Scalability Considerations for Enhanced VPN (VPN+)

draft-dong-teas-enhanced-vpn-vtn-scalability-04

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Recap of VPN+ and VTN

- VPN+ framework is described in draft-ietf-teas-enhanced-vpn
  - One typical use case is to deliver IETF network slices
- A VTN consists of a set of dedicated or shared network resources, and is associated with a customized logical topology
  - Can be used as the virtual underlay to deliver enhanced VPNs (VPN+)
- With the widely deployment of network slices, the scalability of VPN+/VTN becomes an important factor
- This document provides scalability considerations of VPN+/VTN
  - Analysis about the scalability in control plane and data plane
  - Proposes the optimization mechanisms to improve scalability
Proposed Scalability Optimizations

• Control plane scalability optimization
  • Shared control protocol instances/sessions among multiple VTNs
  • Shared topology specific computation among multiple VTNs
  • Hybrid control plane with the help of centralized controller

• Shared IGP instance and adjacency for multiple VTNs

• Shared topology and SPF computation between multiple VTNs

Shared topology

Shared SPF Tree
Proposed Scalability Optimizations (Cont.)

- Data plane scalability optimization
  - Decouple the resource ID from the topology-specific IDs used in packet forwarding
  - A data plane VTN resource ID can be introduced
    - IPv6 data plane
      - Based on IPv6 HBH extension header
    - MPLS data plane
      - Under discussion

General approach

Packet Header
- Topology-specific IDs
- VTN Resource ID
- Payload

Payload

IPv6 Data Plane
- IPv6 Base Header
- HBH Extension header
- VTN Option

MPLS Data Plane
- Under Discussion
Updates in -04 Version

• Updates the descriptions in the abstract and introduction to align with draft-ietf-teas-enhanced-vpn and draft-ietf-teas-ietf-network-slices

• Refines the descriptions about the scalability requirements on VPN+ services and the underlay VTN in section 2

• Refines the descriptions about data plane scalability in section 3.2.

• Refines the descriptions about data plane optimization in section 4.2

• Adds the security considerations section
History of VPN+/VTN Documents

• Enhanced VPN (VPN+) framework
  • 00 version posted in Jul. 2017
  • WG adoption in Jan. 2019

• SR based VPN+/VTN mechanisms
  • 00 version posted in Mar. 2018
  • WG adoption in Feb. 2021
  • Suitable for small or medium scale network slice scenarios

• Scalability Considerations for VPN+ (this document)
  • 00 version posted in Feb. 2020, 4 updates in past 20 months
  • Solution work based on this document is ongoing
Next Steps

• This document provides detailed scalability analysis and optimization for the control plane and data plane of VPN+/VTN
  • Complementary to the scalability considerations in VPN+ framework
  • Provides guidance to the protocol extension work

• Can refer to the generic term introduced in the IETF network slice draft
  • VTN is equivalent to the term “Network Resource Partition” in the context of IETF network slicing

• Collaborate on the protocol extensions based on this document

• The authors believe this version is stable, and would like to request for WG adoption
Thank You