Rule DB2-224:   VPSEQT value might be too large

Finding: CPExpert believes that the Sequential Steal Threshold (VPSEQT) value might be too large.

Impact: This finding can have a MEDIUM IMPACT, or HIGH IMPACT on the performance of the DB2 subsystem.

Discussion: DB2 keeps track of the access characteristics of pages in the buffer pool: whether the pages were accessed as a result of a sequential GETPAGE request, or whether the pages were accessed as a result of a random GETPAGE request.

The Sequential Steal Threshold (VPSEQT) specifies the percentage of the virtual buffer pool that can be occupied by sequentially accessed pages (as distinguished from those pages that are randomly accessed).

When DB2 needs a page in the buffer pool, it first checks the percent of the buffer pool that is occupied by sequentially accessed pages.

- DB2 will steal sequentially accessed pages if more than the VPSEQT percent of the buffer pool is occupied by sequentially accessed pages.

- DB2 will steal a randomly accessed page if less than the VPSEQT percent of the buffer pool is occupied by sequentially accessed pages.

The default value for the VPSEQT threshold is 80%, indicating that DB2 would begin stealing sequentially accessed pages when more than 80% of the buffer pool pages were sequentially accessed.

For example, suppose that the VPSIZE (the number of buffers in the buffer pool) had been specified as 2000 pages. If the default VPSEQT of 80% were used, DB2 would begin stealing sequentially accessed pages when more than 1600 pages (2000 * .8 = 1600) were sequentially accessed. If less than 1600 pages were sequentially accessed, DB2 would steal randomly accessed pages (the remaining 400 pages in this example).

For most environments, the value specified for the VPSEQT threshold determines the available space in the buffer pool that can be used for pages read in by DB2's sequential prefetch mechanism[1].

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[1]Please refer to Rule DB2-230 for a discussion of sequential prefetch.

Rule DB2-224.1

A low value for VPSEQT indicates that less space in the buffer pool can be used by sequential prefetch, while a high value for VPSEQT indicates that more of the buffer pool can be used for sequential prefetch.

Sequential prefetch can significantly improve DB2 performance if most of the GETPAGE requests are sequential. This is because sequential prefetch brings pages into the virtual buffer pool before they are required and reads several pages with a single I/O operation. Consequently, sequential prefetch allows CPU processing and I/O operations to be overlapped.

On the other hand, it would not be a good use of the buffer pool to allow a significant percent of the buffer pool to be used for sequentially accessed pages if most of the GETPAGE requests are random.

From the above discussion, if should be clear that the ratio of randomly accessed pages in the buffer pool to sequentially accessed pages in the buffer pool normally would be the determining factor in selecting values for the VPSEQT threshold. The VPSEQT threshold would be lowered if there are a relatively large percentage of randomly accessed pages. The VPSEQT threshold should be high (set to 99, for example) if there are few randomly accessed pages.

CPExpert computes the percent of GETPAGE requests that were random. The calculation uses data in DB2STATB, and is performed as shown below:

$$\textit{Percent random GETPAGE requests} \; = \; \frac{\textit{GETPAGE requests} \; - \; \textit{Sequential GETPAGE requests}}{\textit{GETPAGE requests}}$$

CPExpert compares the computed percent of GETPAGE requests that were issued by random requestors with the **PCTRAND** guidance variable in USOURCE(DB2GUIDE). CPExpert produces Rule DB2-224 when the percent of GETPAGE requests that were issued by random requestors is **greater than** the value specified by the **PCTRAND** guidance variable, and the value specified for VPSEQT threshold for the buffer pool (obtained from the QDBPVPSH variable in DB2STAT2) is **greater than the value specified for the DB2224GD guidance variable**.

The default value for the **PCTRAND** guidance variable is 50%, and the default value for the DB2224GD guidance variable is 10%. These two defaults indicate that Rule DB2-224 should be produced when the percent of GETPAGE requests that were issued by random requestors was **greater than 95%** and the VPSEQT threshold was **greater than 10%**.

Rule DB2-224.2

Suggestion: If Rule DB2-224 is **consistently** produced, you should consider the following alternatives:

- First, make sure that Rule DB2-224 is consistently produced, particularly for intervals when important DB2 work is executing. This finding might be produced for a few intervals when unimportant work is being processed (for example, during off-shift work). Consequently, make sure that the finding is produced for all (or most) intervals when important work is executing.

  Alternatively, you might have a situation in which one class of work (e.g., work with mostly sequential requests) executes during a particular shift, while another class of work (e.g., work with mostly random requests) executes during a different shift. In this situation, you might consider specifying two different settings for the VPSEQT threshold.

- Unless you have an unusual situation, you should consider reducing the value of the VPSEQT threshold to a low value (for example, 5%).

  The result from CPExpert's analysis is that almost all of the GETPAGE requests are issued by random requestors and very few GETPAGE requests are issued by sequential requestors. In this situation, it is advantageous to allow almost all of the buffer pool to be dedicated to randomly accessed pages.

- You can alter CPExpert's analysis by modifying the **PCTRAND** guidance variable or the **DB2224GD** guidance variable in USOURCE(DB2GUIDE).

Reference: DB2 for OS/390 Version 4: Administration Guide
  Section 5.4.1.7.1 (Fixed Thresholds)
  Section 5.10.5.1 (Sequential Prefetch)

  DB2 for OS/390 Version 5: Administration Guide
  Section 5.4.1.7.1 (Fixed Thresholds)
  Section 5.10.5.1 (Sequential Prefetch)

  DB2 for OS/390 Version 6: Administration Guide
  Section 5.4.1.6.1 (Fixed Thresholds)
  Section 5.10.5.1 (Sequential Prefetch)

  DB2 UDB for OS/390 and z/OS, Version 7: Administration Guide
  Section 5.4.1.6.1 (Fixed Thresholds)
  Section 5.10.5.1 (Sequential Prefetch)

DB2 UDB for z/OS Version 8: Administration Guide
    Chapter 26. Tuning DB2 buffer, EDM, RID, and sort pools
        Buffer Pool Thresholds
    Chapter 33. Using EXPLAIN to improve SQL performance
        Interpreting data prefetch

DB2 UDB for z/OS Version 9: Performance Monitoring and Tuning Guide
    Chapter 4. Tuning DB2 buffer, EDM, RID, and sort pools
        Buffer Pool Thresholds
    Chapter 11. Using EXPLAIN to improve SQL performance
        Interpreting data prefetch

DB2 10 for z/OS: Managing Performance
    Chapter 7. Configuring storage for performance
        Buffer Pool Thresholds
    Chapter 11. Using EXPLAIN to improve SQL performance

DB2 11 for z/OS: Managing Performance |
    Chapter 1. Managing performance in general |
        Buffer Pool Thresholds |
    Chapter 45. Investigating SQL performance by using EXPLAIN |
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DB2 11 for z/OS Buffer Pool Monitoring and Tuning |

Rule DB2-224.4