



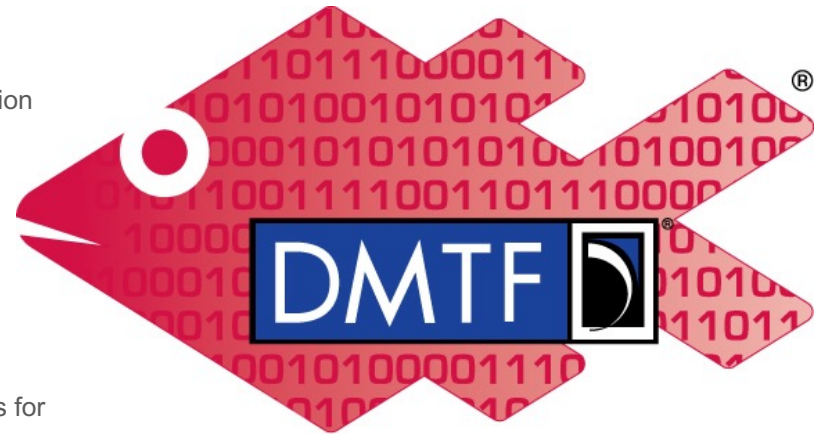
Redfish Release 2022.3

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>



Redfish



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>



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



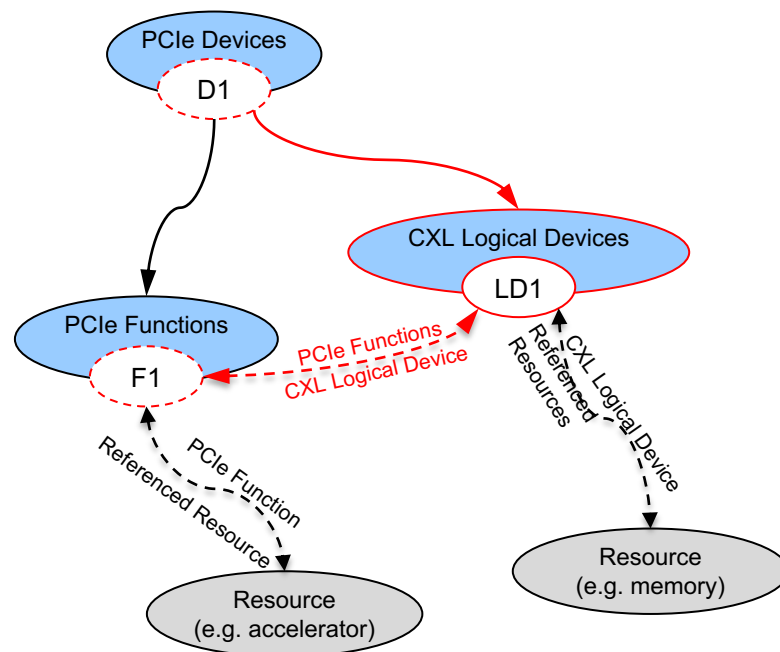
NEW Compute Express Link (CXL) Support

- 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/>



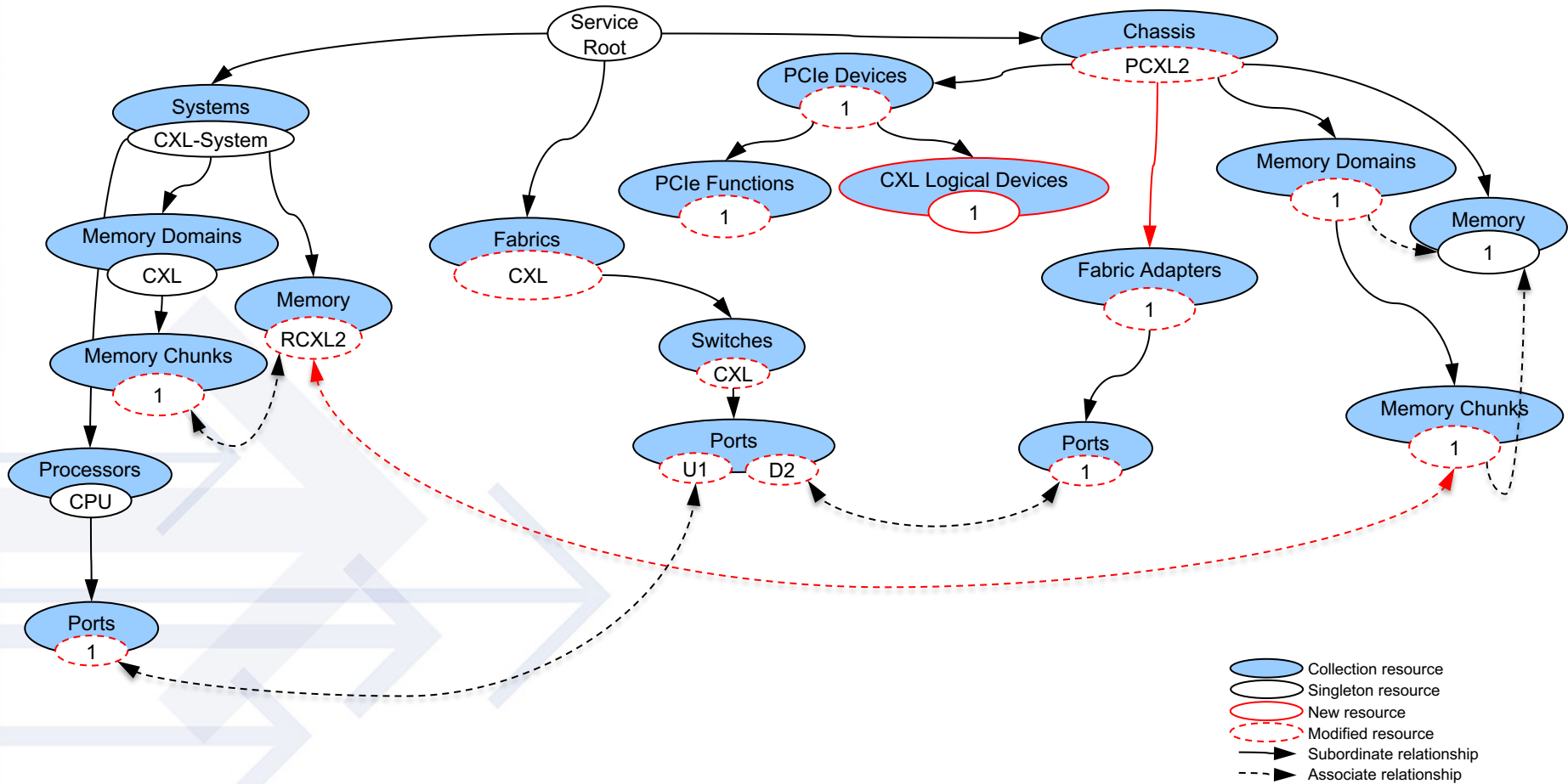
Redfish Model for CXL

- Redfish includes models for both CXL devices and CXL-based fabrics
- CXL devices are described in **ComputerSystem** and **Chassis** models
 - Using *PCleDevices* 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





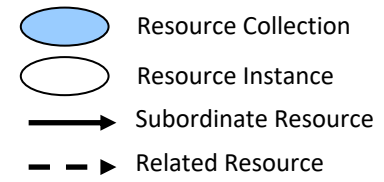
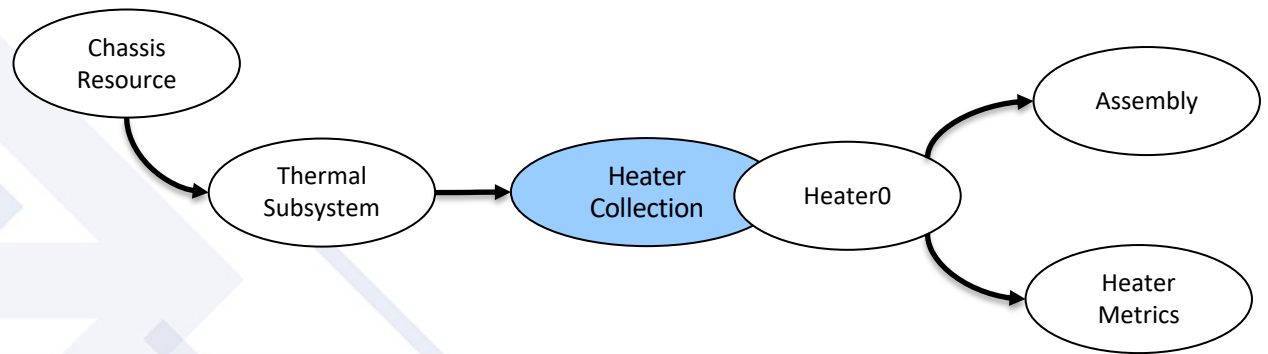
Remote CXL Type 3 Device Model





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*



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 *MFAByPass* to *RoleMapping*
- FabricAdapter v1.5.0
 - Added *Processors*
- Job v1.2.0
 - Added *Links* with *CreatedResources*



Redfish Schema Minor Revisions (3 of 7)

- 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*



Redfish Schema Minor Revisions (5 of 7)

- **MemoryMetrics v1.6.0**
 - Added *CorrectedVolatileErrorCount*, *CorrectedPersistentErrorCount*, *DirtyShutdownCount*, and *CXL*
- **MessageRegistry v1.6.0**
 - Added *ReplacedBy* and *MapsToGeneralMessages*
- **PCleDevice v1.11.0**
 - Added *CXLDevice*, *StagedVersion*, and *CXLLogicalDevices*
- **PCleFunction 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 *PCle* 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*



Redfish Schema Errata Revisions (1 of 4)

- AccountService v1.x.x
 - Clarified the usage of *OAuthServiceSigningKeys* with token validation
- Chassis v1.x.x
 - Updated the descriptions for *Memory*, *MemoryDomains*, and *FabricAdapters* to show the collections are used for fabric-related resource pools
 - Updated the descriptions for *PhysicalSecurity* to show how to build the property when there are multiple sensors
 - Clarified the usage of *IntrusionSensor* and *IntrusionSensorReArm* to show how clients clear the status based on the policy of the system
 - Updated the *PowerState* property to reference the common **Resource** definition
- ComputerSystem v1.x.x
 - Corrected the *BootSourceOverrideEnabled* reference in the *BootSourceOverrideTarget* description
 - Clarified the behavior of *UefiHttp* when *HttpBootUri* is not configured
 - Updated the *PowerState* property to reference the common **Resource** definition



Redfish Schema Errata Revisions (2 of 4)

- **EventDestination v1.x.x**
 - Clarified that *VerifyCertificate* is tied to *Certificates* and services can perform other certificate checks regardless of these properties
 - Updated the tokens used to describe the format of *MessageIds* and *ExcludeMessageIds* to match the Redfish Specification terminology
- **ExternalAccountProvider v1.x.x**
 - Clarified the usage of *OAuthServiceSigningKeys* with token validation
- **Job v1.x.x**
 - Clarified the usage of *Payload* to show it is to contain request payload information
- **License v1.x.x**
 - Clarified the usage of the *Service* and *Capacity* values in *AuthorizationScope* to describe the usage with aggregators
- **ManagerAccount v1.x.x**
 - Updated the description for *Certificates* to provide more details for its usage



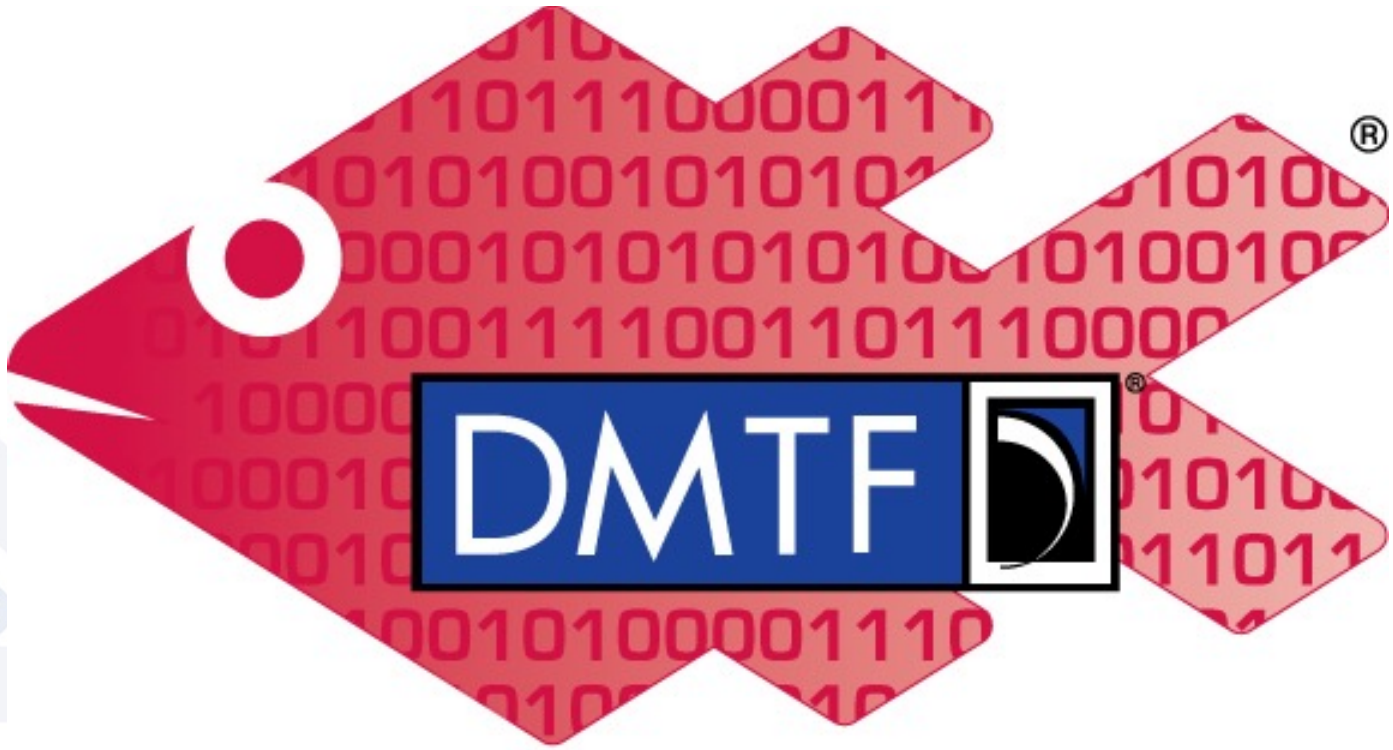
Redfish Schema Errata Revisions (3 of 4)

- **Outlet v1.x.x**
 - Updated the *PowerState* parameter in the *PowerControl* action to reference the common enumeration in the **Circuit** schema
- **OutletGroup v1.x.x**
 - Updated the *PowerState* parameter in the *PowerControl* action to reference the common enumeration in the **Circuit** schema
- **PCleFunction v1.x.x**
 - Clarified the byte ordering of properties that are hex-encoded strings
- **Processor v1.x.x**
 - Updated description for *Ports* to allow fabric-related ports to be shown.
- **ServiceRoot v1.x.x**
 - Removed the upper limit on *MaxLevels*
- **Task v1.x.x**
 - Clarified the usage of *Payload* to show it is to contain request payload information



Redfish Schema Errata Revisions (4 of 4)

- **UpdateService v1.x.x**
 - Updated descriptions for non-resource URI properties to reference the URI rules in the Redfish Specification
 - Clarified that *VerifyRemoteServerCertificate* is tied to *RemoteServerCertificates* and services can perform other certificate checks regardless of these properties
- **VirtualMedia v1.x.x**
 - Clarified that *VerifyCertificate* is tied to *Certificates* and services can perform other certificate checks regardless of these properties



Redfish