Problem Statement and Use Cases of Adaptive Traffic Data Collection

draft-he-adaptive-collecting-problem-usecases-00

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Motivation and Objective

Motivation

- IP carrier network needs to provide real-time traffic visibility to help network operators
  - quickly and accurately Locate network congestion and packet loss
  - make timely path adjustment for deterministic services to avoid congestion
- Persistent sampling at millisecond intervals will generate a considerable amount of data which may claim:
  - too much transport bandwidth resource
  - overload the servers for data collection, storage, and analysis

Objective

- explore the adaptive traffic data collection mechanism so as to capture real-time network state at minimum resource consumption.

Problem Statement

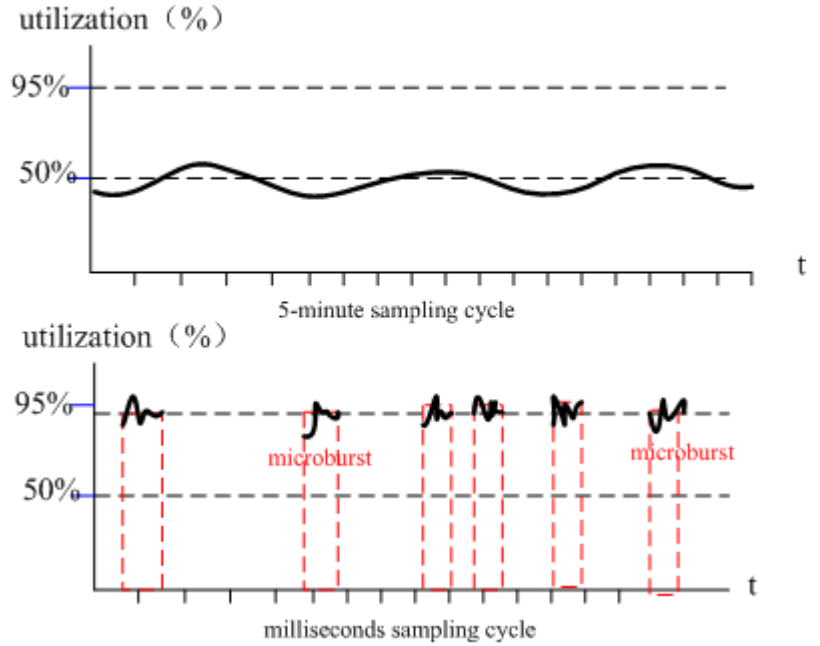
- IP network is of traffic burst characteristics. But, for a long time, operators have obtained traffic visibility from NMS, which can not reflect this kind of burst characteristics :
  - the observed average network traffic masks the characteristics of traffic burst, given that SNMP is widely employed to collect network traffic at 5 minutes intervals.
  - in spite of low link usage such as 30~40% bandwidth utilization , many complaints have still been received about poor QoE in delivering applications with the sensitivity of delay and packet loss.
- A large quantity of laboratory data and operational data indicate that a microburst phenomenon occurs frequently in operator's carrier networks, such as IP RAN, IP metropolitan network, IP backbone network and IDC.
- By means of telemetry techniques, we can capture the complete aspects of a microburst traffic. However, it is impractical to gain the real-time traffic visibility at the cost of persistent sampling at milliseconds intervals.

Scenarios of Adaptive Traffic data collection

Use case1: Multi-dimensional real-time portrait of interface traffic characteristic

- the real-time traffic visibility can help operators better understand network performance so as to achieve SLA guarantees for latency and loss-sensitive applications.
- obtaining the holistic and genuine characteristic of interface traffic is also a basic requirement for the statistical multiplexing model of IP network, which is of great significance for traffic prediction, network planning, network capacity expansion, network optimization, etc.

- It is essential to exploit the adaptive traffic data collection techniques to depict multi-dimensional real-time portrait of interface traffic characteristic at minimum resource consumption.



Scenarios of Adaptive Traffic data collection

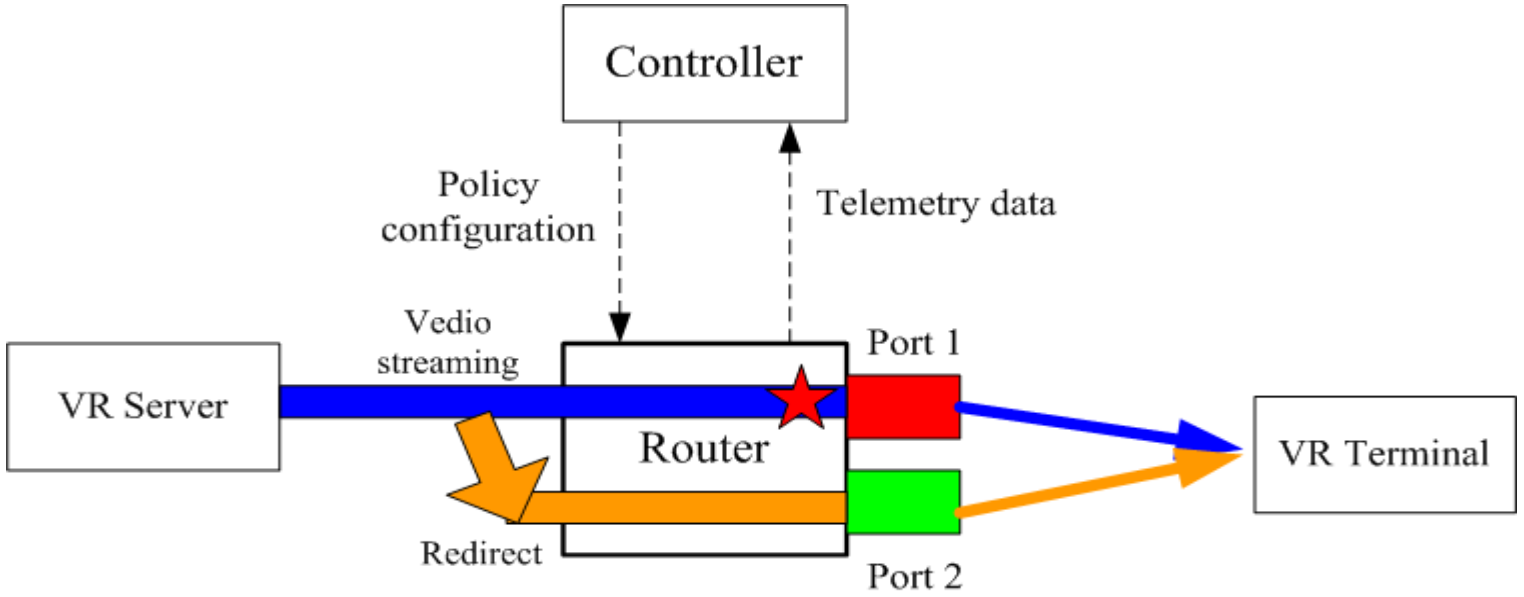
Use case2: Microburst traffic detecting

- Microburst traffic, as an instantaneous congestion phenomenon occurring frequently in IP carrier network, will cause critical delay jitter and even packet loss, which will seriously affect the QoE of latency and loss-sensitive applications.
- The ability of detecting microburst traffic of interface will help network operators quickly and accurately locate network congestion and packet loss, and make timely path adjustment for deterministic-delay services in order to avoid the congested nodes and links.
- Triggered by the events such as packet loss, queue depth beyond the threshold which is detected timely, sampling cycle must be timely tuned to milliseconds to capture a microburst of interface.

Scenarios of Adaptive Traffic data collection

Use case3: Congestion avoidance for deterministic services

- The real-time traffic visibility based on the adaptive traffic data collection techniques can accurately predict the long-term congestion, and quickly capture the instantaneous congestion(i.e., microburst) of interface.
- By means of the real-time traffic visibility, the automatic optimization tool (e.g., AI) can make timely path adjustment for key traffic flows.



Scenarios of Adaptive Traffic data collection

Use case4: On-path telemetry based on adaptive traffic sampling

- Applying on-path telemetry on all packets of selected flows can still be out of reach and a sampling rate should be set for these flows.
  - a too high rate would exhaust the network resource and even cause packet drops.
  - an overly low rate, on the contrary, would result in the loss of information and inaccuracy of measurements.
- An adaptive approach can be used based on the network conditions to dynamically adjust the sampling rate.
  - in normal network state, a low sampling rate is enough to reflect network performance.
  - in case of network congestion, timely adjust the packet sampling rate at very high level so as to acquire real-time measurement data such as latency, jitter and packet loss.

Next Steps

- Solicit comments and refine the draft accordingly
- Cooperation are welcome
- Possible implementation and verification