
Rule CIC161: The number of strings is too low for VSAM LSR pool

Finding: CPExpert has detected that I/O requests for files assigned to a Local Shared Resources (LSR) pool waited for VSAM strings.

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

Logic flow: This is a basic finding, based upon an analysis of the daily CICS statistics.

Discussion: A VSAM "string" is a request to a VSAM data set requiring "positioning" within the data set. Each string results in a number of VSAM control blocks being built.

VSAM requires one or more strings for each concurrent file operation. One string will be required for each access if the file operation is directly to a base data set. Two strings will be required for each access if the file operation is through an AIX path (one string will be required to hold the position on the AIX and one string will be required to hold the position on the base data set).

An operation such as a read direct will free the string (or strings) immediately. However, a read for update, mass insert, or browse will retain the string (or strings) until a corresponding release, update, or end browse is performed.

The number of strings specified for the LSR pool restricts the total number of concurrent requests to the data sets assigned to the LSR pool. Additionally, the number of concurrent requests to individual data sets is restricted to the number of strings associated with each data set.

- If too few concurrent accesses are allowed, tasks may wait on strings. Unacceptable task response times may result from the waiting on strings.
- If more concurrent accesses are specified than required for response time performance, the excess strings will be unused. However, VSAM buffer space will be allocated for the defined strings. This space will increase virtual storage requirements and may cause CICS to have storage constraints.

For LSR VSAM files, the number of strings can be specified explicitly (using the STRNO operand DFHFCT TYPE=SHRCTL macro or using the STRINGS operand in the Resource Definition Online FILE definition).

Alternatively, CICS can automatically compute the number of strings 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 strings in the LSR pool.

- It is easier to allow CICS to perform the computations. Additionally, if the number of strings 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 strings 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 strings in the LSR pool, there is no ability to explicitly specify the number of strings for performance improvement.

It is generally better to explicitly specify the number of strings assigned to the LSR pool. The decreased flexibility of allowing CICS to compute the number of strings often outweighs the savings in programmer time required to make the specifications.

The CICS statistics provide information about the number of times tasks were required to wait for LSR pool strings. This information is provided for each LSR pool, rather than at the individual file level. (String wait information is provided at the file level only for waits caused by the number of strings assigned to each file. Information is not provided at the file level if the wait was caused by the number of strings specified for the LSR pool. However, information is provided at the file level for files waiting for LSR **buffers**.)

Tasks generally should not wait on strings for files assigned to a LSR pool. Consequently, CPEXPERT produces Rule CIC161 if the CICS statistics revealed that tasks waited on LSR pool strings.

Suggestion: CPEXPERT suggests that you consider the following:

- If you are explicitly defining the number of strings assigned to this LSR pool, increase the value of the STRNO operand (or the STRINGS operand in the Resource Definition Online FILE definition) for the LSR pool indicated in this rule.

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

After CICS computes the total number of strings 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 the maximum number of 255 strings is not violated and that the resulting value is at least as large as the largest number of strings specified for any file in the LSR pool.

If you previously specified a value for the RSCLMT operand, the value should be increased. If you did not previously specify a value for the RSCLMT operand, specify a value larger than 50 for the operand. The value should be increased until the wait-on-string for the LSR pool is eliminated.

CICS also uses the RSCLMT operand to control the number of buffers computed by CICS. Increasing the RSCLMT operand may result in an increase in the number of buffers, and a resulting increase in the virtual storage requirement. With Release 1.1 of DFP, the LSR buffers are allocated above the 16 megabyte line. Consequently, the increased requirement for virtual storage may not cause a virtual storage constraint.

If CICS begins to experience a virtual storage constraint because of the increased buffers, you should cease allowing CICS to compute the strings and buffers for the LSR pool, and you should then explicitly specify the required strings and buffers using the SHRCTL macro.

An additional consideration is that additional real storage is required for the increased strings and buffers. Increasing the number of strings (or buffers) may be inappropriate if CICS begins to experience increased paging delays.

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

CICS/MVS Version 2.1.2 Performance Guide: pages 158-162, page 173, and pages 394-397.

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

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

CICS/ESA Version 3.3.1 Performance Guide: pages 157-162 and page 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 4.4.6 and Appendix 1.1.9.

CICS/TS Release 1.2 Performance Guide: Section 4.4.6 and Appendix 1.1.10.

CICS/TS Release 1.3 Performance Guide: Section 4.6.6 and Appendix 1.1.11.

CICS/TS for z/OS Release 2.1 Performance Guide: Chapter 18 (VSAM string settings for LSR (STRINGS)) and Appendix A (Table 53).

CICS/TS for z/OS Release 2.2 Performance Guide: Section 4.5.6 (Defining VSAM string settings for LSR) and Appendix 1.1.17.1.

CICS/TS for z/OS Release 2.2 Performance Guide: Section 4.5.6 (Defining VSAM string settings for LSR) and Appendix 1.1.17.1. |