

Scalability Considerations for Enhanced VPN (VPN+)

draft-dong-teas-enhanced-vpn-vtn-scalability-03

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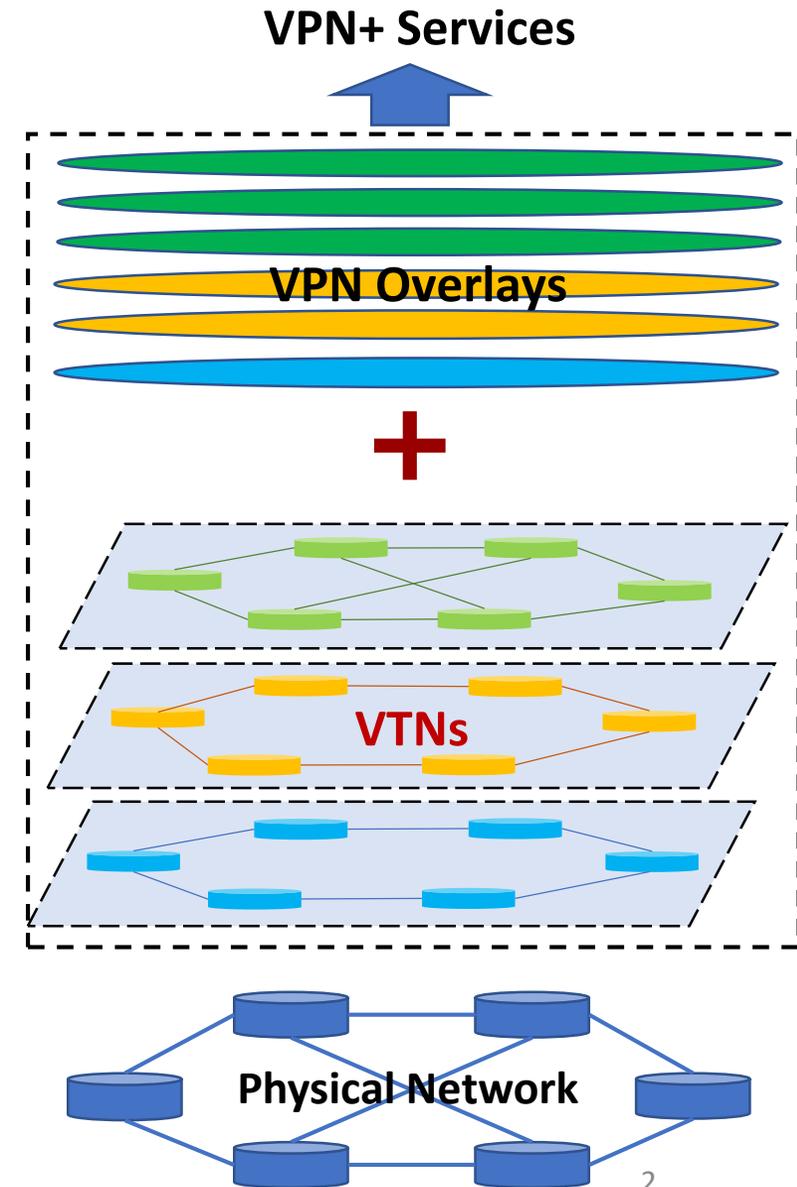
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Recap of VPN+ / VTN

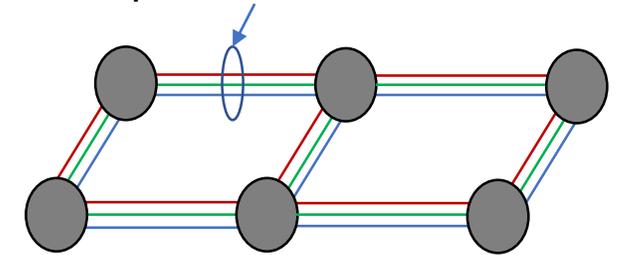
- VPN+ framework is described in *draft-ietf-teas-enhanced-vpn*
 - A layered architecture and candidate technologies to provide VPN+ services
 - One of the typical use cases is network slicing
- VTN is a virtual underlay network with a customized topology and a set of dedicated or shared network resources
 - VPN+ service is delivered by integrating the VPN overlays with VTNs
- Scalability becomes an important factor for the widely deployment of VPN+/VTN e.g. in network slicing scenarios
- This document provides scalability considerations of VTN
 - Scalability analysis of the control plane and data plane
 - Proposes scalability optimization mechanisms



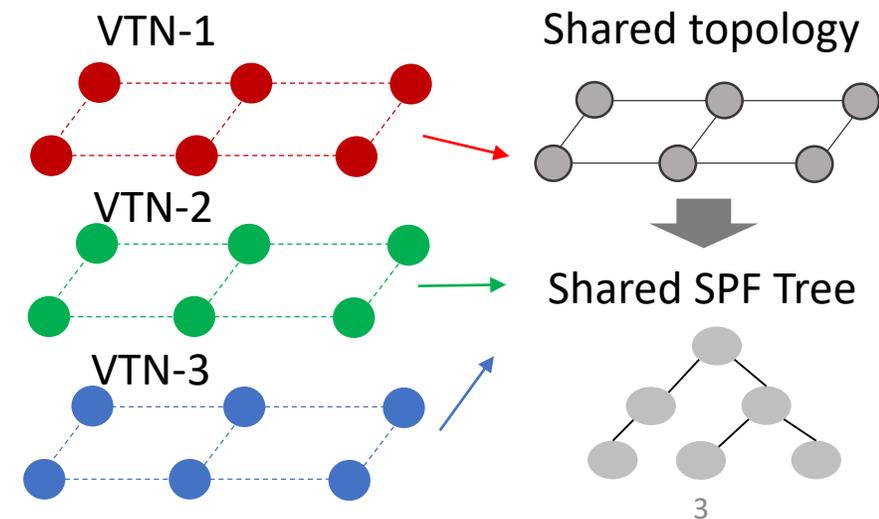
Control Plane Scalability Optimization

- Reduce the number of control protocol instance/session for VTN information distribution
 - Use a shared control protocol instance/session for multiple VTNs
 - Need an identifier in the control messages to distinguish the information of different VTNs
- Decouple the advertisement and processing of different types of VTN attributes, e.g. the topology attribute and the resource attribute
 - The benefit of sharing the topology and SPF computation among multiple VTNs
 - Reduce the overhead in duplicated attribute advertisement
- Divide up the computation load between the centralized controller and the distributed control plane
 - A hybrid control mode is recommended

- 1 IGP instance, 1 IGP adjacency for multiple VTNs

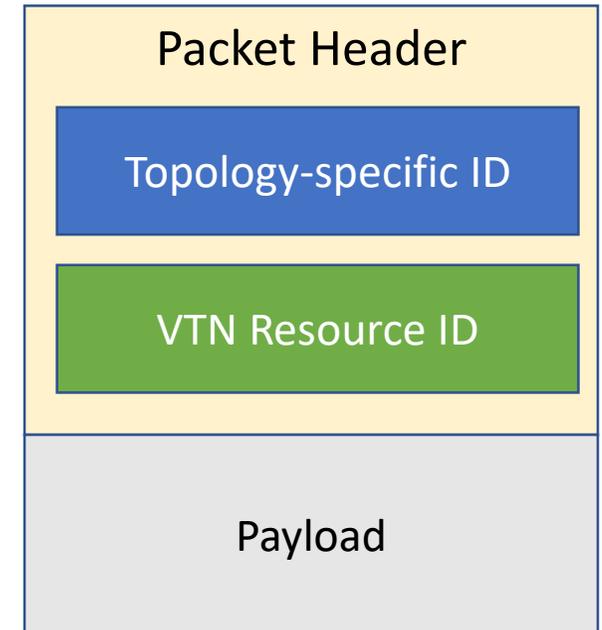


- Shared topology and SPF computation between multiple VTNs



Data Plane Scalability Optimization

- Introduce a dedicated data plane ID to identify the set of resources allocated for per-VTN processing
 - Decouple the VTN resource ID from the topology-specific ID in packet forwarding
- IPv6 data plane
 - Destination IP address is used to determine the topology/path
 - A dedicated VTN resource ID is used to identify the set of resources used for per-VTN packet processing
- MPLS data plane
 - The MPLS forwarding labels are used to determine the topology/path
 - A dedicated label or extension header is used to identify the set of resources used for per-VTN packet processing



Further Considerations

- What types of VTN information need to be advertised in distributed control plane?
 - limitations in advertising large amount of per-VTN information
 - Some information can be centrally provisioned by the controller
- Flex-Algo or Multi-topology?
 - Flex-Algo supports up to 128 different logical topologies, IS-IS MT supports 4K
 - draft-dong-lsr-sr-enhanced-vpn defines the mechanisms to associate VTNs with either MT or Flex-Algo
- IGP or BGP?
 - BGP-LS and BGP-SPF may have better scalability than IGPs
 - Please refer to draft-dong-lsvr-bgp-spf-vtn for a possible approach

Document Update History

- Version -00 submitted in Feb. 2020
 - Analyzes the control plane and data plane scalability, and provide optimization suggestions
- Version -01 submitted in Nov. 2020
 - Add new coauthor
 - Mainly editorial changes
- Version -02 submitted in Feb. 2021
 - Add new coauthor
 - Add further analysis about the data plane options
 - Align the terminology with draft-ietf-teas-ietf-network-slice-definition
- Version -03 submitted in Jul. 2021
 - Add new coauthors
 - Editorial changes to align with draft-ietf-teas-ietf-network-slices

About the Terminology Alignment

- Different terms refer to the similar network construct for network slice realization
 - VTN
 - Slice Aggregate
 - ...
- Recent discussion with the authors of draft-bestbar-ns-packet
 - It is agreed that a common “new term” in draft-ietf-teas-ietf-network-slices is needed for the underlay network construct of the network slice services
 - Both VTN and Slice Aggregate could map to the “new term”

Next Steps

- Work with the authors of draft-ietf-teas-ietf-network-slices to produce a common “new term”
- Update this document with the “new term” , the content has been stable and ready for adoption
- Based on the aligned terminology, collaboration on the following topics will happen between the draft authors
 - Scalability considerations and optimization
 - Procedures of network slice realization
 - Common network/device YANG models
 - Common protocol extensions

Thank You