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Special Use Domain Name 'ipv4only.arpa'
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Abstract

The document "Discovery of the IPv6 Prefix Used for IPv6 Address Synthesis" [[RFC7050](#)] specifies the Special Use Domain Name 'ipv4only.arpa', with certain precise special properties, but, perversely, the Domain Name Reservation Considerations section [[RFC6761](#)] in that document then goes on to deny the specialness of that name, and (as of May 2016) the name 'ipv4only.arpa' does not appear in the Special-Use Domain Names registry.

This document updates [RFC 7050](#) with a more appropriate summary of the legitimate and useful special properties of the name 'ipv4only.arpa', and the corresponding reverse mapping names.

Status of this Memo

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1. Introduction

The document "Discovery of the IPv6 Prefix Used for IPv6 Address Synthesis" [[RFC7050](#)] specifies the Special Use Domain Name 'ipv4only.arpa', with certain precise special properties, but, perversely, the Domain Name Reservation Considerations section [[RFC6761](#)] in that document denies the specialness of that name, and (as of May 2016) the name 'ipv4only.arpa' does not appear in the Special-Use Domain Names registry [[SUDN](#)].

As a result of the name 'ipv4only.arpa' being formally declared to have no special properties, there was no mandate for software to treat this name specially. Consequently, queries for this name have to be handled normally, and result in a large volume of unnecessary queries to the 'arpa' name servers.

Having millions of devices around the world issue these queries generates pointless additional load on the 'arpa' name servers, which is completely unnecessary when the name 'ipv4only.arpa' is defined, by Internet Standard, to have only two IPv4 address records, 192.0.0.170 and 192.0.0.171, and no other records of any type.

At times, for reasons that are as yet unclear, the 'arpa' name servers have been observed to be slow or unresponsive. The failures of these 'ipv4only.arpa' queries result in unnecessary failures of software that depends on them for NAT64 address synthesis.

To remedy this situation, this document updates [RFC 7050](#) with a more appropriate Domain Name Reservation Considerations section [[RFC6761](#)] that properly lists the desirable and beneficial special handling for 'ipv4only.arpa'.

2. Conventions and Terminology Used in this Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in "Key words for use in RFCs to Indicate Requirement Levels" [[RFC2119](#)].

3. Security Considerations

Hard-coding the answers for 'ipv4only.arpa' queries avoids the risk of malicious devices intercepting those queries and returning incorrect answers.

DNSSEC signing issues for the 'ipv4only.arpa' address records don't apply, since the only use of the 'ipv4only.arpa' name is to trigger synthesis of NAT64 AAAA records, which aren't signed by arpa anyway.

4. IANA Considerations

[Once published, this should say]

IANA has recorded the following names in the Special-Use Domain Names registry [[SUDN](#)]:

- ipv4only.arpa
- 170.0.0.192.in-addr.arpa
- 171.0.0.192.in-addr.arpa

IANA has recorded the following IPv4 addresses in the IPv4 Special-Purpose Address Registry [[SUV4](#)]:

- 192.0.0.170
- 192.0.0.171

5. Domain Name Reservation Considerations

5.1. `ipv4only.arpa`

The name '`ipv4only.arpa`' is defined, by Internet Standard, to have two IPv4 address records with rdata `192.0.0.170` and `192.0.0.171`.

When queried via a DNS64 recursive/caching server, the name '`ipv4only.arpa`' is defined to also have two IPv6 AAAA records, with rdata synthesized from a combination of the NAT64 IPv6 prefix, and the IPv4 addresses `192.0.0.170` and `192.0.0.171`. This can return more than one pair of v6 addresses if there are multiple NAT64 prefixes.

The name '`ipv4only.arpa`' has no other DNS records of any type.

The name '`ipv4only.arpa`' is special only to

- (a) client software wishing to perform NAT64 address synthesis, and
- (b) the DNS64 server responding to such requests.

These two considerations are listed in items 2 and 4 below:

1. Normal users should never have reason to encounter the '`ipv4only.arpa`' domain name. If they do, queries for '`ipv4only.arpa`' should result in the answers specified in [RFC 7050](#).
Normal users have no need to know that '`ipv4only.arpa`' is special.
2. Application software may explicitly use the name '`ipv4only.arpa`' for NAT64 address synthesis, and expect to get the answers specified in [RFC 7050](#). If application software encounters the name '`ipv4only.arpa`' in the normal course of handling user input, the application software should resolve that name as usual and need not treat it in any special way.
3. Name resolution APIs and libraries SHOULD NOT recognize '`ipv4only.arpa`' as special and SHOULD NOT treat it differently. Name resolution APIs SHOULD send queries for this name to their configured recursive/caching DNS server(s).

4. Recursive/caching DNS servers SHOULD recognize 'ipv4only.arpa' as special and SHOULD NOT, by default, attempt to look up NS records for it, or otherwise query authoritative DNS servers in an attempt to resolve this name. Instead, recursive/caching DNS servers SHOULD, by default, act as authoritative and generate immediate responses for all such queries.

Traditional recursive/caching DNS servers that act as authoritative for this name MUST generate only the 192.0.0.170 and 192.0.0.171 responses for IPv4 address queries (DNS qtype "A"), and a "no error no answer" response for all other query types. An example configuration for BIND 9 to achieve this result is given in [Appendix A](#).

All DNS64 recursive/caching DNS servers MUST generate the 192.0.0.170 and 192.0.0.171 responses for IPv4 address queries (DNS qtype "A"), the appropriate synthesized IPv6 address record responses for IPv6 address queries (DNS qtype "AAAA"), and a "no error no answer" response for all other query types. This local self-contained generation of these responses is to avoid placing unnecessary load on the 'arpa' name servers.

5. Traditional authoritative DNS server software need not recognize 'ipv4only.arpa' as special or handle it in any special way. As a practical matter, only the administrators of the 'arpa' namespace will configure their name servers to be authoritative for this name and to generate the appropriate answers; all other authoritative name servers will not be configured to know anything about this name and will reject queries for it as they would reject queries for any other name about which they have no information.
6. Generally speaking, operators of authoritative DNS servers need not know anything about the name 'ipv4only.arpa', just as they don't need to know anything about any other names they are not responsible for. Operators of authoritative DNS servers who are configuring their name servers to be authoritative for this name MUST understand that 'ipv4only.arpa' is a special name, with answers specified by Internet Standard (generally this applies only to the administrators of the 'arpa' namespace).
7. DNS Registries/Registrars need not know anything about the name 'ipv4only.arpa', just as they don't need to know anything about any other name they are not responsible for. Only the administrators of the 'arpa' namespace need to be aware of this name's purpose and how it should be configured.

5.2. 170.0.0.192.in-addr.arpa and 171.0.0.192.in-addr.arpa

Since the IPv4 addresses 192.0.0.170 and 192.0.0.171 are defined to be special, and are listed in the IPv4 Special-Purpose Address Registry [[SUV4](#)], the corresponding reverse mapping names in the in-addr.arpa domain are similarly special.

The name '170.0.0.192.in-addr.arpa' is defined, by Internet Standard, to have only a single DNS record, type PTR, with rdata 'ipv4only.arpa'.

The name '171.0.0.192.in-addr.arpa' is defined, by Internet Standard, to have only a single DNS record, type PTR, with rdata 'ipv4only.arpa'.

Practically speaking these two names are rarely used, but to the extent that they may be, they are special only to recursive/caching DNS servers as described in item 3 below:

1. Normal users should never have reason to encounter these two reverse mapping names. However, if they do, queries for these reverse mapping names should return the expected answer 'ipv4only.arpa'. Normal users have no need to know that these reverse mapping names are special.
2. Application software SHOULD NOT recognize these two reverse mapping names as special, and SHOULD NOT treat them differently. For example, if the user were to issue the Unix command "host 192.0.0.170" then the "host" command should issue the query as usual and display the result that is returned.
3. Name resolution APIs and libraries SHOULD NOT recognize these two reverse mapping names as special and SHOULD NOT treat them differently. Name resolution APIs SHOULD send queries for these names to their configured recursive/caching DNS server(s).
4. Recursive/caching DNS servers SHOULD recognize these two reverse mapping names as special and SHOULD NOT, by default, attempt to look up NS records for them, or otherwise query authoritative DNS servers in an attempt to resolve them. Instead, recursive/caching DNS servers SHOULD, by default, act as authoritative and generate immediate responses for all such queries.

Recursive/caching DNS servers that act as authoritative for these names MUST generate only the 'ipv4only.arpa' response for PTR queries, and a "no error no answer" response for all other query types. This local self-contained generation of these responses is to avoid placing unnecessary load on the 'in-addr.arpa' name

servers.

5. Traditional authoritative DNS server software need not recognize these two reverse mapping names as special or handle them in any special way.

As a practical matter, only the administrators of the 'in-addr.arpa' namespace will configure their name servers to be authoritative for these names and to generate the appropriate answers; all other authoritative name servers will not be configured to know anything about these names and will reject queries for them as they would reject queries for any other name about which they have no information.

6. Generally speaking, operators of authoritative DNS servers need not know anything about these two reverse mapping names, just as they don't need to know anything about any other names they are not responsible for. Operators of authoritative DNS servers who are configuring their name servers to be authoritative for this name MUST understand that these two reverse mapping names are special, with answers specified by Internet Standard (generally this applies only to the administrators of the 'in-addr.arpa' namespace).
7. DNS Registries/Registrars need not know anything about these two reverse mapping names, just as they don't need to know anything about any other name they are not responsible for. Only the administrators of the 'in-addr.arpa' namespace need to be aware of the purpose of these two names.

5.3. ip6.arpa Reverse Mapping PTR Records

For all IPv6 addresses synthesized by the NAT64 gateway, the DNS64 recursive/caching server is responsible for synthesizing the appropriate ip6.arpa reverse mapping PTR records, if it chooses to do so. The same applies to the synthesized IPv6 addresses corresponding to the IPv4 addresses 192.0.0.170 and 192.0.0.171.

Generally a DNS64 recursive/caching server synthesizes appropriate ip6.arpa reverse mapping PTR records by extracting the embedded IPv4 address from the encoded IPv6 address, performing a reverse mapping query for that IPv4 address, and then synthesizing a corresponding ip6.arpa reverse mapping PTR record containing the same rdata.

In the case of synthesized IPv6 addresses corresponding to the IPv4 addresses 192.0.0.170 and 192.0.0.171, the DNS64 recursive/caching server does not issue mapping queries for those IPv4 addresses, but instead, according to rule 3 above, immediately returns the answer 'ipv4only.arpa'.

6. References

6.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/[RFC2119](#), March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC6761] Cheshire, S. and M. Krochmal, "Special-Use Domain Names", [RFC 6761](#), DOI 10.17487/RFC6761, February 2013, <<http://www.rfc-editor.org/info/rfc6761>>.
- [RFC7050] Savolainen, T., Korhonen, J., and D. Wing, "Discovery of the IPv6 Prefix Used for IPv6 Address Synthesis", [RFC 7050](#), DOI 10.17487/RFC7050, November 2013, <<http://www.rfc-editor.org/info/rfc7050>>.

6.2. Informative References

- [SUDN] "Special-Use Domain Names Registry", <<https://www.iana.org/assignments/special-use-domain-names/>>.
- [SUV4] "IANA IPv4 Special-Purpose Address Registry", <<https://www.iana.org/assignments/iana-ipv4-special-registry/>>.

[Appendix A](#). Example BIND 9 Configuration

A BIND 9 recursive/caching DNS server could be configured to act as authoritative for the appropriate names as follows.

In `/etc/named.conf` the following lines are added:

```
zone "ipv4only.arpa"           { type master; file "ipv4only"; };
zone "170.0.0.192.in-addr.arpa" { type master; file "ipv4only-r"; };
zone "171.0.0.192.in-addr.arpa" { type master; file "ipv4only-r"; };
```

The file `/var/named/ipv4only` is created with the following content:

```
$TTL 86400                ; Default TTL 24 hours
@ IN SOA nameserver.example. admin.nameserver.example. (
    2016052400            ; Serial
    7200                  ; Refresh ( 7200 = 2 hours)
    3600                  ; Retry   ( 3600 = 1 hour)
    15724800              ; Expire  (15724800 = 6 months)
    60                    ; Minimum
)
@ IN NS  nameserver.example.

@ IN A   192.0.0.170
@ IN A   192.0.0.171
```

The file `/var/named/ipv4only-r` is created with the following content:

```
$TTL 86400                ; Default TTL 24 hours
@ IN SOA nameserver.example. admin.nameserver.example. (
    2016052400            ; Serial
    7200                  ; Refresh ( 7200 = 2 hours)
    3600                  ; Retry   ( 3600 = 1 hour)
    15724800              ; Expire  (15724800 = 6 months)
    60                    ; Minimum
)
@ IN NS  nameserver.example.

@ IN PTR ipv4only.arpa.
```


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