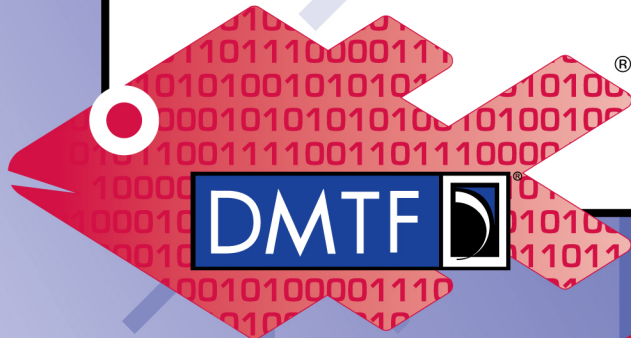




Redfish Composability

Mike Raineri
Dell Inc.



Redfish



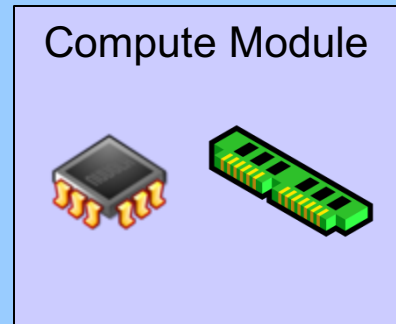
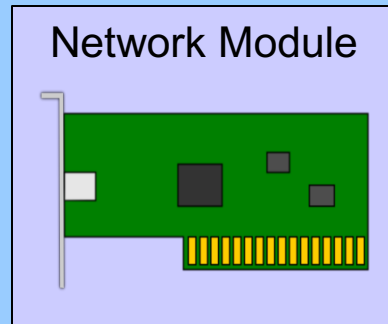
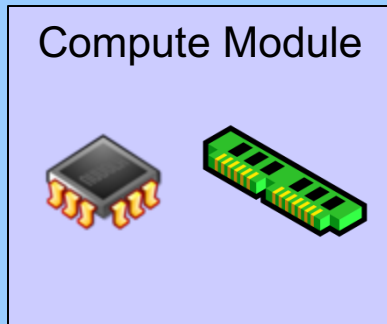
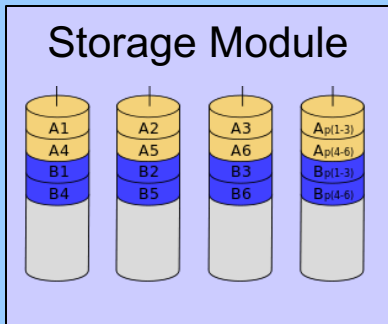
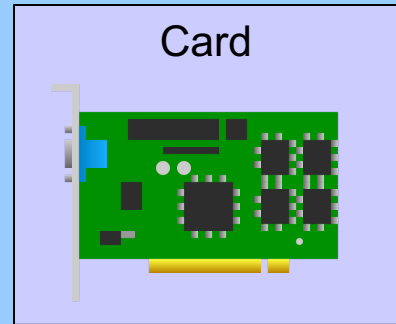
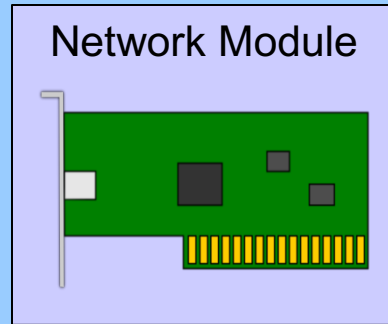
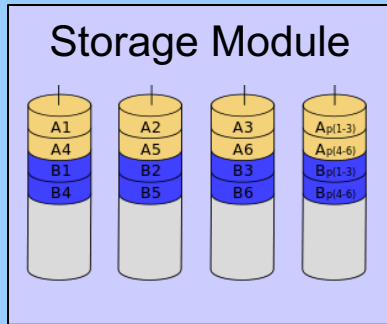
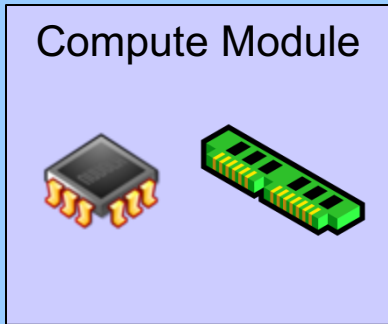
What Is Composability?

- In the context of disaggregated hardware, components are treated independently and are not bound to a singular system
- Compute, network, storage, and other components are treated as individual available resources
- Components are bound together to create a logical system
 - These logical systems function just like traditional computer systems
- This allows a user to compose systems using different sets of components without having to touch any hardware



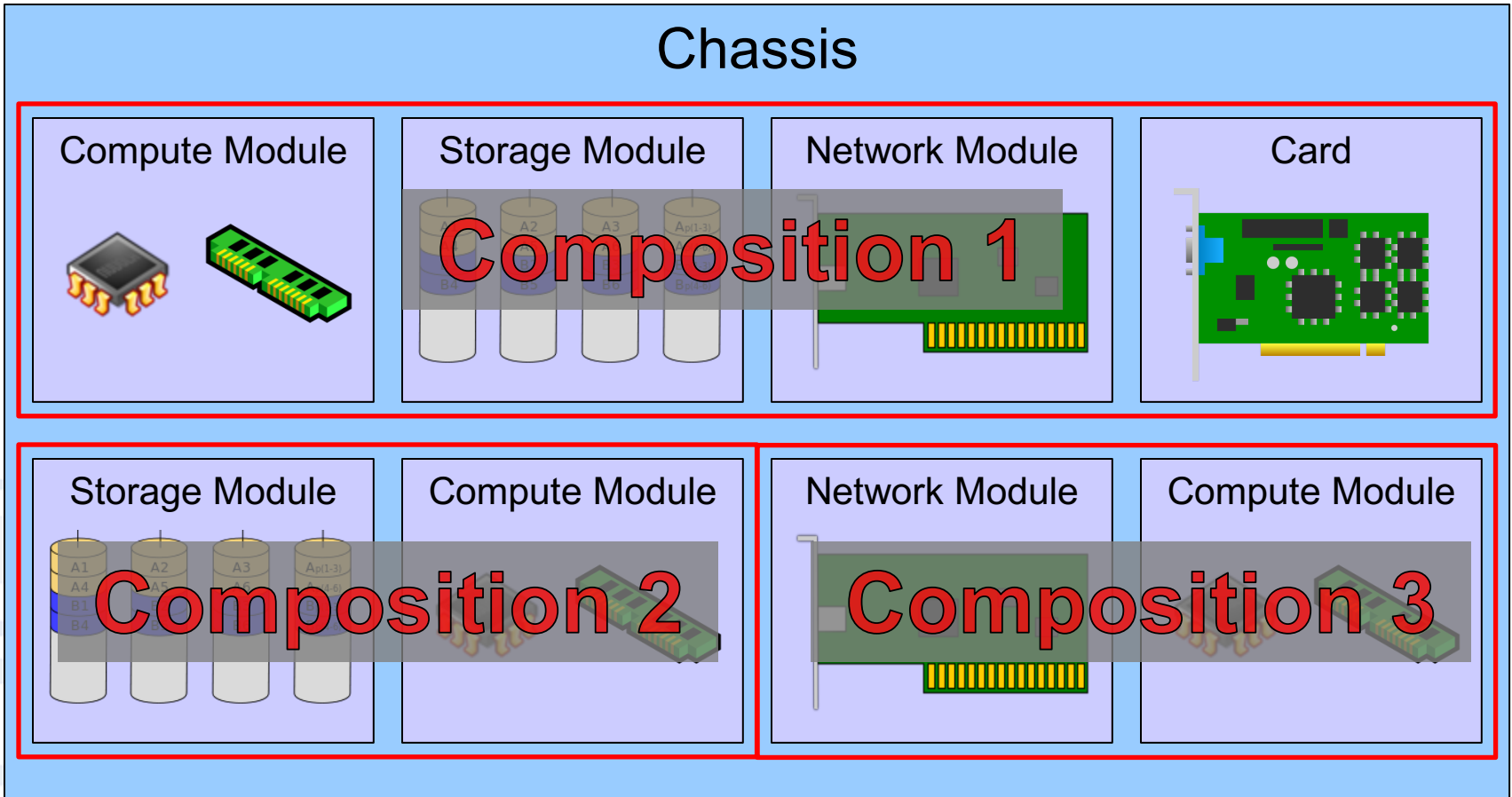
Ex. Composable System (No Composed Systems)

Chassis



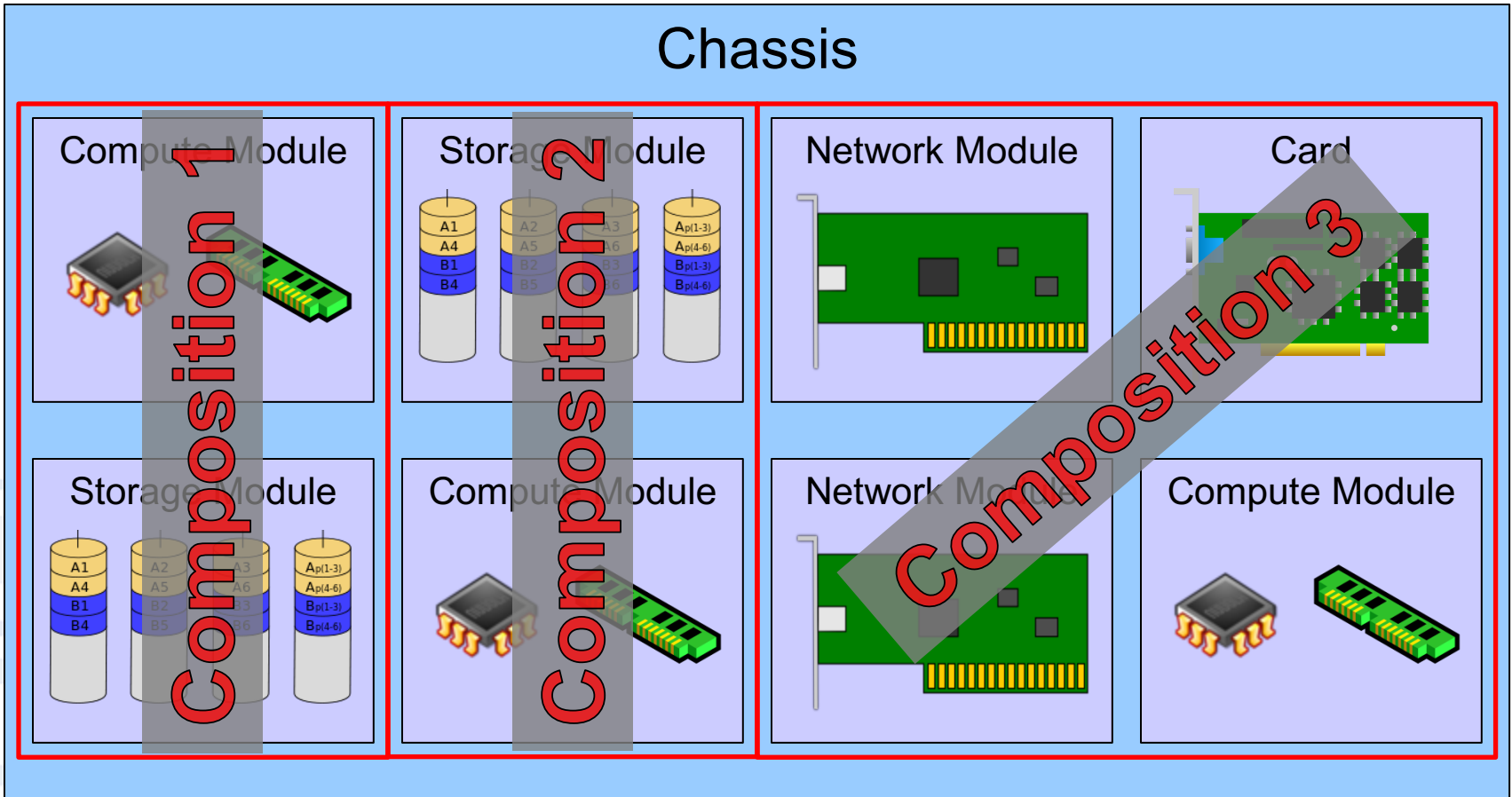


Ex. Composable System (Composed System Config 1)





Ex. Composable System (Composed System Config 2)









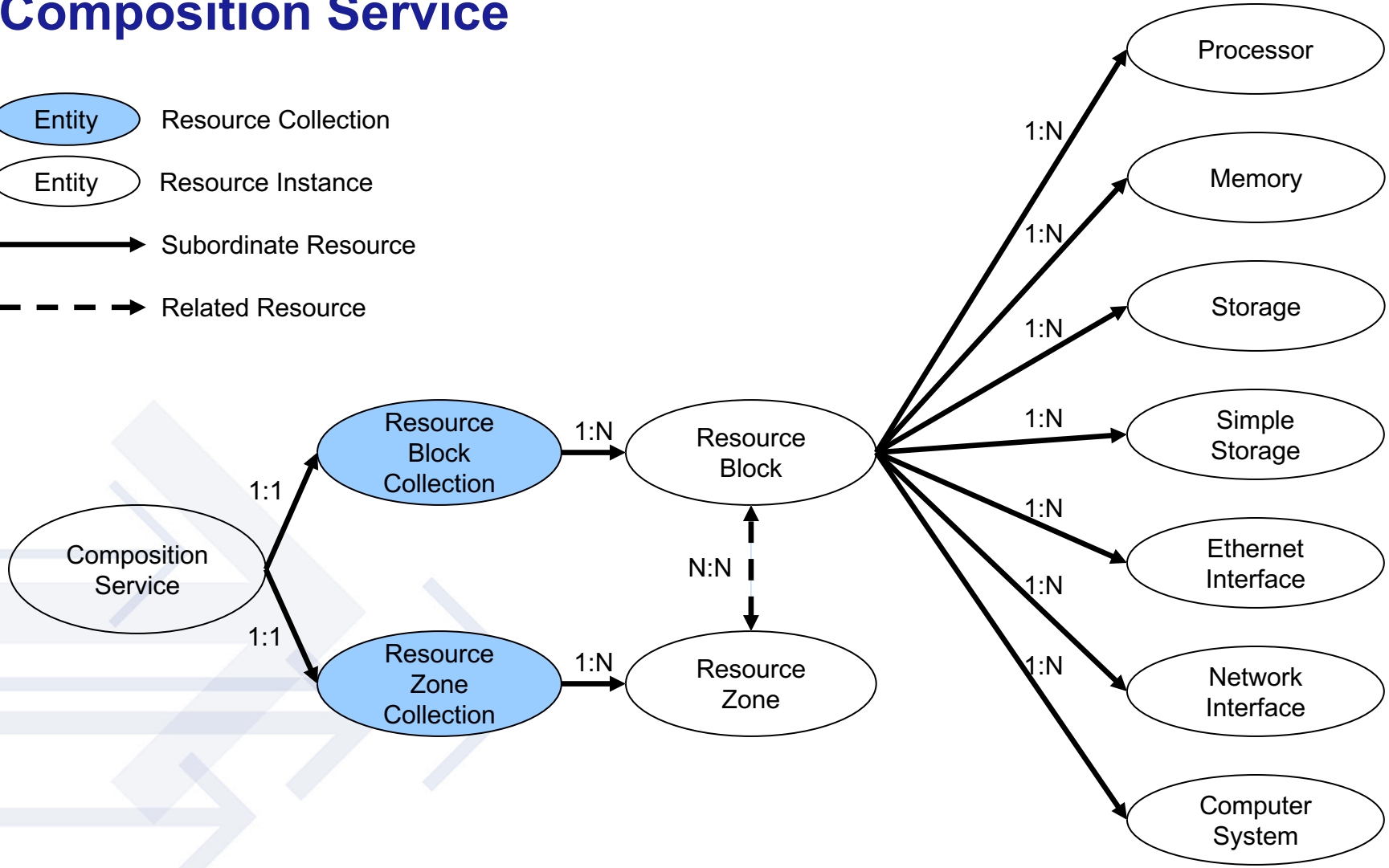
Reporting Composable Resources

- The Composition Service off Service Root is the entry point for clients
- The Composition Service contains Resource Blocks and Resource Zones
- Resource Block: Inventory of all processors, memory, drives, etc
 - Each block instance contains a set of components
 - Each block instance represents the lowest level building blocks for creating a system
 - Each block contains status about the block
- Resource Zones: Shows the relationships between the different Resource Block to establish which blocks can be in the same composition request
 - Resource Zones also report Capabilities, which allows a client to understand the format of composition requests



Composition Service

-  Entity Resource Collection
-  Entity Resource Instance
-  Subordinate Resource
-  Related Resource





Composition Service Example

```
{
  "@odata.context": "/redfish/v1/$metadata#CompositionService.CompositionService",
  "@odata.type": "#CompositionService.v1_0_0.CompositionService",
  "@odata.id": "/redfish/v1/CompositionService",
  "Id": "CompositionService",
  "Name": "Composition Service",
  "Status": {
    "State": "Enabled",
    "Health": "OK"
  },
  "ServiceEnabled": true,
  "ResourceBlocks": {
    "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks"
  },
  "ResourceZones": {
    "@odata.id": "/redfish/v1/CompositionService/ResourceZones"
  },
  "Oem": {}
}
```




Resource Block Example

```
{
  "@odata.context": "/redfish/v1/$metadata#ResourceBlock.ResourceBlock",
  "@odata.type": "#ResourceBlock.v1_0_0.ResourceBlock",
  "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock3",
  "Id": "DriveBlock3",
  "Name": "Drive Block 3",
  "ResourceBlockType": [ "Storage" ],
  "Status": { "State": "Enabled", "Health": "OK" },
  "CompositionStatus": { "Reserved": false, "CompositionState": "Composed" },
  "Processors": [],
  "Memory": [],
  "Storage": [
    { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock3/Storage/Block3NVMe" }
  ],
  "Links": {
    "ComputerSystems": [
      { "@odata.id": "/redfish/v1/Systems/ComposedSystem" }
    ],
    "Chassis": [
      { "@odata.id": "/redfish/v1/Chassis/ComposableModule3" }
    ],
    "Zones": [
      { "@odata.id": "/redfish/v1/CompositionService/ResourceZones/1" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceZones/2" }
    ]
  },
  "Oem": {}
}
```



Resource Zone Example

```
{
  "@odata.context": "/redfish/v1/$metadata#Zone.Zone",
  "@odata.type": "#Zone.v1_1_0.Zone",
  "@odata.id": "/redfish/v1/CompositionService/ResourceZones/2",
  "Id": "2",
  "Name": "Resource Zone 2",
  "Status": { "State": "Enabled", "Health": "OK" },
  "Links": {
    "ResourceBlocks": [
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/ComputeBlock2" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock3" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock4" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock5" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock6" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock7" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkBlock8" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/OffloadBlock9" }
    ],
    "@Redfish.CollectionCapabilities": {
      "@odata.type": "#CollectionCapabilities.v1_0_0.CollectionCapabilities",
      "Capabilities": [
        {
          "CapabilitiesObject": { "@odata.id": "/redfish/v1/Systems/Capabilities" },
          "UseCase": "ComputerSystemComposition",
          "Links": { "TargetCollection": { "@odata.id": "/redfish/v1/Systems" } }
        }
      ]
    }
  }
}
```



Workflow for Composing a Computer System

1. The client performs an inventory of the system
 - The client reads the members of the Resource Blocks Collection to understand the components available
 - The client reads the members of the Resource Zones Collection to understand the binding restrictions of the components
2. Once the client has identified the components needed, it reads the Capabilities information from the appropriate Zone to understand how to form a POST request
 - The Capabilities information contains annotations for which properties are required in the POST request and which properties are optional
3. The client sends a POST request to Computer System collection to create a composed Computer System
4. When the composed system is no longer needed, the client sends a DELETE request to the Computer System instance



Composing a Computer System Example; Capabilities

- In the context of composability, the Capabilities of a collection can be found as “@Redfish” annotations in two places
 - The collection in which the POST request is made
 - The Zone within the CompositionService
- The collection contains all Capabilities for that collection
 - There could be capabilities beyond composability that the collection needs to express
- The Zone contains all capabilities for that Zone
 - A single Zone could be capable of producing different sets of resources for different collections
- The underlying Capabilities information for a given use case, regardless of the location, will be the same



Composing a Computer System Example; Capabilities

```
{
  "@odata.context": "/redfish/v1/$metadata#Zone.Zone",
  "@odata.type": "#Zone.v1_1_0.Zone",
  "@odata.id": "/redfish/v1/CompositionService/ResourceZones/2",
  "Id": "2",
  "Name": "Resource Zone 2",
  "Status": { "State": "Enabled", "Health": "OK" },
  "Links": {
    "ResourceBlocks": [
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/ComputeBlock2" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock3" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock4" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock5" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock6" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock7" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkBlock8" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/OffloadBlock9" }
    ]
  },
  "@Redfish.CollectionCapabilities": {
    "@odata.type": "#CollectionCapabilities.v1_0_0.CollectionCapabilities",
    "Capabilities": [
      {
        "CapabilitiesObject": { "@odata.id": "/redfish/v1/Systems/Capabilities" },
        "UseCase": "ComputerSystemComposition",
        "Links": { "TargetCollection": { "@odata.id": "/redfish/v1/Systems" } }
      }
    ]
  }
}
```



Composing a Computer System Example; Capabilities

```
{
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.type": "#ComputerSystem.v1_4_0.ComputerSystem",
  "@odata.id": "/redfish/v1/Systems/Capabilities",
  "Id": "Capabilities",
  "Name": "Capabilities for the Zone",
  "Name@Redfish.RequiredOnCreate": true,
  "Name@Redfish.SetOnlyOnCreate": true,
  "Description@Redfish.OptionalOnCreate": true,
  "Description@Redfish.SetOnlyOnCreate": true,
  "HostName@Redfish.OptionalOnCreate": true,
  "HostName@Redfish.UpdatableAfterCreate": true,
  "Boot@Redfish.OptionalOnCreate": true,
  "Boot": {
    "BootSourceOverrideEnabled@Redfish.OptionalOnCreate": true,
    "BootSourceOverrideEnabled@Redfish.UpdatableAfterCreate": true,
    "BootSourceOverrideTarget@Redfish.OptionalOnCreate": true,
    "BootSourceOverrideTarget@Redfish.UpdatableAfterCreate": true,
    "BootSourceOverrideTarget@Redfish.AllowableValues": [ "None", "Pxe", "Usb", "Hdd" ]
  },
  "Links@Redfish.RequiredOnCreate": true,
  "Links": {
    "ResourceBlocks@Redfish.RequiredOnCreate": true,
    "ResourceBlocks@Redfish.UpdatableAfterCreate": true
  }
}
```

Property Annotation:
<Prop>@<Annotation>

Required in the Client
Create Request



Composing a Computer System Example; POST

- Client Request

POST /redfish/v1/Systems HTTP/1.1

```
{
  "Name": "Sample Composed System",
  "Links": {
    "ResourceBlocks": [
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/ComputeBlock2" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock6" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkBlock8" }
    ]
  }
}
```

- Service Response

HTTP/1.1 201 Created

Location: /redfish/v1/Systems/NewSystem



Composed Computer System Mockup

```
{
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.type": "#ComputerSystem.v1_4_0.ComputerSystem",
  "@odata.id": "/redfish/v1/Systems/NewSystem",
  "Id": "NewSystem",
  "Name": "Sample Composed System",
  "Description": "Computer System",
  "SystemType": "Composed",
  "UUID": "7e622909-aca7-4762-9d9c-cc946599ef9a",
  "HostName": "DefaultHostName",
  "PowerState": "On",
  "Boot": {
    "BootSourceOverrideEnabled": false,
    "BootSourceOverrideTarget": "None",
    "BootSourceOverrideTarget@Redfish.AllowableValues": [ "None", "Pxe", "Usb", "Hdd" ]
  },
  "Processors": { "@odata.id" : "/redfish/v1/Systems/NewSystem/Processors" },
  "Memory": { "@odata.id" : "/redfish/v1/Systems/NewSystem/Memory" },
  "EthernetInterfaces": { "@odata.id" : "/redfish/v1/Systems/NewSystem/EthernetInterfaces" },
  "Storage": { "@odata.id" : "/redfish/v1/Systems/NewSystem/Storage" },
  "Links": {
    "ResourceBlocks": [
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/ComputeBlock2" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/DriveBlock6" },
      { "@odata.id": "/redfish/v1/CompositionService/ResourceBlocks/NetworkBlock8" }
    ]
  },
  "Oem": {}
}
```




Retiring a Composed Computer System Example

- Client Request

```
DELETE /redfish/v1/Systems/NewSystem HTTP/1.1
```

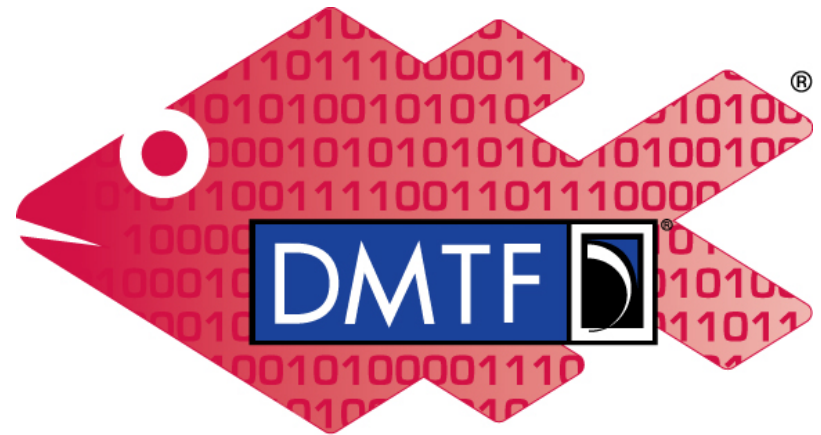
- Service Response

```
HTTP/1.1 204 No Content
```



Thank you for watching!

- Redfish Standards
 - Schemas, Specs, Mockups, White Papers, FAQ, Educational Material & more
 - <http://www.dmtf.org/standards/redfish>
- Redfish Developer Hub
 - Redfish Interactive Explorer, Hosted Schema at Namespace & other links
 - <http://redfish.dmtf.org>
- SPMF (WG that defines Redfish)
 - Companies involved, Upcoming Schedules & Future work, Charter, Information on joining.
 - <http://www.dmtf.org/standards/spmf>



Redfish