

Finding: CPExpert believes that the Region Exit Interval (ICV) specification may be inappropriate. This finding could result from the ICV specification itself, or from CPExpert detecting an apparent conflict between the ICV specification and the specification of another parameter.

Impact: This finding should normally have a LOW IMPACT on the performance of the CICS region. However, the finding could periodically have a HIGH IMPACT on performance of the CICS region.

Logic flow: This is a basic finding, based upon an analysis of the daily CICS statistics.

Discussion: CICS will enter an operating system WAIT state whenever it cannot dispatch a task. The WAIT state may be caused by no work to be done (that is, no CICS tasks are in the system) or may be caused by all CICS tasks waiting on some event to occur (the tasks could be waiting for I/O operations to complete, for example).

Before CICS enters the operating system WAIT state, it issues an STIMER with an expiration of the value specified by the ICV parameter in the System Initialization Table (SIT). The STIMER ensures that CICS will regain control upon expiration of the ICV value, unless CICS regains control earlier.

Many events can cause CICS to exit from the WAIT state and resume processing before expiration of the ICV value. As examples, expiration of the terminal scan delay (ICVTSD) interval will cause CICS to attempt to process terminal output requests, completion of I/O operation will cause CICS to resume the task waiting on the I/O, etc.

For many CICS regions, these other events will be the controlling factor and the ICV value will have no effect whatsoever.

There are some events which do not result in CICS checking whether other work can be done. For example, MRO requests may be "batched" from a connected region (the MROBTCH value in the connected region specifies how many requests will be batched).

Batching MRO requests reduces CICS processor overhead since the processor time required for waiting and posting TCBS is reduced. Additionally, batching MRO requests may reduce differences in CICS response time between peak periods and non-peak periods. This effect

occurs because some "batching" normally occurs during peak periods because of queueing for resources. Batching MRO requests would have little effect during peak periods, but would delay tasks during non-peak periods. If the ICV value is selected properly, the delay in non-peak periods could cause response time to be approximately the same as the delay during peak periods.

CICS normally will process the batched MRO requests only when the number of batched requests is as large as the MROBTCH value. However, CICS will process the batched MRO requests whenever the ICV value lapses. Consequently, it is important if MRO batching is used to specify a value for ICV which will ensure reasonable response time.

Suggestion: The suggestions offered by CPExpert depends upon whether the CICS region is a Test or Production region, and depends upon the MROBTCH specification and the ICV specification.

- **For a production CICS region: CPExpert detected MROBTCH set to default of 1 and ICV set to default of 1000.** Under these conditions, MRO requests are not being batched and the ICV default is too low.

The main purpose of the ICV value in this situation is to retain CICS pages in central storage. CICS will reference many of the page frames upon expiration of the ICV interval. Consequently, these page frames will have a low Unreferenced Interval Count (UIC) and will not likely be stolen.

However, normal CICS operation in a production environment will cause this effect (that is, CICS tasks will be executed frequently) or the ICVTSD value will cause the effect. The ICV value will have an effect only during period of inactivity.

The overhead associated with the low ICV is unnecessary, since it is unlikely that the System High UIC will decrease to the point that page frames will be stolen from the CICS core code. With a ICV value of 1000, the System High UIC would have to be UIC=1 before CICS frames would be stolen. Such a low System High UIC would be cause for serious action by MVS and is unlikely to occur without immediate action by system programmers or system tuners. Consequently, CPExpert believes that the default of ICV=1000 is too low and this specification can result in unnecessary overhead during periods of low CICS activity.

CPExpert suggests that ICV value be increased to 5000. Increasing the ICV value will save unnecessary overhead.

If expanded storage is online and expanded storage is not seriously constrained, the ICV value could be increased even higher than 5000 (for example, up to 20000). This higher specification is suggested to further reduce unnecessary overhead without incurring paging delays. Page frames stolen from the CICS region would be sent to expanded storage (unless expanded storage is constrained such that the Migration Age is low). Page faults resolved from expanded storage do not normally effect performance since the page fault resolution is so quick.

- **For a test CICS region: CPExpert detected MROBTCH set to default of 1 and ICV set to default of 1000.** Under these conditions, MRO requests are not being batched and the ICV default is too low. CPExpert suggests that the ICV value be increased to 20000.

Test CICS regions are not generally heavily used and the ICVTSD value would not be a governing factor. It normally would be better to allow the central storage required by the CICS to be used for other workloads. Allowing the CICS test region to have a high ICV value would cause the Unreferenced Interval Count to rise when the CICS region was unused, page frames could be stolen from the CICS region if necessary, and the processor storage frames could be used by other workloads. Response is not normally critical for test CICS regions, so paging delays would not be a serious performance issue.

- **For either a production or test CICS region: CPExpert detected MROBTCH set larger than default of 1 and ICV set to default of 1000 or larger.** Under these conditions, MRO requests are being batched, and the ICV default may be too high.

The main purpose of the ICV value in this situation is to ensure that response time is not unnecessarily delayed during periods of low activity, because of the batching of MRO requests.

During periods of high activity, the MROBTCH value would be quickly reached and requests would not be delayed too long. In periods of low activity, the MROBTCH value might not be so quickly reached and requests could be delayed longer than management objectives. The ICV value can be used to prevent this situation.

CPExpert suggests that the ICV value be reduced to 500. This will result in a maximum delay to batched MRO requests of 500 milliseconds and an average delay of much less, depending upon how many MRO requests were batched.

Warning: The value specified for the ICV parameter must not be greater than the value specified for the ICVS parameter. The ICVS parameter

controls when CICS detects a system stall condition. After the ICVS time has lapsed, CICS will stall-purge the lowest priority task that is specified as stall-purgable. If the value specified for ICV is greater than the value specified for ICVS, CICS might not be able to detect a stall condition.

Reference: *CICS/MVS Version 2.1.2 Performance Guide*: pages 142-145, 215, and 297-299.

CICS/ESA Version 3.1.1 Performance Guide: pages 219-220, 278-280, and 329-331.

CICS/ESA Version 3.2.1 Performance Guide: pages 118-121, 136-139, and 222-223.

CICS/ESA Version 3.3.1 Performance Guide: pages 129-131, 146-149, and 240-241.

CICS/ESA Version 4.1.1 Performance Guide: Section 4.2.8, Section 4.3.8, and Section 4.8.4.

CICS/TS Release 1.1 Performance Guide: Section 4.2.8, Section 4.3.8, and Section 4.8.4.

CICS/TS Release 1.2 Performance Guide: Section 4.2.8, Section 4.3.8, and Section 4.8.5.

CICS/TS Release 1.3 Performance Guide: Section 4.2.8, Section 4.3.8, and Section 4.12.5.

CICS/TS for z/OS Release 2.1 Performance Guide: Chapter 15 (MVS and DASD - Region exit interval), Chapter 18 (Terminal scan delay), and Chapter 24 (MRO and ISC - Batching requests).

CICS/TS for z/OS Release 2.2 Performance Guide: Section 4.2.8 (Tuning the region exit interval), Section 4.3.8 (Adjusting the terminal scan delay), and Section 4.11.5 (Batching requests).

Additionally, please refer to the CPExpert MVS Component User Manual, Rules MVS400(series) and MVS500(series), for a discussion of central storage and expanded storage concepts. Alternatively, please refer to the papers at www.cpexpert.com where central storage and expanded storage are discussed.