VMware® ESX Server™ 2.1.2 Software for Dell™ PowerEdge™ Servers

Deployment Guide

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Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

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Introduction

VMware® ESX Server™ software provides the rapid creation of multiple virtual machines (VMs) on a single physical server. These VMs each run in a resource-isolated, secure environment and include a Microsoft® Windows, Linux™, or Novell® NetWare® operating system (OS) with their associated applications. The ESX Server software has a virtualization layer that allocates virtualized Dell resources to VMs and a Service Console – a management interface for the VMware virtualization layer. **Figure 1-1** shows the ESX Server architecture.

Figure 1-1.   VMware ESX Server Architecture
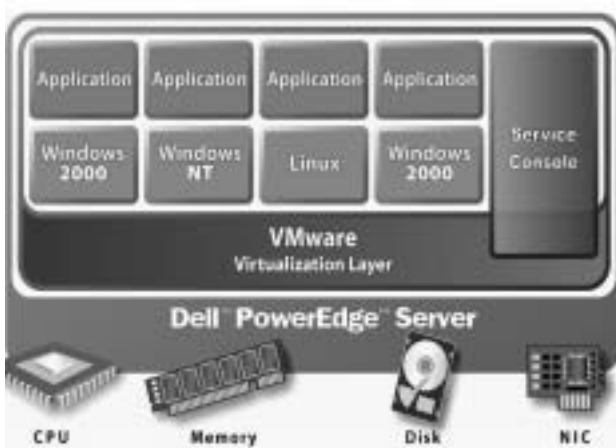
VMware VirtualCenter is a management application that monitors and manages virtual machines distributed across ESX Server installations, as well as the ESX Server systems themselves. VirtualCenter can show global task lists, each individual ESX Server, or each individual VM.

When VirtualCenter-managed ESX Server farms have a common Storage Area Network (SAN), they can take advantage of VMotion™ technology. This technology allows for the "hot" migration of a running VM. A live, state-full application, with its OS, can be moved from one PowerEdge™ server running ESX Server to another. This migration is transparent to the end users, who are not aware that it is taking place. VMotion technology provides dynamic scaling, performance, and

zero-downtime maintenance. If a physical server needs servicing, it can be vacated; that is, all running VMs are moved to other ESX Server systems without affecting users. The vacant system can be shutdown, repaired, then placed back into service at which time VMs can be migrated back to it – all without impacting availability to end users.

Dell configurations of ESX Server software and VirtualCenter allow users to:

- Implement server consolidation
- Deliver high availability and guaranteed service levels
- Streamline testing and deployment
- Scale hardware and software infrastructure
- Upgrade to current and standard hardware, independently of software upgrades

This document is a companion guide to the *VMware ESX Server 2.1 Installation Guide* and provides specific information as it relates to Dell servers and Dell recommended configurations. For the latest version of this document see **www.dell.com/vmware** under the *Resource* tab. For more information about ESX Server software and VirtualCenter, consult the following documents, which are distributed with the software and are available on the VMware Web site at **www.vmware.com/support/esx21/** and **www.vmware.com/support/vc11/**:

- *ESX Server 2.1 Installation Guide*
- *ESX Server 2.1 Administrator's Guide*
- *Guest Operating System Installation Guide*
- *VMware Scripting API User's Manual*
- *VMware VirtualCenter 1.1 User's Manual*

Understanding Dell Configurations

For this release, Dell has qualified a base server configuration for use with ESX Server 2.1.2 software. A single server can be used in a "stand-alone" mode, or one or more servers can be connected to a shared SAN through a switch. VMotion technology is available when two or more servers share a common SAN. VirtualCenter may be used to manage servers in any of these configurations, and is required to initiate VMotion events.

NOTE: USB devices are not supported with ESX Server 2.1.2 software default installation and configuration. Even if USB is enabled in the BIOS, the ESX Server 2.1.2 software will disable it by default. If you need to use USB with ESX Server 2.1.2, see the VMware knowledge base article 1326 - *Using USB When ESX Server Disables It.*

The following tables list Dell's recommended configurations. **Table 1-1** shows the common baseline configuration. For standalone configurations, add the contents of **Table 1-2** to that of **Table 1-1**. For SAN-attached configurations, add the contents of **Table 1-3** to that of **Table 1-1**.

Table 1-1. Base ESX Server System Hardware Configuration

Device Class	Configuration	Configuration	Configuration
Server	PowerEdge 6650	PowerEdge 2850	PowerEdge 1850
Processor	Four Intel Xeon Processors	Two Intel Xeon Processors	Two Intel Xeon Processors
RAM	16 GB (recommended)	8 GB (recommended)	8 GB (recommended)
RAID Controller	PowerEdge Expandable Raid Controller 4, dual channel (PERC4/DC)	PowerEdge Expandable Raid Controller 4e/Di (Dual Channel Integrated)	PowerEdge Expandable Raid Controller 4e/Si (Single Channel Integrated)
Networking	Two Integrated Network Ports	Two Integrated Network Ports	Two Integrated Network Ports
	Add-On NIC	Add-On NIC	Add-On NIC

Table 1-2. Additional Supported Devices for a Stand-Alone ESX Server System Configuration

Server	PE 6650	PE 2850	PE 1850
Storage	Five internal hard disks (15K RPM at RAID 5 recommended)	Six internal hard disks (15K RPM at RAID 5 recommended)	Two internal hard disks (15K RPM at RAID 1 recommended)

Table 1-3. Additional Supported Devices for a SAN-attached ESX Server System

Device Class	Configuration
Host Bus Adapter (HBA)	One fiber channel host bus adapter (HBA)
	or
	Two fiber channel host bus adapters (HBAs) for HBA failover configurations
	For higher availability on the PE 1850, the Qlogic QLA 2342 (dual port HBA card) is recommended.
Storage	Two internal hard disks (15K RPM at RAID 1 recommended)

Table 1-4. Recommended VirtualCenter Server Configuration

Resource Class	Recommendation
Server	PowerEdge 1850
Memory	2 GB RAM
RAID Controller	Integrated RAID controller enabled
Storage	Two internal hard disks (largest capacity available at RAID 5)
Network	Two integrated network ports
Operating System	Microsoft Windows Server 2003

Figure 1-2 shows the Dell qualified base server configuration when not using VirtualCenter.

Figure 1-2. Non-VirtualCenter Configuration, One or More PowerEdge Servers with Optional SAN
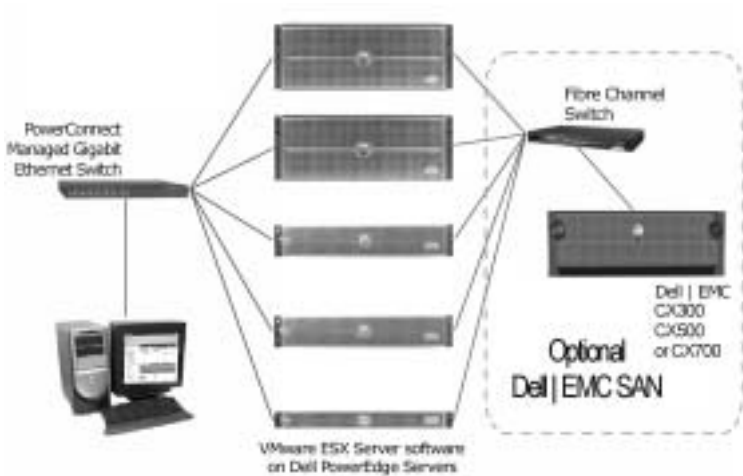
Dell's qualified configuration with VMware VirtualCenter is: VMware ESX Server 2.1.2 software on each PowerEdge server with a single VirtualCenter 1.1 Server on a PowerEdge 1850 managing all ESX Server installations in a farm. For additional performance or VMware VMotion features, Dell|EMC CX300, CX500, or CX700 storage is required. **Figure 1-3** shows the configuration when using VirtualCenter and **Figure 1-4** shows the configuration when implementing HBA failover.

Figure 1-3.   VirtualCenter Configuration with SAN for VMotion

Figure 1-4.   VirtualCenter Configuration with SAN for VMotion (with HBA Failover)
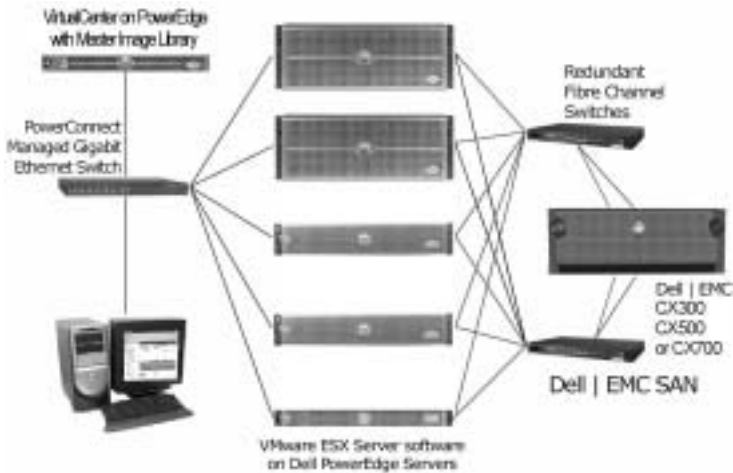
Understanding ESX Server Components

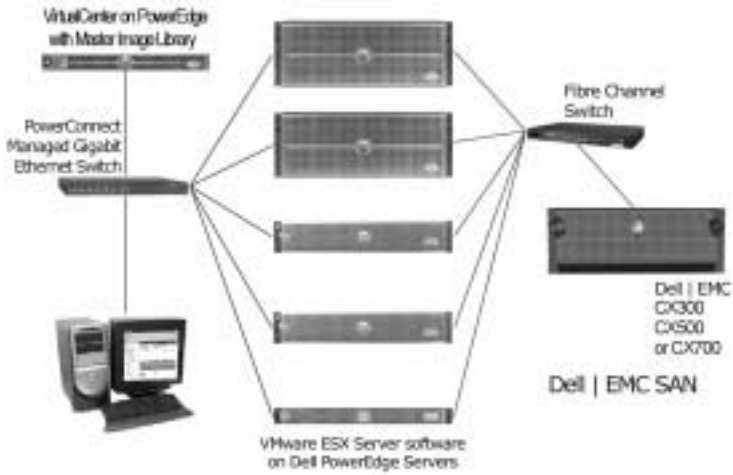- ESX Server – VMware virtualization software infrastructure installed on PowerEdge Servers for partitioning and consolidating systems, providing a platform for VMs.

- Service Console – a management interface for VMware virtualization layer, which enables management of the ESX Server software remotely from a web browser.

- Management User Interface (MUI) – Web based interface used to configure the ESX Server software.

- Remote Console - Windows application, or Linux application that runs locally on a PowerEdge Server. This enables remote console access to Virtual Machines.

- Virtual Machine - an encapsulation of an operating system and its application with dynamic features beyond physical machines.

NOTE: An explanation of the VMware ESX Server software component product license information can be found at the www.dell.com/vmware under the *Product and Services* tab.

Understanding VirtualCenter Components

- VirtualCenter Server - a management server for network-connected VMware ESX Server systems.

- VirtualCenter Client - the client interface for end users and administrators to access the VirtualCenter server. This is often run on the same physical machine as the VirtualCenter Server.

- VirtualCenter Database - backend database used by the VirtualCenter Server. This database can either be located on the same server as the VirtualCenter Server or a separate server with Microsoft SQL or Oracle database.

- Template Repository - is a persistent storage location that maintains VM templates. These are run-able images of OSs, optionally including applications. The images can be rapidly cloned for use by ESX Server systems.

  NOTE: Cloning is deployment of a new VM and not migration of an existing VM.

- VirtualCenter Agent - an agent that is installed on each Dell PowerEdge Server with ESX Server software that is part of a VirtualCenter farm. This agent allows the ESX Server software to be managed by VirtualCenter and allows for the VMotion capability. This agent is installed automatically when a host is added to VirtualCenter.

NOTE: If you are installing ESX Server 2.1.2 software in your network for the first time and are using VirtualCenter, be sure to install or upgrade to VirtualCenter 1.1 first. VirtualCenter 1.1 contains the correct version of the VirtualCenter agent for ESX Server 2.1.2. This agent will be installed automatically on ESX Server 2.1.2 systems when VirtualCenter discovers them.

Current Hardware and Software Qualification List

For current Dell qualified configurations of VMware ESX Server software and VirtualCenter, see **www.dell.com/vmware**.

For Dell|EMC qualified storage configurations of VMware ESX Server software and VirtualCenter, see EMC Support Matrix (ESM) at **www.emc.com/horizontal/interoperability/**.

For additional, non-qualified Dell configurations, see VMware's system, IO, and SAN Compatibility Guides' located at **www.vmware.com/support/**.

Installation of ESX Server 2.1.2 Software

NOTE: ESX Server 2.1.2 software is only supported with VirtualCenter 1.1. If you are using VirtualCenter to manage your ESX Server systems, you MUST upgrade your VirtualCenter installation to VirtualCenter 1.1 BEFORE you upgrade your ESX Server software to 2.1.2.

This section describes the important guidelines for the installation of ESX Server 2.1.2 software on Dell servers. For step by step installation instructions and requirements of the ESX Server 2.1.2 software, see the

ESX Server 2.1 Installation Guide from VMware. This document comes with the installation CD and can also be found at:
http://www.vmware.com/pdf/esx/esx21install.pdf.

Before Installation

Planning

Planning is an important phase in the installation of the ESX Server software. A well planned installation will require fewer reconfigurations and less tuning in the future. Gather the following information prior to installation:

- Determine the number of VMs that will run on the ESX Server installation and their corresponding workloads.
- Size the resource requirements for the VMs, such as CPU requirements, amount of memory, number of NICs, etc. For more information on sizing see the sizing guidelines document at **www.dell.com/vmware**.
- Size the resource requirements for the Service Console.
- Identify resource sensitive VMs and dedicate the required resources to those VMs (for example, dedicating a NIC to a file server).
- Gather the required network information, such as IP addresses, gateways, and so on.
- Determine the most appropriate local disk partitioning scheme. (See below for recommended disk partitioning.)

VirtualCenter

If you are using VirtualCenter to manage your ESX Server systems, be sure to upgrade it to VirtualCenter version 1.1 before upgrading any of the ESX Server systems to 2.1.2.

RAID Configuration

Before installing the ESX Server software make sure that the disks have the required RAID configurations. Use the highest RAID level available, given the number of local disk drives. For two disk drives, use RAID 1. For more than two disk drives, use RAID 5 for improved performance. RAID 0 is not recommended, since it does not provide redundancy of data.

Utility Partition

New Dell Servers ship with the Dell Utility Partition (UP) pre-installed. The UP is a bootable disk partition that contains Dell diagnostic utilities and other software useful in maintaining the hardware. It is accessed by pressing the <F10> key at system boot time. Dell recommends that you keep the UP on your ESX Server system. If the UP has been deleted, it can be restored using the *Dell OpenManage Server Assistant CD-ROM*. For more information, see **www.dell.com/openmanage**.

> **NOTE:** It is recommended to run the Memory Diagnostic test found in the Utility Partition before the installation of ESX Server software.

Recommended Local Disk Partitioning

The following table lists the recommended local disk partitioning for the ESX Server system. When installing the ESX Server system choose the **Manual Partitioning** option and use the following table to create the local disk partitions.

Table 1-5.   Suggested Disk Partitioning within VMware ESX Server

Mount Point	Type	Recommended Size	Notes
(none)	vfat	31 MB	Holds the Utility Partition. Created using *Dell OpenManage Server Assistant CD-ROM*.
/boot	ext3	50 MB	Holds the boot kernel image.
swap	swap	2 * Service Console Memory	This is the swap partition for the Service Console only and NOT the swap file for the ESX Server software.
/	ext3	4 GB	Holds the Service Console and VMware ESX Server kernel.

Table 1-5. Suggested Disk Partitioning within VMware ESX Server *(continued)*

Mount Point	Type	Recommended Size	Notes
/vmimages	ext3	10 GB+	Holds both ISO image files and Template Exported Virtual Disk images.
/home	ext3	2 GB	Holds the individual Virtual Machine configuration files.
(none)	vmkcore	102 MB	Holds the core dump file for the VMkernel.
(none)	vmfs2	Remaining	Holds the disk files for the virtual machines.

NOTE: The /vmimages partition can hold ISO9660 images of CD-ROMs as well as Template Exported Virtual Disks. This space can also be used as temporary or transient storage to assist in relocating Virtual Disk images. For example, the Virtual Disks can be moved to this partition, and then copied to the destination machine or storage area. This space can also be used to make temporary backup copies of Virtual Disks.

Service Console Configuration

During device allocation, the memory reserved for Service Console is configured. The amount of memory for the Service Console depends on the number of virtual machines that are planned to run on the ESX Server system. It is recommended that more memory (around 128 MB) be allocated to the Service Console if Dell OpenManage is installed. The amount of memory dedicated to the Service Console can be changed at any time, but requires a reboot of the ESX Server system.

After Installation

After the installation of the ESX Server software in graphics mode, execute the following steps to complete the installation.

- Create and activate a **swap** file for the VMkernel. The swap file helps in over-provisioning of the memory to the VMs and results in better resource management.

- Give a name to the local VMFS partition. This will improve usability and also preserve access to the local VM disk files, even if one or more peripheral devices are added or removed.

- Create a **virtual switch** and bind one or more outbound adapters to the virtual switch, if the VMs in the server require an uplink.

For detailed instructions on how to execute the above steps see the *VMware ESX Server 2.1 Installation Guide*.

SAN Environment Setup with ESX Server Software

Advanced features such as VMotion technology require a Storage Area Network (SAN) environment using Dell | EMC CX300, CX500, or CX700 storage devices. Setting up the SAN for ESX Server systems does not require any special steps. This section provides a quick overview of the general concepts of a SAN and the steps needed to set up a SAN environment.

LUN: A Logical Unit Number (LUN) is a unique identifier for a set of one or more physical disks.

NOTE: A single disk can encompass more that one LUN, but it is not recommended for performance reasons.

RAID Group: A RAID Group is a collection of one or more physical disks. In order to use the LUNs one has to create a RAID group and bind LUNs to it.

Storage Group: A Storage Group is a set of one or more servers and one or more LUNs. A server in a Storage Group can only access LUNs which are in the same Storage Group. Storage Groups are typically used to implement access control.

In order to create and use Storage Groups in Navisphere, the Access Logic™ option must be enabled.

> **NOTE:** Access Logic is a software component of Navisphere® which needs to be installed at the storage system.

Zoning: Zoning controls access between fiber channel devices. Zoning at the switch would determine the group servers that can access a particular storage device.

The typical steps involved in setting up a SAN are:

1   Install and setup the CX300, CX500, or CX700 storage device.

2   Configure zoning at the switch level.

3   Create RAID groups.

4   Create and bind LUNs.

> **NOTE:** When creating the LUNs, select **Auto Assign** to assign the LUN to the storage processor. This is highly recommended for better load balancing.

5   Manually register the servers (hosts) connected to the SAN (see below for step by step instructions).

6   Create Storage Groups containing the servers and the LUNs.

For detailed information about setting up the storage device, and creating LUNs, RAID groups, and Storage Groups see the *EMC Navisphere Manager: Administrator's Guide*. This document comes with the CX-series storage device on a CD-ROM.

Manual Registration of Servers: The steps to manually register a host server using Navisphere Manager are given below:

1   Click on the **Storage** tab on the Navisphere Manager session. Right-click on the storage system and select **Connectivity Status**. All the World Wide Numbers (WWNs) of the HBAs installed in the connected hosts should be displayed.

2   Select a WWN and select **Register** to register the HBA to the Storage Device.

3   Select the following options:

- **Initiator Type**: CLARiiON Open
- **Failover Mode**:1
- **Array CommPath**: Enabled
- **Unit Serial Number**: Array

4   Enter the required Hostname and IP address for the server and select **OK**. Repeat the steps for all the WWNs connected to the storage device.

5   The host server must now be registered to the storage device. The host is then assigned to a Storage Group along with the LUNs that it will use to store VMFS files.

NOTE: WWN of HBAs installed in a particular server can be determined by executing the command
`more /proc/scsi/qla2300/*` (for Qlogic HBAs) or
`more /proc/scsi/lpfdd/*` (for Emulex HBAs) in the
service console.

NOTE: EMC PowerPath is not supported with ESX software.

Setting Up Manual Load Balancing

Automatic load balancing is not supported in VMware ESX Server software. Load balancing can be achieved by manually configuring the preferred path for each LUN from the ESX MUI. For more information about load balancing, refer to *Configuring redundancy and load balancing in Dell | EMC Storage for VMware ESX Server Software* at **www.dell.com/vmware**.

Dell OpenManage in a VMware ESX Server Environment

OpenManage Software Overview

Dell OpenManage systems management software is a suite of application programs for PowerEdge systems. This software allows you to manage your system with proactive monitoring, diagnosis, notification, and remote access. Each system that you plan to manage with Dell OpenManage software products is called a *managed system*. Managed system applications

include Server Administrator, and remote access controller (RAC) software. Server Administrator provides a comprehensive, one-to-one systems management solution in two ways: from an integrated, Web browser-based GUI (the Server Administrator home page) and from a command line interface (CLI) through the operating system. (For ESX Server systems, Server Administrator is installed in the Service Console.) Server Administrator is designed for system administrators to both locally and remotely manage systems on a network. Server Administrator allows system administrators to focus on managing their entire network by providing comprehensive one-on-one system management. A management station can be used to remotely manage one or more managed systems from a central location. By installing IT Assistant on a management station, you can effectively manage from one to hundreds of remote managed systems.

For more information about OpenManage see the *OpenManage Product Documentation* CD-ROM, which comes with the Dell Server and is also available at **www.dell.com/openmanage**.

Figure 1-5 illustrates the relationship between a management station and its managed systems. **Figure 1-5** also shows the operating systems and the Dell OpenManage software products that may be installed on the managed systems.

Figure 1-5.   Example of a Management Station and Managed Systems
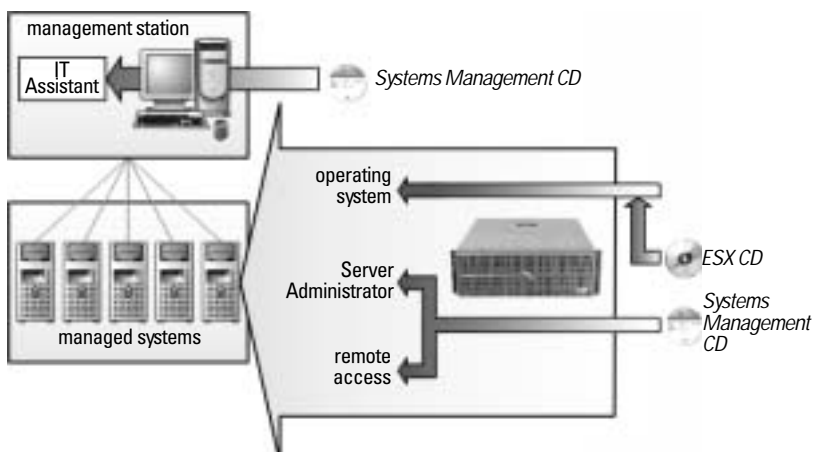
NOTE: Managed system applications such as Server Administrator, and remote access controller (RAC) software are not used inside the virtual machines because the software would only see the virtualized hardware and not the physical hardware.

NOTE: Dell OpenManage Server Administrator will run within the VMware Service Console and can be used to manage the server components. Devices which are dedicated exclusively to the VMkernel are not reported by Dell OpenManage Server Administrator and Service Console. Server Administrator can only monitor hardware components that are shared with the VMware Service Console. The following devices are dedicated exclusively to VMkernel:

- CPU1, CPU2, and CPU3 on PE6650 or CPU1 on PE 2850 and PE 1850
- Network Interface Cards and Host Bus Adapter (HBA) which are dedicated to virtual machines

Using the Dell Remote Access Card III (DRAC III) on PE 6650

If a DRAC III remote access card has been installed in your system, you should also install the **ppp-2.4.1-2.i386.rpm** package before installing the OpenManage Server Administrator. This file can be found on the *ESX Server 2.1 Installation* CD. Insert the installation CD into the systems CD-ROM drive and install the rpm in the Service Console using the commands:

```
mount /dev/cdrom

rpm -ivh /mnt/cdrom/VMware/RPMS/
ppp-2.4.1-2.i386.rpm

umount /dev/cdrom
```

Installing OpenManage Server Administrator and Remote Management

Use the following steps to install Dell OpenManage 4.1 on the ESX Server system. The *ESX Server Installation CD-ROM* and *OpenManage CD-ROM* are required for the installation.

1 Log on with administrator privileges (root) to the Service Console.

2 Install Dell OpenManage using the following command:

```
# omasetup.sh install
```

Follow the instructions to complete the installation. You will be asked to insert the *ESX Server Installation CD-ROM* and the *OpenManage Server Assistant CD-ROM*.

3 Configure SNMPD to send trapsink messages to the management console. Edit **/etc/snmp/snmpd.conf** and add the following line to the end of the file:

```
trapsink <ITA_IP_Address> public
```

Starting Your Server Administrator Session

To start a Server Administrator session on a remote system, open the following URL in your web browser:

```
https://hostname:1311
```

where hostname is the assigned name for the managed node system and 1311 is the default port. The IP address of the managed system can also be used.

Guest Operating Systems

Guest OS Installation

For information on how to install Virtual Machines see the latest *Guest Operating System Installation Guide*.

NOTE: Before installing a W2K OS on a local disk (non-SAN configuration), see the VMware knowledge base article 675 - *Lockup/Reboot Loop During a Windows 2000 Guest Operating System Installation*.

Guest OS Performance Tuning Tips

The following tuning tips significantly improve performance over the Guest OS and VMTools default installations and are highly recommended for Dell qualified configurations.

NOTE: The actual results of the tuning tips provided here depend on the configuration and will vary accordingly.

- Maximize ESX Server system tuning across VMs prior to individual VM Guest OS tuning. See VMware ESX Server 2.1 product documentation at **www.vmware.com/support/esx21/doc** for scheduling CPU, memory, and disk bandwidth across VMs.

- Ensure VMware Tools are installed to improve video and mouse performance and other benefits.

- Disable all CPU-intensive screen savers.

- Ensure that each VM's guest OS type is correct in its configuration file.

- To ensure best device performance ensure that you are using supported devices. See **www.dell.com/vmware** for details.

- For best performance, VMs should use separate resources from the Service Console, specifically Ethernet NIC cards.

- Ideally, each VM should be running only one application.

- For CPU-bound workloads, enable hyper-threading on the ESX Server system.

- For shared resources, pair VMs that will not compete for the same resource.

- Avoid using the two legacy Serial (COM) ports or Parallel (LPT) port devices by VMs.

- Disconnect CD-ROM device from all the VMs.

- For all VMs that do not require PXE boot, it is highly recommended to replace *vlance* with *vmxnet* device as the virtual NIC. It is included and documented in VMware Tools. This will drastically improve performance when Gigabit Ethernet is used and the VMs have high bandwidth requirements.

- Tradeoffs between memory and CPU resources:
  - If VMs are CPU-bound and RAM is under-utilized, then turn off page sharing. You can achieve this from the ESX Server Management User Interface (MUI):
    - Choose **Options** tab.
    - Next, click on **Advanced Settings.**
    - Set **Mem.ShareScanTotal** to 0. (The default is 200.)
  - If VM peak memory is bursty, then decrease idle memory tax rate. From ESX MUI:
    - Choose **Options** tab.
    - Next, click on **Advanced Settings.**
    - Set **Mem.IdleTax** to the rate of your choice. (The default is 75%.)
- VMware performance metrics can be accessed by exploring the directory structure at /proc/vmware within the Service Console.
- For better backup practices, it is recommended to create two virtual disks for each virtual machine: one virtual disk containing OS/application installation files and the other virtual disk containing user data. This allows for more frequent backup of the data virtual disk.
- Identify the limited resource by application type:

Table 1-6.   Limiting Resources by Application Type

Limiting Resource	Likely Application Type
RAM	Web Server, Application Server, File Server
CPU	Application Server, Streaming Server
Network	File Server
Disk	SAN Database, data-intensive Application Server

Microsoft Windows Tuning Tips

- Use Perfmon to profile the Windows application and identify its key resource, then:

    - Isolate or limit sharing to each VM's key resource.

    - Save perfmon-tuned, gold images for cloning. For example:

        - Install Windows, Windows service packs and patches, VMware Tools, anti-virus, management agents, backup agent, application, application service packs, and patches. Save this pre-tuned golden master.

        - Do performance profiling with perfmon to determine the optimal, tuned golden master to save for cloning. Although you may want to retain images at several installation points for future use as golden masters, note that performance tuning is after the full installation, including application.

- Windows Terminal Service (WTS) performance is greatly improved by setting the workload attribute to "Terminal Services". This option can be enabled in the MUI when creating the virtual machine, or by adding the following line in the configuration file of the virtual machine:

    ```
    workload = "TerminalServices"
    ```

- Similarly, Citrix MetaFrame XP performs better by installing hotfix XE102W014 in the guest Windows OS.

Microsoft Windows 2003 Tuning Tips

- Dell recommends that you do all performance tuning experiments prior to activating your license for Windows 2003 operating system.

Microsoft Windows 2000 Tuning Tips

- After installing VMware Tools, you need to change your Windows 2000 screen area to be greater than 640x480 pixels; if you do not change it, Windows 2000 uses the standard VGA driver, degrading performance.

- Use the VMware SCSI driver, supplied within VMware Tools, instead of Microsoft's Buslogic driver.

Microsoft NT4 Tuning Tips

- Virtual disks support DMA transfers for better performance.
  See www.vmware.com/support/esx21 for instructions on how to enable
  this feature.

- Service Pack 6a is highly recommended for performance and
  compatibility.

Linux Tuning Tips

- At the end of Linux OS installation on the VM, make sure that "Text"
  mode is selected for the Login screen instead of "Graphical" mode. For
  Linux, installation of VMware Tools is a semi-manual process. See the
  Guest Operating System Installation Guide for more information.

- Ensure that VMware Tools is installed in the guest OS prior to starting
  the X server. For example, Skip X Configuration in the video card
  installation. One benefit is that you get accelerated SVGA X server,
  instead of the X server installed for example, with Red Hat Linux 9.
  To install VMware tools see the manual for your VMware product.

NOTE: Depending on the Linux distribution and kernel version, the
VMware tools installation script may need to re-compile the VMware tools
agent. This will require that the "make" utility and a C-compiler are resident on
the Linux guest OS.

Additional Resources

Product Documentation Resources

- Complete and current documentation for Dell qualified
  VMware configurations is available at www.dell.com/vmware.

- Dell products: www.dell.com see servers, then product literature.

- EMC Support Matrix (ESM) at
  www.emc.com/horizontal/interoperability/

- For information about Dell Services and Support product offerings and
  requirements see www.dell.com/vmware under the Product and
  Services tab.

- VMware VirtualCenter 1.1
  - Features: **www.vmware.com/products/vmanage/vc_features.html**
  - Documents: **www.vmware.com/support/vc/**
  - Troubleshooting:
    www.vmware.com/support/vc/doc/releasenotes_vc.html
- VMware ESX Server 2.1.2
  - Features, Documentation, Install Guide, Admin Guide,
    Scripting Guide, SAN, Backup, Troubleshooting (also see the
    KnowledgeBase) **www.vmware.com/support**

Technical Support Resources

- Dell-specific VMware information and additional documentation
  are located at **www.dell.com/vmware/**
- VMware support website at **www.vmware.com**
- Dell hardware support at **www.dell.com/support**
- Dell deployment and professional services **www.dell.com/services**

Newsgroups

- VMware Newsgroups at **news.vmware.com**

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