
Rule CIC160: The number of strings may be too low for VSAM file

Finding: CPExpert has detected that I/O requests for VSAM files 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.

For NSR VSAM files, the STRNO operand in the DFHFCT TYPE=DATASET macro (or the STRINGS operand in the Resource Definition Online FILE definition) specifies the number of concurrent requests to the data set. Performance is affected by an appropriate selection of the number of strings.

- 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.

The CICS statistics provide information about the number of times tasks were required to wait for strings. This information is provided for each VSAM file.

IBM's CICS Performance Guide indicates that, for NSR VSAM files, you should not try to eliminate all waits for strings since these may be a result of data set access patterns. For example, read operations may have to wait for the completion of browse operations on the same CI. Consequently, increasing the number of strings may have no positive effect on performance, but may simply require allocation of more virtual storage.

CPEXpert divides the wait-on-string values in the CICS statistics by the total file access operations. CPEXpert produces Rule CIC160 if the resulting percentage is greater than the STRWAIT guidance variable. The CICS Performance Guide indicates that it may be acceptable to have 5% of the file accesses waiting on strings for NSR files. Consequently, the default value for the STRWAIT guidance variable is 5%.

The percentage of file accesses waiting on strings clearly is a function of the file access patterns for the VSAM file. You may wish to change the STRWAIT guidance variable to a lower value to provide an alert about a **potential** constraint to improved performance.

Suggestion: CPEXpert suggests that you consider increasing the value of the STRNO operand (or the STRINGS operand in the Resource Definition Online FILE definition) for the file indicated in this rule. You should then:

- Review the CICS statistics after operating with the new number of strings.
- If the wait on string for this file **has** decreased with the new value, continue operating with the new value.
- If the wait on string for this file has **not** decreased with the new value, the waits are a function of the access patterns of tasks referencing the file. In this case:
 - Return the value to its original setting. There is no point in allocating more strings to the file if the strings are not going to reduce the times tasks must wait on strings. The strings require virtual storage for buffers, and this storage is simply wasted.
 - Increase the value of the STRWAIT guidance variable in USOURCE(CICGUIDE) to eliminate the firing of Rule CIC160. There is no point in firing this rule if changing the STRNO value will not improve performance.

Note that before increasing the value of the STRWAIT guidance variable, you should have evaluated the effect of changing the STRNO operand for all files with high wait-on-string values.

Reference: *CICS/OS/VS Version 1.7 Performance Guide*: pages 63-64 and pages 234-235.

CICS/MVS Version 2.1.2 Performance Guide: pages 158-162, page 172, and pages 391-393.

CICS/ESA Version 3.1.1 Performance Guide: pages 71-73 and pages 228-233.

CICS/ESA Version 3.2.1 Performance Guide: pages 147-148 and page 289.

CICS/ESA Version 3.3.1 Performance Guide: pages 157-159 and page 307.

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 4.4.5 and Appendix 1.1.9.

CICS/TS Release 1.2 Performance Guide: Section 4.4.5 and Appendix 1.1.10.

CICS/TS Release 1.3 Performance Guide: Section 4.6.5 and Appendix 1.1.11.

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

CICS/TS for z/OS Release 2.2 Performance Guide: Section 4.5.5 (Defining VSAM string settings for NSR) and Appendix 1.1.11. |