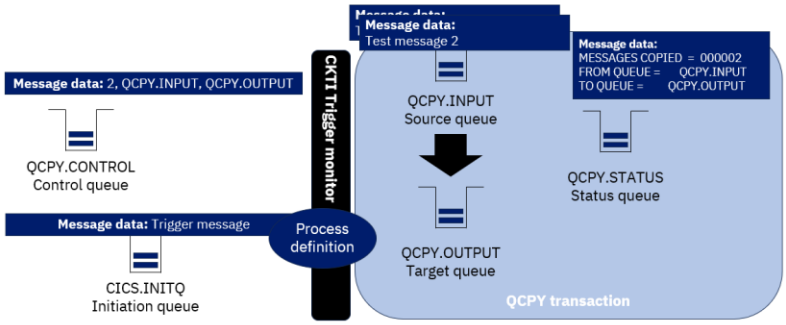
How to use triggering with IBM MQ for z/OS

Introduction:

This lab walks you through a triggering example using a sample COBOL MQ CICS program, QCOPY. The QCOPY program is executed from the QCPY transaction. It copies messages from one queue to another applying a message property to each message. It is started by a comma delimited control message which triggers the transaction. It also uses information from the IBM MQ process object. sample requires a currently supported version of IBM MQ and CICS. You can find the source code in COBOL for this application in ZQS1.COBOL.SOURCE.

QCOPY Program Flow

1. The QCPY transaction is triggered.
2. The control queue QCPY.CONTROL is opened.
3. The copy control message is read.
4. Control message is parsed into the controlling fields.
5. The source queue QCPY.INPUT is opened.
6. The target queue QCPY.OUTPUT is opened.
7. In a loop, messages are read from the source queue and written to the target queue.
8. The status message is built.
9. The status queue QCPY.STATUS opened and the status message is put.
10. All queues are closed.
11. Control is returned to CICS.



Lab Instructions:

1. First thing we need to do is ensure CICS is running. We can test this via sdsf from the main menu

```
 Menu  Utilities  Compilers  Options  Status  Help
 ------------------------------------------------------------------------------
                          ISPF Primary Option Menu            Invalid option

 0  Settings      Terminal and user parameters           User ID . : DQUINCY
 1  View          Display source data or listings        Time. . . : 14:14
 2  Edit          Create or change source data           Terminal. : 3278
 3  Utilities     Perform utility functions              Screen. . : 1
 4  Foreground    Interactive language processing        Language. : ENGLISH
 5  Batch         Submit job for language processing     Appl ID . : ISR
 6  Command       Enter TSO commands                     TSO logon : IKJACCT
 7  Dialog Test   Perform dialog testing                 TSO prefix: DQUINCY
 9  IBM Products  IBM program development products       System ID : MQS1
 10 SCLM          SW Configuration Library Manager       MVS acct. : ACCNT#
 11 Workplace     ISPF Object/Action Workplace           Release . : ISPF 8.1
 12 z/OS System   z/OS system programmer applications
 13 z/OS User     z/OS user applications

      Enter X to Terminate using log/list defaults


 Option ===> SDSF_
```

2. Navigate to ‘da’ once in the SDSF menu to see active users.

3. Set the prefix to * so we can see all active users with the command ‘prefix *’. Then, using the F7 and F8 keys, navigate to see if CICS is running. You should see something

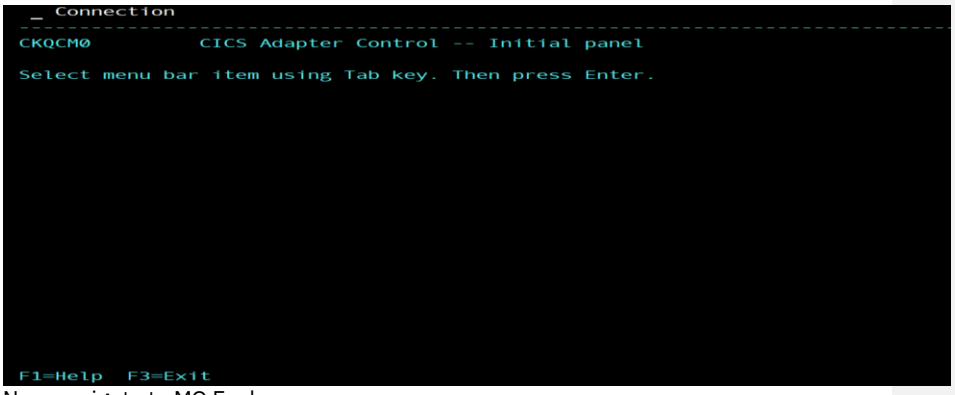
```
  Display  Filter  View  Print  Options  Search  Help
-------------------------------------------------------------------------------
SDSF DA MQS1     MQS1     PAG  0  CPU   2              LINE 51-67 (67)
NP   JOBNAME  StepName ProcStep JobID    Owner    C Pos DP Real Paging    SIO
     AXR04    AXR04             STC08891 SYSPROG    LO  FF  610   0.00   0.00
     FTP1     FTP1              STC08892 SYSPROG    LO  FF  675   0.00   0.00
     INETD1   INETD1            STC08893 SYSPROG    LO  FF  475   0.00   0.00
     SYSLOGD  SYSLOGD           STC08894 SYSPROG    NS  C1  728   0.00   0.00
     ZQS1MSTR ZQS1MSTR PROCSTEP STC08915 SYSPROG    NS  FE  33T   0.00   0.00
     GPMSERVE RMFDDS01 STEP1    STC08916 SYSPROG    NS  FE 6890   0.00   0.00
     TCPIP    TCPIP    TCPIP    STC08898 SYSPROG    NS  FE 8343   0.00   0.00
     RMFGAT   RMFGAT   IEFPROC  STC08899 SYSPROG    NS  FE  21T   0.00   0.00
     D3A1ADMT D3A1ADMT STARTADM STC08913 SYSPROG    IN  FE 2764   0.00   0.00
     D3A1DBM1 D3A1DBM1 IEFPROC  STC08911 SYSPROG    NS  FE  66T   0.00   0.00
     D3A1IRLM D3A1IRLM          STC08910 SYSPROG    NS  FE  10T   0.00   0.00
     TN3270   TN3270   TN3270   STC08904 SYSPROG    NS  FE 2465   0.00   0.00
     D3A1DIST D3A1DIST IEFPROC  STC08912 SYSPROG    NS  FE 4791   0.00   0.00
     MQS1CICS MQS1CICS CICS     STC08914 CICSSTC    NS  FE  25T   0.00   0.00
     BP01     BP01     BP01                         NS  FE 1336   0.00   0.00
     D3A1MSTR D3A1MSTR IEFPROC  STC08909 SYSPROG    NS  FE 2487   0.00   0.42
     PORTMAP  PORTMAP  PORTMAP  STC08902 SYSPROG    LO  FF  515   0.00   0.00
COMMAND INPUT ===> _                                          SCROLL ===> CSR
```

like this:

4. If there is no CICS region active, you will need to start the cics1 region w/ command ‘start cics1’
5. To navigate to CICS, start another MQS1 PCOMM session and use the MQS1CICS command

```
MSG10
                        WSC MQPLEX1

        Enter:  MQS1CICS_
        MQSx     - TSO on MQSx (MQS1 or MQS2)
        MQSxCICS - for CICS on MQSx (MQS1CICS or MQS2CICS)
```

6. From the CICS main screen, hit tab once then type in CKQC. This is the MQ CICS transaction CKQC. This transaction makes it possible to monitor and control the interface between MQ and CICS.
7. 

8. Now navigate to MQ Explorer.
9. You will need to define several queue objects:
    a. QCPY.CONTROL
    b. QCPY.INPUT
    c. QCPY.OUTPUT
    d. QCPY.STATUS

10. You can see the properties for all of these queues below

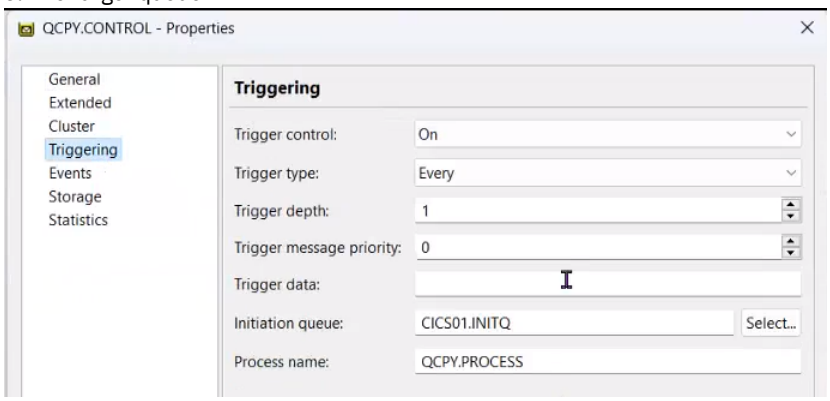
QCPY.CONTROL

Control Message – the message used to start the QCPY transaction. For QCPY the message contains, in comma delimited format:

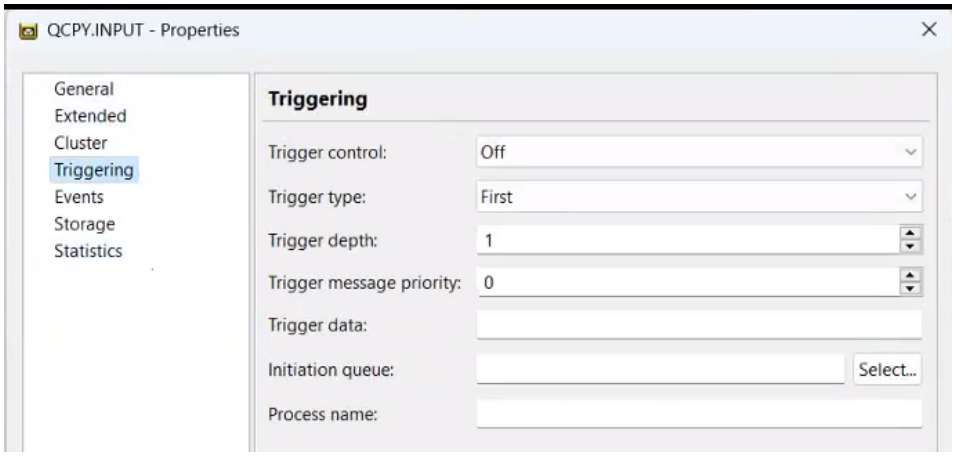
1. The number of messages to be copied

2. The source queue

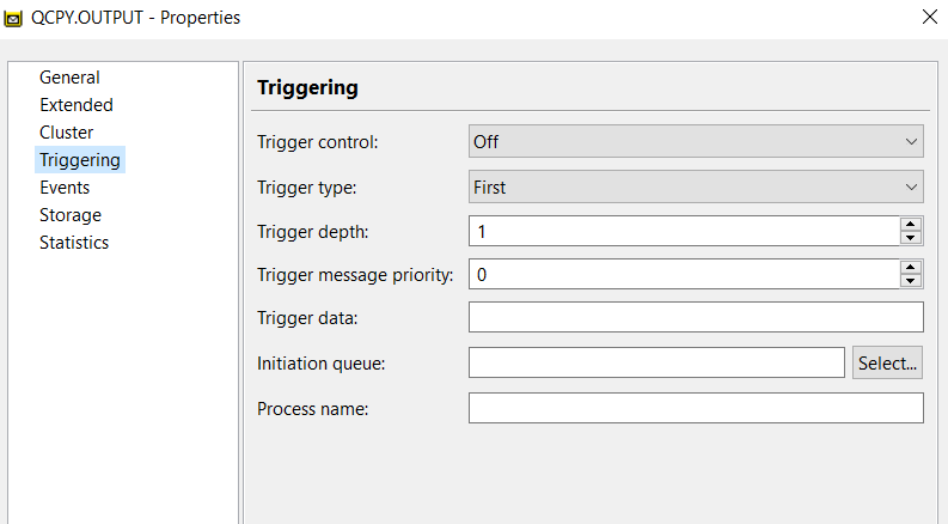
3. The target queue



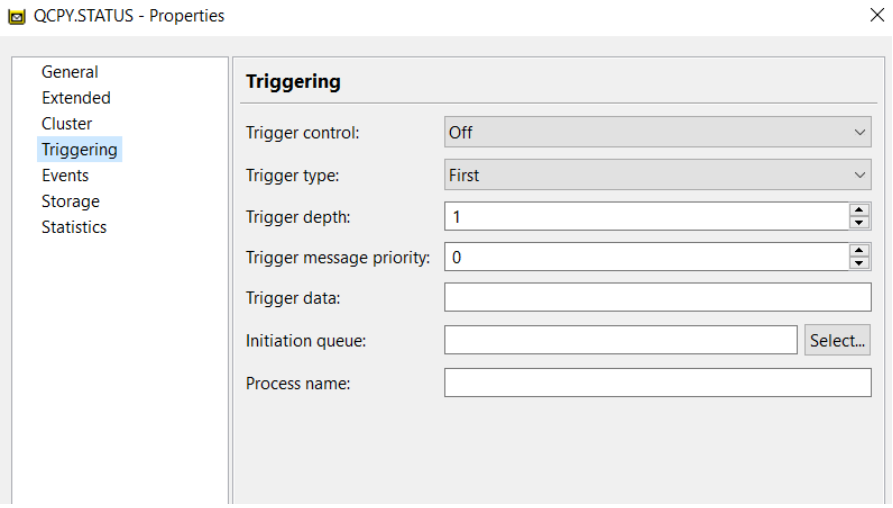
QCPY.INPUT - The source of the messages to be copied.



QCPY.OUTPUT – The target for the copied messages.

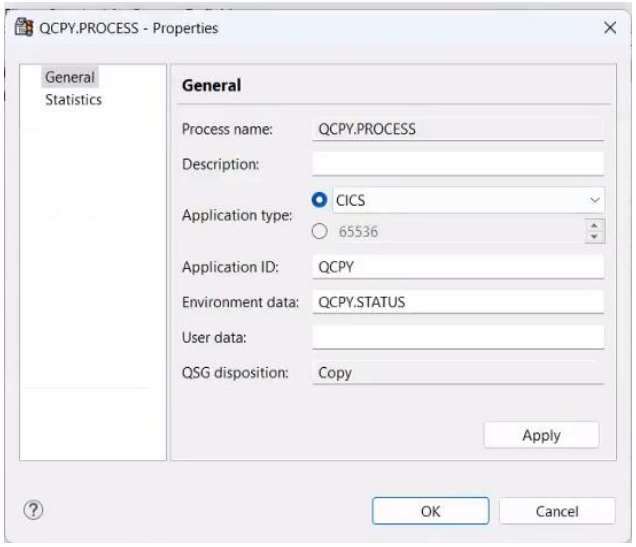


QCPY.STATUS – The queue which will hold the status messages, reporting on success or failure



11. You will also need a process definition. A process is an MQ object that defines an application to the MQ Queue Manager. The process definition is used to identify applications to be started by a trigger monitor. It includes application ID and type, plus some application specific data.
    a. Here, we'll specify CICS as our application and give it the ID 'QCPY'.
    b. Application ID which is the transaction name in CICS
    c. Environment data is status queue which tells us what happen at the end of the process

QCPY.PROCESS



12. Now that we have our queues configured, we will use the QCPYLOAD JCL is used to load up messages onto our queue. QCPYLOAD puts test messages onto QCPY.INPUT using OEMPUT program.

Message browser

Queue Manager Name: ZMQ1

Queue Name: QCPY.INPUT

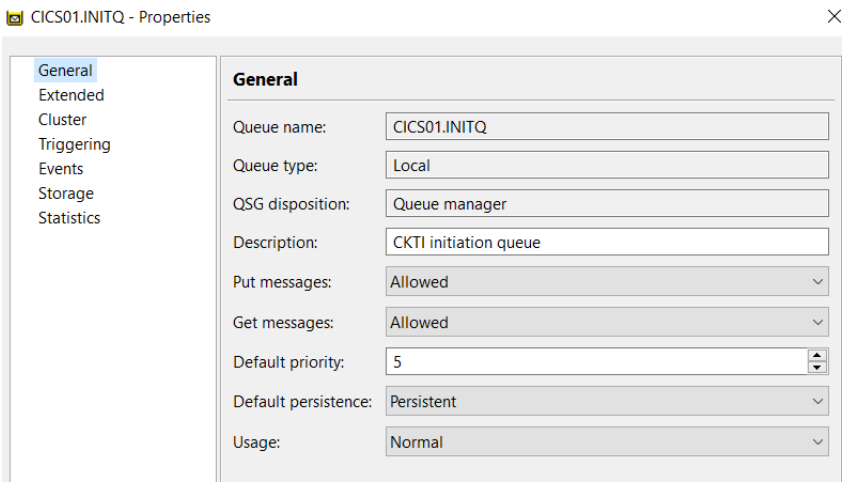
Position	Put date/time	User identifier	Put application name	Format	Total length
1	Mar 15, 2024 1:58:54 PM	LYNELKINS	MQ Explorer 9.3.0	MQSTR	5
2	Mar 15, 2024 1:58:58 PM	LYNELKINS	MQ Explorer 9.3.0	MQSTR	5
3	Mar 15, 2024 1:59:04 PM	LYNELKINS	MQ Explorer 9.3.0	MQSTR	4
4	Mar 15, 2024 1:59:08 PM	LYNELKINS	MQ Explorer 9.3.0	MQSTR	4
5	Mar 15, 2024 1:59:12 PM	LYNELKINS	MQ Explorer 9.3.0	MQSTR	5

Copies from QCPY.INPUT to QCPY.OUTPUT based on a control card that we give it in QCPY.CONTROL

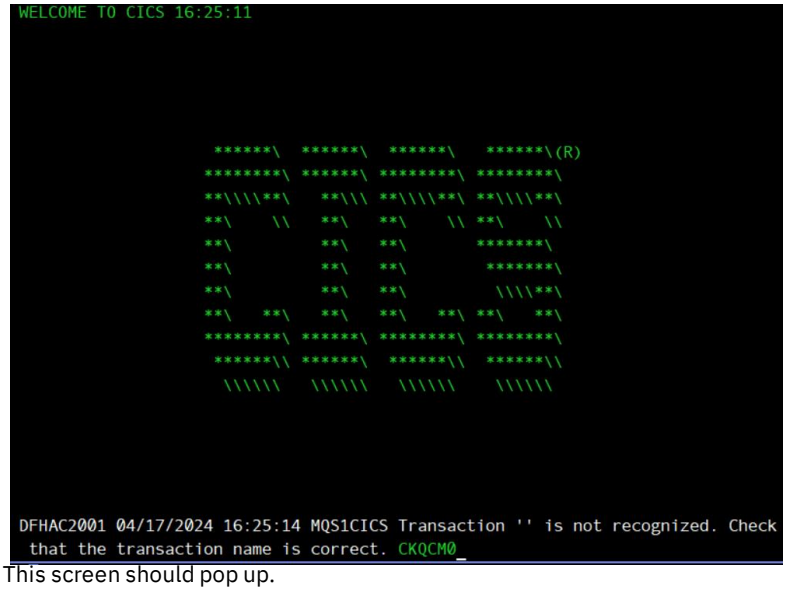
```
  File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
EDIT       ELKINSC.COBOL.JCL(QCYPTST1) - 01.00            Columns 00001 00072
Command ===> _                                               Scroll ===> CSR
****** ***************************** Top of Data ******************************
==MSG> -CAUTION- Profile changed to CAPS ON (from CAPS OFF) because the
==MSG>           data does not contain any lower case characters.
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000001 5,QCOPYPRP.INPUT.QUEUE,QCOPYPRP.OUTPUT.QUEUE,TEST_PROP
****** *************************** Bottom of Data ****************************
```

The input here is: number of messages you want to copy, the input queue, the output queue

13. Currently, no one is listening, so we'll need to add a listener to CICS1.INITQ. Set up a CICS.INITQ local queue with the following properties:



14. From z/OS CICS screen, navigate to CKQCM0 by typing in the command:



15. This screen should pop up.

```
_ Connection        CKTI        Task
-------------------------------------------------------------------------
CKQCM0         CICS Adapter Control -- Initial panel

Select menu bar item using Tab key. Then press Enter.



F1=Help  F3=Exit
```

16. Hit the tab button. The following menu will pop up. Type in option 1 and hit enter.

```
   Connection        CKTI        Task
+--------------------+-------------------------------------
| Select an action.  |apter Control -- Initial panel
|                    |
| 1 1. Start...      |sing Tab key. Then press Enter.
|   2. Stop...       |
|   3. Modify...     |
|   4. Display       |
|                    |
+--------------------+
| F1=Help F12=Cancel |
+--------------------+
```

17. Enter in the following details and hit enter:

```
   Connection        CKTI        Task
------------------ +--------------------+-----------------------------------
CKQCM0         CIC | Select an action.   |itial panel

Select menu bar it | 1 1. Start...       |press Enter.
                   |   2. Stop...        |
                   |   3. Display        |
                   +--- +-----------------------------------------------+
                   | F1 |              Start Task Initiator             |
                   +---
                        | Type Initiation Queue Name. Then press Enter.
                        | Initiation Queue Name (IQ) . . . . . . . . . .
                        | CICS01.INITQ
                        +-----------------------------------------------+
                        | F1=Help  F12=Cancel                           |
                        +-----------------------------------------------+
```

This step initiates the CKTI transaction, which is what controls the CICS trigger monitor.

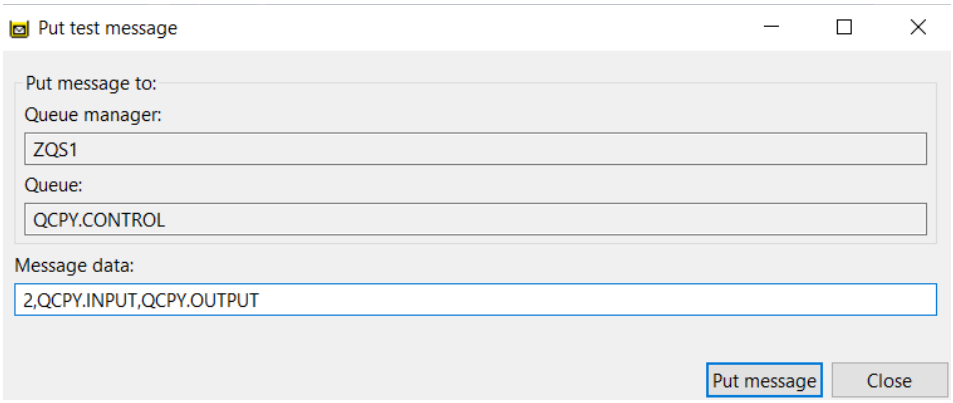
```
_CKQCM1                    CICS adapter messages panel

Read messages. Then press F4 to retry if appropriate, or F12 to cancel.

DFHMQ0386 I MPZ1CIC1 STARTCKTI initiated from TERMID=0031 TRANID=CKSQ
USERID=CICSMQ3 and is accepted.
```

18. Put a test message on QCPY.CONTROL to see everything works.

Commented [LE1]: This message would only cause 1 message to be copied, not 2



19. This message requests that MQ copies 2 messages from QCPY.INPUT to QCPY.OUTPUT. After you submit this, check it worked by looking at the queue depth.

QCPY.INPUT	Local	Queue man...	0	0	1
QCPY.OUTPUT	Local	Queue man...	0	0	2

20. Next look at the QCPY.STATUS messages. You should see a new message on the queue confirming the QCPY was successful:

```
MESSAGES COPIED  =  000002
FROM QUEUE =      QCPY.INPUT
TO QUEUE =        QCPY.OUTPUT
```

21. Congratulations! You have successfully used a CICS application for triggering! Next, we'll look at what we'd do in a more realistic scenario, where you have many messages flowing through MQ.
22. Navigate to option 3.4 from your ISPF main menu on MQS1.
23. Search for the following dataset: ZQS1.COBOL.JCL

```
  Menu  RefList  RefMode  Utilities  Help
 ------------------------------------------------------------------------------
                              Data Set List Utility
                                                                   More:      +
   blank Display data set list                P Print data set list
       V Display VTOC information            PV Print VTOC information

 Enter one or both of the parameters below:
   Dsname Level . . . ZQS1.COBOL.JCL_
   Volume serial  . . _______

 Data set list options
   Initial View                  Enter "/" to select option
   1  1. Volume                  /  Confirm Data Set Delete
      2. Space                   /  Confirm Member Delete
      3. Attrib                  /  Include Additional Qualifiers
      4. Total                   /  Display Catalog Name
                                 _  Display Total Tracks
                                 _  Prefix Dsname Level

 When the data set list is displayed, enter either:
 Option ===>
  F1=Help      F2=Split     F3=Exit      F7=Backward  F8=Forward   F9=Swap
 F10=Actions  F12=Cancel
M B                                                                 09/038
```

24. Choose to browse the data set by putting a 'B' to the left of the name and hitting enter.

```
  Menu  Options  View  Utilities  Compilers  Help
 ------------------------------------------------------------------------------
 DSLIST - Data Sets Matching ZQS1.COBOL.JCL                0 Members processed

 Command - Enter "/" to select action                Message          Volume
 ------------------------------------------------------------------------------
 B_      ZQS1.COBOL.JCL                              Edited           MQ1P00
 ***************************** End of Data Set list *****************************
```

25. Once inside the dataset, you'll see a list of several members. Use the command 'sort changed' or navigate the list using F7 and F8 until you see member 'QCPYLOAD'. Place an 'E' to the left of QCPYLOAD and hit enter like so:

```
 Menu  Functions  Confirm  Utilities  Help
BROWSE              ZQS1.COBOL.JCL                          Row 0000001 of 0000094
          Name      Prompt        Size   Created            Changed            ID
_________ QCPYT2                    21  2018/08/28  2024/04/18 16:01:17 DQUINCY
_________ JC                         1  2024/04/18  2024/04/18 15:50:38 DQUINCY
___e_____ QCPYLOAD                  35  2012/08/09  2024/04/18 15:49:46 DQUINCY
_________ DEFQCPY                   78  2014/03/06  2024/04/18 12:29:23 DQUINCY
_________ DEF3QCPY                  26  2018/08/27  2024/04/18 12:26:47 DQUINCY
_________ QCPYUTIL                  66  2024/03/15  2024/04/18 11:45:06 DQUINCY
_________ CMPLQCPR                  46  2024/03/06  2024/03/06 13:51:01 ELKINSC
_________ CMPLQCPY                  46  2012/08/09  2024/03/05 13:32:55 ELKINSC
_________ AFFINITY                   1  2012/08/09  2024/03/04 15:08:13 ELKINSC
_________ QCPYT1                    21  2018/08/28  2018/08/28 17:40:27 ELKINSC
_________ QCPYLD2                   20  2018/08/27  2018/08/28 14:34:20 ELKINSC
_________ QCPYLOD3                  19  2018/08/28  2018/08/28 14:33:42 ELKINSC
_________ TSTPUT1                   74  2012/04/04  2018/03/15 18:57:32 ELKINSC
_________ CICSMQ7                   36  2012/08/16  2017/07/17 18:15:32 ELKINSC
_________ QCPYST1                   32  2014/03/06  2016/03/03 12:38:52 ELKINSC
_________ CMPLQTST                  36  2015/03/30  2015/03/30 17:53:36 ELKINSC
_________ MKDFQCPY                  26  2014/03/06  2014/03/06 16:29:03 ELKINSC
Command ====> ___________________________________________ Scroll ====> PAGE
 F1=Help    F2=Split   F3=Exit    F5=Rfind   F7=Up      F8=Down    F9=Swap
F10=Left   F11=Right  F12=Cancel
```

26. Browse through the JCL in QCPYLOAD using F7 and F8. You'll notice that this JCL is an execution of OEMPUT. We're going to load up our QCPY.INPUT queue with 500 messages.
27. Submit the JCL using the command line like so:

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
EDIT       ZQS1.COBOL.JCL(QCPYLOAD) - 01.13                Columns 00001 00072
000016 // SET TEMPFILE='TEAMXX.ZZ2'
000017 //*SET P='-p'  NONP messages
000018 // SET P=' '  NONP messages
000019 // SET MSGS=500
000020 //*
000021 // EXEC PGM=OEMPUT,REGION=0M,
000022 //   PARM=('-m&QM. -n&MSGS. -x &P. -pm')
000023 //SYSIN DD *
000024 -qQCPY.INPUT
000025 -fileDD:MSGIN
000026 -dJTEST4
000027 //STEPLIB  DD DISP=SHR,DSN=&APPLOAD.
000028 //         DD DISP=SHR,DSN=&MQLOAD1.
000029 //         DD DISP=SHR,DSN=&MQLOAD2.
000030 //         DD DISP=SHR,DSN=&MQLOAD3.
000031 //MSGIN    DD DISP=SHR,DSN=ZQS1.COBOL.JCL(MSGS)
000032 //SYSPRINT DD SYSOUT=*
000033 //* SUMMARY NOT USED because of concurrent access
Command ====> SUBMIT_                                   Scroll ====> CSR
```

28. Nice! You should receive a RC=0 upon submitting. You can check that the message loading process worked by navigating to MQ Explorer. On MQ Explorer, you will now see QCPY.INPUT has 500 more messages in the queue.
29. Next, navigate back to your terminal display. From here, we will now execute the QCPYT2 job. From the ZQS1.COBOL.JCL members, place an 'b' next to QCPYT2.
30. Before submitting, take a second to see what is being done here. We specify that we want to copy 10 messages from QCPY.INPUT to QCPY.OUTPUT and we will be using the same OEMPUT execution to do this. However, our target queue for OEMPUT here is QCPY.CONTROL, not QCPY.INPUT.

```
 BROWSE     ZQS1.COBOL.JCL(QCPYT2)  -  01.05              Line
//   SET Q=QCPY.CONTROL
//   SET L=80
//   SET N=1
//PUT01A EXEC PGM=OEMPUT,REGION=0M,
// PARM=('-m&M -n&N -q&Q -s&L -sr&L  -fileDD:MIN')
//SYSIN   DD *
/*
//STEPLIB  DD DISP=SHR,DSN=ZQS1.MP1B.LOAD
//         DD DISP=SHR,DSN=MQ933CD.SCSQLOAD
//         DD DSN=MQ933CD.SCSQANLE,DISP=SHR
//         DD DSN=MQ933CD.SCSQAUTH,DISP=SHR
//SYSPRINT DD SYSOUT=*
//MIN     DD *
10,QCPY.INPUT,QCPY.OUTPUT
/*
//*COR     DD DISP=SHR,DSN=ZQS1.COBOL.JCL(COR01)
//SUMMARY  DD SYSOUT=*
```

31. Enter submit in the command line below the job and hit enter.
32. Now, assuming the job completed successfully, you should be able to look over at MQ Explorer and see 10 messages moved from QCPY.INPUT to QCPY.OUTPUT.
33. That is the QCPY lab! Here, you practiced triggering using a CICS application using a rudimentary example and a more advanced example.