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NVM Express® Technical Proposal (TP)

Technical Proposal ID	TP 8029 - Boot Driver Handling of Unavailable SNSS Records
Revision Date	2024.03.10
Builds on Specification(s)	NVM Express Boot Specification 1.0
References	

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Technical Proposal Overview

The NVM Express Boot Specification 1.0 provides a “Unavailable Namespace Flag” in the SNSS Descriptor which may communicate an “Unavailable” state for a given namespace descriptor by the Pre-Boot OS. There may be several reasons for a given namespace descriptor to be “Unavailable”. However, the current “Unavailable” state presents a lack of diagnostic information for the booted OS to determine or correlate why the namespace in question was “Unavailable” to the pre-OS driver.

This proposal seeks to provide better diagnostics by providing one or more reasons for a SNSS Descriptor that has been set to an “Unavailable” state by creating a new data structure that may optionally contain enhanced diagnostic fields (e.g., connection timeout, discovery log page traversal timeout). In support of these optional enhanced diagnostic notes, the SNSS may be expanded to include additional fields for the communication of diagnostic data (e.g., timeout value, HFI or SNSS device number).

In addition to normative content, this proposal should also include informative concepts for pre-OS and OS users and developers on how to interpret these fields and what to do with them. This may include recommendations for the OS driver or administrative entity to consider handling of an unavailable SNSS entries as listed in the NBFT.

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Revision History

Revision Date	Change Description
2023.10.10	Initial draft
2023.11.28	Draft Phase 3 cleanups
2023.12.07	In TWG last edits
2024.01.09	Member Review Feedback
2024.03.10	Integrated

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Description for Changes Document for NVM Express Boot Specification 1.0

New Features/Feature Enhancements/Required Changes:

- Increments the version of the Subsystem Namespace Extended Information Descriptor
- Adds new fields to the Subsystem Namespace Extended Information Descriptor relative to Diagnostic data for:
    - Networking,
    - Connections, and Timeouts, and
    - Authentication and Security

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.
~~Purple Strikethrough~~:	Moved source
Purple:	Moved destination
<Green Bracketed>:	Notes to editor

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Description of Specification Changes for NVM Express Boot Specification 1.0

3.1.2.5.5 Subsystem and Namespace Extended Information Descriptor

Figure 19: Subsystem and Namespace Extended Information Descriptor

<table>
<tr><th>Bytes</th><th>O/M[1]</th><th>Description</th></tr>
<tr><td>00</td><td>M</td><td>Structure ID: This field shall be set to 9h (i.e., SSNS Extended Info; refer to Figure 5).</td></tr>
<tr><td>01</td><td>M</td><td>Version: This field shall be set to ~~1~~2h.</td></tr>
<tr><td>03:02</td><td>M</td><td>SSNS Descriptor Index: This field indicates the value of the SSNS Descriptor Index field of the Subsystem and Namespace Descriptor (refer to Figure 15) whose SSNS Extended Information Descriptor Heap Object Reference field indicates this descriptor.</td></tr>
<tr><td>07:04</td><td>M</td><td>Flags:
<table>
<tr><th>Bits</th><th>Feature</th></tr>
<tr><td>31:02</td><td>Reserved</td></tr>
<tr><td>01</td><td>Administrative ASQSZ: If set to ’1’, then the value of the ASQSZ field was provided by administrative configuration for this SSNS record.

If cleared to 0h, then the value of the ASQSZ field was either obtained by discovery or assumed by the driver.</td></tr>
<tr><td>00</td><td>Descriptor Valid: If set to ’1’, then this descriptor is valid. If cleared to ’0’, then this descriptor is reserved.</td></tr>
</table></td></tr>
<tr><td>09:08</td><td>O</td><td>Controller ID: The controller identifier of the first controller assocaited with the Admin Queue by the driver. If a controller identifier is not administratively specified or direct configuration is not supported by the driver, then this field shall be cleared to 0h.</td></tr>
<tr><td>11:10</td><td>M</td><td>Admin Submission Queue Size (ASQSZ): The Admin Submission Queue Size utilized for the respective SSNS by the driver.</td></tr>
<tr><td>17:12</td><td>O</td><td>DHCP Root Path String Heap Object Reference: If the SSNS DHCP Root Path Override flag bit is set to ’1’, then:

a) this field indicates the offset in bytes of a heap object containing an DHCP Root Path String as defined in section 3.1.2.5.3 used by the driver.
b) the Offset field and the Length field shall be set to non-zero values.

If the SNSS DHCP Root Path Overrid flag bit is cleared to ’0’, then this field is reserved.
<table>
<tr><th>Bytes</th><th>Description</th></tr>
<tr><td>03:00</td><td>Offset: Offset in bytes of the heap object, if any, from byte offset 0h of the NBFT Table Header.</td></tr>
<tr><td>05:04</td><td>Length: Length in bytes of the heap object, if any.</td></tr>
</table></td></tr>
<tr><td>18</td><td>O</td><td>Namespace Availability Enhanced Diagnostic: If the Unavailable Namespace Flag bit (refer to Figure 15) is set to ‘1’ (i.e., Unavailable) in the Subsystem Namespace Descriptor, this field may provide additional status codes provided by the pre-OS driver.
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0h</td><td>No additional information.</td></tr>
<tr><td>1h</td><td>Network Error: The network HFI or SNSS Destition was invalid. Use of this value by a pre-os driver shall be accompanied by the “Network and Connection Extended Error Codes” field.</td></tr>
<tr><td>2h</td><td>Connection Failure: The connection to the controller specified in this SNSS record was invalid.</td></tr>
<tr><td>3h</td><td>Connect Invalid Parameters: Refer to the NVM Express Base Specification. Use of this value by a pre-os driver shall be accompanied by the “Connect Invalid Parameters Extended Error Codes” field.</td></tr>
</table></td></tr>
</table>

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Figure 19: Subsystem and Namespace Extended Information Descriptor

<table>
<tr><th>Bytes</th><th>O/M[1]</th><th>Description</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>4h</td><td>Connect Invalid Host: Refer to the NVM Express Base Specification.</td></tr>
<tr><td>5h</td><td>Connection Timeout: The connection to the controller specified in the SNSS record timed out.</td></tr>
<tr><td>6h</td><td>Discovery Log Page Traversal Timeout</td></tr>
<tr><td>7h</td><td>Namespace Missing: The referenced NID or NSID relative to a namespace on a SNSS descriptor is missing.</td></tr>
<tr><td>8h</td><td>Namespace Not Ready: The system was not able to connect to the namespace requested (refer to the NVM Express Base Specification).</td></tr>
<tr><td>9h</td><td>Redfish Secret Keypath Object: The pre-os driver encountered a failure interacting with the Redfish Secret Keypath Object. Refer to DMTF DSP8010.</td></tr>
<tr><td>10h</td><td>Secure Channel Negotiation: Refer to the NVM Express Base Specification.</td></tr>
<tr><td>11h</td><td>Authentication Failure: General failure with authentication.</td></tr>
<tr><td>12h</td><td>Authentication Required: Refer to the NVM Express Base Specification.</td></tr>
<tr><td>13h</td><td>DHCP Failure</td></tr>
<tr><td>14h</td><td>SNSS DHCP Root-Path</td></tr>
<tr><td>15h to EFh</td><td>Reserved</td></tr>
<tr><td>F0h to FFh</td><td>Vendor Specific</td></tr>
</table>
</td></tr>
<tr><td>19</td><td>O</td><td>Connect Invalid Parameters Extended Error Codes: Connect Invalid Parameters may be returned with additional status details.
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0h</td><td>No Extended Error Known: A value of 0h may be supplied if the driver does not support the Connect Invalid Parameters Extended Error Codes.</td></tr>
<tr><td>1h</td><td>General Parameters Failure: A value of 1h indicates the driver supports the Connect Invalid Parameters Extended Error Codes, but has no additional detail to provide.</td></tr>
<tr><td>2h</td><td>Invalid Attributes in Connect Response</td></tr>
<tr><td>3h</td><td>Diffe-Hellman Mismatch</td></tr>
<tr><td>4h</td><td>Invalid Controller ID</td></tr>
<tr><td>5h</td><td>I/O Controller Disabled</td></tr>
<tr><td>6h to FFh</td><td>Reserved</td></tr>
</table>
</td></tr>
<tr><td>21:20</td><td>O</td><td>Connection Timeout: Specifies in seconds the timeout value used by the pre-os driver for connecting to the object specified with this SNSS descriptor.
If cleared to 0h, this indicates a timeout of 0 seconds.
If set to FFFFh, this indicates that no timeout was specified by the pre-os driver.</td></tr>
<tr><td>22</td><td>O</td><td>Network and Connection Extended Error Codes: Error codes specific to network and connection errors.
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0h</td><td>No Extended Error Known</td></tr>
<tr><td>1h</td><td>Link Error</td></tr>
</table>
</td></tr>
</table>

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Figure 19: Subsystem and Namespace Extended Information Descriptor

Bytes	O/M[1]	Description		
			2h	**Carrier Error**
			3h	**Connection Refused**
			4h	**No Route to Host**
			5h	**Packet Fragmentation Error**
			6h	**MTU Mismatch**
			7h	**Name Resolution Failure**
			8h to FFh	Reserved

Notes:
1. O/M definition: O = Optional, M = Mandatory.

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