



Cisco Remote Expert

Solution Design Guide

August 2014

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Preface

Cisco Validated Designs (CVDs) provide the foundation for systems design based on common use cases or current engineering system priorities. They incorporate a broad set of technologies, features, and applications to address customer needs. Cisco engineers have comprehensively tested and documented each CVD in order to ensure faster, more reliable, and fully predictable deployment.

Comments and Questions

If you would like to comment on a guide or ask questions, please use the [feedback form](#).

For the most recent CVD guides, see the following site:

http://www.cisco.com/c/en/us/solutions/enterprise/design-zone/remote_expert.html

CVD Navigator

The CVD Navigator helps you determine the applicability of this guide by summarizing its key elements: the scope or breadth of the technology covered, and the proficiency or experience recommended. This section is a quick reference only. For more details, see the Introduction.

Use Case Overview

This guide addresses the following technology use cases:

- **Financial Services**—Many financial organizations are asking for a means to increase the coverage of their financial services experts.
- **Retail Consulting Services**—Retail enterprises are asking for a customizable user experience for their customers.
- **Public Service and Government Services**—Public and government service organizations need a means to provide many specialized services that require an immersive experience.

For more information, see the “Use Cases” section in this guide.

Scope

This guide covers the technologies and products that make up the Cisco Remote Expert Smart Solution. This solution primarily consists of Cisco Unified Communications products including TelePresence endpoints, Cisco Unified Contact Center products including Cisco MediaSense for recording, and Cisco Interactive Experience product lines. The focus of this CVD is to discuss the design and implementation considerations associated with integrating and deploying these technologies. For more information, see the “Design Overview” section in this guide. For configuration details, see the *Remote Expert Smart Solution Implementation Guide*.

Proficiency

This guide is for people with the following technical proficiencies—or equivalent experience:

- **CCNA Routing and Switching**—1 to 3 years installing, configuring, and maintaining routed and switched networks
- **CCNA Data Center**—1 to 3 years installing, configuring, and maintaining data center switches, servers, and application optimization
- **CCNP Voice**—3 to 5 years designing, installing, and troubleshooting voice and unified communications applications, devices, and networks

Introduction

Executive Summary

With the increased availability of information and the ability to conduct business transactions via the Internet, people are more and more comfortable using self-service applications for many transactions they previously would have gone to someone for assistance. Because of this self-reliance, when it comes to customer service, customers now expect an even more advanced level of interaction and assistance. This interaction may take place in a store, online, or through a call to the enterprise's call center. So how do vendors of such service scale to cover all the possible means of contact from their customers?

The Cisco Remote Expert Solution® delivers high quality video collaboration between the customer (wherever they may initiate the contact from – an enterprise branch location, retail store or the comfort of their own home) and an industry expert. A customer can now easily connect to a suitable expert in a distant geographic location or corporate office with a rich personalized experience. The expert can make use of video-on-demand, document, and peripheral sharing technologies. This multidimensional interaction results in a superior consultative experience, improving customer acquisition and retention while limiting the cost of geographically dispersed, valuable subject-matter experts.

The Cisco Remote Expert Solution allows an enterprise to intelligently connect customers, whether connecting from within the enterprise network or from their own device outside the enterprise, on the Internet with experts located anywhere using chat, voice, or video communications. This solution can be built on top of an enterprise's existing communications capabilities and extends it to interacting with their customers. It provides customers with the ability to benefit from a face-to-face expert consultation without requiring the customer and the expert to be in the same physical location.

Objective

This Cisco Validated Design guide provides design considerations, recommendations, and configurations for deploying Cisco Remote Expert Solution within the enterprise. This Cisco Validated Design strives to help ensure both a high-quality Remote Expert customer experience as well as a serviceable and maintainable strategic business solution for the enterprise.

This guide is laid out as follows: defining a set of use cases for Cisco Remote Expert Solution that represent prevalent uses of the solution; this is followed by detailed descriptions of the solution architectures, the required infrastructure component, and associated system functions.

This document does not discuss the reference designs, installation, and management of all the foundational technologies such as routing, switching, storage, and Cisco Unified Communications (including Cisco Unified Communication Manager and Cisco Unified Contact Center). Instead, it refers to detailed documents that discuss those technologies.

The Cisco Remote Expert Solution is based on the integration of products and technology from Cisco and third-party vendors. References to third-party vendors' product and system documentation are offered, and although efforts have been made to confirm that these references are accurate, there may be instances in which changes to a vendor's product or design guidance make specific references in this guide out of date.

What's New in Release 1.9

Cisco Remote Expert Solution Release 1.9 introduces the following key new features:

- Access to Experts now included from:
 - Remotely via web-browsers and “smart” devices (RE Mobile)
- Inclusion of the DX650 as an Expert Endpoint
- Cisco Unified Communications Manager Based Video on Hold

Cisco Remote Expert Technology Use Cases

The Cisco Remote Expert Solution is designed to be industry agnostic and is suitable for all kinds of enterprises including, but not limited to financial industry, government services, and retail. Some examples where Cisco Remote Expert Solution may benefit include the following:

Use Case: Financial Services

Many financial organizations are asking for a means to increase the coverage of their financial services experts. Staffing every branch location with the expertise to deal with all matter of financial issues is difficult and cost-prohibitive. They would like locations, perhaps with great geographical distances between them, to share experts.

This design guide enables the following capabilities:

- Remote Expert Immersive Architecture – branch office experience
- Remote Expert Mobile Architecture – Web page integration for “expert escalation”

Use Case: Retail Consulting Services

Retail enterprises are asking for a customizable user experience for their customers. The experience should include the ability to display product and associated information as well as the option to contact a live expert for help with such things as product fit, cross-selling, up-selling, close sales, and multi-lingual support.

This design guide enables the following capabilities:

- Remote Expert Kiosk Architecture – In-store custom experience
- Remote Expert Mobile Architecture – Web page integration for “expert escalation”

Use Case: Public Service Applications and Government Services

Courtrooms are required to provide interpretation services to ensure that clients get the fair and just treatment they deserve even though English may not be their native language. Warrants, arraignments, and even court appearances can be handled via a Remote Expert experience. Likewise healthcare customers can leverage Remote Expert for Specialist Consultation, Interpretation Services, Patient Check-In and Virtual Chaplain to name a few.

This design guide enables the following capabilities:

- Remote Expert Immersive Architecture
- Click-to-Call
- Next-Available-Interpreter

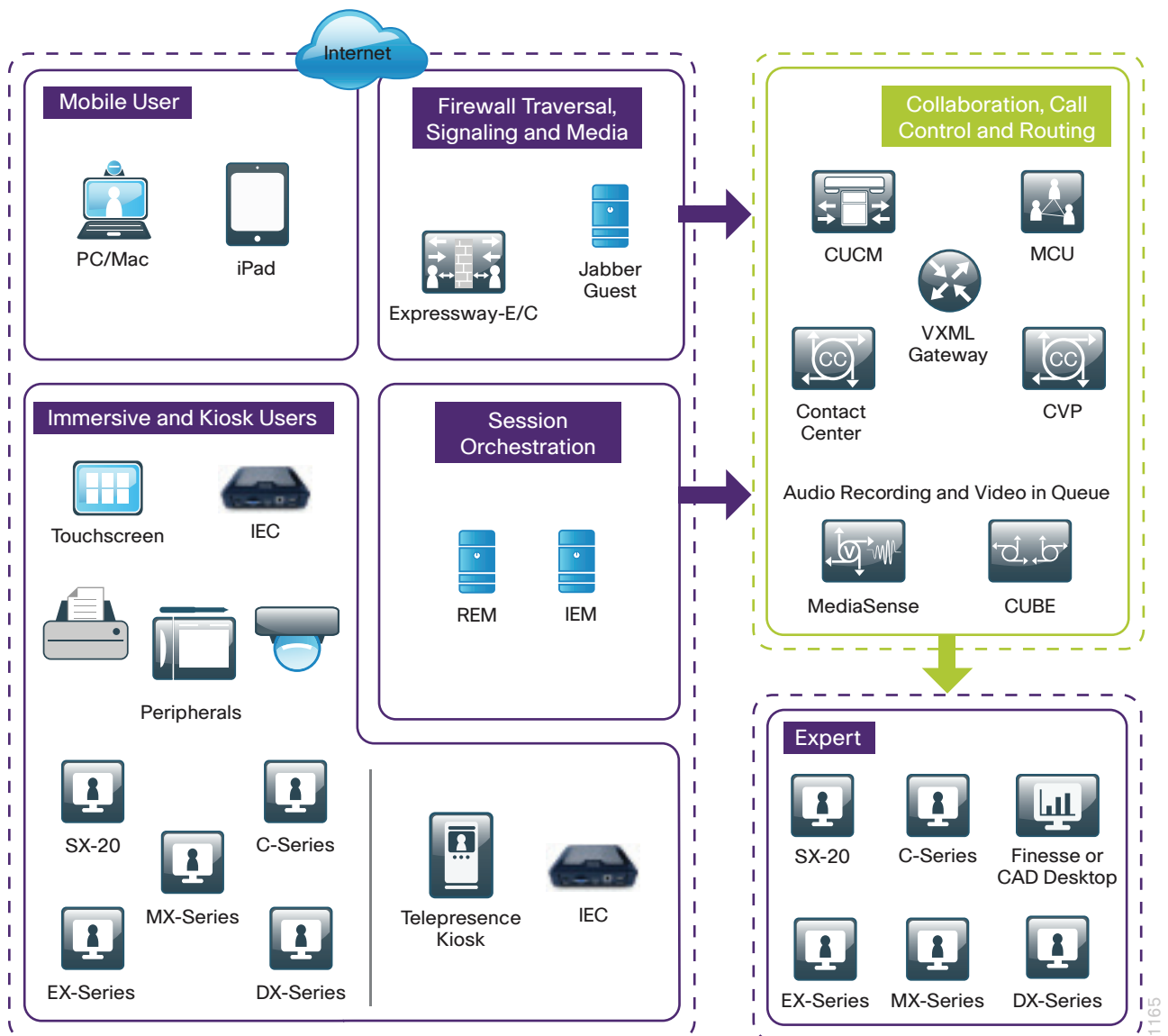
Cisco Remote Expert Solution

Design Overview

The Cisco Remote Expert Solution consists of products from the Cisco Unified Communications Architecture and Interactive Experience product lines. As shown in Figure 1, these products are deployed at different physical and logical locations within the enterprise: at the customer locations, at the enterprise data center, and at the expert location(s).

This section discusses the three architectures that comprise the Cisco Remote Expert Solution and introduces the components involved. Subsequent sections discuss these components and their deployment in greater detail.

Figure 1 - Cisco Remote Expert Solution Architecture

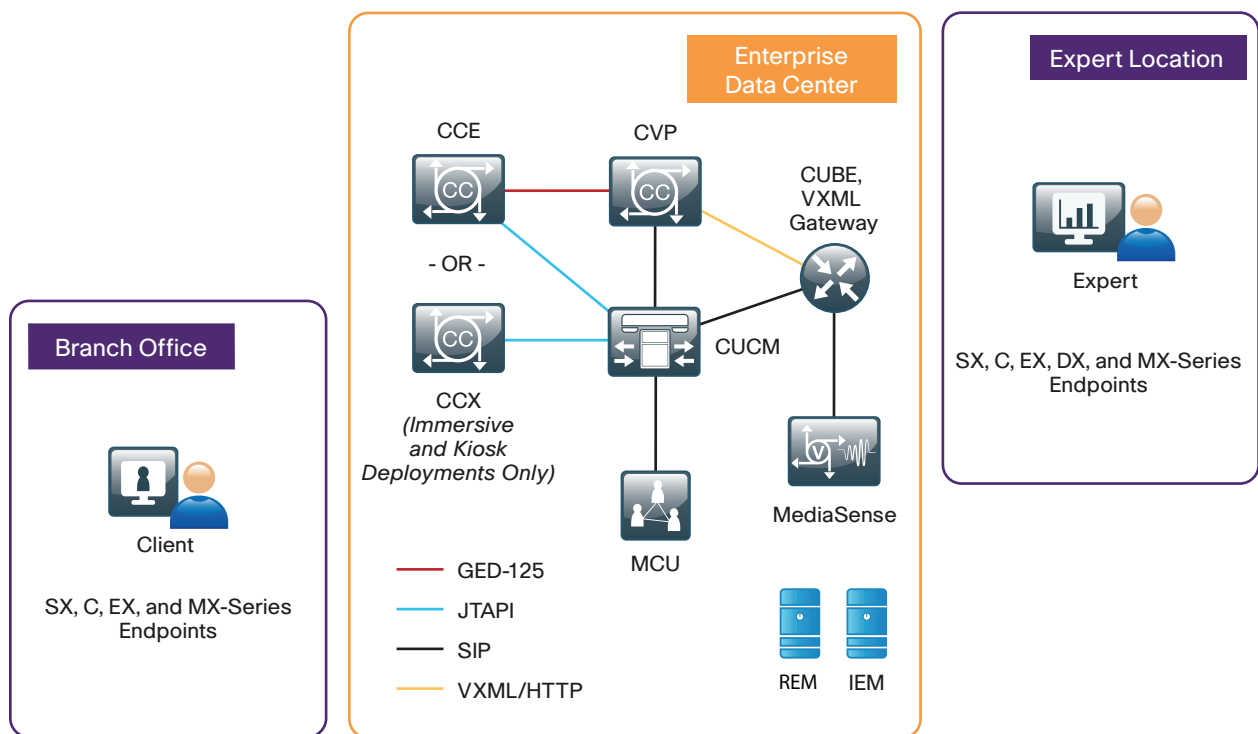


Remote Expert Immersive

The Immersive architecture is generally deployed within branch stores or satellite offices of the enterprise. Immersive conferencing delivers the full Cisco TelePresence experience to the caller. In addition, this method also offers the full complement of peripherals such as a printer, a signature capture tool, a card-reader, and a scanner, everything required to complete a complex transaction. A typical “Customer Pod” at an Immersive location might contain the following equipment:

- Cisco TelePresence endpoint (SX, C, EX-series Options, as well as MX-200 for branch office locations and CTS-500)
- Cisco Interactive Experience Client (IEC-4610 or IEC-4632)
- Common Unix Printing System (CUPS)-compliant laser printer
- Collaboration Panel (touch-screen monitor)
- Human input devices such as card readers, scanners and wet-ink signature capture.
- Application-specific equipment (document cameras).

Figure 2 - Remote Expert Immersive



Tech Tip

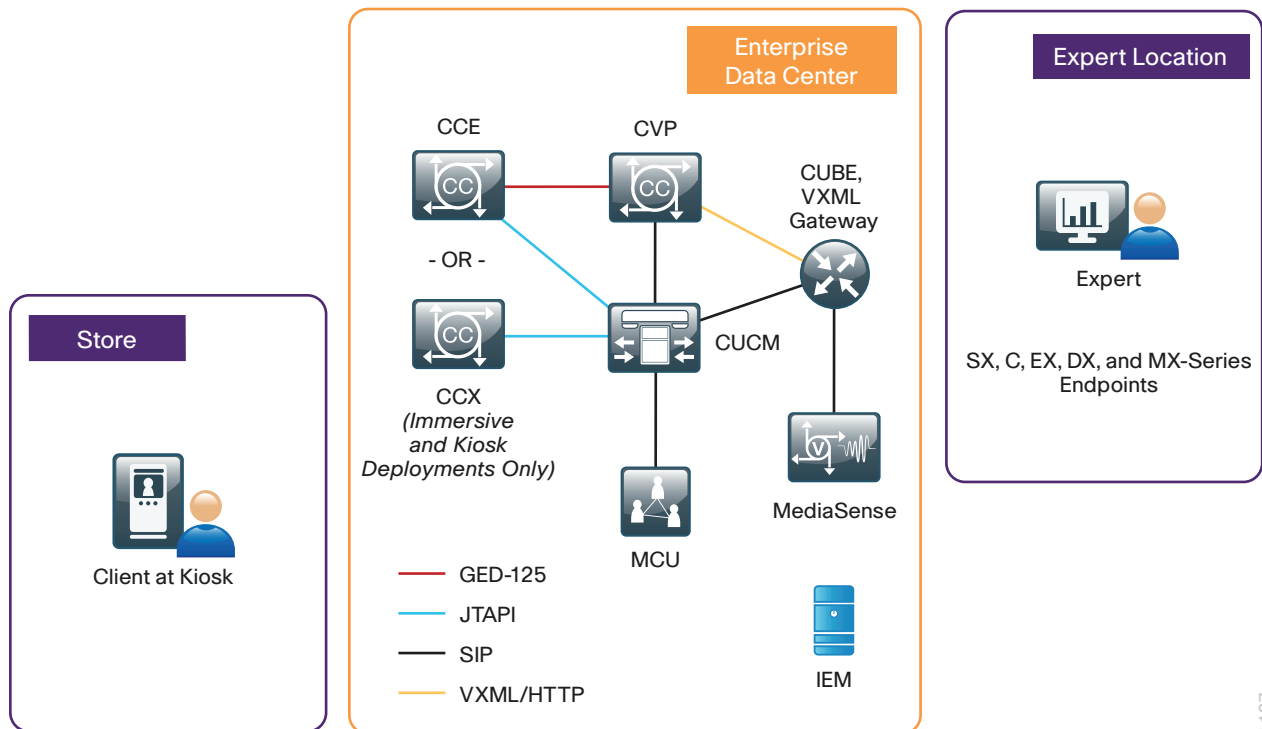
In the above diagram, CCX is a standalone contact center solution and it does not need CVP or the VXML Gateway. CCE requires the use of CVP and VXML Gateway. The two solutions are separate and cannot be used together.

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Remote Expert Kiosk

Self-service kiosks are becoming increasingly common in retail environments. A kiosk presents an ideal platform for the user to browse through the company offerings for information or for purchase. With Cisco Remote Expert, when the user has questions or needs assistance, the kiosk offers a way to establish a video call with an expert. Similar to Cisco Remote Expert Immersive, Remote Expert Kiosk architecture uses the same components to help establish the call. The Interactive Experience Client (IEC) drives the touch-screen and peripherals present in both architectures. A Kiosk location, however, does not have a separate video-enabled collaboration endpoint; therefore, it utilizes the soft-phone API's available via the IEC and allows the Kiosk user to establish a video call in that manner.

Figure 3 - Remote Expert Kiosk



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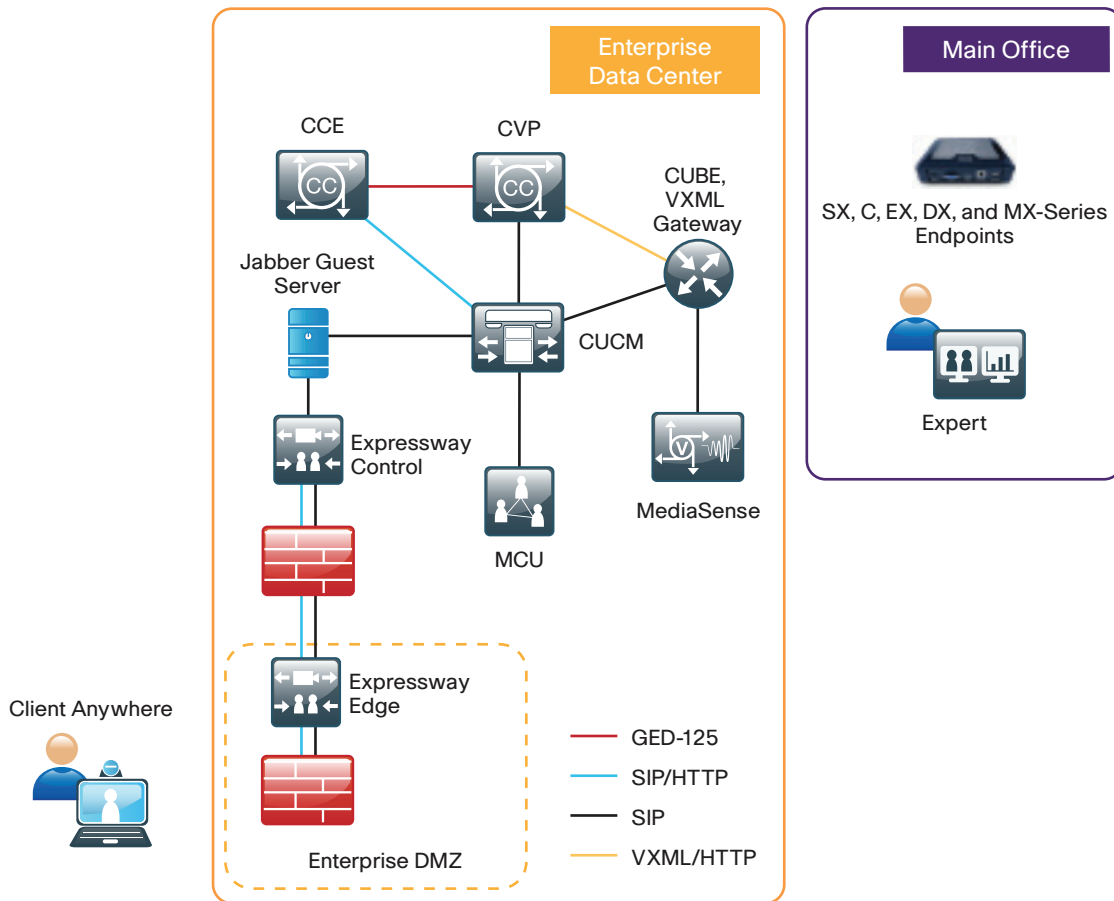
Remote Expert Mobile

Remote Expert Mobile differs greatly from both Remote Expert Immersive and Kiosk as far as access is concerned. Whereas the customer endpoints in Remote Expert Immersive and Kiosk are located within the enterprise network, Cisco Remote Expert Mobile consumers establish access to the enterprise's experts through the public Internet. This typically entails traversing multiple firewalls, and increased IP addressing complexity. Cisco Expressway servers, located within the enterprise's DMZ and Data Center, allow incoming IP connections to the internal infrastructure and ultimately to the enterprise subject matter expert.

Remote Expert Mobile Solution provides the flexibility of being presented in two ways:

- A button widget into an existing enterprise web page that will download the necessary plug-in and connect the call to the pre-determined call center queue
- An enterprise application to integrate with communication software on the device and place the call.

Figure 4 - Remote Expert Solution Mobile



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Deployment Details

There are three architectures within the Cisco Remote Expert Solution:

- Immersive - primarily used for use cases requiring high definition video, additional peripherals, and are located within the enterprise network with dedicated workspaces that provide privacy to the customer
- Kiosk - found mostly within the retail customer space to provide self-service content with the ability to escalate into a video-call with a subject matter expert
- Mobile - used to provide another channel for customers to escalate from a web experience into a video-call with the subject matter expert within the enterprise.

These are developed on a set of required infrastructure components that must be present for any of the three architectures to work. There are also several associated system functions that can be applied in order to round-out the full functionality of the each solution architecture option. Finally, there are system features that are useful, but not mandatory, components for functionality like conferencing or recording for example. These useful features are detailed below with the UC system release that supports them and the architecture they are available in.



Caution

Cisco Remote Expert Solution's Mobile Architecture is only supported with Cisco Unified Communications System Release 10.X with Cisco Unified Contact Center Enterprise. From product perspective, Jabber Guest is deployed in conjunction with Cisco Expressway X8.2 for firewall/NAT traversal, Cisco Unified Communication Manager 8.6 or later.

Table 1 - Feature Availability for UC System Release 9.X with Cisco Unified Contract Center Express

Feature	Immersive	Kiosk	Mobile
Video in Queue and Video on Hold to Touchscreen / Kiosk	X	X	
CVP Video in Queue			
Video Streaming to Touchscreen	X	X	
Desktop & Application Sharing (via Direct Connect)	X	X	
Desktop Sharing (via Cisco TelePresence Presentation Mode)	X	X	
Expert Agent Transfer & Conference			
Session Audio Recording	X	X	
Peripheral Support (Printers, Card Readers, and other peripherals)	X	X	

Table 2 - Feature Availability for UC System Release 9.X with Cisco Unified Contact Center Enterprise

Feature	Immersive	Kiosk	Mobile
Video in Queue and Video on Hold to Touchscreen / Kiosk	X	X	
CVP Video in Queue	X		
Video Streaming to Touchscreen	X	X	
Desktop & Application Sharing (via Direct Connect)	X	X	
Desktop Sharing (via Cisco TelePresence Presentation Mode)	X	X	
Expert Agent Transfer & Conference	X	X	
Session Audio Recording	X	X	
Peripheral Support (Printers, Card Readers, and other peripherals)	X	X	

Table 3 – Feature Availability for UC System Release 10.X with Cisco Unified Contact Center Enterprise

Feature	Immersive	Kiosk	Mobile
Video in Queue and Video on Hold to Touchscreen / Kiosk	X	X	
CVP Video in Queue	X	X	X
Video Streaming to Touchscreen	X	X	
Desktop & Application Sharing (via Direct Connect)	X	X	
Desktop Sharing (via Cisco TelePresence Presentation Mode)	X	X	X
Expert Agent Transfer & Conference	X	X	X
Session Audio Recording	X	X	X
Peripheral Support (Printers, Card Readers, etc.)	X	X	

Required Infrastructure Components

Call routing, call queuing, and expert selection are considered the core features of any Cisco Remote Expert Solution deployment. Components that provide these services are typically housed in the enterprise's data center as part of the enterprise's unified communications infrastructure.

Call Routing - Cisco Unified Communications Manager

In the Cisco Remote Expert Solution, the call routing is provided by the enterprise's Cisco Unified Communications Manager, and its configured dial plan to route calls between the Cisco video endpoints at the customer and expert locations.

Specific design guidance and best practices around call routing, dial plans and Cisco Unified Communications Manager installation and configuration in general are best found in the Cisco Unified Communications Solution Reference Network Design ([SRND](#)).

Where possible, you should keep the following in mind when setting up the Cisco Remote Expert experts/agents:

- The experts should be on a separate subscriber node (or nodes) in the Cisco UCM cluster.
- For solutions including more than a few hundred experts, it is strongly suggested that you separate Cisco Remote Expert agents into a dedicated cluster
- The reasons for these considerations are because of the close interworking between Cisco UCM and Cisco UCCE/X. The products should be closely matched in version, and upgrading may be more complicated if a subscriber hosts both regular and expert endpoints.

Call Queuing and Expert Selection: Cisco Unified Contact Center

- Cisco Unified Contact Center Enterprise (UCCE) delivers intelligent contact routing, call treatment, computer telephony integration (CTI), and multichannel contact management over an IP infrastructure.
- Cisco UCCE integrates with Cisco Unified Communications manager (UCM), Cisco Unified Customer Voice Portal (CVP), Voice XML gateway (VXML), and Cisco TelePresence endpoints to provide enterprises with a complete contact center infrastructure.
- For smaller-scale deployments or where the extensive feature-set of UCCE is not required, Cisco Unified Contact Center Express (UCCX) with Business Edition 6000 (BE6K) may provide the contact center function. UCCX, however, was validated with Cisco Unified Communications Manager 9.X (see Appendix A for version details).

Table 4 - Architectures and Contact Center Support

Feature	UCCE 10.X	UCCX 9.X
RE Immersive & Kiosk	Supported	Supported
RE Mobile	Supported	Not Supported (Video In Queue and Video On Hold features are not available)
Expert Desktop	Finesse	Cisco Agent Desktop

For general design guidance, please refer to the following documents:

[Cisco Unified Contact Center Enterprise Design Guide 10.0\(1\)](#)

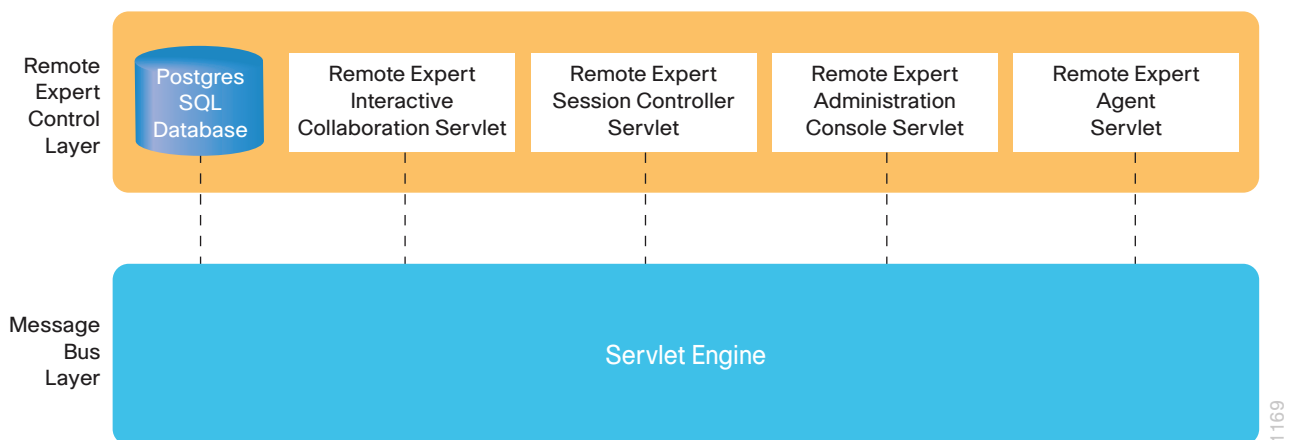
[Cisco Unified Customer Voice Portal Design Guide 10.0\(1\)](#) (covers both Cisco Unified CVP and Cisco IOS VXML Gateway)

Cisco Remote Expert Immersive and Kiosk Specific Components

Cisco Remote Expert Manager

Cisco Remote Expert Manager (REM) is the core control system of the Cisco Remote Expert Solution providing the collaboration features that make the customer's interactions with the expert simple and effective.

Figure 5 - Layers of Remote Expert Manager



The Cisco Remote Expert Session Controller (RESC) provides the core functions for Cisco REM. This includes: initiating and terminating video calls and data sharing sessions, controlling video streaming, triggering customer-side printing, and reserving optional signature capture hardware at the customer and expert locations.

The Cisco Remote Expert Interactive Application Controller (REIC) function is split across two layers of the Cisco Remote Expert Solution architecture. The REIC servlet resides in the Control Layer. At the endpoint layer, each customer pod at a customer location runs an instance of the REIC application. The REIC servlet and application instances exchange commands and responses via HTTP and SOAP/XML protocols.

The Cisco Remote Expert Agent Desktop capability is also split across two layers of the Cisco Remote Expert Solution architecture. The Cisco Remote Expert Agent Desktop (READ/eREAD) servlet resides in the control layer. The READ servlet presents a web interface to the user that is displayed inside their Finesse (eREAD) or Cisco Agent Desktop (CAD) application (READ is referred to as eREAD when it is displayed inside Finesses Agent Desktop). READ uses HTML frames to segment each collaboration functions. By default, READ presents frames for CRM information, document printing, video streaming, file previewing, and sharing history.

Cisco Remote Expert Administration Console (REAC) servlet provides the web-based administrative user interface for setting up, configuring, and managing the Cisco Remote Expert Solution.

Cisco REM uses a PostgreSQL database as a common repository for inventory information of all solution endpoints and expert types, and also to store documents and media files that need to be shared with customers. More information about the Cisco REM database is in the Cisco Remote Expert Manager High Availability section of this document.

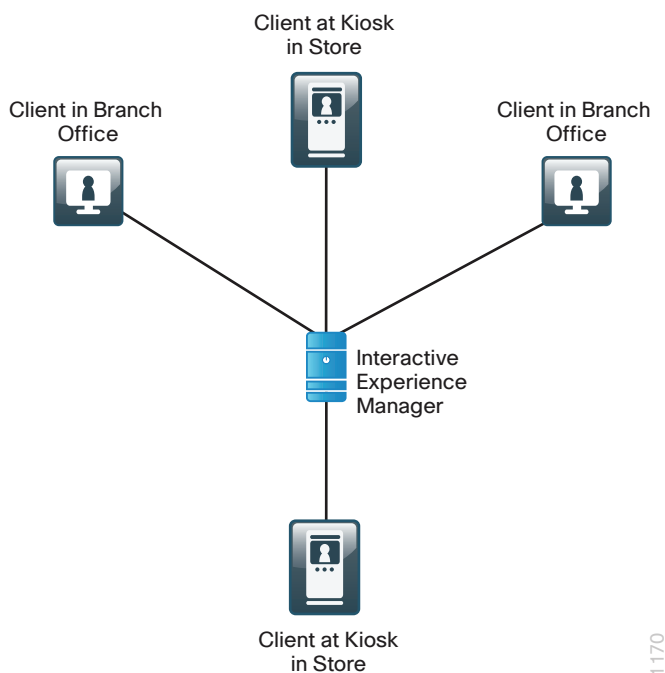
The message bus layer of the Cisco Remote Expert Solution architecture primarily uses Apache and Apache Tomcat for inter-service communication. Cisco REM uses Apache and Apache Tomcat as a web server and servlet container for the Cisco REM components. Apache and Apache Tomcat are also utilized for APIs in communicating with third-party components in customer locations such as credit-card readers and signature-capture devices.

The message bus layer also contains a JTAPI Computer Telephony Interface (CTI) adapter. REM uses the CTI adapter to learn of call events and state transitions in the infrastructure layer.

Interactive Experience Manager

In Figure 6, Cisco Interactive Experience Manager (IEM) is a centralized platform for configuration, control, and support of the Cisco IEC-4600 customer pod controllers located at each customer location.

Figure 6 - Cisco Interactive Experience Manager



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Cisco Remote Expert Immersive and Kiosk Specific Customizations

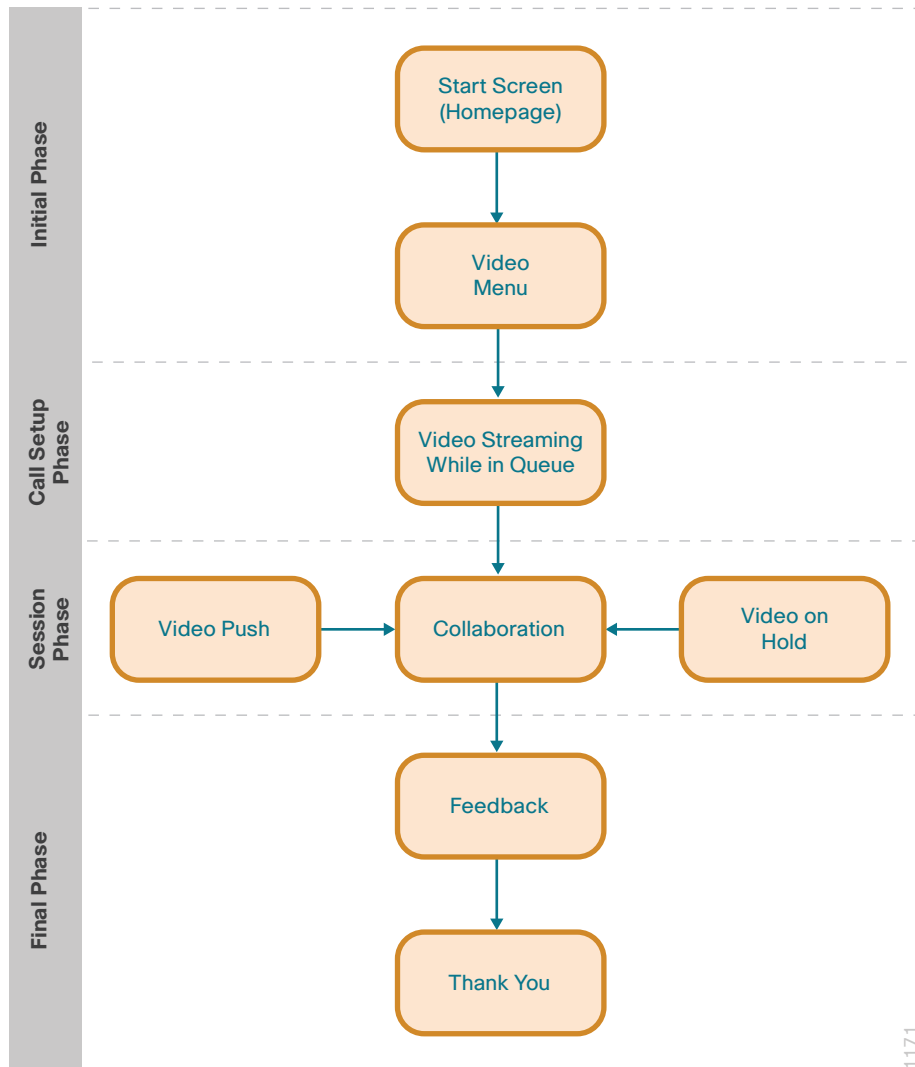
Screen Customizations

Every image and collaboration panel screen in the Cisco Remote Expert Solution can be fully customized using the customer's fonts, graphics, messaging, and videos. The flexibility to "brand" the screens and graphics associated with existing Cisco Remote Expert workflows allow customers to promote their brand while also providing a quality custom experience that their customers expect.

All the customer-facing graphics and workflows shown in Figure 7 below can be customized for Remote Expert Immersive Solution. Remote Expert Kiosk Solution uses open-standard web technologies and allows organizations to use much of their existing web content and application development. In many cases for Remote Expert Kiosk Solution it is as simple as pointing the IEC to a web URL.

Cisco Remote Expert Solution creative customization is offered as a consultative service or outsourced engagement through your Cisco account team. Please send an email message with your contact information to ask-re@cisco.com for additional information and support.

Figure 7 - Cisco Remote Expert Immersive Brand-able Workflow



Click-to-Connect (CTC)

This feature makes use of Extension Mobility within Cisco Unified Communications Manager. It is primarily used in Cisco Connected Justice (CJ) for interpreters in the courtroom, but could be applicable to other deployments.

Once an expert is connected to the other end, whether that is a branch office or a store or in the case of Connected Justice, a courtroom, the expert's phone is loaded with extensions via the Extension Mobility API provided by the Cisco Unified Communications Manager (CUCM). These could be phone extensions local to the remote end that might be necessary to connect to or conference with during the call. This allows the expert to call in another expert local to the caller, requesting assistance without having to look up extensions, or possibly transfer to an expert outside source for assistance.

Refer to [Remote Expert Manager 1.9 Installation Guide](#) for this CTC and additional features.

Remote Expert Mobile Specific Components

The Remote Expert Mobile solution allows a customer, using any device they choose, to access the enterprise's web page or application, download a plug-in if necessary, and initiate a call into an "expert" within the corporate contact center. With the Remote Expert Mobile Solution, all this is done while maintaining the strict security required at the outside edges of the enterprise.

Remote Expert Mobile Solution leverages Cisco Collaboration Edge Architecture (With Cisco Video Communication Server or Cisco Expressway) and also includes Cisco Jabber Guest as one of its core components. Cisco Jabber Guest is a consumer-to-business (C2B) solution that extends the reach of Cisco's enterprise telephony to people outside of a corporate firewall who do not have phones registered with Cisco Unified Communications Manager.



Reader Tip

Collaboration Edge is an umbrella term describing Cisco's entire collaboration architecture for edge.

Cisco VCS is existing product line option providing advanced video and Telepresence applications which includes VCS Control (VCS-C) and VCS Expressway (VCS-E).

Cisco Expressway is a product line option for UCM customers, providing firewall traversal and video interworking which includes Expressway Core (Expressway-C) and Expressway Edge (Expressway-E).

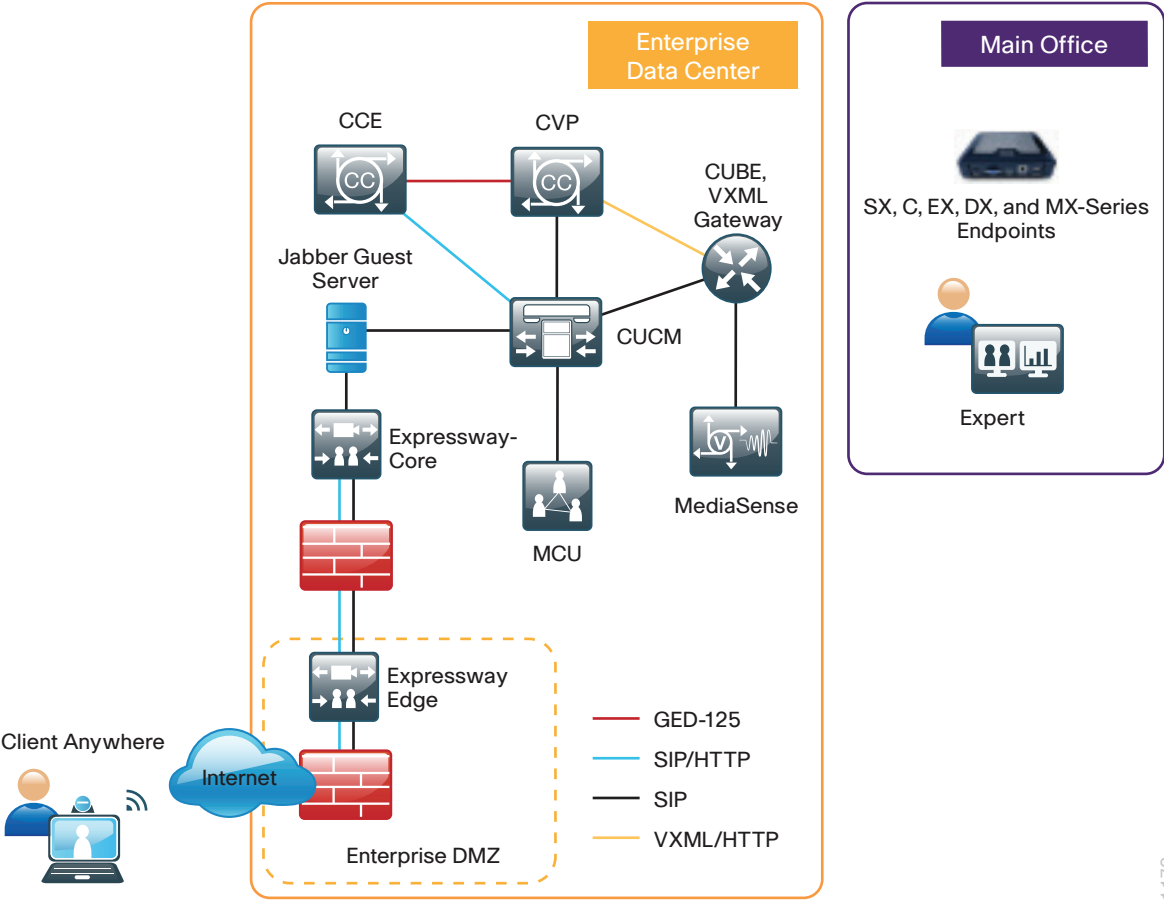
Cisco Jabber Guest can be deployed in combination with Cisco Expressway-Edge (Expressway-E) and Cisco Expressway-Core (Expressway-C) or alternatively in combination with Cisco VCS-Expressway (VCS-E) and VCS-Control (VCS-C).

To simplify the documentation, we reference only Cisco Expressway-E and Cisco Expressway-C throughout this guide.

This solution does not require exposure of portions of the enterprise infrastructure or massive changes to an existing enterprise DMZ. The remainder of this chapter does assume the existence of an enterprise DMZ and a working knowledge of its devices and configuration. For further questions regarding the development of an enterprise DMZ, and possible associated Cisco products, including configurations, please refer to [the Internet Edge Design Guide in Design Zone](#).

Cisco Remote Expert Mobile Architecture

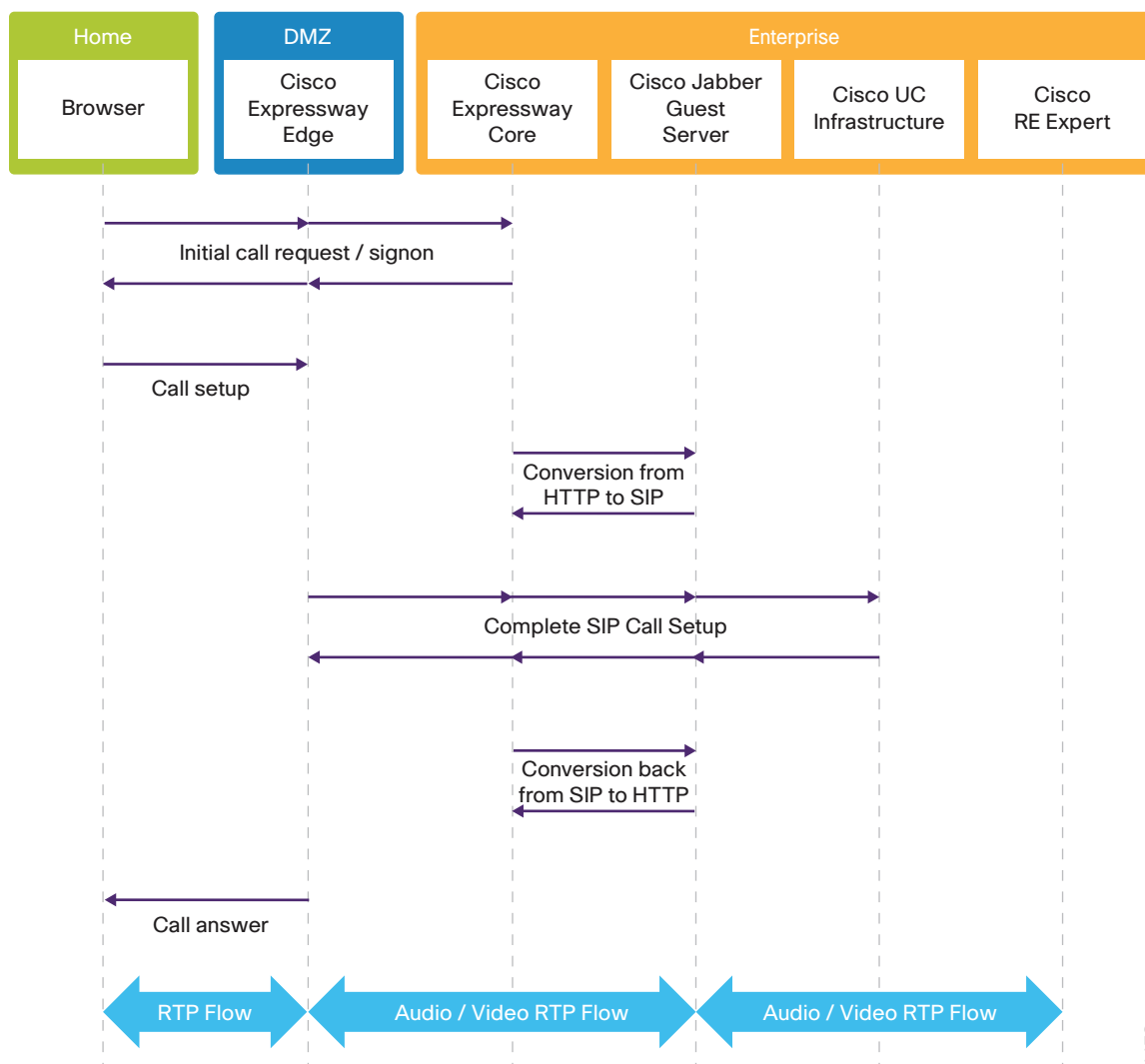
Figure 8 - Cisco Remote Expert Block Diagram



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Cisco Remote Expert Mobile Architecture Call Flow

Figure 9 – Cisco Remote Expert Mobile Call Flow Diagram



The Internet user clicks an embedded widget in a web page or an app is launched placing a call to a pre-determined URL. This URL is to the Expressway-Edge (Expressway-E) on port 9443 with the information needed to forward on to the Cisco Jabber Guest server allowing it to connect a call to the expert within the enterprise. The enterprise's firewall must be set up to allow this and the associated TURN traffic to traverse. Once inside, the Expressway-E sets up an SSH tunnel to the Expressway-Core (Expressway-C). All signaling and media traverse this tunnel. The Expressway-C communicates with the Cisco Jabber Guest server to convert the HTTP traffic into SIP. This SIP traffic is routed back to the Expressway-C and sent on to the Cisco Unified Communication Manager (CUCM). The media path is then connected from the expert endpoint thru the Expressway-C and Expressway-E tunnel and on to the originating endpoint in the Internet.

Firewall Modification Requirements

In addition to the traffic that may already be traversing the firewall between the enterprise's DMZ and the Internet, or Outside Firewall, modifications need to be made to accommodate the media and signaling traffic that this solution generates. The following tables discuss the TCP/UDP ports that are required clear traversal of both firewalls bordering the DMZ. Ports 80, 443, 9443 can be limited by including the fully-qualified domain name or IP address for the specific server receiving the traffic.

Table 5 - Ports to Open on Outside Firewall (Inbound from Internet)

Destination Port # on Expressway-E	Associated Protocol (Use)
9443/TCP	HTTPS
3478/UDP	TURN (control and media sent thru this port)

Between the DMZ location of the Cisco Expressway-Edge server and the rest of the required infrastructure, there is also typically a firewall. This firewall will require different ports to be opened for traversal of solution traffic.

Table 6 - Ports to Open on Internal Firewall (From Data Center to DMZ)

Source Port # on Expressway-C	Destination Port # on Expressway-E	Associated Protocol (Use)
2222/TCP	Ephemeral	SSH (Tunnel between Expressway devices)
48000 - 59999/UDP	60000-61799/UDP	Media

Table 7 - Ports to Open on Internal Firewall (From DMZ to Data Center)

Source Port # on Expressway-E	Destination Port # on Expressway-C	Associated
60000-61799/UDP	48000-59999/UDP	Media

For detailed information about port configuration, refer to [Cisco Jabber Guest Server Installation and Configuration Guide](#).

Expressway-Edge / Expressway-Core

These two virtual servers work together on either side of the data center firewall to assist in the firewall traversal of real time traffic. Their design in this architecture is not unique, but it bears mentioning only release 8.2 or later will support the necessary Jabber Guest Server. Within that release, Jabber Guest features must be enabled in order to start all the processes required on the Expressway servers themselves. One cannot use the same Cisco Expressway-Core and Cisco Expressway-Edge pair or cluster for both Cisco Jabber Guest and Expressway for Mobile and Remote Access.

The Expressway-Edge will run a reverse proxy service in order to proxy for the Jabber Guest server within the Enterprise. It will also run a TURN relay service in order to allow connections from the Internet that may be behind NAT firewalls. This information will be configured in the Expressway-Core as well so that it is aware of the TURN services to use.

The Expressway-Core, in addition to its configuration to talk to the Expressway-Edge needs to know about the Jabber Guest server(s) it will be sending call control traffic for, with their associated priorities. The Jabber Guest server is considered to be in a neighbor zone, and requires no additional search rules to be configured in order to route the traffic to these zones.

For more detailed deployment information please see the Mobile section of [Cisco Remote Expert Implementation Guide](#) or the product documentation listed in the Appendix.



Caution

With version 8.2 of VCS/Expressway software, you cannot configure both Remote Access for Jabber/TP Endpoints (for Cisco Unified Communications Manager access without a VPN) and JabberGuest Access simultaneously. Customers desiring both methods of access should deploy multiple clusters of VCS (one to address each use case).

Jabber Guest Server

The Jabber Guest server should be deployed within the Data Center as outlined in the [Cisco Jabber Guest Server Installation and Configuration Guide](#). Details around the tested configuration of this solution can be found in the Mobile section of [Cisco Remote Expert Implementation Guide](#).



Caution

It should be noted that the URL generated by the Jabber Guest administration page contains a number that will map to a queue within Cisco Unified Contact Center Enterprise (UCCE). This URL could be “reused” to continue to place calls into this queue, potentially for malicious reasons. It is suggested to regenerate the URL occasionally in order to change the mapping if this is a concern.

Jabber Guest SDK

For customizing Jabber Guest for your applications, there is an SDK available for iOS that was used during the testing of Remote Expert 1.9. For details around how to implement these please see [Jabber Guest SDK Guide](#).

Associated System Functions

Video in Queue

There are two methods in which video may be streamed to the caller while they are waiting in queue for an expert. The two methods are Cisco Remote Expert Manager (REM) based and Cisco MediaSense based. The deployment choice for Video in Queue (ViQ) is largely driven by the call center software and the deployment model. REM based ViQ is supported with both Cisco Unified Contact Center Enterprise (UCCE) and Cisco Unified Contact Center Express (UCCX) with Business Edition 6000 (BE6K), while Cisco MediaSense based is only supported with UCCE. REM base video in queue is not feasible with Mobile Remote Expert deployment because there is no REM.

Video in Queue using Cisco Remote Expert Manager

To understand how this method works there are a couple of points we need to keep in mind:

1. REM maintains a JTAPI link with the Cisco CUCM for the duration of the call. This link informs REM of the various events that the call goes through after it is originated.
2. REM is configured with the location of the video that should be played for the caller as they are waiting.

With the above two points in mind let's take a look at a call flow from start until the call is connected to an expert.

- Caller initiates call using the collaboration touch panel and the call is routed to UCCE or UCCX (depending on your deployment).
- When UCCE or UCCX determines that no expert immediately available, the call is queued and the Unified CM is informed.
- Unified CM informs REM that the call is queued.
- REM instructs the IEC to fetch the configured video from the media-server and play it on the touch panel.

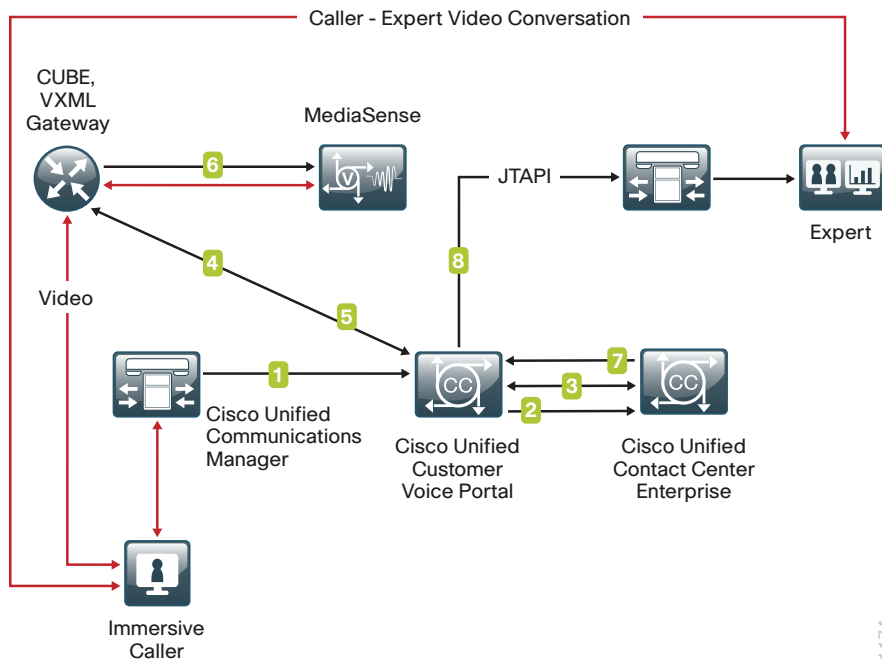
The video will continue to loop until an expert is available or the call is canceled. When one of these events occurs:

- UCCE or UCCX informs CUCM of the event.
- CUCM informs REM.
- REM informs IEC to stop playing the video.

Video in Queue using Cisco MediaSense

In deployments using UCCE, the Customer Voice Portal (CVP) can also be configured to play video to the caller when the call is waiting in queue for an expert. CVP video-in-queue (ViQ) feature allows a video caller on Cisco Unified Communication Manager to view a high-definition video prompt and navigate video menu using dual-tone multifrequency (DTMF) keys while in queue for a video agent. Cisco Unified Call Studio provides the scripting for this feature. This method streams video to the same screen that handles the video call, that is, the TelePresence endpoint in RE Immersive, expert video iframe area in RE Kiosk, and the browser or the tablet for RE Mobile.

Figure 10 - Video in Queue Using Customer Voice Portal and MediaSense



The flow in the above mentioned figure assumes that Cisco MediaSense is configured with a ViQ video associated with a DN, and the CUBE is configured to send a received call for the DN to MediaSense.

1. Caller initiates a call that arrives at Customer Voice Portal via CUCM.
2. Call is directed to Unified CCE that asks Customer Voice Portal to queue it waiting for an agent.
3. Customer Voice Portal executes Call Studio script.
4. Customer Voice Portal sends call to CUBE/VXML GW.
5. Customer Voice Portal VXML Server application instructs VXML GW to connect to the configured DN.
6. CUBE sends call to MediaSense with the configured DN and MediaSense streams video to caller endpoint.
7. When expert is available, Unified CCE informs Customer Voice Portal.
8. Customer Voice Portal cancels video streaming and connects caller endpoint with the expert endpoint.

Tech Tip

ViQ using Customer Voice Portal only works in Cisco Remote Expert deployments using Unified CCE.

Video on Hold

Video on Hold (VoH) is supported through REM, CUCM and can also be configured using UCCE/CVP and Call Studio scripts. In case of REM based VoH, the video on hold will be displayed on the collaboration panel (Touch Screen). In case of UCCE/CVP or CUCM based VoH, the video on hold will be displayed on the caller end-point for Immersive and Kiosk channels, and to the tablet device or desktop browser for Mobile channel.



Tech Tip

Since REM is not involved in call setup for RE Mobile calls, VoH using REM does not apply to RE Mobile.

Call Recording

Cisco Remote Expert Solution 1.9 supports network based audio recording for all deployment models with Cisco Unified Border Element (CUBE) and Cisco MediaSense. Cisco Remote Expert Solution 1.9 supports MediaSense 9.x and 10.0 based on the Unified Communication system release. For example RE Mobile is supported with Unified Communication system release 10.X therefore MediaSense 10.0 will be required for such deployment.

Recording Formats

Cisco Remote Expert Solution 1.9 supports two recording formats: G711 and AAC-LD. AAC-LD for 1.9 and requires IOS 15.3(3)M1 or greater running on the CUBE.

Playback and Live Monitoring

Options for playback and live monitoring are largely driven by the deployment model and scale requirement. For Immersive and Kiosk deployments REM or MediaSense can be used for playback and monitoring. While RE Mobile will require third party software (refer to MediaSense documentation for a list of supported third party software vendors). For deployments where MediaSense is deployed as a cluster, Remote Expert will need third-party software for play back and monitoring. Refer to [MediaSense documentation](#) for a list of supported third-party vendors.



Tech Tip

Live monitoring is not supported where recording is done with AAC-LD. Due to playback software limitation the call has to complete before the recording can be played.

Long Term Storage Consideration

MediaSense does support use of fiber-channel SAN storage for long term requirements. For details please see the Storage section of the [MediaSense Compatibility Matrix in the MediaSense SRND](#).

Call Conferencing

The Cisco Remote Expert Solution allows the expert to invoke a supervised three-party conferencing session when necessary. The Cisco 45XX Series MCU performs the conferencing function between a customer and two experts. The expert originating the supervised three-party conference must remain on the call and speak to the third-party expert before actually joining all three parties to the conference call.

Call Transfer between Agents

This feature works much the same as a typical call transfer, but it should be noted that the associated desktop that might be shared with the consumer is NOT automatically transferred to the next agent. If the same information will be needed by the next expert, the first agent needs to communicate links and information to be opened before transferring the client. While an agent is active with a client their screen will be shared, once transferred that screen share is disconnected and the new agent will need to share their applications.

Desktop Sharing

Immersive and Kiosk Architectures

Desktop sharing is accomplished in these architectures through the use of Direct Connect, a 3rd party product installed within the expert desktop. This application allows full desktop sharing as well as application level sharing.

Mobile Architecture

Desktop sharing from an expert to a mobile customer is supported via BFCP (Binary Floor Control Protocol) feature on the Cisco TelePresence (TP) endpoint. Expert TP system will display “Desktop Sharing” as an option on its touch panel controls. If selected, the expert need only select “View PC”, and the two streams from their video camera and the image of the desktop are combined into a single composite video stream which can then be displayed at the customer end.

At this time, the ability to adjust display size, layout, and content is not yet available. Improvements to this feature within Cisco Remote Expert Mobile architecture are expected in future releases.

Caution

The sharing of an entire desktop, versus a single application, may have legal implications in some market segments. Please be aware of what is open and available for viewing on the entire expert desktop when using this feature. Future improvements will address this concern.

Design Considerations for End-to-End Cisco Remote Expert Solution

Security

General network and infrastructure security will not be addressed as part of the Cisco Remote Expert Solution Validated Design. It is assumed that the enterprise has already developed and deployed an underlying security structure. If further design guidance in this area is desired, the [Cisco SAFE Security Reference Architecture](#) is available. The following sections highlight a couple security considerations specific to the Cisco Remote Expert Solution.

Peripheral Device Security: Credit Card Readers and Wet Signature Devices

Payment Card Industry Data Security Standards (PCI DSS) exist to help protect sensitive customer transactions from fraud. Enterprise customers in many of the industries addressed by the Cisco Remote Expert Solution are most likely familiar with PCI DSS requirements. However, when designing and implementing the Cisco Remote Expert Solution for an enterprise customer, PCI DSS considerations should be followed whenever sensitive customer data is gathered or passes through integrated components of the solution.

For instance, an immersive customer pod can have an attached card reader. If the reader is used, the personal data is then transferred through the Cisco IEC-4600 and needs to be acknowledged by the Cisco Remote Expert Solution designer. In contrast, the data representing the signature telemetry of a customer wet signature capture

is transmitted outside the data streams normally associated with the rest of the Cisco Remote Expert Solution. However, this data still traverses the branch-location LAN and WAN to reach the signature printer at the expert location, so this infrastructure must also comply with PCI DSS.

More information about PCI DSS and best practices for compliance can be found in the [Cisco PCI Solution for Retail 2.0 Design and Implementation Guide](#).

High Availability

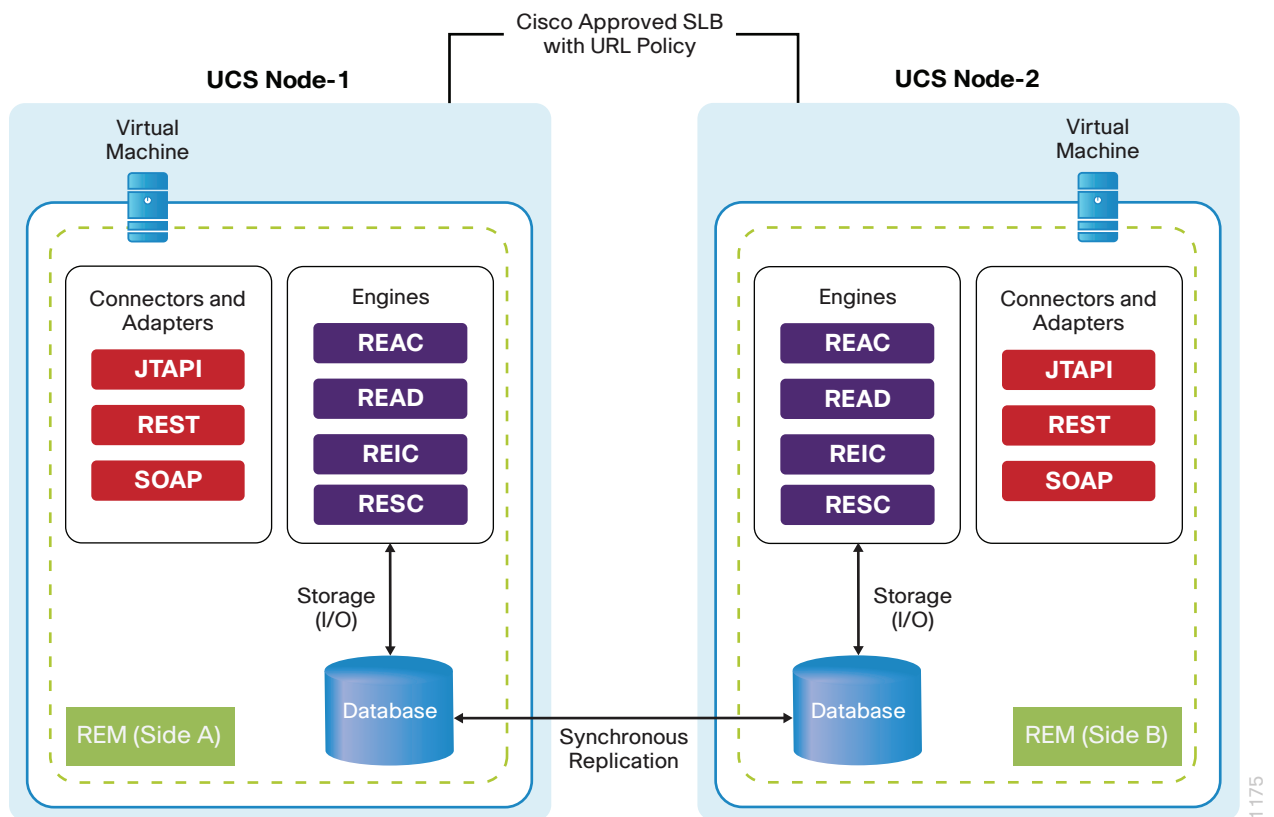
Many components of the Cisco Remote Expert Solution are capable of running in a High Availability configuration. The details on how these services are deployed for failover are well understood at the product level.

Cisco Remote Expert Manager

Remote Expert Manager has the ability to be deployed in a High Availability design. All testing completed for Remote Expert Solution 1.9 (both feature testing and performance testing) was done with this in place. For details on the deployment please see [Remote Expert Manager 1.9 Installation Guide](#).

Cisco REM achieves high availability of the services it offers by using hardware-based server load balancers such as the Cisco ACE Module, as well as component-level hardware and software application redundancy, as detailed in Figure 11.

Figure 11 - Cisco Remote Expert Manager High Availability



When the suggested recommendations for a high-availability implementation are met, Cisco Remote Expert Manager is designed to meet the following high availability goals:

- In the event of a failure of the Cisco REM active node (physical host), automatic failover to a warm standby node should occur without the need for any manual intervention.
- In the event of application failures (Apache Web Server, Apache Tomcat, Postgres database, or Cisco IEM), there should be no application downtime.
- There should be no application downtime in the event of a server hardware failure.
- During a failure, the currently active Cisco Remote Expert sessions should be managed without any call disruption.
- The solution should survive the failure and restoration of the primary and secondary Apache Tomcat or Cisco RESC servlet.
- If a streaming video terminates unexpectedly due to failure of the video server, the customer pod controller should detect that failure and return to the prior state.
- Simultaneous failure and restoration of IP connectivity to up to 20 percent of the remote customer pods should result in the return of the affected customer pods to an available known state, with no adverse effects on the operating status of other active and registered customer pods.

Application cluster health information should be available in a console in the event of a node failure.

Cisco REM Web-Request High-Availability Architecture

After the load-balancing engine has routed a web request to a physical server, Apache first routes the request to an Apache Tomcat instance. The solution helps ensure high availability for Cisco REM web requests in the following manner:

- A cluster of two Apache Tomcat instances, A and B, are located on separate physical hosts (as shown in Figure 11).
- Each instance sends a multicast ping that includes its IP address and TCP port.
- Each Apache Tomcat instance that receives this ping registers the other instance as a member in its local database.
- Each Apache Tomcat instance uses the received host IP address and TCP port to establish a socket to the other Apache Tomcat instance.
- With the two sockets open, each instance can now send every received session request from the Cisco Remote Expert customer pod applications to the other Apache Tomcat instance; so all session requests are replicated across the two Apache Tomcat instances.

The Apache Tomcat instance receiving a session request from a Cisco Remote Expert customer pod application via the Cisco ACE Module fulfills all parts of the request, from session initiation through session termination. If the replicating Apache Tomcat server, for example, instance B, does not receive expected multicast heartbeats from the originating instance, A, the replicating instance will take over and begin to service the needs of the session originally serviced by Apache Tomcat instance A. Likewise, Apache Tomcat instance A services session requests initially handled by instance B in this same manner.

Cisco REM Database High-Availability Architecture

Cisco REM uses a PostgreSQL database that is clustered across the two Cisco REM physical hosts by a High Availability Java Database Connectivity (HA-JDBC) front-end that runs on each host. The HA-JDBC instances load balance database queries and writes across the two clustered instances of PostgreSQL to improve database system throughput.

Cisco Immersive Experience Manager Database

While the Cisco Immersive Experience Manager can be deployed in a High-Availability design, this architecture was not tested as part of Cisco Remote Expert Solution 1.9, and as such, cannot be guaranteed to work with the Cisco Remote Expert Solution 1.9 infrastructure.

Cisco Jabber Guest Server

Cisco Jabber Guest supports a three-server cluster. Cisco Jabber Guest will function properly with two operational servers in the cluster. But Cisco Jabber Guest will not function properly if only server in the cluster is operational. Hence, it is recommended to have three operational servers for full redundancy.

The data such as users, secure SIP Trust Certificates, Links, Call Control and Media setting is replicated among the cluster nodes. However Local data such as Local SSL certificates and logs are not replicated.

Quality of Service

Customer Location Network Infrastructure Requirements

Immersive and Kiosk Customer Locations

Cisco REM maintains communication with each IEC-4600. If connectivity between Cisco IEC-4600 and Cisco REM is interrupted even for just a few seconds, the customer pod will enter an offline state until connectivity is restored. While the customer pod is in this offline state, collaboration sessions cannot be initiated from the customer pod. Therefore, excessive latency, jitter, or dropped packets could adversely affect communications between the customer pod and Cisco REM.

Media streaming is, by far, the most demanding requirement in terms of bandwidth and QoS considerations at the customer location. For the Cisco Remote Expert Solution, three types of media streaming need to be explored and understood:

- The video call between the Cisco TelePresence endpoints
- Data collaboration traffic between the Customer Location's customer pod(s) and the expert workstations (through the Direct Connect application)
- Video-on-demand (VoD) traffic from the media server and the customer location customer pods while the customer is in the queue to meet with an expert, when the expert places the customer on hold, or when the expert pushes an informative VoD to the customer pod for the customer to view.

Keep in mind that data sharing traffic and VoD traffic never occur simultaneously. The bandwidth required by VoD traffic is greater than the bandwidth required by data sharing traffic. Therefore, for purposes of Customer Location bandwidth planning, the maximum bandwidth required for each customer pod within a Customer Location is the sum of the Cisco TelePresence bandwidth and the VoD bandwidth.

The bandwidth required by other functions, such as customer pod supervision and human-interface device traffic is not significant when compared to media streaming bandwidth requirements; however, QoS for this traffic is an important consideration and is discussed in the Quality of Service section of this document.

Cisco TelePresence Bandwidth Requirements

To create an immersive collaborative experience between the customer and the expert, Cisco best practices recommend planning for and provisioning Cisco TelePresence calls for the best quality at a resolution of 1080p (1920 x 1080).

The Cisco TelePresence System EX60 and EX90 offer several profile definitions depending on the physical environment in which the devices are located. The minimum bandwidth required depends on the optimal definition profile (normal, medium, or high), the resolution, and the frame rate. Note that the names of the profile definitions actually refer to the amount of compression applied to the media streams, rather than the amount of bandwidth required for a particular profile.

In the Cisco TelePresence System codec software, you can increase the video resolution for situations in which lighting and other environmental conditions are especially good. The High setting should be used in dedicated rooms with optimal lighting conditions. Medium is for good, stable light conditions. Normal is the default and is recommended in most cases.

Best practices dictate the testing of every customer pod location for session quality, especially when selecting either Medium or High mode. In customer pod areas with many windows, testing should be conducted at different times of the day (and night, if applicable to customer location operating hours) to help ensure that the chosen profile results in an immersive conferencing experience at all times.

Table 8 below details the bandwidth requirements per call or session for the Cisco TelePresence System EX60 and EX90 endpoints used in the Cisco Remote Expert Solution. Network design best practices recommend over provisioning by 20 percent to allow for burst conditions and network encapsulation overhead.

Table 8 - Cisco EX60 and EX90 Per-Call Bandwidth Requirements

Profile (Compression Level)	“Raw” Bandwidth (Audio and Video)	Recommended Bandwidth (Audio and Video)	Resolution	Frame Rate
Normal	3 Mbps	3.6 Mbps	1920 x 1080p	30 fps
Medium	2.25 Mbps	2.7 Mbps	1920 x 1080p	30 fps
High	1.5 Mbps	1.8 Mbps	1920 x 1080p	30 fps

For other resolutions and frame rates, please see the [Cisco TelePresence System EX60 and EX90 Administrator Guide](#) for Cisco EX Series.

Data Collaboration Bandwidth Requirements

The desktop collaboration feature of the Cisco Remote Expert Solution is handled by the Direct Connect application. Direct Connect is covered in more detail in Customer Location section of this chapter. For purposes of Customer Location bandwidth requirements planning, the best practice recommendation is to allow 2 Mbps, including network overhead, per customer pod for desktop collaboration.

Video-on-Demand Bandwidth Requirements

The bandwidth required for video streaming to a customer pod largely depends on the characteristics of the individual VoD. Assuming that most VoDs are recorded at the standard 30 fps, the most significant factor affecting the bandwidth requirement will be the resolution of the VoD clip.

The table below lists the approximate bandwidth requirements per customer pod for common VoD resolutions used in the Cisco Remote Expert Solution. Network design best practices recommend over provisioning by 20 percent to allow for burst conditions and network encapsulation overhead.

Table 9 - Approximate VoD Bandwidth Requirements

VoD Resolution	Approximate Raw Bandwidth Requirement	Recommended Bandwidth Requirement
448p30	256 Kbps	307 Kbps
720p30	1.5 Mbps	1.8 Mbps
1080p30	3 Mbps	3.6 Mbps

Table 10 - Example of Calculating Approximate Total Bandwidth for Cisco Remote Expert Solution 1.9 Immersive Solution Call

Data Component of Total	Bandwidth (kbps)
720p-30fps EX60/90 Video	2560
REM / IEM / DC	1500
Call Signaling	150
VoD / Streaming Video	500
Total Bandwidth	5000

Expert Location Network Infrastructure Requirements

Immersive and Kiosk Expert Locations

The network infrastructure requirements for the Cisco Remote Expert Solution at the expert location are similar to those at the customer location, with media streaming by far the most demanding requirement in terms of bandwidth and QoS. One advantage that the expert location has over the customer location is that bandwidth planning and monitoring, as well as QoS policies, are likely to be already in place to help ensure acceptable voice-over-IP (VoIP) voice quality. Although the additional bandwidth requirements and dynamics introduced by the Cisco Remote Expert Solution may require a reassessment, existing policies can provide a baseline that may not exist for many customer locations.

As at the expert location, three types of media streaming need to be explored and understood:

- Video calls between the Cisco TelePresence endpoints
- Data collaboration traffic between each expert's workstation and the remote customer pods (through the Direct Connect application)
- VoD traffic between the media server and the expert's workstation, when the expert chooses to preview an informative VoD prior to directing it to be streamed to the customer pod, or when the expert decides to view the video at the same time as the customer views it at the customer pod.

Keep in mind that data sharing traffic and VoD traffic never occur simultaneously. The bandwidth required by VoD traffic is greater than the bandwidth required by data sharing traffic. Therefore, for purposes of Expert Location bandwidth planning, the total bandwidth required for the Cisco Remote Expert Solution at each Expert Location is the sum of the Cisco TelePresence bandwidth and the VoD bandwidth, multiplied by the number of agent positions participating in the solution as Experts.

Cisco TelePresence Bandwidth Requirements

To create an immersive collaborative experience between the customer and the expert, Cisco best practices recommend planning for and provisioning Cisco TelePresence calls for the best quality at a resolution of 1080p (1920 x 1080).

The Cisco TelePresence System EX60 and EX90 offer several profile definitions depending on the physical environment in which the devices are located. The minimum bandwidth required depends on the optimal definition profile (normal, medium, or high), the resolution, and the frame rate. Note that the names of the profile definitions actually refer to the amount of compression applied to the media streams, rather than the amount of bandwidth required for a particular profile.

In the Cisco TelePresence System codec software, you can increase the video resolution for situations in which lighting and other environmental conditions are especially good. The High setting should be used in dedicated rooms with optimal lighting conditions. Medium is for good, stable light conditions. Normal is the default and is recommended in most cases.

Best practices dictate the testing of every customer pod location for session quality, especially when selecting either Medium or High mode. In customer pod areas with many windows, testing should be conducted at different times of the day (and night, if applicable to customer location operating hours) to help ensure that the chosen profile results in an immersive conferencing experience at all times.

The table below lists the raw bandwidth requirements per call or session for the Cisco TelePresence System EX60 and EX90 endpoints used in the Cisco Remote Expert Solution. Network design best practices recommend over provisioning by 20 percent to allow for burst conditions and network encapsulation overhead.

Table 11 - Cisco TelePresence EX60 and EX90 Per-Call Bandwidth Requirements

Profile (Compression Level)	“Raw” Bandwidth (Audio and Video)	Recommended Bandwidth (Audio and Video)	Resolution	Frame Rate
Normal	3 Mbps	3.6 Mbps	1920 x 1080p	30 fps
Medium	2.25 Mbps	2.7 Mbps	1920 x 1080p	30 fps
High	1.5 Mbps	1.8 Mbps	1920 x 1080p	30 fps

Data Collaboration Bandwidth Requirements

As mentioned previously, desktop collaboration is handled by the Direct Connect application on each agent workstation. For purposes of expert location bandwidth requirements planning, the best practice recommendation is to allow 2 Mbps, including network overhead, per expert agent position for desktop collaboration.

Video on Demand Bandwidth Requirements

The bandwidth required for video streaming to an expert agent position largely depends on the characteristics of the individual VoD. Assuming that most VoDs are recorded at the standard 30 fps, the most significant factor affecting the bandwidth requirement is the resolution of the VoD clip.

The table below details the approximate bandwidth requirements per expert position for common VoD resolutions used in the Cisco Remote Expert Solution. Network design best practices recommend over provisioning by 20 percent to allow for burst conditions and network encapsulation overhead.

Table 12 - Approximate VoD Bandwidth Requirements

VoD Resolution	Approximate Raw Bandwidth Requirement	Recommended Bandwidth Requirement
448p30	256 Kbps	307 Kbps
720p30	1.5 Mbps	1.8 Mbps
1080p30	3 Mbps	3.6 Mbps

General Quality of Service Requirements

As with bandwidth requirements, the QoS requirements for the Cisco TelePresence System are the most demanding QoS requirements for the expert location. The table below lists some general QoS requirements for the Cisco TelePresence System that you should consider when planning expert location capacity.

Table 13 - Cisco TelePresence General QoS Requirements

Parameter	Optimal	Acceptable	Unacceptable
Latency	<= 150 ms	<= 200 ms	>= 400 ms
Jitter (peak to peak)	<= 10 ms	<=20 ms	>= 40 ms
Packet loss	<= 0.05%	<= 0.10%	>= 0.20%

Detailed QoS guidance for the expert location WAN edge can depend on the whether the WAN is based on a Layer 2 design or on an MPLS and VPN design. Best QoS design practices for the Cisco TelePresence System can be found in the [Cisco TelePresence Network System 2.0 Design Guide](#).

Remote Expert Immersive and Kiosk Specific QoS Requirements for the Customer Location

Although the QoS requirements for Cisco Remote Expert customer pod supervision and human-interface device traffic are not as stringent as those for media streaming, this traffic is important to the smooth and proper operation of the solution at the customer location.

Also, the customer pods tend to aggressively poll Cisco REM with supervisory messages and even a few missed polls can cause the customer pod to enter an offline state until connectivity is restored.

Cisco TelePresence traffic between the Customer and Expert Locations requires the most scrutiny when it comes to bandwidth planning and QoS design. In all cases, the best practices suggested and referenced should be interpreted as guidance rather than as rules that must be strictly followed.

With that qualification in mind, best practices dictate that you follow the guidelines stated in the Cisco Differentiated Services (DiffServ) QoS Recommendations for MediaNet for traffic classification and marking. In many cases, however, this guidance can be complicated by the availability of WAN service provider offerings and their associated costs, which may vary across locations and individual service providers.

Characteristics for Cisco TelePresence traffic in particular are well known, which can help to make this planning more deterministic. Cisco recommends marking REM control and supervisory traffic as AF2x.

After available bandwidth, jitter is one of the most important traffic characteristics that can affect Cisco TelePresence quality. Assuming that properly classified and marked traffic traverses the WAN edge, the network designer has two queuing options available for Cisco TelePresence traffic: Low-Latency Queuing (LLQ) and Class-Based Fair Weighted Queuing (CBFWQ).

Each of these approaches has a number of benefits and qualifications. LLQ offers the capability to maintain network jitter well below the best-practice recommendations for the Cisco TelePresence System. However, reserving the required bandwidth for this strict-priority queuing could have negative effects on other mission-critical traffic as Cisco TelePresence sessions are initiated and disconnected during the business day. This degradation can especially occur when existing QoS policies are already configured to handle VoIP traffic using LLQ.

CBFWQ, however, often provides adequate protection of traffic from excessive jitter without the potential serious degradation of other network traffic. In fact, current versions of Cisco TelePresence firmware offer superior traffic smoothing capabilities as well as deeper de-jitter buffering, both of which lead to less overall sensitivity of the Cisco TelePresence System to jitter. Therefore, LLQ has even less of an advantage compared to CBFWQ policies with newer versions of Cisco TelePresence System software. In the end, the choice requires careful consideration of customer expectations and requirements weighed against the cost and availability of service provider real-time offerings.

For QoS considerations regarding Cisco UCM components of the Cisco Remote Expert Solution please see the respective solution reference network design documents.

Remote Expert Immersive and Kiosk Specific QoS Requirements for the Expert Location

The smooth presentation of desktop collaboration to the customer in the customer location is also a critical component of the Cisco Remote Expert Solution experience. Cisco recommends following the traffic classification and marking model for Cisco TelePresence traffic detailed in Chapter 4, Quality of Service Design for TelePresence, of the [Cisco TelePresence Network System 2.0 Design Guide](#). Cisco also recommends classifying Cisco TelePresence supervisory traffic as AF2x, and Cisco Remote Expert Solution desktop collaborative traffic as AF3x. This traffic can be characterized as shown in the table below.

Table 14 - Expert Location Traffic Characterization

Traffic Type	Protocol	Port(s)
Direct Connect collaboration traffic	TCP	Source: Expert workstation, ephemeral port >32768 Destination: Customer pod IEC-4600, port 8800

Performance Guidelines

Remote Expert Immersive and Interactive Services

The Cisco Remote Expert Solution has been thoroughly tested and validated at scale of 250 simultaneous collaboration sessions with Unified Contact Center Enterprise (UCCE). For testing purposes, a “collaboration session” is defined as:

- A number of Customer Pods (featuring virtual IEC4600s using the actual Java API into the contact center cloud) each initiate a session for a particular product/service at the rate of seven sessions per minute
- The session is connected to an agent running in a virtual machine controlled by a script, providing the actual mouse movements, and key clicks of a human using the agent desktop
- All network traffic is sourced as normal and sink to the virtual IEC4600

During the collaboration session, the agent:

- Prints 2 documents at the Customer Pod, one short and one long
- Plays one short-duration video (two to three seconds long) on demand at the Customer Pod
- Places the session on hold for a period of time (which includes the short duration video as “the on-hold video”)
- Plays a long-duration video (approximately 45 seconds long) on demand at the Customer Pod
- The agent then terminates the session.

During scalability testing, 250 calls from Customer Pods were initiated to agents in the contact center at a rate of approximately seven sessions per minute. If necessary, the calls were queued by UCCE until an agent could answer them. Once all 250 calls were established then the agents were instructed to begin carrying out the collaboration session actions noted above until all actions were completed. Then, the collaboration sessions were disconnected at approximately the same seven sessions per minute rate.

During peak utilization, this resulted in a maximum of six concurrent print jobs, three concurrent short-duration videos on demand and 60 concurrent long-duration videos on demand simultaneously (end to end) across all Customer Pods.

The scalability with Cisco Unified Contract Center Express is slightly smaller. This testing was completed in the same manner, but with a maximum of 100 simultaneous sessions.

For more information on the validated scalability testbed and its configuration, please see the [Cisco Remote Expert Solutions Implementation Guide](#).

Remote Expert Mobile Services

The Cisco Remote Expert Mobile solution has been thoroughly tested and validated at scale of 500 simultaneous collaboration sessions with Unified Contact Center Enterprise (UCCE). For testing purposes a collaboration session is defined as:

- A number of simulated mobile customers (simulating iPad, PC and MAC browser clients) each initiate a session into the Expressway-Edge from where it is securely tunneled through Expressway-Core into the Jabber Guest for HTTP to SIP conversion. And finally From Expressway-Core to Enterprise’s Cisco Unified Communication infrastructure for call routing and treatment.
- Before the call is connected to the agent, a video in queue is being played by the UCCE and CVP based contact center solution from the Cisco MediaSense server.
- The session is then connected to an agent running in a virtual machine controlled by a script, providing the actual mouse movements, and key clicks of a human using the Finesse agent desktop.

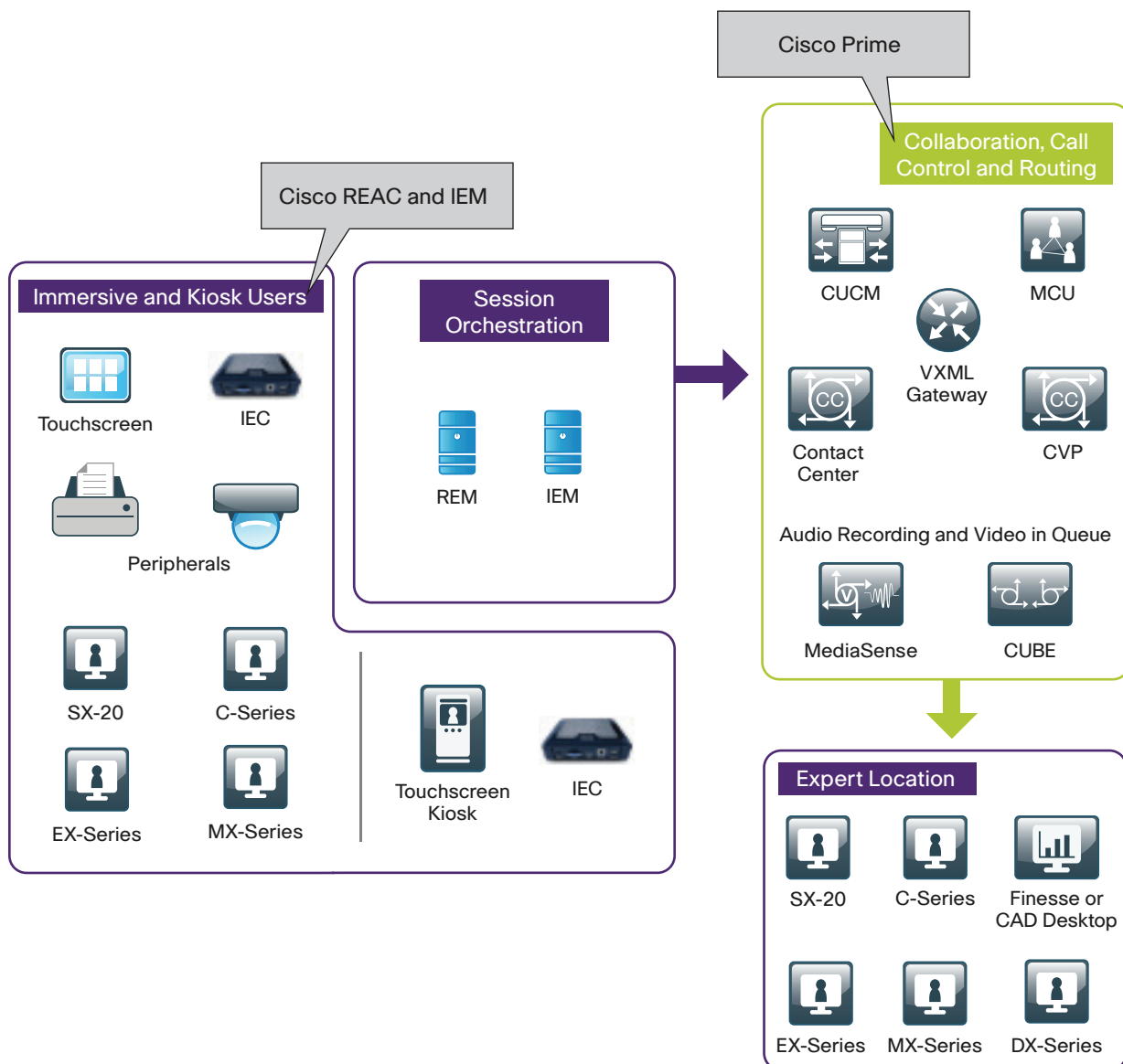
Operations and Management

Practical Deployment Considerations

An end-to-end Cisco Remote Expert Solution deployment requires a comprehensive management architecture that provides the capability to provision, monitor, and troubleshoot the solution for a large number of geographically dispersed customer pods and expert agent positions on a continuous basis. This chapter provides best practices and guidelines for managing a Cisco Remote Expert Solution. An understanding of the demands of managing the system can serve as a basis for validating off-the-shelf management tools and developing specialized tools in-house, where necessary.

Managing a Cisco Remote Expert Solution system is challenging given the number of hardware and software components in the end-to-end system (data center, customer location, and expert location). These components provide services to remote end users and administrators. Administrators are expected to manage different technologies and services, such as network, storage, database, and unified communications resources (Figure 12).

Figure 12 - Management Tools in Cisco Remote Expert Solution



Management and Operations Architecture

This section describes the main aspects of management architecture for the Cisco Remote Expert Solution. Operations management, reporting, service management, provisioning management, and customization are the main management elements for the Cisco Remote Expert Solution.

Table 15 - Cisco Remote Expert Solution Management Architecture Aspects

Main Aspects of a Cisco Remote Expert Solution Management Architecture
Operations management is the capability to monitor the status of every element in real time and provide diagnostics. For the Cisco Remote Expert Solution, this process includes the use of syslog and XML-based monitoring as well as the use of HTTP-based interfaces to manage devices. It also includes customer pod inventory and asset management.
Reporting is the capability to manage information from disparate data sources and present them as a coherent reference for recognizing important trends and gathering business intelligence. Cisco Unified Intelligence Center (Unifi) can access data across multiple Cisco Systems product families.
Service management is the capability to monitor and troubleshoot the status and quality of experience (QoE) of user sessions. It includes the use of packet capture and monitoring tools such as Cisco Network Analysis Module (NAM), NetFlow, and Wireshark to monitor a session. It also enables the Cisco Remote Expert Solution administrator to remotely access the customer pod to troubleshoot and observe performance and collect bandwidth and latency measurements.
Provisioning management is the capability to provision customer pods and agent end users, using HTML interfaces. It includes customer pod firmware image and application management.
Customization includes modifying the look and feel of the solution to match the customer's brand and appeal to the customer's customers. For example the Collaboration Panel should be customized for each implementation to reflect their branding, areas of expertise and terminology.

High Availability of Management Applications

For high availability, deploy management applications in redundant configurations (primary and secondary servers), and back up configurations and databases periodically. Also deploy management application servers on virtual machines, to use resources efficiently and take advantage of high-availability features provided by the hypervisor infrastructure, such as virtual machine migration (VMware vMotion), VMware Distributed Resource Scheduling (DRS), and VMware Fault Tolerance (FT). Although many applications will need to reside on a dedicated server, consider consolidating applications and servers on the same virtual machine to conserve resources where possible. In general, the best place to locate management servers is in the data center with other critical resources.

Management Traffic

As a general guideline, a separate IP network for management traffic is recommended. For example, a dedicated IP subnet and VLAN for remote-access, SNMP, syslog, and FTP traffic could be managed out of band, where practical. This approach helps ensure that end-user and administrative traffic flows do not compete for, or interfere with, available bandwidth, and that remote access to a device is not compromised when the device needs to be reset or provisioned. This approach also mitigates threats to network security and availability that could be introduced when end-user traffic and administrative traffic share the same interface.

The isolation of management traffic may not be practical in some parts of the system. For example, a Cisco IEC-4600 has a single Ethernet port, so it must use this port for both end-user and administrative traffic. Also, it may not be practical to set up a separate out-of-band network dedicated to management traffic across a WAN because of cost and network address conservation concerns. In these cases, keep in mind that certain types of management traffic (SNMP polling) can consume substantial bandwidth and should be scheduled appropriately monitored, and possibly rate limited using standard QoS techniques.

Each management tool uses a specific set of protocols to communicate with devices. Refer to the vendor documentation for a complete list of protocols and ports used by each tool. Make sure that these ports are open on all intermediary routers, switches, and firewalls.

Customer Pod Management

The firmware, applications, and settings of the Cisco IEC-4600 need to be managed, as do the attached customer pod peripherals. Cisco REAC handles configuration, monitoring, and management of the customer pod as a whole. The Cisco IEM in the data center manages and monitors the Cisco IEC-4600 customer pod controllers, including handing firmware updates. During initial setup of a new customer pod or for extremely low-level troubleshooting, you may need to locally manage the Cisco IEC-4600 either by using the soft keyboard built into the Cisco IEC 600 firmware or by connecting an external USB keyboard.

Network-based services such as Dynamic Host Configuration Protocol (DHCP) can be used to provision network connectivity for the Cisco IEC-4600. Local software repositories or content distribution services such as Cisco ECDS can be used to distribute digital assets such as VoDs to increase quality and performance while reducing overall network bandwidth requirements.

For more information about setting up and configuring the Cisco IEC-4600, see the [Cisco Interactive Experience Customer 4600 Series Quick Start Guide](#).

Management Tools Summary

This section summarizes the Cisco Remote Expert Solution system components and the management tools that can be used to provision and monitor each element. It also provides a brief description of each associated capability and a link to additional documentation. The main data center components that need to be managed are the core component servers, hypervisor, virtual machines, storage, unified communications servers, and devices that provide network and communications functions such as Cisco Unified CVP, CUBE, and Cisco MediaSense. The management tasks include the provisioning of administrative users, expert agents, and customer pods, as well as the monitoring of sessions and use of resources (computing, memory, storage, and network). Cisco Remote Expert Solution Management Tools summarizes the components and management tools. Only the management tools that are directly related to the Cisco Remote Expert Solution are discussed in detail in this document.

Table 16 - Cisco Remote Expert Solution Management Tools

Product	Management Tool	Description	Product Documentation Link
VMware ESX and ESXi and virtual machines	VMware vCenter and vSphere customer	Use VMware ESX and ESXi hypervisor manager to create and manage virtual machines.	VMware vSphere documentation
Cisco UCS® C-Series Blade Servers	Cisco UCS Manager	Provision and monitor the Cisco UCS C-Series Blade Servers.	Cisco UCS Manager documentation
Cisco Unified Communications Manager (UCM) and Cisco TelePresence System	Cisco Unified Management Suite (UMS)	Cisco Unified Operations Manager (UOM), Unified Provisioning Manager (UPM), Unified Service Manager (USM), and Unified Service Statistics Manager (USSM)	Cisco UMS documentation
Cisco Unified Contact Center Enterprise (UCCE)	Cisco Unified Contact Center Management Portal (CCMP)	Management, provisioning and administration of UCCE	Administration Guide for Cisco Unified Contact Center Enterprises
Cisco Unified Customer Voice Portal (CVP)	Unified CVP Operations Console (Operate, Administer, Maintain, Provision)	Management, provisioning and administration of CVP	Configuration and Administration Guide for Cisco Unified Customer Voice Portal 10.0(1)

Table 16 (continued) – Cisco Remote Expert Solution Management Tools

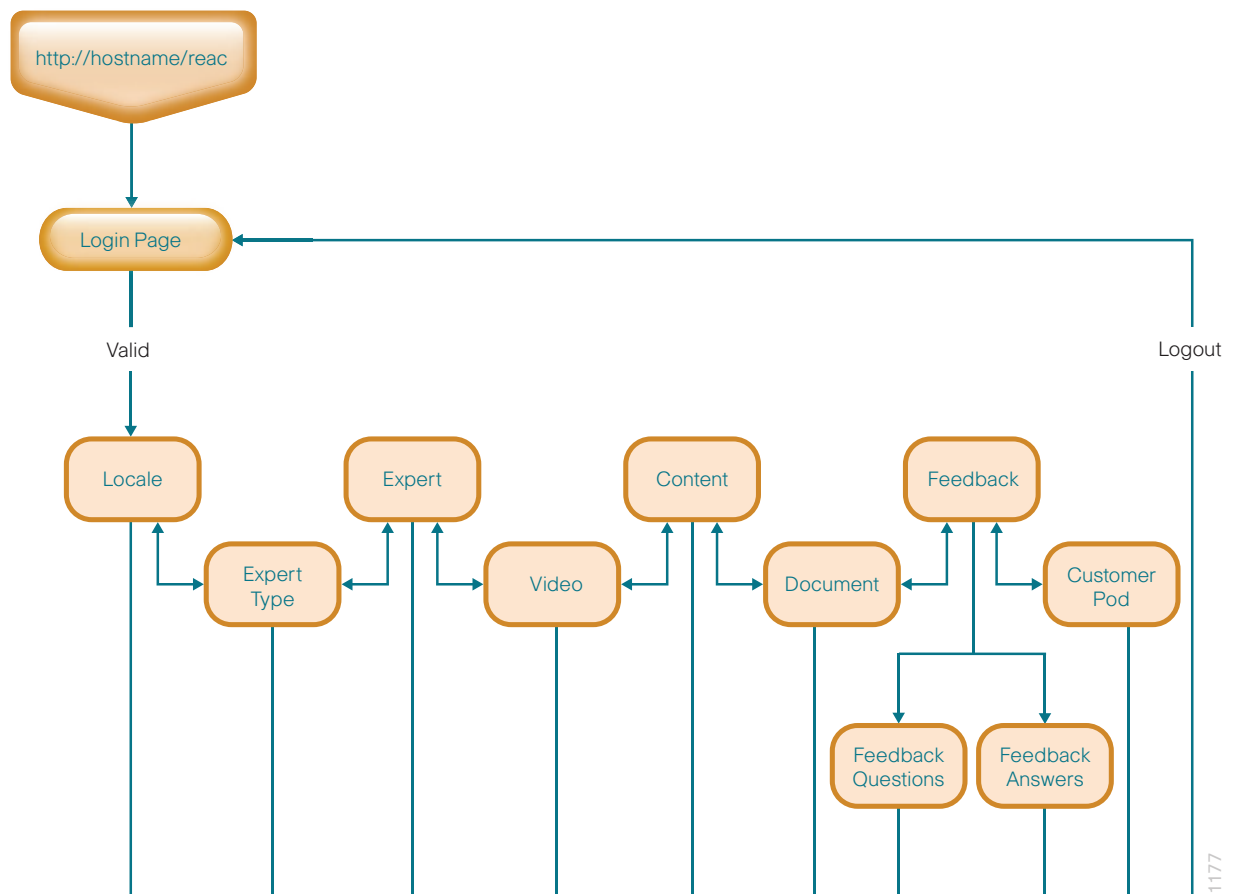
Product	Management Tool	Description	Product Documentation Link
Cisco Unified Voice XML (VXML) Gateway	Unified VMXL Gateway Operations Console (Operate, Administer, Maintain, Provision)	Management, provisioning and administration of VXML Gateway	Configuration Guide for Cisco Unified Customer Voice Portal, Release 10.0(1)
Cisco MediaSense and Cisco Unified Border Element (CUBE)	Real-Time Monitoring Tool (RTMT)	Cisco MediaSense provisioning and administration	Cisco MediaSense SRND
Cisco Network Analysis Module (NAM)	Cisco NAM administrative GUI	Provision and monitor Cisco NAM.	Cisco NAM documentation
Cisco Application Control Engine (ACE)	Cisco ACE Device Manager	Provision and monitor Cisco ACE.	Cisco ACE documentation
Cisco Enterprise Content Delivery System (ECDS)	Cisco Integrated Management Controller (CIMC)	Provision and monitor Media Delivery Engines	Cisco Media Delivery Engine Administration Guide
Cisco Interactive Experience Customer (IEC) 4600	Cisco Interactive Experience Manager (IEM)	Provision and monitor Cisco IEC-4600 customer pod controllers.	Cisco Interactive Experience Manager (IEM) User Guide
Cisco Remote Expert Manager (REM) expert agents	Cisco Remote Expert Administrative Console (REAC)	Configure the interface between Cisco UCCE and the Cisco Remote Expert Solution.	Remote Expert Solution 1.9 Implementation Guide
Cisco Remote Expert customer location customer pods	Cisco Remote Expert Administrative Console (REAC)	Provision, configure, and monitor customer location customer pods.	Remote Expert Solution 1.9 Implementation Guide
Microsoft Active Directory, Domain Name System (DNS), and DHCP	Standard enterprise management tools	Manage end-user profiles and authenticate user sessions. Provide DHCP services to endpoints.	Microsoft Active Directory and network services documentation
Jabber Guest Server	CLI and browser based GUI management	Manage Ad Hoc and non-Ad Hoc call links. Manage users. Provision, configure and monitor consumer to business video interworking.	Cisco Jabber Guest Administration Guide
Expressway-C and Expressway-E	Browser based GUI management	Provides highly secure firewall traversal. Session based access to comprehensive collaboration for remote workers	Cisco Expressway Administrator Guide

Cisco Remote Expert Administration Console

The Cisco REAC application provides a GUI for remotely administering the components of the Cisco Remote Expert Solution. Administrators can remotely provision new customer pods, define experts and expert types, manage digital assets used during the session, and configure survey questions displayed at the end of the session. All the communication through Cisco REAC is through clear text using HTTP. Cisco REAC is installed as part of the Cisco REM virtual machine.

Figure 13 illustrates the major components of the Cisco REAC interface.

Figure 13 - Cisco REAC Administrative User Interface



For more information about Cisco REAC, please see the Cisco Remote Expert Solution Implementation Guide.

Cisco Interactive Experience Manager

Cisco IEC is a management platform allowing configuration, control, and support of Cisco IEC-4600 Interactive Experience Customers. Although Cisco IEM offers many management functions, in the Cisco Remote Expert Solution many of these functions are superseded by services provided by Cisco REM. The role of Cisco IEM as part of the Cisco Remote Expert Solution is primarily to provide Cisco IEC-4600 initial provisioning capabilities, including device firmware and policy management, as well as limited logging capabilities.

One important aspect of new customer pod provisioning is that currently a centralized configuration approach is not available for the Cisco IEC-4600: that is, the device has no way of dynamically learning the network address of Cisco IEM through DHCP or the Cisco Medianet services interface. Therefore, the Cisco IEC-4600 will need to be manually provisioned with this information either prior to or at the point of installation.

For more information about Cisco IEM, please refer to the [Cisco Interactive Experience Manager \(IEM\) User Guide](#). For more information about Cisco IEC-4600, please refer to the [IEC-4600 Quick Start Guide](#).

References

[Cisco Remote Expert Solution Home Page](#)
[Cisco Remote Expert Solution Design Zone](#)
[Cisco Unified Communications Manager and Unified Contact Center Design](#)
[Cisco TelePresence](#)
[Cisco Finesse](#)
[Cisco Agent Desktop](#)
[Cisco Jabber Guest Server](#)
[Cisco Expressway](#)
[Cisco Interactive Experience Client 4600 Series User Guide](#)
[Cisco Remote Expert Manager Home Page](#)
[Cisco Remote Expert Manager 1.9 Installation Guide](#)
[Cisco Remote Expert Manager 1.9 Administration Guide](#)
[Cisco Remote Expert Manager 1.8 Agent Desktop User Guide](#)
[Cisco Remote Expert Manager 1.9 Upgrade Guide](#)
[Cisco Remote Expert Manager 1.9 Troubleshooting & Serviceability Guide](#)
[Cisco Remote Expert Manager 1.9 Release Notes](#)

Appendix A: Product and Version Lists

The following products and software versions have been validated for CVD.

Remote Expert 1.9 based on UC 10.X versions

Functional Area	Product	Software Version
UC Infrastructure	Communications Manager	10.0.1.10000-24
	Unified Contact Center Enterprise	10.0.1-1662
	Cisco Voice Portal (CVP)	10.0(1)-1662
	VXMLGW	15.3(2)T
Recording	MediaSense	10.0.1.10000-64
	CUBE on Cisco 3945	15.3(3)M1
	CUBE on Cisco ASR	3.10.3
Expert/Immersive Endpoints	SX-series, C-series, EX-series	TC 7.0.1
	MX-200	TC 7.1.0.48db3d2
	DX-650	sipdx650.10-1-1-78
Remote Expert Infrastructure	IEM	2.1.1-2.3.10-9009-142
	REM	1.9.2
	IEC	5.126.151
Agent Desktop	Finesse	10.0(1)
	Cisco Agent Desktop	9.0(2)
Load Balance for Remote Expert Infrastructure	Cisco ACE	3.0(0)A5(1.1)
Remote Expert Mobile Components	VCS/Expressway-E/C	X8.2
	JabberGuest Server	10.0.2.75

Remote Expert 1.9 Versions for Backwards Compatibility with UC 9.X versions (UCCX and CAD supported here)

Functional Area	Product	Software Version
UC Infrastructure for Unified Contact Center Express Testing	Unified Contact Center Express	9.0.2.11001-24
	CUCM	9.1.2.10000-28
Recording	MediaSense	9.1.1.10000-25
	CUBE	IOS 15.3(3)M1
Agent Desktop	Cisco Agent Desktop (CAD)	9.0.2
Recording	MediaSense	10.0.1.10000-64
	CUBE on Cisco 3945	15.3(3)M1
Expert/Immersive Endpoints	SX-series, C-series, EX-series	TC 7.0.1
Remote Expert Infrastructure	IEM	2.1.1-2.3.10-9009-142
	REM	1.9.2
	IEC	5.126.151

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