IGP Extensions for Scalable SR based Enhanced VPN (VPN+)

draft-dong-lsr-sr-enhanced-vpn-07

J. Dong, Z. Hu, Z. Li@Huawei

X. Tang, R. Pang @China Unicom

L. JooHeon @LG U+

Stewart Bryant @University of Surrey

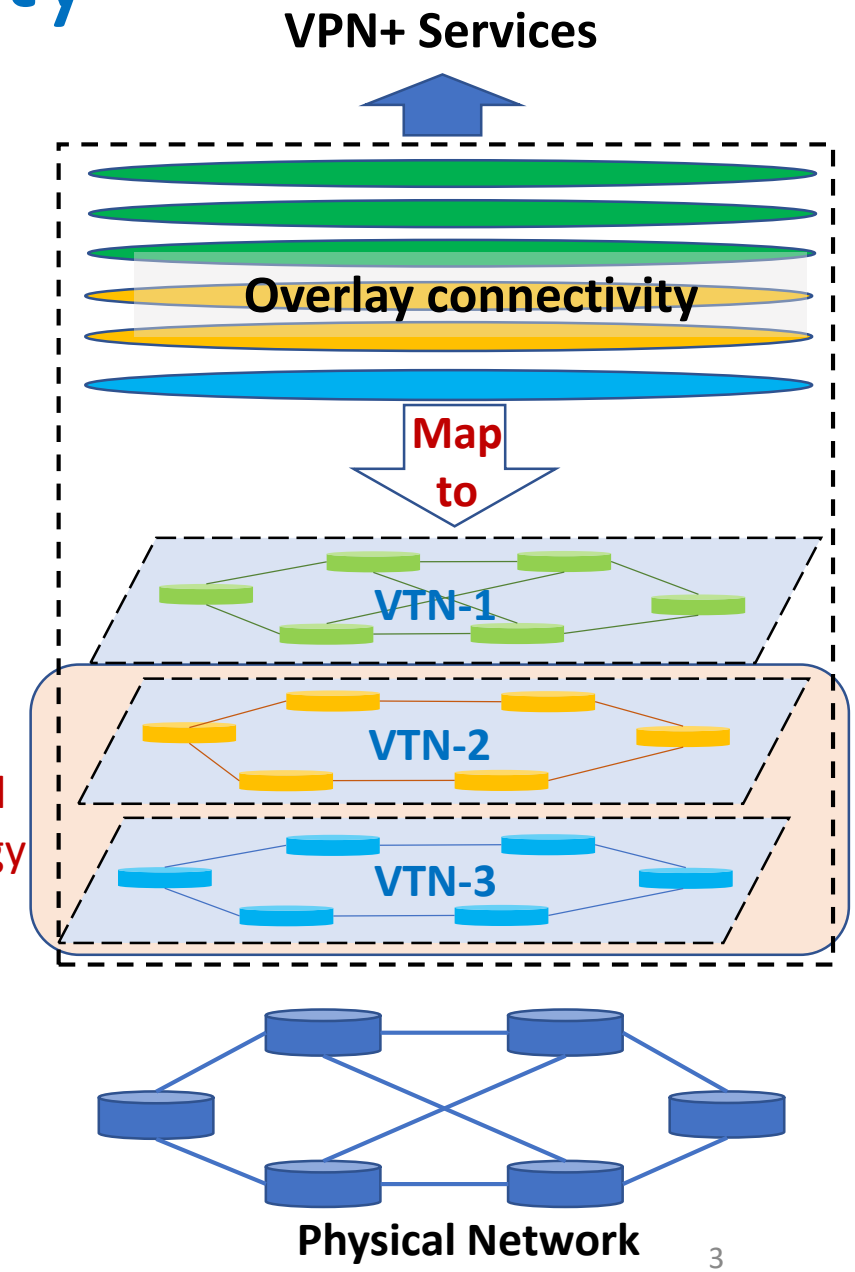
LSR WG IETF 113 Hybrid Meeting Mar. 2022

Background

- VPN+ framework is described in draft-ietf-teas-enhanced-vpn
  - One typical use case is to deliver IETF network slice service
- IETF network slice framework is described in draft-ietf-teas-ietf-network-slices
  - It introduces the concept Network Resource Partition (NRP) for network slice realization
  - An NRP is an instantiation of VTN defined in VPN+ framework
- The scalability of NRP is analyzed in draft-dong-teas-nrp-scalability
  - It also provides guidelines for control plane and data plane optimizations
- This document defines the IGP extensions for Scalable SR VPN+
  - Follows the mechanisms in draft-dong-teas-nrp-scalability

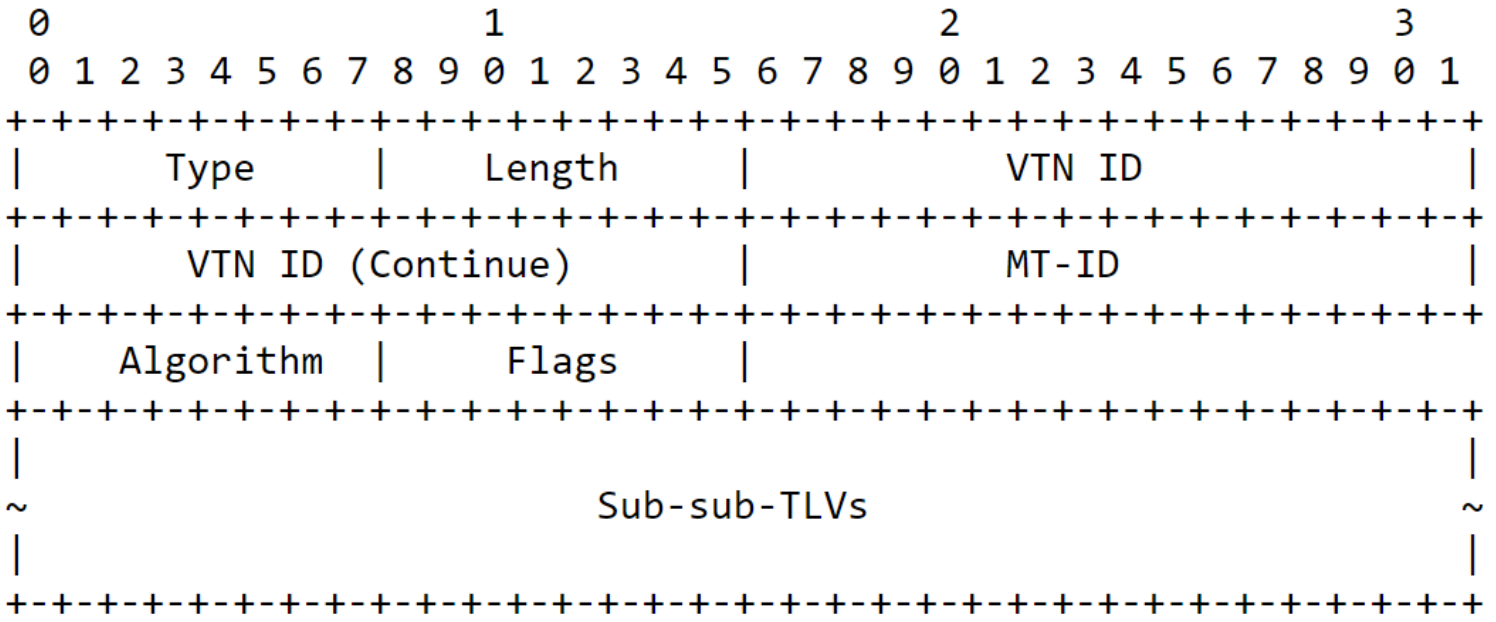
Optimizations for Better Scalability

- Multiple overlay connectivity services can map to the same VTN
  - VTN provides the underlay network topology and resources required by a group of overlay connectivity services
- Decouples the topology and resource attributes of VTN
  - Multiple VTNs can share the same topology, and the topology-specific route computation
  - Multiple VTNs may share the same set of resources on some network segments
- Introduces network-wide “VTN ID” in data plane
  - Avoid the allocation and distribution of per-VTN SR SIDs
- The alignment with the terminology “NRP ID” is on-going



IS-IS Extensions: VTN Definition Sub-TLV

- Is used to advertise the associated topology and other attributes of VTN
  - A new sub-TLV of IS-IS Router-Capability TLV (242)



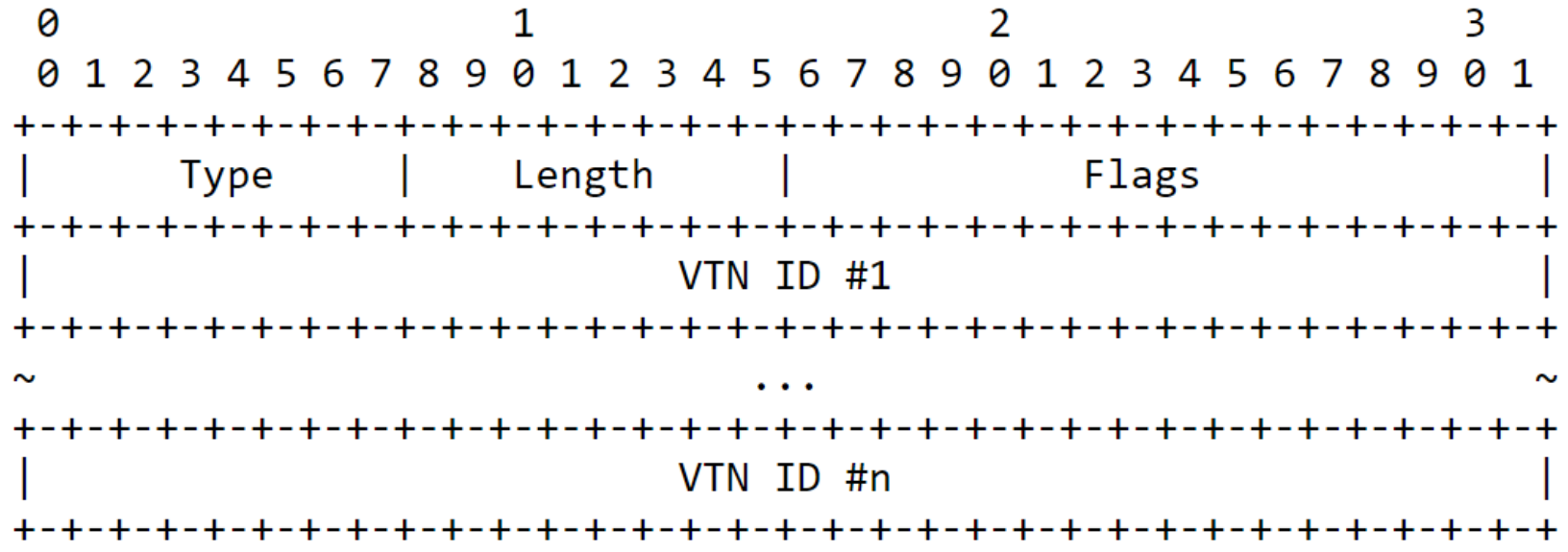
  - VTN-ID: 32-bit network wide identifier of VTN
  - MT-ID: 16-bit identifier which contains the MT-ID of the IGP topology
  - Algorithm: 8-bit algorithm ID, can be normal algorithm or Flex-Algo
  - Sub-sub-TLVs: optional for additional attributes of VTN

Reuse IGP MT/Flex-Algo for Topology Advertisement

- The topology associated with a VTN can be defined and distributed by reusing MT and/or Flex-Algo mechanisms
  - MT can be used to define logical topology and per-topology node/link attributes
  - Flex-Algo can be used to specify the metric type and topological constraints applied on a topology
  - The <topology, algorithm> tuple can be referred to by multiple VTNs
- IGP extensions for SR provide the distribution of per <topology, algorithm> SR SIDs and SRv6 Locators

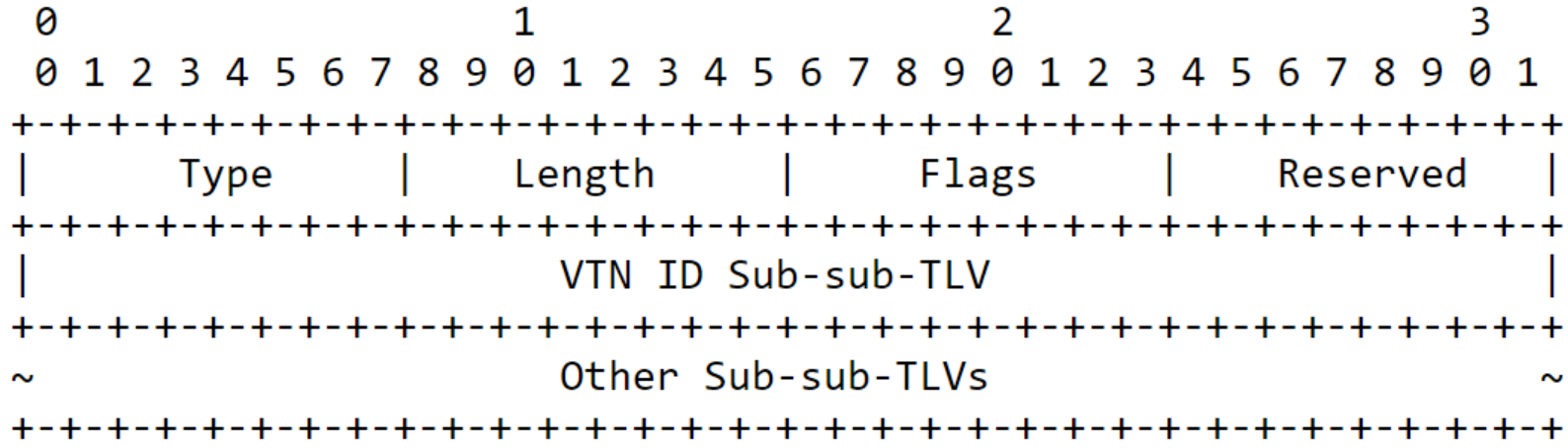
Advertisement of VTN Resource Attributes

- Option 1: IGP L2bundle based approach
  - A subset of link resource can be modeled as a physical or virtual L2 member link
  - A new Flag “E” is defined to indicate whether the member link can be used for load balancing, or each member link is used exclusively for the associated VTNs
  - A new VTN IDs sub-TLV is defined under the L2 Bundle Attribute Descriptors
    - Describes the association between a list of VTNs and the L2 member link



Advertisement of VTN Resource Attributes (cont.)

- Option 2: Per VTN link TE attributes
  - A subset of link resource can be modeled as per VTN TE attributes of the link
  - A new VTN-specific TE attribute sub-TLV is defined to advertise the set of link resource and other TE attributes associated with a VTN



  - VTN-ID Sub-sub-TLV: A list of VTN-IDs which share the same set of TE attributes
  - Other Sub-sub-TLVs: The TE attributes TLVs, e.g. VTN bandwidth sub-sub-TLV

Advertisement of VTN-specific Data Plane IDs

- Option 1: Per-VTN SR SIDs and SRv6 Locators
  - New sub-TLVs for VTN-specific SR-MPLS prefix-SIDs and adj-SIDs
  - New TLV/sub-TLV for VTN-specific SRv6 Locators and End SIDs
  - New sub-TLV for VTN-specific SRv6 End.X SIDs

- Option 2: Dedicated VTN-ID in data plane
  - The data plane VTN-ID can be the same as the VTN-ID in control plane
  - No need to advertise additional VTN-specific data plane information
  - The encapsulation of VTN ID information is defined for IPv6 and MPLS data plane

Next Steps

- Work in progress to align the terminology with TEAS documents and other network slicing related control plane extensions
- Solicit comments and feedbacks
- Consider WG adoption?

Thank You