

Principles Guiding the Operation of the Public Root Server System

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The public root server system (RSS) for the domain name system (DNS) has been in place since the 1980s and has been operated by independent root server operators (RSOs) ever since. The DNS and the RSS remain an integral part of the Internet's infrastructure.

During the writing of RSSAC037, the RSSAC identified the key factors for the success of the DNS in general, and the RSS in particular.¹ Eleven guiding principles emerged from the discussions and are listed in RSSAC037. The principles have been referred to in different contexts often enough that the RSSAC has decided to publish them separately here, with additional explanatory text.

Some items in the list of guiding principles apply to the RSS as a whole, while others apply to the individual RSOs that make up the RSS. A primary goal for the RSS is to support the entire Internet community by serving a single consistent root zone. To support that goal for the RSS, each RSO is committed to being neutral, impartial, and focused on the provisioning and maintenance of the RSS technical infrastructure. Thus, the principles listed for the RSS and the RSOs are interrelated.

The principles that have enabled the success of this service, and which should remain core principles going forward, include:

1. To remain a global network, the Internet requires a globally unique public namespace.

The DNS namespace is a hierarchy derived from a single, globally unique root. This is the key tenet of RFC 2826.²

If domain names are not unique, then the names are no longer useful for identifying a specific service, and the network is no longer singular and universal. This is succinctly described in RFC 2826 by the Internet Architecture Board (IAB).

2. IANA is the source of DNS root data. RSOs are committed to serving the IANA global root DNS namespace. Root servers provide DNS answers containing *complete* and *unmodified* DNS data, including DNS Security Extensions (DNSSEC) data.³ In addition, IANA maintains the necessary technical information identifying root servers.⁴

¹ See RSSAC037: A Proposed Governance Model for the DNS Root Server System

² See RFC 2826: IAB Technical Comment on the Unique DNS Root

³ See RSSAC020: Statement on the Client Side Reliability of Root DNS Data

⁴ See RSSAC030: RSSAC Statement on Entries in DNS Root Sources

More information about root zone management can be found at the Internet Assigned Numbers Authority (IANA).⁵

3. The RSS must be a stable, reliable, and resilient platform for the DNS service to all users. The RSOs have a responsibility to provide a high-quality service to the Internet.⁶ For example, if an RSO should need to transition operational control to a successor operator, the RSO will provide the Internet community with advance notice and take reasonable measures to facilitate a smooth transition.

The RSS is by design distributed and operated in a decentralized manner by individual RSOs, serving the single root zone data provided by IANA. Each RSO must provide equal service to all users. The RSS must work under all circumstances. The typical users of the RSS are caching recursive DNS resolvers.

4. Diversity of the root server operations is a strength of the overall system. Diversity in RSOs' operational models and organizational structures increases the resiliency of the overall system.⁷

Stability is more important than performance for the RSS. If a system is made from homogenous components that happen to suffer from a common flaw, the components could all fail at the same time if that flaw is triggered. This may lead to a failure of the entire system. Because diverse software and operations are used by RSOs to serve the root zone, a failure or vulnerability will have limited consequences to the whole RSS. Because the DNS protocol has redundant fail-over mechanisms built in, a diverse system with a partial failure will continue to function.

5. Architectural changes should result from technical evolution and demonstrated technical need. RSOs should embrace emerging technologies affecting the RSS, as long as the Internet's globally unique public namespace is preserved.⁸

The RSS is technical infrastructure. Due to its importance for the Internet and its role as enabler of transactions on a global scale, the RSS must evolve with the caution expected from operators of such important technical infrastructure. The stability of the system is paramount.

⁵ See IANA Root Zone Management, <https://www.iana.org/domains/root>

⁶ See RSSAC016: RSSAC Workshop 2015 Report

⁷ See RSSAC016: RSSAC Workshop 2015 Report

⁸ See RSSAC016: RSSAC Workshop 2015 Report

6. The IETF defines technical operation of the DNS protocol. The IETF and IAB define the protocols underlying DNS implementation in Requests for Comments (RFCs) and other documentation.

The uniqueness of the namespace described in principle #1 depends on a common understanding of how the DNS functions and how it is operated. In order to maintain that common understanding and synchronization, there must be one definitive source of information about how the system functions. The Internet Engineering Task Force (IETF) provides the open platform for discussing evolution and development of the DNS protocol and its implementation. The RSOs recognize the IETF as the primary body for creating Internet-related technologies, and it is also where the DNS was defined and is being updated. The IAB provides long-range technical direction for Internet development and for matters of operation of Internet infrastructure services. As such, it sets operational expectations with respect to protocol interpretation and utilization of namespaces designed within the IETF.

7. RSOs must operate with integrity and an ethos demonstrating a commitment to the common good of the Internet. RSOs should operate with high moral and ethical standards. They must be committed to sending and responding to traffic without filtering, to serving the IANA global root DNS namespace,⁹ and to avoiding conflicts of interest and reciprocal agreements.

In order to fulfill the requirements on stability, resilience, and neutrality described in these principles, the RSOs must operate ethically. They each uphold these values without any pressure or influence from external bodies. Each RSO commits to work with the other RSOs to reach collectively-specified goals for the RSS.

8. RSOs must be transparent. RSOs must be as transparent as is reasonable without compromising their operational security.

End user trust of the RSS is key to the uniqueness of the namespace which leads to integrity of a single DNS and therefore the wholeness of the Internet. Transparency plays a critical role in the strength of that trust.

9. RSOs must collaborate and engage with their stakeholder community. An RSO must collaborate openly with other operators, participate in group meetings and activities, engage at the IETF in the technical standardization process, and respond to stakeholder questions in a timely manner.

⁹ See RSSAC020: Statement on the Client Side Reliability of Root DNS Data

The RSOs provide service to the Internet community. In order to remain relevant they must listen to community voices that express legitimate needs, and work with the community to provide services that are relevant for the Internet's users.

10. RSOs must be autonomous and independent. An RSO should have autonomy and independence in architecting and operating their service, while also adhering to standards and service expectations.

In order to make sure equal service is provided to all users, each RSO must stay autonomous and independent from entities that may exert influence over their operations aiming to promote their own business or political interests, at the expense of other network citizens. Independence for each RSO is crucial, both in relation to ICANN and other governance bodies, and in relation to the other RSOs. This is further articulated in RSSAC042 “Statement on Root Server Operator Independence”.¹⁰

11. RSOs must be neutral and impartial. An RSO is neutral to the politics of geographic regions and nation states when delivering the DNS root service. The RSO's focus is on provisioning a reliable technical service which knows no political boundaries and maintains an unbiased position to the politics of any nation state. RSOs must offer DNS service without bias, on the same terms, to users everywhere.

The neutrality and impartiality of individual RSOs contributes to the security, stability, and resilience of the entire RSS by making individual RSOs appear the same to the Internet users who rely on the DNS root serving a single global namespace.

¹⁰ See RSSAC042: RSSAC Statement on Root Server Operator Independence