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## Rule WLM120: Significant transaction time was in Active state

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**Finding:** A significant amount of the transaction response time for the service class missing its performance goal was spent in the Active state. This finding applies to service classes that are part of a subsystem (e.g., CICS transactions).

**Impact:** This finding has a MEDIUM IMPACT or HIGH IMPACT on performance of the service class. The level of impact depends on the percent of transaction response time spent in the Active state.

**Logic flow:** The following rules cause this rule to be invoked:

- Rule WLM104: Subsystem Service Class did not achieve average response goal
- Rule WLM105: Subsystem Service Class did not achieve percentile response goal

**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. The delays from the served service class are reported by CICS (with CICS/ESA Version 4.1 or later) or by IMS (with IMS Version 5 or alter) interaction with the Workload Manager. These subsystems use the Workload Management Services macros<sup>1</sup> to provide the interaction.

CICS reports two separate views of the transactions: the *begin\_to\_end phase* and the *execution phase*<sup>2</sup>.

- **Begin\_to\_end phase.** The begin\_to\_end phase starts when CICS has classified the transaction<sup>3</sup>. This action normally is done in a CICS Terminal Owning Region (TOR).
- **Execution phase.** The execution phase starts when either CICS or IMS has started an application task to process the transaction. For CICS, this

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<sup>1</sup>Please refer to Section 4 of this document for more detail about the Workload Management Services macros and how the subsystems use these macros to exchange information with the Workload Manager.

<sup>2</sup>IMS Version 5 reports only *execution phase* samples.

<sup>3</sup>Classifying the transaction into a service class is actually done by the Workload Manager when CICS issues the IWMCLSFY macro. Please refer to Section 4 for a more complete discussion of the subsystem work manager (e.g., CICS) interaction with the Workload Manager.

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normally is done in a CICS Application Owning Region (AOR). For IMS, this is done in an IMS Message Processing Region (MPR).

Within each phase, CICS or IMS report the "state" of the transaction, from the view of CICS or IMS. The state of the transaction is reported in the following categories<sup>4</sup>:

- **Idle state.** (Both CICS and IMS report this state.
- **Ready state.** Only CICS reports this state.
- **Active state.** Both CICS and IMS report this state.
- **Wait state.** Both CICS and IMS report this state, but IMS provides only Wait for I/O state and Wait for Lock state.
- **Switched state.** Only CICS reports this state.

If the subsystem supports work manager delay reporting, the delay information is available in the "Work Manager/Resource Manger State Section" of SMF Type 72 (Subtype 3) records. When a transaction service class fails to achieve its performance goal, CPExpert analyzes the information to identify the primary and secondary causes of delay.

CPExpert produces Rule WLM120 when the primary or secondary cause of delay was that the transaction service class was in the Active state for a significant percent of its response time.

The Active state indicates that a task was executing on behalf of the transaction, **from the perspective of CICS or IMS**. This last phrase is in bold to indicate that the information is only from the perspective of CICS or IMS.

The transaction is not active, of course, even though the Active state is reported for the transaction service class. The actual "Active state" is the state of the **task associated with the transaction**. For CICS transactions, this is the time accounted for by tasks executing in the CICS region. These tasks would be shown as "Running" by the CEMT INQUIRE TASK command.

**The fact that CICS reports "Active" state does not mean that the CICS or IMS programs are actually processing the transaction.** MVS allocates CPU cycles based on dispatching priority, and the CICS or IMS region may be denied access to a CPU.

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<sup>4</sup>Please refer to Section 4 of this document for a more comprehensive discussion of the transaction states and the interaction between the subsystem (CICS or IMS) and the Workload Manager.

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CICS might have dispatched a task from the dispatch queue, and a Message Processing Region might have been assigned to process the transaction. However, the task could be preempted by other address spaces outside of CICS or IMS.

For example, an address space with a higher dispatching priority could have preempted CICS. Consequently, CICS could be waiting for access to a CPU and not actually executing, although the CICS region would have reported to the Workload Manager that the transaction was in Active state.

The following example illustrates the output from Rule WLM120:

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RULE WLM120:  SIGNIFICANT TRANSACTION TIME WAS IN ACTIVE STATE
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A significant amount of the transaction response time for CICSAMP Service Class was spent in the Active State. For CICS transactions, this is the time accounted for by tasks executing in the CICS region. These tasks would be shown as "Running" by the CEMT INQUIRE TASK command. The fact that CICS reports "Active" state does not mean that the CICS programs are actually processing the transaction, however. MVS allocates CPU cycles based on dispatching priority, and the CICS region may be denied access to a CPU. CPExpert will analyze the CICS regions to determine whether the regions were denied access to a CPU.
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**Suggestion:** There are no suggestions directly associated with this finding. The tasks supporting the transaction service class are active from the perspective of CICS or IMS. Actions to improve performance depend upon whether the server service class is actually using the CPU or whether the server service class is denied use of the CPU.

- **Using the CPU.** If the server service class is primarily using the CPU, actions could be taken to optimize application code of the tasks serving the transactions. These actions should reduce the CPU requirements of the code. Alternatively, performance improvement actions could include increasing the CPU capacity by acquiring a faster processor.
- **Denied use of the CPU.** If the server service class is denied use of the CPU, actions could be taken to increase the relative CPU dispatching priority of the server service class.

In Goal Mode, users cannot specify a dispatching priority for address spaces or service classes. The Workload Manager adjusts dispatching priority based upon the importance of performance goals associated with the service class and based on whether the service class is meeting its

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performance goal. By definition, the service class identified by this rule is not meeting its performance goal.

Consequently, a user can affect the relative CPU dispatching priority only by (1) increasing the goal importance of the transaction service class or (2) decreasing the goal importance of other service classes.

CPEXpert will analyze the "server" service class to determine whether the server (e.g., the CICS region) was using the CPU, or whether the server was denied access to the CPU. As a result of CPEXpert's analysis, other rules may be produced to provide more information.