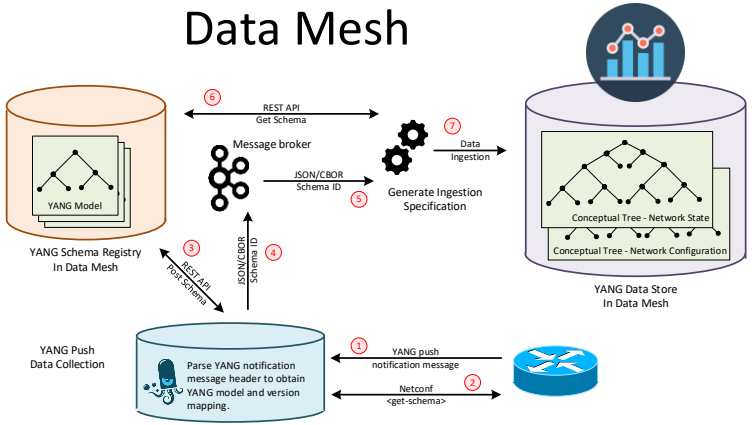
Validate Configured Subscription YANG-Push Publisher Implementations

NETCONF & NMOP WG



IETF 120

July 20-21th, 2024

Hackathon

Hackathon – Plan, Software, Repo

Plan

- Validate work in progress vendor YANG-Push publisher implementations.
- Configure RFC 8641 compliant YANG-Push configured subscription.
- Verify output in packet capture before YANG-Push receiver and after transformation.

Software

- YANG-Push Publisher - Cisco IOS XR
- YANG-Push Publisher - 6WIND VSR
- YANG-Push Publisher - Huawei VRP
- YANG-Push Receiver - Pmacct

Test Repository

- https://github.com/network-analytics/ietf-network-analytics-document-status/tree/main/120/Hackathon
- Contains
  - Packet capture on the wire
  - Netconf RPCs and YANG-Push JSON messages
  - Python script which performed test cases

An Architecture for YANG-Push to Apache Kafka Integration

draft-netana-nmop-yang-kafka-integration

- Subscription to YANG Notifications
  RFC 8639
- Subscription to YANG Notifications for Datastore Updates
  RFC 8641
- UDP-based Transport for Configured Subscriptions
  draft-ietf-netconf-udp-notif
- Subscription to Distributed Notifications
  draft-ietf-netconf-distributed-notif
- Support of Hostname and Sequencing in YANG Notifications
  draft-tgraf-netconf-notif-sequencing
- Support of Versioning in YANG Notifications Subscription
  draft-ietf-netconf-yang-notifications-versioning
- Support of Network Observation Timestamping in YANG Notifications
  draft-tgraf-netconf-yang-push-observation-time
- YANG Library
  RFC 8525
- Augmented-by Addition into the IETF-YANG-Library
  draft-lincla-netconf-yang-library-augmentation

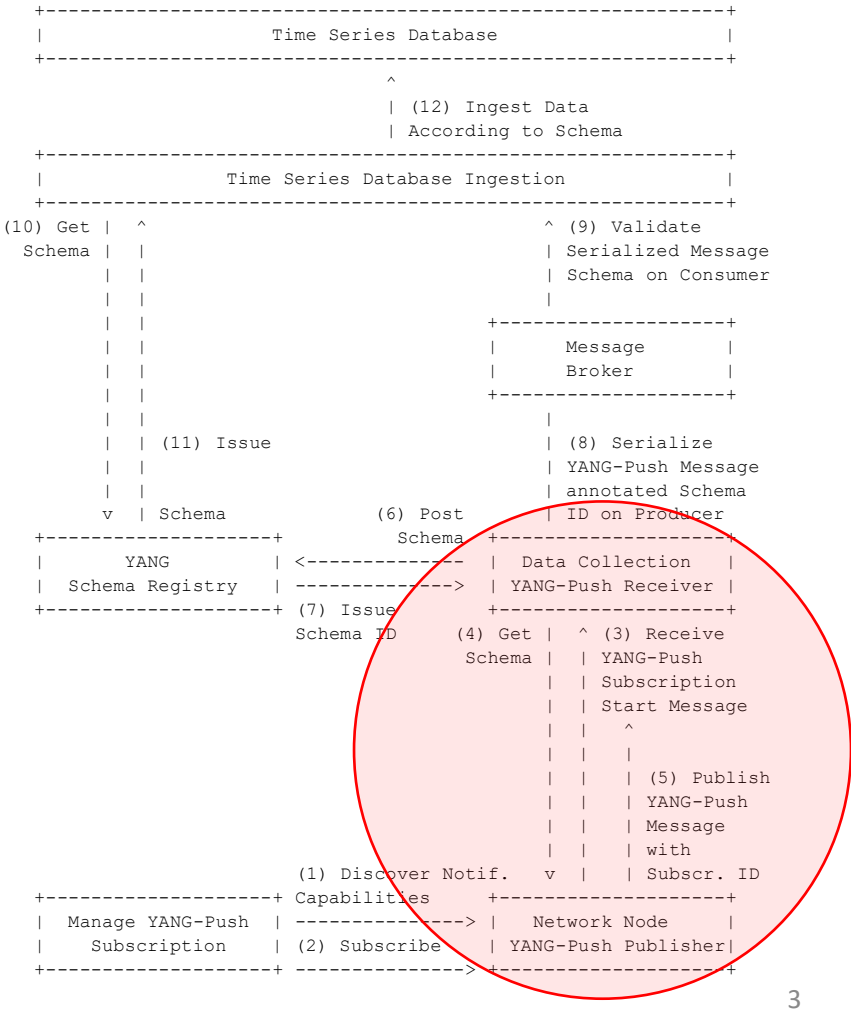


Figure 1: End to End Workflow

Cisco – YANG-Push Notifications

Push-Change-Update Notification


```
{
    "ietf-notification:notification": {
      "eventTime": "2024-07-19T15:01:30.175Z",
      "ietf-yang-push:push-change-update": {
        "id": 1,
        "datastore-changes": {
          "yang-patch": {
            "patch-id": "TODO - insert patch-id here",
            "edit": [
              {
                "edit-id": "1",
                "operation": "replace",
                "target": "/Cisco-IOS-XR-pfi-im-cmd-oper:interfaces/interface-
xr/interface[interface-name='Loopback12']",
                "value": {
                  "Cisco-IOS-XR-pfi-im-cmd-oper:interface": {
                    "interface-name": "Loopback12",
                    "interface-handle": "Loopback12",
                    "interface-type": "IFT_LOOPBACK",
                    "hardware-type-string": "Loopback interface(s)",
                    "state": "im-state-admin-down",
                    "line-state": "im-state-admin-down",
                    "encapsulation": "loopback",
                    "encapsulation-type-string": "Loopback",
                    "mtu": 1500,
                    "is-l2-transport-enabled": false,
                    "state-transition-count": 10,
                    "last-state-transition-time": "1721401289960121958",
                    "is-dampening-enabled": false,
                    "bandwidth": "0",
                    "max-bandwidth": "0",
                    "is-l2-looped": false,
                    "loopback-configuration": "no-loopback",
                    "ip-information": {
                      "ip-address": "192.0.2.90",
                      "subnet-mask-length": 32
                    },
                    "fast-shutdown": false,
                    "if-index": 154,
                    "is-intf-logical": true,
                    "is-intf-type-management": false,
                    "is-intf-type-cpu": false
```


Subscription-Started Notification


```
{
    "ietf-notification:notification": {
      "eventTime": "2024-07-19T15:01:00.300Z",
      "ietf-subscribed-notifications:subscription-started": {
        "id": 1,
        "stream-xpath-filter": "Cisco-IOS-XR-pfi-im-cmd-oper:interfaces",
        "transport": "transport",
        "encoding": "encode-json"
      }
    }
  }
```


Subscription-Terminated Notification


```
{
    "ietf-notification:notification": {
      "eventTime": "2024-07-19T15:03:58.590Z",
      "ietf-subscribed-notifications:subscription-terminated": {
        "id": 1,
        "reason": "no-such-subscription"
      }
    }
  }
```

6WIND - Subscription Started Notifications


```
{
  "ietf-notifications:notification": {
    "eventTime": "2024-07-09T13:26:53.295857916+00:00",
    "sysName": "daisy-ietf-ipf-zbl1843-r-daisy-58",
    "sequenceNumber": 855,
    "ietf-subscribed-notifications:subscription-started": {
      "id": 12345678,
      "ietf-yang-push:datastore": "ietf-datastores:operational",
      "ietf-yang-push:datastore-xpath-filter":
"/state/vrf/interface/physical[name='ens192']/counters",
      "transport": "ietf-udp-notif-transport:udp-notif",
      "encoding": "encode-json",
      "purpose": "send notifications",
      "ietf-distributed-notif:message-publisher-ids": [
        0
      ],
      "ietf-yang-push:periodic": {
        "period": 3000
      },
      "ietf-yang-push-revision:module-version": [
        {
          "module-name": "vrouter-interface",
          "revision": "2024-04-22"
        }
      ]
    }
  }
}
```


- **Support of Hostname and Sequencing in YANG Notifications**, draft-tgraf-netconf-notif-sequencing, extends the NETCONF notification defined in RFC5277 with sysName, publisherId and sequenceNumber.
- **UDP-based Transport for Configured Subscriptions**, draft-ietf-netconf-udp-notif, provides a UDP-based protocol for YANG notifications to collect data from network nodes.
- **Subscription to Distributed Notifications**, draft-ietf-netconf-distributed-notif, extends YANG notifications subscription to allow metrics being published directly from processors on line cards.
- **Support of Versioning in YANG Notifications Subscription**, draft-ietf-netconf-yang-notifications-versioning, adds the ability to subscribe to a specific revision or latest-compatible-semversion. Extends the YANG-Push Subscription State Change Notifications so that the receiver learns on top of xpath and the sub-tree filter also the YANG module name, revision and revision-label.

Huawei - Subscription Started Notifications

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-03-12T23:20:24Z",
    "ietf-subscribed-notification:subscription-started": {
      "id": 1,
      "ietf-yang-push:datastore": "ietf-datastores:operational",
      "ietf-yang-push:datastore-xpath-filter":
"/ifm:ifm/ifm:interfaces/ifm:interface",
      "ietf-yang-push-revision:revision": "2024-01-23",
      "ietf-yang-push-revision:module-name": "ifm",
      "ietf-yang-push-revision:revision-label": "1.0.0",
      "ietf-distributed-notif:message-observation-domain-id":
[1,2],
      "transport": "ietf-udp-notif-transport:udp-notif",
      "encoding": "encode-json",
      "ietf-yang-push:periodic": {
        "ietf-yang-push:period": 60000
      }
    }
  }
}
```

- **Support of Versioning in YANG Notifications Subscription**, draft-ietf-netconf-yang-notifications-versioning, adds the ability to subscribe to a specific revision or latest-compatible-semversion. Extends the YANG-Push Subscription State Change Notifications so that the receiver learns on top of xpath and the sub-tree filter also the YANG module name, revision and revision-label.
- **UDP-based Transport for Configured Subscriptions**, draft-ietf-netconf-udp-notif, provides a UDP-based protocol for YANG notifications to collect data from network nodes.
- **Subscription to Distributed Notifications**, draft-ietf-netconf-distributed-notif, extends YANG notifications subscription to allow metrics being published directly from processors on line cards.

6WIND - Push Update Notifications


```
{
  "ietf-notifications:notification": {
   "eventTime": "2024-07-09T13:35:23.653892256+00:00",
   "sysName": "daisy-ietf-ipf-zbl1843-r-daisy-58",
   "sequenceNumber": 873,
   "ietf-yang-push:push-update": {
    "id": 68,
    "datastore-contents": {
     "vrouter:state": {
      "vrf": [
       {
        "name": "main",
        "vrouter-interface:interface": {
         "physical": [
          {
           "name": "ens192",
           "counters": {
            "in-octets": "63771919981",
            "in-unicast-pkts": "363662364",
            "in-discards": "63590",
            "in-errors": "0",
            "out-octets": "59850316180",
            "out-unicast-pkts": "307798704",
            "out-discards": "0",
            "out-errors": "0"
           }
          }
         ]
        }
       }
      ]
     }
    },
    "ietf-distributed-notif:message-publisher-id": 0,
    "ietf-yp-observation-time:observation-time": "2024-07-09T13:35:23.654432588+00:00",
    "ietf-yp-observation-time:point-in-time": "current-state"
   }
  }
 }
```


- **Support of Hostname and Sequencing in YANG Notifications**, draft-tgraf-netconf-notif-sequencing, extends the NETCONF notification defined in RFC5277 with sysName, publisherId and sequenceNumber.
- **UDP-based Transport for Configured Subscriptions**, draft-ietf-netconf-udp-notif, provides a UDP-based protocol for YANG notifications to collect data from network nodes.
- **Subscription to Distributed Notifications**, draft-ietf-netconf-distributed-notif, extends YANG notifications subscription to allow metrics being published directly from processors on line cards.
- **Support of Network Observation Timestamping in YANG Notifications**, draft-tgraf-netconf-yang-push-observation-time, extends YANG-Push push-update notifications with observation-time and state-changed-observation-time.

6WIND - Push Change Update Notifications


```
{
 "ietf-notifications:notification": {
  "eventTime": "2024-07-09T13:47:56.887480682+00:00",
  "sysName": "daisy-ietf-ipf-zbl1843-r-daisy-58",
  "sequenceNumber": 900,
  "ietf-yang-push:push-change-update": {
   "id": 69,
   "datastore-changes": {
    "yang-patch": {
     "patch-id": "patch-1",
     "edit": [
      {
       "edit-id": "edit-1",
       "operation": "replace",
       "target": "/vrouter:state/vrf[name='main']/l3vrf[name='A9']/vrouter-
interface:interface/vrouter-loopback:loopback[name='Loopback-A9']/enabled",
       "value": {
        "vrouter-loopback:enabled": "false"
       }
      }
     ]
    }
   },
   "ietf-distributed-notif:message-publisher-id": 0,
   "ietf-yp-observation-time:observation-time": "2024-07-
09T13:47:56.887798493+00:00",
   "ietf-yp-observation-time:point-in-time": "current-state"
  }
 }
}
```


- **Support of Hostname and Sequencing in YANG Notifications**, draft-tgraf-netconf-notif-sequencing, extends the NETCONF notification defined in RFC5277 with sysName, publisherId and sequenceNumber.
- **UDP-based Transport for Configured Subscriptions**, draft-ietf-netconf-udp-notif, provides a UDP-based protocol for YANG notifications to collect data from network nodes.
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- **Support of Network Observation Timestamping in YANG Notifications**, draft-tgraf-netconf-yang-push-observation-time, extends YANG-Push push-update notifications with observation-time and state-changed-observation-time.

YANG-Push Implementation Status

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	6WIND VSR	Huawei VRP	Cisco IOS XR
RFC 8639 YANG-Push Subscription	x	x	
RFC 8641 YANG-Push Notification	x	x	x
draft-ietf-netconf-udp-notif	x	x	
draft-ietf-netconf-distributed-notif	x	x	
draft-ietf-netconf-yang-notifications-versioning	x	x	
draft-tgraf-netconf-notif-sequencing	x		
draft-tgraf-netconf-yang-push-observation-time	x		
RFC 7895 YANG Module Library		x	
RFC 8525 YANG Library	x		x
draft-lincla-netconf-yang-library-augmentation			

Red marked describes new capability at IETF 120

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- Holger Keller – DT
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- Alex Huang-Feng – INSA Lyon
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