Carrying VTN-ID in IPv6 Extension Header

draft-dong-6man-enhanced-vpn-vtn-id-04

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Background

• A VTN is a virtual underlay network with the topology and network resources required by one or a group of services
  • Introduced in draft-ietf-teas-enhanced-vpn

• The identifier of the VTN needs to be carried in data packet
  • To steer packet to use the set of network resource allocated to the VTN for packet processing
  • The VTN information needs to be parsed on each hop along the path in packet forwarding

• This document proposes a mechanism to carry VTN information in IPv6 HBH extension header
  • Applicable to both IPv6 and SRv6 networks
Options of Carrying VTN information in IPv6 Packet

• IPv6 destination address
  • Used to determine the next-hop and outgoing interface
  • Need to allocate different IPv6 addresses/SRv6 SIDs per node per VTN
    • May increase the complexity of address management and the amount of forwarding entries

• Traffic Class
  • Used for Diff-Serv QoS treatment and ECN
  • May be used to further specify different traffic classes within a VTN

• Flow label
  • Used for load distribution across ECMP or LAG paths
  • Only limited number of bits may be borrowed for other use

• IPv6 HBH header
  • Designed for per-hop processing in packet forwarding
  • A new option type can be defined to carry VTN information
Proposed Mechanism

• A new HBH option type is defined to carry VTN ID in HBH extension header

<table>
<thead>
<tr>
<th>Option Type</th>
<th>Option Data Len</th>
<th>Option Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBCTTTTTT</td>
<td>00000100</td>
<td>4-octet VTN ID</td>
</tr>
</tbody>
</table>

• **BB**: set to 00, if unrecognized, skip and continue processing
• **C**: set to 0, can not change en route
• **VTN ID**: 4-octet identifier of a VTN
  • match the length of 5G network slice ID (S-NSSAI) defined in 3GPP
Procedures

• Based on the classification/mapping policy, the ingress node of IPv6 domain encapsulates a data packet with an outer IPv6 header, in which the VTN option carries the VTN-ID the packet maps to

• On each node along the forwarding path which can parse the VTN option
  
  • IPv6 destination address is used to determine the next-hop and the outgoing interface
  
  • VTN-ID in the VTN option is used to further determine the set of local resources allocated on the outgoing interface for processing and sending the packets of the VTN
  
  • Traffic Class may be used to provide Diff-Serv treatment for packets of the same VTN

• The egress node of IPv6 domain decapsulates the outer IPv6 header, including the VTN option in the HBH header
Updates in -03/04 version

• Gyan Mishra joined as co-author

• Clarifies that the VTN option is a Hop-by-Hop option

• Clarifies the packet forwarding procedure
  • VTN ID is only used to determine the local resources for packet processing
    • Perhaps it could be renamed “VTN resource ID” to better reflect this

• The operational considerations section is updated
  • Add reference to draft-hinden-6man-hbh-processing
  • The nodes involved in a VTN should either process the HBH header in fast path, or ignore the HBH header
Next Steps

• This document proposes a HBH option for per-hop forwarding treatment
• The content of the document has become stable
• Does this work belong to 6man?
• WG adoption?
Thank You