Evolution of the Subscription & Event Notification Drafts

IETF #97 Seoul
17-Nov-2016

NETCONF Charter Item 6:
“Enhance RFC 5277 with the ability to delete subscriptions without closing the client session, to modify existing subscriptions, and to have multiple subscriptions on a established client session. These changes should not affect older clients that do not support these particular subscription requirements. The RPCs and the data models in RFC 5277 should be converted to YANG

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Dezign™ Team
Event & YANG Subscriptions
Context

Subscribing to updates
• YANG Datastores
• NETCONF Notifications/Events
• Statically configured or dynamically signaled

Streaming of updates
• Customizable to recipient
• On-change, Periodic, Event
Event & YANG Subscriptions
4 Drafts

| Subscription Mechanism: | Subscribing to YANG datastore push updates
draft-ietf-netconf-yang-push-04 |
|------------------------|--------------------------------------------------------------------------------|
|                        | Subscribing to Event Notifications
draft-ietf-netconf-rfc5277bis-01                                      |
| Choice of Transports:  | NETCONF Support for Event Notifications
draft-ietf-netconf-netconf-event-notifications-01 |
|                        | RESTCONF & HTTP Transport for Event Notifications
draft-ietf-netconf-restconf-notif-01                                      |

Github repository [https://github.com/netconf-wg](https://github.com/netconf-wg)

- Minutes, Meeting Recordings, Terminology, Issues
4 Drafts in Layered Framework

Application

Subscriber

Receiver

Subscription Mgmt

Dynamic Configured Subscription Mtc
Admission Control OAM Negotiation
Stream Discovery

Transport Session

Update Packaging and Flow Control

TLS SSH
HTTP2 HTTP1.1
gRPC Restconf Netconf

Encoding

Thrift CBOR GPB JSON XML YANG

Filtering Access Control On-Change Periodic

Event Notification Generation

Event Generation

NETCONF Stream custom Running Config Startup Config Candidate Config Intended Config Control Plane Applied Operational State
Updates since IETF #96

- 04 revision
- Updates-not-sent flag added for incomplete push update
- Not-notifiable extension added for items where on-change not viable (via Metadata)
- Moved start/stop into rfc5277bis, added anchor time for periodic
- Dampening period is subscription, not per object
- Asynch refresh of full set of on-change objects
- Editorial updates, and material moved to 5277bis
Feedback Request #1
Simplifying streams and filter types

• Optional: Custom platform streams.
  – If used reduces set of objects for existing filters.
• Future: filters based on the intersection of OpState datastore fetch + Subtree + Metadata
  – can be used to accomplish objectives of streams
  – Predefined filters that reference a target datastore or filter contents based on metadata
• Request: Agree with above? If/when OpState adopted, charter new work so that corresponding filter-types exist. Who is interested in this topic?
Feedback Request #2
Topic Filtering

• YANG 1.1 identityrefs tagging existing objects
  – Could provide IETF standard inheritance
  – More efficient than content filtering
  – Could be used in conjunction with existing filters

• WG interest in classifying Model, Subtree, & Leaf via independent categorizations such as Event-type & severity?

```yang
extension event-topic {
  argument id {
    identity topic-id {
      ...
    }
  }
}

grouping topic-filter {
  leaf-list topic-filter {
    type identityref {
      base topic-id;
    }
  }
  augment "/notif-bis:establish-subscription/notif-bis:input" { uses topic-filter; }
```
## Feedback Request #3
Optional Update-Number to Detect Loss/Duplication

- TCP can’t cover all cases for update loss & duplication of a push update.
- Request: Should we allow push-change-updates to include current & previous update number
  - Performance concern? Should this go in transport draft?

### Detection Method

<table>
<thead>
<tr>
<th>Lifecycle of a pushed change</th>
<th>Publisher</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object change</strong></td>
<td>TCP</td>
<td></td>
</tr>
<tr>
<td>Loss / Duplication prior to update bundling is invisible</td>
<td>On TCP Socket $\Delta$: Ignore, OAM error to receiver, or suspend</td>
<td>On receipt of OAM: Ignore, Replay, or Resynch On receipt of suspend: do nothing</td>
</tr>
<tr>
<td><strong>Update bundling</strong></td>
<td>Update Number</td>
<td></td>
</tr>
</tbody>
</table>
### Simplify scope: Document and frame other follow-on work and potential augmentations

- Request #1: Future Filter Types, OpState, Metadata
- Request #2: Topic Definition and Filtering

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<table>
<thead>
<tr>
<th>Feedback Request #3</th>
<th>Should we include push-change-update number?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Partial push of periodic updates in a subscription?</td>
</tr>
<tr>
<td>Open</td>
<td>YANG-Push statistics (e.g. counters of object changes, of update messages)</td>
</tr>
</tbody>
</table>
Updates since IETF #96

- -00 & -01 revisions
- YANG Model changes.
  - New groupings for subscription info to allow, restrict what is modifiable via RPC.
  - Removed notifications for adding and removing receivers of configured subscriptions.
  - Collapsed data model into single YANG module (ietf-event-notifications)
    - ietf-5277-netmod and ietf-5277-netconf were removed from notif-netconf draft
    - May need to “reverse” the split and pull out portions required for RFC 5277 backward compatibility (need separate namespace), e.g. create-subscription RPC
- Expanded/renamed definitions from event server to publisher, and client to subscriber as applicable.
- Cleaned-up wording, terminology, and redundancy
## Next steps

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>open</td>
<td>Scrub for completeness of error codes and diagnostics</td>
</tr>
<tr>
<td>pending</td>
<td>Split the current single model into two to keep the existing namespace for</td>
</tr>
<tr>
<td></td>
<td>backwards compatibility with 5277.</td>
</tr>
<tr>
<td>pending</td>
<td>Move 5277 backwards compatibility objects into notif-netconf</td>
</tr>
<tr>
<td>pending</td>
<td>Definition of NETCONF &amp; vendor custom stream types</td>
</tr>
<tr>
<td>pending</td>
<td>‘Test-only’ option to see if a subscription might be established</td>
</tr>
</tbody>
</table>
Updates since IETF #96

- -01 revision
- Single subscription goes to single HTTP2 stream.
- Updated call flows. Extensively.
- Shift to HTTP2 where available
  - SSE only used with Restconf and HTTP1.1 Dynamic Subscriptions
- Many clean-ups of wording and terminology
Feedback Request #4:
HTTP2 compatibility with GRPC

Agree that adopting messages/exchanges for seamless transport over GRPC implementations? Who can provide extra eyes to validate proposed solution?

Restconf / HTTP2
## Next Steps

<table>
<thead>
<tr>
<th>Feedback</th>
<th>HTTP2 transport message compatibility with GRPC (need extra set of eyes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>open</td>
<td>Do we include 3rd party signaled subscriptions within models that need to be supported generically, or for a particular type of transport.</td>
</tr>
</tbody>
</table>
Updates since IETF #96

- -00 and -01 revisions
- Added Call Home in solution for configured subscriptions.
- Clarified support for multiple subscription on a single session. No need to support multiple create-subscription.
- Added mapping between terminology in [yang-push] and [RFC6241].
- Other editorial improvements.
Feedback Request #5
Ask Receiver to Call Home via a known Port

• Recommendation
  – For configured subscription, if no NETCONF session live to Receiver then Publisher initiates a Call Home to the Receiver on address and well-known port for subscription. Once session is established, Publisher sends "subscription-started" notification.

• Assumptions
  – Receiver is aware that calls on the configured port are intended only for pushing notifications.
  – Receiver is ready to accept notifications on the session as soon as it is established.
<table>
<thead>
<tr>
<th>Feedback Request #5</th>
<th>Should Receiver Call Home to a well known Receiver Port?</th>
</tr>
</thead>
<tbody>
<tr>
<td>pending</td>
<td>Move create subscription RFC to this document as it will only be used for NETCONF legacy.</td>
</tr>
<tr>
<td>pending</td>
<td>Express filter in JSON should be documented.</td>
</tr>
</tbody>
</table>
Join the Dezign™ Team

Andy Bierman  
Sharon Chisholm  
Alexander Clemm  
Yan Gang  
Peipei Guo  
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Guangying Zheng (Walker)

<table>
<thead>
<tr>
<th>Meetings since IETF 96 Berlin (Wed 8AM Pacific)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Nov-2016</td>
</tr>
<tr>
<td>26-Oct-2016</td>
</tr>
<tr>
<td>19-Oct-2016</td>
</tr>
<tr>
<td>12-Oct-2016</td>
</tr>
<tr>
<td>5-Oct-2016</td>
</tr>
<tr>
<td>28-Sep-2016</td>
</tr>
<tr>
<td>14-Sep-2016</td>
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<tr>
<td>7-Sep-2016</td>
</tr>
<tr>
<td>31-Aug-2016</td>
</tr>
<tr>
<td>26-Aug-2016</td>
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<tr>
<td>17-Aug-2016</td>
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<tr>
<td>10-Aug-2016</td>
</tr>
<tr>
<td>4-Aug-2016</td>
</tr>
<tr>
<td>27-Jul-2016</td>
</tr>
</tbody>
</table>
Thank you!
## Functional Partitioning

<table>
<thead>
<tr>
<th>Subscription</th>
<th>Event Notifications</th>
<th>YANG Datastore Push</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of Subscription</td>
<td>Dynamic</td>
<td>Dynamic and Configured</td>
</tr>
<tr>
<td>Subscriptions per Session</td>
<td>one</td>
<td>many</td>
</tr>
<tr>
<td>Negotiation</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>RPCs</td>
<td>create</td>
<td>establish, modify, delete</td>
</tr>
<tr>
<td>Control Plane Notifications</td>
<td>None</td>
<td>started, suspended, resumed, terminated, modified</td>
</tr>
<tr>
<td>Data Plane Notifications</td>
<td>notification</td>
<td>+subscription-id, push-update, push-change-update</td>
</tr>
</tbody>
</table>

### Transport

| NETCONF | Yes |
| RESTConf, HTTP, HTTP2 | No | Yes |

**Legend**

- YANG Datastore Push
- Subscriptions for Event Notifications
- NETCONF Transport for Event Notifications
- RESTCONF Transport for Event Notifications

Compatibility with RFC-5277
## 4 Drafts Functional Partitioning

<table>
<thead>
<tr>
<th><strong>YANG Datastore Push</strong> (includes functions above Base Subscription Draft):</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Datastore on-change and periodic triggers</td>
</tr>
<tr>
<td>• YANG filters per RFC6241</td>
</tr>
<tr>
<td>• Authorization model per object</td>
</tr>
<tr>
<td>• Negotiation</td>
</tr>
<tr>
<td>• Push-update, Push-change-update</td>
</tr>
<tr>
<td>• New stream types &amp; stuff</td>
</tr>
<tr>
<td>• Prioritization</td>
</tr>
</tbody>
</table>

### Subscriptions for Event Notifications (Base Subscription Draft)

- Support for many subscriptions / transport
- Dynamic & Configured state machines
- Multiple configured receivers
- New stream types?
- Authorization model per stream
- RPCs: Establish, modify, delete
- Error responses (under error-info?)
- Notifications: started, suspended, resumed, terminated, modified

<table>
<thead>
<tr>
<th><strong>NETCONF Transport for Event Notifications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Transport mapping</td>
</tr>
<tr>
<td>• 5277 mode</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>RESTCONF &amp; HTTP Transport for Event Notifications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Transport mappings</td>
</tr>
<tr>
<td>• Subscriber/receiver different</td>
</tr>
<tr>
<td>• Heartbeats and clean-up</td>
</tr>
<tr>
<td>• Subscription to HTTP2 stream</td>
</tr>
</tbody>
</table>