
Rule CIC282: CICS-DB2 Entry tasks overflowed to Thread Pool

Finding: At least one CICS-DB2 Entry task overflowed to the thread pool because an Entry thread was unavailable, and the DB2ENTRY THREADWAIT attribute specified POOL.

Impact: This finding should normally have a LOW IMPACT on the performance of CICS tasks in the region that use the CICS-DB2 connection. There could be a HIGH IMPACT, however, if the tasks that overflow to the Thread Pool encounter no pool threads available and if the pool THREADWAIT attribute specified THREADWAIT=NO. THREADWAIT=NO would cause the DB2 Entry tasks to abend if no pool thread was available.

Logic flow: This is a basic finding, based upon an analysis of the CICS statistics. This finding applies only with CICS/Transaction Server for OS/390 Release 1.2 and subsequent releases of CICS.

Discussion: The CICS DB2 attachment facility creates an overall connection between CICS and DB2. CICS applications use this connection to issue commands and requests to DB2.

A CICS transaction accesses DB2 via a *thread*, which is an individual connection into DB2. Threads are created when they are needed by transactions, at the point when the application issues its first SQL or command request. The transaction uses the thread to access resources managed by DB2.

There are three types of threads: Command threads, Pool threads, and DB2ENTRY threads,.

C Command threads are used by the CICS DB2 attachment facility for issuing commands to DB2 via the DSNC transaction.

C Pool threads are used for all transactions and commands that are not using a Command thread (because the transaction is not DSNC), are not using an Entry thread (because an Entry thread had not been defined for the transaction), or have been “overflowed” to the pool because a Command thread or an Entry thread was not available.

C One or more Entry thread categories optionally can be defined (using the DB2ENTRY definition) for specific transactions or groups of transactions. Entry threads are used for transactions that need to be managed separately from the normal transactions, or for transactions that have

special accounting needs.

When a thread is no longer needed by the transaction, the thread is released. The thread release typically occurs after syncpoint completion. The thread may be terminated immediately upon release or it may be retained for a period of time, depending on the type of thread and whether “thread protection” has been specified .

Transactions use Entry threads because (1) they were assigned to the Entry via the DB2ENTRY definition or (2) they were assigned to the Entry via the DB2TRAN definition.

An Entry thread must be available when the transaction attempts to acquire an Entry thread. The maximum number of pool threads is specified via the DB2ENTRY definition of the specific Entry, using the THREADLIMIT attribute. Once the number of Entry threads in use reaches the value of the THREADLIMIT attribute specified on the DB2ENTRY definition, no more Entry threads are available for the specific Entry.

The THREADWAIT attribute for the DB2ENTRY definition controls the action that should be taken if an Entry thread is unavailable:

- **THREADWAIT=YES** means that the transaction will wait (be placed on the Pool Ready Queue) until a Pool thread becomes available.
- **THREADWAIT=NO** means that the transaction will be abended (aborted) if no Entry thread is available. The CICS DB2 attachment issues abend code AD3T, when THREADWAIT=NO is coded and the number of Entry threads is exceeded.
- **THREADWAIT=POOL** means that requests for Entry threads are transferred to the pool when the value of THREADLIMIT is exceeded. A transaction is then under the control of the PRIORITY¹, THREADLIMIT, and THREADWAIT attributes for the pool.

When an Entry request is transferred to the pool, this is called “overflowing” to the pool. The transaction keeps the PLAN and the AUTHID/AUTHTYPE values that were specified for the entry thread.

However, the request operates under the THREADLIMIT and THREADWAIT attributes associated with the pool. If the pool has reached the maximum number of active threads specified by the THREADLIMIT attribute of the DB2CONN definition, the Entry transaction will either wait or abend, depending on the THREADWAIT attribute of the DB2CONN definition.

¹The PRIORITY attribute is not relevant when CICS is connected to DB2 Version 6 or later.

Additionally, pool threads are always unprotected threads and the thread is terminated immediately upon release. If Entry threads are protected, but Entry transactions overflow to the Pool, the transactions will not be associated with a “protected thread” concept. This could cause additional overhead for creating and terminating the threads. Had the transaction remained in the DB2ENTRY threads and if the Entry threads were protected, the overhead could be eliminated.

Some organizations assign CICS-DB2 tasks to an Entry for accounting or management control reasons, but expect the transactions to use threads from the Pool threads. These Entry threads have a THREADLIMIT attribute of zero, and have a THREADWAIT attribute of POOL.

CICS-DB2 Entry statistics are available in MXG file CICDB2RE. CPEXpert uses data in CICDB2RE to determine whether THREADWAIT=POOL was specified for the DB2ENTRY definition, whether threads were defined for the Entry, and whether any Entry threads overflowed to the pool.

CPEXpert produces Rule CIC282 when THREADWAIT=POOL was specified for the DB2ENTRY definition, when the THREADLIMIT attribute for the DB2ENTRY was greater than zero (indicating that Entry threads were provided), and when the number of Entry threads that overflowed to the pool was greater than the **ENTRFLOW** guidance variable in USOURCE(CICGUIDE).

The default value for the ENTRFLOW guidance variable is zero, indicating that Rule CIC282 should be produced when Entry threads were defined for the DB2ENTRY and any Entry threads overflowed to the pool.

Suggestion: If Rule CIC282 is produced, you should consider the following alternatives:

C Increase THREADLIMIT value. You can increase the THREADLIMIT value on the DB2ENTRY definition if you wish to allow more threads to be used for the transactions associated with the DB2ENTRY (or as defined by the DB2TRAN specification).

C Change the THREADWAIT attribute so transactions wait for an Entry thread to become available. You can change the THREADWAIT attribute from THREADWAIT=POOL to THREADWAIT=YES in the DB2ENTRY definition. This will allow transactions to wait for an Entry thread if no Entry thread is available.

C Use transaction class limits. If you wish to limit the amount of CICS-DB2 activity, you should consider using transaction class limits rather than using the THREADLIMIT value and THREADWAIT=NO attribute.

IBM states that it is better to limit transactions using a transaction class than allow them to queue for threads.

C Turn off Rule CIC282. You might have deliberately exercised the option that Entry transactions should overflow to the pool. In this case, you should “turn off” rule CIC282 (see Section 3 for instructions on how to “turn off” rules).

C Modify guidance. You can modify the ENTRFLOW guidance variable in USOURCE(CICGUIDE) if you feel that Rule CIC282 is produced prematurely.

Reference: *CICS/TS Release 1.3 CICS DB2 Guide*: Section 5.4 (Creating, using, and terminating threads)

CICS/TS Release 1.3 Resource Definition Guide: Section 5.1.4 (DB2ENTRY) and Section 5.1.5 (DB2TRAN)

CICS/TS for z/OS Release 2.2 CICS DB2 Guide: Section 5.4 (How threads are created, used, and terminated)

CICS/TS for z/OS Release 2.2 Resource Definition Guide: Section 2.4 (DB2 entry definitions) and Section 2.5 (DB2 transaction definitions)