Design Guide for Cisco Unity Virtualization

Revised August 17, 2011 (Originally published February 27, 2009)

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Text Part Number:

Design Guide for Cisco Unity Virtualization

CONTENTS

Preface v

Design Guide Use and Audience v

Cisco Unity Documentation v

Obtaining Documentation and Submitting a Service Request vi

Cisco Product Security Overview vi

CHAPTER 1 **Virtualizing Cisco Unity Messaging on VMware ESX** 1-1

Introduction 1-1

Requirements 1-2

VMware Infrastructure Feature Support 1-4

Feature Limitations and Restrictions 1-5

VMware ESX Software Updates 1-5

Cisco Unity Virtual Machine Templates 1-5

Cisco Unity Template 1 1-6

Cisco Unity Template 2 1-6

Exchange 2003 Voice Mail Run-Time Edition Template 1-7

Cisco Unity Voice-Recognition Template 1-7

Software Installation and System Setup 1-8

Provisioning of Host Resources for Virtual Machines 1-8

Processor 1-8

Memory 1-10

Disk 1-10

Network 1-11

Redundancy 1-11

Disaster Recovery 1-12

Licensing 1-12

Platform Migration 1-12

Technical Support 1-12

APPENDIX A **Performance Test Information** A-1

Test Scenarios A-1

Load Servers Used in Large-Deployment Scenario A-1

Load Servers Used in Medium-Deployment Scenario A-2

Network Layout A-2
Disk Layouts A-3
Network I/O Test Results A-3
Large-Deployment Network I/O Test Results A-3
Medium-Deployment Network I/O Test Results A-4
Disk I/O Test Results A-4
Large-Deployment Disk I/O Test Results A-4
Medium-Deployment Disk I/O Test Results A-5
Voice Quality Comparison A-6

Preface

This preface contains the following sections:

- Design Guide Use and Audience, page v
- Cisco Unity Documentation, page v
- Obtaining Documentation and Submitting a Service Request, page vi
- Cisco Product Security Overview, page vi

Design Guide Use and Audience

The *Design Guide for Cisco Unity Virtualization* provides requirements, recommendations, policies, and performance metrics to aid in deploying a Cisco Unity system on VMware ESX. In many ways, deploying Cisco Unity on VMware ESX is identical to deploying on a physical server; however, this guide notes the differences for deploying in a virtualized environment.

The *Design Guide* is intended for anyone responsible for the design or configuration of a Cisco Unity system on VMware ESX. Successful deployments require cooperation between the groups responsible for the Cisco Unity system, VMware ESX software, server hardware, data networking, and storage. Organizations with strong internal cooperation among these groups and significant experience virtualizing applications using VMware ESX are the best candidates for Cisco Unity virtualization.

The *Design Guide* is to be used in conjunction with the related Cisco Unity documentation on Cisco.com. (See the next section, "Cisco Unity Documentation.")

Cisco Unity Documentation

Cisco Unity documentation is available on Cisco.com at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/tsd_products_support_series_home.html.

For descriptions and URLs of Cisco Unity documentation, see the *Documentation Guide for Cisco Unity* at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_documentation_roadmaps_list.html.

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:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

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.

Cisco Product Security Overview

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

Further information regarding U.S. export regulations may be found at http://www.access.gpo.gov/bis/ear/ear_data.html.

CHAPTER 1

Virtualizing Cisco Unity Messaging on VMware ESX

This chapter contains the following sections:

- Introduction, page 1-1
- Requirements, page 1-2
- VMware Infrastructure Feature Support, page 1-4
- VMware ESX Software Updates, page 1-5
- Cisco Unity Virtual Machine Templates, page 1-5
- Software Installation and System Setup, page 1-8
- Provisioning of Host Resources for Virtual Machines, page 1-8
- Disaster Recovery, page 1-12
- Licensing, page 1-12
- Platform Migration, page 1-12
- Technical Support, page 1-12

Introduction

Revised April 21, 2010

Virtualization has emerged as a leading trend in the data center. Organizations are embracing the virtualized data center for a variety of reasons, including total cost of ownership (TCO), consolidation, operational efficiency and flexibility, disaster recovery and business continuity, security, and reduced carbon footprint.

Cisco is committed to leading the transition toward the virtualized data center through innovative products and solutions, including support for Cisco Unity messaging on the VMware ESX platform, part of the VMware Infrastructure suite.

Deploying Cisco Unity messaging on VMware ESX delivers the following advantages:

- Allows customers to extend the benefits of their virtualization and storage data center investments to Cisco Unity messaging.
- Maintains the same predictable scalability provided by running the Cisco Unity application on a physical server.

Cisco Unity messaging is a real-time application, which makes it more difficult to virtualize than traditional data-centric applications, such as database and email servers. (For example, to support 144 concurrent voice sessions, Cisco Unity messaging must place 7,200 packets on the wire at a precise 20 ms interval.) Delivering this level of performance in a reliable, predictable, and serviceable manner requires some concessions, primarily surrounding CPU Affinity.

You can virtualize the Cisco Unity system in a Unified Messaging or Voice Messaging configuration:

- In a Unified Messaging configuration, you can also virtualize Microsoft Exchange, Active Directory, or IBM Lotus Domino servers. However, this guide provides information about virtualizing the Cisco Unity application and voice-recognition servers and not the others. In addition, Cisco does not provide technical support for message-store servers or for domain controllers/global catalog servers for Unified Messaging deployments.

Note Virtualizing a Domino server is supported only for use with Cisco Unity 7.0(2). With the release of Cisco Unity 8.x, Domino is no longer supported.

- In a Voice Messaging configuration, you must use the Voice Mail Run-Time Edition of Exchange Server 2003 (with or without Active Directory installed). This guide provides information about virtualizing the Cisco Unity application, voice-recognition, and Voice Mail Run-Time servers.

You can also run a mix of virtual and nonvirtual machines, including the servers in a Cisco Unity failover pair.

Also note that to virtualize Cisco Unity messaging, there is an additional support burden. Customers provide the hardware, VMware ESX software, and Microsoft Windows Server software, and are responsible for coordinating support for these components, including provisioning and performance troubleshooting.

Customers who are unwilling to take on such support may be better candidates for deploying Cisco Unity messaging on physical servers.

Requirements

Revised August 12, 2011

Cisco supports virtualizing the following servers:

- Cisco Unity application servers—Version 7.0(2), or version 8.0(3) or later.
- Cisco Unity voice-recognition servers—Version 7.0(2), or version 8.0(3) or later.
- Voice Mail Run-Time Edition of Microsoft Exchange Server 2003 servers (with or without Active Directory installed).

Note This guide collectively refers to the three types of virtualized servers mentioned above as "Cisco Unity virtual machines."

The following requirements apply to all virtual machines running the Cisco-provided software, unless otherwise noted:

- VMware ESX 3.5 or later, or VMware ESXi 3.5 or later.

Note This guide refers to both VMware ESX and VMware ESXi as VMware ESX.

- VMware ESX must be deployed in a configuration supported by VMware.

  VMware provides comprehensive compatibility guides on its website for systems (servers), I/O devices, and storage and storage-area networks.

- The following VMware ESX host server CPU models are supported:

Intel Xeon E5540	Intel Xeon W5580
Intel Xeon E5472	Intel Xeon X7350
Intel Xeon E5462	Intel Xeon X5570
Intel Xeon E5450	Intel Xeon X5560
Intel Xeon E5440	Intel Xeon X5550
Intel Xeon E5430	Intel Xeon X5492
Intel Xeon E5420	Intel Xeon X5482
Intel Xeon E5640	Intel Xeon X5472
Intel Xeon E6540	Intel Xeon X5470
Intel Xeon L5430	Intel Xeon X5460
Intel Xeon L5420	Intel Xeon X5450

  If a CPU model is not listed, it is not supported.

- The Cisco Unity virtual machine hard disks must reside on shared Fibre Channel storage. Traditional Fibre Channel host bus adapters and Fibre Channel over Ethernet converged network adapters are supported.

  NAS/NFS, iSCSI, and direct-attached storage are not supported.

- All Cisco Unity virtual machine configuration properties must match a virtual machine template. (See the "Cisco Unity Virtual Machine Templates" section on page 1-5).

- The CPU Affinity feature of VMware ESX is required to dedicate CPU cores to the Cisco Unity virtual machines. (See "Processor" in the "Provisioning of Host Resources for Virtual Machines" section on page 1-8.)

- The Memory Reservation feature is required for each Cisco Unity virtual machine. (See "Memory" in the "Provisioning of Host Resources for Virtual Machines" section on page 1-8.)

- Disk I/O performance must meet or exceed the required level. (See "Disk" in the "Provisioning of Host Resources for Virtual Machines" section on page 1-8.)

- The IP network design must ensure that Cisco Unity virtual machine traffic never encounters contention or delay when leaving the VMware ESX host. (See "Network" in the "Provisioning of Host Resources for Virtual Machines" section on page 1-8. In addition, the appendix "Performance Test Information" includes network I/O examples to aid design.)

  Cisco Technical Assistance Center (TAC) asks for the results before troubleshooting performance issues.

- Cisco Unity application virtual machines must run the Cisco Unity Performance Information and Diagnostics utility at all times with the appropriate configuration file. Cisco Technical Assistance Center (TAC) asks for the results before troubleshooting performance issues.

  On Cisco Unity 7.0 voice-recognition virtual machines and on Exchange 2003 Voice Mail Run-Time Edition virtual machines, the utility is optional but recommended.

(The Windows-based utility is not supported with Cisco Unity 8.x voice-recognition software, which runs on the Linux operating system.)

- Read-only VMware Infrastructure Client access to the VMware ESX host.

  Cisco TAC requires access to confirm that configuration requirements are met.

- The NIC on a Cisco Unity application virtual machine must have a static MAC address. (Cisco Unity voice-recognition and Exchange 2003 Voice Mail Run-Time Edition virtual machines do not need to have static addresses.)
- The Cisco Unity virtual machines must have VMware Tools installed.
- The Cisco Unity virtual machines' time (clock) must be reliably kept in sync with true time.

  VMware provides documentation on timekeeping in the "Timekeeping in VMware Virtual Machines" document available on its website.

- Cisco Unity Voice Connector for Microsoft Exchange can be installed on an Exchange server in both Unified Messaging and Voice Messaging configurations.

VMware Infrastructure Feature Support

VMware Infrastructure includes a number of innovative features such as VMotion that are not available with traditional physical hardware installations. Not all of these features lend themselves to real-time streaming media applications such as Cisco Unity messaging. Table 1-1 lists VMware Infrastructure features and their current support status for use with Cisco Unity virtual machines.

Note that "supported" means that no problems are expected when the feature is used with Cisco Unity virtual machines. Although some supported features were tested with Cisco Unity virtual machines, not all were tested.

Table 1-1 Support Status of VMware Infrastructure Features for Use with Cisco Unity Virtual Machines

Feature	Support Status
VMware Consolidated Backup	Supported.
VMware Dynamic Resource Scheduler (DRS)	Not supported. (Incompatible with CPU Affinity, and it requires VMotion, which also is not supported.)
VMware High Availability (HA)	Not supported. (Incompatible with CPU Affinity.)
VMware Site Recovery Manager	Supported.
VMware Snapshots	Supported.
VMware Snapshots with Memory	Not supported. (Interrupts Cisco Unity performance.)
VMware Storage VMotion	Not supported. (Incompatible with CPU Affinity, and it leverages VMotion, which also is not supported.)
VMware VMotion	Not supported. (Incompatible with CPU Affinity, and it is service interrupting.) See also "VMware VMotion" in the following "Feature Limitations and Restrictions" section.
VMware vCenter Update Manager	Supported with limitations. See "VMware vCenter Update Manager" in the following "Feature Limitations and Restrictions" section.

Feature Limitations and Restrictions

VMware vCenter Update Manager

The standalone Cisco Security Agent for Cisco Unity is not supported for use with vCenter Update Manager.

Customers who do not install Cisco Security Agent for Cisco Unity can use vCenter Update Manager.

Cisco Unity upgrades and engineering specials are not delivered through vCenter Update Manager.

VMware VMotion

VMotion and features that leverage it are not supported because VMotion presents the following significant challenges for the Cisco Unity application:

- A virtual machine with CPU Affinity enabled cannot be migrated with VMotion. Therefore CPU Affinity must be disabled prior to migration, a condition that is known to dramatically affect voice quality.
- During the VMotion cutover, the system is paused. For a real-time streaming media application such as Cisco Unity messaging, this creates service interruption. While testing shows that calls are not dropped during a VMotion migration, voice calls that were in progress experience degraded voice quality after the migration.

We recommend that customers deploying Cisco Unity application virtual machines do so with the Cisco Unity failover feature. Manual Cisco Unity failovers do not interrupt service, thus mitigating the need to migrate a live virtual machine.

VMware ESX Software Updates

Software updates for VMware ESX are supported at the time of release. This includes major releases, minor releases, and patches. In the event that an update negatively impacts Cisco Unity messaging, Cisco will work to correct the issue in a reasonable time frame.

To mitigate risk associated with VMware ESX software updates and Cisco Unity virtual machines, we highly recommend that customers maintain sufficient VMware ESX host resources running the known compatible version of VMware ESX. If there is a compatibility issue, Cisco Unity virtual machines can be migrated back to the known compatible VMware ESX version until Cisco provides a resolution.

Cisco Unity Virtual Machine Templates

Cisco Unity messaging on VMware ESX provides predictable scalability through minimum hardware requirements, minimum performance requirements, and predefined virtual machine templates.

A virtual machine template defines the configuration of the virtual machine hardware. The configuration of a Cisco Unity virtual machine must match a supported virtual machine template defined in this section:

- Cisco Unity Template 1, page 1-6
- Cisco Unity Template 2, page 1-6
- Exchange 2003 Voice Mail Run-Time Edition Template, page 1-7

- Cisco Unity Voice-Recognition Template, page 1-7

Caution Cisco conducted all testing on VMware ESX hosts with the default set of Advanced Settings. Settings other than the defaults could potentially impact performance of Cisco Unity virtual machines, resulting in undesirable performance.

Cisco Unity Template 1

Configuration

- 4 vCPU
- 4 GB RAM
- 1 vNIC with static MAC address
- 4 vDisks:
  - vDisk 1 = 24 GB—Operating system
  - vDisk 2 = 24 GB—Cisco Unity binaries
  - vDisk 3 = 24 GB—Cisco Unity logs, SQL Server transaction logs
  - vDisk 4 = 24 GB—Cisco Unity Message Repository (UMR), SQL Server database

Limits

- 144 ports
- 15,000 users
- 36 text-to-speech ports

When assigning a static MAC address, we recommend choosing a complex address that another customer is unlikely to use. This can prevent accidental licensing overlap between different customers.

An example of a complex MAC address is 00:50:56:01:3B:9F.

A less complex MAC address is 00:50:56:11:11:11, because of the repeating 1s.

Cisco Unity Template 2

Added April 2, 2009

Configuration

- 2 vCPU
- 4 GB RAM
- 1 vNIC with static MAC address
- 4 vDisks:
  - vDisk 1 = 24 GB—Operating system
  - vDisk 2 = 24 GB—Cisco Unity binaries
  - vDisk 3 = 24 GB—Cisco Unity logs, SQL Server transaction logs
  - vDisk 4 = 24 GB—Cisco Unity Message Repository (UMR), SQL Server database

Limits

- 48 ports
- 5,000 users
- 36 text-to-speech ports

When assigning a static MAC address, we recommend choosing a complex address that another customer is unlikely to use. This can prevent accidental licensing overlap between different customers.

An example of a complex MAC address is 00:50:56:01:3B:9F.

A less complex MAC address is 00:50:56:11:11:11, because of the repeating 1s.

Exchange 2003 Voice Mail Run-Time Edition Template

Revised April 21, 2010

Configuration

- 1 vCPU
- 4 GB RAM
- 1 vNIC
- 3 vDisks
  - vDisk 1 = 24 GB—Operating system, Exchange binaries
  - vDisk 2 = 24 GB—Active Directory transaction logs, Exchange transaction logs
  - vDisk 3 = <User defined size>—Active Directory database, Exchange mailbox store

Limits

- 7,500 Exchange mailboxes (with or without IMAP)

For vDisk 3, you can set the disk size based on your message storage and directory needs.

Cisco provides sizing numbers for the various supported codecs in the white paper *Audio Codecs and Cisco Unity* at http://www.cisco.com/en/US/docs/voice_ip_comm/unity/white/paper/cuaudiocodecs.html. Sizing guidance for Active Directory is available in the white paper *Active Directory Capacity Planning for Cisco Unity* at http://www.cisco.com/en/US/docs/voice_ip_comm/unity/white/paper/5xcuadsizing.html.

Cisco Unity Voice-Recognition Template

Configuration

- 1 vCPU
- 2 GB RAM
- 1 vNIC
- 1 vDisk = 24 GB—Operating system, Cisco Unity voice-recognition binaries, Cisco Unity voice-recognition logs

Software Installation and System Setup

Revised April 21, 2010

Installation of Cisco Unity software and the associated applications, and system setup follow the same processes described in the applicable Cisco Unity installation documentation, available at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

Note the following virtualization exceptions to content in the *Installation Guide for Cisco Unity*:

- Create a single partition for each virtual disk.
- Follow the layout of disks defined in the "Cisco Unity Virtual Machine Templates" section on page 1-5 of this guide.
- For Windows Server, follow the *Installation Guide* instructions for installing Windows Server by using a retail Windows Server disc. (The other options in the *Installation Guide* do not apply in the virtualization context.)

Note For Cisco Unity 7.0, you use the Release 5.x versions of the guides. Content and instructions in the 5.x guides apply to version 7.0 as well. See also the "New Functionality" and "Changed Functionality" sections of *Release Notes for Cisco Unity Release 7.0(2)* at http://www.cisco.com/en/US/docs/voice_ip_comm/unity/7x/release/notes/702curelnotes.html.

Provisioning of Host Resources for Virtual Machines

This section addresses the following resources:

- Processor, page 1-8
- Memory, page 1-10
- Disk, page 1-10
- Network, page 1-11
- Redundancy, page 1-11

Processor

Revised May 7, 2010

Note The information in this section applies to virtualized Cisco Unity application servers and to virtualized Cisco Unity voice-recognition servers. For virtualized servers running the Voice Mail Run-Time Edition of Microsoft Exchange Server 2003, the settings are recommended.

Each Cisco Unity virtual machine must have physical CPU cores dedicated to the virtual machine. Without dedicated CPU cores, call quality degrades noticeably.

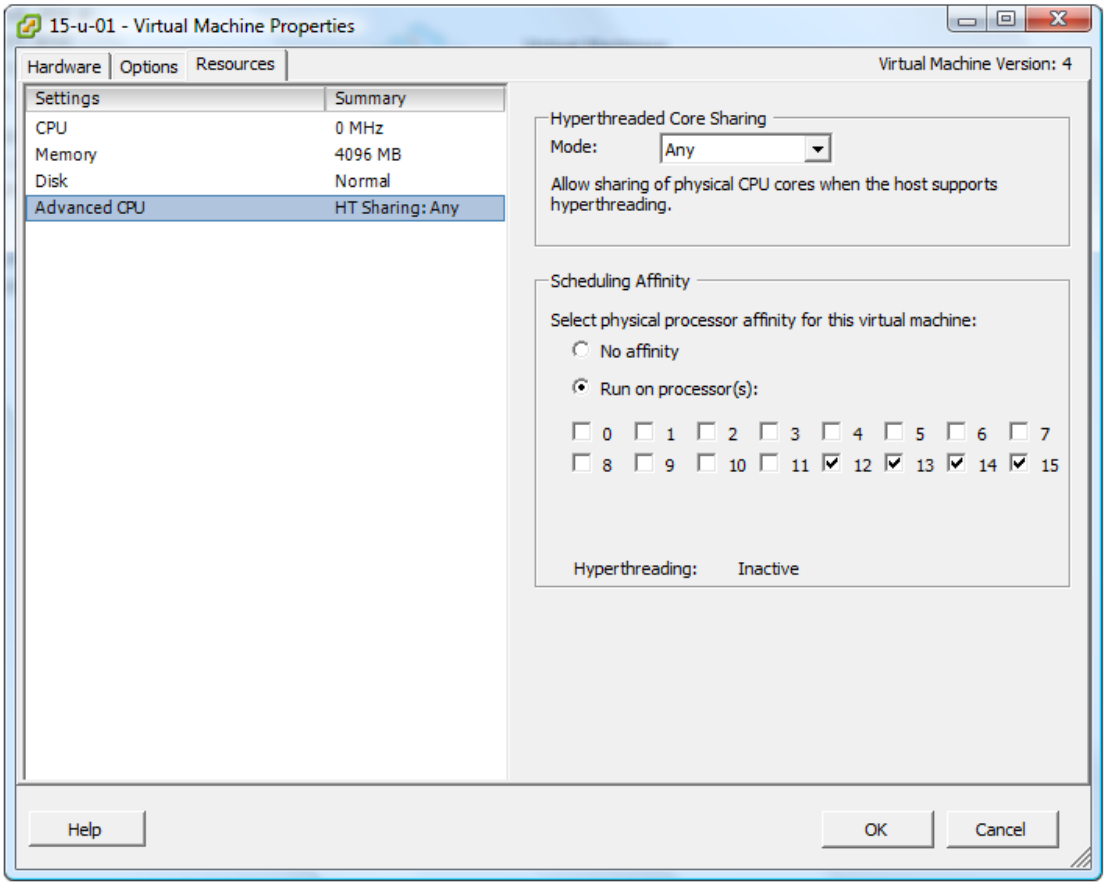
The CPU Affinity feature of VMware ESX is the mechanism used to dedicate CPU cores. CPU Affinity is applied at the virtual-machine level and restricts the CPU cores on which a given virtual machine is allowed to execute.

For CPU Affinity to effectively partition CPU resources so that the Cisco Unity virtual machines have a dedicated one-to-one mapping of physical CPU core to vCPU, the following conditions must be met:

- All virtual machines running on the VMware ESX host must have CPU Affinity configured.
- Each Cisco Unity virtual machine must be configured to execute on as many cores as vCPUs configured.
- No other virtual machine running on the ESX host can be assigned a core that is assigned to a Cisco Unity virtual machine.

Figure 1-1 shows CPU Affinity settings for a Cisco Unity virtual machine with four vCPUs.

Figure 1-1 CPU Affinity Settings



If unallocated CPU cores exist after provisioning the Cisco Unity virtual machines, then third-party virtual machines are permitted to run on the same VMware ESX host. Cisco does not require the third-party virtual machines to have dedicated one-to-one mappings of physical CPU core to vCPU core, as is required for the Cisco Unity virtual machines. The unallocated CPU cores can be pooled together and shared between the third-party virtual machines without undermining the performance of the Cisco Unity virtual machines running on the same VMware ESX host.

When configuring CPU Affinity with a multiprocessor virtual machine, the assigned CPU cores must be on the same CPU die. Doing so greatly improves performance by keeping interprocessor communication on die and is required to achieve the scalability numbers described in the "Cisco Unity Virtual Machine Templates" section on page 1-5.

With VMware ESX, the console operating system runs on CPU 0. We recommend that you do not configure Cisco Unity virtual machines to use CPU 0, particularly if you run scripts or agents in the console operating system, as it may impact Cisco Unity voice quality and capacity.

Memory

Revised May 7, 2010

Note The information in this section applies to virtualized Cisco Unity application servers and to virtualized Cisco Unity voice-recognition servers. For virtualized servers running the Voice Mail Run-Time Edition of Microsoft Exchange Server 2003, the settings are recommended.

Each Cisco Unity virtual machine must have the Memory Reservation for the full amount of memory allocated to the virtual machine. For example, if the virtual machine has 4 GB of RAM allocated, the Memory Reservation must be set to 4096 MB.

Disk

Revised May 7, 2010

Note The information in this section applies to virtualized Cisco Unity application servers and to virtualized Cisco Unity 7.0 voice-recognition servers. (The Windows-based utilities referred to are not supported with Cisco Unity 8.x voice-recognition software, which runs on the Linux operating system.) For virtualized servers running the Voice Mail Run-Time Edition of Microsoft Exchange Server 2003, the settings are recommended.

Table 1-2 lists the minimum performance requirements that each Cisco Unity virtual machine hard disk must meet, as reported by Microsoft Windows Performance Monitor or by the Cisco Unity Performance Information and Diagnostics utility.

Table 1-2 Minimum Performance Requirements

Performance Monitor Object	Requirement
PhysicalDisk\% Idle Time	Average greater than 25 (during a busy hour)
PhysicalDisk\Avg. Disk sec/Read	Less than 0.25
PhysicalDisk\Avg. Disk sec/Write	Less than 0.25
PhysicalDisk\Current Disk Queue Length	Less than 4

While troubleshooting a Cisco Unity virtual machine, Cisco TAC asks for log output from the Cisco Unity Performance Information and Diagnostics utility. If any disk is not performing at or better than the minimum requirements, Cisco TAC will decline support until the system is performing at or above the minimum requirements.

The virtual disk layouts for Cisco Unity virtual machines defined in the "Cisco Unity Virtual Machine Templates" section on page 1-5 were designed to provide maximum flexibility with regard to LUN placement and I/O segmentation. In addition, the appendix "Performance Test Information" provides disk I/O characterization data to aid the storage architect with successful design.

Storage design is left to your discretion, with the exception of requiring shared Fibre Channel storage.

Network

Revised May 7, 2010

Note The information in this section applies to virtualized Cisco Unity application servers and to virtualized Cisco Unity voice-recognition servers. For virtualized servers running the Voice Mail Run-Time Edition of Microsoft Exchange Server 2003, the settings are recommended.

Network design is left to your discretion, with the exception of requiring gigabit or faster NICs.

When multiple virtual machines share the same VMware ESX host physical network interface, there is the possibility of contention for inbound and outbound bandwidth. Inbound bandwidth contention can be managed with Quality of Service (QoS) in a hardware switch. The VMware ESX soft switch does not support the same QoS capabilities for outbound traffic, making contention more difficult to manage dynamically.

One way to avoid outbound contention completely is to dedicate a NIC on the VMware ESX hosts to the Cisco Unity virtual machines. This, however, is not a requirement. Deploying 10 Gigabit Ethernet and/or link aggregation with Link Aggregation Control Protocol or Cisco EtherChannel can help reduce or eliminate the possibility of outbound contention as well. In testing, the VMware ESX software switch rate-limiting feature also proved capable, although using the feature might be impractical for most customers.

The appendix "Performance Test Information" provides network I/O characterization data to aid the network architect with design. Additional factors the architect should consider are any third-party virtual machines that will share the outbound interface with the Cisco Unity virtual machines. A file server might not be the best candidate to share bandwidth with Cisco Unity virtual machines, whereas a low-traffic print server might be. Examining the historical traffic patterns of coresident virtual machines through the VMware Infrastructure client could prove helpful.

Unfortunately, there is no simple method to detect outbound contention from within a virtual machine. In situations where inbound or outbound contention is suspected, troubleshooting will need to occur from the switch(es) to which the VMware ESX host links.

Redundancy

Revised May 7, 2010

Note The information in this section applies to virtualized Cisco Unity application servers.

With storage fabric redundancy, failover is not instantaneous. During a failover event, the Cisco Unity system cannot write to disk, and it pauses—typically for 1 to 2 minutes—until the event completes.

For this reason, we recommend that customers deploying Cisco Unity application virtual machines do so with the Cisco Unity failover feature. To get the full benefits of failover, there must be careful consideration given to redundancy of the underlying server, network, and storage infrastructure.

Note If a failover event happens because of a storage redundancy event, there is no information within the Cisco Unity virtual machine to determine that the failover event was caused by the storage event. You need to coordinate with the teams that manage the components of the storage infrastructure to conduct cause analysis.

Disaster Recovery

Disaster recovery for Cisco Unity virtual machines supports the same in-host techniques as Cisco Unity messaging on physical servers: the Cisco-provided Cisco Unity Disaster Recovery tools (DiRT) and optional third-party backup applications.

Virtualization and storage networks allow for new out-of-host disaster-recovery techniques. Examples include snapshots, entire virtual machine backups, and multisite recovery scripts with products such as VMware Site Recovery Manager. You can use out-of-host disaster-recovery techniques, provided disk-performance minimums are maintained.

Caution Disaster-recovery techniques that rely on snapshot or synchronous interdata-center I/O writes can have a negative impact on disk performance.

Licensing

Licensing of Cisco Unity messaging on VMware ESX is identical to Cisco Unity licensing on physical hardware. (See also the "Technical Support" section on page 1-12.)

Platform Migration

Revised April 21, 2010

Migrating a Cisco Unity physical server to a virtual machine is supported only by using the process for replacing a server, as described in the Cisco Unity documentation:

- For Cisco Unity 8.x—See the "Replacing or Converting a Cisco Unity 8.x Server, or Upgrading to Windows 2003" chapter of the *Reconfiguration and Upgrade Guide for Cisco Unity Release 8.x* at http://www.cisco.com/en/US/docs/voice_ip_comm/unity/8x/upgrade/guide/8xcurugx.html.
- For Cisco Unity 7.0—See the "Replacing or Converting a Cisco Unity 5.x Server, or Upgrading to Windows 2003" chapter of the applicable *Reconfiguration and Upgrade Guide for Cisco Unity Release 5.x* at http://www.cisco.com/en/US/products/sw/voicesw/ps2237/prod_installation_guides_list.html.

Note Content and instructions in the 5.x *Reconfiguration and Upgrade Guides* apply to reconfiguring version 7.0 as well. See also the "New Functionality," "Changed Functionality," and "Documentation Updates" sections of *Release Notes for Cisco Unity Release 7.0(2)* at http://www.cisco.com/en/US/docs/voice_ip_comm/unity/7x/release/notes/702curelnotes.html.

Converting or migrating a Cisco Unity physical server to a virtual machine in any other way—including by using physical-to-virtual migration tools from VMware or other third parties—is not supported.

If the Cisco Unity physical server has a Cisco-provided embedded Windows Server license, it is not transferable to the virtual machine.

Technical Support

Revised April 21, 2010

To virtualize Cisco Unity messaging, customers provide the hardware, VMware ESX software, and Microsoft Windows Server software, and are responsible for coordinating technical support for these components, including provisioning and performance troubleshooting.

Cisco TAC does not provide technical support for provisioning the VMware ESX environment or the Cisco Unity virtual machines. The expectation is that the customer has sufficient experience to complete these processes.

When Cisco Unity is installed in a Unified Messaging configuration, IBM Lotus Domino or Microsoft Exchange can be installed on any hypervisor supported by IBM or Microsoft, respectively. In addition, Active Directory domain controllers/global catalog servers (DC/GCs) can be installed on any hypervisor supported by Microsoft. (Cisco does not provide technical support for message-store servers or for DC/GCs.)

Note For virtualization, Domino is supported only for use with Cisco Unity 7.0(2). With the release of Cisco Unity 8.x, Domino is no longer supported.

Cisco TAC provides technical support only for Cisco Unity software and the related Cisco-provided components.

APPENDIX A

Performance Test Information

This appendix contains the following sections:

- Test Scenarios, page A-1
- Network I/O Test Results, page A-3
- Disk I/O Test Results, page A-4
- Voice Quality Comparison, page A-6

Test Scenarios

Revised April 2, 2009

Load testing was conducted against sample large-scale and medium-scale virtualized Cisco Unity deployments. Characteristics of network I/O and disk I/O are provided to aid design of the host infrastructure for Cisco Unity virtual machines.

Network I/O was collected for a period of 5 minutes with the Cisco Network Analysis Module.

Disk I/O was collected for a period of 10 minutes with the VMware vscsiStats utility. VMware vscsiStats is a disk I/O workload characterization utility that presents results in histogram format on a per-vDisk basis. (VMware provides additional details on vscsiStats on its website—search for the document *Easy and Efficient Disk I/O Workload Characterization in VMware ESX Server;* the filename is iiswc_2007_distribute.pdf.)

The Cisco Unity server had the following macro traces turned on: Call Flow Diagnostics; Call Control (MIU) Traces–For TAPI Systems (only the TAPI subtrace was on); and Skinny TSP Traces. The diagnostics at these levels caused an increase in the disk I/O, which is reflected in the test results provided. These diagnostic traces represent a typical level of diagnostics for troubleshooting but do not represent the maximum possible set of diagnostic traces.

Load Servers Used in Large-Deployment Scenario

- Four Bomber XP call generators. Bomber XP, a Cisco load-generation tool, was configured to apply the standard load associated with a 144-port configuration.
- One HTTP-generation server, which simulated web requests to the Cisco Personal Communications Assistant website. This server made 100 requests per minute across 15,000 subscribers.

- One IMAP-generation server, which simulated typical end-user IMAP activity. This server did a login and logout once every three hours for 1,875 mailboxes. Within the three-hour loop, it fetched a message once per hour, changed message flags 15 times per hour, expunged messages three times per hour, and polled the message box once per minute.

Load Servers Used in Medium-Deployment Scenario

Added April 2, 2009

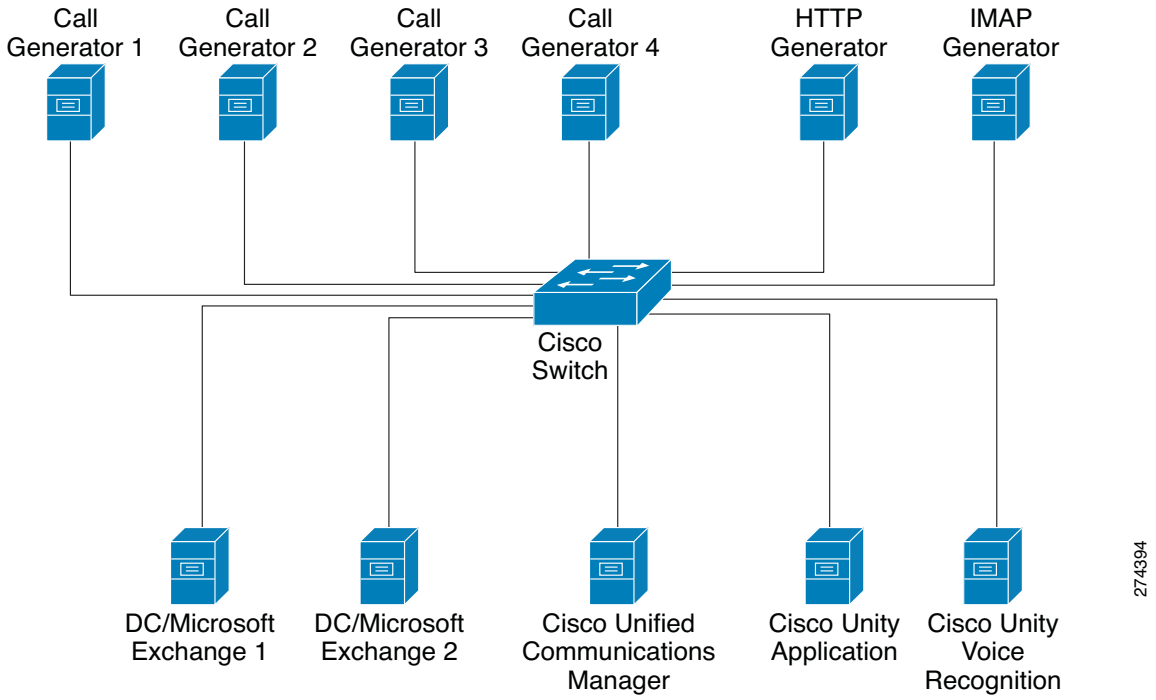
- Two Bomber XP call generators. Bomber XP, a Cisco load-generation tool, was configured to apply the standard load associated with a 48-port configuration.
- One HTTP-generation server, which simulated web requests to the Cisco Personal Communications Assistant website. This server made 60 requests per minute across 5,000 subscribers.
- One IMAP-generation server, which simulated typical end-user IMAP activity. This server did a login and logout once every three hours for 1,250 mailboxes. Within the three-hour loop, it fetched a message once per hour, changed message flags 15 times per hour, expunged messages three times per hour, and polled the message box once per minute.

Network Layout

Revised April 2, 2009

Figure A-1 shows the network layout used for the large-deployment scenario; the network layout for the medium-deployment scenario was basically the same, except that only the Exchange 1 server was used.

Figure A-1 Network Layout



Disk Layouts

Revised April 2, 2009
The following disk layouts were used:

Cisco Unity Application Server

- Disk 1: Operating system files
- Disk 2: Binaries
- Disk 3: SQL logs, Cisco Unity logs
- Disk 4: SQL/Cisco Unity database, Cisco Unity Message Repository

Exchange 1 and Exchange 2 Servers

- Disk 1: Operating system files
- Disk 2: Binaries
- Disk 3: Exchange logs, Active Directory logs
- Disk 4: Exchange database, Active Directory database

Note The medium-deployment tests used only the Exchange 1 server.

Cisco Unity Voice-Recognition Server

- Disk 1: Operating system files, binaries

Network I/O Test Results

The following sections detail the network I/O test results:

- Large-Deployment Network I/O Test Results, page A-3
- Medium-Deployment Network I/O Test Results, page A-4

Large-Deployment Network I/O Test Results

Revised April 2, 2009
Table A-1 shows the traffic generated among the servers in a typical large virtualized Cisco Unity deployment.

Table A-1 Network Traffic—Large Deployment

Server	Send (bytes/sec)	Receive (bytes/sec)
Cisco Unified Communications Manager – Call Generators	24289	13671
Cisco Unity Application – Cisco Unified Communications Manager	13330	27576
Cisco Unity Application – HTTP Generator	125045	3815
Cisco Unity Application – Call Generators	1592626	291459

Table A-1 Network Traffic—Large Deployment (continued)

Server	Send (bytes/sec)	Receive (bytes/sec)
Cisco Unity Application – Cisco Unity Voice Recognition	66438	10126
Exchange 1 – IMAP Generator	734626	45516
Exchange 1 – Exchange 2	161871	49850
Exchange 1 – Cisco Unity Application	381668	317919
Exchange 2 – Cisco Unity Application	228356	121992

Medium-Deployment Network I/O Test Results

Added April 2, 2009

Table A-2 shows the traffic generated among the servers in a typical medium virtualized Cisco Unity deployment.

Table A-2 Network Traffic—Medium Deployment

Server	Send (bytes/sec)	Receive (bytes/sec)
Cisco Unified Communications Manager – Call Generators	8680	5025
Cisco Unity Application – Cisco Unified Communications Manager	4384	8549
Cisco Unity Application – HTTP Generator	82404	2355
Cisco Unity Application – Call Generators	741653	134095
Cisco Unity Application – Cisco Unity Voice Recognition	93758	13883
Exchange 1 – IMAP Generator	171253	10817
Exchange 1 – Cisco Unity Application	227842	166710

Disk I/O Test Results

The following sections detail the disk I/O test results:

- Large-Deployment Disk I/O Test Results, page A-4
- Medium-Deployment Disk I/O Test Results, page A-5

Large-Deployment Disk I/O Test Results

Revised April 2, 2009

Table A-3 shows a high-level overview of the disk I/O test results in a typical large virtualized Cisco Unity deployment.

For the full output of large-deployment disk I/O test results provided by the VMware vscsiStats utility, see the document on the Cisco Unity Tools website at http://www.ciscounitytools.com/Documents/Virtualization/VirtualUnityLargeScenario-DiskIO.xls.

Table A-3 Overview of Disk I/O Test Results—Large Deployment

Disk	Total IOPS[1]	Top IOPS Block Size as Percentage of Total IOPS	Read/Write Percent Ratio
Cisco Unity Disk 1	37	4096 at 43%	2 / 98
Cisco Unity Disk 2	72	65536 at 66%	45 / 55
Cisco Unity Disk 3	56	512 at 48%	4 / 96
Cisco Unity Disk 4	7	8192 at 89%	63 / 37
Exchange DC1 Disk 1	5	4096 at 73%	64 / 36
Exchange DC1 Disk 2	4	4096 at 62%	0 / 100
Exchange DC1 Disk 3	32	512 at 56%	0 / 100
Exchange DC1 Disk 4	489	4096 at 80%	58 / 42
Exchange DC2 Disk 1	2	4096 at 57%	2 / 98
Exchange DC2 Disk 2	4	4096 at 59%	0 / 100
Exchange DC2 Disk 3	16	512 at 59%	0 / 100
Exchange DC2 Disk 4	88	4096 at 74%	49 / 51
Cisco Unity Voice-Recognition Disk	2	4096 at 58%	0 / 100

1. I/O operations per second.

Medium-Deployment Disk I/O Test Results

Added April 2, 2009

Table A-4 shows a high-level overview of the disk I/O test results in a typical medium virtualized Cisco Unity deployment.

For the full output of medium-deployment disk I/O test results provided by the VMware vscsiStats utility, see the document on the Cisco Unity Tools website at http://www.ciscounitytools.com/Documents/Virtualization/VirtualUnityMediumScenario-DiskIO.xls.

Table A-4 Overview of Disk I/O Test Results—Medium Deployment

Disk	Total IOPS[1]	Top IOPS Block Size as Percentage of Total IOPS	Read/Write Percent Ratio
Cisco Unity Disk 1	31	4096 at 49%	0 / 100
Cisco Unity Disk 2	16	65536 at 44%	33 / 66
Cisco Unity Disk 3	37	4096 at 43%	2 / 98
Cisco Unity Disk 4	1	8192 at 91%	59 / 41
Exchange DC1 Disk 1	4	4096 at 74%	58 / 42
Exchange DC1 Disk 2	1	4096 at 96%	0 / 100
Exchange DC1 Disk 3	19	512 at 63%	0 / 100

Table A-4 Overview of Disk I/O Test Results—Medium Deployment (continued)

Disk	Total IOPS[1]	Top IOPS Block Size as Percentage of Total IOPS	Read/Write Percent Ratio
Exchange DC1 Disk 4	280	4096 at 80%	64 / 36
Cisco Unity Voice-Recognition Disk	2	4096 at 59%	0 / 100

1. I/O operations per second.

Voice Quality Comparison

Added April 2, 2009

Figure A-2 and Figure A-3 show the mean and maximum jitter statistics gathered from a Cisco Unity virtual machine and a Cisco Unity physical server, captured under a 144-port load for 5 minutes.

The Cisco Unity virtual machine shows more jitter than the Cisco Unity physical server. However, the amount of jitter is within the range typically buffered by endpoints, such as IP phones and gateways.

Figure A-2 Mean Jitter Statistics

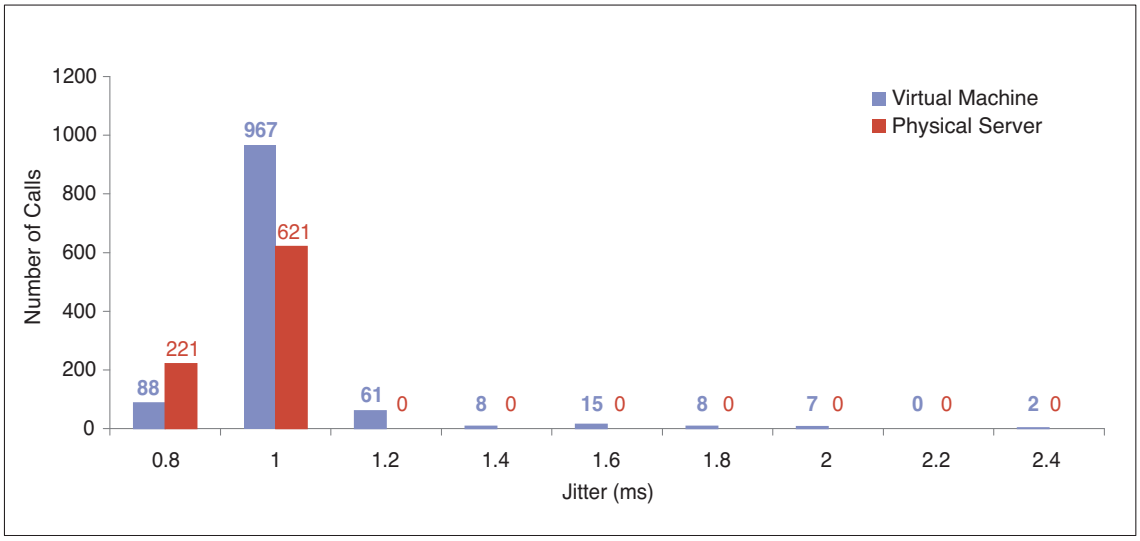


Figure A-3 Maximum Jitter Statistics