WebSphere MQ Serviceability: Solving Problems Effectively

Barry Robbins (robbinsb@us.ibm.com)
Justin Fries (justinf@us.ibm.com)
WebSphere MQ Level 2 Support
December 3, 2013
Agenda

- WebSphere MQ Diagnostics
- WebSphere MQ MustGathers
- Automatic Data Collection with runmqras
- Analyzing WebSphere MQ Data
- Working with IBM Support
- Summary and Questions
WebSphere MQ Diagnostics
WebSphere MQ Diagnostics

- Always active and available

- Error Logs
  - Two sets of logs containing three files
  - AMQERR01.LOG, AMQERR02.LOG, AMQERR03.LOG
  - Contain informational, warning, and error messages

- First Failure Support Technology (FFST) Files
  - Provide extended information for unexpected errors
Error Reporting

- Queue managers use shared resources to communicate within itself and its applications

- When a process is connected to a queue manager, its messages are routed to that queue manager's error logs
  - /var/mqm/qmgrs/IBMAIX1/errors
  - Drive:\mqmtop\qmgrs\IBMWindows1\errors

- All other messages go to the top level errors directory
  - /var/mqm/errors
  - Drive:\mqmtop\errors
Error Message Components

- Messages always include an identifier and basic text
  - Interactive messages frequently print only this information

- Message written to the logs will also contain additional data
  - The local date and time, pid.tid, user, program
  - An explanation of the message
  - Suggested action to handle the message
  - The MQ source file and line which generated it

- The message may contain two numeric and three string inserts
First Failure Support Technology

- When an unexpected error occurs, an FFST is written to:
  - `/var/mqm/errors`
  - `Drive:\mqmtop\errors`

- MQ names the files `AMQxxxxx.y.FDC`
  - `xxxxx` is the process identifier (pid)
  - `y` is a number incremented when the file can't be opened
  - Process 33927: `AMQ33927.0.FDC`
    - As needed: `AMQ33927.1.FDC`, `AMQ33927.2.FDC`...

- All threads in a process will append their FFSTs to the same file
FFST Layout

- The Header
- The Function Stack
- The Trace History
- The Component Dumps
- The Environment
WebSphere MQ MustGathers
WebSphere MQ MustGathers

- MustGathers describe the data you must gather for IBM to diagnose a particular kind of problem
- MustGathers may also provide additional tools required to gather data for certain problem types
- For WebSphere MQ, MustGathers are organized by platform, then by symptom or product area
# WebSphere MQ MustGather Index

<table>
<thead>
<tr>
<th>Linux, UNIX &amp; Windows</th>
<th>IBM i</th>
<th>z/OS</th>
<th>z/VSE</th>
<th>HP NonStop</th>
<th>HP OpenVMS</th>
</tr>
</thead>
</table>

## Linux and UNIX

Collect WebSphere MQ data as soon as you see a problem happening so that you can analyze the issue and involve IBM support if necessary. Start by selecting the category which best matches the problem on your AIX, HP-UX, Linux or Solaris system:

- C, C++, COBOL and .NET Clients
- Channels
- Clustering
- Data Conversion
- Databases
- Dead Letter Queue Messages
- Error Messages and FDC Files
- File Transfer Edition (WMQFTE)
- Hang or High CPU
- Installation

- Java™ and JMS
- Logging and Recovery
- Managed File Transfer (WMQMFT)
- Performance
- Publish/Subscribe
- Remote Administration with the WebSphere MQ Explorer
- SSL
- Security
- Triggering channels
- Triggering programs

If your problem type is not listed, follow these instructions:

- Other, General, or Unknown Problems
MustGather Instructions

- MustGathers describe how to generate diagnostic information when a problem is happening
  - This step requires manual activity
  - For example, capturing a trace showing a problem with a WebSphere MQ cluster

- Every MustGather also describes the information to collect for a particular symptom or product area
  - Automatic and manual instructions are given
MustGather Layout

Resolving the problem

Step 1: Generate Data

If the problem has already happened and you cannot reproduce it reliably, proceed to Step 2 to collect the information already logged by WebSphere MQ. Otherwise, please try to generate the following diagnostic data while the problem is happening:

1. WebSphere MQ trace on the queue manager with the cluster problem.
2. WebSphere MQ trace on the full repository queue managers for the cluster, taken at the same time as the first trace.

Try to start and stop trace as quickly as possible in order to limit both the overhead of tracing and the size of the trace files. On systems other than IBM i and Windows, format the trace files after stopping the trace.

Step 2: Collect Data

Collect the following data for your cluster problem. Use the runmqras tool if your WebSphere MQ installation is V7.0.1.8 or later, V7.1.0.1 or later, or V7.5, otherwise follow the manual instructions:

1. WebSphere MQ data from the queue manager with the cluster problem.
2. WebSphere MQ data from the full repository queue managers for the cluster.

- Collect WebSphere MQ data automatically with runmqras
- Collect WebSphere MQ data manually

Click above to expand the data collection steps
Manual Data Collection Instructions

1. If your system has multiple WebSphere MQ installations, issue the `setmqenv` command to choose the right installation. On Linux and UNIX, source `setmqenv` using a dot. For example:

   Linux & UNIX
   sh> . /path/to/mqm/bin/setmqenv -m Installation0

   Windows
   C:> C:\Program Files (x86)\IBM\WebSphere MQ\bin\setmqenv -m

2. Record the operating system version and maintenance level on both systems.

3. Record the WebSphere MQ version and maintenance level on both systems.

4. Collect the WebSphere MQ error logs as well as any WebSphere MQ FFST files. On IBM i, follow these instructions to save the necessary files and job logs.

5. Use `runmqsc` to record your queue manager, queues, and namelist information:

   ```
   DISPLAY QMGR ALL
   DISPLAY QLOCAL(*) ALL
   DISPLAY QREMOTE(*) ALL
   DISPLAY NAMELIST(*) ALL
   ```

6. Use `runmqsc` to record your cluster queue managers, cluster queues, and cluster topics:

   ```
   DISPLAY CLUSQMGR(*) ALL
   DISPLAY QCLUSTER(*) ALL
   DISPLAY TCLUSTER(*) ALL
   ```

7. Use `runmqsc` to record your channels, listeners, and their status:

   ```
   DISPLAY CHANNEL(*) ALL
   DISPLAY CHSTUSR(*) ALL
   DISPLAY LISTENER(*) ALL
   DISPLAY LSSTATUS(*) ALL
   ```

8. Dump the queue manager cluster repository cache using the `amqrdm` utility. Be sure to provide your queue manager name and to use the correct input file (attached to the end of this TechNote) for the platform. For example, to dump queue managers QMA, QMB and QMC on different platforms:

   IBM i Q shell
   ===>
   /QSYS.LIB/QMNN.LIB/AMQRFDM.PGM -m QMA < cluster-iBm.txt > QMA.cluster.txt

   Linux & UNIX
   sh> amqrdm -m QMB < cluster-unix.txt > QMB.cluster.txt

   Windows
   C:> amqrdm -m QMC < cluster-win.txt > %TEMP%\QMC.cluster.txt
Automatic Data Collection with runmqras
What is runmqras?

- A WebSphere MQ tool to automate collecting of diagnostic data
- Already included with WebSphere MQ V7 installations
  - AIX, HP-UX, IBM i, Linux, Solaris and Windows
  - MQ clients: SupportPacs MAC7, MAC71, MAC75, MAT1
- To use runmqras for MustGather purposes, MQ should be:
  - V7.0.1.8 or later
  - V7.1.0.1 or later
  - V7.5 (any level)
- The runmqras tool in V7.1.0.0 and older V7.0.1 levels is incomplete
Where is runmqras?

- A launcher script in the WebSphere MQ `bin` directory:
  - Linux, UNIX, IBM i and HP Integrity NonStop client: `runmqras`
  - Windows: `runmqras.cmd`

- A Java program in the WebSphere MQ `java/lib` directory:
  - `com.ibm.mq.tools.ras.jar` (requires Java 5 or later)

- An XML configuration file which tells the Java program what to do:
  - Linux, UNIX, IBM i and NonStop: `isa.xml` in the `bin` directory
  - Windows: `isa.xml` in the top-level installation directory, except V7.0.1 where it is located in the `Config` subdirectory
What data does runmqras collect?

- That depends on the *isa.xml* file you use

- The *isa.xml* contains two XML stanza types
  - A `<files>` stanza describes files to collect from the system
  - A `<commands>` stanza lists commands to run and save output

- Each stanza contains an attribute indicating the target platform:
  
  AIX  HP-UX  Linux  OS/400  SunOS  Windows  NONSTOP_KERNEL

- These stanzas *may* be labeled with a `section` attribute as well
  - Stanzas with no section name are collected by default
  - Stanzas with a name are optional, for example:
    
    cluster  dap  defs  kernel  logger  topic  trace  QMGR
Sample isa.xml contents

```xml
<files platform="AIX">
    <file path="MQD::/errors" detail="*"/>
    <file path="MQD::" detail="mq.ini"/>
    <file path="QMD::" qm="*" detail="qm.ini"/>
    <file path="QMD::" qm="*" detail="qmstatus.ini"/>
    <file path="QMD::" qm="*" detail="amqalchk.fil"/>
    <file path="QMD::/errors" qm="*" detail="*"/>
    <file path="QML::" qm="*" detail="amqhlctl.lfh"/>
    <file path="/etc/opt/mqm" detail="mqinst.ini"/>
    <file path="MQ::" detail="mqpatch.dat"/>
    <file path="MQ::" detail="mqpatch.log"/>
    <file path="MQD::/mqxr/config" detail="*"/>
</files>

<commands platform="AIX" section="cluster">
    <command name="MQ::/bin/amqrfdm" args="-m QM:: -d" qm="*" output="amqrfdm_SQM::"/>
    <command name="MQ::/samp/bin/amqsbcg" args="SYSTEM.CLUSTER.REPOSITORY.QUEUE QM::" qm="*" output="amqsbcg_SQM:::SCRQ"/>
    <command name="MQ::/samp/bin/amqsbcg" args="SYSTEM.CLUSTER.COMMAND.QUEUE QM::" qm="*" output="amqsbcg_SQM:::SCCQ"/>
    <command name="MQ::/samp/bin/amqsbcg" args="SYSTEM.CLUSTER.TRANSMIT.QUEUE QM::" qm="*" output="amqsbcg_SQM:::SCTQ"/>
    <command name="MQ::/samp/bin/amqsbcg" args="SYSTEM.CLUSTER.HISTORY.QUEUE QM::" qm="*" output="amqsbcg_SQM:::SCHQ"/>
</commands>
```
Substitution strings in isa.xml

- **MQ::**
  - WebSphere MQ installation path
- **MQD::**
  - WebSphere MQ data path
- **MQI::**
  - WebSphere MQ installation name
- **QM::**
  - Queue manager name (e.g. PROD/QMGR)
- **SQM::**
  - Safe queue manager name (e.g. PROD&QMGR)
- **QML::**
  - Queue manager log path
- **QMD::**
  - Queue manager data path
What sections are there?

- **all**
  - Gathers all sections known to runmqras

- **default**
  - Gathers error logs, FFSTs, basic information and status
  - Always collected unless you specify the `nодефолт` section

- **cluster**
  - WebSphere MQ cluster configuration and queues

- **defs**
  - WebSphere MQ object definitions and status information

- **trace**
  - Does not generate any traces, just collects any it finds
What sections were added in fix packs?

- dap – Added in 7.0.1.9, 7.1.0.1, 7.5.0.1
  - WebSphere MQ transaction and persistence information
- kernel
  - WebSphere MQ queue manager internals information
- logger
  - WebSphere MQ recovery logging information
- topic
  - WebSphere MQ publish/subscribe topic tree information

- QMGR – Added in 7.0.1.11, 7.1.0.3, 7.5.0.2
  - Gathers all the files that make up the queue manager
How do I invoke runmqras?

- If you have multiple installations, first set your environment
  
  . /opt/mqm/bin/setmqenv -n Installation2

- When entering the runmqras command...
  
  ▶ Choose your sections with the option: -section
  
  ▶ Choose your queue managers with the option: -qmlist
  
  ▶ Enter your IBM PMR number with the option: -pmrno

- For example:

  runmqras -qmlist QMA -section defs,trace -pmrno 12345,67R,890

  runmqras -section all -pmrno 12345,67R,890
What other options are there?

- Use an alternate working location if there is a lot of data to collect
  - Normally the runmqras output goes in /tmp (or %TMP%)
  - Enter an alternate location using the option: -workdirectory

- You can upload data to your IBM PMR automatically with: -ftp IBM
  - This upload uses standard FTP and requires a PMR number

- For example:
  
  runmqras -qmlist QMB,QMC -section defs,cluster,logger,trace
  -workdirectory /var/bigdata -pmrno 12345,67R,890 -ftp IBM
Analyzing WebSphere MQ Data
Reviewing WebSphere MQ Diagnostics

- Error logs
  - Initial point of review for MQ problems

- FFST files (FDCs)
  - Header
  - Environment
Common Use of Error Logs

- Channel problems
- Security failures
- Clustering issues
- Log file management
- Process availability
- Queue manager object issues
Sample Error Log Message

10/8/2013 17:20:25 - Process(9932.1) User(mqm) Program(amqzlaa0.exe)
   Host(IBMAIX1MQ) Installation(Installation1)
   VRMF(7.5.0.1) QMgr(QMGR1)

AMQ7472: Object SYSTEM.CHANNEL.INITQ, type queue damaged.

EXPLANATION:
Object SYSTEM.CHANNEL.INITQ, type queue has been marked as damaged. This indicates that the queue manager was either unable to access the object in the file system, or that some kind of inconsistency with the data in the object was detected.

ACTION:
If a damaged object is detected, the action performed depends on whether the queue manager supports media recovery and when the damage was detected. If the queue manager does not support media recovery, you must delete the object as no recovery is possible. If the queue manager does support media recovery and the damage is detected during the processing performed when the queue manager is being started, the queue manager will automatically initiate media recovery of the object. If the queue manager supports media recovery and the damage is detected once the queue manager has started, it may be recovered from a media image using the rcrmqobj command or it may be deleted.

----- amqaocua.c : 547-----------------------------------------
WebSphere MQ First Failure Symptom Report

| Date/Time         :- Thu September 05 2013 15:18:29 EDT |
| UTC Time          :- 1378408709.489223               |
| UTC Time Offset   :- -240 (EST)                    |
| Host Name         :- aix1                          |
| Operating System  :- AIX 7.1                       |
| PIDS              :- 5724H7221                       |
| LVLS              :- 7.5.0.2                        |
| Product Long Name :- WebSphere MQ for AIX         |
| Vendor            :- IBM                            |
| Installation Path :- /usr/mqm                      |
| Installation Name :- Installation1 (1)             |
| Probe Id          :- XY129037                        |
| Application Name  :- MQM                            |
| Component         :- xstConnectExtent               |
| SCCS Info         :- /build/slot1/p750_P/src/lib/cs/unix/amqxstex.c, |
| Line Number       :- 1545                           |
| Build Date        :- Jun 28 2013                     |
| Build Level       :- p750-002-130627                |
| Build Type        :- IKAP - (Production)            |
| Effective UserID  :- 7001 (testusr)                 |
| Real UserID       :- 7001 (testusr)                 |
| Program Name      :- java                           |
| Addressing mode   :- 32-bit                         |
| LANG              :- en_US                          |
| Process           :- 527583                         |
| Thread            :- 1                              |
| QueueManager      :- QA75                           |
| UserApp           :- TRUE                           |
| ConnId(1) IPCC    :- 153                            |
| ConnId(4) App     :- 0                              |
| Last HQC          :- 1.0.0-167084782                 |
| Last HSHMEMB      :- 0.0.0-0                         |
| Major Errorcode   :- xecX_E_SEGMENT_TABLE_FULL      |
| Minor Errorcode   :- OK                             |
| Probe Type        :- MSGAMQ6207                      |
| Probe Severity    :- 2                              |
| Probe Description :- AMQ6207: Failed to attach shared memory segment as Segment table is Full. |
| FDCSequenceNumber :- 0                              |
| Arith1            :- 20 (0x14)                       |
| Arith2            :- 24 (0x18)                       |
| Comment1          :- Failed to attach shared memory segment: shmat(ShmId 0x000000014) [rc=-1 errno=24] The process file table is full. |
| Comment2          :- The process file table is full. |
Sample FFSTs

- Probe id
  - XY129037
- Component
  - XstConnectExtent
- Major ErrorCode
  - xecX_E_SEGMENT_TABLE_FULL
- Program Name
  - java
- Comment1
  - Failed to attach shared memory segment: shmat(ShmId 0x0000002a) [rc=-1 errno=24] Too many open files
Sample FFSTs

- Probe id
  - XY051025
- Component
  - InitPrivateServices
- Major ErrorCode
  - xecF_E_UNEXPECTED_RC
- Program Name
  - MyPutProgram
- Comment1
  - Duplicate AMQXCS2.dll found
Using ffstsummary

- Extracts key FFST elements and generates a timeline
  - Only works with English timestamps
  - Normalizes all FFST timestamps to GMT
  - Must be run from the directory with the FFSTs

- Output contains the following in time event order
  - File name
  - Program name
  - Probe ID
  - Major and minor error codes
  - Date and Time
  - Process and Thread
  - Component
## Sample ffstsummary Output

<table>
<thead>
<tr>
<th>FFSTKey</th>
<th>FFSTSubKey</th>
<th>TimeStamp</th>
<th>FFSTDescriminator</th>
<th>FFSTServiceId</th>
<th>FFSTMessageId</th>
<th>FFSTInstanceName</th>
<th>FFSTInstanceSeq</th>
<th>FFSTRtnVal</th>
<th>FFSTErrorDescriminator</th>
<th>FFSTErrorId</th>
<th>FFSTErrorMsg</th>
<th>FFSTErrorInstanceName</th>
<th>FFSTErrorInstanceSeq</th>
<th>FFSTErrorRtnVal</th>
<th>FFSTErrorDescriminator</th>
<th>FFSTErrorId</th>
<th>FFSTErrorMsg</th>
<th>FFSTErrorInstanceName</th>
<th>FFSTErrorInstanceSeq</th>
<th>FFSTErrorRtnVal</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMQ7455.0.FDC</td>
<td>2013/10/22 22:00:29.955620-5</td>
<td>amqzxma0</td>
<td>7455</td>
<td>ZX155001</td>
<td>zxcFileLockMonitorThread</td>
<td>9</td>
<td>lrcE_S_Q_MGR_UNRESPONSIVE</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ19399.0.FDC</td>
<td>2013/10/22 22:00:46.795405-5</td>
<td>amqrrmf0</td>
<td>19399</td>
<td>RM181007</td>
<td>rrmGetMsg</td>
<td>1</td>
<td>rrcI_QM_TERMINATING</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ18532.0.FDC</td>
<td>2013/10/22 22:00:49.651503-5</td>
<td>amqzmuf0</td>
<td>18532</td>
<td>PS000035</td>
<td>psiReceivePublications</td>
<td>11</td>
<td>MQRC_CONNECTION_BROKEN</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ18532.0.FDC</td>
<td>2013/10/22 22:00:51.555129-5</td>
<td>amqzmuf0</td>
<td>18532</td>
<td>PS017089</td>
<td>psiProcessProxySubs</td>
<td>9</td>
<td>MQRC_CONNECTION_BROKEN</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ7455.0.FDC</td>
<td>2013/10/22 22:00:53.516586-5</td>
<td>amqzxma0</td>
<td>7455</td>
<td>ZX005025</td>
<td>zxcProcessChildren</td>
<td>1</td>
<td>zrcX_PROCESS_MISSING</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ7455.0.FDC</td>
<td>2013/10/22 22:01:13.183895-5</td>
<td>amqzxma0</td>
<td>7455</td>
<td>ZX015255</td>
<td>zxcStopAgents</td>
<td>1</td>
<td>OK</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMQ7455.0.FDC</td>
<td>2013/10/22 22:01:13.229545-5</td>
<td>amqzxma0</td>
<td>7455</td>
<td>XC332255</td>
<td>xlsWaitEvent</td>
<td>3</td>
<td>OK</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Working with IBM Support
Best Practices

- Use Service Request to report problems
- Use runmqras to gather initial PMR documentation
- Continue using runmqras for additional PMR documentation
- Provide details on the supplied documentation
- Share details concerning the affected environment
- Consider communications method based on business impact
Summary

- WebSphere MQ Diagnostics
- WebSphere MQ MustGathers
- Automatic Data Collection with runmqras
- Analyzing WebSphere MQ Data
- Working with IBM Support
- Summary and Questions
Additional WebSphere MQ Resources

- WebSphere MQ MustGather Index
  http://www.ibm.com/support/docview.wss?uid=swg21229861

- WebSphere MQ Support Portal
  http://www.ibm.com/support/entry/portal/product/websphere/websphere_mq

- Using the runmqras tool

- IBM Service Request
  https://www.ibm.com/support/servicerequest

- Open Mic Replay: Reading WebSphere MQ Traces

- WebSphere MQ Diagnostics on Distributed Systems
Additional WebSphere Product Resources

- Learn about upcoming WebSphere Support Technical Exchange webcasts, and access previously recorded presentations at:

- Discover the latest trends in WebSphere Technology and implementation, participate in technically-focused briefings, webcasts and podcasts at:

- Join the Global WebSphere Community:
  [http://www.websphereusergroup.org](http://www.websphereusergroup.org)

- Access key product show-me demos and tutorials by visiting IBM® Education Assistant:

- View a webcast replay with step-by-step instructions for using the Service Request (SR) tool for submitting problems electronically:
  [http://www.ibm.com/software/webSphere/support/d2w.html](http://www.ibm.com/software/webSphere/support/d2w.html)

- Sign up to receive weekly technical My Notifications emails:
Connect with us!

1. Get notified on upcoming webcasts
   Send an e-mail to wsehelp@us.ibm.com with subject line “wste subscribe” to get a list of mailing lists and to subscribe

2. Tell us what you want to learn
   Send us suggestions for future topics or improvements about our webcasts to wsehelp@us.ibm.com

3. Be connected!
   Connect with us on Facebook
   Connect with us on Twitter