Abstract

This document provides for the association of tags with YANG modules. The expectation is for such tags to be used to help classify and organize modules. A method for defining, reading and writing a modules tags is provided. Tags may be standardized and assigned during module definition; assigned by implementations; or dynamically defined and set by users. This document provides guidance to future model writers and, as such, this document updates [RFC8407].

Status of This Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at https://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on August 19, 2019.

Copyright Notice

Copyright (c) 2019 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents (https://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect
1. Introduction

The use of tags for classification and organization is fairly ubiquitous not only within IETF protocols, but in the internet itself (e.g., #hashtags). One benefit of using tags for organization over a rigid structure is that it is more flexible and can more easily adapt over time as technologies evolve. Tags can be usefully standardized, but they can also serve as a non-standardized mechanism available for users to define themselves. This document provides a mechanism to define tags and associate them with YANG modules in a flexible manner. In particular, tags may be standardized as well as assigned during module definition; assigned by implementations; or dynamically defined and set by users.
This document defines a YANG module [RFC7950] which provides a list of module entries to allow for adding or removing of tags as well as viewing the set of tags associated with a module.

This document defines an extension statement to be used to indicate tags that SHOULD be added by the module implementation automatically (i.e., outside of configuration).

This document also defines an IANA registry for tag prefixes as well as a set of globally assigned tags.

Section 7 provides guidelines for authors of YANG data models. This document updates [RFC8407].

The YANG data model in this document conforms to the Network Management Datastore Architecture defined in [RFC8342].

1.1. Some possible use cases of YANG module tags

During this document's progression there were requests for example uses of module tags. The following are a few example use cases for tags. This list is certainly not exhaustive.

One example use of tags would be to help filter different discrete categories of YANG modules supported by a device. E.g., if modules are suitably tagged, then an XPath query can be used to list all of the vendor modules supported by a device.

Tags can also be used to help coordination when multiple semi-independent clients are interacting with the same devices. E.g., one management client could mark that some modules should not be used because they have not been verified to behave correctly, so that other management clients avoid querying the data associated with those modules.

Tag classification is useful for users searching module repositories (e.g., YANG catalog). A query restricted to the ‘ietf:routing’ module tag could be used to return only the IETF YANG modules associated with routing. Without tags, a user would need to know the name of all the IETF routing protocol YANG modules.

Future management protocol extensions could allow for filtering queries of configuration or operational state on a server based on tags. E.g., return all operational state related to system-management.
2. Conventions Used in This Document

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 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Tag Values

All tags SHOULD begin with a prefix indicating who owns their definition. An IANA registry is used to support standardizing tag prefixes. Currently 3 prefixes are defined with all others reserved. No further structure is imposed by this document on the value following the standard prefix, and the value can contain any yang type 'string' characters except carriage-returns, newlines and tabs.

3.1. IETF Standard Tags

An IETF standard tag is a tag that has the prefix "ietf:". All IETF standard tags are registered with IANA in a registry defined later in this document.

3.2. Vendor Tags

A vendor tag is a tag that has the prefix "vendor:". These tags are defined by the vendor that implements the module, and are not standardized; however, it is RECOMMENDED that the vendor include extra identification in the tag to avoid collisions such as using the enterprise or organization name following the "vendor:" prefix (e.g., vendor:example.com:vendor-defined-classifier).

3.3. User Tags

A user tag is any tag that has the prefix "user:". These tags are defined by the user/administrator and will never be standardized.

3.4. Reserved Tags

Any tag not starting with the prefix "ietf:", "vendor:" or "user:" is reserved for future standardization.

4. Tag Management

Tags can become associated with a module in a number of ways. Tags may be defined and associated at module design time, at implementation time, or via user administrative control. As the main
consumer of tags are users, users may also remove any tag, no matter how the tag became associated with a module.

4.1. Module Definition Association

A module definition can indicate a set of tags to be added by the module implementer. These design time tags are indicated using the module-tag extension statement. If the module definition is IETF standards track, the tags MUST also be IETF standard tags (Section 3.1). Thus, new modules can drive the addition of new standard tags to the IANA registry, and the IANA registry can serve as a check against duplication.

4.2. Implementation Association

An implementation MAY include additional tags associated with a module. These tags may be standard or vendor specific tags.

4.3. Administrative Tagging

Tags of any kind can be assigned and removed using normal configuration mechanisms.

5. Tags Module Structure

5.1. Tags Module Tree

The tree associated with the "ietf-module-tags" module follows. The meaning of the symbols can be found in [RFC8340].

module: ietf-module-tags
  +--rw module-tags
     +--rw module* [name]
       +--rw name yang:yang-identifier
       +--rw tag* tag
       +--rw masked-tag* tag

5.2. Tags Module

<CODE BEGINS> file "ietf-module-tags@2019-02-15.yang"
module ietf-module-tags {
  yang-version 1.1;
  prefix tags;

  import ietf-yang-types {
    prefix yang;
  }
</CODE BEGINS>
This module describes a mechanism associating tags with YANG modules. Tags may be IANA assigned or privately defined.

Copyright (c) 2018 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 Simplified 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://tools.ietf.org/html/rfcXXXX); see the RFC itself for full legal notices.

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

revision 2018-10-17 {
  description
    "Initial revision.";
  reference "RFC XXXX: YANG Module Tags";
}

typedef tag {
  type string {
    length "1..max";
    pattern '^[a-zA-Z_][a-zA-Z0-9\-_]*:[\S ]+$';
  }
  description
"A tag value is composed of a standard prefix followed by any type ‘string’ value that does not include carriage return, newline or tab characters."

extension module-tag {
  argument tag;
  description
  "The argument ‘tag’ is of type ‘tag’. This extension statement is used by module authors to indicate the tags that SHOULD be added automatically by the system. As such the origin of the value for the pre-defined tags should be set to ‘system’."
}

container module-tags {
  description
  "Contains the list of modules and their associated tags"
  list module {
    key "name";
    description
    "A list of modules and their associated tags"
    leaf name {
      type yang:yang-identifier;
      mandatory true;
      description
      "The YANG module name."
    }
    leaf-list tag {
      type tag;
      description
      "Tags associated with the module. See the IANA ’YANG Module Tag Prefix’ registry for reserved prefixes and the IANA ’YANG Module IETF Tag’ registry for IETF standard tags.

      The ’operational’ state [RFC8342] view of this list is constructed using the following steps:

      1) System tags (i.e., tags of ’system’ origin) are added.
      2) User configured tags (i.e., tags of ’intended’ origin) are added.
      3) Any tag that is equal to a masked-tag is removed."
    }
    leaf-list masked-tag {
      type tag;
      description
      "The list of tags that should not be associated with this module. The user can remove (mask) tags from the operational state datastore [RFC8342] by adding them to
this list. It is not an error to add tags to this list that are not associated with the module, but they have no operational effect.

6. Other Classifications

It is worth noting that a different YANG module classification document exists [RFC8199]. That document only classifies modules in a logical manner and does not define tagging or any other mechanisms. It divides YANG modules into two categories (service or element) and then into one of three origins: standard, vendor or user. It does provide a good way to discuss and identify modules in general. This document defines standard tags to support [RFC8199] style classification.

7. Guidelines to Model Writers

This section updates [RFC8407].

7.1. Define Standard Tags

A module MAY indicate, using module-tag extension statements, a set of tags that are to be automatically associated with it (i.e., not added through configuration).

```yang
module example-module {
  ...
  import module-tags { prefix tags; }

  tags:module-tag "ietf:some-new-tag";
  tags:module-tag "ietf:some-other-tag";
  ...
}
```

The module writer can use existing standard tags, or use new tags defined in the model definition, as appropriate. For standardized modules new tags MUST be assigned in the IANA registry defined below, see Section 8.2 below.
8. IANA Considerations

8.1. YANG Module Tag Prefix Registry

This registry allocates tag prefixes. All YANG module tags SHOULD begin with one of the prefixes in this registry.

The allocation policy for this registry is Specification Required [RFC5226].

The initial values for this registry are as follows.

<table>
<thead>
<tr>
<th>prefix</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ietf:</td>
<td>IETF Standard Tag allocated in the IANA YANG Module IETF Tag Registry.</td>
</tr>
<tr>
<td>vendor:</td>
<td>Non-standardized tags allocated by the module implementer.</td>
</tr>
<tr>
<td>user:</td>
<td>Non-standardized tags allocated by and for the user.</td>
</tr>
</tbody>
</table>

Other SDOs (standard organizations) wishing to standardize their own set of tags could allocate a top level prefix from this registry.

8.2. YANG Module IETF Tag Registry

This registry allocates prefixes that have the standard prefix "ietf:". New values should be well considered and not achievable through a combination of already existing standard tags.

The allocation policy for this registry is IETF Review [RFC5226].

The initial values for this registry are as follows.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ietf:network-element-class</td>
<td>A module for a network element.</td>
<td>[RFC8199]</td>
</tr>
<tr>
<td>ietf:network-service-class</td>
<td>A module for a network service.</td>
<td>[RFC8199]</td>
</tr>
<tr>
<td>ietf:sdo-defined-class</td>
<td>A module defined by a standards organization.</td>
<td>[RFC8199]</td>
</tr>
<tr>
<td>ietf:vendor-defined-class</td>
<td>A module defined by a vendor.</td>
<td>[RFC8199]</td>
</tr>
<tr>
<td>ietf:user-defined-class</td>
<td>A module defined by the user.</td>
<td>[RFC8199]</td>
</tr>
<tr>
<td>Module Tag</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>ietf:hardware</td>
<td>A module relating to hardware (e.g., inventory).</td>
<td></td>
</tr>
<tr>
<td>ietf:software</td>
<td>A module relating to software (e.g., installed OS).</td>
<td></td>
</tr>
<tr>
<td>ietf:qos</td>
<td>A module for managing quality of service.</td>
<td></td>
</tr>
<tr>
<td>ietf:protocol</td>
<td>A module representing a protocol.</td>
<td></td>
</tr>
<tr>
<td>ietf:system-management</td>
<td>A module relating to system management (e.g., a system management protocol such as syslog, TACAC+, SNMP, netconf, ...)</td>
<td></td>
</tr>
<tr>
<td>ietf:network-service</td>
<td>A module relating to network service (e.g., a network service protocol such as an NTP server, DNS server, DHCP server, etc).</td>
<td></td>
</tr>
<tr>
<td>ietf:oam</td>
<td>A module representing Operations, Administration, and Maintenance (e.g., BFD).</td>
<td></td>
</tr>
<tr>
<td>ietf:routing</td>
<td>A module related to routing.</td>
<td></td>
</tr>
<tr>
<td>ietf:signaling</td>
<td>A module representing control plane signaling.</td>
<td></td>
</tr>
<tr>
<td>ietf:lmp</td>
<td>A module representing a link management protocol.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: IETF Module Tag Registry
9. References

9.1. Normative References


9.2. Informative References


Appendix A. Acknowledgements

Special thanks to Robert Wilton for his help improving the introduction and providing the example use cases.
Appendix B. Example

The following is a fictional example result from a query of the module tags list. For the sake of brevity only a few module results are imagined.

```
{
  "ietf-module-tags:module-tags": {
    "module": [
      {
        "name": "ietf-bfd",
        "tag": [
          "ietf:network-element-class",
          "ietf:oam",
          "ietf:protocol",
          "ietf:sdo-defined-class"
        ]
      },
      {
        "name": "ietf-isis",
        "tag": [
          "ietf:network-element-class",
          "ietf:protocol",
          "ietf:routing",
          "ietf:sdo-defined-class"
        ]
      },
      {
        "name": "ietf-ssh-server",
        "tag": [
          "ietf:network-element-class",
          "ietf:protocol",
          "ietf:sdo-defined-class",
          "ietf:system-management"
        ]
      }
    ]
  }
}
```

Authors’ Addresses

Christian Hopps
LabN Consulting, L.L.C.

Email: chopps@chopps.org
Lou Berger
LabN Consulting, L.L.C.

Email: lberger@labn.net

Dean Bogdanovic
Volta Networks

Email: ivandean@gmail.com