LEGAL NOTICE:

© Copyright 2007 to 2021 NVM Express™, Inc. ALL RIGHTS RESERVED.

This NVM Express revision 2.0 technical proposal is proprietary to the NVM Express, Inc. (also referred to as "Company") and/or its successors and assigns.

NOTICE TO USERS WHO ARE NVM EXPRESS, INC. MEMBERS: Members of NVM Express, Inc. have the right to use and implement this NVM Express revision 2.0 technical proposal subject, however, to the Member's continued compliance with the Company's Intellectual Property Policy and Bylaws and the Member's Participation Agreement.

NOTICE TO NON-MEMBERS OF NVM EXPRESS, INC.: If you are not a Member of NVM Express, Inc. and you have obtained a copy of this document, you only have a right to review this document or make reference to or cite this document. Any such references or citations to this document must acknowledge NVM Express, Inc. copyright ownership of this document. The proper copyright citation or reference is as follows: **"© 2007 to 2021 NVM Express, Inc. ALL RIGHTS RESERVED."** When making any such citations or references to this document you are not permitted to revise, alter, modify, make any derivatives of, or otherwise amend the referenced portion of this document in any way without the prior express written permission of NVM Express, Inc. Nothing contained in this document shall be deemed as granting you any kind of license to implement or use this document or the specification described therein, or any of its contents, either expressly or impliedly, or to any intellectual property owned or controlled by NVM Express, Inc., including, without limitation, any trademarks of NVM Express, Inc.

LEGAL DISCLAIMER:

THIS DOCUMENT AND THE INFORMATION CONTAINED HEREIN IS PROVIDED ON AN "**AS IS**" BASIS. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, NVM EXPRESS, INC. (ALONG WITH THE CONTRIBUTORS TO THIS DOCUMENT) HEREBY DISCLAIM ALL REPRESENTATIONS, WARRANTIES AND/OR COVENANTS, EITHER EXPRESS OR IMPLIED, STATUTORY OR AT COMMON LAW, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, VALIDITY, AND/OR NONINFRINGEMENT.

All product names, trademarks, registered trademarks, and/or servicemarks may be claimed as the property of their respective owners.

The NVM Express® design mark is a registered trademark of NVM Express, Inc.

NVM Express Workgroup
c/o VTM, Inc.
3855 SW 153rd Drive
Beaverton, OR 97003
USA
info@nvmexpress.org

Technical input submitted to the NVM Express™ Workgroup is subject to the terms of the NVM Express™ Participant's agreement. Copyright © 2014 to 2021 NVMe™ Corporation.

NVM Express Technical Proposal for New Feature

Technical Proposal ID	**4114 Vendor Specific Directives**
Change Date	**2021-07-06**
Builds on Specification	**NVM Express Base Specification 2.0**
References Specification	

Technical Proposal Author(s)

Name	**Company**
Mike Allison, Andres Baez, Kapil Karkra, John Rudelic	Intel

This proposal reserves a directive to be vendor specific.

Revision History

Revision Date	**Change Description**
2021-03-30	Initial version
2021-05-14	Removed all comments, accepted all changes, and converted references/cross-references to text for member review.
2021-05-24	Reworded list of directive types to point to table instead.
2021-06-18	• Updated content with latest available word version of the NVMe Base specification • Accepted all comments
2021-07-06	Integrated into the NVMe Base Specification, revision 2.0.

Description for NVMe Base Specification 2.0 Changes Document

Feature Enhancement:

- Add support for vendor specific directives.
- **New requirement / incompatible change**:
  - .A new directive for vendor specific usage has been defined.

Description of Specification Changes

Markup Conventions:

Black: Unchanged (however, hot links are removed)

Technical input submitted to the NVM Express™ Workgroup is subject to the terms of the NVM Express™ Participant's agreement. Copyright © 2014 to 2021 NVMe™ Corporation.

~~Red Strikethrough~~: Deleted

Blue: New

Blue Highlighted: TBD values, anchors, and links to be inserted in new text.

<Green Bracketed>: Notes to editor

Modify portions of NVM Express Base Specification 2.0 Preratification (dated 05/17/2021) as shown below:

Modify a portion of section 8.7 as shown below:

8.7 Directives

Directives is a mechanism to enable host and NVM subsystem or controller information exchange. The Directive Receive command (refer to section 5.10) is used to transfer data related to a specific Directive Type from the controller to the host. The Directive Send command (refer to section 5.11) is used to transfer data related to a specific Directive Type from the host to the controller. Other commands may include a Directive Specific value specific for a given Directive Type (e.g., the Write command in the NVM command set).

Support for Directives is optional and is indicated in the Optional Admin Command Support (OACS) field in the Identify Controller data structure (refer to Figure 275).

If a controller supports Directives, then the controller shall:

- Indicate support for Directives in the Optional Admin Command Support (OACS) field in the Identify Controller data structure;
- Support the Directive Receive command;
- Support the Directive Send command; and
- Support the Identify Directive (i.e., Type 00h).

The Directive Types that may be supported by a controller are shown in Figure 416~~(refer to Figure 416) are the Identify Directive (refer to section 8.7.2), and the Streams Directive (refer to section 8.7.3).~~ The Directive Specific field and Directive Operation field are dependent on the Directive Type specified in the command (e.g., Directive Send, Directive Receive, or I/O command).

Figure 416: Directive Types

Directive	Directive Type Value	Definition	I/O Command Directive
Identify	00h	Section 8.7.2	No
Streams	01h	Section 8.7.3	Yes
Vendor Specific	0Fh	Vendor specific	Yes

If a Directive is not supported or is supported and disabled, then all Directive Send commands and Directive Receive commands with that Directive Type shall be aborted with a status code of Invalid Field in Command.

Support for a specific directive type is indicated using the Return Parameters operation of the Identify Directive. A specific directive may be enabled or disabled using the Enable operation of the Identify Directive. Before using a specific directive, the host should determine if that directive is supported and should enable that directive using the Identify Directive.

Modify a portion of section 8.7.1 as shown below:

8.7.1 Directive Use in I/O Commands

I/O Command Directives are the subset of Directive Types that may be used as part of I/O commands. For example, a Write command in the NVM command set may specify a Directive Type and an associated

Technical input submitted to the NVM Express™ Workgroup is subject to the terms of the NVM Express™ Participant's agreement. Copyright © 2014 to 2021 NVMe™ Corporation.

Directive Specific value. I/O Command Directives shall have a Directive Type value that is less than or equal to 0Fh due to the size of the Directive Type field in I/O commands. When a Directive Type is specified in an I/O command, the most significant four bits are assumed to be 0h. A Directive Type of 00h in an I/O command specifies that the I/O command is not using Directives.

In an I/O command, if the Directive Type (DTYPE) field is set to an I/O Command Directive, then the Directive Specific (DSPEC) field includes additional information for the associated I/O command (refer to Figure 417).

Figure 417: Directive Specific Field Interpretation

Directive Type Value	Directive Specific Field Definition
00h (Directives not in use)	Field not used.
01h (Streams)	Specifies the identifier of the stream associated with the data.
02h to ~~0F~~0Eh	Reserved
0Fh (Vendor Specific)	Vendor specific

In an I/O command:

- if no I/O Command Directive is enabled or the DTYPE field is cleared to 00h, then the DTYPE field and the DSPEC field are ignored; and
- if one or more I/O Command Directives is enabled and the DTYPE field is set to a value that is not supported or not enabled, then the controller shall abort the command with a status code of Invalid Field in Command**.**

For the Streams Directive (i.e., DTYPE field set to 01h), if the DSPEC field is cleared to 0h in an I/O command that supports the Streams Directive, then that I/O command shall be processed normally (i.e., as if DTYPE field is cleared to 00h).

Modify a portion of section 8.7.2.1.1 as shown below:

8.7.2.1.1 Return Parameters (Directive Operation 01h)

This operation returns a data structure that contains a bit vector specifying the Directive Types supported by the controller and a bit vector specifying the Directive Types enabled for the namespace. The data structure returned is defined in Figure 419. If an NSID value of FFFFFFFFh is specified, then the controller shall abort the command with a status code of Invalid Field in Command. The DSPEC field in command Dword 11 is not used for this operation.

Technical input submitted to the NVM Express™ Workgroup is subject to the terms of the NVM Express™ Participant's agreement. Copyright © 2014 to 2021 NVMe™ Corporation.

Figure 419: Identify Directive – Return Parameters Data Structure

Bytes	Bits	Description
		Directives Supported
31:00	255:16	Reserved
	15	**Vendor Specific Directive:** This bit is set to '1' if the Vendor Specific Directive is supported. This bit is cleared to '0' if the Vendor Specific Directive is not supported.
	14:02	Reserved
	01	**Streams Directive:** This bit is set to '1' if the Streams Directive is supported. This bit is cleared to '0' if the Streams Directive is not supported.
	00	**Identify Directive:** This bit shall be set to '1' to indicate that the Identify Directive is supported.
		Directives Enabled
63:32	255:16	Reserved
	15	**Vendor Specific Directive:** This bit is set to '1' if the Vendor Specific Directive is enabled. This bit is cleared to '0' if the Vendor Specific Directive is not enabled.
	14:02	Reserved
	01	**Streams Directive:** This bit is set to '1' if the Streams Directive is enabled. This bit is cleared to '0' if the Streams Directive is not enabled.
	00	**Identify Directive:** This bit shall be set to '1' to indicate that the Identify Directive is enabled.
4095:64	n/a	Reserved

Technical input submitted to the NVM Express™ Workgroup is subject to the terms of the NVM Express™ Participant's agreement. Copyright © 2014 to 2021 NVMe™ Corporation.