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Operational Requirements for X.400 Management Domains in the GO-MHS Community

Status of this Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

1. Introduction

There are several large, operational X.400 services currently deployed. Many of the organizations in these services are connected to the Internet. A number of other Internet-connected organizations are beginning to operate internal X.400 services (for example, U.S. government organizations following U.S. GOSIP). The motivation for this document is to foster a Global Open Message Handling System (GO-MHS) Community that has full interoperability with the existing E-mail service based on RFC-822 (STD-11).

The goal of this document is to unite regionally operated X.400 services on the various continents into one GO-MHS Community (as seen from an end-user's point of view). Examples of such regional services are the COSINE MHS Service in Europe and the XNREN service in the U.S.

A successful GO-MHS Community is dependent on decisions at both the national and international level. National X.400 service providers are responsible for the implementation of the minimum requirements defined in this document. In addition to these minimum requirements, national requirements may be defined by each national service provider.

This document refers to other documents which are published as RFCs. These documents are [1], [2], [3], [4], [6] and [7] in the reference list.

This document handles issues concerning X.400 1984 and X.400 1988 to 1984 downgrading. Issues concerning pure X.400 1988 are left for further study.

We are grateful to Allan Cargille and Lawrence Landweber for their input and guidance on this paper. This paper is also a product of discussions in the IETF X.400 Operations WG and the RARE WG-MSG (former RARE WG1 (on MHS)).

1.1. Terminology

This document defines requirements, recommendations and conventions. Throughout the document, the following definitions apply: a requirement is specified with the word shall. A recommendation is specified with the word should. A convention is specified with the word might. Conventions are intended to make life easier for RFC-822 systems that don't follow the host requirements.

1.2. Profiles

Different communities have different profile requirements. The following is a list of such profiles.

- o U.S. GOSIP - unspecified version
- o ENV - 41201
- o UK GOSIP for X.400(88)

In the case when mail traffic is going from the RFC-822 mail service to the GO-MHS Community, the automatic return of contents when mail is non-delivered should be requested by RFC 1327 gateways and should be supported at the MTA that generates the non-delivery report. However, it should be noted that this practice maximizes the cost associated with delivery reports.

2. Architecture of the GO-MHS Community

In order to facilitate a coherent deployment of X.400 in the GO-MHS Community it is necessary to define, in general terms, the overall structure and organization of the X.400 service. This section is broken into several parts which discuss management domains, lower layer connectivity issues, and overall routing issues.

The GO-MHS Community will operate as a single MHS community, as defined in reference [1].

2.1. Management Domains

The X.400 model supports connectivity between communities with different service requirements; the architectural vehicle for this is a Management Domain. Management domains are needed when different administrations have different specific requirements. Two types of management domains are defined by the X.400 model: an Administration

Management Domain (ADMD) and a Private Management Domain (PRMD).

Throughout the world in various countries there are different organizational policies for MDs. All of these policies are legal according to the X.400 standard. Currently, X.400 service providers in a country (inside or outside the GO-MHS Community), are organized as:

a) One or several ADMDs.
b) One or several PRMDs and with no ADMDs present in the country, or that are not connected to any ADMD.
c) One or several PRMDs connected to one or several ADMDs.

Or in combinations of a), b) and c). At this stage it is not possible to say which model is the most effective. Thus, the GO-MHS Community shall allow every model.

2.2. The RELAY-MTA

The X.400 message routing decision process takes as input the destination O/R address and produces as output the name (and perhaps connection information) of the MTA who will take responsibility of delivering the message to the recipient. The X.400 store and forward model permits a message to pass through multiple MTAs. However, it is generally accepted that the most efficient path for a message to take is one where a direct connection is made from the originator to the recipient’s MTA.

Large scale deployment of X.400 in the GO-MHS Community will require a well deployed directory infrastructure to support routing. In the GO-MHS Community X.500 is considered to be the best protocol for such an infrastructure. In this environment, a routing decision can be made by searching the directory with a destination O/R address in order to obtain the name of the next hop MTA. This MTA may be a central entry point into an MD, or it may be the destination MTA within an MD.

Deployment of X.400 without a well deployed Directory infrastructure, will require the use of static tables to store routing information. These tables (keyed on O/R addresses), will be used to map a destination O/R address to a next hop MTA. In order to facilitate efficient routing, one could build a table that contains information about every MTA in every MD. However, this table would be enormous and very dynamic, so this is not feasible in practice. Therefore, it is necessary to use the concept of a RELAY-MTA.

The purpose of a RELAY-MTA is to act as a default entry point into an MD. The MTA that acts as a RELAY MTA for an MD shall be capable of accepting responsibility for all messages that it receives that are destined for well-defined recipients in that MD.

The use of a RELAY-MTA for routing is defined by reference [1]. RELAY-MTAs in the GO-MHS Community shall route according to reference [1].

2.3. Lower Layer Stack Incompatibilities

A requirement for successful operation of the GO-MHS Community is that all users can exchange messages. The GO-MHS Community is not dependent on the traditional TCP/IP lower layer protocol suite. A variety of lower layer suites are used as carriers of X.400 messages.

For example, consider Figure 1.

```
-----------------------------------------------------
!                                                   !
!            PRMD A                                 !
!        --------------------                       !
!        !   o       x      !                       !
!        !                  !                       !
!        !     o        w   !                       !
!        !          z       !                       !
!        --------------------                       !
!                                PRMD B             !
!                            ------------------     !
!                            !      o     o   !     !
!    PRMD C                  !  o             !     !
!  ------------------        !      o     z   !     !
!  !       o        !        !                !     !
!  !  o        x    !        ------------------     !
!  !     o        w !                               !
!  !        o       !                               !
!  ------------------                               !
!                                                   !
!               Key: Each character the in          !
!                    the boxes illustrates an MTA.  !
!                                                   !
!                    x: TP0/RFC1006/TCP RELAY-MTA   !
!                    w: TP4/CLNP RELAY-MTA          !
!                    z: TP0/CONS/X.25 RELAY-MTA     !
!                    o: MTA                         !
-----------------------------------------------------
```

Figure 1: A Deployment Scenario

PRMD A has three RELAY-MTAs which collectively provide support for the TP0/CONS/X.25, TP0/RFC1006, and TP4/CLNS stacks. (Note: it is acceptable for a single RELAY-MTA to support more than one stack. Three RELAY-MTAs are shown in this figure for clarity.) Thus, PRMD A is reachable via these stacks. However, since PRMD B only supports the TP0/CONS/X.25 stack, it is not reachable from the TP0/RFC 1006 or the TP4/CLNS stack. PRMD C supports TP0/RFC1006 and TP4/CLNS. Since PRMD B and PRMD C do not share a common stack, how is a message from PRMD C to reach a recipient in PRMD B?

One solution to this problem is to require that PRMD B implement a stack in common with PRMD C. However this may not be a politically acceptable answer to PRMD B.

Another solution is to implement a transport service bridge (TSB) between TP0/RFC 1006 in PRMD C to TP0/CONS in PRMD B. This will solve the problem for PRMD C and B. However, the lack of coordinated deployment of TSB technology makes this answer alone unacceptable on an international scale.

The solution to this problem is to define a coordinated mechanism that allows PRMD B to advertise to the world that it has made a bilateral agreement with PRMD A to support reachability to PRMD B from the TP0/RFC 1006 stack.

This solution does not require that every MTA or MD directly support all stacks. However, it is a requirement that if a particular stack is not directly supported by an MD, the MD will need to make bilateral agreements with other MD(s) in order to assure that connectivity from that stack is available.

Thus, in the case of Figure 1, PRMD B can make a bilateral agreement with PRMD A which provides for PRMD A to relay messages which arrive on either the TP4/CLNP stack or the TP0/RFC 1006 stack to PRMD B using the TP0/CONS stack.

The policies described in reference [1] define this general purpose solution. It is a requirement that all MDs follow the rules and policies defined by reference [1].

3. Description of GO-MHS Community Policies

A GO-MD is a Management Domain in the GO-MHS Community.

The policies described in this section constitute a minimum set of common policies for GO-MDs. They are specified to ensure interoperability between:

- all GO-MDs.
- all GO-MDs and the RFC-822 mail service (SMTP).
- all GO-MDs and other X.400 service providers.

3.1. X.400 Address Registration

An O/R address is a descriptive name for a UA that has certain characteristics that help the Service Providers to locate the UA. Every O/R address is an O/R name, but not every O/R name is an O/R address. This is explained in reference [5], chapter 3.1.

Uniqueness of X.400 addresses shall be used to ensure end-user connectivity.

Mailboxes shall be addressed according to the description of O/R names, Form 1, Variant 1 (see reference [5], chapter 3.3.2). The attributes shall be regarded as a hierarchy of:

```
Country name (C)
Administration domain name (ADMD)
[Private domain name] (PRMD)
[Organization name] (O)
[Organizational Unit Names] (OUs)
[Personal name] (PN)
[Domain-defined attributes] (DDAs)
```

Attributes enclosed in square brackets are optional. At least one of PRMD, O, OU and PN names shall be present in an O/R address. At least one of PN and DDA shall be present.

In general a subordinate address element shall be unique within the scope of its immediately superior element. An exception is PRMD, see section 3.1.3. There shall exist registration authorities for each level, or mechanisms shall be available to ensure such uniqueness.

3.1.1. Country (C)

The values of the top level element, Country, shall be defined by the set of two letter country codes, or numeric country codes in ISO 3166.

3.1.2. Administration Management Domain (ADMD)

The values of the ADMD field are decided on a national basis. Every national decision made within the GO-MHS community shall be supported by a GO-MD.

3.1.3. Private Management Domain (PRMD)

The PRMD values should be unique within a country.

3.1.4. Organization (O)

Organization values shall be unique within the context of the subscribed PRMD or ADMD if there is no PRMD. For clarification, the following situation is legal:

1) C=FI; ADMD=FUMAIL; O=FUNET.
2) C=FI; ADMD=FUMAIL; PRMD=NOKIA; O=FUNET.

In this case 1) and 2) are different addreses. (Note that 2) at this point is a hypotethical address). O=FUNET is a subscriber both at ADMD=FUMAIL, 1), and at PRMD=NOKIA, 2).

3.1.5. Organizational Units (OUs)

If used, a unique hierarchy of OUs shall be implemented. The top level OU is unique within the scope of the immediately superior address element (i.e., Organization, PRMD or ADMD). Use of multiple OUs may be confusing.

3.1.6. Given Name, Initials, Surname (G I S)

Each Organization can define its own Given-names, Initials, and Surnames to be used within the Organization. In the cases when Surnames are not unique within an O or OU, the Given-name and/or Initial shall be used to identify the Originator/Recipient. In the rare cases when more than one user would have the same combination of G, I, S under the same O and/or OUs, each organization is free to find a practical solution, and provide the users with unique O/R addresses.

Either one of Given-name or Initials should be used, not both. Periods shall not be used in Initials.

To avoid problems with the mapping of the X.400 addresses to RFC-822 addresses, the following rules might be used. ADMD, PRMD, O, and OU values should consist of characters drawn from the alphabet (A-Z), digits (0-9), and minus. Blank or Space characters should be avoided. No distinction is made between upper and lower case. The last character shall not be a minus sign or period. The first character should be either a letter or a digit (see reference [6] and [7]).

3.1.7. Domain Defined Attributes (DDAs)

The GO-MHS Community shall allow the use of domain defined attributes. Note: Support for DDAs is mandatory in the functional profiles, and all software must upgrade to support DDAs. The following DDAs shall be supported by a GO-MD:

"RFC-822" - defined in reference [3].

The following DDAs should be supported by a GO-MD:

"COMMON" - defined in reference [2].

3.2. X.400 88 -> 84 Downgrading

The requirements in reference [2] should be implemented in GO-MDs

3.3. X.400 / RFC-822 address mapping

All GO-MHS Community end-users shall be reachable from all end-users in the RFC-822 mail service in the Internet (SMTP), and vice versa.

The address mapping issue is split into two parts:

1) Specification of RFC-822 addresses seen from the X.400 world.
2) Specification of X.400 addresses seen from the RFC-822 world.

The mapping of X.400 and RFC-822 addresses shall be performed according to reference [3].

3.3.1. Specification of RFC-822 Addresses seen from the X.400 World

Two scenarios are described:

A. The RFC-822 end-user belongs to an organization with no defined X.400 standard attribute address space.
B. The RFC-822 end-user belongs to an organization with a defined X.400 standard attribute address space.

Organizations belong to scenario B if their X.400 addresses are registered according to the requirements in section 3.1.

3.3.1.1. An Organization with a defined X.400 Address Space

An RFC-822 address for an RFC-822 mail user in such an organization shall be in the same address space as a normal X.400 address for X.400 users in the same organization. RFC-822 addresses and X.400 addresses are thus sharing the same address space. Example:

University of Wisconsin-Madison is registered under C=US; ADMD=Internet; PRMD=XNREN; with O=UW-Madison and they are using OU=cs to address end-users in the CS-department. The RFC-822 address for RFC-822 mail users in the same department is: user@cs.wisc.edu.

An X.400 user in the GO-MHS Community will address the RFC-822 mail user at the CS-department with the X.400 address:

C=US; ADMD=Internet; PRMD=xnren; O=UW-Madison; OU=cs; S=user;

This is the same address space as is used for X.400 end-users in the same department.

3.3.1.2. An Organization with no defined X.400 Address Space

RFC-822 addresses shall be expressed using X.400 domain defined attributes. The mechanism used to define the RFC-822 recipient will vary on a per-country basis.

For example, in the U.S., a special PRMD named "Internet" is defined to facilitate the specification of RFC-822 addresses. An X.400 user can address an RFC-822 recipient in the U.S. by constructing an X.400 address such as:

C=us; ADMD=Internet; PRMD=Internet; DD.RFC-822=user(a)some.place.edu;

The first part of this address:

C=us; ADMD=Internet; PRMD=Internet;

denotes the U.S. portion of the Internet community and not a specific "gateway". The 2nd part:

DD.RFC-822=user(a)some.place.edu

is the RFC-822 address of the RFC-822 mail user after substitution of non-printable characters according to reference [3]. The RFC-822 address is placed in an X.400 Domain Defined Attribute of type RFC-822 (DD.RFC-822).

Each country is free to choose its own method of defining the RFC-822 community. For example in Italy, an X.400 user would refer to an RFC-822 user as:

C=IT; ADMD=MASTER400; DD.RFC-822=user(a)some.place.it

In the UK, an X.400 user would refer to an RFC-822 user as:

C=GB; ADMD= ; PRMD=UK.AC; O=MHS-relay; DD.RFC-822=user(a)some.place.uk

3.3.2. Specification of X.400 Addresses seen from the RFC-822 World

If an X.400 organization has a defined RFC-822 address space, RFC-822 users will be able to address X.400 recipients in RFC-822/Internet terms. This means that the address of the X.400 user, seen from an RFC-822 user, will generally be of the form:

Firstname.Lastname@some.place.edu

where the some.place.edu is a registered Internet domain.

This implies the necessity of maintaining and distributing address mapping tables to all participating RFC-1327 gateways. The mapping tables shall be globally consistent. Effective mapping table coordination procedures are needed.

If an organization does not have a defined RFC-822 address space, an escape mapping (defined in reference [3]) shall be used. In this case, the address of the X.400 user, seen from an RFC-822 user, will be of the form:

```
"/G=Firstname/S=Lastname/O=org name/PRMD=foo/ADMD=bar/C=us/"@
                                   some.gateway.edu
```

Note that reference [7] specifies that quoted left-hand side addresses must be supported and that these addresses may be greater than 80 characters long.

This escape mapping shall also be used for X.400 addresses which do not map cleanly to RFC-822 addresses.

It is recommended that an organization with no defined RFC-822 address space, should register RFC-822 domains at the appropriate registration entity for such registrations. This will minimize the number of addresses which must use the escape mapping.

If the escape mapping is not used, RFC-822 users will not see the difference between an Internet RFC-822 address and an address in the GO-MHS Community. For example:

The X.400 address:

C=us; ADMD=ATTMail; PRMD=CDC; O=CPG; S=Lastname; G=Firstname;

will from an RFC-822 user look like:

Firstname.Lastname@cpg.cdc.com

3.4. Routing Policy

To facilitate routing in the GO-MHS Community before an X.500 infrastructure is deployed, the following two documents, a RELAY-MTA document and a Domain document, are defined. These documents are formally defined in reference [1]. The use of these documents is necessary to solve the routing crisis that is present today. However, this is a temporary solution that will eventually be replaced by the use of X.500.

The RELAY-MTA document will define the names of RELAY-MTAs and their associated connection data including selector values, NSAP addresses, supported protocol stacks, and supported X.400 protocol version(s).

Each entry in the Domain document consists of a sub-tree hierarchy of an X.400 address, followed by a list of MTAs which are willing to accept mail for the address or provide a relay service for it. Each MTA name will be associated with a priority value. Collectively, the list of MTA names in the Domain document make the given address reachable from all protocol stacks. In addition, the list of MTAs may provide redundant paths to the address, so in this case, the priority value indicates the preferred path, or the preferred order in which alternative routes should be tried.

The RELAY-MTA and Domain documents are coordinated by the group specified in the Community document. The procedures for document information gathering and distribution, are for further study.

3.5. Minimum Statistics/Accounting

The following are not required for all MTAs. The information is provided as guidelines for MTA managers. This is helpful for observing service use and evaluating service performance.

This section defines the data which should be kept by each MTA. There are no constraints on the encoding used to store the data (i.e., format).

For each message/report passing the MTA, the following information should be collected.

The following fields should be collected.

Date
Time
Priority
Local MTA Name
Size

The following fields are conditionally collected.

From MTA Name (fm)
To MTA Name (tm)
Delta Time (dt)
Message-id (id)

At least one of 'fm' and 'tm' should be present. If one of 'fm' and 'tm' is not present, 'id' should be present. If both 'fm' and 'tm' are present, then 'dt' indicates the number of minutes that the message was delayed in the MTA. If 'id' cannot be mapped locally because of log file formats, 'id' is not present and every message creates two lines: one with 'fm' empty and one with 'tm' empty. In this case, 'date' and 'time' in the first line represent the date and time the message entered the MTA. In the second line, they represent the date and time the message left the MTA.

The following fields are optionally collected.

From Domain (fd)
To Domain (td)

For route tracing, 'fd' and 'td' are useful. They represent X.400 OU's, O, PRMD, ADMD and C and may be supplied up to any level of detail.

4. Community Document

For the GO-MHS community there will exist one single COMMUNITY document containing basic information as defined in reference [1]. First the contact information for the central coordination point can be found together with the addresses for the file server where all the documents are stored. It also lists network names and stacks to be used in the RELAY-MTA and DOMAIN documents. The GO-MHS community must agree on its own set of mandatory and optional networks and stacks.

5. Security Considerations

Security issues are not discussed in this memo.

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