



Cisco Unity Design Guide

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Preface

Audience

The *Cisco Unity Design Guide* is intended for anyone responsible for the design or configuration of a Cisco Unity system.

Document Conventions

The *Cisco Unity Design Guide* uses the following conventions:

Note: Means reader take note. Notes contain helpful suggestions or references to material not covered in the document.

Caution! Means reader be careful. In this situation, you might do something that could result in equipment damage or loss of data.

Additional Cisco Unity Documentation, System Requirements, and Supported Hardware and Software

For descriptions and the URLs of Cisco Unity documentation on Cisco.com, refer to the *Cisco Unity Documentation Guide*. The document is shipped with Cisco Unity and is available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/about/index.htm.

In particular, note:

- For system requirements, and lists of supported hardware and software, the *Cisco Unity System Requirements, and Supported Hardware and Software*, at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_pre_installation_guides_list.html.
- For a list of servers that meet Cisco Unity specifications, the *Cisco Unity Supported Platforms List*, at http://cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html.
- For client workstations, a list of the software that is compatible with the version of Cisco Unity that you are installing, and a list of messaging clients that are compatible with the version of Cisco Unity that you are installing, the *Compatibility Matrix: Cisco Unity and the Software on Subscriber Workstations*, at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_pre_installation_guides_list.html.



- For hardware and software requirements for the Cisco Unity Bridge server, the *Cisco Unity Bridge System Requirements, and Supported Hardware and Software*, at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_pre_installation_guides_list.html.

Additional Design Documentation

The *Cisco Unity Design Guide* explains how to design a Cisco Unity system based on the message store, directory, phone system, and Cisco Unity features that the customer wants to use; on the network infrastructure on the customer site; and on a number of other Cisco Unity-specific configuration details.

In addition, refer to the following:

- If Cisco Unity will be integrated with Cisco CallManager, the *Cisco IP Telephony Solution Reference Network Design Guide*, at http://www.cisco.com/warp/customer/779/largeent/netpro/avvid/IPtel_srnd.pdf. This document explains how to design the Cisco CallManager portion of the system.
- The IP Telephony Steps to Success website, at <http://www.cisco.com/partner/WWChannels/technologies/IPT/index.html>, has information on IP telephony system requirements and solutions; on network equipment and applications that may be affected in an IP telephony deployment; on designing an IP telephony system; on developing a project implementation plan; on installing and testing the selected solution; and on documenting the system and its components.

Support Policy for Optional Third-Party Software

The Cisco support policy states that customers can deploy third-party software for backup, monitoring, and security on the Cisco Unity server. However, Cisco expects that customers (or their systems integration partners) will have tested the interoperability of such products with Cisco Unity before the products are deployed. Such testing is essential in mitigating the risk that problems between Cisco Unity and the third-party products loaded on the Cisco Unity server will be discovered within the production environment.

If a customer calls the Cisco Technical Assistance Center (TAC) with a problem, a Cisco TAC engineer may require that optional third-party software be turned off or even removed from the Cisco Unity server during the course of troubleshooting. If it is determined that the interoperability between the third-party software and Cisco Unity was the root cause of the problem, the third-party software will be required to be disabled or removed from the Cisco Unity server until such time that the interoperability issue is addressed, so that the customer can continue to have a functional Cisco Unity system.



Before installing any qualified optional Microsoft service pack on the Cisco Unity server, confirm that the manufacturer of any optional third-party software or hardware that you plan to install on the Cisco Unity server—or that is already installed—also supports the service pack for use with its product.

Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

International Cisco websites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which may have shipped with your product. The Documentation CD-ROM is updated regularly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual or quarterly subscription.

Registered Cisco.com users can order a single Documentation CD-ROM (product number DOC-CONDOCCD=) through the Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/ordering_place_order_ordering_tool_launch.html

All users can order monthly or quarterly subscriptions through the online Subscription Store:

<http://www.cisco.com/go/subscription>

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpk/pdi.htm



You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:

<http://www.cisco.com/en/US/partner/ordering/index.shtml>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit comments electronically on Cisco.com. On the Cisco Documentation home page, click Feedback at the top of the page.

You can e-mail your comments to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com, which includes the Cisco Technical Assistance Center (TAC) website, as a starting point for all technical assistance. Customers and partners can obtain online documentation, troubleshooting tips, and sample configurations from the Cisco TAC website. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC website, including TAC tools and utilities.

Cisco.com

Cisco.com offers a suite of interactive, networked services that let you access Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com provides a broad range of features and services to help you with these tasks:

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages
- Order Cisco learning materials and merchandise



- Register for online skill assessment, training, and certification programs

To obtain customized information and service, you can self-register on Cisco.com at this URL:

<http://tools.cisco.com/RPF/register/register.do>

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available: the Cisco TAC website and the Cisco TAC Escalation Center. The type of support that you choose depends on the priority of the problem and the conditions stated in service contracts, when applicable.

We categorize Cisco TAC inquiries according to urgency:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration. There is little or no impact to your business operations.
- Priority level 3 (P3)—Operational performance of the network is impaired, but most business operations remain functional. You and Cisco are willing to commit resources during normal business hours to restore service to satisfactory levels.
- Priority level 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively impacted by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.
- Priority level 1 (P1)—An existing network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Cisco TAC Website

The Cisco TAC website provides online documents and tools to help troubleshoot and resolve technical issues with Cisco products and technologies. To access the Cisco TAC website, go to this URL:

<http://www.cisco.com/tac>

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC website. Some services on the Cisco TAC website require a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

<http://tools.cisco.com/RPF/register/register.do>



If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC website, you can open a case online at this URL:

<http://www.cisco.com/tac/caseopen>

If you have Internet access, we recommend that you open P3 and P4 cases online so that you can fully describe the situation and attach any necessary files.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to this URL:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Before calling, please check with your network operations center to determine the Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The Cisco Product Catalog describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

http://www.cisco.com/en/US/products/products_catalog_links_launch.html

- Cisco Press publishes a wide range of networking publications. Cisco suggests these titles for new and experienced users: Internetworking Terms and Acronyms Dictionary, Internetworking Technology Handbook, Internetworking Troubleshooting Guide, and the Internetworking Design Guide. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

<http://www.ciscopress.com>

- Packet magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training:



<http://www.cisco.com/go/packet>

- iQ Magazine is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- Internet Protocol Journal is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

http://www.cisco.com/en/US/learning/le31/learning_recommended_training_list.html



Chapter 1: Cisco Unity Concepts

How Cisco Unity Works

Cisco Unity is a unified messaging system that can also be a voice messaging system, which requires a dedicated messaging infrastructure. When Cisco Unity subscribers are busy or away from their phones, Cisco Unity answers the phone and takes voice messages for them. The subscribers can retrieve their messages over the phone, or by using IBM Lotus Notes, Microsoft Outlook, or the Cisco Unity Inbox.

When a call comes in for a subscriber, the following occurs:

1. A caller dials the subscriber extension. If the subscriber phone is busy or the subscriber does not answer, the phone system routes the call and information about the call, including the subscriber extension, to Cisco Unity.
2. Cisco Unity answers the call, looks up the subscriber extension in the Cisco Unity database, retrieves and plays the subscriber greeting (“Hi, this is Pat, and I am not at my desk right now...”), and lets the caller leave a message.
3. When the caller ends the call, the message is temporarily saved on the hard disk on the Cisco Unity server.
4. Cisco Unity gives the message to Domino or Exchange, which routes the message to the subscriber home server and stores it in the subscriber mailbox. If the call is from:
 - Another subscriber, the message is identified as coming from that person.
 - An outside caller who has not logged on to Cisco Unity as a subscriber, the message is identified as coming from the Unity Messaging System mailbox.
5. Cisco Unity informs the subscriber in one or more of the following ways that a message has arrived, regardless of the source of the call. (This is unlike some voice messaging systems, which activate message waiting indicators only when a message is left over the phone.)
 - If the subscriber has a phone connected to the phone system, Cisco Unity activates the subscriber message waiting indicator (MWI).

Note: This is true unless the MWI had already been activated because of a prior message arrival, in which case it simply remains activated.

- If the subscriber has configured personal notification options in the Cisco Unity Assistant, Cisco Unity can also call one or more phones or pagers, or send an e-mail to a text pager, to notify the subscriber that a new voice message has arrived.



Characteristics of Unified Messaging and Voice Messaging Systems

Cisco Unity can be configured either for Cisco Unity Unified Messaging (a valid option for all message stores) or for Cisco Unity Voice Messaging (only when Exchange 2000 is the message store, or when a Cisco Unity 2.x or 3.x system is being upgraded). This section enumerates the characteristics of each configuration.

Unified Messaging

- Cisco Unity voice messages are stored in the same message store in which e-mails and faxes (if applicable) are stored.
- Subscribers see all messages—e-mails, voice messages, and faxes (if applicable)—in the same Inbox.
- Subscribers check messages by using the phone or an e-mail client.
- Subscribers have access to the Cisco Unity Assistant.
- Cisco Unity delivers voice messages to an off-box mailstore and allows subscribers to play back voice messages via the telephone user interface. Cisco Unity can also play back electronic messages over the phone by using Text to Speech, and can support identifying, redirecting, and printing third party faxes.
- Voice mail and e-mail attributes of subscriber accounts can be administered from a single location by using the Cisco Unity Administrator.
- Cisco Unity administration can be performed over the network.
- The Cisco Unity server is connected to the network; therefore, it has access to the directory (a Domino address book, Active Directory, or the Exchange 5.5 directory) and to network utilities such as virus checking and backup.
- Domino or Exchange must be installed on a separate server.

Voice Messaging (Exchange 2000 Only)

- Subscribers check messages by phone. When the Cisco Unity server is connected to the network, subscribers also have the option to check messages by using the Cisco Unity Inbox.
- Voice messages are stored in Exchange 2000. (Beginning with Cisco Unity version 4.0, Exchange 5.5 is not supported for the Voice Messaging configuration, except in the case of upgrades.) The Exchange message store contains only Cisco Unity voice messages, not e-mails or faxes.



- Exchange 2000 can be installed either on the Cisco Unity server or on a separate server, depending on the number of subscribers that need to be supported by Cisco Unity.
- The Cisco Unity server supports voice messages, and also supports third party faxes. E-mail messages are not supported by a Cisco Unity Voice Messaging only solution.
- The Cisco Unity server may or may not be connected to the network in a voice messaging only configuration (Cisco Unity must be connected to the network for Unified Messaging configurations). When it is not connected to the network, Cisco Unity can be integrated only with a circuit-switched phone system.

When the Cisco Unity server is connected to the network:

- Cisco Unity can also be integrated with an IP phone system (for example, Cisco CallManager or a SIP proxy server).
 - Cisco Unity administration can be performed over the network.
 - Subscribers have access to the Cisco Unity Assistant via CPCA.
 - Exchange can be installed either on the Cisco Unity server or on a separate server.
 - The server has access to network utilities such as virus checking and backup.
- Attributes for e-mail accounts, if any, and attributes for Cisco Unity subscribers must be administered separately.

Hardware Components of a Cisco Unity System

Cisco CallManager or Another Supported Phone System

Cisco Unity can be integrated with Cisco CallManager or another supported phone system. For a list of supported phone systems, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysrq.htm.

For integrations with circuit-switched phone systems, the customer may require special cables, line splitters, and so on. For more information, refer to the integration guide for the phone system that the customer uses. Cisco Unity integration guides are available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_configuration_guides_list.html.



One or More Cisco Unity Servers

For a detailed list of servers that are qualified for use with Cisco Unity, refer to the *Cisco Unity Supported Platforms List*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html.

Each qualified Cisco Unity server can service a specified number of Cisco Unity subscribers depending on the type of server and, for Voice Messaging configurations, depending on whether Exchange 2000 or Exchange 2003 is installed on the Cisco Unity server. The *Cisco Unity Supported Platforms List* indicates how many subscribers can be serviced by each type of server.

For Unified Messaging configurations, at least one Cisco Unity is required for each:

- Domino domain
- Exchange 2000 or Exchange 2003 organization
- Exchange 5.5 site

If the customer purchases Cisco Unity failover, two Cisco Unity servers are required:

- The primary server, which takes calls the majority of the time; and
- The secondary server, which takes calls when the customer wants to perform maintenance on the primary server or when the primary server stops functioning for any reason.

Voice Cards (Required Only for Integrations with Circuit-Switched Phone Systems)

If the customer integrates Cisco Unity with a circuit-switched phone system, voice cards are required for the Cisco Unity server. For a list of supported voice cards, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysrq.htm.

Expansion Chassis (Required Only for Integrations with Circuit-Switched Phone Systems and a Large Number of Voice Cards)

If the customer is integrating Cisco Unity with a circuit-switched phone system and needs more voice cards than will fit in the Cisco Unity server, an expansion chassis is required for the voice cards (refer to the CUSPL for more information). All voice cards must be installed in the expansion chassis; they cannot be split between the server and the expansion chassis, because all of the cards must be connected to one another by using a single H.100 cable.



One or More Message Store Servers (Optional for Some Configurations)

For Cisco Unity systems configured for Unified Messaging, the message store software (IBM Lotus Domino, Microsoft Exchange 2000 or Exchange 2003, or Microsoft Exchange 5.5) must be installed on a server other than the Cisco Unity server.

For Cisco Unity systems configured for Voice Messaging, Exchange 2000 or Exchange 2003 can be installed on the Cisco Unity server or on a separate server. The number of subscribers homed on the Cisco Unity server cannot exceed the maximum listed for that type of server on the *Cisco Unity Supported Platforms List*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_pre_installation_guides_list.html.

One or More Dedicated Domain Controllers/Global Catalog Servers (Exchange 2000 or Exchange 2003 Only, Large Voice Messaging Configurations Only)

For large Voice Messaging configurations, one or more dedicated domain controllers/global catalog (DC/GC) servers may be required. For more information, see Chapter 2, “Network and Infrastructure Considerations.”

Cisco Unity Bridge Server (Exchange Only, Required Only for Interoperating with Avaya Voice Messaging Systems)

If the customer wants Cisco Unity to interoperate with an Avaya voice messaging system, a dedicated Cisco Unity Bridge server is required. For more information, refer to the following documents:

- For information on how Cisco Unity can send voice messages to Avaya and receive voice messages from Avaya, refer to the *Cisco Unity Bridge Networking Guide*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/bridge30/bnet/index.htm.
- For requirements for connecting Cisco Unity and Avaya, refer to *Cisco Unity Bridge System Requirements, and Supported Hardware and Software*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/bridge30/sysreq/30bsysrq.htm.



Network Connection (Optional for Some Configurations)

For Cisco Unity systems configured for Unified Messaging, a network connection is required.

For Cisco Unity systems configured for Voice Messaging, a network connection is required only if the customer wants to do one or more of the following:

- Integrate Cisco Unity with an IP phone system (for example, Cisco CallManager or SIP)
- Administer Cisco Unity over the network
- Give subscribers access to the Cisco Unity Assistant or to the Cisco Unity Inbox
- Install Exchange on a separate server

Note: For a system with a large number of Cisco Unity subscribers or for a system that includes Cisco Unity failover, installing Exchange on a separate server is required.

- Give the Cisco Unity server access to network utilities such as virus checking and backup

Software Components of a Cisco Unity System

For information on the software installed on the Cisco Unity server, the supported versions of Domino and Exchange, and the supported versions of client software, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysrq.htm.

Where Cisco Unity Stores Data

Cisco Unity stores data in a variety of locations, as described in the following sections.

Voice Messages Are Stored in Domino, Exchange 2000, Exchange 2003, or Exchange 5.5

Cisco Unity stores voice messages as follows, depending on message store:

IBM Lotus Domino

Cisco Unity stores voice messages in a user mail file database on the Domino server. Domino is installed on one or more servers (never on the Cisco Unity server); therefore, all subscribers have their Domino mailboxes on other servers. A Cisco Unity subscriber is someone who has a Domino mailbox and whose Domino person document includes Cisco Unity-specific information.



Every Domino server that homes Cisco Unity subscribers must have IBM Lotus Domino Unified Communication Software (DUC) for Cisco Unity installed. Currently, DUC is available only for Windows NT 4 and Windows 2000 Server.

Cisco Unity can service subscribers on multiple Domino servers. You specify one Domino server (the partner Domino server) through which Cisco Unity communicates with the other Domino servers.

Cisco Unity can also service subscribers on Domino clusters. If subscribers are homed on one or more Domino servers in a cluster, every Domino server in the cluster on which there will be Cisco Unity subscribers must have DUC installed.

Exchange 2000 or Exchange 5.5

Cisco Unity can store voice messages in the Exchange 2000 message store, the Exchange 5.5 message store, or both. For some Cisco Unity configurations, Exchange is installed on the Cisco Unity server, and all Cisco Unity subscribers have their Exchange mailboxes on the Cisco Unity server. A Cisco Unity subscriber is someone who has an Exchange mailbox and whose Active Directory or Exchange 5.5 account includes Cisco Unity-specific information.

For other Cisco Unity configurations, Exchange is installed on one or more other servers instead of or in addition to being installed on the Cisco Unity server. For these configurations, some or all subscribers may have their Exchange mailboxes on other Exchange servers.

Cisco Unity can service subscribers on multiple Exchange servers. You specify one Exchange server (the partner Exchange server) through which Cisco Unity communicates with the other Exchange servers. In this case, Cisco Unity can communicate with Exchange installed on the Cisco Unity server or with Exchange installed on a separate server.

For Exchange 2000, Cisco Unity can also service subscribers on both active/active and active/passive clusters. For active/passive clustering, Cisco Unity can service subscribers only on two-node clusters. Do not install Cisco Unity on a server in an Exchange cluster.

Cisco Unity does not support Exchange 5.5 clustering.

All Subscriber Information Is Stored in a SQL Server 2000 Database

Cisco Unity version 4.0 stores all information about Cisco Unity subscribers, as well as selected Cisco Unity configuration data, in a SQL Server 2000 or Microsoft Data Engine (MSDE) database on the Cisco Unity server. (The number of voice ports on the Cisco Unity server and, therefore, the number of subscribers the server can support, determines whether data is stored in SQL Server 2000 or in MSDE, which is a data engine that is fully compatible with SQL Server 2000.)



When two or more Cisco Unity servers are in the same Domino domain and monitoring the same address book, or are added to the same Active Directory forest or Exchange 5.5 directory, the SQL Server 2000 database on each Cisco Unity server also includes a small amount of information about all of the subscribers on the other Cisco Unity servers. (For Exchange 5.5, the SQL Server 2000 database on each Cisco Unity server may include subscribers for every Cisco Unity server in the Exchange organization or only for the servers in the current Exchange site. This scope is specified on each Cisco Unity server.)

By storing all subscriber data in a SQL Server 2000 database, Cisco Unity provides the following benefits:

- **Performance**—Because the SQL Server 2000 database is on the Cisco Unity server itself and because the data is heavily indexed, accessing data—including looking up subscriber extensions—is fast. The current maximum number of Cisco Unity subscribers in a Domino address book, Global Address List, or Exchange 5.5 directory is 250,000.
- **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 even when the Domino or Exchange network is down. (When the Domino or Exchange network is unavailable, messages are stored on the Cisco Unity server, and subscribers have access to those messages.)
- **Scalability**—SQL Server 2000 was designed to support the largest enterprise data processing systems, so there is more than enough room for storing the Cisco Unity data. Although MSDE has storage limitations that SQL Server does not, it is also 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.

Some Subscriber Information Also Appears in the Domino Address Book, in Active Directory, or in the Exchange 5.5 Directory

A small amount of data that appears in the SQL Server 2000 database also appears in the Domino address book, in Active Directory, or in the Exchange 5.5 directory. This information, mostly subscriber data (including the recorded voice name), is replicated in the directory for the following reasons:

- To enable Cisco Unity servers to communicate with one another
- To enable communication between Cisco Unity and other voice messaging systems



Cisco Unity uses a directory monitor to keep the data synchronized.

If the customer is using:

- Domino, IBM Lotus Domino Unified Communications Services (DUC) for Cisco Unity must be installed on the Domino servers that will home Cisco Unity subscribers. This adds elements to the address book. In addition, DUC software must be installed on the client workstation for each Cisco Unity subscriber, thus adding elements to the mail file for the client.
- Exchange 2000, the Active Directory schema must be extended with a few Cisco Unity-specific attributes.
- Exchange 5.5, Cisco Unity uses several Exchange 5.5 custom attributes.

For information about the Active Directory schema extensions or Exchange 5.5 custom attributes, refer to the *White Paper: Cisco Unity Data and the Directory (All Versions with Microsoft Exchange)*, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/whitpaper/datadir.htm.

Enabling Cisco Unity Servers to Communicate with One Another

When two or more Cisco Unity servers are added to the same Domino address book, Active Directory forest, or Exchange 5.5 directory, each Cisco Unity server serves a distinct group of subscribers. (For Exchange 5.5, the directory monitor searches the Exchange 5.5 directory at the site level, by default. This scope can be expanded to the organization.)

Allowing the servers to communicate with one another provides several benefits, including being able to administer subscriber accounts on all Cisco Unity servers from a single location, and giving callers the ability to leave messages for any subscriber, regardless of the Cisco Unity server with which the subscriber is associated. To make this possible, two types of Cisco Unity data are stored in the directory:

- A primary location object for each Cisco Unity server. This unique identifier contains the addressing information that Cisco Unity needs to route messages to other Cisco Unity servers. The directory contains one primary location object for each Cisco Unity server in the Domino domain, Active Directory forest, or Exchange 5.5 site.
- Selected subscriber data. The stored properties include the Cisco Unity server with which the subscriber is associated, the subscriber extension, and a recording of the subscriber name.

Because this information is stored in the directory, the information replicates to all Domino servers in the domain (for Domino), domain controllers in the forest (for



Exchange 2000), or all Exchange 5.5 servers in the site or organization, if appropriate (for Exchange 5.5), thus ensuring appropriate access to information.

For detailed information on adding two or more Cisco Unity servers to the same Domino domain, Active Directory forest, or Exchange 5.5 organization, refer to the *Networking in Cisco Unity Guide*, which is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.

Enabling Communication Between Cisco Unity and Other Voice Messaging Systems (Exchange Only)

Cisco Unity supports the Audio Messaging Interchange Specification analog (AMIS-a) protocol, which provides an analog mechanism for transferring voice messages between different voice messaging systems. To send and receive voice messages by using AMIS, the customer creates a delivery location object for each remote voice messaging system. As with the primary location objects, which allow one Cisco Unity server to send messages to subscribers associated with another Cisco Unity server, delivery location objects contain the information necessary for Cisco Unity subscribers to exchange voice messages with people who are using another voice messaging system.

Cisco Unity is also able to communicate with Octel servers by using the Cisco Unity Bridge, which acts as a networking gateway between Cisco Unity servers and Octel servers. The Cisco Unity Bridge communicates with Octel servers by using the OctelNet analog protocol; it communicates with Cisco Unity servers by using the Digital Networking protocol, which is based on the Voice Profile for Internet Mail (VPIM) protocol, with proprietary extensions.

Because the servers use different protocols, Cisco Unity Bridge uses the concept of a node to translate messages as appropriate for each server. For the Octel node, the Cisco Unity Bridge maintains a table that contains the Octel server name, unique serial number, and phone number. For the Cisco Unity node, it maintains another table that contains the Cisco Unity server name, assigned serial number, and domain name. By using these two tables, the Cisco Unity Bridge server can, for example, receive a message from an Octel node, look up the routing information from the Cisco Unity node table, reformat the information for the destination Cisco Unity node, and then send the message to the Cisco Unity node.

For detailed information on how Cisco Unity works with other voice messaging systems by using AMIS and/or the Cisco Unity Bridge, refer to the *Networking in Cisco Unity Guide*, which is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.



Data That Appears in Both the SQL Server 2000 Database and in the Address Book/Directory Is Automatically Synchronized

Some Cisco Unity information is stored in both the SQL Server 2000 database and in the address book/directory. This data can be changed both from within Cisco Unity (for example, subscriber information can be changed by using the Cisco Unity Administrator), and from outside Cisco Unity (for example, subscriber information can be changed by using Active Directory Users and Computers). Because this information can be stored and changed in two different locations, it must be regularly synchronized. Cisco Unity includes a directory monitor that keeps the directory synchronized with the SQL Server 2000 database. There are separate directory monitors for Domino, Active Directory, and Exchange 5.5. Every few minutes, the directory monitor checks for new, changed, and deleted objects, and replicates the information.

When two or more Cisco Unity servers are added to the same Active Directory forest, a global catalog monitor keeps the SQL Server 2000 database synchronized with the global catalog. This is how each Cisco Unity server gathers information on subscribers who are associated with other Cisco Unity servers.

Because the amount of data stored in the directory is so small, the impact of replication between the SQL Server 2000 database and the directory is minimal (except when the first Cisco Unity subscribers are created by importing them in bulk from Exchange or from a text file).

Messages from Outside Callers Are Temporarily Stored on the Cisco Unity Server

All messages from outside callers are temporarily stored on the Cisco Unity server before they are forwarded to Domino or Exchange for storage in the subscriber mailbox. This allows Cisco Unity to continue functioning when the network connection between the Cisco Unity server and the Domino or Exchange servers is down, or when one or more Domino or Exchange servers are down.

While Domino, Exchange, and/or the network are off line, Cisco Unity can still answer calls, allow outside callers to look up subscriber extensions, and record voice messages. During this time, subscribers who check their voice messages hear the Unity Messaging Repository (UMR) conversation, which explains that their Domino or Exchange server is not available, but lets them access voice messages left since it went down. When the Domino server, Exchange server, and/or the network are back on line, the voice messages stored in the UMR are routed to the subscriber mailboxes. (In some cases when a network connection or a Domino or Exchange server is down, subscriber-to-subscriber messages are also treated as outside caller messages and stored on the Cisco Unity server until they can be delivered to the appropriate mailbox.)



Some Subscriber Information and Configuration Settings Are Stored on the Cisco Unity Server

Selected recordings and configuration settings are stored in files on the Cisco Unity server, including subscriber greetings (“Hi, this is Pat and I am out of the office today...”), recorded voice names, and some phone system integration settings.

Some Configuration Settings Are Stored in the Registry

Selected server-specific configuration settings are stored in the Windows registry, including some phone system integration and logging settings.



Chapter 2: Network and Infrastructure Considerations

Overview

This chapter focuses on the infrastructure requirements and considerations for Cisco Unity deployment and operation. After Cisco Unity has been installed, the customer needs to ensure that the infrastructure is not changed in ways that will affect Cisco Unity performance and functionality. For example, congestion on the network can cause sporadically slow response times when Cisco Unity subscribers check voice messages over the phone, and an unreliable domain controller can prevent Cisco Unity from quickly authenticating administrators or subscribers.

Infrastructure Requirements

From the perspective of Cisco Unity, “infrastructure” refers to any server or gateway on which Cisco Unity depends. Cisco Unity is dependent on infrastructure and on network resources, so you must carefully attend to the infrastructure into which Cisco Unity is being installed as you are designing a system.

Physical Location of the Cisco Unity Server

The Cisco Unity server should be treated the same way the customer treats any other mission-critical server, as follows:

- Place the Cisco Unity server in a secure server room or computer room where rack storage space is available to support the server and related servers and hardware. For example, you may need rack storage space for an expansion chassis for voice cards, a secondary server for Cisco Unity failover, a Cisco Unity Bridge server, message store servers, a domain controller/global catalog (DC/GC) server, and so on.
- Ensure that the Cisco Unity server has the proper power source.
- Ensure that the Cisco Unity server has proper ventilation and air conditioning.

Cabling and Connectivity

Cisco Unity needs adequate network cabling to connect it to the network, for access to:

- Cisco CallManager
- Cisco CallManager Express
- SIP proxy server when Cisco Unity is integrated with an IP phone system.



- Message store servers for all Unified Messaging configurations and for Voice Messaging configurations in which the message store is on a separate server.
- A secondary Cisco Unity server when Cisco Unity failover is configured.
- A Cisco Unity Bridge server when Cisco Unity is connected with an Avaya voice messaging system using Octelnet as the interoperability messaging protocol.
- Network backup servers and other network resources, as applicable.

When Cisco Unity is integrated with a circuit-switched phone system, other cabling is also required:

- Cabling between the phone system and voice cards in the Cisco Unity server.
- For serial integrations, a serial cable between the phone system and the Cisco Unity server.
- Other cabling when using integrations such as PBXLink for Nortel Meridians and Avaya G3.
- If voice cards are installed in an expansion chassis, a cable between the Cisco Unity server and the expansion chassis.

Ensure that the cabling and the network switch are reliable and fully functional. Faulty cabling is often the reason for intermittent failures between Cisco Unity and the network or the phone system, and it is difficult to troubleshoot.

Availability of Network Resources

The following network resources must be available at all times and in close physical proximity to Cisco Unity (over a local area network, not a wide area network), or Cisco Unity functionality will be impaired:

- All name resolution hosts used by standard Windows 2000 networks, including DNS hosts and WINS, if a Windows NT network is present.
- Domain controllers that provide authentication for the Cisco Unity service accounts. Windows global catalog servers are also necessary if Cisco Unity services Exchange 2000.
- The message store servers and their corresponding directories. Each message store server on which Cisco Unity subscribers are homed must be accessible to Cisco Unity. The corresponding directory must also be available so that Cisco Unity can synchronize its local data with the directory **Error! Reference source not found.**
- All gateways that provide Cisco Unity with access to required resources, such as name resolution hosts, domain controllers, message stores, and directories.



Name Resolution

Cisco Unity must be able to find the servers it interacts with by resolving the names of those servers to IP addresses, unless the Cisco Unity server is not connected with the network. For example, Cisco Unity can send messages from outside callers to the message store server on which the mailbox of the recipient is homed only if Cisco Unity can find that message store server. Name resolution is also used when:

- A subscriber uses the Cisco Unity telephone user interface (TUI) to listen to messages or send messages to other subscribers. Name resolution is used by Cisco Unity whenever a process requires the Unity application to execute commands that leave the Cisco Unity server and access information across the network to the mailbox stores where subscriber mailboxes are located.
- Administrators access the Cisco Unity Administrator from other servers, which is primarily done when using the administrative web interfaces. Typically, if a server name is used instead of an IP address, the server name must be resolved to an IP address before access can occur over the network.
- Subscribers access the Cisco Unity Assistant or the Cisco Unity Inbox, which is primarily done when using the client web interfaces. Typically, if a server name is used instead of an IP address, the server name must be resolved to an IP address before access can occur over the network.

When deciding whether Cisco Unity should use DNS, WINS, or both, the customer should use the name resolution that is native to the directory and message store being accessed by Cisco Unity. Also consider the following best practices:

- If the Cisco Unity server is in a Windows 2000 domain, it must use Dynamic DNS (DDNS) or another version of DNS that supports dynamic updates. Simply creating a host file on the Cisco Unity server is not sufficient.

If a DNS host that fully supports Windows 2000 servers via dynamic server updates is used by a given organization, it is best to use the existing DNS host. Otherwise, a Windows 2000 DNS host must be made available to Cisco Unity and its supporting infrastructure to ensure the proper operation of all systems, including any domain controllers and message store servers that support Cisco Unity. The reason for providing dynamic server updates is to allow Windows 2000 servers to use the service locator records that are created as a part of the Windows domain structure in DNS. This structure must be present in DNS (for more information, refer to Microsoft documentation on using name resolution).

- Use the same name resolution used by the messaging clients. Usually, this is DNS, although DNS and WINS are sometimes used together. For example, when Outlook clients use DNS, Cisco Unity must also use DNS. Likewise, if Notes clients are



using Notes Name Resolution, Cisco Unity must also use Notes Name Resolution, through the Notes client that is installed on the Cisco Unity server.

- When Cisco Unity is installed in a Windows 2000 domain, and when a company uses any version of DNS that does not fully support DDNS as described on the Microsoft website, a DDNS server must be installed to support Cisco Unity (see the note above regarding service locator records). When Cisco Unity is installed into a Windows 2000 domain, and when it services:
 - Domino Notes clients via DUC, DDNS is required on the Windows 2000 domain controller in the domain in which the Cisco Unity server belongs.
 - Exchange 2000 or Exchange 2003 mailboxes, a DDNS server must be present and accessible by Cisco Unity and the supporting Exchange 2000 or Exchange 2003 servers.
 - Exchange 5.5 mailboxes, a DDNS server must be present and accessible by Cisco Unity. Exchange 5.5 does not use DDNS, but DDNS is used for name resolution and for record locator information in the Windows 2000 domain.
- When Cisco Unity is installed in a Windows NT domain, servicing Exchange 5.5 mailboxes (this is the only circumstance in which a Cisco Unity server can be installed in a Windows NT domain), Cisco Unity does not require DDNS, but it does require WINS and possibly static DNS access.
- The Windows DNS service can only be installed on the Cisco Unity server in the following cases:
 - With Domino, the Cisco Unity server is configured as a Windows 2000 domain controller in order to service Domino Notes clients via DUC. This is a Cisco Unity requirement, not a DUC requirement. The Cisco Unity server supports its own dedicated domain for Domino. Cisco Unity supports Domino only in a Unified Messaging configuration, and not in a Voice Messaging configuration.
 - With Exchange 2000, Exchange 2003, or Exchange 5.5, the Cisco Unity server is configured as a Windows 2000 domain controller in a Voice Messaging only configuration, and all other servers in the domain are used only to support Cisco Unity (for example, a secondary server for Cisco Unity failover, message store servers, DC/GC server, and so on). In this configuration, the Cisco Unity server supports its own dedicated domain for Exchange 2000 or Exchange 2003 (in Cisco Unity 4.0(x) systems or systems upgraded from Cisco Unity 2.x or 3.x) and for Exchange 5.5 (systems upgraded from Cisco Unity 2.x or 3.x only).



- When Cisco Unity is configured in a failover solution, in a Voice Messaging configuration, name resolution should not be located on the Cisco Unity servers, but on the Exchange mailstore server or dedicated DC/GC server.
- When the Cisco Unity server is a member server in a Windows 2000 domain, and it services Exchange 2000, Exchange 2003, or Exchange 5.5 in a Unified Messaging configuration, do not install the Windows DNS service on the Cisco Unity server.

Domain Controller Access and Availability

For all configurations and all message stores, Cisco Unity must have access to a Windows domain controller to authenticate service accounts. For Exchange 2000, Exchange 2003, and Exchange 5.5, Cisco Unity must also have access to a domain controller in order to authenticate subscribers. For Domino, subscribers can be authenticated for GUI-based access to Cisco Unity by using either Windows authentication or Domino authentication; Domino authentication does not require access to a Windows domain controller.

For Exchange 2000 and Exchange 2003, Cisco Unity must also have access to the same global catalog server(s) used by the Exchange 2000 and Exchange 2003 servers that Cisco Unity services.

Availability of Message Store Servers

When Cisco Unity is installed, the installer specifies one Domino or Exchange server that Cisco Unity connects with; this is known as the partner Domino server or the partner Exchange server. The partner server is the home of the Cisco Unity system mailbox (alias: Unity_<ServerName>). (The Unity system mailbox is used for Exchange; Domino's setup is different. For more information about Domino, see Chapter 7, "Using Lotus Domino as the Directory and Message Store.") The Unity system mailbox is the mailbox that originates voice messages from outside callers. It is also the home for default mailboxes and distribution groups (Cisco Unity distribution lists) that are created during installation. If Cisco Unity subscribers are homed on servers other than the partner server, all voice messages from outside callers pass through the partner server on their way to the home servers for Cisco Unity subscribers.

When the partner server or a message store server on which Cisco Unity subscribers are homed is unavailable, Cisco Unity functionality is affected in the following ways:

- Messages from outside callers are stored on the Cisco Unity server in the Unity Message Repository (UMR), and can be retrieved during the outage. However, voice messages previously received by subscribers are not available until the home server is back online.
- When the home server of a calling subscriber is down, any messages from that subscriber are stored on the Cisco Unity server in the UMR, and can be retrieved by the recipient during the outage.



- When the home server of a message recipient is down, the home mailstore server of the calling subscriber holds the message until the home mailstore server of the recipient is available again. The recipient cannot retrieve this message.
- Message waiting indicators and message notification will not work.

When the partner server becomes available again, it may be necessary to restart Cisco Unity.

Note: Make sure that the importance of message store availability is clearly understood prior to installing one or more Cisco Unity servers, particularly those that service message stores on separate servers.

Message Store Performance and Capacity Planning

In addition to ensuring that every message store is available, you must ensure that the response time on each message store is fast—40 milliseconds or less. This is particularly important for Exchange. When subscribers play or record messages over the phone, Cisco Unity processes happen in real time. This can expose any delays in the message store that are not apparent when the subscriber uses Notes or Outlook to play and record messages from the desktop. If clients are already experiencing delays when accessing the message store server and retrieving messages, these delays must be resolved before Cisco Unity is installed.

For every subscriber homed on an Exchange message store server, Cisco Unity logs on to the subscriber mailbox, sends and receives messages on behalf of the subscriber, and queries the contents of the subscriber mailbox. The longer Cisco Unity takes to log on to a mailbox and retrieve messages, the longer it takes a subscriber to log on and hear messages by using the phone.

The message store server must meet IBM Lotus requirements for Domino, and Microsoft requirements for Exchange. These requirements include adhering to recommendations for: the maximum number of users per server, the proper amount of memory, the proper processors and processor speed, hard disks that can meet disk-access response times, and placement of data files and transaction log files.

Cisco Unity cannot support message store servers that have performance bottlenecks such as slow hard drives or insufficient memory. For example, if slow hard drives or the lack of a dedicated mirror for transaction logs cause delays in MAPI recording log transactions, MAPI access (which is used by Microsoft Outlook, Exchange, and Cisco Unity to access Exchange) will be temporarily suspended until the transaction buffers can be cleared to a certain level. This can substantially delay phone access to Cisco Unity.

Cisco Unity filters through messages in each subscriber mailbox to find new voice messages for which the message waiting indicator must be turned on. Filtering is much



faster for small mailboxes than for large ones. Therefore we recommend that mailboxes not exceed 100 MB.

Directory Access and Availability

Directory access and availability are primarily issues in Unified Messaging configurations.

Cisco Unity stores a small amount of information in the directory, primarily subscriber information. This information also appears in a SQL Server/MSDE database on the Cisco Unity server. A Cisco Unity service keeps data in the directory synchronized with data in the SQL Server database. If there are multiple Cisco Unity servers, the SQL Server database on each Cisco Unity server also has a small amount of information about subscribers that are homed on other Cisco Unity servers.

Cisco Unity needs specific permissions to access the directory and write changes to it. Each Cisco Unity server must have at least the following access, or Cisco Unity will not work properly. Cisco Unity must be able to:

- Query the directory for changes to data that also appears in the SQL Server 2000/MSDE database. Cisco Unity must be able to find all of the subscribers in the directory, either by searching from the highest level in the directory hierarchy or by searching all of the domains where Cisco Unity subscribers are homed.
- Read and write to its own objects and to objects whose attributes are used by Cisco Unity.
- Read the objects used by other Cisco Unity servers so that it can store this information in its global tables.
- Write to specific attributes associated with each object serviced by Cisco Unity. It also must be able to read the rest of the attributes associated with each object serviced by Cisco Unity.
- Create, write to, and have full control over its own location documents or location objects in the directory. These location objects are specific to a given Cisco Unity server.

For more information on Cisco Unity and the Exchange 2000, Exchange 2003, and Exchange 5.5 directories, refer to the *White Paper: Cisco Unity Data and the Directory (All Versions with Microsoft Exchange)*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/whitpapr/datadir.htm. Note that this document does not include information specific to Cisco Unity for Domino.

When running in a Unified Messaging configuration, Cisco Unity generally does not need a dedicated directory server. This means that a directory server must exist, but a directory server does not need to be set up just to support Cisco Unity. The directory



servers that are dedicated to the existing message store servers being serviced by Cisco Unity should be sufficient to support Cisco Unity.

When Cisco Unity is running in a Voice Messaging configuration, a directory server is typically dedicated to Cisco Unity, because the directory is a dedicated part of the messaging infrastructure.

Gateway Access

If a router separates Cisco Unity from the network resources on which it depends (for example, if there is a router between Cisco Unity and the Domino or Exchange servers), and if the router becomes unavailable, Cisco Unity will be affected. If the network infrastructure is configured with redundant paths, gateway access becomes less of an issue.

Keep in mind the expectation that Cisco Unity will be co-located with the messaging store servers it services. Separating Cisco Unity from the messaging stores creates too many points of failure, and creates an undesirable end-user experience due to delays in retrieving messages and mailbox information, and performing logins into end-user mailboxes.

In addition, if the router is slow or busy, and the network resources are on different segments, access to Cisco Unity over the phone will be affected.

Deployment Requirements

Deploying one or more Cisco Unity servers takes a significant amount of planning. Some deployments also require testing and acceptance, including:

- Migrating from an existing legacy voice messaging system by performing a flashcut from the existing system to Cisco Unity.
- Migrating from a legacy voice messaging system by setting up communication between the existing system and Cisco Unity, by using AMIS, the Cisco Unity Bridge (for Octel Analog Networking), or VPIM.
- Implementing a new Voice Messaging or Unified Messaging infrastructure to provide features and functionality the customer has never used, such as Cisco Unity failover.
- Supporting a migration from Exchange 5.5 to Exchange 2000 or Exchange 2003. For more information, see Chapter 6, “Migrating from Exchange 5.5 to Exchange 2000 for the Message Store.”

Each of these deployments requires its own set of planning criteria for the project to be successful. In addition, all of these deployments have a common set of criteria:



- When the customer is replacing another voice messaging system with Cisco Unity, consider the differences in how users interact with each system. For example, the options offered by the Cisco Unity standard conversation (the telephone user interface, or TUI), and the key presses used to accomplish tasks, may be different from what users are accustomed to using. As an alternative to the Cisco Unity standard conversation, some customers may want to activate Optional Conversation 1 (the ARIA-like conversation available in Cisco Unity) so that Cisco Unity subscribers hear message-retrieval menus that more closely resemble the choices they are familiar with. However, other menus—those that outside callers and Cisco Unity subscribers use to send and manage messages, as well as the menus that subscribers use to change their Cisco Unity settings—are the same as those in the Cisco Unity standard conversation.
- Ensure that the customer understands Cisco Unity behaviors that are different from those of the voice messaging system it is replacing. For example, if the customer does not currently use an automated attendant feature and wants Cisco Unity to be configured the same way, this should be noted so that the installer configures Cisco Unity correctly. If it is necessary to change any Cisco Unity behavior, such as the opening greeting, or zeroing out to an operator option during a personal greeting, these changes should be made and tested prior to the day of the cutover.
- Plan a method for adding subscribers to Cisco Unity. Will they be imported from the message store (Domino or Exchange), imported from a text file (Exchange only), or entered by using the Cisco Unity Administrator (Exchange only)? If they will be imported from a text file or entered by using the Cisco Unity Administrator, where will the information come from? Creating subscribers requires planning and testing prior to the cutover.
- The larger the installation or number of servers, the greater the need to perform subscriber enrollment tasks prior to the day of the cutover. If too many subscribers try to enroll simultaneously, some subscribers (up to the number of voice ports available) will succeed in accessing the Cisco Unity server and enrolling, but the rest will get a busy signal.

To prevent this negative user experience, smaller groups of subscribers should be told, perhaps a few days in advance, how to call the pilot number and enroll in Cisco Unity before the system goes live.

- If the customer has special audio-text applications set up in the existing voice messaging system, Cisco Unity equivalents should be planned and set up before cutover. Cisco Unity supports audio-text applications and provides tools for designing and configuring them.



- Cisco Unity does not support group mailboxes, but the same functionality can be made available by setting up a call handler whose greeting prompts the caller to “press 1 for Pat, press 2 for Chris,” and so on.
- The supporting infrastructure (for example, message store servers), whether dedicated to Cisco Unity or being used by Cisco Unity, must be evaluated for availability and responsiveness. This can be accomplished by helping a customer understand the dependencies Cisco Unity has on the infrastructure, and how Cisco Unity performance or functionality can be affected by loss of connectivity to any of the external dependencies. Any problem areas should be addressed prior to installation of Cisco Unity. Cisco Unity will expose any deficiencies on the network, due to the way it uses the resources available on the network.

When the Cisco Unity design is finalized and verified through lab qualification, Cisco Unity functionality should also be tested before cutover by running a simulated load test and by running application test plans.

Sizing and Scaling Cisco Unity Servers

When sizing a Cisco Unity server, follow the guidelines in the following sections.

For a list of servers that meet Cisco Unity specifications, refer to the *Cisco Unity Supported Platforms List*, available at

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

Maximum Number of Users on Dedicated Domino or Exchange Servers

You should not allow the Domino or Exchange servers to service the maximum number of Domino or Exchange users that IBM Lotus or Microsoft allow. In addition, servers qualified by Cisco as Exchange message store servers for use with Cisco Unity have a maximum number of Exchange users, and the customer should not allow the number of users on these servers to reach the maximum.

You should also be careful not to exceed the disk capacity for the information store. For example, in order to enable recovery if the information store is corrupted, Microsoft recommends that the total size of an Exchange 2000 or Exchange 2003 information store never exceed 50 percent of the capacity of the drive on which the information store is installed. For more information, refer to the Microsoft website.

Storage Capacity for Voice Messages

For Cisco Unity systems configured for Voice Messaging, base the server requirements on the total number of voice storage minutes required for each subscriber. Typical hardware configurations accommodate a certain number of subscribers with 20 minutes or 30 minutes of messaging per subscriber.



For Cisco Unity systems configured for Unified Messaging, it is not possible to base server requirements on the total number of voice storage minutes required for each subscriber, because the message store also includes e-mail messages and possibly faxes. However, you can calculate the storage requirement for the desired number of voice storage minutes and add that to the current mailbox limits.

If the customer is replacing an existing voice messaging system with Cisco Unity, it may be possible to obtain information from the existing system on the average number of minutes of voice messages users currently have. You can then multiply the average number of minutes by the recording size per minute—according to the codec that Cisco Unity will use to record messages—to arrive at the average amount of disk space required for voice messages per user.

Start with a one-to-one correlation of legacy voice messaging system to Cisco Unity. If the legacy system handles a larger capacity than the largest Cisco Unity server, consider off-loading the legacy subscriber population onto more than one Cisco Unity server by extension number ranges or prefixes. It is not necessary to segment subscribers onto backend message stores by extension number ranges or prefixes but it may be easier to manage. Consider ways to organize subscribers on the backend message store in a voice messaging only configuration. Exchange 2000 and Exchange 2003 (Enterprise Editions) have the ability to support more than one mailstore per server. It may be useful to determine if multiple mailstores should be used on a single Exchange 2000 or Exchange 2003 server. However, remember if this is done, it requires more administrative overhead to manage Cisco Unity and the Exchange 2000 or Exchange 2003 backend for voice messaging.

If Cisco Unity is being installed in a Voice Messaging configuration with future plans to migrate to a Unified Messaging configuration, consider keeping the user density low on each Cisco Unity server to facilitate a manageable migration process. It is easier to migrate subscribers in smaller increments than it is to do the entire server at once, unless the server is sized to handle a smaller subscriber population.

Number of Voice Ports

To determine the number and configuration of voice ports required, you can start with the existing voice messaging system, if applicable. This may give you some idea how many ports are required for taking voice messages, for turning message waiting indicators on and off, and for message notification.

In a Unified Messaging configuration, Cisco Unity uses telephone record and playback (TRAP), to allow subscribers who use Notes or Outlook for voice messaging to play and record voice messages over the phone rather than by using speakers and a microphone. This feature is especially desirable when subscribers work in cubicles, where there is a lack of privacy. However, when a subscriber plays or records a message by using TRAP, a port on the Cisco Unity server is used. (No port is used when a subscriber uses speakers



and a microphone to play and record messages.) If the customer wants subscribers to use TRAP, calculations for the total number of voice ports required will need to take this into account.

For Cisco Unity failover, the primary and secondary servers must have the same number of ports.

In some cases you might find that an existing voice messaging system has more than 72 ports, which is the current maximum number of voice ports on a Cisco Unity system. In this case, the customer can purchase additional Cisco Unity servers and connect them by using Cisco Unity Digital Networking.

Deployment Requirements for Placement of Servers

An important design issue is where to place a Cisco Unity server, both physically and logically. A Cisco Unity server must have acceptable access to its resources on the network, including all of the resources discussed in this chapter. Note the following best practices, particularly the first two bullets, as they are your primary design rules for deploying any Cisco Unity solution:

- If Cisco Unity is integrated with a circuit-switched phone system, ensure that the Cisco Unity server is within the maximum allowable cable length of the phone system. If Cisco Unity is integrated with Cisco CallManager, the distance between the servers is less crucial.
- Install the Cisco Unity server as close as possible to the message store servers that will home Cisco Unity subscribers. The Cisco Unity server and the message store servers should be located in the same network segment, Windows 2000 site, and Windows 2000 or Windows NT domain as the message store servers, though this may not always be possible.
- For Cisco Unity for Exchange, the Cisco Unity server should also use the same DC/GC servers that the Exchange 2000 or Exchange 2003 servers are using. The more that Cisco Unity is separated from these resources, the longer it will take for authentication and for synchronizing changes between the Cisco Unity database and Active Directory. In addition, loss of access to a Windows 2000 Global Catalog server will render Cisco Unity inoperable.
- Ensure that Cisco Unity can resolve server names to IP addresses. If this is not possible on a given network segment, consider adding the necessary resource or moving the Cisco Unity server to a segment that provides easy access to these services.
- Because the Cisco Unity server provides mission-critical voice messaging for an entire enterprise, never place the Cisco Unity server outside of a firewall. Never



allow Cisco Unity to be separated from its network dependency resources by a firewall.

- A single Cisco Unity server can service both local and remote subscribers, especially when Cisco Unity is integrated with Cisco CallManager, and when Cisco Unity is configured for Voice Messaging only. In a Voice Messaging only configuration, the message store server must be in the same location as the Cisco Unity server.

Acceptable Deployment Models

The key to a successful Cisco Unity deployment is to minimize the variables that can cause Cisco Unity to lose functionality or suffer in performance. Cisco Unity has dependencies on the messaging infrastructure it services and also on the call processing or IP telephony it is connected to and servicing. For this reason, any Cisco Unity design must use two sets of deployment models, one for messaging and one for call processing. (However, the dominant deployment model for any Cisco Unity design is the messaging deployment model.)

Messaging Deployment Models

The messaging deployment models represent the physical layout of a given messaging solution, and how its clients access messages. A messaging solution may have dependencies that reside on the network, such as name resolution, authentication providers, domain controllers, and directory services. To Cisco Unity, all of these dependencies are considered a part of the messaging infrastructure. In general, these messaging infrastructure components, which can change depending upon the messaging system that Cisco Unity is using, will typically be co-located. This usually implies a LAN or MAN but rarely a WAN. (Although WAN connectivity between a messaging server and an authentication provider such as a domain controller is technically possible, it is not practical, given that a loss of WAN connectivity or even bandwidth congestion will render the messaging server inoperable, or will cause its response to client requests to be unacceptably delayed).

Each messaging deployment model is based on the physical location of the messaging system that Cisco Unity is expected to service. It is also expected that the messaging infrastructure components will be located within the same physical network proximity as the messaging system they are servicing. Cisco Unity will use these messaging infrastructure components just as they are used by the messaging system and its clients. None of the messaging deployment models for Cisco Unity consider or support messaging systems where the messaging infrastructure components are remotely separated from the messaging system that Cisco Unity is expected to service. This is an important distinction between what is possible and what is practical as a sustainable solution. The primary reason for this rather strict adherence to pure messaging models (where all messaging infrastructure components are co-located within close physical



proximity to the messaging system they service) is to improve the likelihood of acceptable response times between Cisco Unity and its subscribers.

There are three primary messaging deployment models for Cisco Unity: single site messaging, multi-site WAN with centralized messaging, and multi-site WAN with distributed messaging. In some cases, a large-scale deployment will contain more than one messaging deployment model.

Single Site Messaging

In a single site messaging deployment model, the messaging system and the messaging system infrastructure components are all located in the same site. This site can either be one physical location or several buildings in a campus interconnected via a high-speed campus network backbone. All clients of the messaging system are located at the single site. There may be WAN connectivity to remote sites, but the remote clients do not access the messaging systems over the WAN.

When deployed in a single site, Cisco Unity can be deployed in a Unified Messaging or a Voice Messaging configuration¹.

Multi-Site WAN with Centralized Messaging

In a centralized messaging deployment model, the messaging system and the messaging system infrastructure components are all located in a centralized location. This location can either be one physical location, which is typical, or part of a campus. Clients of the centralized messaging system will be both local and remote. The remote clients access the centralized messaging system over a WAN connection from their remote offices.

When deployed in a multi-site WAN with centralized messaging, Cisco Unity can be deployed in a Unified Messaging or a Voice Messaging configuration². Cisco Unity can service both local and remote clients via the TUI. Local and remote clients should experience no difference in the TUI; however, the GUI experience will be different. The local clients can use VMO or the DUC client (depending upon whether Cisco Unity is implemented with Exchange or with Domino) and they can also use features such as TRAP and message streaming. Local clients can also use the Cisco Unity Inbox, accessed via the CPCA. Remote clients, however, will not be able to use TRAP and messaging streaming over the WAN. In fact, if they use a GUI client such as VMO or the DUC client, they should download messages before playback and also be configured not to use TRAP.

¹ All Cisco Unity Voice Messaging solutions use Microsoft Exchange 2000.

² All Cisco Unity Voice Messaging solutions use Microsoft Exchange 2000.



Multi-Site WAN with Distributed Messaging

In a distributed deployment model, the messaging systems and their messaging infrastructure components are co-located in a distributed fashion. There may be several locations, each with its own messaging system and messaging infrastructure components. All clients access their messages locally, because each is co-located with its messaging system. The messaging systems share a messaging backbone that spans to all locations. Thus, though the messaging systems are distributed, they still can deliver messages to a messaging backbone through a hub-and-spoke type of message routing infrastructure. The model can also be more elaborate, for example by including redundancy paths, and containing multiple hub-and-spoke configurations for message routing.

When deployed in a multi-site WAN with distributed messaging, Cisco Unity can be deployed in a Unified Messaging or Voice Messaging configuration³. Cisco Unity will be co-located with the messaging systems it services. No messaging system should be separated from Cisco Unity via WAN connectivity. In a distributed messaging deployment model all subscribers are co-located with Cisco Unity just as they are co-located with their messaging system. This model is similar to many single-site messaging models, with a messaging backbone added to connect them.

Messaging Failover

There are two types of failover available with Cisco Unity. Both types require access to the same messaging systems and messaging infrastructure components. There is local failover, in which both the primary and secondary failover servers are co-located in the same physical site as the messaging system they service. There is also remote failover, where the primary and secondary failover servers are located in separate physical sites. In a remote failover configuration, the network connectivity should be no less than 100 Mbps between the sites, and the messaging systems and messaging infrastructure components must be accessible by both Cisco Unity servers. (Note that messaging infrastructure components include domain controllers and/or directory servers, global catalog servers, and name resolution hosts.) Regardless of your network connectivity bandwidth, the response time between the Cisco Unity server and the Exchange servers it is connected to should be no more than a 40-millisecond round trip delay in order for Cisco Unity to service subscriber TUI requests normally.

Site Classification

To classify a site, determine the following:

- Where the e-mail clients are in relation to the messaging system they access.
- Where the messaging infrastructure components are located in relation to the messaging system they service. It is crucial that you verify that these messaging infrastructure components are in place to support Cisco Unity, just as they should

³ All Cisco Unity Voice Messaging solutions use Microsoft Exchange 2000.



be in place to support the messaging systems and clients to which they are connected.

When designing a Cisco Unity implementation, you must classify your sites before you can determine how Cisco Unity can best be deployed. When you know where your messaging systems are located, you should also be able to tell where Cisco Unity can be located, as it should be located in the same physical proximity to the messaging systems it will service.

IP Telephony Deployment Models

As mentioned at the beginning of this section, Cisco Unity requires both a messaging deployment model and a call processing deployment model for any Unity design.

Descriptions and use of IP Telephony deployment models can be found in the latest SRND for IP Telephony. However, Cisco Unity-specific dependencies for each combination can be found in this design guide.

Deployment Model Combinations

Because Cisco Unity uses a messaging deployment model first, they are listed that way below. The design requirement therefore is to determine Unity's placement with the messaging deployment model prior to determining Unity's placement with the CallManager server or cluster it will connect to. For legacy PBX integrations, the cabling distance required between Cisco Unity and the legacy switch may dictate where Cisco Unity is located, but this is the only rule that may override the design requirement to place Unity as near as possible to the messaging system it will service. However, this does not mean that Cisco Unity should be deployed across a WAN from the messaging system. In fact, if this is the only option you have, then you do not have a deployable and sustainable solution for Cisco Unity.

Possible deployment model combinations include:

- Single Site Messaging and Single Site Call Processing
- Centralized Messaging and Centralized Call Processing
- Distributed Messaging and Centralized Call Processing
- Centralized Messaging and Distributed Call Processing
- Distributed Messaging and Distributed Call Processing

An acceptable failover deployment model combination is remote failover and Cisco CallManager clustering at the two Cisco Unity-specific failover locations only.



Network Traffic and Bandwidth Requirements

Cisco Unity depends on the infrastructure into which it is installed, so careful design consideration must be given to the amount of network traffic and the bandwidth available to Cisco Unity.

Cisco Unity depends on the timely responsiveness of the messaging systems it connects to. To prevent unwanted delays in recording and playing messages over the phone, always install Cisco Unity as close as possible to the messaging stores it services. The Cisco Unity server should always be in the same well-connected LAN, and in the same Domino domain or Windows 2000 domain.

Placement considerations include installing Cisco Unity into the same Windows 2000 site as the Exchange 2000 servers it services. Cisco Unity with Domino does not have this requirement. Also, Cisco Unity should be installed into the same VLAN as Exchange in order to avoid any unwanted delays with message waiting indicators. Cisco Unity for Domino does not have this requirement.

In addition, to prevent an unacceptable end user experience, adhere to the following requirements for connecting Cisco Unity to any messaging store it services (Microsoft Exchange or Lotus Domino, unless otherwise specified):

- A 100 Mbps or faster full-duplex network connection is required between the Cisco Unity server and the partner message store server.
- For Exchange 2000, Exchange 2003, or an Exchange mixed-mode environment, a 100 Mbps or faster full-duplex network connection is required between the Cisco Unity server and the DCs and GCs that service the message stores that home Cisco Unity subscribers.
- If Cisco Unity is integrated with Cisco CallManager, a 100 Mbps or faster full-duplex network connection is recommended between the Cisco Unity server and the Cisco CallManager server. However, when Cisco Unity is remotely connected with Cisco CallManager, it is acceptable to calculate the per-port bandwidth and necessary overhead. The aggregate total of bandwidth for all ports plus any necessary overhead should be the minimal bandwidth required.
- If the Cisco Unity server has two NICs, the NICs cannot be used for load balancing, either full or half duplex. If dual NICs are configured, we recommend that they be configured in adaptive fault tolerant (AFT) or network fault tolerant (NFT) mode. For additional information about dual NICs, refer to the “Customizing the Cisco Unity Platform” chapter in the *Cisco Unity Installation Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.



- For Exchange 2000, Exchange 2003, or an Exchange mixed-mode environment, the Cisco Unity server must not be separated by a firewall from the message store servers that home Cisco Unity subscribers, from the DCs and GCs that service those message store servers, or from other network resources necessary to operate normally.
- Cisco Unity cannot be connected to Exchange or Domino via a WAN connection.
- Cisco Unity failover servers may be on separate network segments or subnets. However, both servers must reside in the same Windows 2000 site, and both servers must directly connect to the DCs, GCs, message store servers, and other network resources necessary to operate normally. This is true even when using a remote failover deployment model.
- Subscribers who use IBM Lotus Domino Unified Communications Services (DUC) for Cisco Unity or ViewMail for Microsoft Outlook should not play or record messages over the phone if they must do so over a WAN connection (including streaming messages). This is important where Unity services remote clients in centralized messaging, centralized call processing deployment models.
- Use of the Cisco Unity Administrator and the Cisco Unity Assistant over a WAN should be kept to a minimum, especially if limited bandwidth is allocated for normal voice traffic. The Cisco Unity Inbox cannot effectively support message streaming over a WAN.
- Bandwidth requirements for connecting Cisco Unity with a SIP proxy server over a WAN have not been determined.

Connecting Cisco Unity with a Messaging System over a WAN

Cisco Unity cannot be connected over a WAN connection to a messaging system it supports, regardless of the bandwidth available. Cisco Unity must be installed with the messaging system and the messaging infrastructure components belonging to the messaging system. A WAN is a data communications network that serves users across a broad geographic area, often using transmission devices provided by common carriers, for example Frame Relay, SMDS, and MPLS. WAN speeds may vary, but are typically any speed lower than a 100Mbps Full Duplex Ethernet network.

A WAN is a computer and voice network bigger than a city or metropolitan area.

A WAN may be in place, and in fact most of the Cisco Unity deployment models have a WAN. However, Unity may or may not use the WAN connectivity to service subscribers, but it will not remotely connect to a mailstore in order to service subscribers.

Using Firewalls with Cisco Unity

Cisco Unity can coexist with firewalls. However, note the following:



- Cisco Unity should never be deployed outside of a firewall. Doing so can expose the Cisco Unity server to unwanted intrusion from the Internet, even if the server is hardened.
- Cisco Unity should never be separated by a firewall from the partner Domino or Exchange server or from any Domino or Exchange server that homes Cisco Unity subscribers.
- The best way to use the Cisco Unity Administrator, the Cisco Unity Assistant, or the Cisco Unity Inbox through a firewall is by using a virtual private network.

Opening the firewall by filtering specific ports and protocols is a configuration challenge because the Cisco Unity Administrator, the Cisco Unity Assistant, and the Cisco Unity Inbox all use DCOM. Configuring DCOM to work through a firewall requires a significant amount of configuration (including opening several ports and port ranges) and testing. In addition, Network Address Translation (NAT) cannot be used because it is not supported by DCOM.

Cisco Unity can be configured to use DCOM over HTTP, so HTTP can be opened up through the firewall directly into Cisco Unity. However, note that this configuration exposes Cisco Unity to potential threats that a web server might be exposed to from the Internet, including denial-of-service attacks, viruses, and hacking of sensitive information.

Processing Impact of Third-Party Applications Installed on the Cisco Unity Server

If third-party applications (for example, virus scanning software or backup software) are installed on the Cisco Unity server, we recommend that these applications not be started unless CPU usage remains below 70 percent while the system is under normal call traffic loads.

Access for Cisco TAC

The Cisco Technical Assistance Center (TAC) requires that Windows Terminal Services and at a minimum a modem are installed on the Cisco Unity server, thus giving support analysts access the server remotely, if necessary. The modem need not be connected to a phone line at all times; the customer can hook it up only when Cisco TAC requires access. The recommended method for remote TAC support is via a higher speed connection directly via the Internet. A VPN can be used to secure the remote access.

Audio Codecs

A codec is a coder/decoder algorithm or a compression/decompression algorithm. Codecs are used to encode/decode or compress/decompress various types of data that would



otherwise use up large amounts of disk space, such as sound and video files. Cisco Unity uses audio codecs with streaming (live conversation) content and file-based (WAV file voice message) content.

The following audio codecs are supported for use with all versions of Cisco Unity:

- G.711 Mu-Law (the default codec)
- G.711 A-Law
- G.729a
- Intel Dialogic OKI ADPCM 8 kHz
- Intel Dialogic OKI ADPCM 6 kHz
- GSM 6.10

In addition, the G.726 codec is supported for use with a Cisco Unity version 4.0(1) or later system that is running Microsoft Exchange and using the Voice Profile for Internet Messaging (VPIM) networking option.

Codec Overview

Coding techniques are standardized by the International Telecommunications Union (ITU), headquartered in Geneva, Switzerland. The ITU is an international organization within which governments and the private sector coordinate global telecom networks and services. The two ITU G-series codecs that are fully supported by Cisco Unity—G.711 and G.729a—are among the most popular standards for Voice over IP (VoIP) applications.

G.711

The G.711 codec is the standard format for digital voice delivery in the public switched telephone network (PSTN) and through PBXs. It is widely used in the telecommunications field because it improves the signal-to-noise ratio without increasing the amount of data.

There are two subsets of the G.711 codec: Mu-Law and A-Law. Mu-Law is used in North American and Japanese phone networks, while A-Law is used in Europe and elsewhere around the world. (Sometimes these codecs are known as CCITT Mu-Law and CCITT A-Law. CCITT stands for the Comité Consultatif Internationale de Télégraphie et Téléphonie, the former French name of the ITU. The name lives on in some applications.)

Both Mu-Law and A-Law subsets use compressed speech carried in 8-bit samples. They use an 8-kHz sampling rate with 64 Kbps storage.



G.711 is supported by Cisco Systems, Intel Dialogic, and many other hardware manufacturers. It is also supported by Microsoft in all versions of its server and client operating systems.

To play messages recorded in G.711 format, Cisco Unity subscribers can use Cisco Unity ViewMail for Microsoft Outlook, IBM Lotus Domino Unified Communications Services (DUC) for Cisco Unity, Sound Recorder, or any other audio application that uses the Audio Compression Manager to decompress the audio signal.

G.711 MuLaw must be selected as the message recording and storage codec if you are using the Cisco Unity TTY language. Cisco Unity TTY is not compatible with G.729a or other message recording and storage codecs.

G.729a

The G.729 codec is a high-complexity algorithm, and G.729a (Annex A) is a medium-complexity variant of G.729. The undistorted, toll-quality speech ensured by this standard makes it a popular choice for applications such as teleconferencing, visual telephony, VoIP, cellular phones, and other wireless applications for which quality, delay, and bandwidth are important.

The advantage of G.729a is that it uses fewer digital signal processor (DSP) resources, making it easier to implement on lower-performance, less expensive DSP chips. G.729a uses an 8-kHz sampling rate with 8 Kbps storage.

G.729a is supported by Cisco Systems and many other hardware manufacturers. Note that G.729a is represented as G.729ar8 in some applications, including Cisco IOS gateways.

While some reports rate G.729a audio quality not as good as G.711, others rate it from very acceptable to astounding. One source said: “I recently experienced a LAN-based call using the G.729a codec and stood next to the person calling me. I could detect no perceptible delay between the direct path, his mouth to my ear, and the link across the network. If I had not known otherwise, I would have sworn it was a normal PSTN call. This codec is the future of Internet telephony.”

To play messages recorded in G.729a format, Cisco Unity subscribers must use either ViewMail for Microsoft Outlook or DUC for Cisco Unity, or download the G.729a codec to their desktops.

A second medium-complexity variant of G.729 exists and is known as G.729b (Annex B). G.729b does not interoperate with G.729a, and the G.729b codec is not supported for use with Cisco Unity.

ADPCM

The adaptive differential pulse code modulation (ADPCM) method of encoding sound data files takes up less storage space than the regular PCM format used by WAV, AIF, and CD audio. The algorithm encodes the difference between actual audio sample



amplitude and predicted amplitude, and adapts resolution based on recent differential values.

Many versions of ADPCM exist. Cisco Unity supports two options for Intel Dialogic OKI ADPCM: an 8-kHz sampling rate with 32 Kbps storage, and a 6-kHz sampling rate with 24 Kbps storage.

OKI ADPCM is a hardware-based compression method that is used by Intel Dialogic analog voice cards. This method provides a data-compression alternative to G.711 for a traditional PBX integration. However, when used with an IP phone system integration, ADPCM compression and decompression happens at the CPU level, which can have a performance impact on a heavily loaded system.

OKI ADPCM is not compatible with Microsoft Windows ADPCM. To play recorded messages, Cisco Unity subscribers must use either ViewMail for Microsoft Outlook or DUC for Cisco Unity, or download the codec to their desktops.

To use the VPIM networking option when the OKI ADPCM codec is used for message recording and storage on Cisco Unity, the OKI ADPCM codec must be installed on the Exchange Voice Connector server.

G.726

The G.726 ADPCM voice codec, available from a variety of vendors, is used in many applications that require high-quality, robust speech reproduction, such as video conferencing systems, multimedia, flight recording, ISDN, and satellite communications.

In Cisco Unity version 4.0(1) and later with Microsoft Exchange, G.726 32 Kbps is used for outgoing VPIM messages from the Cisco Unity Exchange Voice Connector and is also supported for incoming VPIM messages.

G.726 is not recommended for system-wide voice message recording and storage on Cisco Unity. G.726 is also not supported as a region (line) format for a Cisco CallManager integration.

If VPIM messages are stored in G.726, all Cisco Unity servers and subscriber workstations must have the G.726 codec installed.

GSM 6.10

The Groupe Speciale Mobile (GSM), or Global System for Mobile Communications, set of standards is a cellular network architecture that originated in Europe and is used worldwide. It was developed for the European digital cellular phone network to make the most of tight bandwidth, by analyzing and deriving a mathematical formulation of small sections of speech using a model of the human vocal tract.

GSM 6.10 uses an 8-kHz sampling rate with 13 Kbps storage. It is optimized for speech reproduction, is used in many Internet phone applications, and is not dependent on the cellular network.



A Microsoft version of GSM 6.10, sometimes referred to as MSGSM, is shipped with Microsoft Windows. MSGSM is fully compatible with GSM 6.10.

GSM 6.10 is supported for message storage on Cisco Unity with all phone system integrations, and for storage of incoming VPIM messages. It is not supported with a Cisco CallManager integration as a region (line) format.

A Cisco Unity site might want to use GSM 6.10 to minimize the disk space used by voice messages and to ensure that messages are playable, even when a recipient does not have ViewMail for Microsoft Outlook or DUC for Cisco Unity.

GSM 6.10 is also supported for playback on a Pocket PC, and is a higher quality recording format than MP3.

Network, Software, and Hardware Considerations That Impact Codec Choice

In sites with only one Cisco Unity server installed, a single codec is chosen for recording and storage. In a networked environment, different Cisco Unity servers may be configured with different recording and storage codecs to meet the needs of their sites. We do, however, recommend minimizing the number of different codes in use on a Cisco Unity system (for message recording and storage, Cisco CallManager region, prompts, VPIM, etc.) in order to reduce the need for transcoding and, thus, minimize CPU performance impact and preserve audio quality.

Typical considerations when choosing an audio codec for Cisco Unity include the type of network and bandwidth available, disk storage space available for voice messages and greetings, and associated hardware and software support.

The default codec, G.711, is recommended for the following connections:

- Traffic between analog phones and IP phones normally on the same LAN.
- Traffic between an analog or digital trunk and an IP phone.
- Traffic between an analog phone, analog trunk, or digital trunk and a Cisco Unity integration with Cisco CallManager.

If calls go through a WAN link with limited bandwidth, a codec with voice compression/decompression may be desirable, such as G.729a. G.729a is also recommended for traffic between analog phones and remote IP phones using VoIP over the WAN. The benefits of reduced file size for voice messages and greetings can be seen in the database and local e-mail folders, as well as in reduced network traffic associated with transferring voice messages to and from Cisco Unity subscriber workstations. To minimize the performance impact of transcoding when G.729a is used over WAN connections or remote IPT sites, use Cisco hardware resources for transcoding, such as transcoders and G.729a WAN partitions in Cisco CallManager servers, rather than having



the Cisco Unity server do all of the transcoding. Other codecs can be used by Cisco Unity. For more information, refer to the *White Paper: Audio Codecs and Cisco Unity (All Versions)* available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/whitpapr/codecs.htm.

When using ViewMail for Microsoft Outlook in a low-bandwidth deployment or with a slower modem, remote subscribers should download messages before playing them for best performance and quality. (For information on setting up ViewMail for Microsoft Outlook for low-bandwidth deployment, refer to the *Cisco Unity System Administration Guide*. The guide is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_administration_guides_list.html.)

Bandwidth is also an issue when dial-up lines to the Internet are used for calls and voice-message retrieval. In the PSTN world, the audio on the local loop is digitized into a 64-Kbps digital data stream and presented to the phone company central office equipment, which then compresses the data for transport across the phone system backbone. Because G.711 requires a minimum bandwidth of 64 Kbps in each direction for full-quality voice, the codec does not make it practical to make calls or retrieve messages across a dial-up Internet connection of 56 Kbps.

When estimating network bandwidth savings among the different codecs, it is important to take into account that bandwidth savings are realized only on the actual voice frames. The compression method affects the ratio of IP packet overhead data to actual voice frames per packet, and packetizing overhead of IP headers can account for considerable bandwidth consumption. In one study, Tolly Research found that G.711-encoded traffic averaged about 110 Kbps. As the ITU defines G.711 as 64 Kbps, the remaining 46 Kbps is IP overhead. Compressed G.729a traffic, which can reduce voice-frame bandwidth consumption to as little as 8 Kbps, was also found to be bogged down by as much as 80 percent IP packet overhead.

For Cisco Unity sites using text to speech (TTS), any supported codec may be used to record messages. However, TTS output is currently available only in G.711 and G.729a audio formats.

Messages must be stored in either G.711 or G.729a when the Cisco Unity Bridge is installed.

Codec choice does not affect AMIS messages. (AMIS is the Audio Messaging Interchange Specification protocol, an analog mechanism for transferring voice messages between different voice messaging systems.)

GSM 6.10 is supported for playback on a Pocket PC, and is a higher quality recording format than MP3. G.711 and G.729a usually are not compatible with hand-held computers.



Table 1 shows a summary of decision factors to consider when choosing a codec for Cisco Unity.

Table 1. Network, Hardware, and Software Considerations for Supported Codecs

Audio Codec	Recommended Deployment Model	Client Workstation Operating System Native Support	ViewMail for Microsoft Outlook or DUC for Cisco Unity	Additional Supported Hardware and Software
G.711 Mu-Law and A-Law	<ul style="list-style-type: none"> • Single site messaging with single site call processing • Distributed messaging with distributed call processing 	Windows	Not required	<ul style="list-style-type: none"> • Cisco CallManager • Cisco 7960 phones • Intel Dialogic voice cards • TTS output • Microsoft NetMeeting
G.729a	<ul style="list-style-type: none"> • Centralized messaging with centralized call processing • Centralized messaging with distributed call processing • Distributed messaging with centralized call processing 	Codec available from Cisco for Cisco Unity subscribers only	Required, if codec is not installed on workstation	<ul style="list-style-type: none"> • Cisco CallManager • Cisco 7960 phones • TTS output



Audio Codec	Recommended Deployment Model	Client Workstation Operating System Native Support	ViewMail for Microsoft Outlook or DUC for Cisco Unity	Additional Supported Hardware and Software
OKI ADPCM 8 kHz	<ul style="list-style-type: none"> • Single site messaging with single site call processing • Distributed messaging with distributed call processing 	Codec available from Cisco	Required, if codec is not installed on workstation	Intel Dialogic voice cards
OKI ADPCM 6 kHz	<ul style="list-style-type: none"> • Single site messaging with single site call processing • Distributed messaging with distributed call processing 	Codec available from Cisco	Required, if codec is not installed on workstation	Intel Dialogic voice cards
G.726 32 Kbps	<ul style="list-style-type: none"> • Centralized messaging with centralized call processing • Centralized messaging with distributed call processing • Distributed messaging with centralized call processing 	Codec available from third-party vendors	Not required (codec must be installed on workstation)	Cisco Unity Exchange Voice Connector



Audio Codec	Recommended Deployment Model	Client Workstation Operating System Native Support	ViewMail for Microsoft Outlook or DUC for Cisco Unity	Additional Supported Hardware and Software
GSM 6.10	<ul style="list-style-type: none"> • Single site messaging with single site call processing • Centralized messaging with centralized call processing • Centralized messaging with distributed call processing • Distributed messaging with centralized call processing 	Windows	Not required	GSM wireless handsets

Table 2 shows a summary of codec considerations for Cisco Unity networking options.

Table 2. Networking Interoperability Comparison for Audio Codecs

Networking Option	Supported Codecs
AMIS	<p>The AMIS protocol is not dependent on audio format.</p> <p>The Cisco Unity servers may use any of the supported codecs.</p>



Networking Option	Supported Codecs
Cisco Unity Bridge	Octel Analog Networking is not dependent on audio format. The Cisco Unity servers must use either G.711 or G.729a in order to communicate with the Cisco Unity Bridge servers.
VPIM	VPIM supports the audio formats G.711, G.726, and GSM 6.10. The Cisco Unity servers may use any of the supported codecs.

Stored voice messages can consume considerable amounts of disk space. The amount of storage a WAV file uses depends on what kind of compression the codec uses, if any. The higher the compression, the smaller the file and the smaller the disk-space impact on the database and at the subscriber workstation. However, some sound-quality reduction and some CPU processing overhead may result when compressing messages during recording and decompressing at playback.

As illustrated in Table 3, voice messages recorded in G.711 Mu-Law and A-Law require the most disk space to store, while G.729a offers the smallest file size.

Note: Audio quality ratings are subjective, and are provided here only for basic comparison between the different fully supported codecs.

Table 3. Voice Message File Sizes and Audio Quality Ratings

Audio Codec	Approximate File Size, 1-Minute Message	Quality Rating
G.711 Mu-Law and A-Law	480 KB	Excellent
G.726 32 Kbps	240 KB	Fine
OKI ADPCM 8 kHz	240 KB	Fine
OKI ADPCM 6 kHz	180 KB	Fine
GSM 6.10	98 KB	Good
G.729a	60 KB	Good



We recommend using G.711 whenever possible, because of its excellent quality for recording and playback. However, if bandwidth, disk space, Active Directory impact, or any other customer-site issue requires it, it is fine to use G.729a. G.729a is a voice-quality codec, and should be used when it is needed. Also consider the possibility that a large-scale or multiserver deployment may require the use of more than one codec.

For information on how codec choice affects Active Directory, refer to the *White Paper: Active Directory Capacity Planning (Cisco Unity Versions 4.0, 3.1, and 3.0(3) and Later with Microsoft Exchange)*, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/whitpapr/adsizing.htm.

Packetization

The Real-Time Transport Protocol (RTP) is used to send and receive audio packets over the IP network. Each discrete packet has a fixed-size header, but the packets themselves can vary in size, depending on the size of the audio stream to be transported (varies by codec) and the packetization setting. This variable size function helps utilize network bandwidth more efficiently—reducing the number of packets created per call sends fewer total bytes over the network.

Packetization is set in the CallManager Service Parameters, in the Preferred G711 Millisecond PacketSize and Preferred G729 Millisecond PacketSize parameters. When integrated with Cisco CallManager version 3.1 or later, and when using Cisco Unity-CM TSP version 7.0(3) and later, Cisco Unity supports any packet size up to 30ms for G.711 audio, and any packet size up to 60 ms for G.729a audio. The default setting is 20ms for both, and there can be latency issues with lower settings.

DSCP is a priority setting on each packet. DSCP helps intermediary routers manage network congestion and lets them know which packets to prioritize ahead of others. Following Cisco AVVID standards, the Cisco Unity-CM TSP marks the SCCP packets (call control) with a default DSCP value of 26 (the TOS octet is 0x68), and the RTP packets (audio traffic) with a default DSCP value of 46 (the TOS octet is 0xB8). Thus, the RTP audio packets can be assigned priority over other packets by using the router settings. Note that even though Cisco CallManager allows you set different DSCP values, when integrated with Cisco Unity, the DSCP values set by the Cisco Unity-CM TSP always take precedence.

With each new audio stream (once per call), Cisco CallManager tells Cisco Unity which packet size to use, and the Cisco Unity-CM TSP sets the DSCP priority for the stream. The entire stream (call) stays at the specified packet size and priority. For example, an audio stream could be broken up into packets of 30ms each. A 30ms G.729a audio stream would be 30 bytes plus the header per packet, and a 30ms G.711 stream would be 240 bytes plus the header per packet. For information on setting CallManager Service Parameters, refer to the Cisco CallManager documentation, available on Cisco.com.



Chapter 3: Integrating Cisco Unity with the Phone System

Overview

An integration enables communication between Cisco Unity and a phone system, providing subscribers with features that typically include the following:

- Calls to a subscriber extension that does not answer or is busy are forwarded to the subscriber personal greeting.
- Messages left for a subscriber activate the message waiting indicator (MWI) on the extension.
- A subscriber has easy access to messages by pressing a button on the phone and entering a password.

Depending on the phone system and the integration, other integration features may be available, including caller ID, call forward to the subscriber busy greeting, and identified subscriber messaging.

The phone systems that Cisco Unity can integrate with are Cisco CallManager, Cisco CallManager Express, supported SIP proxy servers, and supported circuit-switched phone systems. Cisco Unity can integrate with a single phone system, or with two different phone systems, including:

- Cisco CallManager with a supported circuit-switched phone system
- Cisco CallManager with a SIP proxy server
- A SIP proxy server with a supported circuit-switched phone system

For a list of supported phone systems, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysrq.htm.

Circuit-switched phone systems use one of the following integration methods:

DTMF (or analog, also known as in-band signaling)	The phone system communicates with Cisco Unity by using DTMF packets sent over the analog lines. This method does not use an RS-232 serial cable.
----------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------



Serial (also known as out-of-band signaling)	The phone system communicates with Cisco Unity by using serial packets sent over an RS-232 serial cable.
Digital Feature Set Emulation	Certain phone systems require PBXLink boxes to convert digital phone lines into a serial cable. This method also uses analog lines but only for voice connectivity.

For detailed information on integrating Cisco Unity with a specific phone system, refer to the applicable Cisco Unity integration guide, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_configuration_guides_list.html.

How an Integration Works

An integration depends on the following components to be successful:

- Lines and cables necessary to make physical connections (in circuit-switched phone systems) or a network connection (in Cisco CallManager and SIP proxy servers).
- Settings in the phone system and in Cisco Unity.
- Call information exchanged by the phone system and Cisco Unity.
- Call control (signals used to set up, monitor, and tear down a call) to determine and control the status of the call.

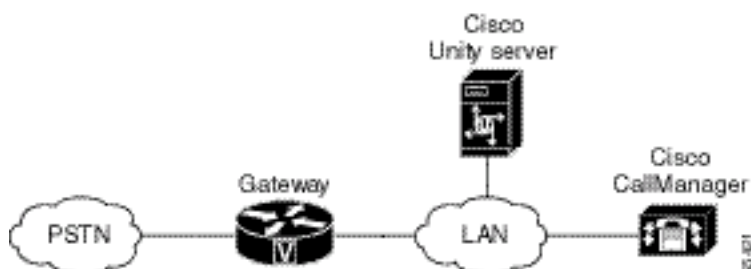
Lines and Cables to Make Physical Connections

Depending on the type of integration, different combinations of lines and cables are used to connect the phone system and Cisco Unity.

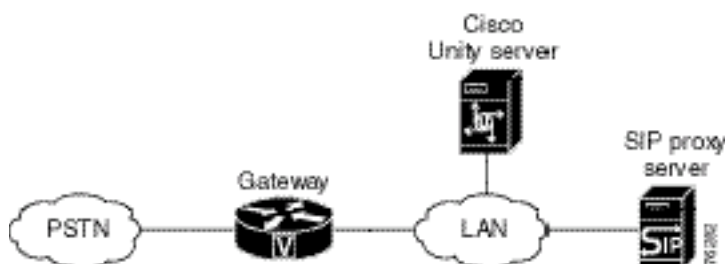


Integration with Cisco CallManager or a SIP Proxy Server

Cisco CallManager and SIP proxy servers use network connections that carry all communication to and from Cisco Unity. The following figure shows the network connections used in an integration with Cisco CallManager.



The following figure shows the network connections used in an integration with a SIP proxy server.



DTMF (Analog) Integration

In DTMF integrations (also called analog or in-band integrations), circuit-switched phone systems use analog lines to carry voice connections, call information, and MWI activation requests. The lines connect the ports on the phone system to the voice messaging ports on voice cards installed on the Cisco Unity server. Signaling carried across the analog lines is achieved through DTMF digits being sent to and from the PBX and Cisco Unity. For example, in order for Cisco Unity to turn on or off the MWI lamp, DTMF digits (including #, *, and the digits 0-9) are sent from Cisco Unity to the PBX.



The following figure shows the connections used in a DTMF integration.



Serial/SMDI Integration

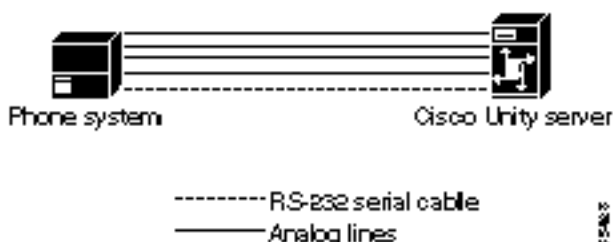
In serial integrations (also called SMDI or MCI integrations for NEC PBX's), circuit-switched phone systems use an RS-232 serial cable to carry call information and MWI activation requests. The serial cable connects the serial port on the phone system to the serial port on the Cisco Unity server. (Some phone systems require hardware such as a modem or PBXLink box to connect to the serial cable.)

PBXLink Integration

The PBXLink integration works in a way similar to the serial integration. The only difference is the addition of a digital phone port that connects to the PBXLink. All calls going to Cisco Unity are placed to the digital port, which has analog line appearances that are programmed to appear on the port and that are connected to the Cisco Unity server. When a call is placed to Cisco Unity, the PBXLink converts the display information to Simplified Message Desk Interface (SMDI) format. When the call is received, the PBXLink checks the status of the analog ports and transfers the call to an available port. At the same time, the SMDI information is sent via an RS-232 connection.

The integration also uses analog lines to carry voice connections. The lines connect the ports on the phone system to the voice messaging ports on voice cards installed on the Cisco Unity server.

The following figure shows the connections used in a serial integration.



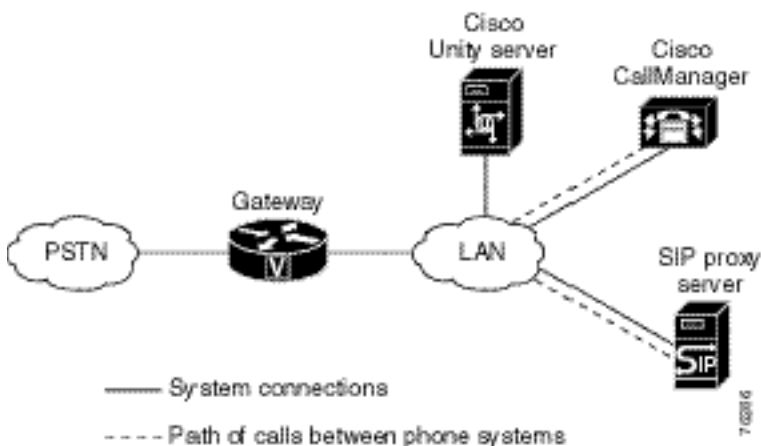


Dual Phone System Integrations

In dual phone system integrations, both phone systems use the applicable connections with the Cisco Unity server.

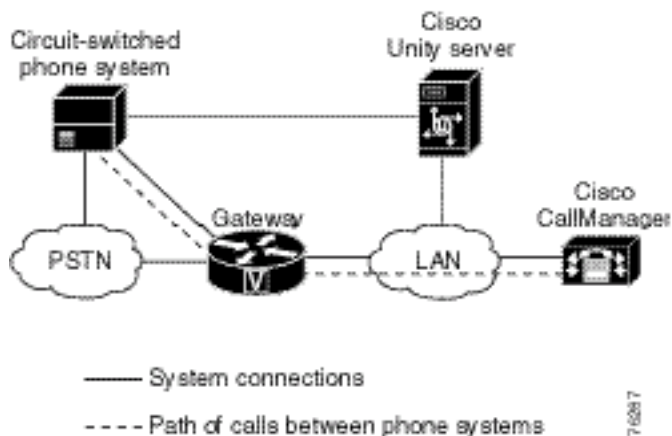
Note: In a dual switch scenario, the total number of ports available is 72, for both integrations to share. Therefore, care should be taken to properly size each port configuration according to the integration needs.

The following figure shows the connections for a dual phone system integration with Cisco CallManager and a SIP proxy server. Calls between the phone systems are connected through the LAN.





The following figure shows the connections for a dual phone system integration with Cisco CallManager and a circuit-switched phone system. Calls between the phone systems are connected through the gateway.



Settings in the Phone System and Cisco Unity

For an integration to be successful, Cisco Unity and the phone system must know the connections to use (for example, cables, IP addresses, and channels) and the expected method of communication (for example, IP packets, serial packets, or DTMF tones). Certain integrations require specific codes or extensions for turning MWIs on and off.

There are required settings for Cisco Unity, and programming for the phone system, that must be made in order to enable the integration. For information on these settings, refer to the applicable integration guide, available at

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

Call Information Exchanged by the Phone System and Cisco Unity

The phone system and Cisco Unity exchange call information to manage calls and to make the integration features possible. Call information about the calls that the phone system forwards to Cisco Unity is sent across the network for Cisco CallManager and SIP integrations, across analog or T1 lines for DTMF integrations, and across an RS-232 serial cable for serial integrations.



With each call, the following call information is typically passed between the phone system and Cisco Unity:

- The extension of the called party
- The extension of the calling party (for internal calls) or the phone number of the calling party (if it is an external call and the phone system supports caller ID)
- The reason for the forward (the extension is busy, does not answer, or is set to forward all calls). There is also a reason code for Direct Calls.

If the phone system sends the necessary information and if Cisco Unity is configured correctly, an integration can provide the following features:

Call forward to personal greeting	When an incoming call is routed to an unanswered extension, the call is forwarded to the voice mail of the subscriber. The caller then hears the personal greeting of the subscriber and can leave a message.
Call forward to busy greeting	When an incoming call is routed to a busy extension, the call is forwarded to the voice mail of the subscriber. The caller then hears the busy greeting (if the subscriber enabled it) and can leave a message.
Caller ID	Cisco Unity receives caller ID information from the phone system (if available). This information appears in the subject line of the message in the desktop messaging application.
Easy message access	A subscriber can retrieve messages without entering an ID. Cisco Unity identifies a subscriber based on the extension from which the call originated. A password may be required.
Identified subscriber messaging	Cisco Unity automatically identifies a subscriber who leaves a message during a forwarded internal call, based on the extension from which the call originated.
Message waiting indication	When a message is waiting for a subscriber, Cisco Unity notifies the phone system to activate the MWI on the subscriber extension.



Call Control

The phone system uses a set of signals to set up, monitor, and release connections for a call. Cisco Unity monitors call control signals to determine the state of the call, and uses these signals to respond appropriately to phone system actions and to communicate with the phone system. For example, a caller who is recording a message might hang up, so Cisco Unity detects the call has ended and stops recording.

Depending on the phone system, the following types of call control signals are used.

Cisco CallManager	Cisco CallManager generates SCCP (Skinny) messages, which are translated by the Cisco Unity-CM TSP into TAPI that Cisco Unity uses. Cisco Unity actions—such as hookflash for transferring calls—are translated by the Cisco Unity-CM TSP into the SCCP messages that Cisco CallManager uses.
SIP proxy server	The SIP proxy server sends messages, and Cisco Unity sends responses when a call is set up or terminated.
Circuit-switched phone system	The phone system generates and responds to in-band signaling (for example, busy, disconnect, DTMF, and hookflash). The signaling tones are translated by the Dialogic TSP into TAPI events that Cisco Unity can use. Cisco Unity makes a telephony request such as “transfer,” which is translated by the Dialogic TSP into the signal (hookflash) that the phone system can use.

Sample Path for a Call from the Phone System to a Subscriber

The following steps give an overview of a sample path that an external call can take when traveling from the phone system to a subscriber.

1. For Cisco CallManager or a SIP proxy server, when an external call arrives, the gateway sends the call over the LAN to Cisco CallManager or to the SIP proxy server.



The corresponding step for circuit-switched phone systems, when an external call arrives via PSTN, T1/PRI, DID or LS/GS analog trunks, is for the call to be routed through the circuit switch to the Cisco Unity voice mail pilot number.

2. The phone system routes the call to an available Cisco Unity extension (a voice messaging port).
3. Cisco Unity answers the call and plays the opening greeting.
4. During the opening greeting, the caller enters an extension. For example, the caller enters 1234 to reach a person with that extension.
5. Cisco Unity notifies the phone system that there is a call for extension 1234.
6. Depending on whether Cisco Unity is set up to perform a supervised transfer or a release transfer, the following occurs:

Supervised transfer	<p>While Cisco Unity holds the call, the phone system attempts to establish a connection with extension 1234.</p> <p>If the line is available, the phone system connects the call from Cisco Unity to extension 1234. The phone system and Cisco Unity drop out of the loop, and the call is connected directly from the original caller to extension 1234.</p> <p>If the line is busy or unanswered, the phone system gives that information to Cisco Unity, and Cisco Unity performs the operation the subscriber has specified. For example, Cisco Unity takes a message.</p>
Release transfer (blind transfer)	<p>Cisco Unity passes the call to the phone system, and the phone system sends the call to extension 1234 without waiting to determine whether the line is available. Then the phone system and Cisco Unity drop out of the loop.</p> <p>In this configuration, if the customer wants Cisco Unity to take a message when a line is busy or unanswered, each phone must be configured to forward calls to Cisco Unity when the line is busy or unanswered.</p>

General Integration Issues

For a detailed list of the requirements for a specific integration, refer to the applicable Cisco Unity integration guide, available at



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

If Cisco Unity is configured for failover, line connections between the phone system and the Cisco Unity servers are described in the *Cisco Unity Failover Configuration and Administration Guide*, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/fail/fail401/ex/index.htm

In addition, consider the following list of integration issues:

- Cisco CallManager and SIP proxy servers integrate with Cisco Unity only through a network connection.
- Beginning with Cisco Unity 4.0(4), circuit-switched phone systems that connect to PIMG units integrate with Cisco Unity only through a network (Note, however, that PIMG integration is not covered in this design guide. For more information, refer to the Cisco Unity 4.0(4) product documentation, available on Cisco.com.)
- Circuit-switched phone systems that use an RS-232 serial cable for the integration must be within 50 feet of the Cisco Unity server. For serial cable specifications, refer to the applicable Cisco Unity integration guide.
- Circuit-switched phone systems can integrate with Cisco Unity only through supported voice cards that are installed in the Cisco Unity server. For a list of supported voice cards, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysreq.htm.
- The license file for Cisco Unity may enable more voice messaging ports than the customer needs. Install only the number of ports that are needed, so that system resources are not allocated to unused ports, and do not exceed the port limitations set for the platform that is used (refer to the *Cisco Unity Supported Platform List* for details; the document is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html). For additional information about installing voice messaging ports, refer to the “Planning How the Voice Messaging Ports Will Be Used in Cisco Unity” section in the applicable Cisco Unity integration guide, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_configuration_guides_list.html.



Chapter 4: Using Active Directory and Exchange 2000 for the Directory and Message Store

Overview

This chapter focuses on using Exchange 2000 as the message store and Active Directory as the directory for Cisco Unity.

Throughout this chapter, when we refer to a single Cisco Unity server, we mean a dedicated Cisco Unity server running as a single physical server, configured either for Voice Messaging or for Unified Messaging. Note that some single-server configurations may actually require several servers:

- Cisco Unity failover requires two Cisco Unity failover servers (primary and secondary) running as member servers in a domain.
- Unified Messaging configurations require access to a domain controller/global catalog (DC/GC).
- Large Voice Messaging configurations require either a dedicated DC/GC, or both a DC server and a GC server.
- Unified Messaging configurations, large Voice Messaging configurations, and failover configurations all require one or more message stores off-box, up to a recommended maximum of ten message stores. A customer can have more message stores in its environment, but a single Cisco Unity server (including failover configurations), can service a recommended maximum of ten message stores.

Cisco Unity and Exchange 2000

Cisco Unity 4.0 supports Exchange 2000 in nearly any configuration supported by Microsoft. It will support one or more Exchange 2000 message stores in a Voice Messaging or Unified Messaging configuration. Cisco Unity can also support one or more Exchange 2000 clusters (Active/Active or Active/Passive).

Note: If any Cisco Unity subscribers will be homed on Exchange 5.5 servers, also see Chapter 6, “Migrating from Exchange 5.5 to Exchange 2000 for the Message Store.”

For Unified Messaging configurations, we do not support installing Exchange 2000 on the Cisco Unity server, nor do we support using the Cisco Unity server as a DC/GC.



The Cisco Unity connection to Exchange 2000 is with the message store only. Cisco Unity does not use the public message store (also known as public folders) or any other Exchange 2000 feature or function.

The servers used for Exchange 2000 must be on the Microsoft hardware compatibility list for servers. For more information, refer to the Microsoft website.

Exchange Server Connected with Cisco Unity: The Partner Exchange Server

When Cisco Unity is installed, the installer specifies one Exchange server with which Cisco Unity connects as the partner Exchange server. The partner server has several purposes:

- It is the home of the Cisco Unity system mailbox (alias: Unity_<ServerName>), which is the mailbox that originates voice messages from outside callers. (Voice messages from Cisco Unity subscribers originate from their own mailboxes.) Each Cisco Unity server must have its own system mailbox.
- It is the home for default mailboxes and Cisco Unity distribution lists that are created during installation.
- If Cisco Unity subscribers are homed on Exchange servers other than the partner server, all voice messages from outside callers pass through the partner server on their way to the home servers of the Cisco Unity subscribers. (Subscriber-to-subscriber messages originate from the Exchange server of the caller and are sent to the Exchange server of the recipient without passing through the partner Exchange server.)

If several Cisco Unity servers are needed in order to service a group of Exchange servers, it is acceptable to designate one Exchange server as the partner server for all of the Cisco Unity servers servicing the same group of Exchange servers. However, this is not a requirement, and in cases where very heavy messaging traffic is an issue, it is not desirable to have all Cisco Unity servers point to the same partner server.

Number of Exchange Message Stores Supported by a Single Cisco Unity Server

A single Cisco Unity 4.0(x) server can service several Exchange servers. A recommended maximum is ten servers if the servers use the maximum number of mailstores. A single Cisco Unity 4.0(x) server can service multiple servers with multiple mailstores directly or via a Microsoft Exchange 2000 front end/back end configuration.

Note: More than one message store per Exchange server is allowed.



Server Placement

A Cisco Unity server must reside in the same domain and Windows 2000 site as the Exchange 2000 servers that home Cisco Unity subscribers. This means that the Cisco Unity server should also use the same DC and GC as the Exchange 2000 servers on which Cisco Unity subscribers are homed. Otherwise the customer will experience delays in telephone user interface (TUI) access, in account replication, and in directory lookups.

Ensure that the MAPI profile for the Cisco Unity system mailbox (Unity_<ServerName>) and the Cisco Unity directory services point to the same DC and GC.

Exchange 2000 Clusters

Cisco Unity can support Exchange 2000 clusters in active-active or active-passive mode. The Exchange 2000 cluster configuration must meet Microsoft guidelines for total number of users and hardware usage.

A very functional configuration is a one-to-one correlation of Cisco Unity (with or without Cisco Unity failover) connected to an active-passive cluster. In this configuration, the Cisco Unity system mailbox is homed on the Exchange 2000 cluster.

The customer is responsible for installing, configuring, and maintaining the Exchange 2000 cluster.

The servers used for Exchange 2000 clusters must be on the Microsoft hardware compatibility list for servers and clusters. For more information, refer to the Microsoft website.

Exchange Administrative Groups and Routing Groups

In most Cisco Unity configurations, Exchange 2000 is not installed on the Cisco Unity server; the function of the Exchange 2000 server is to service subscribers whose mailboxes reside in an Exchange 2000 administrative group. More than one Exchange 2000 routing group can reside within an administrative group. Cisco Unity can service users homed on multiple Exchange 2000 servers in more than one routing group in an administrative group. Connectivity between routing groups is an issue if the routing groups are connected via WAN connections. However, if the routing groups are connected via LAN connections, Cisco Unity can be adversely affected by limited bandwidth between routing groups. Slow response time between Cisco Unity and remotely connected Exchange servers will cause unacceptable TUI delays for subscribers and possibly for outside callers. This is the primary reason Cisco Unity cannot service Exchange servers over a WAN.

In order to allow Cisco Unity to use more than one routing group, it must be able to connect to the Exchange servers in that routing group over a LAN, not a WAN. If the target Exchange servers are separated by a WAN, a second Cisco Unity server must be co-located with them in order to service the clients connected to them. You must adhere



to the Cisco Unity deployment rules found in Chapter 2 - Network and Infrastructure Considerations.

In order to minimize the administrative overhead of Cisco Unity, we recommend that a single Cisco Unity server should not service more than one administrative group regardless of the Exchange messaging mode being used. However, if more than one administrative group resides in the same well-connected LAN, and at the same proximity to Cisco Unity, then Unity can also service those administrative groups.

Exchange System Management Tools

Cisco Unity 4.0 requires that Exchange System Management Tools be installed on the Cisco Unity server. One of these tools, the Exchange System Manager, requires that NNTP and SMTP be installed on the Cisco Unity server, but does not require that they be enabled. We recommend that NNTP and SMTP on the Cisco Unity server be disabled, unless Exchange 2000 (not just the Exchange System Manager) is also installed on the Cisco Unity server. (Exchange 2000 is allowed on the Cisco Unity server only in a Voice Messaging configuration.)

Other Exchange Features

Cisco Unity can coexist with other Exchange features, such as Instant Messenger and Conference Server, but it does not require them, and they are not supported on the Cisco Unity server. If Exchange is installed on a separate server, these features can be enabled, but Cisco Unity does not integrate with them.

For Unified Messaging configurations, Cisco Unity can work with Outlook Web Access (OWA), but the functionality of ViewMail for Microsoft Outlook, which is installed on client computers, is not available if subscribers use OWA instead of using ViewMail. OWA users receive voice messages as e-mails with attached wave files. These voice messages can be played by using the Windows Media Player (though there can be difficulties depending on the codec used to record the message in Cisco Unity). OWA users can reply to voice messages via e-mail, but cannot reply via a voice message. ViewMail for Microsoft Outlook does not have these OWA limitations. With ViewMail, voice messages can be played by using the VCR-like control that appears in the custom e-mail form, and subscribers can reply to voice messages and to e-mail messages with a voice message.

Client Access Licenses

You may need to purchase Client Access Licenses (CALs), depending on your Cisco Unity configuration.

In Voice Messaging configurations, Cisco Unity ships with the Voice Mail Run-Time Edition of Exchange 2000 Server and Exchange 2000 Enterprise Server. These are full versions of Exchange, and they can be used for any Cisco Unity configuration. If you are



using the shipped version of Exchange, if Exchange contains only voice messages, and if subscribers access messages by using only a phone or the Cisco Unity Inbox, you do not need to purchase CALs.

In Unified Messaging configurations, you need CALs for all Cisco Unity subscribers. However, if you are adding Cisco Unity to an existing Exchange deployment, you probably already have the necessary CALs.

Cisco Unity and Active Directory

Cisco Unity for Exchange 2000 uses Active Directory as its directory service.

Cisco Unity performs directory to database synchronization as its primary synchronization direction. Writes from Cisco Unity to the directory typically happen via administrative or subscriber activities.

Cisco Unity will perform periodic queries against the local DC and GC, but this will not be process intensive unless significant changes are being made to Active Directory user accounts. In this case, a query against a DC would return any relevant changes necessary for Cisco Unity to synchronize its database.

In Unified Messaging configurations, a highly available DC and GC server are required. Cisco Unity does not require a dedicated domain controller, but the domain controller that Cisco Unity uses must be highly available or Cisco Unity performance will be affected. Cisco Unity must use the same DC and GC as the Exchange servers it is servicing. This means that Cisco Unity should be installed into the same Windows 2000 site.

Cisco Unity requires full control over the location objects contained in the Cisco Unity locations folder. By default, the location folder is created as follows:

```
ou=Locations, ou=Cisco Unity, dc=<DomainName>, dc=com
```

An alternate location can be used if desired.

Impact of Cisco Unity on Directory Size

For information on capacity planning recommendations related to using Cisco Unity with Active Directory, refer to the *White Paper: Active Directory Capacity Planning (Cisco Unity Versions 4.0, 3.1, and 3.0(3) and Later with Microsoft Exchange)*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/whitpapr/adsizing.htm.

This white paper also includes sizing information for Active Directory objects that have been voice enabled by Cisco Unity. Finally, it discusses the Cisco Unity schema: what is required when the customer extends the schema, and when it is required.



Active Directory Accounts with Which Cisco Unity Services Log On

The main Cisco Unity services log on by using two Active Directory accounts that are created during Cisco Unity installation:

- Message store services log on by using one account. These services are responsible for sending and receiving messages on behalf of the subscriber. The account with which these services log on must have direct access to the Exchange 2000 message store where the subscribers reside.
- Directory services log on by using another account. These services write to user, group, and contact objects when the objects are imported into Cisco Unity, and they write to individual subscriber properties when a subscriber or an administrator changes personal settings for the subscriber.

Each service account can be used by more than one Cisco Unity server in the same domain.

Note: Several other services, including the Text to Speech (TTS) service and the service that controls Cisco Unity licensing, log on by using the local system account.

To do required tasks, these services require Exchange 2000 permissions, Windows user rights, Active Directory permissions, and a group membership. For detailed information on the rights and permissions required, refer to the chapters “Creating Accounts for the Installation and Setting Rights and Permissions,” and “Permissions Set by the Cisco Unity Permissions Wizard,” in the *Cisco Unity Installation Guide*. The *Cisco Unity Installation Guide* is available at

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

Windows 2000 Domain Configurations

Exchange 2000 requires that Cisco Unity for Exchange 2000 reside in a Windows 2000 domain. The customer can have Windows NT domains, and Cisco Unity can service subscribers whose primary accounts exist in a Windows NT domain. However, those subscribers must also appear in Active Directory because Cisco Unity for Exchange 2000 looks only at Active Directory, not in any other directory.

As a best practice, Cisco Unity should be installed into the same domain as the Exchange servers it is designated to service.

Cisco Unity can support subscribers in a maximum of three Windows 2000 sites in the same Windows 2000 domain. Each Windows 2000 site is considered a physical site



equivalent to one or more well-connected IP subnets. Use the “Windows 2000 Sites and Services” Microsoft application to create and manage the Windows 2000 sites.

Note: Failure to properly configure your subnet works according to Microsoft requirements—as outlined for Sites and Services—affects directory replication and can cause Cisco Unity to become impaired or inoperable.

Cisco Unity 4.0(x) for Exchange 2000 can run under the Windows domain configurations shown in the following table.

Table 4. Supported Windows 2000 Configurations

Cisco Unity Configuration	Supported Windows 2000 Configurations
Voice Messaging	<ul style="list-style-type: none">• The Cisco Unity server as a member server in a Windows 2000 domain. (This requirement is based on whether Exchange is on-box or off-box. Refer to the <i>Cisco Unity Supported Platforms List</i> for details, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html.)• The Cisco Unity server as a Windows 2000 DC/GC in a Windows 2000 domain. The Windows 2000 domain should be an isolated, dedicated Voice Messaging domain. The domain controller should not service non-Cisco Unity client requests, such as logon authentication for end-users.
Unified Messaging	<ul style="list-style-type: none">• Cisco Unity as a Windows 2000 member server in a Windows 2000 domain. Cisco Unity as a Windows 2000 DC/GC server is not supported.

Voice Messaging Configurations

A Cisco Unity 4.0 Voice Messaging configuration can be installed into either of the following network and domain infrastructures:

- **Voice Messaging with no access to the Cisco Unity Personal Assistant (CPCA) or the Cisco Unity Inbox**—Subscribers access messages only over the phone (not by using the Cisco Unity Inbox), and they cannot change their settings by using the Cisco Unity Assistant. This configuration should be installed in a dedicated and possibly isolated network and domain infrastructure.
- **Voice Messaging with access to the CPCA or the Cisco Unity Inbox**—Subscribers can access messages by using the Cisco Unity Inbox (which is a licensed feature), change their settings by using Cisco Unity Assistant, or both. This



configuration can be installed in a dedicated and isolated network and domain infrastructure, or it can be installed in an existing network and Windows infrastructure where certain resources are already established for Cisco Unity to use.

For a Voice Messaging configuration with no access to the Cisco Unity client applications, the supporting infrastructure depends on the size of the installation. The larger the number of subscribers, the more resources need to be set up to support Cisco Unity. For example, given the maximum Voice Messaging limitation of 7,500 subscribers for a single Cisco Unity server, at least two off-box message stores are required. This means that at a minimum, three servers are necessary to support this number of subscribers. If it is necessary to support more than 7,500 subscribers, a dedicated domain controller is required.

Voice Messaging: No Client Access to the CPCA or the Cisco Unity Inbox

This is a dedicated and/or isolated configuration. The supporting resources, such as off-box message stores and domain controllers, are dedicated:

- The Windows 2000 domain controller must be configured according to Cisco specifications.
- Exchange 2000 message store servers must be configured according to Cisco specifications.

All Cisco Unity servers must be purchased from Cisco or must be on the *Cisco Unity Supported Platforms List*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.htm. All supporting servers (mailbox servers, directory servers, and so on) can be provided by Cisco or by the customer.

Voice Messaging: With Client Access to the CPCA or the Cisco Unity Inbox

For this configuration, you can add a dedicated infrastructure or use an existing configuration. If subscribers will use the Cisco Unity Assistant or the Cisco Unity Inbox, it is best to use an existing infrastructure because the customer may already have one or more domains with an accounts database that Cisco Unity can use for Voice Messaging subscribers. An existing infrastructure is also valuable because of the name resolution typically provided for web access.

To facilitate a future migration from Voice Messaging to Unified Messaging, a company may choose to use an existing domain structure to create voice-messaging-specific accounts dedicated to the voice-messaging-specific message stores and Cisco Unity



operations. This option is also very workable, and it comes with the same administrative overhead as a dedicated infrastructure.

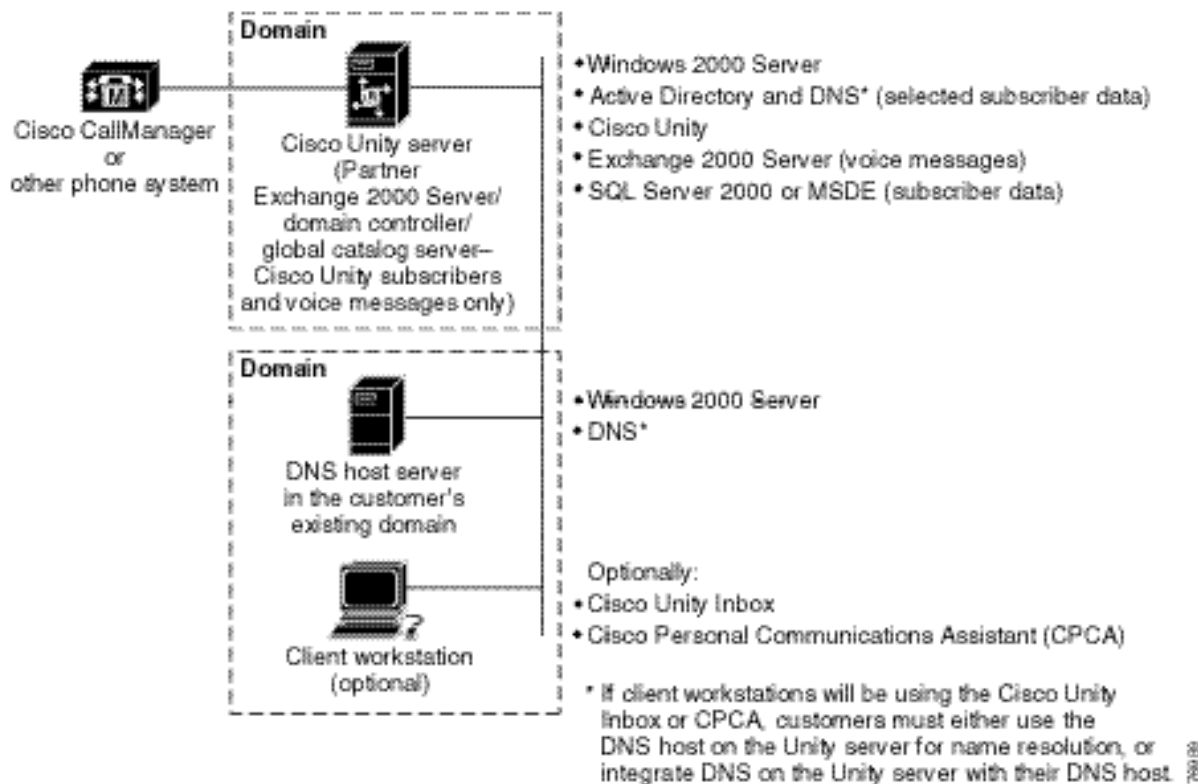
The same configuration criteria apply as when configuring Voice Messaging with no client access. In addition, the customer provides:

- Hardware and software for the Exchange 2000 servers that home Cisco Unity subscribers
- Hardware and software for dedicated DC/GCs
- Necessary network connectivity



Voice Messaging Configuration 1: All Software on a Single Cisco Unity Server

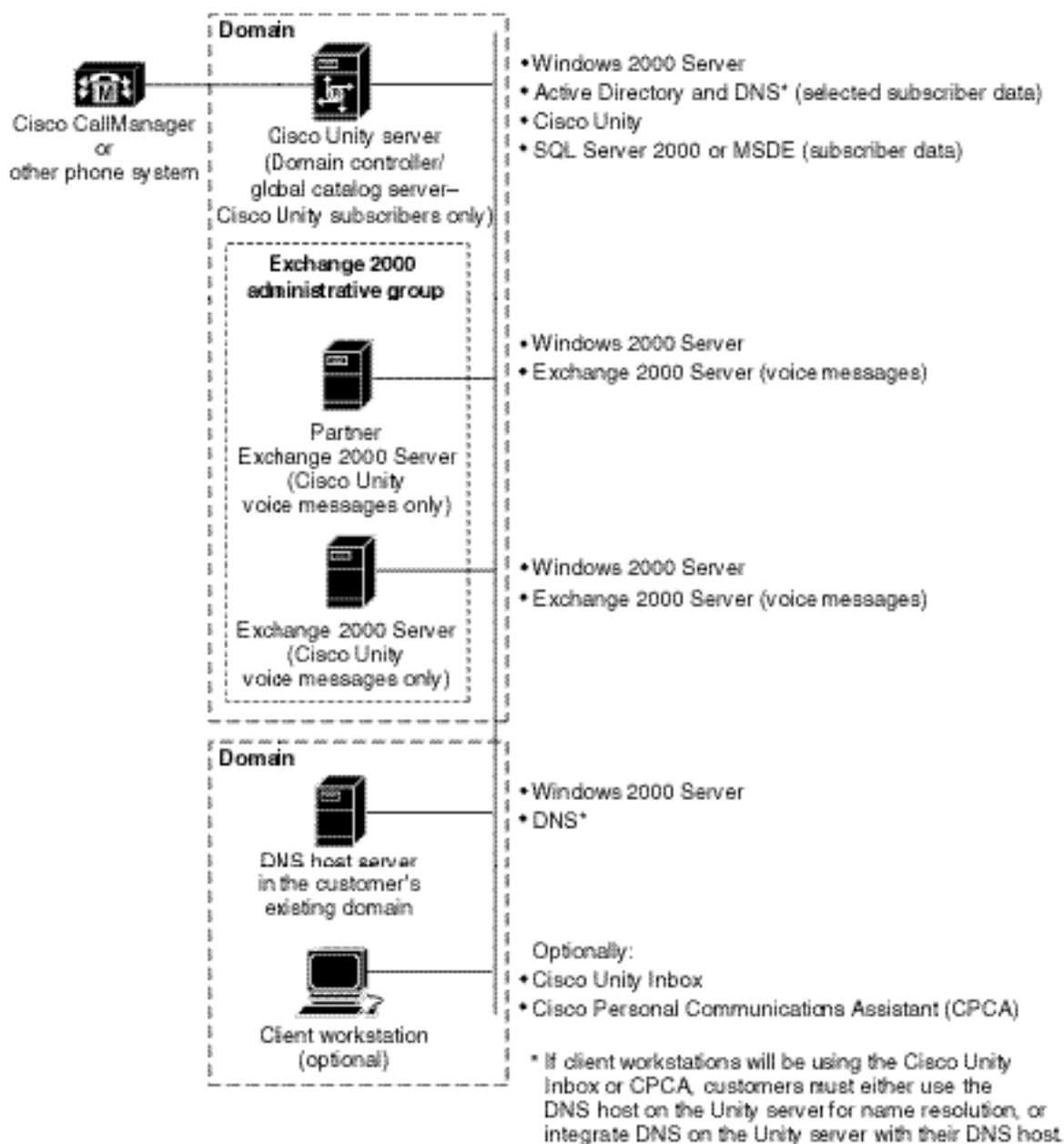
In this configuration, the Cisco Unity server has Active Directory installed as a DC/GC in its own forest and domain. It has Exchange 2000 installed on the server along with the Cisco Unity components, such as SQL Server/MSDE, and so on. The server is connected to a circuit-switched phone system, to Cisco CallManager, or to both.





Voice Messaging Configuration 2: One or Two Exchange 2000 Message Stores Installed on Separate Servers

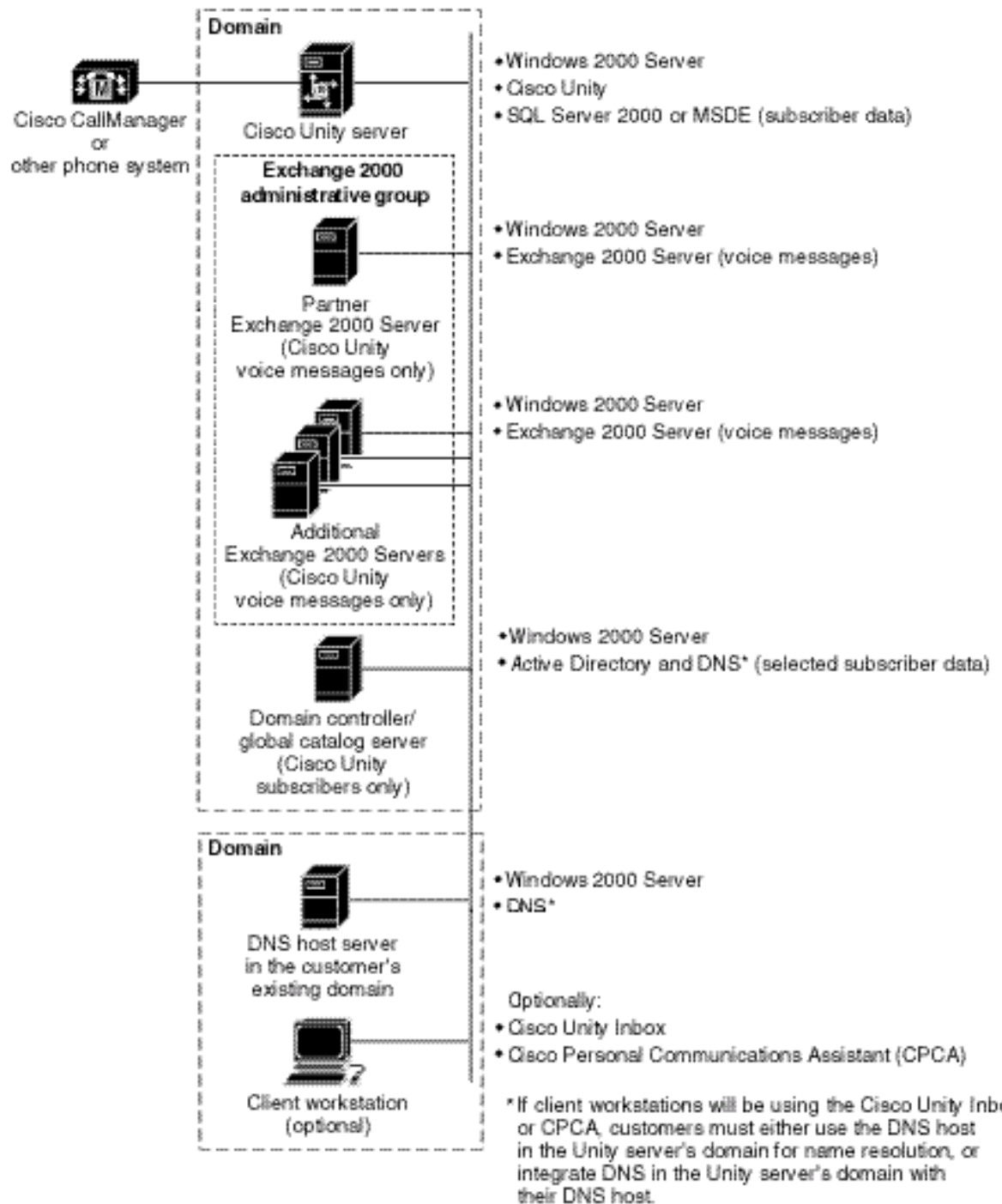
In this configuration, Cisco Unity services one or two off-box message stores. Cisco Unity has Active Directory installed as a DC/GC in its own forest and domain. The server is connected to a circuit-switched phone system, to Cisco CallManager, or to both.





Voice Messaging Configuration 3: Three to Five Exchange 2000 Message Stores Installed on Separate Servers

With three to five off-box message stores, Cisco Unity is a member server in a dedicated Voice Messaging domain. There is a dedicated domain controller provided by Cisco as a part of the Voice Messaging configuration. The server is connected to a circuit-switched phone system, to Cisco CallManager, or to both.





Voice Messaging Configuration 4: Multiple Cisco Unity Servers

Each Cisco Unity server can support a recommended maximum of ten off-box message stores, which requires at least one dedicated DC/GC in the Voice Messaging domain. The Cisco Unity servers can be networked to support Digital Networking. One of the off-box message stores can be used as a voice gateway server if necessary for interoperability with other voice messaging systems. Each Cisco Unity server is connected to a circuit-switched phone system, to Cisco CallManager, or to both.

The diagram for each Cisco Unity server in this configuration looks like the diagram in the Voice Messaging Configuration 3 section. If the phone system has ports available, you can hook up more than one Cisco Unity server to each phone system.

Requirements for Domain Controllers and Exchange Servers in Large Voice Messaging Configurations

For large Voice Messaging configurations with one or more dedicated Windows 2000 domain controllers, the domain controllers must be configured according to Cisco specifications. This is typically a large Voice Messaging installation servicing several thousand subscribers.

We recommend the following:

- Each domain controller is also a global catalog server, or a DC/GC.
- Each domain is a dedicated Voice Messaging domain, and no user activity is required to authenticate against the dedicated domain controller (no GUI client activity).
- There is one DC/GC for every four Exchange 2000 message stores in a single Voice Messaging domain in a single subnet (Windows 2000 site).
- The Exchange 2000 servers are configured with dedicated mirrors for the Exchange transaction logs, and they use a RAID 5 or RAID 10 configuration for the information store. Windows is installed either on its own mirror (preferred) or on a separate partition of the same mirror as the transaction logs. (The configuration will depend on which server is used for the Exchange server.)

Unified Messaging Configurations

- For Cisco Unity Unified Messaging configurations, Cisco Unity installs into an existing infrastructure. This means that with Unified Messaging, the Cisco Unity server is a part of the messaging environment and serves to voice enable existing Exchange 2000 mailboxes. This reduces administrative overhead in comparison to

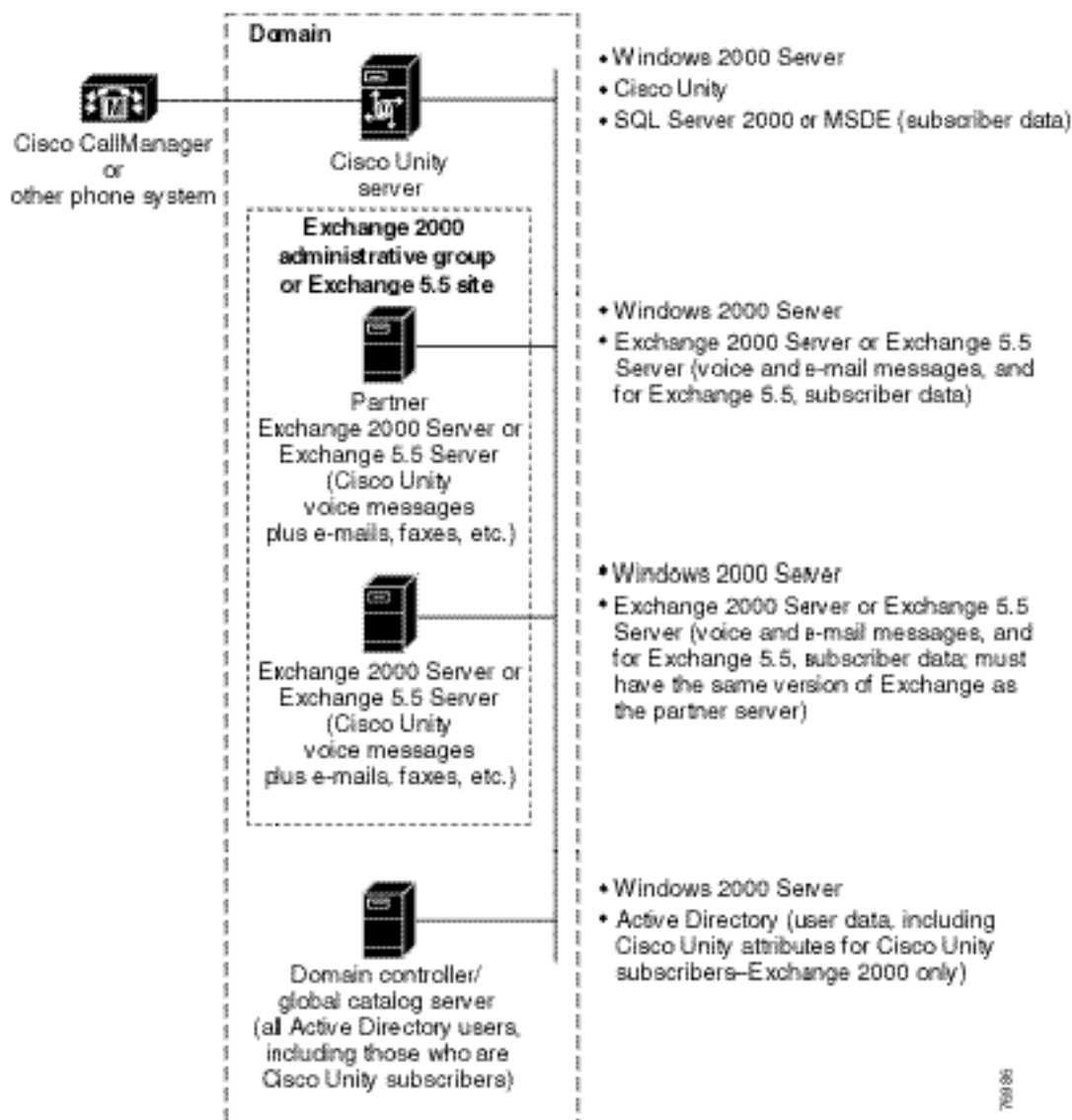


maintaining a Cisco Unity Voice Messaging solution or maintaining a legacy voice messaging system. With Unified Messaging, only one messaging infrastructure is required to support both e-mail and voice messaging.



Unified Messaging Configuration 1: No Failover Configuration

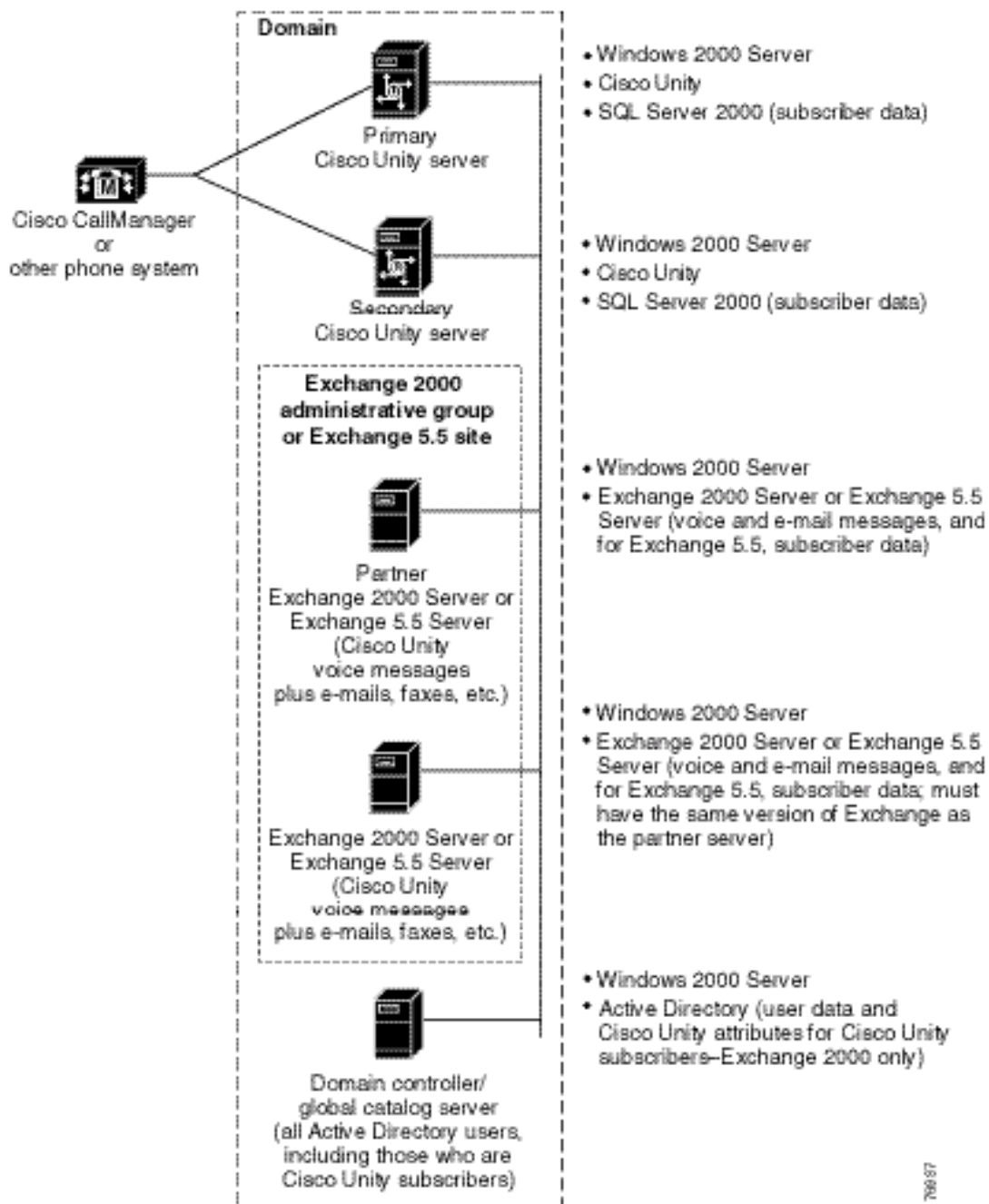
In this configuration, Cisco Unity services subscribers who are homed on existing Exchange 2000 e-mail servers, and uses an existing DC/GC. The server is connected to a circuit-switched phone system, to Cisco CallManager, or to both.





Unified Messaging Configuration 2: Failover Configuration

This configuration is the same as the configuration diagrammed in the Unified Messaging Configuration 1 section, except that it includes primary and secondary servers for Cisco Unity failover.





Deploying Cisco Unity for Exchange 2000

Cisco Unity for Exchange 2000 can be deployed in the following ways. The list is arranged in order, with the easiest deployment first:

- Unified Messaging with one or more Cisco Unity servers servicing multiple Exchange 2000 mailboxes in the same admin group in the same well-connected network.
- Voice Messaging without access to the Cisco Unity Inbox or the CPCA, installed in an isolated, dedicated environment. The challenge associated with this deployment is the migration tasks required to move it to Unified Messaging.
- Unified Messaging with access to the CPCA and ViewMail for Outlook (VMO).
- Unified Messaging with an existing Exchange 2000 cluster with access to the CPCA and ViewMail for Outlook (VMO).
- Voice Messaging with access to the Cisco Unity Inbox and/or the CPCA. Cisco Unity uses the existing infrastructure, possibly including the Active Directory database, messaging servers, and/or name resolution.
- Unified Messaging or Voice Messaging with interoperability with other voice messaging systems. For more information about this deployment scenario, refer to the *Networking in Cisco Unity Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.
- Both Voice Messaging and Unified Messaging servers, with the separate infrastructures required for each configuration. In most cases, having separate infrastructures means a significant loss in functionality between the two separate servers. For example, Cisco Unity Digital Networking does not work in this configuration.

Administrative Access and Control

To manage administrative access to the Cisco Unity server and its resources, the customer may want different levels of access for different operations, for example, backing up the server or gathering performance information for trending.

When installing Cisco Unity in a Unified Messaging configuration, it is best to allow administrative access to the server to be governed by the server administration policies of the customer. This should not detract from the administrative access required for normal Cisco Unity operations but may require separate accounts. This includes:

- Managing the server resources (hardware, operating system, file system, and other supporting software).



- Managing the Cisco Unity application, including:
 - Web access
 - Support of components such as SQL Server/MSDE, IIS, and Internet Explorer
 - Cisco Unity application log files
 - Utilities such as the Windows Event Viewer and the Performance Monitor
- Administering Cisco Unity subscribers, distribution lists, call handlers, and so on.
- Administering Cisco Unity switch connectivity to Cisco CallManager or to a circuit-switched phone system.

Administering the Cisco Unity Server in a Voice Messaging Configuration

In a Voice Messaging configuration, it is expected that the Cisco Unity service accounts will have a broader set of permissions granted because of the additional tasks these accounts will need to accomplish outside of normal Cisco Unity functions. In a Voice Messaging configuration it is far more common for the installation to be made up of a domain account, such as the Domain Administrator, that acts as both the service account and as the administrative account. Using one account for administering the Cisco Unity server and for Cisco Unity services is functional for a Voice Messaging configuration, especially when the infrastructure is dedicated to Cisco Unity. An administrator can then use this account to perform tasks in and outside of Cisco Unity, such as using tools and applications to manage the operating system, file system, sub-system components such as the SQL Server/MSDE database, Exchange 2000 System Manager, and so on.

The administrative tasks include:

- In the domain that includes the Cisco Unity server:
 - Creating and managing domain users
 - Creating and managing domain distribution groups
 - Creating and managing domain contacts
 - Creating Organizational Units (OUs)
- Configuring and managing the on-box or off-box Exchange 2000 installation by using Microsoft tools such as the Exchange 2000 System Administrator.
- Shutting down and backing up the server.
- Configuring and managing storage groups in Exchange 2000 as needed. This becomes very important when managing the mailstore databases in each storage group, especially if there are a large number of subscribers.



- Configuring and managing the Active Directory database, including extending the schema.
- Configuring and managing the operating system and applications, and applying service packs as needed.
- Configuring and managing services on the Cisco Unity server or supporting servers.
- Configuring and managing the file system on the Cisco Unity server.
- Configuring and managing the IIS services and websites.
- Configuring and managing networking services, such as DNS, DHCP, Sites and Services, and so on.
- Configuring and managing other Cisco Unity tools and applications.
- Configuring and managing third-party tools and applications used by Cisco Unity, for example virus-scanning and backup applications.

Establishing Support Policies

To make administering Cisco Unity more manageable, establish a support policy that separates Cisco Unity-specific administration from administration of the rest of the server. This allows Cisco Unity administrators with limited class of service (COS) settings to access the Cisco Unity application only as designated by their COS settings.

Depending on the administrative model the customer uses, the GrantUnityAccess utility can be used to associate multiple Active Directory accounts with a single Cisco Unity subscriber that has an administration COS. (You can also use GrantUnityAccess to associate multiple Cisco Unity subscribers with a single Active Directory account.) Use of the GrantUnityAccess utility gives all of the associated Active Directory accounts the right to administer Cisco Unity by using the Cisco Unity Administrator.

To prevent unwanted access to GrantUnityAccess, limit file and directory access—of the Cisco Unity CommServer folder on the Cisco Unity server—to the administrators who are responsible for administering the entire server.

Network Services

Cisco Unity for Exchange 2000 has an indirect dependency on DDNS. In a Windows 2000 domain, Cisco Unity relies on DDNS for name resolution for Active Directory and Exchange 2000. In a Cisco-provided Voice Messaging system, DDNS is required. To support Cisco Unity applications, for example the Cisco Unity Inbox, it is necessary to tie the DDNS solution to the existing name resolution, such as a third-party DNS host.



Deployment Tasks for Unified Messaging Configurations

In a Unified Messaging configuration, pay careful attention to the placement of Cisco Unity servers, how they are managed, and the accounts that are used to manage them.

Consider the following deployment best practices for Cisco Unity in a Unified Messaging configuration:

- Define and create the accounts to be used in running the Cisco Unity services.
- Define and create the accounts to be used to administer Cisco Unity.
- Define the level of access to the local Cisco Unity server necessary for an administrator. Subscribers who are not administrators do not need direct access to the Cisco Unity server operating system or file system.
- Define a policy for Cisco Unity classes of service for each Cisco Unity server.
- Define the Cisco Unity templates to be used for subscribers.
- Define the Cisco Unity distribution lists (Active Directory distribution groups) for each installation.
- Define any audio-text applications that need to be created on each Cisco Unity server.
- Define dialing restrictions necessary to prevent subscribers from accessing unauthorized outside numbers.
- Verify that the number of subscribers serviced by each Cisco Unity server is known and documented.
- Verify that each Cisco Unity server is properly sized for the number of subscribers it will service.
- Verify that the total capacity for each Cisco Unity server is known and documented.
- Create and document a suitable disaster recovery plan.
- Verify that the telephony integration method is understood. This is true for Cisco CallManager, a legacy PBX, or a SIP proxy.
- Decide the number of ports needed for message notification, and for recording and playing messages over the phone.
- Verify that all hardware and supporting components are set up correctly.
- List the acceptance tests to be run after the server is installed and before going live.
- Verify that there is a fallback procedure in the event that problems are encountered.



- Define any measurements necessary to benchmark the initial performance of the system.

Operational Tasks

The following are best practices for an operational Cisco Unity system:

- Create and implement a regular maintenance schedule to gather logs and to monitor the use of server resources such as disk space, memory, and the CPU. (Use CUPID to form a baseline for installation.)
- Verify that regular backups are occurring.
- Make arrangements for any regular downtime necessary for offline maintenance activities.
- Make arrangements for any special administrative tasks, for example maintaining and creating audio text applications and running clean up utilities such as Directory Walker.
- Before reconfiguring the system, for example when migrating from Voice Messaging to Unified Messaging or when upgrading hardware, mock up the existing Cisco Unity system in a lab environment, and test and validate the work.



Chapter 5: Using Exchange 5.5 for the Directory and Message Store

Overview

This chapter focuses on using Exchange 5.5 as the message store and directory for Cisco Unity.

Throughout this chapter, when we refer to a single Cisco Unity server, we mean a dedicated Cisco Unity server running as a single physical server. Note that some single-server configurations may actually require several servers:

- Cisco Unity failover requires two Cisco Unity failover servers (primary and secondary) running as member servers in a domain.
- A dedicated domain controller, running either Windows 2000 or Windows NT, is required.
- A single Cisco Unity server requires one or more separate Exchange 5.5 servers, up to a recommended maximum of ten Exchange 5.5 servers. A customer can have more Exchange 5.5 servers in its environment, but a single Cisco Unity server (including failover configurations), can service a recommended maximum of ten Exchange 5.5 servers.

Cisco Unity and Exchange 5.5

A Cisco Unity for Exchange 5.5 installation is very likely the easiest of all the messaging stores and directories supported by Cisco Unity to work with. The primary reason for this is the ease of establishing the necessary directory access and information store access for a single Cisco Unity service account. In addition, because Exchange 5.5 contains its own directory, the complication of establishing the account permissions required by Cisco Unity for Exchange 2000 is not an issue for Cisco Unity for Exchange 5.5.

Cisco Unity 4.0 supports Exchange 5.5 in nearly any configuration supported by Microsoft, with the exception of Exchange 5.5 clusters. An Exchange 5.5 server can have only a single information store, also called a private information store. Cisco Unity does not use the Exchange 5.5 public information store.

New installations of Cisco Unity 4.0 can use Exchange 5.5 only in a Unified Messaging configuration. If you want to set up a new installation in a Voice Messaging configuration, you must use Exchange 2000 and Active Directory for the message store and directory.



When a Cisco Unity 2.4(6) or 3.x system is configured as Voice Messaging, and when Exchange 5.5 is installed on the Cisco Unity server, Cisco Unity can be upgraded to version 4.0 without removing Exchange 5.5 from the server.

Homing Cisco Unity Subscribers on Both Exchange 2000 and Exchange 5.5

Cisco Unity for Exchange 5.5 can service only Exchange 5.5 mailboxes. If the customer wants some Cisco Unity subscribers to be homed in Exchange 5.5 and others to be homed in Exchange 2000, the customer must use Cisco Unity for Exchange 2000. The Cisco Unity partner Exchange server must be an Exchange 2000 server, and an Exchange mixed-messaging environment must be configured as described in Chapter 6, “Migrating from Exchange 5.5 to Exchange 2000 for the Message Store.”

Exchange 5.5 Directory

Cisco Unity for Exchange 5.5 uses the Exchange 5.5 directory as its directory service. However, the majority of information about Cisco Unity subscribers and other Cisco Unity objects appears only in a SQL Server/MSDE database. For the small amount of data that appears both in the Exchange 5.5 directory and in the Cisco Unity database (for example, subscriber extensions), Cisco Unity periodically checks the Exchange 5.5 directory for changes, and replicates any changes in the Cisco Unity database. Likewise, a portion of the changes that are made in the Cisco Unity Administrator are replicated to the Exchange 5.5 directory. When a Cisco Unity system is installed and running, changes to the directory and to settings in the Cisco Unity Administrator are relatively few in number, so this replication does not hurt performance.

A dedicated domain controller is not required for Cisco Unity; Unity can use an existing domain controller. A highly-available domain controller is required for Cisco Unity, or slow response times will affect its performance.

Exchange 5.5 Mailstore

Cisco Unity stores voice messages in the Exchange 5.5 private information store. No data other than voice messages is stored in the private information store. Cisco Unity does not use the Exchange 5.5 public mailstore.

When you install Cisco Unity, the Cisco Unity system mailbox (alias: Unity_<ServerName>) is added to Exchange. This is the mailbox that originates voice messages from outside callers.

Exchange 5.5 Organizations and Sites

An Exchange 5.5 installation consists of an Exchange 5.5 organization and one or more Exchange 5.5 sites. A single Cisco Unity server (or a group of Cisco Unity servers installed into one Exchange 5.5 organization) can service only the subscribers in that



organization. A single Cisco Unity server can service only the subscribers in a single Exchange 5.5 site; therefore, every Exchange site that will home Cisco Unity subscribers must have at least one Cisco Unity server. An Exchange 5.5 site includes one or more recipient containers. By default, a single Cisco Unity server services one container per Exchange site. However, Cisco Unity can be configured to service multiple recipient containers in a single site by changing the scope for mailusers from the Recipients container to the site name. (Note that changing the scope to the site level can adversely affect Cisco Unity performance.)

If you have more than one Exchange 5.5 site, Cisco Unity Digital Networking should be set up so that subscribers in different sites in the organization can communicate with one another. In addition, if subscribers need to communicate between Exchange 5.5 organizations, Internet Subscribers or blind addressing will need to be set up. For more information on Cisco Unity Digital Networking, Internet Subscribers, or blind addressing, refer to the *Networking in Cisco Unity Guide*, which is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.

Exchange Server Connected with Cisco Unity: The Partner Exchange Server

When Cisco Unity is installed, the installer specifies one Exchange server with which Cisco Unity connects as the partner Exchange server. The partner server has several purposes:

- It is the home of the Cisco Unity system mailbox (alias: Unity_<ServerName>), which is the mailbox that originates voice messages from outside callers. (Voice messages from Cisco Unity subscribers originate from their own mailboxes.) Each Cisco Unity server must have its own system mailbox.
- It is the home for default mailboxes and groups (called distribution lists in Cisco Unity) that are created during installation.
- If Cisco Unity subscribers are homed on Exchange servers other than the partner server, all voice messages from outside callers pass through the partner server on their way to the home servers of the Cisco Unity subscribers. (Subscriber-to-subscriber messages originate from the Exchange server of the caller and are sent to the Exchange server of the recipient without passing through the partner Exchange server.)

Number of Exchange Servers Supported by a Single Cisco Unity Server

A single Cisco Unity 4.0(x) server can service several Exchange servers. We recommend a maximum of ten servers. Consider that the maximum number of users a Cisco Unity



server can support is the primary factor in determining the number of servers that can be supported.

On the other hand, if you have smaller user densities on your Exchange 5.5 servers, and you would like one Cisco Unity server to service them, you should be able to do so as long as the number of subscribers does not exceed the maximum number that can be supported by your Cisco Unity server.

However, take into consideration that the more Exchange servers you connect to a single Cisco Unity server, the greater chance you have of experiencing performance degradation. The reason for this is simple: Cisco Unity must maintain access to the subscriber mailboxes in order to perform notification tasks, and it also logs in to mailboxes when subscribers leave and retrieve messages. If one Exchange server becomes unavailable and if Cisco Unity is performing subscriber activities on that server at the time it goes offline, subscribers on the other Exchange servers could experience slow response times. In order to prevent performance degradation, minimize the number of Exchange servers that each Cisco Unity is connected to.

Server Placement

Cisco Unity should reside in the same domain and well-connected LAN as Exchange 5.5. The further Cisco Unity is from the Exchange 5.5 servers it services, the more likely it is that Cisco Unity subscribers will experience delays in playing and recording messages over the phone (it is also possible that in this circumstance, Cisco Unity may stop processing calls altogether). These delays are caused by primary issues such as slow Exchange servers, and secondary issues such as multiple network hops, domain authentication, and reestablishing RPC sessions for MAPI access.

Exchange 5.5 Clusters

Cisco Unity for Exchange 5.5 does not support mailboxes on Exchange 5.5 clusters, nor can a Cisco Unity server use an Exchange 5.5 cluster as its partner server. However, Cisco Unity can co-exist with an Exchange 5.5 cluster.

Exchange 5.5 Administrator

When Cisco Unity services Exchange 5.5 mailboxes, Exchange 5.5 Administrator must be installed on the Cisco Unity server, because Exchange 5.5 Administrator contains the MAPI service provider that Cisco Unity uses to perform messaging operations.

Outlook Web Access

Cisco Unity can work with Outlook Web Access (OWA), but the functionality of ViewMail for Microsoft Outlook, which is installed on client computers, is not available if subscribers use OWA instead of using ViewMail. OWA users receive voice messages as e-mails with attached wave files. These voice messages can be played by using the



Windows Media Player (though there can be difficulties depending on the codec used to record the message in Cisco Unity). OWA users can reply to voice messages via e-mail, but cannot reply via a voice message. ViewMail for Microsoft Outlook does not have these OWA limitations. With ViewMail, voice messages can be played by using the VCR-like control that appears in the custom e-mail form, and subscribers can reply to voice messages and to e-mail messages with a voice message.

Client Access Licenses

You may need to purchase Client Access Licenses (CALs), depending on your Cisco Unity configuration.

Cisco Unity ships with the Voice Mail Run-Time Edition of Exchange Server version 5.5. This is a full version of Exchange, and it can be used for any Cisco Unity configuration. If you are using the shipped version of Exchange, if Exchange contains only voice messages, and if subscribers access messages by using only a phone or the Cisco Unity Inbox, you do not need to purchase CALs.

In Unified Messaging configurations, you need CALs for all Cisco Unity subscribers. However, if you are adding Cisco Unity to an existing Exchange deployment, you probably already have the necessary CALs.

Windows Domain Configurations

The operating system on the Cisco Unity server must be Windows 2000 server or Windows 2000 Advanced Server. Other operating systems, including other versions of Windows, are not supported.

Domain for the Cisco Unity Server

The Cisco Unity server can be in a Windows 2000 domain or a Windows NT domain (for Unified Messaging configurations only):

- **Windows 2000**—Cisco Unity for Exchange 5.5 can reside in a Windows 2000 domain. The domain is considered an accounts domain and not a directory because Cisco Unity and Exchange 5.5 look to the Exchange 5.5 directory as the primary source of information for subscribers it services.
- **Windows NT**—Cisco Unity for Exchange 5.5 can reside in a Windows NT domain. This is possible because Exchange 5.5 can reside in a Windows NT domain.

The Cisco Unity server can be:

- A member server in a Windows 2000 domain
- A member server in Windows NT domain



However, because of the resource requirements of a domain controller, using a Cisco Unity server as a domain controller is discouraged, except in single server Voice Messaging only configurations.

Domains for Exchange 5.5 Servers

Cisco Unity uses the Exchange 5.5 directory, and thus it uses the domain as an accounts domain rather than as a directory. Therefore, Cisco Unity functions properly regardless of whether Exchange 5.5 is running in a Windows 2000 domain or a Windows NT domain.

In a pure Windows 2000 domain or a pure Windows NT domain, Cisco Unity can support Exchange 5.5 in:

- A single domain
- A master/resource domain
- A multimaster domain

In any of these configurations, the Cisco Unity server and the Exchange 5.5 servers should be in the same domain. If the servers must be in different domains, it is necessary to ensure that the domains will not lose connectivity (for example, because of broken trust relationships, changed permissions, or an inaccessible Windows 2000 DC or Windows NT primary/ backup domain controller), or Cisco Unity will not be able to deliver messages to Exchange 5.5 mailboxes or retrieve the messages for playback. Regardless of the domain configuration, the best design for Cisco Unity is one in which the risk of losing access to Exchange 5.5 is minimized or eliminated.

Cisco Unity can support subscribers that are homed on Exchange 5.5 servers in a maximum of three Windows 2000 or Windows NT domains. If subscribers will be homed on Exchange servers in more than three domains, an additional Cisco Unity server is required. Windows 2000 domains should be well connected and all be a part of the same tree in the forest. Windows NT domains should also be well connected and the necessary access provided via trust relationships between domains.

Best Practices

It is possible to have any combination of Windows 2000 domains, Windows NT domains, master/resource domains, and parent/child domains. However, the following best practices are recommended for Cisco Unity servicing Exchange 5.5 sites:

- The Cisco Unity server must be installed into the same domain as the Exchange 5.5 servers on which subscribers are homed.
- Cisco Unity can be configured to use the same accounts to run its services as the Exchange 5.5 servers. In most cases, this is recommended. However, it is not



required, and larger installations will typically require that Cisco Unity have its own accounts. This is perfectly acceptable.

- Cisco Unity should use the same name resolution as the Exchange 5.5 servers it services.
- As previously mentioned, each Exchange 5.5 site in which Cisco Unity subscribers are homed must have its own Cisco Unity server. One Exchange site can have multiple Cisco Unity servers, but one Cisco Unity server cannot service more than one Exchange site.

Voice Messaging Configurations

Installing a new Cisco Unity 4.0 for Exchange 5.5 system and configuring it as Voice Messaging is not supported.

Upgrading a Voice Messaging system from a previous version of Cisco Unity to Cisco Unity 4.0 is supported. However, we recommend that a customer who wants to upgrade to Cisco Unity 4.0 also upgrade to Exchange 2000.

Unified Messaging Configurations

Cisco Unity uses the Exchange 5.5 Directory Monitor. Because Cisco Unity does not use the Active Directory as its primary directory, Cisco Unity treats any Active Directory domain controller as if it were a Windows NT domain controller.

Setting up Cisco Unity in a Unified Messaging configuration offers significant benefits over setting up Cisco Unity in a Voice Messaging configuration:

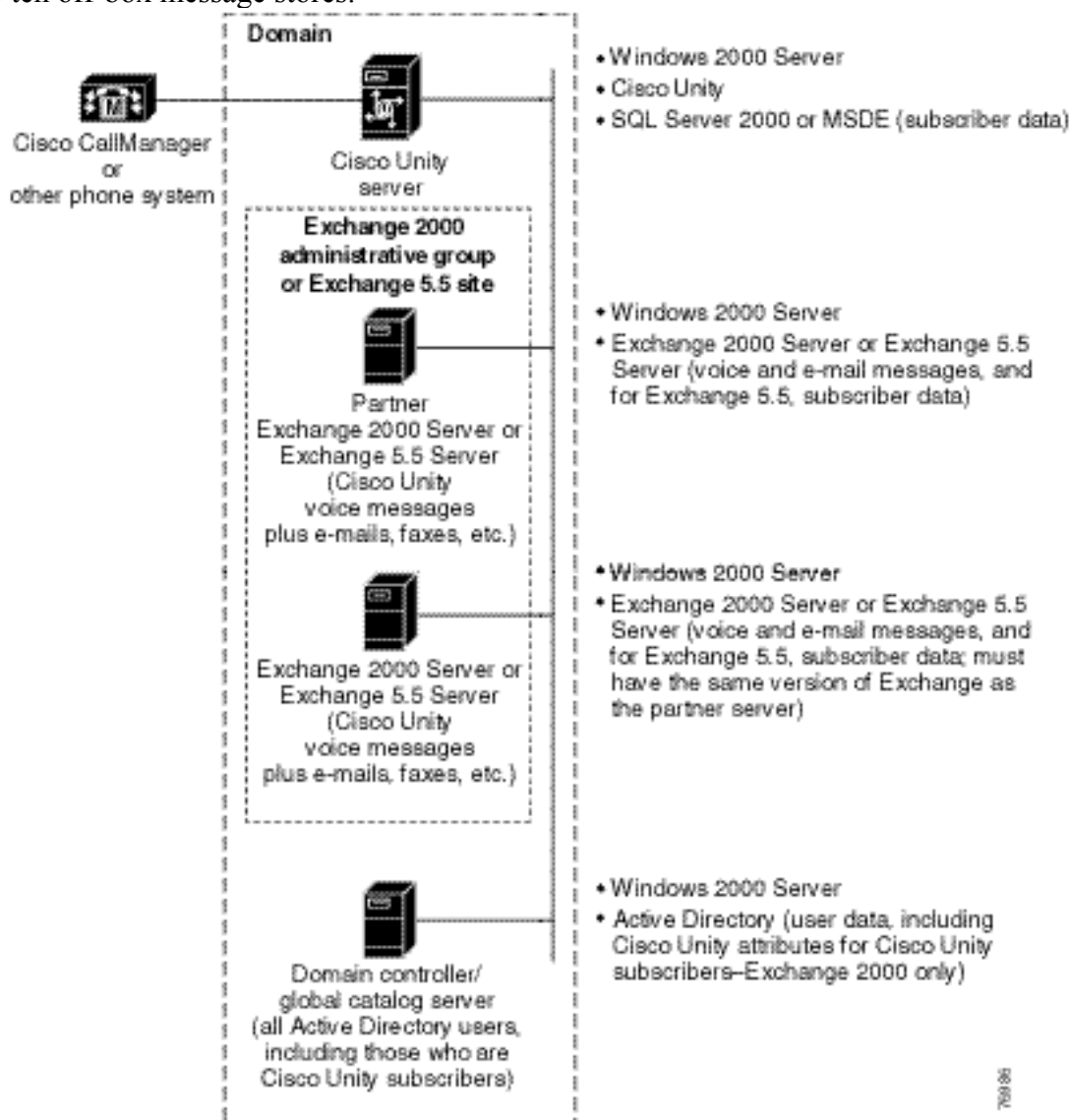
- Administrative overhead is significantly lower than with separate voice messaging and e-mail servers.
- No dedicated infrastructure is required for Unified Messaging configurations. Cisco Unity uses the existing messaging infrastructure by voice-enabling the e-mail environment.
- In a medium or large enterprise, Unified Messaging is easier to install and maintain than a dedicated Voice Messaging system.
- If the customer eventually wants Unified Messaging, beginning with a Unified Messaging configuration eliminates the tasks required to migrate from a Voice Messaging configuration.



Configuration 1: Cisco Unity Subscribers in One Exchange 5.5 Site

In this configuration, one or more Cisco Unity servers, running as domain member servers, service Exchange 5.5 mailboxes in a single Exchange 5.5 site. A single Cisco Unity server can never span more than one Exchange 5.5 site in this configuration. Cisco Unity can be running in a failover configuration as domain member servers in a Windows 2000 or Windows NT domain servicing Exchange 5.5 mailboxes in a site.

The domain and domain controller can be Windows NT instead of Windows 2000. Cisco Unity can support up to ten off-box message stores.





Configuration 2: Cisco Unity Subscribers in Two or More Exchange 5.5 Sites

If the customer has more than one Exchange 5.5 site:

- At least one Cisco Unity server is required per site.
- If using Cisco Unity Digital Networking, Cisco Unity in one Exchange 5.5 site can communicate with a Cisco Unity server in other Exchange 5.5 sites in the organization.
- Cisco Unity can be running in a failover configuration.
- Cisco Unity must be a member server running on Windows 2000.
- One Cisco Unity server can service a single Exchange 5.5 site.
- The diagram for each Cisco Unity server in this configuration looks like the diagram in the Configuration 1 section. If the phone system has ports available, you can hook up more than one Cisco Unity server to each phone system.

Deploying Cisco Unity for Exchange 5.5

Cisco Unity for Exchange 5.5 can be deployed in the following ways. The list is arranged in order, with the easiest deployment first:

- One or more Cisco Unity servers servicing multiple Exchange 5.5 servers in the same Exchange 5.5 site. The Cisco Unity and Exchange 5.5 servers are installed in the same-well connected network. We also recommend connecting Cisco Unity to the same VLAN as the Exchange 5.5 servers it is servicing.

If there are multiple Cisco Unity servers, set up Cisco Unity Digital Networking to allow subscribers on one Cisco Unity server to address voice messages to subscribers on another Cisco Unity server. For information on setting up Digital Networking, refer to the *Networking in Cisco Unity Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.

- Two or more Cisco Unity servers servicing two or more Exchange 5.5 sites (with at least one Cisco Unity server per Exchange site). To allow subscribers on one Cisco Unity server to address voice messages to subscribers on another Cisco Unity server, set up Cisco Unity Digital Networking.
- A Cisco Unity system with access to the CPCA and to ViewMail for Outlook (VMO).



- A Cisco Unity system that requires AMIS interoperability with other voice messaging systems.

Administrative Access and Control

To manage administrative access to the Cisco Unity server and its resources, the customer may want different levels of access for different operations, for example, backing up the server or gathering performance information for trending.

When installing Cisco Unity in a Unified Messaging configuration, it is best to allow administrative access to the server to be governed by the server administration policies of the customer. However, the customer policies should not detract from the administrative access required for normal Cisco Unity operations, which includes:

- Managing the server resources (hardware, operating system, file system, and other supporting software).
- Managing the Cisco Unity application, including:
 - Web access
 - Support of components such as SQL Server/MSDE, IIS, and Internet Explorer
 - Cisco Unity application log files
 - Utilities such as the Windows Event Viewer and the Performance Monitor
- Administering Cisco Unity subscribers, distribution lists, call handlers, and so on.
- Administering Cisco Unity switch connectivity to Cisco CallManager or to a circuit-switched phone system.

Active Directory or Windows NT Account That Owns Cisco Unity Services

The main Cisco Unity services are owned by an Active Directory or Windows NT account. These services fall into two categories:

- Message store services are responsible for sending and receiving messages on behalf of the subscriber.
- Directory services write to user, group, and contact objects when the objects are imported into Cisco Unity, and they write to individual subscriber properties when a subscriber or an administrator changes personal settings for the subscriber.

The service account can be used by more than one Cisco Unity server in the same domain.



Note: Several other services, including the Text to Speech (TTS) service and the service that controls Cisco Unity licensing, are owned by the local system account.)

To do the required tasks, these services require Exchange 5.5 permissions, Windows user rights, and a group membership. For detailed information on the rights and permissions required, refer to the chapters “Creating Accounts for the Installation and Setting Rights and Permissions,” and “Permissions Set by the Cisco Unity Permissions Wizard,” in the *Cisco Unity Installation Guide*. The *Cisco Unity Installation Guide* is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

Establishing Support Policies

To make administering Cisco Unity more manageable, establish a support policy that separates Cisco Unity-specific administration from administration of the rest of the server. This allows Cisco Unity administrators with limited class of service (COS) settings to access the Cisco Unity application only as designed by their COS settings.

Depending on the administrative model the customer uses, the GrantUnityAccess utility can be used to associate multiple Active Directory accounts with a single Cisco Unity subscriber that has an administration COS. (You can also use GrantUnityAccess to associate multiple Cisco Unity subscribers with a single Active Directory account.) Use of the GrantUnityAccess utility gives all of the associated Active Directory accounts the right to administer Cisco Unity by using the Cisco Unity Administrator.

To prevent unwanted access to GrantUnityAccess, limit file and directory access—of the Cisco Unity CommServer folder on the Cisco Unity server—to the administrators who are responsible for administering the entire server.

Network Services

Cisco Unity for Exchange 5.5 does not have a strict dependency on network services such as DDNS or WINS. However, if Cisco Unity for Exchange 5.5 is running in a Windows NT domain, it should use the same name resolution as the Exchange 5.5 servers it services. The same holds for Cisco Unity for Exchange 5.5 running in a Windows 2000 domain. It should use DDNS, which is the name resolution required by Windows 2000. A simple rule of thumb can be used to determine which name resolution system Cisco Unity should use: if the messaging clients in the existing messaging environment use WINS, DNS, or both, then configure the Cisco Unity system to use the same name resolution system(s).

Deployment Tasks

Consider the following deployment best practices:

- Define and create the accounts to be used in running the Cisco Unity services.



- Define and create the accounts to be used to administer Cisco Unity.
- Define the level of access to the local Cisco Unity server necessary for an administrator. Subscribers who are not administrators do not need direct access to the Cisco Unity server operating system or file system.
- Define a policy for Cisco Unity classes of service for each Cisco Unity server.
- Define the Cisco Unity templates to be used for subscribers.
- Define the Cisco Unity distribution groups needed for each installation.
- Define any audio-text applications that need to be created on each Cisco Unity server.
- Define dialing restrictions necessary to prevent subscribers from accessing unauthorized outside numbers.
- Verify that the number of subscribers serviced by each Cisco Unity server is known and documented.
- Verify that each Cisco Unity server is properly sized for the number of subscribers it will service.
- Verify that the total capacity for each Cisco Unity server is known and documented.
- Create and document a suitable disaster recovery plan.
- Verify that the switch integration is understood and supported.
- Decide the number of ports needed for message notification, and for recording and playing messages over the phone.
- Verify that all hardware and supporting components are set up correctly and properly sized.
- List the acceptance tests to be run after the server is installed and before going live.
- Verify that there is a fallback procedure in the event that problems are encountered.
- Define any measurements necessary to benchmark the initial performance of the server.

Operational Tasks

The following are best practices for an operational Cisco Unity system:

- Create and implement a regular maintenance schedule to gather logs, run reports, and monitor the use of server resources such as disk space, memory, and the CPU.
- Verify that regular backups are occurring.



- Make arrangements for any regular downtime necessary for offline maintenance activities.
- Make arrangements for any special administrative tasks, for example maintaining and creating audio text applications, and running cleanup utilities such as Directory Walker.
- Before reconfiguring the system, for example when migrating from Voice Messaging to Unified Messaging or when upgrading hardware, mock up the existing Cisco Unity system in a lab environment, and test and validate the work.



Chapter 6: Migrating from Exchange 5.5 to Exchange 2000 for the Message Store

Overview

To understand how Cisco Unity supports a migration from Exchange 5.5 to Exchange 2000, you need to understand the following:

- Characteristics of an Exchange mixed-mode environment.
- How Cisco Unity uses the directory.
- How Cisco Unity can be affected by replication between the Exchange 5.5 directory and Active Directory.
- How to design a Cisco Unity 4.0 deployment in a mixed-mode configuration.
- How to upgrade from an earlier version of Cisco Unity that is currently running in a mixed-mode configuration.

Note the following about Cisco Unity support in an Exchange mixed-mode environment:

- A single Cisco Unity server can directly support either Active Directory or the Exchange 5.5 directory, but not both. However, a single Cisco Unity server can service both Exchange 2000 and Exchange 5.5 mailboxes when Cisco Unity is connected to Exchange 2000 and when it uses Active Directory as its primary directory. The Exchange 5.5 servers must replicate directory data to Active Directory, and an Exchange 2000 server must join the Exchange 5.5 site serviced by Cisco Unity. (In this configuration, there need not be any Cisco Unity subscribers homed in Exchange 2000.)
- A Cisco Unity server connected to Active Directory and servicing only Exchange 2000 mailboxes, and another Cisco Unity server connected to the Exchange 5.5 directory and servicing only Exchange 5.5 mailboxes, cannot share directory data. However, Cisco Unity subscribers on one server can send voice messages to subscribers on the other server by using blind addressing or Internet subscriber accounts.
- A Cisco Unity server that services Exchange 5.5 mailboxes in a mixed-mode environment is not affected by standard directory replication between the Exchange 5.5 directory and Active Directory. However, the Cisco Unity Exchange 5.5 location object can be affected if a customer changes the object and attribute mapping in the Active Directory Connector to allow that object to be replicated to Active Directory and back.



- Versions of Cisco Unity prior to Cisco Unity 3.0 may be severely affected if replication is set up between Exchange 5.5 and Active Directory, depending on how replication is set up.

If the customer has both Exchange 2000 and Exchange 5.5 servers in the same Windows 2000 domain, but has not set up an Exchange mixed-mode environment:

- Exchange 5.5 sees Active Directory as another accounts domain, just as it sees a Windows NT domain.
- An Active Directory user is associated with an Exchange 5.5 mailbox, but the Exchange 5.5 directory does not use the Exchange attributes in Active Directory.
- The Active Directory user is not mail-enabled in Active Directory.
- If Exchange 2000 is installed, it cannot join the existing Exchange 5.5 organization and site.
- Exchange 2000 mailboxes can mistakenly be created for users who already have Exchange 5.5 mailboxes.
- A Cisco Unity server that services Exchange 5.5 mailboxes would not be aware of Exchange 2000 mailboxes.
- Another Cisco Unity server that services Exchange 2000 mailboxes would not be aware of the Cisco Unity server that services the Exchange 5.5 mailboxes.

Running both Exchange 2000 and Exchange 5.5 servers in the same Windows 2000 domain without setting up an Exchange mixed-mode environment is not a recommended configuration for Cisco Unity.

Cisco Unity 4.0 supports Exchange mixed-mode environments in the following configurations:

- Unified Messaging for new installations and for upgrades to Cisco Unity 4.0.
- Voice Messaging for upgrades to Cisco Unity 4.0.

The Voice Messaging configuration is not supported for new installations in Exchange mixed-mode environments if the Cisco Unity server is servicing both Exchange 2000 and Exchange 5.5 servers.

This chapter discusses the requirements for Cisco Unity and provides design guidelines necessary for Cisco Unity to support a migration from Exchange 5.5 to Exchange 2000.



Requirements for Servicing Subscribers in an Exchange Mixed-Mode Environment

For Cisco Unity to service subscribers who are homed in Exchange 2000 and subscribers who are homed in Exchange 5.5, an Exchange mixed-mode environment must be correctly set up. For detailed information on setting up a mixed-mode environment, refer to the Microsoft website. The requirements of a mixed-mode environment that are most important to Cisco Unity are the following:

- There is only one Exchange 5.5 organization, with one or more Exchange 5.5 sites.
- The Exchange 5.5 servers can be installed into a Windows NT or Windows 2000 domain. However, it is best to upgrade the domains to Windows 2000 domains before introducing the other components of a mixed-mode Exchange environment.
- A Windows 2000 domain has been installed. The domain can be either a new domain or a Windows NT domain that has been migrated to a Windows 2000 domain.
- The Exchange version of the Microsoft Active Directory Connector is installed.
- A connection agreement (CA) has been created that replicates Recipients containers from Exchange 5.5 to Active Directory. The CA can be created at any container level in Exchange 5.5 and Active Directory.
- Exchange 2000 schema extensions have been added to Active Directory. ForestPrep, which adds Exchange 2000 schema extensions, prompts whether to create a new Exchange 2000 organization or to join an existing Exchange 5.5 organization.
- If the customer wants Cisco Unity to service subscribers in both Exchange 2000 and Exchange 5.5, the new Exchange 2000 server must join the existing Exchange 5.5 organization.

If the requirements listed here are not met, the customer will need one or more Cisco Unity servers to service subscribers in the Exchange 5.5 organization and one or more Cisco Unity servers to service subscribers in the Exchange 2000 organization. If the customer wants subscribers on a Cisco Unity server in the Exchange 5.5 organization to address messages to subscribers on a Cisco Unity server in the Exchange 2000 organization, it is necessary to set up SMTP Networking between the two Cisco Unity systems. For more information on SMTP Networking, refer to the *Networking in Cisco Unity Guide*, which is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.



Permissions Required by Cisco Unity

When a single Cisco Unity server services mailboxes on both Exchange 2000 and Exchange 5.5, the permissions that Cisco Unity requires for Exchange 2000 and the permissions that Cisco Unity requires for Exchange 5.5 must both be set. These permissions are detailed in the chapters “Creating Accounts for the Installation and Setting Rights and Permissions,” and “Permissions Set by the Cisco Unity Permissions Wizard,” in the *Cisco Unity Installation Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

How Cisco Unity Operates in an Exchange Mixed-Mode Environment

In an Exchange mixed-mode environment, Cisco Unity can connect with Exchange 2000 or with Exchange 5.5. When Cisco Unity connects with:

- Exchange 2000, a single Cisco Unity server can service subscribers homed on Exchange 2000, on Exchange 5.5, or on both. For Cisco Unity to service subscribers homed on both, an Exchange mixed-mode environment must be properly configured, and Cisco Unity must be configured for Unified Messaging.
- Exchange 5.5, a single Cisco Unity can service only subscribers homed on Exchange 5.5, even if Exchange 2000 is present and an Exchange mixed-mode environment is properly configured.

Cisco Unity Connected with an Exchange 2000 Server

When the Cisco Unity partner server is an Exchange 2000 server and an Exchange mixed-mode environment is properly configured, Cisco Unity can also service Exchange 5.5 mailboxes. In this configuration, Cisco Unity gets information from Active Directory about both Exchange 5.5 and Exchange 2000 mailboxes. Cisco Unity can service Exchange 5.5 mailboxes only in the site to which the Exchange 2000 servers are joined.

Ideally, a two-way CA is configured between Exchange 5.5 and Windows 2000. When a one-way CA is configured from Exchange 5.5 to Windows 2000, the Cisco Unity system mailbox must be created in Exchange 5.5 and moved to Exchange 2000, as documented in the chapter “Creating Accounts for the Installation and Setting Rights and Permissions,” in the *Cisco Unity Installation Guide*, which is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

The CA allows data in the Exchange 5.5 directory to replicate to Active Directory and, for a two-way CA, allows changes to Active Directory data to replicate back to the Exchange 5.5 directory. When a two-way CA is configured, Cisco Unity-specific Active



Directory attributes (which are added when the Active Directory schema is extended for Cisco Unity) do not replicate to the Exchange 5.5 directory; therefore, those attributes cannot be changed in the Exchange 5.5 directory.

Cisco Unity Connected with an Exchange 5.5 Server

When the Cisco Unity partner server is an Exchange 5.5 server, Cisco Unity can service only Exchange 5.5 mailboxes, regardless of whether Exchange 2000 servers are present or an Exchange mixed-mode environment is set up.

In this configuration, Cisco Unity uses the Exchange 5.5 directory exclusively. If the customer sets up an Exchange mixed-mode environment, care must be taken to ensure that replication does not adversely affect Cisco Unity data in the Exchange 5.5 directory. A one-way CA from Exchange 5.5 to Active Directory will not affect Cisco Unity, because the directory that Cisco Unity uses cannot be changed through Active Directory. However, an improperly configured two-way CA could cause problems for Cisco Unity.

For example, the customer might set up a connection agreement that replicates data from the Exchange 5.5 Recipients container to Users in Active Directory, and from Users in Active Directory to a Users container in Exchange 5.5. In this circumstance, changes to the Exchange 5.5 directory will be made in one location (Recipients), and changes to Active Directory data that are replicated to Exchange 5.5 will be replicated to a different location (Users). If the customer now makes all changes to the directory in Active Directory, the Exchange 5.5 directory data that Cisco Unity accesses (Recipients) is not updated.

If the customer has an Exchange mixed-mode environment set up, the best model for Cisco Unity is for Exchange 5.5 Recipients data to replicate to Active Directory Users, and for Active Directory Users data to replicate back to Exchange 5.5 Recipients.

Multiple Cisco Unity Servers Connected with Different Versions of Exchange

A customer can install two Cisco Unity 4.0 servers, configure one to service Exchange 5.5 mailboxes, and configure the other to service Exchange 2000 mailboxes. However, in this configuration, Cisco Unity Digital Networking is not available, so subscribers on one server can send voice messages to subscribers on the other server only by using blind addressing or Internet Subscribers.

The same is true if one Cisco Unity server services Exchange 5.5 mailboxes and another services both Exchange 2000 and Exchange 5.5 mailboxes in a mixed-mode environment. The Cisco Unity server servicing both Exchange 2000 and Exchange 5.5 mailboxes cannot service the same Exchange 5.5 mailboxes as the Cisco Unity server that is servicing only Exchange 5.5 mailboxes.



Cisco Unity 2.4(6) and 4.0 Servers Connected with the Same Exchange 5.5 Site

If a customer has a Cisco Unity 2.4(6) server, and adds a Cisco Unity 4.0 server to service the same Exchange 5.5 site, the Cisco Unity 4.0 server can see Cisco Unity 2.4(6) subscribers as unimported mailboxes. If these Cisco Unity 2.4(6) subscribers are mistakenly imported into Cisco Unity 4.0, the Cisco Unity 2.4(6) subscriber data stored in the Exchange 5.5 directory will be overwritten with Cisco Unity 4.0 subscriber data.

The same problem can occur if the Cisco Unity 4.0 server services both Exchange 2000 mailboxes and Exchange 5.5 mailboxes in a mixed-mode configuration.

In addition, Cisco Unity version 2.4(6) connected to Exchange 5.5 can be adversely affected if connection agreements replicate the Unity container in Exchange 5.5, for example when a CA is established at the site level or higher. This can render the Cisco Unity server inoperable and could require a reinstallation or restore. We recommend that CAs be configured to replicate containers at the level of the Unity folder or below.

Migrating from Exchange 5.5 to Exchange 2000

There are several different methods for migrating from Exchange 5.5 to Exchange 2000. The customer can set up an Exchange mixed-mode environment, move user accounts from Windows NT to Active Directory, and move mailboxes from Exchange 5.5 to Exchange 2000.

The customer can also create a brand new infrastructure for Active Directory, create a new Exchange 2000 organization, and migrate by exporting user and mailbox information from the old environment and importing it into the new environment. However, note that this is not considered an Exchange mixed-mode environment, and the migration steps are different.

Exchange Mixed-Mode Environment

If a customer is currently using Exchange 5.5 and wants to migrate from Exchange 5.5 to Exchange 2000 gradually, Cisco Unity can be configured to service Exchange 5.5 mailboxes until the Exchange mixed-mode environment is properly configured (however, the customer must upgrade the Cisco Unity installation to versions 4.0(3) or 4.0(4) first). Then Cisco Unity can be reconfigured to service mailboxes in both versions of Exchange.

For information on reconfiguring an existing Cisco Unity server that is currently servicing only Exchange 5.5 mailboxes so that it will service both Exchange 5.5 and Exchange 2000 mailboxes, refer to the Cisco Unity Reconfiguration and Upgrade Guide, available at

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/rug/index.htm.



Exchange 2000 and Exchange 5.5 Are Not Connected

If a customer wants to cut over from Exchange 5.5 to Exchange 2000 all at once without setting up an Exchange mixed-mode environment first, they have two options for migrating Cisco Unity, as follows:

Option 1: Reinstall Cisco Unity Without Saving Cisco Unity Settings

If the customer does not want to preserve Cisco Unity settings or Exchange 5.5 directory data, Cisco Unity can be reinstalled and reconfigured in the new environment, and the mailbox-enabled Active Directory users imported into Cisco Unity.

Option 2: Save Cisco Unity Settings, Reinstall Cisco Unity, and Restore Cisco Unity Settings

If the customer wants to preserve Cisco Unity subscriber settings, the following process is recommended:

- Back up Cisco Unity data by using the Cisco Unity Disaster Recovery Tool (DiRT).

Note: The Disaster Recovery Tool does not support versions of Cisco Unity earlier than version 3.1. A customer using an earlier version must upgrade to 3.1 or 4.0 before backing up.

If the customer also wants to preserve Exchange messages, either ExMerge or DiRT (which uses ExMerge for messages) can be used. In order to make this effective, verify that you use the same alias names on the Exchange 5.5 server that you use on the Exchange 2000 server. This is necessary before you begin your migration. Otherwise, the account names that exist in the Exchange 5.5 server will be recreated in the Exchange 2000 server.

- Install a new Cisco Unity server in the new environment by using the exact version of Cisco Unity for which data was backed up. (The Disaster Recovery Tool will restore data only to the exact version of Cisco Unity that was backed up.)
- Restore Cisco Unity data by using the Disaster Recovery Tool, which restores Cisco Unity data to the Cisco Unity SQL Server/MSDE database.

After data has been restored to the database, Cisco Unity goes through the database one subscriber at a time and searches Active Directory for a matching user based on Directory ID, relative distinguished name (RDN), or Alias. If a match is found, the Active Directory user is updated with Cisco Unity data from the Exchange 5.5 directory. If no match is found, Cisco Unity creates a new user in Active Directory (in the OU that was specified during Cisco Unity installation) and updates the user with Cisco Unity data.

- If Exchange 5.5 messages were backed up, restore them to Exchange 2000.



- If the customer wants to change aliases on the Active Directory accounts:
 - Create accounts that have the desired aliases, if they do not already exist.
 - Use the Cisco Unity Move Subscriber tool to merge the accounts that were created when you restored Cisco Unity into the new Active Directory accounts.
 - Delete the accounts that have the old aliases.
- Restore the settings that the Disaster Recovery Tool did not restore. For more information, refer to the Disaster Recovery Tool Help.

Migrating from Cisco Unity 2.4(6) to 4.0: An Example

A customer has an existing Exchange 5.5 organization with one Exchange 5.5 site. A Cisco Unity 2.4(6) server services subscribers in the default Recipients container.

To begin the migration from Windows NT and Exchange 5.5 to Windows 2000 and Exchange 2000, the customer upgrades all PDCs and BDCs to Windows 2000 domain controllers.

The use of Cisco Unity 2.4(6) in an Exchange mixed-mode environment imposes some limits on the configuration of connection agreements and on changes to attribute mappings, so this is a good time to upgrade Cisco Unity to version 4.0, before installing the Microsoft Active Directory Connector and setting up connection agreements. During the upgrade, the installer reconnects Cisco Unity with Exchange 5.5, because replication between the Exchange 5.5 directory and Active Directory has not been set up.

Caution! The customer must ensure that connection agreements do not replicate the Unity container in the Exchange 5.5 directory, located at the same level as the Recipients container. In addition, the customer should not change the object and attribute mappings in the Active Directory Connector.

The customer installs the Microsoft Active Directory Connector and sets up connection agreements between Active Directory and Exchange 5.5, to replicate Exchange 5.5 directory data to Active Directory.

Before beginning to migrate mailboxes to Exchange 2000, disconnect Cisco Unity from Exchange 5.5 and reconnect to Exchange 2000. This allows Cisco Unity to service both the mailboxes that have been migrated to Exchange 2000 and the mailboxes that remain in Exchange 5.5.

When the migration from Exchange 5.5 is complete, the Exchange 5.5 server can be removed.



Attributes in the Exchange 5.5 Directory Used by Cisco Unity

Cisco Unity 3.x and later use the following attributes in the Exchange 5.5 directory. These attributes should not be altered through replication, either by the Active Directory Connector or by a third-party replication application.

- Extension-Attribute-12
- Extension-Attribute-14
- Recipient or Mail User
- Voice-Mail-Flags
- Voice-Mail-Greetings
- Voice-Mail-Speed
- Voice-Mail-Recorded-Name
- Voice-Mail_User-ID

For Cisco Unity versions 3.0 and later, the Cisco Unity location object is created from the Exchange 5.5 Person object found in the Exchange 5.5 schema. This Person object does not have an exact parallel in Active Directory (it is just one part of an Active Directory contact), so it is not replicated through the Microsoft Active Directory Connector via any connection agreement. The ADC can replicate Exchange 5.5 mailboxes (recipients) to an Active Directory mail-enabled user, an Exchange 5.5 custom recipient to an Active Directory contact, and an Exchange 5.5 distribution list to an Active Directory distribution group.



Chapter 7: Using Domino for the Directory and Message Store

This chapter focuses on using IBM Lotus Domino as the message store and a Domino address book as the directory for Cisco Unity.

Cisco Unity, Domino, and Notes

Cisco Unity 4.0 for Domino currently supports the Domino configurations described in this chapter, and will support additional Domino configurations as customers require them and ECSBU tests and approves them. Note in particular:

- Cisco Unity Unified Messaging configurations are supported.
- Voice Messaging configurations are not supported.
- Installing Domino on the Cisco Unity server is not supported.

Older Cisco Unity for Exchange systems, configured either for Voice Messaging or Unified Messaging, can be converted to Cisco Unity 4.0 for Domino, but only by reinstalling all software, and losing Cisco Unity settings and voice messages.

When a customer needs multiple Cisco Unity servers, subscribers on the separate servers can send voice messages to one another if Cisco Unity Digital Networking is configured. However, the initial release of Cisco Unity for Domino does not support exchanging voice messages with other voice messaging systems using the Cisco Unity Bridge, AMIS, or VPIM because the Internet Voice Connector has not been updated for Cisco Unity for Domino.

Domino Address Book Terminology

Names.nsf is the first address book (directory) file in a Domino domain, and is created when the first Domino server is installed. Each additional Domino server that is added to the domain receives a replica of Names.nsf. During Cisco Unity installation, the installer specifies a Domino address book on a Domino server that Cisco Unity will monitor. In general, the address book that Cisco Unity will monitor will be a replica of Names.nsf.

A secondary address book is an address book that is a subset of Names.nsf. Secondary address books are typically created to house non-local mail users (those who do not own a mailbox in the domain or enterprise). The Active Directory equivalent is contacts, and the Exchange 5.5 equivalent is custom recipients.



DUC for Cisco Unity on Domino Servers and on Client Workstations

For Cisco Unity to use Domino as the message store and directory, the customer must install components of IBM Lotus Domino Unified Communications Services (DUC) for Cisco Unity on the Domino servers, as follows:

- csServer must be installed on each Domino server that homes Cisco Unity subscribers.
- Both csServer and csAdmin must be installed on the Domino servers that contain the Domino address books that Cisco Unity monitors. However, csServer needs to be installed on the Lotus Domino server that contains the address book only if Cisco Unity users are also homed on that server.
- csServer must be installed on every Domino server in a cluster if any Cisco Unity subscribers are homed on the cluster. In addition, csAdmin must be installed on the server with which Cisco Unity connects in the cluster.

In addition, DUC client software must be installed on the client workstation of each Notes user who will be a Cisco Unity subscriber. Installing the client software adds VCR-style recording and playback controls to the message form. DUC provides message notification, message waiting indicators, and a Lotus Mail template for recording and playing voice messages. DUC was created and is supported by IBM Lotus, and is available only from IBM Lotus; it cannot be purchased from Cisco.

Note: DUC is currently available only for Domino servers running Windows 2000 or Windows NT 4.

Cisco Unity 4.0 initially supported the following Domino/Notes and DUC versions:

- On the Domino admin/address book server, and on message store servers, either Domino version 5.0.10 or 5.0.11 and DUC version 1.1
- On the Cisco Unity server, Notes version 5.0.10
- On client workstations, Notes client version 5.0.11 and DUC version 1.1

Refer to the Cisco Unity 4.0(3) or 4.0(4) product documentation for information on the recent versions of DUC software supported by Cisco Unity.

Changes That DUC Makes to the Domino Address Book

Table 1 shows the elements added to the Domino address book when the DUC admin client is installed on a Domino server. If the DUC admin client is uninstalled, these items are removed from the address book.



Table 5. Elements Added to the Address Book by Installing the DUC Admin Client

Element	Name
Forms	Unity Location
Views	<ul style="list-style-type: none">• Unity Locations• (\$UnityLocLookup)• (\$UnityNameLookup)
Agent	UC License Tracking
Subforms	<ul style="list-style-type: none">• \$CSUnityDLSubform• \$CSUnityUserSubform• \$GroupExtensibleSchema• \$PersonExtensibleSchema

Changes That the DUC Client Makes to the Mail File

When DUC for Cisco Unity client software is installed on a client workstation, the elements in Table 2 are added to the mail file. If DUC for Cisco Unity is uninstalled, these elements are removed from the mail file.

Table 6. Elements Added to the Mail File by Installing the DUC Client

Element	Name
Forms	<ul style="list-style-type: none">• UCDisplayInfo• Voice Message• (Display Received Voice Message)• (UCMemo)
Views	<ul style="list-style-type: none">• Voice Inbox• (\$UCInbox)—this view is added when the user is imported into Cisco Unity
Agents	<ul style="list-style-type: none">• (UCEnable)• (UCPreferences)



Element	Name
Images	<ul style="list-style-type: none">• Phone.jpg• act_EDIT.GIF• act_Listen.GIF
Subforms	<ul style="list-style-type: none">• UCPlayer• (DisplayFwrContent)• (UCItems)• (UCVoiceNote)• (VoiceDeliveryOptions)
Script libraries	<ul style="list-style-type: none">• Core UC Classes• Core UC Strings• Unified Communications

Domino Server Connected with Cisco Unity: The Partner Domino Server

When Cisco Unity is installed, the installer specifies one Domino server with which Cisco Unity connects as the partner Domino server. The partner server has several purposes:

- It is the home of the Cisco Unity system mailbox, which is the sender of voice messages from outside callers. (Voice messages from Cisco Unity subscribers are identified as coming from those subscribers.) There must be a system mailbox for each Cisco Unity server.
- It is the server on which Cisco Unity creates contact address book entries for default system accounts (for example, Default Admin and distribution lists).
- All Cisco Unity voice messages, from outside callers and from subscribers, are placed in Mail.box of the partner server for routing.

Windows Domains, Domino Domains, and Server Placement

A Cisco Unity 4.0 server must run Windows 2000 Server and must be one of the following:



- A domain controller in a Windows 2000 domain
- A member server in a Windows 2000 domain
- A member server in a Windows NT domain

If the Cisco Unity server is a member server, it should reside in the same highly available and connected network as a domain controller for that domain.

The Cisco Unity server should reside in the same highly available and connected network as the partner Domino server and any Domino servers that home Cisco Unity subscribers, or the customer will experience delays in message access, in directory replication, and in directory lookups.

For the Cisco Unity 4.0 release, the customer will need at least one Cisco Unity server for each Domino domain that will home Cisco Unity subscribers.

Windows Accounts and Permissions

Cisco Unity 4.0 requires that three Windows domain accounts be created during installation, as described in the *Cisco Unity Installation Guide*. One account is used to install Cisco Unity, one is the account that most Cisco Unity services log on as, and one account is used to access the Cisco Unity administration interface, the Cisco Unity Administrator. (Some services, including the Text to Speech (TTS) service and the service that controls Cisco Unity licensing, log on as the local system account.)

The permissions required by each of the accounts are set by the Cisco Unity Permissions Wizard. The account that owns most Cisco Unity services can be used by more than one Cisco Unity server in the same domain. For detailed information on the rights and permissions required, refer to the chapters “Creating Accounts for the Installation and Setting Rights and Permissions,” and “Permissions Set by the Cisco Unity Permissions Wizard,” in the *Cisco Unity Installation Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

These accounts and permissions are required for Cisco Unity-specific functionality and are separate from Domino permissions. When setting Domino-specific permissions, as described in the “Domino Permissions” section, the Permissions Wizard is not used nor required.

Domino users who are Cisco Unity subscribers do not need Windows accounts, and Cisco Unity administrators and subscribers are not required to use Windows authentication.



Authentication

Cisco Unity subscribers whose class of service (COS) allows them access to the Cisco Unity Administrator can log on to the Cisco Unity Administrator by using Domino authentication, Integrated Windows authentication, or Anonymous authentication, depending on how the system is configured. Subscribers whose COS allows them access to the Cisco Unity Assistant can log on to the Cisco Unity Assistant by using the same authentication methods.

Domino Permissions

Before Cisco Unity is installed, the Cisco Unity installer or a qualified Domino administrator needs to create a group for Cisco Unity servers named UnityServers, and grant the group “editor” permissions for Admin4.nsf and “editor with delete-documents” permissions for Names.nsf. With these permissions, Cisco Unity acts as a Notes user to:

- Create Cisco Unity subscribers, contacts, and distribution lists, by importing them from the Domino address book.
- Change the Domino address book by using the Cisco Unity Administrator.
- Submit voice messages through Domino.
- Retrieve and play messages left for subscribers.
- Get information about the read/unread status of voice messages, e-mail, and fax messages in a subscriber mailbox, and send notification when there are new messages.

In addition, when a Domino user is imported into Cisco Unity, Cisco Unity submits an AdminP request to grant the user access to the imported user mail file.

For more information on setting Domino-specific permissions, refer to the *Cisco Unity Installation Guide*.

Cisco Unity Subscribers and Domino Users

A Cisco Unity subscriber is a Domino user who has been DUC-enabled and imported into Cisco Unity. The person document of each subscriber has Cisco Unity attributes, and the mail file has DUC attributes. The only way to create a Cisco Unity subscriber is to import an existing Domino user into Cisco Unity. Cisco Unity cannot create Domino users by using the Cisco Unity Administrator.

Domino Clusters

Cisco Unity supports homing Cisco Unity subscribers on Domino clusters. The Domino cluster must meet all IBM Lotus requirements, particularly those related to the maximum number of users and to supported hardware. A Cisco Unity server can support up to 7,500



subscribers on up to five Domino mailstores; a cluster counts as one mailstore. Depending on the number of users on a cluster, the customer may want to install one Cisco Unity for each Domino cluster.

The customer is responsible for installing, configuring, and maintaining the Domino cluster.

For more information on Domino clusters, refer to the Lotus Domino documentation, available on the Lotus Domino website.

Message Routing

Cisco Unity voice messages are routed to Domino mailboxes by Domino. When someone leaves a voice message (whether an outside caller or a subscriber), Cisco Unity submits the messages to Mail.box on the partner Domino server. The partner server determines the routing path to the mail file of the recipient. When Cisco Unity has given the message to the partner Domino server, the Domino services are responsible for delivery.

Notes Client on the Cisco Unity Server

For Cisco Unity to interact with a Domino server, a Notes Client must be installed on the Cisco Unity server. No other Domino software is installed on the Cisco Unity server. In order to determine the correct version of the Notes Client to use, refer to the applicable Cisco Unity Release Notes documentation.

Client Access Licenses

The Cisco Unity for Domino customer needs to purchase a DUC license for:

- Each server that will home Cisco Unity subscribers.
- The Cisco Unity partner Domino server, which contains the Domino address book monitored by Cisco Unity (and which can also be the administration server for the Domino domain).

DUC licenses are available only through IBM Lotus. Customers should contact their local IBM Lotus representatives for information on purchasing DUC. Cisco will not sell DUC.

The customer is responsible for purchasing and maintaining any other Lotus licenses that may be required.

Backing Up and Restoring Data

Backing up mailboxes is important in any Unified Messaging deployment. The customer should use a backup program qualified by IBM Lotus for use with Domino.



Cisco Unity and the Domino Address Book

Cisco Unity for Domino uses a Domino address book as its directory service. However, the majority of information on Cisco Unity subscribers and other Cisco Unity objects appears only in a SQL Server/MSDE database. For the small amount of data that appears both in the Domino address book and in the Cisco Unity database (for example, extension), Cisco Unity periodically checks the Domino address book for changes and replicates those changes in the Cisco Unity database. Some of the changes that are made in the Cisco Unity Administrator are replicated to the Domino address book. After a Cisco Unity system is installed and running, changes to the address book and to settings in the Cisco Unity Administrator are relatively few in number, so this replication will not hurt performance.

Cisco Unity requires “editor with delete-documents” permissions for the address book that Cisco Unity monitors. In the Cisco Unity 4.0 release, a Cisco Unity server can monitor the address books for one domain, including Names.nsf and any secondary address book that may be supporting proxy/remote users (users who do not have mail files in the Domino domain).

For more information on permission requirements, refer to the *Cisco Unity Installation Guide*.

Supported and Unsupported Configurations

In the first release of Cisco Unity 4.0 for Domino, the supported configurations will be restricted to those that have been thoroughly tested to ensure the success of each installation. More supported configurations will be added as customers require them and ECSBU tests them.

Cisco SEs, ECSBU TMEs, and others will determine whether a customer environment will work with Cisco Unity 4.0. Additional testing may be required before Cisco Unity can be deployed. If a customer configuration does not meet the criteria in this chapter, contact ECSBU TMEs before making any commitments to the customer.

Voice Messaging Only Configurations

Cisco Unity 4.0 for Domino does not support Voice Messaging configurations. If the customer needs a Voice Messaging configuration, see Chapter 4, “Using Active Directory and Exchange 2000 for the Directory and Message Store.”

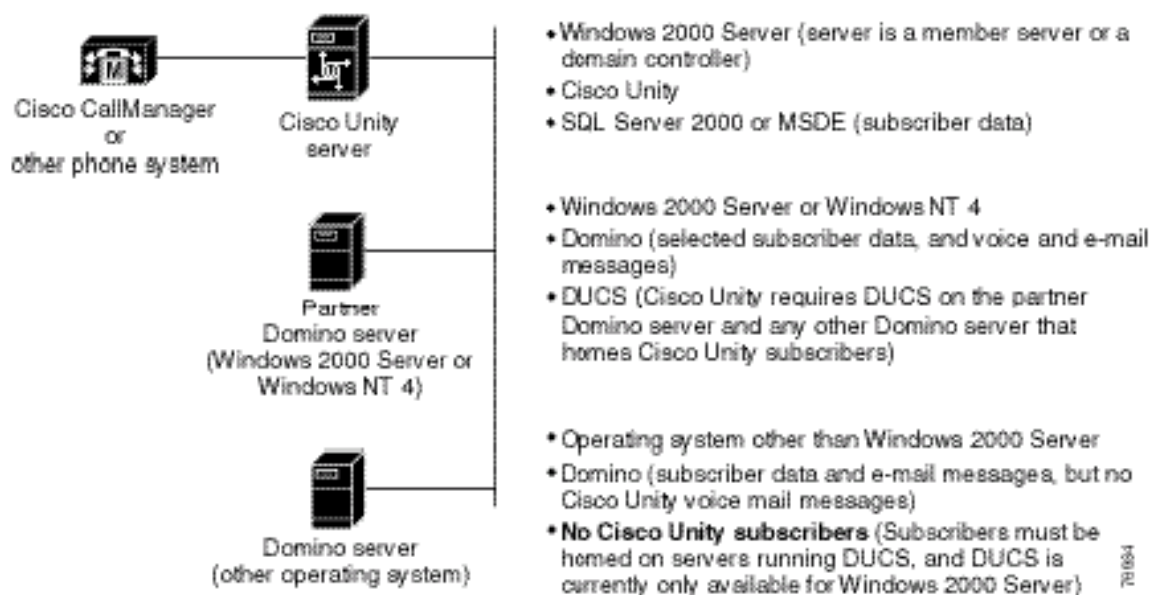
Unified Messaging Configurations

In a Unified Messaging configuration, Cisco Unity does not own the directory or messaging data but instead uses existing directory (Domino address book) and message store information. The benefits of Unified Messaging include:



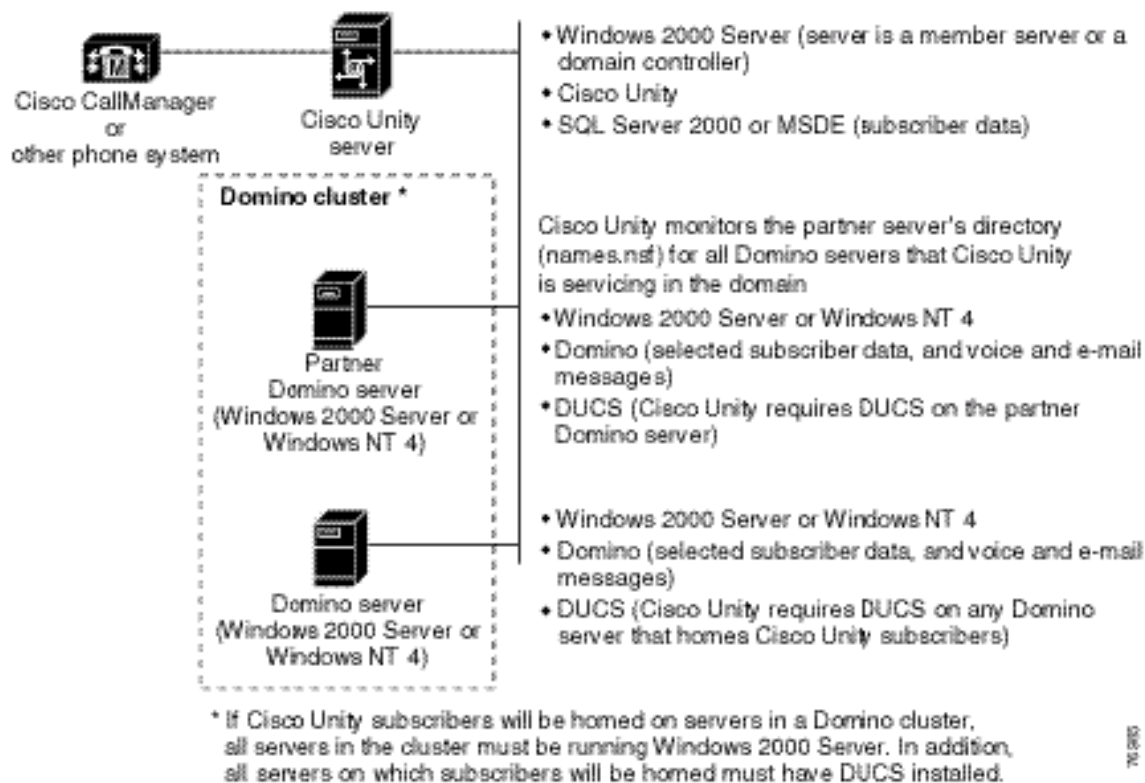
- Significantly reduced administrative overhead because the customer does not need to create and maintain separate accounts for e-mail and voice messaging applications.
- No dedicated infrastructure for a separate voice-messaging system. Cisco Unity uses the existing messaging infrastructure by voice-enabling the e-mail environment.
- Starting with Unified Messaging is administratively easier than starting with a Voice Messaging system and later migrating to Unified Messaging.

Unified Messaging, No Domino Cluster





Unified Messaging, Domino Cluster



Criteria for a Supported Configuration

Caution! If a proposed deployment does not meet the following criteria, contact an ECSBU TME before proceeding.

Requirements for supported configurations for Cisco Unity 4.0 for Domino include the following:

- Domino servers and Domino clusters must meet all IBM Lotus requirements, including requirements related to DUC.
- A Cisco Unity server can service a single physical site, meaning one or more well-connected LANs, such as a campus, single building, or other centralized facility where network bandwidth is not a problem.
- A Cisco Unity server can service mailboxes on up to a recommended maximum of ten Domino servers or clusters in a single physical site.



- A Cisco Unity server can service a single Domino address book (directory or Names.nsf file) for local Cisco Unity data (data for subscribers homed on the local Cisco Unity server) and global Cisco Unity data (data for subscribers homed on other Cisco Unity servers).
- A Cisco Unity server can service a single secondary address book for contacts. The secondary address book must have the same views as Names.nsf, and must be DUC enabled (must contain the DUC admin view). The secondary address book can reside on a different Domino server in the same Domino domain.
- Two or more Cisco Unity servers can be installed in a single Domino domain. Subscribers homed on one Cisco Unity server can send voice messages to subscribers homed on another Cisco Unity server by using Cisco Unity Digital Networking.
- Cisco Unity for Domino subscribers and Cisco Unity for Exchange subscribers cannot send voice messages to one another by using Cisco Unity Digital Networking.
- Cisco Unity for Domino subscribers in one Domino domain can only send voice messages to subscribers in another Domino domain using Internet subscribers.

Deploying Cisco Unity for Lotus Domino

Cisco Unity for Lotus Domino version 4.0 can be deployed in the following ways:

- Unified Messaging with one or more Cisco Unity servers servicing Cisco Unity subscribers on multiple Domino servers in the same Domino domain and the same well-connected network.
- Unified Messaging with access to Cisco Unity Assistant and DUC for Cisco Unity (the form in Notes that allows subscribers to play and record messages).
- Unified Messaging with multiple Cisco Unity servers. This requires either Cisco Unity Digital Networking (if two or more Cisco Unity servers are in the same Domino domain) or SMTP gateways and Internet subscribers (if two or more Cisco Unity servers are in separate Domino domains). For more information, refer to the *Networking in Cisco Unity Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guides_list.html.

Administrative Access and Control

To manage administrative access to the Cisco Unity server and its resources, the customer may want different levels of access for different operations, for example, backing up the server or gathering performance information for trending.



When installing Cisco Unity in a Unified Messaging configuration, it is best to allow administrative access to the server to be governed by the server administration policies of the customer. This should not detract from the administrative access required for normal Cisco Unity operations, which include:

- Managing the server resources (hardware, operating system, file system, and other supporting software).
- Managing the Cisco Unity application, including web access; supporting components such as SQL Server/MSDE, IIS, and Internet Explorer; the Cisco Unity application log files; and utilities such as the Windows Event Viewer, Performance Monitor, and so on.
- Administering Cisco Unity subscribers, distribution lists, call handlers, and so on.
- Administering Cisco Unity switch connectivity to Cisco CallManager, a SIP proxy server, or a circuit-switched phone system.

Establishing Support Policies

To make administering Cisco Unity more manageable, establish a support policy that separates Cisco Unity-specific administration from administration for the rest of the server. This allows Cisco Unity administrators with limited COS settings to access the Cisco Unity application only as designed through their COS.

Network Services

Cisco Unity is a Notes client that uses Notes name resolution to resolve FQDNs in the Domino/Notes environment. Cisco Unity must be able to access and resolve server names across the deployment, or performance will suffer and some Cisco Unity operations will fail. Ideally, the name resolution server will be on the same highly available network as the Cisco Unity server. Because Cisco Unity for Domino can only be deployed in existing Domino environments, name resolution servers should already be available.

Because Cisco Unity still needs to be installed into a Windows domain, Cisco Unity relies on Windows DNS. If you install Cisco Unity into an existing Windows domain, there should be an existing DNS server highly available. If the customer does not have an existing Windows domain, DNS must be installed on the Cisco Unity server.

Deployment Tasks for Unified Messaging Configurations

In a Unified Messaging configuration, pay careful attention to the placement of Cisco Unity servers, how they are managed, and the accounts that are used to manage them.

Consider the following deployment best practices for Cisco Unity in a Unified Messaging configuration:

- Define and create the accounts to be used in running the Cisco Unity services.



- Define and create the accounts to be used to administer Cisco Unity.
- Create a group for Cisco Unity servers, and grant the group editor permissions for Admin4.nsf, and editor with delete- documents permissions for Names.nsf.
- Define the level of access to the local Cisco Unity server necessary for an administrator. Subscribers who are not administrators do not need direct access to the Cisco Unity server operating system or file system.
- Define a policy for Cisco Unity classes of service for each Cisco Unity server.
- Define the Cisco Unity templates to be used for subscribers.
- Define the Cisco Unity distribution lists for each installation. (Other than the default distribution lists created during installation, you must either identify existing distribution lists in the Domino address book or create new distribution lists, and then import them into Cisco Unity.)
- Define any audio-text applications that need to be created on each Cisco Unity server.
- Define dialing restrictions necessary to prevent subscribers from accessing unauthorized outside numbers.
- Verify that the number of subscribers serviced by each Cisco Unity server is known and documented (there is a limit of 7,500 subscribers per Cisco Unity server).
- Verify that each Cisco Unity server is properly sized for the number of subscribers it will service. For additional sizing information, refer to the *Cisco Unity Supported Platforms List*, available at http://cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html
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- Create and document a suitable disaster recovery plan.
- Verify that the switch integration is understood.
- Decide the number of ports needed for message notification, and for recording and playing messages over the phone.
- Verify that all hardware and supporting components are set up correctly.
- List the acceptance tests to be run after the server is installed and before going live.
- Verify that there is a fallback procedure in the event that problems are encountered.
- Define any measurements necessary to benchmark the initial performance of the system.



- Install the DUC client on workstations for Cisco Unity subscribers. This is necessary before a Domino user can be imported into Cisco Unity as a subscriber.

Operational Tasks

The following are best practices for an operational Cisco Unity system:

- Create and implement a regular maintenance schedule to gather logs and to monitor the use of server resources such as disk space, memory, and the CPU.
- Verify that regular backups are occurring.
- Make arrangements for any regular downtime necessary for offline maintenance activities.
- Make arrangements for any special administrative tasks, for example maintaining and creating audio text applications and running clean up utilities such as Directory Walker.
- Before reconfiguring the system, for example when migrating from Voice Messaging to Unified Messaging or when upgrading hardware, mock up the existing Cisco Unity system in a lab environment, and test and validate the work.

Feature Parity Between Cisco Unity for Domino and Cisco Unity for Exchange

Cisco Unity 4.0 for Domino does not support:

- Communicating with other voice messaging systems by using the Cisco Unity Bridge, AMIS, or VPIM. Cisco Unity subscribers can send voice messages to and receive voice messages from non-Cisco Unity subscribers only by using SMTP-based Internet subscribers.
- Cisco Unity reports.
- The Cisco Unity Inbox (Note that in version 3.1 and earlier, the Cisco Unity Inbox was known as the Visual Messaging Interface, or VMI.)
- Cisco Unity failover.

The following capabilities of Cisco Unity for Exchange are not available in Cisco Unity for Domino:

- Preventing Cisco Unity from taking messages if the mailbox for a subscriber is full.
- Creating a Cisco Unity subscriber and the corresponding Domino user by using the Cisco Unity Administrator. In Cisco Unity for Domino, a subscriber must first be created as a Domino user and then imported into Cisco Unity.



- Functionality of the Deleted Items folder.
- Future delivery
 - Mailbox status
 - Mailbox size

The following Cisco Unity tools are not available with Cisco Unity for Domino:

- Audio Text Manager
- Disaster Recovery Tool Backup
- Disaster Recovery Tool Restore
- Extension Address Utility
- Failover Config
- Failover Monitor
- FullDB Import
- FullDB Export
- Message Store Manager
- Move Subscriber Data
- Public DL Builder
- GrantUnityAccess
- Remove Subscriber Properties



Chapter 8: Selecting Hardware

Cisco Unity Server

Cisco Unity servers must be selected from the Cisco Unity Supported Platforms List (CUSPL), available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.htm. Support from the Cisco Technical Assistance Center (TAC) is available only for servers listed in the CUSPL.

RAID Volumes

All multiprocessor servers on the CUSPL include multiple RAID volumes, as follows:

Configuration	Description
Three RAID volumes	A multiprocessor server that includes three RAID volumes is optimized for installation of Cisco Unity in a Voice Messaging configuration with Exchange 2000 or Exchange 2003 on the Cisco Unity server. This configuration allows binaries, transaction logs, and databases to be stored on separate disks.
Two RAID-1 volumes (for example, Dell PowerEdge-6650 or Hewlett-Packard DL580) in platform overlays 4 and 5	A multiprocessor server that includes two RAID-1 volumes is optimized for configurations in which the message store is not installed on the Cisco Unity server. Binaries and transaction logs can still be separated, but there is no need for a third RAID volume for Exchange databases.
Two RAID volumes in platform overlay 3	A multiprocessor server in this configuration can be used with Exchange 2000 or Exchange 2003 on the Cisco Unity server or on a separate server.

Cisco Unity Server Issues

When deciding which Cisco Unity server to use, consider the following hardware-related issues:



- **Voice cards and slots:** Take note of the number of slots in the server for voice cards (for integration with a circuit-switched phone system only). If there are fewer slots available than needed for all cards, an expansion chassis is required.

All analog loopstart cards shipped prior to Cisco Unity 4.0 were 5Vdc-only PCI cards. Beginning with Cisco Unity 4.0, new analog loopstart PCI cards are available. The new cards, which are compatible with both 3.3Vdc and 5Vdc PCI or PCI-X buses, are called Universal PCI (uPCI) cards. The new cards, which supersede the cards that appeared on price lists for earlier versions of Cisco Unity, are not compatible with Cisco Unity 3.1 or earlier. The old cards will function with Cisco Unity 4.0, but cannot be ordered for new Cisco Unity 4.0 installations. (The D/240PCI-T1 is still a 5Vdc-only PCI card.)

All voice cards qualified for use with Cisco Unity have a 33MHz clock speed. In some servers, slots are paired, so that inserting a 33MHz card in one slot will cause the clock speed on the paired slot to slow down to 33MHz. This could negatively affect the operation or performance of the card in the second slot (for example, a RAID controller or a NIC). Ensure that the voice cards you select are appropriate for use in the available slots in the server you select.

- **Number of processors:** Cisco Unity systems with more than 32 voice ports or with failover require Microsoft SQL Server for the Cisco Unity database. SQL Server is licensed per processor, so a server with multiple processors has a higher SQL Server license fee than a server with a single processor.
- **Number of voice ports.**
- **Disk size and RAID configuration:** This includes calculating an approximate requirement for message storage (in minutes).

Subscriber-Related Issues

When deciding which Cisco Unity server to use, consider the following subscriber-related issues:

- **Number of Cisco Unity Inbox sessions:** If the recommended number of Cisco Unity Inbox sessions is exceeded, Cisco Unity Inbox performance will suffer, and end users will see “server busy” messages more often. (Note that in version 3.1 and earlier, the Cisco Unity Inbox was known as the Visual Messaging Interface, or VMI.)
- **Number of users.**
- **Number of Text to Speech (TTS) sessions.**
- **Whether Cisco Unity will be configured for Voice Messaging or for Unified Messaging.**



Multiple Network Interface Controllers (NICs)

Cisco Unity supports the use of multiple NICs for Adapter Fault Tolerance (AFT), which is also referred to by some server manufacturers as Network Fault Tolerance (NFT). AFT/NFT provides an additional backup link between the server and the hub or switch, and is implemented with a primary NIC and a backup (secondary) NIC. During normal operation, if the primary NIC fails, the link to the secondary NIC automatically takes over. To use AFT/NFT, two NICs must be installed in the Cisco Unity server and they must be linked to the same network segment. A single IP address is assigned to the two NICs, and only one NIC is identified by the operating system.

Cisco Unity does not support the use of multiple NICs for load balancing, either full or half duplex. If a Cisco Unity server has dual NICs and each NIC is configured for different network segments, Exchange 2000 or Exchange 2003 cannot reliably deliver messages. Additionally, a caller may hear Cisco Unity prompts, but will not hear the caller speaking.

Gigabit Ethernet Ports

Use of gigabit Ethernet is recommended on the Cisco Unity server for general connectivity, and in particular for the heartbeat link between Cisco Unity failover nodes, but it is not required.

IBM xSeries-345 Slot Descriptions

The IBM specifications for an xSeries-345 server indicate that it has five slots. However, note the following qualifications:

- Two slots are low-profile slots that stand vertically in this 2U server, so they can be used only by selected aftermarket PCI cards. One of these slots is used for the IBM ServeRAID-5i RAID controller.
- One slot is a half-length 33MHz slot. It is most useful for either the IBM RSA management card or for a host card that is shipped with the PCI expansion chassis.
- The remaining two slots are full-length 33-133MHz (3.3Vdc) PCI-X slots. These two slots can be used only for the new Intel Universal-PCI (uPCI) voice cards that will be released with Cisco Unity 4.0. They cannot be used with earlier versions of Cisco Unity.

If you want to use the xSeries-345 server to integrate Cisco Unity 4.0 with a circuit-switched phone system, by using an analog loopstart connection, the two full length slots can be used with the new uPCI analog loopstart cards (UNITY-D/41U-LS, UNITY-D/41U-EU, UNITY-D/120U-LS or UNITY-D/120U-EU).

If you want to use the xSeries-345 server to integrate Cisco Unity 4.0 with an NEC NEAX 2400 or an Intecom E14 Millenium, by using a dry-T1 connection, an expansion



chassis must be used. The only T1 PCI card supported by Cisco Unity 4.0 is 5Vdc only (UNITY-D/240PCI-T1).

Failover Configuration

The Cisco Unity secondary failover server must be from the same platform overlay in the CUSPL as the primary failover server, and the primary and secondary servers must have the same number of voice ports. In the event that something happens to the primary server, this allows the secondary server to temporarily support the load that the primary server supports. This also allows the secondary server to be converted into the primary if the primary suffers a catastrophic failure.

When setting up Cisco Unity failover, the message store must be installed on a separate server regardless of the number of Cisco Unity subscribers, thus ensuring that messages will be available even when one Cisco Unity server is down.

Cisco Unity failover requires Microsoft SQL Server for the Cisco Unity database. (MSDE is not supported for a failover configuration regardless of the number of ports.) SQL Server is licensed per processor, so a server with multiple processors has a higher SQL Server license fee than a server with a single processor.

For detailed information on cabling requirements for Cisco Unity failover, refer to:

- The Cisco Unity integration guide for the applicable phone system, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_configuration_guides_list.html.
- The *Cisco Unity Failover Configuration and Administration Guide*, available at http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/fail/fail401/ex/index.htm.

Finally, consider the following failover-related issues:

- **Ring Equivalency Numbers (RENs):** If Cisco Unity is being integrated with a circuit-switched phone system, devices other than those described in the Cisco Unity documentation should not be connected to the analog voice lines for any voice messaging port. Otherwise, the REN may be exceeded and the primary and secondary servers may not receive sufficient ring current to answer calls.
- **Analog line splitters:** If Cisco Unity is being integrated with a circuit-switched phone system, the analog lines between the phone system and the voice cards in the Cisco Unity servers must be broken into two lines by using line splitters or a punchdown cross-connect block (for example, 66-type) so that each line connects to both servers. Y-type line splitters can be ordered by the dozen from the Cisco Unity price list.



- **RS-232 cable splitter (serial integrations only):** If Cisco Unity is being integrated with a circuit-switched phone system by using a serial (or SMDI) integration, the RS-232 cable that connects the phone system (or, for some integrations, connects the PBXLink box) to a serial port on the Cisco Unity servers must be split so that data packets go to both servers. A data splitter is shipped with all failover orders, so it is not necessary to purchase a separate device.
- **Maximum cable length (serial integrations only):** The maximum combined length of the cable between the phone system and a serial port on either Cisco Unity server must not exceed 50 feet (15.2 meters).

Tax Impulse Metering

Tax impulse metering is used for public phones in Austria, Belgium, the Czech Republic, Germany, Spain, and Switzerland. It is rarely used for private lines. Cisco Unity is not affected by tax impulse metering because the frequency of tax impulses (about 12 to 16 KHz) is substantially higher than the frequency bandpass switched by the phone system (typically 4 KHz bandwidth). As a result, it is never necessary to deploy inline impulse RF filters for Cisco Unity or Cisco Unity Bridge servers facing the station side of a phone system. It is also extremely unlikely that a PSTN-facing Bridge server would need inline RF filters.

No detrimental effects have been reported from using filters.

Cisco Unity Bridge Server

Cisco Unity Bridge servers must be selected from the *Cisco Unity Supported Platforms List*, available at

http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.htm

1. Support from Cisco TAC is available only for servers that are listed as qualified for use as Cisco Unity Bridge servers.

Ensure that the server includes enough slots for the required number of fax cards. If there are fewer slots available than are needed for all cards, an expansion chassis is required.

Voice-Fax Cards in the Cisco Unity Bridge Server

- **Selecting the correct card for the country or region:** *Cisco Unity Bridge System Requirements, and Supported Hardware and Software* lists supported voice-fax cards and the countries in which they can be used. There are significant differences between versions of the same card, and these differences prevent cards from being used in countries for which they are not qualified. The document is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_pre_installation_guides_list.html.



- **Connecting cards in the Cisco Unity Bridge server with the phone system:** The Brooktrout Technology voice-fax cards that are required in the Cisco Unity Bridge server are each bundled with a cable for connecting the card with the phone system. The connectors on the cable differ depending on which country the card is for, as follows:
 - United Kingdom and Hong Kong cards ship with a cable that has an RJ-45 connector on the end that connects to the card, and BT431A connectors on the end that connects to the phone system.
 - The TBR-21-compliant card that ships to European countries other than the United Kingdom uses the same cable as the card that ships to the US and Canada.
 - The Australia cable uses the same connectors as the US and Canada cable, but the RJ-45 connector is wired differently—the four tip-and-ring connections are reversed.
 - The Japan cable uses the same connectors as the US and Canada cables, but it is marked for Japanese telecom approval; a US and Canada cable cannot be substituted.

Message Store Servers and Domain Controllers/Global Catalog Servers

When selecting Domino servers, follow IBM Lotus recommendations.

When selecting Exchange 2000, Exchange 2003, or Exchange 5.5 servers, ensure that the servers meet Microsoft minimum requirements. If you purchase the servers from Cisco, refer to the *Cisco Unity Supported Platforms List*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html.

If the customer wants Cisco Unity failover, note that the message store must be installed on a separate server regardless of the number of Cisco Unity subscribers.

Voice Cards

Voice cards are required only when Cisco Unity is being integrated with a circuit-switched phone system.

For a list of the voice cards supported for Cisco Unity version 4.0, including information on the countries in which they are supported, refer to *Cisco Unity System Requirements, and Supported Hardware and Software*, available at



http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/sysreq/40_sysrq.htm. If you need voice cards for a country that is not listed, contact Cisco Systems ECSBU.

Also consider the following voice card issues:

- **D/120JCT-LS voice cards.** There are two versions of the Intel Dialogic D/120JCT-LS voice cards:
 - The D/120JCT-LS revision 1 card: This card (Intel voice card part number 96-0685-nnn, top assembly number 99-3931-nnn) requires Intel Dialogic voice card software version DNA 3.3. The revision 1 card is supported for use with all versions of Cisco Unity, however the card cannot be ordered for new Cisco Unity version 4.0(x) installations. In addition, the revision 1 card can only be used when it is appropriate for the available slots (5.0 Vdc slots required) in the Cisco Unity server or expansion chassis.
 - The D/120JCT-LSU revision 2 card: This card (Intel voice card part number 96-0853-nnn, top assembly number 99-5371-nnn) requires a version of Intel Dialogic voice card software (SR 5.01 or greater) that is compatible only with Cisco Unity 4.0 and later. This is a Universal PCI card, so it can be installed in either 3.3 Vdc or 5.0 Vdc slots.
- **Selecting the correct card for the country or region:** Cisco Unity System Requirements, and Supported Hardware and Software lists supported voice-fax cards and the countries in which they can be used. There are significant differences between versions of the same card, and these differences prevent cards from being used in countries for which they are not qualified. If you need voice cards for a country that does not appear on the list, contact your Cisco sales representative.
- **Japanese and Mainland Chinese versions of D/41JCT and D/120JCT voice cards:** Intel produces D/41JCT and D/120JCT cards specifically for Japan and for the People's Republic of China. These cards do not appear on the Cisco Unity price list. Please contact your Cisco sales representative for additional information.
- **Intel Dialogic D/240PCI-T1 voice cards:** The D/240PCI-T1 is not a universal PCI card. The card is supported only for integrating with NEC NEAX-2400 or Intecom E14 Millennium phone systems.
- **T1 cable length limitation:** Dialogic does not publish a specification for maximum DSX-1 cable length (the card has a 3.0Vdc nominal signal level). When using shielded, low-capacitance cable, we recommend that cable length not exceed 200 meters (655 feet), which is a typical maximum cable length for a DSX-1. The electrical environment and the quality of the cable may adversely affect performance. Extending the maximum length by adding a CSU/DSU (Channel Service Unit/Data Service Unit) has not been tested and is not supported.



- **Cabling multiple voice cards together:** All Cisco Unity Intel voice cards that we ship have an H.100 bus connector on the top edge of the card. If more than one card is installed in the Cisco Unity server or in an expansion chassis, the cards must be connected by using an H.100 cable, or the Intel firmware and driver will not load. Refer to the Cisco Unity price list for cables with four, eight, and twelve connectors.

Compatibility of Slots and Voice Cards

When selecting a Cisco Unity server from the *Cisco Unity Supported Platforms List* for integration with a circuit-switched phone system, ensure that the following conditions are met:

1. The server is qualified for use for a circuit-switched phone system integration. Note that some servers cannot be used for integrations with circuit-switched phone systems because voice cards are too tall to fit in the case.
2. The server contains enough slots compatible with the type of voice cards that will be used, or the server contains a slot compatible with the card for the expansion chassis that will be used. All voice cards must be able to be installed in the same computer or in the same expansion chassis. If all the voice cards do not fit in the Cisco Unity server, then you must install all of them in an expansion chassis.

The slots in the servers on the *Cisco Unity Supported Platforms List* have a signaling voltage of either 3.3 Vdc or 5 Vdc. Some servers have one or more slots of each type, while some servers have only one type or the other. All supported voice cards can be used in 5 Vdc slots. Universal PCI voice cards are the only cards that can be used in 3.3 Vdc slots. (The Cisco Unity System Requirements, and Supported Hardware and Software indicates which cards are Universal PCI cards.)

All supported voice cards are 32-bit/33-MHz cards, which may affect the clock speed of cards in adjacent slots. The servers on the *Cisco Unity Supported Platforms List* have a segmented PCI bus, typically with two slots per segment. In most of the supported servers, the clock speed of most slots is 66 MHz or greater. (Some servers also have a slot that is in a segment by itself.) If there are cards in both slots in a segment and the clock speed of one card is slower than the clock speed of the other card, the clock speed of both slots is reduced to the clock speed of the slower card. This can adversely affect the performance of the faster card (for example, RAID controllers and NICs).

The *Cisco Unity Supported Platforms List* is available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_data_sheets_list.html.



PBXLink Box (Avaya Definity Gx and Nortel Meridian 1 Integrations Only)

A PBXLink box is a digital set emulation unit that translates call information from digital ports on certain phone systems into SMDI (simplified message desk interface) data packets that the Cisco Unity server receives through a serial port. Depending on the number of digital ports installed on the phone system and on the number of voice messaging ports on the Cisco Unity server, one or more PBXLink boxes are connected by digital lines to the phone system and by an RS-232 serial cable to the Cisco Unity server.

One or more PBXLink boxes are used to integrate Cisco Unity with the Avaya Definity Gx and the Nortel Meridian 1 phone systems.

- **Avaya Definity Gx:** In a PBXLink integration with an Avaya Definity Gx phone system, it is highly recommended that one or more analog port(s) on the Cisco Unity server be used for MWI dialouts. However, if the analog port density is low, for example four ports, Cisco Unity can pass MWI requests to the PBXLink via SMDI. The PBXLink would then use a single digital port for MWI dialouts. The Avaya Definity G3 can be integrated with Cisco Unity by using either PBXLink boxes or a DTMF integration.
- **Nortel Meridian 1:** In an integration with a Nortel Meridian 1 phone system, Cisco Unity sets message waiting indicators (MWIs) through the PBXLink boxes. However, each digital port on the PBXLink box must be set either for calls or for MWIs, but should not be set for both. Digital ports that are set for calls can handle call information for up to 24 voice messaging ports. For example, if you are integrating a 24-port Cisco Unity server with a Nortel Meridian 1 phone system, we recommend that you use a PBXLink-48 box, and set Port A for MWIs only and Port B for calls only. A single digital port set for both MWI and calls should be used only for very low-density systems, for example, four ports.

For more information on integrating Cisco Unity with Avaya Definity Gx or Nortel Meridian 1 phone systems by using PBXLink boxes, refer to the applicable Cisco Unity integration guide, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_configuration_guides_list.html.

Expansion Chassis

An expansion chassis is required in the following situations:

- Cisco Unity is being integrated with a circuit-switched phone system and the Cisco Unity server does not have enough slots for the required voice cards.



- A Cisco Unity Bridge server does not have enough slots for the required voice-fax cards.

Two high-speed I/O PCI cards are associated with the PCI expansion sub-system. The host card is installed in the Cisco Unity server, and the other card is installed in a designated slot on the passive backplane in the expansion chassis.

The host card is a 33 MHz Universal PCI card, and it can be inserted into any PCI or PCI-X slot regardless of the maximum clock speed of the slot. If the host card is installed in the same bus segment as a faster card, the card in the other slot in the segment will also run at 33 MHz, which can adversely affect the performance of the faster card (for example, RAID controllers and NICs). Because different Cisco Unity servers have different system resources available, and because of potential conflicts with other customer-selected hardware, it may be necessary to run tests to identify a PCI slot in the Cisco Unity server that interoperates with the host card so that the voice or voice-fax cards in the expansion chassis will work as expected.

The chassis can be used to integrate 5 Vdc D/240PCI-T1 cards to servers without 5 Vdc PCI slot(s).

The chassis is 4 RU in height and can accommodate four-post rack rails, which must be purchased separately.

The autoranging power supply of the chassis operates from single-phase 100-240 Vac and does not support redundant power.

Cables

Connecting the Cisco Unity Server to the Network

If the Cisco Unity server will be connected to the network—as required for most Cisco Unity configurations and when Cisco Unity will be integrated with Cisco CallManager or SIP—Ethernet cable is required to connect the server to the network. At transmission rates of up to 1 gigabit per second (Gbps), the maximum segment length is 328 feet (100 meters), and Category 5 Unshielded Twisted Pair (UTP) cable is sufficient. At a transmission rate of 1 Gbps, Category 5E or Category 6 UTP cable is preferable.

Connecting the Cisco Unity Server to a Circuit-Switched Phone System

If Cisco Unity is integrated with a circuit-switched phone system, the type of cabling required depends on the type of integration.

Caution! DTMF and serial integrations are integrations with circuit-switched phone systems and are grouped under the term “traditional” in the CUSPL. “Dual” integrations in the CUSPL refer to integrating Cisco Unity with two phone



systems in one of the following configurations: Cisco CallManager with a supported circuit-switched phone system; Cisco CallManager with a SIP proxy server; or a SIP proxy server with a supported circuit-switched phone system.

DTMF (Analog) Integrations

If Cisco Unity is integrated with a circuit-switched phone system by using a DTMF integration, analog lines wired for RJ-11 or RJ-14 are required to connect the phone system with voice cards in the Cisco Unity server or in an expansion chassis. These lines carry phone connections and call information.

For pinout diagrams for voice card connectors, refer to “Appendix A: Voice Cards” in the *Cisco Unity Installation Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

Serial (SMDI) Integrations

Serial (or SMDI) integrations require the following cables:

- For integrations with most phone systems, analog lines wired for RJ-11 or RJ-14 to connect the phone system with voice cards in the Cisco Unity server or in an expansion chassis. These lines carry phone connections.

Integrations with Intecom E14 Millennium phone systems (and optionally for NEC NEAX 2400 phone systems, depending on the type of voice card installed in the Cisco Unity server) require cables wired for RJ-48C for Digital Service Level 1 (DSX-1, also known as short-haul or dry T1). These cables carry encoded voice channels. The maximum length is 655 feet (200 meters).

For pinout diagrams for voice card connectors, refer to “Appendix A: Voice Cards” in the *Cisco Unity Installation Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

- An RS-232 cable to connect the phone system with a serial port on the Cisco Unity server. The maximum length is 50 feet (15.2 meters). Serial cables carry call information and MWI requests.

Integrations That Use PBXLink Boxes

Integrations that use PBXLink boxes require the following cables:

- Digital lines wired for RJ-14 that connect digital phone ports on the phone system with the PBX ports on the PBXLink box. Refer to the phone system documentation for information on wiring the digital port connectors.
- Analog lines wired for RJ-11 or RJ-14 to connect the phone system with voice cards in the Cisco Unity server or in an expansion chassis.



- An RS-232 cable that connects the PBXLink box and the Cisco Unity server. The maximum length is 50 feet (15.2 meters).
- For multiple PBXLink boxes, RS-232 cables that connect the PBXLink boxes to one another. The maximum length is 50 feet (15.2 meters).

Lighting MWIs on Non-Integrated Phone Systems (Cisco CallManager Integrations Only)

If Cisco Unity is integrated with Cisco CallManager, MWIs can be lit on a non-integrated phone system.

The cabling requirements are:

- An RS-232 cable connecting the Cisco Unity server and the non-integrated phone system for sending MWI requests. The maximum length is 50 feet (15.2 meters).
- A trunk connection between the non-integrated phone system and the gateway for sending calls between the non-integrated phone system and the Cisco CallManager phone system.

Constructing an RS-232 Cable

An RS-232 cable is required for several types of integrations with circuit-switched phone systems. You can purchase a serial I/O kit that includes a 50-foot shielded RS-232 cable, a null modem adapter, a 9- to 25-pin gender changer, a 25- to 9-pin gender changer, and a simple RS-232 line activity monitor.

The published cable length limitation of the RS-232 protocol standard is 10 feet (3.05 meters). Carefully constructed, high quality RS-232 cable assemblies should perform as expected in a normal environment with a cable length up to 50 feet (15.2 meters) at up to 9600 baud.

We recommend that the RS-232 cable be constructed with the following characteristics:

- A maximum length of 50 feet (15.2 meters)
- 24 AWG stranded conductors
- Low capacitance—for example, no more than 12 pF/ft (39.4 pF/m) between conductors
- At least 65 percent braided shield over aluminized polymer sleeve around conductors
- UL-recognized overall cable jacket insulation with low dielectric constant
- Braided shield fully terminated to and enclosed by a metal connector backshell
- Gold-plated connector contacts



For more information on cabling for integrations, refer to the applicable integration guide, available at

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

Connecting the Cisco Unity Server or Cisco Unity Bridge Server to an Expansion Chassis

If an expansion chassis is required because voice cards will not fit in the Cisco Unity server or voice-fax cards will not fit in the Cisco Unity Bridge server, a cable is required to connect the expansion chassis card in the server with the expansion chassis. The required cable is shipped with the expansion chassis.

Connecting the Cisco Unity Bridge Server to the Phone System

For the Cisco Unity Bridge, cables are required to connect the phone system with voice-fax cards in the Cisco Unity Bridge server or in an expansion chassis. The cable that ships with the card has an RJ-45 connector on one end and four single-pair RJ-14 connectors on the other end.

Cisco TAC Remote Access

Cisco strongly recommends that at least a V.34 modem be installed with each Cisco Unity server for Cisco TAC remote access. We recommend external modems over internal modems because external modems do not use either a slot in the server or the PCI sub-system resources (for example, DMA and memory space) that an internal modem could require. This is particularly an issue when Cisco Unity is integrated with a circuit-switched phone system, which requires voice cards. An external modem does use system resources, but only a single IRQ and an I/O port map allocation.

A typical Cisco Unity server has only two serial ports. However, for some configurations, three serial ports may be required, most typically for an external modem, an uninterruptible power supply, and a serial cable data link to the phone system. If the proposed configuration will require more serial ports than are available on the server, an internal modem may be substituted for the external modem. Modems are customer-provided.

However, for the most effective TAC remote access, a VPN over broadband or any other high-speed Internet connection is strongly recommended.

Remote Centrex SMDI Connection

If Cisco Unity is being integrated with a circuit-switched phone system by using a serial (or SMDI) integration, and if the serial cable that connects the phone system and the Cisco Unity server is more than 50 feet long, two Bellcore 202T or 212A modems and a



dedicated line between them are required. Otherwise, the length of the cable will seriously degrade signal integrity.

The 1200baud 202T and 212A modems are Bellcore standards for a leased line, dedicated, asynchronous serial interface for SMDI:

- The 202T standard is asynchronous half-duplex on a 2-wire circuit and full duplex on a 4-wire circuit.
- The 212A standard is asynchronous full duplex on a 2-wire circuit. 212A is equivalent to ITU V.22.

Hardware for Backing Up Cisco Unity Data

If the customer does not already have a process for backing up servers, we strongly recommend that a process be established for backing up the Cisco Unity server. For detailed information on backing up and restoring a Cisco Unity system, refer to the applicable *Cisco Unity Maintenance Guide*, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_maintenance_guides_list.html.

When choosing backup hardware, choose hardware that is supported by the manufacturer of the backup software that will be used to back up the Cisco Unity server.

For servers with moderate volume sizes, the customer can back up Cisco Unity data by using a digital audio tape (DAT) tape drive installed in the Cisco Unity or Cisco Unity Bridge server. The DDS-4 tape format can hold 20GB of data without hardware compression. When using compression, the same media can hold 40GB of data. Cisco sells DAT drive kits that are compatible with servers on the CUSPL.

Digital linear tape (DLT) can also be used.

For servers that have multiple RAID volumes to back up, the amount of data to be backed up could easily exceed the capacity of a single DAT or DLT tape. In this case, options include network backup to a dedicated backup server in the customer data center, or to a tape autoloader connected either to the Cisco Unity server or to a backup server. Cisco does not sell an autoloader; however, many suitable products are offered by both Hewlett-Packard and IBM that interoperate with Cisco servers.

Use of a separate backup server reduces the processing impact of disk-to-tape or tape-to-disk I/O operations on the Cisco Unity or Cisco Unity Bridge server, but such backups still require noticeable disk I/O and processor time on the server being backed up. We strongly recommend that the customer perform backups outside of peak business hours.



Backup of many dozens of gigabytes of data can take a long time. The typical DAT subsystem can write data to tape at approximately 8.6GB/hour; this figure needs to be considered when planning the implementation with the customer.

External Storage

In Voice Messaging configurations with Exchange installed on the Cisco Unity server, the storage of any Cisco Unity-related data (SQL Server/MDSE database, Exchange data, and so on) on a storage area network is not supported.

In Unified Messaging configurations, the storage of the Cisco Unity SQL Server/MDSE database on a storage area network is not supported.

However, the storage of data on direct-attached storage (for example, external hard disks) is supported.

Client Hardware

Cisco Unity can be configured to play and record voice messages over the phone, or to play and record messages by using computer speakers and a microphone or headset. If the customer wants Cisco Unity subscribers to use speakers, microphones, or headsets, client computers must be equipped with an audio controller and compatible devices.