TechU

IBM

z106740: MQ for z/OS: Wellness and what to do when the queue manager is ill

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MQ for z/OS
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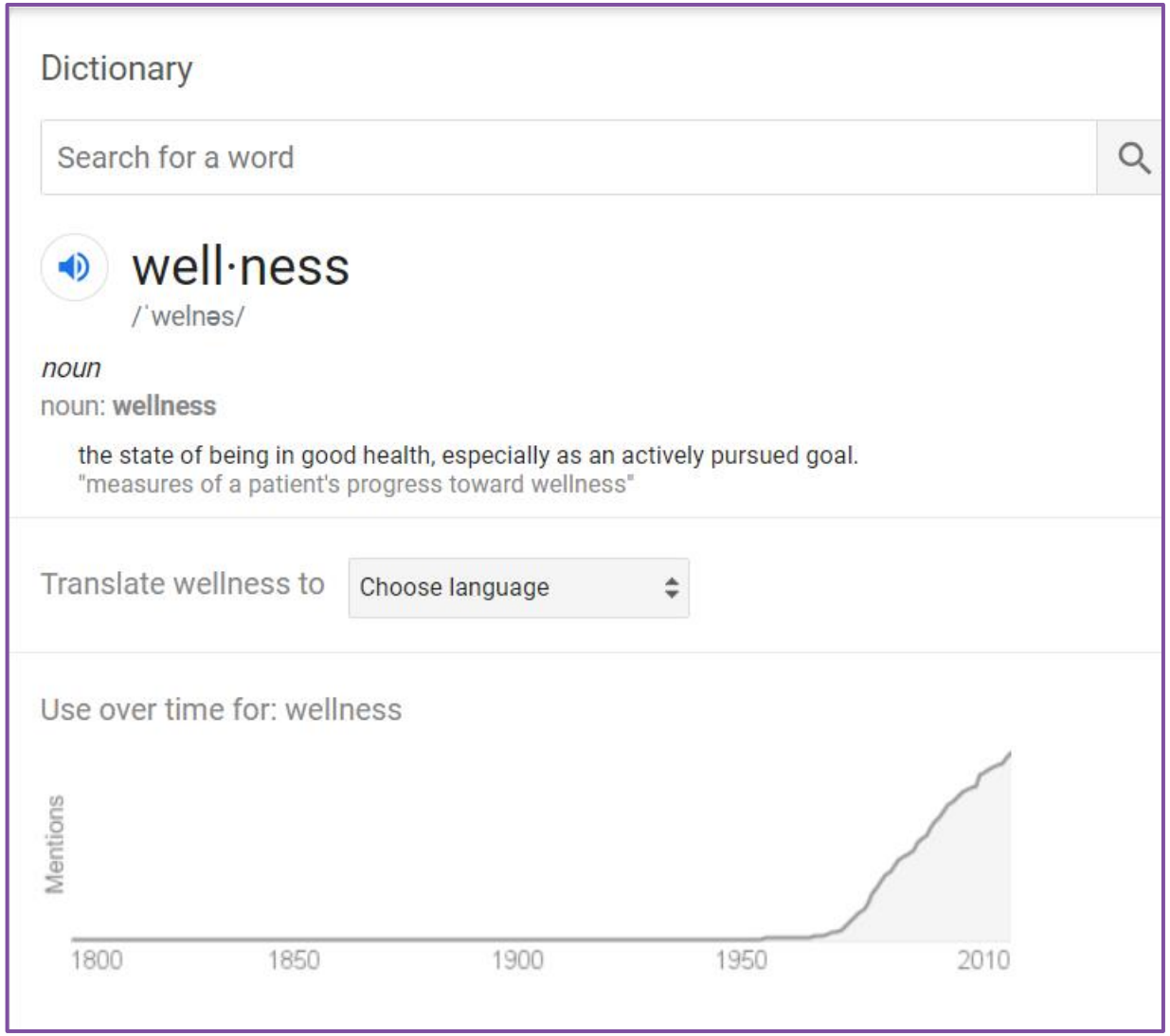
Wellness – what is it

- According to the Google dictionary:

  “The State of being in good health, especially as an actively pursued goal.”

- “Wellness” gives you the opportunity to write books about health without having to have an actual degree



What is wellness in this context?

- Wellness is having z/OS queue managers that give the administrators time to:
  - Plan upgrades
  - Review current usage, looking for issues
  - Research new features and functions
  - Research application and queue manager behaviors
  - Resolve problems as they arise

What can contribute to MQ for z/OS Wellness?

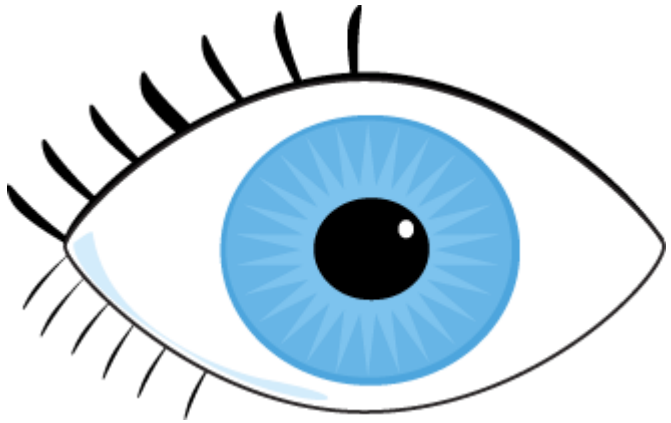
- Proper monitoring
- Operations Reviews
  - SMF data
- Application Reviews
- Problem reviews and Post mortems

Proper Monitoring

- A balancing act between knowledge of how things are currently behaving, anticipating issues, and the dreaded over notification.
- It includes watching:
  - Queue Managers
  - Queues
    - High priority queues
  - Channel Initiators
  - Individual channels
  - Queue Manager Clusters
  - And everything else….

Monitoring the queue managers

— Systems automation tools can do a very good job of this
  - As an admin, you must determine if they are looking for the ‘right’ messages in the queue manager JES log
    - Alerting on CSQJ110E +QMGR LAST COPY 1 ACTIVE LOG DATA SET IS 5 PERCENT FULL is critical
    - Alerting on CSQJ322I QML4 DISPLAY LOG report is not
  - What’s right for your queue managers may vary!
  - Warning – new messages!
    - New versions of MQ introduce new messages – check for criticality and whether your automation is looking for them
    - Use of new functions may introduce new messages
  - Warning – Don’t become too dependent on the tools
    - Take a look periodically, see if something looks new and different
    - CSQIBALL is your friend



JES log evaluation - other messages to look for

Security

- CSQH023I – Security profile is OFF
- This may be OK for some profiles, for example if it is off for topics and pub/sub is not being used

Logging

- CSQJ032E - APPROACHING END OF THE LOG RBA RANGE OF FFFFFFFFFFFF.
- CSQJ111A - OUT OF SPACE IN ACTIVE LOG DATA SETS
- CSQJ112E - INSUFFICIENT ACTIVE LOG DATA SETS DEFINED IN BSDS
- Look for long running applications:
  - CSQJ160I - Long running UOWs
  - CSQR026I - Log shunting reported via CSQR026I

Coupling Facility

- CSQE041E – Structure backup is more than a day old
- CSQE040I – Structure backup is more than two hours old

JES log evaluation - other messages to look for

Buffers and Pagesets

- CSQP004E – I/O error on a pageset
- CSQP017I –Pageset expansion has started
- CSQP013I – Pageset has been expanded, new pages will now be formatted
- CSQP014E – Pageset expansion has failed
- CSQP016E – Pageset has reached maximum number of extents
- CSQP051I – insufficient storage for bufferpool

Monitoring the queues

- Are queue-level performance events turned on?
  - Is there an event monitor in place looking for queue full, queue high depth messages?
  - Are service intervals important?
- Is another monitoring tool in place?
  - Typically using DISPLAY QSTATUS and possibly RESET QSTATS
  - QSTATUS can provide:
    - Current depth
    - Number of input and output processes currently connected
    - Whether there are uncommitted messages on a queue
    - Last GET and PUT dates and times
    - Age of oldest message on the queue
  - RESET QSTATS can provide
    - Queue highest depth since last reset
    - Message count (PUT and GET) since last reset

Monitoring the queues

Are alerts being generated appropriately?

- High volume queue for key transactions needs more careful monitoring
  - **Both MQ admins and application owners need to be alerted**
  - When input procs count falls to zero - application failure or maintenance window?
  - Is queue depth growing – Need more processing instances?
  - Are service times lengthening - ditto
- Critical transmission queues need careful monitoring
  - MQ administrators need to be alerted
  - May indicate channel stops or failures

Monitoring the Channel Initiators

— Much like queue manager

- Looking for the right messages:
  - Alerting on CSQX511I will drive you insane if you have poorly behaved clients , some customers even suppress the client connect and disconnect messages
  - Alerting on CSQX599E (channel not defined) might be necessary
  - Alerting on CSQX599E (channel ended abnormally) is probably critical
  - CSQX191I – message reallocation may be of interest, especially during problem determination, but not so much for alerting
- What's right for your channel initiators will vary!
- Warning – new messages!
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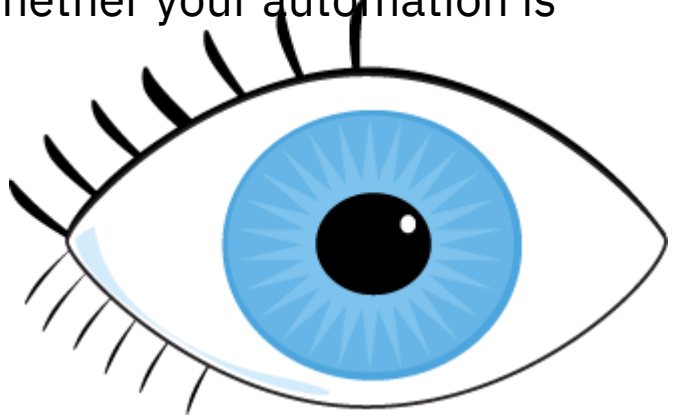


Individual Channels & Clusters

- Many monitoring tools use DISPLAY CHSTATUS
  - Looking for unexpected channels in a retry, binding or stopped status
  - Alert on critical channels!
- Look for issues with the cluster channels in particular
  - If queue managers have been removed improperly, messages may be produced until all partial repositories have reached their 90-day time out

Operations Reviews

- **Security reviews**
  - Check security settings periodically
  - New object may need additional consideration
  - **MQ Security lab (and others) tomorrow at 9 or 10 in Piedmont room**
- High Availability reviews
  - Using Shared queues?
    - Look at CF activity report to show entire Queue Sharing Group (QSG) use of a shared structure
  - Queue Manager restart and failover automated?
    - If using a QSG may not be necessary
    - If not using a QSG, and failover not automated, this could lead to longer outages
    - If not automated, how many people know how to recover or failover a queue manager
- Disaster Recovery
  - How often are tests run?
  - Are the scripts run by people who didn't write them?
  - Does the DR environment reflect production, or are there known differences?

Operations Reviews

- Reviewing MQ SMF data
  - See also session **z106741 Thursday at 3:15 Regency V**
- After the fact data, even if streamed
- Look at the MQ Statistics data
- The SMF 115 data is the statistical information produced by a MQ for z/OS queue manager.
  - Primarily used to track major trends and resolve performance problems with the queue manager
  - Very lightweight (I say this a lot, not because I want to)
  - Broken down into the major ‘managers’ within MQ
- Should be reviewed weekly
  - Often reviewed by both capacity planning and MQ administrators
  - At the very least; the log manager, message manager and buffer manager statistics should be reviewed

Log Manager Data

- The log manager data shows if persistent messaging is being used
- Area to primarily focus on:
  - Long log I/O duration
  - Log I/O vs. storage subsystem capacity
  - Log reads
  - Checkpoints

QMGR Wellness – Long Log I/O duration

- In this example there are a number of very long log I/O response times
- Reported in microseconds, this is going as high an 1.4+ seconds – impacting persistent message speed.
- The average I/O time over the week was around 65,000 microseconds – so these are well out of line
- Not shown here was the log number, the long I/Os were not always on the same log - but many were
- This needs to be investigated by the folks who manage the I/O subsystem.

MB_PerSecond	IO_Total_Time_1_1_us	IO_Total_Suspend_Time_1_1_us	IO_Max_Duration_1_1_us
0.18	10597717	11065671	1434308
0.15	12716669	13221591	1390594
0.1	8684189	8952939	1340836
0.2	8898824	9208455	1003748
0.12	9603396	10015326	975297
0.14	13584386	14137813	958608
0.2	12086895	12575309	943756
0.13	8770048	9094084	933591
0.18	16134054	16813463	919142
0.17	11199830	11660753	842476
0.2	12952539	13415911	834920
0.2	14622726	15273655	781723
0.15	10658564	11090891	679185
0.11	9726687	10149635	677612
0.21	19876884	20659627	513114
0.21	13723385	14223804	447616
0.22	14733487	15284274	445473
0.19	14649385	15139950	433519

QMGR Wellness – Log Manager

- In this example, the log writes are well within typical I/O capacity (well under 50 MB/second)
- There were no unavailable buffers for logging
- There were a surprising number of log reads, an indication of application backouts of an inflight transaction
  - In this sample, there were both buffer reads and active log reads

  Need to look into applications to see why this is being done so often
- Also examine high number of checkpoints

INTERVAL_DURATION	UNAVAILABLE_BUFFER_COUNT	LOG_READ_OUTPUT_BUFFER	LOG_READ_ACTIVE_LOG	LOG_READ_ARCHIVE_LOG	TOTAL_LOG_READS	TAPE_CONTENTION_DELAYS	CHECKPOINTS	LOG_CI	MB_PER_SECOND
1795	0	623	4461	0	5084	0	10	2821634	6.14
1789	0	417	3337	0	3754	0	9	2825604	6.17
1796	0	540	2638	0	3178	0	12	3453542	7.51
1792	0	511	2307	0	2818	0	10	2972254	6.48
1789	0	449	2082	0	2531	0	10	2818718	6.15
1773	0	392	1952	0	2344	0	12	3445866	7.59
1798	0	424	1835	0	2259	0	10	3061346	6.65
1787	0	518	1725	0	2243	0	8	2460906	5.38
1797	0	381	1824	0	2205	0	14	4037442	8.78
1797	0	581	1597	0	2178	0	9	2778470	6.04
1791	0	306	1841	0	2147	0	11	3259292	7.11

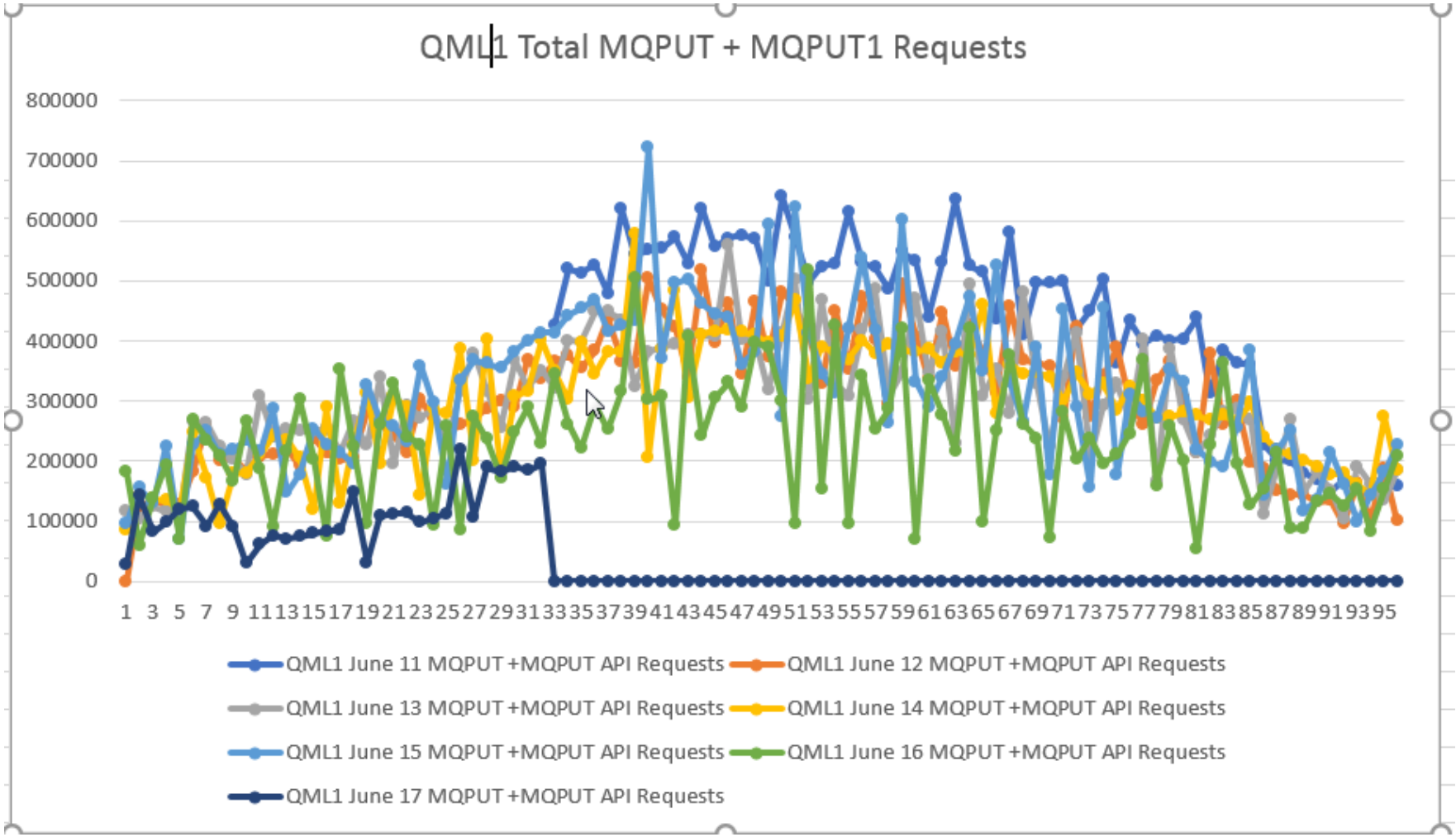
The Message Manager information - for gross use numbers

- Message Manager Information
  - Good indication of queue manager usage
    - This is only a count of API calls, not one of successful calls
    - Volume trends can be approximated from the MQPUT and MQPUT1 calls, as these are generally successful
    - MQGETs may or may not have data returned

QMGR	Open	Close	Get	Put	Put1	Inq	Inq1	Set	Total API calls	Total Puts
QML1	160	151	2,925,084	3,417,313	0	1	0	0	6,342,709	3,417,313
QML1	248	228	2,256,084	3,150,666	0	5	0	0	5,407,231	3,150,666
QML1	897	895	3,468,114	3,093,355	0	50	0	0	6,563,311	3,093,355

Message Manager – Put and Put1 Chart

— Charting the Message Manager output example



QMGR Wellness – Bufferpool Constraints

Red Flags for Bufferpools

- SOS

QMGR	BP	NumBuff	%now	%low	dwt	dmc	stl	stla	sos
QML2	3	70000	18	0	109	198906	922354	1	50
QML2	3	70000	19	0	68	143872	387873	1	13

- Freepages at 5% or less – DMC count greater than zero

Date	Time	QMGR	BP	NumBuff	%now	%low	dwt	dmc	stl	stla	sos
201133	408:15:21.	QML1	3	70000	98	5		9	27	32357	0	0
201133	420:41:19.	QML1	3	70000	95	5		2	364	61145	0	0

QMGR Wellness – Bufferpool Constraints

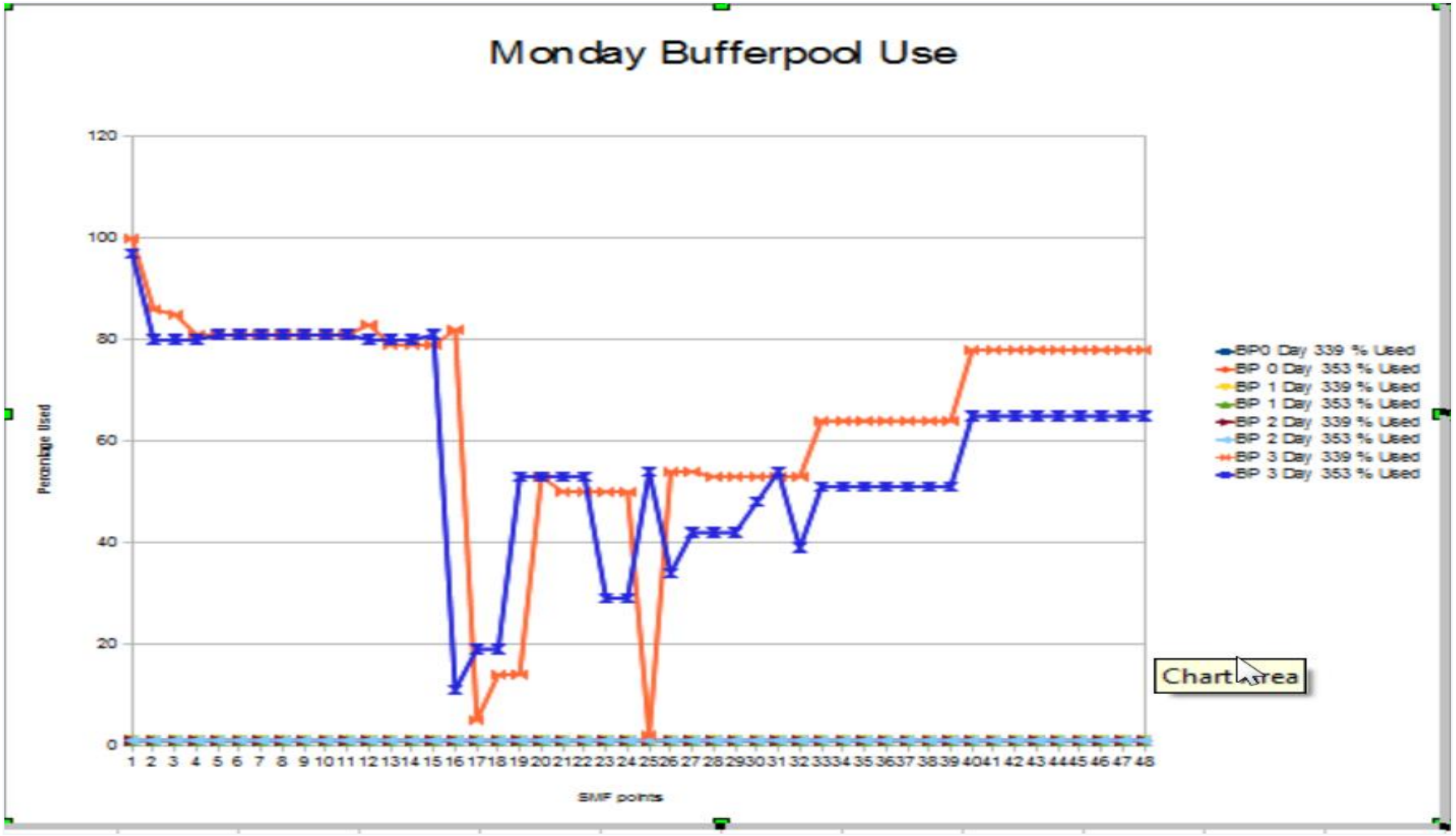
—Red Flags for Bufferpools - Continued

- DMC – synchronous write process kicks off

QMGR	BP	NumBuff	%now	%low	dwt	dmc	sti	stla	sos
QML3	3	70000	16	0	58	210092	853991	1	0
QML3	3	70000	22	3	132	38526	1232774	2	0

  - The DMC count should be used in conjunction with the IMW (Immediate Write) field to see how many synchronous writes were actually performed.

QMGR Wellness – spotting trends



Application Reviews

- I keep hearing ‘MQ on z/OS is too expensive’ from people who have a lot of application abuse going on.
  - Are applications using MQ efficiently?
    - Client applications well behaved?
    - Using MQPUT1 appropriately?
    - Interpreting reason codes correctly?
    - Message expiry set appropriately?
    - Message Persistence done right
- Periodic review of the Task accounting (SMF 116 class 3 data)
  - Shows exactly how the applications are using MQ
  - More detailed data to feed back into recommendations, answers questions like
    - Who is using (or abusing) a Bufferpool and Pageset
    - Which application or channels are issuing all the transaction backouts
    - Which applications are expiring many messages
    - Which applications are skipping messages

Problem Reviews & Post mortems

- How many MQ problems are in fact MQ problems?
  - Some applications use time of request put to request response message received as the sole measure of application responsiveness
    - Therefore, every delay and every problem is an MQ problem
  - Some organizations have learned that only the MQ admins look across platforms for issues
    - So all problems are reported as MQ problems
    - This is becoming more of an issue with off premises cloud participation in an business transaction
  - Common MQ problems:
    - Running out of resources (buffers, CF, pagesets) – what does my SMF data tell me?
    - New feature use not working as expected
    - Channels stopped
    - MQ Clustering changes
  - Workload pattern changes
    - More messages/different times
    - Batch window overrun
  - Have there been business transaction changes?
  - Was this an anomaly or is it now a habit?
  - Have there been application changes

Problem reviews and Post Mortems

- Are the results being captured for next time?
  - What did we learn?
  - Where is it documented?
  - How will the lesson apply in the future?

Thank you!

- MQ for z/OS Wellness
  - Doesn’t require a medical degree
  - Does need some adult supervision at times

MQ sessions this week

Day	Monday	Tuesday	Wednesday	Thursday	Friday
9:00		z106724: IBM MQ for z/OS - Security and REST hands-on lab - Part 1 Piedmont Mitch Johnson, Carolyn Elkins			z106740: MQ for z/OS: Wellness and what to do when the queue manager is ill Chicago C-D Carolyn Elkins, Shalawn King, Mitch Johnson
10:15	z106855: Introduction to IBM MQ - Enterprise messaging that makes your life easier Grand Hall D Simon Page	z106725: IBM MQ for z/OS - Security and REST hands-on lab - Part 2 Piedmont Mitch Johnson, Carolyn Elkins			
11:30	z106851: The MQ journey to date and what's new in MQ V9.1 LTS and MQ V9.1.n CD releases Grand Hall C Mayur Raja		z106852: MQ clustering deep dive Fairlie Simon Page		
1:00 – 1:45 PM				z106859: POSTER MQ Appliance (M2002) Lunch Area Simon Page, Mayur Raja	
1:45 PM	You are Here		z106835: MQ - Getting the most from shared queues Grand Hall D Carolyn Elkins	z106853: Multicloud deployment with IBM MQ Chicago C-D Mayur Raja	
3:15 PM	z106740: MQ for z/OS: Wellness and what to do when the queue manager is ill Grand Hall B Carolyn Elkins, Shalawn King, Mitch Johnson			z106741: MQ for z/OS - SMF, what we've learned since we last spoke Regency V Carolyn Elkins, Mitch Johnson	
4:30 PM		z106854: Introduction to IBM Event Streams and how it relates to IBM MQ Marietta Mayur Raja			
5:30 - 7:30 PM		z106859: POSTER MQ Appliance (M2002) Grand Hall Foyer Simon Page, Mayur Raja			

Shameless Promotion - MQ for z/OS WildFire Workshops currently in plan

- **IMQ09 - MQ V9 for z/OS Wildfire Workshop**
  - New York, NY - July 16 - 18, 2019 (TBA)
- **MQPERF1 - MQ z/OS Performance & SMF Evaluation Wildfire Workshop**
  - New York, NY - April 16 - 17, 2019
  - Coppell, TX - May 7 - 8, 2019
  - Dublin, OH - June 19 - 20, 2019
- **ZCONNEE - z/OS Connect Wildfire Workshop**San Antonio, TX - April 3, 2019
  - Des Moines, IA - April 10, 2019
  - Palisades, NY - April 17, 2019
  - Jacksonville, FL - April 25, 2019
  - Herndon, VA - May 15, 2019