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Redfish for Thermal Equipment

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1 Foreword

This white paper covers Redfish schema support for managing cooling distribution equipment and infrastructure. This includes liquid cooling distribution units, air handlers, air conditioners, immersion cooling units, and facility cooling loops.

The Redfish standard has expanded its coverage of data center components, having started with server management and added storage systems, networking and fabric support. As this provides a consistent protocol and data model for managing the bulk of the IT equipment in a data center, it was natural to further extend the data model to include cooling systems, power distribution and other facility services. This allows the utilization of a common set of tools to manage the entire infrastructure, and enable development of tools that can integrate data across the various subsystems to optimize resource utilization.

1.1 Where can I find more information?

The following web sites provide more information about the Redfish standard:

- **Redfish Developer Hub:** http://redfish.dmtf.org Resources for developers building applications using Redfish. Contains an interactive schema explorer, hosted schema and other links.
- **Redfish User Forum:** http://www.redfishforum.com User forum monitored by DMTF Redfish personnel to answer questions about any Redfish-related topics:
- **DMTF Github Repositories:** http://www.github.com/DMTF Open source tools and libraries for working with the Redfish API.
- **Redfish Standards:** http://www.dmtf.org/standards/redfish Schemas, specs, mockups, white papers, FAQ, educational material and more.
- **DMTF Redfish Forum** (Working group that maintains the Redfish standard): http://www.dmtf.org/standards/spmf Companies involved, upcoming schedules and future work, charter, and information about joining.

1.2 Using the reference guide

The cooling distribution-related schemas are listed in the following section for reference. This section should be considered an extension to the contents of DSP2046, the Redfish Resource and Schema Guide, which lists the common Redfish properties, other object definitions, and all released Redfish schemas (including those shown here).

This guide was produced using the contents of the schema files from DMTF Redfish Schema bundle DSP8010 and merged with supplemental text using the DMTF's Redfish Documentation Generator.

1.3 Common Properties

Properties and objects defined for all Redfish schemas, or referenced by this white paper are detailed in the Redfish Resource and Schema Guide (DSP2046), available for download at the Redfish Standards site: http://www.dmtf.org/standards/redfish

2 Central data model concepts

The Redfish data models for air and liquid cooling distribution equipment are heavily leveraged from previous work to model power distribution in the data center. As the management and control of cooling equipment follows similar use cases to data center power infrastructure, many of the concepts developed, including the Facility, Sensor, and Control models, apply directly to this class of equipment.

2.1 Chassis

To keep the data model consistent across devices managed via Redfish, it is expected that most products will include at least one Chassis resource, to describe the physical product or container. This is important to show the "contains" and "contained by" relationships among components, especially when attempting to model a full cooling domain.

The recommendation to always include a Chassis resource is a change from the guidance given when the PowerDistribution model was released. At the time, it was deemed duplicative with the functional model provided by the `PowerDistribution` schema. But as those model matured, it has become clear that the pure physical model view provided by a `Chassis` resource is needed to ensure client software can, for example, discover all of the equipment contained within a rack. This becomes vital for immersion cooling systems, where `ComputerSystem` units and their associated `Chassis` are contained within the immersion tank. A new `ChassisType` value of "ImmersionTank" has also been added for this reason.

2.2 Facility

One of the basic model constructs for Redfish is the presentation of both a "Functional" and a "Physical" view of the managed systems or devices. For Computer Systems (servers) this results in resources for both a `ComputerSystem` (functional view) and a `Chassis` (physical view). The chassis model works well for equipment that is "contained within a sheet metal box", but the terminology and concept becomes confusing when describing equipment placed in a room.

This was addressed by the addition of the `Facility` schema to describe a room or other physical location that can contain equipment and likely has relationships to other facilities. Many of the concepts from the `Chassis` schema were applied to `Facility`, including the ability to nest facilities (e.g., a Room is contained by a Floor or Building).

2.2.1 Cooling Domain

One of the primary associations within a facility is the physical relationship of equipment connected to external or facility-level cooling loops, or otherwise affected by environmental conditions within a

physical space. The CoolingDomain schema allows the user to map a cooling "zone" or fault domain to a list of gear that are served by a cooling system.

3 Thermal Equipment resource tree

Below is a diagram of the resource tree, starting at the Redfish Service Root, containing all resources used to model a rack-based Cooling Distribution Unit (CDU). Other types of cooling systems, such as immersion cooling units, follow the same model. The individual resources are detailed in the following sections.

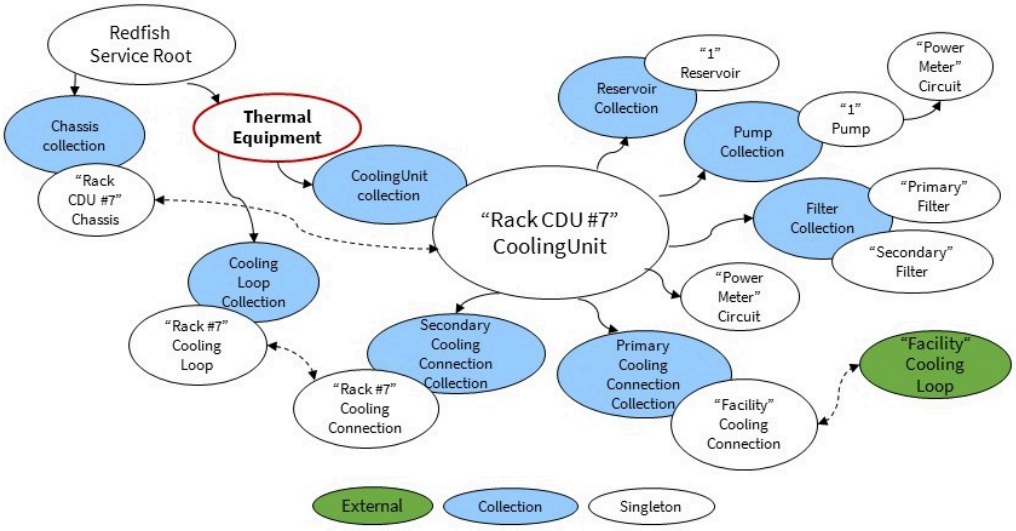

Figure 1: Resource Tree for Thermal Equipment

3.1 Thermal Equipment

A new resource, linked from the Service Root, was added to contain all links to cooling equipment and any future properties that may relate to cooling, heating, or environmental systems in general. The `ThermalEquipment` resource can be used to quickly determine the types of equipment supported by the Service. It also allows for future additions to the schema without requiring changes to the `ServiceRoot` schema.

3.2 Cooling Unit

The main resource for describing a cooling system component is the `CoolingUnit` schema and resource. As various types of cooling distribution gear follow a very similar model (cooling loop connections, temperature and pressure measurements, and general product identification), these are

all modeled using a single schema. This schema is then used to populate a number of Resource Collections, grouped by the type of equipment, but all sharing the same schema definition.

In this work-in-progress release of the schema, there are separate Resource Collections for Cooling Distribution Units (CDUs), Immersion Cooling units, Air Conditioners (also known as CRAC units), and Air Handlers. These proposed collections are intended to allow similar gear to be grouped together to match common management use cases. The list of collections for the v1.0 release will depend on feedback, with collections added or removed for the initial release.

For each cooling unit instance, there are a number of subordinate resources and resource collections that describe the various components, connections, and subsystems that may be present.

3.3 Cooling Loops

Large-scale cooling equipment are generally connected through "loops", which can describe either a primary or facility level system (e.g. chilled water loop) or a secondary or "technology" loop that services the IT equipment in a single rack. These are modeled by a `CoolingLoop` resource, which contains both product information and shows the connections (as links to other resources) to and from the loop. Besides providing the basic inventory functions, this resource is intended to enable software to follow the flow of coolant through its entire cycle in a facility-level cooling system.

3.4 Cooling Connections

The primary monitoring points within a cooling system are at the supply and return connections for a particular piece of equipment. These are treated similar to a `Circuit` or `Outlet` in a power distribution system. A `CoolingConnection` can model both a supply and return in a single resource instance, as in general, a user is concerned with the change in coolant condition, so providing measurements for both is efficient for client software.

The `CoolingConnection` schema has been designed primarily to describe liquid cooling systems, but further investigation is intended to produce a definition that would also apply to air/gas systems, in support of rack-level heat exchangers or similar air-cooling systems.

4 Schema Guide (Work in Progress)

4.1 Chassis 1.20.0

Version	*v1.20*	*v1.19*	*v1.18*	*v1.17*	*v1.16*	*v1.15*	*v1.14*	*v1.13*	*v1.12*	*v1.11*	*v1.10*	...
Release	2022.1	2021.4	2021.3	2021.2	2021.1	2020.4	2020.3	2020.2	2020.1	2019.4	2019.2	...

4.1.1 Description

The Chassis schema represents the physical components of a system. This resource represents the sheet-metal confined spaces and logical zones such as racks, enclosures, chassis and all other containers. Subsystems, such as sensors, that operate outside of a system's data plane are linked either directly or indirectly through this resource. A subsystem that operates outside of a system's data plane are not accessible to software that runs on the system.

4.1.2 URIs

/redfish/v1/Chassis/*{ChassisId}*

4.1.3 Properties

Property	Type	Attributes	Notes
Assembly *(v1.6+)* {}	object		The link to the assembly associated with this chassis. See the *Assembly* schema for details on this property.
AssetTag	string	*read-write (null)*	The user-assigned asset tag of this chassis.
Certificates *(v1.15+)* {	object		The link to a collection of certificates for device identity and attestation. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Certificate*. See the Certificate schema for details.
}			
ChassisType	string (enum)	*read-only required*	The type of physical form factor of the chassis. *For the possible property values, see ChassisType in Property details.*

Property	Type	Attributes	Notes
Controls *(v1.17+)* {	object		The link to the collection of controls located in this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Control*. See the Control schema for details.
}			
DepthMm *(v1.4+)*	number (mm)	*read-only* *(null)*	The depth of the chassis.
Drives *(v1.14+)* {	object		The link to the collection of drives within this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Drive*. See the Drive schema for details.
}			
ElectricalSourceManagerURIs *(v1.18+)* [ ]	array (URI) (string, null)	*read-write*	The URIs of the management interfaces for the upstream electrical source connections for this chassis.
ElectricalSourceNames *(v1.18+)* [ ]	array (string, null)	*read-write*	The names of the upstream electrical sources, such as circuits or outlets, connected to this chassis.
EnvironmentalClass *(v1.9+)*	string (enum)	*read-only* *(null)*	The ASHRAE Environmental Class for this chassis. *For the possible property values, see EnvironmentalClass in Property details.*
EnvironmentMetrics *(v1.15+)* {}	object		The link to the environment metrics for this chassis. See the *EnvironmentMetrics* schema for details on this property.
FabricAdapters *(v1.20+)* {	object		The link to the collection of fabric adapters located in this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *FabricAdapter*. See the FabricAdapter schema for details.
}			
HeightMm *(v1.4+)*	number (mm)	*read-only* *(null)*	The height of the chassis.

Property	Type	Attributes	Notes
IndicatorLED *(deprecated v1.14)*	string (enum)	*read-write (null)*	The state of the indicator LED, which identifies the chassis. *For the possible property values, see IndicatorLED in Property details. Deprecated in v1.14 and later. This property has been deprecated in favor of the LocationIndicatorActive property.*
Links {	object		The links to other resources that are related to this resource.
Cables *(v1.17+)* [{ }]	array (object)		An array of links to the cables connected to this chassis. See the *Cable* schema for details on this property.
Cables@odata.count	integer	*read-only*	The number of items in a collection.
ComputerSystems [{ }]	array (object)		An array of links to the computer systems that this chassis directly and wholly contains. See the *ComputerSystem* schema for details on this property.
ComputerSystems@odata.count	integer	*read-only*	The number of items in a collection.
ContainedBy {	object		The link to the chassis that contains this chassis.
@odata.id	string	*read-write*	Link to another Chassis resource.
}			
Contains [{	array		An array of links to any other chassis that this chassis has in it.
@odata.id	string	*read-write*	Link to another Chassis resource.
}]			
Contains@odata.count	integer	*read-only*	The number of items in a collection.
CooledBy [{	array		An array of links to resources or objects that cool this chassis. Normally, the link is for either a chassis or a specific set of fans.
@odata.id	string (URI)	*read-only*	The unique identifier for a resource.
}]			
CooledBy@odata.count	integer	*read-only*	The number of items in a collection.
Drives *(v1.2+)* [{ }]	array (object)		An array of links to the drives located in this chassis. See the *Drive* schema for details on this property.
Drives@odata.count	integer	*read-only*	The number of items in a collection.

Property	Type	Attributes	Notes
Facility *(v1.11+)* {	object		The link to the facility that contains this chassis. See the *Facility* schema for details on this property.
@odata.id	string	*read-write*	Link to a Facility resource. See the Links section and the *Facility* schema for details.
}			
ManagedBy [{ }]	array (object)		An array of links to the managers responsible for managing this chassis. See the *Manager* schema for details on this property.
ManagedBy@odata.count	integer	*read-only*	The number of items in a collection.
ManagersInChassis *(v1.2+)* [{ }]	array (object)		An array of links to the managers located in this chassis. See the *Manager* schema for details on this property.
ManagersInChassis@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
PCIeDevices *(v1.4+, deprecated v1.10* [{ }]	array (object)		An array of links to the PCIe devices located in this chassis. See the *PCIeDevice* schema for details on this property. *Deprecated in v1.10 and later. This property has been deprecated in favor of the PCIeDevices resource collection in the root of this resource.*
PCIeDevices@odata.count	integer	*read-only*	The number of items in a collection.
PowerOutlets *(v1.18+)* [{ }]	array (object)		An array of links to the outlets that provide power to this chassis. See the *Outlet* schema for details on this property.
PowerOutlets@odata.count	integer	*read-only*	The number of items in a collection.
PoweredBy [{	array		An array of links to resources or objects that power this chassis. Normally, the link is for either a chassis or a specific set of power supplies.
@odata.id	string (URI)	*read-only*	The unique identifier for a resource.
}]			
PoweredBy@odata.count	integer	*read-only*	The number of items in a collection.
Processors *(v1.9+)* [{ }]	array (object)		An array of links to the processors located in this chassis. See the *Processor* schema for details on this property.
Processors@odata.count	integer	*read-only*	The number of items in a collection.

Property	Type	Attributes	Notes
ResourceBlocks *(v1.5+)* [{ }]	array (object)		An array of links to the resource blocks located in this chassis. See the *ResourceBlock* schema for details on this property.
ResourceBlocks@odata.count	integer	*read-only*	The number of items in a collection.
Storage *(v1.2+)* [{ }]	array (object)		An array of links to the storage subsystems connected to or inside this chassis. See the *Storage* schema for details on this property.
Storage@odata.count	integer	*read-only*	The number of items in a collection.
Switches *(v1.7+)* [{ }]	array (object)		An array of links to the switches located in this chassis. See the *Switch* schema for details on this property.
Switches@odata.count	integer	*read-only*	The number of items in a collection.
}			
Location *(v1.2+)* {}	object		The location of the chassis. See the *Resource* schema for details on this property.
LocationIndicatorActive *(v1.14+)*	boolean	*read-write (null)*	An indicator allowing an operator to physically locate this resource.
LogServices {	object		The link to the logs for this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *LogService*. See the LogService schema for details.
}			
Manufacturer	string	*read-only (null)*	The manufacturer of this chassis.
MaxPowerWatts *(v1.12+)*	number (Watts)	*read-only (null)*	The upper bound of the total power consumed by the chassis.
Measurements *(v1.15+, deprecated v1.19* [{ }]	array (object)		An array of DSP0274-defined measurement blocks. See the *SoftwareInventory* schema for details on this property. *Deprecated in v1.19 and later. This property has been deprecated in favor of the ComponentIntegrity resource.*
MediaControllers *(v1.11+, deprecated v1.20* {	object		The link to the collection of media controllers located in this chassis. Contains a link to a resource. *Deprecated in v1.20 and later. This property has been deprecated in favor of FabricAdapters.*

Property	Type	Attributes	Notes
@odata.id	string	*read-only*	Link to Collection of *MediaController*. See the MediaController schema for details.
}			
Memory *(v1.11+)* {	object		The link to the collection of memory located in this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Memory*. See the Memory schema for details.
}			
MemoryDomains *(v1.11+)* {	object		The link to the collection of memory domains located in this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *MemoryDomain*. See the MemoryDomain schema for details.
}			
MinPowerWatts *(v1.12+)*	number (Watts)	*read-only (null)*	The lower bound of the total power consumed by the chassis.
Model	string	*read-only (null)*	The model number of the chassis.
NetworkAdapters *(v1.4+)* {	object		The link to the collection of network adapters associated with this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *NetworkAdapter*. See the NetworkAdapter schema for details.
}			
PartNumber	string	*read-only (null)*	The part number of the chassis.
PCIeDevices *(v1.10+)* {	object		The link to the collection of PCIe devices located in this chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *PCIeDevice*. See the PCIeDevice schema for details.
}			
PCIeSlots *(v1.8+)* {}	object		The link to the PCIe slot properties for this chassis. See the *PCIeSlots* schema for details on this property.
PhysicalSecurity *(v1.1+)* {	object		The state of the physical security sensor.

Property	Type	Attributes	Notes
IntrusionSensor *(v1.1+)*	string (enum)	*read-write (null)*	This indicates the known state of the physical security sensor, such as if it is hardware intrusion detected. *For the possible property values, see IntrusionSensor in Property details.*
IntrusionSensorNumber *(v1.1+)*	integer	*read-only (null)*	A numerical identifier to represent the physical security sensor.
IntrusionSensorReArm *(v1.1+)*	string (enum)	*read-only (null)*	The method that restores this physical security sensor to the normal state. *For the possible property values, see IntrusionSensorReArm in Property details.*
}			
Power *(deprecated v1.15)* {}	object		The link to the power properties, or power supplies, power policies, and sensors, for this chassis. See the *Power* schema for details on this property. *Deprecated in v1.15 and later. This link has been deprecated in favor of the PowerSubsystem link property.*
PowerState *(v1.0.1+)*	string (enum)	*read-only (null)*	The current power state of the chassis. *For the possible property values, see PowerState in Property details.*
PowerSubsystem *(v1.15+)* {}	object		The link to the power subsystem properties for this chassis. See the *PowerSubsystem* schema for details on this property.
Sensors *(v1.9+)* {	object		The link to the collection of sensors located in the equipment and sub-components. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Sensor*. See the Sensor schema for details.
}			
SerialNumber	string	*read-only (null)*	The serial number of the chassis.
SKU	string	*read-only (null)*	The SKU of the chassis.
SparePartNumber *(v1.16+)*	string	*read-only (null)*	The spare part number of the chassis.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

Property	Type	Attributes	Notes
Thermal *(deprecated v1.15)* {}	object		The link to the thermal properties, such as fans, cooling, and sensors, for this chassis. See the *Thermal* schema for details on this property. *Deprecated in v1.15 and later. This link has been deprecated in favor of the ThermalSubsystem link property.*
ThermalSubsystem *(v1.15+)* {}	object		The link to the thermal subsystem properties for this chassis. See the *ThermalSubsystem* schema for details on this property.
UUID *(v1.7+)*	string	*read-only (null)*	The UUID for this chassis.
WeightKg *(v1.4+)*	number (kg)	*read-only (null)*	The weight of the chassis.
WidthMm *(v1.4+)*	number (mm)	*read-only (null)*	The width of the chassis.

4.1.4 Actions

4.1.4.1 Reset

Description

This action resets the chassis but does not reset systems or other contained resources, although side effects can occur that affect those resources.

Action URI: {Base URI of target resource}/Actions/Chassis.Reset

Action parameters

Parameter Name	Type	Attributes	Notes
ResetType	string (enum)	*optional*	The type of reset. *For the possible property values, see ResetType in Property details.*

Request Example

```
{
    "ResetType": "ForceRestart"
```

```
}
```

4.1.5 Property details

4.1.5.1 ChassisType:

The type of physical form factor of the chassis.

string	Description
Blade	An enclosed or semi-enclosed, typically vertically-oriented, system chassis that must be plugged into a multi-system chassis to function normally.
Card	A loose device or circuit board intended to be installed in a system or other enclosure.
Cartridge	A small self-contained system intended to be plugged into a multi-system chassis.
Component	A small chassis, card, or device that contains devices for a particular subsystem or function.
Drawer	An enclosed or semi-enclosed, typically horizontally-oriented, system chassis that can be slid into a multi-system chassis.
Enclosure	A generic term for a chassis that does not fit any other description.
Expansion	A chassis that expands the capabilities or capacity of another chassis.
ImmersionTank *(v1.20+)*	An immersion cooling tank.
IPBasedDrive *(v1.3+)*	A chassis in a drive form factor with IP-based network connections.
Module	A small, typically removable, chassis or card that contains devices for a particular subsystem or function.
Other	A chassis that does not fit any of these definitions.
Pod	A collection of equipment racks in a large, likely transportable, container.
Rack	An equipment rack, typically a 19-inch wide freestanding unit.
RackGroup *(v1.4+)*	A group of racks that form a single entity or share infrastructure.
RackMount	A single-system chassis designed specifically for mounting in an equipment rack.
Row	A collection of equipment racks.
Shelf	An enclosed or semi-enclosed, typically horizontally-oriented, system chassis that must be plugged into a multi-system chassis to function normally.

string	Description
Sidecar	A chassis that mates mechanically with another chassis to expand its capabilities or capacity.
Sled	An enclosed or semi-enclosed, system chassis that must be plugged into a multi-system chassis to function normally similar to a blade type chassis.
StandAlone	A single, free-standing system, commonly called a tower or desktop chassis.
StorageEnclosure *(v1.6+)*	A chassis that encloses storage.
Zone	A logical division or portion of a physical chassis that contains multiple devices or systems that cannot be physically separated.

4.1.5.2 EnvironmentalClass:

The ASHRAE Environmental Class for this chassis.

string	Description
A1	ASHRAE Environmental Class 'A1'.
A2	ASHRAE Environmental Class 'A2'.
A3	ASHRAE Environmental Class 'A3'.
A4	ASHRAE Environmental Class 'A4'.

4.1.5.3 IndicatorLED:

The state of the indicator LED, which identifies the chassis.

string	Description
Blinking	The indicator LED is blinking.
Lit	The indicator LED is lit.
Off	The indicator LED is off.
Unknown *(deprecated v1.2)*	The state of the indicator LED cannot be determined. *Deprecated in v1.2 and later. This value has been deprecated in favor of returning null if the state is unknown.*

4.1.5.4 IntrusionSensor:

This indicates the known state of the physical security sensor, such as if it is hardware intrusion detected.

string	Description
HardwareIntrusion	A door, lock, or other mechanism protecting the internal system hardware from being accessed is detected to be in an insecure state.
Normal	No abnormal physical security condition is detected at this time.
TamperingDetected	Physical tampering of the monitored entity is detected.

4.1.5.5 IntrusionSensorReArm:

The method that restores this physical security sensor to the normal state.

string	Description
Automatic	Because no abnormal physical security condition is detected, this sensor is automatically restored to the normal state.
Manual	A manual re-arm of this sensor restores it to the normal state.

4.1.5.6 PowerState:

The current power state of the chassis.

string	Description
Off	The components within the chassis have no power, except some components might continue to have AUX power, such as the management controller.
On	The components within the chassis have power.
PoweringOff	A temporary state between on and off. The components within the chassis can take time to process the power off action.
PoweringOn	A temporary state between off and on. The components within the chassis can take time to process the power on action.

4.1.5.7 ResetType:

The type of reset.

string	Description
ForceOff	Turn off the unit immediately (non-graceful shutdown).
ForceOn	Turn on the unit immediately.
ForceRestart	Shut down immediately and non-gracefully and restart the system.
GracefulRestart	Shut down gracefully and restart the system.
GracefulShutdown	Shut down gracefully and power off.
Nmi	Generate a diagnostic interrupt, which is usually an NMI on x86 systems, to stop normal operations, complete diagnostic actions, and, typically, halt the system.
On	Turn on the unit.
Pause	Pause execution on the unit but do not remove power. This is typically a feature of virtual machine hypervisors.
PowerCycle	Power cycle the unit. Behaves like a full power removal, followed by a power restore to the resource.
PushPowerButton	Simulate the pressing of the physical power button on this unit.
Resume	Resume execution on the paused unit. This is typically a feature of virtual machine hypervisors.
Suspend	Write the state of the unit to disk before powering off. This allows for the state to be restored when powered back on.

4.1.6 Example response


```
{
    "@odata.type": "#Chassis.v1_19_0.Chassis",
    "Id": "1U",
    "Name": "Computer System Chassis",
    "ChassisType": "RackMount",
    "AssetTag": "Chicago-45Z-2381",
    "Manufacturer": "Contoso",
    "Model": "3500RX",
    "SKU": "8675309",
    "SerialNumber": "437XR1138R2",
```

```
    "PartNumber": "224071-J23",
    "PowerState": "On",
    "LocationIndicatorActive": true,
    "Location": {
        "Placement": {
            "Row": "North",
            "Rack": "WEB43",
            "RackOffsetUnits": "EIA_310",
            "RackOffset": 12
        }
    },
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "HeightMm": 44.45,
    "WidthMm": 431.8,
    "DepthMm": 711,
    "WeightKg": 15.31,
    "EnvironmentalClass": "A3",
    "Sensors": {
        "@odata.id": "/redfish/v1/Chassis/1U/Sensors"
    },
    "PowerSubsystem": {
        "@odata.id": "/redfish/v1/Chassis/1U/PowerSubsystem"
    },
    "ThermalSubsystem": {
        "@odata.id": "/redfish/v1/Chassis/1U/ThermalSubsystem"
    },
    "EnvironmentMetrics": {
        "@odata.id": "/redfish/v1/Chassis/1U/EnvironmentMetrics"
    },
    "Links": {
        "ComputerSystems": [
            {
                "@odata.id": "/redfish/v1/Systems/437XR1138R2"
            }
        ],
        "ManagedBy": [
            {
                "@odata.id": "/redfish/v1/Managers/BMC"
            }
        ],
        "ManagersInChassis": [
            {
                "@odata.id": "/redfish/v1/Managers/BMC"
            }
        ],
        "Oem": {}
    },
```

```
    "Oem": {},
    "@odata.id": "/redfish/v1/Chassis/1U"
}
```

4.2 Circuit 1.6.0

Version	*v1.6*	*v1.5*	*v1.4*	*v1.3*	*v1.2*	*v1.1*	*v1.0*
Release	2022.1	2021.4	2021.3	2021.2	2020.4	2020.3	2019.4

4.2.1 Description

This is the schema definition for an electrical circuit.

4.2.2 URIs

/redfish/v1/PowerEquipment/ElectricalBuses/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/ElectricalBuses/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/PowerEquipment/FloorPDUs/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/FloorPDUs/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/PowerEquipment/FloorPDUs/*{PowerDistributionId}*/Subfeeds/*{CircuitId}*
/redfish/v1/PowerEquipment/PowerShelves/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/PowerShelves/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/PowerEquipment/RackPDUs/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/RackPDUs/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Feeders/*{CircuitId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Subfeeds/*{CircuitId}*
/redfish/v1/PowerEquipment/TransferSwitches/*{PowerDistributionId}*/Branches/*{CircuitId}*
/redfish/v1/PowerEquipment/TransferSwitches/*{PowerDistributionId}*/Feeders/*{CircuitId}*
/redfish/v1/PowerEquipment/TransferSwitches/*{PowerDistributionId}*/Mains/*{CircuitId}*
/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/PowerMeter
/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Pumps/*{PumpId}*/PowerMeter
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/PowerMeter
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Pumps/*{PumpId}*/PowerMeter

4.2.3 Properties

Property	Type	Attributes	Notes
BreakerState	string (enum)	*read-only (null)*	The state of the over current protection device. *For the possible property values, see BreakerState in Property details.*
CircuitType	string (enum)	*read-only (null)*	The type of circuit. *For the possible property values, see CircuitType in Property details.*
ConfigurationLocked *(v1.5+)*	boolean	*read-write*	Indicates whether the configuration is locked.
CriticalCircuit	boolean	*read-write (null)*	Designates if this is a critical circuit.
CurrentAmps {}	object		The current (A) for this single phase circuit. For more information about this property, see SensorCurrentExcerpt in Property Details.
ElectricalConsumerNames *(v1.4+)* [ ]	array (string, null)	*read-write*	An array of names of downstream devices that are powered by this circuit.
ElectricalContext	string (enum)	*read-only (null)*	The combination of current-carrying conductors. *For the possible property values, see ElectricalContext in Property details.*
ElectricalSourceManagerURI *(v1.4+)*	string (URI)	*read-write*	The URI of the management interface for the upstream electrical source connection for this circuit.
ElectricalSourceName *(v1.4+)*	string	*read-write*	The name of the upstream electrical source, such as a circuit or outlet, connected to this circuit.
EnergykWh {}	object		The energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
FrequencyHz {}	object		The frequency (Hz) for this circuit. For more information about this property, see SensorExcerpt in Property Details.
IndicatorLED *(deprecated v1.1)*	string (enum)	*read-write (null)*	The state of the indicator LED, which identifies the circuit. *For the possible property values, see IndicatorLED in Property details. Deprecated in v1.1 and later. This property has been deprecated in favor of the LocationIndicatorActive property.*
Links {	object		The links to other resources that are related to this resource.

Property	Type	Attributes	Notes
BranchCircuit {	object	*(null)*	A reference to the branch circuit related to this circuit.
@odata.id	string	*read-only*	Link to another Circuit resource.
}			
DistributionCircuits *(v1.4+)* [{	array		An array of links to the circuits powered by this circuit.
@odata.id	string	*read-write*	Link to another Circuit resource.
}]			
DistributionCircuits@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
Outlets [{ }]	array (object)		An array of references to the outlets contained by this circuit. See the *Outlet* schema for details on this property.
Outlets@odata.count	integer	*read-only*	The number of items in a collection.
PowerOutlet *(v1.4+)* {}	object	*(null)*	A link to the power outlet that provides power to this circuit. See the *Outlet* schema for details on this property.
SourceCircuit *(v1.4+)* {	object	*(null)*	A link to the circuit that provides power to this circuit.
@odata.id	string	*read-write*	Link to another Circuit resource.
}			
}			
LocationIndicatorActive *(v1.1+)*	boolean	*read-write* *(null)*	An indicator allowing an operator to physically locate this resource.
NominalVoltage	string (enum)	*read-only* *(null)*	The nominal voltage for this circuit. *For the possible property values, see NominalVoltage in Property details.*
PhaseWiringType	string (enum)	*read-only* *(null)*	The number of ungrounded current-carrying conductors (phases) and the total number of conductors (wires). *For the possible property values, see PhaseWiringType in Property details.*
PlugType	string (enum)	*read-only* *(null)*	The type of plug according to NEMA, IEC, or regional standards. *For the possible property values, see PlugType in Property details.*

Property	Type	Attributes	Notes
PolyPhaseCurrentAmps {	object	*(null)*	The current readings for this circuit.
Line1 {}	object		Line 1 current (A). For more information about this property, see SensorCurrentExcerpt in Property Details.
Line2 {}	object		Line 2 current (A). For more information about this property, see SensorCurrentExcerpt in Property Details.
Line3 {}	object		Line 3 current (A). For more information about this property, see SensorCurrentExcerpt in Property Details.
Neutral {}	object		Neutral line current (A). For more information about this property, see SensorCurrentExcerpt in Property Details.
}			
PolyPhaseEnergykWh {	object	*(null)*	The energy readings for this circuit.
Line1ToLine2 {}	object		The Line 1 to Line 2 energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
Line1ToNeutral {}	object		The Line 1 to Neutral energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
Line2ToLine3 {}	object		The Line 2 to Line 3 energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
Line2ToNeutral {}	object		The Line 2 to Neutral energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
Line3ToLine1 {}	object		The Line 3 to Line 1 energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
Line3ToNeutral {}	object		The Line 3 to Neutral energy (kWh) for this circuit. For more information about this property, see SensorEnergykWhExcerpt in Property Details.
}			
PolyPhasePowerWatts {	object	*(null)*	The power readings for this circuit.

Property	Type	Attributes	Notes
Line1ToLine2 {}	object		The Line 1 to Line 2 power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
Line1ToNeutral {}	object		The Line 1 to Neutral power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
Line2ToLine3 {}	object		The Line 2 to Line 3 power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
Line2ToNeutral {}	object		The Line 2 to Neutral power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
Line3ToLine1 {}	object		The Line 3 to Line 1 power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
Line3ToNeutral {}	object		The Line 3 to Neutral power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
}			
PolyPhaseVoltage {	object	*(null)*	The voltage readings for this circuit.
Line1ToLine2 {}	object		The Line 1 to Line 2 voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
Line1ToNeutral {}	object		The Line 1 to Neutral voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
Line2ToLine3 {}	object		The Line 2 to Line 3 voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
Line2ToNeutral {}	object		The Line 2 to Neutral voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
Line3ToLine1 {}	object		The Line 3 to Line 1 voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.

Property	Type	Attributes	Notes
Line3ToNeutral {}	object		The Line 3 to Neutral voltage (V) for this circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
}			
PowerControlLocked *(v1.5+)*	boolean	*read-write*	Indicates whether power control requests are locked.
PowerCycleDelaySeconds	number	*read-write (null)*	The number of seconds to delay power on after a PowerControl action to cycle power. Zero seconds indicates no delay.
PowerEnabled	boolean	*read-only (null)*	Indicates if the circuit can be powered.
PowerLoadPercent *(v1.3+)* {}	object		The power load (percent) for this circuit. For more information about this property, see SensorExcerpt in Property Details.
PowerOffDelaySeconds	number	*read-write (null)*	The number of seconds to delay power off after a PowerControl action. Zero seconds indicates no delay to power off.
PowerOnDelaySeconds	number	*read-write (null)*	The number of seconds to delay power up after a power cycle or a PowerControl action. Zero seconds indicates no delay to power up.
PowerRestoreDelaySeconds	number	*read-write (null)*	The number of seconds to delay power on after power has been restored. Zero seconds indicates no delay.
PowerRestorePolicy	string (enum)	*read-write*	The desired power state of the circuit when power is restored after a power loss. *For the possible property values, see PowerRestorePolicy in Property details.*
PowerState	string (enum)	*read-only (null)*	The power state of the circuit. *For the possible property values, see PowerState in Property details.*
PowerStateInTransition *(v1.5+)*	boolean	*read-only*	Indicates whether the power state is undergoing a delayed transition.
PowerWatts {}	object		The power (W) for this circuit. For more information about this property, see SensorPowerExcerpt in Property Details.
RatedCurrentAmps	number (A)	*read-only (null)*	The rated maximum current allowed for this circuit.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

Property	Type	Attributes	Notes
UnbalancedCurrentPercent *(v1.5+)* {}	object		The current imbalance (percent) between phases. For more information about this property, see SensorExcerpt in Property Details.
UnbalancedVoltagePercent *(v1.5+)* {}	object		The voltage imbalance (percent) between phases. For more information about this property, see SensorExcerpt in Property Details.
UserLabel *(v1.4+)*	string	*read-write*	A user-assigned label.
Voltage {}	object		The voltage (V) for this single phase circuit. For more information about this property, see SensorVoltageExcerpt in Property Details.
VoltageType	string (enum)	*read-only (null)*	The type of voltage applied to the circuit. *For the possible property values, see VoltageType in Property details.*

4.2.4 Actions

4.2.4.1 BreakerControl

Description

This action attempts to reset the circuit breaker.

Action URI: {Base URI of target resource}/Actions/Circuit.BreakerControl

Action parameters

Parameter Name	Type	Attributes	Notes
PowerState	string (enum)	*optional*	The desired power state of the circuit if the breaker is reset successfully. *For the possible property values, see PowerState in Property details.*

Request Example

```
{
    "PowerState": "On"
}
```

4.2.4.2 PowerControl

Description

This action turns the circuit on or off.

Action URI: {Base URI of target resource}/Actions/Circuit.PowerControl

Action parameters

Parameter Name	Type	Attributes	Notes
PowerState	string (enum)	*optional*	The desired power state of the circuit. *For the possible property values, see PowerState in Property details.*

Request Example

```
{
    "PowerState": "Off"
}
```

4.2.4.3 ResetMetrics

Description

This action resets metrics related to this circuit.

Action URI: {Base URI of target resource}/Actions/Circuit.ResetMetrics

Action parameters

This action takes no parameters.

4.2.5 Property details

4.2.5.1 BreakerState:

The state of the over current protection device.

string	Description
Normal	The breaker is powered on.
Off	The breaker is off.
Tripped	The breaker has been tripped.

4.2.5.2 CircuitType:

The type of circuit.

string	Description
Branch	A branch (output) circuit.
Bus *(v1.3+)*	An electrical bus circuit.
Feeder	A feeder (output) circuit.
Mains	A mains input or utility circuit.
PowerMeter *(v1.5+)*	A power Metering point.
Subfeed	A subfeed (output) circuit.

4.2.5.3 ElectricalContext:

The combination of current-carrying conductors.

string	Description
Line1	The circuits that share the L1 current-carrying conductor.
Line1ToLine2	The circuit formed by L1 and L2 current-carrying conductors.
Line1ToNeutral	The circuit formed by L1 and neutral current-carrying conductors.
Line1ToNeutralAndL1L2	The circuit formed by L1, L2, and neutral current-carrying conductors.
Line2	The circuits that share the L2 current-carrying conductor.
Line2ToLine3	The circuit formed by L2 and L3 current-carrying conductors.
Line2ToNeutral	The circuit formed by L2 and neutral current-carrying conductors.
Line2ToNeutralAndL1L2	The circuit formed by L1, L2, and Neutral current-carrying conductors.

string	Description
Line2ToNeutralAndL2L3	The circuits formed by L2, L3, and neutral current-carrying conductors.
Line3	The circuits that share the L3 current-carrying conductor.
Line3ToLine1	The circuit formed by L3 and L1 current-carrying conductors.
Line3ToNeutral	The circuit formed by L3 and neutral current-carrying conductors.
Line3ToNeutralAndL3L1	The circuit formed by L3, L1, and neutral current-carrying conductors.
LineToLine	The circuit formed by two current-carrying conductors.
LineToNeutral	The circuit formed by a line and neutral current-carrying conductor.
Neutral	The grounded current-carrying return circuit of current-carrying conductors.
Total	The circuit formed by all current-carrying conductors.

4.2.5.4 IndicatorLED:

The state of the indicator LED, which identifies the circuit.

string	Description
Blinking	The indicator LED is blinking.
Lit	The indicator LED is lit.
Off	The indicator LED is off.

4.2.5.5 NominalVoltage:

The nominal voltage for this circuit.

string	Description
AC100To127V *(v1.6+)*	AC 100-127V nominal.
AC100To240V	AC 100-240V nominal.
AC100To277V	AC 100-277V nominal.
AC120V	AC 120V nominal.
AC200To240V	AC 200-240V nominal.

string	Description
AC200To277V	AC 200-277V nominal.
AC208V	AC 208V nominal.
AC230V	AC 230V nominal.
AC240AndDC380V	AC 200-240V and DC 380V.
AC240V	AC 240V nominal.
AC277AndDC380V	AC 200-277V and DC 380V.
AC277V	AC 277V nominal.
AC400V	AC 400V or 415V nominal.
AC480V	AC 480V nominal.
DC240V	DC 240V nominal.
DC380V	High Voltage DC (380V).
DC48V *(v1.2+)*	DC 48V nominal.
DCNeg48V	-48V DC.

4.2.5.6 PhaseWiringType:

The number of ungrounded current-carrying conductors (phases) and the total number of conductors (wires).

string	Description
OneOrTwoPhase3Wire	Single or Two-Phase / 3-Wire (Line1, Line2 or Neutral, Protective Earth).
OnePhase3Wire	Single-phase / 3-Wire (Line1, Neutral, Protective Earth).
ThreePhase4Wire	Three-phase / 4-Wire (Line1, Line2, Line3, Protective Earth).
ThreePhase5Wire	Three-phase / 5-Wire (Line1, Line2, Line3, Neutral, Protective Earth).
TwoPhase3Wire	Two-phase / 3-Wire (Line1, Line2, Protective Earth).
TwoPhase4Wire	Two-phase / 4-Wire (Line1, Line2, Neutral, Protective Earth).

4.2.5.7 PlugType:

The type of plug according to NEMA, IEC, or regional standards.

string	Description
California_CS8265	California Standard CS8265 (Single-phase 250V; 50A; 2P3W).
California_CS8365	California Standard CS8365 (Three-phase 250V; 50A; 3P4W).
Field_208V_3P4W_60A	Field-wired; Three-phase 200-250V; 60A; 3P4W.
Field_400V_3P5W_32A	Field-wired; Three-phase 200-240/346-415V; 32A; 3P5W.
IEC_60309_316P6	IEC 60309 316P6 (Single-phase 200-250V; 16A; 1P3W; Blue, 6-hour).
IEC_60309_332P6	IEC 60309 332P6 (Single-phase 200-250V; 32A; 1P3W; Blue, 6-hour).
IEC_60309_363P6	IEC 60309 363P6 (Single-phase 200-250V; 63A; 1P3W; Blue, 6-hour).
IEC_60309_460P9	IEC 60309 460P9 (Three-phase 200-250V; 60A; 3P4W; Blue; 9-hour).
IEC_60309_516P6	IEC 60309 516P6 (Three-phase 200-240/346-415V; 16A; 3P5W; Red; 6-hour).
IEC_60309_532P6	IEC 60309 532P6 (Three-phase 200-240/346-415V; 32A; 3P5W; Red; 6-hour).
IEC_60309_560P9	IEC 60309 560P9 (Three-phase 120-144/208-250V; 60A; 3P5W; Blue; 9-hour).
IEC_60309_563P6	IEC 60309 563P6 (Three-phase 200-240/346-415V; 63A; 3P5W; Red; 6-hour).
IEC_60320_C14	IEC C14 (Single-phase 250V; 10A; 1P3W).
IEC_60320_C20	IEC C20 (Single-phase 250V; 16A; 1P3W).
NEMA_5_15P	NEMA 5-15P (Single-phase 125V; 15A; 1P3W).
NEMA_5_20P	NEMA 5-20P (Single-phase 125V; 20A; 1P3W).
NEMA_6_15P	NEMA 6-15P (Single-phase 250V; 15A; 2P3W).
NEMA_6_20P	NEMA 6-20P (Single-phase 250V; 20A; 2P3W).
NEMA_L14_20P	NEMA L14-20P (Split-phase 125/250V; 20A; 2P4W).
NEMA_L14_30P	NEMA L14-30P (Split-phase 125/250V; 30A; 2P4W).
NEMA_L15_20P	NEMA L15-20P (Three-phase 250V; 20A; 3P4W).
NEMA_L15_30P	NEMA L15-30P (Three-phase 250V; 30A; 3P4W).
NEMA_L21_20P	NEMA L21-20P (Three-phase 120/208V; 20A; 3P5W).

string	Description
NEMA_L21_30P	NEMA L21-30P (Three-phase 120/208V; 30A; 3P5W).
NEMA_L22_20P	NEMA L22-20P (Three-phase 277/480V; 20A; 3P5W).
NEMA_L22_30P	NEMA L22-30P (Three-phase 277/480V; 30A; 3P5W).
NEMA_L5_15P	NEMA L5-15P (Single-phase 125V; 15A; 1P3W).
NEMA_L5_20P	NEMA L5-20P (Single-phase 125V; 20A; 1P3W).
NEMA_L5_30P	NEMA L5-30P (Single-phase 125V; 30A; 1P3W).
NEMA_L6_15P	NEMA L6-15P (Single-phase 250V; 15A; 2P3W).
NEMA_L6_20P	NEMA L6-20P (Single-phase 250V; 20A; 2P3W).
NEMA_L6_30P	NEMA L6-30P (Single-phase 250V; 30A; 2P3W).

4.2.5.8 PowerRestorePolicy:

The desired power state of the circuit when power is restored after a power loss.

string	Description
AlwaysOff	Always remain powered off when external power is applied.
AlwaysOn	Always power on when external power is applied.
LastState	Return to the last power state (on or off) when external power is applied.

4.2.5.9 PowerState:

4.2.5.9.1 In top level:

The power state of the circuit.

string	Description
Off	The state is powered off.
On	The state is powered on.
Paused	The state is paused.

string	Description
PoweringOff	A temporary state between on and off.
PoweringOn	A temporary state between off and on.

4.2.5.9.2 In Actions: BreakerControl, Actions: PowerControl:

The desired power state of the circuit if the breaker is reset successfully.

string	Description
Off	Power off.
On	Power on.
PowerCycle *(v1.5+)*	Power cycle.

4.2.5.10 SensorCurrentExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

CrestFactor *(v1.1+)*	number	*read-only (null)*	The crest factor for this sensor.
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.
THDPercent *(v1.1+)*	number	*read-only (null)*	The total harmonic distortion (THD).

4.2.5.11 SensorEnergykWhExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

ApparentkVAh *(v1.5+)*	number (kV.A.h)	*read-only (null)*	Apparent energy (kVAh).
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
LifetimeReading *(v1.1+)*	number	*read-only (null)*	The total accumulation value for this sensor.
ReactivekVARh *(v1.5+)*	number (kV.A.h)	*read-only (null)*	Reactive energy (kVARh).
Reading	number	*read-only (null)*	The sensor value.
SensorResetTime	string (date-time)	*read-only (null)*	The date and time when the time-based properties were last reset.

4.2.5.12 SensorExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.

4.2.5.13 SensorPowerExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

ApparentVA	number (V.A)	*read-only (null)*	The product of voltage and current for an AC circuit, in volt-ampere units.

DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
PhaseAngleDegrees *(v1.5+)*	number	*read-only (null)*	The phase angle (degrees) between the current and voltage waveforms.
PowerFactor	number	*read-only (null)*	The power factor for this sensor.
ReactiveVAR	number (V.A)	*read-only (null)*	The square root of the difference term of squared apparent VA and squared power (Reading) for a circuit, in VAR units.
Reading	number	*read-only (null)*	The sensor value.

4.2.5.14 SensorVoltageExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

CrestFactor *(v1.1+)*	number	*read-only (null)*	The crest factor for this sensor.
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.
THDPercent *(v1.1+)*	number	*read-only (null)*	The total harmonic distortion (THD).

4.2.5.15 VoltageType:

The type of voltage applied to the circuit.

string	Description
AC	Alternating Current (AC) circuit.
DC	Direct Current (DC) circuit.

4.2.6 Example response


```
{
    "@odata.type": "#Circuit.v1_5_0.Circuit",
    "Id": "A",
    "Name": "Branch Circuit A",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "CircuitType": "Branch",
    "PhaseWiringType": "TwoPhase3Wire",
    "NominalVoltage": "AC200To240V",
    "RatedCurrentAmps": 16,
    "BreakerState": "Normal",
    "PolyPhaseVoltage": {
        "Line1ToNeutral": {
            "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/VoltageAL1N",
            "Reading": 118.2
        },
        "Line1ToLine2": {
            "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/VoltageAL1L2",
            "Reading": 203.5
        }
    },
    "CurrentAmps": {
        "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/CurrentA",
        "Reading": 5.19
    },
    "PolyPhaseCurrentAmps": {
        "Line1": {
            "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/CurrentA",
            "Reading": 5.19
        }
    },
    "PowerWatts": {
        "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/PowerA",
        "Reading": 937.4,
        "ApparentVA": 937.4,
        "ReactiveVAR": 0,
        "PowerFactor": 1
    },
```

```
    "PolyPhasePowerWatts": {
        "Line1ToNeutral": {
            "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/PowerA1",
            "Reading": 937.4,
            "PeakReading": 1000.5,
            "ApparentVA": 937.4,
            "ReactiveVAR": 0,
            "PowerFactor": 1
        }
    },
    "FrequencyHz": {
        "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/FrequencyA",
        "Reading": 60
    },
    "EnergykWh": {
        "DataSourceUri": "/redfish/v1/PowerEquipment/RackPDUs/1/Sensors/EnergyA",
        "Reading": 325675
    },
    "Links": {
        "Outlets": [
            {
                "@odata.id": "/redfish/v1/PowerEquipment/RackPDUs/1/Outlets/A1"
            },
            {
                "@odata.id": "/redfish/v1/PowerEquipment/RackPDUs/1/Outlets/A2"
            },
            {
                "@odata.id": "/redfish/v1/PowerEquipment/RackPDUs/1/Outlets/A3"
            }
        ]
    },
    "Actions": {
        "#Circuit.BreakerControl": {
            "target": "/redfish/v1/PowerEquipment/RackPDUs/1/Branches/A/Circuit.BreakerControl"
        },
        "#Outlet.ResetMetrics": {
            "target": "/redfish/v1/PowerEquipment/RackPDUs/1/Branches/A/Circuit.ResetMetrics"
        }
    },
    "@odata.id": "/redfish/v1/PowerEquipment/RackPDUs/1/Branches/A"
}
```


4.3 Control 1.2.0

Version	*v1.2*	*v1.1*	*v1.0*
Release	2022-02-03	2021.4	2021.2

4.3.1 Description

The Control schema describes a control point and its properties.

4.3.2 URIs

/redfish/v1/Chassis/*{ChassisId}*/Controls/*{ControlId}*
/redfish/v1/PowerEquipment/FloorPDUs/*{PowerDistributionId}*/Controls/*{ControlId}*
/redfish/v1/PowerEquipment/PowerShelves/*{PowerDistributionId}*/Controls/*{ControlId}*
/redfish/v1/PowerEquipment/RackPDUs/*{PowerDistributionId}*/Controls/*{ControlId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Controls/*{ControlId}*
/redfish/v1/PowerEquipment/TransferSwitches/*{PowerDistributionId}*/Controls/*{ControlId}*
/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Controls/*{ControlId}*
/redfish/v1/ThermalEquipment/CoolingLoops/*{CoolingUnitId}*/Controls/*{ControlId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Controls/*{ControlId}*

4.3.3 Properties

Property	Type	Attributes	Notes
Accuracy	number (%)	*read-only (null)*	The estimated percent error of measured versus actual values.
AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
AllowableNumericValues [ ]	array (number, null)	*read-only*	The supported values for the set point.
AssociatedSensors [{	array		An array of links to the sensors associated with this control.
@odata.id	string	*read-only*	Link to a Sensor resource. See the Links section and the *Sensor* schema for details.
}]			
ControlDelaySeconds	number	*read-write (null)*	The time delay in seconds before the control will activate once the value has deviated from the set point.
ControlLoop {	object	*(null)*	The control loop details.

Property	Type	Attributes	Notes
CoefficientUpdateTime	string (date-time)	*read-only (null)*	The date and time that the control loop coefficients were changed.
Differential	number	*read-write (null)*	The differential coefficient.
Integral	number	*read-write (null)*	The integral coefficient.
Proportional	number	*read-write (null)*	The proportional coefficient.
}			
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
ControlType	string (enum)	*read-only (null)*	The type of control. *For the possible property values, see ControlType in Property details.*
DeadBand	number	*read-write (null)*	The maximum deviation from the set point allowed before the control will activate.
Implementation	string (enum)	*read-only (null)*	The implementation of the control. *For the possible property values, see Implementation in Property details.*
Increment	number	*read-only (null)*	The smallest increment supported for the set point.
Location {}	object		The location information for this control. See the *Resource* schema for details on this property.
PhysicalContext	string (enum)	*read-only (null)*	The area or device to which this control applies. *For the possible property values, see PhysicalContext in Property details.*
PhysicalSubContext	string (enum)	*read-only (null)*	The usage or location within a device to which this control applies. *For the possible property values, see PhysicalSubContext in Property details.*
RelatedItem [{	array		An array of links to resources that this control services.
@odata.id	string (URI)	*read-only*	The unique identifier for a resource.
}]			
Sensor {	object (excerpt)		The sensor reading associated with this control. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

Property	Type	Attributes	Notes
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.
}			
SetPoint	number	*read-write (null)*	The desired set point of the control.
SetPointType	string (enum)	*read-only (null)*	The set point type used to operate the control. *For the possible property values, see SetPointType in Property details.*
SetPointUnits	string	*read-only (null)*	The units of the set point.
SetPointUpdateTime	string (date-time)	*read-only (null)*	The date and time that the set point was changed.
SettingMax	number	*read-write (null)*	The maximum set point in the allowed range.
SettingMin	number	*read-write (null)*	The minimum set point in the allowed range.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.3.4 Property details

4.3.4.1 ControlMode:

The current operating mode of the control.

string	Description
Automatic	Automatically adjust control to meet the set point.
Disabled	The control has been disabled.
Manual	No automatic adjustments are made to the control.
Override	User override of the automatic set point value.

4.3.4.2 ControlType:

The type of control.

string	Description
Frequency	Frequency (Hz) control.
FrequencyMHz *(v1.1+)*	Frequency (MHz) control.
Power	Power (W) control or power limit.
Pressure *(v1.1+)*	Pressure (kPa) control.
Temperature	Temperature (C) control or thermostat.
Valve *(v1.2+)*	Valve (% open) control.

4.3.4.3 Implementation:

The implementation of the control.

string	Description
Direct	The set point directly affects the control value.
Monitored	A physical control that cannot be adjusted through this interface.
Programmable	The set point can be adjusted through this interface.

4.3.4.4 PhysicalContext:

The area or device to which this control applies.

string	Description
Accelerator	An accelerator.
ACInput	An AC input.
ACMaintenanceBypassInput	An AC maintenance bypass input.
ACOutput	An AC output.
ACStaticBypassInput	An AC static bypass input.

string	Description
ACUtilityInput	An AC utility input.
ASIC	An ASIC device, such as a networking chip or chipset component.
Back	The back of the chassis.
Backplane	A backplane within the chassis.
Battery	A battery.
Board	A circuit board.
Chassis	The entire chassis.
ComputeBay	Within a compute bay.
CoolingSubsystem	The entire cooling, or air and liquid, subsystem.
CPU	A processor (CPU).
CPUSubsystem	The entire processor (CPU) subsystem.
DCBus	A DC bus.
Exhaust	The air exhaust point or points or region of the chassis.
ExpansionBay	Within an expansion bay.
Fan	A fan.
FPGA	An FPGA.
Front	The front of the chassis.
GPU	A graphics processor (GPU).
GPUSubsystem	The entire graphics processor (GPU) subsystem.
Intake	The air intake point or points or region of the chassis.
LiquidInlet	The liquid inlet point of the chassis.
LiquidOutlet	The liquid outlet point of the chassis.
Lower	The lower portion of the chassis.
Memory	A memory device.
MemorySubsystem	The entire memory subsystem.
Motor	A motor.

string	Description
NetworkBay	Within a networking bay.
NetworkingDevice	A networking device.
PowerSubsystem	The entire power subsystem.
PowerSupply	A power supply.
PowerSupplyBay	Within a power supply bay.
Pump	A pump.
Rectifier	A rectifier device.
Room	The room.
StorageBay	Within a storage bay.
StorageDevice	A storage device.
SystemBoard	The system board (PCB).
Transceiver	A transceiver.
Transformer	A transformer.
TrustedModule	A trusted module.
Upper	The upper portion of the chassis.
VoltageRegulator	A voltage regulator device.

4.3.4.5 PhysicalSubContext:

The usage or location within a device to which this control applies.

string	Description
Input	The input.
Output	The output.

4.3.4.6 SetPointType:

The set point type used to operate the control.

string	Description
Range	Control uses a range of values.
Single	Control uses a single set point.

4.3.5 Example response


```
{
    "@odata.type": "#Control.v1_1_0.Control",
    "Id": "PowerLimit",
    "Name": "System Power Limit",
    "PhysicalContext": "Chassis",
    "ControlType": "Power",
    "ControlMode": "Automatic",
    "SetPoint": 500,
    "SetPointUnits": "W",
    "AllowableMax": 1000,
    "AllowableMin": 150,
    "Sensor": {
        "Reading": 374,
        "DataSourceUri": "/redfish/v1/Chassis/1U/Sensors/TotalPower"
    },
    "Status": {
        "Health": "OK",
        "State": "Enabled"
    },
    "@odata.id": "/redfish/v1/Chassis/1U/Controls/PowerLimit"
}
```


4.4 CoolingConnection 1.0.0

Version	*v1.0*
Release	2022-02-03

4.4.1 Description

This is the schema definition for a cooling loop connection.

4.4.2 URIs

/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/PrimaryCoolingConnections/*{CoolingConnectionId}*
/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/SecondaryCoolingConnections/*{CoolingConnectionId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/PrimaryCoolingConnections/*{CoolingConnectionId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/SecondaryCoolingConnections/*{CoolingConnectionId}*

4.4.3 Properties

Property	Type	Attributes	Notes
CoolingConnectionType	string (enum)	*read-only (null)*	The type of CoolingConnection. *For the possible property values, see CoolingConnectionType in Property details.*
CoolingLoopName	string	*read-write (null)*	The name of the cooling loop attached to this interface.
CoolingManagerUri	string (URI)	*read-write (null)*	The link to the application that manages the cooling loop.
DeltaPressurePa {}	object		The differential pressure reading. For more information about this property, see SensorExcerpt in Property Details.
DeltaTemperatureCelsius {}	object		The delta temperature reading. For more information about this property, see SensorExcerpt in Property Details.
DrainValvePercent {	object (excerpt)		The drain valve control. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.
AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.

Property	Type	Attributes	Notes
}			
FlowLSeconds {}	object		The liquid flow (L/sec). For more information about this property, see SensorExcerpt in Property Details.
FluidType	string (enum)	*read-write (null)*	The type of fluid used in the loop. *For the possible property values, see FluidType in Property details.*
GlycolMixturePercent	number (%)	*read-write (null)*	The percent glycol mixture used in the loop.
Links {	object		The links to other resources that are related to this resource.
CoolingLoop {	object	*(null)*	A reference to the CoolingLoop related to this CoolingConnection. See the *CoolingLoop* schema for details on this property.
@odata.id	string	*read-write*	Link to a CoolingLoop resource. See the Links section and the *CoolingLoop* schema for details.
}			
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
LocationIndicatorActive	boolean	*read-write (null)*	An indicator allowing an operator to physically locate this resource.
RatedFlowLSeconds	number (L/s)	*read-only (null)*	The rated liquid flow for this loop interface.
ReturnFlowValve {}	object		The supply flow control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
ReturnPressurePa {}	object		The return pressure reading. For more information about this property, see SensorExcerpt in Property Details.
ReturnTemperatureCelsius {}	object		The return temperature reading. For more information about this property, see SensorExcerpt in Property Details.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.
SupplyFlowValve {}	object		The supply flow control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
SupplyPressurePa {}	object		The supply pressure reading. For more information about this property, see SensorExcerpt in Property Details.

Property	Type	Attributes	Notes
SupplyTemperatureCelsius {}	object		The supply temperature reading. For more information about this property, see SensorExcerpt in Property Details.

4.4.4 Actions

4.4.4.1 ResetMetrics

Description

This action resets metrics related to this CoolingConnection.

Action URI: {Base URI of target resource}/Actions/CoolingConnection.ResetMetrics

Action parameters

This action takes no parameters.

4.4.5 Property details

4.4.5.1 ControlMixedUnitsExcerpt:

The Control schema describes a control point and its properties. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.

AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.

ReadingUnits	string	*read-only (null)*	The units of the sensor reading associated with this control.
SetPointUnits	string	*read-only (null)*	The units of the set point.

4.4.5.2 ControlMode:

The current operating mode of the control.

string	Description
Automatic	Automatically adjust control to meet the set point.
Disabled	The control has been disabled.
Manual	No automatic adjustments are made to the control.
Override	User override of the automatic set point value.

4.4.5.3 CoolingConnectionType:

The type of CoolingConnection.

string	Description
Closed	A closed or self-contained loop.
Primary	A facility input or primary loop interface.
Secondary	An output or secondary loop interface.

4.4.5.4 FluidType:

The type of fluid used in the loop.

string	Description
Dielectric	Dielectric fluid.
GlycolMixture	Water / Glycol mixture.

string	Description
Water	Water.

4.4.5.5 SensorExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.

4.4.6 Example response

```
{
    "@odata.type": "#CoolingConnection.v1_0_0.CoolingConnection",
    "Id": "A",
    "Name": "Rack Cooling Loop A",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "CoolingConnectionType": "Secondary",
    "RatedFlowLSeconds": 30,
    "SupplyFlowValve": {
        "SetPoint": 50,
        "SetPointUnits": "%",
        "Reading": 24.5,
        "ReadingUnits": "L/s"
    },
    "SupplyTemperatureCelsius": {
        "Reading": 14.8
    },
    "ReturnTemperatureCelsius": {
        "Reading": 38.2
    },
    "DeltaTemperatureCelsius": {
        "Reading": 23.4
    },
    "SupplyPressurePa": {
```

```
        "Reading": 426.6
    },
    "ReturnPressurePa": {
        "Reading": 409.9
    },
    "DeltaPressurePa": {
        "Reading": 31.7
    },
    "Links": {
        "CoolingLoop": {
            "@odata.id": "/redfish/v1/ThermalEquipment/CoolingLoops/Rack4"
        }
    },
    "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/SecondaryCoolingConnections/A",
    "@Redfish.Copyright": "Copyright 2014-2020 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.5 CoolingDomain 1.0.0

Version	*v1.0*
Release	2022-02-03

4.5.1 Description

The CoolingDomain schema contains definition for the DCIM cooling domain.

4.5.2 URIs

/redfish/v1/Facilities/*{FacilityId}*/CoolingDomains/*{CoolingDomainId}*

4.5.3 Properties

Property	Type	Attributes	Notes
Links {	object		The links to other resources that are related to this resource.
CDUs [{	array		An array of links to the rack-level cooling distribution units in this cooling domain.
@odata.id	string	*read-write*	Link to a CoolingUnit resource. See the Links section and the *CoolingUnit* schema for details.

Property	Type	Attributes	Notes
}]			
CDUs@odata.count	integer	*read-only*	The number of items in a collection.
ImmersionUnits [{	array		An array of links to immersion cooling units in this cooling domain.
@odata.id	string	*read-write*	Link to a CoolingUnit resource. See the Links section and the *CoolingUnit* schema for details.
}]			
ImmersionUnits@odata.count	integer	*read-only*	The number of items in a collection.
ManagedBy [{ }]	array (object)		An array of links to the managers responsible for managing this cooling domain. See the *Manager* schema for details on this property.
ManagedBy@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.5.4 Example response

```
{
    "@odata.type": "#CoolingDomain.v1_0_0.CoolingDomain",
    "Id": "Row1",
    "Name": "Row #1 Domain",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Links": {
        "ManagedBy": [
            {
                "@odata.id": "/redfish/v1/Managers/CDU"
            }
        ],
        "CDUs": [
            {
```

```
                "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1"
            }
        ]
    },
    "@odata.id": "/redfish/v1/Facilities/Room237/CoolingDomains/Row1",
    "@Redfish.Copyright": "Copyright 2014-2021 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.6 CoolingLoop 1.0.0

Version	*v1.0*
Release	2022-02-03

4.6.1 Description

This is the schema definition for a cooling loop.

4.6.2 URIs

/redfish/v1/ThermalEquipment/CoolingLoops/*{CoolingLoopId}*

4.6.3 Properties

Property	Type	Attributes	Notes
ConsumingEquipmentNames [ ]	array (string, null)	*read-write*	An array of names of downstream devices that receive coolant from this loop.
CoolingLoopType	string (enum)	*read-only (null)*	The type of CoolingLoop. *For the possible property values, see CoolingLoopType in Property details.*
CoolingManagerUri	string (URI)	*read-write (null)*	The link to the application that manages the cooling loop.
DeltaPressurePa {}	object		The differential pressure reading. For more information about this property, see SensorExcerpt in Property Details.

Property	Type	Attributes	Notes
DeltaTemperatureCelsius {}	object		The differential temperature reading. For more information about this property, see SensorExcerpt in Property Details.
DrainValvePercent {	object (excerpt)		The drain valve control. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.
AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.
}			
FluidLevelPercent {}	object		The percent of fluid capacity filled. For more information about this property, see SensorExcerpt in Property Details.
FluidLevelStatus	string (enum)	*read-only (null)*	The level of the fluid in the loop. *For the possible property values, see FluidLevelStatus in Property details.*
FluidQuality	string (enum)	*read-only (null)*	The quality of the fluid in the loop. *For the possible property values, see FluidQuality in Property details.*
FluidType	string (enum)	*read-write (null)*	The type of fluid used in the loop. *For the possible property values, see FluidType in Property details.*
GlycolMixturePercent	number (%)	*read-write (null)*	The percent glycol mixture used in the loop.
Links {	object		The links to other resources that are related to this resource.
ConsumingEquipment [{	array		Any array of links to equipment receiving coolant from this loop.
@odata.id	string (URI)	*read-only*	The unique identifier for a resource.

Property	Type	Attributes	Notes
}]			
ConsumingEquipment@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
LocationIndicatorActive	boolean	*read-write* *(null)*	An indicator allowing an operator to physically locate this resource.
RatedFlowLSeconds	number (L/s)	*read-only* *(null)*	The rated liquid flow for this loop interface.
ReturnFlowValve {}	object		The supply flow control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
ReturnPressurePa {}	object		The return pressure reading. For more information about this property, see SensorExcerpt in Property Details.
ReturnTemperatureCelsius {}	object		The return temperature reading. For more information about this property, see SensorExcerpt in Property Details.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.
SupplyEquipmentNames [ ]	array (string, null)	*read-write*	An array of names of upstream devices that supply coolant to this loop.
SupplyFlowValve {}	object		The supply flow control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
SupplyPressurePa {}	object		The supply pressure reading. For more information about this property, see SensorExcerpt in Property Details.
SupplyTemperatureCelsius {}	object		The supply temperature reading. For more information about this property, see SensorExcerpt in Property Details.

4.6.4 Actions

4.6.4.1 ResetMetrics

Description

This action resets metrics related to this CoolingLoop.

Action URI: {Base URI of target resource}/Actions/CoolingLoop.ResetMetrics

Action parameters

This action takes no parameters.

4.6.5 Property details

4.6.5.1 ControlMixedUnitsExcerpt:

The Control schema describes a control point and its properties. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.

AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.
ReadingUnits	string	*read-only (null)*	The units of the sensor reading associated with this control.

SetPointUnits	string	*read-only (null)*	The units of the set point.

4.6.5.2 ControlMode:

The current operating mode of the control.

string	Description
Automatic	Automatically adjust control to meet the set point.
Disabled	The control has been disabled.
Manual	No automatic adjustments are made to the control.
Override	User override of the automatic set point value.

4.6.5.3 CoolingLoopType:

The type of CoolingLoop.

string	Description
Condenser	A Condenser Water System (CWS).
Facility	A Facilities Water System (FWS).
Immersion	A tank or other form of immersion cooling.
Internal	A loop fully contained within a chassis.
Technology	A Technology Cooling System (TCS).

4.6.5.4 FluidLevelStatus:

The level of the fluid in the loop.

string	Description
Critical	A critical condition requires immediate attention.
OK	Normal.

string	Description
Warning	A condition requires attention.

4.6.5.5 FluidQuality:

The quality of the fluid in the loop.

string	Description
Abnormal	Abnormal fluid quality.
Normal	Normal fluid quality.

4.6.5.6 FluidType:

The type of fluid used in the loop.

string	Description
Dielectric	Dielectric fluid.
GlycolMixture	Water / Glycol mixture.
Water	Water.

4.6.5.7 SensorExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.

4.6.6 Example response


```
{
    "@odata.type": "#CoolingLoop.v1_0_0.CoolingLoop",
    "Id": "BuildingChiller",
    "Name": "Feed from building chiller",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "CoolingLoopType": "Facility",
    "SupplyEquipmentNames": [ "Chiller" ],
    "ConsumingEquipmentNames": [ "Rack #1 CDU", "Rack #2 CDU", "Rack #3 CDU", "Rack #4 CDU"],
    "SupplyTemperatureCelsius": {
        "Reading": 13.7
    },
    "SupplyPressurePa": {
        "Reading": 414.4
    },
    "SupplyFlowValve": {
        "OperatingMode": "Manual",
        "Reading": 15.7,
        "ReadingUnits": "L/s",
        "SetPoint": 80,
        "SetPointUnits": "%"
    },
    "Links": {
        "ConsumingEquipment": [
            {
                "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1"
            }
        ]
    },
    "@odata.id": "/redfish/v1/ThermalEquipment/CoolingLoops/BuildingChiller",
    "@Redfish.Copyright": "Copyright 2014-2021 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.7 CoolingUnit 1.0.0

Version	*v1.0*
Release	2022-02-03

4.7.1 Description

This is the schema definition for a cooling distribution component or unit, such as a rack cooling distribution unit (CDU) or an air conditioner.

4.7.2 URIs

/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*
/redfish/v1/ThermalEquipment/CRACs/*{CoolingUnitId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*

4.7.3 Properties

Property	Type	Attributes	Notes
AssetTag	string	*read-write (null)*	The user-assigned asset tag for this equipment.
Controls {	object		The link to the collection of controls. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Control*. See the Control schema for details.
}			
EnvironmentMetrics {}	object		The link to the environment metrics for this equipment. See the *EnvironmentMetrics* schema for details on this property.
EquipmentType	string (enum)	*read-only required*	The type of equipment this resource represents. *For the possible property values, see EquipmentType in Property details.*
Filters {	object		A link to the filters for this equipment. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Filter*. See the Filter schema for details.
}			
FirmwareVersion	string	*read-only*	The firmware version of this equipment.
Links {	object		The links to other resources that are related to this resource.
Chassis [{	array		An array of links to the chassis that contain this equipment.
@odata.id	string	*read-only*	Link to a Chassis resource. See the Links section and the *Chassis* schema for details.

Property	Type	Attributes	Notes
}]			
Chassis@odata.count	integer	*read-only*	The number of items in a collection.
Facility {	object		A link to the facility that contains this equipment. See the *Facility* schema for details on this property.
@odata.id	string	*read-only*	Link to a Facility resource. See the Links section and the *Facility* schema for details.
}			
ManagedBy [{ }]	array (object)		An array of links to the managers responsible for managing this equipment. See the *Manager* schema for details on this property.
ManagedBy@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Location {}	object		The location of the equipment. See the *Resource* schema for details on this property.
Manufacturer	string	*read-only (null)*	The manufacturer of this equipment.
Model	string	*read-only (null)*	The product model number of this equipment.
PartNumber	string	*read-only (null)*	The part number for this equipment.
PowerMeter {	object		A link to the power meter for the serviced equipment. See the *Circuit* schema for details on this property.
@odata.id	string	*read-only*	Link to a Circuit resource. See the Links section and the *Circuit* schema for details.
}			
PrimaryCoolingConnections {	object		A link to the primary cooling loop interfaces for this equipment. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingConnection*. See the CoolingConnection schema for details.
}			

Property	Type	Attributes	Notes
ProductionDate	string (date-time)	*read-only (null)*	The production or manufacturing date of this equipment.
Pumps {	object		A link to the pumps for this equipment. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Pump*. See the Pump schema for details.
}			
Reservoirs {	object		A link to the reservoirs for this equipment. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Reservoir*. See the Reservoir schema for details.
}			
SecondaryCoolingConnections {	object		A link to the secondary cooling loop interfaces for this equipment. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingConnection*. See the CoolingConnection schema for details.
}			
Sensors {	object		A link to the collection of sensors located in the equipment and sub-components. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Sensor*. See the Sensor schema for details.
}			
SerialNumber	string	*read-only (null)*	The serial number for this equipment.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.
UUID	string	*read-only (null)*	The UUID for this equipment.
Version	string	*read-only (null)*	The hardware version of this equipment.

4.7.4 Property details

4.7.4.1 EquipmentType:

The type of equipment this resource represents.

string	Description
AirConditioner	A air conditioning unit providing cooling for a room or facility.
AirHandler	An air handler unit providing cooling for a room or facility.
CDU	A cooling distribution unit providing cooling for a rack or similar quantity of devices.
HeatExchanger	A heat exchanger.
ImmersionUnit	An immersion cooling unit.

4.7.5 Example response


```
{
    "@odata.type": "#CoolingUnit.v1_0_0.CoolingUnit",
    "Id": "1",
    "EquipmentType": "RackCDU",
    "Name": "Rack #4 Cooling Distribution Unit",
    "FirmwareVersion": "3.2.0",
    "Version": "1.03b",
    "ProductionDate": "2020-12-24T08:00:00Z",
    "Manufacturer": "Contoso",
    "Model": "BRRR4000",
    "SerialNumber": "29347ZT536",
    "PartNumber": "ICE-9",
    "UUID": "32354641-4135-4332-4a35-313735303734",
    "AssetTag": "PDX5-92381",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Location": {
        "Placement": {
            "Row": "North 1"
        }
    },
    "PrimaryCoolingConnections": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/PrimaryCoolingConnections"
    },
```

```
    "SecondaryCoolingConnections": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/SecondaryCoolingConnections"
    },
    "Pumps": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Pumps"
    },
    "Filters": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Filters"
    },
    "EnvironmentMetrics": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/EnvironmentMetrics"
    },
    "PowerMeter": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/PowerMeter"
    },
    "Sensors": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Sensors"
    },
    "Controls": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Controls"
    },
    "Links": {
        "Facility": {
            "@odata.id": "/redfish/v1/Facilities/Room237"
        }
    },
    "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1",
    "@Redfish.Copyright": "Copyright 2014-2021 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.8 Facility 1.4.0

Version	*v1.4*	*v1.3*	*v1.2*	*v1.1*	*v1.0*
Release	2022-02-03	2021.3	2021.2	2020.4	2019.4

4.8.1 Description

The Facility schema represents the physical location containing equipment, such as a room, building, or campus.

4.8.2 URIs

/redfish/v1/Facilities/*{FacilityId}*

4.8.3 Properties

Property	Type	Attributes	Notes
AmbientMetrics *(v1.1+)* {}	object		The link to the ambient environment metrics for this facility. See the *EnvironmentMetrics* schema for details on this property.
EnvironmentMetrics *(v1.1+)* {}	object		The link to the environment metrics for this facility. See the *EnvironmentMetrics* schema for details on this property.
FacilityType	string (enum)	*read-only* *required*	The type of location this resource represents. *For the possible property values, see FacilityType in Property details.*
Links {	object		The links to other resources that are related to this resource.
ContainedByFacility {	object		The link to the facility that contains this facility.
@odata.id	string	*read-write*	Link to another Facility resource.
}			
ContainsChassis [{	array		An array of links to outermost chassis contained within this facility.
@odata.id	string	*read-write*	Link to a Chassis resource. See the Links section and the *Chassis* schema for details.
}]			
ContainsChassis@odata.count	integer	*read-only*	The number of items in a collection.
ContainsFacilities [{	array		An array of links to other facilities contained within this facility.
@odata.id	string	*read-write*	Link to another Facility resource.
}]			
ContainsFacilities@odata.count	integer	*read-only*	The number of items in a collection.
CoolingLoops *(v1.4+)* [{	array		An array of links to the cooling loops in this facility.
@odata.id	string	*read-write*	Link to a CoolingLoop resource. See the Links section and the *CoolingLoop* schema for details.
}]			
CoolingLoops@odata.count	integer	*read-only*	The number of items in a collection.

Property	Type	Attributes	Notes
CoolingUnits *(v1.4+)* [{	array		An array of links to the cooling units in this facility.
@odata.id	string	*read-write*	Link to a CoolingUnit resource. See the Links section and the *CoolingUnit* schema for details.
}]			
CoolingUnits@odata.count	integer	*read-only*	The number of items in a collection.
ElectricalBuses *(v1.3+)* [{ }]	array (object)		An array of links to the electrical buses in this facility. See the *PowerDistribution* schema for details on this property.
ElectricalBuses@odata.count	integer	*read-only*	The number of items in a collection.
FloorPDUs [{ }]	array (object)		An array of links to the floor power distribution units in this facility. See the *PowerDistribution* schema for details on this property.
FloorPDUs@odata.count	integer	*read-only*	The number of items in a collection.
ManagedBy [{ }]	array (object)		An array of links to the managers responsible for managing this facility. See the *Manager* schema for details on this property.
ManagedBy@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
PowerShelves *(v1.2+)* [{ }]	array (object)		An array of links to the power shelves in this facility. See the *PowerDistribution* schema for details on this property.
PowerShelves@odata.count	integer	*read-only*	The number of items in a collection.
RackPDUs [{ }]	array (object)		An array of links to the rack-level power distribution units in this facility. See the *PowerDistribution* schema for details on this property.
RackPDUs@odata.count	integer	*read-only*	The number of items in a collection.
Switchgear [{ }]	array (object)		An array of links to the switchgear in this facility. See the *PowerDistribution* schema for details on this property.
Switchgear@odata.count	integer	*read-only*	The number of items in a collection.
TransferSwitches [{ }]	array (object)		An array of links to the transfer switches in this facility. See the *PowerDistribution* schema for details on this property.
TransferSwitches@odata.count	integer	*read-only*	The number of items in a collection.
}			

Property	Type	Attributes	Notes
Location {}	object		The location of the facility. See the *Resource* schema for details on this property.
PowerDomains {	object		Link to the power domains in this facility. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *PowerDomain*. See the PowerDomain schema for details.
}			
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.8.4 Property details

4.8.4.1 FacilityType:

The type of location this resource represents.

string	Description
Building	A structure with a roof and walls.
Floor	A floor inside of a building.
Room	A room inside of a building or floor.
Site	A small area consisting of several buildings.

4.8.5 Example response

```
{
    "@odata.type": "#Facility.v1_3_0.Facility",
    "Id": "Room237",
    "Name": "Room #237, 2nd Floor",
    "FacilityType": "Room",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Location": {
```

```
        "PostalAddress": {
            "Country": "US",
            "Territory": "OR",
            "City": "Portland",
            "Street": "1001 SW 5th Avenue",
            "HouseNumber": 1100,
            "Name": "DMTF, Inc.",
            "PostalCode": "97204",
            "Floor": "2",
            "Room": "237"
        }
    },
    "PowerDomains": {
        "@odata.id": "/redfish/v1/Facilities/Room237/PowerDomains"
    },
    "Links": {
        "ContainedByFacility": {
            "@odata.id": "/redfish/v1/Facilities/Building"
        },
        "RackPDUs": [
            {
                "@odata.id": "/redfish/v1/PowerEquipment/RackPDUs/1"
            }
        ]
    },
    "@odata.id": "/redfish/v1/Facilities/Room237"
}
```


4.9 Filter 1.0.0

Version	*v1.0*
Release	2022-02-03

4.9.1 Description

The Filter schema describes a Filter unit for a cooling system or similar device.

4.9.2 URIs

/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Filters/*{FilterId}*
/redfish/v1/ThermalEquipment/CRACs/*{CoolingUnitId}*/Filters/*{FilterId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Filters/*{FilterId}*

4.9.3 Properties

Property	Type	Attributes	Notes
Assembly {}	object		The link to the assembly associated with this Filter. See the *Assembly* schema for details on this property.
FilterType	string	*read-only* *(null)*	The type of filter.
InstallDate	string (date-time)	*read-write* *(null)*	The date this filter was installed.
Links {	object		The links to other resources that are related to this resource.
CoolingLoop {	object	*(null)*	A reference to the CoolingLoop related to this CoolingConnection. See the *CoolingLoop* schema for details on this property.
@odata.id	string	*read-write*	Link to a CoolingLoop resource. See the Links section and the *CoolingLoop* schema for details.
}			
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Location {}	object		The location of the Filter. See the *Resource* schema for details on this property.
LocationIndicatorActive	boolean	*read-write* *(null)*	An indicator allowing an operator to physically locate this resource.
Manufacturer	string	*read-only* *(null)*	The manufacturer of this Filter.
Model	string	*read-only* *(null)*	The model number for this Filter.
PartNumber	string	*read-only* *(null)*	The part number for this Filter.
PhysicalContext	string (enum)	*read-only*	The area or device associated with this Filter. *For the possible property values, see PhysicalContext in Property details.*
ReplaceDate	string (date-time)	*read-write* *(null)*	The date this filter should be replaced.

Property	Type	Attributes	Notes
SerialNumber	string	*read-only (null)*	The serial number for this Filter.
SparePartNumber	string	*read-only (null)*	The spare part number for this Filter.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.9.4 Property details

4.9.4.1 PhysicalContext:

The area or device associated with this Filter.

string	Description
Accelerator	An accelerator.
ACInput	An AC input.
ACMaintenanceBypassInput	An AC maintenance bypass input.
ACOutput	An AC output.
ACStaticBypassInput	An AC static bypass input.
ACUtilityInput	An AC utility input.
ASIC	An ASIC device, such as a networking chip or chipset component.
Back	The back of the chassis.
Backplane	A backplane within the chassis.
Battery	A battery.
Board	A circuit board.
Chassis	The entire chassis.
ComputeBay	Within a compute bay.
CoolingSubsystem	The entire cooling, or air and liquid, subsystem.
CPU	A processor (CPU).

string	Description
CPUSubsystem	The entire processor (CPU) subsystem.
DCBus	A DC bus.
Exhaust	The air exhaust point or points or region of the chassis.
ExpansionBay	Within an expansion bay.
Fan	A fan.
FPGA	An FPGA.
Front	The front of the chassis.
GPU	A graphics processor (GPU).
GPUSubsystem	The entire graphics processor (GPU) subsystem.
Intake	The air intake point or points or region of the chassis.
LiquidInlet	The liquid inlet point of the chassis.
LiquidOutlet	The liquid outlet point of the chassis.
Lower	The lower portion of the chassis.
Memory	A memory device.
MemorySubsystem	The entire memory subsystem.
Motor	A motor.
NetworkBay	Within a networking bay.
NetworkingDevice	A networking device.
PowerSubsystem	The entire power subsystem.
PowerSupply	A power supply.
PowerSupplyBay	Within a power supply bay.
Pump	A pump.
Rectifier	A rectifier device.
Room	The room.
StorageBay	Within a storage bay.
StorageDevice	A storage device.

string	Description
SystemBoard	The system board (PCB).
Transceiver	A transceiver.
Transformer	A transformer.
TrustedModule	A trusted module.
Upper	The upper portion of the chassis.
VoltageRegulator	A voltage regulator device.

4.9.5 Example response


```
{
    "@odata.type": "#Filter.v1_0_0.Filter",
    "Id": "1",
    "FilterType": "Cartridge",
    "Name": "Cooling Loop Filter",
    "InstallDate": "2020-12-24T08:00:00Z",
    "ReplaceDate": "2021-12-24T08:00:00Z",
    "Manufacturer": "Contoso",
    "Model": "MrCoffee",
    "PartNumber": "Cone4",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Location": {
        "Placement": {
            "Row": "North 1"
        }
    },
    "Links": {
        "CoolingLoop": {
            "@odata.id": "/redfish/v1/ThermalEquipment/CoolingLoops/BuildingChiller"
        }
    },
    "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Filters/1",
    "@Redfish.Copyright": "Copyright 2014-2020 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```

4.10 Pump 1.0.0

Version	*v1.0*
Release	2022-02-03

4.10.1 Description

The Pump schema describes a Pump unit for a cooling system or similar device.

4.10.2 URIs

/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Pumps/*{PumpId}*
/redfish/v1/ThermalEquipment/CRACs/*{CoolingUnitId}*/Pumps/*{PumpId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Pumps/*{PumpId}*

4.10.3 Properties

Property	Type	Attributes	Notes
Assembly {}	object		The link to the assembly associated with this Pump. See the *Assembly* schema for details on this property.
AssetTag	string	*read-write (null)*	The user-assigned asset tag for this equipment.
FirmwareVersion	string	*read-only*	The firmware version of this equipment.
FrequencyControlHz {	object (excerpt)		The operating speed (Hz). This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.
AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.

Property	Type	Attributes	Notes
Reading	number	*read-only* *(null)*	The reading of the sensor associated with this control.
}			
Links {	object		The links to other resources that are related to this resource.
CoolingLoop {	object	*(null)*	A reference to the CoolingLoop related to this CoolingConnection. See the *CoolingLoop* schema for details on this property.
@odata.id	string	*read-write*	Link to a CoolingLoop resource. See the Links section and the *CoolingLoop* schema for details.
}			
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Location {}	object		The location of the Pump. See the *Resource* schema for details on this property.
LocationIndicatorActive	boolean	*read-write* *(null)*	An indicator allowing an operator to physically locate this resource.
Manufacturer	string	*read-only* *(null)*	The manufacturer of this Pump.
Model	string	*read-only* *(null)*	The model number for this Pump.
PartNumber	string	*read-only* *(null)*	The part number for this Pump.
PhysicalContext	string (enum)	*read-only*	The area or device associated with this Pump. *For the possible property values, see PhysicalContext in Property details.*
PowerMeter {	object		A link to the power meter for this equipment. See the *Circuit* schema for details on this property.
@odata.id	string	*read-only*	Link to a Circuit resource. See the Links section and the *Circuit* schema for details.
}			
ProductionDate	string (date-time)	*read-only* *(null)*	The production or manufacturing date of this equipment.

Property	Type	Attributes	Notes
PumpType	string (enum)	*read-only (null)*	The type of pump. *For the possible property values, see PumpType in Property details.*
SerialNumber	string	*read-only (null)*	The serial number for this Pump.
SparePartNumber	string	*read-only (null)*	The spare part number for this Pump.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.
UUID	string	*read-only (null)*	The UUID for this equipment.
Version	string	*read-only (null)*	The hardware version of this equipment.

4.10.4 Property details

4.10.4.1 ControlMode:

The current operating mode of the control.

string	Description
Automatic	Automatically adjust control to meet the set point.
Disabled	The control has been disabled.
Manual	No automatic adjustments are made to the control.
Override	User override of the automatic set point value.

4.10.4.2 PhysicalContext:

The area or device associated with this Pump.

string	Description
Accelerator	An accelerator.
ACInput	An AC input.

string	Description
ACMaintenanceBypassInput	An AC maintenance bypass input.
ACOutput	An AC output.
ACStaticBypassInput	An AC static bypass input.
ACUtilityInput	An AC utility input.
ASIC	An ASIC device, such as a networking chip or chipset component.
Back	The back of the chassis.
Backplane	A backplane within the chassis.
Battery	A battery.
Board	A circuit board.
Chassis	The entire chassis.
ComputeBay	Within a compute bay.
CoolingSubsystem	The entire cooling, or air and liquid, subsystem.
CPU	A processor (CPU).
CPUSubsystem	The entire processor (CPU) subsystem.
DCBus	A DC bus.
Exhaust	The air exhaust point or points or region of the chassis.
ExpansionBay	Within an expansion bay.
Fan	A fan.
FPGA	An FPGA.
Front	The front of the chassis.
GPU	A graphics processor (GPU).
GPUSubsystem	The entire graphics processor (GPU) subsystem.
Intake	The air intake point or points or region of the chassis.
LiquidInlet	The liquid inlet point of the chassis.
LiquidOutlet	The liquid outlet point of the chassis.
Lower	The lower portion of the chassis.

string	Description
Memory	A memory device.
MemorySubsystem	The entire memory subsystem.
Motor	A motor.
NetworkBay	Within a networking bay.
NetworkingDevice	A networking device.
PowerSubsystem	The entire power subsystem.
PowerSupply	A power supply.
PowerSupplyBay	Within a power supply bay.
Pump	A pump.
Rectifier	A rectifier device.
Room	The room.
StorageBay	Within a storage bay.
StorageDevice	A storage device.
SystemBoard	The system board (PCB).
Transceiver	A transceiver.
Transformer	A transformer.
TrustedModule	A trusted module.
Upper	The upper portion of the chassis.
VoltageRegulator	A voltage regulator device.

4.10.4.3 PumpType:

The type of pump.

string	Description
Compressor	A compressor.
Liquid	A water or liquid pump.

4.10.5 Example response


```
{
    "@odata.type": "#Pump.v1_0_0.Pump",
    "Id": "1",
    "PumpType": "Liquid",
    "Name": "CDU Pump",
    "Version": "1.03b",
    "ProductionDate": "2020-12-24T08:00:00Z",
    "Manufacturer": "Contoso",
    "Model": "UP-JAM",
    "SerialNumber": "29347ZT536",
    "PartNumber": "MAARS",
    "UUID": "32354641-4135-4332-4a35-313735303734",
    "AssetTag": "PDX5-92381",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "FrequencyControlHz": {
        "OperatingMode": "Automatic",
        "SetPoint": 68,
        "Reading": 68
    },
    "PowerMeter": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Pumps/1/PowerMeter"
    },

    "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Pumps/1",
    "@Redfish.Copyright": "Copyright 2014-2020 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.11 Reservoir 1.0.0

Version	*v1.0*
Release	2022-02-03

4.11.1 Description

The Reservoir schema describes a Reservoir unit for a cooling system or similar device.

4.11.2 URIs

/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Reservoirs/*{ReservoirId}*
/redfish/v1/ThermalEquipment/CRACs/*{CoolingUnitId}*/Reservoirs/*{ReservoirId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Reservoirs/*{ReservoirId}*

4.11.3 Properties

Property	Type	Attributes	Notes
AirBleedValve {	object (excerpt)		The air bleed valve control. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.
AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.
}			
Assembly {}	object		The link to the assembly associated with this Reservoir. See the *Assembly* schema for details on this property.
CapacityLiters	number	*read-only (null)*	The capacity of the reservoir (l).
DrainValve {}	object		The drain valve control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
FillValve {}	object		The fill valve control. For more information about this property, see ControlMixedUnitsExcerpt in Property Details.
FluidLevel	string (enum)	*read-only (null)*	The level of the fluid in the reservoir. *For the possible property values, see FluidLevel in Property details.*
FluidLevelPercent {}	object		The percent of fluid capacity filled. For more information about this property, see SensorExcerpt in Property Details.

Property	Type	Attributes	Notes
InternalPressurePa {}	object		The internal pressure reading. For more information about this property, see SensorExcerpt in Property Details.
Links {	object		The links to other resources that are related to this resource.
CoolingLoop {	object	*(null)*	A reference to the CoolingLoop related to this reservoir. See the *CoolingLoop* schema for details on this property.
@odata.id	string	*read-write*	Link to a CoolingLoop resource. See the Links section and the *CoolingLoop* schema for details.
}			
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Location {}	object		The location of the reservoir. See the *Resource* schema for details on this property.
LocationIndicatorActive	boolean	*read-write* *(null)*	An indicator allowing an operator to physically locate this resource.
Manufacturer	string	*read-only* *(null)*	The manufacturer of this reservoir.
Model	string	*read-only* *(null)*	The model number for this reservoir.
PartNumber	string	*read-only* *(null)*	The part number for this reservoir.
PhysicalContext	string (enum)	*read-only*	The area or device associated with this Reservoir. *For the possible property values, see PhysicalContext in Property details.*
ReservoirType	string	*read-only* *(null)*	The type of reservoir.
SerialNumber	string	*read-only* *(null)*	The serial number for this reservoir.
SparePartNumber	string	*read-only* *(null)*	The spare part number for this reservoir.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.11.4 Property details

4.11.4.1 ControlMixedUnitsExcerpt:

The Control schema describes a control point and its properties. This object is an excerpt of the *Control* resource located at the URI shown in DataSourceUri.

AllowableMax	number	*read-only (null)*	The maximum possible setting for this control.
AllowableMin	number	*read-only (null)*	The minimum possible setting for this control.
ControlMode	string (enum)	*read-write (null)*	The current operating mode of the control. *For the possible property values, see ControlMode in Property details.*
DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this control.
Reading	number	*read-only (null)*	The reading of the sensor associated with this control.
ReadingUnits	string	*read-only (null)*	The units of the sensor reading associated with this control.
SetPointUnits	string	*read-only (null)*	The units of the set point.

4.11.4.2 ControlMode:

The current operating mode of the control.

string	Description
Automatic	Automatically adjust control to meet the set point.
Disabled	The control has been disabled.
Manual	No automatic adjustments are made to the control.

string	Description
Override	User override of the automatic set point value.

4.11.4.3 FluidLevel:

The level of the fluid in the reservoir.

string	Description
Critical	A critical condition requires immediate attention.
OK	Normal.
Warning	A condition requires attention.

4.11.4.4 PhysicalContext:

The area or device associated with this Reservoir.

string	Description
Accelerator	An accelerator.
ACInput	An AC input.
ACMaintenanceBypassInput	An AC maintenance bypass input.
ACOutput	An AC output.
ACStaticBypassInput	An AC static bypass input.
ACUtilityInput	An AC utility input.
ASIC	An ASIC device, such as a networking chip or chipset component.
Back	The back of the chassis.
Backplane	A backplane within the chassis.
Battery	A battery.
Board	A circuit board.
Chassis	The entire chassis.
ComputeBay	Within a compute bay.

string	Description
CoolingSubsystem	The entire cooling, or air and liquid, subsystem.
CPU	A processor (CPU).
CPUSubsystem	The entire processor (CPU) subsystem.
DCBus	A DC bus.
Exhaust	The air exhaust point or points or region of the chassis.
ExpansionBay	Within an expansion bay.
Fan	A fan.
FPGA	An FPGA.
Front	The front of the chassis.
GPU	A graphics processor (GPU).
GPUSubsystem	The entire graphics processor (GPU) subsystem.
Intake	The air intake point or points or region of the chassis.
LiquidInlet	The liquid inlet point of the chassis.
LiquidOutlet	The liquid outlet point of the chassis.
Lower	The lower portion of the chassis.
Memory	A memory device.
MemorySubsystem	The entire memory subsystem.
Motor	A motor.
NetworkBay	Within a networking bay.
NetworkingDevice	A networking device.
PowerSubsystem	The entire power subsystem.
PowerSupply	A power supply.
PowerSupplyBay	Within a power supply bay.
Pump	A pump.
Rectifier	A rectifier device.
Room	The room.

string	Description
StorageBay	Within a storage bay.
StorageDevice	A storage device.
SystemBoard	The system board (PCB).
Transceiver	A transceiver.
Transformer	A transformer.
TrustedModule	A trusted module.
Upper	The upper portion of the chassis.
VoltageRegulator	A voltage regulator device.

4.11.4.5 SensorExcerpt:

The Sensor schema describes a sensor and its properties. This object is an excerpt of the *Sensor* resource located at the URI shown in DataSourceUri.

DataSourceUri	string (URI)	*read-only (null)*	The link to the resource that provides the data for this sensor.
Reading	number	*read-only (null)*	The sensor value.

4.11.5 Example response

```
{
    "@odata.type": "#Reservoir.v1_0_0.Reservoir",
    "Id": "1",
    "ReservoirType": "Expansion",
    "Name": "Cooling Loop Reservoir",
    "Manufacturer": "Contoso",
    "Model": "Tarantino",
    "CapacityLiters": 10,
    "PartNumber": "Pink",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
```

```
    "Location": {
        "Placement": {
            "Row": "North 1"
        }
    },
    "FluidLevelPercent": {
        "Reading": 64.8
    },
    "InternalPressurePa": {
        "Reading": 427.6
    },
    "FillValve": {
        "State": "Open",
        "Reading": 4.2,
        "ReadingUnits": "L/s"
    },
    "DrainValve": {
        "State": "Closed"
    },
    "AirBleedValve": {
        "State": "Closed"
    },
    "Links": {
        "CoolingLoop": {
            "@odata.id": "/redfish/v1/ThermalEquipment/CoolingLoops/Rack4"
        }
    },
    "@odata.id": "/redfish/v1/ThermalEquipment/CDUs/1/Reservoirs/1",
    "@Redfish.Copyright": "Copyright 2014-2020 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```


4.12 Sensor 1.5.0

Version	*v1.5*	*v1.4*	*v1.3*	*v1.2*	*v1.1*	*v1.0*
Release	2021.4	2021.2	2021.1	2020.4	2019.4	2018.3

4.12.1 Description

The Sensor schema describes a sensor and its properties.

4.12.2 URIs

/redfish/v1/Chassis/*{ChassisId}*/Sensors/*{SensorId}*

/redfish/v1/PowerEquipment/FloorPDUs/*{PowerDistributionId}*/Sensors/*{SensorId}*
/redfish/v1/PowerEquipment/PowerShelves/*{PowerDistributionId}*/Sensors/*{SensorId}*
/redfish/v1/PowerEquipment/RackPDUs/*{PowerDistributionId}*/Sensors/*{SensorId}*
/redfish/v1/PowerEquipment/Sensors/*{SensorId}*
/redfish/v1/PowerEquipment/Switchgear/*{PowerDistributionId}*/Sensors/*{SensorId}*
/redfish/v1/PowerEquipment/TransferSwitches/*{PowerDistributionId}*/Sensors/*{SensorId}*
/redfish/v1/ThermalEquipment/CDUs/*{CoolingUnitId}*/Sensors/*{SensorId}*
/redfish/v1/ThermalEquipment/CoolingLoops/*{CoolingUnitId}*/Sensors/*{SensorId}*
/redfish/v1/ThermalEquipment/ImmersionUnits/*{CoolingUnitId}*/Sensors/*{SensorId}*

4.12.3 Properties

Property	Type	Attributes	Notes
Accuracy	number (%)	*read-only (null)*	The estimated percent error of measured versus actual values.
AdjustedMaxAllowableOperatingValue	number	*read-only (null)*	The adjusted maximum allowable operating value for this equipment based on the environmental conditions.
AdjustedMinAllowableOperatingValue	number	*read-only (null)*	The adjusted minimum allowable operating value for this equipment based on the environmental conditions.
ApparentkVAh *(v1.5+)*	number (kV.A.h)	*read-only (null)*	Apparent energy (kVAh).
ApparentVA	number (V.A)	*read-only (null)*	The product of voltage and current for an AC circuit, in volt-ampere units.
AverageReading *(v1.4+)*	number	*read-only (null)*	The average sensor value.
AveragingInterval *(v1.4+)*	string	*read-write (null)*	The interval over which the average sensor value is calculated.
AveragingIntervalAchieved *(v1.4+)*	boolean	*read-only (null)*	Indicates that enough readings were collected to calculate the average sensor reading over the averaging interval time.
Calibration *(v1.4+)*	number	*read-write (null)*	The calibration offset applied to the Reading.
CalibrationTime *(v1.4+)*	string (date-time)	*read-write (null)*	The date and time that the sensor was last calibrated.
CrestFactor *(v1.1+)*	number	*read-only (null)*	The crest factor for this sensor.

Property	Type	Attributes	Notes
ElectricalContext	string (enum)	*read-only (null)*	The combination of current-carrying conductors. *For the possible property values, see ElectricalContext in Property details.*
Implementation *(v1.1+)*	string (enum)	*read-only (null)*	The implementation of the sensor. *For the possible property values, see Implementation in Property details.*
LifetimeReading *(v1.1+)*	number	*read-only (null)*	The total accumulation value for this sensor.
Links *(v1.3+)* {	object		The links to other resources that are related to this resource.
AssociatedControls *(v1.4+)* [{	array		An array of links to the controls that can affect this sensor.
@odata.id	string	*read-only*	Link to a Control resource. See the Links section and the *Control* schema for details.
}]			
AssociatedControls@odata.count	integer	*read-only*	The number of items in a collection.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
LoadPercent *(deprecated v1.1)*	number (%)	*read-only (null)*	The power load utilization for this sensor. *Deprecated in v1.1 and later. This property has been deprecated in favor of using a sensor instance with a ReadingType of* `Percent` *to show utilization values when needed.*
Location {}	object		The location information for this sensor. See the *Resource* schema for details on this property.
LowestReading *(v1.4+)*	number	*read-only (null)*	The lowest sensor value.
LowestReadingTime *(v1.4+)*	string (date-time)	*read-only (null)*	The time when the lowest sensor value occurred.
MaxAllowableOperatingValue	number	*read-only (null)*	The maximum allowable operating value for this equipment.
MinAllowableOperatingValue	number	*read-only (null)*	The minimum allowable operating value for this equipment.

Property	Type	Attributes	Notes
PeakReading	number	*read-only (null)*	The peak sensor value.
PeakReadingTime	string (date-time)	*read-only (null)*	The time when the peak sensor value occurred.
PhaseAngleDegrees *(v1.5+)*	number	*read-only (null)*	The phase angle (degrees) between the current and voltage waveforms.
PhysicalContext	string (enum)	*read-only (null)*	The area or device to which this sensor measurement applies. *For the possible property values, see PhysicalContext in Property details.*
PhysicalSubContext	string (enum)	*read-only (null)*	The usage or location within a device to which this sensor measurement applies. *For the possible property values, see PhysicalSubContext in Property details.*
PowerFactor	number	*read-only (null)*	The power factor for this sensor.
Precision	number	*read-only (null)*	The number of significant digits in the reading.
ReactivekVARh *(v1.5+)*	number (kV.A.h)	*read-only (null)*	Reactive energy (kVARh).
ReactiveVAR	number (V.A)	*read-only (null)*	The square root of the difference term of squared apparent VA and squared power (Reading) for a circuit, in VAR units.
Reading	number	*read-only (null)*	The sensor value.
ReadingRangeMax	number	*read-only (null)*	The maximum possible value for this sensor.
ReadingRangeMin	number	*read-only (null)*	The minimum possible value for this sensor.
ReadingTime *(v1.1+)*	string (date-time)	*read-only (null)*	The date and time that the reading was acquired from the sensor.
ReadingType	string (enum)	*read-only (null)*	The type of sensor. *For the possible property values, see ReadingType in Property details.*
ReadingUnits	string	*read-only (null)*	The units of the reading and thresholds.
RelatedItem *(v1.2+)* [{	array		An array of links to resources or objects that this sensor services.

Property	Type	Attributes	Notes
@odata.id	string (URI)	*read-only*	The unique identifier for a resource.
}]			
SensingFrequency *(deprecated v1.1)*	number	*read-only* *(null)*	The time interval between readings of the physical sensor. *Deprecated in v1.1 and later. This property has been deprecated in favor of the SensingInterval property, which uses the duration time format for interoperability.*
SensingInterval *(v1.1+)*	string	*read-only* *(null)*	The time interval between readings of the sensor.
SensorGroup *(v1.4+)* {}	object		The group of sensors that provide readings for this sensor. See the *v1_4_0.v1_4_0* schema for details on this property.
SensorResetTime	string (date-time)	*read-only* *(null)*	The date and time when the time-based properties were last reset.
SpeedRPM *(v1.2+)*	number ({rev}/min)	*read-only* *(null)*	The rotational speed.
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.
THDPercent *(v1.1+)*	number	*read-only* *(null)*	The total harmonic distortion (THD).
Thresholds {	object		The set of thresholds defined for this sensor.
LowerCaution {}	object		The value at which the reading is below normal range. For more information about this property, see Threshold in Property Details.
LowerCautionUser *(v1.2+)* {}	object		The value at which the reading is below normal range. For more information about this property, see Threshold in Property Details.
LowerCritical {}	object		The value at which the reading is below normal range but not yet fatal. For more information about this property, see Threshold in Property Details.
LowerCriticalUser *(v1.2+)* {}	object		The value at which the reading is below normal range but not yet fatal. For more information about this property, see Threshold in Property Details.

Property	Type	Attributes	Notes
LowerFatal {}	object		The value at which the reading is below normal range and fatal. For more information about this property, see Threshold in Property Details.
UpperCaution {}	object		The value at which the reading is above normal range. For more information about this property, see Threshold in Property Details.
UpperCautionUser *(v1.2+)* {}	object		The value at which the reading is above normal range. For more information about this property, see Threshold in Property Details.
UpperCritical {}	object		The value at which the reading is above normal range but not yet fatal. For more information about this property, see Threshold in Property Details.
UpperCriticalUser *(v1.2+)* {}	object		The value at which the reading is above normal range but not yet fatal. For more information about this property, see Threshold in Property Details.
UpperFatal {}	object		The value at which the reading is above normal range and fatal. For more information about this property, see Threshold in Property Details.
}			
VoltageType	string (enum)	*read-only (null)*	The voltage type for this sensor. *For the possible property values, see VoltageType in Property details.*

4.12.4 Actions

4.12.4.1 ResetMetrics

Description

Resets metrics related to this sensor.

Action URI: {Base URI of target resource}/Actions/Sensor.ResetMetrics

Action parameters

This action takes no parameters.

4.12.5 Property details

4.12.5.1 Activation:

The direction of crossing that activates this threshold.

string	Description
Decreasing	Value decreases below the threshold.
Either	Value crosses the threshold in either direction.
Increasing	Value increases above the threshold.

4.12.5.2 ElectricalContext:

The combination of current-carrying conductors.

string	Description
Line1	The circuits that share the L1 current-carrying conductor.
Line1ToLine2	The circuit formed by L1 and L2 current-carrying conductors.
Line1ToNeutral	The circuit formed by L1 and neutral current-carrying conductors.
Line1ToNeutralAndL1L2	The circuit formed by L1, L2, and neutral current-carrying conductors.
Line2	The circuits that share the L2 current-carrying conductor.
Line2ToLine3	The circuit formed by L2 and L3 current-carrying conductors.
Line2ToNeutral	The circuit formed by L2 and neutral current-carrying conductors.
Line2ToNeutralAndL1L2	The circuit formed by L1, L2, and Neutral current-carrying conductors.
Line2ToNeutralAndL2L3	The circuits formed by L2, L3, and neutral current-carrying conductors.
Line3	The circuits that share the L3 current-carrying conductor.
Line3ToLine1	The circuit formed by L3 and L1 current-carrying conductors.
Line3ToNeutral	The circuit formed by L3 and neutral current-carrying conductors.
Line3ToNeutralAndL3L1	The circuit formed by L3, L1, and neutral current-carrying conductors.
LineToLine	The circuit formed by two current-carrying conductors.

string	Description
LineToNeutral	The circuit formed by a line and neutral current-carrying conductor.
Neutral	The grounded current-carrying return circuit of current-carrying conductors.
Total	The circuit formed by all current-carrying conductors.

4.12.5.3 Implementation:

The implementation of the sensor.

string	Description
PhysicalSensor	The reading is acquired from a physical sensor.
Reported	The reading is obtained from software or a device.
Synthesized	The reading is obtained by applying a calculation on one or more properties or multiple sensors. The calculation is not provided.

4.12.5.4 PhysicalContext:

The area or device to which this sensor measurement applies.

string	Description
Accelerator	An accelerator.
ACInput	An AC input.
ACMaintenanceBypassInput	An AC maintenance bypass input.
ACOutput	An AC output.
ACStaticBypassInput	An AC static bypass input.
ACUtilityInput	An AC utility input.
ASIC	An ASIC device, such as a networking chip or chipset component.
Back	The back of the chassis.
Backplane	A backplane within the chassis.
Battery	A battery.

string	Description
Board	A circuit board.
Chassis	The entire chassis.
ComputeBay	Within a compute bay.
CoolingSubsystem	The entire cooling, or air and liquid, subsystem.
CPU	A processor (CPU).
CPUSubsystem	The entire processor (CPU) subsystem.
DCBus	A DC bus.
Exhaust	The air exhaust point or points or region of the chassis.
ExpansionBay	Within an expansion bay.
Fan	A fan.
FPGA	An FPGA.
Front	The front of the chassis.
GPU	A graphics processor (GPU).
GPUSubsystem	The entire graphics processor (GPU) subsystem.
Intake	The air intake point or points or region of the chassis.
LiquidInlet	The liquid inlet point of the chassis.
LiquidOutlet	The liquid outlet point of the chassis.
Lower	The lower portion of the chassis.
Memory	A memory device.
MemorySubsystem	The entire memory subsystem.
Motor	A motor.
NetworkBay	Within a networking bay.
NetworkingDevice	A networking device.
PowerSubsystem	The entire power subsystem.
PowerSupply	A power supply.
PowerSupplyBay	Within a power supply bay.

string	Description
Pump	A pump.
Rectifier	A rectifier device.
Room	The room.
StorageBay	Within a storage bay.
StorageDevice	A storage device.
SystemBoard	The system board (PCB).
Transceiver	A transceiver.
Transformer	A transformer.
TrustedModule	A trusted module.
Upper	The upper portion of the chassis.
VoltageRegulator	A voltage regulator device.

4.12.5.5 PhysicalSubContext:

The usage or location within a device to which this sensor measurement applies.

string	Description
Input	The input.
Output	The output.

4.12.5.6 ReadingType:

The type of sensor.

string	Description
AbsoluteHumidity *(v1.5+)*	Absolute humidity (g/cu m).
AirFlow	Airflow (cu ft/min).
Altitude	Altitude (m).
Barometric	Barometric pressure (mm).

string	Description
ChargeAh *(v1.4+)*	Charge (Ah).
Current	Current (A).
EnergyJoules	Energy (J).
EnergykWh	Energy (kWh).
EnergyWh *(v1.4+)*	Energy (Wh).
Frequency	Frequency (Hz).
Humidity	Relative humidity (percent).
LiquidFlow	Liquid flow (L/s).
LiquidLevel	Liquid level (cm).
Percent *(v1.1+)*	Percent (%).
Power	Power (W).
Pressure	Pressure (Pa).
PressurekPa *(v1.5+)*	Pressure (kPa).
Rotational	Rotational (RPM).
Temperature	Temperature (C).
Voltage	Voltage (VAC or VDC).

4.12.5.7 Threshold:

The threshold definition for a sensor.

Activation	string (enum)	*read-write (null)*	The direction of crossing that activates this threshold. *For the possible property values, see Activation in Property details.*
DwellTime	string	*read-write (null)*	The duration the sensor value must violate the threshold before the threshold is activated.
Reading	number	*read-write (null)*	The threshold value.

4.12.5.8 VoltageType:

The voltage type for this sensor.

string	Description
AC	Alternating current.
DC	Direct current.

4.12.6 Example response


```
{
    "@odata.type": "#Sensor.v1_5_0.Sensor",
    "Id": "CabinetTemp",
    "Name": "Rack Temperature",
    "ReadingType": "Temperature",
    "ReadingTime": "2019-12-25T04:14:33+06:00",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Reading": 31.6,
    "ReadingUnits": "C",
    "ReadingRangeMin": 0,
    "ReadingRangeMax": 70,
    "Accuracy": 0.25,
    "Precision": 1,
    "SensingInterval": "PT3S",
    "PhysicalContext": "Chassis",
    "Thresholds": {
        "UpperCritical": {
            "Reading": 40,
            "Activation": "Increasing"
        },
        "UpperCaution": {
            "Reading": 35,
            "Activation": "Increasing"
        },
        "LowerCaution": {
            "Reading": 10,
            "Activation": "Increasing"
        }
    },
    "Oem": {},
    "@odata.id": "/redfish/v1/Chassis/1/Sensors/CabinetTemp"
```

```
}
```

4.13 ServiceRoot 1.14.0

Version	*v1.14*	*v1.13*	*v1.12*	*v1.11*	*v1.10*	*v1.9*	*v1.8*	*v1.7*	*v1.6*	*v1.5*	*v1.4*	...
Release	2022-02-03	2021.4	2021.3	2021.2	2021.1	2020.3	2020.2	2020.1	2019.4	2018.3	2018.2	...

4.13.1 Description

The ServiceRoot schema describes the root of the Redfish Service, located at the '/redfish/v1' URI. All other Resources accessible through the Redfish interface on this device are linked directly or indirectly from the Service Root.

4.13.2 URIs

/redfish/v1
/redfish/v1/

4.13.3 Properties

Property	Type	Attributes	Notes
AccountService {}	object		The link to the Account Service. See the *AccountService* schema for details on this property.
AggregationService *(v1.8+)* {}	object		The link to the aggregation service. See the *AggregationService* schema for details on this property.
Cables *(v1.11+)* {	object		The link to a collection of cables. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Cable*. See the Cable schema for details.
}			
CertificateService *(v1.5+)* {}	object		The link to the Certificate Service. See the *CertificateService* schema for details on this property.
Chassis {	object		The link to a collection of chassis. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Chassis*. See the Chassis schema for details.

Property	Type	Attributes	Notes
}			
ComponentIntegrity *(v1.13+)* {	object		The link to a collection of component integrity information. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *ComponentIntegrity*. See the ComponentIntegrity schema for details.
}			
CompositionService *(v1.2+)* {}	object		The link to the Composition Service. See the *CompositionService* schema for details on this property.
EventService {}	object		The link to the Event Service. See the *EventService* schema for details on this property.
Fabrics *(v1.1+)* {	object		The link to a collection of all fabric entities. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Fabric*. See the Fabric schema for details.
}			
Facilities *(v1.6+)* {	object		The link to a collection of facilities. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Facility*. See the Facility schema for details.
}			
JobService *(v1.4+)* {}	object		The link to the JobService. See the *JobService* schema for details on this property.
JsonSchemas {	object		The link to a collection of JSON Schema files. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *JsonSchemaFile*. See the JsonSchemaFile schema for details.
}			
KeyService *(v1.11+)* {}	object		The link to the key service. See the *KeyService* schema for details on this property.
LicenseService *(v1.12+)* {}	object		The link to the license service. See the *LicenseService* schema for details on this property.
Links {	object	* required*	The links to other Resources that are related to this Resource.
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.

Property	Type	Attributes	Notes
Sessions {	object	* required*	The link to a collection of Sessions. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Session*. See the Session schema for details.
}			
}			
Managers {	object		The link to a collection of managers. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Manager*. See the Manager schema for details.
}			
NVMeDomains *(v1.10+)* {}	object		The link to a collection of NVMe domains.
PowerEquipment *(v1.6+)* {}	object		The link to a set of power equipment. See the *PowerEquipment* schema for details on this property.
Product *(v1.3+)*	string	*read-only* *(null)*	The product associated with this Redfish Service.
ProtocolFeaturesSupported *(v1.3+)* {	object		The information about protocol features that the service supports.
DeepOperations *(v1.7+)* {	object		The information about deep operations that the service supports.
DeepPATCH *(v1.7+)*	boolean	*read-only*	An indication of whether the service supports the deep PATCH operation.
DeepPOST *(v1.7+)*	boolean	*read-only*	An indication of whether the service supports the deep POST operation.
MaxLevels *(v1.7+)*	integer	*read-only*	The maximum levels of resources allowed in deep operations.
}			
ExcerptQuery *(v1.4+)*	boolean	*read-only*	An indication of whether the service supports the excerpt query parameter.
ExpandQuery *(v1.3+)* {	object		The information about the use of $expand in the service.
ExpandAll *(v1.3+)*	boolean	*read-only*	An indication of whether the service supports the asterisk (`*`) option of the $expand query parameter.
Levels *(v1.3+)*	boolean	*read-only*	An indication of whether the service supports the $levels option of the $expand query parameter.

Property	Type	Attributes	Notes
Links *(v1.3+)*	boolean	*read-only*	An indication of whether this service supports the tilde (`~`) option of the $expand query parameter.
MaxLevels *(v1.3+)*	integer	*read-only*	The maximum $levels option value in the $expand query parameter.
NoLinks *(v1.3+)*	boolean	*read-only*	An indication of whether the service supports the period (`.`) option of the $expand query parameter.
}			
FilterQuery *(v1.3+)*	boolean	*read-only*	An indication of whether the service supports the $filter query parameter.
OnlyMemberQuery *(v1.4+)*	boolean	*read-only*	An indication of whether the service supports the only query parameter.
SelectQuery *(v1.3+)*	boolean	*read-only*	An indication of whether the service supports the $select query parameter.
}			
RedfishVersion	string	*read-only*	The version of the Redfish Service.
RegisteredClients *(v1.13+)* {	object		The link to a collection of registered clients. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *RegisteredClient*. See the RegisteredClient schema for details.
}			
Registries {	object		The link to a collection of Registries. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *MessageRegistryFile*. See the MessageRegistryFile schema for details.
}			
ResourceBlocks *(v1.5+)* {	object		The link to a collection of all Resource Block Resources. This collection is intended for implementations that do not contain a Composition Service but that expose Resources to an orchestrator that implements a Composition Service. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *ResourceBlock*. See the ResourceBlock schema for details.
}			

Property	Type	Attributes	Notes
ServiceConditions *(v1.13+)* {}	object		The link to the service conditions. See the *ServiceConditions* schema for details on this property.
SessionService {}	object		The link to the Sessions Service. See the *SessionService* schema for details on this property.
Storage *(v1.9+)* {	object		The link to a collection of storage subsystems. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *Storage*. See the Storage schema for details.
}			
StorageServices *(v1.1+)* {}	object		The link to a collection of all storage service entities.
StorageSystems *(v1.1+)* {}	object		The link to a collection of storage systems.
Systems {	object		The link to a collection of systems. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *ComputerSystem*. See the ComputerSystem schema for details.
}			
Tasks {}	object		The link to the Task Service. See the *TaskService* schema for details on this property.
TelemetryService *(v1.4+)* {}	object		The link to the Telemetry Service. See the *TelemetryService* schema for details on this property.
ThermalEquipment *(v1.14+)* {	object		The link to a set of cooling equipment. See the *ThermalEquipment* schema for details on this property.
@odata.id	string	*read-only*	Link to a ThermalEquipment resource. See the Links section and the *ThermalEquipment* schema for details.
}			
UpdateService *(v1.1+)* {}	object		The link to the Update Service. See the *UpdateService* schema for details on this property.
UUID	string	*read-only* *(null)*	Unique identifier for a service instance. When SSDP is used, this value should be an exact match of the UUID value returned in a 200 OK from an SSDP M-SEARCH request during discovery.
Vendor *(v1.5+)*	string	*read-only* *(null)*	The vendor or manufacturer associated with this Redfish Service.

4.13.4 Property details

4.13.4.1 idRef:

@odata.id	string (URI)	*read-only*	The unique identifier for a resource.

4.13.5 Example response


```
{
    "@odata.type": "#ServiceRoot.v1_13_0.ServiceRoot",
    "Id": "RootService",
    "Name": "Root Service",
    "RedfishVersion": "1.6.0",
    "UUID": "92384634-2938-2342-8820-489239905423",
    "Product": "UR99 1U Server",
    "ProtocolFeaturesSupported": {
        "ExpandQuery": {
            "ExpandAll": true,
            "Levels": true,
            "MaxLevels": 2,
            "Links": true,
            "NoLinks": true
        },
        "SelectQuery": false,
        "FilterQuery": false,
        "OnlyMemberQuery": true,
        "ExcerptQuery": true
    },
    "ServiceConditions": {
        "@odata.id": "/redfish/v1/ServiceConditions"
    },
    "Systems": {
        "@odata.id": "/redfish/v1/Systems"
    },
    "Chassis": {
        "@odata.id": "/redfish/v1/Chassis"
    },
    "Managers": {
        "@odata.id": "/redfish/v1/Managers"
    },
    "UpdateService": {
        "@odata.id": "/redfish/v1/UpdateService"
    },
    "CompositionService": {
        "@odata.id": "/redfish/v1/CompositionService"
```

```
    },
    "Tasks": {
        "@odata.id": "/redfish/v1/TaskService"
    },
    "SessionService": {
        "@odata.id": "/redfish/v1/SessionService"
    },
    "AccountService": {
        "@odata.id": "/redfish/v1/AccountService"
    },
    "EventService": {
        "@odata.id": "/redfish/v1/EventService"
    },
    "Links": {
        "Sessions": {
            "@odata.id": "/redfish/v1/SessionService/Sessions"
        }
    },
    "Oem": {},
    "@odata.id": "/redfish/v1/"
}
```


4.14 ThermalEquipment 1.0.0

Version	*v1.0*
Release	2022-02-03

4.14.1 Description

This is the schema definition for the set of cooling equipment.

4.14.2 URIs

/redfish/v1/ThermalEquipment

4.14.3 Properties

Property	Type	Attributes	Notes
AirConditioners {	object		A link to a collection of Air Conditioning units. Contains a link to a resource.

Property	Type	Attributes	Notes
@odata.id	string	*read-only*	Link to Collection of *CoolingUnit*. See the CoolingUnit schema for details.
}			
AirHandlers {	object		A link to a collection of Air Handler units. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingUnit*. See the CoolingUnit schema for details.
}			
CDUs {	object		A link to a collection of rack-level cooling distribution units. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingUnit*. See the CoolingUnit schema for details.
}			
CoolingLoops {	object		A link to a collection of cooling loops. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingLoop*. See the CoolingLoop schema for details.
}			
HeatExchangers {	object		A link to a collection of heat exchanger units. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingUnit*. See the CoolingUnit schema for details.
}			
ImmersionUnits {	object		A link to a collection of immersion cooling units. Contains a link to a resource.
@odata.id	string	*read-only*	Link to Collection of *CoolingUnit*. See the CoolingUnit schema for details.
}			
Links {	object		The links to other resources that are related to this resource.
ManagedBy [{ }]	array (object)		An array of links to the managers responsible for managing this equipment. See the *Manager* schema for details on this property.
ManagedBy@odata.count	integer	*read-only*	The number of items in a collection.

Property	Type	Attributes	Notes
Oem {}	object		The OEM extension property. See the *Resource* schema for details on this property.
}			
Status {}	object		The status and health of the resource and its subordinate or dependent resources. See the *Resource* schema for details on this property.

4.14.4 Example response

```
{
    "@odata.type": "#ThermalEquipment.v1_0_0.ThermalEquipment",
    "Id": "ThermalEquipment",
    "Name": "Cooling Equipment",
    "Status": {
        "State": "Enabled",
        "HealthRollup": "OK"
    },
    "CDUs": {
        "@odata.id": "/redfish/v1/ThermalEquipment/CDUs"
    },
    "Links": {},
    "@odata.id": "/redfish/v1/ThermalEquipment",
    "@Redfish.Copyright": "Copyright 2014-2021 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/ab
}
```

5 Redfish documentation generator

This document was created using the Redfish Documentation Generator utility, which uses the contents of the Redfish schema files (in JSON schema format) to automatically generate the bulk of the text. The source code for the utility is available for download at the DMTF's Github repository located at http://www.github.com/DMTF/Redfish-Tools.