
Rule WLM054: The number of page slots allocated to individual local page data sets may not be sufficient

Finding: CPExpert has determined that the number of page slots allocated to a particular local page data set may not always allow the Auxiliary Storage Manager to implement the *contiguous slot algorithm*. This finding applies only if a different number of page slots are allocated to **individual** local page data sets. This finding identifies specific local page data sets which have insufficient page slots assigned.

Impact: This finding can have a LOW IMPACT, MEDIUM IMPACT, or HIGH IMPACT on performance of your computer system. The level of impact depends upon how many physical swaps to auxiliary storage are done by the SRM and how much the average swap is delayed.

Logic flow: The following rule causes this rule to be invoked:
 Rule WLM400: Page-in from auxiliary storage significantly delayed the service class

Discussion: Swaps to auxiliary storage occur in "swap sets" of 30 page frames if local page data sets are used. The number of pages to be swapped out is divided into these swap sets. For example, if 95 page frames are swapped, there would be 4 swap sets. Three of the swap sets would be 30 page frames and 1 swap set would be 5 frames.

The Auxiliary Storage Manager (ASM) will attempt to attempt to write the swap set to a contiguous set of slots. The logic necessary to locate contiguous slots is called "the contiguous slot algorithm".

If the contiguous slot algorithm is successful in locating contiguous slots, only one seek is required to write the swap set (and only one seek would be required to read the swap set when the address space is swapped back in). Additionally, there would be no latency between page writes (or page reads upon swap-in).

The effect of the contiguous slot algorithm is to minimize the device service time per page and to minimize the device utilization.

The contiguous slot algorithm is effective only if there is a sufficiently large number of slots allocated to local page data sets so that fragmentation of the data sets does not preclude the ASM finding contiguous slots. As a

general guidance, the number of slots allocated should be at least four times the number of slots used.

CPEXpert analyzes the number of slots allocated to local page data sets, versus the number of slots in use. This analysis is based upon information contained in SMF Type 75 records (SMF75SLA and SMF75MXU, respectively).

Rule **WLM052** will be produced if the **total** number of slots allocated for local page data sets is not four times the number of slots used and if some service class missed its performance goal because of page-in or swap-in delays.

However, you may have allocated a different number of page slots to different local page data sets. While the total number of slots may not cause the contiguous slot algorithm to be ineffective, the slots allocated to any individual page data set may be sufficiently low that the contiguous slot algorithm may not be effective for the particular local page data set.

Rule **WLM054** will be produced if a varying number of slots are allocated to local page data sets, and if the number of slots allocated for an **individual** local page data set is not four times the number of slots used by the local page data set.

The following example illustrates the output from Rule WLM054:

RULE WLM054: THE NUMBER OF ALLOCATED PAGE SLOTS MAY BE INSUFFICIENT			
The number of slots allocated for the local page data set on VOLSER PG3040 may not always allow the Auxiliary Storage Manager to implement the contiguous slot algorithm. During the measurement intervals shown below, the number of available slots was less than the desired percent of slots allocated, and at least one service class missed its performance goal because of paging delays from auxiliary storage. As a general rule, the number of allocated slots should be about 4 times the average number of slots used to ensure that the contiguous slot algorithm has sufficient space.			
MEASUREMENT INTERVAL	AUXILIARY STORAGE SLOTS ALLOCATED	SLOTS USED	PERCENT SLOTS USED
7:30- 8:00, 16AUG1995	36,000	16,427	45.6
8:00- 8:30, 16AUG1995	36,000	16,090	44.7

Suggestion: CPEXpert suggests that you consider increasing the number of slots allocated to the local page data set so that the contiguous slot algorithm can be effective.

Additionally, you may wish to review the decision to allocate a varying number of slots to different local page data sets.

Reference: "Paging Analysis in an Expanded Storage Environment", Beretvas, Thomas (IBM Corporation), *CMG '87 Conference Proceedings*, The Computer Measurement Group, Inc., Chicago, IL. **This paper is highly recommended.**