Delay and Loss Traffic Engineering Problem Statement for MPLS

draft-fuxh-mpls-delay-loss-te-problem-statement-01

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Overview of this Draft

- Substantial Rewrite of draft-fuxh-mpls-delay-loss-te-framework-05 as requested by MPLS Review Team
  - Retained key use cases, problems to be solved and requirements from framework-05
  - Framework related text/concepts retained in framework-06
- Much new text in the following outline
  - Defined context and scope
  - Definitions of performance as used for TE (delay, loss, delay variation)
  - Statement of use cases and problems faced by several classes of operators
  - Defined functional, non(less)-solution oriented requirements and updated references
- Changed Intended Status from Standards Track to Informational

Context and Scope

- (G) MPLS network
- Make a prediction of end-to-end delay, loss and delay variation based upon the current state of this network with acceptable accuracy before an LSP is established
- Single Layer or Potentially multiple layers (e.g., MPLS, OTN)
- Single Domain or Area/Level or Potentially multiple domains or inter-area/level

Terminology & Assumptions

- Service Level Agreement/Specification (SLA/SLS) and Network Performance Objective (NPO)
- NPO definitions and composition methods from ITU-T Y.1540, Y.1541 used
- NPO measured over interval of minutes
  - Delay = sum of arithmetic average of one-way delay
  - Loss = inversion of successful packet transfer rate
  - Delay Variation = quantile based, sub-additive

Use Case Classes

- Generalized, Performance-Based
  - Delay: wide geography context sensitive to propagation delay, local geography sensitive to nodal delay
  - Loss: different link technology characteristics (e.g., wireless, wifi, wired)
  - Delay Variation (caused primarily by queuing, or packets taking different paths)
- Specific Industry Segment Examples
  - High-Frequency Trading (low delay)
  - Network-based VPN (customer specific SLAs)
  - Cloud-based services (Tradeoff between delay and placement of compute, storage)

Problem Statement

- End-to-end Measurement Insufficient to Support Performance Sensitive LSP Path Placement
- Lower Layer MPLS Networks Unable to Communicate Significant Performance Changes
- No Method to Communicate Significant Node/Link Performance Changes
- Routing Metrics Insufficient to Support Performance Sensitive Path Selection
- LSP Signaling Methods Insufficient to Support Performance Sensitive Path Selection

Functional Requirements

- Augment LSP Requestor Signaling with Performance Parameter Values
  - Minimum possible values or maximum acceptable values
- Specify Criteria for Node and Link Performance Parameter Estimation, Measurement Methods
- Support Node Level Performance Information when Needed
  - Not all deployment contexts require this, and/or node performance may be composed with and represented as link performance
- Augment Routing Information with Performance Parameter Estimates
  - Intra and inter-domain
- Augment Signaling Information with Concatenated Estimates
  - Necessary for multiple-domains that do not share node/link performance information
- Define Significant Performance Parameter Change Thresholds and Frequency
  - Respond only to important changes and dampen oscillation

Functional Requirements

- Define Thresholds and Timers for Links with Unusable Performance
  - Useful to declare links/nodes as unacceptable in some contexts
- Communicate Significant Performance Changes between Layers
  - For example, a lower layer (e.g., OTN) server network markedly increases delay by a restoration action and impacts performance of client networks
- Support for Networks with Composite Link
  - Parallel component links in a composite link may have different performance
- Restoration, Protection and Rerouting
  - Desirable feature to selectively reroute based upon performance degradation
- Management and Operational Requirements

Next Steps

- Solicit comments on the wg mailing list (or private comments, suggestions)
- Is the problem more clearly described?
- How many operators see this as a problem?
- Continue to advance as individual draft, or consider wg adoption?
- Which wg?