Gen-Z Fabric extensions for Redfish

Ver. 1.0.1
November 2019

www.dmtf.org

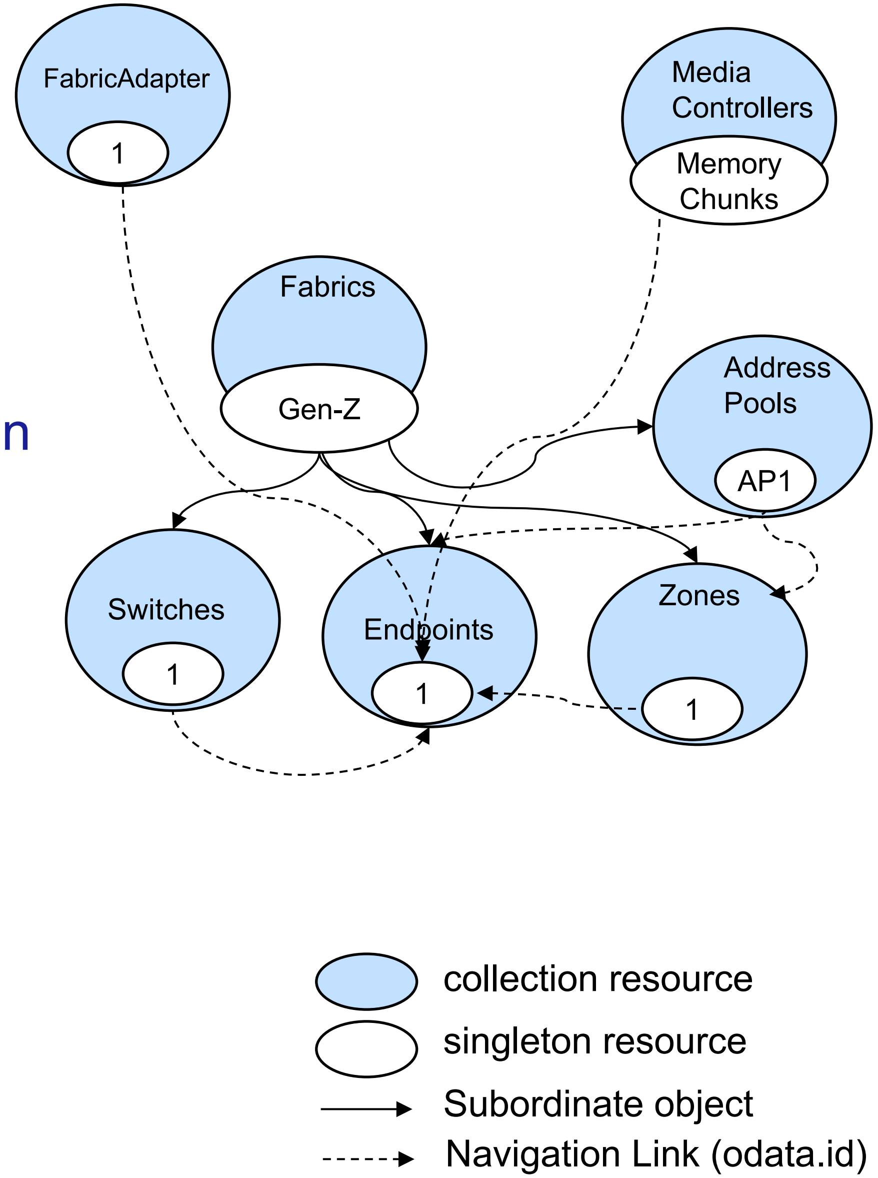
Goal & Status

Goal of Gen-Z Fabric extensions

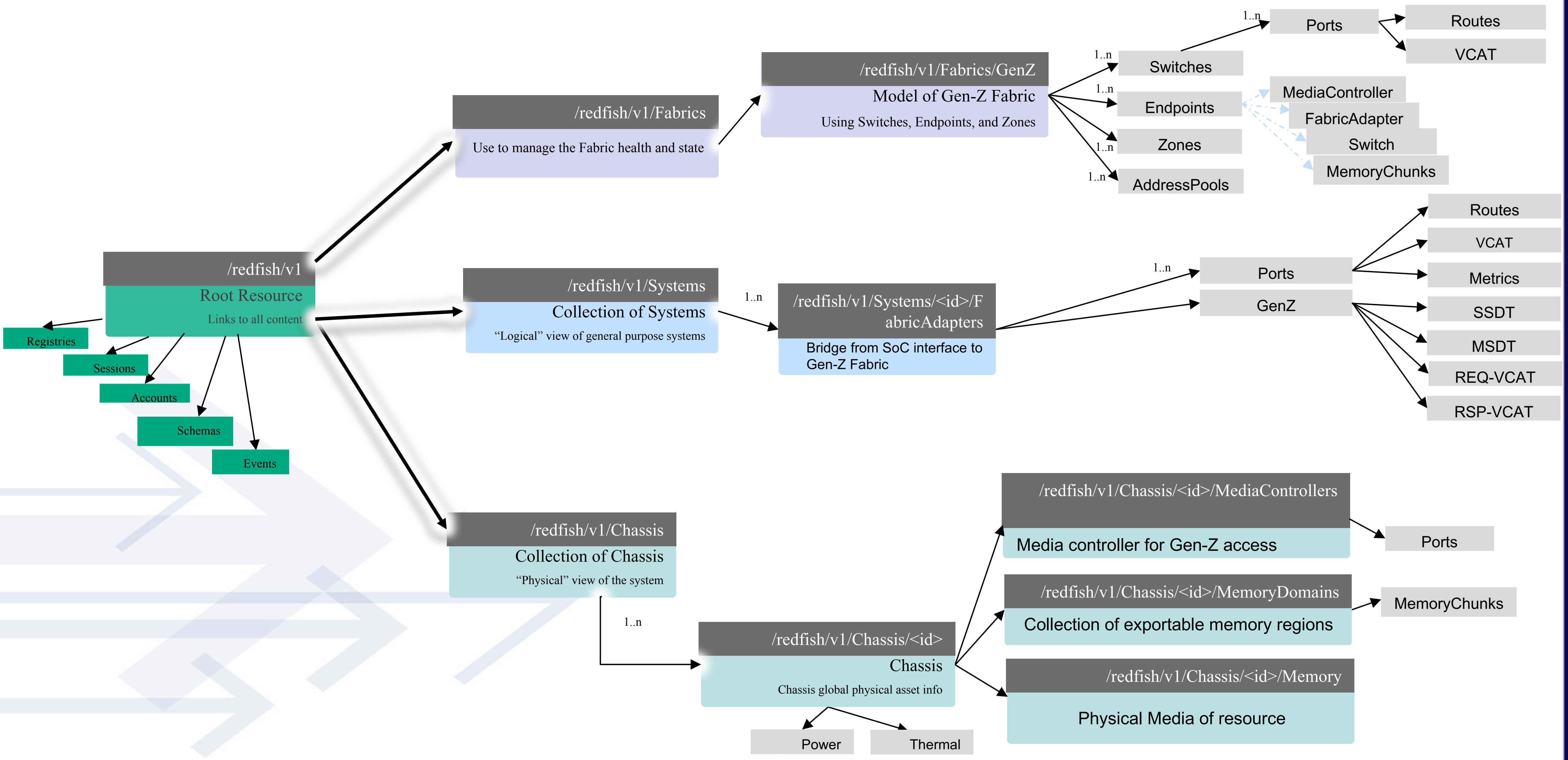
- Support the management of port-based Gen-Z Fabrics(Initiators/Targets)
- Support Fabric-attached Resources (Targets)

Status

- Redfish has an existing model for host/target mechanism on a port-based fabric
- Formed a DMTF work register to develop the schema and mockups representing Gen-Z fabric management
- Gen-Z schemas v1.0 approved by Redfish Forum
- Schemas included in Redfish schema release v2019.4
  - DSP8010 available for download at http://www.dmtf.org/standard/redfish



Top Level Fabric Gen-Z Extensions



/redfish/v1
Root Resource
Links to all content

Registries

Sessions

Accounts

Schemas

Events

/redfish/v1/Fabrics
Use to manage the Fabric health and state

/redfish/v1/Fabrics/GenZ
Model of Gen-Z Fabric
Using Switches, Endpoints, and Zones

1..n Switches

1..n Ports

Routes

VCAT

1..n Endpoints

MediaController

FabricAdapter

Switch

MemoryChunks

1..n Zones

1..n AddressPools

/redfish/v1/Systems
Collection of Systems
"Logical" view of general purpose systems

1..n

/redfish/v1/Systems/<id>/F
abricAdapters
Bridge from SoC interface to
Gen-Z Fabric

1..n Ports

Routes

VCAT

Metrics

GenZ

SSDT

MSDT

REQ-VCAT

RSP-VCAT

/redfish/v1/Chassis
Collection of Chassis
"Physical" view of the system

1..n

/redfish/v1/Chassis/<id>
Chassis
Chassis global physical asset info

Power

Thermal

/redfish/v1/Chassis/<id>/MediaControllers
Media controller for Gen-Z access

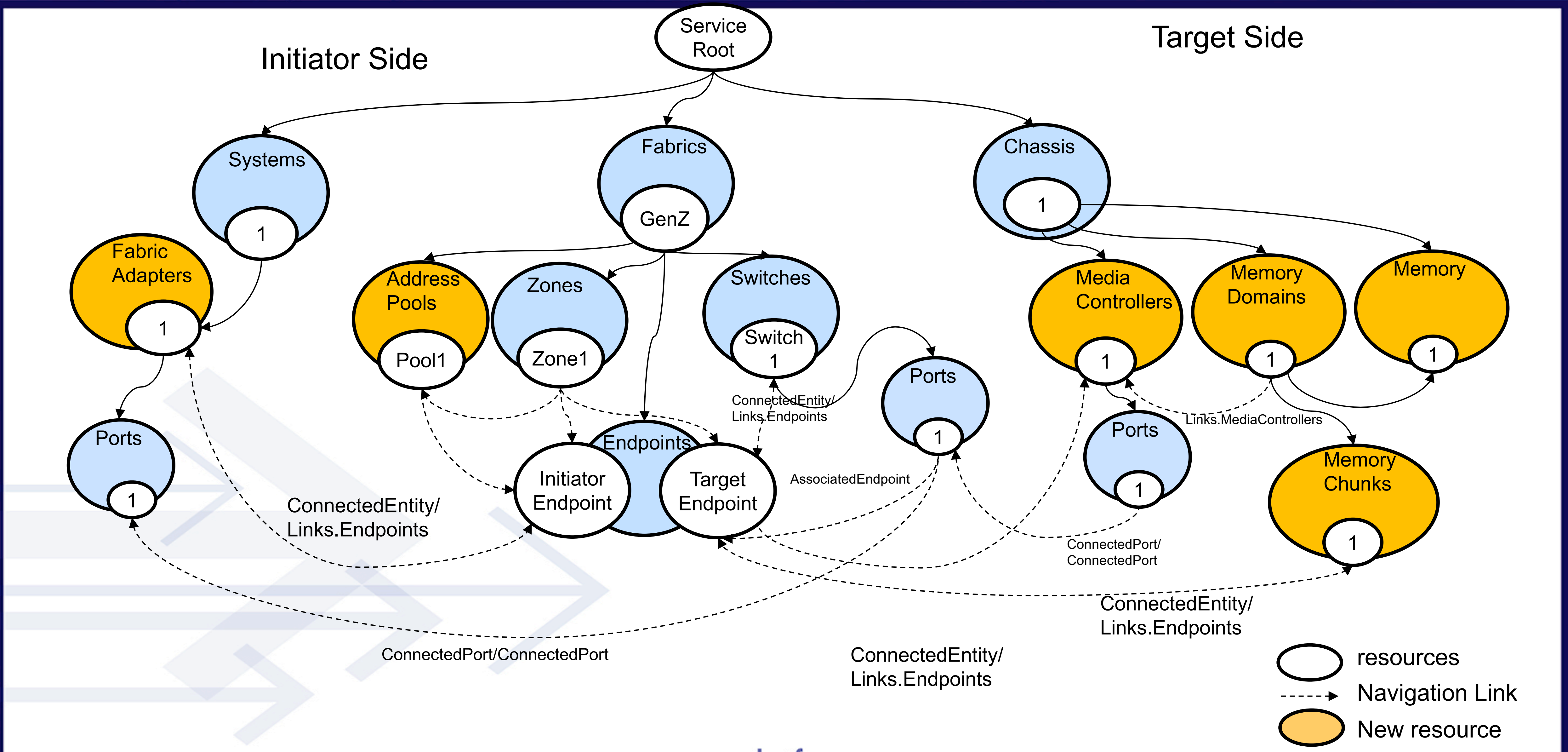
Ports

/redfish/v1/Chassis/<id>/MemoryDomains
Collection of exportable memory regions

MemoryChunks

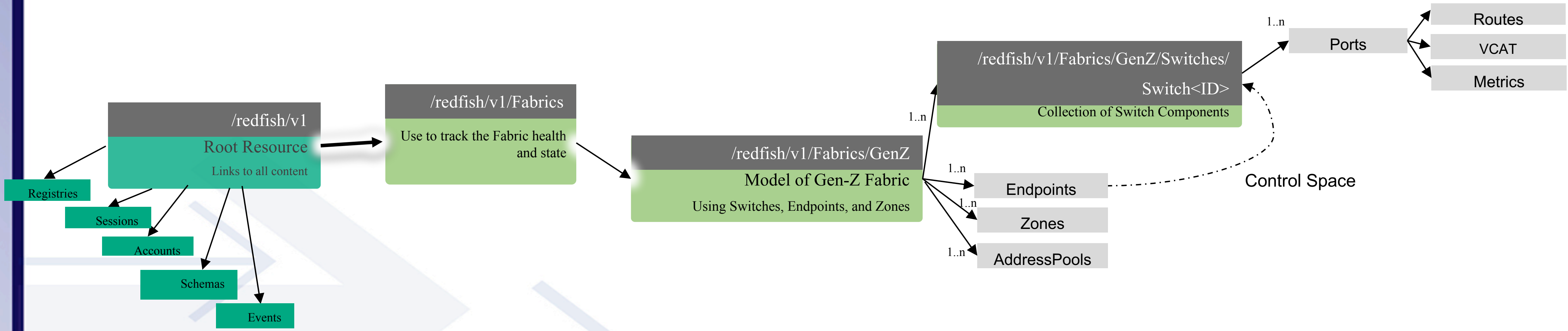
/redfish/v1/Chassis/<id>/Memory
Physical Media of resource

Fabric model (Gen-Z) to FAM



FABRIC MODEL

Fabric model of a Gen-Z Switch



/redfish/v1

Root Resource

Links to all content

Registries

Sessions

Accounts

Schemas

Events

/redfish/v1/Fabrics

Use to track the Fabric health and state

/redfish/v1/Fabrics/GenZ

Model of Gen-Z Fabric

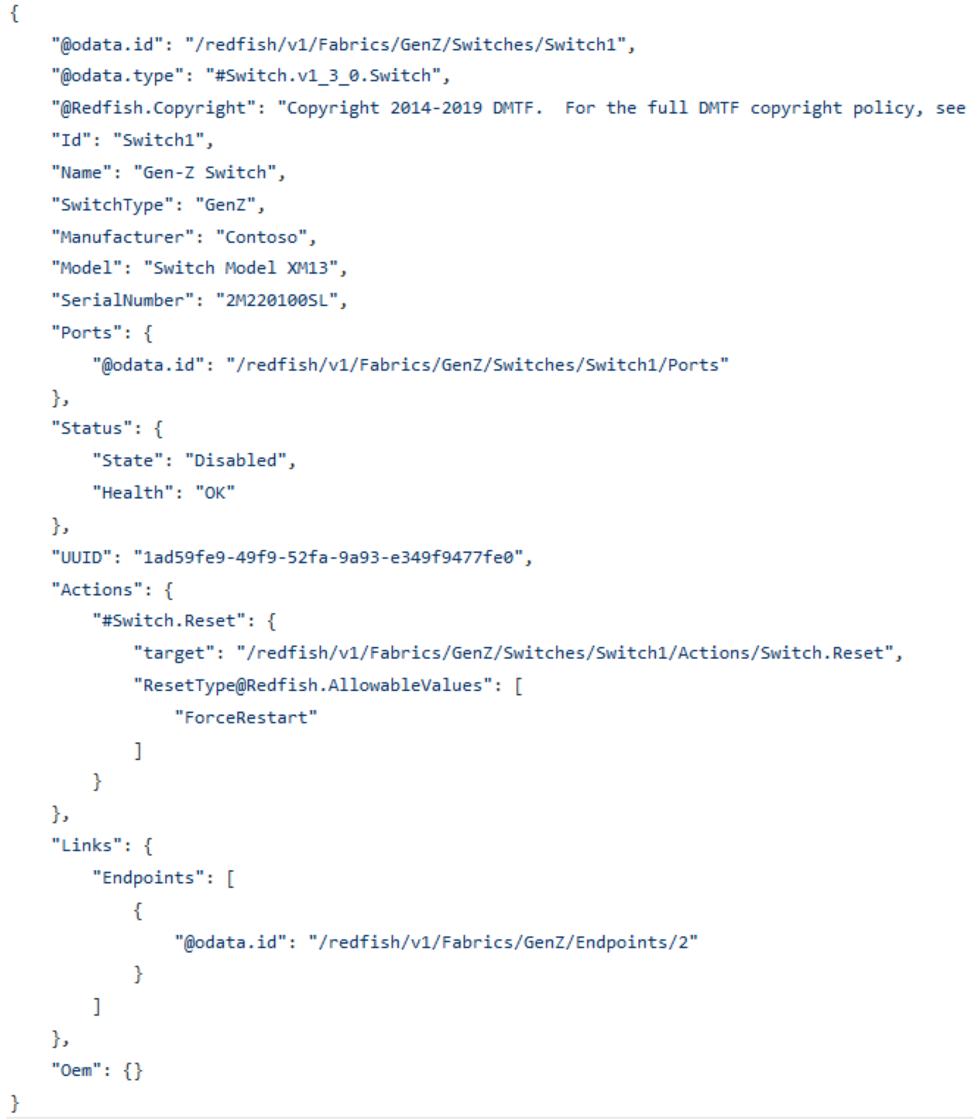
Using Switches, Endpoints, and Zones

/redfish/v1/Fabrics/GenZ/Switches/Switch<ID>

Collection of Switch Components

Fabric Model of a Gen-Z Switch

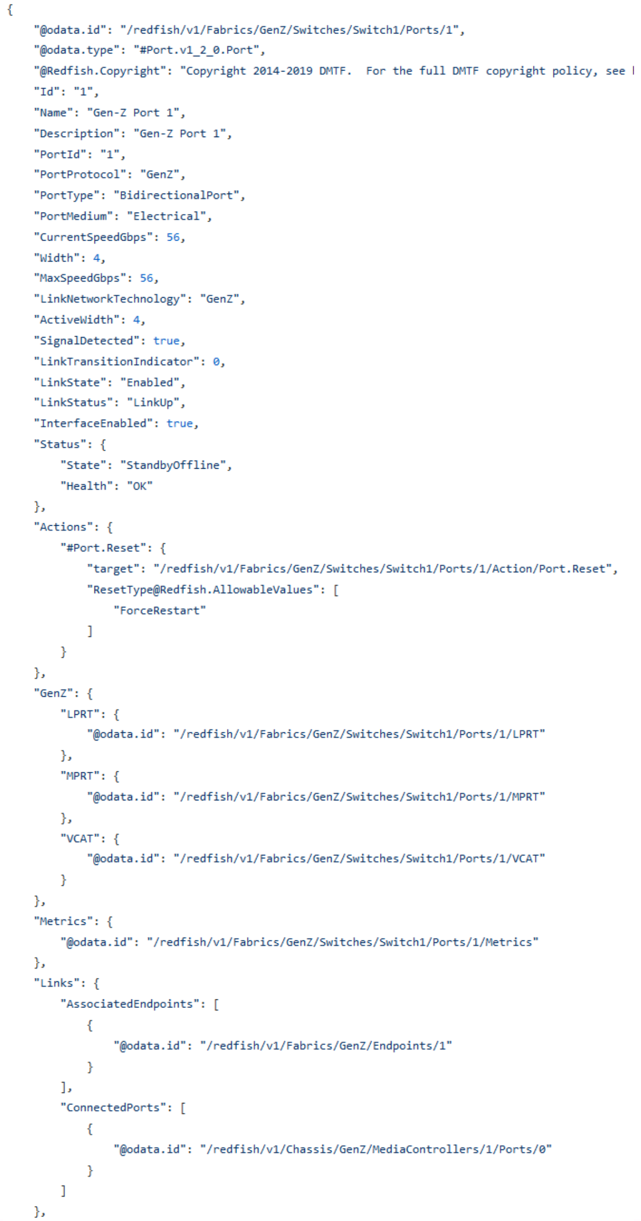
- Gen-Z Switch Details
  - Describes Switch Details
  - Contains Ports
  - Enable/Disables Switch functionality
  - Allows for switch-specific configuration



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1",
    "@odata.type": "#Switch.v1_3_0.Switch",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see
    "Id": "Switch1",
    "Name": "Gen-Z Switch",
    "SwitchType": "GenZ",
    "Manufacturer": "Contoso",
    "Model": "Switch Model XM13",
    "SerialNumber": "2M220100SL",
    "Ports": {
        "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports"
    },
    "Status": {
        "State": "Disabled",
        "Health": "OK"
    },
    "UUID": "1ad59fe9-49f9-52fa-9a93-e349f9477fe0",
    "Actions": {
        "#Switch.Reset": {
            "target": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Actions/Switch.Reset",
            "ResetType@Redfish.AllowableValues": [
                "ForceRestart"
            ]
        }
    },
    "Links": {
        "Endpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/2"
            }
        ]
    },
    "Oem": {}
}
```

Fabric Model of Gen-Z Switch Ports

- Gen-Z Port Details
  - Describes Port details
  - Describes Routing Info
  - Describes Virtual Channels

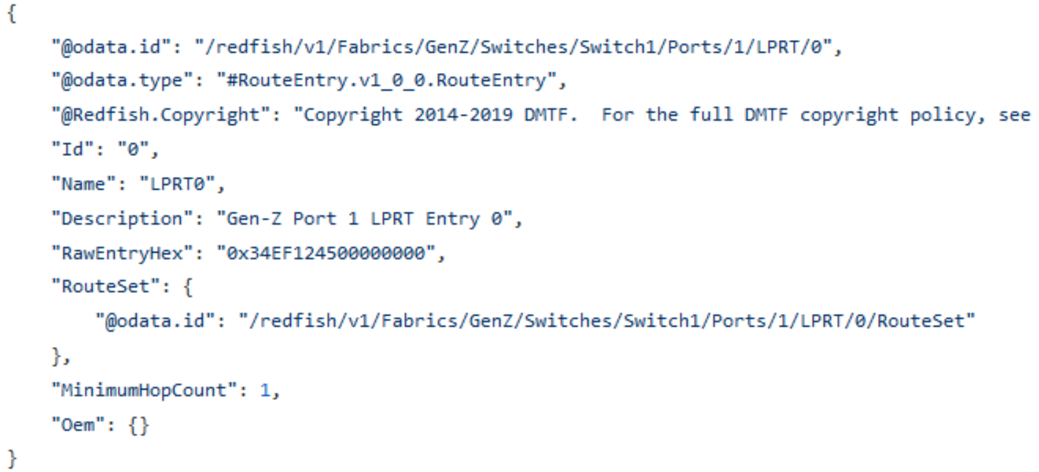


```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1",
    "@odata.type": "#Port.v1_2_0.Port",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see
    "Id": "1",
    "Name": "Gen-Z Port 1",
    "Description": "Gen-Z Port 1",
    "PortId": "1",
    "PortProtocol": "GenZ",
    "PortType": "BidirectionalPort",
    "PortMedium": "Electrical",
    "CurrentSpeedGbps": 56,
    "Width": 4,
    "MaxSpeedGbps": 56,
    "LinkNetworkTechnology": "GenZ",
    "ActiveWidth": 4,
    "SignalDetected": true,
    "LinkTransitionIndicator": 0,
    "LinkState": "Enabled",
    "LinkStatus": "LinkUp",
    "InterfaceEnabled": true,
    "Status": {
        "State": "StandbyOffline",
        "Health": "OK"
    },
    "Actions": {
        "#Port.Reset": {
            "target": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/Action/Port.Reset",
            "ResetType@Redfish.AllowableValues": [
                "ForceRestart"
            ]
        }
    },
    "GenZ": {
        "LPRT": {
            "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/LPRT"
        },
        "MPRT": {
            "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/MPRT"
        },
        "VCAT": {
            "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/VCAT"
        }
    },
    "Metrics": {
        "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/Metrics"
    },
    "Links": {
        "AssociatedEndpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/1"
            }
        ],
        "ConnectedPorts": [
            {
                "@odata.id": "/redfish/v1/Chassis/GenZ/MediaControllers/1/Ports/0"
            }
        ]
    },
```

Fabric Model of Gen-Z Switch Port Routes

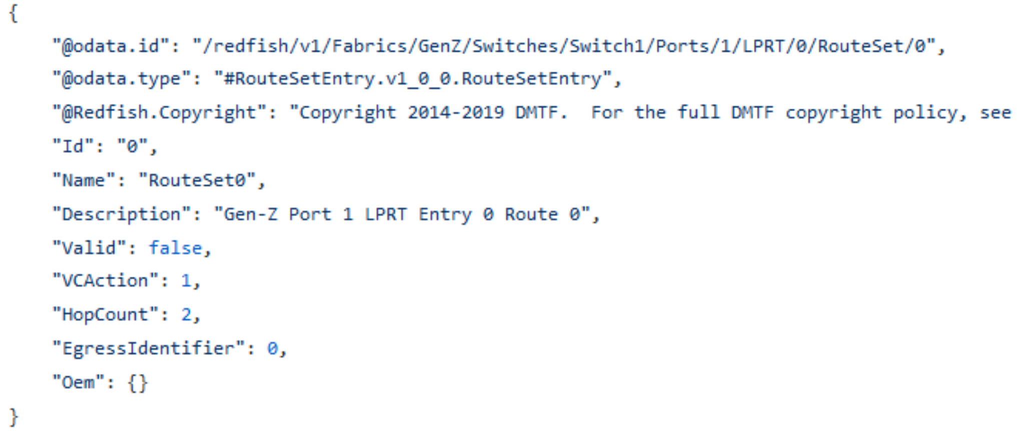
- Gen-Z Ports have 2 route tables
  - Linear Packet Relay Table(LPRT)
  - Multi-subnet Packet Relay Table(MPRT)
- LPRT has 4k possible route table entries
- MPRT has 64k possible route table entries
  - Patch each route entry to set route info
  - Use RawEntryHex to patch the entire entry at once
  - Can patch specific route data if required

Route Table Entry



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/LPRT/0",
    "@odata.type": "#RouteEntry.v1_0_0.RouteEntry",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see
    "Id": "0",
    "Name": "LPRT0",
    "Description": "Gen-Z Port 1 LPRT Entry 0",
    "RawEntryHex": "0x34EF124500000000",
    "RouteSet": {
        "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/LPRT/0/RouteSet"
    },
    "MinimumHopCount": 1,
    "Oem": {}
}
```

Route Set Entry



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1/LPRT/0/RouteSet/0",
    "@odata.type": "#RouteSetEntry.v1_0_0.RouteSetEntry",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see
    "Id": "0",
    "Name": "RouteSet0",
    "Description": "Gen-Z Port 1 LPRT Entry 0 Route 0",
    "Valid": false,
    "VCAction": 1,
    "HopCount": 2,
    "EgressIdentifier": 0,
    "Oem": {}
}
```

Fabric Model of a Gen-Z Switch Port Route DeepPatch

- Each port has 4k LPRT entries, 64k MPRT entries and 32 VCAT entries
  - Lot of data to transmit to HW
  - High radix switches have many ports to patch!
- Propose to utilize a “Deep Patch” method to patch many entries at once
  - Entries can be sparse
  - Single connection to server for patching many entries
  - Reduces amount of data being transmitted to the HW
  - Use relative identifier “Id” to reduce amount of characters being sent to HW
- Deep Patch support expected in next release of Redfish Specification

Ex. PATCH /redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1 [{“LPRT”:{ “Members”:[{ “Id”: 1, “RawEntryHex”: “0x12dfeb” }] } }]

Example Deep Patch (Proposed)

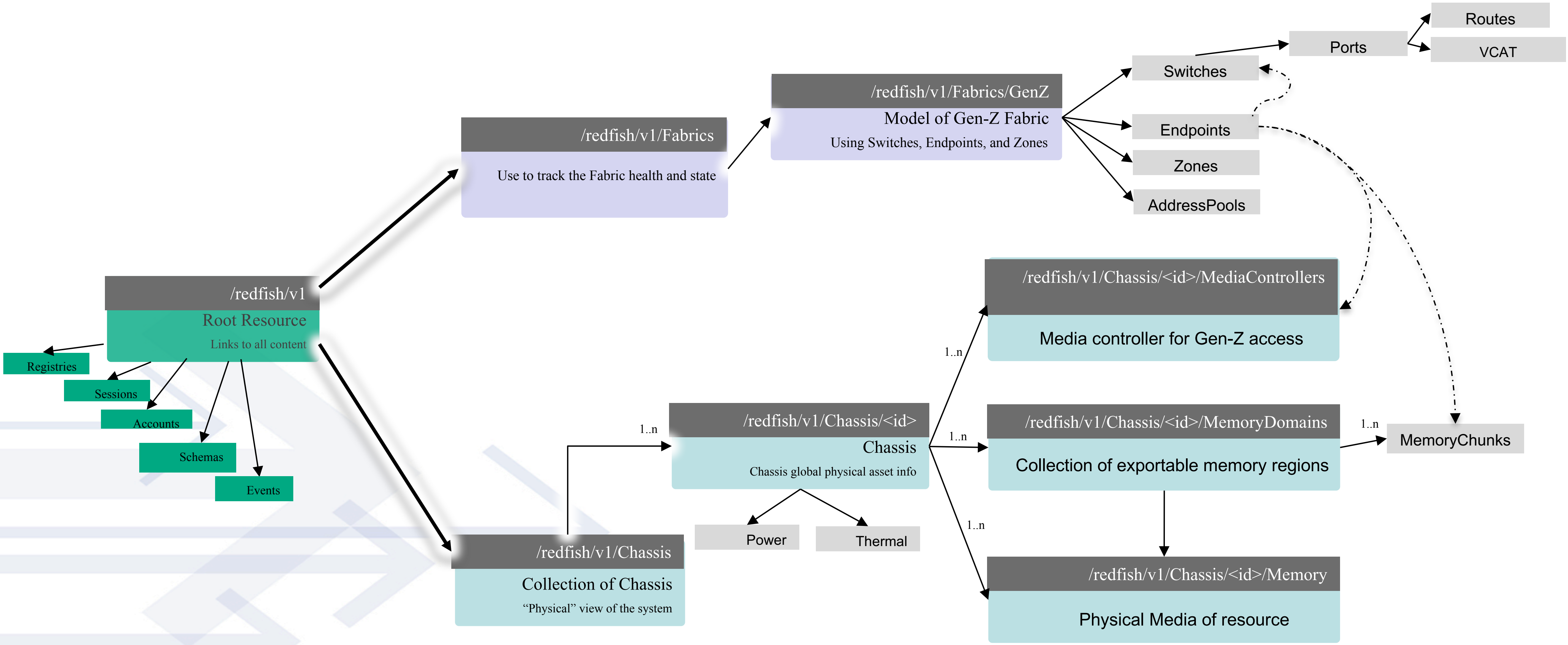
- PATCH /redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1

```
    [
        { “LPRT”: {
            “Members”:  [
                { “Id”: 1, “RawEntryHex”: “0x12dfeb” },
                { “id”: 2, “RawEntryHex”: “0x334ddf” },
                { “Id”: 9, “RawEntryHex”: “0x073e5d”}
            ]
        },
        { “MPRT”: {
            “Members”: [
               { “Id”: 1, “RawEntryHex”: “0x31124fd”},
               { “Id”: 7, “RawEntryHex”: “0x1b458df”}
            ]

        }
        }
    ]
```

FABRIC ATTACHED TARGET MODEL

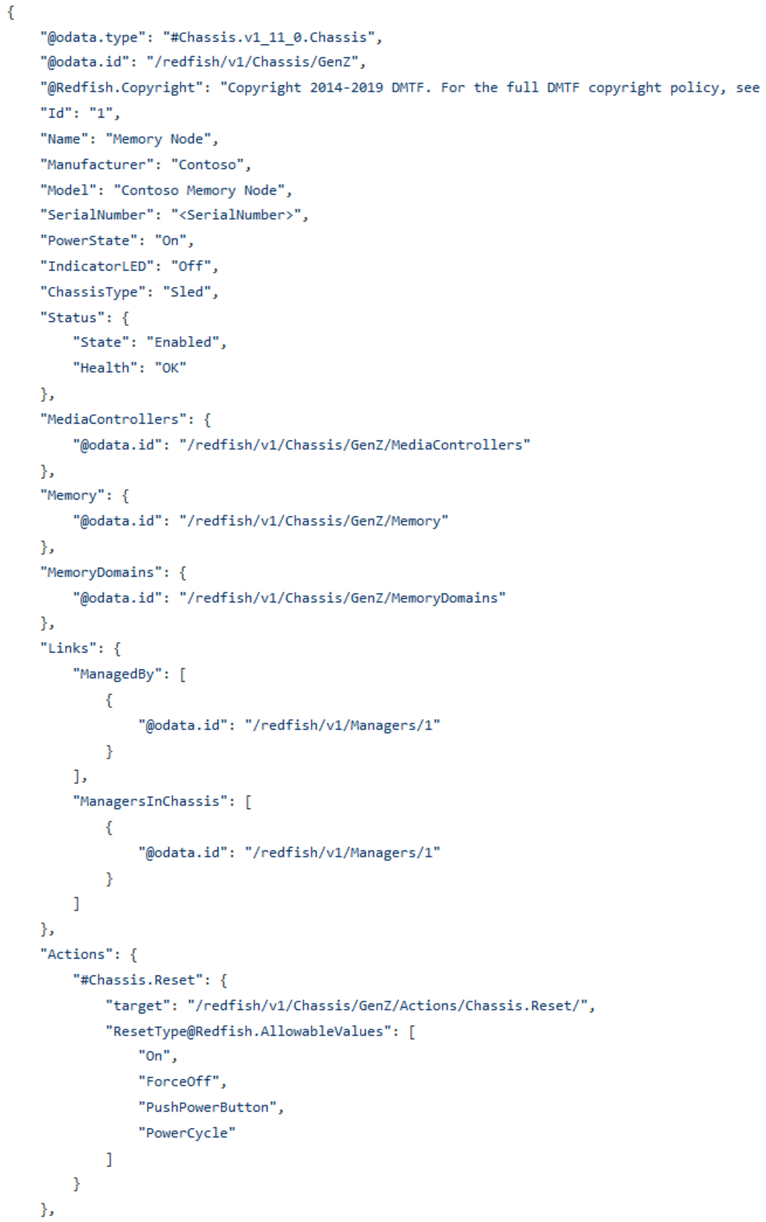
Fabric model to a Fabric Attached Target



/redfish/v1
Root Resource
Links to all content
Registries
Sessions
Accounts
Schemas
Events
/redfish/v1/Fabrics
Use to track the Fabric health and state
/redfish/v1/Fabrics/GenZ
Model of Gen-Z Fabric
Using Switches, Endpoints, and Zones
Switches
Ports
Routes
VCAT
Endpoints
Zones
AddressPools
/redfish/v1/Chassis
Collection of Chassis
"Physical" view of the system
1..n
/redfish/v1/Chassis/<id>
Chassis
Chassis global physical asset info
Power
Thermal
1..n
/redfish/v1/Chassis/<id>/MediaControllers
Media controller for Gen-Z access
1..n
/redfish/v1/Chassis/<id>/MemoryDomains
Collection of exportable memory regions
1..n
MemoryChunks
1..n
/redfish/v1/Chassis/<id>/Memory
Physical Media of resource

Model of Fabric Attached Memory

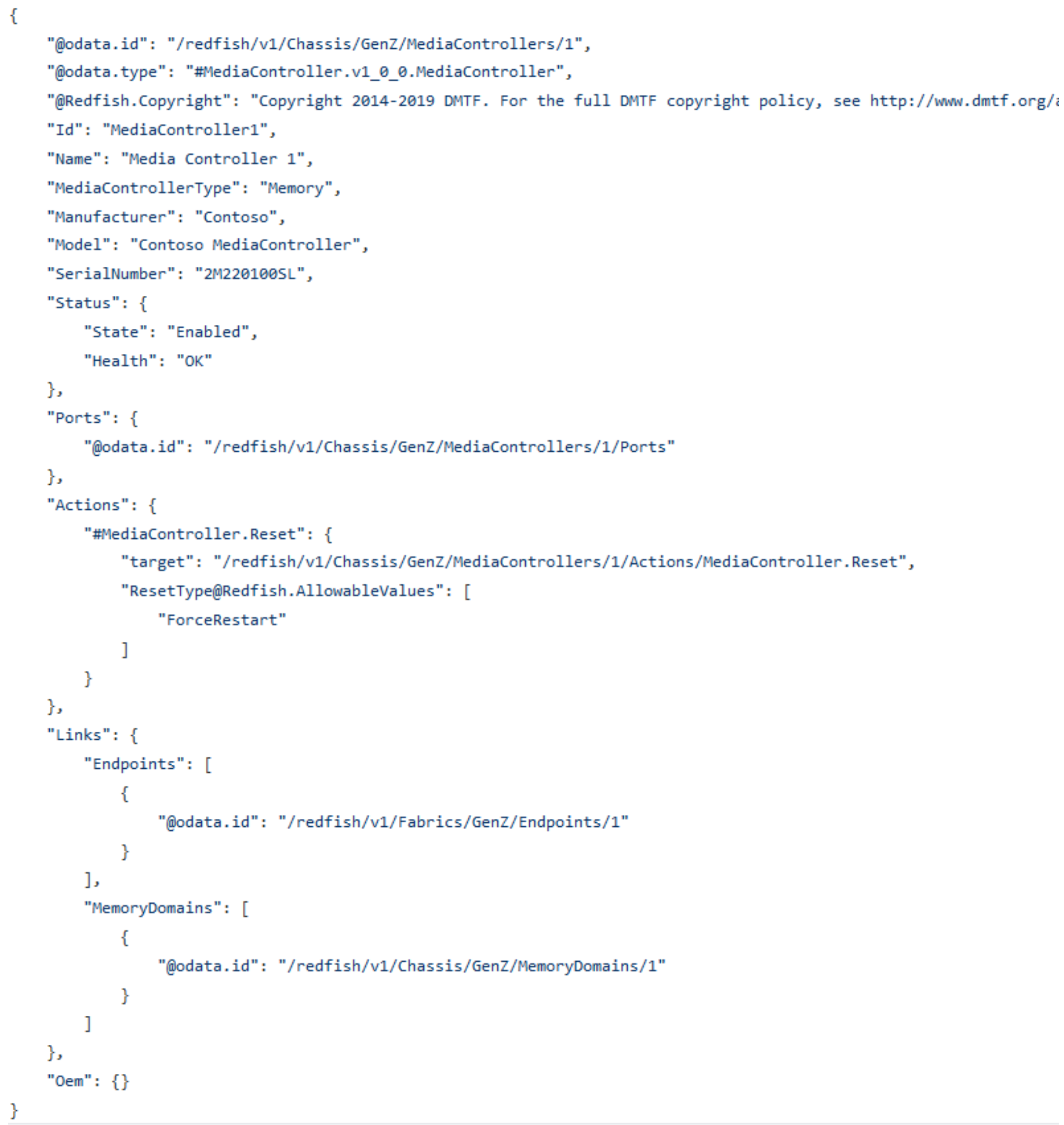
- FAM resides in Chassis
  - Physical description of media
  - Not associated with a specific system
    - Not attached to an SoC
  - Can be composed with multiple systems
- Add MediaControllers to describe FAM controller
- Use Memory and MemoryDomains to describe assignable media



```
{
    "@odata.type": "#Chassis.v1_11_0.Chassis",
    "@odata.id": "/redfish/v1/Chassis/GenZ",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF. For the full DMTF copyright policy, see
    "Id": "1",
    "Name": "Memory Node",
    "Manufacturer": "Contoso",
    "Model": "Contoso Memory Node",
    "SerialNumber": "<SerialNumber>",
    "PowerState": "On",
    "IndicatorLED": "Off",
    "ChassisType": "Sled",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "MediaControllers": {
        "@odata.id": "/redfish/v1/Chassis/GenZ/MediaControllers"
    },
    "Memory": {
        "@odata.id": "/redfish/v1/Chassis/GenZ/Memory"
    },
    "MemoryDomains": {
        "@odata.id": "/redfish/v1/Chassis/GenZ/MemoryDomains"
    },
    "Links": {
        "ManagedBy": [
            {
                "@odata.id": "/redfish/v1/Managers/1"
            }
        ],
        "ManagersInChassis": [
            {
                "@odata.id": "/redfish/v1/Managers/1"
            }
        ]
    },
    "Actions": {
        "#Chassis.Reset": {
            "target": "/redfish/v1/Chassis/GenZ/Actions/Chassis.Reset/",
            "ResetType@Redfish.AllowableValues": [
                "On",
                "ForceOff",
                "PushPowerButton",
                "PowerCycle"
            ]
        }
    },
```

Model of MediaController

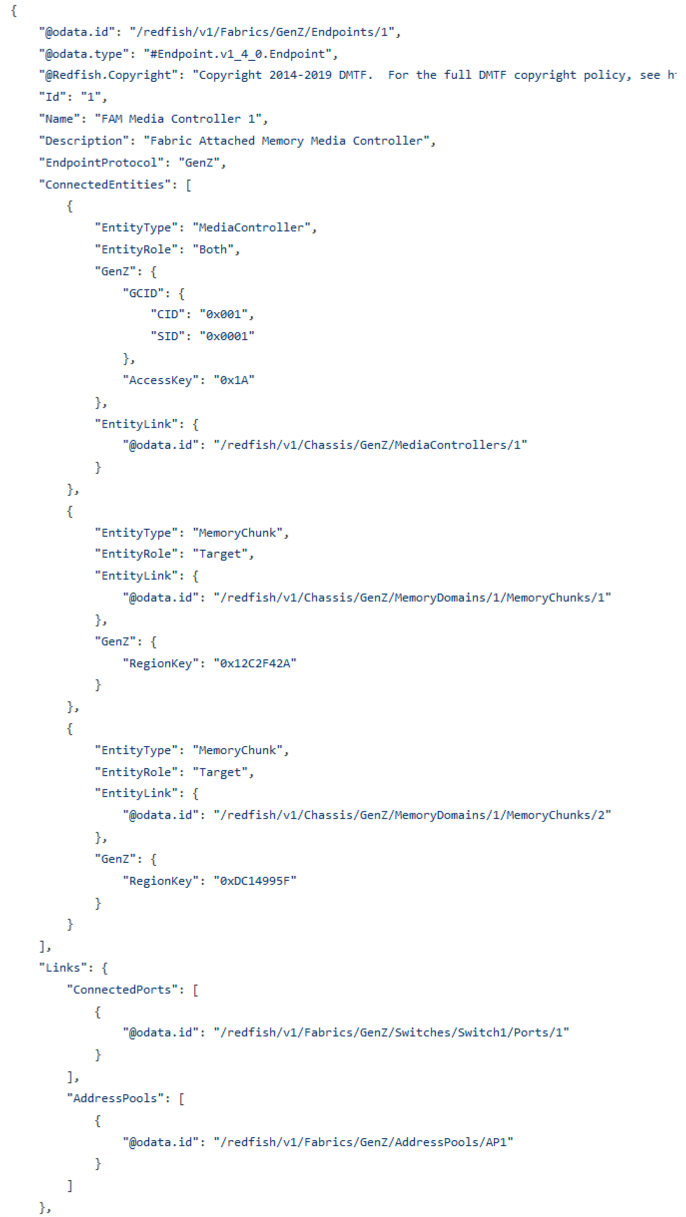
- MediaController physical device
  - Has Gen-Z Ports, same as Fabric Switches
- Can configure MediaController settings
- Describes status of controller
- Links to associated endpoint and MemoryDomain



```json
{
    "@odata.id": "/redfish/v1/Chassis/GenZ/MediaControllers/1",
    "@odata.type": "#MediaController.v1_0_0.MediaController",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/a
    "Id": "MediaController1",
    "Name": "Media Controller 1",
    "MediaControllerType": "Memory",
    "Manufacturer": "Contoso",
    "Model": "Contoso MediaController",
    "SerialNumber": "2M220100SL",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Ports": {
        "@odata.id": "/redfish/v1/Chassis/GenZ/MediaControllers/1/Ports"
    },
    "Actions": {
        "#MediaController.Reset": {
            "target": "/redfish/v1/Chassis/GenZ/MediaControllers/1/Actions/MediaController.Reset",
            "ResetType@Redfish.AllowableValues": [
                "ForceRestart"
            ]
        }
    },
    "Links": {
        "Endpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/1"
            }
        ],
        "MemoryDomains": [
            {
                "@odata.id": "/redfish/v1/Chassis/GenZ/MemoryDomains/1"
            }
        ]
    },
    "Oem": {}
}
```

Model of FAM Endpoint

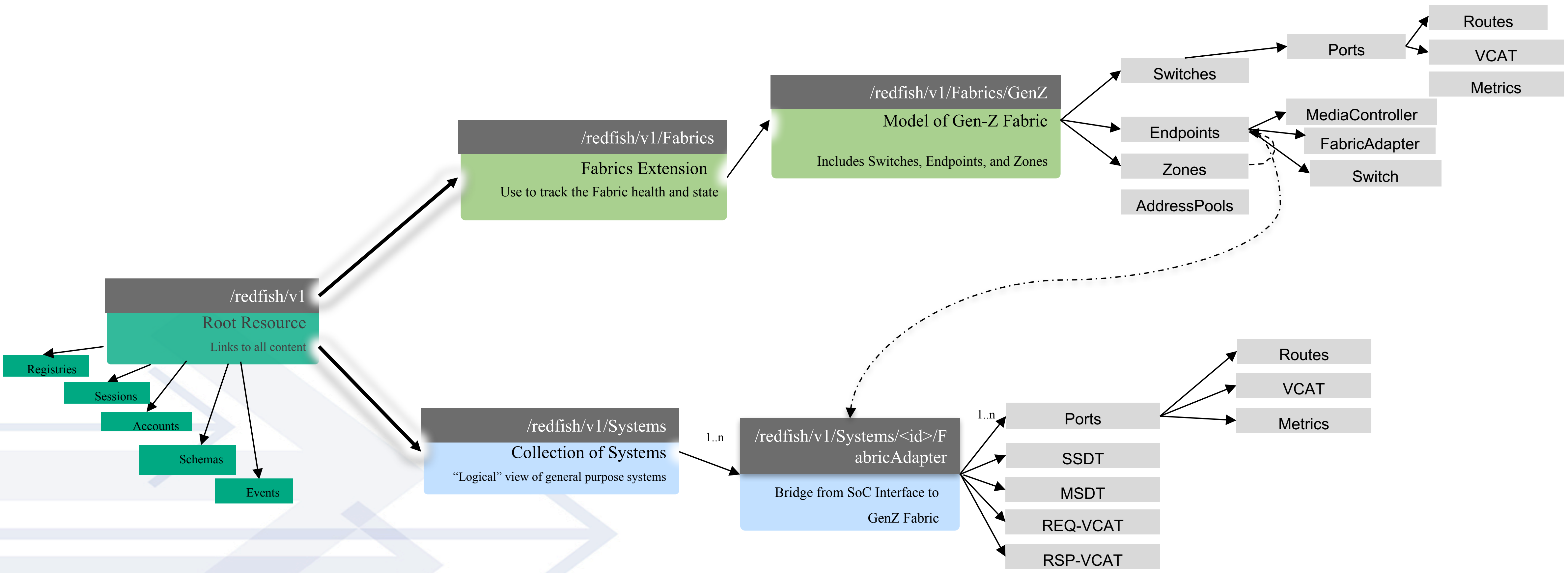
- Fabric Endpoint describes MediaController and Memory Chunks
- Each MemoryChunk describes a region of FAM
  - Includes attributes of the region like Region Key
- Each Endpoint describes the Global Component Identifier (GCID)
  - Logical Fabric Identifier
  - Used in Gen-Z Address from Initiator



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/1",
    "@odata.type": "#Endpoint.v1_4_0.Endpoint",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see h
    "Id": "1",
    "Name": "FAM Media Controller 1",
    "Description": "Fabric Attached Memory Media Controller",
    "EndpointProtocol": "GenZ",
    "ConnectedEntities": [
        {
            "EntityType": "MediaController",
            "EntityRole": "Both",
            "GenZ": {
                "GCID": {
                    "CID": "0x001",
                    "SID": "0x0001"
                },
                "AccessKey": "0x1A"
            },
            "EntityLink": {
                "@odata.id": "/redfish/v1/Chassis/GenZ/MediaControllers/1"
            }
        },
        {
            "EntityType": "MemoryChunk",
            "EntityRole": "Target",
            "EntityLink": {
                "@odata.id": "/redfish/v1/Chassis/GenZ/MemoryDomains/1/MemoryChunks/1"
            },
            "GenZ": {
                "RegionKey": "0x12C2F42A"
            }
        },
        {
            "EntityType": "MemoryChunk",
            "EntityRole": "Target",
            "EntityLink": {
                "@odata.id": "/redfish/v1/Chassis/GenZ/MemoryDomains/1/MemoryChunks/2"
            },
            "GenZ": {
                "RegionKey": "0xDC14995F"
            }
        }
    ],
    "Links": {
        "ConnectedPorts": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Switches/Switch1/Ports/1"
            }
        ],
        "AddressPools": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/AddressPools/AP1"
            }
        ]
    },
```

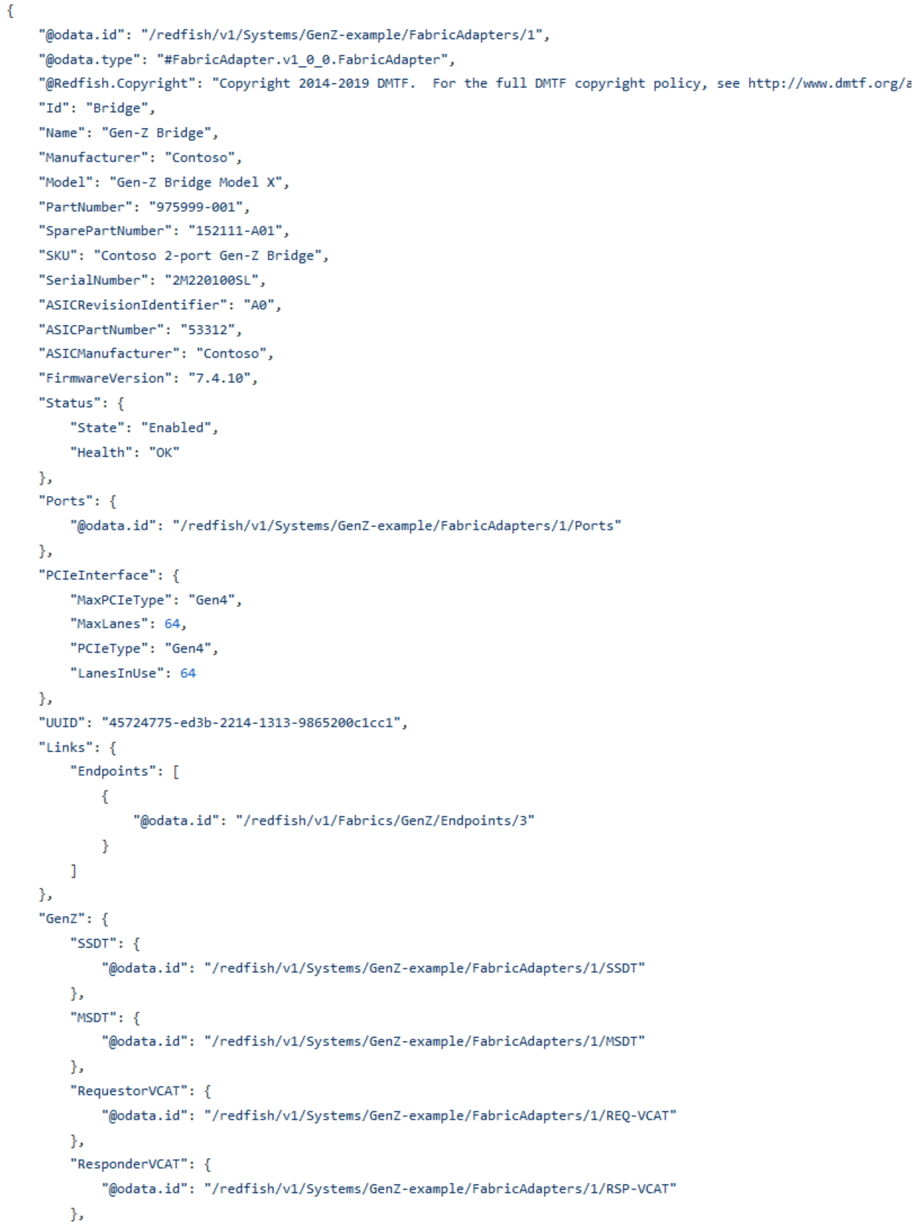
FABRIC ADAPTER MODEL

Fabric model of a Gen-Z Bridge (Initiator)



Model of a Gen-Z Fabric Adapter(Initiator)

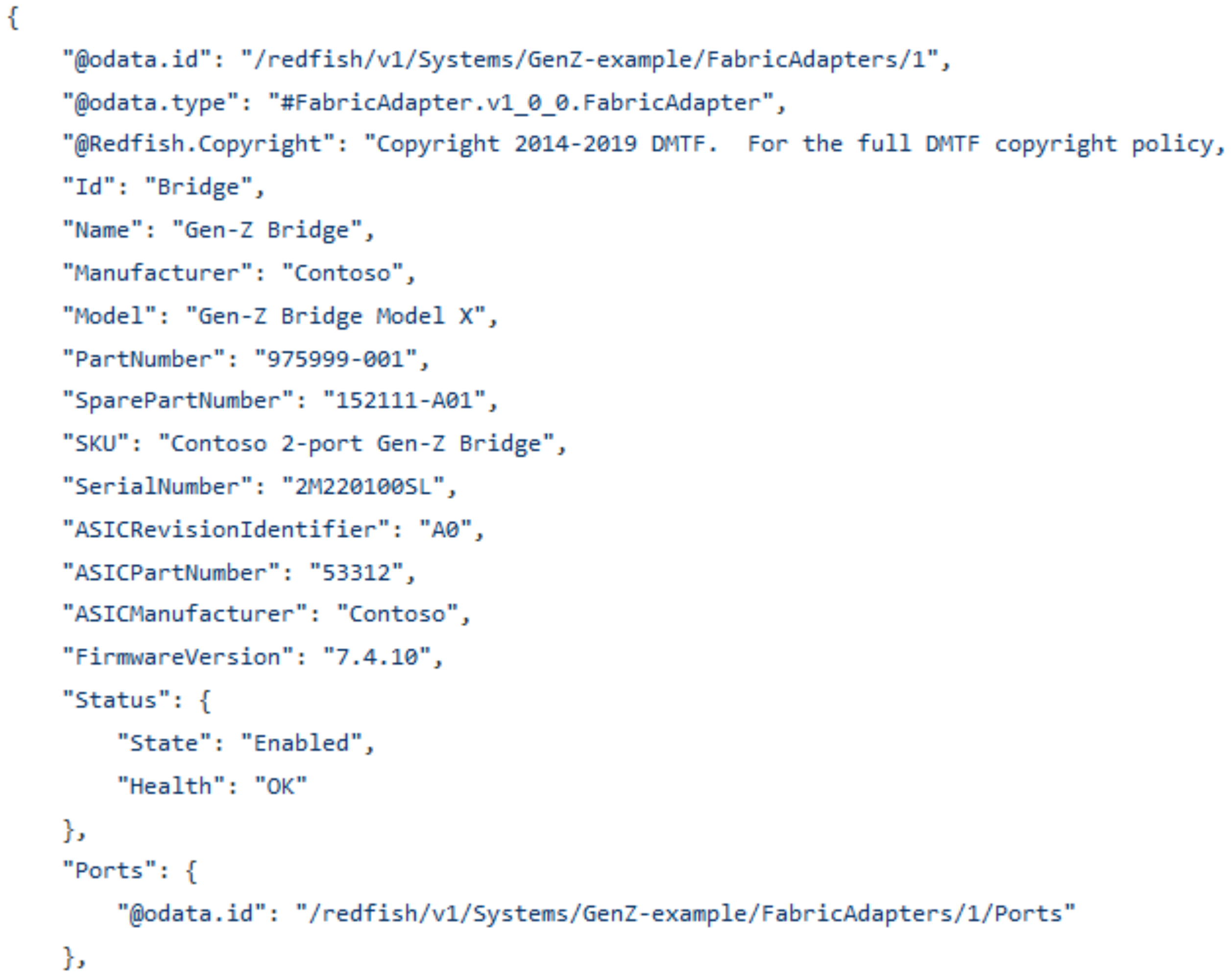
- Fabric Adapter bridges Gen-Z Fabric and SoC Interface
- Fabric Adapter has a Gen-Z Requestor to inject packets into the Fabric
  - Uses Routing tables to determine path to target
  - Describes the details of the Adapter HW
- Fabric Adapter may also contain an Integrated switch
  - May contain ports for packet relaying
- Fabic Adapters may also be a responder on the Gen-Z Fabric



```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1",
    "@odata.type": "#FabricAdapter.v1_0_0.FabricAdapter",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/a
    "Id": "Bridge",
    "Name": "Gen-Z Bridge",
    "Manufacturer": "Contoso",
    "Model": "Gen-Z Bridge Model X",
    "PartNumber": "975999-001",
    "SparePartNumber": "152111-A01",
    "SKU": "Contoso 2-port Gen-Z Bridge",
    "SerialNumber": "2M220100SL",
    "ASICRevisionIdentifier": "A0",
    "ASICPartNumber": "53312",
    "ASICManufacturer": "Contoso",
    "FirmwareVersion": "7.4.10",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Ports": {
        "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports"
    },
    "PCIeInterface": {
        "MaxPCIeType": "Gen4",
        "MaxLanes": 64,
        "PCIeType": "Gen4",
        "LanesInUse": 64
    },
    "UUID": "45724775-ed3b-2214-1313-9865200c1cc1",
    "Links": {
        "Endpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/3"
            }
        ]
    },
    "GenZ": {
        "SSDT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/SSDT"
        },
        "MSDT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/MSDT"
        },
        "RequestorVCAT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/REQ-VCAT"
        },
        "ResponderVCAT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/RSP-VCAT"
        },
```

Model of a Embedded Switch in Fabric Adapter

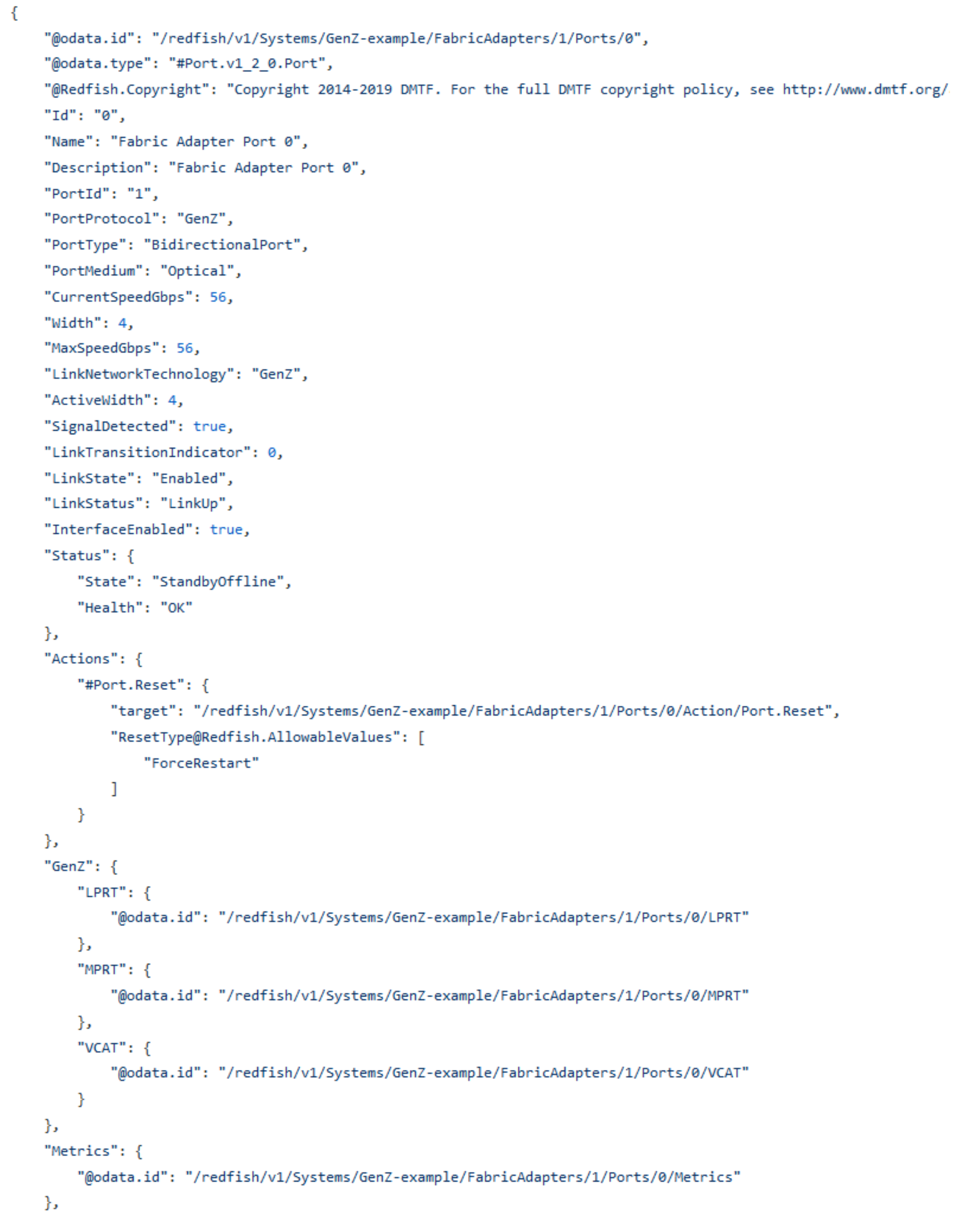
- Some Fabric Adapters may contain an embedded switch
- Embedded Switches have Gen-Z Ports
  - If ports can relay traffic, they would have route tables
  - If Ports do not relay traffic, ports would not require routing tables
  - Ports also describe Virtual Channels (VCAT) like Switch ports



```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1",
    "@odata.type": "#FabricAdapter.v1_0_0.FabricAdapter",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy,
    "Id": "Bridge",
    "Name": "Gen-Z Bridge",
    "Manufacturer": "Contoso",
    "Model": "Gen-Z Bridge Model X",
    "PartNumber": "975999-001",
    "SparePartNumber": "152111-A01",
    "SKU": "Contoso 2-port Gen-Z Bridge",
    "SerialNumber": "2M220100SL",
    "ASICRevisionIdentifier": "A0",
    "ASICPartNumber": "53312",
    "ASICManufacturer": "Contoso",
    "FirmwareVersion": "7.4.10",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "Ports": {
        "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports"
    },
```

Model of a Embedded Switch Port

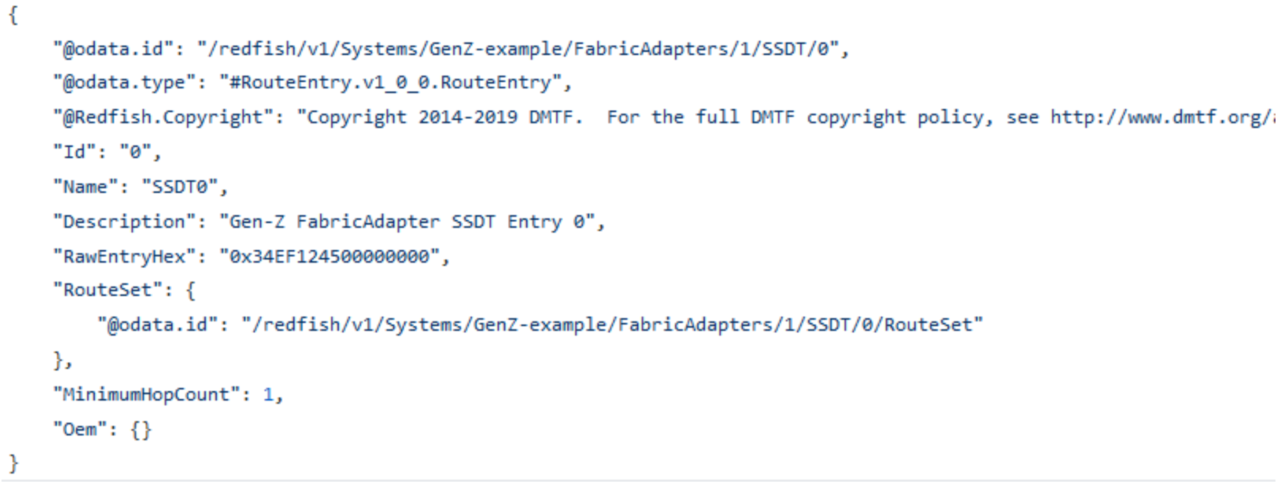
- Embedded Switch Ports
    - Same as switch ports in Fabrics
    - Ports can relay traffic, so they have route tables
    - Ports also describe Virtual Channels(VCAT)



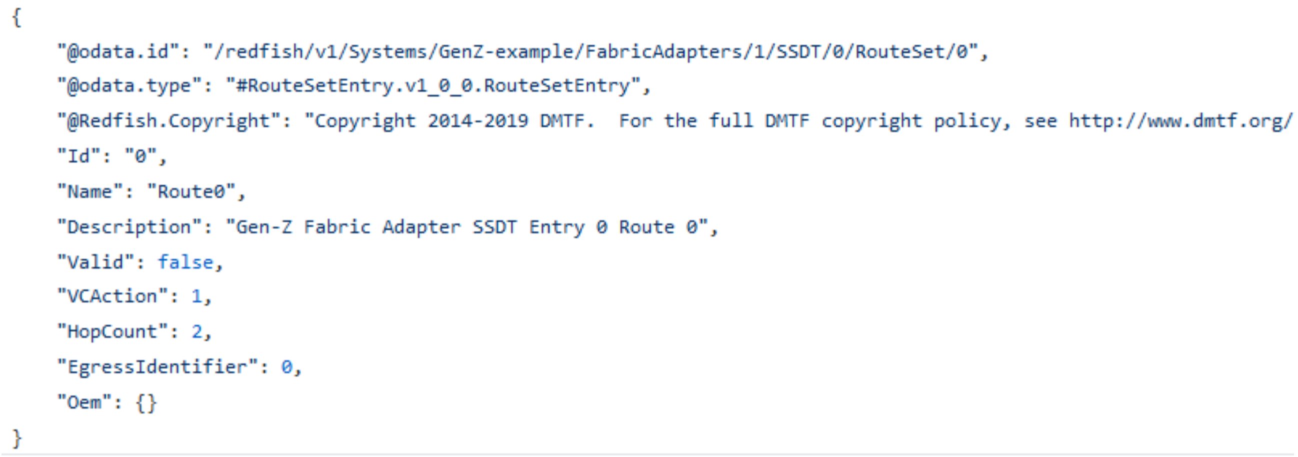
```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0",
    "@odata.type": "#Port.v1_2_0.Port",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF. For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "0",
    "Name": "Fabric Adapter Port 0",
    "Description": "Fabric Adapter Port 0",
    "PortId": "1",
    "PortProtocol": "GenZ",
    "PortType": "BidirectionalPort",
    "PortMedium": "Optical",
    "CurrentSpeedGbps": 56,
    "Width": 4,
    "MaxSpeedGbps": 56,
    "LinkNetworkTechnology": "GenZ",
    "ActiveWidth": 4,
    "SignalDetected": true,
    "LinkTransitionIndicator": 0,
    "LinkState": "Enabled",
    "LinkStatus": "LinkUp",
    "InterfaceEnabled": true,
    "Status": {
        "State": "StandbyOffline",
        "Health": "OK"
    },
    "Actions": {
        "#Port.Reset": {
            "target": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0/Action/Port.Reset",
            "ResetType@Redfish.AllowableValues": [
                "ForceRestart"
            ]
        }
    },
    "GenZ": {
        "LPRT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0/LPRT"
        },
        "MPRT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0/MPRT"
        },
        "VCAT": {
            "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0/VCAT"
        }
    },
    "Metrics": {
        "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/Ports/0/Metrics"
    },
```

Model of a Fabric Adapter Routing

- Fabric Adapter with multiple ports has route tables
  - Single Subnet Destination Table(SSDT)
  - Multi-subnet Destination Table(MSDT)
  - Describes which egress port to get to each destination
  - Describes which virtual channel to use on a particular egress port
  - Each Entry can have a set of possible egress routes



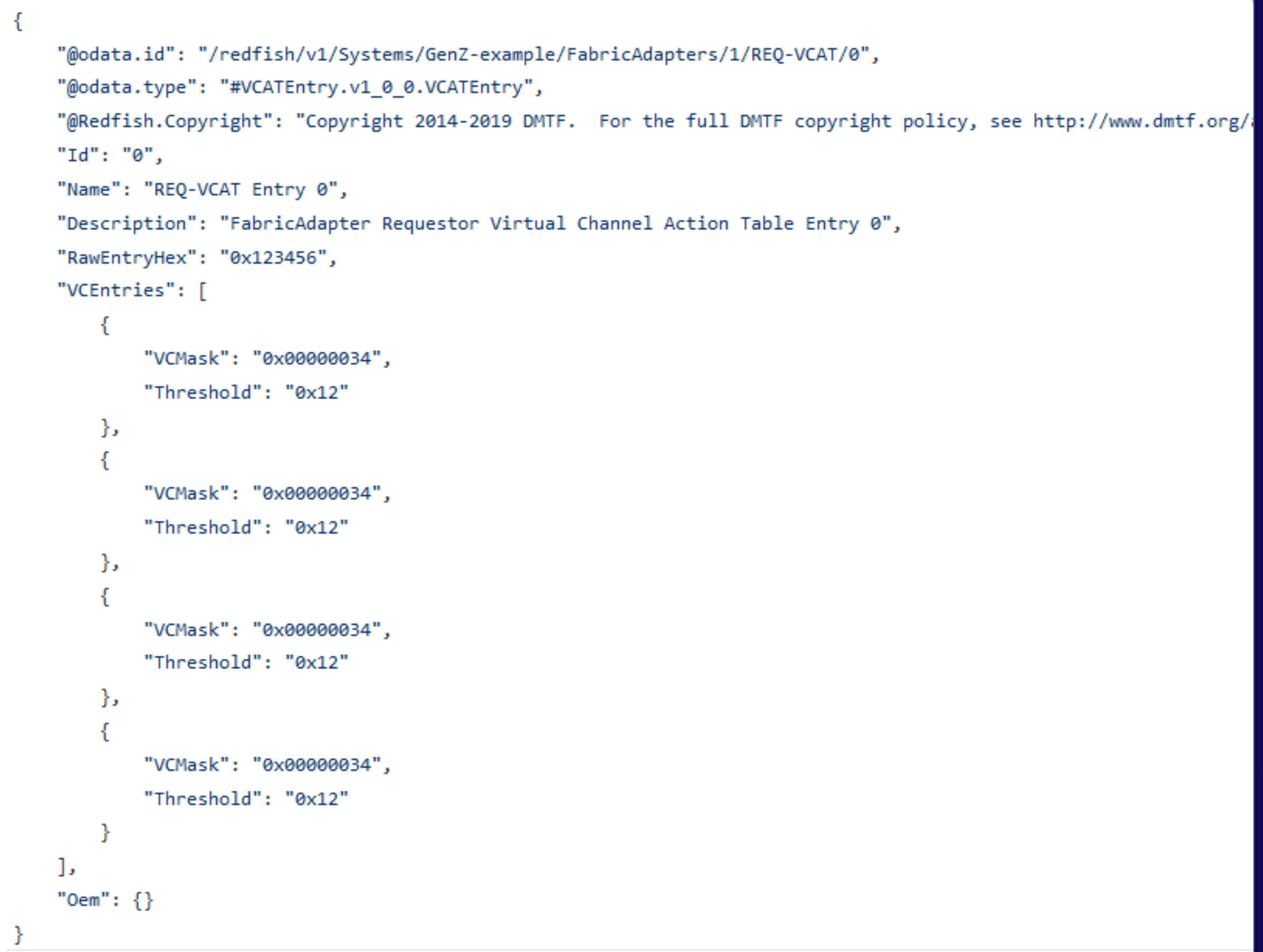
```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/SSDT/0",
    "@odata.type": "#RouteEntry.v1_0_0.RouteEntry",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "0",
    "Name": "SSDT0",
    "Description": "Gen-Z FabricAdapter SSDT Entry 0",
    "RawEntryHex": "0x34EF124500000000",
    "RouteSet": {
        "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/SSDT/0/RouteSet"
    },
    "MinimumHopCount": 1,
    "Oem": {}
}
```



```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/SSDT/0/RouteSet/0",
    "@odata.type": "#RouteSetEntry.v1_0_0.RouteSetEntry",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "0",
    "Name": "Route0",
    "Description": "Gen-Z Fabric Adapter SSDT Entry 0 Route 0",
    "Valid": false,
    "VCAction": 1,
    "HopCount": 2,
    "EgressIdentifier": 0,
    "Oem": {}
}
```

Model of a Fabric Adapter Virtual Channels

- Fabric Adapter has Virtual Channel Action Tables
  - For Requestor and Responder (REQ-VCAT, RSP-VCAT)
  - Describes which virtual channels to use

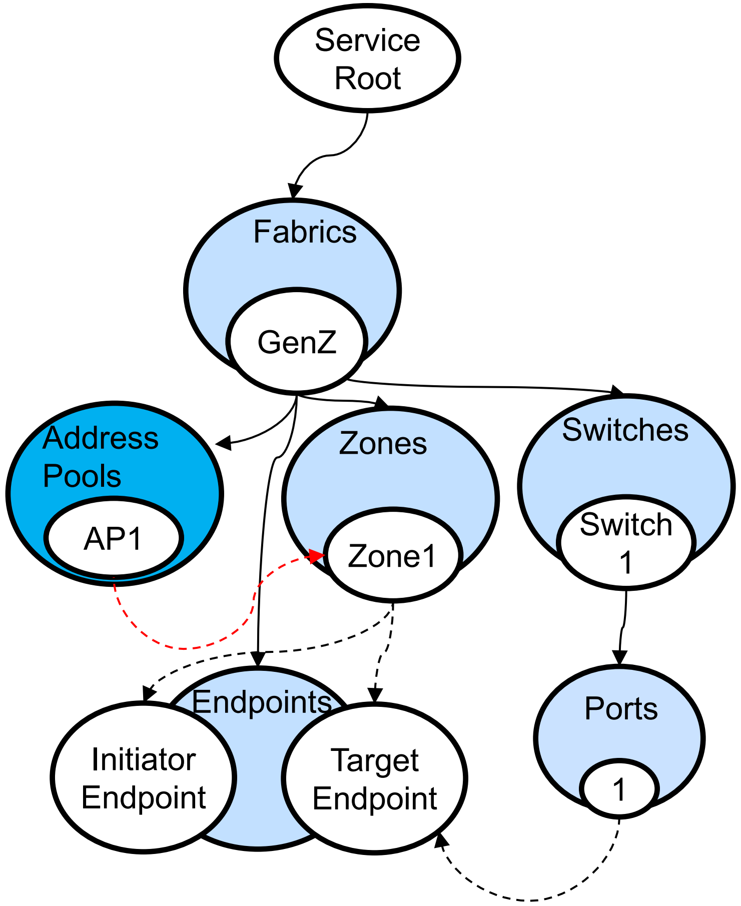


```
{
    "@odata.id": "/redfish/v1/Systems/GenZ-example/FabricAdapters/1/REQ-VCAT/0",
    "@odata.type": "#VCATEntry.v1_0_0.VCATEntry",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "0",
    "Name": "REQ-VCAT Entry 0",
    "Description": "FabricAdapter Requestor Virtual Channel Action Table Entry 0",
    "RawEntryHex": "0x123456",
    "VCEntries": [
        {
            "VCMask": "0x00000034",
            "Threshold": "0x12"
        },
        {
            "VCMask": "0x00000034",
            "Threshold": "0x12"
        },
        {
            "VCMask": "0x00000034",
            "Threshold": "0x12"
        },
        {
            "VCMask": "0x00000034",
            "Threshold": "0x12"
        }
    ],
    "Oem": {}
}
```

ADDRESS POOLS

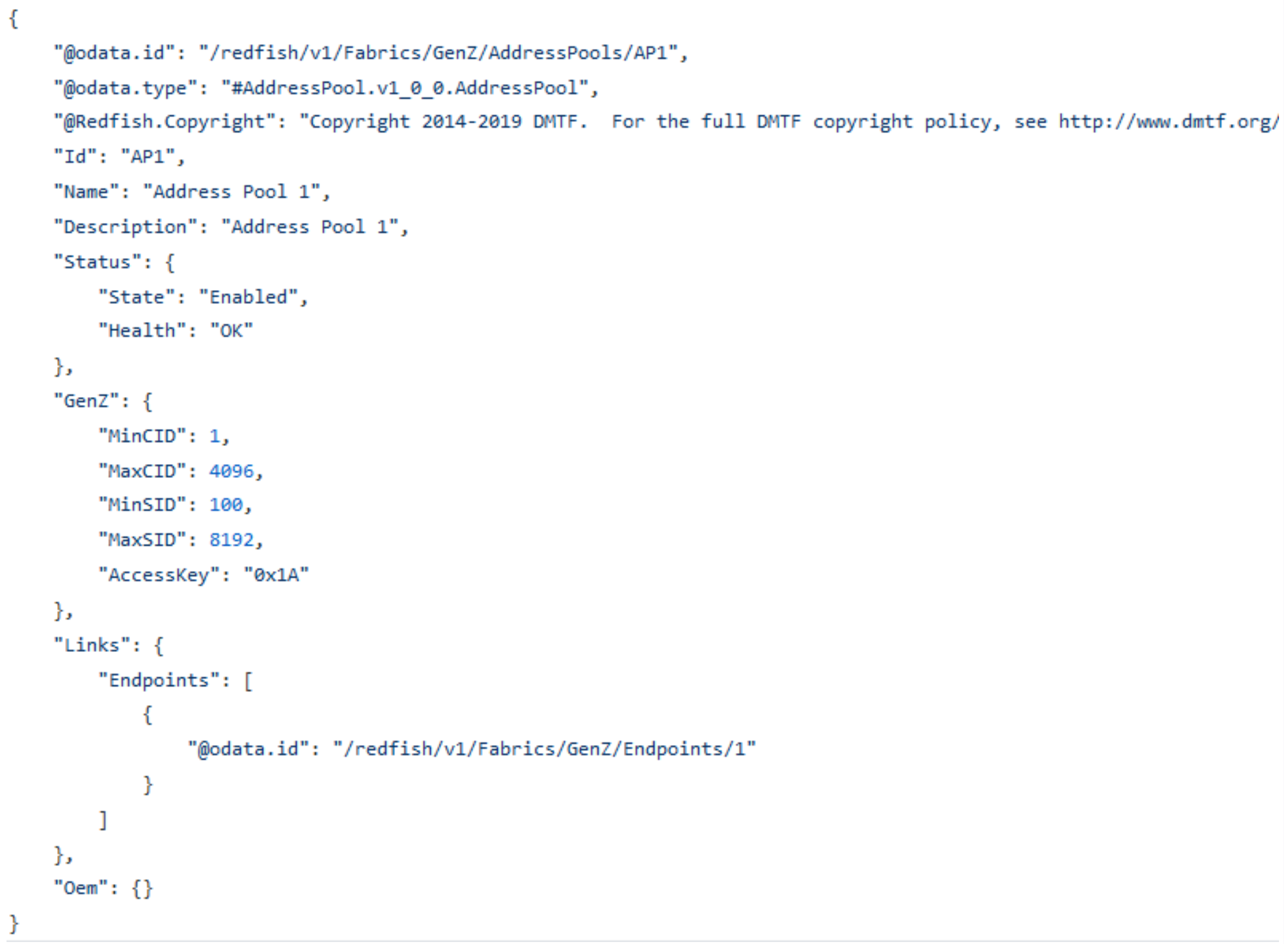
Address Pools to provide constraints

- Provides constraints on the values in Endpoints
  - Ex. Limiting CID values for a Gen-Z Address
- Typical constraints are minimum/maximum
- All endpoints within that pool would adhere to the pool constraints
- Address Pool would be specific to a particular fabric type



Address Pools for Endpoints

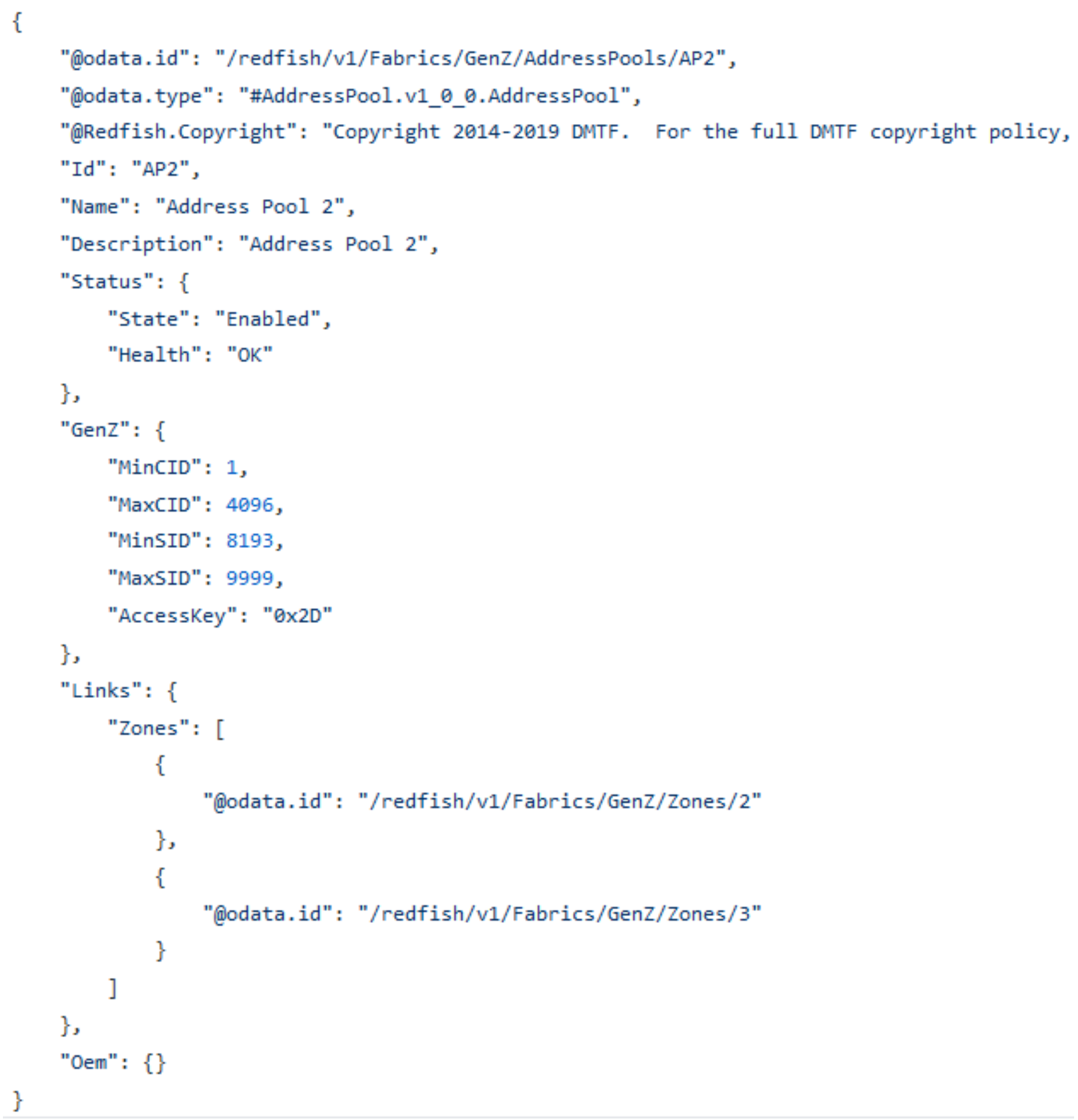
- Elements Within an Address Pool
  - Endpoints
  - Zones
- Allows for constraints for a group of endpoints



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/AddressPools/AP1",
    "@odata.type": "#AddressPool.v1_0_0.AddressPool",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "AP1",
    "Name": "Address Pool 1",
    "Description": "Address Pool 1",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "GenZ": {
        "MinCID": 1,
        "MaxCID": 4096,
        "MinSID": 100,
        "MaxSID": 8192,
        "AccessKey": "0x1A"
    },
    "Links": {
        "Endpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/1"
            }
        ]
    },
    "Oem": {}
}
```

Address Pools for Zones

- Elements Within an Address Pool
  - Endpoints
  - Zones
- Allows constraining all endpoints within a specific zone
- Provides scalability for managing address ranges



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/AddressPools/AP2",
    "@odata.type": "#AddressPool.v1_0_0.AddressPool",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy,
    "Id": "AP2",
    "Name": "Address Pool 2",
    "Description": "Address Pool 2",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "GenZ": {
        "MinCID": 1,
        "MaxCID": 4096,
        "MinSID": 8193,
        "MaxSID": 9999,
        "AccessKey": "0x2D"
    },
    "Links": {
        "Zones": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Zones/2"
            },
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Zones/3"
            }
        ]
    },
    "Oem": {}
}
```

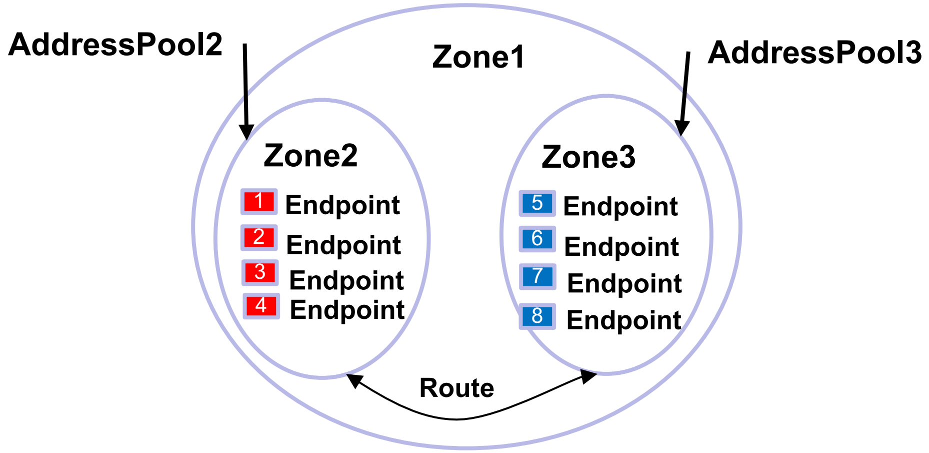
ZONES

Zones need scalability

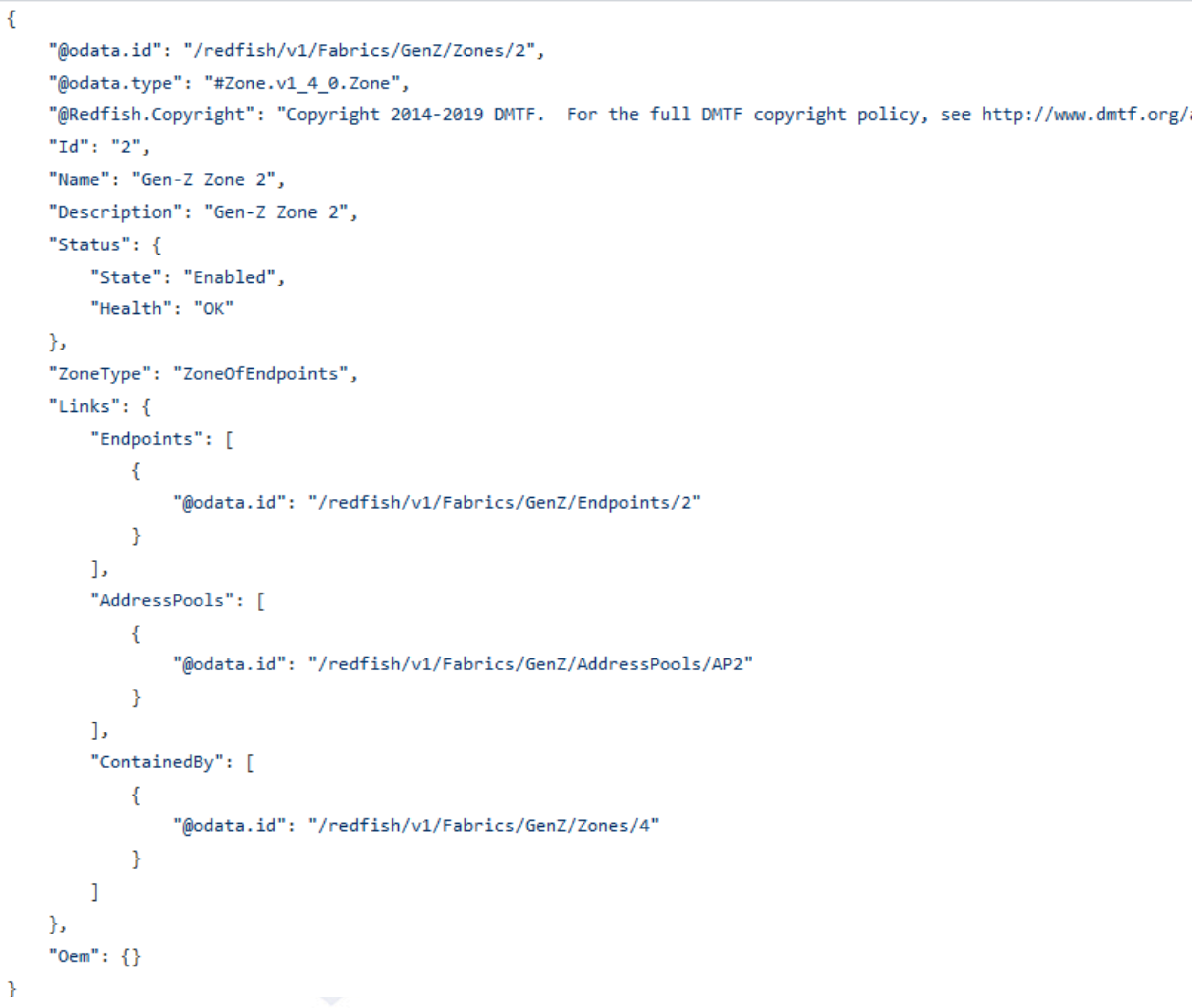
- Zones represent connections
  - Which resources are allowed to communicate with other resources
- Large scale fabrics can have thousands of zones with thousands of endpoints within those zones
- Allowing one zone to start communicating with another group would require another zone
- Not scalable, would have to create another zone with all the previous zone endpoints within that zone
- Hard to manage
  - Removing a single endpoint would require DELETEing from all zones containing that endpoint

Zone of Zones

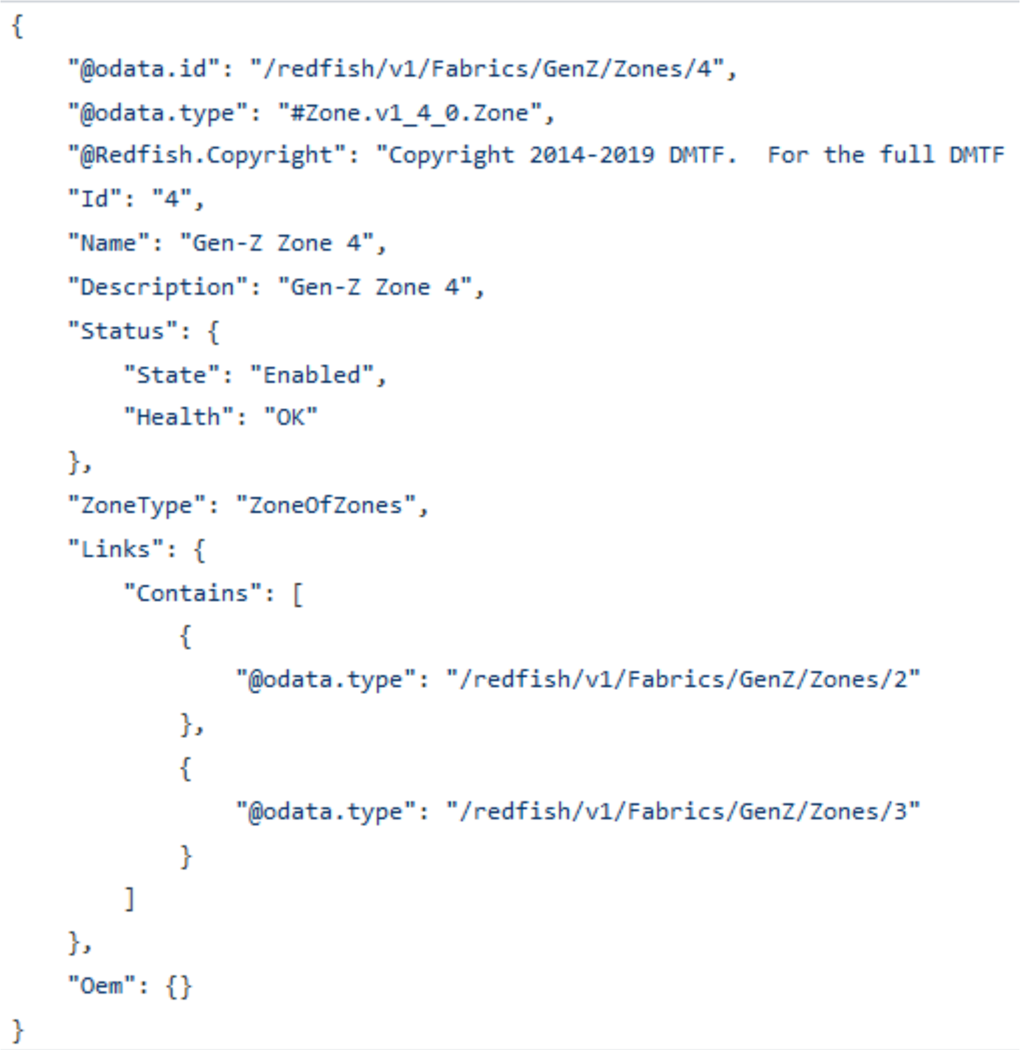
- Created a new Zone of Zones
- Allow for endpoints in one zone to communicate within another zone
- Reduces number of required IOs from a client
- Scalable for large fabrics
- Uses ZoneType to differentiate Zone of Zones from Zone of Endpoints



Example Zones



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Zones/2",
    "@odata.type": "#Zone.v1_4_0.Zone",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF copyright policy, see http://www.dmtf.org/
    "Id": "2",
    "Name": "Gen-Z Zone 2",
    "Description": "Gen-Z Zone 2",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "ZoneType": "ZoneOfEndpoints",
    "Links": {
        "Endpoints": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Endpoints/2"
            }
        ],
        "AddressPools": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/AddressPools/AP2"
            }
        ],
        "ContainedBy": [
            {
                "@odata.id": "/redfish/v1/Fabrics/GenZ/Zones/4"
            }
        ]
    },
    "Oem": {}
}
```



```
{
    "@odata.id": "/redfish/v1/Fabrics/GenZ/Zones/4",
    "@odata.type": "#Zone.v1_4_0.Zone",
    "@Redfish.Copyright": "Copyright 2014-2019 DMTF.  For the full DMTF
    "Id": "4",
    "Name": "Gen-Z Zone 4",
    "Description": "Gen-Z Zone 4",
    "Status": {
        "State": "Enabled",
        "Health": "OK"
    },
    "ZoneType": "ZoneOfZones",
    "Links": {
        "Contains": [
            {
                "@odata.type": "/redfish/v1/Fabrics/GenZ/Zones/2"
            },
            {
                "@odata.type": "/redfish/v1/Fabrics/GenZ/Zones/3"
            }
        ]
    },
    "Oem": {}
}
```

EVENTS AND NOTIFICATIONS

Unsolicited Event Packets

- Gen-Z UEPs have a table of descriptions for each Unsolicited Event
- Need to generate a Message Registry based on the UEP table defined in the Gen-Z Core Specification to describe each event type
  - Table 6-40 in the Gen-Z Core Spec. has the list of events to turn into individual messages
  - Take the UEP format to provide parameters for the messages

Questions/ Comments?