Traffic Engineering Extensions for
Enhanced DetNet

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What is TE for DetNet?

• As per draft-ietf-teas-rfc3272bis, DetNet is described:
  • “DetNet can be seen as a specialized branch of TE”
  • “since it sets up explicit optimized paths with allocation of resources as requested.”
  • “A DetNet application can express its QoS attributes or traffic behavior using any combination of DetNet functions described in sub-layers.”
  • “They are then distributed and provisioned using well-established control and provisioning mechanisms adopted for traffic engineering.”

• As per draft-ietf-teas-rfc3272bis, the scalability concerns for DetNet:
  • “In DetNet, a considerable amount of state information is required to maintain per-flow queuing disciplines and resource reservation for a large number of individual flows.”
  • “This can be quite challenging for network operations during network events such as faults, change in traffic volume or re-provisioning.”
  • “DetNet recommends support for aggregated flows, however, it still requires a large amount of control signaling to establish and maintain DetNet flows.”
What is TE Requirements for enhanced DetNet?

**DetNet QoS of Scaling Deterministic Networks**
- DetNet QoS can be classified based on the applications with different SLAs requirements
- It demands differentiated QoS behaviors in scaling deterministic networks

**Characteristics of Scaling Deterministic Networks**
- Scaling Flows
  - Massive traffic flows
  - Different levels/types services
  - Flows with Different T-Spec/SLAs
- Scaling Networks
  - Large number of nodes and links
  - High speed, long-distance transmission
  - Multiple domains
  - Interconnected with Heterogeneous sub-network technologies

**TE Requirements for enhanced DetNet**
- Provide path steering to forward packet and provide deterministic behaviors for data plane to achieve differentiated DetNet QoS
- Resolve the scalability issues to reduce the amount of control signaling and network operations
- Resource management should be considered
  - guanrantee the time-based SLAs requirements
  - make reasonable use of resources
- End-to-end deterministic routes establishment and control in scaling networks
  - Distributed routes and inter-domain routes
  - Path computation with multiple network metrics and frequent topology changes
  - Path planning with resource reservation
Solution Consideration from TE Elements

• Policy
  • The routing policy including bounded latency constraint-based routing can be considered when selecting and distributing the candidate paths.

• Path Steering
  • Per-class traffic scheduling should be considered for differentiated DetNet QoS.
  • The deterministic latency information may be provided to forward packets for path steering in IPv6/SRv6/MPLS.

• Resource management
  • Time-based resource-aware control and forwarding should be considered based on the queuing mechanisms and different traffic classes.
Differentiated DetNet-aware Traffic Engineering (DD-TE)

• Differentiated DetNet-aware Traffic Engineering (DD-TE) Vs DetNet
  • DetNet
    • per-flow/ Flow-aggregates based DetNet QoS + per-flow/aggregates TE (explicit path+resources allocation)
  • DD-TE
    • traffic-aggregates based Differentiated DetNet QoS + per-class TE (QoS-aware Routing policy+Time-based Resources management)

• Benifits
  • achieve scalable network supporting different levels of deterministic applications
  • achieve fine-grained time-based resource scheduling and management to meet the bounded latency requirements, rational utilization of resources, improvement of network performance
Next Step

• Seek feedback in TEAS WG.

• Comments and discussions are very welcome!
Thank you!