Extensible YANG Model for YANG-Push Notifications

I-D: draft-netana-netconf-notif-envelope-00

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Extensible YANG model for YANG-Push Notifications

- 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)

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/
- Thorough 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

YANG model for NETCONF Event Notifications

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

```
<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>
```

```
{
   "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

Thanks Andy for confirming the approach was not correct.

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 it’s intended 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

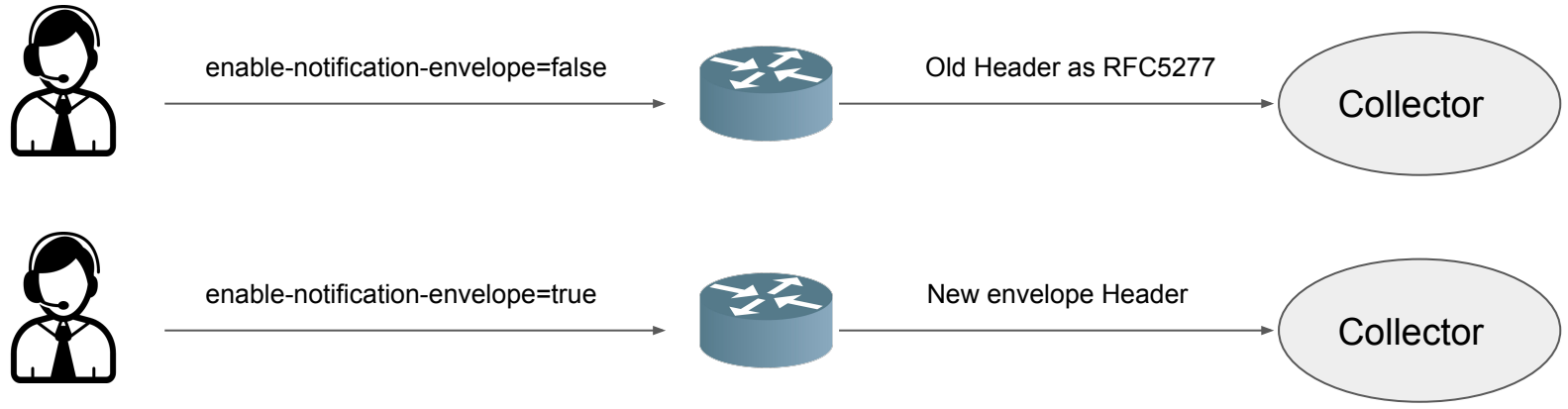
(1) Option to “opt-in” through a YANG-Push Subscription

- 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

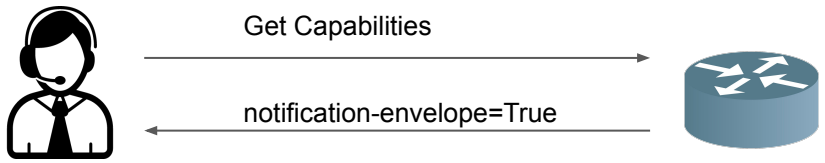


Extensible YANG model for YANG-Push Notifications

(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
```



Extensible YANG model for YANG-Push Notifications

(3) Extensible header defined in YANG

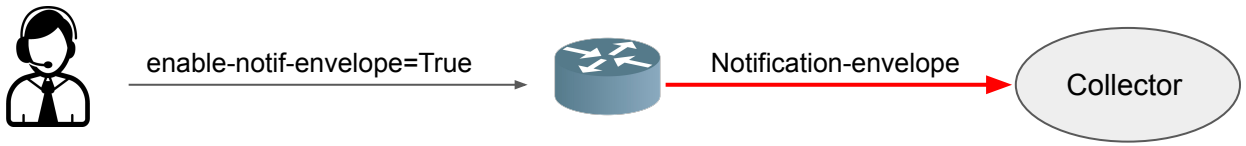
- Structure defined as a notification containing
  - event-time
  - metadata(s)
  - notification-contents

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

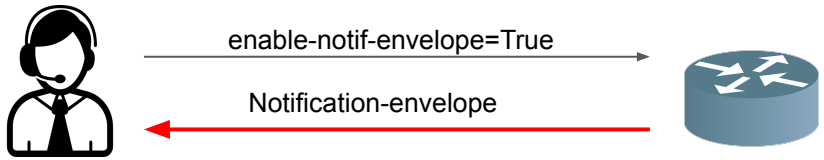
```
{
    "ietf-yp-notification:envelope": {
        "event-time": "2024-10-10T08:00:11.22Z",
        "notification-contents": {
          "ietf-yang-push:push-update": {
              "id": 1011,
              "datastore-contents": {
                  "ietf-interfaces:interfaces": [
               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

JSON example without metadata

Configured Subscriptions



Dynamic Subscriptions



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)
  - Present 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 notification and subscription extensions should be added?
  - Metadata sent 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?