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CBOR: Generating Numeric Map Labels from Textual EDN
draft-bormann-cbor-edn-mapkey-01

Abstract

The Concise Binary Object Representation (CBOR, STD 94 == RFC 8949) is a data format whose design goals include the possibility of extremely small code size, fairly small message size, and extensibility without the need for version negotiation.

CBOR diagnostic notation (EDN) is widely used to represent CBOR data items in a way that is accessible to humans, for instance for examples in a specification. Complex examples often use nested maps, the map keys (labels) for each of which are often sourced from different specifications. While the e'' application extension provides a way to import data items, particularly constant values, from a CDDL model, it does not help with automatically selecting the right kind of map depending on its position in the nested maps.

// The present document is intended to capture ideas initially
// discussed at the CBOR WG interim 2025-06-25 and demonstrate some
// design alternatives. It is not ready for adoption yet in any way.

About This Document

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

The latest revision of this draft can be found at https://cabo.github.io/mapkey/draft-bormann-cbor-edn-mapkey.html. Status information for this document may be found at https://datatracker.ietf.org/doc/draft-bormann-cbor-edn-mapkey/.

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/mapkey.

Status of This Memo

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1. Introduction

(Please see abstract.) [STD94] [I-D.ietf-cbor-edn-literals] [I-D.ietf-cbor-edn-e-ref]

2. The mapkey<<>> application extension: importing map labels from CDDL

Problem

In diagnostic notation examples, authors often would prefer to use text names in place of the integer map keys that are used in a protocol message for efficiency. While the e'' application extension provides a way to associate names with integer data items, the protocol designer must be very careful to use the right name for the kind of map that uses the integer key: Different specifications may use different integer numbers for a key with the same textual name, and even in a single specification there may be homonyms that resolve to different integer values in different kinds of maps (e.g., in [STD96], alg is represented by 1 in headers and by 3 in COSE_Key).

For example, Figure 4 in Section 3.5.2 of [RFC9528] contains this example that employs nested maps:

```
{                                                  /CCS/
  2 : "42-50-31-FF-EF-37-32-39",                   /sub/
  8 : {                                            /cnf/
    1 : {                                          /COSE_Key/
      1 : 1,                                       /kty/
      2 : h'00',                                   /kid/
     -1 : 4,                                       /crv/
     -2 : h'b1a3e89460e88d3a8d54211dc95f0b90       /x/
           3ff205eb71912d6db8f4af980d2db83a'
    }
  }
}
```

To check this example, a human reviewer has to look up the integer labels in the specifications for the different maps employed and translate them to the names of the map keys defined for each type of map. The outer map is a CWT Claims Set (CCS), for which the labels 2 (sub) and 8 (cnf) are defined in [RFC8392] and [RFC8747], respectively. Within cnf, the label for COSE_Key is also defined by [RFC8747], while the labels within that map are defined in Section 7 of RFC 9052 [STD96]. Map keys are also often an extension point, and obtaining their numeric values therefore also may require consulting an IANA registry.

The objective of the present proposal is that a specification writer could employ an EDN app-extension that allows the example to read a bit like:

```
mapkey<<"Claims-Set",
  {
    "sub": "42-50-31-FF-EF-37-32-39"
    "cnf": {
      "COSE_Key": {
        "kty": "OKP"
        "kid": h'00'
        "crv": "X25519"
        "x": h'b1a3e89460e88d3a8d54211dc95f0b90
              3ff205eb71912d6db8f4af980d2db83a'
      }
    }
  }
>>
```

Note that this example not only uses names for map keys, but also uses names for map values 1 ("OKP") and 4 ("X25519").

// Discussion: For use in EDN, the names need to be provided in some form that is a valid CBOR data item. In the example above, this is done in text strings; for increased clarity, it could be done in a more eye-catching way, e.g., as single-quoted (byte) strings or even in an e'...'-like construct.

Solution

In many cases, the constants needed to handle the numeric map labels in this example are already available in a CDDL model, or could be easily made available in this way.

For the example used in this section, [RFC9781] provides CDDL for [RFC8392] and [RFC8747], and [STD96] provides CDDL for its own data types. Note that, to remain useful with extension points where new map keys are defined regularly, there needs to be a way to reference IANA registries for the name-to-integer translation; this is a separate problem for which a potential solution is presented in Appendix A.2.1 of [I-D.bormann-cbor-cddl-2-draft].

This section needs to define where in the CDDL the names to be resolved are looked for; CDDL rule names are one obvious candidate, as are member names for group choices that are often employed for documentation (Figure 2 in Section 2 of [RFC9290] shows member names such as "title", "detail", etc.):

```
problem-details = non-empty<{
  ? &(title: -1) => oltext
  ? &(detail: -2) => oltext
  ? &(instance: -3) => ~uri
  ? &(response-code: -4) => uint .size 1
  ? &(base-uri: -5) => ~uri
  ? &(base-lang: -6) => tag38-ltag
  ? &(base-rtl: -7) => tag38-direction
```

This specification defines an app-extension mapkey<<>> with two parameters:

* The name of the CDDL rule for the top level (here: Claims-Set), and

* an EDN depiction of the data structure where names can be used in place of numeric map keys and values.

Note that the app-extension does not itself define where the CDDL definitions it uses come from. This information needs to come from the context of the example, and there is probably value in establishing a convention.

3. IANA Considerations

IANA is requested to make the following two assignments in the CBOR Diagnostic Notation Application-extension Identifiers registry [IANA.cbor-diagnostic-notation] established by [I-D.ietf-cbor-edn-literals]:

Application-extension Identifier	Description
mapkey	import map labels from external CDDL

Table 1: Additions to Application-extension Identifier Registry

All entries have the Change Controller "IETF" and the Reference "RFC-XXXX".

// RFC Editor: please replace RFC-XXXX with the RFC number of this
// RFC, [IANA.cbor-diagnostic-notation] with a reference to the
// registry group established by [I-D.ietf-cbor-edn-literals], and
// remove this note.

4. Security considerations

The security considerations of [RFC8610], [STD94], [I-D.ietf-cbor-edn-literals] apply.

TBD.

5. References

5.1. Normative References

[I-D.ietf-cbor-edn-literals]
Bormann, C., "CBOR Extended Diagnostic Notation (EDN)", Work in Progress, Internet-Draft, draft-ietf-cbor-edn-literals-19, 16 October 2025, <https://datatracker.ietf.org/doc/html/draft-ietf-cbor-edn-literals-19>.

[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>.

[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>.

5.2. Informative References

[I-D.bormann-cbor-cddl-2-draft]
Bormann, C., "CDDL 2.0 and beyond -- a draft plan", Work in Progress, Internet-Draft, draft-bormann-cbor-cddl-2-draft-07, 30 August 2025, <https://datatracker.ietf.org/doc/html/draft-bormann-cbor-cddl-2-draft-07>.

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Bormann, C., "External References to Values in CBOR Diagnostic Notation (EDN)", Work in Progress, Internet-Draft, draft-ietf-cbor-edn-e-ref-02, 2 July 2025, <https://datatracker.ietf.org/doc/html/draft-ietf-cbor-edn-e-ref-02>.

[RFC8392] Jones, M., Wahlstroem, E., Erdtman, S., and H. Tschofenig, "CBOR Web Token (CWT)", RFC 8392, DOI 10.17487/RFC8392, May 2018, <https://www.rfc-editor.org/rfc/rfc8392>.

[RFC8747] Jones, M., Seitz, L., Selander, G., Erdtman, S., and H. Tschofenig, "Proof-of-Possession Key Semantics for CBOR Web Tokens (CWTs)", RFC 8747, DOI 10.17487/RFC8747, March 2020, <https://www.rfc-editor.org/rfc/rfc8747>.

[RFC9290] Fossati, T. and C. Bormann, "Concise Problem Details for Constrained Application Protocol (CoAP) APIs", RFC 9290, DOI 10.17487/RFC9290, October 2022, <https://www.rfc-editor.org/rfc/rfc9290>.

[RFC9528] Selander, G., Preu Mattsson, J., and F. Palombini, "Ephemeral Diffie-Hellman Over COSE (EDHOC)", RFC 9528, DOI 10.17487/RFC9528, March 2024, <https://www.rfc-editor.org/rfc/rfc9528>.

[RFC9781] Birkholz, H., O'Donoghue, J., Cam-Winget, N., and C. Bormann, "A Concise Binary Object Representation (CBOR) Tag for Unprotected CBOR Web Token Claims Sets (UCCS)", RFC 9781, DOI 10.17487/RFC9781, May 2025, <https://www.rfc-editor.org/rfc/rfc9781>.

[STD96] Internet Standard 96, <https://www.rfc-editor.org/info/std96>. At the time of writing, this STD comprises the following:

Schaad, J., "CBOR Object Signing and Encryption (COSE): Structures and Process", STD 96, RFC 9052, DOI 10.17487/RFC9052, August 2022, <https://www.rfc-editor.org/info/rfc9052>.

Schaad, J., "CBOR Object Signing and Encryption (COSE): Countersignatures", STD 96, RFC 9338, DOI 10.17487/RFC9338, December 2022, <https://www.rfc-editor.org/info/rfc9338>.

Acknowledgements

TBD.

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