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/whitpapr/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.