Extensible YANG Model for YANG-Push Notifications

I-D: draft-netana-netconf-notif-envelope-00
I-D: ~~draft-ahuang-netconf-notif-yang~~

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YANG model for NETCONF Event Notifications

Problem statement - (draft-ahuang-netconf-notif-yang)

```xml
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2022-09-02T10:59:55.32Z</eventTime>
 <push-update xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-push">
  <id>101</id>
  <datastore-contents>
    <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">
     <interface>
      <name>eth0</name>
      <oper-status>up</oper-status>
     </interface>
    </interfaces>
  </datastore-contents>
 </push-update>
</notification>
```

```json
{
    "ietf-notification:notification": {
      "eventTime": "2017-10-25T08:00:11.22Z",
      "ietf-yang-push:push-update": {
        "id": 1011,
        "datastore-contents": {
          "ietf-interfaces:interfaces": [
            "interface": {
              "name": "eth0",
              "oper-status": "up"
            }
          ]
        }
      }
    }
}
```

RFC 5277 - Netconf Event Notifications
RFC 8641 - YANG Push

YANG encodings:
- RFC 7950 - YANG XML
- RFC 7951 - YANG JSON
- RFC 9254 - YANG CBOR

Implementation Issues:
(1) YANG module not defined
(2) Non-existing Normative text defining this header

YANG model for NETCONF Event Notifications
Interim 2024-09-19 – draft-ahuang-netconf-notif-yang

- https://datatracker.ietf.org/doc/minutes-interim-2024-netconf-02-202409191300/
- Throughout review of draft-ahuang-netconf-notif-yang/YANG-Push/NETCONF Event Notifications

- Conclusion
  - draft-ahuang-netconf-notif-yang fixes a **gap** for YANG-Push but might be worth putting the effort on a brand new header
  - We need:
    - Bypass RFC5277, thus use YANG-Push only
    - Extensible header
      - be able to add new metadata (sequencing, versioning, others…)
    - A client should be able to "opt-in"
      - Clients that don't support this new header should continue working seamlessly
    - The notification should be a YANG-based solution
    - Fix JSON and CBOR underspecification
      - including CBOR-SID allocation

Extensible YANG model for YANG-Push Notifications
Proposal

- New YANG Notification structure for YANG-Push Notifications

  ○ (1) Option to "opt-in" through a YANG-Push Subscription

  ○ (2) Able to discover the capability of this new header through "ietf-notification-capabilities"

  ○ (3) Extensible header defined in YANG

  ○ (4) Definition of each encoding (XML, JSON, CBOR)

  ○ (5) Extensions for hostname and sequence-number included (I-D.tgraf-netconf-notif-sequencing)

Extensible YANG model for YANG-Push Notifications
Proposal (comments)

- As requested

  - Scoped to YANG-Push (both dynamic and configured subscriptions)

    - Can be implemented with NETCONF and RESTCONF

  - Use a "notification" statement rather than a "sx:structure"

  - Given that is for YANG-Push, the following notifications are impacted:

    - push-update; push-change-update

    - subscription-started; subscription-modified; subscription-terminated

    - subscription-suspended; subscription-resumed; subscription-completed

    - replay-completed

Extensible YANG model for YANG-Push Notifications
(1) Option to "opt-in" through a YANG-Push Subscription

- Configuration on a per-subscription basis

```
module: ietf-notification-container

  augment /sn:subscriptions/sn:subscription:
    +--rw enable-notification-envelope?   boolean {notification-envelope}?
    +--rw metadata
  augment /sn:establish-subscription/sn:input:
    +---w enable-notification-envelope?   boolean {notification-envelope}?
    +---w metadata
  augment /sn:modify-subscription/sn:input:
    +---w enable-notification-envelope?   boolean {notification-envelope}?
    +---w metadata
```

Currently
Default=False

enable-notification-envelope=false   Old Header as RFC5277   Collector

enable-notification-envelope=true   New envelope Header   Collector

Extensible YANG model for YANG-Push Notifications
(2) Able to discover the capability of this new header

- Augmentation on notification capabilities (RFC9196)

```
augment /sysc:system-capabilities/notc:subscription-capabilities:
  +--ro notification-metadata
     +--ro notification-envelope?    boolean {notification-envelope}?
     +--ro metadata
```

Get Capabilities

notification-envelope=True
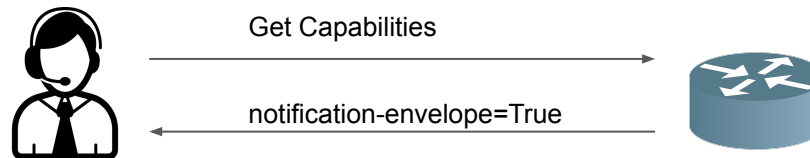
Extensible YANG model for YANG-Push Notifications
(3) Extensible header defined in YANG

- Structure defined as a notification containing
  - event-time
  - metadata(s)
  - notification-contents

```
notifications:
  +---n envelope
     +--ro event-time              yang:date-and-time
     +--ro notification-contents?  <anydata>
```

```
{
    "ietf-yp-notification:envelope": {
        "event-time": "2024-10-10T08:00:11.22Z",
        "notification-contents": {
            "ietf-yang-push:push-update": {
                "id": 1011,
                "datastore-contents": {
                    "ietf-interfaces:interfaces": [
                        {
                            "interface": {
                                "name": "eth0",
                                "oper-status": "up"
                            }
                        }
                    ]
                }
            }
        }
    }
}
```

JSON example without metadata

Configured Subscriptions

enable-notif-envelope=True

Notification-envelope

Collector
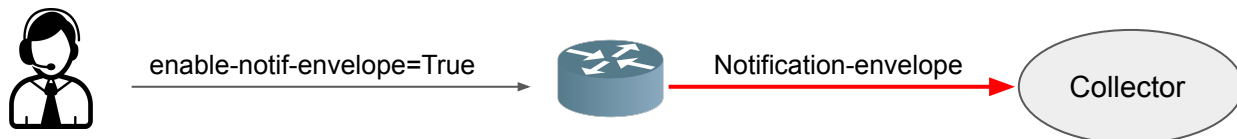
Dynamic Subscriptions

enable-notif-envelope=True

Notification-envelope
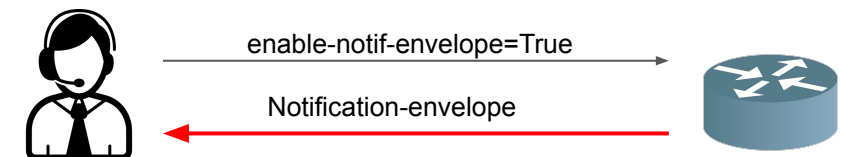
Extensible YANG model for YANG-Push Notifications
(4) Definition of each encoding (XML, JSON, CBOR)

- Explicit definition of the content of the "envelope" (solving gap for JSON and CBOR)
  - Definition of the namespace (urn:ietf:params:xml:ns:netconf:notification:2.0)
  - Mandatory event-time node
  - Mandatory notification-contents node
  - Metadata present when configured

A YANG notification encoded in XML is structured as a root "envelope"
container. The namespace of this container is the namespace defined
in the YANG module "ietf-yp-notification":

    urn:ietf:params:xml:ns:netconf:notification:2.0

Two mandatory child nodes within the "envelope" container are
expected, representing the event time and the notification payload.
The "event-time" node is defined within the same XML namespace as the
"envelope" container. The "event-time" node MUST be compliant with
[RFC3339]. Other metadata defined within the YANG module defined in
Section 5 MUST use the same XML namespace. See Section 3.4 for more
details.

Extensible YANG model for YANG-Push Notifications
(5) Extensions for hostname and sequence-number

- Definition of hostname and sequence-number extensions (draft-tgraf-netconf-notif-sequencing)
  - Enabled by default when the envelope is enabled
  - Discovery of support of this header through RFC9196

```
notifications:
  +---n envelope
     +--ro event-time                    yang:date-and-time
     +--ro hostname?                     inet:host
     |        {notification-hostname-sequence-number}?
     +--ro sequence-number?              yang:counter32
     |        {notification-hostname-sequence-number}?
     +--ro notification-contents?        <anydata>
```

```
{
    "ietf-yp-notification:envelope": {
    "event-time": "2023-03-25T08:30:11.22Z",
    "hostname": "example-router",
    "sequence-number": 1,
    "notification-contents": {
       "ietf-yang-push:push-update": {
          "id": 6666,
          "datastore-contents": {
             "ietf-interfaces:interfaces": [
                {
                   "interface": {
                   "name": "eth0",
                   "type": "iana-if-type:ethernetCsmacd",
                   "oper-status": "up",
                   "mtu": 1500
                }
             }
          ]
       }
    }
  }
}
```

Extensible YANG model for YANG-Push Notifications
Discussion and open issues

- Is this approach the way to go?

- All the YANG notifications or only YANG-Push Notifications?

- Should this notification be defined as a "notification" or as a "sx:structure"?

- XML namespace: which one to use?

  - urn:ietf:params:xml:ns:netconf:notification:2.0 → following RFC5277

  - urn:ietf:params:xml:ns:yang:ietf-yp-notification → following YANG guidelines

- Which extensions should be added?

  - Enabled by default when the envelope is enabled?

  - YANG versioning? [draft-ietf-netconf-yang-notifications-versioning (*currently adopted*)]

  - Observation time? [draft-tgraf-netconf-yang-push-observation-time]

  - Some of the extensions only impact a subset of YANG-Push notifications

    - How to deal with this?

BACKUP