MQ SMF
Buffer Pool Statistics
Part 1

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Presentation

Agenda

- The breakdown

- What does private message storage look like?

- What are buffer pools?

- Fields in the buffer pool SMF data
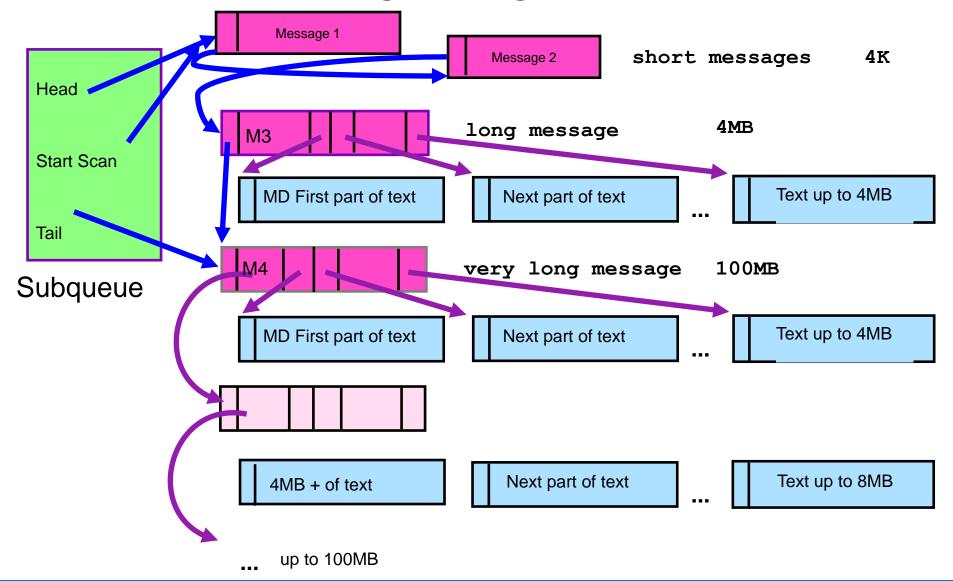
- Interpretation of critical fields

The breakdown

- Buffer pools remain the single largest area of opportunity for tuning

- This presentation is the first in the Buffer pool SMF data series

- Time limitations being what they are – under 15 minutes – this topic is broken into segments

- The information fields and critical use indicators are covered in this presentation
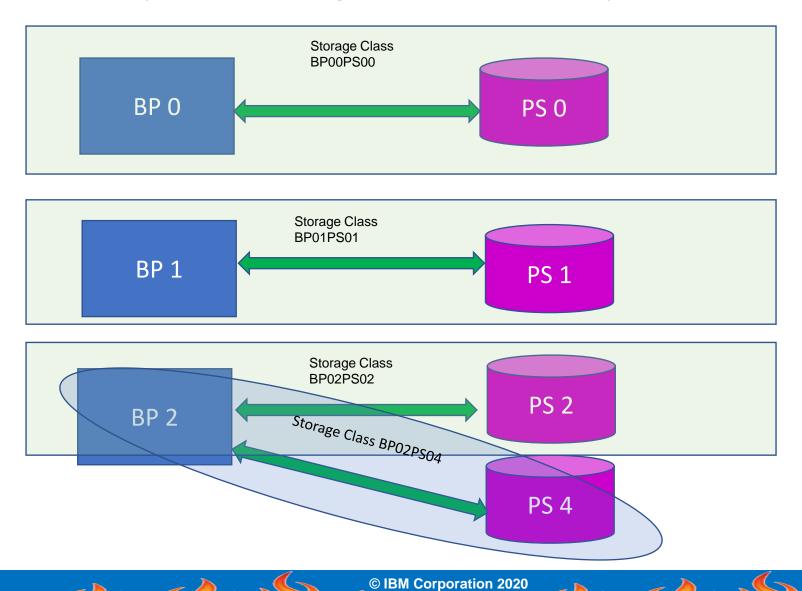
Private Queue Message Storage

Message 1

Message 2

`short messages     4K`

Head

Start Scan

Tail

Subqueue

M3

`long message        4MB`

MD First part of text

Next part of text

...

Text up to 4MB

M4

`very long message   100MB`

MD First part of text

Next part of text

...

Text up to 4MB

4MB + of text

Next part of text

...

Text up to 8MB

... up to 100MB

What are the bufferpools?

- Bufferpools are the in-memory storage for private queues
  - More efficient processing than files or databases
  - They are backed up by VSAM linear datasets
    - Used for overflow or long-term message storage

- There can be up to 100
  - Most z/OS queue managers have fewer than 20

- Buffer pools are organized into 4K pages
  - Messages smaller than 4K are on a single page
  - Message larger than 4K get multiple pages, the first page acting as a 'pointer page' to the pages containing the message parts

- The buffer pools remain the biggest area of opportunity for tuning a queue manager.
  - It is all about avoiding I/O
    - Or making the I/O faster!
  - It is the first place to look when there is a slowdown

Buffer pool and Page set relationship

Storage Class
BP00PS00

BP 0 ⟷ PS 0

Storage Class
BP01PS01

BP 1 ⟷ PS 1

Storage Class
BP02PS02

BP 2 ⟷ PS 2

Storage Class BP02PS04

PS 4

The Buffer Pool SMF information

- There are many fields in the buffer pool data, some are more relevant to tuning the pool than others.

- In this topic I am only going to talk about the bufferpool definition values and the critical counts.

  - QPSTID – The ID of the block, x'D70F'
  - QPSTLL – Length of the record
  - QPSTEYEC – Eyecatcher, 'QPST'
  - **QPSTPOOL – Buffer pool number (ranges from 00 – 99)**
  - **QPSTNBUF – number of 4K pages defined for this pool**
  - **QPSTCBSL – lowest number of 4K pages available during the interval**
  - **QPSTCBS – current number of available buffers**
  - QPSTGETP – Count of get page (old) requests
  - QPSTGETN – Count of get page (new) requests
  - QPSTRIO – Read I/O Count
  - QPSTSTW – Set Write Intent Count
  - QPSTTPW – Count of pages written
  - QPSTWIO – Count of DASD Write operations
  - QPSTIMW – Synchronous write count
  - **QPSTDWT – Deferred write threshold met count**
  - **QPSTDMC – Synchronous write threshold met count**
  - QPSTSTL – Number of buffer steals
  - QPSTSTLA – number of hash chain changes during a buffer steal
  - **QPSTSOS – The number of times the available buffer count is zero**
  - **QPSTFLAG – Flags indicating location (below or above) and fixed**

Sample Buffer pool record

- Very simple sample
  - Note that a single message being written during this test was larger than the buffer pool itself, so it is not a typical situation

Field Name	CSQ4SMFD Sample Value
QPSTID	d70f
QPSTLL	104
QPSTEYEC	QPST
QPSTPOO	5
QPSTNBU	1000
QPSTCBS	49
QPSTCBS	257
QPSTGET	12
QPSTGET	1188
QPSTRIO	2
QPSTSTW	1193
QPSTTPW	455
QPSTWIO	35
QPSTIMW	7
QPSTDWT	5
QPSTDMC	0
QPSTSTL	1190
QPSTSTLA	0
QPSTSOS	0
QPSTFLAG	Buffer pool located below bar
	Buffer pool backed by pageable 4KB pages

The Informational Fields

- **QPSTPOOL – the Pool ID**
  - This is the buffer pool number – between 00 and 99
  - 00 should be reserved for the queue manager, used for objects

- **QPSTNBUF – Number of pages**
  - The number of 4K pages defined for this pool
  - All pages are 4K currently

- **QPSTFLAG – the use flags**
  - Flags for this pool currently only first 2 bits used
  - **QPSTLOC** –
    - 0 – buffer pool is below the bar
    - 1 – buffer pool is above the bar
  - **QPSTF4KB**
    - 0 – buffer pool is pageable
    - 1 – buffer pool is fixed in memory (only valid for above the bar pools)

The Informational Fields – continued

- **QPSTCBSL**
  - The lowest number of free pages during the interval
  - Used when calculating the percentage of free pages

- **QPSTCBS**
  - The current number of free pages at the time the SMF record was written

The 'Big Three' Critical Indicators

- **QPSTSOS**
  - The number of times the buffer pool went to zero free pages
  - Never want to see this

- **QPSTDMC**
  - The number of times the synchronous write threshold was hit during the interval
  - This is when the pool is at 5% free pages

- **QPSTDWT**
  - The number of time the asynchronous write threshold was hit during the interval
  - This is when the pool is at 15% free pages
  - Note – this may not be a problem for batch related workloads

The Critical Indicators – Questions & Responses

- **The questions to ponder when any of the counts are non-zero**
  - **Is this an anomaly?**
    - Did something unusual happen (application failure, channel down, etc.)?

  - **If it is becoming a habit -** Time to address the situation
    - Make pool larger?
    - Move it above the bar
    - Move queues to other storage classes – new or existing underutilized ones
    - Add getting application instances
    - Make the queue a shared queue to add application instances in other LPARs

Foreshadowing

- In the next in the series, more of the buffer pool SMF fields will be described.