White Paper: Cisco Unity Data and the Directory

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This document describes the Cisco Unity data that is stored in the directory and explains how this data is kept consistent with the SQL database on the Cisco Unity server. Included in this document are tables that map the Cisco Unity attributes to their corresponding Exchange 5.5 and Active Directory attributes.

Introduction

The architecture of Cisco Unity 3.x is significantly different from earlier versions of the product in that almost all of the information about subscriber accounts and other Cisco Unity objects is stored in a SQL database on the Cisco Unity server, rather than in the directory. However, a minimal amount of Cisco Unity information about subscribers, distribution lists, and locations is also still stored in the directory. For detailed information, see the following topics:

- About Subscribers, page 2
- About Distribution Lists, page 2
- About Locations, page 3

About Subscribers

Anyone who has an account on Cisco Unity is a subscriber. A subscriber is also an Active Directory user, and has an Exchange mailbox in which Cisco Unity stores voice messages. The user objects for subscribers in Active Directory or the Exchange 5.5 directory contain Cisco Unity-specific attributes (see Table 1 on page 10 and Table 4 on page 12).

In addition to regular subscriber accounts, Cisco Unity has a number of special subscriber accounts. An Internet subscriber is an Active Directory contact (or an Exchange 5.5 custom recipient), as are AMIS and Bridge subscribers. The contacts in Active Directory or the custom recipients in the Exchange 5.5 directory for Internet, AMIS, and Bridge subscribers contain Cisco Unity-specific attributes. Note the following specifics about these subscribers:

- Internet subscribers do not have mailboxes on the local Exchange network. Instead, voice messages for Internet subscribers are sent to an e-mail address that you specify when you create the Internet subscriber account.

- AMIS subscribers are individuals who use a voice messaging system other than Cisco Unity. They are Cisco Unity subscribers, but voice messages addressed to them are sent to their voice messaging system by using the AMIS analog protocol.

- Bridge subscribers are individuals who use an Octel voice messaging system. They are Cisco Unity subscribers, but voice messages addressed to them are sent to their voice messaging system by using the Cisco Unity Bridge. The Cisco Unity Bridge and Bridge subscribers are available beginning with the 3.1(3) release of Cisco Unity.

Unless you explicitly hide subscribers in Active Directory Users and Computers or in the Exchange 5.5 System Administrator, all subscribers (including Internet, AMIS, and Bridge subscribers) are listed in the Exchange address book. (Note however that the Cisco Unity Administrator provides a setting to hide Bridge subscribers from the address book.)

About Distribution Lists

A Cisco Unity public distribution list is an Active Directory group or an Exchange 5.5 distribution list that contains Cisco Unity-specific attributes (see Table 2 on page 10 and Table 5 on page 13).

Distribution lists can contain both subscribers and non-subscribers. When a voice message is sent to a distribution list, it is delivered as a voice message to the mailboxes of subscribers and as an e-mail with a WAV attachment to the mailboxes of non-subscribers. Distribution lists, like subscribers, appear in the Exchange address book unless you explicitly hide them.

About Locations

Locations are Cisco Unity-specific objects that are used in networking (see Table 3 on page 11 and Table 6 on page 14). There are two types of locations: primary locations and delivery locations.

Each Cisco Unity server is associated with one location object—referred to as the primary location—which is created during installation and which cannot be deleted. Each primary location contains the network information that identifies the Cisco Unity server to other Cisco Unity servers and other voice messaging systems.

A delivery location contains the network information that Cisco Unity needs to send messages to and receive messages from other voice messaging servers—which may or may not be Cisco Unity servers. You create a delivery location for each voice messaging server that the local Cisco Unity server will communicate with. The delivery location identifies the voice messaging system to Cisco Unity.

See the *Networking in Cisco Unity* guide for more information about networking in Cisco Unity. The *Networking in Cisco Unity* guide is available on Cisco.com at
http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/unity31/net/index.htm.

The Cisco Unity Database and the Directory

In versions of Cisco Unity prior to 3.x, all Cisco Unity data (except for recorded greetings) is stored in the directory. For small organizations where the Cisco Unity server is the only Exchange server, storing all the data in the directory works fine. However, storing all the Cisco Unity data in the directory proved to be

impractical for larger organizations. By using both the SQL database and the directory, Cisco Unity 3.x provides the groundwork for enhancements that benefit both large and small organizations.

See the following sections for more information:

The Cisco Unity Database

The Cisco Unity database is a Structured Query Language (SQL)-based, scalable, relational database. Depending on your configuration, the database that Cisco Unity uses is either Microsoft SQL Server 2000 or Microsoft Data Engine 2000 (MSDE 2000). (Note that the MSDE 2000 data engine is fully SQL Server compatible.)

Cisco Unity stores its data in a database called Unitydb. Unitydb contains tables for each type of Cisco Unity object. These tables contain all of the Cisco Unity objects that have been created on the local Cisco Unity server. Additionally, there are global tables that contain information about the subscriber accounts and locations that were created on other Cisco Unity servers. When subscriber accounts and location objects from other servers replicate in the directory, Cisco Unity detects these objects and saves information about them in the global tables.

You can use the standard database tools on the Cisco Unity server to run SQL queries on the Unitydb tables to view the data, but you should use the tools that Cisco Unity provides to modify the data. In particular, do not add or delete tables, and do not add or delete columns from the tables in the Unitydb.

Note that recorded voice names and greetings are stored in files on the Cisco Unity server and not in the SQL database.

Why the SQL Database Is Used

By storing its data in a SQL database rather than in the directory, Cisco Unity 3.x provides the following improvements:

- Performance—Because the SQL database is on the Cisco Unity server itself and because the database is heavily indexed, accessing data—including looking up subscriber extensions—is fast.

- Reliability—Because subscriber data is stored on the Cisco Unity server, Cisco Unity can answer calls, let outside callers look up subscriber extensions, and take messages when the Exchange network is down. (While the Exchange network is unavailable, messages are stored on the Cisco Unity server, and subscribers have access to those messages.)

- Scalability—SQL Server 2000 is designed to support the largest enterprise data processing systems, so there is more than enough room for storing the Cisco Unity data. MSDE is based on the same data engine as SQL Server. Although MSDE has storage limitations that SQL Server does not, it is more than adequate for the Cisco Unity configurations for which it is sold.

- Network Impact—Only a small subset of subscriber information needs to be stored in the directory, and that information does not change frequently. Therefore, directory replication caused by changes to Cisco Unity data is minimal after subscriber accounts have been created.

The Directory

Cisco Unity stores data in either the Exchange 5.5 directory or Active Directory. The directory that Cisco Unity uses for data storage depends on the Exchange server that is selected in the Cisco Unity Server Configuration Wizard during setup. In turn, the server that is selected depends on the nature of your Exchange network, as follows.

When your network consists only of Exchange 5.5 servers:

- The Exchange server that Cisco Unity is connected to must be an Exchange 5.5 server. You can choose to install Exchange 5.5 on the Cisco Unity server, or configure Cisco Unity to connect to an Exchange 5.5 server on your network.

- Cisco Unity stores data in the Exchange 5.5 directory.

When your network consists only of Exchange 2000 servers, or a mixture of Exchange 2000 and Exchange 5.5 servers:

- The Exchange server that Cisco Unity is connected to must be an Exchange 2000 server. You can choose to install Exchange 2000 on the Cisco Unity server, or configure Cisco Unity to connect to an Exchange 2000 server on your network.

- Cisco Unity stores data in Active Directory.

Why the Directory Is Used

Because there is a SQL database on the Cisco Unity server, it may not be clear why any Cisco Unity objects are stored in the directory. At first glance, it seems to add complexity, because of the need to keep two data stores synchronized. While this is a valid concern, there are three main reasons for storing information in the directory:

- To support unified messaging. See the "Supporting Unified Messaging" section on page 6.

- To support networking. See the "Supporting Networking" section on page 7.

- To provide flexible administration. See the "Flexible Administration" section on page 8.

Supporting Unified Messaging

Cisco Unity provides true unified messaging: voice messages are stored along with e-mail messages in the Exchange information store. Cisco Unity uses the Exchange message transfer agent to route voice messages to subscribers. Because of the reliance on Exchange, some information about subscribers and distribution lists must be stored in the directory to support unified messaging.

Cisco Unity needs access to Active Directory user account information and/or the associated Exchange mailboxes in order to:

- Authenticate subscribers when they log on to Cisco Unity.

- Provide the text-to-speech feature, allowing subscribers to have their e-mail messages read to them over the phone.

- Allow subscribers to use the same address book when addressing voice mails by using the phone that they use when addressing e-mails by using Outlook.

- Support ViewMail for Outlook, which allows subscribers to record and play voice messages within Outlook.

- Turn on and off message waiting indicators on subscriber phones.

Supporting Networking

In organizations with two or more Cisco Unity servers connected to a network, each Cisco Unity installation serves a distinct group of subscribers. In Cisco Unity, "networking" is the general term for messaging between Cisco Unity servers, and between Cisco Unity and other voice messaging systems. The term networking has a broad definition and encompasses the following ideas:

- Subscribers associated with one Cisco Unity server can use the phone to send voice messages to:

    – Subscribers associated with another Cisco Unity server.

    – Individuals with access to a computer connected to the Internet.

    – Individuals who use a voice messaging system other than Cisco Unity.

- Outside callers can find any subscriber in the directory and leave a voice message. Depending on the phone system and network configuration, outside callers who reach the Cisco Unity automated attendant or directory assistance can be transferred to any subscriber phone, even to the phone of a subscriber who is not associated with the local server.

By storing all the attributes for primary and delivery location objects in the directory, the addressing information that Cisco Unity needs for messaging between other Cisco Unity servers and other voice messaging systems replicates to all the Cisco Unity servers in the Active Directory forest or the Exchange 5.5 directory.

In order to address messages to subscribers associated with another Cisco Unity server, each server in the network needs access to some subscriber attributes such as the location the subscriber is associated with and the subscriber extension. These subscriber attributes (and others) are stored in the directory so that they replicate to all Cisco Unity servers on the network. Cisco Unity stores this replicated data in a table for global subscriber data in the SQL server.

Like other voice messaging systems, Cisco Unity allows subscribers to record their names. A subscriber must have a recorded name in order to be listed in Cisco Unity directory assistance. The recorded name is played when outside

callers use directory assistance to look up a subscriber extension by pressing keys on the phone to spell part of the recipient name ("For John Smith at extension 5512, press 1; for Jane Smith at extension 5591, press 2."). When subscribers use the phone to address messages, the recorded name is played so that the subscribers can confirm that the extension they entered is correct. To allow outside callers to look up any subscriber in directory assistance no matter which Cisco Unity server the subscriber is associated with, the recorded name must be stored in the directory so that it replicates to the other Cisco Unity servers. Similarly, to provide confirmation to subscribers when they address messages over the phone to subscribers on other Cisco Unity servers, the recorded name must be in the directory.

Flexible Administration

Because information is stored in the directory, Cisco Unity allows for flexible administration of subscribers and distribution lists. You can create subscriber accounts and distribution lists by using the Cisco Unity Administrator, which is a Web-based interface to all Cisco Unity data. When creating a subscriber, Internet subscriber, or distribution list, Cisco Unity creates the corresponding user, contact, and group automatically; it is not necessary to first create the directory objects by using the standard Microsoft tools.

In addition, if the directory objects already exist, they can be imported into Cisco Unity. For example, if your organization has an existing directory of Exchange users, then these users can be imported into Cisco Unity in bulk by using the Cisco Unity Import utility. When the user data is imported, the Cisco Unity-specific data is added to the user accounts. You can then use the Cisco Unity Administrator to view and modify the subscriber accounts as needed. (Note you can also use the Cisco Unity Administrator to import existing Exchange users one at a time.)

However, if you delete a subscriber, Internet subscriber, or distribution list in the Cisco Unity Administrator, for security reasons the objects are not deleted from the directory. Instead, only the Cisco Unity-specific attributes are deleted from the directory object. You can then use standard Microsoft tools to delete the directory object.

Because Cisco Unity synchronizes the information between the SQL database and the directory, if you make a change to a subscriber account in the Cisco Unity Administrator (such as changing the last name of the subscriber), this information is written to the directory. Similarly, if you change the last name of a user in

Active Directory Users and Computers, Cisco Unity detects the change and updates the SQL database. See the "About Synchronization" section on page 15 for more information.

The Cisco Unity Data in the Directory

The Cisco Unity data stored in Active Directory is the same as the data stored in the Exchange 5.5 directory. How Cisco Unity stores the objects and their attributes is quite different in each directory.

With the exception of the recorded voice name, the Cisco Unity-specific attributes added to subscriber accounts is small (approximately 1K or less). In general, the length of a recording for a voice name will be approximately 2 seconds. The size depends on the codec, and on the version of Cisco Unity used to make the recording. The size of recorded voice names in version 3.1(2) (and later) of Cisco Unity is smaller than in previous versions.

The size of both the Exchange 5.5 directory and Active Directory increases in stages. For example, when you create numerous subscriber accounts, the directory grows to accommodate the new data and provides room to grow. Subsequently, when you create additional subscriber accounts, the directory may not increase in size until a certain threshold is reached, and then the size of the directory jumps. In this way, space does not need to be allocated in the directory each time you add a subscriber.

For more information about the size impact of the Cisco Unity attributes and capacity planning for Cisco Unity, refer to the white paper, *Cisco Unity Active Directory Capacity Planning*, which will be available on Cisco.com in spring 2002.

- For details on the information stored in the Exchange 5.5 Directory, see the "Exchange 5.5 Directory" section on page 9.

- For details on the information stored in the Active Directory, see the "Active Directory" section on page 12.

Exchange 5.5 Directory

The schema for the Exchange 5.5 directory is not extensible like Active Directory is. However, there are four hidden Custom Attributes that applications may use. If you open the Exchange Administrator in "raw" mode (use the /r command line option to open in raw mode), you can look at a list of the attributes in the schema. This list includes Custom Attribute 11 through Custom Attribute 14.

Because the Custom Attributes are available to any application running on your network, you need to verify that none of them store data in the Custom Attributes that Cisco Unity uses. Cisco Unity checks to see if the Custom Attributes that it needs are in use before it creates a subscriber account or distribution list. If the Custom Attributes that it needs already contains data, then the creation fails, and Cisco Unity displays an error message.

Users and Custom Recipients

The Cisco Unity-specific attributes in Table 1 are added to Exchange 5.5 users and custom recipients. Specifically, the mail-recipient and mailbox object classes are used to store data for regular subscribers, and the remote-address object class is used to store data for Internet, AMIS, and Bridge subscribers.

Table 1   User and Custom Recipient Attributes in Exchange 5.5

Cisco Unity Attribute	Exchange 5.5 Attribute (LDAP Name)
Alternate Extensions	Voice-Mail-Greetings
AMIS Disable Outbound	Voice-Mail-Speed
Extension	Voice-Mail-User-ID
List In Phone Directory	Voice-Mail-Flags
Call Transfer String	Extension-Attribute-14
Location Object ID	Extension-Attribute-12
Recorded Voice Name	Voice-Mail-Recorded-Name
Object Type	ObjectClass

For regular and Internet subscribers, the Location Dial ID is the Dial ID of the primary location. For AMIS and Bridge subscribers, the Location Dial ID is the Dial ID of the delivery location with which the subscribers are associated.

Distribution Lists

The Cisco Unity-specific attributes in Table 2 are added to Exchange 5.5 distribution lists.

Table 2   Distribution List Attributes in Exchange 5.5

Cisco Unity Attribute	Exchange 5.5 Attribute (LDAP Name)
Extension	Voice-Mail-User-ID
Location Object ID	Extension-Attribute-12
Voice Enabled	Voice-Mail-Speed
Alias	uid
Recorded Voice Name	Voice-Mail-Recorded-Name
Object Type	ObjectClass

Location Objects

Locations are Cisco Unity-specific objects. Because additional object classes cannot be added to the Exchange 5.5 schema, an existing Exchange 5.5 object class is used to store data for location objects. Specifically, the Exchange 5.5 person object class is used to store information about locations, and in some cases, more than one Cisco Unity attribute is added to one Exchange 5.5 attribute. Table 3 shows the attributes for location objects.

Table 3   Location Object Attributes in Exchange 5.5

Cisco Unity Attribute	Exchange 5.5 Attribute (LDAP Name)
Addressing Max Scope	Voice-Mail-Speed
Allow Blind Addressing	Extension-Attribute-1
AMIS Delivery Phone Number	Extension-Attribute-5
AMIS Node Active	Voice-Mail-Password

Table 3   Location Object Attributes in Exchange 5.5

Cisco Unity Attribute	Exchange 5.5 Attribute (LDAP Name)
AMIS Node ID	Extension-Attribute-14
Blind Addressing Max Scope	Voice-Mail-Recording-Length
Destination Type	Extension-Attribute-2
Dialing Domain Name	Extension-Attribute-5
Dial ID	Voice-Mail-User-ID
SMTP Domain	mail
Location Object ID	Extension-Attribute-12
System ID	Extension-Attribute-3
Undeletable	Extension-Attribute-4
Display Name	Admin-Description
Directory ID	distinguishedName
Recorded Voice Name	Voice-Mail-Recorded-Name
Home Server	Extension-Attribute-6
Alias	uid
Object Changed ID	USN_Changed

For Cisco Unity installations that will be using the Cisco Unity Bridge, the
location object will also store a node ID and server address for the Bridge.

Active Directory

The Active Directory schema can be extended to store application-specific data.
Active Directory supports the use of LDAP Data Interchange Format (LDIF)
scripts to extend the schema. Before installing Cisco Unity 3.x for use with
Exchange 2000, you must run a script that makes the Cisco Unity-specific
modifications to the Active Directory schema. The LDIF script with the
Cisco Unity schema extensions is located on the Cisco Unity compact disc 1 in
the file Schema\LdifScripts\avdirmonex2k.ldf.

Users and Contacts

The Cisco Unity-specific attributes in Table 4 are added to Active Directory users and contacts.

Table 4   User and Contact Attributes in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Alternate Extensions	ciscoEcsbuAlternateDtmfIds
AMIS Disable Outbound	ciscoEcsbuAmisDisableOutbound
Extension	ciscoEcsbuDtmfId
List In Phone Directory	ciscoEcsbuListInUMDirectory
Call Transfer String	ciscoEcsbuTransferId
Location Object ID	ciscoEcsbuUMLocationObjectId
Undeletable	ciscoEcsbuUndeletable
Recorded Voice Name	msExchRecordedName
Object Type	ciscoEcsbuObjectType

For regular and Internet subscribers, the Location Dial ID is the Dial ID of the primary location. For AMIS and Bridge subscribers, the Location Dial ID is the Dial ID of the delivery location with which the subscribers are associated.

Distribution Lists

The Cisco Unity-specific attributes in Table 5 are added to Active Directory groups.

Table 5   Distribution List Attributes in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Extension	ciscoEcsbuDtmfId
Location Object ID	ciscoEcsbuUMLocationObjectId
Undeleteable	ciscoEcsbuUndeletable
Voice Enabled	ciscoEcsbuVoiceEnabled

Table 5   Distribution List Attributes in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Alias	mailNickname
Recorded Voice Name	msExchRecordedName
Object Type	ciscoEcsbuObjectType

Location Objects

Table 6 shows the attributes for location objects in Active Directory.

Table 6   Location Object Attributes in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Addressing Max Scope	ciscoEcsbuAddressingMaxScope
Allow Blind Addressing	ciscoEcsbuAllowBlindAddressing
AMIS Delivery Phone Number	ciscoEcsbuAmisDialId
AMIS Node Active	ciscoEcsbuAmisNodeActive
AMIS Node ID	ciscoEcsbuAmisNodeId
Blind Addressing Max Scope	ciscoEcsbuBlindAddressingMaxScope
Destination Type	ciscoEcsbuDestinationType
Dialing Domain Name	ciscoEcsbuDialingDomainName
Location Dial ID	ciscoEcsbuDtmfId
Include Locations	ciscoEcsbuIncludeLocations
SMTP Domain	ciscoEcsbuUMDomain
Domain ID	ciscoEcsbuUMDomainId
Location Object ID	ciscoEcsbuUMLocationObjectId
System ID	ciscoEcsbuUMSystemId
Schema Version	ciscoEcsbuUMSchemaVersion
Undeletable	ciscoEcsbuUndeletable
Display Name	displayName
Alias	ciscoEcsbuDirectoryAlias

Table 6   Location Object Attributes in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Recorded Voice Name	msExchRecordedName
Object Type	ciscoEcsbuObjectType
Home Server	ciscoEcsbuUMServer

For Cisco Unity installations that will be using the Cisco Unity Bridge, the location object will also store a node ID and server address for the Bridge. These schema modifications are in the script omnigateway.ldf.

About Synchronization

Cisco Unity includes directory monitors that keep the Cisco Unity objects in the directory synchronized with the SQL database on the Cisco Unity server. In addition to monitoring the directory for changes, the monitors also work in the other direction, and write changed information from Cisco Unity to the directory.

There are separate directory monitors for Active Directory and for Exchange 5.5. For Active Directory, there are two monitors: one monitors changes to Cisco Unity objects associated with the local server, and the other monitors the Active Directory global catalog for changes to Cisco Unity objects associated with other servers.

See the following sections for more detailed information about synchronization:

Updates to the Directory Are Synchronous

Changes to subscriber accounts, distribution lists, and location objects made by using the Cisco Unity Administrator (or another Cisco Unity application) are written to the directory when the change occurs, so that both the SQL database and the directory remain consistent, as Figure 1 illustrates.

The changes made to the directory depend on the action in the Cisco Unity application: create, import, modify, or delete.

- **Create**—When subscriber accounts, distribution lists, and location objects are created, the objects are written to both the SQL database and the directory. The objects in the directory include Cisco Unity-specific attributes.

- **Import**—When subscriber accounts and distribution lists are created by importing existing directory objects, the objects are written to the SQL database, and the Cisco Unity-specific attributes are written to the directory objects.

- **Modify**—When a subscriber account, distribution list, or location object is modified by using a Cisco Unity application, the updated information is written to both the SQL database and the directory.

- **Delete**—When subscriber accounts and distribution lists are deleted by using the Cisco Unity Administrator, the objects are deleted from the SQL database, and the Cisco Unity-specific attributes are deleted from the directory objects. You then use standard Microsoft tools to delete the directory objects.

  When location objects are deleted by using the Cisco Unity Administrator, the location objects are deleted from both the SQL database and the directory.

Figure 1   Updates to the Directory Are Synchronous
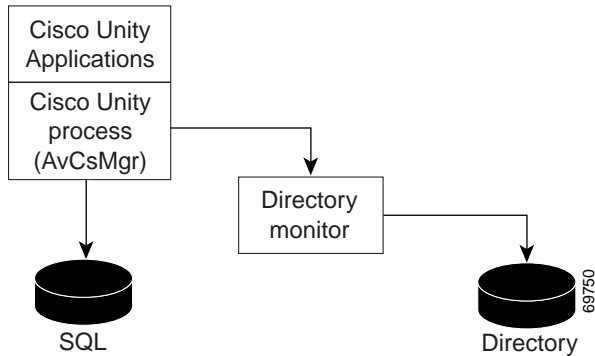
Updates to the SQL Database Are Asynchronous

Every few minutes the directory monitor polls for new, changed, and deleted objects and then queues the detected changes. The changed information is pulled from the queue and written to the SQL database. Figure 2 illustrates this process.

Figure 2   Updates to the SQL Database Are Asynchronous
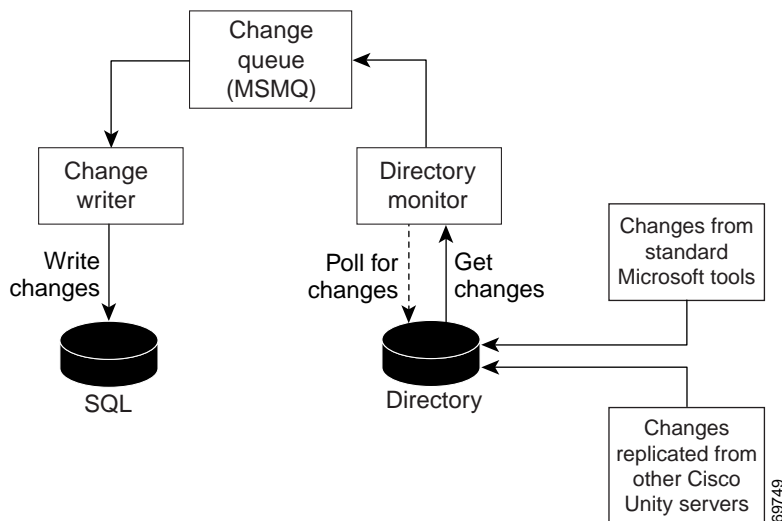
Exchange 5.5 Directory Monitor

The Exchange 5.5 directory monitor, AvDSEx55.exe, runs as a service on the Cisco Unity server. Polling is done at regular, configurable intervals; the default is every ten minutes. The directory monitor queries the directory to filter out all non-Cisco Unity objects. By comparing the universal sequence number (USN) from the last polling to the USN of each object, the query filters out all the objects that have not changed since the last polling.

When a change is detected, the monitor sends a notification by using Microsoft Message Queuing (MSMQ). The notification specifies whether the object has been changed or deleted. The notification includes the value of each object property that is used by Cisco Unity. In case of conflict, changes to an object made by using the Cisco Unity Administrator take precedence over changes detected in the directory.

By default, the directory monitor looks for changes from the site level down, but you can configure the directory monitor to look for changes in the entire Exchange organization if you have Cisco Unity servers installed in different sites.

Subscriber Attributes that Are Synchronized

The directory monitor keeps the subscriber attributes shown in Table 7 synchronized. The Cisco Unity-specific attributes are in bold.

Table 7   Subscriber Attributes Synchronized in Exchange 5.5

Cisco Unity Attribute	Exchange Attribute (LDAP Name)
Alias	uid
First Name	givenName
Last Name	sn
Display Name	cn
Primary Fax Number	facsimileTelephoneNumber
SMTP Address	mail
Object Changed ID	USN-Changed
Directory ID	distinguishedName
Location Object ID	**Extension-Attribute-12**

Table 7   Subscriber Attributes Synchronized in Exchange 5.5

Cisco Unity Attribute	Exchange Attribute (LDAP Name)
Extension	**Voice-Mail-User-ID**
Mailbox ID	distinguishedName
Mail Server	Obtained from Home-MDB
Address Type	Obtained from Target-Address
Voice Name Data	**Voice-Mail-Recorded-Name**
Transfer String	**Extension-Attribute-14**
SID	Assoc-NT-Account
E-mail Address	distinguishedName
AMIS Disable Outbound	**Voice-Mail-Speed**
Alternate Extensions	**Voice-Mail-Greeting**s
List In Directory	**Voice-Mail-Flags**
Distinguished Name	distinguishedName
Remote Address	Target-Address
Mail Database	Home-MDB
Mailbox Warning Limit	MDB-Storage-Quota
Mailbox Send Limit	MDB-Over-Quota-Limit
Mailbox Send/Receive Limit	DXA-Task
Mailbox Use Default Limits	MDB-Use-Defaults

Distribution List Attributes that Are Synchronized

The directory monitor keeps the distribution list attributes shown in Table 8 synchronized. The Cisco Unity-specific attributes are in bold.

Table 8   Distribution List Attributes Synchronized in Exchange 5.5

Cisco Unity Attribute	Exchange Attribute (LDAP Name)
Alias	uid
Display Name	cn

Table 8   Distribution List Attributes Synchronized in Exchange 5.5

Cisco Unity Attribute	Exchange Attribute (LDAP Name)
DTMF Dlist ID (Extension)	**Voice-Mail-User-ID**
SMTP Address	mail
Directory ID	distinguishedName
Object Changed ID	USN-Changed
Voice Name Data	**Voice-Mail-Recorded-Name**
Distinguished Name	distinguishedName
E-mail Address	distinguishedName
Voice Enabled	**Voice-Mail-Speed**
Location Object ID	**Extension-Attribute-12**

Location Attributes that Are Synchronized

All location attributes are synchronized. See for a list of location object attributes.

Active Directory Monitors

The Active Directory monitors run as services on the Cisco Unity server. Both Active Directory domain controller (DC) databases and global catalog (GC) databases are polled for changes. There are two monitors:

- AvDSAD.exe—Monitors Active Directory for the domains that contain Cisco Unity objects. AvDSAD.exe looks for changes to objects associated with the local Cisco Unity server. Polling is done at regular, configurable intervals; the default is every two minutes.

- AvDSGlobalCatalog.exe—Monitors the Active Directory global catalog. AvDSGlobalCatalog.exe looks for changes to objects associated with other Cisco Unity servers in the network. Polling is done at regular, configurable intervals; the default is every fifteen minutes. AvDSGlobalCatalog.exe writes information to the global tables in the SQL database.

Changes to Active Directory objects that are in the same domain as the Cisco Unity server will be reflected in Cisco Unity within the two-minute polling interval. In order for changes to objects associated with other Cisco Unity servers to be reflected, the changes first have to be replicated to the Active Directory global catalog, and then the monitor can detect the changes. The time that it takes for changes to be reflected in the global catalog depends upon your network configuration and replication schedule.

The monitors query the DC and GC databases to filter out all non-Cisco Unity objects. The query then filters out all objects that have not changed since the last time polling was done. The monitors use the universal sequence number (USN) of each object to determine whether the object has changed since the last polling.

When a change is detected, the monitor sends a notification by using Microsoft Message Queue (MSMQ). The notification specifies whether the object has been changed or deleted, and whether the change has been detected in the DC or in the GC. The notification includes the value of each object property that is used by Cisco Unity. In case of conflict, changes to an object made by using the Cisco Unity Administrator take precedence over changes detected in Active Directory.

The monitor uses a table called ADMonitorDirObjsList in the SQL database that associates each object used by Cisco Unity with the domain in which it resides. Additionally, the monitor uses a table called ADMonitorDistributionListMember in the SQL database that associates each distribution list used by Cisco Unity with the members of the list.

Subscriber Attributes that Are Synchronized

The directory monitor keeps the subscriber attributes shown in Table 9 synchronized. The Cisco Unity-specific attributes begin with the letters "ciscoEcsbu," except for msExchRecordedName, and are in bold.

Table 9   Subscriber Attributes Synchronized in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Alias	mailNickName
First Name	givenName
Last Name	surName
Display Name	displayName

Table 9   Subscriber Attributes Synchronized in Active Directory (continued)

Cisco Unity Attribute	Active Directory Attribute
Primary Fax Number	facsimileTelephoneNumber
SMTP Address	Mail
Object Changed ID	uSNChanged
Directory ID	objectGUID
Location Object ID	**ciscoEcsbuUMLocationObjectId**
Extension	**ciscoEcsbuDtmfId**
Mailbox ID	LegacyExchangeDN
Recorded Voice Name	**msExchRecordedName**
Call Transfer String	**ciscoEcsbuTransferId**
SID	objectSid
E-mail Address	Mail
AMIS Disable Outbound	**ciscoEcsbuAmisDisableOutbound**
Alternate Extensions	**ciscoEcsbuAlternateDTMFIds**
List in Directory	**ciscoEcsbuListInUMDirectory**
SID History	SIDHistory
Remote Address	targetAddress
Mail Database	homeMDB
Mailbox Warning Limit	mDBStorageQuota
Mailbox Send Limit	mDBOverQuotaLimit
Mailbox Send Receive Limit	mDBOverHardQuotaLimit
Mailbox Use Default Limits	mDBUseDefaults

Distribution List Attributes that Are Synchronized

The directory monitor keeps the distribution list attributes shown in Table 10 synchronized. The Cisco Unity-specific attributes are in bold.

Table 10   Distribution List Attributes Synchronized in Active Directory

Cisco Unity Attribute	Active Directory Attribute
Alias	**mailNickName**
Display Name	displayName
Recorded Voice Name	**msExchRecordedName**
DTMF Dlist ID	**ciscoEcsbuDtmfId**
SMTP Address	mail
Directory ID	objectGUID
Object Changed ID	uSNChanged
Location Object ID	**ciscoEcsbuUMLocationObjectId**
E-mail Address	legacyExchangeDN
Cisco Unity or E-Mail List	**ciscoEcsbuVoiceEnabled**

Location Attributes that Are Synchronized

All attributes for location objects are synchronized. For a list of the location object attributes, see Table 6 on page 14.