
Rule WLM255: Service class was in Active state but server was denied access to CPU

Finding: CPExpert has determined that the transaction service class which missed its performance goal was in Active state, but the server service class was denied access to a CPU.

Impact: This finding has a HIGH IMPACT on performance of your computer system.

Logic flow: The following rule causes this rule to be invoked:
Rule WLM120: Significant transaction time was in Active state

Discussion: When CPExpert produces Rule WLM104 or Rule WLM105 to indicate that a subsystem service class did not achieve its performance goal, the logic of these rules tries to identify the cause of the delay. The cause of the delay initially is analyzed from the "served" service class view. Rule WLM120(series) and Rule WLM130(series) describe the results from this analysis.

After analyzing the subsystem transaction delays, CPExpert identifies the service classes which serve the transactions. The subsystem transactions typically are CICS transactions, and the servers are the CICS regions. Alternatively, the transactions could be IMS transactions and the servers could be the IMS control regions or transaction processing regions.

Address spaces executing in the system can be in a variety of states from the perspective of the Workload Manager: using the CPU, delayed for an identifiable reason, or delayed for some unknown reason.

The System Resources Manager (SRM) periodically samples the state of each address space in each service class. These samples are accumulated into variables which are recorded by RMF in the "Service Class Period Data Section" of SMF Type 72 (Subtype 3) records¹.

CPExpert produces Rule WLM120 when a significant cause of delay to a subsystem transaction was that the transaction was in Active state. The Active state indicates that a task was executing on behalf of the transaction, from the perspective of CICS or IMS.

¹Please see Section 4 for a discussion of these states and the sampling process.

CPEXpert analyzes the CPU requirements of the server service class to determine if the server was denied access to a CPU.

As the System Resources Manager takes its samples of the state of address spaces, it examines whether a TCB or SRB associated with the address space is waiting for dispatching to a CPU, or whether a TCB is waiting for a local lock.

If an address space is waiting for dispatching, it is being denied access to a CPU because processors are active with higher priority address spaces or with address spaces at the same dispatching priority as the address space waiting for dispatching. Samples reflecting the time address spaces are denied access to a CPU are recorded by RMF in the SMF Type 72 delay samples, as CPU Delay (R723CCDE).

For a service class consisting of CICS or IMS regions, the CICS or IMS regions compete with each other at the same dispatching priority. This is because the Workload Manager will create an internal service class (\$SRMSnnn) consisting of all address spaces which provide service to the subsystem transactions served by the CICS or IMS service class. The Workload Manager will manage these address spaces collectively from a CPU dispatching view (that is, all address spaces will have the same CPU dispatching priority)².

CPEXpert computes the percent of CPU Delay for the server service class, as a function of the response time of the subsystem transaction service class missing its performance goal. CPEXpert produces Rule WLM255 if the percent of CPU Delay for the subsystem transaction service class is greater than the significance value specified in the **WLMSIG** guidance variable in USOURCE(WLMGUIDE).

With Rule WLM255, CPEXpert provides the total CPU service units consumed by the service class in the RMF measurement interval, the percent of active time when transactions in the service class were denied access to a CPU, and the average multiprogramming level of the server service class. The average multiprogramming level is provided so you can assess whether address spaces might have competed with each other.

The following example illustrates the output from Rule WLM255:

²The address spaces will be managed **individually** from a processor storage access policy view.

RULE WLM255: SERVICE CLASS WAS ACTIVE BUT SERVER WAS DENIED CPU

During the above measurement intervals, the CICUSRTX Service Class was in the READY STATE during a significant portion of its response time. However, at least one address space in the CICSRRGN server was denied access to a CPU for a significant percent of this time. During the following RMF measurement intervals, CICSRRGN had a TCB or SRB waiting to be dispatched, or a TCB was waiting for a local lock. The below information shows the CPU used by CICSRRGN during the measurement interval, and the "PERCENT DENIED CPU" value represents the percent of CICSRRGN's ACTIVE time when at least one address space was waiting for access to a CPU. CPEXpert will produce a report at the end of this analysis which shows the CPU time used by all service class periods.

MEASUREMENT INTERVAL	CPU USED BY SERVER	PCT SERVER DENIED CPU	AVERAGE SERVER MPL
13:07-13:12,21JUN1994	0:02:00	60.4	4.0
13:17-13:22,21JUN1994	0:02:00	57.7	4.0

Suggestion; Please refer to the suggestions in Rule WLM250 for a discussion of the alternatives which can be implemented to improve access to a CPU.