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Redfish™ Configuration of UEFI HII Settings

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Agenda

- Introduction
- HII Overview
- What is Redfish™
- DMTF/SPMF
- Redfish Data Model
- BIOS Configuration
- Questions?

Introduction

- Goals of the presentation
  - Talking about “What” in this session.
    - The “How” is covered in our deep dive on Wednesday @ 2:30pm.
  - Give a working overview of how configuration data is handled within UEFI-compliant platforms.
  - Give a working overview of Redfish™ and how it would be used with a UEFI-compliant platform.

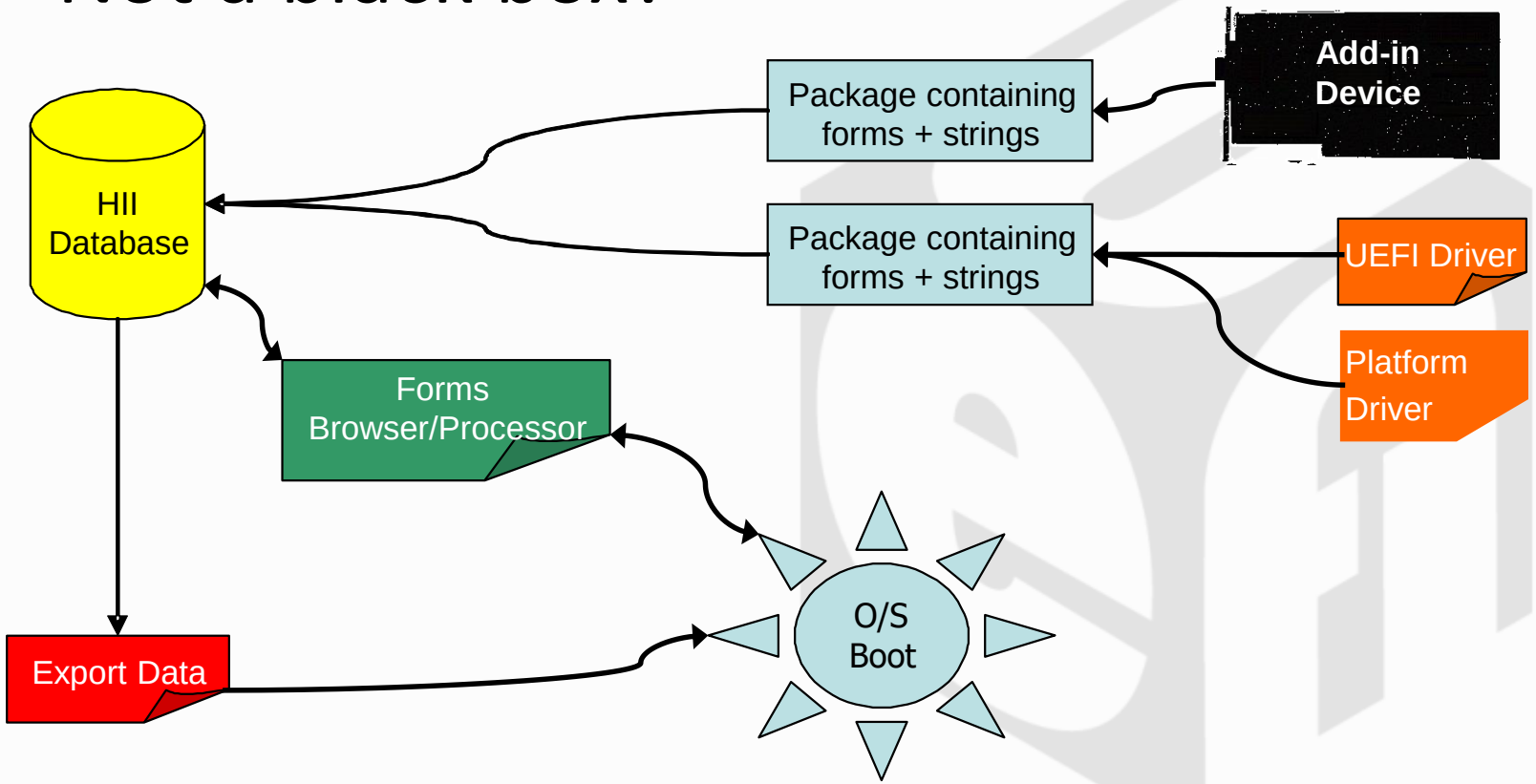
Overview of UEFI Human Interface Infrastructure (HII)

HII Overview

- Philosophy
  - Make configuration no longer a black box
    - All configurable components in the system will expose data to central platform control. Yes, even third-party components.
  - Enable scriptability of platform configuration
  - Enable multiple language support for all components in the system.
- Target audience
  - Platform, Third Party Devices, Manageability SW.

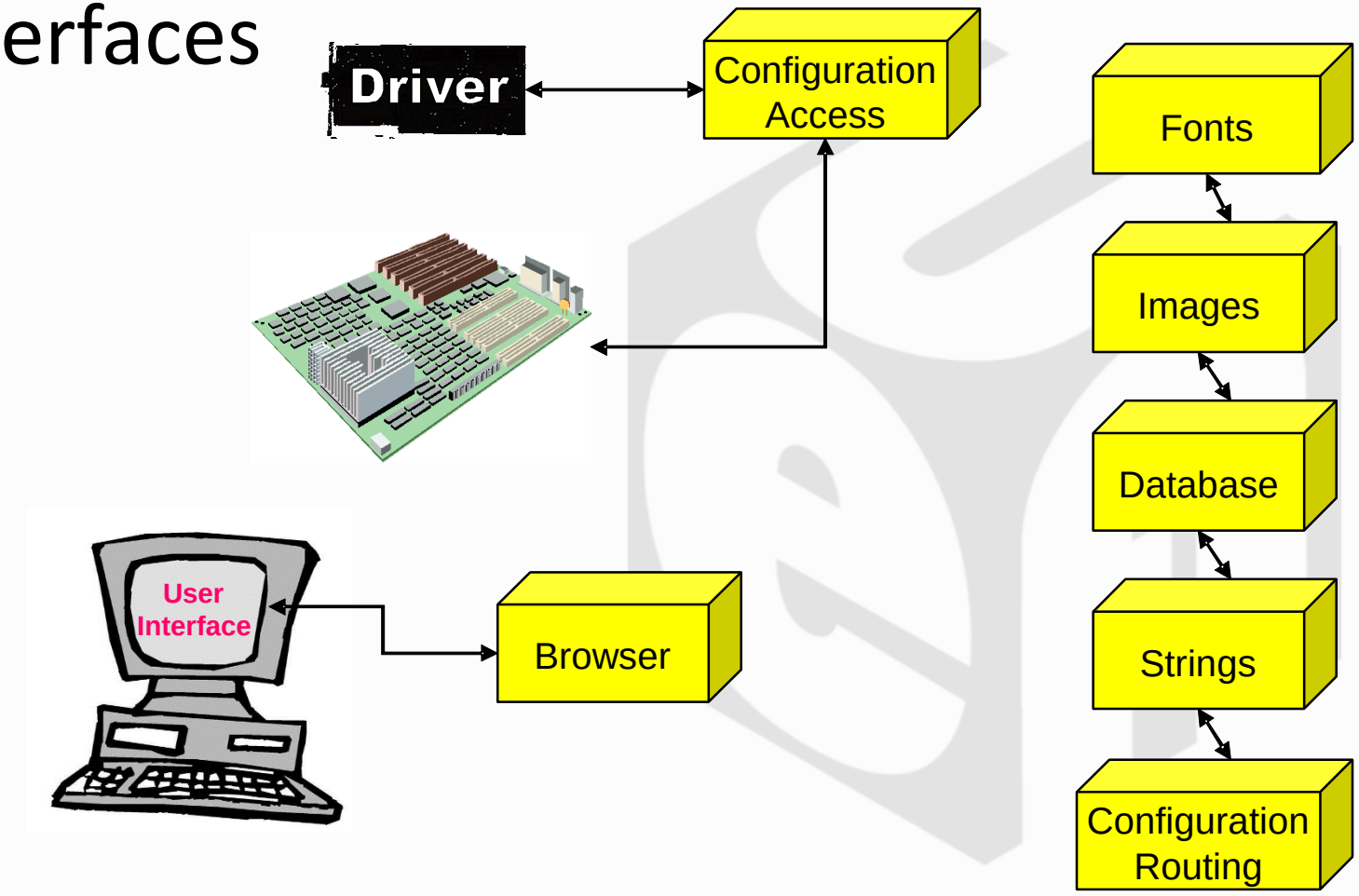
HII Overview

- Not a black box?

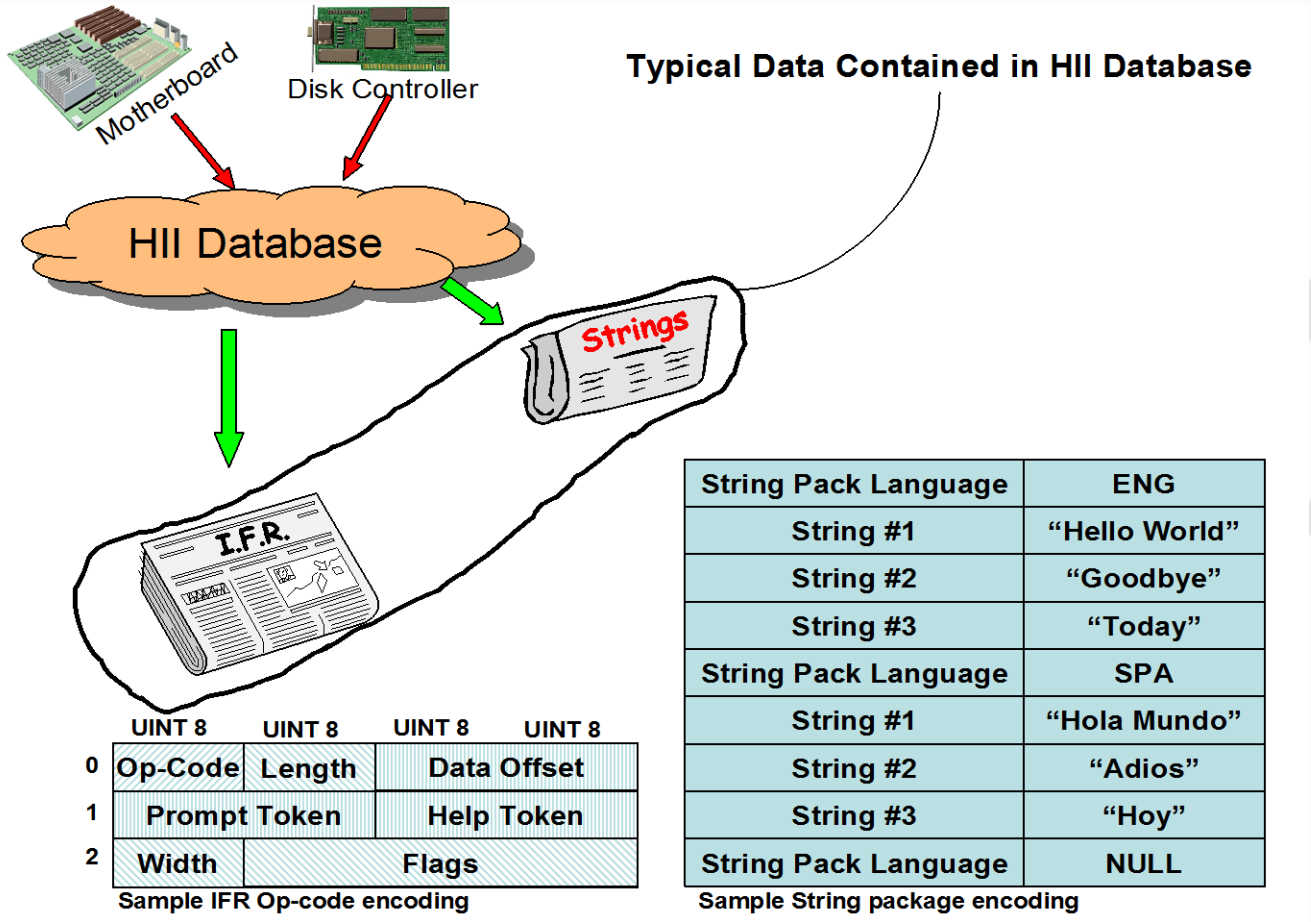


HII Overview

- Interfaces



HII Overview



	UINT 8	UINT 8	UINT 8	UINT 8
0	Op-Code	Length	Data Offset	
1	Prompt Token		Help Token	
2	Width	Flags		

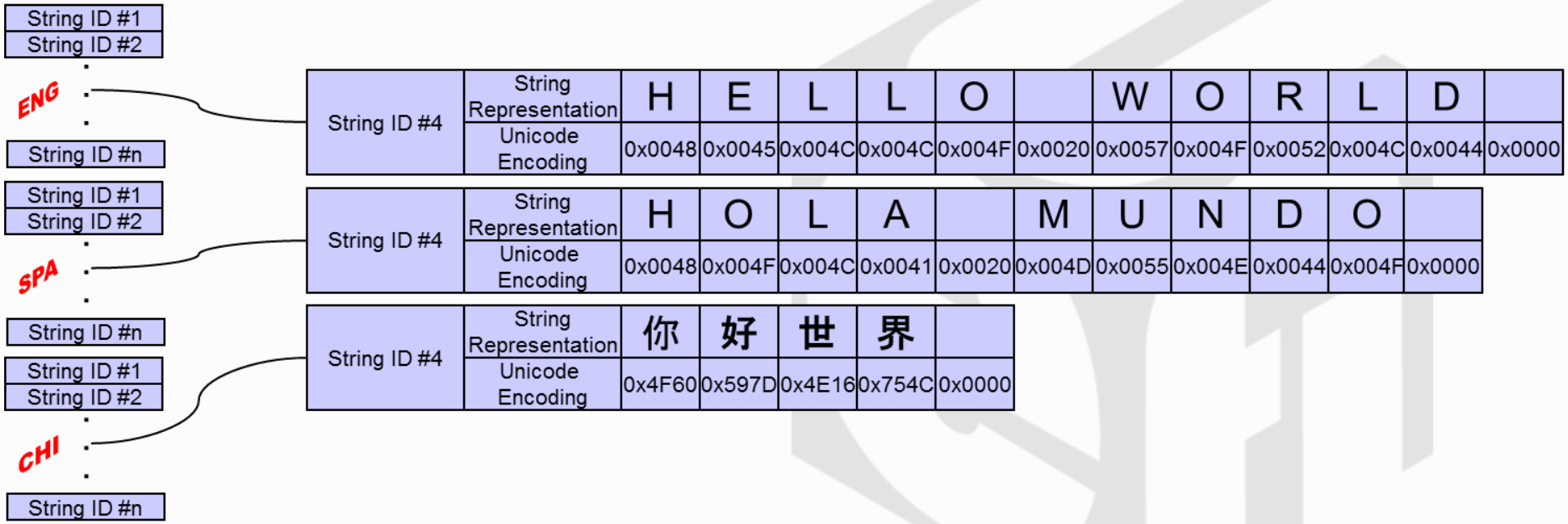
Sample IFR Op-code encoding

String Pack Language	ENG
String #1	“Hello World”
String #2	“Goodbye”
String #3	“Today”
String Pack Language	SPA
String #1	“Hola Mundo”
String #2	“Adios”
String #3	“Hoy”
String Pack Language	NULL

Sample String package encoding

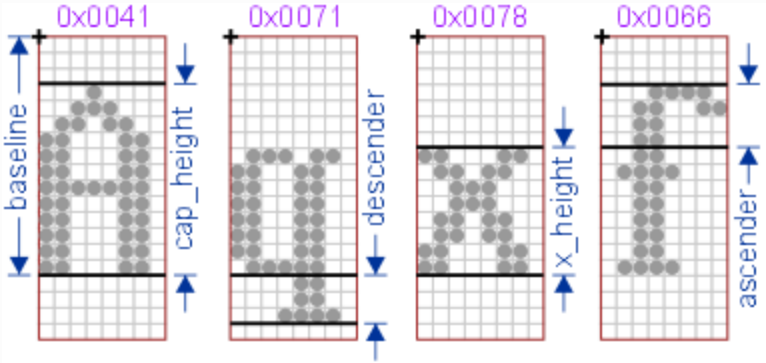
HII Overview

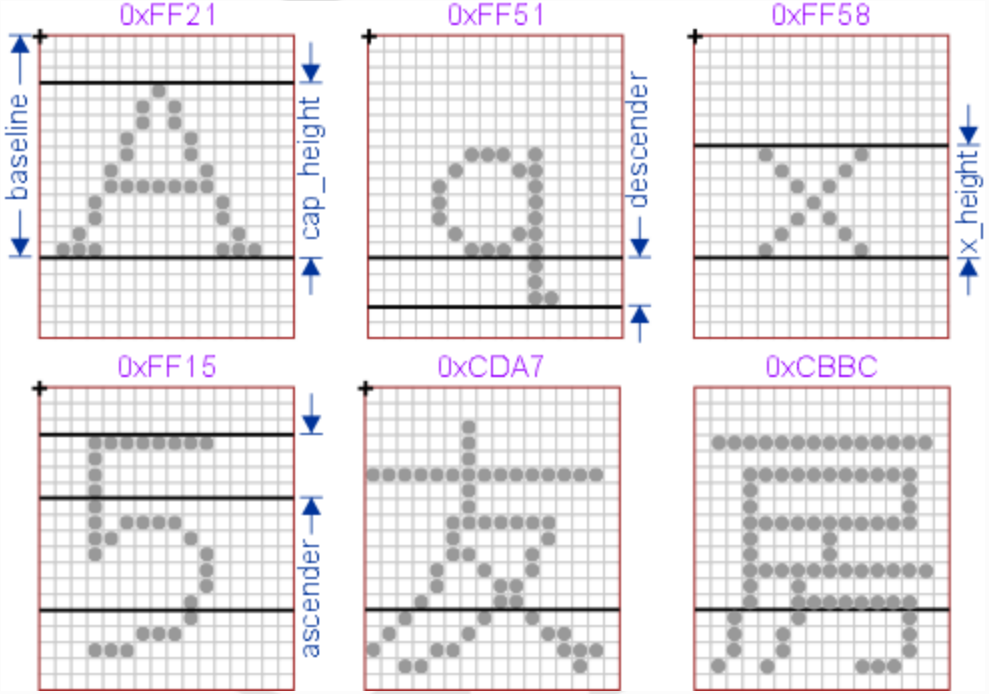
- Multiple Languages



HII Overview

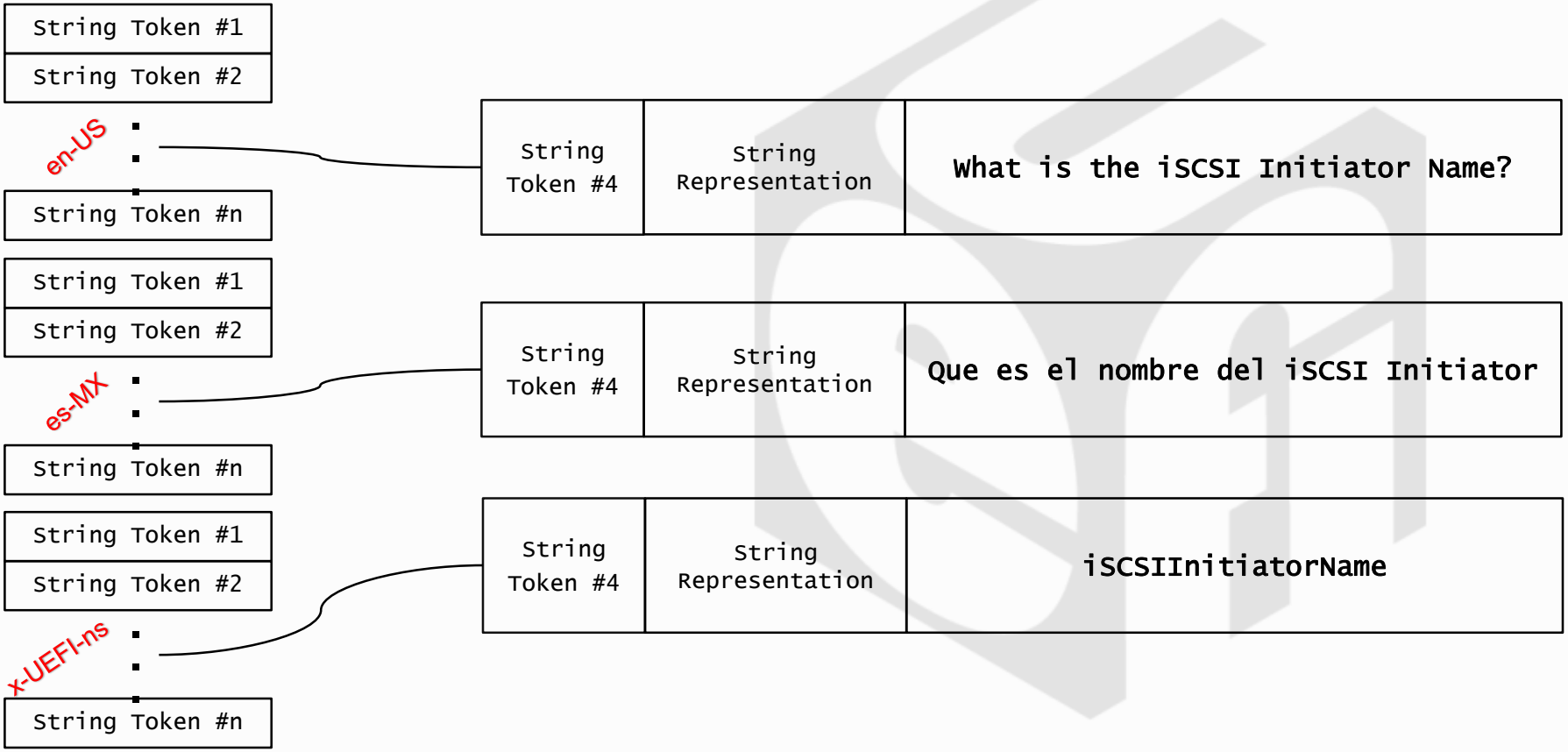
- Fonts
  - StringToImage
  - StringIdToImage
  - GetGlyph
  - GetFontInfo





HII Overview

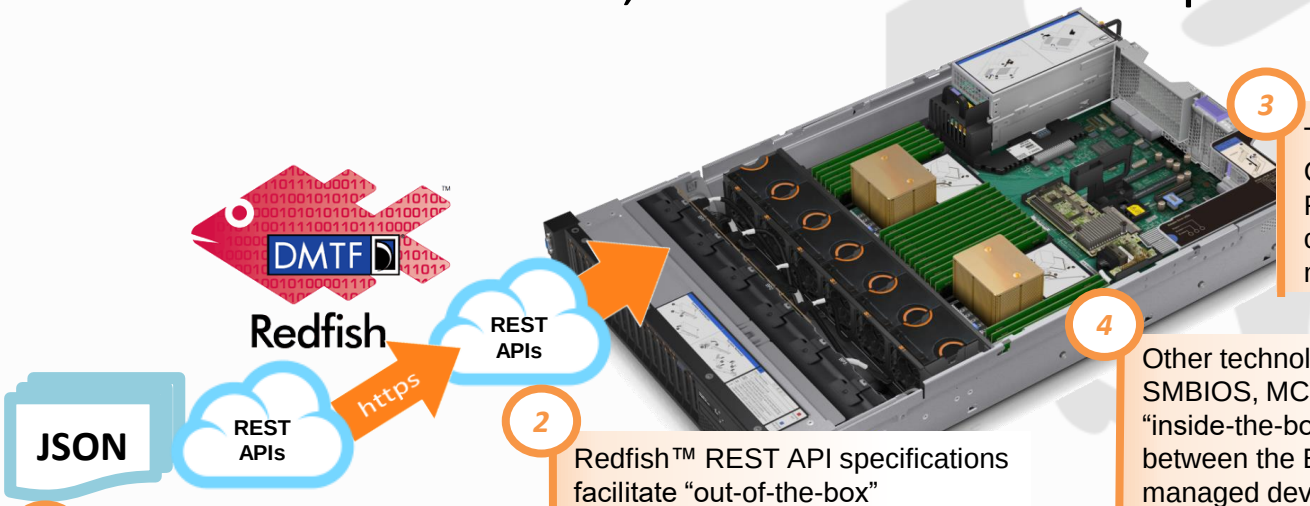
- A “platform language?”



Overview of Redfish™

What is Redfish™?

- **A DMTF industry standard**
  - RESTful interface for managing IT Infrastructure
  - Built on modern tool-chain (HTTPs/TLS, REST, JSON, OData)
  - Schema-backed, human readable output



1 Applications and scripts make REST API calls over HTTPs to request data from the system or to execute a specific task

2 Redfish™ REST API specifications facilitate "out-of-the-box" communication between applications and the managed system

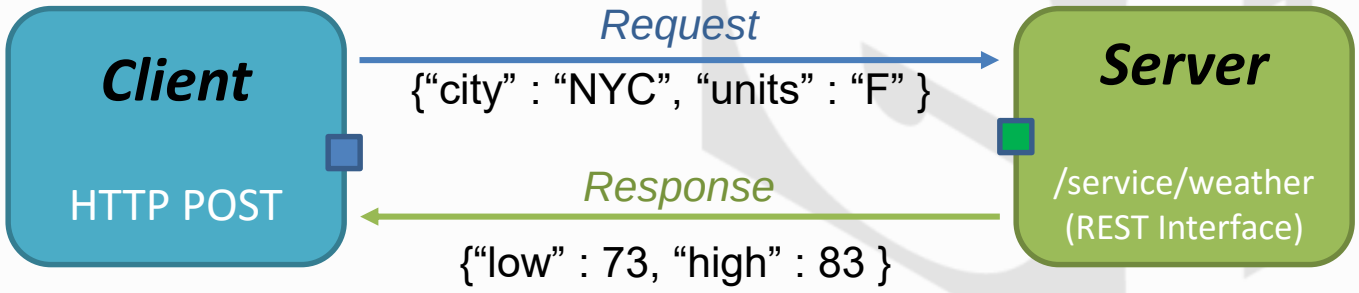
3 The Baseboard Management Controller (BMC) receives Redfish™ REST API calls, and initiates communication with internally managed device endpoints

4 Other technologies, such as UEFI, SMBIOS, MCTP and PLDM facilitate "inside-the-box" communication between the BMC and internally managed device endpoints

What is REST?

REpresentational **S**tate **T**ransfer

- Software Architectural “style” for web development
- Standardized operations (verbs)
  - HTTP GET, POST, PUT, PATCH, HEAD and DELETE
- Standardized operands (nouns)
  - Resources uniquely identified by URIs



What is JSON?

- **J**ava **S**cript **O**bject **N**otation
  - http://www.json.org
- Lightweight human readable data-interchange format
  - Easy for humans to read and write
  - Easy for machines to parse and generate

```
{
  "BootMode": "Uefi",
  "EmbeddedSata": "Raid",
  "Nic1Enable": true,
  "ProcCoreCount": 8
}
```

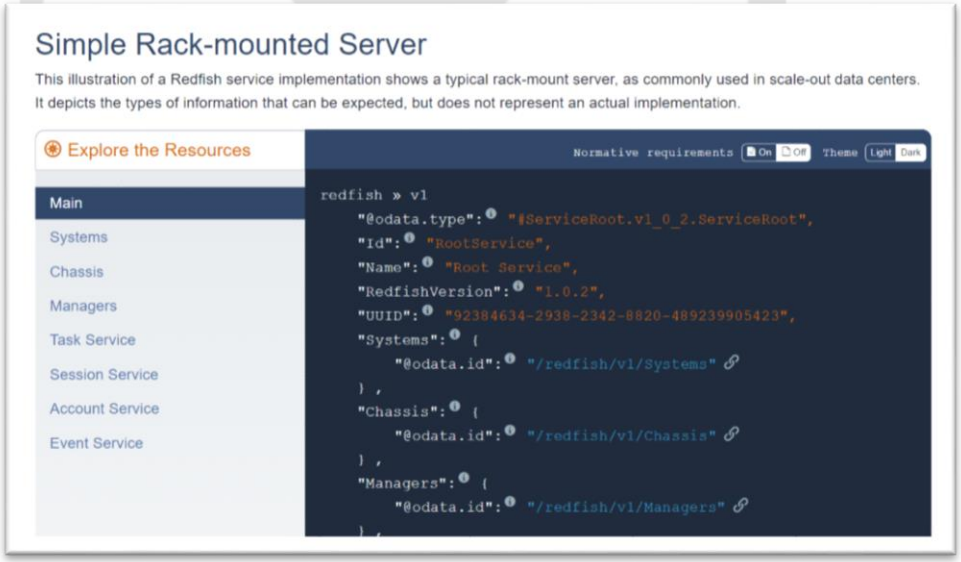
SPMF : Redfish™ Standard

- DMTF Scalable Platforms Management Forum (SPMF)
- **Promoters**: Broadcom Limited, Dell, EMC, Emerson, Hewlett Packard Enterprise, Intel, Lenovo, Microsoft, Supermicro, VMWare
- **Supporters**: AMI, Fujitsu, HGST, Huawei, IBM, Insyde Software, Mellanox, NetApp, Oracle, Microsemi, Qualcomm, Seagate
- **Join the SPMF**: http://www.dmtf.org/join/spmf

Create and publish an open industry-standard specification and schema that meets the expectations of Cloud and Web-based IT professionals for scalable platform hardware management utilizing existing tool chains as well as being usable by personnel with minimal experience.

SPMF Deliverables

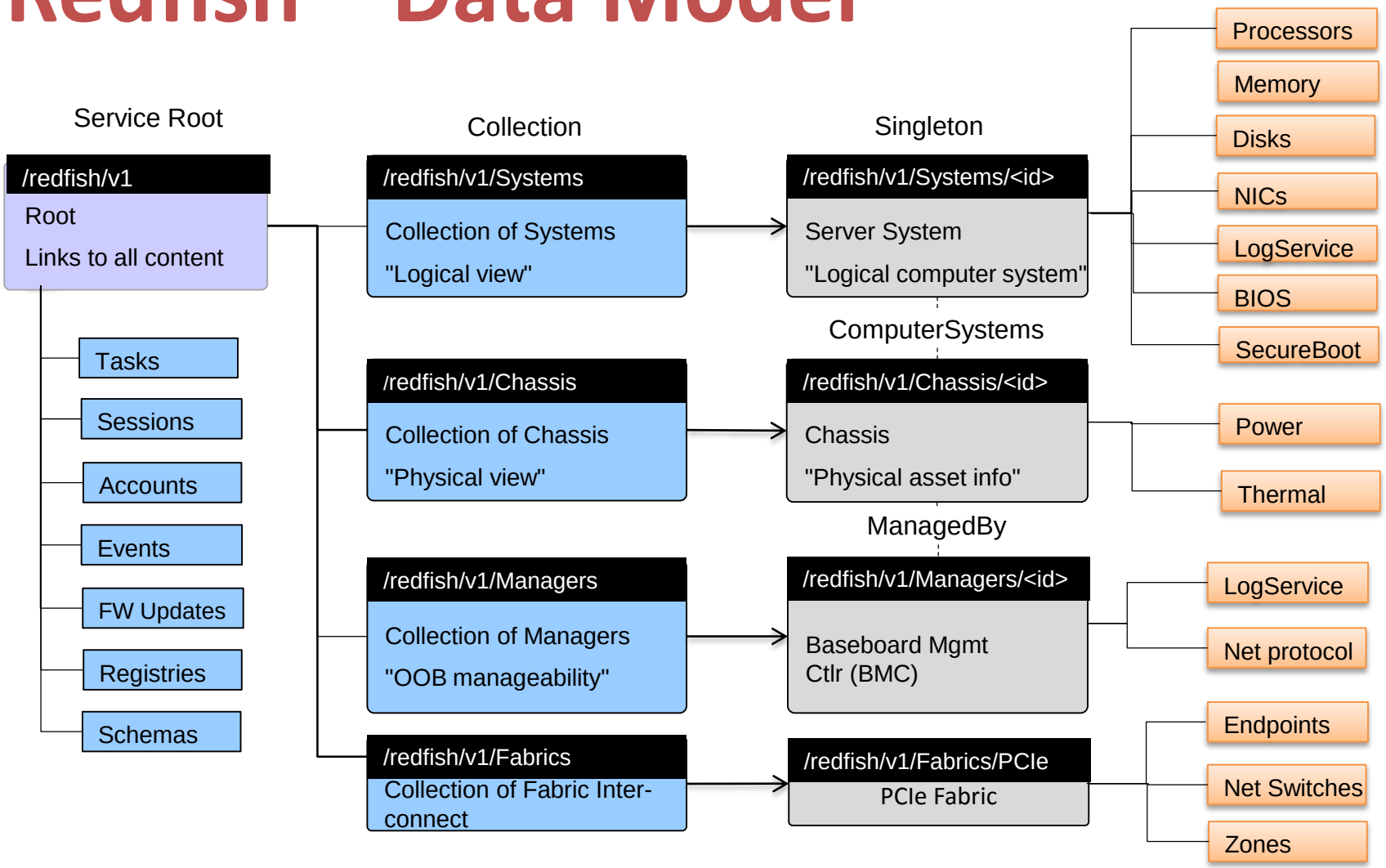
- Developer hub: http://redfish.dmtf.org/
- Schema, whitepapers, presentations, mockups, user forum, webinars, tech notes, tutorials and education videos
- Mockups (Rack, Blade, OCP Profile:) http://redfish.dmtf.org/redfish/v1
- Github repository for open source tools: https://github.com/DMTF/Redfish-Tools
- User Forum: http://redfishforum.com/



DMTF / UEFI Work Register

- Alliance to enable collaboration between UEFI Forum and DMTF
  - Enables UEFI Forum members access to unpublished DMTF work relating to UEFI/BIOS.
  - Enables DMTF members to access unpublished UEFI Specifications.
- Jan 2016: Extended to cover SPMF
  - "Redfish Specifications, Schema, Mockup, and Host Interface, relevant to UEFI"
- https://www.dmtf.org/sites/default/files/UEFI-DMTFWorkReg1_2_v2.pdf

Redfish™ Data Model



Service Root

HTTP GET @ https://<ip>/redfish/v1/


```
{
 "@odata.id": "/redfish/v1/",
 "@odata.type": "#ServiceRoot.1.0.0.ServiceRoot",
 "@odata.context": "/redfish/v1/$metadata#ServiceRoot",
 "RedfishVersion": "1.0.0",
 "UUID": "00000000-0000-0000-0005-000000000001",
 "Chassis": {
   "@odata.id": "/redfish/v1/Chassis/",
 },
 "Managers": {
   "@odata.id": "/redfish/v1/Managers/",
 },
 "Systems": {
   "@odata.id": "/redfish/v1/Systems/"
 },
 "SessionService": {
   "@odata.id": "/redfish/v1/SessionService/",
 },
 "Registries": {
   "@odata.id": "/redfish/v1/Registries/"
 },
 "JsonSchemas": {
   "@odata.id": "/redfish/v1/JsonSchemas/"
 }
}
```


Starting point
- Links to all resources
- Systems, Chassis, Managers Collections

Services
- Events
- Accounts
- Tasks
- Sessions
- FW Updates

Metadata
- Links to Schema (JSON, CSDL XML)
- Links to Registries (BIOS Attributes, Messages)

Computer System

HTTP GET @ https://<ip>/redfish/v1/Systems/1


```
{
  "@odata.id": "/redfish/v1/Systems/1",
  "@odata.type": "#ComputerSystem.1.0.0.ComputerSystem",
  "SerialNumber": “LXV9152",
  "Manufacturer": “Lenovo",
  "BiosVersion": “1.21",
  "UUID": “AC790328-A1DC-D421-93A0-A0E73F3F4E3A2",
  "PowerState": "Off",
  "ProcessorSummary": {
    "Count": 2,
    "Model": "Intel(R) Xeon(R) CPU E5-2699 v3 @ 2.30GHz"
  },
  "Boot": {
        "BootSourceOverrideEnabled": "Once",
        "BootSourceOverrideMode": "UEFI",
        "BootSourceOverrideTarget": "Pxe",
        "UefiTargetBootSourceOverride": “UEFI device path"
    }
  "Actions": {
    "#ComputerSystem.Reset": {
      "target":
"/redfish/v1/Systems/1/Actions/ComputerSystem.Reset",
    }
  }
}
```


Boot flow
- Power Control
- Boot Order

System Info
- BIOS Version
- UUID
- Serial Number
- Asset Tag
- Manufacturer
- Model

Links to components
- Memory
- CPU
- Storage
- Networking
- TPM
- BIOS
- SecureBoot

UEFI BIOS Settings

HTTP GET @ https://<ip>/redfish/v1/Systems/1/BIOS


```
{
  "@odata.id": "/redfish/v1/Systems/1/Bios",
  "@odata.type": "#Bios.v1_0_0.Bios",
  "AttributeRegistry": "BiosAttributeRegistryP89.v1_0_0",
  "Actions": {
    "#Bios.ResetBios": {
      "target": "/redfish/v1/Systems/1/Bios/Actions/Bios.ResetBios"
    },
    "#Bios.ChangePassword": {
      "target": "/redfish/v1/Systems/1/Bios/Actions/Bios.ChangePassword"
    }
  },
  "Attributes": {
    "BootMode": "Uefi",
    "EmbeddedSata": "Raid",
    "NicBoot1": "NetworkBoot",
    "NicBoot2": "Disabled",
    "PowerProfile": "MaxPerf",
    "ProcCoreDisable": 0,
    "ProcHyperthreading": "Enabled",
    "ProcTurboMode": "Enabled",
    "UsbControl": "UsbEnabled"
  }
}
```


BIOS / UEFI Attributes

- Name/Value Pairs
- OEM/IBV specific
- Described by the "Attribute Registry"
- Mapped to HII Settings

BIOS Actions

- Change Passwords
- Reset BIOS defaults

UEFI Attribute Registry

HTTP GET @ https://<ip>/redfish/v1/Registries/ BiosAttributeRegistryXYZ.v1_0_0

```
{
  "@odata.type":
"#AttributeRegistry.v1_0_0.AttributeRegistry",
  "Description": "This registry defines a
representation of UEFI HII BIOS Attributes",
  "Id": "BiosAttributeRegistryXYZ.v1_0_0",
  "Language": "en",
  "Name": “System X BIOS Attribute Registry",
  "OwningEntity": “Lenovo",
  "RegistryVersion": "1.0.0",
  "Attributes" : [
     ...
  ],
  "Menus" : [
     ...
  ],
  "Dependencies" : [
     ...
  ]
}
```

Attributes[] - UEFI HII Metadata

- Setting name and type
- Possible Values and constraints
- Default Value
- Localized Display strings (setting, help, warning)

Menus[] - UEFI HII menus

- Menu names
- Localized Display strings
- Display order
- Hierarchy

Dependencies[] - UEFI HII menus

- Relationship between settings
- ReadOnly / Hide settings
- Force value
- Change display strings

SecureBoot Configuration

HTTP GET @ https://<ip>/redfish/v1/Systems/1/BIOS/SecureBoot


```
{
  "@odata.id": "/redfish/v1/Systems/1/SecureBoot",
  "@odata.type": "#SecureBoot.v1_0_0.SecureBoot",
  "Name": "UEFI Secure Boot",
  "Actions": {
    "#SecureBoot.ResetKeys": {
      "target": "/redfish/v1/Systems/1/SecureBoot/
Actions/SecureBoot.ResetKeys",
      "ResetKeysType@Redfish.AllowableValues": [
         "ResetAllKeysToDefault",
         "DeleteAllKeys",
         "DeletePK"
       ]
    },
  },
  "SecureBootEnable": false,
  "SecureBootCurrentBoot": "Disabled",
  "SecureBootMode": "UserMode",
  "Oem": {}
}
```


UEFI Secure Boot
- Enable/Disable
- Current State
- Current Mode (User, Setup, Audit, Deploy)

Reset SecureBoot
- Delete All Keys
- Reset all Keys to defaults
- Delete PK (Switch to Setup Mode)

OEM Extensions
- Customize keys
- Etc…

Firmware Updates

- /redfish/v1/UpdateService/FirmwareInventory
  - FirmwareInventory
  - SimpleUpdate Action
- Model is
  - Give FW binary/package URI (HTTPs/FTP) to BMC
  - BMC downloads and applies (or stages) FW
- Back-end could be
  - UEFI Firmware Management Protocol (FMP)
  - UEFI Capsules
  - Other Technologies

Thanks for attending the
UEFI US Fall Plugfest 2016

For more information on the Unified EFI Forum and UEFI Specifications, visit
http://www.uefi.org

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