

24 Shared Registration System (SRS) Performance

1 ROBUST PLAN FOR OPERATING A RELIABLE SRS

1.1 High-Level Shared Registration System (SRS) System Description

Verisign, RB's selected provider of backend registry services, provides and operates a robust and reliable SRS that enables multiple registrars to provide domain name registration services in the top-level domain (TLD). Verisign's proven reliable SRS serves approximately 915 registrars, and Verisign, as a company, has averaged more than 140 million registration transactions per day. The SRS provides a scalable, fault-tolerant platform for the delivery of gTLDs through the use of a central customer database, a web interface, a standard provisioning protocol (i.e., Extensible Provisioning Protocol, EPP), and a transport protocol (i.e., Secure Sockets Layer, SSL).

The SRS components include:

- **Web Interface:** Allows customers to access the authoritative database for accounts, contacts, users, authorization groups, product catalog, product subscriptions, and customer notification messages.
- **EPP Interface:** Provides an interface to the SRS that enables registrars to use EPP to register and manage domains, hosts, and contacts.
- **Authentication Provider:** A Verisign developed application, specific to the SRS, that authenticates a user based on a login name, password, and the SSL certificate common name and client IP address.

The SRS is designed to be scalable and fault tolerant by incorporating clustering in multiple tiers of the platform. New nodes can be added to a cluster within a single tier to scale a specific tier, and if one node fails within a single tier, the services will still be available. The SRS allows registrars to manage the .vanish gTLD domain names in a single architecture.

To flexibly accommodate the scale of its transaction volumes, as well as new technologies, Verisign employs the following design practices:

- **Scale for Growth:** Scale to handle current volumes and projected growth.
- **Scale for Peaks:** Scale to twice base capacity to withstand "registration add attacks" from a compromised registrar system.
- **Limit Database CPU Utilization:** Limit utilization to no more than 50 percent during peak loads.
- **Limit Database Memory Utilization:** Each user's login process that connects to the database allocates a small segment of memory to perform connection overhead, sorting, and data caching. Verisign's standards mandate that no more than 40 percent of the total available physical memory on the database server will be allocated for these functions.

Verisign's SRS is built upon a three-tier architecture as illustrated in Figure 24-1 and detailed here:

- **Gateway Layer:** The first tier, the gateway servers, uses EPP to communicate with registrars. These gateway servers then interact with application servers, which comprise the second tier.
- **Application Layer:** The application servers contain business logic for managing and maintaining the registry business. The business logic is particular to each TLD's

business rules and requirements. The flexible internal design of the application servers allows Verisign to easily leverage existing business rules to apply to the .vanish gTLD. The application servers store RB's data in the registry database, which comprises the third and final tier. This simple, industry-standard design has been highly effective with other customers for whom Verisign provides backend registry services.

- **Database Layer:** The database is the heart of this architecture. It stores all the essential information provisioned from registrars through the gateway servers. Separate servers query the database, extract updated zone and Whois information, validate that information, and distribute it around the clock to Verisign's worldwide domain name resolution sites.

Scalability and Performance. Verisign, RB's selected backend registry services provider, implements its scalable SRS on a supportable infrastructure that achieves the availability requirements in Specification 10. Verisign employs the design patterns of simplicity and parallelism in both its software and systems, based on its experience that these factors contribute most significantly to scalability and reliable performance. Going counter to feature-rich development patterns, Verisign intentionally minimizes the number of lines of code between the end user and the data delivered. The result is a network of restorable components that provide rapid, accurate updates. Figure 24-2 depicts EPP traffic flows and local redundancy in Verisign's SRS provisioning architecture. As detailed in the figure, local redundancy is maintained for each layer as well as each piece of equipment. This built-in redundancy enhances operational performance while enabling the future system scaling necessary to meet additional demand created by this or future registry applications.

Besides improving scalability and reliability, local SRS redundancy enables Verisign to take down individual system components for maintenance and upgrades, with little to no performance impact. With Verisign's redundant design, Verisign can perform routine maintenance while the remainder of the system remains online and unaffected. For the .vanish gTLD registry, this flexibility minimizes unplanned downtime and provides a more consistent end-user experience.

1.2 Representative Network Diagrams

Figure 24-3 provides a summary network diagram of RB's selected backend registry services provider's (Verisign's) SRS. This configuration at both the primary and alternate-primary Verisign data centers provides a highly reliable backup capability. Data is continuously replicated between both sites to ensure failover to the alternate-primary site can be implemented expeditiously to support both planned and unplanned outages.

1.3 Number of Servers

As RB's selected provider of backend registry services, Verisign continually reviews its server deployments for all aspects of its registry service. Verisign evaluates usage based on peak performance objectives as well as current transaction volumes, which drive the quantity of servers in its implementations. Verisign's scaling is based on the following factors:

- Server configuration is based on CPU, memory, disk IO, total disk, and network throughput projections.
- Server quantity is determined through statistical modeling to fulfill overall performance objectives as defined by both the service availability and the server configuration.

- To ensure continuity of operations for the .vanish gTLD, Verisign uses a minimum of 100 dedicated servers per SRS site. These servers are virtualized to meet demand.

1.4 Description of Interconnectivity with Other Registry Systems

Figure 24-4 provides a technical overview of the RB's selected backend registry services provider's (Verisign's) SRS, showing how the SRS component fits into this larger system and interconnects with other system components.

1.5 Frequency of Synchronization Between Servers

As RB's selected provider of backend registry services, Verisign uses synchronous replication to keep the Verisign SRS continuously in sync between the two data centers. This synchronization is performed in near-real time, thereby supporting rapid failover should a failure occur or a planned maintenance outage be required.

1.6 Synchronization Scheme

Verisign uses synchronous replication to keep the Verisign SRS continuously in sync between the two data centers. Because the alternate-primary site is continuously up, and built using an identical design to the primary data center, it is classified as a "hot standby."

2 SCALABILITY AND PERFORMANCE ARE CONSISTENT WITH THE OVERALL BUSINESS APPROACH AND PLANNED SIZE OF THE REGISTRY

Verisign is an experienced backend registry provider that has developed and uses proprietary system scaling models to guide the growth of its TLD supporting infrastructure. These models direct Verisign's infrastructure scaling to include, but not be limited to, server capacity, data storage volume, and network throughput that are aligned to projected demand and usage patterns. Verisign periodically updates these models to account for the adoption of more capable and cost-effective technologies.

Verisign's scaling models are proven predictors of needed capacity and related cost. As such, they provide the means to link the projected infrastructure needs of the .vanish gTLD with necessary implementation and sustainment cost. Using the projected usage volume for the most likely scenario (defined in Question 46, Template 1 – Financial Projections: Most Likely) as an input to its scaling models, Verisign derived the necessary infrastructure required to implement and sustain this gTLD. Verisign's pricing for the backend registry services it provides to RB fully accounts for cost related to this infrastructure, which is provided as "Total Critical Registry Function Cash Outflows" (Template 1, Line IIb.G) within the Question 46 financial projections response.

3 TECHNICAL PLAN THAT IS ADEQUATELY RESOURCED IN THE PLANNED COSTS DETAILED IN THE FINANCIAL SECTION

Verisign, the RB's selected provider of backend registry services, is an experienced backend registry provider that has developed a set of proprietary resourcing models to project the number and type of personnel resources necessary to operate a TLD. Verisign routinely adjusts these staffing models to account for new tools and process innovations. These models enable

Verisign to continually right-size its staff to accommodate projected demand and meet service level agreements as well as Internet security and stability requirements. Using the projected usage volume for the most likely scenario (defined in Question 46, Template 1 – Financial Projections: Most Likely) as an input to its staffing models, Verisign derived the necessary personnel levels required for this gTLD’s **initial implementation and ongoing maintenance**. Verisign’s pricing for the backend registry services provided to RB fully accounts for this personnel-related cost, which is provided as “Total Critical Registry Function Cash Outflows” (Template 1, Line IIb.G) within the Question 46 financial projections response.

Verisign employs more than 1,040 individuals of which more than 775 comprise its technical work force. (Current statistics are publicly available in Verisign’s quarterly filings.) Drawing from this pool of **on-hand and fully committed technical resources**, Verisign has maintained DNS operational accuracy and stability 100 percent of the time for more than 13 years for .com, proving Verisign’s ability to align personnel resource growth to the scale increases of Verisign’s TLD service offerings.

Verisign projects it will use the following personnel roles, which are described in Section 5 of the response to Question 31, Technical Overview of Proposed Registry, to support SRS performance:

- **Application Engineers:** 19
- **Database Administrators:** 8
- **Database Engineers:** 3
- **Network Administrators:** 11
- **Network Architects:** 4
- **Project Managers:** 25
- **Quality Assurance Engineers:** 11
- **SRS System Administrators:** 13
- **Storage Administrators:** 4
- **Systems Architects:** 9

To implement and manage the .vanish gTLD as described in this application, Verisign, RB’s selected backend registry services provider, scales, as needed, the size of each technical area now supporting its portfolio of TLDs. Consistent with its resource modeling, Verisign periodically reviews the level of work to be performed and adjusts staff levels for each technical area.

When usage projections indicate a need for additional staff, Verisign’s internal staffing group uses an in-place staffing process to identify qualified candidates. These candidates are then interviewed by the lead of the relevant technical area. By scaling one common team across all its TLDs instead of creating a new entity to manage only this proposed gTLD, Verisign realizes significant economies of scale and ensures its TLD best practices are followed consistently. This consistent application of best practices helps ensure the security and stability of both the Internet and this proposed gTLD, as Verisign holds all contributing staff members accountable to the same procedures that guide its execution of the Internet’s largest TLDs (i.e., .com and .net). Moreover, by augmenting existing teams, Verisign affords new employees the opportunity to be mentored by existing senior staff. This mentoring minimizes start-up learning curves and helps ensure that new staff members properly execute their duties.

4 EVIDENCE OF COMPLIANCE WITH SPECIFICATION 6 AND 10 TO THE REGISTRY AGREEMENT

Section 1.2 (EPP) of Specification 6, Registry Interoperability and Continuity

Specifications. Verisign, RB's selected backend registry services provider, provides these services using its SRS, which complies fully with Specification 6, Section 1.2 of the Registry Agreement. In using its SRS to provide backend registry services, Verisign implements and complies with relevant existing RFCs (i.e., 5730, 5731, 5732, 5733, 5734, and 5910) and intends to comply with RFCs that may be published in the future by the Internet Engineering Task Force (IETF), including successor standards, modifications, or additions thereto relating to the provisioning and management of domain names that use EPP. In addition, Verisign's SRS includes a Registry Grace Period (RGP) and thus complies with RFC 3915 and its successors. Details of the Verisign SRS' compliance with RFC SRS/EPP are provided in the response to Question 25, Extensible Provisioning Protocol. Verisign does not use functionality outside the base EPP RFCs, although proprietary EPP extensions are documented in Internet-Draft format following the guidelines described in RFC 3735 within the response to Question 25. Moreover, prior to deployment, RB will provide to ICANN updated documentation of all the EPP objects and extensions supported in accordance with Specification 6, Section 1.2.

Specification 10, EPP Registry Performance Specifications. Verisign's SRS meets all EPP Registry Performance Specifications detailed in Specification 10, Section 2. Evidence of this performance can be verified by a review of the .com and .net Registry Operator's Monthly Reports, which Verisign files with ICANN. These reports detail Verisign's operational status of the .com and .net registries, which use an SRS design and approach comparable to the one proposed for the .vanish gTLD. These reports provide evidence of Verisign's ability to meet registry operation service level agreements (SLAs) comparable to those detailed in Specification 10. The reports are accessible at the following URL: <http://www.icann.org/en/tlds/monthly-reports/>.

In accordance with EPP Registry Performance Specifications detailed in Specification 10, Verisign's SRS meets the following performance attributes:

- **EPP service availability:** ≤ 864 minutes of downtime (≈98%)
- **EPP session-command round trip time (RTT):** ≤4000 milliseconds (ms), for at least 90 percent of the commands
- **EPP query-command RTT:** ≤2000 ms, for at least 90 percent of the commands
- **EPP transform-command RTT:** ≤4000 ms, for at least 90 percent of the commands