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Support of Versioning in YANG Notifications Subscription

Abstract

This document extends the YANG notifications subscription mechanism to specify the YANG module semantic version at the subscription. Then, a new extension with the revision and the semantic version of the YANG push subscription state change notification is proposed.

Requirements Language

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.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on 18 July 2023.

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1. Introduction

In order to process the received YANG push notification messages described in section 3.7 of [RFC8641] at the YANG push receiver, a semantic reference to the YANG module and the XPath or subtree is needed to determine the data types for each field and which part of the YANG module the metrics are expose from.

This specification applies to the YANG push configured subscriptions defined in Section 2.5 of [RFC8639], where a publisher is configured to stream notification out of band, as opposed to dynamic subscriptions defined in Section 2.4 of [RFC8639], where the subscriber can initiate and modify the subscription dynamically in-band. In the latter case, the subscriber knows already all the subscriber YANG-related information, which it has to know in order to configure the subscription.

This semantic reference is available when the subscription is being establish as described in Section 3.6 of [RFC8641] and being streamed from the publisher to receiver with the subscription state change notifications described in Section 2.7 of [RFC8639] where for each subscription a locally unique subscription ID described in

Section 4.3.2 of [RFC8641] is being issued and streamed as metadata with the notification message in the YANG push message header.

The semantics can change between different YANG module revisions. The YANG module version statement is specified in Section 7.1.2 of [RFC6020] and states that the newer revision needs to be backward compatible to the previous revision. Section 3.1 of [I-D.ietf-netmod-yang-module-versioning] specifies that newer semantic versions introduced in [I-D.ietf-netmod-yang-semver] MAY not be backward compatible to the previous version when indicated with non-backwards-compatible keyword.

The YANG notifications subscription mechanism defined in [RFC8641] does not allow to specify the YANG module revision. When a network node is upgraded, the subscribed YANG module revision MAY have updated and might, consequently, break the data processing pipeline since the YANG push receiver may not be aware of this change.

This documents extends the current YANG notifications subscription mechanism to allow to subscribe to a specific revision or latest YANG module semantic version to which the YANG module version needs to be backward compatible to. The subscription state change "subscription-started" and "subscription-modified" notification messages are also extended to include the revision and semantic version.

2. Extend the Datastore Selection

The YANG notifications subscription OPTIONALLY can be restricted to the following YANG module revision for future capabilities:

latest: Restricts the subscription to the latest YANG module revision.

revision: Restricts the subscription to a specific YANG module revision. Example: "2014-05-08".

latest-compatible-semversion: Restricts the subscription to the latest compatible YANG module semantic version referenced to. Example: "2.0.0".

If nothing is specified, latest YANG module version is implied.

3. Extend the Subscription State Change Notifications

Besides the Subscription ID and the xpath or sub-tree filter reference as described in Section 2.7 of [RFC8639], the following metadata objects are part of a "subscription-started" or "subscription-modified" subscription state change notification.

revision:
Describes the YANG module revision as specified in Section 7.1.9 of [RFC6020] for the related streamed content.

revision-label: Describes the YANG module semantic version as specified in [I-D.ietf-netmod-yang-semver] for the related streamed content.

Figure 1 provides an example of a "subscription-modified" subscription state change notification message with the YANG revision, revision label and datastore-xpath-filter for tracking the operational status of a single Ethernet interface (per [RFC8343]). This subscription state change notification message is encoded XML [W3C.REC-xml-20081126] over the Network Configuration Protocol (NETCONF) as per [RFC8640].

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2023-01-03T10:00:00Z</eventTime>
  <subscription-modified
      xmlns="urn:ietf:params:xml:ns:yang:ietf-subscribed-notifications">
    <id>101</id>
    <revision>2014-05-08</revision>
    <revision-label>1.0.0</revision-label>
    <stream-xpath-filter xmlns:int="urn:ietf:params:xml:ns:yang:ietf-int
      /int:interfaces
    </stream-xpath-filter>
    <stream>NETCONF</stream>
  </subscription-modified>
</notification>
```

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

Figure 2 provides an example of a JSON encoded, [RFC8259], subscription state change 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-restconf:notification" : {
    "eventTime": "2023-01-03T10:00:00Z",
    "ietf-subscribed-notifications:subscription-modified": {
      "id": 101,
      "revision": "2014-05-08",
      "revision-label": "1.0.0",
      "stream-xpath-filter": "/ietf-interfaces:interfaces",
      "stream": {
         "ietf-netconf-subscribed-notifications" : "NETCONF"
      }
    }
  }
}
```

Figure 2: JSON Push Example for a subscription-modified notification message

4. The "ietf-yang-push-revision" Module

4.1. Data Model Overview

This YANG module augments the "ietf-yang-push" module with the revision and revision-label in the "subscription-started" and "subscription-modified" subscription state change notifications and the ability to define the "revision" and "revision-label" in the "establish-subscription" and "modify-subscription" RPCs in the datastore push subscription.

4.1.1. Tree View

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

```
module: ietf-yang-push-revision

  augment /sn:establish-subscription/sn:input/sn:target:
    +--rw revision?         rev:revision-date-or-label
    +-- revision-label?   ysver:version
  augment /sn:modify-subscription/sn:input/sn:target:
    +--rw revision?         rev:revision-date-or-label
    +-- revision-label?   ysver:version
  augment /sn:subscription-started/sn:target:
    +--ro revision          rev:revision-date-or-label
    +-- revision-label?   ysver:version
  augment /sn:subscription-modified/sn:target:
    +--ro revision          rev:revision-date-or-label
    +-- revision-label?   ysver:version
  augment /sn:subscriptions/sn:subscription/sn:target:
    +--ro revision          rev:revision-date-or-label
    +--rw revision-label?   ysver:version
```

4.1.2. Full Tree View

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

```
pyang -f tree ietf-yang-push-revision.yang ietf-yang-revisions.yang ietf
ietf-yang-push-revision.yang:118 (at ietf-yang-push-revision.yang:88): e
module: ietf-subscribed-notifications
  +--ro streams
  |  +--ro stream* [name]
  |     +--ro name                        string
  |     +--ro description?                string
  |     +--ro replay-support?             empty {replay}?
  |     +--ro replay-log-creation-time    yang:date-and-time {replay}?
  |     +--ro replay-log-aged-time?       yang:date-and-time {replay}?
  +--rw filters
  |  +--rw stream-filter* [name]
  |     +--rw name                           string
  |     +--rw (filter-spec)?
  |        +--:(stream-subtree-filter)
  |        |  +--rw stream-subtree-filter?   <anydata> {subtree}?
  |        +--:(stream-xpath-filter)
  |           +--rw stream-xpath-filter?     yang:xpath1.0 {xpath}?
  +--rw subscriptions
     +--rw subscription* [id]
        +--rw id                                        subscription-id
        +--rw (target)
        |  +--:(stream)
        |  |  +--rw (stream-filter)?
        |  |  |  +--:(by-reference)
        |  |  |  |  +--rw stream-filter-name            stream-filter-r
        |  |  |  +--:(within-subscription)
        |  |  |     +--rw (filter-spec)?
        |  |  |        +--:(stream-subtree-filter)
        |  |  |        |  +--rw stream-subtree-filter?   <anydata> {subt
        |  |  |        +--:(stream-xpath-filter)
        |  |  |           +--rw stream-xpath-filter?    yang:xpath1.0 {
        |  |  +--rw stream                               stream-ref
        |  |  +--ro replay-start-time?                   yang:date-and-t
        |  |  +--rw configured-replay?                   empty {configur
        |  +--:(ypm:revision)
        |  |  +--ro ypm:revision                         rev:revision-da
        |  +--:(ypm:revision-label)
        |     +--rw ypm:revision-label?                  ysver:version
        +--rw stop-time?                                 yang:date-and-t
        +--rw dscp?                                      inet:dscp {dscp
        +--rw weighting?                                 uint8 {qos}?
        +--rw dependency?                                subscription-id
        +--rw transport?                                 transport {conf
        +--rw encoding?                                  encoding
        +--rw purpose?                                   string {configu
        +--rw (notification-message-origin)? {configured}?
        |  +--:(interface-originated)
        |  |  +--rw source-interface?                    if:interface-re
```

```
      |  +--:(address-originated)
      |     +--rw source-vrf?                          -> /ni:network-
      |     +--rw source-address?                      inet:ip-address
      +--ro configured-subscription-state?             enumeration {co
      +--rw receivers
         +--rw receiver* [name]
            +--rw name                       string
            +--ro sent-event-records?        yang:zero-based-counter64
            +--ro excluded-event-records?    yang:zero-based-counter64
            +--ro state                      enumeration
            +---x reset {configured}?
               +--ro output
                  +--ro time    yang:date-and-time

rpcs:
  +---x establish-subscription
  |  +---w input
  |  |  +---w (target)
  |  |  |  +--:(stream)
  |  |  |  |  +---w (stream-filter)?
  |  |  |  |  |  +--:(by-reference)
  |  |  |  |  |  |  +---w stream-filter-name            stream-filter
  |  |  |  |  |  +--:(within-subscription)
  |  |  |  |  |     +---w (filter-spec)?
  |  |  |  |  |        +--:(stream-subtree-filter)
  |  |  |  |  |        |  +---w stream-subtree-filter?   <anydata> {su
  |  |  |  |  |        +--:(stream-xpath-filter)
  |  |  |  |  |           +---w stream-xpath-filter?    yang:xpath1.0
  |  |  |  |  +---w stream                               stream-ref
  |  |  |  |  +---w replay-start-time?                   yang:date-and
  |  |  |  +--:(ypm:revision)
  |  |  |  |  +---w ypm:revision?                        rev:revision-
  |  |  |  +--:(ypm:revision-label)
  |  |  |     +---w ypm:revision-label?                  ysver:version
  |  |  +---w stop-time?                                 yang:date-and
  |  |  +---w dscp?                                      inet:dscp {ds
  |  |  +---w weighting?                                 uint8 {qos}?
  |  |  +---w dependency?                                subscription-
  |  |  +---w encoding?                                  encoding
  |  +--ro output
  |     +--ro id                             subscription-id
  |     +--ro replay-start-time-revision?    yang:date-and-time {replay
  +---x modify-subscription
  |  +---w input
  |     +---w id                                      subscription-
  |     +---w (target)
  |     |  +--:(stream)
  |     |  |  +---w (stream-filter)?
  |     |  |     +--:(by-reference)
```

```
  |     |  |     |  +---w stream-filter-name            stream-filter
  |     |  |     +--:(within-subscription)
  |     |  |        +---w (filter-spec)?
  |     |  |           +--:(stream-subtree-filter)
  |     |  |           |  +---w stream-subtree-filter?   <anydata> {su
  |     |  |           +--:(stream-xpath-filter)
  |     |  |              +---w stream-xpath-filter?    yang:xpath1.0
  |     |  +--:(ypm:revision)
  |     |  |  +---w ypm:revision?                       rev:revision-
  |     |  +--:(ypm:revision-label)
  |     |     +---w ypm:revision-label?                ysver:version
  |     +---w stop-time?                               yang:date-and
  +---x delete-subscription
  |  +---w input
  |     +---w id    subscription-id
  +---x kill-subscription
     +---w input
        +---w id    subscription-id

notifications:
  +---n replay-completed {replay}?
  |  +--ro id    subscription-id
  +---n subscription-completed {configured}?
  |  +--ro id    subscription-id
  +---n subscription-modified
  |  +--ro id                                          subscription-id
  |  +--ro (target)
  |  |  +--:(stream)
  |  |  |  +--ro (stream-filter)?
  |  |  |  |  +--:(by-reference)
  |  |  |  |  |  +--ro stream-filter-name            stream-filter-re
  |  |  |  |  +--:(within-subscription)
  |  |  |  |     +--ro (filter-spec)?
  |  |  |  |        +--:(stream-subtree-filter)
  |  |  |  |        |  +--ro stream-subtree-filter?   <anydata> {subtr
  |  |  |  |        +--:(stream-xpath-filter)
  |  |  |  |           +--ro stream-xpath-filter?     yang:xpath1.0 {x
  |  |  |  +--ro stream                               stream-ref
  |  |  |  +--ro replay-start-time?                   yang:date-and-ti
  |  |  +--:(ypm:revision)
  |  |  |  +--ro ypm:revision                         rev:revision-dat
  |  |  +--:(ypm:revision-label)
  |  |     +--ro ypm:revision-label?                  ysver:version
  |  +--ro stop-time?                                 yang:date-and-ti
  |  +--ro dscp?                                      inet:dscp {dscp}
  |  +--ro weighting?                                 uint8 {qos}?
  |  +--ro dependency?                                subscription-id
  |  +--ro transport?                                 transport {confi
  |  +--ro encoding?                                  encoding
```

```
|  +--ro purpose?                                    string {configur
+---n subscription-resumed
|  +--ro id    subscription-id
+---n subscription-started {configured}?
|  +--ro id                                          subscription-id
|  +--ro (target)
|  |  +--:(stream)
|  |  |  +--ro (stream-filter)?
|  |  |  |  +--:(by-reference)
|  |  |  |  |  +--ro stream-filter-name            stream-filter-re
|  |  |  |  +--:(within-subscription)
|  |  |  |     +--ro (filter-spec)?
|  |  |  |        +--:(stream-subtree-filter)
|  |  |  |        |  +--ro stream-subtree-filter?   <anydata> {subtr
|  |  |  |        +--:(stream-xpath-filter)
|  |  |  |           +--ro stream-xpath-filter?     yang:xpath1.0 {x
|  |  |  +--ro stream                               stream-ref
|  |  |  +--ro replay-start-time?                   yang:date-and-ti
|  |  |  +--ro replay-previous-event-time?          yang:date-and-ti
|  |  +--:(ypm:revision)
|  |  |  +--ro ypm:revision                         rev:revision-dat
|  |  +--:(ypm:revision-label)
|  |     +--ro ypm:revision-label?                  ysver:version
|  +--ro stop-time?                                  yang:date-and-ti
|  +--ro dscp?                                       inet:dscp {dscp}
|  +--ro weighting?                                  uint8 {qos}?
|  +--ro dependency?                                 subscription-id
|  +--ro transport?                                  transport {confi
|  +--ro encoding?                                   encoding
|  +--ro purpose?                                    string {configur
+---n subscription-suspended
|  +--ro id        subscription-id
|  +--ro reason    identityref
+---n subscription-terminated
   +--ro id        subscription-id
   +--ro reason    identityref
```

4.2. YANG Module

The YANG module has two leaves augmenting the model of Subscription to YANG Notifications [RFC8639].

```
<CODE BEGINS> file "ietf-yang-push-revision@2023-01-12.yang"

module ietf-yang-revisions {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-revisions";
  prefix rev;

  organization
    "IETF NETMOD (Network Modeling) Working Group";
  contact
    "WG Web:   <https://datatracker.ietf.org/wg/netmod/>
     WG List:  <mailto:netmod@ietf.org>

     Author:   Joe Clarke
               <mailto:jclarke@cisco.com>

     Author:   Reshad Rahman
               <mailto:reshad@yahoo.com>

     Author:   Robert Wilton
               <mailto:rwilton@cisco.com>

     Author:   Balazs Lengyel
               <mailto:balazs.lengyel@ericsson.com>

     Author:   Jason Sterne
               <mailto:jason.sterne@nokia.com>";
  description
    "This YANG 1.1 module contains definitions and extensions to
     support updated YANG revision handling.

     Copyright (c) 2002 IETF Trust and the persons identified as
     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 terms contained in, the Revised BSD License set
     forth in Section 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.

     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 (RFC 2119) (RFC 8174) when, and only when,
     they appear in all capitals, as shown here.";
  // RFC Ed.: update the date below with the date of RFC publication
```

```
// and remove this note.
// RFC Ed.: replace XXXX (inc above) with actual RFC number and
// remove this note.

revision 2022-11-29 {
  rev:label "1.0.0-draft-ietf-netmod-yang-module-versioning-08";
  description
    "Initial version.";
  reference
    "XXXX: Updated YANG Module Revision Handling";
}

typedef revision-date {
  type string {
    pattern '[0-9]{4}-(1[0-2]|0[1-9])-(0[1-9]|[1-2][0-9]|3[0-1])';
  }
  description
    "A date associated with a YANG revision.

     Matches dates formatted as YYYY-MM-DD.";
  reference
    "RFC 7950: The YANG 1.1 Data Modeling Language";
}

typedef revision-label {
  type string {
    length "1..255";
    pattern '[a-zA-Z0-9,\-_.+]+';
    pattern '[0-9]{4}-[0-9]{2}-[0-9]{2}' {
      modifier "invert-match";
      error-message
        "The revision-label must not match a revision-date.";
    }
  }
  description
    "A label associated with a YANG revision.

     Alphanumeric characters, comma, hyphen, underscore, period
     and plus are the only accepted characters. MUST NOT match
     revision-date or pattern similar to a date.";
  reference
    "XXXX: Updated YANG Module Revision Handling;
     Section 3.3, Revision label";
}

typedef revision-date-or-label {
  type union {
    type revision-date;
    type revision-label;
```

```
  }
  description
    "Represents either a YANG revision date or a revision label";
}

extension non-backwards-compatible {
  description
    "This statement is used to indicate YANG module revisions that
     contain non-backwards-compatible changes.

     The statement MUST only be a substatement of the 'revision'
     statement.  Zero or one 'non-backwards-compatible' statements
     per parent statement is allowed.  No substatements for this
     extension have been standardized.

     If a revision of a YANG module contains changes, relative to
     the preceding revision in the revision history, that do not
     conform to the backwards-compatible module update rules
     defined in RFC-XXX, then the 'non-backwards-compatible'
     statement MUST be added as a substatement to the revision
     statement.

     Conversely, if a revision does not contain a
     'non-backwards-compatible' statement then all changes,
     relative to the preceding revision in the revision history,
     MUST be backwards-compatible.

     A new module revision that only contains changes that are
     backwards-compatible SHOULD NOT include the
     'non-backwards-compatible' statement.  An example of when an
     author might add the 'non-backwards-compatible' statement is
     if they believe a change could negatively impact clients even
     though the backwards compatibility rules defined in RFC-XXXX
     classify it as a backwards-compatible change.

     Add, removing, or changing a 'non-backwards-compatible'
     statement is a backwards-compatible version change.";
  reference
    "XXXX: Updated YANG Module Revision Handling;
     Section 3.2,
     non-backwards-compatible revision extension statement";
}

extension label {
  argument revision-label;
  description
    "The revision label can be used to provide an additional
     versioning identifier associated with a module or submodule
     revision.  One such scheme that could be used is [XXXX:
```

```
      ietf-netmod-yang-semver].

      The format of the revision label argument MUST conform to the
      pattern defined for the revision label typedef in this module.

      The statement MUST only be a substatement of the revision
      statement.  Zero or one revision label statements per parent
      statement are allowed.  No substatements for this extension
      have been standardized.

      Revision labels MUST be unique amongst all revisions of a
      module or submodule.

      Adding a revision label is a backwards-compatible version
      change.  Changing or removing an existing revision label in
      the revision history is a non-backwards-compatible version
      change, because it could impact any references to that
      revision label.";
  reference
    "XXXX: Updated YANG Module Revision Handling;
     Section 3.3, Revision label";
}

extension revision-label-scheme {
  argument revision-label-scheme-base;
  description
    "The revision label scheme specifies which revision label
     scheme the module or submodule uses.

     The mandatory revision-label-scheme-base argument MUST be an
     identity derived from revision-label-scheme-base.

     This extension is only valid as a top-level statement, i.e.,
     given as as a substatement to 'module' or 'submodule'.  No
     substatements for this extension have been standardized.

     This extension MUST be used if there is a revision label
     statement in the module or submodule.

     Adding a revision label scheme is a backwards-compatible
     version change.  Changing a revision label scheme is a
     non-backwards-compatible version change, unless the new
     revision label scheme is backwards-compatible with the
     replaced revision label scheme.  Removing a revision label
     scheme is a non-backwards-compatible version change.";
  reference
    "XXXX: Updated YANG Module Revision Handling;
     Section 3.3.1, Revision label scheme extension statement";
}
```

```
  extension recommended-min {
    argument revision-date-or-label;
    description
      "Recommends the revision of the module that may be imported to
       one that matches or is derived from the specified
       revision-date or revision label.

       The argument value MUST conform to the
       'revision-date-or-label' defined type.

       The statement MUST only be a substatement of the import
       statement.  Zero, one or more 'recommended-min' statements per
       parent statement are allowed.  No substatements for this
       extension have been standardized.

       If specified multiple times, then any module revision that
       satisfies at least one of the 'recommended-min' statements is
       an acceptable recommended revision for import.

       A particular revision of an imported module adheres to an
       import's 'recommended-min' extension statement if the imported
       module's revision history contains a revision statement with a
       matching revision date or revision label.

       Adding, removing or updating a 'recommended-min' statement to
       an import is a backwards-compatible change.";
    reference
      "XXXX: Updated YANG Module Revision Handling; Section 4,
       Recommending a minimum revision for module imports";
  }

  identity revision-label-scheme-base {
    description
      "Base identity from which all revision label schemes are
       derived.";
    reference
      "XXXX: Updated YANG Module Revision Handling;
       Section 3.3.1, Revision label scheme extension statement";
  }
}

<CODE ENDS>
```

5. Security Considerations

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

6. IANA Considerations

This document has no IANA actions.

7. Acknowledgements

The authors would like to thank xxx for their review and valuable comments.

8. References

8.1. Normative References

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