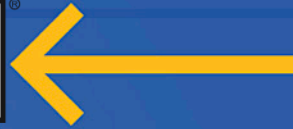# Redfish Release History

DMTF Redfish Forum

May 2024

Releases

- 2024.1 – May 2024
- 2023.3 – December 2023
- 2023.2 – September 2023
- 2023.1 – May 2023
- 2022.3 – December 2022
- 2022.2 – August 2022
- 2022.1 – May 2022
- 2021.4 – December 2021
- 2021.3 – October 2021
- 2021.2 – August 2021
- 2021.1 – May 2021

- 2020.4 – December 2020
- 2020.3 – September 2020
- 2020.2 – June 2020
- 2020.1 – April 2020
- 2019.4 – December 2019
- 2019.3 – October 2019
- 2019.2 – August 2019
- 2019.1 – May 2019
- 2018.3 – December 2018
- 2018.2 – August 2018
- 2018.1 – April 2018
- 2017.3 – December 2017
- 2017.2 – September 2017
- 2017.1 – May 2017
- 2016.3 – December 2016
- 2016.2 – September 2016
- 2016.1 – May 2016
- 1.0 – August 2015

Schema and Registry Guide documents

- **Redfish Data Model Specification (DSP0268)**
  - Document was previous titled "Redfish Schema Supplement"
  - Now includes normative statements ("LongDescription") and informative description details from schema in a single document
  - Intended for both Redfish Service and client-side developers

- **Redfish Resource and Schema Guide (DSP2046)**
  - Presents schema (data model) contents in a more friendly format for end users
  - Includes example payloads for each resource type

- **Redfish Message Registry Guide (DSP2065)**
  - Presents message registry definitions in a more human-readable format
  - Includes summary table and individual message details

- **Redfish Property Guide (DSP2053)**
  - Provides an alphabetical list of all properties defined in Redfish schema
  - Useful for schema writers to locate existing definitions or properties
  - Helps avoid re-defining property names already in use

Available Redfish conformance testing tools

- DMTF Redfish Forum provides open source tools for service developers to validate their conformance with the Redfish protocol, data model, and profiles

- **Redfish Protocol Validator**
  - Tests a live service for conformance to the Redfish HTTP protocol, including response headers and status codes
  - https://github.com/DMTF/Redfish-Protocol-Validator

- **Redfish Service Validator**
  - Tests a live service for conformance with Redfish schemas, ensuring the returned JSON payloads validate against the standard data models
  - Recommend that developers run this tool first, as errors in payload are more likely to cause issues for end users and interoperability
  - https://github.com/DMTF/Redfish-Service-Validator

- **Redfish Interop Validator**
  - Tests a service against a Redfish interoperability profile
  - https://github.com/DMTF/Redfish-Interop-Validator

Redfish-Publications repository

- Public GitHub repository contains an official read-only copy of the Redfish schemas and standard message registries
  - https://github.com/DMTF/Redfish-Publications
  - Creates public, durable locations for referencing specific schema or registry items in issue reports, forum postings, or other online references
  - Allows developers to automatically synchronize with new Redfish releases using normal GitHub tools and processes
- Repository will be updated as each Redfish release become public
- Contains materials published as DSP8010 and DSP8011
  - **/csdl** – Redfish schemas in OData CSDL XML format
  - **/json-schema** – Redfish schemas in JSON Schema format
  - **/openapi** – Redfish schemas in OpenAPI YAML format
  - **/dictionaries** – RDE dictionaries
 - **/registries** – Redfish standard message registries

Redfish Release 2024.1

DMTF Redfish Forum

May 2024

Redfish Release 2024.1

- Redfish Specification v1.20.1 (errata release)
  - Clarified that privilege enforcement is required when sending events
  - Added "Transiently unavailable resources" clause to describe best practices for showing status of devices in an unavailable state
  - Clarified $expand query parameter to show HTTP 200 as the proper response code when a resource collection is partially expanded

- Redfish Schema Bundle 2024.1
  - DSP8010 contains all released Redfish schemas

- Redfish Message Registry Bundle 2024.1
  - DSP8011 contains all released Redfish registries
  - Added *NVRAMClearAsserted* and *SecurityBypassAsserted* to Platform v1.1.0
  - Added *PropertyValueModifiedByClient* to ResourceEvent v1.4.0
  - Added *NoTargetsDetermined* to Update v1.1.0

- Redfish Interoperability Profile Specification v1.8.0
  - Added *ChassisType, DriveProtocol, MemoryType, PortProtocol,* and *ProcessorType* as additional UseCaseType methods to allow selection of resources based on type information from a parent or related resource in the tree

- 29 Updated schemas (highlights)
  - See release notes in DSP8010 for errata details
  - Deprecated and replaced *ThroughputReductionSupport* with *TemporaryThroughputReductionSupported* for CXL devices
  - Added part identification (*Manufacturer, Model, SKU, SerialNumber, PartNumber, SparePartNumber, UserLabel) to* **Sensor**
  - Added *ResetMetrics* to **PortMetrics**, **NetworkAdapterMetrics***,* and **NetworkDeviceFunctionMetrics**

- Download all published material at: http://www.dmtf.org/standards/redfish

www.dmtf.org
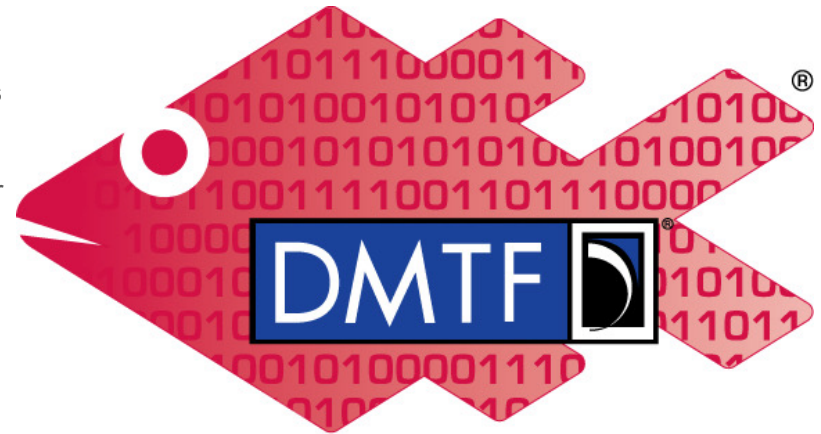
Redfish Interoperability Profile Specification v1.8

- Created additional *UseCaseType* values for selecting resources based on a subset of parent resources in the tree
  - ChassisType – Compare value of *ChassisType* in the parent **Chassis**
  - DriveProtocol – Compare value of *Protocol* in the parent **Drive**
  - MemoryType – Compare value of *MemoryType* in the parent **Memory**
  - PortProtocol – Compare value of *Protocol* in the parent **Port**
  - ProcessorType – Compare value of *ProcessorType* in the parent **Processor**
- This allows for use cases where the "device type" is determined in a parent resource, for example:
  - Set **MemoryMetrics** requirements for NV-DIMM memory devices
    - *MemoryType* != "DRAM" in the parent **Memory** resource
  - Require **PowerSupply** resource support, but only for rack-mount servers
    - *ChassisType* = "RackMount" in the parent **Chassis** resource
  - Set **DriveMetrics** requirements for NVMe drives
    - *DriveProtocol* = "NVMe" in the parent **Drive** resource

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Redfish Schema

MINOR REVISION DETAILS

Redfish Schema Minor Revisions (1 of 5)

- AddressPool v1.3.0
  - Deprecated *ARPSupressionEnabled* and *NDPSupressionEnabled* in favor of *ARPSuppressionEnabled* and *NDPSuppressionEnabled*

- Battery v1.3.0
  - Added *NominalOutputVoltage*

- Circuit v1.8.0
  - Added *NominalFrequencyHz*

- CXLLogicalDevice v1.2.0
  - Deprecated *TemporaryThroughputReductionSupported* in favor of *TemporaryThroughputReductionSupported* in **PCIeDevice**

- Drive v1.19.0
  - Added *SparePartNumber* and *ConfigurationLock*

- Endpoint v1.x.0
  - Deprecated URIs subordinate to `Storage` resources

- LeakDetector v1.1.0
  - Added *UserLabel*

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Redfish Schema Minor Revisions (2 of 5)

- LogService v1.7.0
  - Added *DiagnosticDataDetails* and *AutoClearResolvedEntries*
- Memory v1.20.0
  - Added *PowerManagementICManufacturerID*, *PowerManagementICRevisionID*, and *CacheLevel*
  - Added "Cache" to *MemoryType*
- NetworkAdapter v1.11.0
  - Added *Reset* action
- NetworkAdapterMetrics v1.1.0
  - Added *ResetMetrics* action
- NetworkDeviceFunctionMetrics v1.2.0
  - Added *ResetMetrics* action
- OutletGroup v1.2.0
  - Added *OutletGroupType*
  - Added *OutletGroups* to *Links*

Redfish Schema Minor Revisions (3 of 5)

- **Protocol**
  - Added "eMMC" to the list of protocols
- **PCIeDevice v1.14.0**
  - Added *TemporaryThroughputReductionSupported* and *TemporaryThroughputReductionEnabled* to *CXLDevice*
  - Deprecated *ThroughputReductionSupport* in *CXLDevice* in favor of *TemporaryThroughputReductionSupported*
- **PCIeFunction v1.6.0**
  - Added *SegmentNumber, BusNumber, DeviceNumber,* and *FunctionNumber*
- **Port v1.12.0**
  - Deprecated *TemporaryThroughputReductionEnabled* and *TemporaryThroughputReductionSupported* in favor of *TemporaryThroughputReductionSupported* and *TemporaryThroughputReductionEnabled* in **PCIeDevice**
  - Deprecated *PortId* in favor of *ServiceLabel* in *Location*
- **PortMetrics v1.6.0**
  - Added *ResetMetrics* action

Redfish Schema Minor Revisions (4 of 5)

- PowerDistribution v1.4.0
  - Added the *PowerCapacityVA*
- PowerSupply v1.6.0
  - Added *Certificates*
- Processor v1.20.0
  - Added *CacheMemory*
- Pump v1.1.0
  - Added *SpeedControlPercent*
- Resource v1.19.0
  - Deprecated "Qualified" in *State* in favor of *StandbySpare*
  - Added "Degraded" to *State*
- Sensor v1.9.0
  - Added *Manufacturer, Model, SKU, SerialNumber, PartNumber, SparePartNumber, UserLabel*, and *LifetimeStartDateTime*

Redfish Schema Minor Revisions (5 of 5)

- ## ServiceRoot v1.17.0
  - Added *TopSkipQuery, FilterQueryComparisonOperations*, and *FilterQueryCompoundOperations* to *ProtocolFeaturesSupported*

- ## Settings v1.4.0
  - Added "OnTargetReset" to *OperationApplyTime*

- ## Storage v1.16.0
  - Added *RekeyExternalKey* action
  - Added *NVMeSubsystemProperties* and *ConfigurationLock*

- ## Triggers v1.4.0
  - Added *TriggerEnabled* and *TriggerActionMessage*

- ## UpdateService v1.14.0
  - Added "OnTargetReset" to *ApplyTime* in *HttpPushUriApplyTime*
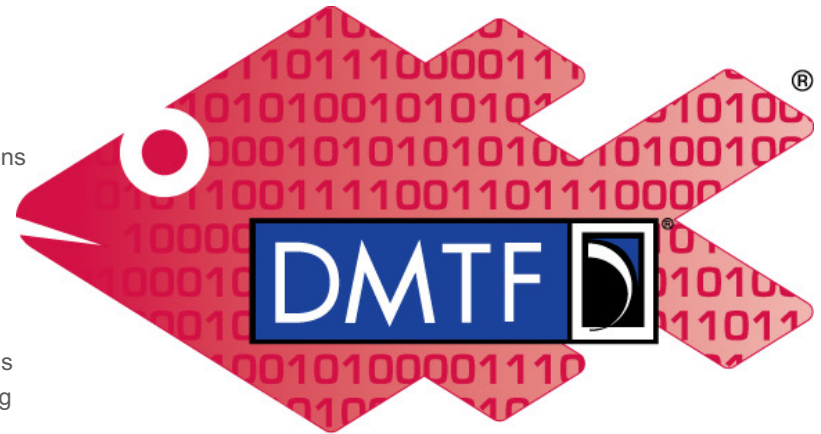
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Redfish Release 2023.3
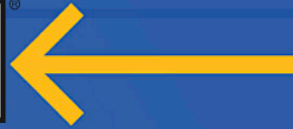
DMTF Redfish Forum

December 2023

Redfish Release 2023.3

- Redfish Specification v1.20.0
  - Added requirement for Outbound Connections to include the Sec-WebSocket-Protocol header as "Redfish"
  - Added requirement that services <u>shall</u> accept empty JSON objects for actions that do not have required parameters. **This change might require modification to an implementation to support this version of the specification**
- Redfish Specification v1.19.1 (errata release)
  - Clarified that users can delete their own Session resources
  - Added URI construction guidance for @Redfish.ActionInfo and OEM actions
  - Updated the <u>Members@odata.nextLink</u> clause to give guidance for handling the original query parameters and for using the $skiptoken parameter
  - Clarified the behavior of $expand query option when used with resources containing reference objects
  - Added ability to configure the support of HTTP Basic authentication
- Redfish Schema Bundle 2023.3
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2023.3
  - DSP8011 contains all released Redfish registries
  - Added *ActionParameterValueOutOfRange* to Base v1.18.0 message registry
- 1 New schema
  - ResolutionStep for providing a recommended step to resolve a condition (fault, error, etc.)
- 26 Updated schemas (highlights)
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

NEW ResolutionStep

- Allows a service to give programmatic guidance to clients for resolving errors, faults, or other issues

- Each *LogEntry, Event, Condition*, and *Message* object is allowed to contain a *ResolutionSteps* property

- *ResolutionSteps* is an array of objects consisting of…
    - The type of action to perform
    - The priority of the step
    - URIs and action parameters required to perform the resolution step
    - Retry policy

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ResolutionStep Example

```json
{
    "Status": {
        "State": "Enabled",
        "Health": "Critical",
        "Conditions": [
            {
                "MessageId": "Contoso.1.0.TooManyFatalErrors",
                "Message": "Too many fatal errors detected on this device",
                "ResolutionSteps": [
                    {
                        "ResolutionType": "Reset",
                        "Priority": 0,
                        "ActionURI": "/redfish/v1/Systems/1/Actions/ComputerSystem.Reset",
                        "ActionParameters": [
                            {
                                "Name": "ResetType",
                                "AllowableValues": [ "ForceRestart" ]
                            }
                        ]
                    },
                    {
                        "ResolutionType": "ReplaceComponent",
                        "Priority": 1,
                        "TargetComponentURI": "/redfish/v1/Systems/1/Processors/GPU3"
                    },
                    {
                        "ResolutionType": "ContactVendor",
                        "Priority": 2
                    }
                ]
            }
        ]
    }
}
```

Release 2023.3 Minor Schema Revision Highlights

- **AccountService** v1.15.0
  - Added *HTTPBasicAuth* control property
- **Drive** v1.18.0
  - Added *RevertToOriginalFactoryState* action
- **LogService** v1.6.0
  - Added *TargetURI, UserName, Password,* and *TransferProtocol* parameters to the *CollectDiagnosticData* action to optionally push diagnostic data to a remote URI
  - Added PushDiagnosticData action
- **Processor** v1.19.0
  - Added "RISC-V" to *ProcessorArchitecture*
  - Added "RV32" and "RV64" to *InstructionSet*

Redfish Schema

MINOR REVISION DETAILS

Redfish Schema Minor Revisions (1 of 5)

- AccountService v1.15.0
  - Added *HTTPBasicAuth*

- AggregationSource v1.4.0
  - Added "CFB128_AES192" and "CFB128_AES256" to *SNMPEncryptionProtocols*

- Assembly v1.5.0
  - Added *ISOCountryCodeOfOrigin*

- Chassis v1.25.0
  - Added "PowerStrip" to *ChassisType*
  - Added *HeatingCoolingManagerURIs* and *HeatingCoolingEquipmentNames* to *Links*

- ComputerSystem v1.22.0
  - Added *EfficiencyFavorPower* and *EfficiencyFavorPerformance* to *PowerMode*

- Control v1.5.0
  - Added "Percent" and "DutyCycle" to *ControlType*

- Drive v1.18.0
  - Added "EDSFF" and "M2" to *FormFactor*
  - Added *RevertToOriginalFactoryState* action

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- DriveMetrics v1.2.0
  - Added *ReadIOKiBytes* and *WriteIOKiBytes*
- EthernetInterface v1.12.0
  - Added *IPv6Enabled*
- Event v1.10.0
  - Added *ResolutionSteps*
- EventDestination v1.14.0
  - Added "CFB128_AES192" and "CFB128_AES256" to *SNMPEncryptionProtocols*
- Key v1.3.0
  - Added *Comment* to *SSH*
- LogEntry v1.16.0
  - Added *ResolutionSteps*

Redfish Schema Minor Revisions (3 of 5)

- LogService v1.6.0
  - Added *TargetURI, UserName, Password,* and *TransferProtocol* parameters to the *CollectDiagnosticData* action
  - Added *PushDiagnosticData* action

- Manager v1.19.0
  - Added *DaylightSavingTime*

- ManagerAccount v1.12.0
  - Added "CFB128_AES192" and "CFB128_AES256" to *SNMPEncryptionProtocols*

- ManagerNetworkProtocol v1.10.0
  - Added *FTP, SFTP*, and *FTPS*
  - Added *RestrictCommunityToIPv4AddressRange*, *IPv4AddressRangeLower*, and *IPv4AddressRangeUpper* to *CommunityStrings* in *SNMP*
  - Added "CFB128_AES192" and "CFB128_AES256" to *SNMPEncryptionProtocols*
  - Deprecated *CommunityAccessMode* property in *SNMP* in favor of existing *AccessMode* property in *CommunityStrings*

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Redfish Schema Minor Revisions (4 of 5)

- Memory v1.19.0
    - Added "LPDDR5_SDRAM" to *MemoryDeviceType*
    - Deprecated *PredictedMediaLifeLeftPercent* property in favor of existing *PredictedMediaLifeLeftPercent* in *MemoryMetrics* resource

- Message v1.2.0
    - Added *ResolutionSteps*

- NetworkAdapter v1.10.0
    - Added *ActiveSoftwareImage* and *SoftwareImages* to *Links* in *Controllers*

- PCIeDevice v1.13.0
    - Added *UnsupportedRequestCount* to *PCIeErrors*

- Port v1.11.0
    - Added *SupportedCXLModes* to CXL
    - Deprecated *Reserved* in *CurrentPortConfigurationState* in favor of *FabricLink*

Redfish Schema Minor Revisions (5 of 5)

- Processor v1.19.0
  - Added "RISC-V" to *ProcessorArchitecture*
  - Added "RV32" and "RV64" to *InstructionSet*
  - Added "Partition" to *ProcessorType*

- Resource v1.18.0
  - Added *ResolutionSteps* to *Conditions*

- TrustedComponent v1.3.0
  - Added *TPMGetEventLog* action

- UpdateService v1.13.0
  - Added *GenerateSSHIdentityKeyPair* and *RemoveSSHIdentityKeyPair* actions
 - Added *PublicIdentitySSHKey*
  - Added *SupportedUpdateImageFormats*

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Redfish Release 2023.2

DMTF Redfish Forum

September 2023

Redfish Release 2023.2

- Redfish Specification v1.19.0
  - Added Atomic Password Changes clause
  - Added Outbound Connections clause
  - Updated Session Login clause to define behavior when a token is required but not provided
- Redfish Specification v1.18.1 (errata release)
  - Recommend weak Etag compares for PUT and PATCH
  - Updated Deep Operations clause to show deep POST may include different types of resources
  - Recommend $expand responses include entire resource
- Redfish Schema Bundle 2023.2
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2023.2
  - DSP8011 contains all released Redfish registries
  - Added *OneTimePasscodeSent* to Base message registry
- 6 new schemas
  - Application, Container, ContainerImage, OperatingSystem for container, operating system, and application management
  - MemoryRegion to support CXL dynamic capacity devices (DCD)
  - OutboundConnection for enabling connections to cloud-based services
- 31 updated schemas (highlights)
  - Added PhysicalAddress to *Location*
  - *Added Decommission action to ComputerSystem*
  - *Added RemoteServerSSHKeys to UpdateService*
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

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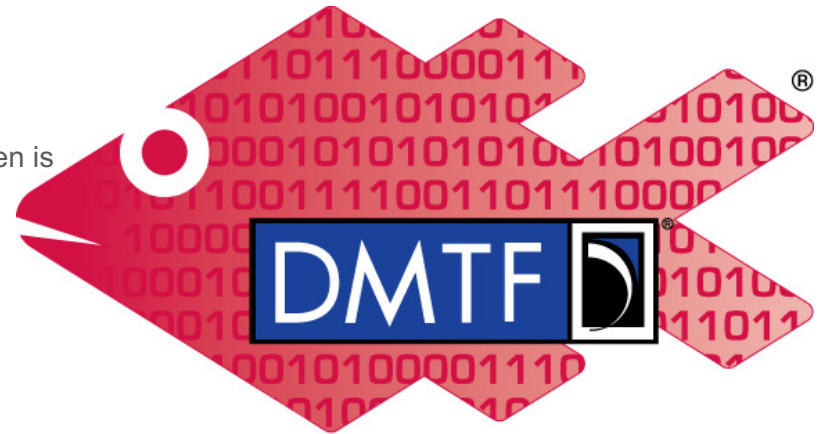
NEW Operating System, Application, Container models

- New resources model operating systems and application software
  - Developed with input from the Open Process Automation™ Forum
    - https://www.opengroup.org/forum/open-process-automation-forum
- **OperatingSystem** - Contains information about the operating system running on the system, including virtualization engines
- **Application** - Represents a software instance running on a system
- **ContainerImage** - Represents an available container image
- **Container** - Represents a container instance running on a system
  - Also contains its own **EthernetInterfaceCollection** to represent network connectivity of the container
- Existing **ComputerSystem** model represents virtual machines
  - A virtual machine is identified with *SystemType* as "*Virtual*"
  - New links added to show hosting **ComputerSystem** for the virtual machine

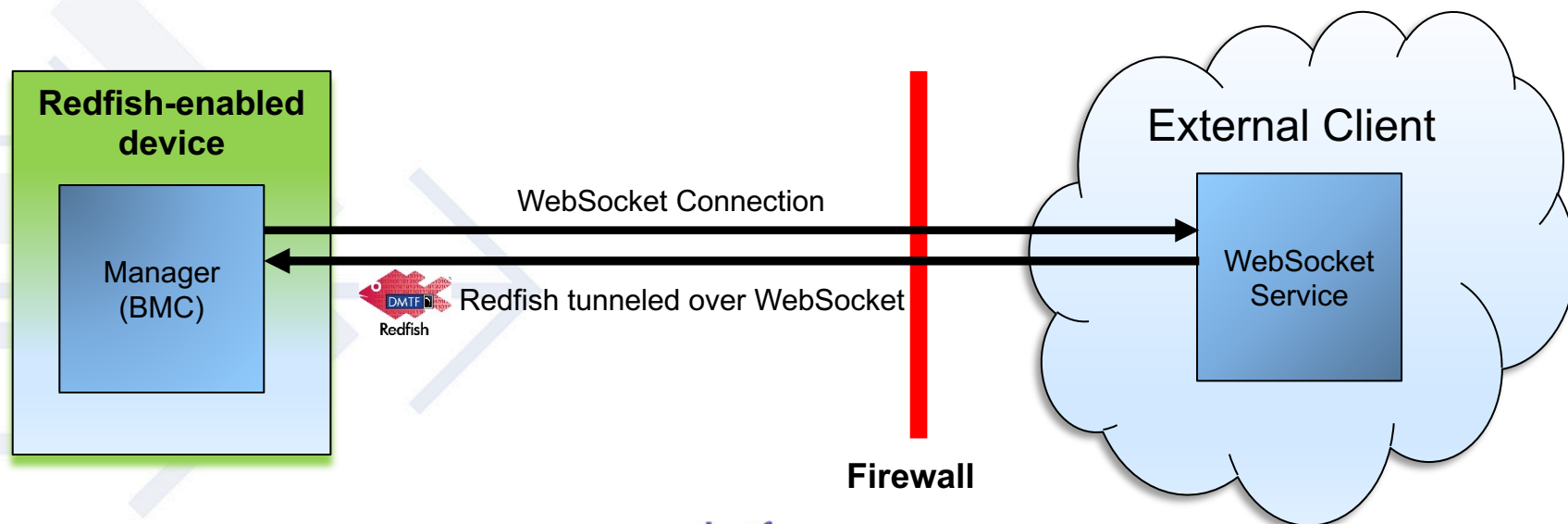# NEW Operating System, Application, Container Model
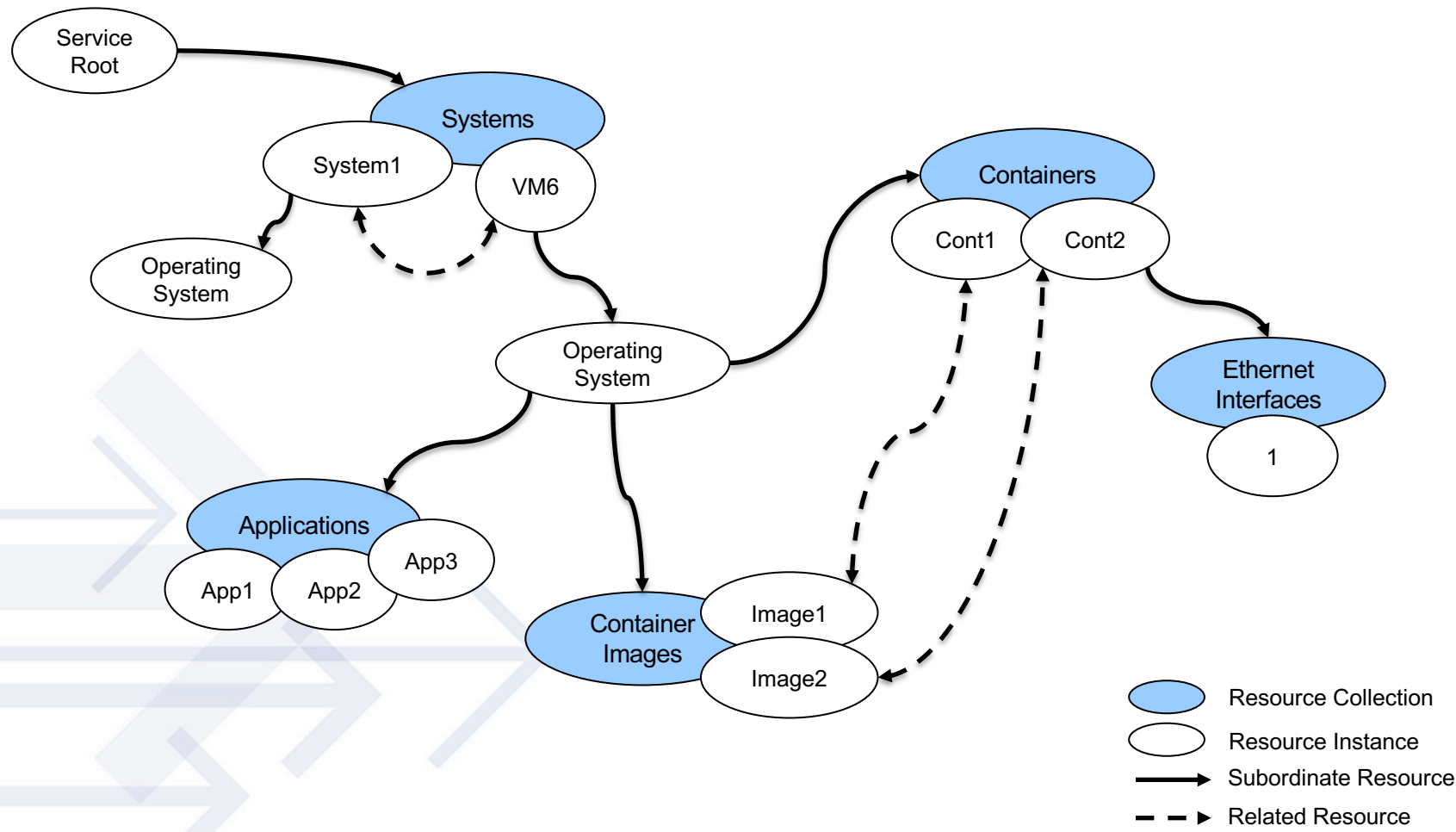
NEW Outbound Connections

- Internet-based applications or other "cloud-based" services cannot typically initiate HTTP connections to Redfish-enabled devices
  - Firewalls prevent inbound connections unless specifically configured to allow for specific use cases – and this is cumbersome and problematic
  - Devices will instead initiate an outbound connection, typically using WebSockets, to communicate with Internet-hosted clients
  - This avoids need to configure firewalls or other networking infrastructure

- **OutboundConnection** provides a standardized means to configure and establish a Redfish **Session** using a WebSocket
  - New WebSocket mechanism defined for Redfish HTTP operations
    - IANA-registered "Redfish" WebSocket sub-protocol
  - Initiated by the Redfish service, an outbound connection is made to a specified Internet / cloud-based client (hosted web service)
  - Client uses the WebSocket to perform operations and receive responses

Outbound Connection Usage

- An administrator configures the Redfish service to establish a persistent WebSocket connection to a client outside of the firewall
  - Provides URI, required info for external client connection, certificates, etc.
- WebSocket connection is initiated by the Redfish-enabled device
  - The **Manager** responsible for the Redfish Service opens the WebSocket
- The external client sends Redfish requests using the WebSocket

Redfish-enabled device

Manager (BMC)

WebSocket Connection

DMTF Redfish

Redfish tunneled over WebSocket

Firewall

External Client

WebSocket Service

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Additional password handling mechanisms

- **NEW** One-time Passcode support for multi-factor authentication
  - Allows service to generate and deliver a one-time passcode (OTP)
  - Users attempting to create sessions will generate an OTP
    - Initial attempt will fail with the *OneTimePasscodeSent* message returned
    - OTP is sent via email to *OneTimePasscodeDeliveryAddress* from **ManagerAccount**
    - User retrieves OTP from email, uses OTP value as *Token* to create a session
- **NEW** *ChangePassword* action in **ManagerAccount**
  - Provides means for atomic password change
    - May also apply to initial settings for accounts with *PasswordChangeRequired*
  - Action with required *Password* and *SessionAccountPassword* parameters
    - User must provide password associated with the current session
  - *RequireChangePasswordAction* added to **AccountService**
    - Indicates service requires use of the atomic *ChangePassword* action
    - If <u>*true*</u>, service will not allow a PATCH to *Password*

Enhancements to Location for "Physical" Address

- *PostalAddress* definition in common *Location* followed RFC5139

- But modern usage makes the cumbersome structure unnecessary
  - Mapping, search, and location APIs don't use individual partial address properties
  - Developers don't know which properties to provide or what they can depend on

- **NEW** *PhysicalAddress* replaces *PostalAddress* (now deprecated)
  - Fewer properties needed to render a complete address

```
"Location": {
   "PhysicalAddress": {
      "StreetAddress": "95 W Oak #9740",
      "City": "Houston",
      "StateOrProvince": "Texas",
      "Country": "United States",
      "PostalCode": "77070-3002",
      "ISOCountryCode": "USA",
      "ISOSubdivisionCode": "TX"
   },
```

- Program-friendly *ISOCountryCode* and *ISOSubdivisionCode*
  - Utilize ISO 3166-1 and 3166-2 codes
  - Avoids issues with string matching due to abbreviations, mixed languages, etc.

- Expect implementations to support "all or none" for interoperability

Deprecation of PCIeSlots resource

- PCIeSlots was a mostly static resource that provided information about PCIe slots

- *Slot* object available in **PCIeDevice** provides slot capabilities in context of an installed device

- Chassis includes empty PCIe slots as **PCIeDevice** resources with an "Absent" *State*
  - Shows capabilities of the chassis
  - Provides that data without a separate resource / code path

```
"@odata.type": "#PCIeDevice.v1_12_0.PCIeDevice",
"Id": "Slot2",
"Name": "PCIe Slot #2 (Empty)",
"Status": {
    "State": "Absent"
},
"Slot": {
    "PCIeType": "Gen4",
    "Lanes": 4,
    "SlotType": "FullLength",
    "Location": {
        "PartLocation": {
            "ServiceLabel": "Slot 2",
            "LocationOrdinalValue": 2,
            "LocationType": "Slot",
            "Orientation": "LeftToRight",
            "Reference": "Rear"
        }
    }
},
```

Redfish Schema Minor Revisions (1 of 5)

- AccountService v1.14.0
  - Added *RequireChangePasswordAction* and *OutboundConnections*
  - Added *OneTimePasscode* to *MFABypassType*
  - Added *EmailAttribute* to *SearchSettings* in *LDAPService*
- ActionInfo v1.3.0
  - Added *AllowableValueDescriptions* to *Parameters*
- Certificate v1.8.0
  - Added *IDevID, LDevID, IAK,* and *LAK* to *CertificateUsageType*
- Chassis v1.24.0
  - Added *Doors*
  - Deprecated *PCIeSlots* in favor of *PCIeDevices*
- ComputerSystem v1.21.0
  - Added *OperatingSystem*
  - Added *HostingComputerSystem* and *VirtualMachines* to *Links*
  - Added *Decommission* action
  - Deprecated "OS" for *SystemType* in favor of new *OperatingSystem* resource

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Redfish Schema Minor Revisions (2 of 5)

- Connection v1.3.0
  - Added *MemoryRegionInfo*
- CoolingUnit v1.1.0
  - Added *CoolantConnectorRedundancy*
- CXLLogicalDevice v1.1.0
  - Added *MemoryRegions*
- DriveMetrics v1.1.0
  - Added *NativeCommandQueueDepth*
- EthernetInterface v1.11.0
  - Added *RoutingScope*
- Event v1.9.0
  - Added *Resolution* and *OEMDiagnosticDataType*
- ExternalAccountProvider v1.7.0
  - Added *EmailAttribute* to *SearchSettings* in *LDAPService*
- Fan v1.4.0
  - Added *SecondarySpeedPercent*

Redfish Schema Minor Revisions (3 of 5)

- Key v1.3.0
  - Added *RemoteServerHostName* to *SSH*
- LogService v1.5.0
  - Added *CXL* to *LogEntryType*
- ManagerAccount v1.11.0
  - Added *EmailAddress, PhoneNumber*, and *OneTimePasscodeDeliveryAddress*
  - Added *ChangePassword* action
- Memory v1.18.0
  - Added *MemoryRegionMediaSources* to Links
- MemoryChunks v1.6.0
  - Added *MemoryRegions* to Links
- PCIeDevice v1.6.0
  - Added *LocationIndicatorActive*
  - Added *Processors* to *Links* and *HotPluggable* to *Slot*
  - Added *DynamicCapacity* object to *CXLDevice*

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Redfish Schema Minor Revisions (4 of 5)

- PCIeSlots v1.6.0
  - Deprecated schema in favor of *PCIeDevice* schema
- Port v1.10.0
  - Deprecated *Enabled* in favor of existing *InterfaceEnabled*
- PortMetrics v1.5.0
  - Added *PhyResetProblemCount* to *SAS*
- Resource v1.17.0
  - Added *PhysicalAddress* object to *Location*
  - Deprecated *PostalAddress* in favor of new *PhysicalAddress* property in *Location*
- SerialInterface v1.2.0
  - Added *Links*
- Session v1.7.0
  - Added *Roles* and *Links*
  - Added "OutboundConnection*"* to *SessionType*

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Redfish Schema Minor Revisions (5 of 5)

- SoftwareInventory v1.10.0
  - Added *ReleaseType* and *AssociatedPhysicalContext*
- ThermalEquipment v1.1.0
  - Added *CoolingLoopRedundancy*
- ThermalMetrics v1.3.0
  - Added *PowerWatts* and *EnergykWh*
- ThermalSubsystem v1.3.0
  - Added *Pumps, LeakDetection,* and *CoolantConnectorRedundancy*
- TrustedComponent v1.2.0
  - Added *Owner* to *Links*
- UpdateService v1.12.0
 - Added *RemoteServerSSHKeys* and *VerifyRemoteServerSSHKey*

Redfish Release 2023.1

DMTF Redfish Forum

May 2023

Redfish Release 2023.1

- Redfish Specification v1.18.0
  - Adds URI segment annotation clause to allow schemas to describe URIs that do not match applicable naming rules
- Redfish Specification v1.17.1 (errata release)
  - Improved M-SEARCH example response
  - Updated authentication requirements to state that services can optionally reject requests to unauthenticated resources if the provided credentials are invalid
  - Added guidance for finding the schema for an Action response
  - Made Access-Control-Allow-Origin an optional response header
- Redpath Specification v1.1.0
  - **NEW** Additional query parameters added to the syntax
- Redfish Schema Bundle 2023.1
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2023.1
  - DSP8011 contains all released Redfish registries
  - **NEW** Environment, Power, and Platform message registries
  - Added *TestMessage* to ResourceEvent message registry
- 11 new schemas
  - ThermalEquipment, CoolingUnit, CoolingLoop, CoolantConnector, Filter, Pump, Reservoir, LeakDetection, LeakDetector
  - DriveMetrics and StorageControllerMetrics
- 28 updated schemas (highlights)
  - Added AttachNamespaces, DetachNamespaces, SecuritySend, and SecurityReceive actions to StorageController
  - Added *PartLocationContext* to *Location*
  - See release notes in DSP8010 for errata details
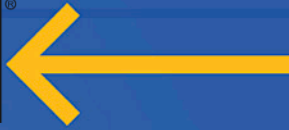- Download all published material at: http://www.dmtf.org/standards/redfish
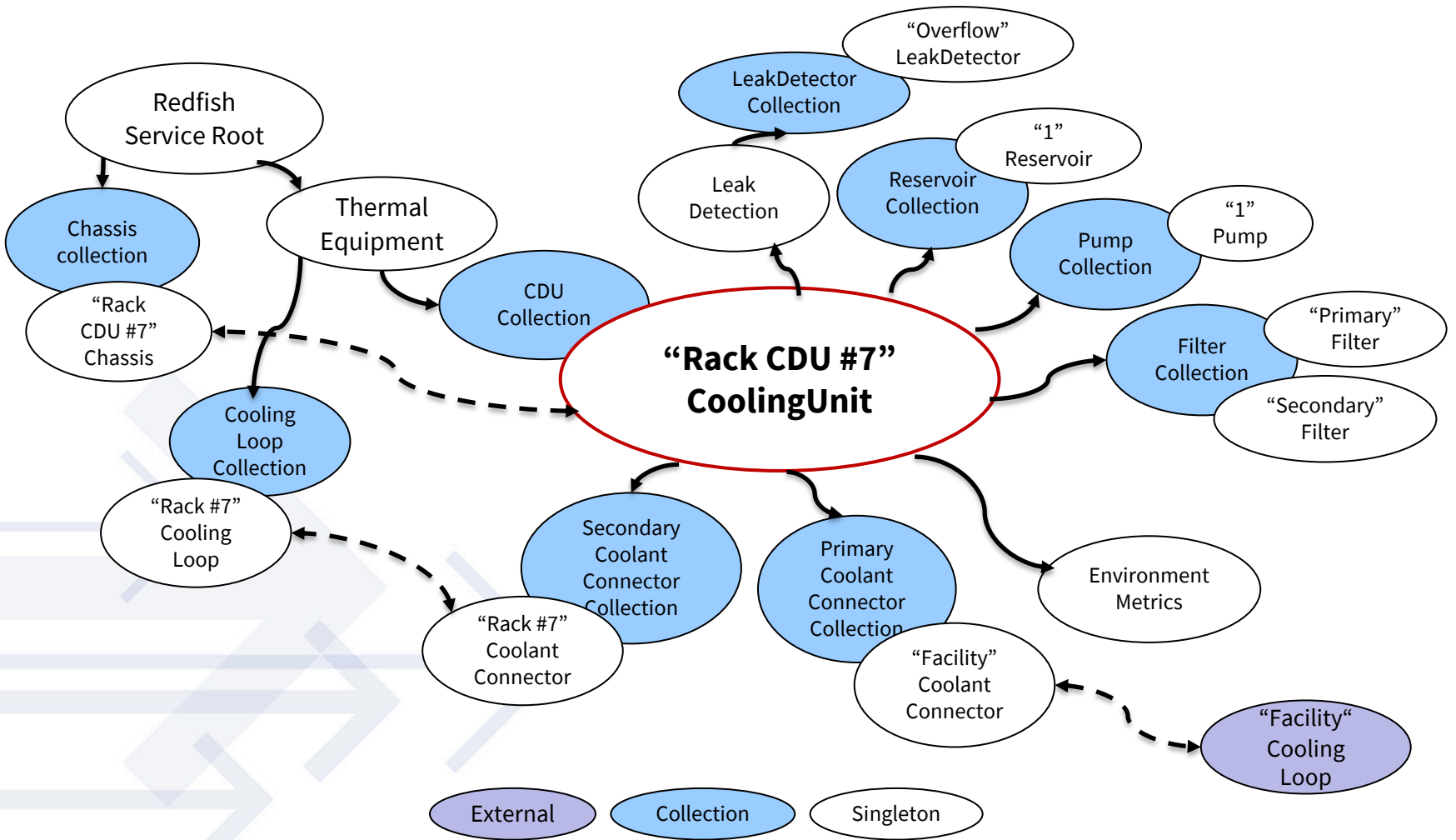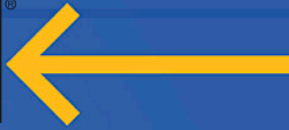
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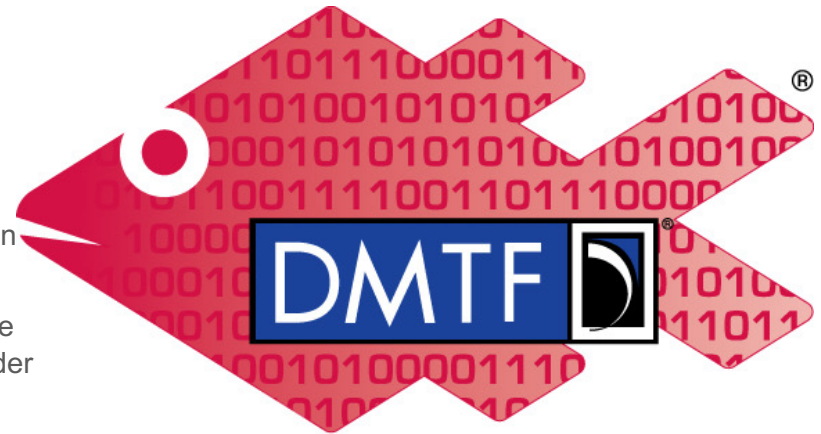
NEW Redfish for Cooling Distribution Units

- Extending Redfish data model to incorporate liquid cooling units
  - Cooling Distribution Units (CDUs)
  - Immersion cooling units and systems
  - Rear-door and in-rack heat exchangers
- **ThermalEquipment** resource located off ServiceRoot
  - Used primarily for discovery of managed equipment
- **CoolingUnit** schema provides bulk of the equipment details
  - Includes subsystem schemas for **Pump**, **Reservoir**, and **Filter** collections
- **CoolingLoop** describes coolant pathways at chassis or facility level
- **CoolantConnector** describes connectivity and telemetry
  - Pressure, temperature, and liquid flow rates on supply and return
  - New Sensor definitions for "delta" values
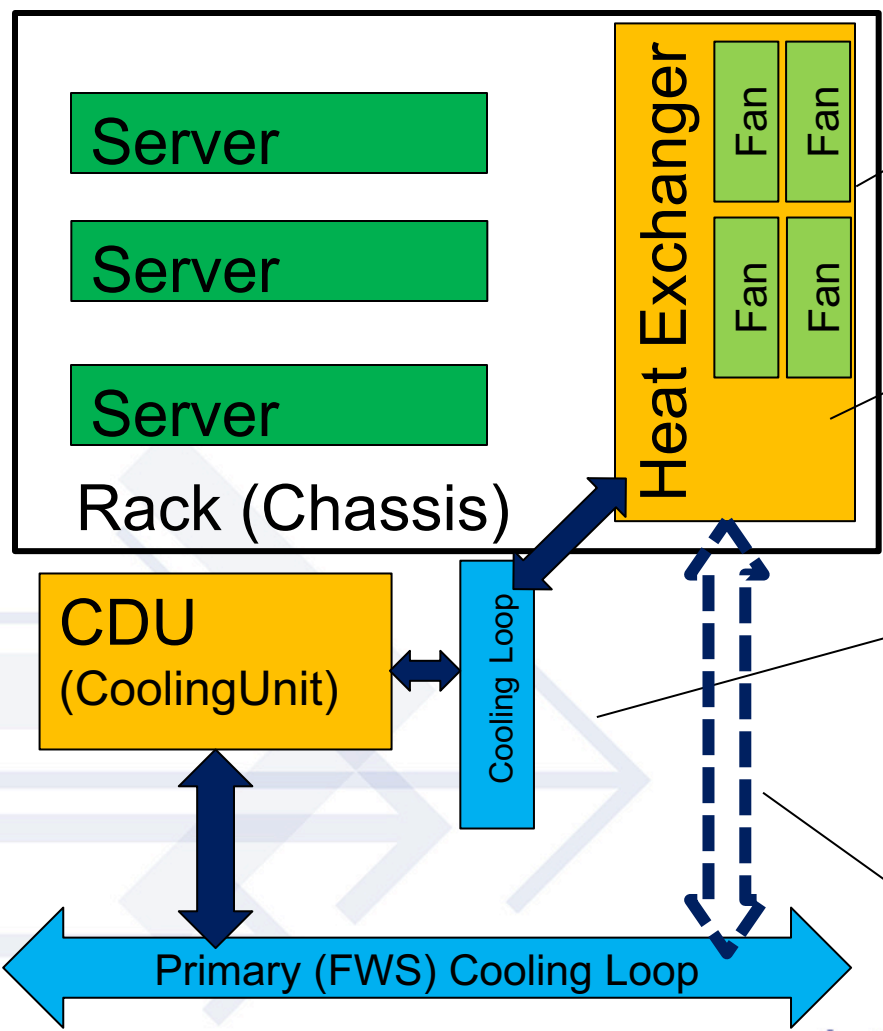- **LeakDetection** and **LeakDetector** support this critical subsystem

Cooling Unit Model

External   Collection   Singleton

Example: Rear Door Heat Exchanger and CDU

Server

Server

Server

Rack (Chassis)

Heat Exchanger

Fan Fan

Fan Fan

CDU
(CoolingUnit)

Cooling Loop

Primary (FWS) Cooling Loop

The heat exchanger is modeled as a **Chassis** with a **ThermalSubsystem** that describes the **Fans**

ThermalMetrics has new sensor excerpts to describe airflow and delta pressure

CDU *primary* **CoolantConnector** attaches to the facility cooling loop and its *secondary* **CoolantConnector** connects to a technology loop, which in turn connects to the heat exchanger via **CoolantConnector**

OR the heat exchanger directly connects to the facility loop via a **CoolantConnector**

Drive and Storage Controller Updates

- **NEW DriveMetrics** and **StorageControllerMetrics** resources
  - Reports usage and health statistics for drives and storage controllers
  - Error counters, I/O statistics, NVMe SMART/Health Information log page
- **NEW StorageController** actions
  - AttachNamespaces and DetachNamespaces actions allow users to assign NVMe namespaces to NVMe I/O controllers
  - SecuritySend and SecurityReceive actions allow users to send and receive SPC5-defined security payloads for on-boarding enablement of storage devices

Message Registry additions

- **NEW Platform** v1.0.0
  - Messages related to computer "platform" events, such as OS crashes, memory errors, or processor faults
- **NEW Power** v1.0.0
  - Messages related to electrical measurements, such as voltage, current or power threshold violations
  - Messages related to power-handling devices or systems, such as power supplies, circuits, or power distribution units
- **NEW Environmental** v1.0.0
  - Messages related to environmental conditions or measurements, such as humidity or temperature threshold violation
- **ResourceEvent** v1.3.0
  - Added "TestMessage" to provide standardized response for the new *TestEventSubscription* action
- **Base** v1.16.0
  - Added "StringValueTooShort", "ArraySizeTooLong", "ArraySizeTooShort", and "LicenseRequired" messages

Redfish Schema Minor Revisions (1 of 6)

- AccountService v1.13.0
  - Added *Retries* and *TimeoutSeconds* to *ExternalAccountProvider*
  - Added *AuthorizationService* and *Oem* to *TACACSplus*
- Certificate v1.7.0
  - Added *AlternativeNames* to *Subject*
- Chassis v1.23.0
  - Added *CoolingUnits* and *ConnectedCoolingLoops* to *Links*
  - Added *ImmersionTank* and *HeatExchanger* to *ChassisType*
- Connection v1.2.0
  - Added *LUN to VolumeInfo*
  - *Added CHAP and DHCHAP to ConnectionKeys*
- Control v1.3.0
  - Added *DefaultSetPoint*
  - Added "PressurekPa" and "Valve" to *ControlType*
  - Deprecated the "Pressure" in *ControlType* in favor of "PressurekPa"

Redfish Schema Minor Revisions (2 of 6)

- Drive v1.17.0
  - Added *FirmwareVersion* and *Metrics*
  - Added *OperationType* to *Operations*
  - Deprecated *OperationName* in favor of *OperationType* in *Operations*
- EthernetInterface v1.10.0
  - Added *AffiliatedInterfaces* to *Links*
- Event v1.8.0
  - Added *CPER, DiagnosticData, DiagnosticDataType, AdditionalDataSizeBytes*, and *AdditionalDataURI*
- EventService v1.10.0
  - Added *TestEventSubscription action*
  - Added *MessageSeverity* parameter to the *SubmitTestEvent* action
- ExternalAccountProvider v1.6.0
  - Added *Retries* and *TimeoutSeconds*
  - Added *AuthorizationService* and *Oem* to *TACACSplus*

Redfish Schema Minor Revisions (3 of 6)

- Facility v1.4.0
  - Added *CDUs, ImmersionUnits*, and *CoolingLoops* to *Links*
- Fan v1.4.0
  - Added *FanDiameterMm*
- LogEntry v1.15.0
  - Added *CPER and DiagnosticData*
- Manager v1.18.0
  - Added *SelectedNetworkPort to Links*
- MemoryMetrics v1.7.0
  - Added *CapacityUtilizationPercent*
- PowerSupplyMetrics v1.1.0
  - Added *FanSpeedsPercent* to support multiple fans within a power supply
  - Deprecated *FanSpeedPercent* in favor of *FanSpeedsPercent*

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Redfish Schema Minor Revisions (4 of 6)

- Processor v1.18.0
  - Added *"ManagementDetectedFault" to ThrottleCauses*
- RegisteredClient v1.1.0
  - Added *Context* and *SubContext*
- Resource v1.16.0
  - Added *PartLocationContext* to *Location*
- Sensor v1.7.0
  - Added *ReadingBasis*
  - Added *HysteresisReading* and *HysteresisDuration* to the threshold properties
  - Added "PressurePa" and "Heat" to *SensorType*
  - Added "Disabled" to *Activation*
  - Deprecated "Pressure" for *SensorType* in favor of "PressurePa"
  - Deprecated "AirFlow" for *SensorType* in favor of "AirFlowCMM"
  - Deprecated "LiquidFlow" for *SensorType* in favor of "LiquidFlowLPM"

Redfish Schema Minor Revisions (5 of 6)

- ServiceRoot v1.16.0
  - Added *ThermalEquipment*

- Storage v1.15.0
  - Added *Connections* and *AutoVolumeCreate*
  - Added *NVMeoFDiscoverySubysystems* to *Links*
  - Deprecated *StorageGroups* in favor of *Connections*

- StorageController v1.7.0
  - Added *AttachNamespaces*, *DetachNamespaces*, *SecuritySend*, and *SecurityReceive* actions
  - Added *Metrics*
  - Added *NVMeDiscoveredSubsystems* to *Links*

- ThermalMetrics v1.2.0
  - Added *DeltaPressurekPa and AirFlowCubicMetersPerMinute*

- ThermalSubsystem v1.2.0
  - Added *CoolantConnectors*

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Redfish Schema Minor Revisions (6 of 6)

- Triggers v1.3.0
    - Added *HysteresisReading* and *HysteresisDuration* to threshold properties
    - Added *Disabled* to *Activation*

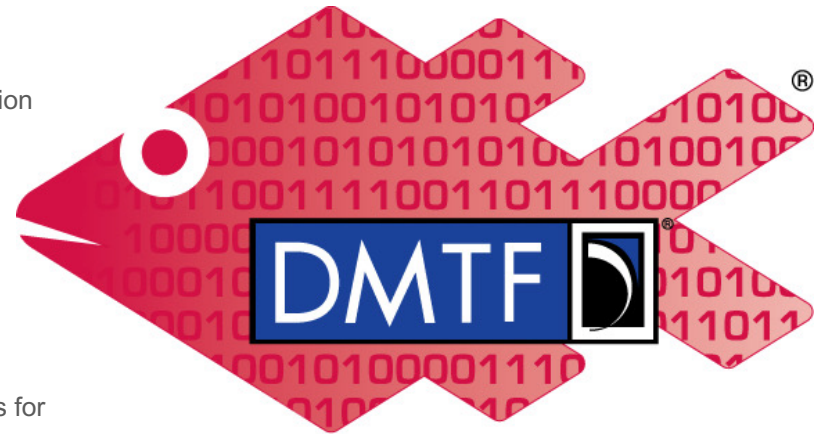- TrustedComponent v1.1.0
    - Added *TPM*

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Redfish Release 2022.3

DMTF Redfish Forum

December 2022

Redfish Release 2022.3

- Redfish Specification v1.17.0
  - Adds support for multi-factor and client certificate-based authentication
  - Enhanced schema annotations support URI deprecation and write-only properties
  - Adds optional support for HTTP 2.0
- Redfish Specification v1.16.1 (errata release)
  - Matched UUID / GUID to the correct formats shown in schema
  - Improved terminology for MessageId and related tokens
  - Clarified $select usage with array properties
- Redfish Interoperability Profile Specification v1.6.0
  - Adds support for Resource Use Cases to simplify creation of profiles for schemas used in multiple locations in the data model
  - Adds *Replaces* and *ReplacedBy* terms to improve profile handling of deprecated or obsolete properties
- Redfish Schema Bundle 2022.3
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2022.3
  - DSP8011 contains all released Redfish registries
  - Base v1.15.0 registry added *QueryParameterUnsupported* and *AuthenticationTokenRequired* messages
- 3 new schemas
  - CXLLogicalDevice, Heater, and HeaterMetrics
- 40 updated schemas (highlights)
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

NEW Multi-factor Authentication Support

- Added *MultiFactorAuth* to **AccountService** to configure a service for multi-factor authentication
  - RSA SecurID, Google Authenticator, Microsoft Authenticator, and client certificate authentication
- HTTP Basic authentication is not available for accounts configured for multi-factor authentication
  - Users are required to establish Redfish sessions for those accounts
- For RSA SecurID, Google Authenticator, and Microsoft Authenticator, clients provide a new *Token* property in the session creation request
  - The service verifies the token with the token provider
  - The username and password are verified by the service
- For client certificate authentication, the client provides their identity certificate during TLS handshaking
  - The service verifies the provided certificate is signed by a known CA
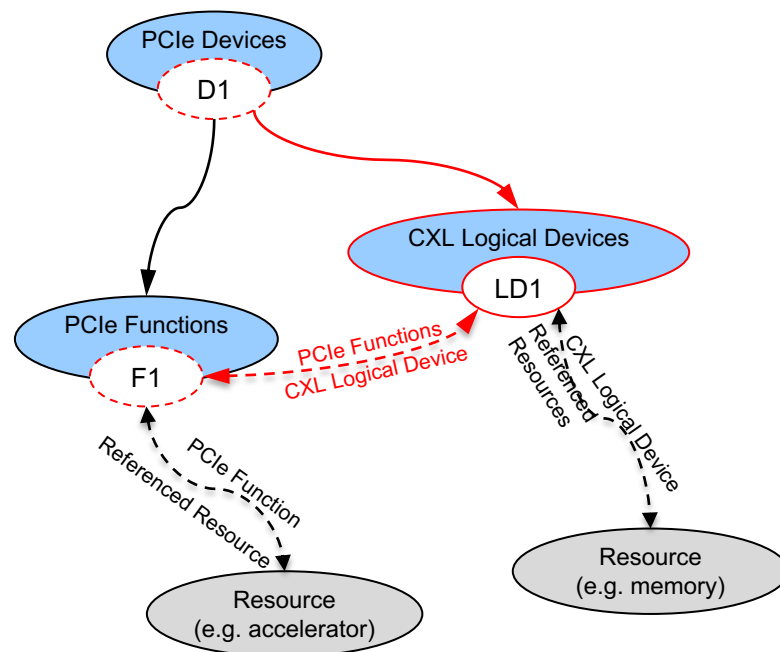 - The service matches the provided certificate with a user account

NEW Compute Express Link (CXL) Support

- Defined by the Compute Express Link Consortium
  - Built upon the PCI Express Physical Layer
    - Creates a cache-coherent interconnect with processor
    - Adds new protocols on top of PCI Express
  - 3 different Device Types
    - Type 1(Caching Devices/Accelerators)
    - Type 2(Accelerators with Memory)
    - Type 3(Memory buffers)
- Redfish data model extended through DMTF alliance partnership with CXL Consortium
- For more information, visit https://www.computeexpresslink.org/
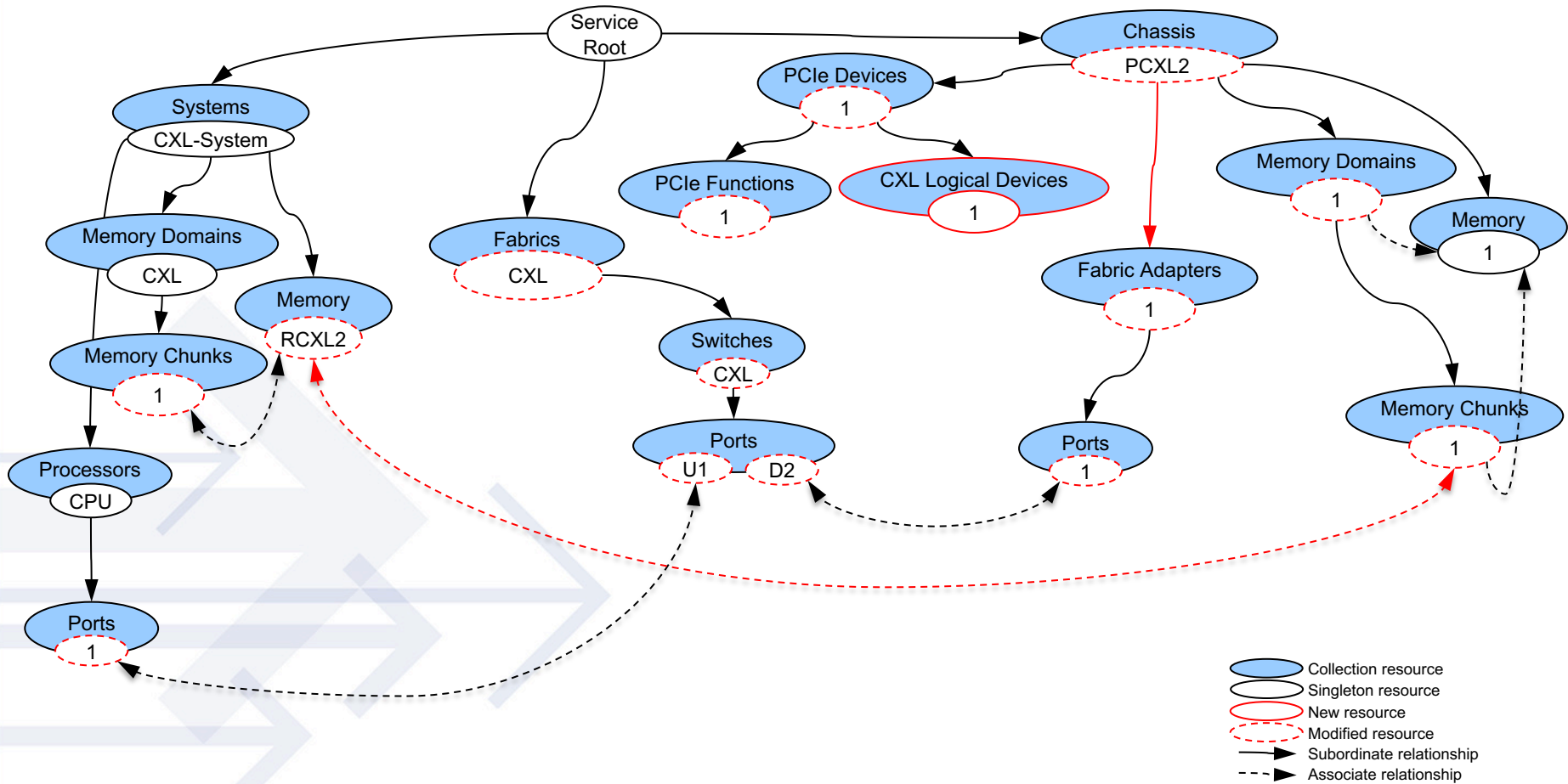
Redfish Model for CXL

- Redfish includes models for both CXL devices and CXL-based fabrics
- CXL devices are described in **ComputerSystem** and **Chassis** models
    - Using *PCIeDevices* and addition of *Processors* into **Chassis** allows us to describe local and remote devices
    - **ComputerSystem** describes the host's connection to the CXL Device
        - **Processor** can show a connection to a local or remote accelerator
        - **Memory** can show a local or remote CXL memory buffer
- CXL fabrics are described by **Fabric** model
    - Shows embedded and remote switches
    - *Ports* show connectivity to devices
    - *Connections* show how hosts are connected to remote CXL resources
- Additional training material under development

Remote CXL Type 3 Device Model

Legend:
- Collection resource
- Singleton resource
- New resource
- Modified resource
- Subordinate relationship
- Associate relationship

NEW Heater and HeaterMetrics Resources

- Heaters are used in designs where a system is in an extreme environment and components require heat to stay in operating range
- Resources added to provide information about heaters inside a chassis
  - Product and part (FRU) information
  - Metrics
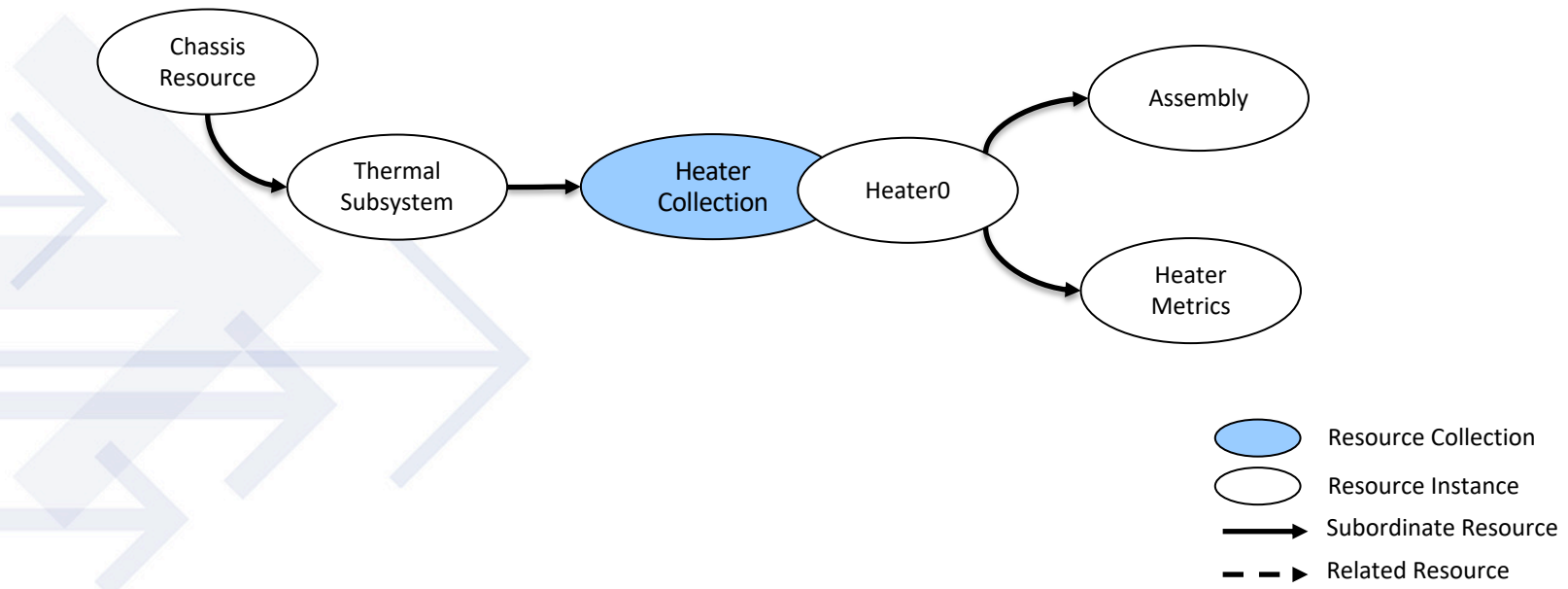
Interoperability profile v1.6 enhancements

- Resource "UseCase"
  - New method to create multiple sets of requirements for a specific resource (schema) by defining a use case to check each resource for applicability
    - For example, NV-DIMM instances of the Memory resource have a different set of requirements than DRAM-based (DIMM) instances
  - Significantly reduces need to create complex *conditionalRequirements* to accomplish the same set of requirements in the profile
    - Resulting profile document is easier to comprehend and re-use

- Handling of deprecated properties
  - New *Replaces* and *ReplacedBy* annotations creating pairing between properties, to improve "must have one, or the other, or both" requirements
  - These annotations define prioritized handling of "new" vs. "old" properties
    - In many cases, profiles can omit deprecated properties, but still allow legacy implementations to pass validation using the "old" properties

Redfish Schema Minor Revisions (1 of 7)

- AccountService v1.12.0
  - Added *MultiFactorAuth*
- AggregationSource v1.3.0
  - Added *GenerateSSHIdentityKeyPair* and *RemoveSSHIdentityKeyPair* actions
  - Added *SSHSettings* and *Status*
- Chassis v1.22.0
  - Added *Processors*
  - Deprecated *IntrusionSensorNumber* in *PhysicalSecurity*
- ComputerSystem v1.20.0
  - Added *CachePolicy* and *CacheDuration* to *KMIPServers*
- ConnectionMethod v1.1.0
  - Added *TunnelingProtocol*
- Drive v1.16.0
  - Added *SlotFormFactor, DriveFormFactor*, and *SlotCapableProtocols*
  - Added *ActiveSoftwareImage* and *SoftwareImages* to *Links*

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Redfish Schema Minor Revisions (2 of 7)

- Endpoint v1.8.0
  - Added *CXLDevice* and *Memory* to *EntityType*
- EventDestination v1.13.0
  - Added *Kafka* to *Protocol*
  - Added *Severities*
- EventService v1.9.0
  - Added *Severities*
  - Added *PasswordSet* to *SMTP*
- ExternalAccountProvider v1.5.0
  - Added MFABypasss to RoleMapping
- FabricAdapter v1.5.0
  - Added *Processors*
- Job v1.2.0
  - Added *Links* with *CreatedResources*

- Key v1.2.0
  - Added SSH
- License v1.1.0
  - Added TargetServices
- LicenseService v1.1.0
  - Added *AuthorizedDevices* and *TargetServices* parameters to the *Install* action
- LogEntry v1.14.0
  - Added *CXL* to *EntryType*
  - Added *OverflowErrorCount, FirstOverflowTimestamp, LastOverflowTimestamp, CXLEntryType,* and *Persistency*
- Manager v1.17.0
  - Added *Version*
- ManagerAccount v1.10.0
  - Added *MFABypass*

Redfish Schema Minor Revisions (4 of 7)

- *ManagerDiagnosticData v1.2.0*
  - *Added ServiceRootUptimeSeconds*
- *Memory v1.17.0*
  - *Added FreezeSecurityState, ScanMedia, InjectPersistentPoison, SetMasterPassphrase, and DisableMasterPassphrase actions*
  - *Added PoisonListMaxMediaErrorRecords, CXL, VolatileSizeLimitMiB, NonVolatileSizeLimitMiB, SecurityStates, and HealthData*
  - *Added Endpoints and MemoryMediaSources to Links*
  - *Added HBME2 to MemoryType*
- *MemoryChunks v1.5.0*
  - *Added MediaLocation and RequestedOperationalState*
  - *Added CXLLogicalDevices to Link*
- *MemoryDomain v1.5.0*
  - *Added Status, MinMemoryChunkSizeMiB, MemoryChunkIncrementMiB, and MemorySizeMiB*
  - *Added FabricAdapters, PCIeFunctions, and CXLLogicalDevices to Links*

- MemoryMetrics v1.6.0
  - Added *CorrectedVolatileErrorCount, CorrectedPersistentErrorCount, DirtyShutdownCount,* and *CXL*

- MessageRegistry v1.6.0
  - Added *ReplacedBy* and *MapsToGeneralMessages*

- PCIeDevice v1.11.0
  - Added *CXLDevice, StagedVersion,* and *CXLLogicalDevices*

- PCIeFunction v1.5.0
  - Added *FunctionProtocol*
  - Added *MemoryDomains* and *CXLLogicalDevice* to *Links*

- Port v1.8.0
  - Added *ResetPPB* action
  - Added *RemotePortId* and *CXL*
  - Added *SystemName, SystemDescription*, and *SystemCapabilities* to *LLDPTransmit* and *LLDPReceive*
  - Added *PCIe* to *LinkNetworkTechnology*

Redfish Schema Minor Revisions (6 of 7)

- PortMetrics v1.4.0
  - Added *CXL*
- PowerDistribution v1.3.0
  - Added *UserLabel*
- Processor v1.17.0
  - Added *PowerState*
  - Added *FabricAdapters* to *Links*
  - Added "HBME2" and "Cache*"* to *ProcessorMemoryType*
- Resource v1.15.0
  - Added "GCXLID" to *DurableNameFormat*
- Session v1.6.0
  - Added *Token*
- ServiceRoot v1.15.0
  - Added *ManagerProvidingService* to *Links*

Redfish Schema Minor Revisions (7 of 7)

- SoftwareInventory v1.10.0
  - Added *VersionScheme*
- Storage v1.14.0
  - Added *HotspareActivationPolicy*, *EncryptionMode*, and *LocalEncryptionKeyIdentifier*
  - Added *EncryptionKeyIdentifier* and *CurrentEncryptionKey* to *SetEncryptionKey* action
- Switch v1.8.0
  - Added *CXL*
- Task v1.7.0
  - Added *Links* with *CreatedResources*
- ThermalMetrics v1.1.0
  - Added *HeaterSummary*
- ThermalSubsystem v1.1.0
  - Added *Heaters*
- VirtualMedia v1.6.0
  - Added *EjectPolicy* and *EjectTimeout*

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Redfish Release 2022.2

DMTF Redfish Forum

August 2022

Redfish Release 2022.2

- ## Redfish Specification v1.16.0
  - Adds new optional standard roles
  - Adds allowable string pattern, allowable number values, and writeable property payload annotations
- ## Redfish Specification v1.15.2
  - Errata release
  - Clarified URI naming rules
  - Clarified usage of HTTP 204 response code
  - Added explanation of service-defined filtering of properties based on user identity beyond what is assigned by Redfish privileges.
  - Explained some design exceptions to Links definitions
- ## Redfish Schema Bundle 2022.2
  - DSP8010 contains all released Redfish schemas
- ## Redfish Message Registry Bundle 2022.2
  - DSP8011 contains all released Redfish registries
  - **NEW** Sensor registry defines general events from the Sensor model
- ## 27 updated schemas (highlights)
  - Added *ResetToDefaults* action to various resources
  - Added support for clients to create *EthernetInterface* resources
  - Added manager network port information
  - See release notes in DSP8010 for errata details
- ## Download all published material at: http://www.dmtf.org/standards/redfish

www.dmtf.org
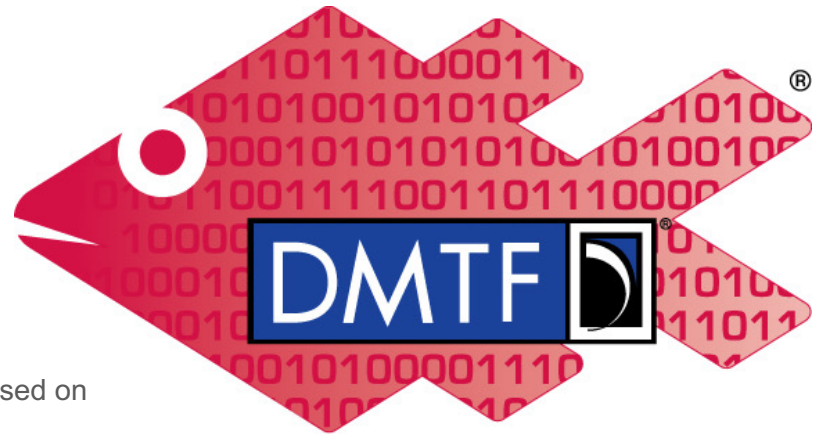
NEW SecurityPolicy Resource

- Provides a central point to configure the security policy of a manager
  - Each *Manager* resource can contain a *SecurityPolicy* resource
- Configures SPDM-related connection settings for the manager
  - Enable/disable SPDM
  - Enable/disable secure sessions
  - Allowed/denied SPDM versions and algorithms
  - Trusted/revoked device and CA certificates for SPDM devices
  - For more information, see the Security Protocols and Data Models Working Group: https://www.dmtf.org/standards/spdm
- Configures TLS-related connection settings for the manager
  - Allowed/denied TLS versions and algorithms
  - Trusted/revoked server and CA certificates when the manager acts as a TLS client

NEW TrustedComponent Resource

- Represents a security device for establishing trust
  - Examples include: a TPM, external hardware root of trust, embedded hardware root of trust
- Collection of *TrustedComponent* resources can be found subordinate to the *Chassis* resource
  - Allows for a client to discover containment hierarchy of these devices
- Each *TrustedComponent* resource contains inventory-related information about the device
  - Part number, serial number, model, and other FRU information
  - Certificates installed on the device
  - Software images installed on the device

Creating (POST) EthernetInterface Resources

- *EthernetInterfaceCollection* allows for POST operations
  - Clients can create a VLAN based off an existing interface (replaces the deprecated *VLanNetworkInterfaceCollection* resource)
  - Clients can create interface teams or bonds from a set of interfaces
- *TeamMode* and *RelatedInterfaces* were added to *EthernetInterface*
  - Clients provide these properties in the POST operation
  - *TeamMode*: The teaming/bonding policy for the new interface
  - *RelatedInterfaces*: The parent interface for the new VLAN or the set of interfaces to team/bond
- Existing properties, such as *VLAN*, *IPv4Addresses*, and *IPv4StaticAddresses*, are used in the same manner as physical interfaces
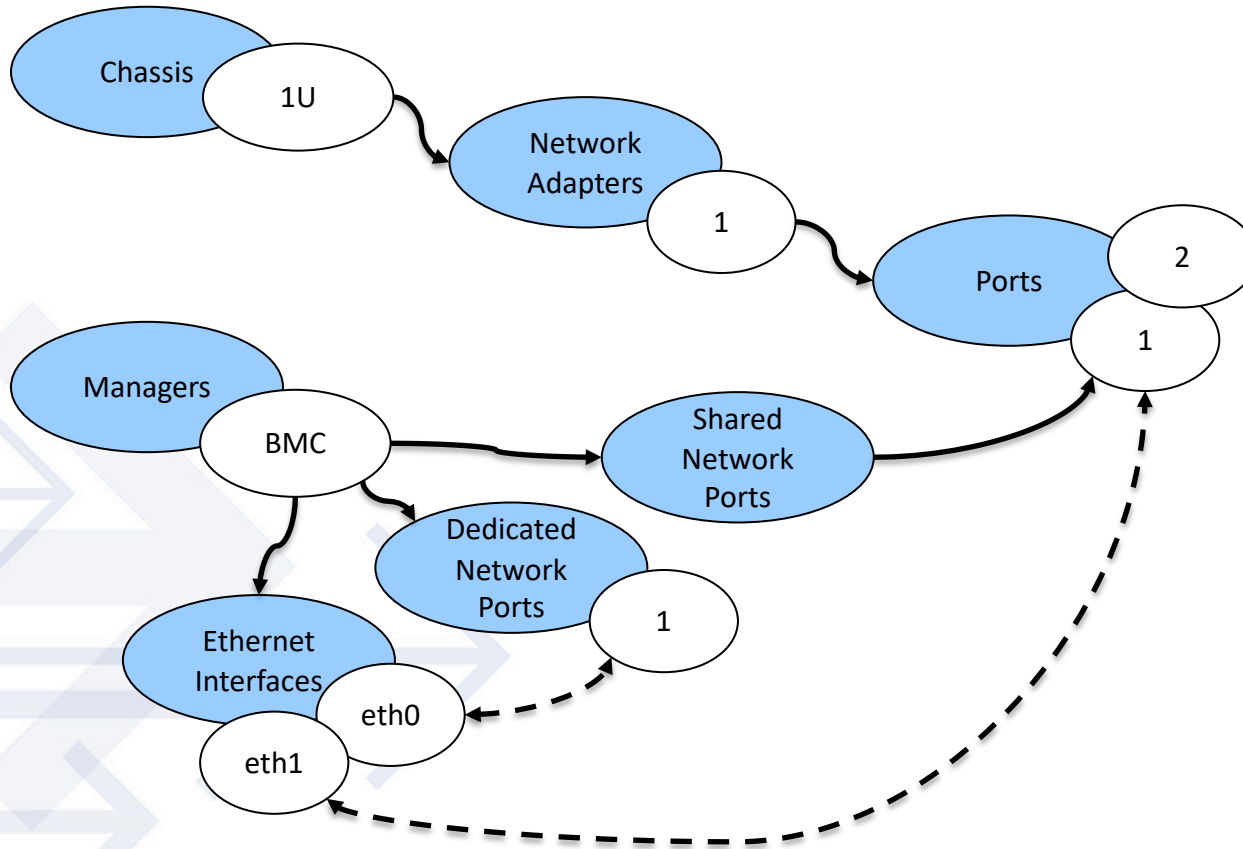
Manager Network Ports

- *DedicatedNetworkPorts* added to *Manager*
    - Represents physical network ports on the manager
    - Example: 1GbE MAC on a BMC
- *SharedNetworkPorts* added to *Manager*
    - Represents physical network ports on the manager that are shared with a host system
    - Example: Shared port provided via NCSI from a host system NIC
    - Collection members reference *Port* resources found in *NetworkAdapter*
- Added links between *EthernetInterface* and *Port*
    - Links are only provided when there is a physical association between a port and Ethernet interface
    - Allows a client to find port attributes of an Ethernet interface, such as LLDP information

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Manager Network Ports

Legend:
- Collection resource
- Singleton resource
- Subordinate resource
- Related resource

Chassis — 1U → Network Adapters — 1 → Ports — 2, 1

Managers — BMC → Shared Network Ports → 1

BMC → Dedicated Network Ports — 1

BMC → Ethernet Interfaces — eth0, eth1

Redfish Schema Minor Revisions (1 of 5)

- ActionInfo v1.3.0
  - Added *AllowableNumbers* and *AllowablePattern* to Parameters
- Assembly v1.4.0
  - Added *Replaceable* to *Assemblies*
- Battery v1.2.0
  - Added *Replaceable*
- Chassis v1.21.0
  - Added *TrustedComponents*, *HotPluggable*, *Replaceable*, and *Version*
- Circuit v1.7.0
  - Added "DC16V", "DC12V", "DC9V", "DC5V", "DC3_3V", and "DC1_8V" to *NominalVoltageType*
- ComponentIntegirty v1.2.0
  - Added *TPMGetSignedMeasurements* action
  - Added *NonceSizeBytesMaximum* to *TPM*

Redfish Schema Minor Revisions (2 of 5)

- ComputerSystem v1.19.0
  - Deprecated *TrustedModules* in favor of *TrustedComponents* in *Links*
  - Added *Recovery* to *BootSource*
- Control v1.2.0
  - Added *ResetToDefaults* action
- EnvironmentMetrics v1.3.0
  - Added *ResetToDefaults* action
- EthernetInterface v1.9.0
  - Added *TeamMode*
  - Added Ports and *RelatedInterfaces* to *Links*
- FabricAdapter v1.4.0
  - Added *LocationIndicatorActive*
- Fan v1.3.0
  - Added *Replaceable*

- LogEntry v1.13.0
  - Added *SpecificEventExistsInGroup*

- Manager v1.16.0
  - Added *SecurityPolicy, DedicatedNetworkPorts,* and *SharedNetworkPorts*

- ManagerDiagnosticData v1.1.0
  - Added *UptimeSeconds, RestartCount,* and *RestartAfterFailureCount* to *TopProcesses*

- ManagerNetworkProtocol v1.9.0
  - Added *NetworkSuppliedServers* to *NTP*

- Memory v1.16.0
  - Added *ResetToDefaults* action

- MetricReport v1.5.0
  - Deprecated *MetricDefinition* in favor of *MetricId*

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Redfish Schema Minor Revisions (4 of 5)

- NetworkDeviceFunction v1.9.0
  - Added "HTTP" to *BootMode*
  - Added *HTTPBoot*
- PCIeDevice v1.10.0
  - Added *Switch* to *Links*
  - Added "Retimer" to *DeviceType*
- PCIeFunction v1.4.0
  - Added *Processor* to *Links*
- PowerSupply v1.5.0
  - Added "DCRegulator" to *PowerSupplyType*
  - Added *OutputNominalVoltageType* and *Replaceable*
- Processor v1.16.0
  - *Added Throttled, ThrottleCauses, Replaceable, ProcessorIndex,* and *Family*
  - Added *ResetToDefaults* action

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Redfish Schema Minor Revisions (5 of 5)

- ProcessorMetrics v1.6.0
  - Added *PowerLimitThrottleDuration* and *ThermalLimitThrottleDuration*
- Sensor v1.6.0
  - Added *ResetToDefaults* action
- Session v1.5.0
  - Added *Context*
- SoftwareInventory v1.8.0
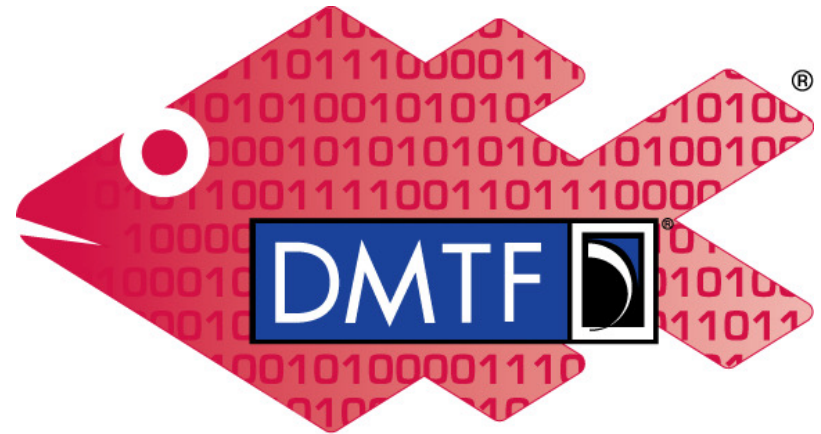 - Added *OSDistribution* to *AdditionalVersions*

Redfish Release 2022.1

DMTF Redfish Forum

May 2022

Redfish Release 2022.1

- ## Redfish Specification v1.15.1
    - Errata release
    - Removed conflicting statement regarding Event Subscription that prevented specification of both RegistryPrefixes and MessageIds for inclusion in a subscription
- ## Redfish Schema Bundle 2022.1
    - DSP8010 contains all released Redfish schemas
- ## Redfish Message Registry Bundle 2022.1
    - DSP8011 contains all released Redfish registries
    - Base v1.13.0 adds new messages invalid HTTP requests and dropped event notifications
    - Corrected argument descriptors in Base, License, ResourceEvent, and Update

- ## 34 updated schemas (highlights)
    - Addition of SSH key related properties
    - Method to register an existing system as a resource block
    - Added properties in Chassis to represent containment of power and thermal relationships
    - See release notes in DSP8010 for errata details

- ## Download all published material at: http://www.dmtf.org/standards/redfish

www.dmtf.org

Redfish Schema Minor Revisions (1 of 6)

- AccountService v1.11.0
  - Added *SSHKeyAttribute* and *SearchSettings* for LDAP configuration
- Battery v1.1.0
  - Added *Links* with *Memory* and *StorageControllers*
- Certificate v1.6.0
  - Added *DisplayString*, *DomainComponents*, *AdditionalCommonNames*, and *AdditionalOrganizationalUnits* to *Subject* and *Issuer*
- Chassis v1.20.0
  - Added *FabricAdapters*, *PoweredByParent*, *ThermalManagedByParent*, and *ThermalDirection*
  - Added *PowerSupplies*, *Fans*, and *PowerDistribution* to Links
  - Deprecated *MediaControllers* in favor of *FabricAdapters*
  - Deprecated *PoweredBy* and *CooledBy* in favor of hardened references to deterministic resource types

Redfish Schema Minor Revisions (2 of 6)

- ## Circuit v1.6.0
  - Added "AC100To127V" to *NominalVoltageType*

- ## CollectionCapabilities v1.4.0
  - Added "RegisterResourceBlock" to *UseCase*

- ## ComponentIntegrity v1.1.0
  - Added *SecurityVersionNumber* for SPDM measurements

- ## ComputerSystem v1.18.0
  - Added *ManufacturingMode* and *Composition*
  - Added *LastBootTimeSeconds* to *BootProgress*

- ## Drive v1.15.0
  - Added *SanitizationType* and *OverwritePasses* to the *SecureErase* action

- ## Endpoint v1.7.0
  - Added *LocalPorts* to *Links*
  - Deprecated *Ports* in *Links* in favor of *ConnectedPorts* and *LocalPorts*

Redfish Schema Minor Revisions (3 of 6)

- ## ExternalAccountProvider v1.4.0
  - Added *SSHKeyAttribute* and *SearchSettings* for LDAP configuration
- ## EventDestination v1.12.0
  - Added *ExcludeRegistryPrefixes* and *ExcludeMessageIds*
  - Added *SuspendSubscription* action
  - Added *DeliverBufferedEventDuration* parameter to the *ResumeSubscription* action
- ## EventService v1.8.0
  - Added *ExcludeRegistryPrefix* and *ExcludeMessageId* properties
- ## FabricAdapter v1.3.0
  - Added *FabricType* and *FabricTypeCapabilities*
  - Added *MemoryDomains* to Links
- ## Fan v1.2.0
  - Added Links with *CoolingChassis*
- ## Job v1.1.0
  - Added *EstimatedDuration*

Redfish Schema Minor Revisions (4 of 6)

- Key v1.1.0
  - Added "SSH" to *KeyType*
  - Added *UserDescription*
- LogEntry v1.12.0
  - Added *RelatedItem* and *RelatedLogEntries* to Links
- Manager v1.15.0
  - Added *ServiceIdentification* and *AdditionalFirmwareVersions*
- ManagerAccount v1.9.0
  - Added *Keys*
- Manifest v1.1.0
  - Added "RegisterResourceBlock" stanza type
- Memory v1.15.0
  - Added *Batteries* to *Links*

Redfish Schema Minor Revisions (5 of 6)

- MemoryMetrics v1.5.0
  - Added *IndeterminateCorrectableErrorCount* and *IndeterminateUncorrectableErrorCount* to *CurrentPeriod* and *LifeTime*

- MetricDefinition v1.3.0
  - Added *LogicalContexts*

- PortMetrics v1.3.0
  - Added *PCIeErrors* property

- PowerSupply v1.4.0
  - Added *PoweringChassis* to Links

- Processor v1.15.0
  - Added *AdditionalFirmwareVersions*

- ProcessorMetrics v1.5.0
  - Added *CorrectableCoreErrorCount*, *UncorrectableCoreErrorCount*, *CorrectableOtherErrorCount*, and *UncorrectableOtherErrorCount*

Redfish Schema Minor Revisions (6 of 6)

- ServiceRoot v1.14.0
  - Added *ServiceIdentification*
  - Added *MultipleHTTPRequests* to *ProtocolFeaturesSupported*
- Session v1.4.0
  - Added *CreatedTime*
- SoftwareInventory v1.7.0
  - Added *AdditionalVersions*
- Storage v1.13.0
  - Deprecated the *StorageControllers* array property in favor of *Controllers* to represent storage controllers as their own resources
- StorageController v1.6.0
  - Added *Batteries* to *Links*
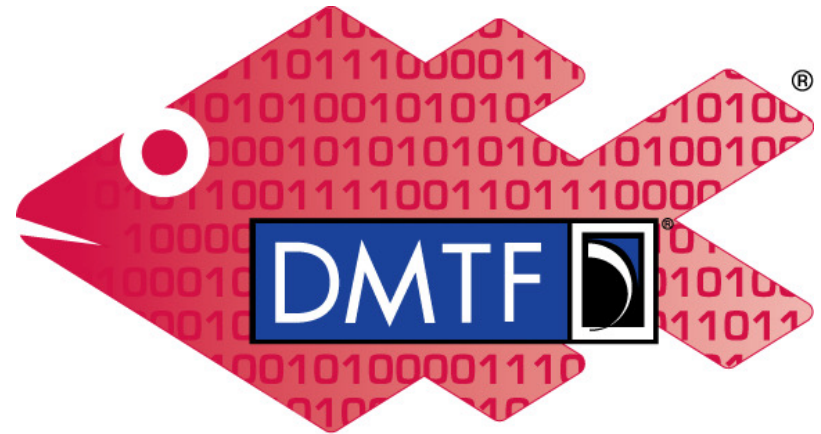- Task v1.6.0
  - Added *EstimatedDuration*

Redfish Release 2021.4

- Redfish Specification v1.15.0
  - Updated Operation apply time and Multipart HTTP push updates to expand usage of *OperationApplyTimeSupport*
- Redfish Specification v1.14.2
  - Errata release
- Redfish Schema Bundle 2021.4
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2021.4
  - DSP8011 contains all released Redfish registries
  - StorageDevice v1.1.0 adds new messages for controller and battery-related conditions
  - ResourceEvent v1.2 adds *AggregationSourceDiscovered*
- Redfish Interoperability Profile v1.5.0
  - Added JSON Pointer support for property-level comparisons

- 4 NEW Schemas, 29 updated schemas
  - Addition of ComponentIntegrity, ManagerDiagnosticData, RegisteredClient, and ServiceConditions schemas
  - See release notes in DSP8010 for errata details

- Download all published material at: http://www.dmtf.org/standards/redfish

NEW Component Integrity Model

- New **ComponentIntegrity** resource to represent security related information between two entities (typically a BMC and end device)
  - Measurement information
  - Secure channel information
  - Health of the channel between the devices
  - Action to return signed measurements from the end device
- **ComponentIntegrity** resources located in a collection off service root
  - Provides a single location for a client to discover all internal secure channels and their status
- Model aligns with SPDM and TPM types of devices
  - Additional technologies can be added over time as needed

NEW RegisteredClient and ServiceConditions

- **RegisteredClient** resource collection enables clients to be aware of other clients to limit configuration from a single client when desired

  - Intended as a cooperative approach from clients, no enforcement required (or expected) from Manager

  - Clients may check for other registered clients to inform users of other configuration tools to limit "collisions"

  - Allows clients to register for configuration of collections and down to individual resources if necessary

- **ServiceConditions** resource provides a roll up of all active, non-normal status conditions that require attention

  - Located at /redfish/v1/ServiceConditions

  - Uses the common object definition for *Conditions*[] within *Status*

  - Allows clients to retrieve a "status dashboard" with a single operation

Redfish Schema Minor Revisions (1 of 6)

- Cable v1.2.0
  - Added "CDFP" and "OSFP" to *CableType*
- Chassis v1.19.0
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource
- Circuit v1.4.0
  - Added *UnbalancedVoltagePercent*, *UnbalancedCurrentPercent*, *PowerControlLocked*, *ConfigurationLocked*, and *PowerStateInTransition*
  - Added "PowerCycle" to *PowerState* parameter for *PowerControl*
- ComputerSystem v1.17.0
  - Added *OffloadedNetworkDeviceFunctions* to *Links*
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource
- Control v1.1.0
  - Added "Pressure" and "FrequencyMHz" to *ControlType*

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Redfish Schema Minor Revisions (2 of 6)

- Drive v1.14.0
  - Added *NetworkDeviceFunctions* to *Links*
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- EnvironmentMetrics v1.2.0
  - Added *AbsoluteHumidity* and *EnergyJoules*

- EthernetInterface v1.8.0
  - Deprecated "Stateful" and "Stateless" for *OperatingMode* in *DHCPv6* in favor of "Enabled"

- Fabric v.3.0
  - Added *UUID*

- LogEntry v1.10.0
  - Added *Originator* and *OriginatorType*

Redfish Schema Minor Revisions (3 of 6)

- Manager v1.14.0
  - Added *ManagerDiagnosticData*
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- Memory v1.14.0
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- NetworkAdapter v1.9.0
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- NetworkDeviceFunction v1.8.0
  - Deprecated *PhysicalNetworkPortAssignment* in favor of *PhysicalNetworkPortAssignment* in *Links*

- Outlet v1.4.0
  - Added *PowerControlLocked*, *ConfigurationLocked*, and *PowerStateInTransition*
  - Added "PowerCycle" to *PowerState* parameter for *PowerControl*

Redfish Schema Minor Revisions (4 of 6)

- **OutletGroup v1.1.0**
  - Added *PowerControlLocked*, *ConfigurationLocked*, and *PowerStateInTransition*
  - Added "PowerCycle" to *PowerState* parameter for *PowerControl*

- **PCIeDevice v1.9.0**
  - Added *Slot* to describe slot capabilities

- **Port v1.6.0**
  - Added *InfiniBand* property with *AssociatedPortGUIDs, AssociatedNodeGUIDs,* and *AssociatedSystemGUIDs*

- **PowerDistributionMetrics v1.3.0**
  - Added *AbsoluteHumidity*

- **PowerSupply v1.3.0**
  - Added *LineInputStatus*

- **Processor v1.14.0**
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

Redfish Schema Minor Revisions (5 of 6)

- **Resource v1.14.0**
  - Added *Resolution* to *Conditions*
  - *Added MACAddress to DurableNameFormat*

- **Sensor v1.5.0**
  - Added "AbsoluteHumidity" and "PressurekPa" to *ReadingType*
  - Added *ApparentkVAh*, *ReactivekVARh*, and *PhaseAngleDegrees*

- **ServiceRoot v1.13.0**
  - Added *ComponentIntegrity, RegisteredClients*, and *ServiceConditions*

- **SoftwareInventory v1.6.0**
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- **Storage v1.12.0**
  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

Redfish Schema Minor Revisions (6 of 6)

- ## StorageController v1.5.0

  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- ## Switch v1.8.0

  - Deprecated *Measurements* in favor of reporting measurements in the **ComponentIntegrity** resource

- ## UpdateService v1.11.0

  - Added *ForceUpdate* to *SimpleUpdate*, multipart HTTP push updates, and *HttpPushUriOptions*

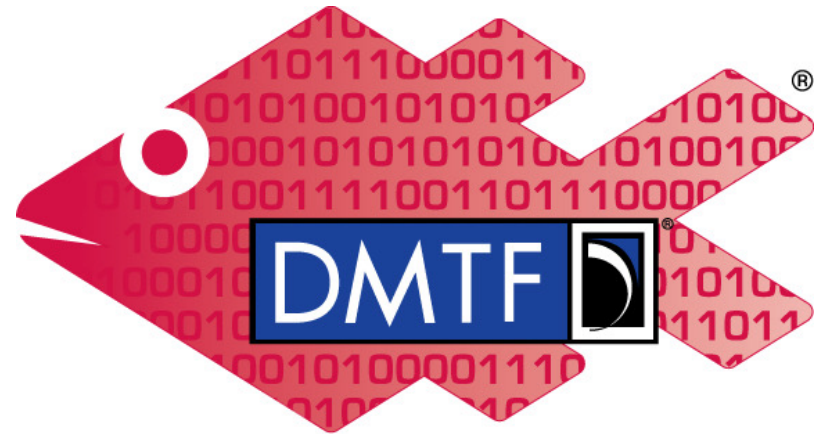 - Added "OnStartUpdateRequest" to *ApplyTime* in *HttpPushUriApplyTime*

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Redfish Release 2021.3

- ## Redfish Specification v1.14.1
  - Errata release
  - Clarified the Link header clause and corrected payload annotation examples

- ## Redfish Schema Bundle 2021.3
  - DSP8010 contains all released Redfish schemas

- ## Redfish Message Registry Bundle 2021.3
  - DSP8011 contains all released Redfish registries
  - Base v1.12 adds *ActionParameterValueConflict*, *ResetRecommended,* and *PropertyNotUpdated*
  - ResourceEvent v1.1 adds *PowerState* change and resource-level *State* change messages
  - NEW License registry for license management messages

- ## 3 NEW Schemas, 20 updated schemas
  - Addition of License, LicenseService, and SwitchMetrics schemas
  - Support for electrical bus products added to the PowerDistribution schema
  - Added properties to Outlet, Circuit, Chassis, and PowerSupply to show electrical connectivity between devices
  - Addition of UEFI-defined "CPER" and "CPERSection" types to DiagnosticDataType in LogEntry
  - See release notes in DSP8010 for errata details

- ## Download all published material at: http://www.dmtf.org/standards/redfish

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NEW Support for Licenses and License Management

- **LicenseService**
    - Licenses installed by POST operation to the **LicenseCollection**
    - Also provides an *Install* action to pull a license from a remote location
- **License**
    - A single license, as obtained by the user, or otherwise installed
    - Supports Service-level, Device-centric or Capacity-limited license types
    - *LicenseString* is a Base64-encoded string provided on POST
        - This format allows for support of either binary (file-based) or text-based licenses, and is not returned in payload
        - Instead*, EntitlementId* provides a user-facing, displayable representation
        - The full license may be downloaded (if supported) from *DownloadURI*
    - *AuthorizedDevices[], MaxAuthorizedDevices, RemainingDuration and RemainingUseCount* provide additional details for specific license types

NEW Electrical buses and electrical connectivity

- *EquipmentType* of "Bus" added to **PowerDistribution**
- Busbars / busways are modeled as **PowerDistribution** instances
  - Input Circuit instance allows for power monitoring if supported
  - Output "drops" can be modeled as **Circuit** or **Outlet** instances
  - Provides a consistent model to follow electrical connections
- Additional properties show electrical connections to/from devices
  - Allows links to Redfish resources, as well as simple text labels to document connections to un-managed devices
  - Connections from **Circuit / Outlet** to **Circuit / Chassis / PowerSupply**
  - *ElectricalSourceNames[]* – Text labels to document power source
  - *ElectricalSourceManagerURIs[]* – URI to web interface of power source
  - *PowerOutlets[]* – Link to **Outlet** resources providing power
  - *SourceCircuit[]* – Link to **Circuit** resources providing power
  - *DistributionCircuits[]* – Link to downstream **Circuit** in the distribution chain

Redfish Schema Minor Revisions (1 of 4)

- AggregationSource v1.2.0
  - Added *AggregationType*
  - Added *TrapCommunity* to *SNMP*
  - *HostName* is not required if *AggregationType* contains "NotificationsOnly"
- Cable v1.1.0
  - Added *UserLabel*
- Certificate v1.5.0
  - Added *SPDM* with *SlotId*
- Chassis v1.18.0
  - Added *ElectricalSourceManagerURIs and ElectricalSourceNames* properties
  - Added *PowerOutlets* to *Links*
- Circuit v1.4.0
  - Added UserLabel, *SourceCircuit, PowerOutlet, ElectricalSourceManagerURI, ElectricalSourceName, ElectricalConsumerNames,* and *DistributionCircuit* properties
  - Added Bus to *CircuitType*

Redfish Schema Minor Revisions (2 of 4)

- **FabricAdapter v1.3.0**
  - Added *PCIeDevices* to *Links*
- **Facility v1.3.0**
  - Added *ElectricalBuses* to *Links*
- **LogEntry v1.10.0**
  - Added "CPER" and "CPERSection" to *DiagnosticDataType*
- **MessageRegistry v1.5.0**
  - Added *VersionAdded*, *Deprecated*, and *VersionDeprecated* properties
- **Outlet v1.3.0**
  - Added "BusConnection" to *OutletType*
  - Added *UserLabel* and *ElectricalConsumerNames* properties
  - Added *DistributionCircuits*, *Chassis*, and *PowerSupplies* to Links
- **PCIeDevice v1.8.0**
  - Added common *PCIeErrors* object for reference from other schemas

Redfish Schema Minor Revisions (3 of 4)

- **PCIeSlots v1.5.0**
  - Added *Processors* to *Links* for each slot
- **PowerDistribution v1.3.0**
  - Added "Bus" to *PowerEquipmentType*
- **PowerDomain v1.2.0**
  - Added *ElectricalBuses* to *Links*
- **PowerEquipment v1.2.0**
  - Added *ElectricalBuses* property
- **PowerSupply v1.2.0**
  - Added *ElectricalSourceManagerURIs* and *ElectricalSourceNames* properties
  - Added *PowerOutlets* to *Links*
- **ProcessorMetrics v1.4.0**
  - Added *PCIeErrors* property

Redfish Schema Minor Revisions (4 of 4)

- ServiceRoot v1.12.0
  - Added *LicenseService* property

- StorageController v1.4.0
  - Added *AllocatedSubmissionQueues* and *AllocatedCompletionQueues* to *NVMeControllerPropertie*

- *Switch v1.7.0*
  - Added *Metrics* property
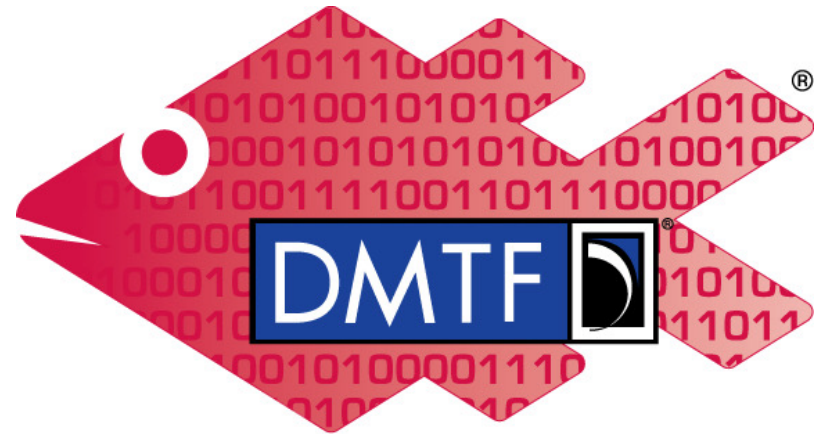
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Redfish Release 2021.2

DMTF Redfish Forum

August 2021

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Redfish Release 2021.2

- Redfish Specification v1.14.0
  - Adds OAuth 2.0 as a method of authorization
  - New clause describing OEM-defined query parameters
- Redfish Specification v1.13.1
  - Errata release
- Redfish Schema Bundle 2021.2
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2021.2
  - DSP8011 contains all released Redfish registries
  - NEW HeartbeatEvent message registry for clients desiring periodic notification
- Redfish Interoperability Profiles v1.4.0
  - Adds support for documenting License and ContributedBy information within a Profile document
  - Updated both DSP0272 and DSP8013
- 8 NEW Schemas, 42 updated schemas
  - Addition of AllowDeny, Battery, BatteryMetrics, Cable, Control, Key, KeyPolicy, KeyService schemas
  - Support for "power shelf" products (requested by OCP members) added to the PowerDistribution schema
  - New *PowerLimitWatts* and *OperatingSpeedRangeMHz* properties complete transition from Power and Thermal schemas
  - Added metrics for Fibre Channel devices to PortMetrics and NetworkDeviceFunctionMetrics
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

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OAuth 2.0

- The OAuth 2.0 Authorization Framework allows for authorization to be performed by an external entity
    - No usernames or passwords need to be provided by the client
- If supported by a service, configuration of the OAuth 2.0 server is performed as another type of external account provider
    - Specify the server address
    - If needed, specify the issuer string and the signing keys of the server
- Redfish services can accept signed tokens in the Authorization HTTP request header
    - Token contains identifier for the OAuth 2.0 server, client, and privileges
    - If the signature of the token is valid, the service gives the client the privileges described in the token for the operation
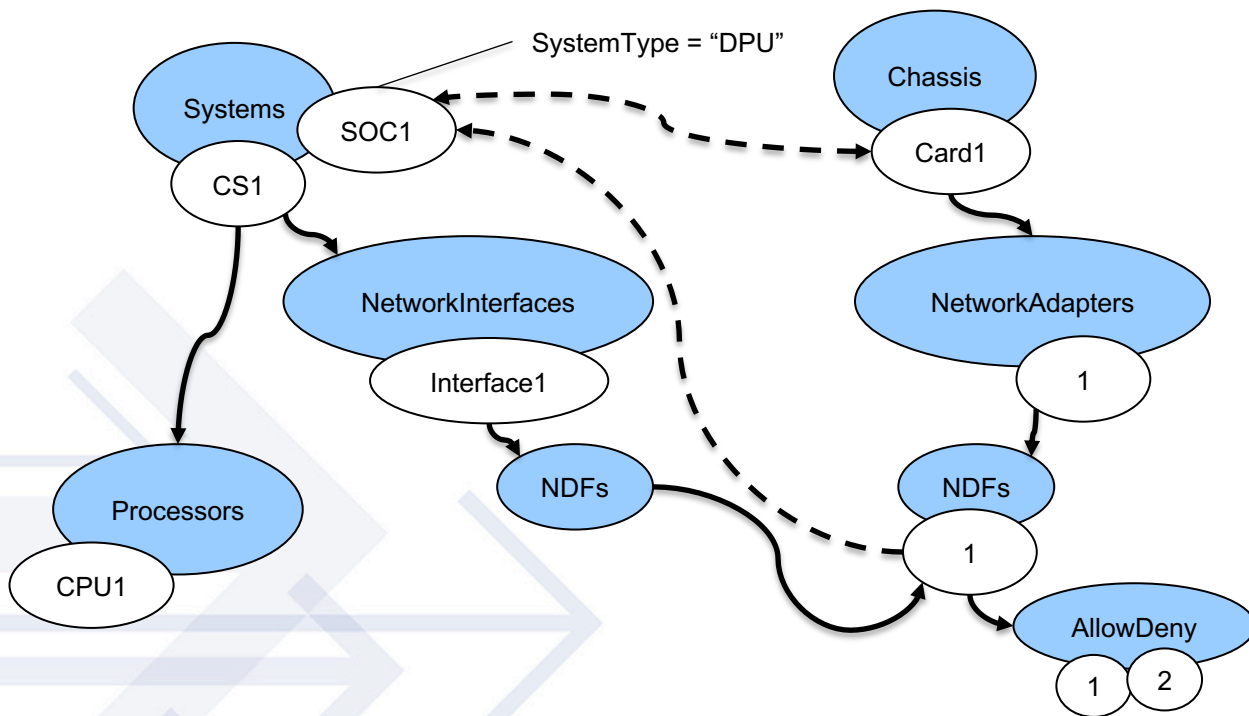
SmartNICs

- New additions to support modeling use cases for SmartNICs
  - **AllowDenyCollection** added to **NetworkDeviceFunction** to show firewalling configurations
  - **ProcessorCollection** added to **NetworkAdapter** to show offload processors dedicated to a SmartNIC
  - *DPU* (Data Processing Unit) value added to *SystemType* in **ComputerSystem** for showing a system-view of an SoC on a SmartNIC
- Establishing patterns for modeling SmartNICs with existing schemas
  - Advanced Communications Device (ACD) model is the base model
  - Each SmartNIC has its own **Chassis** resource
  - **Processor** and **ComputerSystem** resources are used to represent the offload capabilities of a SmartNIC
  - **AddressPool** in fabrics represents switching-related configurations

SoC-based SmartNICs

SystemType = "DPU"

Systems — SOC1
CS1
NetworkInterfaces — Interface1 — NDFs
Processors — CPU1
Chassis — Card1
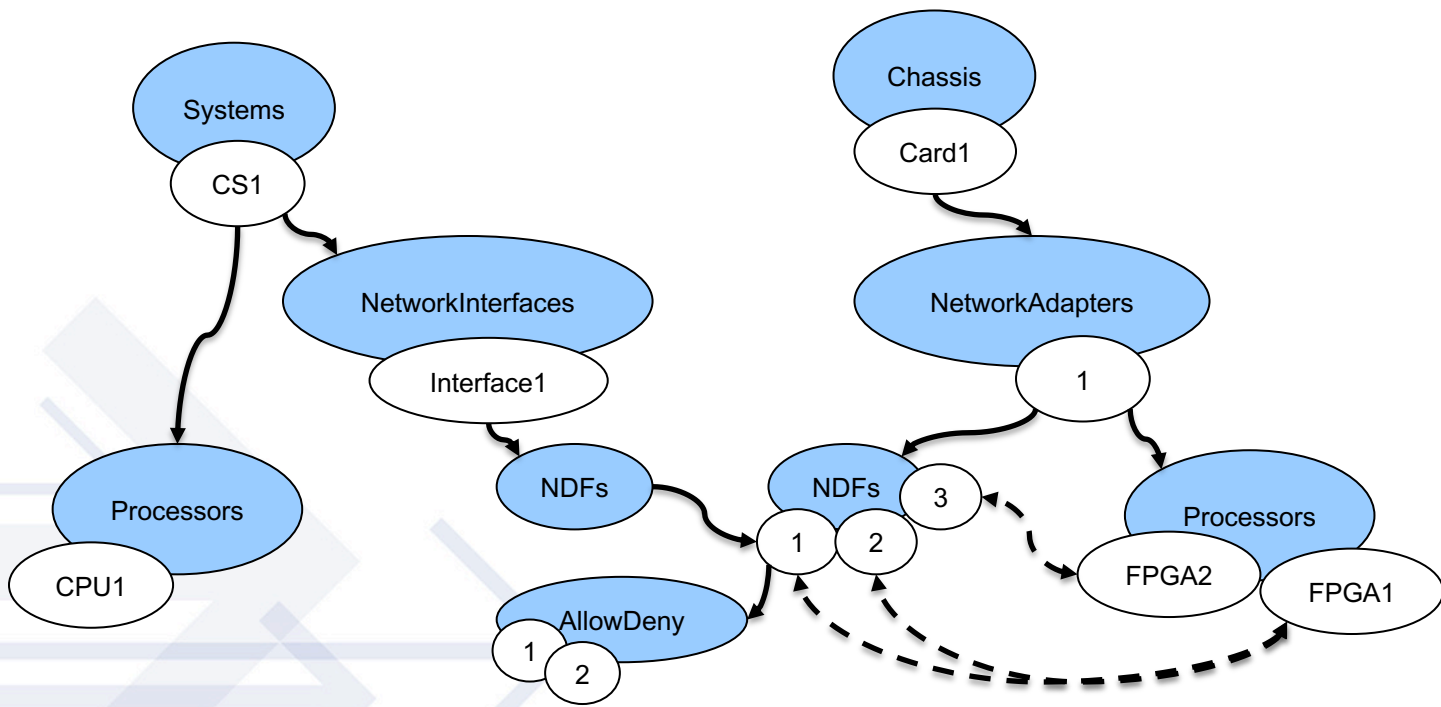NetworkAdapters — 1 — NDFs — 1 — AllowDeny — 1, 2

*NDF = Network Device Function

FPGA-based SmartNICs

*NDF = Network Device Function

NEW Control schema

- Concepts heavily leveraged from **Sensor**
- Describes an individual control point plus associated sensor(s) that measures the effects of that control point
  - Also known as an "effector" in some specifications
- *SetPoint* is the primary focus for end users
  - The desired value for a **Sensor** *Reading* instance resulting from the **Control** setting
  - *SettingMin* and *SettingMax* can specify a range of values rather than a single point
- *ControlLoop* object exposes coefficients used in a control loop algorithm
- Schema excerpts defined in **EnvironmentMetrics, Memory,** and **Processor** for *PowerLimitWatts* and *OperatingSpeedRangeMHz*
  - These use cases complete the transition from the deprecated **Power** and **Thermal** schemas (fully replaced by **PowerSubsystem** and **ThermalSubsystem**)
  - *PowerLimitWatts* limits power consumption of a resource
  - *OperatingSpeedRangeMHz* provides range of allowed speeds for a **Memory** or **Processor** device

NEW Battery and BatteryMetrics schema

- Various system designs incorporate battery modules
  - Example: A battery to provide power to NVDIMMs so that DRAM contents are flushed to flash when power is lost
  - Does not include "simple" batteries, such as a coincell battery for an RTC
- **PowerSubsystem** was updated to include a **BatteryCollection**
  - The members of the collection represent the batteries in a **Chassis**
  - Contains FRU information and metrics associated with the battery
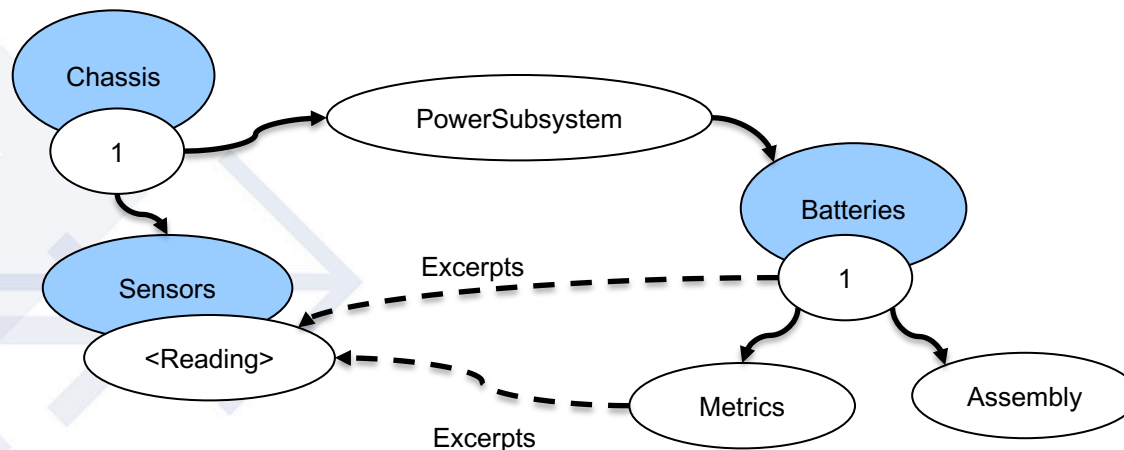
NEW Power Shelf support

- Product category added to **PowerDistribution** schema
  - Feedback received that requested support of this OCP-defined category
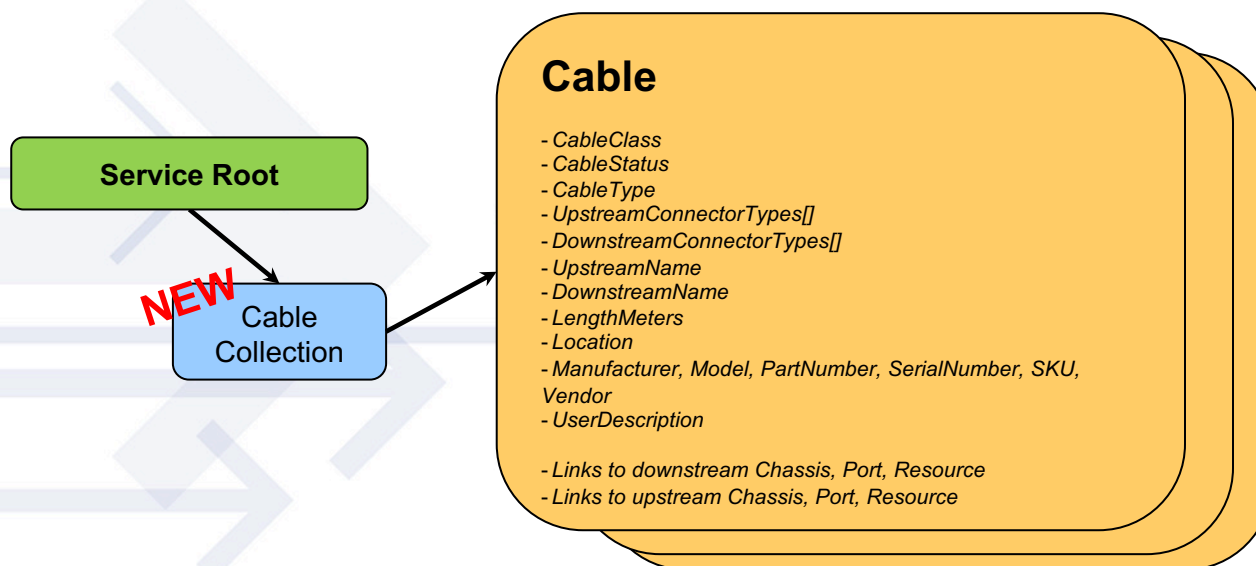- A unit intended to power a rack (or similar group) from a common output
  - Primary difference from other power equipment is the presence of power supplies
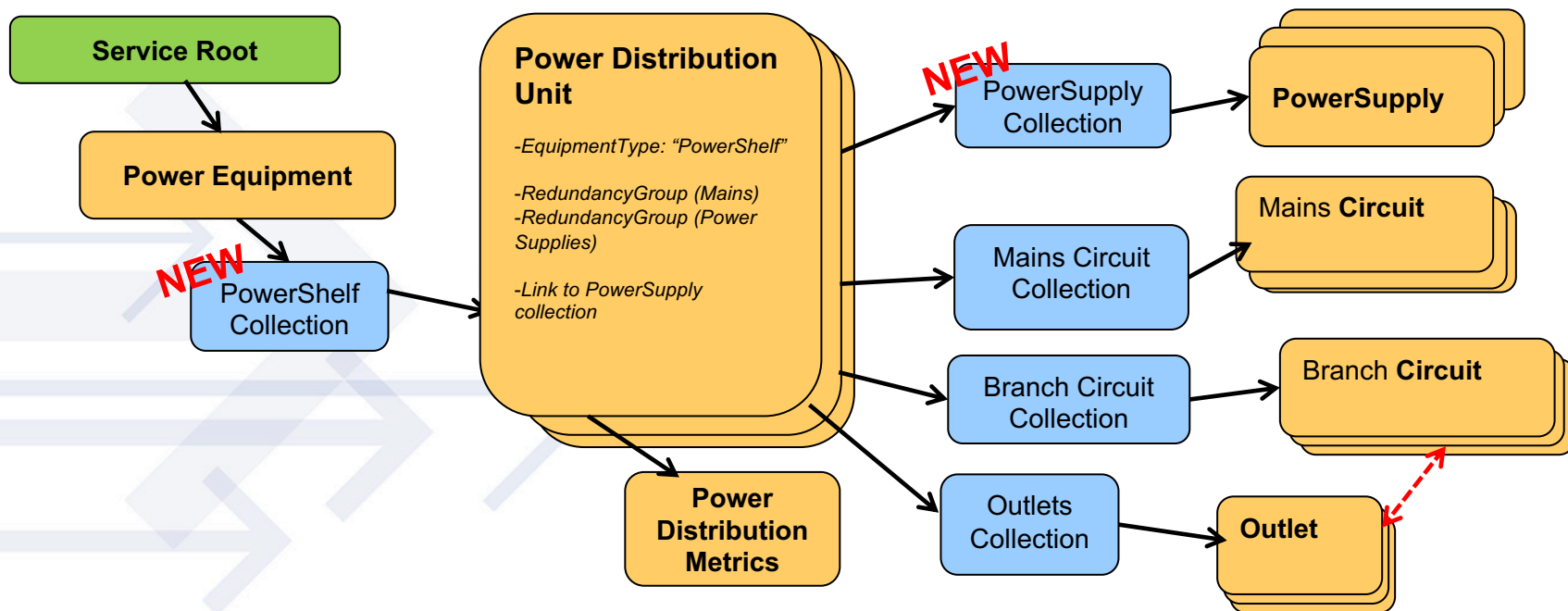
NEW Cables

- Cable resources for tracking inventory info and connectivity
  - Connectivity between Chassis, Ports, and arbitrary Resources
  - Exposes cabling without requiring extra links to report logical connections
- Properties are user-updatable for the option of manual management
  - e.g. Physical status, connectivity types, cable types, identifiers
- **CableCollection** can be found off ServiceRoot

Service Root

NEW

Cable Collection

Cable

- *CableClass*
- *CableStatus*
- *CableType*
- *UpstreamConnectorTypes[]*
- *DownstreamConnectorTypes[]*
- *UpstreamName*
- *DownstreamName*
- *LengthMeters*
- *Location*
- *Manufacturer, Model, PartNumber, SerialNumber, SKU, Vendor*
- *UserDescription*

- *Links to downstream Chassis, Port, Resource*
- *Links to upstream Chassis, Port, Resource*

NEW KeyService, Key, and KeyPolicy schemas

- A **KeyService** resource can be found off **ServiceRoot**
  - This is for configuration of keys within a service
  - External key management functions have also been added to **ComputerSystem** (see *KeyManagement* property)
- Each **Key** resource contains the key string and format of the key
- Each **KeyPolicy** resource contains administrative settings for usage of keys, such as allowed hash algorithms and cryptographic functions
- Initial use cases identified for NVMe-oF boot key management
  - **KeyService** contains a **KeyCollection** named *NVMeoFSecrets* for storing NVMe-oF keys to access subsystems
  - **KeyService** contains a **KeyPolicyCollection** named *NVMeoFKeyPolicies* for managing how system software is allowed to use the NVMe-oF keys

NVMe-oF Boot Key Management

- Clients install NVMe-oF keys by performing a POST to the *NVMeoFSecrets* collection found in **KeyService**

- System software (UEFI and OS) access the key information in order to establish NVMe-oF connections to remote subsystems

  - UEFI discovers the installed keys and configures ACPI entries to specify the available boot paths

  - ACPI entries contain a reference to the URI in the Redfish model for a given key

  - The OS uses this information to re-establish NVMe-oF connections to remote subsystems

Redfish Schema Minor Revisions (1 of 9)

- AccountService v1.10.0
  - Added *OAuth2* property for configuring OAuth 2.0 authorization. Added "OAuth2" to *AccountProviderType*

- ActionInfo v1.2.0
  - Added *ArraySizeMinimum* and *ArraySizeMaximum* properties

- AddressPool v1.2.0
  - Added *Enabled* and *CIDR* to *BGPNeighbor*
  - Added *RouteDistinguisherAdministratorSubfield*, *RouteTargetAdministratorSubfield*, and *GatewayIPAddressRange* to *BGPEvpn*
  - Added *SystemMACRange* to *IPv4*

- Certificate v1.4.0
  - Added *PEMchain* to *CertificateType* to support chain of PEM certificates
  - Added *CertificateUsageTypes* property
  - Added *Issuer* and *Subjects* in *Links* to report how certificates are chained

Redfish Schema Minor Revisions (2 of 9)

- Chassis v1.17.0
  - Added *Controls* property. Added *Cables* to *Links*
- Circuit v1.3.0
  - Added *PowerLoadPercent* property
- ComputerSystem v1.16.0
  - Added *IdlePowerSaver* property
  - Added *KeyManagement* with *KMIPServers* and *KMIPCertificates* properties
  - Added "DPU" to *SystemType*
  - Deprecated *Status* in *ProcessorySummary* and *MemorySummary* in favor of *Status* in the individual resources
- Drive v1.13.0
  - Added *Storage* to *Links*
- EnvironmentMetrics v1.1.0
  - Added *PowerLoadPercent*, *DewPointCelsius*, and *PowerLimitWatts* properties

- ## EthernetInterface v1.7.0
  - Deprecated *VLANs* in favor of using multiple **EthernetInterface** resources to express additional VLANs
  - Deprecated *NetworkDeviceFunction* in favor of *NetworkDeviceFunctions* in *Links*
- ## Event v1.7.0
  - Added *LogEntry* property
- ## EventDestination v1.11.0
  - Added *SendHeartbeat*, *HeartbeatIntervalMinutes*, and *ClientCertificates* properties
- ## ExternalAccountProvider v1.3.0
  - Added *OAuth2Service* property for configuring OAuth 2.0 authorization. Added "OAuth2" and "TACACSplus" to *AccountProviderType*
- ## FabricAdapter v1.1.0
  - Added *Location* property
- ## Facility v1.2.0
  - Added *PowerShelves* to *Links*

- ## LogService v1.3.0
  - Added *LogEntriesETag* parameter to the *ClearLog* action
  - Added *AutoDSTEnabled* property

- ## Manager v1.13.0
  - Added *Certificates* and *Measurements* properties

- ## ManagerNetworkProtocol v1.8.0
  - Added *Proxy* for configuring proxy settings on the manager

- ## Memory v1.13.0
  - Added *Log* property for showing internal device logs
    Added *OperatingSpeedRangeMHz* property

- ## NetworkAdapter v1.8.0
  - Added *Processors* property

- NetworkDeviceFunction v1.7.0
  - Added *SAVIEnabled, Limits*, and *AllowDeny* properties
  - Added *EthernetInterfaces* property to *Ethernet* for non-system related interfaces
  - Added *OffloadSystem* and *OffloadProcessors* to Links
  - Deprecated *VLANs* in favor of using multiple **EthernetInterface** resources to express additional VLANs
  - Deprecated *EthernetInterface* in favor of *EthernetInterfaces* in *Links*
- NetworkDeviceFunction v1.1.0
  - Added *FibreChannel* property
- Outlet v1.2.0
  - Added *PowerLoadPercent* property
- Port v1.4.0
  - Added *WakeOnLANEnabled* and *EEEEnabled* properties. Added *Cables* to *Links*
  - Added several new values to *PortConnectionType* for Fibre Channel ports
  - Deprecated *SupportedEthernetCapabilities* in favor of showing individual properties for the configured capabilities

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Redfish Schema Minor Revisions (6 of 9)

- PortMetrics v1.2.0
  - Added *FibreChannel* property
- PowerDistribution v1.1.0
  - Added "PowerShelf" to *PowerEquipmentType*
  - Added *PowerSupplies*, *PowerSupplyRedundancy*, and *MainsRedundancy* properties
- PowerDistributionMetrics v1.2.0
  - Added *PowerLoadPercent* property
- PowerDomain v1.1.0
  - Added *PowerShelves* to *Links*
- PowerEquipment v1.1.0
  - Added *PowerShelves* property
- PowerSubsystem v1.1.0
  - Added *Batteries* property

Redfish Schema Minor Revisions (7 of 9)

- Processor v1.13.0
  - Added *Ports* and *OperatingSpeedRangeMHz* properties
  - Added *ECCModeEnabled* to *MemorySummary*
  - Added *NetworkDeviceFunctions* to *Links*

- ProcessorMetrics v1.3.0
  - Added *CoreVoltage* property

- Resource v1.13.0
  - Added "Embedded" to *LocationType*
  - Added "Suspend", "Pause", and "Resume" to *ResetType*
  - Added "Paused" to *PowerState*

Redfish Schema Minor Revisions (8 of 9)

- ## Sensor v1.4.0
  - Added *SensorGroup, LowestReading, LowestReadingTime, AverageReading, AveragingInterval, AveragingIntervalAchieved, Calibration,* and *CalibrationTime* properties
  - Added *AssociatedControls* to *Links*
  - Added "EnergyWh" and "ChargeAh" to *ReadingType*

- ## ServiceRoot v1.11.0
  - Added *KeyService* and *Cables* properties

- ## SoftwareInventory v1.5.0
  - Added *MeasurementIndex* to *MeasurementBlock*

- ## Storage v1.11.0
  - Added *ResetToDefaults* action
  - Added *HostingStorageSystems* to *Links*

- ## StorageController v1.3.0
  - Added *NetworkDeviceFunctions* to *Links*

Redfish Schema Minor Revisions (9 of 9)

- Triggers v1.2.0
  - Added *MetricIds* property
- UpdateService v1.10.0
  - Added *ClientCertificates* property
- VirtualMedia v1.5.0
  - Added *ClientCertificates* property
- VlanNetworkInterface v1.3.0
  - Deprecated the resource representation of **VLanNetworkInterface** in favor of using multiple **EthernetInterface** resources to express additional VLANs
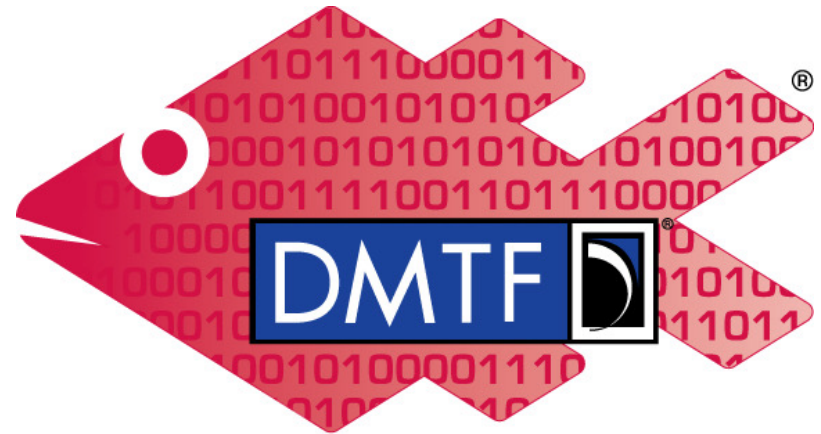 - Added *Tagged* property to common VLAN object

Redfish Release 2021.1

- Redfish Specification v1.13.0
  - Adds composability support via Compose action
  - Adds multi-client support to the composition model
- Redfish Specification v1.12.1
  - Errata release
- Redfish Schema Bundle 2021.1
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2021.1
  - DSP8011 contains all released Redfish registries
  - NEW Update message registry for monitoring and reporting the firmware / software update workflow
  - Updated Composition and Base message registries
- 6 NEW Schemas, 37 updated schemas
  - Addition of CompositionReservation, GraphicsController, Manifest, NetworkAdapterMetrics, NetworkDeviceFunctionMetrics, and USBController
  - Added EnvironmentMetrics link to numerous device-centric resources
  - Added support for determining LLDP connectivity information to Port
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish
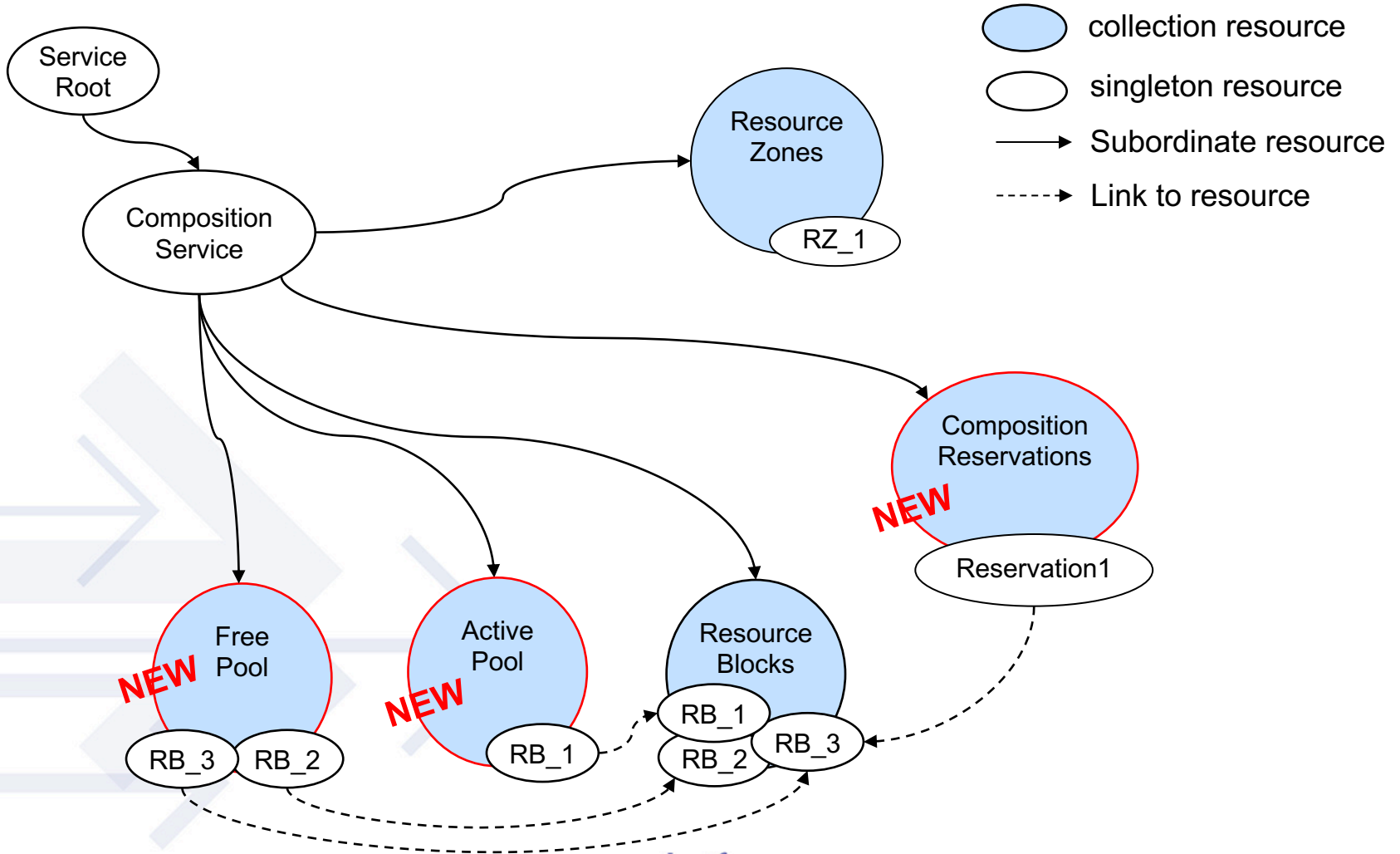
Redfish Composability Enhancements

- Addition to assign resource blocks to a client and to active/free pools
    - Supports multi-tenancy: collections are filtered by the service based on who is performing the request
    - Allows clients to easily determine resource consumption
- Ability to perform compositions with an outcome-based **Manifest**
    - *Compose* action added to the composition service
    - Client provides the manifest as part of the action request, along with a control option for how to process the manifest
        - Preview: Service responds with what the outcome will be
        - PreviewReserve: Service responds with what the outcome will be and reserves the resources to be applied later
        - Apply: Service applies the manifest or enacts it based on a reservation
    - A manifest document is structured as a set of stanzas, where each stanza is a desired outcome to be fulfilled
        - Processing the manifest is an atomic transaction

Redfish Composability Enhancements - Model

Legend:
- collection resource
- singleton resource
- Subordinate resource
- Link to resource

Service Root → Composition Service → Resource Zones (RZ_1)

Composition Service → Composition Reservations (NEW) (Reservation1)

Composition Service → Free Pool (NEW) (RB_3, RB_2)

Composition Service → Active Pool (NEW) (RB_1)

Composition Service → Resource Blocks (RB_1, RB_2, RB_3)

Composability Enhancements – Manifest POST Example

POST /redfish/v1/CompositionService/Actions/CompositionService.Compose

```
{
  "RequestFormat": "Manifest",
  "RequestType": "Apply",
  "Manifest": {
    "Stanzas": [
      {
        "StanzaType": "ComposeSystem",
        "StanzaId": "Compute1",
        "Request": {
         "Links": {
           "ResourceBlocks": [
             { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/BladeServer-1" },
             { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NVMe-TargetsAppliance-1" },
             { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkCard1" }
           ]
         }
        }
      },
      ...
    ]
  }
}
```
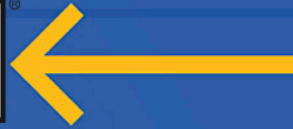
Redfish Composability Enhancements - Manifest

```json
{
  "RequestFormat": "Manifest",
  "RequestType": "Apply",
  "Manifest": {
    "Stanzas": [
      {
        "StanzaType": "ComposeSystem",
        "StanzaId": "Compute1",
        "Request": { ... },
        "Response": {
          "@odata.id": "/redfish/v1/Systems/ComposedCompute1",
          "@odata.type": "#ComputerSystem.v1_14_0.ComputerSystem",
          "Id": "ComposedCompute1",
          "Name": "Computer system composed from Compute1",
          "Processors": { ... },
          "Memory": { ... },
          "NetworkInterfaces": { ... },
          "Storage": { ... },
          "Links": {
            "ResourceBlocks": [
              { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/BladeServer-1" },
              { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NVMe-TargetsAppliance-1" },
              { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkCard1" }
            ]
          }
        }
      },...
    ]
  }
}
```

Enhancements for Networking

- **NEW** Networking Metrics Resources

    - **NetworkAdapterMetrics**: 14 metrics for networking

    - **NetworkDeviceFunctionMetrics**: 16 metrics for networking, Ethernet

    - Updated **PortMetrics**: 43 metrics for networking, transceivers, and storage

- **NEW** LLDP Support

    - Enabled at the adapter level via **NetworkAdapter** or on each **Port**

    - Includes ChassisID, ManagementVLANID, ManagementAddress, PortID

    - Model supports values transmitted to / received from link partner

NEW USB Controller and Graphics Controller Schemas

- **USBController** schema
  - Provides mapping of USB Port to **PCIeDevice** or **Processor** resources
  - Collection can appear under **ComputerSystem** resource
- **GraphicsController** schema
  - Provides adapter-level information for graphics / display subsystem
  - **Port** instances can show display connections
- Resource Collections for both schemas appear in the resource tree as subordinate to an instance of a **ComputerSystem** resource

Redfish Schema Minor Revisions (1 of 6)

- AccountService v1.9.0
  - Added *PasswordExpirationDays* property
- Bios v1.2.0
  - Added *ResetBiosToDefaultsPending* property
- Certificate v1.3.0
  - Added *SerialNumber, Fingerprint, FingerprintHashAlgorithm,* and *SignatureAlgorithm* properties
- Chassis v1.16.0
  - Added *SparePartNumber* property
- CollectionCapabilities v1.3.0
  - Added *ResourceBlockComposition* and *ResourceBlockConstrainedComposition* to *UseCase*
- CompositionService v1.2.0
  - Added *ActivePool, FreePool, CompositionReservations, and ReservationDuration* properties
  - Added *Compose* action

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Redfish Schema Minor Revisions (2 of 6)

- ComputerSystem v1.15.0
  - Added *PowerMode, GraphicsControllers,* and *USBControllers* properties
  - Added *SetupEntered* to *LastState* within *BootProgress*
  - Added *StopBootOnFault* to *Boot*
  - Added *ThreadingEnabled* to *ProcessorSummary*
- Connection v1.1.0
  - Added *MemoryChunkInfo* and *ConnectionKeys* properties
- Endpoint v1.6.0
  - Added *StorageSubsystem* to EntityType
  - Added *Zones* to *Links*
  - Deprecated *AccessKey* and *RegionKey* in favor of new properties in **Connection**
- Fan v1.1.0
  - Added *PowerWatts* property
- LogEntry v1.9.0
  - Added *ServiceProviderNotified* and *Resolution* properties

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Redfish Schema Minor Revisions (3 of 6)

- Manager v1.12.0
  - Added *USBPorts* property
- ManagerAccount v1.8.0
  - Added *AccountExpiration* and *HostBootstrapAccount* properties
- MediaController v1.2.0
  - Added *EnvironmentMetrics* property
- Memory v1.12.0
  - Added *Enabled* property
- MetricDefinition v1.2.0
  - Added *String* to *MetricType*
- NetworkAdapter v1.7.0
  - Added *Metrics*, *EnvironmentMetrics*, and *LLDPEnabled* properties
- NetworkDeviceFunction v1.6.0
  - Added *Metrics* property

Redfish Schema Minor Revisions (4 of 6)

- PCIeDevice v1.7.0
  - Added *ReadyToRemove* and *EnvironmentMetrics* properties
- PCIeFunction v1.3.0
  - Added *Enabled* property
- Port v1.4.0
  - Added *FunctionMinBandwidth*, *FunctionMaxBandwidth*, *SFP*, and *EnvironmentMetrics* properties
  - Added *AssociatedMACAddresses*, *LLDPEnabled*, *LLDPTransmit*, and *LLDPReceive* properties to *Ethernet*
  - Added *AssociatedWorldWideNames* to *FibreChannel*
- PortMetrics v1.1.0
  - Added *RXBytes, TXBytes, RXErrors, TXErrors, Networking, Transceivers*, and *SAS* properties
- PowerDistributionMetrics v1.2.0
  - Added *TemperatureCelsius* and *HumidityPercent* properties

Redfish Schema Minor Revisions (5 of 6)

- PowerSupply v1.1.0
  - Added *Version* and *ProductionDate* properties
- Processor v1.12.0
  - Added *Enabled* property
  - Added *GraphicsController* to *Links*
- Resource v1.12.0
  - Deprecated *NSID* in favor of *NGUID* within *DurableNameFormat*
- ResourceBlock v1.4.0
  - Added *Pool* and *Client* properties
  - Added *IndependentResource* to *ResourceBlockType*
  - Added *ConsumingResourceBlocks* and *SupplyingResourceBlocks* to *Links*
- Sensor v1.3.0
  - Added *Links* property

Redfish Schema Minor Revisions (6 of 6)

- ServiceRoot v1.10.0
  - Added *NVMeDomains* property
- StorageController v1.2.0
  - Added *EnvironmentMetrics* property
  - Added *SupportsReservations* to *NVMecontrollerAttributes*
- Switch v1.6.0
  - Added *Enabled* and *EnvironmentMetrics* properties
- TaskService v1.2.0
  - Added *TaskAutoDeleteTimeoutMinutes* property
- UpdateService v1.9.0
  - Added *RemoteServerCertificate* and *VerifyRemoteServerCertificate* properties
- VirtualMedia v1.4.0
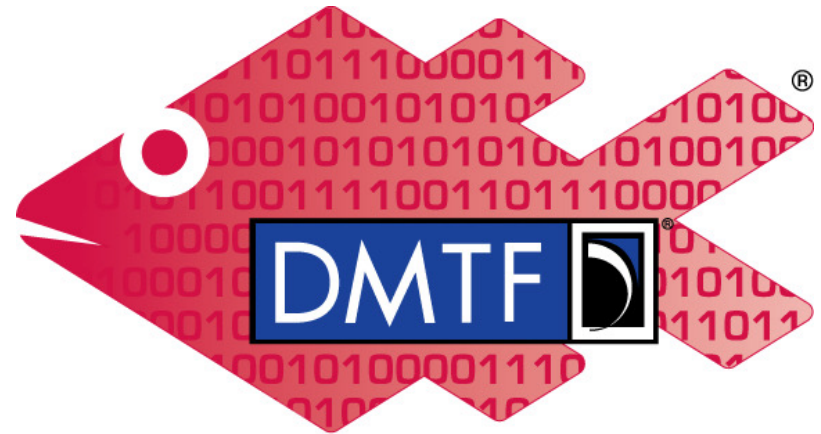 - Added *Status*, *Certificate*, and *VerifyCertificate* properties

Redfish Release 2020.4

DMTF Redfish Forum

December 2020

(presentation updated June 2021)

Redfish Release 2020.4

- Redfish Specification v1.12.0
  - Adds "restricted role" and "restricted privilege" concepts for user accounts
- Redfish Specification v1.11.2
  - Errata release
- Redfish Schema Bundle 2020.4
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2020.4
  - DSP8011 contains all released Redfish registries
  - NEW Fabric and EthernetFabric message registries
  - Added messages to Base message registry to support Conditions array
- 7 NEW Schemas, 29 updated schemas
  - Addition of PowerSubsystem, ThermalSubsystem, Fan, PowerSupply, PowerSupplyMetrics
  - Addition of EnvironmentMetrics for device-level reporting of environmental data (e.g. power and temperature)
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

Migration to new resource definitions

- Three schemas have been replaced by new definitions, with the existing schemas deprecated in this release
  - **Power** – replaced by PowerSubsystem, PowerSupply, PowerSupplyMetrics, and EnvironmentMetrics
  - **Thermal** – replaced by ThermalSubsystem, Fan, and EnvironmentMetrics
  - **NetworkPort** – replaced by Port (existing, last revised in 2020.3)
- New implementations should use the new schemas
  - Services can implement both "old" and "new" to provide a migration path
  - New implementations can implement both if consistency with existing product families or client software is desired
- Deprecated schema files can be identified via:
  - CSDL: "Redfish.Revisions" annotation with "RevisionKind" of "Deprecated"
  - JSON schema: "deprecated" attribute in the un-versioned schema file
  - OpenAPI YAML: "deprecated" attribute in the un-versioned schema file

NEW PowerSubsystem and supporting schemas

- Replaces the **Power** schema with improved definitions
- **PowerSubsystem**
  - The equipment and connectivity that provides power to a Chassis
  - Redundancy group information
    - Streamlined definition from existing *Redundancy* object
  - Lays groundwork to populate batteries and other external power sources
- **PowerSupply**
  - Resource Collection for individual power supply (and bay) resources
- **PowerSupplyMetrics**
  - Support measurements for a well-instrumented power supply

NEW ThermalSubsystem and supporting schemas

- Replaces the **Thermal** schema with improved definitions
- **ThermalSubsystem**
  - The equipment and connectivity that provides cooling for a Chassis
  - Redundancy group information
  - Lays groundwork to populate other cooling equipment
- **ThermalMetrics**
  - Summary of temperature readings for interoperable comparison
    - Allows implementation to assign a particular sensor to a well-known "purpose"
    - Object contains readings for "Ambient", "Intake", "Internal", and "Exhaust"
  - Array of all temperature readings for a Chassis
- **Fan**
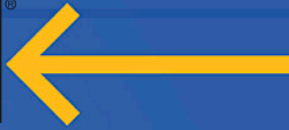 - Resource Collection for individual fan (and bay) resources

NEW EnvironmentMetrics schema

- Common schema used to report sensor readings specific to a Facility, Chassis or a device (e.g. Drive, Processor, Memory)

- Provides consistent naming for the sensor readings across the model

- Defined readings include:

  - Energy (kWh)

  - Fan speed (percent and RPM)

  - Humidity

  - Power

  - Temperature

- Resource contains schema excerpts with links to the Sensor resource that reports each *Reading*

Power and Thermal Migration Summary

- **Power** and **Thermal** resources are completely replaced
- *Fans[0..n]* and *PowerSupplies[0..n]* become Resource Collections
  - Contain mostly static data for these devices (and their "bays")
  - PowerSupply links to a PowerSupplyMetrics resource for sensor readings
- *Voltages[0..n]* and *Temperature[0..n]* become Sensor resources
  - Temperature readings now summarized in ThermalMetrics
  - Voltage readings move to PowerSupplyMetrics or the Sensor collection
- *PowerControl[0..n]* object split along functional lines
  - Power limits move to the appropriate resources
- Sensor excerpts added to EnvironmentMetrics resources as needed
  - Much easier to correlate "CPU readings" by starting at Processor instead of searching Sensor collection

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Power and Thermal resource tree additions
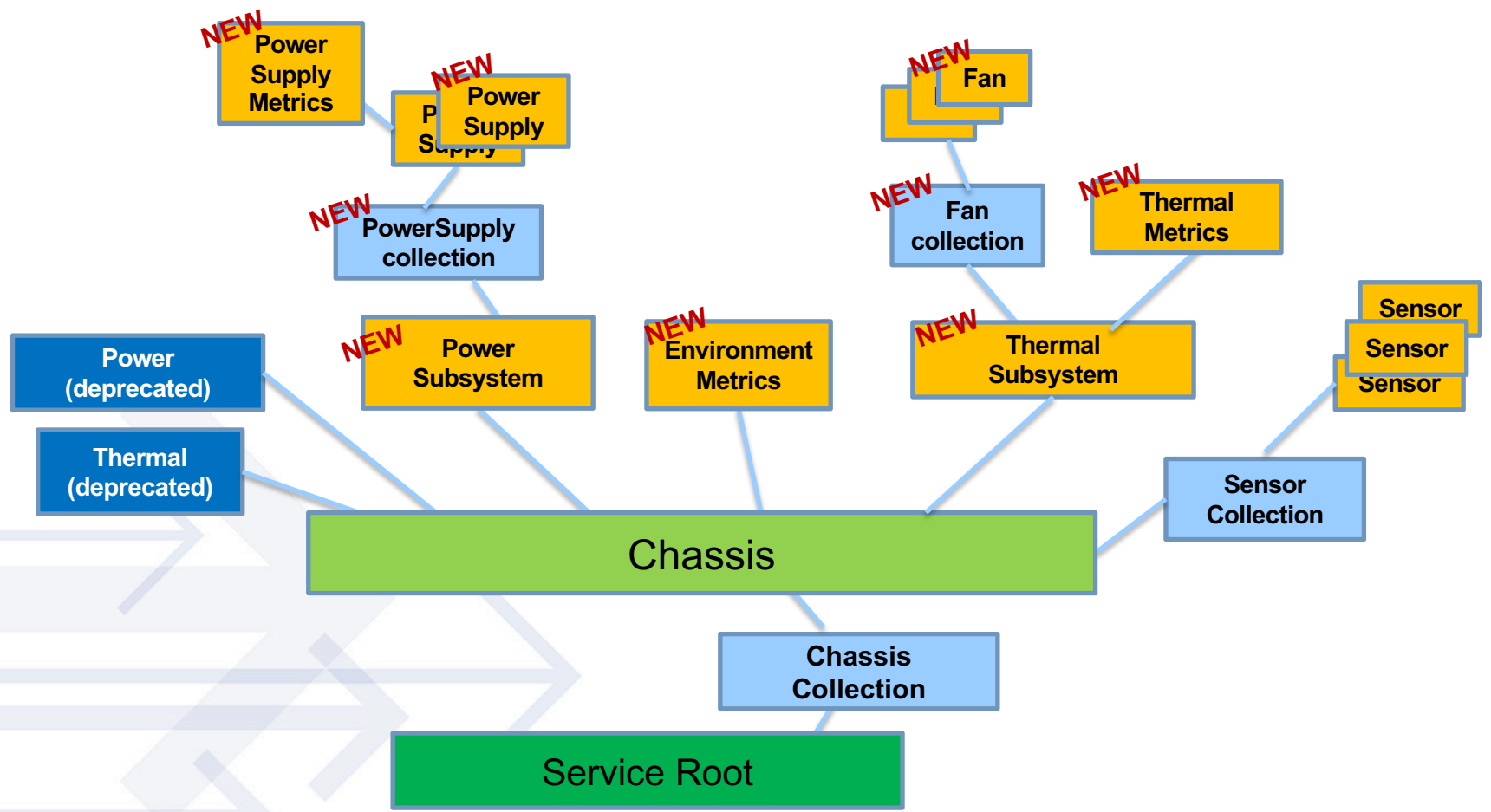
NEW Additional AccountTypes

- Expanding functionality of *AccountTypes* in **ManagerAccount** to allow management of accounts for non-Redfish services or other functions
- Access can be granted to other protocols and services:
    - HostConsole - Allow access to the host's console
    - IPMI - Allow access to the IPMI service
    - KVMIP - Allow access to a Keyboard-Video-Mouse over IP session
    - ManagerConsole - Allow access to the manager's console
    - OEM - OEM account type. See the OEMAccountTypes property
    - Redfish - Allow access to the Redfish service
    - SNMP - Allow access to SNMP services
    - VirtualMedia - Allow access to control virtual media
    - WebUI - Allow access to a web-based user interface
- *SupportedAccountTypes*[] added to AccountService
    - Advertises which account types are supported by the service
- Granular privileges are supported by *StrictAccountTypes* property

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NEW *Conditions* array in common *Status* definition

- Array of Messages and additional data which describe conditions that cause the *Health* or *HealthRollup* to be in "non-OK" states
  - Describes active conditions that need attention or user awareness
  - Not a replacement for Events or Log entries
- Definition within *Status* allows support to appear throughout model
  - Client can detect support by presence of the empty *Conditions* array
- A *Condition* element may contain an *OriginOfCondition*
  - Link to a subordinate or related resource where the condition originated
  - Absence indicates the origin of the condition is within the resource
- Allows for a unified "follow the red" pathway through the model
  - New Base message "ConditionInRelatedResource" defined to indicate a condition exists in a subordinate or related resource

Example *Conditions* array

```
"Status": {
    "Health": "Critical",
    "HealthRollup": "Warning",
    "State": "Enabled",
    "Conditions": [{
        "MessageId": "StorageDevice.1.0.WriteCacheDegraded",
        "Timestamp": "2020-11-08T12:25:00-05:00",
        "Message": "The write cache state on the storage controller located in 'Slot 4' is degraded."
        "Severity": "Critical",
        "MessageArgs": [ "Slot 4" ],
        "LogEntry": { "@odata.id": "/redfish/v1/Systems/1/LogService/MyLog/7865" }
    },
    {
        "MessageId": "Base.1.9.ConditionInRelatedResource",
        "OriginOfCondition": { "@odata.id": "/redfish/v1/Chassis/1U/Drives/9" },
        "Message": "One or more conditions exist in a related resource.  See the
            OriginOfCondition property."
        "Severity": "Warning"
    }
    ]
}
```

This *Condition* originated from this resource

MessageId, Message, and *MessageSeverity* come from a Message Registry

LogEntry link allows correlation to events

This *Condition* is a rollup of one or more conditions in a related resource located at the *OriginOfCondition*

Redfish Schema Minor Revisions (1 of 7)

- AccountService v1.8.0
  - Added *RestrictedPrivileges, RestrictedOemPrivileges, SupportedAccountTypes,* and *SupportedOEMAccountTypes* properties
  - Added *TACACSplus* property for configuring external authentication via TACACS+
  - Added *Priority* property to external account providers

- AggregationSource v1.1.0
  - Added *SNMP* property for configuring SNMP aggregation sources

- Chassis v1.15.0
  - Added *Certificates, Measurements, PowerSubsystem, ThermalSubsystem,* and *EnvironmentMetrics* properties.
  - Deprecated *Power* and *Thermal* links in favor of the new *PowerSubsystem*, *ThermalSubsystem*, and *EnvironmentMetrics* link properties

- Circuit v1.2.0
  - Added *DC48* to *NominalVoltageType*

Redfish Schema Minor Revisions (2 of 7)

- ## ComputerSystem v1.14.0
  - Added *Certificates* and *Measurements* properties
  - Added *TrustedModuleRequiredToBoot* to Boot
  - Added *CoreCount* to *ProcessorySummary*

- ## Drive v1.12.0
  - Added *Certificates, Measurements,* and *EnvironmentMetrics* properties

- ## EventDestination v1.10.0
  - Added *AuthenticationKeySet* and *EncryptionKeySet* properties
  - Added HMAC128_SHA224, HMAC192_SHA256, HMAC256_SHA384, and HMAC384_SHA512 to *SNMPAuthenticationProtocols*
  - Added RetryForeverWithBackoff to *DeliveryRetryPolicy*

- ## ExternalAccountProvider v1.2.0
  - Added *TACACSplusService* property for configuring external authentication via TACACS+
  - Added *Priority* property

Redfish Schema Minor Revisions (3 of 7)

- Facility v1.1.0
  - Added *EnvironmentMetrics* and *AmbientMetrics* properties
- LogEntry v1.8.0
  - Added *Resolved* property
- Manager v1.11.0
  - Added Location, LocationIndicatorActive, and SparePartNumber properties
- ManagerAccount v1.7.0
  - Added StrictAccountTypes property
  - Added HMAC128_SHA224, HMAC192_SHA256, HMAC256_SHA384, and HMAC384_SHA512 to SNMPAuthenticationProtocols.
  - Extended AccountTypes enumeration to add HostConsole, ManagerConsole, IPMI, KVMIP, VirtualMedia, and WebUI

Redfish Schema Minor Revisions (4 of 7)

- Memory v1.10.0
  - Added *SparePartNumber, Model, Certificates, Measurements,* and *EnvironmentMetrics* properties
  - Added *Processors* to *Links*
  - Added HBM3, GDDR, GDDR2, GDDR3, GDDR4, GDDR5, GDDR5X, GDDR6, DDR5, and OEM to *MemoryDeviceType*
- MetricReportDefinition v1.4.0
  - Added *Oem* to *Metrics*
- NetworkAdapter v1.6.0
  - Added *Certificates* and *Measurements* properties
- NetworkPort v1.4.0
  - Deprecated schema in favor of Port schema
- PCIeDevice v1.6.0
  - Added *SparePartNumber* property

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- PhysicalContext
  - Added *TrustedModule* physical context type
- Power v1.7.0
  - Deprecated schema in favor of *PowerSubsystem* schema
- Processor v1.11.0
  - Added *MemorySummary, SparePartNumber, Certificates, Measurements,* and *EnvironmentMetrics* properties
  - Added *Memory* to *Links*
- ProcessorMetrics v1.2.0
  - Added *CacheMetrics* property
  - Added *ClearCurrentPeriod* action for clearing the *CurrentPeriod* property within *CacheMetrics*
  - Deprecated temperature related properties in favor of the EnvironmentMetrics resource

- **Redundancy**
  - Added *RedundantGroup* definition to migrate away from the Referenceable Member definition for redundancy

- **Resource v1.11.0**
  - Added *Conditions* property to Status for showing details about items that need attention in a resource

- **Role v1.3.0**
  - Added *Restricted* and *AlternateRoleId* properties

- **Sensor v1.2.0**
  - Added *RelatedItem, SpeedRPM,* and *DeviceName* properties.
  - Added *UpperCautionUser, UpperCriticalUser, LowerCautionUser, and LowerCriticalUser* to *Thresholds*.

- **SoftwareInventory v1.4.0**
  - Added *Measurement* property.
  - Added *MeasurementBlock* definition for containing SPDM-related measurement information

Redfish Schema Minor Revisions (7 of 7)

- Storage v1.10.0
  - Added *Certificates* and *Measurements* to *StorageControllers*.
- StorageController v1.1.0
  - Added *Certificates* and *Measurements* properties
- Switch v1.5.0
  - Added *Certificates* and *Measurements* properties
- TelemetryService v1.3.0
  - Added *ClearMetricReports, ResetMetricReportDefinitionsToDefaults,* and *ResetTriggersToDefaults* actions.
- Thermal v1.7.0
  - Deprecated schema in favor of ThermalSubsystem schema
- VLanNetworkInterface v1.2.0
  - Added *VLANPriority* property
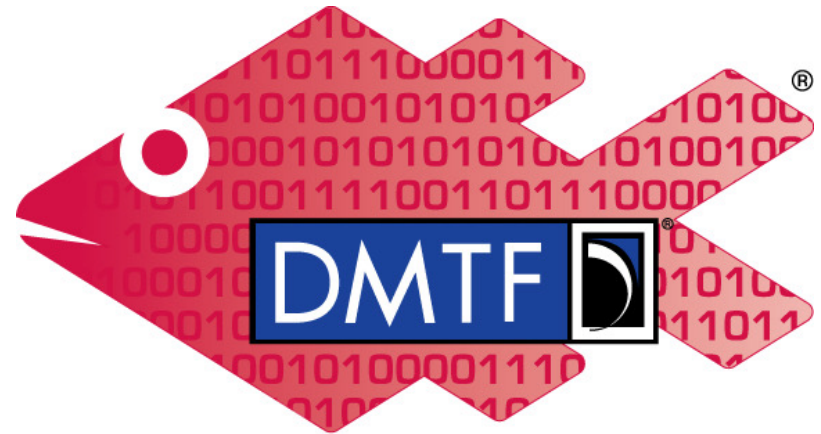- Zone v1.6.0
  - Added *ZoneOfResourceBlocks* to *ZoneType*

Redfish Release 2020.3

DMTF Redfish Forum

September 2020

Redfish Release 2020.3

- Redfish Specification v1.11.1
  - Errata release
- Redfish Host Interface Specification v1.3.0
  - Adds bootstrap credential method
- Redfish Schema Bundle 2020.3
  - DSP8010 contains all released Redfish schemas
- Redfish Message Registry Bundle 2020.3
  - DSP8011 contains all released Redfish registries
  - NEW Job and LogService message registries
  - Updated Privilege registry
  - Updated Base message registry to include argument descriptions for all messages
- 2 NEW Schemas, 37 updated schemas
  - Addition of Connection and StorageController schema
  - Support for NVMe-over-Fabric
  - Support for collecting and retrieving DiagnosticData ("crash dumps")
  - Migration from NetworkPort to Port schema for consistency throughout model
  - Added support for per-system remote console and virtual media instances, expanded details of serial console
  - See release notes in DSP8010 for errata details
- Download all published material at: http://www.dmtf.org/standards/redfish

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NEW Host Interface Specification Updates

- New credential bootstrapping feature added to the Redfish Host Interface Specification v1.3

- Added a set of IPMI commands to allow host software or the operating system to generate credentials for itself without requiring a-priori knowledge about the Redfish service

  - Previous UEFI variable mechanism for transporting host credentials has been deprecated in favor of this approach

- Additions to the *HostInterface* resource to control whether the credential bootstrapping feature is enabled, and control the role assigned to the bootstrap account

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NEW Connection schema

- Added *Connection* to the fabric model
- A *Connection* resource is used to express the types of resources an endpoint can 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

- Created *StorageController* to address scalability concerns
  - The Storage schema currently contains an object array for controllers
    - This property works for traditional HBAs or RAID adapters that have a physical controller, where the *Storage* resource contains only one or two controllers
  - Added a link in *Storage* to a *StorageController* resource collection
- A *StorageController* resource collection allows 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 NVMe-oF modeling using Redfish

- Additions made to the data model to support NVMe-oF
    - *Storage* added to *ServiceRoot* for showing externally accessible storage subsystems
    - *Connection* added to *Fabric* to allow mapping of *Endpoints* to other resources, such as *Volumes*
    - *Drives* added to *Chassis* to show drives within an enclosure
- *Endpoints* are used to represent NVMe-oF hosts and interfaces on an NVMe-oF subsystem
    - An *Initiator Endpoint* represents a host, and contains the host's NQN
    - A *Target Endpoint* represents an interface to the subsystem, and contains the subsystem's NQN as well as a reference to the *NetworkDeviceFunction* representing the physical interface
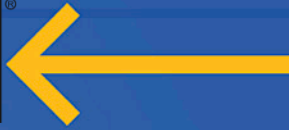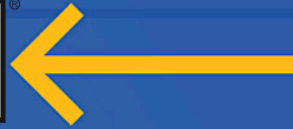
NEW NVMe-oF Modeling in Redfish
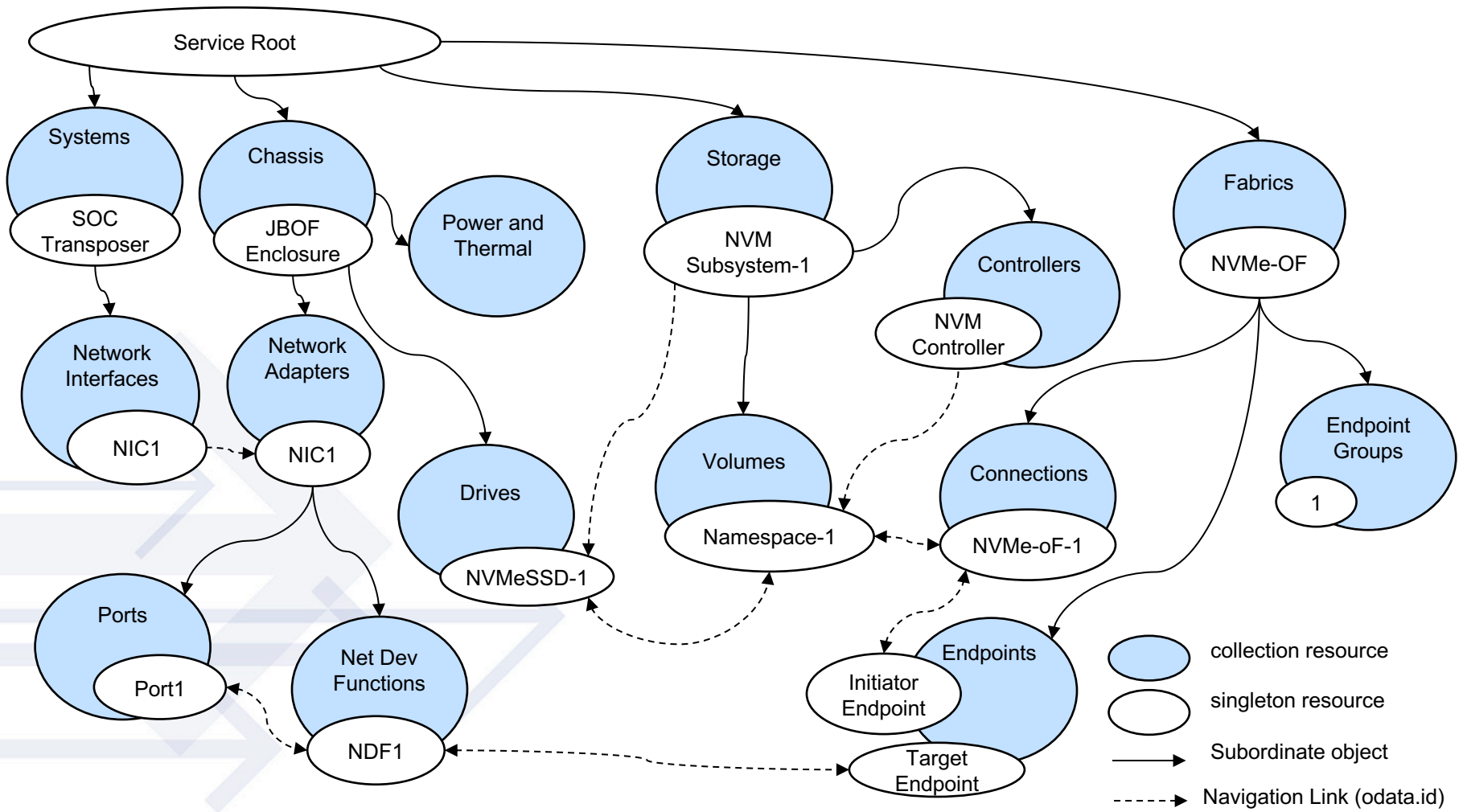
Port schema updates, migration from NetworkPort

- Large overlap between *Port* and *NetworkPort*
  - Both schemas filled essentially the same purpose
  - Standardize on *Port* going forward
  - Properties added to *Port* that were present only in *NetworkPort*
- References to *NetworkPort* deprecated and references to *Port* added
  - *NetworkAdapter*
  - *NetworkInterface*
  - *NetworkDeviceFunction*
- Autospeed negotiation for network adapters now explicitly supported
  - *AutoSpeedNegotiationEnabled* - allows turning negotiation on/off
  - *ConfiguredNetworkLinks* - set of lane speed/count possibilities to which autospeed negotiation is restricted

NEW Diagnostic Data support in LogService / LogEntry

- Diagnostic data can be collected at any time and is stored in a file to troubleshoot problems that have occurred

- The data may consist of a "crash dump", application core, network configuration, system inventory configuration, journal log, etc.

- *LogService CollectDiagnosticData* action collects the diagnostic data
  - Parameters *DiagnosticDataType* and *OEMDiagnosticDataType*

- *LogEntry* adds support for referencing a diagnostic data file
  - *AdditionalDataSizeBytes* - Size of the additional data file
  - *AdditionalDataURI* - URI of the additional data file
  - *DiagnosticDataType* - Type of diagnostic data
    - Types include: *Manager, OEM, OS,* and *PreOs*
  - *OEMDiagnosticDataType* – OEM-defined diagnostic data type
    - Used when *DiagnosticDataType* is *OEM*

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NEW InfiniBand support

- Added *InfiniBand* to *NetDevFuncType* in *NetworkDeviceFunction* to be able to identify network devices that support InfiniBand

- Added *InfiniBand* property to *NetworkDeviceFunction* for containing InfiniBand specific properties
  - Port GUID
  - Node GUID
  - System GUID
  - MTU capabilities and configuration

NEW *LocationIndicatorActive* property

- Deprecates and replaces *IndicatorLED* property throughout the model
  - *IndicatorLED* improperly exposed hardware implementation details
    - Redfish attempts to model usage semantics rather than physical characteristics
  - This caused interoperability issues discovered during Redfish Plugfests
    - Some vendors use "On" as the active state, others use "Blinking"
    - Some vendors use "Off" as the inactive state, other use "On"

- *LocationIndicatorActive* property is a simple Boolean
  - True if the locator function is active, False if it is not in use
  - Added to *Assembly, Circuit, Chassis, ComputerSystem, Drive, Memory, Outlet, PCIeSlots, Port, Processor, Switch*

- For compatibility with existing clients, services should:
  - Implement both properties in ComputerSystem, Chassis, Drive, Switch instances where *IndicatorLED* already exists
    - Reflect changes (from user PATCH operations) in both properties
  - Replace *IndicatorLED* support in Circuit, Outlet as these are new schemas

Remote console and Virtual Media updates

- Remote console and virtual media properties moved to *ComputerSystem*
  - Allows clients to locate functionality in multi-node
- New *VirtualMediaConfiguration* object, *VirtualMediaCollection* link
  - Configuration object provides connection information per system
  - No changes to *VirtualMedia* resource collection definition
- *SerialConsole*
  - Support allows for multiple console protocols
    - SSH, Telnet, IPM-over-LAN Serial-over-LAN supported
  - *SharedWithManagerCLI* indicates console also allows access to Manager
  - *ConsoleEntryCommand* reports the command sequence client issues to access the host console once connected using the given protocol
  - *HotKeySequenceDisplay* provides text to client software to display to user showing the keyboard "hotkey" sequence used to exit the host console

Redfish Schema Minor Revisions (1 of 7)

- AddressPool v1.1.0
  - Added *Ethernet* property
- Assembly v1.3.0
  - Added *LocationIndicatorActive* and *Location* properties
- Chassis v1.14.0
  - Added *LocationIndicatorActive* and *Drives* properties
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*
- Circuit v1.1.0
  - Added *LocationIndicatorActive* property
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*
- ComputerSystem v1.13.0
  - Added *LocationIndicatorActive, BootProgress, SerialConsole, GraphicalConsole, VirtualMediaConfig, VirtualMedia, PowerOnDelaySeconds, PowerOffDelaySeconds,* and *PowerCycleDelaySeconds properties*
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*

Redfish Schema Minor Revisions (2 of 7)

- Drive v1.11.0
  - Added *LocationIndicatorActive* property
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*
- Endpoint v1.5.0
  - Added *Manager and Connections* properties
- EndpointGroup v1.3.0
  - Initial transition from SNIA contribution to DMTF
  - Deprecated *AccessState* in favor of *AccessState* in Connection. Deprecated *Endpoints* in favor of *Endpoints* in Links. Deprecated *Client* and *Server* in favor of *Initiator* and *Target*. Added *Connections* to *Links*
  - Added *Connections* property
- Event v1.6.0
  - Added *SpecificEventExistsInGroup* property

Redfish Schema Minor Revisions (3 of 7)

- EventDestination v1.9.0
  - Added *Certificates*, *VerifyCertificate, SyslogFilters, OEMProtocol,* and *OEMSubscriptionType* properties
  - Added syslog-related values to *Protocol* and *SubscriptionType*

- Fabric v1.2.0
  - Added *EndpointGroups and Connections* properties

- HostInterface v1.3.0
  - Added *CredentialBootstrapping* property and *CredentialBootstrappingRole* to *Links*.
  - Deprecated *KernelAuthRoleId*, *KernelAuthEnabled*, *FirmwareAuthRoleId*, *FirmwareAuthEnabled*, *KernelAuthRole*, and *FirmwareAuthRole* in favor of new credential bootstrapping properties

- LogEntry v1.7.0
  - Added *AdditionalDataSizeBytes, AdditionalDataURI, DiagnosticDataType, OEMDiagnosticDataType* properties

- LogService v1.2.0
  - Added *SyslogFilters* property and *CollectDiagnosticData* action

- **Manager v1.10.0**
  - Added *TimeZoneName* property
  - Deprecated *VirtualMedia* and *SerialConsole* properties in favor of those added to ComputerSystem

- **Memory v1.10.0**
  - Added *LocationIndicatorActive property*

- **MemoryChunks v1.4.0**
  - Added *DisplayName property*

- **MemoryMetrics v1.4.0**
  - Added *CorrectableECCErrorCount* and *UncorrectableECCErrorCount* properties to *CurrentPeriod* and *LifeTime*

- **MetricDefinition v1.1.0**
  - Added *OEMCalculationAlgorithm* property and OEM *value to CalculationAlgorithm*

- **NetworkAdapter v1.5.0**
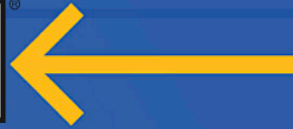 - Deprecated *NetworkPorts* property in favor of *Ports* to leverage the common Port schema

Redfish Schema Minor Revisions (5 of 7)

- NetworkDeviceFunction v1.5.0
  - Added *Infiniband* property and *MTUSizeMaximum* to *Ethernet*
  - Deprecated *AssignablePhysicalPorts* and *PhysicalPortAssignment* properties in favor of AssignablePhysicalNetworkPorts and PhysicalNetworkPortAssignment to leverage the common Port schema

- NetworkInterface v1.3.0
  - Deprecated *NetworkPorts* property in favor of *Ports* to leverage the common Port schema

- NetworkPort v1.3.0
  - Added *Starting* and *Training* values to LinkStatus

- Outlet v1.1.0
  - Added *LocationIndicatorActive* property
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*

- PCIeDevice v1.5.0
  - Added *UUID* property

Redfish Schema Minor Revisions (6 of 7)

- PCIeSlots v1.4.0
  - Added *LocationIndicatorActive* property
- Port v1.3.0
  - Added *LocationIndicatorActive, MaxFrameSize, LinkConfiguration, FibreChannel,* and *Ethernet* properties
- Processor v1.10.0
  - Added *LocationIndicatorActive, BaseSpeedMHz, SpeedLimitMHz,* and *SpeedLocked* properties
  - Added *ProtectedIdentificationNumber* to *ProcessorId*
- Protocol
  - Added *Ethernet* and *Infiniband* values
- Resource v1.10.0
  - Added *NGUID* to *DurableName*
- ServiceRoot v1.9.0
  - Added *Storage* property

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- ## Session v1.3.0
  - Added *ClientOriginIPAddress* property
- ## SimpleStorage v1.3.0
  - Added *Storage* to *Links*
- ## Storage v1.9.0
  - Added *Controllers* and *Identifiers* properties
  - Added *SimpleStorage* and *StorageServices* to *Links*
- ## Switch v1.4.0
  - Added *LocationIndicatorActive, CurrentBandwidthGbps,* and *MaxBandwidthGbps* properties. Added *PCIeDevice* to *Links*
  - Deprecated *IndicatorLED* property in favor of *LocationIndicatorActive*
- ## Task v1.5.0
  - Added *SubTasks* property
- ## Zone v1.5.0
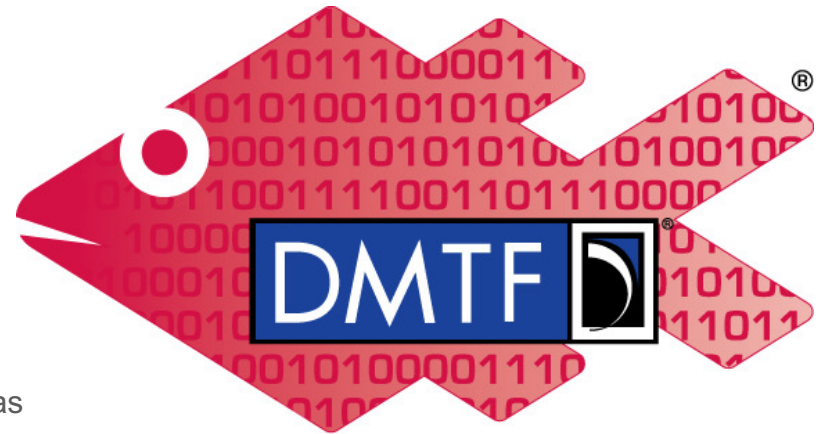 - Added *AddEndpoint* and *RemoveEndpoint* actions

Redfish Release 2020.2

- Redfish Specification v1.11.0
  - Adds clauses for aggregators
  - Contains informative text describing aggregators
  - Specifies requirements of aggregators (unifying southbound services, assembling resource collections, sanitizing URIs)
- Redfish Schema Bundle 2020.2
  - Bundle (DSP8010) contains all released Redfish schemas
- Redfish Message Registry Bundle 2020.2
  - Bundle (DSP8011) contains all released Redfish message registries
  - NEW StorageDevice registry to provide storage-specific events or status changes
- 5 NEW Schemas, 10 updated schemas
  - Addition of Aggregate, AggregationService, AggregationSource, ConnectionMethod, and OperatingConfig
- Download all published material at: http://www.dmtf.org/standards/redfish
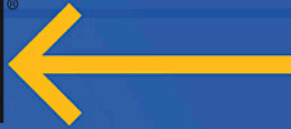
NEW AggregationService

- New service exposed via service root

- Provides client interface for managing aggregation of southbound services

- Provides links to AggregationSource, ConnectionMethod, and Aggregate resources

NEW AggregationSource and ConnectionMethod

- AggregationSource
    - Represents a southbound service being aggregated
    - Clients can create new instances and specify the location of the southbound service, credentials to access the service, and the type of connection (ConnectionMethod) used with the service

- ConnectionMethod
    - Represents a type of connection/protocol the service supports for aggregation
    - Connection types can be Redfish, IPMI, SNMP, NETCONF, or OEM
    - Connection types further qualified using *ConnectionMethodVariant*
        - Example: For IPMI, a variant could be "Contoso IPMI Flavor"

NEW Aggregate

- A client-defined grouping of resources
  - The *Elements* array contains the set of the resources to aggregate
  - Clients use the *AddElements* and *RemoveElements* actions to modify the array after the resource is created
- Used to perform large-scale operations on multiple, similar resources
  - For example, resetting 10000 systems at the same time
  - Aggregate allows single action to occur on a set of resources
- Defines two actions that can be performed on the aggregate
  - *Reset*
  - *SetDefaultBootOrder*
- When invoked, the action is carried out on all members of the aggregate (if the member supports the action)

NEW OperatingConfig

- Added to Processor to express pre-defined operating modes supported by the processor

  - Core count configuration

  - Speed configuration

  - Turbo mode profiles

- Properties added to Processor to allow a client to specify which OperatingConfig to apply to the Processor

NEW StorageDevice Message Registry

- Registry provides messages specific to storage devices
  - Follows "topic-based" message pattern from NetworkDevice registry
  - Explicit messages defined for device and controller state changes
  - Registry to expand as more standardized messages are defined
- Topics covered in StorageDevice message registry v1.0.0
  - Storage Controller status changes
  - Drive (Storage device) status changes
  - Predictive Failure status changes
  - Write Cache status changes
  - Drive Inserted or Removed
  - Volume status changes

Redfish Schema Minor Revisions (1 of 2)

- ComputerSystem v1.12.0
  - Added *LastResetTime* property
- Drive v1.10.0
  - Added *ReadyToRemove* property
- Event v1.5.0
  - Added *MessageSeverity* property and deprecated *Severity* property
  - *Severity* was not tied to the enumeration values of *State*, which caused interoperability issues
- EventService v1.7.0
  - Deprecated *Login* enumeration in *SMTPAuthenticationMethods* in favor of *Plain*
- Manager v1.9.0
  - Added *LastResetTime* property
  - Added *ManagedBy* and *ManagerForManagers* properties to *Links*

Redfish Schema Minor Revisions (2 of 2)

- MediaController v1.1.0
  - Added *UUID* property
- MetricReport v1.4.0
  - Added *Context* property
- NetworkAdapter v1.4.0
  - Added *Identifiers* and *Location* properties
- Processor v1.9.0
  - Deprecated *FirmwareVersion* in *FPGA* in favor of *FirmwareVersion* at the root of the resource
  - Added *TurboState*, *BaseSpeedPriorityState*, *HighSpeedCoreIDs*, *OperatingConfigs*, and *AppliedOperatingConfig* properties
- ServiceRoot v1.8.0
  - Added *AggregationService* property

Redfish Release 2020.1

- Redfish Specification v1.10.0
  - "Deep" operation support for creating or updating multiple resources with a single operation
  - Restructured Security details clause for readability
  - Require support of TLS v1.2 or later
  - Deprecated use of TLS v1.1
- Redfish Specification v1.9.1
  - Numerous clarifications regarding query parameters and Actions
  - Clarified naming guidelines, especially concerning acronyms
  - Deprecated use of full ISO8601 "Duration" format to allow for a simplified version that omits years/months/weeks
- Redfish Schema Bundle 2020.1
  - Bundle (DSP8010) contains all released Redfish schemas
- Redfish Message Registry Bundle 2020.1
  - Bundle (DSP8011) contains all released Redfish message registries
  - NEW NetworkDevice registry to provide NIC / networking adapter-specific events or status changes
  - Minor release of *Base* Registry adding *MaximumErrorsExceeded, PreconditionFailed, PreconditionRequired, OperationFailed* and *OperationTimeout* messages
- 2 NEW Schemas, 19 updated schemas
  - Addition of SecureBootDatabase and Signature
- Download all published material at: http://www.dmtf.org/standards/redfish

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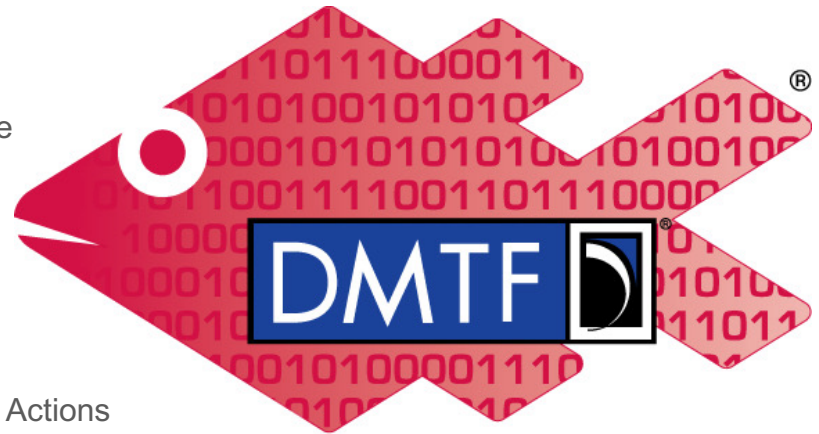
NEW SecureBoot Database

- SecureBootDatabase contains UEFI SecureBoot certificates or hashes

- *DatabaseId* – Database name from the UEFI specification

  - e.g. PK, KEK, db, dbx, dbc, dbt, Pkdefault, KEKDefault, dbDefault, dbxDefault, dbrDefault, dbtDefault

- Link to *SignatureCollection* for this database

  - Contains the hashes and encrypted hashes that are stored in this database

- Link to *CertificateCollection* for this database

  - Contains the Certificates that are stored in this database

- Action to ResetKeys

  - Allows resetting individual databases to their default (*ResetAllKeysToDefault*), or deleting all keys in this database (*DeleteAllKeys*)

NEW Signatures

- Each SecureBootDatabase contains a *SignatureCollection*

- *Signature* contains the following:
  - *SignatureTypeRegistry* to look up the definitions
    - Values of: UEFI, TCG, IANA, DMTF
  - *SignatureType -* Definition from referenced specification
  - *SignatureString* - Encodes the signature bytes in hexadecimal format
  - *UefiSignatureOwner* – Similar to the property in Certificate

Redfish Schema Minor Revisions (1 of 3)

- ## Certificate v1.2.0
  - Added *UefiSignatureOwner* property
- ## Chassis v1.12.0
  - Added *MaxPowerWatts* and *MinPowerWatts* properties
- ## ComputerSystem v1.11.0
  - Added *AutomaticRetryConfig, AutomaticRetryAttempts,* and *RemainingAutomaticRetryAttempts* properties to *Boot*
- ## EthernetInterface v1.6.0
  - Added *EthernetInterfaceType* property
  - Added *NetworkDeviceFunction* to *Links*
- ## EventDestination v1.8.0
  - Added *IncludeOriginOfCondition* property – this allows an event subscriber to request the entire resource be included in the event payload
- ## EventService v1.5.0
  - Added *IncludeOriginOfConditionSupported* property

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Redfish Schema Minor Revisions (2 of 3)

- ## LogEntry v1.6.0
  - Added *Modified* property
- ## Manager v1.8.0
  - Added *ResetToDefaults* action
- ## ManagerAccount v1.6.0
  - Added *PasswordExpiration* property
- ## ManagerNetworkProtocol v1.6.0
  - Added *ArchitectureId* to *EngineId* in *SNMP*
- ## MemoryMetrics v1.3.0
  - Added *OperatingSpeedMHz* property
- ## MessageRegistry v1.4.0
  - Added *MessageSeverity* property and deprecated *Severity* property
  - *Severity* was not tied to the enumeration values of *State*, which caused interoperability issues

Redfish Schema Minor Revisions (3 of 3)

- NetworkDeviceFunction v1.4.0
  - Added *EthernetInterface* to *Links*
- PCIeSlots v1.3.0
  - Added *U2* to *PCIeSlotType*
- Processor v1.8.0
  - Added *SystemInterface*, *OperatingSpeedMHz,* and *MinSpeedMHz* properties
  - Added *AMBA*, *CCIX*, and *CXL* values to the interface type enumeration
- ProcessorMetrics v1.1.0
  - Added *OperatingSpeedMHz* property and deprecated *AverageFrequencyMHz*
- SecureBoot v1.1.0
  - Added *SecureBootDatabases* property
- SoftwareInventory v1.3.0
  - Added *WriteProtected* property

Errata Schema Revisions (1 of 2)

- ## Event v1.x.x
  - Updated description for *OriginOfCondition* to show that a subscriber can request the full resource for the origin of the event to be included in the event itself

- ## ManagerAccount v1.x.x
  - Corrected formats for *AuthenticationKey* and *EncryptionKey* within *SNMP* to support patterns defined in RFC3414

- ## ManagerNetworkProtocol v1.x.x
  - Clarified *EnterpriseSpecificMethod* is tied to the "type 2 format" of the RFC3411-defined snmpEngineID
  - Made *PrivateEnterpriseId* and *EnterpriseSpecificMethod* read-only

- ## MemoryMetrics v1.x.x
  - Corrected description of *HealthData* to allow its usage with regards to being metrics for a memory summary

Errata Schema Revisions (2 of 2)

- ## MetricReportDefinition v1.x.x
  - Clarified that *ReportUpdates* and *ReportActions* should be ignored when *MetricReportDefinitionType* is *OnRequest*
  - Clarified behavior of some properties when a metric report stops.
  - Clarified *ReportTimespan* is the maximum timespan the report can cover
- ## SecureBoot v1.x.x
  - Updated descriptions as needed to reference UEFI Secure Boot databases
- ## TaskService v1.x.x
 - Clarified *LifeCycleEventOnTaskStateChange* to reference the Task Event Message Registry for task events

Redfish Release 2019.4

DMTF Redfish Forum

December 2019

Redfish Release 2019.4

- **Redfish Specification v1.9.0**
  - Loosened requirements on @odata.type in arrays
  - HTTP "Server" response header no longer required
  - OEMs can add URIs to copies of schema
- **Redfish Specification v1.8.1**
  - Significant re-formatting of Service Details and Security clauses
  - Unless specifically mentioned, any change in normative language was unintentional and should be considered errata (please provide feedback)
- **Redfish Schema Bundle 2019.4**
  - Bundle (DSP8010) contains all released Redfish schemas
  - NEW bundle now includes schemas in RDE Dictionary format
  - Removed down-revision errata schemas from "un-versioned" JSON schema files to improve performance
- **Redfish Message Registry Bundle 2019.4**
  - Bundle contains all released Redfish message registries
  - Minor release of *Base* Registry adding *PropertyValueIncorrect* and *ResourceCreationConflict* messages
- **15 NEW Schemas (highlights), 23 updated schemas**
  - Addition of support for configuring and managing Gen-Z fabrics
  - Addition of support for Power Distribution equipment (PDU's and Transfer switches)
- **Download all published material at: http://www.dmtf.org/standards/redfish**

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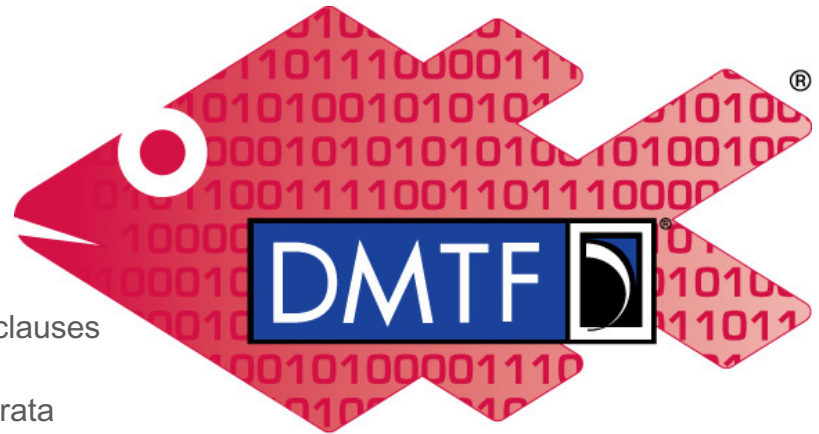
NEW: Gen-Z Fabric support

- Supports management of port-based Gen-Z fabrics (Initiators/Targets)
- Supports fabric-attached resources (Targets)
- Extends *Endpoint, Fabric, Port*
- **NEW** schemas:
  - *AddressPool*
  - *FabricAdapter*
  - *MediaController*
  - *PortMetrics*
  - *RouteEntry*
  - *RouteSetEntry*
  - *VCATEntry*
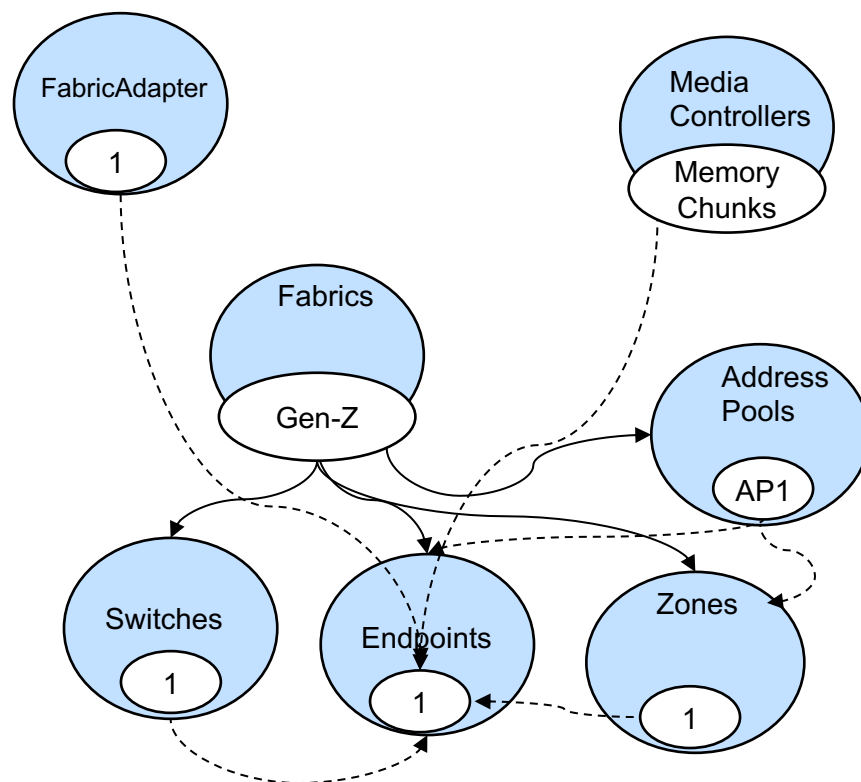
NEW: Power Distribution equipment and Facilities

- Ability to monitor and control Power Distribution Units (PDUs) and Transfer Switches via Redfish
  - Rack-level PDUs, Floor-level PDUs, Transfer Switches and Switchgear all share a common *PowerDistribution* schema definition
  - All grouped in the resource tree under a new *PowerEquipment* resource
  - Expect this model to include UPS devices in future releases
  - PDU-level metrics reported in a *PowerDistributionMetrics* resource
- *Circuit, Outlet* and *OutletGroup*
  - Properties to monitor circuits, individual outlets, or groups of outlets
  - Ability to control power state and reset breakers
- *Facility*
  - New schema to describe rooms and other physical locations in order to show equipment relationships
  - Includes *PowerDomain* schema for grouping related power equipment

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JSON schema file update

- Each Redfish schema version generates a JSON schema file
  - e.g. ComputerSystem.v1_9_0.json, ComputerSystem.v1_9_1.json
- The "un-versioned" JSON schema file is updated for each release
  - e.g. ComputerSystem.json
  - This file contains an "anyOf" array of references to every release
- Problem: As the "anyOf" array included every release, it created issues:
  - Large number of files referenced is a performance burden for tools
    - For example, ComputerSystem has 70 references
  - Schema errata corrected by later releases are still exposed to users
    - Errors in schema definitions (e.g. invalid URIs, etc.) break schema-based tools
    - To avoid known and fixed issues, those files must be removed from references
- Solution: Un-versioned JSON schema files now contains only the highest-numbered errata for each minor version
  - e.g. ComputerSystem version v1.10.0, v1.9.1, v1.8.1, v1.7.2, etc.
  - This significantly improves tool performance and avoids known issues
    - e.g. ComputerSystem schema drops from 70 references to 12 references

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Redfish Schema Minor Revisions (1 of 4)

- AccountService v1.7.0
  - Added *PasswordSet* to *LDAP* and *ActiveDirectory*
- Chassis v1.11.0
  - Added *MediaControllers, Memory*, and *MemoryDomains* properties
  - Added *Facility* to *Links*
- ComputerSystem v1.10.0
  - Added *Appliance*, *BareMetalServer*, *VirtualMachineServer*, and *ContainerServer* values to *HostingRoles*
  - Added *FabricAdapters* property
- Drive v1.9.0
  - Added *Multipath* property
- Endpoint v1.4.0
  - Added *GenZ* property
  - Added *MediaController*, *MemoryChunk*, *Switch*, and *FabricBridge* values to *EntityType*

Redfish Schema Minor Revisions (2 of 4)

- ## Fabric v1.1.0
  - Added *AddressPools* property
- ## Manager v1.7.0
  - Added *Manufacturer*, *SerialNumber* and *PartNumber* properties
- ## ManagerAccount v1.5.0
  - Added *AuthenticationKeySet* and *EncryptionKeySet* properties to *SNMP*
- ## Memory v1.9.0
  - Deprecated *DeviceLocation* (Location should be used in its place)
- ## MemoryChunks v1.3.0
  - Added *AddressRangeOffsetMiB* and *Links* properties
- ## MemoryDomain v1.3.0
  - Added *Links* property
- ## MetricReport v1.3.0
  - Deprecated *ReportSequence* based on client feedback with usage of SSE "id"

Redfish Schema Minor Revisions (3 of 4)

- PCIeSlots v1.2.0
  - Added *OCP3Small* and *OCP3Large* values to *SlotType*

- Port v1.2.0
  - Added *PortMedium, LinkNetworkTechnology, InterfaceEnabled, SignalDetected, LinkTransitionIndicator, ActiveWidth, LinkState, LinkStatus, GenZ,* and *Metrics* properties

- Processor v1.7.0
  - Added *Manufacturer*, *PartNumber, SerialNumber* and *Version* properties

- Protocol
  - Added *MultiProtocol* and *GenZ* protocols

- Resource v1.9.0
  - Added *Qualified* value to *State*

- Sensor v1.1.0
  - Added *CrestFactor, THDPercent, LifetimeReading, SensingInterval, ReadingTime*, and *Implementation* properties

Redfish Schema Minor Revisions (4 of 4)

- ServiceRoot v1.6.0
  - Added *PowerEquipment* and *Facilities* properties
- Switch v1.3.0
  - Added *SupportedProtocols* and *UUID* properties
  - Added *Endpoints* to *Links*
- Telemetry v1.2.0
  - Added *ServiceEnabled* property
- Thermal v1.6.0
  - Added *UpperThresholdUser* and *LowerThresholdUser* properties to *Temperatures*
- UpdateService v1.8.0
  - Added *Oem* to *UpdateParameters*
- Zone v1.4.0
  - Added *ZoneType* and *DefaultRoutingEnabled* properties
  - Added *AddressPools*, *ContainedByZones*, and *ContainsZones* to *Links*

Errata Schema Revisions (1 of 2)

- ## Assembly v1.x.x
  - Clarified *Version* property to state it refers to the version of hardware

- ## ComputerSystem v1.x.x
  - Corrected description for *UefiTargetBootSourceOverride* to remove erroneous mention of *@Redfish.AllowableValues*

- ## IPAddress v1.x.x
  - Corrected minimum term on *PrefixLength*

- ## LogEntry v1.x.x
  - Clarified several references to the IPMI Specification to show a specific version of the specification

- ## ManagerAccount v1.x.x
  - Removed incorrect clause that tied *Enabled* and *Locked* together

Errata Schema Revisions (2 of 2)

- PCIeSlots v1.x.x
  - Corrected typo in the description for *Location*

- Processor v1.x.x
  - Corrected typos in several property descriptions

- Resource
  - Extended *InTest* state to mention "capturing information"

- Sensor v1.0.4
  - Corrected action to reset metrics to be named *ResetMetrics*

- Task v1.x.x
  - Clarified the behavioral aspects of *HidePayload* and *Payload*

Redfish Release 2019.3

DMTF Redfish Forum

October 2019

Redfish Release 2019.3

- ## Redfish Host Interface v1.2.0
  - Supports for multiple SMBIOS Type 42 structures to allow specification of multiple Protocol Records

- ## Redfish Schema Bundle 2019.3
  - Bundle contains all released Redfish schemas

- ## Redfish Message Registry Bundle 2019.3
  - Bundle contains all released Redfish message registries
  - Errata releases of *Base* and *Privilege* Registries

- ## 14 Updated Schemas (highlights)
  - Addition of support for configuring SNMP or SMTP-based services and event delivery
  - Added *GeneratorId* in LogEntry for mapping IPMI SEL events
  - Added *Reset* action for power supplies and processors

- ## Download all published material at: http://www.dmtf.org/standards/redfish

NEW: SNMP and SMTP support

- Ability to configure SNMP and SMTP services via Redfish
  - These services / protocols are expected to remain in production for years
  - Customers desire ability to perform all configuration tasks using Redfish
- Support added in four schemas to provide this functionality
- *EventDestination*
  - Allow destinations to receive events via SNMP Trap / Inform or by email
- *EventService*
  - Properties to configure outbound SMTP messages from the Service
- *ManagerAccount*
  - Provide configuration and credentials for accessing SNMP services
- *ManagerNetworkProtocol*
  - Enable and configure support for SNMP v1, v2c, v3 services

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Redfish Schema Minor Revisions (1 of 2)

- ComputerSystem v1.9.0
  - Added *HttpBootUri* property to *Boot*
- Drive v1.8.0
  - Added *StoragePools* property to *Links*
- EventDestination v1.7.0
  - Added properties to support SNMP and SMTP-based event delivery
- EventService v1.5.0
  - Added properties to support SMTP-based event delivery
- LogEntry v1.5.0
  - Added *GeneratorId* property
- ManagerAccount v1.4.0
  - Added properties to support access to SNMP services
- ManagerNetworkProtocol v1.5.0
  - Added properties to support configuration of SNMP services

Redfish Schema Minor Revisions (2 of 2)

- Power v1.6.0
  - Added *PowerSupplyReset* action
- Privilege
  - Added *NoAuth* privilege
- Processor v1.6.0
  - Added *Reset* action
- Protocol
  - Added *TCP, UDP,* and *TFTP protocols*
- Settings v1.3.0
  - Added *OnStartUpdateRequest* to the *OperationApplyTime* enumeration
- Storage v1.8.0
  - Added *FileSystems, StoragePools, StorageGroups, EndpointGroups* and *ConsistencyGroups* properties
- UpdateService v1.7.0
  - Added *StartUpdate* action

Errata Schema Revisions

- ## LogEntry v1.x.x
  - Modified description of *MessageId* to include the Event Type / Event Direction byte in the string for SEL type entries

- ## Privileges
  - Clarified the description for *ConfigureSelf* to show that it's also used for users to log out of their own sessions

- ## Processor v1.x.x
  - Removed "CPUID" term from the *IdentificationRegisters* description in order to not be tied to x86 processors

- ## Resource v1.8.3
  - Removed "Excerpt" annotations from common *Name* property

- ## Sensor v1.0.3
  - Corrected units for ApparentVA and ReactiveVAR. Fixed several "Excerpt" annotations.

Redfish Release 2019.2

DMTF Redfish Forum

August 2019

Redfish Release 2019.2

- Redfish Specification v1.8.0
  - **NEW**: Standard multipart HTTP for software updates
  - *SubordinateResource* parameter for SSE
  - Defined URI for OpenAPI document
- Redfish Specification v1.7.1
  - Errata version of v1.7.0
  - Numerous clarifications for HTTP response codes
- Redfish Schema Bundle 2019.2
  - Bundle contains all released Redfish schemas
- Redfish Message Registry Bundle 2019.2
  - Bundle contains all released Redfish message registries
  - **NEW**: Composition Message Registry
- 17 Updated Schemas (highlights)
  - *MultipartPushUpdateUri* property in *UpdateService* to provide push-style software updates
  - Deprecated *PCIeDevices* in *Links* in favor of new *PCIeDevice* and *PCIeFunction* Collections
- Download all published material at: http://www.dmtf.org/standards/redfish
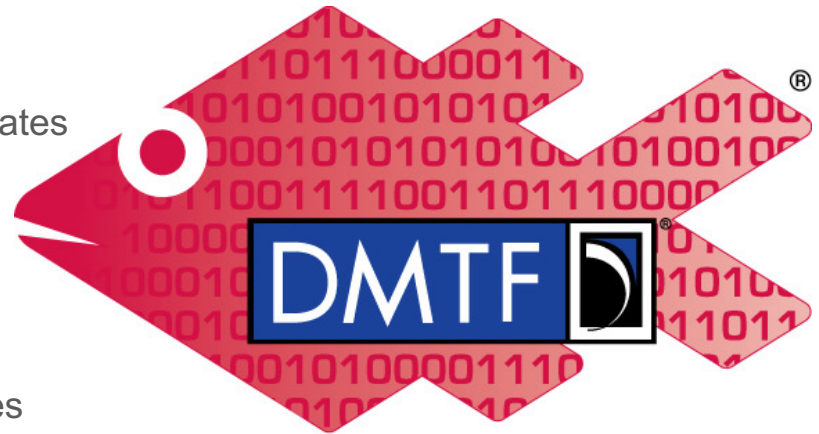
Redfish Specification v1.8.0

- **NEW**: Added support for standardized push-style software updates
    - Multipart HTTP format POST to URI specified by *MultipartHttpPushUri*
    - Form parts contain:
        - Redfish-defined JSON document for update parameters
        - Binary update file (software image)
        - OEM-defined additional data
- **NEW**: Added fixed URI location for OpenAPI document
    - /redfish/v1/openapi.yaml
- Clarified that properties that contain "Uri" in their names are accessible using the Redfish protocol semantics
- Added *SubordinateResources* $filter parameter for SSE

Redfish Schema Minor Revisions (1 of 3)

- AccountService v1.6.0
  - Added *LocalFirst* to the *LocalAccountAuth* property
- Bios v1.1.0
  - Added *SoftwareImages* and *ActiveSoftwareImage* properties to *Links*
- Chassis v1.10.0
  - Deprecated *PCIeDevices* array inside *Links* in favor of new *PCIeDevices* Resource Collection
- CollectionCapabilities v1.2.0
  - Added *MaxMembers* property
- ComputerSystem v1.8.0
  - Added *Metrics* link property to *MemorySummary*
- Drive v1.7.0
  - Added *WriteCacheEnabled* property
  - Added *Reset* action

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Redfish Schema Minor Revisions (2 of 3)

- ## EventDestination v1.6.0
  - Added *DeliveryRetryPolicy*, *Status*, and *MetricReportDefinitions* properties
  - Added *ResumeSubscription* action
- ## EventService v1.4.0
  - Added *SubordinateResources* property to *SSEFilterPropertiesSupported*
- ## Manager v1.6.0
  - Added *SoftwareImages* and *ActiveSoftwareImages* properties to *Links*
- ## Memory v1.8.0
  - Added *Reset* action
- ## MemoryMetrics v1.2.0
  - Added *BandwidthPercent* property
- ## MetricReport v1.2.0
  - Added *Oem* property to *MetricValues*

Redfish Schema Minor Revisions (3 of 3)

- ## MetricReportDefinition v1.3.0

  - Added *ReportTimespan* property

- ## NetworkAdapter v1.3.0

  - Added *Identifiers* property to *Controllers*

- ## PCIeDevice v1.4.0

  - Deprecated *PCIeFunctions* array inside *Links* in favor of new *PCIeFunctions* Resource Collection

- ## Switch v1.2.0

  - Added *FirmwareVersion* property

- ## UpdateService v1.6.0

  - Added *MultipartHttpPushUri* property for performing an update using HTTP multipart forms

  - Standardized push semantics specified in the Redfish Specification
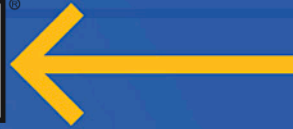
Errata Schema Revisions (1 of 3)

- Complete errata details shown in the Change Log within DSP8010
- All schemas
  - Descriptions in all schemas were updated for consistency in language and terminology. Any functional changes made that are not listed in the change log are unintentional and will be treated as errata.
- Various schemas
  - Clarified that properties with "Uri" in name use Redfish protocol semantics
  - Fixed several password related properties to be "null" in all responses regardless of the operation
  - Corrected some property abilities to not return "null" value
  - Removed "@odata.id", "@odata.context", and "@odata.etag" properties from registry resources

Errata Schema Revisions (2 of 3)

- ## AccountService, ExternalAccountService v1.x.x
  - Clarified that the *LDAPService* property should only be used in the context of LDAP services.

- ## EthernetInterface v1.x.x
  - Fixed several properties to allow for "null" so that services can advertise the size of configurable arrays. Clarified the description of the *SpeedMbps* property to state that it's writable only when *AutoNeg* is false

- ## Event v1.x.x
  - Clarified the description of *EventId* to give guidance on its usage. Added semantics of when *EventGroupId* is 0.

- ## EventService v1.x.x
  - Fixed parameters in *SubmitTestEvent* so that only *MessageId* is required. Added language to *DeliveryRetryAttempts* to show how it ties to the *DeliveryRetryPolicy* property in EventDestination

Errata Schema Revisions (3 of 3)

- ## NetworkDeviceFunction v1.x.x
  - Added missing regex pattern for MAC address properties

- ## PCIeSlots v1.1.1
  - Corrected the location of the *HotPluggable* property

- ## ProcessorMetrics v1.0.2
  - Clarified descriptions of several properties to explain the usage when the Resource represents a summary of processors

- ## UpdateService v1.x.x
  - Clarified description of *ImageURI* parameter to reference RFC3986. Clarified descriptions of various properties to replace 'firmware' with 'software'.

Message Registry updates

- Redfish Message Registries v2019.2
  - **DSP8011_2019.2.ZIP** – contains all published message registries
- Base v1.6.0
  - Added *QueryNotSupportedOnOperation*, *ResetRequired*, *PropertyValueConflict*, *ChassisPowerStateOnRequired*, and *ChassisPowerStateOffRequired* messages
- Composition v1.0.0
  - Initial release. Defines messages to use for composition events
- ResourceEvent v1.0.2
  - Corrected @*odata.type* and *Id* property formats.
  - Corrected cases where *ParamTypes* was incorrectly using 'value'

Redfish Release 2019.1

- ## Redfish Specification v1.7.0
  - Significant clean-up of document for clarity
  - Improved account password management
  - Clarification of array property handling
- ## Redfish Schema Bundle 2019.1
  - Bundle contains all released Redfish schemas
- ## Redfish Host Interface v1.1.0
  - Numerous clarifications to SMBIOS table data
  - Added v2 of USB and PCIe device descriptors
- ## Redfish Message Registry Bundle 2019.1
  - Bundle contains all released Redfish message registries
- ## 19 Updated Schemas (highlights)
  - Certificate v1.1 – Added *Renew* and *Rekey* Actions
  - ManagerAccount v1.3 – Added *PasswordChangeRequired*
  - *Event* related schemas – Completed transition to new Event Subscription methods
- ## Download all published material at: http://www.dmtf.org/standards/redfish

Redfish Specification v1.7.0

- Document renamed simply "Redfish Specification"
- **NEW**: Added Redfish Dictionary (RDE) file naming rules and repository
- **NEW**: Added Password Management clause to describe functional behavior when an account requires a password change
- **NEW**: Enhanced schema localization definitions and repository location
- Significant re-formatting and clean-up throughout document
  - Unless specifically mentioned, any change in normative language was unintentional and should be considered errata (please provide feedback)
- Protocol details now three separate clauses
  - General protocol description, Service requests, and Service responses
- Data model clause now separate from schema definition
- New clauses for each of the supported schema definition languages
  - OData CSDL, JSON schema and OpenAPI YAML

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Redfish Specification v1.7.0, continued

- Normative clarifications (highlights)
  - Handling of array properties and PATCH operations on arrays
  - Clarified schema versioning methodology
  - Added missing statements regarding SSE in Event mechanism clause
  - Clarified that Event Subscriptions are persistent across service restarts
  - Clarified Task operations involving *@Redfish.OperationApplyTime* and *@Redfish.MaintenanceWindow* annotations
- See change log in document for complete list of clarifications

Redfish Schema Minor Revisions (1 of 4)

- AccountService v1.5.0
  - Added *AccountLockoutResetAfterEnabled* property
  - Deprecated *AccountProviderType* property in *LDAP* and *ActiveDirectory*
- Certificate v1.1.0
  - Added *Renew* and *Rekey* actions
- ComputerSystem v1.7.0
  - Added *Certificates* link property to *Boot*
  - Added *Metrics* link property to *ProcessorSummary*
- Drive v1.6.0
  - Added *PCIeFunctions* to *Links*
- EthernetInterface v1.5.0
  - Added *FallbackAddress* property to *DHCPv4*

Redfish Schema Minor Revisions (2 of 4)

- Event Mechanism Updates
  - Finished transition to v2018.3 event subscription methods (deprecating EventType throughout schema)
- Event v1.4.0
  - Added *Other* to the *EventType* enumeration (transition to new methods)
- EventDestination v1.5.0
  - Deprecated *EventTypes* property (no longer a required property)
- EventService v1.3.0
  - Deprecated *EventType* related properties throughout
  - Added *EventGroupId* parameter to *SubmitTestEvent*
- ManagerAccount v1.3.0
  - Added *PasswordChangeRequired* property

Redfish Schema Minor Revisions (3 of 4)

- MessageRegistry v1.3.0

  - Added *LongDescription*, *ArgDescriptions* and *ArgLongDescriptions* *properties*

- MetricReportDefinition v1.2.0

  - Added *MetricReportDefinitionEnabled*, *SuppressRepeatedMetricValue*, and *MetricReportHeartbeatInterval* properties

  - Added *Triggers* to *Links*

- PCIeSlots v1.1.0

  - Added *HotPluggable* property

- PhysicalContext (unversioned)

  - Added *PowerSubsystem* and *Rectifier PhysicalContext* types.

- Processor v1.5.0

  - Added *TotalEnabledCores* property

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Redfish Schema Minor Revisions (4 of 4)

- Session v1.2.0
  - Added *SessionType* and *OEMSessionType* properties
- Storage v1.7.0
  - Added *Ports* and *ControllerRates* to *StorageControllers*
  - Added *PCIeFunctions* to *Links*
- Triggers v1.1.0
  - Added *EventTriggers* property
  - Added *MetricReportDefinitions* to *Links*
  - Added *RedfishMetricReport* to *TriggerActionEnum*
- UpdateService v1.5.0
  - Added *MaxImageSizeBytes* property
- Zone v1.3.0
  - Added *ExternalAccessibility* property

Errata Schema Revisions (1 of 2)

- Complete errata details shown in the Change Log within DSP8010

- All schemas

  - JSON schemas revised to use "uri-reference" instead of "uri" as the format for properties that represent URIs.

  - Corrected several properties that allowed for "null" that were not intended

  - Various typographical corrections and improvements to descriptions

- Event v1.x.x

  - Removed @*odata.id* and @*odata.etag* properties from JSON schemas

- EventDestination v1.x.x

  - Modified rules around usage of *HttpHeaders* in a GET response to allow for an empty array

Errata Schema Revisions (2 of 2)

- ## Resource v1.x.x

  - Corrected regex pattern for properties inside of *Oem* to match requirements in the specification

- ## Sensor v1.0.1

  - Corrected descriptions and units definition for Energy reading types of "kWh" and corrected UCUM unit definition to use "kW.h"

- ## UpdateService v1.x.x

  - Clarified *HttpPushUri* to indicate a recommendation of using HTTP status 411 when the request does not include the "Content-Length" header

Host Interface and Message Registry updates

- Redfish Host Interface v1.1.0 (DSP0270)
  - Added version 2 of the USB and PCI/PCI-e device descriptors
    - Superset of information provided in v1 of the descriptor
    - Adds MAC Address to descriptor
    - Added bus/device/function information for PCI devices
  - Clarified byte ordering in SMBIOS structures
  - Clarified formats of Host Name and UUID
  - Clarified data and reformatted tables in Device Descriptor Table clause
  - Added Descriptor Table examples

- Redfish Message Registries v2019.1
  - **DSP8011_2019.1.ZIP** – contains all published message registries
  - Added *SubscriptionTerminated* and *PasswordChangeRequired* messages to Base v1.5.0

Redfish Release 2018.3

DMTF Redfish Forum

August 2018

Redfish Release 2018.3

- Redfish Specification v1.6.1
  - Errata release with numerous clarifications
- Redfish Schema Bundle 2018.3
  - **DSP8010_2018.3.ZIP**
  - Bundle contains all released Redfish schemas
- Redfish Registries 2018.2
  - Errata release of 'Task', 'Resource' registries
- Redfish Interoperability Profiles 2018.2
  - Errata releases of RedishInteroperabilityProfile schema
- **10 NEW** Schemas v1.0.0
  - AccelerationFunction, ProcessorMetrics, Sensor, RedfishError
  - Certificate, CertificateLocations, CertificateService (plus 3 Resource Collections)
- 20 Updated Schemas (highlights)
  - AccountService, ExternalAccountProvider, ManagerAccount – Added support for Certificates
  - ComputerSystem v1.6.0 – Added *AliasBootOrder* to allow for more usable Boot Order selection
  - Memory v1.7.0 – Replaced *SecurityStates* property with more usable properties
  - UpdateService v1.4.0 – Added *Username* and *Password* parameters to *SimpleUpdate*
  - Storage v1.6.0 – Added *SupportedRAIDTypes* to *StorageControllers*
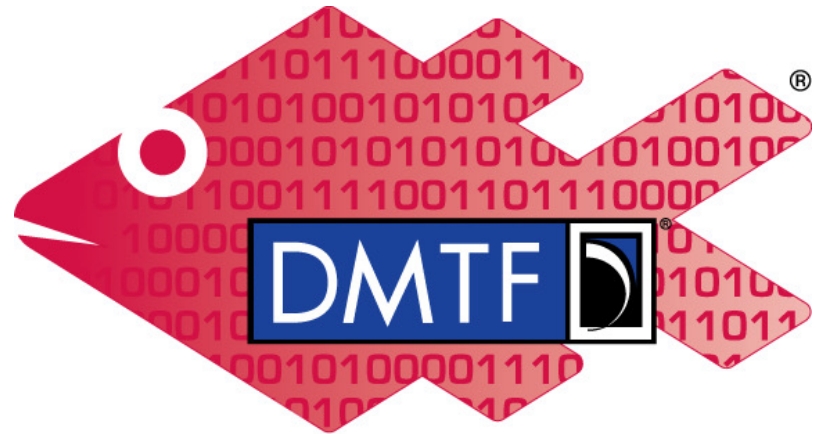
NEW Redfish Schemas for 2018.3

- CertificateService – Managing Security Certificates
  - CertificateService – Properties and Actions to manage security certificates
  - CertificateLocations – Location of all certificates within the resource tree
  - Certificate – Description of each security certificate
- Sensor
  - Core resource for defining a "sensor" in the Redfish data model
  - Expected usage throughout future DCIM and IoT resources
- AccelerationFunction – FPGAs and Programmable silicon
  - AccelerationFunction – Describes acceleration functions within a processor
  - ProcessorMetrics – Performance metrics (CPU, GPU, FPGA)
- Three Resource Collection schemas to support all the above
- RedfishError
  - Supporting schema definition useful for validating error response payloads

Certificate Management

- **NEW** Frequently-requested desire to manage certificates via the Redfish interface in an interoperable fashion
- **NEW** *CertificateService* resource off the Service Root
  - Contains service level Actions
    - GenerateCSR: Manage certificate signing requests from a user
    - ReplaceCertificate: Provide an atomic approach for deleting and adding a certificate
- **NEW** *CertificateCollection*
  - Perform standard Create and Delete operations for managing certificates
  - Collections added to resources that can have certificates installed to it
    - The location of the collection will inform the client about the relationship between the certificate and other resources in the data model
    - Able to control access to different certificate collections; some examples:
      - ConfigureSelf: Able to manage the certificates related to your account
      - ConfigureManager: Able to manage the certificates within the *Manager* tree
      - ConfigureComponents: Able to manage the certificates within the *ComputerSystem* tree
- **NEW** *CertificateLocations* resource contains links to all the certificates so administrators and auditors can easily obtain a complete set

Sensor

- **NEW** Sensor and SensorCollection is an architectural foundation for future Redfish resource definitions
    - Expect datacenter environmental equipment (e.g. power and HVAC) and IoT devices to take advantage of this model
- A Redfish Sensor is a monitoring device which produces a single reading
    - May include other related, time-coherent readings (e.g. Power, ReactiveVAR, etc.)
    - Reports physical context and other identification properties to describe its purpose
    - Metadata describing accuracy, sampling frequency, etc.
- Sensor resource includes:
    - *ReadingType* – The sensor type (temperature, voltage, etc.)
    - *Reading* – Value of the sensor (no Units in name to allow for generic software use)
    - *ReadingUnits* – Applies to all values in sensor (thresholds, reading)
        - Units shall be explicitly defined for each ReadingType to avoid mis-identification
        - Large-scale difference in magnitude handled by separate ReadingTypes (e.g. mW, kW)
    - *Thresholds* – Structured set of thresholds with a common definition
        - Severity, hysteresis, etc.

Redfish Schema Minor Revisions (1 of 5)

- ## AccountService v1.4.0

  - Added *Certificates* property to *LDAP* and *ActiveDirectory* objects

- ## AttributeRegistry v1.3.0

  - Added *Oem* property to *Attributes* and *Menus*.

  - Added *Hidden* property to *Menus*

- ## Chassis v1.9.0

  - Added *Sensors* and *EnvironmentalClass* properties

- ## ComputerSystem v1.6.0

  - Added *AliasBootOrder*, *BootOrderPropertySelection*, and *PowerRestorePolicy* properties

  - Added *AddResourceBlock* and *RemoveResourceBlock* actions

- ## Endpoint v1.3.0

  - Added *AccelerationFunction* to the *EntityType* enumeration

Redfish Schema Minor Revisions (2 of 5)

- Endpoint v1.2.0

  - Added *AccelerationFunction* to the *EntityType* enumeration

- ExternalAccountProvider v1.1.0

  - Added *Certificates* property

- ManagerAccount v1.2.0

  - Added *Certificates* property

- Memory v1.7.0

  - Added "Intel3DXPoint" to the *MemoryMedia* enumeration

  - Added "HBM" and "HBM2" to the *MemoryDeviceType* enumeration

  - Added "Die" to the *BaseModuleType* enumeration

  - Deprecated "Unlocked" and "Frozen" enumerations in *SecurityStates*, as well as the *SecurityStates* property in favor of the new *SecurityState*, *ConfigurationLocked*, *ConfigurationLockCapable*, *DataLockCapable*, and *PassphraseLockLimit* properties

Redfish Schema Minor Revisions (3 of 5)

- ## MetricReport v1.1.0

  - Added *Timestamp* property for the overall MetricReport.

- ## MetricReportDefinition v1.1.0

  - Deprecated *Keys* property within *Wildcards* in favor of *Values* property to align with other schemas

- ## PhysicalContext (unversioned)

  - Added "CPUSubsystem", "GPUSubsystem", "FPGA", "Accelerator", "MemorySubsystem", "CoolingSubsystem", "Motor", "Transformer", "ACUtilityInput", "ACStaticBypassInput", "ACMaintenanceBypassInput", "DCBus", "ACOutput", and "ACInput" enumerations to *PhysicalContext* types.

  - Added *PhysicalSubContext* property to allow for further differentiation within a particular context

  - Updated "Intake" and "Exhaust" descriptions to allow for calculated values over a region

Redfish Schema Minor Revisions (4 of 5)

- Processor v1.4.0
  - Added *TDPWatts*, *MaxTDPWatts*, *AccelerationFunctions*, and *Metrics*
  - Added various properties to support reporting and management of FPGAs
  - Added "Power" to *ProcessorArchitecture* enumerations
  - Added "PowerISA" to *InstructionSet* enumerations

- ResourceBlock v1.3.0
  - Added *ResourceBlockLimits* term
  - Added *Drives* property

- ServiceRoot v1.5.0
  - Added *Vendor*, *ResourceBlocks*, and *CertificateService* properties

- Storage v1.6.0
  - Added *SupportedRAIDTypes* to *StorageControllers*

Redfish Schema Minor Revisions (5 of 5)

- ## Task v1.4.0

  - Added *PercentComplete* property

- ## TelemetryService v1.1.0

  - Deprecated *MetricReportValues* parameter in *SubmitTestMetricReport* action in favor of the *GeneratedMetricReportValues* parameter in order to match the *MetricValues* definition of a MetricReport

- ## UpdateService v1.4.0

  - Added *Username* and *Password* parameters to *SimpleUpdate*

  - Added *HttpPushUriOptions* and *HttpPushUriOptionsBusy* properties

- ## VirtualMedia v1.3.0

  - Added *UserName*, *Password*, *TransferProtocolType*, and *TransferMethod* properties

  - Added *UserName*, *Password*, *TransferProtocolType*, and *TransferMethod* parameters to *InsertMedia* action

Errata Schema Revisions (1 of 2)

- **All schemas**
  - Added *Revisions* annotation to describe additions, changes, and deprecations to allow each schema file to contain a free-standing history
  - Added *Release* annotation to enable documentation generator to include Redfish release bundle information
  - Various typographical corrections and improvements to descriptions
- **Complete errata details shown in the Change Log within DSP8010**
- **AttributeRegistry v1.x.x**
  - Clarified the description for *ValueName*. Added missing Required terms for *AttributeName* and *ValueName*
- **Drive v1.x.x**
  - Modified references to *Volume* to point to the Swordfish definition
- **JsonSchemaFile v1.x.x**
  - Removed strict normative wording about the format of the schema file name in favor of pointing to the specification for the acceptable format

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Errata Schema Revisions (2 of 2)

- ## Redundancy v1.x.x
  - Removed "Required" term on *MaxNumSupported*

- ## ServiceRoot v1.x.x
  - Allow *Product* property to be null

- ## Storage v1.x.x
  - Modified references to Volume to point to the Swordfish definition

- ## Triggers v1.0.1
  - Fixed description for the *RedfishEvent* enumeration

- ## UpdateService v1.x.x
  - Clarified *HttpPushUri* to indicate a client requires the same privileges as if performing operations on the UpdateService

Redfish Registries

- Released as **DSP8011_2018.2.ZIP**
- ResourceEvent Message Registry v1.0.1
  - Corrected @*odata.type* and *Id* property formats
  - Corrected invalid *ParamType* of "value" to use "number" or "string" as appropriate
- TaskEvent Message Registry v1.0.1
  - Corrected @*odata.type* and *Id* property formats.
  - Fixed spelling of the *TaskProgressChanged* event
  - Corrected invalid *ParamType* of "value" to use "number" or "string" as appropriate

Redfish Interoperability Profiles

- Released as **DSP8013_2018.2.ZIP**

- RedfishInteroperabilityProfile v1.0.3
  - Errata release. Corrected the type for *CompareType* to allow for booleans, numbers, and strings

- RedfishInteroperabilityProfile v1.0.2
  - Errata release. Corrected the depth of *additionalProperties* found in *Parameters* for *ActionProfile*

Redfish Release 2018.2

DMTF Redfish Forum

August 2018
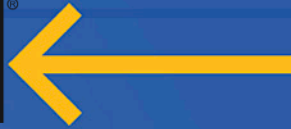
Redfish Release 2018.2

- Redfish Specification v1.6.0
  - NEW OpenAPI v3.0 Support
  - NEW Telemetry Streaming & Eventing
  - Improved Event Subscription methods
- Redfish Specification v1.5.1
  - Errata release with numerous clarifications
- Redfish Schema Bundle 2018.2
  - **DSP8010_2018.2.ZIP** - contains all Redfish schemas
- Redfish Registries 2018.1
  - NEW 'Task', 'Resource' registries
  - Updated 'Base', 'Privilege' registries
- **13 NEW** Schemas v1.0.0
  - TelemetryService, MetricDefinition, MetricReportDefinition, MetricReport, Triggers
  - JobService, Job, PCIeSlots, (plus 5 Resource Collections)
- 29 Updated Schemas (highlights)
  - Schedule v1.2.0 – Contribution from SNIA.org with minor additions
  - EventDestination v1.4.0, Event v1.3.0, MessageRegistry v1.2.0 – Improved subscriptions
  - Resource v1.7.0 – Added 'ContactInfo' array to commonly-used Location object

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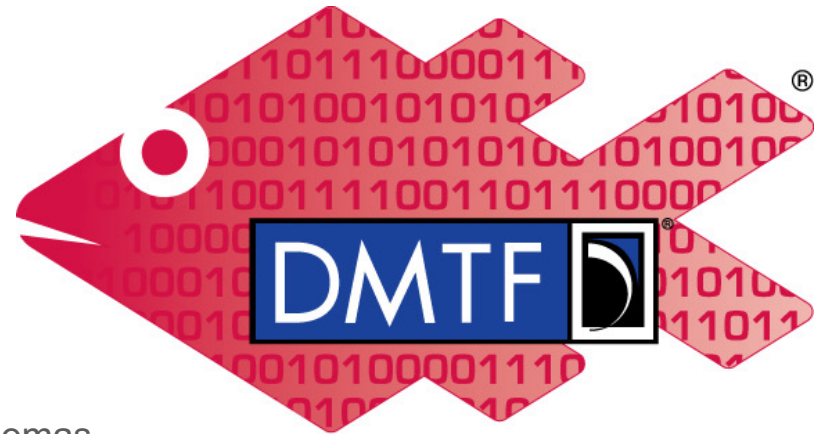
Redfish for OpenAPI™ Specification v3.0

- OpenAPI Specification
  - A community-driven open specification from the OpenAPI Initiative (OAI), The Linux Foundation® Collaborative Project
  - Describes API services in a YAML-format definition document
  - Rich ecosystem of tools for developers and end users
- Supported by Redfish Specification v1.6.0
  - Added support for OpenAPI schema files (YAML)
  - Requires use of standardized URIs
    - Fixed URIs for all Redfish resources
    - Construct path to Collection member using "Id"
- Redfish Schema (DSP8010) bundle 2018.2
  - Now includes OpenAPI YAML files
  - Along with JSON Schema and CSDL files

Redfish Specification v1.6.0

- Fixed or constructed URIs now specified
    - Required for OpenAPI v3.0 support
    - Previous Redfish versions allowed "hypermedia" URI structure, with each URI discovered via links in parent resources
    - Resource Collection members must use "Id" property as URI segment
    - All non-Collection resources must use URIs defined by schema
- Use *RedfishVersion* in *ServiceRoot* to check protocol version
    - Values of "1.6.0" or higher support OpenAPI and fixed URI definitions
    - For values below "1.6.0", URI tree structure is not specified, clients continue to discover path from ServiceRoot
    - Examples:
        - "1.6.0", "1.6.1", "1.7.5", "1.10.2" : supports OpenAPI
        - "1.5.1" : does not support OpenAPI – URI structure cannot be guaranteed

Redfish Message and Event Enhancements

- More flexible subscription modes
  - Subscribe to specific Registries or Resource Types instead of loosely defined classes
  - Added *SubordinateResources* which can be used in conjunction with *ResourceOrigin*
- Grouping **NEW**
  - *EventGroupId* property indicates that multiple messages share a root cause
- Telemetry support **NEW**
  - *EventFormatType* allows event delivery in either *Event* or *MetricReport* format
- SSE filtering **NEW**
  - Added support of $filter for SSE event subscriptions
- New Message Registries
  - Added *Task* and *Resource* Message Registries
  - Expect more in the future that are more device/service specific.
- New Registry properties
  - Added ClearingLogic allowing a message to indicate that it resolves a previous situation
- OEM Registries
  - Clarified rules allowing OEMs to extend messages in the standard registries

Redfish Registries

- Released as **DSP8011_2018.1.ZIP**
- ResourceEvent Message Registry **NEW**
  - Defines messages for Resource-related events
- TaskEvent Message Registry **NEW**
  - Defines messages to use for Task-related events
- Base Message Registry v1.4.0
  - Added *NoOperation* message
- Base Message Registry v1.3.1
  - Errata release. Clarified description and message text for *GeneralError*
- Redfish Privilege Registry v1.0.3
  - Errata release correcting plurality of *ConfigureComponents* and correcting the JSON structure throughout
- Base Message Registry v1.3.0
  - Added *PropertyValueOutOfRange* and *SessionTerminated* messages
  - Previously approved for release but not posted publicly

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NEW Redfish Schemas for 2018.2

- TelemetryService – Monitoring and reporting for Redfish
  - MetricDefinition – Defines a measurement point and its metadata
  - MetricReport – Output of the Telemetry Service
  - MetricReportDefinition – Defines the contents of a Report
  - Triggers – Methods for triggering output from the Telemetry Service
- JobService – Scheduled and complex tasks for Redfish
  - Job – Describes a single Job with scheduling and JSON payload
- PCIeSlots
  - Physical PCIe slot information for each Chassis
- Five Resource Collection schemas to support Telemetry and Jobs
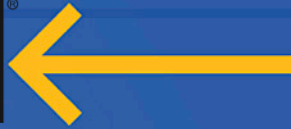
Redfish Schema Minor Revisions (1 of 6)

- ## ActionInfo v1.1.0
  - Added *MinimumValue* and *MaximumValue* properties

- ## Assembly v1.2.0
  - Added *SerialNumber* and *PhysicalContext* to *AssemblyData*

- ## Chassis v1.8.0
  - Added *PCIeSlots* resource link

- ## CollectionCapabilities v1.1.0
  - Added *ComputerSystemContrainedComposition* enumeration

- ## CompositionService v1.1.0
  - Added *AllowOverprovisioning* and *AllowZoneAffinity* properties

- ## Drive v1.5.0
  - Added *HotspareReplacementMode* property

Redfish Schema Minor Revisions (2 of 6)

- ## Endpoint v1.2.0
  - Deprecated *PciFunctionNumber* and *PciClassCode* in favor of *FunctionNumber* and *ClassCode* inside *PciId*

- ## Event v1.3.0
  - Deprecated EventType in favor of new subscription properties
  - Added EventGroupId to EventRecord

- ## EventDestination v1.4.0
  - Added *RegistryPrefixes*, *ResourceTypes*, *SubordinateResources* and *EventFormatType* properties

- ## EventService v1.2.0
  - Added *RegistryPrefixes*, *ResourceTypes*, *SubordinateResourcesSupported* and *EventFormatType* properties
  - Added SSEFilterPropertiesSupported object

Redfish Schema Minor Revisions (3 of 6)

- ## HostInterface v1.2.0
  - Added *AuthNoneRoleId* and *AuthNoneRole* properties
- ## LogEntry v1.4.0
  - Deprecated *EventType*, added *EventGroupId* properties
- ## Manager v1.5.0
  - Added *RemoteRedfishServiceUri* property
  - Added *RemoteAccountService* resource link
- ## ManagerNetworkProtocol v1.3.0
  - Added *DHCPv6*, *DRP* and *RFB* objects
- ## Memory v1.6.0
  - Added *OverwriteUnit* Action
  - Added *IntelOptane* to the *MemoryType* enumerations

Redfish Schema Minor Revisions (4 of 6)

- MessageRegistry v1.2.0
  - Added *ClearingLogic* property
- NetworkAdapter v1.2.0
  - Added *PCIeInterface* object, *NPAR* property to control NIC partitioning
- NetworkDeviceFunction v1.3.0
  - Added *VLAN* and *VLANs* properties to *Ethernet* object
  - Added *FibreChannelId* to *FibreChannel* object.
  - Deprecated *PhysicalPortAssignment* at root in favor of property within *Links*
- NetworkPort v1.2.0
  - Added properties to support Fibre Channel devices
  - Deprecated *LinkSpeedMbps* in favor of *CapableLinkSpeedMbps*
- PCIeDevice v1.3.0
  - Added *PCIeInterface* object and definition for external referencing

- ## Protocol (unversioned)
  - Added *I2C* protocol type

- ## Resource v1.7.0
  - Deprecated *Location* string within *PostalAddress* in favor of *AdditionalInfo*
  - Added *AdditionalInfo* in *Placement*
  - Added *Contacts* object array in *Location*

- ## ResourceBlock v1.2.0
  - Added *Expansion* to *ResourceBlockType* enumerations
  - Added *Unavailable* to *CompositionState* enumerations

- ## Schedule v1.2.0
  - Transitioned from SNIA to DMTF ownership
  - Added enumeration *Every* to *DayOfWeek* and *MonthOfYear*
  - Updated several properties to use Duration and DateTimeOffset types

Redfish Schema Minor Revisions (6 of 6)

- ServiceRoot v1.4.0
  - Added *ExcerptQuery* and *OnlyMemberQuery* to *ProtocolFeaturesSupported*
  - Added *JobService* and *TelemetryService* resource links

- Storage v1.5.0
  - Added *CacheSummary* and *PCIeInterface* objects to *StorageController*

- Task v1.3.0
  - Added Payload object and *HidePayload* property

- Thermal v1.5.0
  - Added *SensorNumber* to *Fan* object

- UpdateService v1.3.0
  - Deprecated *NSF* enumeration in *TransferProtocolType* in favor of *NFS*

Errata Schema Revisions (1 of 2)

- ## All schemas
  - Numerous clarification in *Descriptions* and *LongDescriptions*
  - Corrected some cases in JSON Schema where the type *integer* should have been used instead of *number*
  - Added *@odata.id*, *@odata.type*, and *@odata.context* as required properties in JSON Schema.
  - Added *Description* and *LongDescription* terms to all schema elements where missing.
  - Added *Capabilities* and *Uris* annotations on all resources.
- ## Resource Collection schemas
  - Added missing *Required* annotation on *Members* properties
  - Added missing *Members@odata.nextLink* property
- ## Complete errata details shown in the Change Log within DSP8010

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Errata Schema Revisions (2 of 2)

- ## Assembly v1.x.x
  - Added guidance for reporting timestamps for ProductionDate

- ## AttributeRegistry v1.x.x
  - Relaxed regex patterns for *ValueName*, *MenuName*, and *MenuPath*

- ## EthernetInterface v1.0.7
  - Fixed type definition of *IPv6StaticDefaultGateways* to not require *PrefixLength*

- ## EventService v1.x.x
  - Added clarification to *OriginOfCondition* parameter for *SubmitTestEvent* to highlight that it's a string and not a reference object

- ## Resource v1.6.1
  - Fixed permissions of *Longitude*, *Latitude*, and *AltitudeMeters* properties

- ## SoftwareInventory v1.x.x
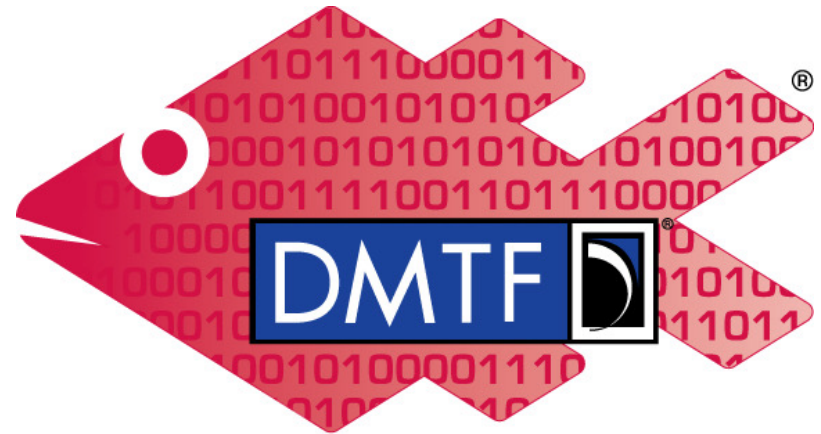 - Added guidance for reporting timestamps for ReleaseDate

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Redfish Release 2018.1

- Redfish Specification v1.5.0
  - NEW Server-sent Eventing (SSE) Support
  - OperationApplyTime annotation
    - Behavior of Create, Delete or Action (POST) operations
- Redfish Specification v1.4.1
  - Errata release with numerous clarifications
- Redfish Schema Bundle 2018.1
  - **DSP8010_2018.1.ZIP** - contains current versions
- **NEW** Schemas v1.0.0
  - ExternalAccountProvider – LDAP / ActiveDirectory support
- Updated schemas (highlights)
  - AccountService – LDAP / ActiveDirectory support for Redfish
  - EventService & EventDestination – Server-sent Eventing support
  - Processor – Added "SubProcessor" information for Cores and Threads
  - Settings – Added "OperationApplyTime" and "MaintenanceWindow" support

Redfish Specification v1.5.0 and v1.4.1

- Minor release of the Redfish Specification (DSP0266) v1.5.0
    - Adds support for Server Sent-Eventing (SSE)
        - Enables streaming events to web-based GUIs and other clients
    - OperationApplyTime annotation
        - Provides mechanism for specifying deterministic behavior for the application of Create, Delete or Action (POST) operations
    - Includes all errata from v1.4.1

- Errata release of the Specification (DSP0266) v1.4.1
    - Numerous clarifications and corrections, detailed in the Change Log

New Redfish Schemas for 2018.1

- ExternalAccountProvider v1.0.0
    - Single LDAP or ActiveDirectory instances are supported within updated AccountService resource
    - A Collection of "ExternalAccountProviders" describes additional providers, or allows for multiple LDAP/AD trees if Service supports their usage
        - Uses same properties and definitions as the single-instance LDAP and ActiveDirectory objects within AccountSerivce

Redfish Schema Minor Revisions (1 of 3)

- AccountService v1.3.0
  - Added support for LDAP and Active Directory external account providers.
    - Provide configuration parameters to enable Redfish Services to utilize network-based authentication instead of requiring individual (local) accounts
    - Removes need to maintain separate credentials for each Redfish Service
  - Added link to additional *ExternalAccountProviders*
- Assembly v1.1.0
  - Added *Status* to *AssemblyData*
- AttributeRegistry v1.2.0
  - Added *ResetRequired*, *UefiDevicePath*, *UefiKeywordName*, and *UefiNamespaceId* attributes to registry entries.
- Chassis v1.7.0
  - Added *UUID* property
  - Added *Switches* resource link

Redfish Schema Minor Revisions (2 of 3)

- Drive v1.4.0
  - Deprecated *Location* array in favor of singular *PhysicalLocation*
- EventDestination v1.3.0
  - Added *SubscriptionType* to allow for Server-Sent Eventing support
- EventService v1.1.0
  - Added *ServerSentEventUri* to support Server-Sent Eventing (SSE)
- Manager v1.4.0
  - Added *AutoDSTEnabled* property
  - Added *Switches* resource link
- Memory v1.5.0
  - Deprecated poorly-named *PassphraseState* in *Regions* object and added *PassphraseEnabled* to replace it.

Redfish Schema Minor Revisions (3 of 3)

- ## PCIeFunction v1.2.0
  - Added *NetworkDeviceFunction* resource link

- ## Processor v1.4.0
  - Added *SubProcessors* collection to provide details on 'cores' and 'threads'
  - Added 'Core' and 'Thread' to *ProcessorType*

- ## ResourceBlock v1.1.0
  - Added properties to support sharing capabilities

- ## Settings v1.2.0
  - Added *OperationApplyTimeSupport* and *MaintenanceWindow* objects to provide deterministic behavior for the application of Settings-based data

- ## SoftwareInventory v1.2.0
  - Added *Manufacturer* and *ReleaseDate* properties

- ## Task v1.2.0
  - Added *TaskMonitor* property

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Errata Schema Revisions

- Description clarifications in numerous schemas

- AttributeRegistry v1.x.x

  - Corrected *regex patterns for various properties*

- EventService v1.0.7

  - Fixed permissions on *DeliveryRetryAttempts* and *DeliveryRetryIntervalSeconds* properties.

- ManagerAccount v1.x.x

  - Clarified the *RoleId* property description by stating its relation to *RoleId* in the Role resource.

- UpdateService v1.x.x

  - Regenerated JSON schema to pick up action parameters added in previous release

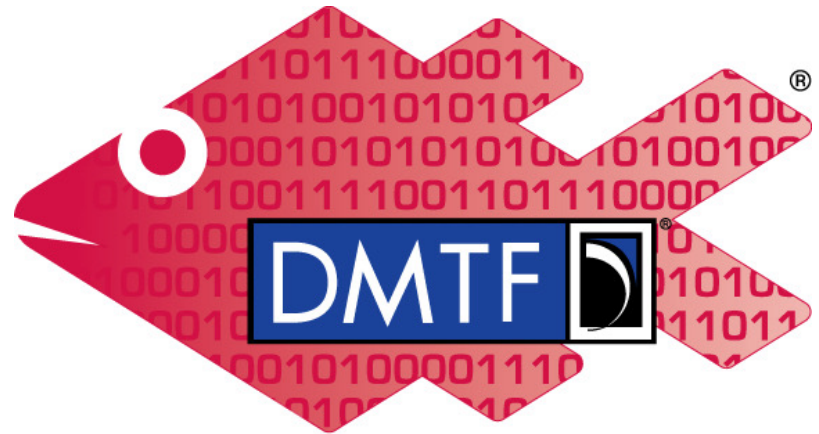- Complete errata details shown in the Change Log within DSP8010

Redfish Release 2017.3

- Redfish Specification v1.4.0
  - NEW query parameters: $expand, $filter, $select
  - Clarified usage of HTTP response codes
  - Clarified HTTP header usage and requirements
  - Numerous other clarifications
- **NEW** Redfish Interoperability Profiles
  - New specification DSP0272 v1.0.0
  - New profile bundle DSP8013 v2017.1
  - Allows creation of property-level support checklist
- Redfish Schema Bundle 2017.3
  - **DSP8010_2017.3.ZIP** - contains current versions of all Redfish schema
- **NEW** Schemas v1.0.0
  - Assembly (manufacturing details), Boot Option (configure boot order)
- Updated schemas
  - Added multiple objects to EthernetInterface allowing complete DHCP configuration
  - Added properties to Power and Thermal to address feedback from ASHRAE and TGG
  - Numerous minor additions, errata and description clarifications throughout the schema

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Redfish Specification v1.4.0

- Minor release of the Specification (DSP0266)

  - Numerous clarifications and corrections, detailed in the Change Log

- Adds support for query parameters on GET requests

  - $expand – Includes data from subordinate resources (especially collections) to allow highly-efficient data retrieval

  - $select – Include only specified properties

  - $filter – Include only members of a collection that match an expression

- Clarifications to HTTP header requirements and Status Code usage

  - Clarified HTTP status and payload responses after successful processing of data modification (POST, PATCH or PUT) requests

  - Added HTTP status code entries for 428 and 507 to clarify the proper response to certain error conditions

  - Detailed client's and service's HTTP header requirements and usage

Redfish Interoperability Profile Specification v1.0.0

- An "Interoperability Profile" provides a common ground for Service implementers, client software developers, and users
  - A profile applies to a particular category or class of product (e.g. "Front-end web server", "NAS", "Enterprise-class database server")
  - It specifies Redfish implementation requirements, but *is not* intended to mandate underlying hardware/software features of a product
  - Provides a target for implementers to meet customer requirements and a baseline of schema and property-level support for software developers utilizing Redfish
  - Enable customers to easily specify Redfish functionality / conformance in RFQs
- Specification (DSP0272) defines a machine-readable Profile definition
  - JSON document designed to be human-readable and easy to create
- Profiles will be created by DMTF, partner organizations, and others
  - DMTF will provide re-publication via the Redfish Developer Hub
  - Published profiles will be included in a bundle for download (DSP8013)
- DMTF open source utility available to test conformance to a Profile
  - https://github.com/DMTF/Redfish-Interop-Validator

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New Redfish Schemas

- BootOption v1.0.0
  - Describes a single, bootable target device for a Computer System
  - The BootOption Collection allows for configuration of boot order
  - Does <u>not</u> replace the temporary *BootSourceOverride* function
    - Boot Option describes the permanent boot order
    - Override is used for temporary (usually one-time) changes to the boot order

- Assembly v1.0.0
  - Describes manufacturing data useful for service personnel
  - Data usually stored in EEPROMs and heavily binary-encoded
  - Does <u>not</u> replace product identification properties (part #, serial #, etc.)
  - Single resource allows for multiple assembly descriptions
  - Adds mechanism to extract a binary image for service/support analysis

- Protocol
  - Supporting schema file to contain the common *Protocol* property

Redfish Schema Minor Revisions (1 of 6)

- ## Chassis v1.6.0
  - Added *Assembly* resource link
  - Added *StorageEnclosure* enumeration to *ChassisType*
- ## ComputerSystem v1.5.0
  - Added *BootOrder* and *Assembly* resource links
  - New *SetDefaultBootOrder* Action
  - Added links to *ConsumingComputerSystems* and *SupplyingComputerSystems* for describing aggregated systems
  - Added *SubModel* to describe product model variations
  - Added *LogicalProcessorCount* to *ProcessorSummary*
- ## Drive v1.3.0
  - Added *Assembly* resource link
- ## Endpoint v1.1.0
  - Added *IPTransportDetails* object

Redfish Schema Minor Revisions (2 of 6)

- EthernetInterface v1.4.0
  - New objects to allow for full configuration of DHCP and SLAAC support
    - Configuration objects to support both *DHCPv4* and *DHCPv6* added
    - Separate *StatelessAddressAutoConfig* object added
  - New objects create a consistent configuration pattern
    - Separate objects or properties for the desired configuration vs. actual "in use"
    - New *IPv4StaticAddresses* allows for Static IP address configuration regardless of DHCP configuration or usage
    - New *IPv6StaticDefaultGateways* and *StaticNameServers* arrays

- LogEntry v1.3.0
  - Added *OemLogEntryCode* and *OemSensorType* properties to allow for legacy IPMI OEM definitions

- LogService v1.1.0
  - Added *LogEntryType* to describe the content type of a log

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Redfish Schema Minor Revisions (3 of 6)

- Memory v1.4.0
  - Added *VolatileSizeMib*, *NonVolatileSizeMiB*, *CacheSizeMiB*, *LogicalSizeMiB* properties to provide discrete memory size for each type
  - Added *Location* object
- MemoryChunks v1.2.0
  - Added *Status* object
- NetworkAdapter v1.1.0
  - Added *Assembly* resource link
  - Added *Location* object to *Controllers* object
- NetworkDeviceFunction v1.2.0
  - Added *Endpoints* resource link
- PCIeDevice v1.2.0
  - Added *Assembly* resource link

Redfish Schema Minor Revisions (4 of 6)

- PhysicalContext v1.3.0
  - Added additional enumerations to *PhysicalContext*
- Port v1.1.0
  - Added *Location* object
- Power v1.5.0
  - Several additions to *PowerSupplies* object array
    - Based on feedback from **ASHRAE** and **The Green Grid** industry groups
    - *PowerInputWatts*, *PowerOutputWatts*, and *EffciencyPercent* properties
    - *Assembly* resource link
    - *Location* object
- Processor v1.2.0
  - Added *Assembly* resource link
- Redundancy v1.3.0
  - Added *NotRedundant* enumeration to *Mode* (now a read-write property)

- ## Resource v1.6.0
  - Added *Latitude, Longitude* and *AltitudeMeters* to *Location* object

- ## ServiceRoot v1.3.0
  - Added *Product* property for general product identification
  - Added ProtocolFeaturesSupported object to allow for discovery of supported optional Redfish protocol features

- ## Storage v1.4.0
  - Added *Assembly* resource link

- ## Switch v1.1.0
  - Added *Location* object

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Redfish Schema Minor Revisions (6 of 6)

- ## Thermal v1.4.0
  - Added *Assembly* resource link to *Fan* object
  - Several additions to *Temperatures* object array
    - Based on feedback from **ASHRAE** and **The Green Grid** industry groups
    - *DeltaReadingCelsius* and *DeltaPhysicalContext* for describing a temperature change rather than an absolute temperature reading
    - *MaxAllowableOperatingValue, MinAllowableOperatingValue, AdjustedMaxAllowableOperatingValue, and AdjustedMinAllowableOperatingValue* for reporting the range of allowable operating temperatures for a given piece of equipment

- ## VirtualMedia v1.2.0
  - New *InsertMedia and EjectMedia* Actions to control virtual media usage
  - *Image, Inserted* and *WriteProtected* are now read-write properties

- ## Zone v1.2.0
  - Added *Identifiers* property

Errata Schema Revisions

- Added or corrected parameter descriptions in Action definitions throughout the schema

- Action Parameters are now described in JSON schema

- Changed internal schema location several properties to allow those commonly-defined properties to be referenced externally

- IPAddresses v1.0.6

  - Corrected *PrefixLength* in *IPv6StaticAddresses* to be a read-write property

- Memory v1.x.x

  - Corrected description of *OperatingSpeedMHz* to reflect changes in memory device reporting (value may be in MHz or MT/s, but will match published specifications in either case)

- Complete errata details shown in the Change Log within DSP8010

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Redfish Release 2017.2

DMTF Scalable Platforms Management Forum
September 2017

Redfish Release 2017.2

- Redfish Specification v1.3.0
  - Adds "Apply Time" concept to Settings objects
  - Improves ETag support to avoid race conditions
  - Numerous clarifications
  - Also releasing v1.2.1 errata release
- Redfish Schema Bundle 2017.2
  - **DSP8010_2017.2.ZIP**
  - Contains current versions of all Redfish schema
- Schema minor updates
  - Expanded "Location" object definition to include physical locations at the building, room and intra-chassis levels.
  - Added "SupportedApplyTimes" to allow control over the application of Settings to a resource. This includes support for specifying maintenance windows.
  - Numerous errata and description clarifications throughout the schema
- Base Message Registry v1.2.0
  - Added new 'ResourceNotFound', 'ResourceExhaustion', 'StringValueTooLong' and 'EmptyJSON' messages.
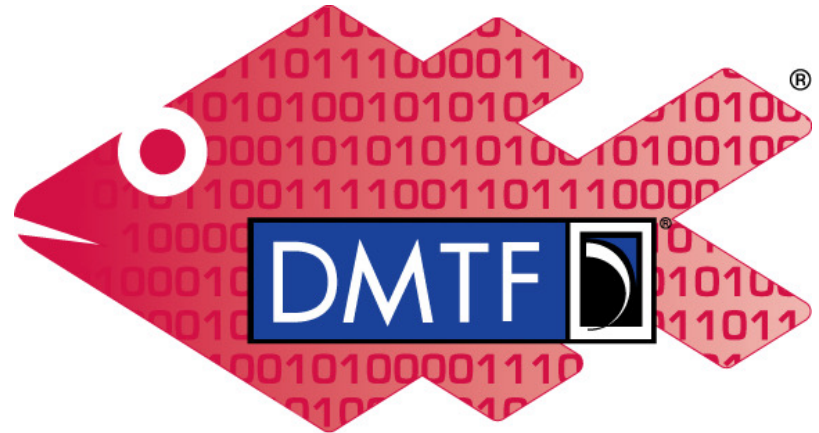
Redfish Specification v1.3.0

- Minor release of the Specification (DSP0266)
  - Service may optionally reject a PATCH or PUT operation if the If-Match or If-Match-None HTTP header is required
    - Allows Service to avoid race conditions from multiple clients performing PATCH or PUT operations, or clients using stale data from previous GETs
    - Returns HTTP 428 response code
  - Added support for a Service to describe the "Apply Time" for Settings
    - "SupportedApplyTimes" array in the "@Redfish.Settings" annotation
      - Reports available options for applying settings to that resource
      - Maintenance Window parameters available to schedule Settings
    - Clients use "@Redfish.PreferredApplyTime" annotation in request body
      - "ApplyTime" parameter describes options to apply settings
        - "Immediate", "OnReset", and several Maintenance Window options
  - Numerous clarifications and corrections, detailed in the Change Log
- Errata release v1.2.1 includes same clarifications and corrections

Redfish Schema Minor Revisions (1 of 2)

- Memory v1.3.0
  - Added memory module-centric identification properties:
    - "ModuleManufacturerID", "ModuleProductID", "MemorySubsystemControllerManufacturerID", "MemorySubsystemControllerProductID"
  - Deprecated "FunctionClasses"
    - Duplicative, unstructured string data
  - Deprecated the PCIe-centric identification properties:
    - "VendorID", "DeviceID", "SubsystemVendorID", and "SubsystemDeviceID"

- PhysicalContext v1.2.0
  - Added "Chassis" and "Fan" as enumerations

- Power v1.4.0
  - Added "PhysicalContext" to "PowerControl" object

Redfish Schema Minor Revisions (2 of 2)

- ## Resource v1.5.0
  - Expanded the "Location" object with new sub-objects to cover in-room and intra-chassis location identification
  - Deprecated "Info" and "InfoFormat" properties in favor of these sub-objects

- ## Role v1.2.0
  - Added "RoleId" property to enable references from ManagerAccount

- ## Settings v1.1.0
  - Added "SupportedApplyTimes" to allow control over the application of Settings to a resource. This includes support for specifying maintenance windows.

- ## Storage v1.2.0
  - Added common "Name" property to "StorageController" object

Errata Schema Revisions

- Clarified usage of the "IndicatorLED" and "ServiceEnabled" enumerations throughout the data model

- Removed errant auto-expand annotations within "Redundancy"

- EventDestination v1.x.x
  - Added clarifications to "OriginResources" and "MessageId" usage

- EventService v1.x.x
  - Added clarifications to "DeliveryRetryAttempts" usage

- Manager v1.x.x
  - Corrected enumeration descriptions for "CommandShell"

- ManagerAccount v1.x.x
  - Added clarifications to "RoleId" usage.

- SerialInterface v1.x.x
 - Removed errant periods in enumeration strings

Redfish Release 2017.1

DMTF Scalable Platforms Management Forum

May 2017

Redfish Release 2017.1

- Redfish Specification v1.2.0
  - Adds Composability support
- Redfish Schema Bundle 2017.1
  - **DSP8010_2017.1.ZIP**
  - Contains current versions of all Redfish schema
- **NEW** Schemas v1.0.0
  - Composition Service
  - Resource Blocks for system composition
- Schema minor updates
  - Updates to provide support for system composition with new links between resources
  - Additions to UpdateService to support multiple targets for updates
  - Enhanced support for allocating memory regions
  - Numerous errata and description clarifications throughout the schema
- Base Message Registry Update v1.1.0
  - Added new "ResourceInStandby" message
- New mockups
  - Composability (perhaps two examples)

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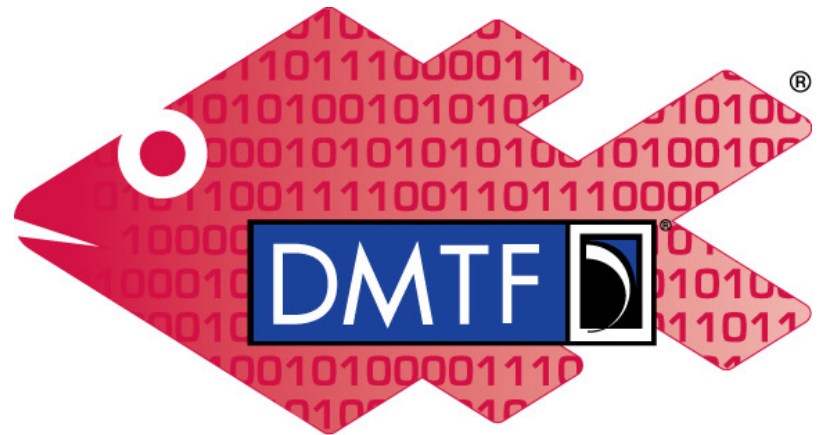
Redfish Specification v1.2.0

- Minor release of the Specification (DSP0266)
    - Adds Composability to the standard
    - Numerous clarifications and corrections, detailed in the Change Log
- Composability support
    - Standardizes how services implement the Composition Service
    - Defines the types of composition requests a service is allowed to support
    - Defines the supporting resources required for each type of composition request
    - Defines baseline expectations a client can make when using the different composition requests

New Redfish v1.0.0 Schemas

- ## CollectionCapabilities
  - Allows for a service to provide an inline annotation for what a client is allowed to provide in the POST request for a Resource Collection
  - The underlying object is of the same type as the members of the collection and contains annotations for each property in terms of what's allowed in the POST request

- ## CompositionService
  - Entry point for the composition service
  - Contains sets of Resource Blocks and Resource Zones to express what's available to a client to compose

- ## ResourceBlock
  - Container object to express the building blocks available for compositions
  - Contains the composition status of the block in addition to the inventory of components that are within the block

Redfish Schema Minor Revisions (1 of 2)

- Most schemas were updated to add Actions and OemActions objects to allow for OEM extensions
- Chassis v1.5.0
  - Links entry for new ResourceBlock resources
- ComputerSystem v1.4.0
  - Links entry for new ResourceBlock resources
  - Added TotalSystemPersistentMemoryGiB to MemorySummary
- Drive v1.2.0, EthernetInterface v1.3.0
  - Links entry for Chassis resource
- Memory v1.2.0
  - Added properties for describing and allocating memory regions
- PhysicalContext v1.1.0
  - Added "Memory" as an enumeration value

Redfish Schema Minor Revisions (2 of 2)

- ## Resource v1.4.0
    - Added "PowerCycle" as an enumeration value for <u>ResetType</u>
    - Modified descriptions of <u>ResetType</u> to remove system-centric text
- ## ServiceRoot v1.2.0
    - Added <u>CompositionService</u> link
- ## Storage v1.2.0
    - Added "FCP" and "FICON" as enumeration values for <u>Protocol</u>
- ## UpdateService v1.2.0
    - Added <u>HttpPushUriTargets</u> and <u>HttpPushUriTargetsBusy</u> properties
    - Added <u>Targets</u> optional parameter for <u>SimpleUpdate</u> action

Errata Schema Revisions

- Corrected integer type properties in CSDL schemas to Int64 (from Int16 or Int32) for consistency in many schemas

- Added missing descriptions in Complex Type definitions in many schemas

- Corrected <u>Links</u> and <u>Members</u> properties (Collection schemas) in all schemas to be non-nullable in many schemas

- Removed unreferenced inclusions in many schema files

- Endpoint v1.0.2, PCIeFunction v1.0.2
  - Corrected validation pattern on PCI ID-related properties

- EventDestination v1.1.3, v1.0.4
  - Marked <u>Context</u> property as Required instead of RequiredOnCreate
    - Service is required to provide the <u>Context</u> (may be NULL), but clients are not required to specify a context when creating a new Event Destination

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New Mockups

- New mockups to support Composability

- Composability

  - Shows a service with various sets of disaggregated hardware as resources

  - Provides an example composed system utilizing some of the disaggregated hardware

  - Shows how Resource Zones can provide information about binding restrictions

- Bladed Partitions

  - Shows a service with a set of ComputerSystems as their own resource blocks

  - Contains example composed systems that are created from other ComputerSystems
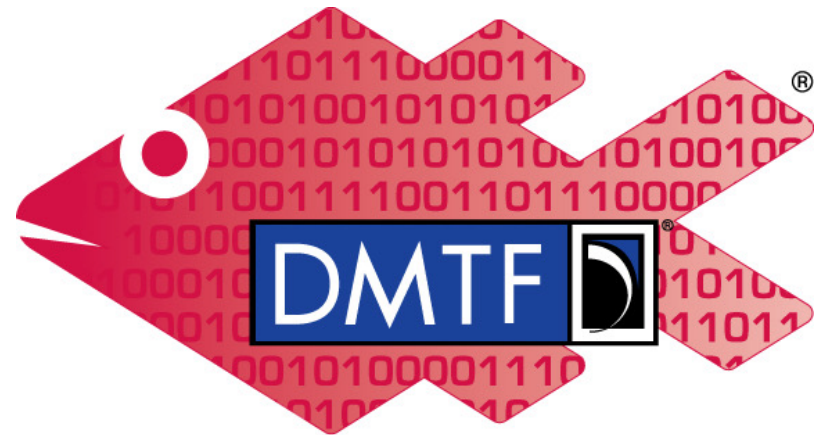
Redfish Release 2016.3

DMTF Scalable Platforms Management Forum
December 2016

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Redfish Release 2016.3

- Redfish Specification v1.0.5
  - Errata release with numerous clarifications
- Redfish Specification v1.1.0
  - Adds Privilege Mapping
  - Adds Host Interface
- **NEW** Redfish Host Interface Specification
  - Describes IP / NIC-based host (OS) interface
- **NEW** Schemas v1.0.0
  - HostInterface, NetworkAdapter, NetworkInterface, NetworkDeviceFunction, NetworkPort, (collections of all the above), PrivilegeRegistry
- Schema minor updates
  - AccountService, Chassis, ComputerSystem, EthernetInterface, Manager, ManagerNetworkProtocol, Memory, MemoryDomain, Resource, SoftwareInventory, Thermal, UpdateService.
  - Numerous errata and description clarifications throughout the schema
- New mockups
  - Storage related mockups: Local Storage and SAS Fabric

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Redfish Specification v1.0.5

- Errata release of the Specification (DSP0266)
    - No new features or functionality in this release (errata only)
    - Numerous clarifications and corrections, detailed in the Change Log
- Various terminology clarifications for "Resource Collection" and "Members" so that the specification is consistent in their usage
    - Helps differentiate the general OData Collection from the Redfish Resource Collection

Redfish Specification v1.1.0

- Minor release of the Specification (DSP0266)
    - Adds Privilege Mapping to the standard
    - Adds the Host Interface to the standard
- Privilege Mapping
    - Defines a registry format for describing privileges for each type of entity, such as ComputerSystem
    - For each entity type, it maps the different roles for the different HTTP methods
    - Each entity type can also have override conditions for when to apply special sets of privileges, such as for a particular URI
- Host Interface
    - References new Host Interface specification for details

Redfish Host Interface Specification v1.0.0

- New specification (DSP0270)
- Defines an interface between a Host and its Redfish Service
  - This is to allow for local management operations similar to how a Host could collect information via IPMI over KCS
- Currently defines a network based interface
  - Extensions can be added later for different protocols as needs arise in the industry
- SMBIOS Type 42 (Management Controller Host Interface) has been expanded to add a new Interface Type (Network Host Interface)
  - The expanded type definition provides a way for the Host to find the address and credentials for its Redfish Service

New Redfish v1.0.0 Schemas

- **HostInterface**
  - Contains properties for describing and configuring a Redfish Host Interface
- **NetworkAdapter**
  - Describes general-purpose network adapters
- **NetworkInterface**
  - Provides linkages between NetworkAdapter, NetworkPort, and NetworkDeviceFunction instances
- **NetworkDeviceFunction**
  - Describes a logical interface exposed by a NetworkAdapter
- **NetworkPort**
  - Describes a discrete physical port capable of connecting to a network
- **PrivilegeRegistry**
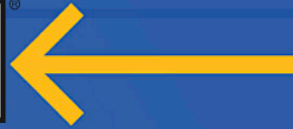 - Schema for definition of HTTP Operation to Privilege mapping

Redfish Schema Minor Revisions (1 of 3)

- Chassis v1.4.0
  - Added "RackGroup" to ChassisType enumeration
  - Added links to NetworkAdapters and PCIeDevices
  - Added HeightMm, WidthMm, DepthMm, and WeightKg properties
- ComputerSystem v1.3.0
  - Added link to NetworkDevices
  - Added FirmwareVersion2 and InterfaceTypeSelection to TrustedModules
- EthernetInterface v1.2.0
  - Added link to HostInterface to support Redfish Host Interface specification
- Manager v1.3.0
  - Added link to HostInterfaces resource collection
- ManagerNetworkProtocol v1.1.0
  - Added DHCP protocol object

Redfish Schema Minor Revisions (2 of 3)

- ## Memory v1.1.0
  - Added Status object

- ## MemoryDomain v1.1.0
  - Added AllowsMirroring and AllowsSparing properties

- ## Resource v1.3.0
  - Added PostalAddress and Placement objects to Location, each containing numerous properties for detailed location information

- ## SoftwareInventory v1.1.0
  - Added SoftwareId, LowestSupportedVersion, UefiDevicePaths, and RelatedItem properties

- ## Thermal v1.2.0
  - Added Manufacturer, Model, SerialNumber, PartNumber, SparePartNumber, and IndicatorLED to Fan object

Redfish Schema Minor Revisions (3 of 3)

- UpdateService v1.1.0
  - Added HttpPushUri property

Errata Schema Revisions (1 of 2)

- Added explicit permissions annotations to all properties to clearly show which properties are read-write vs. read-only

- Corrected Permission annotation with invalid enumeration references

- Removed permissions annotation from embedded objects (permissions now on every property)

- Removed permission annotations from CSDL Type definitions to avoid conflicts with property definitions

- Corrected all property descriptions to always end with a period

- Corrected Reference URI links to OData v4 (errata 3)

- Added Capabilities annotations to CSDL files

- ComputerSystem v1.0.4, v1.1.2, v1.2.1

  - Corrected CSDL Type of TotalSystemMemoryGiB from Int64 to Decimal

Errata Schema Revisions (2 of 2)

- ## Port v1.0.1
  - Corrected CSDL Type of <u>CurrentSpeedGbps</u> and <u>MaxSpeedGbps</u> from Int64 to Decimal

- ## Power v1.0.3, v1.1.1, v1.2.1
  - Corrected descriptions for voltage-related properties and changed sensor descriptions to avoid use of term "current", instead referring to "present value"

- ## ServiceRoot v1.1.1
  - Added missing EntityContainer for <u>ServiceContainer</u> in CSDL schema
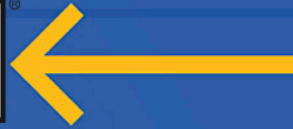
New Mockups

- New mockups to show storage models

- Local Storage

  - Shows a typical 1U or 2U server with local RAID Storage

  - Uses the new "Storage" model rather than "SimpleStorage"

  - Shows a set of Drives and Volumes behind on a single Storage sub-system

- SAS Fabric

  - Represents a drive array without a ComputerSystem

  - Shows a managed SAS fabric with redundant switches

 - Shows how Switches, Ports, and Endpoints map together

Redfish Release 2016.2

DMTF Scalable Platforms Management Forum
**September 2016**

Redfish Release 2016.2

- Redfish Specification v1.0.3 and v1.0.4 (errata)
- **NEW** Schemas v1.0.0
    - ActionInfo, Endpoint, Fabric, MemoryChunks, MemoryDomain, PCIeDevice, PCIeFunction, Port, SoftwareInventory, Switch, UpdateService, Zone
- Schema minor updates
    - Chassis, ComputerSystem, Drive, EthernetInterface, EventDestination, LogEntry, Manager, MemoryMetrics, Power, Redundancy, Resource, ServiceRoot, SessionService, Storage
- New mockups
    - Bladed System and Proposed OCP Profile
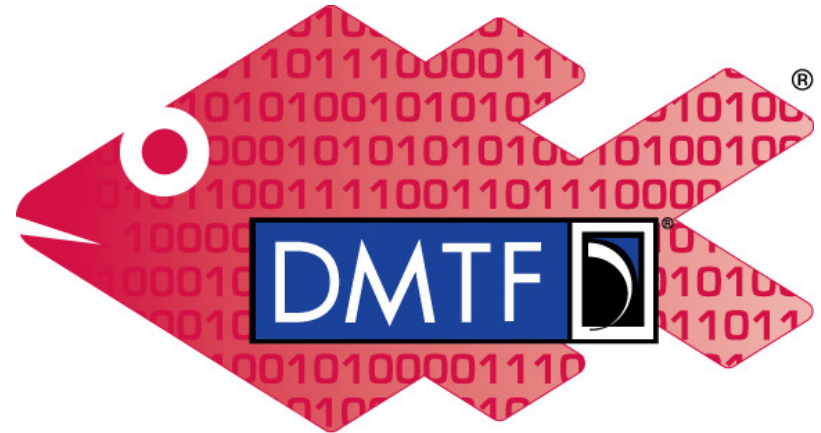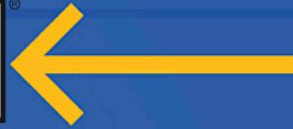
Redfish Specification v1.0.3 and v1.0.4

- Errata release of the Specification (DSP0266)
  - No new features or functionality in this release (errata only)
  - Numerous clarifications and corrections, detailed in the Change Log

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New Redfish v1.0.0 Schemas (1 of 3)

- ## ActionInfo
  - Describes the parameters and other information necessary to perform a Redfish Action to a particular Action target

- ## Endpoint
  - An entity that sends or receives protocol defined messages over a transport

- ## Fabric
  - Consists of one or more Switches and may include Endpoints and Zones
  - Used to describe topologies

- ## MemoryChunks
  - Describes a chunk of memory and its associated interleave sets

New Redfish v1.0.0 Schemas (2 of 3)

- MemoryDomain
  - Used to indicate to the client which Memory (DIMMs) can be grouped together in Memory Chunks to form interleave sets or otherwise grouped together

- PCIeDevice
  - Describes a PCI-e Device attached to a system

- PCIeFunction
  - Describes a PCI-e Function

- Port
  - Describes a Port of a Switch
  - Connects to Switches, Endpoints, or other Ports

- SoftwareInventory
  - Describes an inventory of software components

New Redfish v1.0.0 Schemas (3 of 3)

- ## Switch
  - Describes a simple fabric Switch
  - Contains a set of Ports

- ## UpdateService
  - Describes the Redfish Update Service
  - Contains update actions and sets of Software Inventory entities

- ## Zone
  - Describes a simple fabric Zone
  - Used to map associated Endpoints and Switches into different partitions

Redfish Schema Minor Revisions (1 of 3)

- ## Chassis v1.3.0
  - Added "IPBasedDrive" to <u>ChassisType</u> enumerations
- ## ComputerSystem v1.2.0
  - Added <u>HostedServices</u> and <u>HostingRoles</u> properties
  - Added <u>MemoryDomains,</u> <u>PCIeDevices</u>, <u>PCIeFunctions</u>, and <u>Endpoints</u> links
  - Added "RemoteDrive" enumeration to <u>BootSourceOverrideTarget</u>
- ## Drive v1.1.0
  - Added <u>Operations</u> property and <u>Endpoints</u> link
- ## EthernetInterface v1.1.0
  - Added <u>LinkStatus</u> property and <u>Endpoints</u> link
- ## EventDestination v1.1.0
  - Added <u>OriginResources</u> and <u>MessageIds</u> properties

Redfish Schema Minor Revisions (2 of 3)

- ## LogEntry v1.1.0
  - Added <u>EventType</u>, <u>EventId</u>, and <u>EventTimeStamp</u> properties

- ## Manager v1.2.0
  - Added <u>PowerState</u> property

- ## MemoryMetrics v1.1.0
  - Added <u>PredictedMediaLifeLeftPercent</u> property to the <u>HealthData</u> object

- ## Power v1.2.0
  - Added <u>IndicatorLED</u> property to <u>PowerSupply</u> object

- ## Redundancy v1.1.0
  - Added <u>RedundancyEnabled</u> property

- ## Resource v1.2.0
  - Added "Deferring", "Quiesced", and "Updating" to <u>State</u> enumerations

Redfish Schema Minor Revisions (3 of 3)

- ## ServiceRoot v1.1.0
  - Added links to <u>Fabrics</u>, <u>StorageSystems</u>, <u>StorageServices</u> and <u>UpdateService</u>

- ## SessionService v1.1.0
  - Added OEM Action capabilities

- ## Storage v1.1.0
  - Added <u>Links</u> object and <u>Endpoints</u> link

Errata Schema Revisions (1 of 2)

- ## ComputerSystem v1.1.1, v1.0.3
  - Clarified description of ComputerSystem and the UUID property
- ## Drive v1.0.1
  - Added "Unencrypted" enumeration to EncryptionStatus and deprecated misspelled enumeration
- ## Event v1.1.1, v1.0.3
  - Deprecated Context property in favor of the Event-specific Context contained within each Event
- ## IPAddresses v1.0.3
  - Corrected validation patterns for IPv4Address and SubnetMask
  - Added validation pattern for Gateway
- ## Message v1.0.3
  - Corrected MessageId to mark it as a required property

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Errata Schema Revisions (2 of 2)

- ## Resource v1.1.1
  - Removed errant <u>ReferenceableMember</u> entity type

- ## ServiceRoot v1.0.3
  - Corrected validation pattern annotation for <u>RedfishVersion</u>

- ## Storage v1.0.1
  - Corrected type definition of the <u>Volumes</u> link

- ## Volume v1.0.1
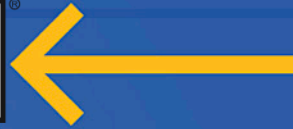 - Corrected description of <u>VolumeType</u>

New Mockups

- New mockups to a bladed system and a proposed OCP profile definition

- Bladed System
  - Shows an enclosure that contains a set of four blades
  - Shows how a Chassis instance can contain subordinate Chassis instances with the Contains/ContainedBy relationship
  - Each Chassis instance that represents a blade has its own ComputerSystem

- Proposed OCP Profile
  - An example that shows how Redfish can be adapted to meet the Open Compute Project's Hardware Management requirements
  - Contains a single system instance with a minimal set of properties required to support OCP
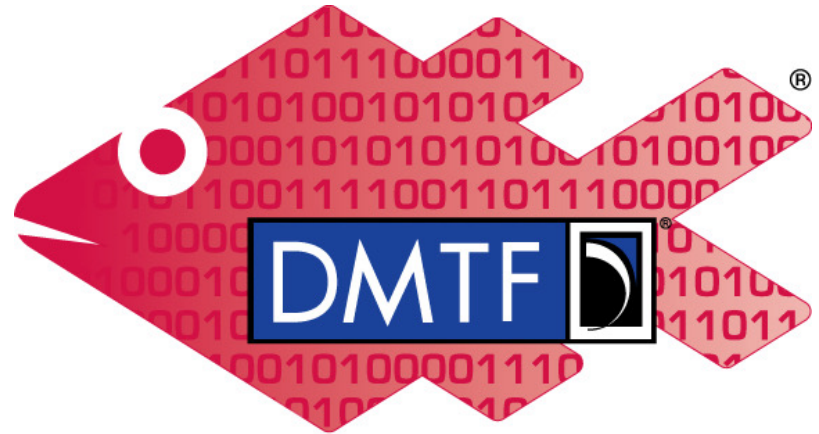
Redfish Release 2016.1

DMTF Scalable Platforms Management Forum

May 2016

Redfish Release 2016.1

- Redfish Specification v1.0.2 (errata)
- **NEW** Schemas v1.0.0
  - AttributeRegistry, Bios, Drive, Memory, MemoryCollection, MemoryMetrics, SecureBoot, Storage, StorageCollection, Volume
- Schemas v1.1.0 or v1.2.0 (minor revs)
  - Chassis, ComputerSystem, Event, Manager, Power, Resource, SimpleStorage, Thermal
- Schemas v1.x.2 (errata)

Schema Release Bundles (posted at http://www.dmtf.org/standards/redfish)

DSP8010_2016.1: All new, minor, and errata 2016.1 schemas

Individual file contents also posted on http://redfish.dmtf.org/schemas

DSP8010_2016.0.9a: Work in Progress

New schemas under development within SPMF

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Redfish Specification v1.0.2

- Errata release of the Specification (DSP0266)
  - No new features or functionality in this release (errata only)
  - Numerous clarifications and corrections, detailed in the Change Log
- Schema namespace rules were corrected
  - Schema versioning method conflicted with OData namespace definitions
  - Old: <schema name>.<major>.<minor>.<errata>
  - New: <schema name>.v<major>_<minor>_<errata>
  - Example: Chassis.v1_0_2 instead of Chassis.1.0.2
- OEM company-level property naming corrected
  - Use of colon ':' in JSON property names is problematic for some languages
  - Dot '.' separator also creates additional work for Javascript
  - Solution is to use underscore "_" instead for both of these cases
    - For compatibility, the colon and dot are allowed (but future use is discouraged)

New Redfish v1.0.0 Schemas (1 of 2)

- Bios
  - Allows viewing and changing System BIOS settings
  - Uses an AttributeRegistry to perform these functions
- AttributeRegistry
  - Adds ability to describe a large quantity of platform/vendor-specific properties ("attributes")
  - Can describe usage and menu structures for user interface displays
- SecureBoot
  - Properties for managing the UEFI Secure Boot functionality of a system
- Memory / MemoryCollection
  - Adds detailed DIMM Inventory and status
- Memory Metrics
  - Statistics and performance metrics for individual memory modules

New Redfish v1.0.0 Schemas (2 of 2)

- Storage / StorageCollection
  - This schema defines a storage subsystem and its respective properties
  - Includes storage controller / subsystem properties and links to the resources such as volumes that can be accessed from that subsystem
- Drive
  - Detailed hard drive and SSD inventory and status
- Volume
  - Contains properties used to describe a volume, virtual disk, LUN, or other logical storage entity for any system

Redfish Schema Minor Revisions (1 of 3)

- ## Chassis v1.2.0
  - <u>Links</u> entries for new <u>Drive</u> and <u>Storage</u> resources
  - <u>Links</u> entry for <u>ManagersInChassis</u>
    - Provides reference to the Manager(s) physically located in the chassis

- ## ComputerSystem v1.1.0
  - <u>Links</u> entries for new <u>Bios</u>, <u>Memory</u>, <u>Storage</u> and <u>SecureBoot</u> resources
  - <u>MemoryMirroring</u> in <u>MemorySummary</u> object
    - Reports system-level "memory mirroring" functionality
  - <u>TrustedModule</u> object
    - Reports status and configuration of a Trusted Platform Module (TPM)
  - <u>BootSourceOverrideMode</u> in <u>Boot</u> object
    - Allows switching between UEFI and "legacy" BIOS boot modes
  - New "*SDCard*" and "*UefiHttp*" enumerations to <u>BootSourceOverrideTarget</u>
    - Boot from SD Memory Card or use the UEFI boot from HTTP function

Redfish Schema Minor Revisions (2 of 3)

- **Event v1.1.0**
  - Context property
    - Information provided by the subscriber to be included with Event payloads
- **Manager v1.1.0**
  - Links entry for ManagerInChassis
    - Provides reference to the Chassis which physically contains the Manager
- **Power v1.1.0**
  - InputRanges, Manufacturer in PowerSupplies[]
    - Describes the range of input voltage(s) supported by the power supply
    - Manufacturer of the power supply
  - Improved enumerations in LineInputVoltageType in PowerSupplies
    - New values describe 'generic' input voltage ranges in place of terminology which was used inconsistently among vendors.
    - Enumerations with inconsistently-used terminology have been deprecated

Redfish Schema Minor Revisions (3 of 3)

- **Resource v1.1.0**
  - Identifier, Location, and IndicatorLED objects
    - Common functionality to apply across the data model
    - Allows specifying a standards-based device identification method
    - Provides structure for reporting physical location
    - Common functionality for a simple LED indicator light
  - "UnavailableOffline" enumeration added to State in Status
    - Shows a device in an invalid or incompatible configuration

- **SimpleStorage v1.1.0**
  - CapacityBytes added to Device
    - Reports the capacity of a storage device - missing from the v1.0.0 release

- **Thermal v1.1.0**
  - Name replaces FanName in Fan
    - Made usage of the "Name" property consistent with the data model

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Errata Schema releases (1 of 2)

- All schemas revised to v1.x.2 for namespace convention corrections
  - CSDL (XML) files now follow <schema>_v1.xml filename format
  - json-schema files now follow <schema>.v1_x_x.json filename format
- All existing v1.x.x schemas were also re-published using the new json-schema filename structure. *Previously released schemas remain available and valid.*

- **Chassis v1.1.2**
  - Deprecates the "Unknown" value for IndicatorLED
- **ComputerSystem v1.0.2**
  - Deprecates the "Unknown" value for IndicatorLED
- **EventService v1.0.2**
  - Corrected Unit annotation(s) to match UCUM unit definitions
- **Manager v1.0.2**
  - Corrected description for ServiceEntryPointUUID to match intent
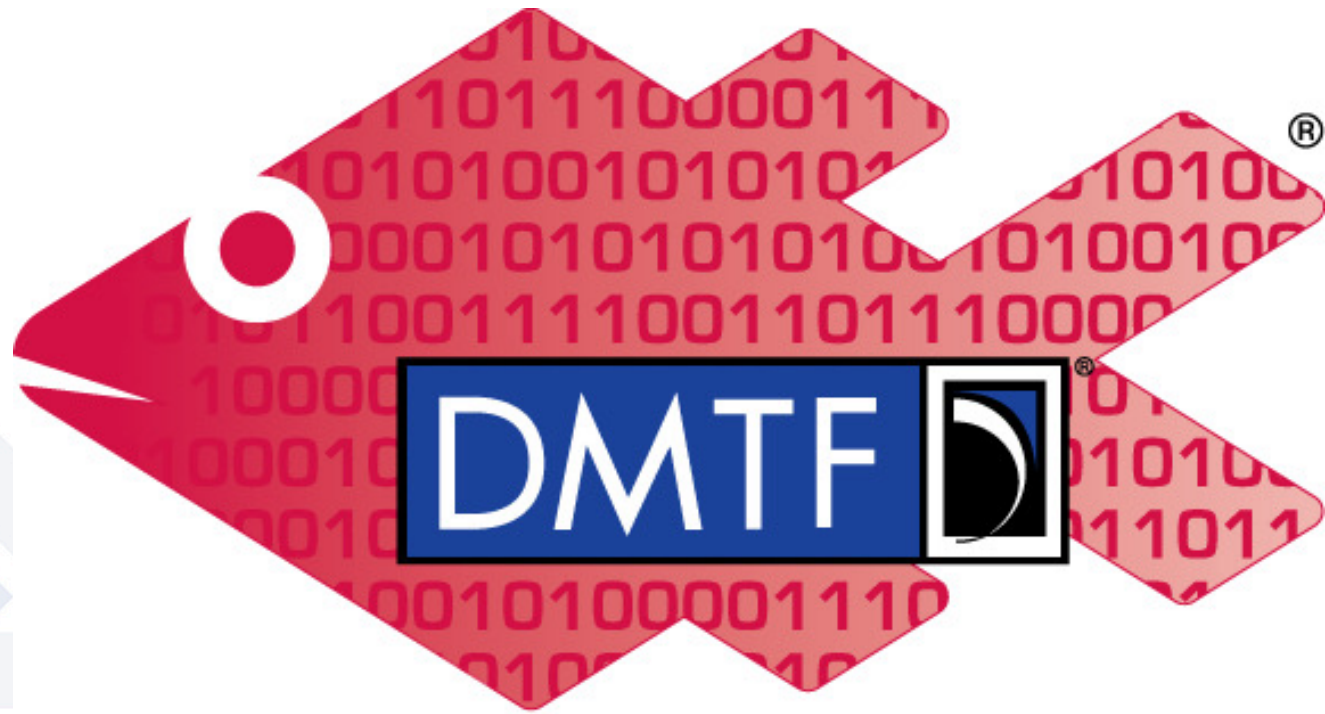
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Errata Schema releases (2 of 2)

- **ManagerNetworkProtocol v1.0.2**
  - Corrected (confusing) read-write permissions on embedded objects
  - Corrected Unit annotation(s) to match UCUM unit definitions
- **Power v1.0.2**
  - Corrected (confusing) read-write permissions on embedded objects
  - Corrected Unit annotation(s) to match UCUM unit definitions
- **Resource v1.0.2**
  - Corrected missing Required annotation on 'Id' property.
  - Added 'Pattern' Redfish annotation for 'Oem' property names.
- **SessionService v1.0.2**
  - Added missing Unit annotation(s) to match UCUM unit definitions
- **SimpleStorage v1.0.2**
  - Corrected Unit annotation(s) to match UCUM unit definitions
- **Thermal v1.0.2**
  - Corrected (confusing) read-write permissions on embedded objects
  - Corrected Unit annotation(s) to match UCUM unit definitions

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Q&A & Discussion

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