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Constrained YANG Module Library
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Abstract

This document describes a YANG library that provides information about all the YANG modules used by a constrained network management server (e.g., a CoAP Management Interface (CoMI) server). Simple caching mechanisms are provided to allow clients to minimize retrieval of this information.

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[1.](#) Introduction

The YANG library specified in this document is available to clients of a given server to discover the YANG modules supported by this constrained network management server. A CoMI server provides a link to this library in the /mod.uri resource. The following YANG module information is provided to client applications to fully utilize the YANG data modeling language:

- o module list: The list of YANG modules implemented by a server, each module is identified by its assigned YANG Schema Item Identifier (SID) and revision.
- o submodule list: The list of YANG submodules included by each module, each submodule is identified by its assigned SID and revision.
- o feature list: The list of features supported by the server, each feature is identified by its assigned SID.
- o deviation list: The list of YANG modules used for deviation

statements associated with each YANG module, each module is identified by its assigned SID and revision.

1.1. Major differences between ietf-constrained-yang-library and ietf-yang-library

YANG module ietf-constrained-yang-library targets the same functionality and shares the same approach as YANG module ietf-yang-library. The following changes with respect to ietf-yang-library are specified to make ietf-constrained-yang-library compatible with SID [[I-D.ietf-core-yang-cbor](#)] used by CoMI [[I-D.ietf-core-comi](#)] and to improve its applicability to constrained devices and networks.

- o YANG module ietf-constrained-yang-library extends the caching mechanism supported by ietf-yang-library to multiple servers. This is accomplished by supporting the identityref datatype for "module-set-id". This enables the use of a managed identifier (i.e. a SID) to identify a specific assembly of YANG modules, deviations and features implemented by a group of constrained servers.
- o Modules, sub-modules, deviations and features are identified using a numerical value (SID) instead of a string (yang-identifier).
- o The "namespace" leaf, not required for SIDs, but mandatory in ietf-yang-library is not included in ietf-constrained-yang-library.
- o Schemas can be located using the already available module or sub-module identifier (SID) and revision. For this reason, support of module and sub-module schema URIs have been removed.
- o To minimize their size, each revision date is encoded in binary.

2. Terminology and Notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

The following terms are defined in [[RFC7950](#)]:

- o module
- o submodule
- o feature
- o deviation

The following terms are defined in [[I-D.ietf-core-yang-cbor](#)]:

- o YANG Schema Item iDentifier (SID)

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

- o client
- o server

The following terms are used within this document:

- o library: a collection of YANG modules used by a server.

[3.](#) Overview

The "ietf-constrained-yang-library" module provides information about the YANG library used by a given server. This module is defined using YANG version 1 as defined by [[RFC7950](#)], but it supports the description of YANG modules written in any revision of YANG.

[3.1.](#) Tree diagram

The tree diagram of YANG module ietf-constrained-yang-library is provided below. This graphical representation of a YANG module is defined in [[I-D.ietf-netmod-yang-tree-diagrams](#)].

```
module: ietf-constrained-yang-library
  +--ro modules-state
    +--ro module-set-id      union
    +--ro module* [sid revision]
```

```

    +---ro sid                sid
    +---ro revision            revision
    +---ro feature*            sid
    +---ro deviation* [sid revision]
    |   +---ro sid            sid
    |   +---ro revision        revision
    +---ro conformance-type    enumeration
    +---ro submodule* [sid revision]
        +---ro sid            sid
        +---ro revision        revision
notifications:
    +---n yang-library-change
        +---ro module-set-id    -> /modules-state/module-set-id

```

[3.2.](#) Description

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[3.2.1.](#) modules-state

This mandatory container specifies the module set identifier and the list of modules supported by the server.

[3.2.2.](#) modules-state/module-set-id

This mandatory leaf contains an identifier representing the current set of modules and submodules used by a server. This identifier is server-specific when implemented as `unit32` or can be used by multiple servers when implemented as `identityref`. The value of this leaf **MUST** change whenever the set of modules and submodules in the library changes. There is no requirement that the same set always results in the same 'module-set-id' value.

This leaf allows a client to fetch the module list once, cache it, and only re-fetch it if the value of this leaf has been changed.

If the value of this leaf changes, the server also generates a 'yang-library-change' notification, with the new value of 'module-set-id'.

[3.2.3.](#) modules-state/module

This mandatory list contains one entry for each YANG module supported by the server. There MUST be an entry in this list for each revision of each YANG module that is used by the server. It is possible for multiple revisions of the same module to be imported, in addition to an entry for the revision that is implemented by the server.

4. YANG Module "ietf-constrained-yang-library"

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

```
<CODE BEGINS> file "ietf-constrained-yang-library@2017-01-20.yang"
module ietf-constrained-yang-library {
  namespace
    "urn:ietf:params:xml:ns:yang:ietf-constrained-yang-library";
  prefix "lib";

  organization
    "IETF CORE (Constrained RESTful Environments) Working Group";

  contact
    "WG Web:  <http://datatracker.ietf.org/wg/core/>

    WG List:  <mailto:core@ietf.org>
```

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description

"This module contains the list of YANG modules and submodules implemented by a server.

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

```
revision 2017-01-20 {
  description
    "Initial revision.";
  reference
    "RFC XXXX: Constrained YANG Module Library.";
}
```

```
/*
 * Typedefs
 */
```

```
typedef revision {
  type binary {
    length "4";
  }
  description
```

```
"Revision date encoded as a binary string as follow:
- First byte = Year divided by 100
- Second byte = Year modulo 100 (0 to 99)
- Third byte = Month (1 = January to 12 = december)
- Forth byte = Day (1 to 31)";
}
```

```
typedef sid {
```

```

    type uint64;
    description
        "Identifier assigned to different YANG items such as
        data nodes, RPCs and actions, notifications, modules,
        sub-modules, features and deviations.";
}

/*
 * Groupings
 */

grouping identification-info {
    description
        "YANG modules and submodules identification information.";

    leaf sid {
        type sid;
        mandatory true;
        description
            "SID assigned to this module or submodule.";
    }

    leaf revision {
        type revision;
        description
            "Revision date assigned to this module or submodule.
            A zero-length binary string is used if no revision statement
            is present in the YANG module or submodule.";
    }
}

identity module-set {
    description
        "Base identity from which shared module-set identifiers
        are derived.";
}

/*
 * Operational state data nodes
 */

```

```

container modules-state {

```



```

config false;
description
    "Contains information about the different data models
    implemented by the server.";

leaf module-set-id {
    type union {
        type uint32;
        type identityref {
            base "lib:module-set";
        }
    }
    mandatory true;
    description
        "Identifier representing the current set of modules
        and submodules listed in the 'module' list. This
        identifier is server-specific when implemented as
        uint32 or shared between multiple servers when
        implemented as identityref. The server MUST change
        the value of this leaf each time the content of the
        'module' list instance change.";
}

list module {
    key "sid revision";
    description
        "Each entry represents one revision of one module
        currently supported by the server.";

    uses identification-info;

    leaf-list feature {
        type sid;
        description
            "List of YANG features from this module that are
            supported by the server, regardless whether
            they are defined in the module or in any included
            submodules.";
    }

    list deviation {
        key "sid revision";
        description
            "List of YANG deviation modules used by this server
            to modify the conformance of the module associated
            with this entry. Note that the same module can be
            used for deviations for multiple modules, so the

```

same entry MAY appear within multiple 'module' entries.

The deviation module MUST be present in the 'module' list, with the same sid and revision values.

The 'conformance-type' value will be 'implement' for the deviation module.";

```
    uses identification-info;
  }
```

```
leaf conformance-type {
  type enumeration {
    enum implement {
      value 0;
      description
        "Indicates that the server implements one or more
        protocol-accessible objects defined in the YANG
        module identified in this entry. This includes
        deviation statements defined in the module.
```

For YANG version 1.1 modules, there is at most one module entry with conformance type 'implement' for a particular module, since YANG 1.1 requires that at most one revision of a module is implemented.

For YANG version 1 modules, there SHOULD NOT be more than one module entry for a particular module.";

```
  }
  enum import {
    value 1;
    description
      "Indicates that the server imports reusable definitions
      from the specified revision of the module, but does
      not implement any protocol accessible objects from
      this revision.
```

Multiple module entries for the same module MAY exist. This can occur if multiple modules import the same module, but specify different revision-dates in the import statements.";

```
  }
}
mandatory true;
description
  "Indicates the type of conformance the server is claiming
  for the YANG module identified by this entry.";
```

```
}
```

```
    list submodule {
      key "sid revision";
      description
        "Each entry represents one submodule within the
         parent module.";
      uses identification-info;
    }
  }
}

/*
 * Notifications
 */

notification yang-library-change {
  description
    "Generated when the set of modules and submodules supported
     by the server has changed.";

  leaf module-set-id {
    type leafref {
      path "/lib:modules-state/lib:module-set-id";
    }
    mandatory true;
    description
      "Contains the module-set-id value representing the
       set of modules and submodules supported by the server
       at the time the notification is generated.";
  }
}
}
<CODE ENDS>
```

[5.](#) IANA Considerations

[5.1.](#) YANG Module Registry

This document registers one YANG module in the YANG Module Names registry [[RFC7950](#)].

name: ietf-constrained-yang-library

namespace: urn:ietf:params:xml:ns:yang:ietf-constrained-yang-library

prefix: lib

reference: RFC XXXX

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

[6.](#) Security Considerations

This YANG module is designed to be accessed via the CoMI protocol [[I-D.ietf-core-comi](#)]. Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access to these data nodes.

Specifically, the 'module' list may help an attacker to identify the server capabilities and server implementations with known bugs. Server vulnerabilities may be specific to particular modules, module revisions, module features, or even module deviations. This information is included in each module entry. For example, if a particular operation on a particular data node is known to cause a server to crash or significantly degrade device performance, then the module list information will help an attacker identify server implementations with such a defect, in order to launch a denial of service attack on the device.

[7.](#) Acknowledgments

The YANG module defined by this memo have been derived from an already existing YANG module, ietf-yang-library [[RFC7895](#)], we will like to thanks to the authors of this YANG module. A special thank also to Andy Bierman for his initial recommendations for the creation of this YANG module.

[8.](#) References

[8.1.](#) Normative References

[I-D.ietf-core-comi]

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[RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", [RFC 7950](#), DOI 10.17487/RFC7950, August 2016, <<http://www.rfc-editor.org/info/rfc7950>>.

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[RFC7895] Bierman, A., Bjorklund, M., and K. Watsen, "YANG Module Library", [RFC 7895](#), DOI 10.17487/RFC7895, June 2016, <<http://www.rfc-editor.org/info/rfc7895>>.

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