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NVM Express Technical Proposal for New Feature

Technical Proposal ID	4002 – HMB Enhancements
Change Date	8/22/2017
Builds on Specification	NVM Express 1.3

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A controller that supports the Host Memory Buffer feature may not be able to support complex host memory layouts. This proposal allows a controller to indicate two limitations to the host in order to help the host in allocation of host memory:

- Maximum number of descriptor entries.
- Minimum size of host memory allocation for a particular descriptor.

If the host does not follow this guidance, the host memory provided to a controller may not be used optimally.

Revision History

Revision Date	Change Description
2017/05/09	Editorial changes.
2017/06/08	Editorial changes, new section 8 text.
2017/06/12	Editorial changes and recommendations for host use.
2017/06/14	Editorial changes.
2017/08/22	Ratified

Description of Specification Changes

Modify Figure 109 (Identify – Identify Controller data structure) as shown below:

335:332	○	Host Memory Buffer Minimum Descriptor Entry Size (HMMINDS): This field indicates the minimum usable size of a Host Memory Buffer Descriptor Entry in 4KB units. If this field is cleared to 0h, then the controller does not indicate any limitations on the Host Memory Buffer Descriptor Entry size.
337:336	○	Host Memory Maximum Descriptors Entries (HMMAXD): This field indicates the number of usable Host Memory Buffer Descriptor Entries. If this field is cleared to 0h, then the controller does not indicate a maximum number of Host Memory Buffer Descriptor Entries.
544:332 511:338		Reserved

Modify a portion of section 8.9 (Host Memory Buffer (Optional)) as shown below:

The Host Memory Buffer (HMB) feature allows the controller to utilize an assigned portion of host memory exclusively. The use of the host memory resources is vendor specific. Host software may not be able to provide any or a limited amount of the host memory resources requested by the controller. The controller shall function properly without host memory resources. Refer to section 5.21.1.13.

The controller may indicate limitations for the minimum usable descriptor entry size and the maximum number of descriptor entries (refer to the HMMINDS and HMMAXD fields in the Identify Controller data structure). If the host does not create the Host Memory Buffer within the indicated limits, then the host memory allocated for use by the controller may not be fully utilized (e.g., descriptor entries beyond the maximum number of entries indicated may be ignored by the controller).

During initialization, host software may provide a descriptor list that describes a set of host memory address ranges for exclusive use by the controller. The host memory resources assigned are for the exclusive use of the controller (host software should not modify the ranges) until host software requests that the controller release the ranges and the controller completes the Set Features command. The controller is responsible for initializing the host memory resources. Host software should request that the controller release the assigned ranges prior to a shutdown event, a Runtime D3 event, or any other event that requires host software to reclaim the assigned ranges. After the controller acknowledges that it is no longer using the ranges, host software may reclaim the host memory resources. In the case of Runtime D3, host software should provide the host memory resources to the controller again and inform the controller that the ranges were in use prior to the RTD3 event and have not been modified.

The host memory resources are not persistent in the controller across a reset event. Host software should provide the previously allocated host memory resources to the controller after the reset completes. If host software is providing previously allocated host memory resources (with the same contents) to the controller, the Memory Return bit is set to '1' in the Set Features command.

The controller shall ensure that there is no data loss or data corruption in the event of a surprise removal while the Host Memory Buffer feature is being utilized.