
Rule CIC324: Maximum key list was reached for shared temporary storage

Finding: The CICS Shared Temporary Storage Queue Server statistics showed that the maximum list key had been reached for shared temporary storage, indicating that the maximum queue size or the maximum queues had been reached (depending on the list).

Impact: This finding has a MEDIUM IMPACT or 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 or for z/OS.

Discussion: Shared temporary storage queues are stored in named pools in an MVS coupling facility. A shared TS pool consists of an XES list structure, which is accessed through a cross-memory queue server region. Three parameters control how many shared temporary storage queues can be in a specific pool and the characteristics of the queues:

- The *MAXQUEUES* parameter specifies the maximum number of data lists to be reserved when the structure is allocated. This parameter determines the maximum number of large queues that can be stored in the structure. The default value for the *MAXQUEUES* parameter is 1000, indicating that a maximum of 1000 large queues can be stored in the structure.
- The *SMALLQUEUEITEMS* specifies the maximum number of items that can be stored in the small queue format in the queue index entry data area. This parameter can force a queue to be converted to the large queue format if it has a large number of small items. This conversion “uses” one of the large queues that was specified by the *MAXQUEUES* parameter, in the sense that it adds to the current number of large queues stored in the structure.

The default value for the *SMALLQUEUEITEMS* parameter is 9999, indicating that a maximum of 9999 items can be stored in the small queue format in the queue index entry data area before the queue would be converted to the large queue format.

- The *SMALLQUEUEESIZE* parameter specifies the maximum data size for a small queue including the two-byte length prefix on each data item. Any queue exceeding the maximum size, when writing the second or subsequent item to a queue, is converted to the large queue format. This

conversion “uses” one of the large queues that was specified by the MAXQUEUES parameter, in the sense that it adds to the current number of large queues stored in the structure.

The default value for the *SMALLQUEUESIZE* parameter is 32K, indicating that the queue would be converted to the large queue format when the queue size was more than 32K.

If the number of queues is reached (as set by the MAXQUEUES server initialization parameter described above), any further request to establish a queue will fail, and message **DFHXQ0443** (*CF structure strname request failed, all lists are in use*) will be issued. The failing request is given a NOSPACE indication if it originated from a CICS API request.

Shared temporary storage queue server statistics for the coupling facility are available in MXG file CICXQ1. CPExpert uses data in CICXQ1 to determine whether a List Full condition occurred. CICXQ1 variable S1RSP6CT (List full: maximum list key reached) indicates that maximum queue size or maximum queues were reached, depending on the list.

CPExpert produces Rule CIC324 when the number of List Full conditions is greater than the value specified by the **TSLSTFUL** guidance variable in USOURCE(CICGUIDE). The default value for the **TSLSTFUL** is 0, indicating that CPExpert should produce Rule CIC324 whenever any List Full conditions occurred.

Suggestion: If this finding is produced, you should examine the output from Rule CIC324 to determine whether the highest number of queues in the TS pool is as large as the MAXQUEUES parameter.

- If the highest number of queues in the TS pool is **equal to** the MAXQUEUES parameter, the finding was produced because the maximum number of queues had been reached. In this case, you should consider the following alternatives:
 - Review the application to ensure that any queues of total size greater than 32K bytes are deleted when they are no longer in use. This action will free up data lists.
 - The number of lists is fixed when the structure is allocated. Consequently, the only way to increase the number of lists in a structure is to (1) unload the structure, (2) use SETXCF FORCE to delete the structure, and (3) reload the structure with a larger MAXQUEUES parameter.

-
- If the highest number of queues in the TS pool is **less than** the MAXQUEUES parameter, the finding was produced because the maximum data size for a small queue had been reached, or the maximum number of queues had been reached. In this case, you should consider the following alternatives:

- Examine the SMALLQUEUEITEMS parameter to see whether the value has been significantly reduced from its default of 9999. This parameter can force queues to be converted to the large queue format if it has a large number of small items. It can be more efficient to write the items separately than to rewrite the whole small queue data area each time.

If the SMALLQUEUEITEMS parameter has been significantly reduced, verify that the value is appropriate for the TS pool. If the value is appropriate, consider specifying a larger value for the TSLSTFUL guidance variable in USOURCE(CICGUIDE) as described below.

- Examine the SMALLQUEUEUSIZE parameter to see whether the value has been significantly reduced from its default of 32K. This parameter can force queues to be converted to the large queue format at a smaller size than 32K. This action might be desired to prevent large amounts of data being written to the small queue format.

If the SMALLQUEUEUSIZE parameter has been significantly reduced, verify that the value is appropriate for the TS pool. If the value is appropriate, consider specifying a larger value for the TSLSTFUL guidance variable in USOURCE(CICGUIDE) as described below.

- Change the TSLSTFUL guidance variable in USOURCE(CICGUIDE) so Rule CIC324 is produced only when you wish to be aware of a larger number of List Full situations. Unless you have a very unusual situation, this alternative should not be selected. You normally should be aware of List Full situations unless you are using non-default values for the SMALLQUEUEITEMS parameter or SMALLQUEUEUSIZE parameter to deliberately force a queue to be converted to the large queue format based on the number of elements in the queue or the maximum queue size.
- You can “turn off” the rule using the process described in Section 3 of this User Manual. However, this alternative is **not** recommended! You should always be aware of List Full situations.

-
- Reference:** *CICS/TS for OS/390 Release 1.1*
CICS System Definition Guide: Section 3.4.3 (Defining TS server regions)
- CICS/TS for OS/390 Release 1.2*
CICS System Definition Guide: Section 3.4.3 (Defining TS server regions)
- CICS/TS for OS/390 Release 1.3*
CICS System Definition Guide: Section 4.2.2 (Defining TS server regions)
- CICS/TS for z/OS Release 2.1*
CICS System Definition Guide: Chapter 21 (Starting a TS server region)
- CICS/TS for z/OS Release 2.2*
CICS System Definition Guide: Chapter 21 (Starting a TS server region)