A DNS Query including A Main Question with Accompanying Questions
              draft-yao-dnsop-accompanying-questions-01

Abstract

   This document enables DNS initiators to send a main question
   accompanying with several related questions in a single DNS query,
   and enables DNS responders to put the answers into a single DNS
   response. This mechanism can reduce the number of DNS round-trips
   per application work-unit.

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1. Introduction

      There are many scenarios in which an application must send several
      related questions to a DNS responder. For examples, when asking
      about a QTYPE=A RRset, a QTYPE=AAAA RRset may also be of use [RFC
      5321]; When asking for some RRset of www.example.com about A and
      AAAA, records of a sub-domain name such as _443._tcp.www.example.com
      for TLSA may be of interest[RFC 6698].

      Query example.com for A and AAAA

      Query www.example.com for A and AAAA, and _443._tcp.www.example.com
      for TLSA

This document describes a method by which DNS initiators can send a
main question accompanying with several related questions in a single
DNS query, and enables DNS responders place all related answers into
a single DNS response. This mechanism can reduce the number of DNS
round-trips per application work-unit, by carrying several related
queries in a single query transaction.

2. Terminology

The basic key words such as "MUST", "MUST NOT", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "MAY", and "MAYNOT" are to be interpreted as
described in [RFC2119].

The basic DNS terms used in this specification are defined in the
documents [RFC1034] and [RFC1035].

3. Mechanism for a main question with accompanying questions

The initiator still puts a main question into the question section of
the DNS query packet, as described in [RFC1035]. Accompanying
questions will be put into the variable part of an OPT RR [RFC6891].

The variable part of an OPT RR is encoded in its RDATA and is
structured as the following:

```
              +0 (MSB)                          +1 (LSB)
       +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    0: |                          OPTION-CODE                         |
       +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    2: |                         OPTION-LENGTH                        |
       +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    4: |                                                              |
       /                          OPTION-DATA                         /
       /                                                              /
       +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```
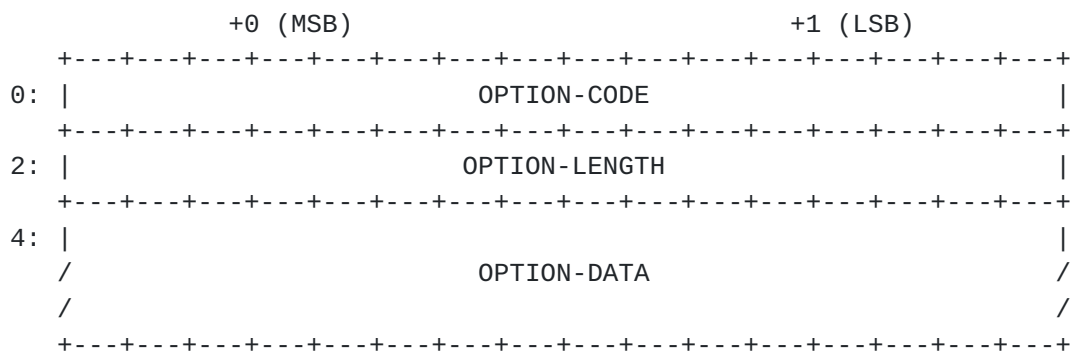
OPTION-CODE   (Assigned by IANA.)

OPTION-LENGTH   Size (in octets) of OPTION-DATA.

OPTION-DATA   including at most 8 accompanying questions with AQ-RCODE.

```
      0   1   2   3   4   5   6   7   8   9   0   1   2   3   4   5
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |AQ |   Count   |                 AQ-RCODE                     |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                     AQ-TYPE                                  |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                                                              |
    /              Prefix                                          /
    /                                                              /
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |AQ |    Seq    |                 AQ-RCODE                     |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                     AQ-TYPE                                  |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                                                              |
    /              Prefix                                          /
    /                                                              /
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |AQ |    Seq    |                 AQ-RCODE                     |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                     AQ-TYPE                                  |
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                                                              |
    /              Prefix                                          /
    /                                                              /
    +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
    |                                                              |
    /                          ......                              /
    /                                                              /
```
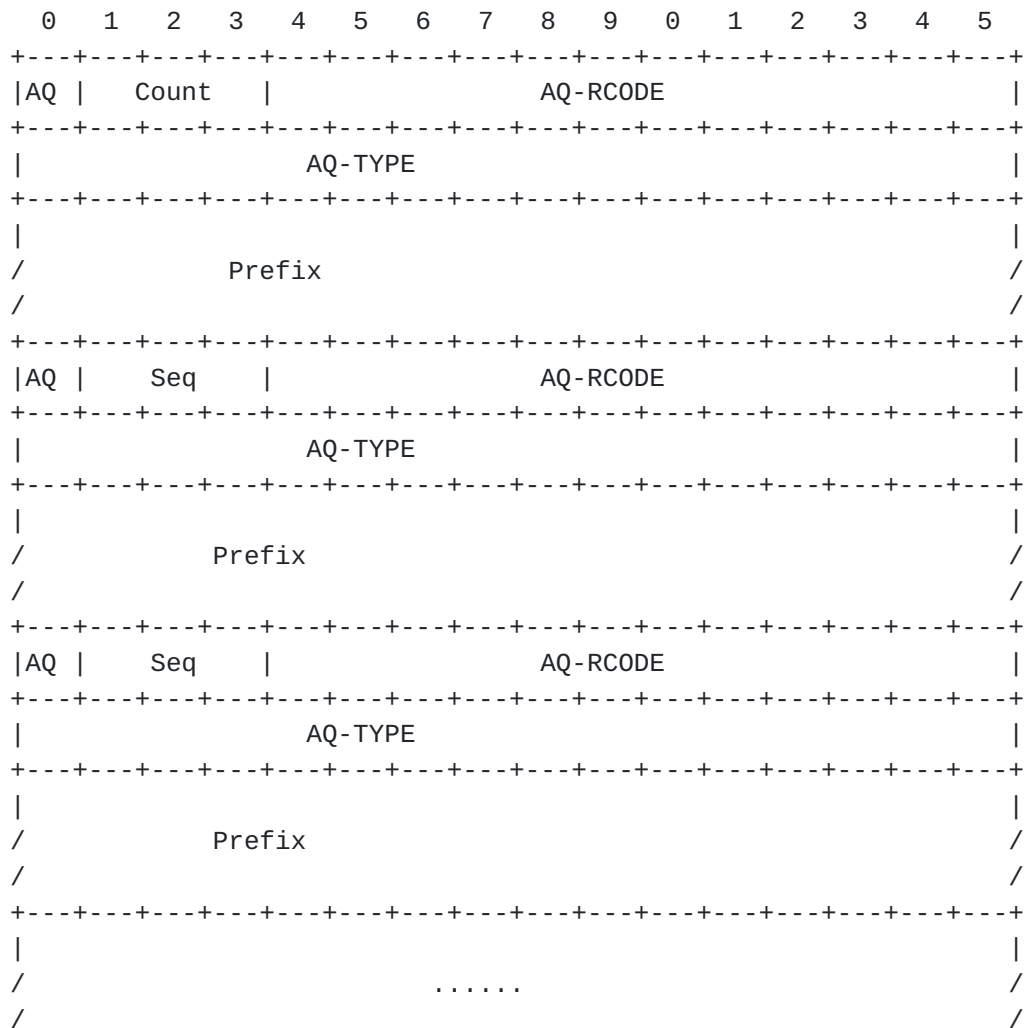
o AQ field indicates whether this accompanying question is the first
   question. If it is set as 1, this question is the first question.

o Count field represents the total numbers of all accompanying
   questions. Seq field represents the sequence number of
   accompanying questions from 1 to 7 There will have at most 8
   accompanying questions.

o AQ-RCODE field will be set to 111111110100 bits when being
   initialized. The AQ-RCODE with the value of 111111110100 bits
   means that the mechanism for accompanying has not been
   implemented, where "0100" in the RCODE value is "not been
   implemented". The AQ aware responders will put the RCODE value
   for the query of this question into AQ-RCODE fields.

   o Prefix field is a substring between the main domain name of the
      main quesiton and the accompanying domain name of the accompanying
      question. That is, if the main domain name is string S and the
      accompanying domain name is string S1, the prefix is (S-S1). For
      an example, if the main domain name is example.com and the
      accompanying domain name is mail.example.com, the prefix is
      "mail.".

[4]. Responder Processing

   The AQ aware responder will check the main question first, and put
   the results into the DNS response packet. If the AQ OPT is present,
   the responder assembles the prefix with the main domain name and make
   it to be an accompanying question, checks the accompanying questions
   in order, and put the results into the DNS answer section of the
   response following [RFC 1034]; but the response code is placed in the
   respective AQ-RCODE field in AQ OPT of the response. The RCODE field
   in the DNS response header refers to the main question only. An AQ
   unaware responder is expected to ignore the AQ OPT of the query, and
   may echo the received OPT back into additional section of the
   response message.

[5]. Initiator Processing

   An AQ aware initiator will put the main question into the question
   section of the DNS query packet, and put related accompanying
   questions into the Accompanying Question fields of OPTION-DATA of OPT
   RR. AQ-RCODE value will be sent as 111111110100 bits. The AQ value
   should be set to 1 and Count value should be set to total number of
   accompanying questions, if the accompanying question is the first
   one; For the remain accompanying questions, the AQ value should be
   set to 0 and Seq value should be set to the sequence of the
   corresponding accompanying questions. The AQ-TYPE value should be
   set as the query type related accomanying questions. The Prefix
   should be set as the substring between the main domain name of the
   main quesiton and the accompanying domain name of the accompanying
   question. If the main domain name and the accompanying domain name
   are same, the Prefix should be set as all zero bits.

   If the initial value of the AQ-RCODE is unchanged in the response, it
   indicates that the responder is AQ unaware. In that case, the
   responder will deal with the main question only. The initiator
   should sent the accompanying questions one by one via the normal DNS
   query. In such followup related queries, AQ processing should
   probably not be attempted, to reduce waste of network resources.

[6](#). **Query and Response Example**

   Example: one main question with 2 accompanying questions

   The query would look like:

```
            +---------------------------------------------------+
   Header   | OPCODE=SQUERY                                     |
            +---------------------------------------------------+
   Question | QNAME=EXAMPLE.COM., QCLASS=IN, QTYPE=A            |
            +---------------------------------------------------+
   Answer   |                                                   |
            +---------------------------------------------------+
   Authority | <empty>                                          |
            +---------------------------------------------------+
   Additional |                                                 |
            | AQ=1,Count=2,AQ-TYPE=AAAA,AQ-RCODE=111111110100,  |
            | Prefix=0,                                         |
            | AQ=0, SEQ=1,AQ-TYPE=TLSA,,AQ-RCODE=111111110100,  |
            | Prefix=_443._tcp.,                                |
            +---------------------------------------------------+
```

   The response from AQ aware responders would be:

```
            +---------------------------------------------------+
   Header   | OPCODE=SQUERY,  RESPONSE, AA, RCODE=NOERROR       |
            +---------------------------------------------------+
   Question | QNAME=EXAMPLE.COM., QCLASS=IN, QTYPE=A            |
            +---------------------------------------------------+
   Answer   |        example.com  IN A 192.168.0.1             |
            |        example.com. IN AAAA 2001:cc8::1           |
            |    _443._tcp.example.com. IN TLSA                 |
            |        ( 3 0 0 30820307308201efa003020102020... ) |
            +---------------------------------------------------+
   Authority | <empty>                                          |
            +---------------------------------------------------+
   Additional |                                                 |
            | AQ=1, COUNT=2, AQ-TYPE=AAAA, AQ-RCODE=NOERROR,    |
            | Prefix=0,                                         |
            | AQ=0, SEQ=1, AQ-TYPE=TLSA, AQ-RCODE=NOERROR,      |
            | Prefix=443._tcp.,                                 |
            +---------------------------------------------------+
```

       The response from AQ unaware responders would be:

```
            +---------------------------------------------------+
    Header   | OPCODE=SQUERY,  RESPONSE, AA, RCODE=NOERROR      |
```

```
             +----------------------------------------------------+
   Question  | QNAME=EXAMPLE.COM., QCLASS=IN, QTYPE=A              |
             +----------------------------------------------------+
   Answer    |            example.com  IN A 192.168.0.1            |
             +----------------------------------------------------+
   Authority | <empty>                                             |
             +----------------------------------------------------+
   Additional |                                                   |
             | AQ=1, COUNT=2, AQ-TYPE=AAAA,AQ-RCODE=111111110100,|
             | Prefix=0,                                           |
             | AQ=0, SEQ=1, AQ-TYPE=TLSA, AQ-RCODE=111111110100,  |
             | Prefix=443._tcp.,                                   |
             +----------------------------------------------------+
```

7. IANA Considerations

IANA should allocate DNS EDNS0 Option Codes (OPT) following this
document. IANA should reserve RCODE with the value of 111111110100
bits for this document.

8. Security Considerations

TBD

9. Acknowledgements

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10. Change History

RFC Editor: Please remove this section.

10.1. draft-yao-dnsop-accompanying-questions: Version 00

o A Mechanism for DNS query including one main question with several
   accompanying questions

10.2. draft-yao-dnsop-accompanying-questions: Version 01

o Simpilfy the mechanism.

11. Normative References

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              of Named Entities (DANE) Transport Layer Security (TLS)
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