



Lab Objective

This lab emphasizes examining the messages output – what it does and does not report on - and task reports from MP1B in more detail.

Lab Steps

- 1) Alter the MQSMFV9 JCL to point to the TEAMXX.MQSMF.COMBO dataset.
- 2) Save and submit the job.
- 3) Navigate to SDSF.ST to review the results.
- 4) Select the job, using the question mark to display the list of files:

SDSF STATUS DISPLAY ALL CLASSES								LINE
COMMAND INPUT ==>								
NP	JOBNAME	JobID	Owner	PrtY	Queue	C	Pos	SAff
?	ELKINSCM	JOB06703	ELKINSC	1	PRINT	A	41	
	ELKINSSF	JOB06702	ELKINSC	1	PRINT	A	40	

- 5) Page forward to the SYSPRINT output, or do a F(ind) for the file. Select it as shown:

SDSF JOB DATA SET DISPLAY - JOB ELKINSCM (JOB					
COMMAND INPUT ==>					
NP	DDNAME	StepName	ProcStep	DSID	Owner
s	SYSPRINT	S1		151	ELKINSC
-	PSET	S1		152	ELKINSC
	BUFFIO	S1		153	ELKINSC

- 6) Navigate to the bottom on the output, by entering the 'bot' command and hitting enter:

COMMAND INPUT ==> bot_		SCROLL
***** TOP OF DATA *****		
Compiled Jul 16 2017 06:58:22.		
buffer: SMF_Interval_time 1		
buffer: Debug 1		
buffer: Detail 20		

- 7) The output should look something like this:

```

      0 MQTASK37W Gets from local queue are more expensive than puts ELKINSC.TEST.PS10
      0 MQTASK36W Did BP 21 fill up for puts to ELKINSC.TEST.PS21
      0 MQTASK37W Gets from local queue are more expensive than puts ELKINSC.TEST.PS21
Summary of MQ SMF records and subtypes found
=====
SMF type 115 subtype 1, record count      8 System statistics(1)
SMF type 115 subtype 2, record count      8 System statistics(2)
SMF type 115 subtype 5, record count      8 Storage statistics
SMF type 115 subtype 6, record count      8 Storage detail statistics
SMF type 115 subtype 7, record count      8 Storage summary statistics
SMF type 115 subtype 201, record count     8 Page set statistics
SMF type 115 subtype 215, record count     8 Buffer manager extension
SMF type 115 subtype 231, record count     7 Chinit statistics
SMF type 116 subtype 0, record count     19 Accounting class(1)
SMF type 116 subtype 1, record count     77 Accounting class(3)
SMF type 116 subtype 10, record count     4 Channel accounting data

```

- 8) If the output looks radically different, please let the instructor know.

- 9) Return to the list of files by using the F3 key.

- 10) Select the Message output, as shown:

NP	DDNAME	StepName
	JESMSG LG	JES2
	JESJCL	JES2
	JESYSMSG	JES2
S_	MESSAGE	S1
-	BUFF	S1

- 11) There are several problems reported, just of the first page of messages.

```

MQQJST11W MPX1,QML1,2018/12/17,14:48:43,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQJST11W MPX1,QML3,2018/12/17,14:49:32,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQJST11W MPX1,QML1,2018/12/17,14:49:43,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQJST11W MPX1,QML1,2018/12/17,14:50:06,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQJST11W MPX1,QML3,2018/12/17,14:50:33,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQIST02W MPX1,QML3,2018/12/17,14:50:33,VRM:900, QIST Message read from disk 2 > 0
MQPSET02W MPX1,QML3,2018/12/17,14:50:33,VRM:900, Page set 21 expansion occurred. Current expansion count 11 times
MQPSET03E MPX1,QML3,2018/12/17,14:50:33,VRM:900, Page set 0, I/O for writing to page set was 2% busy
MQPSET04E MPX1,QML3,2018/12/17,14:50:33,VRM:900, Page set 0, I/O for Immediate Writing to page set was 3% busy
MQPSET05E MPX1,QML3,2018/12/17,14:50:33,VRM:900, Page set 0, I/O for getting from page set was 2% busy
MQPSET06E MPX1,QML3,2018/12/17,14:50:33,VRM:900, Page set 0, Total I/O time to page set was 7% busy
MQQPST00W MPX1,QML3,2018/12/17,14:50:33,VRM:900, BP 21 Many(5975) buffers written immediately. Buffer pool may be too small
MQQPST02S MPX1,QML3,2018/12/17,14:50:33,VRM:900, BP 21 Filled many(610) times. This is typical of long lived messages. Buffer pool may be too small
MQQPST04E MPX1,QML3,2018/12/17,14:50:33,VRM:900, BP 21 Many (5877) pages read from disk. This is typical of long lived messages. Buffer pool may be too small
MQQJST11W MPX1,QML3,2018/12/17,14:51:34,VRM:900, logging rate is low 0 < 50 MB/Sec
MQQJST11W MPX1,QML1,2018/12/17,14:51:45,VRM:900, logging rate is low 0 < 50 MB/Sec

```

- 12) As noted before, these messages provide direction on where to look for problems. The first problem to investigate is MQQPST02S. As that is immediately followed by MQQPST04E – it is a pretty clear indication that Bufferpool 21 is too small for the workload.

13) Return to the list of reports and select the BUFF report.

NP	DDNAME	StepName
	MESSAGE	S1
S	BUFF	S1
-	BUFFCSV	S1

14) Page forward until Bufferpool 21 is located. How many pages are allocated? -

15) Is Bufferpool 21 below or above the bar? _____

16) Is BP 21 page fixed? _____

17) Keep paging forward (F8) until you find a record that indicates the bufferpool trouble:

= BPool 21, Size 1000,%full now 40, Highest %full 95, Disk reads 5877 MPX1,QML3,2018/12/17,14:50:33,VRM:900,									
< BPool 21, Pages written/sec 194, Pages read/sec 96 MPX1,QML3,2018/12/17,14:50:33,VRM:900,									
> 21 Buffs	1000	Low	50	Now	592	Getp	7511	Getn	12185
21 Rio	5877	STW	13901	TPW	11847	WIO	6342	IMW	5975
21 DWT	610	DMC	0	STL	16492	STLA	0	SOS	0
21 Above the bar	PAGECLAS 4KB								

18) Note that even though the bufferpool was reported in the messages as having 'filled many times (610)' that is the Deferred Write Threshold count – or the number of times the BP hit the 15% free pages threshold. This may not be a problem for some workloads, for a batch workload where messages will remain on a queue for a long period of time this can be expected behavior.

19) The bufferpool never when into a short on storage situation but did see a large number of immediate writes (5975), to me that is a more telling problem than the DWT count – this means that the messages were probably quite large – and even though the pool had not hit the 5% freepage DMC threshold or short on storage, the messages would not fit. This may mean that message sizes or workload has increased, and may be both. It may also indicate that a very active queue was defined to the wrong bufferpool. Has someone recently done a define like. The Messages file reports this as a warning, but I think it is a much more serious problem that the DWT count going non-zero – which is reported as an error.

- 20) There are no messages in the MESSAGE output about the pageset, but we know from the buffer report that there was I/O. Navigate to the PSET output file to see what may have happened. Once opened, do a find on 'BP 21' (note there are two spaces between the 'BP' and the '21'), and keep repeating the find until pageset I/O activity is found. It should look like this:

```

PS21 BP 21, Pages      7018, Size  27 MB, free  100.0%, used   0.0%, P  0%, NP  0%, #full 0,
    Pages written in checkpoint          0
    Pages written not in checkpoint    11847
    Number of stripes                   1
    Put Cursor high                     00000106
    Expansion type:User   Expansions    11

    Page set expansion occurred
PS21 Type :I/O requests,   Pages, Avg I/O time, pages per I/O, MB/Sec,  busy%
PS21 Write:      367,    5872,      4128,      16.0,    15,    2%
PS21 IMW :      5975,    5975,      328,      1.0,    12,    3%
PS21 GET  :      5877,    5877,      213,      1.0,    18,    2%

```

- 21) As you can see, the pageset itself has expended 11 times – and pageset expansion can be a component of response time problems. Each time a pageset expands, there is not only the normal VSAM activity to do the expansion but there is also formatting of the new extent. However, not allowing expansion could mean that applications start receiving a 2192 (Storage Media Full) reason code.
- 22) Another useful piece of information is that none of the pages were writing during checkpoint processing. If messages have been in a bufferpool for 3 checkpoints, they will be written at that 3rd checkpoint. The checkpoint could be from log switches or the LOGLOAD records being reached. If there is an increase in the number of messages being written during checkpoint processing, and the bufferpool is supposed to be processing real-time workload that often indicates the serving processes cannot keep up. It may be time to add more instances of the serving applications.
- 23) The other output files dealing with pageset and buffer I/O are summaries and may be more helpful when dealing with large quantities of data, instead of a few short tests.
- 24) Tests were also run to look at the impact of an MQGET with match options, without a corresponding index. It is a bit surprising that there was no message in the MESSAGE output, especially when there was one in the JES log:

```

CSQI004I QML3 CSQIMGE3 Consider indexing 749
ELKINSC.TEST.PS10 by CORRELID for BATCH connection ELKING2P, 140
messages skipped

```

- 25) Open the TASK output and search for the ELKING2P task, as this is a controlled test the data does not have to be sorted to just get the records for that task.

26) Page forward in the task, bringing the get count to the top of the page as shown.

95	Get count	10	ELKINSC.TEST.PS10
95	Get avg elapsed time	296 uS	ELKINSC.TEST.PS10
95	Get avg CPU time	255 uS	ELKINSC.TEST.PS10
95	Get avg suspended time	26 uS	ELKINSC.TEST.PS10
95	Get skipped message count	1411	ELKINSC.TEST.PS10
95	Get TOQ average	74422305 uS	ELKINSC.TEST.PS10
95	Get TOQ maximum	74428879 uS	ELKINSC.TEST.PS10
95	Get TOQ minimum	74418602 uS	ELKINSC.TEST.PS10
95	Get valid count	10	ELKINSC.TEST.PS10
95	Get valid destructive	10	ELKINSC.TEST.PS10
95	Get size maximum	1000 bytes	ELKINSC.TEST.PS10
95	Get size minimum	1000 bytes	ELKINSC.TEST.PS10
95	Get size average	1000 bytes	ELKINSC.TEST.PS10
95	Get Dest-Specific	10	ELKINSC.TEST.PS10
95	Get not persistent count	10	ELKINSC.TEST.PS10
95	Curdepth maximum	199	ELKINSC.TEST.PS10
95	Total Queue elapsed time	3016 uS	ELKINSC.TEST.PS10
95	Total Queue CPU used	2603 uS	ELKINSC.TEST.PS10
95	Grand total CPU time	0.002610 S	

- 27) How many messages were skipped? _____
- 28) How many messages returned to the application? _____
- 29) What was the maximum depth? _____
- 30) Adding a proper index to the queue would eliminate the skipped messages in this case and make processing more efficient.
- 31) Note that if an application is using message selectors to retrieve messages from a queue, there can be skipped messages without a corresponding CSQI004I message. Some customers have suppressed the CSQI004I message, so there may be instances where there are a large number of skipped messages and no corresponding message in the JES log. The TASK report shows that – and is the only place to catch these inefficiencies under those circumstances.

- 32) Open the DB2 report, and search for the word 'Blob'. There are entries for both queue managers QML1 and QML3.

MPX1,QML1,2018/12/17,14:50:06,VRM:900,								
Tasks : Servers		8, Active	9, Conns	0, Discs	0			
HighMax		1, Abend	0, Requeue	0				
	Count	Task avg	Task max	DB2 avg	DB2 max (ms)	(Task-DB2) Avg	Max	
List :	4	0	0	0	0	0	0	0
Blob Select:	326	0	7	0	7	0	0	0
Blob Delete:	326	1	2	1	2	0	0	0
MPX1,QML3,2018/12/17,14:50:33,VRM:900,								
Tasks : Servers		8, Active	9, Conns	0, Discs	0			
HighMax		1, Abend	0, Requeue	0				
	Count	Task avg	Task max	DB2 avg	DB2 max (ms)	(Task-DB2) Avg	Max	
List :	14	1	8	1	8	0	0	0
SCS Select :	1	0	0	0	0	0	0	0
Blob Insert:	326	4	209	4	209	0	0	0

- 33) There is no indication of message offloading to Db2 in the messages file, which there probably should be. Using Db2 for message offloading is much less efficient than using Shared Message Data sets. The use of Db2 for that is discouraged for that reason.
- 34) Also note that due to the timing of the SMF generation on the two queue managers, it almost looks like the Blobs were retrieved before they were actually written – the time reported on QML1, where the gets were done was 14:50:06, on QML3 it was 14:50:03 and that is where the puts were done.
- The only reason I mention this is that I've gotten questions on that before! A queue manager is many things, but it is not clairvoyant.
- 35) To compare the costs of Db2 blobs to SMDS, really to compare any two messaging or infrastructure choices, locating the TASK records for the tests must be done. Return to the list of output files and select the TASK output.
- 36) Do a find for DB2OFF, which I used as part of the queue name for the test.

```
SDSF OUTPUT DISPLAY ELKINSCM JOB06703
COMMAND INPUT ==> f DB2OFF
***** TOP OF
```

37) Page back to the top of the task, it should look like this:

```

79 MPX1,QML3,2018/12/17,14:49:58,VRM:900,
79 QML3 Batch Jobname:ELKINTPT Userid:ELKINSC
79 Start time Dec 17 14:49:33 2018 Started this interval
79 Interval   Dec 17 14:49:33 2018 - Dec 17 14:49:34 2018 : 1.428541 seconds
79 Other reqs : Count                1
79 Other reqs : Avg elapsed time      7 uS
79 Other reqs : Avg CPU               7 uS
79 Other reqs : Total ET              0.000007 Seconds
79 Other reqs : Total CPU             0.000007 Seconds
79 == DB2 activity :                326 requests
79 > Average time per DB2 request-Server :    4223 uS
79 > Average time per DB2 request-Thread :    4223 uS
79 > Maximum time per DB2 request-Server :   209279 uS
79 > Maximum time per DB2 request-Thread :   209293 uS
79 > Bytes put to DB2 : 32714752
79 > Bytes read from DB2 : 0
79 == CF activity : Requests - Single      652, Multiple      163
79 > Retries - Single                     0, Multiple        0

```

38) There is a great deal of detail in this report, as it has been run at the maximum detail level ('20'). For normal problem resolution, including most performance work, that much detail is not usually necessary. It is presented in this exercise for your review.

39) Page forward to the end of the task, which looks like this:

```

79 Put avg elapsed time          4305 uS    ELKINSC.TEST.DB2OFF
79 Put avg CPU time              47 uS      ELKINSC.TEST.DB2OFF
79 Put suspended time           4227 uS    ELKINSC.TEST.DB2OFF
79 Put + put1 valid count        326        ELKINSC.TEST.DB2OFF
79 CF time/verb                  30
79 CF Avg Sync elapsed time/verb  30 us
79 CF Sync number of request      326
79 CF Avg Sync CF response time   30 us
79 CF Avg Sync CF response time   30 us
79   New      Avg Sync elapsed time/verb  30 us
79   New      Avg Sync number of request  326
79   New      Avg Sync CF response time   30 us
79 Put size maximum              100000 bytes ELKINSC.TEST.DB2OFF
79 Put size minimum              100000 bytes ELKINSC.TEST.DB2OFF
79 Put size average              100000 bytes ELKINSC.TEST.DB2OFF
79 Put num not persistent         326        ELKINSC.TEST.DB2OFF
79 Curdepth maximum              2          ELKINSC.TEST.DB2OFF
79 Total Queue elapsed time       1403840 uS ELKINSC.TEST.DB2OFF
79 Total Queue CPU used           15715 uS   ELKINSC.TEST.DB2OFF
79 Grand total CPU time           0.019232 S
79 Grand Elapsed time            1.421942 S
79 % total busy                  100        B,ELKINTPT," ",

```

- 40) How many messages were put? _____
- 41) What was the queue CPU time? _____
- 42) What was the queue elapsed time? _____
- 43) What was the put average CPU time? _____

- 44) Paging forward the next task is the Get task that retrieved the messages. Again, there is quite a bit of Db2 activity

```

81 MPX1,QML1,2018/12/17,14:49:58,VRM:900,
81 QML1 Batch Jobname:ELKINTGT Userid:ELKINSC
81 Start time Dec 17 14:49:33 2018 Started this interval
81 Interval Dec 17 14:49:33 2018 - Dec 17 14:49:34 2018 : 1.838559 seconds
81 Other reqs : Count 1
81 Other reqs : Avg elapsed time 9 uS
81 Other reqs : Avg CPU 9 uS
81 Other reqs : Total ET 0.000009 Seconds
81 Other reqs : Total CPU 0.000009 Seconds
81 == DB2 activity : 652 requests
81 > Average time per DB2 request-Server : 893 uS
81 > Average time per DB2 request-Thread : 893 uS
81 > Maximum time per DB2 request-Server : 7361 uS
81 > Maximum time per DB2 request-Thread : 7383 uS
81 > Bytes put to DB2 : 0
81 > Bytes read from DB2 : 32714752
81 == CF activity : Requests - Single 332, Multiple 8
81 > Retries - Single 0, Multiple 0

```

- 45) Paging forward, to the GET counts:

```

81 Get count 489 ELKINSC.TEST.DB2OFF
81 Get avg elapsed time 399 uS ELKINSC.TEST.DB2OFF
81 Get avg CPU time 28 uS ELKINSC.TEST.DB2OFF
81 Get avg suspended time 350 uS ELKINSC.TEST.DB2OFF
81 Get TOQ average 7052 uS ELKINSC.TEST.DB2OFF
81 Get TOQ maximum 212793 uS ELKINSC.TEST.DB2OFF
81 Get TOQ minimum 3295 uS ELKINSC.TEST.DB2OFF
81 Get valid count 326 ELKINSC.TEST.DB2OFF
81 Get valid destructive 326 ELKINSC.TEST.DB2OFF
81 Get size maximum 100000 bytes ELKINSC.TEST.DB2OFF
81 Get size minimum 100000 bytes ELKINSC.TEST.DB2OFF
81 Get size average 100000 bytes ELKINSC.TEST.DB2OFF
81 Get Dest-Next 489 ELKINSC.TEST.DB2OFF
81 Get not persistent count 326 ELKINSC.TEST.DB2OFF
81 CF time/verb 21
81 CF Avg Sync elapsed time/verb 21 us
81 CF Sync number of request 327
81 CF Avg Sync CF response time 32 us
81 StartMon Avg Sync elapsed time/verb 0 us
81 StartMon Avg Sync number of request 1
81 StartMon Avg Sync CF response time 23 us
81 Move Avg Sync elapsed time/verb 21 us
81 Move Avg Sync number of request 326
81 Move Avg Sync CF response time 32 us
81 Curdepth maximum 0 ELKINSC.TEST.DB2OFF
81 Total Queue elapsed time 195910 uS ELKINSC.TEST.DB2OFF
81 Total Queue CPU used 14297 uS ELKINSC.TEST.DB2OFF
81 Grand total CPU time 0.014372 S
81 Grand Elapsed time 0.614083 S

```

- 46) How many valid destructive gets were completed? _____
- 47) What was the Total queue CPU? _____
- 48) Total queue elapsed time? _____
- 49) The average CPU time per GET? _____

50) The average elapsed time per GET? _____

51) Page forward in the TASK report until you find:

QML1 Batch Jobname:ELKINTPT

This is the start of the SMDS Offload test.

52) Paging forward to the end of this put task

91	Put count	326	ELKINSC.TEST.SMDSOFF
91	Put avg elapsed time	2677 uS	ELKINSC.TEST.SMDSOFF
91	Put avg CPU time	79 uS	ELKINSC.TEST.SMDSOFF
91	Put suspended time	2570 uS	ELKINSC.TEST.SMDSOFF
91	Put + put1 valid count	326	ELKINSC.TEST.SMDSOFF
91	CF time/verb	31	
91	CF Avg Sync elapsed time/verb	31 us	
91	CF Sync number of request	326	
91	CF Avg Sync CF response time	31 us	
91	New Avg Sync elapsed time/verb	31 us	
91	New Avg Sync number of request	326	
91	New Avg Sync CF response time	31 us	
91	Put size maximum	100000 bytes	ELKINSC.TEST.SMDSOFF
91	Put size minimum	100000 bytes	ELKINSC.TEST.SMDSOFF
91	Put size average	100000 bytes	ELKINSC.TEST.SMDSOFF
91	Put num not persistent	326	ELKINSC.TEST.SMDSOFF
91	Curdepth maximum	3	ELKINSC.TEST.SMDSOFF
91	Total Queue elapsed time	873095 uS	ELKINSC.TEST.SMDSOFF
91	Total Queue CPU used	26097 uS	ELKINSC.TEST.SMDSOFF

91 Grand total CPU time 0.029407 S

53) 91 Grand Elapsed time 0.890596 S

54) What was the put + Put1 valid count? _____

55) What was the put average elapsed time? _____

56) What was the put average CPU time? _____

57) What was the total Queue CPU time? _____

58) Total Queue Elapsed time? _____

59) The puts for the DB2 offloaded messages were:

79 Total Queue elapsed time 1403840 uS ELKINSC.TEST.DB2OFF

79 Total Queue CPU used 15715 uS ELKINSC.TEST.DB2OFF

60) What is the difference in total CPU costs? _____

61) What is the Elapsed Time difference? _____

62) Paging forward to the end of the get task, the totals for the queue and grand totals are:

93 Curdepth maximum	0	ELKINSC.TEST.SMDSOFF
93 Total Queue elapsed time	890908 uS	ELKINSC.TEST.SMDSOFF
93 Total Queue CPU used	32099 uS	ELKINSC.TEST.SMDSOFF
93 Grand total CPU time	0.032176 S	
93 Grand Elapsed time	0.891740 S	

63) What is interesting is that the Db2 offloaded Puts and Gets use less CPU in this test environment, but the elapsed time is significantly higher. This is not typical, in most environments the CPU costs for the Db2 offloads will also be higher.

THIS IS WHY WE ALWAYS RECOMMEND TESTING! Your mileage will vary.