Site Finder Review

SECSAC Meeting
October 15, 2003

Welcome

▶ **Welcome**

▶ **Agenda**

VeriSign Site Finder Pre-Launch Activities	Anthony Renzette
Technical Review Panel Summary	Scott Hollenbeck
Review of Technical Issues and VeriSign Response	Matt Larson
Usability Market Research	Ben Turner
Next Steps/Concluding Remarks	Rusty Lewis

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VeriSign Site Finder Pre-Launch Activities

Anthony Renzette
Director of Product Development

Site Finder Pre-Launch Activities – Overview

▶ **Concept Evolution**

  – Concept development

  – Concept testing research

▶ **Product Testing**

  – Baseline Assumption

  – 3rd Party Testing

  – Controlled Live Test

▶ **Product Development & Testing**

  – Development testing & process

  – Post-launch analysis

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Site Finder Concept Evolution

▶ **Research of domain name holders (October 2002)**

– Objective: To assess needs of consumers and SOHOs in Europe and USA.

– Methodology:

▶ 1,387 random online interviews across representative demographic and user profiles (Confidence Interval: 95%, +/-3%)

▶ Currently registered/recently registered domain name; primary or co-equal decision-maker for domain names

▶ Purpose of research: to determine user buying behavior and preferences when purchasing domain names and related products

– Results: 'Current Pains' question to yield free-form/unprompted responses:

▶ Top concerns included "new ways to find URLs you are attempting to find" (spell correction on the web)

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Site Finder Concept Testing

▶ **Two concept tests conducted:**

– Objective: Understand customer needs identified in earlier research

– Methodology:

  ▶ 955 interviews; weighted to 15% highly savvy Internet users

  ▶ High level of awareness on traditional error response page

– Initial concept testing – December 2002

  ▶ 2/3 of users rated ability to initiate search (67%) and links to related/relevant sites (65%) as highly useful on an error response help page

– Secondary concept testing – January 2003

  ▶ Higher preference towards search (70%) and links to related sites (68%) capabilities than previously received

▶ **Results: Final Site Finder Service included features determined by end-user interviews/research**

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Site Finder Concept Maturation

Solution to meet the end user need:

▶ **Drivers:**
  – Meet end user demand to improve web browsing experience
  – Service must be standards compliant
  – Service must be scalable
  – Service must maintain stability and security of internet

▶ **Existing registry wildcard solutions**
  – VeriSign operating .tv and .cc registries with wildcard A records for many years
  – VeriSign implemented synthesized records for IDN (endorsed by SECSAC)
  – Other registries known to have wildcards include: .bz, .cn, .cx, .io, . mp, .museum, .nu, .ph, .pw, .td, .tk, .tw, .va, .ws

▶ **Developed wildcard guidelines & shared concept with technical community**

▶ **Site Finder originated from combination of "spell correction" concept + wildcard experience from other registries and IDNs**

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Site Finder Development Research – Baseline

▶ **Objective: Estimate volume & types of traffic**

▶ **Methodology:**

– Traffic profile created by collecting live DNS data

▶ 30 random samples per day over 7 days

▶ 3,000 +/- responses per sample

▶ Ranged across entire .com/.net DNS

▶ Total of 16,825,974 responses collected

– External statistician used certified sampling methodology and analysis

▶ Margin of error: +/- 5% at 95% confidence level

▶ **Results:**

– Provided a detailed view of DNS traffic

▶ Of the approximately 300B monthly DNS requests, approximately 600M monthly Name Error responses resulting from web browsers

– Provided insight into types of requests

– Pre-launch analysis closely matches data received during Site Finder operation

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Site Finder Development Research – 3rd Party Testing

▶ **Objective:** Identify and analyze protocols and implementations affected by DNS A record wildcards

▶ **Methodology:** Utilized external test group to evaluate effects of a wildcard response to requests for nonexistent domains on various applications

  – 13 categories (i.e. file transfer, email…)

  – 37 different protocols (i.e. smtp, pop, ftp…)

  – 53 implementations of protocols (i.e. MS Outlook, Sendmail…)

▶ **Results:** Testing and analysis produced recommended course of actions which we followed in Site Finder deployment:

  – User experience should be optimized for email – recommended implementing a stub server

  – Recommended implementing a "TCP Reset Option"

    ▶ Requests to non-HTTP or SMTP traffic responded as:

      ▶ TCP – connection refused

      ▶ UDP – ICMP port unreachable

▶ **3rd Party Conclusion:** User experience would not change dramatically given this implementation

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Site Finder Development Research –
Controlled Live Test

▶ **Objective: Test DNS traffic types, volumes and sources; identify anomalies as applicable**

▶ **Methodology**

– 61,465 wildcard responses given out across three tests

  ▶ I.e., A records instead of Name Error

– 194,491 "hits" at the Response Server over 12 minutes of testing

  ▶ "Hit" is defined as a single TCP SYN packet or UDP packet

  ▶ That's four minutes of analysis for each of three tests

    ▶ Three minutes when wildcard was active plus…

    ▶ One additional minute to watch "decay" because of the A record's TTL

– That's a ratio of 3.16 Response Server hits per wildcard response

  ▶ Ratio was 5.5 for first controlled test

▶ **Results: Validated earlier research regarding protocol analysis & confirmed assumptions regarding sizing & capacity requirements**

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Site Finder Development Research – Co-operative External Testing

▶ **Objective: Identify responses of production systems to Site Finder solution**

▶ **Methodology:**
  – Worked with diverse range of companies via external survey/review process:
    ▶ over 600 companies contacted: 55 companies briefed (all under NDA) - 35 participated in testing:
      ▶ Cross-section of representative industries – health care, telecomm, web crawlers, financial, transportation, software, etc.
  – Companies that conducted testing
    ▶ QA and production applications against DNS server configured for wildcard response
    ▶ Tested a subset of protocols (HTTP, HTTPS, SSH, FTP, SMTP, DNS, VPN, and custom applications)
    ▶ Tested key applications (some applications intentionally mis-configured with non-existent domains)

▶ **Results: No issues reported by testing companies**

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Site Finder Product Development

▶ **Development of external documentation**

– DNS Wildcards white paper

– VeriSign Site Finder Implementation Guide

– VeriSign Site Finder Application Developers Guide

– All documents and additional FAQs available online:

  ▶ **http://www.verisign.com/nds/naming/sitefinder/**

▶ **Service testing & process review**

– Combination of internal and external resources

  ▶ External party assisted in testing

  ▶ External review of processes/procedures to ensure completeness

▶ **Ongoing monitoring program**

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VeriSign Site Finder
Technical Review Panel Summary

Scott Hollenbeck
Director of Technology

Overview

▶ **Purpose**

▶ **Panel Details**

▶ **Summary of Findings**

▶ **Issues Analysis**

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Purpose of the Technical Review Panel

▶ **STAGE 1:** Solicit and gather technical information and data regarding the implementation of the Site Finder service from interested parties.

▶ **STAGE 2:** Distill the received information and data to implementation issues.

▶ **STAGE 3:** Based on the implementation issues, determine which issues are based on fact concerning the service.

▶ **STAGE 4:** For each issue associated with the service, determine the likelihood of the issue arising for Internet users, and the consequences of each issue for Internet users.

▶ **STAGE 5:** Based on the resulting factual analysis of the issues, determine what enhancements could be made to improve the service.

▶ **STAGE 6:** Report the observed implementation issues to VeriSign along with any data supporting such issues.

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Panel Details

▶ **Industry Experts**

 – Bruce Tonkin (chair), CTO, Melbourne IT

 – Ken Schneider, CTO and VP of Operations, Brightmail

 – George Sherman, CTO, Morgan Stanley

 – Keith Teare, Chairman, President and CEO, Santa Cruz Networks

 – Three other members who wish to remain nameless

▶ **VeriSign Engineers**

 – Leslie Daigle, Scott Hollenbeck, Mark Kosters, Matt Larson

 – Role: listen and answer questions

Panel Methodology

▶ **Methodology**

- Looked at Site Finder from three different angles:

  ▶ Reported Issues

  ▶ Protocol Analysis

  ▶ Use Case Analysis

▶ **Considered issues identified by the IAB and issues reported in other forums (NANOG, Slashdot, online press, etc.)**
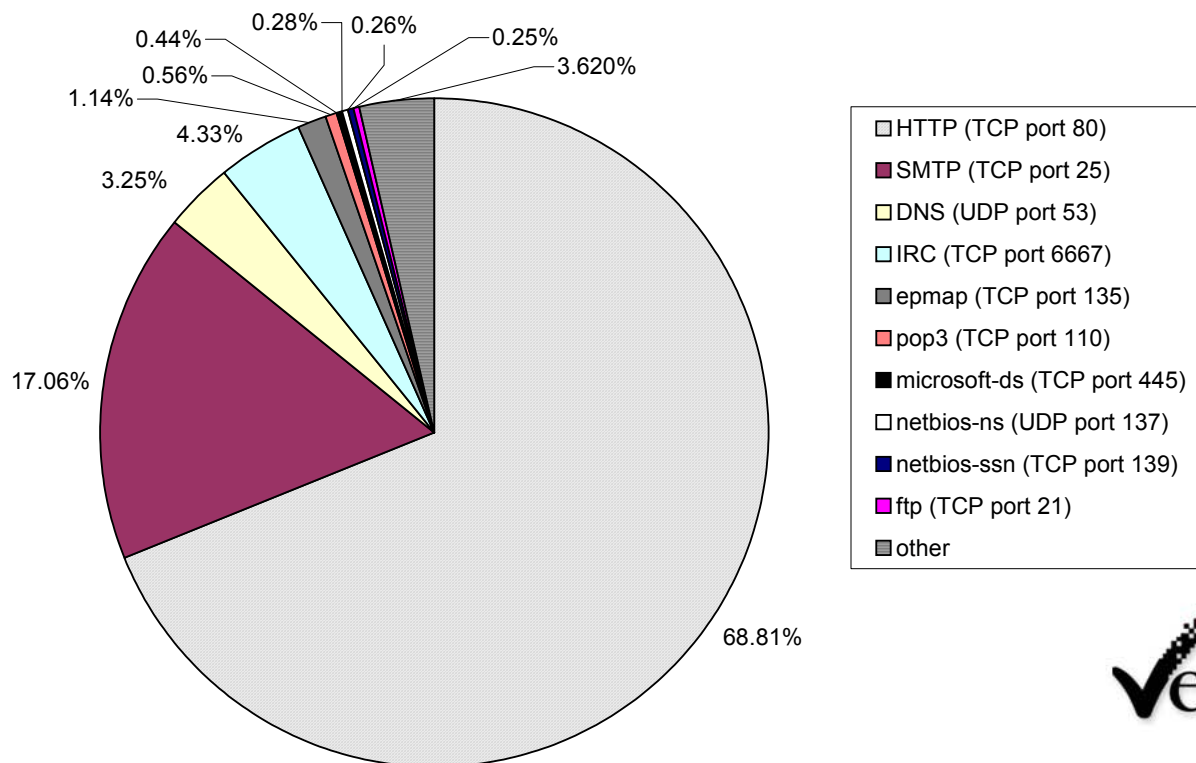
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Issues Analysis

▶ **Issues more likely to occur with at least moderate impact & how addressed:**

– English-only web page
  ▶ can be addressed by service operator

– End-user error reporting
  ▶ software update required

– Spam filtering
  ▶ filter update required

– Automated HTTP tools
  ▶ software update required

– Resolvers with non-DNS fallback
  ▶ software update required

– Using DNS to check domain availability for registration purposes
  ▶ software update required

– Email delivery
  ▶ most issues can be addressed by service operator

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Protocol Analysis

▶ **Panel looked specifically at top 10 protocols (by number of connections attempts)**

– HTTP response considered an improvement for some users

– Other Protocols: Impact is typically a different error and/or slight delay when compared to the pre-Site Finder experience

– Most significant issue: TCP & UDP errors aren't consistently treated the same way as a DNS error

Pie chart with the following values and legend:

0.44%, 0.28%, 0.26%, 0.25%, 3.620%, 0.56%, 1.14%, 4.33%, 3.25%, 17.06%, 68.81%

Legend:
- HTTP (TCP port 80)
- SMTP (TCP port 25)
- DNS (UDP port 53)
- IRC (TCP port 6667)
- epmap (TCP port 135)
- pop3 (TCP port 110)
- microsoft-ds (TCP port 445)
- netbios-ns (UDP port 137)
- netbios-ssn (TCP port 139)
- ftp (TCP port 21)
- other

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Summary of TRP Findings

▶ **No catastrophic problems**

▶ **No identified security or stability problems**

▶ **Stressed desirability of providing time to adapt and educate for issues that can't be addressed by the TLD operator**

▶ **Most issues deemed minor or inconvenient**

▶ **Some moderate (requiring software change that can't be addressed by TLD operator) issues**

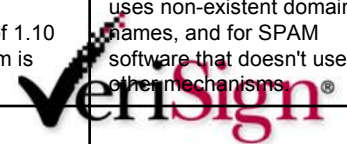VeriSign®

TRP Work Product - VeriSign Takeaways

Protocol	User Experience Before Site Finder	User Experience with Site Finder	Judgment of Change	Suggested Remedy if Applicable
HTTP (TCP port 80)	Error message and/or search page from some source	Error message with search suggestions from Site Finder	Improvement for some users	Provide web page in multiple languages.
SMTP (TCP port 25)	Mail with an invalid recipient address is rejected with a "Name error" from DNS presented to user through their application.	Mail with an invalid recipient address is bounced with an SMTP 550 error code presented to user through their application.	Users may notice a delay compared to previous behaviour	Distribute SMTP responders widely across the network to reduce user delays. Consider wildcard MX record to a non-existent host to address other delivery issues.
DNS (UDP port 53)	"Name error" from DNS presented to user through their application.	ICMP port unreachable error message presented to user through their application.	Users may notice a delay compared to previous behaviour	
IRC (TCP port 6667)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.	Users may notice a delay compared to previous behaviour	
epmap (TCP port 135)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.	Users may notice a delay compared to previous behaviour	
pop3 (TCP port 110)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.	Users may notice a delay compared to previous behaviour	
microsoft-ds (TCP port 445)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.	Users may notice a delay compared to previous behaviour	
netbios-ns (UDP port 137)	"Name error" from DNS presented to user through their application.	ICMP port unreachable error message presented to user through their application.	Users may notice a delay compared to previous behaviour	
netbios-ssn (TCP port 139)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.		
ftp (TCP port 21)	"Name error" from DNS presented to user through their application.	TCP reset error presented to user through their user interface.	Users may notice a delay compared to previous behaviour	

TRP Work Product - VeriSign Takeaways

Application Use Case	User Experience Before Site Finder	User Experience with Site Finder	Judgment of Change	Suggested Remedy if Applicable
Mistyped domain name in browser	Error message and/or search page from some source	Error message with search suggestions from Site Finder	Improvement for some users	End user software likely to eventually provide users with configuration options for wildcard entries.
Mistyped domain name in email address	Mail with an invalid recipient address is rejected with a "Name error" from DNS presented to user through their application.	Mail with an invalid recipient address is bounced with an SMTP 550 error code presented to user through their application.	Users may notice a delay compared to previous behaviour	Provide sufficient points of presence and performance for the SMTP responder service.
Misconfigured outgoing SMTP proxy	Error message from Mail User Agent.	Mail is bounced with an SMTP 550 error code describing a potentially valid recipient address.	A change in expected behaviour. Note all mail will bounce in this configuration which would alert the technical user.	User education
Misconfigured MX records	MX search would either find a valid, lower priority MX record or mail would queue for redelivery. Misconfuration would not be obvious.	Mail with an invalid recipient address is bounced with an SMTP 550 error code presented to user through their application.	A change in expected behaviour. Note all mail bounce intermittently in this configuration which would alert the technical user.	User education
Mistyped domain name in multiple command-line applications (ftp, telnet, etc.)	"host not found" error message.	Different error message (TCP reset or ICMP port unreachable) or timeout depending on the application and the user interface	A change in expected behaviour.	User education
Spam filter using domain name existence check	Mail from a sender with a non-existent domain could be flagged as spam. Other filters (including IP address filters) available.	Non-existence check fails because DNS now returns wildcard A record. Filter update needed.	A change in expected behaviour.	Will require software update to affected spam filters.
Automated web crawlers and link checkers attempt to resolve a non-existent domain name.	DNS "name error" when attempting to resolve a domain name that's not in the .com and .net zones. Robot took some action based on the error response.	Site Finder provides robots.txt to direct robots to not index or crawl the Site Finder site. Crawlers that ignore directive can index Site Finder content.	A change in expected behaviour. Effects will depend on application software.	Will require software update to affected software.
Use of DNS to determine if a domain name is available for registration	DNS returned "name error" for a name not in the zone (including names on hold) and success for a name in the zone. Other methods (whois, SRS) available.	DNS now returns wildcard "A" record, making checkers that only look for a successful answer think the domain name is unavailable. Other name checking methods (whois, SRS) still work as always.	A change in expected behaviour. Effects will depend on application software.	Will require software update to affected software.

TRP Work Product - VeriSign Takeaways

Issue	Behavior Before Site Finder	Behavior After Site Finder	Likelihood	Consequence
English-only web page	Error page, dialog box, or search page, usually in local language	Site Finder page in English (currently)	Almost Certain	Moderate for non-english speaking users
Web server scaling	N/A	Applications attempt to contact Site Finder.	Moderate	Minor - will be increased delay to time out
Email: non-existent domain in recipient address	Error (DNS) message to user	Different error (SMTP) message to user	Likely	Minor - May be noticeable delay in response
Email: Invalid MX record	Error message or silent roll to a valid MX	Application encounters MX with invalid domain and contacts Site Finder; message rejected with no message data exchanged	Unlikely	Minor - easily corrected once detected
Email: Invalid outgoing SMTP proxy	Error (DNS) message to user	Different (SMTP) error message to user, reported as invalid recipient	Rare	Minor - easily corrected once detected
End-user error reporting	Error message to user	Different error message to user	Likely	Minor-moderate depending on application. Application software will need updating.
Spam Filtering	Some spam filters used DNS "name error" to identify non-existent domains	DNS now returns wildcard "A" record	Unlikely (3% of spam by VeriSign's research). Also usually other SPAM detection mechanisms will also be in effect. Per Ken: The latest SpamAssassin 2.6 numbers are as follows for NO_DNS_FOR_FROM - non existant domains in the From: are represented in the following % of the corpus (the corpus overall is 70% spam / 30% legit): 3.284% of the overall corpus 4.6362% of spam messages 0.2115% of legit messages which leads to an assigned weight of 1.10 (where the default threshold for spam is 5.0)	Moderate for SPAM that uses non-existent domain names, and for SPAM software that doesn't use other mechanisms.
Defunct Spam RBLs	DNS returned "name error" on query for defunct RBL name and application reported error	DNS now returns wildcard "A" record and client using the defunct RBL will see all mail blocked as spam.	Unlikely	

TRP Work Product - VeriSign Takeaways

Issue	Behavior Before Site Finder	Behavior After Site Finder	Likelihood	Consequence
Interactions with Other Protocols	DNS returned "name error" on query and application reported error.	DNS now returns wildcard "A" record. Site Finder returns TCP or UDP error.	Likely	Minor - probably most protocols will experience a delay but a user will still get an error condition.
Automated HTTP Tools	DNS returned "name error" on query.	DNS now returns wildcard "A" record. Site Finder provides robots.txt. Tools might disobey robots.txt.	Moderate	Minor-moderate depending on application. Application software will need updating.
HTTP Requests not on port 80	DNS returned "name error" on query.	DNS now returns wildcard "A" record. Site Finder returns TCP error.	Unlikely	Minor-moderate depending on application. Application software will need updating.
Volume-Based Service Charging	DNS returned "name error" on query. Possible search page from another source, such as Microsoft.	Site Finder page	Unlikely	Moderate depending on application - especially mobile data applications.
Single Point of Failure	Single point of failure in name server constellation.	Additional point of failure in response server constellation.	Unlikely	Major for email applications, minor for http
Privacy	Personal information not visible to TLD operator	Email addresses and URL information potentially visible to TLD operator	Dependent on registry operator privacy policy.	Dependent on registry operator privacy policy and level of trust of registry operator. Major for some users.
Reserved Names and Names on "Hold"	DNS returned "name error" on query.	Names match DNS wildcard because they're not in the zone	Likely	Moderate for domainname registration applications, minor for most end users.
DNS Domain Search Lists	DNS returned "name error" on query and search would continue through other names on the search list.	Non-existent names on the search list match DNS wildcard and search terminates.	Unlikely	Minor-moderate depending on application. Application software will need updating.
Resolvers with non-DNS fallback methods	If DNS query failed, resolver could also search NIS, hosts file, NetBIOS, etc.	DNS search either succeeds or matches wildcard.	Almost certain	Minor-moderate depending on application. Application software will need updating.
NIC Addresses Set By Hostname	Unknown	Host is assigned IP address of response server	Rare	Minor - easily corrected once detected

Likelihood of the problem occurring:

Rare, unlikely, moderate, likely, almost certain

Consequence of the problem occurring (from the user's perspective):

Insignificant, minor, moderate, major, catastrophic

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Review of Technical Issues and VeriSign Response

Matt Larson
Principal Engineer

Overview

▶ **The most significant issues, in the TRP's opinion, are discussed in this presentation**

▶ **For each issue:**

 – Identify issue

 – Present applicable data

 – Provide response

Issues

▶ **English-only Web page**

▶ **End-user error reporting**

▶ **Spam filtering**

▶ **Automated HTTP tools**

▶ **Resolvers with non-DNS fallback**

▶ **Using DNS to check domain availability for registration purposes**

▶ **Email delivery**

English-only Web Page

▶ **Issue: Site Finder response page is available only in English**

  – But browser error page is potentially localized

▶ **Response: VeriSign has always planned to introduce a localized version of Site Finder**

  – Future releases will include support for German, Japanese, Spanish, French, Chinese and others

  – HTTP Accept-Language header will determine displayed language

  – Users will also be able to change language once the page displays

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End-user Error Reporting

▶ **Issue: Application behavior in the case of failure changes**

– A user interface issue: the application still fails, but potentially with a different error message to the user

▶ E.g., "connection refused" instead of "host not found"

– To put this in context: no change in application behavior for existent domain names

▶ **Response:**

– Existing applications: a failure is still a failure

▶ Potentially increased user confusion and difficulty troubleshooting

– Future applications: applications could check for a wildcard A record, detect synthesized data in a response and take appropriate action and display an appropriate message

– One possibility: DNS protocol change to indicate synthesized responses

– This does not impact security or stability on the Internet.

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Spam Filtering

▶ **Issue: Spam filtering based on domain name existence checks was affected**

– Our analysis and reports from third parties indicate this issue is more complicated and perhaps less significant than has sometimes been reported

▶ **Response: The reality is using domain existence to identify spam is:**

– Slow and resource-intensive

– Not the obvious and straight-forward test that it might appear to be

– Not effective against a large percentage of spam

– Ideally one test of many in a total anti-spam solution

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Spam Filtering: Analysis

▶ **VeriSign Analysis: Only 3% of messages in a large corpus of all spam contained a nonexistent domain name in the From header**

    – Conducted via NS query against .com/.net servers

▶ **SpamAssassin 2.6 numbers:**

    – Checking for nonexistent domains in From header in a large corpus (70% spam/30% legitimate) of mail:

        ▶ 3.284% of the overall corpus

        ▶ 4.6362% of spam in the corpus

        ▶ 0.2115% of legitimate messages in the corpus

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Spam Filtering: Analysis con't

► **Domain existence checking for spam filtering is subtle**

  – There are no standards and implementations vary

► **gethostbyname() is not intended for this purpose**

  – Only queries for A (or AAAA) records

  – Many spam filter checks use this method and do not differentiate between RCODE 3 ("Name Error") and RCODE 0 without data ("No data")

  – We found 14% difference on a spam corpus between directed NS query for .com/.net and gethostbyname()

  – This method could lead to false positives, e.g., a domain name with MX records but no A records

► **MTAs and anti-spam software have started issuing patches that allow domain existence checks in the presence of a .com/.net wildcard A record**

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Automated HTTP Tools

▶ **Issue: Automated processes using HTTP over TCP port 80 may exhibit problems when encountering the Site Finder page instead of a DNS Name Error response**

▶ **Response: No reported occurrences**

  – The site includes a robots.txt file to prevent indexing

  – Other types of automated tools are discouraged according to BCP 56

Resolvers With Non-DNS Fallback

▶ **Issue: Name resolution processes that continue with other methods (NetBIOS, hosts file, etc.) if DNS fails**

▶ **Response: Sometimes a workaround is available**

　　▶ E.g., change the resolver's configuration to try DNS last

– We are aware of configurations using an intentionally nonexistent .com/.net domain name to force resolution to the next method

– Building a configuration that relies on the nonexistence of a domain name that could potentially become existent, e.g., through registration, is unwise

– RFC 2606 defines example TLDs and sample .com and .net domain names that can be safely used for this purpose

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DNS for Domain Name Availability Checking

▶ **Issue: Applications using a DNS A record query to check for domain name availability do not function as prior to the wildcard A record**

▶ **Response: Reserved names, names on hold and domain names without name servers have never been present in the .com and .net zones**

   – Therefore, using DNS for this purpose is not recommended

   – Registrars should use RRP; the public can use Whois

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Email

▶ **Three email issues:**

– Delivery to nonexistent .com or .net domains now requires additional processing to contact the SMTP bounce server

– Misconfigured MX records with nonexistent .com or .net target domain names interact with the SMTP bounce server to cause hard (i.e., permanent) failures where previously there were soft (i.e., transient) failures

– MUAs with misconfigured SMTP servers for outgoing mail attempt to submit mail to the bounce server, which is rejected with a potentially confusing "domain name does not exist" error

Under Consideration

▶ **VeriSign is considering a change in email behavior to address all these issues:**

– The addition of a wildcard MX record with a nonexistent target domain name to the .com and .net zones, e.g.:
  `*.com.    in    mx    10 domain-name-does-not-exist.com.`

– The cessation of the SMTP bounce server

  ▶ Connections to TCP port 25 would be reset

Delivery to Nonexistent .com/.net Domains

▶ **RFC 2821-compliant servers query for MX records, receive the synthesized response, and "report an error" when the single MX record is unusable because of the nonexistent target**

– Recent versions of Sendmail, Exim, Courier, qmail and Exchange treat this condition as a hard failure and bounce the message immediately back to the sender

– Postfix treats this condition as a soft failure and requeues the message

▶ **This moves the processing back to the SMTP client and eliminates any dependency on the SMTP bounce server**

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Misconfigured MX Records

▶ **An analysis of .com/.net MX records shows few domains with this misconfiguration:**

  – MX leading to known unroutable addresses: 6.135%

  – MX with IP address as target: 1.5%

  – MX with non-existent target: 0.077%

▶ **With the elimination of the bounce server, misconfigured MX records once again become unusable**

▶ **The target matches the .com/.net wildcard A record, but SMTP connections to this IP are reset**

  – Recall that the SMTP bounce server would be discontinued

▶ **Presumption: MTAs react more favorably in this situation to a reset connection than an SMTP 554 response**

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Misconfigured Outgoing SMTP Server

▶ With the elimination of the bounce servers, MUAs can no longer submit mail to it and receive a misleading error message

▶ Presumption: MUAs react more favorably in this situation to a reset connection than an SMTP 554 response

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Usability Market Research

Ben Turner
VP, Naming Services

Research Conducted

Research	Details	Dates	Vendor
End-User Research: US	On-Line Surveys to random 1,027 who had viewed the Site Finder Page. Margin of error +/- 3%	September 26 – September 30	Markitecture
End-User Research: US	On-line survey to random 1,000 internet users. Margin of error +/- 5%	Oct. 2 – Oct. 4	Customer Strategies
End-User Research: UK, Germany China	On-line survey to random 300 end-users in each market who had viewed the Site Finder Page (in each country) Margin of error +/- 3%	September 29 – October 12	Markitecture

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User Feedback: Site Finder Page vs. Error Page — End-users prefer Site Finder page

	Total Users US	Total Users UK	Total Users Germany	Total Users China
	%	%	%	%
Strongly Prefer/Somewhat Prefer	**84**	**81**	**61**	**76**
Strongly Prefer Site Finder Page	38	34	29	32
Somewhat Prefer Site Finder Page	46	47	32	44
Somewhat Prefer Error Page	11	13	24	14
Strongly Prefer Error Page	5	6	15	10

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User Feedback: 76% of Internet users rate the page excellent/very good/good

	Total Users	Used Search Box	Used Web Suggestions	Used Popular Categories
	%	%	%	%
Excellent/Very Good/Good	**76**	**34**	**38**	**45**
Excellent	5	5	7	7
Very Good	28	29	32	38
Good	43	42	41	39
Fair	20	20	18	13
Poor	4	4	3	3

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User Feedback: Ratings of Site Finder Page – over 60% found Site Finder easy, convenient & useful

	Total Users	Site Finder Options			Internet Usage	
		Used Search Box	Used Web Suggestions	Used Popular Categories	Light Internet User	Heavy Internet User
	%	%	%	%	%	%
Easy	65	67	70	72	59	67
Convenient	63	64	69	69	59	65
Useful	62	62	69	66	56	64
Able to find what I was looking for	61	58	67	69	58	62

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User Feedback: Makes Using the Internet Better – over 50% say it improves while only 3% says not at all.

	Total Users	Used Search Box	Used Web Suggestions	Used Popular Categories
	%	%	%	%
Extremely/Very Well	53	53	57	65
Does Describe Extremely Well	13	13	15	18
Does Describe Very Well	40	40	42	46
Does Describe Somewhat	35	34	32	27
Does Not Describe Well	9	11	9	6
Does Not Describe at All	3	2	2	3

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Testimonial & Verbatim

As a heavy but non-technical computer user it has been extremely frustrating for me to encounter 404 errors. Naturally, they happen at the busiest times. Many of us have become dependent on computers and expect all functions to work at a highly consistent level. Alternative suggestions instead of a project-stopping 404 is a welcome and functional improvement to my use of the Web and related searches. It is difficult for me to see a downside to this user friendly enhancement. Roy Lahet, VP Mercy Behavioral Health

"I feel that this is a good feature. Many times in my haste to get information, I make typos. Having the Site Finder service saves a lot of retyping. I especially like the The "Did You Mean?" tool."

"It's OK. It'll be better if given the descriptions of the suggested sites."

The page design is clean and easy to comprehend. It has strong functionality. I believe it helps many people find what they're looking for.

It is very helpful not to have to completely re-type or correct a misspelling of a URL. It also helps find other sites that I might be interested in so very helpful.

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Next Steps/Concluding Remarks

Rusty Lewis
EVP General Manager
Naming & Directory Services

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Next Steps/Concluding Remarks

▶ **Before re-launching the service, we have several specific actions we are considering and we welcome further input**

- 1st, we believe advance notice is appropriate and we would plan to give the community 30-60 days notice before re-launching the service
- 2nd, we think the addition of a wildcard mx record addresses many of the email configuration issues and privacy concerns
- 3rd, we believe localizing the service for the international community is an enhancement worth pursuing and one which we had in our product plans
- Finally, we will be updating our white paper on the proper implementation of wildcards and will be soliciting feedback over the next few weeks

▶ **We also believe it is important to sort out how standards compliant services like Site Finder can be launched**

- What is the point of standards and best practices if the community favors those who choose to ignore the standards at the expense of those who follow the rules

▶ **Finally we believe encouraging innovation at the core is as important as innovation at the edge**

- If innovation at the core is not encouraged, it will result in less investment and R&D into network infrastructure and ultimately a weaker Internet
- This is a problem that should concern us all

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