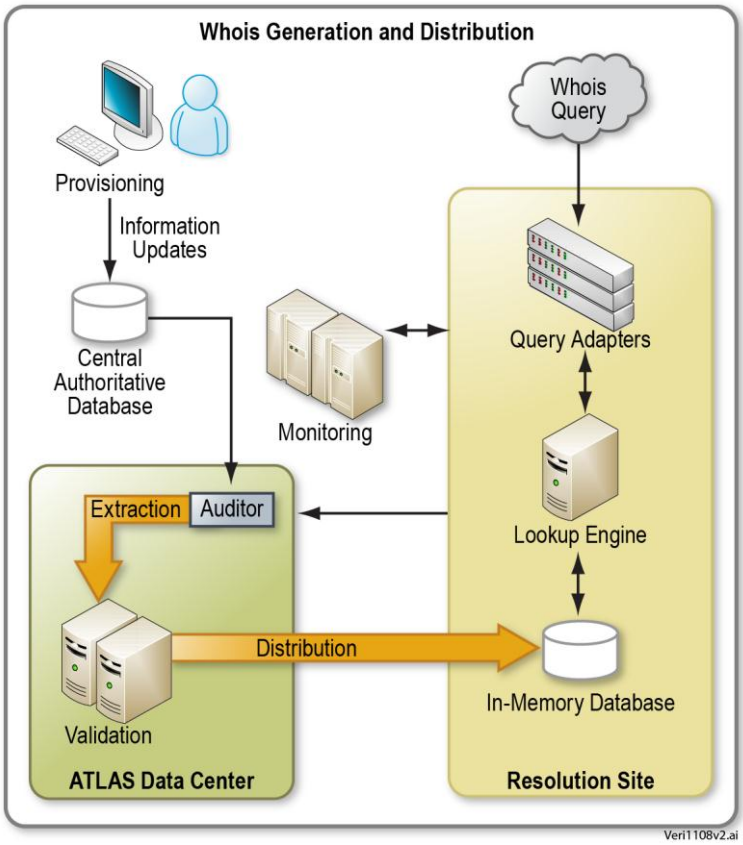

Figure 26-1: Whois Service Network Diagram. *By distributing Whois service across multiple resolution sites, Whois transactions are highly available and performed with low latency.*

Component	Implementation/Configuration
Load Balancers	• Deployed as a pair for maximum availability and resilience. • Help ensure workload is evenly distributed across all systems within the **.barefoot** gTLD resolution network.
Layer-3 Switches	• Four switches are installed in Verisign's resolution network environment: two for front-office management, and two for back-office management. • Switches provide both routing and switching for the **.barefoot** gTLD environment across the front-office network.
Terminal Servers	• Deployed as a pair of terminal servers to enable out-of-band management of all network hardware. • Used in the event that primary network access is unavailable at Verisign's primary resolution sites.
Virtual Private Networks (VPN)	• Pair of VPNs installed at each of Verisign's primary resolution sites for secure remote access to the installed systems.
Commodity Servers	Supporting Whois data processing needs, each commodity server consists of the following specifications: • Two central processing units (CPUs) • 2 – 6 gigabytes (GB) random access memory (RAM) (as dictated by the server function) • 2x73GB hard drive
Database Servers	Supporting Whois data processing needs, each database server consists of the following specifications: • 16 cores (4 x quad-core CPUs) • 64GB RAM • 5x73GB hard drive

Figure 26-2: Whois IT and Infrastructure Resources. *Verisign uses a common Whois resolution network architecture at each primary site provisioning the Whois service.*

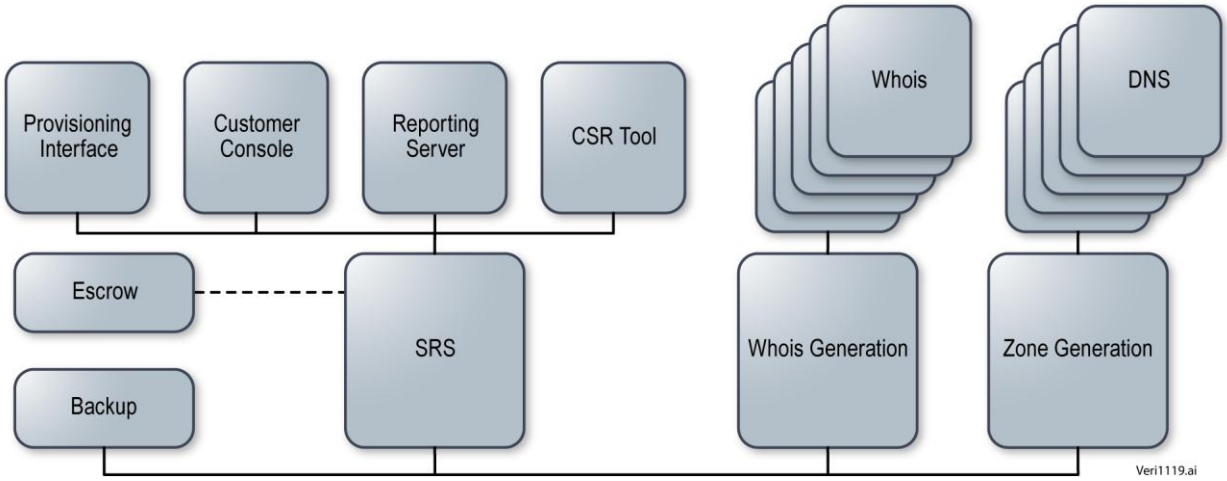

Figure 26-3: Technical Overview. *Verisign's Whois services are co-located at DNS locations.*

Domain Name Data
Query format: whois EXAMPLE.TLD
Response format:
Domain Name: EXAMPLE.TLD
Domain ID: D1234567-TLD
Whois Server: whois.example.tld
Referral URL: http://www.example.tld
Updated Date: 2009-05-29T20:13:00Z
Creation Date: 2000-10-08T00:45:00Z
Expiration Registry Expiry Date: 2010-10-08T00:44:59Z
Sponsoring Registrar: EXAMPLE REGISTRAR LLC
Sponsoring Registrar IANA ID: 5555555
Domain Status: clientDeleteProhibited
Domain Status: clientRenewProhibited
Domain Status: clientTransferProhibited
Domain Status: serverUpdateProhibited
Registrant ID: 5372808-ERL
Registrant Name: EXAMPLE REGISTRANT
Registrant Organization: EXAMPLE ORGANIZATION
Registrant Street: 123 EXAMPLE STREET
Registrant City: ANYTOWN
Registrant State/Province: AP
Registrant Postal Code: A1A1A1
Registrant Country: EX
Registrant Phone: +1.5555551212
Registrant Phone Ext: 1234
Registrant Fax: +1.5555551213
Registrant Fax Ext: 4321
Registrant Email: EMAIL@EXAMPLE.TLD
Admin ID: 5372809-ERL
Admin Name: EXAMPLE REGISTRANT ADMINISTRATIVE
Admin Organization: EXAMPLE REGISTRANT ORGANIZATION
Admin Street: 123 EXAMPLE STREET
Admin City: ANYTOWN
Admin State/Province: AP
Admin Postal Code: A1A1A1
Admin Country: EX
Admin Phone: +1.5555551212
Admin Phone Ext: 1234
Admin Fax: +1.5555551213
Admin Fax Ext: 4321
Admin Email: EMAIL@EXAMPLE.TLD
Tech ID: 5372811-ERL
Tech Name: EXAMPLE REGISTRAR TECHNICAL
Tech Organization: EXAMPLE REGISTRAR LLC
Tech Street: 123 EXAMPLE STREET
Tech City: ANYTOWN
Tech State/Province: AP
Tech Postal Code: A1A1A1
Tech Country: EX
Tech Phone: +1.1235551234
Tech Phone Ext: 1234
Tech Fax: +1.5555551213
Tech Fax Ext: 93

Tech Email: EMAIL@EXAMPLE.TLD
Name Server: NS01.EXAMPLEREGISTRAR.TLD
Name Server: NS02.EXAMPLEREGISTRAR.TLD
DNSSEC: signedDelegation
DNSSEC: unsigned
>>> Last update of Whois database: 2009-05-29T20:15:00Z <<<

Figure 26-4: Domain Name Data Object

Registrar Data

Query format: whois "registrar Example Registrar, Inc."
Response format:
Registrar Name: Example Registrar, Inc.
Street: 1234 Admiralty Way
City: Marina del Rey
State/Province: CA
Postal Code: 90292
Country: USA
Phone Number: +1.3105551212
Fax Number: +1.3105551213
Email: registrar@example.tld
Whois Server: whois.example-registrar.tld
Referral URL: http://www. example-registrar.tld
Admin Contact: Joe Registrar
Phone Number: +1.3105551213
Fax Number: +1.3105551213
Email: joeregistrar@example-registrar.tld
Admin Contact: Jane Registrar
Phone Number: +1.3105551214
Fax Number: +1.3105551213
Email: janeregistrar@example-registrar.tld
Technical Contact: John Tech
Phone Number: +1.3105551215
Fax Number: +1.3105551216
Email: johntech@example-registrar.tld
>>> Last update of Whois database: 2009-05-29T20:15:00Z <<<

Figure 26-5: Registrar Data Object

Name Server Data
Query format: whois "NS1.EXAMPLE.TLD" or whois "name server (IP address)"
Response format:
Server Name: NS1.EXAMPLE.TLD
IP Address: 192.0.2.123
IP Address: 2001:0DB8::1
Registrar: Example Registrar, Inc.
Whois Server: whois.example-registrar.tld
Referral URL: http://www.example-registrar.tld
>>> Last update of Whois database: 2009-05-29T20:15:00Z <<<

Figure 26-6: Name Server Data Object

Potential Abusive Searchable Whois Risks	Verisign Risk Mitigation
Single Source Data Mining The mining of Whois data from a single IP address conducted through manual queries	Access Control Lists (ACL): Implementation of an ACL at the network layer to block the offending IP address for a specified period of time; viable option given a single unique IP address Application Rate Limiting: Implementation of rate-limiting at the application layer to regulate the number of queries allowed from the source IP address for a specified period of time; viable option given a single unique IP address
Automated Data Mining Single Source: The mining of Whois data from a single IP address conducted through the use of automated scripts Distributed: The mining of Whois data from multiple sources/IP addresses conducted through the use of automated scripts, or, "botnets"	ACL and Application Rate Limiting as defined for single source data mining Packet Inspection: Implementation of tools that analyze the incoming "get" request to determine whether the source is a valid user or whether the request is coming from an automated script or botnet; viable option based on "get" request signature Completely Automated Public Turing Test To Tell Computers And Humans Apart (CAPTCHA) Techniques: Implementation of a challenge-response test prior to processing the request; viable option that limits ability to predict challenge-response; almost always requires manual interaction

Figure 26-7: Potential Searchable Whois Forms of Abuse and Mitigation. *Verisign leverages its experience supporting the .name registry to build in to the system the safeguards necessary to minimize abusive Whois practices.*