

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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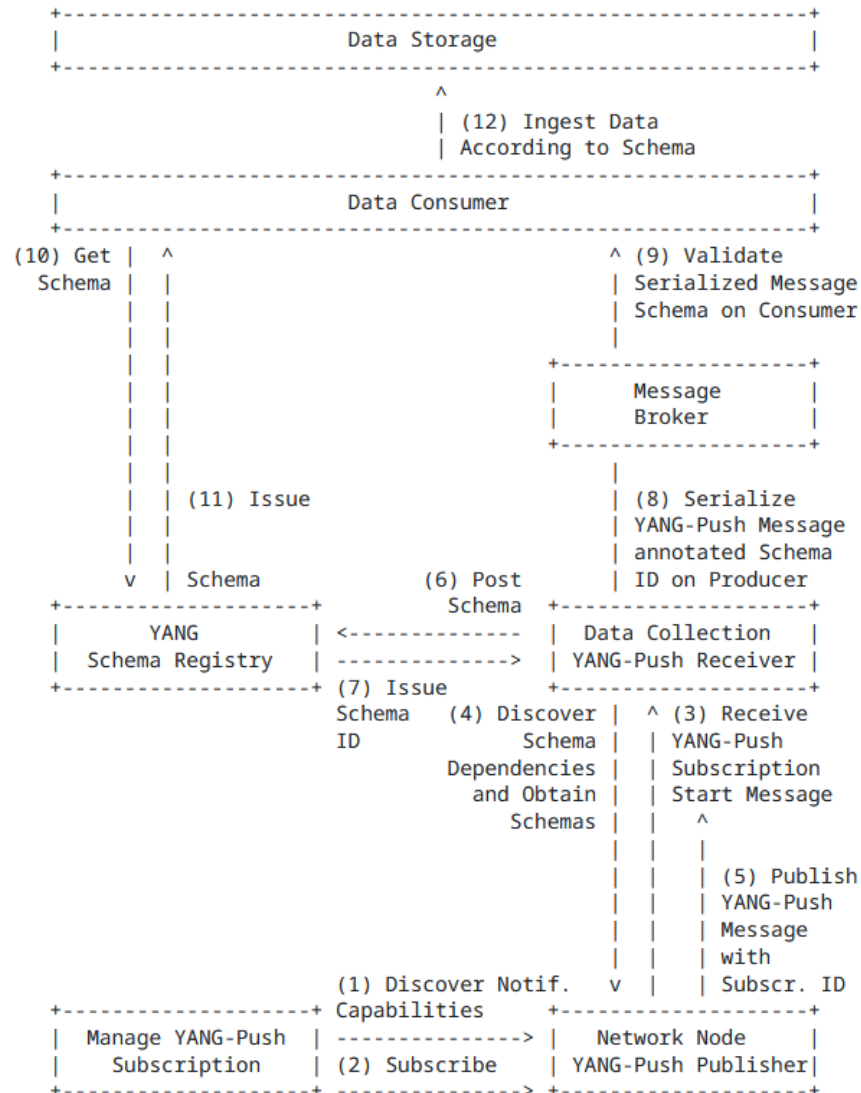
7. February 2025

Agenda Items

- Architecture Overview and Document Relationships
- 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

Document Relationships



4.1. YANG-Push Subscription

Thanks to [RFC 9196](#) based YANG modules describing capabilities for systems and notifications, transport ([draft-netana-netconf-yp-transport-capabilities](#)), notification extensions ([draft-netana-netconf-notif-envelope](#)) and supported xpaths can be discovered.

4.2. YANG-Push Publisher

For configured subscriptions, [udp-notif](#), [distributed-notif](#) and [https-notif](#) are the [RFC 8639](#), [RFC 8641](#) based YANG-Push transport protocols. [draft-netana-netconf-notif-envelope](#) provides the notification header with hostname, sequence and observation timestamp extensions.

4.3. YANG-Push Receiver

Discovers subscription state changes by detecting changes in xpath/sub-tree, module name, revision, revision-label and YANG library content-id defined in [draft-ietf-netconf-yang-notifications-versioning](#) and discovers YANG schema tree through [YANG library](#) with [ietf-netconf-yang-library-augmentedby](#) extension.

4.6. YANG Message Broker Consumer

Validates YANG notifications against schema. Anydata described in [Section 7.10 of RFC 7950](#), validation described in [draft-aelhassany-anydata-validation](#).

4.7. YANG Data Consumer

Thanks to hostname, sequence-number and event-time from [draft-netana-netconf-notif-envelope](#), loss and serialization delay can be measured.

4.8. YANG Data Storage

Metrics can be indexed in timeseries database thanks to observation timestamp defined in [draft-netana-netconf-notif-envelope](#).

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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:

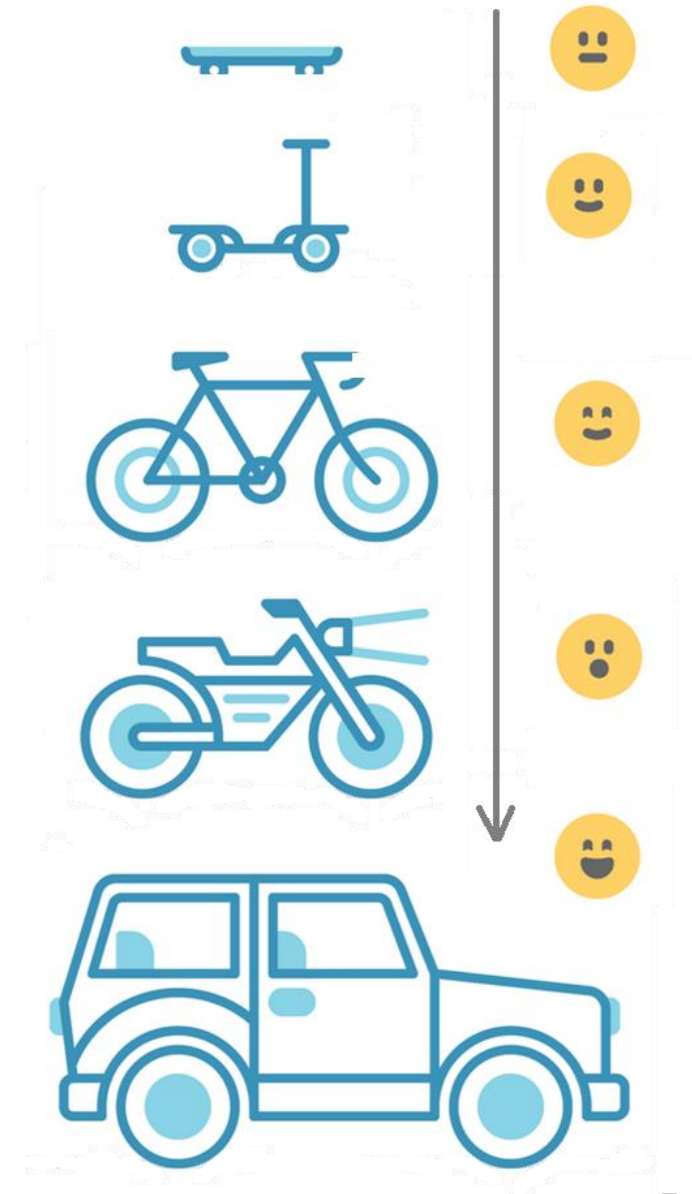
- Extensible YANG model for YANG-Push Notifications
[draft-netana-netconf-notif-envelope](#)
- YANG Notification Transport Capabilities
[draft-netana-netconf-yp-transport-capabilities](#)
- Validating anydata in YANG Library context
[draft-aelhassany-anydata-validation](#)

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

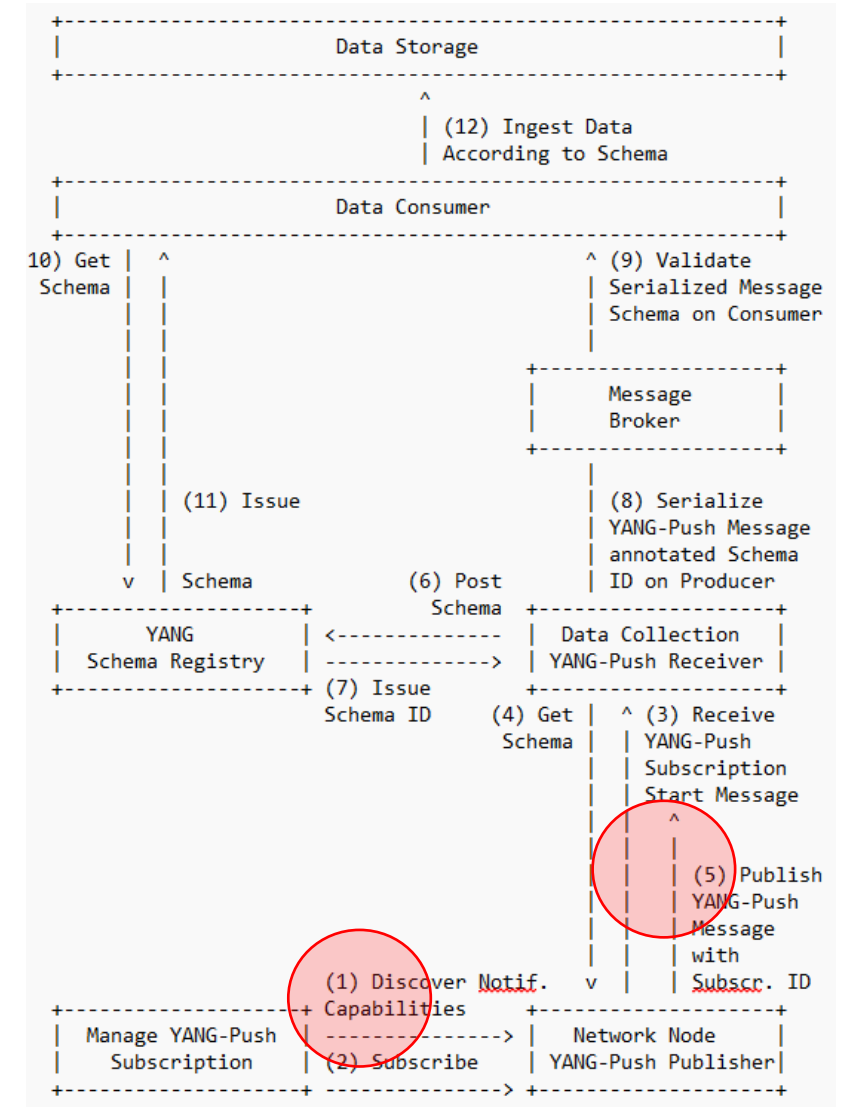
Status, Summary and Next steps

- Section 4.1 covers now

- 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

