
Rule CIC445: LOC=BELOW had low percent minimum free storage

Finding: Coupling Facility Data Table (CFDT) pool AXM storage statistics showed that there was a low percent of LOC=BELOW free storage for the CFDT server pool.

Impact: This finding has a LOW IMPACT on the performance of the CICS region. However, it could be a warning of a pending HIGH IMPACT on the performance of the CICS region.

Logic flow: This is a basic finding, based on an analysis of the data. The finding applies only with CICS/Transaction Server for OS/390 Release 1.3, or CICS/Transaction Server for z/OS.

Discussion: A Coupling Facility Data Table is assigned to a *coupling facility data table pool* in a coupling facility. A CFDT pool consists of an XES list structure on the coupling facility. The coupling facility data table pool can contain one or more CFDTs, and there can be more than one CFDT pool defined for the coupling facility.

Access to a CFDT by CICS transactions running in an AOR is through a *CFDT pool server* that supports a specific named CFDT pool. In this context, the CFDT pool server is similar to a File Owning Region (FOR) that would be used for a normal shared data table.

The CFDT pool server is started in its own region, by executing DFHCFMN. Various parameters are provided to DFHCFMN (POOLNAME, list structure parameters, lock wait parameters, tuning parameters, etc.) to allow tailoring of the data sharing server.

A CFDT pool server must be started on each MVS image for each CFDT pool defined in a coupling facility which can be accessed from that MVS image. The Coupling Facility Data Table pool can contain one or more CFDTs, and there can be more than one CFDT pool defined for the coupling facility.

CICS automatically connects to the server for a given CFDT pool the first time that any CFDT within that CFDT pool is referenced. All CFDT pool access is performed by cross-memory calls to the CFDT server for the named pool. The authorized cross-memory (AXM) page allocation services are used to manage server region storage after the server has been initialized.

During server initialization, the CFDT server acquires all of the available storage above the 16M line, as determined by the REGION size, then releases 5% of it for use by operating system services. This storage is referred to as *AXMPGANY* pool. The server also acquires 5% of the free storage below the line for use in routines which require 24-bit addressable storage. This storage is referred to as *AXMPGLOW* pool. Server statistics indicate how much storage is actually allocated and used within the storage areas above the 16M line (*AXMPGANY* pool) and below the 16M line (*AXMPGLOW* pool).

Storage is initially allocated from the pool using a bit map. For faster allocation, free areas are not normally returned to the pool but are added to a *vector of free chains* depending on the size of the free area (1 to 32 pages). When storage is being acquired, this vector is checked before going to the pool bit map.

If there are no free areas of the right size and there is not enough storage left in the pool, free areas in the vector are put back into the pool, starting from the smallest end, until a large enough area has been created. This action appears as a compress attempt in the statistics. If there is still insufficient storage to satisfy the request, the request fails.

If a task in the server region or a cross-memory request runs out of storage, this is likely to result in AXM terminating that task or request using a simulated ABEND with system completion code 80A to indicate a GETMAIN failure. Although the server can usually continue processing other requests, running out of storage in a critical routine can cause the server to terminate.

Coupling Facility Data Table pool server storage statistics are available in MXG file CICCFS9D. CPEXpert uses data in CICCFS9D to calculate the minimum percent of free storage in the *AXMPGLOW* pool, using the following algorithm:

$$\text{Minimum percent free AXMPGBELOW storage} = \frac{S9LOWLO}{S9LOWMX}$$

where S9LOWLO = Lowest amount of storage that has been free since reset
S9LOWMX = Total number of pages in the storage pool

CPEXpert produces Rule CIC445 when the percent free storage in the *AXMPGLOW* pool is less than the value specified by the **CFPCTLMN** guidance variable in USOURCE(CICGUIDE). The default value for the **CFPCTLMN** is 25, indicating that CPEXpert should produce Rule CIC445 whenever less than 25% of storage in the *AXMPGLOW* pool is free.

Suggestion: If this finding is produced, you should consider the following alternatives:

- If storage in the AXMPGLOW pool is in danger of becoming exhausted, you should consider increasing the amount of storage that is available for the CFDT pool server identified by this finding. Increasing the amount of storage can be accomplished by increasing the REGION parameter on the EXEC Job Control Language that starts the server.

In order to prevent overloading the CFDT pool server, the number of CFDT requests that each connected CICS region can have active at a time is limited. The *CICS System Definition Guide* states that this limit is about 10 concurrent requests. Since each request requires about 40KB, the REGION size should specify at least 400KB for each connected CICS region, plus a margin of about 10% for other storage areas. Thus, for a server supporting up to 5 CICS regions, IBM suggests that you should specify REGION=2200K.

It is possible that the REGION size was specified correctly initially, but additional CICS regions began using CFDTs (via the CFDT pool server, of course). In this case, it is possible that the REGION size for the CFDT pool server was not updated to account for the additional CICS regions requiring service. Rule CIC446 will be produced if CPExpert's analysis indicates that more CICS regions are using the CFDT pool server than would be expected based on the amount of storage allocated.

- Change the CFPCTLMN guidance variable in USOURCE(CICGUIDE) so Rule CIC445 is produced only when you wish to be aware of a different minimum percent of free storage in the AXMPGLOW pool.

Reference: *CICS/TS for OS/390 Release 1.3*

CICS System Definition Guide: Section 4.3.2 (Defining and starting a coupling facility data table server region)

CICS Performance Guide: Section 4.6.13 (Coupling facility data tables)

CICS/TS for z/OS Release 2.1

CICS System Definition Guide: Section 4.3.2 (Defining and starting a coupling facility data table server region)

CICS Performance Guide: Section 4.5.13 (Using coupling facility data tables to gain performance benefits)

CICS/TS for z/OS Release 2.2

CICS System Definition Guide: Section 4.3.2 (Defining and starting a coupling facility data table server region)

CICS Performance Guide: Section 4.5.13 (Using coupling facility data tables to gain performance benefits)