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A S S O C I A T E S

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Configuring the Internet Exchange Directory Server

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INTRODUCTION

A directory server is a machine that holds a database of information, such as names, phone numbers, e-mail addresses and other information about the people in an organization. The information is kept in a format that is accessible using the Internet standard protocol known as LDAP (Lightweight Directory Access Protocol). LDAP was originally designed as a simple Internet client-server protocol for accessing the X.500 directory service. Since then, LDAP has become the Internet standard way of accessing on-line directory systems that follow the X.500 data model. LDAP provides an extendable architecture for centralized storage and management of information that needs to be available for today's distributed systems and services.

Having directories that support a standard, open protocol moves applications and software vendors from a desktop-oriented focus to a network-centered one. Instead of being limited to looking up addresses in a local address book, users can search external directories that support the standard protocol.

The Internet Exchange Messaging Server features an LDAP-enabled Directory Server, which is based on client-server architecture. It can be used to search for a person or an organization's e-mail address or other important information stored in the database. The Directory Server is well integrated with all of the other Internet Exchange components, such as the IMAP4 Server, POP3 Server, Message Switch, DL (Distribution List) Manager and LMDA (Local Mail Delivery Agent). Once messages are received by the Internet Exchange, the Message Switch then routes the messages to the appropriate channels (SMTPC, Message Store, DL, ccMail/Notes Connectors, etc.) and performs pre-set processing on each message, during which the message routing is facilitated by the Directory Server.

This paper provides an overview on how the Internet Exchange Directory Server works, the naming style and the schema used. This document also explains in detail how to configure the Directory Server on your machine. Before you can configure the Directory Server, you must first install the Internet Exchange 4.1 software in your machine. You may download the Messaging Server Administrator's Guide at <http://www.ima.com/pdf/adminman2.pdf>. It provides detailed information on how to install the software successfully. After the installation, you can then configure the Directory Server. Please see *page 14* of this document for the configuration procedure.

OVERVIEW

Before the implementation of LDAP, directory-type information was often stored in an application-specific private database, possibly shared across small workgroups through LAN (Local Area Network) file sharing using proprietary protocols. An application-specific networked directory would use a protocol that was proprietary to the application (i.e., Lotus Notes or Microsoft Exchange) or to the operating system (i.e., Novell NDS Directory), restricting use of the directory to people using that application or operating system.

Then, the need for a standard, open protocol became evident. The IETF (Internet Engineering Task Force) has defined an Internet standard protocol for directory services that run over TCP/IP (Transmission Control Protocol/Internet Protocol). The Internet directory protocol (based on a client-server model) that was initially developed at the University of Michigan is now known as "LDAP". At first, LDAP was just a simplified ("lightweight") front end to X.500, spurred a lot of development and soon evolved into a stand-alone protocol that meets Internet requirements. LDAP products and services are currently being offered by more than 40 vendors, including Netscape, Novell, Oracle, Microsoft and IBM.

Throughout this document, you will chance upon terms that might be new to you. They include the following:

- **RFC 2377**
Describes a directory naming plan for the construction of an Internet directory infrastructure to support directory-enabled applications that can serve as an alternative (or extension) to the conventional X.500.
- **X.500**
The X.500 directory standard was developed to provide the networking community with an on-line version of the “white pages” or “yellow pages”. The X.500 standard seeks to provide a directory that contains a wide range of information, such as names, phone numbers and even postal codes. However, this standard suffered significant flaws, such as difficulty obtaining and maintaining good data in the directory service.
- **Directory Information Tree (DIT)**
The DIT is utilized to organize directory entries. The root of the DIT is represented by a special entry whose DN (Distinguished Name) is called the directory suffix. The directory suffix will have an attribute of “organization” or “o”. For example, if the Internet domain name for IMA is *ima.com*, the directory suffix for the company’s DIT will be “o=ima.com”.
- **Object classes**
In LDAP, object classes are used to group related information. Each directory entry belongs to one or more object classes. The names of the object classes to which an entry belongs are always listed as values for a special multi-valued attribute called *object class*.
It determines which attributes must be included in the entry.
- **Domain Name System (DNS)**
DNS provides mapping between textual names (e.g. *ima.net*) and the IP (Internet Protocol) addresses (e.g. 198.137.241.30) that the Internet uses behind the scene. It serves as the major telephone directory for the Internet. It is a distributed database that contains a collection of servers used by TCP/IP applications to perform two-way mapping between host names and IP addresses; and to provide e-mail routing information.
- **Distinguished Name**
A DN is a unique address that enables you to have an easy-to-recognize address for your web site and your e-mail. For example, *instead of* having a URL address that is shared with your provider, such as *http://www.yourprovider.com/~yourname/*, your address will be *http://yourname.com/*.
- **Domain Component (DC)**
Used in the construction of a DN from a domain name. For example, “IMA”, having the registered domain name “ima.net.”, would construct the DN “dc=ima, dc=net” from its domain name. It would then use this DN as the root of its sub-tree of directory information.
- **Common Name (CN)**
Specifies the common name of the user or the name of the modules. If used as a common name of the user, it combines the “firstname” and “sn” attributes.

For more information about the Internet Exchange Directory Server, please go to <http://www.ima.com/pdf/ienews/vol1no5.pdf> (The Lightweight Directory Access Protocol (LDAP):

An overview), <http://www.ima.com/product/v4/dirserver/ldap.pdf> (Internet Exchange Directory Server) and <http://www.ima.com/faq/msgsrv/dirserver/ldif.html> (Internet Exchange Directory Server Import/Export Tools).

HOW THE INTERNET EXCHANGE DIRECTORY SERVER WORKS

The Directory Server runs on a host computer on the Internet. Its client program constructs a request and sends it over the network to a computer running the directory server. The server receives the request, takes an appropriate action and returns the result back to the client.

The Internet Exchange Directory Server consists of two major subsystems--the front-end protocol engine and the back-end database engine (**Figure 1**). The *front-end protocol engine* receives requests from the client and processes these requests by invoking read-and-write functions in the back-end database engine. Among the operations performed by the front-end protocol engine are bind, unbind, search, modify, modify RDN (Relative Distinguished Name), delete and abandon operations. The *back-end database engine* searches for information in the directory and modifies it based on commands from the protocol engine. It communicates with the front-end engine through a well-defined API (Application Programming Interface).

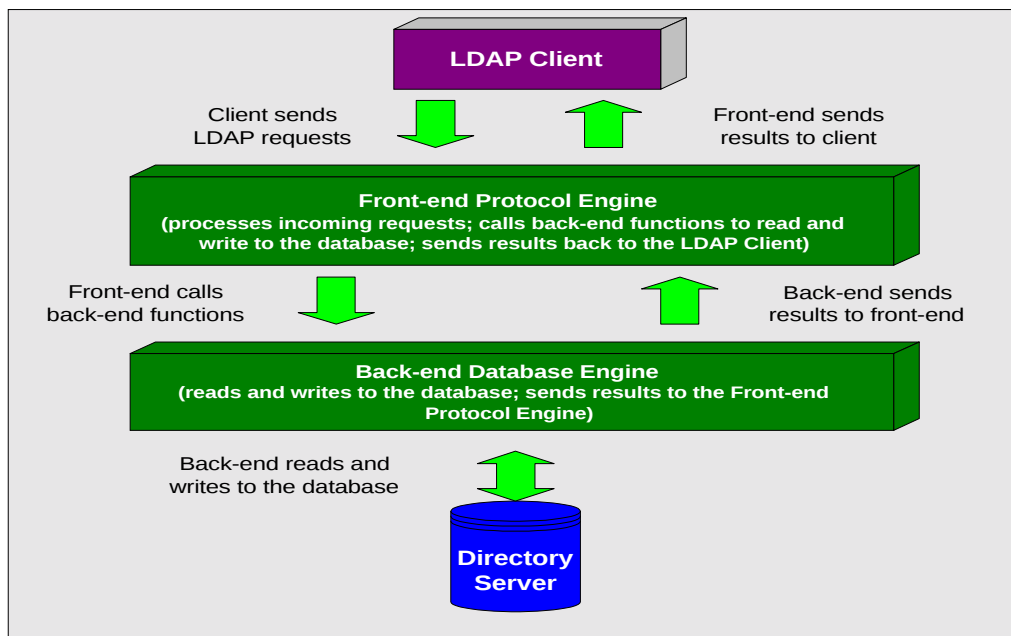


Figure 1: Internet Exchange LDAP-enabled Directory Server Architecture

The Directory Server also allows the client to issue multiple requests at once. If the client searches the directory and multiple matching entries are found, each entry will be sent to the client. It also provides an "authentication" service, restricting access to sensitive information, such as passwords and confidential user profiles. Operations are provided for adding and deleting an entry from the directory, modifying an existing entry and searching for a particular entry. The search operation allows some portion of the directory to be searched for entries that matched some criteria specified by a search filter. Information can be requested from each entry that matches the criteria.

INTERNET EXCHANGE NAMING STYLE

The Internet Exchange Directory Server utilizes a standard naming style to organize the directory data. The standard naming style, which is based on the name hierarchy of the existing DNS infrastructure, recommends that the directory structure be based on the domain component of a

user's e-mail address. The DNS provides mapping between textual names (e.g. ima.net) and the IP address (e.g. 123.456.7.8) that the Internet uses behind the scene.

Directory entries in the Directory Server are organized using a DIT. The root of the DIT is represented by a special entry whose DN is called the directory suffix. The upper portions of a directory tree are constructed using the registered DNS names in combination with the "mail" and "dc" attributes to define the DN of each registered user. A domain name like "ima.net" can be constructed as "dc=ima, dc=net". All of the other sub-domains under "ima.net" can be named under this directory tree (e.g. dc=sales, dc=ima, dc=net). They represent the directory tree for the domain "sales.ima.net".

Example:

```
objectclass: ieperson
dn: mail=peterchan@ima.net, dc=ima, dc=net
mail: peterchan@ima.net
cn: Peter Chan
firstname: Peter
streetaddress: 107 Alfaro Street, Makati City
telephonenumber: 1234567
x-permission: SMTPC$Send/Receive
sn: Chan
othermailbox: SMTPC$peterchan@otherisp.net
```

In the above example, the record entry is represented by an objectclass attribute with value "ieperson". The first entry specifies the DN "mail=peterchan@ima.net, dc=ima, dc=net". The Internet mail address is "peterchan@ima.net" as defined by the attribute "mail". The CN is "Peter Chan" which is composed of the values "sn" (surname) and "firstname" attributes.

Internet Exchange uses the attribute "othermailbox" to define the mail routing for the different channels, such as CCMail, Notes, Local, SMTPC and BSMTTP. The format to specify the value of the "othermailbox" is composed of a string identifying the channel name, followed by a "\$" character and then the address defined in the corresponding channel. For example, the value "LOCAL\$peter@ima.net" specifies a LOCAL user (using the account in the Internet Exchange Message Store) with an account name "peter@ima.net". Multiple values can also be defined such that all incoming messages will be routed to multiple channels.

The character "\$" is used to separate the channel name and the mail address in the channel. The Message Switch uses this information to determine the channel that the message should be routed to.

DIRECTORY SCHEMA USED IN INTERNET EXCHANGE

The Directory Schema is a set of rules that defines the data that can be stored in the directory and how the client/server program should treat the information during directory operations. It also reduces the duplication of data and provides a well-documented, predictable way for directory-enabled applications to access and modify the collection of directory objects. Before the directory server can modify or store a new entry, the directory first checks the entry's contents against the schema rules. Whenever the client or server program compares two attribute values, it will consult the defined schema to determine the appropriate comparison algorithm to use.

The Directory Schema consists of an attribute type, attribute syntax and object class. Each attribute has a type and one or more values. The *attribute type* describes the kind of information contained in the attribute, and the value contains the actual data. For example, for the attribute

"cn", a possible value is "Peter Chan". The *attribute syntax* describes the types of data that may be placed in attribute values of that type. It also defines how the directory compares values when searching. The Internet Exchange Directory Server uses the "caseIgnoreString" syntax. This means that the case is not significant when searching or comparing values. Hence, when searching for a user named "Peter Chan", you may type in either "peter chan" or "PETER CHAN". The values "peter chan", "PETER CHAN" are equivalent to "Peter Chan". The *object classes* are used to group related information. Each directory entry belongs to one or more object classes. The names of the object classes to which an entry belongs to are always listed as values for a special multi-valued attribute called *object class*. It determines which attributes must be included in the entry. Internet Exchange defines several object classes, namely: *ieperson*, *iemessagestoreuser*, *iemessagestoreshared*, *ieconfig*, *ielist*, *ielistowner*, *ielistrequest* and *IEMachine*.

The following are the top level schema used in the Internet Exchange Directory Server:

- User Profile Information
- Message Store
- Mail Routing/Address Mapping
- Configuration
- Distribution List Manager
- IEMachine

User Profile Information

The profile information for an Internet Exchange user is stored in the directory. The attributes are defined by the objectclass "ieperson". These include the following attributes:

```
objectclass: ieperson
    requires
        objectclass,
        cn,
        firstname,
        mail
    allows
        sn,
        userpassword,
        othermailbox,
        telephonenumber,
        streetaddress,
        x-permission,
```

**Note: Please see the example found on page 6.*

- mail - specifies the e-mail address (e.g. peterchan@ima.net) of the user; it must be unique in the directory for it is also used to construct the DN of the user.
- cn - specifies the common name (e.g. Peter Chan) of the user. It is a combination of the "firstname" and "sn" attributes.
- firstname - specifies the first name of the user (e.g. Peter).
- sn - specifies the surname of the user (e.g. Chan).
- streetaddress - specifies the postal address of the user (e.g. 107 L.P. Leviste Street, Makati City).

- telephonenumber - specifies the telephone number of the user (e.g. 1234567).
- othermailbox - specifies the channel identifier and the channel connectors of the user. This is used for mail routing purposes (e.g. SMTPC\$peterchan@otherisp.net).
- x-permission - specifies the send/receive permission of the user in the specified channel (e.g. SMTPC\$Send/Receive).

Message Store

The user profile information for every Message Store user is stored in the directory database. This information includes the mail address, homedirectory, mailquota and sharedaccountlist. Objectclass "iemessagestoreuser" is used to define a Message Store user. The attributes are:

```
objectclass: iemessagestoreuser
mail: peterchan@ima.net
homedirectory: d:\ie41\msgstore\peterchan@ima.net
mailquota: 5Mb
sharedaccountlist: techsupport@ima.net
```

The objectclass "iemessagestoreuser" is a record type used to represent a Message Store user in the Internet Exchange.

The "homedirectory" defines the directory location where the mailbox folder for the message user will be stored (e.g. d:\ie41\msgstore\peterchan@ima.net). "Mailquota" defines the quota size (e.g. 5Mb) of the mailbox for the Message Store user. "Sharedaccountlist" specifies the Shared Message Store account (e.g. techsupport@ima.net) that this user has access to.

Internet Exchange also supports a Shared Message Store account, which is specified by the objectclass "iemessagestoreshared". The attributes are:

```
objectclass: iemessagestoreshared
mail: peterchan@ima.net
homedirectory: d:\ie41\msgstore\peterchan@ima.net
mailquota: 5Mb
```

Mail Routing/Address Mapping

Internet Exchange supports multiple channels that connect to different mail systems. These mail systems may use different naming conventions for mail addresses. A mechanism is required to support the address mapping between the Internet mail address and the corresponding address in the channel while providing the mail routing. The attribute "othermailbox" is used for this purpose. It specifies the channel and the mail address for the user in this channel. When a channel connector is created for a user, the value of the mail address in this channel and the channel name is stored in the attribute "othermailbox".

For example, if the user has two mailboxes with two different connectors say "LOCAL" and "ccMail", the values for the attribute "othermailbox" will be like:

```
othermailbox: LOCAL$peterchan@ima.net
othermailbox: ccMail$Peter Chan at PO
```

In the above example, the user has a LOCAL Message Store account "peterchan@ima.net" and a ccMail mailbox account "Peter Chan at PO".

Configuration

The Directory Server is also used to store the configuration information for the Preprocessor and MQAPI modules. The "cn" specifies the name of the modules--the Preprocessor and the MQAPI. The objectclass for both is "ieconfig", while the other attributes specify the configuration option. The attributes are:

```
objectclass: ieconfig
dn: cn=Preprocessor
localdomain: pattaya.ima.net, ima.net
cn: Preprocessor
defaultchannel: local
externalchannel: smtpc
postmaster: postmaster@pattaya.ima.net
notifybad: 1
dn: cn=MQAPI
mqserverallow: 202.75.0.70
objectclass: ieconfig
cn: MQAPI
mqserver: pattaya
mqlocalrootdir: c:\ie41\MsgQueue
mqremoterootdir: \\pattaya\mta
mqcredentials: root,"100fb7bd7ba015d92da650cd7ffbd90a11"
```

- localdomain - defines the Internet domain names (e.g. pattaya.ima.net, ima.net) recognized by the Internet Exchange as local.
- defaultchannel - defines the default local channel (e.g. local).
- externalchannel - defines the default external channel (e.g. SMTPC).
- postmaster - defines the e-mail address of the person that the Preprocessor will send a warning message when necessary.
- notifybad - specifies if the Preprocessor should notify the postmaster regarding the detection of corrupt messages. Possible values are:

0: Yes
1: No

In the above example, the value is set to "No" therefore, the Preprocessor will not notify the postmaster regarding the corruption of message.

- mqserverallow - specifies the list of IP addresses (e.g. 123.45.6.78) that are allowed to connect to the Message Queue (MQ) server.
- mqserver - specifies the NETBIOS name of the MQ server (e.g. pattaya).
- mqlocalrootdir - specifies the name of the local MQ directory (e.g. c:\ie41\MsgQueue). This is where the MQ database and the sub-directories for the message files are installed.
- mqremoterootdir - specifies the name of the remote MQ directory (e.g. \\pattaya\mta). This is the directory path where the message queue can be accessed remotely. For instance, if the MQ server is running on a machine named "pattaya", a connector on

machine named "pattaya2" can access the queued messages using this directory prefix.

- **mqcredentials** - stores the user/password information to access the MQ server (e.g. "root,'100fb7bd7ba015d92da650cd7ffbd90a11". This entry provides authentication information if the user accessing the MQ server is listed in the MQ user database.

Distribution List Manager

The DL Manager uses three different object classes to store the mailing list information, its list member and the list owner address. The object classes are: **ielist**, **ielistowner** and **ielistrequest**.

objectclass: ielist

The "ielist" object is used mainly to store the mailing list attributes used by the DL Manager. The attributes are:

```
objectclass: ielist
mail: maillist@ima.net
mode: 0
archive: 0
description: mailing list description
listmember: Immediate;peterchan@ima.net
subtxtpath: d:\iems41\dlmgr\mailinglist@ima.net\sub.txt
unsubtxtpath: d:\iems41\dlmgr\mailinglist@ima.net\unsub.txt
welcometxtpath: d:\iems41\dlmgr\mailinglist@ima.net\welcome.txt
disclaimertxtpath: d:\iems41\dlmgr\mailinglist@ima.net\disclaimer.txt
disclaimerhtmlpath: d:\iems41\dlmgr\mailinglist@ima.net\disclaimer.htm
frequency: 0
whichday: 0
maxdigestsize: 0
digestdelivertime: 30 minutes
invalidposting: 1
usemimedigest: 1
utosubscription: 0
postingpermission: 0
othermailbox: DL$mailinglist@ima.net
```

- **mail** - stores the e-mail address of the mailing list (e.g. `maillist@ima.net`).
- **mode** - indicates if non-list member is allowed to post messages to the mailing list. Possible values are:
 0: Yes
 1: No
- **archive** - indicates if the mail archive option is turned on or off. The possible values are:
 0: Yes
 1: No
- **description** - stores a short description (ASCII string) of the mailing list.
- **listmember** - stores each mailing list member, its mode (digest/immediate) and determines if the mailing list member is being blocked from posting messages.

Example:

```
listmember: Immediate;peterchan@ima.net
listmember: Digest;peterchan@ima.net
listmember: Immediate;blocked;spammer@ima.net
```

Since the mailing list can have more than one list member, multiple list member attributes can also be created.

- **subtxtpath** - stores the filename (e.g. d:\iems41\dlmgr\mailinglist@ima.net\sub.txt) of the content which is to be inserted whenever a subscription confirmation message is generated by the DL engine.
- **unsubtxtpath** - stores the filename (e.g. d:\iems41\dlmgr\mailinglist@ima.net\unsub.txt) of the content which is to be inserted whenever an unsubscription confirmation message is generated by the DL engine.
- **welcometxtpath** - stores the filename (e.g. d:\iems41\dlmgr\mailinglist@ima.net\welcome.txt) of the content which is to be inserted in the welcome message. The DL Manager sends a welcome message whenever a new member is successfully accepted to the mailing list.
- **disclaimertxtpath** - stores the filename (e.g. d:\iems41\dlmgr\mailinglist@ima.net\disclaimer.txt) of the content which is to be inserted to all the messages posted to the mailing list that is being forwarded to the list member. The file should be in ASCII format. The file is used whenever the message contains TEXT/PLAIN MIME body.
- **disclaimerhtmlpath** - stores the filename (e.g. d:\iems41\dlmgr\mailinglist@ima.net\disclaimer.htm) of the content which is to be inserted to all the messages posted to the mailing list which will then be forwarded to the list member. The file should be in HTML format. The file is used whenever the message contains TEXT/HTML MIME body.
- **frequency** - controls how often a message digest will be sent to members of the mailing list. The possible values are:
 - 0: Daily
 - 1: Weekly
 - 2: Monthly
- **whichday** - controls when a message digest will be generated. The message digest can be generated either weekly or monthly. The possible values are:
 - 0: 1-7 (for weekly)
 - 1: 1-31 (for monthly)
- **maxdigestsize** - controls the maximum size of the message digest. If the message digest exceeds the limit, the DL Manager will split the messages into smaller pieces. The possible values are:
 - 0: no limit

N: N is integer value in number of kilo byte

- `digestdelivertime` - controls the time when the message digest will be generated. The value is stored in hh:mm 24 hour notation.
- `invalidposting` - controls how the DL Manager should react to mail that is incorrectly posted to the mailing list.

Invalid posting includes:

- Non-list member posting a message to a closed list.
- A blocked member posting a message to a mailing list.

The possible values are:

0: Discard the message
 1: Bounce the message to the sender
 2: Forward the message to the list owner
 3: Bounce the message to the sender as well as forward the message to the list owner

- `usemimedigest` - controls if multipart/digest will be used for mail digest generation. The possible values are:

0: do not use multipart/digest
 1: use multipart/digest

- `autosubscription` - determines if it will allow people to subscribe and automatically be subscribed to the mailing list via e-mail. Possible values are:

0: Yes
 1: No

- `postingpermission` - controls when a new user will be accepted in the mailing list. The user will be blocked from sending by default. This is very useful for people who want to post announcement type of mailing lists so that limited people can post e-mail to it.

0: Allow
 1: Block

- `othermailbox` - this is used by the Preprocessor module for internal mail routing in the Internet Exchange system.

For DL, this should contain "othermailbox: DL\$mailinglist@ima.net" if the mailing list is called "mailinglist@ima.net". The prefix "\$" indicates that any mail sent to mailinglist@ima.net should be routed to the DL channel.

objectclass: ielistowner

The "ielistowner" class is used to store the mailing list's owner information and is used by the Preprocessor module for mail routing purposes. The attributes are:

```
objectclass: ielistowner
mail: maillist@ima.net
listowner: mailinglist-owner@ima.net
userpassword: password
```

```

maillist: maillist@ima.net
othermailbox: DL$maillinglist-owner@ima.net

```

- mail - stores the mailing list owner address. In Internet Exchange, whenever a new mailing list is created, the list owner address is created automatically.

For example if the mailing list is "maillist@ima.net", the list owner address will be "maillinglist-owner@ima.net".

The construction rule is to append "-owner" to the local part of the mailing list e-mail address.

- listowner - stores the e-mail address of the mailing list owner (e.g. maillinglist-owner@ima.net).

Whenever the DL receives a message addressed to the mailing list owner, that message will be forwarded to the e-mail address assigned in the "listowner" field.

- userpassword - stores the password (e.g. password) used by the mailing list owner to log on to the mailing list administration page.
- maillist - stores the name of the mailing list (e.g. maillist@ima.net) that the list owner address belongs to.
- othermailbox - this is used by the Preprocessor module for internal mail routing in the Internet Exchange system.

For DL, this should contain "othermailbox: DL\$maillinglist-owner@ima.net" if the mailing list owner is called "maillinglist-owner@ima.net".

objectclass: ielistrequest

The "ielistrequest" object stores the mailinglist-request address. The "-request" address is used by the DL for handling mailing subscription/unsubscription message. The Preprocessor also uses this object to handle internal mail routing. The attributes are:

```

objectclass: ielistrequest
mail: maillist-request@ima.net
othermailbox: DL$maillinglist-request@ima.net

```

Whenever a new mailing list is created, a "-request" will be created automatically. The construction rule is to append the "-request" portion to the local part of the mailing list's mail address. If the mailing list is "maillist@ima.net", the "-request" address will be "maillist-request@ima.net".

- mail - stores the e-mail address (e.g. maillist-request@ima.net).
- othermailbox - this is used by the Preprocessor for internal mail routing in the Internet Exchange system.

For DL, this should contain "othermailbox: DL\$maillinglist-request@ima.net".

IEMachine

It is possible to run the different components of Internet Exchange on multiple machines. The Internet Exchange system uses a special object class, "IEMachine", to record some of the

components/system information in the Directory Server so that the information can be shared easily across the machine's boundary. The attributes are:

```
objectclass: IEMachine
host: mail.ima.net
mailzone: local
webport: 80
modules: Preprocessor, LOGD, DL, SMTPC, SMTPD, MQRouter, BSMTMP
```

- host - stores the FQDN (Fully Qualified Domain Name) of the system where the Internet Exchange components are installed (e.g. mail.ima.net).
- mailzone - this is reserved for future development. Currently, the value of Mailzone is set to "local".
- webport - in each Internet Exchange installation, there will either be Apache or another web server running for administration purposes. Internet Exchange uses this field to record the TCP port number used by that web server. By default, port 80 is assigned.
- modules - records the modules/components being installed on that system (i.e., Preprocessor, LOGD, DL, SMTPC, SMTPD, MQRouter, BSMTMP).

The IEMachine is configured automatically during system installation and/or updates. The system administrator should not modify these values.

CONFIGURING THE INTERNET EXCHANGE DIRECTORY SERVER

Internet Exchange provides a separate web interface for the system administrator and end users in configuring the Directory Server. The system administrator can configure the module via the "System Administration" web interface, while the end users are provided with the "End User" page. To go to the "System Administration" web interface, the system administrator must click the **System Administration** button, while the end users must click the **End User** button (see **Figure 2** below).



Figure 2: Internet Exchange Main Web Interface

By using the web interface, the system administrator can perform the following functions:

- add new entries
- delete existing entries
- search for a particular entry
- modify existing entries

The end users, meanwhile, can perform the following functions:

- view existing entries
- edit/modify existing entries

Configuration Procedure for System Administrator

Before the system administrator can perform the above mentioned list operations, he must log in to the Internet Exchange main web configuration page. The system administrator login screen presents a username and password for authentication. Once the user is successfully logged in, the “System Administration” main web interface will appear. The top menu of the “System Administration” web interface displays the links of Internet Exchange modules. The system administrator must click on the LDAP link.

The “Directory Server” web interface will then appear where the system administrator can perform various list operations. The links on the left side of the “Directory Server” screen are composed of Find Users, Add Users, List Connectors and Browse Domain. If the system administrator will configure this page for the first time, he must first create a new user.

Creating a new user entry

1. Click the **Add Users** button on the left menu frame. The “New User” screen will be displayed (see **Figure 3** below).



Figure 3: Creating a new user

2. Type in the first name, last name, telephone number, current address and e-mail address of the user in their respective fields.
3. After entering all the required information, click the **Create User** button. The “User Details” screen (see **Figure 3** on page 15) displays the confirmation that you have successfully created a new user.

Note: You may delete users from the database, edit any and/or all of the user attributes; view, create and delete connectors; and create aliases through this page.

Editing an existing user entry

1. On the “User Details” screen (see **Figure 3** on page 15), click the **Edit** button. An “Edit User” screen for modifying user attributes will be displayed.
2. You may modify either the first name, last name, telephone number, address or mail (e-mail address) of the user.
3. After making the necessary changes, click the **Update** button to save the changes you have made.

Deleting an existing user entry

1. On the “User Details” screen (see **Figure 3** on page 15), click the **Delete** button. The “Delete User” page will be displayed.
2. Click the **Confirm** button to delete the user from the directory.

Creating connectors

1. On the “User Details” screen (see **Figure 3** on page 15), click the **View Connectors** button. The “View Connector” screen for viewing existing connectors will appear (see **Figure 4** on page 17). If you have already created a connector for the existing user/identifier, this page will display the existing connectors under the Connector column. Since you still have to

create a connector for the new user, click the **New** button. The “New Connector” screen will be displayed.

2. Select the channel to be added from the pull-down menu.
3. Type in the corresponding identifier. The identifier enables the directory server to identify the recipient to which a specific connector is assigned. The identifier to be used should be either an e-mail address, cc:Mail address, Notes address, or a Local Mail Delivery user's address.
4. Select the permission level—None, Send, Receive and Send/Receive—from the pull-down menu. Selecting None does not allow the user to receive and send messages. The Send permission allows the user to send messages, but is not allowed to receive messages. The Receive permission allows the user to receive messages, but is not allowed to send messages. The Send/Receive permission allows the user to send and receive messages.

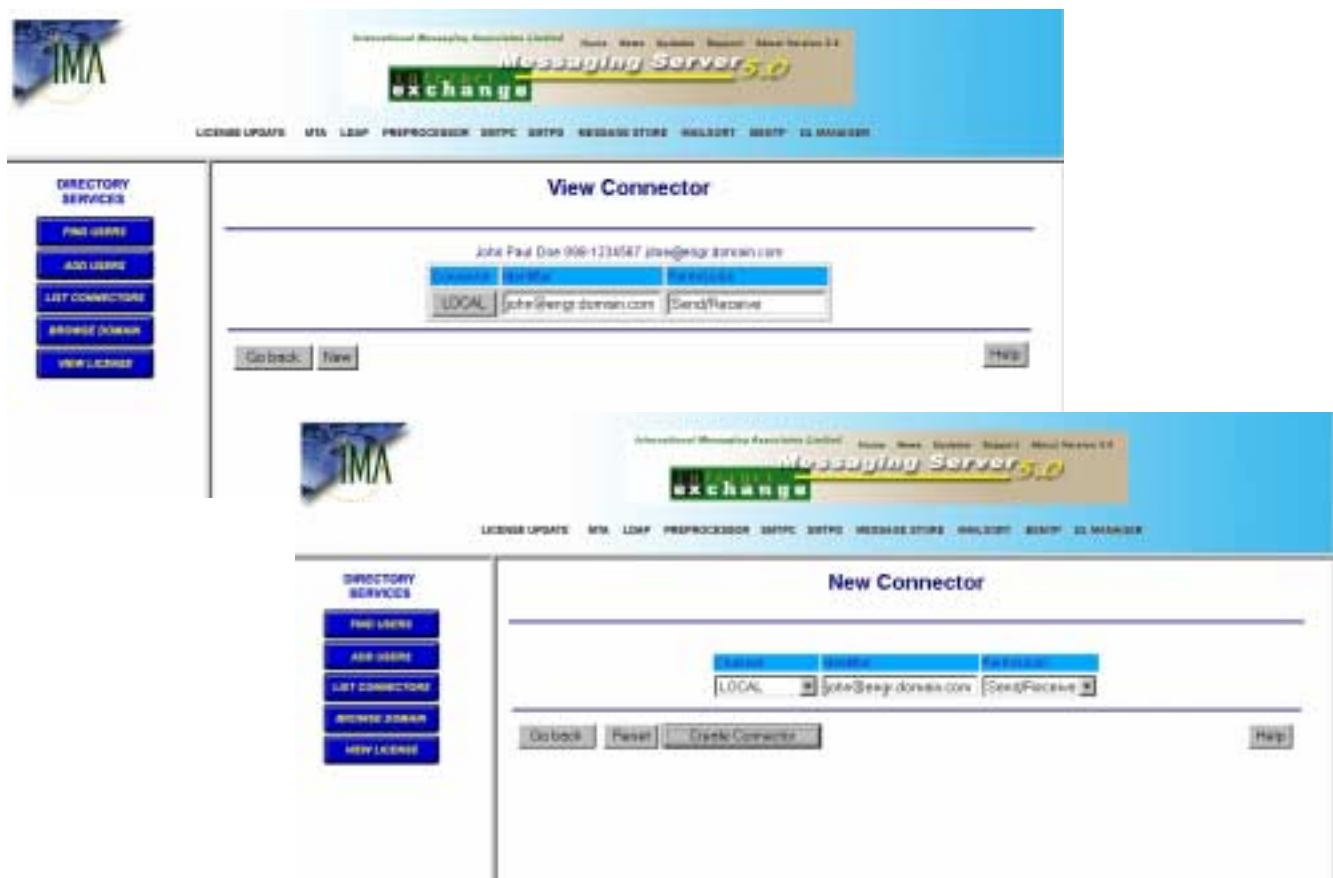


Figure 4: Viewing and creating a new connector

5. After selecting a connector for the user and specifying the connector's attributes, click the **Create Connector** button.

Note: You may delete the connector by clicking the **Delete** button below the Connector column. A connector information screen where you can either edit the entry or delete the entry from the database will appear.

Creating a mail alias

1. On the "User Details" screen (see **Figure 3** on page 15), click the **New Mail Alias** button. The "New Alias" screen will appear (see **Figure 5** on page 18).
2. Type in the new mail alias for the entry selected.
3. Click the **Add** button. This will serve as an e-mail alias address of the user who uses "jdoe@music.ima.com" as his e-mail address and at the same time uses "john@music.ima.com" as an alias.

If you already have an alias for a particular user, the E-mail Alias column will display the alias for that user. You may edit or delete the alias by clicking its link. A new screen for editing or deleting the alias will appear.



Figure 5: Creating a mail alias

Finding a user

1. Click the **Find Users** button on the left menu frame. The "Find User Menu" page will be displayed.
2. Type in the first name, last name, and e-mail address of the user to be searched for.
3. Tick the Include Distribution List Entries check box if you want to retrieve entries recorded in the directory server, including the distribution list entries. Leaving the check box blank will retrieve only entries recorded in the directory server, excluding the distribution list entries.

You may also use wildcards (asterisks*) in any and/or all of the text fields. Use of asterisks in all fields will display all the entries recorded in the database.

4. After entering all the parameters required, click the **Find** button. If the directory server finds a user whose attributes match those entered by the system administrator, a new screen displaying the list of user(s) will appear.
5. To view the attributes of the user, click the Last Name, First Name or Mail link. A screen displaying the user's details will appear.

Listing connectors

1. Click the **List Connectors** button on the left menu frame. The "List Connector" screen will appear (see **Figure 6** on page 19).
2. Select a connector from the pull-down menu.



Figure 6: A list of connectors

3. Type the identifier for the particular connector.
4. Click the **List** button to view the user(s) for that connector.
5. To view the attributes of the user, click the Last Name, First Name or Mail link. A screen displaying the user's details will appear.

Browsing domains

1. Click the **Browse Domain** button. A screen displaying the domains used (e.g. com) will appear (see **Figure 7** below).

In this example, the domain used is "com". A sub-domain of this domain will appear after clicking the "com" link (e.g. the domain is "com" and the sub-domain is "ima.com").



Figure 7: Browsing the domains

2. If you are using the “ima.com” domain, for instance, click the **Find users in ‘ima.com’** button. A screen showing the user(s) for the domain selected will be displayed.

Configuration Procedure for End Users

Before you can access any of the “End User” administration web interface, you must first log on to the end user interface. To do this, follow these steps:

1. Click the **End User** button (see **Figure 2** on page 14) in the main administration interface. The “Authentication Information” page will appear.
2. On the “Authentication Information” page (see **Figure 8** below), enter your username and password in their corresponding text boxes.
3. Click the **Log On** button. A screen that provides links to the Directory Server, Message Store and Distribution List will appear.



Figure 8: Authentication Information

Note: The username is the e-mail address (e.g. johndoe@ima.com) of the user as it is entered in the Message store or mailing list address (e.g. mailinglistname@ima.com) entered in the Distribution List Manager.

The password is a series of characters entered by the user in order for the system to verify that he is indeed the person with that username. The password appears on screen as a series of asterisks for security purposes.

4. To configure the Directory Server, click the **Directory Services** button to display the “Directory Server” page (see **Figure 9** below). The links on the left side of the screen are composed of View User and Log out.



Figure 9: End User Directory Server Main web interface

Viewing user profile

1. Click the View Users button. This option displays the “View User” page (see **Figure 10** on page 22), which discloses your current user profile.

Updating user profile

You can edit the telephone number and/or address attributes of your current user profile while viewing it. To do so, follow these steps:

1. On the “View User” page (see **Figure 10** on page 22), click the **Edit** button. This option displays the “Edit User” page.
2. On the “Edit User” page shown in **Figure 11**, modify the values of the attributes you wish to change. You can change the following parameters:

- Telephone number
- Address

Note: Only the administrator can change the “First Name”, “Last Name” and “Mail” (e-mail) attributes.

3. Click the **Update** button to save the new settings.

The screenshot shows the 'View User' page of the Messaging Server 5.0 administration console. The page has a blue header with the IMA logo and navigation links: Home, News, Updates, Support, About Version 5.0. Below the header is a navigation bar with 'LDAP', 'MESSAGE STORE', and 'DL MANAGER'. On the left, there is a sidebar with 'LDAP CONTROLS' and buttons for 'NEW USERS' and 'LOGOUT'. The main content area is titled 'View User' and displays a form for user details. The form fields are: First Name (John), Last Name (Doe), Telephone Number (1234567), Address (1234 Main St, Building, Emerald Avenue), and Mail (john@ima.com). At the bottom of the form are 'Go back' and 'Edit' buttons, and a 'Help' button is located at the bottom right of the page.

Figure 10: View User

The screenshot shows the 'Edit User' page of the Messaging Server 5.0 administration console. The page layout is identical to Figure 10, but the 'Edit User' title is present. The form fields are: First Name (John), Last Name (Doe), Telephone Number (99797634), Address (23 Sea Signal Building, Octagon Center), and Mail (john@ima.com). At the bottom of the form are 'Go back', 'Update', and 'Reset' buttons, and a 'Help' button is located at the bottom right of the page.

Figure 11: Edit User

Logging Out

To log out, click the **Log Out** button on the left menu frame.

Conclusion

The Internet Exchange Messaging Server features an LDAP-enabled Directory Server that holds a database of information, such as names, phone numbers, e-mail addresses and other information about the people in an organization. The Internet Exchange Directory Server uses a naming style and schema in organizing the information in the directory. It utilizes the standard naming style to organize the directory data. The schema used defines the data that can be stored in the directory and how the client/server program should treat the information during directory operations. Its client program constructs a request and sends it over the network to a computer running the directory server. The server receives the request, takes an appropriate action and returns the result back to the client.