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C. Bormann
Universitaet Bremen TZI

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A feature freezer for the Concise Data Definition Language (CDDL)
draft-bormann-cbor-cddl-freezer-01

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 collects nice-to-have features that did not make it into the first RFC for CDDL.

Status of This Memo

This Internet-Draft will expire on February 11, 2019.

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1. Introduction

(TO DO: Insert an extended form of the abstract first here, expanding the reference to [I-D.ietf-cbor-cddl].)

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 real-world experience with the first CDDL standard.

2. Cuts

Section 3.5.3 of [I-D.ietf-cbor-cddl] 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 [I-D.ietf-cbor-cddl], before this possibly becomes a mainline language feature in a future version of CDDL.

3. Literal syntax

3.1. Computed Literals

CDDL cannot compute.

This is a liability in at least two situations:

- integers often need to be defined relative to an offset. It might be desirable to be able to write something like:

```
base = 16777216
a = base + 1
b = base + 2
```

- some string literals (in particular, complex regular expressions) would best be composed from components. This could be done by adding a concatenation operator (maybe even "+" as used for addition above), or by adding string interpolation to the string literal syntax.

3.2. Tag-oriented Literals

Some CBOR tags often would be most natural to use in a CDDL spec with a literal syntax that is tailored to their semantics instead of their serialization in CBOR. There is currently no way to add such syntaxes, no defined extension point either.

3.3. Regular Expression Literals

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 5.1 then raises the question of how to indicate the regular expression flavor.

4. Embedded ANBF

It would often be desirable to define a text string type by employing ABNF [RFC5234] [RFC7405] embedded into the CDDL specification. Currently, that ABNF would usually need to be translated into a regular expression (if that is even possible).

Note that some applications of computed literals for strings could be covered by such a feature (or partially vice versa).

5. Controls

Controls are the main extension point of the CDDL language. It is relatively painless to add controls to CDDL. Several candidates have been identified that aren't quite ready for adoption, of which one shall be listed here.

5.1. Control operator .pcre

There are many variants of regular expression languages. Section 3.8.3 of [I-D.ietf-cbor-cddl] 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.)

5.2. 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.)

5.3. .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).

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

7. Module superstructure

CDDL rules could be packaged as modules and referenced from other modules. There could be some control of namespace pollution, as well as unambiguous referencing ("versioning").

This is probably best achieved by a pragma-like syntax which could be carried in CDDL comments, leaving each module to be valid CDDL (if missing some rule definitions to be imported).

8. IANA Considerations

This document makes no requests of IANA.

9. Security considerations

The security considerations of [I-D.ietf-cbor-cddl] apply.

10. References

10.1. Normative References

[I-D.ietf-cbor-cddl]
Birkholz, H., Vigano, C., and C. Bormann, "Concise data definition language (CDDL): a notational convention to express CBOR data structures", draft-ietf-cbor-cddl-03 (work in progress), July 2018.

10.2. Informative References

[I-D.handrews-relative-json-pointer]
Luff, G. and H. Andrews, "Relative JSON Pointers", draft-handrews-relative-json-pointer-01 (work in progress), January 2018.

[PCRE] "Perl-compatible Regular Expressions (revised API: PCRE2)", n.d., <http://pcre.org/current/doc/html/>.

[RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <https://www.rfc-editor.org/info/rfc5234>.

[RFC6901] Bryan, P., Ed., Zyp, K., and M. Nottingham, Ed., "JavaScript Object Notation (JSON) Pointer", RFC 6901, DOI 10.17487/RFC6901, April 2013, <https://www.rfc-editor.org/info/rfc6901>.

[RFC7405] Kyzivat, P., "Case-Sensitive String Support in ABNF", RFC 7405, DOI 10.17487/RFC7405, December 2014, <https://www.rfc-editor.org/info/rfc7405>.

[XSD2] Biron, P. and A. Malhotra, "XML Schema Part 2: Datatypes Second Edition", World Wide Web Consortium Recommendation REC-xmlschema-2-20041028, October 2004, <http://www.w3.org/TR/2004/REC-xmlschema-2-20041028>.

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Author's Address

Carsten Bormann
Universitaet Bremen TZI
Postfach 330440
Bremen D-28359
Germany

Phone: +49-421-218-63921
Email: cabo@tzi.org