



White Paper: Active Directory Capacity Planning (Cisco Unity Version 5.x and Later with Microsoft Exchange)

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Purpose

This document provides capacity planning recommendations for using Cisco Unity version 5.x and later with Active Directory. It also includes sizing information for Active Directory objects when they have been voice enabled by Cisco Unity. It covers additional schema extensions for voice mail networking, and how they affect the directory. Finally, it discusses the impact that the Cisco Unity Permissions wizard can have on the directory size.

Audience

This document is written for anyone who is responsible for designing, deploying, or managing Active Directory in conjunction with Cisco Unity.

Overview: Capacity Planning

In order to plan how much capacity you need for your Active Directory installation for Cisco Unity, consider the following:

- Cisco Unity requires a schema extension in Active Directory.
- Cisco Unity makes use of both domain controller and global catalog (DC/GC) servers in a way similar to Exchange.
- The Active Directory forest and domain needs to be prepared with Exchange schema extensions before extending the schema for Cisco Unity.



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- There may be a slight increase in the size of the Active Directory database (Ntds.dit) when the Cisco Unity schema extensions are added.
- The increase in the Active Directory database size when Cisco Unity starts using it occurs over a period of time, depending on the type of installation and migration performed. See the [“Size Impact of Cisco Unity” section on page 7](#) for more information.
- The user object is the most affected Active Directory object.
- If you are using Internet subscribers or any of the Cisco Unity voice mail interoperability features (AMIS, VPIM, or the Cisco Unity Bridge), the contact object may also be affected.
- The type of system codec used by Cisco Unity affects the size of each recorded name stored in Active Directory.
- When you extend the schema for Cisco Unity, a Cisco Unity-specific property set is added to the schema for permissions.
- When you run the Cisco Unity Permissions wizard, Cisco Unity creates a set of Access Control Entries (ACEs) in Active Directory for the installation, directory services, and message store services accounts. The size impact of these ACEs depends on whether the Active Directory domain controllers used by Cisco Unity are running Microsoft Windows 2000 Server or Windows Server 2003.

**Caution**

If the forest that contains the Cisco Unity server includes any domain controllers running Windows 2000 Server, running Permissions wizard may cause the Active Directory database on those servers to grow to twice or more the current size. For more information, see the [“Size Impact of the Permissions Required by Cisco Unity” section on page 7](#).

See the following sections for more information:

- [Active Directory Objects Used by Cisco Unity, page 2](#)
- [Default Average Size of the Cisco Unity Schema, page 7](#)
- [Size Impact of Cisco Unity, page 7](#)
- [Size Impact of the Permissions Required by Cisco Unity, page 7](#)
- [Average Size of Objects After Import into Cisco Unity, page 10](#)
- [Calculating the Size Impact, page 14](#)
- [Other Cisco Unity Schemas, page 15](#)

Active Directory Objects Used by Cisco Unity

Cisco Unity extends three existing Active Directory schema classes: [User](#), [Group](#), and [Contact](#). During the schema extension process, Cisco Unity-specific attributes are assigned to these classes. In addition, a new class is created in the schema, called the [Unity Location](#). Cisco Unity also adds a new property set to the schema, called [ciscoEcsbuUnityInformation Property Set](#).

**Note**

The Cisco Unity base schema includes the necessary attributes to make a Cisco Unity subscriber from a mailbox-enabled User. It also includes attributes that provide additional functionality used for Cisco Unity features such as Digital Networking. If this added functionality is not used, the attributes will not be populated with any values, and therefore do not need to be counted when determining the actual size increase that Cisco Unity attributes will have on the User object in Active Directory.

The following tables—[Table 1](#), [Table 2](#), [Table 3](#), and [Table 4](#)—display information about the Cisco Unity attributes and the maximum and nominal sizes of each attribute. The information contained in each column is defined as follows:

Attribute Name—Shows the displayed name of the attribute in Active Directory.

Variable or Static Length—States whether the attribute is a fixed length (static) or variable length (variable).

Maximum Size—Defines the maximum size of the attribute. Note that the values specified for maximum size use a multiplier because the attributes are stored in Active Directory as Unicode strings. Unicode strings are necessary for multilingual support.

Nominal Size—Defines the average size of the attribute. The nominal size is typically much smaller than the maximum size. For variable length attributes, the nominal size can be calculated by determining the total number of digits or characters in the field, and multiplying by two (because the values are stored in Active Directory as Unicode strings).

User

When an existing mailbox is imported as a Cisco Unity subscriber, the Cisco Unity-specific attributes are populated onto the User object.

[Table 1](#) shows the new Cisco Unity-specific attributes assigned to the User object.

Table 1 Cisco Unity User Attributes

Attribute Name	Variable or Static Length	Maximum Size	Nominal Size
ciscoEcsbuAlternateDtmfIds ¹	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuDtmfId	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuListInUMDirectory	Static	4 Bytes	4 Bytes
ciscoEcsbuTransferId ²	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuUMLocationObjectId	Static	64 Bytes	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes	4 Bytes
msExchRecordedName	Variable	1.3 x the size of the WAV file	Average recorded name is about 2 seconds
ciscoEcsbuObjectType	Static	4 Bytes	4 Bytes
ciscoEcsbuAmisDisableOutbound	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuAlternateDtmfIdsOrder	Static	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributes	Static ³	24 Bytes	24 Bytes
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use	Reserved for future use

1. This attribute is not populated when a subscriber is created; it is used to provide added functionality.

2. This attribute is not populated when a subscriber is created; it is used to provide added functionality.

3. Additional data may be stored in this attribute in future versions of Cisco Unity, but currently, the size is static.

Group

The Group object is used by Cisco Unity to allow subscribers to address messages to groups of subscribers by using the phone. The only type of Active Directory Group used is Distribution Group, because it is the Exchange-specific group type. During installation, Cisco Unity creates three Groups, which are used by the Cisco Unity system and by subscribers.

For more information on distribution lists, see the “Managing Distribution Lists” chapter in the *System Administration Guide for Cisco Unity*, at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_maintenance_guides_list.html.

Table 2 shows the Cisco Unity-specific attributes assigned to the Group object.

Table 2 Cisco Unity Group Attributes

Attribute Name	Variable or Static Length	Maximum Size	Nominal Size
ciscoEcsbuDtmfId	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuUMLocationObjectId	Static	64 Bytes	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes	4 Bytes
ciscoEcsbuVoiceEnabled	Static	4 Bytes	4 Bytes
mailNickname	Variable	64 Bytes	Total number of characters x 2
msExchRecordedName	Variable	1.3 x the size of the WAV file	Average recorded name is about 2 seconds
ciscoEcsbuObjectType	Static	4 Bytes	4 Bytes
ciscoEcsbuUnityAttributes	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use	Reserved for future use

Contact

The Contact object is used by Cisco Unity to create Internet subscribers or to create other voice mail specific subscribers, such as AMIS, Cisco Unity Bridge, or VPIM subscribers. Internet and Trusted Internet subscribers—which are not used in every Cisco Unity installation—can receive messages like other subscribers do; however, they do not have mailboxes on the Exchange server. The size of the Cisco Unity schema does not affect the Contact object, unless you import existing contacts as Internet or Trusted Internet subscribers. The base Cisco Unity schema will support Internet, Trusted Internet, and AMIS subscribers only. In order to use the VPIM and Cisco Unity Bridge voice mail interoperability features, it is necessary to use a specific voice mail interoperability LDF file to extend the schema (for more information, see the “Other Cisco Unity Schemas” section on page 15).

Table 3 shows the Cisco Unity-specific attributes for the Contact object.

Table 3 Cisco Unity Contact Attributes

Attribute Name	Variable or Static Length	Maximum Size	Nominal Size
ciscoEcsbuAlternateDtmfIds ¹	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuAmisDisableOutbound	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuDtmfId	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuListInUMDirectory	Static	4 Bytes	4 Bytes
ciscoEcsbuTransferId ²	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuUMLocationObjectId	Static	64 Bytes	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes	4 Bytes
msExchRecordedName	Variable	1.3 x the size of the WAV file	Average recorded name is about 2 seconds
ciscoEcsbuObjectType	Static	4 Bytes	4 Bytes
ciscoEcsbuAlternateDtmfIdsOrder	Static	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributes	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use	Reserved for future use

1. This attribute is not populated when a subscriber is created; it is used to provide added functionality.

2. This attribute is not populated when a subscriber is created; it is used to provide added functionality.

Unity Location

During the schema extension, a new class is created in the schema called the Unity Location. For each installation of Cisco Unity, a single location is created to identify the Cisco Unity server and the subscribers associated with it. Other locations can be created by using the Cisco Unity Administrator. The location is also used to allow subscribers to address and receive messages to and from subscribers on other Cisco Unity servers on the network. For more information about the Cisco Unity Digital Networking feature and locations, see the *Networking Guide for Cisco Unity*, at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_feature_guides_list.html.

The Unity Location consists of common or existing Active Directory schema attributes and Cisco Unity-specific schema attributes. In order to view the existing Active Directory schema used by the location, use LDP or ADSIEdit. Note that the existing Active Directory attributes used by the Unity Location were intentionally omitted from Table 4 as they are not a significant factor in the overall size of the object.

Table 4 shows the Unity Location object and its attributes.

Table 4 Unity Location Attributes (cisco-Ecsbu-UM-Location)

Attribute Name	Variable or Static Length	Maximum Size	Nominal Size
ciscoEcsbuAddressingMaxScope	Static	4 Bytes	4 Bytes
ciscoEcsbuAllowBlindAddressing	Static	4 Bytes	4 Bytes
ciscoEcsbuAmisDialId	Variable	40 Bytes x 2	Total number of digits x 2

Table 4 Unity Location Attributes (*cisco-Ecsbu-UM-Location*) (continued)

Attribute Name	Variable or Static Length	Maximum Size	Nominal Size
ciscoEcsbuAmisNodeActive	Static	4 Bytes	4 Bytes
ciscoEcsbuAmisNodeId	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuBlindAddressingMaxScope	Static	4 Bytes	4 Bytes
ciscoEcsbuDestinationType	Static	4 Bytes	4 Bytes
ciscoEcsbuDialingDomainName	Variable	40 Bytes x 2	Total number of characters x 2
ciscoEcsbuDtmfId	Variable	40 Bytes x 2	Total number of digits x 2
ciscoEcsbuIncludeLocations	Static	4 Bytes	4 Bytes
ciscoEcsbuUMDomain	Variable	64 Bytes	Total number of characters x 2
ciscoEcsbuUMLocationObjectId	Static	64 Bytes	64 Bytes
ciscoEcsbuUMSystemId	Static	4 Bytes	4 Bytes
ciscoEcsbuUMSchemaVersion	Static	4 Bytes	4 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes	4 Bytes
displayName	Static	128 Bytes x 2	128 Bytes x 2
ciscoEcsbuDirectoryAlias	Static	64 Bytes	64 Bytes
msExchRecordedName	Variable	1.3 x the size of the WAV file	Average recorded name is about 2 seconds
ciscoEcsbuObjectType	Static	4 Bytes	4 Bytes
ciscoEcsbuUMServer	Variable	32 Bytes x 2	32 Bytes x 2
ciscoEcsbuUMSystemState	Variable	4096 Bytes ¹	Unity system data; use 4096 Bytes
ciscoEcsbuUnityAttributes	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use	Reserved for future use

1. This value applies only to the default location object (one per Cisco Unity server). Other location objects do not currently make use of this field.

ciscoEcsbuUnityInformation Property Set

The `ciscoEcsbuUnityInformation` property set allows Cisco Unity to set permissions required to access Cisco Unity-specific Active Directory objects once at the property set level rather than setting permissions on each individual Cisco Unity-specific property. This property set has only a very minimal effect on the overall size of the schema.

Default Average Size of the Cisco Unity Schema

A review of the Avdirmonex2k.ldf file shows that the schema is not a significant size. However, during the schema extension process, the schema is added to the directory schema container and is also added to the existing objects in the directory. It is difficult to state exactly how much larger the Active Directory database file (Ntds.dit) will become as a result of extending the schema before values are populated into the newly created Cisco Unity attributes. Internal tests conducted by Cisco have shown that the Cisco Unity schema extensions have little impact on Active Directory. Tests conducted on directories with 1,000, 10,000, 20,000, 50,000, and 100,000 users have shown no increase in the size of Ntds.dit after adding the Cisco Unity schema extensions. However, keep in mind that your results may differ, depending on your Active Directory structure and other factors such as the file system block size and hard disk fragmentation.

For example, on a server with Windows 2000 and Exchange 2000:

- With an empty directory, the Ntds.dit file is just over 10 MB in size.
- In a recent test, after running Exchange 2000 ForestPrep and DomainPrep, and installing Exchange 2000, Ntds.dit increased to 24.5 MB. In a test done several years ago on a different server, the size was 22 MB.
- In a recent test, after the Cisco Unity schema extensions were added, the size of Ntds.dit remained at 24.5 MB. In the earlier test, the size went from 22 MB to just over 24 MB. Another test done on a Windows 2003 server that had been through several Cisco Unity 4.x upgrades showed an increase of 4 MB.

As you can see, the size impact of extending the schema on Ntds.dit varies, but generally, the impact is small. If you notice an increase at all, it will be on the order of 2 MB to 4 MB.

Size Impact of Cisco Unity

Each Cisco Unity installation creates the following Active Directory objects, which will have a small impact on the Active Directory database size:

- Three users: Example Administrator, Unity Messaging System, UnityBroadcast
- Three groups: All Subscribers, System Event Messages, Unaddressed Messages
- One default location object

The increase in the Active Directory database size when Cisco Unity starts using it occurs over a period of time, depending upon the type of installation and migration performed. For example, when you create numerous Cisco Unity subscriber accounts, the Active Directory database grows to accommodate the new data and provides room to grow. Subsequently, when you create additional subscriber accounts, the database may not increase in size until a certain threshold is reached, and then the size of the database jumps. In this way, space does not need to be allocated in the database each time you add a subscriber.

Size Impact of the Permissions Required by Cisco Unity

The permissions required by Cisco Unity have an effect on the size of the Active Directory database file (Ntds.dit) on each domain controller. After extending the schema, but before you run Cisco Unity setup, you run the Permissions wizard, which sets the permissions that Cisco Unity requires to function. The Permissions wizard sets the permissions that Cisco Unity requires for the following accounts:

- The account that you will use to install Cisco Unity.

- The account that Cisco Unity directory services will log on as.
- The account that Cisco Unity message store services will log on as.

To address customer security concerns, the Permissions wizard sets only the permissions that Cisco Unity requires to function rather than setting permissions at a higher level. To simplify the setting of permissions for the Cisco Unity-specific properties, a property set that contains these individual properties—`ciscoEcsbuUnityInformation`—has been added to the schema. Permissions for Cisco Unity-specific attributes are set at the property set level instead of at the object level, and permissions for non-Cisco Unity-specific attributes that Cisco Unity requires access to are set at the property level. For a comprehensive list of all permissions, privileges, and group memberships that are granted by the Permissions wizard, see the Permissions wizard help file, which is available on www.ciscounitytools.com, or the file `PWHelpPermissionsSet_<language>.htm` on the Cisco Unity server.

In order to set permissions, the Permissions wizard creates an Access Control Entry (ACE) in Active Directory. Permissions wizard creates a set of ACEs in Active Directory for the installation, directory services, and message store services accounts. Most of these ACEs are approximately 72 bytes in size; the total number of ACEs, and thus the overall size impact, depends primarily on whether the Active Directory domain controllers used by Cisco Unity are running Microsoft Windows 2000 Server or Windows Server 2003.

The total number of ACEs written by the Permissions wizard is the same for Windows 2000 Active Directory and Windows 2003 Active Directory; however, the ultimate size impact differs because the two types of Active Directory handle inheritance differently. Windows 2000 Active Directory writes a copy of each ACE to each sub-object in the container, whereas Windows 2003 Active Directory creates a link from the sub-object to the original ACE in the container.



Caution

If the forest that contains the Cisco Unity server includes any domain controllers running Windows 2000 Server, running Permissions wizard may cause the Active Directory database on those servers to grow to twice or more the current size. As explained in Microsoft documentation, when you apply delegated permissions on a parent container, as Permissions wizard does, all objects in the container inherit those permissions even when the permissions only apply to one type of object. This problem, known as ACL bloat, does not occur on domain controllers running Windows Server 2003. For more information, including information on using offline garbage collection to return unused disk space from the Active Directory database to the file system, see the Microsoft website.

In Windows 2000

- The number of ACEs grows as additional users, groups, contacts, and computers are added to the Active Directory containers on which Permissions wizard has set permissions.
- Because of Active Directory inheritance, when Permissions wizard writes an ACE that is needed for user objects, for example, all other object types in the container inherit the ACE.
- The organization of the containers in Active Directory can significantly affect the total number of ACEs. When you run Permissions wizard, you specify the containers in which user, computer, and location objects will be created, and the container from which subscribers will be imported. Again, because of inheritance, when Permissions wizard writes an ACE on a specific object in a container, all the objects in the container inherit the ACE. If you create additional containers for Cisco Unity objects, and apply the permissions only to those containers when running Permissions wizard, you avoid ACEs being inherited by objects that have nothing to do with Cisco Unity. A notable example: The directory services account needs permissions on the containers that include the servers on which Cisco Unity and Cisco Unity Voice Connectors are (or will be) installed. By creating a separate

container just for these servers, and specifying the container in Permissions wizard, you avoid having ACEs inherited by all other computer objects. See the Permissions wizard help file for more information.

In Windows 2003

- Permissions wizard writes a fixed number of ACEs per container. Each sub-object in the container has a link to the original ACE.
- The number of ACEs remains the same as additional users, groups, contacts, and computers are added to the Active Directory containers on which Permissions wizard has set permissions.

Estimating the Size Impact of Permissions on the Active Directory Database

Because of these factors, providing estimates of the size impact on Ntds.dit by Permissions wizard is difficult. Each ACE is approximately 72 bytes in size. [Table 5](#) and [Table 6](#) show the calculations that you can use to estimate the total number of ACEs added in Windows 2000 Active Directory and Windows 2003 Active Directory for each type of account. In theory, with these numbers, you can estimate the size impact of the permissions. However, tests conducted by Cisco have shown that on Windows 2000 domain controllers, the increase in size of Ntds.dit is larger than estimated. In many tests, Ntds.dit has grown to well over twice its current size.¹ Tests have shown an increase of up to 18.74KB per user.²

For capacity planning on Windows 2000 domain controllers, we recommend that you allow for an increase of at least 150 percent in the size of Ntds.dit after running Permissions wizard. To make the math easier in the [“Calculating the Size Impact” section on page 14](#), add 20KB to the size of each user, contact, and group to account for the size impact of the permissions.

For Windows 2003 domain controllers, the size impact on Ntds.dit varies, but generally, the impact is quite small. If you notice an increase at all, it will be on the order of 13 KB to 18 KB, and this number does not change as additional objects are added to Active Directory.

Table 5 Access Control Entries Added for Windows 2000 Active Directory

Account	Access Control Entries Added for Account
Installation	53 x number of objects in the containers in which default subscribers, groups, and locations will be created
Directory Services	9 x number of objects in the container(s) containing the computer objects for the Cisco Unity and Voice Connector servers 9 x number of objects in the container for domain controllers 108 x number of objects in the container(s) in which subscribers and public distribution lists will be created or imported counted
Message Store Services	2 x number of objects in the container(s) in which subscribers and public distribution lists will be created or imported counted 4 x number of message stores selected 1 x number of storage groups containing those message stores

1. In tests, the percent increase of Ntds.dit ranged from 36.35 percent to 132.07 percent.

2. The per user figure was obtained by dividing the size of Ntds.dit by the number of users before running Permissions wizard and again after running Permissions wizard. In tests, the per-user size increase ranged from 12.39KB to 18.74KB.

Table 6 Access Control Entries Added for Windows 2003 Active Directory

Account	Access Control Entries Added for Account
Installation	11 for the container in which default Groups will be created 39 for the container in which default Users will be created 3 for the container in which the default Location object will be created
Directory Services	9 x number of containers containing computer objects for the Cisco Unity and Voice Connector servers 9 x number of containers containing computer objects for domain controllers 22 x number of containers from which groups will be imported 51 x number of containers from which users will be imported 26 x number of containers from which contacts will be created 11 miscellaneous overhead
Message Store Services	4 x number of message stores selected 1 x number of storage groups containing those message stores

Average Size of Objects After Import into Cisco Unity

The average size of each object will vary depending on the codec selected and on the average length of the recorded name of the object. For example, in order to determine the actual size of a given User object, it is necessary to know the size of the object prior to making the User a Cisco Unity subscriber (in other words, the size of the User with the base Active Directory and Exchange schema applied to the object). When the base size of the User object is known, you can add that value to the results of the calculations of Cisco Unity-related attributes—following the model shown in the [Table 7](#)—in order to obtain the total size for a given Cisco Unity subscriber in Active Directory.

[Table 7](#) shows the size of a User object once it is imported into Cisco Unity as a subscriber. Note that the data included is for the Cisco Unity-specific attributes only; the non-Cisco Unity attributes—those included as a part of the base Active Directory and Exchange schema—are not changed and thus are not counted in this example. Note also that it is necessary to know the length of the extensions used by a subscriber (for example, 4 digits, 5 digits, 7 digits, and so on), and to understand how Cisco Unity servers will communicate with one another. For more information, see the *Networking Guide for Cisco Unity*, at

http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_feature_guides_list.html.

[Table 9](#) and [Table 11](#) show the size of the Group and Contact objects used by Cisco Unity. Note that not all groups will be used by Cisco Unity. In fact, it is typical that only a small set of groups are used for voice messaging; however, this can vary depending on how groups are used within a given company. Again, it is only necessary to calculate the size of Contact objects if they are being imported into Cisco Unity as Internet subscribers.

[Table 13](#) shows the size of the Unity Location. Typically, there is one default location created during installation. Other locations can be created and used for various reasons. In order to determine how many locations a given installation might need, see the *Networking Guide for Cisco Unity*.

User Object Size

Note that in [Table 7](#), data marked with an asterisk (*) is example data. The reader should substitute real data when calculating object sizes.

Table 7 *User Object Imported into Cisco Unity*

Cisco Unity Attribute	Size Criteria	Total
CiscoEcsbuAlternateDtmfIds	206NNXXXXXX*	20 Bytes
CiscoEcsbuDtmfId	NNXXXXXX*	14 Bytes
ciscoEcsbuListInUMDirectory	Static	4 Bytes
ciscoEcsbuTransferId	NNXXXXXX*	14 Bytes
ciscoEcsbuUMLocationObjectId	Static	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes
msExchRecordedName	1.3 x the size of the WAV file	2 Seconds using the G.711 codec = approximately 20.8 KB* 2 Seconds using the G.729a codec = approximately 3 KB*
ciscoEcsbuObjectType	Static	4 Bytes
ciscoEcsbuAlternateDtmfIdsOrder	N/A	Reserved for future use
ciscoEcsbuUnityAttributes	Static ¹	24
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use

1. Additional data may be stored in this attribute in future versions of Cisco Unity, but currently, the size is static.

Table 8 *User Object Totals, Using the Sample Data Provided*

Total size of all Cisco Unity User object attributes except recorded name	148 Bytes
Total size of recorded name using the G.711 codec	20.8 Kbytes
Total size of recorded name using the G.729a codec	3 Kbytes

Group Object Size

Note that in [Table 9](#), data marked with an asterisk (*) is example data. The reader should substitute real data when calculating object sizes.

Table 9 *Group Object Imported into Cisco Unity*

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuDtmfId	Extension is optional. For this example, a 7 digit NNXXXXXX is used.*	14 Bytes
ciscoEcsbuUMLocationObjectId	Static	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes

Table 9 Group Object Imported into Cisco Unity (continued)

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuVoiceEnabled	Static	4 Bytes
mailNickname	Voice-All-Corp*	28 Bytes
msExchRecordedName	1.3 x the size of the WAV file	2 Seconds using the G.711 codec = approximately 20.8 KB* 2 Seconds using the G.729a codec = approximately 3 KB*
ciscoEcsbuObjectType	Static	4 Bytes
ciscoEcsbuUnityAttributes	N/A	Reserved for future use
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use

Table 10 Group Object Totals, Using the Sample Data Provided

Total size of all Cisco Unity Group object attributes except recorded name	118 Bytes
Total size of recorded name using the G.711 codec	20.8 Kbytes
Total size of recorded name using the G.729a codec	3 Kbytes

Contact Object Size

Note that in [Table 11](#), data marked with an asterisk (*) is example data. The reader should substitute real data when calculating object sizes.

Table 11 Contact Object Imported into Cisco Unity

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuAlternateDtmfIds	206NNXXXXX*	20 Bytes
ciscoEcsbuDtmfId	NNXXXXX*	14 Bytes
ciscoEcsbuListInUMDirectory	Static	4 Bytes
ciscoEcsbuTransferId	NNXXXXX*	14 Bytes
ciscoEcsbuUMLocationObjectId	Static	64 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes
msExchRecordedName	1.3 x the size of the WAV file	2 Seconds using the G.711 codec = approximately 20.8 KB* 2 Seconds using the G.729a codec = approximately 3 KB*
ciscoEcsbuObjectType	Static	4 Bytes
ciscoEcsbuAlternateDtmfIdsOrder	Static	Reserved for future use
ciscoEcsbuUnityAttributes	N/A	Reserved for future use

Table 11 Contact Object Imported into Cisco Unity (continued)

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use

Table 12 Contact Object Totals, Using the Sample Data Provided

Total size of all Cisco Unity Contact object attributes except recorded name	124 Bytes
Total size of recorded name using the G.711 codec	20.8 Kbytes
Total size of recorded name using the G.729a codec	3 Kbytes

Location Object Size

Note that in [Table 13](#), data marked with an asterisk (*) is example data. The reader should substitute real data when calculating object sizes.

Table 13 Unity Location Object Imported into Cisco Unity

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuAddressingMaxScope	Static	4 Bytes
ciscoEcsbuAllowBlindAddressing	Static	4 Bytes
ciscoEcsbuBlindAddressingMaxScope	Static	4 Bytes
ciscoEcsbuDestinationType	Static	4 Bytes
ciscoEcsbuDialingDomainName	Dialingdomain1*	28 Bytes
ciscoEcsbuDtmfId	XXXX, a Dial ID for the Location object*	8 Bytes
ciscoEcsbuIncludeLocations	Static	4 Bytes
ciscoEcsbuUMDomain	Variable	64 Bytes
ciscoEcsbuUMLocationObjectId	Static	64 Bytes
ciscoEcsbuUMSystemId	Static	4 Bytes
ciscoEcsbuUMSchemaVersion	Static	4 Bytes
ciscoEcsbuUndeletable	Static	4 Bytes
displayName	Variable	128 Bytes x 2
ciscoEcsbuDirectoryAlias	Static	64 Bytes
msExchRecordedName	1.3 x the size of the WAV file	2 Seconds using the G.711 codec = approximately 20.8 KB* 2 Seconds using the G.729a codec = approximately 3 KB*
ciscoEcsbuObjectType	Static	4 Bytes
ciscoEcsbuUMServer	In this example, the server name is 10 characters long*	20 Bytes

Table 13 Unity Location Object Imported into Cisco Unity (continued)

Cisco Unity Attribute	Size Criteria	Total
ciscoEcsbuUMSystemState	Cisco Unity system information; use 4096 Bytes	4096 Bytes ¹
ciscoEcsbuUnityAttributes	N/A	Reserved for future use
ciscoEcsbuUnityAttributesIndexed	N/A	Reserved for future use
ciscoEcsbuUnityAttributesEncoded	N/A	Reserved for future use

1. This value applies only to the default location object (one per Cisco Unity server). Other location objects do not currently make use of this field.

Table 14 Location Object Totals, Using the Sample Data Provided

Total size of all Cisco Unity Location object attributes except recorded name	4,636 Bytes
Total size of recorded name using the G.711 codec	20.8 Kbytes
Total size of recorded name using the G.729a codec	3 Kbytes

Calculating the Size Impact

To estimate the total size impact on Active Directory, you calculate the size impact of objects plus the size impact of permissions.

Table 15 shows a summary view, with sample data, of the average object sizes for a recorded name that is 2 seconds in length—using either the G.711 or the G.729a codec—and using the Unity base schema (avdirmonex2k.ldf). The size of an existing Active Directory object is not included. Use Microsoft guidelines for determining the size of a given object in Active Directory.

Table 15 Object Size Examples

Object	Recorded Name with G.711 Codec	Recorded Name with G.729a Codec	Other Cisco Unity Attributes (Using Nominal Unity Base Schema Sizes)	Total Size with G.711 Codec	Total Size with G.729a Codec
User	20.8 KB	3 KB	148 Bytes	20.94 KB	3.12 KB
Group	20.8 KB	3 KB	118 Bytes	20.91 KB	3.11 KB
Contact	20.8 KB	3 KB	124 Bytes	20.92 KB	3.12 KB
Unity Location	20.8 KB	3 KB	4,636 Bytes	25.29 KB	7.49 KB

Table 15 shows the linear increase in the size of each object in the directory after the attributes are populated by Cisco Unity. Use Table 16 to determine the real size increase with your own data. Once the average size for each object is known and entered in Column 2, calculate a final value for each object by adding the values in Column 2, Column 3, and Column 4, and enter the sum in Column 5. Multiply that sum by the value in Column 6, and enter the result in Column 7. Finally, the total size of the Active Directory is the sum of the values in Column 7.

Table 16 Active Directory Total Object Size Calculation

Column 1: Object Name	Column 2: Size of Existing Active Directory and Exchange Object	Column 3: Size Impact of Permissions	Column 4: Size of Cisco Unity Object	Column 5: Object Size = Column 2 + Column 3 + Column 4	Column 6: Number of Objects of Same Type in Directory	Column 7: Total Size of Each Object = Column 5 x Column 6
User	Determine by referencing Microsoft documentation	Windows 2000: 20KB Windows 2003: 0	See Table 7 . Use real data rather than sample data.			
Group	Determine by referencing Microsoft documentation	Windows 2000: 20KB Windows 2003: 0	See Table 9 . Use real data rather than sample data.			
Contact	Determine by referencing Microsoft documentation	Windows 2000: 20KB Windows 2003: 0	See Table 11 . Use real data rather than sample data.			
Unity Location	N/A	Windows 2000: 148 Bytes Windows 2003: 0	See Table 13 . Use real data rather than sample data.			
TOTAL SIZE						Sum of All Values in Column 7:

Other Cisco Unity Schemas

Two other Cisco Unity LDF files are included with Cisco Unity, the [omnigateway.ldf](#) and the [vpimgateway.ldf](#). They are used to extend the schema only when needed.

omnigateway.ldf

The omnigateway.ldf is used to affix attributes to the Unity Location object that is used with the Cisco Unity Bridge. The Cisco Unity Bridge allows Cisco Unity to interoperate with Octelnet.

If you are integrating Cisco Unity with Octel by using the Cisco Unity Bridge, calculate an additional 200 Bytes in the size of the Unity Location object. As previously stated, the Contact object may also be affected, and this can be a significant factor in determining the size impact on the Directory.

vpimgateway.ldf

The vpimgateway.ldf is used to affix attributes to the Unity location object that is used with other voice mail systems that use VPIM.

If you are integrating Cisco Unity with other voice mail systems by using VPIM, calculate an additional 300 Bytes in the size of the Unity location object. As previously stated, the Contact object may also be affected, and this can be a significant factor in determining the size impact on the Directory.

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