Rule WLM081: WLM-managed job class assigned to multiple service classes

Finding: CPExpert has detected that a WLM-managed job class was assigned to more than one service class based on the workload classification scheme.

Impact: This finding should be viewed a LOW IMPACT, MEDIUM IMPACT, or HIGH IMPACT on the performance of the batch jobs assigned to the service class. The level of impact will depend primarily on the number of WLM-managed jobs executing in the multiple service classes.

Logic flow: This is a basic finding. There are no predecessor rules.

Discussion: With OS/390 Version 2 Release 4, the Workload Manager allows installations to define job classes as being managed by Job Entry Subsystem (JES) or by the Workload Manager (WLM).

- For jobs assigned to JES-managed job classes, the normal selection of the jobs for initiation will be done. That is, JES initiators will select jobs from the job class queue based on the normal selection criteria (e.g., priority, aging, resource affinity, etc.).

- For jobs assigned to WLM-managed job classes, the WLM will control selection of jobs by dynamically changing the number of WLM initiators and/or their work selection criteria. These actions will be taken by the WLM in an attempt to met installation defined goals for the service classes to which the jobs are classified.

WLM control of batch work is enabled by changing the mode of a JES2 job class (on a job class by job class basis) to MODE=WLM. When that is done, no job in that JES2 job class will be selected by normal JES2 initiators. Instead WLM will be informed of the jobs waiting execution and will start and stop WLM controlled initiators based the current backlog of work.

After conversion of a job's JCL, JES2 places the job into an appropriate class queue to await execution. If the job class is a JES2 managed class (JOBCLASS MODE=JES), JES2 initiators select a job from the class queue (depending on the job's priority) and pass control to MVS to execute your program. If the job class is a WLM managed class (JOBCLASS MODE=WLM), JES provides the WLM with a list of jobs waiting to execute, by service class. Based on installation goals for the service classes, the WLM can determine whether job queue time is a significant delay to a

service class meeting its performance goal. If so, the WLM might start an initiator for a job class assigned to the service class.

Job initiators for WLM managed job classes are controlled dynamically by workload management. These initiators run under the Master Subsystem and are not assigned JES2 job numbers. WLM can adjust the number of initiators on each system based on:

- The queue of jobs awaiting execution in WLM managed classes.
- The performance goals and relative importance of this work.
- The success of meeting these goals.
- The capacity of each system to do more work.

The WLM evaluates the performance of service class periods relative to the performance goals established by the installation. It is important to appreciate that the performance of a service class period *is based on the work executing in the service class*. Further, the delays to work in the service class *is based on all work executing in the service class*.

When the WLM examines service class delays, it attempts to manage resource allocation to eliminate the most serious delays, where eliminating the delay would cause performance to be significantly improved.

If the WLM workload classification scheme results in jobs assigned to a job class with MODE=WLM being assigned to more than one service class, the WLM will be unable to distinguish the effect of execution queue delay on the performance of the multiple service classes.

The execution queue delay for the jobs will be included in the calculation of execution velocity or response time for the service classes. The resulting execution velocity or response time will be used to calculate a performance index for the service classes. The resulting performance index will be used by the WLM to assess how well the service classes are meeting their performance goals. If a service class is not meeting its performance goal, the WLM might decide to add an initiator to the job class to attempt to reduce the execution queue delay.

However, the initiator will be associated with the job class queue. Since jobs in the job class queue are assigned to more than one service class, the WLM would be unable to take action that would specifically address execution queue delays for the service class missing its goal. Consequently, the WLM would not be effective in managing the initiators for the job class.

Prior to OS/390 Version 2 Release 9, only the SMF Type 26 records contained an indication as to whether a job was assigned a job class with MODE=JES or MODE=WLM. Since SMF Type 26 records are not often kept in a performance data base (and are not available until after a job has ended) analysis of conflicts between JES-managed and WLM-managed initiators was not feasible. Consequently, CPExpert requested that IBM place an indicator in the SMF Type 30 records so that potential problems with WLM-managed initiators could be analyzed. With OS/390 Version 2 Release 9, IBM created the SMF30WMI indicator as a part of the SMF30PF1 (performance section flag byte) variable.

CPExpert examines the SMF30WMI indicator in SMF Type 30 records to determine whether a job is assigned to a JES-managed or WLM-managed initiator. CPExpert then determines the service classes to which the jobs in a job class with MODE=WLM are assigned.

CPExpert produces Rule WLM081 if any jobs assigned to a job class with MODE=WLM are assigned to the more than one service class.

The following example illustrates the output from Rule WLM081:

```
RULE WLM081: WLM-MANAGED JOB CLASS ASSIGNED TO MULTIPLE SERVICE CLASSES

   CPExpert detected that a job class with MODE=WLM was classified to
   more than one service class.  The Workload Manager bases many of its
   decisions about WLM-managed initiators on the achievement of goals for
   the service classes to which the jobs are assigned. The Workload
   Manager might not effectively manage initiators if jobs are assigned
   to service classes with different goals or goal importance.
   Additionally, the Workload Manager will be unable to honor job class
   limits, because the WLM considers job class limits only with a service
   class.  Consequently, the WLM might start extra initiators even though
   the job class limits would restrict jobs from running.

                    JOB
   JOB NAME        CLASS    SYSTEM   SERVICE CLASS   INITIATOR TIME
   CQQUERY           R      J90      DISCR           17MAR2000:15:01:09
   CQQUERY           R      J90      DISCR           17MAR2000:15:15:29
   CQCHKPT           R      J90      DISCR           17MAR2000:15:15:34
   TEST1             R      J90      TEST081         17MAR2000:15:01:09
   TEST2             R      J90      TEST081         17MAR2000:15:15:29
   TEST3             R      J90      TEST085         17MAR2000:15:01:09
```

Suggestion: CPExpert suggests that you (1) change the workload classification scheme to eliminate the assignment of jobs in the job class to more than one service class or (2) change the job classification scheme so the jobs are assigned to different jobs classes. Either option should result in the specific jobs in the job class shown in the output from Rule WLM081 being assigned to the same service class or assigned to different job classes.

Reference: MVS Planning: Workload Management

OS/390 (V2R4):	Section 3.3: Batch Workload Management
OS/390 (V2R5):	Section 3.3: Batch Workload Management
OS/390 (V2R6):	Section 3.3: Batch Workload Management
OS/390 (V2R7):	Section 3.3: Batch Workload Management
OS/390 (V2R8):	Section 3.3: Batch Workload Management
OS/390 (V2R9):	Section 3.3: Batch Workload Management
OS/390 (V2R10:	Section 3.3: Batch Workload Management
z/OS (V1R1):	Section 3.3: Batch Workload Management
z/OS (V1R2):	Section 3.3: Batch Workload Management
z/OS (V1R3):	Section 3.3: Batch Workload Management
z/OS (V1R4):	Section 3.3: Batch Workload Management

