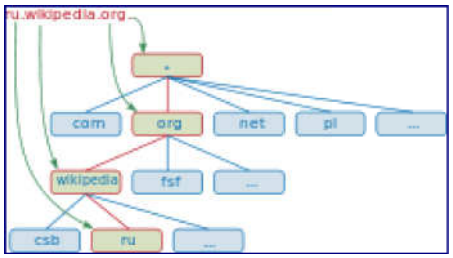
Domain Name



The hierarchy of labels in a domain name.

A **domain name** is an identification string that defines a realm of administrative autonomy, authority or control on the Internet. Domain names are formed by the rules and procedures of the Domain Name System (DNS). Any name registered in the DNS is a domain name.

Domain names are used in various networking contexts and application-specific naming and addressing purposes. In general, a domain name represents an Internet Protocol (IP) resource, such as a personal computer used to access the Internet, a server computer hosting a web site, or the web site itself or any other service communicated via the Internet.

Domain names are organized in subordinate levels (subdomains) of the DNS root domain, which is nameless. The first-level set of domain names are the top-level domains (TLDs), including the generic top-level domains (gTLDs), such as the prominent domains com, info, net, edu, and org, and the country code top-level domains (ccTLDs). Below these top-level domains in the DNS hierarchy are the second-level and third-level domain names that are typically open for reservation by end-users who wish to connect local area networks to the Internet, create other publicly accessible Internet resources or run web sites. The registration of these domain names is usually administered by domain name registrars who sell their services to the public.

A fully qualified domain name (FQDN) is a domain name that is completely specified in the hierarchy of the DNS, having no parts omitted.

Domain names are usually written in lowercase, although labels in the Domain Name System are case-insensitive.

Purpose

Domain names serve as more easily memorable names for Internet resources such as computers, networks, and services. A domain name represents an Internet Protocol (IP) resource. Individual Internet host computers use domain names as host identifiers, or host names. Host names are the leaf labels in the domain name system usually without further subordinate domain name space. Host names appear as a component in Uniform Resource Locators (URLs) for Internet resources such as web sites (e.g., en.wikipedia.org).

Domain names are also used as simple identification labels to indicate ownership or control of a resource. Such examples are the realm identifiers used in the Session Initiation Protocol (SIP), the Domain Keys used to verify DNS domains in e-mail systems, and in many other Uniform Resource Identifiers (URIs).

An important function of domain names is to provide easily recognizable and memorizable names to numerically addressed Internet resources. This abstraction allows any resource to be moved to a different physical location in the address topology of the network, globally or locally in an intranet. Such a move usually requires changing the IP address of a resource and the

corresponding translation of this IP address to and from its domain name.

Domain names are used to establish a unique identity. Organizations can choose a domain name that corresponds to their name, helping Internet users to reach them easily. For instance IBM's web site is at ibm.com, and GNU's is at gnu.org.

Generic domain names increase popularity. A generic domain name may sometimes define an entire category of business that a company is involved in, rather than being the name of the company. Some examples of generic names include books.com, music.com, travel.com and art.com. Companies have created successful brands based on a generic name, and such generic domain names tend to be very valuable.

Domain names are often referred to simply as *domains* and domain name registrants are frequently referred to as *domain owners*, although domain name registration with a registrar does not confer any legal ownership of the domain name, only an exclusive right of use for a particular duration of time.

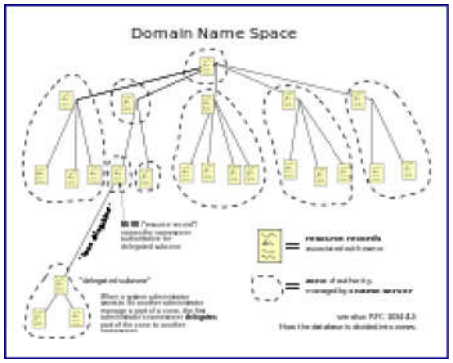
The use of domain names in commerce may subject them to trademark law. In 2010, the number of active domains reached 196 million.[1]

History

The practice of using a simple memorable abstraction of a host's numerical address on a computer network dates back to the ARPANET era, before the advent of today's commercial Internet. In the early network, each computer on the network retrieved the hosts file (*host.txt*) from a computer at SRI (now SRI International).[2][3] which mapped computer host names to numerical addresses. The rapid growth of the network made it impossible to maintain a centrally organized hostname registry and in 1983 the Domain Name System was introduced on the ARPANET and published by the Internet Engineering Task Force as RFC 882 and RFC 883.

Domain name space

Today, the Internet Corporation for Assigned Names and Numbers (ICANN) manages the top-level development and architecture of the Internet domain name space. It authorizes domain name registrars, through which domain names may be registered and reassigned.



The hierarchical domain name system, organized into zones, each served by domain name servers.

The domain name space consists of a tree of domain names. Each node in the tree holds information associated with the domain name. The tree sub-divides into *zones* beginning at the

Domain Name

DNS root zone.

Domain name syntax

A domain name consists of one or more parts, technically called *labels*, that are conventionally concatenated, and delimited by dots, such as *example.com*.

- The right-most label conveys the top-level domain; for example, the domain name *www.example.com* belongs to the top-level domain *com*.
- The hierarchy of domains descends from the right to the left label in the name; each label to the left specifies a subdivision, or subdomain of the domain to the right. For example: the label *example* specifies a node *example.com* as a subdomain of the *com* domain, and *www* is a label to create *www.example.com*, a subdomain of *example.com*. This tree of labels may consist of 127 levels. Each label may contain from 1 to 63 octets. The empty label is reserved for the root node. The full domain name may not exceed a total length of 253 ASCII characters in its textual representation.[4] In practice, some domain registries may have shorter limits.
- A hostname is a domain name that has at least one associated IP address. For example, the domain names *www.example.com* and *example.com* are also hostnames, whereas the *com* domain is not. However, other top-level domains, particularly country code top-level domains, may indeed have an IP address, and if so, they are also hostnames.
- Hostnames impose restrictions on the characters allowed in the corresponding domain name. A valid hostname is also a valid domain name, but a valid domain name may not necessarily be valid as a hostname.

Top-level domains

The top-level domains (TLDs) such as com, net and org are the highest level of domain names of the Internet. Top-level domains form the DNS root zone of the hierarchical Domain Name System. Every domain name ends with a top-level domain label.

When the Domain Name System was devised, in the 1980s, the domain name space was divided into two main groups of domains.[5] The country code top-level domains (ccTLD) were primarily based on the two-character territory codes of ISO-3166 country abbreviations. In addition, a group of seven generic top-level domains (gTLD) was implemented which represented a set of categories of names and multi-organizations.[6] These were the domains gov, edu, com, mil, org, net, and int.

During the growth of the Internet, it became desirable to create additional generic top-level domains. As of October 2009, 21 generic top-level domains and 250 two-letter country-code top-level domains existed.[7] In addition, the ARPA domain serves technical purposes in the infrastructure of the Domain Name System.

During the 32nd International Public ICANN Meeting in Paris in 2008,[8] ICANN started a new process of TLD naming policy to take a "*significant step forward on the introduction of new generic top-level domains*." This program envisions the availability of many new or already proposed domains, as well as a new application and implementation process.[9] Observers believed that the new rules could result in hundreds of new top-level domains to be registered.[10]

Domain Name

IANA maintains an annotated list of top-level domains in the root zone database as well as a list of special-use (reserved) top-level domain names.

Second-level and lower level domains

Below the top-level domains in the domain name hierarchy are the second-level domain (SLD) names. These are the names directly to the left of .com, .net, and the other top-level domains. As an example, in the domain *example.co.uk*, *co* is the second-level domain.

Next are third-level domains, which are written immediately to the left of a second-level domain. There can be fourth- and fifth-level domains, and so on, with virtually no limitation. An example of an operational domain name with four levels of domain labels is *sos.state.oh.us*. Each label is separated by a full stop (dot). 'sos' is said to be a sub-domain of 'state.oh.us', and 'state' a sub-domain of 'oh.us', etc. In general, subdomains are domains subordinate to their parent domain. An example of very deep levels of subdomain ordering are the IPv6 reverse resolution DNS zones, e.g. 1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.ip6.arpa, which is the reverse DNS resolution domain name for the IP address of a loopback interface, or the localhost name.

Second-level (or lower-level, depending on the established parent hierarchy) domain names are often created based on the name of a company (e.g. *bbc*.co.uk), product or service (e.g. *hotmail*.com). Below these levels, the next domain name component has been used to designate a particular host server. Therefore, *ftp.example.com* might be an FTP server, *www.example.com* would be a World Wide Web server, and *mail.example.com* could be an email server, each intended to perform only the implied function. Modern technology allows multiple physical servers with either different (cf. load balancing) or even identical addresses (cf. anycast) to serve a single hostname or domain name, or multiple domain names to be served by a single computer. The latter is very popular in Web hosting service centers, where service providers host the websites of many organizations on just a few servers.

The hierarchical DNS labels or components of domain names are separated in a fully qualified name by the full stop (dot, .).

Internationalized domain names

The character set allowed in the Domain Name System is based on ASCII and does not allow the representation of names and words of many languages in their native scripts or alphabets. ICANN approved the Internationalized domain name (IDNA) system, which maps Unicode strings used in application user interfaces into the valid DNS character set by an encoding called Punycode. For example, københavn.eu is mapped to xn--kbenhavn-54a.eu. Many registries have adopted IDNA.

Domain name registration

History

The first commercial Internet domain name, in the TLD *com*, was registered on 15 March 1985 in the name symbolics.com by Symbolics Inc., a computer systems firm in Cambridge, Massachusetts.

By 1992, fewer than 15,000 *com* domains had been registered.

In December 2009, 192 million domain names had been registered.[11] A large fraction of them are in the *com* TLD, which as of March 15, 2010 had 84 million domain names, including 11.9 million online business and e-commerce sites, 4.3 million entertainment sites, 3.1 million finance related sites, and 1.8 million sports sites.[12] As of July 2012 the *com* TLD has more registrations than all of the ccTLDs combined.[13]

Administration

The right to use a domain name is delegated by domain name registrars, which are accredited by the Internet Corporation for Assigned Names and Numbers (ICANN), the organization charged with overseeing the name and number systems of the Internet. In addition to ICANN, each top-level domain (TLD) is maintained and serviced technically by an administrative organization operating a registry. A registry is responsible for maintaining the database of names registered within the TLD it administers. The registry receives registration information from each domain name registrar authorized to assign names in the corresponding TLD and publishes the information using a special service, the WHOIS protocol.

Registries and registrars usually charge an annual fee for the service of delegating a domain name to a user and providing a default set of name servers. Often, this transaction is termed a sale or lease of the domain name, and the registrant may sometimes be called an "owner", but no such legal relationship is actually associated with the transaction, only the exclusive right to use the domain name. More correctly, authorized users are known as "registrants" or as "domain holders".

ICANN publishes the complete list of TLD registries and domain name registrars. Registrant information associated with domain names is maintained in an online database accessible with the WHOIS protocol. For most of the 250 country code top-level domains (ccTLDs), the domain registries maintain the WHOIS (Registrant, name servers, expiration dates, etc.) information.

Some domain name registries, often called *network information centers* (NIC), also function as registrars to end-users. The major generic top-level domain registries, such as for the COM, NET, ORG, INFO domains and others, use a registry-registrar model consisting of hundreds of domain name registrars (see lists at ICANN or VeriSign). In this method of management, the registry only manages the domain name database and the relationship with the registrars. The *registrants* (users of a domain name) are customers of the registrar, in some cases through additional layers of resellers.

Technical requirements and process

In the process of registering a domain name and maintaining authority over the new name space created, registrars use several key pieces of information connected with a domain:

- *Administrative contact*. A registrant usually designates an administrative contact to manage the domain name. The administrative contact usually has the highest level of control over a domain. Management functions delegated to the administrative contacts may include management of all business information, such as name of record, postal address, and contact information of the official registrant of the domain and the obligation to conform to the requirements of the domain registry in order to retain the right to use a domain name. Furthermore the administrative contact installs additional contact information for technical and billing functions.
- *Technical contact*. The technical contact manages the name servers of a domain name. The functions of a technical contact include assuring conformance of the configurations of the domain name with the requirements of the domain registry, maintaining the domain zone records, and providing continuous functionality of the name servers (that leads to the accessibility of the domain name).
- *Billing contact*. The party responsible for receiving billing invoices from the domain name registrar and paying applicable fees.
- *Name servers*. Most registrars provide two or more name servers as part of the registration service. However, a registrant may specify its own authoritative name servers to host a domain's resource records. The registrar's policies govern the number of servers and the type of server information required. Some providers require a hostname and the corresponding IP address or just the hostname, which must be resolvable either in the new domain, or exist elsewhere. Based on traditional requirements (RFC 1034), typically a minimum of two servers is required.

Domain names may be formed from the set of alphanumeric ASCII characters (a-z, A-Z, 0-9), but characters are case-insensitive. In addition the hyphen is permitted if it is surrounded by a characters or digits, i.e., it is not the start or end of a label. Labels are always separated by the full stop (period) character in the textual name representation.

Business models

Domain names are often seen in analogy to real estate in that (1) domain names are foundations on which a website (like a house or commercial building) can be built and (2) the highest "quality" domain names, like sought-after real estate, tend to carry significant value, usually due to their online brand-building potential, use in advertising, search engine optimization, and many other criteria.

A few companies have offered low-cost, below-cost or even cost-free domain registrations with a variety of models adopted to recoup the costs to the provider. These usually require that domains be hosted on their website within a framework or portal that includes advertising wrapped around the domain holder's content, revenue from which allows the provider to recoup the costs. Domain registrations were free of charge when the DNS was new. A domain holder can give away or sell infinite number of subdomains under their domain name. For example, the owner of *example.org* could provide subdomains such as *foo.example.org* and *foo.bar.example.org* to interested parties.

Domain Name

Because of the popularity of the Internet, many desirable domain names are already assigned and users must search for other acceptable names, using Web-based search features, or WHOIS and dig operating system tools. Many registrars have implemented **Domain name suggestion** tools which search domain name databases and suggest available alternative domain names related to keywords provided by the user.

Resale of domain names

The business of resale of registered domain names is known as the domain aftermarket. Various factors influence the perceived value or market value of a domain name.

Most of the million dollar domain deals are carried out privately and go unreported. As of 2011, the most expensive domain name sales on record were:

1. Insure.com $16 million in 2009 [14]
2. Fund.com 2008 £9.99 million[14]
3. Sex.com for $14 million in October 2010[14][15]
4. Porn.com 2007 $9.5 million[14]
5. Fb.com for $8.5 million in November 2010[14]

Domain name confusion

Intercapping is often used to emphasize the meaning of a domain name. However, DNS names are not case-sensitive, and some names may be misinterpreted in certain uses of capitalization. For example: *Who Represents*, a database of artists and agents, chose *whorepresents.com*, which can be misread as *whore presents*. Similarly, a therapists' network is named *therapistfinder.com*. In such situations, the proper meaning may be clarified by use of hyphens in the domain name. For instance, Experts Exchange, a programmers' discussion site, for a long time used *expertsexchange.com*, but ultimately changed the name to *experts-exchange.com*.

Intellectual property entrepreneur Leo Stoller threatened to sue the owners of StealThisEmail.com on the basis that, when read as *stealthisemail.com*, it infringed on claimed (but invalid) trademark rights to the word "stealth".

Use in web site hosting

The domain name is a component of a Uniform Resource Locator (URL) used to access web sites, for example:

- **URL:** http://www.example.net/index.html
- **Top-level domain name:** net
- **Second-level domain name:** example.net
- **Host name:** www.example.net

A domain name may point to multiple IP addresses in order to provide server redundancy for the cybernetic services to be delivered; such multi-address capability is used to manage the traffic of large, popular web sites. More commonly, however, one server computer, at a given IP address, may also host web sites in different domains. Such address overloading enables virtual web hosting, commonly used by large web hosting services to conserve IP address space. IP-

address overloading is possible through a feature in the HTTP version 1.1 protocol, but not in the HTTP version 1.0 protocol, which requires that a request identify the domain name being referred for connection.

Abuse and regulation

Critics often claim abuse of administrative power over domain names. Particularly noteworthy was the VeriSign Site Finder system which redirected all unregistered .com and .net domains to a VeriSign webpage. For example, at a public meeting with VeriSign to air technical concerns about SiteFinder,[16] numerous people, active in the IETF and other technical bodies, explained how they were surprised by VeriSign's changing the fundamental behavior of a major component of Internet infrastructure, not having obtained the customary consensus. SiteFinder, at first, assumed every Internet query was for a website, and it monetized queries for incorrect domain names, taking the user to VeriSign's search site. Unfortunately, other applications, such as many implementations of email, treat a lack of response to a domain name query as an indication that the domain does not exist, and that the message can be treated as undeliverable. The original VeriSign implementation broke this assumption for mail, because it would always resolve an erroneous domain name to that of SiteFinder. While VeriSign later changed SiteFinder's behaviour with regard to email, there was still widespread protest about VeriSign's action being more in its financial interest than in the interest of the Internet infrastructure component for which VeriSign was the steward.

Despite widespread criticism, VeriSign only reluctantly removed it after the Internet Corporation for Assigned Names and Numbers (ICANN) threatened to revoke its contract to administer the root name servers. ICANN published the extensive set of letters exchanged, committee reports, and ICANN decisions.[17]

There is also significant disquiet regarding the United States' political influence over ICANN. This was a significant issue in the attempt to create a .xxx top-level domain and sparked greater interest in alternative DNS roots that would be beyond the control of any single country.[18]

Additionally, there are numerous accusations of domain name front running, whereby registrars, when given whois queries, automatically register the domain name for themselves. Network Solutions has been accused of this.[19]

Truth in Domain Names Act

In the United States, the Truth in Domain Names Act of 2003, in combination with the PROTECT Act of 2003, forbids the use of a misleading domain name with the intention of attracting Internet users into visiting Internet pornography sites.

The Truth in Domain Names Act follows the more general Anticybersquatting Consumer Protection Act passed in 1999 aimed at preventing typosquatting and deceptive use of names and trademarks in domain names.

Seizures

- Seizure notices
  - 

absolutepoker.com

  - 

channelsurfing.net

  - 

libertyreserve.com

In the early 21st century, the US Department of Justice (DOJ) began using a tactic of seizing domain names, based on the legal theory that domain names constitute property used to engage in criminal activity, and thus are subject to forfeiture. For example, in the seizure of the domain name of a gambling website, the DOJ referenced 18 U.S.C. § 981 and 18 U.S.C. § 1955(d).[20]. In 2013 the US government seized Liberty Reserve, citing 18 U.S.C. § 982(a)(1).[21]

The U.S. Congress passed the Combating Online Infringement and Counterfeits Act in 2010. Consumer Electronics Association vice president Petricone was worried that seizure was a *blunt instrument* that could harm legitimate businesses.[22][23] After a joint operation in February 15, 2011, the DOJ and the Department of Homeland Security claimed to have seized ten domains of websites involved in advertising and distributing child pornography, but also mistakenly seized the domain name of a large DNS provider, temporarily replacing 84,000 websites with seizure notices.[24]

Fictitious domain name

A *fictitious domain name* is a domain name used in a work of fiction or popular culture to refer to a domain that does not actually exist, often with invalid or unofficial top-level domains such as ".web", a usage exactly analogous to the dummy 555 telephone number prefix used in film and other media. The canonical fictitious domain name is "example.com", specifically set aside by IANA in RFC 2606 for such use, along with the *.example* TLD.

Domain names used in works of fiction have often been registered in the DNS, either by their creators or by cybersquatters attempting to profit from it. This phenomenon prompted NBC to purchase the domain name Hornymanatee.com after talk-show host Conan O'Brien spoke the name while ad-libbing on his show. O'Brien subsequently created a website based on the concept and used it as a running gag on the show.[25]

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