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Representing metadata annotations in YANG-CBOR
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Abstract

This specification defines the representation of metadata annotations (RFC 7952) in YANG-CBOR (RFC 9254).

About This Document

This note is to be removed before publishing as an RFC.

Status information for this document may be found at
<https://datatracker.ietf.org/doc/draft-bormann-cbor-yang-metadata/>.

Discussion of this document takes place on the cbor Working Group mailing list (<mailto:cbor@ietf.org>), which is archived at <https://mailarchive.ietf.org/arch/browse/cbor/>. Subscribe at <https://www.ietf.org/mailman/listinfo/cbor/>.

Source for this draft and an issue tracker can be found at
<https://github.com/cabo/yang-metadata>.

Status of This Memo

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1. Introduction

This specification defines the representation of metadata annotations [RFC7952] in YANG-CBOR [RFC9254].

1.1. Conventions and Definitions

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 [BCP14] when, and only when, they appear in all capitals, as shown here.

The term "CDDL" refers to the data definition language defined in [RFC8610] and its registered extensions (such as those in [RFC9165]), as well as [RFC9682].

Specific examples are notated in CBOR Extended Diagnostic Notation (EDN), as originally introduced in Section 8 of RFC 8949 [STD94] and extended in Appendix G of [RFC8610]. ([I-D.ietf-cbor-edn-literals] more rigorously defines and further extends EDN.)

```
// RFC-Editor: This document uses the CPA (code point allocation)
// convention described in [I-D.bormann-cbor-draft-numbers]. For
// each usage of the term "CPA", please remove the prefix "CPA" from
// the indicated value and replace the residue with the value
// assigned by IANA; perform an analogous substitution for all other
// occurrences of the prefix "CPA" in the document. Finally, please
// remove this note.
```

The terms of [RFC7952] and [RFC9254] apply.

2. Specification

This section defines the metadata encoding for YANG-CBOR [RFC9254], analogous to the Subsections for YANG-XML and YANG-JSON of Section 5 of [RFC7952].

Section 5.2.1 of [RFC7952] defines a "Metadata Object" for YANG-JSON. Analogously, the YANG-CBOR encoding of metadata annotations uses a `_Metadata Map_`, which is identical in structure to the other CBOR maps used in [RFC9254].

Where YANG SIDs are used as the basis for the map keys for the metadata map, the map's reference SID is the reference SID of the enclosing data structure, as defined in Section 3.2 of [RFC9254]. Where names (Section 3.3 of [RFC9254]) are used as the map keys for the metadata map, they MUST be fully qualified, analogous to Section 5.2.1 of [RFC7952].

Metadata annotations are added to a data node instance by replacing the representation of the instance ("Instance-Representation") with the structure specified in CDDL in Figure 1:

```
annotated-data-node<Instance-Representation> = #6.109([ ; CPA109
  metadata-map,
  Instance-Representation
])
```

Figure 1: Metadata-Annotated Data Node

In essence, the annotated-data-node `_stands in_` for the Instance-Representation; a consuming implementation that wants to ignore all metadata received can simply replace each annotated-data-node by the Instance-Representation embedded in it.

// (Editor's note:) QUESTION: Do we need to represent metadata maps without the actual instance representation present? If yes, we could simply make the second element of the array in Figure 1 optional.

// (Editor's note:) QUESTION: This representation assumes that it is good that metadata always come before the actual data node, as would also be the case with XML attributes. Sections 5.2.3 and 5.2.4 of [RFC7952] show examples with metadata last, though. Can we simply focus on one of these orders (always first, or always last), or do we really need to support both (avoid!)?

3. Examples

This section provides a number of examples, based on the examples in Section 5.2 of [RFC7952]; please see the descriptions of these examples there. Note that the examples here always show an enclosing map if needed; this is generally elided in Section 5.2 of [RFC7952] (which shows only map key and map value separated by colon).

All but one example below use YANG SIDs (Section 3.2 of [RFC9254]). For this, the examples assume the example SID assignments in Table 1, the relevant ones of which are also repeated at the start of each subsection:

name	SID
cask	61600
seq	61601
name	61602
stuff	61603
example-last-modified:last-modified	61610
foo:flag	61620
bibliomod:folio	61630

Table 1: Example SID values

For computing the outermost SID deltas, the examples assume the reference SID is 61000.

3.1. Examples from Section 5.2.2 of [RFC7952]

The examples here show that the map representing the instance representation is not extended by a new member as in Section 5.2.2 of [RFC7952], but is enclosed in an annotated-data-node structure like in the other examples.

name	SID
cask	61600
seq	61601
name	61602
example-last-modified:last-modified	61610

Table 2: Example SID values for this section

"cask" is a container or anydata node:

```

{
  600: /CPA/ 109([
    {
      10: "2015-09-16T10:27:35+02:00" # SID: 61610
    },
    ... # instance representation in its own map
  ])
}

```

Figure 2: Cask example

The same "cask" example with name-based CBOR maps (Section 3.3 of [RFC9254]):

```

{
  "cask": /CPA/ 109([
    {
      "example-last-modified:last-modified":
        "2015-09-16T10:27:35+02:00"
    },
    ... # instance representation in its own map
  ])
}

```

Figure 3: Cask example with names

"seq" is a list whose key is "name"; annotation "last-modified" is added only to the first entry:

```

{
  601: [
    /CPA/ 109([
      {
        9: "2015-09-16T10:27:35+02:00" # SID: 61610
      },
      {
        1: "one", # SID: 61602
        ...: ...
      }
    ]),
    { # no metadata annotation # SID: 61602
      1: "two",
      ...: ...
    }
  ]
}

```

Figure 4: Seq example

3.2. Examples from Section 5.2.3 of [RFC7952]

name	SID
stuff	61603
example-last-modified:last-modified	61610
foo:flag	61620

Table 3: Example SID values for this section

"flag" is a leaf node of the "boolean" type defined in module "foo". The SID 61620 for "foo:flag" expresses both the name "flag" and the namespace name "foo" in its CBOR encoding:

```
{
  620: 109([
    {
      -10: "2015-09-16T10:27:35+02:00" # SID: 61610
    },
    true
  ])
}
```

Figure 5: Foo:flag example

"stuff" is an anyxml node:

```
{
  603: 109([
    {
      7: "2015-09-16T10:27:35+02:00" # SID: 61610
    },
    [1, null, "three"]
  ])
}
```

Figure 6: Stuff example

3.3. Examples from Section 5.2.4 of [RFC7952]

name	SID
example-last-modified:last-modified	61610
bibliomod:folio	61630

Table 4

```
{
  630: [
    6,
    # SIDs below: -20 -> SID: 61610
    /CPA/ 109([{-20: "2015-06-18T17:01:14+02:00"}, 3]),
    /CPA/ 109([{-20: "2015-09-16T10:27:35+02:00"}, 7]),
    8,
  ]
}
```

Figure 7: Bibliomod:folio example

4. Security Considerations

The security considerations of [RFC7952] and [RFC9254] apply.

5. IANA Considerations

5.1. CBOR Tags Registry

In the registry "CBOR Tags" [IANA.cbor-tags], IANA is requested to allocate one tag:

- * Tag: CPA109
- * Data item: Array [metadata, ?data]
- * Semantics: "YANG data node with metadata annotations"
- * Reference: This document

6. References

6.1. Normative References

- [BCP14] Best Current Practice 14,
<<https://www.rfc-editor.org/info/bcp14>>.

At the time of writing, this BCP comprises the following:

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>>.

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[IANA.cbor-tags]

IANA, "Concise Binary Object Representation (CBOR) Tags", <<https://www.iana.org/assignments/cbor-tags>>.

[RFC7952] Lhotka, L., "Defining and Using Metadata with YANG", RFC 7952, DOI 10.17487/RFC7952, August 2016, <<https://www.rfc-editor.org/rfc/rfc7952>>.

[RFC8610] Birkholz, H., Vigano, C., and C. Bormann, "Concise Data Definition Language (CDDL): A Notational Convention to Express Concise Binary Object Representation (CBOR) and JSON Data Structures", RFC 8610, DOI 10.17487/RFC8610, June 2019, <<https://www.rfc-editor.org/rfc/rfc8610>>.

[RFC9165] Bormann, C., "Additional Control Operators for the Concise Data Definition Language (CDDL)", RFC 9165, DOI 10.17487/RFC9165, December 2021, <<https://www.rfc-editor.org/rfc/rfc9165>>.

[RFC9254] Veillette, M., Ed., Petrov, I., Ed., Pelov, A., Bormann, C., and M. Richardson, "Encoding of Data Modeled with YANG in the Concise Binary Object Representation (CBOR)", RFC 9254, DOI 10.17487/RFC9254, July 2022, <<https://www.rfc-editor.org/rfc/rfc9254>>.

[RFC9682] Bormann, C., "Updates to the Concise Data Definition Language (CDDL) Grammar", RFC 9682, DOI 10.17487/RFC9682, November 2024, <<https://www.rfc-editor.org/rfc/rfc9682>>.

[STD94] Internet Standard 94, <<https://www.rfc-editor.org/info/std94>>.

At the time of writing, this STD comprises the following:

Bormann, C. and P. Hoffman, "Concise Binary Object Representation (CBOR)", STD 94, RFC 8949, DOI 10.17487/RFC8949, December 2020, <<https://www.rfc-editor.org/info/rfc8949>>.

6.2. Informative References

[I-D.ietf-cbor-edn-literals]
Bormann, C., "CBOR Extended Diagnostic Notation (EDN)",
Work in Progress, Internet-Draft, draft-ietf-cbor-edn-
literals-16, 8 January 2025,
<[https://datatracker.ietf.org/doc/html/draft-ietf-cbor-
edn-literals-16](https://datatracker.ietf.org/doc/html/draft-ietf-cbor-edn-literals-16)>.

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