# YANG Data Node Self Explanation Tags

## draft-tao-netmod-yang-node-tags-03

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# Document Status

- Presented in NETMOD session IETF 107, we got a lot of supports in the hum conducted via etherpad in April 14
- IPR call on draft-tao-netmod-yang-node-tags was issued in July 14
  - IPR has been disclosed in compliance with IETF IPR rules

- Changes in v-03 since IETF 107
  - One usage example on telemetry data tagging is provided in the Appendix.
  - Provide clear definition for operation-type
  - Change parent grouping into multi-source tag.
  - Add one new value for operation type tag, i.e.,sum
  - Update multi-source tag attribute names
  - Change the order of telemetry data tags

# Telemetry Data Tagging Recap
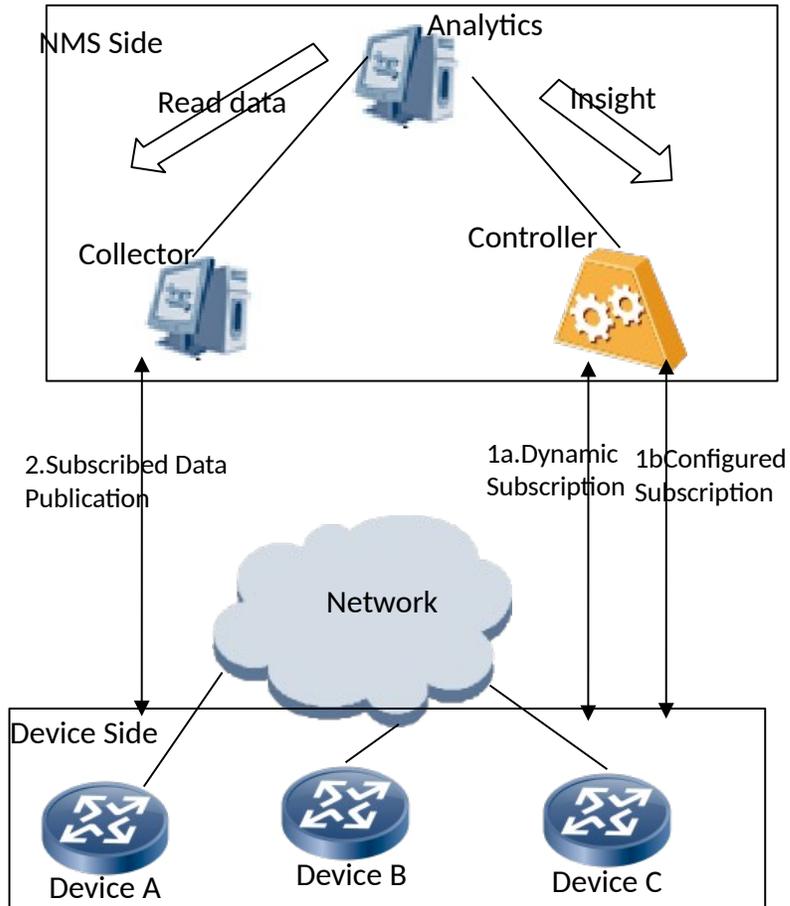


- **Problem:** Huge resource consumption due to massive data collection and processing; The data to be fetched is not data objects that are of interest to client application.

- **Objective:**
  - Using Telemetry data self explanation tags to capture characteristic data and provide multiple dimension network visibility analysis
- **Motivation:**
  - Identify Performance measurement related data for service assurance application.
  - Provide Network visibility to Network load, traffic flow, capacity, Network QoS data category in milliseconds or seconds
    - The dimensions of telemetry data can be categorized from performance metric group, data source, statistics operation(Max, Min, Average, threshold), object type
  - Provide tendency prediction, threshold based telemetry, anomaly detection, KPI/KQI Correlation, RCA, etc data analysis capability
  - Improve data quality by making structured data more usable
  - Provide consistent representation and reporting for characteristics data from multiple data source

NETMOD IETF 108 virtual interim meeting

# Telemetry data tag Classification

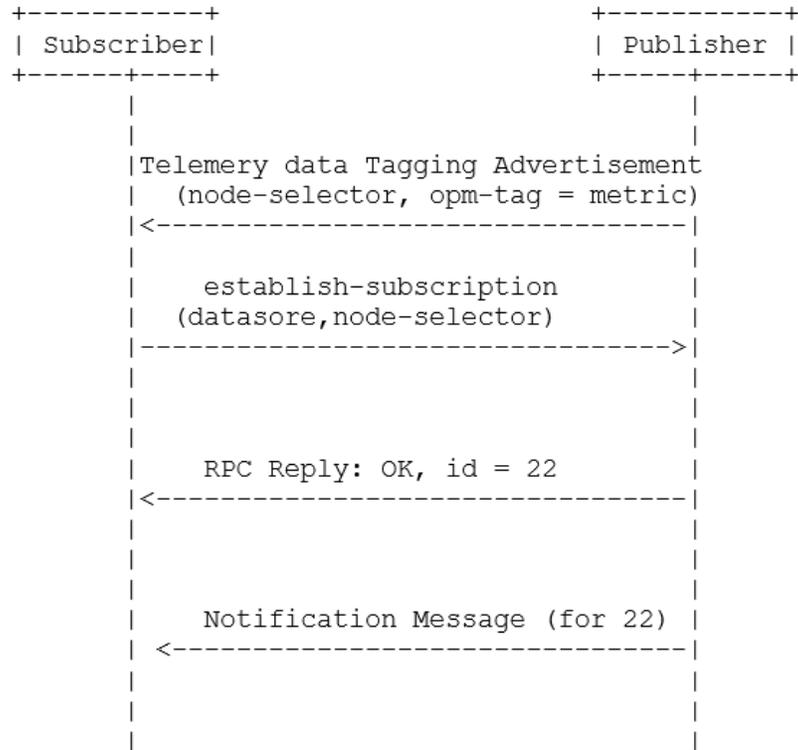| Category | Definition | Value |
|---|---|---|
| **OPM -tag** | The abbreviation of opm is Object type, property, metric. OPM Tag is used to classify telemetry data into object type, property, metric group and metric | Object type, property, Metric group, metric |
| **Operation-type** | Statistics operation of performance metric related to telemetry data node, The statistics operation include min, max, average, sum | Min, max, sum, average, threshold |
| **Metric-Scale** | Provide an additional metric scale (e.g., Measurement scaling factor of $10^0$, $10^{-3}$,$10^3$) information associated with the performance metric related to telemetry data node; | Kilo, mega, etc. |
| **Metric-precision** | Provide an additional metric precision (e.g., the range -8 to -1, 0, the range 1 to 9) information associated with the performance metric related to telemetry data node; | (-8,9) |
| **Data-source-type** | The data source type (e.g., connectivity,resource, hardware ,qos,policy) associated with the performance metric data node within YANG module. | connectivity,resource, hardware ,qos,policy |
| **Multi-source-tag** | Identify multiple source aggregation tye(e.g., line card,member link in an aggregated Ethernet interface) related to performance metric related data node or interface related to data node). Two source aggregation source types are supported, one is aggregation, the other is membership | Aggregation, Membership |

# Model Design

ietf-module-tags ← **Augment** ← ietf-self-explanation-node-tags Module
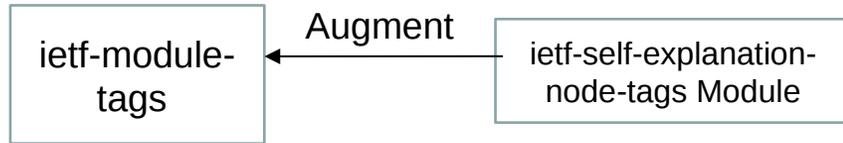
```
module: ietf-data-node-tags
augment /tags:module-tags/tags:module:
  +--rw self-explanation-node-tags
    +--rw self-explanation-node* [node-name]
      +--rw node-name          nacm:node-instance-identifier
      +--rw opm-tag            tags:tag
      +--rw metric-precision   tags:tag
      +--rw metric-scale       tags:tag
      +--rw operation-type     tags:tag
      +--rw service-tag*       tags:tag
      +--rw task-tag*          tags:tag
      +--rw multi-source-tag   tags:tag
      +--rw data-source        tags:tag
```

- Augments Module tag model and
  - provides a list of data node entries to allow for adding or removing of data node self explanation tags
  - as well as viewing the set of self explanation tags associated with a YANG data nodes.

# Usage example of telemetry data tagging with opm-tag

```
+----------+                    +----------+
| Subscriber|                   | Publisher |
+-----+----+                    +-----+-----+
      |                               |
      |                               |
      |Telemery data Tagging Advertisement
      |  (node-selector, opm-tag = metric)
      |<------------------------------|
      |                               |
      |     establish-subscription    |
      |   (datasore,node-selector)    |
      |------------------------------>|
      |                               |
      |                               |
      |                               |
      |     RPC Reply: OK, id = 22     |
      |<------------------------------|
      |                               |
      |                               |
      |                               |
      |     Notification Message (for 22) |
      |  <----------------------------|
      |                               |
      |                               |
      |                               |
```

a. The publisher advertise telemetry data node capability to the subscriber.

b. Subscriber sends a establish- subscription RPC to subscribe specific data objects that are interests to the client application from the publisher.

## a. Advertise opm-tag on targeted data object

```
<?xml version="1.0" encoding="UTF-8"?>
<instance-data-set xmlns=\
    "urn:ietf:params:xml:ns:yang:ietf-yang-instance-data">
  <name>acme-router-notification-capabilities</name>
  <content-schema>
    <module>ietf-system-capabilities@2020-03-23</module>
    <module>ietf-notification-capabilities@2020-03-23</module>
    <module>ietf-data-export-capabilities@2020-03-23</module>
  </content-schema>
  <!-- revision date, contact, etc. -->
  <description>Defines the notification capabilities of an acme-router.
    The router only has running, and operational datastores.
    Every change can be reported on-change from running, but
    only config=true nodes and some config=false data from operational.
    Statistics are not reported based on timer based trigger and counter
    threshold based trigger.
  </description>
  <content-data>
    <system-capabilities \
      xmlns="urn:ietf:params:xml:ns:yang:ietf-system-capabilities" \
      xmlns:inc=\
        "urn:ietf:params:xml:ns:yang:ietf-notification-capabilities" \
      xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
      <datastore-capabilities>
        <datastore>ds:operational</datastore>
        <per-node-capabilities>
          <node-selector>\
            /if:interfaces/if:interface/if:statistics/if:in-errors\
          </node-selector>
          <sec:self-describing-capabilities>
            <sec:self-tag-id>bandwith</sec:self-tag-id>
            <sec:opm-tag>metric</sec:opm-tag>
          </sec:self-describing-capabilities>
        </per-node-capabilities>
      </datastore-capabilities>
    </system-capabilities>
  </content-data>
</instance-data-set>
```

## b. establish-subscription RPC sending

```
<netconf:rpc message-id="101"
    xmlns:netconf="urn:ietf:params:xml:ns:netconf:base:1.0">
  <establish-subscription
      xmlns="urn:ietf:params:xml:ns:yang:ietf-subscribed-notifications"
      xmlns:yp="urn:ietf:params:xml:ns:yang:ietf-yang-push">
    <yp:datastore
        xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
      ds:operational
    </yp:datastore>
    <yp:datastore-xpath-filter
        xmlns:ex="https://example.com/sample-data/1.0">
      /if:interfaces/if:interface/if:statistics/if:in-errors
    </yp:datastore-xpath-filter>
    <yp:periodic>
      <yp:period>500</yp:period>
    </yp:periodic>
  </establish-subscription>
</netconf:rpc>
```
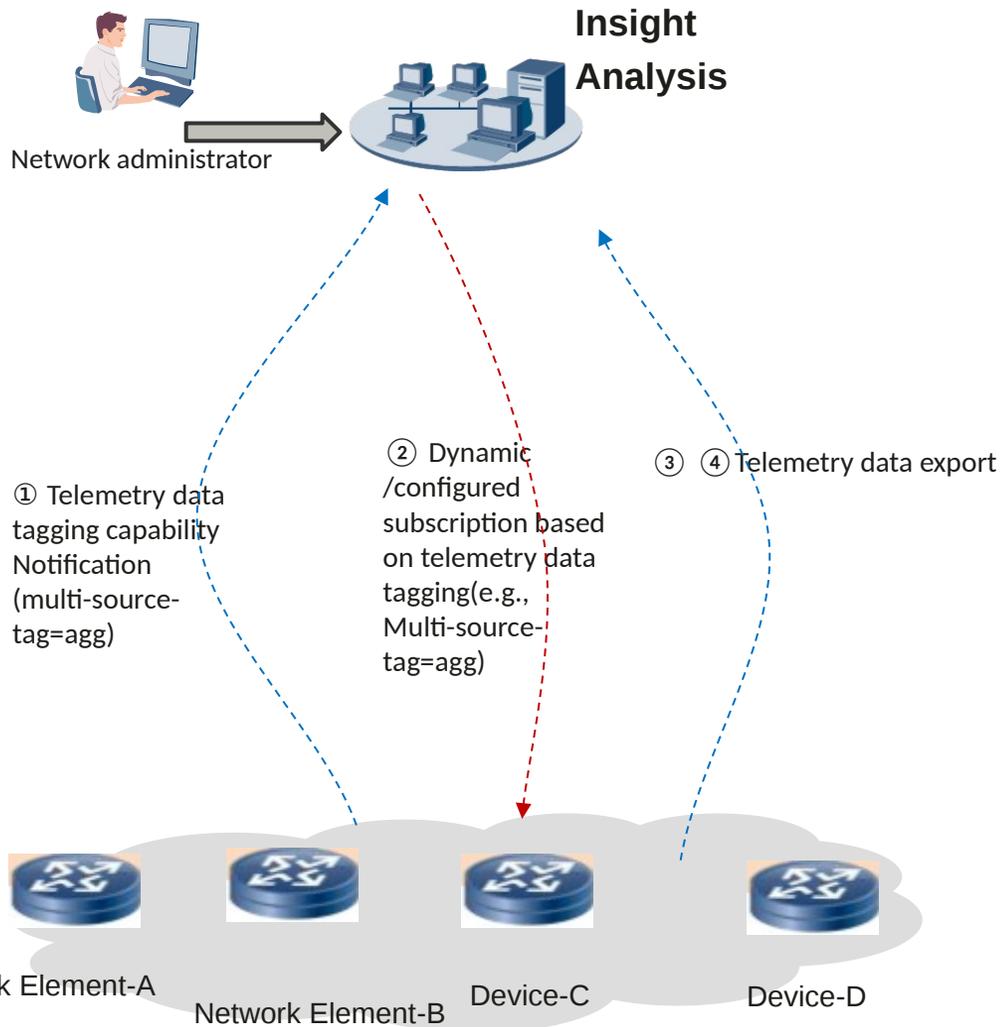
# Telemetry data tag usage Example
# Multi-Source Telemetry data aggregation

a. Advertise multi-source-tag on targeted data object

**Insight Analysis**

Network administrator

① Telemetry data tagging capability Notification (multi-source-tag=agg)

② Dynamic /configured subscription based on telemetry data tagging(e.g., Multi-source-tag=agg)

③ ④ Telemetry data export

Network Element-A

Network Element-B

Device-C

Device-D

```xml
<?xml version="1.0" encoding="UTF-8"?>
<instance-data-set xmlns=\
    "urn:ietf:params:xml:ns:yang:ietf-yang-instance-data">
  <name>acme-router-notification-capabilities</name>
  <content-schema>
    <module>ietf-system-capabilities@2020-03-23</module>
    <module>ietf-notification-capabilities@2020-03-23</module>
    <module>ietf-data-export-capabilities@2020-03-23</module>
  </content-schema>
  <!-- revision date, contact, etc. -->
  <description>Defines the notification capabilities of an acme-router.
    The router only has running, and operational datastores.
    Every change can be reported on-change from running, but
    only config=true nodes and some config=false data from operational.
    Statistics are not reported based on timer based trigger and counter
    threshold based trigger.
  </description>
  <content-data>
    <system-capabilities \
      xmlns="urn:ietf:params:xml:ns:yang:ietf-system-capabilities" \
      xmlns:inc=\
        "urn:ietf:params:xml:ns:yang:ietf-notification-capabilities" \
      xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
      <datastore-capabilities>
        <datastore>ds:operational</datastore>
        <per-node-capabilities>
          <node-selector>\
              /if:interfaces/if:interface[type=if:line-card]/if:statistics/if:in-errors\
          </node-selector>
          <sec:self-describing-capabilities>
            <sec:self-tag-id>multi-source-aggregation</sec:self-tag-id>
            <sec:multi-source-tag>agg</sec:multi-source-tag>
          </sec:self-describing-capabilities>
        </per-node-capabilities>
      </datastore-capabilities>
    </system-capabilities>
  </content-data>
</instance-data-set>
```

# Next Step

- Key value:
  - Identify Performance measurement related data for service assurance application.
  - Provide Network visibility to Network load, traffic flow, capacity, Network QoS data category in milliseconds or seconds
  - Provide tendency prediction, threshold based telemetry, anomaly detection, KPI/KQI Correlation, RCA, etc data analysis capability
- Get a lot of supports from virtual hum.
- Adopt it as WG work item?