A Concise Binary Object Representation (CBOR) of DNS Messages

draft-lenders-dns-cbor
(https://datatracker.ietf.org/doc/draft-lenders-dns-cbor/)

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Outline

Introduction

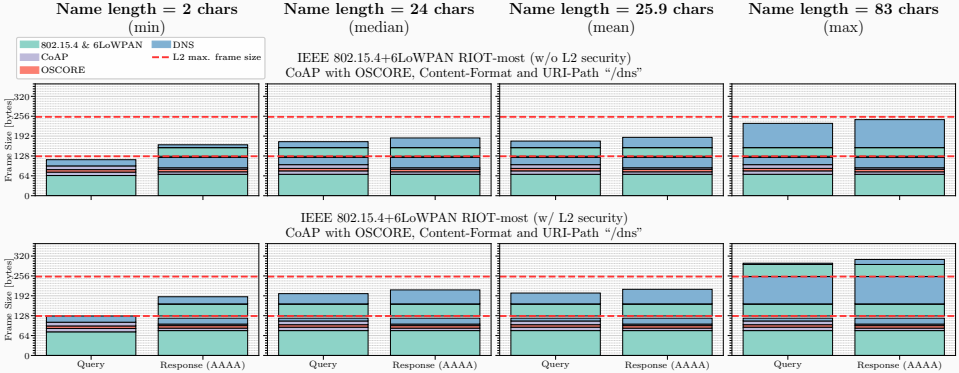
Definition of `application/dns+cbor`

Examples and Analysis

TBDs

Motivation

- DNS over CoAP (DoC) currently discussed in CoRE/DNSOP/DPRIVE (https://datatracker.ietf.org/doc/draft-ietf-core-dns-over-coap/)
- Packet size exceeds 802.15.4 PDU depending on queried name length
  ⇒ Fragmentation



Motivation

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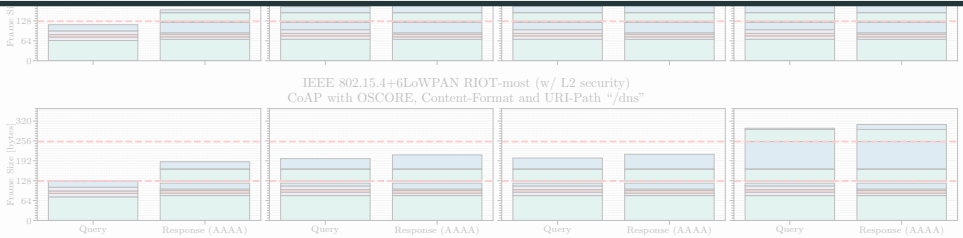
- Packet size exceeds 802.15.4 PDU depending on queried name length
  $\Rightarrow$ Fragmentation

Compression format for DNS messages is needed!



Objectives of draft-lenders-dns-cbor

- Specify encoding of DNS messages in CBOR
- Reduction of data in DNS queries and answers by omitting DNS fields

DNS Query

```
domain-name = tstr .regexp "([^.]+\.)*[^.]+"
type-spec = (
  record-type: uint,
  ? record-class: uint,
)
dns-question = (
  name: domain-name,
  ? type-spec,
)
dns-query = [dns-question]
```

CBOR array:

- At minimum containing text string domain name (IDNA encoded)
- Optional record type specification
  (record-type defaults to `AAAA`, record-class to `IN`)

DNS Resource Record

```
rr = (
  ? name: domain-name,
  ttl: uint,
  ? type-spec,
  rdata: bstr / domain-name,
)
dns-rr = [rr]
```

CBOR array:

- At minimum containing TTL and resource data
- Optional name and record type specification
  (both default to question values)

DNS Response

```
extra-sections = (
  ? authority: [+ dns-rr],
  additional: [+ dns-rr],
)
sections = (( answer: [+ dns-rr] ) // (
  question: dns-query,
  answer: [+ dns-rr],
  ? extra-sections,
))
dns-response = [sections]
```

CBOR array of arrays:

- At minimum containing answer section (array of DNS resource records)
- Assumes that transport can map query to response!
  (original question may be amended optionally)

Simple Example

Query IPv6 address for `example.org`
(13 bytes vs. 52 bytes wire-format: compression 400%)

```
["example.org"]
```

Corresponding response (24 bytes vs. 68 bytes wire-format: compression 283.3%):

```
[[[3600, h'20010db800000000000000000000001']]]
```

A More Complex Example

Query any record for `example.org` (*cf.* DNS-SD)
(17 bytes vs. 52 bytes wire-format: compression 305,9%)

```
["example.org", 255, 255]
```

Corresponding response (200 bytes vs. 195 bytes wire-format: compression 97.5%):

```
[
  ["example.org", 12, 1],
  [[3600, "_coap._udp.local"]],
  [[3600, 2, "ns1.example.org"], [3600, 2, "ns2.example.org"]],
  [
    ["_coap._udp.local", 3600, 28, h'20010db8000000000000000000000001'],
    ["ns1.example.org", 3600, 28, h'20010db8000000000000000000000035'],
    ["ns2.example.org", 3600, 28, h'20010db8000000000000000000003535'],
  ]
]
```

⇒ Larger than wire-format! Accept and just use wire-format instead?

TBDs

- Feedback appreciated, in particular about CBOR details!
- Do we need special treatment for EDNS(0)?
- Should we add name and address compression, e.g., based on SCHC?
  - Any suggestions to increase conciseness further?