Rule CIC164: The number of buffers may be too high for VSAM LSR pool

Finding: CPExpert has detected that storage was a constraint to CICS performance. However, a Local Shared Resources (LSR) pool potentially had excessive buffers allocated.

Impact: This finding should normally have a LOW IMPACT or MEDIUM IMPACT on the performance of the CICS region.

Logic flow: The following rule causes this rule to be invoked:
Rule CIC110: CICS encountered a Short-on-Storage condition

Discussion: A VSAM buffer is used to hold each VSAM control interval (CI) required to respond to a file access request. The number of data and index buffers are explicitly specified for Nonshared Resources (NSR) files. However, LSR files share a common pool of buffers, and there is no preallocation of buffers to particular files, to data or index, or to strings. Additionally, the LSR pool of buffers may be divided into "subpools" where each subpool consists of buffers of a specific size.

For LSR VSAM files, the number of buffers of each size can be specified explicitly (using the BUFFERS operand in the DFHFCT TYPE=SHRCTL macro or the DEFINE LSRPOOL command of Resource Definition Online).

Alternatively, CICS can automatically compute the number of buffers for the LSR pool, based upon the characteristics of files assigned to the pool. There are advantages and disadvantages to allowing CICS to compute the number of buffers in the LSR pool.

- It is easier to allow CICS to perform the computations. Additionally, if the number of buffers in the LSR pool is explicitly defined, the definition usually should be altered when additional files are assigned to the LSR pool or when files are removed from the pool.

- However, allowing CICS to compute the number of buffers for the LSR pool requires additional overhead (at startup) to build the LSR pool. This is because CICS must read the VSAM catalog for each file assigned to the LSR pool. Additionally, if CICS is allowed to compute the number of buffers in the LSR pool, there is no ability to explicitly specify the number of buffers for performance improvement.

It generally is better to explicitly specify the number of buffers assigned to the LSR pool. The decreased flexibility of allowing CICS to compute the

number of buffers often outweighs the savings in programmer time required to make the specifications.

The CICS statistics provide information about the number of requests waiting for a buffer at any one time, and the total number of times request had to wait for a buffer. This information is provided by file name, and information is given about the size of the data and index buffers associated with the file.

It is normally undesirable for VSAM I/O requests to wait for buffers in a LSR pool. However, the CICS statistics revealed that storage was a constraint to CICS performance. In this situation, CPExpert tries to identify possible ways in which storage can be conserved. VSAM buffers usually account for a significant amount of the real and virtual storage requirements of a CICS region. It may be prudent to allow some I/O access requests to wait for buffers if the alternative is unacceptable paging or a shortage of virtual storage.

CPExpert produces Rule CIC164 if the CICS statistics revealed that storage was a constraint to CICS performance, and if files assigned to the LSR pool **never** waited for buffers. CPExpert computes the total amount of virtual storage associated with the LSR pool and provides this information.

Suggestion: The suggestions associated with this rule should be followed only if (1) you believe that the number of buffers truly is excessive and (2) other opportunities to reduce the storage constraint have been unsuccessful.

This caution is presented because there normally are **significant** performance advantages in having a relatively large number of LSR buffers. A relatively large number of buffers usually implies a relatively large percentage of "read hits" (that is, I/O access operations are satisfied from the LSR buffers, rather than requiring a physical I/O operation to provide the data).

With the above caution in mind, CPExpert suggests that you consider the following:

- If you are explicitly defining the number of buffers assigned to this LSR pool, examine the DFHFCT TYPE=SHRCTL,BUFFER operand for the LSR pool. The BUFFER operand shows the CI size for the buffers, and the number of buffers allocated to each size. You should consider decreasing the number of buffers for associated with the LSR pool.

  In selecting a buffer size to reduce the number of buffers, it is

generally advisable to reduce the buffers matching the data buffer size rather than the index buffer size. It normally is much more desireable to have read hits on index buffers than it is to have read hits on data buffers.

- If you are allowing CICS to compute the number of buffers assigned to this LSR pool, you should decrease the value of the RSCLMT operand in the SHRCTL macro.

  After CICS computes the total number of buffers of each size required by all files assigned to the LSR pool, CICS reduces this number by 50% or to the percentage specified in the RSCLMT operand (the RSCLMT operand value takes precedence). CICS makes sure that there is at least three buffers in each LSR subpool).

  If you previously specified a value for the RSCLMT operand, the value should be decreased. If you did not previously specify a value for the RSCLMT operand, specify a value lower than 50 for the operand.

  This method is imprecise and applies to all buffers in the LSR pool. The limitations of the method illustrate another advantage of explicitly specifying LSR pool operands, rather than allowing CICS to compute the operands.

Reference: *CICS/OS/VS Version 1.7 Performance* Guide: pages 65-68, pages 232-238, and page 244.

CICS/MVS Version 2.1.2 Performance Guide: pages 158-162, page 170, and pages 394-397.

CICS/ESA Version 3.1.1 Performance Guide: pages 71-73, pages 93-106, and page 239.

CICS/ESA Version 3.2.1 Performance Guide: pages 147-152, page 155, and pages 310-321.

CICS/ESA Version 3.3.1 Performance Guide: pages 157-162, page 165, and pages 329-339.

CICS/ESA Version 4.1.1 Performance Guide: Section 4.4.2 and Appendix A.1.11.

CICS/TS Release 1.1 Performance Guide: Section 4.4.2 and Appendix 1.1.9.

CICS/TS Release 1.2 Performance Guide: Section 4.4.1 and Appendix 1.1.10.

CICS/TS Release 1.3 Performance Guide: Section 4.6.2, Section 4.6.4, and Appendix 1.1.11.

CICS/TS for z/OS Release 2.1 *Performance Guide*: Chapter 18 (VSAM resource usage (LSRPOOL)), Chapter 18 (VSAM buffer allocations for LSR), and Appendix A (Table 53).

CICS/TS for z/OS Release 2.2 *Performance Guide*: Section 4.5.2 Defining VSAM resource usage, Section 4.5.4 Defining VSAM buffer allocations for LSR, and Appendix 1.1.17.6.

