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Self-explanation data Node tag capability
draft-tao-netconf-notif-node-tag-capabilities-02

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-explanation data Node tag capability which augments system capabilities model and provide additional self-explanation 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-explanation data Node tag capability which augments System Capabilities model and provide additional self-explanation 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 object type nodes, which performance metric nodes, which property related nodes they can push to the target recipient;
- o Specification of measurement precision or granularity associated with performance metric related data nodes;
- o Specification of operation type associated with performance metric related data nodes;
- o Specification of service classification information associated with data nodes;
- o Specification of task group information associated with a set of data nodes;
- o Specification of self tag name of a set of data nodes they can push to the target recipient.
- o Specification of data source type associated with a set of data nodes;
- o Specification of multi-source aggregation associated with a set of data nodes;

2.1. Tree Diagram

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


```
module: ietf-self-explanation-capabilities
augment /sysc:system-capabilities/sysc:datastore-capabilities/ +
  sysc:per-node-capabilities/sys:node-selection/sys:node-selector:
  +--ro self-describing-attributes* [self-tag-id]
    +--ro self-tag-id                string
    +--ro opm-tag                    tags:tag
    +--ro metric-precision            tags:tag
    +--ro metric-scale                tags:tag
    +--ro operation-type              tags:tag
    +--ro service-tag*                tags:tag
    +--ro task-tag*                  tags:tag
    +--ro data-source                 tags:tag
    +--ro multi-source-tag            tags:tag
```

3. YANG Module

<CODE BEGINS> file "ietf-self-explanation-capabilities.yang"

```
module ietf-self-explanation-capabilities {
  yang-version 1.1;
  namespace urn:ietf:params:xml:ns:yang:ietf-self-explanation-capabilities;
  prefix sec;
  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/>
    WG List:  <mailto:netconf@ietf.org>

    Editor:   Qin Wu
              <bill.wu@huawei.com>
              Bo Wu
              <lane.wubo@huawei.com>;
```

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";
list self-describing-attributes {
key self-tag-id;
description "self describing attributes for each data node.";
leaf self-tag-id {
type string;
description
    "This self tag id is used to uniquely identify a set of data nodes
    of the same group which have a common characteristic. If the opm-tag
    is metric, self-tag-id represents specific metric name. If the opm-
tag
    is metric-group, self-tag-id represents specific metric group name.";
}
leaf opm-tag {
type tags:tag ;
description
    "Object, Property and Metric(OPM) Tags associated with
    the data node 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.";
}
leaf metric-precision {
type tags:tag;
description
    "The numeric expression precision of performance
    metric related data node.";
}

leaf metric-scale {
type tags:tag;
description
    "The measurement scale of performance
    metric related data node.";
}
leaf operation-type{
```

```
type tags:tag;  
description
```

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```
    "Statistics operation of performance metric related
    data node.If the operation type is threshold type, the corresponding
    data object support threshold handling,e.g.,scan all interfaces
    for a certain type every 5 seconds and check the counters or
    status to cross threshold, return an array of interface entries
    that match the search.If the operation type is average,min,max, sum,
    it indicate the data object supports statistics operation, e.g.,
    scan all interfaces for a certain type every 5 seconds up to 60
seconds,
    only return min, average, max, sum value of specific data object
rather than
    the values that are current at the end of 60 seconds.";
}
leaf-list service-tag {
  type tags:tag;
  description
    "The node-service-tag can be used to provide a service
    classification information (e.g., tunnel, l3vpn,l2vpn)
    information associated with YANG data node.";
}
leaf-list task-tag {
  type tags:tag;
  description
    "The node-task-tag can be used to provide a task
    classification information (e.g., fault management,
    performance measurement) information associated with
    YANG data node.";
}
leaf data-source {
  type tags:tag;
  description
    "The data source type can be used to identify different
    data source type(e.g., service flow, resource, policy,
    qos, hardware).";
}
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-explanation-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-explanation-capabilities
namespace:
    urn:ietf:params:xml:ns:yang:ietf-self-explanation-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:self-tag-id
- 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-precision
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:operation-type
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:service-tag
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:task-tag
- o /sysc:system-capabilities/sysc:datastore-capabilities/sysc:per-node-capabilities/sys:node-selection/sys:node-selector/sec:self-describing-attributes/sec:data-source
- 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 for his major contributions to the initial modeling and use cases.

7. References

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- [RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", [RFC 8342](#), DOI 10.17487/RFC8342, March 2018, <<https://www.rfc-editor.org/info/rfc8342>>.
- [RFC8407] Bierman, A., "Guidelines for Authors and Reviewers of Documents Containing YANG Data Models", [BCP 216](#), [RFC 8407](#), DOI 10.17487/RFC8407, October 2018, <<https://www.rfc-editor.org/info/rfc8407>>.

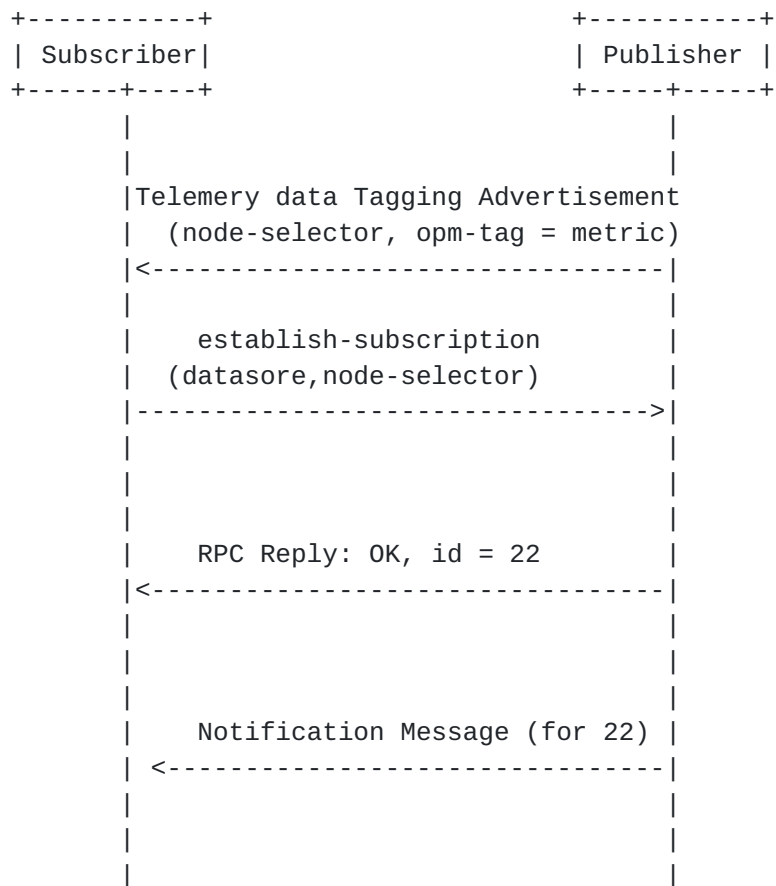
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- [RFC3688] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/info/rfc3688>>.
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Appendix A. Targeted data object subscription 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.



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:self-tag-id>bandwidth</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>
```

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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