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NVM Express Technical Proposal for New Feature

Technical Proposal ID	4086 – PEL State and Source Reporting
Change Date	2021-3-16
Builds on Specification	NVMe 1.4b
References	TP 4071b CEL Enhancements TP 4083 PEL Context Counter

Technical Proposal Author(s)

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This proposal adds bits/fields that allow a host to determine if a Persistent Event Log reporting context exists, and if so, the interface (NVMe, NVMe-MI, or NVMe-oF) and Port Identifier from which the reporting context was established. Additionally, new fields will be added to indicate the interface (NVMe, NVMe-MI, or NVMe-oF) and Port Identifier associated with the event, if applicable.

Revision History

Revision Date	Change Description
2020-09-16	<ul style="list-style-type: none">Initial version.
2020-11-05	<ul style="list-style-type: none">Synced up to NVMe Base Spec 1.4b.Aligned Port Identifier field in Identify Primary Controller Capabilities Structure to the definition of Port Identifier defined by the NVMe-MI specification.Updated PIT field to indicate that newer devices can't use the "not reported" option and added a value to indicate that the event is not associated with any port.Incremented the Log Revision to 02h.Clarified what the Log Revision and Event Type Revision applies to.Wordsmithing.
2020-11-19	<ul style="list-style-type: none">Fixed a typo in the PELPID field.
2020-12-09	<ul style="list-style-type: none">Editorial updates.
2020-12-14	<ul style="list-style-type: none">Added bit to advertise support for the PEL action Establish Context and Read Log Header.
2020-12-17	<ul style="list-style-type: none">Made the LID Specific field 16 bits instead of 31 bits.
2021-01-12	<ul style="list-style-type: none">Require Persistent Event Log Generation Number to be supported if Establish Context and Read Log Header action is supported.Renamed Establish Context and Read Log Header to Establish Context and Read 512 Bytes of Header.Clarified that for the Establish Context and Read 512 Bytes of Header action, the controller returns the first 512 bytes of data and ignores the LPOL, LPOU, NUMDL, and NUMDU fields.Bumped up Log Revision to 3h since TP 4083 bumps it up to 2h.
2021-03-03	<ul style="list-style-type: none">Editorial updates based on member review feedback.
2021-03-16	<ul style="list-style-type: none">Integrated into the NVMe Base Specification.

Description for NVMe Base Specification Changes Document

- Feature Enhancements
 - Persistent Event Log Enhancements
 - **New Requirement / incompatible change** in section 5.14.1.13.
 - If an event is associated with a specific NVMe/NVMe-MI/NVMe-oF Port Identifier, then store the details about that Port Identifier in the Persistent Event Log Event Header.
 - If a Persistent Event Log reporting context has been established, then define a mechanism to allow the controller to report to the host the interface (NVMe, NVMe-MI, or NVMe-oF) and Port Identifier from which the reporting context was established.
 - Clarified what the Log Revision and Event Type Revision applies to.
 - Incremented the Log Revision to 03h.
 - **New Requirement / incompatible change** in section 5.15.2.10.
 - Aligned the definition of the Port Identifier field in Identify Primary Controller Capabilities Structure to the definition of Port Identifier in the NVMe-MI specification.
 - References:
 - NVMe Base Specification, Revision 1.4b section 5.14.1.13 and 5.15.2.10.

Description of Specification Changes to the NVMe Base Specification

Markup Conventions:

Black:	Unchanged (however, hot links are removed)
Red Strikethrough:	Deleted
Blue:	New
Blue Highlighted:	TBD values, anchors, and links to be inserted in new text.
<Green Bracketed>:	Notes to editor

Modify these figures in Section 5.14 (Get Log Page command) as follows:

Figure 190: Get Log Page – Command Dword 10

Bits	Description
31:16	Number of Dwords Lower (NUMDL): This field specifies the lower 16 bits of the number of dwords to return <i>unless otherwise specified</i> . If host software specifies a size larger than the log page requested, the controller returns the complete log page with undefined results for dwords beyond the end of the log page. The combined NUMDL and NUMDU fields form a 0's based value.
...	...

Figure 191: Get Log Page – Command Dword 11

Bits	Description	
31:16	Log Specific Identifier: This field specifies an identifier that is required for a particular log page. The log pages that require a log specific identifier are indicated in the table below.	
	Log Page	Definition
	Endurance Group Information	Endurance Group Identifier (refer to section 8.17)
	Predictable Latency Per NVM Set	NVM Set Identifier (refer to section 4.9)
15:00	Number of Dwords (NUMDU): This field specifies the upper 16 bits of the number of dwords to return <i>unless otherwise specified</i> .	

Figure 192: Get Log Page – Command Dword 12

Bits	Description
31:00	<p>Log Page Offset Lower (LPOL): The log page offset specifies the location within a log page to start returning data from <i>unless otherwise specified</i>. This field specifies the lower 32 bits of the log page offset. The offset shall be dword aligned, indicated by bits 1:0 being cleared to 00b.</p> <p>The controller is not required to check that bits 1:0 are cleared to 00b. The controller may report an error of Invalid Field in Command if bits 1:0 are not cleared to 00b. If the controller does not report an error of Invalid Field in Command, then the controller shall operate as if bits 1:0 are cleared to 00b.</p> <p>If the host specifies an offset (i.e., LPOL and LPOU) that is greater than the size of the log page requested (e.g., a log page containing 100 bytes is requested starting at offset 200), then the controller shall abort the command with a status of Invalid Field in Command.</p>

Figure 193: Get Log Page – Command Dword 13

Bits	Description
31:00	Log Page Offset Upper (LPOU): This field specifies the upper 32 bits of the log page offset <i>unless otherwise specified</i> . Refer to the Log Page Offset Lower definition.

Add a new field to Figure 216 (Persistent Event Format) as follows:

Bytes	Description																
Persistent Event Log Event Header																	
...	...																
03	<p>Event Header Additional Information (EHAI): This field indicates if additional information is present in this event header.</p> <table> <tr> <th>Bits</th><th>Definition</th></tr> <tr> <td>7:2</td><td>Reserved</td></tr> <tr> <td>1:0</td><td> <p>Port Identifier Type (PIT): This field indicates the type of port identifier reported in the Port Identifier (PELPID) field. Implementations that are compliant with revisions of this specification later than 1.4 shall not clear this field to 0h.</p> <table> <tr> <th>Value</th><th>Definition</th></tr> <tr> <td>0h</td><td>The Port Identifier Type is not reported and the Port Identifier (PELPID) field does not apply.</td></tr> <tr> <td>1h</td><td>If this event is associated with an NVM subsystem port, then this field shall be set to 1h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVM subsystem port associated with this event.</td></tr> <tr> <td>2h</td><td>If this event is associated with an NVMe-MI port, then this field shall be set to 2h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVMe-MI port associated with this event.</td></tr> <tr> <td>3h</td><td>If this event is not associated with any port, then this field shall be set to 3h and the Port Identifier (PELPID) field does not apply.</td></tr> </table> </td></tr> </table>	Bits	Definition	7:2	Reserved	1:0	<p>Port Identifier Type (PIT): This field indicates the type of port identifier reported in the Port Identifier (PELPID) field. Implementations that are compliant with revisions of this specification later than 1.4 shall not clear this field to 0h.</p> <table> <tr> <th>Value</th><th>Definition</th></tr> <tr> <td>0h</td><td>The Port Identifier Type is not reported and the Port Identifier (PELPID) field does not apply.</td></tr> <tr> <td>1h</td><td>If this event is associated with an NVM subsystem port, then this field shall be set to 1h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVM subsystem port associated with this event.</td></tr> <tr> <td>2h</td><td>If this event is associated with an NVMe-MI port, then this field shall be set to 2h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVMe-MI port associated with this event.</td></tr> <tr> <td>3h</td><td>If this event is not associated with any port, then this field shall be set to 3h and the Port Identifier (PELPID) field does not apply.</td></tr> </table>	Value	Definition	0h	The Port Identifier Type is not reported and the Port Identifier (PELPID) field does not apply.	1h	If this event is associated with an NVM subsystem port, then this field shall be set to 1h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVM subsystem port associated with this event.	2h	If this event is associated with an NVMe-MI port, then this field shall be set to 2h and the Port Identifier (PELPID) field indicates the Port Identifier of the NVMe-MI port associated with this event.	3h	If this event is not associated with any port, then this field shall be set to 3h and the Port Identifier (PELPID) field does not apply.
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15:14	<p>Port Identifier (PELPID): If the PIT field in the EHAI field is cleared to 0h or set to 3h, then this field shall be cleared to 0h.</p> <p>If the PIT field in the EHAI field is not cleared to 0h or set to 3h, then this field contains a Port Identifier of the type indicated in the PIT field.</p> <p>If the PIT field in the EHAI field is set to 1h, then this field shall contain the Port Identifier as defined in the Primary Controller Capabilities data structure (refer to section 5.15.2.10).</p> <p>If the PIT field in the EHAI field is set to 2h, then the least-significant byte of this field shall contain the Port Identifier as defined in the Controller Information Data Structure (refer to the NVM Express Management Interface Specification) and the most-significant byte of this field shall be cleared to 0h.</p>																
...	...																

Modify Figure 214 (Command Dword 10 – Log Specific Field) as follows:

Bits	Description										
14:10	Reserved										
09:08	<p>Action: This field specifies the action the controller shall take during processing this Get Log Page command.</p> <table> <tr> <th>Value</th><th>Definition</th></tr> <tr> <td>00b</td><td> <p>Read Log Data: Return persistent event log page data starting at the address indicated by the LPOU field and the LPOL field in the Get Log Page command. If the controller does not have a persistent event log reporting context, then the controller shall fail the command with a status code of Command Sequence Error.</p> </td></tr> <tr> <td>01b</td><td> <p>Establish Context and Read Log Data: The controller shall:</p> <ul style="list-style-type: none"> a) determine the length of the persistent event log page data; b) determine the set of events to report in the persistent event log page data; and c) establish a persistent event log reporting context to store information describing the persistent event log data to be reported and track persistent event log page data accesses. <p>After establishing a persistent event log reporting context the controller shall return persistent event log page data starting at the address indicated by the LPOU field and the LPOL field in the Get Log Page command.</p> <p>A number of dwords to return set to zero in the Get Log Page command indicates that no log data shall be returned.</p> <p>If a persistent event log reporting context already exists, then the controller shall fail the command with a status code of Command Sequence Error.</p> </td></tr> <tr> <td>10b</td><td> <p>Release Context: The controller shall release the persistent event log reporting context, if any. 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Modify Figure 215 (Get Log Page – Persistent Event Log (Log Identifier 0Dh) as follows:

...	...																				
377:374	<p>Reporting Context Information (RCI): This field contains information about the Persistent Event Log reporting context.</p> <table> <tr> <th>Bits</th><th>Definition</th></tr> <tr> <td>31:19</td><td>Reserved</td></tr> <tr> <td>18</td><td> <p>Reporting Context Exists (RCE): This bit indicates the persistent event log reporting context. If this bit is set to '1', then a persistent event log reporting context already existed when the Get Log Page command that requested this log page was processed. If this bit is cleared to '0', then a persistent event log reporting context did not already exist when the Get Log Page command that requested this log page was processed.</p> </td></tr> <tr> <td>17:16</td><td> <p>Reporting Context Port Identifier Type (RCPIT): If the RCE bit is set to '1', then this field indicates the type of port identifier reported in the Reporting Context Port Identifier (RCPID) field. 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31:19	Reserved																				
18	<p>Reporting Context Exists (RCE): This bit indicates the persistent event log reporting context. If this bit is set to '1', then a persistent event log reporting context already existed when the Get Log Page command that requested this log page was processed. If this bit is cleared to '0', then a persistent event log reporting context did not already exist when the Get Log Page command that requested this log page was processed.</p>																				
17:16	<p>Reporting Context Port Identifier Type (RCPIT): If the RCE bit is set to '1', then this field indicates the type of port identifier reported in the Reporting Context Port Identifier (RCPID) field. If the RCE bit is cleared to '0', then this field shall be cleared to 0h.</p> <table> <tr> <th>Value</th><th>Definition</th></tr> <tr> <td>0h</td><td>A persistent event log reporting context does not already exist.</td></tr> <tr> <td>1h</td><td>The reporting context was established by an NVM subsystem port and the Reporting Context Port Identifier (RCPID) field indicates the Port Identifier of the NVM subsystem port that established the reporting context.</td></tr> <tr> <td>2h</td><td>The reporting context was established by an NVMe-MI port and the Reporting Context Port Identifier (RCPID) field indicates the Port Identifier of the NVMe-MI port that established the reporting context.</td></tr> <tr> <td>3h</td><td>Reserved</td></tr> </table>	Value	Definition	0h	A persistent event log reporting context does not already exist.	1h	The reporting context was established by an NVM subsystem port and the Reporting Context Port Identifier (RCPID) field indicates the Port Identifier of the NVM subsystem port that established the reporting context.	2h	The reporting context was established by an NVMe-MI port and the Reporting Context Port Identifier (RCPID) field indicates the Port Identifier of the NVMe-MI port that established the reporting context.	3h	Reserved										
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3h	Reserved																				
15:00	<p>Reporting Context Port Identifier (RCPID): If the RCE bit is cleared to '0', then this field shall be cleared to 0h.</p> <p>If the RCE bit is set to '1', then this field contains a Port Identifier of the type indicated in the RCPIT field.</p> <p>If the RCPIT field is set to 1h, then this field shall contain the Port Identifier as defined in the Primary Controller Capabilities data structure (refer to section 5.15.2.10).</p> <p>If the RCPIT field is set to 2h, then the least-significant byte of this field shall contain the Port Identifier as defined in the Controller Information Data Structure (refer to the NVMe Express Management Interface Specification) and the most-significant byte of this field shall be cleared to 0h.</p>																				

Modify a portion of Section 5.15.2.10 (Primary Controller Capabilities data structure (CNS 14h)) as follows:

The Primary Controller Capabilities Structure (refer to Figure 256) is returned to the host for the primary controller specified.

Figure 256: Identify – Primary Controller Capabilities Structure

Bytes	Description
01:00	Controller Identifier (CNTLID): This field indicates the Controller Identifier of the primary controller.
03:02	Port Identifier (PORTID): This field indicates the Port Identifier of the NVM subsystem port associated with the primary controller. The Port Identifier for a PCI Express Port shall be unique within the NVM subsystem is the same as the Port Number field in Link Capabilities Register in the PCI Express Capability structure (refer to section 2.5.6). If the NVM subsystem supports an NVMe-MI Management Endpoint on this PCIe port, then this field shall contain the same value as the Port Identifier field in the Controller Information Data Structure (refer to the NVMe Express Management Interface Specification) for this primary controller.

Description of Specification Changes to TP 4071b

Modify Figure TBD_FX2 as follows:

Figure <TBD_FX2>: Get Log Page – LID Supported and Effects Data Structure

Bits	Description
31:16	Reserved LID Specific Field: This field is specific to the log page identifier as defined in Figure TBD4.
15:1	Reserved
0	LID Supported (LSUPP): If this bit is set to '1', then the LID is supported for a Get Log Page command by the controller. If this bit is cleared to '0', then this LID is not supported for a Get Log Page command by the controller. Refer to section 7.1 for the LID support requirements for each controller type.

Add a new table after Figure TBD_FX2 as follows:

Figure <TBD4>: LID Supported and Effects Data Structure – LID Specific Field

Log Page Identifier	LID Specific Field						
0 to Ch	Reserved						
0Dh	<p>The LID Specific Field for log page identifier 0Dh (Persistent Event Log as described in section 5.14.1.13) is defined as follows:</p> <table> <tr> <th>Bits</th><th>Description</th></tr> <tr> <td>15:1</td><td>Reserved</td></tr> <tr> <td>0</td><td> <p>Establish Context and Read 512 Bytes of Header Supported: If this bit is cleared to '0', then the controller does not support the Establish Context and Read 512 Bytes of Header action (refer to Figure 214).</p> <p>If this bit is set to '1', then the controller supports the Establish Context and Read 512 Bytes of Header action. If this bit is set to '1', then the Generation Number field in the Persistent Event Log shall also be supported.</p> <p><note to editor: the Generation Number field referenced above is defined in TP 4083></p> <p>Implementations compliant to versions of this specification later than 1.4 shall set this bit to '1'.</p> </td></tr> </table>	Bits	Description	15:1	Reserved	0	<p>Establish Context and Read 512 Bytes of Header Supported: If this bit is cleared to '0', then the controller does not support the Establish Context and Read 512 Bytes of Header action (refer to Figure 214).</p> <p>If this bit is set to '1', then the controller supports the Establish Context and Read 512 Bytes of Header action. If this bit is set to '1', then the Generation Number field in the Persistent Event Log shall also be supported.</p> <p><note to editor: the Generation Number field referenced above is defined in TP 4083></p> <p>Implementations compliant to versions of this specification later than 1.4 shall set this bit to '1'.</p>
Bits	Description						
15:1	Reserved						
0	<p>Establish Context and Read 512 Bytes of Header Supported: If this bit is cleared to '0', then the controller does not support the Establish Context and Read 512 Bytes of Header action (refer to Figure 214).</p> <p>If this bit is set to '1', then the controller supports the Establish Context and Read 512 Bytes of Header action. If this bit is set to '1', then the Generation Number field in the Persistent Event Log shall also be supported.</p> <p><note to editor: the Generation Number field referenced above is defined in TP 4083></p> <p>Implementations compliant to versions of this specification later than 1.4 shall set this bit to '1'.</p>						
0Eh to BFh	Reserved						
C0h to FFh	Vendor specific						

Description of Specification Changes to TP 4083

Modify Figure 215 (Get Log Page – Persistent Event Log (Log Identifier 0Dh) as follows:

Bytes	Description
16	Log Revision: Contains a number indicating the revision of the Get Log Page data structure that this log page data complies with. Shall be set to 02h 03h. This revision applies to the Persistent Event Log and the Persistent Event Format (refer to Figure 216). This revision does not apply to the contents of the Event Data field in the Persistent Event Format as that field is covered by the Event Type Revision (refer to Figure 216).
...	...