
General Information Paper: Internationalized Domain Name Resolution

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Version 2.0



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Technical White Paper: Internationalized Domain Name Registration Testbed Deployment
Version 2.0

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1 Introduction

The Internationalized Domain Name (IDN) Testbed developed by VeriSign Global Registry Services (VeriSign GRS) is in Stage 3: Internationalized Domain Name Resolution. This paper is a general discussion of the resolution stage, and is part of a continuing effort by VeriSign GRS to share with all interested parties the plans for and progress of the Internationalized Domain Name Testbed.

This paper is not a technical discussion of Internationalized Domain Name Resolution. For a more detailed and technical analysis of the resolution stage, please refer to the “Technical White Paper: Internationalized Domain Name Resolution Testbed Deployment,” which is available in the IDN section of the VeriSign GRS Web site (www.verisign-grs.com).

2 A Brief Review of the Internationalized Domain Name Testbed

Internet use is increasing dramatically throughout the world. Users who speak a primary language other than English comprise one of the fastest growing categories of users. Despite this growth, the Internet remains an English-centric resource with barriers of entry for non-English speaking people. One such barrier is the lack of multilingual capability within the Domain Name System (DNS). Currently, the DNS only supports domain names consisting of letters from the English alphabet and digits. In response to the high demand for support of domain names in characters used by other languages, VeriSign GRS seeks to make this capability a reality through the work of the IDN Testbed.

The VeriSign GRS approach in implementing its testbed is to ensure adherence to the Internet Architecture Board (IAB) principle of a single DNS root and compliance with the standards developed by the IDN Working Group of the Internet Engineering Task Force (IETF). VeriSign GRS is currently migrating to the recently published standards and continues to update its members on the plans for and progress of the testbed. Valuable input and feedback has been received from these groups, much of which is being incorporated into future planning for the testbed. Likewise, the testbed has proved a valuable tool in gathering information and real-world experience about some of the solutions and proposals put forth to date.

To ensure the continued stability of the DNS, VeriSign GRS has employed a staged approach to the deployment of its IDN Testbed. The stages are as follows: Self-Certification and Preparation of Registrars; IDN Registration; and IDN Resolution, the topic of this paper.

3 Self-Certification and Preparation of Registrars

On October 17, 2000, VeriSign GRS began the certification testing of registrars for the testbed. A total of 26 registrars successfully passed the certification test during the first stage.

Certification testing continued beyond the initiation of the second stage, however only those registrars certified during the first stage were able to register names in the testbed when registration began.

There is no longer a formalized certification test required for new IDN registrars. For details on the requirements to become a registrar for the testbed, please see the “Internationalized Domain Name Registrar Information Packet,” located on the VeriSign GRS Web site (www.verisign-grs.com).

4 Internationalized Domain Name Registration

On November 9, 2000, VeriSign GRS opened its IDN Testbed for registration. Since that time, more than 1,000,000 names have been registered. Over 900,000 remain after the VeriSign GRS’ disposition of .org.

Because the DNS does not support characters from non-English scripts, the names to be registered in the IDN testbed must first be converted into an encoded sequence of supported characters. Consider the domain name 网域.com, for example. The internationalized portion, 网域, becomes “3b7vcv67.” To complete the registration in the IDN testbed, a two character extension, known as a *prepend*, and two hyphens (“-”) are added by the registrar to flag the domain name as an IDN. The prepend is “xn.” Thus the registration in our example goes into the testbed as “xn--3b7vcv67.” This representation is referred to as the domain name’s *ACE* (ASCII Compatible Encoding) representation. We’ll refer back to these examples later.

5 Domain Name Resolution

To understand how the functionality of these names has evolved, one must first understand the two elements involved in making a domain name work: registration and resolution.

Registration involves placing a unique domain name in the registry database. Resolution is the process by which a domain name is looked up (or *queried*) to locate information about it, such as an IP address that allows Internet users to access the corresponding Web site through a browser. Resolution is a technical process that takes place on the DNS infrastructure of the Internet and, when successful, is invisible to the end-user.

The following provides a basic example of how resolution takes place. When an Internet user types a domain name into a browser the request is sent to a networked computer, called a name server. This name server contacts other name servers throughout the Internet to find the domain name’s IP address information. That information is then returned to the end-user’s computer and the browser accesses the desired Web site using the IP address. The whole process typically

takes only a few seconds, despite the frequent need to query several name servers before finding the address.

The DNS is hierarchical in structure; a domain name request works its way down the network of name servers until it reaches a server with the desired information. The system, and the Internet itself, is dependent upon successful communication between these name servers. If a request is sent that cannot be interpreted by a single name server in the chain, the process breaks down. The requirement of compatibility within the network of name servers makes the introduction of new functionality into the DNS, such as an IDN support, a complex and delicate procedure.

6 Internationalized Domain Name Resolution Implementation

Due to the significant technical complexity of IDN resolution, Stage 3 of the IDN Testbed is being conducted in three phases. This gradual implementation of resolution will ensure the continued stability of the more than 24 million *com* and *net* names currently managed by VeriSign GRS.

A brief summary of each of the phases is below, with a more detailed explanation to follow. Diagrams depicting the flow of a domain name request for each of the phases appear in the appendix.

- Phase 3.1 allows users to verify that a web site URL entered into their browser using the testbed domain name responds with the correct information. Phase 1 began on January 15, 2001.
- Phase 3.2, within a controlled environment, tests the resolution of testbed names on the name servers to their corresponding Web sites throughout the Internet. We are currently in this phase. IDNs that have no associated nameserver will still exhibit Phase I behavior.
- Phase 3.3 will introduce the testbed names into the *com*, and *net* zone files, allowing for full-featured resolution. Phase I behavior will no longer exist.

6.1 Phase 3.1

Phase 3.1 of IDN resolution allows users to query a testbed domain name in its ACE (ASCII Compatible Encoding) format (for example, *xn--3b7vcv67.mltbd.com*) and ensure that the name resolves to the correct *confirmation page*. The confirmation page is hosted by VeriSign GRS and contains information of use to the registrant of the name. Specifically, the page indicates whether or not the resolution was successful, and displays the queried IDN.

Also on the confirmation page are links to download a small software plug-in called i-NavTM, referred to as an *internationalized domain name resolution client* (“client”), which is required to enable proper resolution in subsequent resolution phases. Over time, multiple clients with similar functionality from different vendors will be available. The clients perform the native character-to-ACE transformation within the user’s computer. This is the transformation described

previously, which will change the 网域.com example name into *xn--3b7vcv67.com*, that name's ACE representation. Once a user downloads one of the clients, he or she can enter domain names using the native language characters in applications such as Web browsers. Without a client, a user would have to type in the domain name's ACE representation. Clients will be required of all users wishing to access Web sites using native character names until browser software incorporates similar transformation functionality. <JM: I have never seen this paper.> Notice that the example provided above (*xn--3b7vcv67.mltbd.com*) includes a second-level domain, *mltbd*. During Phases 3.1 and 3.2, the testbed names are accessible within a controlled environment only, and are not accessible directly within the *com* and *net* top-level domains. The temporary controlled environment allows the testbed names to be isolated, and mitigates any risks inherent in deployment. Availability of testbed names as second-level domain names will come in Phase 3.3.

6.2 Phase 3.2

Phase 3.2 of IDN resolution allows IDNs to be maintained by the registrant of the name, who can direct users to his or her own Web site (rather than the VeriSign GRS confirmation page). This represents the first opportunity for testbed name owners to use their name in conjunction with their site. Phase 3.1 behavior will continue to exist for those domains that have no associated name servers.

6.3 Phase 3.3

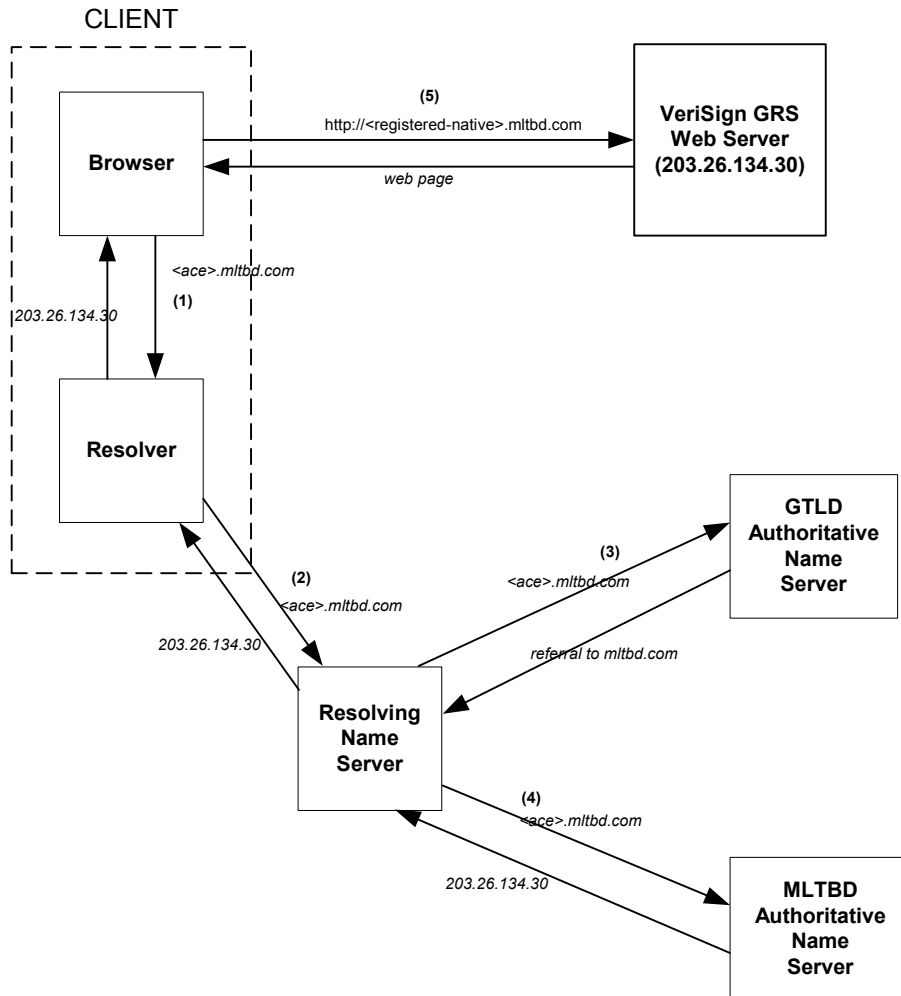
Phase 3 will be the introduction of IDNs into the *com*, and *net* top-level domains. Once implemented, any Web site (or IP address) will resolve through a query using the domain name registered in the testbed. Thus, our example name can be queried as www.网域.com and the corresponding site will be accessed. VeriSign GRS anticipates concluding the testbed soon now that the IETF's IDN Working Group RFCs are published. At the conclusion of the testbed, it is expected that testbed names will continue to resolve in the DNS.

7 Conclusion

The successful implementation of Phase 3 will effectively end the development period for the IDN Testbed. With the standard approved and adopted by the IETF, the names in the testbed are being checked for compliance with the standards. Those meeting the standards will remain functional within the Internet DNS. The testbed then is concluded and the registered IDNs will be treated as any other name in the *com* and *net* top-level domains.

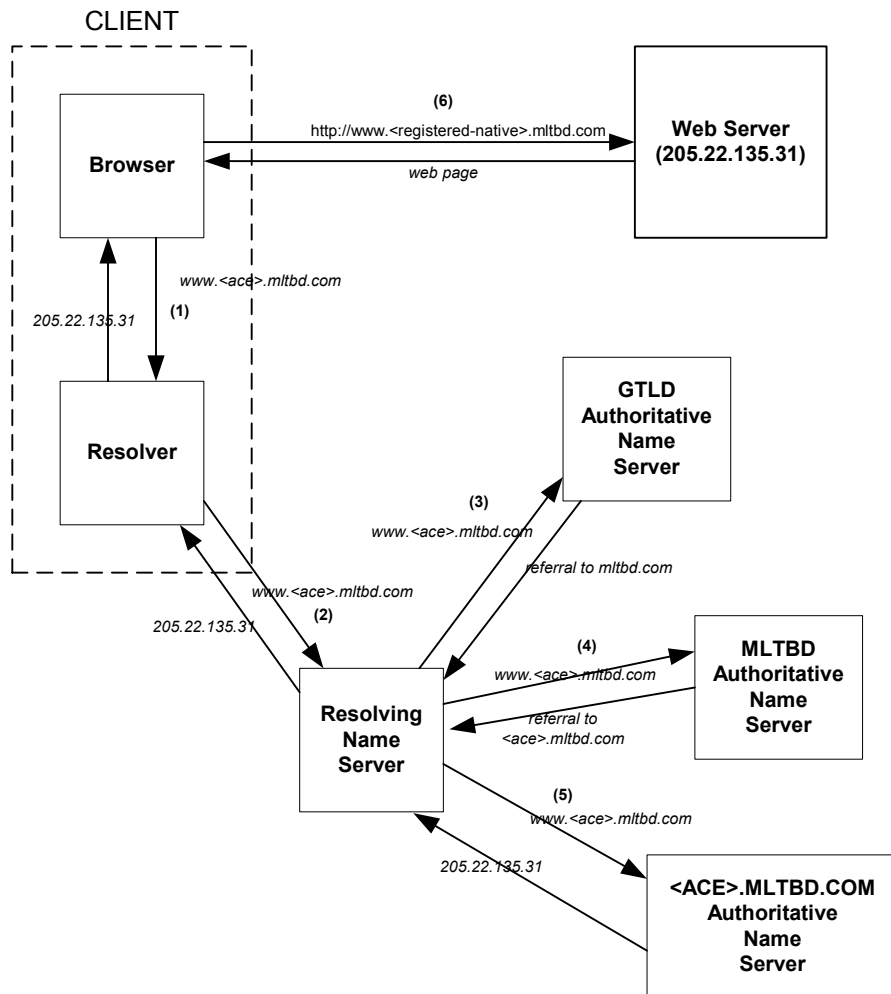
8 Appendix A: Phase 3.1 Example Resolution

A user enters *<registered-native>.mltbd.com* at the web browser and is connected to the VeriSign GRS web site at 203.26.134.30 (not the actual IP address, only an example). Note that the resolution can only happen if the user has an IDN resolution client to convert the *registered-native* to the appropriate Name Prepped ACE.



9 Appendix B: Phase 3.2 Example Resolution

A user enters `www.<registered-native>.mltbd.com` at the web browser and is connected to a web site at `205.22.135.31` (not the actual IP address, only an example). Again, in order for resolution to occur user must have an IDN resolution client to convert the *registered-native* to the appropriate Name Prepped ACE.



10 Appendix C: Phase 3.3 Example Resolution

A user enters **www.<registered-native>.com** at the web browser and is connected to a web site at address 205.22.135.31. Again, in order for resolution to occur user must have an IDN resolution client to convert the *registered-native* to the appropriate Name Prepped ACE.

