Sizing and Scaling Cisco Unity Connection Servers

For a list of servers that meet Unity Connection specifications, see the Cisco Unity Connection 15 Supported Platforms List at
https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html

Audio Codecs

Audio Codec Usage for Call Connections and Recording

In Unity Connection, a call in any audio codec format supported by SCCP or SIP signaling—G.711 mu-law, G.711 a-law, G.722, G.729, and iLBC—are always transcoded to PCM linear. From PCM linear, the recording is encoded in the system-level recording audio codec—PCM linear, G.711 mu-law, G.711 a-law, G.729a, or G.726—a systemwide setting in Cisco Unity Connection Administration. G.711 mu-law is the default.

In this section, we refer to the audio codec that is negotiated between the calling device and Unity Connection as the "line codec," and the audio codec that is set as the system-level recording audio codec as the "recording codec."

Supported Line Codecs (Advertised Codecs)

- G.711 mu-law

- G.711 a-law

- G.722

- G.729

- iLBC

Supported Recording Codecs (System-Level Recording Audio Codecs)

- PCM linear

- G.711 mu-law (default)

- G.711 a-law

- G.729a

- G.726

- GSM 6.10

Because transcoding occurs in every connection, there is little difference in system impact when the line codec differs from the recording codec. For example, using G.729a as the line codec and G.711 mu-law as the recording codec does not place a significant additional load on the Unity Connection server for transcoding. However, the iLBC or G.722 codecs require more computation to transcode, and therefore places a significant additional load on the Unity Connection server. Consequently, a Unity Connection server can support only half as many G.722 or iLBC connections as it can G.711 mu-law connections.

Note Use of the G.722 or iLBC codec as line codecs or advertised codecs reduces the number of voice ports that can be provisioned on the Unity Connection server. For more information on the number of voice ports supported for each platform overlay when using G.722 or iLBC codecs, see the *Cisco Unity Connection 15 Supported Platforms List* at
https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html

Generally, you should not change the system recording format from the default setting except in the following situations:

- To address disk space considerations, consider using a low bit-rate codec such as G.729a or G.726. Note that a low bit-rate codec produces lower quality audio than a high bit-rate codec such as G.711 mu-law.

- To improve the audio quality of recordings for endpoints that use G.722 as the line codec, consider using PCM linear. Note that PCM linear increases the disk space that is used.

There are additional possible reasons to change the recording codec or to choose only to advertise specific line codecs. Review the following information when making decisions on the system-level recording audio codec and the advertised codecs on the SCCP or SIP integration:

- The audio codecs that are negotiated between the majority of the endpoints and Unity Connection. This information helps you decide the audio codecs that Unity Connection should advertise and the audio codecs that Unity Connection should not advertise. You can then decide when you need Cisco Unified Communications Manager to provide hardware transcoding resources rather than using Unity Connection

to provide computationally significant native transcoding, such as when the configuration requires a number of clients to connect to Unity Connection using G.722 or iLBC.

- The types of graphical user interface (GUI) clients that play the recordings (for example, web browsers, email clients, or media players) and the audio codecs that these GUI clients support.

- The quality of the sound produced by the selected audio codec. Some audio codecs produce higher audio quality than other audio codecs. For example, G.711 produces a higher audio quality than G.729a and is a better choice when higher audio quality is necessary.

- The amount of disk space that the audio codec takes up per second of recording time.

PCM linear produces the highest audio quality and is the most widely supported by media players, yet it uses the most disk space and bandwidth (16 KB/sec). G.711 (both a-law and mu-law) produces moderate audio quality compared to PCM linear and is also widely supported by media players, though it uses half as much disk space and bandwidth (8 KB/sec). G.729a produces the lowest audio quality of the four supported audio codecs and is poorly supported by media players because it requires a license for use. Yet this audio codec uses the least amount of disk space (1 KB/sec). G.726 produces moderate audio quality, is moderately supported by media players, and uses less disk space than most of the other codecs (3 KB/sec). This information is summarized in below table.

Table 1: Comparison of Audio Codecs Used for Recording

Recording Audio Codec	Audio Quality	Supportability	Disk Space Used	Sampling Rate	Channels	S
PCM linear	Highest	Widely supported	16 KB/sec	8 kHz/sec	1	
G.711 mu-law/a-law	Moderate	Widely supported	8 KB/sec	8 kHz/sec	1	8
G726	Moderate	Moderately supported	4 KB/sec	8 kHz/sec	1	4
GSM 6.10	Moderate	Poorly supported	1.63 KB/sec	8 kHz/sec	1	1
G.729a	Lowest	Poorly supported	1 KB/sec	8 kHz/sec	1	1

For details on changing the audio codec that is advertised by Unity Connection, or the system-level recording audio codec, see the "Changing the Audio or Video Format of Recordings" section of the "User Settings" chapter of the System Administration Guide for Cisco Unity Connection *Release 15*, at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/administration/guide/b_15cucsag.html.

When modifying the advertised audio codecs, the choices are G.711 mu-law, G.711 a-law, G.722, G.729, and iLBC. In addition, you also indicate an order of preference for the chosen codecs.

For SCCP integrations, the order of the audio codecs is not important because Cisco Unified CM negotiates the audio codec based on the location of the port and the device in the negotiated call. However, for SIP integrations the order of the audio codecs is important. If one audio codec is preferred over another audio codec, Unity Connection advertises that it supports both audio codecs but prefers to use the one specified over the other.

Note In Web Inbox, the received voice messages are always played or downloaded in PCM linear whether any codec is selected to record the messages.

Audio Codec Considerations for VPIM Networking

If VPIM networking connects Unity Connection to another Unity Connection server, to a Cisco Unity server, or to a third-party voice-messaging system, you must choose a compatible audio codec.

Note the following audio codec considerations for Unity Connection VPIM networking:

- For inbound messages, Unity Connection can do one of the following:
  - Convert voice messages to any audio format that Unity Connection supports.
  - Not convert the audio format of the voice message, keeping the voice message in its original audio format.

- For outbound voice messages, Unity Connection can do one of the following:
  - Convert voice messages to the G.726 audio format.
  - Not convert the audio format of the voice message, keeping the voice message in its original audio format. Not converting is useful when you use VPIM networking to send voice messages between Unity Connection servers, or between Unity Connection and Cisco Unity servers.

For more information on VPIM Networking, see the VPIM Networking .

Voice Messaging Ports

- **The existing voice messaging system** -Evaluate how well the existing voice messaging system functions, if applicable. This evaluation may give you some idea how many ports are needed for taking voice messages, for turning message waiting indicators (MWIs) on and off, and for message notification.

- **Use of the Web Inbox web client, or the Cisco Unity Connection ViewMail for Microsoft Outlook client** -When users use the Web Inbox web client, the Messaging Inbox web client, or the ViewMail for Outlook client, Unity Connection uses telephone record and playback (TRAP) to allow users to play and record voice messages by phone rather than using speakers and a microphone. This feature is especially useful when users work in cubicles, where there is a lack of privacy. However, when a user plays or records a message using TRAP, a port on the Unity Connection server is used. (No port is used when a user uses speakers and a microphone to play and record messages.) If the customer wants users to use TRAP, calculations for the total number of voice ports required need to take this into account.

- **Unity Connection cluster** -In some cases, an existing voice messaging system has more voice messaging ports than Unity Connection supports. When configured as a Unity Connection cluster (an active/active high availability Unity Connection server pair), the Unity Connection system can support double the number of voice messaging ports compared to a single-server deployment.

- **Networking** -The customer can purchase additional Unity Connection servers or Unity Connection cluster pairs and connect them using intrasite and/or intersite networking to increase the number of voice ports supported. For more information, see the Networking chapter.

For additional information on the number of voice messaging ports, see the "Planning the Usage of Voice Messaging Ports" chapter in *Cisco SIP Proxy Server Integration Guide for Cisco Unity Connection Release 15* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/integration/sip-csps/b_cuc15intcsps.html.

Storage Capacity for Voice Messages

For Unity Connection systems that are configured to store voicemails only (no emails or faxes are stored on the server), base the server requirements on the total number of voice storage minutes required for each user. A supported Unity Connection server generally provides storage for at least 20 to 30 minutes of voice messages per user for the maximum number of users supported on that server. See the *Cisco Unity Connection 15 Supported Platforms List* for the exact amount of voice-message storage supported for each server.

For Unity Connection systems that are configured to store faxes and email replies to voice messages in addition to voice messages, you cannot base server requirements on the total number of voice-storage minutes required for each user because the message store on the Unity Connection server also include faxes and possibly email. However, you can calculate the storage requirement for the desired number of voice-storage minutes and add that to the current mailbox limits.

For Unity Connection systems that are configured to store faxes and email replies to voice messages in addition to voice messages, start with the total number of voice-storage minutes required for each user, and add the amount of storage space that you want users to have for faxes. In general, the email stored in Unity Connection should not significantly affect storage capacity.

Note The email stored in Unity Connection is only replies to or forwards of Unity Connection voice messages, with or without the original voice message. This email is not related to email in the email inbox of the user.

If the customer is replacing an existing voice-messaging system with Unity Connection, it may be possible to obtain information from the existing system on the average number of minutes of voice messages that users currently have. You can then multiply the average number of minutes by the recording size per minute—according to the codec that Unity Connection uses 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 between the legacy voice-messaging system and Unity Connection. If the legacy system handles a larger capacity than the largest Unity Connection server, consider splitting the legacy user population onto more than one Unity Connection server.

Users

For the maximum number of users supported for each supported server, planning, and selection of servers, take into account the possibility of adding users in the future. For more information, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html

For information on moving users from one Cisco Unity Connection server to another, see the "Moving or Migrating Users Between Locations in Cisco Unity Connection" section of the "Users" chapter of the System Administration Guide for Cisco Unity Connection, Release 15, available at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/administration/guide/b_15cucsag.html.

Simultaneous TUI/VUI Sessions

To determine the maximum number of simultaneous TUI (touchtone conversation) and/or VUI (voice-recognition) sessions that Unity Connection can support, consider the following:

- **Unity Connection cluster**—If a Unity Connection cluster server pair is configured (active/active high availability) instead of a standalone Unity Connection server, the maximum number of TUI and/or VUI sessions supported is doubled for each platform overlay. For the maximum number of sessions that Unity Connection can support for each platform overlay when a Unity Connection cluster is configured, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

- **Desktop Clients**—When desktop clients (for example, the Web Inbox and IMAP) are deployed, the maximum number of TUI and/or VUI sessions that Unity Connection supports is reduced for Platform Overlay 1 servers. For more information, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

Note that some IMAP clients (for example, Cisco Unified Personal Communicator 7.0 and earlier) do not support the IMAP IDLE command. IMAP clients that do not support IMAP IDLE consume more system resources on a Unity Connection server. As a result, each active instance of each client that does not support IMAP Idle and is accessing Unity Connection voice messages counts as four active clients. See the IMAP Clients Used to Access Unity Connection Voice Messages for additional details.

- **G.722, iLBC or Opus Audio Codecs**—Using G.722, iLBC or Opus audio codecs "on the line" or as advertised codecs reduces the maximum number of TUI and/or VUI sessions that Unity Connection supports for each platform overlay as compared to using the G.711 audio codec. For the maximum number of sessions that Unity Connection supports for each platform overlay when using the G.722, iLBC or Opus audio codec, see the *Virtualization for Cisco Unity Connection (CUC)* at http://www.cisco.com/c/dam/en/us/td/docs/voice_ip_comm/uc_system/virtualization/virtualization-cisco-unity-connection.html. For a discussion of supported system recording and advertised or "on the line" audio codecs with Unity Connection, see the Audio Codecs section.

- **Media Encryption and Authentication using Secure Real Time Protocol (SRTP)**—Using SRTP for media encryption and authentication reduces the maximum number of TUI and/or VUI sessions that Unity Connection supports for each platform overlay upto 15 percent.

IMAP Clients Used to Access Unity Connection Voice Messages

Third-party IMAP clients such as email clients are supported for accessing voice messages from Unity Connection. Scalability of IMAP clients depends on whether they support IMAP Idle. Using clients that support IMAP Idle reduces the load on the Unity Connection server; a Unity Connection server can support four times as many IMAP Idle clients as it can non-IMAP Idle clients. (IMAP Idle, described in RFC 2177, allows a client to indicate to the server that it is ready to accept real-time notifications.)

Most third-party IMAP email clients, such as Microsoft Outlook and Lotus Notes, support IMAP Idle. Cisco Unified Personal Communicator (CUPC) version 8.0 and later supports IMAP idle. The Unity Connection Plug-in for IBM Lotus Sametime version 7.11 and later supports IMAP idle. Among the clients that do not support IMAP Idle are Cisco Unified Mobility Advantage and Cisco Unified Mobile Communicator. For information on whether a client supports IMAP Idle, see the documentation for the client. For information on

the number of IMAP clients supported for each platform overlay (each grouping of comparable supported Unity Connection servers), see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html

You can mix IMAP Idle and non-IMAP Idle clients if necessary. However, to simplify sizing calculations, you should isolate IMAP Idle and non-IMAP Idle clients on separate Unity Connection servers or cluster server pairs (active/active high availability). If you must mix IMAP Idle and non-IMAP Idle clients on the same server or cluster server pair, count each non-IMAP Idle client as four IMAP Idle clients for sizing calculations. In addition, you may want to put users who use IMAP Idle clients and users who use non-IMAP Idle clients into separate classes of service so that you can run a report that tells you how many of each you have accessing voice messages on a given Unity Connection server.

Note that when you isolate IMAP Idle and non-IMAP Idle clients on separate servers or cluster server pairs, you should set up networking between the servers if they are not already networked. For more information on Unity Connection networking, see the Networking chapter.

Note Accessing voice messages from Unity Connection through IMAP clients is supported with both the IPv4 and IPv6 addresses. However, sending voice messages to Unity Connection using SMTP is only supported with the IPv4 addresses.

Visual Voicemail Clients and Sessions

The maximum number of visual voicemail clients is equivalent to the maximum number of users supported by a Unity Connection server or a cluster (active/active high availability) server pair. For the maximum number of Visual Voicemail clients, sessions, or ports supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

The maximum number of Visual Voicemail sessions is equivalent to the maximum number of ports available on a Unity Connection server or cluster (active/active high availability) server pair.

For supported versions of Cisco Unified Communications Manager and Cisco IP Phones with the Visual Voicemail feature, see System Requirements for Cisco Unity Connection *Release 15* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/requirements/b_15cucsysreqs.html.

For system requirements, see the *System Requirements for Cisco Unity Connection Release 15* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/requirements/b_15cucsysreqs.html.

For installation and configuration information, see the applicable *Installation and Configuration Guide for Visual Voicemail Release* at http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cupa/visual_voicemail/8-5/install/guide/vv_install.html.

For end-user information, see the *Quick Start Guide: Visual Voicemail Release 8.5* at http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cupa/visual_voicemail/8-5/quick_start/guide/Quick_Start_Guide_for_Visual_Voicemail_Release_8-5_chapter1.html.

Simultaneous Mobile Clients

Cisco Unified Mobility Advantage (CUMA) Release 7.0 connects to the Unity Connection server using IMAP, so it is considered an IMAP client. Because the Cisco Unified Mobility Advantage IMAP connection is not an IMAP Idle connection, the maximum number of simultaneous mobile clients supported by Cisco Unified Mobility Advantage, Cisco Unified Mobile Communicator, and Unity Connection is reduced by approximately 70 percent. For the maximum number of Cisco Unified Mobility Advantage clients and Cisco Unified Mobile Communicator clients supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

Messaging Assistant Clients

The maximum number of Messaging Assistant clients is equivalent to the maximum number of users supported by a Unity Connection server or a cluster (active/active high availability) server pair. For the maximum number of Messaging Assistant clients or users supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

For information on using the Messaging Assistant, see the User Guide for the Cisco Unity Connection Personal Call Transfer Rules Web Tool at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/user/guide/pctr/b_15cucugpctr.html.

Web Inbox Clients

For the maximum number of Web Inbox clients supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/supported_platforms/b_15cucspl.html.

For information on using the Web Inbox, see the Quick Start Guide for the Cisco Unity Connection Web Inbox at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/quick_start/guide/b_15cucqsginbox.html.

Cisco Unified Personal Communicator Clients

The Cisco Unified Personal Communicator (CUPC) client does not support IMAP Idle, so the number of CUPC clients supported by a Unity Connection server or a cluster (active/active high availability) server pair is lower than the maximum number of users. For the maximum number of CUPC clients supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/quick_start/guide/b_15cucqsginbox.html

For information on using CUPC, see the applicable Cisco Unified Personal Communicator user guide at http://www.cisco.com/c/en/us/support/unified-communications/unified-personal-communicator/products-user-guide-list.html.

IBM Lotus Sametime Clients

The voice messaging plug-in for the IBM Lotus Sametime client does not support IMAP Idle, so the number of IBM Lotus Sametime clients supported by a Unity Connection server or a cluster (active/active high availability) server pair is lower than the maximum number of users. For the maximum number of IBM Lotus Sametime clients supported for each platform overlay, see the *Cisco Unity Connection 15 Supported Platforms List* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/quick_start/guide/b_15cucqsginbox.html.

For information on the IBM Lotus Sametime client, see the applicable version of *Release Notes for Cisco Unified Messaging with IBM Lotus Sametime* at http://www.cisco.com/c/en/us/support/unified-communications/unity-connection/products-release-notes-list.html.

RSS Reader Clients

The maximum number of RSS reader clients is equivalent to the maximum number of users supported by a Unity Connection server or a cluster (active/active high availability) server pair.

For more information on the RSS Feed feature and RSS reader clients, see the "Configuring an RSS Reader to View Voice Messages" section of the "Advanced System Settings" chapter of the System Administration Guide for Cisco Unity Connection *Release 15,* at https://www.cisco.com/c/en/us/td/docs/voice_ip_comm/connection/15/administration/guide/b_15cucsag.html.