
Rule CIC110: CICS encountered a Short-on-Storage condition

Finding: CPExpert has detected that the CICS region encountered a short-on-storage condition.

Impact: This finding has a 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: CICS tries to keep a minimum amount of free space in the dynamic storage area (DSA) to respond to GETMAIN requests from tasks. This is accomplished by performing "program compression" whenever the number of available pages in the DSA falls below a threshold or whenever a GETMAIN cannot be satisfied from available free storage.

During program compression, CICS frees the storage of all programs not currently in use and marks for deletion programs that are loaded so low in the DSA that they are mixed in with, or are near, nonprogram storage. Some program compression is a natural result of the design of CICS, since non-resident programs are not automatically removed from the DSA at the end of a task. (CICS does not automatically remove non-resident programs in case a subsequent tasks would require the program.) Since the non-resident programs are not automatically removed, DSA will periodically become full and program compression must be implemented to free the storage.

If the GETMAIN causing program compression to be invoked cannot be satisfied after program compression, CICS enters a "short-on-storage" condition. A shortage of free space in the dynamic storage area is a serious performance problem for a CICS region. This situation is referred to as CICS entering a "stress" condition and a message is sent to the operator ("DHF0506 CICS/VS IS UNDER STRESS - SHORT-ON-STORAGE")

After the short-on-storage is signaled, CICS stops various activities that might require dynamic storage. For example, CICS generally stops creating new tasks and stops inviting input messages to start new tasks. These actions translate into poor performance for the end user.

Additionally, since CICS stops inviting input messages until the stress condition is alleviated, a "backlog" of input messages can become artificially queued at the terminals. This is because an increasing number of users may be waiting for CICS to accept their inputs. Consequently,

when the short-on-storage condition is relieved, many input messages may be waiting to be submitted. These transactions would occur in "burst" mode, and may cause additional CICS stress conditions!

The CICS statistics report the number of times CICS signaled a short-on-storage condition because available dynamic storage had fallen below a threshold limit or was too fragmented for a large area to be allocated (reported as "Number of cushion releases"). Additionally, the CICS report the number of times a new storage queue was started (reported as "Times requests queued from zero"). The sum of the number of cushion releases and the times a new storage queue was started represents the total number of times that CICS had a short-on-storage condition, meaning that there was a shortage of free space in the dynamic storage area.

CPEXpert sums the "Number of cushion releases" and the "Times requests queued from zero" values. CPEXpert produces Rule CIC110 if the result is greater than zero.

Suggestion: CPEXpert strongly suggests that you investigate the causes of the short-on-storage situation and take actions to alleviate the situation. You should increase the size of the dynamic storage area or tune CICS to minimize the demands on the dynamic storage area.

There are too many possible ways to minimize the demands on the dynamic storage area to describe in this Rule Description (for example, page 187 of the CICS Performance Guide for CICS 1.7 lists 51 actions to improve usage of virtual storage). Furthermore, including the actions in this document would unnecessarily duplicate the excellent guidance in IBM's CICS Performance Guide.

CPEXpert suggests that you review the suggested actions in the IBM CICS Performance Guide appropriate to your version of CICS.

- CICS/OS/VS Version 1.7 Performance Guide: page 187.
- CICS/MVS Version 2.1.2 Performance Guide: page 227.
- CICS/ESA Version 3.1.1 Performance Guide: page 203.
- CICS/ESA Version 3.2 Performance Guide: page 107.
- CICS/ESA Version 3.3 Performance Guide: page 117.
- CICS/ESA Version 4.1 Performance Guide: Section 4.1.2
- *CICS/TS Release 1.1 Performance Guide: Section 4.1.2*

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- *CICS/TS Release 1.2 Performance Guide*: Section 4.1.2
 - *CICS/TS Release 1.3 Performance Guide*: Section 4.1.2
 - *CICS/TS for z/OS Release 2.1 Performance Guide*: Section 4.1.2
 - *CICS/TS for z/OS Release 2.2 Performance Guide*: Section 4.1.2

When Rule CIC110 is produced, CPExpert will attempt to determine which of the possible actions listed in the CICS Performance Guide could result in a savings of storage. CPExpert reports the results of its analysis by producing different rules associated with potential actions.

Reference: *CICS/OS/VS Version 1.7 Performance Guide*: pages 155 and 339.

CICS/MVS Version 2.1.2 Performance Guide: pages 87 and 278.

CICS/ESA Version 3.1.1 Performance Guide: pages 173 and 319.

CICS/ESA Version 3.2.1 Performance Guide: pages 78, 216, and 330.

CICS/ESA Version 3.3.1 Performance Guide: pages 88, 214, and 349.

CICS/ESA Version 4.1 Performance Guide: Section 4.7.5 and Appendix A.1.30.

CICS/TS Release 1.1 Performance Guide: Section 3.2.3.2, Section 4.7.5, and Appendix 1.1.27.

CICS/TS Release 1.2 Performance Guide: Section 3.2.3.2, Section 4.1.2 and Appendix 1.1.24.

CICS/TS Release 1.3 Performance Guide: Section 3.2.3.2, Section 4.1.2 and Appendix 1.1.25.

CICS/TS for z/OS Release 2.1 Performance Guide: Chapter 11 (Short-on-storage condition), Part 4 (Virtual storage above and below 16MB line checklist), and Appendix A (Table 128).

CICS/TS for z/OS Release 2.2 Performance Guide: Section 3.2.2.2 (Short-on-storage condition), Section 4.1.2 (Virtual storage above and below 16MB line performance checklist)