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NVM Express Technical Proposal for New Feature

Technical Proposal ID	**4093 – Zone Relative Data Lifetime Hint**
Change Date	**2021-06-24**
Builds on Specification	**NVMe - Zoned Namespace Command Set Specification 1.1**
Refers to Ratified Technical Proposals	**TP4053a**

Technical Proposal Author(s)

Name	**Company**
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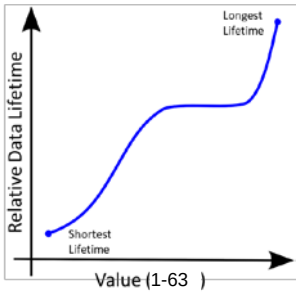
This proposal will add a method for a host to advertise to the device a relative lifetime hint upon opening a zone. The hint communicates the relative lifetime of the data that will be subsequently written to that zone.

The relative lifetime hint is defined as a range (e.g., 1-63), that allows the host to bucketize its data according to the relative lifetime of the data. The range itself is monotonically increasing. For example, a relative lifetime value of 0 advertises the shortest lifetime of the data to be written, and a value of 63 advertises the longest lifetime of the data to be written. The device can use the advertises value and the monotonicity property to optimize its data placement.



As an example, a host splits the lifetime of the data it writes to zones into eight buckets. The relative lifetime is monotonically increasing from bucket 1 to bucket 8 (i.e., the first bucket is data that has the shortest relative lifetime, and the last bucket is data with the longest relative lifetime). When the host opens a zone, it advertises the relative lifetime of the data that will be subsequently written to the zone.

Another example is a host that splits the lifetime of the data into eight buckets, but initially spreads them across the 63 values. Another host may only split its data into two buckets (e.g., 1 and 63), or simply don't advertise any value. Ultimately, the device internally maps as appropriate by means that are not part of this proposal.

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Revision History

Revision Date	Change Description
2020-10-06	Initial version
2020-11-13	Change the Data Lifetime field to be MSB
2020-12-08	Editorial changes to the Data Lifetime filed
2021-01-12	Incorporated comments from Phase 2 exit vote
2021-01-26	Changes in the Data Lifetime field - Make it clear that the scope is namespace - More editorial changes
2021-02-01	Added some text that the value can only be set once per open
2021-02-02	Change of the bit ordering of the Data Lifetime filed and move text from the field's definition to the Open Zone section
2021-02-09	Editorial text changes for the Data Lifetime filed
2021-02-15	Cleaning for Phase 3 exit ballot
2021-02-16	• In the description of the Data Lifetime field, three occurrences of "indicates" where changed to "specifies" • We modified "A value of 1h indicates the shortest estimated period before the zone is reset" to "A value of 1h specifies the shortest Data Lifetime." Similar change is in the 63h value text. • Editorial changed 4.3.1.3
2021-02-17	• Modified text based on members comments: o Fixed navigation pan o Editorial changes o Remove the Read-Only state from the list in 4.3.1.3
2021-02-23	• Removing addressed comments and more editorial cleanup
2021-02-25	• Editorial cleanups before entering to 30day member review
2021-03-22	• Members review comments o Changed the value of the longest Data Lifetime to 3Fh (from 63h)
2021-06-08	• Aligned to NVMe 2.0 specification
2021-06-20	• Integrated into the NVMe Zoned Namespace Command Set Specification, revision 1.1.
2021-06-24	• Clean version for integration

Description for NVMe 2.0 Changes Document

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Description of Zoned Namespace Command Set Specification Changes

TP 4053a adds base support for Zoned Namespaces. The proposal will add a method for a host to advertise to the device a relative lifetime hint upon opening a zone. The hint communicates the relative lifetime of the data that will be subsequently written to that zone.

Description of Specification Changes

Markup Conventions:

Black:	Unchanged (however, hot links are removed)
~~Red Strikethrough~~:	Deleted
Blue:	New
Highlighted:	TBD values, anchors, and links to be inserted.
Orange Bracketed:	**Notes to editor**

3.4.2.2.3 Zone Descriptor Data Structure***...***

Figure 39: Zone Management Send – Command Dword 13

<table>
<tr><th>Bits</th><th>Description</th></tr>
<tr><td>31:~~09~~24</td><td>Reserved</td></tr>
<tr><td>23:16</td><td>
Zone Management (ZM): This field indicates attributes for the Zone Send Action being issued.
<table>
<tr><th>Zone Send Action</th><th>Description</th></tr>
<tr><td>Open Zone</td><td>
<table>
<tr><th>Bits</th><th>Attribute</th><th>Definition</th></tr>
<tr><td>07:06</td><td>Reserved</td><td></td></tr>
<tr><td>05:00</td><td>Data Lifetime</td><td>The value in this field specifies an estimate of the relative Data Lifetime of this zone as compared to the relative Data Lifetime of other zones in this namespace. Refer to section 3.4.3.1.3.
A value of 0h specifies that no estimate is provided.
A value of 1h specifies the shortest Data Lifetime.
A value of 3Fh specifies the longest Data Lifetime.</td></tr>
</table>
</td></tr>
<tr><td>All other values</td><td>Reserved</td></tr>
</table>
</td></tr>
<tr><td>15:09</td><td>Reserved</td></tr>
<tr><td>08</td><td>Select All: If this bit is set to ‘1’, then the SLBA field shall be ignored. If this bit is cleared to ‘0’, then the SLBA field specifies the lowest logical block of the zone. Refer to section 4.3.1 for specific behavior for each Zone Send Action.</td></tr>
</table>

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3.4.3.1.3 Open Zone:

...

If there are insufficient available Active Resources or insufficient available Open Resources, then the command shall be aborted as described in section 2.1.1.4 and no zone state transition shall occur.

The Data Lifetime of a zone is relative to the Data Lifetimes of other zones in the same namespace.

The Data Lifetime of a zone is not defined until a Zone Management Send command is processed that transitions that zone from the ZSE:Empty state to an active state.

The Data Lifetime of a zone (refer to Figure 39) is from the time a Zone Management Send command transitions that zone from the ZSE:Empty state to an active state (refer to section 2.1.1.4) until that zone transitions to:

a) the ZSE:Empty state; or
b) the ZSO:Offline state.

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