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Compute Project

# OCP Server Hardware Management Interface (Redfish Profile) v0.2.0

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## 1. Scope

This document specifies the model for managing Open Compute Project (OCP) server platforms hardware via a Redfish interface.

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### 3. Overview

Scalability in today's data center is increasingly achieved with horizontal, scale-out solutions, which often include large quantities of simple servers. The usage model of scale-out hardware is drastically different than that of traditional enterprise platforms, and requires a new approach to management.

Designed to meet the expectations of end users for simple and secure management of modern scalable platform hardware, DMTF's Redfish® is an open industry standard specification and schema that specifies a RESTful interface and utilizes JSON and OData to help customers integrate solutions within their existing tool chains. An aggressive development schedule is quickly advancing Redfish toward its goal of addressing all the components in the data center with a consistent API. ([dmtf.org/redfish](http://dmtf.org/redfish))

#### 1.1 License

As of January 19, 2018, the following persons or entities have made this Specification available under the Open Web Foundation Final Specification Agreement (OWFa 1.0), which is available at <http://www.openwebfoundation.org/legal/the-owf-1-0-agreements/owfa-1-0>:

Intel Corporation

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## 4. Introduction

### 1.2 Reference Documents

Redfish Whitepaper ([DSP2044 v1.0.2](#), June 2017)

Redfish Scalable Platforms API Specification ([DSP0266 v1.4.0](#), Dec 2017).

Redfish Schema ([DSP8010 v2017.3](#), Dec 2017)

Redfish Interoperability Profiles Specification ([DSP0272 v0.99.0a](#), Dec 2017, Work-in-Progress)

OCP Baseline Hardware Management (Redfish Profile) (v0.2.0, Jan 2018, draft)

### 1.3 Redfish

The Redfish Scalable Platforms Management API ("Redfish") is a standard that uses RESTful interface semantics to access data defined in model format to perform systems management. It is suitable for a wide range of servers, from stand-alone servers to rack mount and blade environments but scales equally well for large scale cloud environments.

### 1.4 Redfish Profile Format

The Redfish Interoperability Profile is a JSON document which contains Schema-level, Property-level, and Registry-level requirements. A Redfish Profile file provides a machine readable file for prescriptive requirements on an implementation.

In the Profile JSON file, the requirements are expressed as the value to the ReadRequirement, WriteRequirement, and ConditionalRequirement properties.

The value of the ReadRequirement and WriteRequirement properties can be:

- Mandatory – must be present
- Recommended – optional and recommended, and may be mandatory in the future
- IfImplemented – must be present, if the managed entity is implemented

The ConditionalRequirement property specifies more complex conditions on the existence of a property.

## 5. Redfish Profile for OCP Server Hardware Management

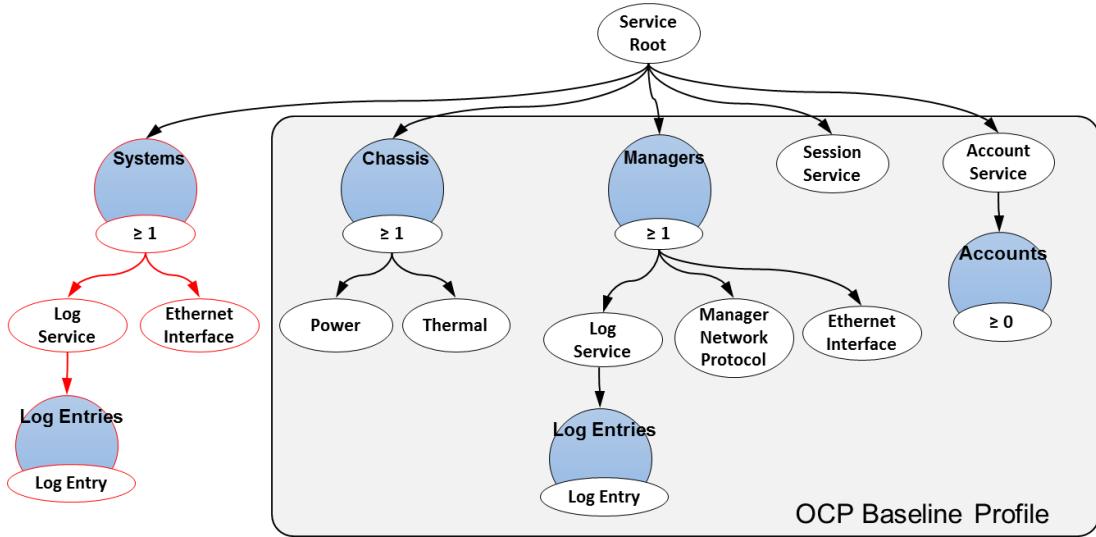
The Redfish model for OCP Server Hardware Management is specified in this document.

The figure below shows the resources which are specified in the OCP Server Hardware Management model and for which the specification imposes requirements. The diagram shows the OCP Server Hardware Management profile as an extension to the OCP Baseline Hardware Management profile.

The above dependency is encapsulated in the Profile JSON file, in the following fragment. The OCP Server Hardware Management Profile JSON file is only allowed to add requirements to the OCP Baseline Hardware Management Profile JSON file. It may not relax a requirement from the

referenced OCP Baseline Hardware Management Profile.

```
"RequiredProfiles": {
    "OCPBaselineHardwareManagement": {
        "MinVersion": "1.0.0"
    }
},
```



The subsequent sections specifies the requirements per resource. Each section has a mockup, which shows the properties of the resource and the properties with requirements. The properties requirement are specified in a subsequent table.

(The mockups include a superset of properties for a resource. The properties which have a requirement in this document are bold-faced. This provides context, during of this document, for decisions on whether additional (or fewer) requirements should be stated in this document.)

Section 6 contains the Redfish Profile file which expresses these same requirements.

## 1.5 Service Root resource

The ServiceRoot resource shall exists.

Figure 1 shows a mockup of the ServiceRoot resource. The properties in bold have requirements, which are specified in Table 1.

```
{
    "@odata.context": "/redfish/v1/$metadata#ServiceRoot.ServiceRoot",
    "@odata.id": "/redfish/v1/",
    "@odata.type": "#ServiceRoot.v1_3_0.ServiceRoot",
    "Id": "RootService",
    "Name": "Root Service",
    "Product": "Contoso WidgetDeluxe 8744",
    "RedfishVersion": "1.0.0",
    "UUID": "92384634-2938-2342-8820-489239905423",

    "Systems": { ... },
    "Chassis": { ... },
    "Managers": { ... },
    "SessionService": { ... },
    "AccountService": { ... },
    "Fabrics": { ... },
```

```
{
  "Tasks": { ... },
  "EventService": { ... },
  "UpdateService": { ... },
  "CompositionService": { ... },
  "Registries": { ... },
  "JsonSchemas": { ... },
  "Links": {
    "Sessions": { ... }
  }
}
```

**Figure 1 – Mockup of ServiceRoot resource**

**Table 1 - Requirement for ServiceRoot resource properties**

Property	Requirement	Value
Chassis	Mandatory	
Systems	Mandatory	

## 1.6 Systems collection resource

Figure 6 shows a mockup of the Systems collection resource. The properties in bold have requirements, which are specified in Table 6.

```
{
  "@odata.context": "/redfish/v1/$metadata#SystemCollection.SystemCollection",
  "@odata.id": "/redfish/v1/Systems",
  "@odata.type": "#SystemCollection.SystemCollection",
  "Name": "System Collection",
  "Members@odata.countMembers

```

**Figure 2 – Mockup of Systems collection resource**

**Table 2 - Requirement for Systems collection resource properties**

Property	Requirement	Value
<b>Members@odata.count</b>	Mandatory	$\geq 1$
<b>Members</b>	Mandatory	$\geq <\text{one item}>$

## 1.7 ComputerSystem resource

Figure 7 shows a mockup of the ComputerSystem resource. The properties in bold have requirements, which are specified in Table 7.

The ComputerSystem resource version shall be at least "1.0.0".

```
{
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.id": "/redfish/v1/Systems/1",
  "@odata.type": "#ComputerSystem.v1_5_0.ComputerSystem",
  "Id": "1",
  "Name": "My Computer System",
  "Description": "Description of server",
  "SystemType

```

```

"PartNumber": "",
"UUID": "00000000-0000-0000-0000-000000000000",
"HostName": "web-srv344",
>Status": {
    "State": "Enabled",
    "Health": "OK",
    "HealthRollup": "OK"
},
"IndicatorLED": "Off",
"PowerState": "On",
"Boot": {
    "BootSourceOverrideEnabled": "Once",
    "BootSourceOverrideMode": "UEFI",
    "BootSourceOverrideTarget": "Pxe",
    "BootSourceOverrideTarget@Redfish.AllowableValues": [ ... ],
    "UefiTargtBootSourceOverride": "",
    "BootOptions": { ... },
    "BootNext": "Boot0003",
    "BootOrder": [ ... ]
},
"BiosVersion": "P79 v1.00 (09/20/2013)",
"ProcessorSummary": {
    "Count": 8,
    "Model": "Multi-Core Intel(R) Xeon(R) processor 7xxx Series",
    "LogicalProcessorCount": 256,
    "Status": {
        "State": "Enabled",
        "Health": "OK",
        "HealthRollup": "OK"
    }
},
"MemorySummary": {
    "TotalSystemMemoryGiB": 16,
    "MemoryMirroring": "System",
    "Status": {
        "State": "Enabled",
        "Health": "OK",
        "HealthRollup": "OK"
    }
},
"LogServices": { ... },
"TrustedModules": [ { ... } ],
"HostWatchdogTimer": { ... },
"Processors": { ... },
"Memory": { ... },
"EthernetInterfaces": { ... },
"NetworkInterfaces": { ... },
"SimpleStorage": { ... },
"SecureBoot": { ... },
"Bios": { ... },
"PCIeDevices": [ { ... } ],
"PCIeFunctions": [ ... ],
"Links": {
    "Chassis": [
        {
            "@odata.id": "/redfish/v1/Chassis/1"
        }
    ],
    "ManagedBy": [
        {
            "@odata.id": "/redfish/v1/Managers/1"
        }
    ],
    "Endpoints": [ ... ]
},
"Actions": {
    "#ComputerSystem.Reset": {
        "target": "/redfish/v1/Systems/1/Actions/ComputerSystem.Reset",
        "@Redfish.ActionInfo": "/redfish/v1/Systems/1/ResetActionInfo"
    },
    "#ComputerSystem.SetDefaultBootOrder": {
        ...
    }
}

```



```
        "target": "/redfish/v1/Systems/1/Actions/ComputerSystem.SetDefaultBootOrder",
        "@Redfish.ActionInfo": "/redfish/v1/Systems/1/SetDefaultBootOrderActionInfo"
    }
},
}
```

### Figure 3 – Mockup of ComputerSystem resource

**Table 3 - Requirement for ComputerSystem resource properties**

Property	Requirement	Value
SystemType	Mandatory	
AssetTag	Mandatory, Read/write	
SerialNumber	Mandatory	
Manufacturer	Mandatory	
Model	Mandatory	
SKU	Recommended, Read only, Conditional (see 1.7.1)	
PartNumber	Recommended, Read only, Conditional (see 1.7.1)	
PowerState	Mandatory	
BiosVersion	Mandatory	
UUID	Mandatory	
IndicatorLED	Recommended, Read only, Conditional (see 1.7.2)	
MemorySummary	Mandatory	
TotalSystemMemoryGiB	Mandatory	
ProcessorSummary	Mandatory	
Count	Mandatory	
Model	Mandatory	
EthernetInterface	Mandatory	
Status	Mandatory	
State	Mandatory	
Health	Mandatory	
Boot	Mandatory	
BootSourceOverrideEnabled	Mandatory	
BootSourceOverrideTarget	Mandatory	
BootSourceOverrideMode	Recommended, Read only	
UefiTargetBootSourceOverride	Recommended, Read only, Conditional (see 1.7.3)	
LogService	Mandatory, Read only	
Links	Mandatory	
Chassis	Mandatory	
ManagedBy	Mandatory	
Action		
#ComputerSystem.Reset	Mandatory	

ResetType@AllowableValues	Mandatory	"ForceRestart, "On", "ForceOff"

### 1.7.1 Conditional on SKU and PartNumber properties

Either the PartNumber property or the SKU property (or both) shall have a value.

### 1.7.2 Conditional on IndicatorLED property

If the SystemType property has a value of "Physical".

### 1.7.3 Conditional on UefiTargtBootSourceOverride property

If the BootSourceOverrideMode property has a value of "UEFI".

## 1.8 Systems/{id}/EthernetInterfaces/{id} resource

Figure 4 shows a mockup of the EthernetInterface resource when it is a subordinate resource of ComputerSystem. The properties in bold have requirements, which are specified in Table 4.

The EthernetInterface resource version shall be at least "1.1.0".

```
{
    "@odata.context": "/redfish/v1/$metadata#EthernetInterface.EthernetInterface",
    "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces/1",
    "@odata.type": "#EthernetInterface.v1_4_0.EthernetInterface",
    "Id": "1",
    "Name": "Manager Ethernet Interface",
    "Description": "Management Network Interface",
    Status: {
        "State": "Enabled",
        "Health": "OK"
    },
    InterfaceEnabled: true,
    PermanentMACAddress": "1E:C3:DE:6F:1E:24",
    MACAddress: "1E:C3:DE:6F:1E:24",
    SpeedMbps: 100,
    AutoNeg": true,
    FullDuplex": true,
    MTUSize": 1500,
    HostName: "MyHostName",
    FQDN: "MyHostName.MyDomainName.com",
    MaxIPv6StaticAddresses": 1,
    VLAN: {
        VLANEnable": true,
        VLANId": 101
    },
    DHCPv4: { ... },
    IPv4Addresses: [
        {
            Address: "192.168.0.10",
            SubnetMask: "255.255.252.0",
            AddressOrigin: "Static",
            Gateway: "192.168.0.1"
        }
    ],
    IPv4StaticAddresses: [ { ... } ],
    DHCPv6: { ... },
    IPv6Addresses: [
        {
            Address: "fe80::1ec1:deff:fe6f:1e24",
            PrefixLength: 64,
            AddressOrigin: "Static",
            AddressState: "Preferred"
        }
    ]
}
```

```

],
"IPv6StaticAddresses": [ { ... } ],
"IPv6AddressPolicyTable": [ { ... } ],
"IPv6StaticDefaultGateways": [ { ... } ],
"IPv6DefaultGateway": "fe80::214:c1ff:fe4c:5c4d",
"StatelessAddressAutoConfig": {
    "IPv4AutoConfigEnabled": false,
    "IPv6AutoConfigEnabled": true
},
"NameServers": [ ... ],
"StaticNameServers": [ ... ],

"@Redfish.Settings": {
    "@odata.type": "#Settings.v1_0_0.Settings",
    "SettingsObject": {
        "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces/1/SD"
    },
    "Time": "2012-03-07T14:44.30-05:00",
    "ETag": "someetag",
    "Messages": [
        {
            "MessageId": "Base.1.0.SettingsFailed",
            "RelatedProperties": [
                "#/IPv6Addresses/PrefixLength"
            ]
        }
    ]
}
}
}

```

**Figure 4 – Mockup of EthernetInterface resource**

**Table 4 - Requirement for EthernetInterface resource properties**

Property	Requirement	Value
InterfaceEnabled	Mandatory	
MACAddress	Mandatory	
SpeedMbps	Mandatory	
HostName	Mandatory	
FQDN	Mandatory	
NameServers	Mandatory	
IPv4Addresses	Mandatory	
Address	Mandatory	
SubnetMask	Mandatory	
AddressOrigin	Mandatory	
Gateway	Mandatory	
IPv6Addresses	Mandatory	
Address	Mandatory	
PrefixLength	Mandatory	
AddressOrigin	Mandatory	
AddressState	Mandatory	
IPv6StaticAddresses	Mandatory	
IPv6AddressPolicyTable	Mandatory	

## 1.9 Systems/{id}/ResetActionInfo

Figure 8 shows a mockup of the ResetActionInfo resource. The properties in bold have requirements, which are specified in Table 8.

```
{
  "@odata.context": "/redfish/v1/$metadata#ActionInfo.ActionInfo",
  "@odata.id": "/redfish/v1/Systems/1/ResetActionInfo",
  "@odata.type": "#ActionInfo.v1_0_0.ActionInfo",
  "Parameters": [
    {
      "Name": "ResetType",
      "Required": true,
      "DataType": "String",
      "AllowableValues": [ ... ]
    }
  ]
}
```

**Figure 5 – Mockup of Power resource**

**Table 5 - Requirement for Power resource properties**

Property	Requirement	Value
Parameters	Mandatory	
AllowableValues	Mandatory	"ForceOff", "On", "ForceRestart"

## 1.10 Chassis collection resource

Figure 6 shows a mockup of the Chassis collection resource. The properties in bold have requirements, which are specified in Table 6.

```
{
  "@odata.context": "/redfish/v1/$metadata#ChassisCollection.ChassisCollection",
  "@odata.id": "/redfish/v1/Chassis",
  "@odata.type": "#ChassisCollection.ChassisCollection",
  "Name": "Chassis Collection",
  "Members@odata.count": 1,
  "Members": [ { ... } ]
}
```

**Figure 6 – Mockup of Chassis collection resource**

**Table 6 - Requirement for Chassis collection resource properties**

Property	Requirement	Value
Members@odata.count	Mandatory	$\geq 1$
Members	Mandatory	$\geq \langle\text{one item}\rangle$

## 1.11 Chassis resource

Figure 7 shows a mockup of the Chassis resource. The properties in bold have requirements, which are specified in Table 7.

The Chassis resource version shall be at least "1.0.0".

```
{
  "@odata.context": "/redfish/v1/$metadata#Chassis.Chassis",
  "@odata.id": "/redfish/v1/Chassis/1",
  "@odata.type": "#Chassis.v1_5_0.Chassis",
  "Id": "1",
  "Name": "Computer System Chassis",
  "ChassisType": "RackMount",
  "Manufacturer": "ManufacturerName",
```

```

"Model": "ProductModelName",
"SKU": "",
"SerialNumber": "2M220100SL",
"PartNumber": "",
"AssetTag": "CustomerWritableThingy",
"IndicatorLED": "Lit",
"PowerState": "On",
>Status": {
    "State": "Enabled",
    "Health": "OK"
},
"HeightMm": 44.45,
"WidthMm": 431.8,
"DepthMm": 711,
"WeightKg": 15.31,
"Thermal": {
    "@odata.id": "/redfish/v1/Chassis/1/Thermal"
},
"Power": {
    "@odata.id": "/redfish/v1/Chassis/1/Power"
},
"NetworkAdapters": {
    "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters"
},
"Assembly": {
    "@odata.id": "/redfish/v1/Chassis/1/Assembly"
},
"Links": {
    "ComputerSystems": [ { ... } ],
    "ManagedBy": [ { ... } ],
    "ContainedBy": { ... },
    "ManagersInChassis": [ { ... } ],
    "PCIeDevices": [ { ... } ]
}
}
}

```

**Figure 7 – Mockup of Chassis resource**

**Table 7 - Requirement for Chassis resource properties**

Property	Requirement	Value
Thermal	Mandatory	
Power	Mandatory	
Links	Mandatory	
ComputerSystems	Mandatory	

## 1.12 Chassis/{id}/Power resource

Figure 8 shows a mockup of the Power resource. The properties in bold have requirements, which are specified in Table 8.

```

{
    "@odata.context": "/redfish/v1/$metadata#Power.Power",
    "@odata.id": "/redfish/v1/Chassis/1/Power",
    "@odata.type": "#Power.v1_5_0.Power",
    "Id": "Power",
    "Name": "Power",
    "PowerControl": [
        {
            "@odata.id": "/redfish/v1/Chassis/1/Power#/PowerControl/0",
            "MemberId": "0",
            "Name": "System Power Control",
            "PhysicalContext": "Chassis",
            "PowerConsumedWatts": 8000,
}

```

```

    "PowerCapacityWatts": 10000,
    "PowerRequestedWatts": 8500,
    "PowerAvailableWatts": 8500,
    "PowerAllocatedWatts": 8500,
    "PowerMetrics": {
        "IntervalInMin": 30,
        "MinConsumedWatts": 7500,
        "MaxConsumedWatts": 8200,
        "AverageConsumedWatts": 8000
    },
    "PowerLimit": {
        "LimitInWatts": 9000,
        "LimitException": "LogEventOnly",
        "CorrectionInMs": 42
    },
    "RelatedItem": [ { ... } ],
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Oem": {}
}
],
"Voltages": [ { ... } ],
"PowerSupplies": [ { ... } ],
"Redundancy": [ { ... } ]
}

```

**Figure 8 – Mockup of Power resource****Table 8 - Requirement for Power resource properties**

<b>Property</b>	<b>Requirement</b>	<b>Value</b>
PowerControl	Mandatory	
PowerControl/PowerConsumedWatts	Mandatory	
PowerControl/PowerCapacityWatts	Mandatory	
PowerControl/PowerLimit	Mandatory	
PowerControl/PowerLimits/LimitInWatts	Mandatory	
PowerControl/PowerLimits/LimitException	Mandatory	

### 1.13 Chassis/{id}/Thermal resource

Figure 9 shows a mockup of the Thermal resource. The properties in bold have requirements, which are specified in Table 9.

The Thermal resource version shall be "1.1.0".

```

{
    "@odata.context": "/redfish/v1/$metadata#Thermal.Thermal",
    "@odata.id": "/redfish/v1/Chassis/1/Thermal",
    "@odata.type": "#Thermal.v1_1_0.Thermal",
    "Id": "Thermal",
    "Name": "Thermal",

    "Temperatures": [
        {
            "@odata.id": "/redfish/v1/Chassis/1/Thermal#/Temperatures/0",
            "MemberId": "0",
            "Name": "CPU1 Temp",
            "SensorNumber": 42,
            "Status": { ... },
            "ReadingCelsius": 21,
            "UpperThresholdNonCritical": 42,
            "UpperThresholdCritical": 42,
            "UpperThresholdFatal": 42,
            "LowerThresholdNonCritical": 42,

```

```

    "LowerThresholdCritical": 5,
    "LowerThresholdFatal": 42,
    "MinReadingRangeTemp": 0,
    "MaxReadingRangeTemp": 200,
    "PhysicalContext": "CPU",
    "RelatedItem": [
        {"@odata.id": "/redfish/v1/Systems/1/Processors/1" }
    ]
},
"Redundancy": [
    {
        "@odata.id": "/redfish/v1/Chassis/1/Thermal#/Redundancy/0",
        "MemberId": "0",
        "Name": "BaseBoard System Fans",
        "RedundancyEnabled": false,
        "RedundancySet": [ { ... } ],
        "Mode": "N+M",
        "Status": { ... },
        "MinNumNeeded": 1,
        "MaxNumSupported": 2
    }
],
"Fans": [ { ... } ]
}

```

**Figure 9 – Mockup of Thermal resource**

**Table 9 - Requirement for Thermal resource properties**

Property	Requirement	Value
Temperatures	Mandatory	≥3
ReadingCelsius	Mandatory	
PhysicalContext	Mandatory	"CPU" "Intake" "SystemBoard"
Status	Mandatory	
UpperThresholdFatal	Recommended, Read only	
UpperThresholdCritical	Recommended, Read only	
UpperThresholdNonCritical	Recommended, Read only	
Redundancy	If Implemented	
MemberID	Mandatory	
RedundancySet	Mandatory	
Node	Mandatory	
Status	Mandatory	
MinNumNeeded	Mandatory	
MaxNumSupported	Recommended, Read only	

## 1.14 Managers collection resource

Figure 6 shows a mockup of the Managers collection resource. The properties in bold have requirements, which are specified in Table 6.

```

{
    "@odata.context": "/redfish/v1/$metadata#ManagerCollection.ManagerCollection",
    "@odata.id": "/redfish/v1/Managers",
    "@odata.type": "#ManagerCollection.ManagerCollection",
}

```

```

    "Name": "Manager Collection",
    "Members@odata.count": 1,
    "Members": [ { ... } ]
}

```

**Figure 10 – Mockup of Managers collection resource****Table 10 - Requirement for Managers collection resource properties**

Property	Requirement	Value
Members@odata.count	Mandatory	≥1
Members	Mandatory	≥ <one item>

## 1.15 Managers/{id} resource

Figure 11 shows a mockup of the Manager resource. The properties in bold have requirements, which are specified in Table 11.

```

{
    "@odata.context": "/redfish/v1/$metadata#Manager.Manager",
    "@odata.id": "/redfish/v1/Managers/1",
    "@odata.type": "#Manager.v1_1_0.Manager",
    "Id": "1",
    "Name": "Manager",
    "ManagerType": "BMC",
    "Description": "BMC",
    "ServiceEntryPointUUID": "92384634-2938-2342-8820-489239905423",
    "UUID": "00000000-0000-0000-0000-000000000000",
    "Model": "Joo Janta 200",
    "DateTime": "2015-03-13T04:14:33+06:00",
    "DateTimeLocalOffset": "+06:00",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "GraphicalConsole": { ... },
    "SerialConsole": {
        "ServiceEnabled": true,
        "MaxConcurrentSessions": 1,
        "ConnectTypesSupported": [
            "Telnet",
            "SSH",
            "IPMI"
        ]
    },
    "CommandShell": { ... },
    "FirmwareVersion": "1.00",
    "NetworkProtocol": { ... },
    "EthernetInterfaces": { ... },
    "SerialInterfaces": { ... },
    "LogServices": { ... },
    "VirtualMedia": { ... },
    "Links": {
        "ManagerForServers": [ { ... } ],
        "ManagerForChassis": [ ( ... ) ],
        "ManagerInChassis": { ... }
    },
    "Actions": { ... }
}

```

**Figure 11 – Mockup of Manager resource****Table 11 - Requirement for Manager resource properties**

Property	Requirement	Value



SerialConsole	Mandatory, Read nly	
ConnectTypesSupport	Mandatory	AnyOf ( "SSH", "IPMI")
Links	Mandatory	
ManagedForServers	Mandatory	

## 6. OCP Server Management Interface Profile

Redfish specifies that format of a 'profile' file which express the prescriptive requirements of Redfish resources. The profile file can be read by the Redfish Interoperability Tool, with will run a series of conformance tests against an implementation. This can be used to verify the conformance of the implementation to the profile.

See the OCPServerHardwareManagement.<version>.json file.