

Workgroup: Network Working Group  
Internet-Draft:  
draft-tgraf-netconf-yang-notifications-  
versioning-03  
Published: 17 January 2023  
Intended Status: Standards Track  
Expires: 21 July 2023  
Authors: T. Graf B. Claise A. Huang Feng  
Swisscom Huawei INSA-Lyon  
**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.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 21 July 2023.

## **Copyright Notice**

Copyright (c) 2023 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License.

## Table of Contents

- 1. [Introduction](#)
- 2. [Extend the Datastore Selection](#)
- 3. [Extend the Subscription State Change Notifications](#)
- 4. [The "ietf-yang-push-revision" Module](#)
  - 4.1. [Data Model Overview](#)
  - 4.2. [YANG Module](#)
- 5. [Security Considerations](#)
- 6. [IANA Considerations](#)
- 7. [Acknowledgements](#)
- 8. [References](#)
  - 8.1. [Normative References](#)
  - 8.2. [Informative References](#)
- [Authors' Addresses](#)

### 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 exposed 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 established 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 document 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 OPTIONALY 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
  |        |        +-+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-push-revision {
    yang-version 1.1;
    namespace
        "urn:ietf:params:xml:ns:yang:ietf-yang-push-revision";
    prefix ypm;
    import ietf-subscribed-notifications {
        prefix sn;
        reference
            "RFC 8639: Subscription to YANG Notifications";
    }
    import ietf-yang-revisions {
        prefix rev;
        reference
            "RFC XXXX: draft-ietf-netmod-yang-module-versioning-06, Updated YA
             Module Revision Handling";
    }
    import ietf-yang-semver {
        prefix ysver;
        reference
            "RFC XXXX: draft-ietf-netmod-yang-semver-08, YANG Semantic Version
    }

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 revision and
     the revision-label. Adds the support of the revision and
     revision-label selection in the YANG push subscription RPCs.

Copyright (c) 2023 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.";

revision 2023-01-12 {
    description
        "First revision";
    reference
        "RFC XXXX: Support of Versioning in YANG Notifications Subscription"
}

feature yang-push-revision-supported {
    description
        "This feature indicates the YANG Subscription Notifications support
         the revision and revision-label defined in this YANG module.";
}

grouping yang-push-module-version-config {
    description
        "This grouping combines the revision and revision-label leaves, wi
         the revision being configurable.";
    leaf revision {
        type rev:revision-date-or-label;
        description
            "This references the YANG module revision to be sent in the subs
        }
    leaf revision-label {
        type ysver:version;
        description
            "This references the YANG module semversion to be sent in the su
        }
    }
}

grouping yang-push-module-version {
    description
        "This grouping combines the revision and revision-label leaves, wi
         the revision being non configurable.";
    leaf revision {
        type rev:revision-date-or-label;
        config false;
        mandatory true;
        description
            "This references the YANG module revision of the sent notificati
        }
    leaf revision-label {
        type ysver:version;
        description
            "This references the YANG module semversion of the sent notifica
    }
}

```

```

}

// Subscription parameters
augment "/sn:establish-subscription/sn:input/sn:target" {
    description
        "Augment the establish-subscription RPC from the ietf-subscribed-n
         YANG module with the yang-push-module-version-config grouping.";
    uses ypm:yang-push-module-version-config;
}
augment "/sn:modify-subscription/sn:input/sn:target" {
    description
        "Augment the modify-subscription RPC from the ietf-subscribed-noti
         YANG module with the yang-push-module-version-config grouping.";
        uses ypm:yang-push-module-version-config;
}

// Subscription notifications
augment "/sn:subscription-started/sn:target" {
    description
        "Augment the subscription-started RPC from the ietf-subscribed-not
         YANG module with the yang-push-module-version grouping.";
        uses ypm:yang-push-module-version;
}
augment "/sn:subscription-modified/sn:target" {
    description
        "Augment the subscription-modified RPC from the ietf-subscribed-no
         YANG module with the yang-push-module-version grouping.";
        uses ypm:yang-push-module-version;
}

// Subscription container
augment "/sn:subscriptions/sn:subscription/sn:target" {
    description
        "Augment the subscriptions RPC from the ietf-subscribed-notificati
         YANG module with the yang-push-module-version grouping.";
        uses ypm:yang-push-module-version;
}
}

<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 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

#### [I-D.ietf-netmod-yang-module-versioning]

Wilton, R., Rahman, R., Lengyel, B., Clarke, J., and J. Sterne, "Updated YANG Module Revision Handling", Work in Progress, Internet-Draft, draft-ietf-netmod-yang-module-versioning-08, 12 January 2023, <<https://www.ietf.org/archive/id/draft-ietf-netmod-yang-module-versioning-08.txt>>.

#### [I-D.ietf-netmod-yang-semver]

Clarke, J., Wilton, R., Rahman, R., Lengyel, B., Sterne, J., and B. Claise, "YANG Semantic Versioning", Work in Progress, Internet-Draft, draft-ietf-netmod-yang-semver-09, 12 January 2023, <<https://www.ietf.org/archive/id/draft-ietf-netmod-yang-semver-09.txt>>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

[RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

[RFC8639] Voit, E., Clemm, A., Gonzalez Prieto, A., Nilsen-Nygaard, E., and A. Tripathy, "Subscription to YANG

Notifications", RFC 8639, DOI 10.17487/RFC8639, September 2019, <<https://www.rfc-editor.org/info/rfc8639>>.

- [RFC8641] Clemm, A. and E. Voit, "Subscription to YANG Notifications for Datastore Updates", RFC 8641, DOI 10.17487/RFC8641, September 2019, <<https://www.rfc-editor.org/info/rfc8641>>.

## 8.2. Informative References

- [I-D.ietf-netconf-https-notif] Jethanandani, M. and K. Watsen, "An HTTPS-based Transport for YANG Notifications", Work in Progress, Internet-Draft, draft-ietf-netconf-https-notif-13, 4 November 2022, <<https://www.ietf.org/archive/id/draft-ietf-netconf-https-notif-13.txt>>.
- [I-D.ietf-netconf-udp-notif] Zheng, G., Zhou, T., Graf, T., Francois, P., Feng, A. H., and P. Luente, "UDP-based Transport for Configured Subscriptions", Work in Progress, Internet-Draft, draft-ietf-netconf-udp-notif-08, 12 September 2022, <<https://www.ietf.org/archive/id/draft-ietf-netconf-udp-notif-08.txt>>.
- [RFC8259] Bray, T., Ed., "The JavaScript Object Notation (JSON) Data Interchange Format", STD 90, RFC 8259, DOI 10.17487/RFC8259, December 2017, <<https://www.rfc-editor.org/info/rfc8259>>.
- [RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <<https://www.rfc-editor.org/info/rfc8340>>.
- [RFC8343] Bjorklund, M., "A YANG Data Model for Interface Management", RFC 8343, DOI 10.17487/RFC8343, March 2018, <<https://www.rfc-editor.org/info/rfc8343>>.
- [RFC8640] Voit, E., Clemm, A., Gonzalez Prieto, A., Nilsen-Nygaard, E., and A. Tripathy, "Dynamic Subscription to YANG Events and Datastores over NETCONF", RFC 8640, DOI 10.17487/RFC8640, September 2019, <<https://www.rfc-editor.org/info/rfc8640>>.
- [W3C.REC-xml-20081126] Bray, T., Paoli, J., Sperberg-McQueen, M., Maler, E., and F. Yergeau, "Extensible Markup Language (XML) 1.0 (Fifth Edition)", World Wide Web Consortium Recommendation REC-xml-20081126, November 2008, <<https://www.w3.org/TR/2008/REC-xml-20081126>>.

## **Authors' Addresses**

Thomas Graf  
Swisscom  
Binzring 17  
CH-8045 Zurich  
Switzerland

Email: [thomas.graf@swisscom.com](mailto:thomas.graf@swisscom.com)

Benoit Claise  
Huawei

Email: [benoit.claise@huawei.com](mailto:benoit.claise@huawei.com)

Alex Huang Feng  
INSA-Lyon  
Lyon  
France

Email: [alex.huang-feng@insa-lyon.fr](mailto:alex.huang-feng@insa-lyon.fr)