YANG model for NETCONF Event Notifications

draft-ahuang-netconf-notif-yang-05

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YANG model for NETCONF Event Notifications

Context - Netconf Notification

```
<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

Issues:

(1) YANG module not defined

(2) Non-existing Normative text defining this header

YANG model for NETCONF Event Notifications

Status

- Clear interest from the WG
  - Plenty of support on the WG adoption call
  - Push back from Mohamed Boucadair on -04 working group adoption call
- Triggered other discussions related to YANG-Push

YANG model for NETCONF Event Notifications

Proposal (1)

- (1) Use Normative text to explicit how message need to be encoded [mimick RFC8040 RESTCONF]
- (2) Definition of the notification structure in a YANG
- (3) RESTCONF out of the scope of the document

- Updates multiple RFCs:
  - RFC5277 (NETCONF Notifications) → The Notification is defined in this RFC, using XML
  - RFC8639 (Subscribed Notifications) → The Notification uses the definition of RFC5277
  - RFC7951 (YANG JSON) → Notifications are not **explicitly** defined
  - RFC9254 (YANG CBOR) → Notifications are “container-like” instances

YANG model for NETCONF Event Notifications

Proposal (2)

- (1) Use Normative text to explicit how message need to be encoded [mimick RFC8040]

- Normative text for each encoding and including an example: XML, JSON, CBOR

> A YANG notification encoded in JSON is structured as a root "notification" container. The namespace of this container is the name of the YANG module "ietf-notification" defined in Section 5.¶
>
> Two child nodes within the "ietf-notification:notification" container are expected, representing the event time and the notification payload. The "eventTime" node is defined within the same namespace as the "ietf-notification:notification" container and is compliant with [RFC3339].

Section 4.2. JSON encoding

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Proposal (3)

- (2) Definition of the notification structure in a YANG

- Definition of the notification structure in a YANG
- Uses the same XML URI as RFC5277
- “eventTime” in CamelCase following model defined in RFC5277

```
sx:structure notification {
  leaf eventTime {
    type yang:date-and-time;
    mandatory true;
    description
      "The date and time the event was generated by the event source.
      This parameter is of type dateTime and compliant to [RFC3339].
      Implementations must support time zones.
      The leaf name in camel case matches the name of the XSD element
      defined in Section 4 of RFC5277.";
  }
}
```

```
module: ietf-notification

  structure notification:
    +-- eventTime    yang:date-and-time
```

YANG model for NETCONF Event Notifications

Proposal (4)

- (3) RESTCONF out of the scope of the document

- Namespace of a notification for RESTCONF remains “ietf-restconf” as defined in RFC8040 (Sec. 6)

```
<notification
   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2013-12-21T00:01:00Z</eventTime>
   <event xmlns="http://example.com/event/1.0">
      <event-class>fault</event-class>
      <reporting-entity>
          <card>Ethernet0</card>
      </reporting-entity>
      <severity>major</severity>
    </event>
</notification>
```

XML notification from RFC8040

```
{
  "ietf-restconf:notification" : {
    "eventTime" : "2013-12-21T00:01:00Z",
    "example-mod:event" : {
      "event-class" : "fault",
      "reporting-entity" : { "card" : "Ethernet0" },
      "severity" : "major"
    }
  }
}
```

JSON notification from RFC8040

YANG model for NETCONF Event Notifications

Questions to the WG

- (1) Is updating the RFCs the way to fix this issue?
- (2) Is normative text rather than only providing the YANG module the way to solve this gap?

Next steps:

➢ Request more feedback from the WG and YANG-Push developers

BACKUP

Notifications encoded in XML/YANG-JSON/YANG-CBOR

- RFC5277 (NETCONF Event Notifications) Defines the structure of the Notification and XML examples:

```
<notification
  xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2007-07-08T00:02:00Z</eventTime>
   <event xmlns="http://example.com/event/1.0">
       <eventClass>fault</eventClass>
       <reportingEntity>
           <card>Ethernet2</card>
       </reportingEntity>
       <severity>critical</severity>
    </event>
</notification>
```

- RFC7950 (YANG 1.1) Section 4.2.10, defines how Notifications should be encoded when modeled in YANG:

YANG Example:

```
  notification link-failure {
    description
      "A link failure has been detected.";
    leaf if-name {
      type leafref {
        path "/interface/name";
      }
    }
    leaf if-admin-status {
      type admin-status;
    }
    leaf if-oper-status {
      type oper-status;
    }
  }
```

NETCONF XML Example:

```
  <notification
      xmlns="urn:ietf:params:netconf:capability:notification:1.0">
    <eventTime>2007-09-01T10:00:00Z</eventTime>
    <link-failure xmlns="urn:example:system">
      <if-name>so-1/2/3.0</if-name>
      <if-admin-status>up</if-admin-status>
      <if-oper-status>down</if-oper-status>
    </link-failure>
  </notification>
```

Notifications encoded in XML/YANG-JSON/YANG-CBOR

- RFC7951 (YANG-JSON):
  - Notifications are **not explicitly** covered
  - Example in Section 5.5 covering how “anydata” statements should be encoded:

```
Example: For the anydata definition

anydata data;

the following is a valid JSON-encoded instance:

"data": {
  "ietf-notification:notification": {
    "eventTime": "2014-07-29T13:43:01Z",
    "example-event:event": {
      "event-class": "fault",
      "reporting-entity": {
        "card": "Ethernet0"
      },
      "severity": "major"
    }
  }
}
```

eventTime as defined in RFC5277 present

Notifications encoded in XML/YANG-JSON/YANG-CBOR

- RFC9254 (YANG-CBOR):
  - Notifications are **not explicitly** covered
  - Defines a Notification as a "container-like" structure:

> **container-like instance:**
> An instance of a container, a YANG data structure, notification contents, RPC input, RPC output, action input, or action output (Section 4.2); a list entry in a list (Section 4.4); or an anydata node (Section 4.5).

  - An example of a "notification" statement is in Section 4.5 covering "anydata" statements

```
module example-port {
  ...

  notification example-port-fault {   // SID 60200
    leaf port-name {                  // SID 60201
      type string;
    }
    leaf port-fault {                 // SID 60202
      type string;
    }
  }
}
```

```
{
  60123 : {                   / last-event (SID 60123) /
    47(60200) : {             / event-port-fault (SID 60200) /
      1 : "0/4/21",           / port-name (SID 60201) /
      2 : "Open pin 2"        / port-fault (SID 60202) /
    }
  }
}
```

Using YANG-SID

```
{
  "event-log:last-event" : {
    "example-port:example-port-fault" : {
      "port-name" : "0/4/21",
      "port-fault" : "Open pin 2"
    }
  }
}
```

ietf-notification:notification container missing

eventTime leaf missing

Using names in keys

BACK UP: Difference with ***draft-ietf-netconf-notification-messages***

draft-ahuang-netconf-notif-yang

```
module: ietf-notification

  structure notification:
    +-- eventTime    yang:date-and-time
```

draft-ietf-netconf-notification-messages

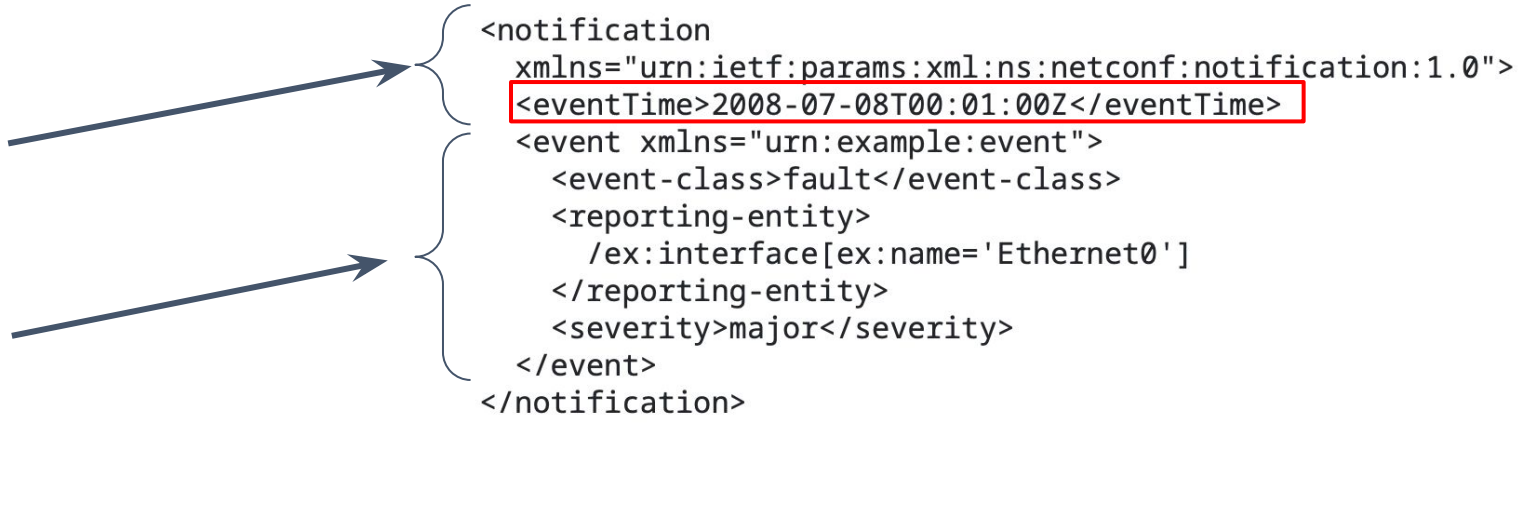
```
structure message
   +--ro message!
      +--ro message-header
      |  +--ro message-time            yang:date-and-time
      |  +--ro message-id?             uint32
      |  +--ro message-generator-id?   string
      |  +--ro notification-count?     uint16
      +--ro notifications*
      |  +--ro notification-header
      |  |  +--ro notification-time         yang:date-and-time
      |  |  +--ro yang-module?              yang:yang-identifier
      |  |  +--ro subscription-id*          uint32
      |  |  +--ro notification-id?          uint32
      |  |  +--ro observation-domain-id?    string
      |  +--ro notification-contents?
      |  +--ro notification-footer!
      |     +--ro signature-algorithm    string
      |     +--ro signature-value        string
      |     +--ro integrity-evidence?    string
      +--ro message-footer!
         +--ro signature-algorithm    string
         +--ro signature-value        string
         +--ro integrity-evidence?    string
```

BACK UP: Why the YANG module defines a “structure” rather than a “container”?

Section 7.16.3 of RFC7950 defines:

```
module example-event {
  yang-version 1.1;
  namespace "urn:example:event";
  prefix "ev";

  notification event {
    leaf event-class {
      type string;
    }
    leaf reporting-entity {
      type instance-identifier;
    }
    leaf severity {
      type string;
    }
  }
}
```



```
<notification
  xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2008-07-08T00:01:00Z</eventTime>
  <event xmlns="urn:example:event">
    <event-class>fault</event-class>
    <reporting-entity>
      /ex:interface[ex:name='Ethernet0']
    </reporting-entity>
    <severity>major</severity>
  </event>
</notification>
```

BACK UP: Why the YANG module defines a “structure” rather than a “container”?

If we define the notification as a container:

```
container notification {
  leaf eventTime {
    type yang:date-and-time;
    mandatory true;
    description
      "The date and time the event was generated by the event
      source. This parameter is of type dateTime and compliant
      to [RFC3339]. Implementations must support time zones.
      The leaf name in camel case matches the name of the XSD
      element defined in Section 4 of RFC5277.";
  }
}
```

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2007-09-01T10:00:00Z</eventTime>
</notification>
```

The notification defined in Section 7.16.3 of RFC7950 needs to be defined as augmentation rather than using the “notification” statement. Otherwise, the relationship is between “example-event” and “ietf-notification” is non-existant.

```
module example-event {
  yang-version 1.1;
  namespace "urn:example:event";
  prefix "ev";

  import ietf-notification {
    prefix inotif;
  }

  augment "/inotif:notification" {
    container event {
      leaf event-class {
        type string;
      }
      leaf reporting-entity {
        type instance-identifier;
      }
      leaf severity {
        type string;
      }
    }
  }
}
```