Rule DAS133: LARGE PEND TIME MAY BE CAUSED BY CONTROLLER ACTIVITY

Finding: A significant amount of the PEND time delay may have been caused by controller activity. This controller activity probably was caused by staging/destaging of cached controllers.

Impact: This finding may have a MEDIUM IMPACT or HIGH IMPACT on the performance of the device.

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

DAS100: Volume with the worst overall performance
DAS130: Major cause of I/O delay was PEND time

Discussion: PEND time is the time from the issuance of the SSCH instruction until the device is selected by the control unit. This time is caused by queuing for the path (wait for channel, wait for control unit or wait for head-of-string), and can be caused by other systems sharing the device (wait for device).

Large PEND times for devices attached to cached controllers may imply a high percent of read miss operations, or non-volatile storage (NVS) writes for IBM-3990-3 devices.

Staging in caching controllers can cause hidden device busy (with the device busy potentially reflected in high PEND time):

- The normal (random) caching algorithm stages all records to the end of the track after a requested record is read.
- The normal (random) caching algorithm stages all records from the beginning of the track to the requested record if a front-end miss occurs.
- The sequential caching algorithm stages all records to the end of the track after the requested record is read, and stages in all of the next track. IBM-3990 (Model 3) controllers stage in all of the next three tracks.
- Most writes to extended function IBM-3990 (Model 3) go into NVS with a subsequent destaging required.

Suggestion: Large PEND times caused by staging or destaging of cached controllers implies a low hit rate for data in the cache. There are several alternatives you should consider:

- Determine whether workload scheduling would increase the cache hit rate. Potentially, contending workloads access data sets in a pattern requiring that data be frequently staged into the cache (for read operations) or destaged from the cache (for write operations).

- Examine the cache hit rate of the volumes attached to the controller and potentially remove selected data sets or volumes from the cache, or move them to other cached devices.

  If you have the Cache RMF Reporter (IBM Product 5798-DQD) or comparable products, you will be able to obtain measurement information about the cache utilization and hit rates. The DASD Component of CPExpert does not analyze the Cache RMF Reporter data at present. However, this analysis will be done in a future update to the Component.

- Large PEND times for IBM-3390 devices may be caused by dual copy initialize. In this case, the dual copy initialize should be turned off.

