



MQPERF1

Introduction to MQ SMF- Overview, Data Capture and Initial Post Processing



Your first MQ SMF experience





Agenda

- Background
- Setting up for capture
- MQ SMF – Processing the data
 - We have to use what is free
- The statistics data
- The accounting data
- Additional information



Background & Objectives

- MQ does not report into the z/OS Health checker
 - So how do I know if my queue manager is healthy?
 - You have to use a combination of sources
 - The MQ JES log for storage use, the number of log switches, etc.
 - The MQ SMF data and general RMF data to see how the resources are really being used
 - From active MQ for z admins, 'I spend 50% of my time or more proving that MQ on z is NOT the problem.'
- SMF data doesn't lie
 - Though it can be misinterpreted and under captured!



Mea Culpa

- Because of the continued use of MQSMFCSV I have discovered some errors in the collection, production, and in my understanding and interpretation of some of the MQ SMF data.
- You will see some new rules and explanations where I have found these issues.
- I once again owe a great deal of thanks to Gwydion Tudur and Mark Taylor for investigating these issues and responding after their investigation of the actual code.



Types of MQ SMF and Collection Classes

- The MQ SMF data is broken down into two major categories (and SMF data types)
 - Statistics – Type 115
 - Accounting – Type 116
- The generation is controlled by type and class
 - Do not confuse the classes with the subtype
 - Statistics classes
 - * - collect all classes (01,02) of statistics except channel initiator
 - 04 – channel initiator statistics class
 - Accounting Classes
 - * - collect all classes of accounting data except channel accounting
 - 01 – only collect the QMAC data, only used for chargebacks
 - 03 – Collect the Task with queue use accounting
 - 04 – channel accounting records



MQ Statistics – The basic health of the QMGR

- The SMF 115 data is the statistical information produced by a IBM MQ for z/OS queue manager.
 - Primarily used to track major trends and resolve performance problems with the queue manager
 - Very lightweight
 - At least two records per queue manager per SMF interval (V8+)



Statistics Data – Source and Subtype

Source	Subtype
Storage Manager	1
Log Manager	1
Message Manager	2
Data Manager	2
Lock Manager	2
Db2 Manager	2
Coupling Facility Manager	2
Topic Manager	2
SMDS Usage	2
Buffer Manager	215
Channel Initiator	231
Data Manager – Page Set	201

MQ Accounting – The Task and Queue details

- The SMF 116 data is the accounting information produced by a IBM MQ for z/OS queue manager.
 - Primarily used to determine what is going on within IBM MQ workload
 - Heavyweight
 - Very much so!
 - Individual tasks get multiple large records produced
 - Each task gets records produced at the end of the task
 - Long running tasks (like channels, batch jobs, long CICS reader transactions) will get multiple sets of task records at each SMF interval
 - Channel accounting records are accumulated and produced at SMF intervals (not when the channel stops)



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MQ Accounting – The home of the devil

- The SMF 116 data is the task related data produced by an IBM MQ for z/OS queue manager.
 - Very detailed
 - Often necessary to track down performance problems
 - Costs vary by:
 - Application Style
 - SMF production type (MAN datasets or Logstreams)
 - Recently seen some examples of there being little to no overhead for collection and production of the data
 - Standard estimates are between 3-7% overhead



Accounting Data – Source and Subtype

Source/type of data	Subtype	Comments
Message Manager	0	The 'QMAC' records at times used for chargebacks, largely ignored these days
Thread identification record	1	Task ID
Thread accounting	1	Task accounting info – things not associated with an individual queue
Queue Accounting	1	Queue use for this task
Thread identification record	2	Task ID - overflow
Queue Accounting	2	Queue use overflow
Channel Accounting	10	Individual channel accounting records

Capture

**CAPTURE
THE | SMF**





Setting up for Capture

- CSQ4ZPRM

- SMFSTAT=NO – Default, (ARRGGGHHH!) should be changed to SMFSTAT=(*)
 - Gathering and producing the statistics is not expensive
 - Most are always gathered, just written when the interval expires

- **NEW Knowledge**

- **Using the asterisk does not include the class 4 data.**
- **AND if you have SMFSTAT=NO, you must turn on all the classes first and then turn on the class 4 data collection independently.**

- SMFACCT=NO – Default, normally controlled via commands
- STATIME – the interval, in minutes, between the creation of the SMF statistical and long running task accounting records
 - 30 – default, every 30 minutes
 - 0 – Use the system wide SMF interval, usually preferred
 - Any other integer up to 1440
 - Once a day



Setting up for Capture - continued

- **START TRACE Command**

- **START TRACE(S) CLASS(*)**

- Starts the statistics production for the queue manager
- Note that if you have never produced this data, the first record should be ignored. It will have data from when the queue manager started.

- **START TRACE(S) CLASS(4)**

- Starts the channel initiator statistics

- **START TRACE(A) CLASS(*)**

- Starts the task accounting capture and production
- Note that tasks that cross interval boundaries will cut a set of accounting records per interval reflecting the activity for that interval

- **START TRACE(A) CLASS(4)**

- Starts the channel accounting trace

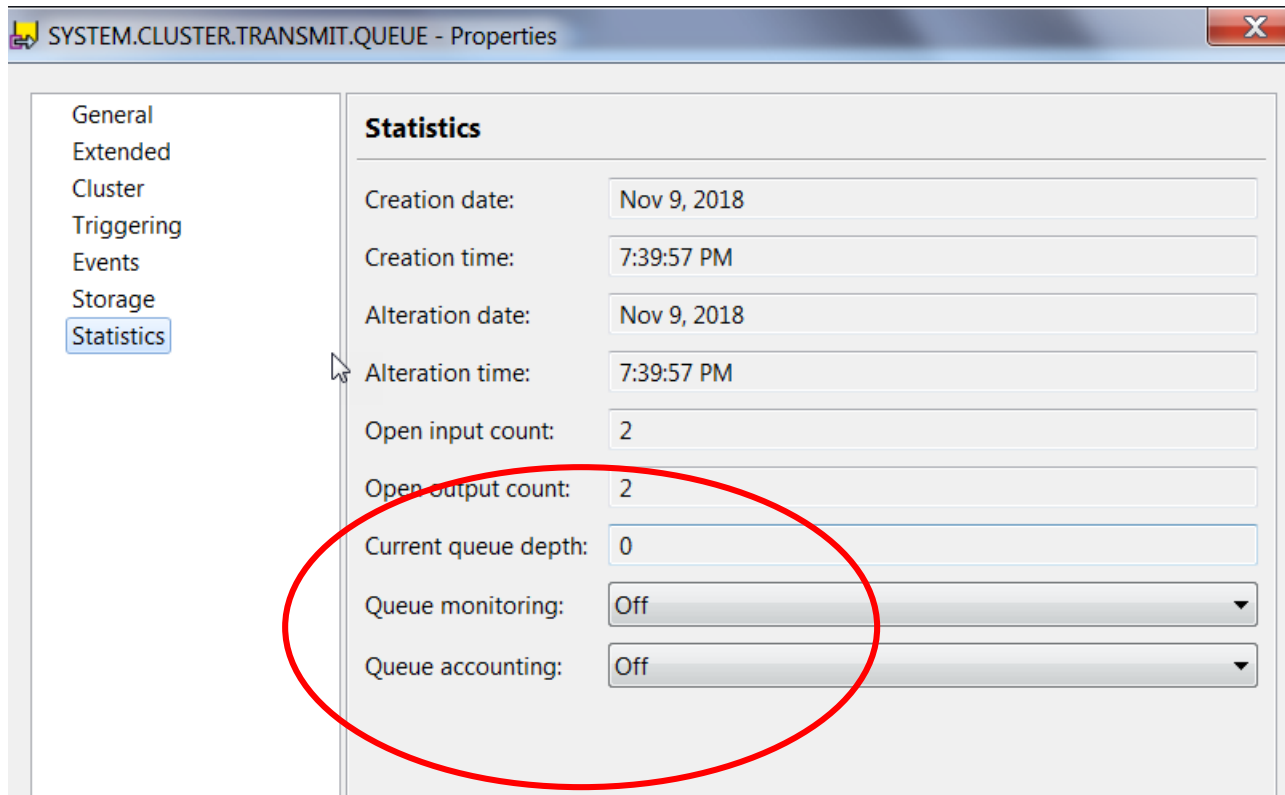


Setting up for Capture - concluded

- SET SYSTEM STATIME (interval)
 - The interval is in minutes
 - Change takes effect at the end of the current interval
 - So if you've been silly and set it to a full day (1440), it will be a day before this takes effect
 - Often used to shorten the interval when trying to isolate a performance problem.

Check your queue definitions!

- This makes me a bit crazy:



SYSTEM.CLUSTER.TRANSMIT.QUEUE - Properties

General
Extended
Cluster
Triggering
Events
Storage
Statistics

Statistics

Creation date:	Nov 9, 2018
Creation time:	7:39:57 PM
Alteration date:	Nov 9, 2018
Alteration time:	7:39:57 PM
Open input count:	2
Open output count:	2
Current queue depth:	0
Queue monitoring:	Off
Queue accounting:	Off



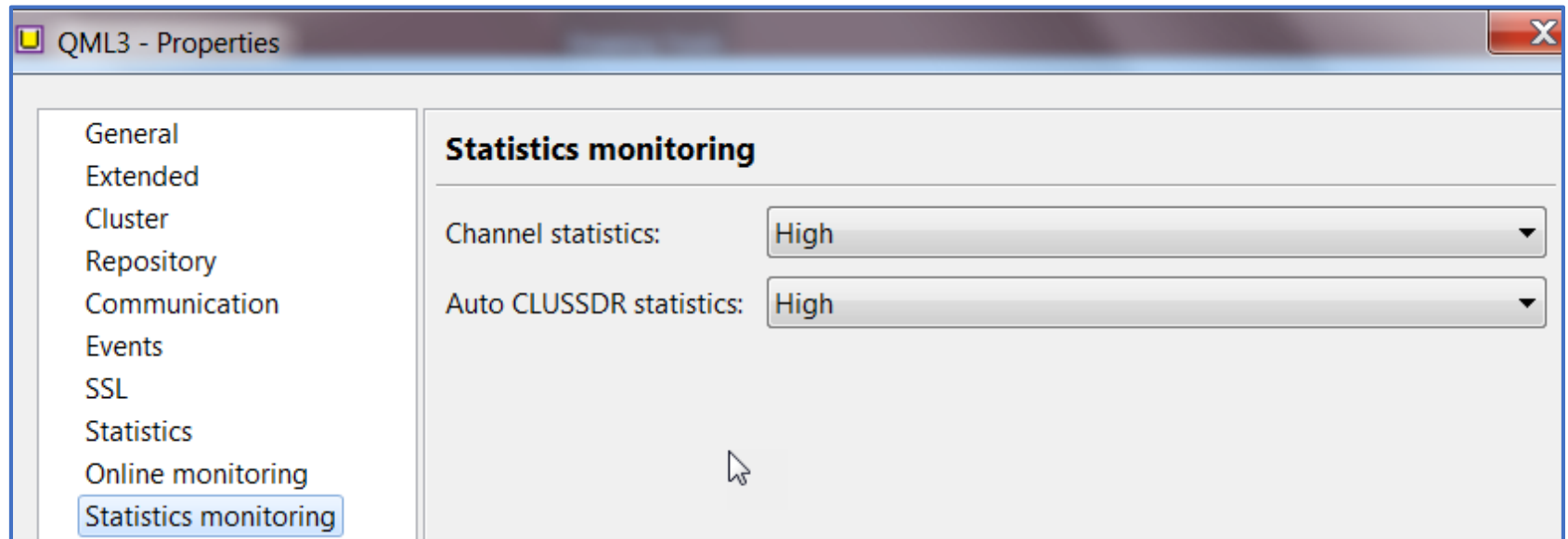
Check you QMGR definitions!

```
BROWSE      MQ910.SCSQPROC(CSQ4INYG)
```

```
Command ==>
```

```
*      MONQ( OFF ) +  
*      MONCHL( OFF ) +  
*      MONACLS( QMGR ) +  
*      STATCHL( OFF ) +  
*      STATACLS( QMGR ) +  
*      ROUTER( OFF ) +
```

These QMGR values should look like this





Post-processing the data – MQ Extraction

- SMF data can be on z/OS Logstreams or written to the 'MAN' datasets
- The MQ Data can be extracted using the IFASMFDL program (datasets) or IFASMFDL (log streams)
- The options are similar for both extraction program, but the important one is the TYPE option:
TYPE(115,116)
 - That will pull the MQ statistics and accounting data of all subtypes
- At some point we plan to test real streaming the SMF data into MQSMFCSV, but we are not there yet!

Sample SMF Extract

```
//SMFDUMP8 EXEC PGM=IFASMFDP
//DUMPINA DD DISP=SHR,DSN=MPXCAT.SMF.MPX1.MANY
//DUMPOUT DD DSN=ELKINSC.TESTPUT1.MQSMF01,
//          DISP=(NEW,CATLG,DELETE),
//          VOL=SER=Q70006,
//          RECFM=VB,BLKSIZE=27998,
//          SPACE=(CYL,(10,10),RLSE),UNIT=SYSDA
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
    INDD(DUMPINA,OPTIONS(DUMP))
    OUTDD(DUMPOUT,TYPE(115,116))
/*
```



Additional Information

- Info on the Dataset dump program:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.ieag200/dump.htm
- The dataset dump formatter options:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.ieag200/dumpopt.htm
- Info on the Logstream dump program:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.ieag200/dmplog.htm
- The Logstream dump formatter parameters:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.ieag200/dumplopt.htm



So I've gotten the data, what do I do with it?

- Well that depends...

MQ SMF – Processing the data

- CSQ4SMFD
 - Provided with MQ
 - Dump format of the data

CSR

```
***** TOP OF DATA *****
message manager statistics data
--Q-M-S-T---H-E-X---P-R-I-N-T----
Address  = 2072AC08
00000000 : D40F0048 D8D4E2E3 000024FE 00002402 <M...QMST.....>
00000010 : 0000EB1A 0000B480 00000000 00000C48 <.....>
00000020 : 00000000 00000000 00000000 00000000 <.....>
00000030 : 00000000 00000000 000000B4 00000438 <.....>
00000040 : 00000000 00000000 <.....>
--Q-M-S-T---F-O-R-M-A-T-T-E-D----
qmstid   = d40f
qmstll   = 0072
qmsteyec = QMST
qmstopen = 00009470
qmstclos = 00009218
qmstget  = 00060186
qmstout  = 00046208
```



MP1B – the standard post processor

- Provided as an IBM MQ SupportPac
- The MQSMF post processor may be used to format the MQ SMF data, and can assist with both monitoring the health of the z/OS queue managers and with problem determination.
- The reports and CSV files can help with these tasks:
 - Determine what applications are using a particular queue manager and it's objects
 - Listing the queues that are actually in use
 - Locating the storage used by particular queues
 - Which system resources may be under strain
 - Which MQ verbs are being used by individual tasks
 - I/O responsiveness issues
 - etc

MQ SMF – Processing the data

- MP1B – MQ SMF report formatter
 - Message Manager, MSGM output file, report sample:

Message Manager

MPX2,QML2,2017/01/12,08:50:54,VRM:800,

From 2017/01/12,08:21:04.455699 to 2017/01/12,08:50:54.787219, duration 1790 seconds.

MQOPENS	9470,	MQCLOSEs	9218,	MQGETs	60186,	QMLUTs	46208
---------	-------	----------	-------	--------	--------	--------	-------

QMLUT1s	0,	MQINQs	3144,	MQSETs	0,	C ALL H	0
---------	----	--------	-------	--------	----	---------	---

MQSUBs	0,	MQSUBRQs	0,	MQCBs	180
--------	----	----------	----	-------	-----

MQCTLs	1080,	MQSTATs	0,	Publish	0
--------	-------	---------	----	---------	---

MQGet rate 33.000000/sec QMLut rate 25.000000/sec

MPX1,QML1,2017/01/12,08:53:53,VRM:800,

From 2017/01/12,08:24:00.111232 to 2017/01/12,08:53:53.553654, duration 1793 seconds.

MQOPENS	27170,	MQCLOSEs	24670,	MQGETs	325273,	QMLUTs	291386
---------	--------	----------	--------	--------	---------	--------	--------

QMLUT1s	0,	MQINQs	1043,	MQSETs	0,	C ALL H	0
---------	----	--------	-------	--------	----	---------	---

MQSUBs	0,	MQSUBRQs	0,	MQCBs	2958
--------	----	----------	----	-------	------

MQCTLs	8933,	MQSTATs	0,	Publish	0
--------	-------	---------	----	---------	---

MQGet rate 181.000000/sec QMLut rate 162.000000/sec

MQ SMF – Processing the data

- MP1B – MQ SMF report formatter
 - Message Manager CSV, MSGMCSV output file, sample:

MVS,QM,Date,Time,Puts,Putls,Gets,Open,Close,Inquire,Set,"Close all H",Sub,SubR,"Reg CB",Control,Stat,Publish,
MPX1,QML2,2017/01/12,08:50:54,46208,0,60186,9470,9218,3144,0,0,0,
0,180,1080,0,0,
MPX1,QML1,2017/01/12,08:53:53,291386,0,325273,27170,24670,1043,0,0,0,
0,2958,8933,0,0,
MPX1,QML3,2017/01/12,08:54:25,40824,0,44904,1735,1700,232,0,0,0,
0,57,440,0,0,
MPX1,QML4,2017/01/12,08:55:10,44112,0,48907,2008,1910,337,0,0,0,
0,57,427,0,0,



MQ SMF – Processing the data

- **MP1B is a great place to start with examining the data**
 - If you have not looked at the data previously, it gives guidance on where you should look for potential problems
 - In the WSC we use this to give us a “first look”

MQ SMF – Processing the data

- MP1B produces messages to warn of potential problems

```
MQQPST02S MPX1,QML1,2017/01/10,23:31:36,VRM:800, BP 1 Filled many(386) times. This is typical of long lived messages. Buffer pool  
may be too small  
MQQPST04E MPX1,QML1,2017/01/10,23:31:36,VRM:800, BP 1 Many (626104) pages read from disk. This is typical of long lived messages. B  
uffer pool may be too small  
MQQJST00I MPX1,QML1,2017/01/11,00:01:37,VRM:800, Log read log buffers from storage 14 > 0  
MQQJST01W MPX1,QML1,2017/01/11,00:01:37,VRM:800, Log read log buffers from active logs 458 > 0  
MQQJST03E MPX1,QML1,2017/01/11,00:01:37,VRM:800, Log Number of checkpoints 24 > 10  
MQQJST11W MPX1,QML1,2017/01/11,00:01:37,VRM:800, logging rate is low 14 < 50 MB/Sec  
MQQIST01W MPX1,QML1,2017/01/11,00:01:37,VRM:800, QIST read ahead message count 285 > 0  
MQQIST02W MPX1,QML1,2017/01/11,00:01:37,VRM:800, QIST Message read from disk 122 > 0  
MQQPST00W MPX1,QML1,2017/01/11,00:01:37,VRM:800, BP 1 Many(1802) buffers written immediately. Buffer pool may be too small  
MQQPST02S MPX1,QML1,2017/01/11,00:01:37,VRM:800, BP 1 Filled many(339) times. This is typical of long lived messages. Buffer pool  
may be too small  
MQQPST04E MPX1,QML1,2017/01/11,00:01:37,VRM:800, BP 1 Many (391542) pages read from disk. This is typical of long lived messages. B  
uffer pool may be too small  
MQQJST01W MPX1,QML1,2017/01/10,20:32:38,VRM:800, Log read log buffers from active logs 93 > 0
```



Additional formatting tools - Github project

<http://github.com/ibm-messaging/mq-smf-csv>

We will talk more about this tomorrow!



Commercial Interpreters

- There are several available on the market.



Finally – Making things more manageable

- The SMF dump utilities are not very granular
 - And when faced with millions of records, that can be daunting
- Use DFSORT to extract data for
 - Specific queue managers
 - Specific batch jobs
 - Specific transactions

Sorting for CICS TRANID

```
//*  
//*  SORT BY THE CICS TRANID  
//*  
//SYSIN DD *  
  OPTION VLSHRT  
  SORT FIELDS=(109,4,BI,A)  
  INCLUDE COND=(109,4,CH,EQ,C'ABCD')  
/*
```



Summary

- The SMF data can be used in many ways to find patterns of use, problems with the queue managers, and application programming problems.
- There are many other things within the data that are helpful, and more to come with V9 and the formatting programs.