

24. Shared Registration System (SRS) Performance.

Public Interest Registry (PIR) has been successfully managing .ORG, one of the internet's original gTLDs, for over nine years. PIR uses Afilius Limited as the registry backend service provider who will also support this gTLD. Afilius has experience managing registrations for over a decade and supports comprehensive registration lifecycle services including the registration states, any modifications required with the introduction of any new ICANN policies, and the operation of a robust Shared Registration System (SRS).

Afilius operates a state-of-the-art EPP-based SRS that is secure, stable and reliable. The SRS is a critical component of registry operations that must balance the business requirements for the registry and its customers, such as numerous domain acquisition and management functions. The SRS meets or exceeds all ICANN requirements given that Afilius:

- Operates a secure, stable and reliable SRS which updates in real-time and in full compliance with Specification 6 of the new gTLD Registry Agreement;
- Is committed to continuously enhancing our SRS to meet existing and future needs;
- Currently exceeds contractual requirements and will perform in compliance with Specification 10 of the new gTLD Registry Agreement;
- Provides SRS functionality and staff, financial, and other resources to more than adequately meet the technical needs of this gTLD; and,
- Manages the SRS with a team of experienced technical professionals who can seamlessly integrate this g TLD into the Afilius registry platform and support the gTLD in a secure, stable and reliable manner.

Description of Operation of the SRS, Including Diagrams

Afilius' SRS provides the same advanced functionality as that used in the .ORG registry, as well as the fifteen other TLDs currently supported by Afilius. The Afilius registry system is standards-compliant and utilizes proven technology, ensuring global familiarity for registrars, and it is protected by our massively provisioned infrastructure that mitigates the risk of disaster.

An abbreviated list of Afilius SRS functionality includes the list below. EPP functionality is described fully in our response to Evaluation Question #25.

- Domain registration: provides registration of names in the gTLD, in both ASCII and IDN forms, to accredited registrars via EPP and a web-based administration tool.
- Domain renewal: provides services that allow registrars the ability to renew domains under sponsorship at any time. Further, the registry performs the automated renewal of all domain names at the expiration of their term, and allows registrars to rescind automatic renewals within a specified number of days after the transaction for a full refund.
- Transfer: provides efficient and automated procedures to facilitate the transfer of sponsorship of a domain name between accredited registrars. Further, the registry enables bulk transfers of domains under the provisions of the Registry-Registrar Agreement.
- RGP and restoring deleted domain registrations: provides support for the Redemption Grace Period (RGP) as needed, enabling the restoration of deleted registrations.
- Other grace periods and conformance with ICANN guidelines: provides support for other grace periods that are evolving as standard practice inside the ICANN community. In addition, the Afilius registry backend services system supports the evolving ICANN guidelines on IDNs.

Afilius also supports the basic check, delete, and modify commands.

As required for all new gTLDs, "thick" registry system functionality is provided. In this model, all key contact details for each domain are stored in the registry. This allows better access to domain data and provides uniformity in storing the information.

Afilias' SRS complies today and will continue to comply with global best practices including relevant RFCs, ICANN requirements, and the gTLD's respective domain policies. With over a decade of experience, Afilias has fully documented and tested policies and procedures, and our highly skilled team members are active participants in the major relevant technology and standards organizations, so ICANN can be assured that SRS performance and compliance are met. Full details regarding the SRS system and network architecture are provided in responses to Evaluation Questions #31 and #32.

SRS Servers and Software

All applications and databases for the gTLD will run in a virtual environment currently hosted by a cluster of servers equipped with the latest Intel Westmere multi-core processors. (It is possible that by the time this application is evaluated and systems deployed, Westmere processors may no longer be the "latest"; the Afilias policy is to use the most advanced, stable technology available at the time of deployment.) The data for the registry will be stored on storage arrays of solid state drives shared over a fast storage area network. The virtual environment allows the infrastructure to easily scale both vertically and horizontally to cater to changing demand. It also facilitates effective utilization of system resources, thus reducing energy consumption and carbon footprint.

The network firewalls, routers and switches support all applications and servers. Hardware traffic shapers are used to enforce an equitable access policy for connections coming from registrars. The registry system accommodates both IPv4 and IPv6 addresses. Hardware load balancers accelerate TLS/SSL handshaking and distribute load among a pool of application servers.

Each of the servers and network devices are equipped with redundant, hot-swappable components and multiple connections to ancillary systems. Additionally, 24x7 support agreements with a four-hour response time at all our data centers guarantee replacement of failed parts in the shortest time possible.

Examples of current system and network devices used are:

- Servers: Cisco UCS B230 blade servers
- SAN storage arrays: IBM Storwize V7000 with Solid State Drives
- SAN switches: Brocade 5100
- Firewalls: Cisco ASA 5585-X
- Load balancers: F5 Big-IP 6900
- Traffic shapers: Procera PacketLogic PL8720
- Routers: Juniper MX40 3D
- Network switches: Cisco Nexus 7010, Nexus 5548, Nexus 2232

These system components are upgraded and updated as required, and have usage and performance thresholds which trigger upgrade review points. In each data center, there is a minimum of two of each network component, a minimum of 25 servers, and a minimum of two storage arrays.

Technical components of the SRS include the following items, continually checked and upgraded as needed: SRS, WHOIS, web admin tool, DNS, DNS distributor, reporting, invoicing tools, and deferred revenue system (as needed).

All hardware is massively provisioned to ensure stability under all forecast volumes from launch through "normal" operations of average daily and peak capacities. Each and every system application, server, storage and network device is continuously monitored by the Afilias Network Operations Center for performance and availability. The data gathered is used by dynamic predictive analysis tools in real-time to raise alerts for unusual resource demands. Should any volumes exceed established thresholds, a capacity planning review is instituted that will address the need for additions well in advance of their actual need.

SRS Diagram and Interconnectivity Description

As with all core registry services, the SRS is run from a global cluster of registry system data centers, located in geographic centers with high Internet bandwidth, power, redundancy and availability. All of the registry systems will be run in a <n+1> setup, with a primary data center and a secondary data center. For detailed site information, please see our responses to Evaluation Questions #32 and #35. Registrars access the SRS in real-time using EPP.

A sample of the Afiliis SRS technical and operational capabilities (displayed in figure 24-a) include:

- Geographically diverse redundant registry systems;
- Load balancing implemented for all registry services (e.g. EPP, WHOIS, web admin) ensuring equal experience for all customers and easy horizontal scalability;
- Disaster Recovery Point objective for the registry is within one minute of the loss of the primary system;
- Detailed and tested contingency plan, in case of primary site failure; and,
- Daily reports, with secure access for confidentiality protection.

As evidenced in figure 24-a, the SRS contains several components of the registry system. The interconnectivity ensures near-real-time distribution of the data throughout the registry infrastructure, timely backups, and up-to-date billing information.

The WHOIS servers are directly connected to the registry database and provide real-time responses to queries using the most up-to-date information present in the registry.

Committed DNS-related EPP objects in the database are made available to the DNS Distributor via a dedicated set of connections. The DNS Distributor extracts committed DNS-related EPP objects in real-time and immediately inserts them into the zone for dissemination.

The Afiliis system is architected such that read-only database connections are executed on database replicas and connections to the database master (where write-access is executed) are carefully protected to ensure high availability.

This interconnectivity is monitored, as is the entire registry system, according to the plans detailed in our response to Evaluation Question #42.

Synchronization Scheme

Registry databases are synchronized both within the same data center and in the backup data center using a database application called Slony. For further details, please see the responses to Evaluation Questions #33 and #37. Slony replication of transactions from the publisher (master) database to its subscribers (replicas) works continuously to ensure the publisher and its subscribers remain synchronized. When the publisher database completes a transaction the Slony replication system ensures that each replica also processes the transaction. When there are no transactions to process, Slony “sleeps” until a transaction arrives or for one minute, whichever comes first. Slony “wakes up” each minute to confirm with the publisher that there has not been a transaction and thus ensures subscribers are synchronized and the replication time lag is minimized. The typical replication time lag between the publisher and subscribers depends on the topology of the replication cluster, specifically the location of the subscribers relative to the publisher. Subscribers located in the same data center as the publisher are typically updated within a couple of seconds, and subscribers located in a secondary data center are typically updated in less than ten seconds. This ensures real-time or near-real-time synchronization between all databases, and in the case where the secondary data center needs to be activated, it can be done with minimal disruption to registrars.

SRS SLA Performance Compliance

Public Interest Registry
Cyrillic IDN new gTLD Application
24. Shared Registration System (SRS) Performance (*Cont.*)

Afilias has a ten-year record of delivering on the demanding ICANN SLAs, and will continue to provide secure, stable and reliable service in compliance with SLA requirements as specified in the new gTLD Registry Agreement, Specification 10, as presented in figure 24-b.

The Afilias SRS currently handles over 200 million EPP transactions per month for just .INFO and .ORG. Overall the Afilias SRS manages over 700 million EPP transactions per month for all TLDs under management.

Given this robust functionality, and more than a decade of experience supporting a thick gTLD registry with a strong performance history, Afilias, on behalf of PIR, will meet or exceed the performance metrics in Specification 10 of the new gTLD Registry Agreement. The Afilias services and infrastructure are designed to scale both vertically and horizontally without any downtime to provide consistent performance as this gTLD grows. The Afilias architecture is also massively provisioned to meet seasonal demands and marketing campaigns. Afilias' experience also gives high confidence in the ability to scale and grow registry operations for the gTLD in a secure, stable and reliable manner.

SRS Resourcing Plans

Since its founding, Afilias has focused on delivering secure, stable and reliable registry services. Several essential management and staff who designed and launched the Afilias registry in 2001 and expanded the number of TLDs supported, all while maintaining strict service levels over the past decade, are still in place today. This experiential continuity will endure for the implementation and ongoing maintenance of this gTLD. Afilias operates in a matrix structure, which allows its staff to be allocated to various critical functions in both a dedicated and a shared manner. With a team of specialists and generalists, the Afilias project management methodology allows efficient and effective use of its staff in a focused way.

Over 100 Afilias team members contribute to the management of the SRS code and network that will support this gTLD. The SRS team is composed of Software Engineers, Quality Assurance Analysts, Application Administrators, System Administrators, Storage Administrators, Network Administrators, Database Administrators, and Security Analysts located at three geographically separate Afilias facilities. The systems and services set up and administered by these team members are monitored 24x7 by skilled analysts at two NOCs located in Toronto, Ontario (Canada) and Horsham, Pennsylvania (USA). In addition to these team members, Afilias also utilizes trained project management staff to maintain various calendars, work breakdown schedules, utilization and resource schedules and other tools to support the technical and management staff. It is this team who will both deploy this gTLD on the Afilias infrastructure, and maintain it. Together, the Afilias team has managed 11 registry transitions and six new TLD launches, which illustrate its ability to securely and reliably deliver regularly scheduled updates as well as a secure, stable and reliable SRS service for this gTLD.