Redfish Release 2022.3

DMTF Redfish Forum
December 2022
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- **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](http://www.dmtf.org/standards/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

  - 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](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](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](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/](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
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`

- **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 `LLDPPReceive`
  - 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`
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

- **PCIeFunction 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