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Negative Answer of DNS Queries
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Status of this Memo

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Abstract

There is no way to indicate the negative answer of resource records (RR) with name and type other than QNAME and QTYPE. This memo proposes a method to inform the nonexistence of a given name and a given type.

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1. Introduction

1.1. Current DNS Operation

Negative answer for QNAME and QTYPE, which is categorised into "NXDOMAIN" and "NODATA", has been covered by the DNS specifications [RFC1035]. "Name Error" RCODE expresses the nonexistence of QNAME (or "NXDOMAIN"). And the combination of "No Error" RCODE and no RRs relevant to QNAME in the answer section indicates that the name is valid, for the given class, but are no records of the given type (or "NODATA").

1.2. Problem for Current DNS Operation of Negative Answers

There are some applications or DNS extensions that require "glue" RRs with their names other than QNAME and QTYPE in the response. i.e., in order to get both IPv4 and IPv6 addresses in a response, one "glue" proposal is to include AAAA RR as additional data in A responses and include A RR as additional data in AAAA responses. For this specific problem, no data answer for the glued RRs in the additional section is not distinguishable from the case that this "glue" proposal is not implemented by the name servers or resolvers. The difficulty is mainly due to the dependency of negative answer on RCODE, while RCODE only serves the answer for QNAME and QTYPE. In order to solve the problem, a new method of negative answer independent of RCODE is proposed.

2. Negative Answer Definitions

2.1. Negative Answer Data Format

Negative answer is also categorised into two types "NXDOMAIN" and "NODATA".

The four relevant fields are

NAME TYPE CLASS RDATA

Fields not mentioned are not important in terms of the negative answer.

Negative answer of "NXDOMAIN" is

NAME <empty> CLASS <empty>

Negative answer of "NODATA" is

NAME TYPE CLASS <empty>

2.2. Negative Answers from Authoritative Servers

Name Servers authoritative for a zone MAY place the negative answer to names and types other than QNAME and QTYPE in the response (i.e., in the additional section). If so, name servers authoritative for a zone MUST include the SOA record of the zone in the response (i.e., in the additional section). If needed, the appropriate NSEC RR SHOULD be included in the response [RFC5155] (i.e., in the additional section).

2.3. Caching Negative Answers

Negative answer to names and types other than QNAME and QTYPE in the response MAY be cached as specified in [RFC2308 5].

3. Example

The following example is based on the "glue" proposal mentioned in section 1.2. The response to the query for AN.EXAMPLE. AAAA MAY include the negative answer of AN.EXAMPLE. A in the additional section.

Header:

RDCODE=NOERROR

Query:

AN.EXAMPLE. AAAA

Answer:

<empty>

Authority:

EXAMPLE. SOA NS1.XX. HOSTMASTER.NS1.XX. ....

EXAMPLE. NS NS1.XX.

EXAMPLE. NS NS2.XX.

Additional:

NS1.XX. A 127.0.0.2

NS2.XX. A 127.0.0.3

AN.EXAMPLE. A

The negative answer that resulted from a no data error (NODATA) of AN.EXAMPLE. A MAY be cache such that it can be retrieved and returned in response to another query for the same <QNAME, QTYPE, QCLASS> that resulted in the cached negative response.

4. Security Considerations

TBD.

5. IANA Considerations

TBD.

6. References

[RFC1035] Mockapetris, P., "Domain Names - Implementation and Specifications", STD 13, RFC 1035, November 1987.

[RFC2308] Andrews, M., "Negative Caching of DNS Queries (DNS NCACHE)", RFC 2308, March 1998.

[RFC5155] Laurie, B., Sisson, G., Arends, R., and D. Blacka, "DNS Security (DNSSEC) Hashed Authenticated Denial of Existence", RFC 5155, March 2008.

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