

*presented by*



**Hewlett Packard  
Enterprise**



# Redfish Implementation for UEFI

Spring 2019 UEFI Plugfest

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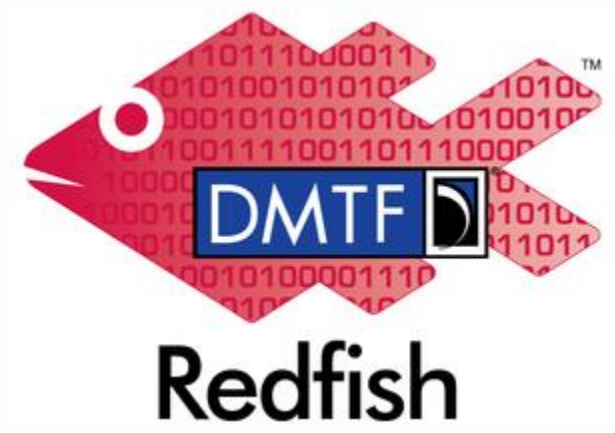
Presented by Jason Spottswood(HPE)

# Agenda

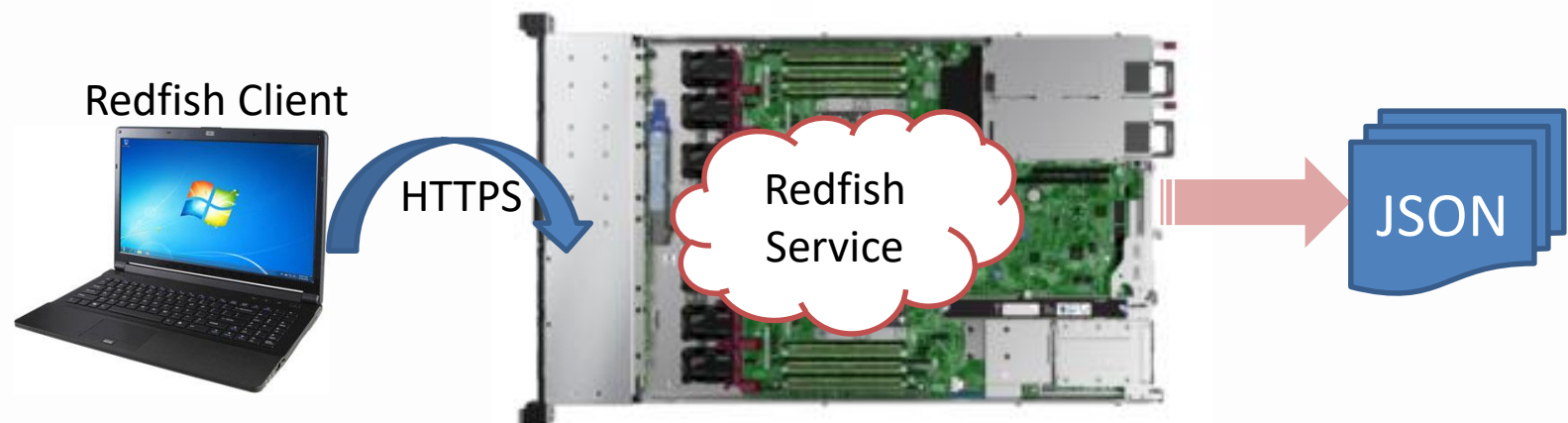


- Overview of Redfish
- State of UEFI in Redfish
- Problem Statement
- Solution
- PoC and spec updates

# Redfish Recap



- **DMTF Industry Standard**
  - RESTful API for IT Infrastructure
  - Secured connection via HTTPS
  - In-band or out-of-band
  - Schema-backed
  - Human-readable data (JSON)



Computer System

```
{
  "@Redfish.Copyright": "Copyright 2014-2018 DMTF.",
  "@odata.id": "/redfish/v1/Systems/1",
  "@odata.type": "#ComputerSystem.v1_6_0.ComputerSystem",
  "Id": "1",
  "Name": "My Computer System",
  "SystemType": "Physical",
  "AssetTag": "free form asset tag",
  "Manufacturer": "Manufacturer Name",
  "Model": "Model Name",
  "SKU": "",
  "SerialNumber": "2M220100SL",
  "PartNumber": "",
  "Description": "Description of server",
  "UUID": "00000000-0000-0000-0000-000000000000",
  "HostName": "web-srv344",
  "Status": {
    "State": "Enabled",
    "Health": "OK",
    "HealthRollup": "OK"
  }
}
```

# UEFI in Redfish Service



## BIOS Resource

```
{
  "@Redfish.Copyright": "Copyright 2016 DMTF",
  "@odata.context": "/redfish/v1/$metadata#Bios.Bios",
  "@odata.id": "/redfish/v1/Systems/1/Bios",
  "@odata.type": "#Bios.v1_0_0.Bios",
  "Id": "Bios",
  "Name": "BIOS Configuration Current Settings",
  "Description": "BIOS Configuration Current Settings",
  "AttributeRegistry": "BiosAttributeRegistryv1_0_0",
  "Attributes": {
    "AdminPhone": "",
    "BootMode": "Uefi",
    "EmbeddedSata": "Raid",
    "NicBoot1": "NetworkBoot",
    "NicBoot2": "Disabled",
    "PowerProfile": "MaxPerf",
    "ProcCoreDisable": 0,
    "ProcHyperthreading": "Enabled",
    "ProcTurboMode": "Enabled",
    "UsbControl": "UsbEnabled",
    "ConsoleBaudRate": "115200",
    ...
  }
}
```

DMTF schema file defining structure of the BIOS resource

File created by FW describing all attributes listed in the BIOS resource

## BIOS Attribute Registry

```
"CurrentValue": null,
"DisplayName": "Embedded NIC 1 Boot",
"DisplayOrder": 5,
"HelpText": "Select this option to enable network...",
"MenuPath": "./SystemOptions/NetworkBootOptions",
"AttributeName": "NicBoot1",
"Value": [
  {
    "ValueDisplayName": "Network Boot",
    "ValueName": "NetworkBoot"
  },
  {
    "ValueDisplayName": "Disabled",
    "ValueName": "Disabled"
  }
],
"WarningText": "Important: When enabling network..."
```



# What is the Problem?

- BIOS attributes are not standardized
- Zero script interoperability!



```
"Attributes": {  
  "AdminPhone": "132-243-2543",  
  "ProcCoreDisable": 0,  
  "ProcHyperthreading": "Enabled",  
  "ProcTurboMode": "Enabled",  
  "UsbControl": "UsbEnabled",  
  "ConsoleBaudRate": "115200"  
}
```

```
"Attributes": {  
  "AdminNum": "132-243-2543",  
  "CpuCoreDisable": 0,  
  "Hyperthread": "Enabled",  
  "TurboMode": "Enabled",  
  "UsbConfig": "UsbEnabled",  
  "UartBaud": "115200"  
}
```

```
"Attributes": {  
  "X10299": "1322432543",  
  "X20451": "Half",  
  "X21909": 1,  
  "X22778": 1,  
  "X24354": "True",  
  "X24356": "Setting1"  
}
```

# Redfish Helped a bit



## Secure Boot

- Secure Boot
- Boot Order

```
{
  "@Redfish.Copyright": "Copyright 2014-2016 DMTF. All rights reserved.",
  "@odata.context": "/redfish/v1/$metadata#Systems/1/SecureBoot",
  "@odata.id": "/redfish/v1/Systems/1/SecureBoot",
  "@odata.type": "#SecureBoot.v1_0_0.SecureBoot",
  "Id": "SecureBoot",
  "Name": "UEFI Secure Boot",
  "Actions": {
    "#SecureBoot.ResetKeys": {
      "target": "/../SecureBoot/Actions/SecureBoot.ResetKeys",
      "ResetKeyType@Redfish.AllowableValues": [
        "ResetAllKeysToDefault",
        "DeleteAllKeys",
        "DeletePK"
      ]
    },
    "Oem": {}
  },
  "SecureBootEnable": false,
  "SecureBootCurrentBoot": "Disabled",
  "SecureBootMode": "UserMode",
  "Oem": {}
}
```

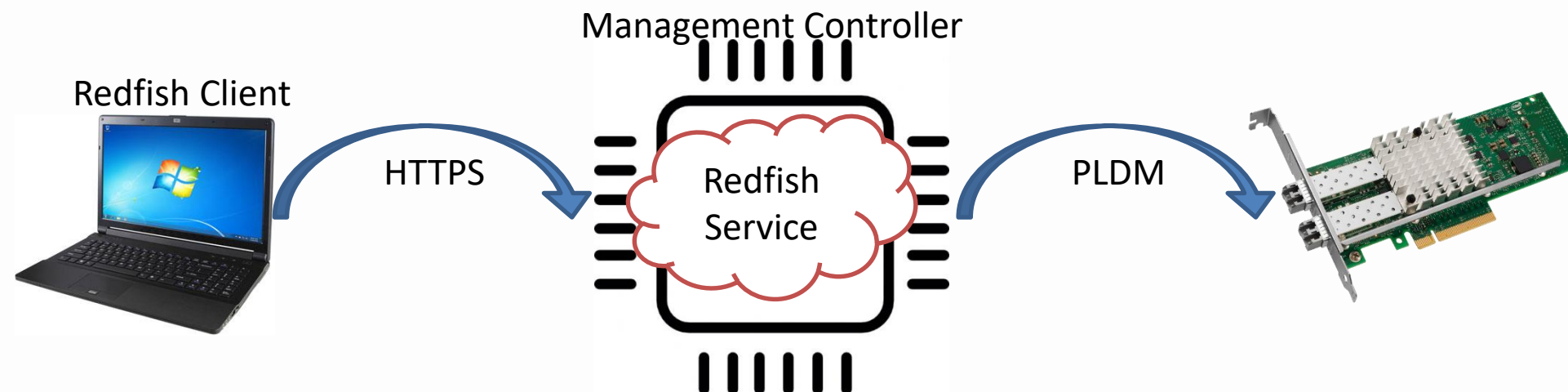
A common BIOS setting!





# Redfish Device Enablement

- DMTF standard enabling a management controller to present Redfish-conformant management of I/O adapters in a server.
- Devices support PLDM (Platform Level Data Model)
- Industry standard for I/O device configuration



# Platform Configuration Attributes



- UEFI Responsibility

- Processors settings
- Memory controllers
- Chipset configuration
- Microcontrollers
- OEM firmware features

- Standardized settings and Vendor unique settings that should not be represented in Redfish schema



# Defining Common UEFI Settings



- Ongoing standardization of common settings by the UEFI forum at <http://uefi.org/confignamespace> using x-UEFI-ns keywords

## CPU SETTINGS

Keyword	Data Type	Usage Type	Description
CpuName:#	Buffer	ReadOnly	Name of the CPU. CHAR16 Variable[]
CpuFrequency:#	Numeric	ReadOnly	Numeric value of the CPU frequency in hertz.
CpuID:#	Numeric	ReadOnly	The numeric ID of the CPU.
CpuStepping:#	Numeric	ReadOnly	Stepping value of the CPU
<b>CPUPerformanceMode</b>	Numeric:1	ReadWrite	The performance state the firmware will set before OS handoff. <ul style="list-style-type: none"><li>• 0 – Max Performance</li><li>• 1 – Max Power Savings</li><li>• 2 – Balanced Performance</li><li>• 3 – Balanced Power</li></ul>



# Keyword Namespace Registries



**X-UEFI-ns**

Common Config Elements

**X-UEFI-acme**

Acme Northbridge

**X-UEFI-contoso**

Contoso SuperIO

**X-UEFI-hpe**

Server OEM

- Continue expanding x-UEFI-ns
- Recommend vendors publish keywords
- Versioned
- Keywords conformant to Redfish naming standard



# Multiple Attribute Registries

- Attributes must be unique
- Attribute Array
  - Backwards compatibility
  - May still be used by OEM
- Platform Attributes
  - An array of driver-specific BIOS attributes
  - Not to include I/O devices

```
"AttributeRegistry": "",
"Attributes": {
  "Option1": "",
  ...
},
"PlatformAttributes": [
  {
    "AttributeSetName": "",
    "AttributeRegistry": ""
    Attributes: {}
    ...
  },
  {
    "AttributeSetName": "",
    "AttributeRegistry": ""
    ...
  },
  {
    "AttributeSetName": "",
    "AttributeRegistry": ""
    ...
  },
],
```

# Benefit

- Platforms using same components would have same attributes
- Interoperability



```
“PlatformAttributes”: [  
  {  
    “AttributeSetName”: “UefiCommon”,  
    “AttributeRegistry”: ”UefiCommon.v2_8”  
    Attributes: {}  
    ...  
  },  
  {  
    “AttributeSetName”: “AcmeCpuXyz”,  
    “AttributeRegistry”: ”AcmeCpuXyz.v1_0”  
    ...  
  },  
  {  
    “AttributeSetName”: “ContosoChipset”,  
    “AttributeRegistry”: ” ContosoChipset.v1_0”  
    ...  
  },  
],
```

# Bridging HII and Redfish



- UEFI 2.8 added VFR syntax for REST style

```
formset
  guid = FORM_SET_GUID
  title = OemFormSet
  help =
  classguid = EFI_HII_PLATFORM_SETUP_FORMSET_GUID |
              EFI_HII_REST_STYLE_FORMSET_GUID

oneof varid = Varstore.Somewhere,
  questionid = THIS_QUESTION_ID,
  prompt = STRING_TOKEN(ThisQuestion),
  help =,
  option text = STRING_TOKEN(STR_OPTION1),
    value = 0,
    flags = INTERACTIVE | REST_STYLE;
  option text = STRING_TOKEN(STR_OPTION2),
    value = 1,
    flags = INTERACTIVE | REST_STYLE;

endoneof;
```



# New VFR Syntax

- REST target name
- REST target version

```
formset
  guid = FORM_SET_GUID
  title = OemFormSet
  help =
  classguid = EFI_HII_PLATFORM_SETUP_FORMSET_GUID |
             EFI_HII_REST_STYLE_FORMSET_GUID
  resttargetname = "AcmeNorthbridgeXYZ"
  resttargetversion = "v1_0_0"
```

```
"PlatformAttributes": [
  {
    "AttributeSetName": "AcmeNorthbridgeXYZ",
    "AttributeRegistry": "AcmeNorthbridgeXYZ.v1_0_0",
    "Attributes": {}
    ...
  },
]
```





# Proof of Concept

- [https://github.com/tianocore/edk2-staging/tree/UEFI\\_Redfish](https://github.com/tianocore/edk2-staging/tree/UEFI_Redfish)
- Contributions by Intel and HPE
- Comprehensive Redfish implementation



# Spec updates



- **UEFI spec Section 31 Redfish Service Support**
  - Add a new section on how UEFI Redfish Service generates BIOS Redfish properties and configures BIOS settings.
  - Add new section “Clarification of UEFI Redfish Implementation” for the implementation guidance of EFI platform configuration through Redfish.
- **UEFI spec Section 33 Human Interface Infrastructure**
  - Describe the relationship between HII Formset and Redfish BIOS Attribute Registry.
  - Describe HII Formset to Redfish convertor operation
  - In 33.3.8, add IFR opcodes for creating Redfish BIOS Attribute Registry
- **Add new section of EFI Platform Hardware Change Protocol**

Platform Protocol for reporting status of hardware configuration changes.

  - The hardware change status to be used by HII Formset to Redfish convertor to determine when to update BIOS Attribute Registry, and for maintenance of properties in the Attribute Sets.
- **VFR spec change**
  - Add VFR syntax to generate BIOS Attribute Registry
- **DMTF Redfish spec change**
  - BIOS Attribute Registry schema update

# Call to Action!

- Define keyword registries
- Publish versioned registry files
- Contribute to workgroups discussions and pitch in with open source



Thanks for attending the 2019 Spring UEFI  
Plugfest

For more information on UEFI Forum and UEFI  
Specifications, visit <http://www.uefi.org>

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