Control Plane Considerations for Enhanced VPN (VPN+)

draft-dong-teas-enhanced-vpn-control-plane

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Introduction

- VPN+ Framework is described in draft-ietf-teas-enhanced-vpn

  - A layered architecture with candidate technologies in data plane, control plane and management plane

  - To meet the requirements of 5G network slicing and other generic scenarios

- This document analyses the requirements, functions and considerations of VPN+ control plane

  - To guide the design of control plane mechanisms and potential extensions

Control Plane Requirements

- Support of isolation
  - Data plane isolation
    - Control plane needs to collect and distribute network information needed for both soft and hard isolation
  - Control plane isolation
    - Different mechanisms can provide different isolation characteristics with different overhead
    - E.g., multi-topology, multi-instance, logical systems etc.
- Support the attributes of transport network slice
  - Two major types of attributes: topology and resource
- Support the number of network slices required in different phases/scenarios
  - Relevant to the scalability considerations

Control Plane Functions

- A hybrid of distributed and centralized control plane

- Distributed control plane
  - Overlay
    - Distribution of routing information of VPN+ tenants
  - Underlay
    - Advertisement of customized topology and resource attributes of each network slice
    - Compute routing and forwarding entries for each network slice

- Centralized controller
  - Collect the network topology and resource attributes of each network slice
  - Provide global computation and optimization of TE paths within each network slice

Control Plane Scalability Considerations

- The scalability of distributed control plane needs to be considered with:
  - Number of protocol instances on each node
  - Number of protocol sessions on each node
  - Number of routes to be advertised in the network
  - Amount of information and attributes associated with each route
  - Number of route computation (i.e. SPF) to be executed on each node

- Optimization needs to be considered to meet the requirement of increasing network slices

Optimization Suggestions

- Reduce the amount of control sessions
  - Using a shared control plane for information distribution of multiple network slices
  - Need identifiers to distinguish information of different network slices

- Decouple the advertisement and processing of different types of attributes
  - For example, the topology attributes and resource attributes can be decoupled
  - For network slices with the same topology attribute, SPF computation could be shared and the total amount of computation could be reduced

- Divide the load between centralized and distributed control plane

Next Steps

- Solicit comments and feedbacks

- Coordinate on the protocol work in relevant WGs