



## **Virtualization Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted**

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## Preface

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### Purpose

This manual provides information to help you understand, install, and implement the Virtualization Solution. The Virtualization Solution is supported for Cisco Unified Intelligent Contact Management (Unified ICM) and Cisco Unified Contact Center Enterprise (Unified CCE).

### Audience

This document is intended for the users of Unified ICM software, implementing the Virtualization Solution for Unified ICM and Unified CCE.

### Organization

The following table describes the information contained in each chapter of this guide.

| Chapter   | Description  |
|---|--|
| Chapter 1: <a href="#">Overview (page 5)</a>  | A brief overview of the Virtualization Solution.   |
| Chapter 2: <a href="#">Deployment Configuration Considerations (page 7)</a>                                       | Discusses deployment configuration considerations for PGs and Client AWs on a VMware platform.                 |
| Chapter 3: <a href="#">Virtualization Management Tools (page 11)</a>  | Describes the Virtualization management tools.   |
| Chapter 4: <a href="#">Installation and Configuration of the ESX Server and VMware Management Tools (page 13)</a> | Explains the steps required to configure the ESX Server, explains the installation of VMware Management Tools. |

## Related Documentation

| Chapter  | Description  |
|--|--|
| Chapter 5: <a href="#">Configuring the Virtual Machines (page 17)</a>        | Explains how to configure and install ICM components on a Virtual machine. Explains the procedure to remote control and monitor a Virtual machine. |
| Chapter 6: <a href="#">System Backup and Migration (page 33)</a>             | Explains the procedures to backup the Virtual Machines.  |
| Chapter 7: <a href="#">Unsupported Features and Configurations (page 35)</a> | Lists the features that are not supported on the Unified ICM/CCE virtualized platform.   |

## Related Documentation

Documentation for the Cisco Unified ICM/CCE software and related documentation, is accessible from Cisco.com at: [www.cisco.com](http://www.cisco.com) (<http://www.cisco.com/web/psa/products/index.html?c=278875240>)

## Conventions

This manual uses the following conventions:

| Convention           | Description   |
|----------------------|---|
| <b>boldface font</b> | Boldface font is used to indicate commands, such as user entries, keys, buttons, and folder and submenu names. For example: <ul style="list-style-type: none"> <li>• Choose <b>Edit &gt; Find</b>.</li> <li>• Click <b>Finish</b>.</li> </ul>   |
| <i>italic font</i>   | Italic font is used to indicate the following: <ul style="list-style-type: none"> <li>• To introduce a new term. Example: A <i>skill group</i> is a collection of agents who share similar skills.</li> <li>• For emphasis. Example: <i>Do not</i> use the numerical naming convention.</li> <li>• A syntax value that the user must replace. Example: IF (<i>condition, true-value, false-value</i>)</li> <li>• A book title. Example: See the <i>Cisco CRS Installation Guide</i>.</li> </ul> |
| <b>window font</b>   | Window font, such as Courier, is used for the following: <ul style="list-style-type: none"> <li>• Text as it appears in code or that the window displays. Example: <code>&lt;html&gt;&lt;title&gt;Cisco Systems, Inc. &lt;/title&gt;&lt;/html&gt;</code></li> </ul>   |
| < >                  | Angle brackets are used to indicate the following:  |



| Convention | Description   |
|------------|---|
|            | <ul style="list-style-type: none"><li>• For arguments where the context does not allow italic, such as ASCII output.</li><li>• A character string that the user enters but that does not appear on the window such as a password.</li></ul> |

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# Chapter 1

## Overview

---

The *Virtualization Solution* enables you to run the Unified ICM/CCE Client Administrator Workstations (AWs) and certain Peripheral Gateways (PGs) on VMware's ESX platform.

This will reduce box count for installations that have multiple PGs at the same location and for deployments that require multiple separate desktops solely to support Client AWs - for example, a supervisor whose primary machine is running an operating system that is not supported by the Client AW, needs a separate machine in order to run Client AW. Reduced box count helps reduce general management overhead.

This manual assumes that you have the proper VMware infrastructure training, and have acquired the necessary knowledge and experience regarding deployment and management of VMs. Also, although Cisco has performed due diligence in testing, Cisco does not provide support on VMware products. Contact VMware or VMware partners for all VMware product support and training.

Currently Cisco supports virtualization only for Unified ICM/CCE Client AWs and certain PGs on VMware's ESX platform. All other Unified ICM/CCE components, including CallRouter, Logger, AW Distributor, Historical Data Server (HDS), WebView Server, Cisco Agent Desktop (CAD) Server, are at this time not supported running on VMs.

For the Central Processing Unit (CPU) resources to handle critical Call Center operations, one or more dedicated CPU processors must be allocated to the VMs. To avoid interference from other non-ICM applications, do not have a co-resident deployment with non-ICM application VMs running on the same ESX Server.

The VMs deployed in a Virtualization solution must be run on one of the Cisco servers listed as supported in the *Hardware & System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted, Release 7.5(x)*.





# Chapter 2

## Deployment Configuration Considerations

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This chapter discusses deployment configuration considerations for PGs and Client AWs on a VMware platform.

This chapter contains the following topics:

- [Supported and Not Supported PGs on Virtual Machines, page 7](#)
- [Configuration Considerations for the PGs, page 7](#)
- [Configuration Considerations for the Agent PGs, page 8](#)
- [Configuration Considerations for the Unified CCE Gateway PG, page 9](#)
- [Configuration Considerations for the VRU PGs, page 9](#)
- [Configuration Considerations for the MR PG, page 9](#)
- [Configuration Considerations for the Time Division Multiplexing \(TDM\) ACDs PG, page 10](#)
- [Configuration Considerations for the Client AWs, page 10](#)

### Supported and Not Supported PGs on Virtual Machines

In general, all PGs are supported in the VMware ESX environment with the exception of limited TDM PG types utilizing non-standard communications links. Additionally, certain PG configuration options, such as the MR PG with Outbound Dialer, are unsupported at this time. For detailed information on supported PGs, refer to the section "Server Virtualization" in the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted*, available at [http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products\\_user\\_guide\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products_user_guide_list.html)

### Configuration Considerations for the PGs

For PG capacity information and VM resource requirements, refer to the section "Server Hardware Requirements" in the *Hardware and System Software Specification (Bill of Materials)*

for Cisco Unified ICM/Contact Center Enterprise & Hosted, available at [http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products\\_user\\_guide\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products_user_guide_list.html).

The following considerations are applicable to all the PGs in the Virtualization deployment:

- You can install only one PG per VM.
- For hardware redundancy and fault tolerance, you should not place Side A and Side B PGs on the same ESX Server. It is **required** that you have two separate ESX Servers, one for each side of the PG deployment.
- Assign the same number of vCPUs as the number of assigned processors for the VM in your ESX affinity scheduling. Specify the number of vCPUs during the virtual machine creation and assign processors to the virtual machine after you have created the VM. (A vCPU is a virtual CPU, which is emulated by the ESX Server hypervisor layer.)

## Configuration Considerations for the Agent PGs

The Unified CM PG, Unified CCE Generic/System PG, and Unified ICM ARS PG are referred to as Agent PGs in this manual.

The ARS PG provides agent routing services, and it integrates TDM peripherals with ICM.

The following configuration considerations are applicable for deploying Agent PGs on VMs:

- The sizing capacity of the Agent PG VM is based on the “Operating Conditions” and “Additional Sizing Factors” described in the *Cisco Unified Contact Center Enterprise 7.5 Solution Reference Network Design (SRND)* (Chapter: Sizing Unified CCE Components and Servers), available at: [www.cisco.com](http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/ipcc_enterprise/srnd/75/ccsrnd75.html) ([http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cust\\_contact/contact\\_center/ipcc\\_enterprise/srnd/75/ccsrnd75.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/ipcc_enterprise/srnd/75/ccsrnd75.html)).
- The sizing capacity of the Agent PG VM is based on the CTI OS server being co-resident with the Agent PG on the same Virtual Machine, and on up to five skill groups per agent.
- You can have only one PIM per Agent PG.
- If there are more than five skill groups per agent, refer to the chapter “Sizing Unified CCE Components and Servers” in the *Cisco Unified Contact Center Enterprise 7.5 Solution Reference Network Design (SRND)*, available at: [www.cisco.com](http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/ipcc_enterprise/srnd/75/ccsrnd75.html) ([http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cust\\_contact/contact\\_center/ipcc\\_enterprise/srnd/75/ccsrnd75.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/ipcc_enterprise/srnd/75/ccsrnd75.html)).
- You cannot install Mobile Agent on Agent PGs running on VMs.

The Agent PG Deployment Configuration is explained via the following examples:

### **Example 1: Agent PG Deployment with 4 PGs on an ESX Server.**

In this configuration,

- There are four Agent PG VMs on an ESX Server, with one Agent PG per VM.
- Three PG VMs have affinity scheduled for two physical processors and 4GB RAM.
- One PG VM has affinity scheduled for one physical processor and 2GB RAM.

**Example 2: Agent PG Deployment with seven PGs on an ESX Server.**

In this configuration,

- There are seven Agent PG VMs on an ESX Server, with one Agent PG per VM.
- Each of the seven PG VMs has affinity scheduled for one physical processor and 2GB RAM.

## Configuration Considerations for the Unified CCE Gateway PG

The following configuration considerations are applicable for deploying the Unified CCE Gateway PGs on VMs:

- The maximum number of skill groups per agent on the child is five.
- A Unified CCE Gateway PG can manage multiple child Unified CCE peripherals, with up to five child systems.

For information on general ICM Parent/Child deployment options, refer to the *Cisco Unified Contact Center Enterprise 7.5 Solution Reference Network Design (SRND)* (Section "Parent/Child"), available at [www.cisco.com](http://www.cisco.com) ([http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cust\\_contact/contact\\_center/ipcc\\_enterprise/srnd/75/ccsrnd75.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cust_contact/contact_center/ipcc_enterprise/srnd/75/ccsrnd75.html)).

## Configuration Considerations for the VRU PGs

For VRU PG capacity information and VM resource requirements, refer to the section "Server Hardware Requirements" in the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted*, available at [http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products\\_user\\_guide\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products_user_guide_list.html).

## Configuration Considerations for the MR PG

For the MR PG capacity information and its VM resource requirements, refer to the section "Server Hardware Requirements" in the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted*, available at [http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products\\_user\\_guide\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products_user_guide_list.html).

**Note:** Deploying an MR PG on a VM in an Outbound Option configuration is not supported.

## Configuration Considerations for the Time Division Multiplexing (TDM) ACDs PG

The following considerations are applicable to all the TDM ACD PGs in a Virtualization deployment:

- You can install only one PIM per TDM ACD PG.
- The sizing capacity of the TDM ACD PG is based on five skill groups per agent. (The Avaya PG is an exception. See the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted* for details.)
- Running the TDM ACD PGs with the MR PG and the Outbound Option Dialer co-resident on the same VM is not supported.

## Configuration Considerations for the Client AWs

You must create the Client AW VM using only one vCPU. The ESX CPU affinity scheduling for Client AW VMs depends on whether you choose to deploy only Client AW VMs, or a mix of Client AW VMs and PG VMs on a single ESX Server.

The two types of Client AW Virtualization deployment options are:

- **Client AW Deployment Option 1 (Client AW VMs only)**
  - In this case, allocate a dedicated ESX Server for running Client AW VMs only. Ensure that no other application component VMs are running on this ESX Server.
  - Only one Client AW per VM.
  - The ESX CPU affinity scheduling is not used. The CPU processors are shared among the VMs and are managed by the ESX kernel.
- **Client AW Deployment Option 2 (Co-resident with PG VMs)**
  - You can have Client AW VMs co-resident with PG VMs.
  - Since Client AW is co-resident with PG virtual machines, the CPU affinity scheduling is used. Up to two Client AW VMs can share one physical processor, i.e., if you have two Client AW VMs, you should assign the same processor to both of them.





# Chapter 3

## Virtualization Management Tools

The following table lists the tools required to deploy and manage the virtualization environment.

**Table 1: Virtualization Management Tools**

| <b>Tools</b>                            | <b>Description</b>  | <b>Source</b>   |
|---|---|---|
| VMware Infrastructure Client 2.5        | This tool allows the central management of virtual machines on a virtual host machine.  | You can download from VMware. This is packaged along with the ESX Server. |
| VMware Tools                            | VMware drivers that allow your virtual machines to run more optimally and allow you to manage them more efficiently.  | The VMware tools are packaged along with the ESX software.                |
| Veeam FastSCP 2.0 for VMware ESX Server | Veeam FastSCP is a tool to perform file management in the ESX environment. FastSCP allows you to copy files from one ESX Server to another ESX Server.  | You can download it from VMware.  |
| WinSCP 4.0.5 or later                   | A tool that allows Windows machines SSH access to Linux systems, such as ESX Server. You can perform file transfer between the Windows machine and the ESX Server. Using this tool, you can deliver an ISO file to ESX Server, make a backup copy of an existing virtual machine (VM) or copy VMs and templates between ESX Servers through your Windows machine. | This can be downloaded from the Internet.                                 |
| Putty                                   | A tool that allows you to connect via Secure Shell (SSH), Telnet, and Rlogin to remote Linux/Unix systems, such as the ESX Server.  | This can be downloaded from the Internet.                                 |

The optional VMware Virtual Center tool allows the central management of VMs on multiple host machines, such as virtual machine creation and configuration, remote control, and performance monitoring. You can obtain this software from VMware.

Refer to the User Manual/Online Help of the respective tools for information on using the tools, or contact VMware or VMware partners for training and support.



# Chapter 4

## Installation and Configuration of the ESX Server and VMware Management Tools

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This chapter discusses Unified ICM/CCE specifics involved in the installation and configuration of the ESX Server.

This chapter contains the following topics:

- [Installing the ESX Server Hardware, page 13](#)
- [Configuring ESX Hardware, page 13](#)
- [Installing and Configuring the ESX Software, page 14](#)
- [Installing and Configuring VMware Management Tools, page 16](#)

### Installing the ESX Server Hardware

For virtualization solution hardware and software requirements, see the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted*.

The ESX Server must be configured with the following logical drive configurations:

| Logical Drive | Logical Drive Disks | Usage                        |
|---------------|---------------------|------------------------------|
| 0             | Disk 1 and Disk 2   | ESX Software                 |
| 1             | Disk 3 to Disk 8    | Storage for Virtual Machines |

### Configuring ESX Hardware

The following steps describe the configuration of ESX Server hardware:

- Step 1** Install the additional RAM. The MCS-7845 server (MCS-7845-H2-CCE4 or MCS-7845-I2-CCE4) has 4GB RAM. Additionally, you need to install 16GB RAM in the server. The Virtualization platform server should have 20GB or more of RAM.
- Step 2** Install the additional Ethernet adapters. The MCS-7845 server has two Ethernet ports. Additionally, you need to install two dual Ethernet adapters on the server. This provides a total of six ethernet ports.
- Step 3** Install the server on the rack, and connect the cables for the power, KVM (for keyboard, mouse, and monitor), and the network.
- Step 4** Turn on the server.
- Step 5** Configure RAID. There are a total of 8 drives on this machine. Drives 1 to 2 are configured as RAID 1, and drives 3 to 8 are configured as RAID 1+0. Here is an example of steps to set up RAID for the MCS-7845-H2-CCE4 server.
- a. During startup, hit the "F8" key for ROM configuration.
  - b. Select the **Create Logical Drive** menu.
  - c. Check the drives 1 and 2 and RAID 1+0. (Note: Since there are two disks for logical drive 0, the HP Option ROM Configuration for Arrays tool will configure them as RAID 1.)
  - d. Select **Save**. This will be the logical drive 0, which is used for the installation of the ESX software.
  - e. Select the **Create Logical Drive** menu again.
  - f. Check drives 3 to 8 and RAID 1+0.
  - g. Select **Save**. This will be the logical drive 1, which is used for the storage of the VMs.
  - h. Reboot the machine.
- 

## Installing and Configuring the ESX Software

**Note:** Before installing the ESX software, refer to the *VMware Infrastructure 3 Online Library – ESX Server 3 Edition*, available at: [www.vmware.com](http://www.vmware.com). (<http://pubs.vmware.com/vi35/wwhelp/wwhimpl/js/html/wwhelp.htm>)

For information on how to install the ESX software, refer to the section "Installing ESX Server" in the *VMware ESX Server 3 Installation Guide*, which is available for download at: [www.vmware.com](https://www.vmware.com/pdf/vi3_35/esx_3/r35/vi3_35_25_installation_guide.pdf). ([https://www.vmware.com/pdf/vi3\\_35/esx\\_3/r35/vi3\\_35\\_25\\_installation\\_guide.pdf](https://www.vmware.com/pdf/vi3_35/esx_3/r35/vi3_35_25_installation_guide.pdf))

While you navigate through the ESX installer, you will see a screen which allows you to set up partitions on your logical drives. Select the installation options and the configuration values as described in the following section:

### Partition the logical Drive 0

This logical drive is used for the installation of the ESX software. To create a partition, set the configuration values as follows:

Logical Drive 0

- **Boot**
  - Create a new partition on drive 0.
  - Select **/boot** from mount point, **ext3** from file system type drop-down menu.
  - Allocate 100MB.
  - Make Primary.
- **Swap**
  - Create a new partition on drive 0.
  - Select **Swap** from the file system type drop-down menu.
  - Allocate 1.5 x RAM size, 30GB for 20GB of physical RAM.
  - Make Primary.
- **Root**
  - Edit the free partition on drive 0.
  - Select **/** from mount point, **ext3** from the file system type drop-down menu.
  - Use the remaining disk space.
  - Make Primary.

### Partition the logical Drive 1

This logical drive is used for the storage of the VMs.

Logical Drive 1

- Edit the free partition on drive 1.
- Select **vmfs3** from file system type drop-down.
- Use the remaining disk space.
- Make Primary.

### Configure the network and time zone

---

**Installing and Configuring VMware Management Tools**

- Enter the IP configuration information for the ESX Server.
- Provide full node and domain name when entering the network name, e.g., M3P-ESX3.cisco.com. If you do not provide the full name, you may encounter configuration errors.
- Set the time zone for your location.

## Installing and Configuring VMware Management Tools

Install VMware Infrastructure Client on your Windows workstation. You can use this tool to create and monitor VMs, make backups, etc.

You have the option to use VirtualCenter to perform administrative tasks for your virtualized environment. If you already have a VirtualCenter installed in your datacenter, you can just add the ESX hosts or VM cluster to your existing VirtualCenter. Otherwise, you can add the VirtualCenter to your datacenter environment.

To install the VirtualCenter component, follow the VMware *Quick Start Guide* and the *ESX Server 3 Installation Guide*.



# Chapter 5

## Configuring the Virtual Machines

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Refer to the VMware documentation available at [www.vmware.com](http://pubs.vmware.com/vi35/quick_start/wwhelp/wwhtml/common/html/wwhelp.htm?context=quick_start&file=vi_quick_start_manage.5.1.html) ([http://pubs.vmware.com/vi35/quick\\_start/wwhelp/wwhtml/common/html/wwhelp.htm?context=quick\\_start&file=vi\\_quick\\_start\\_manage.5.1.html](http://pubs.vmware.com/vi35/quick_start/wwhelp/wwhtml/common/html/wwhelp.htm?context=quick_start&file=vi_quick_start_manage.5.1.html)), to create VMs for the PGs and Client AWs. The sections in this chapter include the properties of the PG and Client AW VMs, information that you will need when you create and configure the VMs. The sections also contain information on configuring networks for VMs.

This chapter contains the following topics:

- [Virtual Machine Properties for the PG, page 17](#)
- [Virtual Machine Properties for the Client AW, page 18](#)
- [Virtual Machine Resource Management Considerations, page 19](#)
- [Virtual Machine Network Configuration, page 21](#)
- [Installing the VMware Tools, page 30](#)
- [Installing ICM Components on a Virtual Machine, page 31](#)
- [Remote Control of the Virtual Machines, page 31](#)
- [System Monitoring, page 31](#)

### Virtual Machine Properties for the PG

The PG VM CPU and RAM configurations depend on your capacity requirements. For the PG capacity information and its VM CPU and RAM requirements, refer to the section "Server Hardware Requirements" in the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted*, available at [http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products\\_user\\_guide\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/products_user_guide_list.html).

When you create the PG VMs, you need to enter the VM properties specified in the table below.

## Virtual Machine Properties for the Client AW

Table 2: PG and IPCC Gateway Virtual Machine Properties

| Parameter                           | Setting  | Comments  |
|-------------------------------------|--|---|
| Memory (memory for this VM)         | see the <i>Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise &amp; Hosted</i> |   |
| CPUs (number of virtual processors) | see the <i>Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise &amp; Hosted</i> | The number of vCPUs must be the same as the number of assigned processors for the VM in your ESX affinity scheduling. |
| Floppy Drive                        | 1  |   |
| CD/DVD Drive                        | 1  | CD/DVD drive can be used for installing software that is in the ISO format.   |
| Network Adapter                     | 2  | One for the private network and one for the public network  |
| SCSI Controller                     | LSI Logic  |   |
| Hard Disk                           | Disk 1: 25GB   |   |

For the detailed steps about creating a VM, refer to the *VMware Quick Start Guide*, available at: [www.vmware.com](http://pubs.vmware.com/vi35/quick_start/wwhelp/wwhimpl/common/html/wwhelp.htm?context=quick_start&file=vi_quick_start_manage.5.1.html) ([http://pubs.vmware.com/vi35/quick\\_start/wwhelp/wwhimpl/common/html/wwhelp.htm?context=quick\\_start&file=vi\\_quick\\_start\\_manage.5.1.html](http://pubs.vmware.com/vi35/quick_start/wwhelp/wwhimpl/common/html/wwhelp.htm?context=quick_start&file=vi_quick_start_manage.5.1.html)). (Refer to the section "Creating and Managing VMware Infrastructure Components, Creating a Virtual Machine").

## Virtual Machine Properties for the Client AW

When you create the Client AW VMs, you need to enter the VM properties specified in the table below.

Table 3: Client AW Virtual Machine Properties

| Parameter                           | Setting  | Comments   |
|-------------------------------------|--|--|
| Memory (memory for this VM)         | see the <i>Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise &amp; Hosted</i> |  |
| CPUs (number of virtual processors) | see the <i>Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise &amp; Hosted</i> | See the <a href="#">Configuration Considerations for the Client AWs (page 10)</a> section for Client AW VM CPU requirements. |
| Floppy Drive                        | 1  |  |
| CD/DVD Drive                        | 1  |  |
| Network Adapter                     | 1  |  |



| Parameter       | Setting      | Comments |
|-----------------|--------------|----------|
| SCSI Controller | LSI Logic    |          |
| Hard Disk       | Disk 1: 10GB |          |

## Virtual Machine Resource Management Considerations

To achieve consistent system performance, use the VMware ESX CPU affinity scheduling for the PG VMs and for the Client AW VMs if they are co-resident with the PGs. The ESX CPU affinity configuration option allows you to allocate dedicated CPU processors to VMs.

For detailed steps to configure the CPU affinity, refer to the *VMware Resource Management Guide*, available at [www.vmware.com/support](http://www.vmware.com/support) ([http://pubs.vmware.com/vi35/resmgmt/wwhelp/wwhimpl/common/html/wwhelp.htm?context=resmgmt&file=vc\\_advanced\\_mgmt.11.1.html](http://pubs.vmware.com/vi35/resmgmt/wwhelp/wwhimpl/common/html/wwhelp.htm?context=resmgmt&file=vc_advanced_mgmt.11.1.html)). (Refer to the section: "Advanced Resource Management, Using CPU affinity to Assign Virtual Machines to Specific Processors".)

The processor 0 is used by the VMware ESX kernel and the remaining seven processors are assigned to the VMs that require dedicated CPU processors.

**Caution:** You must not schedule CPU affinity that assigns processor 0 to any VMs since processor 0 is used by the ESX kernel.

The following section describes examples of the CPU affinity scheduling for the PG VMs and the Client AW VMs if they are co-resident with the PG VMs.

### Examples of CPU Affinity Scheduling for Agent PG VM

Refer to the sections "[Configuration Consideration for the PGs \(page 7\)](#)" and "[Configuration Consideration for the Agent PGs \(page 8\)](#)" regarding the configuration considerations for Agent PGs. The following examples of the CPU affinity scheduling for Agent PG VM are based on the considerations described in the above sections.

**Example 1:** In this example, each of the three Agent PG VMs has affinity scheduled for two physical processors and an Agent PG VM has affinity scheduled for one physical processor.

**Note:** You must not schedule CPU affinity that assigns processor 0 to any VMs since processor 0 is used by the ESX kernel.

**Table 4: CPU Affinity Scheduling for Four PG VMs on an ESX Server**

| Virtual Machine | ESX CPU Affinity Scheduling |
|-----------------|-----------------------------|
| PG1 VM          | Processors 1 and 2          |
| PG2 VM          | Processors 3 and 4          |
| PG3 VM          | Processors 5 and 6          |
| PG4 VM          | Processor 7                 |

## Virtual Machine Resource Management Considerations

**Example 2:** In this example, there are seven Agent PG VMs, and each of these PG VMs has affinity scheduled for one physical processor.

**Note:** You must not schedule CPU affinity that assigns processor 0 to any VMs since processor 0 is used by the ESX kernel.

**Table 5: CPU Affinity Scheduling for Seven PG VMs**

| Virtual Machine | ESX CPU Affinity Scheduling |
|-----------------|-----------------------------|
| PG 1 VM         | Processor 1                 |
| PG 2 VM         | Processor 2                 |
| PG 3 VM         | Processor 3                 |
| PG 4 VM         | Processor 4                 |
| PG 5 VM         | Processor 5                 |
| PG 6 VM         | Processor 6                 |
| PG 7 VM         | Processor 7                 |

## ESX CPU Affinity Scheduling for the Client AW VMs Co-Resident with the PG VMs

If there is a need to have the Client AWs co-resident with PG VMs, then up to two Client AW VMs can share one physical processor, i.e., if you have two Client AW VMs, you should assign the same processor to both of them. Similarly, you also need to assign dedicated processors to the PG VMs.

Here is an example of CPU affinity scheduling for four Client AW VMs and other PG VMs present on the remaining processors (on the same physical ESX Server):

**Table 6: CPU Affinity Scheduling for 4 Client AW VMs and 3 PG VMs**

| Virtual Machine | ESX CPU Affinity Scheduling |
|-----------------|-----------------------------|
| Client AW VM 1  | Processor 1                 |
| Client AW VM 2  | Processor 1                 |
| Client AW VM 3  | Processor 2                 |
| Client AW VM 4  | Processor 2                 |
| PG VM 1         | Processors 3 and 4          |
| PG VM 2         | Processors 5 and 6          |
| PG VM 3         | Processor 7                 |

## Virtual Machine Resource Management Default Settings

There is no need to change the VM resource management configuration default settings. The following table lists the VM resource management configuration default settings:

**Table 7: VM Resource Management Default Settings**

| Parameters | Shares | Reservation | Limit     |
|------------|--------|-------------|-----------|
| CPU        | Normal | 0           | Unlimited |
| Memory     | Normal | 0           | Unlimited |
| Disk       | Normal | NA          | NA        |

## Virtual Machine Network Configuration

### Configuring the VM Network

To configure the network for the VMs, you create a virtual switch connected to a physical port, then associate the virtual machine's network adapter to this virtual switch.

#### To Add a vSwitch

1. Login to the ESX host using VMware Infrastructure Client
2. Select the ESX host
3. Click on the Configuration tab
4. Click on Hardware/Networking
5. Click on Add Networking...
6. Select Connection Types: Virtual Machine. Click **Next**.
7. Select "Create a virtual switch" and select an associated VM NIC.
8. Enter Port Group Properties/Network label: VM Network n, where n is an integer. (Example: "VM Network 1")
9. Click on **Finish**.

#### To Associate a VM Network Adapter to Network Connection

1. Edit virtual machine settings.
2. Select the Network Adapter.
3. Select a virtual switch from the Network Connection/network label. (Example: "VM Network 1".)
4. Click **OK**.

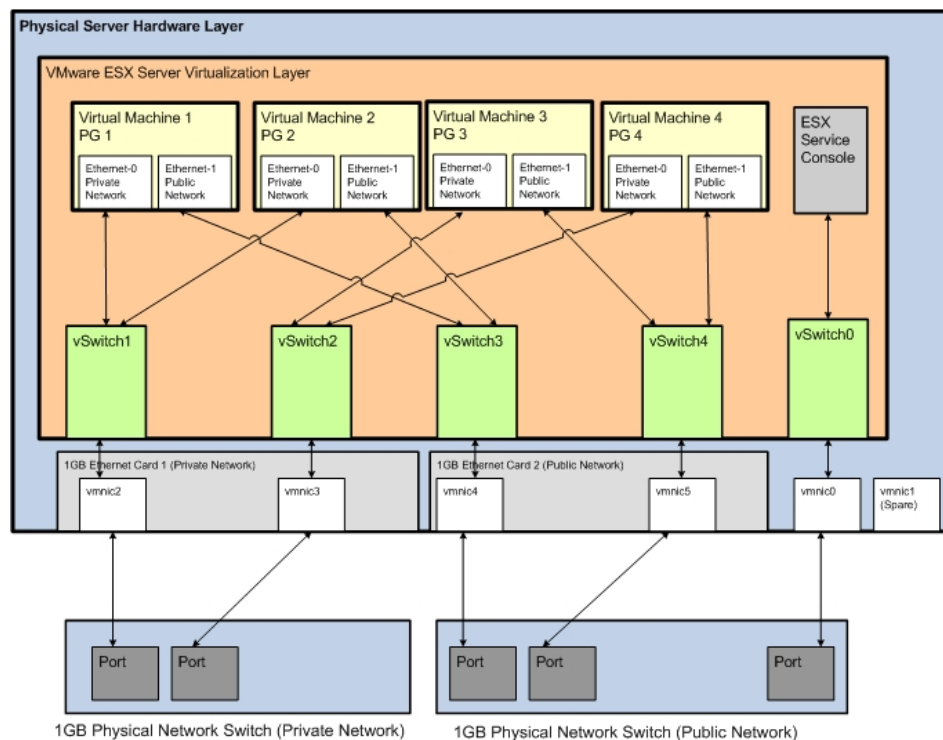
## Virtual Machine Network Configuration for the PGs

You must configure the VMware ESX Server Network based on the following requirements:

- 1GB Ethernet network is recommended. However, you can also use 100MB Ethernet network.
- Six Ethernet ports are distributed as follows:
  - Two ports are provided by the motherboard and one port is connected to the ESX Service Console.
  - Among the two dual port Ethernet adapters, one is connected to the ICM private network and the other is connected to the ICM public network.
- You must follow the section "Server Hardware Configuration Guidelines" in the *Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted* to ensure VM network interface port speed/duplex matching the network switch port capability.

Figure 1 (page 22) shows an example of VMware ESX Server network components and connections for the **four** PGs for Side A. The virtual network for the PG Side B should be configured in a similar way. If fewer PGs are deployed, then the network configuration is scaled accordingly.

Figure 1: VMware ESX Server Network Components and Connections for 4 PGs



In the above example:

- There are four PGs and each PG has two Ethernet connections: one for the private network and one for the public network.
- There are five virtual switches:
  - vSwitch0 – used for the ESX Service Console.
  - vSwitch1 – used for the private network connected to two PGs.
  - vSwitch2 – used for the private network connected to two PGs.
  - vSwitch3 – used for the public network connected to two PGs.
  - vSwitch4 – used for the public network connected to two PGs.

[Figure 2 \(page 24\)](#) shows an example of the ESX networking configuration for four PGs, as seen from the VMware Infrastructure Client.

## Virtual Machine Network Configuration

Figure 2: Example of ESX Networking Configuration for 4 PGs, Side - A

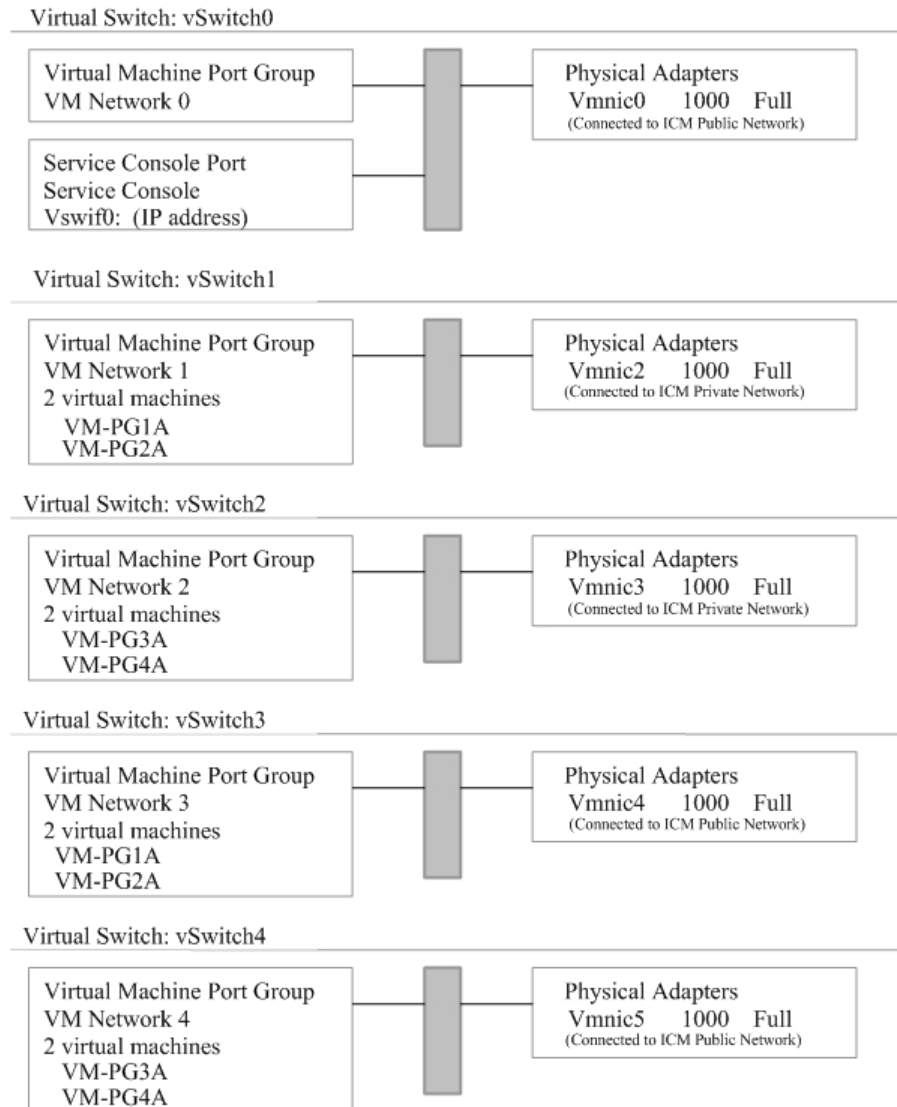
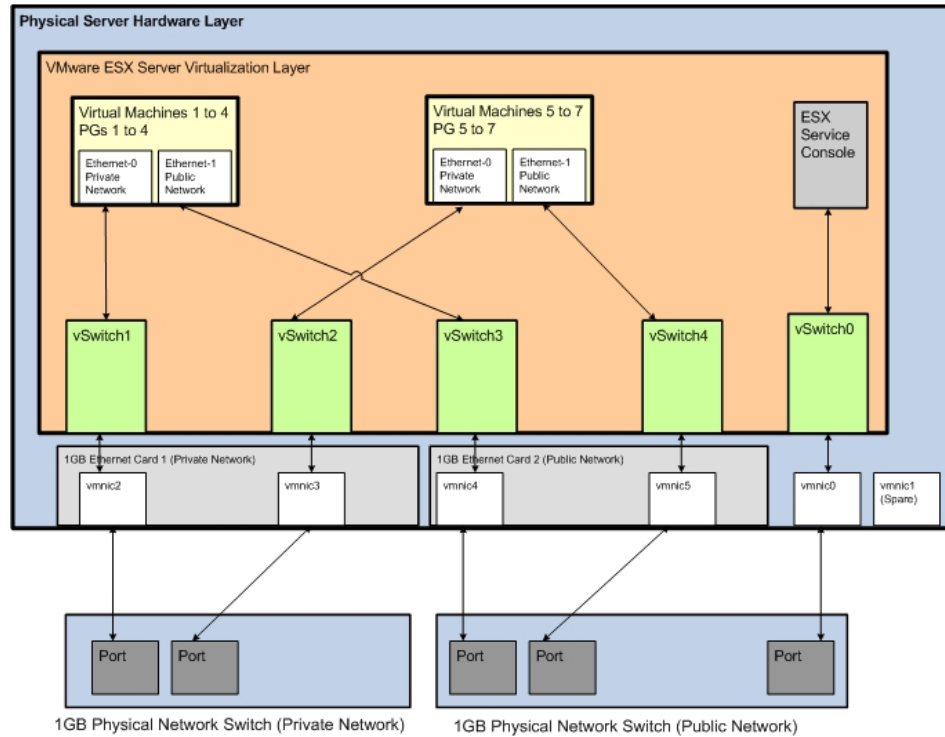


Figure 3 (page 25) shows an example of VMware ESX Server network components and connections for **seven** PGs for side A. The virtual network for the PG Side B should be configured in a similar way. If fewer PGs are deployed, then the network configuration is scaled accordingly.

Figure 3: VMware ESX Server Network Components and Connections for 7 PGs



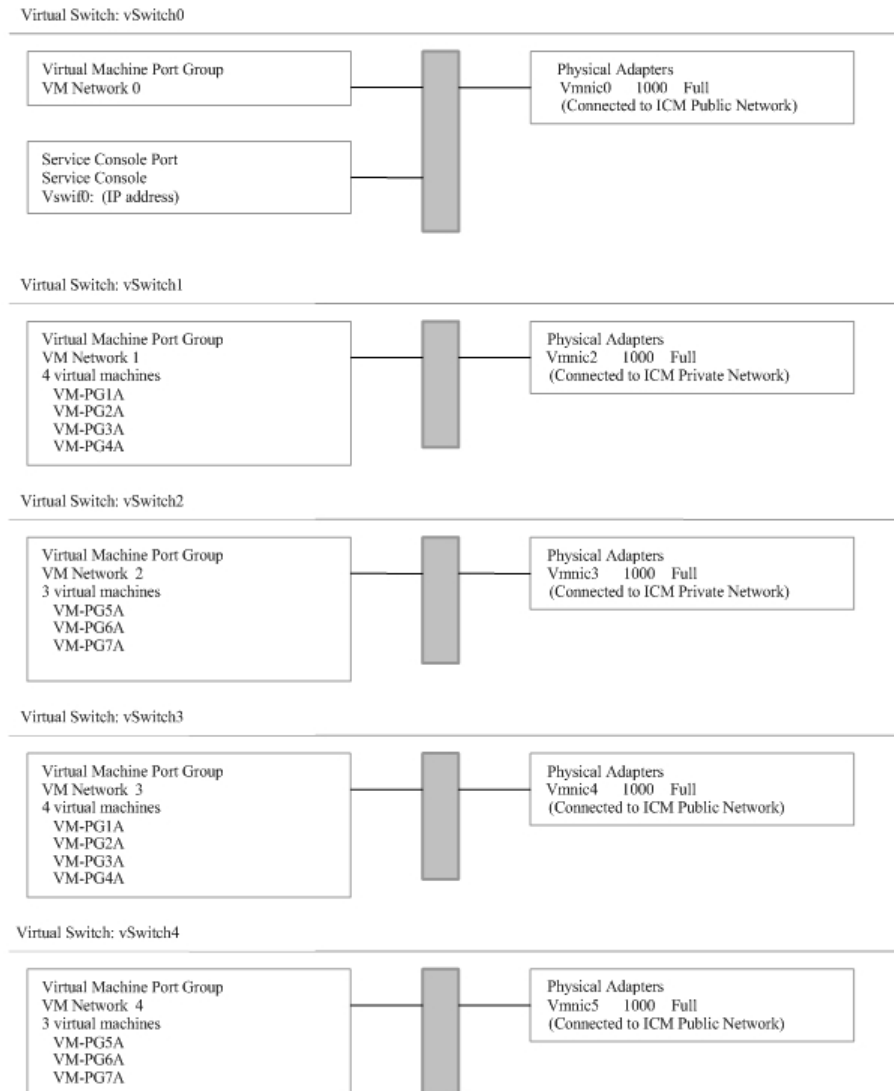
In the above example:

- There are seven PGs and each PG has two Ethernet connections: one for the private network and one for the public network.
- There are five virtual switches:
  - vSwitch0 – used for the ESX Service Console.
  - vSwitch1 – used for the private network connected to four PGs.
  - vSwitch2 – used for the private network connected to three PGs.
  - vSwitch3 – used for the public network connected to four PGs.
  - vSwitch4 – used for the public network connected to three PGs.

Figure 4 (page 26) shows an example of the ESX networking configuration for seven PGs, as seen from the VMware Infrastructure Client.

## Virtual Machine Network Configuration

Figure 4: Example of ESX Networking Configuration for 7 PGS, Side - A



## Virtual Machine Network Configuration for the Client AWs

Figure 5 (page 27) shows an example of VMware ESX Server Network components and connections for 20 Client AWs on the ESX Server, with five Client AW VMs sharing a physical Ethernet port. If a lesser number of Client AWs are deployed, the network configuration scales accordingly.



Figure 5: VMware ESX Server Network Components and Connections for the Client AWs

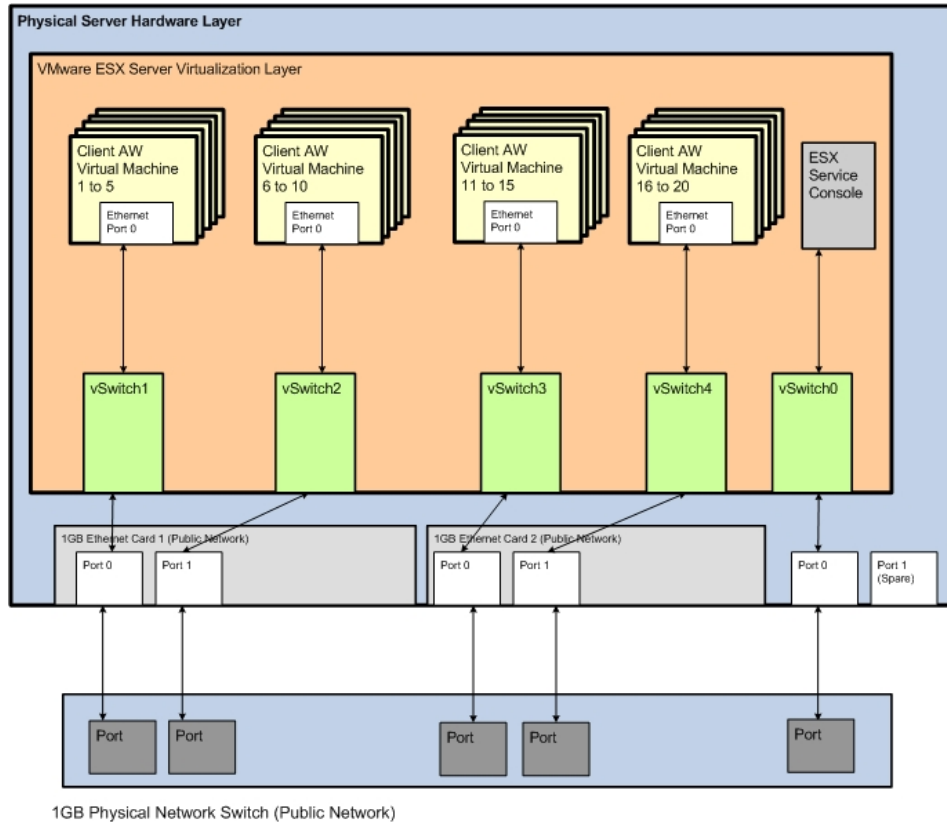
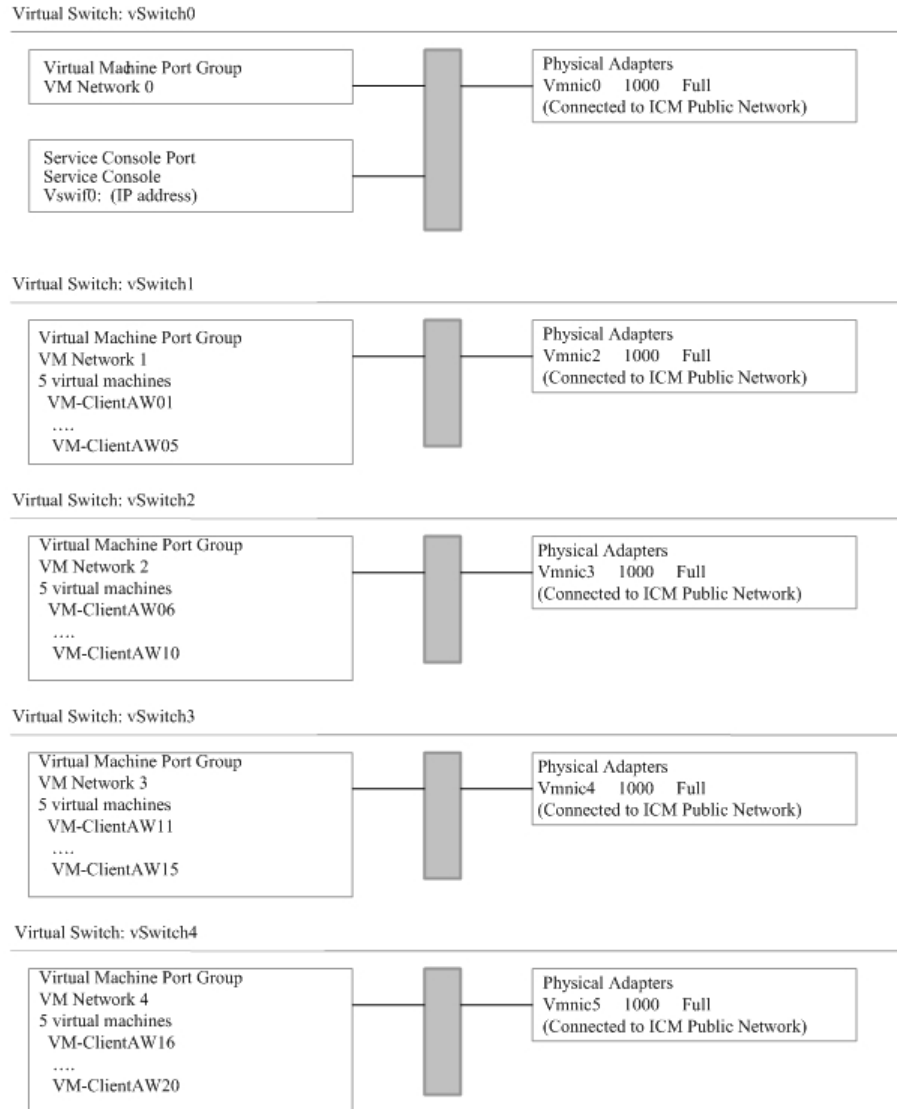


Figure 6 (page 28) shows an example of the ESX networking configuration for 20 Client AWs, as seen from the VMware Infrastructure Client.

## Virtual Machine Network Configuration

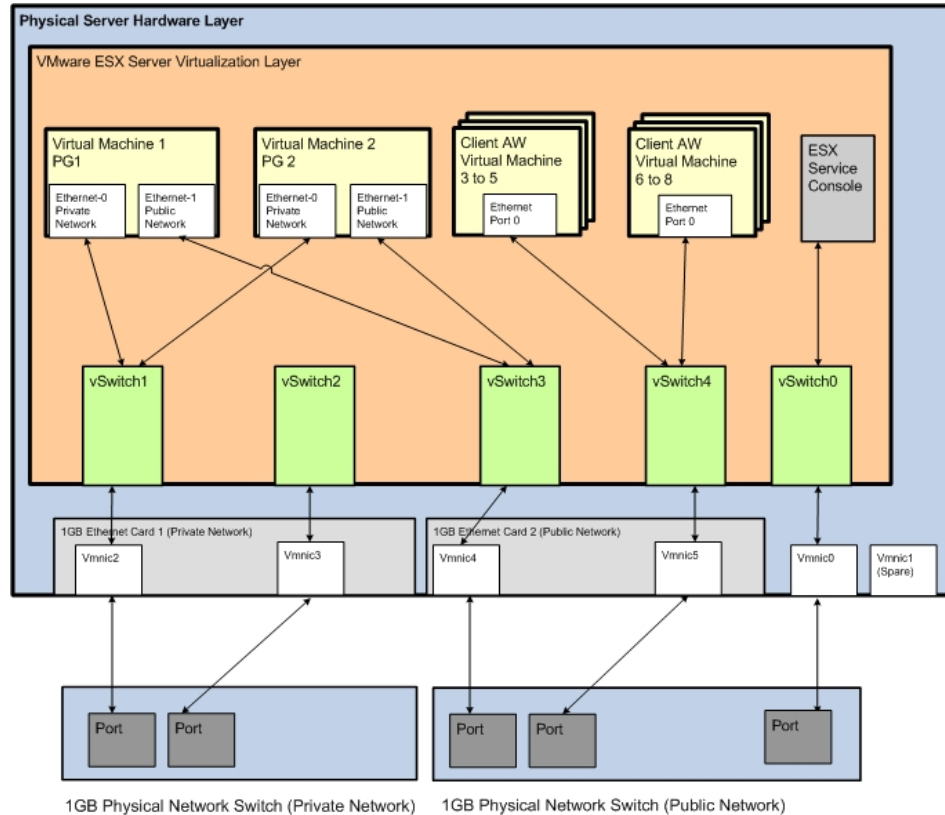
Figure 6: Example of ESX Networking Configuration for 20 Client AWs



## Virtual Machine Network Configuration for a Mix of PGs and Client AWs

Figure 7 (page 29) shows an example of VMware ESX Server network components and connections for two PG VMs and six Client AW VMs.

Figure 7: VMware ESX Server Network Components and Connections for 2 PGs and 6 Client AWs

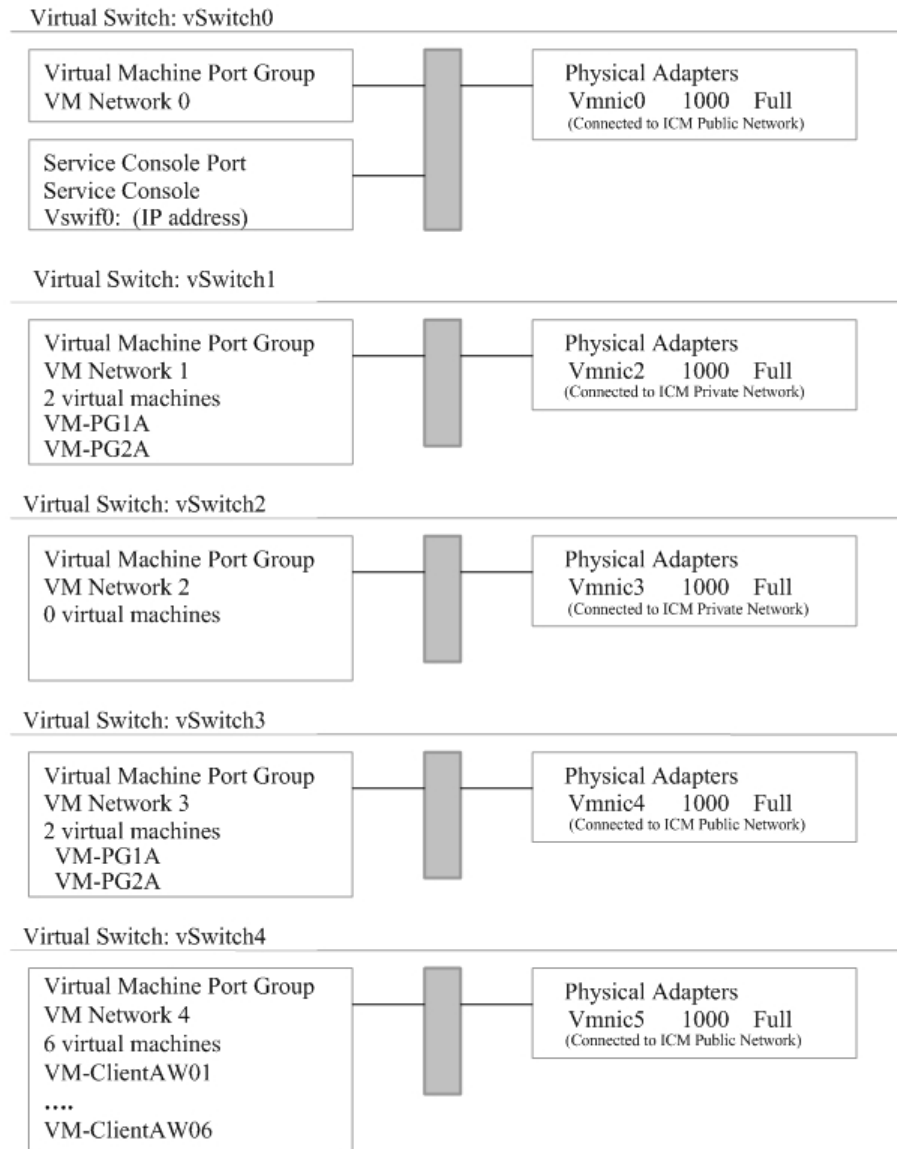


In the above example:

- There are two PGs and each PG has two Ethernet connections, one for the private network and one for the public network.
- There are six Client AW VMs, and each Client AW VM is connected to the public network.
- There are five virtual switches:
  - vSwitch0 – used for the ESX Service Console.
  - vSwitch1 – used for the private network connected to two PGs.
  - vSwitch2 – spare, not used.
  - vSwitch3 – used for the public network connected to two PGs.
  - vSwitch4 – used for the public network connected to six Client AWs.

Figure 8 (page 30) shows an example of the ESX networking configuration for two PGs and six Client AWs, as seen from the VMware Infrastructure Client.

Figure 8: Example of ESX Networking Configuration for 2 PGs and 6 Client AWs



## Installing the VMware Tools

**The VMware Tools must be installed on each of the VMs and all of the VMware Tools default settings should be used.**

To install or upgrade VMware Tools on the VM, refer to the *VMware Quick Start Guide*, available at: [www.vmware.com/support](http://www.vmware.com/support) ([http://pubs.vmware.com/vi301/quick\\_start/wwhelp/wwhimpl/common/html/wwhelp.htm?context=quick\\_start&file=vi\\_quick\\_start\\_manage.5.1.html](http://pubs.vmware.com/vi301/quick_start/wwhelp/wwhimpl/common/html/wwhelp.htm?context=quick_start&file=vi_quick_start_manage.5.1.html)). (Refer to the section: "Creating and Managing VMware Infrastructure Components, Installing Guest Operating Systems: VMware Tools".)

## Installing ICM Components on a Virtual Machine

You can install the ICM components (PGs and Client AWs) after the configuration of the VMs. The installation of these ICM components on a VM is the same as the installation of these components on real physical hardware.

Refer to the ICM documentation available at: [www.cisco.com/support](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/prod_installation_guides_list.html) ([http://www.cisco.com/en/US/products/sw/custcosw/ps1001/prod\\_installation\\_guides\\_list.html](http://www.cisco.com/en/US/products/sw/custcosw/ps1001/prod_installation_guides_list.html)), for the steps to install ICM components. You can install the supported Virus Scan software, the Cisco Security Agent (CSA), or any other software in the same way as it is installed on physical hardware.

## Remote Control of the Virtual Machines

For administrative tasks, you can use either Windows Remote Desktop or the VMware Infrastructure Client for remote control. The contact center supervisor can access the Client AW VM using Windows Remote Desktop.

## System Monitoring

VMware provides a set of system monitoring tools for the ESX platform and the VMs. These tools are accessible through the VMware Infrastructure Client or through VirtualCenter.

You can use Windows Performance Monitor to monitor the performance of the VMs. Be aware that the CPU counters may not reflect the physical CPU usage since the Windows Operating System has no direct access to the physical CPU.

You can use ICM Serviceability Tools and ICM reports to monitor the operation and performance of the ICM system.

The ESX Server and the virtual machines must operate within the limit of the following ESX performance counters. If you find that the CPU or RAM usage exceeds the following guidelines, you need to allocate more CPU or RAM resources to this virtual machine in order to avoid interruption due to resource contention.

- CPU usage (average) should not exceed 60% for the ESX Server and for each of the individual processors.
- Memory usage (average) should not exceed 80% for the ESX Server and for each of the VMs.





# Chapter 6

## System Backup and Migration

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Use the following techniques to back up a Virtual Machine:

- You can backup and restore VMs by copying the VM folders. This technique allows you to restore your system from disastrous situations, such as a corrupted/bad hard drive.

**Note:** It is recommended that you back up the VMs, after the ICM application is successfully installed, configured, and tested. These VMs can later be restored from the folder backup.

This chapter contains the following topics:

- [Backup and Restore Technique, page 33](#)
- [Migrating the VMs to another Host by Cloning, page 34](#)

### Backup and Restore Technique

#### Backup by Copying the Virtual Machine Folder

The backup procedure requires a Windows 2003 file server as the backup system, and the WinSCP tool (the WinSCP tool is available for download on the Internet).

Follow these steps to backup a VM, by copying the VM folder:

- 
- Step 1** Stop the ICM services and close all the applications on this VM.
  - Step 2** Shutdown the VM.
  - Step 3** Use WinSCP to copy the VM folder from the ESX host machine to the Windows 2003 file server. (As an example, the VM folder can be in the ESX host `//root/vmfs/` folder.)

---

**Migrating the VMs to another Host by Cloning**

- Step 4** Power on the VM.
  - Step 5** Restart the ICM services and applications
- 

**Restore VM from a VM Backup Folder**

Follow these steps to restore a VM from a VM folder backup:

---

- Step 1** If the VM is powered on, stop the ICM services and close all the applications on this VM.
  - Step 2** Shutdown the VM.
  - Step 3** Use WinSCP to copy the VM folder from the Windows 2003 file server to the ESX host machine folder, to the same location from which it was copied for the backup.
  - Step 4** Power on the VM.
  - Step 5** You may need to rejoin the Domain if you are unable to log into the Domain and the Domain Controller is unable to recognize the restored VM.
  - Step 6** Restart the ICM services and applications.
- 

**Migrating the VMs to another Host by Cloning**

You can migrate the VMs from one ESX host to another, using the VMware Cloning technique. The Cloning technique does not delete the original VMs. You can delete the original VMs after you have migrated the VMs and tested them successfully on the new ESX host. For general VM cloning steps, refer to the section "Cloning Virtual Machines" in the VMware document *Basic System Administration*.





# Chapter 7

## Unsupported Features and Configurations

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This chapter contains the following topics:

- [VMware Features, page 35](#)
- [Unified CCE Components/Features on Virtual Machine, page 36](#)
- [SAN, iSCSI, and NAS, page 36](#)

### VMware Features

Cisco has not evaluated nor tested the following VMware tools or features. Therefore, they are not supported on the Unified ICM/CCE virtualized solution.

**Table 8: Unsupported VMware Features**

| Tools/Features   | Description  |
|--|--|
| VirtualCenter Virtual machine provisioning and migration | Provision VMs instantaneously and move the VMs between physical servers.   |
| VirtualCenter Integrated Physical to VM conversion       | Manage multiple simultaneous conversions to VMs.<br><br>Converts physical machines, virtual machine formats such as Microsoft VirtualServer or VirtualPC, backup images of physical machines such as Symantec Backup Exec LiveStateRecovery, Ghost 9, VMware Consolidated backup images to running virtual machines. |
| VirtualCenter Live migration of VMs                      | Migrates running virtual machines from one physical server to another with VMware VMotion.   |
| VirtualCenter Live migration of VM disk                  | Migrates running virtual machine disks from one storage array to another with VMware Storage VMotion.  |
| VMotion  | Allows you to move a running virtual machine from one physical ESX Server to another   |

## Unified CCE Components/Features on Virtual Machine

| Tools/Features  | Description   |
|---|---|
| Platespin's PowerP2V                                    | Tool that allows physical-to-virtual migration  |
| Platespin's PowerRecon                                  | Tool that allows ESX Server sizing by gathering the detailed utilization and trending information of your physical server.          |
| VMware HA   | VMware High Availability solution. This is not applicable to Unified ICM/CCE since it already has a fault-tolerance solution.       |
| Shared storage in VMware VMFS with multiple ESX Servers | A cluster file system that leverages shared storage to allow multiple instances of ESX Server to read and write to the same storage |

## Unified CCE Components/Features on Virtual Machine

Cisco has only evaluated and tested the Client AW and specific PGs on the virtualized platform. No other Unified ICM/CCE components or features are supported on the Unified ICM/CCE virtualized platform. This means that components such as the following are not supported:

- CallRouter
- Logger
- AW Distributor
- HDS
- WebView
- Outbound
- Mobile Agent
- Unified System CCE
- CAD server

## SAN, iSCSI, and NAS

Cisco has neither evaluated nor tested the SAN (Storage Area Network), iSCSI, or NAS (Network Attached Storage) in the virtualized environment for the Unified ICM/CCE application. Therefore, they are not supported in the Unified ICM/CCE virtualized environment.

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