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DNS Root Name Service Protocol and Deployment Requirements

Abstract

The DNS root name service is a critical part of the Internet architecture. The DNS root name service's DNS protocol and deployment requirements are defined in this document. Operational requirements for the root name service are out of scope.

Status of This Memo

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1. Introduction

This document co-exists with a corresponding operational requirements document published by the Root Server System Advisory Committee of ICANN in [\[RSSAC-001\]](#) or any subsequent version. Although intricately tied together, both of these documents may be updated at any time to reflect required updates to the protocol, deployment and operational requirements. Further notes about the history of these documents is discussed in [Appendix A](#).

The root servers are authoritative servers of the unique [\[RFC2826\]](#) root zone (".") [\[ROOTZONE\]](#). They currently also serve the root-servers.net zone. Some also serve the zone for the .arpa top-level domain [\[ARPAZONE\]](#) [\[RFC3172\]](#), although at the time of this writing there are plans to move the service for the .arpa top-level domain to different infrastructure [\[RFC9120\]](#).

This document describes the external interface of the root name servers from a protocol viewpoint of the service. It specifies basic requirements for the Internet that DNS clients meet when interacting with a root name service over the public Internet.

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 [\[RFC8174\]](#) when, and only when, they appear in all capitals, as shown here.

1.1. Relationship to RFC2870 and RFC7720

This document obsoletes both [\[RFC2870\]](#) and [\[RFC7720\]](#).

2. Protocol Requirements

This section describes the minimum high-level protocol requirements.

The root name service:

- *MUST implement core DNS [[RFC1035](#)] and clarifications to the DNS [[RFC2181](#)].
- *MUST support IPv4 [[RFC0791](#)] and IPv6 [[RFC2460](#)] transport of DNS queries and responses.
- *MUST support UDP [[RFC0768](#)] and TCP [[RFC0793](#)] transport of DNS queries and responses.
- *MUST generate checksums when sending UDP datagrams and MUST verify checksums when receiving UDP datagrams containing a non-zero checksum.
- *MUST implement DNSSEC [[RFC4035](#)] as an authoritative name service.
- *MUST implement extension mechanisms for DNS (EDNS(0)) [[RFC6891](#)].
- *MUST support distributing Message Digests for DNS Zones [[RFC8976](#)].
- *MAY support validating Message Digests for DNS Zones [[RFC8976](#)].

3. Deployment Requirements

The root name service:

- *MUST answer queries from any entity conforming to [[RFC1122](#)] with a valid IP address.
- *MUST serve the unique [[RFC2826](#)] root zone [[ROOTZONE](#)].

4. Security Considerations

This document does not specify a new protocol. However, the root name service is a key component of the Internet architecture and plays a key role into the overall security of the Internet [[RFC2826](#)]. Specific security considerations on the DNS protocols are discussed in their respective specifications. The security considerations on the operational side of the root name servers are discussed in the corresponding document published by RSSAC ([\[RSSAC-001\]](#) or a subsequent version).

5. References

5.1. Normative References

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Appendix A. History

[RFC2870] originally discussed both the protocol and operational requirements for root name servers for the Internet's domain name system (DNS) protocol [RFC1035]. Since its initial publication, both protocol and operational requirements have evolved. The protocol requirements was later split into [RFC7720] and the operational requirements was moved to [RSSAC-001] and published by ICANN's Root Server System Advisory Committee (RSSAC). These two documents functionally replaced [RFC2870]. Similarly, this document now functionally replaces [RFC7720].

As both of these requirement sets are expected to evolve over time, the authors of both document sets hope to always keep them roughly in synchronization. However, the latest version of both of these two documents should be consider the most recent set of requirements regardless of whether they were published together or separately.

Appendix B. Acknowledgements

This document was prepared by the ICANN RSSAC Caucus with participation of many Caucus members.

Much of this text is a rearrangement and restatement of [[RFC7720](#)], which itself contains text was taken from [[RFC2870](#)].

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