Error Performance Measurement in Packet-switched Networks

draft-mirsky-ippm-epm

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Network Slicing, Quality Attenuation, and etc.

- IETF view on a network slice is an extension of a VPN model. As the TEAS WG continues the discussion of draft-ietf-teas-ietf-network-slice-definition, one of the proposals may be of interest:

  IETF Network Slice Service is a set of CEs, a set of connectivity constructs (MP2MP, P2MP, P2P, etc.) between subsets of these CEs, and an SLO for each CE sending to each connectivity construct.

  SLO (Service Level Objective), in turn, is a combination of measurable metrics, e.g., latency, jitter, packet loss ratio

- Quality Attenuation [BBF TR-452.1] gives a far greater insight than simply using speed test results as a proxy for quality of experience and application outcomes and much greater measurement fidelity of packet layer performance than simple min/average/max latency and jitter measurements. It can be practically measured using multi-point observations using minor extensions to existing active OAM protocols, e.g., STAMP.

What is Error Performance?

- OAM toolset includes methods to detect defects and measure performance

- Defect is an inability to communicate. Defect in PSN is Loss of path continuity, i.e., there's no path through the network to get a packet from the source node to the destination node

- Defect state is the state of 100% packet loss – bridge Fault Management and Performance Monitoring OAM

- Packet Loss is an infinite delay of a packet

- Error Performance – quantitative characterization of the network condition between endpoints

EPM is Active OAM

- EPM is well-known in constant bit-rate, e.g., TDM, communication technologies (ITU-T G.826 and G.827)
  - based on the guaranteed presence of data, several EPM states and metrics defined, including state of path availability and unavailability
- A packet-switched network is based on the principle of statistical multiplexing and does not provide a predictable, guaranteed rate of receiving packets in the specified flow
- Without predictable flow, the operational state of a PSN cannot be characterized with certainty. If the state to be determined using only data traffic, how to differentiate pause in receiving data packets caused by the nature of the application from caused by the network failure?
- Only active OAM can create a sub-flow with a predictable rate of packets that EPM OAM can use

EPM Apparatus

- Consider using G.826/G827 EPM parameters:
  - Errored Interval (second)
  - Severely Errored Interval (second)
  - Error-free Interval (second)

- Consecutive intervals form a period of:
  - Availability
  - Unavailability

- To make it stable, the definition of a period includes hysteresis. For example:
  - Ten consecutive Severely Errored intervals determine that a path is in an unavailable period that started at the beginning of the first Severe Errored interval.
  - A sequence of Errored and Error-free intervals shorter than ten does not change the state of the path, i.e., it is still in unavailable period.

- Other metrics:

- Errored Interval Ratio = Errored Intervals / Total Number of Intervals

- Severely Errored Interval Ratio = Severely Errored Intervals / Total Number of Intervals

Integrated OAM and EPM

- Integrated OAM (draft-mmm-rtgwg-integrated-oam) is a new active measurement protocol built on the foundation of a lightweight FM mechanism

- PM part of the Integrated OAM is based on RFC 6374 with additional capability test packet rate negotiation

Next steps

- Welcome comments, questions
- Contributions, cooperation are most appreciated
- WG adoption?

Thank you