Rule CIC301:   CICS waited for logger "structure full" condition

Finding: The CICS interval statistics showed that CICS waited for logger "structure full" conditions.

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 CICS interval statistics.

Discussion: The CICS Log Manager is a domain that was introduced with CICS/Transaction Server for OS/390. The CICS Log Manager replaces the journal control management function of earlier releases of CICS.

CICS uses the MVS system logger[1] for all logging and journaling requirements. Using services provided by the MVS system logger, the CICS log manager supports:

- The CICS **system log**, which is used for dynamic transaction backout, emergency restart, and preserving information for resynchronizing in-doubt units-of-work.

  Each CICS region has only one system log (the system log can be defined as a dummy if it is not required by the region). The CICS system log is intended for use only for recovery purposes (for example, it would be used during dynamic transaction backout, or during an emergency restart).

  In CICS Transaction Server for OS/390, the system log is implemented as two MVS system logger log streams, but together they form a single logical stream. System log stream names are generally qualified names, where the last qualification is *DFHLOG* for the primary and *DFHSHUNT* for the secondary stream name.

- Forward recovery logs, auto-journals, and user journals. The CICS forward recovery logs, autojournals, and user journals are referred to as **general logs**, to distinguish them from *system logs*. This distinction in important when analyzing performance data. These logs are kept separate from the system log. CICS checks their stream names to ensure that they are different from that of the system log.

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[1]The MVS system logger allows applications (e.g., CICS) to write records into a log stream. The MVS system logger provides sysplex-wide services and ensures data integrity for multiple systems accessing the log stream. Prior to OS/390 Release 2.4, the MVS system logger required a coupling facility (unless appropriate APARs were installed with OS/390 Release 1.3). With OS/390 Release 2.4 (or Release 1.3 with appropriate APARs), individual log streams can use either DASD or a coupling facility.

The CICS Log Manager uses the MVS system logger instead of CICS journal data sets. The CICS Log Manager provides online merging of general log streams from different CICS regions, which may be on different MVS images in a sysplex. The MVS system logger allows direct access to blocks of log data. This feature enables the CICS log manager to read the system log directly during dynamic transaction backout.

From the CICS view, the log stream is a set of records in time sequence order, merged into a single stream, independent of physical residence of the log stream. The log stream can reside in data space storage, in a staging dataset, in a coupling facility, or in a log stream dataset. During installation of MVS, system parameters control the placement and length of log stream.

One significant advantage of the MVS system logger design is that any other system in a sysplex can recover data in the log stream. This feature prevents data loss in case of failure of one system.

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The MVS logger is not always able to satisfy immediately requests from the CICS Log Manager. This problem normally occurs in two situations

- For a log stream that uses a coupling facility structure, a 'STRUCTURE FULL' condition can exist. In this case, the coupling facility has reached its capacity before off loading data to DASD[2]. This condition is analyzed by Rule CIC301.

- For a DASD-only log stream, a 'STAGING DATA SET FULL' condition can exist. In this case, the staging data set has reached its capacity before off loading data to secondary storage. This condition applies only with CICS/TS Release 1.2 and later releases, and is analyzed by Rule CIC302.

If either of the above situations occurs, they indicate that the logger cannot write data to secondary storage quickly enough to keep up with incoming

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[2]This condition could be encountered during the rebuilding of a coupling facility structure, but rebuilding of a coupling facility structure is an event that would not require CPExpert's analysis - such an event would be well-known to systems personnel!

data. Both situations cause CICS to wait before it can write more data. Depending on the length of time CICS must wait, significant performance degradation would be experienced by the CICS region.

CPExpert examines the SMF88STN variable in the MXG TYPE88 data set (this variable indicates whether the log stream is a coupling facility type, or is a DASDONLY type). When this variable indicates the log stream is a coupling facility type, CPExpert compares the SMF88ESF (times a structure full condition was detected) variable in the MXG TYPE88 data set with the **STRFULL** guidance variable in USOURCE(CICGUIDE). CPExpert produces Rule CIC301 when the SMF88ESF value exceeds the **STRFULL** guidance variable. The default value for the **STRFULL** guidance variable is zero, indicating that CPExpert should produce Rule CIC301 when any structure full condition was detected.

Suggestion: IBM suggests that you consider the following alternatives to reduce CICS waits for buffer full conditions:

- Review the number of data sets that were defined to a single log stream. If you define too many data sets to a single log stream, you could experience frequent structure-full events when the log stream can't keep up with data flow.

- Increase the size of the coupling facility structure in order to smooth out spikes in logger load.

- Reduce the data written to the log stream by not merging so many journals or forward recovery logs onto the same stream.

- Reduce the HIGHOFFLOAD threshold percentage (the point at which the system logger begins off loading data from primary storage to off-load data sets).

- Review the size of the off-load data sets. These should be large enough to avoid too many "DASD shifts"--that is, new data set allocations. CPExpert normally will produce Rule CIC307 if too many DASD shifts occurred.

- Examine device I/O statistics for possible contention on the I/O subsystem used for off-load data sets.

- Use faster DASD devices.

Reference: *CICS/TS Release 1.1 Performance Guide*: Section 4.6.1 (Monitoring the logger environment).

CICS/TS Release 1.2 Performance Guide: Section 4.6.2 (Monitoring the logger environment).

CICS/TS Release 1.3 Performance Guide: Section 4.10.2 (Monitoring the logger environment).

CICS/TS for z/OS Release 2.1 *Performance Guide*: Chapter 22 (Monitoring the logger environment).

CICS/TS for z/OS Release 2.2 *Performance Guide*: Section 4.9.1 (Monitoring the logger environment)

CICS/TS for z/OS Release 2.3 *Performance Guide*: Section 4.9.1 (Monitoring the logger environment)

CICS/TS for z/OS Release 3.1 *Performance Guide*: Section 4.9.1 (Monitoring the logger environment)

CICS/TS for z/OS Release 3.2 *Performance Guide*:
   Chapter 18. Logging and journaling: performance considerations
     Monitoring the logger environment

CICS/TS for z/OS Release 4.1 *Performance Guide*:
   Chapter 18. Logging and journaling: performance considerations
     Monitoring the logger environment

CICS/TS for z/OS Release 4.2 *Performance Guide*:
   Chapter 15. CICS logging and journaling: Performance and tuning
     Monitoring the logger environment

CICS/TS for z/OS Release 5.1 *Performance Guide*: |
   Chapter 17. CICS logging and journaling: Performance and tuning |
     Monitoring the logger environment |

Rule CIC301.4