



BY Developers FOR Developers

Storage Developer Conference
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Redfish Ecosystem for Storage & HPE Perspective on Open Standards & Redfish Storage

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Disclaimer

- The information in this presentation represents a snapshot of work in progress within SNIA
- This information is subject to change without notice.
- For additional information, see the SNIA website: www.snia.org/swordfish



- DMTF
- Redfish
 - Background
 - General Structure
 - Storage Support
 - Local Storage
 - RDE
 - Changes in 2020.3
 - Fabric
- HPE experience & direction

DMTF – An Industry Standards Organization

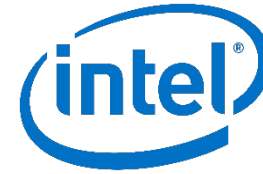
- WHO** Led by innovative, industry-leading companies, DMTF has a global presence with members from 21 countries and local bodies in China and Japan.
- WHAT** DMTF standards support diverse emerging and traditional IT infrastructures including cloud, virtualization, network, servers and storage. A complete list is available at **www.dmtf.org/standards**.
- WHY** Nationally and internationally recognized by ANSI and ISO, DMTF standards enable a more integrated and cost-effective approach to management through interoperable solutions.
- HOW** Simultaneous development of Open Source and Open Standards is made possible by DMTF, which has the support, tools and infrastructure for efficient development and collaboration.

DMTF Board Member Companies



Hewlett Packard
Enterprise

HITACHI
Inspire the Next



DMTF does more than Redfish

- SMBIOS is everywhere
- PMCI
 - Security Task Force SPDM Protocol
 - Based on the USB Authentication Protocol (and then expanded)
 - Expected to be leveraged by PCIe, OCP, JEDEC, HDBaseT and others
 - Provides Authentication, Attestation and Encryption Key Exchange
 - Includes mapping for MCTP & encrypted MCTP
 - FW Update, NC-SI, Monitoring & Control, FRU, RDE, MCTP, PLDM, Mappings and Bindings
 - Updated White Paper forthcoming
- CIM
 - Consolidated efforts under a single CIM Forum

What is Redfish?

- **Industry Standard Software Defined Management for Converged, Hybrid IT defined by the DMTF**
 - RESTful interface using HTTPS in JSON format
 - Schema-backed but human-readable payload usable by GUIs, Scripts and browsers
 - Extensible, Secure, Interoperable
 - Accepted by ISO as [ISO/IEC 30115:2018](https://www.iso.org/standard/68811.html)
 - Developer hub at redfish.dmtf.org
- **Initial release in 2015**
 - Additional features coming out approximately every 4 months
 - Started as secure, multi-node capable replacement for IPMI-over-LAN
 - Represent full server category: Rackmount, Blades, HPC, Racks, Future
 - Scope expanded to cover Storage, Networking, Fabrics, Datacenter Infrastructure
 - Shipping on almost every industry standard server shipped today
- **Current releases address the rest of IT infrastructure**
 - Alliances with multiple other standards bodies to define Redfish support
 - Working with [SNIA](https://www.snia.org) to cover more advanced **Storage** (Swordfish)
 - Working with [OCP](https://opencompute.org/) & [ASHRAE](https://www.ashrae.org/) to cover **Facilities** (DCIM)
 - Adapt & translate YANG models to cover some level of Ethernet **Switching**
 - Work with [Gen-Z](https://www.gen-z.io/) & others to cover **Fabrics**
 - Work within the DMTF for internal support (MCTP/PLDM, RDE, SPDM etc.)
 - Host Interface – replacement for IPMI KCS
 - Profiles, Test Tools, Integrations and more



Redfish



Swordfish



OPEN
Compute Project



the green grid™



World Class Standards

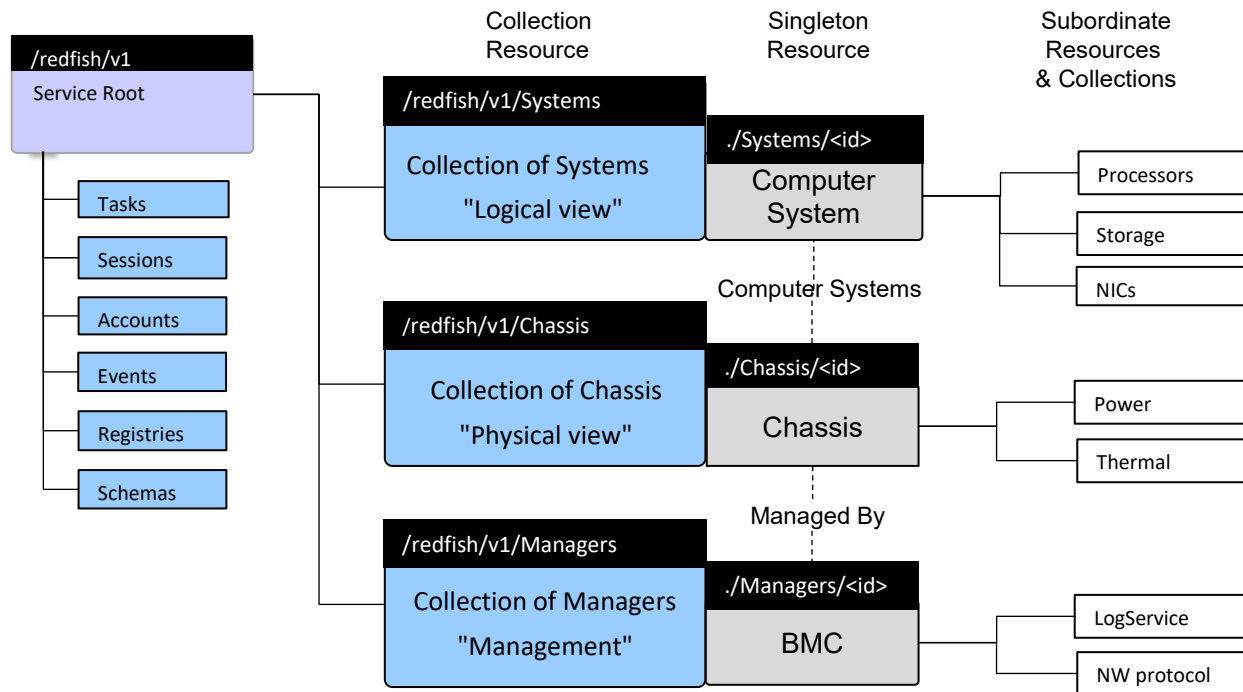


Compute Express Link™

opendatacenter.cn



Redfish Resource Map (simplified)



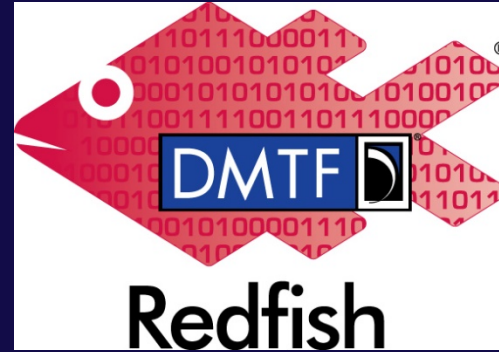
GET <http://<ip-addr>/redfish/v1/Systems/{id}/Processors/{id}>

Use the Redfish Resource Explorer (redfish.dmtf.org) to explore the resource map

Redfish Storage Model

also known as

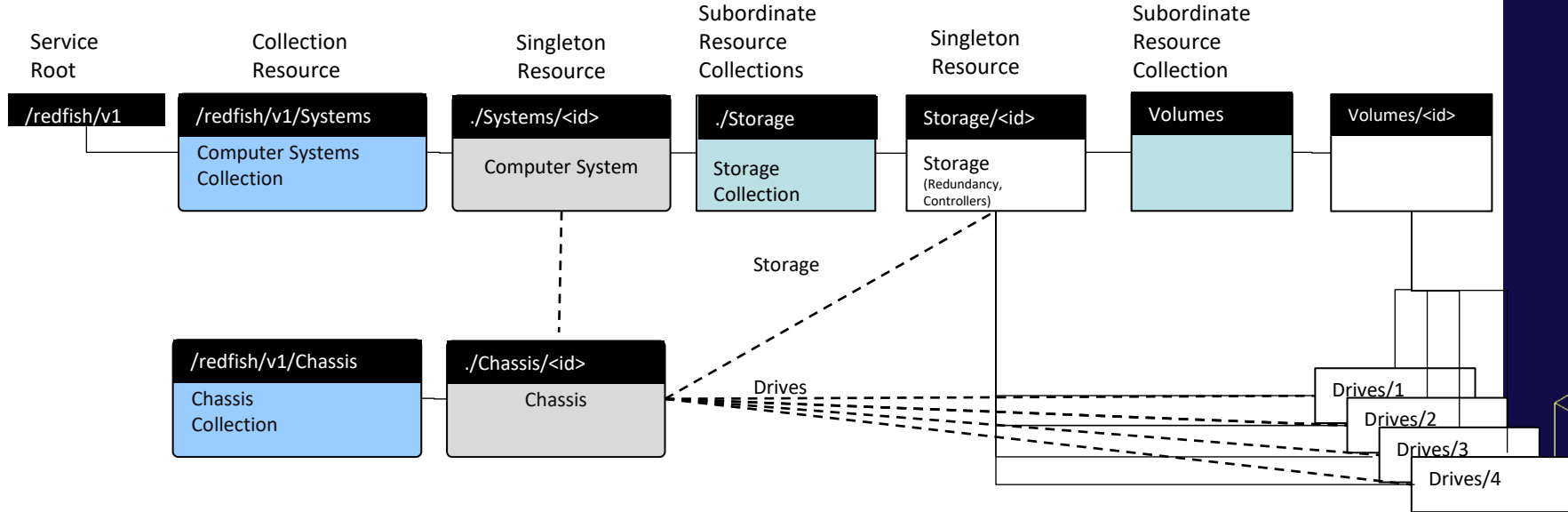
- Local Storage
- Server Storage
- Redfish Storage



Storage Resource Overview

- **Storage:** A representation of a storage sub-system
 - Contains sets of Volumes, Drives, and Storage Controllers
 - Storage Controller information is an array of objects in the Storage resource
 - Describes the protocols supported by the controller, the speed of the controller interface, and manufacturer information about the controller
- **Drive:** The physical media for the data
 - Manufacturer information about the drive (part number, serial number, etc.)
 - Capability information about the drive (size, protocol, encryption, etc.)
 - Contains control aspects (secure erase and LED setting)
- **Volume:** The logical construct used by the OS/hypervisor
 - Contains status about a volume (what drives contribute to the volume, size information, identifier information, etc.)
 - Allows a client to control the volume (initialization, encryption settings, etc.)

Storage in Redfish – pre 2020.3



Note that the Volumes are in Collections off of the Storage resource, drives are in arrays off of the storage resource and optionally the Chassis.



Redfish Device Enablement (RDE)

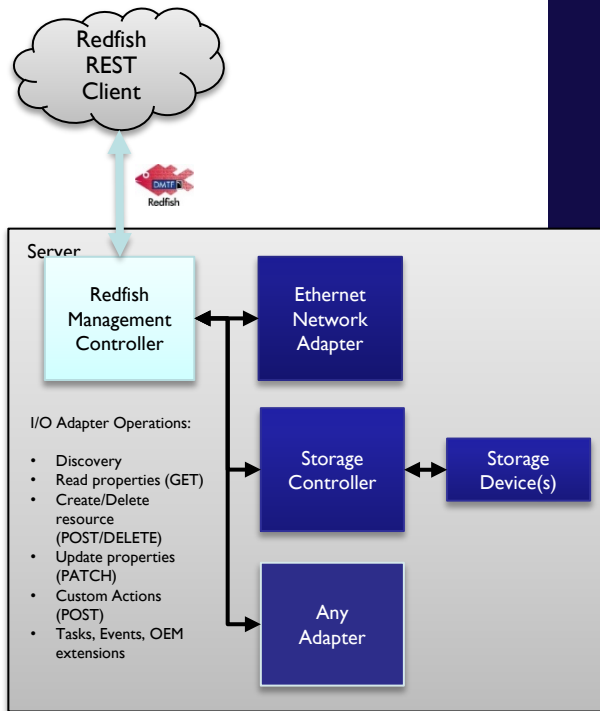
Or “How you can fill all that storage stuff out without creating a lock step firmware dependency between the management controller firmware and the storage firmware”

Redfish Device Enablement: PLDM

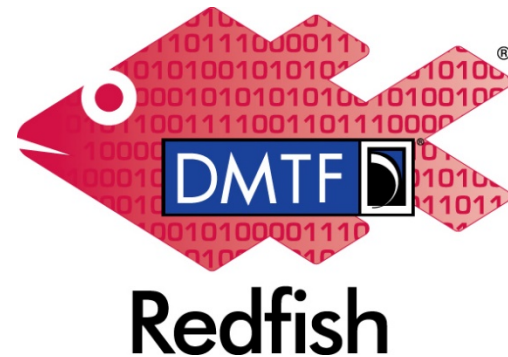
Redfish Providers

PMCI WG developing a standard to enable a server Management Controller to present a Redfish-conformant management of I/O Adapters without building in code specific to each adapter family/vendor/model.

- Support adapter “self-contained, self-describing” including value-add (OEM) properties
- New managed devices (and device classes) do not require Management Controller firmware updates
- Support a range of capabilities from primitive to advanced devices (lightweight/low bandwidth options)
- Leveraging PLDM, a provider architecture is being specified that can binary encode the data in a small enough format for devices to understand and support.
- MC acts as a broker to encode/decode the data to/from the provider
- PLDM works over I2C & PCIe VDM. Additional mappings under consideration.



Redfish Changes in 2020.3 that apply to NVMe



NEW *Connection* Schema

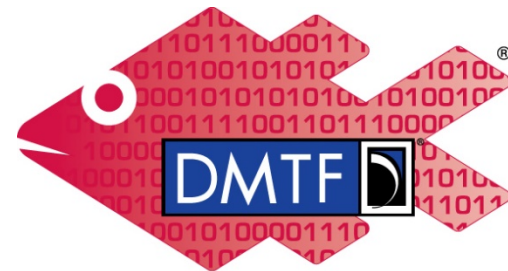
- *Connection* has been added to the fabric model
- A *Connection* resource is used to express the types of resources an endpoint is allowed to access when connected to another endpoint within a fabric
 - For example, if a storage initiator connects to a storage target, which volumes can the initiator access
- *Connection* maps *Endpoint* resources to other resources, and specifies the permissions for the resource

NEW *StorageController* Schema

- *StorageController* has been added to address scalability concerns with the *Storage* resource
 - *Storage* contains an array of controller objects
 - This array works well for traditional HBAs that have a physical controller, where the *Storage* resource will contain only one or two controllers
- A *StorageController* resource collection has been added to account for cases where a single storage subsystem will have a more dynamic set of controllers
 - For NVMe-oF, controllers are created and retired as NVMe-oF hosts connect or disconnect from NVMe-oF targets

NEW

- Endpoint Groups added to Fabric
- Storage also off Service Root
- Indicator LED on Drive
- Ethernet in Fabric
- Port migration NetworkPort
- Added InfiniBand to advanced NIC Model



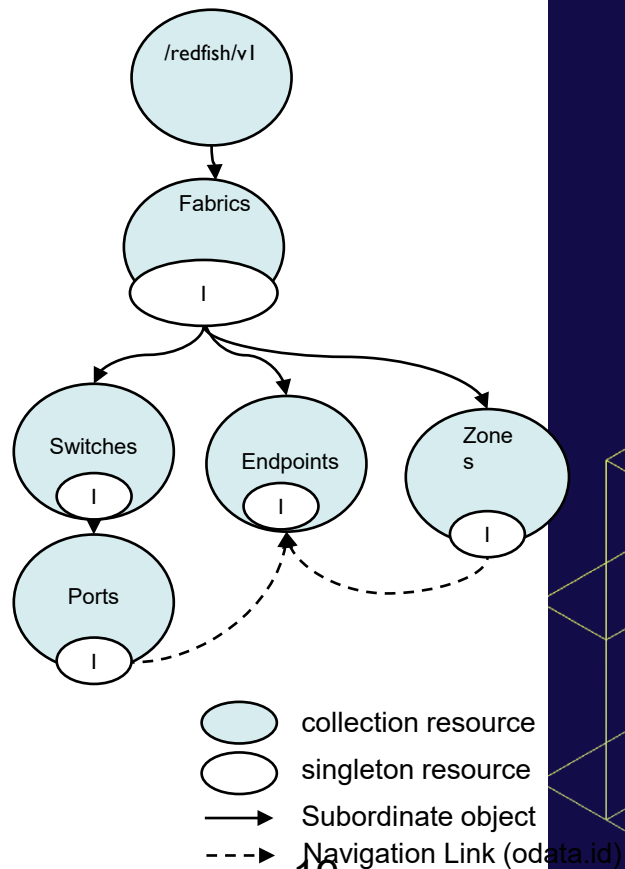
Redfish

Redfish Fabric Model

- Initial Model
- Changes in 2020.3

Redfish Common Fabric Model

- Goal is to unify the representation of Fabrics, regardless of fabric type
 - Then the rest of the resources in Redfish can show their relationship to the fabric.
 - Enable client to walk from the controller to the port to the switch port, on through the switches and ports to the target's port and controller.
- Simple Representation
 - Collection of Fabrics off of the Service Root
 - Fabrics have Switches, Endpoints and Ports
 - Switches
 - Switches have Ports that represent the connection
 - Endpoints
 - Represent the “logical” endpoint, not where the cable ends.
 - Parts of the protocol stack/standard that determine source or destination
 - Endpoints are associated to Ports
 - Zones
 - Represents what is allowed to communicate.
 - Zones contain Endpoints.
 - Initiator or Target permission is restricted by Endpoint properties.



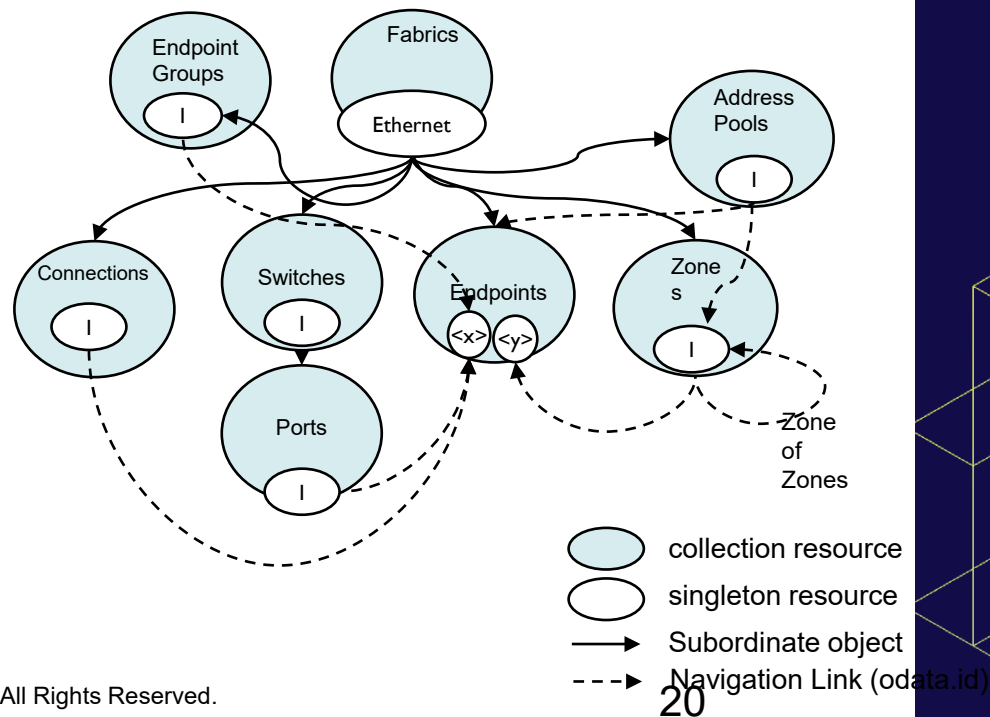
Additions to the Fabric Model

Additions were needed for modern fabrics

- Support the management of port-based Gen-Z Fabrics(Initiators/Targets)
- Support Fabric-attached Resources (Targets)
- Support for Ethernet Underlay/Overlay
- Support for NVMe
- Also added Fabric Controller (not shown)

Status

- Added Address Pools
 - To show address allocation
- Added Connections
 - For Storage, IPC to show which endpoints are allowed to communicate
- Added Endpoint Groups
 - Donation from SNIA to add scalability and mapping/masking for storage





- Resources
 - Schema Index
 - Specifications
 - GitHub for Redfish Tools
 - Registries
 - Other Documentation
- Mockups
 - Simple Rack-mounted Server
 - Bladed System
 - Proposed OCP Redfish Profile
 - More being added
- Education/Community
 - Redfish User Forum
 - Whitepapers, Presentations
 - YouTube shorts & Webinars



In Summary

- Redfish, along with the other DMTF WGs and DMTF alliance partners, is working to define interoperable software defined hybrid IT management for servers, storage, networking, power/cooling, fabrics and more
- And is solving problems from composition to resource managers, aggregation engines to fabric management
- As well as plumbing the mechanisms inside the box to be self contained and self describing
- And enable a zero-trust model in the platform



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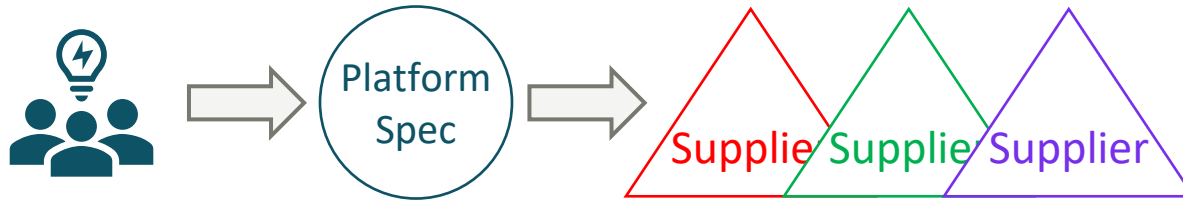
HPE Perspective on Open Standards & Redfish Storage

Scott Bunker, HPE Technologist



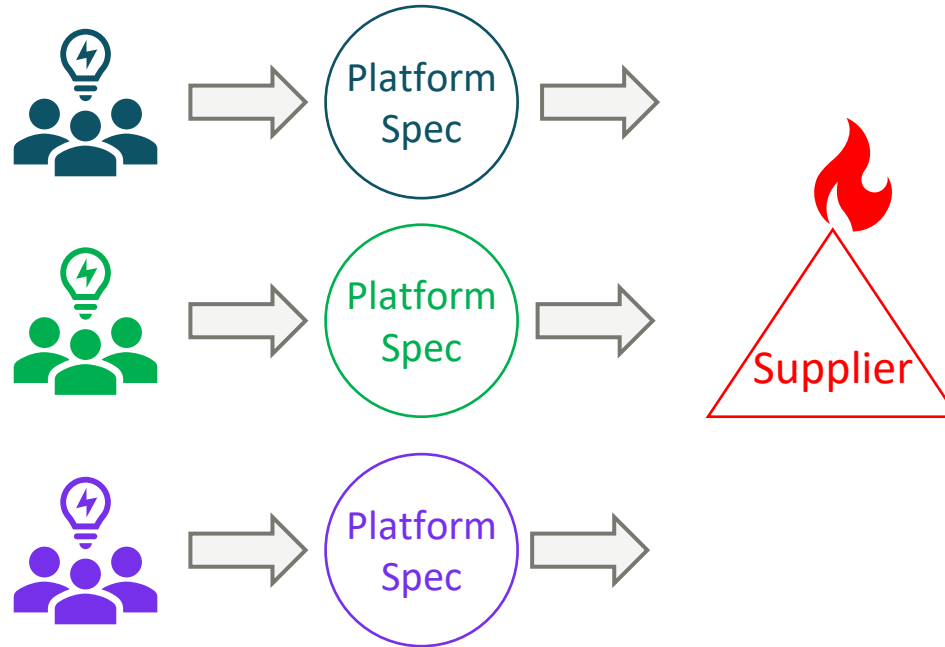
Platform Owned Technology

New ideas start out with great intentions



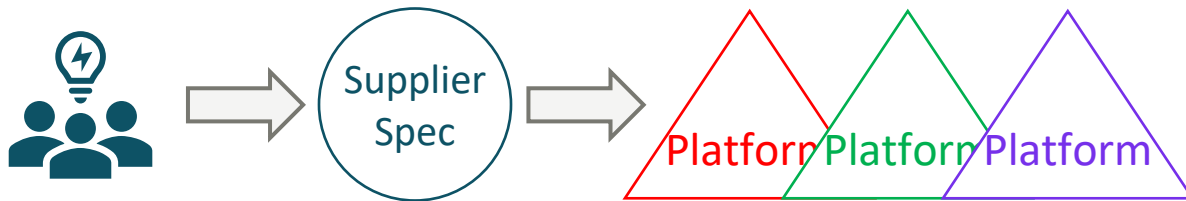
Platform Owned Technology

But from a supplier perspective, this method does not scale across platforms



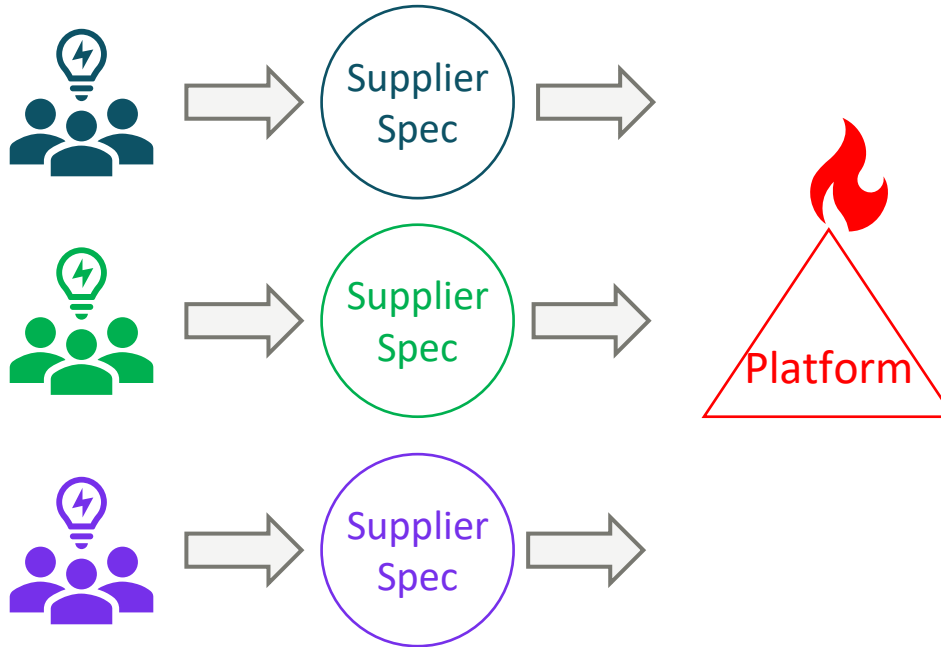
Supplier Owned Technology

The obvious solution is to let the supplier own the technology



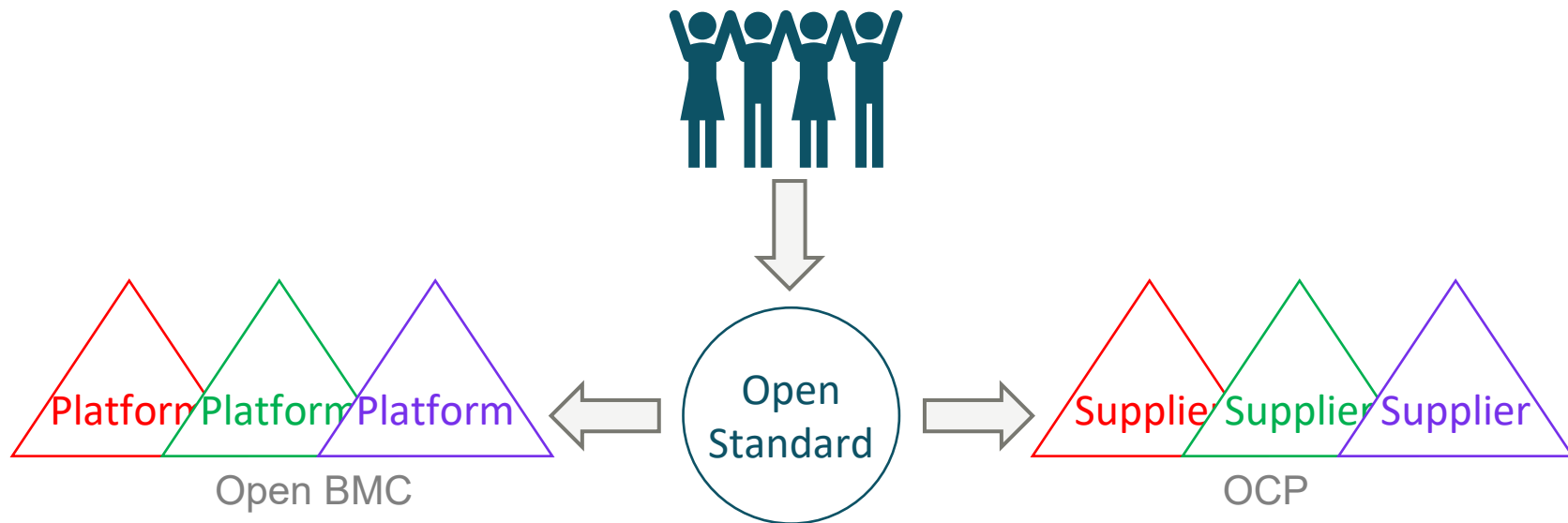
Supplier Owned Technology

But from a platform perspective, this method does not scale across suppliers

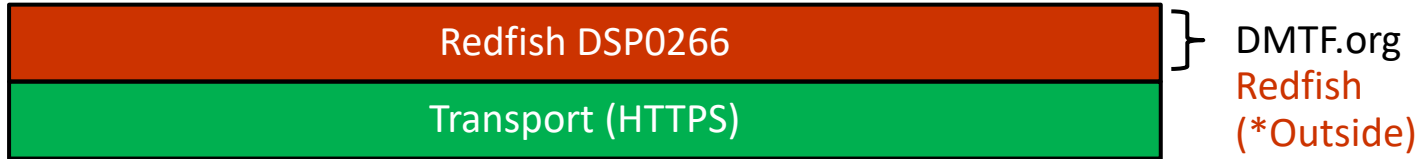


Community Standards

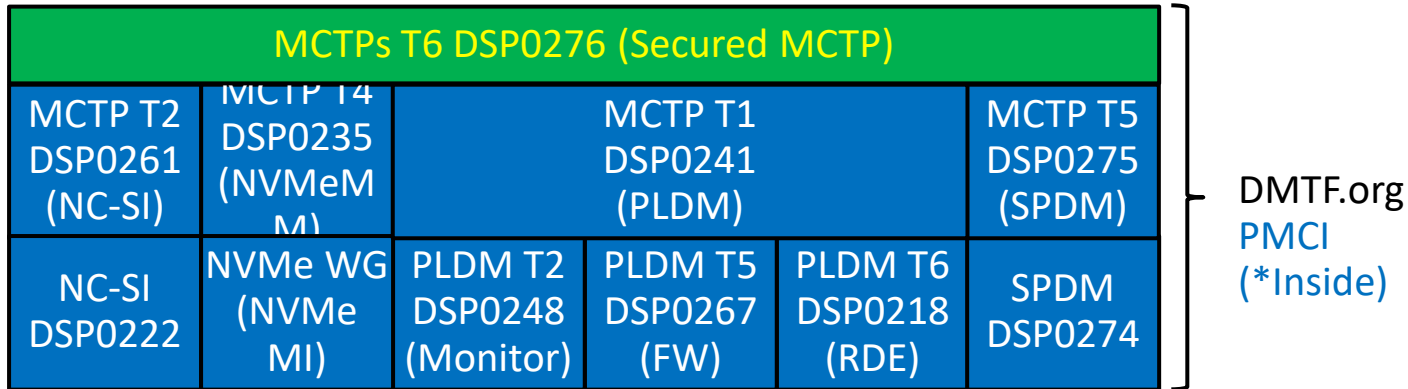
Designing with open standards such as DMTF, scales across the industry



DMTF Unlocks Supplier Value

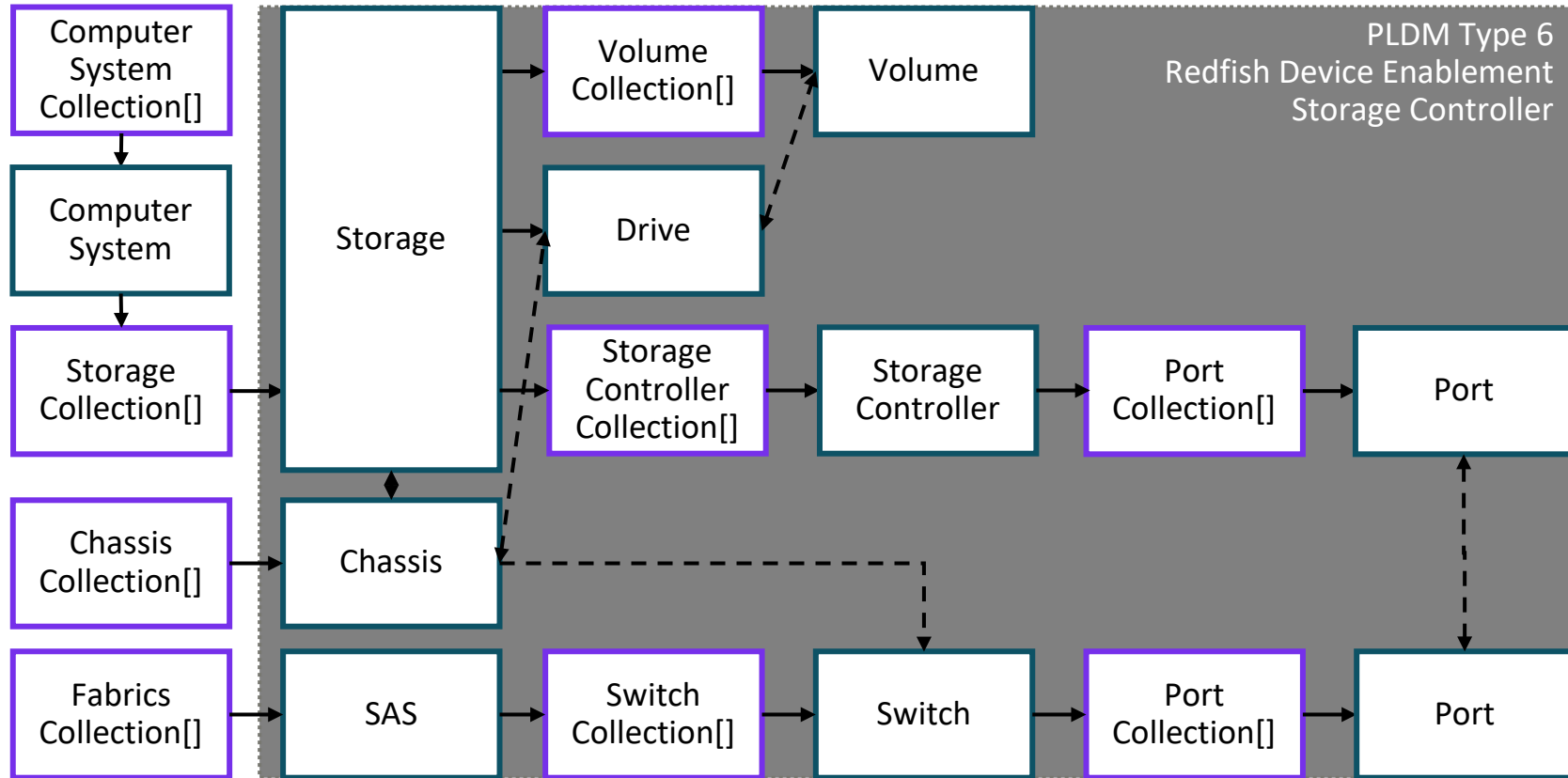


----- BMC -----



- Card Temps
- Drive Temps
- Encl Temps
- Card FW
- Drive FW
- Encl FW
- Config
- Alerts
- Metrics
- Auth
- Certs
- Attestation

Local RAID using RDE



What's Next

- Storage Device Message Registry (Complete)
- Hot Spare Management
- Decommissioning Controllers
- SED Encryption Enhancements
- Storage Device Metrics

Thank you for watching

- **SNIA Swordfish™ Standards**
 - Schemas, Specs, Mockups, Users Guide, Practical Guide & more
<https://www.snia.org/swordfish>
- **Redfish / Swordfish Specification Forum**
 - This is where you can ask and answer questions about Redfish and Swordfish
 - <http://swordfishforum.com/>
- **Scalable Storage Management (SSM) TWG**
 - Technical Work Group that defines Swordfish
 - Influence the next generation of the Swordfish standard
 - Join SNIA and participate: https://www.snia.org/member_com/join-SNIA
- **Join the SNIA Storage Management Initiative**
 - Unifies the storage industry to develop and standardize interoperable storage management technologies
 - <https://www.snia.org/forums/smi/about/join>





Thank you!