                    MILNET NAME DOMAIN TRANSITION

STATUS OF THIS MEMO

   This RFC consolidates information necessary for the implementation of
   domain style names throughout the DDN/MILNET Internet community.
   Although no official policy has been published, the introduction of
   domain style names will impact all hosts in the DDN/MILNET Internet.
   The RFC is designed as an aid to implementors and administrators by
   providing 1) an overview of the transition process from host tables
   to domains, 2) a potential timetable for the transition, and 3)
   references to documentation and software relating to the DDN/ARPANET
   domain system. Distribution of this RFC is unlimited.

BACKGROUND

   All MILNET hosts are expected to have a way of translating the name
   of any other host into its Internet address. Although the current
   method of name resolution is to look up the information in a table of
   all hosts, this method of operation is cumbersome and relies on a
   central point of information. The Network Information Center (NIC)
   maintains a table of hosts registered in the MILNET Internet and
   their addresses. The size of this table and the frequency of updates
   has reached the limits of manageability. The central host table is
   FTP'd by a host on a timely basis from the NIC, processed locally (to
   pare or reformat the table), and used in name resolution.

   The domain system uses a distributed database and software to perform
   the same functions as the host table. In this system, host resolvers
   query domain servers for name resolution. They may cache answers for
   performance improvement. The domain servers each maintain a portion
   of the hierarchical database under separate administrative authority
   and control. Redundancy is obtained by transferring data between
   cooperating servers.

   The domain system has been operating successfully on the ARPANET for
   over a year. One indication of success is that the NIC's central
   host table is no longer a complete list (i.e., ARPANET does not
   depend primarily on the host table). The domain system is being
   implemented on the MILNET with DoD military standard protocols. The
   first step in changing to the domain system has been taken, as
   required by DDN Management Bulletin #32 (22 Jan 1987). All host

names were converted from a simple, flat namespace to a structured
name consistent with domains. In the second step, servers acting as
the root of the database hierarchy were put in place. In the next
step, hosts are moving away from host table usage.

MIGRATION PATH

All hosts will not change from host table to domain server usage at
one time. Accordingly, three stages of conversion to the domain
system are envisaged. These stages roughly correspond to 1)
continuing to use the host table for all applications, 2) using the
domain system for only some applications, and 3) using the domain
system for all applications. These stages will exist simultaneously
as various hosts convert their application software according to
available resources. The following paragraphs discuss these stages
in more detail.

Host Table Only

In the first stage, a host depends entirely on the host table for
name resolution. The table is obtained from the NIC's central
copy and the resolution is done by local table scanning. Most
hosts are in this stage.

Certain hosts may find it infeasible ever to convert to the domain
system, owing to older architectures, unchangeable software, or
other considerations. At the end of the conversion period, the
NIC will stop maintaining an internet host table. To continue
operations, hosts that do not convert will need to obtain an
equivalent of the host table from some source. This source may be
another host with which a bilateral agreement has been negotiated
offline, a community-of-interest host acting as central repository
for that community, or a locally-maintained table of host names
and addresses. Transfer of the table from the source is a matter
of local implementation and bilateral agreements.

Domain System and Host Table

In the second stage, a host will use both the host table and the
domain system. A likely scenario is that applications like TELNET
and FTP will use the domain system and that MAIL will continue to
use the host table for name resolution. An alternate scenario is
that batchstyle applications like MAIL would use the domain system
and that the interactive applications would convert later.

This stage is viewed as transitory, as hosts convert over to use
the domain system exclusively. It is highlighted as a separate
stage to emphasize the need during transition for both the host

table and the domain system.

Domain System Only

In the third and final stage, a host will have completed
conversion and will be using the domain system exclusively. This
includes correct processing of the mailbox and mail exchanger
resource records.

MIGRATION TIMETABLE

Table 1 shows the events and dates involved in the MILNET transition
from host table to domain system. The operational testing of the
root server software has been completed. Voluntary conversion can
begin immediately, with mandatory conversion required by October
1989. After this date, hosts not converted need to obtain the host
table equivalent by private arrangement (see "Migration Path" above).

```
                                                  Start     End
        Milestone                                 Date      Date
        =========================================  ======   ======
        Root server operational testing           Dec 86   Jul 87
        Policy announced in DDN Management Bulletin Oct 87
        Host conversion                           Oct 87   Oct 89
        Host table discontinued                   Oct 89
```

MILNET Name Domain Timetable

Table 1

DOCUMENTATION

The Name Domain system is described in several documents that are
maintained and available from the NIC in both online and in hardcopy
form. The documents are in "Request For Comments" format (RFC)
commonly used in the Internet to document and discuss various
networking issues. The documents noted in Table 2 fully describe the
concepts, conventions, enhancements, requirements, and operation of
the Name Domain system. The following paragraphs give a brief
synopsis of each document.

```
     RFC    PH   DOCUMENT TITLE
     ===    ==   ======================================================

     799    *    Internet Name Domains
     819         Domain Naming Convention for Internet User Applications
     920         Domain Requirements
     921         Domain Name System Implementation Schedule - Revised
     952    *    Internet Host Table Specification
     953    *    Hostnames Server
     974         Mail Routing and the Domain System
    1032         Domain Administrators Guide
    1033         Domain Administration Operations Guide
    1034         Domain Names - Concepts and Facilities
    1035         Domain Names - Implementation Specification
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   *   Included in the DDN Protocol Handbook

                        Name Domain Documents

                              Table 2

   RFC-799

      This RFC is an early description of the concepts of a name domain
      system. It is exploratory in nature and offers scenarios for name
      resolution and mail forwarding.

   RFC-819

      This RFC is a think peice about hierarchical naming conventions
      for internetworking applications. The conventions proposed are
      aligned along administrative rather than topological boundaries
      and is designed for interoperation among heterogeneous naming
      environments. Further topics of discussion include mail relaying,
      name service approaches, and naming authorities.

   RFC-920

      This RFC contains a policy statement on the requirements of
      establishing a new domain in the ARPA Internet and introduces the
      limited set of top level domains.

   RFC-921

      This RFC contains a policy statement on the implementation
      schedule of the ARPA Internet domain system (as of October 1984).
      The discussion describes schedule and future operational
      scenarios, as well as the transition between the two.

   RFC-952

      This RFC specifies the format of the host/address table maintained
      by the NIC.

   RFC-953

      This RFC contains the official specification of the Hostname
      Server Protocol. This TCP-based protocol accesses machine-
      readable name/address information in the format described by RFC-
      952 and is used by hosts to obtain all or a portion of the
      centralized host table.

   RFC-974

      This RFC presents a description of how mail systems are expected
      to route messages based on domain system information. In
      particular, it discusses how mailers should interpret mail
      exchanger resource records for message routing to both host and
      domain names.

   RFC-1032

      This RFC describes the guidelines for a domain administrator to
      follow to establish a new domain.

   RFC-1033

      This RFC provides procedures for domain administrators in
      operating a domain server and maintaining their portion of the
      hierarchical database.

   RFC-1034

      This RFC introduces domain style names, their use for ARPA
      Internet mail and host address support, and the protocols and
      servers used to implement domains. The concepts and facilities of
      the domain system are described. The RFC also discusses the
      hierarchical database model, resource record usage, query
      formation, query resolution, and domain control.

   RFC-1035

      This RFC specifies the format of domain system transactions,
      discusses the implementation of domain servers, and explores the
      use of domain names in the context of mail and other network
      software.

IMPLEMENTATIONS

   Several implementations of the domain system exist. The first two
   paragraphs (JEEVES and BIND) discuss the prominent (and most mature)
   two implementations and their authors/maintainers. These
   implementations are available online. The last paragraphs list
   implementations under development. Points of contact can supply more
   information.

   The intent of listing these implementations is to give vendors the
   opportunity to inspect working code. These implementations embody
   experience with the domain system and offer interpretations of the
   protocols found acceptable in operational environments.

Tops-20 Server and Resolver (JEEVES)

   Some domain root servers on the ARPANET are hosted on TOPS-20 systems
   and run the code called JEEVES. The JEEVES resolver is specific to
   version 5 of TOPS-20. The code is maintained by Paul Mockapetris
   (ISI), is available using anonymous FTP from host a.isi.edu, and
   resides in the files

                    <domain.version5>version5.mss
                    <domain.version5>version5.doc
                    <domain.version5>version5.txt

   His mail addresses are:

           ARPANET: pvm@venera.isi.edu

           US MAIL: USC Information Sciences Institute
                     4676 Admiralty Way
                     Marina del Rey, California 90292-6695

4BSD Unix Resolver and Server (BIND)

   Most hosts running lower level domain servers on the ARPANET are
   hosted on 4BSD systems and run the code called BIND. This code is
   maintained for periodic releases by Mike Karels (UCB). His mail
   addresses are:

           ARPANET: karels@okeeffe.berkeley.edu

           US MAIL: Computer Systems Research Group
                     Computer Science Division
                     Department of EE & CS
                     University of California
                     Berkeley, CA 94720

   There are two distribution mailing lists that publish information
   about BIND. General discussions can be received by contacting
   bindrequest@ucbarpa.berkeley.edu and requesting to join the BIND
   list. Information relating to testing developmental versions of BIND
   can be received by contacting bind-test-request@ucbarpa.berkeley.edu
   and requesting to join the BIND-TEST list.

   A commercial version of BIND is distributed with Sun Microsystems'
   operating system version 3.2. The point of contact is Bill Nowicki.
   His addresses are:

           ARPANET: nowicki@sun.com

           US MAIL: Sun Microsystems
                     2550 Garcia Avenue
                     Mountain View, CA 94043

MS-DOS Server and Resolver

   FTP Software is working on a port of BIND to their PC/TCP environment
   under MS/DOS (their PC/TCP package). They already have a resolver
   that depends on recursive queries. The point of contact is Philip A.
   Prindeville. His mail addresses are:

           ARPANET: pap4@ai.ai.mit.edu

           US MAIL: FTP Software Inc
                     P.O. Box 150
                     Kendall Sq. Branch
                     Boston, MA 02142

Tops-20 Resolver

    A resolver is being written in C for Tops-20 and ITS by Rob Austein.
    He encourages contacts from Tops-10, WAITS, and TENEX system
    programmers. His mail addresses are:

            ARPANET: sra@xx.lcs.mit.edu.

            US MAIL: MIT LCS NE43-503
                      545 Technology Square
                      Cambridge MA 02139

Symbolics Resolver

    Symbolics Inc. has an implementation for the 36xx series Lisp
    Machines. Steven L. Sneddon is the point of contact. His addresses
    are:

            ARPANET: sned@pegasus.scrc.symbolics.com

            US MAIL: Manager, Networks and Communications
                      Symbolics, Inc.
                      11 Cambridge Center
                      Cambridge, MA 02142

Xerox Cedar Resolver

    Xerox has a resolver running in the Cedar language/environment at
    Xerox PARC. John Larson is the point of contact. His addresses are:

            ARPANET: jlarson.pa@xerox.com

            US MAIL: Xerox Palo Alto Research Center
                      3333 Coyote Hill Road
                      Palo Alto, CA 94304

Harris Resolver

    There is a domain resolver for the Harris H series that handles
    canonical name, host address, name server, and mail agent (MX)
    records. Bruce Orchard is the point of contact. His addresses are:

            ARPANET: orchard/bruc@scarecrow.waisman.wisc.edu

            US MAIL: 549 Waisman Center
                      University of Wisconsin-Madison
                      1500 Highland Avenue
                      Madison, Wisconsin 53705-2280

Fuzzball Server and Resolver

    Dave Mills has both server and solver for the so-called PDP11/LSI- 11
    Fuzzballs. However, these are not complete implementations and do
    not support zone transfers and so forth. They have little use
    outside the fuzzball community, since the code is in assembler and is
    not for Unix. His addresses are:

            ARPANET: mills@udel.edu

            US MAIL: Electrical Engineering Department
                      University of Delaware
                      Newark, DE 19716

Multics Resolver

    There is a resolver for Multics that is nearly ready for release.
    Art Beattie is the point of contact. His addresses are:

            ARPANET: beattie%pco@bco-multics.arpa

            US MAIL: MS K55
                      Honeywell Bull
                      PO Box 8000
                      Phoenix, AZ, 85066-8000

VAX/VMS Resolver

    There is a partial resolver implementation (only supports address
    queries and IN-ADDR PTR lookups) that is part of the CMU/TEK TCP/IP
    package for VAX/VMS. It is written in BLISS-32. Vince Fuller is the
    point of contact. His addresses are:

            ARPANET: vince.fuller@c.cs.cmu.edu

            US MAIL: Computer Science Department
                      Carnegie-Mellon University
                      Schenley Park
                      Pittsburgh, Pa. 15213

Macintosh Resolver and Server

   Tom Unger has ported BIND to the Macintosh. This was done using the
   Macintosh Programmer's Workshop and CITI's MacIP that currently
   consists of IP, UDP, and a Berkeley style socket library. His mail
   addresses are:

            ARPANET: tom@citi.umich.edu

            US MAIL: Center for Information and Technology Integration
                      University of Michigan
                      2901 Hubbard
                      Ann Arbor, MI 48105

ORDERING INFORMATION

   Documents are available online from the NIC (IP address 10.0.0.51 or
   26.0.0.73) by using FTP with the login ANONYMOUS and the password
   GUEST. RFCs are in files named RFC:RFCnnn.TXT and are simple ASCII
   files ready for printing. Pages within the documents are separated
   by a form feed character on a line by itself.

   Hardcopy of the documents and software mentioned in the discussions
   above may be obtained from the NIC or the author. Prices are
   available on request and are documented in DDN Newsletter #50 (12 Dec
   1986). The address and phone numbers of the NIC are listed below.

                      DDN Network Information Center
                      SRI International, Room EJ291
                      333 Ravenswood Avenue
                      Menlo Park, CA 94025

                      (800) 235-3155
                      (415) 859-3695