



Cisco Unified Web and E-Mail Interaction Manager Solution Reference Network Design (SRND) Guide

For Unified Contact Center Express

Release 4.2(1)
July 2007

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

CCVP, the Cisco logo, and the Cisco Square Bridge logo are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn is a service mark of Cisco Systems, Inc.; and Access Registrar, Aironet, BPX, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, LightStream, Linksys, MeetingPlace, MGX, Networking Academy, Network Registrar, *Packet*, PIX, ProConnect, ScriptShare, SMARTnet, StackWise, The Fastest Way to Increase Your Internet Quotient, and TransPath are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0705R)

Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

Cisco Unified Web and E-Mail Interaction Manager Solution Reference Network Design (SRND) Guide: For Unified Contact Center Express
© 2007 Cisco Systems, Inc. All rights reserved.

Contents

1.0	Introduction	4
2.0	Cisco Interaction Manager System Overview	5
2.1	Cisco Unified E-Mail Interaction Manager (Unified EIM).....	5
2.2	Cisco Unified Web Interaction Manager (Unified WIM)	5
2.3	Cisco Interaction Manager for Cisco Unified Contact Center Express (Unified CCX).....	6
3.0	System Flow	8
3.1	Email Routing	8
3.2	Chat Routing	9
4.0	System Architecture	11
4.1	Architecture Overview	11
4.2	Communication protocols used between layers	13
4.3	Port number configuration between components	14
4.4	Integration between Cisco Unified CCX and Cisco Interaction Manager	16
5.0	Deployment Models.....	17
5.1	Cisco Interaction Manager components and items included	17
5.2	Single Server deployment.....	18
5.3	Split Server deployment	19
5.4	Distributed Server deployment.....	20
5.5	Geographic Server Distribution	21
5.6	Supported configurations	21
6.0	Sizing guidelines.....	22
6.1	Sizing for dedicated Unified EIM clusters supporting maximum agents @ 12 emails/hour/agent.....	22
6.2	Sizing for dedicated Unified WIM clusters supporting maximum number of simultaneous chat sessions.....	23
6.3	Sizing shared Unified EIM + Unified WIM Cluster - Maximum combined agents @ 12 emails/hour/agent and simultaneous chat sessions	24
6.4	Computing database and file server growth	24
6.5	Considerations	25
7.0	Load Balancing and High Availability	28
7.1	Load Balancing Considerations	28
7.2	High Availability options	28
7.3	Managing fail-over.....	30
8.0	Network Latency and QoS Considerations	32
9.0	Interface Boundaries	34
10.0	Firewall and Hardening considerations	35
10.1	Firewall Considerations.....	35
10.2	Server Hardening Considerations	35
11.0	Glossary.....	37

1.0 Introduction

This document is intended for engineers, system architects, and other technical audience responsible for planning the Cisco Interaction Manager for Cisco Unified Contact Centre Express deployment and maintenance. This guide provides a reference for the solution and related networking aspects of Cisco Interaction Manager. For information about Unified CCX, refer to the Unified CCX SRND guide at www.cisco.com/go/srnd.

The document is designed to provide an overview of the system and its architecture, system flow for different types of interactions—mail and chat, deployment models, sizing guidelines, high-availability and load-balancing options, network latency and QoS considerations and interface boundaries.

2.0 Cisco Interaction Manager System Overview

Cisco Interaction Manager provides an integrated suite of interaction channels that include Cisco Unified E-mail Interaction Manager (Unified EIM) and Cisco Unified Web Interaction Manager (Unified WIM). The integrated suite of applications provide collaborative capability to efficiently administer and manage rich knowledge base repositories, partitions, departments, queues, business workflows, data adapters, historical reporting, etc. The following sections explain the key features and capabilities of Unified EIM and Unified WIM. Multi-channel requirements of agents to selectively handle email, chat, and phone requests can be served by using Cisco Interaction Manager and Cisco Unified CCX. Agents can access Cisco Interaction Manager through an embedded browser with Cisco Desktop Agent (CAD).

2.1 Cisco Unified E-Mail Interaction Manager (Unified EIM)

An integral part of Cisco Interaction Manager, Cisco Unified E-Mail Interaction Manager enables organizations to intelligently route and process inbound emails, webform inquiries, faxes, and letters.

Key features and capabilities include:

- Predefined workflows to manage incoming email and webform inquiries. Contains service level agreement (SLA) triggers to automate email routing and monitoring.
- Intelligent parsing of the content of all queries. Ability to send auto-responses and recommend responses to agents.
- Complete customer information and interaction history, across channels, available to agents, enabling informed interactions.
- A common knowledge base that enables agents to accurately resolve complex inquiries and processes, interacting directly with data sources and devices where required. Agents can also contribute to the knowledge base.
- Varied collaboration options with experts within and outside the system.
- Web-based consoles for a range of users: agents, supervisors and managers, business analysts, knowledge authors, programmers, and system administrators.
- Comprehensive analytics and real-time alarms for operational performance management.
- Flexible deployment options: in-house implementation, subscription-based hosted delivery, and managed services for remote administration of licensed software.

2.2 Cisco Unified Web Interaction Manager (Unified WIM)

An integral part of Cisco Interaction Manager, Cisco Unified Web Interaction Manager provides agents with a comprehensive set of tools for serving customers in real-time. It enables call center agents to provide immediate, personalized service to customers through text chat messaging and page-push abilities. Agents could also use Unified WIM to assist

customers while on the phone, by navigating through web pages that the customer is currently browsing.

Key features and capabilities include:

- Ability to exchange text messages, as well as, web pages with the customer.
- Ability to collaborate and escort the customer through complex tasks such as filling-out forms
- Integration with other channels. Common Knowledge base, customer-view and history across Chat and non-Chat channels
- Unified agent console for handling multiple channels including Chat. Single login to email and chat queues, one-click logout.
- Easy escalation to chat channel from self service, email
- Case management allows an agent to tag multiple activities together, irrespective of the channel or when they get created.
- Agents can service multiple chats and do both chat & web collaboration from the same console
- Load-balanced algorithm of routing chats to available agents.
- Configurable list of inbox list columns – it will be possible to add/remove new columns to/from the chat inbox easily
- Ability to add custom attributes to the customer data and the ability to link to third party external databases using Data adaptors
- Customer / agent typing indication
- Ability to search for chat activities based on specific criteria, and then download the results into Microsoft Excel .csv files
- Keyboard shortcuts to toggle between chats, and between consoles
- It will be possible to include frequently-used substitution variables such as customer-name, in the chat typing area as well as in canned responses
- An audit history of the chat interaction is available even while the chat is in progress.
- Re-sizeable chat message typing area
- Ability to check the daily service level for each queue, at any point of time
- Provide notifications to managers when specific conditions are met (for e.g. when SLA for a queue is exceeded, etc) from the Supervision console.

2.3 Cisco Interaction Manager for Cisco Unified Contact Center Express (Unified CCX)

The focus of the Cisco Interaction Manager and Unified CCX integration is to provide the capability for agents to selectively handle email, chat, and phone requests using a unified system including Cisco Interaction Manager and Unified CCX, with accessibility and interoperability of both within the Cisco Agent Desktop embedded browser. Some of the key points of the integration include:

- Reading configuration from Unified CCX into Cisco Interaction Manager, and maintaining configuration as non-editable in Cisco Interaction Manager. This process is also referred to as auto-configuration.
- Auto-configuration from Unified CCX at the time of Cisco Interaction Manager application start-up and subsequently based on runtime events generated by Unified CCX for edits that take place within Unified CCX.
- Ability for an administrator to perform on-demand auto-configuration, if the configuration goes out of sync between Cisco Interaction Manager and Unified CCX. This feature is also referred to as Manual Synchronization.
- Ability for agents to launch Cisco Interaction Manager within CAD Embedded Browser, and work with email, chat and voice using a unified interface.
- Common user authentication for agents in Cisco Interaction Manager through Unified CCX.
- Auto-synchronization of licenses from Unified CCX into Cisco Interaction Manager at application start-up time.
- Availability of the integration as 2 Cisco Interaction Manager packages, namely, Basic or Advanced. The Basic license can be upgraded to Advanced, but Advanced license cannot be downgraded back to Basic.
- Unified CCX supports both Unified Communications Manager and Unified Communications Manager Express, and Cisco Interaction Manager is supported in both types of deployments.

3.0 System Flow

This section illustrates the major components involved in the life-cycle of email and chat routing respectively. The various steps in the handling of an interaction from the point where a customer sends a query to it being routed to the appropriate user or queue for the response are detailed below. To service email and chat requests received from customers, agents launch Cisco Interaction Manager using a pre-configured task button within CAD. Upon successful authentication against the Unified CCX server using the CRS CTI protocol, agents are logged into Cisco Interaction Manager.

3.1 Email Routing

There are various steps involved in efficiently responding to emails received from customers spanning across receiving these, routing appropriately, and being responded by a user. The general system flow for email routing is as tabulated.

General system flow for email routing:

Serial No.	Action
1.	A customer sends an email into the system
2.	The retrieval service picks up email from the email server for a configured alias
3.	An Activity is created in the system for the email and a Case is created that will hold all subsequent, corresponding Activities
4.	Workflow engine processes the new email based on the conditions specified and subsequently assigns it to a queue or user mapped to CSQ or Unified CCX agent respectively
5.	If the workflow assigns the activity to a user directly, the user will find it in the inbox on logging in. Or the agent can pull an activity to work upon from the queue.
6.	The agent responds to the activity and performs a 'send' and/or 'send and complete' action. This sends an email response back to the customer and the email activity is completed. A Case ID # is put into the subject line of the outgoing email
7.	The customer responds. The retrieval service picks up the email from the email server and creates a new activity for the email
8.	The system recognizes the Case ID# and threads the new activity into the existing Case

Serial No.	Action
9.	The Activity is routed to a queue or an agent via a workflow.
10.	Also all events are logged for each agent action during the lifecycle of the activity, and this is useful for reporting on agent/user or queue/CSQ or user group/team.

3.2 Chat Routing

There are various steps involved in efficiently responding to chat requests received from customers. The general system flow for handling a chat request is as tabulated.

General system flow for chat routing:

Serial No.	Action
1.	Agent who is a mapped user in Unified CCX, logs in to the Live Application Servlet (LAS), which makes agent's entry in the Session manager and informs Agent Assignment Service (AAS) about agent login
2.	The customer initiates a chat through an entry point on the website. This entry point is mapped to a Unified CCX queue.
3.	When customer initiates a chat, a request is sent to the LAS, which then checks for agent availability (from AAS) and loads the Login template at customer-end
4.	The customer submits the completed login form, which then creates a session in LAS (also written into database)
5.	AAS receives this session information, and assigns an available agent and informs LAS about the agent assignment. LAS sends the response back to the customer with the session info and connection info to connect with EVS (supplied by the Cisco Interaction Manager platform). Customer gets a nailed connection to EVS and registers himself to receive the messages
6.	The Service template is loaded at the customer end
7.	LAS fetches latest information about the session and publishes message to EVS and sends the selects agent ID to EVS. A nailed connection is then established with the respective agent browser and the agent registers himself to receive the messages
8.	All chat messages are stored in memory periodically; the rest of the

Serial No.	Action
	activity information is written into DB asynchronously
9.	During the chat, the agent and customer browsers intimate LAS of their respective connection status
	<p>When the agent ends a call:</p> <ul style="list-style-type: none"> – Agent browser sends http request to LAS, which sends a message to DB – All session messages are written into DB. – LAS informs AAS (as an RMI call) so that the agent load is decremented <p>LAS renders exit page at the customer end, through the Template Cache</p>
10.	Also all events are logged for each agent action during the lifecycle of the activity, and this is useful for reporting on agent/user or queue/CSQ or user group/team.

4.0 System Architecture

Cisco Interaction Manager is an enterprise level application built on native web-centric architecture. This application which provides enterprises the ability to address business-critical tasks offers an unmatched array of resources and response tools. The product is built in a modular component-based architecture, providing the best advantages of design and maintainability.

4.1 Architecture Overview

This section describes the system architecture of Cisco Interaction Manager. Given below are details of each of the layers and components, and the figure below depicts the detailed architecture diagram.

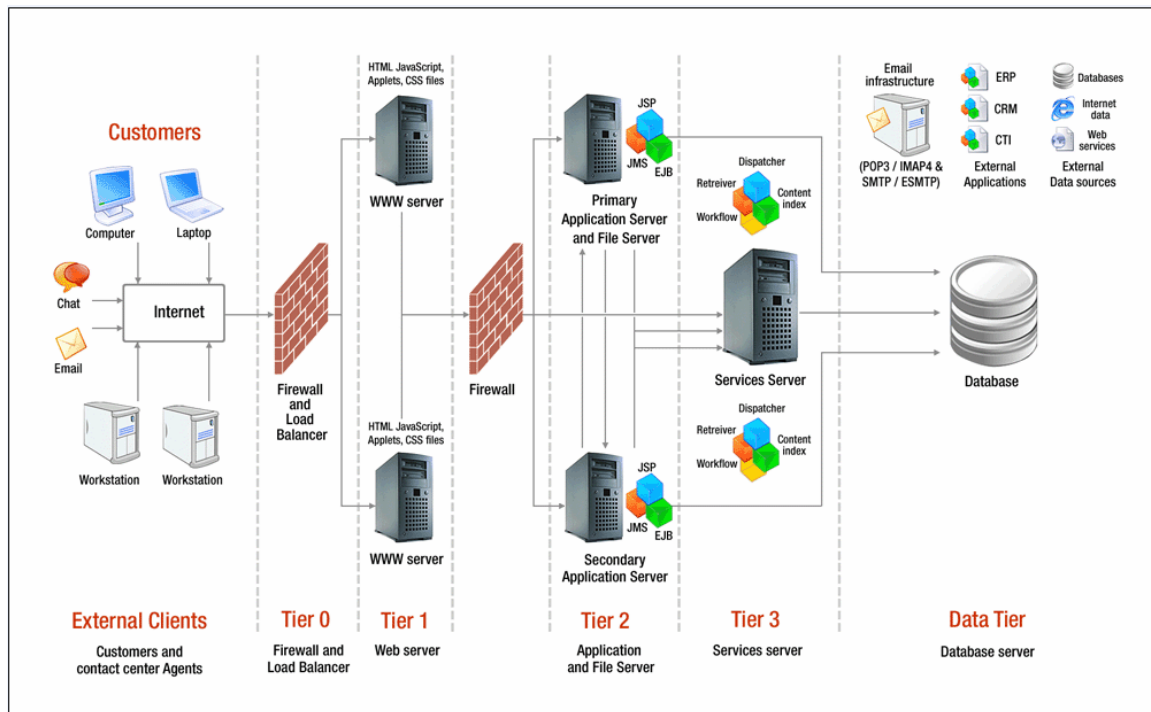


Figure 1: Cisco Interaction Manager system architecture details

External Clients

Cisco Interaction Manager is a 100% web-based product that agents and end-customers can access using a web browser from their respective desktops.

Agents can access the application using Microsoft Internet Explorer or the embedded CAD browser, and customers can access the appropriate applications from any of the common

browsers such as Microsoft IE, Mozilla, Firefox or Netscape. Cisco Interaction Manager is currently not supported on agent desktops running in a Citrix terminal services environment.

▪ **Tier 0 – Firewall and Load Balancer**

Agents and customers connect to the application from their respective browsers through a firewall, if configured for the application.

A load-balancer may also be used in case of a distributed installation of the application, so that requests from agents and customers are routed to the least-loaded web servers.

▪ **Tier 1 – Web server**

The Web Server is used to serve static content to the browser. Cisco Interaction Manager is designed to be Web server agnostic with the single requirement being for the Application Server vendor to provide a Web Server plug-in for the corresponding Application Server.

▪ **Tier 2 – Application and File server**

The Application Server is used as a web container (a.k.a. the JSP/Servlet engine) and EJB Container. The core business logic resides in the Business Object Layer as well as stored procedures residing on the Database server. The business logic residing in java classes is deployed in Application server. The JSP/Servlets interact with the business objects through business client layer and these in turn interact with the database to execute some business logic on data present in database server.

Example: Outbound task creation:

- User logs in to the application and creates an outbound task.
- The JSP layer calls Business Client layer which interacts with Business Objects residing in the same application server where JSPs/Servlets are deployed.
- The Business Objects execute queries/stored procedure residing on DB server.
- Activities are created and stored in Database tables.

The file server is used for storing all email and article attachment files, report templates and all locale-specific strings used in the application.

▪ **Tier 3 – Services server**

Cisco Interaction Manager has processes that perform specific business functions, such as fetching emails from a POP server, sending emails to an SMTP server, processing workflows, assigning chats to the agents, etc. All services run on the Services server and are managed by the Distributed Service Manager (DSM).

Cisco Interaction Manager facilitates the creation of multiple instances of services with work distributed among the various instances. For instance, the service used to retrieve emails could be configured to have multiple instances to retrieve emails from different email addresses. This capability can be used to process increasing volumes of customer interactions coming into a contact center.

- **Data Tier – Database server**

The Data tier includes databases that are SQL-compliant, HTML/XML data-sources and ultimately Web services that consume and produce SOAP messages.

Business objects and Data Adapters use this layer to extract data from various third-party applications and data sources. This layer also deals with HTML and XML parsing using relevant J2EE compliant packages to process data in other formats.

4.2 Communication protocols used between layers

Given below is a description on various communication protocols used in Cisco Interaction Manager.

- **Browser-Server communication:**

All traffic between browser-server is HTTP based since the Cisco Interaction Manager consoles are all web-based. HTTPS, the SSL variant of HTTP is also supported. Cisco Interaction Manager is supported for agent browsers to access it through a SSL. There is neither custom encryption nor compression on data being transferred between the browser to server.

- **Messaging between server-side components:**

Messaging among various server-side modules is limited to local-methods call in case of “in-process” invocation, and remote-method invocation in case the server-side component is “out-of-process”. Another method of server-side communication is also using Java Message Service (JMS), which is integral to J2EE platform.

- **Server-Browser event publishing:**

Although, request-response communication from browser-server is common, server-side “push” of events and other critical information is achieved via “pushlets” a framework unique to Cisco Interaction Manager version. Using this robust server-side to browser-push framework, one could publish key events to connected browser clients and it also allows browser clients to subscribe to specific topics and be notified when messages arrive on those topics.

- **Communication between distributed components:**

Cisco Interaction Manager being an enterprise application caters to large deployments demanding high-availability, high-performance and remote manageability. In order to meet these advanced needs the application implements a complex distributed framework of remote objects. These remote components communicate and work collectively to achieve these objectives. The primary communication protocol employed is through “remote method invocation (RMI)” which is an integral part of the J2EE platform.

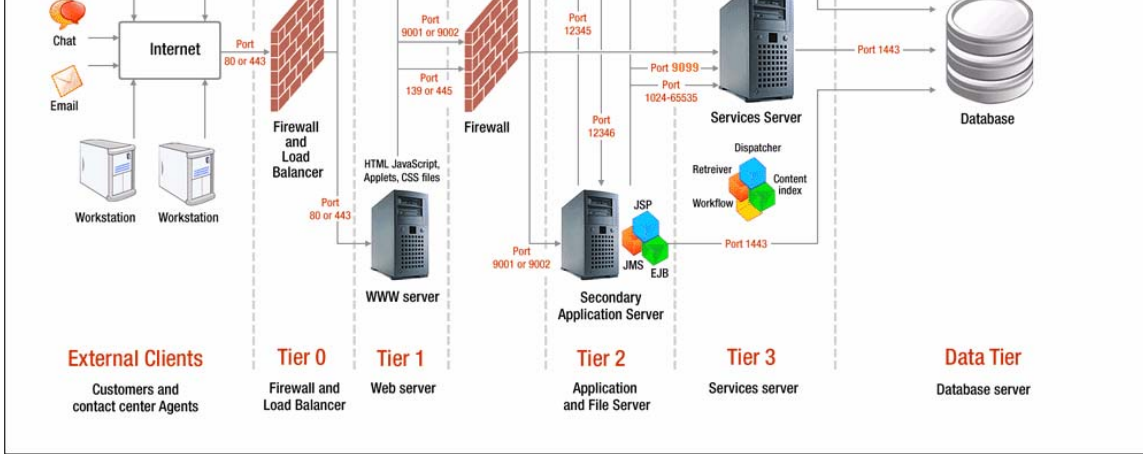


Figure 2: Port number configuration diagram

The following table describes the inbound and outbound ports that need to be opened for the flow of requests.

From Server	To Server	Destination Port(s) Required
Workstation (Internet)	Web Server	80 (for HTTP) 443 (for HTTPS)
Web Server	Application Server	9001 or 9002 139 or 445 (for file server)
Application Server	Services Server	9099, 1024 to 65535
Services Server	Database Server	1443
Primary Application Server	Secondary Application Server	12346
Secondary Application Server	Primary Application Server	12345 139 or 445 (for file server)
Primary Application Server	Database Server	1443
Secondary Application Server	Database Server	1443
User Browser	Web Server	80 (for HTTP) 443 (for HTTPS)
Cisco Interaction Manager	Unified CCX Server (Master Listener)	994
Cisco Interaction Manager	Unified CCX Server (RmCm)	42027

4.4 Integration between Cisco Unified CCX and Cisco Interaction Manager

The following figure depicts the block diagram of high-level integration between Cisco Unified CCX and Cisco Interaction Manager. The key protocols that interface between Unified CCX, CAD and Cisco Interaction Manager are CRS CTI Protocol and HTTP. For more details on the interface boundaries, refer to section 9.0.

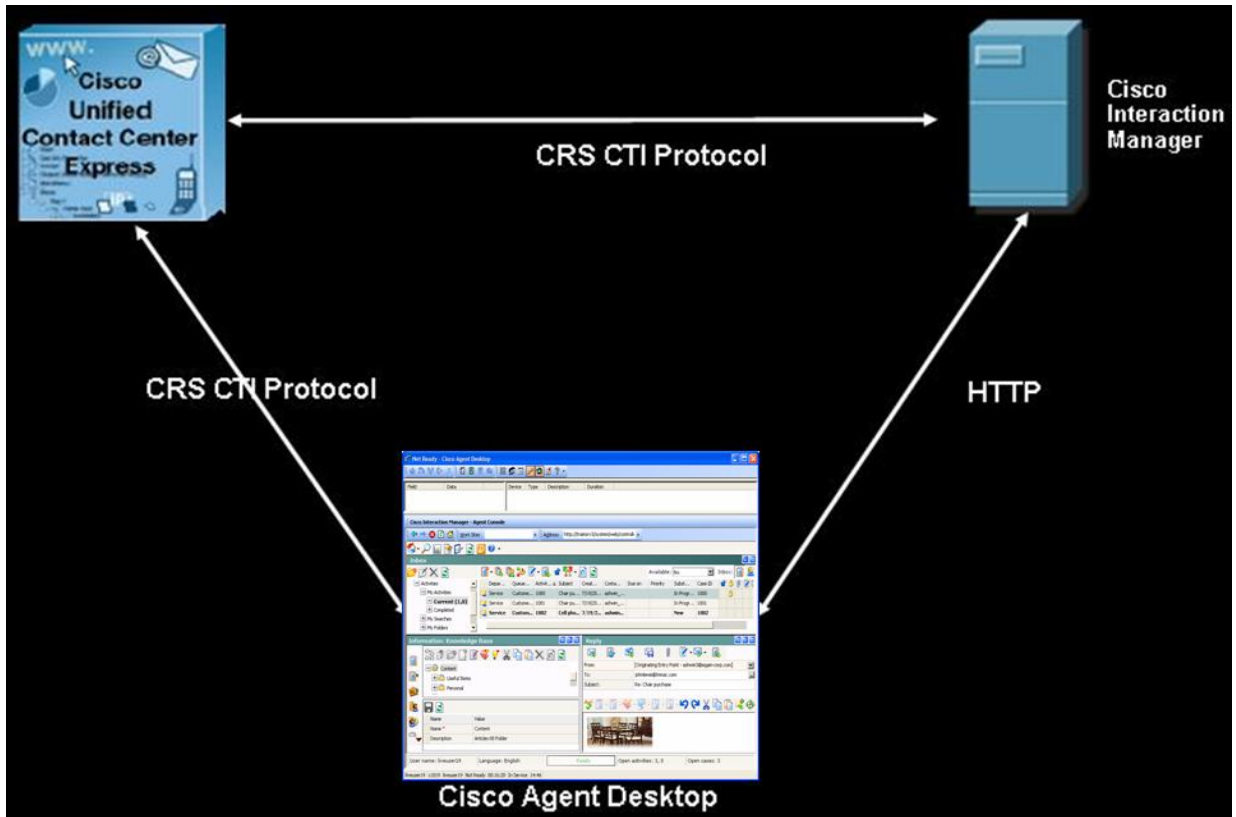


Figure 3: Block diagram - High-level integration between Unified CCX and Cisco Interaction Manager

5.0 Deployment Models

Due to the modular, component-based nature of the architecture, Cisco Interaction Manager has the ability to cater to the growing demands concurrent user loads. To provide the flexibility to suit deployments of varied sizes, Cisco Interaction Manager supports various components that may be distributed across various servers in a deployment. This section provides details of the possible deployment options.

5.1 Cisco Interaction Manager components and items included

A Cisco Interaction Manager installation has the following five components:

Sr. No.	Components	Items included
1.	File Server	The Cisco Interaction Manager file system comprising JSP, JS, HTM, CSS, JAR, CLASS, etc, file extensions This should be installed on the primary application server
2.	Database Server	Microsoft SQL Server with Cisco Interaction Manager Active, Master, and Archive databases
3.	Application Server	BEA WebLogic Server 8.1 SP5 and JDK 1.4.2.08
4.	Web Server	Microsoft IIS 6.0
5.	Services Server	JDK 1.4.2.08 and Cisco Interaction Manager components such as the DSM, Host Manager, RMI Registry, RMID, License Manager, and active processes for all the back-end Cisco Interaction Manager services

These components can be installed in any of the following three types of configurations.

1. **Single server or collocated:** All components are on a single server. This is the simplest type of configuration. A true single-server deployment is possible only for Unified EIM installations. If the installation includes Unified WIM, it becomes a collocated deployment, where the web server is installed on a separate machine outside the firewall.
2. **Split server:** Components are split across two servers. The database is on one server, while all other components are on the other server. A true split-server deployment is possible only for Unified EIM installations. If the installation includes Unified WIM, the web server is installed on a separate machine outside the firewall.
3. **Distributed server:** Components are distributed over three or more servers. A wide range of options is available for distributed-server configurations. The database is usually installed on a dedicated server, and the other components are spread over

two or more servers. If the installation includes Unified WIM, the web server is installed on a separate machine outside the firewall.

5.2 Single Server deployment

All components are typically installed on a single server. For chat, the web server is separated from the application server, and placed outside the firewall, thus establishing the need for 2 servers.

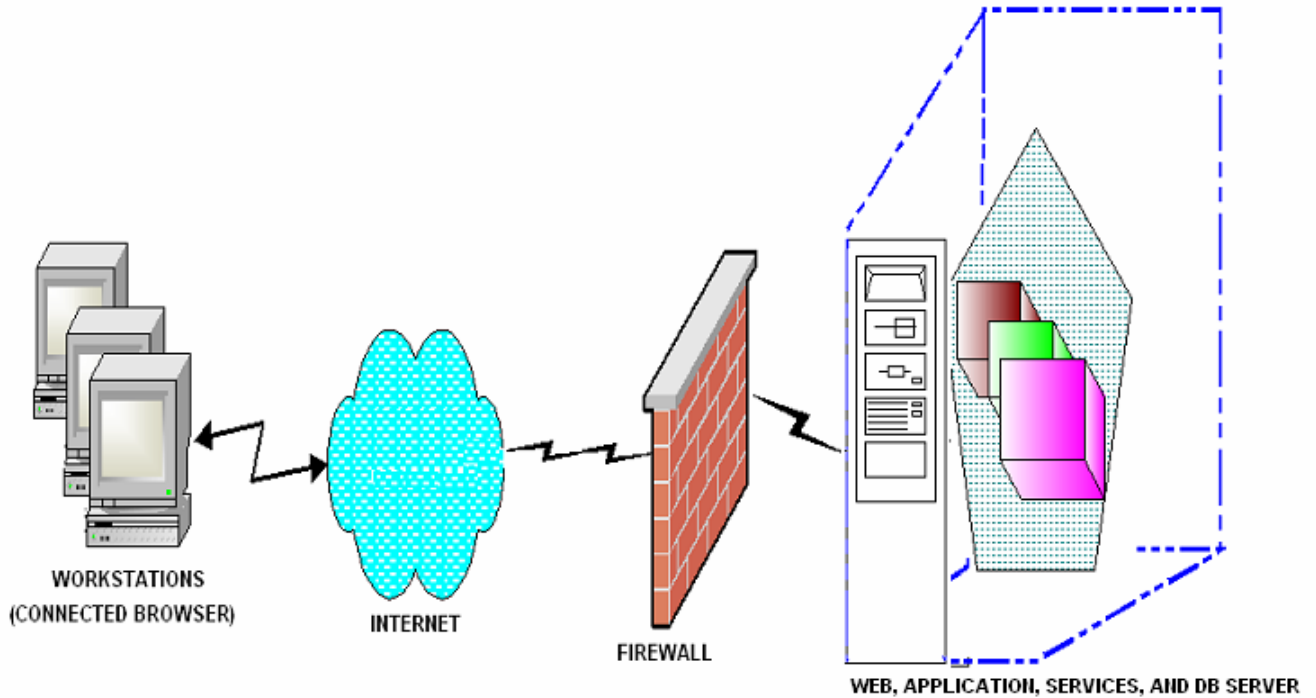


Figure 4: Typical Single Server Deployment

5.3 Split Server deployment

The database server is installed on one server, while all other components are installed on another server. This configuration option is not available for Unified WIM and Unified EIM+ Unified WIM deployments.

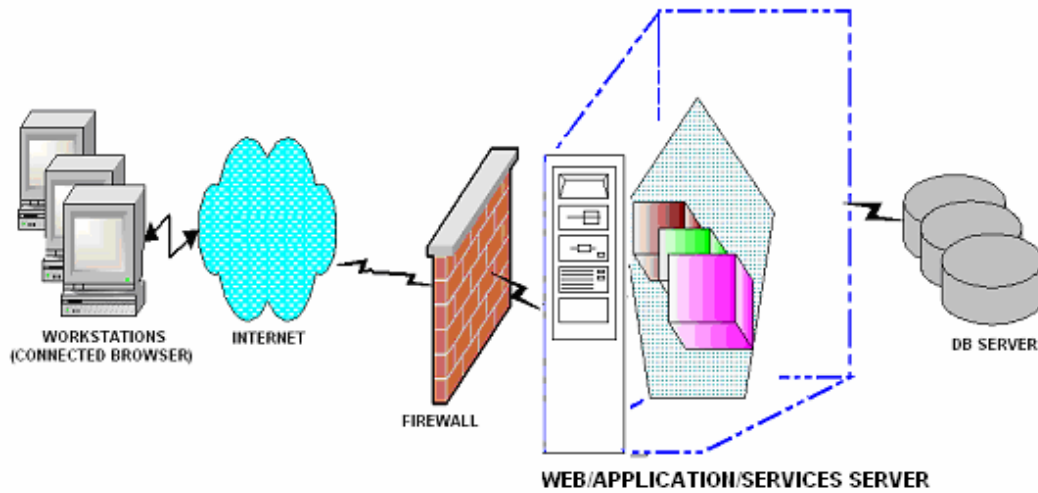


Figure 5: Typical Split Server Deployment

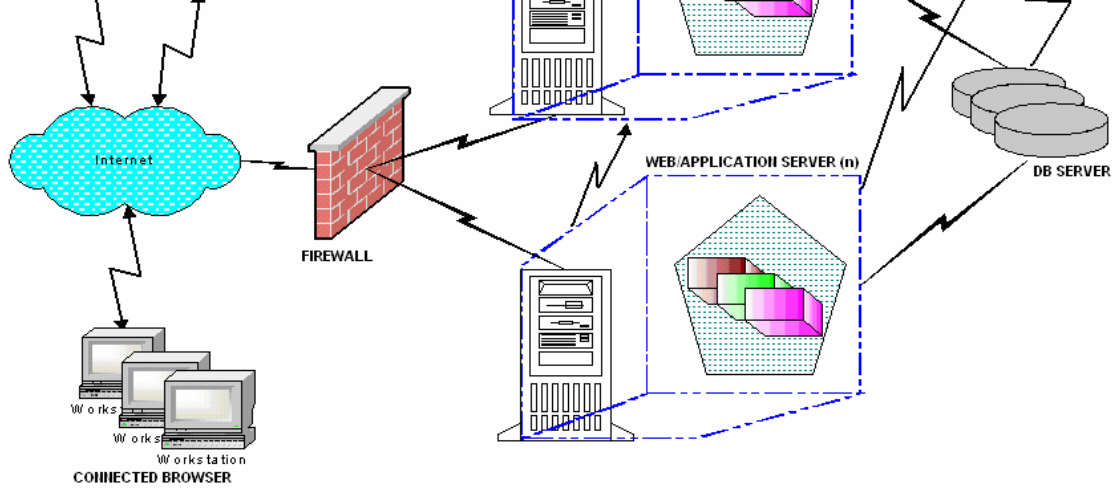


Figure 6: Typical Distributed Server Deployment

5.5 Geographic Server Distribution

All Cisco Interaction Manager servers need to be located in the same Campus LAN as the Unified CCX servers. The maximum round-trip delay between the servers should be less than 5 ms. Cisco Interaction Manager does not provide support for Geographic Server Distribution.

5.6 Supported configurations

		Modules [Number of servers (Components)]		
		Unified EIM	Unified WIM	Unified EIM+WIM
Deployment Model	Single Server	1 (App + DB + Services + Web)	2 (App + DB + Services) + (Web)	2 (App + DB + Services) + (Web)
	Split Server	2 (App + Services + Web) + (DB)	-	-
	Distributed Server	4 (App1/Web1) + (App2/Web2) +(Services) + (DB)	6 (App1 + App2 + DB + Services) + 2 (Web)	6 (App1 + App2 + DB + Services) + 2 (Web)

6.0 Sizing guidelines

This section describes the hardware configurations required to support a production environment for Cisco Interaction Manager. It lists the hardware configuration required for the planned number of concurrent users and incoming email volumes. For computing database and file server growth, as well as the considerations for scalability, please refer to the appendix at the end of the guide.

Configurations presented in the following sections provide sizing for *Standardized* agents who handle up to 12 email messages per hour. If your agents are expected to handle more than 12 messages per hour, on average, you must convert your agent count into a *Standardized* agent count using the following formula.

$$\text{Standardized agent count} = \text{Actual agent count} * \text{Average Number of messages handled per hour by each agent} / 12$$

Use the standardized agent count to find the appropriate configuration to fit your needs.

However, an important point to note is that the number of concurrent agents cannot exceed 120 per application server, as this is the maximum number of concurrent agents that can be supported by an application server in Cisco Interaction Manager.

6.1 Sizing for dedicated Unified EIM clusters supporting maximum agents @ 12 emails/hour/agent

Configuration types Cluster type / Max agents	Database, Application and Services on a single box	Database, Application and Services on a single box (Requires additional 2GB memory kit)	Application and Services on a single box, Database on a separate box	Application, Services, DB and 2nd App servers on separate boxes
Cluster type	1 X 7825 2GB	1 X 7825 4GB	2 X 7825 2GB	4 X 7825 2GB
Max agents	10	59	80	174
Cluster type	1 X 7835 2GB	1 X 7835 4GB	2 X 7835 2GB	4 X 7835 2GB
Max agents	10	59	82	184
Cluster type	NA	1 X 7845 4GB	2 X 7845 4GB	4 X 7845 4GB
Max agents		70	91	196

6.2 Sizing for dedicated Unified WIM clusters supporting maximum number of simultaneous chat sessions

Configuration types Cluster type/ Max simultaneous chat sessions	Database, Application and Services on one box, Firewall web server on separate box	Database, Application and Services on one box, Firewall web server on separate box (Requires additional 2GB memory kit)	Application, Services, DB, 2nd App; and 2 firewall Web servers on separate boxes
Cluster type Max simultaneous chat sessions	1 X 7825 2GB 1 X 7825 2GB 10	1 X 7825 4GB 1 X 7825 2GB 50	6 X 7825 2GB 108
Cluster type Max simultaneous chat sessions	1 X 7835 2GB 1 X 7835 2GB 15	1 X 7835 4GB 1 X 7835 2GB 60	6 X 7835 2GB 130
Cluster type Max simultaneous chat sessions	NA	1 X 7845 4GB 1 X 7845 4GB 70	6 X 7845 4GB 160

6.3 Sizing shared Unified EIM + Unified WIM Cluster - Maximum combined agents @ 12 emails/hour/agent and simultaneous chat sessions

Configuration types		Database, Application and Services on one box, Firewall web server on separate box	Application, Services, DB, 2nd App; and 2 firewall Web servers on separate boxes
Cluster type / Max agents and simultaneous chat sessions	Database, Application and Services on one box, Firewall web server on separate box	Database, Application and Services on one box, Firewall web server on separate box (Requires additional 2GB memory kit)	Application, Services, DB, 2nd App; and 2 firewall Web servers on separate boxes
Cluster type	1 X 7825 2GB 1 X 7825 2GB	1 X 7825 4GB 1 X 7825 2GB	6 X 7825 2GB
Max agents and simultaneous chat sessions	15	50	108
Cluster type	1 X 7835 2GB 1 X 7835 2GB	1 X 7835 4GB 1 X 7835 2GB	6 X 7835 2GB
Max agents and simultaneous chat sessions	15	60	130
Cluster type	NA	1 X 7845 4GB 1 X 7845 4GB	6 X 7845 4GB
Max agents and simultaneous chat sessions		70	160

6.4 Computing database and file server growth

1. Email volume

Computation of email volume per month is based on the following four assumptions.

1. Agents are working for 8 hours a day, 7 days a week, 30 days a month
2. Each agent is responding to 12 emails per hour.
3. Cisco email retriever is retrieving 12 emails per hour per agent
4. For each incoming email, an auto-response or auto-acknowledgement is sent out by workflows

(2) And (4) imply that for each incoming email, two emails are being sent out of the system by Cisco email dispatcher.

Based on this, for 60 agents, monthly incoming email volume will be $60 * 12 * 8 * 30 = 172,800$.

And outgoing email volume per month will be $2 * 172,800 = 345,600$

You can use the following formula to compute the incoming email volume:

(Number of concurrent agents) * (Number of emails responded by each agent per hour) * (Number of hours of daily work) * (Number of days agents work per month)

2. Database growth

Following factors are considered for calculating the rate of growth of database.

1. Incoming and Outgoing email volume per month
2. Average size of each email (KB): This excludes the size of attachments since attachments are stored on file-server and not in database

You can use the following formula to compute the rate of growth of database server (MB) per month

$((\text{Number of incoming and outgoing emails per month}) * (6 + (\text{Average size of each email in KB} * 2))) / 1024$

3. File server growth

Disk usage on File server is directly proportional to two factors:

1. Number and size of email attachments with incoming and outgoing emails: If you know the number of incoming and outgoing emails per month and the average size of attachments with each email, you can compute the growth rate of space occupied by attachments.
2. Rate of growth of log files for Cisco Interaction Manager: Average growth rate of size of Cisco log files (assuming that log levels are set to SEVERE only) is 20MB per day.

Combining (1) and (2) should give you an estimate of how much disk space usage will increase per month on the file server. You can use the following formula for computing the monthly growth rate of file server size:

$((\text{Number of emails per month with attachments} * \text{Avg. size of attachments (K)})/1024) + 20*30$

E.g., if average volume of incoming and outgoing emails with attachments is 50,000 and average size if each attachment is 5KB, monthly rate of growth for file server can be computed as:

$((50,000 * 5)/1024) + 20*30 = 845\text{MB per month.}$

6.5 Considerations

Following limitations impact the deployment and scalability of applications in the Cisco Interaction Manager suite.

1. One Services Server

Each installation of Cisco Interaction Manager can have only one services server. All services such as email retriever, email dispatcher, workflows, license manager, session manager, etc, run on the services server.

This also means that services server is a single point of failure. If services server goes down (or needs to be restarted), the entire Cisco Interaction Manager application needs to be restarted through the Cisco Service in Windows Services Panel.

If services server needs to be scaled based on high volumes of emails, it needs to be scaled vertically, i.e. by adding more physical RAM and additional CPUs.

2. **One Primary Application Server**

Each installation of Cisco Interaction Manager can have only one Primary Application server. Based on concurrent agent load, an installation can be scaled by adding more application servers. All the additional application servers are treated as Secondary Application servers.

Difference between Primary and Secondary Application Servers

Apart from serving agent requests (just like secondary application servers), the primary application server also works as the messaging server, i.e., JMS running within the primary application server is used for messaging purposes by all the other secondary application servers and services servers.

Limitation of having a single primary application server in a deployment also implies that this server is also a single point of failure. For Unified EIM the impact of primary application server failure would be less, but will affect the Unified WIM functionality and need restarting the application. If this server crashes, or needs to be restarted, the entire Cisco Interaction Manager application needs to be restarted through the Cisco Service in Windows Services Panel.

Note

If one or more of the secondary application server(s) crashes, or needs to be restarted, is not required to restart the entire application. Only the secondary application server which crashed needs to be restarted.

In order to reduce the probability of failure of the primary application server, it is required that if agent load increases beyond a certain number, the primary application server must not be used for serving agent requests. Requirements about this have been provided in the subsequent chapters that have details about hardware sizing.

3. **One Database Server**

Each installation of Cisco Interaction Manager can point to only one database server.

If needed, the database server has to be scaled vertically by adding more physical RAM, more CPU, and configuring the hard disks on RAID 10 configuration.

Limitation of only a single database server per installation also implies that this server is a single point of failure. If database is stopped or server needs to be restarted, the entire application needs to be restarted as a result of this.

The database server supported is SQL 2000 SP 4.

Note

SQL 2000 clustering has not been certified, and there is no plan to certify and support this at this time by Cisco.

4. Port requirements

For details please refer to section 4.3.

5. Security

Cisco Interaction Manager supports SSL connections to the web server (IIS) through HTTPS, and between the web server and the application server (BEA WebLogic Server). It also supports Cisco Security Agent (CSA). Connectivity encryption supported by Cisco Interaction Manager is limited to the encryption capability available with SSL.

6. SQL Licensing

Microsoft SQL Server 2000 (with SP 4) software and corresponding licenses need to be procured independently, and are not shipped with the Cisco Interaction Manager software. The choice of a SQL license model is left entirely to the customer. Please note that this guide does not provide any specific recommendations on the SQL license model that should be used by a customer.

However, the following are commonly used SQL license models.

- a. SQL licensing per user (client access licensing model, e.g., 50 users => 50 SQL licenses)
- b. SQL licensing per CPU (processor based model; e.g., 2 CPU => 2 SQL licenses)

Please contact a Microsoft-certified reseller for more guidance in this area.

7.0 Load Balancing and High Availability

To optimize resource utilization and enhance performance access to the Cisco Interaction Manager application can be set up via load-balancers. This section discusses some considerations for load-balancing and high-availability.

7.1 Load Balancing Considerations

The web service component of a Cisco Interaction Manager deployment can be load-balanced to serve large number of agents accessing the application at the same time. The web (or Web/App) servers can be configured behind load balancer with Virtual IP and an agent can access Cisco Interaction Manager through Virtual IP. Depending on the load balancing algorithm set, the load balancer will send a request to one of the web/app server behind it and send response back to agent. This way, from a security perspective, it serves as a reverse proxy server, too.

One of the most essential parameters while configuring a load balancer is to set it to sticky session with cookie based persistence. After every scheduled maintenance task, before access is opened for users, it is advised to verify that all web/app servers are available to share the load. In absence of this, the first web/app server could be overloaded, due to sticky connection feature. With other configurable parameters, one can define load balance algorithm to meet various objectives – equal load balance, isolation of primary web/app server or sending less request to low powered web/app server.

It is recommended that the load balancer be monitored for the health check of Web/App servers and if a problem is diagnosed, to remove it from the available pool of servers.

7.2 High Availability options

Based on internal testing and typical customer deployment scenarios, recommendations have been made. However, they do not necessarily indicate the only possible means of achieving a high-available system deployment.

Recommendations for High Availability Needs

Aspect	Description	Advantage(s)
Load Balancer	The load-balancer piece is used for distributing web request across different web servers. Various types of load balancers are available in the market. Each of these could be configured with different options work distribution, handling failures or increased activity.	<p>Helps distribute load across different servers.</p> <ul style="list-style-type: none"><input type="checkbox"/> Helps configure load distribution based on server capacity and current server resources.<input type="checkbox"/> Helps handles failures by

		alternate means of routing web request.
High-Speed Dedicated LAN	The network is a key ingredient to a successful and highly available application. It is recommended that the entire deployment is self-contained within a LAN and does not span over other network domains. This LAN setup should be setup in such a way that alternate means of routing is provided in case of certain network nodes being flooded or when there are packet losses.	<p>Stable network connections for distributed components.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Helps serve web requests in a more predictable and reliable manner. <input type="checkbox"/> Less delay in responses and thereby increases user experience.
Configuring more than 1 Web/App server(s)	<p>It is highly recommended that more than 1 web/app server(s) be configured.</p> <p>The Load balancer detects application server failure and redirects requests to another application server after which a new user session will be created and users will have to re-login to Cisco Interaction Manager.</p>	<p>More than 1 Web/app server helps load balance web requests to multiple servers based on system load, availability of server too.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Helps the system scale better to meet growing needs of the enterprise.
Multiple I/O Channels on Database Server with disk-mirrors	Database servers access disks in which data is stored & retrieved. But since enterprise databases are large and hold different entities that could be accessed in parallel, it is highly recommended that the Unified EIM database schema be created with multiple table-spaces. Each table-space could potentially reside on an individual hard disk that has its own I/O channel for data transfer.	<p>This helps faster data access since I/O could occur in parallel</p> <ul style="list-style-type: none"> <input type="checkbox"/> Helps in data redundancy since data is replicated on mirror disks and could be seamless in the event of disk failures. <input type="checkbox"/> Ensures high-availability of database.

In addition, to the above recommendations, if a load-balancer is configured to monitor the health of web/app servers, it also serves the purpose of high availability. Also implementing sound backup and disaster recovery strategies help with bringing the systems up sooner in case of any problems.

7.3 Managing fail-over

Cisco Interaction Manager supports clustered deployments. This ensures high availability and performance via transparent replication, load-balancing and failover. Some of the key methods on handling failure conditions within a Cisco Interaction Manager deployment and when integrated with Cisco Unified CCX are listed below:

- Implementing multiple Web/App servers. If the primary server goes down, the load-balancer can help handle the failure through routing requests to alternate Web/App servers. The Load balancer detects application server failure and redirects requests to another application server after which a new user session will be created and users will have to re-login into Cisco Interaction Manager.
- Allowing servers to be dynamically added or removed from the on-line cluster to accommodate external changes in demand or internal changes in infrastructure.
- Leveraging the abilities of the DSM component within Cisco Interaction Manager. Some of the key benefits of DSM are:
 - DSM provides the “redundancy” capability in the Cisco Interaction Manager application by being able to manage & maintain various service components in a distributed fashion
 - Provides scalable solution to dynamically scale one service component into multiple instances
 - Improved availability by continuing to provide Unified EIM services even during hardware or software failure
- Availability of a Secondary Unified CCX server for Cisco Interaction Manager to connect with if Primary Unified CCX Server is unavailable
- If TCP socket connection to Primary Unified CCX server over CRS CTI Protocol hangs or goes down, Cisco Interaction Manager automatically establishes a connection to the Secondary Unified CCX server. 3 retries with a delay of 10 seconds between each are attempted before establishing a socket connection with the Secondary Unified CCX server. If a connection to the Secondary Unified CCX server fails after 10 such tries, then the system tries to establish a connection with the Primary CCX server again. 10 such cycles of tries between the primary and secondary are performed. If a successful connection does not get established at the end of 10 cycles, the system sends an error message to the administrator and Cisco Interaction Manager does not start. A manual intervention is needed at this point to restore the system.
- Auto-configuration of data can take place over either primary or secondary Unified CCX connection. The system first tries over the primary, in case it fails; it does so over the secondary Unified CCX connection. The two system talk through the secondary connection till the time it is broken. At this point, Cisco Interaction Manager tries establishing a connection to the primary again, as per the steps as described in the above point. Upon restoration of primary setup, Cisco Interaction Manager defaults back to use a TCP connection to the primary Unified CCX server.

- License download using Unified CCX APIs can also take place using either of the connections. Upon restoration of primary setup, Cisco Interaction Manager defaults back to use a TCP connection to the primary Unified CCX server

The single points of failure include:

- The primary Web/App server of Cisco Interaction Manager going down
- The Services server going down

8.0 Network Latency and QoS Considerations

Like any web-based application, it is required to setup Cisco Interaction Manager in a good network environment that has enough bandwidth with less latency. If the network conditions degrade, it could impact the application performance, which is not desirable. Listed below are some recommendations for network latency and QoS considerations:

- The servers which are part of Cisco Interaction Manager application should be connected at wire speed on a gigabit network i.e. LAN.
- In a distributed setup scenario, they can be separated on different networks via Firewall.
- Preferably the setup should be such that the Cisco Interaction Manager agents are on the same LAN as the application servers. High latency between the agents and the applications servers could lead to slower performance on the agent interface.
- An agent can use the application with reasonable performance if he/she is within 150ms (one way) network response away and provided there is required level QoS implemented for the network communication.
- The Cisco Interaction Manager servers must be located in the same Campus LAN as the Unified CCX servers. The maximum round-trip delay between the Cisco Interaction Manager servers and the Unified CCX servers should be less than 5 ms.
- Adequate QoS configurations need to be made on all network devices in the path between the Agent Desktop and Application servers.
- The application network traffic should get priority among others and should always get allocated bandwidth.

The above points serve well towards ensuring application performance. However it may be important to note that bandwidth is also related to what the user perceives as good performance. For example, one typical 'operation' within the application may take 'n' seconds to complete with certain bandwidth, and it may take 'n – m' seconds to complete, if the available bandwidth is more. In both cases, application is useable though.

- **Bandwidth requirements**

- 384 kilobits/second (DSL) or higher is the minimum required network bandwidth for a remote agent connecting to servers located in a different geography, for both upload and download operations.
- Additionally, to illustrate the round-trip delay when an agent is in one geography/location and the servers are in another, following is sample data corresponding to a hosted customer.

E.g.,

The hosted customer has agents located in India. In such a case, the traffic first goes to the hosted customer's US network on the customer's private network link, and then to the hosting network. With these hops, the round trip delay between agent's browser and remote servers was observed to be 360 ms.

- **Pointers for sizing bandwidth**

As a pointer to size bandwidth, below is some data from a test exercise:

For a 100 concurrent agent load, when agents processing 12 emails/hour of size 15KB each (with no attachments), each user utilizes about 30Kbits. For a larger frequency of emails and/or of larger size, the bandwidth requirement will accordingly go up.

9.0 Interface Boundaries

This section describes the various external interfaces and the Cisco Unified CCX API framework used to facilitate the same. For multi-channel agents, CAD acts as the interface between Cisco Unified Cisco Interaction Manager and Unified CCX applications. Task buttons can be pre-configured within CAD to launch the Unified Cisco Interaction Manager UI in the CAD embedded browser.

From the Unified CCX API framework, the CRS CTI protocol is mainly involved in interfacing the boundaries of Unified CCX and Cisco Interaction Manager.

▪ **CRS CTI Protocol**

- Cisco Interaction Manager uses the CRS CTI protocol to connect and communicate with the Unified server. It uses a TCP socket connection, with the default port number for connection being 42027.
- Provides the necessary APIs to download and auto-configure agent and supervisor data, CSQ data, and agent to team association from Unified CCX. During auto-configuration, if connectivity to primary Unified CCX server fails, a provision has been made for socket connectivity to be initiated to the secondary Unified CCX server. TCP client alternately attempts a connection to primary and secondary Cisco Unified CCX until a successful connection has been established.
- Cisco Interaction Manager uses this CTI protocol to authenticate login credentials of agents with Unified CCX database
- Notifications to Cisco Interaction Manager about changes in Unified CCX are facilitated via CRS CTI Protocol

▪ **Licensing**

- Cisco Interaction Manager uses Unified CCX APIs to obtain the license information from Unified CCX server

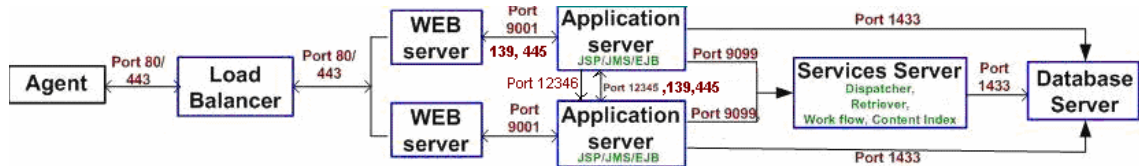
10.0 Firewall and Hardening considerations

This section discusses some of the firewall and hardening considerations that are useful for Cisco Interaction Manager.

10.1 Firewall Considerations

- For agents to access Cisco Interaction Manager, either the HTTP or HTTPS (for secured connections) port would need to be opened at the firewall.

-



In a typical installation where agents using Cisco Interaction Manager could be spread across multiple locations, the Load balancer along with Web/App servers can be deployed in a DMZ. However, having the web/app within the intranet is possible, too. The Services and Database server can reside in the network over same or different VLAN.

Some of the options on how the application can be accessed are:

- Agents (for Unified EIM and Unified WIM) from intranet can directly access web servers located on Tier 0
- Agents can access the application externally through the internet, i.e. through Tier 1
- In case of Unified WIM, customers will always access the customer interface from the internet through Tier 0
- If integration of these servers is implemented with Active Directory then associated ports should be opened for communication with Domain Controllers.

10.2 Server Hardening Considerations

Dual strategies could be implemented towards securing the Cisco Interaction Manager application. The first includes implementing standard best practices for physical and access controls. These steps could typically be at the corporate level. The other measure is hardening of the server OS and its service components. Some recommendations for the Cisco Interaction Manager deployment are listed below:

- **Default Setting for services and IIS servers**
 - *In Accessories*, No Document Templates, No Mouse Pointers.
 - *In Communications*, No Hyper Terminal.
 - *In Application Server*, No Application Server Console, No ASP.NET, No Enbale network DTC access, No Message Queuing, IN IIS, No BITS, NO FTP, No

FrontPage, No Internet Printing, No NNTP, No, SMTP, In WWW, only WWW Services.

- No Certificate Services
- No Email Services
- No Fax Services
- No Indexing Services
- No Networking Services
- No Other Network Files & Print Services
- No Security Configuration Wizard
- No Terminal Server
- No Terminal Server Licensing
- No UDDI
- No Windows Deployment
- No Windows Media Services
- *In Management & Monitoring Tools, Only SNMP*

▪ **Guidelines for SQL Server:**

- Restrict windows authentication user to access .mdf and .ldf files and assign read/write access to appropriate users
- Use NTFS file system as it provides advanced security and recovery features
- Rename the Windows NT/2000 Administrator account on the SQL Server server to discourage hackers from guessing the administrator password.
- Hide SQL Server service from appearing in the server enumeration box in Query Analyzer, using the /HIDDEN: YES switch of NET CONFIG SERVER command
- Disable Windows guest user account on production servers.
- Setup roles in SQL and configure permissions for windows authentication. Take advantage of the fixed server and database roles by assigning users to the appropriate roles.
- Restrict access to SQL logs directory
- Secure registry by restricting access to SQL Server registry keys like HKEY_LOCAL_MACHINE\Software\Microsoft\MSSQLServer.
- Encrypt User Views, Stored procedure, Function and triggers while going live
- Examine the audit for login failure events and look for trends to detect any possible intrusion

11.0 Glossary

Unified EIM: Cisco Unified E-Mail Interaction Manager

Unified WIM: Cisco Unified Web Interaction Manager

LAS: Live Application Servlet

AAS: Agent Assignment Service

UI: User Interface

DB: Database

HA: High Availability

SLA: Service Level Agreement

DSM: Distributed Services Manager

CSA: Cisco Security Agent

EVS: Event Management Service