Updating Disk Firmware with RDM 4.30

A White Paper

April 27, 2006

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1 Preface

This White Paper explains how to use IBM® Remote Deployment Manager (RDM) 4.30 (or a later RDM version) to update the firmware on all SCSI or SAS hard drives in a target system, as well as to update the BIOS firmware on the SAS controller. There are 3 separate tasks described herein:

- Deploying SCSI drive firmware
- Deploying SAS drive firmware
- Deploying SAS BIOS firmware

There are other ways to flash drive firmware (e.g., with the FLASHDRV CD, with the UpdateXpress CD, etc.). But using RDM to do this from a remote console on many systems concurrently, without having to visit the systems, is a powerful and easy way to accomplish this task.

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

- Updating drive firmware to the specific level covered in this book.

In addition, this White Paper will help you learn some of the typical techniques that you can use to extend and customize RDM:

- Create RDM custom tasks.
- Create RDM custom images and use them in an RDM task.
- Create new RDM DOS system environments.
- Generalizing the procedures described herein to other drive firmware levels.

One good use of the custom task described below is in an end-to-end deployment procedure (i.e., an RDM Script task that does all steps in deploying a system). For example, such a Script task might contain the following subtasks:

1. System Firmware Flash task – updates System BIOS and Integrated System Management Processor firmware.
2. Custom task to update the firmware or BIOS on a disk controller, such as the SAS controller (described herein) or a ServeRAID adapter (see section 0 below to obtain a white paper on how to do this).
3. Custom task to update disk-drive firmware (i.e., the task described in section 2 below).
4. Custom task to update Diagnostics (see section 0 below to obtain a white paper on how to do this).
5. Custom task to update network adapter firmware (see section 0 below to obtain a white paper on how to do this).
6. RAID Custom Configuration task.
7. Task to deploy the operating system and applications – one of these:
    - Windows Native Install task.
    - Windows Clone Install task.
    - Linux Clone Install task.
    - Linux Native Install task (note that this task only deploys very old versions of Linux).
8. Power Restore task.
9. CMOS Update task – modifies the CMOS/BIOS settings.

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1.1 How this document is organized

Chapter 3 below contains a step-by-step procedure for how to create the Custom task that this document describes.

You can save time by extracting the entire task from an embedded file, and then importing it into your RDM server. Chapter 2 below contains this import procedure.

1.2 Who should read this White Paper

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

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.

Guides

The following product documentation is available for RDM:

- *Remote Deployment Manager 4.20 Users Reference* – The main reference manual for RDM
- *Remote Deployment Manager 4.20 Installation and Configuration Guide* – Describes the complete installation process of RDM
- *Remote Deployment Manager 4.20 Compatibility 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-56662 to get the current versions of the above documents.

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.

Online help

In general, most RDM windows have 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.

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 4.20, 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.

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2 Import Tasks

Because RDM 4.30 has the ability to import a task, you can use the attached self-extracting ZIP files in this section to create your tasks and their required DOS System Environment quickly and with minimal effort.

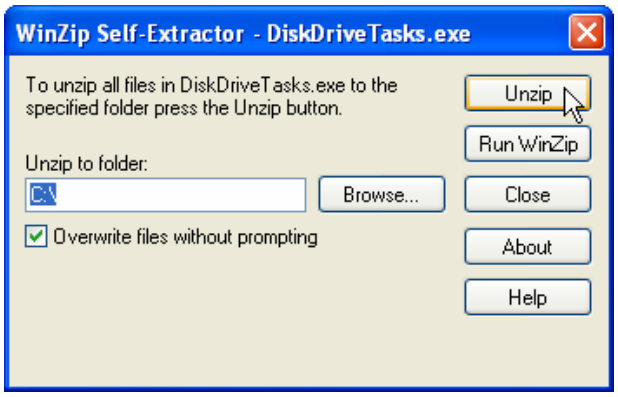
2.1 Unzip the Attached File (the Tasks)

This file contains an exported copy of the task created in section 3 below.

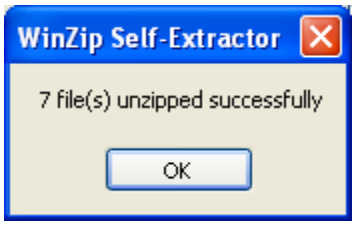
1. Extract the attached self-extracting ZIP file, *DiskDriveTasks.EXE*, by right clicking on the paperclip icon and saving the file to disk.

   Note: You may need Adobe Acrobat Reader 6.0.1 or later to be able to extract the file. If you are using Adobe Acrobat Reader 7.0 or later, you may need to modify your Windows Registry to be able to extract the file. See http://www.adobe.com/support/techdocs/328671.html and http://www.adobe.com/support/techdocs/328671.html for configuration instructions.

2. Run *DiskDriveTasks.EXE*.
3. Change the target folder name appropriately (e.g., to C:\), and then click the *Unzip* button.



4. Click the *OK* button on the message box when the unzip is complete.



5. Click the *Close* button to exit WinZip.

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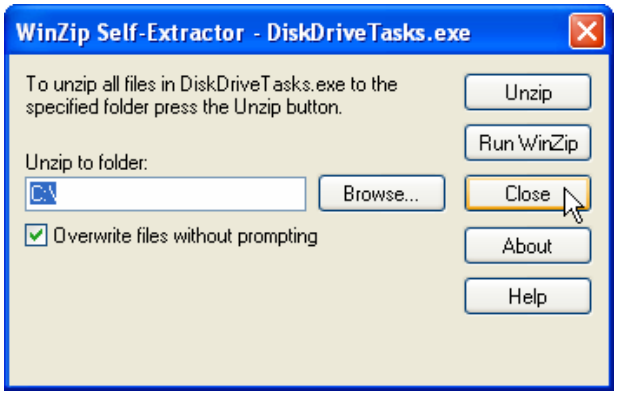
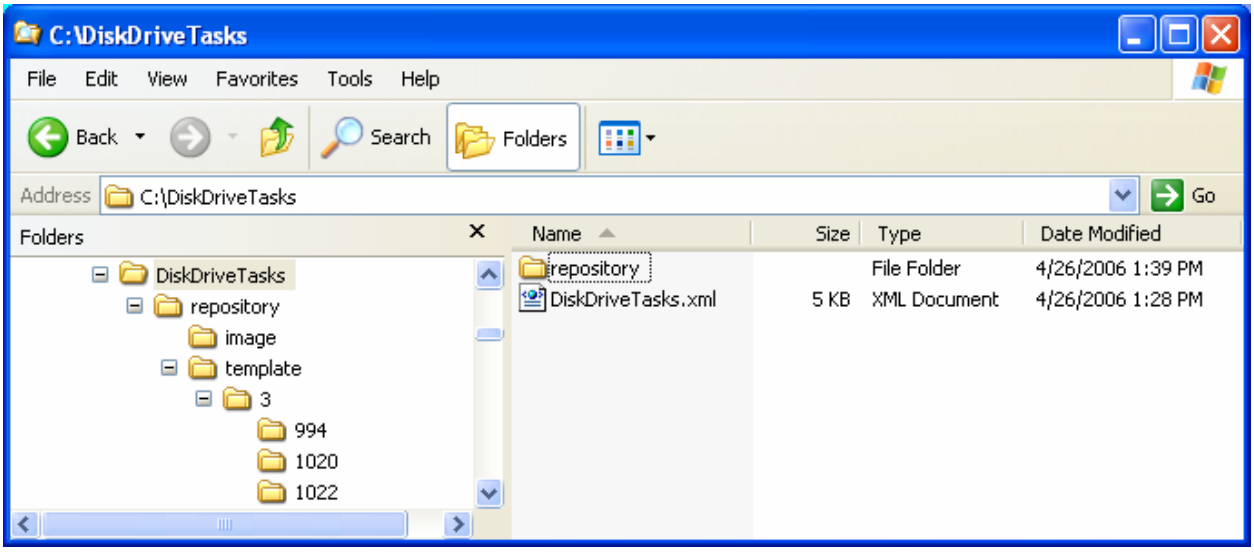
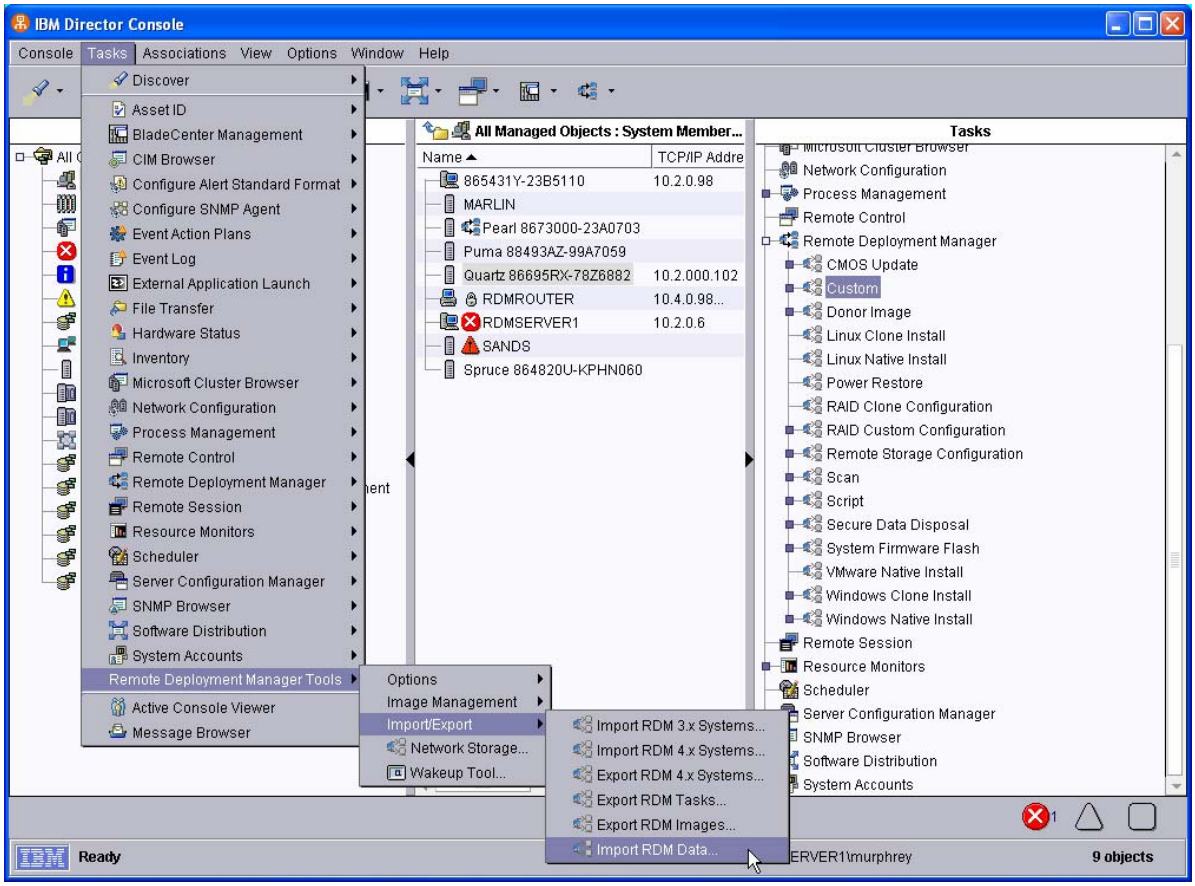


The above procedure will extract the directories and files shown below.

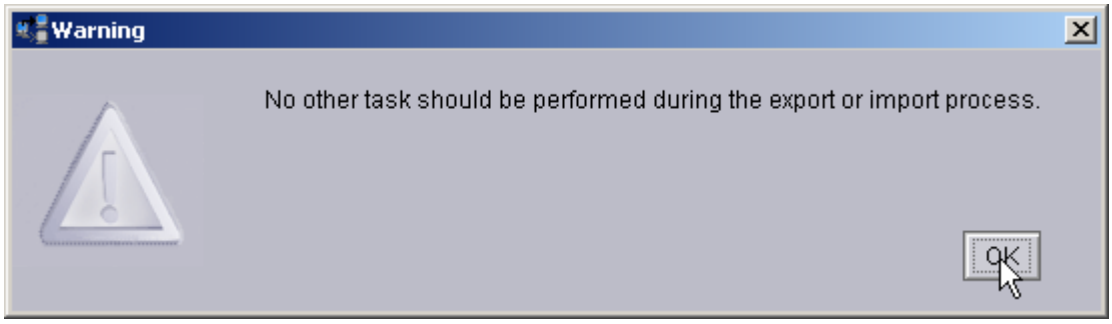


2.2 Import the Custom Tasks

6. From the Director console, select the **Tasks**, **Remote Deployment Manager**, **Import/Export,** and **Import RDM Data...** menus.



7. Make sure that you are not running any other RDM tasks. Then click *OK* on the warning message.



8. Select the *Browse* button on the *Import Data* window.

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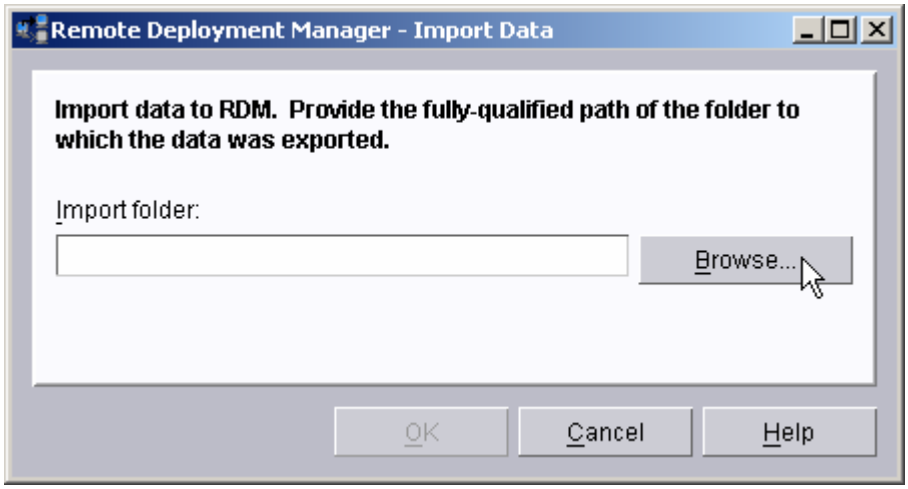
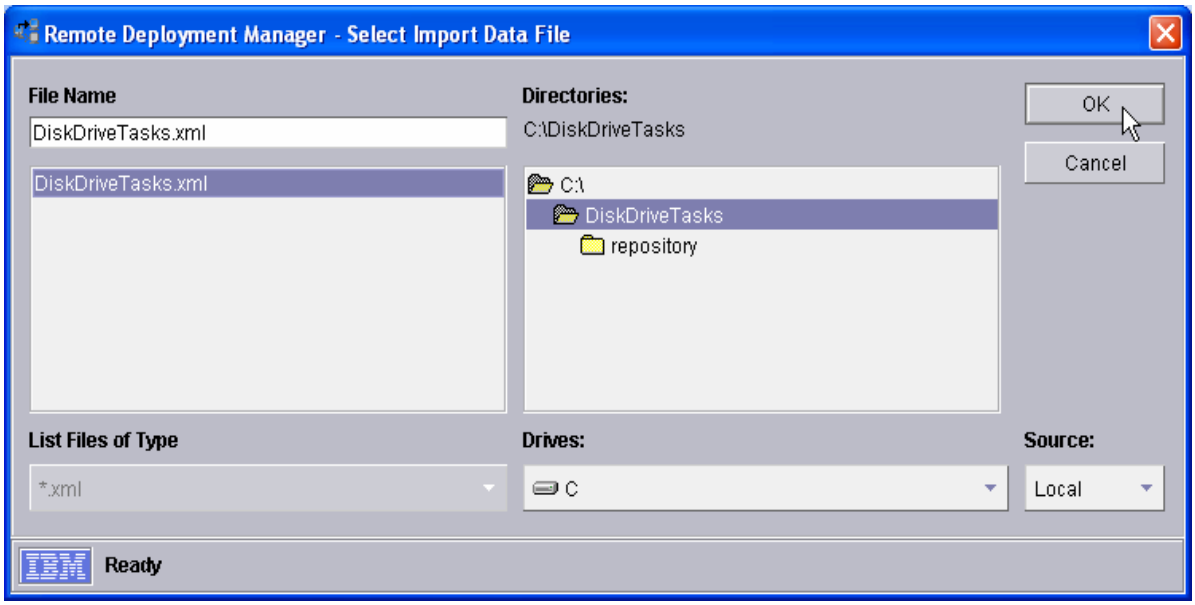
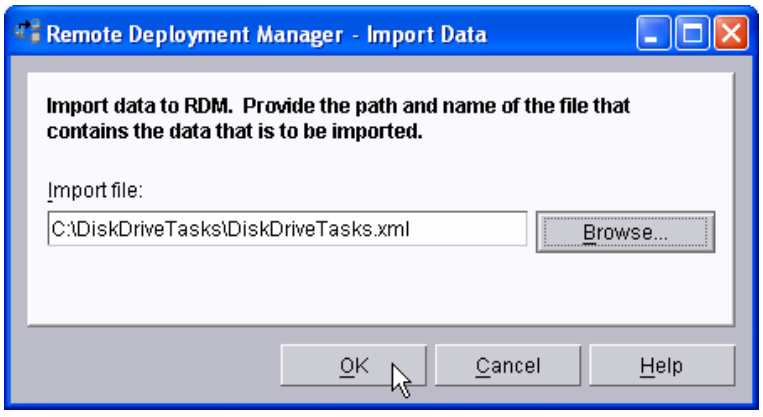


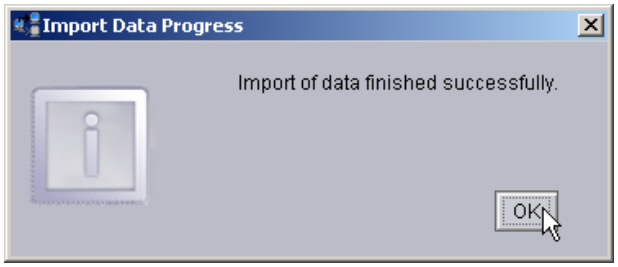
9. Navigate to the *DiskDriveTasks* folder, select the *DiskDriveTasks.xml* file, and select the *OK* button.



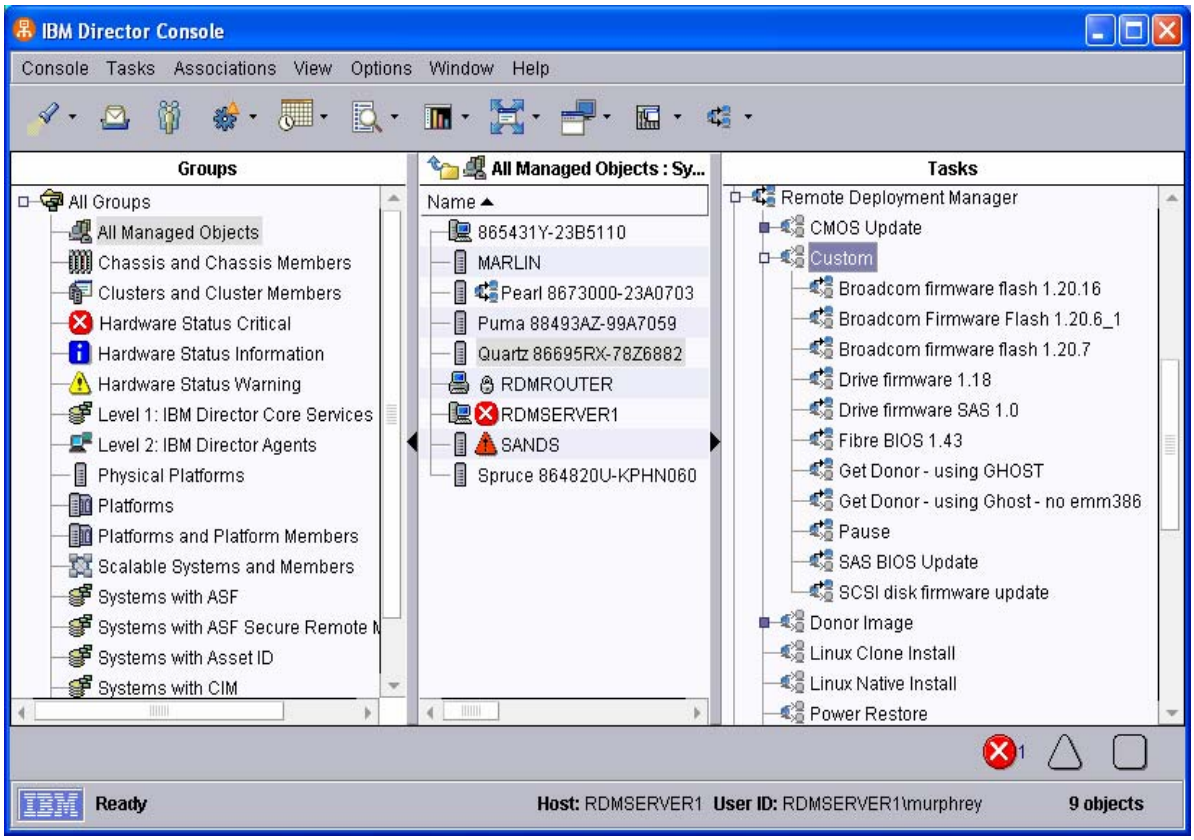
10. Select the *OK* button on the *Import Data* window.



11. Select the OK button on the Progress Indicator message window.



12. Expand the Custom template to validate that the 3 new tasks are there.



This procedure adds the following tasks:

- Drive firmware 1.18
- Drive firmware SAS 1.0
- SAS BIOS Update

13. Open the *Image Management* window to validate that the 3 new images are there.

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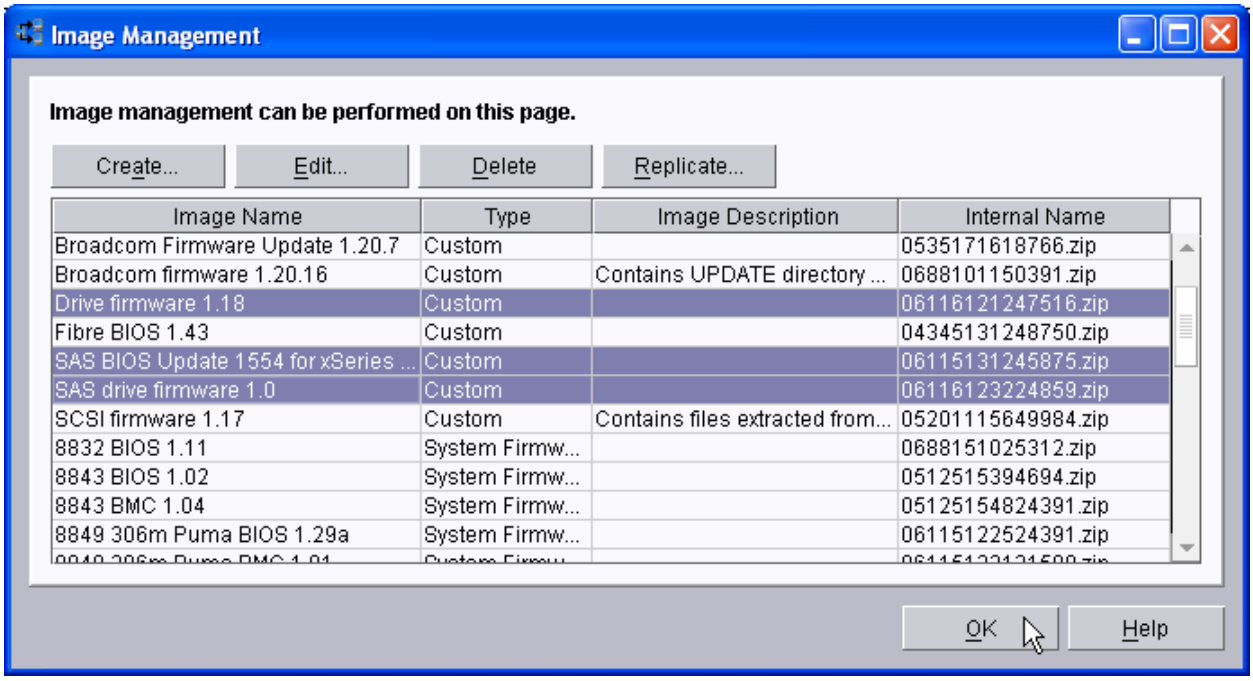


2.3 Unzip the Attached File (DOS System Environment)

This file contains an exported copy of the task created in section 3 below.

14. Extract the attached self-extracting ZIP file, *DOS71Y.EXE*, by right clicking on the paperclip icon and saving the file to disk.

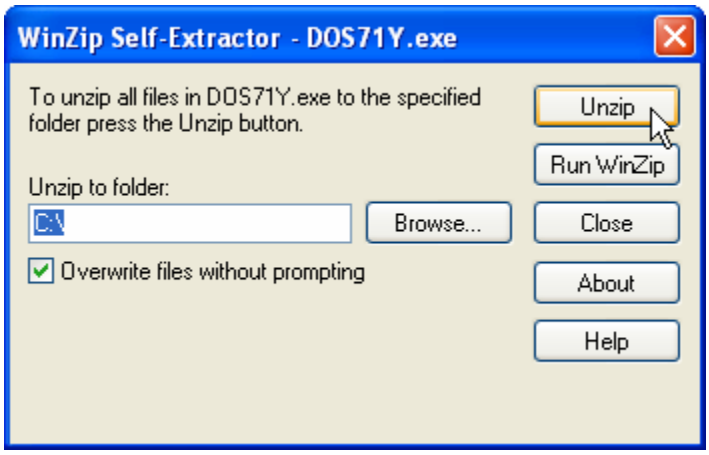
    Note: You may need Adobe Acrobat Reader 6.0.1 or later to be able to extract the file.

15. Run *DOS71Y.EXE*.

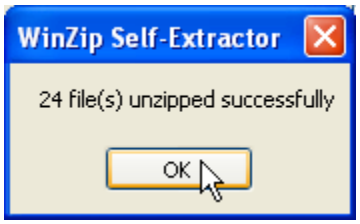
16. Change the target folder name appropriately.

    This file was created from an RDM server that is installed in the default location (C:\Program Files\IBM\RDM). If you installed RDM using the default path name, change the folder name to the drive on which you installed RDM (e.g., to C:\).

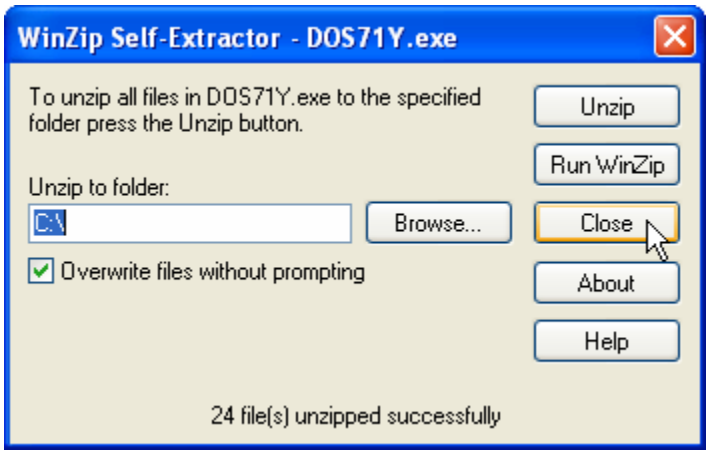
    If you installed RDM in a non-standard path, then use a temporary directory (e.g., C:\MyTemp).



17. Click the *OK* button when the unzip is complete.



18. Click the *Close* button to exit WinZip.



19. If you installed RDM in a non-standard path, use Windows Explorer (or a similar tool) to put all of the files into the appropriate directories.

2.4 Create a new DOS System Environment

20. If you installed RDM in a non-standard path, use Windows Explorer (or a similar tool) to put all of the files into the appropriate directories.
21. Execute the \Program Files\IBM\RDM\local\env\DRVMKIM.BAT file. After the batch file pauses, make sure that there are no error messages before closing the window.

2.5 Test the New Custom Tasks

Follow the procedure in section 3.5 below to test the tasks.

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3 Procedure for updating drive firmware

The Custom task template is a general-purpose template that you use to create your own processes to run on a target system. Like most RDM tasks, it contains the following:

- A CommandList file containing the commands that are to be executed as part of the task.
- Executable programs and batch files commands that are to be executed as part of the task.
- An image file that contains all the supporting files that are required by the commands.
- An IBM DOS 7.1 System Environment.

This example creates a Custom task for updating SCSI hard drive firmware, Version 1.18. You can use an identical procedure for updating SAS hard drive firmware, Version 1.0.

Note: If newer versions of the firmware become available, you may need to modify some of the files described below.

3.1 Acquire the disk firmware files

1. Download and create the FLASHDRV CD.
2. Download and create the FLASHDRV diskette 1. In version 1.18, the diskette image is on the CD, file name FLASHDRV.IMG.

3.2 Create a new DOS 7.1 System Environment

We need a new system environment because the SCSI firmware update procedure requires 2 large RAM drives and some ASPI drivers that are not included in any of the built-in system environments. The easiest way to create a new system environment is to make a copy of a built-in system environment's source files, to modify them to meet our configuration requirements, and to compile the new system environment.

3. Using Windows Explorer, drag the \Program Files\IBM\RDM\local\env\71f directory to make a new directory named \Program Files\IBM\RDM\local\env\Copy of 71f.

   The built-in DOS71F system environment is used for the System Firmware Flash task. We will modify a copy of that system environment.

4. Rename that directory to \Program Files\IBM\RDM\local\env\71y.
5. Right click on the paperclip icon below, and save the imbedded file to \Program Files\IBM\RDM\local\env\71y\config.sys, replacing the existing version of this file (or use Notepad or your favorite editor to modify the file). This file contains the following statements:

```
REM ******************************************************
REM * Remote Deployment Manager
REM * (C) Copyright IBM Corp. 1996, 2006 All rights reserved.
REM ******************************************************
REM * CONFIG.SYS file for the DOS71Y DOS image.
REM * It contains HIMEM.SYS, and SWITCHES statements, but no
REM * EMM386.EXE statement.  It is an IBM DOS 7.1 image used
REM * for RDM drive firmware update processing.
REM ******************************************************
DOS=HIGH,UMB
SWITCHES = /I
BUFFERS=20
FILES=100
```

```
FCBS=16,8
STACKS=9,256
SHELL=A:\COMMAND.COM A:\ /E:1024 /P
DEVICE=A:\NET\PXUTIL.SYS -a A:\NET\PROTOCOL.INI
DEVICE=A:\DOS\HIMEM.SYS /NUMHANDLES=120 /VERBOSE
DEVICE=A:\DOS\RAMDRIVE.SYS 32767 512 400 /E
DEVICE=A:\DOS\RAMDRIVE.SYS 32767 512 400 /E
LASTDRIVE=F
DEVICE=A:\NET\PROTMAN.DOS /I:A:\NET
DEVICE=A:\NET\NDIS.DOS
DEVICE=A:\NET\LCIPS.DOS
REM
REM Load ASPI/CD Drivers
REM
DEVICE=A:\ASPI\ASPI320.SYS
DEVICE=A:\ASPI\ASPI8U2.SYS
DEVICE=A:\ASPI\ASPI8DOS.SYS
DEVICE=A:\ASPI\IPSRASPI.SYS /T:4000 /F
DEVICE=A:\ASPI\ASPIMPT.SYS /T=60<> /MIRROR=OFF<>
DEVICE=A:\ASPI\QL21ASPI.SYS
DEVICE=A:\ASPI\QL22ASPI.SYS
DEVICE=A:\ASPI\QL23ASPI.SYS DEVICE=\ASPI\MPTSAS.SYS /T=60<>
REM
REM For SAS drives
DEVICE=A:\ASPI\ASPI94xx.SYS /M /Q /T=120
DEVICE=A:\ASPI\ASRDI.SYS /M /Q /S /T=120
```

Note: It is normal to see error messages when some of the DEVICE=A:\ASPI\... statements are processed.

6. If your FLASHDRV CD is newer than version 1.18, inspect any CONFIG.SYS and AUTOEXEC.BAT files on the FLASHDRV CD or diskette to see if there are changes needed (e.g., in the above CONFIG.SYS file or in the \Program Files\IBM\RDM\local\env\71y\autoexec.bat file). For example, a new version of FLASHDRV.EXE might require a different DOS configuration.
7. Copy the ASPI directory from FLASHDRV diskette 1 to \Program Files\IBM\RDM\local\env\71y. Note that the whole ASPI directory should be copied, not just the contents of that directory.
8. Create the file \Program Files\IBM\RDM\local\env\71y\ DISKFW.BAT (or use Notepad or your favorite editor to create the file). This file contains the following statements:

```
REM ******************************************************
REM * Remote Deployment Manager
REM * (C) Copyright IBM Corp. 2004, 2006 All rights reserved.
REM ******************************************************
REM * Batch file that flashes the drive firmware.
REM * Used in an RDM Custom task.
REM ******************************************************
RDAGENT /L "DISKFW.BAT: Entering ..."

RDAGENT /L "DISKFW.BAT: running PINWHL.EXE..."
PINWHL

RDAGENT /L "DISKFW.BAT: running FLASHDRV.EXE..."
FLASHDRV /CD:%RAMDSK% /NOSATA /AUTOXPRESS /FORCE

if ERRORLEVEL 4 goto ERROR
if ERRORLEVEL 3 goto END
if ERRORLEVEL 1 goto ERROR
goto END

:ERROR
set RDRASLEVEL=1
set RDSTATUS="RDMLAR001E Disk firmware update failed - see %BOOTMAC%.custom.FLASHDRV.log in
RDM log directory"
mtftp put %SERVER_IP% FLASHDRV.log %BOOTMAC%.custom.FLASHDRV.log

:END
RDAGENT /L "DISKFW.BAT: Exiting ..."
```

Note: The "`set RDSTATUS="RDMLAR001E...`" line in this example is long and is shown wrapped onto 2 lines.

This file runs FLASHDRV.EXE, which flashes the drive firmware.

The RDAGENT /L statements write messages to the task execution history (e.g., to help with debugging and task-progress monitoring).

If you want to back-level drive firmware or to flash over the same-level drive firmware, add a /FORCE parameter onto the FLASHDRV command line above.

9. Create file \Program Files\IBM\RDM\\local\env\DRVMKIM.BAT (or use Notepad or your favorite editor to create the file). This file contains the following statements:

```
REM ************************************************************
REM * Remote Deployment Manager
REM * (C) Copyright IBM Corp. 2004 All rights reserved.
REM ************************************************************
REM * Batch file that creates the DOS71Y DOS system environment.
REM * It is an IBM DOS 7.1 image used in the custom task that
REM * updates SCSI drive firmware.
REM ************************************************************
echo .
echo . Changing to %~p0
cd %~p0
echo .
echo . Making DOS71Y image
copy baseimg DOS71Y
bpdisk -d DOS71Y -i b
bpdisk -d DOS71Y -i o\r
bpdisk -d DOS71Y -i o\h
bpdisk -d DOS71Y -i 71Y
move DOS71Y ..\..\repository\environment\DOS71Y
PAUSE
```

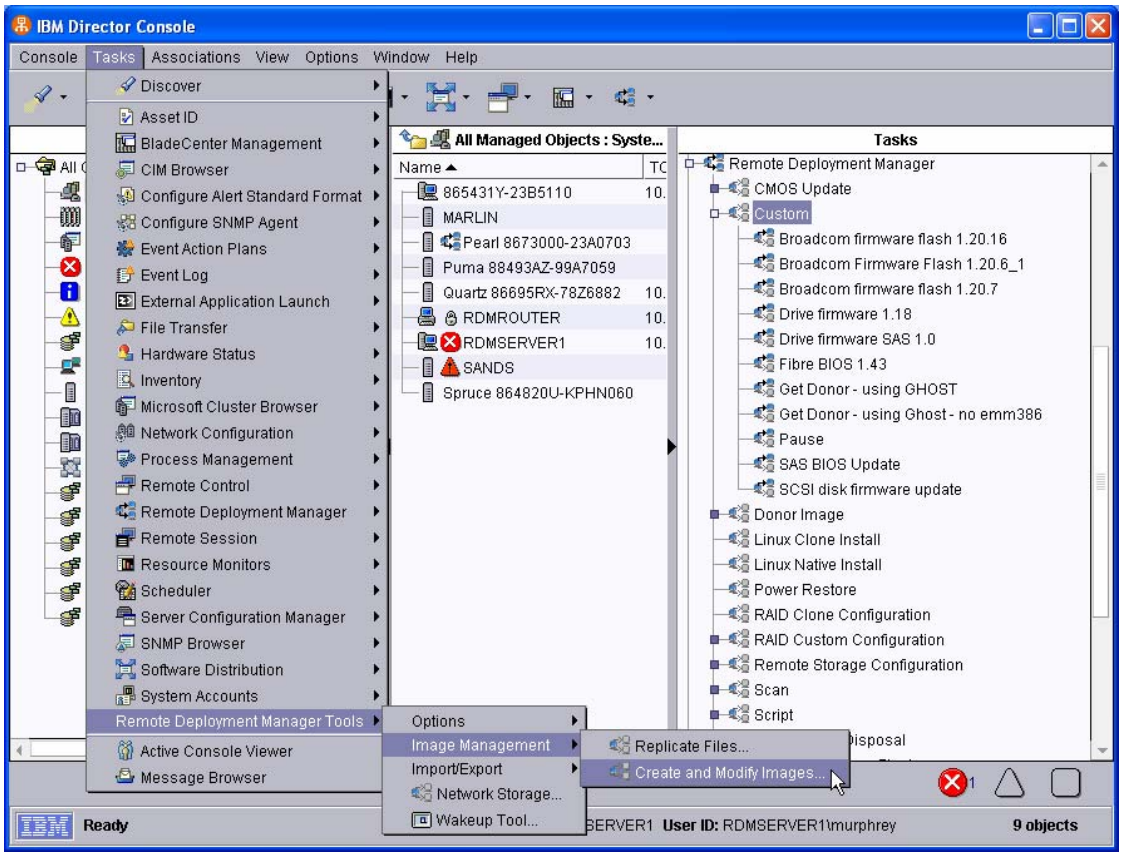
This file creates the new DOS system environment. It first copies the DOS 7.1 kernel files (file name baseimg) into DOS71Y (the file name of the new DOS system environment). Then is uses BPDISK.EXE to add other files into DOS71Y. Finally, it moves the finished DOS71Y file to the RDM master repository.

Note that DOS71Y is the name that is used in the task's command list (see step 24 below).

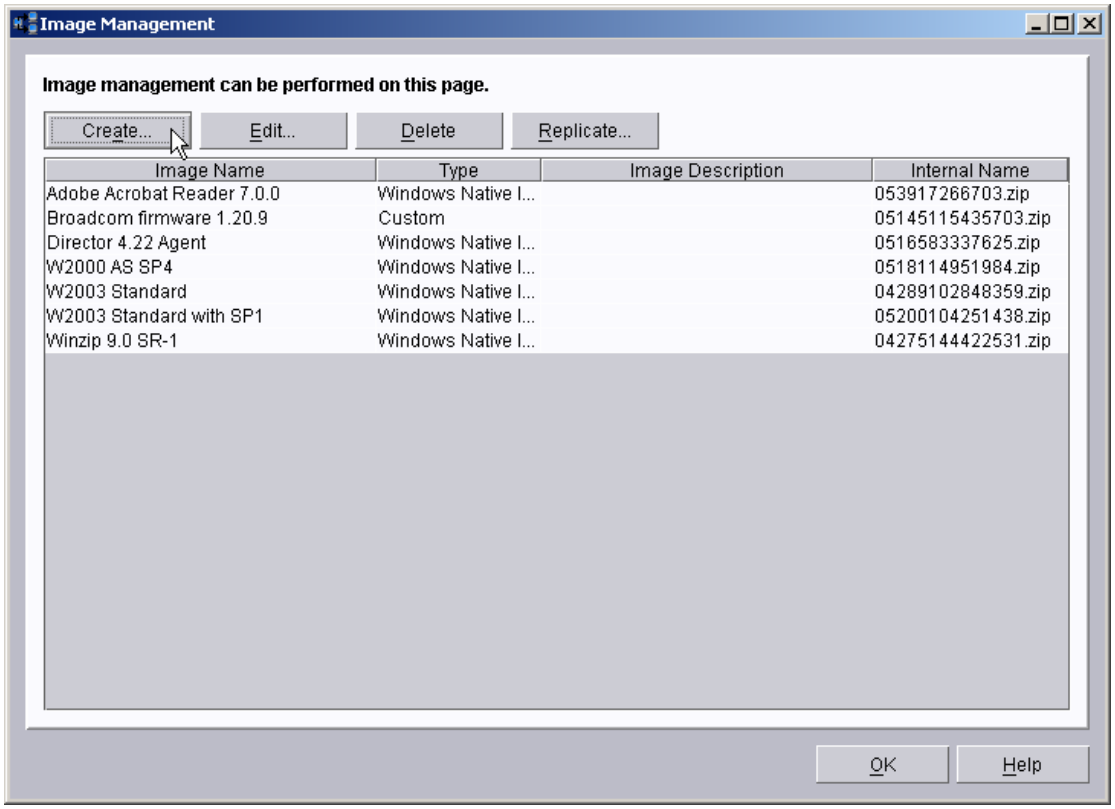
10. Execute the \Program Files\IBM\RDM\local\env\DRVMKIM.BAT file. After the batch file pauses, make sure that there are no error messages before closing the window.

3.3 Create an RDM image containing the FLASHDRV files

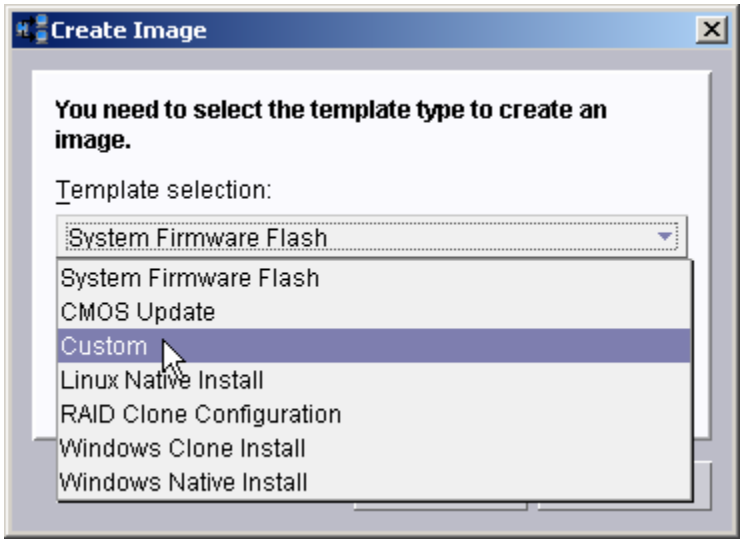
11. Insert the FLASHDRV CD into your CD drive.
12. From the Director console, select the **Tasks**, Remote **Deployment Manager**, **Image Management**, and **Create and Modify Images...** menus.



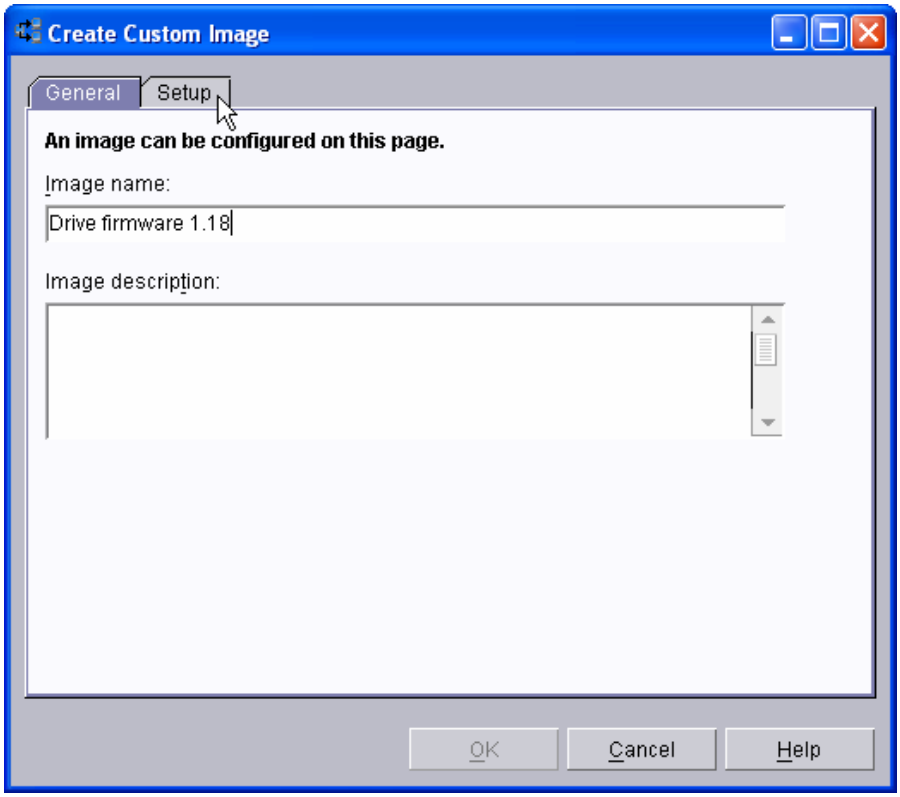
13. When the *Image Management* window displays, select the **Create…** button.



14. When the *Create Image* window displays, select **Custom** from the drop-down list, and then select the **OK** button. This displays the *Create Custom Image* window.



15. On the **General** tab, enter an image name and (optionally) a description.



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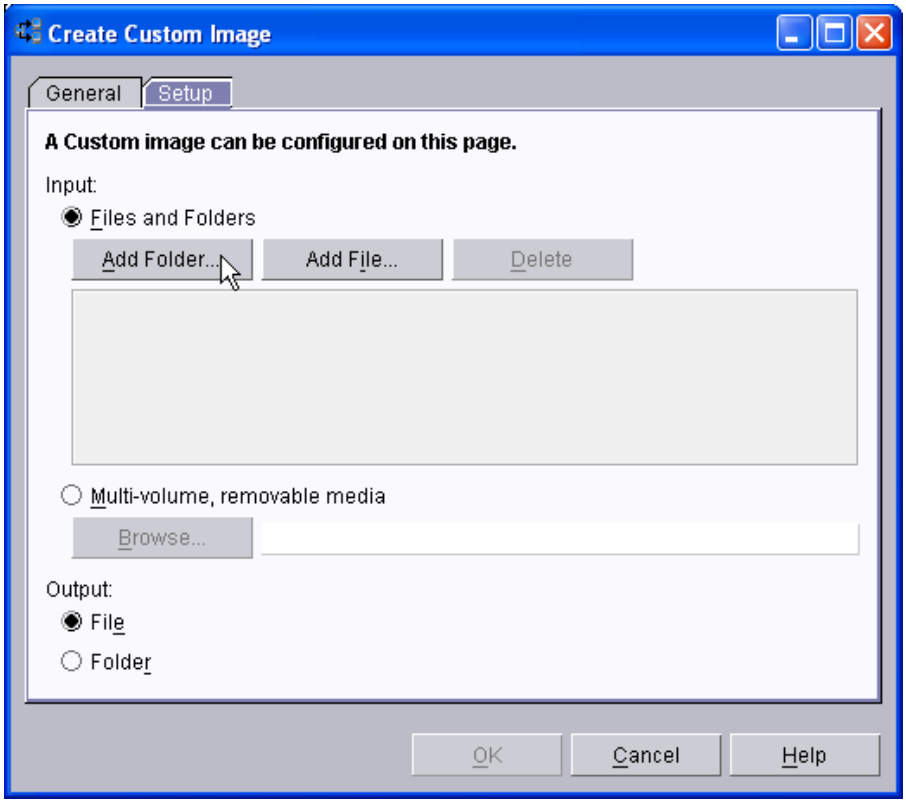
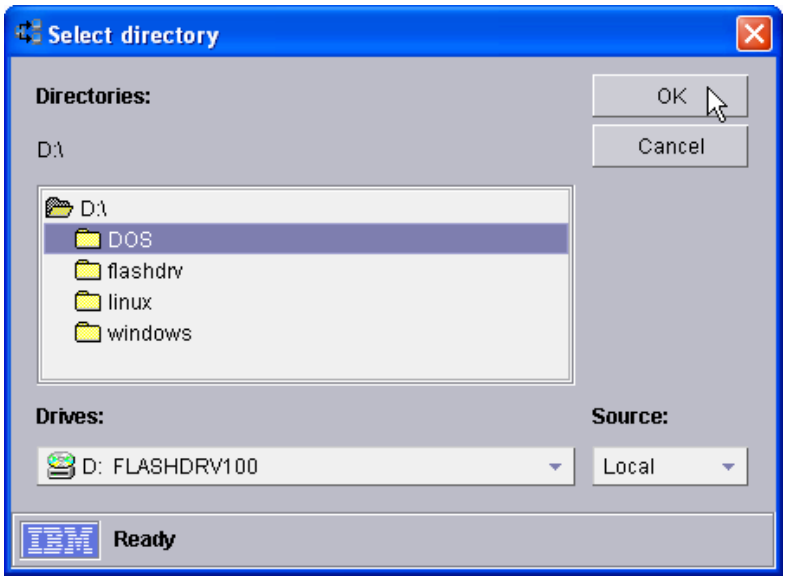
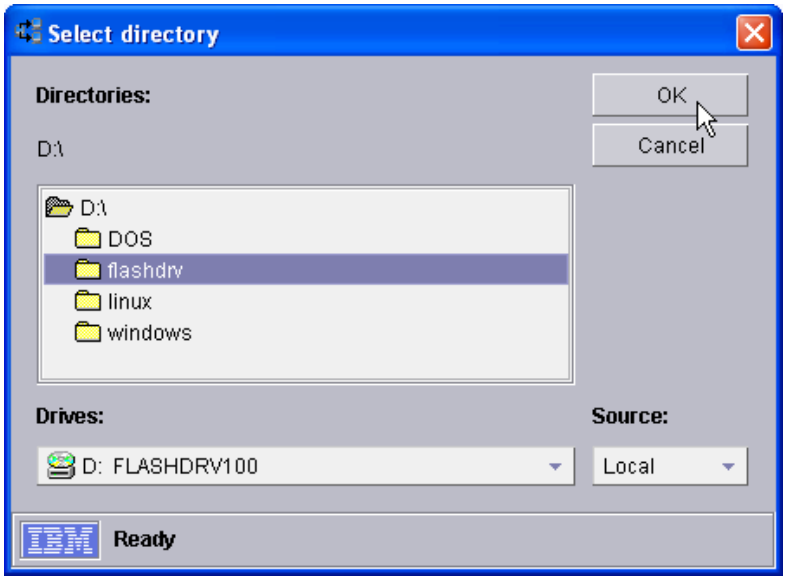
16. On the **Setup** tab, select the **Add Folder…** button. This displays a file dialog window.



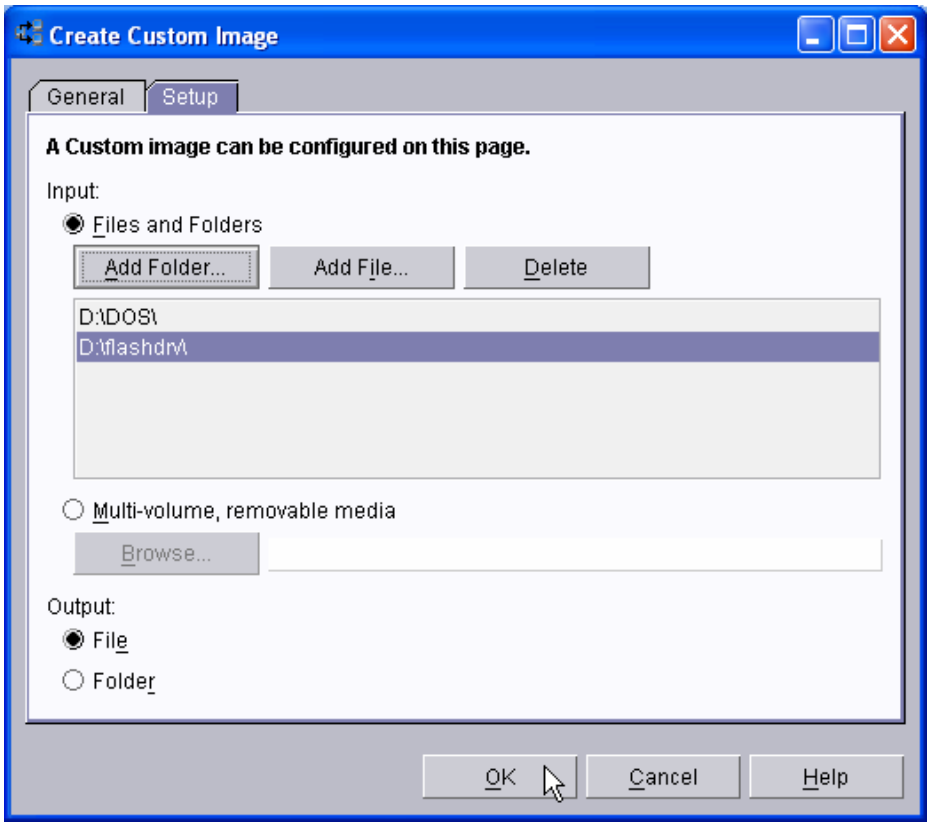
17. In the *Select Directory* window, Navigate to and select the D:\DOS directory (where D: is the CD drive). Then select the **OK** button.



18. In the *Select Directory* window, Navigate to and select the D:\FLASHDRV directory (where D: is the CD drive). Then select the **OK** button.



19. On the **Setup** tab, select the **File** radio button. Then select the **OK** button. This will cause RDM to create the image as a single ZIP file.



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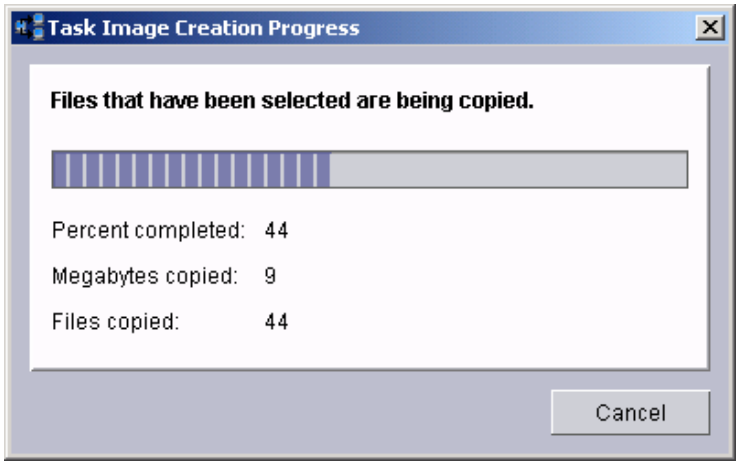
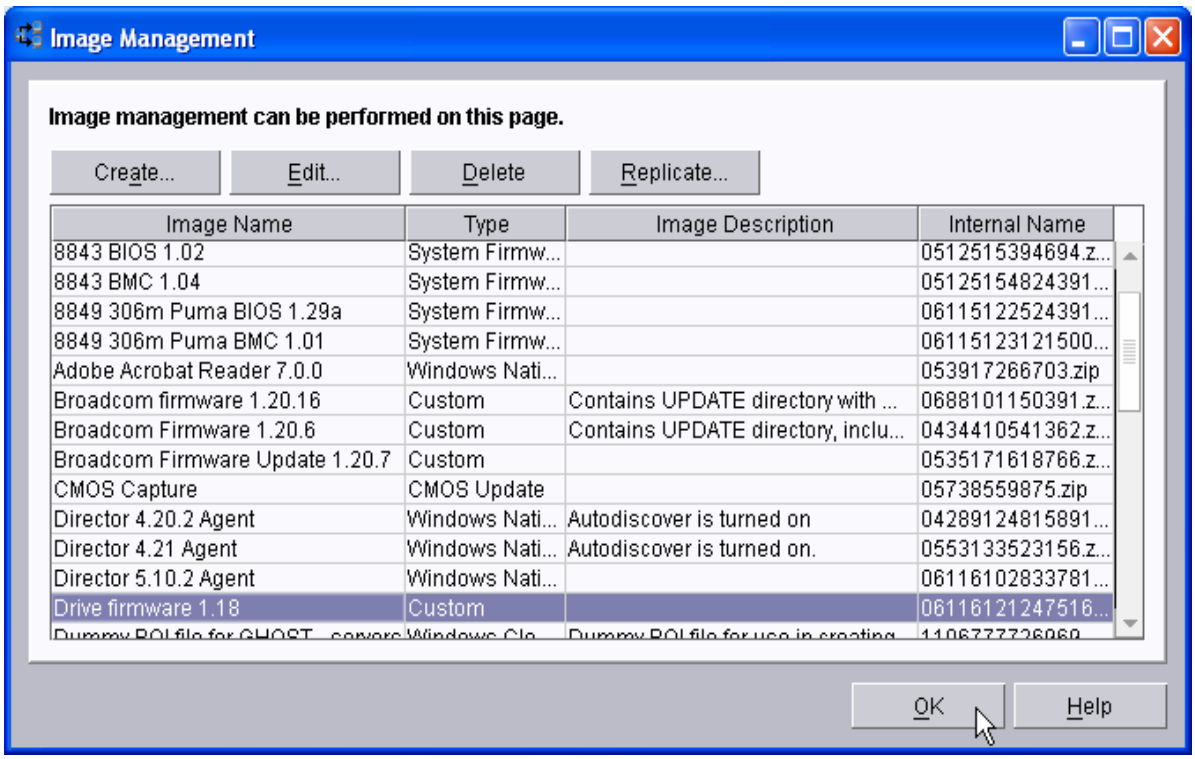
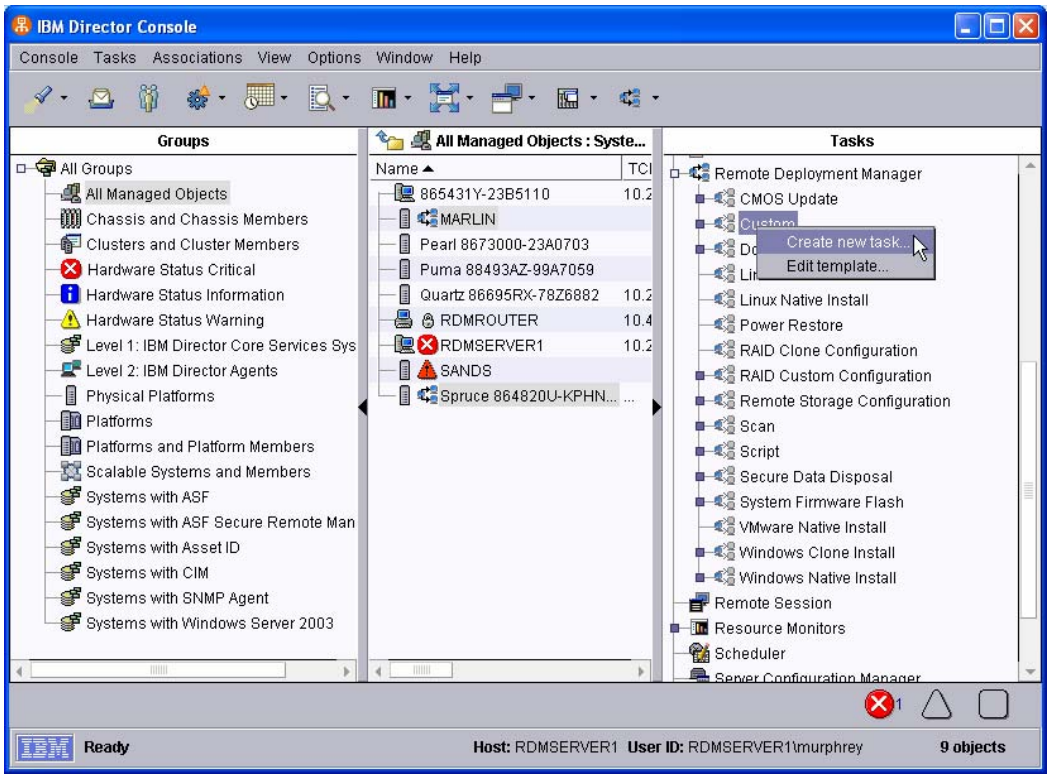


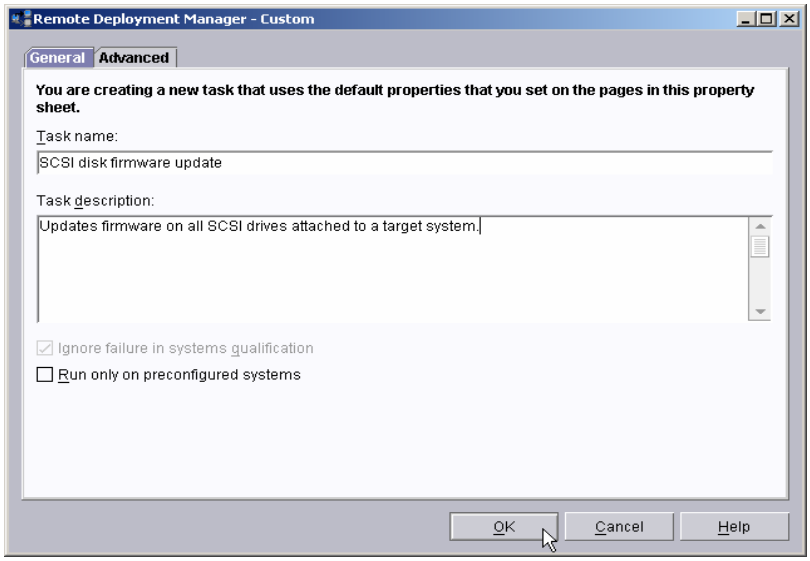
20. After the image creation is done, select the OK button on the Task Image Creation Progress window. The main Image Management window will now contain an entry for the new image.



3.4 Create a Custom task that will deploy the SCSI disk firmware



21. Expand **Remote Deployment Manger** in the Tasks pane of the Director console, and right-click **Custom**. The menu is displayed.
22. Click **Create new task…** on the menu to access the property pages. There are two pages:
    - **General**: Contains basic information about the task.
    - **Advanced**: Contains the command list, user parameters, and task folder name for the task.



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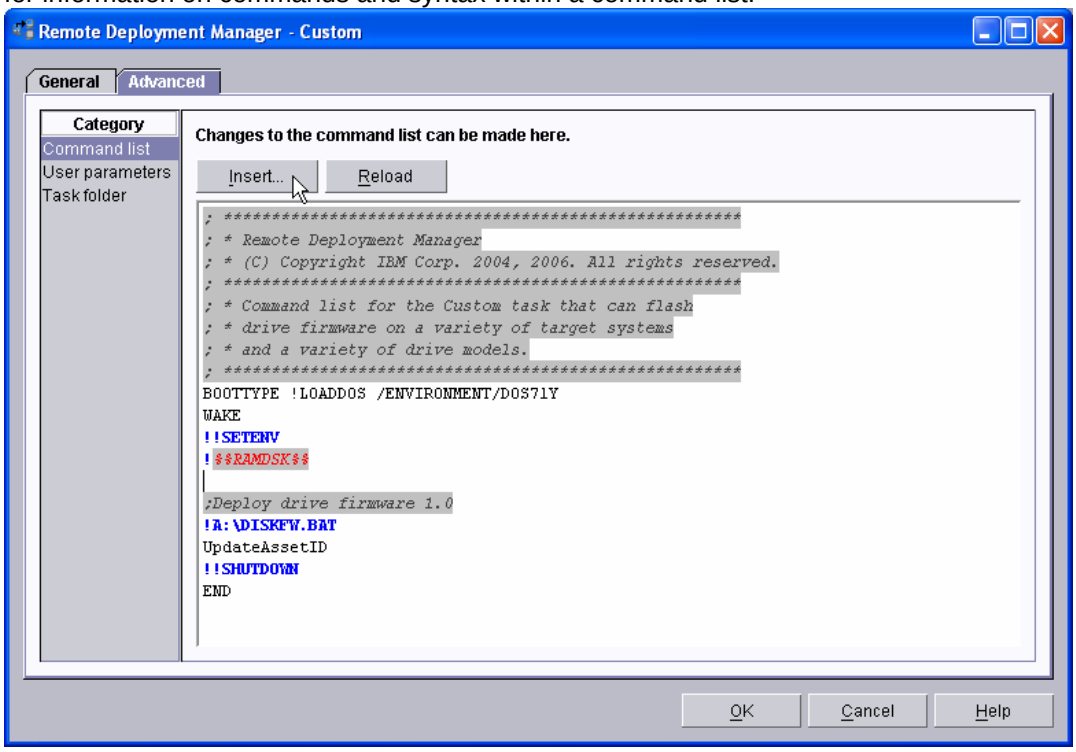
23. Enter the task information on the General page (e.g., name the task *SCSI disk firmware update*).
24. Click the **Advanced** tab, and modify the command list this way (e.g., you can right click on the paperclip icon below, save the imbedded file to disk, open the file with Notepad, and cut/paste the text into the RDM command list window):

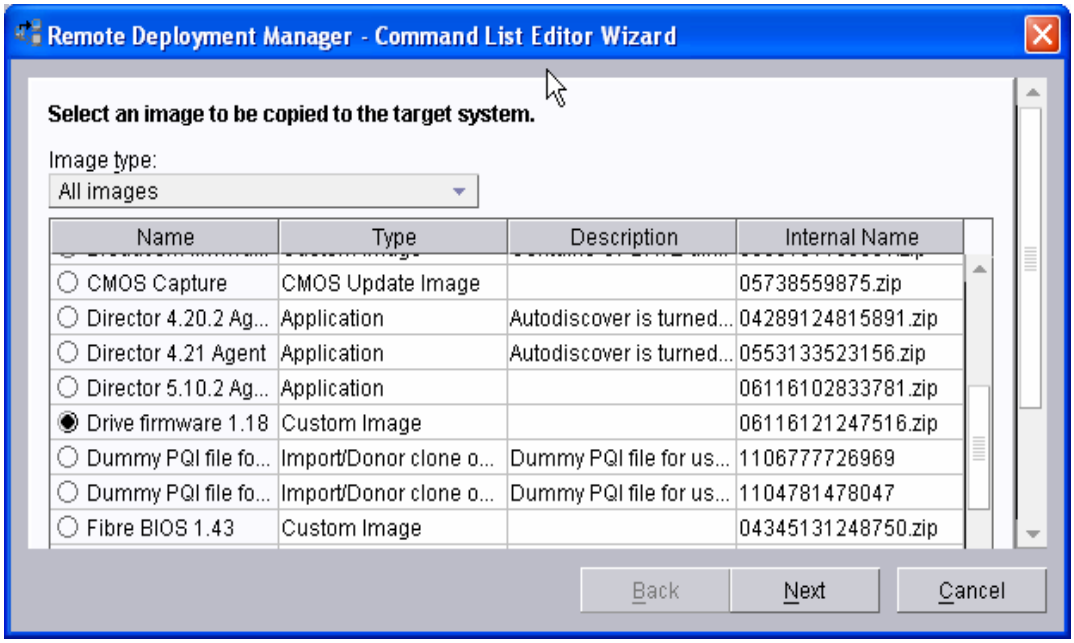
```
; ******************************************************
; * Remote Deployment Manager
; * (C) Copyright IBM Corp. 2004, 2006. All rights reserved.
; ******************************************************
; * Command list for the Custom task that can flash
; * drive firmware on a variety of target systems
; * and a variety of drive models.
; ******************************************************
BOOTTYPE !LOADDOS /ENVIRONMENT/DOS71Y
WAKE
!!SETENV
!%%RAMDSK%%

;Deploy drive firmware 1.18a
!A:\DISKFW.BAT
UpdateAssetID
!!SHUTDOWN
END
```

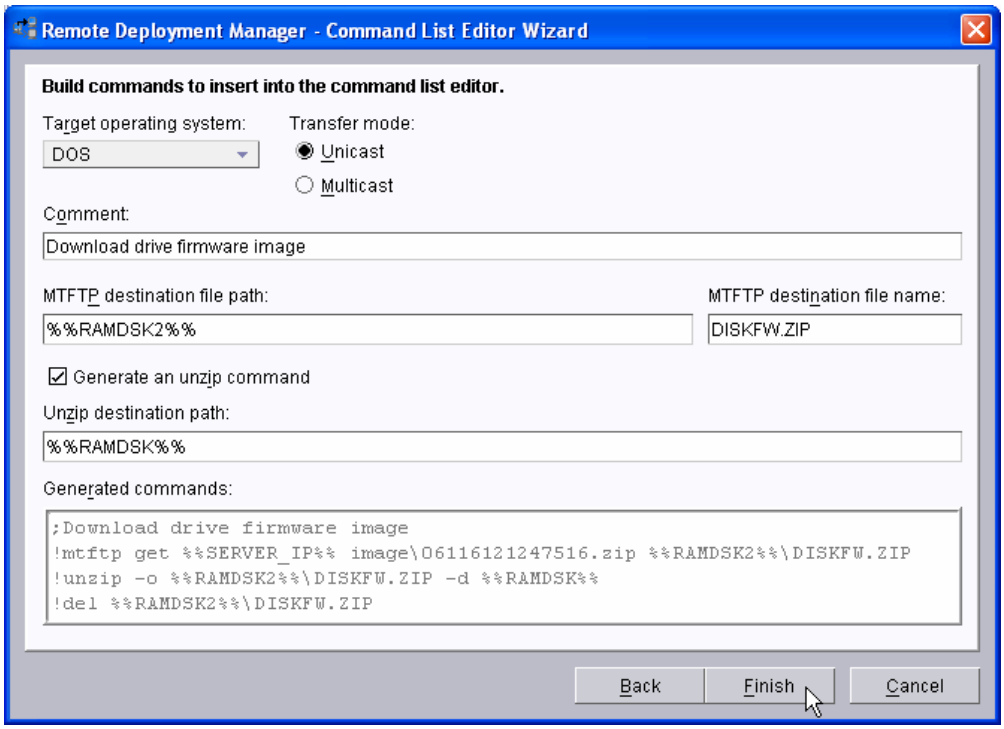
Note: The command list is a list of RDM and DOS commands that perform the Custom task. Refer to Appendix A, "Command list commands", in the *Remote Deployment Manager 4.30 User's Reference* for information on commands and syntax within a command list.



25. Place the cursor on the blank line (see the picture, above), and select the **Insert** button. The *Command List Editor Wizard* window appears.



26. Select the custom image that you created in section 3.3 above, and then select the **Next** button.



27. Enter the appropriate data to generate the commands to download and unzip the custom image you created in section 3.3
    - Select DOS as the target operating system.
    - Leave the transfer mode as Unicast.
    - Add an optional comment, if you like.
    - Enter the path (%%RAMDSK2%%) and name (DISKFW.ZIP) that you want the image file to have on the target system.

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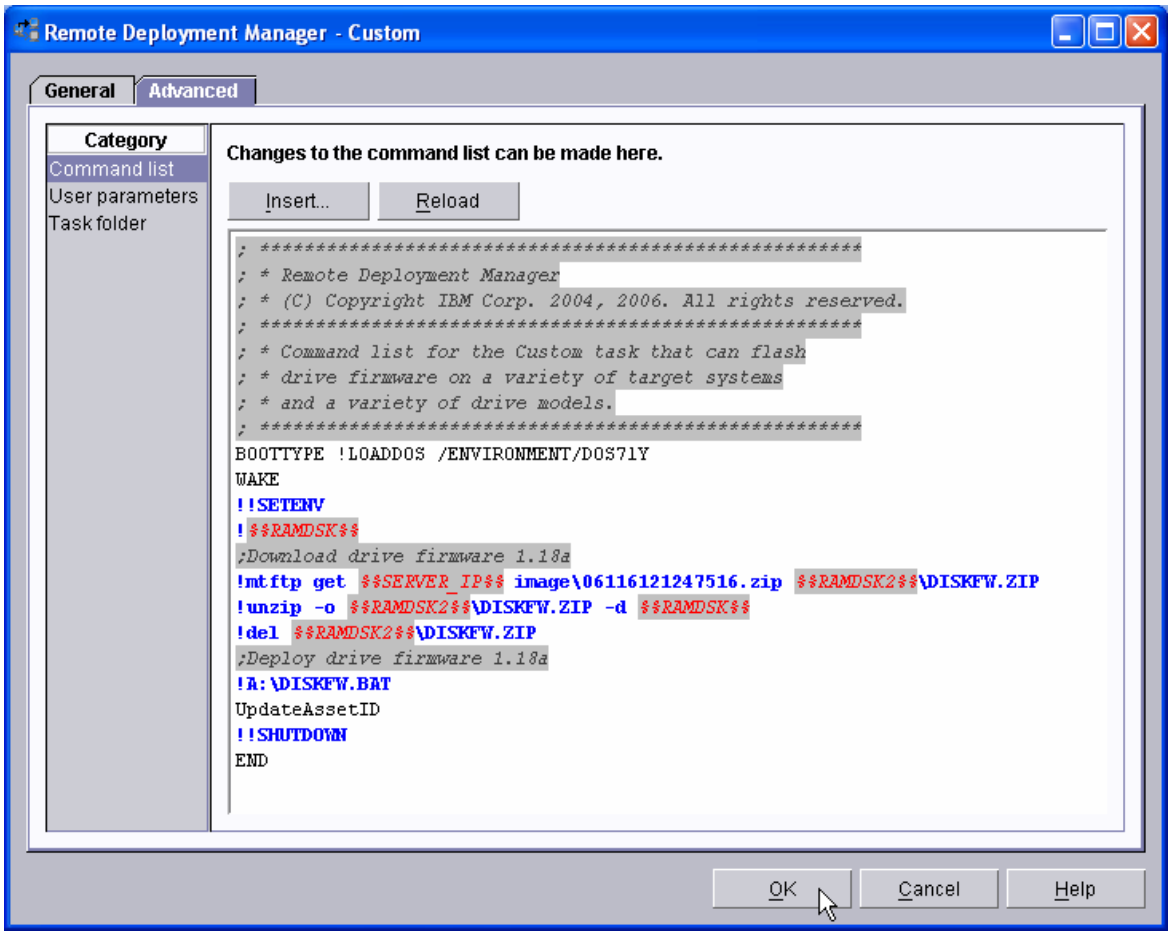
- Select the check box to generate an unzip command.
- Enter the target path (%%RAMDSK%%) for the unzipped files.

Important: The above 2 paths represent 2 different RAM drives. You must code them as shown. Otherwise, your task will fail.

28. Select the **Finish** button to add the generated commands to the command list

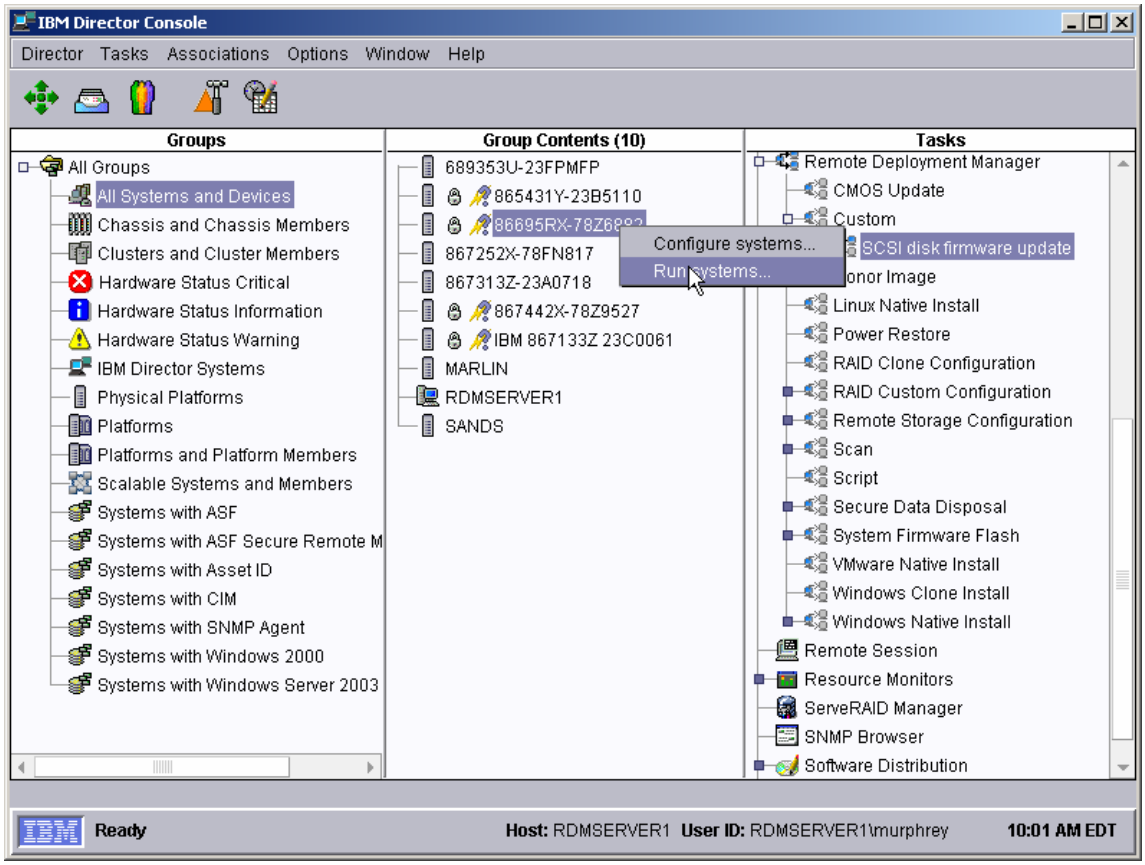


29. Click the **OK** button to create the task.

3.5 Test the new custom task

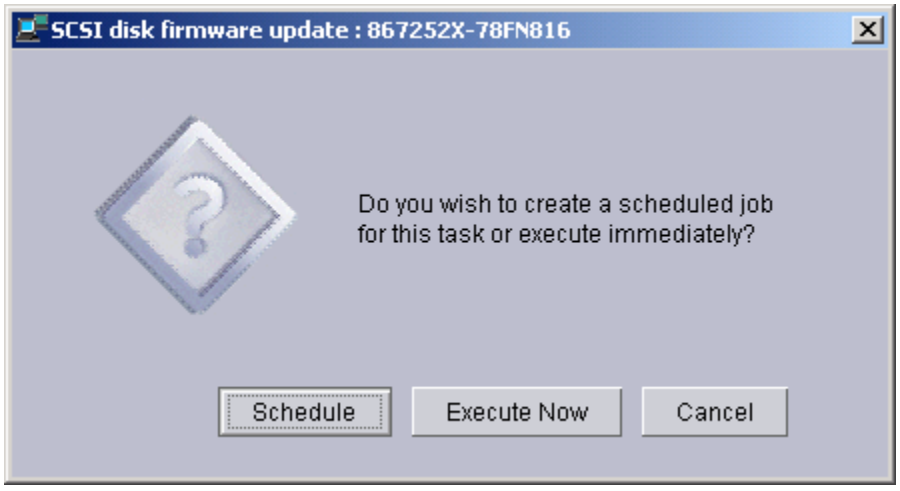
30. Power on a server (one that contains SCSI drives) in a way that forces a network boot. RDM will run its Scan task on the system and power it off. The system will appear in the middle pane of a Director console.

    Note: Skip this step if you have previously run an RDM Scan task on the system.



31. Drag the entry for the new *SCSI disk firmware update* task and drop it on that system in the middle pane. The menu appears. Click **Run systems …** in the menu. A message window appears.

    Note: You could, instead, drag the target system and drop it on the task – the Director/RDM drag/drop operation works the same way in either direction.



32. Click the **Execute now** button. The target system will wake up (i.e., automatically power itself on) and do a network boot.

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33. Immediately after the Starting PC DOS… message appears on the system's monitor, press the F8 key. This allows you to step through all of the batch files and the CommandList file statement-by-statement.
34. Press the "y" key to execute each statement in-turn. Observe each statement, and watch for any errors that may occur.

    Note: If an error occurs, debug it, fix it as appropriate (usually in one of the files you created or modified above), and then rerun the test.

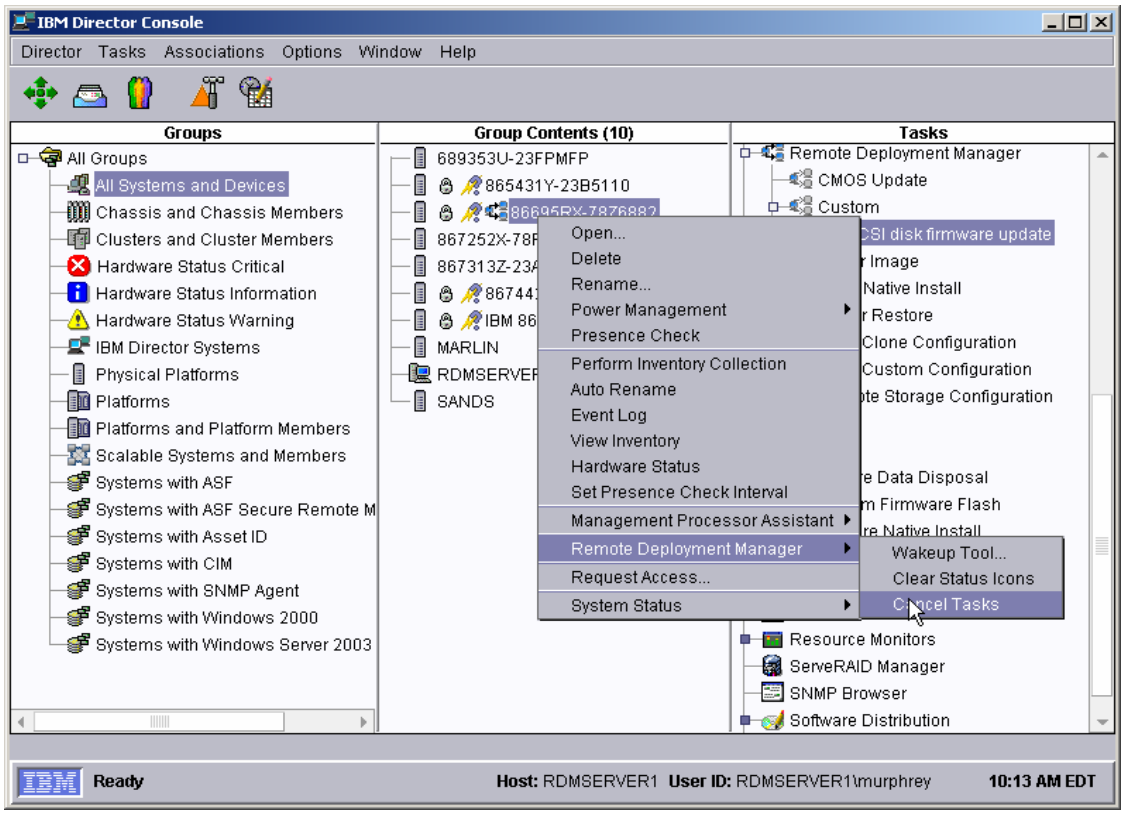
    To rerun the test, you will usually need to do the following:

    a. Power off the server with the power switch.

    b. Right-click on the server in the middle pane.

    c. Click the **Remote Deployment Manager** and the **Cancel Tasks** menu items.

    d. Go back to step 31 above.



4 Procedure for updating SAS BIOS firmware

This example creates a Custom task for updating SAS BIOS firmware, Version 1554.

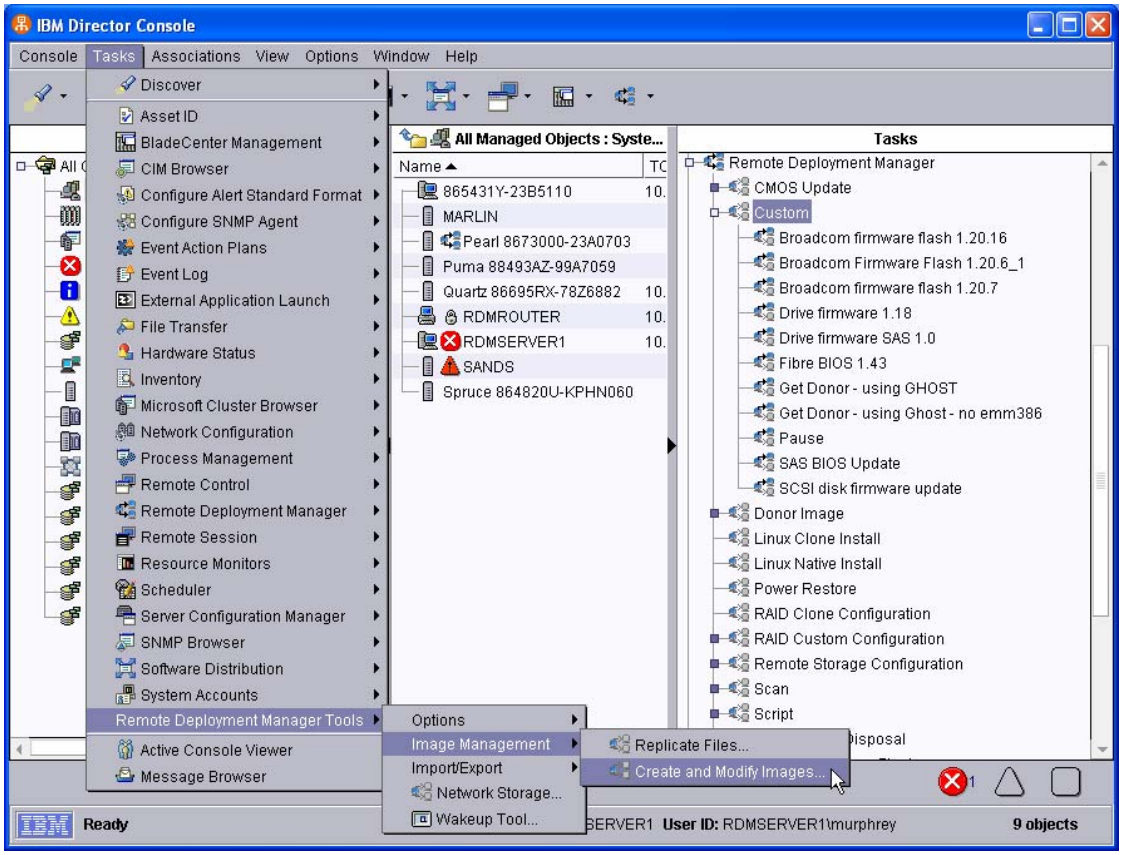
Note: If newer versions of the firmware become available, you may need to modify some of the files described below.

4.1 Acquire the disk firmware files

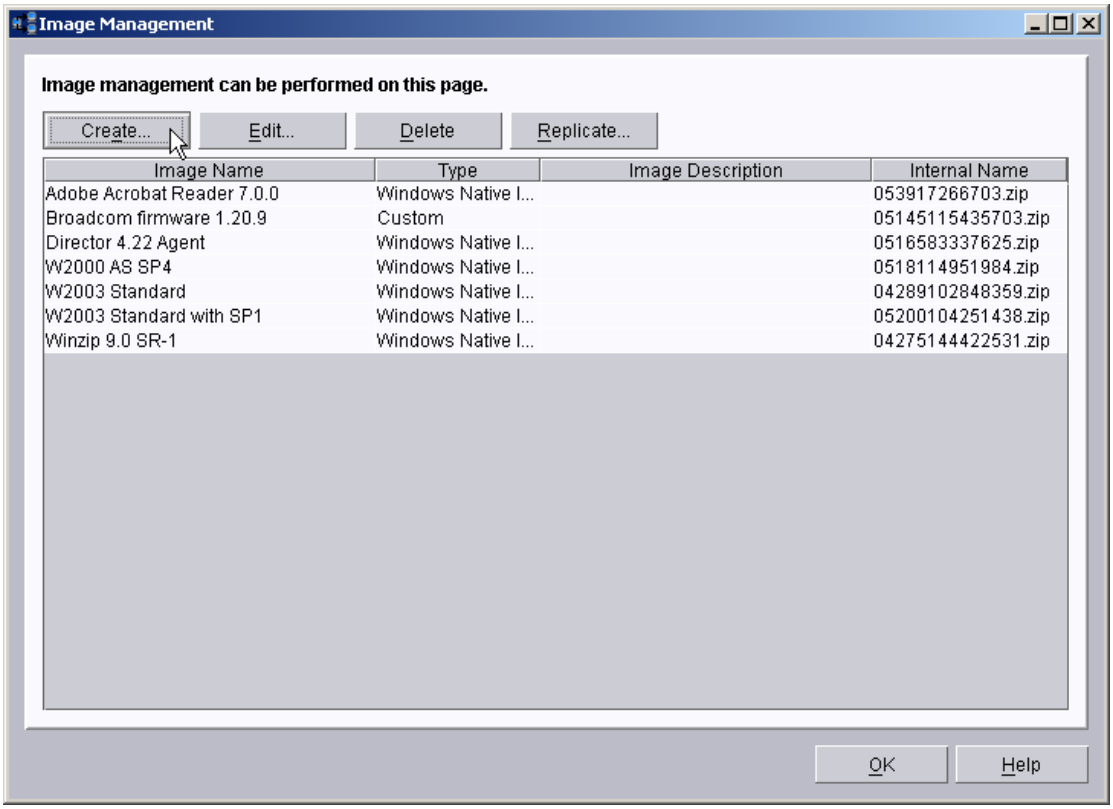
1. Download and create the firmware update diskette.

4.2 Create an RDM image from the firmware diskette

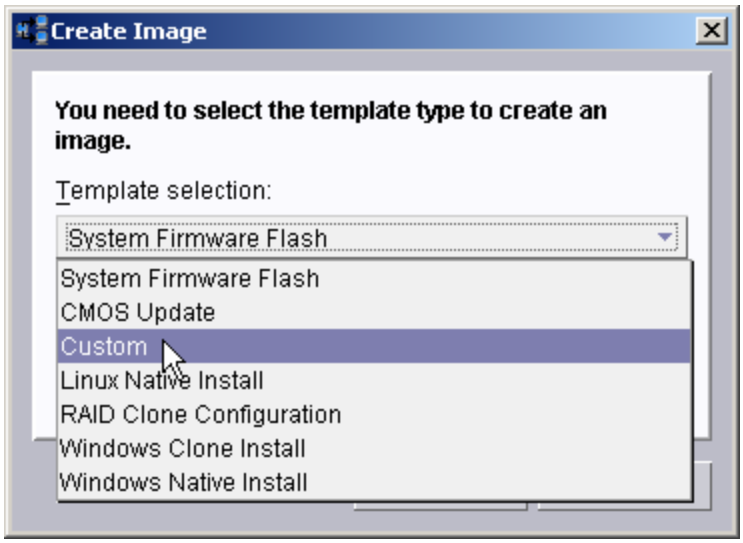
2. Insert the diskette into your CD drive.
3. From the Director console, select the **Tasks**, Remote **Deployment Manager**, **Image Management**, and **Create and Modify Images...** menus.



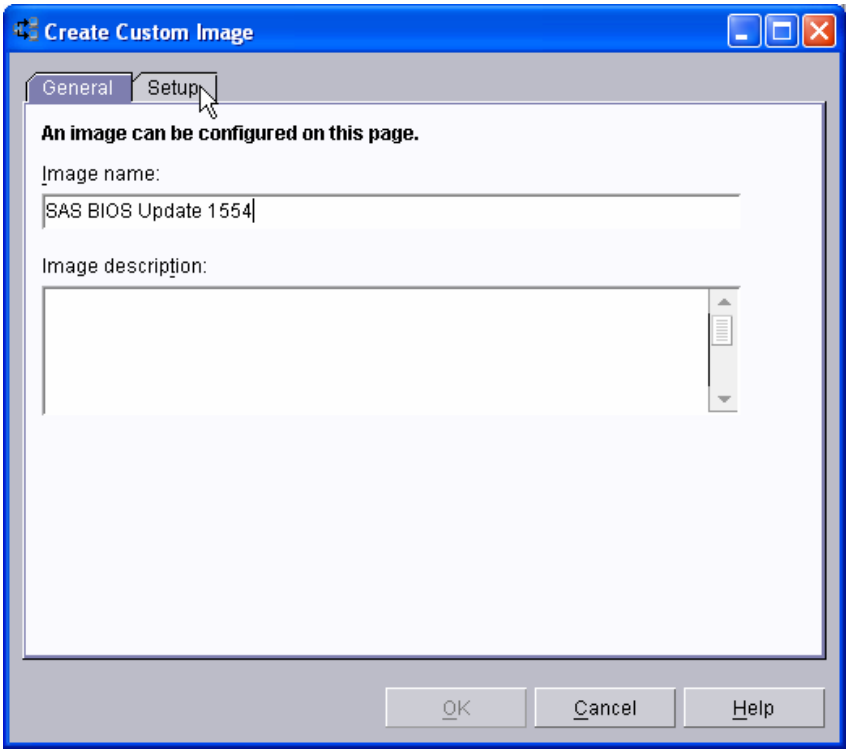
4. When the *Image Management* window displays, select the **Create…** button.



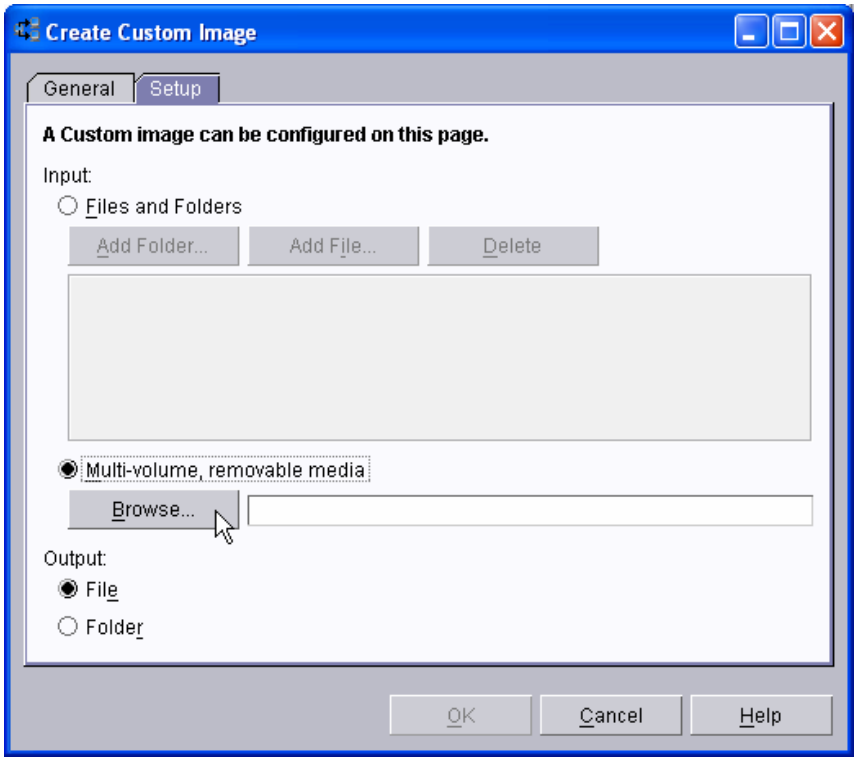
5. When the *Create Image* window displays, select **Custom** from the drop-down list, and then select the **OK** button. This displays the *Create Custom Image* window.



6. On the **General** tab, enter an image name and (optionally) a description.



7. On the **Setup** tab, select the **Multi-volume, removable media** button. This displays a file dialog window.



8. In the *Select Directory* window, Navigate to and select the A:\ directory. Then select the **OK** button.

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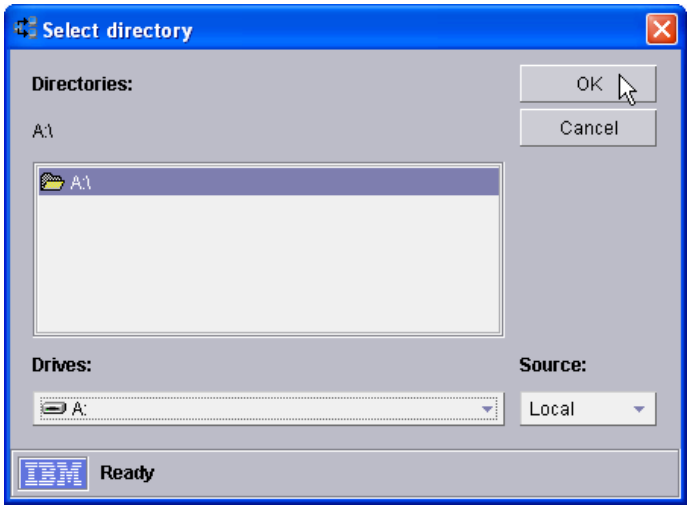
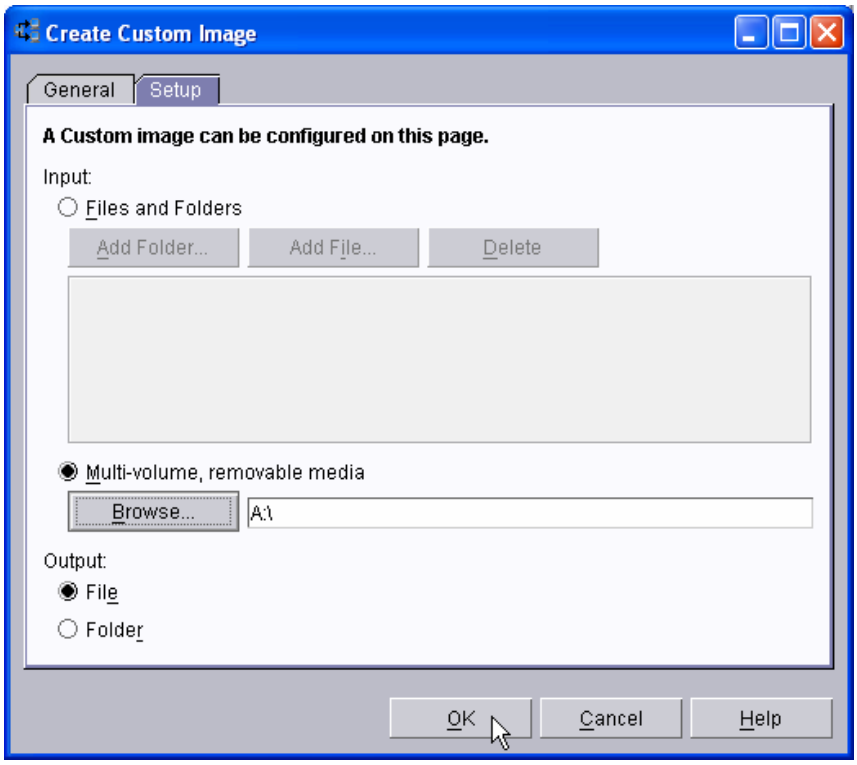
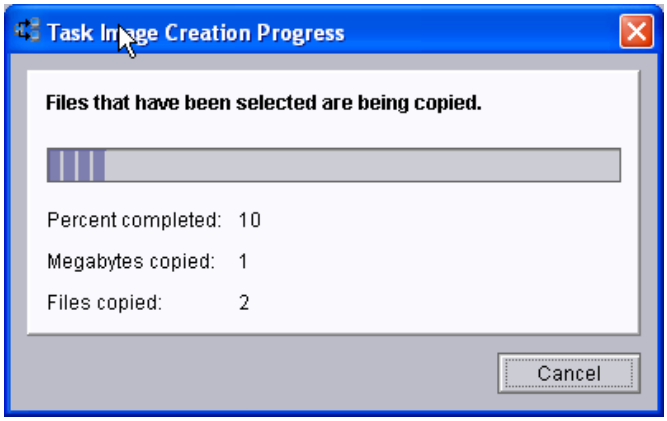
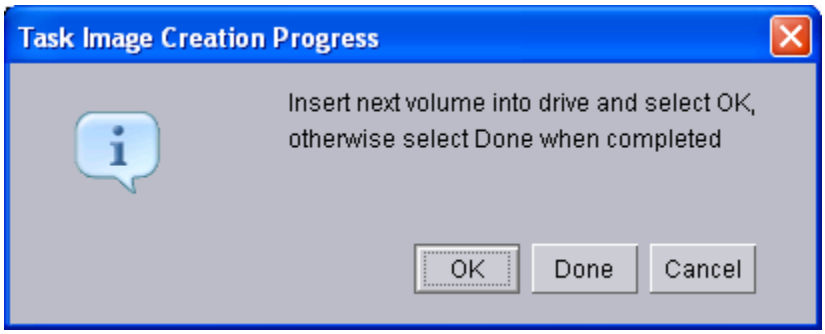


9. On the **Setup** tab, select the **File** radio button. Then select the **OK** button. This will cause RDM to begin creating the image as a single ZIP file.

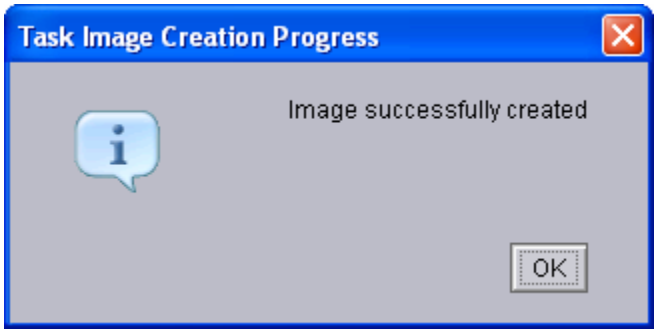




10. After RDM copies the diskette, it displays a second Task Image Creation Progress window. Select the Done button.



11. Then select the OK button on the third Task Image Creation Progress window.



The main Image Management window will now contain an entry for the new image.

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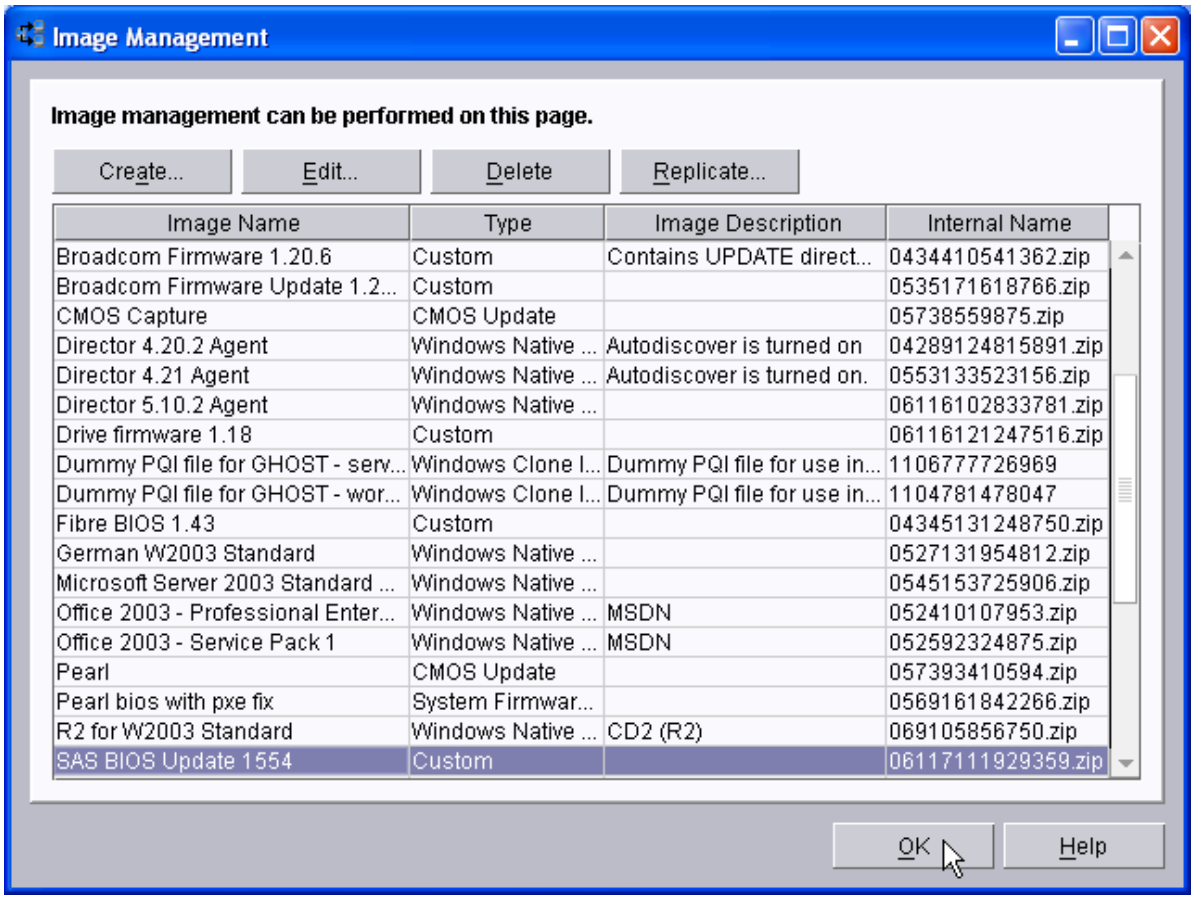
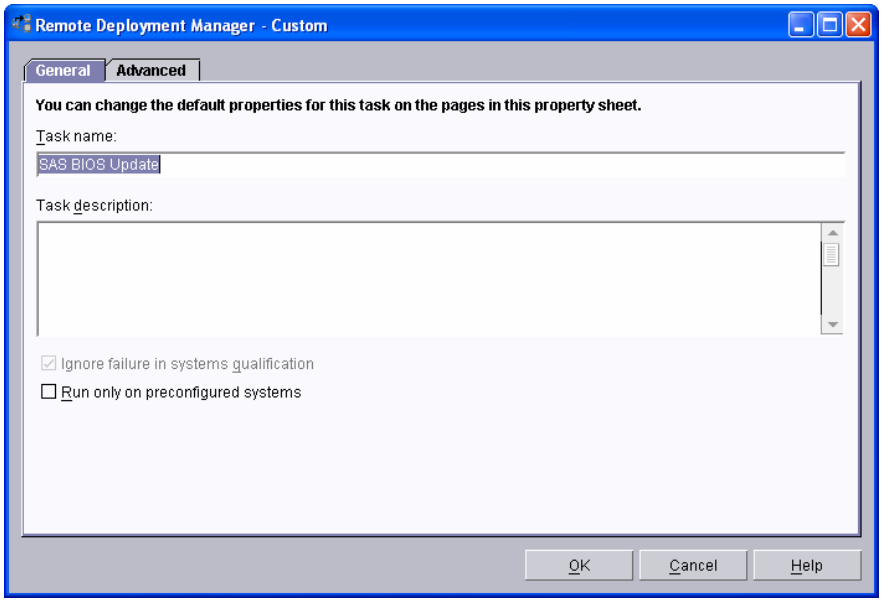
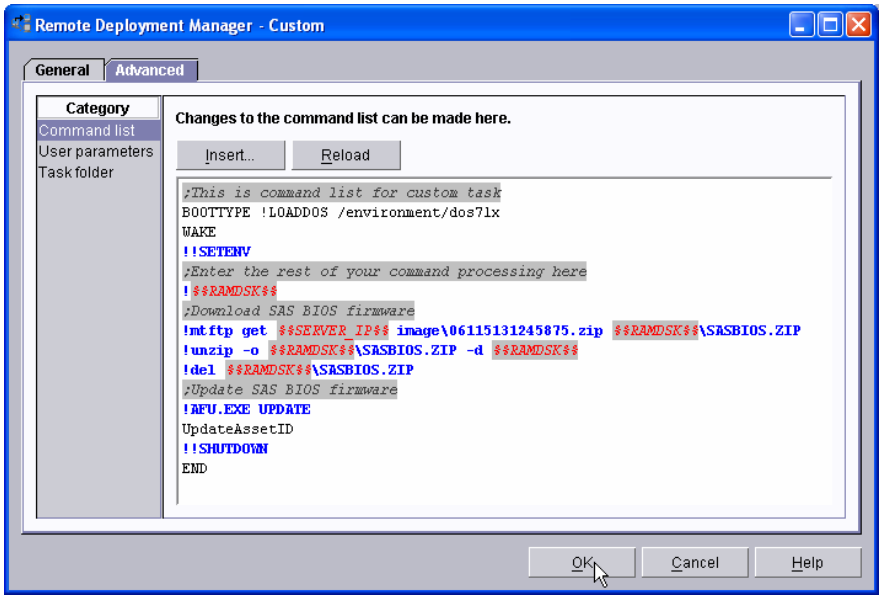


4.3 Create an RDM custom task that will deploy the firmware

12. Follow a procedure similar to what is in section 3.4 above, using the image you just created and the command list statements shown below. Here is the **General** page of the task properties.



13. On the **Advanced** tab, use the Command List Wizard, as in section 3.4 above, and modify the command list this way.




```
;This is command list for custom task
BOOTTYPE !LOADDOS /environment/dos71x
WAKE
!!SETENV
;Enter the rest of your command processing here
!%%RAMDSK%%
;Download SAS BIOS firmware
!mtftp get %%SERVER_IP%% image\06115131245875.zip %%RAMDSK%%\SASBIOS.ZIP
!unzip -o %%RAMDSK%%\SASBIOS.ZIP -d %%RAMDSK%%
!del %%RAMDSK%%\SASBIOS.ZIP
;Update SAS BIOS firmware
!AFU.EXE UPDATE
UpdateAssetID
!!SHUTDOWN
END
```

Note: The command list is a list of RDM and DOS commands that perform the Custom task. Refer to Appendix A, “Command list commands”, in the *Remote Deployment Manager 4.30 User’s Reference* for information on commands and syntax within a command list.

4.4 Test the new custom task

14. Use the procedure from section 3.5 above to test the new task.

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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

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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.

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.

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