Using RDM to Deploy VMware
ESX Server and Guests (Windows)

A White Paper

September 29, 2006

Notes:

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Table of contents

1. Preface

This White Paper explains how to deploy VMware with RDM. In particular, it describes techniques for deploying the following with RDM:

- VMware ESX Server (we used version 2.5.3).

- VMware Guest Operating Systems (we used Windows 2003 Server Standard with Service Pack 1 and several applications).

The procedures described in this paper accomplish their desired functions in a specific way. There are alternate techniques available for doing most or all of these functions. The intent is to illustrate how to take advantage of RDM's capabilities to do these kinds of deployments.

Using RDM to deploy a Guest operating system on a VMware Virtual Machine is substantially slower than it would be to use RDM to deploy that same operating system on the target system. Even so, RDM is a good tool to accomplish this. You can start the deployment task and allow it to deploy unattended, while you then do other work. The actual time you spend doing the Guest operating system deployment is only a minute or so.

You can use this White Paper to learn how to do the following:

- Create *Custom* images.

- Create a *VMware Native Install* task.

The target server used in the pictures in this white paper is an xSeries 305, with 2 internal SCSI drives, 2 on-board network adapters, and no RAID adapter. You should be able to extrapolate the procedures to your own hardware.

1.1 Who should read this White Paper

This paper is intended to help skilled RDM administrators to create deployment procedures and to understand the concepts involved. To effectively use this paper, you should already have an extensive knowledge of your Network environment, your RDM environment, DOS batch files, and standard installation techniques for Windows applications.

1.2 Assumptions

This paper assumes that you have installed RDM in its default location: C:\Program Files\IBM\RDM. If you have installed RDM in a different location, you will have to make the necessary adjustments to the file paths.

1.3 Further reference

In addition to this paper, there are various other sources of information that you can consult for RDM and for RDM Custom tasks.

1.3.1 Guides

The following product documentation is available for RDM:

- *Remote Deployment Manager 4.30 Users Guide* – The main reference manual for RDM

- *Remote Deployment Manager 4.30 Installation Guide* – Describes the complete installation process of RDM

- *Remote Deployment Manager 4.30 Compatibility and Configuration Guide* – Lists RDM-supported hardware and software

Check the IBM Web site at http://www-307.ibm.com/pc/support/site.wss/document.do?lndocid=MIGR-50575 to get the current versions of the above documents.

1.3.2 White Papers

The various RDM white papers are available on the IBM Web site at http://www-307.ibm.com/pc/support/site.wss/document.do?lndocid=MIGR-53487.

1.3.3 Online help

In general, every window has online help available (except for some message windows or other windows where no help is applicable), either using a **Help** menu or a **Help** button.

1.3.4 Links

The following links are available for further information:

- Support is available for supported systems (IBM and non-IBM) through e-mail or fee-based telephone support. Telephone support is not available in all countries. For more information about the fee-based telephone support, go to http://www.ibm.com/support or http://service.software.ibm.com/supportline.html. For more information about e-mail support, refer to the RDM home page.

Important: Before using RDM, check the compatibility test results and browse the rest of the RDM Web site for additional information and tips concerning the installation and use of RDM.

1.4 Change history

- May 15, 2006 – Updated for RDM 4.30. Used VMware ESX version 2.5.3 for examples.

- September 29, 2006 – Replaced incorrect screen capture in section 2.1.

2. Installing VMware ESX Server 2.53

We will use an RDM *VMware Native Install* (VNI) task to do this. The basic procedure is described in the RDM 4.30 User's Reference. We will elaborate on our specific techniques in this section.

2.1 Configure an FTP file server

The VNI task does not formally use an RDM image (as the Windows Native Install or the older Linux Native Install tasks do). Instead, VNI requires that you set up a file server, outside of RDM, to handle the network-based install of VMware. The file server can use HTTP, FTP, or NFS protocol. It is up to you to decide what kind of file server to use and to configure the file server correctly.

We used the Windows FTP server on the RDM server.

For convenience, we chose the directory for the FTP site to be:

> C:\Program Files\IBM\RDM\repository\image

This directory is also where RDM stores its images. Using this directory allows all of the images used by RDM to be in the same place. This also gives us a good way to use a formal RDM image as the source of files for our task that will install VMware ESX Server.

You can, of course, use a different directory, or even a different computer, for your file server.
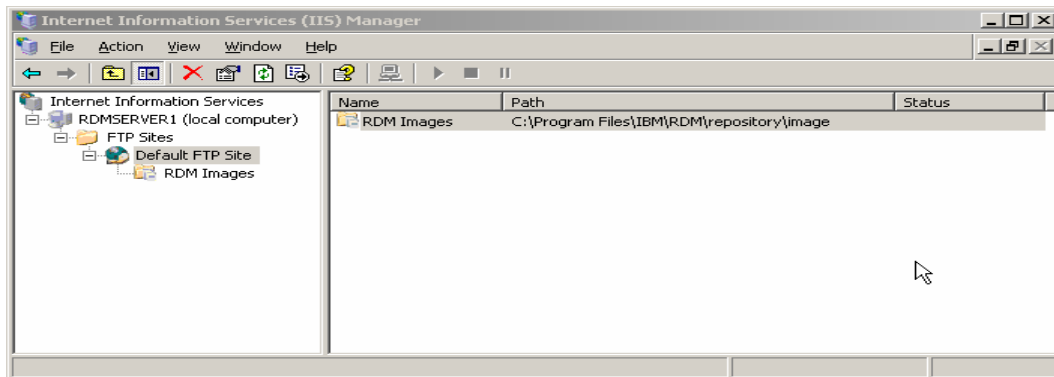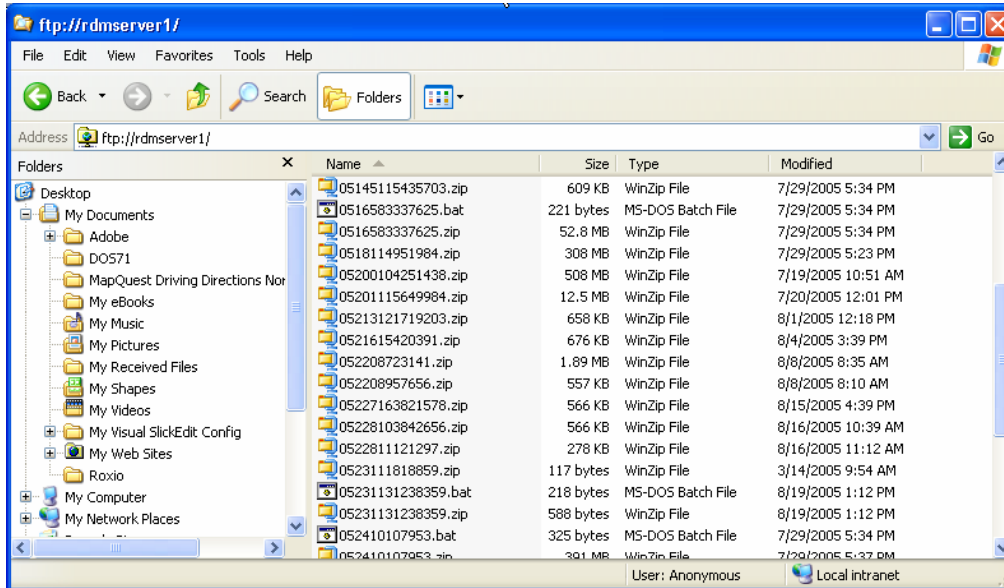

We configured our FTP site for read access, only. You should follow your organization's best practices when you create your file server, paying strict attention to security procedures.
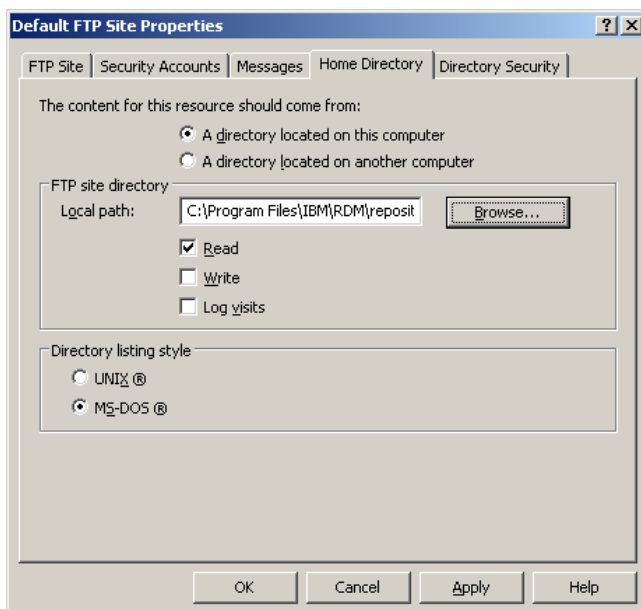
2.2 Test the FTP file server

You can test the FTP file server by using other systems to access the data. For example, using Windows Explorer, make sure that you can access the files.

2.3 Create an RDM image of VMware install files

We will create an RDM custom image of the VMware install files. Even though we will access it via our FTP file server (i.e., not the way RDM accesses its images, in general), we choose to use a "real" RDM image for this task. This gives us the added benefit of having RDM manage the image.
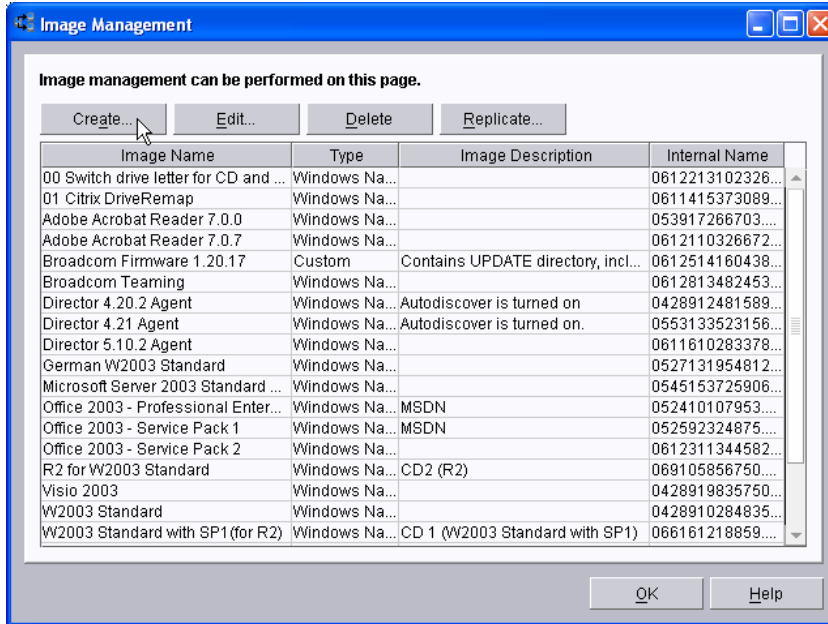
Here is the procedure to create the image:

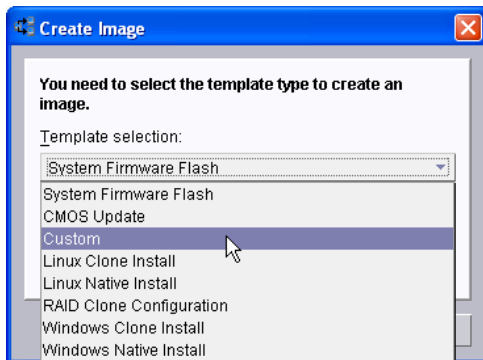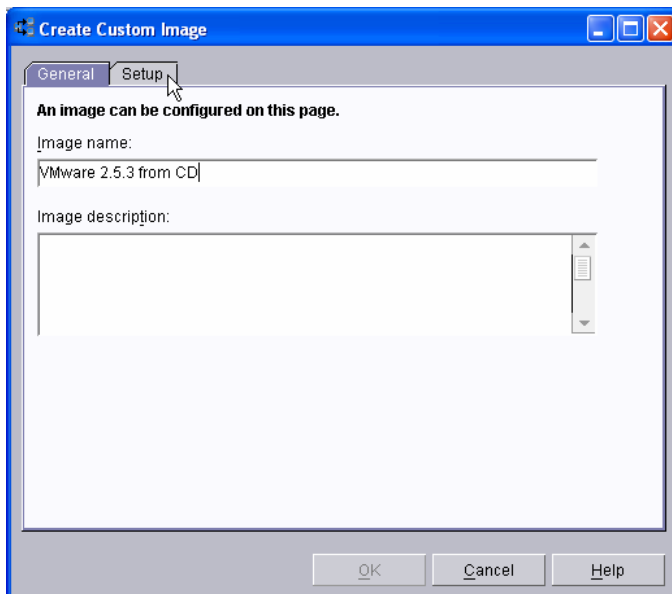1. Use the RDM console menus to open the Image Management window.
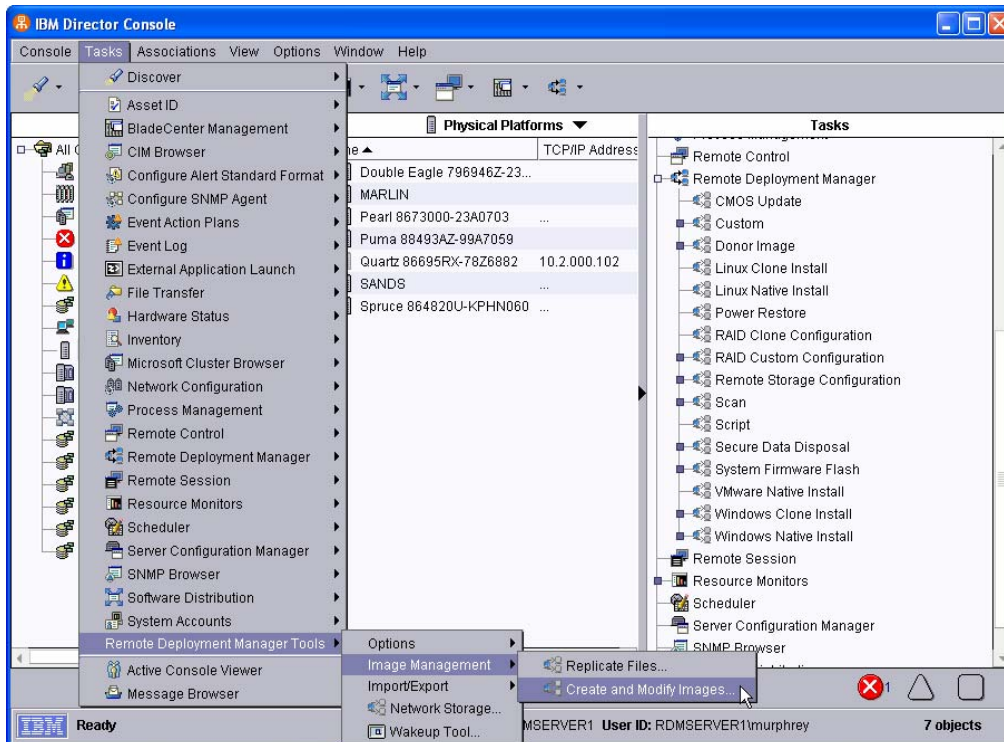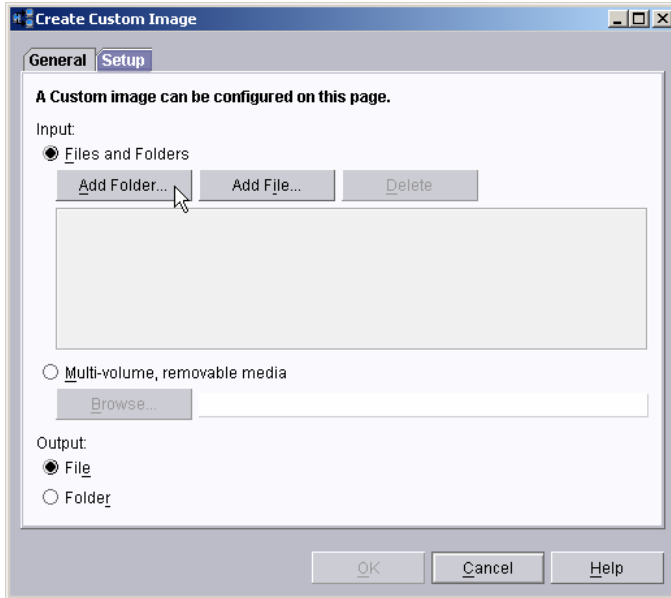
2. Select the *Create* button.

Image Management

Image management can be performed on this page.

Create...   Edit...   Delete   Replicate...

Image Name	Type	Image Description	Internal Name
00 Switch drive letter for CD and ...	Windows Na...		0612213102326...
01 Citrix DriveRemap	Windows Na...		0611415373089...
Adobe Acrobat Reader 7.0.0	Windows Na...		053917266703....
Adobe Acrobat Reader 7.0.7	Windows Na...		0612110326672...
Broadcom Firmware 1.20.17	Custom	Contains UPDATE directory, incl...	0612514160438...
Broadcom Teaming	Windows Na...		0612813482453...
Director 4.20.2 Agent	Windows Na...	Autodiscover is turned on	0428912481589...
Director 4.21 Agent	Windows Na...	Autodiscover is turned on.	0553133523156...
Director 5.10.2 Agent	Windows Na...		0611610283378...
German W2003 Standard	Windows Na...		0527131954812...
Microsoft Server 2003 Standard ...	Windows Na...		0545153725906...
Office 2003 - Professional Enter...	Windows Na...	MSDN	052410107953....
Office 2003 - Service Pack 1	Windows Na...	MSDN	052592324875....
Office 2003 - Service Pack 2	Windows Na...		0612311344582...
R2 for W2003 Standard	Windows Na...	CD2 (R2)	069105856750....
Visio 2003	Windows Na...		0428919835750...
W2003 Standard	Windows Na...		0428910284835...
W2003 Standard with SP1 (for R2)	Windows Na...	CD 1 (W2003 Standard with SP1)	066161218859....

OK   Help

3. Choose the *Custom* template from the dropdown list. Then select the *OK* button.

Create Image

You need to select the template type to create an image.

Template selection:

System Firmware Flash

System Firmware Flash
CMOS Update
Custom
Linux Clone Install
Linux Native Install
RAID Clone Configuration
Windows Clone Install
Windows Native Install

4. Enter an image name on the *General* page, and then select the *Setup* page.

Create Custom Image

General   Setup

An image can be configured on this page.

Image name:

VMware 2.5.3 from CD

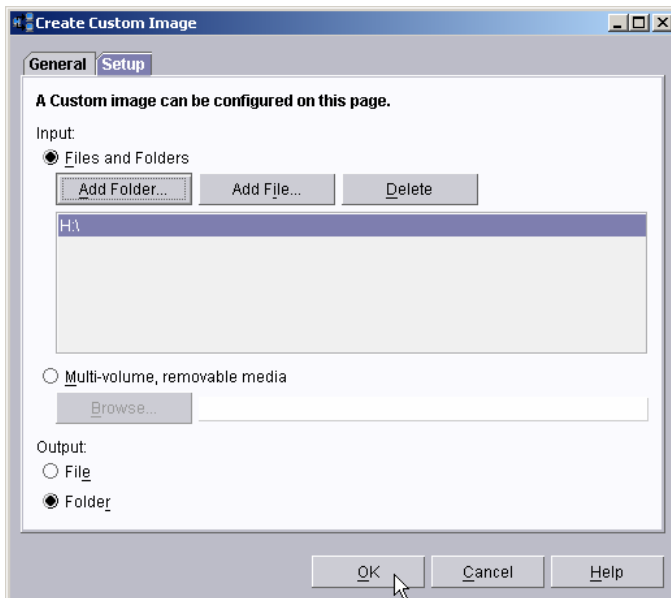Image description:

OK   Cancel   Help

5. Select the *Add Folder...* button.

6. Select the CD drive (that contains the VMware CD) from the dropdown list, and then select the *OK* button.
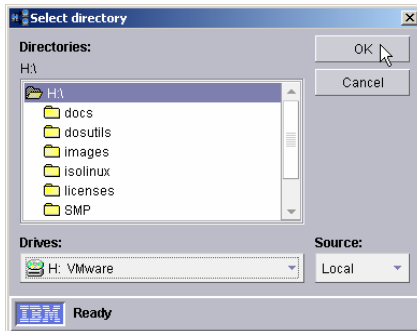
7. Select the Folder radio button, because we want the image to look exactly like the VMware CD. Then select the OK button to start creating your image.

8. You will see a progress indicator window, followed by a message window indicating that RDM has finished copying the CD.
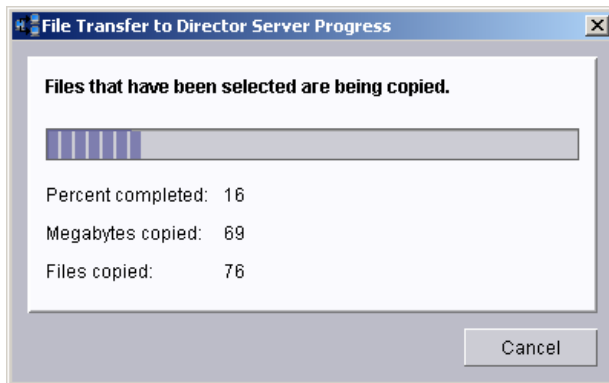
9. Select the OK button. Notice that your new image now appears in the Image Management Window.
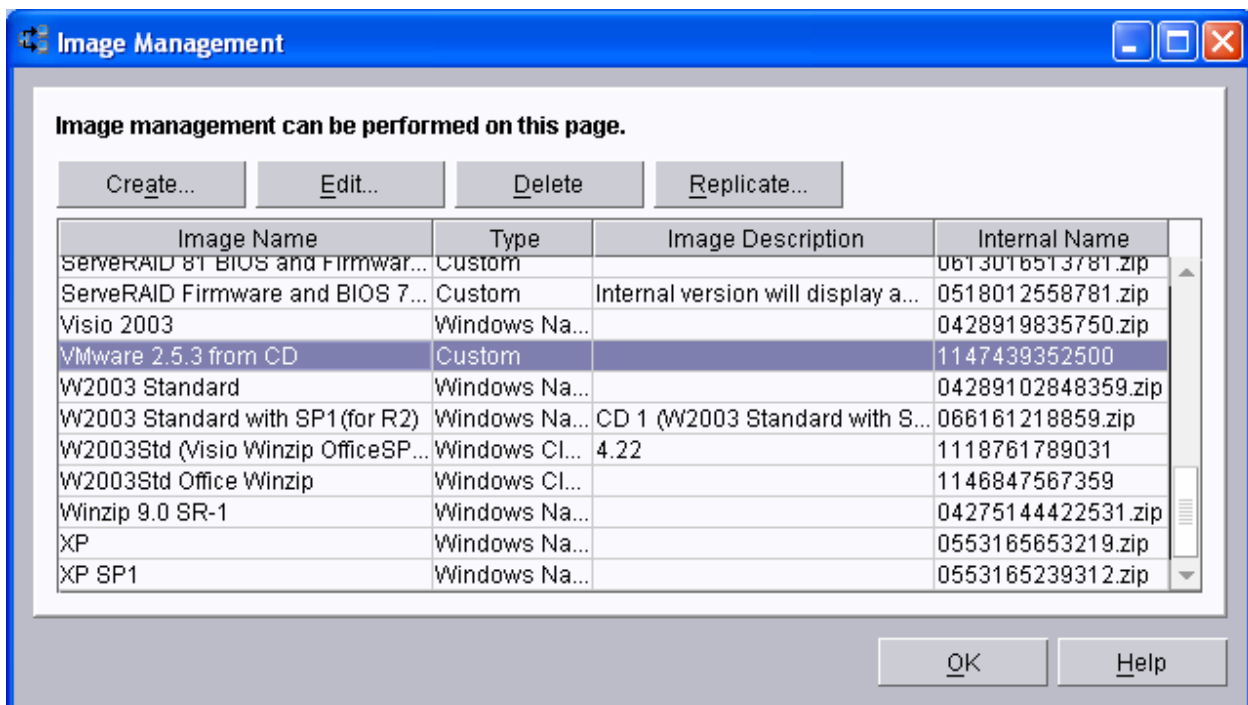
10. Note the internal name of this image (1147439352500 in our example), because you will use that name later. Then select the *OK* button to close the *Image Management* window.

2.4 Create the *VMware Native Install* task

You will use a *VMware Native Install* task to deploy the ESX server. Here is the procedure to create the task:

1. Use the RDM console menus to initiate task creation. Right click on *VMware Native Install* and select the *Create New Task...* menu.
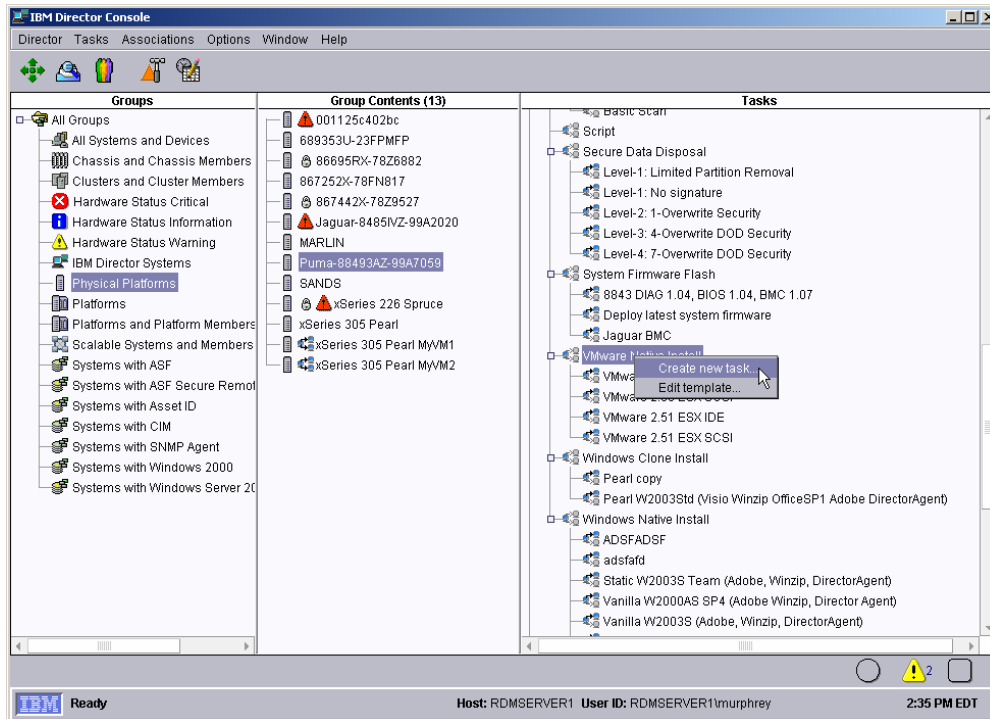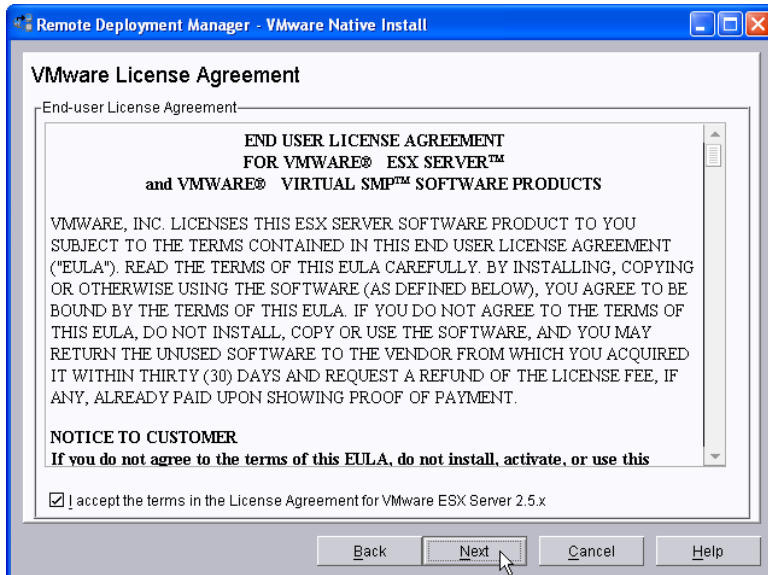
2. Insert a task name, and then select the *Next* button. Since VNI tasks depend on the kind of disks in the target system, we indicate that this task is for SCSI systems.
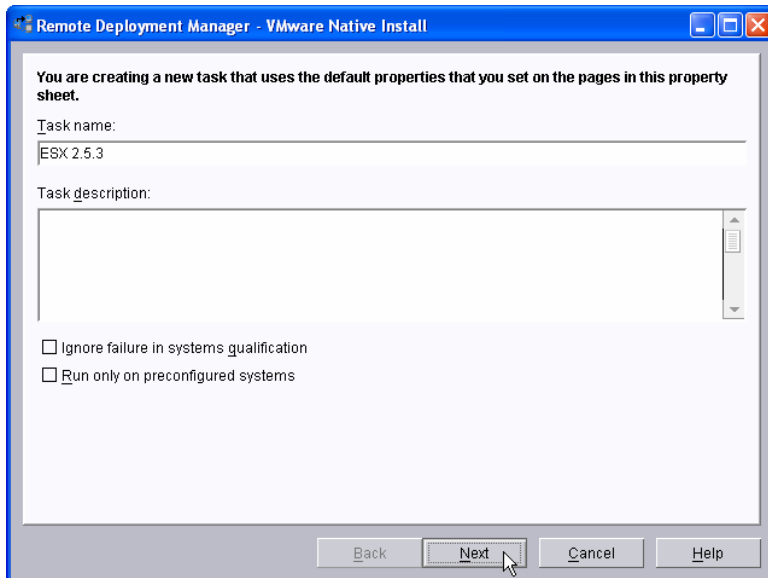
3. Select the correct version of VMware from the dropdown list, and then select the *Next* button.
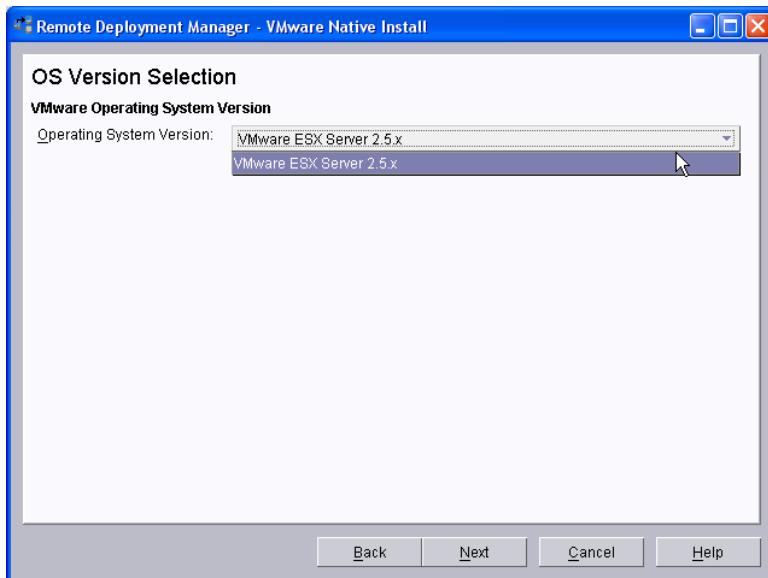
4. Check the box about the license terms, and then select the *Next* button.


5. The following window is used to enter configuration data needed to access the file server that contains the VMware image. Fill in all the values on this page. Here are the values that we chose:

   a. *Method* – FTP is the installation method.

   b. *Server Name* – We used the IP address of the RDM server. This field is used to identify the FTP server (which we have installed on our RDM server). We could have entered its hostname (e.g., RDMSERVER1) instead of its IP address. Had we done it that way, it would require that we have a fully functional DNS server in our environment.

   c. *VMware Directory* – We used the directory name from step 10 in section 2.3 above. Note that the leading slash (/) is optional.

   d. *Server Port* – We used 21, the standard FTP port number.

   e. *User name* – We entered the user name that is required to access the FTP server.

   f. *Password* – We entered the password that is required to access the FTP server.

   g. *Confirm* – We entered the same value that we entered in the *Password* field.
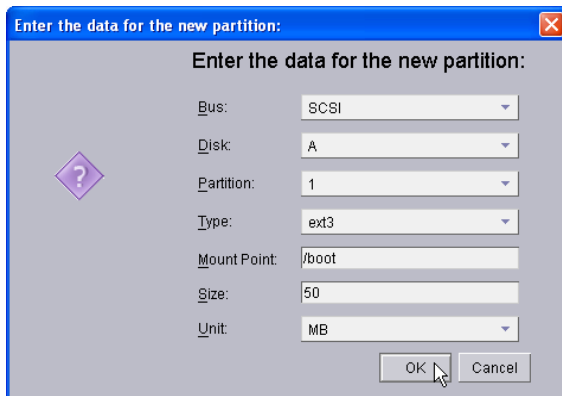
Then select the *Next* button.
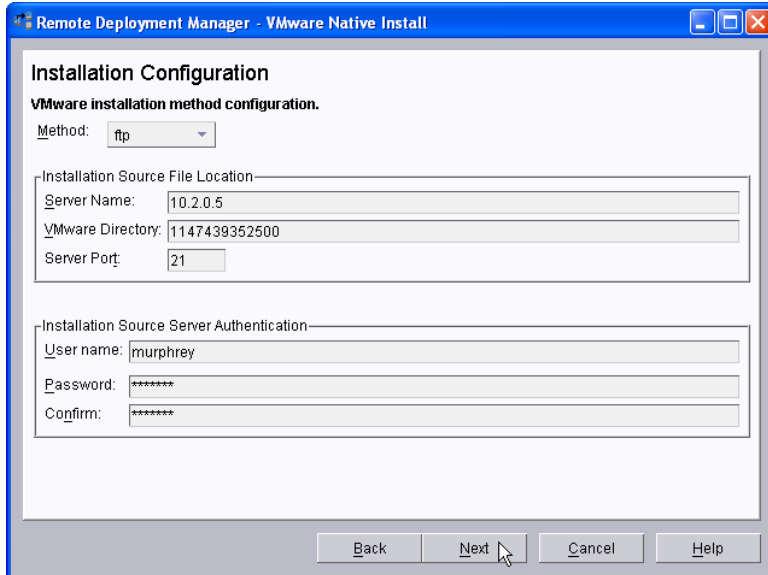
6. You have to define the disk partitions for this task. You must select the *Add* button three times to create the required partitions.
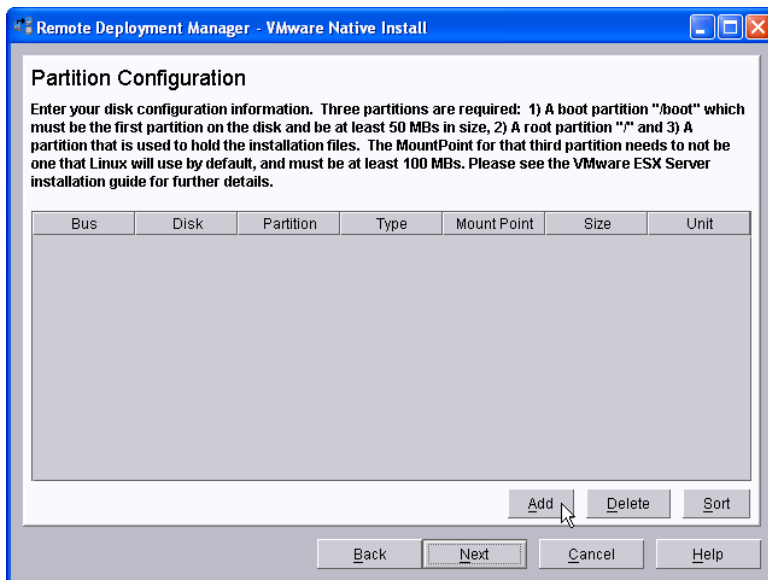

7. Just fill in the fields, as appropriate.

8. The three partitions shown here are required. Make sure that partition 1 is your boot partition. Make sure that you choose the correct bus (i.e., so that it matches the target systems that you will deploy with this task). For example, choose SCSI if your system has SATA or SAS drives.

    Note that we did not define partitions for the virtual machines. You will do that later, after you deploy VMware.

    After you add the information for all three partitions, select the *Next* button.
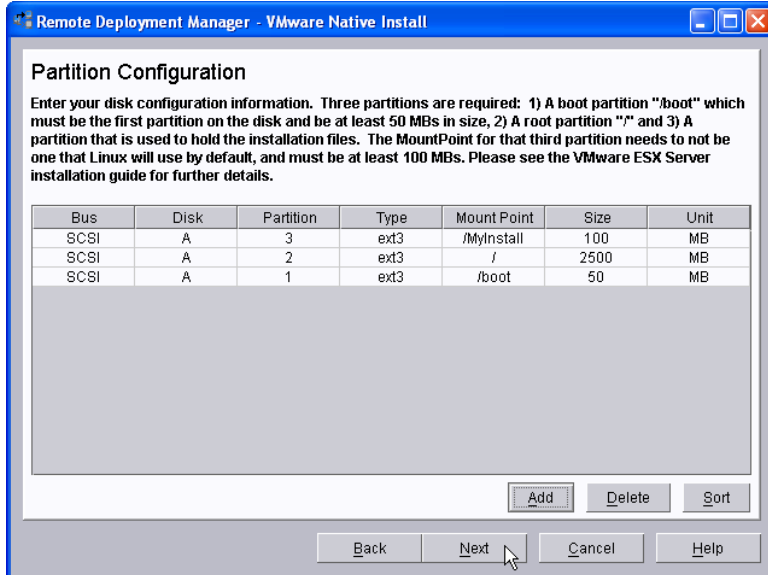
9. Enter the appropriate TCP/IP information. If (like most users) you will use a static IP address, uncheck the DHCP box to enable the fields. Enter values as appropriate. Remember that these values become default values for the task. You will be able to override them later, if appropriate, when you configure the task with the *System/Task Configuration* window.

    In our example, all of the target systems will be on the same subnet, so we enter a default value for the *Gateway IP* field. If our target systems would be on several different subnets, then we might leave this field blank (choosing to enter this value in the *System/Task Configuration* window.

    Best practice is not to use the *IP Range parameters* section. This is for a highly specialized deployment scenario, and it is not appropriate for most users. You should, instead, plan to enter the static IP addresses in the *System/Task Configuration* window.

    Note that you can only configure one network adapter. You will typically configure the other network adapters later, after you deploy VMware (assuming that you want to assign static IP addresses to the other adapters).

    After entering your data, select the *Next* button.

10. Now enter your root password (the password used to login to VMware as root) in the *Root Password* and *Confirm* fields. If appropriate, use the dropdown lists to change the default memory and time-zone settings.

Select the Finish button to create the task.

Important: You may, at this point, notice that the VMware Native Install task differs from the other RDM operating-system-install tasks in that it does not allow you to specify a default value for the VMware serial number. You will have to enter the serial number when you configure the task with the *System/Task Configuration* window. It is important that you do enter the serial number, there; otherwise, the task will stop and ask you to enter the serial number at the target system's keyboard.

2.5 Configure the target systems

If your target systems (the systems on which you will install VMware) contain more than one network adapter, you will probably have to change their primary startup sequence. The following is an acceptable sequence:

1. CD

2. Diskette

3. Network

4. Hard disk drive

The key is to have "Network" before "Hard disk drive".

Important: If you don't make this change, the final reboot of the task will boot VMware instead of DOS, and the task will not complete properly.

2.6 Test the *VMware Native Install* task

Best practice is to test the task as soon as you create it. You run this task in the same way as other RDM tasks.

Important: It is required that you configure your system with this task. If you run the task using the default parameter values (i.e., if you choose not to *Configure systems...*), the task will pause, asking for a serial number.

1. Drag the new task and drop it on your test system. Then select the *Configure systems...* menu item.
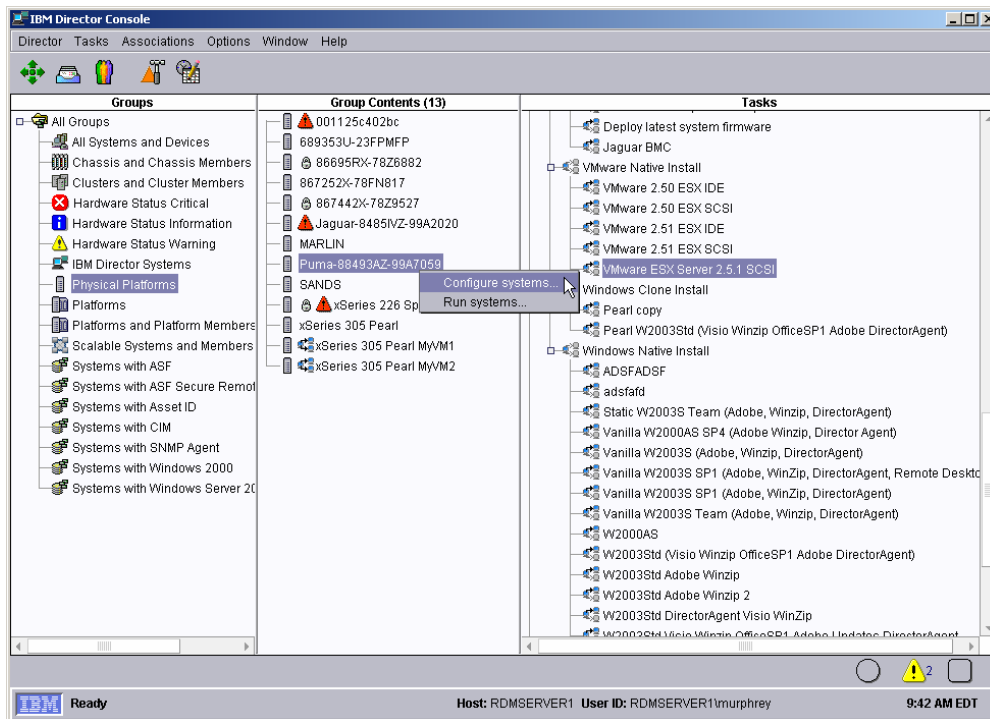
2. On the *General* page, enter the static IP address for the target system. Then select the *Serial* page.
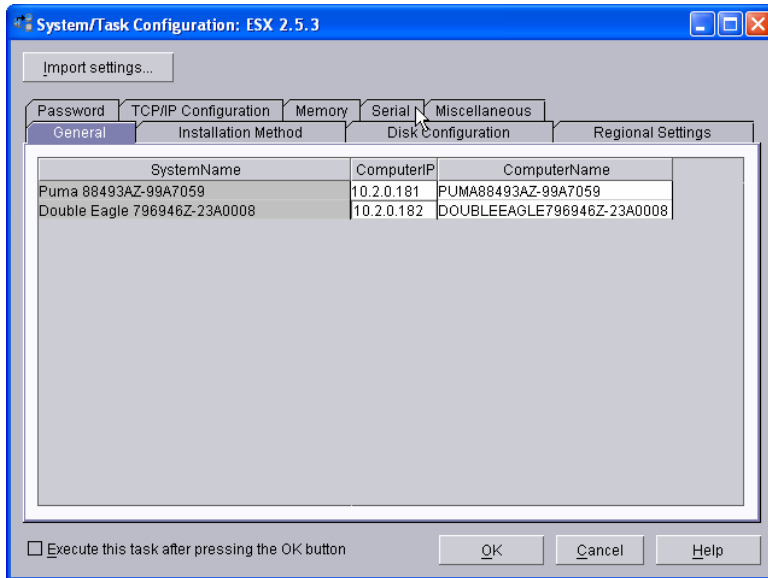
3. On the *Serial* page, enter the VMware serial number (whichever one is appropriate).

   Important: If you leave the serial fields blank, your task will stop and ask you to enter the serial number at the target system's keyboard.

   Then select the *TCP/IP Configuration* page.
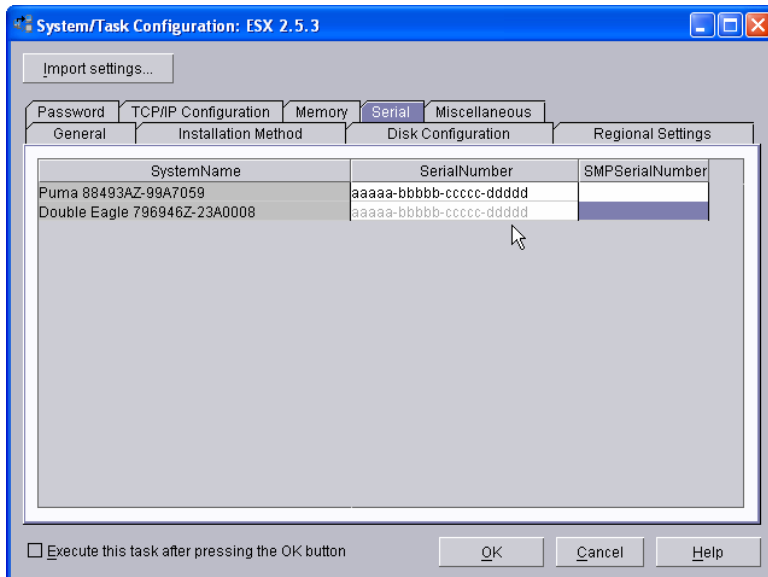
4. If necessary, enter or change values. Typically, the *GatewayIP* field might be what you change, here.

   Check the *Execute this task after pressing the OK button* box, and then select the *OK* button.
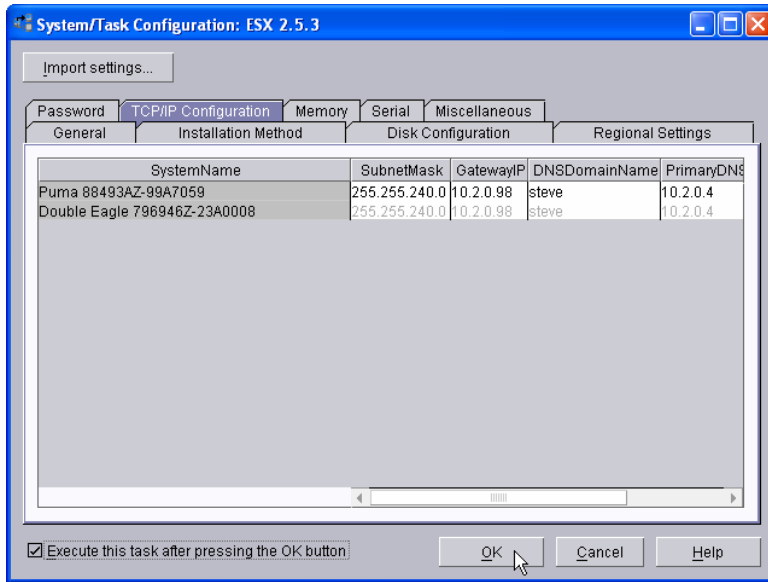
5.   Select the *Execute Now* button to run the task.

Now the target system should power on, run the task (with no errors), and then power off.

3. Configuring VMware

After you install VMware ESX Server, you have to define resources, create virtual machines, and assign resources to each machine. This document is not meant to be a primer on how to configure VMware. Instead, we just describe a single example, to indicate the kind of things you need to configure.
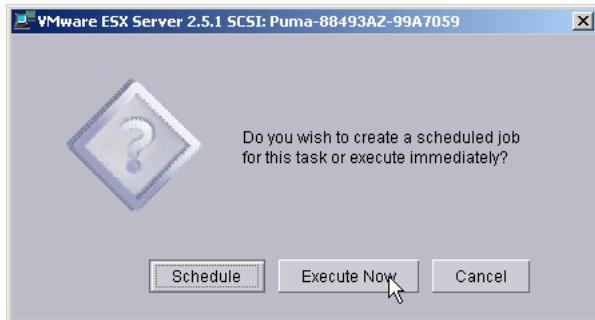
You should consult the VMware documentation to learn about how to configure VMware. Then you should design your VMware configuration in a way appropriate for your applications.

3.1 Start the VMware server

Now we'll consider each command, in the context of this task.

1. Power on the VMware server that you deployed in section 1.4 above.

2. Open the web interface in Windows Explorer. Use the IP address (or hostname) of the VMware ESX Server. This is the IP address that you entered in step 2 of section 2.5 above. If you get the *Security Alert* window, select the *Yes* button.
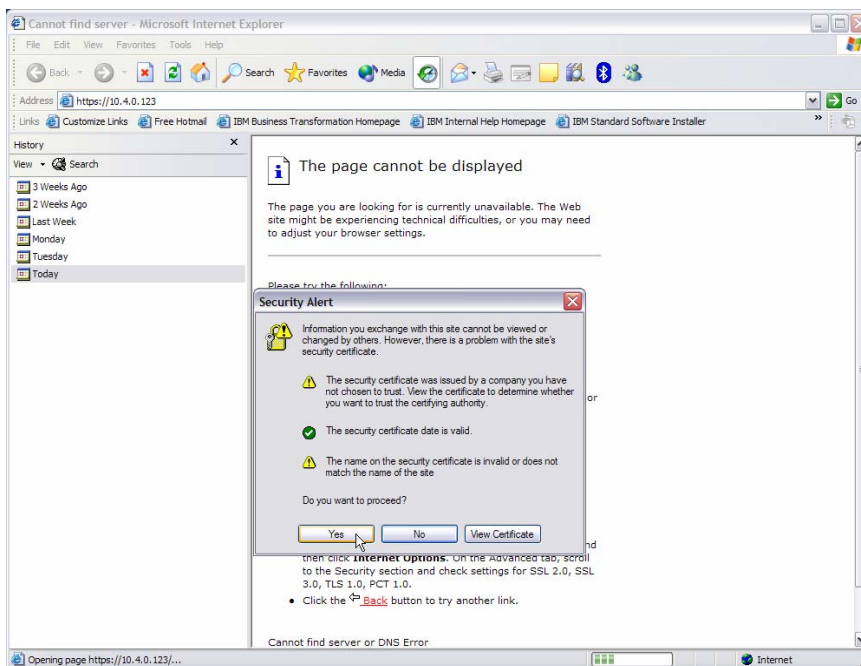
3. Login to the web interface. Enter *root* as the *Username*. Enter the *Password* that you entered in step 10 of section 2.4 above.
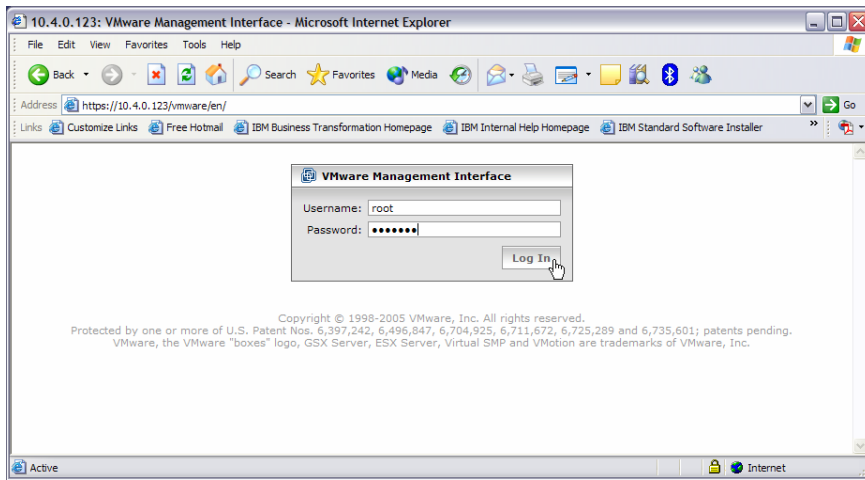
3.2 Configure the server

1. Begin configuring the server by selecting the *Next* button.
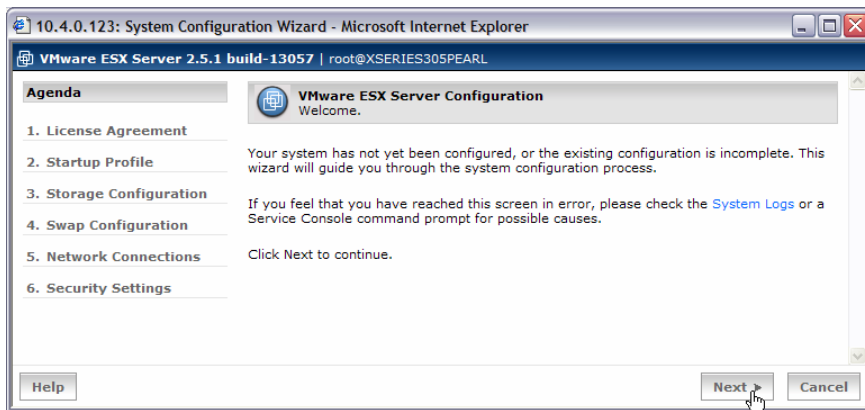
2. Notice that the serial number that you entered in step 3 of section 2.5 above is displayed, and the check box for accepting the license agreement is already checked. So just select the *Next* button.
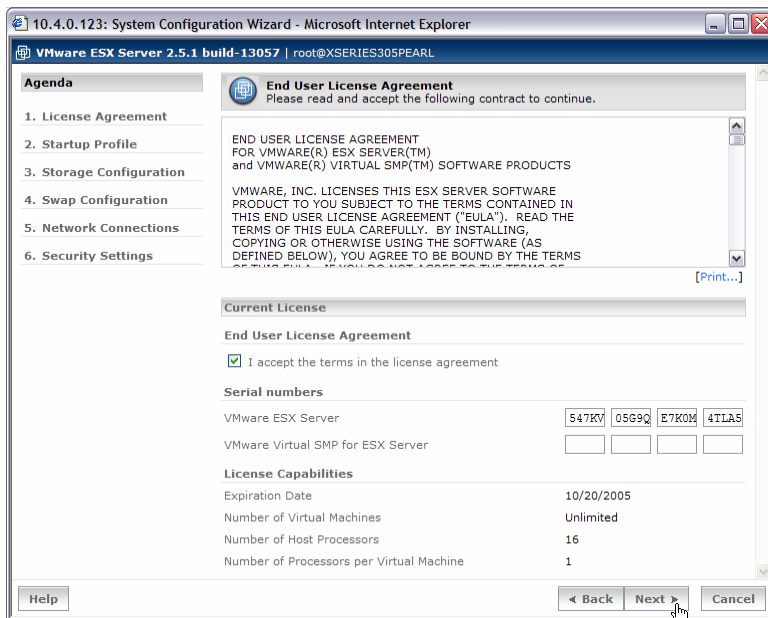
3. In our example, we did not change any fields in the *Startup Profile* window. Select the *Next* button.
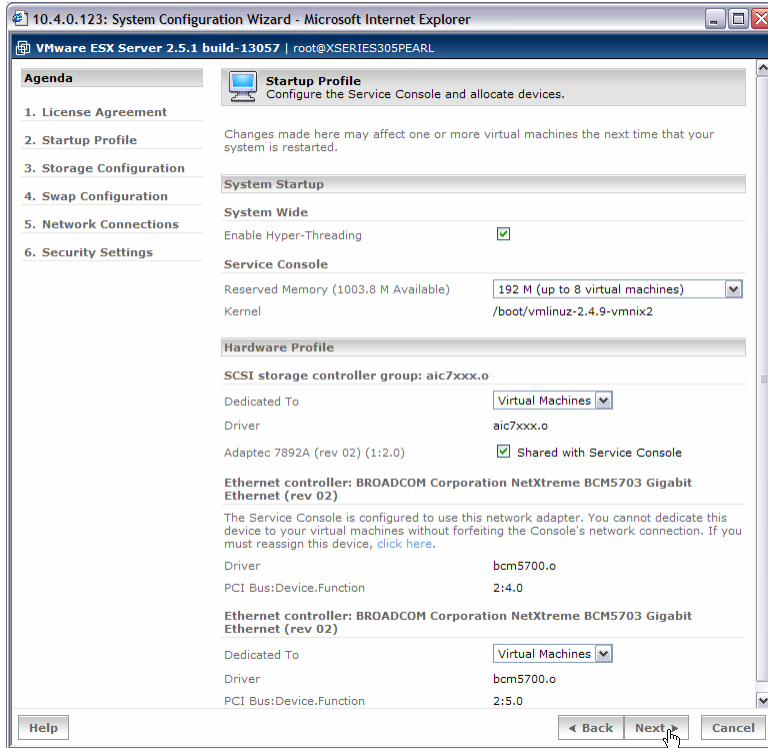
4. The server will reboot after you select the *Next* button on the *Reboot* window.
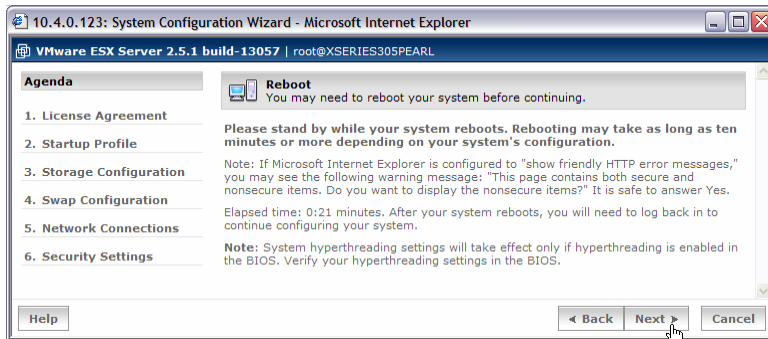
5. After the server reboots, login to the *VMware Management Interface* again, as you did in section 3.1 above.
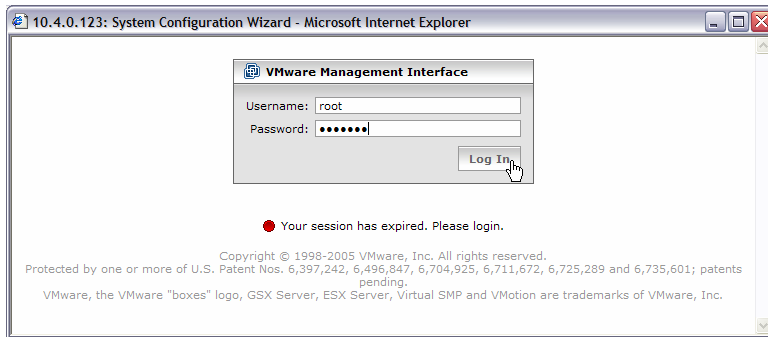
6. Select the *Create Volume...* link.
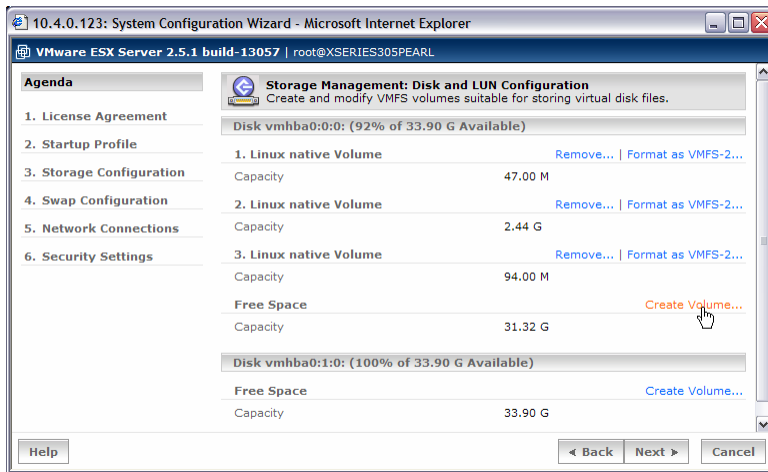
7. We used the *Typical* volume creation method. So we selected the *Next* button.

8. We selected *Yes* to create a core dump partition. Then we selected the *Next* button.

9. Enter a disk label name, and then select the *OK* button.

Explorer User Prompt

Script Prompt:
Please provide a unique label for your new VMFS volume:

OK

Cancel

MyVolume1

10. Select the *Create Volume...* link for the second physical disk.

https://10.4.0.123 - 10.4.0.123: Storage Management - Microsoft Internet E...

VMware ESX Server 2.5.1 build-13057 | root@XSERIES305PEARL

Disks and LUNs   **Failover Paths**   **Adapter Bindings**   Refresh | Rescan SAN | Help | Close

Storage Management: Disk and LUN Configuration
Create and modify VMFS volumes suitable for storing virtual disk files.

Disk vmhba0:0:0: (0% of 33.90 G Available)

1. Linux native Volume		Remove...	Format as VMFS-2...
Capacity	47.00 M	
2. Linux native Volume		Remove...	Format as VMFS-2...
Capacity	2.44 G	
3. Linux native Volume		Remove...	Format as VMFS-2...
Capacity	94.00 M	
4. Extended Partition		Remove...
5. MyVolume1 (Logical VMFS-2.11 Volume)		Edit...
Capacity	31.22 G	
Maximum File Size	456.00 G	
Access Mode	Public	
6. Logical VMware Core Dump		Remove...
Capacity	101.00 M	

Disk vmhba0:1:0: (100% of 33.90 G Available)

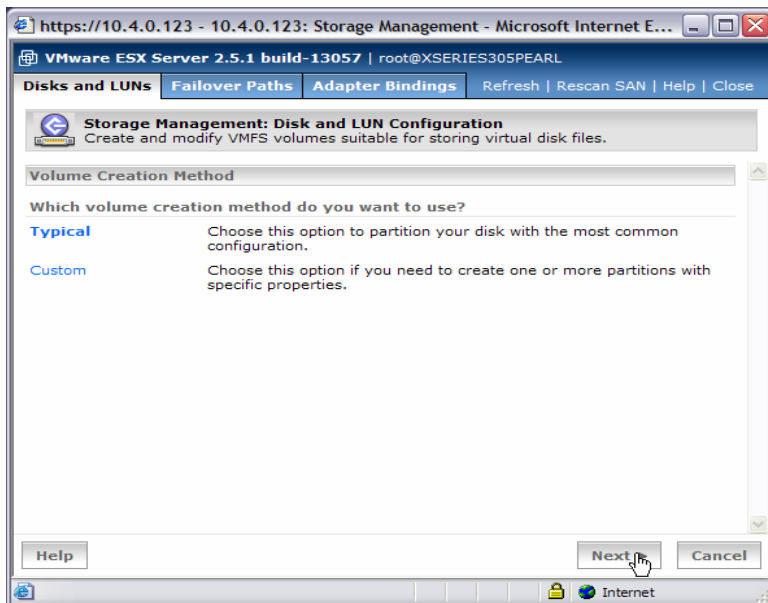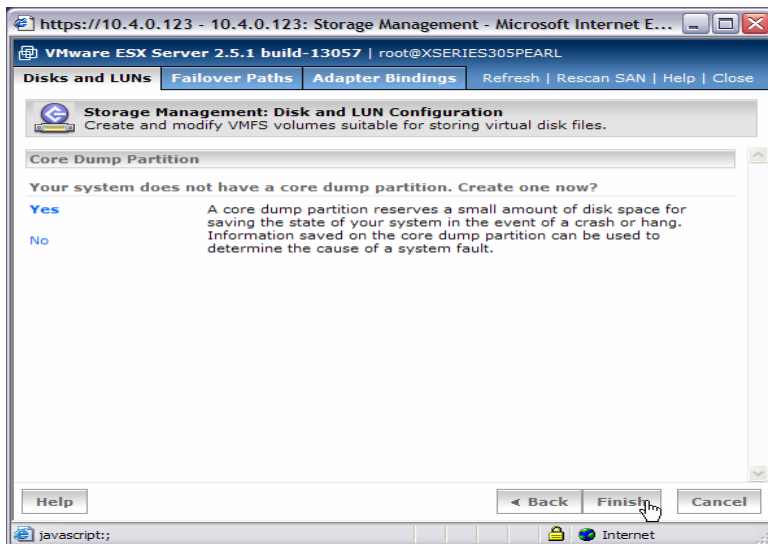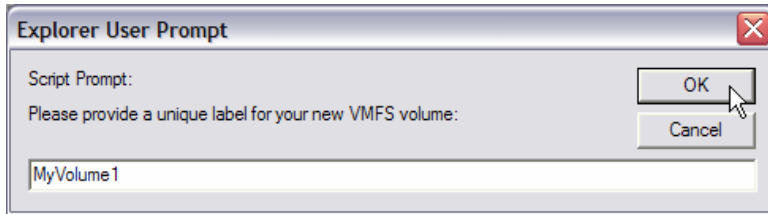| Free Space | | Create Volume... |
| Capacity | 33.90 G | |

javascript:self.location.replace('/vmware/en/addPartition.ht   Internet

11. We used the *Typical* volume creation method. So we selected the *Next* button.

https://10.4.0.123 - 10.4.0.123: Storage Management - Microsoft Internet E...

VMware ESX Server 2.5.1 build-13057 | root@XSERIES305PEARL

Disks and LUNs   **Failover Paths**   **Adapter Bindings**   Refresh | Rescan SAN | Help | Close

Storage Management: Disk and LUN Configuration
Create and modify VMFS volumes suitable for storing virtual disk files.

Volume Creation Method

Which volume creation method do you want to use?

Typical   Choose this option to partition your disk with the most common configuration.

Custom   Choose this option if you need to create one or more partitions with specific properties.

Help   Next   Cancel

Internet

12. Enter a disk label name, and then select the *OK* button.

Explorer User Prompt   ✕

Script Prompt: OK
Please provide a unique label for your new VMFS volume: Cancel

MyVolume2

13. The following picture shows the results of our partition creation.

https://10.4.0.123 - 10.4.0.123: Storage Management - Microsoft Internet E... _ □ ✕

VMware ESX Server 2.5.1 build-13057 | root@XSERIES305PEARL

Disks and LUNs   **Failover Paths**   **Adapter Bindings**   Refresh | Rescan SAN | Help | Close

Storage Management: Disk and LUN Configuration
Create and modify VMFS volumes suitable for storing virtual disk files.

Disk vmhba0:0:0: (0% of 33.90 G Available)

| 1. Linux native Volume | | Remove... | Format as VMFS-2... |
| Capacity | 47.00 M | |

| 2. Linux native Volume | | Remove... | Format as VMFS-2... |
| Capacity | 2.44 G | |

| 3. Linux native Volume | | Remove... | Format as VMFS-2... |
| Capacity | 94.00 M | |

4. Extended Partition   Remove...

5. MyVolume1 (Logical VMFS-2.11 Volume)   Edit...

Capacity   31.22 G
Maximum File Size   456.00 G
Access Mode   Public

6. Logical VMware Core Dump   Remove...

Capacity   101.00 M

Disk vmhba0:1:0: (0% of 33.90 G Available)

1. MyVolume2 (VMFS-2.11 Volume)   Edit...

Capacity   33.90 G
Maximum File Size   456.00 G
Access Mode   Public

Done   🔒 🌐 Internet

14. Select the *Reconfigure...* link in the web interface.

XSERIES305PEARL: VMware Management Interface - Microsoft Internet Explorer   _ □ ✕

File Edit View Favorites Tools Help

Back ▾ ✕ 📄 🔍 Search ⭐ Favorites 📄 ▾ 📄 ▾ 📄 ▾

Address https://10.4.0.123/vmware/en/   Go

Links Customize Links   Free Hotmail   IBM Business Transformation Homepage   IBM Internal Help Homepage   IBM Standard Software Installer   Search the Web with Lycos

VMware ESX Server 2.5.1 build-13057 | root@XSERIES305PEARL

Status Monitor Memory Options   Refresh | Manage Files... | Help | Log Out

Last updated Wed Aug 17 11:22:02 EDT 2005

⚠ **Warning:** No swap space is configured or none is active. Reconfigure...

⚠ **Warning:** No virtual ethernet switches found. Reconfigure...

System Summary   5 Minute Average

Physical Processors (1)   Memory (1017 M)
Virtual Machines   0 %   Virtual Machines   0
System Services   1 %   System Services   274.8 M
System Total   1 %   System Total   274.8 M

Virtual Machines (0)

No virtual machines are registered with this system. Click Add Virtual Machine to create one.

Download VMware Remote Console: Windows (exe) | Linux (rpm) | Linux (tar.gz)   Add Virtual Machine

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Protected by one or more of U.S. Patent Nos. 6,397,242, 6,496,847, 6,704,925, 6,711,672, 6,725,289 and 6,735,601; patents pending.
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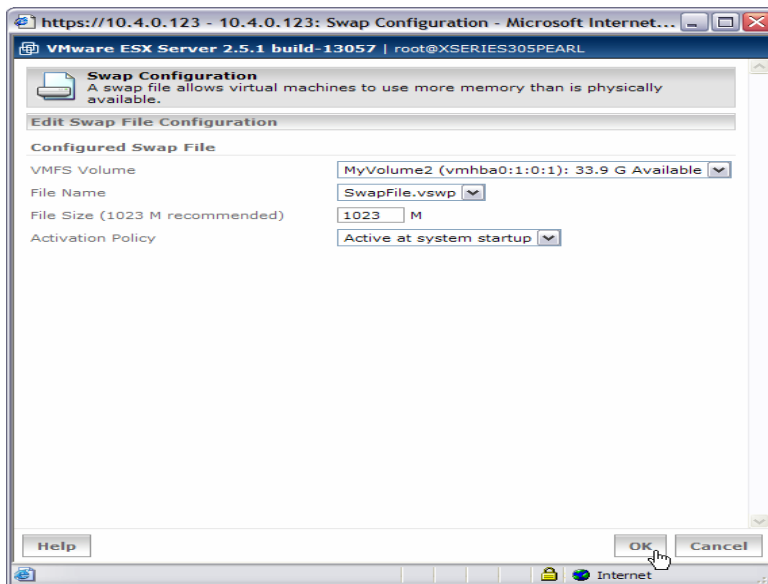Idle since Wed Aug 17 11:22:02 EDT 2005   🔒 🌐 Internet

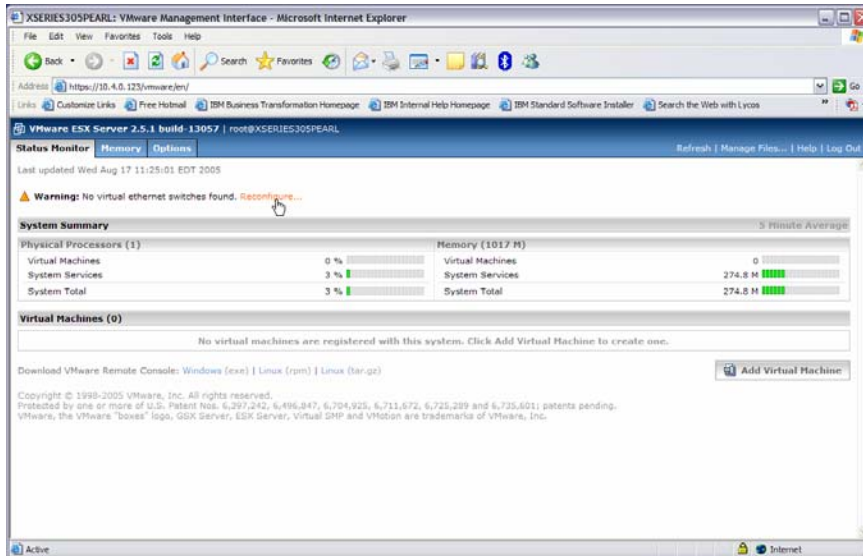15. Select the *Create...* link to configure swap files.
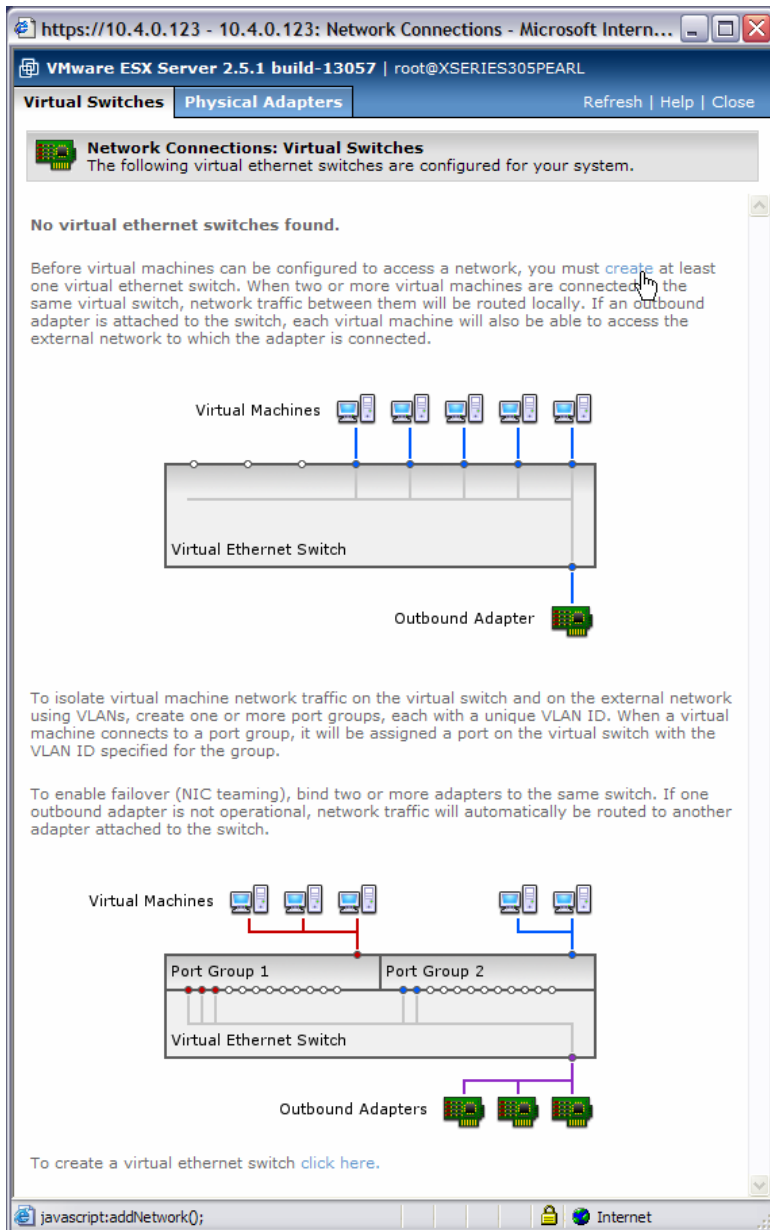
16. Select the *Activate* link.

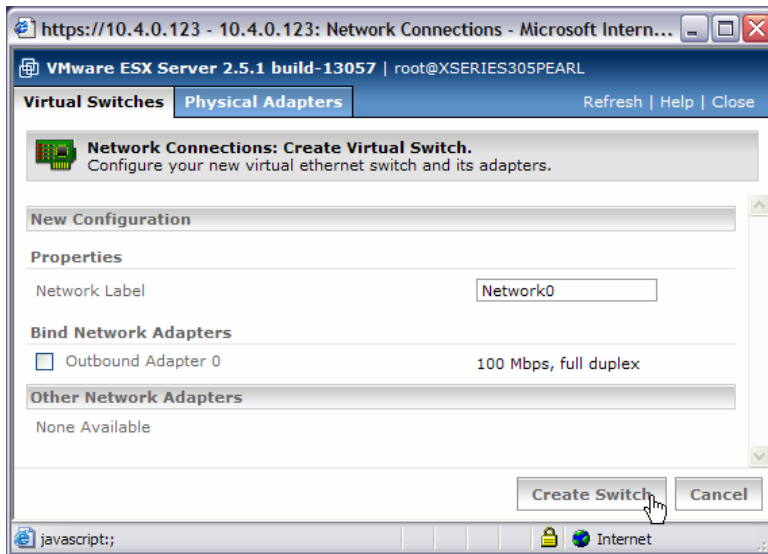17. Select the *OK* button on the *Swap Configuration* window.

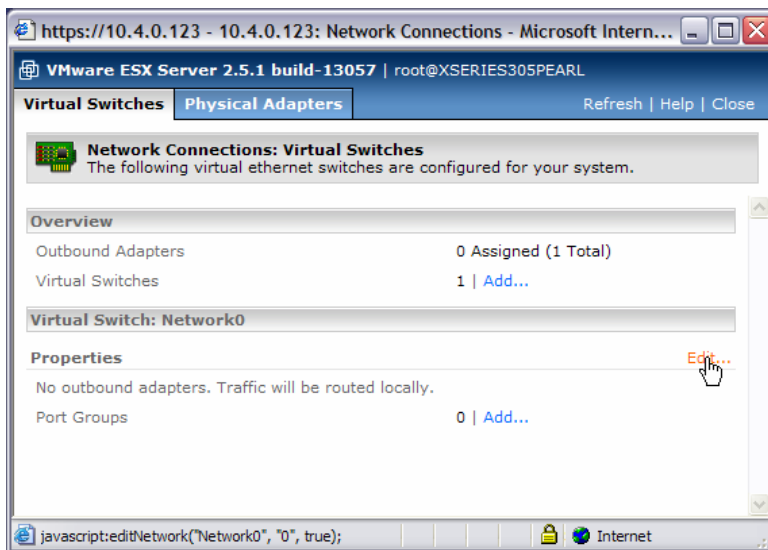18. On the web interface, select the *Reconfigure...* link.

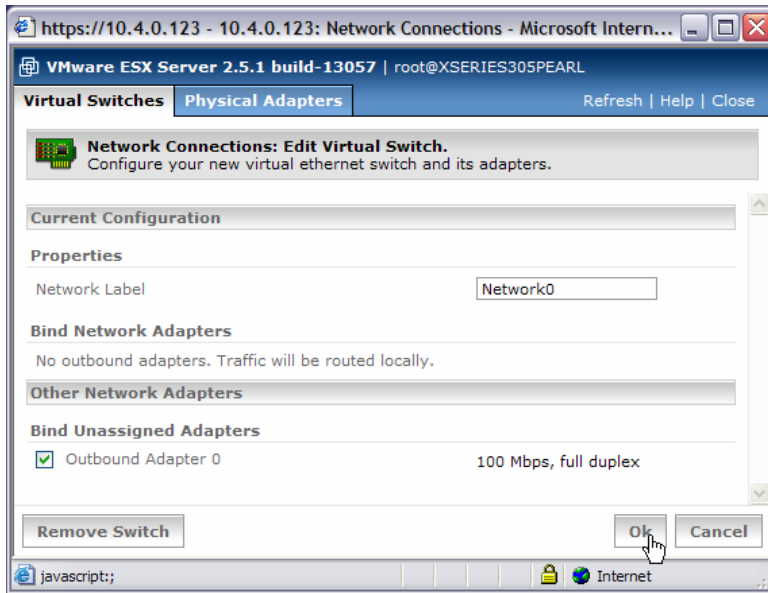19. Select the *Click here* link to create your virtual switch.

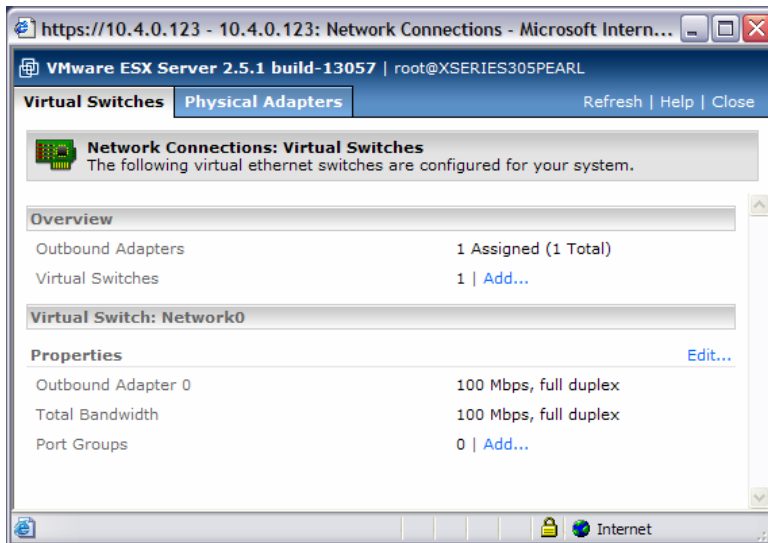20. Select the *Create Switch* button.

21. Select the *Edit...* link.

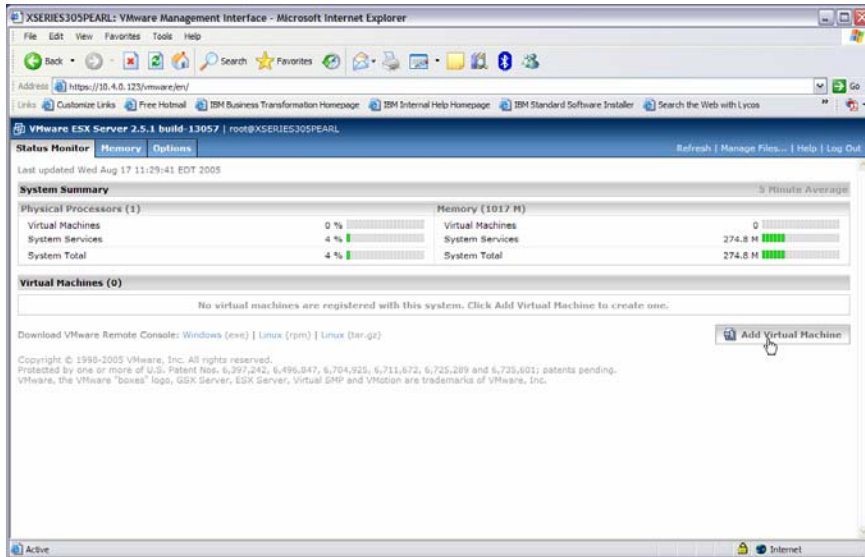22. Check the *Outbound Adapter 0* box, and then select the *OK* button.

23. You may now close the Network Connections: Virtual Switches window.
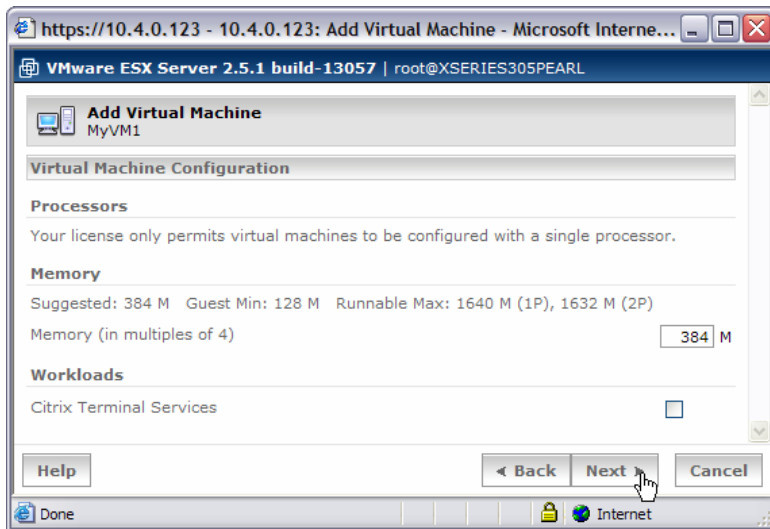

3.3 Create virtual machines

1.   On the web interface, select the *Add Virtual Machine* button.

2. Enter an appropriate name in the *Display Name* field. Then change the *Location* to something that corresponds to your display name. We added a 1 to the directory name to correspond to the 1 in our display name. Then select the *Next* button.
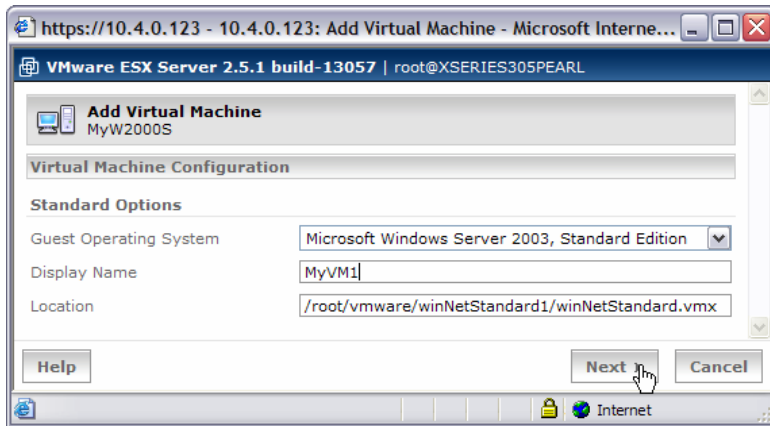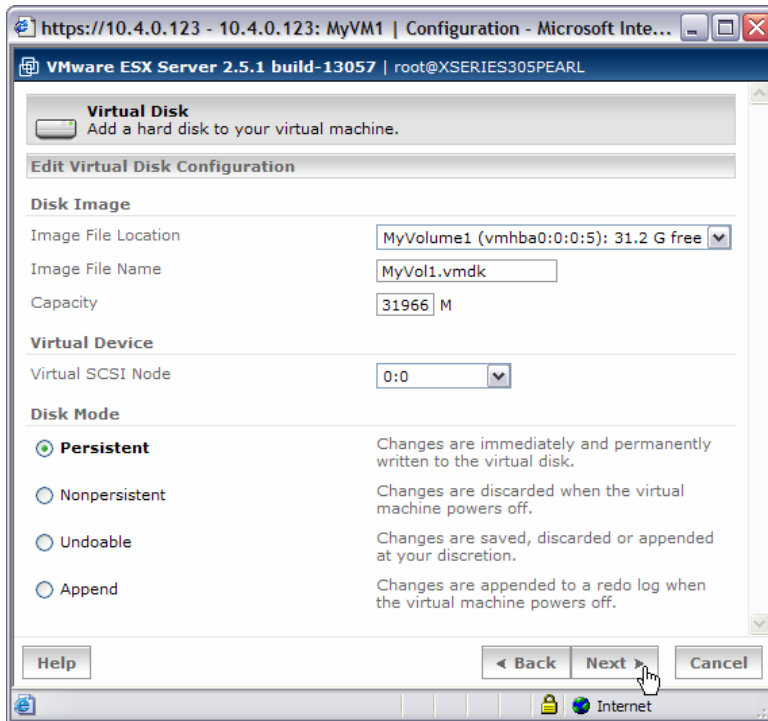

3. We accepted the default memory size, and selected the *Next* button.

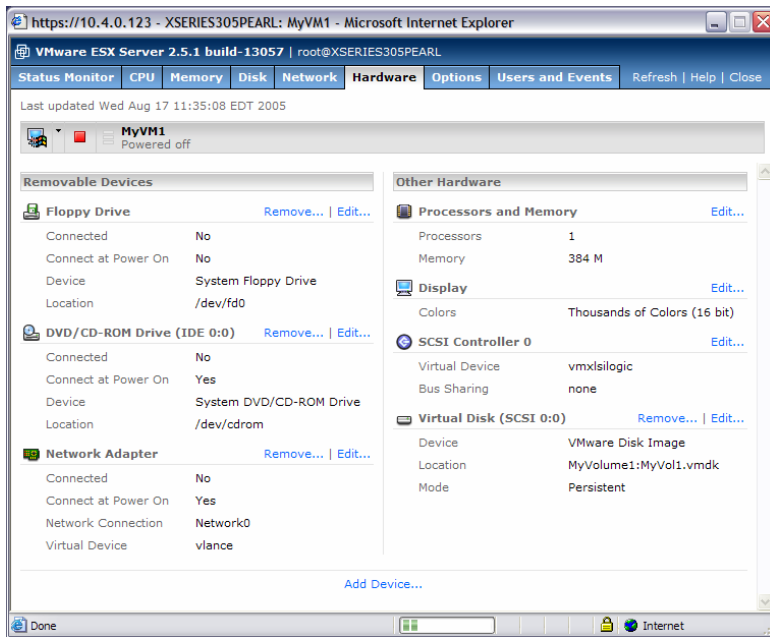4. We selected the *Blank* link on the *Virtual Disk* window.
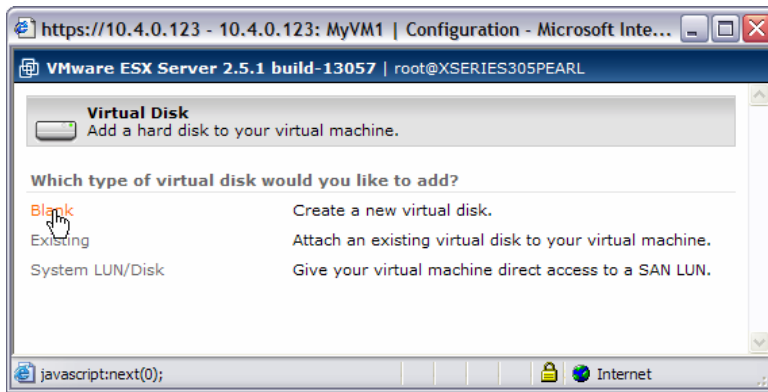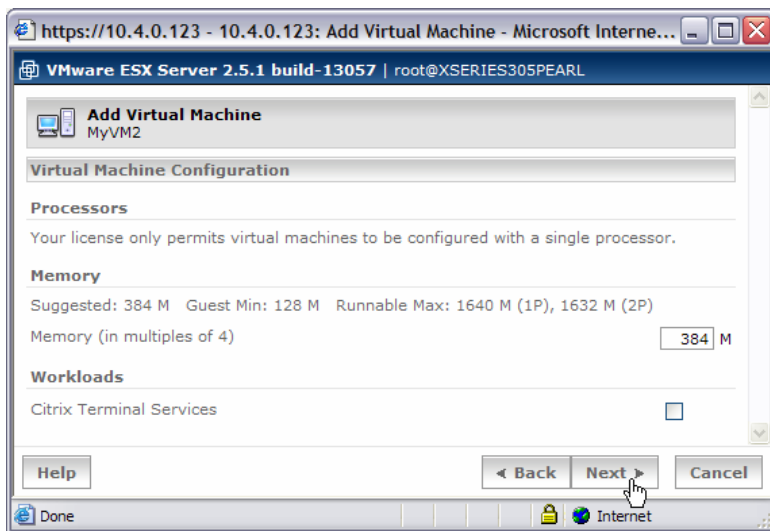
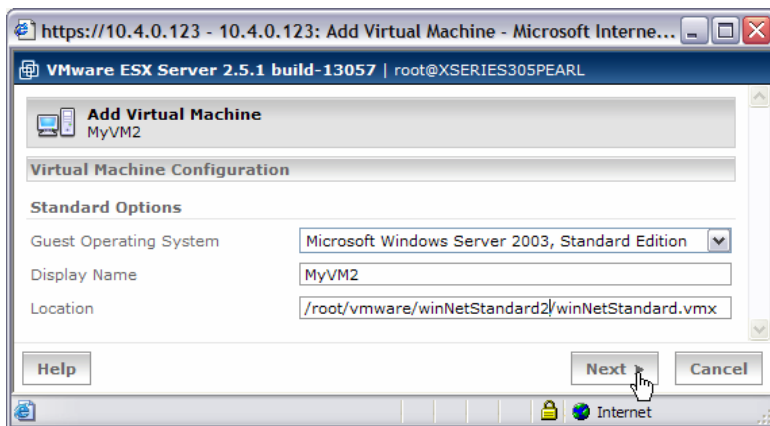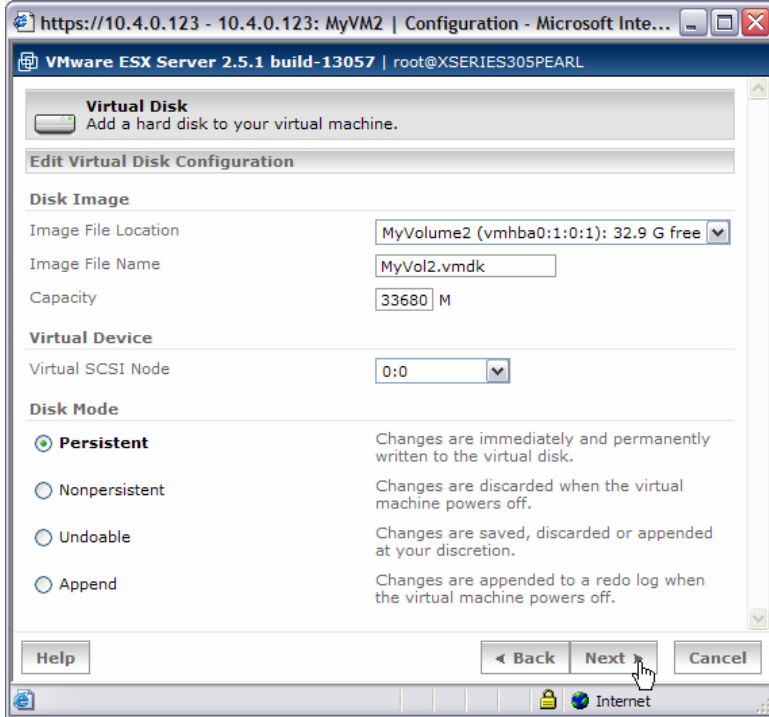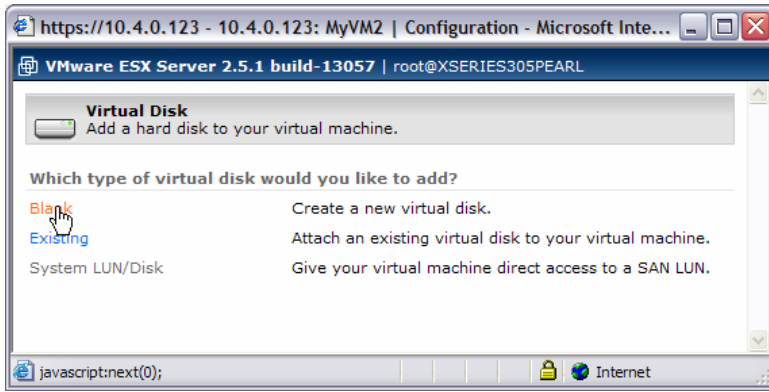5. We accepted all the default values, and we selected the *Next* button.
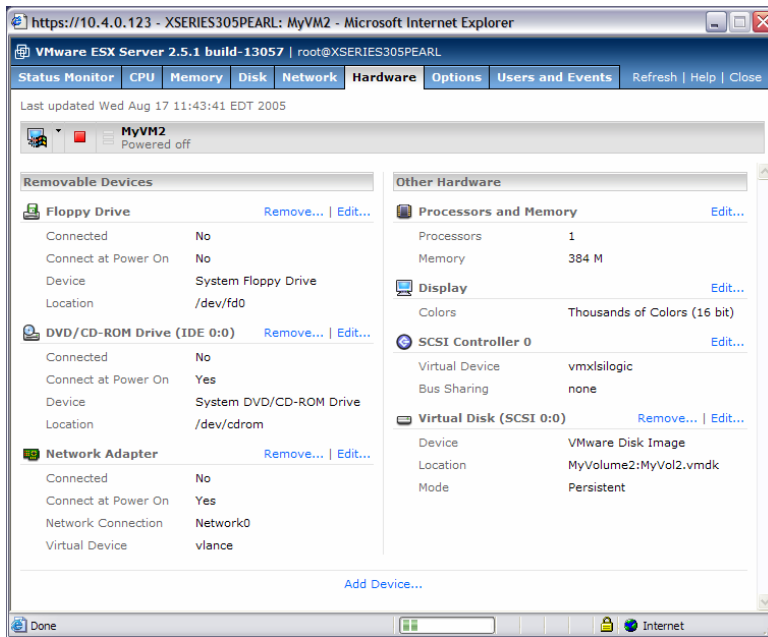

6. We closed the configuration window for MyVM1.

7.   We repeated the above steps for our second virtual machine. We added a 2 to the directory name to correspond to the 2 in our display name.
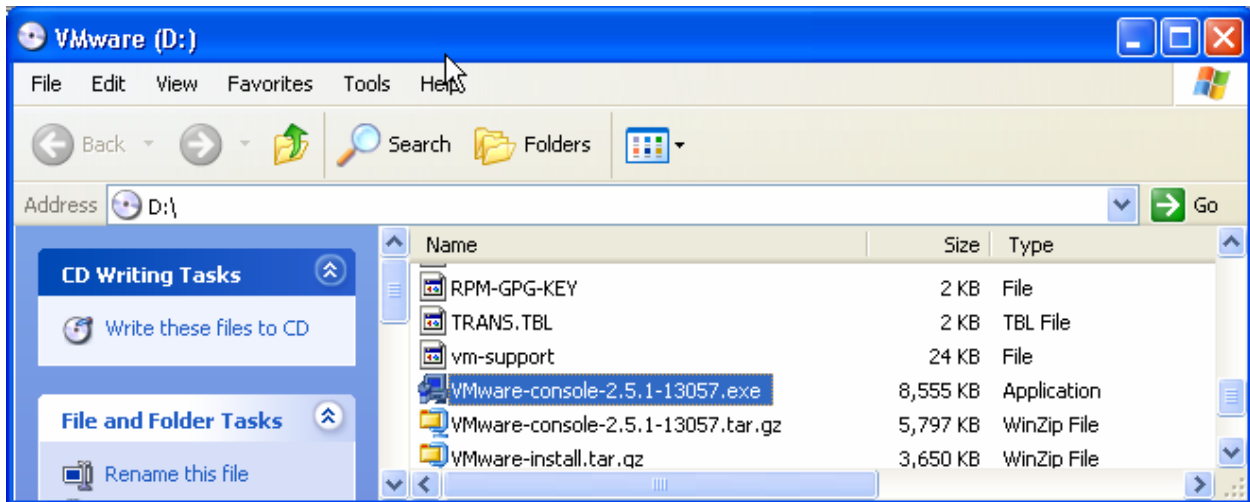
3.4 Install the *VMware Remote Console*

In order to use the virtual machines, you must use the *VMware Remote Console*. A typical best practice is to install the *VMware Remote Console* on your personal workstation or laptop computer.

1.   Locate the appropriate file on the VMware CD (*VMware-console-2.5.1-13057.exe* in our example).

2.   Run that file to install the *VMware Remote Console*.

Consult your VMware documentation for instructions, if needed.

3.5 Change the RDM MTFTP block size

RDM's default MTFTP block size of 2560 does not work well with VMware virtual machines. It causes severe performance degradation. So the best practice for deploying operating systems (using the *Windows Native Install* task) on VMware virtual machines is to lower the block size.

1.   On the RDM console, use the menus to open the *Deployment Server Management Options* window.
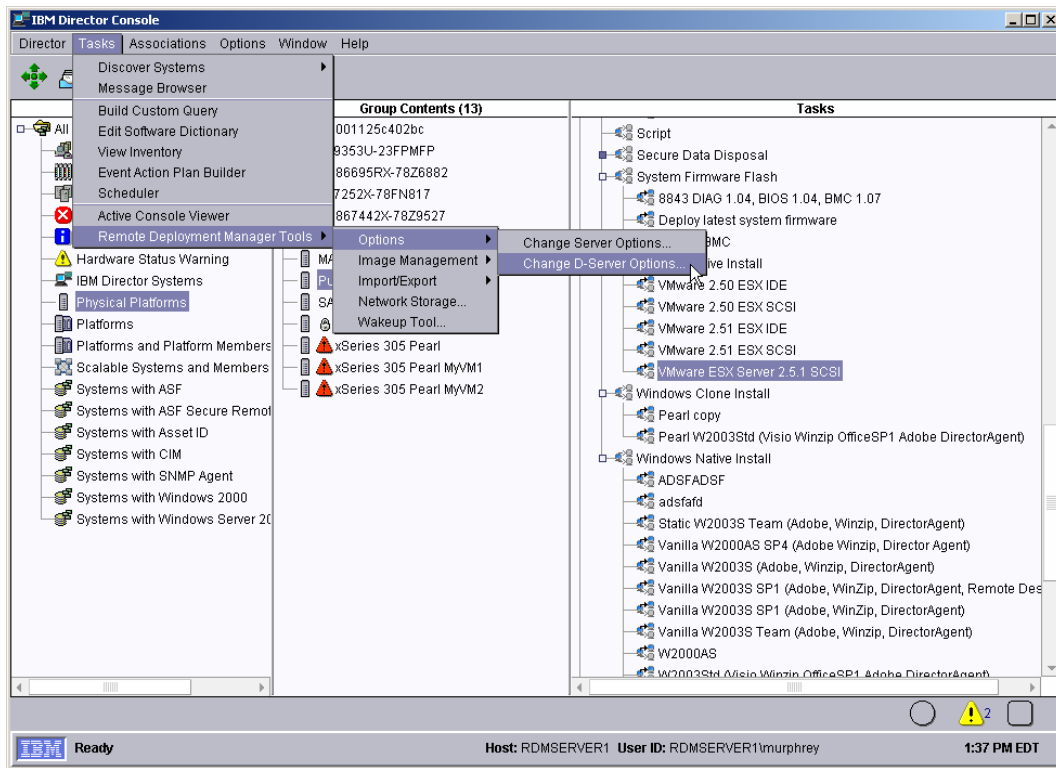
2.   Select the *Multicast* page.
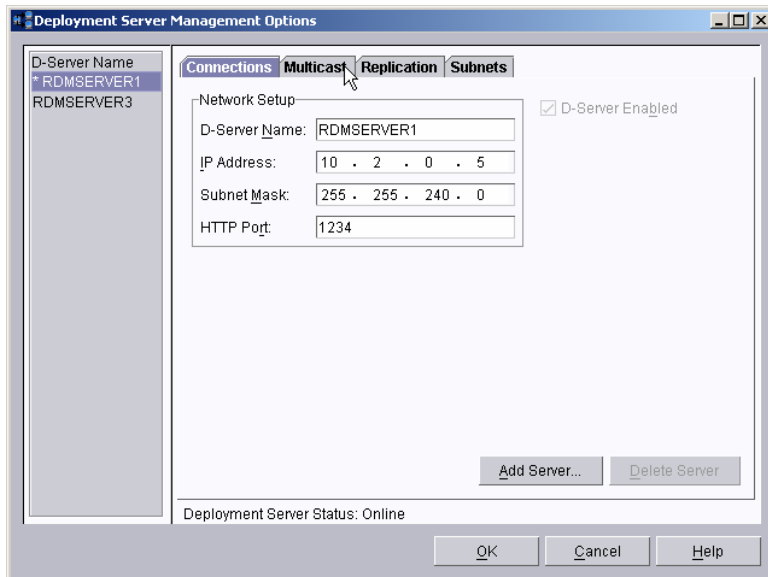
3.   Change the *Get Blocksize* value to 1024 (it must be a multiple of 512).
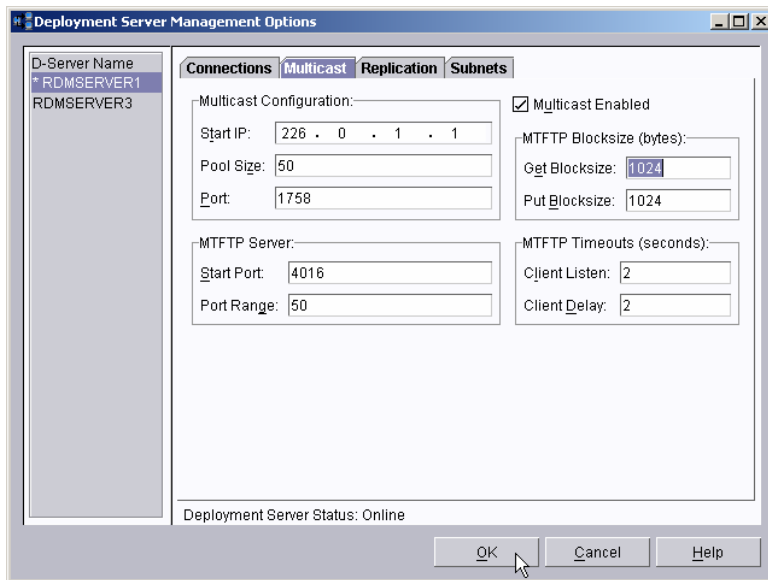
4. If you have more than one D-Server, select each D-Server in the left column, and change its *Get Blocksize* value the same way.

5. Then select the OK button. This will save the settings and restart all of the *IBM RDM D-Server* services.

Important: If you are running RDM version 4.20.3, do not attempt to change the block size to 512.

3.6 Configure the virtual machines

In order to use RDM to deploy your virtual machines, you must change their startup sequence.

1. Start the *VMware Remote Console* (on your workstation, for example) via the *Start* and *Programs* menus. Enter *root* as the user, and enter your password in the *Connect to VMware Server* window. Then select the *Connect* button.
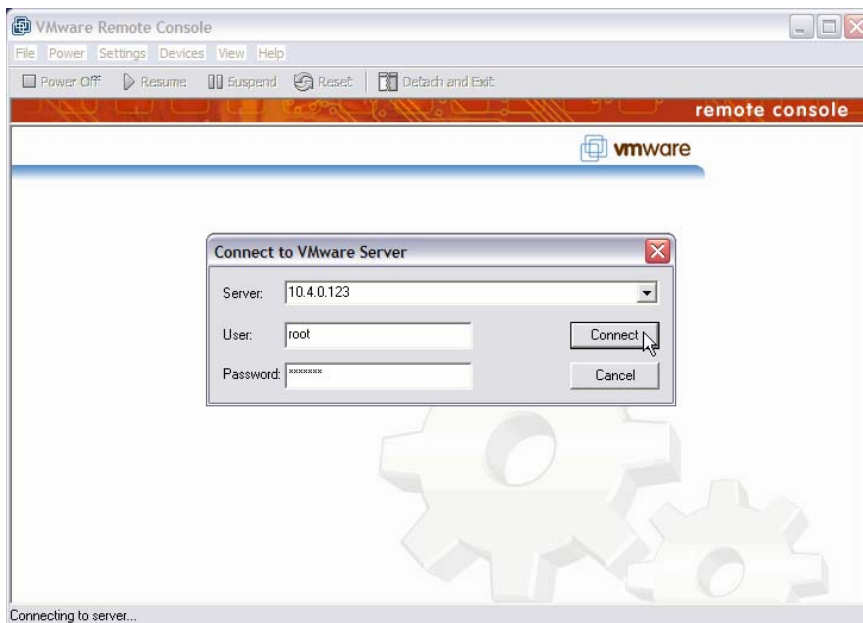
2. Select one of the virtual machines, and then select the *OK* button.
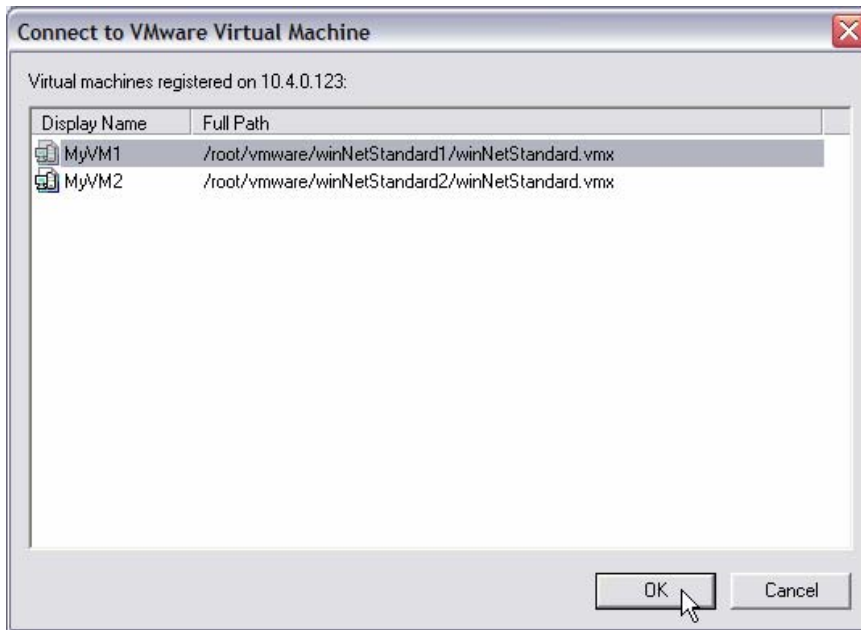
3. Select the Power On button.
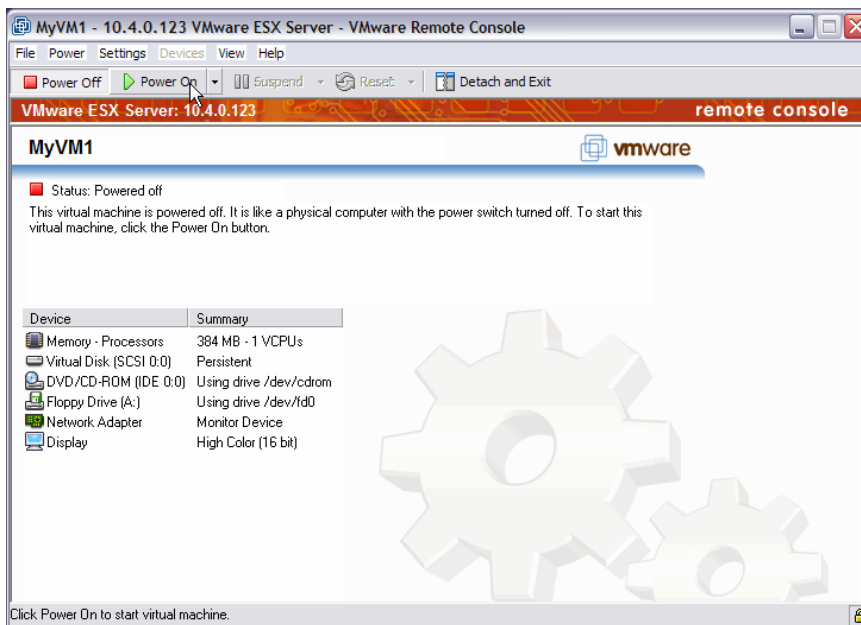
4. When the startup screen appears, click the mouse in the window and then quickly press the F2 key to bring up the BIOS setup window.
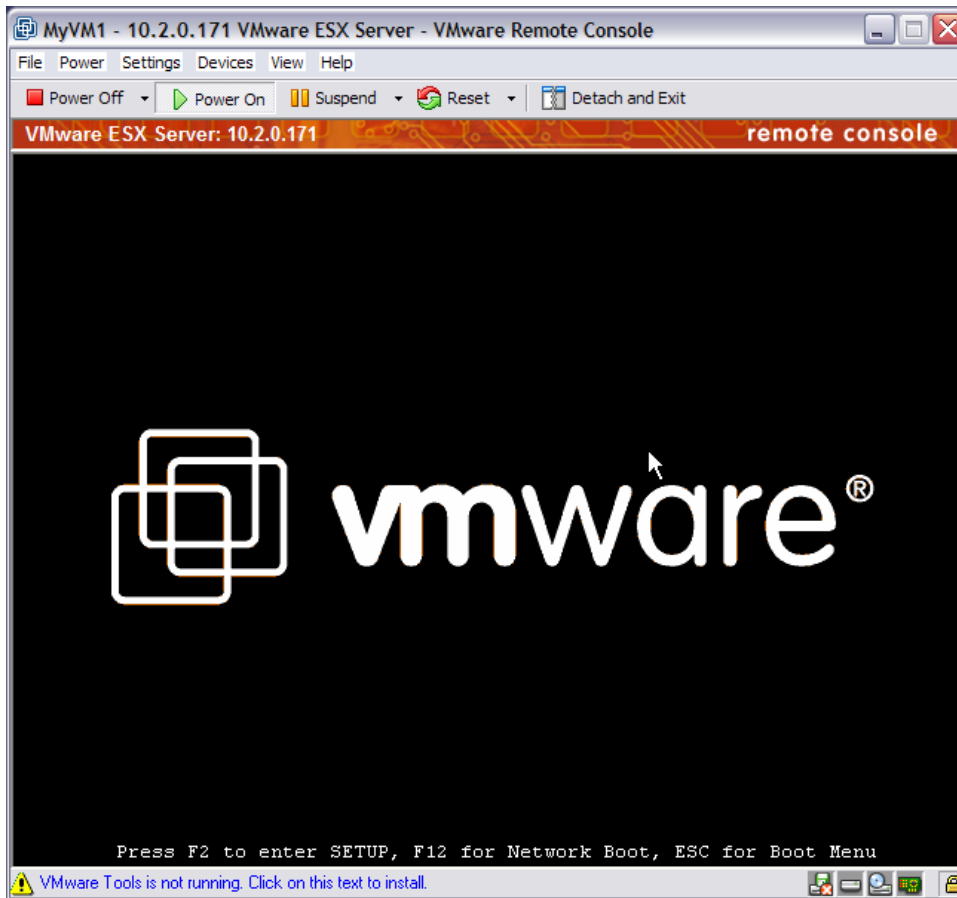
5. Move the *Network boot...* item to the top of the list. Then press the F10 key to save and exit.
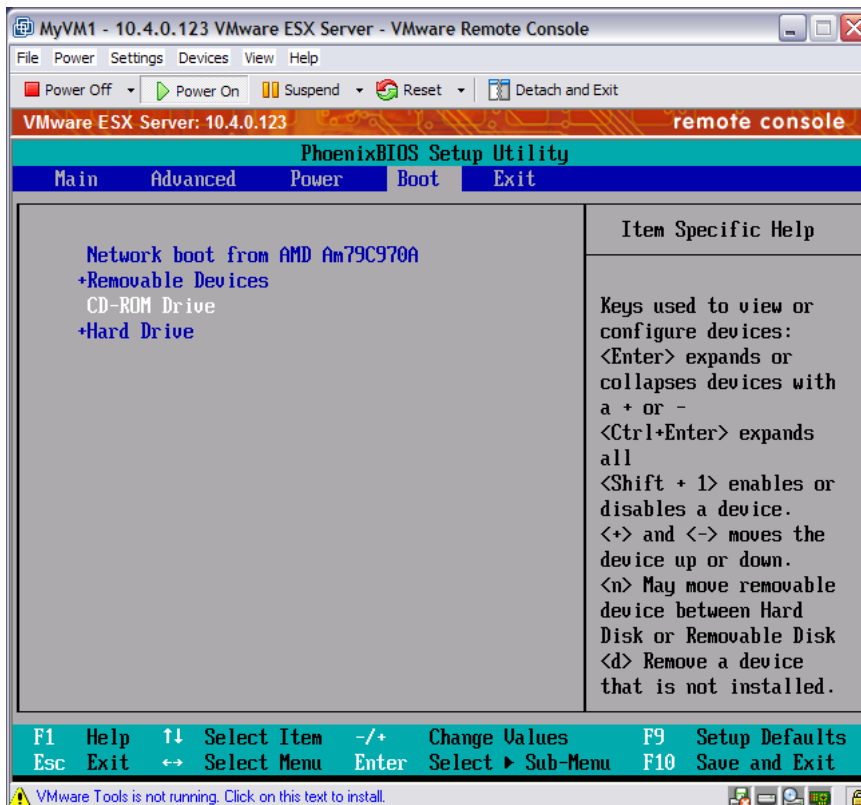
6. The virtual machine will reboot. This time, it will do a PXE boot. Because the Director/RDM server does not know about this virtual machine, RDM will run its default *Scan* task on the virtual machine. At the end of this task, RDM will power off the virtual machine and create a *Physical Platform Managed Object* in the Director/RDM console.

```
MyVM1 - 10.4.0.123 VMware ESX Server - VMware Remote Console
File  Power  Settings  Devices  View  Help

 ■ Power Off  ▼   ▷ Power On   ▐▐ Suspend  ▼  🔄 Reset  ▼  │  Detach and Exit

 VMware ESX Server: 10.4.0.123                                  remote console

Network boot from AMD Am79C970A
Copyright (C) 2003-2004  VMware, Inc.
Copyright (C) 1997-2000  Intel Corporation

CLIENT MAC ADDR: 00 0C 29 D3 28 F7  GUID: 564D8138-278F-05DC-D069-2F49CFD328F7
CLIENT IP: 10.4.0.127  MASK: 255.255.240.0
DHCP IP: 10.2.0.4  PROXY IP: 10.4.0.5
GATEWAY IP: 10.4.0.98

Auto-select:
     RDM

BOOT SERVER IP: 10.4.0.5

IBM Bootstrap Loader v2.1 (RDM v4.20.3)
(C) Copyright IBM Corp. 1999,2004 All Rights Reserved.
Copyright (C) 1997,1999 Intel Corporation.

D-SERVER IP: 10.4.0.5
Contacting RDM D-Server ._

 ⚠ VMware Tools is not running. Click on this text to install.
```

7. On the RDM console, the system name is unique, but it is not particularly friendly. We chose to rename the virtual machine with a more friendly name.

8. Repeat the above steps for the second virtual machine.

4. Installing a guest operating system

4.1 Create an RDM task that deploys an operating system

An operating-system deployment task for a virtual machine is no different than an operating-system deployment task for a physical machine. We assume that you already know how to do that, and we won't describe it here.

4.2 Configure systems

You configure your virtual machines for an operating-system deployment task just like you do for any other target system. We assume that you already know how to do that, and we won't describe it here.

4.3 Run systems

You run the task on your virtual machines just like you do for any other target system. We assume that you already know how to do that, and we won't describe it here.

4.4 Power on the virtual machines

The primary difference in running an RDM task on a virtual machine versus a physical machine is that RDM cannot power on the virtual machine. This means that you have to power on the virtual machines.

You can do this either with the web interface to the VMware ESX Server or with the VMware Remote Console. Just select the appropriate button in either interface.

RDM will then run the task, just as it would for a physical machine. The big difference for a virtual versus a physical machine is that the task will take much longer on the virtual machine. Other than that, it will deploy in the same way that a physical machine would deploy.

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6. Glossary

BAT file. A file that contains a batch program (that is, a set of commands).

bind. Associating one or more systems to a task. This causes all information to be verified (by one of the STC modules) and a resulting job to be scheduled to run.

console, or RDM Console. The group of programs that make up the user interface to RDM. RDM is client/server in nature so that the Console might run on any computer and not necessarily be running on the same computer as the RDM server or other RDM components. The RDM Console is actually an IBM Director Console on which the RDM Console component is installed.

image. An image is the software stored on a deployment server that is downloaded to a system during an operation. Images vary in size and in the type of software they provide to the system. The purpose and content of each image depends on the task to be accomplished, as well as the method used to download the image from the deployment server to the system. A *native* image is built off a product installation CD. A *clone* image is copied from a donor system.

job. An object managed by the scheduler and created by STC. A job is a binding of one task and one or more systems. A job can be scheduled to run once or to recur. Sometimes a job is called by a different name (Scheduled Task, Running Task), to emphasize some aspect of the job.

managed system. The IBM Director term for its system. Mentioned here only for clarity; the term *system* is preferred when referring to an RDM system.

preboot DOS agent. The preboot DOS agent is a DOS operating system with a communications stack that is booted from the network by the bootstrap agent. The preboot DOS agent performs actions on a system as directed by the RDM server.

Preboot Execution Environment (PXE). PXE is an industry standard client/server interface that allows networked computers that are not yet loaded with an operating system to be configured and booted remotely. PXE is based on Dynamic Host Configuration Protocol (DHCP). Using the PXE protocol, clients can request configuration parameter values and startable images from the server.

The PXE process consists of the system initiating the protocol by broadcasting a DHCPREQUEST containing an extension that identifies the request as coming from a client that uses PXE. The server sends the client a list of boot servers that contain the operating systems available. The client then selects and discovers a boot server and receives the name of the executable file on the chosen boot server. The client downloads the file using Trivial File Transfer Protocol (TFTP) and executes it, which loads the operating system.

Redundant Array of Independent Disks (RAID). RAID is way of storing the same data in different places (thus, redundantly) on multiple hard disks. By placing data on multiple disks, I/O operations can overlap in a balanced way, improving performance. Multiple disks increase the mean time between failure (MTBF) and storing data redundantly increases fault-tolerance.

system. An individual, target system being deployed or managed by RDM. In IBM Director terminology, an RDM system is always a platform managed object. These can represent any of the supported-by-RDM systems. They cannot represent an IBM Director object that RDM does not process, such as a chassis or an SNMP object.

system environment. This is the RDM term for a preboot operating system, one that contains a communications stack and is booted from the network by the bootstrap loader program.

task. An already defined and configured unit of work that is available to be applied to a system or a group (of systems). You create a task by clicking on the applicable task template from the RDM main

console. RDM is installed with predefined tasks, such as data disposal and scan.

task template. A prototype of a specific kind of RDM task. This is a term used to describe the different kinds of tasks shown on the task pane in the main window of the RDM console. Each task template has its own characteristics and attributes. RDM comes with a set of task templates.

Wake on LAN. Technology developed by IBM that allows LAN administrators to remotely power up systems. The following components are essential for the Wake on LAN setup:

- Wake on LAN-enabled network interface card (NIC).

- Power supply that is Wake on LAN-enabled.

- Cable which connects NIC and power supply.

- Software that can send a magic packet to the system.

If the system has the first three of the previous components, the system is called a Wake on LAN-enabled system. Even though a system might be powered off, the NIC keeps receiving power from the system power supply to keep it alive. A network administrator sends a magic packet to the system through some software, for example, RDM or Netfinity IBM Director. The NIC on the system detects the magic packet and sends a signal to the power supply to turn it on. This process is also called *waking up the system*. Using RDM, this process can be scheduled for individual systems. The Wake on LAN feature and RDM together make it very easy for you to deploy software on individual systems on a scheduled basis.