



Unified CCE Reference Designs

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Introduction to the Reference Designs



Note The first four chapters of this book are for anyone who wants to get familiar with the three contact center enterprise solutions:

- Packaged Contact Center Enterprise
- Cisco Hosted Collaboration Solution for Contact Center
- Unified Contact Center Enterprise

For information about design considerations and guidelines specific to HCS for CC, see the remaining chapters.

The Contact Center Enterprise Reference Designs are a set of Cisco validated designs of our contact center enterprise solutions. The Reference Designs define the technologies and topologies that fit the needs for most deployments. The Reference Designs focus on simplifying the contact center enterprise solution design. They provide complete contact center functionality based on components that are strategic to Cisco.

We have defined the Reference Designs in the following table to cover most contact center needs:

Table 1: Reference Design Use by Contact Center Enterprise Solution

Reference Design	Packaged CCE	Cisco HCS for Contact Center	Unified CCE
2000 Agents	Yes	Yes	Yes
4000 Agents	No	Yes	Yes

Reference Design	Packaged CCE	Cisco HCS for Contact Center	Unified CCE
12000 Agents	No	Yes	Yes
Contact Director	No	No	Yes
Non-Reference Designs	No	Avaya PG only	Yes

If your solution exceeds the configuration limits for a particular Reference Design, use a Reference Design with higher limits. For example, if your 2000-agent deployment requires 350 active reporting users, use the 4000 Agent Reference Design for your solution.

Contact center solutions that include something not covered by the Contact Center Enterprise Reference Designs are called *Non-Reference Designs*. Packaged CCE does not support Non-Reference Design solutions. Cisco HCS for Contact Center supports the Avaya PG as a Non-Reference Design.

You require Unified CCE for any other Non-Reference Design deployments.

Reference Designs and Deployment Types

The Contact Center Enterprise Reference Designs are mapped to specific contact center solutions through deployment types. Deployment types are system codes that impose system limits and apply congestion control.

This table maps the Reference Designs and Non-Reference Designs with the deployment type that you use for each.

Table 2: Deployment Type Usage by Reference Design

Reference Design	Packaged CCE	Cisco HCS for Contact Center	Unified CCE
	Label	Label	Label
2000 Agent	Packaged CCE: 2000 Agents	HCS-CC: 2000 Agents	UCCE: 4000 Agents ¹ UCCE: 2000 Agents ²
4000 Agent	NA	HCS-CC: 4000 Agents	UCCE: 4000 Agents
12000 Agent	NA	HCS-CC: 12000 Agents	UCCE: 12000 Agents
Contact Director	NA	NA	Contact Director
Non-Reference Designs	NA	NA	ICM Rogger
			ICM Router/Logger
			UCCE: 8000 Agents Router/Logger
Lab Only Designs	Packaged CCE: Lab Mode	NA	UCCE: Progger (Lab Only)

- ¹ For now, Unified CCE 2000 Agent designs use the UCCE: 4000 Agents deployment type. But, you use the 2000 Agent Reference Design OVA and server layout.
- ² In 11.5, Unified CCE 2000 Agent designs used the UCCE: 4000 Agents deployment type. But, they used the 2000 Agent Reference Design OVA and server layout.

We have deprecated the following deployment types.

Table 3: Deprecated Deployment Types

Packaged CCE	Cisco HCS for Contact Center	Unified CCE
NA	NA	NAM (Deprecated)
		NAM Rogger (Deprecated)

Benefits of a Reference Design Solution

Contact centers offer more possibilities with each new generation of software and hardware. New technology can make previously preferred methods obsolete for current contact centers. We created the Contact Center Enterprise Reference Designs to simplify your design choices and speed the development of your contact center. We expect that most new contact centers can use the Reference Designs to meet their needs.

By following the Reference Designs, you can:

- Guide your customers' expectations by presenting clear options.
- Streamline your design process with standard models.
- Avoid using components and features that are near the end of their lifecycle.
- Find powerful and efficient replacements for obsolete features.
- Align your designs with Cisco's vision of our future contact center developments.
- Enjoy quicker and easier approval processes.

Specifications for a Reference Design Solution

The Reference Designs define our vision of the functionality that most contact centers use. The Reference Designs consist of:

- **Core components**—Components that make up every contact center:
 - Ingress, Egress, and VXML Gateways
 - Unified Customer Voice Portal (Unified CVP)
 - Unified Contact Center Enterprise (Unified CCE)
 - Cisco Virtualized Voice Browser (VVB)
 - Unified Communications Manager (Unified CM)
 - Cisco Finesse

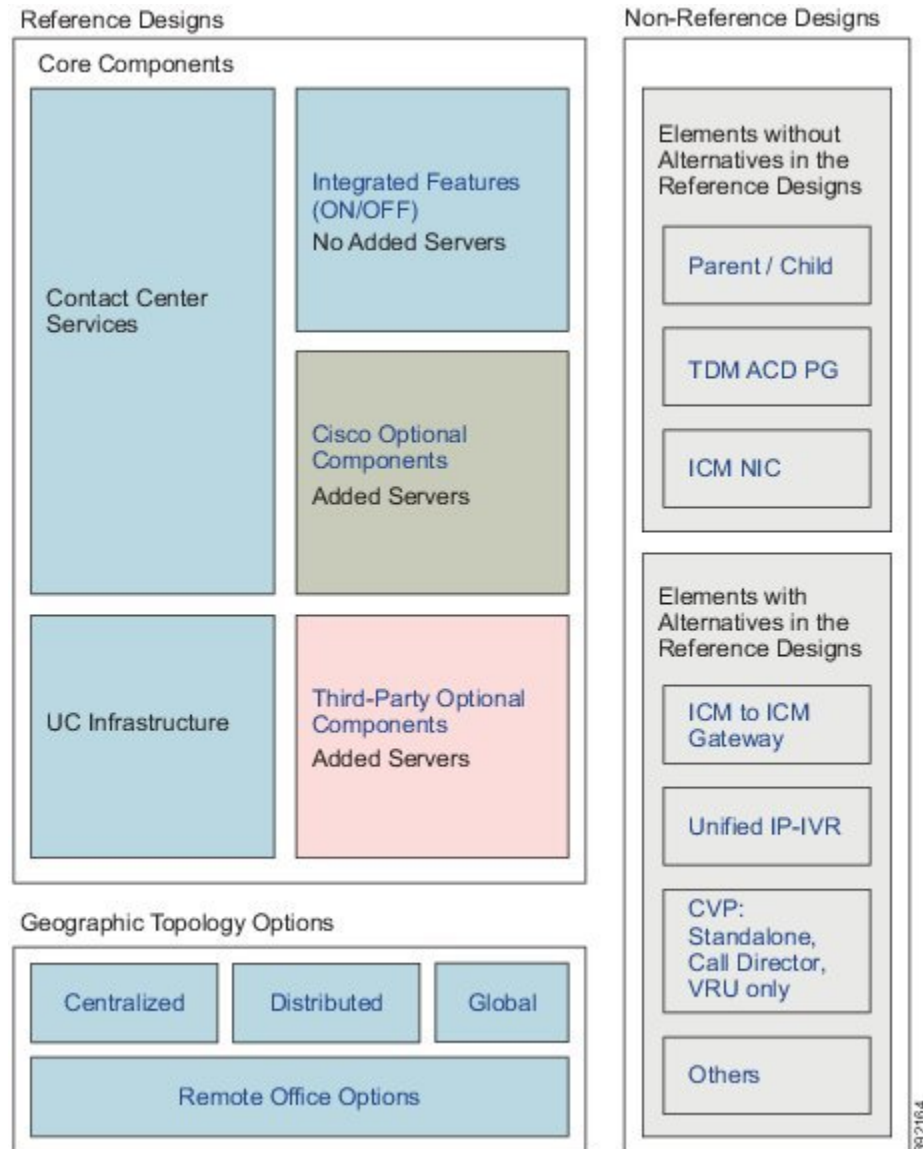
- Cisco Unified Intelligence Center
- **Optional Cisco components**—Components that add functionality that not every contact center needs.
 - Cisco MediaSense
 - Cisco Remote Expert
 - SocialMiner
 - Cisco Unified SIP Proxy
 - Enterprise Chat and Email
 - Cisco IdS
- **Optional third-party components**—Third-party components that you can add to provide other features.
 - Load balancers
 - Recording
 - Speech servers - ASR/TTS
 - Wallboards
 - Workforce management
- **Integrated features**—These features do not require you to add an optional solution component to enable them. But, these features can require configuration in multiple solution components to activate them. They can affect your solution sizing and might have specific design considerations.
- **Call flows**—Standard contact handling and routing methods.
 - Inbound Calls:
 - New calls from a carrier
 - New internal calls
 - Supplementary services
 - Hold and resume
 - Transfers and conferences
 - Refer transfers
 - Network transfers
 - Requery and survivability
- **Topologies**—Standard layouts for your contact center components:
 - Centralized
 - Distributed
 - Global

This figure shows the high-level services that are part of the solutions and the components that provide those services. It also highlights some features and components that are outside of the Reference Designs:



Note This figure highlights only a few Non-Reference Design components and topologies. The Non-Reference Design sections expand on this list.

Figure 1: Contact Center Enterprise Reference and Non-Reference Designs

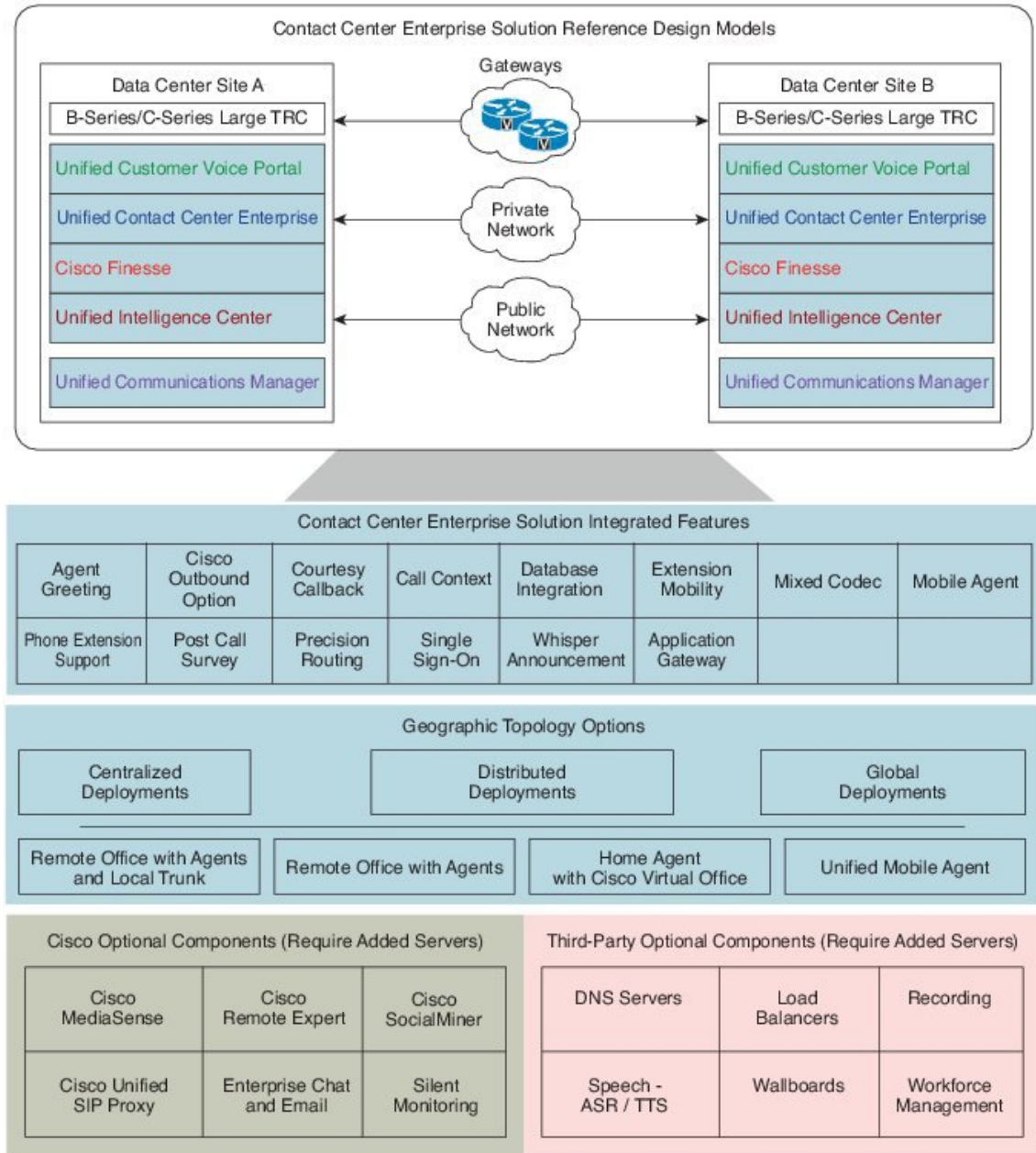




Note In general, you cannot use the ICM-to-ICM Gateway in Reference Designs. Only the Contact Director Reference Design allows you to use that gateway. The Cisco HCS for Contact Center Small Contact Center model does not support the Application Gateway.

This figure encapsulates the basic requirements of a Reference Design-compliant deployment:

Figure 2: Contact Center Enterprise Components and Features



Contact Center Enterprise Reference Designs

The following sections describe the Contact Center Enterprise Reference Designs.

The Reference Designs show the layout of the core components on Cisco UCS B200 and C240 M4 and C240 M5SX Tested Reference Configuration servers which are referred to as the Reference Design servers here interchangeably.



Note For more details on supported servers for the Reference Designs, see the *Cisco Collaboration Virtualization* page for your solution at http://www.cisco.com/c/dam/en/us/td/docs/voice_ip_comm/uc_system/virtualization/cisco-collaboration-virtualization.html.

The following notes apply to all the Reference Designs:

- Contact Center Enterprise solutions use vCPU oversubscription. This policy applies for both Reference Design and Non-Reference Design solutions.
- The standard PG VM includes an Agent (Unified CM) PG, a VRU PG, and an MR PG. Unified CCE and Cisco HCS for Contact Center allow you to add more PGs and their peripherals onto this base layout. Packaged CCE restricts you to just those three PGs, unless you use the Global topology.
- The CVP Reporting Server is an optional component. You can deploy more external CVP Reporting servers based on your deployment type.
- The Reference Design layouts in this section do not show off-box components like Cisco MediaSense and SocialMiner.

Virtual Machines Resource Provisioning Policy



Note The previously used Oversubscription policy is a part of the Virtual Machine (VM) Resource Provisioning Policy.

The Unified CCE Reference Designs support the virtual machine vCPU oversubscription of the physical CPU cores on a server. For the purposes of oversubscription, the hyper-thread cores do not count as physical cores. Whether or not you use oversubscription, use the VM Resource Provisioning policy. This policy limits the total available CPU MHz and the memory of a server that the host-resident VMs can consume.

Apply the VM Resource Provisioning policy when:

- You change the documented Reference Design VM layout by adding or replacing VMs. This means that you use a custom or non-Reference VM layout in a Reference Design solution.
- You provision a non-Reference Design server.
- You provision a Reference Design server for optional and third-party components that are not given a reference VM layout.
- You use UCS or third-party specifications-based servers.

- You upgrade an existing solution and do not migrate to a Reference Design VM layout.



Note Apply the VM Resource Provisioning policy on a per-server basis. This policy does not apply to the Reference Design VM layouts. Your solution can contain servers that use the Reference Design VM layouts and other VM layouts that use the VM Resource Provisioning policy rules.

The application of the VM Resource Provisioning policy requires meeting the following conditions:

- You can use up to two vCPUs for every physical core on each server.
- You can use up to 65% of the total available CPU MHz on each server.
- You can use up to 80% of the total available memory on each server.

For more information on virtualization and specification-based server policies, see the *Cisco Collaboration Virtualization* at http://www.cisco.com/c/dam/en/us/td/docs/voice_ip_comm/uc_system/virtualization/cisco-collaboration-virtualization.html.



Note The Virtual Machine Placement Tool does not currently allow you to oversubscribe. This limitation is only an issue with the tool. You can oversubscribe within the limits that are provided here.

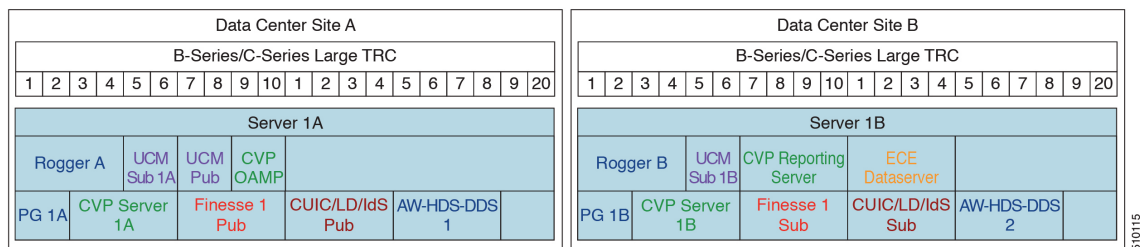
2000 Agents

This reference design for a contact center enterprise solution supports 2000 agents. All solutions support this design.

The 2000 Agent Reference Design is supported on the Cisco UCS B200 and C240 M4 and Cisco UCS C240 M5SX Tested Reference Configuration servers.

This figure shows the base layout of the components in a 2000 Agent Reference Design on Cisco UCS B200 and C240 M4 Tested Reference Configuration servers.

Figure 3: 2000 Agent Reference Design



Notes on the 2000 Agent Reference Design

These notes apply to the 2000 Agent Reference Design:

- In this Reference Design, Cisco Unified Intelligence Center, Live Data, and the Identity Service for Single Sign-On are coresident on a single VM. In the larger Reference Designs, they reside in separate VMs.
- You can optionally deploy the Unified Communications Manager Publisher and Subscribers on separate servers, instead of deploying them as shown in the 2000 Agent Reference Design layout. You should dedicate two of the subscribers to Unified CCE. All devices on these subscribers must be SIP.

In 2000 Agent Reference Designs, a coresident Unified CM can support a maximum of 2000 phones. This includes your phones for all types of agents, whether contact center agents or back-office workers. If your solution requires more than 2000 phones, use a Unified CM on a separate server instead.

- In the global deployment topology, each remote site can have its own Unified CM cluster. A remote site cannot include a Cisco Unified Intelligence Center server.
- You can deploy optional AW-HDS-DDS per site on external servers for longer data retention.
- In 2000 Agent Reference Designs, you can deploy ECE Data Server on-box for up to 400 agents. Deploy ECE off-box for up to 1500 agents.

You can also deploy the ECE Data Server on a separate server.

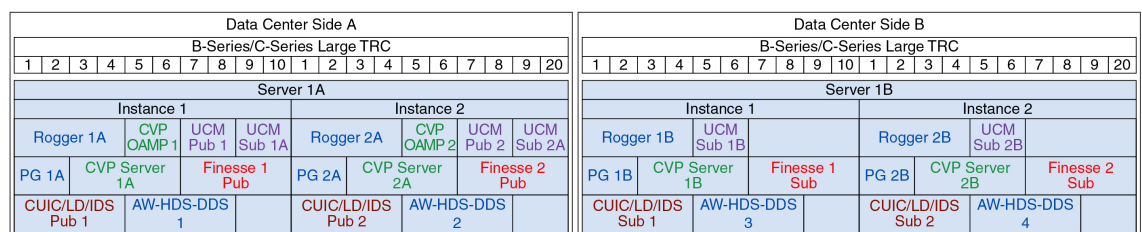
- Deploy the ECE Web Server on an external server. You can place that server either in the same data center as the ECE Data Server or in a DMZ if customer chat interactions require that.

500 Agents

The Cisco HCS for Contact Center 500 Agent Reference Design is a variation of 2000 Agent Reference Design. This reference design supports two instances of 500 agents.

This figure shows the base layout of the components in 500 Agent Reference Design on Cisco UCS M4 Tested Reference Configuration servers.

Figure 4: 500 Agent Reference Design



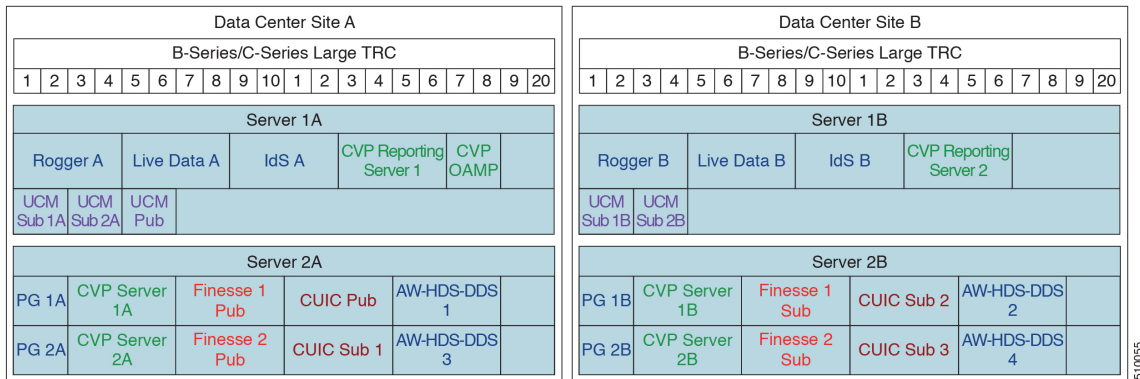
4000 Agents

Cisco HCS for Contact Center and Unified CCE solutions support the 4000 Agent Reference Design. This model adds a pair of servers to scale up from the 2000 Agent Reference Design.

The 4000 Agent Reference Design is supported on the Cisco UCS B200 and C240 M4 and Cisco UCS C240 M5SX Tested Reference Configuration servers.

This figure shows the base layout of the components in a 4000 Agent Reference Design on Cisco UCS B200 and C240 M4 and Cisco UCS C240 M5SX Tested Reference Configuration servers.

Figure 5: 4000 Agent Reference Design Model

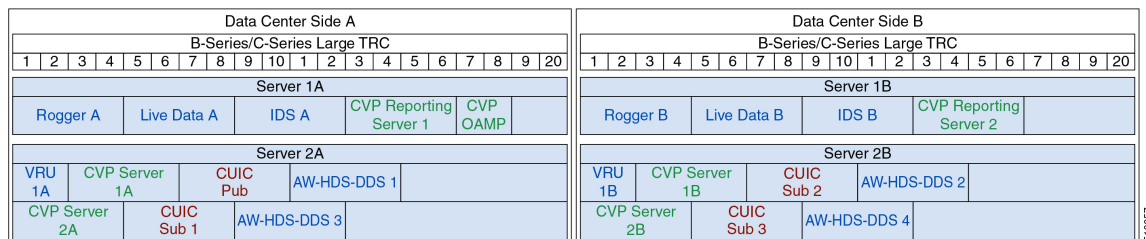


Note You can only deploy two AW-HDS-DDS per data center site in the 4000 Agent Reference Design. In larger solutions, you use a combination of HDS-DDS and AW-HDS.

Small Contact Center

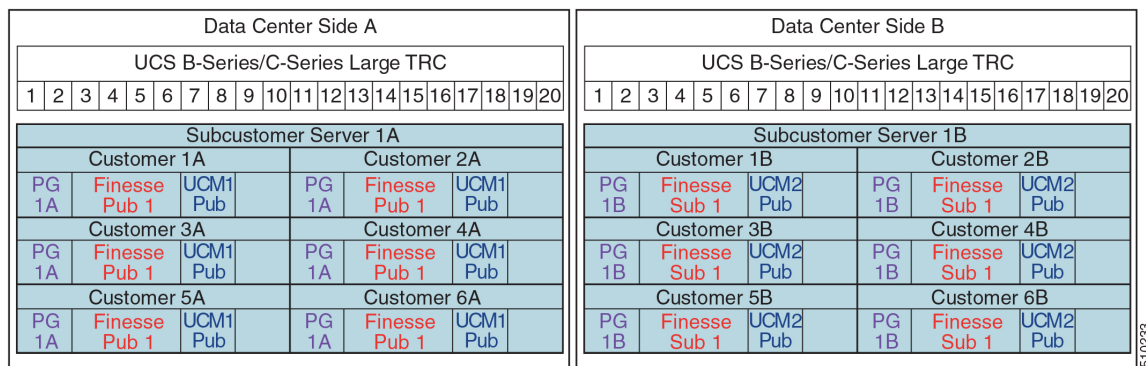
Small Contact Center solution of Cisco HCS for Contact Center is a variation of the 4000 Agent Reference Design. Small Contact Center supports dedicated sub-customer peripherals for up to 100 or 500 agents. It also offers a shared peripheral model for customers with 40 or less agents.

Figure 6: Small Contact Center Reference Design Model



This VM layout shows the shared peripheral option.

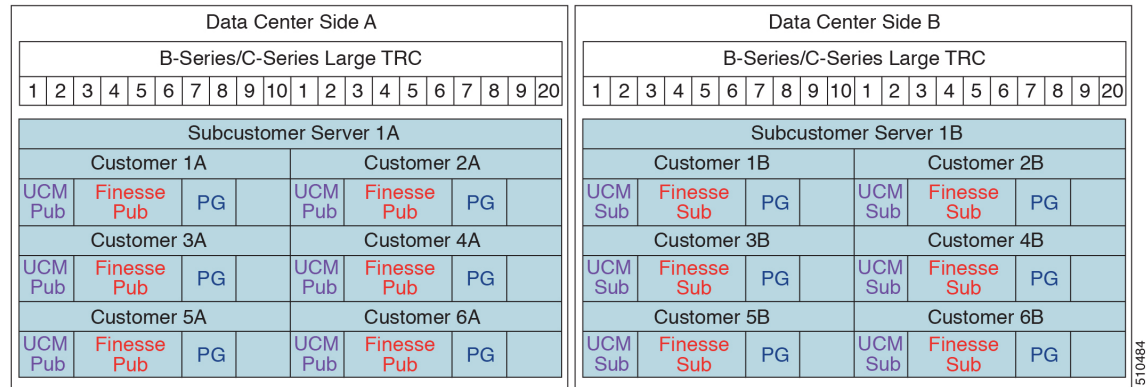
Figure 7: Small Contact Center Shared Peripheral Option



100 Agents

Small Contact Center 100 Agent Reference Design supports 6 sub-customer instances for each server pair. This figure shows the base layout of the components in Small Contact Center 100 Agent Reference Design.

Figure 8: Small Contact Center 100 Agent Reference Design



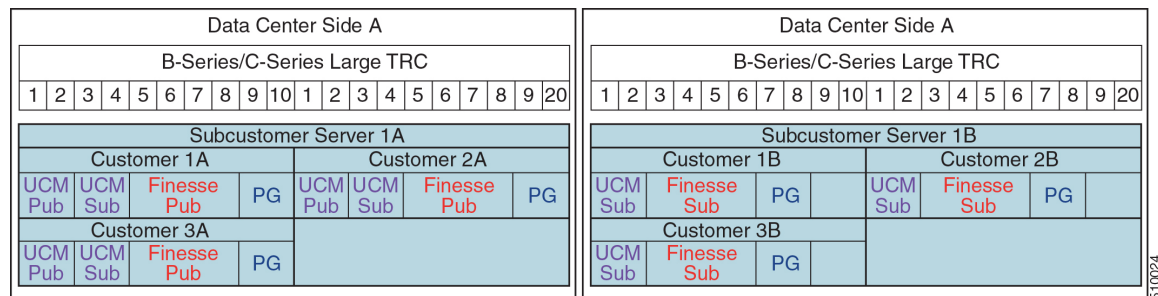
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500 Agents

Small Contact Center 500 Agent Reference Design supports three sub-customer instances.

This figure shows the base layout of the components in Small Contact Center 500 Agent Reference Design.

Figure 9: Small Contact Center 500 Agent Reference Design



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12000 Agents



Note AW-HDS 3, AW-HDS 4, AW-HDS 5, and AW-HDS 6 in Servers 4A and 4B, are optional to support more than 400 reporting users.

The solutions without these optional servers are still considered as 12000 Agent Reference Design.

Cisco HCS for Contact Center and Unified CCE solutions support the 12000 Agent Reference Design. This model adds servers to scale up from the 4000 Agent Reference Design. This Reference Design switches from deploying the Routers and Loggers on the same VM to deploying them on separate VMs.

The 12000 Agent Reference Design is supported on the Cisco UCS B200 and C240 M4 and Cisco UCS C240 M5SX Tested Reference Configuration servers.

This figure shows the base layout of the components in a 12000 Agent Reference Design on Cisco UCS B200 and C240 M4 Tested Reference Configuration servers.

Figure 10: 12000 Agent Reference Design Model



Note Servers 5A and 5B are optional to support more than 8000 agents. Servers 6A and 6B are optional to support more than 400 reporting users.

The solutions without these optional servers are still considered 12000 Agent Reference Design.

Reporting Users in the 12000 Agent Reference Design Model

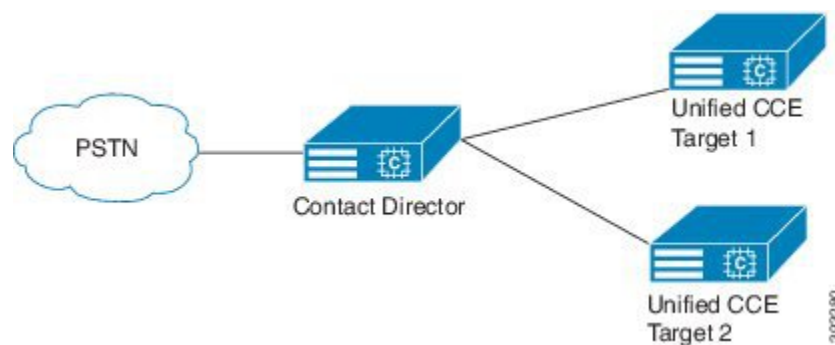
This model supports a maximum of six Unified Intelligence Center nodes, three nodes on each site. This limit can accommodate a maximum of 1200 Reporting users. If one site shuts down, the remaining site can only support 600 Reporting users on its three nodes.

Similarly, this model supports a maximum of six AW-HDS, three on each site. This limit can accommodate a maximum of 1200 Reporting users. If one site shuts down, the remaining site can only support 600 Reporting users on its three AW-HDS.

Contact Director

Only Unified CCE supports the Contact Director reference design. The Contact Director distributes incoming calls to other contact center instances. The targets can be Unified CCE instances or Unified ICM instances that connect to third-party contact centers. The Contact Sharing feature uses a Contact Director to distribute incoming contacts to two 12000 Agent Unified CCE instances. This design gives you support up to 24000 active agents.

Figure 11: Contact Director Solution with Two Unified CCE Target Instances

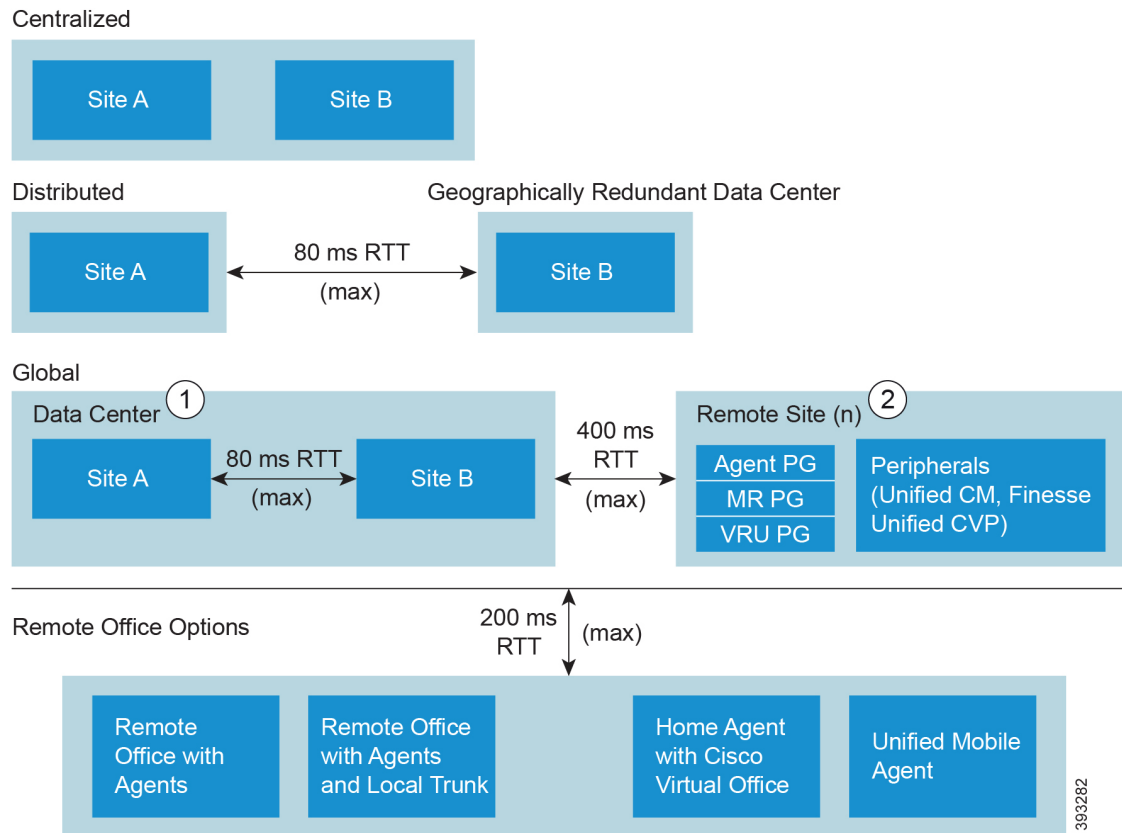


For information on the Contact Sharing feature, see the *Cisco Unified Contact Center Enterprise Features Guide* at <http://www.cisco.com/c/en/us/support/customer-collaboration/unified-contact-center-enterprise/products-feature-guides-list.html>.

Topologies for Reference Designs

The Contact Center Enterprise Reference Designs also define the allowed topologies for your deployment. The deployment topology consists of where you install the VMs for your data center and how your agents connect to the data center. This figure shows the basic topologies that you can use in a Reference Design.

Figure 12: Reference Design Topologies



1. The Main Site can use either a Centralized or a Distributed topology.
2. A Remote Site can be geographically colocated with the Main Site.

The Reference Designs allow the following topologies:

Topology	Description
Centralized	You host both sites of the redundant components in the same physical data center. Even when they are on the same LAN, the maximum round-trip time between the two sites is 80 ms. The data center includes the core contact center components and Unified CM.
Distributed	You host each site of the redundant components in a different geographical location. Distributed sites allow you to keep running on the other site if one site fails. You can also handle routing without sending a contact to a site in a different geographical region. The maximum round-trip time between the two sites is 80 ms.

Topology	Description
Global	<p>You have a centralized or distributed main site. You also have a remote site that is generally in a different geographical location. The remote site gives you local access in that geographic region. The remote site allows you to handle your global work load without creating another contact center instance.</p> <p>The remote site requires a separate Unified CM cluster and a separate Cisco Finesse cluster if the RTT from the data center is greater than 80 ms. The maximum round-trip time between the main site and remote sites is 400 ms.</p> <p>Note A remote site cannot include a Cisco Unified Intelligence Center server.</p> <p>This topology fits the outsourcer model where the outsourcer has a separate peripheral gateway and a corresponding peripheral.</p> <p>Note Starting in Release 11.6, Packaged CCE supports this topology.</p>

The Reference Designs allow the following methods for connecting your agents to a site:

Remote Office Topology	Description
Remote Office with Agents	A contact center office with agent workstations that connects to a site through a WAN router. The voice termination is at the site. All contacts go through the site first and then to the agents.
Remote Office with Agents and Local Trunk	A contact center office with a connection to the local PSTN. Contacts come in on the local trunk and the local gateway passes them to the data center for routing.
Home Agent with Broadband - Cisco Virtual Office (CVO)	An agent at a remote location with a VPN connection to a site. The agent has a Cisco IP Phone and a Cisco Finesse desktop. The agent can optionally use a Cisco Virtual Office (CVO) router for a permanent VPN connection.
Unified Mobile Agent	An agent who uses a PSTN phone.



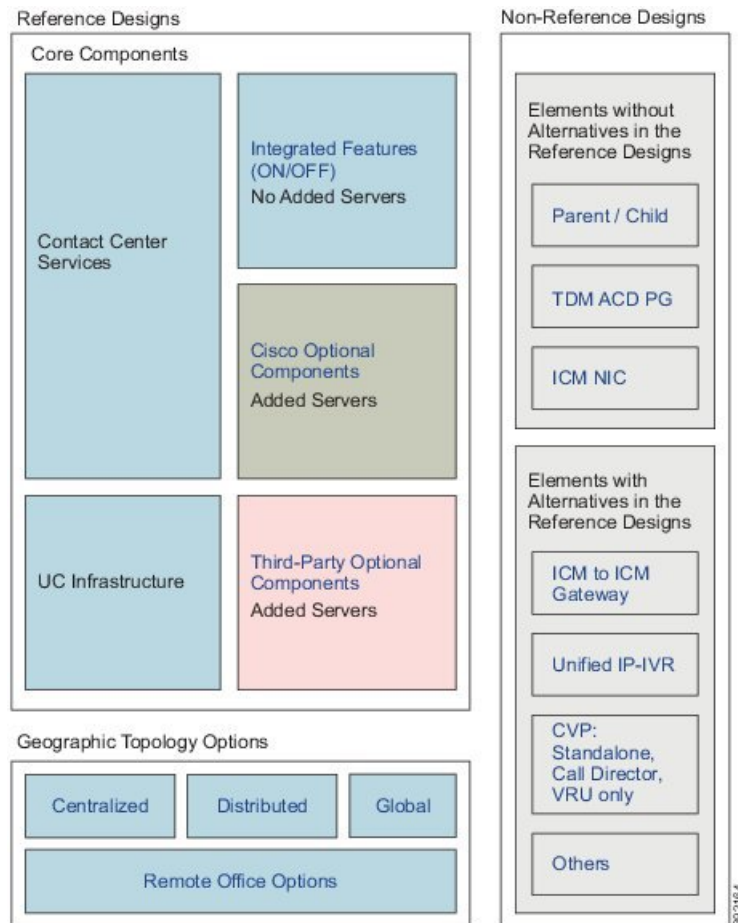
Note The maximum allowed round-trip time between any remote office and the data center is 200 ms.

Related Topics

[Reference Design and Topology Design Considerations](#)
[Topologies](#)

Non-Reference Design Solutions

The Contact Center Enterprise Reference Designs define what you can use in your contact center solution. If your solution includes anything that the Reference Designs do not explicitly allow, your solution is a Non-Reference Design. Most Non-Reference Design solutions require Unified CCE.

Figure 13: Non-Reference Designs

Cisco HCS for Contact Center supports the Avaya PG as a Non-Reference Design solution.

Elements with Alternatives in the Reference Designs

There are newer technologies that supersede most of the components, options, features, and configurations that are not supported in Reference Design solutions. Some of the elements in this category are:

Table 4: Non-Reference Designs and the Reference Design Alternatives

Non-Reference Design Element	Reference Design Alternative
Cisco ICM to ICM Gateway (Except in the Contact Director model)	Contact Director
Unified IP IVR or third-party Voice Response Unit (VRU) applications	Unified CVP
Mismatch versions in Unified CCE subcomponents (This is allowed only while upgrading your contact center from one release to another.)	All versions match after upgrade

Non-Reference Design Element	Reference Design Alternative
Unified CVP Call Director	Unified CVP Comprehensive call flow
Generic PG	Coresident Agent PG, VRU PG, and MR PG
Translation Route	Unified CVP Comprehensive call flow, except for third-party PGs
Multi-Unified CM PIM configuration	Multiple PGs on separate VMs
Unified CM Multi-cast Music on Hold (MoH)	Gateway-based MoH or Unicast MoH
Tomcat as the media server for Unified CVP	Prepackaged IIS included in the Unified CVP install
MGCP protocol	SIP
G.722, iSAC, and iLBC codecs	Mixed codec support
Dialed Number Plan (DNP)	Dialed Numbers and CTI Route Points



Note This is not an exhaustive list.

Elements Without Alternatives in the Reference Designs

There are some elements that you cannot use in Reference Design solutions that do not have a defined alternative. Some of the elements in this category are:

- Time-Division Multiplexing (TDM) (third-party legacy Automatic Call Distribution integration)
- TDM NIC
- Parent/Child topology for out-sourcing deployments



Note This is not an exhaustive list.

