How the Message ID and Correlation ID in an MQ Message Descriptor are handled in a Transmission Queue

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+++ Objective +++

The objective of this techdoc is to show how the Message ID (MsgId) and the Correlation ID (CorrelId) in an MQ Message Descriptor (MQMD) are handled in a message that is sent from a Remote Queue Definition to a Transmission Queue and from there to the destination queue.

This document uses a visualization of the original message shown as a smaller envelope inside a bigger envelope will help to better visualize the processing.

When a message is placed in a remote queue definition, the payload is placed in a small envelope that has MsgId=1 and CorrelId=0 in the MQ Message Descriptor. Then, when the message is forwarded to a transmission queue, a big envelope is made ready with MsgId=2 and CorrelId=0. Subsequently, when the small envelope is placed inside the big envelope, the MsgId=1 of the small envelope is assigned to the Correlation Id of the big envelope. In this case, the Correlation Id of the big envelope is set to CorrelId=1. This demonstrates how utilities that handle the big envelope know the Message ID of the payload in the small envelope.

Related WebSphere Support Technical Exchange (WSTE) webcast:

A Day in the Life of a WebSphere MQ Transmission Queue
Description: This webcast focuses on how the WebSphere® MQ message descriptor is handled in a message that is sent from a remote queue definition to a transmission queue. Additional topics related to the transmission queues are also covered, such as basic troubleshooting, clusters and triggering of channels.
Presented by: Angel Rivera
Level of Difficulty: Beginner Date: 26 April 2011
Chapter 1: Basic scenario of Put and Get of a message in a local queue

Let's start with the basic scenario of doing an MQ PUT of a message into a local queue and then doing an MQ GET of the same message from the local queue.

- The application that uses the MQ client prepares a text message. This is represented as a piece of paper with the actual contents: **Text-1**

![Text-1]

- The application invokes the MQ PUT command and provides the text message. For example, the sample utility "amqsput" can be used to

```
$ amqsput Q1 QMGR
Sample AMQSPUT0 start
target queue is Q1
Text-1
Sample AMQSPUT0 end
```

- We can use the "amqsbcg" utility to display the message from the queue.

```
$ amqsbcg Q1 QMGR
=== begin of output of amqsbcg ===
AMQSBCG0 - starts here
********************
MQOPEN - 'Q1'

MQGET of message number 1
****Message descriptor****
  StrucId : 'MD ' Version : 2
  Report : 0  MsgType : 8
  Expiry : -1  Feedback : 0
  Encoding : 546  CodedCharSetId : 1208
  Format : 'MQSTR '\n  Priority : 0  Persistence : 0
  MsgId : X'414D5120514D5F414E47454C49544F20B5493E4C20001F02'
  CorrelId : X'0000000000000000000000000000000000000000000000000'
  BackoutCount : 0
  ReplyToQ : ''
  ReplyToQMgr : 'QM1'
** Identity Context
**UserIdentifier** : 'rivera'  
**AccountingToken** : X'16010515000000BA1E06D2603C3514885EDBC2EF03000000000000000000B'  
**ApplIdentityData** : '  
**Origin Context**  
**PutApplType** : '11'  
**PutApplName** : 're MQ\java\jre\bin\javaw.exe'  
**PutDate** : '20100714'  
**PutTime** : '23361704'  
**ApplOriginData** : '  
**GroupId** : X'000000000000000000000000000000000000000000000000'  
**MsgSeqNumber** : '1'  
**Offset** : '0'  
**MsgFlags** : '0'  
**OriginalLength** : '-1'  

**** Message ****  
length - 6 bytes  

00000000: 5465 7874 2D31                          'Text-1  

No more messages  
MQCLOSE  
=== end of output of amqsbcg ===  

Notice that the output displayed by amqsbcg shows 2 sections:

1: The Message Descriptor or MD (a good analogy is an envelope): it is a set of fields that are needed by MQ to properly handle the message. This set of fields (which do not include the actual message) is prepared by the MQ client code.

2: The actual message or payload ("Text-1" in our example).

Two of the fields in the MD are of special interest for this techdoc and they are:  
Message ID (MsgId)  
Correlation ID (CorrelId)

The MQ code generates an ID for each Message ID, such as:  
MsgId : X'414D5120514D5F414E47454C495444F20B5493E4C20001F02'

For short, let's identify this MsgId with the 4 last characters: 1F02  
MsgId: X'...1F02'

At this point, the Correlation ID is set to 0:  
CorrelId : X'00000000000000000000000000000000000000000000000'

For short, let's identify this CORRELID with the 4 last characters: 0000  
CorrelId: X'...0000'
The MD and the payload are represented as a traditional envelope used in paper mail, and the payload is the piece of paper that is stuffed inside the envelope.

When the receiving application performs an MQ GET, then the MQ code will receive the envelope (MD + Data) and will extract the data and discard the MQMD. In this case, the actual message is:

Text-1
+++ Chapter 2: Scenario of doing a Put into a Remote Queue Definition and message is placed in a Transmission Queue
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

This scenario builds on top of the basic scenario and instead of doing an MQ PUT on a local queue, the PUT is done on a Remote Queue Definition which is connected to a Transmission Queue (XMITQ).

The topology for this example is as follows:

Queue Manager 1: QM1  
Remote Queue definition: Q2_QM2  
Transmission Queue: QM2  
Sender Channel: QM1.QM2

Queue Manager 2: QM2  
Receiver Channel: QM1.QM2  
Local Queue: Q2

Here is the processing:
Step 1: The application does the MQ PUT of the actual message "Text-2" into the Remote Queue Definition.

Technically speaking, the remote queue definition is NOT a local queue and it does NOT store messages. It can be seen as a transient local queue where there is some processing of the data and immediately it is forwarded to the Transmission Queue.

Thus, if we could "freeze" the processing at the Remote Queue Definition and pause enough to look at the data we will see that we have an envelope with data: the MQMD with the MsgId/CorrelId and the data of the actual message.

The MQ code generates an ID for the Message ID, such as:

```
MsgId :     X'414D5120514D5F414E47454C49544F20B5493E4C20004702'
```

For short, let’s identify this MsgId with the 4 last characters: 4702

```
MsgId: X'...4702'
```

At this point, the Correlation ID is set to 0:

```
CorrelId : X'000000000000000000000000000000000000000000000000000000'
```

For short, let’s identify this CORRELID with the 4 last characters: 0000

```
CorrelId: X'...0000'
```

This is represented by:
Step 2: The message is forwarded from the Remote Queue Definition to the associated Transmission Queue.

This step is the one that is the source for confusion for some MQ customers.

When the message is forwarded from the Remote Queue Definition to the Transmission Queue, it is placed inside a bigger envelope and this is the one that is transmitted by the Message Channel Agent (MCA) of the Sender Channel of the local queue manager to the MCA of the Receiver Channel of the remote queue manager.

Notice that the bigger envelope has to have its own Message ID and it is different than other Message IDs already used. In this case, the MsgId for the bigger envelope is:

MsgId: X'...4703'

Notice that the smaller envelope (original message), has its original MsgId:

MsgId: X'...4702'

It is important for the MQ utilities that transmit the bigger envelope to know what is the message id of the original message (which is in the payload). For this reason, the CorrelId of the bigger envelope is used: the original MsgId (of the smaller envelope) is copied into the CorrelId of the bigger envelope:

CorrelId: X'...4702'
The following picture shows the relationship:

![Diagram showing the relationship between envelopes]

The output of `amqsbcg` from the Transmission Queue shows the physical representation of the bigger envelope that has inside a smaller envelope.

Notice that the big envelope has a special format name:

Format: 'MQXMIT '

This is also known as the Transmission Header.

$ amqsbcg QM2 QM1

```plaintext
AMQSBCG0 - starts here
**************
MQOPEN - 'QM2'

MQGET of message number 1
*****Message descriptor*****
  StrucId : 'MD '  Version : 2
  Report : 0  MsgType : 8
  Expiry : -1  Feedback : 0
  Encoding : 546  CodedCharSetId : 437
  Format : 'MQXMIT '
  Priority : 0  Persistence : 0
  MsgId : X'414D5120514D5F414E47454C49544F20B5493E4C20004703'
  CorrelId : X'414D5120514D5F414E47454C49544F20B5493E4C20004702'
  BackoutCount : 0
  ReplyToQ : '                                                '
  ReplyToQMgr : 'QM1' '
```

```
New

MsgId: X'...4703'
CorrelId: X'...4702'

MsgId: X'...4702'
CorrelId: X'...0000'

Text-2

```
** Identity Context
UserIdentifier : 'rivera'
AccountingToken :
X'16010515000000BA1E06D2603C3514885EDBC5EF03000000000000000000000B'
AppIIdentityData : '
** Origin Context
PutApplType : '7'
PutApplName : 'QM1'
PutDate : '20100714'  PutTime : '23585193'
ApplOriginData : ',

GroupId : X'0000000000000000000000000000000000000000000000000B'
MsgSeqNumber : '1'
Offset : '0'
MsgFlags : '0'
OriginalLength : '-1'

**** Message ****

length - 434 bytes

00000000: 5851 4820 0100 0000 5132 2020 2020 2020 'XQH ....Q2 
00000060: 4E47 454C 4954 4F20 2020 2020 2020 2020 'NGELITO 
00000090: 4E47 454C 4954 4F20 2020 2020 2020 2020 'NGELITO 
000000C0: 1B06 D260 3C35 1488 5EBF C2EF 0300 2020 '...`<5.ê^.....
000000D0: 0000 0000 0000 0000 0000 0000 0000 0000 '............ 
000000E0: 7269 65 2020 2020 2020 2020 7269 7665 'rive
000000F0: 7261 2020 2020 2020 2020 1601 0515 0000 00BA 'ra ......
00000100: 51C6 A661 7661 5C6A 7265 5C62 696E 5C6A 'Q\java\jre\bin\j
00000110: 6176 6177 2E65 7865 3230 3130 3933 3080 'avaw.exe20100714'
00000140: 1B06 D260 3C35 1488 5EBF C2EF 0300 2020 '...`<5.ê^.....
00000150: 0000 0000 0000 0000 0000 0000 0000 0000 '............ 
00000170: 51C6 A661 7661 5C6A 7265 5C62 696E 5C6A 'Q\java\jre\bin\j
00000180: 6176 6177 2E65 7865 3230 3130 3933 3080 'avaw.exe20100714'

===> These 2 lines show the actual payload:
===> 000000A0: 4E47 454C 4954 4F20 2020 2020 2020 2020 'NGELITO 
000000B0: 0000 0000 000B 2020 2020 2020 2020 2020 ' ........
000000C0: 0000 0000 0000 0000 0000 0000 0000 0000 '............ 
000000D0: 0B00 0000 7265 6162 696E 5C6A 7265 5C62 're M'
000000E0: 696E 5C6A 7265 5C62 696E 5C6A 'Q\java\jre\bin\j
000000F0: 6176 6177 2E65 7865 3230 3130 3933 3080 'avaw.exe20100714'

===> These 2 lines show the actual payload:
===> 000001A0: 3233 3538 3531 3933 2020 2020 2020 2020 '5465 7874 '23585193 
No more messages
 MQCLOSE
 MQDISC
 === end of output of amqsbcg ===

As you can see, the format of the message in the Transmission Queue is a bit confusing!

Lines 00000090 and 000000A0 show the MsgId of the "smaller envelope" and it is:
MsgId: X'...4702'

Lines 000001A0 and 000001B0 show the actual text message:
Text-2
The following tries to show the representation of the big envelope and small envelope.
Notice that the XHQ "eye catcher" in the first bytes of the payload indicate the beginning of the Transmission Header, which denotes it to be the "big" envelope.

**BIGGER ENVELOPE (Notice the XHQ "eye catcher")**

*****Message descriptor*****
StrucId : 'MD '  Version : 2
Report   : 0  MsgType : 8
Expiry   : -1  Feedback : 0
Encoding : 546  CodedCharSetId : 437
Format   : 'MQXMIT '
Priority : 0  Persistence : 0
MsgId : X'414D5120514D5F414E47454C49544F20B5493E4C20004703'
CorrelId : X'414D5120514D5F414E47454C49544F20B5493E4C20004702'

***** Message ****
length - 434 bytes

**SMALLER ENVELOPE**

SMALLER ENVELOPE

*** END of Message ***
Step 3: At the remote queue manager side, when the MCA of the Receiver channel completes the processing of receiving the bigger envelope, the MCA extracts the smaller envelope and places the smaller envelope into the local queue.

The empty bigger envelope is then discarded.

Thus, the local queue in the remote queue manager sees the original message:

![Message with details]

The following is the output from amqsbcg for the receiving queue in the remote queue manager:

```
$ amqsbcg Q2 QM2

== begin of output of amqsbcg ==
AMQSBCG0 - starts here
********************
MQOPEN - 'Q2'
MQGET of message number 1
****Message descriptor****

StrucId : 'MD '  Version : 2
Report : 0  MsgType : 8
Expiry : -1  Feedback : 0
Encoding : 546  CodedCharSetId : 1208
Format : 'MQSTR '  
Priority : 0  Persistence : 0
MsgId : X'414D5120514D5F414E47454C49544F20B5493E4C20004702'
CorrelId : X'000000000000000000000000000000000000000000000000'
BackoutCount : 0
ReplyToQ    :
ReplyToQMgr  : 'QM1'
** Identity Context
UserIdentifier : 'rivera'
```
AccountingToken : X'16010515000000BA1E06D2603C3514885EDBC2EF030000000000000000000000B'
ApplIdentityData : '                      '
** Origin Context
PutApplType : '11'
PutApplName : 're MQ\java\jre\bin\javaw.exe'
PutDate : '20100714'  PutTime : '23585193'
ApplOriginData : '                      '
GroupId : X'00000000000000000000000000000000000000000000000000000000000000000'
MsgSeqNumber : '1'
Offset : '0'
MsgFlags : '0'
OriginalLength : '1'

**** Message ****

length - 6 bytes

00000000: 5465 7874 2D32 'Text-2'

No more messages
MQCLOSE
MQDISC
=== end of output of amqsbcg ===

+++ end +++