

### **Cisco Unified Contact Center Express Solution Reference Network Design Release 9.0(2)**

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### **Americas Headquarters**

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# **Preface**

This document provides system-level best practices and design guidance for the Cisco Unified Contact Center Express (Cisco Unified CCX), Release 9.0. With proper planning, design, and implementation, Cisco Unified CCX provides a reliable and flexible voice processing and contact center solution for the enterprise.

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# Audience

This design guide is intended for the system architects, designers, engineers, and Cisco channel partners who want to apply best design practices for Cisco Unified CCX.

This design guide assumes that the reader is already familiar with the following concepts:

- Cisco Unified Communications Manager (Unified CM) Administration
- · Cisco Unified CCX and Cisco Unified IP IVR administration
- General system requirements and network design guidelines available from your local Cisco Systems Engineer (SE)

# Scope

This document describes the various components used to build a Cisco Unified CCX system, and it gives recommendations on how to combine those components into an effective solution for your enterprise.

The following topics are *not* covered in this design guide:

• Installation and configuration of Cisco Unified CCX, Unified IP IVR, and Agent Desktop. For more information about these Cisco products, refer to the online product documentation available at Cisco.com.

- Cisco Unified IP IVR programming guidelines. Cisco Unified CCX is a packaged solution built upon a Cisco software platform called Customer Response Solutions (CRS). The CRS platform supports Unified IP IVR solution package. Unified IP IVR can be used with Cisco Unified Contact Center Enterprise (Unified CCE). Unlike Cisco Unified CCX, the Unified IP IVR solutions do not provide ACD and CTI functions. In Unified CCE deployments, the ACD and CTI functions are provided by the Cisco Unified Intelligent Contact Management Enterprise (Unified ICME) software. Unified ICME software, combined with Unified IP IVR and Cisco Communications Manager (Unified CM), make up the Unified CCE Solution.
- Best practices for Contact Service Queues (CSQs) and priority queuing of Cisco Unified CCX.
- Design guidelines for Cisco Unified Communications common infrastructure and call processing. For information on Cisco IP Telephony design, refer to the Cisco IP Telephony Solution Reference Network Design documentation available online at http://www.cisco.com/go/ucsrnd.
- Cisco Unified CCX Voice Browser (using VoiceXML), automatic speech recognition (ASR), and text-to-speech (TTS) best practices. For specific information on these topics, refer to the Nuance Communications Inc. website at

http://www.nuance.com

or the IBM Websphere Voice server web page at

http://www-306.ibm.com/software/pervasive/voice\_server/

• The call sizing guidelines in this document are intended only to illustrate concepts in providing high-level sizing of call center resources. This document is not intended to be an all-inclusive guide to designing and sizing contact centers. Each deployment will be different and specific to your system requirements.

## Software releases

Unless stated otherwise, the information in this document applies specifically to Cisco Unified CCX Release 9.0. Software releases are subject to change without notice, and those changes may or may not be indicated in this document. Refer to the Cisco Unified CCX release notes for the latest software releases and product compatibility information.

# **Document structure**

This guide contains the following chapters and appendices:

- "Cisco Unified Contact Center Express overview and packaging" provides an overview of the Cisco Unified CCX software and describes the Cisco Unified CCX packaging.
- "Cisco Unified Contact Center Express solution architecture for Cisco Unified Communications Manager" describes the terminology, call processing, system management, Cisco Unified CCX Engine and Database components, Monitoring and Recording components, ASR and TTS, integration with Unified ICME, fault tolerance, and software compatibility for Cisco Unified CCX.
- "Cisco Unified Contact Center Express deployment models" describes the way Cisco Unified CCX can be deployed.
- "Basics of call center sizing," introduces the basic concepts involved in call center sizing.

- "Sizing for Cisco Unified Contact Center Express and Cisco Unified Communications Manager Servers" discusses the impact of performance criteria on the Cisco Unified CCX and Unified CM servers.
- "Bandwidth, Security, and QoS Considerations" discusses estimating bandwidth consumption, serviceability and security, and quality of service and call admission control.
- "Server capacities and limits" provides a list of server capacities and limits.
- "Voice over IP monitoring" provides design considerations for SPAN-based services.
- "Cisco Unified Contact Center Express integration with LDAP server" provides information about directory services.
- The Index helps you find information in this guide.

# Obtaining documentation, obtaining support, and security guidelines

For information on obtaining documentation, obtaining support, security guidelines, and also recommended aliases and general Cisco documents, see the monthly What's New in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

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CHAPTER

# **Cisco Unified Contact Center Express overview** and packaging

This chapter describes the basic architecture and capabilities of Cisco Unified Contact Center Express (Unified CCX), and explains how to match those capabilities to your system requirements.

Cisco Unified CCX can be deployed with Cisco Unified Communications Manager (Unified CM) Cisco Business Edition 6000 (BE 6000). Unified CM was formerly named Cisco CallManager. Cisco Unified CCX is a Linux-based appliance.

A complete list of Cisco Unified CM releases supported with each Cisco Unified CCX release is provided in the *Cisco Unified CCX Software and Hardware Compatibility Guide*, available at: http://www.cisco.com/ en/US/products/sw/custcosw/ps1846/products device support tables list.html.

This document addresses only the capabilities and deployment models of Cisco Unified CCX 9.0(1). For similar information about other releases of Cisco Unified CCX, see the appropriate SRND for the release.

Note

Cisco Unified CCX does not support expansion server for either non-high-availability or high availability inbound deployments. In addition, Cisco Unified CCX does not support co-loading with Cisco Unified CM on the same virtual machine (VM) or bare metal server. High availability is supported only for the inbound voice option.

Cisco Unified CCX 9.0(1) does not support Cisco Unified Survivable Remote Site Telephony (Unified SRST) and Cisco Unified Communications Manager Express.

This chapter contains the following sections:

- Unified CCX overview, page 2
- Unified CCX packaging, page 2
- Inbound voice, page 4
- Unified CCX Outbound Preview Dialer, page 28
- Web Chat, page 31
- Quality Management and Compliance Recording, page 37
- Workforce Management, page 38

# **Unified CCX overview**

Unified CCX provides options to address multiple contact center functional areas using a variety of server deployment models. These functions and their associated deployment models are as follows:

- Inbound voice is deployed on a one server non-high-availability or a two server high availability cluster.
- Outbound voice is deployed on the same servers as inbound voice.
- Inbound web chat is deployed on the same servers as inbound voice.
  - The web chat functionality requires a separate server on which Cisco SocialMiner is deployed.
  - Cisco SocialMiner can be deployed on a virtual machine created using the published OVF templates for Cisco Social Miner. The OVF templates are available here.
- · Cisco Unified Intelligence Center is deployed in the same server as inbound voice.
  - Unified Intelligence Center is the web-based reporting solution that is bundled with Unified CCX.
- Cisco Workforce Manager (WFM) must be deployed on a separate dedicated single server.
- Cisco Compliance Recording (CR), Quality Manager (QM), and Advanced Quality Managers (AQM)
  provide call recording. In addition, QM provides quality management and AQM provides screen recording.
  All are additional cost options. CR is available with all Unified CCX packages, whereas QM and AQM
  are available only with Unified CCX Premium. CR, QM, and AQM must be deployed on a separate
  dedicated server.

You can deploy these options on Cisco Media Convergence Servers (MCSs), Cisco Unified Computing Systems (UCSs) or on HP or IBM MCS equivalents for any of the functional components with the supported deployment models. However, different functional components require different deployment models, and high availability is available only for inbound voice. Different features require different deployment models.

Note

CR, QM, and AQM are different from the integrated on-demand recording capability available with both Unified CCX Enhanced and Premium. On-demand recording continues to run as an integrated feature on the Unified CCX active and standby servers.



The specific deployment models and the server or multiple servers that are required for a deployment model can only be determined by using the Cisco Unified Communications Sizing Tool. This tool is required by the Cisco Assessment to Quality (A2Q) process for every new, add-on, and upgrade system. The tool is available at: http://tools.cisco.com/cucst

# **Unified CCX packaging**

Unified CCX is a complete customer interaction management solution available in three different packages: Standard, Enhanced, and Premium. Different packages provide varying levels of customer interaction management channel options and capability within a contact channel. The table below describe the major

customer interaction management options and their availability. For more detailed information, refer to product data sheets, feature guides, and end user documentation for each type of Unified CCX customer contact interaction management at the following URL:

### http://www.cisco.com/en/US/partner/products/sw/custcosw/ps1846/index.html

Unified CCX deployments must have all product components and optional features of the same package type. Mixing components or options from different packages is not supported. For example, Enhanced Inbound voice option and Premium Quality Manager option are not supported.

Feature	Premium	Enhanced	Standard	Optional
Inbound voice	Yes	Yes	Yes	No
Inbound Voice High-Availability Option	Yes	Yes	No	Yes
Blended Preview Outbound Dialer	Yes, Included	No	No	No
Outbound IVR	Yes	No	No	Yes
Agent E-Mail	Yes, Included	No	No	No
Agent Web Chat	Yes	No	No	No
Remote Monitoring	Yes	No	No	No
Integration with Cisco IM and Presence Server	Yes, Included	Yes, Included	Yes, Included	Yes
Call Recording	Yes	Yes	Yes	Yes
Quality Management Option	Yes	No	No	Yes
Advanced Quality Management Option	Yes	No	No	Yes
Workforce Management Option	Yes	No	No	Yes
Cisco Unified Intelligence Center	Yes	Yes	Yes	No

 Table 1: Feature availability by Unified CCX package for Unified CM and Cisco Business Edition 6000

### **Licensing for Cisco Unified Contact Center Express 9.0**

As indicated in Table 2: Cisco Unified Contact Center Express 9.0 Licensing and Packaging, on page 4, the licensing for Cisco Unified Contact Center Express 9.0 varies for each feature. Licenses are either concurrent or named user licenses. All packaging depends on the number of user with the exception of the Inbound Voice High Availability server software option.

Concurrent licensing example: Customer has three shifts each of 100 users for a total of 300 unique users. In this case the customer needs to purchase 100 licenses.

Named user licensing example: Customer has three shifts of 100 users for a total of 300 unique users. In this case the customer needs to purchase 300 licenses.

Feature	Licensing and Packaging
Inbound Voice Non-High Availability	Concurrent license available with Standard, Enhanced and Premium
Inbound Voice High Availability	Server software option available with Enhanced and Premium
Outbound IVR	Concurrent License available with Premium
Call Recording	Named user license available with Standard, Enhanced and Premium
Quality Management	Named user license available with Premium
Advanced Quality Management	Named user license available with Premium
Workforce Management	Named user license available with Premium

### Table 2: Cisco Unified Contact Center Express 9.0 Licensing and Packaging



Starting from Unified CCX 5.0(2), the standard package will support skill-based and competency-based routing. However, it will no longer support Cisco Agent Desktop. IP Phone Agent and Cisco Supervisor Desktop will continue to be supported.

# **Inbound voice**

Cisco Unified CCX Standard, Enhanced, and Premium each provide varying levels of inbound voice ACD, IVR, CTI, agent and supervisor desktops, desktop administration, real-time and historical reporting, and web-based administration features.

Each user license is for a concurrent user. For example, a contact center with three shifts of 100 agents and supervisors requires 100 concurrent user licenses. Each shift of 100 users would reuse these licenses during their shifts.

The following table lists the inbound voice licensed components.

License		Premium		Enhanced		Standard	
Concurrent inbound voice seat	Yes		Yes		Yes		
<ul> <li>Each concurrent inbound voice user (agent or supervisor) requires a concurrent seat license. Each quantity one seat license provides:</li> <li>Quantity one Cisco Agent Desktop (CAD)</li> <li>Quantity one Cisco IP Phone Agent (IPPA)</li> <li>Quantity one Cisco Supervisor Desktop (CSD)</li> </ul>	Note	On-demand recording available only in Enhanced and Premium.	Note	On-demand recording available only in Enhanced and Premium.	Note	On-demand recording not available in Standard.	
Quantity one Cisco Desktop     Administrator (CDA)							
• Quantity one historical reporting client							
• Quantity one on-demand recording client (CAD and CSD)							
<b>Note</b> In Cisco Unified CCX 5.0(2) and later releases, CAD is available only for Enhanced and Premium packages.							
Advanced IVR port	Yes		Not av	vailable	Not av	ailable	
High Availability (HA) option	Yes		Yes		Not av	ailable	
HA provides licensing for mirrored, warm standby server software.							

### Table 3: Inbound voice licensed components

### **Table 4: Inbound Voice Features**

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Feature	Premium	Enhanced	Standard			
General System Feature	General System Features with Server Software					
Hardware configuration	Cisco Media Convergence Servers and Cisco approved partner servers Cisco UCS B and C Series Cisco Media Convergence Server Appliance	Cisco Media Convergence Servers and Cisco approved partner servers Cisco UCS B and C Series Cisco Media Convergence Server Appliance	Cisco Media Convergence Servers and Cisco approved partner servers Cisco UCS B and C Series Cisco Media Convergence Server Appliance			

Feature	Premium	Enhanced	Standard
System software configuration	Cisco Media Convergence Appliance software Microsoft Windows XP, Vista, and Windows 7 desktop client software Browser-based client software (Cisco Agent Desktop and Workforce Management) Web 2.0 based client software (Quality Management and Advanced Quality Management)	Cisco Media Convergence Appliance software Microsoft Windows XP, Vista, and Windows 7 desktop client software	Cisco Media Convergence Appliance software Microsoft Windows XP, Vista, and Windows 7 desktop client software
Cisco Unified Communications Managers supported	Cisco Unified Communications Manager and Cisco Unified Communications Manager Cisco Business Edition 6000	Cisco Unified Communications Manager and Cisco Unified Communications Manager Cisco Business Edition 6000	Cisco Unified Communications Manager and Cisco Unified Communications Manager Cisco Business Edition 6000
Operating system(s) supported	Cisco Voice Operating System	Cisco Voice Operating System	Cisco Voice Operating System
Inbound voice redundancy support	High-availability cluster over the WAN with automatic failover	High-availability cluster over the WAN with automatic failover.	Not available
Maximum number of analog trunks supported	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Maximum number of digital trunks supported	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Maximum number of IP trunks supported	Unlimited (no software limitations	Unlimited (no software limitations	Unlimited (no software limitations)
Maximum number of SIP trunks supported	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Maximum number of trunk groups supported	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Maximum number of ACD lines	1	1	1
Maximum number of secondary lines (with support for historical reporting)	3	3	3
Call conferencing	Included	Included	Included

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Feature	Premium	Enhanced	Standard
Agent interdialing support	Included	Included	Included
Direct-outward-dialing (DOD) support	Included	Included	Included
Inbound Voice Seats		- -	
Maximum number of configurable inbound agents supported	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Maximum number of active inbound agents supported	400	400	400
Maximum number of inbound supervisor positions supported	42	42	42
Inbound seat license type	Concurrent user	Concurrent user	Concurrent user
Integrated ACD Feature	s with Server Software		
Custom scripting with Cisco Unified Contact Center Express Drag and Drop Editor	Included	Included	Included
Maximum number of agent groups supported	150	150	150
Maximum number of agents per group	400	400	400
Automatic Number Identification (ANI) support	Included	Included	Included
Dialed Number Identification Service (DNIS) support	Included	Included	Included
Route on Skill	Included	Included	Included
Route on Skill competency	Included	Included	Included
Conditional routing (time of day, day of week, and custom variables)	Included	Included	Included
Overflow, interflow, and intraflow routing	Included	Included	Included

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Feature	Premium	Enhanced	Standard
Custom routing based on data from database access (for example, data-directed priority routing)	Included	Not available	Not available
Dynamic priority queuing	Included	Included	Not available
Maximum number of definable skills groups	150	150	150
Maximum number of skills per agent	50	50	50
Maximum number of routing programs	Unlimited (no software limitations)	Unlimited (no software limitations)	Unlimited (no software limitations)
Integrated Recording wi	th Cisco Unified Contact	Center Express Seat Lice	nse
On-demand agent recording	Included	Included	Not available
On-demand supervisor recording	Included	Included	Not available

#### **Related Topics**

IVR ports, on page 8

### **IVR** ports

IVR ports are packaged as either Basic or Advanced IVR ports.

- Basic IVR Ports Licensing—Basic IVR ports are not licensed and a given configuration may have as
  many Basic IVR ports as fit given the server on which the system is deployed and the mix of other
  features deployed on that server. You must use the Cisco Unified Communications Sizing Tool to
  determine the maximum number of Basic IVR ports that are supported on a per configuration basis.
  Basic IVR ports provide a queue point, custom messaging and prompting, caller input collection, and
  processing through DTMF decoding. Decoded DTMF input may be used for both routing and screen
  pop purposes. Basic IVR ports (and only Basic IVR ports) are available in both the Standard and Enhanced
  packages.
- Advanced IVR ports licensing— Advanced IVR ports are licensed on a per inbound voice seat basis and are available only with the Premium package. Each inbound voice seat provides two Advanced IVR port licenses. For example, a 100 seat inbound voice deployment provides 200 Advanced IVR port licenses. Advanced IVR port licenses counts are checked at run-time. In the example given here, the 201st simultaneously active request for an Advanced IVR port to handle an incoming call would be denied. Deployments that require more IVR ports than are provided by this 1:2 seat: Advanced IVR port ratio must purchase one additional Premium inbound voice seat for each two additional Advanced IVR ports required.



The number of IVR ports is also limited by the maximum number supported for a given server platform as listed in Server capacities and limits, on page 129. In the case of virtualized deployment, the maximum number of IVR ports is limited by the maximum number supported for a given virtual machine template.

### Inbound voice packaged components

The following sections describe the primary components that are provided with inbound voice. These sections provide high-level descriptions of the features and functions provided for these components. For more specific information, see the Cisco Unified CCX user documentation.

- Automatic Call Distribution, on page 9
- Interactive Voice Response, on page 12
- Computer Telephony Integration, on page 17
- Cisco Desktop Services, on page 20
- Cisco Unified CCX Historical Reporting, on page 18

### **Automatic Call Distribution**

The following table describes the Automatic Call Distribution (ACD) features that are available in each Unified CCX package.

### Table 5: ACD features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
<b>Conditional Routing</b> . Unified CCX supports routing based on caller input to menus, real-time queue statistics, time of day, day of week, ANI, dialed number, and processing of data from XML text files.	Included.	Included.	Included.
Agent Selection. Unified CCX supports the longest available, linear, most handled contacts, the shortest average handle time, and circular agent selection algorithms. With Basic ACD functionality, agents are associated with one resource group only.	Included.	Included.	Included.
<b>Customizable Queuing Announcements.</b> Unified CCX supports the playing of customizable queuing announcements based on the skill group that the call is being queued to, including announcements related to position in queue and expected delay.	Included.	Included.	Included.

Feature	Premium	Enhanced	Standard
<b>Re-route on Ring No Answer</b> . If the selected agent does not answer within the allowed time limit, the caller retains the position in queue. Any screen pop data is also preserved.	Included.	Included.	Included.
<b>Call Recording</b> . The Unified CCX server can record input from callers. This capability can be used to allow call center staff to remotely record new announcements or prompts.	Included.	Included.	Included.
<b>Cisco Unified Intelligent Contact Management</b> <b>Enterprise (Unified ICME) Integration</b> . Unified CCX can integrate with Unified ICME. Unified ICME integration provides the following capabilities:	Optional.	Optional.	Optional.
• The ability for Unified CCX to send agent, queue, and call state changes to Unified ICME software			
• The ability of Unified ICME software to intelligently route and load balance (using pre-routing or post-routing) calls across multiple ACD sites, which can include one or more Unified CCX systems, Cisco Unified Contact Center Enterprise (Unified CCE) systems, or traditional ACDs (that are supported by Unified ICME software). Calls routed to a Unified CCX application can also be sent call data so that the data can be popped onto an agent screen.			
• The ability for Unified CCX to send post-route requests with call data to the Cisco Unified ICME software to request routing instructions. This event could be in response to a new call that just arrived at Unified CCX or a call that is being transferred from an IVR port or agent. Call data included in the post-route request can be used by the Unified ICME software to profile route the call. Call data is also passed to the terminating ACD site (Unified CCX, Unified CCE, or traditional ACD) for an agent screen pop.			
• The ability for Unified ICME software to provide multisite ACD reporting for a mixed network of ACD sites, which can include one or more Unified CCX systems, Unified CCE systems, or traditional ACDs.			
<b>Data driven routing for HTML and XML data sources</b> . The ability to use data obtained from HTML or XML documents to make routing decisions. XML document processing can also be used as a data store to access system-wide static data, such as a list of holidays, hours of operation, or a short list of hot customer accounts.	Included.	Included.	Included.

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Feature	Premium	Enhanced	Standard
Agent Skill and Competency-Based Routing. Agents can be configured with up to 50 skills, each with up to 10 different competency levels. Contact Service Queues (also known as skill groups) can be configured as requiring up to 50 skills, each with up to 10 minimum skill competency levels. The Unified CCX routing logic then matches the caller and contact requirements with agent skills to find the optimum match using one of the following agent selection criteria:	Included.	Included.	Included.
• Longest available, most handled contacts, or shortest average handle time			
• Most skilled, most skilled by weight, or most skilled by order			
• Least skilled, least skilled by weight, or least skilled by order			
<b>Note</b> Starting with Unified CCX 5.0(2), this feature is available with the Standard package. It is not available with the Standard package for releases earlier than Unified CCX 5.0(2).			
<b>High Availability Failover</b> . With HA failure of the active server can be detected and the ACD subsystem can automatically fail over from the active to the standby server.	Optional with HA license.	Optional with HA license.	Not available.
<b>Dynamic Reskilling by Administrator or Supervisor</b> . Changes to CSQ skills and competencies and agent skills and competencies are applied immediately.	Included.	Included.	Included.
<b>Prioritized Queuing</b> . Up to 10 levels of customer contacts can be prioritized based on call or customer data, and calls may be moved within or among queues under workflow control using priority information.	Included.	Included.	Not available.
Agent Routing. Unified CCX routing applications can select a specific agent if that agent is in Ready state. (Queuing on a per agent basis is not supported.)	Included.	Included.	Not available.
<b>Data-driven routing based on JDBC database sources</b> <b>via SQL</b> . The ability to use data obtained from an JDBC compatible database via a SQL query to make routing decisions.	Included.	Not available.	Not available.

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Feature	Premium	Enhanced	Standard
Wrap-Up and Work Modes. After call completion, an agent can be configured to be automatically placed into Work state, on a per CSQ basis. The agent can also choose to enter work state if that option is provided by the agent desktop administrator. A wrap-up timer is also configurable on a per CSQ basis.	Included.	Included.	Not available.
Wrap-Up Codes. Agents may select administratively defined wrap up codes.	Included.	Included.	Not available.

### **Interactive Voice Response**

The following table describes the Interactive Voice Response (IVR) features that are available in each Unified CCX package.

### Table 6: IVR features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
<b>Basic Prompt and Collect IVR</b> . Basic IVR port provide a queue point, custom messaging and prompting, caller input collection, and processing DTMF decoding. Decoded DTMF input may be u for both routing and screen pop purposes. Basic of controls such as terminate, transfer, and place call also supported as part of the basic IVR functional	s Not available s via used call are lity.	Included	Included
Note Basic IVR port and Advanced IVR port cannot be mixed in the same configurati Advanced IVR port includes all features available in Basic IVR port.	on.		
High Availability Failover. With HA, failure of active server can be detected and the IVR subsys can automatically fail over from the active to the standby server. All IVR functions will be restored the standby server.	the Optional with tem HA license.	Optional with HA license.	Not available
<b>Note</b> All calls in queue and calls receiving IV call treatment will be lost. Calls already transferred to the agent will be preserved	R d.		

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Feature	Premium	Enhanced	Standard
Advanced IVR Port Database Integration. The Unified CCX server can interoperate with any JDBC-compliant database. Databases tested and supported by Cisco are listed in <i>Cisco Unified CCX</i> <i>Software and Hardware Compatibility Guide</i> , which is available at:	Included	Not available	Not available
http://www.cisco.com/en/US/products/sw/custcosw/ ps1846/products_device_support_tables_list.html			
Data retrieved from databases can be used with the conditional routing capabilities to provide customer profile-based routing and queuing. Database integration also provides the ability to offer complete self-service applications to callers. Database views are not supported using the Unified CCX Editor database steps, but database views can be accessed using Voice XML or Java logic modules.			
Advanced IVR Ports HTTP Triggers (the web analog to Unified CM Telephony) to invoke and run a workflow. HTTP triggers enable a Unified CCX to receive a customer contact request through an HTTP request. This approach allows web users to be offered service through a "click to talk to an agent" button. Information collected using the web (a customer call back number, account number, shopping cart content, and so on) can be passed to the Unified CCX script to allow customer profile-based routing and a data-rich window. These contacts can be prioritized and routed using the same methods available to normal inbound voice callers.	Included	Not available	Not available
Advanced IVR Port SMTP outbound mail subsystem that may be used at run time under workflow control to send an email message. Third-party paging or fax products that accept an incoming email message to invoke a page or fax service may use this subsystem to provide real-time paging and fax responses in addition to email responses.	Included	Not available	Not available

Feature	Premium	Enhanced	Standard
Advanced IVR Port Voice XML 2.0 Support. Unified CCX supports executing application logic developed with the Voice XML (VXML) standard. VXML is required for certain complex grammar ASR and TTS interactions and is optional for a DTMF or simple ASR or TTS voice interaction service. VXML allows organizations to reuse application logic from other applications, such as a transaction server to a mainframe database.	Included	Not available	Not available
<ol> <li>Note 1 Use of large vocabulary recognition (LVR) must be validated during the A2Q phase.</li> <li>2 Unified CCX uses MRCP v1 for communicating with third-party ASR-TTS servers.</li> <li>3 The supported ASR-TTS servers include Nuance, Scansoft, and IBM WVS.</li> </ol>			
Advanced IVR Port Java Support. The Unified CCX server can support logic defined using Java. Java support allows for logic from existing web and Java applications to be reused.	Included	Not available	Not available
Advanced IVR Port Automatic Speech Recognition via MRCP. ASR provides the ability to use natural human speech to replace DTMF keypad presses as a way to interact with IVR applications.	Optional with purchase of compatible ASR product from Nuance or IBM.	Not available	Not available
Advanced IVR Port Text to Speech via MRCP. TTS provides the ability to use flat text files as input to a computer-generated speech engine. TTS can replace prerecorded human speech in IVR applications.	Optional with purchase of compatible TTS product from Nuance or IBM.	Not available	Not available
Advanced IVR Port Remote Silent Monitoring. Provides a mechanism for silent monitoring of calls using an IP phone or a PSTN phone. This form of silent monitoring does not require a CSD application to be running but does require a seat license for any supervisor engaged in remote silent monitoring. Remote silent monitoring also does not require any data network connectivity and is ideally suited for management of outsourced customers of a call center service provider. The agent is unaware of being monitored using remote silent monitoring.	Included	Not available	Not available

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Feature	Premium	Enhanced	Standard
Play messages to callers: Music	Included through Cisco Unified Communications Manager Music on Hold server or .wav file	Included through Cisco Unified Communications Manager Music on Hold server or .wav file	Included through Cisco Unified Communications Manager Music on Hold server or .wav file
Play messages to callers: Prompts	Included through .wav file	Included through .wav file	Included through .wav file
Play messages to callers: Combine prompts, music, and messages	Included and fully customizable	Included and fully customizable	Included and fully customizable
Capture and process caller DTMF input	Included	Included	Included
Automated-Attendant support	Included and fully customizable	Included and fully customizable	Included and fully customizable
Database integration	Included	Not available	Not available
Automatic Speech Recognition (ASR)	Optional through Media Resource Control Protocol (MRCP): Order from Nuance or IBM	Not available	Not available
Text to Speech (TTS)	Optional through MRCP: Order from Nuance or IBM	Not available	Not available
Real-time notification services (email; support for paging and fax)	Included (paging and fax require integration with third-party services)	Not available	Not available
VoiceXML for ASR, TTS, and DTMF	Included	Not available	Not available
Read data from HTTP and XML pages	Included	Included	Included
Run workflows through HTTP request	Included	Not available	Not available
Integrated self-service application support	Included	Not available	Not available

Table 7: Outbound IVR Features available in each Unified CCX package, on page 16 shows the features available with the Outbound IVR feature, which is an optional component available only in the Premium version of Cisco Unified Contact Center Express 9.0.

Feature	Premium	Enhanced	Standard		
General System Features with Server Software					
Hardware configuration	IVR Outbound Dialer is deployed co-loaded on the same virtual machine (VM) or bare metal server as the inbound voice server. CPA is performed on the gateway.	Not available	Not available		
Outbound IVR Ports					
Maximum number of Outbound IVR ports supported	150	Not available	Not available		
Outbound IVR Port license type	Concurrent	Not available	Not available		
Outbound IVR Features					
Maximum number of active outbound campaigns	15	Not available	Not available		
Maximum number of active contacts per outbound campaign	10,000	Not available	Not available		
Ability to automatically detect voice answer, answering machine, fax/modem, busy and invalid numbers	Included	Not available	Not available		
Integrated Historical Reporting with Cis	co Unified Contact C	enter Express Seat L	license		
IVR Outbound Campaign Summary report	Included	Not available	Not available		
IVR Outbound CCDR report	Included	Not available	Not available		
IVR Outbound Half Hourly report	Included	Not available	Not available		
Administration					
Ability for administrator to create and configure campaigns	Included	Not available	Not available		
Ability for administrator to create non-North American area code to time-zone mappings	Included	Not available	Not available		

Table 7: Outbound IVR Features available in each Unified CCX package

The summary overview of system maximums for inbound and outbound voice in the above tables are for reference only. All system configurations are required to use the Cisco Unified Communications Sizing Tool to pass required Cisco Assessment to Quality (A2Q) bid assurance.

### **Computer Telephony Integration**

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Computer Telephony Integrative (CTI) refers to the ability to use data available from caller-entered data, ACD, IVR, or other data sources to pop to the agent, to make routing decisions, or to use as a key to perform a data lookup (for example, via a database access prior to popping to the agent or to use in making routing decisions). CTI may also include the ability to invoke a third-party application and to pass data to that application as part of the agent screen pop.

The following table describes the CTI features that are available in each Cisco Unified CCX package.

Table 8: CTI features available in each Cisco Unified CCX package

Feature	Premium	Enhanced	Standard
<b>Basic CTI</b> . Provides a customizable enterprise data window that is popped on the agent desktop upon call ringing. Data in the enterprise data window includes ANI, dialed number, and any caller input (account number, order number, case number, reason for calling, and so on), and details about how long the caller interacted with the IVR, how long the caller waited in queue, and how long the caller spent with all other agents if this was a transferred call.	Included.	Included.	Included.
Note For Cisco Unified CCX 5.0(2) and later releases, CAD is not supported on the Standard package, and so, the enterprise data is only available on IP Phone Agent.			
Advanced CTI. Advanced CTI functionality allows call data to be passed to other Windows-based desktop applications (for example, CRM applications) for an application screen pop on ringing. Passing data to other applications is performed through keystroke macros that are then associated with specific call events such as call ringing or call release. With keystroke macros and HTTP put/get commands, no programming is required to develop a screen pop application.	Included. Premium package adds support for using data from supported databases using workflow-based SQL queries.	Included. Enhanced package adds support for using data from XML data sources. Database integration is not supported.	Not available.
Automatically start any Microsoft Windows-compatible application: Pass initialization parameters	Included	Included	Not available
Populate data to any Microsoft Windows-compatible application	Included	Included	Not available
Populate data to any browser-based application	Included	Not available	Not available

Feature	Premium	Enhanced	Standard
Customer database integration (JDBC)	Included	Not available	Not available

### **Cisco Unified CCX Historical Reporting**

Cisco Unified CCX Historical Reporting provides supervisors and administrators with information about call, agent, and CSQ activities. Users of the historical reports can perform the following functions:

- · View, print, and save reports
- Sort and filter reports
- Send scheduled reports to a file or to a printer
- · Export reports in a variety of formats, including PDF, RTF, XML, and CSV
- Prepare custom reports using a variety of generally available third-party applications that are designed to create reports from databases

The following table describes the historical reporting features that are available in each Cisco Unified CCX package.

Feature	Premium	Enhanced	Standard
<b>Viewing Reports</b> . View reports for the entire contact center using the Historical Reports client.	Included.	Included.	Included.
<b>Custom Reports</b> . Generate custom reports using a combination of the Crystal Reports Developer's Toolkit and SQL stored procedures.	Included.	Included.	Included.
For more information, see the Cisco Unified CCX Historical Reporting Administrator and Developer Guide and Cisco Unified CCX Database Schema.			
Integrated ACD Historical Reporting with Cisco	Unified Contact C	Center Express So	eat License
Abandoned Call Detail Activity report	Included	Included	Included
Aborted and Rejected Call Detail report	Included	Included	Included
Agent Call Summary report	Included	Included	Included
Agent Detail report	Included	Included	Included
Agent Login Logout Activity report	Included	Included	Included
Agent Not Ready Reason Code Summary report	Included	Included	Included
Agent State Detail report	Included	Included	Included
Agent State Summary report (by agent)	Included	Included	Included

### Table 9: Historical reporting features available in each Cisco Unified CCX package

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Feature	Premium	Enhanced	Standard
Agent State Summary report (by interval)	Included	Included	Included
Agent Wrap-up Data Summary report	Included	Included	Not available
Agent Wrap-up Data Summary Detail report	Included	Included	Not available
Application Summary report	Included	Included	Included
Call Custom Variables report	Included	Included	Included
Called Number Summary Activity report	Included	Included	Included
Common Skill Contact Service Queue Activity report	Included	Included	Included
Contact Service Queue Activity report (by CSQ)	Included	Included	Included
Contact Service Queue Activity report (by interval)	Included	Included	Included
Contact Service Queue Activity report	Included	Included	Included
Contact Service Queue Call Distribution Summary report	Included	Included	Included
Contact Service Queue Priority Summary report	Included	Included	Included
Contact Service Queue Service Level report	Included	Included	Included
CSQ Agent Summary report	Included	Included	Included
Detailed Call, CSQ, Agent report	Included	Included	Included
Priority Summary Activity report	Included	Included	Not available
Remote Monitoring Detail report	Included	Not available	Not available
Integrated Self-Service Historical Reporting with 0	Cisco Unified Cor	ntact Center Expi	ess Seat License
Application Performance Analysis report	Included	Included	Included
Call-by-Call Contact Call Detail Record (CCDR) report	Included	Included	Included
Traffic Analysis report	Included	Included	Included
Integrated Multichannel Historical Reporting with (available with HRC or embedded CUIC)	Cisco Unified Co	ntact Center Exp	ress Seat License
Outbound Agent Detail Summary report	Included	Not available	Not available
Outbound Campaign Summary report	Included	Not available	Not available
Agent E-Mail Inbox Traffic Analysis report	Included	Not available	Not available
Agent E-Mail CSQ Activity Summary report	Included	Not available	Not available
Agent E-Mail Agent Summary Activity report	Included	Not available	Not available
Agent E-Mail CSQ Agent Summary Activity report	Included	Not available	Not available
Chat Traffic Analysis	Included	Not available	Not available

Feature	Premium	Enhanced	Standard
Chat Agent Summary Activity report	Included	Not available	Not available
Chat Agent Detailed Activity report	Included	Not available	Not available
Chat CSQ Summary Activity report	Included	Not available	Not available
Chat CSQ Detailed Activity report	Included	Not available	Not available

### **Cisco Unified Intelligence Center**

Cisco Unified Intelligence Center is the web-based reporting platform that is packaged as part of the Cisco Unified CCX 9.0(1).

The Unified Intelligence Center packaged type that are available with Unified CCX packages are listed below.

Contact Channel	Premium	Enhanced	Standard
Unified Intelligence Center Package Type	Unified Intelligence Center Standard - with unlimited users	Unified Intelligence Center Standard - with unlimited users	Unified Intelligence Center Standard - with unlimited users

### **Cisco Desktop Services**

Cisco Desktop Services provide Cisco Agent Desktop (CAD) and IP Phone Agent (IPPA) for agent use, and Cisco Supervisor Desktop (CSD) for supervisor use.

### **Cisco Agent Desktop features**



CAD is not available in the Standard package starting from Unified CCX 5.0(2).

The following table describes the Cisco Agent Desktop features that are available in each Unified CCX package.

#### Table 10: Cisco Agent Desktop features available in each Unified CCX package

Feature	Premium	Enhanced
Agent State Control. From the agent desktop, agents log in, log out, and make themselves ready and not ready.	Included	Included

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Feature	Premium	Enhanced
<b>Call Control</b> . From the agent desktop, agents answer, release, hold, retrieve, conference, and transfer calls. (Call control can also be performed from a Cisco Unified IP Phone.)	Included	Included
For example, to answer a call, the agent can simply pick up the phone handset. The Unified CCX software ensures that the current call state for the phone and CAD application are kept in synch.		
<b>Note</b> Call control initiated from the agent desktop is available only with Unified CCX which has Unified CM.		
<b>Dynamic Regrouping</b> . Change of agent association with a resource group is applied immediately.	Included	Included
<b>Real-Time Statistics</b> . Agents have access to real-time statistics for themselves and the queues to which they are associated. For example, from the agent desktop application, agents can see how many calls they have handled today and how many calls are currently in queue for their team.	Included	Included
<b>Integrated Text Messaging</b> . Agents can interact with their supervisor and other agents through text chat.	Included	Included
<b>Reason Codes</b> . Agents can be configured to enter reason codes for Not Ready and Logout.	Included	Included
<b>Basic CTI</b> . Agent desktops provide an enterprise data window that is popped upon call ringing.	Included	Included
<b>Telephony Support</b> . CAD can be deployed with select Cisco Unified IP Phone models, as described in <i>Cisco Unified CCX Software and Hardware Compatibility Guide</i> . However, there are different features available on different phones.	Included	Included
CAD also supports the agent using the Cisco IP Communicator softphone application running on the same workstation with CAD.		
An agent ACD (Unified CCX) extension cannot be shared across multiple devices. It is valid only with a single line.		
You can set the agent ACD extension for Call Forward No Answer (to voicemail or any other endpoint) as long as the value for the Ring No Answer timer on that device (or in Cisco Unified Communications Manager if the default is chosen) is less than the value for the Select Resource Timeout in the Select Resource step of the script.		
Unified CCX monitors and reports on activities for the first four extensions on a phone, including non-ACD lines.		
Agents are associated with a specific Cisco Unified Communications Manager extension (directory number).		

Feature	Premium	Enhanced
Hot Desking. Hot desking allows agents to log in using CAD and any Cisco Unified IP Phone that is registered with the same Cisco Unified Communications Manager cluster. Agents using CAD and Cisco IP Communicator can also use Extension Mobility. This capability allows multiple agents to use the same phone, but only one at a time. For example, different agents on different shifts may use the same workstation and phone. Extension Mobility brings a user-specific phone profile (including configured extensions for that user) to the phone being logged in from. After logging in to Cisco Unified Communications Manager with Extension Mobility, agents can log in to Unified CCX using CAD.	Included	Included
Auto Update. When the CAD starts up, it checks to see whether a new version of the CAD program is available and automatically performs an update on the agent workstation. This auto update feature can be disabled if required.	Included	Included
<b>Desktop Workflows</b> . A wizard-based interface allowing desktop events (such as ringing or going off hook) to have associated rules and rule actions that are invoked when the rule is met for that event.	Included	Included
<b>Application Integration</b> . CAD can be configured using desktop workflows to allow call data to be passed to other desktop applications (for example, CRM applications) for an application window. Passing data to other applications is performed through keystroke macros or HTTP put/get commands that are then associated with specific call events such as call ringing. No programming is required to develop a screen pop. Application integration can also be done upon call release to pop open a wrap-up application on the agent workstation.	Included	Not available
<b>Workflow Buttons</b> . CAD can be configured to have predefined workflow buttons that execute specified programs and keystrokes. Workflow buttons help agents complete repetitive tasks quickly.	Included	Included
<b>On-Demand Call Recording</b> . CAD can be configured to allow clicking a single button to start and stop call recording. The call recording contains only the portion of the call that occurs after the Start Record button is clicked. There are limits to how many simultaneous call recording sessions can be performed. Capacity and configuration limits are defined in Server capacities and limits, on page 129.	Included	Included
Work Flow Initiated Call Recording. CAD can be configured to automatically start recording on calls that meet conditions defined in the application script and voice contact work flow. Care should be observed when configuring this feature since there are limits to how many simultaneous call recording sessions can be performed. CAD based recording is not intended to be used in place of a compliance recording solution.	Included	Included

Feature	Premium	Enhanced
Automatic Failover. Upon failure of the active Unified CCX server, CAD will automatically log agents back in on the standby server, and the agent will be placed into a Not Ready state. Upon failure of the active Unified CCX server, active calls on agents phones will survive. However, the call duration and other information that is associated with the call in the historical reporting database may be affected. Historical reports generated for time periods in which a failover occurred will have missing or incorrect data. It will be discernable from the report that a failover occurred.	Optional with HA license.	Optional with HA license.
<b>Wrap-Up Codes</b> . The wrap-up code selection is available only when the agent is in the Work state.	Included	Included
Agent Email. This feature is tightly integrated into the agent desktop, with controls built into the toolbar and display. It queues and routes email messages to staffed and skilled agents, helps the agent to respond easily, and provides a collection of real-time and historical reports that help measure email performance accurately.	Included	Not available
<b>Presence</b> . When integrated with Cisco IM and Presence, agents and supervisors can view the presence state of subject matter experts on CAD and chat with them.	Included	Included
<b>Workforce Management</b> . Workforce Management is a workforce scheduling solution in which the supervisor or any contact center manager can schedule their agents based on forecasted call volume and agent expertise, availability, and other factors. Agents have an interface for that portion of the Workforce Management application that applies to them.	Optional with Workforce Management user license.	Not available
<b>Outbound Preview Dialer</b> . CAD includes buttons to control an agent response to an outbound contact offering by the system. If the agent clicks the Accept button, the system places the outbound call to the customer from the agent phone.	Included	Not available
<b>Note</b> The Outbound Preview Dialer feature is only available with Unified CCX which has Unified CM.		

The following table describes the Agent Email features available with Unified CCX Premium licenses.

### Table 11: Agent Email features available in each Unified CCX package

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Feature	Premium	Enhanced	Standard	
Integrated Agent E-Mail General System Features with Cisco Unified Contact Center Express Cisco				
Agent Desktop				

Feature	Premium	Enhanced	Standard	
Microsoft Exchange 2003 or Microsoft Exchange 2007 or 2010	Not included; must be purchased from Microsoft vendor	Not available	Not available	
Assign one or more email addresses to a single Contact Service Queue (CSQ)	Included	Not available	Not available	
Blended voice and email agents	Included and configurable	Not available	Not available	
Dedicated email agents	Included and configurable	Not available	Not available	
Fully integrated with Cisco Agent Desktop, Cisco Supervisor Desktop, and Cisco Desktop Administrator	Included	Not available	Not available	
Email contact detail records saved to Cisco Unified Contact Center Express historical database	Included	Not available	Not available	
Shared global response templates	Included	Not available	Not available	
Separate voice and email state model	Included	Not available	Not available	
Automatic change of focus for desktop to voice call handling for agents also in voice CSQ	Included	Not available	Not available	
Automatic resumption of e-mail processing on voice disconnect	Included	Not available	Not available	
Spell checker (excluding double-byte languages)	Included	Not available	Not available	
Agent can save email draft response and resume at a later time	Included	Not available	Not available	
Agent can re-queue email	Included	Not available	Not available	
Agent can forward, copy, and blind copy email to external addresses	Included	Not available	Not available	
Agents can quality assure email content from less experienced agents prior to external delivery	Included	Not available	Not available	
Agent E-Mail contacts included in agent CSQ, Agent ACD State, Agent E-Mail Log, and Agent E-Mail Detail real-time reports	Included	Not available	Not available	
Integrated Agent E-Mail for Supervisors with Cisco Unified Contact Center Express Seat License				
Supervisor real-time reporting for Agent E-Mail mail volume by CSQ and for agent detail email volume by CSQ	Included	Not available	Not available	
#### **IP Phone Agent features**

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The following table describes the IP Phone Agent (IPPA) features that are available in each Cisco Unified CCX package.

#### Table 12: IPPA features available in each Cisco Unified CCX package

Feature	Premium	Enhanced	Standard
Agent State Control. From the IPPA XML application, agents log in, log out, and make themselves ready or not ready.	Included.	Included.	Included.
<b>Call Control</b> . The Cisco Unified IP Phone provides call control.	Included.	Included.	Included.
<b>Dynamic Regrouping</b> . Change of agent association with a resource group is applied immediately.	Included.	Included.	Included.
<b>Real-Time Statistics</b> . Agents have access to real-time statistics for themselves and the queues to which they are associated.	Included.	Included.	Included.
<b>Reason Codes</b> . Agents can be configured to enter reason codes for Not Ready and Logout.	Included.	Included.	Included.
<b>Basic CTI</b> . IPPA allows for call data to be popped onto the IP Phone display upon call ringing.	Included.	Included.	Included.
<b>Telephony Support</b> . IPPA can be run from any phone that supports an XML client.	Included.	Included.	Included.
Hot Desking. Hot desking allows agents to log in using any Cisco Unified IP Phone that is registered with the same Cisco Unified Communications Manager cluster. Agents using Cisco IP Communicator can also use Extension Mobility. This capability allows multiple agents to use the same phone, but only one at a time. For example, different agents on different shifts may use the same workstation and phone. Extension Mobility brings a user-specific phone profile (including configured extensions for that user) to the phone being logged in from. After logging in to Cisco Unified Communications Manager with Extension Mobility, agents can log in to Cisco Unified CCX using CAD.	Included.	Included.	Included.

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Feature	Premium	Enhanced	Standard
<b>On-Demand Call Recording</b> . IPPA can be configured to allow clicking a single button to start and stop call recording on demand. The call recording contains only the portion of the call that occurs after the Start Record button is clicked. There are limits to how many simultaneous call recording sessions can be performed. Capacity and configuration limits are defined in Server capacities and limits, on page 129.	Included.	Included.	Not available.

#### **Cisco Supervisor Desktop features**

The following table describes the Cisco Supervisor Desktop features that are available in each Cisco Unified CCX package.

#### Table 13: Cisco Supervisor Desktop features available in each Cisco Unified CCX package

Feature	Premium	Enhanced	Standard
View / Change Agent State. Supervisor desktops allow supervisors to view the current state of all agents that are part of that supervisor's team. The supervisor desktop also allows supervisors to change an agent state (Ready, Not Ready, Logout).	Included.	Included.	Included.
<b>Real-Time Agent and Skill Statistics</b> . Supervisors can view statistics for all agents and queues that are associated with their team. See the <i>Cisco Supervisor Desktop User's Guide</i> for more details about statistics available through the CSD application.	Included.	Included.	Included.
<b>Integrated Text Messaging</b> . Supervisors can send text messages to one or more agents.	Included.	Included.	Included.
Marquee Messages. Supervisors can send a scrolling marquee (broadcast) message to all agents on their team.	Included.	Included.	Included.
<b>Silent Monitoring</b> . CSD allows a supervisor to silently monitor agent calls. It can be configured whether the agents are aware or unaware that they are being monitored.	Included.	Included.	Not available.

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Feature	Premium	Enhanced	Standard
<b>Barge-in</b> . CSD allows a supervisor to barge in on an agent call. The Barge-in feature brings the supervisor, the agent, and the caller into a three-way conference. This feature requires the supervisor to have the CAD application open and to be logged in as an agent. The agent is aware when the supervisor barges in. Barge-in is supported for agents using CAD with IP Communicator, CAD with IP Phone, or IPPA.	Included.	Included.	Not available.
<b>Intercept</b> . CSD allows a supervisor to intercept an agent call. The intercept feature transfers the call to the supervisor. This feature requires the supervisor to have the CAD application open and to be logged in as an agent. As the call releases from the agent desktop and phone, the agent is aware when an intercept occurs. The agent is then available to take another call. Intercept is supported for agents using CAD with IP Communicator, CAD with IP Phone, or IPPA.	Included.	Included.	Not available.
<b>On-Demand Agent Call Recording</b> . CSD allows a supervisor to dynamically start and stop recording agent calls on demand. A call recording only contains the portion of the call that occurs after the Start Record button is clicked.	Included.	Included.	Not available.
recording sessions can be performed. Capacity and configuration limits are defined in Server capacities and limits, on page 129.			
<b>Call Recording Playback and Exports</b> . The CSD Record Viewer application allows a supervisor to play back calls that were recorded within the last 7 days. Supervisors can sort the recorded call list by agent, DN, or date/time. Within Record Viewer, supervisors can tag selected recordings for a 30-day extended archiving, and supervisors can save selected recordings as a .wav format in a specified folder for permanent archiving.	Included.	Included.	Not available.
Automatic Failover and Re-login. Upon Cisco Unified CCX Engine failover, the CSD automatically fails over to the standby Cisco Unified CCX Engine so the supervisor does not have to log in again.	Included.	Included.	Not available.

Feature	Premium	Enhanced	Standard
<b>Workforce Management</b> . Workforce Management is a workforce scheduling solution in which the supervisor or any contact center manager can schedule their agents based on forecasted call volume and agent expertise, availability, and other factors.	Optional with Workforce Management user license.	Not available.	Not available.
<b>Quality Management</b> . Quality Management is a recording and quality management solution in which supervisors can choose to record all agent-customer calls, review the recordings, evaluate the agents, and suggest training classes accordingly.	Optional with Quality Management license.	Not available.	Not available.

# **Unified CCX Outbound Preview Dialer**

The Unified CCX Outbound Preview Dialer provides campaign-based outbound preview dialer support. Each inbound Premium seat provides one outbound seat. This means that, if you have 100 inbound seats, you can have up to 100 agents logged in and up to 100 agents handling outbound calls at the same time.

The following table lists the Outbound Preview Dialer availability in each Unified CCX package.

Table 14: Outbound Preview Dialer availability for each Unified CCX package

License	Premium	Enhanced	Standard
Outbound User	Included	Not available	Not available

The following table describes the Outbound Preview Dialer features that are available in each Unified CCX package.

Table 15: Outbound Preview Dialer Features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
General System Features with Server SoftwareNoteThese features are the same as for inbound voice with the exception of redundancy.			
Hardware configuration	Deploys and executes co-loaded on the same virtual machine or bare metal server as the inbound voice server.	Not available	Not available
Outbound Voice Seats			

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Premium	Enhanced	Standard
Unlimited (no software limitations)	Not available	Not available
100	Not available	Not available
42	Not available	Not available
Concurrent user	Not available	Not available
er Features		
15	Not available	Not available
10	Not available	Not available
10,000	Not available	Not available
een Pop Features with Cis	co Unified Contact Cente	r Express Seat License
Included	Not available	Not available
Using CAD task button	Not available	Not available
Using CAD task button	Not available	Not available
Integrated PC-Based Agent Desktop Features with Cisco Unified Contact Center Express Seat License		
Included	Not available	Not available
Included	Not available	Not available
	Premium         Unlimited (no software limitations)         100         100         42         Concurrent user         r Features         15         10         10,000         ren Pop Features with Cis         Included         Using CAD task button         Using CAD task button         Included         Included         Included         Included         Included	PremiumEnhancedUnlimited (no software limitations)Not available100Not available100Not available42Not availableConcurrent userNot availabler FeaturesIon15Not available10Not available10Not available10Not available10Not available10Not available10Not available10Not available10,000Not availableIncludedNot availableIncludedNot availableUsing CAD task buttonNot availableUsing CAD task buttonNot availableIncludedNot availableIncludedNot availableIncludedNot availableIncludedNot availableIncludedNot availableIncludedNot available

Feature	Premium	Enhanced	Standard
Ability for agent to accept, reject, or skip outbound contact. Agent can reclassify call to any one of many call results, such as Busy, Fax and Answering Machine.	Included	Not available	Not available
Ability for agent to mark a contact as "Do not call" for a particular campaign	Included	Not available	Not available
Integrated IP Phone-Bas License	ed Agent Desktop Feature	es with Cisco Unified Con	tact Center Express Seat
VoiceXML for ASR, TTS, and DTMF	Included	Not available	Not available
Integrated PC-Based Su License	pervisor Desktop Feature	s with Cisco Unified Cont	act Center Express Seat
View agent activity in real time	Included	Not available	Not available
Support for Cisco IP Communicator: No Cisco IP Phone required for agent phone	Included	Not available	Not available
Coaching: Provide agent guidance through chat	Included	Not available	Not available
Silent Monitor: Listen in on an agent's call	Included	Not available	Not available
Ability for supervisor to use Silent Monitor remotely from any phone through a dial-in IVR session	Included	Not available	Not available
Barge-In: Join in on an agent's conversation	Included	Not available	Not available
Intercept: Take a call from an agent	Included	Not available	Not available
Record: Capture and archive call audio	Included	Not available	Not available
Integrated Historical Re	porting with Cisco Unifie	d Contact Center Express	Seat License
Preview Outbound Campaign Summary report	Included	Not available	Not available

Feature	Premium	Enhanced	Standard
Preview Outbound Agent Detail Performance report	Included	Not available	Not available
Administration			
Campaign Management: Administrators can create and configure campaigns. They can specify a daily time range during which outbound calls are made and a set of CSQ to specify whose agents make the outbound calls, They can also specify and import a list of customer contacts to be called.	Included	Not available	Not available
Area Code Management: Administrators can add mappings from area-code to time zone for non-North American locations. This information is used to determine the customer contact current time before placing an outbound cal.	Included	Not available	Not available
Ability for administrator to mark "Do not call" contacts as "Do not call" across all campaigns	Included	Not available	Not available

## Web Chat

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Unified CCX Premium provides the facility for end users to initiate a chat session with the agent, from a website, typically the public website of the organization using Unified CCX. Unified CCX provides separate agent and supervisor web application, real-time, and historical reports for Chat.

The chat functionality requires Cisco SocialMiner to be deployed, where SocialMiner acts as the endpoint that hosts the widgets that end users and agents use during the chat session. SocialMiner accepts the chat request, communicates with Unified CCX to allocate an agent for the chat and then establishes the chat session between agent and end user.

The Unified CCX queues the chat requests from SocialMiner, allocates agents, and monitors the chat session. Further, it facilitates agent state changes and provides the real-time and historical reports for the Chat.

The availability of Inbound Web Chat functionality for various Unified CCX packages is given here:

Contact Channel	Premium	Enhanced	Standard
Inbound Web Chat	Yes	No	No

### Web Chat terminologies

#### **Chat Widget**

The chat widget is the UI control that appears for the end user to initiate a chat session. This widget typically includes fields to input details about the user and has the user select a problem statement.

The Unified CCX Application Administrator web interface allows creation of the widget source code, which can then be used to create a web page and host the same on a website.

#### **Problem Statement**

Problem statements are included in the chat widget. One problem statement is selected by the end user, indicating the reason why the user is initiating a chat session. The problem statement the user chooses determines the service queue to which the request will be queued and thus the agent who will respond to the chat request.

#### Chat Contact Service Queue (CSQ)

Agent allocation requests from SocialMiner for new chat contacts are routed to a Chat CSQ. The CSQ to which requests are routed is determined by the problem statement that end user chose while submitting the chat request from the widget.

The Cisco Unified CCX Administrator must create chat CSQs and map skills to the CSQ so that agents are allocated to the CSQ. Further, an agent is chosen for chat only if the agent is logged in to the Agent Chat web application and the agent's chat state is Ready.

### Web Chat packaged components

#### Agent web chat application

The agent web chat application is a thin client agent desktop that can be accessed from the Cisco Agent Desktop integrated browser or a standalone browser. Agents use this interface to log in to Unified CCX chat facility and make themselves ready to accept chat requests.

All inbound chat requests, when routed to the agent, show up in this agent desktop, and the agent can accept it or let it time out. After the agent accepts the chat request, the agent can chat with the end user on a separate chat reply widget that gets loaded on the agent desktop.

#### Supervisor web chat application

The supervisor web chat application is the interface that chat supervisors use to view the Chat CSQ details and agent chat summary report for their teams. This web application is accessed from the Cisco Supervisor Desktop integrated browser or a standalone browser.

#### Chat real-time and historical reports

Unified CCX provides chat-specific real-time reports and historical reports which can be accessed using the respective clients.

For historical reports, the chat reports are available using the historical reporting client (HRC) as well as the Cisco Unified Intelligence Center reporting application, packaged with Unified CCX.

For supervisors, real time reports on the Chat CSQs and the chat-specific team summary report are available in the Chat supervisor desktop web application.

#### **Browser compatibility**

The following table outlines the supported browsers for accessing chat agent and supervisor web applications.

	Supported browsers
Cisco Agent Desktop	Microsoft Internet Explorer v8.0
Cisco Supervisor Desktop	Microsoft Internet Explorer v8.0



If web chat is executed from the Cisco Agent Desktop or Cisco Supervisor Desktop, the agent PC must have Microsoft Internet Explorer v8.0.

### Web Chat contact allocation and distribution

The following table describes the Web Chat contact allocation and distribution features that are available in each Unified CCX package.

Table 16: Web Chat contact allocation and distribution features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
Conditional routing–Web Chat supports routing based on a problem statement chosen by the customer	Included	Not available	Not available
Agent selection–Web Chat supports the longest available and most skilled agent selection algorithm	Included	Not available	Not available
Customizable queuing messages–Web Chat supports customizable contact waiting message	Included	Not available	Not available
Auto chat reject–If no agent is available, web chat rejects chat request	Included	Not available	Not available

Feature	Premium	Enhanced	Standard
Chat timeouts–Web Chat supports various session timeouts for chat inactivity and maximum wait period	Included	Not available	Not available
Rerouting on chat no answer–If the allocated agent does not accept chat within the allowed time limit, the contact is re-queued and re-routed	Included	Not available	Not available
Chat transcript–Web Chat supports storage and retrieval of chat transcripts through Cisco SocialMiner	Included	Not available	Not available
Agent skill and competency based routing–You can configure 50 skills, each with up to 10 different competency levels. You can configure Contact Service Queues (also known as skill groups) as requiring up to 50 skills, each with up to 10 minimum skill competency levels. The web chat routing logic then matches the contact problem statement with agent skills to find the optimum match using one of the following agent selection criteria: • Longest available • Most skilled	Included	Not available	Not available
High Availability (HA) failover–With HA failure of the active server can be detected and the chat subsystem can automatically failover from the active to the standby server	Optional with HA License	Not available	Not available
Dynamic reskilling by administrator–Changes to CSQ skills and competencies and agent skills and competencies are applied immediately	Included	Not available	Not available
Agent routing–Unified CCX routing applications can select a specific agent if that agent is in the Ready state(queuing on a per agent basis is not supported)	Included	Not available	Not available

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Feature	Premium	Enhanced	Standard
Agent and supervisor web-based desktop–Web Chat provides web-based desktops for agents and supervisors. It is integrated inside Cisco Agent Desktop for the agent desktop and the Cisco Supervisor Desktop for the supervisor desktop through the browser control and can be launched from the Cisco Agent Desktop or the Cisco Supervisor Desktop respectively. You can also launch it from standalone browsers	Included	Not available	Not available
Real time and historical reports	Included	Not available	Not available
Supervisory reports-Team report for CSQ and agents	Included	Not available	Not available
Integrated Web Chat General System Featu Agent Desktop	res with Cisco Uni	fied Contact Center 1	Express Cisco
Multiple skills per chat agent	Included	Not available	Not available
Blended voice and chat agents	Included and configurable	Not available	Not available
Dedicated chat agents	Included and configurable	Not available	Not available
Separate voice and chat state model	Included	Not available	Not available
Web Chat desktop accessible on integrated browser in Cisco Agent Desktop and Cisco Supervisor Desktop	Included	Not available	Not available
Web Chat desktop accessible on stand-alone browser for agents and supervisors	Included	Not available	Not available
Maximum number of simultaneous Web Chat session depends on server class - refer Appendix B	50	Not available	Not available

#### Table 17: Voicemail Integration features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
Voicemail Integration			
Voice messaging interface	Optional (Cisco Unity messaging or Cisco Unity Express)	Optional (Cisco Unity messaging or Cisco Unity Express)	Optional (Cisco Unity messaging or Cisco Unity Express)

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Feature	Premium	Enhanced	Standard
Maximum number of voice mailboxes supported	Please consult product documentation	Please consult product documentation	Please consult product documentation
Maximum number of voice storage hours	Unlimited (storage limitation hard disk-dependent)	Unlimited (storage limitation hard disk-dependent)	Unlimited (storage limitation hard disk-dependent)
Support for other vendor voicemail	Yes (through call transfer to voicemail system)	Yes (through call transfer to voicemail system)	Yes (through call transfer to voicemail system)

# Table 18: Integration with Cisco IM and Presence Server with Unified CCX Seat License features available in each Unified CCX package

Feature	Premium	Enhanced	Standard
Integration with Cisco IM and Presence Serv License	ver with Cisco Unifi	ed Contact Center I	Express Seat
Support for Cisco IM and Presence Server Releases 9.0 and 8.5	Included	Included	Included
Support for Cisco IM and Presence Server fault tolerance	Included	Included	Included
Support for intercluster and foreign domains as supported by Cisco IM and Presence Server	Included	Included	Included
Contact ("buddy") lists under administrator control; contact lists assigned to workflow groups; agents have visibility to appropriate contacts only	Included	Included	Included
Persistent, independent presence popup window continuously updated with agent state and subject-matter-expert presence state	Included	Included	Not available with Cisco Unified IP Phone Agent (Agent may use non integrated Cisco IP Phone Messenger only)

# **Quality Management and Compliance Recording**

Quality Management (QM) supports the recording and archiving of every call between agents and customers. Managers and supervisors can evaluate a customer contact by listening to the recording and filling out an electronic evaluation form. They can also monitor and analyze the performance of groups, teams, and individual agents by looking at summary and detail reports of those evaluations. Supervisors and managers can then use these results to suggest training classes for the agents to take.

The Quality Management product also supports Compliance Recording by enabling 100% audio recording of calls for selected teams of agent or knowledge workers. A knowledge worker is defined as any Cisco IP telephony user of a phone supported through Cisco Unified Communications Manager. In addition to 100% call recording, QM also provides a compliance recording call search, playback, and export functions within the QM desktop application.

Each user license is for a named (not concurrent) user. For example, a contact center with three shifts of 100 agents and supervisors needs 300 named user licenses. Each person in a shift of 100 users uses the license associated with them during their shift.

Advanced QM is similar to QM except that it supports screen recording. Screen recording allows a supervisor to see what the agent was doing on the desktop at the time the agent handled a call.

Compliance Recording (CR) enables audio recording of knowledge worker's phone calls according to recording policies established within QM Administrator Desktop within an archive or quality workflow. Compliance recording users can also use the QM desktop application to search and play their own recordings. A QM system with only Compliance recording licenses (no QM or AQM) must be deployed with a Cisco Unified CCX system in the configuration. In addition, CR recording licenses can be assigned to supervisors, managers or archive user roles, thus enabling CR licensed users to access a wider scope of calls within the QM desktop application.

The following table lists the Quality Management licensed component.

License	Premium	Enhanced	Standard
Compliance Recording	Available.	Available.	Available.
Quality Management Configured User	Available.	Not available.	Not available
Advanced QM	Available.	Not available.	Not available.

#### Table 19: Quality Management licensed component

# Note

Advanced QM is available starting with Cisco Unified CCX 5.0(2).

Compliance Recording is available starting with Cisco Unified CCX 7.0(1) SR4.

Quality Management is licensed on a per named user basis and provides all the server software required with the exception of the Windows operating system (Windows 2008) and database software (Microsoft SQL 2005) for the QM server, which must be purchased off the shelf.

The following table describes the features available in each Quality Management package.

Feature	Compliance Recording	QM	Advanced QM
Endpoint Recording and Background Software Services	Available.	Available.	Available.
Server-based Recording (via SPAN port) for Thin Client Environments	Available.	Available.	Available.
Secure Login, User Role-Based Model for Access Scope	Available.	Available.	Available.
Agent, Supervisor, Manager, Role-based Dashboards	Not available.	Available.	Available.
Users Synchronized with CCX or Administered directly in QM	Not available.	Available.	Available.
Evaluator/Agent Comment Threads	Not available.	Available.	Available.
Compressed, Encrypted Recordings Transfer during Off-peak Hours	Available.	Available.	Available.
Immediate Upload of Archival Recordings from Recording Service	Available.	Available.	Available.
Append Custom Metadata to Recordings for Enhanced Search	Available.	Available.	Available.
On-demand Call Tagging	Available.	Available.	Available.
Partial Call Recording	Available.	Available.	Available.
Monitoring and Notification Service (Serviceability)	Available.	Available.	Available.
Quality Evaluation Approval Process	Not available.	Available.	Available.
Screen Recording	Not available.	Not available.	Available.

#### Table 20: Features available in each Quality Management package

# **Workforce Management**

Cisco Workforce Management allows supervisors and contact center managers to develop schedules for their agents and manage key performance indicators and real-time adherence. Managers can create and manage schedules for an unlimited number of sites, manage scheduling for offices spread out in different time zones, and schedule alternative media sources seamlessly, including email.

Each user license is for a configured (not concurrent) user. For example, a contact center with three shifts of 100 agents and supervisors needs 300 configured user licenses. Each person in a shift of 100 users uses the license associated with them during their shift.

The following table lists the Workforce Management licensed component.

Table 21: Workforce Management licensed component

License	Premium	Enhanced	Standard
Workforce Management Configured User	Available.	Not available.	Not available.

The following table describes the Workforce Management features that are available in each Cisco Unified CCX package.

Table 22: Workforce Management features available in each Cisco Unified CCX package

Feature	Premium	Enhanced	Standard
Forecasting	Available.	Not available.	Not available.
2-step Scheduling	Available.	Not available.	Not available.
Multimedia Scheduling	Available.	Not available.	Not available.
Intraday Management	Available.	Not available.	Not available.
KPIs and Reporting	Available.	Not available.	Not available.
Alerts	Available.	Not available.	Not available.
Reporting	Available.	Not available.	Not available.
Web Interface	Available.	Not available.	Not available.
Desktop Integration	Available.	Not available.	Not available.



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Cisco Unified Contact Center Express Solution Reference Network Design Release 9.0(2)



### CHAPTER

# **Cisco Unified Contact Center Express solution architecture for Cisco Unified Communications Manager**

Cisco Unified Contact Center Express (Unified CCX) is a solution composed of many components. These components include not just the Unified CCX software and the servers upon which that software runs, but also include Cisco Unified Communications Manager (Unified CM), Cisco routers, Cisco data switches, Cisco Voice Gateways, and Cisco IP Phones.

Unified CCX software is part of the Unified CCX software platform. Unified CCX provides the software capabilities for not just Unified CCX, but also Cisco Unified IP IVR.

Cisco Unified IP IVR is primarily used for Cisco Unified Contact Center Enterprise (Unified CCE) deployments.

A single physical server can run only one of the Unified CCX packages, either Unified CCX or Cisco Unified IP IVR.

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# **Unified CCX Terminology**

The Unified CM Telephony subsystem provides a mechanism for Unified CCX to communicate with Unified CM for call processing. Within Unified CM, an application user with CTI permissions is defined and that user ID is used by the Unified CM Telephony subsystem to log into Unified CM through JTAPI messaging. This user ID is referred to as the Unified CM Telephony user ID. This login process is what allows Unified CCX to begin communications with Unified CM and offer services like routing control.

When a caller dials the number of an extension configured on an IP Phone, Unified CM is capable of setting up that call without the aid of Unified CCX. However, sometimes callers dial generic numbers that are not associated with any particular phone. In those situations, Unified CM needs a mechanism to request routing instruction from some other application. One such mechanism is a route request message and one such application that can provide routing control is Unified CCX. In order for Unified CM to request routing from another application for a particular dialed number, there must be a CTI Route Point defined within Unified CM for that dialed number. In Unified CCX, this CTI Route Point is defined in the Cisco Unified CM Telephony Trigger. Within Unified CM the CTI Route Point is also associated with the user (application) that can provide routing control. This Unified CM configuration is what enables Unified CM to ask Unified CCX how to route a call. The creation of a CTI Route Point, the association of that CTI Route Point to the dialed number, and the user association of that CTI Route Point to the Cisco Unified CM Telephony user responsible for routing control are done automatically by the Unified CCX Server as part of the creation of a Cisco Unified CM Telephony trigger within Unified CCX.

The Unified CM Telephony trigger also specifies what CTI port group and Unified CCX application to use for a specified dialed number. As discussed in Chapter 1, Unified CCX provides IVR functionality. A Unified CCX system can provide up to 400 logical IVR ports (also called CTI Ports). The CTI ports within Unified CCX are logical VoIP endpoints where calls can be terminated—very similar to a softphone. The difference is that these softphones are controlled by an application that has the ability to encode .wav files from disk into one of the supported VoIP formats (G.711 or G.729) and then stream those VoIP packets out the Ethernet interface on the Unified CCX Server to the calling VoIP endpoint (IP Phone or Voice Gateway port). Each CTI Port must be defined within Unified CM as a device with a type of "CTI Port." Each CTI Port device is assigned a unique directory number (extension), just like a phone. This allows Unified CM to set up calls to these devices and endpoints. The creation of the CTI Ports on Cisco Unified CM is done automatically by the Unified CCX server when a group of CTI Ports (Call Control Group) is defined.

When a caller dials a dialed number that is associated with a CTI Route Point, Unified CM sends a route request to Unified CCX which has the dialed number associated with a group of CTI Ports. The Unified CCX software selects an available CTI Port from that CTI Port Group and returns the extension of that CTI Port to Unified CM. Unified CM then attempts to set up a call to that extension (CTI Port) by sending a ring message to the Unified CCX server. When the Unified CCX server gets the ring message for a particular CTI Port for a particular dialed number, the Unified CCX server begins executing the script associated with that trigger's application. The first step in a script is typically an Accept step. The Accept step in the application will answer the call by sending a message to Unified CM to establish an RTP stream between the selected CTI Port and the Voice Gateway (VG) port (or calling IP Phone). The application can then prompt callers for input and provide the caller self service. When either the caller hangs up or the application executes a Terminate step, Unified CM tears down the call.

Within the application, it is also possible to route or transfer the call to an available agent. If no agents are available, queuing treatment is provided to the caller. Agents in Unified CCX are called resources. There is a subsystem within Unified CCX called the Resource Manager which is responsible for monitoring the state of agents and selecting agents based upon the agent skills and queue skills required. Queues in Unified CCX are called COX are called Contact Service Queues (CSQ). Agents use Cisco Agent Desktop (CAD) or IP Phone Agent (IPPA) state controls to log in and make themselves ready. The Resource Manager is updated upon every agent state change.

Administrators use the Unified CCX Administration web interface to configure agent skills and competencies. Unified CCX Administration is also used to define CSQ skill and competency requirements and the agent selection criteria to be used for that CSQ. Applications use the Select Resource step to specify the CSQ into which the caller shall be placed. The Resource Manager subsystem is queried by the application to select the appropriate agent based upon the agent selection criteria. If no agent is available, the Select Resource step has a queued branch where queuing treatment is defined. When the Resource Manager finds an available and appropriately skilled agent, it will reserve that agent and then request for that call to be transferred to the agent's IP Phone (using JTAPI messaging to Unified CM). After the call has been transferred to and answered by the agent, the CTI Port being used for that call is released.

An agent must be configured in Unified CM as a user. This adds a record to the Unified CM user table. The Unified CM user table can be synchronized with LDAP directories like Microsoft's Active Directory. Details on LDAP integration can be found in Appendix C. Unified CM supports usage of one of the following LDAP directory servers—DC Directory (default), Netscape IPlanet, and Microsoft Active Directory. In Unified CM, an agent's phone and directory number are associated with the agent's Unified CM user name and the directory number is also marked as a Unified CCX extension. This allows Unified CCX to know that this Unified CM user is an agent, and the user then shows up in the resource list in Unified CCX Administration.

In Unified CM, agent phones also are associated with another application user with CTI permissions called the Resource Manager user. This user is referred to as the RmCm Provider. The RmCm Provider allows Unified CCX to monitor the state of the phone. For example, when an agent goes off hook to make an outbound call using the Unified CCX extension, the Unified CCX application needs to be notified so that the Resource Manager can update its agent state machine to show that agent being on an outbound call. The RmCm Provider also allows Unified CCX to control the state of the phone. For example, when an agent clicks Answer on CAD, this triggers Unified CCX to send the RmCm Provider signal to Cisco Unified CM to have that agent's phone go off hook.

If you use Extension Mobility (EM) together with Unified CM 8.0 or later, associate the device profile, instead of the device, with the Resource Manager application user. Irrespective of the device profile you associate the application user with, set the Intra-Cluster Multiple Login Behavior Extension Mobility Service parameter in Unified CM to Auto Logout.

This action helps to overcome design limitations in CTI/JTAPI noticed in the following scenarios, which occur when the Intra-Cluster Multiple Login Behavior Extension Mobility Service parameter in Unified CM is set to **Multiple Logins Allowed**:

- 1 Agent logs in to EM on a Cisco IP Communicator (CIPC) and also logged in to Cisco Agent Desktop (CAD).
- 2 If CIPC unregisters from Unified CM while the agent is still logged in to EM, it does not reregister. This failure to register may happen when the agent closes CIPC without logging out of EM or when the network is severed.
- **3** Agent logs into EM from a different device.
- 4 When the agent attempts to login to CAD, the system displays the error message: Login failed due to a configuration error with your phone and JTAPI or Unified CM. Contact your administrator.

# **Unified CCX Call Processing**

The figure below and the description that follows explain a typical Unified CCX call flow:



#### Figure 1: Unified CCX call flow

- 1 Call arrives at Voice Gateway (VG).
- 2 Voice Gateway asks Unified CM how to route the call (using H.323 or MGCP).
- 3 Unified CM has the dialed number (DN) associated with a CTI Route Point that is associated with a Unified CM Telephony user for Unified CCX. This triggers a JTAPI route request to be sent to Unified CCX.
- 4 Based upon the DN, which is mapped to a Unified CM Telephony trigger, the Cisco Unified CCX server selects an available CTI port and replies back to Unified CM with the extension of the CTI Port to send this call to. Unified CM then sends a call setup (ring) message to Unified CCX, which then maps the DN to the appropriate Unified CCX script. The Accept step (typically the first step) in the script will answer

the call and trigger Unified CM to establish an RTP stream between the Voice Gateway port and the selected CTI Port. Then the script prompts the caller for an account number and does a database lookup. Then the caller is prompted to select from a menu of choices and is provided self-service treatment. If the user presses 0, we go to the transfer to agent section of the script. In this scenario, we are assuming no appropriately skilled agents are available, so the script executes the queued loop logic until an appropriately skilled agent becomes available.

- 5 An appropriately skilled agent becomes available as a result of logging in and going ready or completing a previous call.
- 6 The agent is selected or reserved by the Unified CCX server and this triggers the call to be transferred to the agent phone and subsequently causes the agent phone to ring (using Unified CM signaling). In addition, the Unified CCX server delivers a screen pop to the selected agent desktop and enables the answer button on the agent desktop.
- 7 The agent answers the call, which causes Unified CCX to complete the transfer from the CTI Port to the agent phone and Unified CM to initiate the establishment of an RTP VoIP data stream between the agent's phone and the VG port. The transfer releases the CTI Port on the Unified CCX server. But the Unified CCX software continues to monitor the agent state for the duration of that call. When the agent or caller releases, a Contact Call Detail Record (CCDR) is written to the CCDR table in the database, and the agent's state is updated to reflect the agent's new state (Work, Ready, or Not ready).

### **Unified CCX Web Chat**

The Web Chat feature of the Unified CCX is a solution comprising many components. These components include the Unified CCX software, the servers upon which that software runs, Cisco SocialMiner, the customer's website, proxies, firewalls, Cisco Agent Desktop, and Cisco Supervisor Desktop.

A single physical Cisco SocialMiner server can run only on one Unified CCX deployment.



#### Figure 2: Unified CCX Web Chat flow

The preceding figure and the following description explain a typical Unified CCX Web Chat flow:

1 Configuration: This is a configuration step and is a precursor to the Web Chat flow depicted in the figure. The Unified CCX administrator configures the chat parameters, making sure that the administrator has a SocialMiner, chat CSQ, and a chat widget with a problem statement defined and configured. The Unified CCX administrator also reviews and verifies other Web Chat configuration parameters.

The Unified CCX administrator preconfigures the customer widget form fields using the Unified CCX Administration in the chat widget creation step. The configuration process generates the skeletal web code that the administrator passes over to the web developer for the customer website. The web developer formats the chat widget code and embeds it into an HTML page on the customer website.

- 2 Web Chat request: A customer logs in to the customer (CU) website and initiates a Web Chat request by filling in the customer widget form and selecting an appropriate problem statement.
- **3** SocialMiner receives the request: SocialMiner receives the Web Chat request and opens the chat UI at the customer website. Also, SocialMiner sends the new contact notification to the Unified CCX.
- 4 **Contact queuing:** After receiving the contact notification from SocialMiner, Unified CCX matches the problem statement chosen by the contact, and queues\* the contact in a specific service queue.

\*An alternate flow is a case where the Unified CCX already has an agent waiting for a contact in that queue and the contact is immediately routed to the available agent.

- 5 Agent login: A Web Chat agent belonging to the service queue on which the contact was queued logs in from the Web Chat Agent desktop.
- **6 Agent becomes ready:** An agent sends a request to the Unified CCX to make the agent ready to chat. This request triggers the Unified CCX to start an allocation process and find the appropriate contact for the agent from the service queues. The CSQ configuration decides the allocation logic (either most skilled or longest available).

After a contact is identified for the agent, the contact is allocated and the agent is moved to the Busy state and is prompted to accept the contact through a dialog event.

- 7 Agent accepts: An agent responds to the dialog event. If the agent does not accept during the configured accept time out, the contact is re-queued and is ready to be allocated to the other agent. After receiving a confirmation from the Unified CCX for the accept request, the Cisco Agent Desktop launches the chat reply template.
- 8 Chat session creation: When SocialMiner gets the request to open the chat reply template from the Cisco Agent Desktop, the SocialMiner serves the template page to the Cisco Agent Desktop and connects the agent to the chat session.
- 9 Chat session complete: When an agent or a customer ends the chat session, SocialMiner sends the event back to the Unified CCX to indicate the session ended.
- 10 Unified CCX receives session end message: After receiving the message, the Unified CCX updates the session records and moves the agent back to the Ready state.

### **Unified CCX System Management**

Several applications are available for administering and monitoring a Unified CCX deployment. The primary tool an administrator uses to manage a Unified CCX deployment is the Unified CCX Administration web interface. Unified CCX Administration is a web-based application accessed using a web browser. Using Unified CCX Administration, administrators perform tasks such as uploading applications, uploading prompts,

mapping applications to dialed numbers, configuring agent skills and CSQs, starting and stopping Unified CCX subsystems, and monitoring overall server status.

In addition to Unified CCX Administration, an administrator uses the Unified CCX Editor. The Unified CCX Editor is a client-based utility that produces .aef files which the administrator uploads using Unified CCX Administration. The Unified CCX Editor can be downloaded and installed from Unified CCX Administration onto other workstations.

The Cisco Desktop Administrator (CDA) is another client-based utility that can be downloaded and installed from Unified CCX Administration. CDA allows an administrator to perform tasks such as configuring the agent interface, setting up reason codes, and defining agent workflows and keystroke macros.

Another client utility to monitor a Unified CCX deployment is the Historical Reports client application. You download and install the Historical Reports client from Unified CCX Administration. There are 34 historical reporting templates available. Taken in combination with filtering parameters and chart or no-chart options, there are 282 possible reports available. Some of them provide integrated information about voice and multichannel activities. Custom reporting templates can be created with Crystal Reports development toolkit. Within Unified CCX Administration, there are also 11 browser-based real-time reports. The CSD and CAD both also provide reports to allow real-time monitoring of a Unified CCX deployment. Both CSD and CAD are downloaded and installed from Unified CCX Administration.

For additional information about Unified CCX Administration, see the *Cisco Unified CCX Administration Guide*.

### Unified CCX Engine and Database components

Unified CCX has four core software components:

- Unified CCX Engine
- Database
- Monitoring
- Recording

Every Unified CCX deployment must have a Unified CCX Engine component and a Database component. The Monitoring and Recording components are optional and are discussed in the next section of this chapter. With Unified CCX, only one instance of each component can be installed, and all components must be on the same server.

The Unified CCX Engine (and closely related subsystems) is the component that provides functions such as the following:

- JTAPI communications with Unified CM
- · Execution of scripts
- · Encoding and streaming of .wav files for all CTI Ports defined
- · Communications with CAD for agent state control, call control, and screen pop
- · Agent monitoring and selection
- Unified CCX Administration web interface.

Simply put, the Unified CCX Engine component provides the core ACD, IVR, and CTI services. The other components—Database, Monitoring, and Recording—are auxiliary software components.

The Database component is required for any Unified CCX deployment and manages access to the database. The Unified CCX Database contains four data stores. They are as follows:

- Configuration data store
- Repository data store
- Agent data store
- · Historical data store

The configuration data store contains Unified CCX configuration information such as resources (agents), skills, resource groups, teams, and CSQ information. The repository data store contains user prompts, grammars, and documents. The agent data store contains agent logs, statistics, and pointers to the recording files. The historical data store contains Contact Call Detail Records (CCDRs).

## **Unified CCX Monitoring and Recording components**

The previous section introduced the Unified CCX Engine and Database components. This section introduces the Monitoring and the Recording components, which are optional.

Unified CCX Enhanced and Premium allow a supervisor to silently monitor agents. Unified CCX Enhanced and Premium also allow agent calls to be recorded. Agent call recording can be triggered in the following ways:

- · Supervisor clicks the Record button on CSD for a specified agent call
- Agent clicks the Record button on CAD or IPPA
- Workflow configuration automatically triggers complete call recording on certain types of calls for agents using CAD

In order to use the silent monitoring or recording features, it requires access to the RTP (Real-Time Protocol) packet streams. Silent monitoring and recording will work with either G.711 or G.729 RTP streams, and a mixture of agents using G.711 and G.729 phones is supported. However, silent monitoring and recording will not work with encrypted media streams. Unified CCX provides two mechanisms for access to the RTP packet stream—SPAN port monitoring and desktop monitoring.

SPAN port monitoring requires the Unified CCX server to be connected to the SPAN port of a VLAN on a Catalyst switch where voice traffic from the agent phones can be captured. The SPAN port is like a broadcast port for all data traffic (including voice RTP streams) traversing a VLAN segment. When a supervisor clicks the Silent Monitor button on the CSD, it signals to the Monitoring component to forward a copy of the captured RTP streams for the selected agent to the requesting CSD. The CSD then plays the packets through the sound card on the CSD workstation. No IP Phone (or any type of phone) is involved when the silent monitoring stream is being played using CSD. The CSD can reside anywhere on the Cisco Unified Communications network, but no routing device should exist between agent phones and the Catalyst switch where Unified CCX server is connected for SPAN port monitoring. The Catalyst switch RSPAN feature allows a VLAN to extend across multiple Catalyst switches. Please see *Appendix B* for more detail on SPAN port monitoring design.



For any deployment in which an agent desktop is the IPPA or any deployment in which the desktop is a CAD and the associated phone does not support desktop monitoring, monitoring and recording must be based on SPAN port monitoring. For a list of phones that support desktop monitoring, see *Cisco Unified CCX Software and Hardware Compatibility Guide*, available at: http://www.cisco.com/en/US/products/ sw/custcosw/ps1846/products\_device\_support\_tables\_list.html

Desktop monitoring provides a mechanism for the CAD application to obtain a copy of the RTP packet streams directly from the phone and therefore removes the need for a Monitoring component connected to the SPAN port on the Catalyst switch. A Cisco phone supporting desktop monitoring is required and the agent workstation running CAD must be connected to the data port on the back of the agent phone. The Cisco IP Communicator also supports using desktop monitoring for silent monitoring and recording.



For all deployments in which agents use CAD and agent phones support desktop monitoring, use desktop monitoring instead of SPAN port monitoring.

When a supervisor clicks the Silent Monitor button on the CSD for an agent using desktop monitoring, the RTP streams are sent directly from CAD to CSD, and the SPAN port monitoring component is not required. However, for silent monitoring to occur with desktop monitoring, at least one VoIP Monitor service must be running. CAD uses this service to retrieve the MAC address of the agent phone from the Unified CM. Appendix C of the *Cisco CAD Installation Guide* provides a quick and simple test to determine if a workstation NIC will operate properly with the desktop-monitoring feature of CAD.



CAD recording is not designed for use as a compliance recording solution. The functionality is best deployed to facilitate on-demand recording or recording on a filtered list of calls only. Users must address requirements to record all calls by implementing a compliance recording solution.

CAD does not support 802.1Q VLAN-tagged traffic with SPAN based monitoring.

A Unified CCX deployment can have a mixture of some agents using desktop monitoring and some agents using SPAN port monitoring.

If an agent call requires recording, a copy of the RTP packet streams is sent to the Recording Server process. If the agent being recorded is using the desktop monitoring, CAD sends the RTP streams to the Recording component. If the agent being recorded is using SPAN port monitoring, the Monitoring component sends the RTP streams to the Recording component. Agents can be silently monitored and recorded at the same time. When that occurs in a desktop monitoring environment, CAD sends one copy of the RTP packet streams to the requesting CSD and one copy of the RTP packet streams to the Recording component.

A normal G.7xx VoIP RTP call has two RTP streams (one representing what the agent is hearing and one representing what the agent is saying). These two streams flow in opposite directions across the network. When an agent call is being silent monitored or recorded, both of those RTP streams must be sent. For example, if a supervisor is silent monitoring an agent, two G.7xx RTP streams will be sent from either CAD (desktop monitoring) or the Monitoring component to the CSD. If an agent call is being recorded, two G.7xx RTP streams are sent to the Recording component. If the agent is being silent monitored and recorded, four RTP streams are being sent. This is in addition to the two bidirectional RTP streams of the actual call.

The monitoring and recording packet streams are true G.7xx RTP streams and therefore these packets are tagged like any other RTP stream to ensure that they are delivered with appropriate priority and minimal latency. Chapter 6 further discusses bandwidth requirements.

The agent call recordings are stored on the hard drive of the Unified CCX server with agent data store locator records pointing to the actual recording files. The call recordings in Unified CCX are stored in a raw format that can only be played using the CSD Record Viewer. The CSD Record Viewer shows 7 days' worth of call recording as well as those tagged for 30-day extended archiving. The CSD Record Viewer also provides the supervisor the option to save selected individual recordings into a .wav format in a specified folder.

The amount of disk storage allocated for recordings on a single-server non-high-availability deployment of Unified CCX is 2.6 GB. On a two-server high-availability deployment of Unified CCX, the recordings are alternated between the two servers in a round-robin fashion to provide load balancing and redundancy. Hence the amount of disk storage allocated on each server is 2.6 GB for a combined solution storage of 5.2 GB.

The recording capability of Unified CCX is not intended for use as a permanent recording archival solution. However, an export utility is also available to bulk export all recordings into a .wav format. The export utility has no ability to specify selected recordings and will export all recordings on the Unified CCX server. System administrators can build their own customized command macros or process to perform regular (at least weekly) exporting of the recordings for permanent archival of agent call recordings.

When a supervisor is playing back or saving a recording using the CSD Record Viewer application, a recording resource is used and therefore counts against the maximum simultaneous call recording capacity for the duration of that recording playback. Maximum simultaneous call recording and playback capacity depends on the server size. The *Cisco Unified CCX Data Sheet* can help you choose an appropriately sized server for the amount of recording required.

Because IPPA does not include an agent using CAD, IPPA requires a SPAN port Monitor component on the local VLAN segment for silent monitoring or recording. Also the Cisco Unified IP Phones 7902, 7905, 7912, and 7920 require a SPAN port Monitor component because there are either no data ports on these phones or these data ports are not compatible with desktop monitoring. IPPA also cannot be configured to have calls automatically recorded.

Unified CCX Premium is required for remote supervisory monitoring. Remote supervisory monitoring provides a mechanism to silent monitor calls using an IP Phone or PSTN phone. This form of silent monitoring does not require a CSD or any data network connectivity and is ideally suited for management from outsourcer customers of a call center service provider. Agents are unaware when they are being silent monitored using remote supervisory monitoring. A remote supervisor is configured with a numeric user ID and password and also with the CSQs and agents that the remote supervisor is allowed to silent monitor in this fashion. The remote supervisor then dials a specific number that invokes a Unified CCX application. The application begins by prompting the supervisor for the user ID and password. After the remote supervisor is authenticated, the remote supervisor is prompted to choose to silent monitor calls for a specific agent or for a specific CSQ. Then the Unified CCX application requests a copy of the RTP streams for the selected types of calls, and the Unified CCX application and CTI Port relays those packets to the remote supervisor's phone. Remote supervisory monitoring works with both SPAN port monitoring and desktop monitoring. However, remote supervisory monitoring only works with a Unified CCX Engine and CTI Ports and agent phones using G.711 encoding. Remote supervisory monitoring also places an additional performance impact on the Unified CCX server Unified CCX Engine. This activity is reflected in the Cisco Unified Communications Sizing Tool. For remote monitoring to work, the agent desktop must be daisy chained to the agent phone .

# **Cisco Unified Wireless IP Phone 7920 IP Phone support**

Unified CCX supports use of the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone by agents. Agents can be using CAD with the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone, or agents can use the IPPA interface with the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone. When planning to use the Cisco Unified Wireless IP Phone 7920 for agents with Unified CCX, the following considerations need to be taken into account:

• If a logged-in agent using a Cisco Unified Wireless IP Phone 7920 Wireless IP Phone roams outside Wireless Access Point (WAP) range for greater than 60 seconds (possibly slightly longer depending upon Unified CM time-out), Unified CM unregisters the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone (and ends any call in progress if the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone was off hook). This generates a device unregistered JTAPI event to be sent to Unified CCX, which causes the Unified CCX agent state to change to "not ready". When agents roam between WAPs, the hand off occurs within a second or two (depending upon wireless LAN design, encryption, and authentication techniques used). Therefore, roaming between WAPs is supported. If an agent is using the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone with CAD, but is away from the CAD workstation, there is no way for the agent to know that the agent state is "not ready" and there is no way for the agent to change the agent state to "ready". If the agent is using the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone with IPPA, then the agent can check the agent state via IPPA and can change the agent state to "ready" via IPPA. Therefore, if agents anticipate roaming outside WAP range for greater than 60 seconds, then it is recommended that they log in to Unified CCX via IPPA for that login session. If agents anticipate working at their desk or not roaming outside WAP range, then it is okay for them to log in to Unified CCX via CAD for that login session.

Due to the mobile nature of the 7920 phone, there are certain conditions under which monitoring and/or recording calls may result in gaps in the voice:

• Agent-to-agent conversations when both agents are using the same wireless access point

• When an agent roams from one monitoring domain to another

Deployment of 7920 wireless IP Phone in a Cisco Unified Wireless Meshed Network based on 802.11n and 802.11i is highly recommended to eliminate session time-outs during roaming between WAPs.

- The Cisco Unified Wireless IP Phone 7920 Wireless IP Phone is not supported as a second-line appearance for a wired IP phone for the Unified CCX agents. Second-line appearance is not supported for IPPA.
- Cisco WAPs currently support only a maximum of seven G.711 or eight G.729 active calls. Therefore, do not have a large volume of agents in one location all using the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone. The maximum number of agents that can be equipped with Cisco Unified Wireless IP Phone 7920 Wireless IP Phones depends upon the agent utilization of the phone during busy hour, the codec being used by the phone, and the proximity of agent phones to WAPs.
- Use of the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone as an agent phone requires using SPAN port monitoring for supervisory silent monitoring and call recording. This applies to the Cisco Unified Wireless IP Phone 7920 Wireless IP Phone when used with either CAD or IPPA. The port that is to be included in the SPAN is the one to which the WAP is wired. Unified CCX supports only one monitoring domain. However, that monitoring domain may include multiple WAPs on the same VLAN segment. This will allow agents to roam between WAPs and still be silently monitored by supervisors and have their calls recorded. For Cisco Unified Wireless IP Phone 7920 Wireless IP Phone 7920 Wireless IP Phone 7920 Wireless IP Phone caller to Cisco Unified Wireless IP Phone 7920 Wireless IPPA phone conversations where both are on the same WAP, the RTP stream will not leave the WAP and thus will never traverse the LAN segment that the SPAN port monitoring server is monitoring. Therefore, silent monitoring or recording of those phone calls is not possible.
- For more details on designing wireless LANs with optimal Cisco Unified Wireless IP Phone 7920 Wireless IP Phone QoS and necessary security, please reference the campus design Solution Reference Network Design (SRND) documents for wireless LAN and Cisco Unified Wireless IP Phone 7920 Wireless IP Phone. These SRNDs can be found at:

http://www.cisco.com/go/designzone

### **Multiple lines support**

Unified CCX provides multiple line support using the 6900/7900/8900/9900 series phones as agent devices. The Join Across Line (JAL) and Direct Transfer Across Line (DTAL) operations are supported on the 7900/8900/9900 series phones. Up to four lines are monitored by Unified CCX, including one ACD line and three non-ACD lines (but only the ACD line can be controlled from the agent desktop). The agent state depends only on the ACD line on the agent's device.

Unified CCX allows more than four lines to be configured on the agent device but monitors only the first four lines, provided these lines are not shared. The ACD line should be among the first four lines. The Agent can perform JAL and DTAL operations for the ACD call only by using the monitored lines.

The Unified CCX Engine receives CTI events on the first four configured lines of a monitored device, but it filters events that occur on non-ACD lines.

Cisco Agent Desktop does not show activities that occur on non-ACD lines with the exception of JAL calls that are on non-ACD lines.

Historical reports display call activity on monitored lines. Agent state is determined based on the ACD line only.

Note

For agent devices with monitored non-ACD lines, make sure to include the non-ACD lines as the CTI controlled lines when performing sizing for Unified CM server(s).

### SIP support

Unified CCX agents may use Unified CM Session Initiation Protocol (SIP) phone models 7941, 7961, 7970, and 7971. The 7940 and 7960 phones do support SIP with Unified CM 5.x and 6.x but may not be used for Unified CCX agents (because the necessary third-party call control and monitoring required is not present). The lower-end phone models are also not available to be used as SIP phones for Unified CCX agents. SCCP support for Cisco IP Phones continues to be supported for agent phones.

Unified CCX CTI ports are notified of caller-entered digits (DTMF input) via JTAPI messages from Unified CM. Unified CCX does not support any mechanism to detect in-band DTMF digits where DTMF digits are sent with voice packets. In deployments with voice gateways or SIP phones that only support in-band DTMF or are configured to use in-band DTMF, an MTP resource must be invoked by Unified CM to convert the in-band DTMF signaling so that Unified CM can notify Unified CCX of the caller-entered digits. Be sure to enable out-of-band DTMF signaling when configuring voice gateways in order to avoid using the previous MTP resources. For detailed design consideration related to DTMF handling, media resources and voice gateway deployments, please refer the *Cisco Unified Communications Solution Reference Network Design (SRND)*.

## **IPv6** support

Unified CCX does not support IPv6 but it can inter-operate with Unified CM running in IPv6. All CTI Ports, CTI Route Points and agent phones have to be configured as IPv4 devices. Unified CCX servers, machines running the agent desktop and other optional servers (for example, ASR/TTS, WFM, QM etc) should be running in IPv4 segment, However, the calling device can be configured as either IPv4 or IPv6. Beware that

if the calling device is in IPv6 and the receiving device is in IPv4, Unified CM dynamically inserts a media termination point (MTP) to convert the media between the two devices from IPv4 to IPv6 or vice versa. This would have an impact on Unified CM performance.

For more information on IPv6 deployment with Unified CM, refer to the document *Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager* available at:

http://www.cisco.com/go/ucsrnd

### **Citrix terminal services support for Cisco Agent Desktop**

Unified CCX supports the running of CAD within a Citrix terminal services environment. When planning to use Citrix terminal services for CAD, the following considerations need to be taken into account:

- All Cisco Desktop client applications are supported in a Citrix terminal services environment. Refer to the Citrix integration document below for the supported Cisco Desktop applications.
- Desktop monitoring (for silent monitoring and recording) is not supported with Citrix terminal services. SPAN port monitoring must be used.
- Macros work only if they involve applications running on the Citrix server, and not those running on the client PC.
- Only one Citrix user name is supported per CAD application login.

Please reference *Integrating CAD with Thin Client and Virtual Desktop Environments* for implementation details. This document can be found at:

http://www.cisco.com/en/US/products/sw/custcosw/ps427/products implementation design guides list.html

### Remote agent over broadband

Unified CCX supports remote agents (for example, at-home agents) using Cisco Unified IP Phone over a broadband internet connection. The Cisco Voice and Video Enabled IPSec VPN (V3PN) ADSL or Cable connection can use a Cisco 800 Series router as an edge router to the broadband network. The Cisco 800 Series router can provide the remote agent with V3PN, Encryption, Network Address Translation (NAT), Firewall, Cisco IOS Intrusion Detection System (IDS), and QoS on the broadband network link to the Unified CCX campus. Remote agent V3PN aggregation on the campus is provided via LAN to LAN VPN routers.

Cisco recommends using the Cisco 800 Series router with the following features for remote agent over broadband:

- Quality of Service (QoS) with Low-Latency Queuing (LLQ) and Class-Based Weighted Fair Queuing (CBWFQ) support
- Managed Switch
- Power over Ethernet (optional)

The Cisco 830, 870, and 880 Series routers are examples of the recommended routers. Cisco does not support using the Cisco 850 and 860 Series routers for this application because they have limited QoS feature support.

The Cisco VPN Client feature available in select Cisco Unified IP Phones provides another option for remote agents to connect their IP Phones to the enterprise.

The enterprise will need to deploy and set up a Cisco ASA 5500 series Adaptive Security Appliance which supports SSL VPN connectivity as detailed in the following link:

http://www.cisco.com/en/US/products/ps6120/products\_configuration\_example09186a008071c428.shtml

The VPN feature needs to be configured on the Cisco Unified Communication Manager as per the Cisco Unified Communications Manager Security Guide.

The Cisco Unified IP Phone should then be configured within the enterprise as detailed in the *Cisco Unified IP Phone Administration Guide for Cisco Unified Communications Manager*. This guide can be accessed at the following location:

http://www.cisco.com/en/US/docs/voice\_ip\_comm/cuipph/7962g\_7961g\_7961g-ge\_7942g\_7941g\_7941g-ge/ 8\_0/english/administration/guide/62adm80.html

This guide also has the list of Cisco Unified IP Phones that support the VPN Client feature.

After the IP Phone has been configured in the enterprise, the agent can then take it home and connect it to a regular broadband router to obtain VPN connectivity to the enterprise. The agent will then be able to use the configured extension for receiving and placing calls from home.

### **Cisco TelePresence Virtual Agent solution**

### Cisco TelePresence CTS-1000

The Cisco TelePresence Virtual Agent solution enables organizations to create a live, "face-to-face" interaction with their customers—over the network with Cisco TelePresence. The life-size, high-definition video, CD-quality audio, and interactive elements of the TelePresence solution give customers the feeling of being "in person" with a specialist agent, while the agent maintains all of the contact center functions that they would expect.

For example, a national bank has a limited number of property insurance specialists on staff, resulting in customers being unable to receive the guidance and service the bank wants to deliver. By providing insurance and mortgage experts at branch offices through Cisco TelePresence Virtual Agent, quality service is always available to customers. At the bank branch, a customer can enter an office designated for the virtual agent, make a selection on the Cisco Unified IP Phone, and have an in-person remote meeting with an expert.

This solution consists of the following hardware and software components:

- Cisco TelePresence System with single screen, for example, CTS-500 and 1000
- Unified CM
- Unified CCX Software
- Cisco Unified IP Phone 7970G (SIP), for caller and agent
- Cisco Agent Desktop Software

Cisco Unified IP Phone 7970G phone includes the Cisco IP Phone Service, the contents of which are sent over from the primary codec in XML format over HTTP. The phone provides the user interface to interact with the primary codec for call control and other functions. The phone and primary codec are registered with Cisco Unified CM as SIP devices and they share the same line appearance. However, on the agent side, the phone is associated with the RmCm Provider user so that Cisco Unified CCX can monitor the phone for any

state changes. Because call signaling and media stream traverse through the primary codec (but not the agent phone), the following guidelines apply:

- Agent must perform all call control actions from the phone but not from CAD.
- Supervisor cannot perform barge-in or intercept from CSD.
- · Calls cannot be monitored or recorded.

Cisco TelePresence supports both wideband/AAC and G.711 audio codec. However, the virtual agent solution only supports G.711, which is the common supported audio codec between Unified CCX and Cisco TelePresence. Cisco recommends using Wideband/AAC audio codec for inter- or intra-region setting when configuring Cisco TelePresence device. In this case, Cisco TelePresence will automatically negotiate down to G.711 when connecting to Cisco Unified CCX.

The figure below and the description that follows explain the virtual agent solution call flow:

#### Figure 3: Cisco TelePresence Virtual Agent call flow



- 1 Customer (caller usually calls inside the corporate network) dials a number to reach an application.
- 2 Cisco Unified CM finds the dialed number associated with a CTI route point that is associated with a Unified CCX Unified CM Telephony user for Unified CCX. This event triggers a JTAPI route request to be sent to Unified CCX.
- **3** Based upon the DN, which is mapped to a Unified CM Telephony trigger, Unified CCX finds an available CTI port and redirects the call to the port. Unified CCX runs a script that finds an available agent and reserves the agent. The call is transferred to the primary codec on the agent side and the call is presented to the agent device.
- 4 The agent presses the "Answer" button on the agent device to answer the call. This action causes Unified CCX to instruct Cisco Unified CM to complete the transfer and establishes audio and video between the Cisco TelePresence devices.



• Deployment of Cisco TelePresence endpoints with Unified CCX requires the engagement of the Cisco Remote Expert Team. For further guidance, see *Cisco Remote Expert Design Guide*, available here:

http://iwe.cisco.com/c/document library/get file?folderId=416503167&name=DLFE-265218415.pdf

• For more design details, refer to *Cisco TelePresence Network Systems Design Guide*, available here: http://www.cisco.com/go/designzone.

### **Cisco TelePresence EX 60 and EX 90**

Unified CCX supports Cisco TelePresence EX 60 and EX 90 endpoints as agent phones. You can configure these endpoints similar to other IP phones.

Note

Deployment of Cisco TelePresence EX series endpoints with Unified CCX requires the engagement of the Cisco Remote Expert Team. For further guidance, see *Cisco Remote Expert Design Guide*, available here:

http://iwe.cisco.com/c/document\_library/get\_file?folderId=416503167&name=DLFE-265218415.pdf

The following operations are not supported in Cisco Agent Desktop/Cisco Supervisor Desktop if you are using Cisco TelePresence EX 60 and EX 90 as agent phones:

- Conference and transfer
- Desktop monitoring and recording
- · Barge in and Intercept

However, you can perform all the call operations such as conference, transfer, barge in and intercept from EX 60/90 phones.

The following features are not supported if you are using Cisco TelePresence EX 60 and EX 90 as agent phones:

I

- Multiline (ACD and non-ACD)
- · Extension Mobility

# **Unified CCX Outbound Dialer**

Unified CCX supports the following outbound dialers:

- Unified CCX Outbound Preview Dialer
- Unified CCX Outbound IVR Dialer

Unified CCX Outbound Preview Dialer allows Outbound agents to participate in outbound campaigns in addition to handling inbound calls. This feature selects those agents who are not busy with inbound calls to handle outbound calls, thereby maintaining a high level of agent productivity.

Unified CCX Outbound IVR Dialer allows for Outbound calls to be placed to contacts in a campaign and subsequently for live contacts to be serviced by an IVR application. Call progress analysis (CPA) capabilities of the SIP Voice gateway are used to filter non live contacts (which could be fax and no answer). Live calls which are answered by a customer and answering machine contact are transferred to a CTI route point to be serviced by an associated IVR application. An Outbound IVR call that is answered by a customer contact but cannot be serviced due to unavailability of an IVR port is said to be abandoned.

### **High level components**

The figure below and the following table describe the components involved in Cisco Unified Outbound:



Figure 4: Cisco Unified Outbound components

Campaign Manager	Responsible for starting and stopping each campaign and retrieving and updating contact records from and to the database.
Dialer	Receives contacts from the Campaign Manager and initiates the outbound calls. Notifies the Campaign Manager of the call status and call result after the call is answered. The dialer software is IP based and does not require any telephony cards for making outbound calls. In Outbound Preview, the dialer uses the CAD agent IP phone to place outbound calls through a voice gateway configured in Unified CM. In Outbound IVR, the dialer uses the SIP protocol to place outbound calls through the SIP gateway configured for the Outbound IVR feature.

Resource Manager	Monitors agent states, reserves agents and receives instructions from the Dialer to place the outbound call. This component is used only in the Outbound Preview feature.
CTI Server	Handles requests and responses from and to the CAD and passes the customer data to the CAD for screen pop. This component is used only in the Outbound Preview feature.
IVR Subsystem	Responsible for execution of the IVR application associated with the campaign when a live contact has been detected by the SIP gateway and transferred to the configured CTI Route Point on the Unified CM. This component is used only in the Outbound IVR feature.
Config Datastore (CDS)	Contains the customer contacts information.

All of these components run as part of the Unified CCX Engine and cannot be installed separately.

### **Functional description**

There are typically four types of dialing modes in today's outbound ACDs: predictive, progressive, preview, and direct preview.

### **Outbound Preview**

The Outbound Preview feature supports only the direct preview dialing mode. It uses a 3-stage process for making an outbound call. The first stage is to find an available agent and retrieve the customer information for making the outbound call. The second stage is the reservation call, and its purpose is to reserve an agent and send customer data to the agent desktop. During this stage, the agent is reserved and the data appears on the desktop so that the agent can review the data and decide whether to accept the call by pressing the corresponding button on the CAD. If the agent does not accept the call, the call is handled by other outbound agents or closed for the campaign. If the agent does accept the call, Outbound Preview kicks in the last stage where Unified CM is instructed to place the outbound call using the CAD agent's phone. When the outbound call is answered, Outbound Preview updates the customer contact in the database with the call status and call result.

When the outbound call connects with the customer, the agent can perform all call control operations that are normally supported on inbound calls (transfer, conference, hold, retrieve, and so on). Cisco recommends that the agent transfers or conferences the outbound call only if the call is answered by a person but not through other media such as an answering machine or a fax machine.

#### **Outbound IVR**

The Outbound IVR feature supports two types of dialing modes namely progressive and predictive. Each dialer dials an appropriate number of contacts to make efficient use on the available system resources (IVR Ports). Both algorithms use a ratio called lines per port (LPP) to determine the number of outbound calls to place per available IVR port.

Progressive algorithm uses an LPP value configured by the administrator via Unified CCX Administration.

Predictive algorithm dynamically varies the LPP to ensure that the abandon rate does not exceed the threshold configured via Unified CCX Administration (abandon rate is the percentage of live calls that had to be dropped due to the unavailability of an IVR port).

Outbound IVR uses the Call Progress Analysis (CPA) capability of the SIP gateway to place and filter outbound calls. The SIP gateway filters out non-live contacts such as fax, invalid number, and no answer and forwards only the live calls answered by a customer contact and answering machine to a CTI Route Point on the Unified CM. This in turn triggers execution of an IVR application associated with the campaign at Unified CCX.

Note

You can use the IVR campaign only with service providers that work with TDM, because such gateways support CPA capability, which is an IVR feature. Gateways using SIP or H323 trunks do not support CPA; hence the IVR campaign does not work with such service providers.

#### Behavior under high availability

The CDS is required for normal operation of Outbound for call status and call result updates of contact records. When deploying in a two node high availability system, as long as the publisher CDS is up, the Outbound subsystem will be operational.

The following events occur during a failover in Outbound Preview:

- If a reservation call is at the agent desktop waiting for the agent to accept the call, and the master engine goes down, the agent is automatically logged out and the reservation call disappears from the agent's desktop. If the master engine restarts during failover, the call status for that contact record is be set to unknown. If the master engine does not restart during failover, the contact is called when the campaign starts and there are available agents.
- If a reservation call has been accepted by the agent and the call is ringing on the customer phone, there is no effect on the call. However, the agent is logged off and will be able to invoke call control capabilities only through the phone.

In the case of Outbound IVR, the CTI ports on the master engine will go out of service on a failover, which will result in calls in progress between customers and CTI ports to be disconnected. The standby server will resume dialing out the remaining contacts in the outbound IVR campaigns after the failover.

When deploying Outbound in a high availability environment, only the dialer in the master node is active. Outbound calls cannot be distributed or load balanced to the dialer in the standby node.

### Scalability

Outbound Preview supports different capacities and limits when compared to inbound agents. Refer to Cisco Unified Contact Center Express overview and packaging for more details.

For Outbound IVR, the number of active outbound IVR ports is limited by the maximum number of Outbound IVR ports that are supported for a given platform. In addition, the sum of the active IVR ports in use for inbound and outbound cannot exceed the maximum number of IVR ports that are supported for the platform. Refer to Server capacities and limits to find these limits on the IVR ports for your platform.

Since IVR for inbound and outbound contend for the same set of IVR ports, the actual number of active IVR ports in use for inbound and outbound depends on multiple parameters:

Number of licensed inbound ports

- Number of licensed outbound ports
- Sum of the number of ports dedicated across outbound IVR campaigns

Please refer to the "Configuring Unified CCX Dialer" chapter of the Unified CCX Administration Guide for details on how the numbers of active IVR ports for inbound and outbound are determined by the above parameters.

### **Call flow description**

#### **Direct preview mode**

In the direct preview mode, the agent hears the ring-out on the agent phone. The direct preview call flow proceeds as illustrated in the figure below and the description that follows.

#### Figure 5: Call flow for direct preview mode



- 1 An agent in Ready state is available and the Dialer has retrieved contact records from the Campaign Manager. The Dialer requests the Resource Manager to reserve the agent.
- 2 The Resource Manager reserves the agent by moving the agent to Reserved state.
- **3** The Dialer sends a reservation call to the agent desktop and, at the same time, a screen pops that contains the customer information and is presented to the agent. The agent reviews the customer data and decides whether to take the call.
- 4 The agent can choose to accept, skip, reject, or cancel this reservation call. If the agent chooses to accept it, the agent clicks the Accept button on the desktop.
- 5 The Dialer instructs the Resource Manager to place an outbound call from the agent phone via Unified CM out to the voice gateway. Because this call is a direct preview call, the agent immediately hears the ringback of the customer phone.



Note that no CTI Port is needed to place the outbound call.

6 As soon as the call is answered, the Dialer closes the contact, classifies it as a voice call and sends the result to the Campaign Manager. If an answering machine answers the call, the number is invalid, or the customer requests a callback, and the agent can reclassify the call from the desktop accordingly. If the customer requests a callback and the agent reclassifies the call, the customer is called back using the same number, an alternate number, or a callback number specified by the customer.

### IVR mode

The call flow description for Outbound IVR is illustrated in the figure below and the description that follows.



### Figure 6: Call flow for IVR mode

- 1 Outbound IVR dialer determines the number of contacts to dial per the configured algorithm (progressive or predictive) and places outbound calls using SIP through the voice gateway.
- 2 Voice gateway detects non live contact via its CPA capabilities and sends status of non live contact to the dialer. The dialer uses this to update contact status information in the configuration database.
- **3** Voice gateway detects live contact via its CPA capabilities and sends status of live contact to the dialer. The dialer uses this to update contact status information in the configuration database and also sends a SIP refer message to the SIP gateway which in turn transfers the call to the configured CTI Route Point on Cisco Unified CM.

- 4 Cisco Unified CM transfers the call to a IVR port on Cisco Unified CCX server.
- 5 The IVR subsystem then associates the call with the IVR application associated with the campaign. The engine starts execution of the application and an IVR session takes place between the IVR application for the campaign on Cisco Unified CCX and the customer contact.

# **Deployment guidelines**

The following guidelines should be followed when deploying Outbound:

- Outbound supports a maximum of 15 campaigns and a maximum of 10,000 active outbound records for each campaign.
- Outbound does not come pre-installed with any US National Do Not Call lists. The system administrator should manually filter the contact list against the Do Not Call list prior to importing contacts.

The following guidelines are specific to Outbound Preview:

- Outbound Preview supports a maximum of 10 CSQs for each campaign.
- Only CAD agents are supported. IPPA agents are not supported.
- Outbound Preview cannot detect an answering machine, fax, or modem. The agent should manually reclassify the call to "answer machine" or "fax" from the desktop. The contact will be called again using the same number (in the case of "answer machine") or using an alternate number (in the case of "fax").
- Agent should not transfer or conference the outbound call if the call is answered by the media other than a person, such as an answering machine or fax machine.

The following guidelines are specific to Outbound IVR:

- It is possible to only have a single instance of the SIP gateway in the deployment.
- Cisco recommends to install the SIP Gateway on the same site (i.e., same campus LAN) as the Unified CCX primary engine. However, if the SIP Gateway is installed over the WAN from the Unified CCX primary engine, it is still supported but not recommended.



The primary engine is always the first node that was installed in the Unified CCX cluster and cannot be changed.

- No redundancy of the SIP Gateway or usage of any SIP Proxy is supported.
- The protocol supported between the SIP Gateway and Unified CM for transferring the outbound call to an IVR application includes SIP and H323.
- It is possible to use the same gateway for both inbound and outbound voice.

# **Unified CCX Agent E-mail**

As part of the Premium offering, Unified CCX agents can service customer e-mails using the CAD interface. This capability does not exist with Cisco Agent Desktop - Browser Edition.

CSD includes real-time displays and information that enable supervisors to manage e-mail CSQs and their e-mail capable agents. When creating a CSQ in Unified CCX Administration, you designate the CSQ as either e-mail or voice. A single CSQ cannot be both an e-mail CSQ and a voice CSQ. Agent association with e-mail CSQs is done in the same manner as voice CSQs.

The agent states READY and NOT READY for e-mail and voice are independent of each other. An agent can handle both e-mails and voice calls simultaneously. An agent can receive e-mails only if he manually moves himself to email READY state. Only agents that have been assigned to at least one e-mail CSQ will see the e-mail functionality in CAD. Likewise with supervisors; only supervisors that service at least one e-mail capable team OR at least one e-mail capable agent will see e-mail functionality in CSD.

The Agent E-mail feature requires the use of an external mail store (Microsoft Exchange is supported). This mail store is not provided, installed, or configured as part of the CAD installation.

Agent E-mail uses the IMAPv4 (for message retrieval) and SMTP protocols (for message sending). These protocol types must be enabled in Microsoft Exchange and host/IP information must be specified using Cisco Desktop Administrator. These protocol types are not typically enabled by default. CAD and the Cisco Desktop Agent E-mail Service make IMAP connections to the mail store. Cisco Desktop Agent E-mail Service also makes an SMTP connection to the mail store. Agent E-mail supports both secure and plain text connections to the mail store.

CAD components (Cisco Agent Desktop and Cisco Desktop Agent E-mail Service) will connect to the mail store using a single dedicated mail store account. This account must be created by the mail store administrator. CAD must be configured to use this account via Cisco Desktop Administrator. This account should be a dedicated account, and not used for purposes other than the Agent E-mail feature.

While CAD uses a single e-mail account, it can, and typically will, have multiple distribution list addresses associated with that user. This e-mail account and corresponding distribution lists must be configured manually by the mail store administrator. Routing information for the distribution list addresses can then be specified using Cisco Desktop Administrator.

Review CSQs can be associated with normal email contact CSQs. E-mails sent from a Contact CSQ associated with a Review CSQ will be transferred to the Review CSQ. Members of a Review CSQ who receive e-mails transferred in this manner will be able to perform all of the normal e-mail operations on the message, including editing the draft, and transferring, requeuing, and sending the message.

Messages sent from a review CSQ will be sent using the configured email address of the original CSQ that the message was sent from.



An additional restriction is imposed on the Transfer feature for normal CSQs which prevents transfer to Review CSQs.



In addition to the CSQ setting, an agent must belong to a workflow group that has been configured to be reviewed. This configuration provides flexibility in configuring which agents should be reviewed, and to what CSQ the reviewed messages are sent.



Microsoft Exchange allows you to associate multiple e-mail addresses with an e-mail account. Administrators may be tempted to use this feature instead of distribution lists. However, Microsoft Exchange may rewrite the To: address in the incoming e-mail to the primary address of the account, which then causes the Agent E-mail feature to be unable to properly route e-mails to agents.

**Note** Agent E-mail supports secure IMAP and SMTP connections to the mail store. For more details on the specific security settings that are supported, see the *Cisco CAD Installation Guide*.

### Figure 7: Unified CCX Agent E-mail components and interfaces



The following steps describe how an email is routed using the Agent E-mail feature:

- 1 The Cisco Desktop Agent E-mail Service on the Unified CCX server connects to the mail store (IMAP and SMTP) on startup.
- 2 An e-mail capable agent in the e-mail CSQ logs in using CAD. CAD connects to the Cisco Desktop Agent E-mail Service and to the mail store (IMAP).
- **3** The agent goes to an e-mail ready state. CAD requests an e-mail from the Cisco Desktop Agent E-mail Service.
- 4 A customer sends an e-mail to, for example, sales@companyname.com.
- 5 The website sales@companyname.com is a distribution list with Agent E-mail's account as the only member. Microsoft Exchange presents the e-mail to that account's inbox.

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- 6 The Cisco Desktop Agent E-mail Service has been monitoring the Agent E-mail's account inbox, and sees the new e-mail. Based on the routing rules specified in Cisco Desktop Administrator, it sees that e-mails to sales@companyname.com are associated with the e-mail CSQ and that an agent in the e-mail CSQ is in the Ready state. The service then assigns the e-mail to the agent and notifies the agent.
- 7 CAD receives notification of the assignment and retrieves the e-mail from the mail store directly.
- 8 The agent is presented with the e-mail from the customer.
- 9 The agent authors a response and presses the **Send** button.
- 10 If review CSQs are enabled, the message is routed to the review CSQ before final approval is sent out.
- 11 The agent's response is saved to the outbox folder on the mail store using IMAP commands.
- 12 The Cisco Desktop Agent E-mail Service periodically checks the outbox folder and sends all messages in it.

# **Cisco Agent Desktop integration with Cisco IM and Presence**

CAD agents and supervisors communicate with each other via the chat services built into the desktop applications. If you have deployed Cisco IM and Presence in their environments, agents and supervisors can use these same desktop applications to see the presence status of SMEs as well as other critical members of the enterprise, and to initiate chat sessions with them. The SMEs use the Cisco Unified Personal Communicator to initiate chat sessions with agents who are configured as Cisco IM and Presence users and respond to the chat requests from them. SMEs can also use Microsoft Office Communicator or other clients that are supported with Cisco IM and Presence if Cisco IM and Presence is configured to support federated users. The Cisco IM and Presence integration feature is available in the Standard, Enhanced, and Premium packages.

For example, a customer calls a Cisco Unified Contact Center that has integrated Cisco IM and Presence with CAD. The customer's call is routed to an available agent. If the agent requires assistance in addressing the caller's needs, the agent can launch the contact selection window from the Agent Desktop toolbar. The contact selection window will display the presence status of other agents, supervisors, and SMEs who are assigned to the agent's work flow group. The agent can then select a contact who is available and initiate a chat session with the contact. If appropriate, the agent can also use the contact selection window to conference a contact into the call, or even transfer the customer's call to the contact.

The figure below and the description that follows describe how various components of Cisco Agent Desktop and Cisco IM and Presence interface with each other.



### Figure 8: Interface between Cisco Agent Desktop and Cisco IM and Presence

- 1 Cisco Desktop Administrator retrieves LDAP configuration profile through the SOAP Interface.
- 2 Cisco Desktop Administrator binds to the LDAP server for SME searches and information, such as name and telephone number.
- 3 Administrator places SMEs in logical groups called contact lists and then assigns them to specific work flow groups. This way, Administrators can segment contact lists and ensure that only those agents assigned to a specific work flow group have visibility to the appropriate contact list. This configuration is saved in CAD's LDAP so that each agent/supervisor does not have to access the Unified Presence's LDAP server which might have limitations on number of connections, etc. Administrators can also control the SMEs ability to see the agent's present state.
- 4 CAD retrieves the contact list associated with the agent's workflow group.
- 5 CAD retrieves various configuration profiles via the SOAP interface, for example, Unified Presence server information.

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6 CAD sends a SIP REGISTER to register with Cisco IM and Presence, followed by individual SIP SUBSCRIBE messages for each user in its contact list. CAD also sends a SIP SUBSCRIBE for

"user-contacts" for contacts configured on Cisco IM and Presence. A SIP NOTIFY is received whenever a contact in the contact list changes state. CAD does not allow agents to change their presence states. It only sends a single SIP PUBLISH message to Cisco IM and Presence when an agent logs in.

Call Control is done via the existing CAD main window using CTI. All SIP traffic and presence information sent between CAD and Cisco IM and Presence is not encrypted and is done via TCP or UDP.

Cisco IM and Presence can assign the users registered with it across all nodes within the Cisco IM and Presence cluster. If the user attempts to connect to a node that is not assigned to him, CAD will connect to the SOAP and Presence servers specified in redirect messages from the publisher.

All communication between CAD agents and SMEs is via the Cisco IM and Presence server and is not routed through any CAD server. Refer the chapter on *Cisco IM and Presence in the Cisco Unified Communications SRND* for deployment guidelines.

# Agent phones in countries with toll-bypass regulations

Some countries such as India have telecommunications regulations that require the voice infrastructure to be partitioned logically into two systems: one for Closed User Group (CUG) or Voice over IP (VoIP) to enable communications across the boundaries within the organization, and a second one to access the local PSTN. To ensure adherence of the regulations in such countries, agents typically used to have only one line with access to customer calls only, and they were required to have a different phone (for example, a softphone) to access a VoIP line for contacting fellow teammates or experts located outside the contact center.

The Logical Partitioning feature in Unified CM provides the same capability through a telephony system to control calls and features on the basis of specific allowed or forbidden configurations. A common telephony system in a contact center environment can provide access to both the PSTN and VoIP networks, therefore configurations are required to provide controlled access and to avoid toll bypass. The Logical Partitioning feature can be enabled and configured in Unified CM to prevent toll bypass calls, thus allowing agents in a Unified CCX system to use the same phone for receiving customer calls and for making or receiving VoIP calls to and from other people within the organization. Although this eliminates the need for agents to have a second phone, contact center managers can choose to have a dedicated line or phone for customer calls and allocate a different line or phone for other calls.

# **Cisco Unified Workforce Optimization**

Cisco Unified Workforce Optimization (WFO) for Unified CCX is a full-featured solution for optimizing performance and quality and is an integral component of the Cisco Unified Communications System. WFO suite provides these solutions:

- Workforce Management (WFM)—Allows for forecasting and development of schedules for agents across multiple sites and channels. It also provides real-time dashboards, enabling supervisors to track key performance indicators, and manage agent's adherence to schedules.
- Quality Management (QM)—A voice and screen recording, compliance and evaluation solution for agent performance optimization and dispute resolution.

The figure below shows the overall service communications medium between the WFO solutions and the Unified CCX system.

### Figure 9: Service communications medium between WFO solutions and Unified CCX



This figure illustrates a couple of integration points between the WFO solutions and Unified CCX system.

- Workforce Management Uses the ACMI link to monitor agent's adherence to the schedules. It uses the ODBC link to download the historical data from Unified CCX database to generate the forecasting data.
- Quality Management Uses JTAPI to monitor the call progress on the agent phone so that it knows when to start and stop the voice recording. It uses the ODBC link to download the agent, supervisor and team configuration data from Unified CCX database.

For more details on components architecture, deployment configuration and sizing, refer the *Cisco Workforce Optimization System Configuration Guide* available at the link:

http://www.cisco.com/en/US/products/ps8293/products\_implementation\_design\_guides\_list.html

# **Unified CCX ASR and TTS**

Unified CCX allows integration with Media Resource Control Protocol (MRCP) compliant Automatic Speech Recognition (ASR) and Text-To-Speech (TTS) servers. Nuance, Scansoft, and IBM are the only ASR and TTS providers that have been tested and will be supported. ASR and TTS software must be purchased from one of these vendors. These vendors can provide design and server sizing requirements for their software. Cisco no longer resells Nuance ASR and TTS as a Unified CCX option.

From Unified CCX Administration, you must configure the address of an MRCP server and the number and type of resources provided by that MRCP server. Multiple Unified CCX clusters can interact with the same MRCP servers. Multiple Unified CCX servers can interact with the same MRCP servers. A Unified CCX server can also define multiple MRCP servers, and resources from those servers are selected based upon the system and application configuration.

Calls requiring ASR require the Unified CCX Engine to pass the media stream from the CTI port to the ASR Server. This activity impacts system performance and system sizing. The impact is reflected in the Cisco Unified Communications Sizing Tool.

When using ASR, the ASR resource is allocated at the time of the first step that uses ASR. The ASR resource is then allocated for the duration of the call. When using ASR, you must calculate the required number of ASR resources (ports) similar to the way you calculate any IVR port requirement. You will need the average time the ASR port is used (similar to average call treatment time) and the number of calls using ASR in the busy hour. You can then input this data into any Erlang-B traffic calculator or other tool to compute the number of ASR resources required. In environments where you have long queue times, it might be economical to transfer the call to another CTI Route Point and pass call data to the second application (via session data steps) in order to allow the ASR resource to be released.

For TTS, each "Generate TTS Prompt" allocates and releases a TTS resource, and the TTS resource is typically only allocated for a couple of seconds and then released (this might vary depending on the application). To determine the number of TTS resources, use the same methodology described above for ASR resources.

# Unified CCX integration with Unified ICME software

Unified CCX can also be implemented as a child ACD of Cisco Unified Intelligent Contact Management Enterprise (Unified ICME) software. The Unified CCX integration with Unified ICME software requires a Unified CCX Gateway PG process to be on a separate server from the Unified CCX. This integration provides the following capabilities:

- The ability for Unified CCX to send agent, queue, and call state changes to the Unified ICME.
- The ability for Unified ICME software to intelligently route and load balance calls across multiple ACD sites which can include one or more Unified CCX systems, Cisco Unified Contact Center Enterprise (Unified CCE) systems, or traditional ACDs (that are supported by Unified ICME software). Calls routed to a Unified CCX application can also be sent call data so that it can be popped onto an agent's screen.
- The ability for Unified CCX to send post-route requests with call data to the Unified ICME in order to request intelligent routing instruction. This could be in response to a transfer request from an agent or from a step within and Unified CCX application running on a CTI port.
- The ability for ICM software to provide multi-site ACD reporting for a mixed network of ACD sites which can include one or more Unified CCX systems, Unified Contact Center Enterprise systems, or traditional ACD's.

• The ability for Unified CCX to send post-route requests with call data to the Unified ICME software in order to request routing instructions. This could be in response to a new call that just arrived at Unified CCX or a call that is being transferred from an IVR port or agent. Call data included in the post-route request can be used by the Unified ICME software to profile route the call, and call data is also passed to the terminating ACD site (Unified CCX, Unified CCE, or traditional ACD) for an agent screen pop.



This parent/child deployment is not supported when Unified CCX is integrated with Unified ICME.

The following figure shows one Unified ICME integration deployment scenario. In this scenario, the Unified ICME routes and load balances calls between two Unified CCX deployments. A separate deployment of Cisco Unified IP IVR's is also included to demonstrate how additional IVR capacity (beyond 300 IVR ports) could be added to a Unified CCX deployment. The IVR PG allows call data from IVR applications to be passed to Unified CCX agents at either site. The IVR PG could also connect traditional IVRs (that are supported by the Unified ICME) to allow an organization that has existing IVR applications to continue using those IVR applications.

### Figure 10: Unified CCX gateway solution with two Unified CCX sites



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The following figure shows another Unified ICME integration deployment scenario. In this scenario, the Unified ICME routes and load balances calls between a Unified CCX site, a Unified CCE site, and a traditional ACD site. Call data for agent screen pop can be passed between these sites via the Unified ICME.





For Unified CCX to integrate with Unified ICME software, there must be a Unified CCX Gateway PG installed on a separate server from the Unified CCX server.

The Unified CCX Gateway PG must be ordered as a part of the Unified ICME software suite. The Unified CCX Gateway PG software is installed from the Unified ICME software installation CD—not from the Unified CCX software CD.

Note

Partners must have Unified ICME/Unified CCE ATP status to order and deploy the Cisco Unified Gateway PG with Unified ICME software.

The Cisco Unified Communications Sizing Tool can assist solution planners and designers in sizing the hardware required for a Unified CCX deployment.

When the Unified ICME routes calls to Unified CCX, it is really routing them to a Unified CM dialed number. Then Unified CM goes through the process of resolving the dialed number association to the CTI Route Point and Unified CM Telephony user and offering the call to Unified CCX. Unified CCX then invokes the appropriate script.

For more information about the Unified CCX Gateway, see the Cisco Unified Gateway Deployment Guide.

# Unified CCX fault tolerance

The Unified CCX solution offers a number of capabilities to provide fault tolerance. To begin with, a Unified CCX deployment utilizes a Cisco Unified Communications network composed of Cisco data switches and routers, which provide for a highly available data network with many options for redundancy. Cisco campus and network design guides discuss best practices for designing highly available networks with Cisco switches and routers.

A Unified CM deployment utilizes a cluster approach with up to eight call processing servers per Unified CM cluster. Unified CM groups devices (voice gateways, IP Phones, and CTI Ports) into device pools and allows for device pools to have a primary, secondary, and tertiary Unified CM server. When a device pool's primary Unified CM server fails, the devices within that device pool automatically fail over to the secondary or tertiary Unified CM server. Unified CCX CTI Ports are grouped together into CTI call control groups (often called a CTI port group). Each CTI port group is configured as part of a device pool. Unified CM also supports voice gateways deployed at many locations with trunks from different service providers.

Unified CM has a subsystem called the CTI Manager that abstracts the device management from the JTAPI communications to an application server (like Unified CCX). This implementation allows an application to not be concerned with what specific server a device (voice gateway, agent phone, or CTI port) is currently registered. Unified CCX has the ability to communicate with up to two CTI Managers within a Unified CM cluster, but only actively communicates with one at a time. If the active CTI Manager subsystem or the Unified CM node running the active CTI Manager fails, Unified CCX closes the sockets for all CTI ports and immediately begins JTAPI communications with the backup CTI Manager. Calls being handled by agents survive, but if their phones are registered with the failed Unified CM, they will not be able to perform any subsequent call control. Upon completion of existing calls, agent phones will automatically re-register to the secondary Unified CM immediately.

In addition to being able to fail over to another Unified CM node within the cluster, Unified CCX itself provides a clustering mechanism. In a high availability deployment, up to two servers can be deployed, each server configured with the Unified CCX Engine and Database components with the optional, Monitoring and Recording components.

The four components all provide some level of redundancy and fault tolerance, but each functions a bit differently.

## United CCX Engine redundancy

When deploying with high availability, two Unified CCX Engine components must be deployed on separate servers. If one server initiates the engine mastership election first, it becomes master. The other server becomes standby. If both servers are started approximately at the same time, it is not specified which server becomes master. If the Unified CCX Engine component server fails over, the standby server becomes the master server and remains as the master server until another failure occurs. Any active calls being processed by applications on CTI Ports will be released upon failure of the master Unified CCX Engine server.

All ACD, IVR, and desktop services will failover within 5 seconds in a LAN environment and 12 seconds in a WAN environment. Any incoming call arriving at Unified CM destined for Unified CCX route points can be accepted by the Unified CCX engine and all Unified CCX call treatment and ACD routing services are operational. During failover, agents are automatically logged out and then back into the ACD. The simultaneously logging in large numbers of agents can take significantly longer than the general, more random, log in of individual agents. It is not uncommon for agents to experience log time is excess of 1 minute in a LAN environment and 3 minutes in a WAN environment. Additionally, system and network delays could significantly impact the ultimate login time of each agent.



Historical Report generation is done by giving preference to non-Engine master node so that generation of Historical Reports does not affect the Unified CCX Engine performance. In a two-node scenario, if the current Engine master fails, the historical reports are generated from the new Engine node. Therefore, in a deployment with high availability and with both Unified CCX servers running, the maximum number of historical reporting sessions that is supported during normal operating hours is higher. If a server fails, this number reverts to the limit in a deployment without high availability. Note that this support for higher number of historical reporting sessions in a high availability deployment only applies to newer platforms. Refer the Cisco Unified Communications Sizing Tool for the limits on each platform.

### Web Chat fault tolerance

For Web Chat, the Unified CCX uses SocialMiner in the same way the Unified CM is used for voice calls.

SocialMiner does not support High Availability (HA) deployment options. The fault tolerance for Web Chat is provided in the Unified CCX. In an HA deployment, SocialMiner is configured to communicate with both the Unified CCX nodes. When a new contact arrives at SocialMiner, both the Unified CCX nodes are notified. The master server takes the contact and queues it in its service queues, and the secondary server ignores the notification about this contact.

If a chat agent is logged in to the Unified CCX and there is a failover, the agent is logged out from the Cisco Agent Desktop and is redirected to the new master server with a login prompt. An agent who is busy in an active chat with a customer continues with the chat session until it is terminated by either the agent or the customer. This agent cannot make any subsequent state transitions due to the failover. The agent should log out to be automatically redirected to the new master server.

In the case of a failover, all queued or unread contacts are reintroduced by SocialMiner into the Unified CCX, and the new master server will queue these contacts and start the allocation.

# **Database redundancy**

When deploying with high availability, for Historical Data store, Agent Data store, and Repository Data store, the two servers running the Database components are set up with one being the publisher and one being the subscriber. These roles do not change in the event of a failure. If both the publisher and the subscriber are up and running, the server running the Engine Master is given DB mastership, where data is written to and read from.

If the database is down on the Engine Master, the other server (which is not the Engine Master) is given the DB mastership, where data is written to and read from. Informix Enterprise Replication replicates the data between the publisher and subscriber. Database replication will be automatically removed along with an alert sent to the administrator when the two nodes are unable to communicate for an extended period of time and the replication queue (which holds the data to be replicated) becomes full. Historical data, agent data and repository data may still be written on both the databases when replication is removed, but will not get replicated. Once the root cause of the replication has been identified (say a network issue) and fixed, the command to reset replication should be issued from Unified CCX Administration or from the CLI. This will result in the replication being set up followed by merging of data between both the nodes by means of a repair process. Merging ensures that the data on both the nodes is the same after the repair process. The state of this repair process can be monitored from Unified CCX Serviceability.

Under normal call load volume, a latency of 1 to 3 minutes for Informix Enterprise Replication is expected; this period could be higher for higher call load. The effect could be more when historical reports are running

as it affects the SQL processing. Due to replication latency, the historical reports that are generated from a subscriber might not have the latest call records; the historical reports will be generated up to the last replicated time.

Distributed transactions with the Java Transaction Manager are used to replicate Configuration Data Store data in high availability deployments. The way it works is that when both servers with Database components are operational, configuration data store changes, such as skills and resource groups, are written to both the servers with Database components. If one server with a Database component is down, configuration data store changes are not possible. However, configurations can be read in Unified CCX Administration; that is, no configuration data store data writes are possible, but data reads are possible when one server with a Database component is down. However, call processing, historical data writing, and call activity reporting can continue even when one Database component is down.

In the case where the secondary Database server is not operational and configuration data store changes are required, you can temporarily deactivate the configuration data store component on the secondary Database component server using Unified CCX Serviceability. After that, you can make configuration data store changes on the active (primary) Database server. Once the secondary Database server is back in service, you can activate the configuration data store component on that Database server during off-peak hours as the whole active database configuration data store data will get synchronized.

### Network partitioning

When the network is partitioned (split into two islands), each island elects its own master. When the partition is restored, the primary engine is always elected as the master and the other node becomes the standby. As a result, all calls with the primary engine node remain and all calls under treatment or in queue with the other node are dropped. This primary engine concept does not apply to the master election process in the normal failover. It only applies to the master election after partition restoration or master election initiated from Unified CCX Administration website.



The primary engine is always the first node that was installed in the Unified CCX cluster and cannot be changed.

# **Unified CCX Monitoring and Recording redundancy**

The Monitoring component is automatically installed on the Unified CCX server and should be activated to enable agent monitoring. When deploying with high availability and agent monitoring, the Monitoring components on each server should be activated. The two servers running the Monitoring service are sometimes considered as one *monitoring domain*. When configuring a phone with SPAN port monitoring, only one SPAN port monitoring server can be assigned to this phone.

When desktop monitoring is configured, CAD forwards the RTP stream to CSD. A server running the Monitoring component is still required for CAD to retrieve the agent phone's MAC address from the Cisco Unified CM. Any one of the two monitoring servers could be chosen for this purpose. If one Monitoring components fail, desktop monitoring still works, as long as the other server running the Monitoring component is still available in the Unified CCX cluster. It is possible to configure and enable both SPAN port monitoring and desktop monitoring are configured correctly, desktop monitoring is chosen. If desktop monitoring fails, SPAN port monitoring is used as a backup. Refer the *Cisco Desktop Administrator User's Guide* for more information.

When deploying with high availability and agent call recording, the Recording components on each server must be activated. The two physical recording servers work as a single logical recording server (a *recording domain*) and recording tasks are load balanced in a round robin fashion across the two physical Recording Servers. A Unified CCX deployment only supports one recording domain. The actual call recordings are stored only on the disk of the physical Recording component server where the recording task took place. Therefore, if a recording server fails, the supervisor will be unable to playback those recordings on the failed Recording server until that Recording server is operational again.

The two servers where the Recording components are running also serve as a backup for each other. To function properly during a period when one of the servers fails, the two Recording servers must be sized to be capable of supporting all recording for the Unified CCX cluster. For example, under normal operating conditions, a large call center may be set up to handle 16 recording sessions on each Recording component, for a total of 32 simultaneous call recordings. If either server with a Recording component fails, the other server processes all call recordings. In this failure scenario, make sure that the total number of call recordings does not exceed the server capacity that is shown in the Cisco Unified Communications Sizing Tool.

Recording requires a Monitoring component. When SPAN port monitoring is configured for silent monitoring, the SPAN port monitoring server forwards the RTP stream to the Recording component. If that SPAN port monitoring server fails, recording is not possible. When desktop monitoring is configured, the Monitoring component is still required in order for CAD to retrieve the agent phone's MAC address from the Unified CM. Either of the two monitoring servers could be used for this purpose. If one Monitoring component fails, recording still works, as long as the other server running the Monitoring component is still available in the Unified CCX cluster.

# Unified CCX 9.0 upgrade

Unified CCX 9.0 supports software upgrade from previous versions. Refer the *Cisco Unified CCX Installation Guide* from the link below for compatible upgrade versions. If you wish to upgrade to 9.0 and add high availability, one additional physical server of equal performance as the existing server must be added.

The Windows to Linux upgrade tool, which is downloadable from CCO, can be used to upgrade from select versions of earlier Unified CCX Windows releases to the CCX 9.0 release.

# **Unified CCX software compatibility**

Unified CCX software is dependent upon integration with many other software components, especially Unified CM. Ensure to check that the Unified CCX release you are planning is supported with the Unified CM release for which this deployment is planned.

The Unified CCX 9.0(1) installation on the MCS servers is supported only on few of the specific models. The minimum RAM disk requirement on MCS/VMWare servers for installing Unified CCX 9.0(1) is increased to 4GB.



The RAM disk needs to be upgraded to 4GB before installing Unified CCX 9.0(1) on MCS 7816I4 and MCS 7825I4.

For the list of MCS servers supported for Unified CCX 9.0(1), see *Cisco Unified CCX Software and Hardware Compatibility Guide* available at:

http://www.cisco.com/en/US/products/sw/custcosw/ps1846/products\_device\_support\_tables\_list.html

# **Cisco Unified CCX disk space usage**

This section provides information about determining disk space usage and requirements when you install the Unified CCX. The historical reporting (HR) database (DB) size of the Unified CCX depends on the size of the hard disk on which it is stored. The table below provides an example of disk space usage for these DB types.

Sever Type	Server Disk Size	HR DB Size	Repository DB Size	Agent Db Size (rascal)	Configuration DB Size
7816	1x160 GB	11 GB	3.0 GB	0.5 GB	0.5 GB
	1x250 GB	11 GB	3.0 GB	0.5 GB	0.5 GB
7825	2x160 GB	12 GB	3.0 GB	0.5 GB	0.5 GB
	2x250 GB	12 GB	3.0 GB	0.5 GB	0.5 GB
7835	2x146 GB	13 GB	3.0 GB	0.5 GB	0.5 GB
7845	4x146 GB	20 GB	3.0 GB	0.5 Gb	0.5 GB
	4x300 GB	26 GB	3.0 GB	0.5 GB	0.5 GB

# **Architecture for Cisco Unified Intelligence Center**

Cisco Unified Intelligence Center (Unified Intelligence Center) is a comprehensive, end-to-end reporting solution built using Web 2.0 frameworks. It is designed to make the task of creating reports easier for the user.

The core reporting component of Unified Intelligence Center is bundled with Unified CCX. Cisco Unified Intelligence Center serviceability is integrated with the Cisco Unified CCX serviceability page.

# **Initial configuration**

Historical reporting client is the default reporting solution on Unified CCX. The Unified CCX administrator should switch to Unified Intelligence Center as the preferred reporting solution before accessing the Unified Intelligence Center web interface.

To perform this, configure the following from the Cisco Unified CCX Administration page:

- Configure Unified Intelligence Center as the reporting client.
- Set the maximum number of simultaneous database connections permitted (optional the default values are used for most cases).

· Configure SMTP for emailing scheduled reports.

 Assign reporting capability to users optionally. Any existing historical reporting users are automatically assigned as Unified IC reporting users.

# Flow diagram for reporting operation

### Figure 12: Flow diagram for reporting operation



The flow diagram for the reporting operation is explained below:

- 1 Reporting user accesses the Unified Intelligence Center web interface and provides the necessary login credentials.
- 2 Unified Intelligence Center authenticates the user with Unified CCX.
- 3 Unified CCX authenticates the user with Unified CM using AXL.
- 4 On successful authentication, the user is logged in and shown the main Unified Intelligence Center web interface.
- 5 User launches a report with appropriate filters.
- 6 Unified Intelligence Center invokes the stored procedure corresponding to that report on the Unified CCX database.
- 7 Report data is rendered and displayed in the browser.

# **Auto redirection**

In a two node HA setup, reporting users can connect to any node to run the reports. Auto-redirection is a feature introduced in Unified CCX that redirects the user to the most appropriate node that provides correct data while minimizing the load on the system. The redirection logic is based on the following:

- User is redirected to the non-master Engine node where CDS/HDS replication is enabled and Unified Intelligence Center is running.
- User is redirected to the database master node where Unified Intelligence Center is running.

- If Tomcat is not running on the non-master Engine node, there is no redirection and the user connects to the current node.
- If Tomcat is not running on the current node, there is no redirection and connection fails.
- In any case where redirection does not occur, the user connects to the current node.

# Data source update

A single Unified CCX data source is configured in Unified IC. It will point to a node which has correct data while minimizing database load. In a two node HA setup, the data source will point to the secondary node. This may change depending on the following conditions:

- · Database is not available on secondary node
- · CDS/HDS is disabled on secondary node



### CHAPTER

# CiscoUnifiedContactCenterExpressdeployment models

This chapter discusses the deployment models that are available for this Unified CCX release. Use the Cisco Unified Communications Sizing Tool to help you determine the number and types of servers required for any supported deployment model and call processing requirements (see Sizing for Cisco Unified Contact Center Express and Cisco Unified Communications Manager Servers, on page 105). Before using that tool, it is necessary to have an understanding of what deployment model you desire.

Cisco Unified Communication Manager (Unified CM) co-loaded with Unified CCX on the same virtual machine (VM) or bare metal server is not supported.



Cisco Unified Intelligence Center is deployed co-loaded on the same virtual machine (VM) or bare metal server with Unified CCX and supports all the Unified CCX deployment models.

The following table depicts the deployment models that are supported in Unified CCX. These models have no bearing on which specific server model is used. The minimum server model required is identified by the Cisco Unified Communications Sizing Tool. This chapter provides general rules for design and considerations and limitations for each of these deployment models. This information allows an Unified CCX system planner or designer to understand what other similar deployment models are supported and to understand how to determine the best solution for a given set of requirements.

### Table 24: Unified CCX deployment models

Unified CCX Deployment Model	Unified CCX Components on Server 1	Unified CCX Components on Server 2
Single-Server Non-High Availability Deployment Model—Unified CM Integration	Engine, Database, Recording, Monitoring components	
Two-Server High Availability Deployment Model—Unified CM Integration	Engine, Database, Recording, Monitoring components	Engine, Database, Recording, Monitoring components



Unified CCX deployment model integrated with Unifed CME is not supported in 9.0(1) and higher versions.

The following figure depicts the deployment when integrating Unified CCX with Unified CM. In this deployment, optional Unified CCX components shown with an asterisk (\*) can be added. These components are:

- Cisco Unified Work Force Management and Cisco Unified Quality Manager.
- Cisco IM and Presence Server. For more details about deploying the Presence Server, refer the *Cisco Unified Communications SRND*, which is available at this URL: http://www.cisco.com/go/ucsrnd







ASR and TTS can be added in Unified CCX integrated with Unified CM. ASR and TTS software is not provided by Cisco. This software must be purchased from a vendor such a Nuance, Scansoft, or IBM. These vendors can provide design and server sizing requirements for their software.

1

- Unified CCX General Rules for Design, page 81
- Single-Server Non-High Availability Deployment Model Cisco Unified Communications Manager integration, page 82
- Two-Server High Availability Deployment Model Cisco Unified Communications Manager integration, page 83
- Unified CCX Web Chat deployment model, page 87
- Other design considerations, page 90
- Cisco HCS deployment models, page 92

# **Unified CCX General Rules for Design**

When designing a Unified CCX deployment, the following rules apply:

 When deploying for high availability (HA), the Unified CCX servers can be located in the same campus LAN to provide server redundancy. The Cisco Unified CCX servers can also be located in different sites separated by WAN to provide spatial redundancy.



For HA over LAN deployment, heartbeats are sent every half a second and failover occurs if 5 consecutive heartbeats are missed. For HA over WAN deployment, heartbeats are sent every second and failover occurs if missing 10 consecutive heartbeats. These values are not configurable.

- You can locate the Unified Communications Manager servers that run CTI Managers with which Unified CCX communicates in the same campus LAN. In case of Unified CCX servers that are deployed over WAN, for better site redundancy, Cisco highly recommends that you deploy local Unified Communications Manager server at both sites.
- If recording is going to be used for a high availability deployment, the Recording component must be redundant.
- All agents for a Unified CCX deployment must be using phones that register to the same Unified CM cluster. Calls can be received from devices and callers on another Unified CM cluster (using inter-cluster trunks).
- All Unified CCX deployments must be configured using the Cisco Unified Communications Sizing Tool to be supported. Only the MCS 7835 and 7845 models provide redundant power supplies, redundant fans, and redundant hot-swappable disk drives. Therefore, use the MCS 7835 or the MCS 7845 for higher resiliency.
- High availability is supported with Cisco Unified IP-IVR but not when it is used as the queuing platform for Unified CCE.
- Unified CCX software and database versions must be the same for both the master and standby nodes in a high availability deployment.
- Different server models can be used in a high availability deployment with the following constraints.

• The capacity of the subscriber HDD should be equal to or more than that of the publisher HDD.

- In the case of different servers being used in a high availability deployment, the system capacity is determined by the smaller of the two servers.
- Unified CCX solution works with a combination of software and hardware components, providing an
  open and flexible environment for customers to execute complex scripts, custom codes, documents, etc.
  Overloading any of the software/hardware components such as virtual memory, CPU, etc. could impact
  the solution performance. Cisco recommends reviewing and optimizing scripts, custom codes, documents
  etc., before they are loaded to the production setup; Cisco also recommends also constant monitoring
  of system component/hardware attributes like disk space and CPU utilization.

For more details on optimization and best practices, please refer to "Cisco Unified Contact Center Express and IPIVR - Best Practices" which is available at:

http://www.cisco.com/en/US/docs/voice\_ip\_comm/cust\_contact/contact\_center/crs/express\_7\_0/reference/guide/UCCX\_Best\_Practices.pdf

When deploying Quality Management and Workforce Management with Unified CCX, consider the following guidelines:

- Quality Management and Workforce Management must be installed on separate servers from each other and Unified CCX. No form of co-residency is supported in this release with any other software, such as installing on Unified CCX or installing both Quality Management and Workforce Management on the same server.
- WFO products do not provide redundancy. However, note that both Quality Management and Workforce Management do support redundant Unified CCX environment and are able to switch to a secondary or backup system upon failure of the primary Unified CCX system.
- Unified CCX does not support the use of third party applications (for example, using TAPI) to control its devices.
- For more deployment information about Workforce Management and Quality Management, refer to the Cisco Workforce Optimization System Configuration Guide available at the link: http://www.cisco.com/ en/US/products/ps8293/products\_implementation\_design\_guides\_list.html

### **Related Topics**

Unified CCX high availability over WAN, on page 83

# Single-Server Non-High Availability Deployment Model - Cisco Unified Communications Manager integration

The Single-Server Non-High Availability Deployment Model—Unified CM integration is for small deployments. This deployment model places a single instance of all four Unified CCX software components on the same server and uses Informix IDS as the database server.

This deployment model can support silent monitoring and recording for agents at any WAN-connected site by using desktop monitoring. (Refer the *Cisco Unified CCX Software and Hardware Compatibility Guide* for a list of phones that support desktop monitoring). It can also support SPAN port monitoring for agents on the VLAN segment local to Unified CCX server. This deployment model does not incorporate additional remote Monitoring components, so silent monitoring and recording is not possible for agents who are using the Cisco

IP Phone Agent at remote sites. Similarly, silent monitoring and recording is not possible for agents at remote sites who are using phones that do not support desktop monitoring.

This deployment model allows the Unified CCX Engine to fail over to a backup CTI Manager if the primary CTI Manager fails. CTI ports and CTI route points should be grouped into device pools that have the same primary and secondary server list as those used for JTAPI communications with the CTI Managers.

# Two-Server High Availability Deployment Model - Cisco Unified Communications Manager integration

The Two-Server High Availability Deployment Model—Unified CM integration is for small to medium-sized contact centers requiring high availability. This deployment model incorporates redundant Unified CCX Engine, Database, Recording, and Monitoring components.

Informix IDS replication is used to keep the databases synchronized.

This deployment model can support silent monitoring and recording for agents at any WAN-connected site by using desktop monitoring. (Refer the *Cisco Unified CCX Software and Hardware Compatibility Guide* for a list of phones that support desktop monitoring). It can also support SPAN port monitoring for agents on the VLAN segment local to Unified CCX server. This deployment model provides redundancy for both recording and silent monitoring for all agents using desktop monitoring (regardless of location) or agents on the local VLAN using SPAN port monitoring. This deployment model does not incorporate additional remote Monitoring components, so silent monitoring and recording is not possible for agents who are using the Cisco IP Phone Agent at remote sites. Similarly, silent monitoring and recording is not possible for agents at remote sites who are using phones that do not support desktop monitoring.

This deployment model allows either Unified CCX Engine component to fail over to a backup CTI Manager if the primary server fails. CTI Ports and CTI Route Points should be grouped into device pools that have the same primary and secondary server list as that used for JTAPI communications to the CTI Managers.

Note

In HA deployments, historical data comes from the database located in the standby engine node. On newer platforms, a higher number of historical reporting sessions during operating hours is supported for HA deployments. Refer the Cisco Unified Communications Sizing Tool for the limits.

# Unified CCX high availability over WAN

Unified CCX supports high availability over WAN to provide site redundancy. In this deployment, the Unified CCX servers are located in two different sites across the WAN. Cisco recommends each site should have at least one Unified CM server that is running CTI Manager with which Unified CCX communicates. Agents

and supervisors can be located in one of the sites where the Unified CCX server resides or in any other remote sites. The following figure depicts the deployment for Unified CCX high availability over WAN.



### Figure 14: Unified CCX high availability over WAN deployment

### **Network requirements**

When deploying Unified CCX HA over WAN, observe the following network requirements:

### Delay

The maximum allowed round-trip time (RTT) between Unified CCX servers is 80 ms.



Do not use the ping utility on the Unified CCX server to verify RTT as it will not provide an accurate result. The ping is sent as a best-effort tagged packet and is not transported using the same QoS-enabled path as the WAN traffic. Therefore, Cisco recommends that you verify the delay by using the closest network device to the Unified CCX servers, ideally the access switch to which the server is attached. Cisco IOS provides an extended ping capable of setting the Layer 3 type of service (ToS) bits to make sure the ping packet is sent on the same QoS-enabled path that the WAN traffic will traverse. The time recorded by the extended ping is the round-trip time (RTT), or the time it takes to traverse the communications path and return. Refer to the IOS document available at http://www.cisco.com/en/US/tech/tk365/technologies\_tech\_note09186a0080093f22.shtml#extend\_ping for more detail.

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### Bandwidth

Sufficient bandwidth must be provisioned for Unified CCX cluster, Unified CM cluster, remote agent/supervisor desktops and other optional components in order to deploy HA over WAN successfully.

Account for the bandwidth required for the following components:

Unified CCX Cluster and Unified CM Cluster

Unified CCX cluster consumes bandwidth between the Unified CCX servers in high availability. If the Unified CM running CTI Manager that Unified CCX communicates with is remote, there would be additional bandwidth utilized by Unified CCX.

Unified CM could consume significantly higher bandwidth for Intra-Cluster Communication Signaling (ICCS) between sites when deploying with Unified CCX. This is due to the additional number of call redirects and CTI/JTAPI communications encompassed in the intra-cluster communications.

Unified CCX can be deployed as ACD to route and queue contacts for available agent or as IP-IVR to perform self-service. The bandwidth requirements for Unified CCX and Unified CM clusters are different depending on the deployment type.

The following table shows the minimum bandwidth requirement for Unified CCX and Unified CM clusters when deploying HA over WAN.

Unified CCX Cluster			Unified CM Cluster	
Deployment type	Between Unified CCX Servers	Between Unified CCX and Remote Unified CM Servers	Database <sup>1</sup>	ICCS
ACD	1.2 Mbps	800 kbps	1.544 Mbps (T1)	70 kbps per 100 BHCA <sup>2</sup>
IP-IVR	1.2 Mbps	200 kbps	1.544 Mbps (T1)	25 kbps per 100 BHCA

### Table 25: Unified CCX HA over WAN bandwidth requirement

This column shows the database bandwidth required for Unified CM clustering over WAN and could be subject to change. For the final authorized value, refer 1 to Cisco Unified Communications Solution Reference Network Design (SRND) available at: http://www.cisco.com/go/ucsrnd 2

BHCA (Busy Hour Call Attempt) is the number of calls entering the system in the busy hour for Unified CCX or IP-IVR.

For Unified CCX Cluster in the preceding table:

- The traffic between Unified CCX servers includes database replication, heartbeat and other communication between the Unified CCX HA servers.
- The traffic between Unified CCX server and remote Unified CM server running CTI Manager is the JTAPI call signaling.

For Unified CM Cluster in the preceding table:

- Database column includes traffic for database and other inter-server traffic for every Cisco Unified CM subscriber server remote to the Unified CM publisher.
- ICCS column shows all the ICCS traffic between CallManager/CallManager services and CallManager/CTI Manager services running in the Unified CM nodes across sites.

As an example, assume the Unified CCX HA over WAN deployment has two sites and is used as ACD. Site 1 has the Unified CCX, one Unified CM publisher and two Unified CM subscribers. Site 2 has the other Unified CCX and two Unified CM subscribers. Unified CCX in site 1 communicates with Unified CM subscriber in site 2 for JTAPI signaling. In the busy hour, there are 1500 calls coming into Unified CCX that get routed or queued for agents.



The maximum supported response time between the Unified CCX server and the Microsoft Exchange server is 80 ms.

For Unified CCX cluster, bandwidth required is:

1.2 Mbps + 800 kbps (0.8 Mbps) = 2 Mbps

For Cisco Unified CM cluster, there are two Unified CM subscribers remote from the Unified CM publisher and the BHCA is 1500. Bandwidth required is:

 $1.544 \text{ Mbps} \times 2 + 70 \text{ kbps} \times 15 (1.05 \text{ Mbps}) = 4.138 \text{ Mbps}$ 

In total, 6.138 Mbps between sites is required for this deployment.

Agents and Supervisors

In HA over WAN deployment, agents and supervisors could reside in either Unified CCX sites or they could be remote depending on the location of active Unified CCX server at the time of operation. Bandwidth should be provisioned for remote agents between sites using the maximum number of agents from the two sites. Estimate the required bandwidth using the Cisco Agent Desktop Bandwidth Calculator available at:

http://www.cisco.com/en/US/products/sw/custcosw/ps427/prod\_technical\_reference\_list.html

Optional Components

Customers might have the following optional components deployed across the WAN from Unified CCX or Unified IP IVR. Ensure to account for the additional bandwidth required in their HA over WAN deployment.

- Wallboard Server: Figure out the amount of data that is pulled from Unified CCX database to the remote wallboard server.
- Enterprise Database: Estimate the total amount of data that is retrieved through the database steps from the remote enterprise database.
- SMTP Server: If the SMTP server is remote from the Unified IP IVR, find out the average size of each outgoing email and calculate the total.

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### **Quality of service**

Quality of service (QoS) must be enabled and engineered correctly on the network to provide consistent and predictable end-to-end levels of service. Unified CCX software does not mark any network packet, thus ensure that you mark the traffic at the network edge routers.

The following table shows the recommendations on the QoS markings for Unified CCX HA over WAN deployment.

### Table 26: QoS recommendations for Unified CCX HA over WAN

Traffic	Recommended QoS Marking
Heartbeat and Node Manager Status Messages	IP Precedence 3 (DSCP 26 or PHB AF31)
JTAPI Call Signaling	IP Precedence 3 (DSCP 24 or PHB CS3)
Database Replication between Unified CCX nodes <sup>3</sup>	IP Precedence 0 (DSCP 0 or PHB BE)

<sup>3</sup> The database traffic may be re-prioritized to a higher priority data service (for example, IP Precedence 2 [DSCP 18 or PHB AF21] if required by the particular business needs). An example of this is the usage of outbound dialer in Unified CCX, which relies on writing data to the Config Datastore.

For more information on QoS requirements of VoIP, refer the Enterprise QoS Solution Reference Network Design Guide available here: http://www.cisco.com/en/US/docs/solutions/Enterprise/WAN\_and\_MAN/QoS\_SRND/QoSIntro.html#wp46447

### **Deployment considerations**

Consider the following when deploying High Availability over WAN with Unified CCX:

- Deploy ASR/TTS server locally in each Unified CCX site
- Set up Unified CCX to use the local Unified CM servers for both primary and secondary in the following configurations. If this is not possible, at least the primary Unified CM server should be local.
  - AXL Service Provider
  - JTAPI Provider for Unified CM Telephony Subsystem
  - JTAPI Provider for Resource Manager/Contact Manager Subsystem



There will be significant delays in agent login during Unified CCX failover if AXL and JTAPI communications are made over the WAN, especially under load conditions.

- Assign the two sets of CTI Port (one for the master and other for the standby engine) to different device pools, regions and locations, etc., in the CTI Port Group
- Data in Agent Datastore, Historical Datastore and Repository Datastore of Informix IDS database start merging after the network partition is restored and this could potentially generate heavy data traffic over the WAN. Cisco recommends restoring the WAN link during after hours to minimize the performance impact.
- Do not support VPN tunneling across the WAN.

# Unified CCX Web Chat deployment model

As part of the Premium offering, Unified CCX agents can service customer chat requests using the Agent Web Chat Application from the Cisco Agent Desktop or through a standalone browser.

As stated in the overview section, this feature requires a Cisco SocialMiner deployment to accept and relay the contact requests from a customer website. One SocialMiner deployment can serve only one Unified CCX deployment (single node or High Availability deployment). There are two deployment scenarios.

# Deployment scenario 1: Customer website in Demilitarized Zone (DMZ)

### Figure 15: Customer website in DMZ

Customer website in DMZ



The Unified CCX is deployed inside the enterprise firewall and SocialMiner is deployed inside company premises in the DMZ zone along with the customer website. The DMZ zone is open to all HTTP/HTTPS traffic from the Internet. The Unified CCX is shielded from all outside traffic except the traffic coming from the DMZ zone. Even from the DMZ zone the Unified CCX only responds on HTTP/HTTPS and BOSH (7443/7071) ports.

# **Deployment scenario 2: Customer website in public cloud/domain**

### Figure 16: Customer website in public cloud/domain

### Customer website in public cloud/domain



The Unified CCX is deployed inside the enterprise firewall and SocialMiner is deployed inside company premises in the DMZ. The customer website is on a public cloud or public domain and is open to the Internet. The DMZ zone is open to all HTTP/HTTPS traffic from the Internet. The Unified CCX is shielded from all outside traffic except the traffic coming from the DMZ zone. Even from the DMZ zone the Unified CCX only responds on HTTP/HTTPS and BOSH (7443/7071) ports.

One variation of the preceding scenario can be an addition of a proxy server that can intercept and relay all calls going to SocialMiner.

# Unified CCX high availability deployment

Web Chat supports failover and failback as per the feature description table earlier. You should follow the same considerations and design strategy, as the one considered for the overall Unified CCX high availability deployment.

# Other design considerations

Consider the following when designing your Unified CCX system:

- High availability requires additional disk space, so historical call reporting capacity may be reduced. Historical call reporting capacity also depends upon BHCC, hours of operation per day, and days of operation per week.
- G.711 call recording requires about 1MB per minute. G.729 call recording requires about 256KB per minute.
- The following categories of data use hard disk space:
  - · Linux Server OS, Unified CCX Software, and Informix Database Management Software
  - Unified CCX Logs
  - The Unified CCX Database (comprised of 4 data stores)
  - · Recording Files.

Systems planners and designers should attempt to estimate the impact of each in order to determine hard disk requirements. The Cisco Customer Response Solutions Installation Guide provides more information about disk size requirements for very large installations.

- The Unified CM sizing tools assume devices are evenly distributed across all servers. CTI Route Points
  is configured as part of a device pool that homes primarily to the same Cisco Unified Communications
  Manager Server as the primary CTI Manager being used; it may be required to run the Cisco Unified
  Communications Manager sizing tool on a per location or per server basis.
- The Unified CM QSIG path replacement feature is not supported for Unified CCX calls. For additional
  information about Unsupported Features in Unified CM, see the current release notes for Unified CCX.
- Unified CM Forced Authorization Codes and Client Matter Codes should be turned off for all route patterns in the Unified CM cluster that are used by Unified CCX. Enabling these features for route patterns that aren't used by Unified CCX does not affect Unified CCX.
- For a list of unsupported features in Unified CM with Unified CCX, refer to the current release notes for Unified CCX.
- Unified CCX supports different sets of IP Phones as agent devices on Unified CM and Unified CM platform; not all agent devices can be used as IP Phone Agent. For a complete list of supported agent devices, refer to the Cisco Unified CCX Software and Hardware Compatibility Guide available at:

http://www.cisco.com/en/US/products/sw/custcosw/ps1846/products device support tables list.html

- CAD supports only one localized language per Unified CCX cluster which is determined at installation. As a result, all Cisco Agent and Supervisor Desktop applications in that Unified CCX cluster must use the same language.
- An agent can log in using Extension Mobility but the agent phone must be in the Unified CM cluster that is used by Unified CCX.
- Sometimes new releases of Unified CM will not support Unified CCX immediately at Unified CM first
  customer ship (FCS) time. Some organizations may be early adopters of new Unified CM releases and
  may be slowed from migrating to new Unified CM releases and using new Unified CM features if Unified

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CCX is installed with that same Unified CM cluster. Therefore, in some scenarios, it may make sense to have a separate Unified CM cluster for Unified CCX.

- Cisco Jabber runs in two modes: Deskphone Mode and Softphone Mode. Unified CCX only supports Cisco Jabber as an agent device in Softphone Mode.
- Cisco Agent Desktop/Cisco Supervisor Desktop does not support video operation if you are using Cisco Jabber for Windows as agent phone.
- The following features are not supported if you are using Cisco Jabber for Windows as agent phone:
  - Multiline (ACD and non-ACD)
  - Extension Mobility

# Multiple Cisco Unified CCX Clusters integrated with a single Cisco Unified Communications Manager cluster

It is possible to integrate multiple Unified CCX clusters with a single Cisco Unified Communications Manager cluster.



Note

There is no limit on the number of Unified CCX clusters supported with a single Unified CM cluster as long as the combined agent phones, CTI ports, CTI route points, etc., utilized by all Unified CCX clusters were used to size Unified CM.

• To determine if you need more than one CTI Manager, refer to the *Cisco Unified Communications* Solution Reference Network Design (SRND), available at http://www.cisco.com/go/ucsrnd.

If your deployment requires more than one CTI Manager, Cisco recommends that you load-balance Unified CCX and other CTI applications across the various CTI Managers in the cluster to provide maximum resilience, performance, and redundancy.

For additional CTI Manager best practices, refer to the *Cisco Unified Communications Solution Reference Network Design (SRND)*, available at http://www.cisco.com/go/ucsrnd.

- If more than one primary subscriber is required to support your configuration, distribute all agents equally among the subscriber nodes. This configuration assumes that the busy-hour call attempts (BHCA) is uniform across all agents.
- Each Unified CCX cluster is standalone and independent from other Unified CCX clusters. There is no communication or synchronization between the Unified CCX clusters. Agents should operate in can only one Unified CCX cluster.

Unified CM Telephony Triggers (CTI Route Points) and CTI ports should be different across Unified CCX clusters.

 In the list of Resources in Unified CCX Administration, each Unified CCX cluster displays all the agents in the Cisco Unified Communications Manager cluster, even though the agents can operate and log in to one Unified CCX cluster. This situation requires that the Unified CCX Administrator be aware of which resources are associated with each cluster. The Unified CCX Administrator can mitigate this situation by having a unique naming convention for resources associated with a particular Unified CCX cluster.

- This deployment is not intended to provide Unified CCX redundancy across different Unified CCX clusters. If a Unified CCX cluster fails, the agents that operate in this cluster cannot operate in other Unified CCX clusters. If another Unified CCX cluster is configured to accept the calls that were originally sent to the Unified CCX cluster that failed, there will be no report integration between the Unified CCX clusters.
- This deployment does not change the characteristics and design recommendations of each individual Unified CCX cluster. For example, within a Unified CCX cluster, high availability is still supported.

### **Related Topics**

Sizing for Cisco Unified Contact Center Express and Cisco Unified Communications Manager Servers, on page 105

# Virtualized deployment on Cisco Unified Computing System (UCS)

Unified CCX can be deployed as an application on a virtual machine on the VMWare platform running on the Cisco Unified Computing System (UCS) hardware. This allows Cisco Unified Contact Center Express to be part of a virtualized deployment on the same hardware along with other Cisco Unified Communications applications with resulting savings due to server consolidation and reduced total cost of ownership (TCO).

Unified CCX is installable on a virtual machine using a standard Open Virtualization Format Template (called OVA template). Using a single OVA templates we can install 100, 300, and 400 agents profile. Each OVA template is associated with a certain number of CPU and specific main memory and hard disk capacity, and supports a predefined set of scalability parameters (including the number of agents). Please refer to the Unified CCX Data Sheet for information on scalability parameters supported by each OVA template.

For guidelines on deployment of Unified Communications (UC) applications (including Unified CCX) on UCS servers, refer to the "Deploying Unified Communications on Virtualized Servers" section in the *Cisco Unified Communications System SRND* available at the following location:

http://www.cisco.com/go/designzone

For more details on the hardware requirements, VMWare requirements, supported VMW are features, virtual machine sizing and best practices for this deployment, please refer to the following link: http://www.cisco.com/go/uc-virtualized

# **Cisco HCS deployment models**

Unified Contact Center Express supports both on-premises and hosted deployment models in Cisco HCS to provide contact center capabilities to customers. Contact your account team to obtain a copy of the *Cisco HCS Design and Implementation Guide* to configure and use the Unified Contact Center Express in Cisco HCS.

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### **Related Topics**

Cisco Hosted Collaboration Solution Overview Cisco Unified CCX Software and Hardware Compatibility Guide

# **Hosted Unified CCX deployment**

In the hosted deployment model, Unified CCX is deployed in the HCS data center, along with

- Dependent Cisco HCS elements
- Cisco Unified Communications Manager
- Cisco Unified Presence Service



The hosted deployment model supports only Unified CCX access of Cisco desktop clients, including agent desktop, supervisor desktop, and desktop administrator using real IP address. In other words, if Unified CCX is in a network that has Network Address Translation (NAT) configured in the router, it is not supported.

The following table outlines the various Unified CCX solution components and their supported deployment location.

Unified CCX Solution Element	Functionality	Deployment Location
Agent phones	IP Phone Agent (IPPA), Std Telephony	Customer premises
Cisco desktop clients	Agent Desktop, Supervisor Desktop, and Desktop Administrator	Customer premises
SIP Gateway	Outbound IVR	Hosted
Microsoft Exchange Server	Email Integration	Customer premises
ASR/TTS Servers	Automatic Speech Recognition and Text-to-Speech	Hosted
Wallboard Server	Third-Party Wallboard Application	Customer premises

Table 27: Unified CCX solution components in hosted deployment for Cisco HCS



In a High Availability (HA) setup, you may need to work with your wallboard vendor to handle Unified CCX failover transparently by the wallboard without any manual intervention.

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The following diagram depicts this deployment topology for Unified CCX in Cisco HCS. *Figure 17: Hosted Unified CCX deployment in Cisco HCS* 

### Limitations

The following limitations apply for HCS deployment of Unified CCX.

Table 28: Deployment limitations for hosted HCS

S. No	Limitation
1	Does not support Work Flow Management (WFM), Quality Management (QM/AQM), and Compliance Recording (CR) applications.
2	Does not support SPAN-based VoIP Monitoring and Recording.

# **On-premises Unified CCX deployment**

This deployment model describes Unified CCX as deployed on the customer premises using the Cisco HCS WAN to access

- Dependent Cisco HCS elements
- Cisco Unified Communications Manager
- Cisco Unified Presence Service

The following table outlines the various Unified CCX solution components and their supported deployment location.

Unified CCX Solution Element	Functionality	Deployment Location
Agent phones	IP Phone Agent (IPPA), Std Telephony	Customer premises
Cisco desktop clients	Agent Desktop, Supervisor Desktop, and Desktop Administrator	Customer premises
SIP Gateway	Outbound IVR	Customer premises
Microsoft Exchange Server	Email Integration	Customer premises
ASR/TTS Servers	Automatic Speech Recognition and Text-to-Speech	Customer premises
Wallboard Server	Third-Party Wallboard Application	Customer premises

#### Table 29: Unified CCX solution components in on-premises deployment for Cisco HCS

**Marning** 

The hosted deployment model supports only Unified CCX access of Cisco desktop clients, including agent desktop, supervisor desktop, and desktop administrator using real IP address. In other words, if Unified CCX is in a network that has Network Address Translation (NAT) configured in the router, it is not supported.



In a High Availability (HA) setup, you may need to work with your wallboard vendor to handle Unified CCX failover transparently by the wallboard without any manual intervention.

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The following diagram depicts this deployment topology for Unified CCX in Cisco HCS. *Figure 18: On-premises deployment* 



### Limitations

The following limitations apply for HCS deployment of Unified CCX.

### Table 30: Deployment limitations for HCS

S. No	Limitation
1	Does not support Work Flow Management (WFM), Quality Management (QM/AQM), and Compliance Recording (CR) applications.
2	The maximum WAN round trip delay that Unified CCX supports remains the same when deployed in HCS. The WAN between Unified CM and Unified CCX, or the HCS customer premises to data center over VPN, should meet these requirements.
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## **Basics of call center sizing**

This chapter introduces the basic concepts involved in call center sizing and contains the following sections:

- Terminology, page 99
- Preliminary information requirements, page 100
- Principal design considerations for call center sizing, page 102

## Terminology

The figure below illustrates the common port types and how they map to Unified CCX.

#### Figure 19: Call center port types



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Call center sizing differentiates the port types as follows:

- Gateway or PSTN trunk ports handle calls originating from the PSTN. They are purchased separately from Unified CCX.
- Queue ports are IVR ports that queue calls (when no agents are available) prior to transferring the caller to an available agent. These ports are included at no additional cost with Unified CCX Standard or Enhanced, but they must be sized for proper capacity planning for the Unified CCX server.
- **IVR ports** are full-featured IVR ports available with the Cisco Unified IP IVR and Unified CCX Premium product.

If you want additional supporting features, such as automatic speech recognition (ASR), text-to-speech (TTS), email notification, web server or client functionality, and database operations, you simply need to purchase the Premium package. Additional seats may also be purchased for IVR port licenses if the number of port licenses that come with the seat licenses is not sufficient.

The Unified CCX architecture differs slightly from the example TDM call center configuration in that IVR ports and queue ports (and P&C ports as well) are combined into one logical CTI port as shown in the figure above.

## **Preliminary information requirements**

System designers are advised to create a sizing document to do the following:

- Scope out the preliminary configuration information for the Unified CCX server.
- Size the gateways for the system.

To determine the size of the call center, obtain answers to the following questions:

- How many IVR ports do you need?
- How many PSTN gateway trunk ports do you need?
- How many agents will answer incoming calls?

To answer these questions properly, you will need the sizing metrics and information listed in the following table.

#### Table 31: Call center sizing metrics

Metric	Description
Average handle time (AHT)	Average duration (talk time) of a call plus after-call work time, which is the wrap-up time after the caller hangs up.
Average IVR port usage time	The total time for prompt playout and/or menu navigation (if any) in the Unified CCX script. This should not include the queue time the caller spends waiting in queue before an agent becomes available. Queue time is calculated using Erlang-C automatically as shown in Figure 20: Unified CCX design process – Call center sizing, on page 102.

Metric	Description
Service level goal for agents	Percentage of calls answered by agents within a specific number of seconds.
Busy Hour Call Attempts (BHCA)	Average number of calls received in a busy hour.
Grade of service (% blockage) for gateway ports to the PSTN	Percentage of calls that get a busy tone (no gateway trunks available) out of the total BHCA.

All of the metrics in this table are basic call-sizing metrics. After these information are obtained, calculate the number of gateway trunk ports, IVR ports, and agents using standard Erlang B and C calculators as shown in Principal design considerations for call center sizing, on page 102.

See Figure 20: Unified CCX design process – Call center sizing, on page 102 for an overview of the IP call center sizing process.

Note

If the system being designed is a replacement for an existing ACD or an expansion to an installed Unified CCX or Cisco Unified IP IVR system, you might be able to use the historical reporting information from the existing system to arrive at the above metrics.

In addition, call sizing design considerations may vary if the call center is more self-service oriented.

#### **Related Topics**

Principal design considerations for call center sizing, on page 102

## Principal design considerations for call center sizing

The figure below illustrates the principal steps and design considerations for sizing a call center.

#### Figure 20: Unified CCX design process – Call center sizing



This figure is a general overview of the design considerations for call sizing. For a detailed description of the call center sizing design process, refer to the section on sizing call center resources in the *Cisco Unified Contact Center Enterprise Solution Reference Network Design Guide*, available online at the following URL:

#### http://www.cisco.com/go/ucsrnd

There are similar basic call center sizing considerations and steps for Unified CCE, and they also can be used in sizing a smaller contact center for Unified CCX. This call-sizing approach will provide you with the minimum number of IVR ports to support the total BHCA.

In addition, you should include the following design considerations, specific to Unified CCX, in your call center sizing calculations:

- At a minimum, plan on enough capacity to replace your existing system. The replacement system should perform at least as well as the one it is replacing.
- After all of the Erlang (C and B) calculations are complete for the call center sizing, any changes in queue times or agents will affect the total number of trunks and IVR ports required for an Unified CCX solution.
- As you increase the size of the agent pool, very small changes in the average queue time and percentage of queued calls will affect the required number of gateway trunks and IVR ports.
- Even if you perform all of the calculations for a call center, there are still some variables that you cannot plan for but that will affect the ports needed on a Unified CCX system. For example, one or more agents

could call in sick, and that would affect the port count and queue time for each call. Just two agents calling in sick could increase the port count by over 12%. This would affect the price of the system and, if not planned for, would affect the ability of the call center to meet caller requirements. Properly sizing call center resources is integral to designing an effective Unified CCX system.



**Note** Not all of the Unified CCX system limits are available at the same time.

If all of the call sizing information is available, the next step is to apply Unified CCX sizing limits to the call center requirements. For this step, use the Cisco Unified Communications Sizing Tool, available online at:

http://tools.cisco.com/cucst

The Unified Communications downloadable sizing tools help you with the task of sizing Unified Communications deployments.

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# Sizing for Cisco Unified Contact Center Express and Cisco Unified Communications Manager Servers

This chapter helps you size the Cisco Unified CCX Server and the Cisco Unified Communications Manager (Cisco Unified CM) Server.

- Cisco A2Q bid assurance requirements, page 105
- Sizing tools, page 105
- Effect of performance criteria on Unified CCX server, page 106
- Impact of performance criteria on the Unified CM server(s), page 107

## **Cisco A20 bid assurance requirements**

The Assessment to Quality (A2Q) process is a Cisco design review and deployment assessment initiative that identifies and solves solution issues before a deal gets booked. Cisco Customer Contact Business Unit (CCBU) requires that all new Unified CCX deals be submitted to the A2Q Contact Center team.

Please note the following requirements:

- The Cisco A2Q process must be followed for every Unified CCX deployment.
- Every Unified CCX deployment must use the Cisco Unified Communications Sizing Tool. The tool will either automatically bid assure a configuration or will flag that a manual bid assurance review is required.
- Every Unified CCX configuration must be bid assured prior to making a final offer to a customer.

## Sizing tools

The Cisco Unified Communications Sizing Tool for Unified CCX and Cisco Unified IP IVR must be used to size Unified CCX and Cisco Unified IP IVR systems. Also, the Cisco Unified Communications Sizing Tool is the only approved tool and must be used to properly size the Unified CM server(s). Before sizing the servers,

first familiarize yourself with the on-line Help and frequently asked questions (FAQs) of the tools before using them to size your systems.

Note

For deployments with more than 150 agent phones on MCS 7835 or MCS 7845, Cisco recommends that you deploy a minimum of two subscriber servers and a combined TFTP publisher. This agent phone limit is server platform dependent.

The following table shows the maximum number of agent and non-agent phones supported on different server platforms for a 2-server Unified CM cluster with the publisher as the backup subscriber.

Table 32: Maximum number of agent and non-agent phones supported for a 2-server Unified CM cluster on different platforms

Server platform	Maximum number of agent phones	Maximum number of non-agent phones	Maximum BHCA per agent
MCS 7816	50	10	30
MCS 7825	100	20	30
MCS 7835 or MCS 7845	150	30	30

The Cisco Unified Communications Sizing Tool for Unified CCX and Cisco Unified IP IVR is available online at:

http://tools.cisco.com/cucst

The tool is available online for partner access to account for the capacity required in Unified CM servers to handle CTI and call processing for Unified CCX.

## Effect of performance criteria on Unified CCX server

System performance criteria fall into two general categories:

- Unified CCX and Cisco Unified IP IVR components Applications, SW versions, capabilities, server types, and options and quantities that your system requires
- System usage The average number of calls placed and received per hour, the average call length, the scripts being executed, grammar used for ASR, and so forth

### Effect of performance criteria

Each performance criterion can have an effect on the performance of the Unified CCX or Cisco Unified IP IVR system. In general, the more Unified CCX or Cisco Unified IP IVR components that you install and the heavier the system usage, the higher the demand on the server. However, the performance criteria can also interact in various non-linear ways to affect performance. The Cisco Unified Communications Sizing Tool for Unified CCX and Cisco Unified IP IVR can help you see and evaluate the effects of performance criteria on the Unified CCX and Cisco Unified IP IVR server.

## Impact of performance criteria on the Unified CM server(s)

Similarly, Unified CM system performance is influenced by many criteria such as:

- Software release versions— Using the Cisco Unified Communications Sizing tool, make sure to select the Unified CM software version with which Unified CCX will be working.
- The type and quantity of devices registered, such as:
  - ° CTI ports (IP IVR ports for queuing, call treatment and self service)
  - ° Gateway (GW) ports
  - Agent phones
  - Route points
- The load processed by these devices (calls per second)
- Application call flows
  - ° IVR self-service
  - ° Call treatment/Prompt and collect
  - ° Routing to agents, % transfers and conferences
- · Special Unified CM configuration and services
  - ° Other non- Unified CCX devices-IP phones, GW ports, Unity ports, dial plan, and so forth.
  - Music on Hold (MOH)

 Tracing levels— Unified CM CPU resource consumption varies depending on trace level enabled. Changing trace level from Default to Full on Unified CM can increase CPU consumption significantly under high loads. Changing tracing level from Default to No tracing can also decrease CPU consumption significantly at high loads (this configuration is not supported by Cisco TAC). CPU consumption due to default trace will vary based on load, Unified CM release, applications installed, call flow complexity, and so on.

Server platform type

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## **Estimating bandwidth consumption**

Bandwidth plays a large role in deployments involving:

- The centralized call processing model (Unified CCX at the central site)
- Any call deployment model that uses call admission control or a gatekeeper
- Remote agent traffic profile, page 109
- Silent monitoring bandwidth usage, page 110
- Security, page 122
- QoS and call admission control, page 123
- CAC and RSVP, page 125
- Bandwidth security and QoS considerations for Unified Intelligence Center, page 127

## Remote agent traffic profile

Unified CCX signaling represents only a very small portion of control traffic (Agent/Supervisor Desktop to and from the Unified CCX Server) in the network. For information on TCP ports and Differentiated Services Code Point (DSCP) marking for Unified CCX and CTI traffic, see the sections on Security, on page 122, and QoS and call admission control, on page 123.

Bandwidth estimation becomes an issue when voice is included in the calculation. Because WAN links are usually the lowest-speed circuits in an IP Telephony network, particular attention must be given to reducing packet loss, delay, and jitter where voice traffic is sent across these links. G.729 is the preferred codec for use over the WAN because the G.729 method for sampling audio introduces the least latency (only 30 msecs) in addition to any other delays caused by the network.

Where voice is included in bandwidth, system architects should consider the following factors:

- Total delay budget for latency (taking into account WAN latency, serialization delays for any local area network traversed, and any forwarding latency present in the network devices). The generally agreed-upon limit for total (one-way) latency for applications in a network is 150 milliseconds.
- Impact of delays inherent in the applications themselves. 8 seconds is the average Unified CCX agent login time with no WAN delay. This includes the exchange of approximately 1,000 messages between

the agent application and various servers. The overall time to log in agents increases by approximately 30 seconds for each 30 milliseconds of WAN delay.

- Impact of routing protocols. For example, Enhanced Interior Gateway Routing Protocol (EIGRP) uses quick convergence times and conservative use of bandwidth. EIGRP convergence also has a negligible impact on call processing and Unified CCX agent logins.
- Method used for silently monitoring and recording agent calls. The method used dictates the bandwidth load on a given network link.

#### **Related Topics**

Security, on page 122 QoS and call admission control, on page 123

## Silent monitoring bandwidth usage

The silent monitoring feature of the CAD desktop software, which includes both listening to and recording agent calls, has the largest bandwidth requirements for the CAD product. Properly configuring this feature is especially important for remote agents who are connected to the main site by a WAN connection.

An agent's call can be listened to or recorded by the CAD software. To do this, a request is sent to a VoIP provider. The VoIP provider captures the voice streams representing the call (two voice streams per call) and sends them back to the requestor. The bandwidth requirements detailed in this section are for the network links between the requestor and provider.

### Silent monitoring requestors

There are two possible requestors in the CAD software:

- CSD
- · Recording service

CSDs will send requests when the supervisor wishes to listen to an agent's call in real-time. The VoIP provider will capture the voice streams and send them back to the supervisor's desktop where they can be listened to over the desktop's speakers.

A Recording service will send requests when either a supervisor or agent wishes to record the call. The VoIP provider will send the voice streams and the Recording service will save the streams to disk so they can be listened to at a later time.

In Unified CCX, the Recording service is installed on the Unified CCX server.

### Silent monitoring providers

There are also two possible VoIP providers in the CAD software:

- Cisco Agent Desktop
- VoIP Monitor service

The Cisco Agent Desktop application contains a service referred to as the Desktop Monitor service that runs on the agent's desktop. It is responsible for processing silent monitoring requests only for the agent logged into the CAD application on the desktop. It captures voice packets sent to the IP or soft phone associated with the logged-in agent. The IP phone must be connected in series with the agent desktop on the network for this to work.

By default, this service is active on all agent desktops when the application is started. After initial installation of the CAD servers, all agents are already configured to use the Desktop Monitor service for the silent monitoring feature.

A VoIP Monitor service is able to handle multiple requests for silent monitoring simultaneously. It captures packets directly from the switch via the switch's Switched Port Analyzer (SPAN) configuration. In a deployment without high availability, Unified CCX supports one VoIP Monitor service, which is installed on the Unified CCX server. When high availability is deployed, two VoIP Monitor services are installed, one on each Unified CCX server.



Note

Agents who do not have a CAD destkop (such as IPPA and CADBE agents) must be configured to use a VoIP Monitor service for the silent monitoring feature.

The figure below shows a representative Unified CCX installation supporting a remote office over a WAN. Both the main office and the remote office have a VoIP and Recording service on site.

#### Figure 21: Contact center representation



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It is easy to see where the bandwidth will be required for the silent monitoring feature when you can locate the requestors and providers.

Regardless of who the requestor and VoIP provider are, the bandwidth requirement between these two points is the bandwidth of the IP call being monitored and/or recorded. You can think of each monitoring and/or recording session as being a new phone call (2 voice streams) for calculating bandwidth. Therefore, to calculate bandwidth to support the Silent Monitoring feature, you can use the same calculations used to provision the network to handle call traffic.

### IP call bandwidth usage

An IP phone call consists of two streams of data. One stream is sent from phone A to phone B. The other stream is sent from phone B to phone A. The voice data is encapsulated into packets that are sent over the network. The amount of data required to store a voice stream is dependent upon the CODEC used to encode the data. The CAD software can support both the G.711 and G.729 CODEC.

The voice data itself is transmitted over the network using the Real-Time Transport Protocol (RTP). The RTP protocol supports the idea of *silence suppression*. When silence suppression is used, no voice packets are sent over the network if there is no sound.

Otherwise, even packets that contain silence are sent. This lowers the average required bandwidth for a call. Although CAD supports silence suppression, the lower bandwidth requirements for silence suppression should not be used when provisioning the network because the worst case scenario would be where there is not silence in the call, requiring the full call bandwidth as if silence suppression was not enabled.

When calculating bandwidth for an IP call, you must use the size of the RTP packet plus the additional overhead of the networking protocols used to transport the RTP data through the network.

For example, G.711 packets carrying 20 ms of speech data require 64 kbps (kilobytes per second) of network bandwidth per stream. These packets are encapsulated by four layers of networking protocols (RTP, UDP, IP, and Ethernet). Each of these protocols adds its own header information to the G.711 data. As a result, the G.711 data, once packed into an Ethernet frame, requires 87.2 kbps of bandwidth per data stream as it travels over the network. Since an IP phone call consists of two voice streams, in this example, a call would require 174.4 kbps.

The amount of voice data in a single packet also influences the size of the packet and bandwidth. The example above used packets containing 20 milliseconds of speech for its calculations, but this value can be changed in the Unified CM configuration for each supported CODEC. Configuring packets to contain more speech information reduces the number of packets sent over the network and reduces the bandwidth since there are fewer packets containing the additional networking headers, but the packet sizes increase.

The following table shows the bandwidth required for a phone call for the different combinations of CODEC and amount of speech per packet.

CODEC	Milliseconds of speech per packet	Bandwidth required (Kbps) for a call
G.711	10	220.8
G.711	20	174.4
G.711	30	159.0

#### Table 33: Per-call packet size bandwidth requirements

CODEC	Milliseconds of speech per packet	Bandwidth required (Kbps) for a call
G.729	10	108.8
G.729	20	62.4
G.729	30	47.0
G.729	40	39.2
G.729	50	34.6
G.729	60	31.4



• The calculations are based on G.711 using a sampling rate of 64 kbps speech encoding and the G.729 using 8kbps. This means one second of speech encoded into the G.711 CODEC requires 65,536 bits (or 8,192 bytes) to represent one second of sound.

- For full-duplex connections, the bandwidth speed applies to both incoming and outgoing traffic. (For instance, for a 100-Mbps connection, there is 100 Mbps of upload bandwidth and 100 Mbps of download bandwidth.) Therefore, an IP phone call consumes the bandwidth equivalent of a single stream of data. In this scenario, a G.711 IP phone call with no silence suppression and containing 20 milliseconds of speech per packet requires 87.2 kbps (174.4 / 2) of the available bandwidth.
- Unified CCX supports a-law and µ-law for G.711.
- If a prompt is recorded with G711 a-law phones and uploaded, you may encounter an error while playing the recorded prompt.

#### **Related Topics**

Bandwidth available for monitoring and recording, on page 113

### Bandwidth available for monitoring and recording

The following tables display the percentage of total bandwidth available, based on the network connection, which is required for simultaneous monitoring sessions handled by a VoIP provider.

Table 34: Available u	pload bandwidth	percentage for simult	aneous monitoring	sessions with G.711 CODEC

Number of	Percentage of Available Bandwidth Required (No Silence Suppression)								
Simultaneous Monitoring Sessions	100 Mbps	10 Mbps	1.544 Mbps	640 kbps	256 kbps	128 kbps	64 kbps	56 kbps	
Call only	0.1	0.9	5.6	13.6	34.1	68.1	Not supp (NS) <sup>4</sup>	orted	

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Number of	Percentage of Available Bandwidth Required (No Silence Suppression)								
Simultaneous Monitoring Sessions	100 Mbps	10 Mbps	1.544 Mbps	640 kbps	256 kbps	128 kbps	64 kbps	56 kbps	
1	0.3	2.6	16.8	40.9	NS	NS	NS	NS	
2	0.4	4.4	28.1	68.1	NS	NS	NS	NS	
3	0.6	6.1	39.3	95.4	NS	NS	NS	NS	
4	0.8	7.8	50.5	NS	NS	NS	NS	NS	
5	1.0	9.6	61.7	NS	NS	NS	NS	NS	
6	1.1	11.3	72.9	NS	NS	NS	NS	NS	
7	1.3	13.1	84.2	NS	NS	NS	NS	NS	
8	1.5	14.8	95.4	NS	NS	NS	NS	NS	
9	1.7	16.6	NS	NS	NS	NS	NS	NS	
10	1.8	18.3	NS	NS	NS	NS	NS	NS	

<sup>4</sup> The bandwidth of the connection is not large enough to support the number of simultaneous monitoring sessions.

Number of Simultaneous	Percenta	ge of Avail	able Bandwidth Required (No Silence Suppression)				
Monitoring Sessions	100 Mbps	10 Mbps	1.544 Mbps	640 kbps	256 kbps	128 kbps	64 kbps
Call only	0.0	0.3	2.0	4.9	12.2	24.4	48.8
1	0.1	0.9	6.0	14.6	36.6	73.1	Not supported (NS) <sup>5</sup>
2	0.2	1.6	10.0	24.4	60.9	NS	NS
3	0.2	2.2	14.1	34.1	85.3	NS	NS
4	0.3	2.8	18.1	43.9	NS	NS	NS
5	0.3	3.4	22.1	53.6	NS	NS	NS
6	0.4	4.1	26.1	63.4	NS	NS	NS
7	0.5	4.7	30.1	73.1	NS	NS	NS

Number of Simultaneous	Percentage of Available Bandwidth Required (No Silence Suppression)						
Monitoring Sessions	100 Mbps	10 Mbps	1.544 Mbps	640 kbps	256 kbps	128 kbps	64 kbps
8	0.5	5.3	34.1	82.9	NS	NS	NS
9	0.6	5.9	38.1	92.6	NS	NS	NS
10	0.7	6.6	42.2	NS	NS	NS	NS

<sup>5</sup> The bandwidth of the connection is not large enough to support the number of simultaneous monitoring sessions.

The following notes apply to the bandwidth requirements shown in the tables above:

- The bandwidth values are calculated based on the best speed of the indicated connections. A connection's true speed can differ from the maximum stated due to various factors.
- The bandwidth requirements are based on upload speed. Download speed affects only the incoming stream for the IP phone call.
- The values are based upon each voice packet containing 20 milliseconds of speech.
- The number of bytes in each packet include the entire Ethernet encapsulation.
- The data represents the CODECs without silence suppression. With silence suppression, the amount of bandwidth used may be lower.
- The data shown does not address the quality of the speech of the monitored call. If the bandwidth requirements approach the total bandwidth available and other applications must share access to the network, latency (packet delay) of the voice packets can affect the quality of the monitored speech. However, latency does not affect the quality of recorded speech.
- The data represents only the bandwidth required for monitoring and recording. It does not include the bandwidth requirements for other Cisco Agent Desktop modules as outlined in other sections of this document.

#### **Related Topics**

IP call bandwidth usage

### **Bandwidth requirements for VoIP Monitor service**

Although the bandwidth requirements are the same between the VoIP Monitor service and the Desktop Monitor service, the VoIP Monitor service can handle more simultaneous sessions (since it runs on the server). The tables below expand upon the tables in IP call bandwidth usage by increasing the number of simultaneous sessions.

Number of Simultaneous	Percentage of A	Percentage of Available Bandwidth Required (No Silence Suppression)						
Monitoring Sessions	100 Mbps	10 Mbps	1.544 Mbps					
1	0.3	2.6	16.8					
5	1.0	9.6	61.7					
10	1.8	18.3	Not supported (NS) $\frac{6}{2}$					
15	2.6	26.2	NS					
20	3.5	34.9	NS					
25	4.4	43.6	NS					
30	5.2	52.3	NS					
35	6.1	61.0	NS					
40	7.0	69.8	NS					
45	7.8	78.5	NS					
50	8.7	87.2	NS					

#### Table 36: Available upload bandwidth percentage for simultaneous monitoring sessions with G.711 CODEC

<sup>6</sup> The bandwidth of the connection is not large enough to support the number of simultaneous monitoring sessions.

#### Table 37: Available upload bandwidth percentage for simultaneous monitoring sessions with G.711 CODEC

Number of Simultaneous Monitoring	Percentage of Available Bandwidth Required (No Silence Suppression)		
Sessions	100 Mbps	10 Mbps	1.544 Mbps
1	0.1	0.9	6.0
5	0.3	3.4	22.1
10	0.7	6.6	42.2
15	0.9	9.4	60.2
20	1.2	12.5	80.3
25	1.6	15.6	Not supported (NS)
30	1.9	18.7	NS

Number of Simultaneous Monitoring	Percentage of Available Bandwidth Required (No Silence Suppression)		
Sessions	100 Mbps	10 Mbps	1.544 Mbps
35	2.2	21.8	NS
40	2.5	25.0	NS
45	2.8	28.1	NS
50	3.1	31.2	NS

### CAD desktop applications bandwidth usage

The CAD desktop applications include the following:

- · Cisco Agent Desktop
- Cisco Supervisor Desktop
- Cisco Desktop Administrator

These applications also require a certain amount of bandwidth, although far less than the Desktop Monitor service. In addition, the type of communication across the network is bursty. In general, bandwidth usage is low when the agents are not performing any actions. When features or actions are requested, the bandwidth increases for the time it takes to perform the action, which is usually less than one second, then drop down to the steady state level. From a provisioning standpoint, one must determine the probability of all the CAD agents performing a particular action at the same time. It might be more helpful to characterize the call center and determine the maximum number of simultaneous actions (in the worst case) to determine instantaneous bandwidth requirements, then determine what amount of delay is tolerable for a percentage of the requested actions.

For example, the raw bandwidth requirement for 300 CAD agents logging in simultaneously is about 4.5 Kilobytes/second and the login time is about 9 seconds (with no network delay) for each agent. If the WAN link did not have this much bandwidth, logins would take longer as packets were queued before being sent and received. If this caused the login attempts to take twice as long (18 seconds), would this delay be acceptable? If not, more bandwidth should be provisioned.

Each of these applications communicates with the base CAD services running on server machines. In addition, the agent desktop application communicates with the CTI server for call control actions and state changes. The following table displays the types of messaging for each application.

Application Name	Message types
Cisco Agent Desktop	Login/Logoff, Agent state changes, Call control, Call status Information, Desktop Monitoring/Recording, Chat messages, Team Performance messages, Report generation, and Real-time data refresh

#### Table 38: Messaging type by CAD desktop application

Application Name	Message types
Cisco Supervisor Desktop	Login/Logoff, Agent state updates, Call status updates, Report generation, Silent Monitoring, Call Recording, Call Playback, Chat messages, Team Performance messages, and Real-time data refresh
Cisco Desktop Administrator	Configuration information retrieval and storage Configuration data refresh

### **Cisco Agent Desktop bandwidth usage**

CAD agents are able to login and logoff their agents, change their agent state, handle calls, and send reporting information to the base servers. The bandwidth requirements for these activities are fairly small but can add up when many agents are considered.

The following table displays the average bandwidth requirements for different numbers of agents. This information is derived from bandwidth testing and extrapolation of bandwidth data. Since there are many variables that can affect bandwidth, a configuration that resulted in higher bandwidth usage was chosen to provide near worst-case scenarios. If the agent's WAN link meets or exceeds the bandwidth requirements shown in this table, Cisco Agent Desktop will be able to run without delays in message passing.

Number of agents	Average Download Bandwidth (Kilobytes/second)	Average Upload Bandwidth (Kilobytes/second)
1	0.03	0.05
10	0.2	0.3
50	1.1	1.5
100	2.2	3.0
150	3.3	4.5
200	4.4	6.0
250	5.5	7.0
300	6.6	9.0

Table 39: Average bandwidth requirements for Cisco Agent Desktop

Note

The bandwidth requirements shown do not include the bandwidth of the RTP streams for the call, recording, or monitoring session.

The parameters that affect bandwidth and apply to table 28 are shown below.

- Number of skills per agent: 10
- Number of agents per team: 20
- Number of teams: 50
- Number of agent state changes per agent per hour: 10 (does not count state changes due to handling calls)
- Calls per agent per hour: 60
- Team Performance Messages per team per hour: 8
- Chat messages sent/received per hour: 20
- Average chat message size (in bytes): 40
- Number of calls recorded per hour: 0

Cisco Agent Desktop provides a bandwidth calculator that can be used with both Unified CCX and Unified CCE. Additional information about the Cisco Agent Desktop Bandwidth Calculator is available at http://www.cisco.com/univercd/cc/td/doc/product/icm/bandcalc/index.htm.

## **Cisco Supervisor Desktop bandwidth usage**

A CSD will receive events for all the agent's of the team that the supervisor is logged into. This information includes state changes, call handling, login/logoff, and so on. The more agents, skills, and calls there are, the more data will be sent to supervisors. In addition, particular reports are automatically refreshed periodically to provide real-time data while the supervisor is viewing the report. Refreshing reports requires additional bandwidth.

The following table uses the same basic configuration parameters used to determine the bandwidth numbers in Cisco Agent Desktop bandwidth usage, with the following differences:

- The calculations are based on 1 supervisor per 10 agents
- The Team Agent Statistics Report is viewed
- The Team Skill Statistics Report is viewed

Number of agents	Average Download Bandwidth (Kilobytes/second)	Average Upload Bandwidth (Kilobytes/second)
1	0.05	0.05
10	0.05	0.05
50	0.2	0.2
100	0.5	0.5
150	0.7	0.7
200	1.0	1.0

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Number of agents	Average Download Bandwidth (Kilobytes/second)	Average Upload Bandwidth (Kilobytes/second)
250	1.2	1.2
300	1.4	1.5

#### **Related Topics**

Cisco Agent Desktop bandwidth usage, on page 118

### **Cisco Desktop Administrator bandwidth usage**

The bandwidth requirements for CDA are very small and are only seen when an administrator is actively changing configurations. In general, the bandwidth used by CDA is negligible from a provisioning standpoint.

### Web Chat feature

When deploying the Unified CCX along with Cisco SocialMiner observe the following network requirements.

**Delay:** The maximum allowed round-trip time (RTT) between the Unified CCX server and SocialMiner is 150 ms.

**Bandwidth:** In addition to the requirements for the Unified CCX and Unified CM clusters, you must provision sufficient bandwidth for SocialMiner, the customer web server, and remote agent/supervisor desktops to deploy Web Chat successfully. You must take into account the bandwidth required for the following components:

- Unified CCX and SocialMiner: If SocialMiner and the Unified CCX are not co-located, there is an additional bandwidth requirement for the communication and contact signaling.
- SocialMiner and Cisco Agent Desktop: When a chat session starts, depending on the chat transcript size and communication frequency, there is an additional bandwidth requirement between SocialMiner and the Cisco Agent Desktop.
- SocialMiner and customer website: The customer website transfers all new chat contact requests to SocialMiner. When the chat contact reaches SocialMiner, an active session is maintained and on commencement of chat, the chat agent and the customer website have to and from data traffic to carry chat messages. If the customer website is not on the same network as SocialMiner, you must ensure that the bandwidth requirement is based on mean per session chat traffic.

The following table shows the minimum bandwidth requirement for the Unified CCX and SocialMiner when they are not located in the same network.

Between Unified CCX and SocialMiner (Kilobytes/second)	Between SocialMiner and Agent Desktop (Kilobytes/second)	Between Customer Webserver and SocialMiner (Kilobytes/second)
100	100*	100*

\*Based on a maximum of 50 supported concurrent chat sessions and on the assumption that the average chat message length is 500 characters, and of all the active sessions at any point in time, only 10% contribute to message traffic on the wire. For more information, see http://docwiki.cisco.com/wiki/SocialMiner\_Release\_ 9.0(1)#Provisioning

**Quality of Service:** The criteria and considerations are the same as the Unified CCX High Availability deployment.

### **Remote agent traffic profile**

Unified CCX signaling represents only a very small portion of control traffic (Unified CM CTI and ICD subsystems) in the network. For information on TCP ports and Differentiated Services Code Point (DSCP) marking for Unified CCX ICD and CTI traffic, see Security, on page 122, and QoS and call admission control, on page 123.

Bandwidth estimation becomes an issue when voice is included in the calculation. Because WAN links are usually the lowest-speed circuits in an IP Telephony network, particular attention must be given to reducing packet loss, delay, and jitter where voice traffic is sent across these links. G.729 is the preferred codec for use over the WAN because the G.729 method for sampling audio introduces the least latency (only 30 milliseconds) in addition to any other delays caused by the network.

Where voice is included in bandwidth, system architects should consider the following factors:

- Total delay budget for latency (taking into account WAN latency, serialization delays for any local area network traversed, and any forwarding latency present in the network devices). The generally agreed-upon limit for total (one-way) latency for applications in a network is 150 milliseconds.
- Impact of delays inherent in the applications themselves. 25 seconds is the initial Unified CCX agent login setup time with no WAN delay. The overall time to log in agents and base delay adds approximately 30 seconds of delay per 30 milliseconds of WAN delay.
- Impact of routing protocols. For example, Enhanced Interior Gateway Routing Protocol (EIGRP) uses quick convergence times and conservative use of bandwidth. EIGRP convergence also has a negligible impact on call processing and Unified CCX agent logins.

Use the following table to estimate the number of Unified CCX agents that can be maintained across the WAN (with IP Telephony QoS enabled). These numbers are derived from testing where an entire call session to Unified CCX agents, including G.729 RTP streams, is sent across the WAN. Approximately 30% of bandwidth is provisioned for voice. Voice drops are more of an issue when you are running RTP in conjunction with Cisco Agent Desktop and other background traffic across the WAN. These voice drops might occur with a specific number of agents at a certain link speed, and those possible scenarios are denoted by the entry N/A (not applicable) in the following table.

Frame Relay	128 KB	256 KB	512 KB	768 KB	T1
G.729	3	7	15	25	38
G. 711	N/A	N/A	N/A	N/A	14

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In remote agent deployments, QoS mechanisms should be used to optimize WAN bandwidth utilization. Advanced queuing and scheduling techniques should be used in distribution and core areas as well. For information on QoS traffic classification, see QoS and call admission control, on page 123. For provisioning guidelines for centralized call processing deployments, refer the *Cisco IP Telephony Solution Reference Network Design* documentation, available online at: http://www.cisco.com/go/ucsrnd.

#### **Related Topics**

Security, on page 122 QoS and call admission control, on page 123

## Security

Security can be implemented on many levels. Applications security is clearly dependent upon security implemented at the infrastructure level. For more details on security at the network infrastructure level, refer the security design considerations in the *Cisco IP Telephony Solution Reference Network Design* documentation, available online at

http://www.cisco.com/warp/public/779/largeent/it/ese/srnd.html

### **Corporate data access**

Aside from call routing, Unified CCX or Cisco Unified IP IVR scripts often process enterprise data from existing corporate data stores such as a database or a corporate directory server for functions such as account authorization and order status. Often, these data stores already exist and share data with other enterprise applications.

The figure below shows an example of a network where voice and data components reside in separate VLANs and are separated by a firewall.

#### Figure 22: Unified CCX accessing data stores



Unified CCX can communicate with these external sources through its subsystems, provided Network Address Translation (NAT) is not used.

### Port Utilization for product revisions

For a list of the TCP and UCP ports used by Unified CCX, including Cisco Unified IP IVR and Unified CCX, see the Port Utilization Guide, which is accessible from the following web page:

http://www.cisco.com/en/US/products/sw/custcosw/ps1846/products\_installation\_and\_configuration\_guides\_list.html

### Ping NAT PAT and reverse DNS lookups

The following configurations and information are required for the CAD software to work properly.

The Cisco Agent Desktop application uses the TCP Ping command to verify that it can communicate with the active VoIP servers. This is done even if no agents are configured to use a VoIP Monitor service for the silent monitoring feature. If Ping is disabled on the machine running a CAD VoIP Monitor Server, the silent monitoring feature will not work properly.

There are certain CAD modules that rely upon reverse DNS lookups. If this feature is turned off on the machines running CAD services, there will be a loss of some functionality and errors will be generated and logged.

Network Address Translation (NAT) and Port Address Translation (PAT) are supported between CAD and the Unified CCX servers as long as the CAD client applications are behind a VPN. NAT is supported with IP Phone Agent (IPPA). However, it is required that you use static IP addresses for the IP Phone Agent phones as well as Static NAT. Dynamic NAT and address overloading are not supported. PAT is not supported with IPPA. Refer to the *Cisco CAD Installation Guide* for more detail.

## QoS and call admission control

Quality of Service (QoS) becomes an issue when more voice and application-related traffic is added to an already growing amount of data traffic on your network. Accordingly, Unified CCX and time-sensitive traffic such as voice need higher QoS guarantees than less time-sensitive traffic such as file transfers or emails (particularly if you are using a converged network).

QoS should be used to assign different qualities to data streams to preserve Unified CCX mission-critical and voice traffic. The following are some examples of available QoS mechanisms:

- Packet classification and usage policies applied at the edge of the network, such as Policy Based Routing (PBR) and Committed Access Rate (CAR).
- End-to-end queuing mechanisms, such as Low Latency Queuing (LLQ). Because voice is susceptible to increased latency and jitter on low-speed links, Link Fragmentation and Interleaving (LFI) can also be used to reduce delay and jitter by subdividing large datagrams and interleaving low-delay traffic with the resulting smaller packets.
- Scheduling mechanisms such as Traffic Shaping to optimize bandwidth utilization on output links.

### Unified CCX and application-related traffic

The table below lists TCP ports and DSCP markings for use in prioritizing Unified CCX and Unified CM mission-critical CTI traffic. The DSCP Markings for call signaling traffic between Unified CCX and Cisco Unified Communication manager and for voice traffic played from the Unified CCX server are set by default according to the recommended traffic classification guidelines documented in *Cisco Unified Communications System Design Guidance*, available at: http://www.cisco.com/go/ucsrnd.

Unified CCX does not mark any network traffic other than those mentioned above. As a result, traffic should be marked and prioritized at the edge according to the recommendations in the below table.

The performance criteria used in classifying such traffic includes:

- No packet drops on the outbound or inbound interface of the WAN edge router
- Voice (G.729) loss under 1%
- · One-way voice delay under 150 ms

A detailed description of QoS is not within the scope of this design guide. For QoS design recommendations, refer the Quality of Service design guide available online at: http://www.cisco.com/go/designzone

Unified CCX Component	Interface / Protocol	Port	DSCP Marking
Unified CCX Engine - CTI-QBE messaging destined to Unified CM from Unified CCX	CTI-QBE	TCP 2748	CS3
Unified CCX Administration and BIPPA Service - HTTP traffic destined for web administration and BIPPA interface on Unified CCX	HTTP / HTTPS	TCP 8443	AF21
Unified CCX Engine and Unified CCX Administration - SOAP AXL HTTPS messaging destined to Unified CM from Unified CCX	HTTPS / SOAP	TCP 8443	AF21
Unified CCX Engine - CTI messaging destined to Unified CCX from CAD clients	CTI	TCP 12028	CS3
Unified CCX Engine - RTP voice bearer traffic (bi-directional)	RTP	UDP 16384 - 32767	EF
VoIP Monitor Service - RTP voice bearer traffic destined for CSD from Unified CCX (SPAN-based) or CAD (Desktop-based) monitoring	RTP	UDP 59010 UDP 59012	EF

#### Table 41: Recommended QoS classifications for Unified CCX interfaces

### **QoS** considerations for CAD software

The most important network traffic for quality of service consideration in the CAD software is the voice streams sent between VoIP requestors and providers. The processes that send and receive these voice streams have been set to have higher priorities than other processing threads. This helps assure that there will be no delays in processing these voice streams. However, The voice streams themselves contain no QoS markings. These markings are stripped off when the voice streams are captured by the VoIP provider's software. The networking components used to send these data streams (switches, routers, gateways) should be configured with the appropriate QoS settings to ensure the delivery of these voice streams to meet the intended QoS requirements.

## **CAC** and **RSVP**

Unified CM supports Resource-Reservation Protocol (RSVP) between endpoints within a cluster. RSVP is a protocol used for Call Admission Control (CAC) and is used by the routers in the network to reserve bandwidth for calls. The bandwidth being controlled is only for the voice streams, call signalling traffic is not part of CAC.

Before RSVP, each Unified CM cluster maintained its own calculation of how many active calls were traversing between locations in order to calculate bandwidth usage. If more than one Unified CM cluster shared the same link, bandwidth would have to be carved out and dedicated for each cluster, and this led to inefficient use of available bandwidth. RSVP also enables customers to deploy complex network topology while Location-based CAC is limited to a hub-and-spoke type of topology.

RSVP solves this problem by tracing the path between two RSVP Agents that reside on the same LAN as the IP Phones. A software MTP or transcoder resource that runs on Cisco IOS routers can be RSVP Agents. The RSVP Agents are controlled by Unified CM and are inserted into the media stream between the two IP phones when a call is made. The RSVP Agent of the originating IP Phone will traverse the network to the destination IP Phone's RSVP Agent, and reserve bandwidth. Since the network routers (and not Unified CM) are keeping track of bandwidth usage, multiple phone calls can traverse the same RSVP controlled link even if the calls are controlled by multiple Unified CMs.

For more information, see the RSVP chapter in *Cisco Unified Communications Solution Reference Network Design (SRND).* 

Unified CCX selects a call center agent independent of the mechanism, using either RSVP or Location-based CAC; that is, Unified CCX routes a call to an available agent even though the agent phone might not be able to receive the call due to lack of bandwidth. Thus, proper sizing of bandwidth between sites is very important.

For any call transfer, there are moments when two calls are active. If any of the active calls traverses between sites, then CAC is used. Even when the original call is placed on hold during a transfer, that call still takes up the same amount of bandwidth just like an active call.

In the two examples illustrated below, the voice gateway and agents are at a remote site, while the Unified CCX server is at a data center site. A call from PSTN reaches the voice gateway at the remote site and connects to Unified CCX at the data center. This takes one call bandwidth over the WAN link, which is represented

by the caller stream. Once an agent is available and selected at the remote site, Unified CCX transfers the call to the agent.



#### Figure 23: Call from PSTN to Unified CCX Server to agent

During the transfer, before the agent picks up the call, there is another call setup between Unified CCX and the agent phone. It takes up another call bandwidth over the WAN, and is represented by the agent stream in the example above. Once the agent picks up the call, the voice traffic is between the voice gateway and the agent phone, which are both at the remote site. At that time, no bandwidth is reserved over the WAN, as illustrated in the example below. This example shows how call bandwidth is reserved in a contact center call that is eventually routed to an agent. Depending on where the voice gateway, the agents, and the Unified CCX server are located, proper WAN bandwidth should be provisioned.

#### Figure 24: After agent picks up call



## **Bandwidth security and QoS considerations for Unified Intelligence Center**

The two bandwidth measurements in a Unified Intelligence Center installation include the following:

- Bandwidth between the Unified Intelligence Center and data source
- Bandwidth between the user and Unified Intelligence Center

The Unified CCX database is local to the server. In a normal operating mode, the bandwidth between Unified Intelligence Center and the data source can be ignored.



Note

Each report requires about 2.6 Mbps of bandwidth between the user and Unified Intelligence Center.

The configuration parameters that affect bandwidth include the following:

- Number of rows in the report: 8000
- Size of each row: 500 bytes
- HTML size overhead for each row: 500 bytes
- Time to transfer the rendered report from Unified Intelligence Center to the browser: 3 seconds

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## **Server capacities and limits**

The following table provides a selected list of capacity limits when deploying Unified CCX on UCS and MCS servers.

#### **Table 42: Capacity limits**

	Unified CM Deployment
Maximum number of inbound agents	400 <sup>Z</sup>
Maximum number of preview outbound agents	100
Maximum number of supervisors	42
Maximum number of IVR ports	400
Maximum number of Outbound IVR ports	150

<sup>7</sup> Maximum of 300 is supported when deploying on MCS Server.

This table shows absolute limits. Reaching the limits for multiple criteria in a specific configuration might not be possible. Use the Cisco Unified Communications Sizing Tool to validate your configuration. This tool is available at:

#### http://tools.cisco.com/cucst

The Cisco Unified Communications Sizing Tool is available to Cisco partners only. For more details and to validate your configuration, contact your Cisco sales engineer or Cisco partner to access this tool.

For information on capacity and sizing of Cisco Workforce Optimization, refer to Cisco Workforce Optimization System Configuration Guide.

The summary overview of system maximums for inbound and outbound voice listed in Table 43: Reference capacities for Inbound and Blended Inbound and Outbound systems is for reference only. All system configurations require you to use the Cisco Unified Communications Sizing Tool to pass required Cisco Assessment to Quality (A2Q) bid assurance.

Please note that all deployments containing preview outbound and outbound IVR are by definition blended inbound/outbound deployments. In addition, the media convergence servers (MCS) in Table 43: Reference

capacities for Inbound and Blended Inbound and Outbound systems apply only to Cisco MCS 7816-H3 and MCS 7816-I3, MCS 7825-H3 and MCS 7825-I3, MCS 7835-H2 and MCS 7835-I2, and MCS 7845 -H2 and 7845-I2, and later versions of these servers. Older versions of these servers have lower scalability limits, which you can determine by using the Cisco Unified Communications Sizing Tool.

#### Table 43: Reference capacities for Inbound and Blended Inbound and Outbound systems

Critical Inbound-Only Voice System Maximum Capacities when Deployed with Cisco Unified Communications											
	Stand	alone	Server			Two-S	vo-Server Cluster				
Server class	5	4	3	2	1	5	4	3	2	1	
Agents	400	300	150	100	75	400	300	150	100	75	
Supervisors	42	32	15	10	8	42	32	15	10	8	
Agent E-Mail	120	120	120	30	30	120	120	120	30	30	
Web Chat <sup>8</sup>	50	50	25	25	25	50	50	25	25	25	
Monitoring	42	32	15	10	8	42	32	15	10	8	
Recording and Playback <sup>9</sup>	84	64	32	24	16	84	64	32	24	16	
Customer service queues	150	150	100	25	25	150	150	100	25	25	
Historical reporting sessions	5	5	5	3	3	16	16	10	10	10	
Skills	150	150	150	150	150	150	150	150	150	150	
IVR ports <sup>10</sup>	400	300	150	100	75	400	300	150	100	75	
ASR ports	100	100	50	50	50	100	100	50	50	50	
TTS ports	160	160	40	40	40	160	160	40	40	40	
VoiceXML ports	80	80	40	40	40	80	80	40	40	40	
Remote monitoring	32	32	15	10	8	32	32	15	10	8	
Busy Hour Call Completions (BHCC)	6000	5000	2600	2000	1800	6000	5000	2600	2000	1800	
Number of skills with which an agent can associate	50	50	50	50	50	50	50	50	50	50	

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Communications			-		-					
Number of CSQs with which an agent can associate (includes total combined email CSQs and voice CSQs)	25	25	25	25	25	25	25	25	25	25
Number of skills with which a CSQ can associate	50	50	50	50	50	50	50	50	50	50
Number of CSQs for which a call can queue	25	25	25	25	25	25	25	25	25	25

### Critical Inbound-Only Voice System Maximum Capacities when Deployed with Cisco Unified Communications

 $^{8}$  The number of chat sessions is the minimum of the agent seat count and the maximum capacity. For example:

- 1 If your agent seat count is 100 and your hardware is in the server class 1, 2, or 3, you can have 25 chat sessions. For server classes 4 and 5, you can have 50 chat sessions.
- 2 If your agent seat count is 10, you can have 10 chat sessions, regardless of the server class.

<sup>9</sup> 84 for Premium; 32 for Enhanced.

10 The number of IVR ports is also limited by the maximum number supported for a given server platform. In case of virtualized deployment, the maximum number of IVR ports is limited by the maximum number supported for a given virtual machine template.

Critical Blended Inbound and Outbound Voice System Maximum Capacities when Deployed with Cisco Unified Communications													
	Standalone Server						Server	Cluste	ster				
Agents	400	300	75	75	50	400	300	75	75	50			
Supervisors	42	32	10	10	5	42	32	10	10	5			
Monitoring	42	32	10	10	5	42	32	10	10	5			
Recording and Playback	42	32	10	10	8	42	32	10	10	8			
Historical Reporting sessions	2	2	2	2	2	8	8	4	4	4			
CSQs	150	150	100	25	25	150	150	100	25	25			
Skills	150	150	150	150	150	150	150	150	150	150			
IVR ports	400	300	150	100	75	400	300	150	100	75			
ASR ports	100	100	50	50	50	100	100	50	50	50			
TTS ports	160	160	40	40	40	160	160	40	40	40			
VoiceXML ports	80	80	40	40	40	80	80	40	40	40			
Agent E-Mail	120	120	120	30	30	120	120	120	30	30			

Unified Communications										
Web Chat	50	50	25	25	25	50	50	25	25	25
Remote monitoring	32	32	10	10	5	32	32	10	10	5
Blended or Preview Agents	100	100	75	75	50	100	100	75	75	50
Preview Outbound BHCC	6000	5000	2600	2000	1800	6000	5000	2600	2000	1800
Outbound IVR BHCC	6000	5000	2600	2000	0	6000	5000	2600	2000	0
Total BHCC <sup>11</sup>	6000	5000	2600	2000	1800	6000	5000	2600	2000	1800
Number of skills with which an agent can associate	50	50	50	50	50	50	50	50	50	50
Number of CSQs with which an agent can associate	25	25	25	25	25	25	25	25	25	25
Number of skills with which a CSQ can associate	50	50	50	50	50	50	50	50	50	50
Number of CSQs for which a call can queue	25	25	25	25	25	25	25	25	25	25
Outbound IVR ports	150	150	75	75	0	150	150	75	75	0

Critical Blended Inbound and Outbound Voice System Maximum Capacities when Deployed with Cisco Unified Communications

<sup>11</sup> For high-availability (HA) deployments, the BHCC listed in the table is for LAN deployments. For WAN deployments, BHCC is 5000, 3250, 2250, 750, and 750 for server classes 5, 4, 3, 2, and 1 respectively. In addition, the BHCC contributed by the preview outbound dialer should not exceed 1000, 1000, 750, 750 and 750 for server class 5, 4, 3, 2, and 1 respectively. The BHCC contributed by OutboundIVR should not exceed 1000, 1000, 750, and 750 for server class 5, 4, 3, and 2 respectively. These reduced BHCC apply only to HA over WAN deployments.



All the capacities stated in this section are system maximums. Actual maximums are a function of the hardware server(s) and mix of features deployed on those servers.

The below table lists the server classes, the different servers in each class, and the OVF templates for each server class.

Table 44: Server classes	servers, and OVF templa	ates supported by Unified CCX
--------------------------	-------------------------	-------------------------------

Server Class	1	2	3	4	5
Servers	Cisco MCS 7816	Cisco MCS 7825	Cisco MCS 7835	Cisco MCS 7845	TRC
OVF templates		100 agents		300 agents	400 agents
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For more information about TRC servers, see http://docwiki.cisco.com/wiki/Unified\_Communications\_ Virtualization\_Supported\_Applications#Contact\_Center\_Applications.



## **Voice over IP monitoring**

Monitoring and recording of agent calls can be supported by two different methods in this release of Unified CCX:

- Via the traditional VoIP monitor Service: captures packets directly from an IP network switch via the switch's Switched Port Analyzer (SPAN) configuration. Design considerations for the traditional SPAN-based VoIP monitor Service are provided at the end of this appendix (see Design considerations for SPAN-based services, on page 135).
- Via the Cisco Agent Desktop, also known as Endpoint monitoring or the Desktop Monitoring Service: The agent's IP phone repeats RTP packets to the agent's PC. When a supervisor wants to monitor/record the agent, the supervisor application sends a message to the agent desktop to forward the RTP packets to the supervisor, who can then monitor the agent/caller conversation via the sound card on his or her PC. This method requires the agent to use the Cisco Agent Desktop (not the IP Phone Agent) and a phone that supports desktop monitoring. For a list of phones that support desktop monitoring, refer to the *Cisco Unified CCX Software and Hardware Compatibility Guide*, which is available at:

http://www.cisco.com/en/US/products/sw/custcosw/ps1846/products device support tables list.html

Design considerations for the new Desktop (Endpoint) Monitoring Service are provided in Bandwidth security and QoS considerations

- Design considerations for SPAN-based services, page 135
- Deployment guidelines for agent phones that support G.722 or iLBC, page 137
- Maximum supported sessions for SPAN-based monitoring and recording, page 138
- Recording and Monitoring Support on Unified CCX Hardware Platforms, page 139

### **Design considerations for SPAN-based services**

The traditional SPAN-based VoIP service allows the IP traffic from one or more ports to be copied and sent to a single destination port.

Be aware of these factors when configuring traditional SPAN-based VoIP monitor services:

• Unified CCX does not support using a second NIC for SPAN-Based VoIP monitor. As a result, switches that do not allow the destination port of a SPAN configuration to act as a normal network connection

cannot be used to perform VoIP monitor. The following switches that do not support normal network traffic on SPAN destination ports are not supported: 2950, 3000, 3100, 3200, 3550.

- The following switches do NOT support SPAN sessions: 1700, 2100, 2800, 2948G-L3, 4840G, CE-500, CE-520.
- Local SPANs (LSPANs) are SPANs where all the source ports and the destination port are physically located on the same switch. Remote SPANs (RSPANs) can include source ports that are physically located on another switch. The following switches do NOT support RSPAN (although they may be an intermediate switch in an RSPAN configuration): 1200, 1900, 2820, 2900, 2900XL, 2926GS, 2926F, 2926T, 2948G, 2950, 2980G, 3000, 3100, 3200, 3500XL, 3524-PWR XL, 3508GL XL, 3550, 5000, 5002, 5500, 5505, 5509.
- In some configurations, the VoIP Monitor service can receive duplicate voice packets, which causes poor speech quality. To avoid this, only Ingress packets to a port are sent to the VoIP monitor service. This is a setting for SPAN, which the following switches do NOT support: 1900, 2820, 2900, 2900XL, 3000, 3100, 3200, 3500XL.
- In some switches, SPAN cannot use VLANs as sources, which is known as VSPAN. In that case, SPAN must designate individual ports to use for monitoring. The following switches do NOT support VSPAN: 1200, 1900, 2820, 2900XL, 2950, 3000, 3100, 3200, 3500XL, 3524-PWR XL.

For more information, refer to the Voice Over IP Monitoring Best Practices Deployment Guide.

The following table shows the limits of the number of SPAN and RSPAN sessions that can exist on a switch:

Maximum SPAN sessions allowed
1
1
1
1
1
5
5
5
5
1
5
1

#### Table 45: SPAN and RSPAN switch-based session limits

Switch model	Maximum SPAN sessions allowed		
2960 LAN Base	2		
2980G	5		
3500XL	1		
3524-PWR XL	1		
3508GL XL	1		
3560	2		
3750	2		
4003	5		
4006	5		
2912G	5		
5000	5		
5002	5		
5500	5		
5505	5		
5509	5		
6006	30		
6009	30		
6506	30		
6509	30		
6513	30		

# Deployment guidelines for agent phones that support G.722 or iLBC

Unified CCX is capable of monitoring and recording G.711 and G.729 agent calls only. The newer version of some agent phones for Unified CM and Unified CM support G.722 and iLBC. If both the calling device

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(voice gateway or IP Phone) and agent phone support G.722 or iLBC, these codecs may be chosen as the preferred codec for the call. Thus, monitoring and recording will fail. In order to prevent these codecs from being used in the call, the following configurations are recommended:

Unified CM	• Disable advertising G.722 codec capability for the agent phone if the phone supports this codec.
	• In the Region used by the agent phone, set the audio codec as G.711 or G.729 only and do not set the Link Lossy Type as Lossy to prevent iLBC from being used.

# Maximum supported sessions for SPAN-based monitoring and recording

For the MCS 7845 server, the maximum values for "Silent Monitoring" and "Recording and Playback" sessions are dependent upon whether the deployed environment is making use of SPAN or Desktop-based monitoring.

SPAN-based monitoring is performed by the VoIP Monitoring Service that resides on the Unified CCX server. The VoIP Monitor Service enables the silent monitoring and recording features across the configured domain of agent phones (devices). This VoIP Monitoring Service has a hard-coded maximum of 58 concurrent sessions. An agent that is recorded, or monitored, or recorded and monitored at the same time will consume one session. Since both the Silent Monitoring and Recording features receive packets from a common VoIP Monitoring Service, concurrent use of one feature can impact the number of sessions available for use by the other. As a result, in a Unified CCX environment configured for SPAN-based monitoring, no more than 58 agent devices can be monitored and recorded simultaneously.

For deployments utilizing non-7845 MCS servers, this limitation does not impact the listed maximums, since the combined values listed for maximum concurrent "Silent Monitoring" and "Recording and Playback" are fewer than 58. However, in a 7845 Premium deployment, the stated maximums are 32 monitoring and 64 recording and playback. It would only be possible for the system to operate at both maximums if the combined monitoring sessions and recording sessions are fewer than or equal to 58 and the remainder are playback sessions. For more information on the maximum number of supported "Silent monitoring" and "Recording and Playback" setsions for each server platform, refer to the *Cisco Unified CCX Data Sheet* available here:

http://www.cisco.com/en/US/products/sw/custcosw/ps1846/products data sheets list.html



Desktop-based monitoring is performed by the VoIP Monitoring Service that resides on the Agent Desktop. It also enables silent monitoring and recording, but its domain is the single device to which the agent station is physically attached. Because the VoIP Monitoring Service runs on the agent PC, and not the Unified CCX server, it does not contribute any CPU load to the Unified CCX server. And, unlike the SPAN-based environment, the concurrent monitoring sessions have no impact on concurrent recording and playback sessions. As a result, in a Unified CCX environment configured for Endpoint-based monitoring, the maximum number of concurrent silent monitoring sessions is limited by the number of concurrent supervisor sessions supported for the MCS server. Similarly, in this environment, the maximum number of concurrent selections is also limited by the MCS server size.

## Recording and Monitoring Support on Unified CCX Hardware Platforms

The table below shows the support for live monitoring and recording using the different recording mechanisms (SPAN, Desktop and Network based) on the available Unified CCX hardware platforms.

Network-based recording/monitoring uses the Unified CM Recording and Monitoring feature and utilizes the built-in bridge (BiB) on the agent's phone. For further details on network based recording and monitoring, refer to *Configuring and Troubleshooting VoIP Monitoring guide* at the following location:

http://www.cisco.com/en/US/docs/voice ip comm/cust\_contact/contact\_center/cad\_enterprise/non\_release\_docs/voip-mon-troubleshooting.pdf

Monitoring								
	SPAN (C Series)	SPAN (B Series)	SPAN (MCS)	Desktop Based	Network (BiB)			
CAD	Yes	No	Yes	Yes	No			
IPPA	Yes	No	Yes	No	No			
CAD-BE	Yes	No	Yes	No	No			
CAD (Citrix/Terminal Services)	Yes	No	Yes	No	No			
CR/QM/AQM	No	No	No	No	Yes			
Recording								
	SPAN (C Series)	SPAN (B Series)	SPAN (MCS)	Desktop Based	Network (BiB)			
CAD	Yes	No	Yes	Yes	No			
IPPA	Yes	No	Yes	No	No			
CAD-BE	Yes	No	Yes	No	No			
CAD (Citrix/Terminal Services)	Yes	No	Yes	No	No			
CR/QM/AQM	No	No	Yes	Yes	Yes			

Table 46: Live monitoring and recording using the different recording mechanisms



#### APPENDIX

## **Cisco Unified Contact Center Express integration** with LDAP server

Unified CCX stores the configuration in the local datastore on the Unified CCX server. Unified CCX accesses the user information from Unified CM via the Unified CM Administrative XML Layer (AXL) API. User authentication is also done via the Unified CM AXL API.

Unified CCX supports Microsoft Active Directory (AD) and Netscape Directory (ND). However, since the integration is done on the Unified CM LDAP configuration, the user information is downloaded from the LDAP directory to the Unified CM local database, which in turn is synched down to Unified CCX periodically via the AXL API. User authentication requests are sent to Unified CM via the AXL API and then relayed to the external LDAP directory service if configured.

Because user authentication requires access to a user database in the LDAP server, if the LDAP server is down or unavailable, you cannot access the Unified CCX Administration web interface and agents cannot log in. Thus, install a redundant LDAP server to provide high availability. Unified CM allows you to configure multiple LDAP servers to provide redundancy.

Unified CCX-specific users for Unified CM Telephony and RmCm subsystems are now created under the Cisco Unified Communications Manager Application User Group. Thus, these users are under the control of Unified CM and can be created by Unified CCX via the AXL API. This allows the Unified CCX auto provisioning feature to work seamlessly without requiring manual access to the LDAP directory configuration tool.

In scenarios where multiple Unified CCX systems are configured on the same Unified CM cluster, each Unified CCX system has visibility to all Resources on the Unified CM cluster. Any user who has been assigned an ICD extension in Unified CM will be listed as a Resource in Unified CCX Administration for each Unified CCX system. Since a Resource can only be associated with one Unified CCX system, this requires that the Administrator be aware of which resources are associated with each system. The Administrator can mitigate the confusion by having a unique naming convention for Resources associated with a particular Unified CCX system.

Since Unified CCX synchronizes with the Unified CM database for user information every 10 minutes, a Unified CM cluster with multiple Unified CCX systems will take longer to synchronize and generate more traffic that could impact the network and server performance.

For more information about LDAP integration on Unified CM, refer to the *Cisco Unified Communications* Solution Reference Network Design (SRND).

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For more information about directory access and best practices, please refer to the directory access and integration topic in *Cisco Unified Communications Solution Reference Network Design (SRND)* at: http://www.cisco.com/go/ucsrnd



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