AII information in an AS as a new
TE parameter of a link.

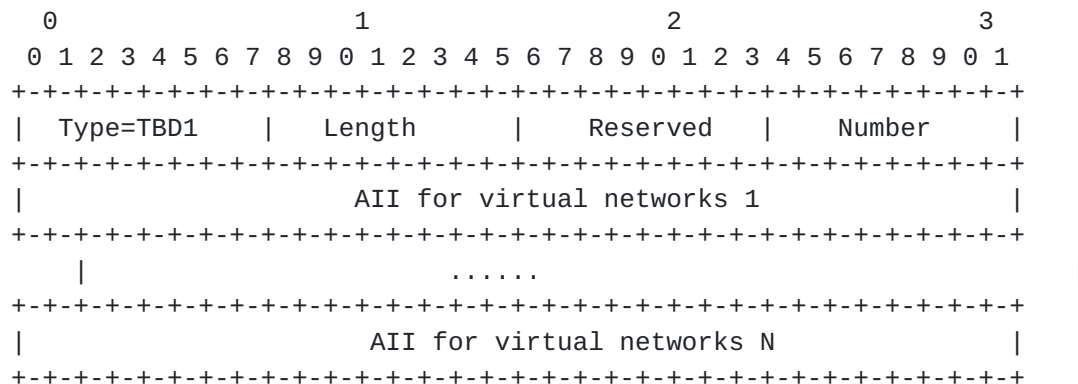The AII list sub-TLV has the following format:

```
    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
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  | Type=TBD1   |    Length    |    Reserved    |    Number     |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                  AII for virtual networks 1                  |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
      |                     ......                              |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                  AII for virtual networks N                  |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1

Type: 43 (Suggested value to be assigned by IANA)

Length: variable.

Number:Number of virtual networks.

AII for VN: allocate different AII for different virtual networks.
AII is used to distinguish different virtual network resources.

This sub-TLV MAY be present in any of the following TLVs:

TLV-22 (Extended IS reachability) [RFC5305].

TLV-222 (Multitopology IS)[RFC5120].

TLV-23 (IS Neighbor Attribute)[RFC5311].

TLV-223 (Multitopology IS Neighbor Attribute)[RFC5311].

TLV-141 (inter-AS reachability information)[RFC5316].

This sub-TLV SHOULD appear once at most in each TLV. Indicates that
a link can be belong to multiple virtual networks.

Note that AII 0 does not require notification, and all links are
always in AII 0 at the same time.

4. Advertising prefix-SID per AII information

[I-D.ietf-isis-segment-routing-extensions] defines a new IS-IS sub-
TLV: the Prefix Segment Identifier sub-TLV (Prefix-SID sub-TLV). The
Prefix-SID sub-TLV carries the Segment Routing IGP-Prefix-SID as
defined in [RFC8402], and is associated to a prefix advertised by a
node.

To distinguish forwarding behavior of different virtual networks,
Prefix-SID need to be allocated per AII and advertised in the IGP
domain. This document defines a new extension of the existing
Prefix-SID sub-TLV.

The Prefix-SID for AII sub-TLV has the following format:

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |   Type=TBD2   |    Length     |      Flag     |   Algorithm   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                             AII                               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                      SID/Index/Label(Variable)                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
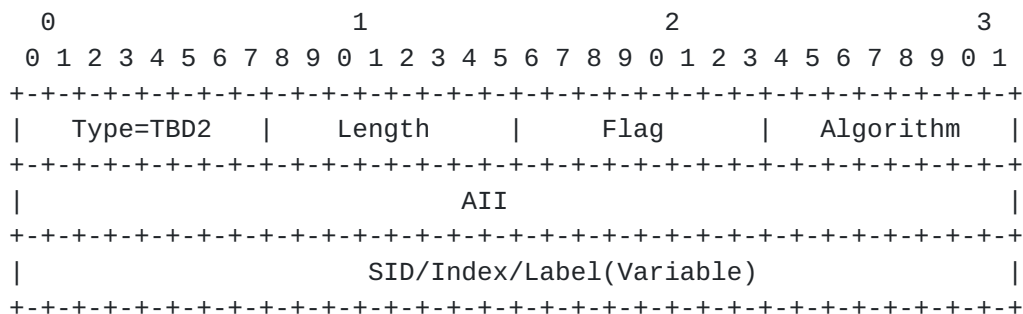
                            Figure 2

where:

Type:33 (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 [I-D.ietf-isis-segment-routing-extensions].

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

This sub-TLV MAY be present in any of the following TLVs:

TLV-135 (Extended IPv4 reachability) defined in [RFC5305].

TLV-235 (Multitopology IPv4 Reachability) defined in [RFC5120].

TLV-236 (IPv6 IP Reachability) defined in [RFC5308].

TLV-237 (Multitopology IPv6 IP Reachability) defined in [RFC5120].

This sub-TLV MAY appear multiple times in each TLV.

5. Advertising Adjacency-SID per AII information

[I-D.ietf-isis-segment-routing-extensions]defines a new IS-IS sub-
TLV: the Adjacency Segment Identifier sub-TLV (Adj-SID sub-TLV).The
Adj-SID sub-TLV is an optional sub-TLV carrying the Segment Routing
IGP-Adjacency-SID as defined in [RFC8402].

To distinguish forwarding behavior of different virtual networks,
Adjacency -SID need to be allocated per AII and advertised in the IGP
domain. This document defines a new extension of the existing
Adjacency-SID sub-TLV.

The Adjacency-SID for AII sub-TLV has the following format:

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |   Type=TBD3   |    Length     |     Flag      |   Algorithm   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                            AII                                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                      SID/Index/Label(Variable)               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
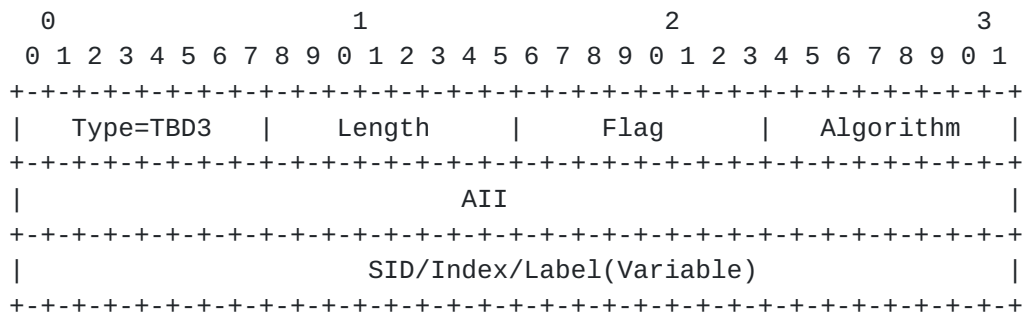
                           Figure 3

where:

Type:44 (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 [I-D.ietf-isis-segment-routing-extensions].

AII: Identifies the AII information corresponding to the Adjacency-
SID.

This sub-TLV MAY be present in any of the following TLVs:

TLV-22 (Extended IS reachability) [RFC5305].

TLV-222 (Multitopology IS)[RFC5120].

TLV-23 (IS Neighbor Attribute)[RFC5311].

TLV-223 (Multitopology IS Neighbor Attribute)[RFC5311].

TLV-141 (inter-AS reachability information)[RFC5316].

Multiple Adj-SID sub-TLVs MAY be associated with a single IS-neighbor. This sub-TLV MAY appear multiple times in each TLV.

6. IANA Considerations

This document requests allocation for the following Sub-TLVs.

6.1. AII list sub-TLV

This TLV shares sub-TLV space with existing "Sub-TLVs for TLVs 22, 222, 23,223 and 141 registry".

Type:43(suggested - to be assigned by IANA).

6.2. Prefix-SID for AII sub-TLV

This TLV shares sub-TLV space with existing "Sub-TLVs for TLVs 135,235,226 and 237 registry".

Type:33(suggested - to be assigned by IANA).

6.3. Adjacency -SID for AII sub-TLV

This TLV shares sub-TLV space with existing "Sub-TLVs for TLVs 22, 222, 23,223 and 141 registry".

Type:44(suggested - to be assigned by IANA).

7. Security Considerations

TBD.

8. Acknowledgements

TBD.

9. References

9.1. Normative references

[I-D.ietf-isis-segment-routing-extensions]
          Previdi, S., Ginsberg, L., Filsfils, C., Bashandy, A.,
          Gredler, H., and B. Decraene, "IS-IS Extensions for
          Segment Routing", draft-ietf-isis-segment-routing-
          extensions-25 (work in progress), May 2019.

[I-D.ietf-teas-enhanced-vpn]
          Dong, J., Bryant, S., Li, Z., Miyasaka, T., and Y. Lee, "A
          Framework for Enhanced Virtual Private Networks (VPN+)
          Service", draft-ietf-teas-enhanced-vpn-01 (work in
          progress), February 2019.

[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>.

[RFC5120] Przygienda, T., Shen, N., and N. Sheth, "M-ISIS: Multi
          Topology (MT) Routing in Intermediate System to
          Intermediate Systems (IS-ISs)", RFC 5120,
          DOI 10.17487/RFC5120, February 2008,
          <https://www.rfc-editor.org/info/rfc5120>.

[RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic
          Engineering", RFC 5305, DOI 10.17487/RFC5305, October
          2008, <https://www.rfc-editor.org/info/rfc5305>.

[RFC5308] Hopps, C., "Routing IPv6 with IS-IS", RFC 5308,
          DOI 10.17487/RFC5308, October 2008,
          <https://www.rfc-editor.org/info/rfc5308>.

[RFC5311] McPherson, D., Ed., Ginsberg, L., Previdi, S., and M.
          Shand, "Simplified Extension of Link State PDU (LSP) Space
          for IS-IS", RFC 5311, DOI 10.17487/RFC5311, February 2009,
          <https://www.rfc-editor.org/info/rfc5311>.

[RFC5316] Chen, M., Zhang, R., and X. Duan, "ISIS Extensions in
          Support of Inter-Autonomous System (AS) MPLS and GMPLS
          Traffic Engineering", RFC 5316, DOI 10.17487/RFC5316,
          December 2008, <https://www.rfc-editor.org/info/rfc5316>.

[RFC8402] Filsfils, C., Ed., Previdi, S., Ed., Ginsberg, L.,
          Decraene, B., Litkowski, S., and R. Shakir, "Segment
          Routing Architecture", RFC 8402, DOI 10.17487/RFC8402,
          July 2018, <https://www.rfc-editor.org/info/rfc8402>.

9.2. **Informative references**

[I-D.peng-lsr-network-slicing]
          Peng, S., Chen, R., and G. Mirsky, "Packet Network Slicing
          using Segment Routing", draft-peng-lsr-network-slicing-00
          (work in progress), February 2019.

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