YANG-based Telemetry storage in TSDBs

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Telemetry Collector

YANG model

TSDB

query /interfaces

YANG model

Consuming system

subscribe /interfaces
telemetry /interfaces

General / Cool dashboard

Bucket1

0 50 100 150 200 250 300 350 400

14:30 14:40 14:50 15:00 15:10 15:20 15:30 15:40 15:50 16:00 16:10 16:20 16:30 16:40
YANG to Time Series Database Mapping

• A mapping of YANG-modelled data into label-set centric Time Series Databases
  • Convert NETCONF XML or RESTCONF JSON payload to store in TSDB

Original YANG Instance-Identifier:

```
/interfaces/interface[name='eth0']/statistics/in-unicast-pkts = 5432100
```

• Metric: `interfaces_interface_statistics_in_unicast_pkts`
• Value: `5432100`
• Labels:
  • `host = router-01`
  • `interfaces_interface_name = eth0`
Label-set centric TSDBs

• Rough concept shared by many TSDBs, not a strict standard
• Metrics / time series are identified by a set of labels
  • Aka tags or dimensions – k/v
• Sometimes time series has a “name” too, but it is similar to a label

• Influxdb, Prometheus, M3DB, OpenTSDB, VictoriaMetrics, Druid
  • Some variation in design
YANG + TSDB = <3

• Time Series Databases (TSDBs) are very common today

• YANG now prevalent on network devices, lots of config false

• Cisco IOS XR 7.6, 404k line of config false YANG

• Nokia SROS 20.10, 230k line of config false YANG

• Juniper 23.2, 509k line of RPC YANG (mostly for retrieving oper state)
Scale, cardinality & queries

• SP scale order of magnitude
  • Thousands PE routers * Hundreds of thousands / millions CPE
    = ~Billions of metrics
  • First gen TSDB has Cardinality limit -> less of an issue today

• Use YANG model as rich index to get overview of data
  • Turn isolated islands into company wide telemetry resource

• Programmatic queries of TSDB data

To retrieve incoming unicast packets for the interface eth0:

*InfluxQL*: SELECT * FROM interfaces_interface_statistics_in_unicast_pkts WHERE interfaces_interface_name = 'eth0'

*PromQL*: interfaces_interface_statistics_in_unicast_pkts{interfaces_interface_name="eth0"}
Goals & next steps

• Deterministic model-driven mapping for programmatic consumption
  • Complete the specification! Talk to me if you are interested in the topic 
• We have some POC-level running code, make further progress
• Fit well into existing TSDBs and systems
• Self-describing data, so no strict reliance on YANG for visualization
  • All existing tooling & system that we want leverage is not YANG-aware
  • Suitable for direct human consumption
  • But extra metadata can be retrieved using YANG model
  • Dashboards and navigation can be built / organized with metadata from YANG model
    • Like show all temperature sensors on one dashboard, grouped by geography
• Encoding of 100% of YANG is NOT a goal
  • For example, anyxml / anydata is impossible / hard to present in TSDB
  • That’s why we call this a “mapping” and not “encoding” as for XML / JSON
• Align with draft-lindblad-mlm-philatelist-00