CHAPTER 1

Introducing Cisco Hosted Unified Communications Services

This chapter provides a high-level overview of the architecture and components of Cisco Hosted UCS, Release 7.1(a), describes applications and features, and defines high-level planning elements for Hosted UCS implementation. It includes the following sections:

Cisco Hosted Unified Communications Services Overview

Service providers can use a single Cisco Hosted UCS platform to offer Cisco Unified Communications Manager (Cisco Unified CM) applications and features to multiple customers (multi-tenant mode), or to one large customer (single-tenant mode).

Hosted UCS allows the sharing of the following centralized resources:

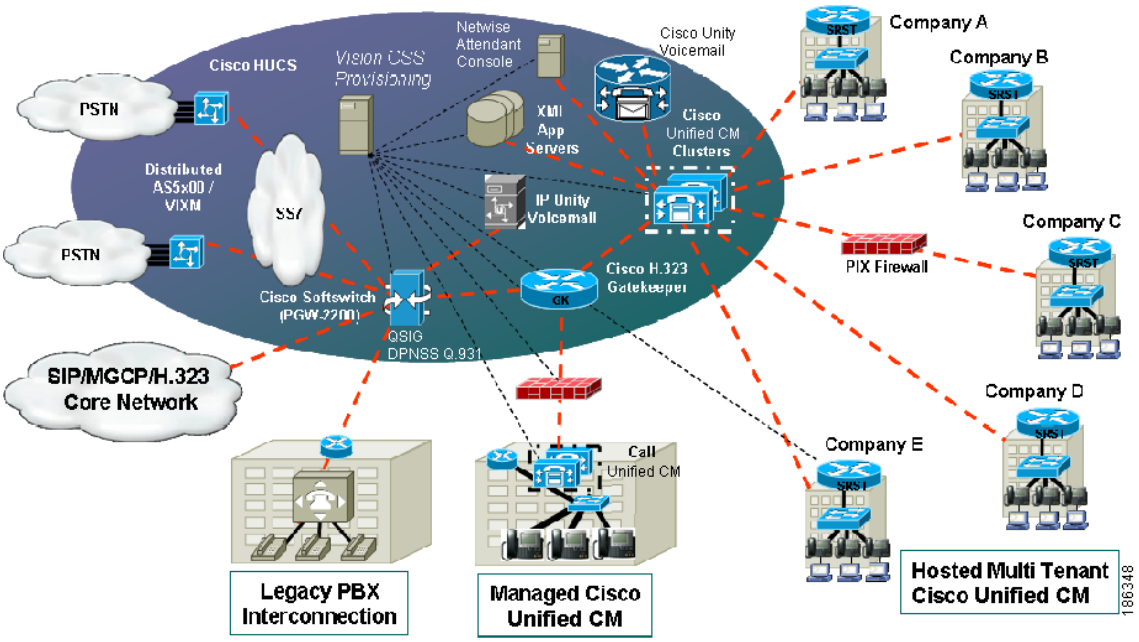
- Cisco PSTN Gateway 2200 Softswitch (PGW)
- Cisco Unified CM
- Trunking gateway
- Media resources

VOSS USM provides provisioning and administration for this multi-tenant solution.

Within a single Hosted UCS platform, a specific set of hardware resources can also be dedicated to a single customer if necessary to support the required level of service. For example, one or more Cisco Unified CM clusters or a Cisco Unity voice mail can be dedicated to a single customer, while other resources can be shared.

The voice network architecture for the Hosted UCS platform integrates the call control capability of a Cisco Unified CM system and the routing and services function of a Cisco PGW. This supports a broad range of Hosted UCS platform deployments. Figure 1-1 illustrates the Hosted UCS platform.

Figure 1-1 Hosted UCS Platform



Voice services for Hosted UCS tenants are provided by Cisco Unified CM and Cisco PGW platforms:

- Cisco Unified CM provides end-user-facing services to individual tenants
- Cisco PGW provides a routing function that mediates among tenants, and connection between the PSTN and each zone in the overall implementation

Virtualized Communications Services

The resources of the Cisco Unified CM system and the Cisco PGW can be shared among several tenants because VoSS USM partitions (*virtualizes*) resources for individual tenants. USM directly supports applications, such as directory services and extension mobility for IP phones, while shielding customers from the complexities of the underlying data structures and routing schema.

Table 1-1 summarizes the applications that are supported by Hosted UCS, Release 7.1(a), in single or multi-tenant mode, and indicates whether the application can be automatically provisioned through USM or if it must be manually provisioned.

Table 1-1 Multi-Tenant and Autoprovisioning Support for Hosted UCS Applications

Component	Multi-tenant?	Auto provision with USM?
Billing Applications (Building Applications Management; billing)	No	Yes[1]
Movius Mereon Voice Messaging (Voice Messaging only)	Yes	Yes
Movius Web Collaboration/Conferencing	Yes	Yes
XML Application Servers	Yes	Yes

1. Sharing customer history files with Mediation system, such as ISI

For more information about VoSS USM, see Chapter 3, "Managing the Hosted Unified Communications Services Platform with VisionOSS BVSM."

Hosted Unified Communications Services Platform Components

This section identifies and briefly describes the Hosted UCS platform components. It includes the following topics:

VoSS USM

\VoSS USM provides a global view of the Hosted UCS platform, and provides integrated provisioning of most of the major components, including:

- Cisco Unified CM
- Cisco PGW
- Cisco IOS Gatekeepers and local gateways (including SRST)
- VoSS DHCP server
- Movius voice mail and unified messaging system

USM provides the following features and functionality:

- Automates the deployment, provisioning, and management of large-scale, multi-tenant, multi-site hosted VoIP services across regional and international boundaries.
- Provides virtualized services by managing the configuration of the Cisco Unified CM and Cisco PGW dial plans and analog gateways, including multiple versions of code on integrated clusters.
- Supports dial plan management across Cisco Unified CM and the Cisco PGW and allows rapid service activation. Service activation includes configuring dial tone, voice mail, conferencing, corporate directories, and XML applications.
- Provides a comprehensive resource inventory management tool for IP addresses, internal numbers and E.164 external numbers. USM also provides a basic inventory management system for phones, lines, and services.

- Ensures that changes in configuration in one Hosted UCS platform component are mapped across other affected components. USM manages multiple network elements, performing multiple configuration steps for each transaction.
- Supports secure, decentralized administration, which allows customers to perform their own moves, adds, and changes.

For more information about VoSS USM, see the following URL: http://www.voss-solutions.com/

Cisco Unified Communications Manager

In the Hosted UCS platform, Cisco Unified CM provides business IP telephony services to enterprises located within the bounds of a shared voice infrastructure. The Cisco Unified CM is a hosted or managed device that can be partitioned in a multi-tenant manner to provide segregated service to multiple enterprises of all sizes or in a dedicated manner to support a single large-scale enterprise. A Cisco Unified CM cluster or clusters can be deployed within a network provider domain to provide service to IP phones located at an end-user facility.

HUCS 7.1(a) adds the Cisco Unified Mobility application known as Mobile Connect or Single Number Reach (SNR) application that allows an incoming call to an enterprise user to be offered to the user's IP desk phone as well as up to four configurable remote destinations, such as mobile or cellular telephone. Once the call is offered to both the desktop and remote destination phone(s), the user can answer at any of those phones. Upon answering the call on one of the remote destination phones or on the IP desk phone, the user has the option to hand-off or pick-up the call on the other phone.

For more information on Cisco Unified CM, see the following URL:
http://www.cisco.com/en/US/products/sw/voicesw/ps556/index.html

Cisco PGW

The Cisco PGW provides the following key functions within the Hosted UCS platform:

- Time-division multiplexing (TDM) PSTN interconnect—Provides connectivity for all services to the TDM-based PSTN via Signaling System 7 (SS7) or ISDN Primary Rate Interface (PRI), depending on the requirements of the installation. The Cisco PGW also incorporates some capabilities that can assist in meeting local regulatory requirements.
- Business voice access—Provides the business voice access service for TDM PBXes and IP PBXs.
- TDM PBX integration—Provides direct management by the Cisco PGW of PBXes that use PRI-based signaling interfaces, using Media Gateway Control Protocol (MGCP) with backhaul techniques, or can be managed indirectly using the H.323 protocol to the Cisco PGW for both PRI and Basic Rate Interface (BRI). The direct connection model typically offers greater flexibility and functionality.
- Routing and analysis engine—Provides a routing engine for inter-domain routing. All service platforms use the Cisco PGW to route calls that are not local, which ensures that the main dial plan and routing functions for the hosted platform are centrally located. The Cisco PGW also includes A and B number analysis and modification functions, as well as regulatory capabilities that can be applied to satisfy local requirements.

For more information about the Cisco PGW, see the following URL:
http://www.cisco.com/en/US/products/hw/vcallcon/ps2027/index.html

Cisco H.323 Signaling Interface

The Cisco H.323 Signaling Interface (HSI) adds an H.323 interface to the Cisco PGW, which allows calls to be established between the PSTN and an H.323 network. The Cisco H.323 HSI provides these services:

- Translation of signaling protocols for establishing, controlling, and releasing calls
- Administration of network parameters and protocol capabilities
- System and call-related statistics
- Fault reporting
- Overload management
- Event logging
- Simple Network Management Protocol (SNMP) interface

The Cisco HSI operates in a load-sharing configuration, while the Cisco PGW operates in an active/standby configuration. This operation allows the benefits of redundancy (if an HSI fails, the remaining HSIs continue to operate) and simple scaling (you can insert additional HSIs as the network expands). A minimum of two HSIs are required to ensure that the system continues to process calls in case of an equipment failure.

For more information about the Cisco HSI, see the following URL:
http://www.cisco.com/en/US/docs/voice_ip_comm/pgw/hsi/4.3/guide/43ch1.html

Gatekeeper

An H.323 gatekeeper provides basic infrastructure capabilities as well as a registration capability for the Cisco PGW, Cisco Unified CM, H.323 customer premises equipment (CPE), and any H.323 customer devices. The gatekeeper forces all call signaling to use the Cisco PGW.

Trunking Gateway

The trunking gateway is a Cisco AS5x00 platform in the baseline architecture, which is based on Cisco IOS software. A Cisco AS5850 with STM-1 and E1 interfaces and a Cisco AS5350 with E1 interfaces were used in Cisco Hosted UCS tests.

However, because of the requirements of the initial applications, it is relatively easy to incorporate the Cisco MGX, Cisco Voice Internetworking Service Module (VISM), and Cisco Voice Switch Service Module (VXSM) products as needed.

For more information on Cisco AS5x00 platforms, see the following URL:
http://www.cisco.com/en/US/products/hw/iad/index.html

Movius Voice Mail

The Movius servers (formerly IP Unity) Unified Messaging platform provides voice mail services in a multi-tenant environment and the Movius voice mail system supports the multi-tenant Hosted UCS architecture. Only the voice mail functions of the Movius server platform are currently used in the Hosted UCS platform.

The USM platform is integrated with the Movius server to allow provisioning through the USM voice mail graphical user interface (GUI) functionality on a per-tenant basis. The interface between the Cisco PGW and the Movius server (IP Unity) voice mail system is SIP.

The Cisco PGW forwards the incoming calls to the voice mail system. After the caller leaves a message, the voice mail system uses the SIP NOTIFY message to notify the Cisco PGW that a message was left for the user.

The Cisco PGW supports only unsolicited subscription to the voice mail system and does not need to send a SIP SUBSCRIBE message to the voice mail system for every user with voice mail service enabled.

The Cisco PGW inter-works SIP and H.323 between the Movius server and Cisco Unified CM for message deposit, retrieval, and message waiting indicator (MWI). The inter-working of the Movius server through SIP and gateway-fronted Digital Private Network Signaling System (DPNSS)/Q Interface Signaling Protocol (QSIG) PBX is not supported in the Hosted UCS 7.1(a) release, so it is not possible to provide a hosted voice mail service for time division multiplexing (TDM) PBX users.

The USM platform uses the Movius server application programming interface (API), which is Common Object Request Broker Architecture (CORBA)/Extensible Markup Language (XML), to define business groups, provision pilot numbers, add/delete mailboxes assigned against a unique "internal" number and an "extension" number, and to assign class of service.

For further information about Movius server, see the following URL:
http://www.moviuscorp.com/ourofferings/platformsandservers

HUCS 7.1(a) adds the Movius Auto Attendant Integration feature which enables PGW and Cisco Unified Communication Manager to route calls to the Movius Auto Attendant from any PSTN or Hosted UCS phone. After selecting an Auto Attendant menu option, these calls can be transferred to another Hosted UCS or PSTN phone.

Billing

In multi-tenant business voice service, call detail records (CDRs) are generated by Cisco Unified CM system and the Cisco PGW. The Cisco Unified CM generates records for calls between phones in the same tenant. The Cisco Unified CM and the Cisco PGW generate records for calls between different tenants and for calls to the PSTN.

Cisco PGW billing records are produced by a Cisco Billing And Measurement Server (BAMS), which observes carrier-class accuracy and contains all necessary timestamps as well as the called party information delivered to the Cisco PGW and the calling party information sent from the Cisco PGW.

BVSM also provides a source of customer history data accessible through an ODBC link to allow Mediation systems to query BVSM for customer data. For example, this can be used to establish the ownership of a telephone number at a given time and to access customer account data.

For more information on Cisco BAMS, see the following URL:
http://www.cisco.com/en/US/docs/voice_ip_comm/pgw/bams/3.13/guide/3132ch1.html

Application Servers

The Hosted UCS platform includes a number of application services, including voice mail, unified messaging, conferencing, music-on-hold (MOH), auto attendant, and XML applications.

Business CPE

Cisco IOS CPE, such as Cisco 2600, 2800, 3600 and 3800 Series routers, provide ISDN PRI and BRI connections to business tenant telephony equipment. For PRI connections, the Cisco PGW can be used directly via D-channel backhaul and MGCP control. For BRI connections (and also for PRI if necessary), gateways can be configured as H.323 endpoints that register with an infrastructure gatekeeper.

Cisco Unified IP phones and analog telephone adaptors (ATAs) are used to provide devices in the business domain where Cisco Unified CM control is used. Cisco Integrated Access Devices (IADs) can also be used to provide analog telephony service to multi-dwelling/multi-office facilities.

Cisco Emergency Responder

The Cisco Emergency Responder (Cisco ER) can be used to manage emergency calls in the telephony network to respond to these calls effectively, so that the service provider can comply with local ordinances concerning the handling of emergency calls.

In North America, these local ordinances are called "enhanced 911," or E911. Other countries and locales might have similar ordinances. Cisco ER is predominantly deployed in North America.

Planning the Hosted Unified Communications Services Implementation

This section provides high-level guidance for planning a Hosted UCS implementation.

This section includes the following topics:

Note Hosted UCS is a Cisco end-to-end solution architecture. The official Hosted UCS design is fully described in the Hosted UCS platform Solution Reference Network Design (SRND) documentation.

Planning Tasks

Before you begin building a Hosted UCS platform, Cisco recommends that you first complete these related planning tasks:

1. Create a bill of materials (BoM) that covers all equipment, and ensure that the correct software is available.
2. Create an architecture diagram, including a rack diagram.
3. Plan the component naming convention.
4. Plan the IP addressing and create a network design (subnets and VLANs).

5. Plan the classes of service.
6. Plan the dial plan requirements.
7. If SS7 connectivity is required, gather the SS7 PSTN interconnect information; for example, point codes, linksets, links, and CIC information.
8. Develop a set of USM bulk loaders.

Design Workbook

It is recommended that you maintain a design workbook document for each Hosted UCS platform. A sample Excel design workbook is available from VoSS USM and contains the various components described in this chapter.

Note Maintaining a design workbook document is a mandatory requirement for all Hosted UCS reference and production platforms.

Dial Plan

The Hosted UCS platform provides a standard dial plan model for common scenarios, such as service provider and multi-tenant. However, the planning and design of a customized, multi-tenant dial plan configuration is a critical requirement.

Dial plan customization includes the following:

- Inter-site calling prefix
- Outside calling prefix
- Location extension digits
- Site code digits
- Emergency number conventions
- E911 requirements
- DID/DDI number length
- DID/DDI number range allocation
- DDI/internal association format
- Area codes
- PSTN number requirements

Standard Equipment Naming Conventions

During the planning phase, you must define the naming convention to use for your equipment. Because of the integrated nature of the architecture, equipment names must be consistent across the platform.

The Cisco Unified CM server computer name is limited to 11 characters because the MOH name, which includes the Cisco Unified CM server name, must be a maximum of 15 characters. USM cannot statically configure Cisco Unified CM clusters where the server names are more than 11 characters, and this prevents the Hosted UCS platform from being configured further on the affected cluster.

Note The Cisco Unified CM server computer name is restricted to a maximum of 11 characters or less and cannot be altered later without a complete software reload (on Cisco Unified CM 4.x clusters).

Hardware, Network, and Software Requirements

This section summarizes the main hardware and software requirements for implementing the Hosted UCS platform. It includes the following topics:

Hardware Requirements

Before implementing Hosted UCS in a production environment, refer to the high-level and low-level detailed design guide and the build of materials (BOM) for the hardware requirements for a specific deployment. Refer to Appendix A, "Sample Hosted Unified Communications Services Build of Materials" to see a sample build of materials.

Each platform employs a unique rack layout that is dependent on the special requirements of each deployment. For instructions to install specific hardware components, refer to the hardware installation guide for each component.

Network Configuration and NAT

After the devices have been physically rack mounted, the network cabling can be completed by using a suitable Layer 3 switch such as the Cisco Catalyst 3560 Series switch. VLANs and subnets should be defined based on the Hosted UCS platform high-level and low-level design and your network configuration.

When the platform is implemented into a service provider network, it is also important to record the external IP address scheme used by Network Address Translation (NAT), so that remote access to the platform is also possible.

Customers sharing a single Hosted UCS-based service provider-hosted service may have internal IP address space ranges that overlap. NAT can be configured on the firewalls to translate the private (non-unique) addresses that are actually on the IP phones into addresses that are unique in the service provider (shared) domain.

Not only must these addresses be unique, they must be reachable from the individual customer networks to allow voice calls to flow between customers through the common address and security domain. To achieve this, routes that represent the address scheme used in the common address and security domain must be injected to each customer domain.

It is therefore important that no customer subscribing to the service is actually using the address space chosen for the IP address and security domain of the common service provider. The NAT pools that are configured on each customer firewall must be large enough to supply addresses to all the IP phones that are deployed in the specific customer.

Firewall Rules

Table 1-2 shows an example of the rules that can be implemented on the firewall to protect both the service provider from the customer and the customers from each other.

Table 1-2 Firewall Rules

Rule	Function
SCCP (TCP port 2000) to the Cisco Unified CMs only	Allows the Cisco Unified CMs to control the phones in the customer domain using the SCCP protocol
TAPI (CTIQBE) to the Cisco Unified CMs running CTI manager only	Used for third-party phone call control or for call control to TAPI-based softphones or software applications
HTTP (TCP port 80) to the Publisher Cisco Unified CMs and USM only	Required for access to phone XML services hosted on the Cisco Unified CM and USM (for example, directory), and also for customer self-provisioning of USM using a web browser
TFTP (UDP port 69) to the TFTP server only	Required to allow phones to download their configuration files and software updates
H.323 (and H.245), to the Cisco Unified CM and maybe the HSI and gatekeeper if customer site applications that use H.323 are required; for example, a customer site-located PSTN gateway using H.323	Required only to support H.323 endpoints in the customer address space; applications for this include site-located PSTN gateways
RTP traffic UDP ports are opened dynamically by the ALG function within the firewall by MGCP, H.323, TAPI, SIP, and SCCP Call Control	Allows voice to flow between customers and to PSTN gateways and conference bridges hosted in the common domain
MGCP (UDP 2427/2428) to the Cisco PGW Various backhaul protocols also need to be allowed to the Cisco PGW depending on the L3 protocol at the gateway; for example, Sigtrans.	Allows the Cisco PGW to control customer site-located PSTN and PBX gateways

For more information about NAT and firewall issues when implementing the Hosted UCS platform, refer to the *Hosted Unified Communications Services, Release 7.1(a) SRND*.

Class of Service

You must define each class of service (CoS) and the naming convention to be used in the dial plan.

Table 1-3 shows an example of CoS and naming conventions.

Table 1-3 CoS and Naming Conventions

Phone Group	Proposed CoS	
	Service Name	**Description**
Unassigned	COS1InternalOnlyNo911	Internal access only (no 911 calls)
Unsecured common area	COS2AllCallsCMCAllButInternal	Internal + 911 + CMC all other calls
Secured common area	COS3AllCallsCMCInternational	All calls allowed (CMC for international)
User (client)	COS4AllCalls(NotIntersite)	All calls allowed (no 9-digit inter-site)
User (service provider)	COS5AllCalls	All calls allowed (+ 9-digit inter-site)

Software Requirements

This section summarizes the software requirements for the core components of the Hosted UCS platform. For information about software compatibility for all the supported platform components, refer to the *Hosted Unified Communications Services, Release 7.1(a)*, *Software Compatibility Matrix*.

Implementation and Configuration Summary

The following summarizes the basic tasks required to implement and configure the Hosted UCS platform, after completing the initial design and planning phase.

Implementation Step	Refer to
1. Install hardware and initialize device software.	Installation and hardware guides for each Hosted UCS platform component. The *Cisco Hosted Unified Communications Services, Release 7.1(a) Software Compatibility Matrix* summarizes the software requirements for each component.
2. Apply static configuration to each device.	Chapter 2, "Configuring Hosted Unified Communications Services Components Before Loading Bulk Data."
3. Load bulk data for each component.	Chapter 3, "Managing the Hosted Unified Communications Services Platform with VisionOSS BVSM."
4. Customize each component as necessary.	Configuration guides or online help for each Hosted UCS platform component. Chapter 3, "Managing the Hosted Unified Communications Services Platform with VisionOSS BVSM" summarizes the options provided by USM for configuring the Hosted UCS platform components.