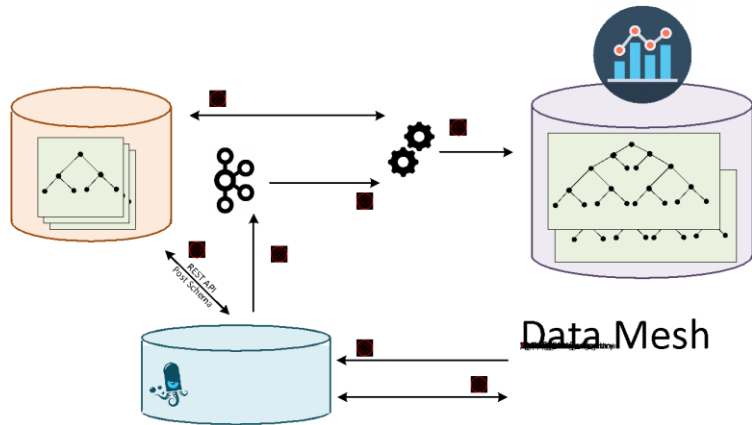


Validate Configured Subscription YANG- Push Publisher Implementations NETCONF & NMOP WG



IETF 121
November 2-3rd, 2024
Hackathon

Hackathon – Plan and Software

Test 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.

Development Plan

- MVP 1 – Basic Requirements (9)
- MVP 2 – Scale and Secure (3)
- MVP 3 – Optimizations (2)

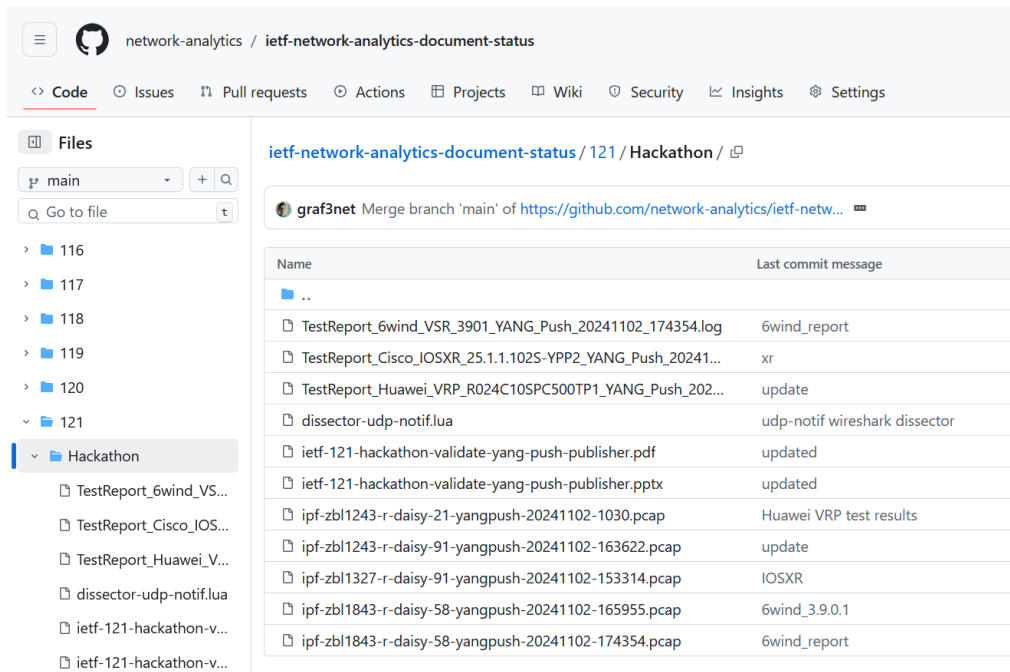
Software

- YANG-Push Publisher - Cisco IOS XR
- YANG-Push Publisher - 6WIND VSR
- YANG-Push Publisher - Huawei VRP
- YANG-Push Receiver – Pmacct
- YANG-Push Receiver – Netgauze
- udp-notif dissector - Wireshark

Hackathon – Repository

Test Repository

- <https://github.com/network-analytics/ietf-network-analytics-document-status/tree/main/121/Hackathon>
- Contains
 - Packet capture on the wire
 - Netconf RPCs and YANG-Push JSON messages
 - Python script which performed test cases



The screenshot shows the GitHub repository page for `network-analytics / ietf-network-analytics-document-status`. The left sidebar displays the file tree with the following structure:

- main
- Go to file
- 116
- 117
- 118
- 119
- 120
- 121
- Hackathon**
 - TestReport_6wind_VS...
 - TestReport_Cisco_IOS...
 - TestReport_Huawei_V...
 - dissector-udp-notif.lua
 - ietf-121-hackathon-v...
 - ietf-121-hackathon-v...

The main content area shows the commit history for the `121 / Hackathon` directory. The commit message for the selected commit is:

graf3net Merge branch 'main' of <https://github.com/network-analytics/ietf-network-analytics-document-status>

Name	Last commit message
..	
TestReport_6wind_VSR_3901_YANG_Push_20241102_174354.log	6wind_report
TestReport_Cisco_IOSXR_25.1.1.102S-YP2_YANG_Push_20241...	xr
TestReport_Huawei_VRP_R024C10SPC500TP1_YANG_Push_202...	update
dissector-udp-notif.lua	udp-notif wireshark dissector
ietf-121-hackathon-validate-yang-push-publisher.pdf	updated
ietf-121-hackathon-validate-yang-push-publisher.pptx	updated
ipf-zbl1243-r-daisy-21-yangpush-20241102-1030.pcap	Huawei VRP test results
ipf-zbl1243-r-daisy-91-yangpush-20241102-163622.pcap	update
ipf-zbl1327-r-daisy-91-yangpush-20241102-153314.pcap	IOSXR
ipf-zbl1843-r-daisy-58-yangpush-20241102-165955.pcap	6wind_3.9.0.1
ipf-zbl1843-r-daisy-58-yangpush-20241102-174354.pcap	6wind_report

An Architecture for YANG-Push to Apache Kafka Integration

draft-ietf-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-ietf-netconf-yang-library-augmentation](#)

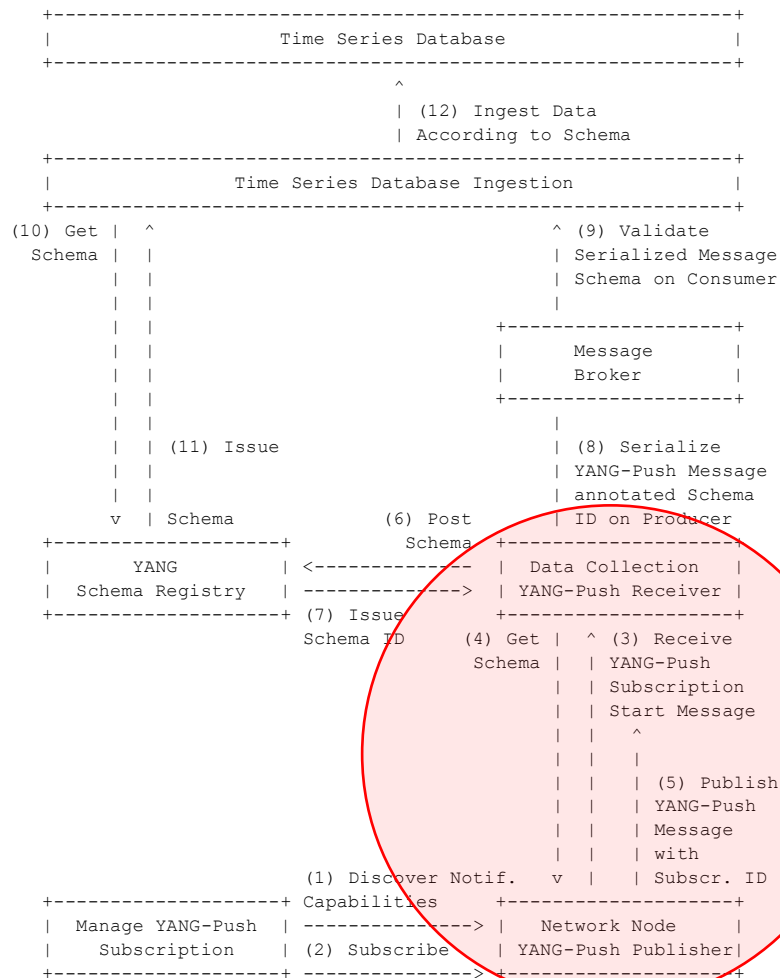


Figure 1: End to End Workflow

Cisco IOS XR – Subscription Notifications

Subscription-Started Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T14:38:22.598Z",
    "ietf-notification:sysName": "ipf-zbl1327-r-daisy-91",
    "ietf-notification:sequenceNumber": 13,
    "ietf-subscribed-notifications:subscription-started": {
      "id": 1,
      "ietf-yang-push:datastore": "IOS-XR",
      "ietf-yang-push:datastore-xpath-filter": "Cisco-IOS-XR-pfi-
im-cmd-oper:interfaces/interface-xr/interface[interface-
name='Loopback13']",
      "transport": "transport",
      "module-version": [
        {
          "module-name": "Cisco-IOS-XR-pfi-im-cmd-oper",
          "revision": "2024-02-29"
        }
      ],
      "encoding": "encode-json",
      "ietf-yang-push:periodic": {
        "period": 4500
      }
    }
  }
}
```

Subscription-Terminated Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T14:43:24.981Z",
    "ietf-notification:sysName": "ipf-zbl1327-r-daisy-91",
    "ietf-notification:sequenceNumber": 21,
    "ietf-subscribed-notifications:subscription-terminated": {
      "id": 1,
      "reason": "no-such-subscription"
    }
  }
}
```

Cisco IOS XR – Push Notifications

Push-Update Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T14:44:30.000Z",
    "ietf-notification:sysName": "ipf-zbl1327-r-daisy-91",
    "ietf-notification:sequenceNumber": 23,
    "ietf-yang-push:push-update": {
      "id": 1,
      "ietf-yp-observation:timestamp": "2024-11-02T14:44:30.000Z",
      "ietf-yp-observation:point-in-time": "current-accounting",
      "datastore-contents": {
        "Cisco-IOS-XR-pfi-im-cmd-oper:interfaces": {
          "interface-xr": {
            "interface": [
              {
                "interface-name": "Loopback13",
                "interface-handle": "Loopback13",
                "interface-type": "IFT_LOOPBACK",
                "hardware-type-string": "Loopback interface(s)",
                "state": "im-state-up",
                "line-state": "im-state-up",
                "encapsulation": "loopback",
                "encapsulation-type-string": "Loopback",
                "mtu": 1500,
```

Push-Change-Update Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T14:54:32.529Z",
    "ietf-notification:sysName": "ipf-zbl1327-r-daisy-91",
    "ietf-notification:sequenceNumber": 1,
    "ietf-yang-push:push-change-update": {
      "id": 1,
      "ietf-yp-observation:timestamp": "2024-11-02T14:54:32.517Z",
      "ietf-yp-observation:point-in-time": "state-changed",
      "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='Loopback13']",
              "value": {
                "Cisco-IOS-XR-pfi-im-cmd-oper:interface": {
                  "interface-name": "Loopback13",
                  "interface-handle": "Loopback13",
                  "interface-type": "IFT_LOOPBACK",
                  "hardware-type-string": "Loopback interface(s)",
                  "state": "im-state-admin-down",
                  "line-state": "im-state-admin-down",
```

Huawei VRP – Push Notifications

Push-Update Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T10:30:52Z",
    "ietf-notification-sequencing:sysName": "ipf-zbl1243-r-daisy-21",
    "ietf-notification-sequencing:sequenceNumber": 5,
    "ietf-yang-push:push-update": {
      "id": 1,
      "ietf-yp-observation:timestamp": "2024-11-02T10:30:52Z",
      "ietf-yp-observation:point-in-time": "current-accounting",
      "ietf-distributed-notif:message-publisher-id": 16974853,
      "datastore-contents": {
        "huawei-ifm:ifm": {
          "interfaces": {
            "interface": [
              {
                "name": "GigabitEthernet0/3/11",
                "mib-statistics": {
                  "receive-byte": "33448478274",
                  "send-byte": "20330971890",
                  "receive-packet": "75363920",
                  "send-packet": "103904697",
                  "receive-unicast-packet": "75340369",
                  "receive-multicast-packet": "23548",
                  "receive-broad-packet": "3",
                  "send-unicast-packet": "103904697",
                  "send-multicast-packet": "0",
                  "send-broad-packet": "0",
```

Push-Change-Update Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2024-11-02T10:38:52Z",
    "ietf-notification-sequencing:sysName": "ipf-zbl1243-r-daisy-21",
    "ietf-notification-sequencing:sequenceNumber": 69,
    "ietf-yang-push:push-change-update": {
      "id": 5,
      "ietf-yp-observation:timestamp": "2024-11-02T10:38:52Z",
      "ietf-yp-observation:point-in-time": "state-changed",
      "ietf-distributed-notif:message-publisher-id": 16974841,
      "datastore-changes": {
        "yang-patch": {
          "patch-id": 19,
          "edit": [
            {
              "edit-id": "edit1",
              "operation": "merge",
              "target": "/huawei-ifm:ifm/interfaces/interface[name=GigabitEthernet0/3/9]/dynamic",
              "value": {
                "dynamic": {
                  "link-status": "down"
                }
              }
            }
          ]
        }
      }
    }
  },
```

Huawei VRP – YANG Library

RPC <get> Request

```
<?xml version="1.0" encoding="UTF-8"?>
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">
  <get>
    <filter type="subtree">
      <yang-library xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-
library" />
    </filter>
  </get>
</rpc>
```

RPC reply

```
<?xml version="1.0" encoding="UTF-8"?>
<rpc-reply message-id="2" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <yang-library xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-library">
      <content-id>3880047851</content-id>
      <module-set>
        <name>config-module</name>
        <module>
          <name>openconfig-acl</name>
          <revision>2017-05-26</revision>
          <namespace>http://openconfig.net/yang/acl</namespace>
          <deviation>huawei-openconfig-acl-deviations-OC-NE-M2K-B</deviation>
        </module>
        <module>
          <name>openconfig-interfaces</name>
          <revision>2021-04-06</revision>
          <namespace>http://openconfig.net/yang/interfaces</namespace>
          <deviation>huawei-openconfig-interfaces-deviations-OC-NE-M2K-B</deviation>
          <augmented-by>huawei-openconfig-qos-ext</augmented-by>
          <augmented-by>openconfig-vlan</augmented-by>
          <augmented-by>openconfig-platform-transceiver</augmented-by>
          <augmented-by>openconfig-platform-port</augmented-by>
          <augmented-by>openconfig-if-tunnel</augmented-by>
          <augmented-by>openconfig-if-ip</augmented-by>
          <augmented-by>openconfig-if-ethernet</augmented-by>
          <augmented-by>openconfig-if-aggregate</augmented-by>
        </module>
```


6WIND VSR – Subscription Notifications

Subscription-Started Notification

```
{
  "ietf-notifications:notification": {
    "eventTime": "2024-11-02T16:20:16.989632098+00:00",
    "ietf-notification-sequencing:sysName": "daisy-ietf-ipf-
zbl1843-r-daisy-58",
    "ietf-notification-sequencing:sequenceNumber": 11008,
    "ietf-subscribed-notifications:subscription-started": {
      "id": 12345678,
      "ietf-yang-push:datastore": "ietf-datastores:operational",
      "ietf-yang-push:datastore-xpath-filter":
"/state/vrf/13vrf/interface/loopback/enabled",
      "transport": "ietf-udp-notif-transport:udp-notif",
      "encoding": "encode-json",
      "purpose": "send notifications",
      "ietf-distributed-notif:message-publisher-ids": [
        0
      ],
      "ietf-yang-push:on-change": {
        "sync-on-start": true
      },
      "ietf-yang-push-revision:module-version": [
        {
          "module-name": "vrouter-loopback",
          "revision": "2024-04-22"
        }
      ]
    }
  }
}
```

Subscription-Terminated Notification

```
{
  "ietf-notifications:notification": {
    "eventTime": "2024-11-02T16:25:19.639303753+00:00",
    "ietf-notification-sequencing:sysName": "daisy-ietf-ipf-
zbl1843-r-daisy-58",
    "ietf-notification-sequencing:sequenceNumber": 11014,
    "ietf-subscribed-notifications:subscription-terminated": {
      "id": 12345678,
      "reason": "no-such-subscription"
    }
  }
}
```

6WIND VSR – Push Notifications

Push-Update Notification

```
{
  "ietf-notifications:notification": {
    "eventTime": "2024-11-02T16:25:20.795276882+00:00",
    "ietf-notification-sequencing:sysName": "daisy-ietf-ipf-zbl1843-r-daisy-58",
    "ietf-notification-sequencing:sequenceNumber": 11016,
    "ietf-yang-push:push-update": {
      "id": 9,
      "datastore-contents": {
        "vrouters:state": {
          "vrf": [
            {
              "name": "main",
              "vrouters-interface:interface": {
                "physical": [
                  {
                    "name": "ens192",
                    "counters": {
                      "in-octets": "68993004950",
                      "in-unicast-pkts": "389889038",
                      "in-discards": "69240",
                      "in-errors": "0",
                      "out-octets": "65180577234",
                      "out-unicast-pkts": "330829342",
                      "out-discards": "0",
                      "out-errors": "0"
                    }
                  }
                ]
              }
            }
          ]
        }
      }
    },
    "ietf-distributed-notif:message-publisher-id": 0,
    "ietf-yp-observation-time:observation-time": "2024-11-02T16:25:20.795814217+00:00",
    "ietf-yp-observation-time:point-in-time": "current-state"
  }
}
```

Push-Change-Update Notification

```
{
  "ietf-notifications:notification": {
    "eventTime": "2024-11-02T16:21:17.889933885+00:00",
    "ietf-notification-sequencing:sysName": "daisy-ietf-ipf-zbl1843-r-daisy-58",
    "ietf-notification-sequencing:sequenceNumber": 11010,
    "ietf-yang-push:push-change-update": {
      "id": 8,
      "datastore-changes": {
        "yang-patch": {
          "patch-id": "patch-1",
          "edit": [
            {
              "edit-id": "edit-1",
              "operation": "replace",
              "target": "/vrouters:state/vrf[name='main']/13vrf[name='A9']/vrouters-interface:interface/vrouters-loopback:loopback[name='Loopback-A9']/enabled",
              "value": {
                "vrouters-loopback:enabled": "false"
              }
            }
          ]
        }
      }
    },
    "ietf-distributed-notif:message-publisher-id": 0,
    "ietf-yp-observation-time:observation-time": "2024-11-02T16:21:17.891267251+00:00",
    "ietf-yp-observation-time:point-in-time": "current-state"
  }
}
```

Udp-notif - Segmentation

72	2024-11-02 15:48:52.036189	203.0.113.91	100.105.33.20	UDPPBUCH.	636	20615	→ 10003	Len=592, JSO
73	2024-11-02 15:48:52.040739	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
74	2024-11-02 15:48:52.040770	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
75	2024-11-02 15:48:52.040780	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
76	2024-11-02 15:48:52.040789	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
77	2024-11-02 15:48:52.040944	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
78	2024-11-02 15:48:52.040974	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
79	2024-11-02 15:48:52.041195	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
80	2024-11-02 15:48:52.041551	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
81	2024-11-02 15:48:52.041573	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
82	2024-11-02 15:48:52.041583	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
83	2024-11-02 15:48:52.041875	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
84	2024-11-02 15:48:52.041910	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
85	2024-11-02 15:48:52.041922	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
86	2024-11-02 15:48:52.042223	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
87	2024-11-02 15:48:52.042247	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
88	2024-11-02 15:48:52.042257	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
89	2024-11-02 15:48:52.042408	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
90	2024-11-02 15:48:52.042422	203.0.113.91	100.105.33.20	UDPPBUCH.	589	20615	→ 10003	Len=545, JSO
91	2024-11-02 15:48:52.048785	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
92	2024-11-02 15:48:52.050550	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234
93	2024-11-02 15:48:52.054794	203.0.113.91	100.105.33.20	UDPPBUCH.	1278	20615	→ 10003	Len=1234

> Frame 90: 589 bytes on wire (4712 bits), 589 bytes captured (4712 bits)	0000 00 00 00 01 00 06 bc 4a 56 85 be a2 00 00 08 00J V.....
> Linux cooked capture v1	0010 45 00 02 3d be dc 00 00 7e 11 b9 fa cb 00 71 5b E.....q[
> Internet Protocol Version 4, Src: 203.0.113.91, Dst: 100.105.33.20	0020 64 69 21 18 77 27 13 02 29 06 44 71 10 02 21 ..P.....jO...i
> User Datagram Protocol, Src Port: 20615, Dst Port: 10003	0030 01 5c 01 23 00 00 00 04 01 04 00 23 73 2c 22 6e \.....\.....
> UDP-Notif Protocol, Publisher: 3244032291, Msg ID: 4	0040 74 75 22 38 31 35 31 34 2c 22 73 75 62 2d 69 6e tu":1514,"sub-in
001... = Header Version: 1	0050 74 65 72 66 61 63 65 2d 6d 74 75 2d 6f 76 65 72 terface-mtu-over
....0001 = Media Type Space: standard media types (0)	0060 80 65 61 64 22 38 30 2c 22 6c 32 2d 74 72 61 65 head":0,"22-tran
Header Length: 16	0070 72 70 6f 72 72 2d 38 65 63 6c 73 65 2d 22 62 6d port":0,"size":0,
Message Length: 545	0080 66 64 77 69 64 74 68 22 38 31 30 30 30 30 30 30 bandwidth":1000000
Publisher ID: 3244032291	0090 30 2c 22 62 61 6e 64 77 69 64 74 68 36 34 2d 62 0,"bandwidth64-b
Message ID: 4	00a0 69 74 22 38 22 31 30 30 30 30 30 30 2d 7d 2c 2d it":"io 000000"},
Option: Segmentation, Segment Number: 17 (last)	00b0 70 2d 69 64 74 65 72 66 61 63 65 2d 66 61 6d 61 "interf ace-name
Option Type: Segmentation (1)	00c0 22 38 22 54 65 6e 47 69 64 75 2f 30 2f 30 2f 30 2f "Tengi ge0/0/0/
Option Length: 4	00d0 37 22 2c 22 69 6e 74 65 72 66 61 63 65 22 3a 22 7","interf ace:"
Segment Number: 17	00e0 54 65 6e 47 69 67 45 30 2f 30 2f 30 2f 37 22 2c Tengige 0/0/77,"
Last Segment: yes (1)	00f0 25 78 70 65 2d 38 22 49 46 54 5f 54 45 46 4e 47 type":"IGTENG
UDP-Notif Payload (529 bytes)	0100 45 54 48 45 52 4e 45 54 2c 22 73 74 61 74 65 55 ETHERNET","state
JavaScript notation	0110 22 3a 22 69 6d 2d 73 74 61 74 65 2d 61 64 6d 69 "":"in-st ate.admi
	0120 2d 64 6f 77 6e 22 2c 22 61 63 74 75 61 6c 2d 0-n-down","actual
	0130 73 74 61 74 65 22 38 22 69 6d 2d 73 74 61 74 65 state":"in-sta
	0140 61 64 6d 6e 2d 64 6f 77 6e 22 2c 22 62 68 6d admin-down","li
	0150 66 65 2d 73 74 61 74 65 22 38 22 69 6d 2d 73 74 ne-state ":"in-st
	0160 61 74 65 2d 61 64 6d 69 6e 2d 64 6f 77 6e 22 2c ate-admi n-down","
	0170 22 61 63 74 75 61 6c 2d 6c 69 6e 65 2d 73 74 61 "actual- line-sta
	0180 74 65 22 38 22 69 6d 2d 73 74 61 74 65 2d 61 64 "type-st ring":
	0190 6d 69 6e 2d 64 6f 77 6e 22 2c 22 65 6e 63 61 70 min-down","encap
	01a0 73 75 6c 61 74 69 6f 6e 22 38 22 65 74 68 65 72 sulation ":"ether
	01b0 22 2c 22 65 6e 63 61 70 73 75 6c 61 74 69 6f 6e "","encap sulation
	01c0 2d 74 72 70 65 2d 73 74 72 69 6e 69 22 38 2d 41 type-st ate:"
	01d0 52 58 41 22 2c 2d 6d 74 75 22 38 31 35 31 34 25 RPA","mt u":1514,
	01e0 22 73 75 62 2d 69 6e 74 65 72 66 61 63 65 2d 6d "sub-int erface-m
	01f0 74 75 2d 6f 76 65 72 68 65 61 64 22 3a 30 2c 22 22 over-ead":0,"
	0200 6c 32 2d 74 72 61 6e 73 70 6f 72 74 72 2d 38 66 61 22-trans port":0,"
	0210 6c 73 65 2c 22 62 61 6e 64 77 69 64 74 68 22 3a lse,"band width":
	0220 31 30 30 30 30 30 30 2c 22 62 61 6e 64 77 69 00000000,"bandwi
	0230 64 74 68 36 34 2d 62 69 74 22 3a 22 31 30 30 30 dth64-bit":"1000
	0240 30 30 30 30 22 7d 5d 7d 7d 7d 7d 7d 7d 0000"}]]]]]]

Frame (589 bytes)	Unnamed (21235 bytes)
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YANG-Push Publisher

- Huawei VRP
- 6WIND VSR
- Cisco IOS XR

YANG-Push Receiver

- Pmacct
<https://github.com/pmacct/pmacct>
- Netgauze
<https://github.com/NetGauze/NetGauze>

Tools

- Wireshark dissector
<https://github.com/network-analytics/ietf-network-analytics-document-status/tree/main/121/Hackathon>

YANG-Push Implementation Status

IETF 121 – MVP 1

	6WIND VSR	Huawei VRP	Cisco IOS XR	Open- Source
RFC 8639 YANG-Push Subscription	✓	P	P	
RFC 8641 YANG-Push Notification	✓	P	✓	
draft-ietf-netconf-udp-notif	✓	✓	✓	✓
draft-ietf-netconf-yang-notifications-versioning	✓	✓	✓	
draft-tgraf-netconf-notif-sequencing	✓	✓	✓	
draft-tgraf-netconf-yang-push-observation-time	✓	✓	✓	
RFC 7895 YANG Library		✓		
RFC 8525 YANG Library (NMDA)	✓		✓	
draft-ietf-netconf-yang-library-augmentation		P		✓
RFC 9196 System and Notification Capabilities				
draft-netana-netconf-notif-envelope				



Green marked describes new capability at IETF 121. "P" to partially implemented.

YANG-Push Implementation Status

IETF 121 – MVP 2

	6WIND VSR	Huawei VRP	Cisco IOS XR	Open- Source
draft-ietf-netconf-distributed-notif	✓	✓		
RFC 9254 CBOR				
RFC 6347/RFC 9147 DTLS				



Green marked describes new capability at IETF 121. "P" to partially implemented

YANG-Push Implementation Status

IETF 121 – MVP 3

	6WIND VSR	Huawei VRP	Cisco IOS XR	Open- Source
RFC 8641 on-change subscriptions	✓	✓	P	
draft-netana-netconf-yp-transport-capabilities				

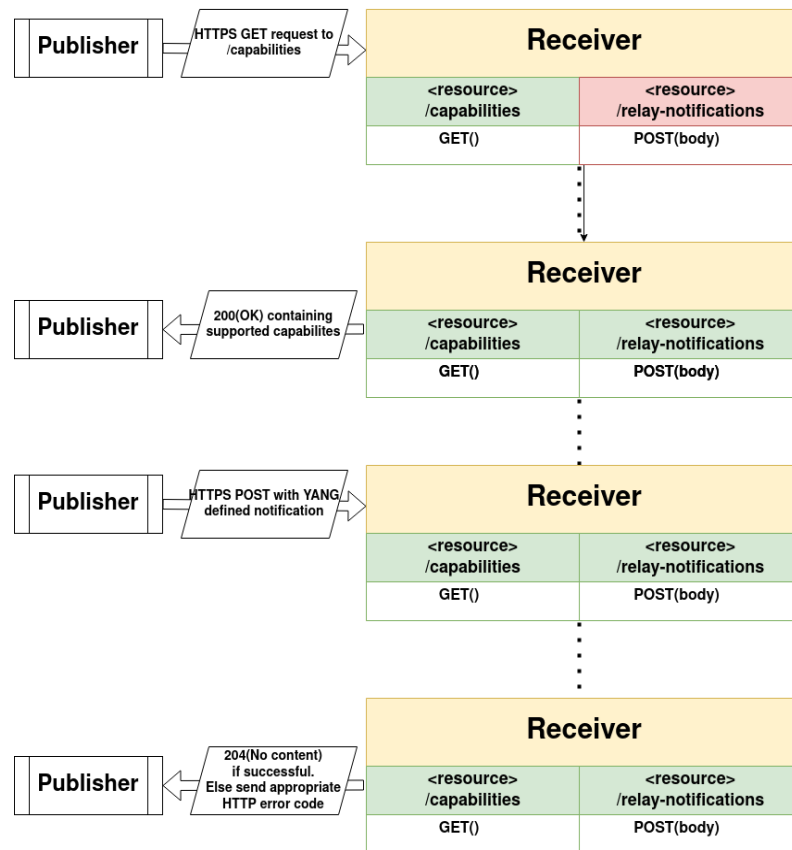


Green marked describes new capability at IETF 121. "P" to partially implemented

Implementation of An HTTPS-based Transport for YANG Notifications

draft-ietf-netconf-https-notif-15

- A protocol for **sending asynchronous event notifications** similar to notifications defined in **NETCONF Event Notifications** [RFC5277], but over **HTTPS**.
- Interactions will occur between a publisher which must be a "server" (e.g., a NETCONF or RESTCONF server) and a **receiver** (which **need not** be a NETCONF or RESTCONF server).
- **Extended Implementation in C [*]** : [github link](#)
- **Python Implementation** : [github link](#)
 - Flask : **synchronous** event handler (WSGI)
 - Fast API : **asynchronous** event handler (ASGI)
- Can be made multithreaded using Gunicorn
- Added **validation** for capability data at collector and relay notification from publisher either by integrating with **sysrepo** as a object datastore or using **libyang** for validation
- Added dynamic **response handling** based on request covering **edge cases**
- Team : Siddharth Bhat, Vartika T R, Hayyan A, Bharadwaja Meherrushi Ch, Prof Mohit P T ;Draft authors : Mahesh Jethanandani, Kent Watsen



* Purple marked describes extended implementation originally implemented by Alex Huang Feng.

* green marked describes implementation from scratch

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- Thomas Graf – Swisscom
- Ahmed Elhassany – Swisscom (remote)
- Uwe Storbeck – Swisscom (remote)

