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 that 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 that provide better than average response. Thus, the candidate set of devices to analyze consists of those that 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 that 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.

	DEVICE	I/O	------AVERAGE PER SECOND DELAYS-------					WEIGHTED
VOLSER	NUMBER	RATE	RESP	CONN	DISC	PEND	IOSQ	DELAYS
SY3085	72BF	77.6	0.282	0.112	0.002	0.030	0.138	27624
SVS10F	72FA	153.8	0.213	0.111	0.018	0.051	0.033	20879
DJ308D	3DD2	48.8	0.115	0.042	0.044	0.010	0.019	11303
SVCKC4	7054	3.4	0.113	0.027	0.000	0.086	0.000	11076
PS1345	3A21	118.5	0.112	0.074	0.004	0.023	0.011	8924
CFAC04	72CA	35.7	0.082	0.025	0.030	0.011	0.016	8029
EM300C	BB16	36.6	0.081	0.063	0.001	0.007	0.010	7916
DJ3012	3B81	39.5	0.078	0.028	0.033	0.008	0.009	7544
SY3062	7292	54.5	0.067	0.026	0.002	0.019	0.019	6529
SY3061	7291	12.0	0.055	0.035	0.005	0.005	0.010	5180
SVC102	7012	41.3	0.052	0.034	0.001	0.013	0.004	5131

In this example, it is clear that the top few devices have the most potential for improvement. The DASD Component would analyze SY3085 as the "worst" device, 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 SY3085. 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 SY3085.

Notice that the data presented by Rule DAS050 are in "average per second" delays rather than "average per I/O" delays. This presentation gives the impact overall of each volume, which is appropriate for the weighted delays (or intensity) shown. If "average per I/O" delays were used, the effect of delays would not be as clear since devices with a few I/O operations could have significant delay per I/O operation. Displaying these significant delays would be misleading, since only a few I/O operations experienced the delays.

After analyzing SY3085, the DASD Component would analyze SVS10F as the next "worst" performing device, then analyze DJ308D, and so forth until the number of devices specified by the ANALYZE guidance variable in USOURCE(DASGUIDE) had been analyzed.

Suggestion: You should use the information displayed by Rule DAS050 to assess the relative impact of the "worst" performing device compared with the performance improvement potential of the other devices. In some cases,

the impact of the “worst” performing device will be several times the impact of the next performing device. In most cases, the impact of the top five or six devices will account for most of the overall impact.

