

An Architecture for YANG-Push to Message Broker **Integration**

draft-ietf-nmop-yang-message-broker-integration-06

Motivation and architecture of a native
YANG-Push notifications and YANG Schema integration
into Message Broker and YANG Schema Registry

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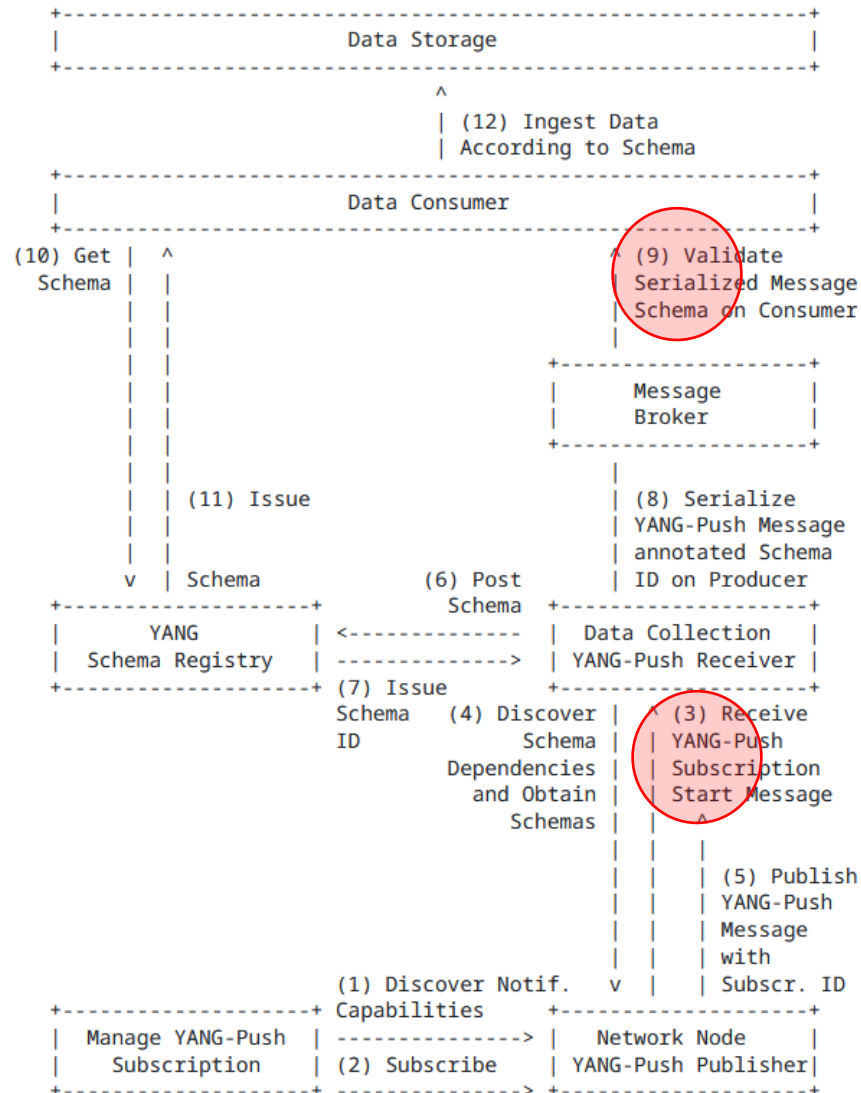
6. February 2025

Agenda Items

- Document Changes in -06 and next steps
- Changes in draft-ietf-netconf-yang-notifications-versioning-07
- IETF 122 hackathon activities
- Related YANG-Push integration and specification gaps status

Elements of the Architecture

Workflow Diagram



- **Network Orchestration** subscribes to YANG datastore.
- **Network Node** informs Data Collection on subscription state and publishes YANG metrics with YANG-Push.
- **Data Collection** obtains for each subscription the YANG module dependencies and the YANG modules on the network node, registers it in the YANG Schema Registry and prefixes the forwarded YANG notifications with the obtained schema ID.
- **YANG Schema Registry** issues for a Message Broker subject a schema ID for each new schema tree, compares a new schema tree with an existing and versions it.
- **Data Consumer** consumes YANG-Push notifications from Message Broker, obtains schema tree from YANG schema registry, validates YANG notifications against schema and uses schema to populate into database table.

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Status, Summary and Next steps

Changes in -06

- [draft-netana-netconf-notif-envelope-02](#), [draft-netana-netconf-yp-transport-capabilities-01](#) and [draft-ietf-netconf-yang-notifications-versioning-07](#) (details on slide 5) changes are incorporated.
- Terminology section has been updated with data product terms from Data Mesh.
- [YANG-Push Receiver section](#) describes now how YANG-Push schema changes are being detected by incorporating xpath, sub-tree filter module name, revision, revision-label or **YANG Library content-id**.

A change in xpath or sub-tree filter or module name in the subscription state change notifications indicates that the subscribed path has changed. A change in revision indicates that the version of the YANG module of the subscribed path has changed, where revision-label indicates wherever the revision was backward compatible or not. YANG Library content-id changes indicates that there were potential semantic changes in the augmented or imported yang modules of the subscribed xpath or sub-tree. If no change to previous subscription state is observed, step 4 can be omitted.

- [YANG Data Consumer section](#) describes how notification message loss and reordering is being detected and how it contributes to Data Mesh data product excellence.

By tracking the YANG-Push notification sequence-number for a given hostname as defined in Section 3.4 of [I-D.netana-netconf-notif-envelope] loss can be recognized across the YANG data processing chain. By taking the event-time in the YANG-Push notification header and the time the YANG-Push notification messages was consumed into account, the serialization delay between YANG-Push publisher and YANG Data Consumer can be measured. The loss rate and delay for a given hostname can be used as a Service Level Indicator for the YANG data product in the Data Mesh [Deh22].

Next Steps

- **Looking forward for review and comments.**
- **Message Broker message schema document will be published before IETF 122.**

Support of **Versioning** in YANG Notifications Subscription

For subscription state change notification messages

```
module: ietf-yang-push-revision
  augment /sn:establish-subscription/sn:input:
    +---w module-version-config* [module-name]
      +---w module-name          yang:yang-identifier
      +---w revision?            rev:revision-date-or-label
      +---w revision-label?      ysver:version

  augment /sn:subscription-started:
    +--ro module-version* [module-name]
    |   {yang-push-revision-supported}?
    | +--ro module-name          yang:yang-identifier
    | +--ro revision            rev:revision-date
    | +--ro revision-label?     ysver:version
    +--ro yang-library-content-id? -> /yanglib:yang-library/content-id
      {yang-push-revision-supported}?
    {
      "ietf-notification:notification": {
        "eventTime": "2023-03-25T08:30:11.22Z",
        "ietf-notification-sequencing:sysName": "example-router",
        "ietf-notification-sequencing:sequenceNumber": 1,
        "ietf-subscribed-notification:subscription-started": {
          "id": 6666,
          "ietf-yang-push:datastore": "ietf-datastores:operational",
          "ietf-yang-push:datastore-xpath-filter": "/if:interfaces",
          "ietf-yang-push-revision:revision": "2014-05-08",
          "ietf-yang-push-revision:module-name": "ietf-interfaces",
          "ietf-yang-push-revision:revision-label": "",
          "ietf-yang-push-revision:yang-library-content-id": "1",
          "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": 100
          }
        }
      }
    }
  }
```

- **Network operators need to control semantics in its data processing pipeline. That includes YANG-Push.**
 - This is today only possible during YANG-Push subscription but not when nodes are being upgraded or when messages are being published for configured subscription.
 - [draft-ietf-netconf-yang-notifications-versioning](#) extends the YANG push subscription and publishing mechanism defined in [RFC 8641](#):
 - **By adding the ability to subscribe to a specific revision or latest-compatible-semversion of one or more yang modules.**
 - **By extending the YANG push Subscription State Change Notifications Message** so that the YANG push receiver learns beside the xpath and the sub-tree filter also the yang module name, revision, revision-label and the yang-library-content-id.
- With YANG Library content-id a YANG-Push receiver is now able to detect changes in the YANG library. This includes also the imported YANG modules of the subscribed xpath.
- Extends [RFC 9196](#) defined subscription-capabilities with a **yang-push-module-revision-supported** leaf.

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IETF 122 Hackathon

Validate Configured Subscription YANG-Push Publisher Implementations

► Champion(s)

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► Draft Specifications

<https://datatracker.ietf.org/doc/html/rfc8639> 
<https://datatracker.ietf.org/doc/html/rfc8641> 
<https://datatracker.ietf.org/doc/html/rfc9196> 
<https://datatracker.ietf.org/doc/html/draft-netana-netconf-notif-envelope> 
<https://datatracker.ietf.org/doc/html/draft-ietf-netconf-yang-notifications-versioning> 
<https://datatracker.ietf.org/doc/html/draft-ietf-netconf-udp-notif> 
<https://datatracker.ietf.org/doc/html/draft-ietf-netconf-distributed-notif> 
<https://datatracker.ietf.org/doc/html/draft-netana-netconf-yp-transport-capabilities> 


► Project Info

Validates and verify 3 YANG-Push vendor implementations in the area of:

► Subscription automation

Discover YANG-Push systems and notifications capabilities and configure periodical and on-change subscriptions with netconf.

► Notification integration

Validate subscription state change and push-update and push-change-update notifications for [draft-ietf-nmop-yang-message-broker-integration](#)  integration.

► Configured subscription transport integration

Validate [draft-ietf-netconf-udp-notif](#)  and [draft-ietf-netconf-distributed-notif](#)  packet format on the wire.

► Repository

<https://github.com/network-analytics/ietf-network-analytics-document-status/tree/main/122/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.



Address YANG Specification and Integration Gaps

Aiming for an automated data processing pipeline

YANG Specifications Gaps:

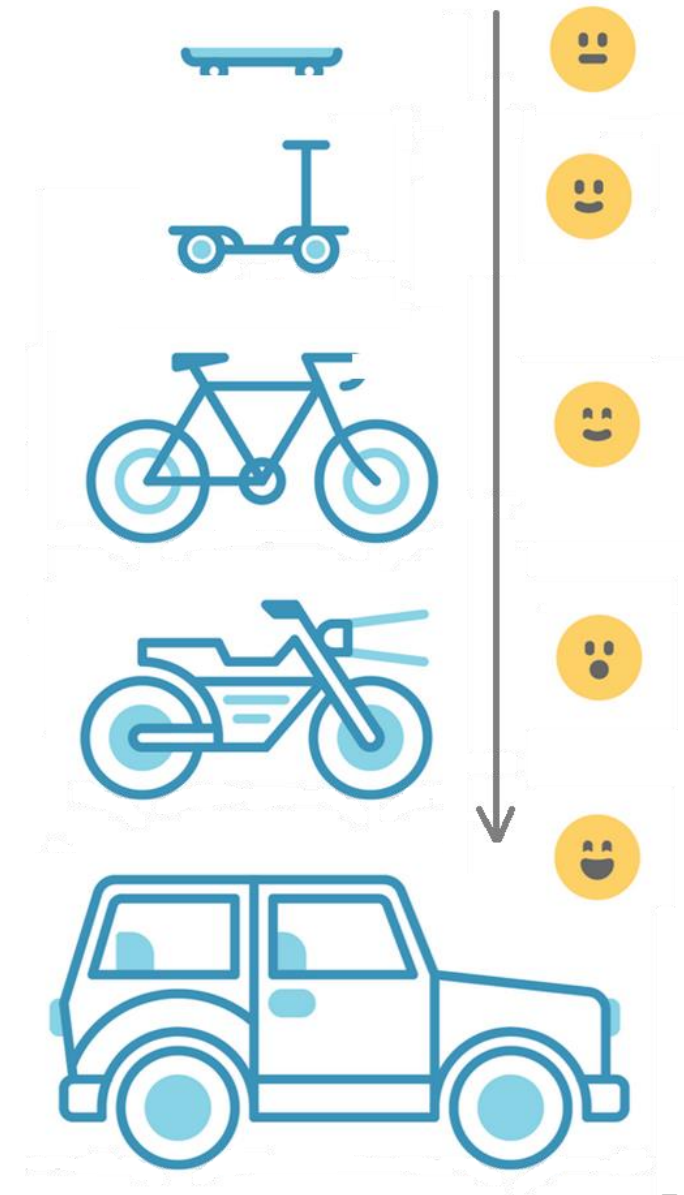
- Extensible YANG model for YANG-Push Notifications
[draft-netana-netconf-notif-envelope](#)
- YANG Notification Transport Capabilities
[draft-netana-netconf-yp-transport-capabilities](#)
- Validating anydata in YANG Library context
[draft-aelhassany-anydata-validation](#)

YANG Integration Gaps:

- ~~Support of Network Observation Timestamping in YANG Notifications~~
~~[draft-tgraf-netconf-yang-push-observation-time](#)~~
- Support of Versioning in YANG Notifications Subscription
[draft-ietf-netconf-yang-notifications-versioning](#)
- Augmented-by Addition into the IETF-YANG-Library
[draft-ietf-netconf-yang-library-augmentation](#)

YANG Simplification:

- YANG-Push Operational Data Observability Enhancements
[draft-wilton-netconf-yp-observability](#)



BACKUP

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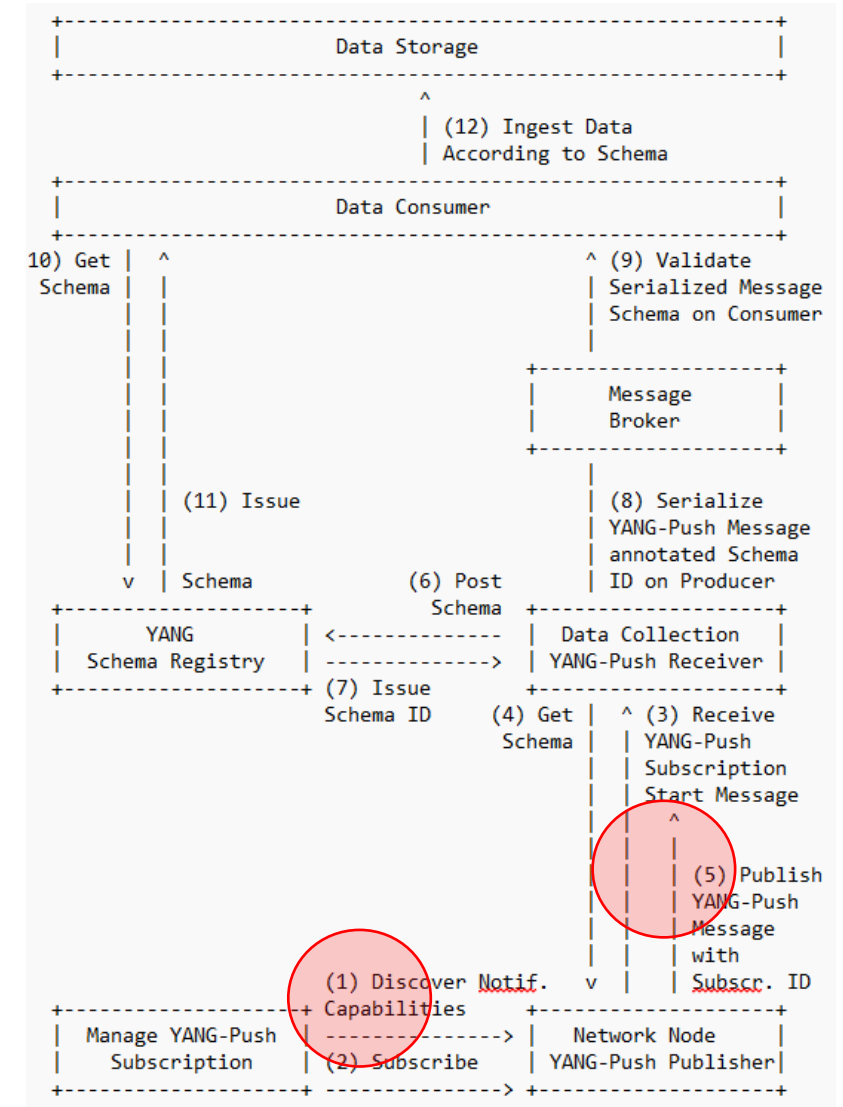
Status, Summary and Next steps

Changes in -05

- Section 4.1 covers now
 - [draft-netana-netconf-yp-transport-capabilities](#) which helps the NETCONF, RESTCONF client performing YANG-Push subscription to discover the YANG-Push transport, encoding and security capabilities of the YANG-Push publisher.
 - [draft-netana-netconf-notif-envelope](#) defines a new extensible notification structure, defined in YANG, for use in YANG-Push Notification messages enabling any YANG compatible encodings such as XML, JSON or CBOR. Replaces and consolidates draft-ahuang-netconf-notif-yang and draft-tgraf-netconf-notif-sequencing based on the outcome of the last NETCONF interim.
- Milestones for IETF 121 and 122 have been added.
- Open Points and YANG-Push notification examples have been updated reflecting the changes from [draft-netana-netconf-yp-transport-capabilities](#) and [draft-netana-netconf-notif-envelope](#).

Next Steps

- Looking forward for review and comments.



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Implementation Status

