## Rule WLM009: Minimum CPU service assigned to Resource Group

**Finding:** CPExpert has determined that a minimum CPU service was specified for a resource group, and CPExpert believes that this minimum CPU service specification caused one or more service classes to miss their performance goal.

**Impact:** This finding should be viewed as generally having a HIGH IMPACT on the performance of your computer system.

**Logic flow:** The following rule causes this rule to be invoked:

Rule WLM252: CPU access might be denied because of Resource Group minimum

**Discussion:** A resource group is simply a "named" description of the total minimum and maximum **unweighted** CPU service units per second which may be used by one or more service classes assigned to the resource group. A resource group is defined using the *Create a Resource Group* panel in the Workload Manager ISPF application. A resource group applies across an entire sysplex. Service class periods[1] are assigned to a resource group using the *Create a Service Class* panel in the Workload Manager ISPF application.

The Workload Manager will attempt to provide the specified minimum CPU service to the resource group. The Workload Manager attempts to provide the specified minimum CPU service to the resource group by adjusting the dispatching priority of service classes assigned to the resource group.

The Workload Manager will restrict service classes assigned to the resource group from using more than the specified maximum CPU service. The Workload Manager uses "CPU capping" to restrict the total amount of CPU time used by service classes assigned to the resource group.

There are potentially serious effects of specifying a minimum CPU service for a resource group. The effect is caused by the order in which the Workload Manager selects service classes for policy adjustment.

[1] A resource group may not be associated with a service class representing subsystem transactions (i.e., a service class defined for transactions executing under CICS/ESA Version 4.1 or under IMS/ESA Version 5). This is because CPU resources are not monitored by the SRM for the transactions; the CPU resources are monitored at the **address space level** (e.g., the CICS region or IMS message processing region). Further, CPU dispatching occurs at the address space level, rather than at the transaction level. Since CPU usage is not collected at the transaction level and CPU dispatching is at the address space level, the Workload Manager cannot control the amount of CPU resources allocated to service classes which represent transactions.

 

- The Workload Manager first determines whether any resource group is below the **minimum** CPU service specification. If the minimum CPU specification is not being provided, the Workload Manager takes the following actions in an attempt to provide the minimum CPU service:

  - The Workload Manager determines whether any service class assigned to the resource group is not meeting its performance goal. If any service class is not meeting its performance goal, the Workload Manager increases the dispatching priority (if appropriate) of the service class.

  - If no service classes assigned to the resource group were missing their performance goal, the Workload Manager increases the dispatching priority (if appropriate) of all service classes assigned to the resource group. The dispatching priority of all service classes assigned to the resource group (including those service classes with a discretionary goal[2]) may be increased.

- After the Workload Manager performs the above tasks, the Workload Manager may examine service classes based on the Goal Importance of the service classes.

The result of the above process can be that service classes with a low importance (or even service classes with a discretionary goal) can be assigned CPU dispatching priority above that which is assigned to the service classes with the highest Goal Importance! The resulting CPU dispatching priorities and CPU demands can result in service classes with high Goal Importance missing their performance goals.

This may not be the effect you wish, but the Workload Manager simply follows the specific direction provided for the resource group, namely, that a minimum CPU service was specified for the resource group and this minimum should be provided.

The discussion of Rule WLM252 describes how CPExpert concludes that the minimum CPU service specification for a resource group may cause a service class to miss its performance goal. The information provided with Rule WLM252 identifies the service class which missed its performance goal.

[2]Please note that the *MVS/ESA SP5 Planning: Workload Management* document is incorrect. This document states in the *Defining Resource Groups* section that "If there is a resource group defined for a service class with a discretionary goal, workload management achieves the minimum as long as the goals of work running in any other service class are not impacted. If other performance goals are impacted, then workload management does not maintain the minimum." Based on personal communication with the Workload Manager developer who wrote the specific code which attempts to provide the minimum specified CPU service, these statements are incorrect in the IBM document and the description provided above is what actually transpires.

 

Rule WLM252 also shows the amount of CPU time used by service classes at the same or lower Goal Importance as the service class missing its performance goal, and which were assigned to a resource group with a minimum CPU specification.

Please refer to the discussion in Rule WLM252 for additional information.

Rule WLM009 is provided to alert you to the possibility that there may be a problem with the service policy specifications. Rule WLM009 is produced only if Rule WLM252 was produced for any service class.

The following example illustrates the output from Rule WLM009:

```
RULE WLM009:  MINIMUM CPU SERVICE ASSIGNED TO RESOURCE GROUP.

   CPExpert believes that assigning a minimum CPU service to a Resource
   Group may have caused a service class to miss its performance goal.  At
   least one service class missed its performance goal and a significant
   reason for missing the performance goal was that the service class was
   denied access to a CPU.  At least one other service class was assigned
   to a Resource Group with a minimum CPU service specified, and the other
   service class was at the same importance or at a lower importance.  Rule
   WLM252 later in this report describes these situations.  You may wish to
   evaluate whether the Resource Group really should have a minimum CPU
   service specification, and whether the importance levels of the service
   classes are appropriate.
```

**Suggestion:** CPExpert suggests that you verify the minimum CPU service specification for resource groups defined in the service policy. Unless there are unique requirements for the minimum CPU service specifications, CPExpert suggests that the minimum be changed to zero.

**Reference:** MVS Planning: Workload Management

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|---|---|
| OS/390 (V2R4): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R5): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R6): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R7): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R8): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R9): | Chapter 7: Defining Resource Groups |
| OS/390 (V2R10): | Chapter 7: Defining Resource Groups |
| z/OS (V1R1): | Chapter 7: Defining Resource Groups |
| z/OS (V1R2): | Chapter 7: Defining Resource Groups |
| z/OS (V1R3): | Chapter 7: Defining Resource Groups |
| z/OS (V1R4): | Chapter 7: Defining Resource Groups |

 