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

**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
<table>
<thead>
<tr>
<th>Potential Abusive Searchable Whois Risks</th>
<th>Verisign Risk Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Source Data Mining</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td>Automated Data Mining</td>
<td>ACL and Application Rate Limiting as defined for single source data mining</td>
</tr>
<tr>
<td>Single Source: The mining of Whois data from a single IP address conducted through the use of automated scripts</td>
<td>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</td>
</tr>
<tr>
<td>Distributed: The mining of Whois data from multiple sources/IP addresses conducted through the use of automated scripts, or, “botnets”</td>
<td>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</td>
</tr>
</tbody>
</table>

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.