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YANG Patch Media Type
draft-ietf-netconf-yang-patch-08

Abstract

This document describes a method for applying patches to configuration datastores using data defined with the YANG data modeling language.

Status of This Memo

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[1](#). Introduction

There is a need for standard mechanisms to patch datastores defined in [\[RFC6241\]](#), which contain conceptual data that conforms to schema specified with YANG [\[I-D.ietf-netmod-rfc6020bis\]](#). An "ordered edit list" approach is needed to provide client developers with more precise client control of the edit procedure than existing mechanisms.

This document defines a media type for a YANG-based editing mechanism that can be used with the HTTP PATCH method [\[RFC5789\]](#). YANG Patch is designed to support the RESTCONF protocol, defined in [\[I-D.ietf-netconf-restconf\]](#).

It may be possible to use YANG Patch with other protocols besides RESTCONF. This is outside the scope of this document. It may be possible to use YANG Patch with datastore types other than a configuration datastore. This is outside the scope of this document.

[1.1](#). Terminology

The keywords "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](#), [\[RFC2119\]](#).

[1.1.1](#). NETCONF

The following terms are defined in [\[RFC6241\]](#):

- o client
- o configuration data
- o datastore
- o configuration datastore
- o protocol operation

- o running configuration datastore
- o server
- o state data
- o user

1.1.2. HTTP

The following terms are defined in [[RFC2616](#)]:

- o entity tag
- o fragment
- o header line
- o message body
- o method
- o path
- o query
- o request URI
- o response body

1.1.3. YANG

The following terms are defined in [[I-D.ietf-netmod-rfc6020bis](#)]:

- o container
- o data node
- o key leaf
- o leaf
- o leaf-list
- o list
- o presence container (or P-container)

- o RPC operation (now called protocol operation)
- o non-presence container (or NP-container)
- o ordered-by system
- o ordered-by user

1.1.4. RESTCONF

The following terms are defined in [[I-D.ietf-netconf-restconf](#)]:

- o data resource
- o datastore resource
- o patch
- o RESTCONF capability
- o target resource

1.1.5. YANG Patch

The following terms are used within this document:

- o YANG Patch: a conceptual edit request using the "yang-patch" YANG container, defined in [Section 3](#). In HTTP, refers to a PATCH method where the media type is "application/yang.patch+xml" or "application/yang.patch+json".
- o YANG Patch Status: a conceptual edit status response using the YANG "yang-patch-status" container, defined in [Section 3](#). In HTTP, refers to a response message for a PATCH method, where the message body is identified by the media type "application/yang.patch-status+xml" or "application/yang.patch-status+json".

1.1.6. Tree Diagrams

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is as follows:

- o Brackets "[" and "]" enclose list keys.
- o Abbreviations before data node names: "rw" means configuration (read-write) and "ro" state data (read-only).

- o Symbols after data node names: "?" means an optional node and "*" denotes a "list" and "leaf-list".
- o Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- o Ellipsis ("...") stands for contents of subtrees that are not shown.

2. YANG Patch

A "YANG Patch" is an ordered list of edits that are applied to the target datastore by the server. The specific fields are defined in the YANG module in [Section 3](#).

For RESTCONF, the YANG Patch operation is invoked by the client by sending a PATCH method request with the YANG Patch media type. A message body representing the YANG Patch input parameters MUST be provided.

The RESTCONF server MUST return the Accept-Patch header in an OPTIONS response, as specified in [[RFC5789](#)], which includes the media type for YANG Patch.

Example:

Accept-Patch: application/yang.patch

A YANG Patch can be encoded in XML format according to [[W3C.REC-xml-20081126](#)]. It can also be encoded in JSON, according to "JSON Encoding of Data Modeled with YANG" [[I-D.ietf-netmod-yang-json](#)]. If any meta-data needs to be sent in a JSON message, it is encoded according to "Defining and Using Metadata with YANG" [[I-D.ietf-netmod-yang-metadata](#)].

2.1. Target Resource

The YANG Patch operation uses the RESTCONF target resource URI to identify the resource that will be patched. This can be the datastore resource itself, i.e., "{+restconf}/data", or it can be a configuration data resource within the datastore resource, e.g., "{+restconf/data/ietf-interfaces:interfaces".

Each edit with a YANG Patch identifies a target data node for the associated edit. This is described in [Section 2.4](#).

2.2. yang-patch Input

A YANG patch is optionally identified by a unique "patch-id" and it may have an optional comment. A patch is an ordered collection of edits. Each edit is identified by an "edit-id" and it has an edit operation (create, delete, insert, merge, move, replace, remove) that is applied to the target resource. Each edit can be applied to a sub-resource "target" within the target resource. If the operation is "insert" or "move", then the "where" parameter indicates how the node is inserted or moved. For values "before" and "after", the "point" parameter specifies the data node insertion point.

A data element representing the YANG Patch is sent by the client to specify the edit operation request. When used with the HTTP PATCH method, this data is identified by the YANG Patch media type.

YANG Tree Diagram For "yang-patch" Container

```
+--rw yang-patch
  +--rw patch-id?    string
  +--rw comment?    string
  +--rw edit [edit-id]
    +--rw edit-id      string
    +--rw operation    enumeration
    +--rw target       target-resource-offset
    +--rw point?      target-resource-offset
    +--rw where?      enumeration
    +--rw value
```

[2.3.](#) yang-patch-status Output

A data element representing the YANG Patch Status is returned to the client to report the detailed status of the edit operation. When used with the HTTP PATCH method, this data is identified by the YANG Patch Status media type, and the syntax specification is defined in [Section 3](#).

YANG Tree Diagram For "yang-patch-status" Container:

```
+--rw yang-patch-status
  +--rw patch-id?    string
  +--rw (global-status)?
  | +--:(global-errors)
  | | +--ro errors
  | |
  | +--:(ok)
  |   +--rw ok?      empty
  +--rw edit-status
    +--rw edit [edit-id]
      +--rw edit-id    string
```



```

+--rw (edit-status-choice)?
  +--:(ok)
  |   +--rw ok?           empty
  +--:(errors)
    +--ro errors

```

2.4. Target Data Node

The target data node for each edit operation is determined by the value of the target resource in the request and the "target" leaf within each "edit" entry.

If the target resource specified in the request URI identifies a datastore resource, then the path string in the "target" leaf is treated as an absolute path expression identifying the target data node for the corresponding edit. The first node specified in the "target" leaf is a top-level data node defined within a YANG module. The "target" leaf MUST NOT contain a single forward slash "/", since this would identify the datastore resource, not a data resource.

If the target resource specified in the request URI identifies a configuration data resource, then the path string in the "target" leaf is treated as a relative path expression. The first node specified in the "target" leaf is a child configuration data node of the data node associated with the target resource. If the "target" leaf contains a single forward slash "/", then the target data node is the target resource data node.

2.5. Edit Operations

Each YANG patch edit specifies one edit operation on the target data node. The set of operations is aligned with the NETCONF edit operations, but also includes some new operations.

Operation	Description
create	create a new data resource if it does not already exist or error
delete	delete a data resource if it already exists or error
insert	insert a new user-ordered data resource
merge	merge the edit value with the target data resource; create if it does not already exist
move	re-order the target data resource
replace	replace the target data resource with the edit value
remove	remove a data resource if it already exists or no


```

|                               | error                               |
+-----+-----+-----+-----+-----+-----+-----+-----+

```

YANG Patch Edit Operations

2.6. Successful Edit Response Handling

If a YANG Patch is completed without errors, the server MUST return a "200 OK" status-line, and a response message-body containing a "yang-patch-status" message.

The server will save the running datastore to non-volatile storage if it supports non-volatile storage, and if the running datastore contents have changed. This will be done in an implementation-specific manner.

Refer to [Appendix D.1.2](#) for a example of a successful YANG Patch response.

2.7. Error Handling

If a well-formed, schema-valid YANG Patch message is received, then the server will process the supplied edits in ascending order. The following error modes apply to the processing of this edit list:

All the specified edits MUST be applied or the target datastore contents MUST be returned to its original state before the PATCH method started.

If a YANG Patch is completed with errors, the server MUST return a "200 OK" status-line, and a response message-body containing a "yang-patch-status" message.

Refer to [Appendix D.1.1](#) for a example of an error YANG Patch response.

2.8. yang-patch RESTCONF Capability

A URI is defined to identify the YANG Patch extension to the base RESTCONF protocol. If the server supports the YANG Patch media type, then the "yang-patch" RESTCONF capability defined in [Section 4.4](#) MUST be present in the "capability" leaf-list in the "ietf-restconf-monitoring" module defined in [\[I-D.ietf-netconf-restconf\]](#).

3. YANG Module

The "ietf-yang-patch" module defines conceptual definitions with the 'restconf-media-type' extension statements, which are not meant to be implemented as datastore contents by a server.

The "ietf-restconf" module from [[I-D.ietf-netconf-restconf](#)] is used by this module for the 'restconf-media-type' extension definition.

RFC Ed.: update the date below with the date of RFC publication and remove this note.

<CODE BEGINS> file "ietf-yang-patch@2016-03-16.yang"

```
module ietf-yang-patch {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-patch";
  prefix "ypatch";

  import ietf-yang-types { prefix yang; }

  import ietf-restconf {
    prefix rc;
    revision-date 2016-03-16;
  }

  organization
    "IETF NETCONF (Network Configuration) Working Group";

  contact
    "WG Web:   <http://tools.ietf.org/wg/netconf/>
    WG List:  <mailto:netconf@ietf.org>

    WG Chair: Mehmet Ersue
              <mailto:mehmet.ersue@nsn.com>

    WG Chair: Mahesh Jethanandani
              <mailto:mjethanandani@gmail.com>

    Editor:   Andy Bierman
              <mailto:andy@yumaworks.com>

    Editor:   Martin Bjorklund
              <mailto:mbj@tail-f.com>

    Editor:   Kent Watsen
              <mailto:kwatsen@juniper.net>";

  description
    "This module contains conceptual YANG specifications
```


for the YANG Patch and YANG Patch Status data structures.

Note that the YANG definitions within this module do not represent configuration data of any kind.

The YANG grouping statements provide a normative syntax for XML and JSON message encoding purposes.

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.";

```
// RFC Ed.: replace XXXX with actual RFC number and remove this
// note.

// RFC Ed.: remove this note
// Note: extracted from draft-ietf-netconf-yang-patch-08.txt

// RFC Ed.: update the date below with the date of RFC publication
// and remove this note.
revision 2016-03-16 {
  description
    "Initial revision.";
  reference
    "RFC XXXX: YANG Patch Media Type.";
}

typedef target-resource-offset {
  type yang:xpath1.0;
  description
    "Contains an XPath absolute path expression identifying
    a sub-resource within the target resource.
    The document root for this XPath expression is the
    target resource that is specified in the
    protocol operation (e.g., the URI for the PATCH request).";
}

rc:restconf-media-type "application/yang.patch" {
  uses yang-patch;
}
```



```
rc:restconf-media-type "application/yang.patch-status" {
  uses yang-patch-status;
}

grouping yang-patch {

  description
    "A grouping that contains a YANG container
    representing the syntax and semantics of a
    YANG Patch edit request message.";

  container yang-patch {
    description
      "Represents a conceptual sequence of datastore edits,
      called a patch. Each patch is given a client-assigned
      patch identifier. Each edit MUST be applied
      in ascending order, and all edits MUST be applied.
      If any errors occur, then the target datastore MUST NOT
      be changed by the patch operation.

      YANG datastore validation is performed before any edits
      have been applied to the running datastore.

      It is possible for a datastore constraint violation to occur
      due to any node in the datastore, including nodes not
      included in the edit list. Any validation errors MUST
      be reported in the reply message.";

    reference
      "draft-ietf-netmod-rfc6020bis, section 8.3.";

    leaf patch-id {
      type string;
      description
        "An arbitrary string provided by the client to identify
        the entire patch. This value SHOULD be present in any
        audit logging records generated by the server for the
        patch. Error messages returned by the server pertaining
        to this patch will be identified by this patch-id value.";
    }

    leaf comment {
      type string;
      description
        "An arbitrary string provided by the client to describe
        the entire patch. This value SHOULD be present in any
        audit logging records generated by the server for the
        patch.";
    }
  }
}
```



```
}

list edit {
  key edit-id;
  ordered-by user;

  description
    "Represents one edit within the YANG Patch
    request message. The edit list is applied
    in the following manner:

    - The first edit is conceptually applied to a copy
      of the existing target datastore, e.g., the
      running configuration datastore.
    - Each ascending edit is conceptually applied to
      the result of the previous edit(s).
    - After all edits have been successfully processed,
      the result is validated according to YANG constraints.
    - If successful, the server will attempt to apply
      the result to the target datastore. ";

  leaf edit-id {
    type string;
    description
      "Arbitrary string index for the edit.
      Error messages returned by the server pertaining
      to a specific edit will be identified by this
      value.";
  }

  leaf operation {
    type enumeration {
      enum create {
        description
          "The target data node is created using the
          supplied value, only if it does not already
          exist.get' leaf identifies the data node to be
          created, not the parent data node.";
      }
      enum delete {
        description
          "Delete the target node, only if the data resource
          currently exists, otherwise return an error.";
      }
      enum insert {
        description
          "Insert the supplied value into a user-ordered
          list or leaf-list entry. The target node must
```



```
        represent a new data resource. If the 'where'
        parameter is set to 'before' or 'after', then
        the 'point' parameter identifies the insertion
        point for the target node.";
    }
    enum merge {
        description
            "The supplied value is merged with the target data
            node.";
    }
    enum move {
        description
            "Move the target node. Reorder a user-ordered
            list or leaf-list. The target node must represent
            an existing data resource. If the 'where' parameter
            is set to 'before' or 'after', then the 'point'
            parameter identifies the insertion point to move
            the target node.";
    }
    enum replace {
        description
            "The supplied value is used to replace the target
            data node.";
    }
    enum remove {
        description
            "Delete the target node if it currently exists.";
    }
}
mandatory true;
description
    "The datastore operation requested for the associated
    edit entry";
}

leaf target {
    type target-resource-offset;
    mandatory true;
    description
        "Identifies the target data node for the edit
        operation. If the target has the value '/', then
        the target data node is the target resource.
        The target node MUST identify a data resource,
        not the datastore resource.";
}

leaf point {
    when "(../operation = 'insert' or ../operation = 'move') "
```



```
    + "and (../where = 'before' or ../where = 'after')" {
description
    "Point leaf only applies for insert or move
    operations, before or after an existing entry.";
}
type target-resource-offset;
description
    "The absolute URL path for the data node that is being
    used as the insertion point or move point for the
    target of this edit entry.";
}

leaf where {
    when "../operation = 'insert' or ../operation = 'move'" {
        description
            "Where leaf only applies for insert or move
            operations.";
    }
    type enumeration {
        enum before {
            description
                "Insert or move a data node before the data resource
                identified by the 'point' parameter.";
        }
        enum after {
            description
                "Insert or move a data node after the data resource
                identified by the 'point' parameter.";
        }
        enum first {
            description
                "Insert or move a data node so it becomes ordered
                as the first entry.";
        }
        enum last {
            description
                "Insert or move a data node so it becomes ordered
                as the last entry.";
        }
    }
}
default last;
description
    "Identifies where a data resource will be inserted or
    moved. YANG only allows these operations for
    list and leaf-list data nodes that are ordered-by
    user.";
}
```



```

anydata value {
  when "../operation = 'create' "
    + "or ../operation = 'merge' "
    + "or ../operation = 'replace' "
    + "or ../operation = 'insert'" {
    description
      "Value node only used for create, merge,
        replace, and insert operations";
  }
  description
    "Value used for this edit operation. The anydata 'value'
      contains the target resource associated with the
      'target' leaf.

```

For example, suppose the target node is a YANG container named foo:

```

container foo {
  leaf a { type string; }
  leaf b { type int32; }
}

```

The 'value' node contains one instance of foo:

```

<value>
  <foo xmlns='example-foo-namespace'>
    <a>some value</a>
    <b>42</b>
  </foo>
</value>
";
}
}
}

```

```

} // grouping yang-patch

```

```

grouping yang-patch-status {

  description
    "A grouping that contains a YANG container
      representing the syntax and semantics of
      YANG Patch status response message.";

  container yang-patch-status {
    description
      "A container representing the response message

```



```
    sent by the server after a YANG Patch edit
    request message has been processed.";

leaf patch-id {
    type string;
    description
        "The patch-id value used in the request.
        If there was no patch-id present in the request
        then this field will not be present.";
}

choice global-status {
    description
        "Report global errors or complete success.
        If there is no case selected then errors
        are reported in the edit-status container.";

    case global-errors {
        uses rc:errors;
        description
            "This container will be present if global
            errors unrelated to a specific edit occurred.";
    }

    leaf ok {
        type empty;
        description
            "This leaf will be present if the request succeeded
            and there are no errors reported in the edit-status
            container.";
    }
}

container edit-status {
    description
        "This container will be present if there are
        edit-specific status responses to report.
        If all edits succeeded and the 'global-status'
        returned is 'ok', then a server MAY omit this
        container";

    list edit {
        key edit-id;

        description
            "Represents a list of status responses,
            corresponding to edits in the YANG Patch
            request message. If an edit entry was
            skipped or not reached by the server,
```


then this list will not contain a corresponding entry for that edit.";

```
leaf edit-id {
  type string;
  description
    "Response status is for the edit list entry
    with this edit-id value.";
}
choice edit-status-choice {
  description
    "A choice between different types of status
    responses for each edit entry.";
  leaf ok {
    type empty;
    description
      "This edit entry was invoked without any
      errors detected by the server associated
      with this edit.";
  }
  case errors {
    uses rc:errors;
    description
      "The server detected errors associated with the
      edit identified by the same edit-id value.";
  }
}
}
}
}
} // grouping yang-patch-status
}

<CODE ENDS>
```

4. IANA Considerations

4.1. YANG Module Registry

This document registers one URI in the IETF XML registry [[RFC3688](#)]. Following the format in [RFC 3688](#), the following registration is requested to be made.

URI: urn:ietf:params:xml:ns:yang:ietf-yang-patch
Registrant Contact: The NETCONF WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

This document registers one YANG module in the YANG Module Names registry [[RFC6020](#)].

```
name:          ietf-yang-patch
namespace:     urn:ietf:params:xml:ns:yang:ietf-yang-patch
prefix:        ypatch
// RFC Ed.: replace XXXX with RFC number and remove this note
reference:     RFC XXXX
```

[4.2.](#) application/yang.patch Media Types

The MIME media type for a YANG Patch document is application/yang.patch.

Type name: application

Subtype name: yang.patch

Required parameters: none

Optional parameters: none

Encoding considerations: 8-bit

Security considerations: See [Section 5](#) of RFC XXXX

Interoperability considerations: none

// RFC Ed.: replace XXXX with RFC number and remove this note

Published specification: RFC XXXX

[4.3.](#) application/yang.patch-status Media Types

The MIME media type for a YANG Patch status document is application/yang.patch-status.

Type name: application

Subtype name: yang.patch-status

Required parameters: none

Optional parameters: none

Encoding considerations: 8-bit

Security considerations: See [Section 5](#) of RFC XXXX

Interoperability considerations: none

// RFC Ed.: replace XXXX with RFC number and remove this note
Published specification: RFC XXXX

4.4. RESTCONF Capability URNs

This document registers one capability identifier in "RESTCONF Protocol Capability URNs" registry

Index

Capability Identifier

:yang-patch

urn:ietf:params:restconf:capability:yang-patch:1.0

5. Security Considerations

The YANG Patch media type does not introduce any significant new security threats, beyond what is described in [\[I-D.ietf-netconf-restconf\]](#). This document defines edit processing instructions for a variant of the PATCH method, as used within the RESTCONF protocol.

It may be possible to use YANG Patch with other protocols besides RESTCONF, which is outside the scope of this document.

It is important for server implementations to carefully validate all the edit request parameters in some manner. If the entire YANG Patch request cannot be completed, then no configuration changes to the system are done.

A server implementation SHOULD attempt to prevent system disruption due to partial processing of the YANG Patch edit list. It may be possible to construct an attack on such a server, which relies on the edit processing order mandated by YANG Patch.

6. Normative References

[I-D.ietf-netconf-restconf]

Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", [draft-ietf-netconf-restconf-08](#) (work in progress), October 2015.

[I-D.ietf-netmod-rfc6020bis]

Bjorklund, M., "The YANG 1.1 Data Modeling Language", [draft-ietf-netmod-rfc6020bis-11](#) (work in progress), February 2016.

[I-D.ietf-netmod-yang-json]

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[Appendix A](#). Acknowledgements

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Appendix B. Change Log

-- RFC Ed.: remove this section before publication.

The YANG Patch issue tracker can be found here: <https://github.com/netconf-wg/yang-patch/issues>

B.1. v07 to v08

- o clarified target datastore and target data node terms
- o clarified that target leaf can be single forward slash '/'
- o added Successful edit response handling section
- o clarified that YANG Patch draft is for RESTCONF protocol only but may be defined for other protocols outside this document
- o clarified that YANG Patch draft is for configuration datastores only but may be defined for other datastore types outside this document
- o fixed typos

B.2. v06 to v07

- o converted YANG module to YANG 1.1
- o changed anyxml value to anydata value
- o updated import revision date for ietf-restconf
- o updated revision date for ietf-yang-patch because import-by-revision date needed to be changed

B.3. v05 to v06

- o changed errors example so a full request and error response is shown in XML format
- o fixed error-path to match instance-identifier encoding for both XML and JSON
- o added references for YANG to JSON and YANG Metadata drafts
- o clarified that YANG JSON drafts are used for encoding, not plain JSON

B.4. v04 to v05

- o updated reference to RESTCONF

B.5. v03 to v04

- o removed NETCONF specific text
- o changed data-resource-offset typedef from a relative URI to an XPath absolute path expression
- o clarified insert operation
- o removed requirement that edits MUST be applied in ascending order
- o change SHOULD keep datastore unchanged on error to MUST (this is required by HTTP PATCH)
- o removed length restriction on 'comment' leaf
- o updated YANG tree for example-jukebox library

B.6. v02 to v03

- o added usage of restconf-media-type extension to map the yang-patch and yang-patch-status groupings to media types
- o added yang-patch RESTCONF capability URI
- o Added sub-section for terms used from RESTCONF
- o filled in security considerations section

B.7. v01 to v02

- o Reversed order of change log

- o Clarified anyxml structure of "value" parameter within a YANG patch request (github issue #1)
- o Updated RESTCONF reference
- o Added note to open issues section to check github instead

B.8. v00 to v01

- o Added text requiring support for Accept-Patch header, and removed 'Identification of YANG Patch capabilities' open issue.
- o Removed 'location' leaf from yang-patch-status grouping
- o Removed open issue 'Protocol independence' because the location leaf was removed.
- o Removed open issue 'RESTCONF coupling' because there is no concern about a normative reference to RESTCONF. There may need to be a YANG 1.1 mechanism to allow protocol template usage (instead of grouping wrapper).
- o Removed open issue 'Is the delete operation needed'. It was decided that both delete and remove should remain as operations and clients can choose which one to use. This is not an implementation burden on the server.
- o Removed open issue 'global-errors needed'. It was decided that they are needed as defined because the global <ok/> is needed and the special key value for edit=global error only allows for 1 global error.
- o Removed open issue 'Is location leaf needed'. It was decided that it is not needed so this leaf has been removed.
- o Removed open issue 'Bulk editing support in yang-patch-status'. The 'location' leaf has been removed so this issue is no longer applicable.
- o Removed open issue 'Edit list mechanism'. Added text to the 'edit' list description-stmt about how the individual edits must be processed. There is no concern about duplicate edits which cause intermediate results to be altered by subsequent edits in the same edit list.

B.9. bierman:yang-patch-00 to ietf:yang-patch-00

- o Created open issues section

[Appendix C](#). Open Issues

-- RFC Ed.: remove this section before publication.

Refer to the github issue tracker for any open issues:

<https://github.com/netconf-wg/yang-patch/issues>

[Appendix D](#). Example YANG Module

The example YANG module used in this document represents a simple media jukebox interface. The "example-jukebox" YANG module is defined in [[I-D.ietf-netconf-restconf](#)].

YANG Tree Diagram for "example-jukebox" Module:

```
+--rw jukebox!
  +--rw library
    | +--rw artist* [name]
    | | +--rw name      string
    | | +--rw album* [name]
    | |   +--rw name      string
    | |   +--rw genre?   identityref
    | |   +--rw year?    uint16
    | |   +--rw admin
    | |   | +--rw label?          string
    | |   | +--rw catalogue-number? string
    | |   +--rw song* [name]
    | |     +--rw name      string
    | |     +--rw location  string
    | |     +--rw format?   string
    | |     +--rw length?   uint32
    | +--ro artist-count?  uint32
    | +--ro album-count?   uint32
    | +--ro song-count?    uint32
  +--rw playlist* [name]
    | +--rw name      string
    | +--rw description? string
    | +--rw song* [index]
    |   +--rw index    uint32
    |   +--rw id       leafref
  +--rw player
    +--rw gap?    decimal64

rpcs:

+---x play
  +--ro input
```



```
+--ro playlist      string
+--ro song-number   uint32
```

D.1. YANG Patch Examples

This section includes RESTCONF examples. Most examples are shown in JSON encoding [[RFC7158](#)], and some are shown in XML encoding [[W3C.REC-xml-20081126](#)].

D.1.1. Add Resources: Error

The following example shows several songs being added to an existing album. Each edit contains one song. The first song already exists, so an error will be reported for that edit. The rest of the edits were not attempted, since the first edit failed. The XML encoding is used in this example.

Request from client:

```
PATCH /restconf/data/example-jukebox:jukebox/
      library/artist=Foo%20Fighters/album=Wasting%20Light HTTP/1.1
Host: example.com
Accept: application/yang.patch-status+xml
Content-Type: application/yang.patch+xml
```

```
<yang-patch xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-patch">
  <patch-id>add-songs-patch</patch-id>
  <edit>
    <edit-id>edit1</edit-id>
    <operation>create</operation>
    <target>/song</target>
    <value>
      <song xmlns="http://example.com/ns/example-jukebox">
        <name>Bridge Burning</name>
        <location>/media/bridge_burning.mp3</location>
        <format>MP3</format>
        <length>288</length>
      </song>
    </value>
  </edit>
  <edit>
    <edit-id>edit2</edit-id>
    <operation>create</operation>
    <target>/song</target>
    <value>
      <song xmlns="http://example.com/ns/example-jukebox">
        <name>Rope</name>
        <location>/media/rope.mp3</location>
```



```
        <format>MP3</format>
        <length>259</length>
    </song>
</value>
</edit>
<edit>
    <edit-id>edit3</edit-id>
    <operation>create</operation>
    <target>/song</target>
    <value>
        <song xmlns="http://example.com/ns/example-jukebox">
            <name>Dear Rosemary</name>
            <location>/media/dear_rosemary.mp3</location>
            <format>MP3</format>
            <length>269</length>
        </song>
    </value>
</edit>
</yang-patch>
```

XML Response from server:

```
HTTP/1.1 409 Conflict
Date: Mon, 23 Apr 2012 13:01:20 GMT
Server: example-server
Last-Modified: Mon, 23 Apr 2012 13:01:20 GMT
Content-Type: application/yang.patch-status+xml
```

```
<yang-patch-status
  xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-patch">
  <patch-id>add-songs-patch</patch-id>
  <edit-status>
    <edit>
      <edit-id>edit1</edit-id>
      <errors>
        <error>
          <error-type>application</error-type>
          <error-tag>data-exists</error-tag>
          <error-path>
            xmlns:jb="http://example.com/ns/example-jukebox">
              /jb:jukebox/jb:library
              /jb:artist[jb:name='Foo Fighters']
              /jb:album[jb:name='Wasting Light']
              /jb:song[jb:name='Burning Light']
            </error-path>
          <error-message>
            Data already exists, cannot be created
          </error-message>
        </error>
      </errors>
    </edit>
  </edit-status>
</yang-patch-status>
```



```

        </error>
      </errors>
    </edit>
  </edit-status>
</yang-patch-status>

```

JSON Response from server:

The following response is shown in JSON format to highlight the difference in the "error-path" object encoding. For JSON, the instance-identifier encoding in the "JSON Encoding of YANG Data" draft is used. The "error-path" string is wrapped for display purposes.

```

HTTP/1.1 409 Conflict
Date: Mon, 23 Apr 2012 13:01:20 GMT
Server: example-server
Last-Modified: Mon, 23 Apr 2012 13:01:20 GMT
Content-Type: application/yang.patch-status+json

```

```

{
  "ietf-yang-patch:yang-patch-status" : {
    "patch-id" : "add-songs-patch",
    "edit-status" : {
      "edit" : [
        {
          "edit-id" : "edit1",
          "errors" : {
            "error" : [
              {
                "error-type": "application",
                "error-tag": "data-exists",
                "error-path": "/example-jukebox:jukebox/library
                              /artist[name='Foo Fighters']
                              /album[name='Wasting Light']
                              /song[name='Burning Light']",
                "error-message":
                  "Data already exists, cannot be created"
              }
            ]
          }
        }
      ]
    }
  }
}

```


D.1.2. Add Resources: Success

The following example shows several songs being added to an existing album.

- o Each of 2 edits contains one song.
- o Both edits succeed and new sub-resources are created

Request from client:

```
PATCH /restconf/data/example-jukebox:jukebox/  
library/artist=Foo%20Fighters/album=Wasting%20Light  
HTTP/1.1
```

```
Host: example.com
```

```
Accept: application/yang.patch-status+json
```

```
Content-Type: application/yang.patch+json
```

```
{  
  "ietf-yang-patch:yang-patch" : {  
    "patch-id" : "add-songs-patch-2",  
    "edit" : [  
      {  
        "edit-id" : "edit1",  
        "operation" : "create",  
        "target" : "/song",  
        "value" : {  
          "song" : {  
            "name" : "Rope",  
            "location" : "/media/rope.mp3",  
            "format" : "MP3",  
            "length" : 259  
          }  
        }  
      },  
      {  
        "edit-id" : "edit2",  
        "operation" : "create",  
        "target" : "/song",  
        "value" : {  
          "song" : {  
            "name" : "Dear Rosemary",  
            "location" : "/media/dear_rosemary.mp3",  
            "format" : "MP3",  
            "length" : 269  
          }  
        }  
      }  
    ]  
  }  
}
```



```
    ]
  }
}
```

Response from server:

```
HTTP/1.1 200 Success
Date: Mon, 23 Apr 2012 13:01:20 GMT
Server: example-server
Last-Modified: Mon, 23 Apr 2012 13:01:20 GMT
Content-Type: application/yang.patch-status+json
```

```
{
  "ietf-yang-patch:yang-patch-status" : {
    "patch-id" : "add-songs-patch-2",
    "ok" : [null]
  }
}
```

D.1.3. Move list entry example

The following example shows a song being moved within an existing playlist. Song "1" in playlist "Foo-One" is being moved after song "3" in the playlist. The operation succeeds, so a non-error reply example can be shown.

Request from client:

```
PATCH /restconf/data/example-jukebox:jukebox/
  playlist=Foo-One HTTP/1.1
Host: example.com
Accept: application/yang.patch-status+json
Content-Type: application/yang.patch+json
```

```
{
  "ietf-yang-patch:yang-patch" : {
    "patch-id" : "move-song-patch",
    "comment" : "Move song 1 after song 3",
    "edit" : [
      {
        "edit-id" : "edit1",
        "operation" : "move",
        "target" : "/song/1",
        "point" : "/song3",
        "where" : "after"
      }
    ]
  }
}
```



```
}
```

Response from server:

```
HTTP/1.1 400 OK
Date: Mon, 23 Apr 2012 13:01:20 GMT
Server: example-server
Last-Modified: Mon, 23 Apr 2012 13:01:20 GMT
Content-Type: application/yang.patch-status+json
```

```
{
  "ietf-restconf:yang-patch-status" : {
    "patch-id" : "move-song-patch",
    "ok" : [null]
  }
}
```

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