SU

IMQ09 - IBM MQ V9 for z/OS Wildfire Workshop

L06 – Introduction to SMF 115 Records

Version V6.0

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Lab Objectives

This lab is to introduce the SMF115 data produced by IBM MQ. The examples used are taken from real data, based on situations both Level 3 and ATS have seen.

*Gen*eral Lab Information and Guidelines

- ✓ This exercise requires using TSO user *USER1* on the *wg31.washinton.ibm.com* system.
- ✓ The TSO password for this exercise will be provided by the lab instructor.
- ✓ If performing this lab as a paper exercise, outside the ATS environment, please:
  a) Download and review SupportPac MP1B, which can be found at: http://www-01.ibm.com/support/docview.wss?rs=171&uid=swg24005907&loc=en_US&cs=utf-8&lang=en
  b) Allocation a library (PDS or sequential) for the sample SMF listing. It should be variable blocked with a record length of 133 and a blocksize of 6233.
  c) Upload the text file SMF115_LAB.txt into the created file.
  d) Edit the file o member, using normal ISPF editing.
  e) Skip to step 8.
  f) Otherwise, if in an ATS lib environment, use the following steps.
- ✓ The data in use is not live; you will be looking at the output from the MP1B provided SMF print jobs. The data set that will be used in this exercise is *USER1.SHARE.SMFTEXT*.

Part I – SMF 115 – IMQ Statistical Data

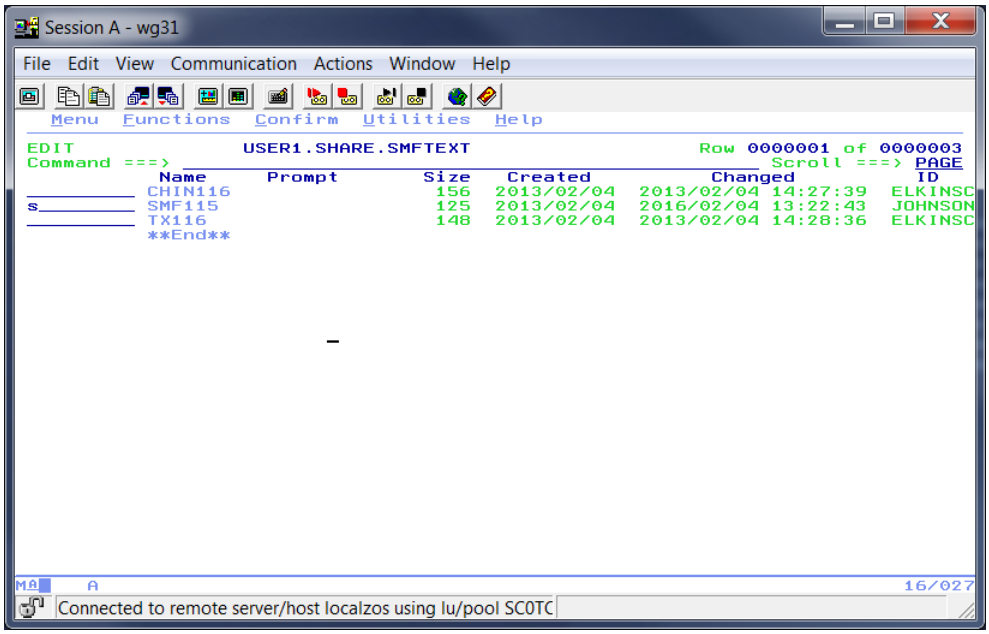
____1. IBM MQ (IMQ) produces statistical information about the overall use of the queue manager and the resources the queue manager provided by the operating system. These lightweight records are produced at predefined intervals; the interval determined by the queue manager or by the global SMF interval set on the system.

The IMQ SMF interval is set by the STATIME parameter. It can be set in the CSQSYSP macro, or by the SET SYSTEM STATIME command. The interval is in minutes and can be set to 0, meaning that the system SMF interval will be used; or any value up to 1440, which will only broadcast the data gathered once a day. Most production environments used 15 or 30 minute intervals. Lower intervals are sometimes set for problem determination.

____2. Logon onto TSO and go to ISPF option 3.4 and on the *Data Set List Utility* panel, enter ***USER1.SHARE***, in the *Dsname Level* fields and click the **ENTER** key.

____3. From the *DSLIST* panel, edit data set *USER1.SHARE.SMFTEXT* by entering an ***E*** in the *Command* field by the data set name and click the **ENTER** key.

____4. Select the *SMF115* member from the list.



____5. The SMF 115 data, as interpreted by the MP1B program MQ1150.

```
z/OS:LP1A  MQ QMGR:QMZ1  Time: 2012120 17:18:03.92
Storage manager : QSST
  Fixed pools   : Created       171,  Deallocated       171
  Fixed segments: Freed         0,  Expanded         3,  Contracted
  Varbl pools   : Created       236,  Deallocated       236
  Varbl segments: Freed      3211,  Expanded      3226,  Contracted
  Getmains       534,  Freemains       529,  Non-zero RCs         0
  SOS bits         0,  Contractions         0,  Abends         0
Log manager     : QJST
  Write_Wait          0,  Write_Nowait   3009742,  Write_Force       109
  Read_Stor         120,  Read_Active          6,  Read_Archive
  BSDS_Reqs         856,  CIs_Created     679405,  BFWR            23083
  ALW                 0,  CIs_Offload          0,  Checkpoints
  WUR                 0,  LAMA                 0,  LAMS
  Write_Susp     220958,  Write_Reqs      645104,  CI_Writes      175538
  Write_Serl          0,  Write_Thrsh       9880,  Buff_Pagein
  Data compression  : 1
  Comp_Req            0,  Comp_fail            0,  Decomp_req
  Compression:   Before                 0,  After                  0   0
```

____6. Storage Manager Questions:
The Storage Manager statistics are described in the macro hlq.SCSQMACS(CSQDQSST), where hlq is the high level qualifier for the WebSphere MQ datasets.

a. What was the value of the SOS bits? _____
   Note that if this is ever non-zero the queue manager address space is critically short on storage.
b. How many fixed pool storage contractions were reported? _____

c. Storage expansions and contractions in the fixed and variable pools are normal. If the contractions value for the queue manager as a whole is greater than zero (QSSTCONT), then the queue manager is going critically short.

____7. Log Manager Questions:
The log manager statistics are described in the macro hlq. SCSQMACS(CSQDQJST), where hlq is the high level qualifier for the WebSphere MQ datasets.

a. How many Checkpoints were issued during the SMF interval? _____
   Typically the recommendation is to keep checkpoints at or below 1 every five minutes. This may not be possible in some very high volume environments.
   Note that checkpoints issued as part of a log switch are not recorded.
b. How many CI_Writes were issued during the internal? _____
   The CI Writes are used to calculate the I/O rate.
c. What is the WTB value? _____
   WTB is a count of the number of times there was a wait for a log buffer. If this is not zero, and the OUTBUFF parameter in the CSQ6LOGP macro is set to the maximum of 4,000, refer to MP1B for additional guidance.

d. What is the data compression rate for compression one? _____
Log data compression is not often used. It often costs more in CPU than the benefit achieved by compressing the message and message header.

____8. Page forward using the **F8** key, and look at the Message manager data. The message manager statistics are described by hlq.SCSQMACS(CSQDQMST), where hlq is the high level qualifier of your IMQ libraries.

```
  Compression:   Before                 0,  After                  0   0
  Decompression: Before                 0,  After                  0   0

z/OS:LP1A  MQ QMGR:QMZ1  Time: 2012120 17:18:03.92
Message manager : QMST
  MQOPENs    24185,  MQCLOSEs    19768,  MQGETs    810210, MQPUTs
  MQPUT1s   117383,  MQINQs          2,  MQSETs         0, Close_all
fata manager    : QIST
  Creates       140,  Puts           18,  Deletes       280,  Gets
  Locates   2101065,  Stgclass        0
Buffer manager  : QPST
> 00 Buffs     30000  Low      28864  Now      28867  Getp    323270  Get
  00 Rio           0  STW     267868  TPW       3017  WIO        761  IMW
  00 DWT           0  DMC          0  STL          0  STLA         0  SOS
> 01 Buffs     30000  Low       1418  Now       7784  Getp    574372  Get
  01 Rio      429784  STW     573058  TPW     475436  WIO     129403  IMW
  01 DWT         160  DMC        271  STL     927247  STLA         0  SOS
> 02 Buffs     30000  Low      29989  Now      29992  Getp    194262  Get
  02 Rio           0  STW       8871  TPW         33  WIO         20  IMW
  02 DWT           0  DMC          0  STL          0  STLA         0  SOS
```

a. How many MQPUT1 commands were issued in the SMF interval? _____
b. How many MQPUT commands were issued? _____
c. Combining the MQPUT counts is the best way to determine the queue manager activity for the period. In many applications, MQGETs are expected to expire during on-peak periods. Also if the number of MQPUT1 requests is quite high, then the SMF116 data should be evaluated to see if a program has put a MQPUT1 request in a loop.

____9. Bring the data manager statistics to the top of the screen. The data manager statistics are described by hlq. SCSQMACS(CSQDQIST),), where hlq is the high level qualifier of your IMQ libraries.

```
Data manager    : QIST
  Creates       140,  Puts           18,  Deletes       280,  Gets
  Locates   2101065,  Stgclass        0
Buffer manager  : QPST
> 00 Buffs     30000  Low     28864  Now     28867  Getp    323270  Get
  00 Rio           0  STW    267868  TPW      3017  WIO        761  IMW
  00 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 01 Buffs     30000  Low      1418  Now      7784  Getp    574372  Get
  01 Rio      429784  STW    573058  TPW    475436  WIO     129403  IMW
  01 DWT         160  DMC       271  STL    927247  STLA         0  SOS
> 02 Buffs     30000  Low     29989  Now     29992  Getp    194262  Get
  02 Rio           0  STW      8871  TPW        33  WIO          20  IMW
  02 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 03 Buffs     50000  Low     49999  Now     49999  Getp         6  Get
  03 Rio           0  STW         6  TPW         6  WIO          6  IMW
  03 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 04 Buffs         0  Low         0  Now         0  Getp         0  Get
  04 Rio           0  STW         0  TPW         0  WIO          0  IMW
  04 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 05 Buffs         0  Low         0  Now         0  Getp         0  Get
```

a. The information printed is about the IBM MQ objects.
b. Two fields that should be monitored, there are not printed in this report are:
    i. QISTRAIO -the number of read-aheads from real I/O
    ii. QISTGETD – the number of gets that retrieved from the pagset (disk I/O)
c. You can use the delivered CSQ4SMFD (hlq.SCSQLOAD, sample JCL in hlq.SCSQPROC) program to dump the SMF data and locate the fields there.

____10. Bring the Buffer Manager statistics to the top of the screen. On the lab system, **F8** pages forward, and typically putting the cursor on the line you want brought to the top and using the **F8** key will position the display properly.
The buffer manager statistics are described in hlq. SCSQMACS(CSQDQPST).

```
Buffer manager  : QPST
> 00 Buffs     30000  Low     28864  Now     28867  Getp    323270  Get
  00 Rio           0  STW    267868  TPW      3017  WIO        761  IMW
  00 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 01 Buffs     30000  Low      1418  Now      7784  Getp    574372  Get
  01 Rio      429784  STW    573058  TPW    475436  WIO     129403  IMW
  01 DWT         160  DMC       271  STL    927247  STLA         0  SOS
> 02 Buffs     30000  Low     29989  Now     29992  Getp    194262  Get
  02 Rio           0  STW      8871  TPW        33  WIO         20  IMW
  02 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 03 Buffs     50000  Low     49999  Now     49999  Getp         6  Get
  03 Rio           0  STW         6  TPW         6  WIO          6  IMW
  03 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 04 Buffs         0  Low         0  Now         0  Getp         0  Get
  04 Rio           0  STW         0  TPW         0  WIO          0  IMW
  04 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 05 Buffs         0  Low         0  Now         0  Getp         0  Get
  05 Rio           0  STW         0  TPW         0  WIO          0  IMW
  05 DWT           0  DMC         0  STL         0  STLA         0  SOS
> 06 Buffs         0  Low         0  Now         0  Getp         0  Get
```

____11. The following questions apply to the buffer manager information:

a. How many buffer pages are assigned to Buffer pool 03 (BP3)? This field is labeled Buffs in this report. _____
b. For BP3, what was the lowest number of free pages? This field is labeled LOW in the report. _____
c. Did any of the buffer pools have a short on storage during this interval? This field is labeled SOS. _____
d. Did any of the buffer pools report reads being done to a page set? This field is labeled Rio. _____
e. If the answer to the above question is Yes, which buffer pools had read associated with them and how many?
   BP0 _____
   BP1 _____
   BP2 _____
   BP3 _____
f. Did and of the buffer pools report writes to the page set(s) associated with the pool? This field is labeled WIO._____
g. If the answer to the above question is Yes, which buffer pools had writes associated with them and how many?
   BP0 _____
   BP1 _____
   BP2 _____
   BP3 _____
h. Did any of the buffer pools have both reads and writes? _____

i. Did any of the buffer pools have the deferred write task start to move messages from the buffer pool to the page set(s)? This field is labeled DWT _____. The DWT is initiated when there are 15% or fewer free pages in the buffer pool.
j. Did any of the buffer pools have the immediate write task start to move messages from the buffer pool to the page set(s)? This field is labeled DMC. _____. The DMC is started when there are 5% free pages of fewer.
k. These last two values can be critical, especially if the queues in this bufferpool are handling online workload. If DMC is non-zero further investigation is necessary to see of pages can be added to the buffer pool, or queues can be moved about to keep from overusing the available buffer space.

____12. Do a find command for DB2 manager, the command is “f 'DB2 manager'” entered on the command line. This information is for shared queue usage.

```
DB2 manager     : Q5ST
  Tasks  : Servers         9,  Active        10,  Conns           0,  D
           High            4,  Abend          0,  Requeue         0
  Number of deadlock conditions         0
                       Count    Task avg    Task max     DB2 avg     DB
  Reads          :       439           2          36           1
  Lists          :       425          68        1405          67
  SCS Selects    :        30           5          10           4
CF manager      : QEST
  Structure #   0,  Name CSQ_ADMIN   ,  Structure-fulls         0
  Single      314415,  Elapsed time 0000005023E8A884,  Retries
  Multiple     36454,  Elapsed time 0000000BC0DCE7DB,  Retries      268
  Max entries      1474,  Max elements      2769
  Structure #   1,  Name QSGMLARGMSGS , Structure-fulls         0
  Single      577588,  Elapsed time 000002369C134918,  Retries       18
  Multiple      9319,  Elapsed time 00000002B8644EF6,  Retries       78
  Max entries      4643,  Max elements     46463
  Structure #   2,  Name QSGMNRMLMSGS,  Structure-fulls         0
  Single       10200,  Elapsed time 0000000046B76182,  Retries
  Multiple         0,  Elapsed time 0000000000000000,  Retries
```

____13. The following questions are about the DB2 information reported.

a. How many deadlock conditions were encountered during this interval?_____
b. This report does not print one critical field from the SMF data, called DHIGMAX. This field is the number of requests queued waiting for a server. If this field is greater than 10, increasing the DB2 server instances on the CSQ6SYSP macro can improve performance.

____14. The following questions are about the CF Manager data.

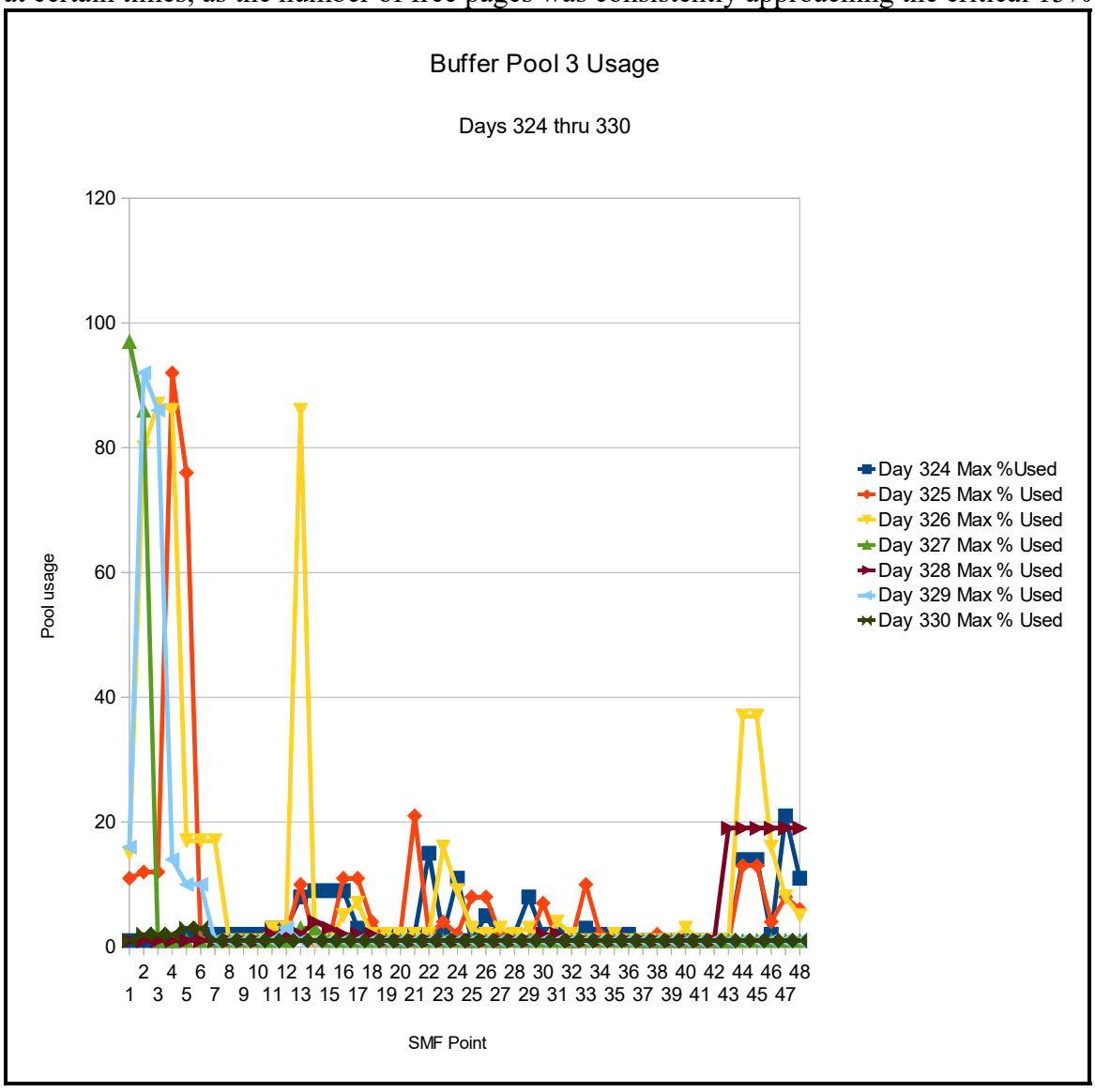
a. Were there any structure full conditions encountered? _____
b. How many retries were performed for the CSQ_ADMIN structure? _____
c. The retry count shows the number of times MQ tried to get information from the CF using a 4K buffer, but that buffer was not large enough. The request is then retried using a larger buffer. There has been some optimization within the queue managers to help control this.

Part II – Evaluating SMF115 data over time

It is critical for the management of any z/OS queue manager to monitor the statistical use over time. This has many benefits, including being able to predict usage and prevent problems that often occur when volume grows, or new applications are added to the mix.

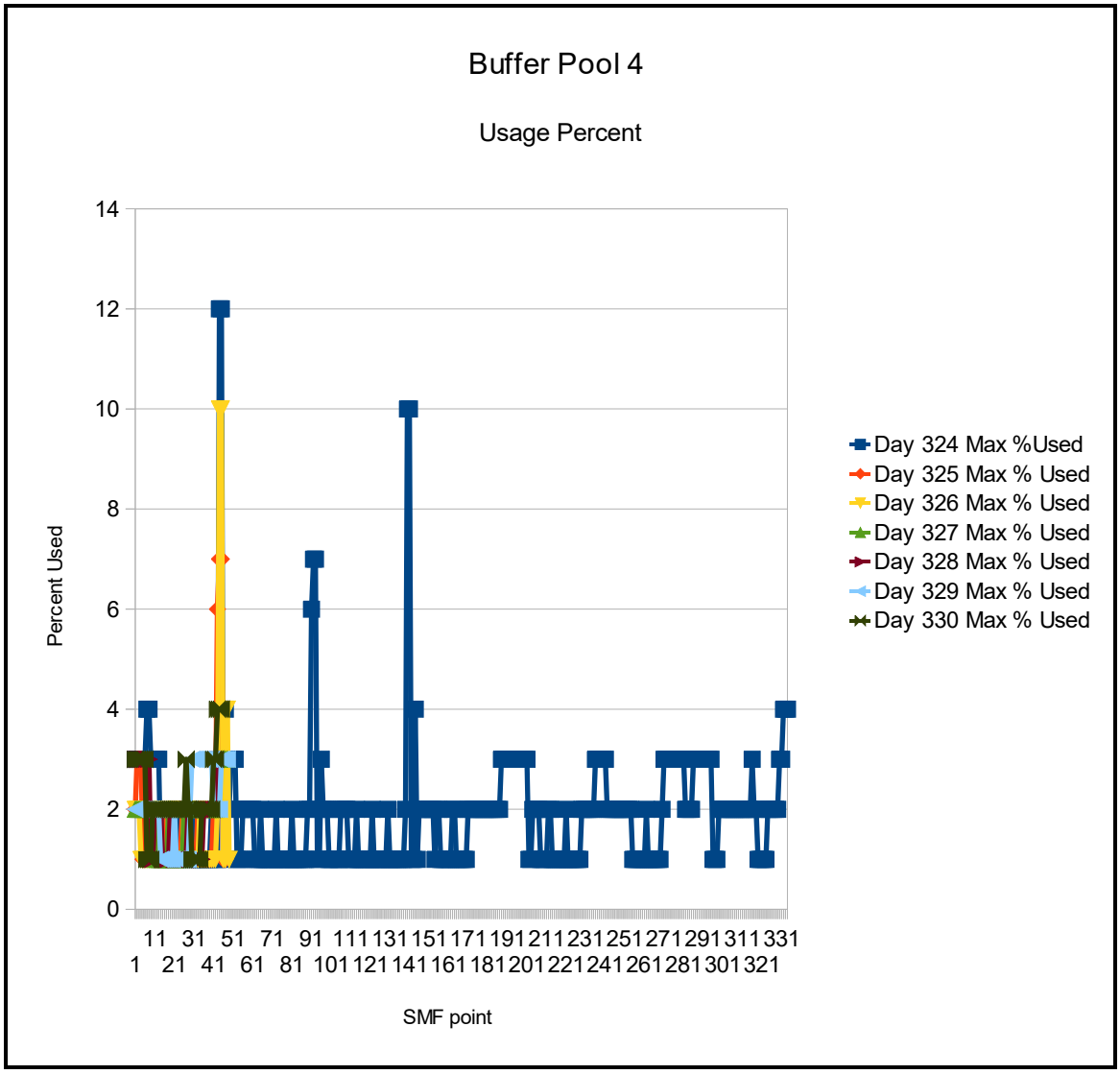
Bufferpool Problems

In this case, the concern was that one bufferpools would be going no critical storage constraints as workload was added to the queue manager. Three days worth of data were evaluated, which is probably not long enough to make a full decision. It may be enough to show a trend and to see where more analysis is needed. Bufferpool 3 in this case was approaching the point where I/O could not be avoided at certain times, as the number of free pages was consistently approaching the critical 15% mark.



As can be seen, there is a noticeable pattern of use on the days observed. There were some anomalies, with some additional spike in use on different days, but overall the pattern was similar.

In a review, another established bufferpool showed far less use during the same time period.



The following suggestions may make sense to improve processing:

1) Reduce the size of BP4 by 5,000 pages initially and add those pages to BP3. Then review the data to see if the adjustment was beneficial to BP3 and did not impact operations on BP4.
2) Reallocate one of the busy queues from BP3 to BP4. Rebalancing the workload by moving one queue at a time and monitoring for the effect is time consuming but is the safest way to do this.
3) Study other bufferpools for usage patterns. In many queue managers there is a noticeable pattern of batch (night time) and online (daylight) processing. The ATS team have seen that by evaluating the use of the underlying resources, putting queues from the daytime processing into the same pools as the batch processing can produce a number of benefits, including:
    a. Increased throughput by distributing highly active queues across resource pools.
    b. Lower CPU costs by avoiding I/O from the bufferpool to pageset.
    c. More workload running on one queue manager.