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Support of Hostname and Sequencing in YANG Notifications

Abstract

This document specifies a new YANG module that augment the NETCONF Event Notification header to support hostname, Message Publisher ID and sequence numbers to identify from which network node and at which time the message was published. This allows the collector to recognize loss, delay and reordering between the publisher and the downstream system storing the message.

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1. Introduction

Section 4 of [[RFC5277](#)] describes the NETCONF event notification header using a XML Schema. In the metadata of the event notification header, only the eventTime is present indicating at which time the notification message was published. For other encodings, the same schema is implemented using a YANG module in [[I-D.ahuang-netconf-notif-yang](#)]. Furthermore, in Section 3.7 of [[RFC8641](#)], the subscription ID is added to the "push-update" and "push-change-update" notification messages allowing to recognize to which xpath or sub-tree the node was subscribed to.

When the NETCONF event notification message is forwarded from the receiver to another system, such as a messaging system or a time series database where the message is stored, the transport context is lost since it is not part of the NETCONF event notification message metadata. Therefore, the downstream system is unable to associate the message to the publishing process (the exporting router), nor able to detect message loss or reordering.

Today, network operators workaround this impediment by preserving the transport source IP address and sequence numbers of the publishing process. However, this implies that this information needs to be encoded in the NETCONF event notification message which impacts the semantic readability of the message in the downstream system.

On top of that, the transport source IP address might not represent the management IP address by which the YANG push server should be known. In other terms, the source-host [[RFC6470](#)], which is the "Address of the remote host for the session" might not be the management IP address.

By extending the NETCONF Event Notification header with sysName, the node's fully-qualified domain name, a reference to the YANG push publisher process and a sequence number as described in [[RFC9187](#)], the downstream system is not only able to identify from which network node, subscription, and time the message was published but also, the order of the published messages.

To correlate network data among different Network Telemetry planes as described in Section 3.1 of [[RFC9232](#)] or among different YANG push subscription types defined in Section 3.1 of [[RFC8641](#)], sysName describes from which network node the state change was observed or from when to when the data was accounted. This is essential for understanding the timely relationship among these different planes and YANG push subscription types.

2. Extend the NETCONF Event Notification Header

Besides the eventTime described in Section 2.2.1 of [[RFC5277](#)] the following metadata objects are part of a "push-update" and "push-change-update" notification message.

sysName: Describes the node's fully-qualified domain name according to the 'sysName' object definition in [[RFC1213](#)] from where the message was published from. This value is usually configured on the node by the administrator to uniquely identify the node in the network.

messagePublisherId: Message Publisher ID is a 32-bit identifier defined in [[I-D.ietf-netconf-distributed-notif](#)]. This identifier is unique to the publisher node and identifies the publishing process of the node to allow the disambiguation of an information source.

sequenceNumber: Generates a unique sequence number as described in [[RFC9187](#)] for each published message.

[Figure 1](#) provides an example of a "push-change-update" message with the sysName, messagePublisherId and sequenceNumber. This "push-change-update" message is encoded in 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>2023-02-04T16:30:11.22Z</eventTime>
  <sysName xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-sequencin
    example-router
  </sysName>
  <messagePublisherId xmlns="urn:ietf:params:xml:ns:yang:ietf-notificatio
    1
  </messagePublisherId>
  <sequenceNumber xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-se
    187653
  </sequenceNumber>
  <push-update xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-push">
    <id>1011</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>

```

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

3. YANG Module for Event Notifications

3.1. YANG Tree Diagram

This `ietf-notification-sequencing` YANG module augments the `ietf-notification` YANG module specified in [[I-D.ahuang-netconf-notif-yang](#)] adding the `sysName` and the `sequenceNumber` leaves as described in Section 2 of this document.

```

module: ietf-notification-sequencing

augment-structure /inotif:notification:
  +-- sysName          inet:host
  +-- messagePublisherId  uint32
  +-- sequenceNumber    yang:counter32

```

3.2. Full Tree View

The following is the YANG tree diagram [[RFC8340](#)] for the `ietf-notification-sequencing` augmentation within the `ietf-notification`.

module: ietf-notification

structure notification:

+-- eventTime	yang:date-and-time
+-- inotifseq:sysName	inet:host
+-- inotifseq:messagePublisherId	uint32
+-- inotifseq:sequenceNumber	yang:counter32

3.3. YANG Module

<CODE BEGINS> file "ietf-notification-sequencing@2023-03-25.yang"

```
module ietf-notification-sequencing {
  yang-version 1.1;
  namespace
    "urn:ietf:params:xml:ns:yang:ietf-notification-sequencing";
  prefix inotifseq;
  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-yang-types {
    prefix yang;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-notification {
    prefix inotif;
    reference
      "draft-ahuang-netconf-notif-yang: NETCONF Event Notification YANG"
  }
  import ietf-yang-structure-ext {
    prefix sx;
    reference
      "RFC 8791: YANG Data Structure Extensions";
  }

  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>
             Jean Quilbeuf
             <mailto:jean.quilbeuf@huawei.com>
             Alex Huang Feng
             <mailto:alex.huang-feng@insa-lyon.fr>";

  description
    "Defines NETCONF Event Notification structure with the sysName and
    the sequenceNumber.

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    modification, is permitted pursuant to, and subject to the license
```

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.";

```
revision 2023-03-25 {
  description
    "First revision";
  reference
    "RFC XXXX: YANG Notifications Sequencing";
}

sx:augment-structure "/inotif:notification" {
  leaf sysName {
    type inet:host;
    mandatory true;
    description
      "Fully-qualified domain name of the node according to [RFC1213].
      This value is usually configured on the node by the administrator
      to uniquely identify the node in the network.";
  }
  leaf messagePublisherId {
    type uint32;
    mandatory true;
    description
      "Identifier of the publishing process generating this notificati
  }
  leaf sequenceNumber {
    type yang:counter32;
    mandatory true;
    description
      "Unique sequence number as described in [RFC3339] for each
      published message.";
  }
}
}
```

<CODE ENDS>

4. Security Considerations

The security considerations for the NETCONF Event notifications are described in [[RFC5277](#)]. This documents adds no additional security considerations.

5. IANA Considerations

5.1. IETF XML Registry

This document registers the following URIs in the "IETF XML Registry" [[RFC3688](#)]:

URI: urn:ietf:params:xml:ns:yang:ietf-notification-sequencing
Registrant Contact: The IESG.
XML: N/A; the requested URI is an XML namespace.

5.2. YANG Module Name

This document registers the following YANG modules in the "YANG Module Names" registry [[RFC6020](#)]:

name: ietf-notification-sequencing
namespace: urn:ietf:params:xml:ns:yang:ietf-notification-sequencing
prefix: inotifseq
reference: RFC XXXX

6. Operational Considerations

6.1. SysName Correlation

In order to allow data correlation among BGP Monitoring Protocol (BMP) [[RFC7854](#)] and YANG push, the same hostname value should be used as described in section 4.4 of [[RFC7854](#)] for the information TLV in the init BMP message type.

7. Acknowledgements

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