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Adaptive Subscription to YANG Notification
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Abstract

This document defines a YANG data model and associated mechanism to enable adaptive subscriptions to YANG notifications. The publisher can dynamically adjust the periodic update interval based on the evaluation of pre-configured conditions (e.g., thresholds or expressions). This allows for finer-grained telemetry by increasing update frequency when certain criteria are met, and reducing it otherwise.

Editorial Note (To be removed by RFC Editor)

Note to the RFC Editor: This section is to be removed prior to publication. Please also remove Section 6.

This document contains placeholder values that need to be replaced with finalized values at the time of publication. This note summarizes all of the substitutions that are needed. No other RFC Editor instructions are specified elsewhere in this document.

Please apply the following replacements:

* XXXX --> the assigned RFC number for this document

* 2025-05-21 --> the actual date of the publication of this document

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

This Internet-Draft will expire on 12 April 2026.

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1. Introduction

YANG-Push subscriptions [RFC8641] allow subscriber applications to request a continuous customized stream of updates from a YANG datastore without needing to poll. It defines a mechanism (i.e., update trigger) to determine when an update record needs to be generated. Two types of subscription are introduced in [RFC8641], distinguished by how updates are triggered: periodic and on-change.

* Periodic subscription allows subscribed data to be streamed to the destination at a configured fixed time interval;

* On-change subscription allows update to be triggered whenever a change in the subscribed information is detected.

However, in some deployments involving an increased data collection rate or "on-change" subscription to push updates that change frequently, it becomes more likely that both clients and servers could be temporarily overwhelmed with a burst of streamed data, and network and computation resources could be excessively consumed. Therefore, it may be expensive to continuously monitor operational data at a high collection rate, and on-change subscriptions are only suitable for data that changes infrequently and may not be supported by all implementations or every data object. Conversely, if a stream of data is collected at a lower rate or some low priority data is allowed to be dropped, insufficient data might not be able to detect and diagnose service problems.

A client might choose to monitor the operational state and send a request to modify the data collection rate on the server as needed. But how often the client evaluates if the modification of the data

collection rate is required highly depends on the current collection rate, collecting a stream of data at a low rate prevents the subscriber from capturing sufficient data for timely decision-making. In addition, when tens of thousands of network devices need to be managed, frequent follow-up modification requests are prone to errors.

This document defines a YANG data model and associated mechanism that enable adaptive subscription to YANG notifications. Servers can be configured with multiple different period intervals and corresponding period update conditions which allow servers/publishers to automatically switch to different period intervals according to the network condition changes without the interaction with the client for policy update instructions. Applying adaptive subscription allows publishers to adjust the subscription period dynamically based on pre-defined threshold for finer-grained network telemetry data sent to receivers.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

The following terms are defined in [RFC5277], [RFC7950], [RFC8342], [RFC8639], [RFC8641] and are not redefined here:

* Event
* Client
* Configuration
* Configured subscription
* Configuration datastore
* Notification message
* Publisher
* Receiver
* Subscriber
* Subscription

* On-change subscription

* Periodic subscription

* Selection filter

This document defines the following term:

Adaptive Subscription: A subscription that specifies subscription period update policy on the servers when the subscription is initialized and allows servers/publishers to automatically switch to different period intervals according to network condition changes without interacting with the client for update policy instructions.

1.2. Experimental Considerations

The YANG data model and associated mechanism detailed in this document are designated as experimental. The experiment aims to explore the use of XPath condition expressions as defined in "eval-expression" parameter to determine the period interval with which to report updates. Some RPC failures specified in Section 2.2 may serve as safeguards against the experiment inadvertently "leaking out" into the unexpected operational environment. Additional implementations would be necessary in the future to assess the scalability, stability, and effectiveness of the proposed solution in the document. Feedback garnered from deployments will be crucial in determining whether this specification merits progression from Experimental to the IETF Standards Track.

2. Solution Overview

2.1. Adaptive Subscription Parameters

Adaptive subscription can be implemented using either dynamic or configured subscription. Regardless of the type of adaptive subscription, triggered updates always occur at the boundaries of specified time intervals when the corresponding trigger condition is evaluated to be satisfied. These boundaries can be calculated from the following parameters:

* "name": represents the unique name of each adaptive period.

* "eval-expression": represents a standard XPath evaluation expression (Section 6.4 of [RFC7950]) that is applied against the targeted data node, which is used to trigger/control the update interval switching within the server. It follows the rules defined in Section 3.4 of [XPATH1.0] and contains a comparison of

a targeted node instance to the specific threshold in the XPath format. Different from selection filter defined in [RFC8641], it monitors a specific data node instance change and evaluates the trigger condition associated with the specified threshold value to be true or false using XPath rules and does not affect the event/ update record output generation from a publisher. The updates are only pushed as the corresponding period interval when the XPath expression is evaluated to "true".

The represented expression defined in "eval-expression" is evaluated in the following XPath context:

- The set of namespace declarations is the set of prefix and namespace pairs for all YANG modules implemented by the server, where the prefix is the YANG module name and the namespace is as defined by the "namespace" statement in the YANG module.

- If the leaf is encoded in XML, all namespace declarations in scope on the "eval-expression" leaf element are added to the set of namespace declarations. If a prefix found in the XML is already present in the set of namespace declarations, the namespace in the XML is used.

- The set of variable bindings is empty.

- The function library is the core function library defined in [XPATH1.0] and the function defined in Section 10 of [RFC7950].

- The context node is the root node in the accessible tree which is the operational state data in the server.

When specified, multiple XPath evaluation criteria inside "adaptive-periodic" container MUST be mutually exclusive. For the cases where the "eval-expression" parameter refers to multiple list/leaf-list instances, XPath abbreviated syntax can be used to identify a particular instance, e.g., to represent a comparison for a leaf in a list entry:

```
/if:interfaces/if:interface[if:name="eth0"]/if:in-errors>1000.
```

The server MUST convert the XPath evaluation expression defined in "eval-expression" to a boolean value and internally apply the "boolean" function defined in Section 4.3 in [XPATH1.0] if the evaluated result is not a boolean value. It MUST evaluates to "false" if the target node instance to be compared is deleted. Only if the XPath expression is evaluated to "true", does the publisher switch to the corresponding period with which push updates are reported.

* "eval-interval": defines how often the XPath condition expression as defined in "eval-expression" is evaluated to decide whether to switch to another period interval. If an "eval-interval" is not provided, then the "eval-interval" is set with the minimum time interval that the server is able to detect wherever changes to the targeted data node occur.

* "period": defines the duration between push updates, in units of 0.01 seconds. The "period" has the same definition as the yp:period for periodic subscription defined in [RFC8641], while it must be present with the "eval-expression" parameter so that update interval can be switched based on trigger conditions indicated by the "eval-expression" parameter;

* "anchor-time": update intervals fall on the points in time that are a multiple of a "period" from an "anchor-time". If an "anchor-time" is not provided, then the "anchor-time" MUST be set with the creation time of the initial update record inside each periodic timeframe. The "anchor-time" parameter, together with the "eval-interval" value, specifies when the initial update is to be pushed within each adaptive periodic timeframe.

Note that the adaptive subscription may not be supported by every YANG datastore node. The solution presented in this document augments the "ietf-notification-capabilities" YANG module defined in [RFC9196] to enable a subscriber to discover adaptive subscription capabilities. A publisher MAY decide to simply reject an adaptive subscription with "adaptive-unsupported" (defined in Section 2.2) if the subscription contains selected data nodes for which adaptive subscription is not supported.

2.2. RPC Failures

RPC error responses from the publisher are used to indicate a rejection of an RPC for any reason. In addition to the RPC failures defined in [RFC8639] and [RFC8641], this document introduces following RPC errors for "establish-subscription" and "modify-subscription" RPCs.

```
establish-subscription
------------------------------
adaptive-unsupported
xpath-evaluation-unsupported
evaluation-interval-unsupported
multi-xpath-criteria-conflict

modify-subscription
------------------------------
xpath-evaluation-unsupported
evaluation-interval-unsupported
multi-xpath-criteria-conflict
```

The "adaptive-unsupported" RPC error is used to indicate that the adaptive subscription is not supported for the targeted set of data nodes that are selected by the filter.

The "xpath-evaluation-unsupported" RPC error is used to indicate that a server failed to parse syntax defined in "eval-expression". The failure can be caused by either a syntax error or some XPath 1.0 syntax not supported against the specific data node.

The "evaluation-interval-unsupported" RPC error is used to indicate that the requested XPath evaluation interval represented by "eval-interval" is too short. Hints suggesting alternative intervals may be returned as supplemental information.

The "multi-xpath-criteria-conflict" error is used to indicate that the multiple XPath evaluation criteria represented by "eval-expression" are evaluated as conflicting, i.e., more than one condition expressions may be evaluated to "true" at the same time.

For an example of how the above RPC errors can be returned, see the "xpath-evaluation-unsupported" error response illustrated in Appendix C.3.

Note that existing RPC errors defined in [RFC8639] and [RFC8641] are still supported by this document. For example, if any configured period for adaptive subscription is not supported by the publisher, a "period-unsupported" error response could be used.

2.3. Subscription State Change Notifications

This document reuses subscription state change notifications and mechanisms from [RFC8639] and [RFC8641]. Notifications "subscription-started" and "subscription-modified" have been augmented to include the adaptive subscription specific parameters.

2.4. Notifications for Adaptive Subscribed Content

This document also defines a new subscription state change notification called "adaptive-period-update", to indicate that an adaptive subscription period interval has been switched based on its trigger condition. Similar to subscription state change notifications defined in [RFC8639], the adaptive period update notification cannot be dropped or filtered out, it cannot be stored in replay buffers, and it is delivered only to impacted receivers of a subscription. The identification of the adaptive update notification is easy to separate from other notification messages using the YANG extension "subscription-state-notification" defined in [RFC8639]. This extension tags a notification as a subscription state change notification.

The elements in the "adaptive-period-update" notification include:

* A subscription ID of the subscription for which the update record was generated.

* A "period" that defines the duration between push updates, the period can be changed based on trigger conditions.

* A "period-update-time" that designates a timestamp when the server starts to switch to another period interval because the evaluated "eval-expression" result changed.

* A chunk of data defined as an anydata node [RFC7950] called "satisfied-criteria-data" to include the instance nodes and values specified in "eval-expression" that satisfy the condition and thus trigger the period interval switching within the server. This node could be useful for troubleshooting.

* A selection filter to identify YANG nodes of interest in a datastore. Filter contents are specified via a reference to an existing filter or via an in-line definition for only that subscription based on XPath Section 6.4 of [RFC7950] evaluation criteria. Referenced filters allow an implementation to avoid evaluating filter acceptability during a dynamic subscription request. The "case" statement differentiates the options. Note that filter contents are not affected by the "eval-expression" parameter defined by the update trigger.

3. Adaptive Subscription Data Model

This document defines a YANG data model named "ietf-adaptive-subscription" which augments the "update-trigger" choice defined in the "ietf-yang-push" module [RFC8641] with subscription configuration parameters that are specific to a subscriber’s adaptive subscription.

In addition to subscription state notifications defined in [RFC8639] and notifications for subscribed content defined in [RFC8641], "ietf-adaptive-subscription" module also defines "adaptive-period-update" notification to report the update interval change.

Additionally, it augments the "ietf-notification-capabilities" data model defined in [RFC9196] so that the adaptive subscription capabilities could be discovered beforehand.

The YANG module specified in this document is compliant with Network Management Datastore Architecture (NMDA) [RFC8342].

3.1. YANG Tree Diagram

The following tree diagrams [RFC8340] provide an overview of the data model for "ietf-adaptive-subscription" module.

```
module: ietf-adaptive-subscription
  augment /sn:subscriptions/sn:subscription/yp:update-trigger:
    +--:(adaptive-periodic) {adaptive-subscription}?
       +--rw adaptive-periodic
          +--rw periodic* [name]
             +--rw name              string
             +--rw eval-expression   yang:xpath1.0
             +--rw eval-interval?    yp:centiseconds
             +--rw period            yp:centiseconds
             +--rw anchor-time?      yang:date-and-time
  augment /sn:establish-subscription/sn:input/yp:update-trigger:
    +--:(adaptive-periodic) {adaptive-subscription}?
       +-- adaptive-periodic
          +-- periodic* [name]
             +-- name              string
             +-- eval-expression   yang:xpath1.0
             +-- eval-interval?    yp:centiseconds
             +-- period            yp:centiseconds
             +-- anchor-time?      yang:date-and-time
  augment /sn:modify-subscription/sn:input/yp:update-trigger:
    +--:(adaptive-periodic) {adaptive-subscription}?
       +-- adaptive-periodic
          +-- periodic* [name]
             +-- name              string
```

```
            +-- eval-expression    yang:xpath1.0
            +-- eval-interval?     yp:centiseconds
            +-- period             yp:centiseconds
            +-- anchor-time?       yang:date-and-time
  augment /sn:subscription-started/yp:update-trigger:
    +--:(adaptive-periodic) {adaptive-subscription}?
       +-- adaptive-periodic
          +-- periodic* [name]
             +-- name               string
             +-- eval-expression    yang:xpath1.0
             +-- eval-interval?     yp:centiseconds
             +-- period             yp:centiseconds
             +-- anchor-time?       yang:date-and-time
  augment /sn:subscription-modified/yp:update-trigger:
    +--:(adaptive-periodic) {adaptive-subscription}?
       +-- adaptive-periodic
          +-- periodic* [name]
             +-- name               string
             +-- eval-expression    yang:xpath1.0
             +-- eval-interval?     yp:centiseconds
             +-- period             yp:centiseconds
             +-- anchor-time?       yang:date-and-time
  augment /sysc:system-capabilities/notc:subscription-capabilities:
    +--ro adaptive-notifications-supported?   notification-support
  augment /sysc:system-capabilities/sysc:datastore-capabilities
            /sysc:per-node-capabilities
            /notc:subscription-capabilities:
    +--ro adaptive-notifications-supported?   notification-support

  notifications:
    +---n adaptive-period-update {adaptive-subscription}?
       +--ro id?
       |       sn:subscription-id
       +--ro period                                yp:centiseconds
       +--ro period-update-time?
       |       yang:date-and-time
       +--ro satisfied-criteria-data?              <anydata>
       +--ro datastore                             identityref
       +--ro (selection-filter)?
          +--:(by-reference)
          |  +--ro selection-filter-ref
          |          selection-filter-ref
          +--:(within-subscription)
             +--ro (filter-spec)?
                +--:(datastore-subtree-filter)
                |  +--ro datastore-subtree-filter?   <anydata>
                |          {sn:subtree}?
                +--:(datastore-xpath-filter)
```

```
                      +--ro datastore-xpath-filter?     yang:xpath1.0
                              {sn:xpath}?
```

3.2. The "ietf-adaptive-subscription" Module

This YANG module imports modules from [RFC6991],[RFC8639], [RFC8641], and [RFC9196].

```
<CODE BEGINS> file "ietf-adaptive-subscription@2025-05-21.yang"
module ietf-adaptive-subscription {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription";
  prefix adaps;

  import ietf-subscribed-notifications {
    prefix sn;
    reference
      "RFC 8639: Subscription to YANG Notifications";
  }
  import ietf-yang-push {
    prefix yp;
    reference
      "RFC 8641: Subscription to YANG Notifications for Datastore
       Updates";
  }
  import ietf-yang-types {
    prefix yang;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-system-capabilities {
    prefix sysc;
    reference
      "RFC 9196: YANG Modules Describing Capabilities for
       Systems and Datastore Update Notifications";
  }
  import ietf-notification-capabilities {
    prefix notc;
    reference
      "RFC 9196: YANG Modules Describing Capabilities for
       Systems and Datastore Update Notifications";
  }

  organization
    "IETF NETCONF (Network Configuration) Working Group";
  contact
    "WG Web:   <http://tools.ietf.org/wg/netconf>
     WG List:  <netconf@ietf.org>
```

```
        Author: Qin Wu
              <mailto:bill.wu@huawei.com>
        Author: Peng Liu
              <mailto: liupengyjy@chinamobile.com>
        Author: Qiufang Ma
              <mailto: maqiufang1@huawei.com>
        Author: Wei Wang
             <mailto: wangw36@chinatelecom.cn>
        Author: Zhixiong Niu
             <mailto: Zhixiong.Niu@microsoft.com>";
      description
        "This module extends the YANG data module defined in
         YANG-push to enable the subscriber's adaptive
         subscriptions to a publisher's event streams with various
         different period intervals to report updates.

         Copyright (c) 2025 IETF Trust and the persons identified
         as authors of the code. All rights reserved.

         Redistribution and use in source and binary forms, with
         or without modification, is permitted pursuant to, and
         subject to the license terms contained in, the Revised
         BSD License set forth in Section 4.c of the IETF Trust's
         Legal Provisions Relating to IETF Documents
         (https://trustee.ietf.org/license-info).

         This version of this YANG module is part of RFC XXXX
         (https://www.rfc-editor.org/info/rfcXXXX); see the RFC
         itself for full legal notices.

         The key words 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL',
         'SHALL NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED',
         'NOT RECOMMENDED', 'MAY', and 'OPTIONAL' in this document
         are to be interpreted as described in BCP 14 (RFC 2119)
         (RFC 8174) when, and only when, they appear in all
         capitals, as shown here.";

      revision 2025-05-21 {
        description
          "Initial revision";
        reference
          "RFC XXXX: Adaptive Subscription to YANG Notification.";
      }

      feature adaptive-subscription {
        description
          "This feature indicates that adaptive-subscriptions are
           supported.";
```

```
  }

  identity adaptive-unsupported {
    base sn:establish-subscription-error;
    description
      "Adaptive-subscription is not supported for the targeted set
       of objects that are selectable by the filter.";
  }

  identity xpath-evaluation-unsupported {
    base sn:establish-subscription-error;
    base sn:modify-subscription-error;
    description
      "Unable to parse the XPath evaluation criteria defined in
       'eval-expression' because of a syntax error or some XPath
       1.0 syntax not supported against the specific data node.";
  }

  identity evaluation-interval-unsupported {
    base sn:establish-subscription-error;
    base sn:modify-subscription-error;
    description
      "The requested XPath evaluation interval represented by
       'eval-interval' is too short. Hints suggesting alternative
       intervals may be returned as supplemental information.";
  }

  identity multi-xpath-criteria-conflict {
    base sn:establish-subscription-error;
    base sn:modify-subscription-error;
    description
      "Multiple XPath evaluation criteria represented by
       'eval-expression' are evaluated as a conflict. I.e.,
       more than one condition expression is evaluated to
       'true'.";
  }

  grouping adaptive-subscription-modifiable {
    description
      "This grouping describes the datastore-specific adaptive
       subscription conditions that can be changed during the
       lifetime of the subscription.";
    container adaptive-periodic {
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The publisher supports
         to switch to different period intervals adaptively based
```

```
           on pre-defined condition expressions.";
         list periodic {
           key "name";
           description
             "A list of adaptive period which defines a push update
              interval and trigger conditions to switch to the update
              interval for sending an event record to the subscriber.";
           leaf name {
             type string {
               length "1..64";
             }
             description
               "The unique name of adaptive period.";
           }
           leaf eval-expression {
             type yang:xpath1.0;
             mandatory true;
             description
               "A standard XPath evaluation expression that is applied
                against the targeted data node, which is used to
                trigger/control the update interval switching within
                the server. The updates are only pushed as the
                corresponding period interval when the XPath expression
                is evaluated to 'true'.

                The expression is evaluated in the following XPath
                context:
                - The set of namespace declarations is the set of
                  prefix and namespace pairs for all YANG modules
                  implemented by the server, where the prefix is the
                  YANG module name and the namespace is as defined by
                  the 'namespace' statement in the YANG module.

                - If the leaf is encoded in XML, all namespace
                  declarations in scope on the 'eval-expression' leaf
                  element are added to the set of namespace
                  declarations.  If a prefix found in the XML is
                  already present in the set of namespace
                  declarations, the namespace in the XML is used.

                - The set of variable bindings is empty.

                - The function library is the core function library
                  defined in XPath1.0 and the functions defined in
                  Section 10 in RFC 7950.

                - The context node is the root node in the accessible
                  tree which is the operational state data in the
```

```
                server.";
          reference
            "XML Path Language (XPath) Version 1.0
             (https://www.w3.org/TR/1999/REC-xpath-19991116)
             RFC 7950: The YANG 1.1 Data Modeling Language,
                       Section 10";
        }
        leaf eval-interval {
          type yp:centiseconds;
          description
            "How often the Xpath condition expression is evaluated
             to decide whether to switch to another period
             interval.";
        }
        leaf period {
          type yp:centiseconds;
          mandatory true;
          description
            "Duration of time that should occur between periodic
             push updates, in units of 0.01 seconds.";
        }
        leaf anchor-time {
          type yang:date-and-time;
          description
            "Designates a timestamp before or after which a series
             of periodic push updates is determined.  The next
             update will take place at a point in time that is a
             multiple of a period from the 'anchor-time'.
             For example, for an 'anchor-time' that is set for the
             top of a particular minute and a period interval of a
             minute, updates will be sent at the top of every
             minute that this subscription is active.";
        }
      }
    }
  }

  augment "/sn:subscriptions/sn:subscription/yp:update-trigger" {
    description
      "This augmentation adds additional subscription parameters
       that apply specifically to adaptive subscription.";
    case adaptive-periodic {
      if-feature "adaptive-subscription";
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The periodicity of
         these notifications are determined by adaptive criteria.";
```

```
      uses adaptive-subscription-modifiable;
    }
  }

  augment "/sn:establish-subscription/sn:input/yp:update-trigger" {
    description
      "This augmentation adds additional establish-subscription
       parameters that apply specifically to datastore updates to
       RPC input.";
    case adaptive-periodic {
      if-feature "adaptive-subscription";
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The periodicity of
         these notifications are determined by adaptive criteria.";
      uses adaptive-subscription-modifiable;
    }
  }

  augment "/sn:modify-subscription/sn:input/yp:update-trigger" {
    description
      "This augmentation adds additional modify-subscription
       parameters that apply specifically to datastore updates to
       RPC input.";
    case adaptive-periodic {
      if-feature "adaptive-subscription";
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The periodicity of
         these notifications are determined by adaptive criteria.";
      uses adaptive-subscription-modifiable;
    }
  }

  augment "/sn:subscription-started/yp:update-trigger" {
    description
      "This augmentation adds additional adaptive subscription
       parameters to the notification that a subscription has
       started.";
    case adaptive-periodic {
      if-feature "adaptive-subscription";
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The periodicity of
         these notifications are determined by adaptive criteria.";
```

```
      uses adaptive-subscription-modifiable;
    }
  }

  augment "/sn:subscription-modified/yp:update-trigger" {
    description
      "This augmentation adds additional adaptive subscription
       parameters to the notification that a subscription has been
       modified.";
    case adaptive-periodic {
      if-feature "adaptive-subscription";
      description
        "The publisher is requested to periodically notify the
         receiver regarding the current values of the datastore
         as defined by the selection filter. The periodicity of
         these notifications are determined by adaptive criteria.";
      uses adaptive-subscription-modifiable;
    }
  }

  notification adaptive-period-update {
    if-feature "adaptive-subscription";
    sn:subscription-state-notification;
    description
      "This notification is sent to indicate that an adaptive
       subscription period interval has been switched based its
       triggered condition.";
    leaf id {
      type sn:subscription-id;
      description
        "This references the subscription that drove the
         notification to be sent.";
    }
    leaf period {
      type yp:centiseconds;
      mandatory true;
      description
        "New duration of time that should occur between periodic
         push updates, in units of 0.01 seconds.";
    }
    leaf period-update-time {
      type yang:date-and-time;
      description
        "Designates a timestamp when the server starts to switch
         to another period interval because the evaluated
         'eval-expression' expression result changed.";
    }
    anydata satisfied-criteria-data {
```

```
        description
          "The corresponding instance nodes and values specified in
           'eval-expression' that satisfy the condition and thus
           trigger the update interval switching within the server.";
      }
      uses yp:datastore-criteria {
        refine "selection-filter/within-subscription" {
          description
            "Specifies the selection filter and where it originated
             from.  If the 'selection-filter-ref' is populated, the
             filter in the subscription came from the 'filters'
             container.  Otherwise, it is populated in-line as part
             of the subscription itself.";
        }
      }
    }

    grouping adaptive-subscription-capabilities {
      description
        "Capabilities related to adaptive subscription and
         notification.";
      typedef notification-support {
        type bits {
          bit config-changes {
            description
              "The publisher is capable of sending
               notifications for 'config true' nodes for the
               relevant scope and subscription type.";
          }
          bit state-changes {
            description
              "The publisher is capable of sending
               notifications for 'config false' nodes for the
               relevant scope and subscription type.";
          }
        }
        description
          "Type for defining whether 'on-change' or
           'periodic' notifications are supported for all data nodes,
           'config false' data nodes, 'config true' data nodes, or
           no data nodes.

           The bits config-changes or state-changes have no effect
           when they are set for a datastore or for a set of nodes
           that does not contain nodes with the indicated config
           value.  In those cases, the effect is the same as if no
           support was declared.  One example of this is indicating
           support for state-changes for a candidate datastore that
```

```
            has no effect.";
        }

        leaf adaptive-notifications-supported {
          type notification-support;
          description
            "Specifies whether the publisher is capable of sending
             'adaptive' notifications for the selected data nodes,
             including any subtrees that may exist below them.";
        }
      }

      augment "/sysc:system-capabilities"
            + "/notc:subscription-capabilities" {
        description
          "Add system level capabilities of adaptive subscription.";
        uses adaptive-subscription-capabilities;
      }

      augment
        "/sysc:system-capabilities/sysc:datastore-capabilities/"
      + "sysc:per-node-capabilities/notc:subscription-capabilities" {
        description
          "Add node-level capabilities of adaptive subscription.";
        uses adaptive-subscription-capabilities;
      }
    }
    <CODE ENDS>
```

4. IANA Considerations

4.1. Updates to the IETF XML Registry for New YANG Module

IANA is requested to register the following URI in the "ns" registry within the "IETF XML Registry" group [RFC3688].

```
---------------------------------------------------------------------
   URI: urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription
   Registrant Contact: The IESG.
   XML: N/A, the requested URI is an XML namespace.
---------------------------------------------------------------------
```

4.2. Updates to the YANG Module Names Registry for New YANG Module

IANA is requested to register the following YANG module in the "YANG Module Names" registry [RFC6020] within the "YANG Parameters" registry group.

```
------------------------------------------------------------------
   Name:       ietf-adaptive-subscription
   Maintained by IANA? N
   Namespace:  urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription
   Prefix:     adaps
   Reference:  RFC XXXX
------------------------------------------------------------------
```

5. Operational Considerations

5.1. XPath Complexity Evaluation

YANG-Push subscriptions [RFC8641] specify selection filters to identify targeted YANG datastore nodes and/or datastore subtrees for which updates are to be pushed. In addition, it specifies update policies which contain conditions that trigger generation and pushing of new update records. To support a subscriber's adaptive subscription defined in this document, the trigger condition also uses similar selection filters to express a standard XPath evaluation criterion that is applied against the targeted data node(s).

The subscriber must take care about the following complex XPath evaluation criteria design and usage, although they have already been well supported by the Section 3.4 of [XPATH1.0]:

* Apply XPath evaluation criteria on any arbitrary "config true" and "config false" data nodes;

* Have more than one target data node selection and operation (e.g., addition, subtraction, division and multiplication) in a single XPath evaluation criterion;

* Target any type of node value in the XPath evaluation criterion, e.g., string, int64, uint64, and decimal64 types;

* Both objects in the XPath evaluation criterion to be compared are node-sets;

* Targeted data to be compared are in different data types, e.g., one is an integer, the other is a string.

As described in Section 6.4 of [RFC7950], Numbers in XPath 1.0 are IEEE 754 [IEEE754-2008] double-precision floating-point values; some values of int64, uint64, and decimal64 types cannot be exactly represented in XPath expressions.

If targeted data to be compared are in different data types, a conversion function is needed to convert different data types into numbers.

If both objects in XPath evaluation criteria to be compared are node-sets, more computation resources are required which add complexity.

To reduce these complexities, the following implementation and use principles are RECOMMENDED:

* XPath evaluation criteria are applied against a minimal set of data nodes in the data model, the minimal set of data nodes can be advertised using "ietf-notification-capabilities" module defined in [RFC9196];

* Both targets in the XPath evaluation criterion to be compared are in the same data type;

* One target to be compared in the XPath evaluation criterion is a leaf/leaf-list data node with numerical data type (e.g., signed/unsigned integer) and the other is a numerical threshold value.

If a server receives an XPath evaluation criterion with some XPath syntax unsupported against the specific targeted data node, an RPC error with "xpath-evaluation-unsupported" MUST be returned.

5.2. Threshold Selection for XPath Evaluation

Determining the threshold used in an XPath expression criterion can be challenging for subscribers sometimes. Generally, the selection of a threshold should be based on the impact of the targeted node on monitored service/application and experience from deployments. In extreme cases, setting a too high or low threshold may make adaptive subscription degenerated to periodic subscription. Sometimes the threshold needs to be adjusted during the lifecycle of an adaptive subscription, depending on factors like historical fluctuation range, how rapid the targeted value of the node changes, distribution characteristics of the targeted node value and even the generated volume of telemetry traffic.

6. Implementation Status

Note to the RFC Editor: Please remove this section before publication, as well as the reference to [RFC7942].

This section records the status of known implementations of the mechanism defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in

[RFC7942]. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

According to [RFC7942], "this will allow reviewers and working groups to assign due consideration to documents that have the benefit of running code, which may serve as evidence of valuable experimentation and feedback that have made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit".

There is at least one known implementation, the details of which are as follows.

* Organization: Huawei Technologies Co.,Ltd.

* Implementation: https://github.com/IETF-Hackathon/ietf113-project-presentations/blob/main/ietf-hackathon-adaptive-subscription.pdf

* Description: gRPC-based adaptive telemetry to collect data from Access Points (APs) in a campus network.

* Level of maturity: prototype.

* Coverage: The "ietf-adaptive-subscription" module with the evaluation criteria supporting a comparison of a limited set of targeted node instances to the threshold in the XPath format.

* Contact: maqiufang1@huawei.com

* Test Scenario: The radio signals of an AP can cover only a limited area, Wi-Fi roaming is what happens when a wireless client disconnects from one AP because it receives weak signals (i.e., the Received Signal Strength Indicator (RSSI) lower than the threshold) and connects to another as the client moves from the coverage area of an AP to that of another AP. One objective of telemetry in this scenario is to collect the RSSI values of a specific client as it moves and detect real-time Wi-Fi roaming events. We also collect the bytes sent from the AP uplink (which is also identified as "upbytes") so as to detect the possible uplink congestion. Three data collection ways are evaluated:

- Periodic subscriptions with periods of 2 seconds for RSSI collection and 1 minute for upbytes collection.

- Periodic subscriptions with periods of 30 seconds for RSSI collection and 10 minutes for upbytes collection.

- Adaptive subscriptions:

  o For the RSSI collection, if the RSSI value is greater than or equal to -65 dB, switch to 30 seconds for publication; otherwise, switch to 2 seconds for publication; threshold detection occurs every 2 seconds.

  o For the upbytes collection, if the upbytes value is greater than or equal to 60000 bytes, switch to 1 minute for publication; otherwise, switch to 10 minutes for publication; threshold detection occurs every minute.

* Implementation experience: The results show adaptive telemetry can greatly reduce the data volume but still ensure network events can be captured at the same time. When the specific value does not reach the threshold, a lower frequency data publication can greatly reduce the amount of collected data; when it does exceed the threshold, the device detects the change and switches to a higher frequency data publication so that sufficient data will not be missed to diagnose network events. Adaptive subscription can be served as a compromise between data management resource cost and data fidelity for network diagnosis. However, the selection of threshold is crucial to adaptive subscription and should be based on operational experience and adjusted as needed.

7. Security Considerations

This section is modeled after the template described in Section 3.7 of [I-D.ietf-netmod-rfc8407bis].

The "ietf-adaptive-subscription" YANG module defines a data model that is designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] and RESTCONF [RFC8040]. These YANG-based management protocols (1) have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and (2) have to use mutual authentication.

The Network Configuration Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., "config true", which is the default). All writable data nodes are likely to be reasonably sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) and delete operations to these nodes without proper protection or authentication can have a negative effect on network operations. The following subtrees and data nodes have particular sensitivities/vulnerabilities:

* "periodic": By modifying this list, an attacker might alter the updates that are being sent in order to confuse a receiver, withhold certain updates to be sent to the receiver, and/or overwhelm a receiver. For example, an attacker might modify the period with which updates are reported and/or the XPath evaluation expression, resulting in certain updates not being published or a high volume of updates being published to exhaust receiver resources.

This YANG module uses groupings from other YANG modules that define nodes that may be considered sensitive or vulnerable in network environments. Refer to the Security Considerations of [RFC8641] for information as to which nodes may be considered sensitive or vulnerable in network environments.

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Appendix A. Use Cases

A.1. Wireless Network Performance Monitoring

Wireless signal strength is a critical factor in determining the quality and reliability of a wireless network connection. In practical scenarios, when the wireless signal strength drops below a specific threshold, the network may experience issues such as increased latency, packet loss, or even disconnections, which would require more frequent monitoring of network and service performance metrics to detect anomalies in a timely manner. Conversely, when the wireless signal strength exceeds a specific threshold, indicating a stable and strong connection, the data streaming rate can be reduced to a reasonable value to help conserve network bandwidth and computational resources.

To optimize the process, adaptive subscription can be employed. When the wireless signal strength falls below a configured threshold, the subscribed data can be streamed at a higher rate to capture potentially important data and events that might indicate continuous service degeneration or anomalies; while when the wireless signal strength crosses a configured threshold, the subscribed data can be streamed at a lower rate to maintain efficient resource utilization.

A.2. Reducing Impact on High CPU Utilization

Continuous monitoring of some metrics is essential for maintaining network and service health, however, this can place a significant burden on the device’s CPU utilization, especially when the device is running resource-intensive tasks and is overloaded. When the CPU utilization on the device exceeds a certain high-level value, it is crucial to manage the network monitoring process in a way that minimizes its impact on overall system performance.

In such cases, adaptive subscription can dynamically adjust the period interval with which to report streaming update and help balance monitoring needs with computational demands. When the CPU utilization on the device exceeds a certain high-level value, the subscriber can specify a longer period interval for some less critical statistics to make room and save more resources. Conversely, When the CPU utilization falls below a specified threshold, indicating the device has sufficient idle resources, the subscriber can revert to a shorter period interval for streaming data without exhausting the CPU resources at the same time.

Appendix B. Example YANG Module

This section presents an example YANG module so that Appendix C can give examples of how the YANG module defined in Section 3.2 is used to perform adaptive subscription. The example YANG module used in this section represents a Wi-Fi Network Diagnostics data specified in [CHIP] which can be used by a Node to assist a user or Administrative Node in diagnosing potential problems.

YANG tree diagram for the "example-wifi-network-diagnostic" module:

```
module: example-wifi-network-diagnostic
  +--ro server
  |  +--ro bssid?                       yang:mac-address
  |  +--ro security-type?               enumeration
  |  +--ro wifi-version?                enumeration
  |  +--ro channel-num?                 int8
  |  +--ro rssi?                        int8
  |  +--ro beacon-lost-count?           int8
  |  +--ro beacon-rx-count?             int8
  |  +--ro packet-multicast-rx-count?   int8
  |  +--ro packet-multicast-tx-count?   int8
  |  +--ro packet-unicast-rx-count?     int8
  |  +--ro packet-unicast-tx-count?     int8
  |  +--ro current-max-rate?            int8
  |  +--ro overrun-count?               int8
  +--ro events
     +--ro event* [name]
        +--ro name                  string
        +--ro disconnection?        enumeration
        +--ro association-failure?  enumeration
        +--ro connection-status?    enumeration
```

B.1. "example-wifi-network-diagnostic" YANG Module

```
   module example-wifi-network-diagnostic {
     yang-version 1;
     namespace "http://example.com/yang/wifi-network-diagnostic";
     prefix wnd;

     import ietf-yang-types {
       prefix yang;
     }

     container server {
       config false;
       description
         "Configuration of the Wi-Fi Server logical entity.";
       leaf bssid {
         type yang:mac-address;
         description
           "The MAC address of a wireless access point.";
       }
       leaf security-type {
         type enumeration {
           enum unspecified {
             value 0;
           }
           enum none {
             value 1;
           }
           enum wep {
             value 2;
           }
           enum wpa {
             value 3;
           }
           enum wpa2 {
             value 4;
           }
           enum wpa3 {
             value 5;
           }
         }
         description
           "The type of Wi-Fi security used. A value of 0
            indicate that the interface is not currently
            configured or operational.";
       }
       leaf wifi-version {
         type enumeration {
           enum 80211a {
             value 0;
```

```
          }
          enum 80211b {
            value 1;
          }
          enum 80211g {
            value 2;
          }
          enum 80211n {
            value 3;
          }
          enum 80211ac {
            value 4;
          }
          enum 80211ax {
            value 5;
          }
        }
        description
          "The highest 802.11 standard version usable
           by the Node.";
      }
      leaf channel-num {
        type int8;
        description
          "The channel that Wi-Fi communication is currently
           operating on. A value of 0 indicates that the interface
           is not currently configured or operational.";
      }
      leaf rssi {
        type int8;
        description
          "The RSSI of the Node's Wi-Fi radio in dBm.";
      }
      leaf beacon-lost-count {
        type int8;
        description
          "The count of the number of missed beacons the
           Node has detected.";
      }
      leaf beacon-rx-count {
        type int8;
        description
          "The count of the number of received beacons. The
           total number of expected beacons that could have been
           received during the interval since association matches
           the sum of BeaconRxCount and BeaconLostCount. ";
      }
      leaf packet-multicast-rx-count {
```

```
        type int8;
        description
          "The number of multicast packets received by
           the Node.";
      }
      leaf packet-multicast-tx-count {
        type int8;
        description
          "The number of multicast packets transmitted by
           the Node.";
      }
      leaf packet-unicast-rx-count {
        type int8;
        description
          "The number of multicast packets received by
           the Node.";
      }
      leaf packet-unicast-tx-count {
        type int8;
        description
          "The number of multicast packets transmitted by
           the Node.";
      }
      leaf current-max-rate {
        type int8;
        description
          "The current maximum PHY rate of transfer of
           data in bytes-per-second.";
      }
      leaf overrun-count {
        type int8;
        description
          "The number of packets dropped either at ingress or
           egress, due to lack of buffer memory to retain all
           packets on the ethernet network interface. The
           OverrunCount attribute is reset to 0 upon a
           reboot of the Node.";
      }
    }
    container events {
      config false;
      description
        "Configuration of WI-FI Network Diagnostic events.";
      list event {
        key "name";
        description
          "The list of event sources configured on the
           server.";
```

```
          leaf name {
            type string;
            description
              "The unique name of an event source.";
          }
          leaf disconnection {
            type enumeration {
              enum de-authenticated {
                value 1;
              }
              enum dis-association {
                value 2;
              }
            }
            description
              "A Node's Wi-Fi connection has been disconnected as a
               result of de-authenticated or dis-association and
               indicates the reason.";
          }
          leaf association-failure {
            type enumeration {
              enum unknown {
                value 0;
              }
              enum association-failed {
                value 1;
              }
              enum authentication-failed {
                value 2;
              }
              enum ssid-not-found {
                value 3;
              }
            }
            description
              "A Node has attempted to connect, or reconnect, to
               a Wi-Fi access point, but is unable to successfully
               associate or authenticate, after exhausting all
               internal retries of its supplicant.";
          }
          leaf connection-status {
            type enumeration {
              enum connected {
                value 1;
              }
              enum notconnected {
                value 2;
              }
```

```
            }
            description
              "A Node's connection status to a Wi-Fi network has
               changed. Connected, in this context, means that
               a Node acting as a Wi-Fi station is successfully
               associated to a Wi-Fi Access Point.";
          }
        }
      }
    }
```

Appendix C. Adaptive Subscription and Notification Example

The examples within this document use the normative YANG module "ietf-adaptive-subscription" defined in Section 3.2 and the non-normative example YANG module "example-wifi-network-diagnostic" defined in Appendix B.1.

This section shows some typical adaptive subscription and notification message exchanges.

C.1. Configured Subscription Example

The client configures adaptive subscription policy parameters on the server. The adaptive subscription configuration parameters require the server to support two update intervals (i.e., 5 seconds, 20 seconds) and report updates every 20 seconds if the RSSI value is greater than or equal to -65 dB; If the RSSI value is less than -65 dB, switch to 5 seconds period value to report updates. The server compares the rssi value with -65 dB every 2 seconds. Figure 1 specifies an example of configured subscription with the <edit-config> operation.

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
 <edit-config>
  <target>
   <running/>
  </target>
  <config>
   <subscriptions
    xmlns="urn:ietf:params:xml:ns:yang:ietf-subscribed-notifications"
    xmlns:yp="urn:ietf:params:xml:ns:yang:ietf-yang-push">
    <subscription>
     <id>1011</id>
     <yp:datastore
      xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
      ds:operational
     </yp:datastore>
```

```
     <yp:datastore-xpath-filter
      xmlns:wnd="http://example.com/yang/wifi-network-diagnostic">
      /wnd:server
     </yp:datastore-xpath-filter>
     <adaps:adaptive-periodic
     xmlns:adaps="urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription">
      <adaps:periodic>
       <adaps:name>adaptive-period-1</adaps:name>
       <adaps:eval-expression>
        /wnd:server/wnd:rssi&lt;-65
       </adaps:eval-expression>
       <adaps:eval-interval>200</adaps:eval-interval>
       <adaps:period>500</adaps:period>
       <adaps:anchor-time>2025-04-11T08:00:00Z</adaps:anchor-time>
      </adaps:periodic>
      <adaps:periodic>
       <adaps:name>adaptive-period-2</adaps:name>
       <adaps:eval-expression>
        /wnd:server/wnd:rssi&gt;-65
       </adaps:eval-expression>
       <adaps:eval-interval>200</adaps:eval-interval>
       <adaps:period>2000</adaps:period>
       <adaps:anchor-time>2025-04-11T08:00:00Z</adaps:anchor-time>
      </adaps:periodic>
     </adaps:adaptive-periodic>
     <receivers>
      <receiver>
       <name>host.example.com</name>
      </receiver>
     </receivers>
    </subscription>
   </subscriptions>
  </config>
 </edit-config>
</rpc>
```

Figure 1: An Example of Configured Subscription

C.2. Dynamic Subscription Example

Alternatively, the subscriber may send an "establish-subscription" RPC with the parameters listed in Section 2.1 to request the creation of an adaptive subscription. The adaptive subscription configuration parameters require the server to report updates every 5 seconds if the RSSI value is less than -65 dB; If the RSSI value is greater than or equal to -65 dB, switch to 20 seconds period value. The server compares the RSSI value with -65 dB every 2 seconds. Figure 2 specifies an example of the "establish-subscription" RPC request.

```
<netconf:rpc message-id="101"
 xmlns:netconf="urn:ietf:params:xml:ns:netconf:base:1.0">
 <establish-subscription
  xmlns="urn:ietf:params:xml:ns:yang:ietf-subscribed-notifications"
  xmlns:yp="urn:ietf:params:xml:ns:yang:ietf-yang-push">
  <yp:datastore
   xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
   ds:operational
  </yp:datastore>
  <yp:datastore-xpath-filter
   xmlns:wnd="http://example.com/yang/wifi-network-diagnostic">
   /wnd:server
  </yp:datastore-xpath-filter>
  <adaps:adaptive-periodic
   xmlns:adaps="urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription">
   <adaps:periodic>
    <adaps:name>adaptive-period-1</adaps:name>
    <adaps:eval-expression>
     /wnd:server/wnd:rssi&lt;-65
    </adaps:eval-expression>
    <adaps:eval-interval>200</adaps:eval-interval>
    <adaps:period>500</adaps:period>
    <adaps:anchor-time>2025-04-11T08:00:00Z</adaps:anchor-time>
   </adaps:periodic>
   <adaps:periodic>
    <adaps:name>adaptive-period-2</adaps:name>
    <adaps:eval-expression>
     /wnd:server/wnd:rssi&gt;-65
    </adaps:eval-expression>
    <adaps:eval-interval>200</adaps:eval-interval>
    <adaps:period>2000</adaps:period>
    <adaps:anchor-time>2025-04-11T08:00:00Z</adaps:anchor-time>
   </adaps:periodic>
  </adaps:adaptive-periodic>
 </establish-subscription>
</netconf:rpc>
```

Figure 2: An Example of Dynamic Subscription

C.3. "xpath-evaluation-unsupported" error response example

If the subscriber has authorization to establish the subscription with a server, but the server had not been able to fully satisfy the request from the subscriber, the server should send an RPC error response.

For instance, if the XPATH 1.0 syntax against the targeted data node defined in "eval-expression" is not supported by the server' s implementation, the server returns a reply indicating a failure. Figure 3 illustrates an example of RPC error response with this.

```
<?xml version="1.0" encoding="utf-8"?>
<rpc-reply message-id="101"
 xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <rpc-error>
    <error-type>application</error-type>
    <error-tag>invalid-value</error-tag>
    <error-severity>error</error-severity>
    <error-app-tag>
      ietf-adaptive-subscription:xpath-evaluation-unsupported
    </error-app-tag>
    <error-path
      xmlns:wnd="http://example.com/yang/wifi-network-diagnostic">
      /wnd:server/wnd:rssi
    </error-path>
  </rpc-error>
</rpc-reply>
```

Figure 3: An Example of RPC Error Response

Since adaptive subscription allows a server to be configured with multiple different period intervals and corresponding XPath evaluation criteria to trigger update interval switch in the server, it may be possible for the server to return multiple <rpc-error> elements with "xpath-evaluation-unsupported" failure specified by different error paths. The subscriber can use this information in future attempts to establish a subscription.

C.4. "adaptive-period-update" notification example

Suppose initially the RSSI value is below -65dB, the server pushes updates every 5 seconds starting at 2025-04-11T08:00:00Z and continuing through 2025-04-11T08:02:05Z. The server evaluates the RSSI value against -65 dB every 2 seconds and from 2025-04-11T08:02:06Z it detects that the RSSI value exceeds -65 dB continuously. As the "anchor-time" is set to 2025-04-11T08:00:00Z for adaptive-period-2, which means updates can only be sent at the top of every 00, 20, 40 second, the server sends the next update record at 2025-04-11T08:02:20Z and adjust the update interval to 20 seconds. Before this, the server generates and sends an "adaptive-period-update" notification to inform receivers of the new period interval value. An example of "adaptive-period-update" notification is indicated in Figure 4.

```
   <notification
    xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0"
    xmlns:yp="urn:ietf:params:xml:ns:yang:ietf-yang-push">
    <eventTime>2025-04-11T08:02:19.33Z</eventTime>
    <adaptive-period-update
     xmlns="urn:ietf:params:xml:ns:yang:ietf-adaptive-subscription">
     <id>1011</id>
     <period>2000</period>
     <period-update-time>2025-04-11T08:02:20Z</period-update-time>
     <satisfied-criteria-data>
      <path>/wnd:server/wnd:rssi</path>
      <value>-40</value>
     </satisfied-criteria-data>
     <yp:datastore
      xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">
          ds:operational
     </yp:datastore>
     <yp:datastore-xpath-filter
      xmlns:wnd="http://example.com/yang/wifi-network-diagnostic">
          /wnd:server
     </yp:datastore-xpath-filter>
    </adaptive-period-update>
   </notification>
```

Figure 4: An Example of "adaptive-period-update" Notification

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