Collection of Telemetry Data in Software Defined Networks in MEF 3.0

Abstract:

MEF[1] is an industry association of 200+ member companies, and recently introduced the MEF 3.0[2] transformational global services framework for defining, delivering, and certifying agile, assured, and orchestrated services over a global ecosystem of automated networks. MEF 3.0 services are designed to provide an on-demand, cloud-centric experience with user- and application-directed control over network resources and service capabilities. MEF 3.0 services are delivered over automated, virtualized, and interconnected networks powered by LSO, SDN, and NFV. MEF produces service specifications, LSO frameworks, open LSO APIs, software-driven reference implementations, and certification programs. MEF 3.0 work will enable automated delivery of standardized Layer 1, Carrier Ethernet, IP, SD-WAN, and Layer 4-7 services across multiple provider networks.

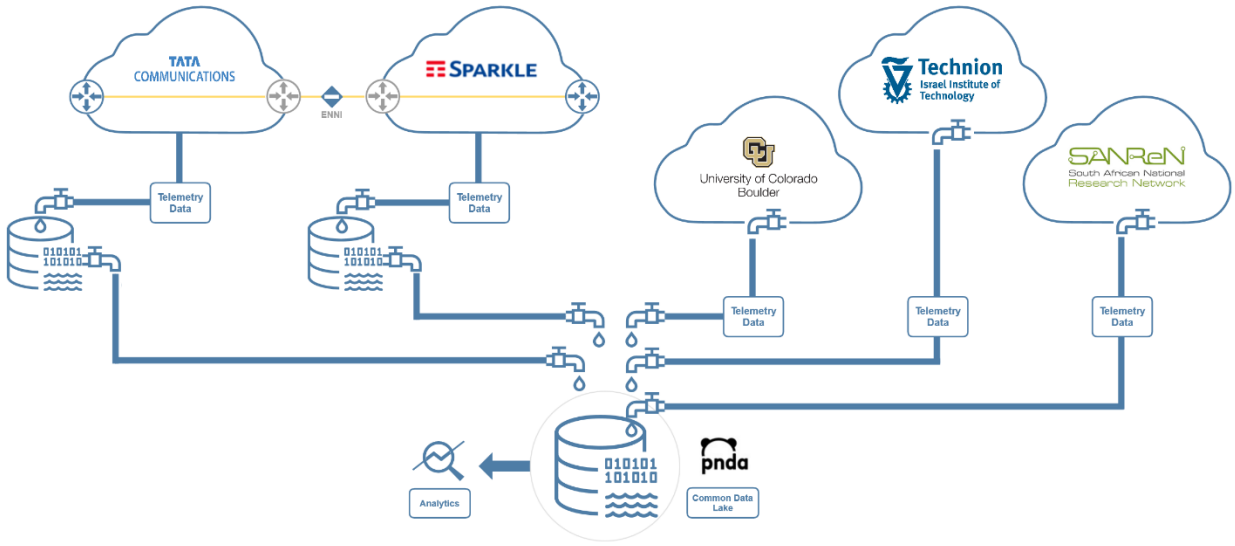
Furthermore, MEF facilitates the collaboration of MEF members and the MEF Developer Community in MEF 3.0 Implementation projects. These projects enable the industry to 'sandbox' various aspects of MEF 3.0, both providing feedback to the standardization work in the MEF committees as well as helping service providers accelerate their development and deployment of MEF 3.0 services.

One of those MEF 3.0 Implementation projects focuses on service telemetry that spans multiple Operator network domains using Big Data Analytics to support:

- Network capacity design and planning
- Service assurance for MEF 3.0 services
- Security threat mitigation

Service telemetry data is collected in a Linux Foundation project BDA platform (PNDA[3]) which is hosted by MEF on MEFnet[4], a Platform as a Service facilitated by the MEF to enable MEF 3.0 Implementation projects. The sources of telemetry data for his project include telecoms, national research and education networks and universities, who are provided with programmatic access to the resulting data lakes, for analytics and research purposes.

[1] http://www.mef.net/
[2] http://www.mef.net/mef30/overview
[3] http://pnda.io
[4] http://www.mef.net/MEFnet



In this Technion project, we define and collect service telemetry metrics are of interest especially in assurance services that are based on OpenFlow-enabled SDN's. These metrics are used in implementing monitoring algorithms which are critical building blocks in a range of management, control, and security applications.

Project Description:

- Running a virtual SDN network on top of Mininet[5] or any other network simulator.
- Generating artificial interesting patterns of traffic in the network, and also replaying recorded real traces such as CAIDA[6] 2016 traces.
- Implementing and deploying a telemetry collection application on top of the SDN network. This application can be based on previously developed framework for monitoring agents for Mininet.[7]
- Implement Statistics Manager Application that will collect periodically the defined metrics from the agents and will and push them to the PNDA database.
- Building a proof-of-concept application that pulls the data from PNDA and performs an analytical task on the data.

Metrics of interest:

The following metrics are to be collected iteratively for each "Service Telemetry Data Period":

- Timestamp since start of period.
- Switch ID.
- Ingress and Egress ports.

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[5] Mininet - An Instant Virtual Network on your Laptop (or any other PC): http://www.mininet.org/

[6] www.caida.org/data/passive/passive_2016_dataset.xml

[7] http://lccn.cs.technion.ac.il/wp-content/uploads/2017/04/Supporting-Built.pdf

- 5-tuple flow information.
- The basic OpenFlow Statistics data such as #packets, bytecount, etc…

Example of analytical tasks:

- Running a “top-k” / Frequency Estimation / Heavy Hitters algorithms.
- Inferring Routing scheme over the network’s topology.
- Flow’s split detection and split-ratio inference.

Requirements:

A group of 2 students with basic Networking Course, also preferably having a basic knowledge of Python.

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