
Rule DAS050: Performance characteristics of significant volumes

Finding: CPExpert identifies the performance characteristics of the volumes in a system that have the most potential for performance improvement.

Impact: This finding is used to assess the importance of the "worst" performing device and to determine whether other devices offer significant performance improvement potential.

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

Discussion: CPExpert uses the following algorithm to identify the devices which have the most potential for improvement:

- CPExpert computes the average device response time for each **type** of device in the configuration, for each RMF measurement interval. The logic computes the average device response by type of device, since better performance would be expected from cached devices (for example) than from non-cached devices. This method essentially assesses the performance of each device against the performance of similar devices in the configuration.
- Devices that exceed the average device response time for their device type in any RMF measurement interval are selected as candidates for improvement. The rationale is that improvement efforts should not be directed at devices which provide better than average response. Thus, the candidate set of devices to analyze consists of those which provided worse than average response.
- The I/O rate of each "candidate device is weighted by its response time, **for the entire set of RMF intervals in which the device exceeded the average response**. The result is a measure of the relative performance improvement **potential** of each device which provided worse than average response, from an overall system view. For example, consider two devices in a device type having an average I/O response of 20 milliseconds:

Device A: I/O rate = 30 I/O operations per second
Device response = 25 milliseconds
RMF intervals with above average response = 4
Seconds per RMF interval = 900
Weighting factor = $30 * 25 * 4 * 900 = 27,000,000$

Device B: I/O rate = 5 I/O operations per second
Device response = 40 milliseconds
RMF intervals with above average response = 5
Seconds per RMF interval = 900
Weighting factor = $5 * 40 = 900,000$

In the above example, CPEXpert would select Device A as having the most overall potential for improvement, even though its per-I/O device response was not as bad as the device response of Device B.

CPEXpert ranks the devices based on the weighting factor computed above. CPEXpert then analyzes the devices, starting at the device with the highest weighting factor.

With Rule DAS050, CPEXpert lists basic characteristics of the volumes having the most potential for improvement, so that you can appreciate the relative performance improvement potential between volumes on the list. The data presented by Rule DAS050 reflects the average per-second delays **only** during measurement intervals when the device I/O performance was worse than the average for its device type. This information is presented on a system view basis.

The "weighted delays" value is a relative measure of the performance improvement potential of the volume. The absolute values in the column are not particularly meaningful. Rather, the values should be compared to each other to assess the relative performance impact of each volume.

It is possible that a volume may have a significant improvement potential in a particular measurement interval, but not be the volume with the most overall potential for improvement. This situation can arise because the analysis is directed toward the volumes with the **most overall** performance improvement potential. If you suspect that this is the case with a particular device, you can "select" that device for analysis, using the select process described in Section 3 of this document.

The following example illustrates the output from Rule DAS050:

RULE DAS050: PERFORMANCE CHARACTERISTICS OF SIGNIFICANT VOLUMES

The following is a list of the most significant volumes showing their overall performance characteristics for the period being analyzed. The "average per second delays" represent the averages ONLY during measurement intervals when the device I/O performance was worse than the average for this device type. The "weighted delays" value is a measure of the overall relative performance impact of each volume.

VOLSER	DEVICE NUMBER	I/O RATE	RESP	-----AVERAGE PER SECOND DELAYS-----				WEIGHTED DELAYS
				CONN	DISC	PEND	IOSQ	
SP0006	FE58	114.0	118.340	0.130	0.003	0.785	117.423	236679
PAGE25	5145	3.8	0.093	0.031	0.054	0.008	0.000	186
PAGE27	5164	3.7	0.091	0.029	0.053	0.009	0.000	182
PAGE26	5150	3.8	0.089	0.028	0.052	0.009	0.000	179
DB007D	FF33	0.4	0.052	0.001	0.017	0.005	0.030	105
PETNV1	FEE7	2.0	0.045	0.022	0.000	0.022	0.001	90
DB0053	FEF9	0.3	0.043	0.002	0.001	0.001	0.038	87
D83PPL	BAD4	1.8	0.037	0.021	0.000	0.016	0.000	75
CAT011	FD7C	1.2	0.022	0.002	0.009	0.010	0.001	45
D83PB1	BABA	0.5	0.020	0.006	0.000	0.014	0.001	41
SS5173	5173	1.7	0.038	0.029	0.007	0.002	0.000	38

In this example, it is clear that SP0006 has significant performance improvement potential on SYZ0. The DASD Component would analyze SP0006 as the "worst" device for system SYZ0, to determine what caused the delays. Additionally, if the CPExpert modification to MXG or MICS (described in Section 2) had been installed, the DASD Component would list the applications referencing SP0006. Further, if SMF Type 42 records were available (and the volume contained data sets managed by DFSMS), the DASD Component would produce Rule DAS400 to show access characteristics of the most significant data sets that resided on SP0006.

Suggestion: You should use the information displayed by Rule DAS050 to assess the relative importance of the "worst" performing device compared with the performance improvement potential of the other devices, from the perspective of the "loved one" workload.