## Rule WLM170:      Address spaces were idle a significant percent of time

**Finding:**      The service class period being analyzed missed its response goal. However, address spaces in the service class were Idle for a significant percent of their overall active time.  Consequently, the Workload Manager delay information may be meaningless.


**Impact:**      This finding is provided for information purposes.


**Logic flow:**      The following rules cause this rule to be invoked:
  Rule WLM101:      Service Class did not achieve average response goal
  Rule WLM102:      Service Class did not achieve percentile  response goal


**Discussion:**      When CPExpert produces Rule WLM101 or Rule WLM102 to indicate that a service class did not achieve its response performance goal, the logic of these rules tries to identify the cause of the delay.

The Workload Manager periodically examines the SRM control blocks describing each address space and acquires samples[1] describing the state of each dispatchable unit of an address space (that is, each TCB or SRB associated with the address space).  The Workload Manager accumulates the samples into counters that describe the state of the address space.  The samples are summarized by service class period.

CPExpert analyzes the causes of delay to service class periods not meeting their response goal.  Rule WLM101 and Rule WLM102 report the primary and secondary causes of delay to the response time.

For example, CPExpert might compute that the primary cause of delay to TSO transactions was that they were denied access to a processor for 35% of their active time, and that they were waiting for "unknown" causes[2] for another 30% of their active time.

CPExpert would report both these causes, and their respective percentages in Rule WLM102.  CPExpert would continue analysis to assess which

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[1]With MVS/ESA SP5.1 Goal Mode, the sampling is done every 250 milliseconds.  The sampling interval is recorded in SMF Type 72 records (R723MTVL).

[2]Recall from Section 4 that the "unknown" cause is unknown as far as the System Resources Manager is concerned.  The SRM identifies causes of delay only for those categories over which it has control.  Delays over which the SRM has no control are grouped together into an "unknown" category.  These delays typically are I/O delay, ENQ delay, waiting for cross-memory services, etc.

service classes might deprive TSO transactions from access to a processor and to assess the likely causes of "unknown" delays.

The analysis performed by the Workload Manager and subsequent analysis by CPExpert is based on samples. The reliability of sampling depends upon having a sufficiently large number of samples such that the samples represent the "population" being sampled[3]. If a small number of samples are taken, invalid conclusions might be reached based on an analysis of the samples. In order for the conclusions about causes of delays to be valid, sufficient samples must be taken while address spaces were in a "ready" state rather than in an "idle" state.

When CPExpert determines that a service class with a response goal has missed its performance goal, CPExpert reviews the number of samples taken during times when address spaces were in a "ready" state. This number of samples is obtained by summing the CPU Using samples (R723CCUS), I/O Using samples (R723CIOU), non-DASD I/O Using or Delay samples (R723CNDI), Total Delay samples (R723CTOT), and Unknown samples (R723CUNK). CPExpert produces Rule WLM171 if this total number of samples is small.

Once CPExpert has determined that an unacceptably small number of samples exist, no further analysis is done. It makes no sense to analyze delays to the service class based on a low number of samples, inasmuch as the conclusions from the samples would be invalid.

The following example illustrates the output from Rule WLM170:

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RULE WLM170:  ADDRESS SPACES WERE IDLE A SIGNIFICANT PERCENT OF TIME

    The delay information presented above is based on the EXECUTION time of
    the TSOUSERS Server Class (the CPU Using, Execution Delay, and Unknown
    Delay).  These percentages show the distribution of time while some
    transaction was active.  However, address spaces in the TSOUSERS Service
    Class were IDLE for a significant percent of their overall active time.
    The below information shows the percent of total active time in which
    address spaces were executing (processing transactions) or were idle,
    and the average number of Workload Manager samples per transaction.
    Please refer to Rule WLM170 in the WLM Component User Manual for a
    discussion of the implications of this finding.

                              TOTAL      PCT       PCT   AVG SAMPLES   AVG SAMPLES
    MEASUREMENT INTERVAL      TRANS   EXECUTING   IDLE    PER TRANS    PER  MINUTE
    10:45-11:00,07DEC1994       63       4.0      96.0       2.3          9.5
    11:15-11:29,07DEC1994       32       3.0      97.0       3.1          7.0
    11:45-12:00,07DEC1994       14       1.2      98.8       3.1          2.9
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[3]With the Workload Manager samples, the "population" consists of the possible execution states of address spaces being sampled.

**Suggestion**: CPExpert suggests that you consider the following alternatives:

- You can ignore the finding (and previous rules in the logic flow) if you feel that the situation is unusual rather than a continuing status. For example, the finding might be made when a service class was temporarily idle. For example, a TSO_SYS service class might be established for systems personnel to use only during certain times (e.g., a crisis situation). This service class might be idle for most of the time, but systems personnel might submit transactions periodically.

  If you chose to ignore the finding, you may wish to exclude the service class from analysis, using the EXCLUDE guidance parameters described in Section 2 of this document. You likely would become annoyed by CPExpert continually reporting that the service class missed its performance goal when you contemplate no action.

- If the service class reported by Rule WLM170 consists of Started Tasks, you should assess the important of the Started Tasks, and whether a response objective is proper. If the Started Tasks are important from a system view, you should consider allowing the Started Tasks to default to the SYSSTC service class. The SYSSTC service class has a high dispatching priority. Address spaces in SYSSTC will not be subject to the Workload Manager's dispatching priority adjustment algorithms[4].

- You may wish to delete the service class and assign the workload to a service class with more active address spaces if you feel that the situation is a continuing one. That is, if you feel that the address spaces normally are idle, you may wish to review whether they need their own service class. As general guidance, it is desirable to keep the service class periods to as small a number as possible.

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[4]This alternative does not reduce the effect of the reduced preemption on address spaces in the service class. The alternative simply removes them from the Workload Manager's control.

**Rule WLM170**.4