WebSphere MQ for z/OS - Performance

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Agenda

- Performance problems in WebSphere MQ (WMQ) for z/OS:

  ▶ When did the problem start?

  ▶ What are some common problems?

    - System resource shortages

    - Configuration

    - Applications

    - Channels

    - APARs

  ▶ What resources are available?

    - Tools

    - Defect support vs. services

    - References

    - Upcoming Workshop

When did the problem start?

- Is there a new configuration or application?
- Did the problem begin after applying maintenance or making configuration or application changes?
- Is the problem associated with a higher workload or a specific time of day?
- Does this seem like a capacity/tuning issue or a product defect?
- What does "normal" look like in your environment?

When did the problem start? - Notes

- Is there a new or changed configuration or application?

  - ▶ Was there a new queue manager cluster implemented?

  - ▶ A new queue sharing group?

  - ▶ Just added a new application to the mix?

  - ▶ Started using MQ clients?

- Is there a pattern to the performance problem?

  - ▶ Always happens at market open time?

  - ▶ First Tuesday of the month?

- Does this seem like a capacity/tuning issue or a product defect?

  - ▶ Sometimes a capacity issue is a defect, sometimes it is just trying to cram too many things into one resource pool!

Common Problems - System Resource shortages

- System CPU, storage, I/O

  - Dispatching priority

    - Work Load Manager (WLM)
    - Planning your storage and performance requirements

  - Virtual Storage configuration, storage leaks

    - WMQ private storage use is discussed in Tech Note 1233245
    - Storage LEAKS are often due to a product defect

Common Problems - System Resource shortages - Notes

- Virtual Storage configuration, storage leaks notes
  - Higher storage USAGE may be due to configuration, application buffer sizes or pending private storage contraction.

Common Problems - System Resource shortages

- System CPU, storage, I/O (cont'd)

  ▸ DASD contention for logs/page sets or hardware issues

    • Page sets and adjacent logs should not be on the same volume

    • Hardware problems can cause slow I/O, affecting MQ, CICS, IMS, etc.

Common Problems - System Resource shortages - Notes

- I/O

  - ▸ Often I/O rates are only reported as averages. Look for the 'outliers', the one or two I/O requests that take an exceptionally long time during the interval observed.

Common Problems - System Resource shortages

- **Program Loading**

    ▸ Use Library LookAside (LLA) to minimize program loading

    ▸ See SupportPac MP16 for further details

- **GRS (global resource serialization) contention**

    ▸ Use MVS commands to display:
    /D GRS,ENQ,LATCH,CONTENTION
    /D GRS,ANALYZE,BLOCKER

Common Problems - Configuration

- **BUFFPOOL shortages**
    - ▶ Tune the buffer pools
        - See the topic Defining your buffer pools in the Information Center
        - Technote 1233798: BUFFPOOL settings are recovered from checkpoint records, which override CSQINP1 definitions
    - ▶ Look for CSQP020E - Buffer pool is too small in the MSTR joblog
    - ▶ Review buffer statistics in SMF 115 data

Common Problems – Configuration - Notes

- BUFFPOOL shortages

    ▸ Queue managers that were created with the defaults from WMQ V5.3 (or before) often have bufferpools that are far too small

    ▸ CSQP020E can be a symptom associated with APARs listed later in the presentation:
    V600: PM33115
    V701: PM32355

Common Problems - Configuration

- Page sets
    - ▸ Have a strategy for queue placement
    - ▸ Do not place any queues on PSID(0) and do not place application queues on PSID(1)
    - ▸ Place short-lived messages and long-lived messages on different page sets
    - ▸ Place SYSTEM.CLUSTER.TRANSMIT.QUEUE on a separate page set

Common Problems – Configuration

- Page sets

  ▶ Consider system queues that may grow large, e.g. the Dead Letter Queue (DLQ) or event queues

  ▶ Be aware V7.0.1 stores each message on a separate page (see the discussion on MAXSHORTMSGS in SupportPac MP1G)

Common Problems – Configuration

- Queue indexing

  - Set INDXTYPE for the queue accordingly if the application matches by MSGID, CORRELID, or GROUPID

    If this is not set or is set incorrectly, performance becomes progressively worse with higher queue depths. The queue must be searched sequentially for the matching message.

Common Problems – Configuration - Notes

- Queue indexing

  - Queue indexing can be checked in the SMF 116 class 3 data.

  - The critical depth is quite low. Performance improvements have been seen with a depth as low as 5 messages.

  - INDXTYPE should be MSGID for queues accessed by Message Driven Beans (MDBs)

Common Problems - Configuration

- Active/archive logs

  ‣ Ideally, make active logs large enough so that it takes at least 30 minutes to fill a single log

  ‣ Consider mount time or HSM recovery for archives on tape or DASD

  ‣ Resolve any archiving problems so that the active logs do not all become full

  ‣ Flash 1496081: Responding to messages CSQI045I / CSQI046E / CSQI047E issued by WebSphere MQ for z/OS as the log RBA grows

Common Problems – Configuration - Notes

- Active/archive logs

  ‣ Maximum log file size is 180,000 records or 4G

  ‣ Log shunting has negated the need for keeping a large number of archives for UOW recovery, but shunting can fail.

  ‣ For media recovery, keep log records as far back as the lowest RBA shown by the DISPLAY USAGE command

  ‣ Flash: CSQI045I, CSQI046E and CSQI047E are issued periodically once the log RBA exceeds 700000000000. Allowing the log RBA to reach the maximum value of FFFFFFFFFFFF will require the queue-manager to be cold-started. This means that messages will be lost.

Common Problems - Configuration

- **SECURITY INTERVAL/TIMEOUT**
  - ▶ TIMEOUT (default 54 minutes) is how long security information about an unused user ID and associated resources is retained by WMQ.

  - ▶ INTERVAL (default 12 minutes) is the time between checks to determine whether the TIMEOUT has expired.

  - ▶ The control blocks are in SP229 KEY7 storage. In WMQ 7.0.1, they are in 64-bit storage (above the bar)

Common Problems – Configuration - Notes

- REFRESH SECURITY command may be used to reset the cache
- If you notice repeated slowdowns at the security interval, the TIMEOUT and INTERVAL settings should be reviewed
- Some users have set up the security checking and time out to occur much less frequently

Common Problems - Configuration

- **LOGLOAD**
  - ▶ The default of 500,000 works well
  - ▶ Making it too small will increase the number of checkpoints
  - ▶ Making it too large will use more SP229 KEY7 private storage
- **CHIADAPS and CHIDISPS (channel initiator adapters and dispatchers)**
  - ▶ See SupportPac MP16 for advice regarding these parameters

Common Problems – Configuration - Notes

- **Checkpoints are also taken at log switches**
  - ▶ The log switch checkpoints are not included in the SMF115 checkpoint counts

Common Problems - Applications

- Reduce overhead caused by unnecessary MQCONN/MQDISC or MQOPEN/MQCLOSE
- Avoid MQPUT1 commands in a loop
- Avoid Temporary Dynamic Queues
- Use an appropriate WaitInterval with MQGET to avoid an application or triggering loop

Common Problems – Applications - Notes

- Poorly behaved clients can eat a lot of CPU in the CHIN
- Avoid MQPUT1 commands in a loop

  ‣ MQPUT1 is more efficient if used for ONE or TWO reply messages to the same queue.

  ‣ Beyond that it is more efficient to use an MQPUT loop

- Avoid Temporary Dynamic Queues

  ‣ The open and close of a tempdyn queue is CPU costly

  ‣ The SMF116 class 3 records show when they are being used and clearly demonstrate the cost difference over a permanent queue

- Apply IZ86170 (Fix Pack 7.0.1.5) to fix a problem with the WaitInterval being incorrectly set to zero for a Java^{TM}/JMS client

Common Problems - Applications

- Consider which messages need to be persistent--persistent messages require logging.
- Keep the Unit Of Work (UOW) small
  - ▶ 50 messages is the highest recommendation
  - ▶ Lower for larger messages
- To see queue depth and whether there are uncommitted puts or gets, issue:
  /cpf DIS QSTATUS(qname) CURDEPTH UNCOM
- Remember MQPMO_SYNCPOINT and MQGMO_SYNCPOINT are the default on z/OS

Common Problems – Applications - Notes

- Message size and number of messages per UOW impact bufferpool usage
- Do load testing well ahead of project deadlines to allow time in case problems are found

Common Problems - Channels

- Issue DISPLAY CHSTATUS commands on both ends of the channel and check STATUS, SUBSTATE and INDOUBT

  ▶ INDOUBT means the channel is waiting for batch confirmation

  ▶ SUBSTATE of NAMESERVER indicates a DNS set-up or availability problem

  ▶ A service parameter (reference PK88882) can cut down on the number of reverse DNS look-ups. This will affect whether channel names appear in error messages

Common Problems - Channels

- Consider settings for BATCHSZ, BATCHINT, and NPMSPEED (reference MP16)
- Review a packet or other network trace to see if delayed ACKs, TCP retransmissions or window sizing are causing delays.
- Be sure you have on TCP/IP APAR PM16788 to address throughput degradation due to TCP/IP buffer sizing with z/OS 1.11 and 1.12

Common Problems - APARs

- Techdoc 7006625 - WebSphere MQ Support and Service summary for z/OS, OS/390 and MVS/ESA lists APARs, highlighting HIPERs and PEs, e.g.:

  - ▶ PM32355/UK65884 if UK53795 or UK62227 is on V7.0.1
    PM33115/UK65885 if UK53282 or UK62226 is on V6.0.0
    for a problem with delays in MQPUT/MQGET

  - ▶ PM44820/UK71098 for clustering

- IZ86170 (Fix Pack 7.0.1.5) for the MQGET WaitInterval being zeroed out for a Java/JMS client

Resources - Tools

- SMF
    - SMF115 (Statistics) & SMF116 (Accounting), including CLASS(3) for thread-level and queue-level data

    - SMFSTATS and SMFACCT in CSQ6SYSP will activate class 1

    - /cpf START TRACE(STAT) DEST(SMF) CLASS(01)

    - /cpf START TRACE(ACCTG) DEST(SMF) CLASS(01:03)

Resources - Tools

- RMF
- Monitors, such as Tivoli Omegamon
- WMQ DISPLAY commands

  ▶ See the Script (MQSC) Command Reference

- Dumps and traces

  ▶ See technote 1291192 "Collect troubleshooting data for a performance problem in WebSphere MQ for z/OS"

Resources - Tools

- **Performance Harness for Java Message Service** on Developerworks
- SupportPacs
  - ▸ **IP13**: WebSphere Business Integration Broker - Sniff test and Performance on z/OS

  - ▸ **IH03**: WebSphere Message Broker V7- Message display, test & performance utilities
    - RFHUTIL

Resources - Defect support vs. services

- See the Software Support Handbook

  - ▶ Performance Analysis is one of the situations that usually requires some form of Advanced Support Offering

  - ▶ Engage services through your Marketing Rep (Find out who this is through the General Inquiries contact at www.ibm.com/planetwide)

- Open a Service Request (SR) to Level2 defect support if analysis reveals a suspected defect in WMQ, or if assistance is needed in analyzing a specific situation in a trace or dump.

Resources – References

- The WebSphere MQ Information Center, for example the topic "Dealing with performance problems"
- The WebSphere MQ Support Portal
- SupportPacs such as

  ▶ MP16 - Capacity planning & tuning

  ▶ MP1B - Interpreting accounting and statistics data

  ▶ MP1G - V7.0.1 Performance Report or equivalent for other releases

Resources – References

- **SMF 115 and 116 record reading and interpretation** – a SHARE presentation by Lyn Elkins
- Webcast replay: Great Expectations - Working with the WebSphere MQ z/OS L2 Support Team

Upcoming Workshop!

- ATS-hosted WildFire Workshop, WMQPD, WMQ for z/OS problem determination and performance, to start delivery in late February 2012.

  Your IBM® representative can request the session to come to an IBM TEC or IBM office near you.

  These workshops are FREE, and include both lecture and labs.

Summary

- We have reviewed

  - ▶ common causes of performance problems

  - ▶ resources to use in diagnosing performance problems

- While some common problems may be identified quickly, others may take considerable time

Additional WebSphere Product Resources

- Learn about upcoming WebSphere Support Technical Exchange webcasts, and access previously recorded presentations at:
  http://www.ibm.com/software/websphere/support/supp_tech.html

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  http://www.ibm.com/developerworks/websphere/community/

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  http://www.ibm.com/software/info/education/assistant

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  http://www.ibm.com/software/websphere/support/d2w.html

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