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Self describing data Node tag capability
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Abstract

Before a client application subscribes to updates from a datastore, server capabilities related to "Subscription to YANG Datastores" can be advertised using YANG Instance Data format. These server capabilities can be documented at implement time or reported at run-time.

This document proposes a YANG module for self describing data Object tag capability which augments system capabilities model and provide additional self describing data node attributes associated with node selectors within per-node capabilities.

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1. Introduction

As described in [I-D.netconf-notification-capabilities], a server supporting YANG-Push MAY have a number of capabilities such as

- o Supported (reporting) periods for periodic subscriptions;
- o Maximum number of objects that can be sent in an update;
- o Supported dampening periods for on-change subscriptions;
- o The set of data nodes for which on-change notification is supported.

Notification capability model defined in [I-D.netconf-notification-capabilities] allows a client to discover basic system capability and YANG-Push related capabilities both at implementation-time and run-time. Without using this notification capability, it might lead to unexpected failures or additional message exchanges for NETCONF

clients to discover data objects with specific capability supported by a NETCONF server.

When all telemetry data on the server subscribed by a particular subscriber is huge, it becomes more likely that a burst of streamed data may temporarily overwhelm a receiver and consume expensive computing and storage resource. Accordingly, there is a need for filtering subscribed telemetry data on a server based on server capabilities, which can greatly reduce the amount of data to be streamed out to the destination.

However without telemetry data classification or prior knowledge of data objects correlation relationship, it is difficult for NETCONF clients to automatically select target data objects that are of interest to the client applications, e.g., identify a set of objects from different YANG data modules which have a common characteristic, collect specific object type nodes for multiple dimensional network visibility analysis.

This document proposes a YANG module for self describing data Node tag capability which augments System Capabilities model and provide additional self describing data node tag attributes associated with node selector for queries filtering.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14 \[RFC2119\] \[RFC8174\]](#) when, and only when, they appear in all capitals, as shown here.

2. Self-explanation data Node tag capability

The YANG module `ietf-notification-capabilities` defined in [I-D.netconf-notification-capabilities] specifies the following server capabilities related to YANG Push:

- o A set of capabilities related to the amount of notifications the server can send out
- o Specification of which data nodes support on-change notifications.
- o Capability values can be specified on server level, datastore level or on specific data nodes (and their contained sub-tree) of a specific datastore. Capability values on a smaller, more specific part of the server's data always override more generic values.

- o On-change capability is not specified on a server level as different datastores usually have different on-change capabilities. On a datastore level on-change capability for configuration and state data can be specified separately.

These server capabilities can be provided either at implementation time or reported at run time.

This document augments system capabilities model and provide additional data node self explanation tag attributes associated with node selector within per-node capabilities:

- o Specification of which data objects (e.g., data object tagged with object tag, property subobject tag, metri subobject tag) they can push to the target recipient;
- o Specification of metric group tag associated with a set of metric subobjects;
- o Specification of multi-source aggregation tag associated with specific metric subobject;

2.1. Tree Diagram

The following tree diagram [[RFC8340](#)] provides an overview of the data model.

```

module: ietf-self-describing-capabilities
augment /sysc:system-capabilities/sysc:datastore-capabilities/ +
    sysc:per-node-capabilities/sys:node-selection/sys:node-selector:
    +--ro self-describing-attributes
        +--ro opm-tag*           tags:tag
        +--ro metric-group      tags:tag
        +--ro muli-source-tag    tags:tag

```

3. YANG Module

```

<CODE BEGINS> file "ietf-self-describing-capabilities.yang"
module ietf-self-describing-capabilities {
  yang-version 1.1;
  namespace urn:ietf:params:xml:ns:yang:ietf-self-description-capabilities;
  prefix sdc;
  import ietf-system-capabilities { prefix sysc ; }
  import ietf-module-tags { prefix tags; }
  organization
    "IETF NETMOD (Network Modeling) Working Group";
  contact
    "WG Web: <https://tools.ietf.org/wg/netconf/>"

```


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description

"This module defines an extension to System Capabilities model and provides additional self explanation data node tag attributes associated with node selector for queries filtering.

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.";

revision 2020-07-08 {

description

"Initial revision";

reference

"RFC XXXX";

}

augment "/sysc:system-capabilities/sysc:datastore-capabilities" +

"/sysc:per-node-capabilities" +

"/sysc:node-selection/sysc:node-selector" {

description "Allows per-node capabilities have additional self-explanation attributes";

container self-describing-attributes {

description "self describing attributes for specific data node.";

leaf-list opm-tag {

type tags:tag;

description

"Object, Property and Metric(OPM) Tags associated with specific data object within YANG module.

See the IANA 'YANG Data Node Tag Prefixes' registry for reserved prefixes and the IANA

'IETF YANG Data Node Tags' registry for IETF tags.";

}

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```
    leaf metric-group {
      type tags:tag;
      description
        "The metric-group can be used to provide correlation between
        different performance metric information associated with YANG
        data node.";
    }
    leaf multi-source-tag {
      type tags:tag;
      description
        "The multiple source tag can be used to aggregate performance
        metric from different sources.";
    }
  }
}
}
<CODE ENDS>
```

4. IANA Considerations

4.1. Updates to the IETF XML Registry

This document registers a URI in the "IETF XML Registry" [[RFC3688](#)]. Following the format in [[RFC3688](#)], the following registration has been made:

```
URI:
    urn:ietf:params:xml:ns:yang:ietf-self-describing-capabilities
Registrant Contact:
    The IESG.
XML:
    N/A; the requested URI is an XML namespace.
```

4.2. Updates to the YANG Module Names Registry

This document registers one YANG module in the "YANG Module Names" registry [[RFC6020](#)]. Following the format in [[RFC6020](#)], the following registration has been made:

```
name:
    ietf-self-describing-capabilities
namespace:
    urn:ietf:params:xml:ns:yang:ietf-self-describing-capabilities
prefix:
    sec
reference:
    RFC XXXX (RFC Ed.: replace XXX with actual RFC number and remove
    this note.)
```


5. Security Considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [RFC6241] or RESTCONF [RFC8040]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [RFC6242]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [RFC8446].

The NETCONF Configuration Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:opm-tag
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:metric-group
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:multi-source-tag

6. Contributors

The authors would like to thank Ran Tao, Hui Cai for his major contributions to the initial modeling and use cases.

7. References

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Appendix A. Targeted data object subscription example

The following subsections provides targeted data object subscription example. The subscription "id" values of 22 used below is just an example. In production, the actual values of "id" might not be small integers.

```

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

```


The publisher advertise telemetry data node capability to the subscriber to instruct the receiver to subscribe targeted data object with specific characteristics (e.g., performance metric related data object) and specific data path corresponding to the targeted data object.

The following XML example [W3C.REC-xml-20081126] illustrates the advertisement of the list of available target objects:

```
<?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:opm-tag>metric</sec:opm-tag>
            <sec:metric-group>loss</sec:metric-group>
          </sec:self-describing-capabilities>
        </per-node-capabilities>
      </datastore-capabilities>
    </system-capabilities>
  </content-data>
</instance-data-set>
```


With telemetry data tagging information carried in the Telemetry data Tagging Advertisement, the subscriber identifies targeted data object and associated data path to the datastore node and sends a establish-subscription RPC to subscribe specific data objects that are interests to the client application from the publisher.

```
<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>
```

The publisher returns specific object type of operational state related to the subscriber.

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