WebSphere MQ V
Intro to SMF115 Lab

Lab Objectives

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

General Lab Information and Guidelines

1) 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 ablocksize 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.
2) Any time the labels TEAM00 or TEAMXX are used, please replace the '00' or 'XX' with your team ID (TEAM01 – TEAM20).
3) The data in use is not live, you will be looking at the output from the MP1B provided SMF print jobs. The libraries used are called:

   TEAM01.SHARE.SMFTEXT
TEAM02.SHARE.SMFTEXT
TEAM03.SHARE.SMFTEXT
TEAM04.SHARE.SMFTEXT
TEAM05.SHARE.SMFTEXT
TEAM06.SHARE.SMFTEXT
TEAM07.SHARE.SMFTEXT
TEAM08.SHARE.SMFTEXT
TEAM09.SHARE.SMFTEXT
TEAM10.SHARE.SMFTEXT
TEAM11.SHARE.SMFTEXT
TEAM12.SHARE.SMFTEXT
TEAM13.SHARE.SMFTEXT
TEAM14.SHARE.SMFTEXT
TEAM15.SHARE.SMFTEXT
TEAM16.SHARE.SMFTEXT
TEAM17.SHARE.SMFTEXT
TEAM18.SHARE.SMFTEXT
TEAM19.SHARE.SMFTEXT

4) You will be signing on to MPX1 for this exercise.

5) The IP address for MPX1 is 192.168.17.252
6) The IP address forMPX2 is 192.168.17.253

7) The TSO password for this lab is 'SHARE02' (S-H-A-R-E -zero - 2).
8) Any difficulty with connectivity should be reported, but please remember that the connections may be slow.

Part I – SMF 115 – WMQ Statistical Data

1) WebSphere MQ (WMQ) 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 WMQ 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) The IP address for MPX1 is 192.168.17.252
3) On your desktop you should have PCOMM shortcuts to your TSO sessions. They are called MPX1_Ext.ws and MPX2_Ext.ws respectively.

1) Double click on the PCOMM image for MPX1. If you do not rather quickly see the TSO panel, check that the IP address (in the lower left hand corner) is correct. If not, then if you do not know how to alter the link parameters please ask one of the lab assistants for help.

2) The TSO signon panel should be shown:

```
Your IP:192.168.215.166                          Terminal: MPX10033
08/24/09                                                   13:30:12
          ****           Washington Systems Center      ****



Enter   TSO  for MPX1 TSO , or:


          USS xxxxxxxx           to access known APPLID xxxxxxxx












Enter Command ==>
```

3) Enter 'tso teamxx' where the XX is your team ID. You should then see the TSO/E logon screen, where you will enter your password (usually SHARE02).

```
------------------------------ TSO/E LOGON ------------------------------


    Enter LOGON parameters below:                RACF LOGON parameters:

    Userid    ===> TEAMXX

    Password  ===>                                New Password ===>

    Procedure ===> IKJACCMQ                       Group Ident  ===>

    Acct Nmbr ===> SVS99

    Size      ===> 1500000

    Perform   ===>

    Command   ===> ispf

    Enter an 'S' before each option desired below:
            -Nomail          -Nonotice      S -Reconnect        -OIDcard

PF1/PF13 ==> Help    PF3/PF15 ==> Logoff    PA1 ==> Attention    PA2 ==> Reshow
You may request specific help information by entering a '?' in any entry field
```

4) Once signed onto TSO and on the ISPF primary options plane, enter '3.4' on the command line and it the enter key.
5) On the 'Data Set List Utility' panel, enter TEAM*.SHARE, in the 'Dsname Level' fields and hit the enter key.

```
                          Data Set List Utility
 Option ===> _

    blank Display data set list              P Print data set list
        V Display VTOC information          PV Print VTOC information

 Enter one or both of the parameters below:
    Dsname Level . . . TEAM*.SHARE
    Volume serial  . .

 Data set list options
    Initial View              Enter "/" to select option
    2  1. Volume              /  Confirm Data Set Delete
       2. Space               /  Confirm Member Delete
       3. Attrib              /  Include Additional Qualifiers
       4. Total               /  Display Catalog Name
                                 Display Total Tracks
                                 Prefix Dsname Level

 When the data set list is displayed, enter either:
   "/" on the data set list command field for the command prompt pop-up,
   an ISPF line command, the name of a TSO command, CLIST, or REXX exec, or
   "=" to execute the previous command.
```

6) From the 'DSLIST' panel, select the PDS for your TEAM ID for edit by entering an 'e' in the 'Command' field by the data set name and hit the enter key.

```
DSLIST - Data Sets Matching TEAM*.SHARE
Command ===>


Command - Enter "/" to select action
----------------------------------------
e_         TEAMXX.SHARE.SMFTEXT
           TEAM01.SHARE.SMFTEXT
```

7) Select the 'SMF115' member from the list.

```
   Menu   Functions  Confirm  Utilities  Help
►
 EDIT              TEAMXX.SHARE.SMFTEXT                   Row 00001 of 00003
 Command ===>                                            Scroll ===> CSR
           Name      Prompt      Size   Created       Changed         ID
 _____ CHIN116              156   2013/02/04  2013/02/04 14:27:39  ELKINSC
 s_____ SMF115               125   2013/02/04  2013/02/04 14:26:54  ELKINSC
 _____ TX116                148   2013/02/04  2013/02/04 14:28:36  ELKINSC
           **End**
```

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

```
EDIT       TEAMXX.SHARE.SMFTEXT(SMF115) - 01.00                                      C
Command ===> _
****** ********************************************************* Top of Data *************************************
000001  z/OS:LP1A  MQ QMGR:QML1  Time: 2012120 17:18:03.92
000002  Storage manager : QSST
000003    Fixed pools  : Created      171,  Deallocated      171
000004    Fixed segments: Freed        0,  Expanded        3,  Contracted        5
000005    Varbl pools  : Created      236,  Deallocated      236
000006    Varbl segments: Freed     3211,  Expanded     3226,  Contracted       18
000007    Getmains       534,  Freemains      529,  Non-zero RCs       0
000008    SOS bits         0,  Contractions       0,  Abends         0
000009  Log manager    : QJST
000010    Write_Wait       0,  Write_Nowait  3009742,  Write_Force    1099,  WTB       2
000011    Read_Stor      120,  Read_Active        6,  Read_Archive      0,  TVC       0
000012    BSDS_Reqs      856,  CIs_Created   679405,  BFWR          230838,  ALR       0
000013    ALW              0,  CIs_Offload        0,  Checkpoints       6
000014    WUR              0,  LAMA               0,  LAMS              0
000015    Write_Susp   220958,  Write_Reqs    645104,  CI_Writes    1755380
000016    Write_Serl       0,  Write_Thrsh     9880,  Buff_Pagein       0
000017    Data compression  : 1
000018    Comp_Req         0,  Comp_fail          0,  Decomp_req        0, Fail       0
000019    Compression:    Before            0,  After          0    0%
000020    Decompression: Before            0,  After          0    0%
000021    Data compression  : 2
```

9) 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.

10) 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.

11) 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 WMQ libraries.

```
EDIT       TEAMXX.SHARE.SMFTEXT(SMF115) - 01.00
Command ===>
000017    Data compression  : 1
000018    Comp_Req          0,  Comp_fail          0,  Decomp_req          0, Fail       0
000019    Compression:    Before              0,  After              0  0%
000020    Decompression: Before              0,  After              0  0%
000021    Data compression  : 2
000022    Comp_Req          0,  Comp_fail          0,  Decomp_req          0, Fail       0
000023    Compression:    Before              0,  After              0  0%
000024    Decompression: Before              0,  After              0  0%
000025    Data compression  : 3
000026    Comp_Req          0,  Comp_fail          0,  Decomp_req          0, Fail       0
000027    Compression:    Before              0,  After              0  0%
000028    Decompression: Before              0,  After              0  0%
000029
000030  z/OS:LP1A  MQ QMGR:QML1  Time: 2012120 17:18:03.92
000031  Message manager : QMST
000032    MQOPENs    24185,  MQCLOSEs    19768,  MQGETs    810210, MQPUTs       119110
000033    MQPUT1s   117383,  MQINQs         2,  MQSETs         0, Close_all       0
000034  Data manager    : QIST
000035    Creates      140,  Puts          18,  Deletes      280,  Gets      90991
```

    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 non-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.

12) 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 WMQ libraries.

```
Data manager     : QIST
  Creates         140,  Puts          18,  Deletes        280,  Gets       90991
  Locates     2101065,  Stgclass        0
```

     a. The information printed is about the WebSphere 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.

13) 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  Getn    49653
  00 Rio          0  STW   267868  TPW     3017  WIO       761  IMW         6
  00 DWT          0  DMC        0  STL        0  STLA        0  SOS         0
> 01 Buffs    30000  Low     1418  Now     7784  Getp   574372  Getn   559658
  01 Rio     429784  STW   573058  TPW   475436  WIO    129403  IMW     14058
  01 DWT        160  DMC      271  STL   927247  STLA        0  SOS         0
> 02 Buffs    30000  Low    29989  Now    29992  Getp   194262  Getn     1767
  02 Rio          0  STW     8871  TPW       33  WIO        20  IMW        12
  02 DWT          0  DMC        0  STL        0  STLA        0  SOS         0
> 03 Buffs    50000  Low    49999  Now    49999  Getp        6  Getn        0
  03 Rio          0  STW        6  TPW        6  WIO         6  IMW         6
  03 DWT          0  DMC        0  STL        0  STLA        0  SOS         0
```

14) 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 bufferpools have a short on storage during this interval? This field is labeled SOS. _____
   d. Did any of the bufferpools report reads being done to a pageset?   This field is labeled Rio. _____
   e. If the answer to the above question is Yes, which bufferpools had read associated with them and how many?
      BP0 _____
      BP1 _____
      BP2 _____
      BP3 _____
   f. Did and of the bufferpools report writes to the pageset(s) associated with the pool? This field is labeled WIO._____
   g. If the answer to the above question is Yes, which bufferpools had writes associated with them and how many?
      BP0 _____
      BP1 _____
      BP2 _____
      BP3 _____
   h. Did any of the bufferpools have both reads and writes? _____
   i. Did any of the bufferpools have the deferred write task start to move messages from the bufferpool to the pageset(s)? This field is labeled DWT _____. The DWT is initiated when there are 15% or fewer free pages in the bufferpool.

j. Did any of the bufferpools have the immediate write task start to move messages from the bufferpool to the pageset(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 bufferpool, or queues can be moved about to keep from overusing the available buffer space.

15) 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,   Discs        0
          High             4,   Abend          0,   Requeue         0
  Number of deadlock conditions          0
                    Count      Task avg      Task max      DB2 avg      DB2 max   (m/s)
  Reads        :     439            2            36            1            35
  Lists        :     425           68          1405           67          1382
  SCS Selects  :      30            5            10            4            10
CF manager      : QEST
  Structure #   0,   Name CSQ_ADMIN   ,  Structure-fulls        0
  Single      314415,  Elapsed time 0000005023E8A884,  Retries         0
  Multiple     36454,  Elapsed time 0000000BC0DCE7DB,  Retries      2684
  Max entries    1474,  Max elements     2769
  Structure #   1,   Name QSGMLARGMSGS , Structure-fulls        0
  Single      577588,  Elapsed time 000002369C134918,  Retries       180
  Multiple      9319,  Elapsed time 00000002B8644EF6,  Retries       781
  Max entries    4643,  Max elements    46463
  Structure #   2,   Name QSGMNRMLMSGS,  Structure-fulls        0
  Single      10200,  Elapsed time 0000000046B76182,  Retries         0
  Multiple        0,  Elapsed time 0000000000000000,  Retries         0
  Max entries     202,  Max elements     2800
  Structure #   3,   Name QSGMSMDSMSGS,  Structure-fulls        0
```

16) 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.
17) 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.
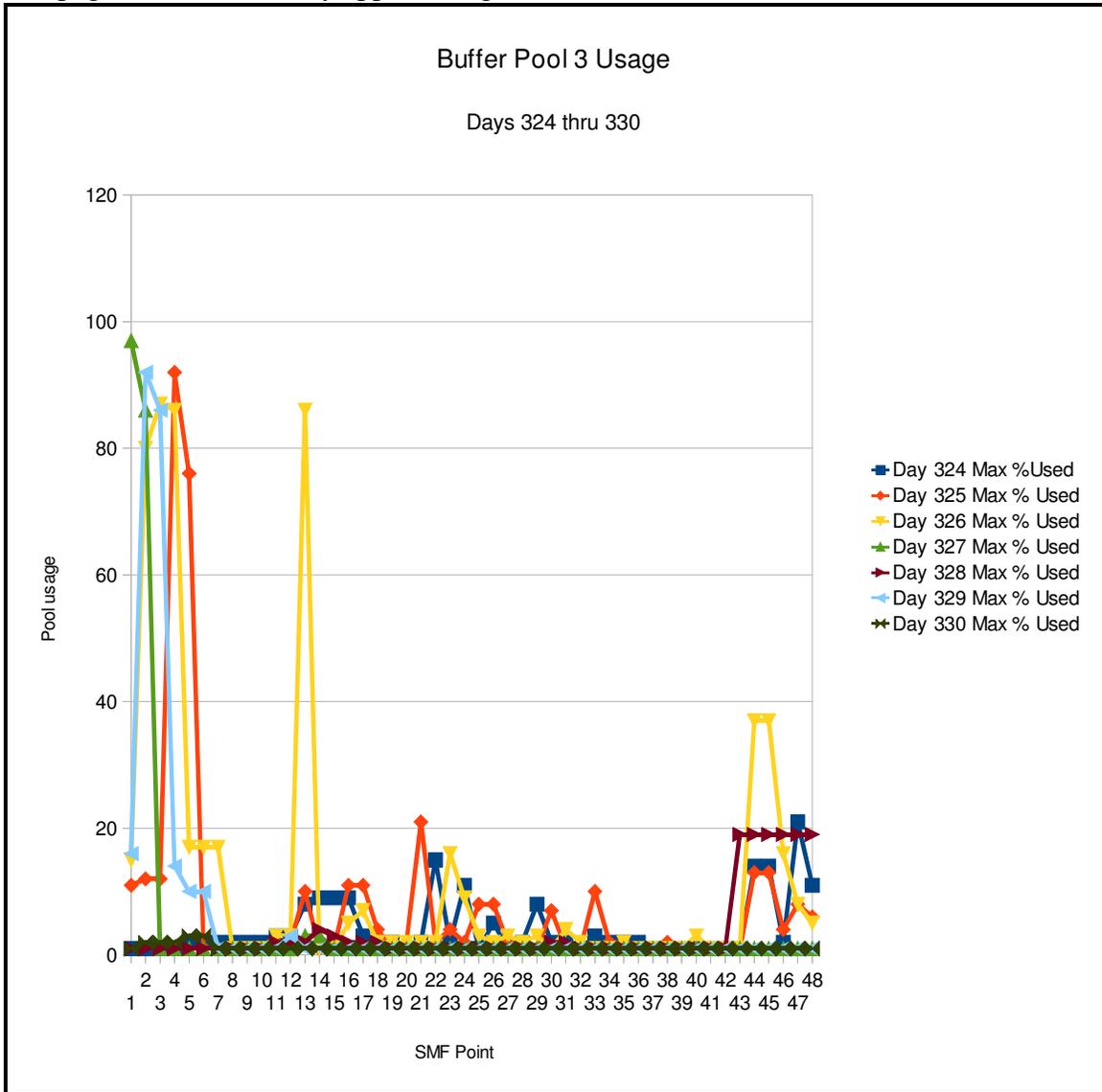
As can be seen, there is a noticeable pattern of use on the days observed. There were some anomalies, with some additional spike in use on different days, but overall the pattern was similar.

In a review, another established bufferpool showed far less use during the same time period.
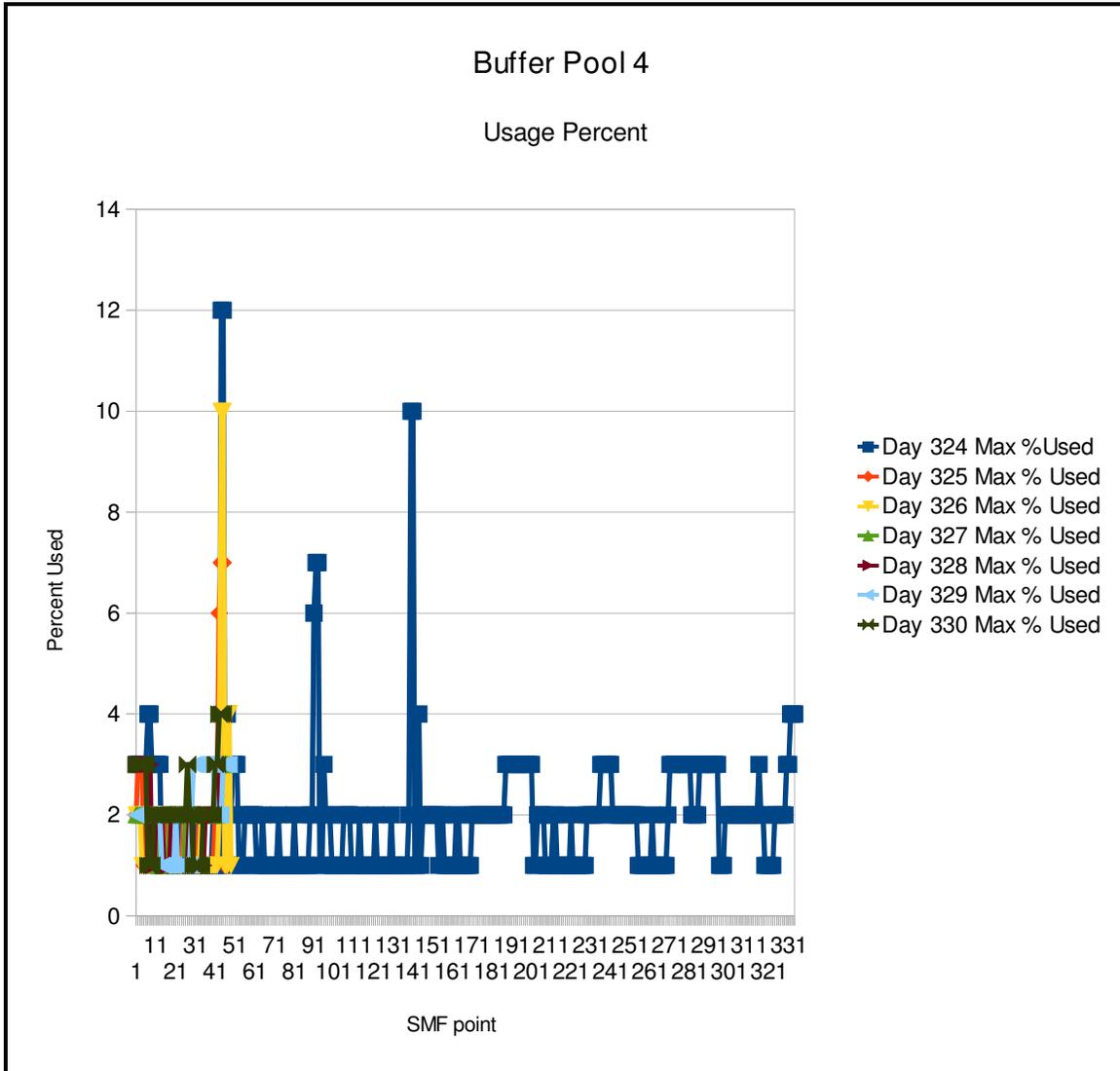
The following suggestions may make sense to improve processing:

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.