Swordfish NVMe Model Overview and Mapping Guide

Version: 1.2.3

Abstract: The Swordfish NVMe Model Overview and Mapping Guide defines the model to manage NVMe and NVMeoF storage systems with Redfish and Swordfish. It provides the detailed mapping information between the NVMe, NVMeoF specifications and the Redfish and Swordfish specifications.

Working Draft

Publication of this Working Draft for review and comment has been approved by the Scalable Storage Management Technical Work Group. This draft represents a 'best effort' attempt by the Scalable Storage Management Technical Work Group to reach preliminary consensus, and it may be updated, replaced, or made obsolete at any time. This document should not be used as reference material or cited as other than a 'work in progress.' Suggestions for revision should be directed to http://www.snia.org/feedback.

Last Updated: 30 August 2021
Contents

USAGE ................................................................. 15
DISCLAIMER ......................................................... 16
Current Revision ................................. 16
Contact SNIA ................................................. 16
FEEDBACK AND INTERPRETATIONS ......... 16
INTENDED AUDIENCE ............................... 17
VERSIONING POLICY ................................. 17
Revision History ............................. 17
About SNIA .................................................... 18
Acknowledgements ......................... 19

1 Abstract ................................. 20

2 Scope ......................................................... 21
2.1 Document Goals ..................... 21
2.2 Audience Assumptions .............. 21

3 Normative References ................. 22
3.1 Overview ........................................ 22
3.2 Approved references .................. 22
3.3 References under development ...... 23
3.4 Other references ...................... 23

4 NVMe Model Overview .......... 24
4.1 Introduction .................................. 24
4.1.1 Fundamental Model Design Assertions ..... 24
4.2 Overall NVMe Subsystem Model .... 25
4.2.1 Major NVM Objects Mapped to RF/SF .. 25
4.2.2 Unmapped objects ............... 26
4.2.3 NVM Subsystem Model ........... 26
4.2.4 NVMe-oF Subsystem Model .......... 27

5 Example Instances .................. 29
5.1 Introduction ................................ 29
5.2 Simple SSD ............................. 29
5.2.1 Overview .................................. 29
5.2.2 Explanation of Object use .............. 30
5.2.3 Redfish / Swordfish Object Representation .... 30

As of 30 August 2021

Working Draft
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Revision History</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Contributors</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>Approved normative references</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>Property Mapping Template and Example</td>
<td>43</td>
</tr>
<tr>
<td>5</td>
<td>Actions.#StorageController.SetEncryptionKey mapping</td>
<td>46</td>
</tr>
<tr>
<td>6</td>
<td>Controllers mapping</td>
<td>47</td>
</tr>
<tr>
<td>7</td>
<td>Description mapping</td>
<td>48</td>
</tr>
<tr>
<td>8</td>
<td>Drives mapping</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>Identifiers mapping</td>
<td>52</td>
</tr>
<tr>
<td>10</td>
<td>Identifiers.DurableNameFormat mapping</td>
<td>54</td>
</tr>
<tr>
<td>11</td>
<td>Identifiers.DurableName mapping</td>
<td>56</td>
</tr>
<tr>
<td>12</td>
<td>Links.Enclosures mapping</td>
<td>58</td>
</tr>
<tr>
<td>13</td>
<td><a href="mailto:Links.Enclosures@odata.count">Links.Enclosures@odata.count</a> mapping</td>
<td>60</td>
</tr>
<tr>
<td>14</td>
<td>Links.Enclosures mapping</td>
<td>61</td>
</tr>
<tr>
<td>15</td>
<td>Links.SimpleStorage mapping</td>
<td>63</td>
</tr>
<tr>
<td>16</td>
<td>Name mapping</td>
<td>63</td>
</tr>
<tr>
<td>17</td>
<td>Status.State mapping</td>
<td>66</td>
</tr>
<tr>
<td>18</td>
<td>Status.Health mapping</td>
<td>69</td>
</tr>
<tr>
<td>19</td>
<td>Status.HealthRollup mapping</td>
<td>71</td>
</tr>
<tr>
<td>20</td>
<td>StorageControllers mapping</td>
<td>73</td>
</tr>
<tr>
<td>21</td>
<td>StorageGroups mapping</td>
<td>74</td>
</tr>
<tr>
<td>22</td>
<td>Volumes mapping</td>
<td>75</td>
</tr>
<tr>
<td>23</td>
<td>Assembly mapping</td>
<td>78</td>
</tr>
<tr>
<td>24</td>
<td>Assembly mapping</td>
<td>80</td>
</tr>
<tr>
<td>25</td>
<td>CacheSummary mapping</td>
<td>81</td>
</tr>
<tr>
<td>26</td>
<td>ControllerRates mapping</td>
<td>82</td>
</tr>
<tr>
<td>27</td>
<td>Description mapping</td>
<td>83</td>
</tr>
<tr>
<td>28</td>
<td>FirmwareVersion mapping</td>
<td>84</td>
</tr>
<tr>
<td>29</td>
<td>Identifiers mapping</td>
<td>85</td>
</tr>
<tr>
<td>30</td>
<td>Identifiers.DurableName mapping</td>
<td>86</td>
</tr>
<tr>
<td>31</td>
<td>Identifiers.DurableNameFormat mapping</td>
<td>87</td>
</tr>
<tr>
<td>32</td>
<td>Links.AttachedVolumes mapping</td>
<td>88</td>
</tr>
<tr>
<td>33</td>
<td>Links.NetworkDeviceFunctions mapping</td>
<td>89</td>
</tr>
<tr>
<td>34</td>
<td>Location mapping</td>
<td>90</td>
</tr>
<tr>
<td>35</td>
<td>Manufacturer mapping</td>
<td>91</td>
</tr>
<tr>
<td>36</td>
<td>Model mapping</td>
<td>92</td>
</tr>
<tr>
<td>Page</td>
<td>Name Mapping</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>100</td>
<td>Name mapping</td>
<td>178</td>
</tr>
<tr>
<td>101</td>
<td>NVMeControllerProperties.ControllerType mapping</td>
<td>180</td>
</tr>
<tr>
<td>102</td>
<td>NVMeControllerProperties.NVMeVersion mapping</td>
<td>181</td>
</tr>
<tr>
<td>103</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.ReportsUUIDList mapping</td>
<td>182</td>
</tr>
<tr>
<td>104</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsSQ Associations mapping</td>
<td>183</td>
</tr>
<tr>
<td>105</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. ReportsNamespaceGranularity mapping</td>
<td>184</td>
</tr>
<tr>
<td>106</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsTrafficBasedKeepAlive mapping</td>
<td>185</td>
</tr>
<tr>
<td>107</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsPredictableLatencyMode mapping</td>
<td>186</td>
</tr>
<tr>
<td>108</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsEnduranceGroups mapping</td>
<td>187</td>
</tr>
<tr>
<td>109</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsReadRecoveryLevels mapping</td>
<td>188</td>
</tr>
<tr>
<td>110</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsNVMSets mapping</td>
<td>189</td>
</tr>
<tr>
<td>111</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. SupportsExceedingPowerOfNonOperationalState mapping</td>
<td>190</td>
</tr>
<tr>
<td>112</td>
<td>NVMeControllerProperties.NVMeControllerAttributes. Supports128BitHostId mapping</td>
<td>191</td>
</tr>
<tr>
<td>113</td>
<td>NVMeControllerProperties.ANACharacteristics mapping</td>
<td>192</td>
</tr>
<tr>
<td>114</td>
<td>NVMeControllerProperties.ANACharacteristics mapping</td>
<td>193</td>
</tr>
<tr>
<td>115</td>
<td>NVMeControllerProperties.ANACharacteristics.AccessState mapping</td>
<td>194</td>
</tr>
<tr>
<td>116</td>
<td>NVMeControllerProperties.ANACharacteristics.Volume mapping</td>
<td>195</td>
</tr>
<tr>
<td>117</td>
<td>NVMeSMARTCriticalWarnings.PowerBackupFailed mapping</td>
<td>196</td>
</tr>
<tr>
<td>118</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed mapping</td>
<td>197</td>
</tr>
<tr>
<td>119</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings. PowerBackupFailed mapping</td>
<td>198</td>
</tr>
<tr>
<td>120</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings. MediaInReadOnly mapping</td>
<td>199</td>
</tr>
<tr>
<td>121</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings. OverallSubsystemDegraded mapping</td>
<td>200</td>
</tr>
<tr>
<td>122</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings. SpareCapacityWornOut mapping</td>
<td>201</td>
</tr>
<tr>
<td>123</td>
<td>PCIeInterface_PCIEType mapping</td>
<td>202</td>
</tr>
</tbody>
</table>
124 PCIeInterface.MaxPCIeType mapping ........................................ 212
125 PCIeInterface.LanesInUse mapping ......................................... 213
126 PCIeInterface.LanesInUse mapping ......................................... 214
127 Ports mapping ................................................................. 215
128 SKU mapping ................................................................. 216
129 SpeedGbps mapping .......................................................... 217
130 Status.State mapping .......................................................... 218
131 Status.Health mapping .......................................................... 221
132 SupportedControllerProtocols mapping .................................... 223
133 SupportedDeviceProtocols mapping ........................................ 224
134 BlockSizeBytes mapping ....................................................... 227
135 Capacity.Data.ConsumedBytes mapping ................................... 228
136 Capacity.Data.ProvisionedBytes mapping ................................ 229
137 Capacity.Data.AllocatedBytes mapping ................................... 231
139 CapacitySources mapping ........................................................ 234
140 Description mapping ............................................................. 235
141 DisplayName mapping ............................................................ 236
142 Identifiers mapping ............................................................... 237
143 Identifiers.DurableName mapping .......................................... 239
144 Identifiers.DurableNameFormat mapping .................................. 240
145 InitializeMethod mapping ...................................................... 241
146 Links.Drives mapping ............................................................ 243
147 LogicalUnitNumber mapping .................................................. 244
148 MaxBlockSizeBytes mapping .................................................. 245
149 Name mapping ................................................................. 246
150 NVMeNamespaceProperties.NamespaceId mapping ...................... 247
151 NVMeNamespaceProperties.IsShareable mapping ....................... 250
152 NVMeNamespaceProperties.NamespaceFeatures. SupportsThinPro-
visioning mapping ................................................................. 251
153 NVMeNamespaceProperties.NamespaceFeatures. SupportsDeallo-
catedOrUnwrittenLBError mapping ........................................... 252
154 NVMeNamespaceProperties.NamespaceFeatures.SupportsNGUIDReuse
mapping ................................................................. 254
155 NVMeNamespaceProperties.NamespaceFeatures. SupportsAtomic-
TransactionSize mapping ..................................................... 256
156 NVMeNamespaceProperties.NamespaceFeatures. SupportsIOPerfor-
manceHints mapping ............................................................. 258
157 158: NVMeNamespaceProperties.NumberLBAFormats mapping . . . 260
158 NVMeNamespaceProperties.FormattedLBASize mapping ............. 262
159 NVMeNamespaceProperties.MetadataTransferredAtEndOfDataLBA
    mapping .................................................................. 263
160 NVMeNamespaceProperties.NVMeVersion mapping .................. 264
161 OptimumIOMSizeBytes mapping ........................................... 265
162 OptimumIOMSizeBytes mapping ........................................... 266
163 Status.State mapping ....................................................... 267
164 Status.Health mapping ..................................................... 269
165 Status.HealthRollup mapping .............................................. 271
166 StorageGroups mapping ..................................................... 272
167 WriteCachePolicy mapping ............................................... 273
168 AllocatedPools mapping .................................................. 276
169 Capacity.Data.AllocatedBytes mapping .............................. 277
170 Capacity.Data.ConsumedBytes mapping .............................. 278
171 CapacitySources mapping ................................................ 279
172 CapacitySources@odata.count mapping .............................. 280
173 Description mapping ....................................................... 281
174 Links.OwningStorageResource mapping .............................. 282
175 Name mapping ................................................................ 283
176 NVMeProperties.NVMePoolType ......................................... 284
177 NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent
    mapping .................................................................... 285
178 NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed map-
    ping ........................................................................ 286
179 NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate
    mapping ..................................................................... 288
180 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead
    mapping .................................................................... 290
181 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten
    mapping .................................................................... 292
182 NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten
    mapping .................................................................... 294
183 NVMeEnduranceGroupProperties.EndGrpLifetime. HostReadCom-
    mandCount mapping .................................................... 296
184 NVMeEnduranceGroupProperties.EndGrpLifetime. HostWriteCom-
    mandCount mapping .................................................... 298
Swordfish NVMe Model Overview and Mapping Guide Version 1.2.3

As of 30 August 2021 Working Draft 11
NVMeEnduranceGroupProperties.EndGrpLifetime. ErrorInformation-LogEntryCount mapping ........................................ 341
NVMeSetProperties.SetIdentifier ........................................ 342
NVMeSetProperties.OptimalWriteSizeBytes mapping .................. 343
NVMeSetProperties.EnduranceGroupIdentifier mapping ............ 344
NVMeSetProperties.Random4kReadTypicalNanoSeconds mapping .... 345
NVMeSetProperties.Random4kReadTypicalNanoSeconds mapping .... 347
Status.State mapping ....................................................... 348
Status.Health mapping ...................................................... 351
Actions.#Drive.Reset mapping ............................................. 354
Actions.#Drive.SecureErase mapping .................................... 355
Assembly.BinaryDataURI mapping ......................................... 355
BlockSizeBytes mapping .................................................... 357
CapableSpeedGpbs mapping ................................................. 358
CapacityBytes for single namespace mapping ......................... 359
CapacityBytes for single namespace mapping ......................... 360
Description mapping ........................................................ 361
EncryptionAbility mapping .................................................. 362
EncryptionStatus mapping ................................................... 362
FailurePredicted mapping .................................................... 363
Identifiers mapping .......................................................... 365
Identifiers.DurableNameFormat mapping ................................ 367
Identifiers.DurableName mapping ......................................... 369
IndicatorLED mapping ......................................................... 370
Links.Volume mapping ....................................................... 371
Links.Volumes@odata.count mapping .................................... 372
Location mapping .............................................................. 373
LocationIndicatorActive mapping ....................................... 374
Manufacturer mapping ......................................................... 375
MediaType mapping ............................................................ 376
Model mapping ................................................................. 376
Multipath mapping ............................................................ 377
Name mapping ................................................................. 378
NegotiatedSpeedGpbs mapping ............................................. 379
PhysicalLocation.Info mapping ............................................. 380
PhysicalLocation.InfoFormat mapping .................................... 380
PhysicalLocation.PartLocation mapping ................................ 381
PredictedMediaLifetimeLeftPercent mapping .......................... 382
List of Figures

1  Subsystem model ................................................. 27
2  NVMe-oF Subsystem Model .................................. 28
3  Simple SSD instance diagram .............................. 29
4  Simple SSD mockup example ............................... 30
5  Complex SSD Model ........................................... 31
6  Complex SSD Model ........................................... 32
7  Simple IP-attached SSD ...................................... 33
8  Simple IP-attached SSD mockup ............................ 34
9  JBOF configuration controller object .................... 35
10 Full JBOF system ............................................... 35
11 JBOF system instance ......................................... 36
12 Opaque array example ........................................ 37
13 Sample opaque system instance ......................... 38
14 NVMe-OF subsystem example .............................. 39
15 NVMe-oF system instance ................................... 40
16 NVMeDomain example ......................................... 41
USAGE

Copyright (c) 2020 - 2021 SNIA. All rights reserved. All other trademarks or registered trademarks are the property of their respective owners.

The SNIA hereby grants permission for individuals to use this document for personal use only, and for corporations and other business entities to use this document for internal use only (including internal copying, distribution, and display) provided that:

1. Any text, diagram, chart, table or definition reproduced must be reproduced in its entirety with no alteration, and,
2. Any document, printed or electronic, in which material from this document (or any portion hereof) is reproduced must acknowledge the SNIA copyright on that material, and must credit the SNIA for granting permission for its reuse.

Other than as explicitly provided above, you may not make any commercial use of this document, or any portion thereof, or distribute this document to third parties. All rights not explicitly granted are expressly reserved to SNIA.

Permission to use this document for purposes other than those enumerated above may be requested by emailing tcmd@snia.org. Please include the identity of the requesting individual and/or company and a brief description of the purpose, nature, and scope of the requested use.

All code fragments, scripts, data tables, and sample code in this SNIA document are made available under the following license:

BSD 3-Clause Software License

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

- Neither the name of The Storage Networking Industry Association (SNIA) nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.
THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

DISCLAIMER

The information contained in this publication is subject to change without notice. The SNIA makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The SNIA shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use.

Suggestions for revisions should be directed to http://www.snia.org/feedback/.

Current Revision

SNIA is actively engaged in expanding and refining the Swordfish documentation. The most current revision can be found on the SNIA web site at https://www.snia.org/tech_activities/standards/curr_standards/swordfish.

Contact SNIA

Current SNIA practice is to make updates and other information available through their web site at http://www.snia.org.

FEEDBACK AND INTERPRETATIONS

Requests for interpretation, suggestions for improvement and addenda, or defect reports are welcome. They should be sent via the SNIA Feedback Portal at
INTENDED AUDIENCE

This document is intended for use by individuals and companies engaged in storage management.

VERSIONING POLICY

This document is versioned material. Versioned material shall have a three-level revision identifier, comprised of a version number ‘v’, a release number ‘r’ and an errata number ‘e’. Future publications of this document are subject to specific constraints on the scope of change that is permissible from one revision to the next and the degree of interoperability and backward compatibility that should be assumed between products designed to this standard. This versioning policy applies to all SNIA Swordfish versioned materials.

Version Number: Versioned material having version number ‘v’ shall be backwards compatible with all of revisions of that material that have the same version number ‘v’. There is no assurance of interoperability or backward compatibility between revisions of a versioned material with different version numbers.

Release Number: Versioned material with a version number ‘v’ and release number ‘r’ shall be backwards compatible with previous revisions of the material with the same version number, and a lower release number. A minor revision represents a technical change to existing content or an adjustment to the scope of the versioned material. Each minor revision causes the release number to be increased by one.

Errata Number: Versioned material having version number ‘v’, a release number ‘r’, and an errata number ‘e’ should be backwards compatible with previous revisions of the material with the same version number and release number (“errata versions”). An errata revision of versioned material is limited to minor corrections or clarifications of existing versioned material. An errata revision may be backwards incompatible, if the incompatibility is necessary for correct operation of implementations of the versioned material.

Revision History

Revisions to this document are summarized in Table 1.
Table 1: Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Rev</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 August 2020</td>
<td>1.2.1</td>
<td>Initial Release</td>
</tr>
<tr>
<td>31 October 2020</td>
<td>1.2.1c</td>
<td>Released as SNIA Approved Publication</td>
</tr>
<tr>
<td>2 March 2021</td>
<td>1.2.2</td>
<td>Added detailed mapping information to match information in NVMe drive profiles for many new referenced properties, and included guidance for mandatory/recommended implementation as reflected in the profiles. Added sections for firmware update, with details for NVMe Drive implementation requirements. Added cross-references to User’s Guide NVMe-specific use cases. Errata fixes – correct diagram, correct table headers.</td>
</tr>
<tr>
<td>30 August 2021</td>
<td>1.2.3</td>
<td>Update Mapping Guide with new mapping guidance, corresponding to the Swordfish NVMe Front End profile.</td>
</tr>
</tbody>
</table>

About SNIA

The Storage Networking Industry Association (SNIA) is a non-profit organization made up of member companies spanning information technology. A globally recognized and trusted authority, SNIA’s mission is to lead the storage industry in developing and promoting vendor-neutral architectures, standards and educational services that facilitate the efficient management, movement and security of information.
Acknowledgements

The SNIA Scalable Storage Management Technical Work Group, which developed and reviewed this work in progress, would like to recognize the significant contributions made by the members listed in 2.

Table 2: Contributors

<table>
<thead>
<tr>
<th>Member</th>
<th>Representatives (* – prior employer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcom Inc.</td>
<td>Richelle Ahlvers*</td>
</tr>
<tr>
<td>Cisco Systems, Inc.</td>
<td>Krishnakumar Gowravaram</td>
</tr>
<tr>
<td>Dell Inc.</td>
<td>David Black</td>
</tr>
<tr>
<td></td>
<td>Jim Pendergraft</td>
</tr>
<tr>
<td></td>
<td>Michael Raineri</td>
</tr>
<tr>
<td>Hewlett Packard Enterprise</td>
<td>Curtis Ballard</td>
</tr>
<tr>
<td></td>
<td>Jeff Hilland</td>
</tr>
<tr>
<td></td>
<td>Chris Lionetti</td>
</tr>
<tr>
<td>Intel Corporation</td>
<td>Richelle Ahlvers</td>
</tr>
<tr>
<td></td>
<td>Rajalaxmi Angadi</td>
</tr>
<tr>
<td></td>
<td>Phil Cayton</td>
</tr>
<tr>
<td></td>
<td>Slawek Putyrski</td>
</tr>
<tr>
<td>Kioxia</td>
<td>Mark Carlson</td>
</tr>
<tr>
<td>Lenovo</td>
<td>Keith Campbell</td>
</tr>
<tr>
<td>NetApp, Inc.</td>
<td>Don Deel</td>
</tr>
<tr>
<td></td>
<td>Fred Knight</td>
</tr>
<tr>
<td>Samsung Corporation</td>
<td>Lu Fan</td>
</tr>
<tr>
<td></td>
<td>Bill Martin</td>
</tr>
<tr>
<td></td>
<td>Tom Rainey</td>
</tr>
<tr>
<td>VMware, Inc.</td>
<td>Murali Rajagopal</td>
</tr>
</tbody>
</table>
1 Abstract

The Swordfish NVMe Model Overview and Mapping Guide defines the model to manage NVMe and NVMe-oF storage systems with Redfish and Swordfish. It provides the detailed mapping information between the NVMe, NVMe-oF specifications and the Redfish and Swordfish specifications.
2 Scope

2.1 Document Goals

This document describes how both the NVMe Subsystem model and the NVMe-oF fabric system model should be mapped consistently to Redfish and Swordfish constructs for implementations to be managed within Redfish and Swordfish management environments.

This model and mapping information does not describe or assert any specific implementation recommendation technologies.

This document also provides the mapping information for properties recommended to be implemented in Redfish/Swordfish for NVMe and NVMe-oF devices and the corresponding reference information from the NVMe and NVMe-oF specifications.

2.2 Audience Assumptions

This document assumes that the reader of this document is familiar with NVMe and NVMe-oF technologies and concepts. It also assumes the reader has knowledge of the Redfish and Swordfish concepts.
3 Normative References

3.1 Overview

The documents listed in Table 3 are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

3.2 Approved references

Table 3: Approved normative references

<table>
<thead>
<tr>
<th>Tag</th>
<th>Title (Version)</th>
<th>Author</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redfish</td>
<td>Redfish Scalable Platforms Management API Specification (v1.11.0)</td>
<td>DMTF</td>
<td><a href="http://www.dmtf.org/sites/default/files/standards/documents/DSP0266_1.4.0.pdf">http://www.dmtf.org/sites/default/files/standards/documents/DSP0266_1.4.0.pdf</a></td>
</tr>
<tr>
<td>Swordfish</td>
<td>Swordfish Scalable Storage Management API Specification (v1.2.1)</td>
<td>SNIA</td>
<td><a href="https://www.snia.org/tech_activities/standards/curr_standards/swordfish">https://www.snia.org/tech_activities/standards/curr_standards/swordfish</a></td>
</tr>
</tbody>
</table>
3.3 References under development

None defined in this document.

3.4 Other references

None defined in this document.
4 NVMe Model Overview

4.1 Introduction

In order to manage NVMe and NVMe-oF devices and systems in a large scale environment, a higher level management ecosystem is needed. The Redfish/Swordfish management specifications are designed to manage multi-system environments, including multiple types of fabrics, covering not only multiple technologies, but also inclusive of system management, storage management and fabric management, making it the ideal ecosystem in which to add not only the integration of NVMe devices for system and storage management, but NVMe-oF for fabric management.

This document describes how both the NVMe Subsystem model and the NVMe-oF fabric system model should be mapped consistently to Redfish and Swordfish constructs for implementations to be managed within Redfish and Swordfish management environments. This model and mapping information does not describe or assert any specific implementation recommendation technologies.

Similar implementations will have similar Redfish and Swordfish constructs. Mockups are used to show static examples of sample representations. Requirements and recommendations for implementations are provided separately through the Swordfish NVMe and NVMe-oF profiles. The profiles use the Redfish interoperability profile schema to specify the required, recommended and optional properties and schema for specific configurations and functionality that correspond to classes of implementations.

4.1.1 Fundamental Model Design Assertions

- There shall be a unified model across all types of NVMe devices.
- There shall not be a different model for “drives” vs other types of NVMe devices
- The model will cover an appropriate level of abstraction for all types of NVMe devices based on modeling and mockups reflected in the documented permutations (e.g., from simple drives through to complex fabric virtual systems)
  - Simple NVMe drives; complex NVMe drives; JBOFs/EBOFs; Arrays/RBOFs
- The logical model for NVMe-oF shall leverage the NVMe Subsystem model
- Logical subsystems, controllers, and namespaces are the same objects with the same relationships as in the NVMe Subsystem Model. Unneeded objects are not instantiated (e.g., Endurance Groups, sets)
• The NVMe native model should map to the existing Redfish and Swordfish constructs when and where possible
  – Mapping future NVMe / NVMe-oF functionality should follow this principle when and where possible (e.g., firmware update mapping to the RF update service)

4.2 Overall NVMe Subsystem Model

Key Tenets:
• Model reflects a unified view of all NVMe device types.
• Devices will instantiate an appropriate subset of the model
• The model diagrams do not reflect all available schema elements.
• Model leverages and coarsely maps to existing (Redfish and) Swordfish storage model

4.2.1 Major NVM Objects Mapped to RF/SF

4.2.1.1 NVM Subsystem  An NVM subsystem includes one or more controllers, zero or more namespaces, and one or more ports. Examples of NVM subsystems include Enterprise and Client systems that utilize PCI Express based solid state drives and/or fabric connectivity.

4.2.1.2 NVM Controller (IO, Admin and Discovery)  The interface between a host and an NVM subsystem

Admin controller: controller that exposes capabilities that allow a host to manage an NVM subsystem

Discovery: controller that exposes capabilities that allow a host to retrieve a Discovery Log Page

I/O: controller that implements I/O queues and is intended to be used to access a non-volatile memory storage medium

4.2.1.3 Namespace  A quantity of non-volatile memory that may be formatted into logical blocks. When formatted, a namespace of size n is a collection of logical blocks with logical block addresses from 0 to (n-1).
4.2.1.4 Endurance Group  A portion of NVM in the NVM subsystem whose endurance is managed as a group

4.2.1.5 NVM Set  An NVM Set is a collection of NVM that is separate (logically and potentially physically) from NVM in other NVM Sets.

4.2.1.6 NVM Domain  A domain is the smallest indivisible unit that shares state (e.g., power state, capacity information). Domain members can be NVM controllers, endurance groups, sets or namespaces.

4.2.2 Unmapped objects

There are a number of objects that are required for the proper integration of NVMe support within Redfish and Swordfish, but which are not supported by an entity that can be mapped directly from the various NVM Specifications. Information about these related but un-mapped objects are defined elsewhere in the documentation provided with each Swordfish release.

They are summarized in Appendix A.

4.2.3 NVM Subsystem Model

The following diagram reflects the high level mapping of the key NVM objects into Redfish / Swordfish schema objects. These largely follow existing relationships used by the Swordfish storage specification for non-NVMe implementations as well, which provides a great deal of consistency for storage clients, as well as for implementations such as NVMe arrays that may be delivering solutions that combine NVMe and other technologies.

This model covers a wide range of instantiations ranging from individual SSDs, to multi-rack storage systems. All of these can be represented by this NVM Subsystem model, shown in Figure 1.
**Figure 1:** Subsystem model

### 4.2.4 NVMe-oF Subsystem Model

Figure 2 shows the high level mapping of the key NVMe-oF objects to Redfish / Swordfish schema objects. Following the tenets described in the model overview section, these extend the mapping used in the NVM Subsystem for the logical versions of the objects.

This model also includes the use of the Redfish Fabric model to cover the connectivity aspects of the fabric.

The grey shaded portion of this diagram reflects the logical / exported portion of the NVMe-oF environment represented in Redfish / Swordfish.
Figure 2: NVMe-oF Subsystem Model
5 Example Instances

5.1 Introduction

This section of the document provides a series of example usages of the model that represent common instantiations of NVMe devices, and how those devices may use the various NVMe, and correspondingly, Redfish and Swordfish objects and schema. This section will not provide comprehensive representations of all potential device types; rather, a representation of several common device types, in order to provide an illustration of the application of the model for those that are unfamiliar with either the NVMe or Redfish / Swordfish ecosystems.

Further, the following sections describe the examples and do not attempt to cover all potential permutations for alternate representations of each device class or possible implementations.

5.2 Simple SSD

5.2.1 Overview

Figure 3 shows a sample representation of a simple NVMe SSD, with a PCIe interface. It is implemented with no endurance group or NVM set functionality; it has only a single namespace capability, and a single IO controller.

![Simple SSD instance diagram](image)

Figure 3: Simple SSD instance diagram
5.2.2 Explanation of Object use

Simple SSDs are SSDs that do not use Endurance Groups or sets. Correspondingly, they only use Storage, Controllers, Volumes (Namespaces), and the Drive schema to represent the fundamental components.

Many SSD implementations support exactly one namespace. These are described by this model, and the mockups reflect this configuration.

This model can also support extensions to cover dual-ported configurations, as well as support for multiple IO controllers per port.

5.2.3 Redfish / Swordfish Object Representation

Figure 4 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.

![Figure 4: Simple SSD mockup example](Image)

5.2.4 Mockup

A corresponding mockup for this configuration can be found at [http://swordfishmockups.com/simple-ssd-mockups](http://swordfishmockups.com/simple-ssd-mockups).
5.3 Complex SSD

5.3.1 Overview

Figure 5 shows a sample representation of a complex NVMe SSD, with a PCIe interface. This example shares many similarities to the simple device model, but adds the representation of NVMe Endurance Groups and NVM Sets using the Swordfish StoragePool schema, with additional NVMe specific properties.

![Complex SSD Model](image)

**Figure 5:** Complex SSD Model

5.3.2 Explanation of Object use

Complex SSDs are SSDs that use Endurance Groups and NVM sets. They also use Storage, Controllers, Volumes (Namespaces), and the Drive schema to represent the fundamental components.

This model can also support extensions to cover dual-ported configurations, as well as support for multiple IO controllers per port.

Endurance Groups divide the media into distinct wear-leveling domains. How this happens is implementation specific.

NVM Sets further subdivide an endurance group in order to limit performance interference within and across these domains.

When this type of device supports dynamic namespace allocation and NVM Sets, the management of the namespaces is done within an NVM Set as the underlying capacity source (e.g., the storage pool).
5.3.3 Redfish / Swordfish Object Representation

Figure 6 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.

![Figure 6: Complex SSD Model](image)

5.3.3.1 Mockup A corresponding mockup for this configuration can be found at http://swordfishmockups.com/simple-ssd-eg-set-mockups.

5.4 Simple SSD with IP (NVMe-oF) Attach

5.4.1 Overview

This example reflects an IP-attached drive configuration, with a single ethernet port configured, as illustrated in Figure 7. It includes a drive configured with a default endurance group and NVM Set, and is instantiated in the Storage Collection off the Service Root. The network configuration is modeled in the Chassis.
5.4.2 Explanation of Object use

Simple SSDs with IP attach are also SSDs that do not use Endurance Groups or sets, but that have IP-based network interfaces. Correspondingly, they only use Storage, Controllers, Volumes (Namespaces), and the Drive schema to represent the fundamental components. In addition, they use the Redfish Network Adapter, Port and Network Device Function to model the configuration of the IP interface port(s).

As with the Simple SSD configuration, Many SSD with IP-attach implementations support exactly one namespace. These are described by this model, and the mockups reflect this configuration.

This model can also support extensions to cover multi-ported configurations, as well as support for multiple IO controllers per port.

5.4.3 Redfish / Swordfish Object Representation

Figure 8 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.
5.4.4 Mockup

A corresponding mockup for this configuration can be found at http://swordfishmockups.com/ethernet-attach-drive-mockups.

5.5 JBOF

5.5.1 Overview

This example covers a representation of a JBOF ("just a bunch of flash") enclosure and contained drives. This mockup reflects a PCIe front-end attach configuration with a set of drives.

Figure 9 shows only the controller object representation for this JBOF configuration. This includes the admin controller function for enclosure management.
5.5.2 Explanation of Object use

This type of JBOF system uses the Chassis, Storage and Controller objects to reflect physical component modeling, Subsystem and Admin Controller functionality.

The Chassis model and Admin controller represent NVM's SES (SCSI enclosure services)
usage.

5.5.3 Redfish / Swordfish Object Representation

Figure 11 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.

![Figure 11: JBOF system instance](image)

5.5.4 Mockup

A corresponding mockup for this configuration can be found at http://swordfishmockups.com/nvme-jbof-mockups
5.6 Opaque Array / NVMe Front End Device

5.6.1 Overview

The “opaque” array reflects a system with an NVMe front end, but the internal implementation is vendor specific, and not necessarily presented by the vendor (aka “opaque”). Figure 12 shows a system that presents an NVMe front-end but also exposes a SATA drive backend. This could be done to support both FRU management and volume/namespace creation.

Requirements for the NVMe portion of this type of configuration is documented in the SwordfishNVMeFrontEnd profile; opaque arrays should implement both traditional Swordfish block profiles, in addition to the SwordfishNVMeFrontEnd profile.

![Figure 12: Opaque array example](image)

5.6.2 Explanation of Object use

The opaque array example presents NVMe specific information in Redfish/Swordfish objects, using the Storage, Controller, and Volume objects.

In addition, device management information is presented through StoragePool and Drive objects, providing internal, non-NVMe implementation specific information to the user, for configuration, diagnosis and other storage management functions. (This set of objects is subject to the standard Swordfish specification and profiles.)
5.6.3 Redfish / Swordfish Object Representation

Figure 13 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.

Figure 13: Sample opaque system instance

5.6.4 Mockup

A corresponding mockup for this configuration can be found at http://swordfishmockups.com/nvme-opaque-array-mockups.

5.7 Subsystem (Fabric) Model - NVMe-oF: Fabric Attach Subsystem

5.7.1 Overview

Figure 14 shows a logical/exported NVMe-oF subsystem presenting one logical subsystem, one I/O controller, one namespace, one port and representing one allowed host, using the Redfish Fabric model. The fabric model uses the Connection schema to characterize the allowed host information, and Endpoints and Zones to show the network connectivity from the device's perspective.

This example also includes NVMeDomains. NVMeDomains contain a collection of domain members; these can be NVM controllers, endurance groups, NVM sets, or namespaces.
5.7.2 Explanation of Object use

The fabric attach subsystem example shows the representation of logical, or exported, subsystems, controllers, and namespaces using the Storage, Controller and Volume objects respectively.

It also uses portions of the Redfish fabric model to represent the host attachment information - allowed hosts and logical port - using the Connections and Endpoints objects respectively.

5.7.3 Redfish / Swordfish Object Representation

Figure 15 shows the representation, as expressed in the mockup indicated below, of a sample instantiation using Redfish / Swordfish objects.

Note that this mockup does not represent a complete service instantiation; it contains only objects of interest for this context.
5.7.4 Mockup

A corresponding mockup for this configuration can be found at http://swordfishmockups.com/nvmeof-mockups.

5.8 NVMe Domains

5.8.1 Overview

This example describes NVMeDomains. NVMeDomains contain a collection of domain members; these can be NVM controllers, endurance groups, NVM sets, namespaces, and ports, as illustrated in Figure 16.

Domains are used to subdivide an NVM Subsystem. For example, if there are multiple power sources, the domain is used to represent the scope of each power source.
5.8.2 Explanation of Object use

The domain object contains two primary elements: the domain members collection, which contains pointers to the relevant controllers, groups, sets, namespaces, and ports that reflect the appropriate subdivision for the purpose of the domain.

The other primary element includes a set of capacity information properties about this set of domain members.

5.8.3 Mockup

A corresponding mockup for this configuration can be found at http://swordfishmockups.com/nvmeof-mockups.
6 Property Mapping

6.1 Introduction

The property mapping provided defines the preferred translation between the Redfish/Swordfish schema objects and properties, and the corresponding NVMe and NVMe-oF specification properties. The information is ordered within the Redfish/Swordfish objects; each cross-referenced property within the Redfish/Swordfish structure therefore contains a detailed reference to its mapped property in the NVMe ecosystem.

Each section also includes a sample Redfish/Swordfish mockup presenting an example usage for that object.

6.2 Property Mapping Template

Table 4 provides the template and an example for the property mapping provided in the following sections of this document.

For each property (whether a reference, collection, complex type or actual property), there is a comparison between the property in Redfish/Swordfish to the corresponding property in either the NVMe or NVMe-oF specification. The RF/SF property is provided within its schema context; the NVMe/NVMe-oF specification reference is provided within the table, showing both which specification, as well as the section and, if appropriate, the figure in which the property is specified.

Similarly, the type of each property is correspondingly specified. The RF/SF type is specified, and the NVM Spec property type is shown, as well as, where appropriate, any additional identifying information, such as byte offset and data structure.

The Mandatory field is used to specify whether properties are Mandatory or Optional on the NVMe specification side, and in the rare instance where properties are Mandatory in the Redfish/Swordfish schema. (Recommended / required properties for specific implementation types in Redfish/Swordfish will be done separately, through the use of profiles.)

The Notes field can / will be used to include any relevant information about either the purpose of the property, additional context, or other useful information to implementers, such as inter-relationships with other properties.
### Table 4: Property Mapping Template and Example

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish / Swordfish Schema Property: RecommendedArbitrationBurstSize</th>
<th>NVM Spec Property / Field: RecommendedArbitrationBurst(RAB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Redfish / Swordfish Schema Type: String</td>
<td>NVM Spec Property Type: Power of 2: $2^n$</td>
</tr>
<tr>
<td>Description</td>
<td>The Recommended Arbitration Burst Size indicates the maximum number of commands that the controller may launch at one time from a particular Submission Queue.</td>
<td>This is the recommended Arbitration Burst size. The value is in commands and is reported as a power of two ($2^n$). This is the same units as the Arbitration Burst size.</td>
</tr>
</tbody>
</table>

**Type**

- **Redfish / Swordfish Schema Type:** String

**Description**

- **Recommended Arbitration Burst Size:**

  This is the recommended Arbitration Burst size. The value is in commands and is reported as a power of two ($2^n$). This is the same units as the Arbitration Burst size.

**NVM Spec**

- **Section:** Figure NVMe 1.4a: Section 5.15.2.2, Figure 249
<table>
<thead>
<tr>
<th>LongDescription</th>
<th>This property shall contain the Recommended Arbitration Burst Size indicates the maximum number of commands that the controller may launch at one time from a particular Submission Queue. The value is expressed as a power of two (e.g., 000b indicates one, 011b indicates eight). A value of 111b indicates no limit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Notes</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>
6.3 NVM subsystem

The Redfish/Swordfish Storage schema is used to represent an NVM Subsystem.

6.3.1 Mockup

The following mockup shows a sample representation of the Storage schema used to represent an NVM Subsystem.

```json
{
   "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",
   "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem",
   "@odata.type": "#Storage.v1_9_0.Storage",
   "Id": "1",
   "Name": "NVMe-oF Logical NVM Fabric System",
   "Description": "Mockup of NVMe-oF Logical NVM Fabric System with 1 Logical Subsystem, 1 Logical I/O Controller and 1 Logical port and 1 allowed host.",
   "Status": {
      "State": "Enabled",
      "Health": "OK",
      "HealthRollup": "OK"
   },
   "Identifiers": [{
      "DurableNameFormat": "NQN",
      "DurableName": "nqn.2014-08.org.nvmexpress:uuid:6c5fe566-10e6-4fb6-aad4-8b4159f50245"
   }],
   "Controllers": {
      "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Controllers"
   },
   "Volumes": {
      "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Volumes/LogicalNamespace1"
   }
}
```
6.3.2 Property Mapping

6.3.2.1 Actions.#StorageController.SetEncryptionKey  The mapping for Actions.#StorageController.SetEncryptionKey is summarized in Table 5.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Action (Special form of POST)</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The available OEM-specific actions for this resource.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the available OEM-specific actions for this resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement (for NVMe Drives, or for devices with an NVMe front end interface, e.g., opaque arrays).</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>N/A for NVMe (drives or for devices with an NVMe front end interface). Drives will generate their own key for CryptoErase, this requires passing a new key.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.2.2 Controllers

The mapping for Controls is summarized in Table 6.

#### Table 6: Controllers mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Controllers</td>
<td>Controllers</td>
</tr>
<tr>
<td>Description</td>
<td>The set of controllers instantiated by this storage subsystem.</td>
<td>A list of controller identifiers in the NVM subsystem that may or may not be attached to namespace(s).</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to a Resource of type StorageControllerCollection that contains the set of storage controllers allocated to this instance of an storage subsystem.</td>
<td>A Controller List (refer to NVMe Bese Specification section 4.11) of up to 2,047 controller identifiers is returned containing a controller identifier greater than or equal to the value specified in the Controller Identifier (CDW10.CNTID) field. The list contains controller identifiers in the NVM subsystem that may or may not be attached to namespace(s).</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes. Implement (for NVMe Drives, or for devices with an NVMe front end interface, e.g., opaque arrays).</td>
<td>No (see note)</td>
</tr>
</tbody>
</table>
Notes
This is a collection of StorageControllers. Refer to the StorageController schema for details of the instance information. These are used to provide information on NVM IO, Admin and Discovery controllers. This property is only mandatory for controllers that support the Namespace Management capability - reference NVMe Base Specification section 5.15.2.9 Controller list (CNS 13h).

6.3.2.3 Description The mapping for Description is summarized in Table 7.

Table 7: Description mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td><strong>Return the common description:</strong> “An NVM Express Subsystem is an NVMe device that contains one or more NVM Express controllers and may contain one or more namespaces.”</td>
</tr>
<tr>
<td><strong>In Redfish,</strong></td>
<td><strong>Description is a read-only field.</strong></td>
</tr>
<tr>
<td><strong>Description is a read-only field.</strong></td>
<td></td>
</tr>
</tbody>
</table>
6.3.2.4 Drives  The mapping for \textit{Drives} is summarized in Table 8.

\textbf{Table 8: Drives mapping}

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collect ion(Drive.Drive)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The set of drives attached to the storage controllers that this resource represents.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a set of the drives attached to the storage controllers that this resource represents.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required (for NVMe Drives). Optional to implement for devices with an NVMe front end interface, e.g., opaque arrays.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  50
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>For NVMe Drive implementation, this links to “Drive” object, which contains the physical representation of NVMe Drive information.</td>
</tr>
</tbody>
</table>
### 6.3.2.5 Identifiers

The mapping for Identifiers is summarized in Table 9.

**Table 9: Identifiers mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Identifiers</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>An array of identifiers</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>An array of identifiers</td>
</tr>
<tr>
<td></td>
<td>This property shall contain a list of all known durable names for the associated subsystem.</td>
<td>This specifies the NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string. Refer to NVMe Base Specification, section 7.9, for the definition of NVMe Qualified Name. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2).</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>This is an array of unique identifiers for the NVM Subsystem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.</td>
<td></td>
</tr>
</tbody>
</table>
6.3.2.6 Identifiers.DurableNameFormat  The mapping for Identifiers.DurableNameFormat is summarized in Table 10.

Table 10: Identifiers.DurableNameFormat mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DurableNameFormat</td>
<td>Identifiers.D</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td></td>
<td>DurableNameFormat</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Resource.v1_1_0.D</td>
<td>There is a single value for this array in Subsystem.</td>
</tr>
<tr>
<td></td>
<td>DurableNameFormat</td>
<td>The property type is of type NVM Qualified Name (NQN).</td>
</tr>
<tr>
<td>Description</td>
<td>The format of the</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td></td>
<td>Durable names for</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the subsystem.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This specifies the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>format of the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>associated NVM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subsystem NVMe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qualified Name</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of type NQN.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Support for this</td>
<td></td>
</tr>
<tr>
<td></td>
<td>field is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mandatory if the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>controller</td>
<td></td>
</tr>
<tr>
<td></td>
<td>supports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>revision 1.2.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or later as</td>
<td></td>
</tr>
<tr>
<td></td>
<td>indicated in the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Version register</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(refer to section</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.1.2).</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This is an enum with multiple potential values. For this particular usage in Subsystem, there will only be one instance populated, of type NQN.</td>
<td>There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.</td>
<td></td>
</tr>
</tbody>
</table>
6.3.2.7 **Identifiers.DurableName**  The mapping for Identifiers.DurableName is summarized in Table 11.

**Table 11: Identifiers.DurableName mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Identifiers.DurableName</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>The NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string</td>
</tr>
<tr>
<td>Description</td>
<td>The format of the Durable names for the subsystem.</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This specifies the NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string. Refer to NVMe Base Specification, section 7.9, for the definition of NVMe Qualified Name. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2).</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>For this particular usage in Subsystem, there will only be one instance populated in the identifiers array.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.2.8 Links.Enclosures

The mapping for Links.Enclosures is summarized in Table 12.

**Table 12: Links.Enclosures mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collection(Chassis.Chassis)</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to the chassis to which this storage subsystem is attached.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an array of links to resources of type Chassis that represent the physical containers attached to this resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 58
Notes

For NVMe Drive implementation, this links to a chassis collection that contains the subsystem's “Drive” object, which contains the physical representation of NVMe Drive information. For devices with an NVMe front end interface, e.g., opaque arrays), this refers to the appropriate chassis instance for the device/system; there may be multiple chassis instances, reflecting different physical entities in the system, such as controllers, drive enclosures, racks, etc).
**6.3.2.9 Links.Enclosures@odata.count**  The mapping for Links.Enclosures@odata.count is summarized in Table 13.

**Table 13: Links.Enclosures@odata.count mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><a href="mailto:Links.Enclosures@odata.count">Links.Enclosures@odata.count</a></td>
<td>(odata property)int64</td>
</tr>
<tr>
<td>Description</td>
<td>Count of the number of items in the Links.Enclosures array.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3.2.10 Links.HostingStorageSystems  The mapping for Links.HostingStorageSystems is summarized in Table 14.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links.HostingStorageSystems</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The storage systems that host this storage subsystem.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an array of links to resources of type ComputerSystem that represent the storage systems that host this storage subsystem. The members of this array shall be in the StorageSystems resource collection off the service root.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended for devices with an NVMe front end interface such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For devices with an NVMe front end interface, e.g., opaque arrays, this refers to the ComputerSystem instances providing the NVMe front end, modeling the device’s controller(s).</td>
<td></td>
</tr>
</tbody>
</table>
6.3.2.11 **Links.SimpleStorage**  The mapping for `Links.SimpleStorage` is summarized in Table 15.

**Table 15:** Links.SimpleStorage mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>SimpleStorage</td>
<td>NVM Spec Property / Field: NVM Spec: Section:Figure</td>
</tr>
<tr>
<td>Description</td>
<td>The link to the simple storage instance that corresponds to this storage.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to a resource of type SimpleStorage that represents the same storage subsystem as this resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.3.2.12 **Name**  The mapping for `Name` is summarized in Table 16.

**Table 16:** Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>String</td>
</tr>
<tr>
<td>Field</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td>Uniquely describes the NVM subsystem.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td>The NVM Subsystem NVMe Qualified Name is a UTF-8 null-terminated string used (e.g., by host software) as the unique identifier for the NVM subsystem.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes (see note)</td>
</tr>
</tbody>
</table>
In Redfish, Name is a read-only field. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2). Reported in the NVM Subsystem NVMe Qualified Name field of the Identify Controller data structure, bytes 1023:768 (refer to figure 249 in section 5.15.2.1 of the NVMe Base Specification). If the NVM Subsystem NVMe Qualified Name field of the Identify Controller data structure is not supported, then all bytes of this field shall be cleared to 0h. Refer to NVMe Base Specification section 7.9 for the definition of NVMe Qualified Name. Refer to NVMe Base Specification section 7.11 for details on the Unique Identifier, including compatibility with older versions of NVMe Controllers that do not support NVM Subsystem NQNs.
### 6.3.2.13 Status.State

The mapping for `Status.State` is summarized in Table 17.

**Table 17: Status.State mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.State</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Resource.State (enum)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
<td>N/A</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Optional for NVMe drives; recommended to implement for NVMe front end devices such as opaque arrays.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  67
Redfish/Swordfish  |  NVMe / NVMe-oF
---|---
Notes |  Possible values:
  |  Enabled / Disabled / StandbyOffline / StandbySpare / InTest / Starting / Absent / UnavailableOffline / Deferring / Quiesced / Updating / Qualified

In general, there is no simple corresponding property or mappable set of information at this time from the NVMe Specifications. Current guidance for NVMe drives: do not implement this property. Guidance will be added in a future version of this document as this is an important concept for clients and for consistency with traditional storage devices. For opaque arrays and other similar devices with an NVMe front end, support and map these properties to the device’s concepts of Enabled/Disabled/etc.
### 6.3.2.14 Status.Health

The mapping for Status.Health is summarized in Table 18.

**Table 18: Status.Health mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Resource.Health</td>
<td>Boolean</td>
</tr>
<tr>
<td>Description</td>
<td>The health state of this resource in the absence of its dependent resources.</td>
<td>Indicates the NVM subsystem has detected a condition that causes at least one of bits 0 to 4 in the Critical Warning field of the SMART / Health Information log (refer to NVMe Base Specification section 5.14.1.2) to be set to one.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td>Bits in this field represent the associated state at the time of this event. The Additional Hardware Error Information field shall be set at the time of the event using the same format as is specified for the Critical Warning field of the SMART / Health Information.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Returned as a Critical Warning Condition (code 06h) in the NVM Subsystem Hardware Error Event data (bytes 01:00) of an NVM Subsystem Hardware Error Event (Event Type 05h) in the Persistent Event Log. Reference NVMe Base Specification 5.14.1.13.1.5 NVM Subsystem Hardware Error Event (Event Type 05h), Figure 221 and Figure 222. Implementations of more complex systems, such as opaque arrays and other similar devices with an NVMe front end, may also map this property to the device’s concepts of OK/Warning/Critical.</td>
<td></td>
</tr>
</tbody>
</table>

| Possible Values: OK / Warning / Critical | 

As of 30 August 2021  
**Working Draft**
6.3.2.15 **Status.HealthRollup**  The mapping for `Status.HealthRollup` is summarized in Table 19.

**Table 19: Status.HealthRollup mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Status.HealthRollup</td>
<td>Critical Warning</td>
</tr>
<tr>
<td>Description</td>
<td>Resource.Health</td>
<td>Boolean</td>
</tr>
<tr>
<td></td>
<td>The overall health state from the view of this resource.</td>
<td>Indicates the NVM subsystem reliability has been degraded due to significant media related errors or any internal error that degrades NVM subsystem reliability.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the health state of the resource and its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td>Indicates if the NVM subsystem reliability has been degraded due to significant media related errors or any internal error that degrades NVM subsystem reliability. Critical warnings regarding the health of the NVM subsystem may be indicated via an asynchronous event notification to the host. The warnings that results in an asynchronous event notification to the host are configured using the Set Features command; refer to section 5.21.1.11.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td><strong>Possible Values: OK / Warning / Critical</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Returned in byte 00, bit 1 of the Get Log Page – SMART / Health Information Log. Reference the NVMe Base Specification section 5.14.1.2 - SMART / Health Information (Log Identifier 02h), Figure 196. Implementations of more complex systems, such as opaque arrays and other similar devices with an NVMe front end, may also map this property to the device’s concepts of OK/Warning/Critical.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.2.16 StorageControllers

The mapping for StorageControllers is summarized in Table 20.

**Table 20: StorageControllers mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>StorageControllers</td>
<td>Storage.StorageControllers</td>
<td>NVM Spec Property / Field: NVM Spec: Section:Figure</td>
</tr>
<tr>
<td>Type</td>
<td>Storage.StorageControllers</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The set of storage controllers that this resource represents.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a set of the storage controllers that this resource represents.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Deprecated for NVMe use - replaced by Controllers (type StorageController).</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.2.17 StorageGroups

The mapping for `StorageGroups` is summarized in Table 21.

**Table 21: StorageGroups mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>StorageGroups</td>
<td>NVM Spec Property / Field: NVM Spec: Section:Figure</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>All of the storage groups, each of which contains a set of volumes and endpoints that are managed as a group for mapping and masking, that belong to this storage subsystem.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain a link to a resource collection of type StorageGroupsCollection. This property shall be used when implementing mapping and masking.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do not implement</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>N/A for NVMe use cases. Deprecated by Connections.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.2.18 Volumes

The mapping for volumes is summarized in Table 22.

**Table 22: Volumes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>VolumeCollection.</td>
<td>Allocated Namespace ID list</td>
</tr>
<tr>
<td></td>
<td>VolumeCollection</td>
<td>List of namespace IDs</td>
</tr>
<tr>
<td>Description</td>
<td>The set of volumes instantiated by this storage subsystem.</td>
<td>A list of Allocated Namespaces for this Subsystem</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to a Resource of type VolumeCollection that contains the set of storage volumes allocated to this instance of a storage subsystem.</td>
<td>A list of namespace IDs is returned to the host containing allocated NSIDs in increasing order.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe drives, as well as opaque arrays and other similar devices with an NVMe front end.</td>
<td>No</td>
</tr>
<tr>
<td>Notes</td>
<td>This is a collection of Namespaces that belong to this NVM Subsystem. Refer to the Volume schema for details of the instance information.</td>
<td>Reference NVMe Base Specification section 5.15.2.6 Allocated Namespace ID list (CNS 10h).</td>
</tr>
</tbody>
</table>
6.4 NVM Controllers

The Redfish/Swordfish StorageControllers schema is used to represent an NVM Controller.

There are three different types of NVM Controllers: Admin, Discovery, and IO.

6.4.1 Admin Controller

6.4.1.1 Mockup  The following mockup shows a sample representation of the StorageController schema used to represent an Admin Controller.

```json
{
    "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",
    "@odata.id": "/redfish/v1/Storage/OpaqueArray/Controllers/NVMeAdminController",
    "@odata.type": "#StorageController.v1_0_0.StorageController",
    "Name": "NVMe Admin Controller",
    "Description": "Single NVMe Admin Controller for in-band admin command access.",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Id": "NVMeAdminController",
    "Manufacturer": "Best NVMe Vendor",
    "Model": "NVMe Connect Array",
    "SerialNumber": "NVME123456",
    "PartNumber": "NVM44",
    "FirmwareVersion": "1.0.0",
    "SupportedControllerProtocols": [
        "PCIe"
    ],
    "NVMeControllerProperties": {
        "ControllerType": "Admin",
        "NVMeVersion": "1.3",
        "NVMeControllerAttributes": {
            "SupportsSQAssociations": false,
            "SupportsTrafficBasedKeepAlive": false,
            "SupportsExceedingPowerOfNonOperationalState": false,
            "Supports128BitHostId": false
        }
    }
}
```
6.4.1.2 Property Mapping

6.4.1.2.1 Assembly  The mapping for Assembly is summarized in Table 23.

Table 23: Assembly mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly</td>
<td>NVM Spec Property / Field: N/A NVM Spec: Section:Figure N/A</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The Assembly schema defines an assembly. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
<td>N/A</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This Resource shall represent an assembly for a Redfish implementation. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement for NVMe drives, or devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.2 AssetTag  The mapping for AssetTag is summarized in Table 24.

Table 24: Assembly mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>AssetTag</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>NVM Spec Property / Field:</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>NVM Spec: Section:Figure</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The user-assigned asset tag for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall track the storage controller for inventory purposes.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVMe Drives, or devices with NVMe front ends, such as opaque arrays.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes
### 6.4.1.2.3 CacheSummary

The mapping for CacheSummary is summarized in Table 25.

**Table 25: CacheSummary mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The cache memory</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>of the storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>controller in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>general</td>
<td></td>
</tr>
<tr>
<td></td>
<td>detail.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>shall contain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>properties</td>
<td></td>
</tr>
<tr>
<td></td>
<td>that describe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the cache memory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for this resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.4 ControllerRates  The mapping for ControllerRates is summarized in Table 26.

Table 26: ControllerRates mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ControllerRates</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>This property describes the various controller rates used for processes such as volume rebuild or consistency checks.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object shall contain all the rate settings available on the controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The mapping for `Description` is summarized in Table 27.

### Table 27: Description mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Optional</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>Return the common description: “An NVM Admin Controller exposes capabilities that allow a host to manage an NVM subsystem. Admin controllers support commands providing management capabilities but does not provide IO access.”</td>
<td></td>
</tr>
</tbody>
</table>

In Redfish, `Description` is a read-only field.
### 6.4.1.2.6 FirmwareVersion

The mapping for `FirmwareVersion` is summarized in Table 28.

#### Table 28: FirmwareVersion mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FirmwareVersion</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Type**: String
- **Description**: The firmware version of this storage controller.
- **LongDescription**: This property shall contain the firmware version as defined by the manufacturer for the associated storage controller.
- **Mandatory**: Required.
- **Notes**: Return the currently active firmware revision information.

---

**NVM Spec Property**

**Field**: IdentifyController:

Firmware Revision (FR) **NVM Spec**:

**Section**:Figure 249: 71:64
6.4.1.2.7 Identifiers  The mapping for Identifiers is summarized in Table 29.

Table 29: Identifiers mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Identifiers</td>
<td>Controller Identifier list</td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a list of all known durable names for the associated storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommend not implementing. No</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft
### 6.4.1.2.8 Identifiers.DurableName

The mapping for `Identifiers.DurableName` is summarized in Table 30.

**Table 30: Identifiers.DurableName mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><code>Identifiers.DurableName</code></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td>Durable Controller Identifier</td>
</tr>
<tr>
<td>LongDescription</td>
<td>T</td>
<td>No</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommend not implementing.</td>
<td>No</td>
</tr>
<tr>
<td>Notes</td>
<td>Recommend not implementing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There isn’t a good mapping for these in the NVMe spec to a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>property that has an appropriate /</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mapping to a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>durable name format.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.1.2.9 Identifiers.DurableNameFormat

The mapping for `Identifiers.DurableNameFormat` is summarized in Table 31.

**Table 31: Identifiers.DurableNameFormat mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Identifiers.DurableNameFormat</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>enum (DurableNameFormat)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a list of the types for all known durable names for the associated storage controller. The type determines the length of the corresponding Namespace ID</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommend not implementing.</td>
<td>No</td>
</tr>
<tr>
<td>Notes</td>
<td>Recommend not implementing.</td>
<td>There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.</td>
</tr>
</tbody>
</table>
The mapping for `Links.AttachedVolumes` is summarized in Table 32.

### Table 32: Links.AttachedVolumes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Links</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>.AttachedVolumes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Collection</td>
<td>N/A</td>
</tr>
<tr>
<td>Volume.Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to volumes that are attached to this controller instance.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the Resources of type Volume that are attached to this instance of storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement (for admin controllers).</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.11 Links.NetworkDeviceFunctions  The mapping for Links.NetworkDeviceFunctions is summarized in Table 33.

Table 33: Links.NetworkDeviceFunctions mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Links.NetworkDeviceFunctions</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Collect</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The network device functions that provide connectivity to this controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an array of links to resources of type NetworkDeviceFunction that represent the devices that provide connectivity to this controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended to implement for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For NVMe-oF configurations.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.12 Location  The mapping for Location is summarized in Table 34.

Table 34: Location mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Location</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Collection(Resourse.Location)</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The location of the storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVM Drives or more complex devices with an NVMe front end, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

As of 30 August 2021  Working Draft  90
6.4.1.2.13 Manufacturer  The mapping for Manufacturer is summarized in Table 35.

**Table 35: Manufacturer mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The manufacturer of this storage controller. This organization might be the entity from whom the storage controller is purchased, but this is not necessarily true.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>End clients expect to see the name of the company (e.g.; Contoso, BestVendor). While the value may be filled from the IdentifyController PCI Vendor ID or SubsystemID field, it would be preferable to have this filled with the actual string value of the company name.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.1.2.14 Model

The mapping for Model is summarized in Table 36.

**Table 36: Model mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td><strong>NVM Spec Property</strong> / <strong>Field</strong>: IdentifyController / Model Number (MN) <strong>NVM Spec</strong>: Section: <strong>Figure</strong> 249 byte 24:63</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The model number for the storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the name by which the manufacturer generally refers to the storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.4.1.2.15 Name

The mapping for Name is summarized in Table 37.
### Table 37: Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>NVM Spec Property / Field: Controller ID (CNTLID) <strong>NVM Spec:</strong> Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
<td>NVMe Spec Property Type: 16-bit hex value <strong>Additional NVM Spec Identifying Information:</strong> ByteOffset: 79:78, IdentifyController data structure</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Redfish, Name is a read-only field.</td>
<td>Map the CNTLID field to a string with the format: “0xABCD”</td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.16 NVMeControllerProperties.ControllerType  The mapping for NVMe-ControllerProperties.ControllerType is summarized in Table 38.

Table 38: NVMeControllerProperties.ControllerType mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>StorageController.v1_0_0.NVMeControllerType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>This property specifies the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>This property must be used to specify the type of NVMe Controller. For an admin controller, set to Admin.</td>
<td>Return “Admin”</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft
6.4.1.2.17 NVMeControllerProperties.NVMeVersion  The mapping for NVMeControllerProperties.NVMeVersion is summarized in Table 39.

**Table 39: NVMeControllerProperties.NVMeVersion mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeVersion</td>
<td>NVM Spec Property / Field: Version (VER) NVM Spec: Section:Figure</td>
<td>NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Spec Property Type: Maps from register 3.1.2.</td>
</tr>
<tr>
<td>Description</td>
<td>The version of the NVMe Base Specification supported.</td>
<td>Additional NVM Spec Identifying Information: ByteOffset: 83:90</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Implementations compliant to revision 1.2 or later of this specification shall report a non-zero value in this field. Map from corresponding value in register 3.1.2 to string as “1.0”, “1.1”, “1.2”, “1.2.1”, “1.3.0”, “1.4.0”, etc.</td>
</tr>
</tbody>
</table>
6.4.1.2.18 NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity

The mapping for NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity is summarized in Table 40.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports reporting of Namespace Granularity.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports reporting of Namespace Granularity.</td>
<td></td>
</tr>
</tbody>
</table>

NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 7 (Namespace Granularity) NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249

NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 7 of Byte 99:96
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory</td>
<td>Recommended for NVM Drives and more complex devices with NVMe front ends, such as opaque arrays.</td>
</tr>
</tbody>
</table>
### 6.4.1.2.19 NVMeControllerProperties.NVMeControllerAttributes.SupportsSQAssociations

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsSQAssociations` is summarized in Table 41.

**Table 41:**
NVMeControllerProperties.NVMeControllerAttributes. SupportsSQAssociations mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish Property NVMeControllerProperties.NVMeControllerAttributes.SupportsSQAssociations</th>
<th>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 8 (SQ Associations)</th>
<th>NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</th>
<th>Type</th>
<th>Boolean</th>
<th>NVM Spec Property Type: Single bit (bool)</th>
<th>Additional NVM Spec Identifying Information: Bit 8 of Byte 99:96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports SQ Associations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports SQ Associations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.20 NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive

The mapping for NVMeControllerProperties.NVMeControllerAttributes.TrafficBasedKeepAlive is summarized in Table 42.

Table 42:
NVMeControllerProperties.NVMeControllerAttributes. SupportsTrafficBasedKeepAlive mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 6 (Traffic Based Keep Alive Support – TBKAS)</td>
<td>NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
</tbody>
</table>

Type: Boolean

NVM Spec Property Type: Single bit (bool)

Additional NVM Spec Identifying Information: Bit 6 of Byte 99:96

Description: Indicates whether or not the controller supports restarting KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive Timeout interval.
<table>
<thead>
<tr>
<th><strong>Redfish/Swordfish</strong></th>
<th><strong>NVMe / NVMe-oF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports restarting KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive Timeout interval.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required for Ethernet-Attach Drives; required for more complex devices with NVMe front ends, such as opaque arrays.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.21 **NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState**

The mapping for NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState is summarized in Table 43.

**Table 43: NVMeControllerProperties.NVMeControllerAttributes. SupportsExceedingPowerOfNonOperationalState mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 1 (Non-Operational Power State Permissive Mode) NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 1 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.1.2.22 NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId` is summarized in Table 44.

**Table 44:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td><code>NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId</code></td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 0 <strong>NVM Spec:</strong> Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 0 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports a 128-bit Host Identifier.</td>
<td><strong>LongDescription</strong> This property shall indicate whether or not the controller supports a 128-bit Host Identifier.</td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td><strong>Notes</strong></td>
</tr>
</tbody>
</table>

As of 30 August 2021 *Working Draft* 104
### 6.4.1.2.23 NVMeControllerProperties.MaxQueueSize

The mapping for NVMeControllerProperties.MaxQueueSize is summarized in Table 45.

**Table 45: NVMeControllerProperties.ANACharacteristics mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>NVMeControllerProperties.MaxQueueSize</td>
<td>NVM Spec Property / Field: Maximum Queues Entries Supported (MQES) NVM Spec: Section: Figure NVMe 1.4a; Section 3.1.1 Controller Capabilities; Figure 69</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Int64</td>
<td>NVM Spec Property Type: Additional NVM Spec Identifying Information: ByteOffset: Bits 15:00</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates the maximum individual queue size that an NVMe IO Controller supports.</td>
<td></td>
</tr>
</tbody>
</table>
LongDescription: This property shall contain the maximum individual queue entry size supported per queue. This is a zero-based value, where the minimum value is one, indicating two entries. For PCIe, this applies to both submission and completion queues. For NVMe-oF, this applies to only submission queues.

Mandatory: Implement for more complex devices with NVMe front ends, such as opaque arrays.

Notes:
The mapping for `NVMeControllerProperties.ANACharacteristics` is summarized in Table 46.

### Table 46: NVMeControllerProperties.ANACharacteristics mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><code>NVMeControllerProperties.ANACHaracteristics</code></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the combination of ANA type and volume information.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the combination of ANA type and volume information.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.1.2.25 NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSystemDegraded

The mapping for `NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSystemDegraded` is summarized in Table 47.

**Table 47:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSystemDegraded</td>
<td></td>
<td>NVM Spec Property / Field: Critical Warning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVM Spec: Section: Figure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Boolean</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM Spec Property Type:</td>
<td>Single bit (bool)</td>
</tr>
<tr>
<td>Additional</td>
<td></td>
</tr>
<tr>
<td>NVM Spec Identifying Information:</td>
<td>Bit 2 of Byte 00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Indicates that the NVM subsystem reliability has been compromised.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the NVM subsystem reliability has been compromised.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
</tbody>
</table>

### 6.4.1.2.26 NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed

The mapping for `NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed` is summarized in Table 48.

---

As of 30 August 2021  
**Working Draft**  
108
### Table 48:

NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NVMe ControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed</td>
<td>NVM Spec Property / Field: Critical Warning NVM Spec: Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 4 of Byte 00</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended for NVM Drives. Required for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  109
6.4.1.2.27 SKU  The mapping for SKU is summarized in Table 49.

Table 49: SKU mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKU</td>
<td>Edm.String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The SKU for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the stock-keeping unit number for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.1.2.28 **SpeedGbps**  The mapping for SpeedGbps is summarized in Table 50.

**Table 50:** SpeedGbps mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Decimal</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The maximum speed of the storage controller’s device interface.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the maximum supported speed of the storage bus interface, in Gbit/s. The specified interface connects the controller to the storage devices, not the controller to a host. For example, SAS bus not PCIe host bus.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
</tbody>
</table>

Notes

As of 30 August 2021  **Working Draft**  111
### 6.4.1.2.29 Status.Health

The mapping for `Status.Health` is summarized in Table 51.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.Health</td>
<td>NVM Spec Property / Field: CSTS – Controller Status NVM Spec: Section:Figure NVMe 1.4a: Section 3.1.6, Figure 79 NVM Spec Property / Field: Critical Warning NVM Spec: Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Resource.Health</td>
<td>NVM Spec Property Type:</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The health state of this resource in the absence of its dependent resources.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td></td>
</tr>
</tbody>
</table>

**Mandatory**

As of 30 August 2021 **Working Draft**
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>Possible Values: OK / Warning / Critical</td>
<td>This comes from CSTS Controller Failure Status, and from the SMART / health information log critical warning field.</td>
</tr>
</tbody>
</table>
6.4.1.2.30 **Status.State**  The mapping for Status.State is summarized in Table 52.

**Table 52: Status.State mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.State</td>
<td>NVM Spec Property / Field: CSTS – Controller Status NVM Spec: Section:Figure NVMe 1.4a: Section 3.1.6, Figure 79</td>
<td></td>
</tr>
<tr>
<td>Resource.State (enum)</td>
<td>NVM Spec Property Type:</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish LongDescription</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

Mandatory
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>Possible values:</td>
<td>Ready (CSTS.RDY) maps to Enabled, Shutdown</td>
</tr>
<tr>
<td>Enabled / Disabled/</td>
<td>(CSTS.SHST) value will tell you if shutdown is in</td>
</tr>
<tr>
<td>StandbyOffline /</td>
<td>progress or complete</td>
</tr>
<tr>
<td>StandbySpare /</td>
<td>(StandbyOffline),</td>
</tr>
<tr>
<td>InTest / Starting /</td>
<td>ProcessingPaused</td>
</tr>
<tr>
<td>ABsent / Una</td>
<td>(CSTS.PP) maps to</td>
</tr>
<tr>
<td>vaialableOffline /</td>
<td>Deferring. If both Ready and</td>
</tr>
<tr>
<td>Deferring / Quiesced</td>
<td>Shutdown are indicated,</td>
</tr>
<tr>
<td>/ Updating /</td>
<td>then the system should</td>
</tr>
<tr>
<td>Qualified</td>
<td>indicate StandbyOffline. If</td>
</tr>
<tr>
<td></td>
<td>both Ready and</td>
</tr>
<tr>
<td></td>
<td>ProcessingPaused are</td>
</tr>
<tr>
<td></td>
<td>indicated, then the system</td>
</tr>
<tr>
<td></td>
<td>should indicate Deferring.</td>
</tr>
</tbody>
</table>
### 6.4.1.2.31 SupportedControllerProtocols

The mapping for `SupportedControllerProtocols` is summarized in Table 53.

**Table 53: SupportedControllerProtocols mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>SupportedControllerProtocols</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>This is an array of protocols supported by the StorageController. This can be set to values including, but not limited to, PCIe, RDMA, NVMe-oF, RoCE, RoCEv2, and InfiniBand.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.1.2.32 SupportedDeviceProtocols

The mapping for `SupportedDeviceProtocols` is summarized in Table 54.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>SupportedDeviceProtocols</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The protocols that the storage controller can use to communicate with attached devices.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the set of protocols this storage controller can use to communicate with attached devices.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.2 Discovery Controller

6.4.2.1 Mockup  The following mockup shows a sample representation of the StorageController schema used to represent a Discovery Controller.

```json
{
  "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",
  "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Controllers/NVMeIOController",
  "@odata.type": "#StorageController.v1_0_0.StorageController",
  "Id": "9",
  "Name": "NVMe Logical Discovery Controller",
  "Description": "Single NVMe Discovery Controller presented to host.",
  "Status": {
    "State": "Enabled",
    "Health": "OK"
  },
  "Id": "NVMeDiscoveryController",

  "SupportedControllerProtocols": ["TCP", "RDMA", "FC"],
  "SupportedDeviceProtocols": ["NVMeOverFabrics"],

  "NVMeControllerProperties": {
    "ControllerType": "Discovery",
    "NVMeVersion": "1.3",
    "NVMeControllerAttributes": {
      "SupportsTrafficBasedKeepAlive": false,
      "SupportsExceedingPowerOfNonOperationalState": false,
      "Supports128BitHostId": false
    }
  }
}
```
## 6.4.2.2 Property Mapping

### 6.4.2.2.1 Assembly

The mapping for **Assembly** is summarized in Table 55.

**Table 55: Assembly mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The Assembly schema defines an assembly. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NVM Spec Property / Field: N/A  
NVM Spec: Section:Figure N/A

As of 30 August 2021  
Working Draft
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LongDescription</td>
<td>This Resource shall represent an assembly for a Redfish implementation. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVMe drives, or devices with NVMe front ends, such as opaque arrays.</td>
</tr>
</tbody>
</table>

Notes
### 6.4.2.2.2 AssetTag

The mapping for AssetTag is summarized in Table 56.

**Table 56: Assembly mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The user-assigned asset tag for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall track the storage controller for inventory purposes.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVMe Drives, or devices with NVMe front ends, such as opaque arrays.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes

As of 30 August 2021

Working Draft
6.4.2.2.3 *CacheSummary*  The mapping for *CacheSummary* is summarized in Table 57.

**Table 57: CacheSummary mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The cache memory</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>of the storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>controller in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>general detail.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>shall contain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>properties</td>
<td></td>
</tr>
<tr>
<td></td>
<td>that describe the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cache memory for</td>
<td></td>
</tr>
<tr>
<td></td>
<td>this resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.2.2.4 ControllerRates

The mapping for `ControllerRates` is summarized in Table 58.

**Table 58: ControllerRates mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>This property describes the various controller rates used for processes such as volume rebuild or consistency checks.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object shall contain all the rate settings available on the controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  124
6.4.2.2.5 Description  The mapping for Description is summarized in Table 59.

**Table 59: Description mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Optional</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>In Redfish, Description is a read-only field.</td>
<td>Return the common description: “An NVM Discovery Controller exposes capabilities that allow a host to retrieve information required to connect to one or more NVM Subsystems. Discovery controllers only support commands providing discovery capabilities; they do not provide IO or management access.”</td>
</tr>
</tbody>
</table>

6.4.2.6 FirmwareVersion  The mapping for FirmwareVersion is summarized in Table 60.
### Table 60: FirmwareVersion mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>FirmwareVersion</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The firmware version of this storage controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the firmware version as defined by the manufacturer for the associated storage controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Return the currently active firmware revision information.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 6.4.2.2.7 Identifiers

The mapping for Identifiers is summarized in Table 61.

### Table 61: Identifiers mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Identifiers</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collection(Resouce.Identifier)</td>
<td></td>
<td>A variable length Controller Identifier structures</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  126
Redfish/Swordfish NVMe / NVMe-oF

Description
The Durable names for the storage controller.

LongDescription
This property shall contain a list of all known durable names for the associated storage controller.

Mandatory
Recommend not implementing. There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.

Notes

6.4.2.2.8 Identifiers.DurableName
The mapping for Identifiers.DurableName is summarized in Table 62.

Table 62: Identifiers.DurableName mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Variable - see notes</td>
<td>Variable - see notes</td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td>Durable Controller Identifier</td>
</tr>
</tbody>
</table>
There isn't a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.

### 6.4.2.2.9 `Identifiers.DurableNameFormat`

The mapping for `Identifiers.DurableNameFormat` is summarized in Table 63.

**Table 63: `Identifiers.DurableNameFormat` mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifiers.DurableNameFormat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>enum (DurableNameFormat)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td></td>
</tr>
</tbody>
</table>
Redfish/Swordfish NVMe / NVMe-oF

LongDescription
This property shall contain a list of the types for all known durable names for the associated storage controller. The type determines the length of the corresponding Namespace ID.

Mandatory
Recommend not implementing. No

Notes
Recommend not implementing. There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.

6.4.2.2.10 Links.AttachedVolumes
The mapping for Links.AttachedVolumes is summarized in Table 64.

Table 64: Links.AttachedVolumes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Links.AttachedVolumes</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Collection</td>
<td>N/A</td>
</tr>
<tr>
<td>Volume.Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>An array of links to volumes that are attached to this controller instance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the Resources of type Volume that are attached to this instance of storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement.</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.11 Links.Endpoints  The mapping for Links.Endpoints is summarized in Table 65.

Table 65: Links.Endpoints mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links.Endpoints</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to the endpoints that connect to this controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an array of links to the Resources of type Endpoint associated with this controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The mapping for **Links.Connections** is summarized in Table 66.

**Table 66: Links.Connections mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collection(Connec</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>tion.Connection)</td>
<td></td>
</tr>
<tr>
<td>An array of links to volumes that are attached to this controller instance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the Resources of type Volume that are attached to this instance of storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>This contains the information used to represent the allowed hosts.</td>
<td>This property contains pointers to the Connections objects. The information about allowed hosts is mapped to the Connections objects for NVMe-oF configurations.</td>
</tr>
</tbody>
</table>

The mapping for **Links.NetworkDeviceFunctions** is summarized in Table 67.
### Table 67: Links.NetworkDeviceFunctions mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collect</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The network device functions that provide connectivity to this controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an array of links to resources of type NetworkDeviceFunction that represent the devices that provide connectivity to this controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended to implement for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For NVMe-oF configurations.</td>
<td></td>
</tr>
</tbody>
</table>

#### 6.4.2.2.14 Location

The mapping for Location is summarized in Table 68.
**Table 68: Location mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Collection(Re source.Location)</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The location of the storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain location information of the associated storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement for NVM Drives, or more complex devices with NVMe front ends, such as opaque arrays.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Notes**

6.4.2.2.15 **Manufacturer** The mapping for Manufacturer is summarized in Table 69.

**Table 69: Manufacturer mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Manufacturer</td>
<td>String</td>
</tr>
<tr>
<td>Description</td>
<td>The manufacturer of this storage controller.</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the name of the organization responsible for producing the storage controller. This organization might be the entity from whom the storage controller is purchased, but this is not necessarily true.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>End clients expect to see the name of the company (e.g., Contoso, BestVendor). While the value may be filled from the IdentifyController PCI Vendor ID or SubsystemID field, it would be preferable to have this filled with the actual string value of the company name.</td>
<td></td>
</tr>
</tbody>
</table>

**6.4.2.2.16 Model** The mapping for Model is summarized in Table 70.
### Table 70: Model mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td></td>
<td><strong>NVM Spec Property</strong> / <strong>Field</strong>: IdentifyController / Model Number (MN) <strong>NVM Spec: Section: Figure</strong> 249 byte 24:63</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The model number for the storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the name by which the manufacturer generally refers to the storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Optional</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021
6.4.2.17 Name  The mapping for Name is summarized in Table 71.

Table 71: Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Name</td>
<td>NVM Spec Property / Field: Controller ID (CNTLID) NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Spec Property Type: 16-bit hex value Additional NVM Spec Identifying Information: ByteOffset: 79:78, IdentifyController data structure</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Notes</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>In Redfish, Name is a read-only field.</td>
<td>Map the CNTLID field to a string with the format: “0xABCD”</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.2.2.18 NVMeControllerProperties.ControllerType

The mapping for `NVMeControllerProperties.ControllerType` is summarized in Table 72.

#### Table 72: NVMeControllerProperties.ControllerType mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><code>NVMeControllerProperties.ControllerType</code></td>
<td><strong>NVM Spec Property Type:</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>This property specifies the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required property when Discovery controller is implemented.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>This property must be used to specify the type of NVMe Controller. For a discovery controller, set to Discovery.</td>
<td>Return “Discovery”</td>
</tr>
</tbody>
</table>
6.4.2.2.19 NVMeControllerProperties.NVMeVersion  The mapping for NVMeControllerProperties.NVMeVersion is summarized in Table 73.

Table 73: NVMeControllerProperties.NVMeVersion mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeVersion</td>
<td>NVM Spec Property / Field: Version (VER) NVM Spec: Section:Figure</td>
</tr>
<tr>
<td></td>
<td>NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Spec Property Type: Maps from register 3.1.2.</td>
</tr>
<tr>
<td>Additional NVM Spec Identifying Information:</td>
<td>ByteOffset: 83:90</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The version of the NVMe Base Specification supported.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Mandatory</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Implementations compliant to revision 1.2 or later of this specification shall report a non-zero value in this field. Map from corresponding value in register 3.1.2 to string as “1.0”, “1.1”, “1.2”, “1.2.1”, “1.3.0”, “1.4.0”, etc.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.20  NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive

The mapping for NVMeControllerProperties.NVMeControllerAttributes.TrafficBasedKeepAlive is summarized in Table 74.

Table 74:
NVMeControllerProperties.NVMeControllerAttributes. SupportsTrafficBasedKeepAlive mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive</td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 6 (Traffic Based Keep Alive Support – TBKAS) <strong>NVM Spec:</strong> Section:Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 6 of Byte 99:96</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports restarting KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive Timeout interval.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports restarting</td>
<td>KeepAlive Timer if traffic is</td>
</tr>
<tr>
<td></td>
<td>KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive</td>
<td>processed from an admin command or IO during KeepAlive Timeout interval.</td>
</tr>
<tr>
<td></td>
<td>Mandatory</td>
<td>Timeout interval.</td>
</tr>
<tr>
<td></td>
<td>Required for Ethernet-Attach Drives; required for more complex devices with NVMe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>front ends, such as opaque arrays.</td>
<td></td>
</tr>
</tbody>
</table>

Notes
The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState` is summarized in Table 75.

**Table 75: NVMeControllerProperties.NVMeControllerAttributes. SupportsExceedingPowerOfNonOperationalState mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
<tr>
<td><em>NVM Spec Property</em> / <em>Field:</em> Controller Attributes (CTRATT): Bit 1 (Non-Operational Power State Permissive Mode)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>NVM Spec: Section:</em> Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>NVM Spec Property Type:</em> Single bit (bool) <em>Additional NVM Spec Identifying Information:</em> Bit 1 of Byte 99:96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.22 NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId

The mapping for NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId is summarized in Table 76.

Table 76:
NVMeControllerProperties.NVMeControllerAttributes. Supports128BitHostId mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 0 NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 0 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports a 128-bit Host Identifier.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports a 128-bit Host Identifier.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.2.23 NVMeControllerProperties.MaxQueueSize  The mapping for NVMeControllerProperties.MaxQueueSize is summarized in Table 77.

Table 77: NVMeControllerProperties.ANACharacteristics mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.MaxQueueSize</td>
<td></td>
<td>NVM Spec Property / Field: Maximum Queues Entries Supported (MQES)</td>
</tr>
<tr>
<td>NVM Spec: Section:Figure</td>
<td></td>
<td>NVMe 1.4a; Section 3.1.1 Controller Capabilities; Figure 69</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>NVM Spec Property Type: Additional NVM Spec Identifying Information: ByteOffset: Bits 15:00</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the maximum individual queue size that an NVMe IO Controller supports.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the maximum individual queue entry size supported per queue. This is a zero-based value, where the minimum value is one, indicating two entries. For PCIe, this applies to both submission and completion queues. For NVMe-oF, this applies to only submission queues.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Implement for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.24 NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSubsystemDegraded

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSubsystemDegraded is summarized in Table 78.

**Table 78:**
NVMeControllerProperties.NVMeSMARTCriticalWarnings. OverallSubsystemDegraded mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSubsystemDegraded</td>
<td>NVM Spec Property / Field: Critical Warning NVMe Spec: Section: Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 2 of Byte 00</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the NVM subsystem reliability has been compromised.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the NVM subsystem reliability has been compromised.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.2.2.25 NVMeControllerProperties.NVMeSMARTCriticalWarnings.SpareCapacityWornOut

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.SpareCapacityWornOut is summarized in Table 79.

**Table 79:** NVMeControllerProperties.NVMeSMARTCriticalWarnings. SpareCapacityWornOut mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVM Con troll erPropertie s.NVMeSMARTCritic alWarnings.SpareCapacityWornOut</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the available spare capacity has fallen below the threshold.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the available spare capacity has fallen below the threshold.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
</tr>
</tbody>
</table>

**NVM Spec Property / Field:** Critical Warning
**NVM Spec: Section:** Figure 196
**NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196**
6.4.2.2.26 NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed is summarized in Table 80.

Table 80:

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed</td>
<td></td>
<td>NVM Spec Property / Field: Critical Warning NVM Spec: Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended for NVM Drives. Required for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.27 Status.Health  The mapping for Status.Health is summarized in Table 81.

Table 81: Status.Health mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.Health</td>
<td></td>
<td>NVM Spec Property / Field: CSTS – Controller Status NVM Spec: Section:Figure NVMe 1.4a: Section 3.1.6, Figure 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVM Spec Property / Field: Critical Warning NVM Spec: Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
</tbody>
</table>

**Type**: Resource.Health

**Description**: The health state of this resource in the absence of its dependent resources.

**LongDescription**: This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.  

Mandatory
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>Possible Values: OK / Warning / Critical</td>
</tr>
</tbody>
</table>
### 6.4.2.28 Status.State

The mapping for `Status.State` is summarized in Table 82.

**Table 82:** Status.State mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.State</td>
<td>NVM Spec Property / Field: CSTS – Controller Status</td>
<td>NVM Spec Property Type:</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.State (enum)</td>
<td>NVM Spec Property Type:</td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021

**Working Draft** 154
<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Ready (CSTS.RDY) maps to Enabled, Shutdown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(CSTS.SHST) value will tell you if shutdown is in progress or complete</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(StandbyOffline), ProcessingPaused</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(CSTS.PP) maps to Deferring. If both Ready and Shutdown are indicated, then the system should indicate StandbyOffline. If both Ready and ProcessingPaused are indicated, then the system should indicate Deferring.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft
6.4.2.2.29 SupportedControllerProtocols  The mapping for SupportedControllerProtocols is summarized in Table 83.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SupportedControllerProtocols</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Protocol.Protocol)</td>
<td><strong>NVM Spec Property Type:</strong> N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This is an array of protocols supported by the StorageController. This can be set to values including, but not limited to, PCIe, RDMA, NVMe-oF, RoCE, RoCEv2, and InfiniBand.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.2.2.30 SupportedDeviceProtocols  The mapping for SupportedDeviceProtocols is summarized in Table 84.

Table 84: SupportedDeviceProtocols mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SupportedDeviceProtocols</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Protocol.Protocol)</td>
<td>NVM Spec Property Type: N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The protocols that the storage controller can use to communicate with attached devices.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the set of protocols this storage controller can use to communicate with attached devices.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3 IO Controller

6.4.3.1 Mockup  The following mockup shows a sample representation of the StorageController schema used to represent an IO Controller.

```json
{
   "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",
   "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Controllers/NVMeIOController",
   "@odata.type": "#StorageController.v1_0_0.StorageController",
   "Id": "9",
   "Name": "NVMe Logical I/O Controller",
   "Description": "Single NVMe I/O Controller presented to host.",
   "Status": {
      "State": "Enabled",
      "Health": "OK"
   },
   "Id": "NVMeIOController",

   "SupportedControllerProtocols": ["TCP", "RDMA", "FC"],

   "SupportedDeviceProtocols": ["NVMeOverFabrics"

   ],

   "NVMeControllerProperties": {
      "NVMeVersion": "1.3",
      "NVMeControllerAttributes": {
         "ReportsUUIDList": false,
         "SupportsSQAssociations": false,
         "ReportsNamespaceGranularity": false,
         "SupportsTrafficBasedKeepAlive": false,
         "SupportsPredictableLatencyMode": false,
         "SupportsEnduranceGroups": false,
         "SupportsReadRecoveryLevels": false,
         "SupportsNVMSets": false,
         "SupportsExceedingPowerOfNonOperationalState": false,
         "Supports128BitHostId": false
      },

      "ANACharacteristics": [{
         "AccessState": "Optimized",
         "Volume": {
```
"@odata.id": "redfish/v1/Systems/Sys-1/Storage/NVMeSSD-EG/Volumes/Namespace1"
}
]

"Links": {
  "AttachedVolumes": [{
  "@odata.id": "redfish/v1/Systems/Sys-1/Storage/NVMeSSD-EG/Volumes/Namespace1"
  }
  ],
  "Endpoints": [{
  "@odata.id": "redfish/v1/Fabrics/NVMe-oF/Endpoints/NVMeEndpoint"
  },
  {
  "@odata.id": "redfish/v1/Fabrics/NVMe-oF/Endpoints/Host"
  }
  ],
  "Connections": [{
  "@odata.id": "redfish/v1/Fabrics/NVMe-oF/Connections/Host1"
  }
  ]
}
6.4.3.2 Property Mapping

6.4.3.2.1 Assembly  The mapping for Assembly is summarized in Table 85.

Table 85: Assembly mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVM / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly</td>
<td>N/A</td>
<td>NVM Spec Property / Field: N/A NVM Spec: Section:Figure N/A</td>
</tr>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The Assembly schema defines an assembly. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
<td>N/A</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This Resource shall represent an assembly for a Redfish implementation. Assembly information contains details about a device, such as part number, serial number, manufacturer, and production date. It also provides access to the original data for the assembly.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVMe drives, or devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.2 AssetTag
The mapping for AssetTag is summarized in Table 86.

**Table 86: Assembly mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>AssetTag</td>
<td>N/A</td>
<td><strong>NVM Spec Property</strong> / <strong>Field</strong>: N/A <strong>NVM Spec</strong>: <strong>Section</strong>:Figure N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The user-assigned asset tag for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall track the storage controller for inventory purposes.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement for NVMe Drives, or devices with NVMe front ends, such as opaque arrays.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes

As of 30 August 2021  Working Draft  163
6.4.3.2.3 CacheSummary  The mapping for CacheSummary is summarized in Table 87.

Table 87: CacheSummary mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>CacheSummary</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The cache memory</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>of the storage</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>controller in</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>general detail.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>shall contain</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>properties</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>that describe</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>the cache memory</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>for this</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>resource.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes: Do Not Implement
### 6.4.3.2.4 ControllerRates

The mapping for `ControllerRates` is summarized in Table 88.

**Table 88: ControllerRates mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ComplexType</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>This property describes the various controller rates used for processes such as volume rebuild or consistency checks.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object shall contain all the rate settings available on the controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.5 Description The mapping for Description is summarized in Table 89.

Table 89: Description mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>In Redfish, Description is a read-only field.</td>
<td>Return the common description: “An NVM IO controller is a general-purpose controller that provides access to logical block data and metadata stored on an NVM subsystem’s non-volatile storage medium. IO Controllers may also support management capabilities.”</td>
</tr>
</tbody>
</table>

6.4.3.2.6 FirmwareVersion The mapping for FirmwareVersion is summarized in Table 90.
**Table 90:** FirmwareVersion mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirmwareVersion</td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> IdentifyController: Firmware Revision (FR) <strong>NVM Spec: Section:Figure</strong> 249: 71:64</td>
</tr>
</tbody>
</table>

**Type:** String  
**Description:** The firmware version of this storage controller.  
**LongDescription:** This property shall contain the firmware version as defined by the manufacturer for the associated storage controller.  
**Mandatory:** Required.  
**Notes:** Return the currently active firmware revision information.

**6.4.3.2.7 Identifiers**  
The mapping for Identifiers is summarized in Table 91.

**Table 91:** Identifiers mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifiers</td>
<td></td>
<td>Controller Identifier list</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Resour ce.Identifier)</td>
<td>A variable length Controller Identifier structures</td>
</tr>
</tbody>
</table>
**Description**
The Durable names for the storage controller.

**LongDescription**
This property shall contain a list of all known durable names for the associated storage controller.

**Mandatory**
Recommend not implementing. There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.

**Notes**

---

**6.4.3.2.8 Identifiers.DurableName**
The mapping for Identifiers.DurableName is summarized in Table 92.

**Table 92: Identifiers.DurableName mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Identifiers.DurableName</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td>Durable Controller Identifier</td>
</tr>
</tbody>
</table>

As of 30 August 2021

**Working Draft**

168
There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.

6.4.3.2.9 Identifiers.DurableNameFormat  The mapping for Identifiers.DurableNameFormat is summarized in Table 93.

Table 93: Identifiers.DurableNameFormat mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>enum (DurableNameFormat)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td></td>
</tr>
<tr>
<td><strong>Redfish/Swordfish</strong></td>
<td><strong>NVMe / NVMe-oF</strong></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain a list of the types for all known durable names for the associated storage controller. The type determines the length of the corresponding Namespace ID.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Recommend not implementing.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Recommend not implementing. There isn’t a good mapping for these in the NVMe spec to a property that has an appropriate / mapping to a durable name format.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.10 Links.AttachedVolumes  The mapping for Links.AttachedVolumes is summarized in Table 94.

Table 94: Links.AttachedVolumes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>.AttachedVolumes</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Collection</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>(Volume.Volume)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to volumes that are attached to this controller instance.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the Resources of type Volume that are attached to this instance of storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td>This contains a pointer to the set of namespaces attached to this IO Controller.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.11 Links.Endpoints

The mapping for `Links.Endpoints` is summarized in Table 95.

**Table 95: Links.Endpoints mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links.Endpoints</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Collection(Endpoint.Endpoint)</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>An array of links to the endpoints that connect to this controller.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This property shall contain an array of links to the Resources of type Endpoint associated with this controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For NVMe-oF configurations.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.12 Links.Connections

The mapping for Links.Connections is summarized in Table 6.4.3.2.12.

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Links.Connections</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Connection.Connection)</td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to volumes that are attached to this controller instance.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the Resources of type Volume that are attached to this instance of storage controller.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>N/A for NVMe Drives.</td>
</tr>
<tr>
<td>Notes</td>
<td>This contains the information used to represented the allowed hosts.</td>
</tr>
<tr>
<td>Notes</td>
<td>This property contains pointers to the Connections objects. The information about allowed hosts is mapped to the Connections objects for NVMe-oF configurations.</td>
</tr>
</tbody>
</table>

Table: Links.Connections mapping

### 6.4.3.2.13 Links.NetworkDeviceFunctions

The mapping for Links.NetworkDeviceFunctions is summarized in Table 97.

#### Table 96: Links.NetworkDeviceFunctions mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Links.NetworkDeviceFunctions</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(NetworkDeviceFunction.NetworkDeviceFunction)</td>
</tr>
<tr>
<td>Description</td>
<td>The network device functions that provide connectivity to this controller.</td>
</tr>
</tbody>
</table>
### LongDescription
This property shall contain an array of links to resources of type NetworkDeviceFunction that represent the devices that provide connectivity to this controller.

**Mandatory**
Recommended to implement for more complex devices with NVMe front ends, such as opaque arrays.

**Notes**
For NVMe-oF configurations.

---

#### 6.4.3.2.14 Location
The mapping for Location is summarized in Table 97.

**Table 97: Location mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>The location of the storage controller.</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Resource.Location)</td>
</tr>
</tbody>
</table>

**Redfish/Swordfish**: N/A
**NVMe / NVMe-oF**:
- **NVM Spec Property**
- **Field**: N/A
- **NVM Spec**: N/A
- **Section**: Figure N/A

As of 30 August 2021 **Working Draft** 174
Redfish/Swordfish NVMe / NVMe-oF

LongDescription
This property shall contain location information of the associated storage controller.

Mandatory
Do Not Implement for NVM Drives, or more complex devices with NVMe front ends, such as opaque arrays.

Notes

6.4.3.2.15 Manufacturer
The mapping for Manufacturer is summarized in Table 98.

Table 98: Manufacturer mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Description</td>
<td>The manufacturer of this storage controller.</td>
</tr>
</tbody>
</table>
**LongDescription**

This property shall contain the name of the organization responsible for producing the storage controller. This organization might be the entity from whom the storage controller is purchased, but this is not necessarily true.

**Mandatory**

Required

**Notes**

End clients expect to see the name of the company (e.g., Contoso, BestVendor). While the value may be filled from the IdentifyController PCI Vendor ID or SubsystemID field, it would be preferable to have this filled with the actual string value of the company name.

**6.4.3.2.16 Model**

The mapping for Model is summarized in Table 99.
Table 99: Model mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>NVM Spec Property / Field: IdentifyController / Model Number (MN) NVM Spec: Section: Figure 249 byte 24:63</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The model number for the storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the name by which the manufacturer generally refers to the storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.4.3.2.17 Name  The mapping for Name is summarized in Table 100.
### Table 100: Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>String</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td>NVM Spec Property Type: 16-bit hex value Additional</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td>NVM Spec Identifying Information: ByteOffset: 79:78, IdentifyController data structure</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Redfish, Name is a read-only field.</td>
<td>Map the CNTLID field to a string with the format: “0xABCD”</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.18 **NVMeControllerProperties.ControllerType**  The mapping for `NVMeControllerProperties.ControllerType` is summarized in Table 101.

**Table 101: NVMeControllerProperties.ControllerType mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><code>NVMeControllerProperties.ControllerType</code></td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>This property specifies the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This property must be used to specify the type of NVMe Controller. For an IO controller, set to IO.</td>
<td>Return “IO”</td>
</tr>
</tbody>
</table>

As of 30 August 2021  **Working Draft**  180
6.4.3.2.19 NVMeControllerProperties.NVMeVersion  The mapping for NVMeControllerProperties.NVMeVersion is summarized in Table 102.

Table 102: NVMeControllerProperties.NVMeVersion mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeVersion</td>
<td>NVM Spec Property / Field: Version (VER) NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
<td>Maps from register 3.1.2.</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>Additional NVM Spec Identifying Information: ByteOffset: 83:90</td>
</tr>
<tr>
<td>Description</td>
<td>The version of the NVMe Base Specification supported.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the type of NVMe Controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required when NVMe version is 1.2 or higher.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Notes</td>
<td>Implementations compliant to revision 1.2 or later of this specification shall report a non-zero value in this field. Map from corresponding value in register 3.1.2 to string as “1.0”, “1.1”, “1.2”, “1.2.1”, “1.3.0”, “1.4.0”, etc.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.20 NVMeControllerProperties.NVMeControllerAttributes.ReportsUUIDList

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.ReportsUUIDList` is summarized in Table 103.

**Table 103: NVMeControllerProperties.NVMeControllerAttributes.ReportsUUIDList mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM Spec Property / Field:</td>
<td>Controller Attributes (CTRATT): UUID List (Bit 9)</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 9 of Byte 99:96</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports reporting of a UUID list.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports reporting of a UUID list.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.21 `NVMeControllerProperties.NVMeControllerAttributes.SupportsSQAssociations`

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsSQAssociations` is summarized in Table 104.

**Table 104:**
`NVMeControllerProperties.NVMeControllerAttributes. SupportsSQAssociations` mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM Spec Property / Field:</td>
<td>Controller Attributes (CTRATT): Bit 8 (SQ Associations)</td>
<td>NVM Spec property Type: Single bit (bool)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td><strong>Boolean</strong></td>
<td><strong>Additional NVM Spec Identifying Information:</strong> Bit 8 of Byte 99:96</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates whether or not the controller supports SQ Associations.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports SQ Associations.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.22 NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity

The mapping for NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity is summarized in Table 105.

Table 105:
NVMeControllerProperties.NVMeControllerAttributes. ReportsNamespaceGranularity mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeControllerAttributes.ReportsNamespaceGranularity</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 7 (Namespace Granularity)</td>
<td>NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 7 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports reporting of Namespace Granularity.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports reporting of Namespace Granularity.</td>
<td></td>
</tr>
</tbody>
</table>
Redfish/Swordfish  |  NVMe / NVMe-oF
---|---
Mandatory  |  Recommended for NVM Drives and more complex devices with NVMe front ends, such as opaque arrays.

Notes
### 6.4.3.2.23 NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.TrafficBasedKeepAlive` is summarized in Table 106.

#### Table 106: NVMeControllerProperties.NVMeControllerAttributes. SupportsTrafficBasedKeepAlive mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>NVMeControllerProperties.NVMeControllerAttributes.SupportsTrafficBasedKeepAlive</code></td>
<td></td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 6 (Traffic Based Keep Alive Support – TBKAS) **NVM Spec: Section:**Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 6 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports restarting KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive Timeout interval.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports restarting KeepAlive Timer if traffic is processed from an admin command or IO during KeepAlive Timeout interval.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required for Ethernet-Attach Drives; required for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>For NVMe SSD Drives: If “Ethernet-Attach for NVMe Drives” feature is advertised, this is required. (This means EnduranceGroups and NVM Sets are supported.)</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.24 NVMeControllerProperties.NVMeControllerAttributes.SupportsPredictableLatencyMode

The mapping for NVMeControllerProperties.NVMeControllerAttributes.PredictableLatencyMode is summarized in Table 107.

**Table 107: NVMeControllerProperties.NVMeControllerAttributes. SupportsPredictableLatencyMode mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsPredictableLatencyMode</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 5 (Predictable Latency Mode) NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 5 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports Predictable Latency Mode.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports Predictable Latency Mode.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 188
6.4.3.2.25 **NVMeControllerProperties.NVMeControllerAttributes.SupportsEnduranceGroups**

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsEnduranceGroups` is summarized in Table 108.

**Table 108:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsEnduranceGroups</td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 4 (Endurance Groups)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates whether or not the controller supports Endurance Groups.</td>
<td><strong>Additional NVM Spec Identifying Information:</strong> Bit 4 of Byte 99:96</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports Endurance Groups.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required when EnduranceGroups/ Sets are supported.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>For NVMe SSD Drives: If “Advanced Features for NVMe Drives” feature is advertised, this is required. (This means EnduranceGroups and NVM Sets are supported.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsReadRecoveryLevels` is summarized in Table 109.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>NVMeControllerProperties.NVMeControllerAttributes.SupportsReadRecoveryLevels</code></td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 3 (Read Recovery Levels) <strong>NVM Spec Section:</strong> Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 3 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports Read Recovery Levels.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports Read Recovery Levels.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.27 NVMeControllerProperties.NVMeControllerAttributes.SupportsNVMSets

The mapping for NVMeControllerProperties.NVMeControllerAttributes.SupportsNVMSets is summarized in Table 110.

**Table 110: NVMeControllerProperties.NVMeControllerAttributes. SupportsNVMSets mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsNVMSets</td>
<td>NVM Spec Property / Field: Controller Attributes (CTRATT): Bit 2 (NVM Sets)</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool)</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports NVM Sets.</td>
<td>Additional NVM Spec Identifying Information: Bit 2 of Byte 99:96</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports NVM Sets.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required when EnduranceGroups/Sets are supported.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>For NVMe SSD Drives: If “Advanced Features for NVMe Drives” feature is advertised, this is required. (This means EnduranceGroups and NVM Sets are supported.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.28 NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState` is summarized in Table 111.

**Table 111: NVMeControllerProperties.NVMeControllerAttributes. SupportsExceedingPowerOfNonOperationalState mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.SupportsExceedingPowerOfNonOperationalState</td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 1 (Non-Operational Power State Permissive Mode)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NVM Spec: Section:</strong> Figure NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 1 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether or not the controller supports exceeding Power of NonOperational State in order to execute controller initiated background operations in a non-operational power state.</td>
<td></td>
</tr>
</tbody>
</table>

**Mandatory**

**Notes**
### 6.4.3.2.29 NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId

The mapping for `NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId` is summarized in Table 112.

**Table 112:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeControllerAttributes.Supports128BitHostId</td>
<td><strong>NVM Spec Property / Field:</strong> Controller Attributes (CTRATT): Bit 0  <strong>NVM Spec:</strong> Section: NVMe 1.4a: Section 5.15.2.2 (IdentifyController), Figure 249</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool)  <strong>Additional NVM Spec Identifying Information:</strong> Bit 0 of Byte 99:96</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether or not the controller supports a 128-bit Host Identifier.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether or not the controller supports a 128-bit Host Identifier.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  196
### 6.4.3.2.30 NVMeControllerProperties.MaxQueueSize

The mapping for `NVMeControllerProperties.MaxQueueSize` is summarized in Table 113.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NVMeControllerProperties.MaxQueueSize</strong></td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> Maximum Queues Entries Supported (MQES) <strong>NVM Spec: Section:Figure</strong> NVMe 1.4a; Section 3.1.1 Controller Capabilities; Figure 69</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Int64</td>
<td><strong>NVM Spec Property Type:</strong> Additional NVM Spec Identifying Information: ByteOffset: Bits 15:00</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td></td>
<td>Indicates the maximum individual queue size that an NVMe IO Controller supports.</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the maximum individual queue entry size supported per queue. This is a zero-based value, where the minimum value is one, indicating two entries. For PCIe, this applies to both submission and completion queues. For NVMe-oF, this applies to only submission queues.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Implement for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.31 NVMeControllerProperties.MaxQueueSize  The mapping for NVMeControllerProperties.ANACharacteristics is summarized in Table 114.

Table 114: NVMeControllerProperties.ANACharacteristics mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>NVMeControllerProperties.ANACharacteristics</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the combination of ANA type and volume information.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the combination of ANA type and volume information.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.32 NVMeControllerProperties.ANACharacteristics.AccessState

The mapping for NVMeControllerProperties.ANACharacteristics.AccessState is summarized in Table 115.

**Table 115: NVMeControllerProperties.ANACharacteristics.AccessState mapping**

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td><strong>NVM Spec Property / Field:</strong> Asymmetric Namespace Access State NVM Spec: Section:Figure NVMe 1.4a; Section 5.14.1.12; Figure 211</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td><strong>NVM Spec Property Type:</strong> Additional NVM Spec Identifying Information: ByteOffset: Bits 03:00 of Byte 16</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Reported ANA Access state.</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the reported ANA Access State.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Available values: Optimized / NonOptimized / Inacessible / PersistentLoss</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  200
6.4.3.2.33 NVMeControllerProperties.ANACharacteristics.Volume  The mapping for NVMeControllerProperties.ANACharacteristics.Volume is summarized in Table 116.

Table 116: NNVMeControllerProperties.ANACharacteristics.Volume mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NV  MeControllerProperties.ANACharacteristics.Volume</td>
<td>NVM Spec Property / Field: Namespace Identifier X: NVM Spec: Section:Figure NVMe 1.4a; Section 5.14.1.12; Figure 211</td>
</tr>
<tr>
<td>Description</td>
<td>The specified volume.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a link to the specified volume.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td>As of 30 August 2021 Working Draft 201</td>
</tr>
<tr>
<td>Redfish/Swordfish Notes</td>
<td>NVMe / NVMe-oF Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------</td>
<td></td>
</tr>
</tbody>
</table>
| This field contains the pointer to the namespace for which the access state applies. | The namespace id should be redirected / linked to the corresponding namespace (volume) object with that namespace id. If this set of fields contains multiple namespaces (e.g., a group of namespaces), a unique entry in the ANACharacteristics array should be created for each namespace.
6.4.3.2.34 NVMeControllerProperties.NVMeSMARTCriticalWarnings.PRMUnreliable

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.PRMUnreliable is summarized in Table 6.4.3.2.34.

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.PRMUnreliable</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
</tr>
<tr>
<td>Description</td>
<td>The Persistent Memory Region has become unreliable.</td>
</tr>
</tbody>
</table>

NVM Spec Property / Field: Critical Warning
NVM Spec: Section: Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196

NVM Spec Property Type: Single bit (bool)
Additional NVM Spec Identifying Information: Bit 5 of Byte 00
This property shall indicate that the Persistent Memory Region has become unreliable. PCI Express memory reads may return invalid data or generate poisoned PCI Express TLP(s). Persistent Memory Region memory writes may not update memory or may update memory with undefined data. The Persistent Memory Region may also have become non-persistent.

Recommended for NVM Drives; required for more complex devices with NVMe front ends, such as opaque arrays.

6.4.3.2.35 NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed
The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed is summarized in Table 119.
### Table 118:
NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>NVMe ControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates that the volatile memory backup device has failed.</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate that the volatile memory backup device has failed.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Recommended for NVM Drives as well as more complex devices with NVMe front ends, such as opaque arrays.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table:** NVMeControllerProperties.NVMeSMARTCriticalWarnings.PMRUnreliable mapping

---

As of 30 August 2021

**Working Draft**

205
The mapping for `NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed` is summarized in Table 119.

**Table 119:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.PowerBackupFailed</td>
<td>NVM Spec Property / Field: Critical Warning NVM Spec: Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 4 of Byte 00</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the volatile memory backup device has failed.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended for NVM Drives. Required for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 206
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
</table>

Notes
6.4.3.2.37 **NVMeControllerProperties.NVMeSMARTCriticalWarnings.MediaInReadOnly**

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.MediaInReadOnly is summarized in Table 120.

**Table 120:**
NVMeControllerProperties.NVMeSMARTCriticalWarnings.MediaInReadOnly mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeControllerProperties.NVMeSMARTCriticalWarnings.MediaInReadOnly</td>
<td></td>
<td>NVM Spec Property / Field: Critical Warning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVM Spec: Section: Figure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVMe 1.4a: Section 5.14.1.2, SMART / Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information, Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVM Spec Identifying Information: Bit 3 of Byte 00</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the media has been placed in read only mode.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate the media has been placed in read only mode. This is not set when the read-only condition on the media is a result of a change in the write protection state of a namespace.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021 **Working Draft** 208
### 6.4.3.2.38 NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSystemDegraded

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.OverallSystemDegraded is summarized in Table 121.

**Table 121:**
NVMeControllerProperties.NVMeSMARTCriticalWarnings. OverallSubsystemDegraded mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NVM Spec Property / Field:</strong></td>
<td>Critical Warning</td>
<td>NVM</td>
<td></td>
</tr>
<tr>
<td><strong>NVM Spec: Section:</strong></td>
<td>SMART / Health Information, Figure 196</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NVMe 1.4a: Section 5.14.1.2,</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates that the NVM subsystem reliability has been compromised.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate that the NVM subsystem reliability has been compromised.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  209
6.4.3.2.39 NVMeControllerProperties.NVMeSMARTCriticalWarnings.SpareCapacityWornOut

The mapping for NVMeControllerProperties.NVMeSMARTCriticalWarnings.SpareCapacityWornOut is summarized in Table 122.

Table 122:
NVMeControllerProperties.NVMeSMARTCriticalWarnings. SpareCapacityWornOut mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property / Field: Critical Warning NVM Spec: Section: Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the available spare capacity has fallen below the threshold.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the available spare capacity has fallen below the threshold.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe drives, as well as for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>As of 30 August 2021 Working Draft 210</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.40 PCIeInterface.PCIeType  The mapping for PCIeInterface.PCIeType is summarized in Table 123.

Table 123: PCIeInterface.PCIeType mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>PCIeInterface.PCIeType</td>
<td>enum (PCIeDevice.PCIeType)</td>
</tr>
<tr>
<td>Description</td>
<td>The version of the PCIe specification in use by this device.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the negotiated PCIe interface version in use by this device.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for PCIe attach NVMe Drives; do not implement for ethernet-attach drives. Optional for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Possible values: Gen1/Gen2/Gen3/Gen4/Gen5</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.41 PCIeInterface.MaxPCIeType

The mapping for PCIeInterface.MaxPCIeType is summarized in Table 124.

#### Table 124: PCIeInterface.MaxPCIeType mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>PCIeInterface.MaxPCIeType</td>
<td>enum (PCIeDevice.PCIeType)</td>
</tr>
<tr>
<td>Description</td>
<td>The highest version of the PCIe specification supported by this device.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the maximum PCIe specification that this device supports.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for PCIe attach NVMe Drives; do not implement for ethernet-attach drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Possible values: Gen1/Gen2/Gen3/Gen4/Gen5</td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.42 PCIeInterface.LanesInUse

The mapping for **PCIeInterface.LanesInUse** is summarized in Table 125.

#### Table 125: PCIeInterface.LanesInUse mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>PCIeInterface.LanesInUse</td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>int64</td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The number of PCIe lanes in use by this device.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the number of PCIe lanes in use by this device, which shall be equal to or less than the MaxLanes property value.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required for PCIe attach NVMe Drives; do not implement for ethernet-attach drives.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.43 PCIeInterface.MaxLanes

The mapping for `PCIeInterface.LanesInUse` is summarized in Table 126.

**Table 126: PCIeInterface.LanesInUse mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIeInterface.LanesInUse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The number of PCIe lanes supported by this device.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the maximum number of PCIe lanes supported by this device.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for PCIe attach NVMe Drives; do not implement for ethernet-attach drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 6.4.3.2.44 Ports

The mapping for *Ports* is summarized in Table 127.

### Table 127: Ports mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>PortCollection</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The link to the</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>collection of ports that exist on the storage controller.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain a link to a resource collection of type PortCollection.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement for NVMe drives; optional for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.45 SKU

The mapping for SKU is summarized in Table 128.

**Table 128: SKU mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The SKU for this</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the stock-keeping unit number for this storage controller.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.4.3.2.46 SpeedGbps

The mapping for SpeedGbps is summarized in Table 129.

**Table 129: SpeedGbps mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Decimal</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The maximum speed of the storage controller's device interface.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the maximum supported speed of the storage bus interface, in Gbit/s. The specified interface connects the controller to the storage devices, not the controller to a host. For example, SAS bus not PCIe host bus.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  217
6.4.3.2.47 Status.State  The mapping for Status.State is summarized in Table 130.

Table 130: Status.State mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Status.State</td>
<td>NVM Spec Property / Field: CSTS – Controller Status NVM Spec: Section:Figure NVMe 1.4a: Section 3.1.6, Figure 79</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.State (enum)</td>
<td>NVM Spec Property Type:</td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
<td></td>
</tr>
</tbody>
</table>

Mandatory  Mandatory
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>Possible values:</td>
<td></td>
</tr>
<tr>
<td>Enabled / Disabled /</td>
<td></td>
</tr>
<tr>
<td>StandbyOffline /</td>
<td></td>
</tr>
<tr>
<td>StandbySpare /</td>
<td></td>
</tr>
<tr>
<td>InTest / Starting /</td>
<td></td>
</tr>
<tr>
<td>ABsent / Una</td>
<td></td>
</tr>
<tr>
<td>AvailableOffline /</td>
<td></td>
</tr>
<tr>
<td>Deferring / Quiesced /</td>
<td></td>
</tr>
<tr>
<td>/ Updating / Qualifed</td>
<td></td>
</tr>
<tr>
<td>Ready (CSTS.RDY) maps to</td>
<td>Enabled, Shutdown</td>
</tr>
<tr>
<td>Enabled, Shutdown (CSTS.SHST) value will tell you if shutdown is in progress or complete (StandbyOffline), ProcessingPaused (CSTS.PP) maps to Deferring. If both Ready and ProcessingPaused are indicated, then the system should indicate Deferring. If both Ready and Shutdown are indicated, then the system should indicate StandbyOffline. If both Ready and ProcessingPaused are indicated, then the system should indicate Deferring.</td>
<td></td>
</tr>
</tbody>
</table>
6.4.3.2.48 Status.Health  The mapping for Status.Health is summarized in Table 131.

**Table 131: Status.Health mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.Health</td>
<td></td>
<td>NVM Spec Property /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Field: CSTS – Controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Status NVM Spec:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section:Figure NVMe 1.4a:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 3.1.6, Figure 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVM Spec Property /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Field: Critical Warning NVM Spec:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section:Figure NVMe 1.4a:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 5.14.1.2,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SMART / Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information, Figure 196</td>
</tr>
</tbody>
</table>

**Type** Resource.Health

**Description**
The health state of this resource in the absence of its dependent resources.

**LongDescription**
This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.

**Mandatory**
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>Possible Values: OK / Warning / Critical</td>
</tr>
<tr>
<td></td>
<td>This comes from CSTS Controller Failure Status, and from the SMART / health information log critical warning field.</td>
</tr>
</tbody>
</table>
6.4.3.2.49 SupportedControllerProtocols  The mapping for SupportedControllerProtocols is summarized in Table 132.

**Table 132: SupportedControllerProtocols mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SupportedControllerProtocols</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Protocol.Protocol)</td>
<td><strong>NVM Spec Property Type:</strong> N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the supported set of protocols for communicating to this storage controller.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>This is an array of protocols supported by the StorageController.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This can be set to values including, but not limited to, PCIe, RDMA, NVMe-oF, RoCE, RoCEv2, and InfiniBand.</td>
<td></td>
</tr>
</tbody>
</table>
The mapping for **SupportedDeviceProtocols** is summarized in Table 133.

**Table 133: SupportedDeviceProtocols mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SupportedDeviceProtocols</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Collection(Protocol.Protocol)</td>
<td>NVM Spec Property Type: N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The protocols that the storage controller can use to communicate with attached devices.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the set of protocols this storage controller can use to communicate with attached devices.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement.</td>
<td></td>
</tr>
</tbody>
</table>
6.5 Namespace

The Redfish/Swordfish Volume schema is used to represent an NVM Namespace.

6.5.1 Mockup

The following mockup shows a sample representation of the Volume schema used to represent an NVM Namespace.

```json
{
   "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",
   "@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Volumes/LogicalNamespace1",
   "@odata.type": "#Volume.v1_5_0.Volume",
   "Id": "1",
   "Name": "Namespace 1",
   "LogicalUnitNumber": 1,
   "Status": {
      "State": "Enabled",
      "Health": "OK"
   },
   "Identifiers": [
      {"DurableNameFormat": "NGUID",
       "DurableName": "FEDCBA9876543210h"
      }
   ],
   "Capacity": {
      "Data": {
         "ConsumedBytes": 0,
         "AllocatedBytes": 10737418240
      },
      "Metadata": {
         "AllocatedBytes": 536870912
      }
   },
   "CapacitySources": [
      {"@odata.id": "/redfish/v1/Storage/NVMe-oF-Subsystem/Volumes/LogicalNamespace1/CapacitySources/Source1"
      }
   ],
   "NVMeNamespaceProperties": {
      "NamespaceId": "0x014",
      "NamespaceFeatures": {
         "SupportsThinProvisioning": false
      }
   }
}
```
"SupportsAtomicTransactionSize": false,
"SupportsDeallocatedOrUnwrittenLBErro": false,
"SupportsNGUIDReuse": false,
"SupportsIOPerformanceHints": false
},
"NumberLBAFormats": 0,
"FormattedLBASize": "LBAFormat0Support",
"MetadataTransferredToEndOfDataLBA": false,

"NVMeVersion": "1.4"
}
}

6.5.2 Property Mapping
6.5.2.1 BlockSizeBytes  The mapping for BlockSizeBytes is summarized in Table 134.

Table 134: BlockSizeBytes mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>BlockSizeBytes</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
</tr>
<tr>
<td>Description</td>
<td>The size, in bytes, of the smallest addressable unit, or block.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain size of the smallest addressable unit of the associated drive or device.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
</tr>
<tr>
<td>Notes</td>
<td>Follow index in 247: Byte 26 (bits 3:0) to the LBA format structure to get the metadata size and LBA data size combination. These combined values are BlockSizeBytes.</td>
</tr>
</tbody>
</table>

6.5.2.2 Capacity.Data.ConsumedBytes  The mapping for Capacity.Data.ConsumedBytes is summarized in Table 135.
## Table 135: Capacity.Data.ConsumedBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity.Data.ConsumedBytes</td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> Namespace Utilization (NUSE) **NVM Spec: Section:**Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td><strong>NVM Spec Property Type:</strong> int 64 <strong>Additional NVM Spec Identifying Information:</strong> ByteOffset: 23:16, Identify Namespace data structure</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>The current number of logical blocks allocated in the namespace.</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>This field indicates the current number of logical blocks allocated in the namespace. This field is smaller than or equal to the Namespace Capacity. The number of logical blocks is based on the formatted LBA size.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes Reporting capacity in bytes is the Redfish and Swordfish standard mechanism. Clients expect the capacity information to be reported consistently for these devices, so the calculation here is to convert the NVMe properties (in blocks) to bytes. Returned in bytes 23:16 of the Identify Namespace Data Structure (NVM Command Set Specific). Reference NVMe Base Specification section n 5.15.2.1 and figure 247).

### 6.5.2.3 Capacity.Data.ProvisionedBytes

The mapping for Capacity.Data.ProvisionedBytes is summarized in Table 136.

**Table 136: Capacity.Data.ProvisionedBytes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Capacity.Data.ProvisionedBytes</td>
<td><strong>NVM Spec Property / Field:</strong> NVM Capacity (NCAP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NVM Spec: Section:</strong> NVM 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td><strong>NVM Spec Property Type:</strong> int64</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Additional NVM Spec Identifying Information:</strong> ByteOffset: 15:08, Identify Namespace data structure</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The maximum number of bytes that can be allocated in this data store for this data type.</td>
<td>The total size of the namespace in logical blocks (LBA 0 through n-1).</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The value shall be the maximum number of bytes that can be allocated in this data store for this data type.</td>
<td>This field indicates the total size of the namespace in logical bytes. The value is in bytes. A namespace of size n consists of LBA 0 through (n - 1). The number of logical blocks is based on the formatted LBA size. This field is undefined prior to the namespace being formatted.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>This property is required when issuing a create namespace command. It is also required for “change namespace” when modifying the size of the namespace.</td>
<td>Returned in bytes 07:00 of the Identify Namespace Data Structure (NVM Command Set Specific). Reference NVMe Base Specification section in 5.15.2.1 and figure 247.</td>
</tr>
</tbody>
</table>

**6.5.2.4 Capacity.Data.AllocatedBytes**  
The mapping for Capacity.Data.AllocatedBytes is summarized in Table 137.
### Table 137: Capacity.Data.AllocatedBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Capacity.Data.AllocatedBytes</td>
<td><strong>NVM Spec Property</strong> / <strong>Field</strong>: Namespace Size (NSZE) <strong>NVM Spec:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Section</strong>: Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td><strong>NVM Spec Property Type</strong>: int 64 <strong>Additional NVM Spec Identifying Information</strong>: ByteOffset: 07:00, Identify Namespace data structure</td>
</tr>
<tr>
<td>Description</td>
<td>The number of bytes currently allocated by the storage system in this data store for this data type.</td>
<td>The total size of the NVM allocated to this namespace.</td>
</tr>
</tbody>
</table>
The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.

The total size of the NVM allocated to this namespace. The value is in bytes. This field shall be supported if the Namespace Management capability (refer to NVMe Base Specification section 8.12) is supported. This field may not correspond to the logical block size multiplied by the Namespace Size field. Due to thin provisioning or other settings (e.g., endurance), this field may be larger or smaller than the Namespace Size reported.

Reporting capacity in bytes is the Redfish and Swordfish standard mechanism.

Returned in bytes 63:48 of the Identify Namespace Data Structure (NVM Command Set Specific). Reference NVMe Base Specification section in 5.15.2.1 and figure 247.

### 6.5.2.5 Capacity.Metadata

The mapping for Capacity.Metadata is summarized in Table 138.

**Table 138: Capacity.Metadata.AllocatedBytes mapping**
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Int64</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The number of bytes currently allocated by the storage system in this data store for this data type.</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>No; not required for NVMe Drives; optional to implement for more complex devices.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not return metadata information for NVMe devices. This is included in the overall reported capacity information.</td>
</tr>
</tbody>
</table>

### 6.5.2.6 CapacitySources

The mapping for `CapacitySources` is summarized in Table 139.
<table>
<thead>
<tr>
<th>Property</th>
<th>CapacitySources</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>An array of space allocations to this volume.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>Fully or partially consumed storage from a source resource. Each entry provides capacity allocation information from a named source resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Table 139: CapacitySources mapping**

- **Property**: CapacitySources
- **Type**: Collection(CapacitySource)
- **Redfish/Swordfish**: NVM Spec Property / Field: NVM Set Identifier (NVMSETID) NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247
- **NVMe / NVMe-oF**: NVM Spec Property Type: int 64 Additional NVM Spec Identifying Information: ByteOffset: 101:100, Identify Namespace data structure
- **Description**: The NVM Set in which the namespace is allocated
6.5.2.7 Description

The mapping for Description is summarized in Table 140.

**Table 140:** Description mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Description</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>The description of this resource.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### LongDescription

This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.

**Mandatory**: Yes

**Notes**: In Redfish, Description is a read-only field. Return the common description: “A Namespace is a quantity of non-volatile memory that may be formatted into logical blocks. When formatted, a namespace of size n is a collection of logical blocks with logical block addresses from 0 to (n-1). NVMe systems can support multiple namespaces.”

### 6.5.2.8 DisplayName

The mapping for DisplayName is summarized in Table 141.

**Table 141: DisplayName mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>DisplayName</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A user-configurable string to name the volume.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  236
As of 30 August 2021

**6.5.2.9 Identifiers**  The mapping for Identifiers is summarized in Table 142.

**Table 142: Identifiers mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifiers</td>
<td>Namespace Identification Descriptor list</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>LongDescription</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Collection(Resource.Identifier)</td>
<td>A variable length Namespace Identification Descriptor structures</td>
<td>A list of Namespace Identification Descriptor structures containing Namespace Type, Namespace Identifier Length (NIDL), and Namespace ID (NID). A list of any number of variable length Namespace Identification Descriptor structures that fit into the 4,096 byte Identify payload. All remaining bytes after the namespace identification descriptor structures should be cleared to 0h, and the host shall interpret a Namespace Identifier Descriptor Length (NIDL) value of 0h as the end of the list. The host should ignore any Namespace Identification Descriptor with a Namespace Identifier Type not supported by the host.</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
6.5.2.10 **Identifiers.DurableName**  The mapping for \texttt{Identifiers.DurableName} is summarized in Table 143.

**Table 143: Identifiers.DurableName mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Identifiers.DurableName</td>
<td>Namespace Identifier (NID)</td>
</tr>
<tr>
<td>Description</td>
<td>Variable - see notes</td>
<td>Variable - see notes</td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td>Durable Namespace Identifier</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a list of all known durable names for the Namespace.</td>
<td>A list of globally unique values assigned to the Namespace when the Namespace is created.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Values remain fixed throughout the life of the Namespace and are preserved across Namespace and Controller operations (e.g., Controller Level Reset, Namespace format, etc.).</td>
</tr>
</tbody>
</table>
6.5.2.11 Identifiers.DurableNameFormat  The mapping for Identifiers.DurableNameFormat is summarized in Table 144.

Table 144: Identifiers.DurableNameFormat mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifiers.DurableNameFormat</td>
<td>Int64</td>
<td>Namespace Identifier Type (NIDT)</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>Int64</td>
</tr>
<tr>
<td>Description</td>
<td>The Durable names for the storage controller.</td>
<td>The Namespace Identifier data type and length.</td>
</tr>
</tbody>
</table>
This property shall contain a list of the types for all known durable names for the associated storage controller. The type determines the length of the corresponding Namespace ID. The data type contained in the Namespace Identifier field and the length of that type as defined in the NVMe Base Specification Figure 251 - Identify (Namespace Identification Descriptor) byte 00. Allowed values are:

1 = an 8-byte IEEE Extended Unique Identifier. 2 = a 10-byte Namespace Globally Unique Identifier. 3 = an 8-byte Namespace UUID.

**Mandatory**
No

**Notes**
This is an array of types for the unique identifiers for the NVM Subsystem. Values may be ‘EUI64’, ‘NGUID’, or ‘UUID’.

Refer to NVMe Base Specification Figure 246 CNS 03h and Figure 251 - Figure 251 (NIDT) of Identify – Namespace Identification Descriptor.

---

**6.5.2.12 InitializeMethod**

The mapping for InitializeMethod is summarized in Table 145.

**Table 145:** InitializeMethod mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>InitializeMethod</td>
<td>Volume. InitializeMethod (enum)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the Initialization Method used for this volume. If InitializeMethod is not specified, the InitializeMethod should be Foreground.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate the initialization method used for this volume. If InitializeMethod is not specified, the InitializeMethod should be Foreground. This value reflects the most recently used Initialization Method, and may be changed using the Initialize Action.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended for NVMe Drives, as well as for more complex devices with NVMe front ends, such as opaque arrays.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Available values: Fast / Slow Not in NVMe Specification today.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**6.5.2.13 Links.Drives** The mapping for Links.Drives is summarized in Table 146.
### Table 146: Links.Drives mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links.Drives</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Collect ion(Drive.Drive)</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>An array of the drives to be used by the volume</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>This parameter shall contain an array of the drives to be used by the volume.</td>
<td>Required for NVMe Drives. Optional, not recommended for more complex devices with an NVMe front end, such as opaque arrays; for these configurations the mapping is to the underlying storage pool, rather than to drives.</td>
</tr>
<tr>
<td>Notes</td>
<td>This array shall contain links to the drive object for this namespace.</td>
<td></td>
</tr>
</tbody>
</table>

6.5.2.14 LogicalUnitNumber

The mapping for LogicalUnitNumber is summarized in Table 147.
Table 147: LogicalUnitNumber mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LogicalUnitNumber</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the host-visible LogicalUnitNumber assigned to this Volume.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain host-visible LogicalUnitNumber assigned to this Volume. This property shall only be used when in a single connect configuration and no StorageGroup configuration is used.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>Do not use with NVMe devices. This is represented more correctly with (NVMeNamespaceProperties).NamespaceId.</td>
<td>Do not implement.</td>
</tr>
</tbody>
</table>

6.5.2.15 MaxBlockSizeBytes

The mapping for MaxBlockSizeBytes is summarized in Table 148.
Table 148: MaxBlockSizeBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaxBlockSizeBytes</td>
<td>NVM Spec Property / Field: Formatted LBA Size (FLBAS)</td>
<td></td>
</tr>
<tr>
<td>NVM Spec:</td>
<td>Section: Figure 247: byte 26</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The size, in bytes, of the smallest addressable unit, or block.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain size of the smallest addressable unit of the associated drive or device.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended to not implement; however, if implemented this should have the same value as BlockSizeBytes.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Follow index in 247: Byte 26 (bits 3:0) to the LBA format structure to get the metadata size and LBA data size combination. These combined values are BlockSizeBytes.</td>
<td></td>
</tr>
</tbody>
</table>

6.5.2.16 Name  The mapping for Name is summarized in Table 149.
Table 149: Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>NVM Spec Property / Field: Namespace ID (NSID)</td>
<td>NVMe 1.4a</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td>To determine the active NSIDs for a particular controller, the host may follow either of the following methods: 1. Issue an Identify command with the CNS field cleared to 0h for each valid NSID (based on the Number of Namespaces value (i.e., MNAM field or NN field) in the Identify Controller data structure). If a non-zero data structure is returned for a particular NSID, then that is an active NSID; or 2. Issue an Identify command with a CNS field set to 2h to retrieve a list of up to 1,024 active NSIDs. If there are more than 1,024 active NSIDs, continue to issue Identify commands with a CNS field set to 2h until all active NSIDs are retrieved.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td></td>
</tr>
</tbody>
</table>
**Redfish/Swordfish NVMe / NVMe-oF**

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Yes</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>In Redfish, Name is a read-only field.</td>
<td>Map the NSID field to a string with the format: “0xABCD”</td>
</tr>
</tbody>
</table>

### 6.5.2.17 NVMeNamespaceProperties.NamespaceId

The mapping for `NVMeNamespaceProperties.NamespaceId` is summarized in Table 150.

**Table 150: NVMeNamespaceProperties.NamespaceId mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeNamespaceProperties.NamespaceId</td>
<td>Namespace Identifier (NSID)</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>8-byte value</td>
</tr>
<tr>
<td>Description</td>
<td>The NVMe Namespace Identifier for this namespace.</td>
<td>An identifier used by a controller to provide access to a namespace.</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the NVMe Namespace Identifier for this namespace. This property shall be a hex value. Namespace identifiers are not durable and do not have meaning outside the scope of the NVMe subsystem. NSID 0x0, 0xFFFFFFFF, 0xFFFFFFFFF are special purpose values.</td>
<td>An identifier used by a controller to provide access to a namespace or the name of the field in the SQE that contains the namespace identifier.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Notes

To determine the active NSIDs for a particular controller, the host may follow either of the following methods: 1. Issue an Identify command with the CNS field cleared to 0h for each valid NSID (based on the Number of Namespaces value (i.e., MNAM field or NN field) in the Identify Controller data structure). If a non-zero data structure is returned for a particular NSID, then that is an active NSID; or 2. Issue an Identify command with a CNS field set to 2h to retrieve a list of up to 1,024 active NSIDs. If there are more than 1,024 active NSIDs, continue to issue Identify commands with a CNS field set to 2h until all active NSIDs are retrieved.

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
</table>

#### 6.5.2.18 NVMeNamespaceProperties.IsShareable

The mapping for NVMeNamespaceProperties.IsShareable is summarized in Table 151.
### Table 151: NVMeNamespaceProperties.IsShareable mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM eNamespaceProperties.IsShareable</td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> Namespace Multi-path I/O and Namespace Sharing Capabilities (NMIC) **NVM Spec: Section:**Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 0 of Byte 30</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the namespace is shareable.</td>
<td>Specifies multi-path I/O and namespace sharing capabilities of the namespace.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the namespace is shareable.</td>
<td>If set to ‘1’, then the namespace may be attached to two or more controllers in the NVM subsystem concurrently (i.e., may be a shared namespace). Bits 7:1 are reserved. Bit 0, if cleared to ‘0’, indicates the namespace is a private namespace and is able to be attached to only one controller at a time.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft 250
Notes Returned in byte 30 of the Namespace Features (NSFEAT) of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247). 

6.5.2.19 NVMeNamespaceProperties.NamespaceFeatures.SupportsThinProvisioning

The mapping for NVMeNamespaceProperties.NamespaceFeatures.SupportsThinProvisioning is summarized in Table 152.

Table 152:
NVMeNamespaceProperties.NamespaceFeatures. SupportsThinProvisioning mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeNamespaceProperties.NamespaceFeatures.SupportsThinProvisioning</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
</tr>
<tr>
<td>Description</td>
<td>This property indicates whether or not the NVMe Namespace supports thin provisioning.</td>
</tr>
<tr>
<td></td>
<td>Indicates that the namespace supports thin provisioning.</td>
</tr>
<tr>
<td>NVM Spec Property / Field: THINP</td>
<td>NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 251
This property shall indicate whether or not the NVMe Namespace supports thin provisioning. Specifically, the namespace capacity reported may be less than the namespace size.

Table 153: NVMeNamespaceProperties.NamespaceFeatures. SupportsDeallocatedOrUnwrittenLBError mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish Property</th>
<th>NVMe Spec Property / Field: DAE NVM Spec: Section:Figure NVMe 1.4a:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NVMeNamespaceProperties.NamespaceFeatures.SupportsDeallocatedOrUnwrittenLBError</td>
<td>Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool)</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Description</td>
<td>This property indicates that the controller supports deallocated or unwritten logical block error for this namespace.</td>
<td>Indicates that the controller supports the Deallocated or Unwritten Logical Block error for this namespace.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the controller supports deallocated or unwritten logical block error for this namespace.</td>
<td>If set to ‘1’ indicates that the controller supports the Deallocated or Unwritten Logical Block error for this namespace. If cleared to ‘0’, then the controller does not support the Deallocated or Unwritten Logical Block error for this namespace. Refer to NVMe Base Specification section 6.7.1.1</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td>Returned in byte 24, bit 2 of the Namespace Features (NSFEAT) of the of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247.</td>
<td></td>
</tr>
</tbody>
</table>

**6.5.2.21 NVMeNamespaceProperties.NamespaceFeatures.SupportsNGUIDReuse**

The mapping for NVMeNamespaceProperties.NamespaceFeatures.SupportsNGUIDReuse
is summarized in Table 154.

**Table 154:** NVMeNamespaceProperties.NamespaceFeatures.SupportsNGUIDReuse mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NVMeNamespaceProperties.NamespaceFeatures.SupportsNGUIDReuse</td>
<td>NVM Spec Property / Field: UIDREUSE NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>NVM Spec Property Type: Single bit (bool) Additional NVM Spec Identifying Information: Bit 3 of Byte 24</td>
</tr>
<tr>
<td>Description</td>
<td>This property indicates that the namespace supports the use of an NGUID (namespace globally unique identifier) value.</td>
<td>Indicates if the value in the NGUID field and the value in the EUI64 field for this namespace may be reused by the controller for a new namespace created after this namespace is deleted.</td>
</tr>
</tbody>
</table>
Redfish/Swordfish  | NVMe / NVMe-oF  
---|---
**LongDescription**  | This property shall indicate that the namespace supports the use of an NGUID (namespace globally unique identifier) value.  
If set to ‘1’ indicates that the value in the NGUID field for this namespace, if non-zero, is never reused by the controller and that the value in the EUI64 field for this namespace, if non-zero, is never reused by the controller. If cleared to ‘0’, then the NGUID value may be reused and the EUI64 value may be reused by the controller for a new namespace created after this namespace is deleted. This bit shall be cleared to ‘0’ if both NGUID and EUI64 fields are cleared to 0h. Refer to NVMe Base Specification, section 7.11.

<table>
<thead>
<tr>
<th><strong>Mandatory</strong></th>
<th><strong>Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Returned in byte 24, bit 3 of the Namespace Features (NSFEAT) of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247).</td>
</tr>
</tbody>
</table>

### 6.5.2.22 NVMeNamespaceProperties.NamespaceFeatures.SupportsAtomicTransactionSize

The mapping for `NVMeNamespaceProperties.NamespaceFeatures.SupportsAtomicTransactionSize` is summarized in Table 155.
Table 155:
NVMeNamespaceProperties.NamespaceFeatures. SupportsAtomicTransactionSize mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>NVMeNamespaceProperties.NamespaceFeatures. SupportsAtomicTransactionSize</td>
<td><strong>NVM Spec Property / Field:</strong> OPTPERF <strong>NVM Spec:</strong> Section:Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
<td><strong>NVM Spec Property Type:</strong> Single bit (bool) <strong>Additional NVM Spec Identifying Information:</strong> Bit 4 of Byte 24</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates whether or not the NVM fields for Namespace preferred write granularity (NPWG), write alignment (NPWA), deallocate granularity (NPDG), deallocate alignment (NPDA) and optimalimal write size (NOWS) are defined for this namespace and should be used by the host for I/O optimization.</td>
<td>Indicates support for the fields NPWG, NPWA, NPDG, NPDA, and NOWS for this namespace; and optimal Write Size field in NVM Sets Attributes Entry</td>
</tr>
</tbody>
</table>
This property shall indicate whether or not the NVM fields for Namespace preferred write granularity (NPWG), write alignment (NPWA), deallocate granularity (NPDG), deallocate alignment (NPDA) and optimimal write size (NOWS) are defined for this namespace and should be used by the host for I/O optimization.

If set to ‘1’ indicates that the fields NAWUN, NAWUPF, and NACWU are defined for this namespace and should be used by the host for this namespace instead of the AWUN, AWUPF, and ACWU fields in the Identify Controller data structure. If cleared to ‘0’, then the controller does not support the fields NAWUN, NAWUPF, and NACWU for this namespace. In this case, the host should use the AWUN, AWUPF, and ACWU fields defined in the Identify Controller data structure in Figure 247. Refer to NVMe Base Specification section 6.4.

Returned in byte 24, bit 4 of the Namespace Features (NSFEAT) of the of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247).

### 6.5.2.23 NVMeNamespaceProperties.NamespaceFeatures.SupportsIOPerformanceHints

The mapping for NVMeNamespaceProperties.NamespaceFeatures.SupportsIOPerformanceHints is summarized in Table 156.
Table 156:
NVMeNamespaceProperties.NamespaceFeatures. SupportsIOPerformanceHints mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMe</td>
<td>NVM Spec Property / Field: NSABP</td>
</tr>
<tr>
<td></td>
<td>NamespaceProperties.NamespaceFeatures.SupportsIOPerformanceHints</td>
<td>NVM Spec: Section:Figure NVMe 1.4a:</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates that the Namespace Atomic Write Unit Normal (NAWUN), Namespace Atomic Write Unit Power Fail (NAWUPF), and Namespace Atomic Compare and Write Unit (NACWU) fields are defined for this namespace and should be used by the host for this namespace instead of the controller-level properties AWUN, AWUPF, and ACWU.</td>
<td>indicates whether or not the fields NAWUN, NAWUPF, and NACWU are defined for this namespace and should be used by the host for this namespace instead of the AWUN, AWUPF, and ACWU fields in the Identify Controller data structure.</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate that the Namespace Atomic Write Unit Normal (NAWUN), Namespace Atomic Write Unit Power Fail (NAWUPF), and Namespace Atomic Compare and Write Unit (NACWU) fields are defined for this namespace and should be used by the host for this namespace instead of the AWUN, AWUPF, and ACWU fields in the Identify Controller data structure. If cleared to ‘0’, then the controller does not support the fields NAWUN, NAWUPF, and NACWU for this namespace. In this case, the host should use the AWUN, AWUPF, and ACWU fields defined in the Identify Controller data structure in NVMe Base Specification Figure 247. Refer to NVMe Base Specification section 6.4.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td>Returned in byte 24, bit 1 of the Namespace Features (NSFEAT) of the of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247).</td>
<td></td>
</tr>
</tbody>
</table>

### 6.5.2.24 NVMeNamespaceProperties.NumberLBAFormats

The mapping for NVMeNamespaceProperties.NumberLBAFormats is summarized in Table 157.
### Table 157: NVMeNamespaceProperties.NumberLBAFormats mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeNamespace</td>
<td><strong>NVM Spec Property / Field:</strong> Number of LBA Formats (NLBAF) <strong>NVM Spec:</strong> Section:Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>spaceProperties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NumberLBAFormats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>Type:** Int64 <strong>Additional NVM Spec Identifying Information:</strong> ByteOffset: 25</td>
</tr>
<tr>
<td>Description</td>
<td>The number of LBA data size and metadata size combinations supported by this namespace. The value of this property is between 0 and 16.</td>
<td>The number of supported LBA data size and metadata size combinations supported by the namespace.</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of LBA data size and metadata size</td>
<td>This property shall contain the number of LBA formats allocated in order starting with 0 and packed</td>
</tr>
<tr>
<td></td>
<td>combinations supported by this namespace. The value of this property is between</td>
<td>sequentially. This is a 0’s based value. The maximum number of LBA formats that may be indicated as</td>
</tr>
<tr>
<td></td>
<td>0 and 16. LBA formats with an index set beyond this value will not be supported.</td>
<td>supported is 16. The supported LBA formats are indicated in bytes 128 to 191 in this data structure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The LBA Format fields with an index beyond the value set in this field are invalid and not supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LBA Formats that are valid, but not currently available may be indicated by setting the LBA Data Size for that LBA Format to 0h.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Notes</td>
<td>Returned in byte 25 (Number of LBA Formats) of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 &amp; figure 247.</td>
<td></td>
</tr>
</tbody>
</table>

6.5.2.25 NVMeNamespaceProperties.FormattedLBASize  The mapping for NVMe-NamespaceProperties.FormattedLBASize is summarized in Table 158.
### Table 158: NVMeNamespaceProperties.FormattedLBASize mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeName spaceProperties. FormattedLBASize</td>
<td>NVM Spec Property / Field: Formatted LBA Size (FLBAS) NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>Type:** Int64 Additional NVM Spec Identifying Information: ByteOffset: 26</td>
</tr>
<tr>
<td>Description</td>
<td>The LBA data size and metadata size combination that the namespace has been formatted with.</td>
<td>The LBA data size and metadata size combination that the namespace has been formatted with.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the LBA data size and metadata size combination that the namespace has been formatted with. This is a 4-bit data structure.</td>
<td>This field indicates the LBA data size &amp; metadata size combination that the namespace has been formatted with (refer to section 5.23). Bits 3:0 indicates one of the 16 supported LBA Formats indicated in this data structure.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
6.5.2.26 NVMeNamespaceProperties.MetadataTransferredAtEndOfDataLBA

The mapping for NVMeNamespaceProperties.MetadataTransferredAtEndOfDataLBA is summarized in Table 159.

**Table 159: NVMeNamespaceProperties.MetadataTransferredAtEndOfDataLBA mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM Spec Property / Field: Metadata transferred at end of LBA</td>
<td>Boolean</td>
<td>Type: ** Bit (bool)</td>
</tr>
<tr>
<td>NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
<td></td>
<td>Additional NVM Spec Identifying Information: Bit 4 of Byte 26</td>
</tr>
<tr>
<td>Description</td>
<td>This property indicates whether or not the metadata is transferred at the end of the LBA creating an extended data LBA.</td>
<td>This property indicates whether or not the metadata is transferred at the end of the data LBA.</td>
</tr>
</tbody>
</table>
This property shall indicate whether or not the metadata is transferred at the end of the LBA, creating an extended data LBA. Bit 4 if cleared to ‘0’ indicates that all of the metadata for a command is transferred as a separate contiguous buffer of data.

**Mandatory**
Yes

**Notes**
Returned in byte 26 (Formatted LBA Size), bit 4 of the Identify Namespace Data Structure (Reference NVMe Base Specification section 5.15.2.1 and figure 247. Bit 4 is not applicable when there is no metadata.

### 6.5.2.27 NVMeNamespaceProperties.NVMeVersion

The mapping for NVMeNamespaceProperties.NVMeVersion is summarized in Table 160.

**Table 160: NVMeNamespaceProperties.NVMeVersion mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>String</td>
<td>Int64</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The version of the NVMe Base Specification supported.</td>
<td>This property shall contain the version of the NVMe Base Specification supported.</td>
</tr>
</tbody>
</table>
### LongDescription
Indicates the major, minor, and tertiary version of the NVM Express base specification that the controller implementation supports. Valid versions of the specification are: 1.0, 1.1, 1.2, 1.2.1, 1.3, and 1.4.

**Mandatory:** Yes  
**Notes:** Returned in bytes 83:80 of the Identify Controller data structure - CNS 01h (reference NVMe Base Specification section 5.15.2.2 and figure 249.)

**6.5.2.28 OptimumIOSizeBytes**  
The mapping for OptimumIOSizeBytes is summarized in Table 161.

**Table 161: OptimumIOSizeBytes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
</table>
| OptimumIOSizeBytes        |                   | **NVM Spec Property / Field:** Namespace Optimal Write Size (NOWS)  
**NVM Spec: Section:Figure**  
Figure 247: Bytes 73:72 |
| Type                      | Int64             |                |
| Description               | The size in bytes of this Volume’s optimum IO size. | N/A |

As of 30 August 2021  
**Working Draft**  
265
This property shall contain the optimum IO size to use when performing IO on this volume. For logical disks, this is the stripe size. For physical disks, this describes the physical sector size.

Recommended for implementations with Endurance Groups and NVM Sets.

Convert from blocks to bytes.

6.5.2.29 ProvisioningPolicy

The mapping for ProvisioningPolicy is summarized in Table 162.

Table 162: OptimumIOSizeBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>ProvisioningPolicy</th>
<th>NVM Spec Property / Field: Identify Namespace / THINP NVM Spec: Section:Figure 247: Byte 24, Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>enum</td>
<td>(DataStorageLoS Capabilities.ProvisioningPolicy)</td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 266
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>N/A</td>
</tr>
<tr>
<td>This property</td>
<td>specifies the volume’s storage allocation, or provisioning policy.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall specify the volume's supported storage allocation policy.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Figure 247: Byte 24, Bit 0 indicates thin provisioning support for the namespace.</td>
</tr>
<tr>
<td>Notes</td>
<td>possible values: Fixed / Thin</td>
</tr>
</tbody>
</table>

### 6.5.2.30 Status.State

The mapping for `Status.state` is summarized in Table 163.

**Table 163**: Status.State mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Status.State</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.State (enum)</td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
</tr>
<tr>
<td></td>
<td>Indicates if the controller is in 'enabled' state.</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes Possible values: Enabled / Disabled / StandbyOffline / StandbySare / InTest / Starting / Absent / Un availableOffline / Deferring / Quiesced / Updating / Qualified

**6.5.2.31 Status.Health**  
The mapping for Status.Health is summarized in Table 164.

**Table 164: Status.Health mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Status.Health</td>
<td>Controller Fatal Status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(CSTS.CFS)</td>
</tr>
<tr>
<td>Description</td>
<td>Resource.Health</td>
<td>Bit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indicates if the controller is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>able to communicate with host</td>
</tr>
<tr>
<td></td>
<td></td>
<td>software via completion queue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>entries in the Admin Completion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Queue or I/O Completion Queues.</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification. If the controller has a serious error condition and is unable to communicate with host software via completion queue entries in the Admin Completion Queue or I/O Completion Queues, then the controller may set the Controller Fatal Status (CSTS.CFS) bit to ‘1’ (refer to section 3.1.6). This indicates to host software that a serious error condition has occurred. When this condition occurs, host software should attempt to reset and then re-initialize the controller. The Controller Fatal Status condition is not indicated with an interrupt. If host software experiences timeout conditions and/or repeated errors, then host software should consult the Controller Fatal Status (CSTS.CFS) bit to determine if a more serious error has occurred.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Possible Values: OK / Warning / Critical</td>
<td>Reference Figure 222 (NVMe Subsystem Hardware Error Event Codes) bit 09h of the NVMe Base Specification.</td>
</tr>
</tbody>
</table>
6.5.2.32 Status.HealthRollup  The mapping for Status.HealthRollup is summarized in Table 165.

**Table 165: Status.HealthRollup mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Status.HealthRollup</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Resource.Health</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The overall health state from the view of this resource.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the health state of the resource and its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>Do not use for Namespace. There are no dependent resources.</td>
<td>Do not implement.</td>
</tr>
</tbody>
</table>
6.5.2.33 StorageGroups  The mapping for StorageGroups is summarized in Table 166.

Table 166: StorageGroups mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>StorageGroupCollection.StorageGroupCollection</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An array of references to Storage Groups that includes this volume.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>The value of this property shall contain references to all storage groups that include this volume.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory Notes</td>
<td>Do Not Implement</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft
### 6.5.2.34 WriteCachePolicy

The mapping for `WriteCachePolicy` is summarized in Table 167.

**Table 167: WriteCachePolicy mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WriteCachePolicy</strong></td>
<td>WriteCachePolicy</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>StorageGroupCollection.StorageGroupCollection</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Indicates the write cache policy setting for the Volume</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain a boolean indicator of the write cache policy for the Volume.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Recommended.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Possible Values: WriteThrough, ProtectedWriteBack, UnprotectedWriteBack, Off. Set to “Off” when write cache disabled; set to other values when enabled.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
6.6 Endurance Group

The Redfish/Swordfish Storage Pool schema is used to represent an NVM Endurance Group.

6.6.1 Mockup

The following mockup shows a sample representation of the Storage Pool schema used to represent an NVM Endurance Group.

```json
{
    "@Redfish.Copyright": "Copyright 2015-2020 SNIA. All rights reserved.",
    "@odata.id": "/redfish/v1/Storage/FabricAttachArray/StoragePools/EnduranceGroup1",
    "@odata.type": "#StoragePool.v1_4_0.StoragePool",
    "Id": "1",
    "Name": "Endurance Group 1",
    "Description": "Single Endurance Group",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "NVMeEnduranceGroupProperties": {
        "EndGrpLifetime": {
            "PercentUsed": 0,
            "EnduranceEstimate": 0,
            "DataUnitsRead": 0,
            "DataUnitsWritten": 0,
            "MediaUnitsWritten": 0,
            "HostReadCommandCount": 0,
            "HostWriteCommandCount": 0,
            "MediaAndDataIntegrityErrorCount": 0,
            "ErrorInformationLogEntryCount": 0
        }
    },
    "Capacity": {
        "Data": {
            "AllocatedBytes": 10995116277760,
            "ConsumedBytes": 10995116277760
        }
    }
}
```
6.6.2 Property Mapping
6.6.2.1 AllocatedPools  The mapping for `AllocatedPools` is summarized in Table 168.

**Table 168: AllocatedPools mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>AllocatedPools</td>
<td></td>
</tr>
<tr>
<td>StoragePool</td>
<td>Collection.Stora</td>
<td></td>
</tr>
<tr>
<td>gePoolCollection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

A reference to the collection of storage pools allocated from this storage pool.

**LongDescription**

The value of this property shall contain a reference to the collection of storage pools allocated from this storage pool.

**Mandatory**

Required.

**Notes**

Contains a pointer to the NVM Set allocated from this Endurance Group.
6.6.2.2 Capacity.Data.AllocatedBytes  The mapping for Capacity.Data.AllocatedBytes is summarized in Table 169.

Table 169: Capacity.Data.AllocatedBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The number of bytes currently allocated by the storage system in this data store for this data type.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe Drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Note: This is not in 1.4a because TP 4009 was not integrated.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.6.2.3 Capacity.Data.ConsumedBytes

The mapping for `Capacity.Data.ConsumedBytes` is summarized in Table 170.

**Table 170: Capacity.Data.ConsumedBytes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Capacity.Data</td>
<td>The Consumed (allocated to NVM Sets) Endurance Group Capacity. Just the</td>
</tr>
<tr>
<td></td>
<td>ConsumedBytes</td>
<td>“Total Endurance Group Capacity” (TEGCAP) minus the Unallocated Endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group Capacity (UEGCAP) in the Endurance Group Log.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See 5.14.1.9 + TP 4009</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>The number of bytes consumed in this data store for this data type.</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>The value shall be the number of logical bytes currently consumed in this</td>
</tr>
<tr>
<td></td>
<td></td>
<td>data store for this data type.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td>Note: This is not in 1.4a because TP 4009 was not integrated.</td>
</tr>
</tbody>
</table>
6.6.2.4 CapacitySources  The mapping for CapacitySources is summarized in Table 171.

Table 171: CapacitySources mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collection(Capacity.CapacitySource)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>An array of space allocations to this volume.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>Fully or partially consumed storage from a source resource. Each entry provides capacity allocation information from a named source resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe Drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Contains the information about the providing capacity (e.g, EnduranceGroup) for this namespace.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.5 CapacitySources@odata.count  The mapping for CapacitySources@odata.count is summarized in Table 172.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><a href="mailto:CapacitySources@odata.count">CapacitySources@odata.count</a></td>
<td>(odata property)int64</td>
</tr>
<tr>
<td>Description</td>
<td>Count of the number of items in the CapacitySources array.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>This should be the same as the number of NVM Sets in the endurance group.</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  280
6.6.2.6 Description  The mapping for Description is summarized in Table 173.

Table 173: Description mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Description</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>String</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LongDescription</th>
<th>Description mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>The description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>In Redfish, Description is a read-only field. Return the common description: “An Endurance Group consists of zero or more NVM Sets. Endurance Groups divide the media into distinct wear-leveling domains.”</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  281
6.6.2.7 Links.OwninStorageResource  The mapping for Links.OwninStorageResource is summarized in Table 174.

Table 174: Links.OwninStorageResource mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Storage.Storage</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>A pointer to the Storage resource that owns or contains this StoragePool.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This shall be a pointer to the Storage resource that owns or contains this StoragePool.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Contains a pointer to the NVM Subsystem that contains this Endurance Group.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.8 Name  The mapping for Name is summarized in Table 175.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td>Endurance Group ID NVM Spec: Section:Figure NVMe 1.4a: Section 5.14,1,9, Get Log Page - Endurance Group Log</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>16-bit value</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>In Redfish, Name is a read-only field.</td>
<td>Map the Endurance Group ID field to a string with the format: “0xABCD”</td>
</tr>
</tbody>
</table>
6.6.2.9 NVMeProperties.NVMePoolType  The mapping for NVMeProperties.NVMePoolType is summarized in Table 176.

Table 176: NVMeProperties.NVMePoolType

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>StoragePool</td>
<td>Enum</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether the StoragePool is used as an EnduranceGroup or an NVMSet.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the StoragePool is used as an EnduranceGroup or an NVMSet.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Set as “EnduranceGroup”</td>
<td></td>
</tr>
</tbody>
</table>
### 6.6.2.10 NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent

The mapping for NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent is summarized in Table 177.

Table 177: NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Decimal %</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The percentage of reads and writes that are predicted to be available for the media.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an indicator of the percentage of life remaining in the drive’s media.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Inverse of “Percentage Used” in the Endurance Group Log. See 5.14.1.9. Subtract the percentage used from 100% to report this value.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.11 NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed  The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed is summarized in Table 178.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>A vendor-specific estimate of the percent life used for the endurance group based on the actual usage and the manufacturer prediction of NVM life.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>R edfish/Swordfish NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td>This property shall contain a vendor-specific estimate of the percent life used for the endurance group based on the actual usage and the manufacturer prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the Endurance Group has been consumed, but may not indicate an NVM failure. According to the NVMe and JEDEC specs, the value is allowed to exceed 100. Percentages greater than 254 shall be represented as 255.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.12 NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate is summarized in Table 179.

Table 179: NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td>“Endurance Estimate” in the Endurance Group Log. See 5.14.1.9</td>
</tr>
<tr>
<td>Description</td>
<td>This property contains an estimate of the total number of data bytes that may be written to the Endurance Group over the lifetime of the Endurance Group assuming a write amplification of 1.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain an estimate of the total number of data bytes that may be written to the Endurance Group over the lifetime of the Endurance Group assuming a write amplification of 1. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates endurance estimates are unsupported.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.13 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead is summarized in Table 180.

Table 180: NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units read from this endurance group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>The property shall contain the total number of data units read from this endurance group. This value does not include controller reads due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mandatory**: Required

**Notes**
6.6.2.14 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten is summarized in Table 181.

**Table 181:** NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units written from this endurance group.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The property shall contain the total number of data units written from this endurance group. This value does not include controller writes due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.</td>
<td></td>
</tr>
</tbody>
</table>

**Mandatory** Required

**Notes**
The mapping for `NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten` is summarized in Table 182.

**Table 182: NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units written from this endurance group.</td>
<td>“Media Units Written” in the Endurance Group Log. See 5.14.1.9</td>
</tr>
</tbody>
</table>
Redfish/Swordfish  NVMe / NVMe-oF

LongDescription
The property shall contain the total number of data units written from this endurance group. This value includes host and controller writes due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.

Mandatory
Required

Notes
6.6.2.16 NVMeEnduranceGroupProperties.EndGrpLifetime.HostReadCommandCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.HostReadCommandCount is summarized in Table 183.

Table 183: NVMeEnduranceGroupProperties.EndGrpLifetime.HostReadCommandCount mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of read commands completed by all controllers in the NVM subsystem for the Endurance Group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of read commands completed by all controllers in the NVM subsystem for the Endurance Group. For the NVM command set, the is the number of compare commands and read commands.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>
The mapping for `NVMeEnduranceGroupProperties.EndGrpLifetime.HostWriteCommandCount` is summarized in Table 184.

**Table 184:** `NVMeEnduranceGroupProperties.EndGrpLifetime.HostWriteCommandCount` mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of write commands completed by all controllers in the NVM subsystem for the Endurance Group.</td>
<td>See 5.14.1.9</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of write commands completed by all controllers in the NVM subsystem for the Endurance Group. For the NVM command set, the is the number of compare commands and write commands.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**
6.6.2.18 NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount is summarized in Table 185.

Table 185: NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of occurrences where the controller detected an unrecovered data integrity error for the Endurance Group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of occurrences where the controller detected an unrecovered data integrity error for the Endurance Group. Errors such as uncorrectable ECC, CRC checksum failure, or LBA tag mismatch are included in this field.</td>
<td></td>
</tr>
</tbody>
</table>

“Media and Data Integrity Errors” in the Endurance Group Log. See 5.14.1.9
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory</td>
<td>Required</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
</tbody>
</table>
The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.ErrorInformationLogEntryCount is summarized in Table 186.

**Table 186: NVMeEnduranceGroupProperties.EndGrpLifetime.ErrorInformationLogEntryCount mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of error information log entries over the life of the controller for the endurance group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of error information log entries over the life of the controller for the endurance group.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.20 NVMeSetProperties.SetIdentifier  The mapping for NVMeSetProperties.SetIdentifier is summarized in Table 187.

Table 187: NVMeSetProperties.SetIdentifier

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSetProperties.SetIdentifier</td>
<td></td>
<td>NVM Spec Property / Field: NVMSETID NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Spec Property Type: 16-bit value Additional NVM Spec Identifying Information: ByteOffset: 01:00</td>
</tr>
<tr>
<td>Description</td>
<td>A 16-bit hex value that contains the NVMe Set identifier.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a 16-bit hex value that contains the NVMe Set identifier. The NVM Set identifier is unique within a subsystem. Reserved values include 0.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeSetProperties as part of an EnduranceGroup.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.21 NVMeSetProperties.OptimalWriteSizeBytes  The mapping for NVMeSetProperties.OptimalWriteSizeBytes is summarized in Table 188.

Table 188: NVMeSetProperties.OptimalWriteSizeBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMeSet</td>
<td>NVM Spec Property / Field: OptimalWriteSize</td>
</tr>
<tr>
<td>Property</td>
<td>Properties.OptimalWriteSizeBytes</td>
<td>NVM Spec: Section:Figure NVM 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>NVM Spec Property Type: Bytes Additional NVM Spec Identifying Information: ByteOffset: 15:12</td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the Optimal Write Size in Bytes for this NVMe Set.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the Optimal Write Size in Bytes for this NVMe Set.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeSetProperties as part of an EnduranceGroup.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.22 NVMeSetProperties.EnduranceGroupIdentifier  The mapping for NVMe-
SetProperties.EnduranceGroupIdentifier is summarized in Table 189.

**Table 189: NVMeSetProperties.EnduranceGroupIdentifier mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSetProperties.EnduranceGroupIdentifier</td>
<td><strong>NVM Spec Property / Field:</strong> EnduranceGroupIdentifier</td>
<td><strong>NVM Spec: Section:</strong> Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td><strong>NVM Spec Property Type:</strong> 2 bytes Additional NVM Spec Identifying Information: ByteOffset: 03:02</td>
</tr>
<tr>
<td>Description</td>
<td>A 16-bit hex value that contains the endurance group identifier.</td>
<td><strong>LongDescription</strong> This property shall contain a 16-bit hex value that contains the endurance group identifier. The endurance group identifier is unique within a subsystem. Reserved values include 0.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td><strong>Mandatory</strong> Do Not Implement.</td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeSetProperties as part of an EnduranceGroup.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.23 NVMeSetProperties.Random4kReadTypicalNanoSeconds  The mapping for NVMeSetProperties.Random4kReadTypicalNanoSeconds is summarized in Table 190.

**Table 190: NVMeSetProperties.Random4kReadTypicalNanoSeconds mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM Spec Property / Field</td>
<td>NVMeSetProperties.Random4kReadTypicalNanoSeconds</td>
<td>NVM Spec Property / Field: Random 4 KiB Read Typical NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>NVM Spec Property Type: 4 bytes Additional NVM Spec Identifying Information: ByteOffset: 11:08</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the typical time to complete a 4k read in 100 nano-second units when the NVM Set is in a Predictable Latency Mode Deterministic Window and there is 1 outstanding command per NVM Set.</td>
<td></td>
</tr>
<tr>
<td>Prop</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the typical time to complete a 4k read in 100 nano-second units when the NVM Set is in a Predictable Latency Mode Deterministic Window and there is 1 outstanding command per NVM Set.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeSetProperties as part of an EnduranceGroup.</td>
<td></td>
</tr>
</tbody>
</table>
6.6.2.24 Status.Health  The mapping for Status.Health is summarized in Table 191.

Table 191: Status.Health mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Resource.Health</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The health state of this resource in the absence of its dependent resources.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Possible Values: OK / Warning / Critical</td>
<td>There is not a clear mapping for health of an Endurance Group. Do not implement this property.</td>
</tr>
</tbody>
</table>
6.6.2.25 Status.State  The mapping for Status.State is summarized in Table 192.

Table 192: Status.State mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Status.State</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.State</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The known state of the resource, such as, enabled.
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do not implement</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
</tr>
<tr>
<td>Possible values:</td>
<td>There is not a clear</td>
</tr>
<tr>
<td>Enabled / Disabled/</td>
<td>mapping for State of an</td>
</tr>
<tr>
<td>StandbyOffline /</td>
<td>Endurance Group. Do not</td>
</tr>
<tr>
<td>StandbySare / InTest/</td>
<td>implement this property.</td>
</tr>
<tr>
<td>Starting / ABsent /</td>
<td></td>
</tr>
<tr>
<td>Una vaialableOffline</td>
<td></td>
</tr>
<tr>
<td>Deferring /</td>
<td></td>
</tr>
<tr>
<td>Quiesced / Updating</td>
<td></td>
</tr>
<tr>
<td>Qualified</td>
<td></td>
</tr>
</tbody>
</table>
6.7 NVM Set

The Redfish/Swordfish Storage Pool schema is used to represent an NVM Set.

6.7.1 Mockup

The following mockup shows a sample representation of the Storage Pool schema used to represent an NVM Set.

```json
{
  "@Redfish.Copyright": "Copyright 2015-2020 SNIA. All rights reserved.",
  "@odata.id": "/redfish/v1/Storage/FabricAttachArray/StoragePools/NVMeSet1",
  "@odata.type": "#StoragePool.v1_4_0.StoragePool",
  "Id": "1",
  "Name": "Set 1",
  "Description": "First Set",
  "Status": {
    "State": "Enabled",
    "Health": "OK"
  },
  "NVMeSetProperties": {
    "SetIdentifier": "0x1F",
    "EnduranceGroupIdentifier": "0x1",
    "Random4kReadTypicalNanoSeconds": 34534345348,
    "UnallocatedNVMNamespaceCapacityBytes": 5497558138880,
    "OptimalWriteSizeBytes": 512
  },
  "Capacity": {
    "Data": {
      "AllocatedBytes": 10995116277760,
      "ConsumedBytes": 5497558138880
    }
  },
  "AllocatedVolumes": {
    "@odata.id": "/redfish/v1/Storage/FabricAttachArray/StoragePools/NVMeSet1/AllocatedVolumes"
  }
}
```
### 6.7.2 Property Mapping

#### 6.7.2.1 AllocatedVolumes

The mapping for `AllocatedVolumes` is summarized in Table 193.

**Table 193: AllocatedVolumes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
<td>AllocatedVolumes</td>
<td><strong>NVM Spec Property / Field: NVM Spec: Section:Figure</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>VolumeCollection. VolumeCollection</td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A reference to the collection of volumes allocated from this storage pool.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The value of this property shall contain a reference to the collection of volumes allocated from this storage pool.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>A pointer to the set of namespaces allocated from this NVM Set.</td>
<td>The allocated volumes contains pointers to the allocated volumes objects. These are the set of namespaces created from this NVM Set.</td>
</tr>
</tbody>
</table>
### 6.7.2.2 Capacity.Data.AllocatedBytes

The mapping for Name is summarized in Table 194.

**Table 194: Capacity.Data.AllocatedBytes mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity.Data.AllocatedBytes</td>
<td></td>
<td>NVM Spec Property / Field: Total NVM Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity NVM Spec: Section:Figure NVMe 1.4a:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>NVM Spec Property Type: bytes Additional NVM Spec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identifying Information: ByteOffset: 31:16 for Total NVM Set Capacity</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>The number of bytes currently allocated by the storage system in this data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>store for this data type.</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>The value shall be the number of bytes currently allocated by the storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>system in this data store for this data type.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.7.2.3 Capacity.Data.ConsumedBytes

The mapping for `Capacity.Data.ConsumedBytes` is summarized in Table 195.

#### Table 195: Capacity.Data.ConsumedBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Int64</td>
<td><strong>NVM Spec Property</strong></td>
</tr>
<tr>
<td><strong>NVM Spec Field</strong></td>
<td>Total NVM Set Capacity</td>
<td><strong>Field:</strong> Total NVM Set Capacity, Unallocated NVM Set Capacity</td>
</tr>
<tr>
<td><strong>NVM Spec Section</strong></td>
<td>NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
<td><strong>Section:</strong> Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td><strong>Additional NVM Spec</strong></td>
<td>bytes</td>
<td><strong>NVM Spec Property Type:</strong> bytes</td>
</tr>
<tr>
<td><strong>Identifying Information</strong></td>
<td></td>
<td><strong>Identifying Information:</strong> ByteOffset: 31:16 for Total NVM Set Capacity</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The maximum number of bytes that can be allocated in this data store for this data type.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The value shall be the maximum number of bytes that can be allocated in this data store for this data type.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>This is calculated as “Total NVM Set Capacity” - “Unallocated NVM Set Capacity”.</td>
</tr>
</tbody>
</table>
6.7.2.4 CapacitySources  The mapping for `CapacitySources` is summarized in Table 196.

Table 196: CapacitySources mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Collection(Capacity .CapacitySource)</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>An array of space allocations to this volume.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>Fully or partially consumed storage from a source resource. Each entry provides capacity allocation information from a named source resource.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended to not implement for NVMe Drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Contains the information about the providing capacity (e.g, memory) for this namespace.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.5 CapacitySources@odata.count  The mapping for CapacitySources@odata.count is summarized in Table 197.

Table 197: CapacitySources@odata.count mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td><a href="mailto:CapacitySources@odata.count">CapacitySources@odata.count</a></td>
<td>(odata property)int64</td>
</tr>
<tr>
<td>Description</td>
<td>Count of the number of items in the CapacitySources array.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement for NVMe Drives.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.6 Description  The mapping for Description is summarized in Table 198.

**Table 198: Description mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Description</td>
<td>NVM Spec Property / Field: N/A</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
<td>See note below.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>In Redfish, Description is a read-only field.</td>
<td>Return the common description: “An NVM Set is a collection of NVM that is separate (logically and potentially physically) from NVM in other NVM Sets. One or more namespaces may be created within an NVM Set and those namespaces inherit the attributes of the NVM Set. A namespace is wholly contained within a single NVM Set and shall not span more than one NVM Set.”</td>
</tr>
</tbody>
</table>
6.7.2.7 Links.OwningStorageResource  The mapping for Links.OwningStorageResource is summarized in Table 199.

**Table 199: Links.OwningStorageResource mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Storage.Storage</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>A pointer to the Storage resource that owns or contains this StoragePool.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This shall be a pointer to the Storage resource that owns or contains this StoragePool.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Contains a pointer to the NVM Subsystem that contains this NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.7.2.8 Name

The mapping for `Name` is summarized in Table 200.

#### Table 200: Name mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td><strong>NVM Spec Property / Field</strong>: NVMSETID NVM Spec: Section:Figure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>The name of the resource or array member.</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the ‘Name’ reserved word format.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>In Redfish, Name is a read-only field. Map the NVMSETID field to a string with the format: “0xABCD”</td>
</tr>
</tbody>
</table>
6.7.2.9 NVMeProperties.NVMePoolType  The mapping for NVMeProperties.NVMePoolType is summarized in Table 201.

### Table 201: NVMeProperties.NVMePoolType

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>StoragePool</td>
<td>Enum</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates whether the StoragePool is used as an EnduranceGroup or an NVMSet.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the StoragePool is used as an EnduranceGroup or an NVMSet.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Set as “NVMSet”</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft
### 6.7.2.10 NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent

The mapping for `NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent` is summarized in Table 202.

**Table 202: NVMeEnduranceGroupProperties.PredictedMediaLifeLeftPercent mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Decimal %</td>
<td>“Percentage Used” in the Endurance Group Log. See 5.14.1.9</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The percentage of reads and writes that are predicted to be available for the media.</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain an indicator of the percentage of life remaining in the drive’s media.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.11 NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed  The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed is summarized in Table 203.

Table 203: NVMeEnduranceGroupProperties.EndGrpLifetime.PercentUsed mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>A vendor-specific estimate of the percent life used for the endurance group based on the actual usage and the manufacturer prediction of NVM life.</td>
<td>“Percentage Used” in the Endurance Group Log. See 5.14.1.9</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain a vendor-specific estimate of the percent life used for the endurance group based on the actual usage and the manufacturer prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the Endurance Group has been consumed, but may not indicate an NVM failure. According to the NVMe and JEDEC specs, the value is allowed to exceed 100. Percentages greater than 254 shall be represented as 255.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.12 NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate is summarized in Table 204.

Table 204: NVMeEnduranceGroupProperties.EndGrpLifetime.EnduranceEstimate mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains an estimate of the total number of data bytes that may be written to the Endurance Group over the lifetime of the Endurance Group assuming a write amplification of 1.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an estimate of the total number of data bytes that may be written to the Endurance Group over the lifetime of the Endurance Group assuming a write amplification of 1. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates endurance estimates are unsupported.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.13 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead is summarized in Table 205.

**Table 205: NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsRead mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units read from this endurance group.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The property shall contain the total number of data units read from this endurance group. This value does not include controller reads due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.7.2.14 NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten is summarized in Table 206.

**Table 206: NVMeEnduranceGroupProperties.EndGrpLifetime.DataUnitsWritten mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units written from this endurance group.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The property shall contain the total number of data units written from this endurance group. This value does not include controller writes due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.15 NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten is summarized in Table 207.

Table 207: NVMeEnduranceGroupProperties.EndGrpLifetime.MediaUnitsWritten mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The property contains the total number of data units written from this endurance group.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>The property shall contain the total number of data units written from this endurance group. This value includes host and controller writes due to internal operations such as garbage collection. The value is reported in billions, where a value of 1 corresponds to 1 billion bytes written, and is rounded up. A value of zero indicates the property is unsupported.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.16 NVMeEnduranceGroupProperties.EndGrpLifetime.HostReadCommandCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.HostReadCommandCount is summarized in Table 208.

Table 208:
NVMeEnduranceGroupProperties.EndGrpLifetime. HostReadCommandCount mapping

<table>
<thead>
<tr>
<th></th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of read commands completed by all controllers in the NVM subsystem for the Endurance Group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of read commands completed by all controllers in the NVM subsystem for the Endurance Group. For the NVM command set, the is the number of compare commands and read commands.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.17 NVMeEnduranceGroupProperties.EndGrpLifetime.HostWriteCommandCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.HostWriteCommandCount is summarized in Table 209.

Table 209:
NVMeEnduranceGroupProperties.EndGrpLifetime. HostWriteCommandCount mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of write commands completed by all controllers in the NVM subsystem for the Endurance Group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of write commands completed by all controllers in the NVM subsystem for the Endurance Group. For the NVM command set, the is the number of compare commands and write commands.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.18 NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount is summarized in Table 210.

**Table 210:**
NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>NVMeEnduranceGroupProperties.EndGrpLifetime.MediaAndDataIntegrityErrorCount</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
</tr>
<tr>
<td>Description</td>
<td>This property contains the number of occurrences where the controller detected an unrecovered data integrity error for the Endurance Group.</td>
</tr>
<tr>
<td></td>
<td>“Media and Data Integrity Errors” in the Endurance Group Log. See 5.14.1.9</td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of occurrences where the controller detected an unrecovered data integrity error for the Endurance Group. Errors such as uncorrectable ECC, CRC checksum failure, or LBA tag mismatch are included in this field.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
</tr>
</tbody>
</table>
6.7.2.19 NVMeEnduranceGroupProperties.EndGrpLifetime.ErrorInformationLogEntryCount

The mapping for NVMeEnduranceGroupProperties.EndGrpLifetime.ErrorInformationLogEntryCount is summarized in Table 211.

Table 211:
NVMeEnduranceGroupProperties.EndGrpLifetime. ErrorInformationLogEntryCount mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description (cont.)</td>
<td>This property contains the number of error information log entries over the life of the controller for the endurance group.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the number of error information log entries over the life of the controller for the endurance group.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Do not implement NVMeEnduranceGroupProperties as part of an NVM Set.</td>
<td></td>
</tr>
</tbody>
</table>

6.7.2.20 NVMeSetProperties.SetIdentifier

The mapping for NVMeSetProperties.SetIdentifier is summarized in Table 212.
### Table 212: NVMeSetProperties.SetIdentifier

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSetProperties.SetIdentifier</td>
<td><strong>NVM Spec Property / Field:</strong> NVMSETID NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td><strong>NVM Spec Property Type:</strong> 16-bit value <strong>Additional NVM Spec Identifying Information:</strong> ByteOffset: 01:00</td>
</tr>
<tr>
<td>Description</td>
<td>A 16-bit hex value that contains the NVMe Set identifier.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a 16-bit hex value that contains the NVMe Set identifier. The NVMe Set identifier is unique within a subsystem. Reserved values include 0.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>Return as hex value as described in the Swordfish schema.</td>
</tr>
</tbody>
</table>
6.7.2.21 NVMeSetProperties.OptimalWriteSizeBytes  The mapping for NVMeSetProperties.OptimalWriteSizeBytes is summarized in Table 213.

**Table 213:** NVMeSetProperties.OptimalWriteSizeBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSet</td>
<td></td>
<td><strong>NVM Spec Property / Field:</strong> OptimalWriteSize</td>
</tr>
<tr>
<td>Properties.OptimalWriteSizeBytes</td>
<td></td>
<td><strong>NVM Spec: Section:</strong> Figure 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td><strong>NVM Spec Property Type:</strong> Bytes Additional NVM Spec Identifying Information: ByteOffset: 15:12</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td>This property contains the Optimal Write Size in Bytes for this NVMe Set.</td>
</tr>
<tr>
<td>LongDescription</td>
<td></td>
<td>This property shall contain the Optimal Write Size in Bytes for this NVMe Set.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6.7.2.22 NVMeSetProperties.EnduranceGroupIdentifier

The mapping for `NVMeSetProperties.EnduranceGroupIdentifier` is summarized in Table 214.

**Table 214: NVMeSetProperties.EnduranceGroupIdentifier mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSetProperties.EnduranceGroupIdentifier</td>
<td><strong>NVM Spec Property</strong> / <strong>Field:</strong> EnduranceGroupIdentifier</td>
<td><strong>NVM Spec: Section:</strong> Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td><strong>NVM Spec Property Type:</strong> 2 bytes Additional NVM Spec Identifying Information: ByteOffset: 03:02</td>
</tr>
<tr>
<td>Description</td>
<td>A 16-bit hex value that contains the endurance group identifier.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a 16-bit hex value that contains the endurance group identifier. The endurance group identifier is unique within a subsystem. Reserved values include 0.</td>
<td></td>
</tr>
<tr>
<td>Mandatory Notes</td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.23 NVMeSetProperties.Random4kReadTypicalNanoSeconds  The mapping for NVMeSetProperties.Random4kReadTypicalNanoSeconds is summarized in Table 215.

Table 215: NVMeSetProperties.Random4kReadTypicalNanoSeconds mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVMeSetProperties.Random4kReadTypicalNanoSeconds</td>
<td>NVM Spec Property / Field: Random 4 KiB Read Typical NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td>NVM Spec Property Type: 4 bytes Additional NVM Spec Identifying Information: ByteOffset: 11:08</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the typical time to complete a 4k read in 100 nano-second units when the NVM Set is in a Predictable Latency Mode Deterministic Window and there is 1 outstanding command per NVM Set.</td>
<td></td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the typical time to complete a 4k read in 100 nano-second units when the NVM Set is in a Predictable Latency Mode Deterministic Window and there is 1 outstanding command per NVM Set.</td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Convert from 100 nanosecond units to nanosecond units.</td>
<td></td>
</tr>
</tbody>
</table>
6.7.2.24 NVMeSetProperties.UnallocatedNVMMNamespaceCapacityBytes  The mapping for NVMeSetProperties.UnallocatedNVMMNamespaceCapacityBytes is summarized in Table 216.

**Table 216: NVMeSetProperties.Random4kReadTypicalNanoSeconds mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVMeSetProperties.UnallocatedNVMMNamespaceCapacityBytes</td>
<td>NVM Spec Property / Field: Random 4 KiB Read Typical NVM Spec: Section: Figure NVMe 1.4a: Section 5.15.2.5, Figure 253: NVM Set Attributes Entry</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Indicates the unallocated capacity of the NVMe Set in bytes.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the unallocated capacity of the NVMe Set in bytes.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Convert from 100 nanosecond units to nanosecond units.</td>
<td></td>
</tr>
</tbody>
</table>

6.7.2.25 Status.State  The mapping for Status.State is summarized in Table 217.
**Table 217:** Status.State mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Resource.State</td>
<td>NVM Spec Property / Field: N/A</td>
</tr>
<tr>
<td>Type</td>
<td>(enum)</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The known state of the resource, such as, enabled.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  348
<table>
<thead>
<tr>
<th><strong>Redfish/Swordfish</strong></th>
<th><strong>NVMe / NVMe-oF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but it can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
</tr>
</tbody>
</table>

**Mandatory** | Do not implement. |
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>Possible values:</td>
<td></td>
</tr>
<tr>
<td>Enabled / Disabled /</td>
<td></td>
</tr>
<tr>
<td>StandbyOffline /</td>
<td></td>
</tr>
<tr>
<td>StandbySpare /</td>
<td></td>
</tr>
<tr>
<td>InTest / Starting /</td>
<td></td>
</tr>
<tr>
<td>ABsent / Una</td>
<td></td>
</tr>
<tr>
<td>elableOffline /</td>
<td></td>
</tr>
<tr>
<td>Deferring / Quiesced</td>
<td></td>
</tr>
<tr>
<td>Updating /</td>
<td></td>
</tr>
<tr>
<td>Qualified</td>
<td></td>
</tr>
</tbody>
</table>

There is not a clear mapping for State of an NVM Set. Do not implement this property.
6.7.2.26 Status.Health  The mapping for Status.Health is summarized in Table 218.

Table 218: Status.Health mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Status.Health</td>
<td>NVM Spec Property / Field: N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.Health</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The health state of this resource in the absence of its dependent resources.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do not implement.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Possible Values: OK / Warning / Critical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is not a clear mapping for health of an NVM Set. Do not implement this property.</td>
<td></td>
</tr>
</tbody>
</table>
6.8 Drive

The Redfish/Swordfish Drive schema represent the physical attributes of an NVMe drive object.

6.8.1 Mockup

The following mockup shows a sample representation of the Volume schema used to represent an NVM Namespace.

```json
{
    "@odata.id": "/redfish/v1/Chassis/SimplestNVMeSSD/Drives/SimplestNVMeSSD",
    "@odata.type": "#Drive.v1_9_0.Drive",
    "IndicatorLED": "Lit",
    "Model": "ST9146802SS",
    "Revision": "S20A",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "CapacityBytes": 899527000000,
    "FailurePredicted": true,
    "Protocol": "NVMe",
    "MediaType": "SSD",
    "Manufacturer": "Contoso",
    "SerialNumber": "72D0A037FRD26",
    "PartNumber": "SG0GP8811253178M02GJA00",
    "Identifiers": [{
        "DurableNameFormat": "NAA",
        "DurableName": "500003942810D13A"
    }],
    "CapableSpeedGbs": 12,
    "NegotiatedSpeedGbs": 12,
    "Links": {
        "Volumes": [{
            "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Volumes/SimpleNamespace"
        }],
        "Actions": {
            "#Drive.Reset": {
                "target": "/redfish/v1/Chassis/SimplestNVMeSSD/Drives/SimplestNVMeSSD/Actions/Drive.Reset"
            }
        }
    }
}
```
6.8.2 Property Mapping
6.8.2.1 Actions.#Drive.Reset  The mapping for Actions.#Drive.Reset is summarized in Table 219.

Table 219: Actions.#Drive.Reset mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions.#Drive.Reset</td>
<td>NVM Spec Property</td>
<td>Shutdown Notification (SHN)</td>
</tr>
<tr>
<td></td>
<td>Field:</td>
<td>NVMe</td>
</tr>
<tr>
<td></td>
<td>Section:Figure</td>
<td>Figure 78: Offset 14h, Bits</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>15:14</td>
</tr>
<tr>
<td>Description</td>
<td>Action (Special form of POST)</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This action resets this drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required for NVMe Drives</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This action has a mandatory property of “ResetType”, which can be any of On/ForceOff/GracefulShutdown/GracefulRestart/Nmi/ForceRestart/ForceOn/PushPowerButton/PowerCycle.</td>
<td>Usage: A normal NVM Subsystem shutdown maps to GracefulShutdown; Subsystem Reset maps to ForceRestart; abrupt Subsystem Shutdown maps to ForceOff. If an implementation that supports the functionality, then they may implement PowerCycle.</td>
</tr>
</tbody>
</table>

6.8.2.2 Actions.#Drive.SecureErase  The mapping for Actions.#Drive.SecureErase is summarized in Table 220.
Table 220: Actions.#Drive.SecureErase mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Action (Special form of POST)</td>
<td>NVM Spec Property / Field: NVM Spec: Section:Figure Section 5.24 Sanitize Command</td>
</tr>
<tr>
<td>Description</td>
<td>This action securely erases the contents of the drive.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This action shall securely erase the drive.</td>
<td>TD</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Maps to sanitize. Implementation can support any variant.</td>
<td></td>
</tr>
</tbody>
</table>

6.8.2.3 Assembly.BinaryDataURI The mapping for Assembly.BinaryDataURI is summarized in Table 221.

Table 221: Assembly.BinaryDataURI mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM-MI Spec Property / Field: Vital Product Data (VPD) NVM Spec: Section:Figure NVMe-MI: Section 9.2</td>
</tr>
</tbody>
</table>

As of 30 August 2021 Working Draft 355
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>The URI at which to access an image of the assembly information.</td>
</tr>
<tr>
<td><strong>LongDescription</strong></td>
<td>This property shall contain the URI at which to access an image of the assembly information, using the Redfish protocol and authentication methods. The Service provides this URI for the download of the OEM-specific binary image of the assembly data. An HTTP GET from this URI shall return a response payload of MIME type application/octet-stream. If the service supports it, an HTTP PUT to this URI shall replace the binary image of the assembly.</td>
</tr>
<tr>
<td><strong>Mandatory</strong></td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Use to map binary blob via NVMe MI to the VPD.</td>
</tr>
</tbody>
</table>
6.8.2.4 BlockSizeBytes  The mapping for BlockSizeBytes is summarized in Table 222.

Table 222: BlockSizeBytes mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BlockSizeBytes</td>
<td></td>
<td>NVM Spec Property / Field: Formatted LBA Size (FLBAS) NVM Spec: Section: Figure 247: byte 26</td>
</tr>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The size, in bytes, of the smallest addressable unit, or block.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain size of the smallest addressable unit of the associated drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Follow index in 247: Byte 26 (bits 3:0) to the LBA format structure to get the metadata size and LBA data size combination. These combined values are BlockSizeBytes.</td>
<td></td>
</tr>
</tbody>
</table>

6.8.2.5 CapableSpeedGpbs  The mapping for CapableSpeedGpbs is summarized in Table 223.
### Table 223: CapableSpeedGpbs mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Decimal</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The speed, in gigabit per second (Gbit/s), at which this drive can communicate to a storage controller in ideal conditions.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain fastest capable bus speed, in gigabit per second (Gbit/s), of the associated drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For PCIe, this is in the PCIe link capabilities (PXCAP+Ch). Figure 53. For NVMe-oF this is not specified; use the value for the highest supported native capability.</td>
<td></td>
</tr>
</tbody>
</table>

**6.8.2.6 CapacityBytes**  The mapping for CapacityBytes is summarized in Table 225.

For drives supporting only a single namespace (no or default endurance group / set only):
Table 224: CapacityBytes for single namespace mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>CapacityBytes</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
<td>NVM Spec Property / Field: Namespace Size (NSZE) NVM Spec: Section:Figure NVMe 1.4a: Section 5.15.2.1 (Identify Namespace), Figure 247</td>
</tr>
<tr>
<td>Description</td>
<td>The size, in bytes, of this drive.</td>
<td></td>
<td>The total size of the NVM allocated to this namespace.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the raw size, in bytes, of the associated drive.</td>
<td></td>
<td>The total size of the NVM allocated to this namespace. The value is in bytes. This field shall be supported if the Namespace Management capability (refer to NVMe Base Specification section 8.12) is supported. This field may not correspond to the logical block size multiplied by the Namespace Size field. Due to thin provisioning or other settings (e.g., endurance), this field may be larger or smaller than the Namespace Size reported.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td>No</td>
<td>NVM Spec Property Type: int 64 Additional NVM Spec Identifying Information: ByteOffset: 07:00, Identify Namespace data structure</td>
</tr>
</tbody>
</table>
Notes Reporting capacity in bytes is the Redfish and Swordfish standard mechanism. Returned in bytes 63:48 of the Identify Namespace Data Structure (NVM Command Set Specific). Reference NVMe Base Specification section in 5.15.2.1 and figure 247.

For drives supporting multiple namespaces:

**Table 225:** CapacityBytes for single namespace mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>CapacityBytes</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Int64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The number of bytes currently allocated by the storage system in this data store for this data type.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.8.2.7 Description  The mapping for Description is summarized in Table 226.

Table 226: Description mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The description of this resource.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the description of this resource. The resource values shall comply with the Redfish Specification-described requirements.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>In Redfish, Description is a read-only field.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6.8.2.8 EncryptionAbility  The mapping for EncryptionAbility is summarized in Table 227.
### Table 227: EncryptionAbility mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>EncryptionAbility</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The encryption ability of this drive.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the encryption ability for the associated drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Required when encryption is supported. Available values: None/SelfEncryptingDrive/Other</td>
<td>Maps to vendor capabilities.</td>
</tr>
</tbody>
</table>

#### 6.8.2.9 EncryptionStatus

The mapping for EncryptionStatus is summarized in Table 228.

### Table 228: EncryptionStatus mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>EncryptionStatus Drive. EncryptionStatus</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The status of the encryption of this drive.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the encryption status for the associated drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>DependsOn EncryptionAbility != None</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Must be implemented and set when Encryption is enabled (EncryptionAbility will indicate encryption capability type.) Possible values: Unlocked/locked/foreign/unencrypted</td>
<td>Set according to vendor specs / mapping.</td>
</tr>
</tbody>
</table>

6.8.2.10 **FailurePredicted**  The mapping for FailurePredicted is summarized in Table 229.

**Table 229:** FailurePredicted mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>FailurePredicted</td>
<td>NVM Spec Property / Field: SmartHealthLog NVM Spec: Section:Figure 196</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>An indication of whether this drive currently predicts a failure in the near future.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether this drive currently predicts a manufacturer-defined failure.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Implements the results of the SMART log data.</td>
<td>Trigger when the smart health errors indicate an issue (e.g.,): media and data integrity errors, and self-check.</td>
</tr>
</tbody>
</table>
### 6.8.2.11 Identifiers

The mapping for Identifiers is summarized in Table 230.

**Table 230: Identifiers mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Identifiers</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>Description</td>
<td>Collection(Resource.Identifier)</td>
<td>An array of identifiers</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain a list of all known durable names for the associated subsystem.</td>
<td>This specifies the NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string. Refer to NVMe Base Specification, section 7.9, for the definition of NVMe Qualified Name. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2).</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This is an array of unique identifiers for the NVM Subsystem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.</td>
<td></td>
</tr>
</tbody>
</table>
6.8.2.12 **Identifiers.DurableNameFormat**  
The mapping for Identifiers.DurableNameFormat is summarized in Table 231.

**Table 231: Identifiers.DurableNameFormat mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Identifiers.DurableNameFormat</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>Type</td>
<td>Resource.v1_1_0.DurableNameFormat</td>
<td>There is a single value for this array in Subsystem. The property type is of type NVMe Qualified Name (NQN).</td>
</tr>
<tr>
<td>Description</td>
<td>The format of the Durable names for the subsystem.</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This specifies the format of the associated NVM Subsystem NVMe Qualified Name of type NQN. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2).</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>This is an enum with multiple potential values. For this particular usage in Subsystem, there will only be one instance populated, of type NQN.</td>
<td>There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.</td>
</tr>
</tbody>
</table>
6.8.2.13 Identifiers.DurableName  The mapping for Identifiers.DurableName is summarized in Table 232.

Table 232: Identifiers.DurableName mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Edm.String</td>
<td>The NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string</td>
</tr>
<tr>
<td>Description</td>
<td>The format of the Durable names for the subsystem.</td>
<td>NVM Subsystem NVMe Qualified Name (SUBNQN)</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This specifies the NVM Subsystem NVMe Qualified Name as a UTF-8 null-terminated string. Refer to NVMe Base Specification, section 7.9, for the definition of NVMe Qualified Name. Support for this field is mandatory if the controller supports revision 1.2.1 or later as indicated in the Version register (refer to section 3.1.2).</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes
For this particular usage in Subsystem, there will only be one instance populated in the identifiers array.

There will only be one instance in this array for Subsystem. Refer to the Identify Controller data structure (CNS 01h) bits 1023:768 in figure 249 (Identify – Identify Controller Data Structure) of the NVMe Base Specification.

6.8.2.14 IndicatorLED
The mapping for IndicatorLED is summarized in Table 233.

Table 233: IndicatorLED mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An indication of whether this drive currently predicts a failure in the near future.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether this drive currently predicts a manufacturer-defined failure.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  370
Notes

This property has been deprecated. See guidance / implement the Location IndicatorActive property instead.

6.8.2.15 Links.Volumes

The mapping for Links.Volume is summarized in Table 234.

Table 234: Links.Volume mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Links.Volume</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>An array of links to the volumes that this drive either wholly or only partially contains.</td>
<td></td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  371
This property shall contain an array of links to resources of type Volume with which this drive is associated. This property shall include all volume resources of which this drive is a member and all volumes for which this drive acts as a spare if the hot spare type is Dedicated.

This array shall contain links to all namespaces associated with this physical drive. One way to do this would be get all of the controllers, iterate through the list and get all of the namespace ids.

### 6.8.2.16 Links.Volumes@odata.count

The mapping for `Links.Volumes@odata.count` is summarized in Table 235.

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:Links.Volumes@odata.count">Links.Volumes@odata.count</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>(odata property)int64</td>
<td>N/A</td>
</tr>
</tbody>
</table>

As of 30 August 2021  Working Draft  372
### Description
Count of the number of items in the Links.Volume array.

### Notes
The number of namespaces is available from NVMe on a per controller basis.

#### 6.8.2.17 Location
The mapping for Location is summarized in Table 236.

**Table 236: Location mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Location</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Collection(Resource.Location)</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The location of the drive.</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes</td>
<td>This property shall contain location information of the associated drive.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This property has been deprecated. See guidance / implement the PhysicalLocation property instead.</td>
<td></td>
</tr>
</tbody>
</table>
### 6.8.2.18 LocationIndicatorActive

The mapping for `LocationIndicatorActive` is summarized in Table 237.

**Table 237: LocationIndicatorActive mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LocationIndicatorActive</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An indicator</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>allowing an operator to physically locate this resource.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the state of the indicator used to physically identify or locate this resource. A write to this property shall update the value of IndicatorLED in this resource, if supported, to reflect the implementation of the locating function.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This property replaces the IndicatorLED, which has been deprecated.</td>
<td>Comes from vendor.</td>
</tr>
</tbody>
</table>

### 6.8.2.19 Manufacturer

The mapping for `Manufacturer` is summarized in Table 238.
Table 238: Manufacturer mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Manufacturer</td>
<td>NVM Spec Property / Field: NVM Spec: Section: Figure</td>
</tr>
<tr>
<td>Description</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The manufacturer of this drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>End clients expect to see the name of the company (e.g., Contoso, BestVendor). While the value may be filled from the IdentifyController PCI Vendor ID or SubsystemID field, it would be preferable to have this filled with the actual string value of the company name.</td>
<td></td>
</tr>
</tbody>
</table>

6.8.2.20 MediaType  The mapping for MediaType is summarized in Table 239.
Table 239: MediaType mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>enum (MediaType)</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The type of media contained in this drive.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the type of media contained in the associated drive.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Possible values: HDD/SSD/SMR.</td>
<td>NVMe SSD Drives to report SSD.</td>
</tr>
</tbody>
</table>

6.8.2.21 Model  The mapping for Model is summarized in Table 240.

Table 240: Model mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The model number for the drive.</td>
<td>NVM Spec Property / Field: IdentifyController / Model Number (MN) NVM Spec: Section: Figure 249 byte 24:63</td>
</tr>
</tbody>
</table>
6.8.2.22 Multipath  The mapping for Multipath is summarized in Table 241.

Table 241: Multipath mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An indication of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>whether the drive is accessible from multiple paths.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the drive is accessible by an initiator from multiple paths allowing for failover capabilities upon a path failure.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NVM Spec Property / Field: IdentifyNamespace: NMIC NVM Spec: Section:Figure 247: Byte 30, bit 0
<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory</td>
<td>Recommended to implement. Required property if drive is dual-ported.</td>
</tr>
</tbody>
</table>

**Notes**

### 6.8.2.23 Name

The mapping for Name is summarized in Table 242.

**Table 242: Name mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Name</td>
<td>NVM Spec Property / Field: Namespace ID (NSID)</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td>NVM Spec: Section:Figure</td>
</tr>
<tr>
<td>Description</td>
<td>The name of the resource or array member.</td>
<td>NVMe 1.4a</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This object represents the name of this resource or array member. The resource values shall comply with the Redfish Specification-described requirements. This string value shall be of the 'Name' reserved word format.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Yes</td>
<td>N/A</td>
</tr>
</tbody>
</table>

As of 30 August 2021  **Working Draft**
6.8.2.24 **NegotiatedSpeedGbps**  The mapping for `NegotiatedSpeedGbps` is summarized in Table 243.

**Table 243: NegotiatedSpeedGbps mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NegotiatedSpeedGbps</td>
<td>N/A</td>
<td><strong>NVM Spec Property / Field:</strong> N/A **NVM Spec: Section:**Figure N/A</td>
</tr>
<tr>
<td>Type</td>
<td>Decimal</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The speed, in gigabit per second (Gbit/s), at which this drive currently communicates to the storage controller.</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain current bus speed, in gigabit per second (Gbit/s), of the associated drive.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>For PCIe, this is in the PCIe link capabilities (PXCAP+12h). Figure 55. For NVMe-oF this is not specified; use the value for the native capability.</td>
<td></td>
</tr>
</tbody>
</table>
6.8.2.25 PhysicalLocation.Info  The mapping for PhysicalLocation.Info is summarized in Table 244.

Table 244: PhysicalLocation.Info mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhysicalLocation.Info</td>
<td>NVM Spec Property / Field: N/A</td>
<td>NVM Spec: Section:Figure N/A</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This property has been deprecated.</td>
<td></td>
</tr>
</tbody>
</table>

6.8.2.26 PhysicalLocation.InfoFormat  The mapping for PhysicalLocation.InfoFormat is summarized in Table 245.

Table 245: PhysicalLocation.InfoFormat mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhysicalLocation.InfoFormat</td>
<td>NVM Spec Property / Field: N/A</td>
<td>NVM Spec: Section:Figure N/A</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Do Not Implement</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>This property has been deprecated.</td>
<td></td>
</tr>
</tbody>
</table>

6.8.2.27 PhysicalLocation.PartLocation  The mapping for PhysicalLocation.PartLocation is summarized in Table 246.
### Table 246: PhysicalLocation.PartLocation mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhysicalLocation.PartLocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Boolean</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An indication of whether the drive is accessible from multiple paths.</td>
<td>N/A</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the drive is accessible by an initiator from multiple paths allowing for failover capabilities upon a path failure.</td>
<td>N/A</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Recommended to implement. Required property if drive is dual-ported.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>The drive should support this property to be filled in by a layered process (e.g., BMC). Support for any other properties in PhysicalLocation are at the discretion of the vendor.</td>
<td></td>
</tr>
</tbody>
</table>
6.8.2.28 PredictedMediaLifetimeLeftPercent  The mapping for PredictedMediaLifetimeLeftPercent is summarized in Table 247.

Table 247: PredictedMediaLifetimeLeftPercent mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NVM Spec Property / Field: Get Log Page – SMART / Health Information Log NVM Spec: Section:Figure Figure 196: 05</td>
</tr>
<tr>
<td>Type</td>
<td>Decimal</td>
</tr>
<tr>
<td>Description</td>
<td>The percentage of reads and writes that are predicted to be available for the media.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain an indicator of the percentage of life remaining in the drive’s media.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
</tr>
<tr>
<td>Notes</td>
<td>Maps to percentage used in SMART information log Calculate as 100 - value reported (PercentageUsed).</td>
</tr>
</tbody>
</table>

6.8.2.29 Protocol  The mapping for Protocol is summarized in Table 248.

Table 248: Protocol mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Protocol</td>
</tr>
</tbody>
</table>
Redfish/Swordfish protocol

Type

Protocol

Description

The protocol that this drive currently uses to communicate to the storage controller.

LongDescription

This property shall contain the protocol that the associated drive currently uses to communicate to the storage controller for this system.

Mandatory

Required.

Notes

Possible values

NVMe Drives shall report “NVMe”.

6.8.2.30 Revision

The mapping for Revision is summarized in Table 249.

Table 249: Revision mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision</td>
<td>String</td>
<td></td>
<td>NVM Spec Property / Field: IdentifyController: Firmware Revision (FR) NVM Spec: Section:Figure 249: 71:64</td>
</tr>
</tbody>
</table>
The revision of this drive. This is typically the firmware or hardware version of the drive.

This property shall contain the manufacturer-defined revision for the associated drive.

Return the currently active firmware revision information.

### 6.8.2.31 RotationSpeedRPM

The mapping for RotationSpeedRPM is summarized in Table 250.

**Table 250: RotationSpeedRPM mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>RotationSpeedRPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Decimal</td>
</tr>
<tr>
<td>Description</td>
<td>An indication of whether the drive is accessible from multiple paths.</td>
</tr>
</tbody>
</table>
**Redfish/Swordfish NVMe / NVMe-oF**

**LongDescription**
This property shall indicate whether the drive is accessible by an initiator from multiple paths allowing for failover capabilities upon a path failure.

**Mandatory**
DependsOn MediaType value. If MediaType == SSD, (not required to) do not implement.

**Notes**
Future proofing - will be a relevant property for NVMe HDDs.

### 6.8.2.32 SKU
The mapping for SKU is summarized in Table 251.

**Table 251: SKU mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>SKU</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>The SKU for this drive.</td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
</tr>
</tbody>
</table>
The drive should support this property to be filled in by a layered process (e.g., OEM manufacturing).

### 6.8.2.33 SerialNumber

The mapping for SerialNumber is summarized in Table 252.

**Table 252: SerialNumber mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>SerialNumber</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The serial number for this drive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall contain the manufacturer-allocated number that identifies the drive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NVM Spec Property / Field: IdentifyController / SerialNumber (SN) NVM Spec: Section: Figure 249 byte 04:23

### 6.8.2.34 Status.State

The mapping for Status.state is summarized in Table 253.
### Table 253: Status.State mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Status.State</td>
<td>Enable (EN)</td>
</tr>
<tr>
<td>Description</td>
<td>Resource.State</td>
<td>(enum)</td>
</tr>
<tr>
<td></td>
<td>The known state of the resource, such as, enabled.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Redfish/Swordfish</td>
<td>NVMe / NVMe-oF</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether and why this component is available. Enabled indicates the resource is available. Disabled indicates the resource has been intentionally made unavailable but can be enabled. Offline indicates the resource is unavailable intentionally and requires action to make it available. InTest indicates that the component is undergoing testing. Starting indicates that the resource is becoming available. Absent indicates the resource is physically unavailable.</td>
<td>Required (for NVM Drives)</td>
</tr>
</tbody>
</table>
The drive should support this property to be filled in by a higher level client (e.g., BMC). The drive can self-set this drive to Enabled / Disabled / InTest / Updating. If any controller in the drive is set to Enabled, set to “Enabled”. If all controllers are set to disabled, set to “Disabled”. If a firmware update is in progress, set to “Updating”. If the drive is running a self-test, set to “InTest”.

### 6.8.2.35 Status.Health

The mapping for Status.Health is summarized in Table 254.

#### Table 254: Status.Health mapping

<table>
<thead>
<tr>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Status.Health</td>
</tr>
</tbody>
</table>

- **NVM Spec Property** / Field: CSTS – Controller Status
- **NVM Spec:** Section:Figure NVMe 1.4a: Section 3.1.6, Figure 79
- **NVM Spec Property** / Field: Critical Warning
- **NVM Spec:** Section:Figure NVMe 1.4a: Section 5.14.1.2, SMART / Health Information, Figure 196
## Description

The health state of this resource in the absence of its dependent resources.

## LongDescription

This property shall represent the health state of the resource without considering its dependent resources. The values shall conform to those defined in the Redfish Specification.

## Mandatory

Required for NVM Drives.

## Notes

Possible Values: OK / Warning / Critical

Report to same value as set for worst-case controller Status.Health.

### 6.8.2.36 StatusIndicator

The mapping for StatusIndicator is summarized in Table 255.

**Table 255: StatusIndicator mapping**

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>StatusIndicator</td>
<td>StatusIndicator</td>
<td>N/A</td>
</tr>
<tr>
<td>Type</td>
<td>enum (StatusIndicator)</td>
<td></td>
</tr>
</tbody>
</table>
6.8.2.37 WriteCacheEnabled

The mapping for writeCacheEnabled is summarized in Table 256.

Table 256: WriteCacheEnabled mapping

<table>
<thead>
<tr>
<th>Property</th>
<th>Redfish/Swordfish</th>
<th>NVMe / NVMe-oF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SerialNumber</td>
<td>NVM Spec Property / Field: Volatile Write Cache Enable (WCE) NVM Spec: Section:Figure 283: 00</td>
<td></td>
</tr>
</tbody>
</table>
### Redfish/Swordfish NVMe / NVMe-oF

<table>
<thead>
<tr>
<th>Type</th>
<th>Boolean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>An indication of whether the drive write cache is enabled.</td>
</tr>
<tr>
<td>LongDescription</td>
<td>This property shall indicate whether the drive write cache is enabled.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>Required (for NVMe Drives).</td>
</tr>
<tr>
<td>Notes</td>
<td>Bits 00 of WCE indicate whether the WCE is enabled or disabled.</td>
</tr>
</tbody>
</table>
## 7 Other Feature Mapping

### 7.1 Introduction

There are additional features and functionality that are also desirable to be exposed via the Redfish/Swordfish management ecosystems; however, there is not necessarily a clear mapping for these to a specific portion of the NVMe specification, or the functionality has a large component provided by the NVMe device implementer. This section provides an overview of the required functionality and presentation required to present a common, standardized interface to the Redfish/Swordfish clients.

### 7.2 Firmware Update

Firmware update is a required function to present comprehensive management. This is presented in Redfish through the “Update” service. The Update Service provides a standardized interface to all software and firmware update mechanisms throughout the server, storage, and networking environment, and as such, provides an abstracted, standardized interface that largely manages the acquisition from the client of the image files (and subsequent distribution of those to the designated targets), as well as very coarse-grained scheduling.

Note that this mechanism does not include any “active image” management capability (e.g., rollback).

#### 7.2.1 Firmware update for NVMe Drives

NVMe drives shall support a standard implementation of the Redfish Update service. This is fundamentally a single-step invocation process on the update service that gets the image file from a specified URI using the SimpleUpdate action.

One parameter that shall be specified is the OperationApplyTime; this indicates when to apply the image. If not explicitly specified, the implementation should assume the request is to be applied immediately.

The values of the OperationApplyTime that shall be supported by NVMe drives are:

- Immediate
- OnReset

Example simple update request:

```plaintext
POST /redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate HTTP/1.1
```

As of 30 August 2021  Working Draft
The following additional parameters may be required to access the image. Implementations should support these:

**Username** | String | The user name to access the URI specified by the `ImageURI` parameter.

**Password** | String | The password to access the URI specified by the `ImageURI` parameter.

Additionally, the implementation may support the `Targets` parameter to specify the list of devices on which to apply the image. If `Targets` is not specified, the image will be applied to all applicable devices.

**Targets** | Array | An array of strings that are URIs to resources that indicate where to apply the image.

The SimpleUpdate mechanism is fundamentally a “pull” mechanism (the implementation pulls a file from a target); the UpdateService also supports a “push” mechanism (the client “pushes” the image to the implementation as part of the request payload) that may also be implemented. For more information this mechanism, using the `MultipartHttpPushUri` property, is documented in the Redfish Specification.

### 7.2.1.1 Mapping Images to NVMe Capabilities

It will be up to the implementation to determine the NVMe specific parameters to use upon receipt of the image from the update service. However, the following general guidelines should be used to ensure behavioral consistency across implementations:

When receiving image:
- If open slots, the implementation can choose what open slot to use, and load the image to that slot.
- If all slots are full, the implementation can choose (typically any slot except the currently active image).

After loaded to a slot, the implementation will mark the image as active. Based on the “apply time” setting, the implementation setting will activate the image either immediately, or set to activate on (the next) reset.
Annex A: Objects without a direct mapping to the NVMe model

A.1: Overview

There are a number of objects that are required for the proper integration of NVMe support within Redfish and Swordfish, but which are not supported by an entity that can be mapped directly from the various NVM Specifications. Information about these related but un-mapped objects are defined elsewhere in the documentation provided with each Swordfish release.

They are summarized in Table A.1 for ease of use, including:

- Object Name
- NVMe Device Expected Usage

<table>
<thead>
<tr>
<th>Object</th>
<th>NVMe Device Expected Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetworkAdapter</td>
<td>NVMe-oF Subsystems, Network-Attach Drives</td>
</tr>
<tr>
<td>Port</td>
<td>NVMe-oF Subsystems, Network-Attach Drives</td>
</tr>
<tr>
<td>NetworkDeviceFunction</td>
<td>NVMe-oF Subsystems, Network-Attach Drives</td>
</tr>
</tbody>
</table>

Table A.1: Related Objects

Required usage of objects and their properties are contained in the relevant Swordfish profiles.

For example, for Ethernet-Attach drives, the NetworkAdapter, Port, and NetworkDeviceFunction required properties are specified as part of the “Ethernet-Attach NVMe Drive” profile.

A.2: Related Use Cases

The Swordfish Scalable Storage Management API User’s Guide contains real-world examples of how clients will interact with an implementation. Table A.2 summarizes the NVMe use cases as of 30 August 2021.
<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attach a Namespace</td>
<td>Attach a Namespace</td>
</tr>
<tr>
<td>Deprovision a Namespace</td>
<td>Deprovision a Namespace</td>
</tr>
<tr>
<td>Detach a Namespace</td>
<td>Detach a Namespace</td>
</tr>
<tr>
<td>Provision a Namespace</td>
<td>Provision a Namespace</td>
</tr>
<tr>
<td>Provision an NVMSet with a Namespace</td>
<td>Provision an NVMe associated with a Namespace</td>
</tr>
<tr>
<td>Report capacity for a Namespace</td>
<td>Report capacity for a Namespace</td>
</tr>
<tr>
<td>Report remaining life for a Namespace</td>
<td>Report remaining life for a Namespace</td>
</tr>
</tbody>
</table>

Table A.2: NVMe Use Case Summary
Annex B: Bibliography

B.1 Overview

The following referenced documents provide important support for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

B.2 Informational references

The informational references are summarized in Table B.1.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Title (Version)</th>
<th>Author</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro files</td>
<td>Swordfish Profile Bundle Working Draft</td>
<td>SNIA</td>
<td><a href="https://www.snia.org/forums/smi/swordfish">https://www.snia.org/forums/smi/swordfish</a></td>
</tr>
</tbody>
</table>

Table B.1: Informational References