MP1B: WebSphere MQ for z/OS V7

Interpreting accounting and statistics data WebSphere MQ for z/OS

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Take Note!
Before using this User's Guide and the product it supports, be sure to read the general information under "Notices".

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This edition applies to Version 7.0.1 of "WebSphere MQ for z/OS" - Interpreting accounting and statistics data" and to all subsequent releases and modifications until otherwise indicated in new editions.

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This report is intended to give guidance on the use and interpretation of the statistics and accounting in WebSphere MQ for zOS Version 7.0. The information in this report is not intended as the specification of any programming interfaces that are provided by z/OS or WebSpere MQ.

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Summary of Amendments

This document is based on the MP1B document for MQ V6.

Date	Changes
December 2009	Support for WMQ version 7.0 Restructure document Remove MQCDUMP as it is shipped as part of the base product

Introduction

WebSphere MQ accounting and statistics

WebSphere MQ for z/OS provides statistics information about processing within the queue manager, and provides accounting information about individual application and channel usage. Both statistics and accounting information are written to the Z/OS SMF facility. For information about SMF see the *z/OS System Management Facilities (SMF)* manual.

WebSphere MQ statistics	These are produced periodically, typically every half an hour, or every hour. Information is provided by the different resource managers (components) within the queue manager, and allows you to identify potential problems in the setup and usage of your queue manager. For example the buffer pool statistics can tell you that you need to increase the size of a buffer pool. You should keep the data for several months and look for trends to see if changing usage patterns will cause problems. For information about processing and interpreting WebSphere MQ statistics see Understanding and using WebSphere MQ statistics data on page 17.
WebSphere MQ accounting	WebSphere MQ produces accounting information about the activities and resources used by applications and channels. These can be used to analyze application activity and to charge users for their WebSphere MQ usage. For information about processing and interpreting WebSphere MQ accounting information see Understanding and using WebSphere MQ accounting data on page 8.

Summary of changes in Version 7.0

There are additional fields in the class 3 accounting records which shows which Coupling Facility requests are issued, and whether they were synchronous or asynchronous.

Topic data is available in the class 3 accounting data.

Control block layouts have been updated. QIST, QJST

Control block QTST has been added

References to Performance reports have been removed.

Cross references in the control block layout have been removed.

There have been formatting changes.

Contents of this report

This document is complimentary to the *WebSphere MQ for z/OS System Setup Guide* and provides examples and additional information on how to use and interpret WebSphere MQ accounting and statistics information. Some of the information in the System Setup guide is repeated in this document so as to have all the relevant information in one place.

If you find this SupportPac useful, have suggestions on improving it, or spot any errors please contact the author, PAICE@UK.IBM.COM.

Required fixes

There are no fixes required to use this SupportPac

Additional materials with this SupportPac

Included in the SupportPac are programs (including one written in C) and JCL which can be used to display the data. Sample SMF data is also included to allow these programs to be run without having to first collect real data.

These additional files are contained in *mp1b.zip* and are named as follows:

mp1b.loa	Load library
mp1b.src	Source library
mp1b.smf	Sample SMF data (New data)

The files need to be transferred to the destination TSO system as sequential binary files with a record format of FB 80. Use one of the following methods to accomplish this:

1. Use the SEND commands below to send the files to TSO as sequential binary files:
   - send mp1b.loa A:mp1b.loadseq
   - send mp1b.src A:mp1b.srcseq
   - send mp1b.smf A:mp1b.smfseq

where A is the TSO session ID.

2. To send them via ftp ensure the BINARY option is set then use the following commands:
   - site fixrecfm 80 `(Optional)`
   - put mp1b.loa mp1b.loadseq
   - put mp1b.src mp1b.srcseq
   - put mp1b.smf mp1b.smfseq

3. With Personal Communications, use the "Send Files to Host" option under the Transfer menu item to transmit to TSO
   - `PC File` mp1b.loa `etc`
   - `Host File` mp1b.loadseq `etc`
     `Transfer Type` pds
   - The Transfer type of pds may need to be correctly setup. To do this, use the "Setup.Define Transfer Types" option under the Transfer menu item and create the pds type with the ASCII, CRLF and Append checkboxes all unselected, the Fixed radio button selected and the LRECL set to 80.
   - You will also need to ensure that that the space allocation is sufficient to avoid problems such as SB37 abends. The largest dataset is the MP1B.SMF dataset that is 3 CYL in size.
   -

On TSO, issue the following commands to unload these sequential files into TSO partitioned datasets:

receive indsname(mp1b.loadseq)
when prompted for a filename, reply dsn(mp1b.v701.mqload)

receive indsname(mp1b.srcseq)
when prompted for a filename, reply dsn(mp1b.v701.mqsource)

receive indsname(mp1b.smfseq)
when prompted for a filename, reply dsn(mp1b.v701.mqsmf)

Contents of MQSOURCE

From MQSOURCE you will get a PDS with the following attributes: record format FB, record length 80, block size 800. This dataset has some C structures and the following members:

CCOMPILE	Sample JCL to compile sample C program
COPYSMF	This extracts the data from SMF into a temporary file and invokes MQ116S to process the statistics.
MQCSMF	This prints out WebSphere MQ statistics and accounting, see Supplied programs to print out the SMF records on page 38.
MQCSMFC	C header file containing layouts to SMF 115 (statistics) and 116 (accounting) records.
RUNCSMF	This runs the C MQCSMF program which prints out the accounting and statistics information.

Contents of MQLOAD

From MQLOAD you will get a load library with the following attributes: record format undefined, record length 0, and block size 6144. This dataset has the following members:

MQ1150	This prints out WebSphere MQ statistics, see Supplied programs to print out the SMF recordson page 45.
MQ116S	This prints out the new task and queue accounting records, see Supplied programs to print out the SMF records on page 45.
MQ1160	This prints out the accounting information which was also available in earlier releases, see Supplied programs to print out the SMF records on page 45.
MQCSMF	The load module

MQCDUMP is now provided as part of the base product. See SCSQPROC(CSQSMFJ), SCSQLOAD(CSQ4SMFD) and SCSQC37S(CSQ4SMFD)

Contents of MQSMF

This dataset has some SMF data collected after a batch job put some messages to a batch server which sent the replies back to the originator. This file is provided so you can run the programs with this SupportPac without having to collect any data yourself.

From MQSMF you will get sequential file with the following attributes: record format VBS, record length 32767, block size 27998.

Understanding and using WebSphere MQ accounting data

Accounting information

WebSphere MQ produces accounting information about the activities and resources used by applications and channels.

There are two classes of accounting data

- Class 1 which provides a count of MQGET and MQPUT verbs by message size, and CPU used
- Class 3 which provides detail information about which queue was used, which MQ verbs were used, the count, cost and elapsed time of MQ verbs, and other detailed statistics.

Who uses the data?

People with different roles might want different views of the data:

- Application architects might be interested in data about applications and queues.
- Systems programmers might be interested in the resources used, and response time of DASD.

People need different views of the data at different times, and so you might keep all data for only 24 hours, but keep only a summary of the data for long term analysis.

- You might want detailed information about the last 24 hours to be able to identify any out of line conditions, and display the data from individual accounting records to explain any unusual events.
- For the long term you might want to have the data summarized by week, so you can do trend analysis on the number of transactions, the amount of data processed, and the delay caused by writing to the log for example.

What can you do with the data?

The examples below show some ways in which the accounting information can be used.

- Charge users' departments for their WebSphere MQ usage, by CPU and by bytes processed. This can be done using information about the application users and the remote destination by using the channel name and network address.
- Identify high use queues and perform trend analysis on throughput over time.
- Show those applications using **MQSET** on a queue. You can check that if an error occurs, these applications reset any attribute they might change. For example make sure they reset the trigger attribute if the application sets the queue to NOTRIGGER.
- Identify where the MQI calls are being delayed, for example waiting for log I/O or waiting for page set I/O. If the log I/O takes a long time, you might need to consider moving the log data sets to a volume that is used less heavily, or splitting the queue manager work into multiple queue managers.
- Show where queues have been set up incorrectly, for example a queue that is not indexed when all of the requests are to get with a specific message ID, or an indexed queue where only get next requests are used.
- Evaluate application changes to make sure that there is no unexpected increase in WebSphere MQ usage. For example if an application puts additional persistent messages, the volume of data logged increases, and so larger or a greater number of logs might be needed.
- Determine why application response time is different between two days. For example after WebSphere MQ startup, messages might have to be read from the page set rather than just accessed from a buffer.
- Correlate the WebSphere MQ accounting information for a CICS transaction with CICS and DB2 accounting in order to understand the complete transaction picture.

Class 1 Accounting information

The following information is available class 1 accounting information.

- Information to identify the task,but not channel names.
- The amount of CPU used on the application TCB.

- Number of **MQPUT** or **MQPUT1** requests for messages of length 0 through 99 bytes, 100 through 999 bytes, 1000 through 9999 bytes, and greater than or equal to 10000 bytes.
- Number of **MQGET** requests for where the message obtained is of length 0 through 99 bytes, 100 through 999 bytes, 1000 through 9999 bytes, and greater than or equal to 10000 bytes.

For more information see Understanding and using the class 1 accounting data on page 9.

The data is written to SMF when the application or channel ends, which may be a long time after it started.

What does it cost to collect class 1 accounting information?

The cost of collecting class 1 accounting records is about 2-3% CPU overhead.

The amount of data produced can be significant. An application that gets a message, puts a message to a different queue and ends, produces a 436 byte record. The space used by 160,000 of these transactions is about 100 cylinders of 3390 DASD.

Summary of the class 3 accounting information

The class(3) accounting information can be broken down into the following areas:

- Task identification. This now includes channel names in addition to other information, and allows you to correlate accounting records with CICS and DB2.
- CPU used per WebSphere MQ call, by queue where appropriate.
- Reasons why calls were delayed, for example waiting for log I/O to complete.
- Other information, for example the time a message spent on a queue from the time it was put to the time it was got, and total number of bytes processed.

The data is written to SMF when the application or channel ends, or when Z/OS issues the SMF interval broadcast - typically every hour or half hour. This interval is defined by the INTVAL statement in the SMFPRMxx member of SYS1.PARMLIB, see z/OS MVS Initialization and Tuning Reference.

What does it cost to collect accounting information?

The cost of collecting the class(3) accounting records is between 5-10% CPU overhead.

The amount of data produced can be significant. An application that gets a message, puts a message to a different queue and ends produces 5240 byte records. The space used by 10,000 of these transactions is about 937 tracks (63 cylinders) of 3390 DASD.

Understanding and using the class 1 accounting data

The accounting data is in SMF type 116 records, subtype 0. For information about the SMF record layout, and how to locate the data in the records see Appendix A. Overall layout of WebSphere MQ SMF records on page 51.

Table 1. Structure of the Common WebSphere MQ SMF header record QWHS

Offsets					
Dec	Hex	Type	Len	Name	Description
0	(0)	Structure	128	QWHS	
0	(0)		6		Reserved.
6	(6)	Character	1	QWHSNSDA	Number of self defining sections in the SMF records. See Table 20 on page 9
7	(7)		5		Reserved.
12	(0C)	Character	4	QWHSSSID	QWHSSSID
16	(10)		24		Reserved.
40	(28)	Character	8	QWHCAID	User ID associated with the Z/OS job.

48	(30)	Character	12	QWHCCV	Thread cross reference (see Thread cross reference data on page 11)
60	(3C)	Character	8	QWHCCN	Connection name.
68	(44)		8		Reserved.
76	(4C)	Character	8	QWHCOPID	User ID associated with the transaction.
84	(54)	Signed	4	QWHCATYP	Type of connecting system (1=CICS, 2=Batch or TSO, 3=IMS control region, 4=IMS MPP or BMP, 5=Command server, 6=Channel initiator, 7=RRS Batch).
88	(58)	Character	22	QWHCTOKN	Accounting token set to the Z/OS accounting information for the user.
110	(6E)	Character	16	QWHCNID	Network identifier
126	(7E)		2		Reserved.

Table 2. Structure of the message manager accounting record QMAC

Offsets					
Dec	Hex	Type	Len	Name	Description
0	(0)	Structure	48	QMAC	Message manager accounting data
0	(0)	Bitstring	2	QMACID	Control block identifier.
2	(2)	Unsigned	2	QMACLL	Control block length.
4	(4)	Character	4	QMACEYEC	Control block eye catcher (QMAC).
8	(8)	Character	8	QMACCPUT	CPU time used (TOD format).
16	(10)	Signed	4	QMACPUTA	Number of MQPUT requests for messages of length 0 through 99 bytes.
20	(14)	Signed	4	QMACPUTB	Number of MQPUT requests for messages of length 100 through 999 bytes.
24	(18)	Signed	4	QMACPUTC	Number of MQPUT requests for messages of length 1000 through 9999 bytes.
28	(1C)	Signed	4	QMACPUTD	Number of MQPUT requests for messages of length greater than or equal to 10000 bytes.
32	(20)	Signed	4	QMACGETA	Number of MQGET requests for messages of length 0 through 99 bytes.
36	(24)	Signed	4	QMACGETB	Number of MQGET requests for messages of length 100 through 999 bytes.
40	(28)	Signed	4	QMACGETC	Number of MQGET requests for messages of length 1000 through 9999 bytes.
44	(2C)	Signed	4	QMACGETD	Number of MQGET requests for messages of length greater than or equal to 10000 bytes.

Interpretation

The QWHC* fields gives you information about the user (for example, the user ID (QWHCAID) and the type of application (QWHCATYP)).

The QMAC* fields gives you information about the CPU time spent processing MQI calls, and counts of the number of **MQPUT** and **MQGET** requests for messages of different sizes.

Records containing zero CPU time

Records are sometimes produced that contain zero CPU time in the QMACCPUT field. These records occur when long running TCBs identified to WebSphere MQ either terminate or are prompted to output accounting

records by accounting trace being stopped. Such TCBs exist in the CICS adapter and in the channel initiator (for distributed queuing without CICS). The number of these TCBs with zero CPU time depends upon how much activity there has been in the system:

- For the CICS adapter, this can result in up to nine records with zero CPU time.
- For the channel initiator, the number of records with zero CPU time can be up to the sum of `Adapters + Dispatchers + 6`, as defined in the channel initiator parameters.

Thread cross reference data

The interpretation of the data in the thread cross reference (QWHCCV) field varies. This depends on what the data relates to:

- CICS (QWHCATYP=1) – see Table 3. Structure of the thread cross reference record for a CICS system
- IMS (QWHCATYP=3 or 4) - see Table 4.
- Batch, TSO, or RRS Batch (QWHCATYP=2 or 7) - this field consists of binary zeros
- Others - no meaningful data

Table 3. Structure of the thread cross reference record for a CICS system

Offsets					
Dec	Hex	Type	Len	Name	Description
48	(30)	Signed	4	QWHCTNO	CICS thread number.
52	(34)	Character	4	QWHCTRN	CICS transaction name.
56	(38)	Packed Decimal	4	QWHCTASK	CICS task number.

Table 4 Structure of the thread cross reference record for an IMS system

Offsets					
Dec	Hex	Type	Len	Name	Description
48	(30)	Character	4	QWHCPST	IMS partition specification table (PST) region identifier.
52	(34)	Character	8	QWHCPSB	IMS program specification block (PSB) name.

Special considerations when using IMS accounting records

A single IMS application might write two SMF records. In this case, the figures from both records should be added to provide the correct totals for the IMS application.

Understanding and using class 3 accounting data

The class(3) accounting data is in SMF type 116 records, subtypes 1 and 2. For information about the SMF record layout, and how to locate the data in the records see Appendix A. Overall layout of WebSphere MQ SMF records on page 51.

When is the queue related accounting data produced?

An SMF record is produced when the accounting trace class (3) has been activated (for example "+cpf START TRACE(A) CLASS(3)") and either:

- The job or application ends.
- The SMF statistics broadcast occurs, and it is a long running application, such as a channel. This means it was running prior to the last SMF statistics broadcast. You can request that records are produced at the SMF broadcast, typically every 30 minutes, by setting STATIME=0 in the CSQ6SYSP system parameter macro.

What is in the accounting record?

In the accounting record there are three sections covering the class(3) data: task identification, task accounting, and queue related.

Task identification

This information is in a structure called the WTID. The detailed description and layout of the fields is given in Table 17. Layout of theTask Id structure(WTID) page 62 and includes the following:

- Job name
- User ID
- Transaction name, if applicable
- Channel name, if applicable, including the TCP/IP address or APPC LU

Task accounting data

This information is in a structure called the WTAS. It includes information about commit and backout verbs, and other information that is not specific to a particular queue. The detailed description and layout of the fields is given in Table 16. Layout of the task related information (WTAS) structure on page 59 and includes the following:

- Number, accumulated elapsed time, and accumulated CPU time per verb for commit and backout requests.
- How many times a request was made to ensure data has been written to the log, and the accumulated time waiting for the write to the logs to complete for commit and backout requests.

Queue related accounting data

The information is in a structure called the WQ. The detailed description and layout of the fields is given in Queue records (WQ) on page55.

- Queue type, for example model queue or local queue.
- Queue name as used by the application, and the base queue name. These might be different, for example an alias queue maps to a base queue name.
- Number, accumulated elapsed time, and accumulated CPU time for **MQOPEN**, **MQCLOSE**, **MQPUT**, **MQPUT1**, **MQGET**, **MQINQ**, and **MQSET**. The accumulated elapse time for each API call is in STCK format.
  Number of successful **MQGET**, **MQPUT** and **MQPUT1** calls that successfully processed a message. For example an **MQGET** that returned 'no message found' is considered an unsuccessful get.
- How many times a request was made to ensure that data has been written to the log, and the accumulated time waiting for the write to the logs to complete. (**MQPUT**, **MQPUT1**, **MQGET**, and **MQSET**.)
- How many page set reads, and the accumulated time doing page set reads, and page set number. (**MQGET**, **MQPUT**, and **MQPUT1**.)
- Type of **MQGET** request, get by message ID or correl ID, or get first; destructive get or get browse. (**MQGET**) .
- Total number of bytes put or got, maximum and minimum message size. (**MQPUT** and **MQGET**.)
- Time on queue (TOQ). The time between the message arriving on the queue, and the get of the message. Total for all messages, the maximum and the minimum time for messages processed on the queue. These values are in STCK format.
- Number of generated messages, such as trigger or event messages.
- The number of requests that specified a selector string.
- The maximum length of the selector string.
- The number, elapsed time, and CPU time of the callback requests.
- The number of messages published.

How to process the data

If you want to examine a few accounting records you can use programs described in "Supplied programs to print out the SMF records" on page 45 to print out the contents of the records. With a large number of records the amount of output quickly becomes unmanageable.

If you want to write your own procedures to process the data you should read "Understanding the fields in the records" on page 16 for guidance on how to interpret the fields.

The way you store the data depends on the analysis you want to perform. For example:

- If you are displaying trends over a long period of time, you might want to summarize the data so there is one row of data per application per week.
- If you want the raw, un-summarized data, you might want to have one row per accounting record, and include all of the fields. You might want one table for the task information, and another table for the individual queue records. You can use the fields in the WTID record to link the tables together.
- If you are displaying the data on an hourly basis, you might want to combine the records, but extract all of the fields.

We recommend that you summarize the information on a daily basis, and keep the last 28 days worth of data.

For these different analyses the data and database structure will be very different.

Typical long term analysis

When you are looking at data over the long term you are looking for trends rather than individual accounting records. The following section gives an example of the sort of data you can use for trend analysis.
Some charts you might use for analysis might include

- Total CPU used by task per week, by week. For illustration see Figure 1 Growth in CPU over time on page 13.
- Total elapsed time in WebSphere MQ per task per week, by week.
- If this is plotted in a bar chart, the height of the bar gives the total elapsed time for all transactions, and with in the bar, it shows how much was CPU and logging for example. For illustration see Figure 2. Breakdown of where time in WebSphere MQ is spent for transaction AAAA. on page 14.
- Bytes processed per task, per week, by week.
- CPU used by the all tasks per week, by week.

Figure 1 Growth in CPU over time

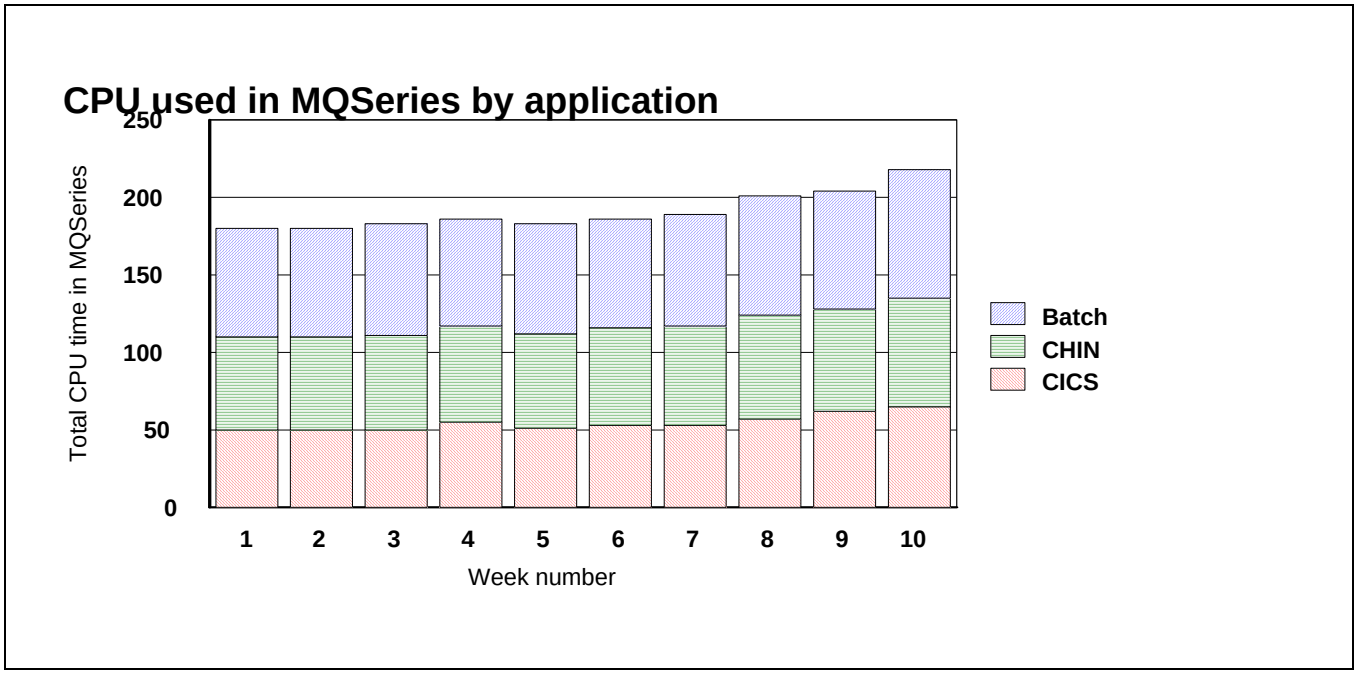


Figure 2. Breakdown of where time in WebSphere MQ is spent for transaction AAAA.

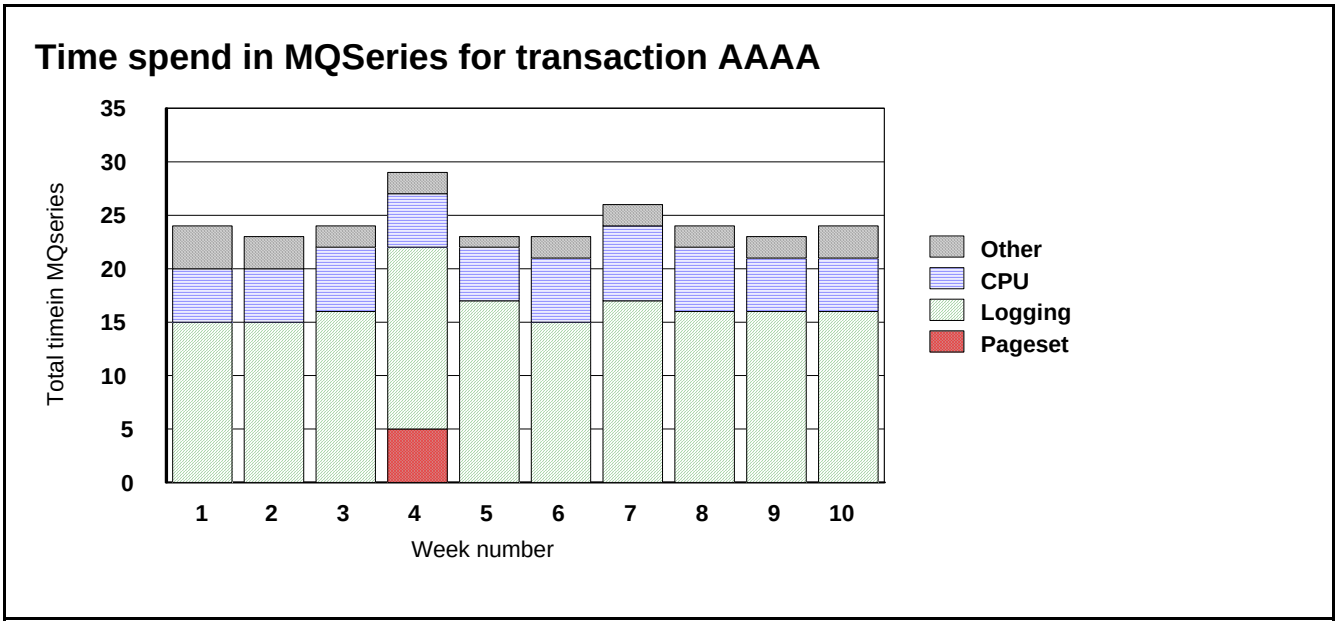


Figure 3. Growth in CPU over time by major application

How to interpret the data

The way you analyze the data depends on the application. For example consider the following four scenarios:

- A simple CICS transaction that gets a message, puts a reply, commits and ends.
- A CICS transaction that drains a queue. This transaction loops doing {**MQGET** (with wait option), **MQPUT1**, commit} and ends when no further messages have arrived in a short period of time.
- A sender channel that gets messages from a transmission queue (and sends them to a remote queue manager).
- A receiver channel that receives messages from a remote queue manager and puts them to various queues.

The following sections show how the data could be interpreted.

A simple CICS transaction

This transaction starts, opens a queue for input, gets a message from the queue, puts a message using **MQPUT1** to the replyto queue, commits the request and ends.

In this case, each transaction will have one accounting record that shows one commit, and the record will have 2 queue subsections.

Some typical analysis and reports might include:

- The average of the total CPU used in MQI calls across all transactions during the day. Plot in a line graph this average and number of records against the day.
- The average of the total elapsed time of the WebSphere MQ calls for a transaction, across all transaction during the day.
- A bar chart, showing the constituent parts of the elapsed time, CPU, log wait, page set I/O, and other suspend time.
- The total CPU time used for MQI calls by transaction, charged back to the user's department.
- The average number of bytes put and got per transaction per day, or the total divided by the number of commits per day.
- The number of transactions where the time spent in WebSphere MQ was greater than a particular value per day.

- The maximum total time in WebSphere MQ per transaction per day.

A CICS transaction that drains a queue

The CICS transaction is triggered, starts, opens the input queue, and loops, getting a message from the queue (with the wait option), putting a reply to the specified queue using **MQPUT1**, committing the work, and going round the loop again. When there are no more messages and the wait interval expires, the transaction terminates.

In this case, there might be multiple units of work within one transaction, and so there might be multiple commits in the accounting record. The elapsed time information is accumulated over many calls, so the average time per call can be obtained, but the maximum time for the calls cannot be obtained. If the transaction runs over half an hour, there might be multiple accounting records, which are produced on the SMF accounting broadcast.

Some typical analysis or reporting might include:

- A plot of total WebSphere MQ CPU used across all transactions by day.
- Total CPU used divided by the number of commits give a measure of the transaction cost. This can be plotted by day to see if there is a trend to the resources used.
- A breakdown of the total elapsed time of the MQI calls across all transaction during the day.
- A bar chart showing the constituent parts of the elapsed time, CPU, log wait, page set I/O, and other suspend time (similar to that for the simple CICS transaction).
- A plot of total elapsed time/number of commits is approximately the same as for the simple CICS transaction.

Because the program issues an **MQGET** with the wait option, there might be two **MQGET** calls for every message processed. The first **MQGET** finds no message, and so waits in the adapter. When a message arrives the **MQGET** is re-issued by the adapter. If there was a message to process, the adapter does not have to wait, and only one **MQGET** call is issued. So in this scenario there are more **MQGET** requests than in the simple CICS transaction.

- The total CPU time used for MQI calls, charged back to the user's department. This might be difficult to do because messages can come from many sources and be processed by this transaction. You might be able to charge back depending on the bytes put to specific application queues.
- The total number of bytes put and got per transaction per day, or the total divided by the number of commits per day.
- The number of transactions where the time spent in WebSphere MQ was greater than a particular value per day.
- The "average response time per day" `(total of time in WebSphere MQ calls/number of commits)` is a useful measure which gives the average amount of time in WebSphere MQ each Unit of Work took. Strictly the "average response time per day" refers to the response time of the transaction.

A sender channel

A sender channel gets one or more messages from a transmission queue and sends them to a remote queue manager. There might be some processing to internal queues at the end of batch. Because there can be a variable number of messages per batch, the `cost/(number of commits)` does not give a very meaningful answer. The number of commits could be zero if only fast messages have been processed, so calculations such as `Elapsed time/Number of commits` are meaningless and could result in a divide by zero condition.

Some of the typical analysis and reports might include:

- Total CPU used by the channel per day
- The total bytes read from the transmission queue per day
- The total number of messages got per day
- The average achieved batch size per day (or per interval)

With data for multiple applications on a channel it might not be possible to charge back usage to departments because you cannot identify who gets charged for what.

A receiver channel

A receiver channel receives one or more messages from a remote queue manager and puts them to one or more queues. There might be some processing to internal queues at the end of a batch. The number of commits could be zero if only fast messages have been processed, so calculations such as `Elapsed time/Number of commits` are meaningless and could result in a divide by zero condition.

Some of the typical analysis and reporting might include:

- Total CPU used by the channel per day
- The total bytes put to each queue per day
- The total number of messages put per day

The average achieved batch size per day (or per interval).

Understanding the fields in the records

MQI calls like **MQPUT** and **MQGET** act on a queue, where a commit call applies to the whole transaction and is not queue specific.

Constants used in the records

For fields like the queue type (QTYPE in the WQ) the values used are in the cmq* member in the SAMPLIB library, depending on the programming language; for example CMQC.H for C.

How to interpret durations

Information on durations is usually stored as a cumulative time, and the number of times that event happened. The figures used in this section are for illustration and do not reflect real figures.

Consider an application that issued 2 **MQSET** requests:

1. The first request, which took 10 ms of elapsed time, and used 1 ms of CPU.
2. The second request on the same queue, which took 10 ms elapsed time and 3 ms of CPU.

This would be reported as:

- SETN - the number of SEQ requests = 2.
- SETET - the accumulated elapsed time of the calls = 20 ms
- SETCT - the accumulated CPU time of the calls = 4ms.

This can be interpreted as follows:

- The average time of the **MQSET** calls was 10 milliseconds.
- The average CPU time used for the **MQSET** calls was 2 milliseconds.
- The time values are in S/390 Store Clock format (STCK), which is a double word where bit 53 is a microsecond. To convert a STCK value to microseconds ignore the bottom 12 bits. In C this can be done by treating the values as long long and dividing by 4096 to get to microseconds.

Other programming considerations

- Most fields are initialized to zero.
- The get minimum message size, and the put minimum message size are set to a large value. You should only use these fields if the number of valid puts (VALIDPUT) or valid gets (VALIDGET) is non zero.
- When an WebSphere MQ application ends, it posts an asynchronous task to create the SMF accounting record. The time in the SMF record (SM116TME) is the time the record was produced (the number of hundredths of a second since midnight). It is usually close (within a second) to the time the transaction or channel ended. If you need more accurate times, you should use the time interval end time (WTASINTE), which is in STCK format.
- Time on queue is calculated when the **MQGET** was successful and it was a destructive get.

Understanding and using WebSphere MQ statistics data

Statistics information

The statistics data is in SMF type 115 records, subtypes 1 and 2. For information on the SMF record layout, and how to locate the data in the records see Appendix A. Overall layout of WebSphere MQ SMF records on page 51.

WebSphere MQ produces statistics providing information on the resource managers (components) of the queue manager.

Who uses the data?

Usually the systems programmer and people responsible for monitoring performance use the WebSphere MQ statistics.

What can you do with the data?

Some data should be reviewed daily, and some is used in the long term to identify potential problems early, to allow preventive actions to be taken.

Exceptions should be reviewed daily as these indicate a problem with your setup, for example a Coupling Facility structure filling up.

Usually statistics are reviewed weekly or monthly and any trends examined.

How to collect statistics

You start the statistics trace using the "+cpf START TRACE(S)" command.

What does it cost to collect statistics?

The CPU cost of collecting statistics is negligible.

The amount of data produced is typically a few thousand bytes every hour.

The data is written to SMF every STATIME minutes, or if STATIME is zero, when z/OS issues the SMF interval broadcast - typically every half hour or hour.

Storage Manager statistics

The storage manager is responsible for managing virtual storage within the queue manager.

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	104	QSST	Storage manager statistics.
0	(0)	Bitstring	2	QSSTID	Control block identifier.
2	(2)	Unsigned	2	QPSTLL	Control block length.
4	(4)	Character	4	QSSTEYEC	Control block eye catcher (QSST).
60	(3c)	Unsigned	4	QSSTCONT	A short on storage condition as detected, and storage compression was invoked
64	(40)	Unsigned	4	QSSTCRIT	Number of critical short ofstorage conditions detected

If QSSTCRIT is non zero, this indicates a severe problems with lack of storage within the queue manager.

If QSSTCONT is non zero this indicates a problem was detected and recover actions were taken. This indicates a severe problem within the queue manager.

See SupportPac MP16 for more information about storage usage and how to prevent problems.

DB2 statistics from WebSphere MQ

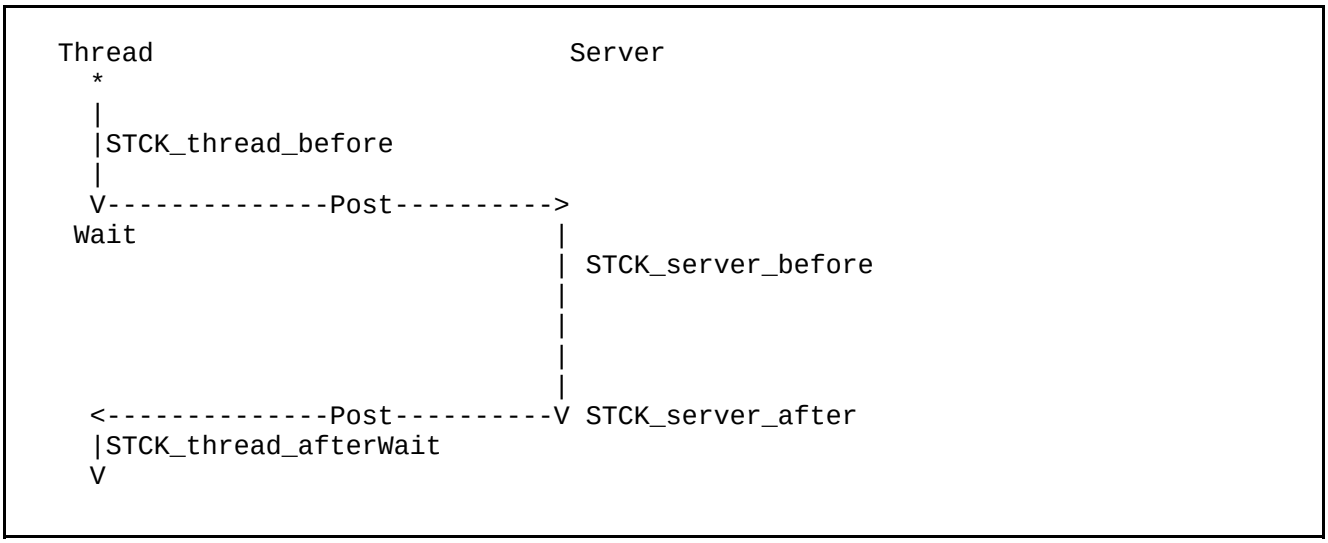
The DB2 manager manages the interface with the DB2 database that is used as the shared repository.

When using shared queues, object definitions and other information are stored in DB2 tables. This means you may be involved in tuning DB2.

DB2 requests are made from the queue manager by passing a request to a pool of server tasks that issue the DB2 request on behalf of the applications.

The figure below shows how DB2 requests are issued

Flow of a request for a DB2 service from a thread to server task



The processing for a thread wanting to issue a read request is as follows:

1. The thread puts a request onto a server work list.
2. The thread determines the current time (STCK_thread_before).
3. The thread posts a server task.
4. The thread waits.
5. The server task wakes up, and determines the current time (STCK_server_before).
6. The server takes the first request off the server work list and issues the DB2 request.
7. When the request has ended it posts the thread task.
8. The server task determines the current time (STCK_server_after) and updates the statistics:
    1. It increments the number of read requests READCNT.
    2. It calculates the time taken it took to process the request, STCK_server_after-STCK_server_before and adds this to the cumulative time READSCUW.
    3. If the time for the request was larger than the previous maximum if replaces the READSMXW with the delta.

Note: For other request, other counters are updated. These are LIST*, UPDT*, DELE*, and WRIT*.

9. The original thread wakes up and determines the current time (STCK_thread_after) and updates the statistics:
    1. It calculates the time spent waiting (STCK_thread_after - STCK_thread_before) and adds this to the cumulative time READTCUW.

2. If the time spent waiting for the request was greater than the previous maximum if replaces the READTMXW with the larger value.

Note: For other request, other counters are updated. These are LIST*, UPDT*, DELE*, and WRIT*.

10. The thread continues processing.

The processing is similar for update, write, and delete requests. The list request is more complex and can result in reads being done from the server task issuing the list request.

Shared-channel-status and shared-sync-key tables

If you are using shared channels, shared-channel-status information and information about the shared-sync-queue are stored in DB2 tables. The fields with names starting SCS* are for DB2 selects, inserts, updates, and deletes from the shared-channel-status table. The fields with names starting SSK* are for DB2 selects, inserts, updates, and deletes for information about the shared-synch-key table.

The shared-sync-key table is used to locate the message id for messages on the shared sync queue. The Shared Channel Sync queue is used when the channel NPMSPEED(NORMAL) is used. There are messages on the queue have information about the status of messages in a batch. The Shared Sync Key table, provides a mapping from channel name, XMITQ name, and remote queue manager name to the messages for the channel in the Shared Channel Sync queue. Information is inserted into the Shared Sync Key table, when a channel processes messages with NPMSPEED(normal) for the first time. Both of these have times for the thread and the server, as described above.

Shared large message support

In version 6 the maximum supported size of a shared message was increased from 63KB to 100MB. For messages greater than 63KB the data is stored in DB2 shared tables as binary large objects (BLOBs).

The SMF 115 statistics records have been extended to report counts, maximum and cumulative thread and SQL response times for the message insertion, browse and deletion operations. The new fields begin with LMS. The time fields are store clock (STCK) differentials consistent with the information collected in prior releases.

As the message processing functions are more performance critical than the object functions, they have dedicated server tasks to reduce the possibility of requests being queued. The QSGDATA parameter in CSQ6SYSP controls the number of server tasks dedicated to object and message processing.

Interpreting the data

You should monitor the following:

- The average time for server requests.

The average times in the server are a measure of the response time from DB2. Update requests to DB2 (update, write, and delete) have to wait for DB2 to log the changes, the response time will typically be between 5 and 10 milliseconds. If the average time is larger than this, you should investigate the DB2 system.

- The average difference between the wait time on thread and the time on the server.

If the difference between the wait time on thread, and time on server (for example readtcuw-readscuw) is greater than a millisecond, this indicates that there was a delay before the server could process the request, and so you should increase the number of server tasks. You change the number of server task using the DB2Servers parameter of keyword QSGDATA in the CSQ6SYSP macro.

- The peak number of requests queued up for the server (field DHIGMAX).

The field DHIGMAX tells you the maximum number of requests queued waiting for a server. If this value is greater than 10 you should consider increasing the number of servers. In our testing, this value was 20 when we started 1000 channels at the same time; the rest of the time it was usually 1.

Notes:

1. The maximum time waiting for a request can occasionally be large if the information is not in the DB2 buffers and so DB2 has to read it from disk.
2. The list request average and maximum values might be large if a lot of data is requested.

DB2 statistics record (Q5ST)

Table 5. DB2 statistics record

Offsets		Type	Len	Name (Dim)	Description
Dec	Hex				
0	(0)	Structure	488	Q5ST	DB2 manager statistics
0	(0)	Bitstring	2	Q5STID	Control block identifier
2	(2)	Unsigned	2	Q5STLL	Control block length
4	(4)	Character	4	Q5STEYEC	Control block eye catcher
8	(8)	Character	480	Q5STZERO	QMST part cleared on occasion
8	(8)	Unsigned	4	NUMTASK	Number of server tasks
12	(C)	Unsigned	4	ACTTASK	Number of active server tasks
16	(10)	Unsigned	4	CONNCNT	Number of connect requests
20	(14)	Unsigned	4	DISCCNT	Number of disconnect requests
24	(18)	Unsigned	4	DHIGMAX	Max. request queue depth
28	(1C)	Unsigned	4	ABNDCNT	Number of DB2SRV task abends
32	(20)	Unsigned	4	REQUCNT	Number of requests requeued
36	(24)	Unsigned	4	DEADCNT	Number of deadlock timeouts
40	(28)	Unsigned	4	DELECNT	Number of delete requests
44	(2C)	Unsigned	4	LISTCNT	Number of list requests
48	(30)	Unsigned	4	READCNT	Number of read requests
52	(34)	Unsigned	4	UPDTCNT	Number of update requests
56	(38)	Unsigned	4	WRITCNT	Number of write requests
60	(3C)	Unsigned	4	SCSSEL	SCST selects (shared-channel-status)
64	(40)	Unsigned	4	SCSINS	SCST inserts (shared-channel-status)
68	(44)	Unsigned	4	SCSUPD	SCST updates (shared-channel-status)
72	(48)	Unsigned	4	SCSDEL	SCST deletes (shared-channel-status)
76	(4C)	Unsigned	4	SSKSEL	SSKT selects (shared-sync-key)
80	(50)	Unsigned	4	SSKINS	SSKT inserts (shared-sync-key)
84	(54)	Unsigned	4	SSKDEL	SSKT deletes (shared-sync-key)
88	(58)	Unsigned	4	SCSBFTS	SCST number of times buffer too small
92	(5C)	Unsigned	4	SCSMAXR	SCST maximum rows on query
96	(60)	Unsigned	4	* (2)	Reserved
104	(68)	Character	8	DELETCUW	Cumulative STCK difference - Thread delete
112	(70)	Character	8	DELETMXW	Maximum STCK difference - Thread delete
120	(78)	Character	8	DELESCUW	Cumulative STCK difference - SQL delete
128	(80)	Character	8	DELESMXW	Maximum STCK difference - SQL delete
136	(88)	Character	8	LISTTCUW	Cumulative STCK difference - Thread list
144	(90)	Character	8	LISTTMXW	Maximum STCK difference - Thread list
152	(98)	Character	8	LISTSCUW	Cumulative STCK difference - SQL list
160	(A0)	Character	8	LISTSMXW	Maximum STCK difference - SQL list
168	(A8)	Character	8	READTCUW	Cumulative STCK difference - Thread read
176	(B0)	Character	8	READTMXW	Maximum STCK difference - Thread read
184	(B8)	Character	8	READSCUW	Cumulative STCK difference - SQL read
192	(C0)	Character	8	READSMXW	Maximum STCK difference - SQL read
200	(C8)	Character	8	UPDTTCUW	Cumulative STCK difference - Thread update
208	(D0)	Character	8	UPDTTMXW	Maximum STCK difference - Thread update
216	(D8)	Character	8	UPDTSCUW	Cumulative STCK difference - SQL update
224	(E0)	Character	8	UPDTSMXW	Maximum STCK difference - SQL update
232	(E8)	Character	8	WRITTCUW	Cumulative STCK difference - Thread write
240	(F0)	Character	8	WRITTMXW	Maximum STCK difference - Thread write
248	(F8)	Character	8	WRITSCUW	Cumulative STCK difference - SQL write
256	(100)	Character	8	WRITSMXW	Maximum STCK difference - SQL write
264	(108)	Character	8	SCSSTCUW	Cumulative STCK difference - Thread select
272	(110)	Character	8	SCSSTMXW	Maximum STCK difference - Thread select

280	(118)	Character	8	SCSSSCUW	Cumulative STCK difference - SQL select
288	(120)	Character	8	SCSSSMXW	Maximum STCK difference - SQL select
296	(128)	Character	8	SCSITCUW	Cumulative STCK difference - Thread insert
304	(130)	Character	8	SCSITMXW	Maximum STCK difference - Thread insert
312	(138)	Character	8	SCSISCUW	Cumulative STCK difference - SQL insert
320	(140)	Character	8	SCSISMXW	Maximum STCK difference - SQL insert
328	(148)	Character	8	SCSUTCUW	Cumulative STCK difference - Thread update
336	(150)	Character	8	SCSUTMXW	Maximum STCK difference - Thread update
344	(158)	Character	8	SCSUSCUW	Cumulative STCK difference - SQL update
352	(160)	Character	8	SCSUSMXW	Maximum STCK difference - SQL update
360	(168)	Character	8	SCSDTCUW	Cumulative STCK difference - Thread delete
368	(170)	Character	8	SCSDTMXW	Maximum STCK difference - Thread delete
376	(178)	Character	8	SCSDSCUW	Cumulative STCK difference - SQL delete
384	(180)	Character	8	SCSDSMXW	Maximum STCK difference - SQL delete
392	(188)	Character	8	SSKSTCUW	Cumulative STCK difference - Thread select
400	(190)	Character	8	SSKSTMXW	Maximum STCK difference - Thread select
408	(198)	Character	8	SSKSSCUW	Cumulative STCK difference - SQL select
416	(1A0)	Character	8	SSKSSMXW	Maximum STCK difference - SQL select
424	(1A8)	Character	8	SSKITCUW	Cumulative STCK difference - Thread insert
432	(1B0)	Character	8	SSKITMXW	Maximum STCK difference - Thread insert
440	(1B8)	Character	8	SSKISCUW	Cumulative STCK difference - SQL insert
448	(1C0)	Character	8	SSKISMXW	Maximum STCK difference - SQL insert
456	(1C8)	Character	8	SSKDTCUW	Cumulative STCK difference - Thread delete
464	(1D0)	Character	8	SSKDTMXW	Maximum STCK difference - Thread delete
472	(1D8)	Character	8	SSKDSCUW	Cumulative STCK difference - SQL delete
480	(1E0)	Character	8	SSKDSMXW	Maximum STCK difference - SQL delete
488	(1E8)	Unsigned	4	LMSSEL	# of DB2 BLOB read requests
492	(1EC)	Unsigned	4	LMSINS	# of DB2 BLOB insert requests
496	(1F0)	Unsigned	4	LMSUPD	# of DB2 BLOB update requests
500	(1F4)	Unsigned	4	LMSDEL	# of DB2 BLOB delete requests
504	(1F8)	Unsigned	4	LMSLIS	# of DB2 BLOB list requests
508	(1FC)	Unsigned	4	*	Reserved
512	(200)	Character	8	LMSSTCUW	Total elapse time - thd. BLOB read
520	(208)	Character	8	LMSSTMXW	Max Elapse time - thd. BLOB read
528	(210)	Character	8	LMSSSCUW	Total elapse time - SQL BLOB read
536	(218)	Character	8	LMSSSMXW	Max Elapse time - SQL BLOB read
544	(220)	Character	8	LMSITCUW	Total elapse time - thd. BLOB write
552	(228)	Character	8	LMSITMXW	Max Elapse time - thd. BLOB write
560	(230)	Character	8	LMSISCUW	Total elapse time - SQL BLOB write
568	(238)	Character	8	LMSISMXW	Max Elapse time - SQL BLOB write
576	(240)	Character	8	LMSUTCUW	Total elapse time - thd. BLOB update
584	(248)	Character	8	LMSUTMXW	Max Elapse time - thd. BLOB update
592	(250)	Character	8	LMSUSCUW	Total elapse time - SQL BLOB update
600	(258)	Character	8	LMSUSMXW	Max Elapse time - SQL BLOB update
608	(260)	Character	8	LMSDTCUW	Total elapse time - thd. BLOB delete
616	(268)	Character	8	LMSDTMXW	Max Elapse time - thd. BLOB delete
624	(270)	Character	8	LMSDSCUW	Total elapse time - SQL BLOB delete
632	(278)	Character	8	LMSDSMXW	Max Elapse time - SQL BLOB delete
640	(280)	Character	8	LMSLTCUW	Total elapse time - thd. BLOB list
648	(288)	Character	8	LMSLTMXW	Max Elapse time - thd. BLOB list
656	(290)	Character	8	LMSLSCUW	Total elapse time - SQL BLOB list
664	(298)	Character	8	LMSLSMXW	Max Elapse time - SQL BLOB list

The field names in the record reflect the content, for example SCSSTCUW is

SCSSTCUW SCS is for Shared Channel Status

SCSSTCUW S is for Select, I for Insert, U for Update, D for Delete

SCSSTCUW T is for Thread wait, S is for SQL waits

SCSSTCUW CUW is for CUmulative Wait, MXW is for MaXimum Wait

So SCSSSCUW is for the Shared Channel Status, Select request, SQL time, Cumulative wait time.

Examples of some DB2 statistics from WebSphere MQ

A queue manager doing no work

The statistics are given below for a 15 minute period.

```
DB2 manager : Q5ST
  Tasks  : Servers  4 Active  5 Conns   0 Discs   0 High 1 Abend  0 Requeue  0
  Number of deadlock conditions :         0
  Lists :  #:180 Task avg m/s :  2 Task max m/s : 3   DB2 avg m/s :  2  DB2 max m/s :  2
```

1. There were 4 DB2 tasks requested(NUMTASK), and the Queue Manager started another task, so there are 5 active(ACTTASK).

2. The maximum number of requests queued was 1(DHIGMAX).

3. There were 180 read requests(READCNT) taking an average of 2 ms(READTCUW/READCNT)and a maximum of 3 ms(READTMXW). Most of this time was spent in DB2(READSCUW, READSMXW).

4. The 180 list requests were in a 15 minute period, this is one request every 5 seconds. This is due to the queue manager querying DB2 for any changed definitions every 5 seconds.

Defining a shared queue

The command "DEF QL(SQFRED) QSGDISP(SHARED) LIKE(SQ0000)" was issued. The statistics produced are given below.

```
DB2 manager : Q5ST
  Tasks  : Servers  4 Active  5 Conns   0 Discs   0 High 1 Abend  0 Requeue    0
  Number of deadlock conditions :         0
  Reads  : #:   3 Task avg m/s :  1 Task max m/s :   1 DB2 avg m/s :   1  DB2 max m/s :    1
  Writes : #:   1 Task avg m/s :110 Task max m/s : 110 DB2 avg m/s : 109  DB2 max m/s :  109
  Lists  : #:  12 Task avg m/s :  2 Task max m/s :   3 DB2 avg m/s :   2  DB2 max m/s :    3
```

1. There were 3 read requests taking a maximum and average of 1 ms, most of this time was spent in DB2.

2. There was 1 write request (WRITCNT). The (average) time was 110 milliseconds (WRITTCUW/WRITCNT) most of which (109 milliseconds) was spent in DB2 (WRITSCUW/WRITCNT).

3. The number of list requests was 12, which happen every 5 seconds, so a total time of 60 seconds, which matches the SMF interval of 61 seconds.

In the example below, a shared receiver channel was started. This accessed the Shared Channel Status table, and the Shared Key Table.

```
DB2 manager : Q5ST
  Tasks  : Servers 4 Active 5 Conns  0 Discs 0 High 1 Abend 0 Requeue  0 Reads  : #:  19 Task avg m/s :  6
Task max m/s :
  Lists  : #:  56 Task avg m/s :  3 Task max m/s :  84
  SCS Maximum rows returned on query   :  2
  SCS Selects: #: 1 Task avg m/s: 2 Task max m/s:  2 DB2 avg m/s : 2 DB2 max m/s :  2
  SCS Inserts: #: 1 Task avg m/s: 4 Task max m/s:  4 DB2 avg m/s : 4 DB2 max m/s :  4
  SCS Updates: #: 1 Task avg m/s: 6 Task max m/s:  6 DB2 avg m/s : 5 DB2 max m/s :  5
  SCS Deletes: #: 1 Task avg m/s: 6 Task max m/s:  6 DB2 avg m/s : 5 DB2 max m/s :  5
  SSK Selects: #: 1 Task avg m/s: 1 Task max m/s:  1 DB2 avg m/s : 1 DB2 max m/s :  1
```

1. When a channel starts it inserts an record into the Shared Channel Status table - which may exist already, so the number of inserts is 1.

2. When a channel stops naturally (not as a result of a stop channel) then the record is deleted from the Shared Channel Status table. The channel disconnect interval expired, so the channel stopped. There was one delete request.

3. The maximum rows returned on a query was 2 (SCSMAXR).

4. There was one select from the Shared Channel Status table(SCSSEL) which took on average 2 ms(SCSSTCUW/SCSSEL), and a maximum of 2 ms (SCSSTMXW).

5. Of this time the amount time in DB2 was 2 ms(SCSSSCUW/SCSSEL), with a maximum of 2ms(SCSSSMXW).

Coupling Facility statistics

The Coupling Facility manager manages the interface with the Coupling Facility.

When using shared queues, messages are stored in the Coupling Facility (CF). During a commit of messages being processed within syncpoint, information about the messages is changed to indicate that the commit has occurred. The Coupling Facility can perform updates on many messages in one request. Updates to elements in the CF can be made one at a time, or as a group of changes that have to be made together. Conceptually, putting two messages in syncpoint followed by a commit is two requests to update an individual element followed by one request to act on both elements.

The requests to update one element are performed using the IXLLSTE request, and the requests to update multiple elements are performed using the IXLLSTM request.

When these requests are issued, the Coupling Facility might not be able to process the request completely, and so the request might have to be reissued. The number of times a request was reissued is recorded in the statistics as the number of redrives.

How the data is stored

The Coupling Facility statistics have a header and a number of records. Currently it is a 4096 byte data segment with 64 bytes for each of the possible 64 structures. Unused structures have a QESTSTR containing nulls.

What you should monitor

- You should monitor the average time for the various requests. For example `(QESTSSTC/4096)/QESTCSEC` (the division by 4096 converts the STCK value to microseconds).
- If the `Number of structure full` is greater than zero you need to determine if this is due to a transient problem or due to an increasing trend. You may want to increase the size of the structure.

If this value is non zero, you will have got Z/OS console messages indicating capacity problems with the structure which you should act on.

Coupling Facility record layout (QEST)

Table 6. Coupling Facility record layout

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	4104	QEST	CF manager statistics
0	(0)	Bitstring	2	QESTID	Control block identifier
2	(2)	Unsigned	2	QESTLL	Control block length
4	(4)	Character	4	QESTEYEC	Control block eye catcher
8	(8)	Character	4096	QESTZERO	QEST part cleared on occasion
8	(8)	Character	64	QESTSTUC (0:63)	Array (one entry per structure)
8	(8)	Character	12	QESTSTR	Structure name
20	(14)	Unsigned	4	QESTSTRN	Structure number
24	(18)	Unsigned	4	QESTCSEC	Number of IXLLSTE calls
28	(1C)	Unsigned	4	QESTCMEC	Number of IXLLSTM calls
32	(20)	Character	8	QESTSSTC	Time spent doing IXLLSTE calls

40	(28)	Character	8	QESTMSTC	Time spent doing IXLLSTM calls
48	(30)	Unsigned	4	QESTRSEC	Number of IXLLSTE redrives
52	(34)	Unsigned	4	QESTRMEC	Number of IXLLSTM redrives
56	(38)	Unsigned	4	QESTSFUL	Number of structure fulls
60	(3C)	Unsigned	4	QESTMNUS	Maximum number of entries in use
64	(40)	Unsigned	4	QESTMLUS	Maximum number of elements in use
68	(44)	Character	4	*	Reserved
4104	(1008)	Character	0	*	End of control block

The QESTSTUC is an array of 64 elements, each element is 64 bytes long.

Examples of some WebSphere MQ CF statistics

A transaction of put commit with a 1000 byte non persistent message was repeated 1000 times.

```
CF manager : QEST
  Structure #:        0, Name      CSQ_ADMIN   , Structure-fulls   0
  Single           1000, Avg time uS         53, Single   retries  0
  Multiple            0, Avg time uS          0, Multiple retries  0
  Max used entries      344, Max used elements       666
  Structure #:        1, Name      APPLICATION1, Structure-fulls   0
  Single           1000, Avg time uS         73, Single   retries  0
  Multiple         1000, Avg time uS        211, Multiple retries  0
  Max used entries     1313, Max used elements      7192
```

1. In the structure name(QESTSTR) corresponding to structure number 0 (QESTSTRN) the number of single requests(QESTCSEC) corresponds to the number of commit requests.
2. The average time for these request (QESTSSTC/QESTCSEC) is 53 micro seconds.
3. In the application structure APPLICATION1 there were 1000 single requests, corresponding to the number of puts, and 1000 requests where potentially multiple messages were committed in one call.
4. Before the run there were 313 used entries, so with 1000 messages the number of used entries is 313 + 1000 = 1313.
5. Before the run there were 1192 elements used.
6. A 1,000 byte message is composed of 6 256 byte segments.
7. The number of segments used is 6*1000 = 6000.
8. The number of segments before + number of segments used = 1192 + 6000 = 7192.
9. An ICS link was used for the Coupling Facility, which has a better response time than a CFS link.

A transaction of get commit with a 1000 byte non persistent message was repeated 1000 times.

```
CF manager : QEST
  Structure #:        0, Name      CSQ_ADMIN   , Structure-fulls   0
  Single           1000, Avg time uS         43, Single   retries  0
  Multiple            0, Avg time uS          0, Multiple retries  0
  Max used entries      344, Max used elements       389
  Structure #:        1, Name      APPLICATION1, Structure-fulls   0
  Single           1000, Avg time uS         52, Single   retries  0
  Multiple         1000, Avg time uS        228, Multiple retries  0
  Max used entries     1037, Max used elements      6090
```

The statistics are similar to the put example above.

A transaction of put commit with a 10,000 byte non persistent message was repeated 1000 times. Then another transaction issued get commit of the messages.

```
CF manager : QEST
  Structure #:        0, Name      CSQ_ADMIN   , Structure-fulls      0
```

```
  Single           2000, Avg time uS         50, Single   retries     0
  Multiple            0, Avg time uS          0, Multiple retries     0
  Max used entries      344, Max used elements       389
  Structure #:        1, Name      APPLICATION1, Structure-fulls      0
  Single           4000, Avg time uS        218, Single   retries  1000
  Multiple         1000, Avg time uS         63, Multiple retries     0
  Max used entries     1040, Max used elements     41248
```

1. Before the measurement the Max used entries was 40 and the Max used elements was 248.

2. There are 2000 single requests for the CSQ_ADMIN structure because there are 1000 for the put requests, and 1000 for the get requests.

3. 1000 messages were processed, and the Max used entries is 40 + 1000

4. A 10,000 byte message is stored in 256 bytes segments, so 1000 messages used 41248 - 248 = 41,000 or 41 segments per message.

5. It is quicker to use a 4KB buffer than a 64KB buffer to get data There are 1000 single retries. When a message is got from the CF an attempt is made using a 4KB, if this is not large enough the message is got using a 64KB buffer. This getting a message using the larger buffer counts as a retry of reading the CF. As a 10,000 byte messages were being retrieved, the size is greater than 4KB so there was a retry for each message.

6. There were 4000 single CF requests, of which 1000 were retries so there were 3000 successful

7. The calculation of the average time uses the total number of requests. This includes the number and time for when the buffer was too small, in this case the response time was of the order of 10's of micro seconds, compared to the 100's of microseconds when the message was retrieved
A more typical response time from the CF should exclude the count of the retries. So excluding the count of the retries from the calculation gives the response time = (4000 * 218)/(4000-1000) = 290 micro seconds. So the response time to actually get a message from the CF is between 218 and 290 micro seconds on average.

Message manager statistics

The message manager processes the MQI verbs.

The following table shows the format of the message manager statistics record. It is defined by member CSQDQMST.

Table 7. Structure of the message manager statistics record QMST

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	48	QMST	Message manager statistics
0	(0)	Bitstring	2	QMSTID	Control block identifier
2	(2)	Unsigned	2	QMSTLL	Control block length
4	(4)	Character	4	QMSTEYEC	Control block eye catcher (QMST)
8	(8)	Signed	4	QMSTOPEN	Number of **MQOPEN** requests
12	(C)	Signed	4	QMSTCLOS	Number of **MQCLOSE** requests
16	(10)	Signed	4	QMSTGET	Number of **MQGET** requests
20	(14)	Signed	4	QMSTPUT	Number of **MQPUT** requests
24	(18)	Signed	4	QMSTPUT1	Number of **MQPUT1** requests
28	(1C)	Signed	4	QMSTINQ	Number of **MQINQ** requests
32	(20)		4		Reserved
36	(24)	Signed	4	QMSTSET	Number of **MQSET** requests
40	(28)		4		Reserved
44	(2C)	Signed	4	QMSTCALH	Number of "close handle" requests
48	(30)	Signed	4	QMSTSUB	Number of Subscribes (**MQSUB**)
52	(34)	Signed	4	QMSTSUBR	Number of Subscribe Requests (**MQSUBRQ**)
56	(38)	Signed	4	QMSTCB	Number of Register Callback requests (**MQCB**)
60	(3c)	Signed	4	QMSTCTL	Number of Control request (**MQCTL**)
64	(40)	Signed	4	QMSTSTUS	Number of Stat requests (**MQSTAT**)
68	(44)	Signed	4	QMSTPUBS	Number of publish (PUT+PUT1) requests

Interpretation

The data gives you counts of different MQI requests. Monitoring the count of verbs per day or week will give an indication if your workload is changing.

Data manager statistics

The data manager manages the links between messages and queues. It calls the buffer manager to process the pages with messages on them.

The following table shows the format of the data manager statistics record. It is defined in member CSQDQIST.

Table 8. Structure of the data manager statistics record QIST

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	60	QIST	Data manager statistics
0	(0)	Bitstring	2	QISTID	Control block identifier
2	(2)	Unsigned	2	QISTLL	Control block length
4	(4)	Character	4	QISTEYEC	Control block eye catcher (QIST)
8	(8)	Unsigned	4	QISTMGET	Number of message get requests
12	(C)	Unsigned	4	QISTMPUT	Number of message put requests
16	(10)		4		Reserved
20	(14)	Signed	4	QISTDCRE	Number of object create requests
24	(18)	Signed	4	QISTDPUT	Number of object put requests
28	(1C)	Signed	4	QISTDDEL	Number of object delete requests
32	(20)	Signed	4	QISTDGET	Number of object get requests
36	(24)	Signed	4	QISTDLOC	Number of object locate requests
40	(28)		4		Reserved
44	(2C)	Signed	4	QISTALST	Number of Stgclass change requests
48	(30)		4		Reserved
52	(34)		4		Reserved
56	(38)		4		Reserved
60	(3C)	Unsigned	4	QISTRAIO	Number of Read aheads doing I/O
64	(40)	Unsigned	4	QISTRABP	Number of Read aheads from the buffer pool
68	(44)	Unsigned	4	QISTGETD	Number of Gets that got msg off disk
72	(48)	Unsigned	4	QISTGETB	Number of Gets that got msg from buffer pool

Interpretation

The data gives you counts of different object requests. You should monitor QISTRAIO and QISTGETD on a regular basis.

Buffer manager statistics

The buffer manager manages the buffer pools in virtual storage and the writing of pages to, and reading pages from, page sets.

The following table shows the format of the buffer manager statistics record. It is defined in member CSQDQPST.

Note: If you have defined a buffer pool, but not used it, no values are set so the buffer manager statistics record will not contain any data.

Table 9. Structure of the buffer manager statistics record QPST

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	104	QPST	Buffer manager statistics.
0	(0)	Bitstring	2	QPSTID	Control block identifier.
2	(2)	Unsigned	2	QPSTLL	Control block length.
4	(4)	Character	4	QPSTEYEC	Control block eye catcher (QPST).
8	(8)	Signed	4	QPSTPOOL	Buffer pool identifier (0000-0003).
12	(C)	Signed	4	QPSTNBUF	Number of buffers in this buffer pool when SMF record was created
16	(10)	Signed	4	QPSTCBSL	Lowest number of available buffers in the interval
20	(14)	Signed	4	QPSTCBS	Number of available buffers when SMF record was created.
24	(18)	Signed	4	QPSTGETP	The number of page get requests where the current page contents are required. This might involve a read DASD operation if the page is not currently in the buffer pool.
28	(1C)	Signed	4	QPSTGETN	The number of **MQGET** requests for a new - or empty - page (that is, no read operation is necessary).
32	(20)	Signed	4	QPSTRIO	The number of page read DASD operations.
36	(24)	Signed	4	QPSTSTW	The number of page updates.
40	(28)	Signed	4	QPSTTPW	Number of pages written to DASD.
44	(2C)	Signed	4	QPSTWIO	The number of page write operations.
48	(30)	Signed	4	QPSTIMW	The number of synchronous page write operations.
52	(34)	Signed	4	QPSTDWT	The number of times the asynchronous write processor was started.
56	(38)	Signed	4	QPSTDMC	The number of times the synchronous page processor was started because the synchronous write threshold was reached.
60	(3C)	Signed	4	QPSTSTL	The number of times a page get request did not find the page already in the buffer pool.
64	(40)	Signed	4	QPSTSTLA	Number of times the hash chain has been changed during a buffer steal.
68	(44)	Signed	4	QPSTSOS	The number of times NO available buffers were found.
72	(48)		32		Reserved.

Interpreting buffer manager statistics

The buffer manager is the component of WebSphere MQ that handles the movement of data between DASD and virtual storage.

Buffer pools are areas of WebSphere MQ virtual storage reserved to satisfy the buffering requirements for WebSphere MQ queues. Each buffer pool contains an installation defined number of 4 KB virtual storage pages or buffers. Page sets are VSAM linear data sets and each page set is associated with a buffer pool. Queues are

mapped to page sets via their storage class attribute. For more information on the relationship between these entities, see the *WebSphere MQ information center*.

Buffer pool 0 contains WebSphere MQ objects and messages. Other buffer pools just contain messages. A buffer pool treats pages containing messages and objects the same way. To be able to estimate the required size of the buffer pools, you must understand their characteristics and how to interpret the buffer manager statistics generated by WebSphere MQ.

A buffer pool can hold WebSphere MQ object definitions, as well as messages, in 4 KB virtual storage pages. WebSphere MQ is designed to keep pages in buffer pool virtual storage as long as possible in order to obtain the best performance.

However, if a buffer pool starts to fill up, pages in the buffer pool which have been updated are written out to their relevant DASD page sets to free up buffer pool space. This happens if, for example, messages are being put onto queues associated with the buffer faster than they are being taken off.

Information contained in pages that have been written out to DASD page sets can be read in again on demand.

Ideally, a transaction pattern should be such that messages do not spend a long time on a queue waiting to be retrieved. This means that messages never have to spill over to DASD because the pages used to hold them remain in virtual storage.

Buffer pool management

To manage your buffer pools efficiently, you must consider the factors that affect the buffer pool I/O operations and also the statistics associated with the buffer pools.

DASD operations

The following factors affect buffer pool I/O operations.

- If a page containing the required data is not found in the buffer pool, it is read synchronously from its DASD page set to an available buffer.
- Whenever a buffer pool page is updated, it is put on an internal queue of pages to be (potentially) written out to DASD. Once a buffer pool page has been updated, it cannot be reused until it has been written to DASD.
- If the number of pages queued to be written to DASD exceeds 85% of the total number of buffers in the pool, an asynchronous write processor is started in order to write the buffers to DASD.

Similarly, should the number of buffers available for page get requests become less than 15% of the total number of buffers in the pool, then the asynchronous write processor is started in order to perform the write I/O operations. If the number of pages queued to be written to DASD is close to 85%, the number of free pages is likely to be just over the 15% limit, so if there are many applications concurrently browsing a queue, thus using pages, the number of free pages may drop below the 15%.
The write processor stops when the number of pages queued to be written to DASD has fallen to 75% of the total number of buffer in the pool.

- If the number of pages queued for writing to DASD exceed 95% of the total number of buffers in the pool, all updates result in a synchronous write of the page to DASD.
- If the number of buffers available for page get requests ever reaches zero, a transaction that encounters this condition is suspended until the asynchronous write processor has finished.
- If a page is frequently updated, the page spends most of its time on the queue of pages waiting to be written to DASD. Because this queue is in least recently used order, it is possible that a frequently updated page placed on this least recently used queue will never be written out to DASD. For this reason, at the time of update, if the page is found to have been waiting on the write to DASD queue for at least 2 checkpoints, it will be synchronously written to DASD.

The aim of the above algorithm is to maximize the time pages spend in buffer pool memory while allowing the system to function should system load put the buffer pool usage under stress.

Fields that you need to monitor daily

You should monitor the QPSTSOS field (the number of times that no buffers were available). If this value is non zero, you should increase the size of your buffer pool and check that the page data sets in the buffer pool are optimally placed to reduce contention.

Fields that you should monitor weekly

The values in the buffer manager statistics vary, depending on the applications that use the buffer pools. You should monitor the values listed below, and investigate any out-of-line conditions, and take the appropriate action. This might be:

- To make the buffer pool bigger.
- To move messages from one page set to another in order to move work to a different buffer pool. You can do this using the COPY and LOAD functions in CSQUTIL. This is described in *WebSphere MQ information center*.
- To investigate why the message pattern has changed. For example a channel might not be working, so messages are accumulating on a transmission queue.

You should monitor the following:

- QPSTCBSL/QPSTNBUF (the ratio of how full the buffer is).
- QPSTRIO (the number of pages read from the page set). This might be non zero after a system restart, and zero the rest of the time
- QPSTDMC (how many times the task was started to move pages out from the buffer pool to the page set).

Examples of buffer pool statistics for WebSpere MQ V7

In V7 the way pages were allocated in a buffer pool was changed so there is only one message per page. A page is used to contain pointers to the message pages.

This improves the performance but requires more pages for the same number of messages. However once the message has been got the page can be freed earlier and so be available to be reused.

Putting 1000 1000 byte messages

04	Buffs	10000	Low	7191	Now	7191	Getp	2040	Getn	1014
04	Rio	0	STW	3041	TPW	0	WIO	0	IMW	0
04	DWT	0	DMC	0	STL	0	STLA	0	SOS	0

The number of new pages (Getn) is one page per message, but pages are used to hold the pointers to pages and when one of these pages fills up, a new page is required, so there are more new pages than messages

Getting 1000 1000 bytes messages

04	Buffs	10000	Low	7191	Now	7191	Getp	5081	Getn	0
04	Rio	0	STW	2039	TPW	0	WIO	0	IMW	0
04	DWT	0	DMC	0	STL	0	STLA	0	SOS	0

This shows that to get a page with messages, multiple pages have to be read. This is more efficient that in V6 because a page does not have more than one message, so there is less locking interaction when putting and getting messages.

Log manager statistics

The log manager is responsible for managing recovery data on log datasets.

- Logging is done for persistent messages, and not for non persistent messages
- Data is written to log buffers
- Data is written from log buffers to active log data sets.

This occurs

- During a commit request - for two phase commit there will be two requests
- During a put or get out of syncpoint
- When an installation specified number of buffers have been filled and there has been no request to force the buffers to disk.
- Any define, delete or alter command.
- An MQSET verb is issued.

The following table shows the format of the log manager statistics record. It is defined in member CSQDQJST.

Table 10. Structure of the log manager statistics record QJST

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	264	QJST	Log manager statistics.
0	(0)	Character	2	QJSTID	Control block identifier.
2	(2)	Signed	2	QJSTLL	Control block length.
4	(4)	Character	4	QJSTEID	Control block eye catcher (QJST).
8	(8)	Signed	4	QJSTWRW	Write_request count - Wait. This request is converted to a write_force requests, so this value is always zero.
12	(C)	Signed	4	QJSTWRNW	Write_request count - No wait. Data is written to log buffers, these buffers are not explicitly written to the active log data sets, and the requestor is not suspended.
16	(10)	Signed	4	QJSTWRF	Write_request count - Force. Data is written to log buffers, these buffers are then written to the active log data sets, and the requesting task is suspended until the write to active log data sets is complete.
20	(14)	Signed	4	QJSTWTB	Wait count for unavailable buffers. Number of times a task was suspended because all the buffers were waiting to be written to the active log data set.
24	(18)	Signed	4	QJSTRBUF	Number of read log requests satisfied from in-storage buffers.
28	(1C)	Signed	4	QJSTRACT	Number of read log requests satisfied from the active log data set.
32	(20)	Signed	4	QJSTRARH	Number of read log requests satisfied from an archive log data set.
36	(24)	Signed	4	QJSTWTL	See QJSTTVC.
36	(24)	Signed	4	QJSTTVC	Number of read log requests delayed because the number of archive log data sets that could be used was limited by the MAXRTU parameter in the CSQ6LOGP system parameter macro.
40	(28)	Signed	4	QJSTBSDS	Total number of bootstrap data set (BSDS) access requests.
44	(2C)	Signed	4	QJSTBFFL	The number of active log control intervals (CIs) created (log pages used).
48	(30)	Signed	4	QJSTBFWR	Number of calls made that wrote to active log buffers.
52	(34)	Signed	4	QJSTALR	Number of times an archive log data set was allocated for a read request.
56	(38)	Signed	4	QJSTALW	Number of times an archive log data set was allocated for a write request.

60	(3C)	Signed	4	QJSTCIOF	Count of CIs off-loaded to the archive data set.
64	(40)	Signed	4	QJSTLLCP	Number of times that checkpoint was invoked because the number of requests to write to the log buffers was the LOGLOAD value specified in the CSQ6SYSP macro.
68	(44)	Signed	4	QJSTWUR	Number of read accesses delayed due to unavailable resource. This occurs during restart or rollback when using archive logs.
72	(48)	Signed	4	QJSTLAMA	Number of look-ahead tape volume mounts attempted. QJSTLAMA-QJSTLAMS shows how many times look-ahead mounting failed. This value applies during restart or rollback when using archive logs.
76	(4C)	Signed	4	QJSTLAMS	Number of look-ahead tape volume mounts performed. This value applies during restart or rollback when using archive logs.
80	(50)	Signed	4	QJSTLSUS	Number of times a request to write data to buffers was suspended. The request can be suspended because it has to wait until a log buffer has been written to the log data sets, or for example, there were insufficient log buffers - see QJSTWTB.
84	(54)	Signed	4	QJSTLOGW	Total number of write requests to active log data sets.
88	(58)	Signed	4	QJSTCIWR	Total number of log CIs written to active log data sets.
92	(5C)	Signed	4	QJSTSERW	For dual logging this is the number of requests to rewrite a CI, when the I/O was done to each log in series, rather than in parallel. For single logging this is the number of requests to rewrite a CI.
96	(60)	Signed	4	QJSTTHRW	Number of times a log write request was scheduled because the log write threshold (WRTHRSH in the CSQ6LOGP system parameter macro) was reached.
100	(64)	Signed	4	QJSTBPAG	Number of times a log-write buffer had to be paged in before it could be used.
104	(68)	Signed	16		Reserved.
120	(78)	Unsigned	4	QJSTCmpReq	Number of compression request
124	(7c)	Unsigned	4	QJSTCmpFail	Number of compression failures
128	(80)	Unsigned	8	QJSTCmpUncmp	Compress – uncompressed bytes
136	(88)	Unsigned	8	QJSTCmpComp	Compress – compressed bytes
144	(90)	Unsigned	4	QJSTDecReq	Number of decompress requests
148	(94)	Unsigned	4	QJSTDecFail	Number of decompress failures
152	(98)	Unsigned	8	QJSTDecUncmp	Decompress – uncompressed bytes
160	(A0	Unsigned	8	QJSTDecComp	Decompress – compressed bytes
168	(A8)		96		Reserved
264	(108)	Character	0	QJSTEND	End of log manager statistics block

Interpreting log manager statistics

- QJSTWRF is the number of times a request was made to force the log buffers to disk. This occurs when:
  - Persistent messages are put or got out of syncpoint.
  - A commit or backout request is issued where persistent messages have been processed in syncpoint.
  - An **MQSET** call has been issued.
  - An object has been changed using the DEFINE, DELETE or ALTER commands.
  - Updates to QJSTRBUF, QJSTRACT, and QJSTRACH occur when work is backed out or at system restart. The number of backouts you have should be small. If you do have backouts, you should try to have the data in log buffers, or on active logs; you should not have tasks needing archive logs.
- QJSTTVC is the number of delays because the MAXRTU limit was reached. (MAXRTU is the maximum number of tape units that can be allocated for archive read.)

- QJSTWUR is the number of delays that were not due to MAXRTU (QJSTTVC). For example this can be caused by not having allocated enough tape units, or a delay due to a WTOR.
- QJSTTHRW is the number of times a log-write request was scheduled because the log write threshold (WRTHRSH in the CSQ6LOGP system parameter macro) was reached.
- QJSTBSDS is the number of requests to write to the BSDS. The BSDS is updated periodically, such as when an active log switches and when the log buffer is about to wrap.
- QJSTCmp* and QJSTDec* provide information on the compression and decompression using Run Length Encoding(RLE).
- QJSTCmpFail is the number of times the queue manager was unable to achieve any reduction in record length. You should compare the number to QJSTCmpReq (number of compression requests) to see if the number of failures is significant.
- QJSTCmpComp is the total of compressed bytes written to the log and QJSTCmpUncmp is the total bytes before compression. Neither total contains bytes written for log records that were not eligible for compression. If the numbers are similar then compression has achieved little benefit.

Fields you need to monitor

You should monitor the following fields daily or weekly:

QJSTWTB	If this field is non zero you should increase the value of OUTBUFF in the CSQ6LOGP system parameter macro.
QJSTRBUF	If this value is large, applications are backing out and not committing requests; this might be an application problem. You can use the queue level statistics to identify which tasks are backing out rather than committing.
QJSTRACT	If this value is non zero this means that you have long running tasks that are backing out.
QJSTRARH	If this value is non zero this means that you have long running tasks that are backing out and you are having to read from archive logs. You should determine why you have long running tasks backing out, and consider increasing the size or number of your active log data sets.
QPSTBPAG	If this field is non zero it indicates a possible problem with your Z/OS system. You might get benefit by decreasing the number of log buffers (OUTBUFF in the CSQ6LOGP system parameter macro) provided that QJSTWTB is zero.
QJSTTVC	If this value is on zero then you should investigate why you need so many archive logs, and consider increasing the value of MAXRTU to allow more devices to be used.
QJSTLLCP	On a busy system you would expect to see typically 10 checkpoints an hour. If the QJSTLLCP value is larger than this, it indicates a problem in the setup of the queue manager. The most likely reason for this is that the LOGLOAD parameter of the CSQ6SYSP system parameter macro is too small. The other event that causes a checkpoint is when an active log fills up and switches to the next active log data set. If your logs are too small, this can cause frequent checkpoints. ß You should increase the value of the LOGLOAD parameter, or increase the size of your log data sets as required.
QJSTCmpFail/ QJSTCmpReq	This gives the ratio of how successful log compression was for compression requests. If the ratio is close to 1 then compression is not very effective
QJSTCmpUncmp/ QJSTCmpComp	This gives the ratio of how successful log compression was for quantity of data compressed. If the ratio is close to 1 then compression is not very effective

Examples of some log manager statistics

The examples below are to illustrate the use of common log manager statistics. Many of the statistics are not useful for day to day monitoring, and are not discussed.

The statistics are displayed with the supplied program described in "Supplied programs to print out the SMF records"on page 45.

Putting 1000 1000 byte messages

A batch application put a 1000 byte message and issued a commit, then repeated this 1000 times.

In the observations following the log statistics the following interesting figures are discussed

- The number of pages used to hold the messages is 467
- There were 2934 write requests, each writing one page

```
Log manager : QJST
  Write_Wait          0 Write_Nowait     10030 Write_Force           0 WTB      0
  Read_Stor           0 Read_Active          0 Read_Archive         0 TVC      0
  BSDS_Reqs          13 CIs_Created       467 BFWR               1000 ALR      0
  ALW                 0 CIs_Offload         0 Checkpoints          0
  WUR                 0 LAMA                0 LAMS                 0
  Write_Susp       1000 Write_Reqs       2934 CI_Writes          2934
  Write_Serl       2000 Write_Thrsh         0 Buff_Pagein          0
```

1. Description of activities involved in putting a message
   - Two 1000 byte messages fit into a 4K page
   - When there is space on the current(last) page for a second message, it can use the current page.
     o The current queue depth is incremented, and the change logged.
     o The data is put into the page and the insertion logged.
     o When there is not enough space to add the message to the current(last) page, a new page must be used and associated with the queue.
     o The current queue depth is incremented, and the change logged.
     o Allocate a page from the free page list, update the list to reflect the change, and log the changes
     o Format the page, and log data to say the page has been formatted.
     o Insert the page at the end of the queue, adjust various pointers to the new page, and log the changes. Put the message into the page and log the data inserted.
   - For every start Unit Of Work data will be written to the logs buffers
   - For every commit or backout data will be written to the log buffers, and a request made to write the buffers to disk.
   - For the put of a 1000 byte message, the number of writes to the log buffers is typically about 4 + 6* number of messages per unit of work.
2. The number of log pages used (CIs_created) is 467 (field QJSTBFFL). The number bytes used in log buffers is 467 * 4096 = 1,912,832 or about 1900 bytes per message

This number depends on message size, and how much data needs to be logged.

3. There were 10030 Write_Nowait requests (field QJSTWRNW). These are requests to put data in to log buffers. For example, as well as inserting the message into the page, the current depth of the queue is updated, pages have to be allocated, and pages have to be chained together.

4. There were 1000 Write_susp requests (field QJSTLSUS). This corresponds to the commit request where data is forced out to the log data sets. With 2 phase commit there will be two write suspends per commit.

5. CI_Writes (field QJSTCIWR) shows 2934 pages were written to the log data sets. As there was dual logging this is 1467 per log.

6. Although there were 467 CIs created, there were 1467 pages written to a log data set. This is because some pages were rewritten one or more times. A CI is rewritten if it was only partially filled with log records on the previous write.

7. There were 2934 Write_Reqs (field QJSTLOGW) and 2934 CI_Writes (field QJSTCIWR), or 1467 to each log. As the number of pages written equals the number of write requests this shows that only one page was written for each disk write request. As the rate of persistent messages processed increases you may get more pages per I/O

8. Write_serl (field QJSTSERW) is the number of times a page was rewritten. 2000 with dual logging is 1000 per log data set. In a busy system this value is usually different from the number of number of write suspends. The first time a page is written it is written to both logs in parallel. If a CI is rewritten it is written to each log in series. 467 CIs were created. So the first time these are written they will be written in parallel. So 467 of the

1467 CI_write request to a log are parallel, the rest are serial, so 1467-467 is 1000 which is the number of Write_serl requests. On average each page was written 1467/467, or 3-4 times, or rewritten 2-3 times.

The BFWR write requests is the number of requests to write data out to the log data sets (QJSTBFWR). Internal tasks also issue these requests, and this number is typically higher than the number of application commits.

9. When the last page in the log buffers is used then it causes the BSDS to be updated with information about the information in the active logs. If the last page is rewritten then BSDS information is rewritten.
The system had OUTBUFF defined as 400KB, so there were 100 4K pages of log buffers allocated. With 467 CIs created the last page in the log buffers was used 4 or 5 times. So if the last page was written 3-4 (rewritten 2-3 times, see above) times on average, we would expect the number of BSDS requests to be around the range of 3*4 to 4*5 or 12 to 20. The value of BSDS_Reqs=13 matches this.
When an active log fills up, or a checkpoint occurs the BSDS is updated with information about the active and archive logs, as well as checkpoint information.

Getting 1000 1000 byte messages

A batch application got a 1000 byte message and issued a commit, then repeated this 1000 times.

```
Log manager : QJST
  Write_wait        0 Write_Nowait     6511 Write_Force         2 WTB        0
  Read_stor         0 Read_Active         0 Read_archive       0 TVC        0
  BSDS_reqs        11 CIs_created        97 BFWR            1004 ALR        0
  ALW               0 CIs_offload       0 Checkpts           0
  WUR               0 LAMA              0 LAMS               0
  Write_susp     1004 Write_Reqs       2202 CI_Writes        2202
  Write_serl     2008 Write_Thrsh         0 Buff_Pagein       0
```

1. 1000 messages got had 97 CIs_created. This is about 97*4096/1000 or about 400 bytes per message
2. There were 2202 pages written, or 1101 pages per log data set.
3. The average number of times a page was written is 1101/97 or about 11 times.
4. The number of Write_susp requests is the number of application commits plus some requests from internal tasks.
5. 97 pages were written. The first time these pages were written they were written in parallel. The remained were written in serial so each log wrote 2008/2 = 1004 pages, in series. With the 97 in parallel we have total CIs written = 1004 + 97 = 1101 which matches the number of CI_Writes requests.

Putting 100 100,000 byte messages

A batch application put a 100,000 byte message and issued a commit, then repeated this 100 times.

```
Log manager : QJST
  Write_wait        0 Write_Nowait     8214 Write_Force         0 WTB        0
  Read_stor         0 Read_Active         0 Read_archive       0 TVC        0
  BSDS_reqs        26 CIs_created      2550 BFWR             200 ALR        0
  ALW               0 CIs_offload       0 Checkpts           0
  WUR               0 LAMA              0 LAMS               0
  Write_susp      100 Write_Reqs        844 CI_Writes        5300
  Write_serl      200 Write_Thrsh       100 Buff_Pagein                 0
```

1. For 100 messages there were 2550 CIs_created. This equates to 2550/100 pages per message or 2550*4096/100 or about 105000 bytes per message.
2. Each log wrote 5300/2 = 2650 pages.
3. 2550 of these 2650 were writing the data to the log, so 2650-2550 = 100 is the number of rewrite requests.
4. 2650 pages were written in 844/2 write requests, or about 6 pages per write request. This shows more data is written for each I/O request

5. Each message needs more than 26 pages of log buffers. The WRTHRSH was specified as 15 pages. So for each message the WRTHRSH value was exceeded, and can be seen in the value of Write_Thrsh(100) field(QJSTTHRW) which in this case matches the number of messages processed.

6. There were 100 pages of log buffers, so the 2550 CIs created means that each page was used about 2550/100 times, or 25-26 times. The number of BSDS requests (QJSTBSDS) is 25, which matches the 25-26 times.

Getting 100 100,000 byte messages

A batch application got a 100,000 byte message and issued a commit, then repeated this 100 times.

```
Log manager : QJST
  Write_wait        0 Write_Nowait      3108 Write_Force          1 WTB         0
  Read_stor         0 Read_Active          0 Read_archive        0 TVC         0
  BSDS_reqs         5 CIs_created         30 BFWR               102 ALR        0
  ALW               0 CIs_offload          0 Checkpts             0
  WUR               0 LAMA                 0 LAMS                 0
  Write_susp      102 Write_Reqs         264 CI_Writes           264
  Write_serl      204 Write_Thrsh          0 Buff_Pagein           0
```

1. Getting 100 messages had 30 CIs_created. This is about 1200 bytes per message
There were 132 pages written per log data set, so the pages were written 4 or 5 times.

Processing messages concurrently

10 Batch jobs each put a 1000 byte message to a server queue and waited for a reply. Each job did this 1000 times, so there were 10,000 messages requests and 10,000 reply messages processed.

There were 3 server jobs getting from a server queue and sending a reply back to the originator. The processing was get commit, put commit (to simulate two phase commit).

```
Log manager : QJST
  Write_wait        0 Write_Nowait    302738 Write_Force        247 WTB         0
  Read_stor         0 Read_Active          0 Read_archive        0 TVC         0
  BSDS_reqs       271 CIs_created      11010 BFWR               41263 ALR        0
  ALW               0 CIs_offload          0 Checkpts             0
  WUR               0 LAMA                 0 LAMS                 0
  Write_susp    41260 Write_Reqs       72084 CI_Write          72298
  Write_serl    50278 Write_Thrsh          0 Buff_Pagein           0
```

1. 10,000 messages put to the server and 10,000 replies is 20,000 messages. The number of write_susp is 41260 which reflects 40,000 commits from the applications, and 260 commits from the internal task which removes empty pages from queues.

2. There were 11010 CIs_created. This equates to 11010*4096/20,000 or 2255 bytes per message. From the figures above for puts and gets the number of bytes per message is 1900 + 400 = 2300 which is approximately the same.

3. A write to a log data set can process one or more CIs. Each log processed 72298/2= 36149 pages, in 72084/2= 36042 write requests, so most I/O requests processed only one CI.

4. Each log processed 50278/2 = 25139 Write_serial request, so in most cases each page was rewritten 25139/11010 times - or written in parallel once and rewritten 2-3 times serially

After an archive log command was issued

```
Log manager : QJST
  Write_Wait        0 Write_Nowait        73 Write_Force          1 WTB        0
  Read_Stor         0 Read_Active          0 Read_Archive         0 TVC        0
  BSDS_Reqs       222 CIs_Created          2 BFWR                 3 ALR        0
  ALW               2 CIs_Offload       6020 Checkpoints          0
  WUR               0 LAMA                 0 LAMS                 0
  Write_Susp        1 Write_Reqs          10 CI_Writes           10
  Write_Serl        6 Write_Thrsh          0 Buff_Pagein          0
```

1. The number of CIs offloaded is 6020, (field QJSTCIOF)

2. Data was written to active logs, Write_Nowait is > 0, and one Write_force. This is checkpoint information, such as the status of applications, and other tasks.

3. There were 222 BSDS requests (field QJSTBSDS), these include request to read and update records.

Topic manager statistics

The topic manager is responsible for managing publish subscribe.

Table 11. Structure of the topic manager statistics record QTST

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	96	QTST	Topic manager statistics.
0	(0)	Unsigned	2	QTSTID	Control block identifier.
2	(2)	Unsigned	2	QTSTLL	Control block length
4	(4)	Character	4	QTSTEYEC	Control block eye catcher QTST
8	(8)	Unsigned	4	QTSTSTOT	Total subscription requests
12	(0c)	Unsigned	4	QTSTSDUR	Durable subscription requests
16	(10)	Unsigned	4	QTSTSHIG[1]	API: Subscription high water mark
20	(14)	Unsigned	4	QTSTSLOW[1]	API: Subscription low water mark
24	(18)	Unsigned	4	QTSTSHIG[2]	ADMIN: Subscription high water mark
28	(1c)	Unsigned	4	QTSTSLOW[2]	ADMIN: Subscription low water mark
32	(20)	Unsigned	4	QTSTSHIG[3]	PROXY: Subscription high water mark
36	(24)	Unsigned	4	QTSTSLOW[3]	PROXY: Subscription low water mark
40	(28)	Unsigned	4	QTSTSEXP	Subscriptions expired and removed. The subscriptions may be physically deleted some time after the subscription has expired.
44	(2c)	Unsigned	4	QTSTTMSG	Total messages put to a subscriber queue
48	(30)	Unsigned	4	QTSTSPHW	The number of applications which published at least one message
52	(34)	Unsigned	4	QTSTPTOT[1]	API : Total publication requests
56	(38)	Unsigned	4	QTSTPTOT[2]	ADMIN : Total publication requests
60	(3c)	Unsigned	4	QTSTPTOT[3]	PROXY: Total publication requests
64	(40)	Unsigned	4	QTSTPHIG	The highest number of messages published by one application
68	(44)	Unsigned	4	QTSTPLOW	The lowest number of messages published by one application, may be zero
72	(48)	Unsigned	4	QTSTPNOS	Number of times a publish request produced no messages
76	(4c)	Unsigned	4	*	reserved
80	(50)	Character	8	QTSTETHW	Maximum duration an application took to publish. STCK value
88	(58)	Character	8	QTSTETTO	Total duration an applications took to publish. STCK value
96	(60)	Character	12	*	Reserved

Sample C program for displaying statistics and accounting

A C program is provided as an executable and as a source file to display WebSphere MQ statistics and accounting data. The program may be used as-is, but it is intended to be a starting point so you can tailor it to meet your requirements.

This program and the header files provided with this SupportPac are not supported by IBM. But if you tell the author (PAICE@UK.IBM.COM) of any problems, improvements may be incorporated in any future updates - if there are any future updates.

Upload the MQSOURCE in binary to TSO and issue `Receive indsn(MQSOURCE)`

Some of the key members of this data set are

MQCSAMP	The source of the C program which will read WebSphere MQ SMF records and display information in many forms. It contains JCL to compile and linkedit it to create a module MQCSMF.
RUNCSMF	This executes the C program to print WebSphere MQ SMF data.

This program is provided to illustrate ways that the data can processed. The output has been designed primarily so that it fits in this report, rather than for functional value. For example if the reports were to print out channel name, channel qualifier, queue used, there would be very little space left to display other information such as number of bytes processed. In particular timestamps have been omitted from most reports.

Using the sample program

If you change the program beware of the following

1. Some of the fields are 64 bit long, for example those containing time values. These can be processed using "long long" variables available in the Z/OS C compiler. On one of our MVS systems, calculations using long-long variables gave incorrect values. On other systems where the service included a 2000 PUT tape the calculations worked properly. By using floating point, instead of long-long, in calculations this problem can be circumvented.
2. Some numbers can be very large and will not format properly using integer arithmetic in printf. You should consider displaying the data in floating point, like 6.221E+04. This applies to bytes processed, and "time on queue" where some messages could be on a queue for a long period, and one day is 86400000000 microseconds. You could convert the data to other units such as MegaBytes processed instead of bytes processed, and seconds instead of microseconds.
3. You can use the facilities of the ICETOOL facility of DFSORT to do simple accumulation and reporting of maximum and minimum values, see DFSORT ICETOOL Mini-User Guide for more information.

Execute the sample code

Example JCL to run the C program is in given below

```
//PAICEC2  JOB '1',MSGCLASS=H,MSGLEVEL=(0,0),COND=(0,LT)
//S1 EXEC PGM=MQCSMF
//STEPLIB DD DISP=SHR,DSN=MQM.LOAD
//SMFIN    DD DISP=SHR,DSN=MQM.STATS
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=132,RECFM=F)
//SUMMARY  DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//STATS    DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//PUT      DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//GET      DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//DB2      DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//CF       DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//SCF      DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//MM       DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//BM       DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//SDB2     DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//THREAD   DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
//LOG      DD SYSOUT=*,DCB=(LRECL=133,RECFM=F,BLKSIZE=133)
```

The files referenced in the JCL are explained below. All of the files need to be defined, but they can be set to "DD DUMMY" if required.

SMFIN data set

The SMFIN data set is the SMF records which have been extracted from SMF using a job like that on page.45 This data set is typically Variable Blocked Spanned with a 32760 record length.

SYSPRINT contents

The records in this data set give notification of any major problems identified, as a buffer pool too small.

```
2000293 VQM2 Buffer pool 3 is too small make larger
2000293 VQM2 Log stats - make OUTBUFF larger.
2000293 VQM2 Archive logs read.
```

SUMMARY contents

The records in this data set give a summary of the usage of MQI verbs acting on a queue, and where time was spent.

```
Jobname   et_ms %open %clos %get %put %put1 %inq %set %cpu %log %pset %other
CSQ1CHIN      0     0     0  100    0     0    0    0|  97    0     0     3
PAICE4P    3329     7     1   85    4     0    0    0|  19   76     0     5
```

Where

Jobname	Is the job name
et_ms	Is the total time spent doing WebSphere MQ calls against a queue in milliseconds
%open	The percentage of the time spent doing **MQOPEN** calls
%clos	The percentage of the time spent doing **MQCLOSE** calls
%get	The percentage of the time spent doing **MQGET** calls
%put	The percentage of the time spent doing **MQPUT** calls
%put1	The percentage of the time spent doing **MQPUT1** calls
%inq	The percentage of the time spent doing **MQINQ** calls

%set	The percentage of the time spent doing **MQSET** calls
%cpu	The percentage of the time using CPU
%log	The percentage of the time waiting for log I/O to complete
%pset	The percentage of the time waiting for page set I/O to complete
%other	This is calculated as 100 - (%log + %pset + %cpu).

The et_ms for CSQ1CHIN is 0 because the total time was less than 1 millisecond.

STATS contents

The records in this data set give an overview of the MQI verbs used and the average elapsed time and average CPU time user per call.

Jobname	Queue	Verb	Number	Avg et	Avg CT
CSQ1CHIN		Commit	5872	4358	49
CSQ1CHIN		Other	6	63	62
CSQ1CHIN	SERVER	Open	1	103	102
CSQ1CHIN	SERVER	Put	5872	155	150
CSQ1CHIN	SYSTEM.ADMIN.CHANNEL.EVENT	Put1	1	3254	262
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	Open	2	71	70
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	Close	1	28	27
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	Put	5872	117	109
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	Get	5874	94	92
CSQ1CHIN		Commit	5871	3485	46
CSQ1CHIN		Other	6	54	54
PAICE4P		Commit	2000	2143	28
PAICE4P	CPVQM1	Open	1000	70	68
PAICE4P	CPVQM1	Close	1000	26	25
PAICE4P	CPVQM1	Get	2000	1431	93
PAICE4P	CSQ1	Open	1000	195	187
PAICE4P	CSQ1	Close	1000	19	19
PAICE4P	CSQ1	Put	1000	154	149

Where

Jobname	Is the job name
Queue	Is the queue name, or blank for commit, backout and "Other".
Verb	The MQI verb used. "Other" is used for some internal verbs, and when data cannot be collected, for example an when an **MQOPEN** fails.
Number	The number of times this verb was used
Avg et	The average elapsed time per call in microseconds
Avg CT	The average cpu time per call in microseconds

PUT contents

The records in this data set give an overview of **MQPUT** and **MQPUT1** verbs.

Jobname	Queue	Valid Put	Put	Put1	Put_Bytes	PutMax	PutMin
CSQ1CHIN	SERVER	5872	5872	0	5872000	1000	1000
CSQ1CHIN	SYSTEM.ADMIN.CHANNEL.EVENT	1	0	1	124	124	124
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	5872	5872	0	2513216	428	428
PAICE4P	CSQ1	1000	1000	0	1000000	1000	1000

Where

Jobname	Is the jobname
Queue	Is the queue name used

Valid Put	Is the number of valid **MQPUT** and **MQPUT1** requests
Put	Is the number of **MQPUT** requests
Put1	Is the number of **MQPUT1** requests
Put_Bytes	Is the number of bytes put to the queue. Note: This is potentially a very large number so this may not display properly. You may decide to modify this to be a floating point number or use MegaByte units.
PutMax	Is the maximum message size in bytes
PutMin	Is the minimum message size in bytes.

GET contents

The records in this data set give an overview of the **MQGET** verb.

There are entries for multiple channels and applications. There is a jobname/queue record for each. If the channel name was specified it would be clearer.

Jobname	Queue	Get	Valid Get	Bytes	MaxGet	MinGet	MaxTOQ	MinTOQ	AvgTOQ
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	5874	5873	2513644	428	428	8.6E+09	3.2E+04	1.5E+06
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	11743	11741	5166052	452	428	1.1E+06	9.3E+03	2.7E+04
CSQ1CHIN	VQM1	17616	11744	8385216	1428	0	1.7E+04	2.7E+03	4.0E+03
CSQ1CHIN	SYSTEM.CHANNEL.SYNCQ	6	3	1284	428	428	1.3E+09	1.3E+09	4.2E+08
PAICE4P	CPVQM1	2000	2000	1000000	1000	0	2.1E+05	6.5E+03	4.1E+04

Where

Jobname	Is the jobname
Queue	Is the queue name used
Valid Get	Is the number of valid gets. See Required fixes on page 5
Get	Is the number of **MQGET** requests
Get_Bytes	Is the number of bytes got from the queue. Note this is potentially a very large number so this may not display properly.
Maxget	Is the maximum message size in bytes
Minget	Is the minimum message size in bytes
MaxTOQ	Is the maximum time a message was on the queue in microseconds
MinTOQ	Is the minimum time a message was on the queue in microseconds
AvgTOQ	Is the average time a message was on the queue in microseconds.

The time on queue is the difference in time from when the message was put onto the queue to the time it was got. This can be a very large number so it is displayed in floating point format.

DB2 contents

The records in this data set are for the time a task spent in DB2.

Jobname	Count	Avg_ET_T	Avg_ET_S	Max_Ti_T	Max_Ti_S
VQM1CHIN	5	3179	3083	3344	3241
VQM1CHIN	5	3366	3260	3571	3462

Where

Jobname	Is the jobname
Count	Is the count of requests

Avg_ET_T	Is the average wait time for the task in microseconds
Avg_ET_S	Is the average wait time for the server in microseconds
Max_Ti_T	Is the maximum wait time for the task in microseconds
Max_Ti_S	Is the maximum wait time for the server in microseconds.

For information on task time and server time, see DB2 statistics from WebSphere MQ on page 18.

CF contents

The records in this data set are for time spent processing Coupling Facility requests by jobname.

See Coupling Facility statistics on page 23 for what the terms mean.

```
Jobname  E_calls E_redrive Avg_E_time M_calls M_redrive Avg_M_time
CSQ1CHIN      32         0        51      16         0        288
CSQ11       4667         0        43    1333         0         55
```

Where

Jobname	Is the jobname
E_calls	Is the count of IXLLSTE requests to the Coupling Facility
E_redrive	Is the number of redrives for IXLLSTE
Avg_E_time	Is the average time for the IXLLSTE in microseconds
M_calls	Is the count if IXLLSTM requests to the Coupling Facility
M_redrive	Is the number of redrives for IXLLSTM
Avg_M_time	Is the average time for the IXLLSTM in microseconds.

SCF contents

The records in this data set are for the time spent processing Coupling Facility requests summarized by Coupling Facility structure name.

```
Date    QMGR CFN CFname       |    Num_E  Avg_E_T %Redrive    Num_M  Avg_M_T %Redrive Num_full
2000293 CSQ1   0 CSQ_ADMIN         11914       32       0        0        0       0        0
2000293 CSQ1   1 APPLICATION1      35082       44       0    17531      156       0        0
2000293 CSQ1   0 CSQ_ADMIN         74621       33       0        0        0       0        0
2000293 CSQ1   1 APPLICATION1     223852       43       0   111937      156       0        0
```

Where

Date	Is the date in yyyyddd format
QMGR	Is the queue manager name
CFN	Is the Coupling Facility number
CFname	Is the name of the Coupling Facility Structure
Num_E	Is the count if IXLLSTE requests
Avg_E_T	Is the average time for the IXLLSTM in microseconds
%Redrive	Is the number of redrives for IXLLSTE
Num_M	Is the count if IXLLSTM requests
Avg_M_T	Is the average time for the IXLLSTM in microseconds
%Redrive	Is the number of redrives for IXLLSTM
Num_full	Is the number of times the structure was full.

MM contents

The records in this data set are for the message manager statistics

Date	Open	Close	Get	Put	Put1	Inq	Inql	Set
2000293	42	0	23193	5637	11914	0	0	0
2000293	0	0	5	0	0	0	0	0

BM contents

The records in this data set are for the buffer manager statistics.

Date...	QMGR	BP	NumBuff	%now	%low	dwt	dmc	stl	stla	sos
2000293	CSQ1	0	50000	0	100	0	0	0	0	0
2000293	CSQ1	1	99000	0	100	0	0	0	0	0
2000293	CSQ1	2	99000	0	100	0	0	0	0	0
2000293	CSQ1	3	99000	0	100	0	0	0	0	0

See Buffer manager statistics on page 28 for information on the meaning of the columns.

SDB2 contents

The records in this data set are for the WebSphere MQ usage of DB2 statistics

Date	Time	QMGR	Max_Depth	Num_deadlock
2000308	00:30:00.40	CSQG	4	0
2000308	01:00:00.00	CSQG	1	0
2000308	01:30:00.00	CSQG	0	0

See DB2 statistics record (Q5ST) on page 20 for information on the meaning of the columns.

THREAD contents

The records in this data set show the job name, jobtype and channel name of active WebSphere MQ threads.

Jobname	type	Channel	channel qualifier
CSQ1	RRS		
CSQ1CHIN	Channel		
CSQ1CHIN	Channel	TO.CSQG	WINMVS2A(2163)
CSQ1CHIN	Channel	VQM1.TO.CSQ1	9.20.101.14
CSQ1CHIN	Channel	CSQ1.VQM1	WINMVS25(2171)
CSQ1CHIN	Channel		
CSQ1CHIN	Channel	TO.CSQ1	WINMVS25(2170)
CSQ1	IMS Control		
CSQ1CHIN	Channel	VQM1.TO.CSQ1	9.20.101.14
CSQ1CHIN	Channel	CSQ1.VQM1	WINMVS25(2171)
CSQ1CHIN	Channel		
CSQ1CHIN	Channel	TO.CSQ1	WINMVS25(2170)
CSQ1CHIN	Channel	TO.CSQG	WINMVS2A(2163)

See Meaning of the channel names on page 63 for information on the meaning of the columns.

LOG contents

The records in this data set are for the log manager statistics

Date	QMGR	wr_wait	wr_nwait	wr_force	Wait_Buf	read_buf	read_act	read_arc	r_delay	N_CheckP	Num I/O	Num_CI_W	paging
2000293	CSQ1	0	273944	157	0	0	0	0	0	0	82188	82188	0
2000293	CSQ1	0	0	0	0	0	0	0	0	0	0	0	0

Supplied programs to print out the SMF records

Three program executables (no source) are available with this SupportPac.

MQ1150 This prints out WebSphere MQ statistics

MQ116S This prints out the class(3) task and queue accounting records

MQ1160 This prints out the class(1) accounting information.

These programs are suitable for displaying the contents of a few records, but are impractical for processing a large number of records as they can generate a large amount of output.

You should use products like Performance Reporter® or SAS® for long term processing of the statistics or accounting data.

To install these on Z/OS, upload the file MQLOAD to Z/OS in binary, for example using FTP, and use the TSO command "Receive indsn(xxx.xxx)" where xxx.xxx is the data set name on Z/OS

To extract the SMF records from the SMF datasets you can use a job similar to the one below.

Sample job to extract the WebSphere MQ SMF records from the SMF data sets. You can specify a time range in hhmm format using START() and END().

Figure 4. Job to extract data from SMF

```
//RUNPROG  JOB 1,CLASS=A
//*
//* Extract the records from the SMF database
//*
//SMFDUMP  EXEC PGM=IFASMFDP,REGION=0M
//DUMPOUT  DD   DSN=PAICE.MQSMF,DISP=(NEW,CATLG),SPACE=(CYL,(10),RLSE)
//SYSPRINT DD   SYSOUT=*
//SYSIN    DD   *
  INDD(DUMPIN,OPTIONS(DUMP))
  START(0000)
  END(2359)
  OUTDD(DUMPOUT,TYPE(115,116))
/*
//DUMPIN   DD   DSN=SYS1.MAN1,DISP=SHR,AMP=('BUFSP=65536')
```

Figure 5 Job to extract data from SMF log stream

```
//STEP1     EXEC  PGM=IFASMFDL
//DUMPOUT  DD   DSN=PAICE.SMF,DISP=(NEW,CATLG),
//       SPACE=(CYL,(200,100),RLSE)
//SYSPRINT DD        SYSOUT=A
//SYSIN    DD  *
DATE(2009344,2010108)
START(1800)
LSNAME(IFASMF.MQ,OPTIONS(ALL))
OUTDD(DUMPOUT,TYPE(116,115))
/*
```

The log stream IFASMF.MQ has been defined in SMF as LSNAME(IFASMF.MQ,TYPE(115,116)). You can use the MVS command DISPLAY SMF,O to display what log streams have been defined, and what SMF record types they collect.

Figure 6. Example JCL to run the supplied programs to print the SMF records

```
//PAICESM1 JOB NOTIFY=PAICE,MSGCLASS=H,MSGLEVEL=(0,0)
//S1 EXEC PGM=CSQW1150
//STEPLIB  DD DISP=SHR,DSN=MQM.MQLOAD
//SYSPRINT DD SYSOUT=*
```

```
//SMFIN    DD DISP=SHR,DSN=PAICE.MQSMF

//PAICESM2 JOB NOTIFY=PAICE,MSGCLASS=H,MSGLEVEL=(0,0)
//S1 EXEC PGM=CSQW1160
//STEPLIB  DD DISP=SHR,DSN=MQM.MQLOAD
//SYSPRINT DD SYSOUT=*
//SMFIN    DD DISP=SHR,DSN=PAICE.MQSMF

//PAICESM3 JOB NOTIFY=PAICE,MSGCLASS=H,MSGLEVEL=(0,0)
//S1 EXEC PGM=CSQW116S
//STEPLIB  DD DISP=SHR,DSN=MQM.MQLOAD
//SYSPRINT DD SYSOUT=*
//SMFIN    DD DISP=SHR,DSN=PAICE.MQSMF
```

Example output and description of the WebSphere MQ statistics printout

Example print out of WebSphere MQ statistics - part 1

```
MVS:MV25 MQ_Subsys:CSQ1 Date 2000297  Time 16:40:34.25
Storage manager : QSST
  fix. pools created:        1, Deallocated:        4
  fix. segments freed:       0, expanded:       0, contracted       0
  var. pools created:        3, Deallocated:        3
  var. segments freed:       4, expanded:       4, contracted       0
  # Getmains:      2003, # Freemains:      2007, # non-zero Rcs        0
  # SOS bit:       0, # contractions        0, # Abends        0
Log manager : QJST
  Write_wait        0 Write_Nowait        0 Write_Force          0 WTB        0
  Read_stor         0 Read_Active         0 Read_archive         0 TVC  0
  BSDS_reqs         0 CIs_created         0 BFWR                 0 ALR        0
  ALW               0 CIs_offload         0 Checkpts             0
  WUR               0 LAMA                0 LAMS                 0
  Write_susp        0 Write_Reqs          0 CI_Writes            0
  Write_serl        0 Write_Thrsh         0 Buff_Pagein          0
```

The header MVS:MV25 MQ_Subsys:CSQ1 Date 2000297 Time 16:40:34.25 is taken from the SMF header.

The Storage manager : QSST section is only of interest to IBM.

For section Log manager: QJST

Log manager statistics on page 31. The fields are in the same order as Table 10 on page 61, and the fields have been given more meaningful names.

Example print out of WebSphere MQ statistics - part 2

```
MVS:MV25 MQ_Subsys:CSQ1 Date 2000297  Time 16:40:34.25
Message manager : QMST
  #MQOPEN      6001 #MQCLOSE 2001 #MQGET  9051 #MQPUT  4000 #MQPUT1  0 #MQINQ  0 #MQSET
0
Data manager : QIST
  #Create        0 #Put        0 #Delete 0 #Get    7000 #Locate   18003    #stgclass      0
Buffer manager : QPST
  00 #buff     50000 #low     49967 #now      49967 #getp     13944 #getn         0
  00 Rio           0 STW      13944 TPW           0 WIO           0 IMW           0
  00 DMC           0 STL          0 STLA          0 SOS           0
  01 #buff     99000 #low     98664 #now      98664 #getp      8334 #getn       672
  01 Rio           0 STW       6018 TPW           0 WIO           0 IMW           0
  01 DMC           0 STL          0 STLA          0 SOS           0
  02 #buff     99000 #low     94876 #now      94876 #getp     16176 #getn      1227
  02 Rio           0 STW      11725 TPW           0 WIO           0 IMW           0
  02 DMC           0 STL          0 STLA          0 SOS           0
  03 #buff     99000 #low     99000 #now         0 #getp         0 #getn         0
  03 Rio           0 STW          0 TPW           0 WIO           0 IMW           0
  03 DMC           0 STL          0 STLA          0 SOS           0
Lock manager : QLST
  #lock gets    105821, already held      2998 releases     32873
DB2 manager : Q5ST
  Tasks  : Servers   10 Active   11 Conns    0 discs    0     High    1 Abend        0 Requeue   0
  Number of deadlock conditions :    0
  Reads  : #:  304 Task Avg m/s :    2 Task Max m/s :    8 DB2 Avg m/s :    2  DB2 Max m/s :    8
  Writes : #:   24 Task Avg m/s :    9 Task Max m/s :   68 DB2 Avg m/s :    8  DB2 Max m/s :   68
  Lists  : #:   60 Task Avg m/s :   20 Task Max m/s :   38 DB2 Avg m/s :   20  DB2 Max m/s :   38
  Deletes: #:   24 Task Avg m/s :   28 Task Max m/s :  104 DB2 Avg m/s :   27  DB2 Max m/s :  104
  SCS Selects: #:   21 Task Avg m/s :    7 Task Max m/s :   92 DB2 avg m/s :    7  DB2 Max m/s :   91
  SCS Inserts: #:   71 Task Avg m/s :   20 Task Max m/s :  259 DB2 avg m/s :   20  DB2 Max m/s :  259
  SCS Updates: #:   71 Task Avg m/s :   13 Task Max m/s :   31 DB2 avg m/s :   13  DB2 Max m/s :   31
CF manager : QEST
  Structure #:        0, Name      CSQ_ADMIN   , Structure-fulls   0
  Single           1000, Avg time uS         53, Single   retries  0
  Multiple            0, Avg time uS          0, Multiple retries  0
  Max used entries       344, Max used elements       666
  Structure #:        1, Name      APPLICATION1, Structure-fulls   0
  Single           1000, Avg time uS         73, Single   retries  0
  Multiple         1000, Avg time uS        211, Multiple retries  0
  Max used entries      1313, Max used elements      7192
```

The header MVS:MV25 MQ_Subsys:CSQ1 Date 2000297 Time 16:40:34.25 is taken from the SMF header.

For section Message manager : QMST see Message manager statistics on page 26. The fields are in the same order as but the fields have been given more meaningful names.

For section Data manager : QIST see Data manager statistics on page 27. The fields are in the same order as in Table 8 on page 52 and the fields have been given more meaningful names.
For section Buffer manager : QPST see Buffer manager statistics on page 28. The fields are in the same order as in Table 9 on page 53 but the fields have been given more meaningful names, and the first field in the line is the buffer pool number.

The Lock manager : QLST statistics are only of interest to IBM.

For section DB2 manager: Q5ST see DB2 statistics record (Q5ST) on page 20. The fields are taken from Table 6 on page 43 . Rows which have all zero values are omitted, for example there was no Shared Sync Queue activity so all of the SSK* counters are zero, and so the rows are omitted.

For section CF manager : QEST see Coupling Facility statistics on page 23. There are 0 or more subsections taken depending on the number of Coupling Facility structures which have had any activity The fields are taken from Table 6 on page 48. Row which have all zero values are omitted.

Example output and description of the WebSphere MQ accounting printout

Example print out of the old WebSphere MQ accounting records

```
MVS:MV25 MQ_Subsys:CSQ1 Date 2000297  Time 16:39:42.04
QWHS: Job IMSV     Job_Userid IMSCREG  Tran_Userid IMSCREG  Connection IMS  Thread 4042322161
CSQQTRMN
QWHC: Accounting token : , Network identifier : IMSV
QMAC: CPU 00000318 MQPUT 0-99        0 100-999        0 1000-9999        0 >9999        0
QMAC:             MQGET 0-99        0 100-999     2002 1000-9999        0 >9999        0
```

The header MVS:MV25 MQ_Subsys:CSQ1 Date 2000297 Time 16:39:42.04 is taken from the SMF header.

The fields are described in **Error! Reference source not found.** on page **Error! Bookmark not defined.**. The CPU field is the CPU time used in milliseconds.

Example output and description of the new WebSphere MQ accounting printout

The statistics are discussed in

Understanding and using class 3 accounting data on page 11 , and the records have information on

- Task identification, described in Table 17. Layout of theTask Id structure(WTID) on page 62. See page 48 for example printout.
- Task accounting data, described in Table 16. Layout of the task related information (WTAS) structure on page 59. See page 48 for example printout.
- Queue accounting data, described in Queue records (WQ)on page 55 . See page 49 for example printout.

Figure 7. Example print out of the class(3) WebSphere MQ accounting records - task identification

```
MVS:MV25 ,WebSphere MQ sys:CSQ1 ,Jobname:PAICEIMS ,Userid:PAICE1 ,Date 2000297  ,Time
16:37:36.61
        ====> New task record found     <==========
== Thread type.....> MVS/TSO
== Connection name.....> PAICEIMS
== Operator id.....> PAICE1
== User identifier.....> PAICE1
== Channel name.....>
== Chl Connection.....>
== Correlator Id.....>
== Correlator Id.....(HEX)> 40404040404040404040404040
== Context token.....>
== Context token.....(HEX)> 00000000000000000000000000000000
== NID.....>
== NID.....(HEX)> 40404040404040400000000000000000
== accounting token.....>
== accounting token..(HEX)> 000000000000000000000000000000000000000000000000
== UOW identifier.....>                ¸O|·x
== UOW identifier....(HEX)> 40404040404040404040404040404040B4D611B3A73D0001
```

The header MVS:MV25 MQ_Subsys:CSQ1 Date 2000297 ,Time 16:37:36.61 is taken from the SMF header.

Figure 8. Example print out of the class(3)WebSphere MQ accounting records - task identification

```
== Task Token : 23/10/2000, 15:36:47.79, 7f14b7b8,   2741f038
```

```
== Interval : START 23/10/2000, 15:36:47.79
== Interval : END   23/10/2000, 15:37:56.61
== Commit  : Count       2000 ,avg elapse        130 ,avg CPU         34
== Suspend : Count       2000 ,avg elapse        100
== Pages   : New      20878 ,Old       1672
== Task Token : 23/10/2000, 15:36:47.79, 7f14b7b8,   2741f038
```

The row with == Commit gives the number of commit requests, and the average elapsed time for the commit requests in microseconds and the average CPU time used on the users TCB in microseconds of CPU.

Figure 9. Example print out of the class(3) WebSphere MQ accounting records - task identification

```
Open name CP0000                                , Base name CP0000
First opened  : 23/10/2000, 15:36:47.80
Last closed   : 23/10/2000, 15:37:56.60
Pageset identifier:          2, Bufferpool:          2
Current opens :          0 , Total Requests :       6000
GETs : Valid       4000 Max size         70 Min Size   0 Total bytes   00000000000222E0
GETs : Dest-S          0, Dest-G       4000, Brow-S          0 Brow-G          0
Gets : Maximum latency 00000  0:00:00.940
Gets : Minimum latency 00000  0:00:00.002
GETs : Average latency 00000  0:00:00.003
Generated messages :          0
MQCall          N        ET        CT     Susp   LOGW  PSET Epages skip expire
Open         1000        62        60
Close        1000        26        25
Get          4000        63        62        0     0    0    2218   0    0
```

The row with GETs : Valid gives the number of gets which returned a message(valid gets) the maximum and minimum message sizes in bytes, and the total number of bytes processed as an 8 character hex number. It is displayed in hex because this number could be very large and normal 31 bit arithmetic may not work.

The row with GETs : Dest-S gives

- the number of destructive gets where a message id or correlation id was specified (Dest-S)
- the number of destructive gets where a message id or correlation id was not specified (Dest-G)
- the number of browse requests where a message id or correlation id was specified (Brow-S)

- the number of browse requests where a message id or correlation id was not specified (Brow-G)

The rows giving latency times give the value in yyddd hh:mm:ss.ttt format.

The row with MQCall N ET CT Susp LOGW PSET Epages skip expire is a heading for information about the verbs following. The columns have the following meaning

MQCall	**MQOPEN**, **MQPUT** etc
N	Number of times the verb was issued
ET	Average elapsed time in microseconds
CT	Average CPU time used in microseconds
Susp	Some verbs can be suspended, this gives the average time in microseconds if the verb was suspended
LOGW	This is the average time in microseconds the verb was suspended waiting for log I/O
PSET	The average time in microseconds waiting for page set I/O in microseconds (when the page set was not page set 0)
Epages	The number of empty pages scanned during a get
skip	the number of messages that were skipped when looking for the required message
expire	the number of expired messages that were skipped when looking for the required message

Sample C program to dump statistics and accounting

A program CSQ4SMFD is now provided as part of the base product. See SCSQPROC(CSQSMFJ) and SCSQLOAD(CSQ4SMFD) and MQM.V700.SCSQC37S(CSQ4SMFD)

This program is provided to show each statistics and accounting control block in an unaltered dump like format. It can be used to view the contents of the each complete block, or individual fields within the control block.

Integer fields are displayed as decimal number whereas doubleword and character fields are displayed in hexadecimal and displayable character format.

Execute the sample code

Example JCL to run the C program is in given below

```
//S1 EXEC PGM=MQCDUMP
//STEPLIB DD DISP=SHR,DSN=++HLQ++.MP1B.LOAD
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=132,RECFM=F)
//QMAC     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QWHS     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//WTID     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//WTAS     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//WQ       DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//Q5ST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QEST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QIST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QJST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QLST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QMST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QPST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//QSST     DD SYSOUT=*,DCB=(LRECL=233,RECFM=F,BLKSIZE=233)
//SMFIN    DD DSN=++SMFIN++(0),DISP=SHR
```

The files referenced in the JCL are explained below. All of the files need to be defined, but they can be set to "DD DUMMY" if required.

SMFIN data set

The SMFIN data set is the SMF records which have been extracted from SMF using a job like that on page.45 This data set is typically Variable Blocked Spanned with a 32760 record length.

Sample output (QMST)

```
message manager statistics data
--Q-M-S-T---H-E-X---P-R-I-N-T----
Address  = 19309A48
00000000 : D40F0030 D8D4E2E3 00000000 00000000 <M...QMST........>
00000010 : 00000000 00000000 00000000 00000000 <................>
00000020 : 00000000 00000000 00000000 00000000 <................>
--Q-M-S-T---F-O-R-M-A-T-T-E-D----
qmstid   = d40f
qmstll   = 0048
qmsteyec = QMST
qmstopen = 00000000
qmstclos = 00000000
qmstget  = 00000000
qmstput  = 00000000
qmstput1 = 00000000
```

```
qmstinq  = 00000000
qmstinql = 00000000
qmstset  = 00000000
qmstendw = 00000000
qmstcalh = 00000000
```

Sample output (WTID)

```
Class 3 Accounting - Thread identification data
--W-T-I-D---H-E-X---P-R-I-N-T----
Address  = 19309A28
00000000 : F70000D0 E6E3C9C4 00000002 C1F8C5C1 <7..}WTID....A8EA>
00000010 : C4C5D740 C1F8C5C1 C4C54040 40404040 <DEP A8EADE      >
00000020 : 40404040 00000000 00000000 40404040 <    ........    >
00000030 : 40404040 40404040 40404040 40404040 <                >
00000040 : 40404040 40404040 BA138276 3CBC0001 <        ..b.....>
00000050 : 00000000 00000000 00000000 00000000 <................>
00000060 : 00000000 00000000 00000000 00000000 <................>
00000070 : 00000000 00000000 00000000 00000000 <................>
00000080 : 00000000 00000000 00000000 00000000 <................>
00000090 : 00000000 00000000 00000000 00000000 <................>
000000A0 : 00000000 00000000 00000000 00000000 <................>
000000B0 : 00000000 00000000 0000C1F8 C5C1C4C5 <.........A8EADE>
000000C0 : 40400000 00000000 00000000 7BFD0838 <  .........#...>
--W-T-I-D---F-O-R-M-A-T-T-E-D----
wtidshex = f700
wtidlen  = 0208
wtideyec = WTID
wtidatyp = 00000002
wtidccn  : (addr) '19309A34' (hex) 'C1F8C5C1C4C5D740' : (disp) 'A8EADEP '
wtidopid : (addr) '19309A3C' (hex) 'C1F8C5C1C4C54040' : (disp) 'A8EADE  '
wtidnid  : (addr) '19309A44' (hex) '40404040404040400000000000000000' : (disp) '        ........'
wtidcori : (addr) '19309A54' (hex) '40404040404040404040404040' : (disp) '            '
```

Appendix A. Overall layout of WebSphere MQ SMF records

SMF record layout

The standard layout for SMF records involves three parts:

Part of record	What it is used for
SMF header	Provides format, identification, and time and date information about the record itself.
Self-defining section	Defines the location and size of the individual data records within the SMF record.
Data records	The actual data from WebSphere MQ that you want to analyze.

For more information about SMF record formats, see the MVS System Management Facilities (SMF) manual.

SMF record header description

The SMF header is the same for subtypes 115 and 116 and the layout is given in Table 11. The fields are labeled SM116* to match the description of other SMF records in the MVS System Management Facilities (SMF) manual.

Note: The length of the record subtype(SM116ST) is now two bytes instead of 1 byte, to conform with the standard SMF record layout.

Table 12. SMF record header description

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	28	SM116	SMF record header.
0	(0)	Unsigned	2	SM116LEN	SMF record length.
2	(2)		2		Reserved.
4	(4)	Unsigned	1	SM116FLG	System indicator.
5	(5)	Unsigned	1	SM116RTY	Record type. The SMF record type, for WebSphere MQ accounting records this is always 116 (X'74'). For WebSphere MQ statistics this is 115 (X'73').
6	(6)	Unsigned	4	SM116TME	Time when SMF moved record.
10	(A)	Unsigned	4	SM116DTE	Date when SMF moved record.
14	(E)	Character	4	SM116SID	Z/OS subsystem ID. Defines the Z/OS subsystem on which the records were collected.
18	(12)	Character	4	SM116SSI	WebSphere MQ subsystem ID.
22	(16)	Unsigned	2	SM116STY	Record subtype.
24	(18)	Character	3	SM116REL	WebSphere MQ version, release and modification
27	(1B)		1	SM116SEQ	Reserved.
28	(1C)	Character	0	SM116END	End of SMF header and start of self-defining section.

Processing accounting records (SMF type 116)

Each SMF 116 record has a subtype, field SM116STY. The subtypes used are

Subtype	Description
0	Message manager accounting. This is described in **Error! Reference source not found.** on page **Error! Bookmark not defined.**
1	Queue level accounting. It has data on task identification, task related statistics and queue records. It is described in Understanding and using class 3 accounting data on page 9.
2	Queue level accounting extension records. This is used when there are too many queue records to fix into a subtype 1 record. It has sections on task identification and queue records. It is described in Understanding and using class 3 accounting data on page 9.

Processing statistics records (SMF type 115)

The SMF header is identical in structure to the SMF type 116 records, and these fields(SM116*) can be used to access the fields.

Each SMF 115 record has a subtype. The subtypes used are

Subtype	Description

1	Log manager statistics. These are described in Log manager statistics on page.31
2	Message manager, data manager, buffer manager, DB2 manager and Coupling Facility manager These are described in Message manager statistics on page 26 , Data manager statistics on page 27, Buffer manager statistics on page 28, **Error! Reference source not found.** on page **Error! Bookmark not defined.** and Coupling Facility statistics on page 23

Self-defining sections

A self-defining section of an SMF record tells you where to find the different records, how long they are, and how many times that type of record is repeated. The self-defining sections follow the header, at a fixed offset from the start of the SMF record.

The table below summarizes the offsets from the start of the SMF record header.

Table 13. SMF record header description

Offsets are from the start of the SMF record and are fixed for each type of accounting source.			
	Offsets		
Source of accounting data	Dec	Hex	See...
Accounting SMF type 116, subtype 0			
Common WebSphere MQ SMF header	28	(X'1C')	Table 12. SMF record header description on page 52
Message manager	44	(X'2C')	Table 7. Structure of the message manager statistics record QMST on page 26
Accounting SMF type 116, subtype 1			
Common WebSphere MQ SMF header	28	(X'1C')	Table 20. Structure of the Common WebSphere MQ SMF header record QWHS on page 63
Task identification	36	(X'24')	Table 17. Layout of theTask Id structure(WTID)on page 62
Task accounting	44	(X'2C')	Task related information(WTAS) on page 59
Queue records	52	(X'34')	Queue records (WQ) Present if QWHSNSDA is larger than 3. See Table 20. Structure of the Common WebSphere MQ SMF header record QWHS on page 63. Note that this section may not be present, if the application did not process any queues in the time period.
Accounting SMF type 116, subtype 2			
Common WebSphere MQ SMF header	28	(X'1C')	Table 20. Structure of the Common WebSphere MQ SMF header record QWHS on page 63
Task identification	36	(X'24')	Table 17. Layout of theTask Id structure(WTID)on page 96
			There is no task accounting section in the subtype 2 record
Queue records	44	(X'2C')	Table 15. Layout of the Queue (WQ) structure on page 55
Statistics SMF type 115, subtype 1			
Storage manager	100	(X'64')	This is of use only to IBM
Log manager	116	(X'74')	Table 10. Structure of the log manager statistics record QJST on page 31
Statistics SMF type 115, subtype 2			
Message manager	36	(X'24')	Table 7. Structure of the message manager statistics record QMST on page 26
Data manager	44	(X'2C')	Table 8. Structure of the data manager statistics record QIST on page 27
Buffer manager	52	(X'34')	Table 9. Structure of the buffer manager statistics record QPST on page 28
Lock manager	60	(X'3C')	This is of use only to IBM
DB2 manager	68	(X'44')	Table 5. DB2 statistics record on page 20
Coupling Facility manager	76	(X'4C')	Table 6. Coupling Facility record layouton page on page 23
Note: Other self-defining sections refer to data for IBM use only.			

Each self-defining record is two fullwords long and has this format: `ssssssssllllnnnn`

where:

ssssssss	Fullword containing the offset from start of the SMF record.
llll	Halfword giving the length of this data record.
nnnn	Halfword giving the number of data records in this SMF record.

Note: Always use offsets in the self-defining sections rather than the absolute position in SMF record to locate the accounting records, because if the length of a section, or the number of sections change, the absolute position in the SMF record will change.

Table 14. Structure of the Common WebSphere MQ SMF header record QWHS

This structure is the same as Structure of the WebSphere MQ SMF header QHWS101except the fields, such as connection name, refer to the task that creates the SMF records, and not to the application.

Offsets					
Dec	Hex	Type	Len	Name	Description
0	(0)	Structure	128	QWHS	
0	(0)		6		Reserved.
6	(6)	Character	1	QWHSNSDA	Number of self defining sections in the SMF records.
7	(7)		5		Reserved.
12	(0C)	Character	4	QWHSSSID	Subsystem name.

Appendix B: Detail layout of WebSphere MQ accounting and statistics records

Queue records (WQ)

This member is defined in CSQDWQ.

This data is present in SMF 116 subtype 1 records, (if the number of self defining sections is greater than 3. See Table 20. Structure of the Common WebSphere MQ SMF header record QWHS on page 54. and in SMF 116 subtype 2 records. See Self-defining sections on page.53

Table 15. Layout of the Queue (WQ) structure

Offsets					
Dec	Hex	Type	Len	Name	Description
0	0	Structure	576	WQSTAT	
0	0	Signed	2	WQID	Control block hex ID
2	(2)	Signed	2	WQLL	Length of the block
4	(4)	Character	4	WQEYE	Eye catcher (WQST)
8	(8)	Signed	4	WQVER	Version number
12	(C)	ADDRESS	4	WQNEXT	Reserved
16	(10)	Character	16	CORREL	Correlator to tie block to owning WTAS
32	(20)	Character	48	OBJNAME	Object name as opened
80	(50)	Character	48	BASENAME	Base name or generate name if applicable
128	(80)	Character	8	OPENTIME	Time queue opened (this is the first time if data is accumulated)
136	(88)	Character	8	CLOSTIME	Time the queue was closed (this is the last time if data is accumulated)
Object information					
144	(90)	Signed	4	QTYPE	Queue type (for example, local)
148	(94)	Signed	4	INDXTYPE	Index type of queue
152	(98)	Signed	4	QSGDISP	QSGDISP (for example, SHARED or GROUP)
MQOPEN					
156	(9C)	Character	4	OPENEYE	Eye catcher (OPEN)
160	(A0)	Character	8	OPENET	Total elapsed time for **MQOPEN** processing
168	(A8)	Character	8	OPENCT	Total amount of CPU time processing **MQOPEN** calls
176	(B0)	Unsigned	4	OPENN	Number of **MQOPEN** calls
MQCLOSE					
180	(B4)	Character	4	CLOSEEYE	Eye catcher (CLOS)
184	(B8)	Character	8	CLOSEET	Total elapsed time for **MQCLOSE** processing
192	(C0)	Character	8	CLOSECT	Total CPU times used for **MQCLOSE** processing
200	(C8)	Unsigned	4	CLOSEN	Number of **MQCLOSE** calls
MQGET					
204	(CC)	Character	4	GETEYE	Eye catcher (GET)
208	(D0)	Character	8	GETET	Elapsed time processing **MQGET** calls
216	(D8)	Character	8	GETCT	CPU times used processing **MQGET** calls
224	(E0)	Unsigned	4	GETN	Total number of **MQGET** calls
228	(E4)	Unsigned	4	GETBRWA	Number of **MQGET** browses (any)
232	(E8)	Unsigned	4	GETBRWS	Number of **MQGET** browses (specific)
236	(EC)	Unsigned	4	GETA	Number of **MQGET** calls (any)
240	(F0)	Unsigned	4	GETS	Number of **MQGET** calls (specific)
244	(F4)	Unsigned	4	GETERR	Number of unaccountable **MQGET**s
248	(F8)	Character	8	GETJWET	Elapsed time waiting for a journal write to complete

					This is for getting persistent messages.
256	(100)	Unsigned	4	GETJWN	Number of journal write requests This is for getting persistent messages.
260	(104)	Character	8	GETPSET	Elapsed time waiting for a read from a page set
268	(10C)	Unsigned	4	GETPSN	Number of reads from a page set
272	(110)	Character	8	GETSUSET	Total suspend time for **MQGET** calls
280	(118)	Unsigned	4	GETSUSN	Number of times suspended
284	(11C)	Unsigned	4	GETEPAGE	Number of empty pages skipped over when doing an **MQGET**
288	(120)	Unsigned	4	GETSMSG	Number of messages skipped when doing an **MQGET**, either by *MsgId* or *CorrelId*
292	(124)	Unsigned	4	GETEXMSG	Number of expired messages processed (this causes an increase in time because the event messages need to be produced)

MQPUT

296	(128)	Character	4	PUTEYE	Eye catcher (PUT)
300	(12C)	Character	8	PUTET	Total elapsed time for the **MQPUT** calls
308	(134)	Character	8	PUTCT	CPU time used during **MQPUT** processing
316	(13C)	Unsigned	4	PUTN	Number of **MQPUT** requests
320	(140)	Character	8	PUTJWET	Elapsed time waiting for a journal write request. This is for putting persistent messages.
328	(148)	Unsigned	4	PUTJWN	Number of journal write requests. This is for putting persistent messages.
332	(14C)	Character	8	PUTSUSET	Elapsed time the task was suspended for
340	(154)	Unsigned	4	PUTSUSN	Number of times suspended
344	(158)	Character	8	PUTPSET	Time taken to read from a page set for **MQPUT**
352	(160)	Signed	4	PUTPSN	Number of page set put requests

MQPUT1

356	(164)	Character	4	PUT1EYE	Eye catcher (PUT1)
360	(168)	Character	8	PUT1ET	Total elapsed time for the **MQPUT1** calls
368	(170)	Character	8	PUT1CT	CPU time used during **MQPUT1** processing
376	(178)	Unsigned	4	PUT1N	Number of **MQPUT1** requests
380	(17C)	Character	8	PUT1JWET	Elapsed time waiting for a journal write request. This is for putting persistent messages.
388	(184)	Unsigned	4	PUT1JWN	Number of journal write requests. This is for putting persistent messages.
392	(188)	Character	8	PUT1SUSET	Elapsed time the task was suspended
400	(190)	Unsigned	4	PUT1SUSN	Number of times suspended
404	(194)	Character	8	PUT1PSET	Time taken to read from a page set for **MQPUT1**
412	(19C)	Signed	4	PUT1PSN	Number of page set **MQPUT1** requests

MQINQ

416	(1A0)	Character	4	INQEYE	Eye catcher (INQ)
420	(1A4)	Character	8	INQET	Total elapsed time for the **MQINQ** calls
428	(1AC)	Character	8	INQCT	CPU time used during **MQINQ** processing
436	(1B4)	Unsigned	4	INQN	Number of **MQINQ** requests
MQSET					
440	(1B8)	Character	4	SETEYE	Eye catcher (SET)
444	(1BC)	Character	8	SETET	Total elapsed time for the **MQSET** calls
452	(1C4)	Character	8	SETCT	CPU time used during **MQSET** processing
460	(1CC)	Unsigned	4	SETN	Number of **MQSET** requests
464	(1D0)	Character	8	SETJWET	Elapsed time waiting for journal write requests
472	(1D8)	Unsigned	4	SETJWN	Number of journal write requests

Other statistics

476	(1DC)	Unsigned	4	NPS	Page set number
480	(1E0)	Character	12	CFSTRUCNAME	Name of CF structure
492	(1EC)	Unsigned	4	NBUFFPOOL	Buffer pool number
Putbytes/validput = average message size put. Getbytes/validget = average size of message got. Failed put and get count in the total above, but only those successful calls get counted below					
496	(1F0)	Character	8	PUTBYTES	Total number of bytes put successfully
504	(1F8)	Character	8	GETBYTES	Total number of bytes got successfully
512	(200)	Unsigned	4	VALIDPUT	Number of **MQPUT**s writing data
516	(204)	Unsigned	4	VALIDGET	Number of **MQGET**s with data
520	(208)	Unsigned	4	NGEN	Number of messages generated (including COA, COD, event, and expiry messages)
524	(20C)	Signed	4	GETMAXMS	Get maximum messages size
528	(210)	Signed	4	GETMINMS	Get minimum messages size
532	(214)	Signed	4	PUTMAXMS	Put maximum messages size
536	(218)	Signed	4	PUTMINMS	Put minimum messages size
540	(21C)	Character	8	MAXLATNT	Maximum latency of message
548	(224)	Character	8	MINLATNT	Minimum latency of message
556	(22C)	Character	8	TOTLATNT	Total latency of messages
564	(234)	Unsigned	4	*	Reserved
568	(238)	Signed	4	USE_COUNT	Use count (plus 1 for **MQOPEN**, minus 1 for **MQCLOSE**)
572	(23C)	Signed	4	TOTAL_USE	Total number of calls using this queue

The following fields are only available in MQ V6 and above, where MQ_VER > 2

576	(240)	Signed	4	GETPMSG	Number of persistent messages created using MQGET
580	(244)	Signed	4	PUTPMSG	Number of persistent messages retrieved using MQPUT
584	(248)	Signed	4	PUT1PMSG	Number of persistent messages created using MQPUT1
588	(24C)	Signed	4	MAXQDPTH	Maximum queue depth encountered during PUT/GET operations
592	(250)		4	*	Reserved
596	(254)		4	GETDVAL	Number of successful destructive MQGET calls
600	(258)		8	GETJCET	Elapse time waiting for force journal writes to complete during MQGET calls
608	(260)		4	GETJCN	Number of force journal writes during MQGET calls
612	(264)		4	PUTPWG	Number of MQPUT calls where message was passed directly to waiting MQGETter. (This occurs when the message is out-of-syncpoint, non-persistent the message satisfies an outstanding MQGET call)
620	(268)		8	PUTJCET	Elapse time waiting for force journal writes to complete during MQPUT calls
624	(270)		4	PUTJCN	Number of force journal writes during MQPUT calls
628	(274)		4	PUT1PWG	Number of MQPUT1 calls where message was passed directly to waiting MQGETter. (This occurs when the message is out-of-syncpoint, non-persistent the message satisfies an outstanding MQGET call)
632	(278)		8	PUT1JCET	Elapse time waiting for force journal writes to complete during MQPUT1 calls
640	(280)		4	PUT1JCN	Number of force journal writes during MQPUT1 calls
644	(284)		8	SETJCET	Elapse time waiting for force journal writes to complete during MQSET calls
652	(28C)		4	SETJCN	Number of force journal writes during MQSET calls
656	(290)		16	* (4)	Reserved

Following fields only available for MQ V7, if WQ_VER is 5 or above

672	(2a0)	Unsigned	4	SELCOUNT	Count of selector calls
676	(2a4)	Unsigned		SELMAXLN	Maximum length of selector
680	(2a8)	Char	4		EyeCatcher ‘CB ‘
684	(2ac)	Unsigned	8	CBET	Total elapsed time for the **MQC**B requests
692	(2b4)	Unsigned	8	CBCT	Total amount of CPU time for processing **MQCB** requests
700	(2bc)	Unsigned	4	CBN	Number of **MQCB** requests

Following fields only available for MQ V701, if WQ_VER is 6 or above

704	(2c0c)	Unsigned	8	OPENSUET	Open Suspend time in STCK format
712	(2c8)	Unsigned	4	OPENSUN	Open Suspend count
716	(2cc)	Unsigned	8	CLOSESUET	Close suspend time in STCK format
724	(2d4)	Unsigned	4	CLOSESUN	Close suspendcount
728	(2d8)	Unsigned	4	OPENCF0	Number of Shared queue open requests which did not require and coupling facility accesses
732	(2dc)	Unsigned	4	CLOSECF0	Number of Shared queue close requests which did not require and coupling facility accesses
736	(2e0)	VERBCFSTATS	400	OPENCFSTATS	See below
1136	(470)	VERBCFSTATS	400	CLOSECFSTATS	
1536	(600)	VERBCFSTATS	400	GETCFSTATS	
1936	(790)	VERBCFSTATS	400	PUTCFSTATS	
2336	(920)	VERBCFSTATS	400	PUT1CFSTATS	
2736	(AB0)	Unsigned	4	PublishedN	The total number of messages published, may be 0 or more for each Put to a topc
2740	(AB4)	*	12	Reserved	
2752	(AC0)	Unsigned	8	TopicOpenSRB	CPU time used (in STCK format) used during open of a topic
2760	(AC8)	Unsigned	8	TopicPutSRB	CPU time used (in STCK format) used during MQPUT to a topic
2768	(AD0)	Unsigned	8	TopicPut1SRB	CPU time used (in STCK format) used during MQPUT1 to a topic
2776	(AD8)	Unsigned	8	TopicCloseSRB	CPU time used (in STCK format) used during MQCLOSE of a topic

Layout of the VERBCFStats structure

0	(0)		400	VERBCFSTATS	For each MQ verb, the times spent doing various CF requests.
0	0	CFSTATS	20	Lock	
20	(14)	CFSTATS	20	UnLock	
40	(28)	CFSTATS	20	WriteLC	Write LControls
60	(3c)	CFSTATS	20	SigXCF	Signal using XCF
80	(50)	CFSTATS	20	SigCF	Signal using the CF
100	(64)	CFSTATS		READ	
120	(78)	CFSTATS		WRITE	
140	(8c)	CFSTATS		StartMon	Start monitor
160	(a0)	CFSTATS		StopMon	Stop monitor
180	(b4)	CFSTATS		Unused	
200	(c8)	CFSTATS		New	
220	(dc)	CFSTATS		Move	
240	(f0)	CFSTATS		MoveEnt	Move entry list
260	(104)	CFSTATS		Delete	
280	(118)	CFSTATS		Unused(6)	

Layout of the CFSTATS structure

0	(0)		20	CFSTATS	Detailed CF request information
0	0	Unsigned	4	CFCount	Number of times in the routine
20	(14)	Unsigned	4	CFSyncN	Number of times the request was synchronous
40	(28)	Unsigned	4	CFSyncET	Total elapsed time doing synchronous request in microseconds
60	(3c)	Unsigned	4	CFASyncN	Number of times the request was Asynchronous
80	(50)	Unsigned	4	CFASyncET	Total elapsed time doing Asynchronous request in microseconds

Task related information(WTAS)

This data is present in SMF 116 subtype 1 records. See Self-defining sections on page 53.

Table 16. Layout of the task related information (WTAS) structure

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	712	WTAS	
0	(0)	Signed	2	WTASSHEX	Hex ID of block
2	(2)	Signed	2	WTASLEN	Length of block
4	(4)	Character	4	WTASEYEC	Eye catcher
8	(8)	Character	16	WTASCORR	Correlator identifier
8	(8)	Character	8	WTASSTRT	When WTAS allocated
16	(10)	Character	8	WTASHASH	Reserved
16	(10)	Signed	4	WTASMTHR	Reserved
20	(14)	Signed	4	WTASWTAS	Reserved
24	(18)	Character	8	WTASLATC	Reserved
32	(20)	Signed	4	WTASHSHI	Reserved
36	(24)	ADDRESS	4	*	Reserved
40	(28)	Bitstring	4	*	Reserved
44	(2C)	Signed	4	WTASWQCT	Count of WQ blocks for this thread
48	(30)	Character	384	WTASTHST	Thread stats, of interest to all users of accounting
48	(30)	Character	8	*	Reserved
304	(130)	INTEGER	4		Reserved
Non-queue 'other' statistics					
432	(1B0)	Character	8	WTASOTET	Other MQI calls elapsed time
440	(1B8)	Character	8	WTASOTCT	Other MQI calls CPU time
448	(1C0)	Unsigned	4	WTASOTN	Number of other calls
452	(1C4)	Character	8	WTASMLW	Maximum latch wait time
460	(1CC)	Signed	4	WTASMLWN	Maximum wait latch number
464	(1D0)	Character	4	*	Reserved
468	(1D4)	Signed	4	*	Reserved
Commit statistics					
472	(1D8)	Character	8	WTASCMET	Commit elapsed time
480	(1E0)	Character	8	WTASCMCT	Commit CPU time

488	(1E8)	Signed	4	WTASCMN	Commit number of calls

Backout statistics

492	(1EC)	Character	8	WTASBAET	Backout elapsed time
500	(1F4)	Character	8	WTASBACT	Backout CPU time
508	(1FC)	Signed	4	WTASBAN	Backout number of calls
512	(200)	Character	4	*	Reserved

Journal and logging information

516	(204)	Character	8	WTASJWET	Log write elapsed time in STCK format
524	(20C)	Unsigned	4	WTASJWN	Number of log writes WTASJWB if required
528	(210)	Unsigned	4	WTASJWB	Number of bytes written to the log
532	(214)	Character	8	WTASJCET	Elapsed time waiting for log data to be forced to DASD
540	(21C)	Unsigned	4	WTASJCN	Number of times the log was forced
544	(220)	Unsigned	4	WTASSUSN	Number of times the task was suspended
548	(224)	Character	8	WTASSUSE	Total suspend time

Page set 0 logging activity

556	(22C)	Character	8	WTASPSE0	Elapse time logging page set 0
564	(234)	Unsigned	4	WTASPSN0	Logging requests page set 0

DB2 manager

568	(238)	Character	8	WTASDBET	DB2 elapse thread
576	(240)	Character	8	WTASDBES	DB2 elapse server
584	(248)	Character	8	WTASDBMT	DB2 maximum elapse thread
592	(250)	Character	8	WTASDBMS	DB2 maximum elapse server
600	(258)	Signed	4	WTASDBCT	DB2 requests

CF manager

604	(25C)	Unsigned	4	WTASCSEC	Number of IXLLSTE calls
608	(260)	Unsigned	4	WTASCMEC	Number of IXLLSTM calls
612	(264)	Unsigned	4	WTASRSEC	Number of IXLLSTE redrives
616	(268)	Unsigned	4	WTASRMEC	Number of IXLLSTM redrives
620	(26C)	Character	8	WTASSSTC	Time spent IXLLSTE calls
628	(274)	Character	8	WTASMSTC	Time spent IXLLSTM calls
640	(280)	Character	8	* (3)	Reserved

Interval data, page counts and chain pointers

664	(298)	Character	8	WTASINTS	Interval start - for post processing
672	(2A0)	Character	8	WTASINTE	Interval end - for post processing
680	(2A8)	Signed	4	WTASGPO	Get pages old
684	(2AC)	Signed	4	WTASGPN	Get rages new
688	(2B0)	Character	8	* (3)	Reserved
696	(2B8)	Signed	4	WTASVER	From version 6 - Version of WTAS block

700	(2BC)	Character	4	*	Reserved
704	(2C0)	Signed	8	WTASDBPT	Number of message bytes written to DB2
712	(2C8)	Signed	8	WTASDBGT	Number of message bytes read from DB2

The following fields are only available in MQV701 and above, when WTAS_VER > 4

720	(2D0)	Character	8	*	Reserved
728	(2d8)	Character	8	*	Reserved
736	(2e0)	Character	8	*	Reserved
744	(2e8)	Character	8	*	Reserved
752	(2f0)	Character	4	*	Reserved
756	(2f4)	Unsigned	8	WTASSUET	Total MQSUB Elapse time
764	(2fc)	Unsigned	8	WTASSUCT	Total MQSUB CPU time
772	(304)	Unsigned	4	WTASSUN	Number of MQSUB requests
776	(308)	Unsigned	4	WTASSUSC	MQSub Count of selectors
780	(30c)	Unsigned	4	WTASSUSL	MQSUB maxlength selector for MQSUBRQ
784	(310)	Unsigned	8	WTASSQET	Total MQSUBRQ elapsed time
792	(318)	Unsigned	8	WTASSQCT	Total MQSUBRQ CPU time
800	(320)	Unsigned	4	WTASSQN	Count of MQSUBRQ requests
804	(324)	Unsigned	8	WTASCTET	Total MQCTL elapsed time
812	(32c)	Unsigned	8	WTASCTCT	Total MQCTL CPU time
820	(334)	Unsigned	4	WTASCTN	Count of MQCTL requests
824	(338)	Unsigned	8	WTASSTET	Total MQSTAT elapsed time
832	(340)	Unsigned	8	WTASSTCT	Total MQSTAT CPU time
840	(348)	Unsigned	4	WTASSTN	Count of MQSTAT requests
848	(350)	Unsigned	8	WTASCTSR	CPU time under SRB

The following fields exist in MQ V701, where WTAS_VER >= 5

864	(360)	VERBCFStats	400	COMMITCF	CF requests
1264	(4f0)	*	800	*	Reserved
2064	810	*	*	*	End of control block

Table 17. Layout of theTask Id structure(WTID)

Offsets		Type	Len	Name	Description
Dec	Hex				
0	(0)	Structure	208	WTID	
0	(0)	Signed	2	WTIDSHEX	Hex ID of block
2	(2)	Signed	2	WTIDLEN	Length of block
4	(4)	Character	4	WTIDEYEC	Eye catcher
8	(8)	Character	186	WTASID	
8	(8)	Signed	4	WTIDATYP	CCBCTCOD 1=CICS etc
12	(C)	Character	8	WTIDCCN	CCBNAME connection name
20	(14)	Character	8	WTIDOPID	CCBOPID operator ID
28	(1C)	Character	16	WTIDNID	NID
44	(2C)	Character	12	WTIDCORI	Correlator
56	(38)	Character	24	WTIDUOWI	LUWID
80	(50)	Character	22	WTIDACCT	Accounting token
102	(66)	Character	20	WTIDCHL	Channel name
122	(7A)	Character	48	WTIDCHLC	Channel connection name
170	(AA)	Character	16	WTIDCTXT	Current context token
186	(BA)	Character	8	WTIDTRAN	CCBUSER MVS user ID
194	(C2)	Character	2	*	Reserved
196	(C4)	ADDRESS	4	WTIDCFWD	Reserved
200	(C8)	ADDRESS	4	WTIDCBWD	Reserved
204	(CC)	ADDRESS	4	WTIDWTAS	Reserved
208	(D0)	Character	0	*	Reserved

How to interpret the correlator field

Table 18. Structure of the WTIDCORI for a CICS system

Offsets		Type	Len	Name	Description
Dec	Hex				
44	(2C)	Hex	4	WTICTNO	CICS thread number.
48	(30)	Character	4	WTIDCTRN	CICS transaction name.
52	(34)	Packed Decimal	4	WTIDCTSK	CICS task number.

Table 19. Structure of WTIDCORI for an IMS system

Offsets		Type	Len	Name	Description
Dec	Hex				

44	(2C)	Character	4	WTIDPST	IMS partition specification table (PST) region identifier.
48	(30)	Character	8	WTIDPSB	IMS program specification block (PSB) name.

Meaning of the channel names

The channel name in the WTID has the following meaning. For a sender channel from queue manager VQM1 to VQM2 the following fields are set with examples of their contents

Field name	Meaning	Example
For queue manager VQM1 the sender channel has the following fields set:		
WTIDCCN	The job name	VQM1CHIN
WTIDCHL	The channel name	VQM1.VQM2
WTIDCHLC	This is defined in the CONNAME of the channel	WINMVS2B(2162)
For the queue manager VQM2 the receiver channel has the following fields set:		
WTIDCCN	The job name	VQM2CHIN
WTIDCHL	The channel name	VQM1.VQM2
WTIDCHLC	Where the channel came from	9.20.101.14

Structure of the WebSphere MQ SMF header QHWS

Table 20. Structure of the Common WebSphere MQ SMF header record QWHS

Offsets					
Dec	Hex	Type	Len	Name	Description
0	(0)	Structure	128	QWHS	
0	(0)		6		Reserved.
6	(6)	Character	1	QWHSNSDA	Number of self defining sections in the SMF records.
7	(7)		5		Reserved.
12	(0C)	Character	4	QWHSSSID	Subsystem name.
16	(10)		24		Reserved.
40	(28)	Character	8	QWHCAID	User ID associated with the Z/OS job.
48	(30)	Character	12	QWHCCV	Thread cross reference (see Thread cross reference data on page 11)
60	(3C)	Character	8	QWHCCN	Connection name.
68	(44)		8		Reserved.
76	(4C)	Character	8	QWHCOPID	User ID associated with the transaction.
84	(54)	Signed	4	QWHCATYP	Type of connecting system (1=CICS, 2=Batch or TSO, 3=IMS control region, 4=IMS MPP or BMP, 5=Command server, 6=Channel initiator, 7=RRS Batch).
88	(58)	Character	22	QWHCTOKN	Accounting token set to the Z/OS accounting information for the user
110	(6E)	Character	16	QWHCNID	Network identifier
126	(7E)		2		Reserved.

Appendix C. Bibliography

This section describes the IBM documentation referred to in the document.

- z/OS System Management Facilities(SMF) SA22-7630-19
- DFSORT ICETOOL Mini-User Guide GC27-1997-00

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