



Cisco Unified ICM Overview

In the initial phase of pre-installation planning, you need to become familiar with the Unified ICM system and understand how it fits into your overall enterprise contact center. You can then determine which products and components you want to deploy in an Unified ICM virtual contact center.

In this chapter, complete the following pre-installation tasks:

- Determine the role of the Unified ICM software in your enterprise. Understand how the Unified ICM software fits into the enterprise contact center and carrier networks.
- Choose Unified ICM products. Will your system be a complete pre-routing and post-routing system? Will you have other options such as Unified ICM Gateway SQL, Cisco CTI, or Unified IP IVR?
- [How Unified ICME Software Works, on page 1](#)
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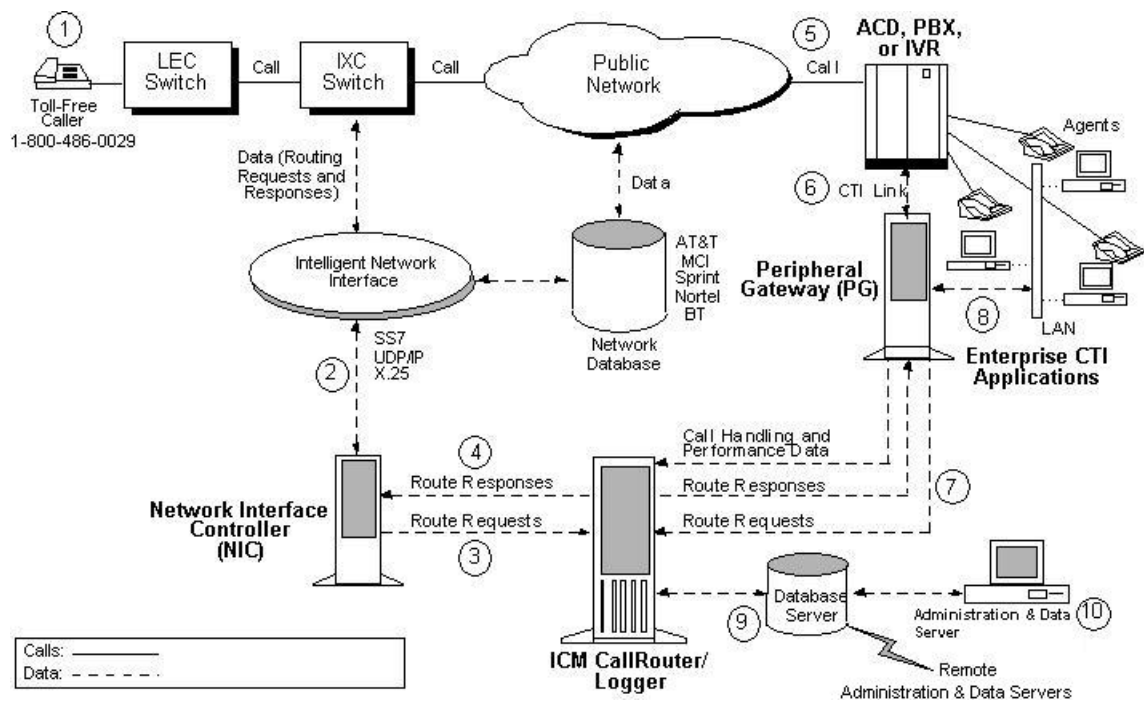
How Unified ICME Software Works

The Unified ICME Edition works with your contact center equipment and the IXC carrier network to create a virtual contact center. In the virtual contact center model, multiple distributed contact centers link to form one Unified CCE. The agents within the Unified CCE become members of a single team that is capable of servicing customer contacts throughout the enterprise.

Unified ICM Call Routing

The Unified ICM software makes the best use of your contact handling resources while ensuring that each customer is directed to the most appropriate resource available. To get an idea of how the Unified ICM software fits into the contact center and carrier environments, refer the following sections. These sections examine how the Unified ICM software routes telephone calls.

Figure 1: Intelligent Contact Routing (Telephone Calls)



Pre-routing

The Unified ICM software runs call routing decisions before a call terminates at a contact center. This concept is called pre-routing. As shown in the preceding figure, calls to be routed usually originate in the public telephone network as calls to a toll-free number (1).

The IXC Network

The Unified ICM software is configured in the intelligent network of the IntereXchange Carrier (IXC) to receive a route request for each designated incoming call (2). A subsystem of the Unified ICM software, called the Network Interface Controller (NIC), communicates with the carrier's network through an intelligent network interface.

Route Requests

The NIC translates the network's description of the call, including point of origin, number dialed, and any customer entered digits, into the language of the Unified ICM software. The NIC passes this call information to the CallRouter in the form of a route request (3).



Note Figures usually show the NIC as a separate computer. Actually, NICs are implemented as software on the Unified ICM software platform (usually on the CallRouter or CallRouter/Logger [Rogger] machines).

Route Responses

At this point, the Unified ICM software may query an ANI or customer profile database before returning a route response to the NIC (4). The NIC passes a destination for the call back to the IXC network. The IXC connects the call and maintains the voice path.

ACDs

Each contact center has one or more Automatic Call Distributor (ACD) systems that direct incoming calls to the telephone sets of individual agents (5). The Unified ICM software maintains real-time communications with the ACDs in each contact center by using a Peripheral Gateway (PG).

Peripheral Gateway

The PG communicates with the ACD over the switch vendor Computer Telephony Integration (CTI) link (6). To make optimal decisions, the Unified ICM software must know the latest status for every call, agent, and agent group in its network. One purpose of the PG is to extract this status information from the ACD and forward it to the CallRouter in-memory database. You can also use the PG as a CTI Server and as a communications interface between the Unified ICM and Voice Response Unit (VRU) systems located at contact center sites or in the network.

Post-routing

In private network configurations, ACDs can also originate call routing requests. This is called post-routing. Post-routing provides the same intelligence used in pre-Routing, but applies it to calls originating from a private network of ACD, PBX, and VRU systems. The PG assists in post-routing by forwarding routing requests to the Unified ICM software and returning the target destinations to the ACD (7).

CTI Server

External server or workstation applications can subscribe with a PG that acts as a CTI Server (8). The CTI Server provides call and agent event data that can be used in screen-pops and other CTI applications. At the desktop level, the Unified ICM CTI desktop provides an environment for integrating soft-phone, screen-pop, and data entry at the agent's workstation.

Monitoring and Reporting

All event data that the PG and router gathers is forwarded to the Unified ICM software and stored in an industry-standard relational database (9). This data is used in real-time monitoring and historical reporting. You can modify the standard Unified ICM monitoring screens and reports with Unified ICM-provided database access tools. Optionally, you can access the data directly with SQL or Open Database Connectivity (ODBC) tools.

Administration & Data Server

An Administration & Data Server (10) monitors and controls the overall operation of the Unified ICM software. The Unified ICM software can support multiple Administration & Data Servers located throughout the contact center network.

Unified ICM System Software Components

Pre-installation planning involves many different Unified ICM system software components. You may want to familiarize yourself with the role of the components in the Unified ICM system.



Note Not every component is used in every Unified ICM system.

CallRouter

The CallRouter is the part of the Unified ICM system that contains the call routing logic. The Unified ICM software receives call routing requests and determines the best destination for each call. It also collects information about the entire system. The Unified ICM software serves as a real-time server by forwarding performance and monitoring information to Administration & Data servers.

Logger

The Logger is the interface between the Unified ICM software and the database manager (Microsoft SQL Server). The Unified ICM software collects performance and monitoring information about the system and passes the information to the Logger for short-term storage in a central relational database. The Logger forwards historical information to the Historical Data Server (HDS). The HDS on the Logger maintains statistics and data for monitoring and reporting.

Network Interface Controller (NIC)

The NIC connects the Unified ICM software to the IXC signaling network. The NIC receives a route request from the signaling network for each incoming call and passes the request to the Unified ICM software. The Unified ICM software responds with routing information (a routing label), which the NIC passes back to the IXC signaling network.



Note Figures usually show the NIC as a separate computer. Actually, NICs are implemented as software on the Unified ICM software platform (usually on the CallRouter or CallRouter/Logger [Rogger] machines).

Peripheral Gateways

Each contact center device (ACD, PBX, or VRU) communicates with a Peripheral Gateway (PG). The PG reads status information from the device and passes it back to the Unified ICM software. The PG runs one or more Peripheral Interface Manager (PIM) processes, which are the software components that communicate with proprietary ACD systems. A single PIM is required for each peripheral to which the PG will interface. Therefore, a single PG (and its associated PIMs) can serve multiple peripherals of the same kind. For example, one PG with four Aspect ACD PIMs can serve four Aspect ACDs in the contact center.



Note A single PG can support both ACD PIMs and VRU PIMs; however, the ACD PIMs and the VRU PIMs must all be the same type of PIM (ACD PIMs must be the same type; VRU PIMs must be the same type).

A single server can support up to two PGs. For details, refer to the *Configuration Guide for Cisco Unified ICM/Contact Center Enterprise*.

Administration and Data Server Control Console

The Administration & Data Server is the human interface to the Unified ICM software. It serves as a control console from which you can monitor agent and contact center activity and change how the Unified ICM software routes calls. For example, you can use the Administration & Data Server to configure the Unified ICM contact center data, create call routing scripts, and monitor and report on the Unified ICM system or some part of the system. Administration & Data Servers can be located anywhere, as long as they have LAN or WAN connections to the Unified ICM software.

Administration & Data Servers have several roles: Administration, Real-time data server, Historical Data Server, and Detail Data Server. A Unified ICM deployment must have Administration & Data Servers to fill these roles. The servers can be deployed in the following combinations to achieve the needed scalability with the minimum number of servers:

- Administration Server and Real-time Data Server (AW)
- Configuration only Administration Server
- Administration Server, Real-time and Historical Data Server and Detail Data Server (AW-HDS-DDS)
- Administration Server and Real-time and Historical Data Server (AW-HDS)
- Historical Data Server and Detail Data Server (HDS-DDS)

An Administration Client (formerly known as a “client AW”) serves the administration role, but is deployed as a client to an Administration Server for scalability. The Administration Client can view and modify the configuration, and receive real-time reporting data from the Administration & Data Server, but does not store the data itself, and does not have a database. You must install each Administration & Data Server on a separate server for production systems to ensure no interruptions to the real-time call processing of the Call Router and Logger processes. For lab or prototype systems, you can install the Administration & Data Server on the same server as the Call Router and Logger.

Historical Data Server and Detail Data Server

Administration & Data Servers need to access historical data (half hour data, call detail, and so on) for historical reporting in the Script Editor or in third-party tools. You must install at least one real-time Administration & Data Server in a system with a Historical Data Server (HDS) to support reporting and long-term historical data storage. The HDS IP address requirements are identical to those of a standard Administration & Data Server.

The Historical Data Server (HDS) and Detail Data Server (DDS) are used for longer-term historical data storage. The HDS stores historical data summarized in 15 or 30 minute intervals and is used for reporting.

DDS stores detailed information about each call or call segment and is used for call tracing. Data may be extracted from either of these sources for warehousing and custom reporting.

Typically these Data Servers are deployed with a primary AW as a single server serving all three roles (AW-HDS-DDS).

ICM Reporting

The Unified ICM Reporting solution provides a Unified Intelligence Center interface to access data describing the historical and real-time states of the system.

Reporting concepts and data descriptions are described in *Cisco Unified Contact Center Enterprise Reporting User Guide*; this description is independent of the reporting user interface being used.

Cisco Unified Intelligence Center

Cisco Unified Intelligence Center (Unified Intelligence Center) is an advanced reporting product used for Unified CCE and other products. This platform is a web-based application offering many Web 2.0 features, high scalability, performance, and advanced features such as the ability to integrate data from other Cisco Unified Communications products or third-party data sources. Unified Intelligence Center incorporates a security model which defines different access and capabilities for specific users. Unified Intelligence Center Standard is included with Unified ICM. Unified Intelligence Center Premium is an optional product with additional features. You must install Unified Intelligence Center on a separate server; it cannot be co-resident with other Unified ICM components.

For a complete description of both Unified Intelligence Center products see *Cisco Unified Contact Center Enterprise Reporting User Guide*.

ICM Options and Related Products

You can set up the Unified ICM software with various options. You can add software to perform database lookups or perform secondary call routing after a call terminates at an ACD. In some cases, the Unified ICM software is part of other Cisco contact center products. Review the Unified ICM software options and related products to learn about the different ways to deploy the Unified ICM software in a Unified CCE.

Pre-routing

The Unified ICM software uses pre-routing to run routing decisions before a call terminates at a contact center. With pre-routing, the Network Interface Controller (NIC) receives the route request from the IXC and passes the call information to the Unified ICM software. The Unified ICM software processes the route request through a call routing script, which defines how the call should be routed. The Unified ICM software returns a route response to the NIC, which in turn forwards it to the IXC. The route response contains the call's final destination.

In pre-routing, the Peripheral Gateway's role is to keep the Unified ICM software informed of the real-time status of switches, calls, and agents in the Unified CCE. The Unified ICM software uses this real-time data to make an informed call routing decision.

Pre-Routing systems require the following components:

- Network Interface Controller (NIC)
- CallRouter
- Logger

- Administration & Data Server
- Peripheral Gateway (PG)

The pre-routing capabilities are enabled through the Network Interface Controller (NIC) and the CallRouter processes. NICs are implemented as software on the Unified ICM software platform (for example, on the CallRouter or Logger machines).

The Unified ICM routes calls within the public network based on several dynamic variables. You can use any combination of the following variables to route calls:

Agent availability	Day of week
Agent skills	Number dialed
Caller-entered digits	Origin of call
Cost of the call	Cost of the transaction
Customer database lookup	Scheduled agents
Customer-defined business rules	Time of day

Calls are routed in the most efficient manner possible given the current contact center load conditions.

Post-routing

In a traditional time-division multiplexing (TDM) environment, post-routing systems have software that allows the CallRouter to make secondary routing decisions after a call is received at a contact center. In post-routing, the ACD or VRU submits a route request to the Unified ICM software. The Unified ICM software runs scripts to process the routing request and return a destination address to the ACD. The Unified ICM software then directs the ACD to transfer the call to an agent, skill group, or service, either in the same contact center or at a different contact center. In making a post-routing decision, the Unified ICM software can use the same information and script it uses in pre-routing. In other words, the same call routing intelligence that is used in the pre-routing of calls is applied to calls that are interflowed between contact center sites, transferred between agents, or transferred into or out of VRU's.

Pre- and Post-routing Systems

A pre- and post-routing Unified ICM system is a complete intelligent call routing, monitoring, and reporting system. The Unified ICM software can run routing decisions before a call terminates at a contact center. It can also make secondary routing decisions after a call is received at a contact center. You can expand a Pre- and post-routing system with optional features such as Unified ICM Application Gateway, Unified ICM Gateway SQL, Unified ICM IVR interface, and CTI Server to create an intelligent call routing and management solution in which all the elements of the Unified CCE play a role in intelligent routing.

Computer Telephony Integration (CTI)

Cisco CTI software provides an interface between the Unified ICM software and agent desktop and server applications. The CTI software works with a PG's ACD and IVR interface software and all associated ACDs to track events and transactions and forward call- and transaction-related data to an agent's desktop computer.

The CTI software has full third-party call control features that allow agents and integrated desktop applications to perform tasks such as transferring calls, conferencing calls, and setting call data all within an enterprise framework. An agent at the desktop can transfer voice and data in the form of a screen-pop among agents and across different ACD platforms. This allows customer and transaction data to accompany a call from an IVR or web server to the agent and from site-to-site as required. The Unified ICM system can also use CTI data to determine call destinations based on factors such as customer value, business objectives, market penetration, and personalized service.

CTI Server

CTI Server, the basic server component of Cisco CTI, enables the Unified ICM software to deliver agent, call, and customer data in real-time to a server and/ or workstation application as events occur throughout the life of a call. The CTI Server is a software process that runs on a Peripheral Gateway (PG).

It is a gateway into the Unified ICM software data and services.

- Pre-route indications identify a caller and provide associated attributes to applications while the call is still in the public or private network and before the caller is connected to an agent, web server or VRU.
- Call events are provided throughout all stages of the call flow, from the moment a call arrives at an answering location (ACD, PBX, VRU, web server) until the caller hangs up.
- Agent work state changes are reported as they occur.

Cisco CTI Object Server (CTIOS)

CTI Object Server (CTIOS) is a high-performance, scalable, fault-tolerant server-based solution for deploying CTI applications. It serves as a single point of integration for third-party applications, including Customer Relationship Management (CRM) systems, data mining, and workflow solutions.

CTIOS is a client of CTI Server and has a single all-events connection to Cisco CTI Server. In turn, CTIOS accepts client connections using session, agent, and call interfaces. These interfaces are implemented in .NET, COM, Java, and C++, allowing for a wide range of application development uses. The interfaces are used for call control, to access data values, and to receive event notifications.

CTIOS configuration and behavior information is managed at the CTIOS server, simplifying customization, updates, and maintenance. You can access and manage the servers remotely. Thin-client and browser-based applications that do not require Cisco software on the desktop can be developed and deployed with CTIOS.

CTIOS incorporates the following major components:

- CTIOS Toolkit
- Client Interface Library
- CTIOS Combo Desktop for Agents and Supervisors



Note Refer to the Cisco CTIOS Software documentation for more information.

VRU Interface

The Voice Response (VRU) interface software runs on a PG platform. It allows the Cisco Unified ICM software to route calls to targets on VRU's and collect data from VRU's for use in call routing, real-time monitoring, and historical reporting.

The VRU interface can also provide queuing at a network-based or premises-based VRU. With this feature, calls can be directed to an VRU queue when no other appropriate answering resource is available. The VRU interface is not specific to a particular VRU system or manufacturer. It is based on an open VRU model. Many VRU systems support Cisco's Open VRU Interface Specification, including Unified CVP.

The Cisco Customer Voice Portal integrates with both traditional time-division multiplexing (TDM) and IP-based contact centers to provide a call-management and call-treatment solution with a self-service VRU option that can use information available to customers on the corporate Web server. With support for automated speech recognition (ASR) and text-to-speech (TTS) capabilities, callers can obtain personalized information and can conduct business without interacting with a live agent.

For a list of VRU's that support this interface, contact your Cisco representative.



Note You can integrate VRU systems into the Cisco Unified ICM software in several ways. [Interactive Voice Response \(VRU\) Systems](#) provides more information on VRU integration as well as examples of how you can integrate VRU's with the Cisco Unified ICM system.

ICM Application Gateway

The Cisco Unified ICM Application Gateway option allows the Cisco Unified ICM software to interact with a host system that is running another contact center application. Within the Cisco Unified ICM software, the Gateway feature is implemented as an Application Gateway node in a call routing script. You add an Application Gateway node to a script to instruct the system to run an external application. This allows the script to evaluate responses from the external application and base subsequent routing decisions on the results produced by the application.

The Gateway option allows the Cisco Unified ICM system to interface with any external application, not just database applications.

You can use the Gateway option within the Cisco Unified ICM system to:

- Allow other applications to select a call's destination.
- Control or trigger external applications through Cisco Unified ICM call routing scripts.
- Pass data to and collect data from other contact center applications.

For example, a simple Gateway application might return a variable to the CallRouter that identifies the caller as having a premium account. The routing script can use this information to control where and how the call is routed. Optionally, the Cisco Unified ICM can pass the retrieved information to the site that is receiving the call. Data such as account numbers, dates, billing phone numbers, and addresses can be passed along with the call to an answering resource.



Note [ICM Application Gateway and ICM Gateway SQL planning](#) provides more information on planning for the Gateway feature.

ICM Gateway SQL

Cisco Unified ICM Gateway SQL allows the Cisco Unified ICM software to query an external Microsoft SQL Server database and use the data in call routing. If you have databases that contain customer account or profile information, you can perform database lookups to assist in call routing. You can base the database lookups on Calling Line ID (CLID), Dialed Number (DN), or Caller Entered Digits (CED) such as account or social security numbers.

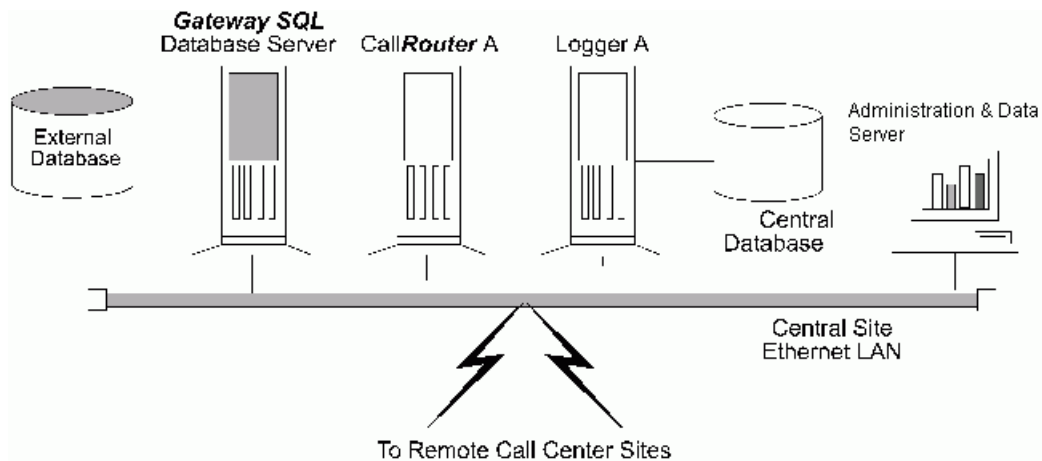
A typical Gateway SQL application can prioritize callers. For example, a call routing script can use the caller's CLID to access a database and retrieve data about the caller such as the caller's average monthly bill. Based on this information, the routing script routes the caller to the most appropriate answering resource.



Note Before implementing the Gateway SQL and DB Lookup functionality, consider a Unified CVP VXML Application for database lookup instead. The DB Lookup node will interrupt routing while doing its queries. The Unified CVP VXML Application will scale well.

The following figure shows a basic Gateway SQL configuration. Note that this configuration requires an additional database server on which you can load the external Microsoft SQL Server database and data.

Figure 2: Gateway SQL Configuration



Note You must perform some pre-installation planning if you are going to use the Cisco Unified ICM Gateway SQL option. [ICM Application Gateway and ICM Gateway SQL planning](#) provides more information on planning for the Cisco Unified ICM Gateway SQL feature.

Internet Script Editor

Internet Script Editor is an application that works with routing and administration scripts. It provides the same functionality as the Cisco Unified ICM Script Editor software, without the need for an Administration & Data Server.

Internet Script Editor works through the IIS Web server on Cisco Unified ICM software, using HTTP to communicate with the Cisco Unified ICM software.

The Internet Script Editor and the Cisco Unified ICM Script Editor GUIs are essentially the same. The menus, toolbars, palette, and work space are utilized in the same manner in both applications. The differences between the two occur primarily in the method by which each application communicates with the Cisco Unified ICM software.

Cisco Unified Contact Center

Cisco Unified Contact Center combines Cisco IP telephony products and Cisco Unified ICM software to create an IP-based contact management solution. Cisco Unified Contact Center provides a migration path to an IP-based contact center by supporting integration with legacy call center platforms and networks. With Cisco Unified Contact Center, agents can use Cisco IP phones to receive both time-TDM and VoIP phone calls. Capabilities of the Cisco Unified Contact Center include intelligent call routing, ACD functionality, network-to-desktop CTI, Unified IP IVR integration, call queuing, and consolidated reporting.

Cisco Unified Contact Center is based mainly on two Cisco products: Unified CM and ICM software. Unified CM provides traditional PBX telephony features in an IP telephony environment. Unified ICM software provides enterprise-wide management and distribution of voice and data from ACDs, Unified IP IVR systems, small office/home office (SOHO) agents, and desktop applications. Cisco Unified IP phones and Unified IP IVRs (as well as traditional TDM IVRs) are also part of the Cisco Unified Contact Center.



Note For information on Unified CCE, see the *Cisco Unified Contact Center Enterprise Installation and Upgrade Guide* at <http://www.cisco.com/c/en/us/support/customer-collaboration/unified-contact-center-enterprise/products-installation-guides-list.html> and the *Administration Guide for Cisco Unified Contact Center Enterprise*.
