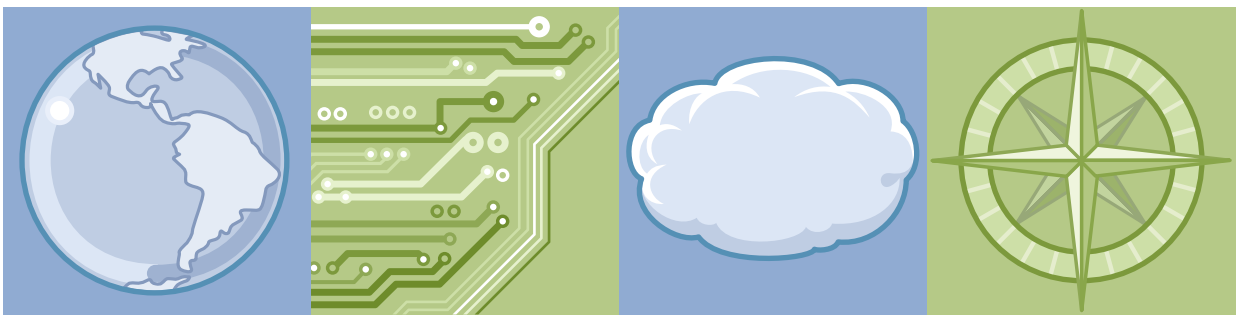
IBM Training

Student Exercises

IBM MQ V8 System Administration for z/OS

Course code WM302 ERC 1.1



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Exercises description

Important

To log on to the lab virtual machine image, use ID `Administrator` and password `web1sphere` and then follow the instructions.

Refer to the readme.txt on the lab image desktop for possible additional information.

Online course material updates might exist for this course. To check for updates, go to the Instructor wiki at: `http://ibm.biz/CloudEduCourses`

This course includes the following exercises:

- Exercise 1 is the queue manager and channel initiator configuration. In this exercise, you also convert the V1 BSDS to a V2 BSDS.
- For all exercises where you are defining remote queues or sender channels, the corresponding definitions for local queues or receiver channels are made in MQ00.
- In Exercise 2, you do some work with queues while learning about the IBM MQ for z/OS administrative facilities. You are encouraged to select the MQSC method that you are most comfortable with to use throughout all the exercises. The facilities to issue MQSC commands are detailed in Exercise 2.
- Exercise 3 is the main connectivity and troubleshooting activity.
- In Exercise 4, although IBM MQ clients are for distributed platforms, the z/OS IBM MQ administrator needs to learn to interface with the IBM MQ client side. For IBM MQ V8, the IBM MQ for z/OS facility to create client channels in the server side is “stabilized.” You cannot create a client channel definition table for IBM MQ V8 and later with the old method. Client channels are created only in the client side by using `runmqsc -n`, instead of using the MAKECLNT CSQUTIL method. You also use the CCDT channel for the security lab, although your instructor might provide a workaround.
- Exercise 5 is the clusters lab. In this exercise, you add your queue manager to the WMADMCLS cluster. You use the cluster channels to add a channel authentication rule in the security exercise.
- Exercise 6 is publish/subscribe. The publish/subscribe lab and the events lab are shorter exercises.
- Exercise 7, the events lab, also contains publish/subscribe work so these labs can be done in sequence.
- Exercise 8 is the security lab. This exercise provides hands-on experience in the channel authentication and channel authentication. You

should start this exercise as early as possible as the work is comprehensive. Until you reach this lab, you work with the channel authentication feature disabled. In this lab, you enable channel authentication and learn to add rules to allow your client and cluster connections. You also work with channel authentication and learn how to test the channel authentication configuration.

- Exercise 9, the IBM MQ Managed File Transfer lab, shows how to configure your IBM MQ Managed File Transfer environment. It is critical that you create your own /var/TSM00## directory in the UNIX System Services system. Detailed instructions are given in the exercise. Most of the IBM MQ Managed File Transfer exercise uses JCL. You are requested to obtain assistance if after reading the instructions you are unsure how to create your working /var/TSM00## directory.
- Exercise 10 is the file-handling lab and the utilities lab.

Exercise 1. Configuring an IBM MQ for z/OS queue manager

What this exercise is about

This exercise provides skills that are necessary to set up the required data sets, and configure and start a z/OS queue manager.

What you should be able to do

After completing this exercise, you should be able to:

- Describe the z/OS setup for a queue manager
- Start and stop a queue manager master and channel initiator task
- Describe and use the input command files
- Explain some of the messages that a z/OS queue manager issues at startup
- Implement eight-byte RBA; change the OPMODE parameter and convert BSDS to Version 2 format

Introduction

In this exercise, you configure and start your queue manager and channel initiator. As you proceed through the tasks, you observe the messages in the console and the components that get started.

IBM MQ V8 for z/OS allows use of an 8-byte relative byte address (RBA), New IBM MQ V8 for z/OS queue managers do not get created to use the 8-byte RBA function by default.

Requirements

- This exercise starts at the configuration process after the IBM MQ V8 for z/OS SMP/E work is completed.
- To expedite the lab, the z/OS configuration steps are completed. You are granted authorization rights to confirm the z/OS configuration for your queue manager.
- A configuration partitioned data set (PDS) <HLQ>.SCSQPROC and pertinent members are required to configure the queue manager and channel initiator.

Exercise instructions

Important

A number of helper lab files are included in the C:\ directory of the Windows VMware image. It is suggested, but not required, that you use the lab files as a template to prevent typographical or syntax errors while working from the Windows client. These files start with the characters “Ex”.

The exercises point you to the lab files as you need them, and they also contain full details of the contents of the lab files if you prefer to type the commands.

Preface

In this exercise, you get acquainted with the environment and create the queue manager that is used throughout the rest of the labs for this course. To start the exercises, log on to the Windows VMware image with the credentials identified in the table.

You are divided into teams. Each team is assigned a team number `##` by the instructor. This team number applies to:

- Your queue manager name: `MQ##`
- Your queue manager port number: `16##`
- Your TSO user ID: `TSM00##`
- Data sets and other names as specified in the exercises
- IBM MQ Managed File Transfer UNIX System Services directory name: `/var/TSM00##`

Your instructor provides directions and logon information to reach the z/OS system. Write down the information that is provided by the instructor in the table to reference as needed throughout the exercises.

Table 1: Classroom details

Item	Value
Windows VMware logon ID	`Administrator`
Windows VMware password	`web1sphere`
Your team number, indicated by `##` placeholders throughout all exercises	
Your queue manager name: `MQ##`	
Your queue manager command prefix string, or CPF: `/MQ##`	
Logon procedure name	
Your TSO ID: `TSM00##`	
Your TSO password	

When you reach the IBM EDUCATION screen, without moving the cursor, enter:
`TSO TSM00##`

- You should now be at the TSO logon screen.
- From the TSO logon screen, check the procedure name as provided by instructor. ***Normally the default value should not need changes***.
- Enter the password that is supplied by the instructor.

An ISPF library is prepared for each team that contains JCL skeletons and input control data for your batch work. This library is named `TSM00##.WM30.SCSQPROC`.

- You might prefer to back up each PDS member before customizing.
- When you open a member of this library, do a global change of the double number sign characters (##) to your two-digit team ID.
- If you did not back up a library member and suspect changes beyond repair in your current member, you can copy the initial contents from the template library:
  `D62WW.WM302V1.STUDENT.SCSQPROC`

  You have read access to this library.
- To get to SDSF, type `S` from the ISPF primary menu.
- IBM WebSphere MQ control panels are integrated into ISPF and are reached by using option `M` from the ISPF primary menu.

Section 1: Confirm z/OS values

Note

Some of the steps in the configuration process are done one time per queue manager. You find that the next two steps are already completed. Normally, depending on the work boundaries in your organization, you can do these tasks yourself, or request that the z/OS system programmer complete the tasks in the next two steps.

__ 1. Browse (do not edit) `SYS2.PARMLIB(VAPPLS00)` to confirm that the subsystem ID and the command prefix (CPF) are defined for your queue manager. In your environment, this check would be done to SYS1.PARMLIB(IEFSSN00). However, for logistics reasons, the class environment uses different members. The CPF string is the second entry in the `INITPARM` parameter, next to `CSQ3EPX`.

   Write your CPF here: _____

__ 2. Browse `SYS1.PARMLIB(SCHED00)` and search for string `MQ` to determine that IBM WebSphere MQ for z/OS is in the PPT.

Note

You might want to back up your PDS members as you use them before editing them.

In the configuration steps and subsequent JCL, you change the `##` placeholder. You do not need to worry about the ++THLQUAL++ or similar changes in the JCL notes. To expedite your work, the variables that are noted "++" in the JCL comments are handled. You must change the `##` placeholder for your team number.

Section 2: Create the queue manager data sets

__ 3. Edit the job control language (JCL) in `TSM00##.WM30.SCSQPROC(CSQ4PAGE)` and change the `##` placeholders to your two-digit team ID. For example: `C MQ## MQ10 all`

__ a. What page sets does it set up?_____

__ b. Submit the job to create ***your*** queue manager page sets and ensure that all steps completed successfully.

__ c. After the job completes, you can optionally check the data sets under your high-level qualifier, TSM00##, and check that the data sets created by this job are listed, option =3.4 from the command menu. Enter `TSM00##*` in the **Dsname level** field and press the Enter (Ctrl) key.

Note

Split the TSO screen, keeping one session for editing, and the other session to check the job output (use **SDSF > ISPF option S**).

__ 4. Edit the JCL in `TSM00##.WM30.SCSQPROC(CSQ4BSDS)` to change the `##` placeholder to your two-digit team ID.

__ a. How many logs and BSDSs does this job set up?_____

__ b. Submit the job to create your queue manager logs and BSDS, and ensure that all steps completed successfully by checking the return code of the job and the output messages.

__ c. After the job completes, you can optionally check the data sets under your high-level qualifier, TSM00##, and check that the data sets created by this job are listed, option =3.4 from the command menu. Enter `TSM00##*` in the **Dsname level** field and press the Enter (Ctrl) key.

Section 3: Create the queue manager MQ##MSTR started task

__ 5. Copy member CSQ4MSTR from your `TSM00##.WM30.SCSQPROC` member to `MQ##MSTR` in the same PDS.

__ 6. Edit `MQ##MSTR` to change all occurrences of `MQ##` to reflect your team number.

Warning

Make sure to leave the second BSDS commented out.

Do not submit this job. This job is the startup procedure for your queue manager.

__ 7. From the previous step, observe what your CSQINP1 and CSQINP2 concatenated data set members are.

__ a. Make sure that all of the members that the JCL references exist. Do not delete any of them.

__ b. Look at the members that are referenced directly from the installation library (**MQ8000.SCSQPROC**).

__ 8. Edit the member **CSQ4INYG** in your **TSM00##.WM30.SCSQPROC** work library:

__ a. Write the available storage classes and the page sets with which they are associated.

_____ _____

_____ _____

_____ _____

__ b. Perform the global change of `++qmgr++` with your queue manager name. Remember, your queue manager is named `MQ##` with your two-digit team ID substituted for the `##` characters.

__ c. Find the **ALTER QMGR** section, and remove all the asterisks from column 1, thus activating the command with all the parameters as they appear within the member.

__ d. Remain in the ALTER QMGR, and locate attribute **CHLAUTH** for channel authentication and change from ENABLED to **DISABLED**.

Warning

Under normal circumstances, channel authentication should not be disabled. In a later exercise, you re-enable CHLAUTH and work with channel authentication records in the security lab after the corresponding material is covered.

Proceed to set CHLAUTH to DISABLED now, or channel blocked problems are going to surface in later exercises.

__ e. **TSM00##.WM30.SCSQPROC(CSQINP2)** is a spare member that you can use to add commands that can run at queue manager initialization at some later time; nothing should be done with it right now.

__ 9. Copy the new member `MQ##MSTR` from `TSM00##.WM30.SCSQPROC` to the `SYS3.STUDENT.PROCLIB` library. This procedure library is used for the startup.

Section 4: Tailor the queue manager parameter module MQ##ZPRM

__ 10. Copy JCL in TSM00##.WM30.SCSQPROC(CSQ4ZPRM) to member MQ##ZPRM in the same PDS.

__ 11. Edit MQ##ZPRM to customize the parameter module. Some changes are already completed, marked by the @WM302 string. Some extra changes are required:

__ a. First, do the global change of MQ## to your team number.

Warning

In the changes remain in the MQ##ZPRM member, take care not to move the continuation character "X" off its position. Do not use the insert or delete key. Overlay the entries, making sure that they are followed by the comma (,) and the "X" remains in its correct column.

__ b. In the CSQ6LOGP macro:

- Keep the dual logging option setting (TWOACTV).
- Change the dual archiving (TWOARCH) and the dual bootstrapping (TWOBSDS) both to NO.
- Reduce the number of archives that are maintained in the BSDS (MAXARCH) to 50.

__ c. In the CSQ6ARVP macro section, set the archive retention period (**ARCRETN**) to 0 (zero) to enable the deletion of archives in the unlikely case that the DASD space runs short during the course.

__ 12. Submit the job.

Important

Ensure all steps in the MQ##ZPRM job complete with CC=00.

Make note of the name of the MQ##ZPRM resulting load module that appears at the bottom of the member. You need to specify this name in the parameter attribute of the START QMGR command.

Section 5: Start the queue manager with the MQ##ZPRM parameters

__ 13. Enter =S in the command prompt to go to SDSF.

__ 14. Use your command prefix string (CPF) to start your queue manager. Make sure to use the start queue manager syntax with the PARM attribute as shown:

Important

Enter exactly as shown, replacing ## with your team number:

```
/MQ## START QMGR PARM(MQ##ZPRM)
```

- SDSF requires the slash (/) to identify a z/OS command.
- `MQ##` is the command prefix string that is used to communicate to your queue manager.
- `MQ##ZPRM` identifies the parameter module that is assembled for your queue manager.

__ 15. Examine the z/OS console log by using SDSF.

__ a. From a command prompt, enter `=S;DA` to go to the list of running jobs.

__ b. You might want to limit the display so only your queue manager shows by entering the following filter on the SDSF command line:

`PRE MQ##*`

where `##` is your team number. Make sure to add the asterisk at the end.

If you need to restore all tasks, again from the command line at `=S;DA` enter `PRE` by itself.

__ 16. Select the output of the MQ##MSTR job as indicated:

__ a. Enter a question mark (?) next to the `MQ##MSTR` started task and press the Enter (Ctrl) key to select the different data set names in the started task separately.

__ b. Select the JESMSGLG data set to check the queue manager startup messages by entering `S` in front of the `DDNAME` and pressing the Enter (Ctrl) key:

- Notice that the early code processing `CSQ3111I` message is at V8.0.
- The parameters that are specified on the MQ##ZPRM are displayed. Page down by pressing PF8.
- After the `CSQJ127I` message, the BSDS and log data set information is displayed.
- Make sure that you see messages `CSQY022I` and `CSQ9022I`. These messages are found at the end of the `JESMSGLG` data set and should confirm that the queue manager initialized and started normally.

__ c. Check whether all the system initialization input commands were processed successfully. Select `CSQOUT1` by typing `S` in front of the `CSQOUT1` entry and press the Enter (Ctrl) key. If the queue manager came up successfully, all this output should be good.

__ d. Select the CSQOUT2 output by entering `S` in front of the `CSQOUT2` entry and pressing the Enter (Ctrl) key.

__ e. From the CSQOUT2 output, search for occurrences of the IBM MQ message `CSQ9022I`. How many times did the `CSQ9022I` message occur? These occurrences are the queue manager objects that the start procedure defined.

__ 17. If there are any problems to correct in the MQ##MSTR procedure, complete those corrections now.

__ 18. If MQ##MSTR started successfully, ensure that the MQ##MSTR procedure remains running, and continue to configure the channel initiator.

Note

Did you notice the various IBM MQ object definitions that are completed as part of the queue manager start? In a working environment, the members that create the one-time definitions would be removed from the MQ##MSTR started task. Thus, the next time the queue manager starts, the procedure does not try to create the definitions again. The cleanup step is skipped in the lab environment to save time. On subsequent queue manager starts, you see several “CSQMXXXXI (various) ALREADY EXISTS” messages; these messages are harmless.

Section 6: Configure the channel initiator MQ##CHIN started task

__ 19. Copy member `CSQ4CHIN` from `TSM00##.WM30.SCSQPROC` into member `MQ##CHIN` in the same data set, where `##` is your team number.

__ 20. Edit member `MQ##CHIN` in `TSM00##.WM30.SCSQPROC` work library and change everything necessary to reflect your team ID in all `MQ##` locations.

Warning

This procedure is the startup procedure for your channel initiator. ***Do not submit.***

__ 21. Copy your updated `MQ##CHIN` to `SYS3.STUDENT.PROCLIB`.

__ 22. Use the ISPF control panels or the CPF string to start the channel initiator task. To use the CPF string, proceed with this step. To use the ISPF panels, proceed to the next numbered step.

__ a. Proceed to SDSF by entering `=S;DA` in the command prompt.

__ b. Enter the start command as shown, substituting queue manager name for `MQ##`, and then press the Enter (Ctrl) key:

```
/MQ## START CHINIT
```

__ c. If you see your `MQ##CHIN` procedure start, proceed to section “Channel initiator checks.”

__ d. If you do not see your `MQ##CHIN` procedure start:

- Look for the failed `MQ##CHIN` job in SDSF.
- Place an `S` next to the `MQ##CHIN` procedure and the press Enter (Ctrl) key.
- Analyze the output to determine the error. If you need assistance, contact the instructor.
- After correcting the errors, repeat the `/MQ## START CHINIT` command and check that it started.

__ 23. If you already used the CPF command string to start your MQ##CHIN, skip to the next numbered step. Use this step only if you want use the IBM MQ ISPF panels to start your MQ##CHIN. To start the channel initiator with the IBM MQ ISPF control panels:

__ a. Enter `M` in the command prompt and press Enter (Ctrl) to go to the IBM MQ ISPF panels.

__ b. Type `6` in the Action field.

__ c. Type `SYSTEM` in the Object Name field.

__ d. Type an asterisk, `*` in the Name field.

__ e. Type `Q` in the Disposition field.

__ f. Type your `MQ##` name in the **Connect name**, **Target queue manager**, and **Action queue manager** fields.

Important

Double check that the **Connect name**, **Target queue manager**, and **Action queue manager** fields of the ISPF panel correctly reflect your `MQ##` queue manager name.

__ g. Press the Enter (Ctrl) key. You now go to the second panel.

__ h. Type `1` in the Function field to select the channel initiator.

__ i. Press the Enter (Ctrl) key.

__ j. Return to SDSF. At the bottom of the IBM MQ ISPF channel initiator panel, enter `=S;DA` in the command prompt and press the Enter (Ctrl) key.

Section 7: Channel initiator checks

__ 24. If it is not already in the SDSF panel, enter `=S;DA` at the command prompt.

__ 25. Look for your `MQ##CHIN` job and enter `S` next to the started task name to list the output data sets.

__ 26. Check that the following IBM MQ channel initiator messages are present in the `MQ##CHIN` started task output:

Note

The entries to be checked might not appear in the same order listed.

Do not be concerned about the listener now. You did not yet start it. You take care of the listener after checking the health of the channel initiator.

__ a. `CSQX011I MQ## CSQXGIP Client attachment available`

__ b. `CSQX141I MQ## CSQXADPI 8 adapter subtasks started, 0 failed CSQX160E MQ## CSQXGIMP SSL communications unavailable`

__ c. `CSQX151I MQ## CSQXSSLI 0 SSL server subtasks started, 0 failed`

__ d. `CSQX410I MQ## CSQXREPO Repository manager started`

__ e. `CSQT975I MQ## CSQXDPSC Distributed Pub/Sub Controller has started`

__ f. `CSQX015I MQ## CSQXSPRI 5 dispatchers started, 0 failed`

__ g. `CSQT975I MQ## CSQXDPSC Distributed Pub/Sub Fan Out Task has started`

__ h. `CSQT975I MQ## CSQXDPSC Distributed Pub/Sub Command Task has started`

__ i. `CSQT975I MQ## CSQXDPSC Distributed Pub/Sub Publish Task has started`

__ j. `CSQX022I MQ## CSQXSUPR Channel initiator initialization complete`

__ k. `CSQT806I MQ## CSQXFCTL Queued Pub/Sub Daemon started`

__ l. `CSQU012I CSQUTIL Initialization command handling completed`

__ 27. If any of these IBM MQ channel initiator messages are missing or there are any error messages, make the necessary corrections. Contact the instructor if you need assistance or have any questions.

Troubleshooting

Certain channel initiator publish/subscribe errors occur due to a missing IBM MQ object definition. After looking up a channel initiator error message, the explanation might state that the error is due to a missing object definition. In this case, you can use the IBM MQ ISPF option 8 CSQUTIL processor or CSQUTIL JCL to define the missing object without adding it to the MQ##MSTR procedure.

Section 8: Start listener

__ 28. Use the ISPF control panels, ***or*** the CPF string, to start the listener. To use the CPF string, proceed with this step. To use the ISPF panels, proceed to the next numbered step.

Warning

Be careful to enter the correct port. This port consists of 4 characters, where the first 2 characters are `16` and the next 2 characters are your team number. For example, for team number 5, which would have queue manager MQ05, the port name is 1605.

__ a. Proceed to SDSF by entering `=S;DA` in the command prompt.

__ b. Enter the start command as shown, substituting your team number for `##` in both the queue manager and the port, and then press the Enter (Ctrl) key:

```
/MQ## START LISTENER PORT(16##)
```

__ c. Proceed to section “Check listener startup.”

__ 29. Skip this step if you already started your listener with the CPF in the SDSF panels. To start the channel listener with the IBM MQ ISPF control panels:

__ a. Enter `M` in the command prompt and press Enter (Ctrl) to go to the IBM MQ ISPF panels.

__ b. Type `6` in the Action field.

__ c. Type `SYSTEM` in the Object Name field.

__ d. Type an asterisk (*) in the Name field.

__ e. Type `Q` in the Disposition field.

__ f. Type your `MQ##` name in the Connect name, Target queue manager, and Action queue manager fields.

__ g. Press the Enter (Ctrl) key. You now go to the second panel.

__ h. Type `2` in the Function type field.

__ i. Confirm that the Action queue manager reflects your queue manager name.

__ j. On the Channel listener menu, type `Q` in the Inbound Disposition field.

__ k. Type `T` in the Transport type field

__ l. Skip the **LU name** field.

__ m. Enter the port number that is assigned to your queue manager in the Port number field. Press the Enter (Ctrl) key to start the channel initiator.

__ n. Press the Enter (Ctrl) key.

Section 9: Listener checks

__ 30. If you are not already in the SDSF panel, enter `=S;DA` in the command prompt.

__ 31. Look for your MQ##CHIN job and enter `S` next to the started task name to list the output data sets.

__ 32. Port startup messages can be usually found towards the end of the MQ##CHIN started task. Type `M` at the command prompt and press PF8 to advance to the end of the MQ##CHIN display.

__ 33. Check that the listener started in the correct port. For example, for queue manager MQ00 at port 1600, the listener display is:

```
CSQU000I CSQUTIL IBM WebSphere MQ for z/OS V8.0.0
CSQU011I  Commands from CSQINPX - 2014-11-10 11:44:52
CSQU055I  Target queue manager is MQ0A
START LSTR PORT(1621)
CSQN205I   COUNT=       2, RETURN=00000000, REASON=00000004
CSQM134I MQ0A CSQMSLIS  START LSTR TRPTYPE(TCP) COMMAND ACCEPTED
CSQN205I   COUNT=       2, RETURN=00000000, REASON=00000000
CSQ9022I MQ0A CSQXCRPS ' START LSTR' NORMAL COMPLETION
CSQU057I  1 commands read
CSQU058I  1 commands issued and responses received, 0 failed
CSQU148I CSQUTIL Utility completed, return code=0
```

Section 10:Channel initiator and listener start automation

You took a step-by-step approach to the initial start of the listener and channel initiator. However, in a real environment it would be inconvenient to manually continue starting the channel initiator separate from the queue manager. You now add a couple of commands to two members of the started procedures to automate the start of the channel initiator and listener when the queue manager starts.

__ 34. Edit member **CSQINP2** in **TSM00##.WM30.SCSQPROC** data set to include the command that is needed to start the channel initiator when the queue manager starts. This member is already included in the MQ##MSTR started task procedure.

__ a. From the option or command prompt, enter: `=3.4`

__ b. At the Dsname Level field, type `TSM00##.WM30*` where `##` is your team number.

__ c. Press the Enter (Ctrl) key.

__ d. Type `E` in front of the `TSM00##.WM30.SCSQPROC` data set, and press the Enter (Ctrl) key.

__ e. Enter `S` in front of member CSQINP2 and press the Enter (Ctrl) key.

__ f. Replace the comments with the command to start the channel initiator as shown:

```
START CHINIT
```

__ g. Press PF3 to save.

__ 35. Edit member **CSQINPX** in **TSM00##.WM30.SCSQPROC** work library to include the command that is needed to start the listener when the channel initiator starts.

__ h. You are already in the correct PDS. Enter `S` in front of member CSQINPX and press the Enter (Ctrl) key.

__ i. Replace the comments with the command to start the channel initiator as shown:

```
START LISTENER PORT(16##)
```

where `##` is your assigned team number.

__ j. Press PF3 to save and exit member edit.

__ 36. Stop the channel initiator and queue manager.

__ a. From the command or input prompt, enter `=S` to proceed to SDSF.

__ b. Type `/MQ## STOP CHINIT` substituting `##` for your team number, and press the Enter (Ctrl) key.

__ c. Type `/MQ## STOP QMGR` substituting `##` for your team number and press the Enter (Ctrl) key.

__ d. Return to SDSF by entering `=S;DA` from the command prompt and confirm that both the MQ##CHIN and MQ## MSTR started tasks are stopped.

__ e. From your command prompt, find the “OK to restart” message as shown:

```
F "MQ## ready for start"
```

including quotation marks, where `##` is your team number. Press the Enter (Ctrl) key.

Note

The message

```
"CSQ3100I MQ00      CSQ3EC0X - SUBSYSTEM MQ00 READY FOR START COMMAND"
```

might occur before the point where you issued the `find` command. If the CSQ3100OI message for your queue manager is not found going forward in the log, try a backwards search by entering:

```
F "MQ## ready for start" PREV
```

__ f. If you are not able to locate the `READY FOR START` message, you might need to wait for the queue manager to end or determine whether anything is keeping the queue manager from stopping before proceeding. If it appears as if your queue manager did not stop, check the system log for messages from your queue manager.

__ 37. After locating the `READY FOR RESTART` message for your queue manager, proceed to start the queue manager by entering: `/MQ## START QMGR PARM(MQ##ZPRM)`

Do not start the channel initiator separately.

__ 38. You should now see both MQ##MSTR and MQ##CHIN started. Type `DA` from the system log screen command prompt and press Enter (Ctrl) to check the started tasks.

__ 39. Assuming both started tasks for your queue manager are active, repeat section *Listener checks* to ensure that the listener also started.

__ 40. If your channel initiator or listener did not start, check your work and make any needed corrections. If you are unable to resolve the problem, contact your instructor for help.

__ 41. If your queue manager, channel initiator, and listener are started, you are finished with the queue manager configuration exercise.

__ 42. Make sure that the queue manager and channel initiator continue running.

Section 11:.Convert the BSDS to enable 8-byte RBA

For this section of the exercise, the BSDS conversion utility is supplemented with more jobs to rename the BSDS as you go through the steps. The steps that are followed are listed here before you start the lab. Review the bullets so you understand the approach you are following during the lab.

- Create a BSDS file. Name the new file and the DATA and INDEX portions to `TSM00##.MQ##.BSDS.NEW` where `##` is your team number. For this step, a copy of the CSQ4BSDS was adapted to create the “NEW” data set. You find the JCL to create the “NEW” data set in your TSM00##.WM30.SCSQPROC PDS member CVTBSDS1.
- Stop your channel initiator and queue manager.
- If not already done, change the CSQ6SYSP OPMODE attribute to enable the new IBM MQ V8 z/OS functions.
- Copy CSQ4BCNV into a new member named CVTBSDS4. After making necessary updates to CVTBSDS4, submit CVTBSDS4 to run the BSDS conversion utility, by using the “NEW” BSDS as output of the conversion.

Important

Making sure that you do not try to start the queue manager with the converted Version 2 BSDS, you can handle any problems with the conversion job at an actual production site: you can always restart the queue manager with the old version 1 BSDS. ***After the queue manager starts with the new version 2 BSDS,*** you cannot go back to an old version 1 BSDS.

Pay particular attention to the completion of the conversion job, and ***be careful that the job indeed completes before continuing with the next steps. The BSDS conversion might take a long time to run in a previously created queue manager.***

- Rename the current BSDS, DATA and INDEX, `TSM00##.MQ##.BSDS`, to be the “OLD” BSDS: `TSM00##.MQ##.BSDS.OLD`

  The lab provides JCL CVTBSDS5 for this purpose.
- Rename the “NEW” named BSDS, DATA and INDEX, TSM00##.MQ##.BSDS.NEW to the current BSDS: `TSM00##.M##.BSDS`

  The lab provides JCL CVTBSDS6 for this purpose.
- Last, you restart the queue manager and check the start messages.

The table that precedes the steps summarizes the JCL members and files that are used in this section.

Table 2: JCL and files that are used in the BSDS V1 conversion to BSDS V2 format and enablement of the IBM MQ V8 for z/OS functions

JCL member	Data set name	Purpose/comments
CVTBSDS1	TSM00##.MQ##.BSDS01.NEW	Allocates “NEW” BSDS data set. BSDS conversion job writes the V2 formatted BSDS to NEW file.
You create CVTBSDS4 (copy of CSQ4BCNV)	Uses current BSDS as input and NEW BSDS as output	You copy CSQ4BCNV to this member and use it to convert the V1 BSDS to a V2 format BSDS.
CVTBSDS5	Current BSDS and “OLD” BSDS	Renames the current BSDS to be the OLD BSDS
CVTBSDS6	“NEW” BSDS to current BSDS	Renames the “NEW” BSDS holding the converted V2 BSDS to be the current BSDS
MQ##ZPRM (or CSQ4ZPRM if you did not rename your JCL member)	N/A	***If not previously done:*** Change the OPMODE parameter to enable IBM MQ V8 for z/OS functions.

You now proceed to convert your queue manager BSDS and enable the IBM MQ V8 z/OS functions:

__ 43. Use two screens for this lab: one screen to edit your TSM00##.WM30.SCSQPROC PDS, and the other screen to check the completion of your conversion jobs and issue stop and start commands.

__ 44. Create a BSDS to hold the output of the BSDS conversion to V2. This data set name is going to have the “NEW” suffix. Proceed to your TSM00##.WM30.SCSQPROC data set and select member **CVTBSDS1**. Review the JCL; notice that it is an adaptation of CSQ4BSDS. Change the ## variables to your team number, submit, and ensure that the return code was zero and the “NEW” BSDS data sets were created successfully. If there are problems, do not continue to the next step: stop and correct any issues before proceeding. If you repeat this step at your site, you need to create similar JCL.

Remember that several teams are submitting the same jobs; take care that you check the output for your team number.

__ 45. Go to ISPF =3.4 and check for TSM00##.MQ##.BSDS01*. You should have two sets of BSDS data sets:

- “Current” BSDS: TSM00##.MQ##.BSDS01* base, DATA, and INDEX
- “NEW” BSDS: TSM00##.MQ##.BSDS01.NEW* base, DATA, and INDEX

__ 46. Stop your channel initiator, and then your queue manager. From the SDSF panel, enter:

```
/MQ## STOP CHINIT
/MQ## STOP QMGR
```

Important

You are manipulating the BSDS data set. Take care to prevent making inadvertent errors that might cause this section of the exercise to fail.

__ 47. Run the conversion utility. Copy member `CSQ4BCNV` into new member `CVTBSDS4`.

__ a. Make the necessary edits of the `##` placeholder to your team number.

__ b. After the edit, check that the input data set at SYSUT1 is set to your current BSDS, and the output data set at SYSUT3 is set to your NEW BSDS.

__ c. Submit the job. This job might take a while to run, so ensure that it is completed. Check results and if needed, resolve any errors.

When the conversion job ends, the V2 BSDS is in the NEW BSDS data set.

__ 48. Rename the current BSDS to be the "OLD" BSDS. Use provided JCL member `CVTBSDS5`. Change the `##` placeholder to your team ID, submit the job, and check results. If needed correct any errors. If you repeat this step at your site, you need to create similar JCL.

__ 49. Go to ISPF =3.4 and check for `TSM00##.MQ##.BSDS01*` to ensure that you now have two BSDS data sets:

- "OLD" BSDS: `TSM00##.MQ##.BSDS01.OLD*` base, DATA, and INDEX
- "NEW" BSDS: `TSM00##.MQ##.BSDS01.NEW*` base, DATA, and INDEX

__ 50. Rename the "NEW" BSDS to be the current BSDS. Use provided JCL member `CVTBSDS6`. Change the `##` placeholder to your team ID, submit the job, and check results. If needed correct any errors. If you repeat this step at your site, you need to create similar JCL.

__ 51. Go to ISPF =3.4 and check for `TSM00##.MQ##.BSDS01*` to ensure that you now have two BSDS data sets:

- "Current" BSDS: `TSM00##.MQ##.BSDS01*` base, DATA, and INDEX
- "OLD" BSDS: `TSM00##.MQ##.BSDS01.OLD*` base, DATA, and INDEX

__ 52. Edit your `MQ##ZPRM` member (or `CSQ4ZPRM` if you did not create the `MQ##ZPRM` copy). Find the `OPMODE` parameter and change it from `COMPAT` to: `NEWFUNC`

The attribute should contain: `OPMODE=(NEWFUNC,800)`

__ a. It is best to change it by typing a "change" command from the command prompt on top of your MQ##ZPRM member, such as: `C COMPAT NEWFUNC`

__ b. Using the change command keeps the continuation character "X" from changing to a different column. If you choose to scroll down to edit the OPMODE line, make sure the continuation "X" remains aligned with the other entries in the correct column.

__ c. Submit the MQ##ZPRM job and check results.

Information

OPMODE must be changed before you restart the queue manager with the converted BSDS or the restart fails. However, if you do not convert the BSDS, OPMODE can be safely changed.

__ 53. Proceed to the system log by entering `=s;log` in the command prompt and pressing the Enter (Ctrl) key.

__ 54. Restart your queue manager. Take care to use the start format, including the parameter module:

```
/MQ## START QMGR PARM(MQ##ZPRM)
```

__ 55. Look for the CSQJ034I message, taking care that the message you find is for your team ID. Check that the log RBA range is now as shown, counting out the 8-byte address (16 ***F***s).

```
CSQJ034I MQ## CSQJW007 END OF LOG RBA RANGE IS FFFFFFFFFFFFFFFF
```

If you see the END OF LOG RBA RANGE as shown, and normal start messages, it means that you successfully converted the BSDS.

End of exercise

Exercise review and wrap-up

You are now familiar with:

- How to configure a queue manager, beginning with the data sets, parameter modules, started tasks, and system definitions
- How to configure the channel initiator and listener
- Starting the queue manager master and channel initiator started tasks
- Automating the channel initiator and listener startup
- How to check for messages that are related to the queue manager and channel initiator started tasks, and what messages to check for a successful start or stop
- How to convert the BSDS to a version 2 BSDS to use 8-byte RBA

Exercise 2. Working with queues

What this exercise is about

This exercise provides an opportunity to create, display, and delete queues with the IBM MQ for z/OS ISPF panels and the CSQUTIL batch program. It uses sample IBM MQ programs to PUT (write) and GET (read) messages to and from queues.

What you should be able to do

After completing this exercise, you should be able to:

- Create, alter, and display queues by using the command prefix string and MQSC commands at the system prompt, and the IBM MQ for z/OS ISPF panels
- Place and retrieve messages from queues with the batch sample programs
- Describe the behavior of various combinations of persistence in the application specification and queue definition attributes

Introduction

In this exercise, you create some queues and test the attributes that are described in the lecture. You also contrast persistence as defined in the queue and determine the behavior when an application overrides the persistence set in the queue.

Requirements

- TSO accesses with adequate privileges are assumed for the lab environment.
- This exercise requires a working queue manager.
- Successful completion of Exercise 1 fulfills this requirement.

Exercise instructions

Note

Throughout this course, you have several options to manipulate IBM MQ objects. You select your preferred method.

1. IBM MQ ISPF panels. These panels support most functions except publish/subscribe; however, you might find it more convenient to work with MQSC commands.

   After you get some experience with the IBM MQ ISPF panels in this exercise, other exercises suggest use of the IBM MQ ISPF MQSC facility to enter MQSC commands. This facility is a convenient way to enter MQSC commands.

2. SDSF CPF commands. For short commands, this option is a good choice. If your command spans more than one line, it is better to use the IBM MQ ISPF MQSC option than to use the SDSF command extender; that is, entering a `/` in the command prompt. The SDSF command extender is not discussed further in the course materials.

3. IBM MQ ISPF MQSC command option. To use this option, select Action 8 from your IBM MQ ISPF main panel. When you select Action 8, you get an ISPF editor session to TSM00##.CSQUTIL.COMMANDS where you enter the MQSC commands. To cancel, press PF12; to create the definition in the command, press PF3. When you press PF3, the results of your MQSC command display in a file called TSM00##.CSQUTIL.OUTPUT.

   Both TSM00##.CSQUTIL files get overwritten every time you press PF3.

4. If you prefer to use a batch job for the MQSC commands, you can use the CSQUTIL member in your TSM00##.WM30.SCSQPROC PDS. Instructions on the use of CSQUTIL are found in the Appendix ***CSQUTIL for MQSC commands*** at the end of this exercise.

5. Later in the course after the Client exercise, you can use IBM MQ Explorer.

It is a good practice to get used to MQSC commands, as there are many times where you need to create MQSC scripts, rather than using the formatted IBM MQ ISPF panels or IBM MQ Explorer.

Section 1: Creating different types of queues

__ 1. Log on using the same team ID as for Exercise 1.

__ 2. If the queue manager is not running, start it from SDSF by entering the following command:

```
/MQ## START QMGR PARM(MQ##ZPRM)
```

where `##` is your two-digit team ID.

Hint

For all exercises, you might want to split your ISPF screen so you can use PF9 to switch between the two screens. To split the screen so you can view most of each screen:

- Starting with your cursor at the Option prompt, use the keyboard up arrow to move to the highest line in the screen, containing drop-down menus titled Menu, Utilities, Compilers, and others.
- Press the PF2 key to split the screen.

You can now switch between the two screens by pressing the PF9 key.

If you are familiar with ISPF, you might also want to remove the PF key display bar at the bottom of your screen. You remove it by typing `PFSHOW OFF` at the command prompt and pressing the Enter (Ctrl) key.

__ 3. Enter the ISPF panels from IBM MQ for z/OS. In most organizations, access to the IBM MQ panels is either customized into the ISPF menu, or accessed by selecting ISPF Option 6 to enter TSO commands and then typing: `CSQOREXX`

In this class, access to the IBM MQ ISPF panels is customized.

For the lab environment in this course, from a command prompt, type `M` and press the Enter (Ctrl) key to reach the IBM MQ ISPF panels.

Important

Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ 4. Display the queues whose names start with the characters `SYSTEM.DEFAULT`.

__ a. Type **1** in the Action field.

__ b. Type `QUEUE` in the Object type field.

__ c. Type `SYSTEM.DEFAULT*` in the Name field.

__ d. Type `Q` in the Disposition field and press the Enter (Ctrl) key.

__ 5. You now do some changes to the default property queue. Use the ALTER option by entering a `3` to the left of **SYSTEM.DEFAULT.LOCAL.QUEUE**:

If the local queue definition does not specify the “LIKE” option that indicates to use another queue name as the template, the SYSTEM.DEFAULT.LOCAL.QUEUE serves as a template. This template determines default values when a new local queue is created. After you make all the changes, press the Enter (Ctrl) key to run the commands.

__ a. Provide a description, such as `MQ01 local queue default settings.`

__ b. Messages that are written to this queue need to be persistent by default.

__ c. Set the maximum number of messages to be hosted by that queue to 777.

__ d. Messages that are written to this queue cannot not be larger than **2048 bytes**.

Warning

Some of the settings that are used in this exercise are for lab purposes only. You would ***never*** want to set your default properties with some of the values that are used in this exercise, particularly persistence. You do not want to fill queues with persistent messages unless those messages have a reason to be persistent; however, the best place to control persistence would be to set it in the application code.

__ 6. Switch to an SDSF screen (option **S**, if you do not have one already active) and create a new local queue named `EX2.BASEQ` issuing the following native command from the SDSF command line:

```
/MQ## DEFINE QLOCAL('EX2.BASEQ')
```

where `##` is going to be replaced with your two-digit team ID.

Be sure that the queue name is written in uppercase as shown.

__ 7. Return to the IBM WebSphere MQ ISPF panels and display the queue that you defined.

Look at the queue characteristics. Is there something that you notice?

_____

__ 8. Create two **ALIAS** definitions that refer to **EX2.BASEQ** as their target queue:

__ a. One called `EX2.ALIASP` that allows **PUT** requests but does not allow **GET**s.

__ b. The other called `EX2.ALIASG` that allows **GET** requests but does not allow **PUT**s.

__ 9. Now use the MQSC option, Action 8 in the ISPF panels. Create a permanent dynamic model queue EX2.MODELP with the attributes of EX2.BASEQ as shown:

```
/MQ##  DEF  QM(EX2.MODELP)   LIKE(EX2.BASEQ)
```

__ 10. Was the command in the previous step successful? You should see an error that states “NAME IN USE AS A DIFFERENT TYPE”. This error means that you cannot create an object LIKE an object of a different object type.

__ 11. Using the ISPF MQSC option, create a permanent dynamic model queue EX2.MODELP:

```
MQ## DEF QM(EX2.MODELP) DEFTYPE(PERMDYN)
```

__ 12. Using the ISPF MQSC option, create a permanent dynamic model queue EX2.MODELT:

```
MQ## DEF QM(EX2.MODELT) DEFTYPE(TEMPDYN)
```

__ 13. Edit `TSM00##.WM30.SCSQPROC(JCLPUT)`. This file contains the JCL to launch a batch program to place messages on a queue.

Important

Before working with the JCLPUT member, review the values that are expected in the PARM attributes. These values are all positional, and must be entered taking care not to overwrite the next adjacent attribute. These values are:

```
PROGRAM CSQ4BCK1 ISSUES MQPUT ON A QUEUE.
     - FIRST PARM  (++QMGR++)  QUEUE MANAGER NAME
     - SECOND PARM (++QUEUE++) QUEUE NAME
     - THIRD PARM  (++MSGS++)  THE NUMBER OF MESSAGES TO PUT-(9999)
     - FOURTH PARM (++PAD++)   THE PADDING CHARACTER
     - FIFTH PARM  (++LEN++)   THE LENGTH OF EACH MESSAGE-(9999)
     - SIXTH PARM  (++PERS++)  (P)ERSISTENT/(N)ON PERSISTENT MESSAGES
 MESSAGES ARE PRINTED TO DD SYSPRINT
```

The fourth PARM “padding character” means that the entire message is composed of the same character, for instance, all “MMMMM”, or all “33333333”. For example, consider the PARM:

```
'MQ15 EX2.BASEQ 0022 Z 0128 P'
```

In this example, you are connecting to queue manager MQ15, opening queue EX2.BASEQ, putting 22 messages, message data is all 1’s, size of message is 128 bytes, and the put uses the persistent option. MQ15 is used as an example only; use your own queue manager in your PARM. ***Except for the queue manager name***, the preceding sample shows your first iteration of the JCLPUT job.

If you get any IBM MQ error codes, you can look them up in two ways:

- The Firefox web browser VMware image has a bookmark to the IBM MQ Knowledge Center.
- The `mqrc` command line utility. Using your VMware Windows command prompt, use the `mqrc` command followed by the error code, such as `mqrc 2033`.

You need to make sure that the name of your queue manager is in the **PARM** field of the **EXEC** statement, along with the name queue you are putting to.

__ a. Submit the job five times, one time for each of the queues you created.

Apart from the change to name your team ID, the number of messages to submit is 22, and the size is 128 bytes. Use any numeric or alpha padding character of your choice. ***Be careful to review the parameter information that is provided in the “Important” section.***

For each time, try to predict the result before you submit.

__ b. Go to IBM MQ ISPF Action 1, Object type QUEUE, Name * to view results.

Table 3:

Queue name	Prediction	Result
EX2.BASEQ		
EX2.ALIASP		

Table 3:

Queue name	Prediction	Result
EX2.ALIASG		
EX2.MODELP		
EX2.MODELT		

__ c. Select each queue for display. ***Your dynamic queues show up with a CSQ* prefix.***

__ d. What succeeded? What failed? Why?

_____

You can use the IBM MQ Knowledge Center to check the IBM MQ for z/OS messages and codes. This topic explains the error or reason codes that are most likely to occur here and at later points of the labs.

__ 14. What queues do contain messages currently?

Are you able to display just those queues (remember command filtering)?

_____

_____

_____

Can you explain the result?

_____

Next, you are going to read the messages.

Important

Before proceeding, take a moment to review the parameter documentation in the JCLGET member.

__ 15. Edit **TSM00##.WM30.SCSQPROC(JCLGET)** so that the **PARM** field on the **EXEC** statement points to your queue manager.

__ a. Again, submit this job five times, one for each of the queues you created. Do not change the number of messages to be read (22). Again, try to predict the results before you submit.

Queue name	Prediction	Result
EX2.BASEQ		
EX2.ALIASP		
EX2.ALIASG		
EX2.MODELP		
EX2.MODELT		

__ b. Use SDSF to examine the output and display the current depth of the queues you used.

__ c. What succeeded? What failed? Why?

__ 16. Can you read the messages from the permanent dynamic queue, which is still there and contains 22 messages?

Section 2: Working with queues and persistence

Note

This section of the exercise demonstrates the importance of having the application, rather than the administrator, determine whether a message is persistent. Persistence is often out of the hands of the administrator. Although persistence is a queue and also a message attribute, the persistence applies to the messages in the queue; that is, the queue itself is not a “persistent queue”. Even if the administrator sets the `DEFPSIST` queue attribute to persistent, an application can overturn this attribute.

You now test by creating a persistent queue. First, you put three messages where the application makes them persistent, and then three more messages where the application makes them non-persistent. You restart the queue manager, and see the results. Follow the instructions, starting in the next step.

__ 17. Create a local queue from the SDSF panels as indicated. This queue is a local queue with the persistence attribute set to persistent; that is, DEFPSIST(YES). You already requested that the template for QLOCAL definitions use persistent queues, but are repeating it here just in case any definitions change. At the SDSF command prompt, type:

```
/MQ## DEF QL(CKPERS) DEFPSIST(YES)
```

where `##` is your team number. Press the Enter (Ctrl) key.

__ 18. Go back to your JCLPUT and send three persistent messages that use all “S”. The S was selected to denote that these messages should stay in the queue if the queue manager is restarted. The S was selected because the MQPUT option is P for persistent. Your PARM attributes should look as shown, changing `##` to your team ID:

```
PARM=('MQ## CKPERS 0003 S 0100 P')
```

Submit the job.

__ 19. Send three more messages to the same queue, but this time, use the PARM attributes shown:

```
PARM=('MQ## CKPERS 0003 G 0100 N')
```

Make sure that the last parameter is N, for non-persistent. The G was selected to denote that these messages should go from the queue if the queue manager is restarted. The G was selected because the MQPUT option is N for non-persistent.

__ 20. You now use the message handler utility, which is provided in ISPF option H of the lab environment, to check your messages. From an ISPF command prompt, type `=H` and press the Enter (Ctrl) key.

__ a. At the main menu, type `MQ##` where `##` is your team number for the queue manager, and `CKPERS` for the queue name, and press the Enter (Ctrl) key.

__ b. You now see a list of messages. Select the first message, which is preselected by pressing the Enter (Ctrl) key.

__ c. Press PF8 until you find the Persistence header. What Persistence value is shown?____

__ d. Keep scrolling down using PF8 until you see your “padding character” in the message buffer area. This first message should show all S for the data.

__ e. Press PF3 to return to the message selection screen.

__ f. Select message 04 and press the Enter (Ctrl) key.

__ g. Use PF8 to scroll down until you find the Persistence MQMD field. What Persistence value is shown? _____

__ h. Keep scrolling down until you see the message buffer. This message should have all G for the data.

__ 21. Stop your channel initiator.

__ a. Go to the SDSF system log. Type `=s;log` in the command prompt.

__ b. Type `/MQ## STOP CHINIT` where `##` is your team number.

__ c. Press the Enter (Ctrl) key. **Stay at the SDSF log command prompt**.

__ 22. Stop your queue manager. Type `MQ## STOP QMGR` at the command prompt and press the Enter (Ctrl) key.

__ 23. Remain at the SDSF command prompt and check the system log until you see the message that follows, confirming that your queue manager stopped:

```
CSQ9022I MQ## CSQYASCP 'STOP QMGR' NORMAL COMPLETION
```

__ 24. Start your queue manager by typing:

```
/MQ## START QMGR PARM(MQ##ZPRM)
```

and pressing the Enter (Ctrl) key. ***Make sure that you include the PARM(MQ##ZPRM) parameter when starting the queue manager***.

__ 25. You created queue local CKPERS with the DEFPSIST attribute set to YES, expecting messages in this queue to be persistent.

__ a. You put three messages where the application specified persistence in the MQPUT.

__ b. You put three messages where the application specified non-persistent messages.

__ c. What messages do you expect to find in the CKPERS queue after the queue manager restarts? _____.

__ 26. Go to the message handler utility by entering `=H` in the command prompt and pressing the Enter (Ctrl) key.

__ 27. Type the queue manager name and queue name and press the Enter (Ctrl) key.

__ a. How many messages do you see?

__ b. Messages that are put with persistence were put with an S; those messages that are put non-persistent were put with a G. What character do you expect to see in the message buffer for all messages?

_____

__ 28. Look at all messages in the queue. What are the actual results?

_____

If the instructions were followed correctly, there should be three messages with an “S” as the padding character. The results illustrate that in most cases, it is best for an ***application*** to specify persistence, depending on the requirements, rather than relying on the queue definition. The application is preferable because as you discovered, the persistence attribute of the queue can be changed with the application put options.

End of exercise

Exercise review and wrap-up

In this exercise, you learned to create, alter, display, and delete queues that use the IBM WebSphere MQ for z/OS ISPF panels or your selected MQSC interface. You are aware that the persistence specified in an application can override the persistence that is specified in a queue definition.

You also learned to place messages on the queues and use the batch sample programs that are provided by the IBM WebSphere MQ for z/OS product to **GET** or browse the messages.

Appendix A: CSQUTIL for MQSC definitions

You might prefer to use the CSQUTIL batch job to create your IBM MQ object definitions instead of the IBM MQ ISPF MQSC facility at Action 8 of the IBM MQ ISPF panels. If so, you can make a backup of member CSQUTIL in your TSM00##.WM30.SCSQPROC data set and include your commands in line.

```
//COMMAND EXEC PGM=CSQUTIL,PARM='MQ##'
 //STEPLIB   DD DSN=SYS2.MQ8000.SCSQANLE,DISP=SHR
 //          DD DSN=SYS2.MQ8000.SCSQAUTH,DISP=SHR
 //SYSPRINT  DD SYSOUT=*
 //SYSIN     DD *,DCB=BLKSIZE=80
   COMMAND
 /*
 //CSQUCMD   DD *,DCB=BLKSIZE=80
 ALTER QL(CKBATCH) DEFPSIST(NO)
 DIS Q(CKBATCH) ALL
 */
```

Optionally if you prefer to keep a member for each set of definitions, you can create a member for each definition, such as DEF1, user your TSM00##.W30.SCSQPROC PDS and point to your member as shown in the next display.

```
//COMMAND EXEC PGM=CSQUTIL,PARM='MQ##'
//STEPLIB   DD DSN=SYS2.MQ8000.SCSQANLE,DISP=SHR
//          DD DSN=SYS2.MQ8000.SCSQAUTH,DISP=SHR
//SYSPRINT  DD SYSOUT=*
//SYSIN     DD *,DCB=BLKSIZE=80
  COMMAND
/*
//CSQUCMD   DD DSN=TSM00##.WM30.SCSQPROC(DEF1),DISP=SHR
```

Exercise 3. Working with channels

What this exercise is about

This lab covers sending a message from the local queue manager to a remote queue manager, defining required objects, and starting and checking the channels. it also covers how to trigger-start a channel, and how to define a queue manager alias and create a multi-hop definition.

What you should be able to do

After completing this exercise, you should be able to:

- Define transmission queues
- Define sender-receiver channels
- Define remote queues
- Start channels
- Trigger-start channels
- Determine the status of a channel
- Demonstrate how to track the path of a message
- Use the message handler sample to process messages in the dead letter queue
- Define a multi-hopping configuration

Introduction

Working with channels is a critical exercise for obtaining experience in creating connectivity across queue managers.

- After setting up a transmission queue, remote queue, and sender channel from your queue manager to MQ00, you learn how to trigger the same channel.
- You check the channel status and use the queue status commands to learn about use of the queue monitoring attributes.
- A troubleshooting session walks through checking the dead-letter queue header to determine the reason that a message was sent to the dead-letter queue.
- The last part of this exercise shows you how to set up a multi-hoping configuration.
- At the end, you are asked to determine what definitions are needed to be able to reroute the incoming application to a different target queue manager.

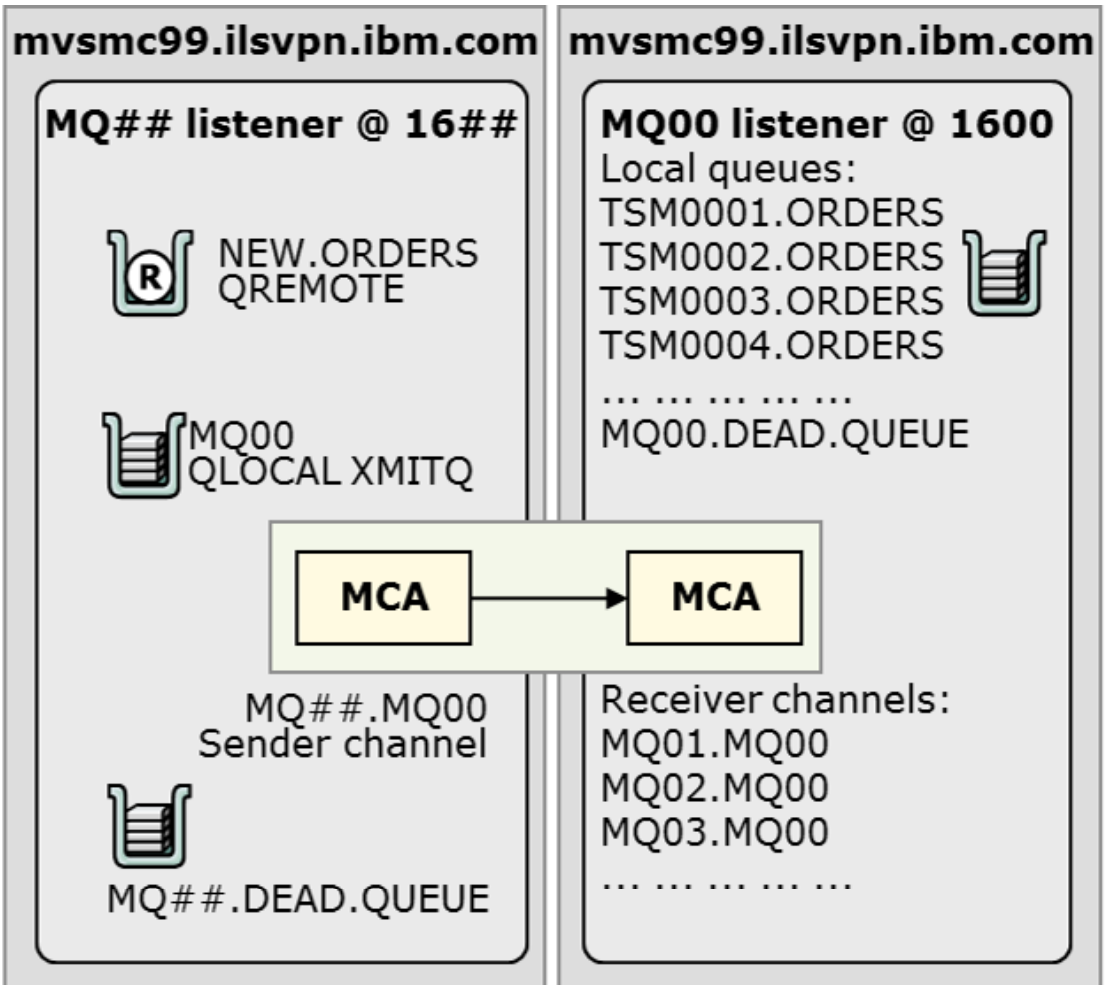
Requirements

- Completion of Exercise 1
- Availability of the MQ00 and MQ0B common course queue managers

Exercise instructions

Preface

You connect your queue manager MQ## to MQ00 with sender-receiver channels. All corresponding IBM MQ objects in the MQ00 queue manager are defined. For the first part of this exercise, you define the transmit queue, sender channel, and remote queue. You already defined your queue manager's dead-letter queue in the first lab.



__ 1. If necessary, log on to the z/OS system with the credentials provided for the first exercise.

__ 2. Confirm that your queue manager is running. Enter `S;DA` in the command prompt to proceed to SDSF.

__ 3. If your queue manager is not running, proceed to start it. See the instructions that are provided in Exercise 1 if you need help starting the queue manager.

__ 4. If your queue manager is running, also check that the channel initiator is running. The channel initiator should be starting automatically after the queue manager starts.

Part 1: Define the objects on the MQ## local source queue manager

__ 5. Start from the IBM MQ ISPF panel option to use commands by entering `=M` at the command prompt.

Important

Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ 6. Enter `8` in the Action field and press the Enter (Ctrl) key.

__ 7. You are now at an edit session for a file called `TSM00##.CSQUTIL.COMMANDS`, where `##` is your team number. This file is input to CSQUTIL, which expects MQSC commands.

Information

Edit this file as you would any PDS member. Remember:

- After you enter the IBM MQ MQSC object definitions:
  - Press PF3 to initiate definition of the object
  - Press PF12 to cancel.
- Your results display in file `TSM00##.CSQUTIL.OUTPUT` automatically upon pressing the PF3 key.
- `TSM00##.CSQUTIL.COMMANDS` and `TSM00##.CSQUTIL.OUTPUT` are overlaid every time that you enter commands, manually remove leftover commands, and select PF3.

__ 8. Create MQSC definitions for the transmit queue, sender channel, and remote queue according to the information in the table.

Important

See the sample definitions in the lecture if you need some help.

In the definition specifications, the IBM MQ object name (queue name or channel name, for example) is given in the table name. The table rows hold the required attributes. For example, the transmit queue definition is entered as `DEF QLOCAL(MQ00) USAGE(XMITQ)` in a single line.

Enter the transmission queue definition with the attributes specified only. Do not add any additional attributes for triggering now. You trigger the channel in a later section of this exercise.

__ 9. First, define the transmission queue that uses the details in Table 1. **Do not press PF3 until you finish entering the transmit queue, channel, and remote queue definitions.**

Table 4: Transmission queue name: MQ00

Attributes	Values
USAGE	XMITQ

__ 10. Define the channel that uses the details in Table 2. Do not press PF3 until you finish entering all definitions. Take care to use quotation marks in the CONNAME attribute as shown in the sample definitions for Unit 3. The corresponding RCVR channel is already defined in MQ00.

Example

```
DEFINE CHL(MQ##.MQ00) CHLTYPE(SDR) TRPTYPE(TCP) +
XMITQ(MQ00) CONNAME('mvsxxxx.ilsvpn.ibm.com(1600)')
```

Ensure that you observe the syntax that is shown for the connection information.

Type all definitions. ***Do not copy definitions to paste them*.** Copied definitions contain invisible special characters and cause errors that are difficult and time consuming to rectify.

Table 5: Sender channel name: MQ##.MQ00 where ## is your team name

Attributes	Values
CHLTYPE	SDR
TRPTYPE	TCP
XMITQ	MQ00
CONNAME	mvsxxxx.ilsvpn.ibm.com(1600) * Confirm the first part of the host name with your instructor

__ 11. Use the details in Table 3 to define the QREMOTE. The corresponding QLOCAL, TSM00##.ORDERS, is already defined on queue manager MQ00.

Table 6: Remote queue name: NEW.ORDERS

Attributes	Values
RNAME	TSM00##.ORDERS where ## is your team number
RQMNAME	MQ00
XMITQ	MQ00

__ 12. Review your definitions.

__ 13. Press the PF3 keys to run CSQUTIL.

__ 14. You are presented with the results of your object definitions in data set TSM00##.CSQUTIL.OUTPUT. Look at the end of the file and check that all three objects were created successfully. You need to check for the items that are listed, *particularly* for the CSQ058I stating “0 failed”.

- The object names created were as expected, and then the results from CSQUTIL:

```
CSQU057I 3 commands read
CSQU058I 3 commands issued and responses received, 0 failed
CSQU144I 3 COMMAND statements executed successfully
```

__ 15. This step is followed ***only if you have errors***. If there are no errors, proceed to the next numbered step. If there are any errors, make the required corrections; go back to the ISPF IBM MQ panel's Action 8. If no errors, proceed to the next numbered stop. Continue in this paragraph ***only*** if you need to make a correction. Some suggestions for corrections are given:

__ a. For the transmission queue: `ALTER QLOCAL(MQ00)` followed by the attribute that needs changing.

__ b. If you misnamed the transmit queue, delete and redefine it:

```
DELETE QLOCAL(MQ00)
```

__ c. To change the remote queue: `ALTER QREMOTE(NEW.ORDERS)` plus the attributes that need changing. You can also use `DELETE QREMOTE` if you need to redefine the QREMOTE.

__ d. To change the sender channel, you must include the channel type in the alter command `ALTER CHANNEL(MQ##.MQ00) CHLTYPE(SDR)` followed by any attributes that need changing. The CHLTYPE attribute is not needed to delete the channel.

__ 16. If no errors, or errors are corrected, ***do not*** start the channel. You are going to make one change so that when the channel starts, it stops in 3 minutes. You perhaps included this specification in the original definition, but it is done separately to provide practice on the syntax that is used to alter a channel.

__ a. Proceed to the ISPF panels; then, select **8** for the `CSQUTIL` command.

__ b. Enter `ALTER CHL(MQ##.MQ00) CHLTYPE(SDR) DISCINT(180)` in the `TSM00##.CSQUTIL.COMMANDS` file.

__ c. Delete any remaining definitions from the `TSM00##.CSQUTIL.COMMANDS` file so that only the `ALTER CHL` command is processed.

__ d. Notice that you entered `CHLTYPE` in the MQSC command. If you attempt this change without the `CHLTYPE` attribute, an error is issued.

__ e. Press PF3 to complete.

__ f. Check the results, making any corrections if needed.

__ g. Repeat steps 16.a through 16.e; but this time, remove `CHLTYPE(SDR)` from the command. Without the `CHLTYPE` attribute, the command fails with message:

```
CSQ9009E MQ## 'CHLTYPE' not specified.
```

Part 2: Put messages in your local remote queue NEW.ORDERS

__ 17. Edit member `JCLPUT` in data set `TSM00##.WM30.SCSQPROC` where `##` is your team number.

__ 18. Make the global change for `MQ##` to have the name of your queue manager.

Information

The parameters that are entered are positional. The PARM line is reproduced as a comment in case you overwrite it and concatenate the parameters; however, they are also documented in the JCL.

- The first parameter is the queue manager: `MQ##` where `##` is your team number.
- The next parameter is the name of your locally defined queue; for this exercise, it is the remote queue called NEW.ORDERS.
- 0003 as shown is the number of messages to write. Do not write more than three.
- The next position, where there is a “1”, is the character that will be used as all the text of the message.
- Next to last is the size of the message; here it is 100. That means that your message is going to be made up of 100 1’s. It is suggested that you change this character with every different exercise to better determine what message you look at later.
- The last parameter is persistence, which for this exercise is persistent.

__ 19. Change the PARM record in your JCL to look as shown. Take care to observe proper syntax and include the quotation marks and parentheses as noted.

```
PARM=('MQ## NEW.ORDERS 0003 1 0100 P')
```

__ 20. Submit the JCLPUT job by entering `SUB` in the command line.

__ 21. Check whether the job ran successfully. Enter `=S;ST` in the command line to go to the SDSF job list. Select your MQ##JPUT job and check results.

__ 22. Make any corrections if needed, and resubmit.

Questions

Where are the messages?

__ 23. QREMOTE queues do not hold messages. Messages that are put to a QREMOTE are placed in the transmission queue that is associated with the QREMOTE until the channel picks them up and sends them to the remote queue manager. Check how many messages are in the transmission queue that you defined.

__ a. Proceed to the SDSF system log by typing `=S;log` and pressing the Enter (Ctrl) key.

__ b. In the command line, type:

```
/MQ## dis q(MQ00) CURDEPTH
```

__ 24. If you did not start the channel, you should have three messages in the transmission queue. If you did not start the channel and your messages are not in the transmission queue, check your QREMOTE definitions and your JCLPUT parameters. Make any necessary corrections, and resubmit the JCLPUT job.

__ 25. Start the channel.

__ a. Go to SDSF by entering `=S;log` in the command prompt and pressing the Enter (Ctrl) key.

__ b. Type: `/MQ## START CHL(MQ##.MQ00)`

__ 26. Type `M` in the command line, and then press PF8 to scroll to the bottom of the system log to see the results. If your channel started, move to the next section before the channel ends.

Important

There are several students with different queue managers that are working simultaneously.

Confirm your channel name when you check the response to the START command in the system log.

A successful response should display:

```
CSQM134I MQ## CSQMSCHL  START CHL(MQ##.MQ00) COMMAND ACCEPTED
+CSQX500I MQ## CSQXRCTL Channel MQ##.MQ00 started
+CSQX500I MQ00 CSQXRESP Channel MQ##.MQ00 started 266
connection 10.31.187.60
CSQ9022I MQ## CSQXCRPS ' START CHL' NORMAL COMPLETION
```

Section 3: Check the channel status

__ 27. You should be in the SDSF log view. If you moved away, return by entering `=S;log` from the command prompt.

__ 28. Display the full channel status by entering:

```
/MQ## DIS CHS(MQ##.MQ00) ALL
```

__ 29. ***If you waited longer than the 3-minute disconnect interval between the time that the channel started and the time you entered this command***, it means that the channel ended normally and went into INACTIVE state. There is no CURRENT status, and the response to the command is:

```
CSQM297I MQ## CSQMDRTC NO CHSTATUS FOUND MATCHING REQUEST CRITERIA
```

__ 30. If you see the CSQM2971I message, you can retrieve the SAVED status; that is, the information kept for the channel before it stopped, by typing:

```
/MQ## DIS CHS(MQ##.MQ00) SAVED ALL
```

Note

If you did not lower the channel DISCINT attribute value earlier, you might not see the SAVED status because the channel is still running.

__ 31. If you received a SAVED status display:

__ a. Review the fields LSTSEQNO and CURSEQNO. These fields represent the number of messages that the MCA tracks between the sending and receiving end of the channel.

__ b. Restart the channel.

__ 32. ***If you entered the request to display the channel before the end of the disconnect interval, or if you just restarted the channel***, you should see:

```
MQ## DIS CHS(MQ##.MQ00)
CSQM293I MQ## CSQMDRTC 1 CHSTATUS FOUND MATCHING REQUEST CRITERIA
CSQM201I MQ## CSQMDRTC  DIS CHSTATUS DETAILS 311
CHSTATUS(MQ##.MQ00)
XMITQ(MQ00)
... ... ... ... ...
CURRENT
CHLTYPE(SDR)
STATUS(RUNNING)
SUBSTATE(MQGET)
... ... ... ... ...
RQMNAME(MQ00)
END CHSTATUS DETAILS
```

This information includes:

- The most commonly checked detail is the channel status, which shows “RUNNING”.
- The SUBSTATE is MQGET. The channel is ready to get messages from the transmission queue.
- The transmission queue name that is used by the channel is shown next to the XMITQ attribute label.
- The remote queue manager name, or RQMNAME, is also displayed.

Section 4: Confirm that the messages arrived at the target queue

The fact that the channel started does not guarantee that the messages arrived at the intended queue. For this check, you assume that only this application puts to the queue, and these messages are the first ones that are expected to arrive, so there should be three messages in the TSM00##.ORDERS queue.

__ 33. Proceed to SDSF by entering `=s;log` and pressing the Enter (Ctrl) key.

__ 34. Display the number of messages in the target queue by using the command that is provided. Take care to use `/MQ00` as the CPF string.

```
/MQ00 DIS Q(TSM00##.ORDERS) CURDEPTH
```

You should see three messages in the CURDEPTH field of the queue display. If you do not see three messages and the messages are not in the transmission queue, request assistance.

Section 5: Trigger the channel and retest

To trigger-start the channel, you alter the transmission queue.

__ 35. Use the attributes in the table to edit the MQ00 transmission queue.

Table 7: Changes to MQ00 QLOCAL to trigger channel

Attribute	Value
TRIGGER	n/a, stand-alone; it is either TRIGGER or NOTRIGGER
INITQ	SYSTEM.CHANNEL.INITQ
TRIGDATA	MQ##.MQ00

Hint

The command that is entered by using IBM MQ ISPF MQSC option 8 is:

```
ALTER QLOCAL(MQ00) TRIGGER INITQ(SYSTEM.CHANNEL.INITQ) + TRIGDATA(MQ##.MQ00)
```

__ 36. Display the status of your channel by using the instructions that were provided earlier in this exercise with `DIS CHS`. Optionally, you can browse the system log for message `CSQX501I` for your channel, stating that the channel is no longer active. The channel should end normally and enter the INACTIVE state. You should see a message that states that there is no channel status available. **Do not start the channel manually**. If the channel is still running, wait a couple of minutes for the disconnect interval to cause the channel to stop. ***Do NOT issue a stop to speed it up***. If you issue a stop, then the channel requires a manual START command before triggering works.

__ 37. After you confirm that the channel is ***not running, and is not in STOPPED state***, resubmit the JCLPUT job by using the same parameters as in Section 2. If you need help resubmitting the job, look at the instructions in Section 2, but do the steps to submit the JCL ***only***.

__ 38. Your channel should be trigger-started when the messages are sent. Go to SDSF to check the messages in the log by entering `=s;log` in the command prompt. Be careful to check for the reply for ***your team's*** queue manager only.

__ 39. Check that the transmission queue is empty, and you have three more messages in the target queue. If you need help checking these results, use the instructions in the earlier steps if necessary.

Note

You use the MQ00 transmission queue and the MQ##.MQ00 channel in other sections and exercises. Keep these definitions in your queue manager.

Section 6: What to do if the messages were not found

In this section of the exercise, you might encounter a situation where a message is "lost" and then you learn how:

- To review queue statistics to determine the time that a message was placed or retrieved from queue
- To check the dead-letter queue and find the reason code by using message handler sample program in ISPF

You have a triggered channel. What is triggered is the transmission queue, but it is customary to refer to it as a triggered channel. It is not necessary to manually start this channel since it auto-starts, if needed, upon arrival of messages in the transmit queue. The channel should pick up messages that are put to a local remote queue and use the same transmission queue as the channel, and they are sent to the remote queue manager. You use a new remote queue to repeat the test that is done in the earlier section, but first, set up the queue manager to collect monitoring information.

__ 40. Go to the SDSF panels by entering `=s;log` from the command line and pressing the Enter (Ctrl) key.

__ 41. Change your queue manager to allow collection of monitoring data for queues. From SDSF, type:

```
/MQ## ALTER QMGR MONQ(LOW)
```

__ 42. Verify that the MONQ attribute of the MQ00 transmission queue is set up to collect statistics if the queue manager is enabled to collect statistics. Confirm by entering:

```
/MQ## DIS Q(MQ00) MONQ
```

__ 43. If the response shows "`MONQ(QMGR)`", proceed with the next step. If the response does not show QMGR, alter the queue so that `QMGR` is the `MONQ` attribute. The fastest way is to enter the command in the SDSF log:

```
ALTER QL(MQ00) MONQ(QMGR)
```

__ 44. Create a new remote queue that also uses the MQ00 transmit queue. If the queue is defined with the specifications provided in the table, you can use the method that you prefer to create the queue.

Table 8: Remote queue name: RUSH.PROJECTS

Attribute	Value
XMITQ	MQ00
RNAME	TSM00##.RUSH.REQUEST where ## is your team name
RQMNAME	MQ00

__ 45. If not already done, edit member JCLPUT in data set `TSM00##.WM30.SCSQPROC` where `##` is your team number and make the global change for `MQ##` to have the name of your queue manager.

__ 46. Change the PARM to put to the new RUSH.PROJECTS remote queue. Change the content of your message to 2. Take care to spell the queue name correctly to match the name of the remote queue you created.

```
PARM='MQ## RUSH.PROJECTS 0003 2 0100 P'
```

__ 47. Submit the JCLPUT job and check for a good completion on the SDSF ST panel.

__ 48. You now check that your channel started when the messages got to the transmission queue. Proceed to the SDSF log by entering `log` at the command prompt and press Enter (Ctrl).

__ 49. Scroll to the bottom of the system log and look to ensure that your channel is starting. Remember to check for your queue manager name and channel name since several people are doing the same task. You should see the following message for your queue manager and channel:

```
+CSQX500I MQ## CSQXRCTL Channel MQ##.MQ00 started
```

Note

It is possible that you might discover what happened in the system log prematurely. However, for purposes of the work in this exercise, pretend that you did not see this information and continue the steps in this exercise.

__ 50. For purposes of this lab, you assume that the messages did not arrive at the remote queue TSM00##.RUSH.REQUEST queue. You do some checking on your queue manager, MQ##.

__ a. Go to the output of your JCLPUT job and confirm the date-time stamp the job completed. Write it down to compare it to the QSTATUS time stamps. _____

__ b. Now issue the DIS QSTATUS command and compare the last time that a message was placed or retrieved from transmission queue MQ00.

```
/MQ## DIS QSTATUS(MQ00)
```

Warning

The approach of checking MONQ fields works well in a low-traffic environment. If you are in an environment where this transmit queue is heavily used, the MONQ information is not as meaningful because several applications might be putting messages to the queue. However, in most testing environments, volume is low enough that the time stamps do relate to recent testing.

QSTATUS results are (sample):

```
QSTATUS(MQ00) ===> The name of the queue
TYPE(QUEUE)
OPPROCS(1) ===>IPPROCS and OPPROCS are the number of open input and output handles.
These values both show 1 because the channel is still running. If you run the DIS QSTATUS
after the channel's disconnect interval expires, they show zero.
IPPROCS(1)
CURDEPTH(0) ===> The number of messages currently on the queue
... ... ...
MONQ(LOW) ===> Notice how this attribute now picked up the queue manager setting
QTIME(14441456,44719597)
MSGAGE(0)
```



```
LPUTDATE(2014-11-14) <=== Last put date
LPUTTIME(15.11.33) <=== Last put time
LGETDATE(2014-11-14) <=== The date that the channel sent the last message
LGETTIME(15.11.33) <=== The time that the channel sent the last message
```

So, if LGETDATE and LGETTIME match the time that your JCLPUT job ran, you know that the message went to the remote queue manager.

__ 51. Confirm that there are no messages in the target queue in MQ00 by displaying the queue contents. From the SDSF log panel command prompt, type:

```
/MQ00 DIS Q(TSM00##.RUSH.REQUEST) CURDEPTH
```

__ 52. The CURDEPTH indicates zero, so messages did not arrive. What is the other location in queue manager MQ00 where the message might be placed?

Section 7: Using the message handler sample to work with messages in the dead-letter queue

__ 53. Check the contents of the MQ00.DEAD.QUEUE. Use the message handler sample program available from ISPF option “H” in the lab environment.

__ a. From the command line, enter `H` and press Enter (Ctrl).

__ b. Enter `MQ00` for the queue manager name

__ c. Enter `MQ00.DEAD.QUEUE` for the queue name

__ d. Press the Enter (Ctrl) key.

__ 54. Search the fields in the message handler screen for the User Identifier heading, and look for messages for your user ID, TSM00##.

__ 55. In the Message Number field, enter the most current message number that matches your user ID, and press the Enter (Ctrl) key. You see the message that starts with the formatted MQMD header.

__ 56. Scroll down using PF8 until you see the dead-letter header. You see the DLH structure ID identifier, followed by:

__ a. Reason: You need to check this return code to determine why the message was put on the dead-letter queue.

__ b. DestQName: Name of the intended target queue.

__ c. DestQMgrName: Name of the intended target queue manager.

__ 57. You see that the reason code is 2051. Under normal work situations, you look up the meaning of this code in the IBM MQ Knowledge Center. In the lab, you might go to the Administration Guide in your desktop, search the document for “reason codes”, and then find 2051. In the interest of time, detail of the 2051 is provided here:

```
2051 (0803) (RC2051): MQRC_PUT_INHIBITED.
```

__ 58. You double check the target queue definitionTSM00##.RUSH.REQUEST in queue manager MQ00 to determine whether the queue is put disabled. The fastest way is to use the SDSF log console to check the queue's PUT attribute:

```
/MQ00 DIS Q(TSM00##.RUSH*) PUT
```

__ 59. Display returns confirming that the queue is indeed `PUT(DISABLED)`.

Under most situations, you do not have access or authority to alter remote objects. Therefore, it is likely that some of this work is done in a chat screen or phone call to the remote IBM MQ administrator. Altering the remote queue to be `PUT(ENABLED)` resolves the problem, but for the purposes of this section, it is not necessary or possible due to current permissions to change it.

Information

What if you wanted to remove the message from the dead-letter queue, or forward it (if possible) to another queue manager? You can use the message handler sample if the forwarding destination for the dead-letter queue message is within reach of the message handler. If you needed to send the message across queue managers, you would need channels, or have the receiving queue be clustered, all depending on the situation.

When you forward a message from the dead-letter queue to another queue that uses the message handler sample, the dead-letter header is removed.

If you need to move several messages across queue managers, you can download the MA01 support pack, also known as the Q utility for this purpose. Adequate connectivity is also needed if moving across a remote queue manager.

Section 8: Set up a multi-hopping configuration

This exercise walks through and partially completes the setup that is required to do multi-hopping across queue managers. You review the configuration for MQ00 and MQ0B, and complete MQ##. For this scenario, assume that there is no cluster in place as you do not use the cluster. The scenario is:

- You receive a request to set up connectivity that uses an interim concentrator queue manager. The target queue manager needs to respond to frequent changes. Therefore, to respond to business needs, you must to be able to switch target queue managers often between MQ0A and MQ0B. ***MQ0B must be set up first, and MQ0A later***.
- MQ0A and MQ0B both contain the same TSM00##.NOMAD queues. These queues are ***not*** clustered.
- The originating queue manager is MQ##.
- The concentrator queue manager where all messages pass through to be routed to the correct queue manager (MQ0A or MQ0B) is MQ00.
- In summary to the requirements, the path is: `MQ##` => `MQ00` => (`MQ0B` or `MQ0A`)
- You completed the MQ00 and MQ0B configuration as detailed in the tables; these definitions are already done. You need to complete the MQ## configuration.

__ 60. Review the configuration ***that is already completed*** for MQ00 and MQ0B detailed in the MQ00-MQ0B table. Remember, this scenario ***does not use*** any cluster components:

Table 9: MQ00-MQ0B Table

MQ00 definitions	MQ0B definitions
MQ##.MQ00 RCVR channel DEF QREMOTE(FREQ.CHANGED.QMGR) + RQMNAME(MQ0B) **<===** *queue manager alias that points to MQ0B* ***Previously defined*** DEF QLOCAL(MQ0B) USAGE(XMITQ) + TRIGGER + TRIGDATA(MQ00.MQ0B) + INITQ(SYSTEM.CHANNEL.INITQ) DEF CHL(MQ00.MQ0B) CHLTYPE(SDR) + TRPTYPE(TCP) XMITQ(MQ0B) + CONNAME ('mvsmcxx.ilsvpn.ibm.com(1622)')	DEF CHL(MQ00.MQ0B) CHLTYPE(RCVR) + TRPTYPE(TCP) DEF QL(TSM00##.NOMAD)

__ a. For MQ00:

- Receiver channels for MQ##.MQ00 were previously defined.
- The queue manager alias FREQ.CHANGED.QMGR uses a QREMOTE object for its definition. Since the requirement is to use MQ0B first, the queue manager alias is pointed to MQ0B.
- Sender channel MQ00.MQ0B is defined.
- There is a transmission queue for MQ0B defined, and it is set up to trigger the MQ00.MQ0B channel.

__ b. For MQ0B:

- The MQ00.MQ0B receiver channel is defined.
- The target local queue, TSM00##.NOMAD, is defined.

__ 61. Set up the required MQ## originating queue manager definitions to complete the multi-hop scenario. Use the ISPF MQ panels MQSC command option to define the objects that are listed in the MQ## table:

Table 10: MQ## Table

MQ## definitions
`MQ00 transmission queue:` ***Previously defined***
`MQ##.MQ00 sender channel:` ***Previously defined***

`DEF QREMOTE(CRITICAL.SALES.NOMAD)+`
`RQMNAME(FREQ.CHANGED.QMR) +`
`XMITQ(MQ00) RNAME(TSM00##.NOMAD)`

__ 62. After completing the missing definitions, use the JCLPUT job at TSM00##.WM30.SCSQPROC to test the multi-hop configuration. Change the PARM record as detailed to put three messages to the CRITICAL.SALES.NOMAD queue.

```
PARM=('MQ## CRITICAL.SALES.NOMAD 0003 N 0100 P')
```

__ 63. Since TSM00##.NOMAD is a new queue, there should be only the three messages. Check the message count from the system log. Type `=s;log` at the command prompt and press the Enter (Ctrl) key.

__ 64. Enter the command to display the queue depth from queue manager MQ0B:

```
/MQ0B dis q(TSM00##.NOMAD) CURDEPTH
```

__ 65. If you see three messages, proceed to the next step. If there are no messages, review your configuration, make any needed corrections, and resubmit the test before proceeding.

__ 66. Remember, the application must also be able to point to the MQ0A queue manager. As configured, ***no changes are needed to MQ## when switching queue managers***. The application continues to use the CRITICAL.SALES.NOMAD remote queue as defined.

Important

For the remainder of this exercise, you do not do any additional configuration in any of the queue managers; however, you document what definitions are needed to switch to MQ0A.

__ 67. In this last step, you document the definitions, and changes that are needed to be able to switch to have messages that are placed on the CRITICAL.SALES.NOMAD queue point to MQ0A. In this way, the application can use the newest business changes that are implemented in the new server. Indicate what you need to do. Each line contains an action on an IBM MQ object. The lines are prefixed with the name of the queue manager where the change or addition is needed.

__ a. On MQ00: _____

__ b. On MQ00:_____

__ c. On MQ00: _____

__ d. On MQ0A: _____

__ e. On MQ0A: _____

Information

The significance of this configuration is the flexibility to be able to switch the target queue managers. This situation occurs frequently when an organization is either applying maintenance to a server, or updating functions in an application.

There are alternatives to the method of switching queue managers that is used in the exercise, such as:

- A similar result might be obtained with two clustered queue managers and clustered queues by using the SUSPEND queue manager command to notify the cluster to stop sending messages to one of the queue managers. As a follow-up, you might review the SUSPEND QMGR command in the IBM MQ Knowledge Center. SUSPEND QMGR has some z/OS-specific variations.
- In addition, an alternative method is to use a queue manager alias for the CRITICAL.SALES.NOMAD queue, and have it point to different QREMOTE queues.

End of exercise

Exercise review and wrap-up

In this exercise, you:

- Defined a transmission queue, sender channel, and remote queue
- Used the sample put programs to put three messages to your local remote queue
- Did not start the channel so you were able to see how the messages stopped in the transmission queue
- Altered the channel before you started it, and then lowered the disconnect interval so the channel stopped 3 minutes after it was started
- Started the channel and confirmed that the messages flowed to the remote MQ00 queue manager and arrived at the target queue, TSM00##.ORDERS
- Checked the channel status
- Implemented changes to trigger-start the channel
- Observed how the channel auto-started in the system log
- Did some troubleshooting to determine why the message did not arrive to its target queue, consisting of using the message handler tool to search for your lost message in the dead-letter queue
- After your message was found, browsed the dead-letter queue header, extracted the reason code, and discovered why the message went to the dead-letter queue
- Used the message handler utility to forward messages from the dead-letter queue to another queue
- Reviewed and completed configuration of a multi-hop connection setup that uses a queue manager alias

Answers to questions in the multi-hopping exercise

__ a. On MQ00: Define the MQ0A transmission queue so the MQ00.MQ0A channel is triggered.

__ b. On MQ00:Define sender channel MQ00.MQ0A

__ c. On MQ00:Change (ALTER) queue manager alias (QREMOTE) FREQ.CHANGED.QMGR so that it points to MQ0A, that is, the RQMNAME attribute is set to MQ0A.

__ d. On MQ0A: Define receiver channel MQ00.MQ0A

__ e. On MQ0A: Define local queue TSM00##.NOMAD

__ f. No changes are required to MQ##. Avoiding application changes is a key point of this configuration.

Exercise 4. Working with IBM MQ clients

What this exercise is about

This exercise explores how to configure IBM MQ client connectivity with a Client Channel Definition Table (CCDT) and with an MQSERVER variable.

What you should be able to do

After completing this exercise, you should be able to:

- Use the IBM MQ V8 client side **runmqsc** command to configure a client channel definition table (CCDT) on the client side
- Define a client connection to a queue manager with the MQSERVER variable
- Use sample IBM MQ client programs to place messages in an IBM MQ server queue
- Configure IBM MQ Explorer to administer your queue manager, and browse the MQ00, MQ0A, and MQ0B queue managers

Introduction

In this exercise, you become familiar with setting up communications between the server SVRCONN and the distributed platform IBM MQ client. For IBM MQ V8, administrators no longer use the CSQUTIL MAKECLNT to create the client connection table (CCDT) and download the CCDT, they now must use the runmqsc -n command at the client side; CCDT is no longer downloaded from the IBM MQ server for IBM MQ V8 and newer. You also learn about precedence between the CCDT and MQSERVER variables.

The CCDT and MQSERVER variable is used later in the security lab to test the CHLAUTH rules that you create in your z/OS queue manager to allow the client connections.

Requirements

- A configured z/OS queue manager and channel initiator, which are obtained through completion of Exercise 1.
- IBM MQ Client V8 in VMware image.
- Access to the course common queue manager MQ00, MQ0A, and MQ0B.

Exercise instructions

Preface

Although this course focuses on the z/OS platform, sometimes an IBM MQ for z/OS administrator needs to work with client applications. The administrator must be able to set up and administer the z/OS queue manager side of the connection. In this exercise, you define the SVRCONN channels in your z/OS queue manager, and also create the CCDT in a Windows IBM MQ client. The IBM MQ Windows client is used to test connecting to your z/OS queue manager. By using it you can observe, in the z/OS log, how the SVRCONN channel starts when the IBM MQ client application initiates the connection.

In IBM MQ versions earlier than V8, the CCDT was assembled in the z/OS queue manager by using the MAKECLNT option of CSQUTIL, and then downloaded to the client. With IBM MQ V8 for z/OS and later, MAKECLNT supports only IBM MQ versions *older than V8*, so you must use the `runmqsc -n` option in the client side to create the CCDT.

After you establish the client connection and basic tests to your queue manager, you configure IBM MQ Explorer to be able to view IBM MQ details in the predefined course queue managers.

__ 1. If necessary, log on to the z/OS system with the credentials provided for the first exercise.

__ 2. Confirm that your queue manager is running. Enter `S;DA` in the command prompt to proceed to SDSF.

__ 3. If your queue manager is not running, proceed to start it. See the instructions provided in Exercise 1 if you need help starting the queue manager.

__ 4. If your queue manager is running, also check that the channel initiator is running. The channel initiator should be starting automatically after the queue manager starts.

Section 1: Create the server connection (SVRCONN) channel in your queue manager

__ 5. Proceed to the ISPF panels IBM MQ MQSC command option by entering `=M` in the command prompt.

Important

Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ 6. Enter an 8 in the Action field and press the Enter (Ctrl) key.

__ 7. Create a new local queue called PRICE.CL. Go to the SDSF panels and enter:

```
/MQ## DEF QL(PRICE.CL)
```

__ 8. Make sure that the queue was defined by displaying it. From the same SDSF panel, enter:

```
/MQ## DIS Q(PR*)
```

__ 9. Use the attributes that are detailed in the table to define an SVRCONN channel named TSM00##.SVRCONN where ## is your team number. An example of the MQSC entry is:

```
DEF CHL(TSM00##.SVRCONN) CHLTYPE(SVRCONN) TRPTYPE(TCP) +
MCAUSER('TSM00##')
```

Table 11: SVRCONN Name: TSM00##.SVRCONN

Attributes	Values
Channel type (CHLTYPE)	SVRCONN
Transport type (TRPTYPE)	TCP
ID (MCAUSER)	TSM00## where ## is your team number

__ 10. Confirm that the definition was created correctly. If needed, make any corrections.

Section 2: Create the CCDT in the client

__ 11. Go to your VMware desktop.

__ 12. Open a command prompt. On your desktop, locate the Windows Command Prompt icon in the taskbar at the bottom of the screen and select it.

__ 13. Proceed to the C: directory. Enter C:\ at the command prompt and press the Enter key.

__ 14. You update file EX4_CLNTCONN.mqsc. At the command prompt, enter:

```
notepad Ex4_CLNTCONN.mqsc
```

__ 15. Make the following changes:

__ a. Change all occurrences of ## to your team name

__ b. Change the ++++++++ string in the first node of the host name to your classroom server name provided at the start of the class.

__ c. Save the file by clicking **File > Save**.

__ 16. From the same directory, run the CLNTCONN definition by using the client-only version of the distributed MQSC utility, runmqsc, exactly as shown. This command uses the file that you updated as input to the MQSC utility.

```
runmqsc -n < Ex4_CLNTCONN.mqsc
```

__ 17. Your results should look similar to the results shown on this step; in particular, look for the AMQ8014: WebSphere MQ channel created message. If there are any problems, correct them before proceeding.

```
C:\>runmqsc -n < Ex4_CLNTCONN.mqsc
5724-H72 (C) Copyright IBM Corp. 1994, 2014.
Starting local MQSC for 'AMQCLCHL.TAB'
....
1 : DEFINE CHANNEL('TSM00##.SVRCONN') CHLTYPE(CLNTCONN) +
:        TRPTYPE(TCP) +
:        CONNAME('mvsmc12.ilsvpn.ibm.com(16##)')
AMQ8014: WebSphere MQ channel created.
No commands have a syntax error.
```


__ 18. Display your definition. From the same windows command prompt:

__ a. Invoke the client command processor by typing `runmqsc -n` from your Windows command prompt.

__ b. Display all existing channel definitions, although you expect only one, by typing:

```
DIS CHL(*) ALL
```

__ 19. Make sure that the definitions are as expected.

Warning

Do ***not*** edit the AMQLCHL.TAB file. If you need to change anything in your CLNTCONN channel:

- Return to your Windows command prompt and enter: `runmqsc -n`
- Use MQSC commands to make the changes – `ALTER`, `DISPLAY`, or `DELETE` – and repeat the `DEFINE` if needed.

You do not start this channel. It is started when you run the client application.

Section 3: Test the client channel definitions

Distributed platform clients have sample test programs. The program that you use is called amqsputc, and the “c” at the end indicates that this version is the IBM MQ client version of this program. amqsputc is started by supplying the queue name where you need to put messages in the z/OS queue manager. Earlier you created queue PRICE.CL, which you use for this test. When running amqsputc, the application provides you the prompt *Sample AMQSPUT0 start* when it successfully connects and finds the PRICE.CL queue in your queue manager. Each line that you enter is a message. Enter a blank line to end.

__ 20. From the windows command prompt, start the amqsputc test program and put three messages to the PRICE.CL queue:

__ a. Type `amqsputc PRICE.CL` and press the Enter key.

__ b. You should get the `Sample AMQSPUT0 start` prompt. If you get an error message instead, make any needed corrections.

__ c. After the `Sample AMQSPUT0 start` prompt type a short test string, such as “Message from TSM00## client” press the enter key.

__ d. Type two more test strings, each followed by the Enter key.

__ e. Press the Enter key without entering any text. After a brief pause, amqsputc should acknowledge it is ending by displaying `Sample AMQSPUT0` end.

__ 21. Return to the z/OS SDSF log. From the z/OS command line, enter: `=s;log`

__ 22. You should see a message that indicates that your client channel started, and you see the channel end after `amqsputc` ends. The output should look similar to:

```
+CSQX511I MQ## CSQXRESP Channel TSM00##.SVRCONN started connection
10.4.127.184.
```

If you do not see a message in the z/OS system log, and you do not see the PRICE.CL queue depth increase, there are two possible reasons. Either the IBM MQ client cannot find the AMQCLCHL.TAB, or there is an error in the CLNTCONN or SVRCONN definitions.

Section 4: Use the MQSERVER environment variable to send messages to the MQ## server queue manager

__ 23. Proceed to the ISPF IBM MQ panel MQSC command facility. At the command prompt, type `=m` and press the Enter (Ctrl) key.

__ 24. Make sure the ISPF IBM MQ main menu is set up to use your team's queue manager.

__ 25. Type `8` in the Action field and press the Enter (Ctrl) key.

__ 26. At the MQSC command input file, discard any leftover definitions and define a new SVRCONN channel as detailed:

Table 12: SVRCONN channel name: TSM00##.MQSERVER

Attribute	Value
Channel type (CHLTYPE)	SVRCONN
Transport type (TRPTYPE)	TCP
User ID (MCAUSER)	TSM00## where ## is your team number

Example

```
DEF CHL(TSM00##.MQSERVER) CHLTYPE(SVRCONN) TRPTYPE(TCP) + MCAUSER(TSM00##)
```

__ 27. After you press PF3 to create the SVRCONN definition, check the results and if needed make any corrections.

__ 28. Return to the system log by entering `=s;log` at the command prompt and pressing the Enter (Ctrl) key. Keep this window open.

__ 29. Return to your VMware command prompt and set the MQSERVER environment variable as shown, making necessary changes for your team number and the host name. You can optionally edit file C\:Ex4_setMQSERVER.txt; copy and paste the command:

```
set MQSERVER=TSM00##.MQSERVER/TCP/+++++++.ilsvpn.ibm.com(16##)
```

where the first field is the SVRCONN channel name, the second field is hardcoded TCP, and last is the connection parameters for the queue manager.

__ 30. There should not be any errors that result from the set MQSERVER. If any errors displayed, correct and reissue the set MQSERVER.

Important

Make sure that the channel name portion of the MQSERVER variable matches the name of the SVRCONN channel exactly

__ 31. From your Windows command prompt, put another message to the PRICE.CL queue by typing: `amqsputc PRICE.CL`

__ 32. If the amqsputc resulted in any errors, look up the error number and make any needed corrections.

__ 33. After a successful amqsputc, scroll to the bottom of your z/OS system log. What channel was used for the amqsputc now?

You should see the SVRCONN channel that you defined for the MQSERVER variable, TSM00##.MQSVR in use now, demonstrating the search order for the client connections.

Information

The MQSERVER variable takes precedence over the CCDT if the application does not have the connectivity information included in its code. If your connection shows up at the z/OS system log as TSM00##.MQSERVER, your MQSERVER environment variable setting is taking precedence over the CCDT.

If you want to revert to using the CCDT, reset the MQSERVER variable by entering:

```
set MQSERVER=
```

in your Windows command prompt, and repeating the amqsputc. If you looked at the z/OS system log, the client would be back to using the CCDT, that is, connecting to channel TSM00##.SVRCONN.

Section 5: Configure IBM MQ Explorer to administer to your queue manager

IBM MQ Explorer provides a flexible option to administer your queue manager. While some administrators prefer the command line, IBM MQ Explorer offers orderly views of not only channels and queues and their status, but also provides organized displays of clusters, publish/subscribe details, and file transfers.

The IBM MQ Explorer configuration does not use the CCDT; it is ***not*** necessary to configure the CCDT table to use IBM MQ Explorer.

__ 34. Locate the IBM MQ Explorer icon on your desktop and double-click. When the application opens, you see the MQ Explorer - Navigator section on the upper left. There are two entries below the Navigator heading: IBM WebSphere MQ and Queue Managers.

__ 35. Right-click Queue Managers, and select the Add Remote Queue Manager option. The Add Queue Manager wizard presents the first of a series of panels. Use the information on the table to configure the connection to your queue manager. You enter the first two panels of the Add Queue Manager wizard:

Table 13: MQ## IBM MQ Explorer queue manager details

IBM MQ Explorer panel number and field	Value
First panel	
Queue manager name	`MQ##` where `##` is your team number
Second panel	
Connection Details	Host name `++++++++.ilsvpn.ibm.com`
Port number	`16##` where `##` is your team number
Server-connection channel	`TSM00##.SVRCONN` where `##` is your team number

__ 36. After completing the second panel, press **Finish** at the lower right of your screen.

__ 37. After a few moments, either the Add Queue Manager wizard disappears and you see your queue manager surface under the Queue Managers heading of IBM MQ Explorer, or you are presented with an error message.

__ 38. If you received an error message, reply 'No' to adding the queue manager to IBM MQ Explorer and correct the problem. Most errors occur due to an error in the connection information.

__ 39. When your queue manager displays in IBM MQ Explorer, return to the z/OS system log and scroll to the bottom. You should see your client channel start again.

__ 40. Return to IBM MQ Explorer. Under your queue manager name, expand the twistie next to the Queue Manager name and select Channels. Scroll down until you find your client channel, TSM00##.SVRCONN. Notice that the channel is running.

__ 41. Under your queue manager name, select the **Queues** menu. Scroll down until you find a group of queues that are prefixed with SYSTEM.COMMAND.REPLY.++++. These queues are dynamic queues that are used by the IBM MQ Explorer application to exchange between the queue manager and your IBM MQ Explorer client session. If you do not see any SYSTEM.* named queues, review the Hint paragraph next in this lab.

Hint

If you cannot see any SYSTEM.* prefixed queues, locate the icons on the upper right of your IBM MQ Explorer session. The leftmost icon is a toggle switch to display or hide system objects. Move your cursor over this leftmost icon and confirm that it displays "Show System Objects". After you locate this toggle switch, click it. You should now find your SYSTEM.* prefixed objects.

__ a. Double-click one of the queues that are prefixed with `SYSTEM.COMMAND.REPLY.*`. On the Navigator pane of the queue display, select **Extended**. On the right content pane, labeled **Extended display**, look for the definition type, about midway in the display. Notice how this queue is a permanent dynamic queue that is used by the IBM MQ Explorer application.

__ b. Place the cursor on your queue manager's dead-letter queue, MQ##.DEAD.QUEUE and scroll to the right by sliding the scroll bar in the bottom of the queue display. Are there any messages on the dead-letter queue?

__ c. In the same Queues section, locate your PRICE.CL queue and right-click over the queue name. Select Browse Messages.

__ d. After the **Browse operation in progress** dialog box disappears, you are presented with a list of messages in the queue. Double-click one of the messages. Look at the different sections of the formatted MQMD. Select Data, and you see the message that you entered in the client side.

__ e. Select **Close** at the lower right of the message properties panel.

__ f. Select **Close** at the lower right of the message browser panel.

__ g. Still on the PRICE.CL queue, right-click and select **Put Test Message**. Enter `Data from IBM MQ Explorer` in the Message data field, and press the Put message at the lower right of the panel.

Warning

Wait a few moments. This panel can take a few seconds to return and might appear as if nothing is happening. When the put completes, the message data disappears from the put message panel.

__ h. As soon as the Message data field comes back blank, select **Close** at the lower right of the Put messages panel.

__ i. Return to the Queue Managers column of IBM MQ Explorer.

Section 6: Add the three common course queue managers to IBM MQ Explorer

This course uses three queue managers. You already worked with MQ00 in the distributed queuing lab. The IBM MQ Clusters lab uses two other queue managers, MQ0A and MQ0B. Although most work in the IBM MQ Clusters lab is done in the z/OS queue manager, IBM MQ Explorer presents good views of the cluster. You add the three common course queue managers to IBM MQ Explorer now.

This section provides three tables, each with information on one of the common course queue managers. Use the instructions that are provided in Section 4 to add these queue managers to your IBM MQ Explorer navigator.

TSM00##.SVRCONN channel is preconfigured in the MQ00, MQ0A, and MQ0B queue managers. This channel carries the correct authorization to be able to connect to these queue managers; you must use the channel as instructed or the connection with fail authorization.

__ 42. Use the information in Table 3 to add the MQ00 queue manager, and confirm that you can see the MQ00 queues and channels before proceeding to the next step.

Table 14: MQ00 IBM MQ Explorer queue manager details

IBM MQ Explorer panel number and field	Value
First panel	
Queue manager name	MQ00
Second panel	
Connection Details	Host name ++++++++.ilsvpn.ibm.com
Port number	1600
Server-connection channel	TSM00##.SVRCONN where ## is your team number

__ 43. Use the information in Table 4 to add the MQ0A queue manager, and confirm that you can see the MQ00 queues and channels before proceeding to the next step.

Table 15: MQ0A IBM MQ Explorer queue manager details

IBM MQ Explorer panel number and field	Value
First panel	
Queue manager name	MQ0A
Second panel	
Connection Details	Host name ++++++++.ilsvpn.ibm.com
Port number	1621
Server-connection channel	TSM00##.SVRCONN where ## is your team number

__ 44. Use the information in Table 5 to add the MQ0B queue manager, and confirm that you can see the MQ00 queues and channels before proceeding to the next step.

Table 16: MQ0B IBM MQ Explorer queue manager details

IBM MQ Explorer panel number and field	Value
First panel	
Queue manager name	MQ0B
Second panel	
Connection Details	Host name ++++++++.ilsvpn.ibm.com
Port number	1622
Server-connection channel	TSM00##.SVRCONN where ## is your team number

__ 45. Check that you can see the MQ00, MQ0A, and MQ0B queue managers. If you have any problems with connecting, double check the configuration properties on the queue manager with the problem. Right-click the queue manager name and select **Connection details > Properties**. If you see the problem, remove the queue manager from IBM MQ Explorer by right-clicking the queue manager name, disconnecting if connected, and selecting Remove. Then, add it back applying any needed corrections.

Section 7: Test getting messages from the client

In the earlier section, you used the amqsputc client sample application to put some messages in the PRICE.CL queue. What if you had to receive, or get messages from the client? This section of the exercise looks at getting messages from the client. You use the client sample get program, amqsgetc, to get messages from your z/OS queue manager.

Under normal situations, an application would not be doing a put and a get to and from the same queue. The same queue is use in the lab for convenience, as you already have messages to get in the PRICE.CL queue.

The start and end prompts for amqsgetc are similar to the prompts for amqsputc.

The amqsgetc application does a get and waits for more messages for a few seconds. When you start amqsgetc, give it a few moments to get the messages, then wait for it to stop.

__ 46. Return to your VMware command prompt. If necessary, double-click the Windows command prompt icon again.

__ 47. From the command prompt, type `amqsgetc PRICE.CL` and press the Enter key.

__ 48. You should see all the messages that you entered with the amqsputc program, plus the message you entered with IBM MQ Explorer.

__ 49. Return to your z/OS system log. What channel was used to do the amqsgetc?

After removing the MQSERVER variable, the CCDT channel was again used (if you did remove MQSERVER setting by entering MQSERVER= at the Windows command prompt).

__ 50. Close the command prompt.

Section 8: A first look at the course cluster

In preparation for the cluster unit, you use IBM MQ Explorer to view the WMADMCLS class cluster.

__ 51. If you closed your IBM MQ Explorer tool, start it by double-clicking the IBM MQ Explorer icon.

__ 52. If necessary, right-click the three course queue managers, and for each select Connect.

__ 53. If you see all the course common queue managers, MQ00, MQ0A, and MQ0B in IBM MQ Explorer, on the IBM MQ Explorer Navigator scroll down until you see Queue Manager Clusters. Expand all sections.

__ 54. You should see cluster WMADMCLS. Under the cluster name, you see a list with the two full repository queue managers, and a smaller list with the partial repository queue manager.

__ 55. On the right of the IBM MQ Explorer, you see the IBM MQ Explorer Content pane. In this pane, there are several tabs with cluster objects.

You learn about IBM MQ clusters in the next unit.

You completed Exercise 4.

End of exercise

Exercise review and wrap-up

In this exercise, you:

- Configured a server connection (SVRCONN) channel in your z/OS queue manager.
- Configured a client connection (CLNTCONN) channel and created a CCDT in the Windows client.
- Used the amqsputc sample client program to put a message from the Windows client to a z/OS queue by using the CCDT.
- Used the amqsgetc sample client program to get a message from a queue in your z/OS queue manager from the Windows client application by using the CCDT.
- Set the MQSERVER variable to a new SVRCONN channel and observed how the client search precedence used the MQSERVER connection instead of the CCDT.
- Added your queue manager to IBM MQ Explorer and looked at some of the tool's capabilities.
- Added the common course queue managers to IBM MQ Explorer.
- Used IBM MQ Explorer to take a first look at the course cluster in preparation for the cluster unit.

Exercise 5. Working with IBM MQ clusters

What this exercise is about

This exercise shows you how to create a cluster, and how the full repositories are created. You add the queue to the cluster and perform checks for problem determination. After the checks are completed, you define a clustered queue and put messages to that queue from a different queue manager where the queue is not hosted. You also learn how to route messages to a clustered queue with distributed channels by using a queue manager alias.

What you should be able to do

After completing this exercise, you should be able to:

- Review the cluster configuration
- Use a queue manager alias to route messages to clustered queues from a queue manager outside the cluster
- Add a queue manager to an existing cluster
- Interpret the information in a cluster display
- Put messages to a clustered queue
- Review the IBM MQ Explorer cluster administrative capabilities

Introduction

In this exercise, you first learn about the WMADMCLS cluster by reviewing the cluster information from a display that you issue so that you become familiar with the cluster. Next, before adding your queue manager to the cluster, you create regular distributed definitions from your queue manager to the cluster queue manager that is used as a gateway, MQ00. This queue manager reaches clustered queues that are defined in MQ0A and MQ0B only. No queues are defined in MQ00 for this part of the exercise.

You then add your queue manager to the cluster, and use the cluster facilities to put messages to other clustered queues in MQ0A and MQ0B without defining remote queues or extra channels.

Finally, you look at some of the cluster administrative capabilities of IBM MQ Explorer.

Requirements

- Completion of Exercise 1

- Availability of the MQ00, MQ0A, and MQ0B common course queue managers

Exercise instructions

Preface

A cluster is already set up in the lab environment. In this lab, you add your queue manager to the lab cluster WMADMCLS. The only difference between the setup of the lab cluster and the work you do, is that the two full cluster repository queue managers have the queue manager repository attribute set to the cluster name. The work that you do in this exercise resembles the addition of queue manager MQ00 to the cluster as shown in the lecture.

Note

In the first section, you display the existing cluster configuration. In the second section, you configure definitions to send messages to a clustered queue by using a queue manager alias ***before*** your queue manager is added to the cluster.

The graphic shows the lab configuration. There are three course common queue managers: MQ00, MQ0A, and MQ0B. MQ0A and MQ0B are the full cluster repositories. MQ00 is a cluster member queue manager with a partial repository. The two full cluster repositories, MQ0A and MQ0B, point to each other. As a result, the CLUSSDR channel for MQ0A points to MQ0B, and the CLUSSDR channel for MQ0B points to MQ0A. With each queue manager, including your queue manager that is being added to the cluster, the CLUSRCVR channel points to itself. The work that you do in this lab makes your queue manager a member of the cluster with a partial repository, much like MQ00. The exception is that students with an odd-numbered team are going to point their queue manager to MQ0A, that is, set the connection information in their CLUSSDR channel to MQ0A. Students with an even-numbered team are going to point their queue manager to MQ0B, that is, set the connection information in their CLUSSDR channel to MQ0B.

You notice arrows between MQ0A and MQ0B. These arrows are not intended to “line up” with the channel names in the graphic. The full cluster repositories “know” these channels and as needed, share this knowledge with the partial repository members. When your queue manager joins the cluster, its cluster sender channel, in this case a CLUSSDRB, provides information to the full cluster repository. In turn, the full cluster repository creates a dynamic CLUSSDRA channel to your queue manager and shares other cluster information with your partial repository.

Important

In this exercise, leave your queue manager as a partial repository. Run only the MQSC definitions indicated in the exercise. Do not add or change anything.

To adequately follow the concepts that the exercise reinforces, it is imperative to work the sections in the order given; do not skip sections.

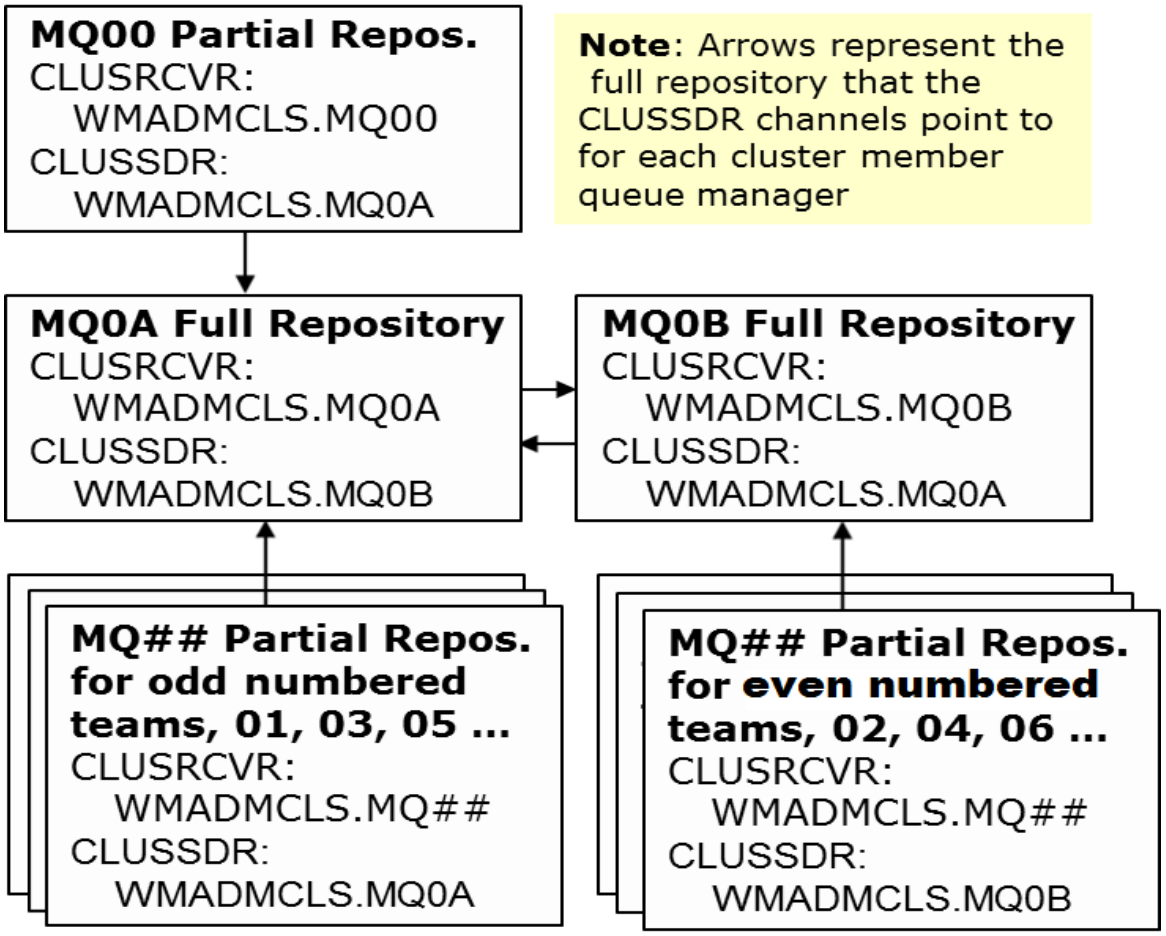


Figure 5-1. Lab cluster WMADMCLS WM3021.1

__ 1. If necessary, log on to the z/OS system with the credentials provided for the first exercise.

__ 2. Confirm that your queue manager is running. Enter `=S;DA` in the command prompt to proceed to SDSF.

__ 3. If your queue manager is not running, proceed to start it. See the instructions that are provided in Exercise 1 if you need help starting the queue manager.

__ 4. If your queue manager is running, also check that the channel initiator is running. The channel initiator should be starting automatically after the queue manager starts.

Stop

Take a minute to differentiate between sending a message to the clustered queue before (from outside the cluster), and after your queue manager joins the cluster (from inside the cluster).

- When you put messages from outside the cluster in Section 1, you use the same channel to queue manager MQ00 you defined earlier, and define a new remote queue.
- When you put from inside the cluster, you put to the clustered local queues directly and use clustered channels.

Section 1: Check information about the WMADMCLS cluster

Before you add your queue manager to the cluster, it is important to review the environment to know what to expect.

__ 5. Go to the SDSF log by entering `=s;=log` in the command prompt and pressing the Enter (Ctrl) key.

For this step, use the command prefix string (CPF) for either the MQ0A or MQ0B full repository queue manager. You might want to use the CPF for the queue manager that you plan to point your cluster sender channel to, depending on having an even or odd numbered ending team number. However, the information for MQ0A and MQ0B is similar.

Hint

Several students are going to issue the same command, and the system log view can become busy. You might find that it is better to use the IBM MQ ISPF MQSC Action 8 panel instead of issuing the CPF command. In this way, you isolate the results for your display in your TSM00##.CSQUTIL.OUTPUT data set.

__ 6. From the SDSF log view, type:

```
/MQ** DIS CLUSQMGR(*) STATUS DEFTYPE
```

where `**` is `0A` or `0B`. You are selecting one of the full repositories.

__ 7. Depending on the activity in the class, you might observe different details:

Before any queue managers are added, you might see that the cluster channels are in inactive status. This status is normal when there has not been activity in the cluster for a while. Since this display changes when activity starts, the output is shown so that you see the original information before anyone adds other queue managers to the cluster. Review the information in these pages before proceeding to add your queue manager to the cluster.

Information

When you issue the `DIS CLUSQMGR`, you see the information *from the perspective* of the queue manager from which you issue the command. As a result, what you see as channel type CLUSSDRA and CLUSSDRB when the command is issued from MQ0A is different when you issue the command from MQ0B or MQ00. This difference is because queue managers point to different full repositories. Queue managers that point to MQ0A show the channel WMADMCLS.MQ0A as CLUSSDRB because they have a defined cluster sender channel to MQ0A. They show only one WMADMCLS.MQ## CLUSRCVR pointing to itself. They show CLUSSDRA channels to other queue managers where there is no defined cluster sender channel. A queue manager should have

only one defined cluster sender channel to one of the full repository queue managers. Any channels that are displayed as CLUSSDR without an A or B ending denote an error. As soon as they are incorporated into the cluster, there should not be any CLUSSDR DEFTYPE channels, even if the explicit definition is for a CLUSSDR channel type.

From the perspective of queue manager MQ0A before any other queue managers are added, at the start of the cluster lab:

Three definitions are found:

- The first definition is for WMADMCLS.MQ0A, the MQ0A CLUSRCVR itself.
- The second definition is WMADMCLS.M0B CLUSSDRB, which indicates that MB0B is the full cluster repository where MQ0A has an explicit CLUSSDR definition to the full repository.
- The last definition, WMADMCLS.MQ00 CLUSSDRA, is for MQ00, which indicates that it is a dynamic channel that is created to MQ00, where MQ0A does not have any defined channels. MQ0A created this dynamic channel by using the information that it found about MQ00 in the cluster repository.

Remember that you see this view before any new queue managers are added to the cluster. After all teams finish adding the cluster definitions to their queue managers, more channels will display in the `DIS CLUQMGR` command.

```
MQ0A DIS CLUSQMGR(*) STATUS DEFTYPE
CSQM293I MQ0A CSQMDRTC 3 CLUSQMGR FOUND MATCHING REQUEST
CSQM201I MQ0A CSQMDRTC DIS CLUSQMGR DETAILS
CLUSQMGR(MQ0A)
CLUSTER(WMADMCLS)
CHANNEL(WMADMCLS.MQ0A)
DEFTYPE(CLUSRCVR)
END CLUSQMGR DETAILS
CSQM201I MQ0A CSQMDRTC DIS CLUSQMGR DETAILS
CLUSQMGR(MQ0B)
CLUSTER(WMADMCLS)
CHANNEL(WMADMCLS.MQ0B)
DEFTYPE(CLUSSDRB)
STATUS(INACTIVE)
END CLUSQMGR DETAILS
CSQM201I MQ0A CSQMDRTC DIS CLUSQMGR DETAILS
CLUSQMGR(MQ00)
CLUSTER(WMADMCLS)
CHANNEL(WMADMCLS.MQ00)
DEFTYPE(CLUSSDRA)
STATUS(INACTIVE)
```

Section 2: Putting a message to a cluster queue from outside the cluster

Your queue manager is not part of the cluster yet. Sometimes there are situations where you need to send messages to a clustered queue, but your queue manager is not allowed to join the cluster.

In the distributed messaging unit, you learned about how to multi-hop and how to use a queue manager alias.

Before joining the cluster, you use regular distributed channels to put messages in a clustered queue. This graphic depicts the required Section 2 setup.

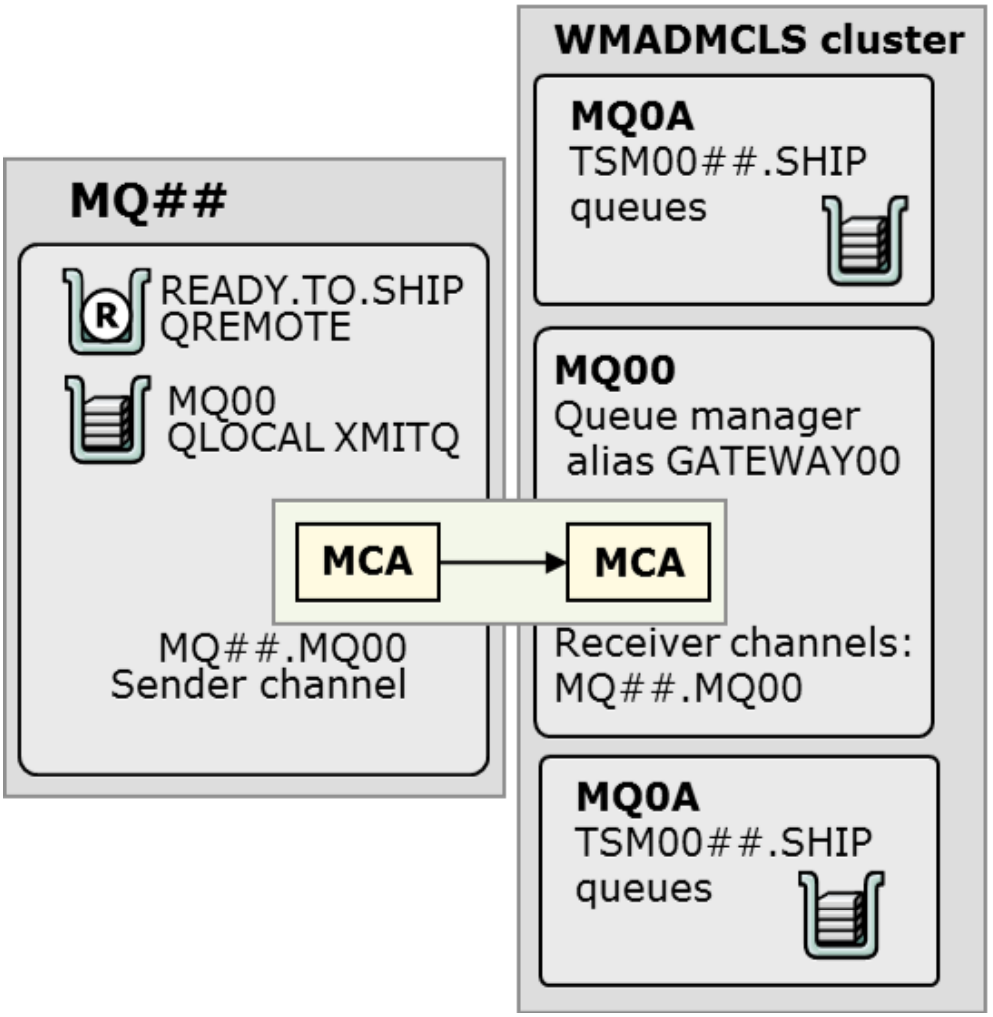


Figure 5-2. Section 1 connection from outside cluster

Assume the following scenario. You are tasked with establishing communication and queues that enable sending messages to the shipping department from a queue manager ***outside the cluster*** and are provided these details:

- The target queue where you need to send messages that are related to the shipping application, TSM00##.SHIP, is clustered and defined in several clustered queue managers.

- The shipping organization that owns the cluster does not allow other applications to join the cluster.
- The designated “gateway” queue manager must be used for all connections to the shipping organization. In the graphic, the gateway queue manager is MQ00.
- The shipping organization provides you with the name of the queue manager alias to use, GATEWAY00, to reach the target queues. The queue manager alias is used to “multi-hop” into the target cluster queues.
- No occurrences of the TSM00##.SHIP queues exist in the MQ00 gateway queue manager. Only the queue manager alias, GATEWAY00, is defined in MQ00.
- The cluster name is not provided to you, as it is not required for your definitions.

In this section, you complete the required definitions by using the gateway queue manager to send messages to a clustered queue without being a member of the cluster.

Hint

If needed, see slide “Definitions to MQ00 gateway from an external queue manager,” which is available towards the end of the “IBM MQ cluster basics” unit, to review the material for this task. The work that you do next is not identical, but similar.

__ 8. Establish channels between your queue manager and the gateway queue manager, MQ00. If you recall, you completed this channel in a previous exercise. Proceed to display the channel.

__ a. Proceed to the SDSF log view by entering `=s;log` at the command prompt and pressing the Enter (Ctrl) key.

__ b. Type command `/MQ## DIS CHL(MQ##*)` where `##` is your team number, followed by an asterisk.

__ c. If your MQ##.MQ00 sender channel is displayed, proceed to the next step. If your MQ##.MQ00 sender channel got deleted, re-create the channel and use the instructions in Exercise 3 to trigger the MQ00 transmission queue.

__ 9. Create a local remote queue in your queue manager that incorporates the gateway queue manager alias so you can reach the cluster queues. The required details for this queue, previously given in the narrative, are captured in table format for convenience. An example of the MQSC command is also provided.

Table 17: QREMOTE name READY.TO.SHIP

Attribute	Value
Remote queue manager name (RQMNAME)	GATEWAY00
Transmission queue (XMITQ)	MQ00
Target queue name (RNAME)	TSM00##.SHIP

Example

```
DEFINE QREMOTE(READY.TO.SHIP) RQMNAME(GATEWAY00) +
DXMITQ(MQ00) RNAME(TSM00##.SHIP)
```

__ 10. Return to your JCLPUT member in the TSM00##.SCSQPROC library. Change the PARM string in the job to send 10 messages with all *G*s to your READY.TO.SHIP remote queue, exactly as shown:

```
PARM=('MQ## READY.TO.SHIP 0010 G 0100 P')
```

__ 11. Go to the SDSF log screen by entering `=s;log` and pressing the Enter (Ctrl) key.

__ 12. Look at the last few entries in the system log. Do you see any channel activity? Write down your observations, including the names of the channels you noticed:

_____

_____

__ 13. Check whether the messages arrived at the clustered queues. Remember, queue TSM00##.SHIP exists in both MQ0A and MQ0B, and you put 10 messages, so ***you need to check both MQ0A and MQ0B queue managers***. You can use either of two methods:

__ a. Check the queue message count in the SDSF log view. Type `=s;log` and press Enter (Ctrl).

```
/MQ0A dis q(TSM00##.SHIP) CURDEPTH
```

- How many messages do you see? Make a note: _____
- Repeat the display command for `MQ0B`.
- How many messages do you see? Make a note: _____

__ b. Use the message handler sample program at ISPF option H to check the queue message count. Type `=H` at the command prompt and press the Enter (Ctrl) key.

- Type `MQ0A` in the queue manager name, and `TSM00##.SHIP` in the queue name.
- Press the Enter (Ctrl) key.
- How many messages do you see? Make a note: _____
- Return to the message handler program menu, and repeat the display for `MQ0B`.
- How many messages do you see? Make a note: _____

__ 14. Why do you think the messages were distributed as you observed?

_____

_____

If no messages are found, make necessary corrections and retest before proceeding to the next section. Request assistance if necessary.

Section 3: Add your queue manager to the WMADMCLS cluster

You add your queue manager to the cluster by creating one CLUSRCVR channel that points to itself, and one CLUSSDR channel that points to one of the two full cluster repositories.

- If your team number ends in an odd number, you use MQ0A as the full repository.
- If your team number ends in an even number, you use MQ0B as the full repository.

There are only two MQSC commands, one for the CLUSRCVR, one for the CLUSSDR. No additional commands should be entered. You are provided with a table with the information required for the channels, followed by a sample of the definitions.

__ 15. Go to the ISPF MQSC panel. Type `=m` in the command prompt and press the Enter (Ctrl) key. Enter 8 in the action, and check the queue manager name ***before pressing Enter.***

Important

Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

Be careful when reading the tables with the definition requirements, as there might be more rows on the following page. Be careful when typing the cluster name.

__ 16. Create the CLUSRCVR and CLUSSDR definitions with the details in the table. A sample command is included. Type the command in the ISPF command input screen.

Table 18: CLUSCVR channel name: WMADMCLS.MQ## where ## is your team number

Attribute	Value
Channel type `CHLTYPE`	`CLUSRCVR`
Transport type `TRPTYPE`	`TCP`
Cluster name `CLUSTER`	`WMADMCLS`
Connection `CONNAME`	`('+++++++.ilsvpn.ibm.com(16##)')` where `##` is your team number.

Table 19: CLUSSDR channel name: WMADMCLS.MQ0# where # is A or B

Attribute	Value
Channel type `CHLTYPE`	`CLUSSDR`
Transport type `TRPTYPE`	`TCP`
Cluster name `CLUSTER`	`WMADMCLS`
Connection `CONNAME`	`('+++++++.ilsvpn.ibm.com(162#)')` where `+++++++` is your server image name that the instructor provides, and `#` is either `A` or `B` depending on which full cluster repository your queue manager points to. If you point to MQ0A, the port is 1621. If you point to MQ0B, the port is 1622.

Warning

Type your commands in the ISPF MQSC command screen. ***Do not copy and paste the example*** into the ISPF edit screen. Copying and pasting the commands causes the special characters to become invalid and results in an error that might be time consuming to rectify.

Example

Here is a sample entry for CLUSRCVR and CLUSSDR definitions for a queue manager that points to MQ0A:

```
DEF CHL(WMADMCLS.MQ##) CHLTYPE(CLUSRCVR) TRPTYPE(TCP) +
CLUSTER(WMADMCLS) CONNAME('+++++++.ilsvpn.ibm.com(16##)')
DEF CHL(WMADMCLS.MQ0A) CHLTYPE(CLUSSDR) TRPTYPE(TCP) +
CLUSTER(WMADMCLS) CONNAME('+++++++.ilsvpn.ibm.com(1622)')
```

__ 17. After carefully checking the commands you typed, create the definitions by pressing the PF3 key.

__ 18. Check the results. Look for the “CSQU058I ... **0 failed**” message toward the bottom of your results view. Confirm the “0 failed.” Correct any errors before proceeding.

__ 19. Proceed to the next section immediately.

Section 4: Check the results of your definitions from the perspective of your queue manager

You do two checks. The first check, without entering any commands, shows you how the cluster channels start automatically. You go to the bottom of the system log and search for the name of your CLUSRCVR channel; that is, `WMADMCLS.MQ##` from the command prompt. Since numerous students are adding cluster channels, there might be numerous results.

The second check that you run is a display command, but use the ISPF MQSC panel to isolate the output for your viewing.

__ 20. Go to the SDSD log by typing `=s;log` in the command line and press the Enter (Ctrl) key.

__ 21. Find the name of your CLUSRCVR channel and determine whether it started.

__ 22. You now obtain cluster information from the perspective of your queue manager. To isolate the output of the command from all the activity from other students, use your ISPF command option. Return to the ISPF MQ panels by typing `=m` in the command action prompt and pressing the Enter (Ctrl) key.

__ 23. Check that the queue managers in the bottom of the ISPF MQ panels still reflect your queue manager name. Change it if needed.

__ 24. Type `8` for the action and press the Enter (Ctrl) key.

__ 25. Delete any previous MQSC entries from the MQSC command file and type the display command as shown:

```
DIS CLUSQMGR(*) ALL
```

__ 26. Press the PF3 key to run the command. You are now able the cluster information from your queue manager's perspective.

__ 27. Realize that it might take a few seconds for the cluster to exchange all information. You should see the CLUSRCVR and a CLUSSDRB to your full cluster repository. It is also possible that enough information was exchanged in the cluster that you see a CLUSSDRA to other partial repository queue manager members. What channels do you see?

__ 28. If you find a CLUSSDR without an A or B suffix, there is a problem. If you did not find any CLUSSDRA channels, repeat the display one or two times, and you might see them then. Remember, there is substantial exchange of information when all students join the cluster.

__ 29. Do not proceed to the next numbered stop until all errors are corrected and you are able to see your CLUSSDRB to your full repository and at least your CLUSRCVR in the DIS CLUSQMGR output.

Stop

Make sure that you only defined cluster channels for your queue manager.

__ 30. From the SDSF log screen, issue command: `/MQ## DIS CHL(WMADM*)`

The result should be only two channels, one CLUSRCVR pointing to your queue manager, and one CLUSSDR pointing to one full repository queue manager. ***If you have more than two channels that are prefixed with the cluster name, stop, and remove any extra channels***. Failure to remove extra channels can cause problems in the class environment. ***Ask for assistance if you have more than two channels that are prefixed with WMADMCLS* in your queue manager and need help removing the extra channel.***

Section 5: Compare the CLUSQMGR with the CHSTATUS display

When you displayed the connectivity that uses the DIS CLUSQMGR, you learned that the DEFTYPE for CLUSSDR channels should be CLUSSDRA or CLUSSDRB if the channels are functioning normally. You now compare the output of CLUSQMGR with the output of CHSTATUS.

__ 31. Proceed to the ISPF MQ panels by entering `=m` in the command prompt.

__ 32. Make sure that this panel is set up to your queue manager name as it was in earlier sections.

__ 33. Type `8` in the action code and press the Enter (Ctrl) key.

__ 34. Display the status of your CLUSRCVR channel by entering the command:

```
/MQ## DIS CHSTATUS(WMADMCLS.*) RQMNAME
```

__ 35. Press PF3 to issue the command. The expected output is a partial display that uses queue manager MQ15. Review the information section directly following the output display for a walk-through of the differences.

```
MQ15 DIS CHS(WMADMCLS.*) RQMNAME
CSQM293I MQ15 CSQMDRTC 5 CHSTATUS FOUND ... ...
CHSTATUS(WMADMCLS.MQ15)
CHLDISP(PRIVATE)
CONNAME(10.31.187.60)
CURRENT
CHLTYPE(CLUSRCVR)
STATUS(RUNNING)
SUBSTATE(RECEIVE)
STOPREQ(NO)
RQMNAME(MQ0A)
END CHSTATUS DETAILS
CSQM201I MQ15 CSQMDRTC DIS CHSTATUS DETAILS
CHSTATUS(WMADMCLS.MQ0A)
CHLDISP(PRIVATE)
XMITQ(SYSTEM.CLUSTER.TRANSMIT.QUEUE)
CONNAME(10.31.187.60)
CURRENT
CHLTYPE(CLUSSDR)
STATUS(RUNNING)
SUBSTATE(MQGET)
STOPREQ(NO)
RQMNAME(MQ0A)
END CHSTATUS DETAILS
CSQM201I MQ15 CSQMDRTC DIS CHSTATUS DETAILS
CHSTATUS(WMADMCLS.MQ15)
CHLDISP(PRIVATE)
CONNAME(10.31.187.60)
CURRENT
CHLTYPE(CLUSRCVR)
STATUS(RUNNING)
SUBSTATE(RECEIVE)
STOPREQ(NO)
RQMNAME(MQ0B)
END CHSTATUS DETAILS
```

Information

After observing the output of this display, you might have some questions:

- Why does the channel type show as `CLUSSDR` (it was stated that this type meant an error)?

  The `DIS CLUSQMGR` is specific to clusters, while `DIS CHSTATUS` applies to all channels. `DIS CLUSQMGR` distinguishes the type of `CLUSSDR` channel by using the attribute: `DEFTYPE`

For channels, this attribute is specific to cluster channels and denotes how the cluster channel was defined. `DIS CHSTATUS` is not specific to cluster channels, so it does ***not*** use `DEFTYPE`, but instead uses `CHLTYPE`, which denotes the type of explicit channel definition. It is normal to see `CHLTYPE CLUSSDR` in a `DIS CHSTATUS`, but it is a problem to see `DEFTYPE CLUSSDR` in a `DIS CLUSQMGR`.

- Why are there more than one CLUSRCVR listed for my queue manager?

  In clusters, other cluster queue managers create dynamic channels to your queue manager by using your CLUSRCVR, so there might be more than one CLUSRCVR for each of the dynamic connections to your queue manager. For each of the CLUSRCVR connections, check the remote queue manager name, or RQMNAME; you see they are different.

  The display that is shown is normal. It is important to remember the differences in the expected output.

Section 6: Display predefined cluster queues

In an earlier section, you put messages to the TSM00##.SHIP queues from outside the cluster. Your queue manager was not part of the cluster. There are other predefined cluster queues with the name `TSM##.PROMO`. You test to determine whether you can use the `DIS QCLUSTER` version of the `DIS QUEUE` command to see the queues that are defined to the cluster.

__ 36. Proceed to the system log by entering `=s;log` from the command prompt and press the Enter (Ctrl) key.

__ 37. Type the display commands and check the response:

```
DIS QCLUSTER(TSM00##.SHIP)
DIS QCLUSTER(TSM00##.PROMO)
DIS QCLUSTER(*)
```

__ 38. Did you find any cluster queues? The results are explained in the Information section.

Information

If you did not do any additional cluster work after your queue manager was added to the cluster, no cluster queues displayed although they exist in the cluster:

```
/MQ## DIS QCLUSTER(*)
 CSQM297I MQ## CSQMDRTC NO QCLUSTER FOUND MATCHING REQUEST CRITERIA
```

Why did the cluster exchange information about the channels and not the about queues? This concept is important to remember. Information about the channels is crucial to the setup of the queue manager in the cluster, but information about clustered queues is exchanged on a need-to-know basis. The “need to know” is established from the first MQOPEN to the queue. The CSQM297I message that states that no clustered queues are found is not an error condition; it is the normal process. When you first define a clustered queue, it is not visible to other queue managers until after an MQOPEN is done to the queue. Using one of the sample put programs is going to generate the MQOPEN.

Section 7: Work with cluster queues

The lab environment for this lab has cluster queues TSM00##.PROMO predefined on MQ0A and MQ0B. The scenario for this section is:

- The company added a promotional incentive in the web page, which provides free shipping for orders over a specific amount.
- Certain queue managers need to receive the promotional messages. Since the organization already has a cluster set up, the decision was made to create promotional queues inside the cluster, so no additional channels or remote queues are required between the shipping and promotional departments.
- These promotional queues are created in duplicate in the internal queue managers, MQ0A and MQ0B.

Warning

Do not define any remote queues for this lab.

__ 39. Return to the JCLPUT member of your TSM00##.WM30.SCSPROC PDS by entering =2 in your ISPF command prompt, specifying your PDS information in the ISPF panel, and pressing the Enter (Ctrl) key.

__ 40. Change the PARM string to send 10 messages to queue TSM##.PROMO, and set the character to use in the message as “P”. The parameter string should look as indicated:

```
PARM=('MQ## TSM00##.PROMO 0010 P 0100 P')
```

Important

Make sure that you are putting to ***your*** MQ## queue manager, not to the common course queue managers.

__ 41. Submit the JCLPUT job.

__ 42. Proceed to the ISPF MQSC Action 8 panel by typing `=m` in the command prompt and pressing the Enter (Ctrl) key, and then type `8` in the Action field.

Important

Remember to check that the Connect name, Target queue manager, and Action queue manager fields are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ 43. Enter the command as given to display cluster queues, and discard any other MQSC commands from the command input file:

```
/DIS QCLUSTER(*) CLUSQMGR
```

__ 44. Make sure that you added the CLUSQMGR attribute and press PF3 to run the command. What queues do you see?

Information

You should now see two TSM00##.PROMO queues for your team. Notice that one queue is defined in MQ0A, and the other queue is defined in MQ0B. Your queue manager "needed to know" about TSM00##.PROMO, and the repository passed it the information the first time the MQOPEN was issued from your ***clustered*** queue manager.

In an earlier section, you worked with queue TSM00##.SHIP; however, you used a remote queue and a sender-receiver channel into MQ00 to put to this queue ***before your queue manager joined the cluster***. When the message was sent to TSM00##.SHIP, queue manager MQ00 was able to use the GATEWAY00 queue manager alias to resolve the TSM00##.SHIP queue, but your queue manager had no knowledge of the cluster or where to find the TSM00##.SHIP queue.

__ 45. Find your messages in MQ0A or MQ0B. Check whether the messages arrived to the clustered queues. Remember, queue TSM00##.PROMO exists in both MQ0A and MQ0B, and you put 10 messages, so you need to check both MQ0A and MQ0B queue managers. You can use either of two methods, a or b:

__ a. Check the queue message count in the SDSF log view. Type `=s;log` and press Enter (Ctrl).

```
/MQ0A dis q(TSM00##.PROMO) CURDEPTH
```

- How many messages do you see? Make a note: _____
- Repeat the display command for MQ0B.
- How many messages do you see? Make a note: _____

__ b. Use the message handler sample program at ISPF option H to check the queue message count. Type `=H` at the command prompt and press the Enter (Ctrl) key.

- Type `MQ0A` in the queue manager name, and `TSM00##.PROMO` in the queue name.
- Press the Enter (Ctrl) key.
- How many messages do you see? Make a note: _____
- Return to the message handler program menu, and repeat the display for MQ0B.
- How many messages do you see. Make a note: _____

__ 46. Why do you think the messages were distributed as you observed?

_____

_____

__ 47. If no messages are found, make necessary corrections and retest before proceeding to the next section. Request assistance if necessary.

Information

You might observe a different distribution between MQ0A and MQ0B from when you put messages from an outside queue manager; possibly all messages would go to only one of the queue managers. If you recall at the end of the lecture for this exercise, it was suggested to baseline your application before changing the workload balancing options. The cluster topics in scope for this course are now completed. Details on the cluster workload algorithm are documented in the IBM MQ Knowledge Center.

Section 8: Use IBM MQ Explorer to check the cluster

__ 48. If you closed the IBM MQ Explorer application, reopen it by double-clicking the MQ Explorer icon on your desktop.

__ 49. On the MQ Explorer Navigator, ensure that you are connected to the MQ0A, MQ0B, MQ00, and your queue manager. If you need to get a queue manager connected to IBM MQ Explorer, right-click the queue manager name, and select **Connect**.

__ 50. After checking that the four named queue managers are active in your IBM MQ Explorer view, proceed to the end of the *Queue Manager* list and locate the heading *Queue Manager Clusters*.

__ 51. Expand the Queue Manager Clusters “twistie”. Continue to expand the WMADMCLS cluster twistie, and expand the Full Repositories and Partial Repositories twisties.

__ 52. Notice that all queue managers line up as either Full or Partial repositories. You see that the queue managers to which you are connected are active in repositories display.

__ 53. Under Partial Repositories, notice the list of unavailable queue managers, which represent the other student queue managers that are not added in your IBM MQ Explorer view.

__ 54. Expand your IBM MQ Explorer view so it covers the entire screen.

__ 55. Select any of the clustered queue managers that are connected in your view. Notice the different tabs with cluster objects on the MQ Explorer - Content view on the right of the display.

The purpose of this section was to familiarize you with the IBM MQ Explorer cluster view.

End of exercise

Exercise review and wrap-up

This exercise took several turns to reinforce certain concepts. You took the following steps:

- Displayed the existing WMADMCLS environment to confirm the cluster configuration before incorporating your queue manager to the cluster.
- Sent some messages to the clustered queues of your team, from outside the cluster. You used an existing channel and a new remote queue to route messages across the designated cluster gateway queue manager. You used the RQMNAME attribute of your remote queue to accomplish the routing.
- Added your queue manager to the cluster.
- Used the DIS CLUSQMGR command to check the outcome of adding your queue manager to the cluster. You reviewed how, if the addition of the queue manager to the cluster was successful, there are CLUSSDRA and CLUSSDRB channels.
- Compared the output of the `DIS CLUSQMGR` command with the `DIS CHSTATUS` command, and learned why it is acceptable to have CLUSSDR type channels on `DIS CHSTATUS`, but not on the `DIS CLUSQMGR`.
- Checked to see whether you were able to find any clustered queues and learned that your queue manager discovers cluster queues on a “need-to-know” basis.
- Used the cluster channels and no remote queue to send messages from your queue manager to clustered queues on queue managers MQ0A and MQ0B.
- Used IBM MQ Explorer to check that the cluster is displayed.

Exercise 6. Publish/subscribe basics

What this exercise is about

In this exercise, you perform basic work with publish/subscribe, provide exposure with the topic tree, and use some of the facilities to administer publish/subscribe.

What you should be able to do

After completing this exercise, you should be able to:

- Create a topic
- Create a managed subscription
- Publish messages
- Subscribe to messages without a managed subscription
- Display publish/subscribe subscription status
- Use IBM MQ Explorer to display publish/subscribe details

Introduction

These exercises are intended to provide a basic introduction to publish/subscribe, creating a topic and a subscription object. You use z/OS sample programs and JCL to subscribe and publish by using the topic and subscription created. You then use IBM MQ Explorer to create a dynamic subscription and publish more messages.

You also use MQSC commands to display the topic status.

There is another publish/subscribe section in the Events exercise.

The publish/subscribe topic cannot be adequately covered within the scope of this course. Use the publish/subscribe unit and this exercise as a roadmap to subsequent publish/subscribe work.

Requirements

- Completion of Exercise 1
- IBM MQ Explorer

Exercise instructions

__ 1. If necessary, log on to the z/OS system with the credentials provided for the first exercise.

__ 2. Confirm that your queue manager is running. Enter `=S;DA` in the command prompt to proceed to SDSF.

__ 3. If your queue manager is not running, proceed to start it. See the instructions that are provided in Exercise 1 if you need help starting the queue manager.

__ 4. If your queue manager is running, also check that the channel initiator is running. The channel initiator should be starting automatically after the queue manager starts.

Section 1: Create IBM MQ objects

You use the MQSC option of the IBM MQ ISPF panels to create the following definitions:

__ 5. From the command prompt, enter `=M` to go to the IBM MQ ISPF panels. Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ 6. Select 8 as the action to get to the MQSC command prompt and press the Enter (Ctrl) key.

__ 7. Create an administrative subscription and topic, and a local queue to hold messages that are published to your subscription. Use the commands that are shown in the MQSC command line:

```
DEFINE QL(ALL.SALES)
DEFINE TOPIC(SALES) TOPICSTR('/National/Sales')
DEFINE SUB(NATIONAL.SALES) TOPICSTR('/National/Sales') + DEST(ALL.SALES).
```

Warning

Do not copy and paste the commands; type them. Special characters do not copy and contain invisible characters that cause problems to be difficult to find.

Check the definition command results to ensure that the objects were created successfully. If there are any problems, make needed corrections before proceeding.

Section 2: Use the publish/subscribe z/OS COBOL samples to subscribe and publish to the topic

__ 8. Return to the `TSM00##.WM30.SCSQPROC` PDS and locate the publish/subscribe JCL, JCLSUB, and JCLPUB.

Important

The subscription program runs for 30 seconds and gets any publication that is done within those 30 seconds. For that reason, make sure that both JCL jobs are updated before submitting. Always submit the JCLSUB first, and then the JCLPUB.

The subscribing program does a destructive get of all the messages in the ALL.SALES queue. If you try to display the ALL.SALES current depth or the messages in the handler program after the subscribe program runs, there will not be any messages.

__ 9. Edit the JCLSUB JCL member and make the following changes:

__ a. Change all instances of the queue manager name `MQ##` to your queue manager name.

__ b. Replace the first line of your SYSIN input with the TOPIC name: `SALES`

__ c. Replace the second line of your SYSIN input with your queue manager name: `MQ##`

__ d. Leave the JCLSUB member open and split the screen if not already done to edit member JCLPUB.

__ 10. Edit the JCLPUB member and make the following changes.

Warning

Take care that you are editing member JCLPUB, ***not*** JCLPUT.

When you overlay TOPIC and QMGR, make sure that you do not leave any additional dashes. Space over the dashes, or the subscription is going to include the dash and cannot receive the publication.

__ a. Change all instances of the queue manager name `MQ##` to your queue manager name.

__ b. Replace the first line of your SYSIN input, originally containing the string `--TOPIC--`, with the defined TOPIC name: `SALES`

__ c. Replace the second line of your SYSIN input, originally containing the string `--QMGR--`, with your queue manager name: `MQ##`

__ d. Create three extra lines of SYSIN input after the queue manager name and type a message in each line, so there are three more lines in the SYSIN following the queue manager name. Originally, two lines contain the text `TESTMSG1` and `TESTMSG2`. Type over the `TESTMSG` text if needed and add a third line.

__ 11. Now that both JCLSUB and JCLPUB members are ready, submit the JCLSUB first, and then submit the JCLPUB.

__ 12. Go to the SDSF job log by entering `=s;st` in the command prompt. After the JCLPUB job ends, select the output of job JCLSUB and scroll to the end to check the outcome. Results should look similar to the sample results displayed here, with variations on the text entered:

```
CSQ4BVP2 start
Please enter the name of the target Topic
Please enter the name of the queue manager:
Target Topic is SALES
Queue Manager is MQ##
Calling MQGET : 30 seconds wait time
message <FIRST MESSAGE
Calling MQGET : 30 seconds wait time
message <SECOND MESSAGE
Calling MQGET : 30 seconds wait time
message <THIRD MESSAGE
Calling MQGET : 30 seconds wait time
```

If your results are similar to the sample results, you successfully completed this section.

Hint

If you did not receive any publications:

- Check that you did not leave any leftover dashes when overlaying the `--TOPIC--` placeholder. Leftover dashes change the topic string.
- Check your topic and subscription definitions.

Section 3: Display publish/subscribe information

__ 13. Go to ISPF IBM MQ panels by entering `=m` at the command prompt and selecting Action 8.

__ 14. Ensure that the panel is set to your queue manager and press the Enter (Ctrl) key.

__ 15. Enter the following MQSC command in the `TSM00##.CSQUTIL.COMMANDS` file:

```
DIS TPSTATUS('SALES/#').
```

Important

The syntax must be identical. Ensure that you have a forward slash and number sign immediately following the subscription name, which is enclosed in quotation marks, or no status is returned.

Section 4: Use IBM MQ Explorer to create a managed subscription

__ 16. If you closed the IBM MQ Explorer application, reopen it by double-clicking the IBM MQ Explorer icon on your desktop.

__ 17. If your queue manager is not connected to the IBM MQ Explorer application, proceed to connect it by right-clicking the queue manager name and selecting **Connect**.

__ 18. Expand the view of your queue manager so you can see the object categories. Right-click **Topics**. Notice that there are options to test a subscription and a publication. Select **Test Subscription**.

__ 19. When the Test Subscription panel surfaces, enter exactly `SALES/December` in the topic string and select **Subscribe**. ***Do not close the Subscribe panel***. You might need to drag the Subscribe panel to the side to access the Topics header.

Important

Do not close the Subscribe pop-up panel. A few moments after you select **Subscribe**, you can see the Unsubscribe button become available. Keep the Subscribe panel open until the end of this exercise.

__ 20. Right-click the topics header again and select **Test Publications**. The Test Publications panel surfaces. You publish three messages as directed:

__ a. In the topic string, type the exact same string as in the subscription: `SALES/December`

__ b. Type a short message of your choice in the data field.

__ c. Check the retained publication box.

__ d. Select **Publish message**. Do not close the publish box. In a few moments, the data box clears, indicating that the message was published.

__ e. If you typed identical topic strings in both the Subscribe and Publish boxes, you should see your first message appear in the Subscribe box.

__ f. Return to the Publish Test Message box. Enter two more messages. Check that they appear in the Subscription box.

__ g. ***Leave the Subscribe panel open***.

__ h. Right-click the topic heading and select **Status**.

__ i. Expand the SALES entry. You see how a new node called December is added.

__ 21. Do not close the Subscribe box. Return to the ISPF IBM MQ MQSC command panel if not already there by entering `=m` at the command prompt.

__ 22. Repeat the last command already in the TSM00##.CSQUTIL.COMMAND file. This command should be: `DIS TPSTATUS('SALES/#')`

__ 23. You now see an entry for the SALES/December topic that is created through the dynamic subscription and publication by using the IBM MQ Explorer application.

__ 24. Return to IBM MQ Explorer. Right-click your queue manager and select **Queues > SYSTEM.RETAINED.PUB.QUEUE > Browse Messages**.

__ 25. Scroll to the right of the message list box until you see the Data column. Do you see any of the messages you entered as retained publications?

__ 26. Close all IBM MQ Explorer panels, including IBM MQ Explorer.

This step concludes the publish/subscribe exercise; however, another publish/subscribe activity is included at the end of the IBM MQ events exercise.

End of exercise

Exercise review and wrap-up

In this exercise, you:

- Created topic and subscription definitions
- Used z/OS sample publish/subscribe programs to subscribe and publish messages to the topic.
- Displayed publish/subscribe information
- Used IBM MQ Explorer to test a managed subscription and publication

Another publish/subscribe exercise is included at the end of the Events lab.

Exercise 7. Working with IBM MQ events

What this exercise is about

This exercise enforces how to work with IBM MQ events and how to set up the dead-letter queue utility.

What you should be able to do

After completing this exercise, you should be able to:

- Explain the uses of performance events
- Configure the queue manager and queues to generate events
- Use publish/subscribe to redirect event messages

Introduction

This exercise provides experience with enabling and viewing IBM MQ events. The exercise includes an extra publish/subscribe activity as an alternative way to receive event notifications. Sometimes system management applications handle events, so any use of the publish/subscribe approach needs to be analyzed; this exercise is provided only as an example and as an extra publish/subscribe activity.

Requirements

- Completion of Exercise 1

Exercise instructions

Preface

__ 1. If necessary, log on to the z/OS system with the credentials provided for the first exercise.

__ 2. Confirm that your queue manager is running. Enter `=S;DA` in the command prompt to proceed to SDSF.

__ 3. If your queue manager is not running, proceed to start it. See the instructions that are provided in Exercise 1 if you need help starting the queue manager.

__ 4. If your queue manager is running, also check that the channel initiator is running. The channel initiator should be starting automatically after the queue manager starts.

Section 1: Activate performance and local queue manager events

__ 5. Alter your queue manager options to support both performance events and channel events.

__ a. From the command prompt, enter `=M` to go to the MQ ISPF panels. Make sure that the Connect name, Target queue manager, and Action queue manager are all set to your queue manager name as indicated by `MQ##` where `##` is your team number.

__ b. Select **8** as the action to get to the MQSC command prompt and press the Enter (Ctrl) key.

__ c. Type the alter statement to activate the events as indicated:

Hint

Type all of the `ALTER` and `DEFINE` commands in the same ISPF MQ MQSC session.

```
ALTER QMGR PERFMEV(ENABLED) LOCALEV(ENABLED)
```

__ d. Stay on the ISPF MQSC command input data set to complete the next step.

__ 6. Create a local queue called `EX7.PERFEV` with the attributes detailed in the table.

Table 20: QLOCAL name: EX7.PERFEV

Attribute	Value
Maximum depth (MAXDEPTH)	12
High watermark (QDEPTHHI)	80
Low watermark (QDEPTHLO)	20
Queue depth high enable (QDPHIEV)	ENABLED
Queue depth low enable (QDPLOEV)	ENABLED

__ 7. Press PF3 to run the MQSC commands.

__ 8. Confirm that all MQSC commands, including the `ALTER QMGR` and creation of the `EX.PERFEV`, completed as expected. Exit the ISPF MQ panels by pressing PF3.

Section 2: Test and analyze performance events

__ 9. Use JCLPUT to send 13 messages to queue EX7.PERFEV.

__ a. The PARM string should be similar to:

```
PARM=('MQ## EX7.PERFEV 0013 P 0100 P')
```

__ b. Submit the job.

__ c. What happened to the 13th message?

__ 10. Examine the performance event queue (SYSTEM.ADMIN.PERFM.EVENT) with the message handler sample program. Type `=H` at the command prompt and press the Enter (Ctrl) key.

__ 11. Enter your queue manager name and the name of the performance event queue (`SYSTEM.ADMIN.PERFM.EVENT`) into the input fields.

__ 12. Select the first message and press the Enter (Ctrl) key.

__ 13. Scroll down until you see the message buffer. Your view should be similar to the display:

```
Queue Manager    : MQ15
Queue            : SYSTEM.ADMIN.PERFM.EVENT
Forward to Q Mgr : MQ15
Forward to Queue :
Action :   :   (D)elete  (F)orward
Message Content : ------------------------------------------------------
PutApplName      : 'MQ15                          '
PutDate          : '20141125'
PutTime          : '15304357'
ApplOriginData   : '    '

Message Buffer : 192 byte(s)
00000000 :  0000 0007 0000 0024 0000 0001 0000 002D  '.
00000010 :  0000 0001 0000 0001 0000 0001 0000 08B0  '.
```

__ 14. The fullword that starts at offset `x'1C'` of the message data contains the event reason code, in this case hex `08B0`, highlighted in bold for this display. You can go to the IBM MQ Knowledge Center and search for the hex value to determine the reason code. The IBM MQ Knowledge Center search yields:

```
2224 (08B0) (RC2224): MQRC_Q_DEPTH_HIGH
```

__ 15. Browse the second event message. This time the hex return is `0805`, indicating:

```
2053 (0805) (RC2053): MQRC_Q_FULL
```

Information

The JCLPUT job already displayed the 2053 completion code. You used the event message to look up the code as part of this event lab.

__ 16. Since you created the queue with the queue high and maximum depth thresholds, the events were as expected. Exit the message handler utility and return to the IBM MQ ISPF panels.

__ 17. At the IBM MQ ISPF panel, type the data detailed, and press the Enter (Ctrl) key.

__ a. Action: `1`

__ b. Object type: `QUEUE`

__ c. Name: `*` (asterisk)

__ 18. At the list of queues, select EX7.PERFEV by entering the number `1` to its left and pressing Enter (Ctrl).

__ 19. Scroll forward by using PF8 until you reach the Event Control panel. You see that the Queue Full is disabled because the event was triggered. You now empty the queue and check again.

__ 20. Go to the system log by entering `=s;log` from the command prompt and press the Enter (Ctrl) key.

__ 21. Enter the command that is shown to clear the messages from EX7.PERFEV and press the Enter (Ctrl) key:

```
/MQ## CLEAR QLOCAL(EX7.PERFEV)
```

__ 22. Return to the IBM MQ ISPF panel and proceed to the Event Control panel. You now see that the EX7.PERFEV queue is restored to the way it was defined.

__ 23. Exit the IBM MQ ISPF panels.

Section 3: Test queue manager events

__ 24. You already activated local queue manager events in the earlier part of this exercise.

__ 25. Create a “defective” alias queue by providing a target queue name for a queue object that does not exist. Go to the system log by entering `=s;log` and pressing the Enter (Ctrl) key. Type the definition that is detailed:

```
/MQ## DEF QA(EX7.QMGREV) TARGET(NOT.THERE)
```

__ 26. Use JCLPUT to put a message to the EX7.QMGREV queue. The PARM string for the JCLPUT should look similar to the PARM shown:

```
PARM=('MQ## EX7.QMGREV 0001 Q 0100 P')
```

__ 27. Return to the message handler utility by entering `=h` at the command prompt and pressing the Enter (Ctrl) key.

__ 28. Type your queue manager name and `SYSTEM.ADMIN.QMGR.EVENT` for the queue name, and press the Enter (Ctrl) key.

Note

It is possible that you might get a 2042 return when accessing this queue. Make sure that you do not have another screen open where you are accessing the queue. If you receive a 2042, exit the message handler completely, and repeat the display.

__ 29. You might find several different messages in this queue, aside from the expected local queue manager event that the defective alias queue caused.

__ a. You can browse the messages, obtain the return code at hex `1C` of the message buffer, and check the IBM MQ Knowledge Center.

__ b. For this step, ***select the last event message*** by typing the message number in the Message number selection field and pressing Enter. The most recent message should match today's date and time.

__ 30. Scroll to the message buffer and locate the return code at hex `1C`. You should see an event message with reason code hex `0822`, indicating:
`2082 (0822) (RC2082): MQRC_UNKNOWN_ALIAS_BASE_Q`

Section 4: Use publish/subscribe to redirect event messages

__ 31. Go to the IBM MQ ISPF panels by typing `=m` in the command prompt and pressing the Enter (Ctrl) key. Make sure that you are working with your `MQ##` queue manager before proceeding.

__ 32. Type `1` for the Action, `QUEUE` for the Object type, and `*` (asterisk) for the Name, and press the Enter (Ctrl) key.

__ 33. Scroll down if necessary by pressing the PF8 key until you see the SYSTEM.ADMIN.PERFM.EVENT and SYSTEM.ADMIN.QMGR.EVENT queues.

__ 34. For each of the queues:

__ a. Enter `4` for "manage" the queue and press the Enter (Ctrl) key.

__ b. Select **`1`** for "Deleting the queue" and press the Enter (Ctrl) key. If the queue has messages, and if the panel asks to confirm deletion of the messages and queue by pressing enter, proceed to press the Enter (Ctrl) key again.

__ c. Repeat the same steps until both SYSTEM.ADMIN.PERFM.EVENT and SYSEM.ADMN.QMGR.EVENT EVENT queues are deleted.

__ 35. Return to the IBM MQ ISPF main menu.

Section 5: Replace the two deleted SYSTEM event queues with aliases and create definitions that are needed to route the event messages to a subscription

__ 36. Carefully review the definitions that are detailed in this step to replace the two deleted SYSTEM event queues and set up a subscription to these events. ***Review them ONLY for now***:

__ a. Replace the deleted SYSTEM queues with aliases to topics:

```
DEFINE QALIAS(SYSTEM.ADMIN.QMGR.EVENT) TARGTYPE(TOPIC) +
TARGET(ADMIN.QMGR.EVENT)

DEFINE QALIAS(SYSTEM.ADMIN.PERFM.EVENT) TARGTYPE(TOPIC) +
TARGET(ADMIN.PERFM.EVENT)
```

__ b. Create the topics where the SYSTEM aliases point.

```
DEFINE TOPIC(ADMIN.PERFM.EVENT) TOPICSTR('Events/Perf')

DEFINE TOPIC(ADMIN.QMGR.EVENT) TOPICSTR('Events/QMgr')
```

__ c. Define two subscriptions to send the events to new local queues:

```
DEFINE SUB(EVENTS.ALL) TOPICSTR('Events/+') PSPROP(NONE) +
DESTCLAS(PROVIDED) DEST(ADMIN.EVENT)

DEFINE SUB(EVENTS.QMGR) TOPICSTR('Events/QMgr') PSPROP(NONE) +
DESTCLAS(PROVIDED) DEST(ADMIN.QMGR.EVENT)
```

__ d. Create the two new local queues where the subscribed events messages are sent:

```
DEFINE QL(ADMIN.EVENT)

DEFINE QL(ADMIN.QMGR.EVENT)
```

Information

The PSPROP keeps message properties added by the publish/subscribe engine from being added to the event message. Review the PSPROP attribute in the IBM MQ Knowledge Center if your plans include use of publish/subscribe.

__ 37. To save time, these definitions are provided in your TSM00##.WM30.SCSQPROC in member PUBEVTS. After you review PUBEVTS, you create the definitions with CSQUTIL:

__ a. From your TSM00##.WM30.SCSQPROC file, make a copy of the CSQUTIL member. At the TSM00##.WM30.SCSQPROC member list command prompt, type `S CSQUTILE` and press the Enter (Ctrl) key.

__ b. Copy the CSQUTIL member into the CSQUTILE file by typing `copy CSQUTIL` at the command prompt for the empty CSQUTILE member and press the Enter (Ctrl) key. You should have a copy of CSQUTIL in your CSQUTILE member.

__ c. At the CSQUCMD DD statement, enter your PUBEVTS member with the preceding definitions so that the CSQUCMD DD looks as shown:

```
//CSQUCMD DD DISP=SHR,DSN=TSM00##.WM30.SCSQPROC(PUBEVTS)
```

__ 38. Submit the CSQUTILE job.

__ 39. Proceed to SDSF and check the outcome of the CSQUTILE job, making sure that all definitions were successfully created.

Section 6: Reproduce the queue manager and performance events

__ 40. Use JCLPUT to send 13 messages to queue EX7.PERFEV.

__ a. The PARM string should be similar to:

```
PARM='MQ## EX7.PERFEV 0013 P 0100 P'
```

__ b. Submit the job.

__ 41. Use JCLPUT to put a message to the EX7.QMGREV queue. The PARM string for the JCLPUT should look similar to the PARM string shown:

```
PARM='MQ## EX7.QMGREV 0001 Q 0100 P'
```

__ 42. Submit the job.

__ 43. Go to the message handler utility menu to view if events were posted to the ADMIN.EVENT and ADMIN.QMGR.EVENT queues.

__ a. Enter `MQ##` for the queue manager and `ADMIN.QMGR.EVENT` in the queue name, and press the Enter (Ctrl) key.

__ b. How many messages do you see? _____

__ c. Press PF3 to return to the message handler menu.

__ d. Change the queue name to `ADMIN.EVENT` and press the Enter (Ctrl) key.

__ e. How many messages do you see? _____

You should find messages in both subscription queues. If your setup did not work, review the configuration and make any needed corrections before proceeding to the next section. Ask for help if needed.

End of exercise

Exercise review and wrap-up

In this exercise, you:

- Activated queue manager and performance events
- Created situations to cause the events to occur
- Used the message handler utility to browse the event messages and determine the reason for an event
- Reconfigured the event queues as aliases to topics and used publish/subscribe to publish the event messages.

Exercise 8. Security

What this exercise is about

In this exercise, you work with selected security areas.

What you should be able to do

After completing this exercise, you should be able to:

- Determine the queue manager connection authentication (CONNAUTH) settings
- Test initial client connection authentication settings
- Change client connection authentication settings to require full credentials
- Use available tools to test connection authentication changes
- Adjust IBM MQ Explorer to work with client connection authentication enabled
- Display the initial channel authentication (CHLAUTH) rules
- Add a rule to allow selected administrative users
- Implement the back-stop rule in full blocking mode
- Add CHLAUTH rules that allow valid connections
- Change and delete CHLAUTH rules
- Interpret event messages that are related to CHLAUTH
- Back up CHLAUTH rules
- Explain how to set rules in warning mode and where to check results of rules that are running in warning mode

Requirements

- Completion of Exercise 1
- Completion of Exercise 6, but can proceed without Exercise 6 by skipping steps that are related to cluster channels
- IBM MQ client to use IBM MQ connection authentication and channel authentication capabilities

Exercise instructions

Preface

Warning

The objective of this exercise is to familiarize you with the connection authentication and channel authentication features. Security needs vary with organizations. The channel authentication (CHLAUTH) work is intended to provide an initial understanding of how to set rules; however, it is not intended to be used as the standard for which rules to set. The course material offers suggestions on how to approach the work, but the rules set in your organization or engagement depend on the needs of the business and must be properly analyzed, planned, and evaluated.

Overall you should strive to work around the default rules, but leave them in place; it is suggested that you start with the back-stop rule, and add rules as needed. Business needs can drive the need for extra rules, or changes to the recommendations.

__ 1. Log on with the same team ID as for Exercise 1.

__ 2. If the queue manager is not running, start it from SDSF by entering the following command:

```
/MQ## START QMGR PARM(MQ##ZPRM)
```

where `##` is your two-digit team ID.

Section 1: Display security information

__ 3. Go to the system log by entering `=s;log` at the command prompt and pressing the Enter (Ctrl) key.

__ 4. Display the authentication information objects. At the system command prompt, type:

```
/MQ## DIS AUTHINFO(*)
```

Press the Enter (Ctrl) key. You see three possible authentication information objects that are defined in a new queue manager. Each object determines what type of connection authentication is done: using the OS user IDs, LDAP, or certificate revocation checking. You need to determine which object is enabled for your queue manager.

__ 5. Determine which authentication object is in force for your queue manager. From the system console, type:

```
/MQ## DIS QMGR CONNAUTH
```

The result shows which authentication option is in force for the queue manager. The default is SYSTEM.DEFAULT.AUTHINFO.IDPWOS, or authentication with an operating system ID and password.

__ 6. You learned that there were different settings for the connection authentication options. Given all the work that you completed with the queue manager, you realize that providing credentials is optional. For this exercise, you confirm the current options. From the system command prompt, type:

```
/MQ## DIS SECURITY
```

Continue to the end of the information displayed. You see:

```
CSQH040I MQ## Connection authentication ...
CSQH041I MQ## Client checks: OPTIONAL
CSQH042I MQ## Local bindings checks: OPTIONAL
```

Information

The security display shows the switch settings that were created for the class queue managers. The switch settings were covered in the lecture; however, the exercise focuses on the most recent security features, CONNAUTH and CHLAUTH, not on the RACF settings.

The display shows that attributes for client checks (CHCKCLNT) and local bindings (CHCKLOCL) are set to optional. OPTIONAL means that a user ID and password are not required; however, if an ID is provided, it must be a valid ID and requires a valid password. If you recall, your client labs did not require an ID and password. You now check what happens when you introduce an ID in the tests.

The client programs (amqsputc, amqsgetc) were updated to use a user name and password. Use of the user name and password is activated in the sample programs by setting environment variable `MQSAMP_USER_ID` at the Windows command prompt. You now test with and without an ID. You already have a CCDT defined at the client, so you are using the TSM00##.SVRCONN defined by the CCDT in your Windows image, in your z/OS queue manager SVRCONN channel.

__ 7. Keep your system log window open on the z/OS view. While at the system log, you might want to clear the messages off the PRICE.CL queue, which is used in this exercise. To clear all messages, type the following command at the system log:

```
/MQ## CLEAR QL(PRICE.CL)
```

Press the Enter (Ctrl) key.

__ 8. Open a Windows command prompt by double-clicking the command prompt icon in your desktop.

__ 9. At the Windows command, use amqsgetc to test your CCDT connection. Type:

```
amqsputc PRICE.CL
```

Press the Enter key, enter a message, and then press the Enter key twice to end the amqsputc application.

__ 10. Check your z/OS queue manager system log. Notice your channel as it connects and disconnects. If you are not able to connect, make any needed corrections; ask for assistance if needed. Do not proceed until you are able to run the amqsputc successfully.

Section 2: Use default connection authentication

Default connection authentication refers to the initial setting of the IBM MQ z/OS queue manager CONNAUTH queue manager attribute, and the CHCKCLNT and CHCKLOCL settings. In other words, ID and password are not required; but if an ID is used, it must be a valid ID with a valid password.

__ 11. Set the IBM MQ user ID that is used by amqsputc to an invalid user. At your Windows command prompt, type:

```
set MQSAMP_USER_ID=INVALUSR
```

__ 12. Try `amqsputc PRICE.CL` again. Press Enter when presented with the password prompt.

__ a. At the Windows command screen, what was the result of this test?

_____

__ b. At the z/OS system log, what messages do you find for your TSM00##.SVRCONN?

_____

__ 13. Reset your Windows user ID to use a valid ID. At your Windows command prompt, type:

```
set MQSAMP_USER_ID=TSM00##
```

where `##` is your team number.

__ 14. Repeat the amqsputc test with a blank password. Type `amqsputc PRICE.CL` and press Enter at the password prompt.

Hint

At the Windows command prompt, you can use the “up” arrow to bring back previously entered commands. You might want to use the up arrow to keep from retyping `MQSAMP_USER_ID=`. You can also use the up arrow to repeat the “`amqsputc PRICE.CL`” execution.

__ a. At the Windows command screen, what was the result of this test?

_____

__ b. At the z/OS system log, what messages do you find for your TSM00##.SVRCONN?

_____

__ 15. Repeat the amqsputc PRICE.CL test with the user still set to `TSM00##` but this time, provide a valid password. Before proceeding, review the warning:

Warning

The password must be entered in all capitals or authentication fails. Use the password that is used for your TSO session.

__ a. At the windows command prompt:

- Type `amqsputc PRICE.CL` and press the Enter key
- At the password prompt, enter your TSO password ***in all capitals*** and press Enter.
- Enter some text for the message and press Enter twice to end the amqsputc application.

__ b. At the Windows command screen, what was the result of this test?

_____

__ c. At the z/OS system log, what messages do you find for your TSM00##.SVRCONN?

_____

In this section of the exercise, you observed the behavior of the CHCKCLNT OPTIONAL setting. You now change the setting to REQUIRED.

Section 3: Change required client credentials

In this section, you change the AUTHINFO record that is configured for your queue manager, SYSTEM.DEFAULT.AUTHINFO.IDPWOS, to require connection authentication client checks.

__ 16. Proceed to your IBM MQ ISPF MQSC option panel. Type `=m` at the command prompt and press the Enter (Ctrl) key. Check that your queue manager is selected, enter `8` in the Action field, and then press the Enter (Ctrl) key to proceed to the MQSC command file.

__ 17. As soon as you are at the MQSC command file:

__ a. Discard any old MQSC commands

__ b. Enter the commands to change the client check attribute and refresh security as detailed in this step:

```
ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) +
AUTHTYPE(IDPWOS) CHCKCLNT(REQUIRED)
REFRESH SECURITY TYPE(CONNAUTH)
```

__ c. Check that you entered both the ALTER and the REFRESH commands

__ d. Press PF3 to run the commands

__ 18. Check that all commands completed successfully in your CSQUTIL output file.

__ 19. Return to your Windows command prompt. Reset the MQSAMP_USER_ID variable to blanks so the test program does not pass any ID or password. At the command prompt, enter `MQSAMP_USER_ID=` without any additional values, and press the Enter key.

__ 20. At the Windows prompt, test the client application again by typing `amqsputc PRICE.CL` and pressing the Enter key.

__ a. At the Windows command screen, what was the result of this test?

_____

__ b. At the z/OS system log, what messages do you find for your TSM00##.SVRCONN?

_____

__ 21. At your Windows command prompt, set MQSAMP_USER_ID to your TSM00## user by typing `MQSAMP_USER_ID=TSM00##` and pressing the Enter key, or use the up arrow to retrieve the partially typed command.

__ 22. At the Windows command prompt, test again with the client application:

Remember to enter the password in all uppercase.

__ a. Type `amqsputc PRICE.CL` and press the Enter key

__ b. Provide the password in uppercase

__ c. Enter some data and press Enter twice to end amqsputc application.

__ d. What was the result?

_____

Note

Local authentication (CHCKLOCL) works in a similar manner to CHCKCLNT for local queue manager connections. In the interest of time, you test only CHCKCLNT in this exercise, but the behavior for CHCKLOCL is the same (only for local connections).

If you need to test local authentication in your shop, download the MA01 support pack, which has switches to allow the use of ID and password in the PUT.

Section 4: Adjust IBM MQ Explorer connection authentication access

Your MQ## queue manager is not accepting any IBM MQ client connections without a valid user ID and password. IBM MQ Explorer is also a client application. You test access and make any needed changes to adapt to the changes in the server queue manager (MQ##).

__ 23. If not already open, locate your IBM MQ Explorer shortcut and double-click to start the application.

__ a. What response do you receive from IBM MQ Explorer when you try to connect to your queue manager?

_____

__ b. At the z/OS system log, what messages do you find for your TSM00##.SVRCONN?

_____

__ 24. Adjust IBM MQ Explorer settings for your MQ## queue manager to provide the now required authentication information. You must first enable the IBM MQ Explorer Eclipse settings to allow entry of the password.

__ a. From the top navigation bar of IBM MQ Explorer, select **Window > Preferences**.

__ b. Expand the twistie titled IBM MQ Explorer and select **Passwords**.

__ c. Read the text about encryption.

__ d. Select **Save passwords to file**.

__ e. Click **Apply** and then **OK** to return to the IBM MQ Explorer main view.

__ f. Right-click your queue manager name.

__ g. From the queue manager name menu, select **Connection Details > Properties**. Double check to make sure that you are in the correct place, a panel titled MQ## - Properties.

__ h. Select the **Userid** field. The panel should have the subheading **Userid**. Do not worry if the Password entry box is unavailable.

__ i. Click the box that is named **Enable user identification**. The second box also shows that it is selected.

__ j. Enter your TSO user ID. You should see a button that is named **Enter password**. Remember that the password needs to be entered in all capitals; be careful that you do not hold the Shift key for any numbers.

__ k. Select **Enter password**, and then enter your TSO password in all capitals.

__ l. Click **Apply** and then **OK**.

__ m. Right-click your queue manager name and type: `Connect`

What happens now? If all settings are correct, you should be connected to your queue manager with IBM MQ Explorer.

Section 5: Check equivalent MQSC capabilities in IBM MQ Explorer

You used MQSC commands to display the connection authentication settings. You now check the same information with IBM MQ Explorer.

__ 25. Check security settings. Right-click your queue manager name, and then select **Configuration > Security**. You see your security switches in the bottom panel. You obtained this information with MQSC by issuing DIS SECURITY for your queue manager. Close the security panel.

__ 26. Right-click your queue manager name and select **Security**. You see that this entry is to refresh different resources, so in the previous step you used **Configuration > Security** instead.

__ 27. Determine what type of connection authentication the queue manager is using. Right-click the queue manager name and select **Properties**. The General menu displays.

__ 28. From the left navigation list, select **Extended**. At first, you do not see the Connection Authentication setting. There is a vertical scroll bar to the right of the Extended display. Scroll all the way to the bottom of this display, and you find the Connection Authentication setting.

__ 29. Check the available authentication information records. If not already expanded, expand the twistie by your queue manager name to show the objects menu.

__ a. Select the **Authentication Information** menu.

__ b. Place your cursor on the authentication record for type `IDPW OS`; the line for this entry should turn blue.

__ c. At the `IDPW OS` line, you can either double-click for the pop-up display, or scroll to the right for the panel view, and you can check the Local Connections and Client Connections settings. You see that Client Connections are required.

In this step, you checked the equivalent MQSC and IBM MQ Explorer capabilities.

Section 6: Reset client authentication to OPTIONAL

Given time constraints, you reset the CHCKCLNT attribute to OPTIONAL so you can save the time of having to enter the password in the channel authentication sections of this exercise.

__ 30. Return to your ISPF IBM MQ MQSC panel if needed. You should still have the MQSC commands that you entered to enable client authentication. You need to change only the CHCKCLNT attribute from “REQUIRED” to “OPTIONAL”.

__ 31. Press PF3 and check your results.

__ 32. Return to IBM MQ Explorer. Right-click your queue manager and select **Connection Details > Properties**. Select **Userid**.

__ 33. Click **Clear password** and confirm, and then clear the **Enable user identification**.

__ 34. Select **Apply** and **OK**. You receive a notice that IBM MQ Explorer needs to restart the connection to this queue manager.

__ 35. If after a few moments IBM MQ Explorer does not restart the connection, right-click the queue manager name and select **Connect**, to reconnect to your queue manager.

Hint

Should the queue manager become hidden or disappear after you remove connection authentication, go to the top of the IBM MQ Explorer Navigator, right-click the **Queue Managers** heading, and select **Show hidden queue managers**. It should now be restored. If you try to readd it when it is hidden, you get a message that states the queue manager is already added.

__ 36. Return to your Windows command prompt.

__ 37. Set MQSAMP_USER_ID to spaces.

__ 38. Test the client. Type: `amqsputc PRICE.CL`

You should now be able to enter a message, and press Enter twice to end the application without providing credentials.

Section 7: Review the channel authentication defaults

In this section, several users are issuing commands. Be careful when you are looking at the results for your queue manager.

Hint

Instead of entering the next two commands in the SDSF log, use the IBM MQ ISPF CSQUTIL option on Action 8. Enter both commands and press PF3 to complete them. If you use the CSQUTIL option, you can skip the two steps that indicate to enter the commands at the system prompt, and proceed to step to “Review the default rules”.

__ 39. Display the queue manager channel authentication setting. Enter `=s;log` at the command prompt and press the Enter (Ctrl) key to reach the SDSF system log. At the system log, type:

```
/MQ## DIS QMGR CHLAUTH
```

Remember, when you configured your queue manager, you set CHLAUTH(DISABLED). The default setting is CHLAUTH(ENABLED).

__ 40. Your queue manager is new, and no CHLAUTH rules are set yet. Any existing rules are the default rules that are included in the new queue manager. Check these rules. At the system command prompt, type:

```
/MQ## DIS CHLAUTH(*)
```

__ 41. Review the default rules, making sure to note the description, or purpose for each rule.

Information

When you reviewed the rules, you noticed the `CHLAUTH('*') TYPE(BLOCKUSER)` for `USERLIST('*MQADMIN')`. Proceed to SDSF `=m;da`, and locate your channel initiator started task, `MQ##.CHIN`. What user ID does it run under?

According to the CHLAUTH BLOCKUSER default rule, the user ID under which the CHIN runs qualifies as an MQADMIN type user. Keep this fact in mind for the next steps.

Section 8: Enable channel authentication and channel events in the queue manager

__ 42. Enable channel authentication and channel events by entering the queue manager alter command from the SDSF system log as shown:

```
/MQ## ALTER QMGR CHLAUTH(ENABLED) CHLEV(EXCEPTION)
```

__ 43. If necessary, reopen the Windows command prompt.

__ a. Retest the client application by entering `amqsputc PRICE.CL` at the Windows command prompt.

__ b. What do you see at the Windows command prompt?

_____

__ c. Browse your `MQ##CHIN` started task by entering `=s;da` at the command prompt and pressing the Enter(Ctrl) key, and then select your `MQ##CHIN`. What messages do you see?

_____

The message to write down should include why the channel got blocked.

Many administrators disable CHLAUTH if the connections are blocked. In this lab, you learn to use CHLAUTH.

Section 9: Allow selected privileged users to bypass the BLOCKUSER rule

Rather than remove the BLOCKUSR rule, you learn to bypass the BLOCKUSR rule by adding a new, more specific BLOCKUSER rule. Leaving the default BLOCKUSR is the suggested practice.

For the new rule, providing the full channel name is more specific. However, the USERLIST cannot be blank because a blank user list does not override the default rule, which has at least one ID value (`'*MQADMIN'`). To get around the rule behavior, you provide a bogus user ID.

__ 44. The channel that you configured in your Windows client is `TSM00##.SVRCONN`.

__ 45. Proceed to the IBM MQ ISPF MQSC panel by entering `=m` from the command prompt.

__ 46. At the MQSC command edit file, remove any old commands and enter the command to remove the BLOCKUSR rule. Type the command exactly as shown, taking care to include the apostrophes, and then press PF3. Do ***not*** copy and paste.

```
SET CHLAUTH('TSM00##.SVRCONN') TYPE(BLOCKUSER) USERLIST('JUNKUSER')
```

It is assumed JUNKUSER is not a privileged user. The command should fit on one line of the command input file, but if you end up needing two lines, add the “+” continuation character. After pressing PF3, complete the following steps:

__ a. Confirm that the command ended successfully with “failed 0” results for commands completed.

__ b. Return to your ISPF MQSC command line, and display CHLAUTH again. At the command input data set, enter `DIS CHLAUTH(*)` and press PF3. You should see four rules, including the new rule.

__ c. Test the client. At the Windows command prompt type: `amqsputc PRICE.CL`

The test should work now.

__ 47. If any part of the previous step did not work as expected, stop and make any needed corrections before proceeding. You are not able to continue until the previous step works. Request assistance if necessary.

Note

So far you did a necessary workaround for one of the default CHLAUTH rules. You now set some new rules

Section 10:Set the “back-stop” rule

The back-stop rule is a concept and a name that is given to a specific CHLAUTH of type ADDRESSMAP definition that inhibits all connections. Since this rule can cause significant inconvenience to unsuspecting users, it can be set in “warning” mode first. With warning mode, you can see what connections would be disallowed, and you receive information on which rules should be set to allow valid connections. In class, the rule is entered in normal blocking mode, not in warning mode.

The description attribute is not often used by administrators, but when setting CHLAUTH rules, it is a good practice to document what the rule is intended for.

You now set the “back-stop” rule in regular mode. Do ***not*** set the rule in warning mode for this exercise.

__ 48. Proceed to the IBM MQ ISPF MQSC command prompt and enter `=m` at the command line, confirming that the panel is set to your queue manager. Enter `8` in the Action field and press the Enter (Ctrl) key.

__ 49. At the CSQUTIL command input file, enter the back-stop rule as shown.

Important

Take care to use the apostrophes as shown in all CHLAUTH commands.

Do not attempt to copy and paste, as it results in invalid characters. Type all commands.

Remember, you are ***not*** using warning mode. You do not see any channel locked messages if you use warning mode.

```
SET CHLAUTH('*') TYPE(ADDRESSMAP) ADDRESS('*') +
USERSRC(NOACCESS) + DESCR('Back-stop rule')
```

You now are allowing connections from administrative users for channel TSM00##.SVRCONN only, but you are blocking all connections with the back-stop rule.

Information

In the previous step, you used a TYPE(ADDRESSMAP) rule to block connections with the back-stop rule. As noted in the lecture, you might also use the TYPE(BLOCKADDR) to block connections. Do you remember the difference? It is important to reiterate.

- When you use TYPE(ADDRESSMAP), the data has already flowed. You know that the name of the channel and full details of the reason the connection was blocked are available in the log, and the system events if configured. This type of rule should be used in most cases.
- TYPE(BLOCKADDR) applies much earlier in the process, before any data flows, so the channel name is not yet known. The best use of BLOCKADDR is to block problem addresses that later get handled with a firewall. BLOCKADDR rules should be used on a temporary basis, and should not permanently substitute for a firewall.

After you set the back-stop rule, you first run two tests; then, you add other CHLAUTH rules to allow access.

__ 50. If necessary, reopen the Windows command prompt and test again:

__ a. Retest the client application by entering `amqsputc PRICE.CL` at the Windows command prompt.

__ b. What do you see at the Windows command prompt?

_____

__ c. Browse your MQ##CHIN started task by entering `=s;da` at the command prompt and pressing the Enter(Ctrl) key; then, select your MQ##CHIN. What messages do you see?

_____

Stop and review the “blocked” messages:

- The first time that TSM00##.SVRCONN was blocked was due to the user ID. Using MQ15 as an example, the message reflected:

  ```
  +CSQX776E MQ15 CSQXRESP Channel TSM0015.SVRCONN from 10.4.127.184 has been
  blocked due to userid, Detail: MCAUSER(TSM0015)
  ```

- You corrected this situation with the bogus BLOCKUSR rule. This recent block was different. It is due to a USERSRC(NOACCESS), which is what the back-stop rule accomplished.

  ```
  +CSQX777E MQ15 CSQXRESP Channel TSM0015.SVRCONN from 10.4.127.184 (10.4.127.184)
  has been blocked due to USERSRC(NOACCESS), Detail: CLNTUSER(nomad789) Now you
  set up an additional blocked condition.
  ```

You are not going to resolve the access for the new blocked situation yet. You return to add needed rules later.

In the next steps, you create another situation where a cluster channel attempts to connect to your queue manager.

Important

Take care in the next two steps:

- ***To create the cluster queue in your queue manager***
- ***To put the message to the cluster queue from the MQ0A queue manager, as shown on the sample PARM setting***

__ 51. Create a clustered queue in your queue manager. Go to `=s;log` to access an SDSF view, and enter:

```
/MQ## DEF QL(TSM00##.CLUSQ) CLUSTER(WMADMCLS)
```

Take care to spell the cluster name correctly.

__ 52. Go to your JCLPUT, and taking care to ***use MQ0A as the queue manager in the PARM***, place a message to your TSM00##.CLUSQ. Use the PARM line exactly as detailed, ensuring that the only substitution is your team number in the `##` placeholder:

```
PARM('MQ0A TSM00##.CLUSQ 0001 Q 0100 P')
```

__ a. Submit your job. It should end up with an IBM MQ return code.

__ b. What return code did the job receive? _____

__ c. Proceed to the system log if you are not already there. Do a find for messages for your queue manager.

__ d. Did you find any new “blocked” messages? For what channel?

_____

Among numerous cluster messages that are trying to get to your TSM00##.CLUSQ, you should see:

```
+CSQX777E MQ15 CSQXRESP Channel WMADMCLS.MQ15 from mvsmc12
 (10.31.187.60) has been blocked due to USERSRC(NOACCESS), Detail:
 QMNAME(MQ0A)
```

Section 11:Create CHLAUTH rules to allow valid connections

After you entered the “back-stop” rule, connections to your queue manager are being blocked. You now add rules to allow them back in, one at a time. You start with the cluster channels.

__ 53. Create a CHLAUTH rule to allow the cluster channels to connect to your queue manager.

__ a. Your instructor should confirm the IP address. If you do not have the IP address to your queue manager, you can confirm it by checking your CSQX777E error message, which shows the IP address.

__ b. An example of the SET CHLAUTH command is provided. Pay attention to all the attributes used, and take time to understand the rule before entering the rule. Type the rule in the IBM MQ ISPF MQSC command panel.

__ c. ADD is the default action so the ACTION attribute can be skipped.

__ d. Confirm your ADDRESS attribute entry in your system log CSQX777E message.

__ e. Take care to use the quotation marks as shown, and ***double check*** your definition before creating it.

```
SET CHLAUTH('WMADMCLS.*') TYPE(QMGRMAP) ADDRESS('10.31.*') +
DESCR('Access for WMADMCLS cluster channels') +
MCAUSER('TSM00##') QMNAME('MQ*')
```

__ f. Notice how you are using a wildcard in the channel name ***and*** in the queue manager name. You want to allow cluster channels from all the member queue managers to connect. In the case of the lab environment, all queue managers are at the same IP domain, so the ADDRESS can be shared for all queue managers.

__ g. `MCAUSER` is set to your TSO ID.

__ 54. Use the same PARM details that were previously given to resubmit the JCLPUT. If the CHLAUTH rule was entered correctly, this time your message should be in the queue.

__ a. If you did not have any errors in the JCLPUT, list the current queue depth from the SDSF system log to see the number of messages in the queue. From an SDSF screen, enter:

```
/MQ## DIS Q(TSM00##.CLUSQ) CURDEPTH
```

__ b. If your CHLAUTH rule did not work and the cluster channels are still blocked, check your WMADMCLS.* CHLAUTH definition. If needed, obtain assistance before proceeding.

Now the channel authentication for the cluster channels should be resolved. You now add a CHLAUTH rule to allow your TSM00##.SVRCONN channel to connect.

__ 55. Return to your IBM MQ ISPF panels and go to Action 8 to proceed to the MQSC command facility. Enter a rule to provide channel authentication to TSM00##.SVRCONN.

__ a. Locate the CSQX777E blocked message for your TSM00##.SVRCONN channel.

__ b. Note the ADDRESS and MCAUSER values to use in the sample CHLAUTH rule provided. Substitute the values in the rule for the values in your CSQX777E message.

__ c. The example rule follows. Substitute the team number and IP from the CSQX777E message. Take care to include a continuation + every time you do a line break:

```
SET CHLAUTH('TSM00##.*') TYPE(ADDRESSMAP) ADDRESS('10.?.?.*') +
DESCR('Access for TSM00##.SVRCONN @ 10.?.?.*') +
MCAUSER('TSM00##')
```

This rule also takes a USRSRC value; however, the default is `USRSRC(MAP)`. Take a moment to check this value in the IBM MQ Knowledge Center for `SET CHLAUTH`.

__ d. Confirm that the rule was created successfully. Apply any corrections if necessary. If you need to apply corrections, use all the fields in the original definition, including the corrected attribute, with the attribute "`ACTION(REPLACE)`" added at the end of the command.

__ 56. Return to your Windows command prompt, and retest either by entering `amqsputc PRICE.CL` or by using your up arrow to retrieve the last `amqsputc` invocation. The test should now work.

Section 12:Correcting and replacing rules

In these last two sections, you go through an iteration of steps to provide practice with replacing and removing rules. You also discover the effects of each rule, how the type of rule that is selected might not be the most adequate, and make necessary corrections.

Note

This section is challenging and contains deliberate errors and omissions to help you resolve problems when you do this work later.

__ 57. Define a new SVRCONN channel named `NOMCAUSR##` and ***leave the MCAUSER field blank***. From your ISPF MQSC facility, type the channel definition command, substituting your team number for the `##` placeholder:

```
DEF CHL(NOMCAUSR##) CHLTYPE(SVRCONN) TRPTYPE(TCP)
```

__ 58. Go to your Windows command input screen and reset the MQSERVER environment variable to reflect use of the new channel. If you remember from the Clients unit, the MQSERVER variable channel takes precedence over the CCDT defined channel. You type the following example, but change the `##` placeholder and host name fields as required, and then press the Enter key:

```
set MQSERVER=NOMCAUSR##/TCP/mvs???.ilsvpn.ibm.com(16##)
```

__ 59. From the Windows command, retest by typing `amqsputc PRICE.CL` and pressing the Enter key. You should see the familiar return 2035, indicating a security issue. If you get a different IBM MQ return code, you might have an error in the set MQSERVER; if so, reissue the set MQSERVER and make the correction.

__ 60. Go to the system log at `=s;log` and find the error for your channel. Keep this window open so you can see the attributes that got rejected when you enter your CHLAUTH rule.

__ 61. Go to your ISPF MQSC facility and enter a CHLAUTH rule to allow connection to this channel.

__ a. There might be a deliberate error or omission in the command, but ***the error is intended*** for this step. When you press the PF3 key to create the command, pay special attention to the messages from the CSQUTIL MQSC processor.

__ b. Remember to confirm the attributes values from the CSQX777E when entering the rule.

__ c. The rule should look similar to the example. Remember to include the asterisks as shown. ***Make sure to leave MCAUSER blank***:

```
SET CHLAUTH('NOMCAUSR##') TYPE(ADDRESSMAP) ADDRESS('?.?.?.*') +
DESCR('Access for NOMCAUSER @ ?.?.?.*') -
MCAUSER()
```

__ 62. Take a close look at the error message in your ##.CSQUTIL.OUTPUT results. Your results should resemble the display:

```
CSQN205I    COUNT=        3, RETURN=00000008, REASON=FFFFFFFF
CSQ9010E MQ15 Required parameter for 'MCAUSER' not specified
```

You see how CHLAUTH results provide clear error messages of any problems with creating a rule. The example had a deliberate error, leaving the required MCAUSER field blank.

__ a. What type of CHLAUTH rule were you creating?

__ b. What was the required field ***for that rule type***, which was missed according to the error message?_____

You now correct this error.

__ 63. Return to the ISPF MQSC facility. Your previous CHLAUTH rule should still show in the editor.

__ a. Add your user ID to the MCAUSER attribute, and add ACTION(REPLACE) as shown. Although the rule was not created, you see how using ACTION(REPLACE) causes addition of rules in many circumstances.

```
SET CHLAUTH('NOMCAUSR##') TYPE(ADDRESSMAP) ADDRESS('?.?.?.*') +
MCAUSER(TSM00##) ACTION(REPLACE)
```

Important

When changing a rule, you do not need the DESCR attribute. You do need to use all the required fields pertinent to the existing rule. If you do not use all required fields, ACTION ADD can be assumed, regardless of the actual ACTION attribute. When you qualify a CHLAUTH rule with a specific attribute, such as an IP address, that rule applies only to the specific IP address.

__ b. Press PF3 to process the change and check results.

__ c. Retest by going to the Windows command prompt and entering: `amqsputc PRICE.CL`

__ d. What happened? You expected the test to succeed; however, take a good look at the reason why the channel was blocked:

```
+CSQX776E MQ## CSQXRESP Channel NOMCAUSR## from 10.4.127.184 has been
blocked due to user ID, Detail: MCAUSER(TSM00##)...
```

Reminder

TSM00## is considered an administrative ID. Earlier in this exercise you entered a specific rule to allow administrative IDs for channel TSM00##.SVRCONN. You need to enter a similar rule for channel NOMCAUSR##.

__ 64. Add the rule to allow privileged uses for the NOMCAUSR## channel.

__ a. Using ISPF MQSC, enter a rule as shown:

```
SET CHLAUTH('NOMCAUSR##') TYPE(BLOCKUSER) USERLIST('JUNKUSER')
```

__ b. Press PF3 to process the change and check results.

__ c. Retest by going to the Windows command prompt and entering: `amqsputc PRICE.CL`

The amqsputc should now work.

You are allowing connections for the new channel; however, the security team is concerned that anyone who logs on to the IBM MQ client/server might send a message to be processed. You are requested to change the CHLAUTH rule so that only the Windows user ID `'ADMINIST'`, who is the valid user for this application, can connect. You change the rule. ***There might be a deliberate error in this instruction, and you fix it later***.

__ 65. Return to the ISPF MQSC facility. Your previous CHLAUTH rule should still show in the editor. Set the MCAUSER field to user ID `'ADMINIST'` as requested and press PF3 to run the change. The example command is shown:

```
SET CHLAUTH('NOMCAUSR##') TYPE(ADDRESSMAP) ADDRESS('?.?.?.*') +
MCAUSER('ADMINIST') ACTION(REPLACE)
```

__ 66. After confirming the change completed successfully, retest by going to the Windows command prompt and entering: `amqsputc PRICE.CL`

__ 67. What happened now? You see the familiar 2035 in the Windows command screen. Check the z/OS system log. If you are not already there, at the command prompt, enter `=m;log` and locate the error message for your SVRCONN channel name. What type of a message did you receive this time?_____

ID ADMINIST is a hypothetical Windows ID that does not exist in the z/OS lab environment. ***This time, you do not get an IBM MQ CSQX777E, but an ICH408I RACF error message***, which indicates that user ADMINIST is not RACF defined. You use the IBM Knowledge Center to research the problem. From this research, you discover that you should use a different CHLAUTH rule type to map the Windows ID user to a designated RACF defined application user ID in z/OS. You now need to delete the original rule for this channel, and create a MAPUSR instead of the ADDRESSMAP rule.

Section 13:Delete a rule and replace with (add) a new rule type

__ 68. Remove the existing CHLAUTH rule for channel NOMCAUSR##. Return to the ISPF MQSC edit file. The last rule for this channel should still be there. You change the ACTION from REPLACE to REMOVE as shown, press PF3 to complete, and check results.

```
SET CHLAUTH('NOMCAUSR##') TYPE(ADDRESSMAP) ADDRESS('?.?.?.*') +
MCAUSER('ADMINIST') ACTION(REMOVE)
```

__ 69. Create a type USERMAP rule to provide access to your Windows administrative user by mapping it to a suitable RACF defined user. For class purposes, the suitable user is TSM00##. Return to the ISPF MQSC edit file. Enter the new CHLAUTH command, making necessary changes, and press PF3 when ready to create the rule. Remember that ADD is the default action; the example omits the ACTION attribute:

```
SET CHLAUTH('NOMCAUSR##') TYPE(USERMAP) +
DESCR('Access for NOMCAUSR##') +
CLNTUSER('Administrator') MCAUSER('TSM00##')
```

__ 70. Now retest from your Windows client by typing: `amqsput PRICE.CL`

The connection should be allowed.

Warning

If you did not change `OPMODE` to `NEWFUNC`, error message `CSQY337E MQ## CSQMSCA CLNTUSER value length not allowed - restricted` surfaces for this most recent `amqsputc` test. Although 12-character user IDs from distributed platforms are allowed for the newest IBM MQ versions, you must set the IBM MQ V8 z/OS queue manager to `NEWFUNC` to allow use of 12-character IDs from distributed applications. If you get this error in this step, stop your queue manager, run `MQ##ZPRM` with `OPMODE` set to `NEWFUNC`, and start the queue manager.

Section 14:Display and confirm CHLAUTH rules

Use MQ15 as an example since this instance is the first time that CHLAUTH was set in this queue manager. Before you display all the rules, make a list of the CHLAUTH rules that you expect to have present in your queue manager. The counts are cumulative:

- There were three default rules. Count =3.
- Added the “Allow privileged admin for TSM00##.* this channel” rule. Count =4.
- Added the “Back-stop” rule. Count = 5.
- Added the WMADMCLS.* rule for cluster channels. Count = 6.
- Added the TSM00##.* rule. Count = 7.
- Added the “Allow privileged admin for this channel” rule for NOMCAUSER##. Count =8.
- Added, replaced deleted, and readded the NOMCAUSR## rule. Count = 9.

__ 71. Write down the rules you expect to find in the table, including the three CHLAUTH default rules:

Table 21: Expected CHLAUTH rules

Rule	Comment

Table 21: Expected CHLAUTH rules

Rule	Comment

__ 72. Proceed to the ISPF MQSC panel and enter the `DIS CHLAUTH` command as shown. Press PF3 and view results. Compare these results to your list.

```
DIS CHLAUTH(*) DESCR
```

Did your actual display meet your expectations?

__ 73. Sometimes a rule can be inadvertently added if all the required attributes are not specified when changing or deleting a rule. When you are at your work environment, you want to clean up the unexpected rules, taking care to include all required and provided attributes. Since you are currently in a lab environment and there is more work to do, proceed to the next section.

Section 15:Checking CHLAUTH-related events

Information

In this lab, you worked with the CHLAUTH WARN attribute set to NO, that is, the CHLAUTH rule was in place and stopped the connection. If a CHLAUTH rule is set to WARN(YES), such as the back-stop rule, the connection is allowed and a warning is generated. However, this warning does not appear on the system console as you saw error messages for blocked channels; it is sent to the SYSTEM.ADMIN.CHANNEL.EVENT queue in the form of a code `X'A12'` event message. The most common event messages you find at SYSTEM.ADMIN.CHANNEL.EVENT show the following codes at displacement `X'1C'` of the event message:

- `X'A11'` = 2577 Channel blocked. This message appears with default WARN(NO).
- `X'A12'` = 2578 Channel blocked warning. This message appears when the WARN attribute for the rule is set to YES.
- `X'811'` = 2283 Channel stopped. This code follows an `X'A11'`.

Since events were enabled, there should be numerous entries with `X'A11'` and `X'A12'` in your SYSTEM.ADMIN.CHANNEL.EVENT queue.

__ 74. Return to the message handler sample, ISPF option H in the lab environment, and view the event messages in your queue manager. You already did this work in an earlier lab; see the event lab if you need refresher instructions. Notice the `X'A11'` and `X'811'` message pair entries, that is, an `X'A11'` message followed by an `X'811'` message. You get only `X'A12'` messages for any CHLAUTH rules with WARN(YES).

If you set up CHLAUTH rules with WARN(YES), you can download the MA01 if you need to format the event records. However, you can use the message handler to view some of the unformatted information.

Information

Implementing MA01 is outside the scope of this class; however, sample settings to format your event records are provided in this information box for your reference.

The MA01, usually referred to as the “Q” utility, has many options that can be confusing to the first-time user. For printing the event messages, notice other example entries that are commented out, and also the FILE DD statement. You need only the PARM string as shown in bold to print the queue. More documentation is found in the MA01 support pack readme file.

```
//*Q1       EXEC PGM=Q,PARM=('-MMQ23 -OQ1 -AP -M"MESSAGE"')
//*Q2       EXEC PGM=Q,PARM=('-MMQ23 -OQ1 -F"//DD:IFILE"')
//Q1        EXEC PGM=Q,PARM=('-mMQ## -ISYSTEM.ADMIN.CHANNEL.EVENT -df3')
//*FILE     DD   DISP=SHR,DSN=YOUR.INPUT(Q1)
```

Section 16:Back up your CHLAUTH definitions

In most shops, the CSQUTIL MAKEDEF utility is scheduled to run at set intervals to safeguard all the queue manager definitions. However, the objects that are backed up are established objects such as queues, channels, and subscription objects. If your environment has queue managers earlier than V7.1, it is possible that the CHLAUTH objects are not yet included in your organization’s MAKEDEF job. You do more work with CSQUTIL MAKEDEF in a later unit, but now you are saving your CHLAUTH definitions. Particularly in an environment where several IBM MQ administrators with varying levels of skill are involved, you must ensure that these definitions are backed up until they get incorporated in the scheduled backup jobs.

__ 75. Go to your TSM00##.WM30.SCSQPROC library on ISPF. You create a new member from an existing one and make some changes.

__ a. From the member list on your library, type `S BKCHLAUT` and press the Enter (Ctrl) key. You should be at an empty BKCHLAUT member now.

__ b. At the command prompt of your empty BKCHLAUT member, type `copy MAKEDEF` and press the Enter (Ctrl) key.

__ c. Go to the last line of the member, and change `OBJDEFS` to: `CHLAUTHS`

This member is where your CHLAUTH definitions are backed up.

__ d. Do the global change from the `##` placeholder to your team number.

__ e. MAKEDEF works by displaying the named objects in full, and copying that display. As suspected, this job includes many object types, but not the CHLAUTH objects. For purposes of this lab, you want to back up only the CHLAUTH definitions. On the first line of the CSQUCMD input records, replace the `DIS QMGR ALL` with: `DIS CHLAUTH(*) ALL`

__ f. Carefully remove the `STGCLASS`, `QUEUE`, `CHANNEL`, `NAMELIST`, and `PROCESS` display lines until the only display you have is for `CHLAUTH`.

__ g. Submit the BKCHLAUT job and check results in the SDFS `=s;st` panel

__ h. Return to your TSM00##.WM30.SCSQPROC library and browse member CHLAUTS. You see all definitions ready to be included in a CSQUTIL job, ready to go in case your definitions are inadvertently altered or removed.

The CHLAUTH backup step concludes the security exercise.

Warning

Remember, the rules and actions that are taken in this exercise were for understanding how to set, change, remove, and do basic troubleshooting of channel authentication and channel authentication rules. While the work done in the lab suggests an orderly way to approach implementing channel authentication rules, it does not imply that these rules must be set as shown. The security requirements of your organization should dictate the needed channel authentication rules and connection authentication settings.

End of exercise

Exercise review and wrap-up

In this exercise, you learned to:

- Determine the queue manager connection authentication (CONNAUTH) settings
- Test initial client connection authentication settings
- Change client connection authentication settings to require full credentials
- Use available tools to test connection authentication changes
- Adjust IBM MQ Explorer to work with client connection authentication enabled
- Display the initial channel authentication (CHLAUTH) rules
- Add a rule to allow certain administrative users
- Implement the back-stop rule in full blocking mode
- Add CHLAUTH rules that allow valid connections
- Make changes and deletions to CHLAUTH rules
- Interpret event messages that are related to CHLAUTH
- Back up CHLAUTH rules
- Explain how to set rules in warning mode and where to check results of rules that are running in warning mode

Exercise 9. IBM MQ Managed File Transfer configuration for z/OS

What this exercise is about

This exercise shows how to configure a basic IBM MQ Managed File Transfer environment and transfer a file.

What you should be able to do

After completing this exercise, you should be able to:

- Examine the parameters that are required to configure IBM MQMFT on z/OS
- Configure and execute the IBM MQMFT customization job
- Create an IBM MQMFT configuration and agent
- Review changes to the Unix System Services file structure during the IBM MQMFT configuration
- Start the IBM MQMFT agent
- Display the health of the agent
- Perform a basic file transfer by using batch JCL
- Add the MQMFT configuration to IBM MQ Explorer
- Check transfer results with IBM MQ Explorer
- Modify an existing MQMFT configuration

Introduction

This exercise provides the basics for the configuration and use of IBM MQ Managed File Transfer in the z/OS environment. Although some steps that use IBM MQ Explorer are included, all key steps can be completed, and a good learning experience can be accomplished by using JCL.

Requirements

- Completion of Exercise 1
- Connection authentication is disabled
-

Exercise instructions

Important

To run this exercise in the lab environment, there are three deviations you would not normally follow in a working deployment:

1. The queue manager that is used for IBM MQ Managed File Transfer is not dedicated to IBM MQ Managed File Transfer. In a “real” environment, whether test or production, you have at least one queue manager that is dedicated to the IBM MQ Managed File Transfer configuration.
2. The file transfer that is used as verification of the environment involves only one agent. Setting up an environment to transfer to a separate agent would not add significant value to the configuration experience, and incurs extra setup effort. In the lab environment, you experience the key configuration tasks, including file transfer. The only difference is that the parameters used in the transfer would point to a different agent, and you need IBM MQ object definitions in place between the agent queue managers. In this exercise, you focus on the configuration, not the additional tasks that are already done in earlier labs.
3. You are creating a higher lever directory to hold your IBM MQ Managed File Transfer configuration. In a normal situation, the same user ID creates the IBM MQ Managed File Transfer configuration. When the first coordination queue manager is set up in the environment, the UNIX System Services directory structure for IBM MQ Managed File Transfer is established. The user who created this directory structure owns it and negates the ability for multiple users to configure IBM MQ Managed File Transfer in the same system. In the lab environment, a higher-level directory is created to bypass UNIX System Services directory contention issues.

Section 1: Create the IBM MQ Managed File Transfer data directory for your configuration

Warning

This step is critical in ensuring the ability to run this exercise for multiple users.

Do not proceed to other sections until you complete and check that this directory is created properly. Request assistance if necessary.

__ 1. From an ISPF command prompt, type `TSO OMVS` and press the Enter (Ctrl) key. You are now at the UNIX System Services directory screen. You need to enter UNIX commands in this screen. The commands are entered at the “===>” prompt. If you are not familiar with UNIX commands, follow the instructions.

__ 2. Identify where you are. Above your command prompt, that is ===>, your directory location is identified.

__ 3. At the command prompt (===>), type `ls -l` and press the Enter (Ctrl) key for your UNIX home directory. Other than a history file not visible with this command, you have no other files. When you first go to OMVS, you might see a location such as:

`TSM00##:/u/wm30/tsm00##:>`

where `##` is the qualifier for your team and TSO ID. If you are familiar with UNIX, it can be compared to your “home” directory.

__ 4. Type `cd /var`, **making sure that you include the slash**, and press Enter (Ctrl). Then, type `ls -l` and press Enter. You notice that there are some unrelated directories in this file, such as:

```
drwxr-xr-x   6 SYSPROG  OMVSGRP     8192 May 21  2007 Printsrv
drwxr-xr-x   3 TSM0015  OMVSGRP     8192 Dec  9 01:46 TSM0015
drwxr-xr-x   3 TSM0019  OMVSGRP     8192 Dec  9 02:05 TSM0019
drwxrwxrwx   3 INGM000  OMVSGRP     8192 Dec  8 21:03 man
drwxrwxr-x   2 SYSPROG  OMVSGRP     8192 Oct  2  2007 ocsf
```

__ 5. Do not worry if you do not see the same directories. Confirm your location above the ===> command prompt. You should see a directory location similar to:

`TSM00##:/MC`*`nn`*`/var:>`

The `##` placeholder shows the needed number for your ID. The `nn` placeholder can vary depending on the virtual host that is used for the class. The critical part is to have `/var` following the ID and host identifiers.

__ 6. Look at the two directories that use a TSO ID as a directory name; TSM0015 and TSM0019 are used as an example. Depending on the progress of other students, you might or might not see TSM00## named directories; however, you create a similar directory for your IBM MQ Managed File Transfer configuration in the next step.

__ 7. Confirm that you are still in the `/var` directory by looking at the location identifier above the ===> command prompt. If you are unsure where you are, type `pwd` at the ===> command prompt and press the Enter (Ctrl) key. The system returns a shortened version of the current path; that is, `/MC`*`nn`*`/var:>` followed by `TSM00##:/MC`*`nn`*`/var:>`. If this path is what you see, you are in the right place. If it is not what you see, type `cd /var` again and press the Enter (Ctrl) key to return to the `/var` directory.

__ 8. **It is important that you type the command for this step from the `/var` directory**. From your current location at the `/var` directory, create a directory with your TSO ID for a name. At the ===> prompt, enter:

```
mkdir TSM00##
```

where `##` is your team ID.

__ 9. Display the contents of `/var` again by typing `ls -l` and pressing the Enter (Ctrl) key. Your `TSM00##` directory should be created in the `/var` directory and should display in a similar manner. For instance, if your TSO ID is `TSM0003`, you should see:

```
drwxr-xr-x   3 TSM0003 OMVSGRP     8192 Dec  9 01:46 TSM0003
```

after you create the directory and display it from `/var`.

__ 10. If your directory is created as expected, proceed to the next section. If you are having any problems with creating your directory, ***do not proceed***. Request help before proceeding.

Section 2: Review other UNIX System Services directories

__ 11. Type `cd /usr/lpp` and press the Enter (Ctrl key). Repeat the `ls -l` and press Enter again. You see many other directories as they scroll by.

__ 12. When the list stops, press the PF7 key until you see the `mqm` and `mqmfte` directories. Enter `cd mqmfte/V8*` and press the Enter (Ctrl) key. Now enter `ls -l` and press Enter again. These files are your mqmfte product files. ***Do not confuse these files with your configuration files***.

__ 13. Return to the ISPF panels by entering exit at the input prompt and pressing the Enter (Ctrl) key.

__ 14. Press Enter (Ctrl) again when you see the message that states the session is ended.

Section 3: Review configuration parameters

__ 15. Before starting, read the following note carefully.

Important

The IBM MQ Managed File Transfer exercise picks up after the activities that are documented in the IBM MQ Managed File Transfer for z/OS Program Directory are already completed in the lab environment:

- The UNIX System Services file system was created by using BFGFAZFS.
- The file system that contains the product code was allocated by using BFGGMKEX.
- The product SMP/E installation is completed.
- A copy of the configuration libraries is placed in your TSM00##.WM30.MQMFT partitioned data set (PDS).

To configure your IBM MQ Managed File Transfer environment, you start by submitting PDS member BFGCUSTM, which causes regeneration of members in your `TSM00##.WM30.MQMFT` PDS with specific changes. After you submit BFGCUSTM, you must exit out of the `TSM00##.WM30.MQMFT` PDS while the rewrite is completing. The rewrite of the PDS is based on the parameter values you provide to the BFGCUSTM job. It is the accuracy of these values that determines how successful your next steps will be.

Warning

You are not changing anything now. You are reviewing the parameters first. To prevent errors and save time, most parameter values are prefilled for you. Leave these values as configured. Change only where indicated by bold characters in the Preconfigured indicator column of the table.

Values that are commented out in BFGCUSTM, that is, the record starts with the "#" (pound) character, are not used for the lab configuration. Leave these values commented out.

Do ***not*** make a global change of `##` to your team number. This job uses the `#` sign to mark comments. In a later section, you need to manually find and change each occurrence of `MQ##` to your team number.

Table 22: BFGCUSTM member parameter values

Parameter	Value	Preconfigured indicator
BFG_JAVA_HOME	/usr/lpp/java/J7.0	Preconfigured
BFG_GROUP_NAME	Must stay blank	Preconfigured
LIBRARY	TSM00##.WM30.MQMFT	Preconfigured
TMPDIR	/tmp	Preconfigured
SERVICE_TYPE	AGENT	**Change ++service_type++ to AGENT**
NAME	MQ##AGT1	**Change ## to your team number. Do *not* do a global change. The comments also use ##.** This name is the name of your agent.
BFG_PROD	/usr/lpp/mqmfte/V8R0M0	Preconfigured. This installation is the IBM MQ Managed File Transfer installation in the z/OS UNIX System Services directories.
BFG_DATA	/var/TSM00##	**Make sure BFG_DATA has the correct parameter; overwrite if necessary. *This parameter is the most critical parameter in your configuration.* Enter the full path of the directory you created; that is, /var/TSM00## where ## is your team number; TSM00## is also your TSO ID.**
BFG_JVM_PROPERTIES	Not used in this configuration	Leave commented out.

Table 22: BFGCUSTM member parameter values

Parameter	Value	Preconfigured indicator
QMGR	MQ##	**Change to your team number**. This change applies to your queue manager name. Do ***not*** do a global change.
MQ_PATH	/usr/lpp/mqm/V8R0M0	Preconfigured. UNIX System Services directory for IBM MQ.
MQ_HLQ	SYS2.MQ8000	Preconfigured. High-level qualifier for IBM MQ data sets.
MQ_LANG	E	Preconfigured. IBM MQ language letter.

__ 16. The remainders of the parameters are preconfigured, but omitted from the table for brevity. You are not using a credential file. Of the remaining parameters, the ones important to review are:

- BFG_WTO=NO. System console messages are suppressed.
- This PATH is set for UNIX System Services commands that are used by IBM MQ Managed File Transfer jobs.
- Below the Properties heading: These fields provide information about the configuration:
  - coordinationQMgr includes the name of the queue manager that fulfills this role. In the lab configuration, the same queue manager serves all rolls. Since you are using distributed channel bindings (versus client bindings) it is not necessary to provide your host, port, and channel. You configured these values with the ## change to your team number.
  - **Your configuration name** consists of the name of your coordination queue manager.
  - ConnectionQMgr is the name of the queue manager that fulfills the command queue manager role. You configured this value with the ## change to your team number.
- An IBM MQ Managed File Transfer configuration can have different agents. You provided the name for the first agent in the NAME parameter. The agent shows under the coordination queue manager in the UNIX System Services directories.
- After the initial configuration is created, extra agents can be added to this configuration by using the fteCreateAgent, or BFGAGCR JCL.

Section 4: Customize your IBM MQ Managed File Transfer PDS

Warning

All values are case-sensitive.

Remember that you are working on PDS TSM00##.WM30.MQMFT only.

The success of this exercise depends on the accuracy with which you configure these parameters. Exercise care. Request help if needed.

__ 17. Create a backup member of your BFGCUSTM job. Proceed to the `TSM00##.WM30.MQMFT` PDS.

__ a. At the PDS command prompt where you see the list of members, type `S BFGCUSTX` from the command prompt and press the Enter (Ctrl) key. You are in an empty member.

__ b. From the command prompt of the empty member, type `"COPY BFGCUSTM"` and press the Enter (Ctrl) key. You now copied the original BFGCUSTM into member BFGCUSTX.

__ c. Press the PF3 key to exit BFGCUSTX. Remember that this action is the backup for your BFGCUSTM member.

__ 18. In your BFGCUSTM member, make the needed changes:

__ a. Change `++service_type++` to: `AGENT`

__ b. Find each occurrence of `MQ##` and manually overlay the `##` with your team number.

__ c. Find parameter `NAME` and change from `MQ##` to: `MQ##AGT1`

__ d. Find parameter `BFG_DATA`. This action needs the full path to the directory you created. If not already correct, this full path is `/var/TSM00##` where `##` is your team number.

__ 19. Review your parameters carefully and compare them to the table in the earlier section. Check with your instructor if you have any questions.

__ 20. After you are sure that your parameters are correct, proceed to submit BFGCUSTM, and ***exit the TSM00##.WM30.MQMFT PDS*** as it is going to be rewritten, customized with the parameters in the BFGCUSTM member. It takes a few moments for this job to complete.

Warning

If your BFGCUSTM job ends with return code 256 and message BGMQ1030E at the end of the job, similar to the displayed message ...

```
BFGMQ1030E: The data directory '/var/TSM00##' specified in the environment
variable BFG_DATA does not exist or is not a directory.
```

... your configuration directory is not created correctly. Obtain help from your instructor before proceeding.

__ 21. When your job ends, carefully review the output:

__ a. Check that return code is zeros.

__ b. The next BFGCL0713W warning similar to the displayed in this substep ***can be safely ignored*** if it shows up at the end of your BFGCUSTM job output.

```
BFGCL0713W: Unable to update configuration properties for coordination
queue manager 'MQ19'. Reason: BFGUB0009E: The following required property
file is missing: "/var/TSM00##/MQ##/coordination.properties"
```

__ c. Confirm that the members you need to create in the IBM MQ Managed File Transfer environment were customized by checking the list of members at the end of the BFGCUSTM job results. These members are:

BFGCFCR, BFGCMCR, BFGAGCR, BFGAGST, BFGAGLI, and BFGTRCRS

Note

After the BFGCUSTM job runs, your JCL members contain all the needed changes to be submitted as is.

Do change the customized JCL unless requested by the instructor.

The actions and JCL used in this section are summarized in the table in the order to be completed.

Table 23: Jobs to configure and verify your IBM MQ Managed File Transfer environment

Action	JCL
Set up the coordination queue manager.	BFGCFCR
Set up the command queue manager.	BFGCMCR
Create the agent and designate the agent queue manager.	BFGAGCR
Start the agent.	BFGAGST JCL
List the agent.	BFGAGLI
Create a transfer.	BFGTRCRS

Section 5: Set up the coordination queue manager

Reminder

Do not change anything in the JCL.

Make sure that you disabled connection authentication in the security lab.

Use of a credentials file was intentionally bypassed in the BFGCUSTM job. You can **safely ignore** message BFGPR0127W as shown when you see it in your job results. The credentials file is used if connection authentication is enabled, or if you configure one of the loggers and need to provide a DB2 password. Do not attribute any errors to this message; it is expected.

```
BFGPR0127W: No credentials file has been specified to connect to WebSphere MQ.
Therefore, the assumption is that WebSphere MQ authentication has been disabled
```

__ 22. Proceed to your TSM00##.WM30.MQMFT PDS and open in edit mode.

__ a. Select member BFGCFCR and examine its contents. In the SYSTSIN data set, next to the %BFGCMD, notice that the command is fteSetupCoordination. The BFGCFCR job sets up the coordination queue manager.

__ b. Notice how all fields are customized with the values you provided in the BFGCUSTM parameters, so you do not need change anything.

__ c. Submit BFGCFCR. It might take a few moments for this job to complete.

__ 23. When BFGCFCR completes, carefully check the results.

__ a. Select your job in the SDSF list.

__ b. From the top of your job, do a find for "COND C". At the first occurrence, make sure that it is return code 0000, and press PF5 to do a repeat find.

__ c. There should be four occurrences of "COND C". They should all be 0000.

__ d. At the last "COND C" occurrence, slowly scroll down until you find a message that starts with: BFGCM0242I: Direct the following MQSC definitions

__ e. Examine how the IBM MQ objects for the coordination queue manager are defined.

__ f. Notice how the underlying mechanism is that IBM MQ Managed File Transfer is using publish/subscribe. Also, note how PSMODE is enabled.

__ 24. Return to the UNIX System Services file system. From the command prompt, enter TSO OMVS and press the Enter (Ctrl) key.

__ 25. At the ===> prompt, type cd /var/TSM00##/mqft/config ***(note: case-sensitive)*** and press the Enter (Ctrl) key. This path is the directory path that IBM MQ Managed File Transfer created from your provided BFG_DATA parameter.

__ 26. Type ls -l and press the Enter (Ctrl) key. You notice a directory with the name of your queue manager. This name is the queue manager name that you provided in the parameter module, and the queue manager name was set up as the configuration queue manager.

Information

This configuration is your configuration. Each configuration can have one or more agents. You can also have more than one configuration, in which case you would have another directory in this view, and this configuration would "own" one or more agents. You need only your MQ## configuration.

__ 27. Continue exploring your configuration. Type cd MQ## and press the Enter (Ctrl) key.

__ 28. Type ls -l to see the entries in your MQ## configuration. At this stage of the configuration, you see two files. Look at them:

__ a. Type cat MQ##.mqsc and press the Enter (Ctrl) key. You see the IBM MQ MQSC commands that the fteSetCoordination script set up in your BFGCFCR JCL. In z/OS, the IBM MQ objects are created automatically. In distributed platforms, you must run the script after the fteSetCoordination is run and the MQ##.mqsc file is available.

__ b. Now type `cat coor*` to see the other file. Since there are no other files with similar names, you can enter the wildcard as a shortcut. This file is one of three key configuration files, and holds the name of the coordination queue manager.

__ c. You return to this directory after running the next job. Return to ISPF by typing `exit` and pressing the Enter (Ctrl) key twice.

Section 6: Set up your command queue manager

__ 29. Return to `TSO00##.WM30.MQMFT` and select member `BFGCMCR`.

__ a. Review the contents of the member. Scroll down to the `SYSTSIN` input and notice that the command is now `fteSetupCommands`. This job configures your command queue manager.

__ b. Submit the job and check results. It might take a few moments for the job to complete. After selecting the job output, find "`COND C`" and press the Enter (Ctrl) key; then, use PF5 to do a repeat find until you see `*BOTTOM OF DATA REACHED*` at the upper right.

__ c. Scroll to the end and examine the updates that are done in the UNIX System Services files.

__ 30. Return to the UNIX System Services file system by typing `TSO OMVS` and pressing the Enter (Ctrl) key.

__ a. Type `cd /var/TSM00##/mqft/config/MQ##` and press the Enter (Ctrl) key.

__ b. Type `ls -l` and press the Enter (Ctrl) key.

__ c. You now see a new file, `command.properties`. Look at this file. Type `cat comm*` and press the Enter (Ctrl) key. This file is the second configuration file that sets up the queue manager that is serving the queue manager role.

__ d. Return to ISPF by typing `exit` and pressing the Enter (Ctrl) key twice.

Section 7: Create agent

__ 31. Return to `TSO00##.WM30.MQMFT` and select member `BFGAGCR`.

__ a. Review the contents of the `fteCreateAgent` command at the SYSTIN input.

__ b. See how the agent name matches your specification in the parameter module, and the agent queue manager is set up to `MQ##`.

__ c. The "`-p`" option tells IBM MQ Managed File Transfer that this agent belongs to the `MQ##` configuration.

__ d. Submit the job and check results. It might take a few moments to complete.

__ 32. Select the job from SDSF and examine the results.

Important

Scroll slowly in the order given. There is some key information in this file that is presented in the sequence found in the job output.

__ a. After selecting the job output, find "COND C" and press the Enter (Ctrl) key; then, use PF5 to do a repeat find until you see *BOTTOM OF DATA REACHED* at the upper right.

__ b. When you see "BOTTOM OF DATA REACHED", slowly scroll down while reviewing the output of the BFGAGCR job. You see some of the parameters displayed.

__ c. Continue scrolling down. You see some additional IBM MQ object definitions for the agent. The BFGAGCR job creates an MQSC script file, and invoked creation of the definitions.

__ d. Take a good look at the objects created. See how each object is suffixed with the agent name you specified in the parameter file. If you needed to create other agents in this IBM MQ Managed File Transfer MQ## configuration, each agent would get its own set of IBM MQ objects.

__ e. Keep this SDSF window open at this position, you return here in the next step. If you choose, you can go to IBM MQ Explorer and find the SYSTEM.*. If you cannot find any SYSTEM queues, find the icon for the IBM MQ Explorer SYSTEM object toggle switch, at the upper right of the MQ Explorer - Content panel, and press it to show SYSTEM objects.

__ f. Back in the SDSF BFGAGCR display, immediately following the IBM MQ object display, find the output for these four messages:

BFGCM0239I, BFGCM0241I, BFGPR0127W, BFGCL0053I

From the view of the four messages, scroll to the right and examine the directory structure that is created for the agent, right below the MQ## configuration structure.

__ g. Write down the UNIX System Services directory path structure for your agent for future use. Your path should be similar to:

/var/TSM00##/mqft/config/MQ##/agents/MQ##AGT1

__ 33. Return to your UNIX System Services view by typing TSO OMVS at the command prompt.

__ 34. Proceed to the agent directory by entering a cd command to the following directory, such as

cd /var/TSM00##/mqft/config/MQ##/agents/MQ##AGT1 and press the Enter (Ctrl) key.

__ 35. Type ls -l and press the Enter (Ctrl) key to view the members of this directory.

__ 36. Display the agent.properties file by entering cat agent.p* and press the Enter (Ctrl) key. These properties were also displayed in the SDSF view.

Information

In the configuration, you specified BFG_WTO=NO. Messages regarding the agent are found in the agent logs, in the UNIX System Services file system. In IBM MQ Managed File Transfer releases before IBM MQ V7.5, the agent log files were found under the agent directory. As of IBM MQ V7.5 and later, the default location for these log files was moved to a different path: `/var/TSM00##/mqft/logs/MQ##/agents/MQ##AGT1`. Notice that this path is different. The logs directory is at the same directory level as the config directory.

At the end of this exercise, you learn to change a configuration parameter for an existing configuration, such as `BFG_WTO`.

__ 37. Locate your agent's log files and write down its location. You use this information in later steps. Type `cd /var/TSM00##/mqft/logs/MQ##/agents/MQ##AGT1` and press Enter (Ctrl) key.

Notice that this path is a parallel path; that is, `/var/TSM00##/mqft/logs` and `var/TSM00##/mqft/config` are at the same level. Each separate configuration lines up agent definitions under its configuration queue manager, `MQ##`. In the exercise, you have one only configuration.

__ 38. Return to ISPF by typing `exit` and pressing the Enter (Ctrl) key twice.

Section 8: Start your agent

Information

It is likely you would use a started task in your organization. In class, you start the agent with JCL. This JCL continues running until you submit a follow-up JCL with a start command.

Watch this job after it is submitted; it is possible that it is going to request a job character upon submission. If it does, enter any character and press the Enter (Ctrl) key.

__ 39. Select member BFGAGST review. You see how this JCL uses command `fteStartAgent`. You also see the job is all set, no changes needed. Submit the job. This job continues running until you submit a job that does an fteStopAgent.

__ 40. Go to SDSF and review your BFGAGST job output. Remember that this job is active. Go to the end of the job display. The output should be similar to the partial output shown:

```
5655-MFT, 5724-H72 Copyright IBM Corp.  2008, 2014.  ALL RIGHTS RESERVED
BFGLM0016I: The MVS Product Registration Service reports that the agent is
BFGPR0127W: No credentials file has been specified to connect to WebSphere
BFGAG0115I: Relative path transfer root directory: /u/wm30/tsm00##
BFGAG0125W: The maximum size to which the java heap can grow is '512'MB, w
BFGAG0058I: The agent has successfully initialized.
BFGAG0059I: The agent has been successfully started.
```

The output that is shown was truncated. You can scroll to the right to view the full messages.

__ 41. Return to the UNIX System Services file system by entering `TSO OMVS` in the command prompt and pressing the Enter (Ctrl) key.

__ 42. Use the directory path that you copied in an earlier section to proceed to the agent log. The command that you type is similar to:

cd `/var/TSM00##/mqft/logs/MQ##/agents/MQ##AGT1/logs`

followed by the Enter (Ctrl) key.

__ 43. Follow with `ls -l` and press Enter (Ctrl).

__ 44. Display the output0.log by entering: `cat output0.log`

You see information similar to the job output. You also see informational messages that pertain to the Java heap. It is safe to ignore these messages for now.

__ 45. If your agent did not start, make any required corrections or request assistance if needed.

__ 46. Return to ISPF by typing exit and pressing the Enter (Ctrl) key twice.

Section 9: Display the status and information about your agent

__ 47. From your `TSM00##.WM30.MQMFT` PDS, select member `BFGAGLI`. Review the command that was issued. You can see `fteListAgents`.

__ 48. Submit the job and review the messages at the end of the job output. Make sure the results for your agent status, found towards the right of the display, denotes READY. If your display does not show READY, resolve the problem. Request assistance if necessary.

Important

If your agent status did not show READY, get the problem resolved before proceeding.

__ 49. Under day-to-day circumstances, you do not need additional information about your agent; however, if you need to obtain exact details about your agent, including the software version, use BFGAGSH.

__ a. Open member BFGAGSH from your `TSM00##.WM30.MQMFT` PDS and submit.

__ b. Review the results and notice the details that are provided, including software version.

Stop

When this course was released, a known issue existed with the use of IBM MQ Explorer that precluded the ability to connect the IBM MQ Managed File Transfer configuration from IBM MQ Explorer. A version of the fix, not available until after the course release date, was obtained and applied in the Windows VMware image for this course. When you take this class, the IBM MQ Explorer environment in your organization might or might not have this fix. Information can be found in the link provided:

`http://www.ibm.com/support/docview.wss?uid=swg1IT04759`

The workaround for this fix is to create a partial client configuration on the server that is hosting IBM MQ Explorer. The workaround consists of using the `fteSetupConfiguration` script to create the partial configuration. There are examples of using `fteSetupConfiguration` in the IBM MQ Knowledge Center, and in the student notes included in the IBM MQ Explorer slides of the IBM MQ Managed File Transfer unit for this course. The workaround works only if the required IBM MQ Managed File Transfer component is installed in the same server as MQ Explorer. This component is the IBM MQ Managed File Transfer Agent, referred to as IBM MQ File Transfer Client before IBM MQ V7.5. The class environment has the required code installed.

Section 10:Add your IBM MQ Managed File Transfer configuration to IBM MQ Explorer

__ 50. On the Windows VMware image, if not already open, double-click the icon for your IBM MQ Explorer application.

__ 51. Go to the Queue Managers menu and locate your queue manager. If not connected, right-click your queue manager name and select **Connect**. Your queue manager must be connected before being able to do any IBM MQ Managed File Transfer work with the Managed File Transfer menu.

__ 52. Scroll down the IBM MQ Explorer Navigator and find the heading Managed File Transfer, which is located a couple of headings below the Queue Managers heading.

__ 53. Right-click the Managed File Transfer heading and select **New Configuration**.

__ a. On the first panel titled *Select the coordination queue manager*, click **Choose**. Find and select your queue manager name, and then select **Next**.

Information

Notice that the first queue manager panel specifies it is for the coordination queue manager role. Next, you are prompted to select the queue manager for the command role. Take care to select your queue manager in both panels. Other advanced configurations employ separate queue managers for the coordination, command, and agent roles. In the class environment, you use the same queue manager for all roles.

Remember, your configuration name is the same as your queue manager name. Your agent name is `MQ##AGT1`.

__ b. On the second panel, proceed to select your queue manager name again by clicking **Choose**, and then click **Next**.

__ c. On the third panel, enter `MQ##` for your coordination. You now have all the information that you need, but proceed to the next panel by clicking **Next**.

__ d. Read the Optional Choose Subscription Durability panel.

Information

This panel deals with the ability to retain transfer log history. You are not configuring a DB logger component. The default is non-durable subscriptions so there is no buildup of messages on the related subscription queue. To learn about options to preserve transfer information, as a follow-up after completing the exercise, you can see section “Ensuring that WebSphere MQ Managed File Transfer log messages are preserved” in the IBM MQ Knowledge Center.

__ e. After reading the information in the last configuration panel, press **Finish** to add the configuration. You should see your `MQ##` configuration under the Managed File Transfer heading.

__ 54. Connect to the configuration. Although you are already connected to your queue manager, you must explicitly connect to your IBM MQ Managed File Transfer configuration. Under the Managed File Transfer heading, right-click your `MQ##` configuration and select **Connect**. Wait a few moments.

Important

The first time that you select **Connect**, your IBM MQ Managed File Transfer queue manager might connect, but you might be unable to see the agents. If so, it is suggested that you restart IBM MQ Explorer and repeat the Connect steps.

You might find that you cannot connect to your IBM MQ Managed File Transfer configuration after restarting IBM MQ Explorer. In that case, proceed to create the partial client configuration by

editing, then copying and pasting script `EX10_bkp_ONLY.txt` in the `C:` drive of your Windows VMware image.

__ 55. You might notice that the configuration icon turns green. After your configuration is active, open the “twistie” to the left of the configuration name to show all the sections available in the IBM MQ Explorer menu for your configuration.

__ 56. Select the Agents heading. On the right IBM MQ Explorer - Content pane, you see your agent in READY status.

__ 57. The other headings do not currently have much in them. Keep IBM MQ Explorer open; you return here later in this exercise.

Section 11:Create a simple transfer to verify your agent

The IBM MQ Managed File Transfer Knowledge Center documents how to verify your configuration without creating a transfer. However, for this exercise you create a simple transfer that uses only one agent to become familiar with using the batch job to create transfers and the parameters that are required for a transfer. You use this transfer as verification.

__ 58. You create a simple transfer to further check the health of your agent. Return to your TSO session.

Important

Make sure to back up a good copy of the BFGCRTRS transfer JCL before attempting any transfers. Use only new transfer JCL members that are created from BFGCRTRS to do all transfer-related editing.

The simple transfer uses only your agent; however, you can later use it as a sample by changing the parameters to point to different destination agents and queue managers.

A major part of the work of the IBM MQ Managed File Transfer configuration is confirming that the channels between connecting queue managers are working before testing your transfer. You already worked with channel connections in an earlier exercise, so to save time, this exercise covers the key points of a transfer, but bypasses use of a different destination agent.

__ a. From your TSM00##.WM30.MQMFT PDS, create a copy of your transfer JCL by entering `S BFGCRTR1` from the command line at the top of your `TSM00##.WM30.MQMFT` member list. You obtain an empty file called `BFGCRTR1`.

__ b. On top of the empty BFGCRTR1 member, enter: copy `BFGTRCRS`

__ c. Do not change anything in BFGTRCRS. Use your BFGTRCR1 member for all work. You can also make more transfer members if needed.

__ 59. Review your BFGCTR1 JCL. You see the transfer parameters. It is important to type the syntax as shown, taking care to include apostrophes and parentheses where shown.

Note

Any time that you need to see what a specific option means, such as `-h`, you can look up the associated command, such as `fteCreateTransfer`, in the IBM MQ Knowledge Center.

The `-h` option displays command syntax.

In all commands entered inline in the JCL, case matters. The `+` continuation character also matters when entering transfer specifications in multiple lines.

Before submitting your transfer JCL, check:

- The case in your commands; the job is case-sensitive
- The continuation characters as needed
- The syntax; that is, where the apostrophes and parentheses are as shown in the example provided

__ 60. You are now ready to edit the transfer option portion of your BFGTRCR1 member. An example is shown, followed by a table that details the options that are used for this transfer. You did not enter information for the transfer in the parameter file, since you might have many different transfers.

__ a. Edit your BFGTRCR1 member and type the transfer details as shown, replacing the `##` placeholders where necessary.

__ b. Be especially careful to enter the exact syntax and use the continuation characters (+). Quotations and apostrophes are critical as placed.

__ c. There should be only one `%BFGCMD` record in the JCL, ending in `+` as shown on the example.

Example

```
%BFGCMD CMD=fteCreateTransfer +
    -p MQ##                   +
    -sa MQ##AGT1              +
    -da MQ##AGT1              +
    -ds "//'TSM00##.CSQUTIL.SAVE1'"   +
     "//'TSM00##.CSQUTIL.COMMANDS'"
/*
//
```

__ d. ***Remove the sample option comments from the BFGTRCR1 member***.

What should be under your last option line, "`//'TSM00##.CSQUTIL.COMMANDS'`", is the end of inline file, or `/*`, and the end of job indicator, or `//` record, as shown in the example.

__ e. In this transfer, you are "transferring" a copy of your most recent `TSM00##.CSQUTIL` MQSC commands to a file called `TSM00##.CSQUTIL.SAVE1`.

__ f. The parameters that are used are:

Table 24: fteCreateTransfer subset of options that are used for the lab exercise

Option	Explanation
`fteCreateTransfer`	This option is the IBM MQ Managed File Transfer command to create a transfer.
`-p`	Stands for the configuration name. In this case, this option matches up with the name in your UNIX System Services file structure configuration that is created with the fteSetCoordination.
`-sa`	Source agent. This name is the agent name included in the `BFGCUSTM NAME` parameter, and also found as a directory under your configuration's agents directory.
`-da`	Destination agent. Normally is the name of a remote agent.
`-ds`	Destination sequential data set. The `-ds` option might change to a different type of option, depending on where the transfer is going.
Last line	Source specification, for example a file, directory, data set, queue, or any other source supported.

Information

The IBM MQ Managed File Transfer transfer options are extensive; this batch job uses a small subset of these options. As a follow-up to this exercise, check the IBM Knowledge Center for the `fteCreateTransfer` command. Check the many alternatives for formats, checksum, scheduling, triggering, and numerous other capabilities that are provided by IBM MQ Managed File Transfer and configured by using these options.

Also, check the different ways of initiating a transfer, including the placement of a specially formatted transfer message in the agent's specific command queue.

__ g. Proceed to submit the job.

Section 12:Checking results after initiating the transfer

__ 61. Wait a few moments for the job to end. As soon as the transfer job ends:

__ a. From the SDSF ST panel, locate your completed job and select it.

__ b. Aside from checking for a condition code zero, proceed to the bottom of the listing and look for the messages shown:

```
BFGCL0035I: Transfer request issued.  The request ID is:
c3e2d840d4d8f1f54040......
BFGCL0182I: The request is now waiting to be processed by the agent.
T
```

The BFGCL0035I message indicates your transfer request ID number. This ID is a long string of numbers, partially shown, indicating your particular transfer. If you need to cancel the transfer, you need to obtain this identifier, usually by using copy and paste, and supply it to the `fteCancelTransfer` command. In this exercise, you ***do not*** cancel the transfer.

Information

IBM MQ Managed File Transfer provides commands to handle numerous situations. The commands are documented in the IBM MQ Knowledge Center by using the name of the command itself, for instance, `fteListAgents`.

To locate the JCL corresponding to these commands, from your `TSM00##.WM30.MQMFT` PDS, browse member `BFG@IDX`. You find the JCL members listed next to each command.

__ c. Go to your ISPF panels and type `=3.4` in the command prompt, and press the Enter (Ctrl) key.

__ d. On the `Dsname level` input field, type your PDS high-level qualifier followed by an asterisk, such as `TSM00##*`, and press the Enter (Ctrl) key.

__ e. You should see a new file `TSM00##.CSQUTIL.SAVE1`, the results of the verification transfer, in your PDS list.

__ f. If your transfer had any problems, make needed corrections before proceeding. Request assistance if needed.

__ 62. Return your IBM MQ Managed File Transfer configuration view in the IBM MQ Explorer application. Under your `MQ##` configuration, select the Transfer Log heading.

__ a. Go to the MQ Explorer - Content view on the right.

__ b. Double-click the transfer. You are now in a panel titled Metadata. Notice how the transfer ID is available in the display panel. Stay on that panel.

__ c. From the left of the Metadata panel, select XML. View the available information. You need to scroll down the panel to view all available entries.

__ d. Expand the entry for your transfer. From the left of the Source name, select the "**>**" icon so that the additional line displays. Scroll to the right and view the information.

__ e. Note how the Completion State is successful.

__ f. Leaving your IBM MQ Explorer open and the `MQ##` configuration connected, close the panel for the one transfer by clicking **OK** or **Cancel** at the bottom of the display. You return to IBM MQ Explorer after the next step.

Information

You might also use IBM MQ Explorer instead of JCL to create the transfer; however, for the scope of this course, which focuses on z/OS, you used JCL for the transfer. If you use IBM MQ Explorer to create the same transfer:

- Right-click in the Managed File Transfer configuration queue manager or Transfer log headers and select **New Transfer**.
- Use the pull-down menu to specify the Source and Destination agent names. You must be able to see the Agent before it is available in the menu.
- In the next New Transfer panel, click **Add** to obtain the panel to specify your transfer.
- Use the pull-down menu for the file for specifying to use a z/OS data set instead of files.
- ***Remember to use quotation marks in your file names***.
- You can click **Next** to see all the scheduling options, or press **Finish** to process the transfer.
- Remember, when you look at the Transfer log, use the XML option to see the status or any problems with the transfer.

Section 13:Following a failed transfer

__ 63. You now force a “failing” transfer. Return to your ISPF BFGTRCR1 member in your TSM00##.WM30.MQMFT PDS.

__ 64. Find the line in the JCL with the name of your `TSM00##.CSQUTIL.COMMANDS`. Overwrite the `CSQUTIL` with `NOTHERE` so the name is `TSM00##.NOTHERE.COMMANDS`.

__ 65. Resubmit the job, wait for it to end, and return to IBM MQ Explorer.

__ 66. From the Transfer log, double-click the failed transfer that is listed on the right.

__ a. Select the XML view.

__ b. Scroll down to the # IN PROGRESS heading. Proceed towards the end of the XML for this heading, and you see the reason for the error.

__ c. Close IBM MQ Explorer.

__ 67. Stop the agent. Select member **BFGAGSP**.

__ 68. Review the contents of this JCL, noting the `fteStopAgent` command.

__ 69. Submit the job to stop the agent. The agent must be stopped for the next steps.

Information

IBM MQ Managed File Transfer uses publish/subscribe. IBM MQ Explorer is able to present the error information with an application that subscribes to the SYSTEM.FTE topic on the coordination queue manager. It presents the results in the Transfer Log section of the Managed File Transfer menu.

Section 14:Changing configuration parameters

Some of the parameters that are used to initially set up the IBM MQ Managed File Transfer configuration can be changed without the need to re-create the entire configuration. In BFGCUSTM, you set the BFG_WTO to NO to disable messages to the system log. In this last section, you change this parameter.

Warning

Before you use this process, you ***must review*** the parameter documentation in BFGCUSTM. Some parameters require significant preparation before they can be changed, such as `BFG_GROUP_NAME`. ***Do not use this process*** without first thoroughly reviewing the documentation for the parameter in question in the BFGCUSTM member.

A summary of the process to follow is:

- Stop the agent or agents under this configuration.
- If you changed anything, or created any JCL members that you want to keep, make sure these members are named something that is different from the original JCL members, or they are overwritten.
- Carefully review the documentation for any parameter you are considering changing. ***Not all parameters can be changed without previous work first. If you are not sure, check IBM Knowledge Center before reconfiguring***.
- Make the needed changes in BFGCUSTM, submit, and exit PDS.
- Restart the agent or agents.

You follow this process now.

__ 70. Your agent should be stopped.

__ a. Check the SDSF `=s;ST` for your agent's job name, and confirm. If your agent is stopped, proceed to the next numbered step. If it is not stopped, proceed with the next step.

__ b. Select member **BFGAGST** and submit.

__ c. Make sure the agent stops before proceeding.

__ 71. Edit and resubmit your `BFGCUSTM TSM00##.WM30.MQMFT` member.

__ a. Find the `BFG_WTO` parameter.

__ b. Change the parameter value for BFG_WTO from NO to YES. This change enables IBM MQ Managed File Transfer messages to be directed to the system log.

__ c. Submit BFGCUSTM and press PF3 to save and exit.

__ d. Exit the PDS to allow the members to be rewritten.

__ 72. Make sure that your BFGCUSTM job ends before continuing; it might take a few moments to complete.

__ a. Carefully check the results of your BFGCUSTM job to make sure that no errors are found.

__ b. Go to the end of BFGCUSTM. You should see a message similar to the one that is shown, partially truncated, indicating that the configuration files were rewritten:

```
Updated file : /var/TSM00##/mqft/config/MQ##/coordination.properties to
cont...
    coordinationQMgr=MQ3##
Updated file : /var/TSM00##/mqft/config/MQ##/command.properties to
contain ...
    connectionQMgr=MQ##
Updated file :
/var/TSM0015/mqft/config/MQ##/agents/MQ##AGT1/agent.properties..
    agentQMgr=MQ##
    agentName=MQ##AGT1
```

__ 73. If there were no errors in BFGCUSTM, proceed to the system log by entering: `=s;log`

If there were any errors, correct before proceeding.

__ 74. Start your agent by submitting your BFGAGST job.

__ 75. Go to the system log by typing `=s;log` in the ISPF command prompt and press the Enter (Ctrl) key.

You should now see the `BFGxxxx` messages for your agent that are displayed in the system log, a result of the parameter change.

__ 76. Stop your agent by submitting the BFGAGSP member.

Reminder

You are finished with the IBM MQ Managed File Transfer exercise. Do not forget to run the last step to stop the agent.

The process in this section can be followed only after making sure that there is no prerequisite work to be done ahead of the IBM MQ Managed File Transfer configuration change. If there is prerequisite work as documented in the BFGCUSTM comments for each parameter, the

prerequisites must be completed before changing or resubmitting BFGUSTM. You might consider creating a new configuration with a different queue manager to test any major changes.

End of exercise

Exercise review and wrap-up

In this exercise, you:

- Examined examine the parameters in the BFGCUSTM configuration member
- Configured and executed the IBM MQ Managed File Transfer customization job
- Created an IBM MQ Managed File Transfer configuration and agent
- Reviewed changes to the UNIX System Services file structure during the IBM MQ Managed File Transfer configuration, and along each stage of the agent definition
- Started the IBM MQ Managed File Transfer agent
- Displayed the health of the agent
- Used batch JCL to do a basic file transfer
- Added the IBM MQ Managed File Transfer configuration to IBM MQ Explorer
- Checked transfer results with IBM MQ Explorer
- Learned to change an existing IBM MQ Managed File Transfer configuration

Exercise 10.Working with file handling utilities

What this exercise is about

In this exercise, you work with critical backup, recovery, and related MQ-specific file utilities

What you should be able to do

After completing this exercise, you should be able to:

- Dynamically create a new page set
- Move buffers for a page set to reside above the 2GB line
- Move queues to a new page set
- Dynamically add and switch to a new log
- Back up object definitions
- List the contents of the BSDS data set

Introduction

IBM MQ on z/OS relies on the BSDS, page sets, and log data sets for its operation. Although adequate capacity planning might be in place, there are many factors, such as data sets getting damaged, unexpected spikes in volume, or even inadequate application development, which can cause problems in the queue manager.

The IBM MQ Knowledge Center contains extensive documentation on different situations that apply to the BSDS, page sets, and log data sets. It is imperative that students review the IBM Knowledge Center and understand how to back up the BSDS and page data sets. While the scenarios are too numerous to include, this exercise provides basic familiarization on some of the common tasks that are done, such as creating page data sets, and adding new log data sets.

Requirements

- This exercise depends on completion of Exercise 1.

Exercise instructions

Note

In the first section of the exercise, assume that the page set where queue EX2.BASEQ is created is overused. You need to determine the queue's page set. You then:

- Create a page set for this queue
- After the page set definition allocates the new buffer pool, change the location of the buffer pool to use the new IBM MQ V8 z/OS above the bar buffer pool location

Section 1: Add a page set to your queue manager

__ 1. If needed, log on with your team ID.

__ 2. Make sure your **EX2.BASEQ** is empty. If it is not, clear all messages. You can use the MQSC command `CLEAR QLOCAL` to empty the queue.

__ 3. Use **JCLPUT** to write three persistent messages, with each one being 1000 bytes in size, to **EX2.BASEQ**. Take care to specify your queue manager name, and to limit to 10 messages, as you are manually moving these messages to another queue later. Determine the page set where EX2.BASEQ is created.

__ a. Display the storage class attribute for the queue. Note the STGCLASS value for the queue: _____

__ b. Display the STGCLASS object that is identified in the STGCLASS attribute of the queue. Note the page set ID (PSID) attribute where this STGCLASS is mapped to. Write the displayed PSID: _____

__ 4. Using the `DISPLAY USAGE` command, determine the number of pages that are used within this page set. Write the values in the table:

PSID	Total number of pages	Unused	Used (P+N)
PSID04			

This task involves the current and next two sections:

- Page set is defined and added to the queue manager with the `DEFINE PSID` command.
- You take advantage of the new, empty buffer pool to move it above the 2-GB line. ***It is not required to do this step in the course of adding a page set***. It is included here to provide familiarity with how buffers are created above 2 GB.
- You are finished with adding the new page set; however, the reason you created the new page set is likely to be a situation where a queue needs to be moved to a larger page set. Therefore, proceed to "move" a queue to the new page set. What really happens is that you move any messages to another queue, and then as soon as the queue is empty, you change the queue's STGCLASS attribute to map to the new page.

IBM MQ is designed so that messages are consumed when they are put to a queue. However, some applications do not observe best IBM MQ practices and they leave messages in the queue for longer periods, which might lead to filling a page set. This process shows you how to add a page set and associated buffer pool.

__ 5. Define the data set to hold this new page set. Edit member NEWPAGE in your **TSM00##.WM30.SCSQPROC** library. The job creates one more page set with a smaller size than the active ones.

__ a. Change the `##` placeholders to your team number.

__ b. Submit the job and check its output to make sure that both steps completed with CC=00.

__ c. Note the data set name, as it is needed for the `DEFINE PSID` command:

_____

__ 6. Use the IBM ISPF MQSC command panel to add the page set to your queue manager by issuing the `DEFINE PSID` command, and observe the following steps before creating running the MQSC command.

__ a. A sample command is provided. See the IBM MQ Knowledge Center for details on this command, associated notes, and required attributes.

__ b. Add the page set as PSID15, just to highlight that page sets do not need to be numbered continuously.

__ c. You add another buffer pool, so choose **15** also for the buffer pool number.

__ d. Although the data set was created with a secondary space allocation, at first you do not want to allow secondary extents for this page set. Set the **EXPAND** attribute to **NONE**.

Warning

Exercise care with the dynamic PSID definition. Ensure that the page name matches your page that is defined in the earlier job. The BUFFPOOL value should not exceed 15 now.

- The example MQSC command is:

  ```
  DEFINE PSID(15) BUFFPOOL(15) DSN('TSM00##.MQ##.PSID15') EXPAND(NONE)
  ```

  where `##` denote your team number. You should not need a continuation character; it should fit on one line of the MQSC command utility.

- For all steps listed, resolve any problems before continuing.

__ 7. Proceed to create the PSID by entering the `DEFINE PSID` command by using the IBM ISPF MQSC panel, taking care to check all parameters before creating the definition.

__ 8. After checking your MQSC definition, press PF3 to create and check results.

__ 9. Check the system log messages for the result. Your results should resemble the display:

```
CSQP042I MQ## Page set 15 definition completed
 MQ## DISPLAY USAGE PSID(15)
 CSQI010I MQ## Page set usage ... 547
   Page Buffer     Total    Unused  Persistent  NonPersist Expansion
    set   pool     pages     pages  data pages  data pages        count
 _   15     15       322       322           0           0 NONE       0
  End of page set report
 CSQI065I MQ## Buffer pool attributes ... 548
   Buffer  Available  Stealable   Stealable  Page      Location
     pool    buffers    buffers  percentage  class
 _     15       1000        999          99  4KB       BELOW
  End of buffer pool attributes
```

__ 10. From the SDSF system log, repeat the buffer pool display with the `DIS USAGE` command and check that the new page set is on the list that is assigned to the correct buffer pool.

Section 2: Move the new buffer to be stored above 2 GB

You already enabled your queue manager for the IBM MQ for z/OS V8 functions by setting the OPMODE attribute of the system parameter module. If this step was not completed, it would need to be done before proceeding.

__ 11. Alter the new buffer pool to be stored above 2 GB, issuing the `ALTER BUFFPOOL` command as shown in the example. You can use the CPF command at the system log.

```
ALTER BUFFPOOL(15) LOC(ABOVE)
```

Check the result after issuing the command. You should see an indication that the change completed successfully.

__ 12. Display usage again and check the location of the new buffer pool. The location for the buffer should display `ABOVE`.

Important

Outside this class environment, you need to incorporate any new pages and buffers in the queue manager MSTR started task so they are preserved across restarts of the queue manager.

Section 3: Map the EX2.BASEQ to PSID 15

To remap EX2.BASEQ to the new page set, the queue must be empty. The steps in this section follow this process:

- Create an STGCLASS object for the new page set.
- Create an interim queue by using the new STGCLASS.
- Use a utility to move messages from EX2.BASEQ to the interim queue.
- As soon as EX2.BASEQ is empty, alter EX2.BASEQ to use the new STGCLASS.
- Move the messages from the interim queue back to EX2.BASEQ.

__ 13. Create a storage class that is named `CLASS15`, which maps to **PSID15**. Using the ISPF MQ MQSC command panel, the command is:

`DEFINE STGCLASS(CLASS15) PSID(15)`

Check that the storage class was successfully created.

__ 14. Create a local queue named: `EX2.INTERIM`

Specify `CLASS15` for the `STGCLASS` attribute, such as:

`DEF QLOCAL(EX2.INTERIM) STGCLASS(CLASS15)`

__ 15. You need to change the EX2.BASEQ STGCLASS to the new CLASS15 STGCLASS; however, you cannot proceed until EX2.BASEQ is empty, so you move the messages to an interim queue to empty EX2.BASEQ, change its STGCLASS, and then move the messages back from the interim queue.

Note

In most environments, administrators download the “Q” utility, support pack MA01. One of the many operations possible with the Q utility is moving messages from one queue to another. It is suggested that if you do not have the Q utility in your environment, you should look into obtaining it.

As an example, if your queue manager received many unexpected messages that are not consumed right away, these messages might create a hardship in the queue manager. With the Q utility, messages can be written to a file, so then the file can be loaded back to a queue when ready to be consumed.

However, in the class environment, rather than introduce a new tool, you use the message handler utility in ISPF option H. The Q utility moves all messages in batch mode. The message handler moves one message at a time.

__ 16. Move all messages from EX2.BASEQ to EX2.INTERIM. You used this utility in an earlier exercise. You need to select each message, enter `EX2.INTERIM` as the Forward To queue on the second panel, and enter `F` in the action. Repeat 10 times until all messages are copied.

__ 17. Make sure that all messages are moved from EX2.BASE2 by invoking the message handler again. It should return an IBM MQ code 2033, indicating that there are no more messages.

__ 18. Change EX2.BASEQ to use the new STGCLASS. The MQSC command is:

`ALT QL EX2.BASEQ STGCLASS(CLASS15)`

If you are in a real situation where an application is waiting to use the messages on queue EX2.BASE2, you would use the same process to copy the messages back from EX2.INTERIM to EX2.BASEQ. To save time, you skip the part that copies the message back to EX2.BASEQ.

Section 4: Dynamically add and switch to a new log

In this exercise, you create a new log data set and switch to it. You might need to add a log for many reasons, such as long-running units of work, or unexpected spikes in volume. The steps in this section follow this process:

- Define the new VSAM data sets.
- Incorporate the logs in the queue manager with the command `DEFINE LOG`.
- Force a log switch that uses the `ARCHIVE` log command.

__ 19. Edit member `NEWLOG` in your `TSM00##.WM30.SCSQPROC` and change the `##` placeholder to your team ID.

__ 20. Submit the job and check for a successful completion. Make any corrections if needed.

__ 21. In a later step, you are going to use the name of the VSAM cluster that the NEWLOG created. Write the VSAM cluster name:

_____

You need to use the `DEFINE LOG` command to incorporate both log data sets to your queue manager.

__ 22. Use the ISPF IBM MQ MQSC utility to issue the two `DEFINE LOG` commands. An example of the commands is shown, where your team number is substituted for the `##` placeholder.

```
DEFINE LOG(TSM00##.MQ##.LOGCOPY1.DS05) COPY(1)
DEFINE LOG(TSM00##.MQ##.LOGCOPY2.DS05) COPY(2)
```

Check that the logs were successfully added. Correct any errors.

__ 23. In this step, you issue the `ARCHIVE LOG` as shown. When you issue the command, several students are going to do the same steps. To isolate your results, proceed to the SDSF DA view, and select your queue manager MSTR task, `MQ##MSTR` with a "?" question mark instead of an `S` to isolate the output data sets. The steps are:

__ a. From an SDFS panel, issue: `/MQ## ARCHIVE LOG`

__ b. Type `DA` at the SDSF panel.

__ c. Find your queue manager started task and select it with a question mark, "?".

__ d. Select data set JESMSGLG, and scroll down to find your `ARCHIVE LOG` command.

__ e. Examine the results. ***Keep the JESMSGLG ISPF view open***.

__ 24. From the JESMSGLG view to isolate your results, issue the command:

```
/MQ## DIS LOG
```

__ 25. Find message `CSQJ370I MQ19 LOG status report`. What is the current log?

Note

Your current log does not necessarily need to be the newly created log; however, if there is a situation where a new log is needed, then the new log would get picked up. This exercise went through the steps of dynamically adding the log to a running queue manager.

It is important that as soon as it is added, you remember to include the new log it in your `MQ##MSTR` procedure.

Section 5: Backing up object definitions

Part of the operation procedures for IBM MQ is to periodically back up all the definitions in the queue manager. The CSQUTIL MAKEDEF utility backs up objects that are DISPLAYED. Depending on how old your procedures are, it is possible that some of the new object types are not included in the scheduled MAKEDEF. You review your MAKEDEF utility and make any needed additions before backing up the objects.

Information

The complete list of IBM MQ objects is found in section ***Using the COMMAND function of CSQUTIL*** in the IBM MQ V8 Knowledge Center. Review this section to confirm that your MAKEDEF procedure includes all needed objects. Your queue manager might not be using some of the objects, such as the queue-sharing group objects; any object that is not used might be omitted from the DISPLAY list. Only objects in the DISPLAY list are backed up.

The following display shows ***only*** the objects that you ***use in this course***; it does not show all available objects. Only common objects, and objects of QSGDISP(QMGR), are shown:

```
DISPLAY QUEUE(*) ALL QSGDISP(QMGR)
DISPLAY TOPIC(*) ALL QSGDISP(QMGR)
DISPLAY NAMELIST(*) ALL QSGDISP(QMGR)
DISPLAY PROCESS(*) ALL QSGDISP(QMGR)
DISPLAY CHANNEL(*) ALL QSGDISP(QMGR)
DISPLAY AUTHINFO(*) ALL QSGDISP(QMGR)
DISPLAY CHLAUTH('*') ALL
DIS SUB(*) SUBTYPE(ADMIN) ALL DISTYPE(DEFINED)

DISPLAY QMGR ALL
```

__ 26. Select member `MAKEDEF` from your `TSO00##.WM30.SCSQPROC` library. Review the objects that are being displayed.

__ a. Check the list of object types in your MAKEDEF member against the list of object types that are shown in the information box. What objects are missing?

__ b. Add DISPLAY statements for any objects types that are shown on the information box that do not exist in your MAKEDEF.

__ c. ***You need not include the QSGDISP(QMGR) attribute,*** as you do not have any queue-sharing group (QSG) definitions, but you need to keep the ALL attribute.

Pay special attention to the syntax for the CHLAUTH object type.

__ d. In the publish/subscribe unit, you learned about administered and dynamic subscriptions; notice the subscription entry.

__ e. After adding the missing objects, submit the MAKEDEF job and check results.

__ 27. The CSQUTIL MAKEDEF for the class environment wrote the definitions to member (OBJDEFS) in your TSM00##,WM30.SCSQPROC data set.

__ a. Open member OBJDEFS and review the definitions. You might need to reopen your PDS to see the OBJDEFS member.

__ b. Notice that most objects except CHLAUTH use the DEF NOREPLACE. CHLAUTH does not use DEFINE; it uses SET. SET does not have a REPLACE-NOREPLACE option; CHLAUTH uses ACTION, which defaults to ADD.

IBM MQ shops should implement regularly scheduled MAKEDEF backups of all their queue manager objects.

Section 6: Displaying the contents of the BSDS

Most of the recovery procedures that are documented in the IBM MQ Knowledge Center start by checking the contents of the BSDS. Checking the location of the data to match a certain start or end RBA is critical. The BSDS shows this information.

__ 28. Locate member CSQJU004 in your TSM00##.WM30.SCSQPROC PDS. Change the ## placeholder to your team number and submit.

__ 29. Examine the listing. Do you have any questions on what you are viewing? What exactly does the listing contain? Go to the IBM MQ Knowledge Center and search for the topic “Finding out what the BSDS contains.”

It is imperative to become familiar with the information provided in this log for recovery and restart situations.

End of exercise

Exercise review and wrap-up

In this exercise:

- You created a new page set, and learned how to move a queue to the new page set. This process is used when a queue becomes inadvertently full. A full queue situation should also be addressed with the application, as queues should not be used for data storage.
- You learned how to dynamically add a page set, and you also learned to dynamically add a log.
- You looked at how to back up the IBM MQ object definitions and how to make sure that all necessary objects were in the backup job.
- You learned how to list and find information on how to interpret the contents of the BSDS.