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Support of Network Observation Timestamping in YANG Notifications

Abstract

This document extends the YANG Notification header with the YANG objects observation timestamping, both for the "push-update" and "push-change-update" notifications.

Status of This Memo

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1. Introduction

To correlate network data among different Network Telemetry planes as described in Section 3.1 of [RFC9232] or among different YANG push subscription types defined in Section 3.1 of [RFC8641], network observation timestamping describes when the state change was observed or from when to when the data was accounted. This is essential for understanding the timely relationship among these different planes and YANG push subscription types.

With [I-D.tgraf-netconf-notif-sequencing] the delay between the YANG Notification export and the arrival at the downstream system storing the data can be measured. With network observation timestamping described in this document, the delay between the network observation and the data export of the YANG push publisher process can be measured as well, extending the delay measurement scope from the time the network observation and storing the data.

By extending the YANG Notification header with the YANG objects observation-time for periodical and state-changed-observation-time for on-change subscriptions these use cases can be addressed accordingly.

2. Terminologies

The following terms are defined in [RFC8639] and are not redefined here:

Publisher

Receiver

Subscription

In addition, this document defines the following terms:

Observation-time: Describes the measurement observation time for the "push-update" notification in a "periodical" subscription.

State-changed-observation-time: Describes the time when the network state change was observed.

3. Extend the Streaming Update Notifications

Besides the Subscription ID as described in Section 3.7 of [RFC8641], the following network observation time metadata objects are part of "push-update" and "push-change-update" notifications.

observation-time: Describes the measurement observation time for the "push-update" notification in a "periodical" subscription. By comparing the "observation-time" of two "push-update" notifications, the collector can deduce the actual cadence of the measurements, and compare it with the configured one.

state-changed-observation-time: Describes in the "push-change-update" notification in a "on-change" subscription the time when the network state change was observed after the subscription was initially established. In case of an "on-change sync on start" subscription it describes the time when the network state change was observed before the subscription was established.

Figure 1 provides an example of a JSON encoded, [RFC8259], "push-change-update" notification message over HTTPS-based [I-D.ietf-netconf-https-notif] or UDP-based [I-D.ietf-netconf-udp-notif] transport for the same subscription.

```

{
  "ietf-notification:notification": {
    "eventTime": "2023-02-04T16:30:11.22Z",
    "sysName": "example-router",
    "sequenceNumber": 187653,
    "ietf-yang-push:push-update": {
      "id": 1011,
      "observation-time": "2023-02-04T16:30:09.44Z",
      "datastore-xpath-filter": "ietf-interfaces:interfaces",
      "datastore-contents": {
        "ietf-interfaces:interface": {
          "name": {
            "eth0": {
              "oper-status": "up"
            }
          }
        }
      }
    }
  }
}

```

Figure 1: JSON Push Example for a subscription-modified notification message

4. The "ietf-yang-push-netobs-timestamping" YANG Module

This YANG module augments the "ietf-yang-push" module with the observation-time in the "push-update" and "push-change-update" streaming update notifications.

4.1. Data Model Overview

4.1.1. Tree View

The following is the YANG tree diagram [RFC8340] for the ietf-yang-push-netobs-timestamping YANG module

```

module: ietf-yang-push-netobs-timestamping

```

```

augment /yp:push-update:
  +--ro observation-time?   yang:date-and-time
augment /yp:push-change-update:
  +--ro state-changed-observation-time?   yang:date-and-time

```

4.1.2. Full Tree View

The following is the YANG tree diagram [RFC8340] for the ietf-yang-push-netobs-timestamping augmentation within the ietf-subscribed-notifications, including the RPCs and notifications.

module: ietf-yang-push

```
augment /sn:establish-subscription/sn:input:
  +---w (update-trigger)?
    +--:(periodic)
      | +---w periodic!
      |   +---w period          centiseconds
      |   +---w anchor-time?   yang:date-and-time
    +--:(on-change) {on-change}?
      +---w on-change!
        +---w dampening-period? centiseconds
        +---w sync-on-start?   boolean
        +---w excluded-change*  change-type
augment /sn:establish-subscription/sn:input/sn:target:
  +--:(datastore)
    +-- datastore          identityref
    +-- (selection-filter)?
      +--:(by-reference)
        | +-- selection-filter-ref
        |   selection-filter-ref
      +--:(within-subscription)
        +-- (filter-spec)?
          +--:(datastore-subtree-filter)
            | +-- datastore-subtree-filter? <anydata>
            |   {sn:subtree}?
          +--:(datastore-xpath-filter)
            +-- datastore-xpath-filter?   yang:xpath1.0
            {sn:xpath}?
augment /sn:modify-subscription/sn:input:
  +---w (update-trigger)?
    +--:(periodic)
      | +---w periodic!
      |   +---w period          centiseconds
      |   +---w anchor-time?   yang:date-and-time
    +--:(on-change) {on-change}?
      +---w on-change!
        +---w dampening-period? centiseconds
augment /sn:modify-subscription/sn:input/sn:target:
  +--:(datastore)
    +-- datastore          identityref
    +-- (selection-filter)?
      +--:(by-reference)
        | +-- selection-filter-ref
        |   selection-filter-ref
      +--:(within-subscription)
        +-- (filter-spec)?
          +--:(datastore-subtree-filter)
            | +-- datastore-subtree-filter? <anydata>
            |   {sn:subtree}?
          +--:(datastore-xpath-filter)
            +-- datastore-xpath-filter?   yang:xpath1.0
            {sn:xpath}?

```

```

        +--:(datastore-xpath-filter)
            +-- datastore-xpath-filter?      yang:xpath1.0
                {sn:xpath}?
augment /sn:subscription-started:
  +--ro (update-trigger)?
    +--:(periodic)
      | +--ro periodic!
      |   +--ro period          centiseconds
      |   +--ro anchor-time?   yang:date-and-time
    +--:(on-change) {on-change}?
      +--ro on-change!
        +--ro dampening-period? centiseconds
        +--ro sync-on-start?   boolean
        +--ro excluded-change*  change-type
augment /sn:subscription-started/sn:target:
  +--:(datastore)
    +-- datastore                      identityref
    +-- (selection-filter)?
      +--:(by-reference)
        | +-- selection-filter-ref
        |   selection-filter-ref
      +--:(within-subscription)
        +-- (filter-spec)?
          +--:(datastore-subtree-filter)
            | +-- datastore-subtree-filter? <anydata>
            |   {sn:subtree}?
          +--:(datastore-xpath-filter)
            +-- datastore-xpath-filter?   yang:xpath1.0
                {sn:xpath}?
augment /sn:subscription-modified:
  +--ro (update-trigger)?
    +--:(periodic)
      | +--ro periodic!
      |   +--ro period          centiseconds
      |   +--ro anchor-time?   yang:date-and-time
    +--:(on-change) {on-change}?
      +--ro on-change!
        +--ro dampening-period? centiseconds
        +--ro sync-on-start?   boolean
        +--ro excluded-change*  change-type
augment /sn:subscription-modified/sn:target:
  +--:(datastore)
    +-- datastore                      identityref
    +-- (selection-filter)?
      +--:(by-reference)
        | +-- selection-filter-ref
        |   selection-filter-ref
      +--:(within-subscription)
        +-- (filter-spec)?

```

```

        +--:(datastore-subtree-filter)
        | +-- datastore-subtree-filter? <anydata>
        |   {sn:subtree}?
        +--:(datastore-xpath-filter)
          +-- datastore-xpath-filter? yang:xpath1.0
             {sn:xpath}?
augment /sn:filters:
  +--rw selection-filter* [filter-id]
    +--rw filter-id string
    +--rw (filter-spec)?
      +--:(datastore-subtree-filter)
      | +--rw datastore-subtree-filter? <anydata>
      |   {sn:subtree}?
      +--:(datastore-xpath-filter)
        +--rw datastore-xpath-filter? yang:xpath1.0
           {sn:xpath}?
augment /sn:subscriptions/sn:subscription:
  +--rw (update-trigger)?
    +--:(periodic)
    | +--rw periodic!
    | +--rw period centiseconds
    | +--rw anchor-time? yang:date-and-time
    +--:(on-change) {on-change}?
      +--rw on-change!
        +--rw dampening-period? centiseconds
        +--rw sync-on-start? boolean
        +--rw excluded-change* change-type
augment /sn:subscriptions/sn:subscription/sn:target:
  +--:(datastore)
  +--rw datastore identityref
  +--rw (selection-filter)?
  +--:(by-reference)
  | +--rw selection-filter-ref
  |   selection-filter-ref
  +--:(within-subscription)
  +--rw (filter-spec)?
    +--:(datastore-subtree-filter)
    | +--rw datastore-subtree-filter? <anydata>
    |   {sn:subtree}?
    +--:(datastore-xpath-filter)
      +--rw datastore-xpath-filter?
         yang:xpath1.0 {sn:xpath}?

rpcs:
  +---x resync-subscription {on-change}?
    +---w input
      +---w id sn:subscription-id

notifications:

```

```

+---n push-update
| +--ro id?                sn:subscription-id
| +--ro datastore-contents? <anydata>
| +--ro incomplete-update?  empty
| +--ro ypnt:observation-time? yang:date-and-time
+---n push-change-update {on-change}?
  +--ro id?
  |       sn:subscription-id
  +--ro datastore-changes
  | +--ro yang-patch
  |   +--ro patch-id    string
  |   +--ro comment?   string
  |   +--ro edit* [edit-id]
  |     +--ro edit-id    string
  |     +--ro operation  enumeration
  |     +--ro target     target-resource-offset
  |     +--ro point?    target-resource-offset
  |     +--ro where?    enumeration
  |     +--ro value?    <anydata>
  +--ro incomplete-update?                empty
  +--ro ypnt:state-changed-observation-time?
      yang:date-and-time

```


4.2. YANG Module

The YANG module has one leaf augmenting the model of Subscription to YANG Notifications [RFC8639].

```
<CODE BEGINS> file "ietf-yang-push-netobs-timestamping@2023-03-06.yang"

module ietf-yang-push-netobs-timestamping {
  yang-version 1.1;
  namespace
    "urn:ietf:params:xml:ns:yang:ietf-yang-push-netobs-timestamping";
  prefix ypnt;
  import ietf-yang-types {
    prefix yang;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-yang-push {
    prefix yp;
    reference
      "RFC 8641: Subscription to YANG Notifications for Datastore Update
  }
  organization "IETF NETCONF (Network Configuration) Working Group";
  contact
    "WG Web: <http://tools.ietf.org/wg/netconf/>
    WG List: <mailto:netconf@ietf.org>

    Authors: Thomas Graf
             <mailto:thomas.graf@swisscom.com>
             Benoit Claise
             <mailto:benoit.claise@huawei.com>
             Alex Huang Feng
             <mailto:alex.huang-feng@insa-lyon.fr>";

  description
    "Defines YANG push event notification header with the observation
    time in push-update and push-change-update notifications.

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    authors of the code. All rights reserved.

    Redistribution and use in source and binary forms, with or without
    modification, is permitted pursuant to, and subject to the license
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    4.c of the IETF Trust's Legal Provisions Relating to IETF Documents
    (https://trustee.ietf.org/license-info).

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

  revision 2023-03-06 {
    description
      "First revision";
    reference
```

```

    "RFC XXXX: Support of YANG Notifications Observation Time";
}

feature yang-push-change-update-obs-timestamp {
    description
        "This feature indicates the YANG-push Notifications support
        the observation timestamps in the push-change-update notifications
    }

feature yang-push-update-obs-timestamp {
    description
        "This feature indicates the YANG-push Notifications support
        the observation timestamps in the push-update notifications.";
}

grouping yang-push-update-obs-timestamp {
    description
        "This grouping adds the start timestamp and the end timestamp of t
        observed metrics.";
    leaf observation-time {
        type yang:date-and-time;
        description
            "This is the time when metrics started counting.";
    }
}

grouping yang-push-change-update-obs-timestamp {
    description
        "This grouping adds the timestamp of the recorded event.";
    leaf state-changed-observation-time {
        type yang:date-and-time;
        description
            "This is the time when event happened.";
    }
}

// Event notifications
augment "/yp:push-update" {
    description
        "This augmentation adds the start timestamp of the counted metrics
        in the push-update notification.";
    uses ypnt:yang-push-update-obs-timestamp;
}

augment "/yp:push-change-update" {
    description
        "This augmentation adds the timestamp of the event in the push-cha
        notification.";
    uses ypnt:yang-push-change-update-obs-timestamp;
}

```

```
}  
}
```

```
<CODE ENDS>
```

5. Security Considerations

The security considerations for the YANG notifications subscription mechanism are described in [RFC8641]. This document adds no additional security considerations.

6. IANA Considerations

This document describes the URI used for the IETF XML Registry and registers a new YANG module name.

6.1. URI

IANA is requested to add this document as a reference in the following URI in the IETF XML Registry [RFC3688].

URI: urn:ietf:params:xml:ns:yang:ietf-yang-push-netobs-timestamping

Registrant Contact: The IESG.

XML: N/A; the requested URI is an XML namespace.

Reference: RFC5277; RFC-to-be

6.2. YANG module name

This document registers the following YANG module in the YANG Module Names Registry [RFC6020], within the "YANG Parameters" registry:

name: ietf-yang-push-netobs-timestamping

namespace: urn:ietf:params:xml:ns:yang:ietf-yang-push-netobs-timestamping

prefix: ypnt

Reference: RFC-to-be

7. Operational Considerations

7.1. On Change Sync On Start

For "on-change sync on start" subscriptions, if the timestamp for the network state change was observed before the subscription was established and is not recorded in the YANG datastore, then no timestamp should be populated to state-changed-observation-time.

8. Acknowledgements

The authors would like to thank Rob Wilton, Nick Corran, Pierre Francois Ahmed Elhassany and Jean Quilbeuf for their review and valuable comments.

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