HP Client Automation Enterprise

Multicast Server

for the HP-UX, Solaris, and Windows® operating systems

Software Version: 7.80

Installation and Configuration Guide

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Documentation Updates

The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
  — The number before the period identifies the major release number.
  — The first number after the period identifies the minor release number.
  — The second number after the period represents the minor-minor release number.
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You will also receive updated and new editions if you subscribe to the appropriate product support service. Contact your HP sales representative for details.

Table 1 below lists the changes that were made to this document.

Table 1   Documentation changes

Chapter	Version	Changes
Entire Guide	5.00	Revised all directory paths. The default directory paths for CM products have been revised to: • `Program Files\Hewlett-Packard\CM` (Windows) And... • `HP/CM` (UNIX)
Chapter 1	5.00	Page 51, removed all information regarding the now-obsolete CM Inventory Manager Server.
Chapter 4	5.00	Page 52, revised all **ROMA** references with the updated product name, HP Configuration Management OS Manager System Agent (CM OSM System Agent).
Chapter 4	7.20	Page 47, inserted a section, Burst Mode, which details data-transmission configuration options that are new in this release.

Chapter	Version	Changes
Appendix B	5.00	Page 65, in the appendix, Multicast Results for Reporting, removed all information regarding the now-obsolete CM Inventory Manager Server.

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Contents

1 Introduction

In this chapter, you will have the opportunity to:

- *Review the chapters in this guide*, as well as other HP Client Automation guides that are associated with *multicast configuration and processing*.

- Understand the difference between *unicasting* and *multicasting*.

- Become familiar with the *benefits of multicasting*.

Audience

This guide is for **HP Client Automation** (**HPCA**) systems administrators who want to use the Multicast Server in their enterprise environments.

Using this Guide with Core and Satellite Servers

⚠️ If your environment uses Core and Satellite servers, read the *Core and Satellite Servers Getting Started Guide* as the installation, configuration, and troubleshooting information in that guide may override the information in this guide.

Documentation Map

This guide describes the **HP Client Automation Multicast Server** (HPCA Multicast Server); the following table provides an overview of this book, which will aid in locating specific information about the Multicast Server.

Table 2   Document Map

Chapter	Contents
Chapter 1 Introduction	The theory behind multicasting, and a comparison of the Multicast Server to traditional data transmission.
Chapter 2 The HPCA Multicast Server	The implementation and benefits of the Multicast Server, including a description of the four primary phases of the multicast process.
Chapter 3 Installing the HPCA Multicast Server	Instructions on installing the Multicast Server.
Chapter 4 Configuring an HPCA Multicast Server Environment	Information on the MULTCAST Class, the **HP Client Automation Configuration Server Database** (**CSDB**) Class in which a multicast session is configured; multicast's dynamic-windows feature; and advanced configuration options.

Chapter	Contents
Chapter 5 Using the HPCA Multicast Server	The three methods by which the Multicast Server can be tested.
Appendix A Time Zone Adjustments	Instructions on calculating time-zone differences, which is necessary for configuring a multicast session.
Appendix B Multicast Results for Reporting	Instructions on how to use the Multicast Server's post-session performance statistics for reporting.
Appendix C, Network Test Modules	Instructions on how the test modules of the Multicast Server can assist in tuning the multicast and broadcast parameters for a network configuration.
Appendix D Implementation and Diagnostics	Information that should be reviewed prior to starting a multicast session (Preliminary Parameter Calculation, Pre-Multicast Session Checklist, and Multicast Program-Call Schematic), as well as diagnostic (Querying the Various Logs) and troubleshooting information (Troubleshooting Tips).

Supporting Documentation

The following documents are referenced in this manual. They are shipped as part of the standard Client Automation library and can be accessed at the HP web site. We recommend having these documents accessible.

- *HP Client Automation Configuration Server User Guide* (*Configuration Server Guide*)

- *HP Client Automation Application Manager and Application Self-service Manager Installation and Configuration Guide* (*Application Manager and Application Self-service Manager Guide*)

- *HP Client Automation Administrator Guide* (*Admin Guide*)

- *HP Client Automation OS Manager System Administrator Guide* (*OS Manager Guide*)

- *HP Client Automation Proxy Server Installation and Configuration Guide* (*Proxy Server Guide*)

Introduction to Multicasting

This chapter provides an overview of the multicast method of transmitting files, and how multicasting compares to the standard method, **unicasting**. It also details the benefits of multicasting, and how the Multicast Server works with other Client Automation products.

Unicasting vs. Multicasting

The standard method of data transmission is **unicasting** (see Figure 1 below). In a unicast scenario, a server communicates with multiple agents individually and at different times, and transmits data to each during its communications session.

Figure 1   Unicasting scenario
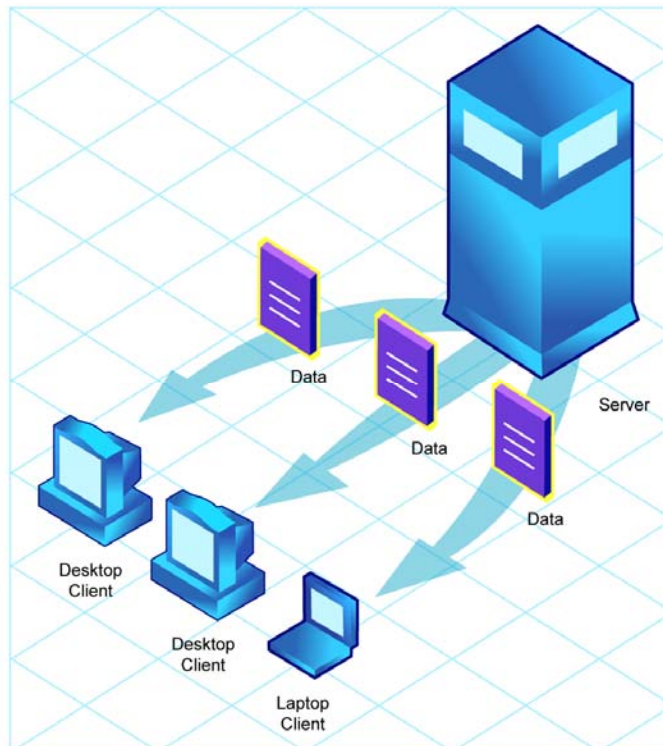
Since the server must repeatedly transmit identical data, the unicast method is very time-consuming.

Multicasting is a technique that allows the simultaneous transmission of a data stream to many receivers (see Figure 2 below). The receivers identify themselves as "interested parties" by joining a logical group, using the **Internet Group Membership Protocol** (**IGMP**).

Figure 2   Multicasting scenario
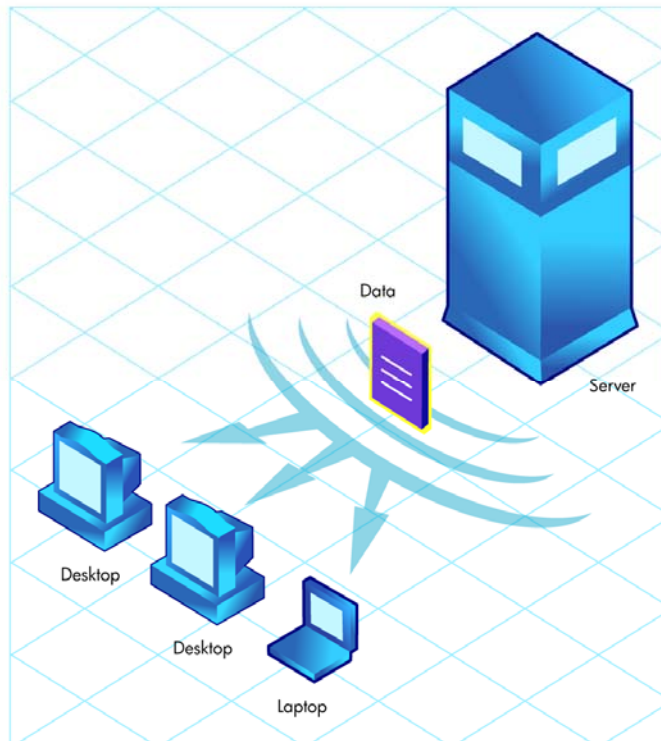
Benefits of Multicasting

Multicasting provides the following benefits:

- It maximizes the use of network bandwidth by transmitting a single data-stream to multiple agents, simultaneously.

- It saves resources on the server by not having to set up separate client sessions and then repetitively transmit data individually to each client.

2 The HPCA Multicast Server

In this chapter, you will have the opportunity to:

- Understand of the *benefits of using the HPCA Multicast Server*.

- Review the *operational and system requirements* that are necessary for a viable Multicast Server environment.

- Learn about the *four phases of the multicast process*.

  — Configuration

  — Collection

  — Distribution

  — Clean-up and Reporting

- Gain a better understanding of the Multicast Server *completion status information*.

Multicasting

Most multicast utilities are designed to provide the simplest delivery of a payload that has been statically composed of all files and components for all possible recipients. In this model, every receiver is forced to take all resources that are bundled into that payload.

The HP multicast option allows the collection of the sets of resources that are needed by only those receivers that are eligible to participate in a specific multicast transmission. This means that only data required that is by the participants is sent, and the participants retrieve only the data that they have requested.

Benefits of HP Client Automation Multicasting

Multicast technology is seamlessly integrated with HP Client Automation products to provide a delivery mechanism that builds on the existing resource-optimization capabilities.

By removing the requirement to repetitively transmit data (to each receiver individually), the Multicast Server provides an additional dimension to its existing architectural focus—using minimum resources in order to bring the desktop computing environment to its desired state.

An administrator also has the ability to perform a "centralized" configuration of the HPCA agents, and the ability to group HPCA agents that have similar needs.

Flexible, Centralized Configuration

In many multicast implementations, the logistics of configuring receivers in order to synchronize them with data transmitters becomes very labor-intensive or, for a large number of receivers, extremely restrictive. The administrator must ensure that the receivers are listening at the time the multicast transmission takes place and that the appropriate multicast address has been configured for all listeners. Altering these parameters on a large number of machines, and orchestrating the synchronization of sender and receivers on short notice, can be extremely difficult, if not impossible.

The configuration that is required in order to setup HPCA multicast distribution is performed centrally by the HPCA administrator. The HPCA

agents obtain all required multicast configuration parameters in the framework of the standard HPCA agent connect. The parameters can be changed regularly or as needed, and the HPCA agent connect process can be started using any of the standard options that allow end user scheduled, or remotely invoked, initiation.

To further optimize its multicast capabilities, HPCA provides the ability (using the standard administration tools that are provided with the product) to associate users that have similar requirements into separate multicast groups (for example, file servers and desktops).

Increasing Network Efficiency

The HP multicasting utility enables you to maximize the functionality of your existing network bandwidth. This is done by configuring the Multicast Server to concurrently transmit a single data-stream to multiple HPCA agents.

Each HPCA agent can distinguish between the files and components that are being delivered in the multicast stream, and retrieve only those that it needs. As a result, transfer time is minimized, and the HPCA agent's storage and processing resources are conserved because they are not forced to process and store superfluous data.

Guaranteed Delivery

The Multicast Server uses existing HPCA functionality to determine whether all of the required resources have been delivered in the multicast phase. It then uses the standard protocol—the HPCA agent connect—to deliver any unsatisfied requirements. This protects against the "thrashing" that can occur in broadcast/multicast type protocols when the quality of the communications channel is poor. The Multicast Server can be tuned to the network characteristics using a buffering/transmit scheme, and a programmable time delay between packets.

> The guaranteed delivery feature is specific to Windows operating systems.

Results Reporting

Since the Multicast Server is an extension of the HPCA product family, results of a multicast session are reported to the HPCA Configuration Server Database (CSDB). This information can then be mined for reporting and

auditing. For more information on how this is accomplished and the benefits of this feature, see Appendix B, Multicast Results for Reporting.

Operational Requirements

It is important to note that the Multicast Server will work only with services (applications) that are specified as mandatory. For more information on how to specify that services are mandatory, refer to the *HPCA Application Manager and Application Self-service Manager Guide*.

HPCA uses the standard IGMP. The Multicast Server requires:

- The availability of HTTP, and
- Routers to be enabled for the IGMP protocol.

> There are network configurations (primarily satellite or single sub-area networks) that might not support IGMP, so a broadcast option is offered as an alternative.

The following requirements must be established in an environment in order to ensure the proper execution of multicasting.

- The Multicast Server must have network connectivity to the HPCA Configuration Server (Configuration Server).
- The Configuration Server must be, at a minimum, at version 4.5.1.

> Although the Multicast Server can be installed on a machine other than that which houses the Configuration Server, it is recommended that they be co-resident.

- HPCA agents must be, at a minimum, version 4.0.1.
- The HPCA Proxy Server must be, at a minimum, at version 2.1.

For more information, refer to the *Proxy Server Guide*.

Platform Support

For information about the platforms that are supported in this release, refer to the *Release Notes* document for this release.

The Multicast Process

During the multicast process, the HPCA agent interacts with the Configuration Server and the Multicast Server. The multicast process is defined by two time windows: the **preparation window** and the **distribution window**. (See Figure 3 on page 22.) The time windows are then subdivided into four **phases**, during which the HPCA agent interacts with the Configuration Server and the Multicast Server in order to:

- Determine which files are needed.
- Collect the requirements for the necessary files.
- Transmit the files.
- Report the results of the transmission.

Multicast Phases

The multicast phases involve interaction (at various times) between the HPCA agent, the Configuration Server, and the Multicast Server. The HPCA agent is involved in all four phases of the process, whereas the Multicast Server and the Configuration Server are active only during some phases. This section details these phases, as well as each component's role in the process.

The four phases of the multicast process are:

- Configuration Phase
- Collection Phase
- Multicast Distribution Phase
- Clean up and Reporting Phase

> The parameters of these phases are configured in multicast instances in the Configuration Server Database.

Figure 3   Multicast time windows and phases
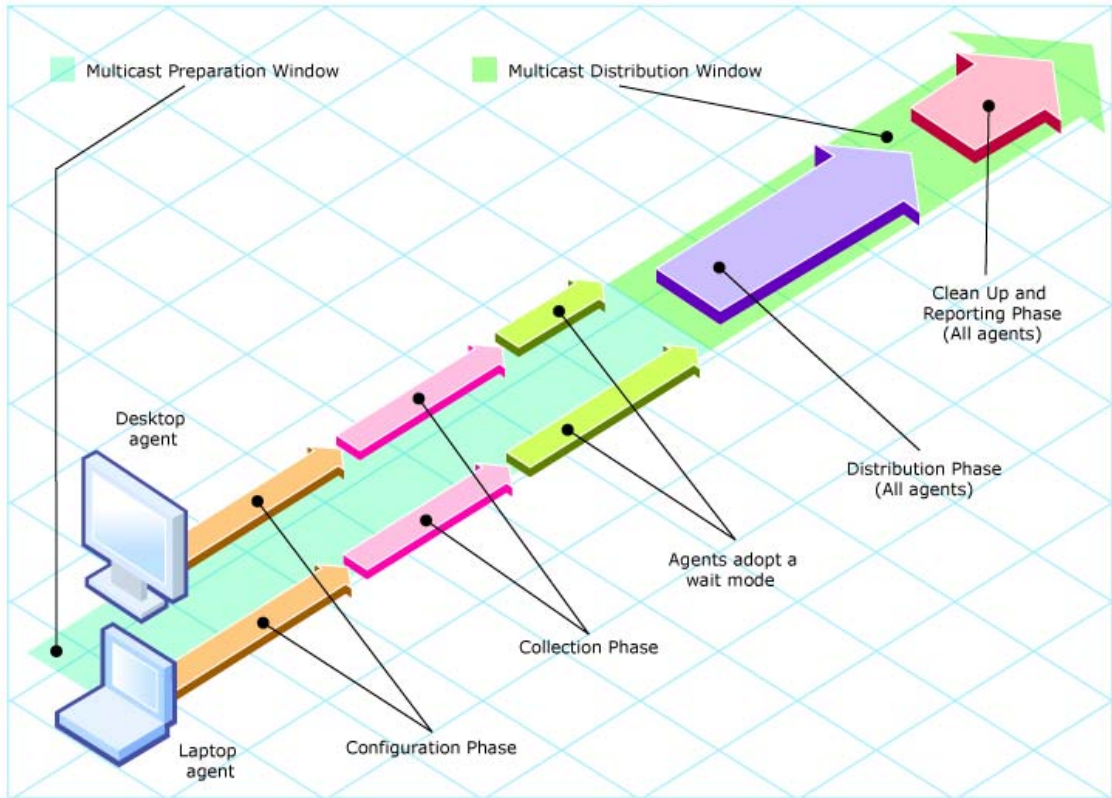
Configuration Phase

The configuration phase (shown in Figure 4 below and Figure 5 on page 24) occurs during a standard HPCA agent connect with the Configuration Server. An HPCA agent goes through a normal resolution to determine the resources it requires, and whether it is attached to a multicast group, as established by the system administrator.

Figure 4   Configuration Phase (first part)
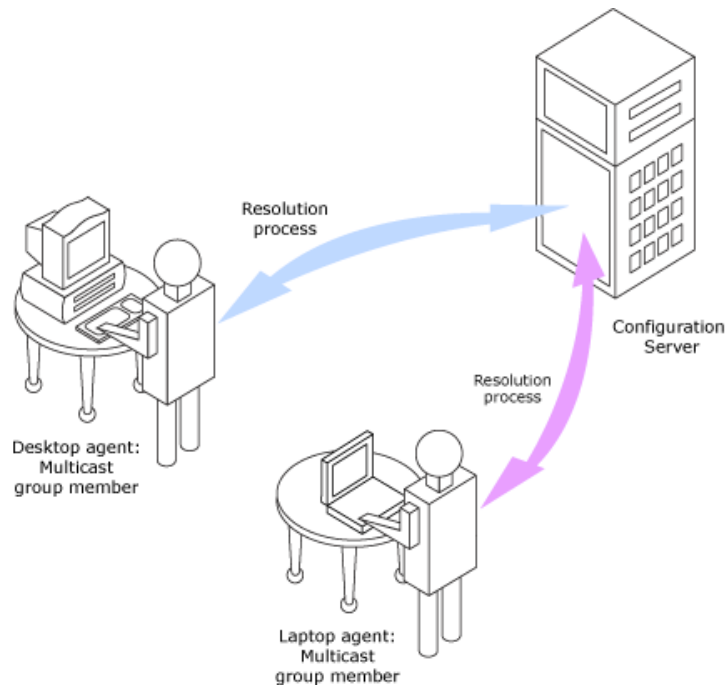
If an HPCA agent is eligible, it then connects to the Multicast Server and exchanges the MULTCAST object, which contains the multicast parameters. If the connection fails in this phase, the HPCA agent will perform normal, point-to-point retrieval (with the Configuration Server, using TCP/IP without multicast) to obtain all resources that are required in order to achieve the desired state.

Thus far, all communications have been performed using HP standard TCP/IP communications.

Figure 5   Configuration Phase (second part)
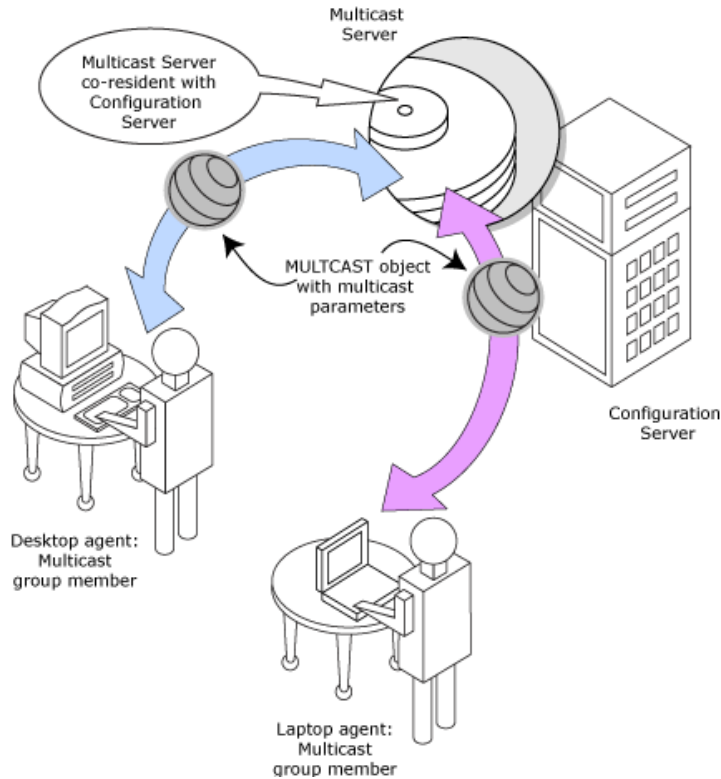
Collection Phase

(HPCA agents –Multicast Server)

In this phase (assuming the criteria to be eligible for multicast distribution, as described in the first phase, have been met), the HPCA agent will send, to the Multicast Server, the MMCLIST object (the list of requested resources that was compiled by the Configuration Server during the configuration phase). The Multicast Server stockpiles all HPCA agent requests and prepares to transmit the files at the scheduled time. The HPCA agent adopts a wait mode in anticipation of the multicast transmission (Figure 6 on page 25).

Figure 6   Collection Phase
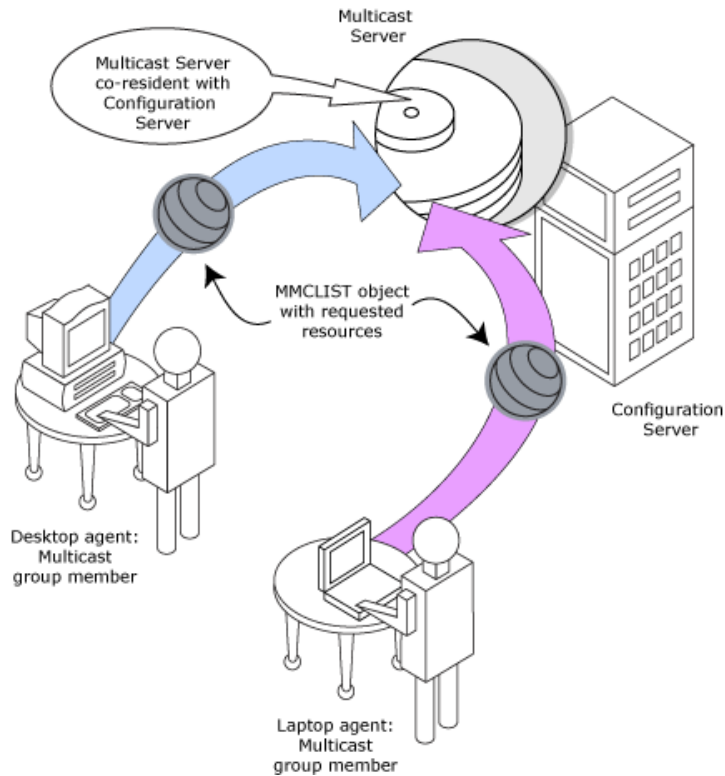
Distribution Phase

(HPCA agents –Multicast Server –Configuration Server)

The third phase is the actual multicast transmission of the files (see Figure 7 on page 26). The Multicast Server retrieves required files from the Configuration Server, and then transmits a single data-stream that contains only the files and components that have been defined by the HPCA agents involved. As files arrive, they are checked (in the MMCLIST object) by the HPCA agent to determine if they are required. If required, they are read from the multicast stream and marked to indicate that they have been received.

Figure 7   Distribution Phase
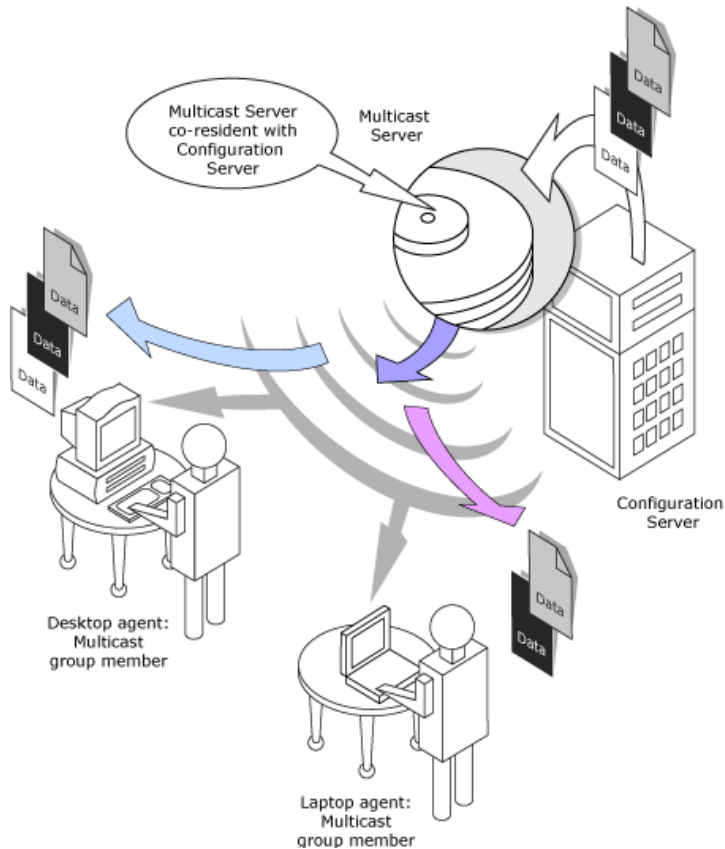
Clean up-and-Reporting Phase

(HPCA agents –Configuration Server)

The final phase of the process runs when all required files have been received
by the HPCA agent, or the distribution time window has expired. At this
time, the HPCA agent checks for the presence of all required resources, and
uses standard HPCA communications techniques to obtain, from the CSDB,
any that are missing. Installation activities are then run for the resources;
the completion status (including error information and multicast file-transfer
statistics) is reported to the CSDB (Figure 8).

Figure 8   Clean up-and-Reporting Phase
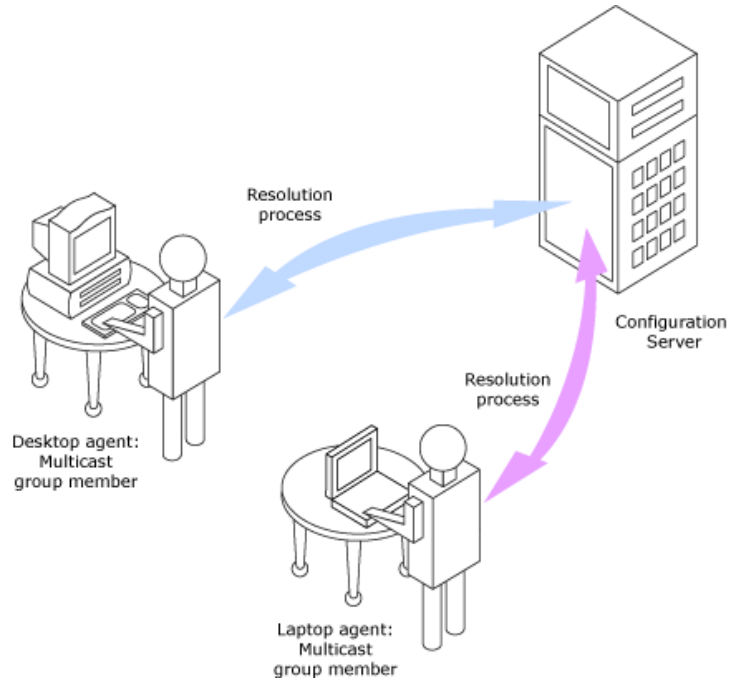
Completion Status Information

Unlike most multicast implementations, which are fundamentally file transfer utilities, the Multicast Server provides full status information on the completion and installation of the distribution for each connecting HPCA agent.

See Appendix B, Multicast Results for Reporting for more information on how multicast session results can be used for auditing and reporting.

3 Installing the HPCA Multicast Server

In this chapter, you will have the opportunity to:

- Gain a better understanding of the Multicast Server's *dependence on the Configuration Server Database* (CSDB).

- Review the contents of the Multicast Server *directories on the release media*.

- Review *pre- and post-installation notes for UNIX* operating systems.

- *Install the Multicast Server*.

- Review information about **mcast**, the Multicast Server *service on Windows platforms*.

> ⚠️ If your environment uses Core and Satellite servers, read the *Core and Satellite Servers Getting Started Guide* as the installation, configuration, and troubleshooting information in that guide may override the information in this guide.

Multicasting Components

The Multicast Server is implemented in the standard HPCA product architecture which contains, at a minimum, a Configuration Server and multiple HPCA agents.

> Configuration Server Database interaction in the multicast process is two-fold—its role in the HPCA agent connect, and as the repository of the database files. There are no Configuration Server changes required in order to enable multicasting.

The Configuration Server Database

The Configuration Server Database (CSDB) is the repository from which the Multicast Server will obtain the files that will be transmitted to the HPCA agents during the multicast.

> Although the Multicast Server does not have to be on a machine that houses a Configuration Server, HP strongly recommends it.

Also, the CSDB contains the information that is needed in order to:

- Determine whether an HPCA agent is eligible for multicast.

- Determine whether a required service is eligible for multicast.

- Assign the HPCA agent to a multicast group.

- Inform the HPCA agent of the files it needs in order to achieve its desired state.

> All installation and testing of HPCA multicasting should be performed on a *copy of the production CSDB*, prior to introducing it to a production environment.

Multicast Server Directories

Table 3 on page 31 lists the directories of the Multicast Server, and the files contained therein.

Table 3   Multicast Server Directories and Contents

Directory	Contents
`multicast_server`	Platform-specific directories that contain the Multicast Server code and execution engine.
`multicast_test_modules`	This directory contains: • the broadcast and multicast receive files (`BRECV.CMD` and `MRECV.CMD`) • the broadcast and multicast receive files (`BSEND.CMD` and `MSEND.CMD`) • the receive executable (`radcrecv.exe`) • the send executable (`radcsend.exe`) • the image-deployment send files (`gdmcsend.exe` and `gdmsend.cmd`) • two application `.dll` files • four test files (TESTDATA000*n*) of varying sizes Note: For information on these test modules, see Appendix C, Network Test Modules on page 69, which describes the test programs for broadcast and multicast file transfers.

Installation

> Before beginning this installation, consult the section Operational Requirements (on page 20).

This section describes the Multicast Server installation. Although this exercise is performed in a Windows environment, the UNIX steps are similar, but with the expected platform differences. Also, there are pre-installation steps for a UNIX environment described in the next section.

UNIX Pre-Installation Notes

- Make sure the user performing the installation has adequate UNIX operating system rights in order to create and update the target installation directory.

- Make sure the user performing the installation has a home directory on the UNIX workstation, and is not logged in as root.

- The logon user ID should be the same user ID as that which was used to install the Configuration Server. (This will ensure that the correct Configuration Server profile is queried in order to locate the CSDB.)

- To start the UNIX installation of the Multicast Server, type **./setup.exe**, on the command line. (Depending on how the UNIX operating system mounts the media, it might require the user to specify the installation program (in uppercase) as **./SETUP.EXE**.)

To install the Multicast Server in a UNIX environment

1   Open a UNIX shell window at the console, or through an X-Windows emulator, logged on as the UNIX user ID who will be running the software.

2   Insert the installation media into the CD/DVD drive.

3   Change the current directory to the directory on the CD/DVD drive that contains the installation program, setup.exe.

4   Press **Enter**.

5   At the prompt, type, **./setup**

6   Press **Enter**.

The installation program will start. Continue with the steps outlined in the next section, HPCA Multicast Server Installation.

1 Insert the installation media into the CD/DVD drive.

2 Navigate through the installation media to

    `Infrastructure\extended_infrastructure\multicast_server\win 32.`

    The contents of the Multicast Server media are displayed.

3 Double-click `setup.exe`.

    The installation program will start. Continue with the steps outlined in the next section, HPCA Multicast Server Installation.

HPCA Multicast Server Installation

The Client Automation Multicast Server Install Welcome window opens.

1 Click **Next**.

    (At any time during the installation, click **Cancel** to exit the installation.)

    The Client Automation Multicast Server Install End User Licensing Agreement window opens.

2 Click **Accept**.

    ▶ If **Accept** is not selected, the Multicast Server installation program will terminate.

    The Client Automation Multicast Server Install Multicast Server Directory window opens.

    This window displays the location of the Multicast Server files.

    — Accept the default directory that is specified in this window. (*Recommended*)

    — Or specify a different location.

3 Click **Next**.

    The Client Automation Multicast Server Install Resource Location window opens.

In this window, select one of the locations in which the Multicast Server files will be stored.

— Select **Client Automation Configuration Server database** or,

— Select **Client Automation Proxy Server static cache**.

> For this exercise, **Client Automation Configuration Server database** was selected.
>
> If **Client Automation Proxy Server static cache** is selected, a similar series of windows will be seen.

4   Click **Next**. The Client Automation Multicast Server Install Configuration Server Database Directory window opens.

This window displays the location of the Configuration Server Database.

— Accept the default directory that is specified in this window. (*Recommended*)

— Or specify a different location.

5   Click **Next**. The Client Automation Multicast Server Install Port window opens.

This window displays the communications port that the Multicast Server will use.

— Accept the default port (**3463**) that is specified in this window. (*Recommended*)

— Or specify a different port for Multicast Server communications.

6   Click **Next**. The Client Automation Multicast Server Install Summary window opens.

This window presents all the information that was specified during the Multicast Server installation. This is the final opportunity to review and modify the specified settings.

— If you discover any errors, or wish to modify any of the entries, click **Back** until you reach the appropriate windows, and make the necessary changes.

The information that was entered in the other windows will not be affected. After making the changes, click **Next** repeatedly, until you arrive back at the Summary window.

7   To continue, click **Install**. When the installation is complete, the Client Automation Multicast Server Install Finish window opens.

8   Click **Finish**. The HPCA Multicast Server has been installed successfully.

In a Windows environment, the Multicast Server should now be present as a Windows service in the **Services** list. It will be listed as **HPCA Multicast Server**.

UNIX Post-Installation Note

Unlike the Windows installation, on UNIX systems the Multicast Server is not automatically started by the installation program. The start and stop shell scripts (`startmcast` and `stopmcast`) are provided in the `media` directory. These scripts can be used as-is, or tailored to the host system.

Windows Services

The Multicast Server is automatically installed as the service **mcast** on Windows platforms. Its startup configuration (**Automatic**, **Manual**, **Disable**) can be specified in the **Startup Type** area on these platforms.

For more information, consult the documentation that is specific to the operating system on which the Multicast Server has been installed.

Chapter 4, Configuring an HPCA Multicast Server Environment, discusses the multicast-specific features of the CSDB and describes the changes that are required using the HP Client Automation Administration Configuration Server Database Editor (Admin CSDB Editor). Chapter 5, Using the Multicast Server, contains an example of how to set up a multicast session on an HPCA agent machine.

4 Configuring an HPCA Multicast Server Environment

In this chapter, you will have the opportunity to:

- Review the required *changes to the MULTCAST Class* of the Configuration Server Database.

- Increase the effectiveness of the Multicast Server by configuring *dynamic windows*.

- Learn how to *customize multicast-specific variables* in the CSDB using the Admin CSDB Editor.

- Learn how to *create multicast instances* in the CSDB and how to associate them with database groups.

- Learn how to *configure Multicast Server* for use with:

  — HP Client Automation Management OS Manager (OS Manager) and

  — HP Client Automation Proxy Server (Proxy Server).

HPCA Multicast Server

The Multicast Server is a processing engine that requires access to the resources in the Configuration Server Database. After the Multicast Server has been installed, it is necessary to make a few modifications to the CSDB.

When the HPCA agent connects to the Multicast Server, it sends up the **MULTCAST** object, from which the Multicast Server obtains control information for the multicast session. The HPCA agent also sends up the list of required files in an object called **MMCLIST**. The Multicast Server collects the file lists in groups based on the multicast address.

The parameters needed for the multicast session are stored in the MULTCAST object (see The MULTCAST Class below) in the CSDB. They are delivered to the HPCA agent during normal resolution, and are stored in the HPCA agent's subdirectory for each service.

HPCA Configuration Server Database Changes

In order for multicasting to execute properly, a few modifications must be made to the CSDB. These changes are described in this section, starting with the **MULTCAST** Class—the database class that controls the multicast session. Following that are the details of variables that deal with:

- multicast eligibility (**MCELIGBL**),
- the delivery and installation of mandatory services (**MCORDER**),
- the delivery of multicast-specific HPCA agent objects (**BYPASCON**), and
- the duration of a multicast session (**MWINDOW**).

The MULTCAST Class

The MULTCAST Class of the POLICY Domain is where an HPCA multicasting session is configured and scheduled. In order to perform these tasks, access the Admin CSDB Editor by clicking **Start**, **Programs**, **HP Client Automation Administrator**, and **Client Automation Administrator CSDB Editor**.

The MULTCAST Class should not be modified during a multicast session.

> Before starting the editing process, do the following.
>
> On the Admin CSDB Editor tool bar, click **View**, **List View**, and select **Details**.
>
> On the Admin CSDB Editor tool bar, click **View**, and select **Options**. Then:
>
> 1 On the **General** tab, select the check box for **Show Class Names Next to Descriptions**.
>
> 2 On the **Instance Options** tab, under **When Displaying Instance Attributes**, **Show Attribute**, select **Both**.

Table 4 contains the instance attributes (with a description and a sample value) of the MULTCAST Class. Configure your environment-specific multicast scenario by specifying these attributes with the appropriate values.

Table 4   MULTCAST Class instance attributes

Attribute	Value	Description
DOMAIN	&(ZOBJDOMN)	Specifies the domain name. Note: Do not change this value.
CLASS	&(ZOBJCLAS)	Specifies the class name. Note: Do not change this value.
INSTANCE	&(ZOBJNAME)	Specifies the instance name. Note: Do not change this value.
MCAST	Y or N	A flag to indicate whether multicast is enabled. The default is **Y**.
MODE	B or M	Broadcast or Multicast. The default is **M**. Notes: If MODE = M, the ADDRESS variable should be specified in the standard Internet dotted-decimal format, and should be between 225.0.0.0 and 239.255.255.255. (Multicast addresses are defined as IP class-D addresses in this range. Avoid using the extreme low end of the range—224.0.0.1 – 224.255.255.255—as most of these are reserved for specific purposes.) The B option is for those network configurations (primarily satellite and single sub-area networks) that do not support IGMP.
MCORDER	B, A, or S	For information about this attribute, see MCORDER on page 45. The default is **S**.

Attribute	Value	Description
ADDRESS	229.0.0.0	Specifies a valid broadcast/multicast address. Also, this attribute can accept up to 19 characters in order to accommodate a range of addresses, which is important to the dynamic multicast feature. For more information, see ADDRESS on page 43.
PORT	9512	Broadcast or Multicast UDP port.
DELAYFP	20	Delay (in milliseconds) after the first packet is sent.
DELAYBP	5	Delay (in milliseconds) between packets. This gives the receiver time to close the current file and open one for the next resource. For information on calculating this value, see Calculate DELAYBP and MWINDOW, on page 75.
RESENDS	1	Number of times a packet will be re-sent. Note: Multicast is designed to re-send all packets if RESENDS > 0. It will send STORE number of packets and then re-send that group for RESENDS times.
STORE	20	Number of packets to buffer for resends. Note: Multicast is designed to re-send all packets if RESENDS > 0. It will send STORE number of packets and then re-send that group for RESENDS times.
CGMTDATE	19991213	The start date of the collection period. The format is **YYYYMMDD**. Also, this attribute is important to the dynamic multicast feature. For more information, see CGMTDATE on page 43.
CGMTTIME	14:00:00	The start time of the collection period. The format is **HH:MM:SS**, expressed in base-24 time. Also, this attribute is important to the dynamic multicast feature. For more information, see CGMTTIME on page 44. Note: This variable is specified in GMT. See the section Time Zone Adjustments on page 61 for important time zone information.
CWINDOW	60	Duration (in minutes) of the collection phase for all HPCA agents to register their list of required files.

Attribute	Value	Description
		This attribute, as it relates to the dynamic multicast feature, is discussed in the section, Multicast Dynamic Windows starting on page 42.
		Note: When specifying the duration of your collection window, be sure it is sufficient to collect all the files in the request list.
MDELAY	1	Delay (in minutes) between the close of the collection window and the start of the multicast.
MWINDOW	60	For information on this attribute, see MWINDOW on page 46.
		Note: For information on calculating this value, see Calculate DELAYBP and MWINDOW on page 75.
TTL	3	Number of router "hops."
BYPASCON	UserJoe	For information on this attribute, see BYPASCON on page 46.
ALTADDRM	208.244.225.46	The IP address of Multicast Server for object exchange.
ALTPORTM	3463	The port of Multicast Server for object exchange.
		Notes: This is the TCP/IP port that the Multicast Server listens on, not the multicast transmission port. The default is **3463**.
		This port was chosen to avoid conflicts with known HPCA ports (such as that of the Configuration Server). Therefore, be prepared to adjust accordingly, as other network software might also conflict.
MINREF	1	The minimum number of HPCA agents that must request a file in order for it to be considered for multicast.
MINSIZE	1024	The minimum size a file must be in order to be considered for multicast.
ALWAYS	SYSTEM. ZMETHOD. MULTICAST	A Configuration Server REXX method.

Example

In the following example, the five primary multicast variables are specified, followed by the result of these specifications.

```
CGMTDATE = 20071016
CGMTTIME = 14:00:00
CWINDOW  = 45
MDELAY   = 2
ALTADDRM = 208.244.225.46
```

Result

With the parameters above specified, a multicast session will be initiated on October 16, 2001 at 2 P.M. Greenwich Mean Time (**GMT**). The collection phase (**CWINDOW**) will last 45 minutes. When the end of the collection window has been reached, the Multicast Server stops the collection process.

There will then be a 2-minute delay (**MDELAY**) before the transmission begins. At the designated multicast start time (*CGMTTIME* + *CWINDOW* + *MDELAY* = **14:47:00 GMT**), the Multicast Server (specified by **ALTADDRM**) starts multicasting the files that are on the list it compiled from the various eligible HPCA agents.

Multicast Dynamic Windows

To further increase the effectiveness of the Multicast Server, it offers the ability to configure dynamic (collection and transmission) windows. This means that for a logical distribution group, multiple multicast distributions can be concurrently active, allowing the delivery of data to members of the group falling into different time windows.

This is accomplished by specifying a range of valid IP addresses in the ADDRESS field and leaving blank either the CGMTDATE or CGMTTIME field.

Assume that:

- Most connections occur in a concentrated time-period (such as morning logons, between 8:00 and 10:00 A.M.) and

- There is a need to optimize the distribution by allocating collection windows for a relatively small duration (such as 30 minutes).

With the dynamic windows feature, the overlap will be avoided because a different address will be used.

ADDRESS

A range of (inclusive) addresses can be specified in order to avoid multiple distributions overlapping on the same multicast address. The range must consist of an IP address, followed by dash, and a valid decimal value for the last octet (as shown in the following example).

> All addresses in the range must be valid within the IGMP class-D IP address range (225.0.0.0 – 239.255.255.255).

```
ADDRESS = 225.0.0.000-034
```

Note that the first three octets (**225.0.0**) are fixed and the range is only in the last octet (**000-034**). The addresses in this range will be used sequentially to accommodate overlapping windows for a group.

The Multicast Server will keep a list of addresses that are currently in use for each MULTCAST instance. When a new multicast session is created, the Multicast Server will look for a valid, available address (within the range specified in ADDRESS), assign it to the new session, and add the address and the associated session to the in-use list. When a session completes its transmission, the address is removed from the in-use list and is available once again. If all of the addresses in the range are in use, the HPCA agent will be informed that no IGMP address is available.

> Although the range is limited to the last octet of the IP address, this should not be a significant limitation because there are 255 possible entries. Even if the collection windows were as small as 15 minutes, for a full 24 hours, only 96 (4 * 24) addresses would be needed. The 255 possible entries allow more than two-and-a-half days of continuous collection windows.

CGMTDATE

If the CGMTDATE field is empty and CGMTTIME has a valid time, a multicast session will be run once a day. Its collection window will start at the same time (as specified by CGMTTIME) each day.

> The duration specified in the CWINDOW field, as well as all other duration-type fields, will be used as described in Table 4 on page 39.

CGMTTIME

Conversely, if the CGMTTIME field is empty and the CGMTDATE field has a valid date, multiple multicast sessions can run throughout the specified date. In this situation, the collection window will begin when the first HPCA agent connects and transmits the MULTCAST object to the Multicast Server. This collection window will remain open for the CWINDOW duration, and multicast-eligible HPCA agents that connect after to this will use this collection window until it closes.

The first HPCA agent to connect after this window closes will cause the Multicast Server to create a new collection window, subject to the availability of a valid IGMP address different from that of the first session. This is determined when a range of addresses is specified in the ADDRESS field.

> This variable is specified in base-24 time, in relation to its offset from GMT. For additional GMT-offset information, see Appendix A, Time Zone Adjustments.

CGMTDATE and CGMTTIME Not Specified

If CGMTDATE and CGMTTIME are blank, the MULTCAST instance can be used continually, over any range of dates and times, subject to the availability of an IGMP address.

Time Zone Offsets

In order for a multicast session to execute when you want, time-zone offsets must be taken into consideration. Since the Multicast Server/Configuration Server and HPCA agent might be in different time zones, all multicast times are specified in GMT. As an administrator, you must determine the GMT offsets of your servers and HPCA agents.

> All HPCA multicast software converts the local system clock to GMT prior to doing any comparisons or calculations.

For an overview of GMT and time zone calculations, see Appendix A, Time Zone Adjustments.

Advanced Multicast Configuration Options

Three multicast-specific variables (MCORDER, MWINDOW, and BYPASCON) are in the MULTCAST Class. A fourth, MCELIGBL, is in the ZSERVICE Class. This section describes these variables, and how they can be customized using the Admin CSDB Editor.

MCELIGBL

In order to participate in a multicast session, services must be individually defined as multicast-eligible. This is done with the MCELIGBL variable, found in PRIMARY.SOFTWARE.ZSERVICE. All services that are instances of the ZSERVICE Class will, by default, be multicast-eligible because the Configuration Server installation sets MCELIGBL=Y.

If a service is not to be distributed via multicast, edit only that service by specifying MCELIGBL=N.

> Do not edit the _BASE_INSTANCE_.

MCORDER

If a service is mandatory but not eligible for multicast, it will be downloaded to and installed on the HPCA agent directly from the CSDB. MCORDER enables an administrator to specify when to download and when to install mandatory services that are not multicast eligible.

Services can be configured as mandatory with the on/off switch, **ZSVCMO**, an instance attribute of all services. For more information on the deployment of mandatory services and ZSVCMO, refer to the *Application Manager and Application Self-service Manager Guide*.

The MCORDER attribute is located in the PRIMARY.POLICY.MULTCAST Class. It has three values, as described in Table 5 below.

Table 5   MCORDER Values

Value	Result
B	Download the service and install it on the HPCA agent BEFORE the multicast session.
A	Download the service and install it on the HPCA agent AFTER

Value	Result
	the multicast session.
S	SPLIT the process so that it downloads the service to the HPCA agent before the multicast, and installs the service after the multicast session. This is the default.

MWINDOW

This variable controls the amount of time (in minutes) for an HPCA agent to run before terminating its multicast "receive" activity. The default is **0**, which allows an HPCA agent to maintain the receive mode for as long as is necessary to receive all the requested data. This will not affect the duration of the multicast session; it will ensure only that the HPCA agent process does not run longer than is necessary to receive the data it requested.

> For more information on calculating a value for MWINDOW, see Appendix D, Implementation and Diagnostics.

BYPASCON

When multicast processing occurs, each HPCA agent connects to the Configuration Server and the Multicast Server. The HPCA agents then send a **control object** and the list of required resource files (a *needs list*) to the Multicast Server.

However, if all the HPCA agents' data payloads are identical, HPCA multicasting can be configured to save on network bandwidth usage by limiting which HPCA agents send which data to the Multicast Server. This is accomplished with the BYPASCON variable (of the PRIMARY.POLICY.MULTCAST Class). BYPASCON has three values.

BYPASCON=
All HPCA agents will exchange a control object and a needs list object with the Multicast Server.

BYPASCON=UserJoe
The HPCA agent with this user ID will send both objects to the Multicast Server, and the other HPCA agents will send only the control object.

BYPASCON=UserJoe 2 (user ID followed by a space and the numeral 2)
The HPCA agent with this user ID will send both objects to the Multicast Server; no other HPCA agents will be part of the object exchange.

> This option requires that the local time on the clock of the machine that houses the Multicast Server be in synchronization with all multicast-eligible HPCA agents.

Burst Mode

> This feature is for multicast software distribution only.
> It is not supported for use with HPCA OS Manager.

The Multicast Server has always supported software downloads. In version 3.1 of Multicast Server, the "guaranteed delivery" option (see Guaranteed Delivery on page 19) was introduced. *Guaranteed delivery* provided higher data-transmission rates and more reliable transmission of large files, but was designed for OS image downloads only—not software downloads.

This version of the Multicast Server includes the **Burst Mode** option which improves the reliability and speed of software downloads.

Using Burst Mode

The Multicast Server has the basic mode of operation of sending one packet of data, then waiting the specified number of milliseconds (the value of *DELAYBP*) before sending the next packet.

> For more information on DELAYBP, see:
>   - DELAYBP in Table 4 on page 39, and
>   - Calculate DELAYBP and MWINDOW starting on page 75.

After every 20 packets (this number is configurable), each packet is re-sent one or more times (the value of *RESENDS* [see RESENDS in Table 4 on page 39]). Although this increases reliability, it does not guarantee that large files will be received.

The **burst mode** feature works differently. Instead of sending 1 packet and delaying for *DELAYBP*, Multicast Server sends multiple packets with no delay and then waits *DELAYBP* before re-sending them. So, the packets are still resent one or more times (the value of *RESENDS*), but in *bursts*, which gives a throughput of *n* multiplied by the basic mode, which is equivalent to **n=1**.

> This version of Multicast Server includes a version of nvdkit that is configured with a lower threshold for the delay—down to at least 2 milliseconds—which provides additional throughput that is independent of and in addition to burst mode.

Parameter Values Selection

Assuming the typical values of **DELAYBP = 10** (ms) and **-burst = 1**, the following changes will affect the throughput as described.

- Setting **DELAYBP = 5** will roughly double the throughput.

- Setting **-burst = 5** will increase throughput by a factor of five.

When used in combination, the improvements in throughput, although not linear, will increase. For example:

- Setting **DELAYBP = 5** and **-burst = 5**, the throughput will increase by a factor of approximately **9**.

  > These figures were obtained on a lightly loaded 1 GBps network. Actual results will vary according to network speed, reliability, and load.

A reasonable maximum value for **-burst** is **10**, and the lowest value for **DELAYBP** would be **2**.

Setting DELAYBP and Burst

1 To open the Admin CSDB Editor click **Start→Programs→HP Client Automation Administrator→Client Automation Administrator CSDB Editor**.

2 In the tree-view, double-click **PRIMARY**, **POLICY**, and **MULTCAST**.

3 Specify a value for the DELAYBP variable in the MULTCAST instance.

    — Save the changes and close the Admin CSDB Editor.

4 Open Windows Explorer and navigate to *SystemDrive*:\Program Files\Hewlett-Packard\CM\MulticastServer\etc.

5 Specify a value for the -burst parameter in the Multicast Server's mcast.cfg file.

    — Save the changes and close Windows Explorer.

6 Stop the Multicast Server.

7 Restart the Multicast Server.

Creating a Multicast Instance

Multicast instances must be created and then connected to users, workgroups, and departments in order for them to be included in a multicast session. This section describes how to create a multicast instance. Associating Groups with a Multicast Instance below describes how to associate workgroup and department instances with a multicast instance.

To create a multicast instance

1   From the **Start** menu, select **Programs→HP Client Automation Administrator→Client Automation Administrator CSDB Editor**.

2   In the tree-view, double-click the following icons to open them:

   PRIMARY, **POLICY**, and **MULTCAST**.

3   Right-click **MULTCAST** and select **New Instance** from the shortcut menu.

   The Create Instance dialog box opens.

4   Type an instance name (for example, **MCAST1**), and click **OK**.

   The MCAST1 Instance is now displayed in the tree view and the list view of the Admin CSDB Editor as an instance of the MULTCAST Class.

5   Double-click **MCAST1** in the list view and verify that it has inherited the attributes of the _BASE_INSTANCE_.

   A multicast instance has been successfully created.

   > To create additional multicast instances, repeat steps 3 and 4.

By creating several instances in the MULTCAST Class (for example MCAST1, MCAST2, etc.), multiple multicast sessions can easily be customized and scheduled for various HPCA agents.

Associating Groups with a Multicast Instance

In order to be included in a multicast session, an HPCA agent must be part of a group (such as a workgroup or a department) that is associated with a multicast instance. After a user is connected to a group, it will automatically be included in any multicast session for which the group is configured. Since, in a typical scenario, there will be more than one HPCA agent, and each HPCA agent will likely be affiliated with more than one group, it is far more efficient to associate a multicast instance with a group.

Typically, users will be assigned to groups based on department or geography. Bandwidth capacity might be another consideration when assigning users and groups. Although an HPCA agent can be associated with several multicast sessions, at any given time, only one session can be active for an HPCA agent.

This section describes how to create this association using the Admin CSDB Editor. For detailed instructions, refer to the *Admin User Guide*.

> Refer to the *Application Manager and Application Self-Service Manager Guide* for comprehensive information on how to include users in workgroups and departments.

To associate a group with a multicast instance

1 Open the Admin CSDB Editor, and navigate to and open PRIMARY.POLICY.WORKGRP.

2 Right-click on the workgroup that you want to associate with multicast, and from the shortcut menu that appears, select **Show Connections**.

3 From the drop-down list in the resulting dialog box, select **POLICY**, and then double-click **MULTCAST**.

   Now, MCAST1 should be in the list view of the Admin CSDB Editor, and the PRIMARY.POLICY.WORKGRP Class should be open in the tree view.

4 Left-click (and hold) the **MCAST1** icon.

5 Drag the **MCAST1** icon (still holding down the left button of the mouse) to the selected instance of PRIMARY.POLICY.WORKGRP.

   As you drag the MCAST1 icon, a circle with a slash will appear. This will change to a paper-clip icon when you place it on the selected instance. This indicates that the connection is allowed.

6 Complete the connection by dropping (releasing the left button of the mouse) the MCAST1 icon on the instance.

   The Select Connection Attribute dialog box opens.

7 Click **Copy** (MCAST1 instance to PRIMARY.POLICY.WORKGRP._BASE_INSTANCE_).

   In the tree view, MCAST1 will be listed under the associated instance, and POLICY.MULTCAST.MCAST1 will be listed as an _ALWAYS_ connection in the list view.

The MCAST1 instance has been successfully connected to the WORKGRP class.

Multicast Server and other HPCA Components

The Multicast Server can be used with HPCA products apart from HPCA agents and the Configuration Server. For more information, see:

- Multicast and the HPCA OS Manager starting below
- Multicast and the HPCA Proxy Server starting on page 53

Multicast and the HPCA OS Manager

> The OS Manager will work with the Multicast Server in a Windows environment only. Therefore, the information in this section is not applicable to other operating-system environments.

The HPCA OS Manager supports guaranteed-delivery multicast so that large numbers of operating system images can be concurrently rolled out.

> This section explains how to configure the Multicast Server for use with the OS Manager.
>
> For information on the OS Manager, refer to the *OS Manager Guide*.

Requirements

In order for the Multicast Server to work with the OS Manager, the requirements that are listed in this section must be met.

- The Multicast Server must be installed on a Windows machine.
- The Multicast Server must be, at a minimum, version 3.1.
- The OS Manager System Agent (OSM System Agent) must be version 2.0 or above (support of a multicast-aware version of ROMA).
- The operating system images will be downloaded only if the **Service Multicast Eligible** option is selected for the operating system service.

  To do this:

a   Open the HP Client Automation Portal (Portal) administrative interface and go to the appropriate operating system service.

b   Click **Modify**.

c   Click **Advanced**.

d   Scroll to near the bottom of the screen and make sure that **Service Multicast Eligible** is selected.

Configuring Multicast for use with the HPCA OS Manager System Agent

The following steps detail how to configure the Multicast Server for use with the OS Manager System Agent.

To configure guaranteed-delivery multicast

1   Go to the appropriate Behavior instance.

2   Click **Advanced** to access the advanced options.

3   Modify the OSM System Agent **Parameters** field as follows:

```
-multicast multicastIPAddress:3463 -mcastretrycount 1
-mcastretrywait 240
```

The following table describes the OSM System Agent parameters.

Table 6   HPCA OSM System Agent parameters described

Parameter	Description
multicastIPAddress	Refers to the Multicast Server host; *host name* can be used also; 3463 is equal to the Multicast Server port.
mcastretrycount	Specifies the number of times that multicast will be retried if there is a failure. The default is **1**.
mcastretrywait	Specifies how long to wait before starting the retry. The default is **240** (seconds; 4 minutes).

4   If necessary, modify the Multicast Server configuration file, mcast.cfg, which is located in *SystemDrive*:\Program Files\Hewlett-Packard\ CM\MulticastServer\etc.

The following table describes the parameters of mcast.cfg.

Table 7   MCAST.cfg parameters described

Parameter	Description
root	The root directory from which the Multicast Server will retrieve resources.
address	A range of IP addresses for use with *dynamic windows*. See Multicast Dynamic Windows on page 42.
minref	The minimum number of HPCA agents that must request a file in order for it to be considered for multicast.
cwindow	The duration (in minutes) of the collection phase during which all HPCA agents must register their list of required files.

5   If changes were made to mcast.cfg, restart the Multicast Server service, **HPCA Multicast Server**, to implement the changes.

Multicast and the HPCA Proxy Server

The Multicast Server's dynamic-windows feature (see Multicast Dynamic Windows on page 42) can be used to pre-load a Proxy Server. For more information, including an example, refer to the *HPCA Proxy Server Guide*.

Preloading a Proxy Server

The Multicast Server can be used to preload the static cache of a Proxy Server.

> *Preloading* is the loading, onto a Proxy Server, of the applications that it is configured to distribute to HPCA agents, before HPCA agents request the application, and in anticipation of such requests.
>
> This practice eliminates the need to involve the Configuration Server.

Proxy Servers that are preloaded are configured in the same way as HPCA agents that receive resources from a Multicast Server.

> Optionally, the Multicast Server dynamic windows feature can be used to preload Proxy Servers (see Multicast Dynamic Windows on page 42).

For additional information on preloading Proxy Servers, refer to the *Proxy Server Guide*.

The following section details how to preload a Proxy Server; it assumes that an administrator has a working knowledge of the Admin CSDB Editor. For additional instructions, refer to the *Admin User Guide*.

To preload a Proxy Server

⚠ HP recommends that administrators become familiar with the operation of the Multicast Server before using it to preload a Proxy Server.

1 For the Proxy Servers that will participate in the preload, use the Admin CSDB Editor to create, in the CSDB, a POLICY.USER instance that matches the user ID that was specified during the Proxy Server installation, or later specified in the -static-user parameter in the `/etc/rps.cfg` file.

   The default user ID is **RPS**. However, it is often set to RPS_*machine_name*.

2 Use the Admin CSDB Editor to create a POLICY.WORKGROUP instance for the Proxy Servers in order to specify their distribution model for the preload of the static cache.

3 Use the Admin CSDB Editor to create a POLICY.MULTCAST instance (for example, MCPRELOAD) that is exclusively for Proxy Server preloads.

4 Edit the MCPRELOAD instance attribute values as follows.

   — ALTADDRM: Specify the IP address of where the Multicast Server is installed.

   — CGMTDATE and CGMTTIME: Specify a multicast session start date and time that will be active when the Proxy Server preload command is executed.

   ▶ The Proxy Server preload command must be issued at the same time as, or shortly after, the multicast collection session starts.

   The following figure illustrates an MCPRELOAD Instance with CGMTDATE and CGMTTIME entries that will initiate a multicast session for the Proxy Server preload on November 4, 2005 at 2 P.M.

Figure 9   Multicast Class MCPRELOAD Instance Attributes

As shown, the collection window will last 45 minutes—as specified by CWINDOW—after which the Multicast Server will stop the collection process.

— There will be a 2-minute delay (MDELAY) before the transmission begins. At the designated multicast start time (CGMTTIME + CWINDOW + MDELAY = 14:47:00 GMT), the Multicast Server will start multicasting the files that were requested by the various HPCA agents.

5   Connect the POLICY.WORKGROUP instance for the Proxy Server Preload Apps to the POLICY.MULTCAST.MCPRELOAD instance.

For details on making this connection, see Associating Groups with a Multicast Instance on page 49.

6   Issue the Proxy Server preload command when the CGMTTIME and CGMTDATE apply.

Preloading an HPCA Proxy Server with Dynamic Windows

The Multicast Server offers the ability to configure dynamic (collection and transmission) windows, as detailed in Multicast Dynamic Windows on page 42. This means that, for a group of Proxy Servers that is being preloaded, multiple multicast distributions can be concurrently active.

The following MULTCAST instance values will initiate a daily (because no value is specified for CGMTDATE) multicast session that will start at 05:01:00 GMT. The multicast session will use up to 22 dynamic windows.

> A Proxy Server preload must also be scheduled for this same time each day in order for it to participate in the multicast session.

```
ADDRESS = 235.0.0.000-021
CGMTDATE =
CGMTTIME = 05:01:00

CWINDOW = 45
MDELAY = 2
ALTADDRM = multicast_server_IP
```

Session Logs for a Preload Using Multicast

On a Proxy Server that receives a preload from a Multicast Server, the preload session logs are found in:

```
<IntegrationServer>\logs\rps.
```

The session logs that trace the activity of the collection, the requests, and the received items in a multicast session are, respectively:

- connect.log

- radreqst.log

- radcrecv.log

> On a Multicast Server-preloaded Proxy Server, connect.log includes the collection information that is found in the radclect.log of an HPCA agent multicast session.

5 Using the HPCA Multicast Server

In this chapter, you will have the opportunity to:

- *Test the Multicast Server* via:
  — An HPCA agent or
  — The HP Client Automation Application Manager (Application Manager).

Testing the HPCA Multicast Server

Now that the HPCA Multicast Server has been installed and configured, it is important to test it before putting it into production to ensure that it will execute as expected. There are three ways to perform a multicast test: one from an HPCA agent perspective, and two from an administrator perspective.

The HPCA agent-based method is not efficient in production because it is specific only for that HPCA agent. However, it is a good test to check the installation and configuration of the Multicast Server. The two remaining methods are more suited to a production environment because they offer the ability to include multiple HPCA agents (as part of a group, as discussed in the previous chapter).

In order to conduct either of these tests, do the following.

- Delete the service that is going to be used for the test from the HPCA agent machine.
- Connect the multicast instance to the HPCA agent via a group.
- Set up a multicast instance with an active collection window.

HPCA Agent vs. Administrator Testing

This section details the testing of Multicast Server from an HPCA agent perspective (starting below) and from an administrator perspective (starting on page 59).

HPCA Agent Testing

To test the operation of the Multicast Server and the associated HPCA agent software

> ▶ Make sure that the service that is being used for the test has been deleted from the Application Manager agent machine on which the test is being conducted.

1 On the HPCA agent machine, open a command window.

2 Change the directory to the database location where the HPCA agent is stored.

3   Type:

```
Radskman.exe mname=serverid,dname=SOFTWARE
,ipaddr=serverid,port=3464,cat=Y
```

where *serverid* is the network name of the Configuration Server.

This method of multicasting files is not suitable in production because these steps would have to be executed on each HPCA agent machine. The methods that are covered in the next section are more appropriate for production because the Configuration Server Database can be accessed and then used to include HPCA agents in a group, which can then be associated with a multicast instance.

This means that at a central location, multiple HPCA agents can be configured for a multicast session. Also, the eligibility of a service (MCELIGBL), the parameters for delivering the service (MCORDER), and the transmission of the request files (BYPASCON) can be determined.

Administrator Testing

This section details testing Multicast Server from an administrator perspective.

Notify and TIMER

In addition to the HPCA agent test presented above, the Application Manager **Notify** and **Scheduler** (**TIMER**) features are convenient ways to transmit data to Application Manager agent computers.

▶   For comprehensive information on these features, refer to the *Application Manager and Application Self-service Manager Guide*.

To determine if the installation (multicast session) was successful, look at connect.log and radrecv.log in the HPCA agent's log directory.

A   Time Zone Adjustments

In order for a multicast session to execute when you want it to, the CGMTTIME Instance of the MULTCAST Class must be correctly configured. Since the Configuration Server uses the operating system's clock, it is important that the CGMTTIME instance be properly set—using Greenwich Mean Time (GMT). Also, **base-24** (a.k.a. military) time must be used when configuring this setting.

> GMT is a constant and does not adjust for Daylight Saving Time (**DST**).

Therefore, a Configuration Server Database in New York, USA, which is 5 hours (300 minutes) behind GMT during local *standard* time, would need the proper number of adjustment minutes added, in order to be synchronized with GMT. For various sample GMT settings, see the examples that follow.

Example A (DST in effect):

To schedule a multicast session to begin collection on Monday, July 09, 2007 at 2:35:15 (P.M.) local time on a Multicast Server in New York, USA, specify:

```
CGMTDATE=20070709
CGMTTIME=18:35:15
```

> The value of the MULTCAST Class instance attribute, CGMTTIME (2:35:15 P.M.), can be calculated as follows:
>
> - Convert the time to base-24 time (2:35:15 becomes 14:35:15).
> - Add to this the difference between EDT and GMT (4 hours).
>
> The result is the GMT time (18:35:15) that must be specified for the CGMTTIME attribute in order to schedule the specified multicast session.

Example B (DST *not* in effect):

To schedule a multicast session to begin collection on Monday, November 09, 2007 at 2:35:15 (P.M.) local time, on a Multicast Server in New York, USA, specify:

```
CGMTDATE=20071109

CGMTTIME=19:35:15
```

> The value of the MULTCAST Class instance attribute, CGMTTIME (2:35:15 P.M.), can be calculated as follows:
>
> - Convert the time to base-24 time (2:35:15 becomes 14:35:15).
> - Add to this the difference between EDT and GMT (5 hours).
>
> The result is the GMT time (19:35:15) that must be specified for the CGMTTIME attribute in order to schedule the specified multicast session.

Time Zone Overview

Figure 10 on page 63 shows a map with a view of the approximate location of GMT, and will help you remember whether to adjust forward or back for various time zones.

Figure 10   Greenwich Mean Time (GMT)

Greenwich Mean Time (GMT)

Time zones WEST of GMT must ADD to their LOCAL TIME

Time zones EAST of GMT must SUBTRACT from their LOCAL TIME
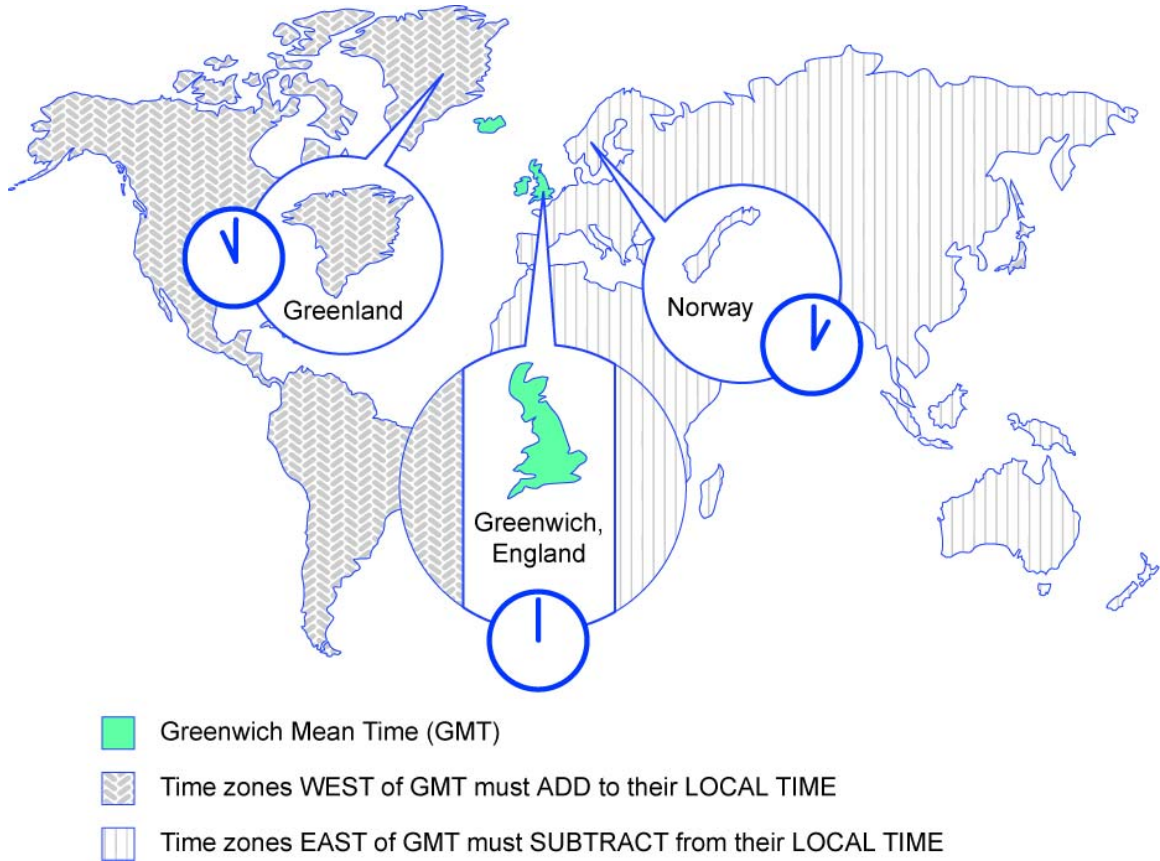
Automatic Adjustments for Daylight Saving Time

If the Configuration Server host machine offers the ability to have its clock automatically adjust for the Daylight Saving Time change, we recommend that this feature be activated.

- On a Windows machine, this is accomplished in the **Control Panel** area.

- On a UNIX machine, this is configured during installation. If you need further information, consult the operating system's documentation.

B Multicast Results for Reporting

At the end of a multicast session, the Multicast Server accumulates session performance statistics and sends them, via HTTP, to the Configuration Server Database. These statistics are sent in a Web-based Enterprise Management (**WbEM**) object, **RMSSTATS**, which contains information such as the:

- Number of files requested
- Number of files rejected
- Number of files and bytes transmitted
- Date and time the transmission started

The full list of session performance statistics is detailed in Table 8 below.

RMSSTATS Object

The RMSSTATS object can be sent to the Configuration Server Database. The database connections can be configured so that the multicast statistics can be examined.

For more information on the RMSSTATS object in the Configuration Server Database , see the section RMSSTATS and the HPCA Configuration Server Database on page 67.

RMSSTATS

Table 8 below contains a list of the variables of the RMSSTATS object.

Table 8   Multicast RMSSTATS object variables

Variable	Value
CLASS	NVD_MulticastStatistics
KEY	ServiceID,SourceType,SourceID
NAMSPACE	NVD

Variable	Value
PROP000	ServiceID:S=*manager.domain.class.instance*
PROP001	Nclients:I=*number of clients connected*
PROP002	Ndevices:I=*number of devices connected*
PROP003	SourceType:S=MCS
PROP004	SourceID:S=*IPaddr:port.MCinstance* • *IPaddr:port* are the address and port that the HPCA agent uses to connect to the Multicast Server. • *MCinstance* (the multicast instance) distinguishes between multiple sessions on the same machine.
PROP005	NfilesReq:I=*number of files requested*
PROP006	NbytesReq:I=*number of bytes requested*
PROP007	NfilesXmt:I=*number of files transmitted*
PROP008	NbytesXmt:I=*number of bytes transmitted*
PROP009	NfilesRej:I=*number of files rejected* Note: The number of files rejected for Nclients < MINREF.
PROP010	NbytesRej:I=*number of bytes rejected* Note: The number of bytes rejected for Nclients < MINREF.
PROP011	StartTime:T=*YYYY-MM-DDThh:mm:ssTZD* Note: The start time of the multicast transmission.
PROP012	Duration:I=*duration of download* (seconds)
STATUS	N/A
TYPE	WbEM
ZOBJDATE	*YYYYMMDD*
ZOBJTIME	*Hh:mm:ss*
ZOBJNAME	*service_name*
ZUSERID	*Hostname*

Multicast Durations

For the Multicast Server, the reported duration of the multicast session might be greater than that of the same session as reported by the HPCA agent. Since the Multicast Server transmits files in the order of *most_files_requested* to *least_files_requested*, an HPCA agent needing only the last file will record a duration that is much longer than the actual file transmission time. It is likely that 90% of the time an HPCA agent will discard packets until its requested files are transmitted. Therefore, multicast durations need to be properly computed before being specified.

RMSSTATS and the HPCA Configuration Server Database

The Configuration Server can be used to view the reporting statistics of a multicast session. In order to use it, an appropriate nvdcast.rc file must be present and configured on the Multicast Server host machine.

> The nvdcast.rc file is for reporting purposes only; it is not required for standard multicast operations.

Multicast statistics can be mined and viewed with the Admin CSDB Editor. To enable this feature, configure the database connections that are shown in the following table.

Table 9   Database Connections for Multicast Statistics

Connect…	To…
PROCESS.RMSSTATS	ZMETHOD.RMSSTATS
PROCESS.CLISTATS	ZMETHOD.CLISTATS

C Network Test Modules

HPCA Multicast Server media contains a `multicast_test_modules` directory. These modules are provided in order to help you tune the multicast and broadcast parameters for a network configuration.

The `multicast_test_modules` directory contains:

- the **broadcast** send and receive files (`BRECV.CMD` and `BSEND.CMD`),
- the **multicast** send and receive files (`MRECV.CMD` and `MSEND.CMD`),
- the receive executable (`radcrecv.exe`),
- the send executable (`radcsend.exe`),
- the image-deployment send files (`gdmcsend.exe` and `gdmsend.cmd`),
- two application `.dll` files, and
- tour test files (`TESTDATA000n`) of varying sizes.

> The parameters that are specified in earlier sections of this document might not be suited to all network configurations. Specify values in accordance with the needs of the environment.

RADCSEND and RADCRECV

Two programs (RADCSEND and RADCRECV) perform broadcast and multicast file transfers, based on command line parameters. On Windows, these can be run from the command line using the `.cmd` files that are provided.

1 Copy the contents of `multicast_test_modules` to a temporary directory on the destination computer.

4 Run `mrecv.cmd`.

5 Copy the contents of `multicast_test_modules` to the source computer.

6 Run `msend.cmd`.

TESTDATA0001 – TESTDATA0003 will be sent to the destination computer via multicast.

RADCRECV will create the log and data files in the current directory.

> If HPCA is not installed, logs are created in the respective, current directories of each program. Otherwise, look for the radcrecv.log in the log subdirectory.
>
> If either IDMSYS or IDMLOG (in win.ini or nvd.ini) is defined, it will make use of directories for the data and log files.

Syntax

The syntax for the RADCSEND and RADCRECV programs is shown below. Following the syntax, Table 10 below defines the parameters.

RADCRECV

```
RADCRECV M|B [address] port buffers timeout (min) [Object with
file names]
```

RADCSEND

```
RADCSEND M|B address port filename file number delay after
first packet delay between packets time-to-live buffers resends
last-file-flag[1] packet data size [n-to-drop[0]]
```

Table 10   Syntax parameters defined

Parameter	Definition
M|B	M = Multicast, B = Broadcast
address	The target network IP address (*xxx.xxx.xxx.xxx*). Note: This parameter must be omitted for RADCRECV in Broadcast mode, and always used for RADCSEND.
port	The IP port that is associated with the (broadcast or multicast) transmission.
filename	The name of the file to be sent.
file number	The relative file number (if more than one file is to be sent, increment this by 1 for each successive file). RADCSEND expects to find these files in the directory from which it is executed.

Parameter	Definition
delay after first packet	The delay (in milliseconds) after the first packet before sending the remaining packet. The delay gives the receiver time to open and compare the file.
delay between packets	The delay (in milliseconds) between data packets (packet size approximately 1 KB).
time-to-live	The IP TTL value (maximum number of routers to traverse).
buffers	The number of packets to buffer when packet-retransmits (resends) are specified.
resends	The number of retransmits for each grouping of *buffers* packets.
last-file-flag	Indicates the last file to be transmitted. This will cause the receiver to terminate execution at the end of this file. The default is **1** (true). Set to zero for all but the last file, if multiple files are sent.
packet size	The maximum number of data bytes transmitted per packet.
n-to-drop	Set this to a non-zero value to simulate packets being dropped by the transmission network. RADCSEND will randomly drop packets so that (100 / *n-to-drop*) percent of the packets will not be sent, and therefore, not received by RADCRECV. This value is optional and the default is **0**.
Object with file names	Multicast only. This value is optional. RADCRECV will store files in IDMDATA as named in this object. If not specified, the received file is stored in the same directory as RADCRECV. The object must have the same format as MMCLIST. RADCRECV also looks in IDMLIB for the object, MULTCAST, which is also optional. To set the parameters log level (default = **40**) and resends (default = **0**), ZTRACEL and RESENDS are set here.
timeout (min)	Maximum time that RADCRECV will accept data before stopping (failsafe mechanism for live run).

> If MULTCAST.ZTRACEL is set to 55 or greater, RADCRECV will log header information for every packet that gets to the GetControlInfo routine. (RADCRECV bypasses packets that are "malformed" or not intended for the multicast/broadcast session it is looking for.)

BROADCAST Tests

The contents of the BSEND.CMD file are:

```
radcsend B 231.1.222.6 9511 TESTDATA000n 1 50 50 2 20 1 1 1020
```

where:

Table 11   RADCSEND Parameters for BROADCAST

B	Indicates Broadcast
231.1.222.6	*address* (specified on the command line)
9511	*port*
TESTDATA000*n*	*filename* (specified on the command line)
1 (2, 3, ...)	*file number*
50	*delay after first packet*
50	*delay between packets*
2	*time-to-live*
20	*buffers*
1	*resends*
1	*last-file-flag*
1020	*packet data size*
	n-to-drop (optional, not used in the above example)

To run, type:

BSEND *dest_IP_address filename*

> The receive program must be started first, in order to receive the file.

The contents of the BRECV.CMD file are:

```
radcrecv B 9511 10 45
```

where:

Table 12   RADCRECV Parameters for BROADCAST

B	Indicates Broadcast
9511	*port*

10	*buffers*
45	*timeout* (minutes)

To run, type:

BRECV

MULTICAST Tests

The contents of the `MSEND.CMD` file are:

```
radcsend M 231.1.222.6 9511 TESTDATA0001 1 50 50 2 20 1 0 1020
radcsend M 231.1.222.6 9511 TESTDATA0002 2 50 50 2 20 1 0 1020
radcsend M 231.1.222.6 9511 TESTDATA0003 3 50 50 2 20 1 1 1020
```

where:

Table 13   RADCSEND Parameters for MULTICAST

M	Indicates Multicast
231.1.222.6	*address* (specified on the command line)
9511	*port*
TESTDATA000*n*	*filename* (specified on the command line)
1 (2, 3, ...)	*file number*
50	*delay after first packet*
50	*delay between packets*
2	*time-to-live*
20	*buffers*
1	*resends*
1	*last-file-flag*
1020	*packet data size*
	n-to-drop (optional, not used in the above example)

To run, type:

MSEND

> The receive program must be started first, in order to receive the file.

The contents of the MRECV.CMD file are:

```
radcrecv M 231.1.222.6 9511 20 45
```

where:

Table 14   RADCRECV Parameters for MULTICAST

M	Indicates Multicast
231.1.222.6	*address*
9511	*port*
20	*buffers*
45	*timeout* (minutes)
	Object with file names (optional, not used in the above example)

To run, type:

MRECV

D Implementation and Diagnostics

This appendix offers information on:

- Implementing the multicast process

    —

    —

    —

- Diagnosing the multicast process to assist in problem resolution

    —

    —

Preliminary Parameter Calculation

Before attempting to run a multicast session, it is necessary to:

1 Calculate the DELAYBP and MWINDOW values.

2 Test the network (using the multicast test modules, RADCSEND and RADCRECV) to ensure that it is properly configured for multicast.

3 Examine the test logs.

Calculate DELAYBP and MWINDOW

DELAYBP

`DELAYBP = (8*P/N)`

- **P** is the *packet size* (typically, **1020** bytes) and

- **N** is the *network bandwidth* (in this example, **16** kilobits/second).

    Therefore, **8** multiplied by **1020** (P) divided by **16384** (16*1024) equals **0.498** seconds, which rounds to **0.5** second.

    So, **DELAYBP = .5 second**.

MWINDOW = *D* *** (***T/P***) * (***R* **+ 1)**

- **D** is the DELAYBP (as computed above),

- **T** is the *total bytes* (to be transmitted),

- **P** is *packet size* (from DELAYBP example), and

- **R** is the *number of resends*.

  Assuming values of: R = **1** and T = **10MB** (10,000,000 bytes), the value of MWINDOW computes as follows: **0.5** (D) multiplied by **10,000,000** divided by **1020** (T/P) multiplied by **2** (R + 1) equals **9803.9215** seconds, which rounds to **9804** seconds.

  So, **MWINDOW = 2 hours, 44 minutes**.

Test the Network

Run the network test modules as discussed in Appendix C, Network Test Modules but substitute the value of DELAYBP with that which pertains to your network.

> Considering the MWINDOW value previously calculated, it is recommended that, if testing on a 16-Kbps network, a smaller test file (such as 10 KB) be used. This should take approximately 10 seconds.

> MWINDOW is only a fail-safe to ensure termination of the receive program (RADCRECV). Use it in production—not for testing, where you are observing the test. Typically, it is used as an estimate of the end of the transmission. In practice, add time for a margin of safety.

Examine the Test Logs

> The following examples contain explanatory comments (italicized test within parentheses) that will not be in the log.

RADCRECV

The `radcrecv.log` is in the same directory as the program. If the HPCA agent is on the same machine, the log is in the `log` subdirectory of the HPCA

agent installation directory, IDMSYS. At the end of the log is the summary information (shown below with irrelevant text removed):

```
08:50:57   Number of times Each Packet is Sent [1] (RESENDS + 1,
no bearing on receiver)
08:50:57   Multicast Packet Inactivity Timeout [5] (minutes)
08:50:57   Multicast IP address [231.1.222.6] mode [M]
08:50:57   Port [9511]
08:50:57   Number of buffers: [20]
08:50:57   MWINDOW value in (sec): [2700]

09:30:20   Packets received: 39216 dropped(est): 0 (The number of
unique packets received, not counting resends. The number dropped is an
estimate, based on the gaps in the packet number sequence.)
09:30:20   Done
```

RADCSEND

The `radcsend.log` (in earlier versions, this was `edmcsend.log`), is always in the program's directory. The log has this information before the start:

(*Test with: 20ms delay, 2 resends, 40 MB file, MWINDOW of 2353 seconds = 39.2 minutes*)

```
EDMCSEND started on [Wed Nov 20 08:44:58 2002]
Mode selected is: [M]
Destination address is: [231.1.222.6]
Destination port is: [9511]
Processing file: [TESTDATA0004]
Relative file number: [1]
Delay after the first packet: [20]
Delay between packets: [20]
Number of packets to re-send: [20]
Number of resends: [2]
Time to live: [3]
Last file flag: [1]
Packet Data Size: [1020]
File Size: [40000000]
```

(*And at the end:*)

```
Total Packets: 117648
Exiting on [Wed Nov 20 09:24:11 2002]: [Done]
```

(*From this, the following can be can computed:*
Effective delay between packets: 2353 seconds divided by 117648 packets = 20 ms/packet(?).
Thruput: 40 MB divided by 2353 sec = 0.017 MB/sec [remember, there were 2 resends])

Pre-Multicast Session Checklist

Prior to starting a multicast session, do the following:

1 Be sure that each SERVICE to be multicast is defined as MANDATORY.

2 Specify MCELIGBL = Y for SERVICES to be multicast.

3 Connect the SERVICE instances and the MULTCAST instance to the USER or WORKGROUP instance.

4 Set the MULTCAST instance parameters, as outlined below:

The most common problems are determining the start time and duration of the Collection window (CGMTTIME and CWINDOW). The Collection window should be long enough to allow HPCA agents to:

— Connect to the Configuration Server to determine the needed resources, and

— Connect to the Multicast Server to exchange the request information.

> Be advised that the internal clocks on the machines (HPCA agents and servers) should be synchronized to within a few minutes of each other, *with respect to GMT*. This means that CGMTTIME should be a few minutes *earlier* than the time that the HPCA agents are expected to connect, and the CWINDOW time should be a few minutes *later* than the time that the last HPCA agent is expected to complete the collection/request phase of multicast.

5 Specify identical values for the parameters DELAYBP and DELAYFP.

> The value of DELAYBP is determined by the calculations shown in Calculate DELAYBP and MWINDOW on page 75 and modified by the results of the tests shown in Examine the Test Logs on page 76.

The value of MWINDOW (calculated in Calculate DELAYBP and MWINDOW on page 75) should be padded 20–50% to allow for unforeseen influences, such as network congestion.

> Remember to base these calculations on the total number of bytes of all the files that are expected to be transmitted.

Multicast Program-Call Schematic

Figure 11 on page 80 illustrates the sequence in which the various programs are called during a multicast session.

The execution flows from *left to right* and *top to bottom*.

Figure 11   Call sequence of the multicast session programs
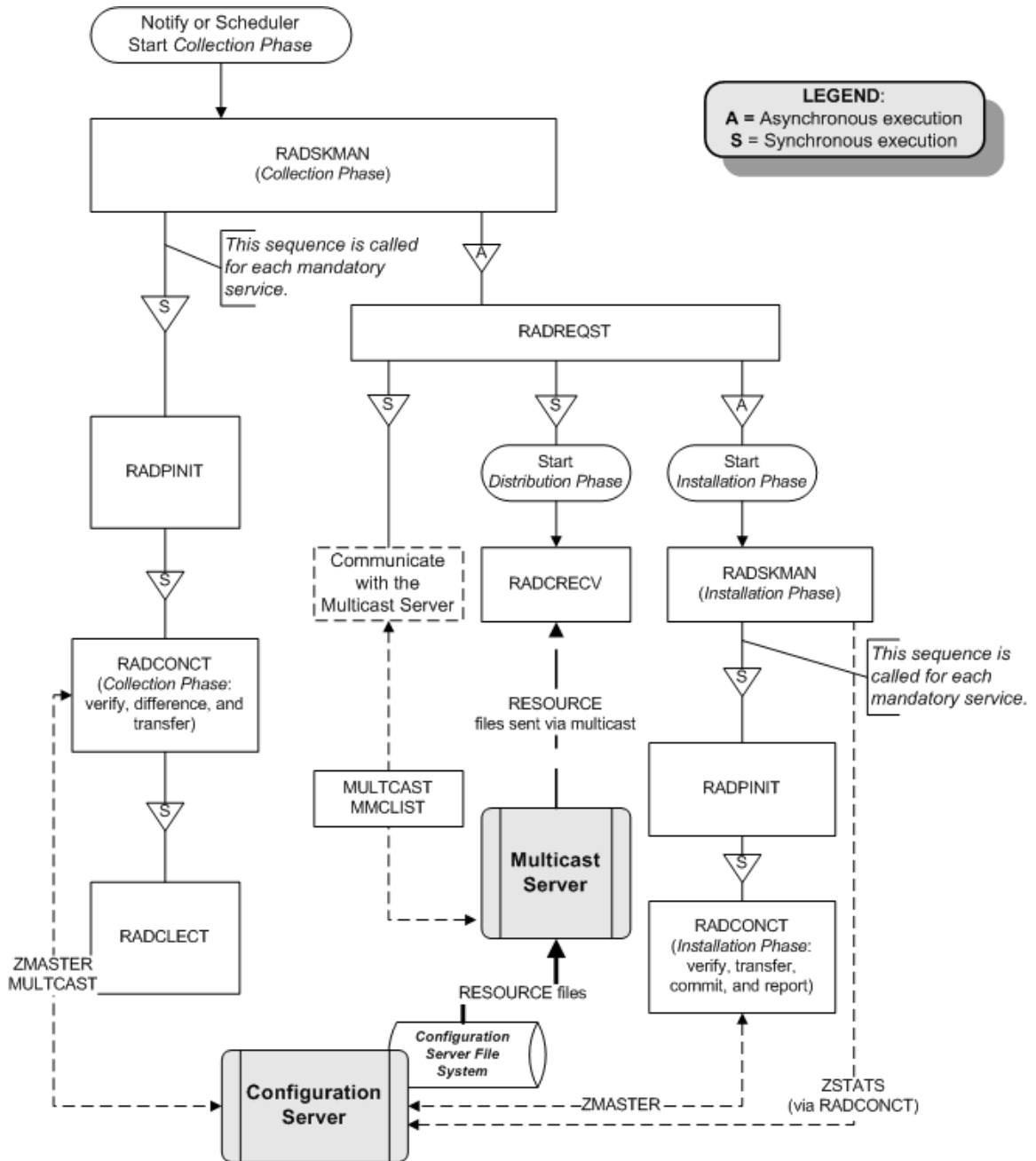
Troubleshooting

Querying the Various Logs

This section provides information on what to look for in the HPCA agent logs (located in IDMSYS\log) when running a multicast session. This process works backwards through the logs in order to determine the point at which a problem occurred.

RADCRECV.log

Does it exist? If NO, check RADREQST.log (see RADREQST.log below).

- If YES, were all files received? If YES, done.
- If NO:
  — Was there a timeout? If YES, increase MWINDOW (or set to 0, don't use).
  — Were too many packets dropped? If YES, increase DELAYBP or RESENDS.
  — Did a file already exist?
  — Does RADCLECT.log show files rejected because of size?
  — Does NVDCAST.log show files rejected because of too few requests?
  — If none of the above, check RADREQST.log.

RADREQST.log

Does it exist? If NO, check RADCLECT.log (see RADCLECT.log on page 82).

- If YES, look at the last line of the log.

  ```
  Sleeping for n seconds – OK; more than 2 minutes before
  multicast.
  ```

  Ending with code:
  — **240** – OK, normal completion of multicast.
  — **241** – Can't open *object_name*.
  — **244** – Outside collection window (check times and time zone in log.).
  — **246** – No MMCLIST object; nothing to process. (See RADCLECT.log.)

— **016** – (Multicast Server error returned; refer to error message text.)

RADCLECT.log

Does it exist? If NO, look at CONNECT.log (see CONNECT.log below).

```
Added heaps: 1 with STATUS = RMS_REQ, 0 with STATUS = REJ_SIZ
– Normal operation.
```

(If no heaps are added, there will be no multicast.)

Note that if some files are not sent by multicast, this program will be called again, but will end with code **241** – "Multicast done."

Ended with code:

```
241 – Multicast NOT enabled – OK
    Multicast done – OK
    APPINFO.MCELIGBL = N, application not eligible for
    multicast. – OK
    Incorrect NVDLIB – Check the directory structure.
    Can't open [object_name]

243 – OK, normal completion of first pass.
```

CONNECT.log

Does it exist? If NO, it has been deleted or the HPCA agent never ran. The normal sequence of events is (look for these lines in the log, in this order):

a   Multicast available; starting Phase 1

b   Adding Branch [MULTCAST] Priority [50]

c   Requesting [n] files via multicast

d   [ZGETAFIL] is launching program [RADCLECT.exe]

e   END RADCLECT.exe ----- rc = [243]

f   Collector loaded MMCLIST with [n] Files [1048576] Bytes

g   RADCONCT exit status [859]

h   RADCONCT [Installation is not complete (phased install process)]

(Steps **c** through **h** will be repeated for each service that requires resources.)

i   Receiver launched [C:\PROGRA~1\Program Files\Hewlett-Packard\CM\RADREQST.exe] rc[0]

j   RADSKMAN Exit code [859]

Wait for multicast to finish, unless some condition causes RADREQST to prematurely terminate.

k CMD LINE = mname=engsvr1,dname=SOFTWARE,ip=engsvr1
   ,port=3464,cat=n,mcast=2
   (*This is the start of the second phase, after multicast has finished.*)

Troubleshooting Tips

This section provides information on how HPCA multicast determines if it is within the collection window, and how to troubleshoot a failed multicast session.

How does HPCA multicast determine if it is within the collection window?

When the HPCA agent exchanges objects with the Configuration Server, a MULTCAST object is returned to the HPCA agent. During the resource determination the HPCA agent puts, into the MULTCAST object, the time that it (the MULTCAST object) was downloaded. The variable is LCLTIME.

When the HPCA agent has collected all the resource requirements, it opens the MULTCAST object again and performs the following sequence:

- Computes the Configuration Server GMT time from ZMGRDATE, ZMGRTIME, and ZMGRTMZN.

- Obtains its LCLTIME and computes the clock difference as *ConfigurationServer_GMT_time* minus *HPCA agent_GMT_time*.

- Computes the current *ConfigurationServer_time* by adding the clock difference to the current *HPCA agent_time* .

- Compares the current *ConfigurationServer_time* with the Collection *start* and *end* times (which are computed using CGMTTIME, CGMTDATE, and CWINDOW).

  — If the current *ConfigurationServer_time* is between the Collection *start* and *end* times, it proceeds to exchange, with the Multicast Server, the MULTCAST and MMCLIST objects.

  — If the current *ConfigurationServer_time* is not between the Collection *start* and *end* times, it immediately starts phase 2.

- If the Multicast Server has an existing, but un-started, session for the MULTCAST instance and IGMP address that were sent by the HPCA agent, the HPCA agent's requests are processed.

- — If the transmission has started, the Multicast Server returns an error, indicating that the collection window is closed.

- — If there is no session for these parameters and the collection window is open, the Multicast Server will create a session.

- The HPCA agent re-computes the clock difference, based on the time returned by the Multicast Server. Two minutes before the scheduled transmission start time, the HPCA agent will awaken and start the receiver.

How can this sequence fail?

- If the Multicast Server is not on the same machine as the Configuration Server, and the clocks are not synchronized, the check done by the HPCA agent against the Configuration Server clock might pass, but the check done by the Multicast Server might not.

- If a MULTCAST object already exists on the HPCA agent (perhaps left over from an aborted connection), the HPCA agent will be using old time stamps. Therefore, when the Multicast Server receives the request from the HPCA agent, the request will not be in the collection window.

- It is possible that the HPCA agent is very near the end of the collection window, and by the time it communicates with the Multicast Server, the collection window will be closed.

- If the HPCA agent has an extensive list of resource requirements, the collection window might close before all of them have been submitted to the Multicast Server.

- — Those that are submitted after the window closes but before the transmission begins will be accepted.

- — Those that are submitted after the transmission begins will be rejected, and the HPCA agent will receive only those that were submitted prior to transmission.

If the multicast process terminates abnormally during testing and the logs have been examined, perform the following steps to ensure a clean restart.

1 Stop the Configuration Server, delete all of its logs, and restart it.

2 Stop the Multicast Server, delete all NVDCAST logs, and restart it.

3 On the HPCA agent: delete all logs, and delete any MULTCAST and MMCLIST objects in the HPCA agent subdirectories.

4 Use HPCA to uninstall the applications that are to be used for testing.

Ensure that all the files are deleted as well.

5   Set up the MULTCAST object with new collection window.

6   Start the HPCA agent process.

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