Deterministic VPN

draft-chen-detnet-det-vpn-00

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Motivations of The Draft

• It would be COMMON that DetNet services and L2/L3 VPNs are integrated together in real-world deployments
• Such integration MAY raise novel requirements to current protocols
• This draft aims to initiate discussions on such requirements and corresponding protocol extensions
DetNet-VPN Integration

• **DetNet recap**: bounded end-to-end latency, ultra-low data loss rate ...
• **VPN recap**: isolation of L2/L3 addresses and traffic ...
• **DetNet-VPN integration**: provide bounded end-to-end latency and ultra-low data loss rate from CE to CE, and isolate L2/L3 addresses and traffic simultaneously, which are useful in:
  • Mobile backhaul networks
  • Enterprise private networks (especially TSN networks)
Mobile Backhaul Networks

• Why VPN:
  • Traffic isolation for different QoSes (e.g., voice traffic and data traffic)
  • Mobile operators may rent third-part ISPs’ networks to carry their traffic (i.e., address isolation is needed)

• Why DetNet:
  • Best-effort IP/MPLS forwarding provides poor QoS performance
  • There are many TDM-based sessions in mobile networks (i.e., E1), unbounded-jitter transmission hurts them more seriously

![Diagram of Mobile Backhaul Networks]

Figure 1
Enterprise Private Networks (especially TSN networks)

- Why VPN:
  - ISP should provide address and traffic isolation for different enterprises

- Why DetNet:
  - Provide SLAs for enterprise's traffic, especially an enterprise aims to inter-connect its two TSN networks by using ISP’s network

- 5GLAN for TSN is one of those scenarios
Deterministic VPN

- Target: 1) address/traffic isolation; 2) CE-to-CE bounded latency and ultra-low data loss rate
- To achieve 1): reuse existing technologies, e.g., BGP/MPLS IP VPN, E-VPN, SR-MPLS VPN, SRv6 VPN, ...
- To achieve 2):
  - Each interface of PE and P nodes has three cyclic scheduled queues
  - To support long link propagation delay, all nodes SHOULD maintain frequency synchronization instead of time synchronization
  - All packets sent from the upstream router in a specific cycle MUST be sent by the downstream router within another (one) specific cycle, thus achieving bounded latency
  - A data plane mechanism is needed to indicate which upstream node's cycle a packet belongs to
(Possible) Protocol Extensions

- **Data plane:**
  - LSP Tunnel: require multiple MPLS labels per LSP to achieve bounded latency, please refer to [draft-chen-mpls-cqf-lsp-dp-00] for more details
  - SR-MPLS Tunnel: require multiple SIDs per node/adjacency to support bounded latency
  - SRv6 Tunnel: require new type(s) of End SIDs to support bounded latency

- **Control plane:**
  - MP-BGP: to advertise VPN routes, require new BGP path attributes for DetNet-VPN descriptions
  - RSVP-TE: to support multiple-labels allocation and signaling (per LSP)
  - IGP: to advertise DetNet related SR-MPLS/SRv6 SIDs

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✓: Need extensions
Next Steps

- Suggestions and comments on this work are highly needed ...
- We will define corresponding protocol extensions in separate documents
Thank You!