Monitoring, Tracking & Stats

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Agenda - Different types of Monitoring

- On-line Status Commands or MQ Explorer
- Event Messages
- Off-line Accounting and Statistics
- MQ Console (to monitor the MQ Appliance)
On-line status commands

• Available via
  – MQSC commands
  – Programmable Command Format (PCF)
  – MQ Explorer GUI

  ▪ Queue Manager
  ▪ Resources
    ▶ Queues
    ▶ Channels
    ▶ Topics
  ▪ Applications
    ▶ Connections
    ▶ Handles
    ▶ Subscriptions
QUEUE MANAGER STATUS
Queue Manager Status via Commands

“Is the queue manager alive”?  

- **Control Command**
  - dspmq

- **MQSC Commands**
  - ping qmgr
    - Test if QMGR is responsive to commands
  - display qmstatus all
    - Run-time state of the QMGR
Queue Manager Status in the MQ Explorer
Queue Manager Status in the MQ Explorer ..
QUEUE STATUS
DISPLAY QSTATUS TYPE(QUEUE) command

- Last message Put/Get date and time
- Age of oldest message on queue in seconds
DISPLAY QSTATUS TYPE(HANDLE) command

- Handles currently open against a queue
Queue Status in the MQ Explorer

- Run-time information about queues
CHANNEL STATUS
DISPLAY CHSTATUS command

- **Channel Type**
- **Work done**
Channel Status in the MQ Explorer

![Image of MQ Explorer showing Channel Status]

- **Filter**: Standard for Channel Status
- **Queue Manager**: NT1MAH
- **Channels**:
  - **Channel Name**: NT1MAH TO NT2MAH
    - **Server connection**: Running
    - **Conn name**: 127.0.0.1
    - **Remote queue manager**: NT2MAH
    - **Transmission queue**: NT2MAH
    - **Messages**: 0
    - **Channel status**: In doubt
    - **End point status**: Not in doubt
  - **Channel Name**: NT1MAH TO NT2MAH.T01
    - **Server connection**: Stopped
    - **Conn name**: localhost(15002)
    - **Remote queue manager**: NT2MAH
    - **Transmission queue**: NT2MAH.T01
    - **Messages**: 0
    - **Channel status**: Not in doubt
    - **End point status**: Not in doubt

**Last Updated**: 18:42:43
TOPIC/PUBSUB STATUS
DISPLAY TPSTATUS TYPE(TOPIC) command

- Resolution of hierarchically inherited attributes

<table>
<thead>
<tr>
<th>Command Prompt - runmqsc TEST1</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPLAY TPSTATUS('Sports/Football/London') TYPE(TOPIC) ALL</td>
</tr>
<tr>
<td>1 : DISPLAY TPSTATUS('Sports/Football/London') TYPE(TOPIC) ALL</td>
</tr>
<tr>
<td>AMQ8754: Display topic status details.</td>
</tr>
<tr>
<td>TOPICSTR(Sports/Football/London) ADMIN(LONDON.Football)</td>
</tr>
<tr>
<td>MDURMDL(SYSTEM.DURABLE.MODEL.QUEUE)</td>
</tr>
<tr>
<td>MNDURMDL(SYSTEM.NDURABLE.MODEL.QUEUE)</td>
</tr>
<tr>
<td>DEFPSIST(NO) DEFPRTY(0)</td>
</tr>
<tr>
<td>DEFPRESP(SYNC) DURSUB(YES)</td>
</tr>
<tr>
<td>PUB(ENABLED) SUB(ENABLED)</td>
</tr>
<tr>
<td>PMSGDLV(ALLDUR) NPMMSGDLV(ALLA VAIL)</td>
</tr>
<tr>
<td>RETAINED(NO) PUBCOUNT(0)</td>
</tr>
<tr>
<td>SUBCOUNT(8) PUBSCOPE(ALL)</td>
</tr>
<tr>
<td>SUBSCOPE(ALL)</td>
</tr>
</tbody>
</table>
DISPLAY TPSTATUS TYPE(PUB/SUB) command

```
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(414D51434E54314D414820202020203FC16B4D20002401)
         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(414D51204E54314D414820202020203FC16B4D2000280A)
  SUBUSER(Hughson) RESMDATE(2011-02-28)
  RESMTIME(16:12:49) LMSGDATE(2011-02-28)
  LMSGTIME(16:12:51)
  ACTCONN(414D51434E54314D414820202020203FC16B4D20002807)
  DURABLE(NO) SUBTYPE(API)
  NUMMSGS(4)
```
Topic Status in the MQ Explorer
APPLICATION STATUS
Status of Applications

- **Application connections**
  - What applications are active?
  - Who is running the applications?
  - Whether there any long running Units of Work (UOWs) outstanding?

- **Application resources**
  - Open queues, topics or subscriptions

- **Subscription definitions**
  - Subscription owner/type
Status of Applications – DISPLAY CONN cmd

Current Time

User Application Connection

User running Application

Application Resource

Application

UOW active for > 4 mins !!
## Status of Applications – Application Connections

![IBM WebSphere MQ Explorer (Installation2)](image)

### Queue Managers

<table>
<thead>
<tr>
<th>Queue manager name</th>
<th>Command level</th>
<th>Version</th>
<th>Queue manager status</th>
<th>Queue-sharing group name</th>
<th>Platform</th>
<th>Dead-letter queue</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAY2</td>
<td>800</td>
<td>8.8.0.0004</td>
<td>Running</td>
<td>Windows</td>
<td>Windows</td>
<td>_SYSTEM_DEAD_LETTER_Q</td>
</tr>
</tbody>
</table>

#### Application Connections

- **App name**: `c:\q\q.exe`  
- **App type**: User  
- **App description**: `WebSphere MQ Queued Pub/Sub Worker`

**Scheme**: Standard for Application Connections - Distributed  
**Last updated**: 11:53:14 (25 items)
Status of Applications – Open Queues
Status of Applications - Subscriptions
IBM MQ EVENT MESSAGES
**Event Messages**

- **Written to specific named queues**
  - Created as **LOCAL queues** in the default set of objects
  - Can be redefined

- **Controlled by ALTER QMGR switch**

- **Message Descriptor**
  - MQMD.Format = **MQFMT_EVENT** (= ‘EVENT ’)

- **Well defined message format**

```plaintext
SYSTEM.ADMIN.<feature name>.EVENT

ALTER QMGR <type>EV(ENABLED)
```

```
PCF Header (MQCFH)
```

```
PCF Sub-structures
```
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
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
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_* (reason qualifier)
IBM MQ Event Messages

- Event Messages for Auditing
  - Security Failures
  - Commands Issued
  - Configuration Changes

- Event Messages for Monitoring
  - Starts and Stops
    - Queue Manager
    - Channels
  - Channel errors
  - Application errors
    - With attempts to access MQ resources
  - Performance of message processing
    - Servicing of queues
    - Depth of queues
EVENT MESSAGES FOR AUDITING
Security Failures
(Queue Manager Events, type Authority Events)

- 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)

Not available on z/OS
## Authority Event Message Details

<table>
<thead>
<tr>
<th>Reason Qualifier</th>
<th>OMGr Name</th>
<th>User Identifier</th>
<th>Appr Type</th>
<th>Appr Name</th>
<th>Options</th>
<th>Dest Open Options</th>
<th>Object OMGr Name</th>
<th>Object Name</th>
<th>Topic String</th>
<th>Admin Topic Names</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQRQ_CONN_NOT_AUTHORIZED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MQRQ_OPEN_NOT_AUTHORIZED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MQRQ_CLOSE_NOT_AUTHORIZED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MQRQ_CMD_NOT_AUTHORIZED</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MQRQ_SUB_NOT_AUTHORIZED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>MQRQ_SUB_DEST_NOT_AUTHORIZED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- An integer field containing the options used

- Examples

<table>
<thead>
<tr>
<th>Options (from MQOPEN)</th>
<th>0x00000012</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQOO_OUTPUT</td>
<td>0x00000010</td>
</tr>
<tr>
<td>MQOO_INPUT_SHARED</td>
<td>0x00000002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options (from MQSUB)</th>
<th>0x0000000A</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQSO_CREATE</td>
<td>0x00000002</td>
</tr>
<tr>
<td>MQSO_DURABLE</td>
<td>0x00000008</td>
</tr>
</tbody>
</table>
Topic Security
(Queue Manager Events, Type Authority Events)

- **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 subscriptions
  - Check is for PUT to the destination queue
COMMAND EVENTS
Commands Issued (Command Events)

- Audit Trail of MQSC/PCF commands issued on your queue manager
- Queue Manager Attribute CMDEV
  - Note: ALTER QMGR CMDEV(NODISPLAY)
- Command Failed => No event

- PCF Header fields
  - Command
    - MQCMD_COMMAND_EVENT
  - Possible Reasons
    - MQRC_COMMAND_MQSC
    - MQRC_COMMAND_PCF
# Command Event Message Details

<table>
<thead>
<tr>
<th>Event Origin</th>
<th>Event User ID</th>
<th>Event QMgr</th>
<th>Event Accounting</th>
<th>Event Identity Data</th>
<th>Event Appl Type</th>
<th>Event Appl Name</th>
<th>Event Appl Origin</th>
<th>Command</th>
<th>Command Data *</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQEVO_CONSOLE</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MQEVO_INIT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MQEVO_MSG</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MQEVO_INTERNAL</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MQEVO_OTHER</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* Either PCF message as it was submitted, or text of MQSC command
CONFIGURATION EVENTS
Configuration Changes (Configuration Events)

- 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
  - Event for every object in the QMGR
  - Note: Heavy weight if you have lots of objects

- 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

```
ALTER QMGR CONFIGEV(ENABLED)
REFRESH QMGR TYPE(CONFIGEV) OBJECT(ALL) NAME(*)
```
Configuration 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
  - Note: Heavy weight if you have lots of objects
Combining Command and Config. Events

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

ALTER QMGR CMDEV(NODISPLAY) CONFIGEV(ENABLED)

Correl ID = 1234
SYSTEM.ADMIN.COMMAND.EVENT

Correl ID = 1234
SYSTEM.ADMIN.CONFIG.EVENT
EVENT MESSAGES FOR MONITORING
Qmgr Events

- Notification of queue manager start and stop

- Queue Manager Attribute STRSTPEV
  - DEFPSIST of event queue

- 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_MGRQUIESCING

```
SYSTEM.ADMIN.QMGR.EVENT

ALTER QMGR STRSTPEV(ENABLED)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Qmgr Name</th>
<th>Reason Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQRC_Q_MGR_ACTIVE</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>MQRC_Q_MGR_NOTACTIVE</td>
<td></td>
<td>X X</td>
</tr>
</tbody>
</table>
```
Channel Events

- Notification of channel starts, stops and errors, including SSL errors
- Queue Manager Attributes CHLEV and SSLEV
- 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

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

SYSTEM.ADMIN.CHANNEL.EVENT

ALTER QMGR CHLEV(EXCEPTION) SSLEV(ENABLED)
Channel Auto-definition Events

- Notification of attempts to automatically define channels

- Queue Manager Attributes
  - CHAD
  - CHADEXIT
  - CHADEV

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

```
ALTER QMGR CHAD(ENABLED)
  CHADEXIT(exit-name)
  CHADEV(ENABLED)
```
## Channel Event Message Details

<table>
<thead>
<tr>
<th>Reason</th>
<th>QMgr Name</th>
<th>Channel Name</th>
<th>XmitQ Name</th>
<th>Connection Name</th>
<th>Error Identifier</th>
<th>Aux Error Data</th>
<th>Conversion Reason Code</th>
<th>Format</th>
<th>Channel Type</th>
<th>SSL Handshake Stage</th>
<th>SSL Return Code</th>
<th>SSL Peer Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQRC_CHANNEL_ACTIVATED</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>MQRC_CHANNEL_STARTED</td>
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<tr>
<td>MQRC_CHANNEL_STOPPED</td>
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<tr>
<td>MQRC_CHANNEL_STOPPED_BY_USER</td>
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<tr>
<td>MQRC_CHANNEL_CONV_ERROR</td>
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<tr>
<td>MQRC_CHANNEL_SSL_ERROR</td>
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</tr>
<tr>
<td>MQRC_CHANNEL_AUTO_DEF_OK</td>
<td>X</td>
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<tr>
<td>MQRC_CHANNEL_AUTO_DEF_ERROR</td>
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<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Decoding Error Information

- **Error Identifier**
  - Example
    - 0x20009208

- **Use mqrc tool**
  - Can enter number in hex or decimal

### Receive Failed

```
\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.
```
Application errors using resources (QMgr events)

- 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

- Reflects an MQRC also given back to the application
- Handy when application forgets to check!
Queue Service Interval (Performance Events)

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

- 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 Depth (Performance 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)
```
The Highs and Lows of Performance Events

| ALTER QMGR | PERFMEV(ENABLED) |
| ALTER QLOCAL(q-name) | MAXDEPTH(1000) | QDEPTHHI(80) | QDEPTHLO(20) | QDPHIEV(ENABLED) |
Viewing Event Messages

- No general in-built event formatter provided with IBM MQ, but:
  - C sample program `amqsevt` was made available in MQ V8 fixpack 4
  - Formats event messages into English-ish format

- Management or monitoring tool

- Several SupportPacs available
  - MO01 – Event and DLQ Monitor
  - MS12 – Print Event Msgs (z/OS batch job)
  - MS0P – WMQ Explorer plug-in
  - MH05 – Events Display Tool

- Other vendor products
Viewing Events – MQ Explorer (with ms0p)
Redefining Event Queues

- Can be redefined as QREMOTE queues

- Can be redefined as QALIAS -> TOPIC

```
EVENTS
DESTCLASS (PROVIDED)
DEST (ADMIN.EVENT)
TOPICSTR ('Events/+')
PSPROP (NONE)
```
Accounting and Statistics – Platform differences

- Statistics: Data about resource usage and activity within the QMGR
- Accounting: Information about what tasks have been doing

- z/OS
  - Written as SMF records
  - Type 115 and 116

- Distributed
  - Written as PCF format messages
  - On specific queues

SMF

SYSTEM.ADMIN.*.QUEUE
Statistics Records (z/OS)

- **SMF 115 Subtype 1**
  - System information, for example, related to the logs and storage
  - Class 1

- **SMF 115 Subtype 2**
  - Information about number of messages, buffer and paging information
  - Queue-sharing group information related to the coupling facility and DB2
  - Class 2

- **SMF 115 Subtype 3**
  - More detailed information about storage usage in the MSTR address space
  - Class 2 and 3
Statistics Records (z/OS) ..

- SMF 115 Subtype 215
  - Bufferpool information when the queue manager is running in OPMODE=(NEWFUNC,800) mode.
  - Class 1

- SMF 115 Subtype 231
  - System information for the CHIN address space.
  - Class 4
  - NEW in IBM MQ V8

New in MQ V8
Channel Initiator Statistics

- High level view of activity in CHINIT
  - Number of channels and TCB usage
  - Dispatchers, Adapters, NameServer, SSL
    - Do I have spare capacity?
    - Do I need more or less dispatchers/adapters?
  - See MP1B supportpack
### Channel Initiator Statistics

**Adapter Task Statistics Report**

<table>
<thead>
<tr>
<th>Task, Type, Requests, Busy %</th>
<th>CPU used, CPU %, &quot;avg CPU&quot;, &quot;avg ET&quot; Seconds, uSeconds, uSeconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, ADAP, 127599, 16.5</td>
<td>0.953615, 0.8, 7, 158</td>
</tr>
<tr>
<td>1, ADAP, 48799, 7.6</td>
<td>0.309678, 0.3, 7, 199</td>
</tr>
<tr>
<td>2, ADAP, 13702, 3.2</td>
<td>0.065380, 0.1, 5, 284</td>
</tr>
<tr>
<td>3, ADAP, 2909, 0.7</td>
<td>0.029541, 0.0, 10, 279</td>
</tr>
<tr>
<td>4, ADAP, 395, 0.1</td>
<td>0.003179, 0.0, 8, 392</td>
</tr>
<tr>
<td>5, ADAP, 37, 0.0</td>
<td>0.000241, 0.0, 7, 149</td>
</tr>
<tr>
<td>6, ADAP, 10, 0.0</td>
<td>0.000175, 0.0, 17, 111</td>
</tr>
<tr>
<td>7, ADAP, 0, 0.0</td>
<td>0.000000, 0.0, 0, 0</td>
</tr>
<tr>
<td>Summ, ADAP, 191442, 3.5</td>
<td>1.361809, 0.1, 7, 179</td>
</tr>
</tbody>
</table>

MQI requests are processed by first free adapter so adapters lower in the list process less requests.

Difference could indicate wait for I/O due to commit or disk read.
Accounting Records (z/OS)

- SMF 116 subtype 0
  - Message manager records
  - Class 1

- SMF 116 subtype 1 & 2
  - Data for each task, at thread and queue level.
  - Class 3

- SMF 116 subtype 10
  - Data for channels
  - Class 4

New in MQ V8
Channel Initiator Accounting

- Detailed view of individual channels
  - What work have channels been doing?
  - Which channels are being heavily utilised?
  - SMF 116, SubType 10

- Controlled by STATCHL attribute on QMgr and predefined channel definitions!
- Controlled by STATACLS attribute for auto-defined cluster sender channel definitions!
## Channel Initiator Accounting Data

<table>
<thead>
<tr>
<th>Address</th>
<th>Name</th>
<th>Display Name</th>
<th>Message Type</th>
<th>Status</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Connection name</td>
<td></td>
<td></td>
<td>127.0.0.1</td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Remote qmgr/app</td>
<td>MQ89</td>
<td></td>
<td>SENDER</td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Channel disp</td>
<td>PRIVATE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Channel type</td>
<td>SENDER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Channel status</td>
<td>HIGH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Channel started</td>
<td>2014/04/08, 19:41:48</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>date &amp; time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Channel stopped</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>status collect</td>
<td>2014/04/08, 19:43:57</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Last msg time</td>
<td>2014/04/08, 19:43:52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Active for</td>
<td>122 seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Batch size</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Messages/batch</td>
<td>38.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Number of messages</td>
<td>2,998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Number of persistent messages</td>
<td>1,506</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Number of batches</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Number of full batches</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Number of partial batches</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Buffers sent</td>
<td>3,319</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Buffers received</td>
<td>109</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127.0.0.1</td>
<td>MQ89_1</td>
<td>Xmitq empty count</td>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Statistics Messages (Distributed)

- Collects information about IBM MQ resources
  - Overall, Per Queue, Per Channel

- Queue Manager Attributes
  - STATINT – Statistics Interval
  - STATMQI – Overall MQI Statistics
  - STATQ – Queue Statistics
  - STATCHL – Channel Statistics
  - STATACLS – Auto-defined Cluster Sender Channel Statistics

- Queue Attribute
  - STATQ – Queue Statistics

- Channel Attribute
  - STATCHL – Channel Statistics

- PCF Header fields
  - MQCMD_STATISTICS_MQI – overall information
  - MQCMD_STATISTICS_Q – per queue
  - MQCMD_STATISTICS_CHANNEL – per channel
Accounting Messages (Distributed)

- Collects information about applications which connect to the Queue Manager
  - Overall
  - Per Queue

- Queue Manager Attribute
  - ACCTINT – Accounting Interval
  - ACCTMQI – Overall MQI Accounting
  - ACCTQ – Queue Accounting

- Queue Attribute
  - ACCTQ – Queue Accounting

- PCF Header fields
  - MQCMD_ACCOUNTING_MQI – overall information
  - MQCMD_ACCOUNTING_Q – per Queue

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

ALTER QLOCAL(q-name)
  ACCTQ(QMGR)
```
What can I discover?

- **Open details**
  - First open time, last close time for a queue
  - MQCMD_ACCOUNTING_Q message on Distributed

- **MQGET details**
  - Count, total bytes, msg-size (min / max), time-on-queue (min / avg / max) (persistent / non-persistent) for a queue
  - MQCMD_ACCOUNTING_Q message on Distributed

- **API counts**
  - For each of the MQ API's (MQPUT / MQGET/ ...) across the queue manager
  - MQCMD_STATISTICS_MQI on Distributed

- **Number of messages transferred (persistent / non-persistent) on a channel**
  - MQCMD_STATISTICS_CHANNEL on Distributed

- **Batch Info (total / number full / avg size) on a channel**
  - MQCMD_STATISTICS_CHANNEL on Distributed
MONITORING THE MQ APPLIANCE
Monitoring the MQ Appliance using the IBM Console

- You use the Chart widget in the IBM MQ Console to view monitoring data for the IBM MQ Appliance.
Monitoring the MQ Appliance using the IBM Console

- Hover over data point to see detailed information

![Graph showing MQPUT/MQPUT1 count over time and Queue Manager counts for ABC and QM1 on Apr 16, 2015, 10:25:12 AM.](Image)
SYSTEM TOPICS (MQ V9)
IBM MQ V9 (and the M2000 Appliance) has created its own branch of the topic tree
  • “$SYS/MQ”
This is used for publishing and subscribing to data from the queue manager

A new default object sits at the root of this branch, SYSTEM.ADMIN.TOPIC
It sits below SYSTEM.BASE.TOPIC but consider it a complete new tree
  • No attributes are inherited from above
  • No authorities are inherited from above
  • The topic nodes are not matched by wildcards above it
    – E.g. Subscribing to ‘#’ will not match anything starting “$SYS/MQ”

Out of the box, access to the branch is restricted to administrators only
  • Access can be granted to other users through the definition of admin topics and access control at key points below $SYS/MQ
New system topic publications

MQ V9 publishes two types to data under the system topic branch
- Application activity trace
- Resource monitoring

Each queue manager *listens* for subscriptions to recognised topic strings and *only publishes when subscriptions exist*.
Subscribe to MQ and system monitoring information

- Subscribe for a regular feed of performance monitoring information
- Familiar queue manager wide and queue level statistics
- Plus new CPU, memory and disk usage
  - For example, disk reads/writes, disk latency
- Enables integration into multiple monitoring solutions

This capability already underpins the charting in the MQ Appliance WebUI

Simplifies integration into off the shelf tooling

Sample tool demonstrates the capabilities and coding
Subscribe to Application Activity Trace

- See exactly what applications are doing with a live stream of data on their API calls
- Useful for tracking application usage and diagnosing application errors
- Subscribe to an application’s name, a channel being used or a specific connection
- Sample tool for dynamic monitoring and formatting of trace

`$ amqsact -m QMGR1 -a amqsput` -w 60

Subscribing to the activity trace topic: `$SYS/MQ/INFO/QMGR/QMGR1/ActivityTrace/AppName/amqsput`

MonitoringType: MQI Activity Trace

```
QueueManager: 'QMGR1'
ApplicationName: 'amqsput'
Application Type: MQAT_UNIX
```

<table>
<thead>
<tr>
<th>Tid</th>
<th>Date</th>
<th>Time</th>
<th>Operation</th>
<th>CompCode</th>
<th>MQRC</th>
<th>HObj</th>
<th>ObjName</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_CONNX</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_OPEN</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>2</td>
<td>QUEUE1</td>
</tr>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_PUT</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>2</td>
<td>QUEUE1</td>
</tr>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_PUT</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>2</td>
<td>QUEUE1</td>
</tr>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_CLOSE</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>2</td>
<td>QUEUE1</td>
</tr>
<tr>
<td>001</td>
<td>2016-04-14</td>
<td>09:56:53</td>
<td>MQXF_DISC</td>
<td>MQCC_OK</td>
<td>0000</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
```

- Sample tool for dynamic monitoring and formatting of trace

Sample AMQSPUT0 start
target queue is Q1
Hello
World
Sample AMQSPUT0 end
Summary - Different types of Monitoring

On-line Status Commands or MQ Explorer

Event Messages

Off-line Accounting and Statistics

MQ Console (to monitor the MQ Appliance)
Any Questions?