Configuring Broadcom Teaming with RDM

A White Paper

May 9, 2006

Note:

Visit www.ibm.com/pc/safecomputing periodically for the latest information on safe and effective computing.

Warranty Information: For a copy of applicable product warranties, write to: Warranty Information, P.O. Box 12195, RTP, NC 27709, Attn: Dept. JDJA/B203. IBM makes no representation or warranty regarding third-party products or services.

Before using this information and the product it supports, read the general information in “Notices,” on page 23.

Contents

1 Preface

This White Paper explains how to use IBM® Remote Deployment Manager (RDM) 4.30 and Broadcom software to configure multiple Broadcom network interface cards (NICs) in a team. You can include this configuration in an RDM Windows Native Install task or an RDM Windows Clone Install task. You can configure shared NICs for such operations as:

- Pooled operations.
- Rollover (or "failover") operations.

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, and DOS batch files.

1.2 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

1.2.1 Guides

The following product documentation is available for RDM:

- *Remote Deployment Manager 4.30 User's Reference* – The main reference manual for RDM
- *Remote Deployment Manager 4.30 Installation and Configuration Guide* – Describes the complete installation process of RDM
- *Remote Deployment Manager 4.30 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.

1.2.2 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.

1.2.3 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.

1.2.4 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 4.30, 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.

1.3 Limitations

The approach defined in this paper requires the use of the Broadcom BASP installation and silent configuration utility programs (available on the Broadcom NetXtreme Gigabit Ethernet Software CD) and is limited to configuring on-board and add-on Broadcom NICs.

It is beyond the purview of this White Paper to be a tutorial on writing shared NIC configuration scripts. For further information on creating shared NIC configuration scripts, please refer to the Broadcom documentation on the Broadcom CD.

1.4 Change History

This section describes significant changes in this document:

- May 9, 2006 – Updates for RDM 4.30 functional enhancements and fixes. Changes how to add the Broadcom Teaming application to a Windows Clone Install task. Eliminates the use of user parameters, using RDM built-in parameters instead. Embedded file contains a newer version 8.3.9 of the Broadcom utilities.

2 Procedure

The approach of this paper can be broken down into the following basic steps:

1. Obtain and create the files needed to configure the NICs.
2. Create an RDM image that contains the files that will configure the NICs.
3. Create an RDM task that deploys Windows.
4. Add statements that implement NIC teaming to the task's command list.
5. Test the task.

2.1 Create an RDM image

You must choose one of two possible ways to accomplish this step:

- Import the image attached to this document.

  Because RDM 4.30 (actually, 4.20 or later) has the ability to import an image, you can use the attached file (which contains an exported copy of the image created in the steps below) to create your image. This is much easier and faster than creating the image yourself.

- Create the image yourself.

  This entails downloading and extracting the Broadcom files, plus creating several other files yourself. It is somewhat more time-consuming than importing the image.

Important: Regardless of which image-creation method you choose, you may have to modify some files from what are shown in this document. For example, you may be using a different version of the Broadcom software that uses newer or different files, you may be using a different type of NIC teaming than what is shown below, or your NICs may require different configuration parameters.

2.1.1 Import an image

There are 2 parts to this step:

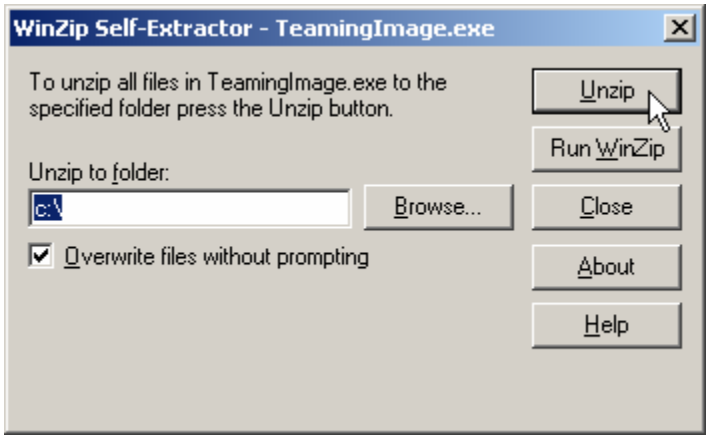
1. Unzip the attached file.
2. Import the image.

2.1.1.1 Unzip the attached file

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

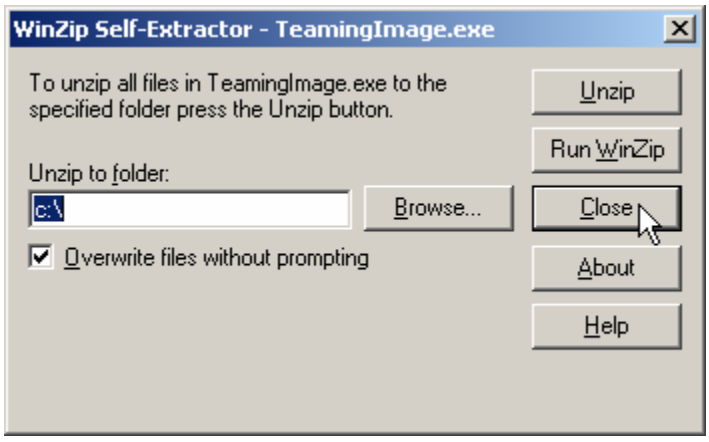
   Note: You may need Adobe Acrobat Reader 6.0.1 or later to be able to extract the file. If you are using Adobe Acrobat Reader 7.0 or later, you may need to modify your Windows Registry to be able to extract the file. See http://www.adobe.com/support/techdocs/328671.html and http://www.adobe.com/support/techdocs/328671.html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

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



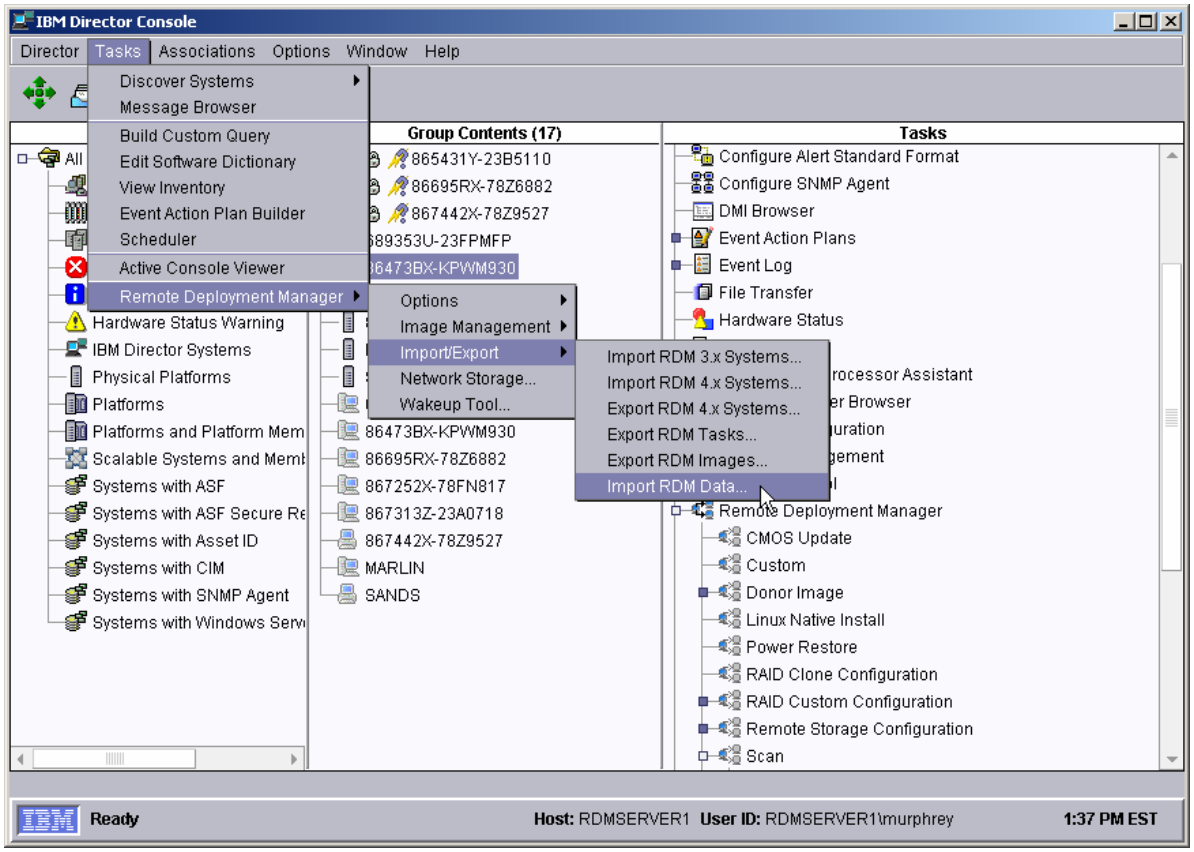
4. Click the *OK* button when the unzip is complete.

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

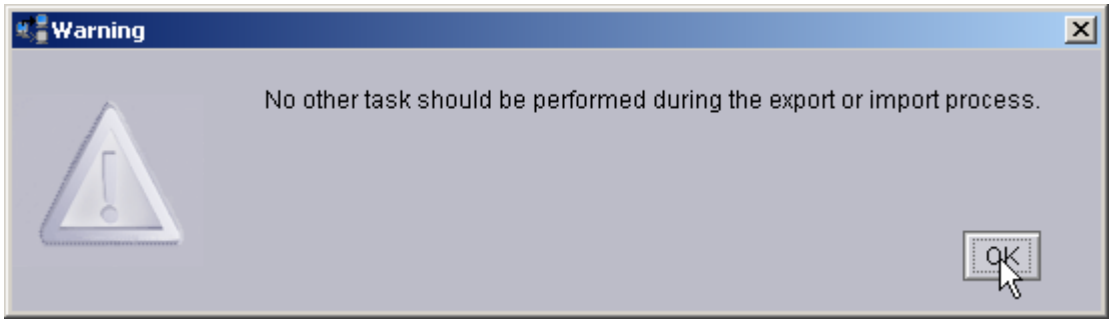


2.1.1.2 Import the image

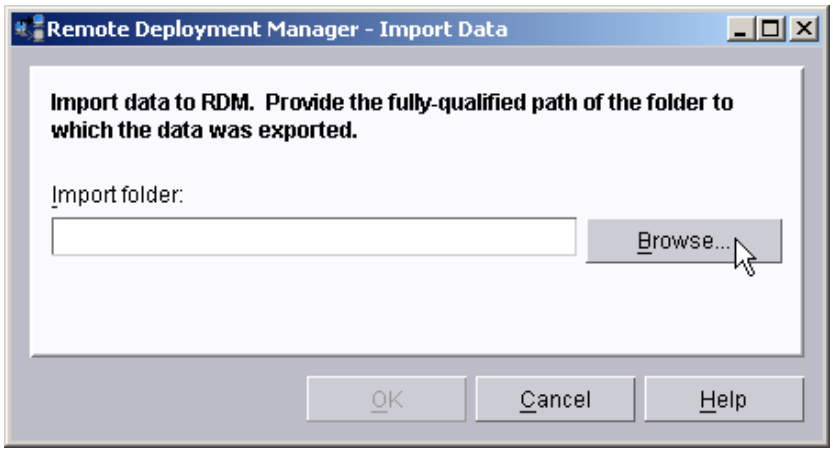
6. From the Director console, select the **Tasks**, **Remote Deployment Manager**, **Import/Export,** and **Import RDM Data...** menus.



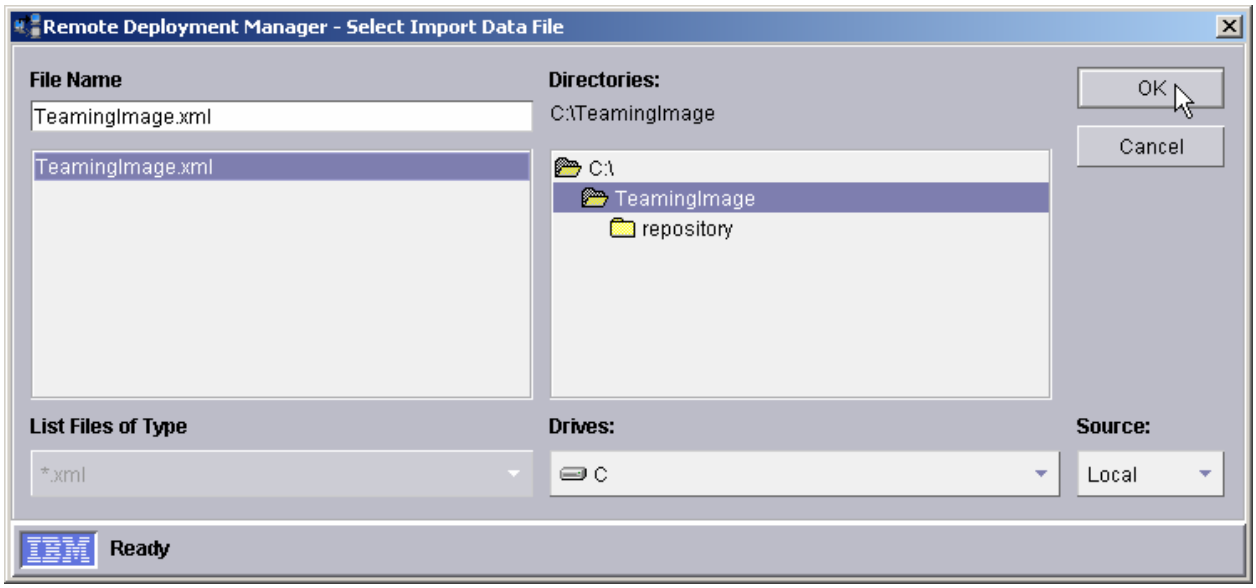
7. Make sure that you are not running any other RDM tasks. Then click *OK* on the warning message.



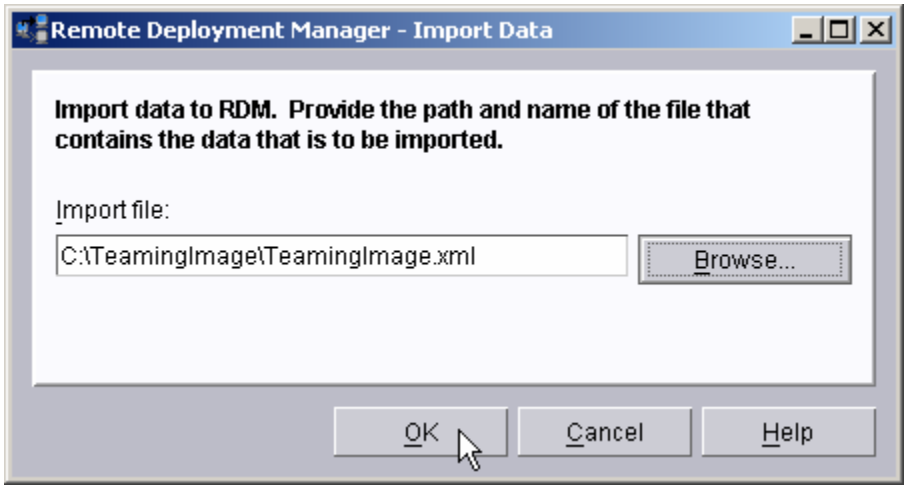
8. Select the *Browse* button on the *Import Data* window.



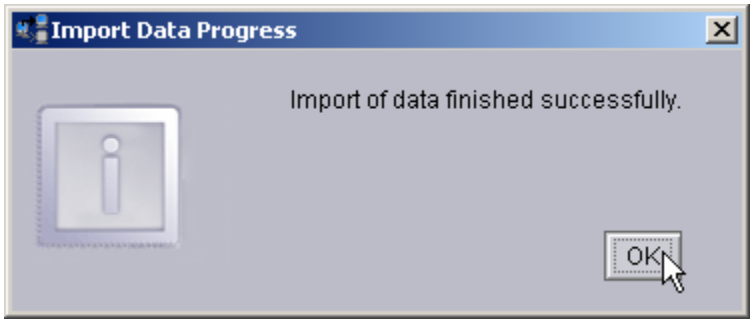
9. Navigate to the *TeamingImage* folder, select the *TeamingImage.xml* file, and select the *OK* button.



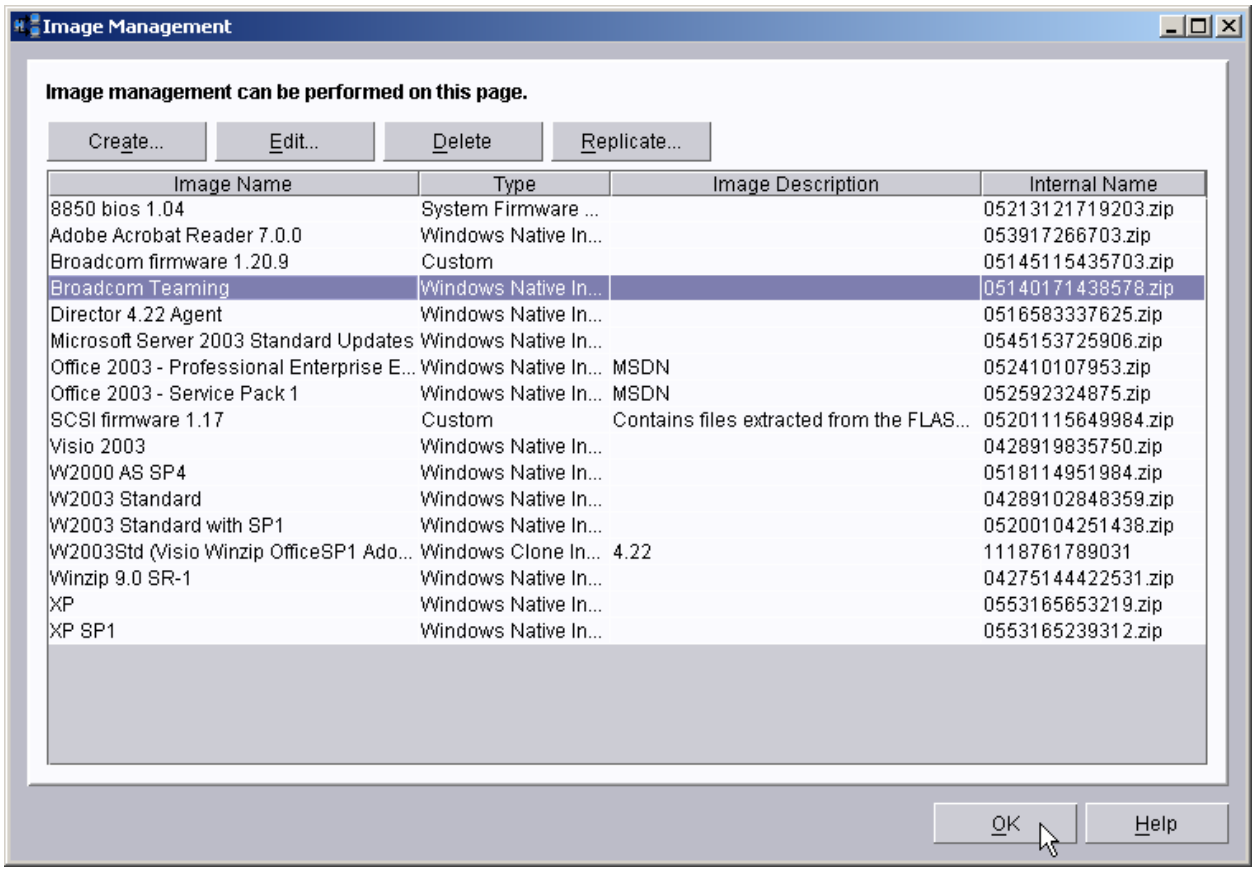
10. Select the *OK* button on the *Import Data* window.



11. Select the OK button on the final *Import Data Progress* message window.



12. Open the *Image Management* window (using the **Tasks**, **Remote Deployment Manger**, **Image Management**, and **Create and Modify Images** menus) to validate that the new image is there.



13. Note the file name of the image's zip file (05140171438578.zip in this example).

2.1.2 Create the image yourself

We are going to create an RDM image that contains the files in the following table.

File name	How obtained
BASFND.SYS	Tools\BASPSCFG\IA32 folder on the Broadcom CD
BASPSCFG.EXE	Tools\BASPSCFG\IA32 folder on the Broadcom CD
BMAPI.DLL	Tools\BASPSCFG\IA32 folder on the Broadcom CD
CONFIG.BAT	Created by the user
LCCUSTOM.EXE	Program Files\IBM\RDM\repository\environment\dos folder on the RDM server
POOLED.BAT	Created by the user
SETUP.EXE	MgmtApps\IA32 folder on the Broadcom CD
TEAMCFG.TXT	Created by the user

2.1.2.1 Obtain Broadcom files

1. Download the appropriate Broadcom(R) NetXtreme (TM) Gigabit Ethernet Drivers Software CD from the IBM web site. We used this URL: http://www-307.ibm.com/pc/support/site.wss/document.do?sitestyle=ibm&lndocid=MIGR-43815 for version 8.3.9 of the Broadcom software.
2. Unpack the CD image, by running the executable file from the above web site. You can unpack it to your hard drive (without creating a CD).
3. Create a temporary folder called BASP on the RDM server.
4. Copy the following Broadcom BASP installation files from the MgmtApps\IA32 folder on the Broadcom CD to the temporary BASP folder on the RDM server:

   SETUP.EXE

5. Copy the following Broadcom BASP configuration tool files from the Tools\BASPSCFG\IA32 folder on the Broadcom NetXtreme Gigabit Ethernet Software CD to the temporary BASP folder on the RDM server:

   BASPSCFG.EXE
   BASFND.SYS
   BMAPI.DLL

2.1.2.2 Create the CONFIG.BAT File

The CONFIG.BAT file actually configures the NIC teaming. It uses BASPSCFG.EXE to do it.

6. Depending on the specific type of pooled NIC configuration you want, the Broadcom BASPSCFG.EXE configuration utility can require one or more parameters to perform configuration tasks. To work with multiple target systems under RDM, the task logic needs to be written so that RDM replaces all “variables” with machine-specific values. You can run BASPSCFG.EXE with command-line parameters, or you can run it with the parameters contained in a file. We use the latter, because it seems to work better in some instances. The following statement, from our example file below, references the parameters in the TEAMCFG.TXT file:

   ```
   BASPSCFG.EXE -restore TEAMCFG.TXT
   ```

   However, the call to the BASPSCFG configuration utility is made in a batch file that you can customize (in case you prefer to use a different technique).

   Following the examples in the Broadcom document *Silent Configuration for Broadcom Advance Server Program*, a batch file used to create a Smart Load Balance and Fail Over team with 2 “teamable” physical network adapters and to configure the team with a static IP address would look like this:

   ```
   TITLE "CONFIG.BAT: Configure the NIC team."
   REM With no command-line parameters, BASPSCFG will create a
   REM default Load Balance SLBTeam with all 'teamable' physical
   REM network adapters and configure SLBTeam with DHCP
   ECHO Configuring multiple NICs for pooled operations. Please wait...

   REM This statement can be used if you want the parameter values on the command line:
   REM BASPSCFG.exe -name Teamed -type 0 -pnic %MACADDRESS_1% -snic %MACADDRESS_2% -ip
   %ComputerIP_1% -smask %SubnetMask_1% -gw %DefaultGateway_1% -dns %DNSPreferredIP_1%

   REM This example uses the parameter values from a file:
   SET >%SYSTEMDRIVE%\MYSET.TXT
   LCCUSTOM TEAMCFG.TXT
   BASPSCFG.EXE -restore TEAMCFG.TXT

   IF ERRORLEVEL 557 GOTO ERR_557
   IF ERRORLEVEL 556 GOTO ERR_556
   ```

```
IF ERRORLEVEL 555 GOTO ERR_555
IF ERRORLEVEL 554 GOTO ERR_554
IF ERRORLEVEL 553 GOTO ERR_553
IF ERRORLEVEL 552 GOTO ERR_552
IF ERRORLEVEL 551 GOTO ERR_551
IF ERRORLEVEL 550 GOTO ERR_550
IF ERRORLEVEL 514 GOTO ERR_514
IF ERRORLEVEL 513 GOTO ERR_513
IF ERRORLEVEL 512 GOTO ERR_512
IF ERRORLEVEL 511 GOTO ERR_511
IF ERRORLEVEL 510 GOTO ERR_510
IF ERRORLEVEL 509 GOTO ERR_509
IF ERRORLEVEL 509 GOTO ERR_509
IF ERRORLEVEL 508 GOTO ERR_508
IF ERRORLEVEL 507 GOTO ERR_507
IF ERRORLEVEL 506 GOTO ERR_506
IF ERRORLEVEL 505 GOTO ERR_505
IF ERRORLEVEL 504 GOTO ERR_504
IF ERRORLEVEL 503 GOTO ERR_503
IF ERRORLEVEL 502 GOTO ERR_502
IF ERRORLEVEL 501 GOTO ERR_501
IF ERRORLEVEL 500 GOTO ERR_500

SET RDRASLEVEL=0

SET RDSTATUS=RDMNIC000I BASPSCFG.EXE completed with no errors.
GOTO FINISH

:ERR_557
SET RDSTATUS=RDMNIC557E Wrong BMAPI
GOTO FAILURE

:ERR_556
SET RDSTATUS=RDMNIC556E Cannot get all created teams
GOTO FAILURE

:ERR_555
SET RDSTATUS=RDMNIC555E Cannot get all unassigned adapters number
GOTO FAILURE

:ERR_554
SET RDSTATUS=RDMNIC554E Cannot create team
GOTO FAILURE

:ERR_553
SET RDSTATUS=RDMNIC553E Cannot get adapter PCI information
GOTO FAILURE

:ERR_552
SET RDSTATUS=RDMNIC552E Cannot get all unassigned adapters data
GOTO FAILURE

:ERR_551
SET RDSTATUS=RDMNIC551E Cannot check BASP status
GOTO FAILURE

:ERR_550
SET RDSTATUS=RDMNIC550E Cannot initialize BMAPI
GOTO FAILURE

:ERR_514
SET RDSTATUS=RDMNIC514E Team already exists, please use a different team name
GOTO FAILURE

:ERR_513
SET RDSTATUS=RDMNIC513E & is not a legal character for the team name
GOTO FAILURE

:ERR_512
SET RDSTATUS=RDMNIC512E Duplicate adapter physical MAC address
GOTO FAILURE
```

```
:ERR_511
SET RDSTATUS=RDMNIC511E Only Broadcom certified adapters are supported in VLAN
GOTO FAILURE

:ERR_510
SET RDSTATUS=RDMNIC510E Cannot create FECGEC or 802.3ad with a standby adapter
GOTO FAILURE

:ERR_509
SET RDSTATUS=RDMNIC509E Incorrect parameter passed to BASPCFG.EXE
GOTO FAILURE

:ERR_508
SET RDSTATUS=RDMNIC508E Cannot set static IP Address
GOTO FAILURE

:ERR_507
SET RDSTATUS=RDMNIC507E BASP is not installed and cannot create any team
GOTO FAILURE

:ERR_506
SET RDSTATUS=RDMNIC506E No team to configure
GOTO FAILURE

:ERR_505
SET RDSTATUS=RDMNIC505E Cannot open the input file
GOTO FAILURE

:ERR_504
SET RDSTATUS=RDMNIC504E Cannot create more than 64 VLANs
GOTO FAILURE

:ERR_503
SET RDSTATUS=RDMNIC503E Cannot create more than one team from command line
GOTO FAILURE

:ERR_502
SET RDSTATUS=RDMNIC502E Team has no member
GOTO FAILURE

:ERR_501
SET RDSTATUS=RDMNIC501E Cannot allocate memory
GOTO FAILURE

:ERR_500
SET RDSTATUS=RDMNIC500E Not supported OS
GOTO FAILURE

:ERR_1
SET RDSTATUS=RDMNIC001E Unspecified error in CONFIG.BAT

:FAILURE
SET RDRASLEVEL=1

:FINISH
ECHO.
```

In the example above, there are no machine-specific values. However, the configuration batch file *may* require machine-specific values for the *name*, *type*, *pnic*, *snic*, *vname*, *vid*, *ip* and/or *smask* command-line parameters. The TEAMCFG.TXT file uses built-in RDM parameters for this purpose.

Any instances of MAC addresses *must* be handled by the user. RDM provides only one parameter for a MAC address: %BOOTMAC%. It is the MAC address of the NIC being used for PXE. The comments in the above file use variable names in the format %MACADDRESS_*n*% where *n* is the number of the NIC containing the MAC address. In a script configuring two NICs, each of which has its own MAC address, the variables would be %MACADDRESS_1% and %MACADDRESS_2%. It will be your responsibility to create user parameters and to set those environment variables if you intend to use MAC address in your command or text file..

In the example above,

- The LCCUSTOM.EXE line substitutes all parameter values in the TEAMCFG.TXT file.
- All of the configuration work is done by the BASPSCFG.EXE line.
- The following lines are simply to trap for error levels that the BASPSCFG.EXE executable can possible generate.
- The REM BASPSCFG.EXE line is an example of how you might use command-line parameters instead of encapsulating the parameters in a text file.

Following the examples in the Broadcom document *Silent Configuration for Broadcom Advance Server Program*, the sample batch file above creates a default Load Balance SLBTeam with all '"teamable" physical network adapters and configures the SLBTeam with DHCP. If you replace the fourth line with the following line, the configuration batch file will create a FEC/GEC FGTeam with one load balanced physical adapter:

```
BaspSCfg.exe -name FGTeam -type 1 -pnic %MACADDRESS_1%
```

Similarly, changing the fourth line to the following line would create a Load Balance BRCMTeam with two VLANs and configure VLAN100 and VLAN200 with DHCP:

```
BaspSCfg.exe -name BRCMTeam -pnic %MACADDRESS_1% -snic %MACADDRESS_2% -vname VLAN100 –vid
    100 –vname VLAN200 –vid 200
```

2.1.2.3 Create the TEAMCFG.TXT file

TEAMCFG.TXT contains the parameter values for BASPSCFG.EXE.

7. The content of our example file is the following:

```
name:  Teamed
type:  0
pnic:  %PCI_BUSNUM_1%:%PCI_DEVNUM_1%.%PCI_FUNCNUM_1%
snic:  %PCI_BUSNUM_2%:%PCI_DEVNUM_2%.%PCI_FUNCNUM_2%
ip:  %computerip_1%
smask:  %subnetmask_1%
gw:  %defaultgateway_1%
dns:  %dnspreferredip_1%
```

These parameters are documented in *Silent Configuration for Broadcom Advance Server Program (BASP)*, a document contained on the Broadcom CD.

Important: It is your responsibility to choose the appropriate parameters and to set their values appropriately.

Here is an explanation of the parameters in our example:

- `name` – This is the name of the team. It is what appears as the name of the Ethernet adapter in the output from a Windows IPCONFIG command.
- `type` – This is the type of teaming. Our example, 0, means that it is a Smart Load Balance and Fail Over team.
- `snic` – This defines which physical NIC is the secondary NIC. We use the bus:dev.func format of this parameter, because we want to force the same NIC to be the secondary NIC on all our target systems. An alternate way to do this would be to use the MAC address as the value of this parameter.

  Important: In the current version of BASPSCFG.EXE, you are required to code the pnic value above the snic value in TEAMCFG.TXT.

- `pnic` – This defines which physical NIC is the primary NIC. We use the bus:dev.func format of this parameter, because we want to force the same NIC to be the primary NIC on all our target systems. An alternate way to do this would be to use the MAC address as the value of this parameter.

  Important: In the current version of BASPSCFG.EXE, you are required to code the pnic value above the snic value in TEAMCFG.TXT.

- `ip` – This is the static IP address of the team. We use a variable for its value. That variable is a standard parameter of the RDM *Windows Native Install* or *Windows Clone Install* task. The task should define a static IP address for its first NIC.

- `smask` – This is the subnet mask of the team. We use a variable for its value. That variable is a standard parameter of the RDM *Windows Native Install* or *Windows Clone Install* task. The task should define a subnet mask for its first NIC.

- `gw` – This is the gateway address of the team. We use a variable for its value. That variable is a standard parameter of the RDM *Windows Native Install* or *Windows Clone Install* task. The task should define a gateway address for its first NIC.

- `dns` – This is the DNS address of the team. We use a variable for its value. That variable is a standard parameter of the RDM *Windows Native Install* or *Windows Clone Install* task. The task should define a DNS address for its first NIC.

2.1.2.4 Create the POOLED.BAT file

POOLED.BAT is the file that the RDM deployment task's command list will call to implement the NIC teaming.

8. The content of our example file is the following:

```
TITLE "POOLED.BAT: Install software and configure NIC team."
ECHO Running POOLED.BAT to install/configure multiple NICs...

RDAGENT /L "POOLED.BAT: Installing the Broadcom Advanced Control Program and Advanced
Server Program (for NIC teaming)."
SETUP /s /v/qn

RDAGENT /L "POOLED.BAT: Configuring the NIC team."
CALL CONFIG.BAT

RDAGENT /L "POOLED.BAT: Waiting for the teamed network adapters to connect to the
network."
SLEEP 20
ECHO.

EXIT
```

This batch file installs the *Broadcom Advanced Control Suite 2* application (via SETUP.EXE), and then it configures the NIC team (via CONFIG.BAT).

If you are running RDM under Linux, make sure you match the cases of the file names being copied by the MTFTP lines in the POOLED.BAT file. If you are running RDM under Windows, the case of the file names is not important, as Windows is not case-sensitive for file activities.

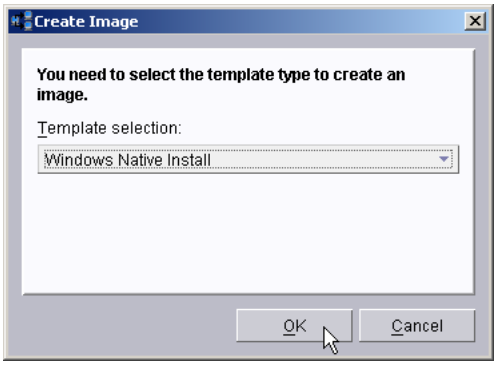
Important:

- The SLEEP 20 statement is intended to give the network team time (i.e., 20 seconds) to connect to the network. You may need to use a different value than 20.
- Previous versions of this document, for RDM 4.20.x, showed POOLED.BAT without an EXIT statement. Because of the RDM 4.30 changes in the area of application handling, we now need the EXIT statement.

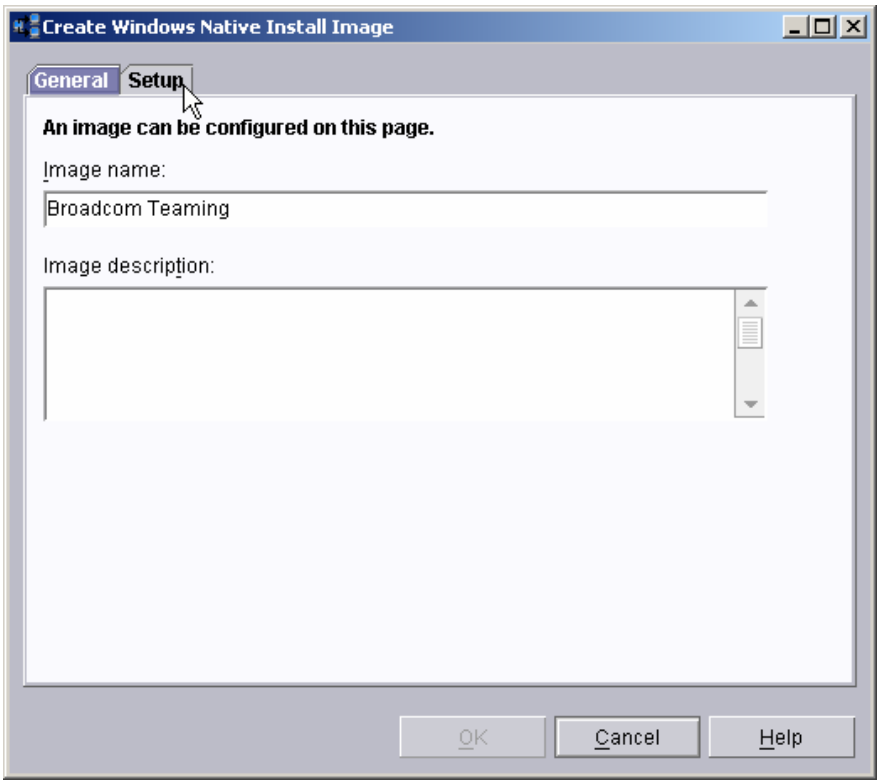
2.1.2.5 Create the RDM image

We will create an RDM image to contain all the files that we use to implement NIC teaming. This image will be an *Application* image associated with the *Windows Native Install* template. Note that you will also be able to use this image in a *Windows Clone Install* task.

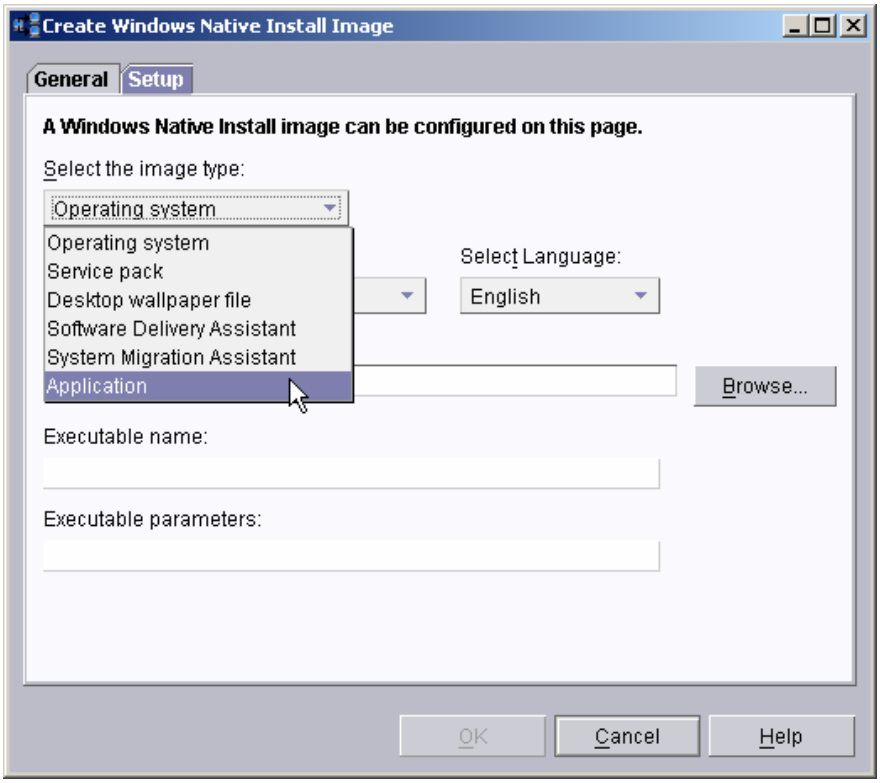
9. Open the *Image Management* window (using the **Tasks**, **Remote Deployment Manger**, **Image Management**, and **Create and Modify Images** menus).
10. Select the *Create...* button.



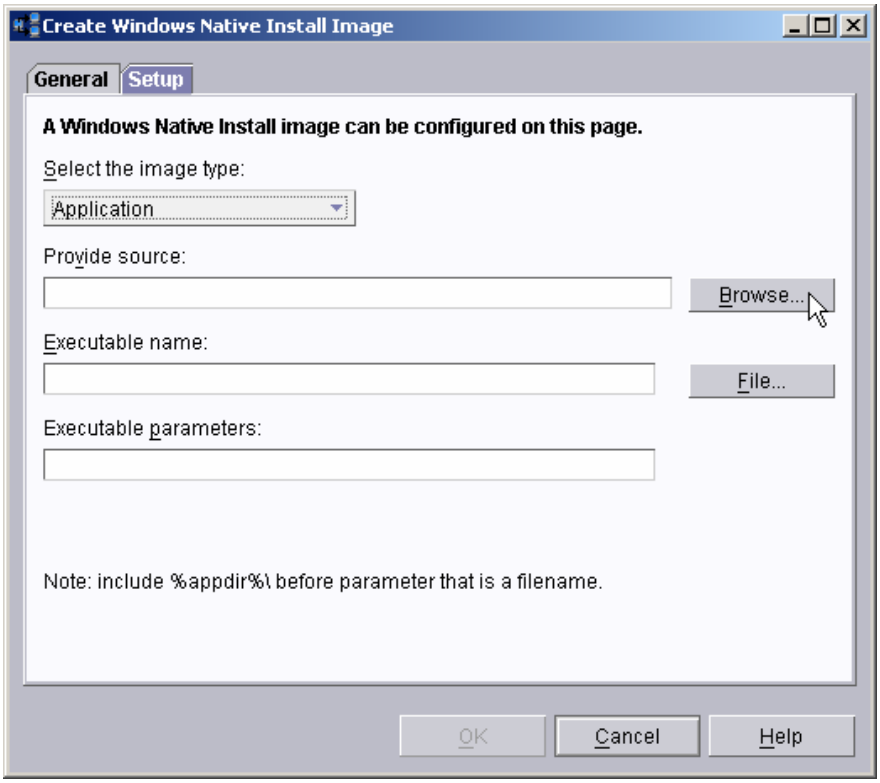
11. Select the *Windows Native Install* template, and then select the *OK* button.



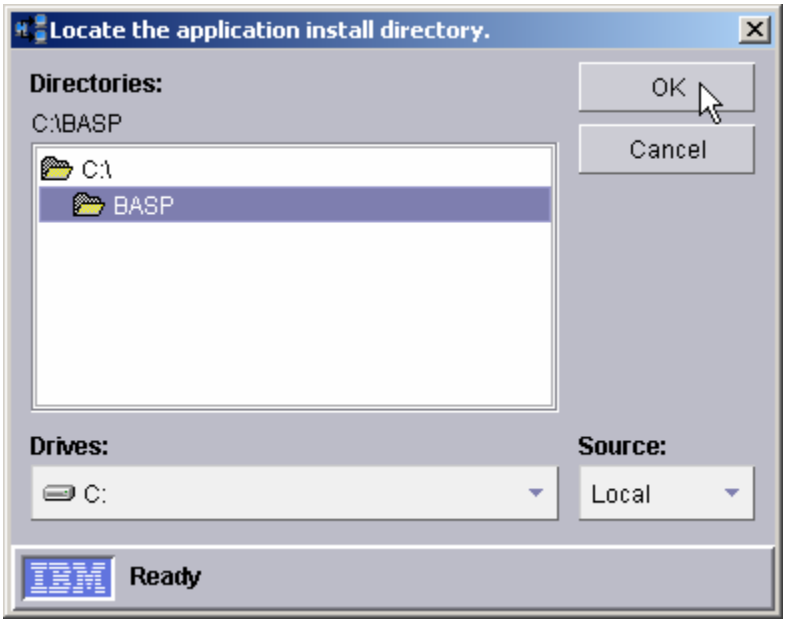
12. Enter an image name, and then select the *Setup* page.



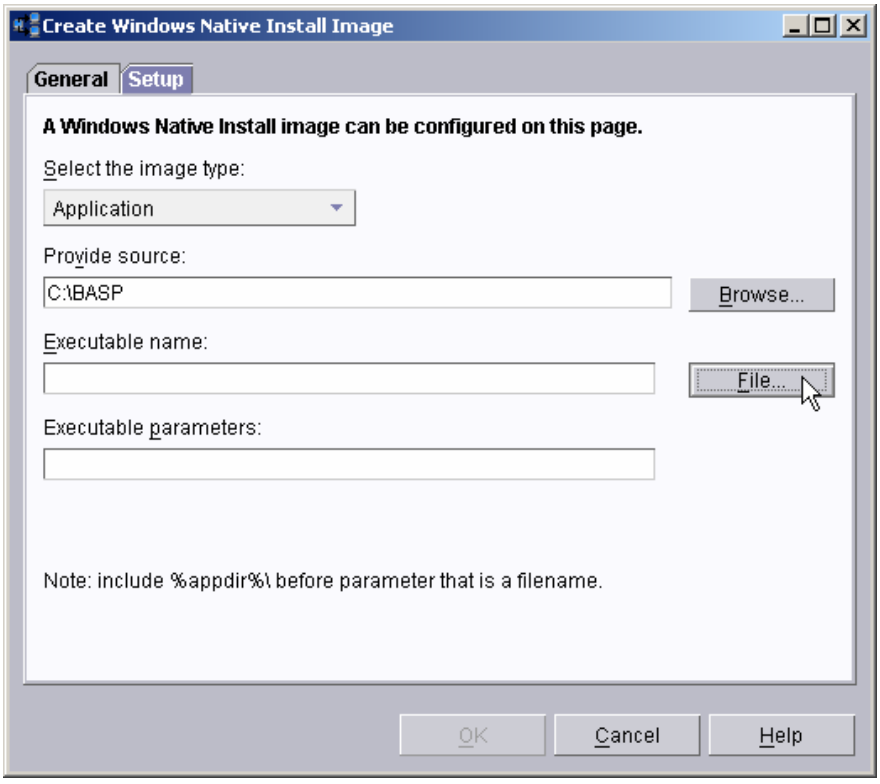
13. Select *Application* as the image type.



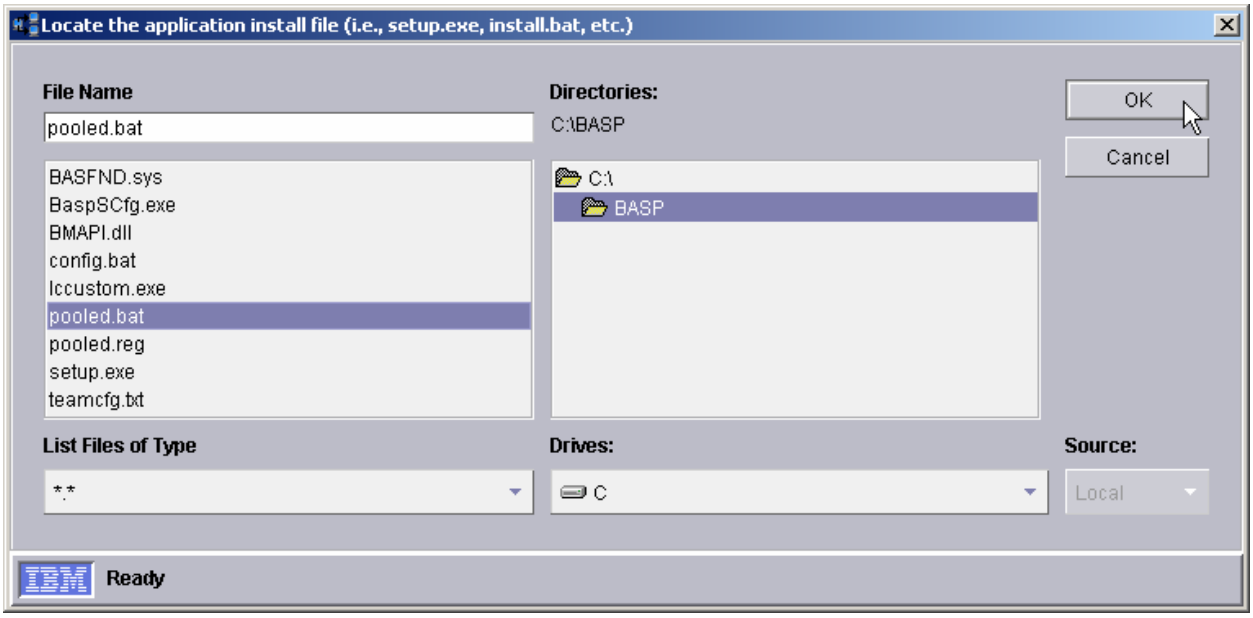
14. Then select the *Browse...* button and navigate to the C:\BASP folder that contains the files that will comprise the image. Then select the *OK* button.



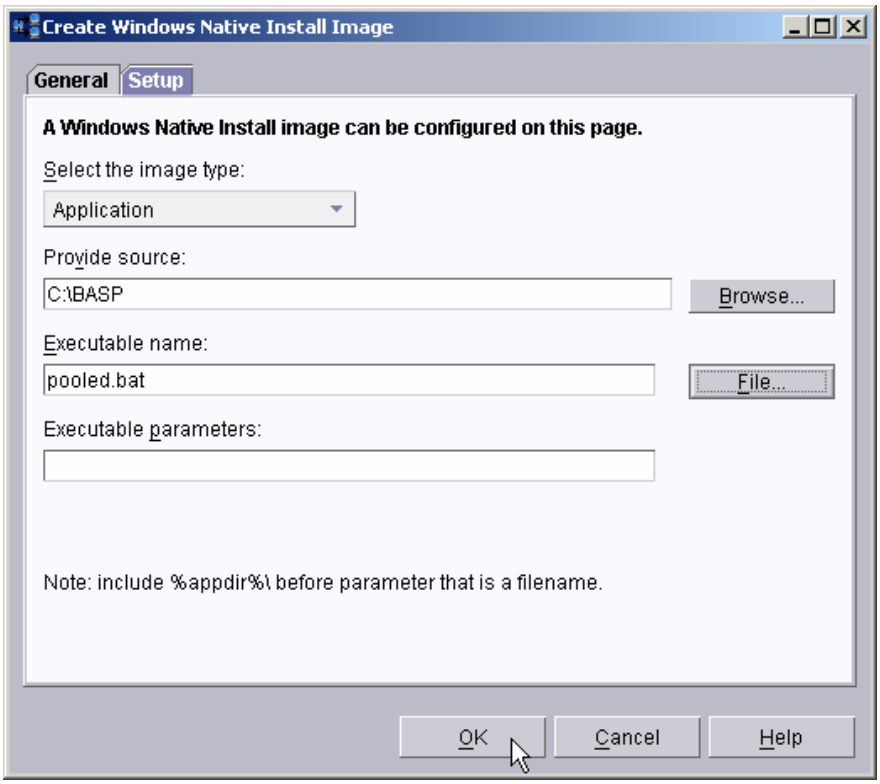
15. Now select the *File...* button.



16. Navigate to the POOLED.BAT file, select the file, and then select the *OK* button.



17. Now select the OK button to create your image.



18. Select the *OK* button on the final message box, and then verify that your new image appeared in the *Image Management* window.

2.2 Add the new image to your task

You will use the teaming image in the same way that you use any other application image. See the *Using RDM to Deploy Applications and Windows* white paper for detailed information about application install with RDM.

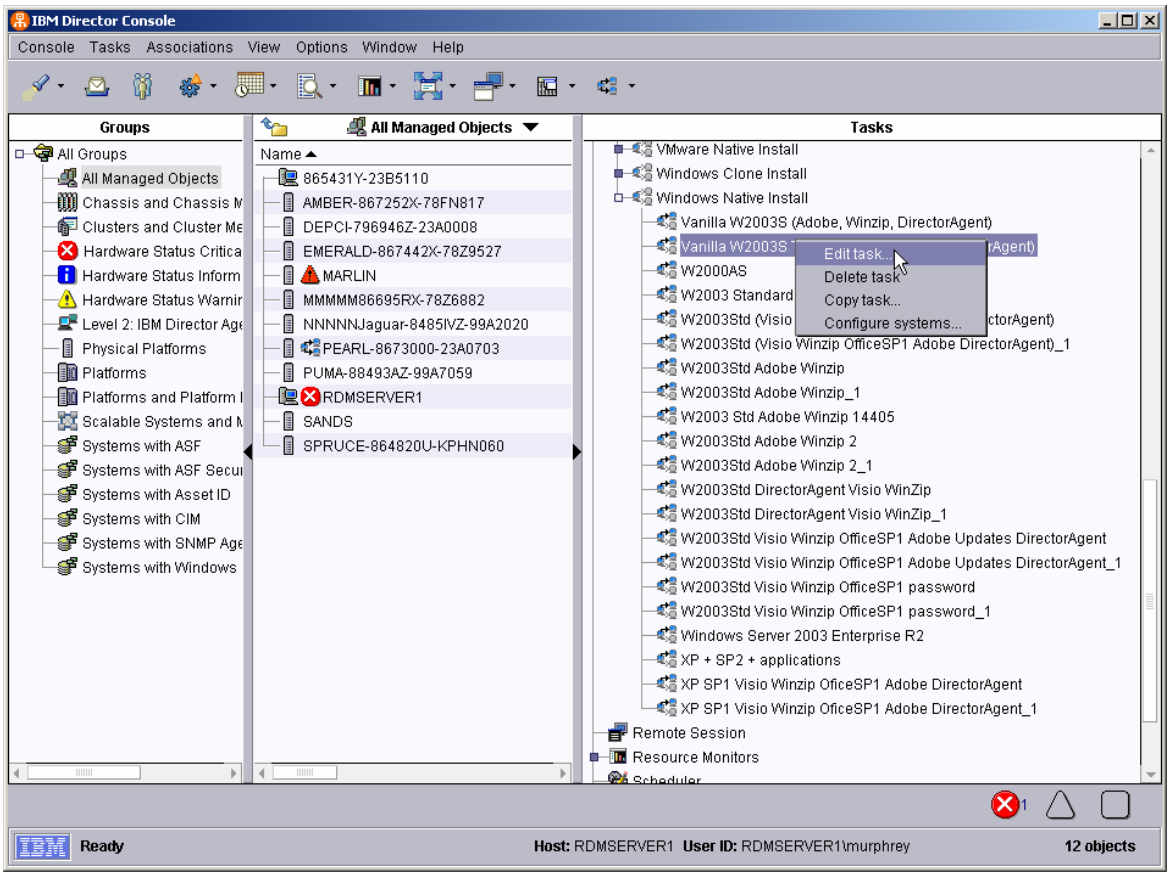
All you have to do is to include the teaming image in the task. You can do that when you first create the task, or you can do it later. We assume that you have already created such a task, and that you have tested the task. That is, the task works the way you want, except that it does not configure the NICs as a team.

To that end, make sure that your task has the first NIC configured for a static IP address. The task should not configure more than one NIC. When you run the task, the IP address that you enter in the *System/Task Configuration* window will become the IP of the team.

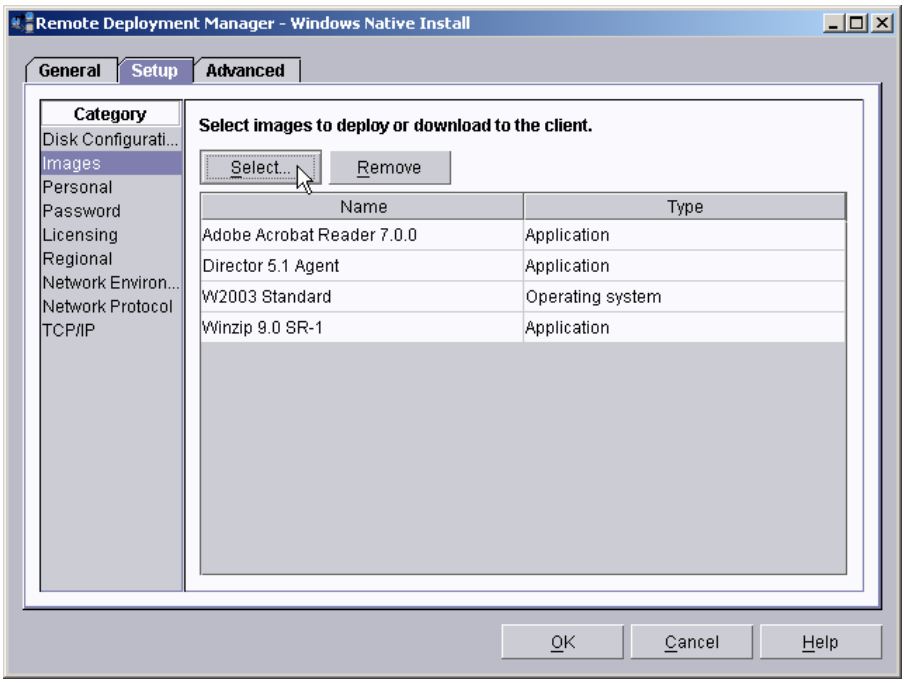
The following sections describe how to add the image to your *Windows Native Install* or *Windows Clone Install* task. The procedures (for the 2 kinds of tasks) are somewhat different, but the end result is essentially identical in each case.

2.2.1 Windows Native Install

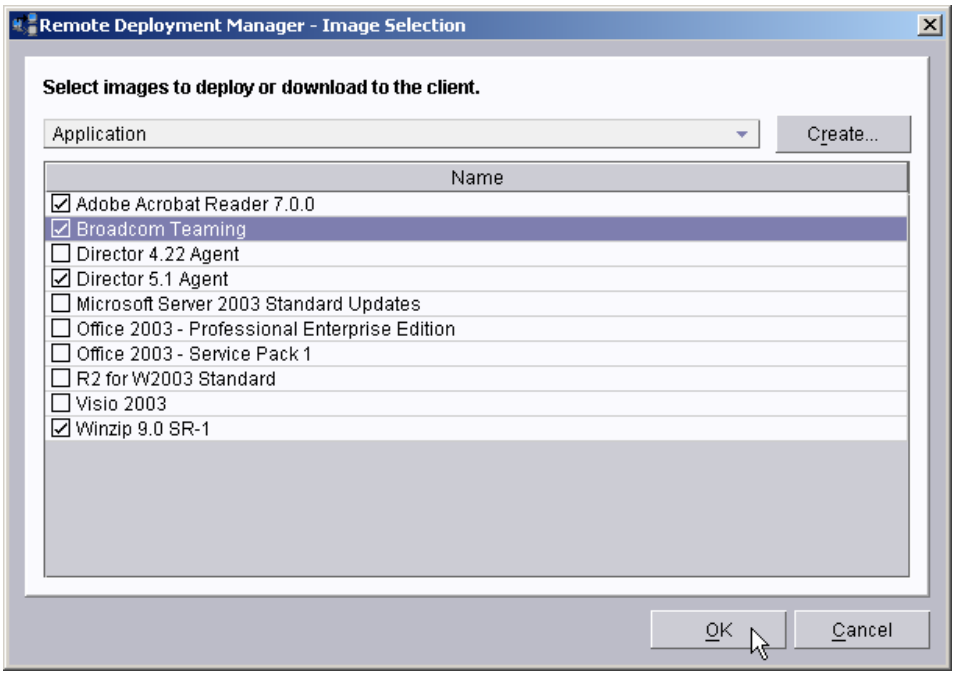
1. Right click on the task, and select the Edit task menu.



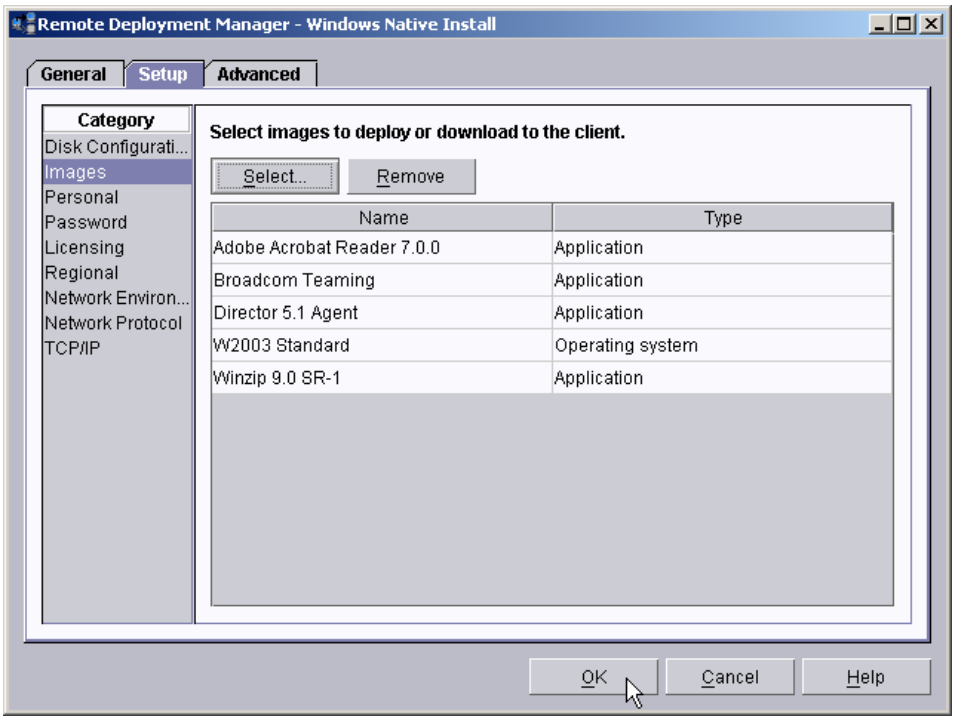
2. Select the *Setup* page and the *Images* category.



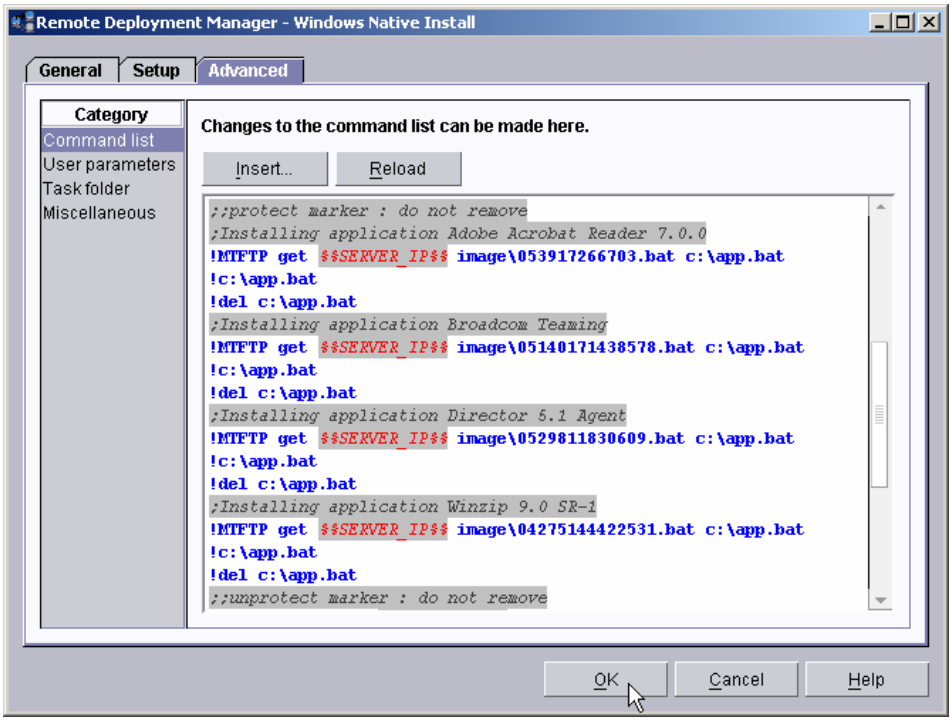
3. Click the *Select…* button, and then select *Application* from the drop-down list.



4. Check the box for your teaming image, and then select the *OK* button.



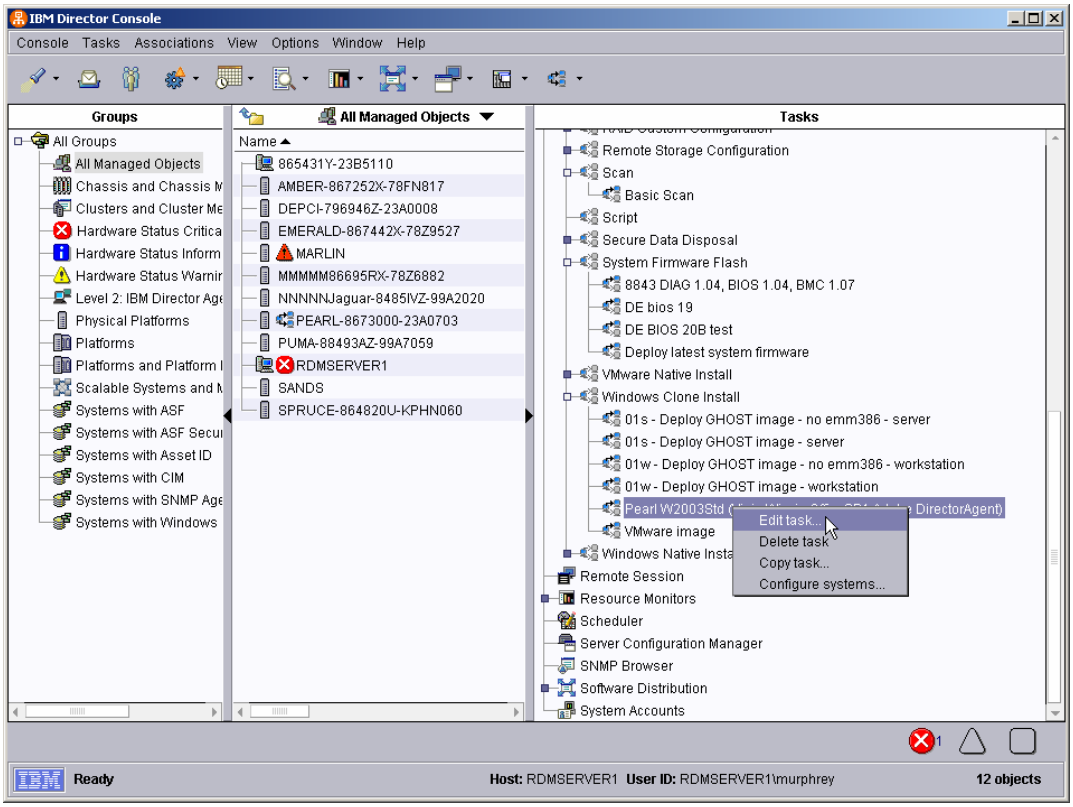
5. Notice that your teaming image is now added to the list. Now select the *Advanced* page to view the Command List.



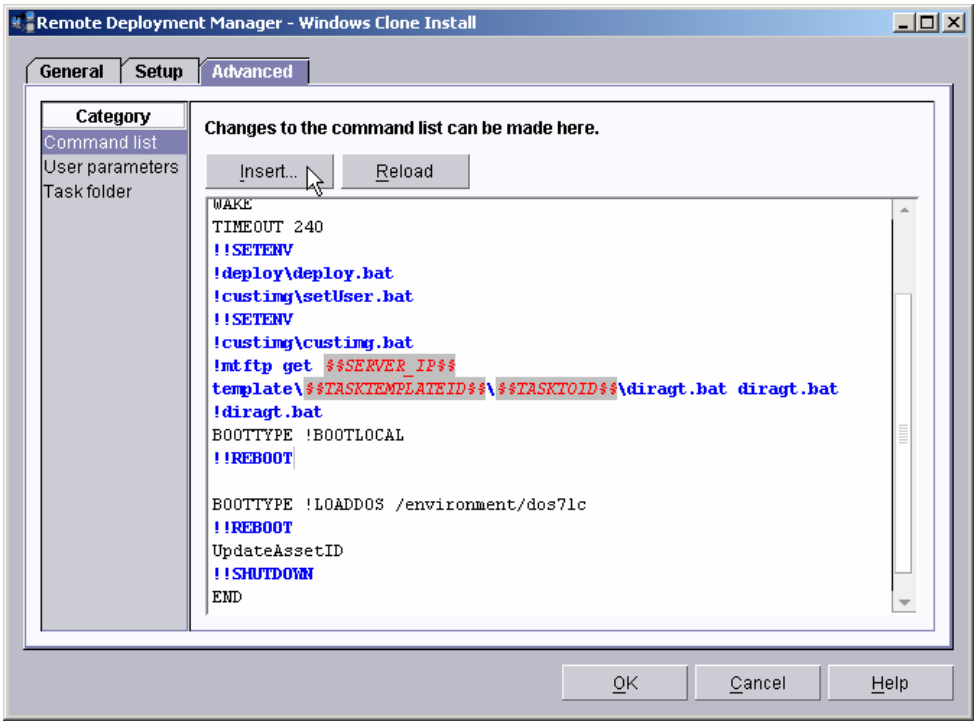
6. Notice that it now has 4 new lines that will install your teaming image. Select the *OK* button to save the task.

2.2.2 Windows Clone Install

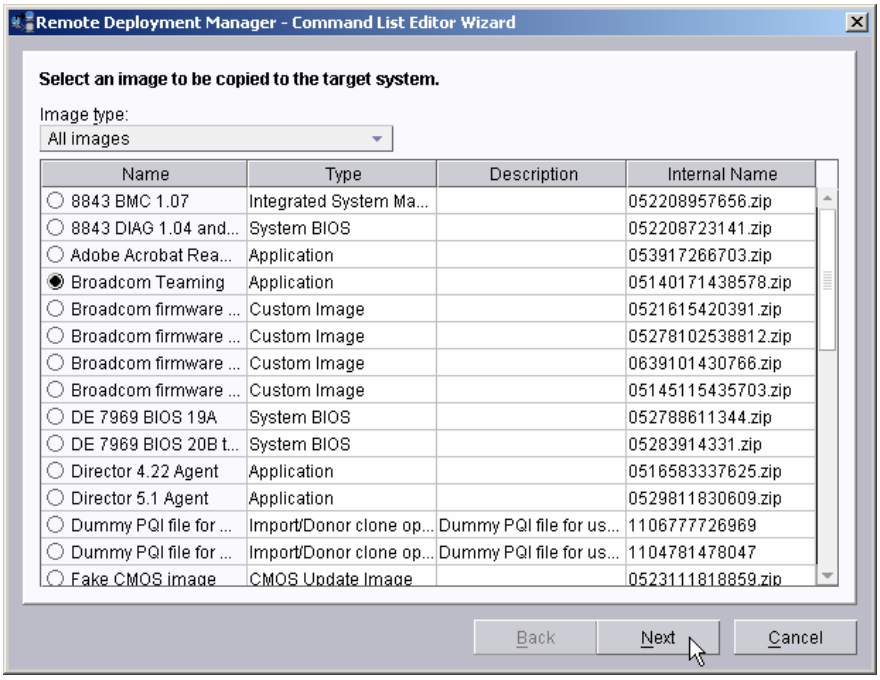
1. Right click on the task, and select the Edit task menu.



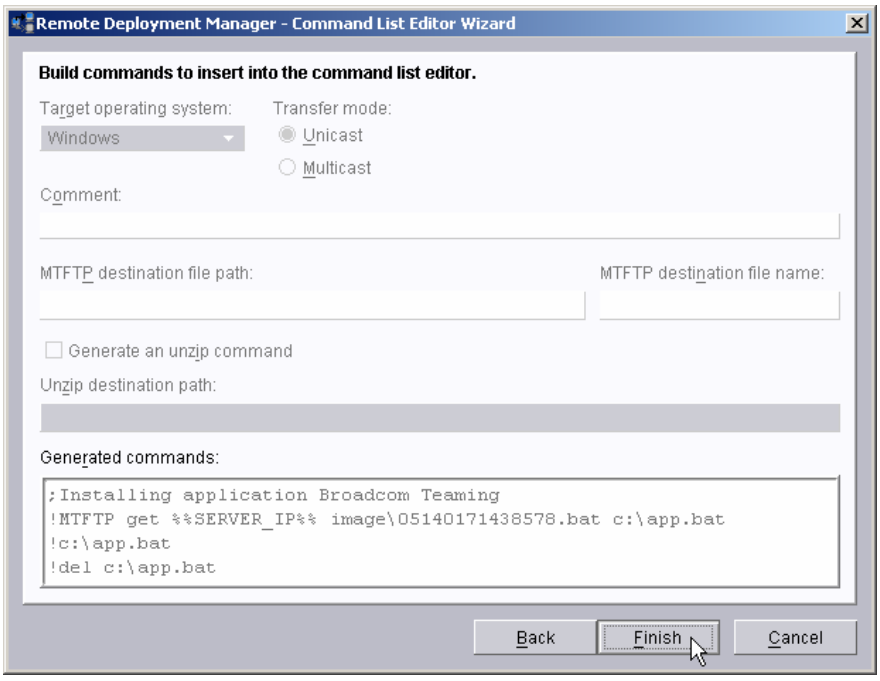
2. Select the *Advanced* page to view the Command List.



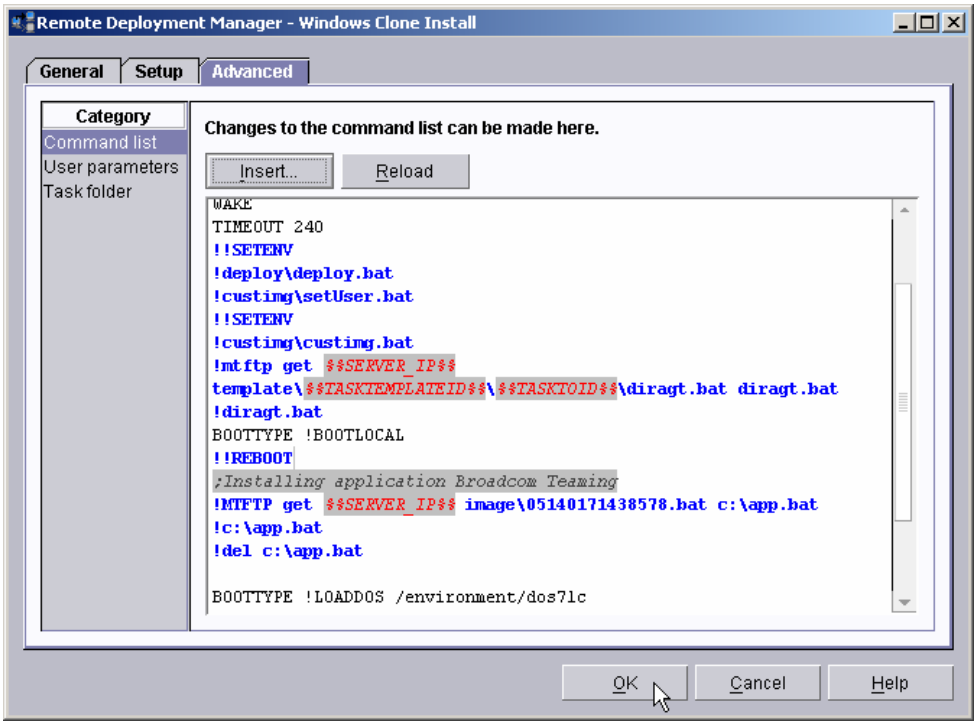
3. Insert a blank line as shown in the above picture. Place the cursor on the blank line, and then select the Insert... button.



4. Select the NIC teaming image that you created earlier, and then select the *Next* button.



5. Notice that RDM automatically filled in the fields of the Command List Editor Wizard. Then select the *Finish* button. The wizard will add the 4 statements to the command list, as shown below.



6. Select the OK button to save your changes.

2.3 Test the Windows deployment Task

Following standard RDM procedures, execute your *Windows Native Install* or *Windows Clone Install* task on the target systems.

3 Notices

This information was developed for products and services offered in the U.S.A.

IBM might not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service might be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right might be used instead. However, it is the user responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM might have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement might not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM might make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM might use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Some software might differ from its retail version (if available) and might not include all user manuals or all program functionality.

IBM makes no representations or warranties regarding third-party products or services.

3.1 Edition notice

3.1.1 Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

IBM

IBM (logo)

Asset ID

IntelliStation

LANClient Control Manager

Netfinity

ServeRAID

ThinkPad

Wake on LAN

xSeries

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names might be trademarks or service marks of others.

4 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.

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.

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.

Printed in U.S.A.