

Network Working Group
Internet-Draft
Updates: 8407 (if approved)
Intended status: Standards Track
Expires: 13 January 2022

B. Claise
Huawei
J. Clarke, Ed.
R. Rahman
R. Wilton, Ed.
Cisco Systems, Inc.
B. Lengyel
Ericsson
J. Sterne
Nokia
K. D'Souza
AT&T
12 July 2021

YANG Semantic Versioning
draft-ietf-netmod-yang-semver-03

Abstract

This document specifies a scheme and guidelines for applying a modified set of semantic versioning rules to revisions of YANG modules. Additionally, this document defines a revision-label for this modified semver scheme.

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 13 January 2022.

Copyright Notice

Copyright (c) 2021 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 to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1. Introduction	2
2. Terminology and Conventions	3
3. YANG Semantic Versioning	3
3.1. YANG Semantic Versioning Pattern	3
3.2. Semantic Versioning Scheme for YANG Artifacts	4
3.2.1. Examples for YANG semantic version numbers	6
3.3. YANG Semantic Version Update Rules	8
3.4. Examples of the YANG Semver Label	10
3.4.1. Example Module Using YANG Semver	10
3.4.2. Example of Package Using YANG Semver	12
4. Import Module by Semantic Version	12
5. Guidelines for Using Semver During Module Development	13
5.1. Pre-release Version Precedence	14
5.2. YANG Semver in IETF Modules	15
6. YANG Module	16
7. Contributors	17
8. Security Considerations	18
9. IANA Considerations	18
9.1. YANG Module Registrations	18
9.2. Guidance for YANG Semver in IANA maintained YANG modules and submodules	19
10. References	19
10.1. Normative References	19
10.2. Informative References	20
Appendix A. Example IETF Module Development	21
Authors' Addresses	22

1. Introduction

[I-D.ietf-netmod-yang-module-versioning] puts forth a number of concepts relating to modified rules for updating modules and submodules, a means to signal when a new revision of a module or submodule has non-backwards-compatible (NBC) changes compared to its previous revision, and a versioning scheme that uses the revision history as a lineage for determining from where a specific revision of a YANG module or submodule is derived. Additionally, section 3.3 of [I-D.ietf-netmod-yang-module-versioning] defines a revision label

which can be used as an overlay or alias to provide additional context or an additional way to refer to a specific revision.

This document defines a revision-label scheme that uses modified [semver] rules for YANG artifacts (i.e., YANG modules, YANG submodules, and YANG packages [I-D.ietf-netmod-yang-packages]) as well as the revision label definition for using this scheme. The goal of this is to add a human readable version label that provides compatibility information for the YANG artifact without one needing to compare or parse its body. The label and rules defined herein represent the RECOMMENDED revision label scheme for IETF YANG artifacts.

Note that a specific revision of the Semver 2.0.0 specification is referenced here (from June 19, 2020) to provide an immutable version. This is because the 2.0.0 version of the specification has changed over time without any change to the semantic version itself. In some cases the text has changed in non-backwards-compatible ways.

2. Terminology and Conventions

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.

Additionally, this document uses the following terminology:

- * YANG artifact: YANG modules, YANG submodules, and YANG packages [I-D.ietf-netmod-yang-packages] , and YANG schema elements are examples of YANG artifacts for the purposes of this document.

3. YANG Semantic Versioning

This section defines YANG Semantic Versioning, explains how it is used with YANG artifacts, and the rules associated with changing an artifact's semantic version number when its contents are updated.

3.1. YANG Semantic Versioning Pattern

YANG artifacts that employ semantic versioning as defined in this document MUST use a version string (e.g., in revision-label or as a package version) that corresponds to the following pattern:
X.Y.Z_COMPAT. Where:

- * X, Y and Z are mandatory non-negative integers that are each less than 2147483647 (i.e., the maximum signed 32-bit integer value) and MUST NOT contain leading zeroes
- * The '.' is a literal period (ASCII character 0x2e)
- * The '_' is an optional single literal underscore (ASCII character 0x5f) and MUST only be present if the following COMPAT element is included
- * COMPAT, if it is specified, MUST be either the literal string "compatible" or the literal string "non_compatible"

Additionally, [semver] defines two specific types of metadata that may be appended to a semantic version string. Pre-release metadata MAY be appended to a semver string after a trailing '-' character. Build metadata MAY be appended after a trailing '+' character. If both pre-release and build metadata are present, then build metadata MUST follow pre-release metadata. While build metadata MUST be ignored by YANG semver parsers, pre-release metadata MUST be used during module and submodule development and MUST be considered base on Section 5 . Both pre-release and build metadata are allowed in order to support all of the [semver] rules. Thus, a version lineage that follows strict [semver] rules is allowed for a YANG artifact.

To signal the use of this versioning scheme, modules and submodules MUST set the revision-label-scheme extension as defined in [I-D.ietf-netmod-yang-module-versioning] to the identity "yang-semver". That identity value is defined in the ietf-yang-semver module below.

Additionally, this ietf-yang-semver module defines a typedef that formally specifies the syntax of the YANG semver version string.

3.2. Semantic Versioning Scheme for YANG Artifacts

This document defines the YANG semantic versioning scheme that is used for YANG artifacts that employ the YANG semver label. The versioning scheme has the following properties:

- * The YANG semantic versioning scheme is extended from version 2.0.0 of the semantic versioning scheme defined at semver.org [semver] to cover the additional requirements for the management of YANG artifact lifecycles that cannot be addressed using the semver.org 2.0.0 versioning scheme alone.

- * Unlike the [semver] versioning scheme, the YANG semantic versioning scheme supports updates to older versions of YANG artifacts, to allow for bug fixes and enhancements to artifact versions that are not the latest. However, it does not provide for the unlimited branching and updating of older revisions which are documented by the general rules in [I-D.ietf-netmod-yang-module-versioning] .
- * YANG artifacts that follow the [semver] versioning scheme are fully compatible with implementations that understand the YANG semantic versioning scheme defined in this document.
- * If updates are always restricted to the latest revision of the artifact only, then the version numbers used by the YANG semantic versioning scheme are exactly the same as those defined by the [semver] versioning scheme.

Every YANG module and submodule versioned using the YANG semantic versioning scheme specifies the module's or submodule's semantic version number as the argument to the 'rev:revision-label' statement.

Because the rules put forth in [I-D.ietf-netmod-yang-module-versioning] are designed to work well with existing versions of YANG and allow for artifact authors to migrate to this scheme, it is not expected that all revisions of a given YANG artifact will have a semantic version label. For example, the first revision of a module or submodule may have been produced before this scheme was available.

YANG packages that make use of this semantic versioning scheme will have their semantic version as the value of the "revision_label" property.

As stated above, the YANG semver version number is expressed as a string of the form: 'X.Y.Z_COMPAT'; where X, Y, and Z each represent non-negative integers smaller than 2147483647 without leading zeroes, and _COMPAT represents an optional suffix of either "_compatible" or "_non_compatible".

- * 'X' is the MAJOR version. Changes in the MAJOR version number indicate changes that are non-backwards-compatible to versions with a lower MAJOR version number.
- * 'Y' is the MINOR version. Changes in the MINOR version number indicate changes that are backwards-compatible to versions with the same MAJOR version number, but a lower MINOR version number and no PATCH "_compatible" or "_non_compatible" modifier.

- * 'Z_COMPAT' is the PATCH version and modifier. Changes in the PATCH version number can indicate editorial, backwards-compatible, or non-backwards-compatible changes relative to versions with the same MAJOR and MINOR version numbers, but lower PATCH version number, depending on what form modifier "_COMPAT" takes:
 - If the modifier string is absent, the change represents an editorial change. An editorial change is defined to be a change in the YANG artifact's content that does not affect the semantic meaning or functionality provided by the artifact in any way. Some examples include correcting a spelling mistake in the description of a leaf within a YANG module or submodule, non-significant whitespace changes (e.g. realigning description statements, or changing indendation), or changes to YANG comments. Note: restructuring how a module uses, or does not use, submodules is treated as an editorial level change on the condition that there is no change in the module's semantic behavior due to the restructuring.
 - If, however, the modifier string is present, the meaning is described below:
 - "_compatible" - the change represents a backwards-compatible change
 - "_non_compatible" - the change represents a non-backwards-compatible change

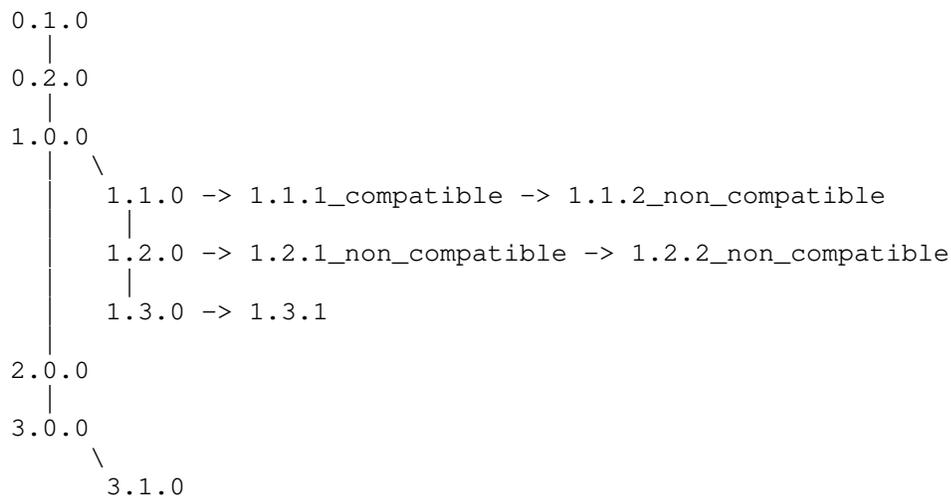
The YANG artifact name and YANG semantic version number uniquely identify a revision of said artifact. There MUST NOT be multiple instances of a YANG artifact definition with the same name and YANG semantic version number but different content (and in the case of modules and submodules, different revision dates).

There MUST NOT be multiple versions of a YANG artifact that have the same MAJOR, MINOR and PATCH version numbers, but different patch modifier strings. E.g., artifact version "1.2.3_non_compatible" MUST NOT be defined if artifact version "1.2.3" has already been defined.

3.2.1. Examples for YANG semantic version numbers

The following diagram and explanation illustrates how YANG semantic version numbers work.

Example YANG semantic version numbers for an example artifact:



Assume the tree diagram above illustrates how an example YANG module's version history might evolve. For example, the tree might represent the following changes, listed in chronological order from oldest revision to newest:

- 0.1.0 - first beta module version
- 0.2.0 - second beta module version (with NBC changes)
- 1.0.0 - first release (may have NBC changes from 0.2.0)
- 1.1.0 - added new functionality, leaf "foo" (BC)
- 1.2.0 - added new functionality, leaf "baz" (BC)
- 1.3.0 - improve existing functionality, added leaf "foo-64" (BC)
- 1.3.1 - improve description wording for "foo-64" (Editorial)
- 1.1.1_compatible - backport "foo-64" leaf to 1.1.x to avoid implementing "baz" from 1.2.0 (BC)
- 2.0.0 - change existing model for performance reasons, e.g. re-key list (NBC)
- 1.1.2_non_compatible - NBC point bug fix, not required in 2.0.0 due to model changes (NBC)
- 3.0.0 - NBC bugfix, rename "baz" to "bar"; also add new BC leaf "wibble"; (NBC)

1.2.1_non_compatible - backport NBC fix, changing "baz" to "bar"

1.2.2_non_compatible - backport "wibble". This is a BC change but "non_compatible" modifier is sticky.

3.1.0 - introduce new leaf "wobble" (BC)

The partial ordering relationships based on the semantic versioning numbers can be defined as follows:

1.0.0 < 1.1.0 < 1.2.0 < 1.3.0 < 2.0.0 < 3.0.0 < 3.1.0

1.0.0 < 1.1.0 < 1.1.1_compatible < 1.1.2_non_compatible

1.0.0 < 1.1.0 < 1.2.0 < 1.2.1_non_compatible <
1.2.2_non_compatible

There is no ordering relationship between 1.1.1_non_compatible and either 1.2.0 or 1.2.1_non_compatible, except that they share the common ancestor of 1.1.0.

Looking at the version number alone, the module definition in 2.0.0 does not necessarily contain the contents of 1.3.0. However, the module revision history in 2.0.0 may well indicate that it was edited from module version 1.3.0.

3.3. YANG Semantic Version Update Rules

When a new revision of an artifact is produced, then the following rules define how the YANG semantic version number for the new artifact revision is calculated, based on the changes between the two artifact revisions, and the YANG semantic version number of the base artifact revision from which the changes are derived.

The following four rules specify the RECOMMENDED, and REQUIRED minimum, update to a YANG semantic version number:

1. If an artifact is being updated in a non-backwards-compatible way, then the artifact version "X.Y.Z[_compatible|_non_compatible]" SHOULD be updated to "X+1.0.0" unless that version has already been used for this artifact but with different content, in which case the artifact version "X.Y.Z+1_non_compatible" SHOULD be used instead.
2. If an artifact is being updated in a backwards-compatible way, then the next version number depends on the format of the current version number:

- i "X.Y.Z" - the artifact version SHOULD be updated to "X.Y+1.0", unless that version has already been used for this artifact but with different content, when the artifact version SHOULD be updated to "X.Y.Z+1_compatible" instead.
 - ii "X.Y.Z_compatible" - the artifact version SHOULD be updated to "X.Y.Z+1_compatible".
 - iii "X.Y.Z_non_compatible" - the artifact version SHOULD be updated to "X.Y.Z+1_non_compatible".
3. If an artifact is being updated in an editorial way, then the next version number depends on the format of the current version number:
 - i "X.Y.Z" - the artifact version SHOULD be updated to "X.Y.Z+1"
 - ii "X.Y.Z_compatible" - the artifact version SHOULD be updated to "X.Y.Z+1_compatible".
 - iii "X.Y.Z_non_compatible" - the artifact version SHOULD be updated to "X.Y.Z+1_non_compatible".
4. YANG artifact semantic version numbers beginning with 0, i.e., "0.X.Y", are regarded as beta definitions and need not follow the rules above. Either the MINOR or PATCH version numbers may be updated, regardless of whether the changes are non-backwards-compatible, backwards-compatible, or editorial. See Section 5 for more details on using this notation during module and submodule development.
5. XXX - Add some text about pre-release labels, or perhaps as a rule 5 above.

Although artifacts SHOULD be updated according to the rules above, which specify the recommended (and minimum required) update to the version number, the following rules MAY be applied when choosing a new version number:

1. An artifact author MAY update the version number with a more significant update than described by the rules above. For example, an artifact could be given a new MAJOR version number (i.e., X+1.0.0), even though no non-backwards-compatible changes have occurred, or an artifact could be given a new MINOR version number (i.e., X.Y+1.0) even if the changes were only editorial.

2. An artifact author MAY skip version numbers. That is, an artifact's revision history could be 1.0.0, 1.1.0, and 1.3.0 where 1.2.0 is skipped. Note that skipping versions has an impact when importing modules by revision-or-derived. See Section 4 for more details on importing modules with revision-label version gaps.

Although YANG Semver always indicates when a non-backwards-compatible, or backwards-compatible change may have occurred to a YANG artifact, it does not guarantee that such a change has occurred, or that consumers of that YANG artifact will be impacted by the change. Hence, tooling, e.g., [I-D.ietf-netmod-yang-schema-comparison] , also plays an important role for comparing YANG artifacts and calculating the likely impact from changes.

[I-D.ietf-netmod-yang-module-versioning] defines the "rev:nbc-changes" extension statement to indicate where non-backwards-compatible changes have occurred in the module revision history. If a revision entry in a module's revision history includes the "rev:nbc-changes" statement then that MUST be reflected in any YANG Semver version associated with that revision. However, the reverse does not necessarily hold, i.e., if the MAJOR version has been incremented it does not necessarily mean that a "rev:nbc-changes" statement would be present.

3.4. Examples of the YANG Semver Label

3.4.1. Example Module Using YANG Semver

Below is a sample YANG module that uses the YANG semver revision label based on the rules defined in this document.

```
module example-versioned-module {
  yang-version 1.1;
  namespace "urn:example:versioned:module";
  prefix "exvermod";
  rev:revision-label-scheme "yangver:yang-semver";

  import ietf-yang-revisions { prefix "rev"; }
  import ietf-yang-semver { prefix "yangver"; }

  description
    "to be completed";

  revision 2018-02-28 {
    description "Added leaf 'wobble'";
    rev:revision-label "3.1.0";
  }
}
```

```
}

revision 2017-12-31 {
  description "Rename 'baz' to 'bar', added leaf 'wibble'";
  rev:revision-label "3.0.0";
  rev:nbc-changes;
}

revision 2017-10-30 {
  description "Change the module structure";
  rev:revision-label "2.0.0";
  rev:nbc-changes;
}

revision 2017-08-30 {
  description "Clarified description of 'foo-64' leaf";
  rev:revision-label "1.3.1";
}

revision 2017-07-30 {
  description "Added leaf foo-64";
  rev:revision-label "1.3.0";
}

revision 2017-04-20 {
  description "Add new functionality, leaf 'baz'";
  rev:revision-label "1.2.0";
}

revision 2017-04-03 {
  description "Add new functionality, leaf 'foo'";
  rev:revision-label "1.1.0";
}

revision 2017-04-03 {
  description "First release version.";
  rev:revision-label "1.0.0";
}

// Note: semver rules do not apply to 0.X.Y labels.

revision 2017-01-30 {
  description "NBC changes to initial revision";
  semver:module-version "0.2.0";
}

revision 2017-01-26 {
  description "Initial module version";
```

```
    semver:module-version "0.1.0";
  }

  //YANG module definition starts here
```

3.4.2. Example of Package Using YANG Semver

Below is an example YANG package that uses the semver revision label based on the rules defined in this document.

```
{
  "ietf-yang-instance-data:instance-data-set": {
    "name": "example-yang-pkg",
    "target-ptr": "TBD",
    "timestamp": "2018-09-06T17:00:00Z",
    "description": "Example IETF package definition",
    "content-data": {
      "ietf-yang-package:yang-package": {
        "name": "example-yang-pkg",
        "version": "1.3.1",
        ...
      }
    }
  }
}
```

4. Import Module by Semantic Version

[I-D.ietf-netmod-yang-module-versioning] allows for imports to be done based on a module or a derived revision of a module. The `rev:revision-or-derived` statement can specify either a revision date or a revision label. When importing by semver, the YANG semver revision label value MAY be used as an argument to `rev:revision-or-derived`. When used as such, any module which has that semver label as its latest revision label or has that label in its revision history can be used to satisfy the import requirement. For example:

```
import example-module {
  rev:revision-or-derived "3.0.0";
}
```

Note: the import lookup does not stop when a non-backward-compatible change is encountered. That is, if module B imports a module A at or derived from version 2.0.0, resolving that import will pass through a revision of module A with version 2.1.0_non_compatible in order to determine if the present instance of module A derives from 2.0.0.

If an import by revision-or-derived cannot locate the specified revision-label in a given module's revision history, that import will fail. This is noted in the case of version gaps. That is, if a module's history includes 1.0.0, 1.1.0, and 1.3.0, an import from revision-or-derived at 1.2.0 will be unable to locate the specified revision entry and thus the import cannot be satisfied.

5. Guidelines for Using Semver During Module Development

This section and the IETF-specific sub-section below provides YANG semver-specific guidelines to consider when developing new YANG modules. As such this section updates [RFC8407] .

Development of a brand new YANG module or submodule outside of the IETF that uses YANG semver as its revision-label scheme SHOULD begin with a 0 for the MAJOR version component. This allows the module or submodule to disregard strict semver rules with respect to non-backwards-compatible changes during its initial development. However, module or submodule developers MAY choose to use the semver pre-release syntax instead with a 1 for the MAJOR version component. For example, an initial module or submodule revision-label might be either 0.0.1 or 1.0.0-alpha.1. If the authors choose to use the 0 MAJOR version component scheme, they MAY switch to the pre-release scheme with a MAJOR version component of 1 when the module or submodule is nearing initial release (e.g., a module's or submodule's revision label may transition from 0.3.0 to 1.0.0-beta.1 to indicate it is more mature and ready for testing).

When using pre-release notation, the format MUST include at least one alphabetic component and MUST end with a '.' and then one or more digits. These alphanumeric components will be used when deciding pre-release precedence. The following are examples of valid pre-release versions

1.0.0-alpha.1

1.0.0-alpha.3

2.1.0-beta.42

3.0.0-202007.rc.1

When developing a new revision of an existing module or submodule using the YANG semver revision-label scheme, the intended target semver version MUST be used along with pre-release notation. For example, if a released module or submodule which has a current revision-label of 1.0.0 is being modified with the intent to make non-backwards-compatible changes, the first development MAJOR version

component must be 2 with some pre-release notation such as `-alpha.1`, making the version `2.0.0-alpha.1`. That said, every publicly available release of a module or submodule MUST have a unique YANG semver revision-label (where a publicly available release is one that could be implemented by a vendor or consumed by an end user). Therefore, it may be prudent to include the year or year and month development began (e.g., `2.0.0-201907-alpha.1`). As a module or submodule undergoes development, it is possible that the original intent changes. For example, a `1.0.0` version of a module or submodule that was destined to become `2.0.0` after a development cycle may have had a scope change such that the final version has no non-backwards-compatible changes and becomes `1.1.0` instead. This change is acceptable to make during the development phase so long as pre-release notation is present in both versions (e.g., `2.0.0-alpha.3` becomes `1.1.0-alpha.4`). However, on the next development cycle (after `1.1.0` is released), if again the new target release is `2.0.0`, new pre-release components must be used such that every revision-label for a given module or submodule MUST be unique throughout its entire lifecycle (e.g., the first pre-release version might be `2.0.0-202005-alpha.1` if keeping the same year and month notation mentioned above).

5.1. Pre-release Version Precedence

As a module or submodule is developed, the scope of the work may change. That is, while a ratified module or submodule with revision-label `1.0.0` is initially intended to become `2.0.0` in its next ratified version, the scope of work may change such that the final version is `1.1.0`. During the development cycle, the pre-release versions could move from `2.0.0-some-pre-release-tag` to `1.1.0-some-pre-release-tag`. This downwards changing of version numbers makes it difficult to evaluate semver rules between pre-release versions. However, taken independently, each pre-release version can be compared to the previously ratified version (e.g., `1.1.0-some-pre-release-tag` and `2.0.0-some-pre-release-tag` can each be compared to `1.0.0`). Module and submodule developers SHOULD maintain only one revision statement in a pre-released module or submodule that reflects the latest revision. IETF authors MAY choose to include an appendix in the associated draft to track overall changes to the module or submodule.

5.2. YANG Semver in IETF Modules

All published IETF modules and submodules MUST use YANG semantic versions for their revision-labels. For IETF YANG modules and submodules that have already been published, revision labels MUST be retrospectively applied to all existing revisions when the next new revision is created, starting at version "1.0.0" for the initial published revision, and then incrementing according to the YANG Semver version rules specified in Section 3.3 .

Net new module or submodule development within the IETF SHOULD begin with the 0 MAJOR number scheme as described above. When revising an existing IETF module or submodule, the revision-label MUST use the target (i.e., intended) MAJOR and MINOR version components with a 0 PATCH version component. If the intended ratified release will be non-backward-compatible with the current ratified release, the MINOR version component MUST be 0.

All IETF modules and submodules in development MUST use the whole document name as a pre-release version string, including the current document revision. For example, if a module or submodule which is currently released at version 1.0.0 is being revised to include non-backwards-compatible changes in draft-user-netmod-foo, its development revision-labels MUST include 2.0.0-draft-user-netmod-foo followed by the document's revision (e.g., 2.0.0-draft-user-netmod-foo-02). This will ensure each pre-release version is unique across the lifecycle of the module or submodule. Even when using the 0 MAJOR version for initial module or submodule development (where MINOR and PATCH can change), appending the draft name as a pre-release component helps to ensure uniqueness when there are perhaps multiple, parallel efforts creating the same module or submodule.

If a module or submodule is being revised and the original module or submodule never had a revision-label (i.e., you wish to start using YANG semver in future module or submodule revisions), choose a semver value that makes the most sense based on the module's or submodule's history. For example, if a module or submodule started out in the pre-NMDA ([RFC8342]) world, and then had NMDA support added without removing any legacy "state" branches -- and you are looking to add additional new features -- a sensible choice for the target YANG semver would be 1.2.0 (since 1.0.0 would have been the initial, pre-NMDA release, and 1.1.0 would have been the NMDA revision).

See Appendix A for a detailed example of IETF pre-release versions.

6. YANG Module

This YANG module contains the typedef for the YANG semantic version.

```
<CODE BEGINS> file "ietf-yang-semver@2020-06-30.yang"
module ietf-yang-semver {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-semver";
  prefix yangver;
  rev:revision-label-scheme "yang-semver";

  import ietf-yang-revisions {
    prefix rev;
  }

  organization
    "IETF NETMOD (Network Modeling) Working Group";
  contact
    "WG Web: <http://tools.ietf.org/wg/netmod/>
    WG List: <mailto:netmod@ietf.org>

    Author: Joe Clarke
            <mailto:jclarke@cisco.com>";
  description
    "This module provides type and grouping definitions for YANG
    packages.

    Copyright (c) 2020 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
    (http://trustee.ietf.org/license-info).

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

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

  revision 2020-06-30 {
    rev:revision-label "1.0.0-draft-ietf-netmod-yang-semver-01";
    description
```

```

        "Initial revision";
    reference
        "RFC XXXX: YANG Semantic Versioning.";
    }

/*
 * Identities
 */

identity yang-semver {
    base rev:revision-label-scheme-base-identity;
    description
        "The revision-label scheme corresponds to the YANG semver scheme
        which is defined by the pattern in the 'version' typedef below.
        The rules governing this revision-label scheme are defined in the
        reference for this identity.";
    reference
        "RFC XXXX: YANG Semantic Versioning.";
    }

/*
 * Typedefs
 */

typedef version {
    type string {
        pattern '\d+[.]\d+[.]\d+(\_(non_)?compatible)?(-[\w\d.]+)?([+][\w\d\.]
)?';
    }
    description
        "Represents a YANG semantic version number. The rules governing the
        use of this revision label scheme are defined in the reference for
        this typedef.";
    reference
        "RFC XXXX: YANG Semantic Versioning.";
    }
}
<CODE ENDS>

```

7. Contributors

This document grew out of the YANG module versioning design team that started after IETF 101. The design team consists of the following members whom have worked on the YANG versioning project:

- * Balazs Lengyel
- * Benoit Claise

- * Ebben Aries
- * Jason Sterne
- * Joe Clarke
- * Juergen Schoenwaelder
- * Mahesh Jethanandani
- * Michael (Wangzitao)
- * Qin Wu
- * Reshad Rahman
- * Rob Wilton

The initial revision of this document was refactored and built upon [I-D.clacla-netmod-yang-model-update] .

Discussions on the use of Semver for YANG versioning has been held with authors of the OpenConfig YANG models based on their own [openconfigsemver] . We would like thank both Anees Shaikh and Rob Shakir for their input into this problem space.

8. Security Considerations

The document does not define any new protocol or data model. There are no security impacts.

9. IANA Considerations

9.1. YANG Module Registrations

The following YANG module is requested to be registered in the "IANA Module Names" registry:

Name: ietf-yang-semver

XML Namespace: urn:ietf:params:xml:ns:yang:ietf-yang-semver

Prefix: yangver

Reference: [RFCXXXX]

9.2. Guidance for YANG Semver in IANA maintained YANG modules and submodules

Note for IANA (to be removed by the RFC editor): Please check that the registries and IANA YANG modules and submodules are referenced in the appropriate way.

IANA is responsible for maintaining and versioning some YANG modules and submodules, e.g., `iana-if-types.yang` [`IfTypeYang`] and `iana-routing-types.yang` [`RoutingTypesYang`] .

In addition to following the rules specified in the IANA Considerations section of [`I-D.ietf-netmod-yang-module-versioning`] , IANA maintained YANG modules and submodules MUST also include a YANG Semver revision label for all new revisions, as defined in Section 3 .

The YANG Semver version associated with the new revision MUST follow the rules defined in Section 3.3 .

Note: For IANA maintained YANG modules and submodules that have already been published, revision labels MUST be retrospectively applied to all existing revisions when the next new revision is created, starting at version "1.0.0" for the initial published revision, and then incrementing according to the YANG Semver version rules specified in Section 3.3 .

Most changes to IANA maintained YANG modules and submodules are expected to be backwards-compatible changes and classified as MINOR version changes. The PATCH version may be incremented instead when only editorial changes are made, and the MAJOR version would be incremented if non-backwards-compatible major changes are made.

Given that IANA maintained YANG modules and submodules are versioned with a linear history, it is anticipated that it should not be necessary to use the "`_compatible`" or "`_non_compatible`" modifiers to the "`Z_COMPAT`" version element.

10. References

10.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC8407] Bierman, A., "Guidelines for Authors and Reviewers of Documents Containing YANG Data Models", BCP 216, RFC 8407, DOI 10.17487/RFC8407, October 2018, <<https://www.rfc-editor.org/info/rfc8407>>.
- [I-D.ietf-netmod-yang-module-versioning]
Wilton, R., Rahman, R., Lengyel, B., Clarke, J., Sterne, J., Claise, B., and K. D'Souza, "Updated YANG Module Revision Handling", Work in Progress, Internet-Draft, draft-ietf-netmod-yang-module-versioning-02, 22 February 2021, <<https://tools.ietf.org/html/draft-ietf-netmod-yang-module-versioning-02>>.

10.2. Informative References

- [I-D.clacla-netmod-yang-model-update]
Claise, B., Clarke, J., Lengyel, B., and K. D'Souza, "New YANG Module Update Procedure", Work in Progress, Internet-Draft, draft-clacla-netmod-yang-model-update-06, 2 July 2018, <<https://tools.ietf.org/html/draft-clacla-netmod-yang-model-update-06>>.
- [I-D.ietf-netmod-yang-packages]
Wilton, R., Rahman, R., Clarke, J., Sterne, J., and B. Wu, "YANG Packages", Work in Progress, Internet-Draft, draft-ietf-netmod-yang-packages-01, 2 November 2020, <<https://tools.ietf.org/html/draft-ietf-netmod-yang-packages-01>>.
- [I-D.ietf-netmod-yang-schema-comparison]
Wilton, R., "YANG Schema Comparison", Work in Progress, Internet-Draft, draft-ietf-netmod-yang-schema-comparison-01, 2 November 2020, <<https://tools.ietf.org/html/draft-ietf-netmod-yang-schema-comparison-01>>.
- [RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", RFC 8342, DOI 10.17487/RFC8342, March 2018, <<https://www.rfc-editor.org/info/rfc8342>>.
- [openconfigsemver]
"Semantic Versioning for Openconfig Models", <<http://www.openconfig.net/docs/semver/>>.

```
[semver] "Semantic Versioning 2.0.0 (text from June 19, 2020)",  
<https://github.com/semver/semver/  
blob/8b2e8eec394948632957639dfa99fc7ec6286911/semver.md>.
```

```
[IfTypeYang]  
"iana-if-type YANG Module",  
<https://www.iana.org/assignments/iana-if-type/iana-if-  
type.xhtml>.
```

```
[RoutingTypesYang]  
"iana-routing-types YANG Module",  
<https://www.iana.org/assignments/iana-routing-types/iana-  
routing-types.xhtml>.
```

Appendix A. Example IETF Module Development

Assume a new YANG module is being developed in the netmod working group in the IETF. Initially, this module is being developed in an individual internet draft, draft-jdoe-netmod-example-module. The following represents the initial version tree (i.e., value of revision-label) of the module as it's being initially developed.

Version lineage for initial module development:

```
0.0.1-draft-jdoe-netmod-example-module-00  
|  
0.1.0-draft-jdoe-netmod-example-module-01  
|  
0.2.0-draft-jdoe-netmod-example-module-02  
|  
0.2.1-draft-jdoe-netmod-example-module-03
```

At this point, development stabilizes, and the workgroup adopts the draft. Thus now the draft becomes draft-ietf-netmod-example-module. The initial pre-release lineage continues as follows.

Continued version lineage after adoption:

```
1.0.0-draft-ietf-netmod-example-module-00  
|  
1.0.0-draft-ietf-netmod-example-module-01  
|  
1.0.0-draft-ietf-netmod-example-module-02
```

At this point, the draft is ratified and becomes RFC12345 and the YANG module version number becomes 1.0.0.

A time later, the module needs to be revised to add additional capabilities. Development will be done in a backwards-compatible way. Two new individual drafts are proposed to go about adding the capabilities in different ways: draft-jdoe-netmod-exmod-enhancements and draft-jadoe-netmod-exmod-changes. These are initially developed in parallel with the following versions.

Parallel development for next module revision:

```

1.1.0-draft-jdoe-netmod-exmod-enhancements-00 || 1.1.0-draft-jadoe-netmod-e
xmod-changes-00
|
1.1.0-draft-jdoe-netmod-exmod-enhancements-01 || 1.1.0-draft-jadoe-netmod-e
xmod-changes-01

```

At this point, the WG decides to merge some aspects of both and adopt the work in jadoe's draft as draft-ietf-netmod-exmod-changes. A single version lineage continues.

```

1.1.0-draft-ietf-netmod-exmod-changes-00
|
1.1.0-draft-ietf-netmod-exmod-changes-01
|
1.1.0-draft-ietf-netmod-exmod-changes-02
|
1.1.0-draft-ietf-netmod-exmod-changes-03

```

The draft is ratified, and the new module version becomes 1.1.0.

Authors' Addresses

Benoit Claise
Huawei

Email: benoit.claise@huawei.com

Joe Clarke (editor)
Cisco Systems, Inc.
7200-12 Kit Creek Rd
Research Triangle Park, North Carolina
United States of America

Phone: +1-919-392-2867
Email: jclarke@cisco.com

Reshad Rahman
Cisco Systems, Inc.

Email: rrahman@cisco.com

Robert Wilton (editor)
Cisco Systems, Inc.

Email: rwilton@cisco.com

Balazs Lengyel
Ericsson
1117 Budapest
Magyar Tudosok Korutja
Hungary

Phone: +36-70-330-7909
Email: balazs.lengyel@ericsson.com

Jason Sterne
Nokia

Email: jason.sterne@nokia.com

Kevin D'Souza
AT&T
200 S. Laurel Ave
Middletown, NJ
United States of America

Email: kd6913@att.com