A feature freezer for the Concise Data Definition Language (CDDL)

Abstract

In defining the Concise Data Definition Language (CDDL), some
features have turned up that would be nice to have. In the interest
of completing this specification in a timely manner, the present
document was started to collect nice-to-have features that did not
make it into the first RFC for CDDL, RFC 8610, or the specifications
exercising its extension points, such as RFC 9165.

Significant parts of this draft have now moved over to the CDDL 2.0
project, described in draft-bormann-cbor-cddl-2-draft. The remaining
items in this draft are not directly related to the CDDL 2.0 effort.

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1. Introduction

In defining the Concise Data Definition Language (CDDL), some
features have turned up that would be nice to have. In the interest
of completing this specification in a timely manner, the present
document was started to collect nice-to-have features that did not
make it into the first RFC for CDDL [RFC8610], or the specifications
exercising its extension points, such as [RFC9165].

Significant parts of this draft have now moved over to
[I-D.bormann-cbor-cddl-2-draft], which in turn references
[I-D.ietf-cbor-update-8610-grammar],
[I-D.ietf-cbor-cddl-more-control], [I-D.ietf-cbor-cddl-modules]. The
remaining items in Sections 3 to 4 of this draft are not directly
related to the CDDL 2.0 effort. Section 5 might turn into a part of
CDDL 2.5.

The remaining sections are not proposing to change CDDL, but are
ancillary developments: Section 6 is more interesting for the
ecosystem of tools around CDDL. Section 7 examines extending the
area of application of CDDL beyond CBOR and JSON.

There is always a danger for a document like this to become a
shopping list; the intention is to develop this document further
based on the rapidly growing real-world experience with the first
CDDL standard. Some sections are labeled WONTFIX, reflecting an
assumption that the specific extension objective will not be
addressed or will be addressed in a different way.

2. Base language features

2.1. Cuts

Section 3.5.4 of [RFC8610] alludes to a new language feature, *cuts*,
and defines it in a fashion that is rather focused on a single
application in the context of maps and generating better diagnostic
information about them.

The present document is expected to grow a more complete definition
of cuts, with the expectation that it will be upwards-compatible to
the existing one in [RFC8610], before this possibly becomes a
mainline language feature in a future version of CDDL.

3. Literal syntax

Literal syntax is also discussed in Appendix A.1 of
[I-D.bormann-cbor-cddl-2-draft], which might provide another
approach to Section 3.1. This appendix is in turn based on ideas in
[I-D.ietf-cbor-edn-literals].

3.1. Regular Expression Literals (WONTFIX)

Regular expressions currently are notated as strings in CDDL, with
all the string escaping rules applied once. It might be convenient
to have a more conventional literal format for regular expressions,
possibly also providing a place to add modifiers such as /i. This
might also imply text .regexp ..., which with the proposal in
Section 4.1 then raises the question of how to indicate the regular
expression flavor.

(With the support for ABNF in [RFC9165], the need for this is
reduced. Also, the proliferation of regular expression flavors is
hard to address with a single syntax.)

4. Controls

Controls are the main extension point of the CDDL language. It is
relatively painless to add controls to CDDL; this mechanism has been
exercised in [RFC9090] for SDNV [RFC6256] and ASN.1 OID related byte
strings, and in [RFC9165] for more generally applicable controls,
including an interface to ABNF [RFC5234] [RFC7405]. A more recent

collection of additions that is ready for standardization is
specified in [I-D.ietf-cbor-cddl-more-control].

Several further candidates have been identified that aren't quite
ready for adoption, of which a few shall be listed here.

4.1. Control operator .pcre

There are many variants of regular expression languages.
Section 3.8.3 of [RFC8610] defines the .regexp control, which is
based on XSD [XSD2] regular expressions. As discussed in that
section, the most desirable form of regular expressions in many
cases is the family called "Perl-Compatible Regular Expressions"
([PCRE]); however, no formally stable definition of PCRE is
available at this time for normatively referencing it from an RFC.

The present document defines the control operator .pcre, which is
similar to .regexp, but uses PCRE2 regular expressions. More
specifically, a .pcre control indicates that the text string given
as a target needs to match the PCRE regular expression given as a
value in the control type, where that regular expression is anchored
on both sides. (If anchoring is not desired for a side, .* needs to
be inserted there.)

Similarly, .es2018re could be defined for ECMAscript 2018 regular
expressions with anchors added.

See also [RFC9485], which could be specifically called out
via .iregexp (even though .regexp as per Section 3.8.3 of [RFC8610]
would also have the same semantics, except for a wider range of
regexps).

4.2. Endianness in .bits

How useful would it be to have another variant of .bits that counts
bits like in RFC box notation? (Or at least per-byte? 32-bit words
don't always perfectly mesh with byte strings.)

4.3. .bitfield control

Provide a way to specify bitfields in byte strings and uints to a
higher level of detail than is possible with .bits. Strawman:

```
Field = uint .bitfield Fieldbits

Fieldbits = [
  flag1: [1, bool],
  val: [4, Vals],
  flag2: [1, bool],
]

Vals = &(A: 0, B: 1, C: 2, D: 3)
```

Note that the group within the controlling array can have choices,
enabling the whole power of a context-free grammar (but not much
more).

5. Co-occurrence Constraints

While there are no co-occurrence constraints in CDDL, many actual
use cases can be addressed by using the fact that a group is a
grammar:

```
postal = {
  ( street: text,
    housenumber: text) //
  ( pobox: text .regexp "[0-9]+" )
}
```

However, constraints that are not just structural/tree-based but are
predicates combining parts of the structure cannot be expressed:

```
session = {
  timeout: uint,
}

other-session = {
  timeout: uint  .lt [somehow refer to session.timeout],
}
```

As a minimum, this requires the ability to reach over to other parts
of the tree in a control. Compare JSON Pointer [RFC6901] and JSON
Relative Pointer [I-D.handrews-relative-json-pointer], as well as
Stefan Gössner's jsonpath, a JSON analogue of XPath that has
recently been standardized [RFC9535].

More generally, something akin to what Schematron is to Relax-NG may
be needed.

6. Alternative Representations

For CDDL, alternative representations e.g. in JSON (and thus in
YAML) could be defined, similar to the way YANG defines an XML-based

serialization called YIN in [Section 11](#) of [[RFC6020](#)]. One proposal
for such a syntax is provided by the cddlc tool [[cddlc](#)], which is
reproduced below. This could be written up in more detail and agreed
upon. (Since cddlc version 0.1.8, the "mem"-labeled array includes
information about the presence of a cut, see [Section 3.5.4](#) of
[[RFC8610](#)].)

```
cddlj = ["cddl", +rule]
rule = ["=" / "/=" / "//=", namep, type]
namep = ["name", id] / ["gen", id, +id]
id = text .regexp "[A-Za-z@_$](([-.])*[A-Za-z0-9@_$])*"
op = ".." / "..." /
   text .regexp "\\.[A-Za-z@_$](([-.])*[A-Za-z0-9@_$])*"
namea = ["name", id] / ["gen", id, +type]
type = value / namea / ["op", op, type, type] /
   ["map", group] / ["ary", group] / ["tcho", 2*type] /
   ["unwrap", namea] / ["enum", group / namea] /
   ["prim", ?((6, type/uint, ?type) // (0..7, ?uint))]
group = ["mem", bool, null/type, type] /
   ["rep", uint, uint/false, group] /
   ["seq", 2*group] / ["gcho", 2*group]
value = ["number"/"text"/"bytes", text]
```

The "prim"-labeled array includes support for non-literal tag
numbers ([Section 3.2](#) of [[I-D.ietf-cbor-update-8610-grammar](#)]).

More recently, a variant of this format has been used for easier
processing. It collects rules in a map (JSON object) and binds
generic parameters to argument positions. This variant will be
described in a further revision of this document.

7. Other target formats

CDDL has originally been designed to describe CBOR and JSON data.
One format of interest is comma-separated values, CSV [[RFC4180](#)].
[[I-D.bormann-cbor-cddl-csv](#)] is a draft for using CDDL models with
CSV.

8. IANA Considerations

This document makes no requests of IANA.

9. Security considerations

The security considerations of [[RFC8610](#)] apply.

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