

**MD0A: WebSphere MQ Graphical Clustering Demo  
User Guide  
Version 1.0**

August 2005

Morag Hughson  
WebSphere MQ Development  
MP211,  
IBM UK Laboratories Ltd.  
Hursley  
Winchester  
Hants, SO21 2JN  
United Kingdom

[hughson@uk.ibm.com](mailto:hughson@uk.ibm.com)

**Take Note!**

Before using this User Guide and the product it supports, be sure to read the general information under "Notices".

**Second Edition, August 2005**

This edition applies to Version 1.0 of *WebSphere MQ Graphical Clustering Demo* and to all subsequent releases and modifications until otherwise indicated in new editions.

**(c) Copyright International Business Machines Corporation 2005.** All rights reserved.

Note to U.S. Government Users - Documentation related to restricted rights - Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corporation.

---

## Notices

The following paragraph does not apply in any country where such provisions are inconsistent with local law.

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 MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore this statement may not apply to you.

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates.

Any reference to an IBM licensed program or other IBM product in this publication is not intended to state or imply that only IBM's program or other product may be used. Any functionally equivalent program that does not infringe any of the intellectual property rights may be used instead of the IBM product. Evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, is the user's responsibility.

IBM may have patents or pending patent applications covering subject matter 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 the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, New York 10594, USA.

The information contained in this document has not be submitted to any formal IBM test and is distributed AS IS. The use of the information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item has been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

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

WebSphere MQ  
IBM  
OS/390

The following terms are trademarks of other Microsoft Corporation in the United States and/or other countries:

Windows NT  
Windows 2000

## Contents

<b>Notices</b> .....	ii
<b>Preface</b> .....	iv
<b>Changes in this release</b> .....	v
<b>Chapter 1. WebSphere MQ Graphical Clustering Demo</b> .....	1
<b>Overview</b> .....	1
<b>Installation</b> .....	1
<b>Quick Beginnings</b> .....	1
<b>Chapter 2. Running the Clustering Demo</b> .....	2
<b>The Provided Scripts</b> .....	2
<b>CRTDEMO Command Script</b> .....	2
<b>RUNDEMO Command Script</b> .....	2
<b>ENDDEMO Command Script</b> .....	2
<b>DLTDEMO Command Script</b> .....	3
<b>Other Command Scripts</b> .....	3
<b>The Graphical Display</b> .....	3
<b>Chapter 3. Demonstrating WebSphere MQ Queue Manager Clustering</b> .....	4
<b>Basic Clustering Features</b> .....	4
<b>Adding a New Server Queue Manager</b> .....	4
<b>Removing a Server Queue Manager from the Cluster</b> .....	4
<b>Using Different Bind Options</b> .....	5
<b>Advanced Workload Balancing Features</b> .....	5
<b>Use Local Queue equally in workload balancing</b> .....	5
<b>Using the Rank parameters on Channels and Queues</b> .....	5
<b>Using the Priority parameters on Channels and Queues</b> .....	6
<b>Using the Most Recently Used Destinations</b> .....	6
<b>Using the Channel Weight parameter</b> .....	6
<b>Chapter 4. Changing the Options</b> .....	7
<b>Preferences Dialog</b> .....	7
<b>Connect Options</b> .....	7
<b>Queue Options</b> .....	7
<b>Display Options</b> .....	8
<b>Message Options</b> .....	8
<b>Menu Options</b> .....	8
<b>File Menu</b> .....	8
<b>Action Menu</b> .....	8
<b>Display Menu</b> .....	9
<b>Chapter 5. Use within an Existing Cluster</b> .....	10
<b>Chapter 6. The Server Application</b> .....	11
<b>Chapter 7. Problem determination</b> .....	12
<b>No Servers appear</b> .....	12
<b>Client cannot ‘see’ clustered queues</b> .....	12
<b>Client cannot open reply queue</b> .....	12

---

## **Preface**

The original version of the clustering demo I wrote (Support Pac MD15) ran only on an OS/390 machine and made use of GDDM to provide it's graphical output. It was shown at several conferences running over a phone line on a system half way across the world. This was simply too nerve wracking a process to continue and I was persuaded to write a version that could be run on a Windows machine locally without any need for a telephone line.

My thanks go to Daniel Millwood and Paul Clarke for giving presentations that included this demo and providing the scripts that are now part of the Support Pac. My thanks go to Ian Vanstone for creating the demos that show the WebSphere MQ V6.0 features.

---

## Changes in this release

There are no changes to the *WebSphere MQ Graphical Clustering Demo* program. This document has been updated to show how you can use it demonstrate the new workload balancing features introduced in WebSphere MQ V6.0. There are examples for each of the new features.

The following files have been updated or created

- **SERVER1.mqs**  
This MQSC script now also defines REPLYQ on this queue manager for use in the “*Advanced Workload Balancing Features*” on page 5.
- **USEQUEUE.cmd**  
This command file has been created to set the CLWLUSEQ value for one example and to reset all other values back to their default values.
- **CHLRANK.cmd**  
This command file has been created to change the CLWLRANK channel parameters for one example.
- **QRANK.cmd**  
This command file has been created to change the CLWLRANK queue parameters for one example.
- **PRIORITY.cmd**  
This command file has been created to change the CLWLPRTY channel and queue parameters for one example.
- **WEIGHT.cmd**  
This command file has been created to change the CLWLWGHT channel parameters for one example.

---

## Chapter 1. WebSphere MQ Graphical Clustering Demo

This document describes the functions available in the SupportPac.

---

### Overview

The Graphical display allows the main features of WebSphere MQ Queue Manager Clustering to be demonstrated. Different options can be chosen from the Preferences dialog to illustrate the differences in behaviour when using those options.

---

### Installation

This SupportPac provides a GUI, some command scripts and MQSC scripts to allow you to set up the clustering demo right from the beginning. In addition to what is provided in this Support Pac you will also need a copy of the Q program (Support Pac MA01). This is available at :-

<http://www-1.ibm.com/support/docview.wss?rs=171&uid=swg24000647>

Create a directory, say MQCLUS, and copy the following files into it :-

- MQCLUS.EXE
- MQCLUS.CFG
- CRTDEMO.cmd
- RUNDEMO.cmd
- ENDDemo.cmd
- DLTDEMO.cmd
- CLIENT1.mqs
- SERVER1.mqs to SERVER4.mqs
- USEQUEUE.cmd
- CHLRANK.cmd
- QRANK.cmd
- PRIORITY.cmd
- WEIGHT.cmd

Note that the directory where you place the .EXE program is the default location where the program will store its configuration file MQCLUS.CFG. You generally need not worry about this file but you should be aware that it is written and therefore the program needs write access to the directory.

Once the program is in the path you can get going very quickly using the provided scripts. The program will dynamically load either the WebSphere MQ client or WebSphere MQ Queue Manager libraries as required. Note that to successfully connect to a Queue Manager at least one of these WebSphere MQ products must be installed. The Windows WebSphere MQ client is available for free download at :-

<http://www-306.ibm.com/software/integration/support/supportpacs/>

---

### Quick Beginnings

To run the demo using the provided scripts (which are explained in more detail in “*The Provided Scripts*” on page 2) follow these steps.

1. Run the CRTDEMO command script to create the queue managers and all the definitions needed.
2. Ensure the installation directory of MA01 is in your path, and run the RUNDEMO command script.
3. Start the GUI by typing MQCLUS, and click the icon next to ‘*Client App*’ on the left pane. The provided MQCLUS.CFG file matches the names used in the scripts.

---

## Chapter 2. Running the Clustering Demo

This chapter describes the scripts required to set up the a clustering demo from scratch. The scripts provided with the SupportPac will create the queue managers and all the definitions required to run the demo. Some suggestions are provided of tasks that could be performed to demonstrate some of the features of WebSphere MQ Queue Manager Clustering that can be shown using the *WebSphere MQ Graphical Clustering Demo*.

---

### The Provided Scripts

There are several scripts provided with this SupportPac. Each one is briefly described below. They are designed so that once the demo is created with CRTDEMO, it can be run and ended repeatedly using RUNDEMO and ENDDemo, and then deleted when no longer required using DLTDemo.

#### CRTDEMO Command Script

This script creates all the queue managers used for this demonstration. It creates four server queue managers, named SERVER1 to SERVER4 and a client queue manager called CLIENT1. These five queue managers are then started, their listeners are also started and the definitions needed are created from five MQSC scripts.

**Note:** The listeners are started as part of the CRTDEMO command script so that the cluster definitions can be successfully propagated around the cluster as they are created rather than waiting until the RUNDEMO command script is used.

- SERVER1.mqs
- SERVER2.mqs
- SERVER3.mqs
- SERVER4.mqs
- CLIENT1.mqs

These scripts are MQSC and therefore can be used on any WebSphere MQ platform, even though the CRTDEMO script does not apply to all platforms.

#### RUNDEMO Command Script

This script starts all the queue managers (although they may be already running if you have just run the CRTDEMO command script). It then starts all the listeners for the queue managers (although these may also be already running if you have just run CRTDEMO - this is not a problem, the subsequent listeners will not be able to bind to the port since it will be already in used, and they will simply end). Finally it starts the server applications which will echo the message back to the client. This script assumes that you are using the MA01 SupportPac, the 'Q' program, as your server application, and that it is in your path so no fully qualified path is specified in this script. For details about the server application and replacing the use of 'Q' see "*The Server Application*" on page 11.

#### ENDDemo Command Script

This script ends all the queue managers and all the listeners. The server applications should all end at this time because the queue managers have been ended.



## DLTDEMO Command Script

This script ends all the queue managers and all the listeners and then deletes all the queue managers.

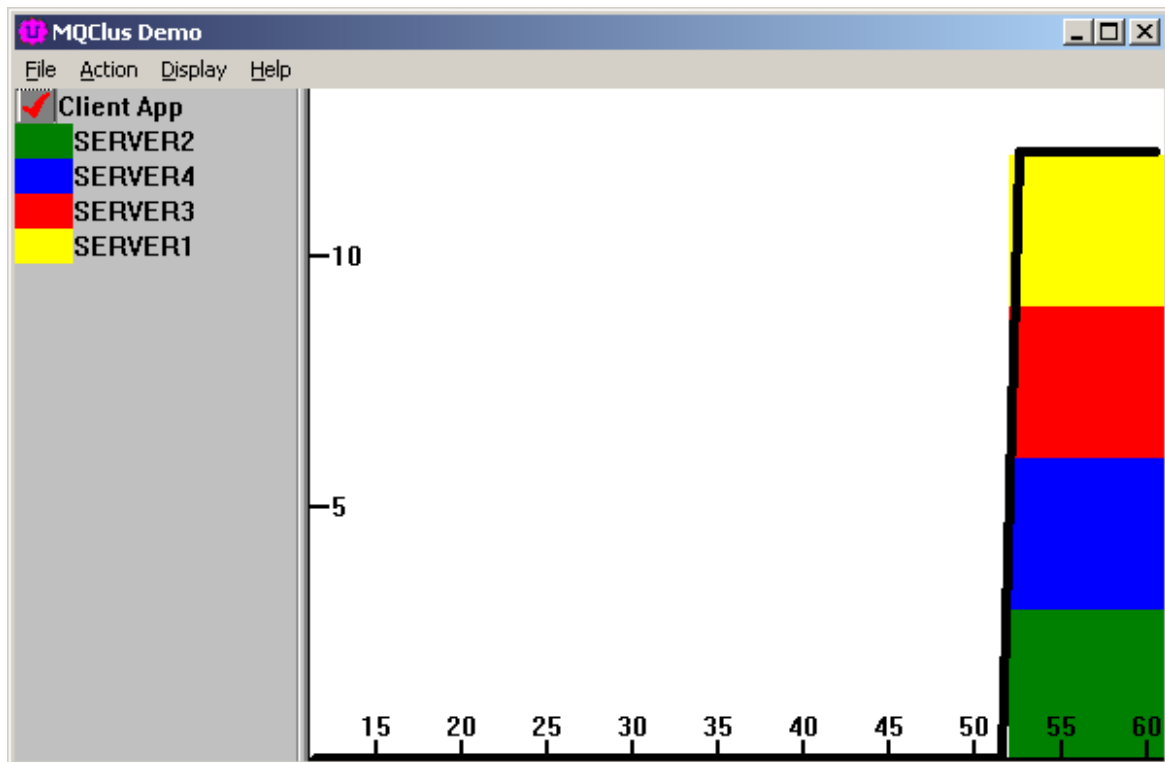
**Note:** If the level of WebSphere MQ you are using does not support the `-w` flag on `endmqsr`, you should remove it from the `ENDDEMO` and `DLTDEMO` scripts.

## Other Command Scripts

The remaining command scripts are used in the examples found in “*Advanced Workload Balancing Features*” on page 5.

## The Graphical Display

To run the graphical display, type `MQCLUS` on the command line. The Graphical display window is split into two panes.



The left pane contains a key showing whether the client thread is running and which queue manager is represented by each colour. When the application is first started there will be no queue managers listed. As the demo runs, the queue managers will be added to the key.

The right pane contains the graphical display showing how many messages have been put by the client thread (controlled through the GUI) as a thick black line; and also showing how many messages each server queue manager has processed, as a coloured bar. This graphical display can either be shown as a set of single graphs or as a single large graph.

---

## Chapter 3. Demonstrating WebSphere MQ Queue Manager Clustering

Here are some suggestions of tasks that could be performed to demonstrate the features of WebSphere MQ Queue Manager Clustering, in addition to the round robin workload balancing that is immediately shown when the demo is started using the provided scripts.

---

### Basic Clustering Features

We will start with some basic clustering features and then move onto more advanced workload balancing features later in the chapter.

### Adding a New Server Queue Manager

Before starting the demo, remove a cluster queue from one of the servers. This can either be done by deleting the queue altogether or by altering it so that it is not in the cluster, for example,

```
ALTER QL(DEMOQ) CLUSTER('')
```

Altering it, rather than deleting it is easier because it allows the server application to continue to run and saves you having to restart it once the queue has been defined.

Once the demo is running you can show how WebSphere MQ Queue Manager Clustering can automatically discover new instances of clustered queues by altering it so that it is back in the cluster, for example,

```
ALTER QL(DEMOQ) CLUSTER(CLUDEMO)
```

This will show the work from the client being spread equally across the set of queue manager which now includes the newly discovered one.

### Removing a Server Queue Manager from the Cluster

There are several things that can be illustrated here. A clustered queue can be altered out of the cluster as shown above and it will no longer be used. The whole queue manager, rather than just one queue, can be suspended from the cluster using the following command,

```
SUSPEND QMGR CLUSTER(CLUDEMO)
```

or the queue manager can be ended, normally or forcefully, by the appropriate mechanism for the platform it is running on.

All these different tasks will show the work from the client being spread equally across the set of queue managers which now no longer includes the server queue manager that has been removed in some way.

## Using Different Bind Options

Changing the Bind options that are used by the client application (see “*Queue Options*” on page 7 for details of how to change the bind options) will show a different display on the GUI. Instead of each set of messages (shown by a vertical column on the GUI) being spread equally between all the server queue managers, each set is now sent entirely to one queue manager, and the next set of messages are sent to a different queue manager.

---

## Advanced Workload Balancing Features

The following examples demonstrate the advanced workload balancing features introduced in WebSphere MQ V6.0. Ensure you are running your queue managers at this level in order to try these out. These setups only use the four SERVER queue managers (in other words queue manager CLIENT1 is not used in these examples).

Change the properties so that you are connecting to SERVER1 queue manager instead of CLIENT1 queue manager (see “*Preferences Dialog*” on page 7 for more details of how to do this).

### Use Local Queue equally in workload balancing

Starting with a setup where each of the four SERVER queue managers host the clustered queue DEMOQ and all the values defined are set to the defaults, you will see that the client application connecting to SERVER1 puts all the messages to the SERVER1 instance of the queue. Now we will change the following setting which tells the queue manager that the client is connected to that the local instance should be used equally with the remote instances instead of being used in preference to the remote instances. Issue the following command on SERVER1 (or run the script USEQUEUE.cmd).

```
ALTER QMGR CLWLUSEQ (ANY)
```

You can also experiment by changing the value of CLWLUSEQ at the queue level instead of the queue manager.

### Using the Rank parameters on Channels and Queues

Run the script USEQUEUE.cmd so that you start off with a setup where all the parameters are at the default values with the exception of CLWLUSEQ which is set to ANY. Set some of your channels to have different rank values (or run the script CHLRANK.cmd).

```
ALTER CHL (TO.SERVER2) CHLTYPE (CLUSRCVR) CLWLRANK (7)
```

The script leaves channels TO.SERVER2 and TO.SERVER3 with the highest rank, and you will see the messages will be put only to these two queue manager.

Now set some of the queues CLWLRANK parameters (or run the script QRANK.cmd).

```
ALTER QL (DEMOQ) CLWLRANK (6)
```

The script gives different values to the queues hosted on SERVER2 and SERVER3, which had the highest equal channel ranks. This helps to show the interaction between channel and queue ranks. The channels ranks are used first and then the queue ranks are chosen from the servers with the highest ranked channels.

### Using the Priority parameters on Channels and Queues

Run the script USEQUEUE.cmd so that you start off with a setup where all the parameters are at the default values with the exception of CLWLUSEQ which is set to ANY. Set some of your channels and queues to have different priority values (or run the script PRIORITY.cmd).

```
ALTER CHL(TO.SERVER2) CHLTYPE(CLUSRCVR) CLWLPRTY(7)
```

```
ALTER QL(DEMOQ) CLWLPRTY(1)
```

The script leaves channels TO.SERVER2 and TO.SERVER3 with the highest priority, and gives different values to the queues hosted on these two servers. This helps to show the interaction between channel and queue priorities. The channels priorities are used first and then the queue priorities are chosen from the servers with the highest priority channels. This works just like rank so long as all your channels are RUNNING.

Now try stopping one of the highest priority channels to see where the messages now go. This helps to illustrate the difference between rank and priority. Channel status is taken into account when choosing the channel to use when using priority, but this is not the case for rank.

### Using the Most Recently Used Destinations

Run the script USEQUEUE.cmd so that you start off with a setup where all the parameters are at the default values with the exception of CLWLUSEQ which is set to ANY. Change the CLWLMRUC parameter on the queue manager your client application is connected to, SERVER1 (or run the script MRU.cmd).

```
ALTER QMGR CLWLMRUC(2)
```

You will now see that the messages are being distributed to only two of the servers.

### Using the Channel Weight parameter

Run the script USEQUEUE.cmd so that you start off with a setup where all the parameters are at the default values with the exception of CLWLUSEQ which is set to ANY. Set some of your channels to have different rank values (or run the script WEIGHT.cmd).

```
ALTER CHL(TO.SERVER1) CHLTYPE(CLUSRCVR) CLWLWGHT(20)
```

You will now see that the messages are being distributed according to the weights that you have set.

## Chapter 4. Changing the Options

This chapter describes the Preferences dialog and the various menu options and what each of them are for.

### Preferences Dialog

The preferences dialog is selected from the file menu or by pressing <Ctrl>-<P>. The options you choose will be saved in the MQCLUS.CFG file. Changing any of the preferences will result in the Client Application being stopped. You should restart it by clicking on icon next to 'Client App' on the left pane of the main window, or through the "Action Menu" (see page 8).

The screenshot shows the 'Preferences' dialog box with the following settings:

- Connect Options:** Queue Manager Name: NT1MAH; Bindings: Queue Manager (selected); Channel Name: (empty); Hostname: (empty).
- Queue Options:** Clustered Queue Name: Q2; Bind Option: Bind Not Fixed (selected); Local Reply Queue: REPLY.Q2.
- Display Options:** User Defined Message Rate: 12; Time Interval (ms): 1000; Show Axis: X and Y (both checked).
- Message Options:** Persistence: Non-Persistent; Syncpoint: Syncpoint if Persistent; Message Size: 100.

### Connect Options

The graphical interface also drives the client thread, that is the application that is putting messages destined to go to cluster queues. This is the queue manager that you connect to and therefore it is this name that goes in the 'Queue Manager Name' field. You can either connect to this queue manager locally, by selecting 'Queue Manager' bindings, or via a client-connection channel by selecting 'Client' bindings. If you choose to connect as a client then you must also fill in the channel name and the TCP/IP host name to use.

### Queue Options

The client thread that is driven by the graphical interface puts messages to a cluster queue. The name of this cluster queue is provided in the 'Clustered Queue Name' field. The bind option allows you choose that either

- all messages between MQOPEN and MQCLOSE go to the same instance of this clustered queue. An MQOPEN is done every time interval (as specified in the Display Options).
- messages can be round robined between all available instances of the clustered queue.

In order for the graphical interface to count the number of messages processed by each queue manager in the cluster that, the replies need to be sent back to the client again. An application processing the messages on the server queue managers, such as the Q program MA01, should simply send the message back to the specified ReplyToQ and ReplyToQMGr. The reply-to queue placed in the message for this purpose is that which is provided in *'Local Reply Queue'*.

## Display Options

The number of messages put to the clustered queues by the client thread can be controlled by choosing one of the different pre-set rates. There is also a User rate to choose and it's value is the number set in *'User Defined Message Rate'* on this dialog. The number of messages chosen will be MQPUT every *'Time Interval'*. The value specified here is in milliseconds. You can choose whether or not to display the axes on the main window by selecting or deselecting the check boxes here.

## Message Options

You can also choose different options to describe the messages put by the client thread. The *'Persistence'* of the message. Whether or not to use *'Syncpoint'*, this can set to a specific value or chosen dependant on the persistence being used by choosing the *'Syncpoint if Persistent'* option. Also the *'Message Size'* can be set.

## Menu Options

### File Menu

The Preferences Dialog (see *Preferences Dialog'* on page 7) can be selected from the File Menu; also, the application can be exited.

### Action Menu

The data being shown can be cleared using the Clear Data option.




The message rate is the number of messages that are put by the client thread within the *'Time Interval'* specified (see *'Display Options'* on page 8 for details of how to set this interval). The message rate can be changed to one of the pre-set message rates, or the user message rate can be selected (see *'Display Options'* on page 8 for details of how to set the user message rate).

### Message Rates

Low Message Rate	1
Medium Message Rate	12
High Message Rate	48

The client thread can be started and stopped from this menu. The status of the client thread is shown in the left hand pane of the main window. Clicking on the icon will also start the client thread if it is not running, and stop it if it is running.

### Client Thread Icon

Client thread not running	
Client thread running	
Client thread stopping	

## **Display Menu**

There are two choices of display for the data on the right hand pane of the main window, single or multiple graphs. These displays can be chosen from the display menu.

### ***Single Graph Display***

The single graph display shows each server queue manager in a separate window. The client numbers (shown as a thick black line) are shown in separate window as well.

### ***Multiple Graph Display***

The multiple graph display shows all the server queue manager numbers in the same graph as a stacked bar graph. The client numbers (shown as a thick black line) are shown in the same graph as these numbers.

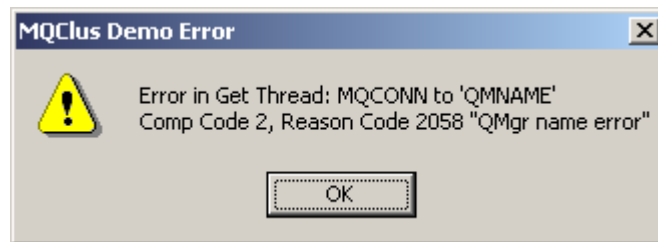
---

## Chapter 5. Use within an Existing Cluster

The *WebSphere MQ Graphical Clustering Demo* can also be used with an existing set of cluster definitions, instead of using the provided scripts.

None of the queue managers are required to run on the same platform as the GUI. The GUI must run on a Windows platform, but can connect to a queue manager which will have the client, or putting, role, as a client connection rather than as a local queue manager binding. See “*Connect Options*” on page 7 for details of how to change the type of connection to this queue manager.

If you are using your own definitions instead of the scripts, you will most likely get an error when the GUI first starts up which looks something like this:-



This is simply indicating that the values set in the MQCLUS.CFG don't match those that you have defined. Open up the Preferences dialog and set the correct values for the clustered queue and the local reply queue.

You will still need to have a server program sending the messages placed on the clustered queues, back to the client queue manager's reply queue. You can use MA01 or any other server program which provides the expected behaviour (see “*The Server Application*” on page 11 for details).



---

## Chapter 6. The Server Application

This chapter details what is required of a server application to interact correctly with the *WebSphere MQ Graphical Clustering Demo*. If you do not wish to use MA01, or it is not available on the platform your queue managers are running on, then you may wish to write your own server application instead.

The client thread, running in the GUI, expects the messages to be returned to its Reply-To-Queue, as specified in the message descriptor fields, *ReplyToQueue* and *ReplyToQMgr*.

It expects the message to be returned with the user data unchanged and with the serving queue manager name filled into the *ReplyToQMgr* field.

---

## Chapter 7. Problem determination

This chapter tries to cover any of the main problems you might see when trying to set up the *WebSphere MQ Graphical Clustering Demo*.

---

### No Servers appear

If your client application is running (shown by a tick on the left hand pane next to the text '*Client App*' but no servers are added to the key (coloured stripe with queue manager name on the left hand pane), this shows that no responses have come back to the client queue manager. Check the following:-

- Is there a server application, e.g. MA01, processing each of the clustered queues?
- Is the server application putting responses back to the reply queue?
- Are the channels from the client queue manager to the server queue managers up and running?
- Are the channels back from the server queue managers up and running?
- If you are using a server application that is not MA01, is it following the expected behaviour detailed in "*The Server Application*" on page 11.

---

### Client cannot 'see' clustered queues

If the *WebSphere MQ Graphical Clustering Demo* reports a 2085, "Unknown object name" from the Put Thread, check that it has connected to the repository manager at all. If this is the first time it has been run, it may not have yet connected successfully, for example, the listeners were not up and running and the channel is in retry. If it reports a 2189, "Cluster resolution error" there may be no queues of that name, or the responses may not be able to come back from the Repository manager. Check the following:-

- Is the channel from the client queue manager to the repository queue manager up and running?
- Is the channel back from the repository queue manager up and running?
- Have you specified the correct queue name in the preferences dialog?

---

### Client cannot open reply queue

If the *WebSphere MQ Graphical Clustering Demo* reports a 2085, "Unknown object name" from the Get Thread, it cannot find the reply queue. Check the following:-

- Have you specified the correct queue name in the preferences dialog?
- Have you defined the reply queue on the queue manager that is connected to by the GUI?