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CDDL models for some existing RFCs
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Abstract

A number of CBOR- and JSON-based protocols have been defined before CDDL was standardized or widely used.

This short draft records some CDDL definitions for such protocols, which could become part of a library of CDDL definitions available for use in CDDL2 processors. It focuses on CDDL in (almost) published IETF RFCs.

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-rfc-cddl-models/>.

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

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

Status of This Memo

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1. Introduction

(Please see abstract.) Add in [STD94] [STD90] [RFC8610] [RFC9682]
[RFC9165] [RFC9741]

2. CDDL definitions for (almost) published RFCs

This section is intended to have one subsection for each CDDL data model presented for an existing RFC. As a start, it is fleshed out with three such data models.

2.1. RFC 7071 (Reputation Interchange)

Appendix H of [RFC8610] contains two CDDL definitions for [RFC7071], which are not copied here. Typically, the compact form would be used in applications using the RFC 7071 format; while the extended form might be useful to cherry-pick features of RFC 7071 into another protocol.

2.2. RFC 8366 (Voucher Artifact for Bootstrapping Protocols)

[RFC8366] defines a data model for a "Voucher Artifact", which can be represented in CDDL as:

```

voucher-artifact = {
  "ietf-voucher:voucher": {
    created-on: yang$date-and-time
    ? (
      expires-on: yang$date-and-time
      ? last-renewal-date: yang$date-and-time
      //
      nonce: json-binary<bytes .size (8..32)>
    )
    assertion: assertion
    serial-number: text
    ? idevid-issuer: json-binary<bytes>
    pinned-domain-cert: json-binary<bytes>
    ? domain-cert-revocation-checks: bool
  }
}

assertion = "verified" / "logged" / "proximity"

yang$date-and-time = text .regexp cat3<"[0-9]{4}-[0-9]{2}-[0-9]{2}T",
  "[0-9]{2}:[0-9]{2}:[0-9]{2}([.][0-9]+)?",
  "(Z|[-+][0-9]{2}:[0-9]{2})">

cat3<A,B,C> = (A .cat B) .cat C

json-binary<T> = text .b64c T

```

Figure 1: CDDL for RFC 8366

The two examples in the RFC can be validated with this little patchup script:

```
sed -e s/ue=/uQ=/ -e s/'"true"/true/ | cddl rfc8366.cddl vp -
```

2.3. RFC 9457 (Problem Details for HTTP APIs)

[RFC9457] defines a simple data model that is reproduced in CDDL here:

```
problem-object = {
  ? type: preferably-absolute-uri
  ? title: text
  ? status: 100..599
  ? detail: text
  ? instance: preferably-absolute-uri
  * text .feature "problem-object-extension" => any
}

; RECOMMENDED: absolute URI or at least absolute path:
preferably-absolute-uri = ~uri
```

Figure 2: CDDL for RFC 9457

Note that Appendix B of [RFC9290] also defines a CBOR-specific data model that may be useful for tunneling [RFC7807] or [RFC9457] problem details in [RFC9290] Concise Problem Details.

2.4. RFC 9595 (YANG-SID)

[RFC9595] defines a data model for a "SID file" in YANG, to be transported as a YANG-JSON instance.

An equivalent CDDL data model is given here:

```
sid-file = {
  "ietf-sid-file:sid-file": {
    module-name: yang$yang-identifier
    ? module-revision: revision-identifier
    ? sid-file-version: sid-file-version-identifier
    ? sid-file-status: "unpublished" / "published"
    ? description: text
    ? dependency-revision: [* dependency-revision]
    ? assignment-range: [* assignment-range]
    ? item: [*item]
  }
}

rep<RE>=cat3<"(", RE, ")"*>
opt<RE>=cat3<"(", RE, ")"?*>
cat3<A,B,C> = (A .cat B) .cat C

id-re = "[a-zA-Z_][a-zA-Z0-9\\-\\.]*"
```

```
yang$yang-identifier = text .regexp id-re
revision-identifier = text .regexp "[0-9]{4}-[0-9]{2}-[0-9]{2}"
sid-file-version-identifier = uint .size 4
sid = text .decimal (0..0x7fffffffffffffffff); uint63 as text string
plus-id<Prefix> = Prefix .cat id-re
schema-node-re = cat3<plus-id<"/">, plus-id<":">, ; qualified
                    rep<plus-id<"/"> .cat ; optionally
                    opt<plus-id<":">> > > ; qualified
schema-node-path = text .regexp schema-node-re

dependency-revision = {
  module-name: yang$yang-identifier
  module-revision: revision-identifier
}

assignment-range = {
  entry-point: sid
  size: sid
}

item = {
  ? status: "stable" / "unstable" / "obsolete"
  (
    namespace: "module" / "identity" / "feature"
    identifier: yang$yang-identifier
  //
    namespace: "data"
    identifier: schema-node-path
  )
  sid: sid
}
```

Figure 3: CDDL for RFC 9595

2.5. Your favorite RFC here...

3. CDDL definitions derived from IANA registries

Often, CDDL models need to use numbers that have been registered as values in IANA registries.

This section is intended to have one subsection for each CDDL data model presented that is derived from an existing IANA registry. As a start, it is fleshed out with one such data model.

The intention is that these reference modules are update automatically (after each change of the registry or periodically, frequent enough.) Hence, this document can only present a snapshot for IANA-derived data models.

The model(s) presented here clearly are in proof-of-concept stage; suggestions for improvement are very welcome.

3.1. COSE Algorithms Registry

The IANA registry for COSE Algorithms is part of the IANA cose registry group [IANA.cose].

The following automatically derived model defines some 70 CDDL rules that have the name for a COSE algorithm as its rule name and the actual algorithm number as its right hand side. The additional first rule is a type choice between all these constants; this could be used in places that just have to validate the presence of a COSE algorithm number that was registered at the time the model was derived.

This section does not explore potential filtering of the registry entries, e.g., by recommended status (such as leaving out deprecated entries) or by capabilities.

The names given in the COSE algorithms registry are somewhat irregular and do not consider their potential use in modeling or programming languages; the automatic derivation used here turns sequences of one or more spaces and other characters that cannot be in CDDL names ([/+] here) into underscores.

===== NOTE: '\ ' line wrapping per RFC 8792 =====

```
algorithms = RS1 / A128CTR / A192CTR / A256CTR / A128CBC / \
  A192CBC / A256CBC / ESB512 / ESB384 / ESB320 / ESB256 / KT256 \
  / KT128 / TurboSHAKE256 / TurboSHAKE128 / WalnutDSA / RS512 / \
  RS384 / RS256 / Ed448 / ESP512 / ESP384 / ML-DSA-87 / ML-DSA-\
  65 / ML-DSA-44 / ES256K / HSS-LMS / SHAKE256 / SHA-512 / SHA-\
  384 / RSAES-OAEP_w_SHA-512 / RSAES-OAEP_w_SHA-256 / RSAES-\
  OAEP_w_RFC_8017_default_parameters / PS512 / PS384 / PS256 / \
  ES512 / ES384 / ECDH-SS_A256KW / ECDH-SS_A192KW / ECDH-\
  SS_A128KW / ECDH-ES_A256KW / ECDH-ES_A192KW / ECDH-ES_A128KW \
  / ECDH-SS_HKDF-512 / ECDH-SS_HKDF-256 / ECDH-ES_HKDF-512 / \
  ECDH-ES_HKDF-256 / Ed25519 / SHAKE128 / SHA-512_256 / SHA-256 \
  / SHA-256_64 / SHA-1 / direct_HKDF-AES-256 / direct_HKDF-AES-\
  128 / direct_HKDF-SHA-512 / direct_HKDF-SHA-256 / ESP256 / \
  EdDSA / ES256 / direct / A256KW / A192KW / A128KW / A128GCM / \
  A192GCM / A256GCM / HMAC_256_64 / HMAC_256_256 / HMAC_384_384 \
  / HMAC_512_512 / AES-CCM-16-64-128 / AES-CCM-16-64-256 / AES-\
```

```
CCM-64-64-128 / AES-CCM-64-64-256 / AES-MAC_128_64 / AES-\
MAC_256_64 / ChaCha20_Poly1305 / AES-MAC_128_128 / AES-\
MAC_256_128 / AES-CCM-16-128-128 / AES-CCM-16-128-256 / AES-\
CCM-64-128-128 / AES-CCM-64-128-256 / IV-GENERATION
RS1 = -65535
A128CTR = -65534
A192CTR = -65533
A256CTR = -65532
A128CBC = -65531
A192CBC = -65530
A256CBC = -65529
ESB512 = -268
ESB384 = -267
ESB320 = -266
ESB256 = -265
KT256 = -264
KT128 = -263
TurboSHAKE256 = -262
TurboSHAKE128 = -261
WalnutDSA = -260
RS512 = -259
RS384 = -258
RS256 = -257
Ed448 = -53
ESP512 = -52
ESP384 = -51
ML-DSA-87 = -50
ML-DSA-65 = -49
ML-DSA-44 = -48
ES256K = -47
HSS-LMS = -46
SHAKE256 = -45
SHA-512 = -44
SHA-384 = -43
RSAES-OAEP_w_SHA-512 = -42
RSAES-OAEP_w_SHA-256 = -41
RSAES-OAEP_w_RFC_8017_default_parameters = -40
PS512 = -39
PS384 = -38
PS256 = -37
ES512 = -36
ES384 = -35
ECDH-SS_A256KW = -34
ECDH-SS_A192KW = -33
ECDH-SS_A128KW = -32
ECDH-ES_A256KW = -31
ECDH-ES_A192KW = -30
ECDH-ES_A128KW = -29
```

```
ECDH-SS_HKDF-512 = -28
ECDH-SS_HKDF-256 = -27
ECDH-ES_HKDF-512 = -26
ECDH-ES_HKDF-256 = -25
Ed25519 = -19
SHAKE128 = -18
SHA-512_256 = -17
SHA-256 = -16
SHA-256_64 = -15
SHA-1 = -14
direct_HKDF-AES-256 = -13
direct_HKDF-AES-128 = -12
direct_HKDF-SHA-512 = -11
direct_HKDF-SHA-256 = -10
ESP256 = -9
EdDSA = -8
ES256 = -7
direct = -6
A256KW = -5
A192KW = -4
A128KW = -3
A128GCM = 1
A192GCM = 2
A256GCM = 3
HMAC_256_64 = 4
HMAC_256_256 = 5
HMAC_384_384 = 6
HMAC_512_512 = 7
AES-CCM-16-64-128 = 10
AES-CCM-16-64-256 = 11
AES-CCM-64-64-128 = 12
AES-CCM-64-64-256 = 13
AES-MAC_128_64 = 14
AES-MAC_256_64 = 15
ChaCha20_Poly1305 = 24
AES-MAC_128_128 = 25
AES-MAC_256_128 = 26
AES-CCM-16-128-128 = 30
AES-CCM-16-128-256 = 31
AES-CCM-64-128-128 = 32
AES-CCM-64-128-256 = 33
IV-GENERATION = 34
```

Figure 4: CDDL for cose-algorithms Registry

4. IANA Considerations

This document makes no requests of IANA.

However, the use of IANA registries for deriving CDDL (e.g., as in Section 3) is an active subject of discussion.

5. Security considerations

The security considerations of [RFC8610], [RFC9682], [RFC9165], [RFC9741], [STD94] and [STD90] apply. This collection of CDDL models is not thought to create new security considerations. Errors in the models could -- if we knew of them, we'd fix those errors instead of explaining their security consequences in this section.

6. References

6.1. Normative References

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- [STD90] Internet Standard 90, <<https://www.rfc-editor.org/info/std90>>. At the time of writing, this STD comprises the following:

Bray, T., Ed., "The JavaScript Object Notation (JSON) Data Interchange Format", STD 90, RFC 8259, DOI 10.17487/RFC8259, December 2017, <<https://www.rfc-editor.org/info/rfc8259>>.

- [STD94] Internet Standard 94,
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- [RFC7807] Nottingham, M. and E. Wilde, "Problem Details for HTTP APIs", RFC 7807, DOI 10.17487/RFC7807, March 2016, <<https://www.rfc-editor.org/rfc/rfc7807>>.
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- [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>>.
- [RFC9457] Nottingham, M., Wilde, E., and S. Dalal, "Problem Details for HTTP APIs", RFC 9457, DOI 10.17487/RFC9457, July 2023, <<https://www.rfc-editor.org/rfc/rfc9457>>.
- [RFC9595] Veillette, M., Ed., Pelov, A., Ed., Petrov, I., Ed., Bormann, C., and M. Richardson, "YANG Schema Item Identifier (YANG SID)", RFC 9595, DOI 10.17487/RFC9595, July 2024, <<https://www.rfc-editor.org/rfc/rfc9595>>.

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