Root Server System
2025 Technical Diversity Report

The Root Server System (RSS) is a critical Internet asset, and the resiliency, stability and security of the system is paramount. Technical and operational security was designed into the RSS and has evolved with the growth and changing threats on the Internet. An important security aspect of the RSS is technical and operational diversity. This helps reduce the impacts of a critical failure of individual software, hardware, or operational components by eliminating single points of failure.

The Root Server System Advisory Committee (RSSAC) has published a document named RSSAC001 and titled "Service Expectations of Root Servers Operators" which places clear expectations on Root Server Operators (RSOs). One such expectation from RSSAC001v2 is for "the RSOs ... to collectively publish aggregated implementation diversity reports from time-to-time." This document addresses that expectation by describing the collective diversity of the RSS.

The categories of diversity described here are based on the recommendations in RSSAC001v2. As a starting point, the RSOs conducted a detailed survey of RSS diversity and collectively analyzed the results. Information presented here is a result of that analysis and has been aggregated across all RSOs with no attempt to convey the relative distribution of each technology. Also note that RSOs often leverage diversity within their own operations (e.g., multiple operating systems, multiple hardware platforms), which is not necessarily reflected in this aggregate view. This report represents a snapshot in time and will evolve as the technologies change in the RSS. Unless specifically stated otherwise, the products, technologies, and services identified in this document are used by the RSOs in their provisioning of the root name service.

Operating System Software

The following variety of operating systems are in use by RSOs to provide root name service: **FreeBSD**, **Linux**, and **NetBSD**.

Furthermore, the following variety of Linux distributions are in use by RSOs: **Alma Linux**, **CentOS**, **Debian**, **Oracle Linux**, **RHEL**, **Rocky Linux**, and **Ubuntu**.

Name Server Software

The following variety of name server software products are in use by RSOs to provide root name service: **Atlas**, **BIND**, **Knot DNS**, and **NSD**.

Routing Hardware and Software

The following variety of routing hardware and software products are in use by RSOs to provide root name service: **Arista**, **Bird**, **Cisco**, **FRR**, **Juniper**, **OpenBGP**, and **Quagga**.

Virtualization

Some RSOs make use of virtual machines in the operation of their root service. The following variety of products are in use: **KVM**, **Proxmox**, and **VMWare**.

Server Hardware

Server hardware from the following hardware vendors is in use by RSOs to provide root name service: **Dell**, **Fujitsu**, **Generic Intel/AMD**, **Hewlett-Packard**, **iXsystems**, and **Supermicro**.

Network Connectivity

There is a great amount of variety in network providers in use by RSOs given the very wide footprint of thousands of anycast sites. RSOs work with hundreds of different transit providers with many thousands of peering sessions.

Regional Internet Registry

RSOs have IP allocations for root name service from the following Regional Internet Registries: **APNIC**, **ARIN**, **LACNIC**, and **RIPE NCC**.

Deployment Automation

Some RSOs utilize automation tools to deploy and manage root server instances. These include: **Ansible**, **Jenkins**, **Puppet**, and **Salt**.

Organization Types

The RSOs themselves consist of the following types of organizations: **Exchange Point Provider**, **Government Agency**, **Network Service Provider**, **Non-Profit**, **Regional Internet Registry**, **Registry Operator**, and **University**.