# Redfish ACD

## (Advanced Communication Devices)

Jeff Hilland
HPE

Redfish

www.dmtf.org

# Agenda

- ACD Overview
- ACD Resource Overview and Map
- Examples

# Redfish for Advanced Communication Devices

- Support released in Redfish 2016.3
- Advanced Communication Devices may include:
  - Ethernet NICs,
  - Fibre Channel HBAs,
  - Future possibility of supporting RDMA, Infiniband HCAs, and other communication components.
- Newly Defined Entities (Objects) for ACD
  - NetworkInterface & NetworkInterfaceCollection
  - NetworkAdapter & NetworkAdapterCollection
  - NetworkPort & NetworkPortCollection
  - NetworkDeviceFunction & NetworkDeviceFunctionCollection

# Resource Overview

- Network Interface: System view of the adapter.
  - Links arrays to NetworkAdapter, NetworkPort, and NetworkDeviceFunction
- Network Adapter: Physical view of the adapter.
  - NetworkAdapter contains an array of controllers.
  - Each controller contains links to the NetworkDeviceFunction & NetworkPort.
  - The controller array is provided to handle modeling adapters that have multiple controllers

# Resource Overview

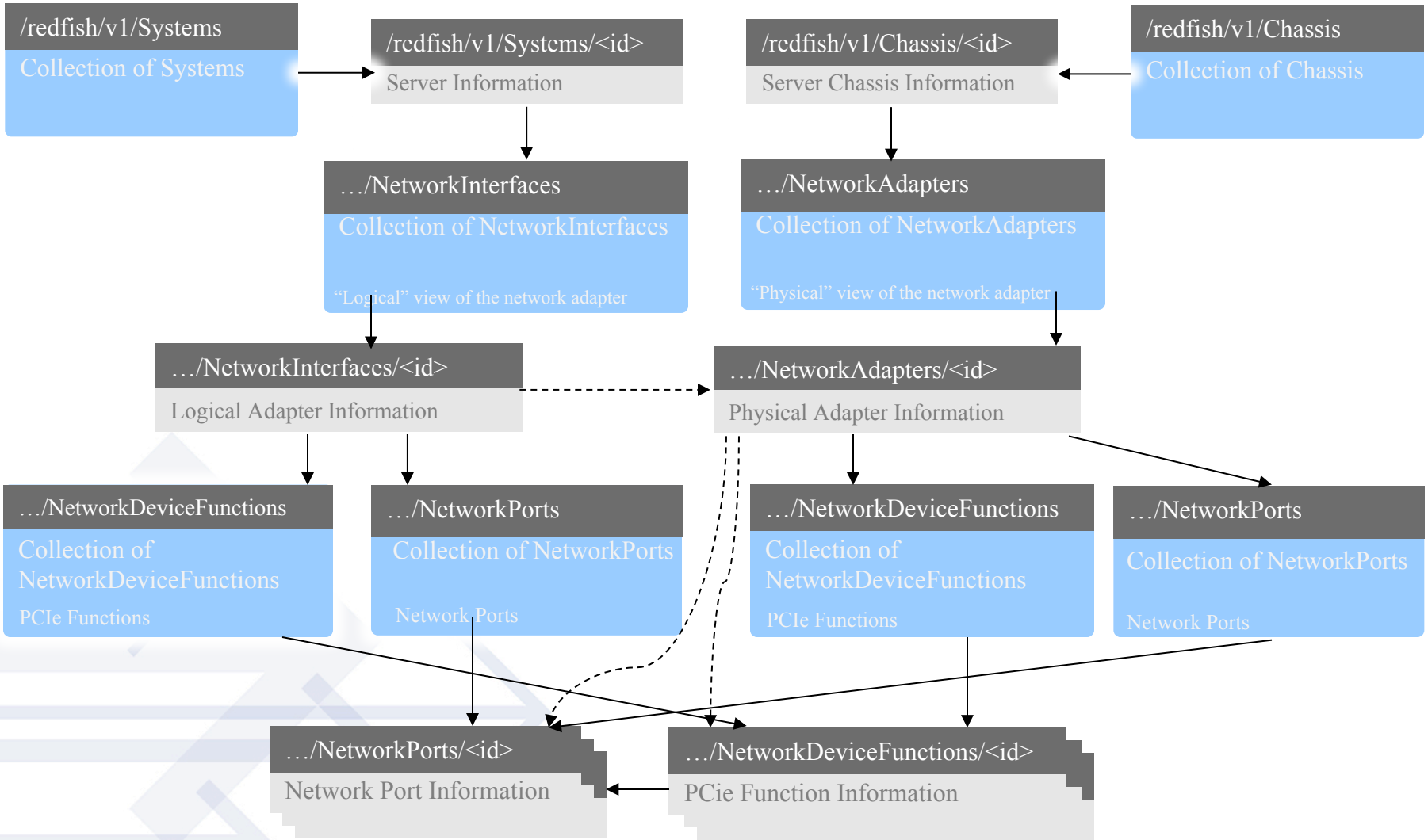
- Network Interface: System view of the adapter.
  - Links arrays to NetworkAdapter, NetworkPort, and NetworkDeviceFunction
  - Different than Network Adapter because it may be just a part of the adapter in a composable system

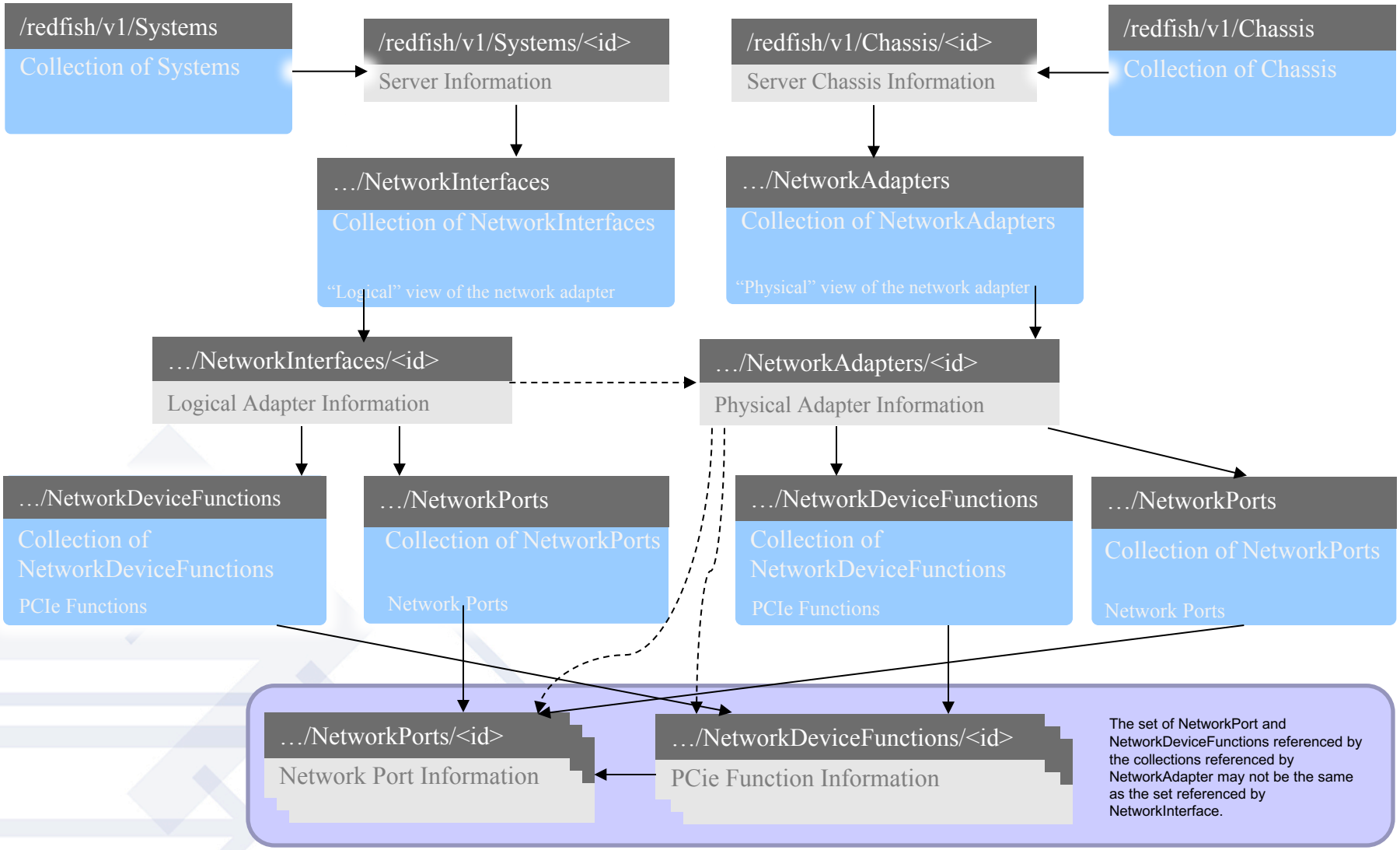
- Network Adapter: Physical view of the adapter.
  - NetworkAdapter contains an array of controllers.
  - Each controller contains links to the NetworkDeviceFunction & NetworkPort.
  - The controller array is provided to handle modeling adapters that have multiple controllers
  - Each controller may contain a link to corresponding PCIeDevice instances.

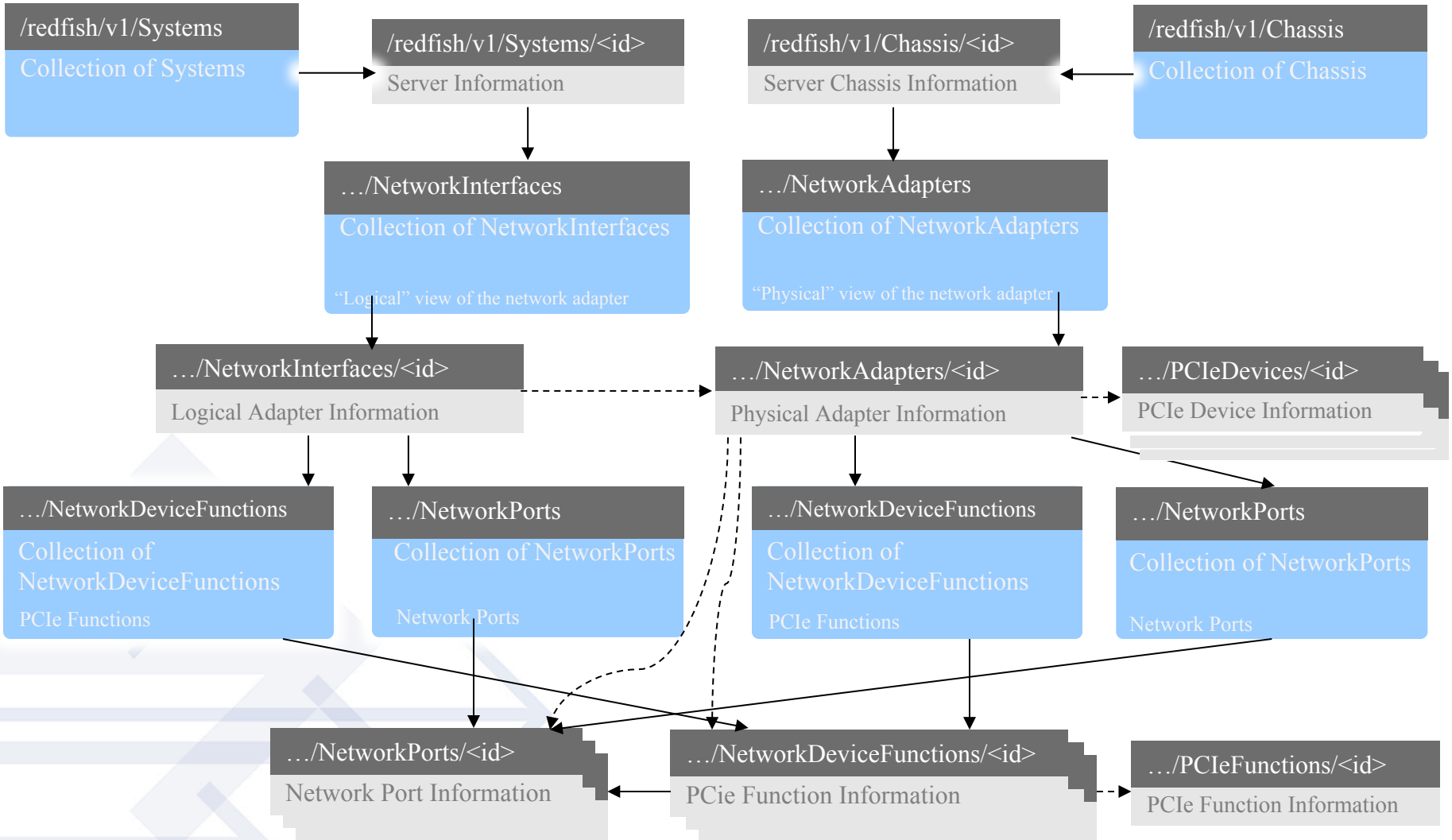
# Resource Overview

- Network Port: Often the physical port.
  - Represents the NetworkAdapter ports (often a physical port) including the configuration, capabilities and status.

- Network Device Function: Most of the device configuration (NIC, HBA, etc.)
  - The NetworkDeviceFunction provides a network adapter-centric view of a function allocated to a NetworkInterface and located on a NetworkAdapter.
  - The NetworkDeviceFunction exposes the capabilities, configuration, and status of a physical function.
  - The NetworkDeviceFunction may contain a link to a correlated PCIeFunction instance.
  - The NetworkDeviceFunction contains a link to a NetworkPort.


/redfish/v1/Systems
Collection of Systems
/redfish/v1/Systems/<id>
Server Information
/redfish/v1/Chassis/<id>
Server Chassis Information
/redfish/v1/Chassis
Collection of Chassis
…/NetworkInterfaces
Collection of NetworkInterfaces
"Logical" view of the network adapter
…/NetworkAdapters
Collection of NetworkAdapters
"Physical" view of the network adapter
…/NetworkInterfaces/<id>
Logical Adapter Information
…/NetworkAdapters/<id>
Physical Adapter Information
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkPorts/<id>
Network Port Information
…/NetworkDeviceFunctions/<id>
PCIe Function Information


/redfish/v1/Systems
Collection of Systems
/redfish/v1/Systems/<id>
Server Information
/redfish/v1/Chassis/<id>
Server Chassis Information
/redfish/v1/Chassis
Collection of Chassis
…/NetworkInterfaces
Collection of NetworkInterfaces
"Logical" view of the network adapter
…/NetworkAdapters
Collection of NetworkAdapters
"Physical" view of the network adapter
…/NetworkInterfaces/<id>
Logical Adapter Information
…/NetworkAdapters/<id>
Physical Adapter Information
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkPorts/<id>
Network Port Information
…/NetworkDeviceFunctions/<id>
PCIe Function Information
The set of NetworkPort and NetworkDeviceFunctions referenced by the collections referenced by NetworkAdapter may not be the same as the set referenced by NetworkInterface.


/redfish/v1/Systems
Collection of Systems
/redfish/v1/Systems/<id>
Server Information
/redfish/v1/Chassis/<id>
Server Chassis Information
/redfish/v1/Chassis
Collection of Chassis
…/NetworkInterfaces
Collection of NetworkInterfaces
"Logical" view of the network adapter
…/NetworkAdapters
Collection of NetworkAdapters
"Physical" view of the network adapter
…/NetworkInterfaces/<id>
Logical Adapter Information
…/NetworkAdapters/<id>
Physical Adapter Information
…/PCIeDevices/<id>
PCIe Device Information
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkDeviceFunctions
Collection of NetworkDeviceFunctions
PCIe Functions
…/NetworkPorts
Collection of NetworkPorts
Network Ports
…/NetworkPorts/<id>
Network Port Information
…/NetworkDeviceFunctions/<id>
PCIe Function Information
…/PCIeFunctions/<id>
PCIe Function Information

# Network Interface (in System)


```
{
    "@odata.id": "/redfish/v1/Systems/1/NetworkInterfaces/9fd725a1",
    "@odata.type": "#NetworkInterface.v1_0_0.NetworkInterface",
    "Id": "9fa725a1",
    "Name": "Network Device View",
    "NetworkPorts": {
        "@odata.id": "/redfish/v1/Systems/1/NetworkInterfaces/9fd725a1/NetworkPorts"
    },
    "NetworkDeviceFunctions": {
        "@odata.id": "/redfish/v1/Systems/1/NetworkInterfaces/9fd725a1/NetworkDeviceFunctions"
    },
    "Links": {
        "NetworkAdapter": {
            "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1"
        }
    }
}
```


System NetworkPorts

System NetworkFunctions

Chassis NetworkAdapter

# Network Adapter (in Chassis)

```
{
    "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1",
    "@odata.type": "#NetworkAdapter.v1_0_0.NetworkAdapter",
    "NetworkPorts": {
        "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkPorts"
    },
    "NetworkDeviceFunctions": {
        "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkDeviceFunctions"
    },
    "Controllers": [
        {
            "FirmwarePackageVersion": "7.4.10",
            "Links":  {
                "PCIeDevices": [
                    {"@odata.id": "/redfish/v1/Chassis/1/PCIeDevices/NIC"}
                ],
                "NetworkPorts": [
                    {"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkPorts/1"}
                ],
                "NetworkDeviceFunctions": [
                    {"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkDeviceFunctions/1"}
                ]
            },
```

Chassis NetworkPorts

Chassis NetworkFunctions

Chassis PCIe Info

Controller's NetworkPorts & Network Fimctopms

Continued on next slide

# Network Adapter (in Chassis) has Capabilities Structure

```
            "ControllerCapabilities": {
                "NetworkPortCount": 2,
                "NetworkDeviceFunctionCount": 8,
                "DataCenterBridging": {"Capable": true },
                "VirtualizationOffload": {
                    "VirtualFunction": {
                        "DeviceMaxCount": 256,
                        "NetworkPortMaxCount": 128,
                        "MinAssignmentGroupSize": 4
                    },
                    "SRIOV": {
                        "SRIOVVEPACapable": true
                    }
                },
                "NPIV": {
                    "MaxDeviceLogins": 4,
                    "MaxPortLogins": 2
                }
            }
        }
    ],
    "Actions": {
        "#NetworkAdapter.ResetSettingsToDefault": {
            "target": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/Actions/NetworkAdapter.Reset"
        }
    }
}
```

Physical Port count, Physical Func count DCB

Virtual Func Info Max Vdevice, port group size

SRIOV

N_Port ID Virt

Action

# Network Device Function (in Chassis, referenced by System


```
"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkDeviceFunctions/111111111100",
"@odata.type": "#NetworkDeviceFunction.v1_0_0.NetworkDeviceFunction",
"Id": "111111111100",
"NetDevFuncType": "Ethernet",
"DeviceEnabled": true,
"NetDevFuncCapabilities": [
    "Ethernet","FibreChannel"
],
"Ethernet": {
    "MACAddress": "00:0C:29:9A:98:ED",
    ...
},
"iSCSIBoot": {
    "IPAddressType": "IPv4",
    ...
},
"FibreChannel": {
    "WWPN": "10:00:B0:5A:DD:BB:74:E0",
    ...
},
"AssignablePhysicalPorts": [
    {"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkPorts/1"}
],
"PhysicalPortAssignment": {
    "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkPorts/1"
},
"BootMode": "Disabled",
"VirtualFunctionsEnabled": true,
"MaxVirtualFunctions": 16,
"Links": {
    "PCIeFunction": {"@odata.id": "/redfish/v1/Chassis/1/PCIeDevices/NIC/Functions/1"}
}
```


Current Function Type, Enabled, Function Capabilities

Properties for Ethernet modes (snipped)

iSCSIBoot properties (snipped)

FC info (snipped)

Port Assignments

# Network Ports (in Chassis, referenced by System


```
{
    "@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NetworkPorts/1",
    "@odata.type": "#NetworkPort.v1_0_0.NetworkPort",
    "Id": "1",
    "Name": "Network Port View",
    "PhysicalPortNumber": "1",
    "LinkStatus": "Up",
    "SupportedLinkCapabilities": [
        {"LinkNetworkTechnology": "Ethernet", "LinkSpeedMbps": 10000
    ],
    "ActiveLinkTechnology": "Ethernet",
    "SupportedEthernetCapabilities":  [
        "WakeOnLAN", "LLDP", "PoE", "EEE"
    ],
    "NetDevFuncMinBWAlloc": [ {
            "NetworkDeviceFunction": {"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NDF/1"},
            "MinBWAllocPercent": 25
        } ],
    "NetDevFuncMaxBWAlloc": [ {
            "NetworkDeviceFunction": {"@odata.id": "/redfish/v1/Chassis/1/NetworkAdapters/9fd725a1/NDF/111111111100"},
            "MaxBWAllocPercent": 100
        } ],
    "AssociatedNetworkAddresses": ["00:0C:29:9A:98:ED", "00:0C:29:9A:98:EF"],
    "EEEEnabled": true,
    "WakeOnLANEnabled": true,
    "PortMaximumMTU": 1500,
    "FlowControlStatus": "None",
    "FlowControlConfiguration": "None",
    "SignalDetected": true
}
```


Information on the current Port, it's connectivity and low level protocol port specifics

Bandwidth Min/Max per Func

# Operations

- The majority of implementations are expected to have the Network Device Functions initially unassigned & un-configured.
  - For simplicity, many vendors will have some of the NetworkDeviceFunctions in an initial default state
    - This is to ensure some level of functionality “out of the box”
  - If the hardware supports X functions, those functions will always be there.
  - Note that physical hardware will have different capabilities that limit the combinations of NetworkDeviceFunctions configurations that can coexist on the same device
    - For example, if the Adapter only has one FC “logic block” per port in the silicon, then only one can be assigned and configured per port.
    - There may be additional affinities that are built into the hardware.
    - The current Redfish model does not expose these affinities & capabilities.

# 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