
Rule WLM370: Non- DASD I/O activity or delay was a major part of execution

Finding: Non-DASD I/O activity or delay experienced by the service class caused significant delays to the service class.

Impact: This finding can have a LOW IMPACT, MEDIUM IMPACT, or HIGH IMPACT, depending upon the amount of non-DASD I/O activity and the delay to the service class caused by the non-DASD I/O activity.

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
- Rule WLM103: Service Class did not achieve execution velocity goal

Discussion: When CPEXpert detects that a service class did not achieve its performance goal, CPEXpert analyzes the basic causes (see the discussion in the above predecessor rules). One of the possible causes of delay is that the service class was delayed because of non-DASD I/O activity.

Prior to OS/390 Release 3, CPEXpert cannot tell from the Type 72 information whether the I/O operations were directed to tape, to DASD, or to other device types. Prior to OS/390 Release 3, any I/O delay is reflected in the UNKNOWN category of delay, and CPEXpert will analyze the I/O delay as discussed in Rule WLM350. However, DASD normally is the fastest medium. If the I/O had been directed to DASD, the delay normally would be less than if the I/O had been directed to other activity. Prior to OS/390 Release 3, CPEXpert simply makes an assumption that all I/O activity had been directed to DASD, simply to get a "feel" as to whether the I/O activity could be a significant cause for delay.

The SRM began collecting non-paging DASD I/O using and delay information, and collecting non-DASD I/O using and delay information beginning with OS/390 Release 3.

- Rule WLM361 analyzes non-paging DASD I/O using and delay information.
- This rule (Rule 370) analyzes non-DASD I/O using and delay information.

The non-DASD I/O using and delay information is reported in SMF Type 72 records for each service class period, as a single variable (R723CNDI).

R723CNDI contains a count of samples in which an address space was using non-DASD I/O or was delayed because of non-DASD I/O. The SRM examines each address space or enclave, and adds a sample count for each non-DASD I/O request queued in IOS or active per address space or enclave.

Since the using and delay are combined into a single variable it is not possible to distinguish between non-DASD I/O using and non-DASD I/O delay. However non-DASD using and delay can be a significant part of the I/O activity of many service classes.

When CPExpert detects that a service class misses its response or execution velocity goal, CPExpert computes the non-DASD I/O activity as a percent of the total samples from address spaces or enclaves (R723CNDI/R723CSAC). Since non-DASD I/O activity can not occur when an address space or enclave is idle, CPExpert adjusts the resulting value by the percent of Idle samples (R723CIDL as a percent of all samples). The result is the average number of non-DASD I/O requests queued in IOS or active per address space or enclave. Note that this number can be greater than 100% if an average of more than one non-DASD I/O request was queued in IOS or active.

CPExpert produces Rule WLM370 when the percent by non-DASD I/O is greater than the **WLMSIG** guidance variable in USOURCE(WLMGUIDE).

The non-DASD I/O using and delay are not under the control of the Workload Manager and are not considered in computing or analyzing service class performance. However, a significant I/O delay may be important from the overall performance of the service class. Consequently, CPExpert reports the non-DASD I/O activity.

The following example illustrates the output from Rule WLM370:

RULE WLM370: NON-DASD I/O USING OR DELAY WAS A MAJOR PART OF EXECUTION

BATCHLOW: Non-DASD I/O using or non-DASD I/O delay was a major part of the execution time of BATCHLOW (Period 1). Only the total of non-DASD I/O using and delay samples is provided by SMF and there is no way to determine whether the non-DASD I/O really caused the service class to miss its goal. However, the non-DASD I/O was a significant part of the execution time of the service class during the below intervals. The percentages are computed as a function of the EXECUTION samples on the local system (the percentages are adjusted to eliminate IDLE time, to reflect the effect when the service class was actually executing). Values greater than 100% indicate that an average of more than one I/O operation was active concurrently during the execution time.

MEASUREMENT INTERVAL	NON-PAGING DASD PCT		NON-DASD PCT USING AND DELAY
	USING	DELAY	
9:00- 9:15,19NOV1998	47.7	7.7	27.7
11:00-11:15,19NOV1998	41.1	9.2	18.3
12:00-12:15,19NOV1998	33.4	6.5	10.2
14:00-14:15,19NOV1998	32.2	5.1	46.9
14:15-14:30,19NOV1998	19.9	3.5	43.5
14:30-14:45,19NOV1998	20.8	1.2	25.0
16:15-16:30,19NOV1998	42.7	2.6	33.3
17:00-17:15,19NOV1998	40.6	12.5	12.7

Suggestion: Please note that the non-DASD I/O activity did not directly cause the service class to miss its performance goal. However, the non-DASD I/O time was significant, and could have caused overall performance to be degraded.