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Domain Name System Implementation Schedule - Revised

Status of this Memo

This memo is a policy statement on the implementation of the Domain Style Naming System in the Internet. This memo is an update of RFC-881, and RFC-897. This is an official policy statement of the IAB and the DARPA. Distribution of this memo is unlimited.

The intent of this memo is to detail the schedule for the implementation for the Domain Style Naming System. The explanation of how this system works is to be found in the references.

The Current Situation

There are three aspects to the domain style naming system, (1) the names themselves, (2) the method of translating names to addresses, and (3) the relationship between the Internet and the rest of the world.

Names

The names are being changed from simple names, or globally unique strings, to structured names, where each component name is unique only with respect to the superior component name.

Simple Names

Until recently, hosts in the DARPA research and DDN operational communities were assigned names in a flat or global name space of character strings. There are some limits on these names. They must start with a letter, end with a letter or digit and have only letters or digits or hyphen as interior characters. Case is not significant.

For example: USC-ISIF

Hierarchical Names

Because of the growth of the Internet, structured names (or domain style names) have been introduced. Each element of the structured name will be a character string (with the same constraints that previously applied to the simple names). The

elements (or components) of the structured names are separated with periods, and the elements are written from the most specific on the left to the most general on the right.

For example: USC-ISIF.ARPA

The Initial and Temporary Domain

The introduction of these hierarchical names has been very limited. Every current name in this new system has the form "old-simple-name.ARPA". That is, the all the hosts are in a domain called "ARPA". This is a temporary situation. The current intention is for the ARPA domain to cease to exist. This means that all hosts will change their names as the domain style names come into full use.

Name to Address Lookup

Every host in the Internet is expected to have a way of translating the name of any other host into its Internet address.

By and large, the name to address translation is done by looking up the information in a table of all hosts.

The maintenance of this table is centralized at the Network Information Center (NIC). Each host is expected to obtain a current copy of the table on a timely basis. This table is called "HOSTS.TXT" [8] and is normally accessed via the Hostnames Server [9].

Interface to the World

A great deal of mail moves between the Internet and other "systems" that somehow transport mail among computers. This is currently done by hiding some sort of "other-system" addressing information in the local-part of the mail address and using a mail-relay host in the host-part of the mailbox.

For example,

OBERST%EDUCOM.MAILNET@MIT-MULTICS.ARPA
EDMISTON.CIC@CSNET-RELAY.ARPA

The Future Situation

Names

Hierarchical Names

The use of the hierarchical names will be greatly expanded according to the rules established in the "Domain Requirements" memo (RFC-920) [5].

For example: F.ISI.USC.EDU

There are several levels of development for use of the domain style names.

First, there is the current simple substitution of the domain style names for the old style host names. At this stage all domain style names directly translate to host addresses (using the NIC tables) and all domain style names have two components. The mail system uses addresses of the form "local-part@host", where host is a domain style host name.

For example: USC-ISIF.ARPA and Postel@USC-ISIF.ARPA

Here we expect that "USC-ISIF.ARPA" is the name of an Internet host and that we can send mail for "Postel" to the SMTP port on that host. It may be that some backward host can still fake it by ignoring the ".ARPA" and looking up an address for "USC-ISIF" in some old style file.

Second, there is an extension to more name components and more top level domains. The mail system still uses addresses of the form "local-part@host", where host is a domain style host name.

For example: F.ISI.USC.EDU and Postel@F.ISI.USC.EDU

Here we expect that "F.ISI.USC.EDU" is the name of an Internet host and that we can send mail for "Postel" to the SMTP port on that host. It is likely that the NIC will enter these new domain style names in the centrally maintained table (i.e., HOSTS.TXT) during the transition period. It is unlikely that a backward host can hack this at all.

Third, there is an extension to domain style names that may represent only organizations or administrative entities. Finding a host that acts for such entities may require a level of

indirection in the search. The mail system may use "local-part@domain-name", where the "domain-name" identifies a host (as before) or an organization.

For example: USC-ISI.EDU and Postel@USC-ISI.EDU

Here we don't count on "USC-ISI. EDU" being the name of an Internet host. When we want to send mail to "Postel" we ask the domain name server about sending mail to "USC-ISI.EDU". The server will tell us the name (and address) of a real Internet host that handles mail on this organizations behalf, for example, "F.ISI.USC.EDU = 10.2.0.52". We then send mail for "Postel@USC-ISI.EDU" to the SMTP port on F.ISI.USC.EDU.

Name to Address Lookup

Every host in the Internet will be expected to have a way of translating the name of any other host into its Internet address.

By and large, the name to address translation will be done by interacting with a lookup server. There will be a number of servers that each hold a portion of the name to address information.

The maintenance of the translation data base will be subdivided and distributed.

The design and implementation details for this service are given in RFC-882 [2] and RFC-883 [3].

Interface to the World

Mail will continue to move between the Internet and other "systems". This may be done by designating some sort of "other-system" representative organization in the domain server data bases that can indirect mail to a mail-relay host.

For example,

Oberst@EDUCOM.MAILNET

When we want to send mail to "Oberst" we ask the domain name server about sending mail to "EDUCOM.MAILNET". The server will tell us the name (and address) of a real Internet host that handles mail on this organizations behalf, for example, "MIT-MULTICS.ARPA = 10.0.0.6". We then send mail for "Oberst@EDUCOM.MAILNET" to the SMTP port on MIT-MULTICS.ARPA.

For example,

Edmiston@CIC.CSNET

When we want to send mail to "Edmiston" we ask the domain name server about sending mail to "CIC.CSNET". The server will tell us the name (and address) of a real Internet host that handles mail on this organizations behalf, for example, "CSNET-RELAY.ARPA = 10.4.0.5". We then send mail for "Edmiston@CIC.CSNET" to the SMTP port on CSNET-RELAY.ARPA.

The Transition Situation

Actually, the situation is a bit more complicated, of course. Hosts are already using domain style names under the constraint that their domain style name is exactly their old style name with the string ".ARPA" appended. The first transition step is to ensure that all hosts do this, and then to eliminate the use of old style names altogether.

Please note carefully that two types of changes are being made:

One is a change in the support mechanism for translating a host name to an internet address,

that is from using local copies of a full centrally maintained table to dynamically accessing a distributed set of servers each posesing a portion of a data base maintained in a distributed fashion.

The other is a change in the host names themselves,

from a flat global space of unstructured strings to a hierarchical structure of names.

There are two steps to the transition plan.

First, change from old names to domain style names.

Second, change from using central tables to using name servers.

There are two communities that are taking slightly different courses in this transition. The DARPA research community is making the full transition. The DDN operational community is making the change in naming on the same schedule, but is not requiring hosts in the DDN operational community make the change to using servers at the same

time (they can if they want to). The DDN PMO will establish a schedule for that change at a later time. The NIC will maintain a central table of all DDN operational hosts.

Interface to the World

The interchange of mail with "other-systems" will have to continue pretty much as it has (except that RELAY-HOST is RELAY-HOST.ARPA) until organization names can be used. Then representative organizations can be designated for each "other-system" in the domain server data bases that will then specify a mail-relay host.

All Hosts Change Names

The impact of introducing the domain style names is that all hosts change their names at least once. Hosts that move to new domains or subdomains may change their names several times.

Hosts have an official (or primary) name and possibly several nicknames. When mail is sent from a host, the official name is used in the mail header address fields.

Suppose, that in the old days before domains were thought of, a host changed its name. What is the impact on users of changing the name of a host?

Mail that was sent before the name was changed can not be answered using mail program commands that automatically fill in the return address. While it may be possible to use special tricks to fix up the "From" or the "To" users addresses, the "Cc" addresses are very difficult to correct.

Suppose one host changed its name from FOO to BAR. Mail that was sent from FRED@FOO to JOE@ABC can not be answered unless the change of name is known to the user or the mail program at ABC and the host name BAR substituted for FOO. Mail that is sent to JOE@ABC from SAM@DEF with a cc to FRED@FOO can not be answered easily.

Any mailing lists that have mailboxes with the host that changed names will now have incorrect entries.

The point is that while the host that changed names may be able to use special tricks for a while to fix things up for the users, it is difficult for other hosts to do this.

A general trick is to make the old name a nickname for the host for some period of time.

The introduction of domain style names means that all hosts change their names essentially at the same time.

To lessen the havoc, there will be a period of time when both the old and the new names are allowed. That is, the old names will be nicknames for a while.

Primary Names

Currently, host have an official or primary names and may have several nicknames. For example,

Primary Name	Nicknames
USC-ISIF.ARPA	USC-ISIF ISIF
ADA-VAX.ARPA	ADA-VAX ISI-VAXB AJPO VAXB

The data base is such than given any of the names for a host one can find the address, and given the address one can find the primary name.

In the new domain style name system this property must be maintained. That is, given the Internet address of a host one must be able to find the primary name of that host. This calls for careful management of the distributed database by those in charge of the domains and zones.

The Revised Time Table

There are three major phases to the implementation of the domain names system: (1) putting the machinery in place (servers, resolvers), (2) getting the data base installed, (3) changing the user programs (mailers, etc.).

The machinery is now (at last) well along, there is a server for TOPS-20, and two different servers for Unix. The data base now contains the ARPA domain and is initialized for the other top level domains. Little has been done to change user programs to use the new procedures.

Done

Service Design and Specification: The design and specification for the protocol and data base were published (RFC-882, RFC-883).

Domain Requirements Specification: The requirements for establishing a new domain are published as an RFC (RFC-920).

Domain Style Names in Table: Hosts are using their domain style names as their official and primary names. The standard table of host names contains domain style names as the official and primary name.

Servers for ARPA Domain: Several domain name servers are in operation to supply host name to internet address translations, one of these servers is at the NIC.

15 Dec 84 Domain Table

A master table of top level domain names and their associated servers is established at the NIC. Probably this information will be added to the HOSTS.TXT file as a new entry type.

15 Jan 85 Begin New Domain Registration

New domains may register according to the procedures and restrictions described in RFC-920 [5].

15 Feb 85 Major Machinery Completed

The principal servers are up and running, there are resolvers programmed and tested for the most popular systems (Unix 4.2bsd, TOPS-20).

15 May 85 Significant Use of Resolvers and Servers

Programs (e.g., Mailers, Telnet, FTP) begin regular use of the new mechanisms (resolvers and servers). This may be done by changing the programs to act as resolvers themselves and call on servers directly, or to provide system calls that include the resolver function to replace old system calls that accessed the host table.

15 Jul 85 Implementation of the Domain Naming System Completed

The goal is to complete the switch over to the domain style names and the use of the servers by this date. All programs that translate host name to Internet addresses should now use procedures based on the use of the domain style names system of resolvers and servers and the distributed data base.

15 Sep 85 Decommission Host Table

At this point the master host table maintained by the NIC need no longer be complete for the DARPA research community. A full table of the DDN operational hosts will be maintained by the NIC.

15 Oct 85 DDN Plan for Domains Name Service

The DDN PMO may establish a plan for the future support of name to address translations in the DDN community.

Appendix : The Old Time Table

Here we present the time table from the previous schedule (RFC-897) with some comments on what was and was not accomplished.

-- Nov 83 Plan and Schedule

At this point the overall plan for the implementation of domain style names and name servers, and a schedule of events was published (RFC-881). Also the design and specification for the protocol and data base were published (RFC-882, RFC-883).

<This was done, but the schedule did not work.>

-- Nov 83 Initial Domain Style Host Name Table

At this point a version of the host table which includes the domain style names is made available (DHOSTS.TXT).

<This was done, on schedule.>

-- Feb 84 Domain Requirements Specification

At this point the requirements for establishing a new domain are published as an RFC.

<This topic was much discussed in the Namedroppers mailing list, but no RFC was published until Oct84 [5].>

14 Mar 84 Begin using Domain Style Names

At this point all hosts should start using their domain style names as their official and primary names. The standard table of host names contains domain style names as the official and primary name (DHOSTS.TXT becomes HOSTS.TXT).

<This was done, on schedule.>

04 Apr 84 Server for ARPA Domain

At this point several domain name servers are in operation to supply host name to internet address translations, one of these servers is at the NIC.

<This was done, not on schedule, but by Sep84.>

04 Apr 84 Domain Table

At this point a master table of top level domain names and their associated servers is established at the NIC.

<Not done yet.>

02 May 84 Stop using old style Names

At this point the use of old style names must be completely phased out.

<I think this is done. Except that some hosts still use the OHOSTS.TXT file.>

02 May 84 Certain New Domains

At this point a few new domains may be established, in particular the DDN domain.

<Not done yet. Well, "DDN" won't be a top level domain according to the new rules (see [5]).>

06 Jun 84 General & Multilevel Domains

At this point additional new domains may be established, if they meet the requirements. Domain style names may have more than two segments.

<Not done yet.>

18 Jul 84 Organizational Domains

Domain style names may identify organizations. Finding an address for a host may involve a level of indirection.

<Not done yet.>

05 Sep 84 Decommission Host Table

At this point the master host table maintained by the NIC need no longer be complete for the DARPA research community. A full table of the DDN operational hosts will be maintained by the NIC.

<Not done yet.>

03 Oct 84 DDN Plan for Domains Name Service

At this point the DDN PMO will establish a plan for the future support of name to address translations in the DDN community.

<Not done yet.>

References

[1] Postel, J., "The Domain Names Plan and Schedule", RFC-881, USC Information Sciences Institute, November 1983.

[2] Mockapetris, P., "Domain Names - Concepts and Facilities", RFC-882, USC Information Sciences Institute, November 1983.

[3] Mockapetris, P., "Domain Names - Implementation and Specification", RFC-883, USC Information Sciences Institute, November 1983.

[4] Postel, J., "Domain Name System Implementation Schedule", RFC-897, USC Information Sciences Institute, February 1984.

[5] Postel, J., and J. Reynolds, "Domain Requirements", RFC-920, USC Information Sciences Institute, October 1984.

[6] Mockapetris, P., "The Domain Name System", Proceedings of the IFIP 6.5 Working Conference on Computer Message Services, Nottingham, England, May 1984. Also as ISI/RS-84-133, June 1984.

[7] Mockapetris, P., J. Postel, and P. Kirton, "Name Server Design for Distributed Systems", Proceedings of the Seventh International Conference on Computer Communication, Sidney, Australia, October 1984. Also as ISI/RS-84-132, June 1984.

[8] Feinler, E., K. Harrenstien, Z. Su, and V. White, "DoD Internet Host Table Specification", RFC-810, Network Information Center, SRI International, March 1982.

[9] Harrenstien, K., V. White, and E. Feinler, "Hostnames Server", RFC-811, Network Information Center, SRI International, March 1982.