Monitoring and Auditing WebSphere MQ

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Session # 8720

Monitoring and Auditing WebSphere MQ

N O T E S

- This session will provide illustrations and insight on the various techniques and capabilities available for MQ Administrators to meet "Monitoring" and "Auditing" demands for WebSphere MQ on distributed non-Mainframe platforms. With the ever increasing demands to provide system runtime "high availability" along with the need to comply with the constantly changing internal and external audit demands, this session will provide information on what can be done from a WebSphere MQ perspective.

Different types of Monitoring

On-line status commands

Event messages

Off-line accounting and statistics

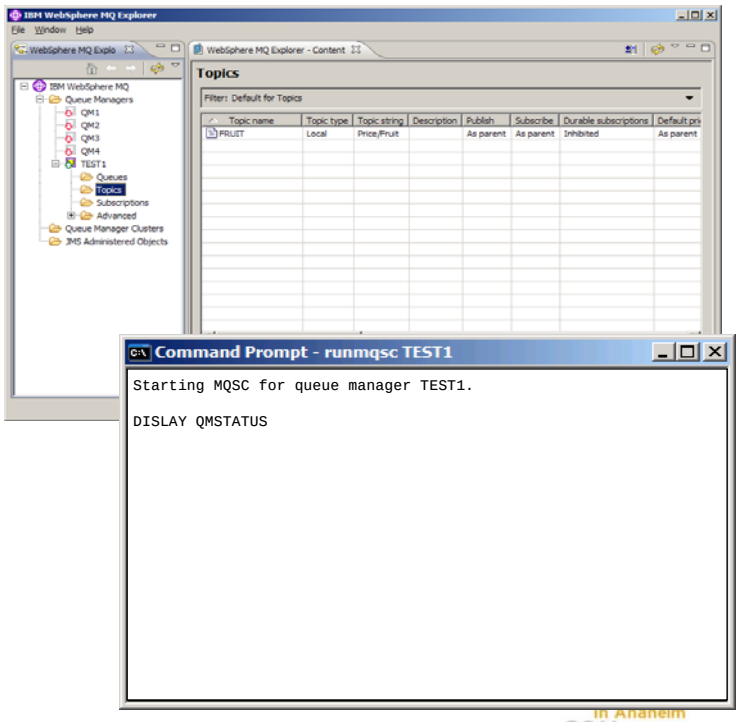
Different types of Monitoring - Notes

N O T E S

- There are several different types of monitoring features in WebSphere MQ. You will likely use some of each type in order to look after your queue managers. Each serves a different purpose.
- There are immediate, on-line, commands that show the status of resources in the queue manager, such as queues and channels. These can be useful for diagnosing problems right now, such why a channel is not moving messages, or why a queue has a deep current depth.
- There are event messages which the queue manager emits when certain interesting, or note-worthy occurrences happen. These can be programmatically collected, processed and acted upon.
- There are off-line statistics and accounting records cut over longer intervals accumulating information about the application activity in the queue manager which can be programmatically collected and post-processed for charge-back or capacity planning purposes.

On-line status commands

- **Queue Manager**
- **Resources**
  - Queues
  - Channels
  - Topics
- **Applications**
  - Connections
  - Handles
  - Subscriptions
- **Available via**
  - MQSC commands
  - Programmable Command Format (PCF)
  - MQ Explorer GUI



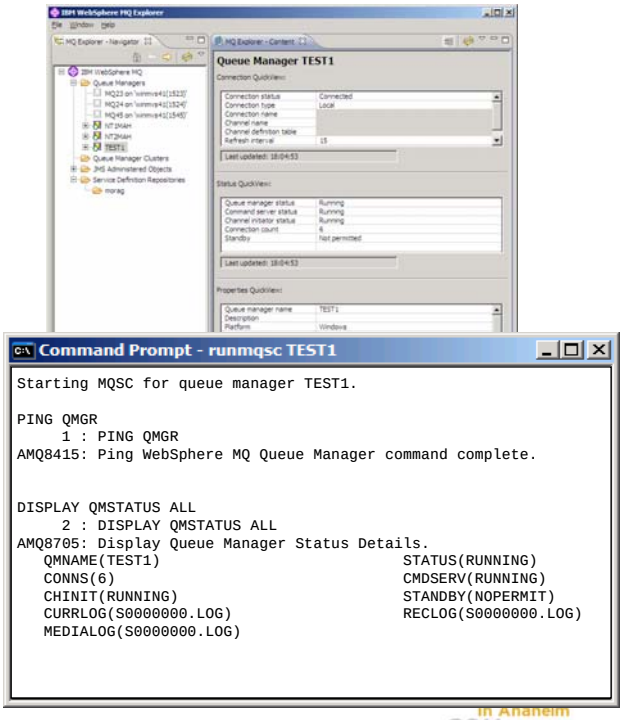
On-line status commands – Notes

N O T E S

- Many of the resources in the queue manager have status commands. These commands show the run-time view of that resource.
- There is a status command for the queue manager, although being able to issue any command of course tells you something about the status of the queue manager!
- There are also status commands for channels, queues and topics, and commands which show the run-time status of applications currently connected to the queue manager, and subscriptions currently active in the system.
- Some of these status commands have additional data that you can activate. This additional data is not enabled by default because it requires the capture of time stamp information to produce and collecting time stamps can be expensive on some platforms. You enable this additional data using the MONCHL and MONQ attributes on channels and queues respectively.
- These status commands are available using MQSC commands or via PCF (and thus through the MQ Explorer GUI and other such PCF based tools). In the MQ Explorer GUI you will find status display available through context menus on a single object, or from the object folder in the Navigator (left hand pane) for status of many objects in one view.

Queue Manager Status

- **"Is the queue manager alive"**
- ✓ **PING QMGR command**
- × **Existence of particular processes**
  - Does not mean a queue manager can do anything useful
- ✓ **dspmq control command**
- × **qmstatus.ini**
  - Not a reliable way to tell if a queue manager is running
- ✓ **DISPLAY QMSTATUS command**
  - A summary of the run-time state of the queue manager



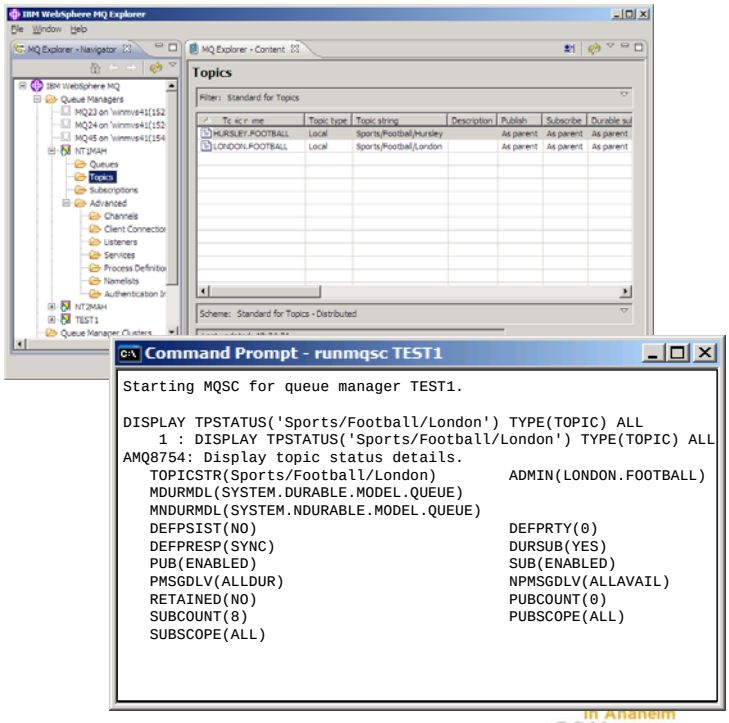
Queue Manager Status – Notes

N O T E S

- The basic question you are trying to determine here is whether the queue manager is alive. Of course that rather depends on what you mean by "alive". In my view it means an application can connect.
- One handy to command to remember is PING QMGR. It needs several components to be working, including an application connecting, in order to complete successfully and so it a good test of whether the queue manager is open for business. HA scripts have typically used this to determine the health of a queue manager.
- Some people want to test for the existence of particular processes. However, I don't like this. Even if amqzxma0 exists, it does not mean the queue manager can do anything useful.
- The dspmq control command is also useful as it also does an MQCONN. It is not design to programmatically use, also the main drawback about translated fields has been solved in V7.0.1, so it could be used in this way successfully now too.
- Some will use the contents of qmstatus.ini file. This is not a reliable method. It will correctly state if a queue manager is down, but you cannot rely on it if it says a queue manager is running, as the queue manager may have failed in a way that meant the update to this file was not able to be made.
- The status command for the queue manager, DISPLAY QMSTATUS covers a number of the run-time parts of the queue manager including the command server and channel initiator. It indicates details about the log files if you are using linear logging, and notes whether this is a multi-instance queue manager. The MQ Explorer GUI provides some of the output from this command in the quick view, and the full output can be displayed using the context menu on the queue manager and selecting Status->General…

Status of run-time resources

- **Queues**
  - Run-time information about the queue
  - Details of each handle currently open on the queue
- **Channels**
  - Partner details
  - Logical UoW details
  - How much work it has done
  - State of channel
- **Topics**
  - Resolution of hierarchically inherited attributes
  - Publisher Status
  - Subscriber Status



Status of run-time resources – Notes

N O T E S

- There are status commands allowing the run-time view of various WebSphere MQ resources to be queried.
- For queues, there is DISPLAY QSTATUS command which has two variants. DISPLAY QSTATUS TYPE(QUEUE) shows overall information about the queue, for example, how many applications have an input or output handle open on that queue, the depth of the queue, whether there is any uncommitted work on this queue and when was the last time the queue was processed either to get or put messages. A second variant, DISPLAY QSTATUS TYPE(HANDLE) shows more detailed information about each handle that currently has the queue open, including information about the application that owns the handle.
- For channels, there is DISPLAY CHSTATUS command which shows the run-time information for each channel instance – remembering of course that there may be multiple channel instances of the same name in the case of receiver and server-connection channels. The information displayed includes the details of the partner we are connected to; any logical unit of work information in the case of queue manager to queue manager channels; how much work the channel has done; and of course the state of the channel.
- For topics, there is DISPLAY TPSTATUS command which has three variants. DISPLAY TPSTATUS TYPE(TOPIC) shows the resolution of any ASPARENT definitional values. Topics are defined in a hierarchical structure which we call the topic tree. Any values which are not specifically set on a topic are inherited from the parent in the topic tree. This command makes the actual run-time values easy to see without having to display many different topic objects. Two further variants, DISPLAY TPSTATUS TYPE(PUB) and TYPE(SUB) show more detailed information about each handle that currently has the topic open, including the connection ID which can be used with the DISPLAY CONN command to discover full information about the application that owns the handle.

Command Examples: Queues and Topics

NOTES

```
DISPLAY QSTATUS(Q1) TYPE(QUEUE)
    1 : DISPLAY QSTATUS(Q1) TYPE(QUEUE)
AMQ8450: Display queue status details.
   QUEUE(Q1)                               TYPE(QUEUE)
   CURDEPTH(5)                             IPPROCS(0)
   LGETDATE(2011-02-28)                    LGETTIME(14.58.36)
   LPUTDATE(2011-02-28)                    LPUTTIME(14.58.52)
   MEDIALOG(S0000000.LOG)                  MONQ(HIGH)
   MSGAGE(29)                              OPPROCS(1)
   QTIME(47076388, 45807040)               UNCOM(NO)
```

```
DISPLAY QSTATUS(Q1) TYPE(HANDLE)
    2 : DISPLAY QSTATUS(Q1) TYPE(HANDLE)
AMQ8450: Display queue status details.
   QUEUE(Q1)                               TYPE(HANDLE)
   APPLDESC( )                             APPLTAG(d:\nttools\q.exe)
   APPLTYPE(USER)                          BROWSE(NO)
   CHANNEL(SYSTEM.DEF.SVRCONN)             CONNAME(127.0.0.1)
   ASTATE(NONE)                            HSTATE(INACTIVE)
   INPUT(NO)                               INQUIRE(NO)
   OUTPUT(YES)                             PID(14608)
   QMURID(0.0)                             SET(NO)
   TID(*)
   URID(XA_FORMATID[00000000] XA_GTRID[] XA_BQUAL[])
   URTYPE(QMGR)                            USERID(hughson@R820DGM)
```

```
DISPLAY TPSTATUS('Sports/Football/London') TYPE(TOPIC) ALL
    1 : DISPLAY TPSTATUS('Sports/Football/London') TYPE(TOPIC) ALL
AMQ8754: Display topic status details.
   TOPICSTR(Sports/Football/London)        ADMIN(LONDON.FOOTBALL)
   MDURMDL(SYSTEM.DURABLE.MODEL.QUEUE)
   MNDURMDL(SYSTEM.NDURABLE.MODEL.QUEUE)
   DEFPSIST(NO)                            DEFPRTY(0)
   DEFPRESP(SYNC)                          DURSUB(YES)
   PUB(ENABLED)                            SUB(ENABLED)
   PMSGDLV(ALLDUR)                         NPMSGDLV(ALLAVAIL)
   RETAINED(NO)                            PUBCOUNT(0)
   SUBCOUNT(8)                             PUBSCOPE(ALL)
   SUBSCOPE(ALL)
```

```
DISPLAY TPSTATUS('Sports/Football/London') TYPE(PUB) ALL
    2 : DISPLAY TPSTATUS('Sports/Football/London') TYPE(PUB) ALL
AMQ8754: Display topic status details.
   TOPICSTR(Sports/Football/London)        LPUBDATE(2011-02-28)
   LPUBTIME(16:11:50)
   ACTCONN(414D51434E54314D4148202020202020203FC16B4D20002401)
   NUMPUBS(1)
```

```
DISPLAY TPSTATUS('Sports/Football/London') TYPE(SUB) ALL
    3 : DISPLAY TPSTATUS('Sports/Football/London') TYPE(SUB) ALL
AMQ8754: Display topic status details.
   TOPICSTR(Sports/Football/London)
   SUBID(414D51204E54314D4148202020202020203FC16B4D2000280A)
   SUBUSER(hughson)                        RESMDATE(2011-02-28)
   RESMTIME(16:12:49)                      LMSGDATE(2011-02-28)
   LMSGTIME(16:12:51)
   ACTCONN(414D51434E54314D4148202020202020203FC16B4D20002807)
   DURABLE(NO)                             SUBTYPE(API)
   NUMMSGS(4)
```


Command Examples: Channels

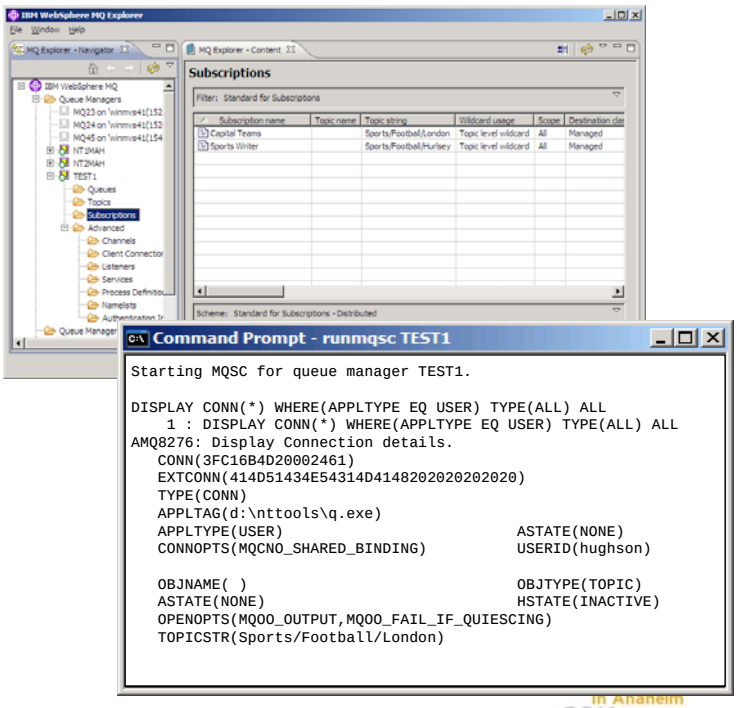
NOTES

```
DISPLAY CHSTATUS(SYSTEM.DEF.SVRCONN) ALL
    1 : DISPLAY CHSTATUS(SYSTEM.DEF.SVRCONN) ALL
AMQ8417: Display Channel Status details.
   CHANNEL(SYSTEM.DEF.SVRCONN)             CHLTYPE(SVRCONN)
   BUFSRCVD(9)                             BUFSSENT(8)
   BYTSRCVD(1688)                          BYTSSENT(1516)
   CHSTADA(2011-02-28)                     CHSTATI(15.30.53)
   COMPHDR(NONE,NONE)                      COMPMSG(NONE,NONE)
   COMPRATE(0,0)                           COMPTIME(0,0)
   CONNAME(127.0.0.1)                      CURRENT
   EXITTIME(0,0)                           HBINT(300)
   JOBNAME(0000391000003B14)               LOCLADDR( )
   LSTMSGDA(2011-02-28)                    LSTMSGTI(15.30.53)
   MCASTAT(RUNNING)                        MCAUSER(hughson)
   MONCHL(OFF)                             MSGS(5)
   RAPPLTAG(d:\nttools\q.exe)              SSLCERTI( )
   SSLKEYDA( )                             SSLKEYTI( )
   SSLPEER( )                              SSLRKEYS(0)
   STATUS(RUNNING)                         STOPREQ(NO)
   SUBSTATE(RECEIVE)                       CURSHCNV(1)
   MAXSHCNV(10)
```

```
DISPLAY CHSTATUS(NT1MAH.TO.NT2MAH) ALL
     2 : DISPLAY CHSTATUS(NT1MAH.TO.NT2MAH) ALL
AMQ8417: Display Channel Status details.
   CHANNEL(NT1MAH.TO.NT2MAH)               CHLTYPE(SDR)
   BATCHES(7)                              BATCHSZ(50)
   BUFSRCVD(8)                             BUFSSENT(13)
   BYTSRCVD(432)                           BYTSSENT(5509)
   CHSTADA(2011-02-28)                     CHSTATI(15.37.58)
   COMPHDR(NONE,NONE)                      COMPMSG(NONE,NONE)
   COMPRATE(0,0)                           COMPTIME(0,0)
   CONNAME(127.0.0.1(1502))                CURLUWID(3DC16B4D10000108)
   CURMSGS(0)                              CURRENT
   CURSEQNO(11)                            EXITTIME(0,0)
   HBINT(300)                              INDOUBT(NO)
   JOBNAME(0000397800003634)               LOCLADDR(127.0.0.1(1901))
   LONGRTS(999999999)                      LSTLUWID(3DC16B4D10000107)
   LSTMSGDA(2011-02-28)                    LSTMSGTI(15.39.16)
   LSTSEQNO(11)                            MCASTAT(RUNNING)
   MONCHL(HIGH)                            MSGS(11)
   NETTIME(110,17)                         NPMSPEED(FAST)
   RQMNAME(NT2MAH)                         SHORTRTS(10)
   SSLCERTI( )                             SSLKEYDA( )
   SSLKEYTI( )                             SSLPEER( )
   SSLRKEYS(0)                             STATUS(RUNNING)
   STOPREQ(NO)                             SUBSTATE(MQGET)
   XBATCHSZ(1,1)                           XMITQ(NT2MAH)
   XQTIME(1794,344)
```

Status of Applications

- **Application connection**
  - What
  - Who
  - UoW details
- **Application resources**
  - Handles opened on queues, topics and subscriptions
- **Subscription details**
  - Same information as in Topic status



Status of Applications – Notes

N O T E S

- DISPLAY CONN provides information about the applications connected to the queue manager and the handles that they have open. Various other commands output a connection ID which can be used as input into DISPLAY CONN in order to find out full details about the application that made the connection in question. You can find out what the application is, whether client or locally connected for example; the user id it is running under; and when the last UoW was started – helpful for diagnosing long running UoWs.
- You can also see details of the handles this connection has open. This shows the same information as DISPLAY QSTATUS and DISPLAY TPSTATUS TYPE(PUB/SUB) but in a different perspective. Those other commands looked at the information from the perspective of the resource and who is using the resources. This command shows the information in the perspective of the application and what resources it is using. It is useful to know that you can start from either perspective and get the same information.
- DISPLAY SBSTATUS provides the same information about subscriptions as DISPLAY TPSTATUS TYPE(SUB) but from the perspective of a subscription rather than the resource, as one subscription may cover a number of topics if it has been made using a wildcarded string.

Command Examples: Connections

NOTES

```
DISPLAY CONN(*) WHERE(APPLTYPE EQ USER) TYPE(ALL) ALL
    1 : DISPLAY CONN(*) WHERE(APPLTYPE EQ USER) TYPE(ALL) ALL
AMQ8276: Display Connection details.
   CONN(3FC16B4D20002461)
   EXTCONN(414D51434E54314D4148202020202020)
   TYPE(CONN)
   PID(16932)                              TID(1)
   APPLDESC( )                             APPLTAG(d:\nttools\q.exe)
   APPLTYPE(USER)                          ASTATE(NONE)
   CHANNEL( )                              CONNAME( )
   CONNOPTS(MQCNO_SHARED_BINDING)          USERID(hughson)
   UOWLOG( )                               UOWSTDA( )
   UOWSTTI( )                              UOWLOGDA( )
   UOWLOGTI( )                             URTYPE(QMGR)
   EXTURID(XA_FORMATID[00000000] XA_GTRID[] XA_BQUAL[])
   QMURID(0.0)                             UOWSTATE(NONE)

   OBJNAME( )                              OBJTYPE(TOPIC)
   ASTATE(NONE)                            HSTATE(INACTIVE)
   OPENOPTS(MQOO_OUTPUT,MQOO_FAIL_IF_QUIESCING)
   READA(NO)
   TOPICSTR(Sports/Football/London)
```

```
DISPLAY CONN(*) WHERE(APPLTYPE EQ USER) TYPE(ALL) ALL
    1 : DISPLAY CONN(*) WHERE(APPLTYPE EQ USER) TYPE(ALL) ALL
AMQ8276: Display Connection details.
   CONN(3FC16B4D20003B01)
   EXTCONN(414D51434E54314D4148202020202020)
   TYPE(CONN)
   PID(17740)                              TID(3)
   APPLDESC( )                             APPLTAG(d:\nttools\q.exe)
   APPLTYPE(USER)                          ASTATE(STARTED)
   CHANNEL(SYSTEM.DEF.SVRCONN)             CONNAME(127.0.0.1)
   CONNOPTS(MQCNO_HANDLE_SHARE_BLOCK,MQCNO_SHARED_BINDING)
   USERID(hughson)                         UOWLOG( )
   UOWSTDA(2011-02-28)                     UOWSTTI(18.13.53)
   UOWLOGDA( )                             UOWLOGTI( )
   URTYPE(QMGR)
   EXTURID(XA_FORMATID[00000000] XA_GTRID[] XA_BQUAL[])
   QMURID(0.57)                            UOWSTATE(ACTIVE)

   OBJNAME(Q1)                             OBJTYPE(QUEUE)
   ASTATE(ACTIVE)                          HSTATE(ACTIVE)
   OPENOPTS(MQOO_INPUT_SHARED,MQOO_FAIL_IF_QUIESCING)
   READA(NO)
```


Command Examples: Subscriptions

NOTES

```
DISPLAY SBSTATUS('SportsWriter') ALL
    48 : DISPLAY SBSTATUS('SportsWriter') ALL
AMQ8099: WebSphere MQ subscription status inquired.
   SUB(SportsWriter)
   SUBID(414D51204E54314D41482020202020203FC16B4D20004604)
   SUBUSER(hughson)                        RESMDATE(2011-02-28)
   RESMTIME(19:04:48)                      LMSGDATE(2011-02-28)
   LMSGTIME(19:05:36)
   ACTCONN(414D51434E54314D41482020202020203FC16B4D20004601)
   DURABLE(NO)                             NUMMSGS(1)
   SUBTYPE(API)
```

WebSphere MQ Event Messages

- **Event Messages for Auditing**
  - Security Failures
  - Commands Issued
  - Configuration Changes
- **Event Messages for Monitoring**
  - Starts and Stops of resources
  - Starts and Stops of Channels
  - Channel errors
  - Application errors using resources
  - Performance of message processing
    - Servicing of queues
    - Depth of queues

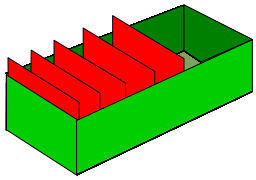
WebSphere MQ Event Messages – Notes

N O T E S

- When WebSphere MQ needs to emit information it often does so in the form of event messages. Several of the auditing features in WebSphere MQ make use of this mechanism as well as many monitoring features so we will take a general look at event messages and how they are built and then we will look at the details for the various features that use event messages.

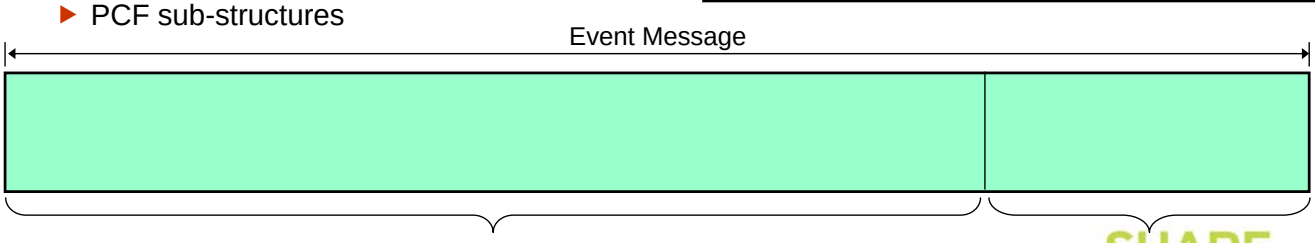
Event Messages

- **Written to specific queue**
  - Created as LOCAL queues in the default set of objects
  - Can be redefined as REMOTE queues
- **Controlled by ALTER QMR switch**
- **Message Descriptor**
  - Format = MQFMT_EVENT
  - 'EVENT '
- **Well defined message format**
  - MQCFH header
  - PCF sub-structures



SYSTEM.ADMIN.<*feature name*>.EVENT

ALTER QMGR <*type*>EV(ENABLED)



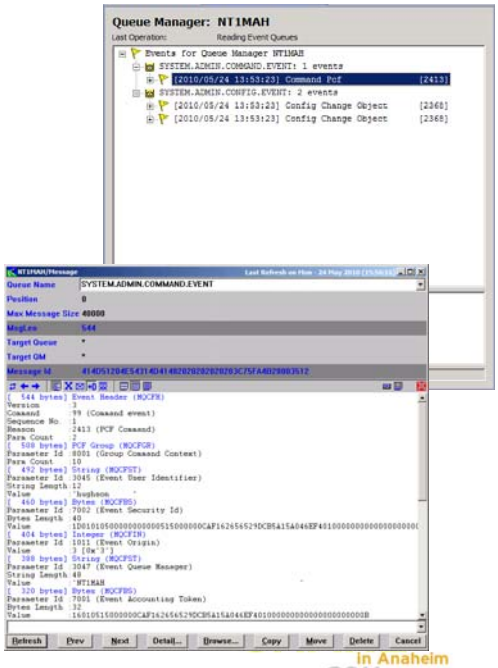
Event Messages - Notes

N O T E S

- Event messages are used for various features of MQ and they share a common mechanism for configuration and format for the emitted events.
- As we look at each specific event feature later we will see each event type is written to a specific queue name which follows the pattern SYSTEM.ADMIN.<feature name>.EVENT, and is controlled by a switch, an attribute on ALTER QMGR, usually with ENABLED/DISABLED as the values (although sometimes there are additional options). The switches also follow a pattern of <type>EV as the name.
- The various event queues are defined as part of the default objects on the queue manager (on distributed platforms) and in CSQ4IN?? CSQINP2 samples (on z/OS) as LOCAL queues. They can be redefined as REMOTE queues to funnel all event messages to a central queue manager to process if wished. The queue name just needs to be correct.
- The format of event messages is shown as MQFMT_EVENT ('EVENT ')in the message descriptor (MQMD) which is a PCF header. This means the message starts with a header using the structure MQCFH. This header is then followed by 1 or more parameter structures which are self-describing sub-structures providing the data of the actual event message.

Viewing Event Messages

- **Management or monitoring tool**
- **No general event formatter provided with WMQ**
- **Several SupportPacs available**
  - MO01 (C) - including source code
  - MS0K (C) - including source code
  - MS12 (COBOL) - including source code
  - MS0P – WMQ Explorer plug-in
  - MO71 – GUI Administrator



Viewing Event Messages

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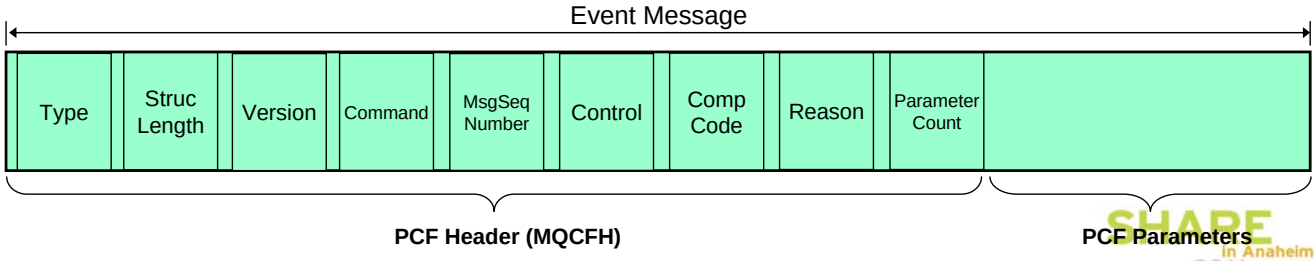
- In order to view MQ Event messages we would normally expect there to be some management or monitoring tool to be used. However, event messages are just an MQ Message with a specific published format (which we will take a look at in a moment) so writing an application to view them is also possible.
- Apart from buying purpose built MQ monitoring tools, there are also a number of freely available MQ Support Pacs that allow the browsing and formatting of MQ event messages.
- MS0P and MO71 provide graphical tools that will format event messages (among various other task that they provide).
- Whether you buy or download a tool, or write your own application, something should be consuming the event messages that you configure you queue manager to emit, and taking appropriate action based on them.

Event Message – PCF Header

- **PCF Header (MQCFH)**
  - Type
    - MQCFT_EVENT
  - StrucLength, Version
    - Standard fields in all MQ headers
  - Command
    - MQCMD_*
    - Indicates what the event is
    - A value for each category of event
  - MsgSeqNumber, Control
    - Helpful with sets of related events
  - CompCode, Reason
    - MQCC_WARNING
    - MQRC_*
    - A value for each type of event within the category
  - ParameterCount
    - How many pieces of data will follow



Event Message – PCF Header - Notes

N O T E S

- We will look at the MQCFH header here and some example (common) sub-structures, and then for each specific event type later we will see more detail on the sort of data that follows in the sub-structures.
- The Type field tells you that this is an event message (MQCFT_EVENT) since the PCF Header is actually used for other messages as well. PCF is a format that allows self-describing messages so it is very useful for lots of things.
- The StrucLength and Version fields are common to all MQ defined headers, allowing future-proofing against changes (extensions) to the structure.
- Our first important field is the Command field. This will contain a value that will indicate what category of event it is, with a defined MQCMD_* constant to use. This means that even if you have all your event messages aliased to a single central queue, you can still tell what they are. We will see the value used for the specific types of events when we come onto them. This is further qualified by Reason which we will see in a moment.

Event Message – PCF Header - Notes

N O T E S

- MsgSeqNumber and Control are helpful when a single event is written as multiple messages. MsgSeqNumber contains an incrementing number of the event message within the set, and Control flags the last messages so you know when you have all the messages in the set. When a single event maps to a single message which is what happens most of the time, you will see MsgSeqNumber = 1, and Control = MQCFC_LAST. We will see this used with one of the specific event types later.
- CompCode and Reason indicate the type of event within the category. CompCode is always MQCC_WARNING, so Reason is the important one.
- ParameterCount tells you how much data to expect to see following this PCF header. The count will vary with event types and sometimes even within event types.

PCF Header – C and COBOL

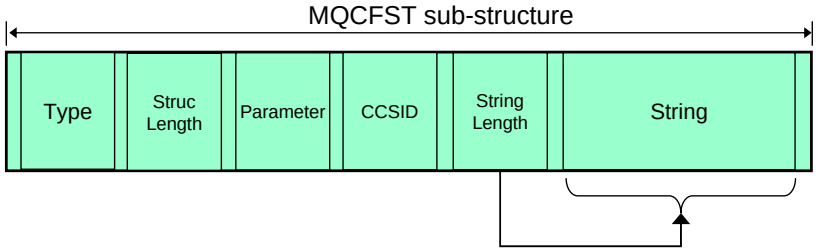
N O T E S

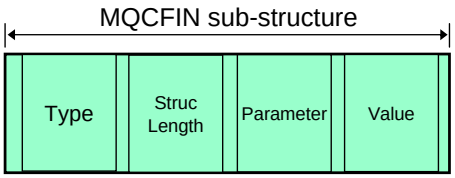
```
struct tagMQCFH {
  MQLONG  Type;            /* Structure type */
  MQLONG  StrucLength;     /* Structure length */
  MQLONG  Version;         /* Structure version number */
  MQLONG  Command;         /* Command identifier */
  MQLONG  MsgSeqNumber;    /* Message sequence number */
  MQLONG  Control;         /* Control options */
  MQLONG  CompCode;        /* Completion code */
  MQLONG  Reason;          /* Reason code qualifying completion code */
  MQLONG  ParameterCount;  /* Count of parameter structures */
};
```

```
** MQCFH structure
 10  MQCFH.
** Structure type
 15  MQCFH-TYPE PIC S9(9) BINARY.
** Structure length
 15  MQCFH-STRUCLENGTH PIC S9(9) BINARY.
** Structure version number
 15  MQCFH-VERSION PIC S9(9) BINARY.
** Command identifier
 15  MQCFH-COMMAND PIC S9(9) BINARY.
** Message sequence number
 15  MQCFH-MSGSEQNUMBER PIC S9(9) BINARY.
** Control options
 15  MQCFH-CONTROL PIC S9(9) BINARY.
** Completion code
 15  MQCFH-COMPCODE PIC S9(9) BINARY.
** Reason code qualifying completion code
 15  MQCFH-REASON PIC S9(9) BINARY.
** Count of parameter structures
 15  MQCFH-PARAMETERCOUNT PIC S9(9) BINARY.
```

Example parameters

- **String (MQCFST) field example**
  - Type
    - MQCFT_STRING
  - StrucLength
  - Parameter
    - MQCA_Q_MGR_NAME for our example
  - CodedCharSetId (CCSID)
    - The codepage that the string characters are represented in
  - StringLength
    - How long the string following is
  - String
    - The actual data
- **Integer field example**
  - Type
    - MQCFT_INTEGER
  - StrucLength
  - Parameter
    - MQIACF_REASON_QUALIFIER
  - Value
    - The actual data
    - MQRQ_*





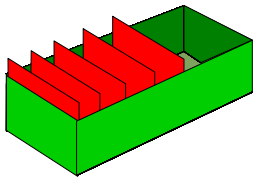
Example Parameters

N O T E S

- We show a couple of example parameters here to give you an idea of the structure of the data in an event message. We have chosen one of each of the most common data types, a string parameter and an integer parameter.
- The example, the string QMgrName field is used by many different types of event messages as it records the name of the queue manager generating the event.
- Our second example, the integer ReasonQualifier field is used by a number of event types to further qualify the type of event within a category – we will see one of the events we look at later using it.

Security Failures

- **Audit Trail of security access failures on your queue manager**
- **Queue Manager Attribute AUTHOREV**
- **PCF Header fields**
  - Command
    - MQCMD_Q_MGR_EVENT
  - Reasons
    - MQRC_NOT_AUTHORIZED
  - Reason Qualifier
    - MQRQ_CONN_NOT_AUTHORIZED
    - MQRQ_OPEN_NOT_AUTHORIZED
    - MQRQ_CLOSE_NOT_AUTHORIZED
    - MQRQ_CMD_NOT_AUTHORIZED
    - MQRQ_SUB_NOT_AUTHORIZED
    - MQRQ_SUB_DEST_NOT_AUTHORIZED



SYSTEM.ADMIN.QMGR.EVENT

ALTER QMGR AUTHOREV(ENABLED)

Security Failures – Notes

N O T E S

- On the distributed platforms, an audit trail of access failures is kept by means of event messages which are written to the SYSTEM.ADMIN.QMGR.EVENT queue. You can enable these events to be written by means of the AUTHOREV switch on ALTER QMGR.
- There are several different types of MQRC_NOT_AUTHORIZED events showing specifically what kind of access was attempted. Each of these types has a different reason qualifier recorded in the event message.
  - MQRQ_CONN_NOT_AUTHORIZED
  - MQRQ_OPEN_NOT_AUTHORIZED
    - MQPUT1 ==> MQOPEN
  - MQRQ_CLOSE_NOT_AUTHORIZED
    - For deletion of dynamic queues
  - MQRQ_CMD_NOT_AUTHORIZED
    - WebSphere MQ MQSC/PCF commands
  - MQRQ_SUB_NOT_AUTHORIZED
    - subscribe check failed
  - MQRQ_SUB_DEST_NOT_AUTHORIZED
    - destination queue check failed
- and, where applicable, there is information in each event message to show the user ID and application that made the failed access attempt.

Not Authorized Event Message Details

Reason Qualifier	QMgr Name	User Identifier	Appl Type	Appl Name	Options	Dest Open Options	Object QMgr Name	Object Name *	Topic String	Admin Topic Names	Command
MQRQ_CONN_NOT_AUTHORIZED	X	X	X	X							
MQRQ_OPEN_NOT_AUTHORIZED	X	X	X	X	X		X	X	X	X	
MQRQ_CLOSE_NOT_AUTHORIZED	X	X	X	X				X	X	X	
MQRQ_CMD_NOT_AUTHORIZED	X	X									X
MQRQ_SUB_NOT_AUTHORIZED	X	X	X	X	X				X	X	
MQRQ_SUB_DEST_NOT_AUTHORIZED	X	X	X	X	X	X	X	X			

* Might be Q Name, Process Name (OPEN only), Namelist Name (OPEN only), Sub Name (CLOSE only)

Not Authorized Event Message Details - Notes

N O T E S

- Much of the contents of the Not Authorized event messages are fairly self-explanatory, but we will look at a few of the interesting fields in a bit more detail. Of course you can read about the details of event messages in the “Monitoring WebSphere MQ” book too.
  - http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/topic/com.ibm.mq.csqzax.doc/mo10120_.htm
- The not authorised events that are from API calls, all except MQRQ_CMD_NOT_AUTHORIZED, provide details of the application making the call as well as the user ID that the application was running under that did not have the required access. These application identity fields are the same fields you will see on DISPLAY CONN, APPLTAG and APPLTYPE along with USERID.
- MQOPEN and MQSUB authorisation failures will provide the options used on the verb to allow you to work out what access was attempted on the resource. These are integer fields that contain all the options and can be decoded most easily working in hex (or of course using a tool such as in MS0P or MO71 to decode these for you).

Identifying the Application

- Event message contains same info you'd see on DISPLAY CONN command
  - APPLTAG
  - APPLTYPE
  - USERID (Not Authorized events only)

```
AMQ8276: Display Connection details.
   CONN(3C75FA4B2001BA01)
TYPE(CONN)
   PID(9428)                    TID(1)
   APPLTAG(d:\nttools\q.exe)    APPLTYPE(USER)
   USERID(hughson)
   CHANNEL( )                   CONNAME( )
   CONNOPTS(MQCNO_SHARED_BINDING)
```

User Identifier	Appl Type	Appl Name
X	X	X
X	X	X
X	X	X
X		
X	X	X
X	X	X

Decoding Options

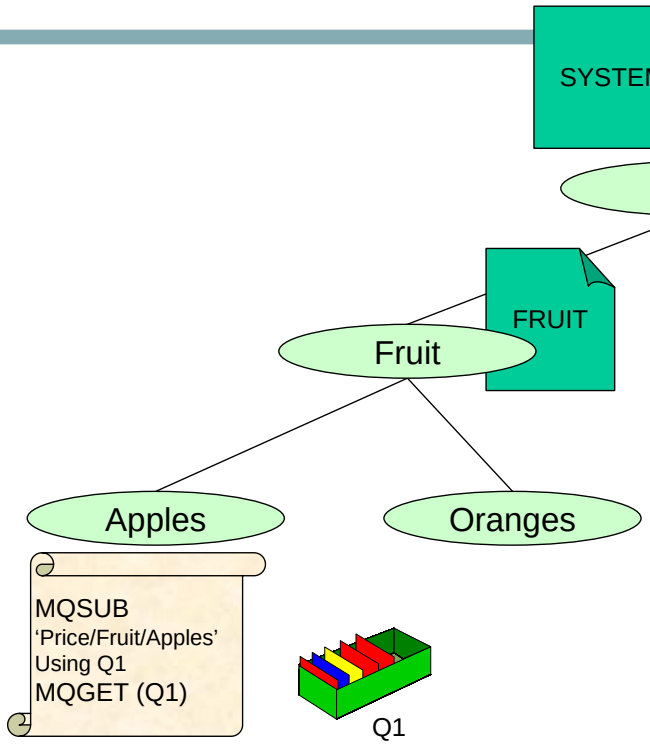
- An integer field containing the options used
- Examples

Options (from MQOPEN)	0x00000012
MQOO_OUTPUT	0x00000010
MQOO_INPUT_SHARED	0x00000002

Options (from MQSUB)	0x0000000A
MQSO_CREATE	0x00000002
MQSO_DURABLE	0x00000008

Options	Dest Open Options
X	
X	
X	X

Topic Security



- **Authority check on topic objects**
  - "Walk up the tree"
  - May be more than one check
  - Failed event records all topic objects used for authority check
- **Authority check on destination queue**
  - When not using MQSO_MANAGED
  - Check is for PUT to that queue

Topic String	Admin Topic Names
X	X
X	X
X	X

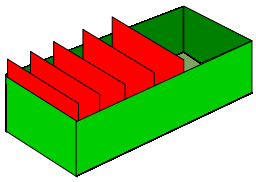
Topic Security

N O T E S

- When MQOPENing a topic (MQOT_TOPIC) for MQOO_OUTPUT – that is, in order to publish, or when making an MQSUB call to subscribe to a topic, a security check is done to see if your user ID has authority to use that topic.
- In our example we have called MQSUB at the point in the topic tree, "Price/Fruit/Apples". There is no topic object at this point in the topic tree, so to find the profile we need to check authorities against we walk up the topic tree to find a node which does have a topic object. The next point is "Price/Fruit". This does have a topic object, FRUIT, so we will check that this user ID has subscribe authority on the profile for the FRUIT topic. If that user ID does have authority, our search stops there. If it does not, we carry on searching up the topic tree and will check the SYSTEM.BASE.TOPIC to see if this user ID has subscribe authority there.
- An additional authorisation check is done for an MQSUB call when the application wishes to use a specific destination queue (i.e. is not using the MQSO_MANAGED option). In this case we also check that this user ID has authority to PUT to that destination queue.

Commands Issued

- **Audit Trail of MQSC/PCF commands issued on your queue manager**
- **Queue Manager Attribute CMDEV**
  - NODISPLAY
- **Command Failed => No event**
- **PCF Header fields**
  - Command
    - MQCMD_COMMAND_EVENT
  - Possible Reasons
    - MQRC_COMMAND_MQSC
    - MQRC_COMMAND_PCF
- **Distributed platform Command events in V7.0.1**
  - MS0P contains a limited Command Event generator for PCF admin
  - For older Distributed systems



SYSTEM.ADMIN.COMMAND.EVENT

ALTER QMGR CMDEV(ENABLED)

Commands Issued - Notes

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- An audit trail of commands issued is kept by means of event messages which are written to the SYSTEM.ADMIN.COMMAND.EVENT queue. You can enable these events to be written by means of the CMDEV switch on ALTER QMGR.
- You can choose to record all commands that are issued, or perhaps more usefully, all commands except DISPLAY commands (PCF Inquire commands), so that you only capture a record of those potentially destructive or interesting commands. This is done using CMDEV(NODISPLAY).
- If the command issued failed, for example a syntax error, then no command event is generated.
- The PCF Header of a command event message will record the Command field as MQCMD_COMMAND_EVENT and can have one of two possible Reasons, MQRC_COMMAND_MQSC or MQRC_COMMAND_PCF. The next page will show the differences.
- Command events are available on z/OS in V6 and Distributed platforms in V7.0.1.
- SupportPac MS0P also provides an API Exit that can be used to log all commands sent to the Command Server on the Distributed platforms for earlier versions.

Command Event Message Details

Event Origin	Command Context								
	Event User ID	Event QMgr	Event Accounting Token	Event Identity Data	Event Appl Type	Event Appl Name	Event Appl Origin	Command	Command Data *
MQEVO_CONSOLE	X	X						X	X
MQEVO_INIT	X	X						X	X
MQEVO_MSG	X	X	X	X	X	X	X	X	X
MQEVO_INTERNAL	X	X						X	X
MQEVO_OTHER	X	X						X	X

* Either PCF message as it was submitted, or text of MQSC command

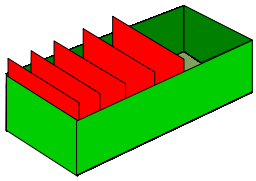
Command Event Message Details - Notes

N O T E S

- Much of the contents of the Command event messages are fairly self-explanatory, but we will look at a few of the interesting fields in a bit more detail. Of course you can read about the details of event messages in the “Monitoring WebSphere MQ” book too.
  - http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/topic/com.ibm.mq.csqzax.doc/mo10120_.htm
- The contents of the command event message varies depending on how the command was issued. If the command was a PCF message then the content of the input PCF message is part of the command event. Alternatively, if the command was an MQSC message then this text string will be found in the event message instead of the PCF input message.
- If the command was issued by putting a message on the command server queue (MQEVO_MSG) then there will be more application identifying information than in other cases because the Message Descriptor (MQMD) of the command message written by the application contains lots of extra data.
- In all cases you will get the user ID issuing the command, the queue manager where the command was entered, and one of the two aforementioned command data variants.

Configuration Changes

- **Audit trail of changes to the configuration of the queue manager.**
  - Commands acting on objects
  - MQSET calls
- **Queue Manager Attribute CONFIGEV**
- **Create a base-line view with REFRESH QMGR**
- **PCF Header fields**
  - Command
    - MQCMD_CONFIG_EVENT
  - Possible Reasons
    - MQRC_CONFIG_CHANGE_OBJECT
    - MQRC_CONFIG_CREATE_OBJECT
    - MQRC_CONFIG_DELETE_OBJECT
    - MQRC_CONFIG_REFRESH_OBJECT



SYSTEM.ADMIN.CONFIG.EVENT

```
ALTER QMGR CONFIGEV(ENABLED)

REFRESH QMGR TYPE(CONFIGEV)
OBJECT(ALL) NAME(*)
```

Configuration Changes - Notes

N O T E S

- An audit trail of changes to the queue manager configuration is kept by means of event messages which are written to the SYSTEM.ADMIN.CONFIG.EVENT queue. You can enable these events to be written by means of the CONFIGEV switch on ALTER QMGR.
- These events will be generated when a DEFINE, ALTER or DELETE command acts upon an object, or an MQSET command is used.
- A base-line picture of the current queue manager configuration can be created by using the REFRESH QMGR TYPE(CONFIGEV) command which will create an event message for every object in the queue manager. Since this could be a heavyweight operation if you have a lot of objects, you can break it down into smaller sets of objects using the NAME and OBJECT qualifiers on the command.
- The PCF Header of a configuration event message will record the Command field as MQCMD_CONFIG_EVENT and can have one of four possible Reasons, MQRC_CONFIG_CHANGE_OBJECT, MQRC_CONFIG_CREATE_OBJECT or MQRC_CONFIG_DELETE_OBJECT for the respective MQSC or PCF commands that you might issue upon an object or MQRC_CONFIG_REFRESH_OBJECT for those event messages written when creating the base-line picture. The next page will show the details.
- Config events are available on z/OS in V5.3 and Distributed platforms in V7.0.1.

Config Event Message Details

- **All config events**
  - Command Context just as Command Event Message Details
  - Object Type
  - Object Name
  - Disposition (z/OS only)
- **PCF Header**
  - When 2 event messages
  - MsgSeqNumber = 1, 2
  - Control = MQCFC_NOT_LAST, MQCFC_LAST
- **MQRC_CONFIG_CHANGE_OBJECT**
  - 2 event messages
  - Attributes before change
  - Attributes after change
- **MQRC_CONFIG_CREATE_OBJECT**
  - 1 event message
  - Attributes after create
- **MQRC_CONFIG_DELETE_OBJECT**
  - 1 event message
  - Attributes before deletion
- **MQRC_CONFIG_REFRESH_OBJECT**
  - 1 event message
  - Current attributes of object

Config Event Message Details - Notes

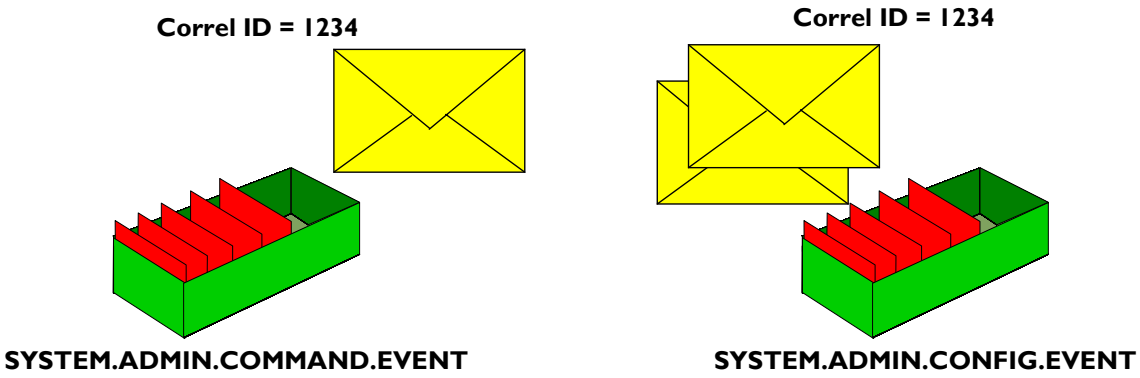
NOTES

- Much of the contents of the Config event messages contain object attributes. These are PCF sub-structures when one issues a PCF command to make or alter an object, and exactly the same sub-structures are used in these event messages. Of course you can read about the details of event messages in the "Monitoring WebSphere MQ" book too.
  - http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/topic/com.ibm.mq.csqzax.doc/mo10120_.htm
- The contents of the command event message varies depending on how the command was issued just as with command events. If the command was issued by putting a message on the command server queue (MQEVO_MSG) then there will be more application identifying information than in other cases because the Message Descriptor (MQMD) of the command message written by the application contains lots of extra data.
- In all cases you will get the user ID issuing the command, the queue manager where the command was entered.
- In the specific case of the MQRC_CONFIG_CHANGE_OBJECT, you will get two messages, one containing the object attributes before the change and one containing those after the change. These will be indicated using the MsgSeqNumber field and the Control field in the PCF Header.

Combining Command and Config Events

- **ALTER Q(FRED) MAXDEPTH(1)**
  - Command Event
  - Before Change Config Event
  - After Change Config Event

ALTER QMGR
CMDEV(NODISPLAY)
CONFIGEV(ENABLED)



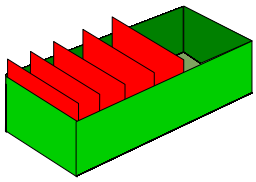
Combining Command and Config Events - Notes

N O T E S

- If you have both Command events and Configuration events enabled, then when an object is changed, the event messages will share the same correlation ID in their MQMDs.

Start and Stop Events

- **Notification of queue manager start and stop**
- **Queue Manager Attribute STRSTPEV**
  - DEFPSIST of event queue



SYSTEM.ADMIN.QMGR.EVENT

- **PCF Header fields**
  - Command
    - MQCMD_Q_MGR_EVENT
  - Possible Reasons
    - MQRC_Q_MGR_ACTIVE
    - MQRC_Q_MGR_NOT_ACTIVE
  - Reason Qualifier
    - MQRQ_Q_MGR_STOPPING
    - MQRQ_Q_MGR_QUIESCING

ALTER QMGR STRSTPEV(ENABLED)

Reason	QMgr Name	Reason Qualifier
MQRC_Q_MGR_ACTIVE	X	
MQRC_Q_MGR_NOT_ACTIVE	X	X

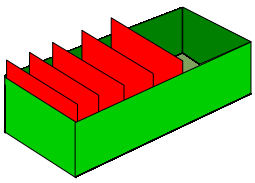
Start and Stop Events - Notes

N O T E S

- Whenever a queue manager starts or stops, an event messages is written to the SYSTEM.ADMIN.QMGR.EVENT queue. You can enable these events to be written by means of the STRSTPEV switch on ALTER QMGR.
- The PCF Header of a start or stop event message will record the Command field as MQCMD_Q_MGR_EVENT and can have two possible Reasons where the MQRC_Q_MGR_NOT_ACTIVE can have two possible Reason Qualifiers as shown.
- A stop event is only recorded if the DEFPSIST attribute of the SYSTEM.ADMIN.QMGR.EVENT queue is defined as persistent.

Channel Events

- **Notification of channel starts, stops and errors, including SSL errors**
- **Queue Manager Attributes CHLEV and SSLEV**
  - EXCEPTION
- **Server-connection channels do not cause start or stop events**
- **PCF Header fields**
  - Command
    - MQCMD_CHANNEL_EVENT
  - Possible Reasons
    - MQRC_CHANNEL_ACTIVATED
    - MQRC_CHANNEL_NOT_ACTIVATED
    - MQRC_CHANNEL_STARTED
    - MQRC_CHANNEL_STOPPED
    - MQRC_CHANNEL_STOPPED_BY_USER
    - MQRC_CHANNEL_CONVERSION_ERROR
    - MQRC_CHANNEL_SSL_ERROR
    - MQRC_CHANNEL_SSL_WARNING



SYSTEM.ADMIN.CHANNEL.EVENT

ALTER QMGR CHLEV(EXCEPTION) SSLEV(ENABLED)

- Reason Qualifier
  - MQRQ_CHANNEL_STOPPED_OK
  - MQRQ_CHANNEL_STOPPED_ERROR
  - MQRQ_CHANNEL_STOPPED_RETRY
  - MQRQ_CHANNEL_STOPPED_DISABLED
  - MQRQ_SSL_HANDSHAKE_ERROR
  - MQRQ_SSL_CIPHER_SPEC_ERROR
  - MQRQ_SSL_PEER_NAME_ERROR
  - MQRQ_SSL_CLIENT_AUTH_ERROR
  - MQRQ_SSL_UNKNOWN_REVOCATION

Channel Events - Notes

N O T E S

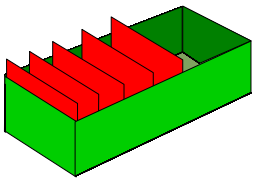
- Whenever a channel does something noteworthy, an event messages is written to the SYSTEM.ADMIN.CHANNEL.EVENT queue. You can enable these events to be written by means of the CHLEV switch on ALTER QMGR. Additionally, if you are using SSL on your channels, you can get detailed event messages on the reason for any SSL failures by enabling SSL error events by means of the SSLEV switch on ALTER QMGR. These are written to the same event queue.
- You can choose to record all channel events that are issued, or perhaps more usefully, all the ones relating to error situations. This is done using CHLEV(EXCEPTION).
- The PCF Header of a channel event message will record the Command field as MQCMD_CHANNEL_EVENT and can have several possible Reasons and Reason Qualifiers as shown.

Channel Auto-definition Events

- **Notification of attempts to automatically define channels**

- **Queue Manager Attributes**
  - CHAD
  - CHADEV
  - CHADEXIT

- **PCF Header fields**
  - Command
    - MQCMD_CHANNEL_EVENT
  - Possible Reasons
    - MQRC_CHANNEL_AUTO_DEF_ERROR
    - MQRC_CHANNEL_AUTO_DEF_OK



SYSTEM.ADMIN.CHANNEL.EVENT

ALTER QMGR CHAD(ENABLED)
CHADEV(ENABLED)
CHADEXIT(*exit-name*)

Channel Auto-defintion Events - Notes

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- If you have enabled channel auto-definition by means of the CHAD switch on ALTER QMGR, then an inbound channel connection who wishes to use a channel that is not defined will cause it to be created (modeled off SYSTEM.AUTO.* channels). You can further configure this behaviour with an exit whose name is specified in the CHADEXIT attribute, and you can also have events emitted whenever an auto-definition of a channel is attempted.
- Whenever a channel is automatically defined, an event messages is written to the SYSTEM.ADMIN.CHANNEL.EVENT queue. You can enable these events to be written by means of the CHADEV switch on ALTER QMGR. The PCF Header of a channel event message will record the Command field as MQCMD_CHANNEL_EVENT and can have one of two possible Reasons, MQRC_CHANNEL_AUTO_DEF_OK or MQRC_CHANNEL_AUTO_DEF_ERROR.

Channel Event Message Details

Reason	QMgr Name	Channel Name	XmitQ Name	Connection Name	Error Identifier	Aux Error Data Int 1/2	Aux Error Data String 1/2/3	Conversion Reason Code	Format	Channel Type	SSL Handshake Stage	SSL Return Code	SSL Peer Name
MQRC_CHANNEL_ACTIVATED	X	X	X	X									
MQRC_CHANNEL_NOT_ACTIVATED	X	X	X	X									
MQRC_CHANNEL_STARTED	X	X	X	X									
MQRC_CHANNEL_STOPPED	X	X	X	X	X	X	X						
MQRC_CHANNEL_STOPPED_BY_USER	X	X	X	X	X								
MQRC_CHANNEL_CONV_ERROR	X	X	X	X				X	X				
MQRC_CHANNEL_SSL_ERROR	X	X	X	X							X	X	X
MQRC_CHANNEL_SSL_WARNING	X	X	X	X									
MQRC_CHANNEL_AUTO_DEF_OK	X	X		X						X			
MQRC_CHANNEL_AUTO_DEF_ERROR	X	X		X	X	X				X			

Channel Event Message Details - Notes

N O T E S

- Much of the contents of the Channel event messages are fairly self-explanatory, but we will look at a few of the interesting fields in a bit more detail. Of course you can read about the details of event messages in the “Monitoring WebSphere MQ” book too.
  - http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/topic/com.ibm.mq.csqzax.doc/mo10120_.htm
- The channel events all provide details of the channel in questions. These channel detail fields are the same fields you will see on DISPLAY CHSTATUS, the channel name, XMITQ and CONNAME.
- The events that report channels failing due to an error, which are probably the most interesting ones for most people, include some interesting fields that it is helpful to know how to interpret.

Identifying the Channel

- **Event message contains same info you'd see on DISPLAY CHSTATUS command**
  - Channel name
  - XMITQ
  - CONNAME

AMQ8417: Display Channel Status details.

CHANNEL(NT1MAH.TO.NT2MAH)	CHLTYPE(SDR)
CONNAME(127.0.0.1(1502))	CURRENT
RQMNAME(NT2MAH)	STATUS(RUNNING)
SUBSTATE(MQGET)	XMITQ(NT2MAH)

Channel Name	XmitQ Name	Connection Name
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X		X
X		X

Decoding Error Information

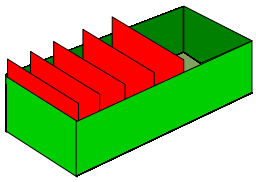
- **Error Identifier**
  - Example
    `0x20009208` **`Receive Failed`**
- **Use mqrc tool**
  - Can enter number in hex or decimal
- **Auxiliary data**
  - Contains data that would be seen in the inserts of the equivalent error log message

```
C:\>mqrc 0x20009208

 536908296  0x20009208  rrcE_RECEIVE_FAILED


C:\>mqrc AMQ9208

MESSAGE:
Error on receive from host <insert one>.

EXPLANATION:
An error occurred receiving data from <insert one>
over <insert two>. This may be due to a
communications failure.

ACTION:
The return code from the <insert two><insert three>
call was 1111 (X'8AE'). Record these values and tell
the systems administrator.
```

Error Identifier	Aux Error Data Int 1/2	Aux Error Data String 1/2/3
X	X	X
X		
X	X	

Application errors using resources

- **Notification of application failures to use local or remote queues, inhibited resources**
- **Queue Manager Attributes**
  - LOCALEV
  - REMOTEEV
  - INHIBITEV
- **PCF Header fields**
  - Command
    - MQCMD_Q_MGR_EVENT
  - Possible Reasons
    - MQRC_ALIAS_BASE_Q_TYPE_ERROR
    - MQRC_UNKNOWN_ALIAS_BASE_Q
    - MQRC_UNKNOWN_OBJECT_NAME
    - MQRC_DEF_XMIT_Q_TYPE/USAGE_ERROR
    - MQRC_Q_TYPE_ERROR
    - MQRC_REMOTE_Q_NAME_ERROR
    - MQRC_XMIT_Q_TYPE/USAGE_ERROR
    - MQRC_UNKNOWN_DEF_XMIT_Q
    - MQRC_UNKNOWN_REMOTE_Q_MGR
    - MQRC_UNKNOWN_XMIT_Q
    - MQRC_GET_INHIBITED
    - MQRC_PUT_INHIBITED



SYSTEM.ADMIN.QMGR.EVENT

```
ALTER QMGR LOCALEV(ENABLED)
           REMOTEEV(ENABLED)
           INHIBITEV(ENABLED)
```

- **Reflects an MQRC also given back to the application**
- **Handy when application forgets to check!**

Application errors using resources – Notes

N O T E S

- These events reflects error that are also returned to applications. They indicate problems where either the object that the application needs to use is defined incorrectly, or the application is using the wrong name of an object, perhaps more likely is cases such as MQRC_UNKNOWN_OBJECT_NAME.
- The inhibit events reflect a problem where an application has attempted to use a resource which is inhibited for the operation required. MQRC_PUT_INHIBIT events are created for PUT(DISABLED) queues and PUB(DISABLED) topics.
- These events can also be generated by internal operations in the queue manager, such as the writing of an event message. In case it would reflect the ReplyToQ and ReplyToQMgr fields of an originating application message containing incorrect information or pointing at a resource that is not correctly defined.

Local/Remote/Inhibit Event Message Details

Reason	QMgr Name	Object Name *	Object QMgr Name	Base Object Name	Xmit Q Name	Base Type	Q Type	Appl Type	Appl Name	Topic Stirng
MQRC_ALIAS_BASE_Q_TYPE_ERROR	X	X	X	X			X	X	X	
MQRC_UNKNOWN_ALIAS_BASE_Q	X	X	X	X		X		X	X	
MQRC_UNKNOWN_OBJECT_NAME	X	X	X					X	X	
MQRC_DEF_XMIT_Q_TYPE_ERROR	X	X	X		X		X	X	X	
MQRC_DEF_XMIT_Q_USAGE_ERROR	X	X	X		X			X	X	
MQRC_Q_TYPE_ERROR	X	X	X					X	X	
MQRC_REMOTE_Q_NAME_ERROR	X	X	X					X	X	
MQRC_XMIT_Q_TYPE_ERROR	X	X	X		X		X	X	X	
MQRC_XMIT_Q_USAGE_ERROR	X	X	X		X			X	X	
MQRC_UNKNOWN_DEF_XMIT_Q	X	X	X		X			X	X	
MQRC_UNKNOWN_REMOTE_Q_MGR	X	X	X					X	X	
MQRC_UNKNOWN_XMIT_Q	X	X	X		X			X	X	
MQRC_GET_INHIBITED	X	X						X	X	
MQRC_PUT_INHIBITED	X	X	X					X	X	X

* Might be Q Name, Process Name, Namelist Name or Topic Name

Local/Remote/Inhibit Event Message Details - Notes

N O T E S

- Much of the contents of these queue manager event messages are fairly self-explanatory, but we will look at a few of the interesting fields in a bit more detail. Of course you can read about the details of event messages in the “Monitoring WebSphere MQ” book too.
  - http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/topic/com.ibm.mq.csqzax.doc/mo10120_.htm
- These events are all caused by some application making an MQ API call (mostly MQOPENs) which failed. So they all provide details of the application making the call. These application identity fields are the same fields you will see on DISPLAY CONN, APPLTAG and APPLTYPE. We saw an example of this earlier with the Not Authorized events.
- When diagnosing an issue reported by one of these events, either the application has coded the wrong thing, or there is an administrative definition missing or incorrect that the application needs to use. You can see the details of exactly what the application coded in the MQOD.ObjectName and MQOD.ObjectQMgrName fields by looking at the equivalent fields in the event message.

Application MQOD details

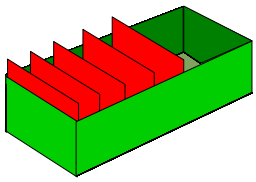
- **MQOPEN API call**
- **MQOD describes the object to open**
  - ObjectName
  - ObjectQMgrName
- **MQMD describes the object to open for a Response/Report message**
  - ReplyToQ
  - ReplyToQMgr
- **Event message data provides these**

```
MQOD   ObjDesc = {MQOD_DEFAULT};

ObjDesc.ObjectType              = MQOT_Q;
strncpy(ObjDesc.ObjectName,
        “MY.APP.QUEUE”,
        MQ_Q_NAME_LENGTH);
```

Object Name *	Object QMgr Name
X	X
X	X
X	X
X	X
X	X
X	X
X	X

Queue Service Interval Events

- **Notification of whether queues are being processed in a timely manner**
  - MQGETs or CLEAR QLOCAL



SYSTEM.ADMIN.PERFM.EVENT

- **Queue Manager Attribute PERFMEV**
- **Queue Attributes**
  - QSVCIEV – Event switch
  - QSVCINT – Interval
- **PCF Header fields**
  - Command
    - MQCMD_PERFM_EVENT
  - Possible Reasons
    - MQRC_Q_SERVICE_INTERVAL_HIGH
    - MQRC_Q_SERVICE_INTERVAL_OK

```
ALTER  QMGR PERFMEV(ENABLED)

ALTER  QLOCAL(q-name)
       QSVCIEV(HIGH)
       QSVCINT(10000)
```

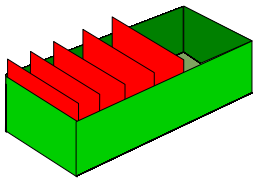

Queue Service Interval Events – Notes

N O T E S

- Queue Service Interval events give you notification that a queue is not being processed in a timely enough manner. You can set the interval on the queue (in milliseconds) for how quickly you expect gets to be issued after some messages are there to be processed, and if a get hasn't been used within that interval you will get an event.
- A CLEAR QLOCAL command will also count as a 'get' for the purposes of these events.
- Both these High/Low events and Queue Depth High/Low events work in co-operation with each other as we will see in a moment.

Queue Depth Events

- **Notification of when queues start to fill up with messages**
- **Queue Manager Attribute PERFMEV**
- **Queue Attributes**
  - QDPHIEV – High Depth Event Switch
  - QDPLOEV – Low Depth Event Switch
  - QDPMAXEV – Max Depth Event Switch
  - QDEPTHHI - % of Max Depth
  - QDEPTHLO - % of Max Depth
  - MAXDEPTH
- **PCF Header fields**
  - Command
    - MQCMD_PERFM_EVENT
  - Possible Reasons
    - MQRC_Q_DEPTH_HIGH
    - MQRC_Q_DEPTH_LOW
    - MQRC_Q_FULL



SYSTEM.ADMIN.PERFM.EVENT

```
ALTER  QMGR PERFMEV(ENABLED)

ALTER  QLOCAL(q-name) MAXDEPTH(1000)
       QDEPTHHI(80) QDEPTHLO(20)
       QDPHIEV(ENABLED)
```

Queue Depth Events – Notes

N O T E S

- Queue Depth events give you prior warning that your queue is getting full. A queue full event of course tells you that the queue is full – too late!! However, you can get prior warning by using the Queue High event, and setting the point you wish to be notified as a percentage of the maximum depth of the queue.
- There are also Queue Low events which tell you when the panic is over and the alarms can be turned off again!
- Both these High/Low events and Queue Service Interval High/Low events work in co-operation with each other as we will see in a moment.

Performance Event Message Details

Reason	QMgr Name	Q Name	Statistics: Time Since Reset	Statistics: High Q Depth	Statistics: Msg Enq Count	Statistics: Msg Deq Count
MQRC_Q_SERVICE_INTERVAL_HIGH	X	X	X	X	X	X
MQRC_Q_SERVICE_INTERVAL_OK	X	X	X	X	X	X
MQRC_Q_DEPTH_HIGH	X	X	X	X	X	X
MQRC_Q_DEPTH_LOW	X	X	X	X	X	X
MQRC_Q_FULL	X	X	X	X	X	X

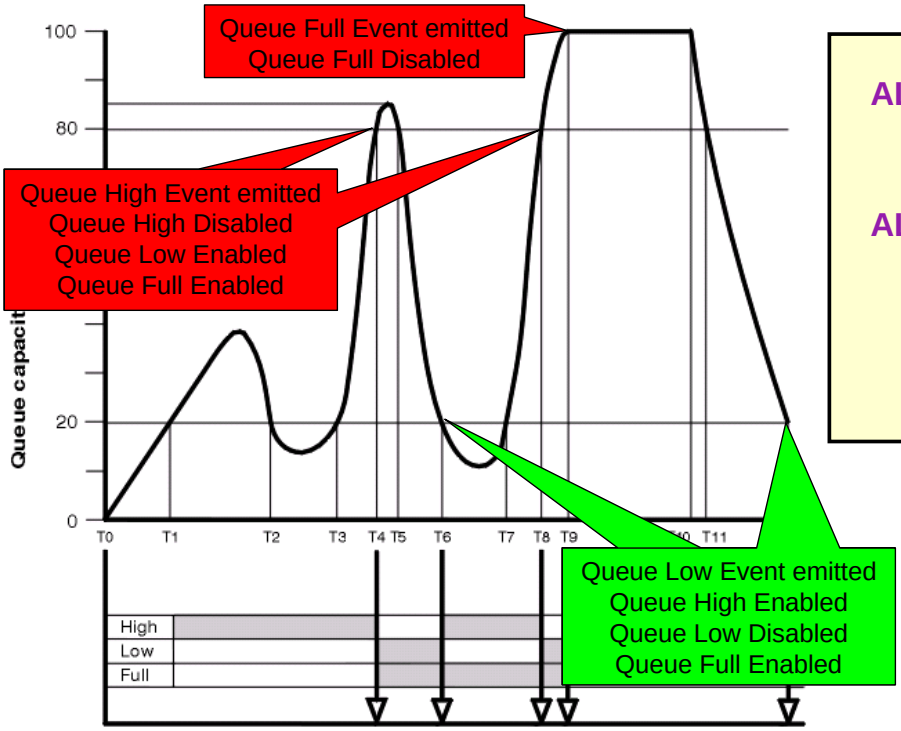
- **Performance Event Statistics are reset**
  - A performance event is emitted
  - The queue manager restarts
  - Reset Queue Statistics (PCF) command is issued
  - RESET QSTATS (MQSC) command is issued (z/OS only)
- **Time Since Reset**
  - Shows time of last one of the above actions

Performance Event Message Details – Notes

N O T E S

- So this is not the most interesting table we've seen today. All these different event messages have exactly the same content. What is perhaps more interesting is the way these events operate which we will look at on the next page.
- Note that the statistics that are provided as part of a performance event are reset are various points, when a performance event is emitted; when the queue manager restarts; and when a command is issued to reset the statistics. The Time Since Reset parameter in the event message details when the last one of these happens. If no reset has happened it will contain the time of the last event message.

The Highs and Lows of Performance Events




```
ALTER  QMGR
       PERFMEV(ENABLED)

ALTER  QLOCAL(q-name)
       MAXDEPTH(1000)
       QDEPTHHI(80)
       QDEPTHLO(20)
       QDPHIEV(ENABLED)
```

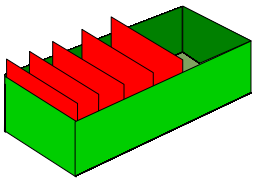
The Highs and Lows of Performance Events - Notes

N O T E S

- Queue Service Interval and Queue Depth events are unusual compared to the other events we have looked at in that they operate in pairs. There is a High event which alerts the monitor of a problem, a slow processing application or backlog of messages, and then when the problem is solved, and the queue is being serviced in a timely manner again, or the depth has returned to a nice low value, the corresponding Low event is emitted.
- This means that only one of the High or Low event from the pair is set at any one time and when the event is generated, let's say the High one, then the High event switch is disabled and the Low event switch is enabled. The reverse happens when the Low event is reached.
- For Depth events there is also the Queue Full event to consider. This is automatically switched on when the Queue High state is reached. There isn't an equivalent event for the Queue Service Interval pair though.

Accounting Messages

- **Collects information about the applications which connect to the Queue Manager**
  - Overall
  - Per Queue
- **Queue Manager Attribute ACCTINT**
- **Overall MQI Accounting**
  - Queue Manager Attribute ACCTMQI
- **Queue Accounting**
  - Queue Manager Attribute ACCTQ
  - Queue Attribute ACCTQ
- **PCF Header fields**
  - Command
    - MQCMD_ACCOUNTING_MQI – overall information
    - MQCMD_ACCOUNTING_Q – queues message



SYSTEM.ADMIN.ACCOUNTING.QUEUE

```
ALTER  QMGR ACCTINT(1800)
       ACCTMQI(ON) ACCTQ(ON)

ALTER  QLOCAL(q-name)
       ACCTQ(QMGR)
```

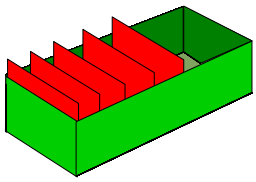
Accounting Messages – Notes

N O T E S

- Accounting Monitoring Data collects information about the applications which connect to the Queue Manager. This data, when enabled by means of the ACCTMQI switch on ALTER QMGR, is written in the form of PCF records to the SYSTEM.ADMIN.ACCOUNTING.QUEUE and can be post-processed to give information on the activity of each application connected. The PCF formatted message is written upon MQDISC (or at regular intervals for long running tasks, controlled by the ACCTINT attribute on ALTER QMGR).
- As well as the standard collection details, detailed queue information for each connection may also be collected. Written at the same time as the standard accounting data collection, a number of PCF formatted messages may we written which includes accounting information for each queue opened by the connection (up to 100 queue details per message). The queues that this information is written for is controlled by the ACCTQ attribute on queues and on the queue manager (providing a way to switch on and off for multiple queues at once).
- The PCF Header of an accounting data message will record the Command field as MQCMD_ACCOUNTING_MQI for the main accounting information and MQCMD_ACCOUNTING_Q for the additional messages written for queues.

Statistics Messages

- **Collects information about WebSphere MQ resources**
  - Queue Manager
  - Per Queue
  - Per Channel
- **Queue Manager Attribute STATINT**
- **Overall MQI Statistics**
  - Queue Manager Attribute STATMQI
- **Queue and Channel Statistics**
  - Queue Manager Attributes STATQ, STATCHL and STATACLS
  - Queue Attribute STATQ
  - Channel Attribute STATCHL
- **PCF Header fields**
  - Command
    - MQCMD_STATISTICS_MQI
    - MQCMD_STATISTICS_Q
    - MQCMD_STATISTICS_CHANNEL



SYSTEM.ADMIN.STATISTICS.QUEUE

```
ALTER  QMGR STATINT(1800) STATMQI(ON)
       STATQ(ON) STATCHL(HIGH)
       STATACLS(QMGR)

ALTER  QLOCAL(q-name) STATQ(QMGR)

ALTER CHL(chl-name) CHLTYPE(SDR)
       STATCHL(QMGR)
```

Statistics Messages – Notes

N O T E S

- Statistics Monitoring Data collects information about WebSphere MQ resources and writes this information at configured intervals (using the STATINT attribute on ALTER QMGR) to the SYSTEM.ADMIN.STATISTICS.QUEUE. This data, written in the form of PCF records, can be post-processed to give information on the activity of the system.
- Data collection is split into 3 classes, statistics based on the activity of the whole system; statistics on the activity of the queue (per queue); and statistics on the activity of the channel (per channel).
- The PCF Header of an accounting data message will record the Command field as MQCMD_STATISTICS_MQI for the activity of the whole system; MQCMD_STATISTICS_Q for the per queue activity and MQCMD_STATISTICS_CHANNEL for the per channel activity.

Accounting Message Details

MQCMD_ACCOUNTING_MQI
Connection Details (application name / process Id / connection type / connect time)
API counts (MQOPEN / MQCLOSE / MQGET / MQPUT / ...)
MQPUT / MQGET / MQGET (browse)
message counts: persistent / non-persistent
bytes counts: persistent / non-persistent
message sizes: persistent / non-persistent

MQCMD_ACCOUNTING_Q
Queue details: name, type
Open details: first open time, last close time
MQPUT details: count, total bytes, msg-sizes (min / max) (persistent / non-persistent)
MQGET details: count, total bytes, msg-size (min / max), time-on-queue (min / avg / max) (persistent / non-persistent)
MQGET(browse): count, total bytes, msg-sizes (min / max) (persistent / non-persistent)

Statistics Message Details

MQCMD_STATISTICS_MQI
API counts for each of the MQ API's (MQCONN / MQDISC / MQPUT / MQGET/ ...)
Total message/bytes put to queues (persistent / non-persistent messages)
Total message/bytes got from queues (persistent / non-persistent messages)

MQCMD_STATISTICS_Q
Minimum / Maximum depth of queue
Average time-on-queue for messages retrieved from the queue
API counts for GET / PUT / BRWS (persistent / non-persistent)
Total byte counts for GET / PUT / BRWS (persistent / non-persistent)

MQCMD_STATISTICS_CHANNEL
Number of messages transferred (persistent / non-persistent)
Number of bytes transferred (persistent / non-persistent)
Network times (min / avg / max) : measured on heartbeats
Exit Times (min / avg / max)
Batch Info (total / number full / avg size)
Number of PUT retries