ENHANCING NVME AND NVME-OF CONFIGURATION AND MANAGEABILITY WITH SNIA SWORDFISH TO ENABLE SCALABLE INFRASTRUCTURES

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SNIA-at-a-Glance

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The information in this presentation:
- Represents a snapshot of the work in progress within SNIA
- It is evolving

For additional information:
- SNIA website: www.snia.org/swordfish
- NVMe Consortium website: nvmexpress.org
• NVMe-oF Refresher

• Managing NVMe and NVMe-oF

• Introducing DMTF Redfish + SNIA Swordfish

• Managing NVMe and NVMe-oF in SNIA Swordfish

• Summary
NVM EXPRESS OVER FABRICS (NVME-OF) REFRESHER

- Extends the efficiency of NVMe over a variety of fabrics
- Builds on base NVMe architecture with thin encapsulation of base NVMe across fabrics
- Enables low-latency/high IOPS access to remote NVMe Storage
- Same architecture regardless of transport
- End-to-end mechanism to transfer NVMe commands and data structures
- Presents an abstraction for exporting NVM Subsystems over fabrics
- Restricted/Unrestricted NVMe-OF Subsystems access
MANAGING NVME/NVME-OF

Management points
- NVMe/NVMe-oF
  - Subsystem(s)
  - Controller(s)
  - Namespace(s)
- NVMe-oF
  - Initiator (host) Endpoint systems HW and/or SW
  - Fabrics

Management Operations
- Set configuration
- Get configuration
- Health status
- Reset
DMTF Redfish® - Infrastructure Management Standard
- IPMI Successor for extended Management Scope
- Focus: management of scale-out commodity servers
- Design: RESTful API, OData, HTTP operations (GET/PUT/POST)
- Three main categories for server management
  - Systems – server, CPU, memory, devices, etc.
  - Managers – BMC, Enclosure Manager, etc.
  - Chassis – racks, enclosures, blades, etc.
- Expanding to cover data center infrastructure, fabrics, network management

SNIA Swordfish® Storage Management and Ecosystem Standard
- Uses and Extends Redfish Schemas
- Focus: Storage Management
  - Logical Storage (Block, Object, File)
- Expanding to encompass NVMe and NVMe-oF
MANAGING NVME USING SWORDFISH

Redfish/Swordfish

- Drive
- Storage
- Controllers
- Volume (This is not Allocated Volumes)

NVMe

- Subsystem (NVMe)
- I/O Controller (NVMe)
- Default Set (0)
- Default Endurance Group (0)
- Namespace (NVMe)
- Physical Element Representation Info
NVME WITH SWORDFISH
SWORDFISH CONFIGURATIONS: NVME (SYSTEMS/SYS-1)

- SNIA SSM Technical Working Group
- Mockups at http://swordfishmockups.com

Note: Mockups are representations of implementations
SWORDFISH CONFIGURATIONS: NVME (STORAGE COLLECTION)

/redfish/v1/Systems/Sys-1/Storage

{  "@odata.type": "#StorageCollection.StorageCollection",  "Name": "Storage Collection",  "Members@odata.count": 1,  "Members": [    {      "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD"    }  ],  "@odata.id": "/redfish/v1/Systems/Sys-1/Storage",  "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved."}

/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD

{  "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",  "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD",  "@odata.type": ":Storage.v1_9_0.Storage",  "Id": "1",  "Name": "NVMe Simplest Configuration",  "Description": "Mockup of simplest NVMe simple config with 1 Subsystem, 1 I/O Controller and 1 Namespace.",  "Status": {    "State": "Enabled",    "Health": "OK",    "HealthRollup": "OK"  },  "Identifiers": [{    "DurableNameFormat": "NQN",    "DurableName": "nqn.2014-08.org.nvmexpress:uuid:6c5fa566-10e6-4fb6-aad4-8b443f9f9245"  }],  "Controllers": {    "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Controllers"  },  "Volumes": {    "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Volumes"  }}
SWORDFISH CONFIGURATIONS: NVME (VOLUME/NAMESPACE)

```
GET /redfish/v1/Systems/Sys-1/Storage/SimpleNVMeSSD/Volumes/SimpleNamespace/1 HTTP/1.1
```
SWORDFISH CONFIGURATIONS: NVME (CONTROLLER)

```
/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Controllers/NVMeIOController
```

{  
  "@Redfish.Copyright": "Copyright 2014-2020 SNIA. All rights reserved.",  
  "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Controllers/NVMeIOController",  
  "@odata.type": "#StorageController.v1_0_0.StorageController",  
  "Id": "1",  
  "Name": "NVMe I/O Controller",  
  "Description": "Single NVMe I/O Controller presented to host.",  
  "Status": {  
    "State": "Enabled",  
    "Health": "OK"  
  },  
  "Id": "NVMeIOController",  
  "Manufacturer": "Best NVMe Vendor",  
  "Model": "Simple NVMe Device",  
  "SerialNumber": "NVMe123456",  
  "PartNumber": "NVM4",  
  "FirmwareVersion": "1.0.0",  
  "SupportedControllerProtocols": [  
    "PCIe"  
  ],
}
SWORDFISH CONFIGURATIONS: NVME (CONTROLLER...)

```
"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  
  }  
},  
"Links": {  
  "AttachedVolumes": [{  
    "@odata.id": "/redfish/v1/Systems/Sys-1/Storage/SimplestNVMeSSD/Volumes/SimpleNamespace"  
  }]  
}
```
NVME WITH ENDURANCE GROUP AND SET

Redfish/Swordfish

NVMe

Chassis

Storage

Controller (Admin/Disc)

Controller (I/O)

StoragePool

Capacity Source

Allocated Volumes

Subsystem (NVMe)

Admin Controller

I/O Controller (NVMe)

Endurance Group

Capacity

Default Endurance Group

Default Set [0]

Set

Namespace (NVMe)

Namespace (NVMe)

NVMe-Chassis: Physical Device Information

Equivalent Objects

Relationship in model

Link between Objects
SWORDFISH CONFIGURATIONS: NVME-OF (ENDPOINT)

```
{
    "@odata.type": "#Endpoint.v1_4_0.Endpoint",
    "Id": "1",
    "Name": "NVMeEndpoint",
    "Description": "Endpoint connected Logical Namespace (NVMe-of)",
    "EndpointProtocol": "NVMeOverFabrics",
    "ConnectedEntities": [{
        "EntityType": "Volume",
        "EntityRole": "Target",
        "Identifiers": [{
            "DurableNameFormat": "NSUUD",
            "DurableName": "FDCEBA9876543210"
        }]
    }],
    "IPTransportDetails": [{
        "TransportProtocol": "RDMA",
        "IPv4Address": {
            "Address": "192.168.155.22"
        },
        "Port": 4428
    }],
    "@odata.id": "/redfish/v1/Fabrics/NVMe-of/Endpoints/NVMeEndpoint",
    "@redfish.Copyright": "Copyright 2014-2020 SMTA. All rights reserved."
}
```
• Schema modeling is a work in progress
  • Mockups – Simple NVMe, NVMe with Endurance Group and Set, JBOF, Fabrics attached array
  • Advanced NVMe features like NVMe Power profiles properties will be added in the future
  • Redfish and swordfish initial draft incorporating NVMe and NVMe-oF management will be release in June 2020 for public review

• Review the currently released Swordfish Mockups
  • Ensure the schema is defined sufficiently to represent your desired implementation
  • Mockup your use case & submit it to the Swordfish forum

Join SNIA and the Scalable Storage Management TWG & help define Schema
https://members.snia.org/wg/ssmtwg/dashboard
THANK YOU
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