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Preface

Purpose

This document provides design considerations and guidelines for deploying network solutions that include the Cisco Unified Intelligence Center (Unified IC). The information in this document applies to Cisco Unified Intelligence Center 8.0(3), which is a major revision of Cisco Unified Intelligence Suite 7.5(x).

Audience

This design guide is intended for system architects, designers, engineers, and Cisco channel partners who want to apply best design practices for Unified IC. This document assumes that you are familiar with the Cisco Systems product with which you intend to integrate Unified IC.

Organization

This guide is organized as follows:

<table>
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<th>Chapter</th>
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<td>Chapter 1 (page 5)</td>
<td>An overview of Unified IC, including a list of reporting features and a discussion of licensing, security, and throttling</td>
</tr>
<tr>
<td>Chapter 2 (page 11)</td>
<td>Unified IC architecture</td>
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Chapter

Chapter 5 (page 33) | Best Practices

This document also has an index and a glossary.

Related Documentation

**Sizing Calculator** ([http://tools.cisco.com/cucst/faces/login.jsp](http://tools.cisco.com/cucst/faces/login.jsp))


**Troubleshooting tips for the Cisco Unified Intelligence Center** ([http://docwiki.cisco.com/wiki/Troubleshooting_Unified_Intelligence_Suite](http://docwiki.cisco.com/wiki/Troubleshooting_Unified_Intelligence_Suite))

**The Developers' Forum for the Cisco Unified Intelligence Center** ([http://developer.cisco.com/web/ccr](http://developer.cisco.com/web/ccr))


**Conventions**

This manual uses the following conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
</table>
| **boldface** font | Boldface font is used to indicate commands, such as user entries, keys, buttons, and folder and submenu names. For example:  
- Choose **Edit > Find**.  
- Click **Finish**. |
| **italic** font | Italic font is used to indicate the following: |
### Convention

<table>
<thead>
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<tr>
<td>• To introduce a new term. Example: A <em>skill group</em> is a collection of agents who share similar skills.</td>
</tr>
<tr>
<td>• For emphasis. Example: <em>Do not</em> use the numerical naming convention.</td>
</tr>
<tr>
<td>• A syntax value that the user must replace. Example: IF <em>(condition, true-value, false-value)</em></td>
</tr>
<tr>
<td>• A book title. Example: See the <em>Cisco CRS Installation Guide</em>.</td>
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### window font

Window font, such as Courier, is used for the following:

- Text as it appears in code or that the window displays. Example: `<html><title>Cisco Systems, Inc. </title></html>`

### < >

Angle brackets are used to indicate the following:

- For arguments where the context does not allow italic, such as ASCII output.
- A character string that the user enters but that does not appear on the window such as a password.

---

**Obtaining Documentation and Submitting a Service Request**

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:


Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

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[mailto:ccbudo_feedback@cisco.com](mailto:ccbudo_feedback@cisco.com)

We appreciate your comments.
Unified IC Overview

Cisco Unified Intelligence Center (Unified IC) is a comprehensive, end-to-end reporting solution, built using Web 2.0 frameworks. It is designed to make the task of creating reports and managing disparate data sources easier for the customer. The Unified IC reporting platform is intended to be a common tool with a consistent user interface that can access data across multiple Cisco Systems product families.

Unified IC can be installed as a standalone server or as a cluster of a maximum of eight server nodes. There is one mandatory publisher node (called the Controller) and up to seven subscriber nodes (called Members). The Controller node includes a Member; thus a deployment can consist of a Controller only.

Cisco Unified Intelligence Center (Unified IC) offers both a web-based Reporting application and an Administration interface. The reporting application (page 13) runs on the member(s). The administration application (page 12) runs on the Controller. See also Cluster Support (page 13).

Unified IC 8.0(3) reporting features include multi-user support, customized reports, security, multiple display formats, web accessibility, support for permalinks, and Web 2.0-like mashup support to display data from multiple sources on a single dashboard. These features make Unified IC a valuable tool in the Information Technology arsenal of any organization and position it as a drop-in replacement or solution for most reporting requirements.

Release 8.0(3) contains built-in (stock) reports for Cisco Unified Contact Center Enterprise (Unified CCE) Release 8.0 and Release 8.5, and accepts the import of reports designed for use with the 8.0(1) release of Cisco Unified Customer Voice Portal (Unified CVP).

This chapter contains the following topics:

- Feature List, page 6
- Report/Database Compatibility, page 7
- Licensing, page 7
- Security, page 7
- Throttling, page 9
This section includes a basic feature list for Unified IC reporting. Refer to the *User Guide for the Cisco Unified Intelligence Center Reporting Application* and the *Report Template Reference Guide For Cisco Unified Intelligence Center* for a comprehensive list of report templates and features and their use.

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<tr>
<td>Report Infrastructure</td>
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</tbody>
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¹) http://docwiki.cisco.com/wiki/Cisco_Unified_Intelligence_Center
Report/Database Compatibility

Cisco Unified Intelligence Center 8.0(3) stock Unified CCE reports and importable Unified CVP reports were qualified to extract report data from product database versions as follows:

- Unified CCE reports are present in the user interface after the Unified IC installation of a member node. These realtime and historical reports are populated by the Unified CCE database. Unified IC is compatible with **Unified CCE Release 8.0 and 8.5**.

- Unified CVP reports ship with the Unified CVP installation. Customers can import them into Unified IC, configure a data source for the **Unified CVP 8.0(1)** reporting database, and run reports populated by that database.

**Note:** Cisco is focussed on making Unified IC the reporting tool of choice for all our customers and hence we are constantly working on having other products interoperate with Unified IC. As part of this, as and when a new product becomes compatible with Unified IC, the information will be delivered to the Cisco customers through [http://developer.cisco.com](http://developer.cisco.com).

Licensing

Unified IC uses Flexlm licensing based on the MAC address of the controller node. The license is downloaded through the Administration console interface and is transmitted to all member nodes by replication. Any changes or updates to the license must be done on the controller node.

For Virtual Machine based deployments of Cisco Unified Intelligence Center, licenses are based on the Licensing MAC. To know more about obtaining and installing licenses, refer to the Unified IC installation guide.

For cluster deployment, the license file specifies the maximum number of Unified IC servers that the cluster can support. Refer to the user documentation for the types of licenses available.

Security

The Unified IC application is accessed over HTTP by default, and users are required to log in to the web application to access it.

User authentication can be performed using either of the following:

- LDAP based authentication
- Application-specific authentication based on the local CUIC database
Once logged in, Security Administrator users can define access permissions for other users based on READ, EXECUTE, or WRITE rights for the objects they own. Role-based access policies are also enforced based on commonly-preformed user roles.

A single identity is used to access the Unified IC internal databases and the other data sources from which report data is extracted. Although each user has an individual login, the application does use multiple logins to access the internal / external) databases. A single, pre-configured login is used to access the databases irrespective of the login used.

Unified IC supports Unified CCE user integration, whereby Unified CCE supervisors can be imported into the Unified IC application, with specific, automatically-assigned roles.

**Internal Firewall**

The Unified IC nodes are shipped with inbuilt firewalls (IpTables based).

The following ports / protocols are opened by default:

- TCP ssh port 22
- TCP HTTP CUIC port 8081
- TCP HTTPS CUIC port 8444
- TCP HTTP OAMP port 8080
- TCP HTTPS OAMP port 8443
- TCP OS cache port 45566
- TCP ports 1500 and 1501 for IDS access and replication (but not open to external access)
- ICMP ping requests
- All UDP (primarily used by SNMP)

**Firewall Integration in a Wide Area Network**

Data source servers that are deployed over WAN links are likely to encounter firewalls.

Firewall requirements for supported databases are as follows:

- **Microsoft SQL Server**

  Default instances of SQL Server listen on TCP port 1433. Named instances, however, dynamically assign an unused TCP port number the first time the instance is started. The named instance can also dynamically change its TCP port address on a later startup if the original TCP port number is being used by another application.
Named instances should therefore be assigned a static port using the SQL Server Configuration Manager.

Microsoft SQL Server uses UDP port 1434 to establish communication links from applications for its SQL server browser service. The firewall should also be configured to forward all requests for UDP port 1434 on the database server address. For more information, see this article on the MSDN Configuring the Windows Firewall to Allow SQL Server Access (http://msdn.microsoft.com/en-us/library/cc646023.aspx) SQL server firewall configuration guide.

- **IBM Informix IDS**

  The Informix IDS server listens on a single incoming TCP port for incoming database connections, which is port 1504 by default.

  This can be modified depending on the application and can be found in the services file (/etc/services on UNIX and %WINDIR%\system32\drivers\etc\services on Windows).

  For example, in Release 8.0(1), the Unified CVP Reporting Server uses port 1526. This is the only port that must be opened on the forwarding firewall that guards access to an Informix IDS server.


**See Also**

Local and Wide Area Network (page 19)

---

**Throttling**

The Unified IC throttling mechanism prevents servers from freezing or encountering an Out-of-Memory situation when they are pushed beyond their limits.

**Note:** This is not the same as ensuring good quality of service. If a Unified IC deployment is being overused, the level of service may degrade substantially before the throttling mechanism is activated.

Memory is the resource that is actively throttled by the Unified IC application. Processing report data accounts for the majority of memory consumption in Unified IC. For that reason, memory throttling is focused on controlling memory consumption due to reporting activity.

The report row is the basic unit used to measure the amount of reporting activity. Using report rows as the basic unit to measure reporting activity gives flexibility to users. A user can decide to run a few big reports or many small ones, and the throttling mechanism will be equally effective without requiring any tuning.

Report rows are counted only as they are loaded into memory, so no guesses are made as to report size. Test results using the row sizes of the installed stock reports quantified that 2 KB
is a conservative estimate for the size of a report row. If each report row is 2KB in size, then 250,000 is the maximum number of report rows that a Unified IC server can allow into memory before the server encounters an Out-of-Memory situation.

To enforce this limit, each Unified IC keeps a count of the number of report rows currently loaded into memory. That count is checked by all reporting operations to determine if additional report rows can be loaded into memory. If an operation cannot proceed because the number of concurrent rows in memory has reached the maximum value, the operation fails and an error is displayed to the user.

**What happens if the limits are exceeded?** Report rows are loaded into memory when the data is being fetched from the data source and when it is being prepared to be sent to the browsers. Either of these operations can fail if the maximum number of concurrent report rows in memory is exceeded:

- If a violation happens while Unified IC is reading data from a data source, the report execution aborts and the report marked as failed. This means that Unified IC does not take partial results – the system either reads all the data that a user requested or marks the report as failed and stores none of the data.

- If a violation occurs while Unified IC is in the process of preparing the HTTP response for a browser (HTML of a Grid, JSON string of a Gauge, XML of a Chart), the request to display the data is rejected and the user sees an error message that says the report cannot be rendered because the server is low on resources.

**Note:** The throttling mechanism should not be used for any sizing purposes. The throttling mechanism is designed to prevent an Out-of-Memory situation and hence this mechanism does not ensure a good quality of service to the users. Always use the sizing calculator to determine your reporting sizing needs.
Architecture

Unified IC is a clustered, web-based reporting application that can extract and display data from external data sources using Structured Query language (SQL) statements. It supports external security (page 7) integration and SNMP-based management tools, which make it very easy to administer and deploy.

This chapter contains the following topics:

- Platform, page 11
- Browser Clients, page 11
- Cisco Unified Intelligence Center Administration, page 12
- Cisco Unified Intelligence Center Reporting, page 13
- Cluster Support, page 13
- Data Source Server, page 17
- Failover using Application Control Engine Load Balancing Module, page 19
- Local and Wide Area Network, page 19

Platform

Unified IC is supported as an appliance and is packaged with its complete environment, including its base platform—the Cisco Unified Operating System (CUOS). CUOS actively discourages user modifications or access to the underlying components except through supported administrative interfaces.

Browser Clients

The Unified IC application is designed to be accessed over Hypertext Transfer Protocol (HTTP), from web browser clients having JavaScript support. Once logged in, HTTP is used for all other pages.
The Internet Explorer and Mozilla Firefox clients are supported in this release. For version information, refer to the Cisco Unified Intelligence Center Bill of Materials (http://www.cisco.com/en/US/products/ps9755/products_user_guide_list.html)

Cisco Unified Intelligence Center Administration

The Cisco Unified Intelligence Center Administration Console server is the administrative and management component for Unified IC and provides Operations Administration Maintenance Provisioning (OAMP) functions. The Administration Console is the primary interface for configuring Unified IC specific application settings for a cluster, as well as provisioning devices in a cluster. The Administration Console works in conjunction with the other CUOS web applications to manage a Unified IC CUOS device.

Administration is a mandatory component and is deployed and accessible only on the primary (controller) node in the cluster. If you install a single (standalone) node only, that node is the controller has both the Administration and the Reporting applications.

The Administration Console is a web based application and requires System Application User or Super User login through HTTP.

Use the Administration console to:

• Configure reporting nodes in the cluster
• Manage licensing
• Download the Real Time Monitoring Tool (RTMT)
• Configure super users and policies
• Configure security related settings such as LDAP configuration
• Manage serviceability settings such as trace levels and log file size, which can be used for troubleshooting and debugging
• Configure SMTP
• Manage start / stop the Unified IC web reporting application on other nodes in the cluster
• Synchronize (integrate) Unified CCE users

The Administration application uses the Web Services Manager (WSM) server process to interface with the Unified IC reporting application.

Note:

• Platform management applications for managing system-level functions such as network options, certificates, upgrades, and SNMP and Alert settings are not handled by the Unified IC Administration application.
• Three Cisco Unified Communications Manager (Unified CM) tools (Cisco Unified OS Administration, Cisco Unified Serviceability, and Disaster Recovery System) are accessible from any node. Refer to the Administration Console User Guide for Cisco Unified Intelligence Center (http://www.cisco.com/en/US/products/ps9755/products_user_guide_list.html) for details on these platform management applications.

Cisco Unified Intelligence Center Reporting

The reporting node contains the core of the Cisco Unified Intelligence Center and contains all the features required for reporting. A single reporting node can be deployed standalone in a Controller node or in a cluster of a Controller node and up to seven reporting "Member" nodes.

The following software components are deployed in the reporting node:

• Firewall

• Web Server (Tomcat 6.0) that runs the Unified IC application

• JAVA services and JSP pages that translate the web requests into HTML

• CUIC Database (Informix) with replication support within the cluster

• The Administration (OAMP) application (when the reporting node is also the only node of the cluster).

Cluster Support

When the number of concurrent logins and reporting needs exceed the capacity of a single (controller) server, Unified IC can be deployed in a clustered mode. In this mode, multiple member (reporting) nodes present a unified application to the user and allow a consistent, shared configuration across the controller and all member nodes.

Multiple nodes bring better scalability to the reporting infrastructure than would be possible using a single, vertically-scaled reporting server. Cluster support also presents an opportunity to scale the solution gradually, depending on the needs of the deployment.

Clustering in Unified IC is made possible by the IBM Informix CUIC database, which serves as the backend data store for the Unified IC reporting application.

Enterprise Replication database connects and synchronizes the multiple nodes participating in a cluster. Administrative changes, configuration updates, and so forth are communicated throughout the cluster, and all users are presented with a common interface of object, irrespective of the node used to serve their requests and actions.

In addition, nodes communicate with each other directly via IP multicast, which happens independently of database replication.
WAN Overview

The CUIC cluster is a group of independent nodes, each of which has a replicated database which is kept in sync with the other nodes in the cluster. With Unified IC Release 8.0.2 (and later) it is possible to distribute the CUIC cluster over the WAN. When participating in a cluster, either over a LAN or WAN, configuration objects created on one node will automatically be replicated to other nodes. This chapter describes the sizing considerations that should be made when considering clustering over the WAN.

In general, the WAN should be sized such that it supports the expected performance characteristics that the customer is expecting. There are several network characteristics to consider as follows:

- **Bandwidth**: is a measure of the amount of data that can be sent per second.

- **Duplex**: is a measure of how data can be transmitted. Full duplex indicates traffic can be transmitted at full bandwidth speed in both directions. CUIC requires a full duplex WAN connection.

- **Latency**: is a measure of the time it takes for a data packet to propagate from one side of WAN to the other side of the WAN. For CUIC, this must be 100ms or less which leads to a Round Trip Time (RTT) of 200ms or less.

- **Jitter**: is a measure of how much variance there is with respect to latency. It is expected that network jitter is minimized and that the latency will account for all the jitter.

- **Loss**: (sometimes referred to packet loss) is a measure of how much data can be lost/dropped. This should be minimized and it is expected that loss is at or near 0%. Anything else will
lead to retransmissions and effective loss of bandwidth (as the same data is being retransmitted).

- **Duplication**: is a measure of how much data can be duplicated. This should be minimized and it is expected that duplication is at or near 0%. Anything else will lead to retransmissions and effective loss of bandwidth (as the same data is being retransmitted).

- **Corruption**: is a measure of how much data can be corrupted. This should be minimized and it is expected that corruption is at or near 0%. Anything else will lead to retransmissions and effective loss of bandwidth (as the same data is being retransmitted).

As stated earlier, each CUIC node is independent of every other node and all database updates (that is, configuration data) are replicated as to all other nodes. When the CUIC cluster is running over the WAN, it should be noted that this replication utilizes the WAN connection and therefore is a function of the network characteristics. As an object is created on one node, it will be instantly available users on that node, but may take a few seconds before the object can replicate to other nodes (see below for time estimate based on object size). The only objects that are replicated are configuration objects.

These configuration objects include:

- **Data Sources**: encapsulates config data for each data source object

- **Dashboard**: encapsulates config data for dashboard object

- **Report Definition Filter**: encapsulates config data for each report definition filter (Note: Running a report with an initial or new filter will cause replication of filter object, but refreshing a report will have no impact on replication.)

- **Report Definitions**: encapsulates report definition config information

- **Reports**: encapsulates a report object which points to a report definition and corresponding views

- **ReportTypes**: encapsulates config information for the type of report (grid, chart, gauge)

- **Views**: encapsulates column names, groupings, hidden fields

- **Users**: encapsulates a user

- **Categories**: encapsulates config information for categorization of reports, report definitions, and dashboards

- **ValueLists**: encapsulates config information for the value list

- **Collections**: encapsulates config information for a collection which includes its values

- **DataSets (from Scheduled Reports)**: encapsulates data set for a scheduled report. All dataset information (report data not config data) is replicated to all subscriber nodes.
In general, it is expected that most users will configure the CUIC system with a set of commonly accessed reports and run these reports periodically. In addition, it is expected that users will also create new objects (e.g. reports), but this should occur less frequently. Any configuration object that is modified or created will need to be replicated and will be replicated as quickly as possible, but since we are expecting users to be modifying or creating objects less frequently than executing or accessing an object, this should minimize the need for large amounts of WAN bandwidth.

Since every node will require a connection to every other node, replication will be estimated by assuming that each node will receive a portion or channel of the WAN bandwidth which is a function of the number of nodes in SiteA and the number of nodes in SiteB or more specifically:

The WAN bandwidth requirements differ depending on how the cluster is setup. See Chapter 4: Bandwidth and Performance Recommendations (page 31) for more information.

Organizing Sites

Since the maximum size of a cluster supported by CUIC is 8 nodes, it is impossible to have a fully redundant clustering solution unless each site is at most 4 nodes. As qualified, each CUIC will support up to 200 users given the Reporting Standard Profile defined in Chapter 4.

In addition, there are some services which only the CUIC Primary node can provide as follows:

- OAMP
- Scheduler

It is highly recommended that the Primary node be located at the customer’s primary site (as these services will be unavailable during failover situation). Furthermore, it is crucial that the Primary node be backed up periodically (LAN or WAN environment).

Failures

Each CUIC node buffers replication data to send to other nodes in the cluster. When communication is lost with other nodes in the cluster (or a node fails) then the data will be queued until contact with the other node(s) is restored. Each node will continue to work independently even during connectivity failure - it just will not have access to objects created/modified on other nodes. Even though the queue is quite large (1600MB) - it is not unlimited, therefore, it is possible to fill up the queue especially during prolonged failure. As the buffer fills and starts to reach capacity, an alarm will be sent (CiscoAlarm30) notifying administrators of the potential buffer exhaustion condition. If connectivity is restored before the buffer is filled then it will synchronize at a rate proportional to the amount of data in the buffer and the connection bandwidth.

If connectivity is not restored before the buffer is filled then replication will be reset. Resetting replication will allow the node to continue running reports and working independently. If the node is a secondary node then it will require full synchronization with the primary node (primary db backup and restore on secondary node) when connectivity with the primary node is restored. If replication is reset then anything created/modified on the secondary node will be rolled-back to the state of the primary database. If the primary node fails then you will have to re-install and revert to a saved backup. Make sure that you backup the primary node periodically - so that
no data is lost. As a result, it is very important in WAN environments to periodically backup the Primary node. Prolonged WAN outage, failure of primary node, and failure to perform recommended backups could result in a cluster which must be reinstalled else there might be data loss.

If connectivity is restored before the buffer is filled then all data will automatically be replicated. Depending upon the connection between the nodes and the amount of data that has accumulated - it may take some time for the nodes to be fully synchronized again. At any time, administrative users can view the status replication (including the number of bytes in the replication queue) using the CLI command:

```
util dbreplication runtimestate
```

Refer to the CLI documentation for more information.

**Configuring WAN**

After installing/configuring all systems – be sure to restart each system. . This will allow clustering to synchronize - and be able to merge on network partitions. This is only required the first time after configuring a new node.

**Database Replication in the Cluster**

The Cisco Unified Operating System (CUOS) installs Informix as part of the base platform installation. Installation-specific scripts create the Unified IC application database (CUIC) on each reporting node and set up the enterprise replication among participating nodes.

The CUIC database is the main data store for the Unified IC reporting web application. It holds configuration information relating to users, reports, user access rights for each node in the cluster.

Unified IC uses the update-anywhere enterprise replication model based on a topology of Fully Connected Database servers. Each database server has connection to all other database servers. Data can be transferred from any machine to all others. Data is replicated immediately, as soon as changes are made. Changes that are apparent in the User Interface (such as the addition or deletion of a dashboard or a change to a report definition) are evident across all devices when the page is refreshed, provided that all devices in the cluster have all the required network connections and CPU power to do the processing.

An automated daily purge that runs every day at midnight takes care of database maintenance activities. The purge schedule can be controlled or changed through the command line interface. Purge is the only local database maintenance apart from the backup that is required for the local CUIC database(s).

**Data Source Server**

Data source servers are used by the Unified IC reporting component to extract data requests from the queries that are defined in the report definitions. Each data source server contains the database and the schema that store the reporting data that populate the reports. For this release,
A Unified IC data source server must be a valid JDBC compliant database. Unified IC is currently validated with SQL server 2005 and Informix 11.5 database versions.

**Note:** SQL Server Authentication must be set to *SQL Server and Windows Authentication mode*. This release does not support Windows Authentication to a SQL Server database.

These data source servers are supported for the stock Unified CCE reports and the importable Unified CVP reports

- Unified CCE AW-HDS, which is part of the Cisco Unified Contact Center Enterprise deployment (page 24)
- Unified CVP reporting server, used in Unified CVP deployments (page 28)

*Figure 2: Unified IC Architecture*

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**Mapping Nodes to Multiple Databases**

The number of data sources that need to be deployed for Unified IC depends on the number of concurrent reports to be supported and the number of concurrent logins. You can distribute the reporting load to several UCCE AW_HDS databases using the Command Line Interface and conventional name resolution. If there is a need to direct a specific member node to a database host other than the one in configured on the Data Sources interface, you can use the `set cuic-properties host-to-ip` command to resolve the data source name differently on each node.

Any given reporting member node can be directed to a specific UCCE database.
Failover using Application Control Engine Load Balancing Module

The Cisco Application Control Engine (ACE) is a multifunction module for Cisco Catalyst 6500 Series Switches and Cisco 7600 Series Routers that can be used for maximizing availability, acceleration, and Server Load balancing. It has a native understanding of multiple protocols such as HTTP, which can be used for content-based traffic redirection, depending on various traffic predictors, source address / round robin / server load, and so forth.

ACE can be used by Unified IC to present a single URL to access the application and to perform server load balancing in the cluster, by redirecting the HTTP requests across the multiple nodes as required. When deployed along with ACE, the failure of a single node does not affect the application, and new requests are automatically routed to the remaining servers.

Coupled with database replication, which replicates the application state across the nodes, ACE presents an elegant failover solution for the overall application.

Local and Wide Area Network

Data Sources have been qualified over local area networks (LAN) and wide area networks (WAN).

Note: Distributing data source servers over a WAN can increase the report execution times, depending on the latencies and traffic conditions over the WAN.

See Also

Firewall Integration in a Wide Area Network (page 8)
Deployment Models

This chapter describes the deployment models for Cisco Unified Intelligence Center. Each model addresses scalability of the solution. The exact model that needs to be employed at different sites will depend upon on the number of clients to be supported and, to a lesser extent, on the amount of data being reported.

See Chapter 4 (page 31) for sizing calculations.

This chapter contains the following topics:

- Unified IC Deployment, page 21
- Cisco Unified Contact Center Enterprise Deployment, page 24
- Cisco Unified Customer Voice Portal Deployment, page 28

Unified IC Deployment

The deployment models supported by Unified IC Release 8.0(3) are

- Standard Deployment (page 21) - one or two servers; no Load Balancer
- Scaled Deployment (page 22) - up to eight servers, use of Load Balancer

Note: The differentiators between the two deployments are the number of servers and the use of the ACE Load Balancer.

Unified IC Standard Deployment Model

The standard model includes the following components:

- One or two Unified IC reporting (member) nodes in a cluster
- Realtime and historical Unified CCE data source(s)
- Optionally, other data sources

This deployment model consists of a Unified IC cluster that communicates directly with the database running on the data source server. Data for all reports — both realtime and historical — are fetched when required, based on report requests issued by web clients. If data must be obtained from multiple servers, reports can be redirected to the corresponding data sources.

Data flow:
- The web client makes an HTTP request for a Unified IC page / report
- The web request is handled by the web server on the Unified IC reporting node
- When a report is requested, the data is pulled from the data source server, which supplies the actual data for both historical and realtime reports

*Figure 4: Unified IC Standard Deployment*

**Unified IC Scaled Deployment Model**

The scaled model includes the following components:
- Multiple (maximum of 8) Unified IC reporting nodes deployed in a cluster
• Multiple data source servers
• A Cisco switch / router capable of deploying ACE module
• Single ACE Load balancer Module

In this model, the multiple Unified IC reporting nodes are deployed across an ACE load balancer module. This allows clients to use the same URL to access the application. The ACE module performs Load Balancing by distributing user sessions among multiple member nodes in the Unified IC cluster that are available at the beginning of the session. The nodes are synchronized through database replication.

If a single data source server is insufficient to server all the reporting data requests from multiple clients, multiple data source servers can be used to spread the report load. The server load factor numbers (present in the bandwidth and sizing section) determine the number of data source servers, depending on the number of simultaneous real clients running the Unified IC reports.

Firefox is the client of choice for administrators in scaled deployments, due to the large amount of data that will be displayed, which render faster on the Firefox browser.

Data flow:
• The web client makes an HTTP request for a Unified IC page / report using the virtual server configured on the ACE module.
• The ACE load balancer determines which available working member (reporting) node is to handle the request and redirects it to that node. ACE continues to redirect subsequent http requests from the browser session to the same node (sticky mode).
• The web request is handled by the Unified IC reporting node.
• When a report is requested, the reporting data is pulled from the database on the associated data source, whose connection parameters are resolved by the reporting node.
Cisco Unified Contact Center Enterprise Deployment

Cisco Unified Contact Center Enterprise (Unified CCE) is an integral component of the Cisco Unified Communications system and delivers a comprehensive solution that provides intelligent routing and logging functionality and call treatment. Unified CCE uses a synchronized, lock and step message-based routing functionality to keep configuration and reporting data up to date. This data is maintained in databases in the Administration & Data Server, formerly called the Distributor Admin Workstation (AW).

**Unified CCE Parent-Child Deployment:** Unified IC does not directly support consolidated reporting of data across parent/child sites. Run reports on overall statistics from the parent site. Run agent-specific reports at the child. Create data sources at the parent and separate data sources that connect to the child.

**Unified CCE Hosted Deployment:** In this release, Unified IC was not qualified by Cisco Quality Assurance in a Hosted environment.

**Administration & Data Server as Unified IC Data Source**

The Administration & Data Server holds the database used as the Unified IC data source for Unified IC stock reports. Unified CCE can support multiple Administration & Data Servers.
Unified CCE has introduced a new set of options based on deployment size.

- For small or medium deployments, select **Administration Server, Historical Data Server, and Detail Data Server (AW-HDS-DDS)**. This is the selection for Unified IC data feed.

- For large deployments, select **Administration Server and Historical Data Server (AW-HDS)**.

These selections are documented in the [Cisco Unified Contact Center Enterprise Solution Reference Network Design (SRND)](http://www.cisco.com/en/US/products/sw/custcosw/ps1844/products_implementation_design_guides_list.html).

**Note:** Cisco Unified Intelligence Center uses AW/HDS as a data source for standard historical reports and AW/HDS or AW as a data source for standard real-time reports. To know more about the use of DDS for custom reporting, see the recommendations for call detail reporting in the [Reporting Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted, Release 8.0(1)](http://www.cisco.com/en/US/products/ps9755/products_user_guide_list.html).

In all cases, the database on the Administration & Data Server and the views inside it are used as the tables for the data source queries run from Unified IC. This makes it unnecessary to maintain additional database network connections to multiple databases from the Unified IC, and all the data pertaining to the Unified CCE can be referenced by single data source.

The Unified IC installation adds two data sources to the reporting (member) nodes:

- The UCCE Historical data source, which support the Unified ICM/CC stocks historical reports and UCCE User Integration.

- The UCCE Realtime data source – This data source is added by default to support the Unified ICM/CC stock realtime reports.

Depending on your environment, the UCCE Historical and UCCE Realtime data sources can point to the same Administration & Data Server.
Network Design - Unified IC Standard Deployment with Unified CCE

The Unified IC deployment with Unified CCE utilizes the AW-HDS as its data source server. It is possible to connect to multiple AW-HDS databases to handle the load from multiple Unified IC reporting nodes. Other data sources such as the CVP Reporting Server can be used along with the Unified CCE AW-HDS as data source servers. The ACE load balancer, an optional component, provides load balancing for report queries across the multiple reporting nodes and servers as a single point of access to the cluster.
Unified CCE deployments with a distributed AW-HDS can be used as a data source for Unified IC reports. However, local area network AW-HDS access ensures better throughput in data extracted and ensures faster response times for reports, especially realtime reports with repeated refresh intervals.

The exact response times and latencies are available in the performance section (page 31) of this document.

Network Design - Unified IC Scaled Deployment with Unified CCE

Unified IC can be deployed as the reporting solution with Unified CCE deployments that scale over WAN networks. In these deployments, Unified IC is deployed locally with one section / data center of the scaled Unified CCE deployment and can access the local AW-HDS over the Local Area Network (LAN) as well as the remote AW-HDS which is deployed along with the remote section of the Unified CCE over the Wide Area Network (WAN).

Other data sources such as Unified CVP can be deployed along with Unified CCE. Firewall considerations when deploying over WAN are applicable to the data source servers and appropriate ports as described in the Firewall Integration (page 8) notes should be opened, depending on the remote database configuration.
Cisco Unified Customer Voice Portal Deployment

Cisco Unified Customer Voice Portal is a VoiceXML-based solution that provides Interactive Voice Response (IVR) and IP switching functionality on Voice over IP (VoIP) networks. It can be deployed in a standalone mode or integrated as part of Unified Contact Center Enterprise (Unified CCE) solution.

Unified CVP Reporting Server as Unified IC Data Source

The Unified CVP Reporting Server component of Unified CVP is used as the data source in a Unified IC deployment that imports reports for the Unified CVP platform.

The Unified CVP Reporting component provides the basic reporting capabilities in a Unified CVP environment. This reporting server is a Windows 2003 server that hosts an IBM Informix Dynamic Server (IDS) database management system. It contains a published schema, which customers can use to create custom reports.

Network Design - Unified IC deployment with Unified CVP

The Unified CVP Reporting Server receives reporting data from the IVR Service, the SIP Service (if used), and the Unified CVP VXML Servers. The Reporting Server depends on the Call Server to receive call records.

For standalone Unified CVP VXML Server deployments, one Call Server is needed per Reporting Server. The Reporting Server must also be local to the Call Server(s) and Unified CVP VXML Server(s) that it is servicing. Deploying the Reporting Server at a remote location across the WAN is not supported by Unified CVP.
The Unified CVP deployment model shown in the diagram below is not a strict requirement for Unified IC. Unified IC is independent of the components connected to the data source server it uses to fetch its data. Therefore, the exact Unified CVP deployment can vary depending on the customer installation and on the required number of Reporting Servers available for the Unified IC reporting nodes to connect to.

Figure 9: Unified IC Deployed with Unified CVP
Bandwidth and Performance Recommendations

This chapter qualified the performance levels that can be expected from a single Unified IC node with respect to bandwidth requirements and user level responsiveness from the reporting application. The assumption is that Unified IC users are working from a standard desktop system with sufficient memory and disk space as recommended by Microsoft to support Internet Explorer 7 or above.

This chapter contains the following topics:

- Definition of Sizing Parameters, page 31
- Measured Bandwidth, page 32
- Bandwidth Requirement, page 32

Definition of Sizing Parameters

The following parameters combined have an effect on the responsiveness and performance of the Cisco Unified Intelligence Center at desktop. Descriptions of these items are:

- Realtime reports: Simultaneous realtime reports run by a single user.

- Refresh rate/realtime: Note that the refresh can be changed if you have a Premium license by editing the Report Definition. The default refresh rate in Unified IC Release 8.0(3) is 15 seconds (this is a change from CUIS Release 7.5 where the default was 30 seconds).

- #Cells per report: The number of columns that are retrieved and displayed in a report.

- #Historical report: Number of Historical reports run by a single user / hour.

- Refresh rate/historical: The frequency that report data are refreshed on a historical report. Note that this can be changed if you have a Premium license by editing the report definition and this value can be set per report. The default is 15 minutes.

- #Rows / report: Total number of rows on a single report.
• Charts / dashboard: Number of charts (pie, bar, line) in use concurrently on a single dashboard.

• Gauges / dashboard: Number of gauges (speedometer) in use concurrently on a single dashboard.

**Note:** You can use the SizingCalculator (http://tools.cisco.com/cucst/faces/login.jsp) to find out the approximate number of reporting servers and source databases needed for your Unified IC implementation. However, there are factors beyond the scope of the sizing calculator that may have an impact on the performance; for example, the complexity of the report, responsiveness of the source database, and so on. Use the sizing calculator as a starting point, but note that you may have to make certain adjustments if the performance is not as per the expectations.

### Measured Bandwidth

Unified IC bandwidth calculations were performed on a local area network with a local AWDB database and client machine running the reports. The bandwidth figures are derived from observations on the network statistics of the Unified IC node and the AWDB HDS box serving the report data. Load Figures from the test setup are as follows:

Two hundred Unified IC Users, each running:

• Four realtime reports with 100 rows per report, with 10 fields each, refreshed every 15 seconds

• Two historical Reports with 2000 rows, with 10 fields each, refreshed every 30 minutes

### Bandwidth Requirement

The observed bandwidth for this test setup was 12657 kbps overall, and the individual network segment bandwidths are:

• Unified IC --> AWDB bandwidth = 2,661 kbps

• Unified IC --> Browser based Reporting Client bandwidth = 9,996 kbps

The exact bandwidth requirement will differ based on the sizing parameters used, such as the number of rows, the refresh frequency, and the number of columns present in each report.

You can use the Bandwidth Calculator (http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/intelligence_suite/intelligence_suite_80/design/guide/CUIC8_0_2_NetBW_Calculator.xlsx) to calculate the bandwidth requirements for your Unified IC implementation.
Best Practices

The following are a brief collection of recommendations or best practices, which if followed while deploying Unified IC will provide the best optimal operation of the application.

This chapter contains the following topics:

- Centralized Ownership and Administration, page 33
- Dashboard Design, page 33
- Refresh Rate, page 33
- Accessing Data Source across WAN, page 34
- Accessing Unified IC servers across the WAN, page 34
- Report Design, page 34
- Reporting Client, page 34
- Scheduled Reports, page 34

Centralized Ownership and Administration

The administration and design of Unified IC is best left to a centralized team who are responsible for ensuring proper report and dashboard design, as well as managing ongoing system utilization.

Dashboard Design

Create targeted dashboards for users and eliminate elements that are not required for those users. Focus dashboard design on just what people need.

Refresh Rate

When possible, increase the time between the refresh (increase the refresh rate) to reduce access to the database. By default, realtime reports are set to refresh every 15 seconds, and historical
reports are set to refresh every 15 minutes, but each custom report definition can be set to a unique refresh rate.

Accessing Data Source across WAN

Unified IC Nodes should not be using Data Sources across the WAN. For example, Unified IC node on Side A should not access data from Data Source on Side B, unless explicitly provisioned, as this will require extra WAN bandwidth.

Accessing Unified IC servers across the WAN

Bandwidth calculator does not take into account the amount of bandwidth required to support clients over the WAN. Cisco strongly recommend that Unified IC users be local to their Unified IC server, otherwise, the Client > CUIC bandwidth must be taken into account. The bandwidth required to support clients over the WAN need to be sized according to the reporting profile being utilized.

Report Design

Use a lab or non-production system for report development and testing prior to deployment. The finished reports can be imported into the production server following testing in the lab environment.

Build reports with historical summary skill group or call type data rather than with individual agent or call records to optimize database queries. There will be fewer records to report on in the summarized forms, which results in improved performance.

For example, whenever possible, use Agent Team reports in Unified CCE deployments instead of Agent reports, if the former will suffice.

Reporting Client

Mozilla Firefox is the preferred client of choice for administrators in scaled deployments, due to the large amount of data that is displayed. Unified IC pages render faster on the Firefox platform.

Scheduled Reports

Identify the reports that are run daily and shared among various users and use the scheduling function in Intelligence Center to send email or update dashboards with this data.

For example: if all managers in a call center require the same Daily Skill Group and Call Type Reports, schedule those reports for email delivery or to update a common dashboard.
Evaluate any reports that require more than 30 seconds to render to determine if the report can be optimized or scheduled for a time of lower system utilization, especially if they access a large amount of data.
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