CDDL:
Additional Control Operators

draft-bormann-cbor-cddl-control-01

Carsten Bormann, CBOR @ IETF 108, 2020-07-27

Additional Control Operators for CDDL

draft-bormann-cbor-cddl-control-01

- .cat .plus
- .abnf .abnfb
- .feature [implemented]

- Register?
- Adopt?

CBORbis issue #204: Diagnostic notation should be surjective (empty strings, NaNs)

https://github.com/cbor-wg/CBORbis/issues/204

Carsten Bormann, CBOR @ IETF 108, 2020-07-27

CBOR diagnostic Notation

- CBOR extended diagnostic notation (RFC 7049 Section 6 + RFC 8610 Appendix G), EDN, provides a human readable form of a CBOR data item at the data model level
- Almost all CBOR data items can be expressed uniquely in EDN
- Exception 1: (_) can be an empty byte string (5FFF) or text string (7FFF):
  No obvious proposal, (_b) and (_t) crutch maybe
- Exception 2: NaN payloads are lost:
  Probably just provide the whole number in hex, e.g. NaN_1_x7E00?

Next steps?

- Don’t try to shoehorn this into 7049bis
- Maybe new document that
  - Points to RFC 7049 Section 6 (DN) + RFC 8610 Appendix G (EDN)
  - Makes these small additions: (_) and NaN
  - Provides more examples for DN/EDN
  - Maybe provides an ABNF (gasp!)?

CBOR Tags for OID

draft-bormann-cbor-tags-oid-07

Carsten Bormann, CBOR @ IETF 108, 2020-07-27

CBOR Tags for ASN.1 Object IDs

draft-bormann-cbor-tags-oid-07

- Draft was started in October 2014, with Sean Leonard, 2½ years … -06
  - Was accreting more functionality on the way than we maybe really needed
- Use cases in RATS and related now create some urgency
- -07 reduces content to what is really needed
- Adoption call ended yesterday — chairs' evaluation?
- Beyond editorial issues, the Tag Factoring functionality is at risk
  - Could solve this while this is a WG document

Editor/Contributor question

- I’m currently unable to reach Sean Leonard.

- (With RFC 8746, we handled a similar issue by moving an author to the contributor list.)

- The chairs can decide this now, or at any time [RFC 2418].

Packed CBOR

draft-bormann-cbor-packed-01

Carsten Bormann, CBOR @ IETF 108, 2020-07-27

JSON, CBOR: Coding efficiency

- CBOR can be more efficient than JSON, in particular if the data model is specifically designed for CBOR (e.g., integer labels in maps)
- Simply encoding JSON data in CBOR reaps less gain
- Significant redundancy often remains
  - Can be removed by, e.g. DEFLATE (RFC 1951)
  - Compression requires decompression before use, though
- Alternative: Exploiting structure and prefix sharing by “**Packing**”
  - CBOR data item can be used while remaining packed

Structure Sharing

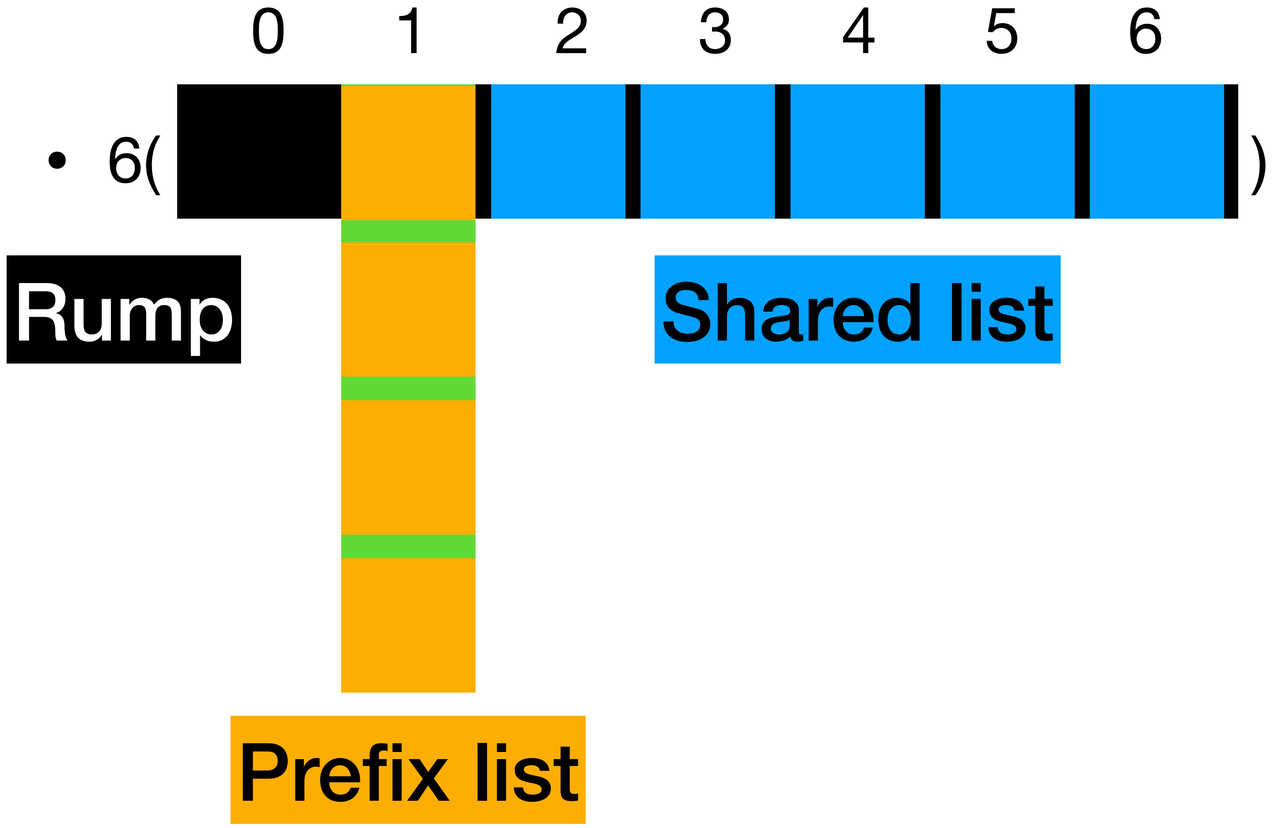
- Many data items nested in a larger data item repeat
  - E.g., strings used for labels or enums
- Idea: Provide one copy of repeated item and **share** it
- Item is put into a sharing array, referenced in the places where a copy is needed

Prefix Sharing

- data items often share a **prefix**
  - E.g., initial parts of URIs are often similar
- Idea: Provide one copy of repeated prefix and **share** it
- Common is put into a prefix array,
  referenced in the places where a copy is needed

Structure of packed CBOR

- Packed data item is an array tagged with tag 6:



- Rump can reference shared items; shared items can, too (yes, needs loop detection)
- Items can use a prefix (identified by a tag) plus a supplied suffix

Experiment

`wot-thing-description/test-bed/data/plugfest/2017-05-osaka/MyLED_f.jsonld`

- JSON file: 3116
- **JSON no whitespace: 1447**
  - deflate: 323, lz4: 415, lz4hc: 411
- **CBOR: 1210**
  - deflate: 325, lz4: 416, lz4hc: 404
- CBOR packed (semantic sharing only): 793
- CBOR packed (prefix compression, too): 564

Conclusion

- Packing (exploiting structural sharing)
  - maintains processability
  - saves ~ 1/3 (implementation not yet complete)
- Prefix sharing helps with URLs, another 20 %
  - but reduces processability
- Could further improve by adding static dictionary
  - In the example: 119 bytes of mostly static data:

```
["name","@type","links","application/json","outputData","mediaType","href",
 {"valueType":{"type":"number"}},["Property"],"writable","valueType","type"]
```

Both Item and Prefix references need to be efficient

- Item references: 16 simple values (1+0),
  one single-byte Tag ➔ 48+512+131072 (1+1, 1+2, 1+4)
- Prefix references: Reuse tag; use more tags (32+4096+268435456)
- Total reservation: 4/7 simple values, 1 1+0 tag (1/24), 1/8 1+1, 1/16 1+2, …
- Worth it if we think this will be a widely used part of CBOR
- Could be less agressive and less efficient, but why?

Standard defines unpacking

- As usual for compression — define decompression, enable diversity in compression effort
- Packing can be done at different levels of complexity
  - Just find shared strings
  - More generally, find shared items (and nest)
  - Add common prefix detection
- Algorithm left as an exercise to the reader
  - May need a reference algorithm (TBD)

Can we go ahead with packed CBOR?

- Interesting development in W3C: “CBOR-LD” proposal
  - Does a form of packing specific to JSON-LD
  - Proposes to use external dictionaries for efficiency
- Could add external dictionaries to packed CBOR, too
- Could add “prefixes” for maps (sets of key/value pairs)

- These could be done for a WG document

Notable CBOR Tags

draft-bormann-cbor-notable-tags-02

Carsten Bormann, CBOR @ IETF 108, 2020-07-27

Notable CBOR Tags

draft-bormann-cbor-notable-tags-02

- Collect definitions of registered tags that are widely dispersed
  - Give the growing field a structure and some additional explanations
  - As far as possible, collect and preserve defining text for tags
- During development of 7049bis, served as repository for some tags we found we needed
- This can live as an individual document for quite a while
  - It would still be useful to have some feedback