IDF16
英特尔信息技术峰会

使用 UEFI 高级功能加速固件开发

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STTS001

intel
experience
what's inside™

议程

- UEFI和ACPI技术规范的最新信息
- Redfish RESTful技术在数据中心的应用范例
- UEFI核心功能应用于UEFI开发
- 总结

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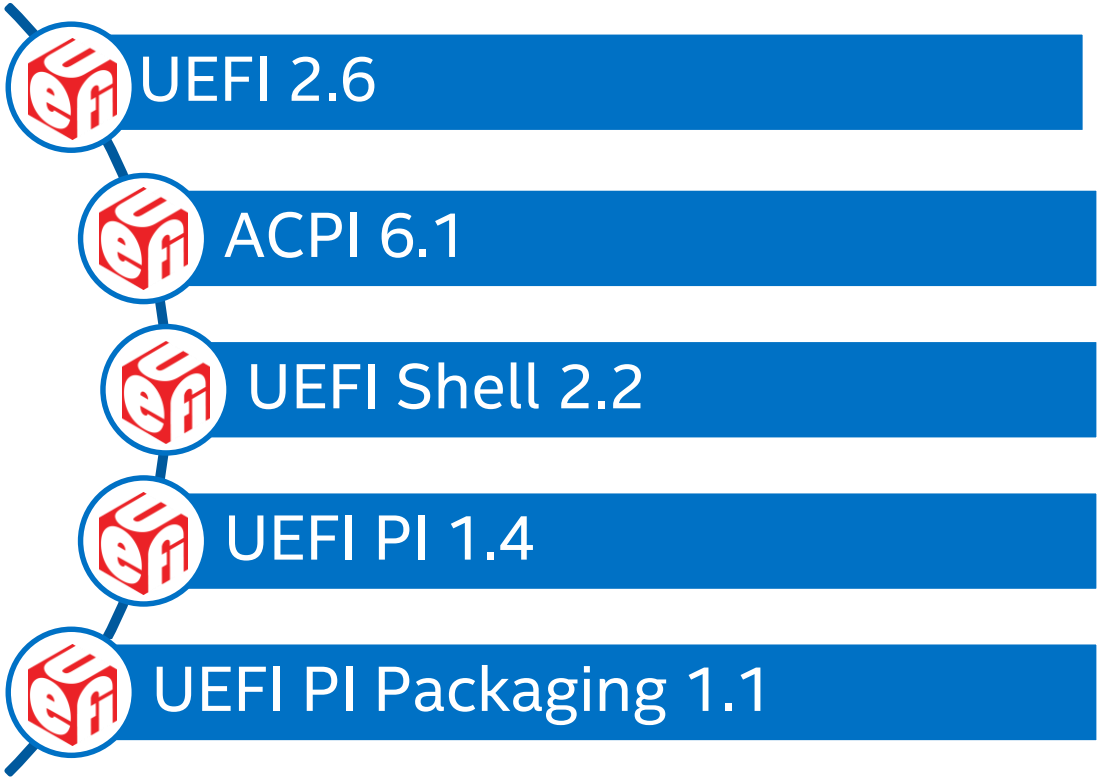
UEFI和ACPI技术规范的最新版本



http://uefi.org/specifications

UEFI 2.5 已定义的网络技术

- HTTP(S) 网络启动 (HTTP 接口, HTTP 辅助型接口, DNS v4/v6, RAMDISK, …)
- Wi-Fi (EAP，可扩展认证协议)
- TLS, 安全传输层协议
- 蓝牙®
- Redfish REST 协议

www.uefi.org

UEFI 2.6规范的更新

网络相关

- Wireless MAC Connection II 协议
- RAMDISK 协议

RAS相关

- CPER (通用型平台出错记录技术) 针对ARM*所做的扩展

HII相关

- 人机接口框架 (HII) Font Ex, Glyph Generator, Image Ex and Image Generator 等协议

I/O相关

- SD/eMMC Pass Thru协议
- PCI Root Bridge和I/O协议支持Non-identity地址映射

www.uefi.org

ACPI 6.1规范的更新

持久性内存相关

- NFIT更新
- NFIT根设备 _DSM

RAS相关

- APEI针对ARM* 所做的扩展
- ERST/EINJ 最大等待时长

管理相关

- Graceful Shutdown技术的说明
- 无线功率校准装置

I/O相关

- 支持利用中断通知的事件

UEFI和ACPI规范的更新有助于加速固件开发

www.uefi.org

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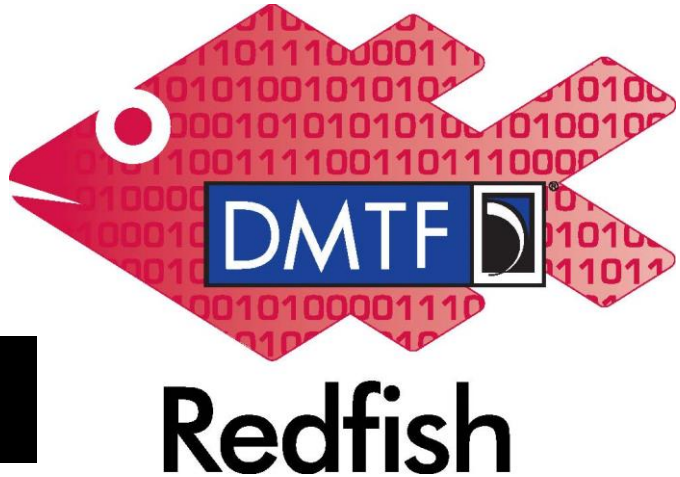
Redfish RESTful技术应用于数据中心的实用范例

什么是 Redfish?

- 业界标准 - www.dmtf.org/standards/redfish
- DMTF* SPMF (可扩展平台管理论坛) 提供技术规范、模式、模型、白皮书、常见问题解答以及资源浏览器

通过RESTful接口管理多代码服务器

- 基于现代工具链(HTTPS, JSON, OData)构建



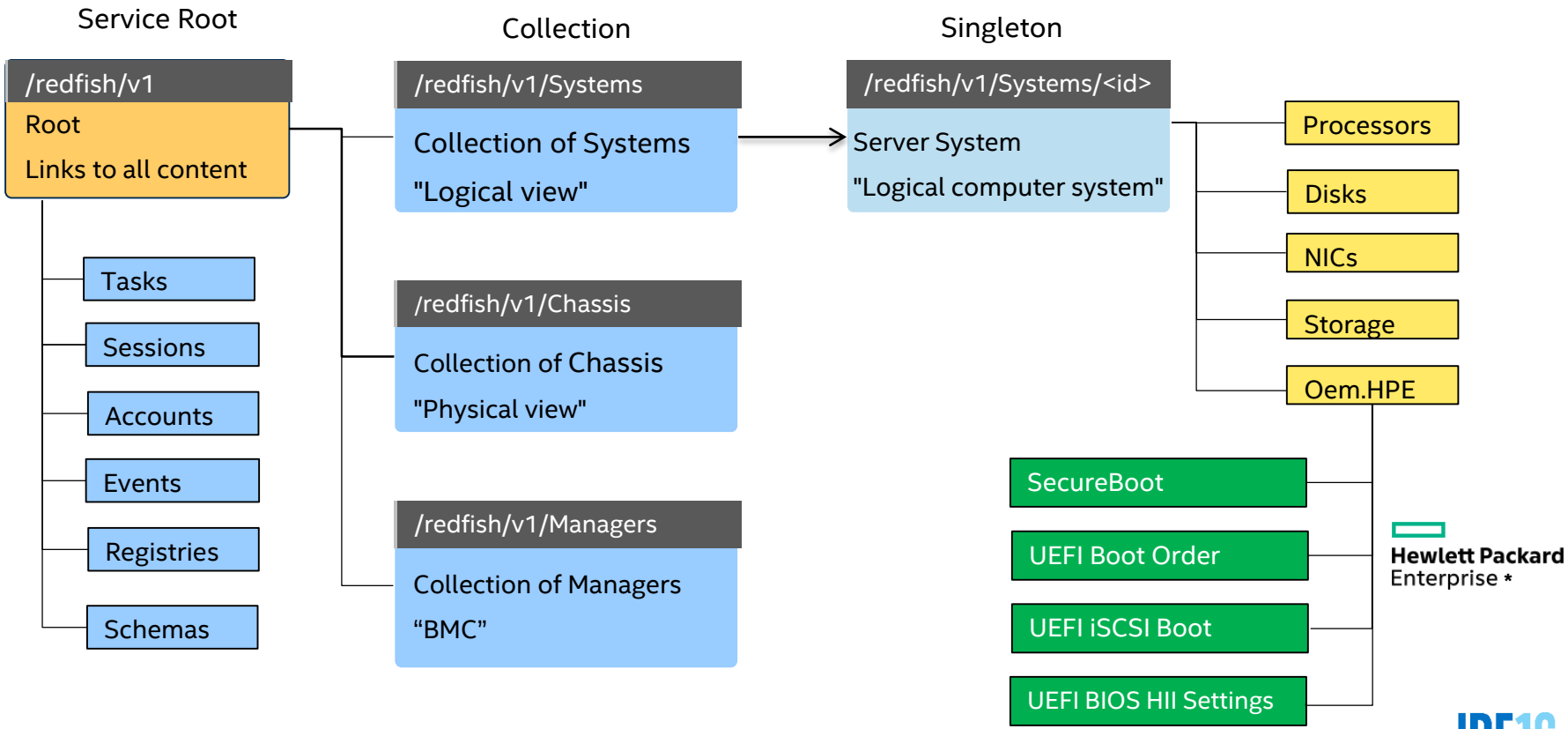
客户端 Python* 代码

```
rawData = urllib.urlopen('https://192.168.0.1/redfish/v1/Systems/1')
jsonData = json.loads(rawData)
print( jsonData['SerialNumber'] )
```

输出

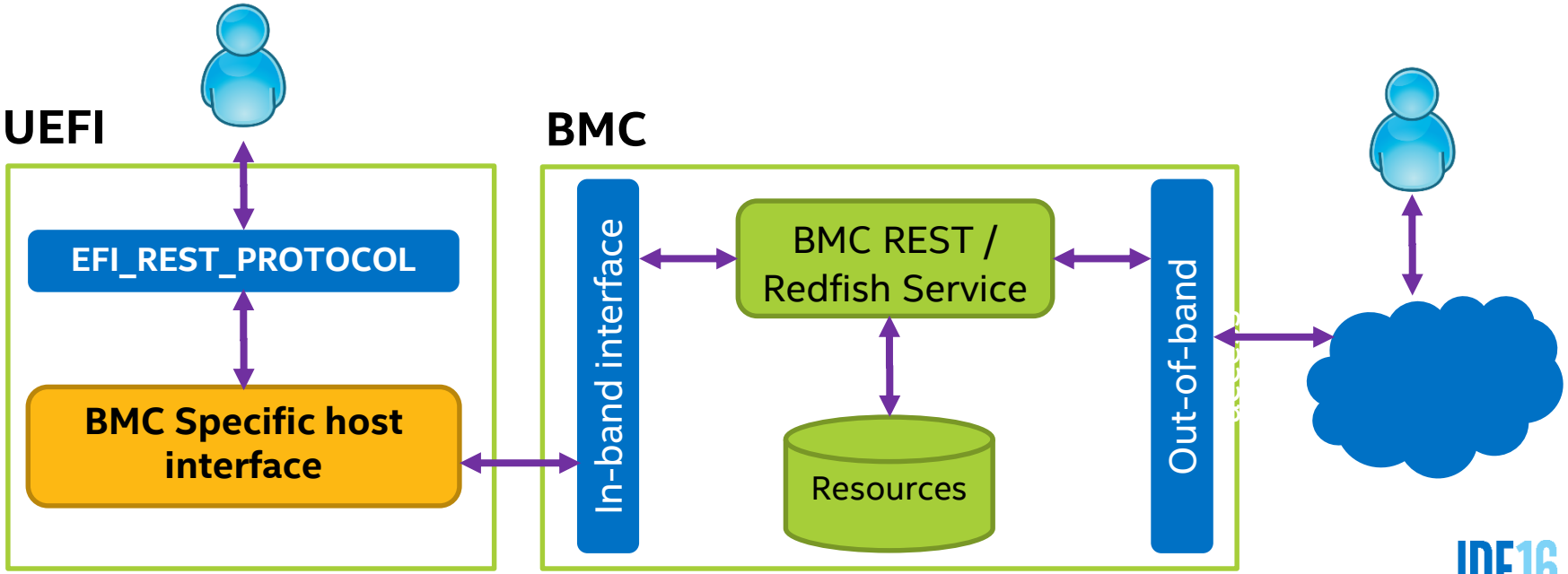
```
0AB8012GQ0
```

Redfish 资源图

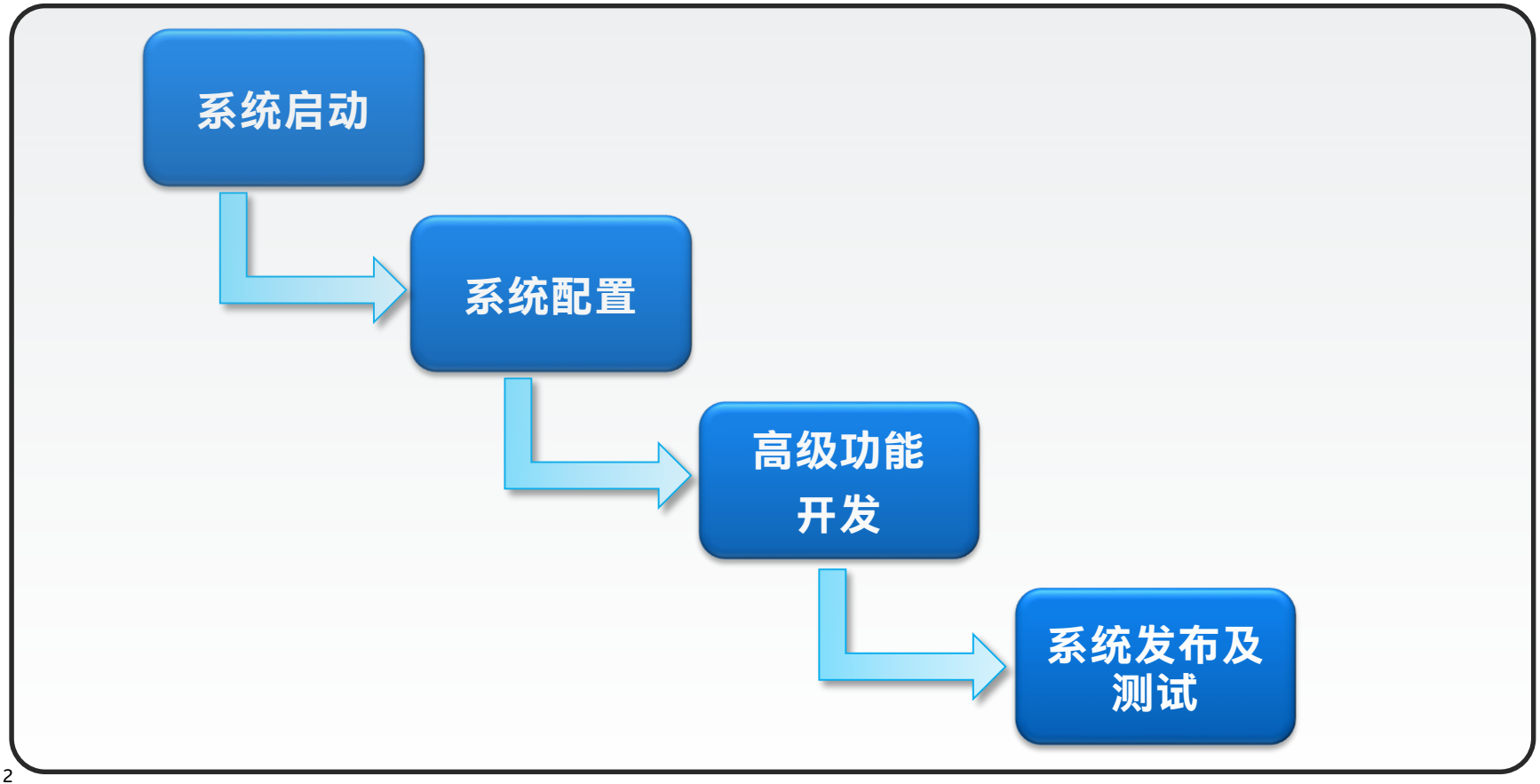


UEFI REST 协议

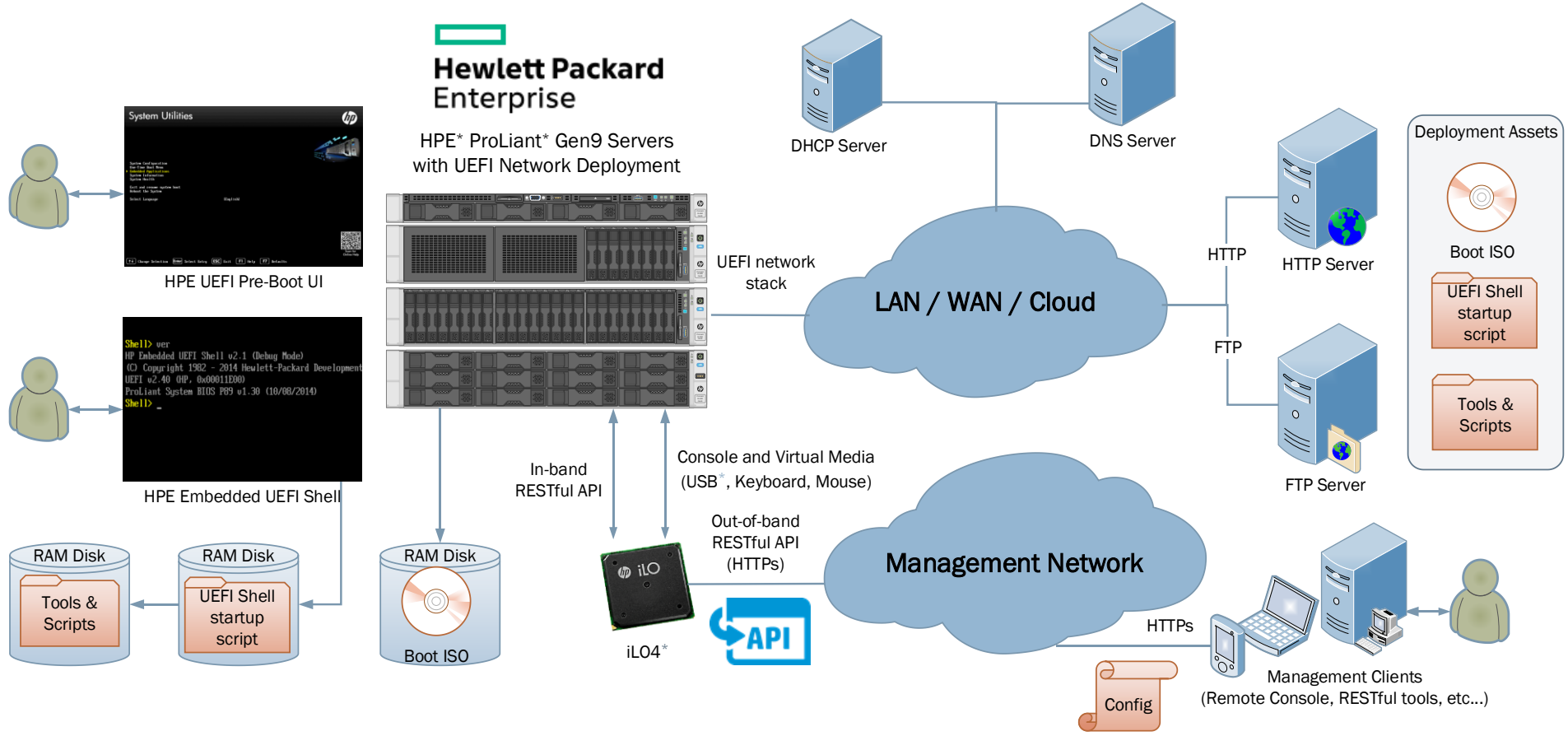
- UEFI 2.5规范定义
- 预启动环境下，支持带内访问RESTful接口(如Redfish)的标准协议
- 将BMC各种(厂商特有的)访问方式抽象化



UEFI 固件开发流程



UEFI在HPE* 服务器上的部署方案



HPE* Redfish范例: UEFI安全启动

GET @
/redfish/v1/systems/1/secureboot

- 开启/禁用UEFI安全启动
- 重置所有UEFI安全启动相关的UEFI变量
- 清空所有密钥 (退回到设置模式)


```
{
    "Name": "SecureBoot",
    "ResetAllKeys": false,
    "ResetToDefaultKeys": false,
    "SecureBootCurrentState": false,
    "SecureBootEnable": false,
    "Type": "HpSecureBoot.0.9.5"
}
```

HPE* Redfish范例: UEFI BIOS HII 配置

GET @ /redfish/v1/systems/1/bios

- 包含所有UEFI BIOS的HII配置信息(名称/值)
- HII meta-data记录在属性注册表中
- 通过名称/值来查找属性注册表中的meta-data


```
"AdminName": "",
"AdminOtherInfo": "",
"AdminPassword": null,
"AdminPhone": "5555555",
"AdvancedMemProtection": "AdvancedEcc",
"AsrStatus": "Enabled",
"AsrTimeoutMinutes": "10",
"AssetTagProtection": "Unlocked",
"AttributeRegistry": "HpBiosAttributeRegistryP89.1.0.40",
"AutoPowerOn": "RestoreLastState",
"BootMode": "Uefi",
```

HPE* Redfish范例: UEFI BIOS HII 配置

GET @ /redfish/v1/registries/HpBiosAttributeRegistryP89.1.0.40


```
{
    "AttributeName": "BootMode",
    "DisplayName": "Boot Mode",
    "HelpText": "Use this option to select the boot mode of the system. Se
    "WarningText": "Boot Mode changes require a system reboot in order to
    "ReadOnly": false,
    "GrayOut": false,
    "Type": "Enumeration",
    "MenuPath": "./BootOptions",
    "DisplayOrder": 81,
    "CurrentValue": null,
    "Value": [
        {
            "ValueName": "Uefi",
            "ValueDisplayName": "UEFI Mode"
        },
        {
            "ValueName": "LegacyBios",
            "ValueDisplayName": "Legacy BIOS Mode"
        }
    ]
},
```

UEFI Shell启动脚本范例

```
# Create FAT32 RAM Disk
ramdisk -c -s 512 -v MYRAMDISK -t F32
FS0:


# Download provisioning OS files from HTTP to RAM Disk
webclient -g http://repo.hpe.com/deploy/efilinux.efi
webclient -g http://repo.hpe.com/deploy/deploy.kernel
webclient -g http://repo.hpe.com/deploy/deploy.ramdisk


# Start provisioning OS
efilinux.efi -f deploy.kernel initrd=deploy.ramdisk
```

应用UEFI高级功能从而加快固件开发的实用范例

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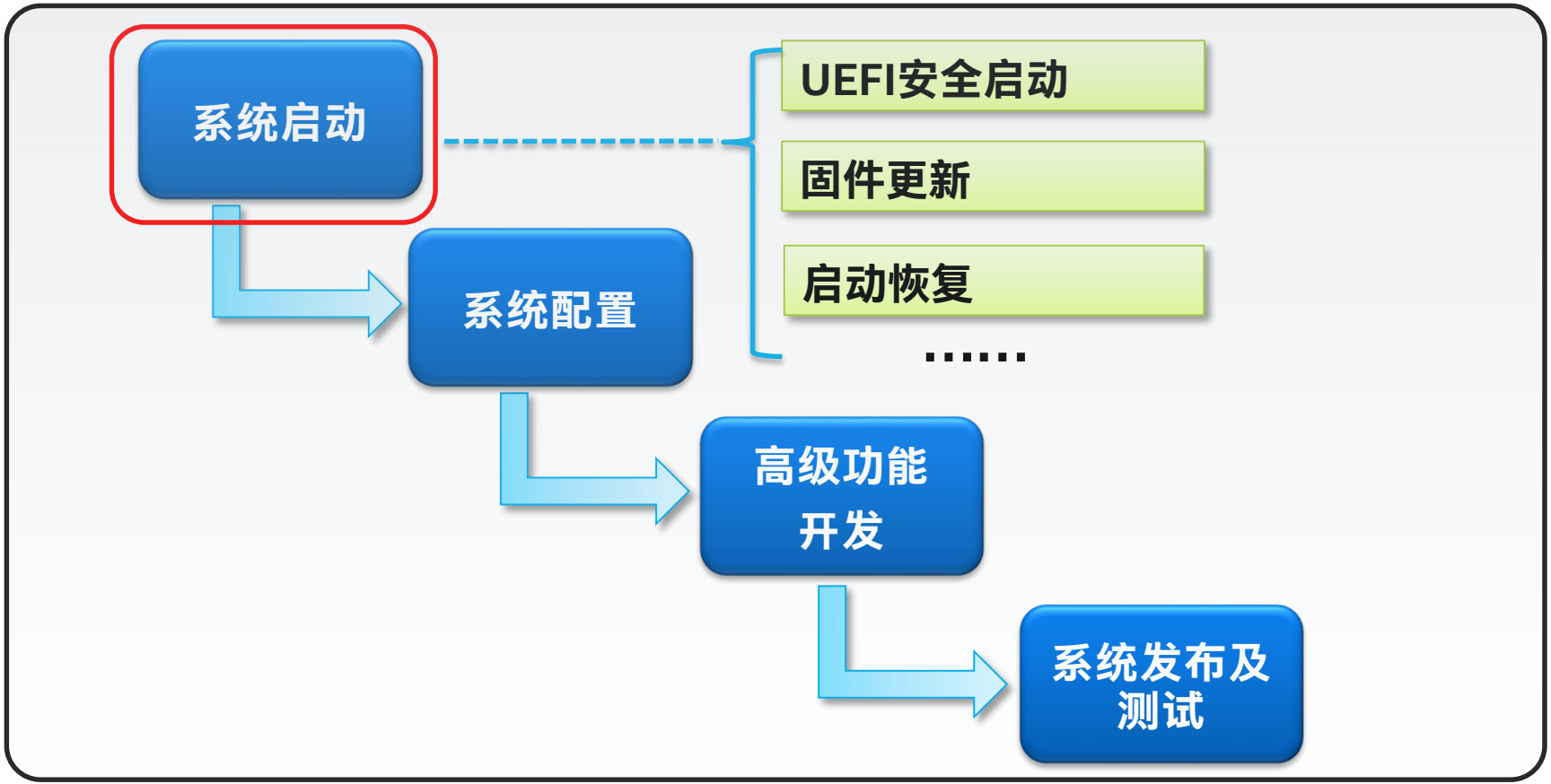
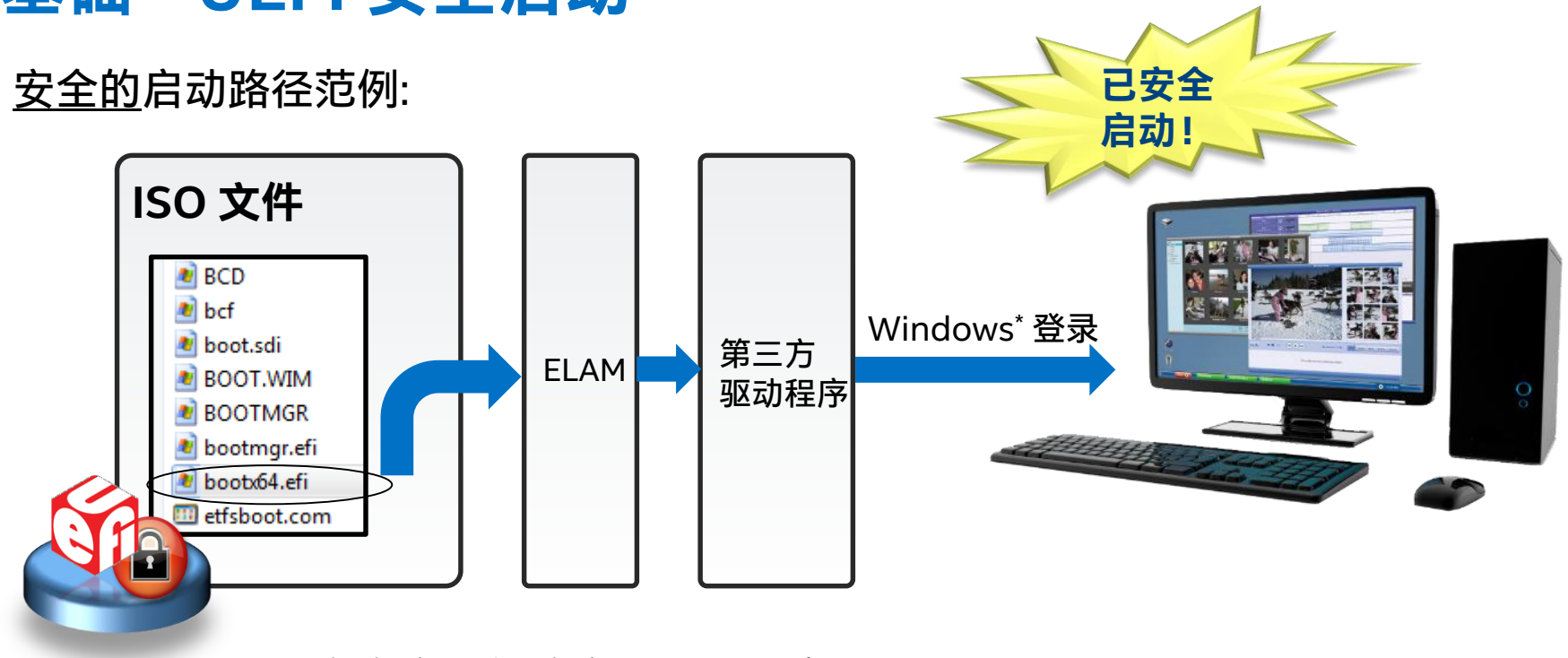
用UEFI核心功能进行开发



基础 - UEFI 安全启动

安全的启动路径范例:



- UEFI安全启动保护启动引导程序 (bootx64.efi)
- 启动引导程序保护ELAM (早期加载的反恶意软件)
- 木马软件无法避开反恶意软件的检查

升级 – 可定制的UEFI安全启动

部署

基础	升级
平台特有的 PK_{pub} 清除方案	增加定制安全启动密钥的 标准化方案
设置模式 用户模式	设置模式　用户模式 审计模式 已部署模式

优势

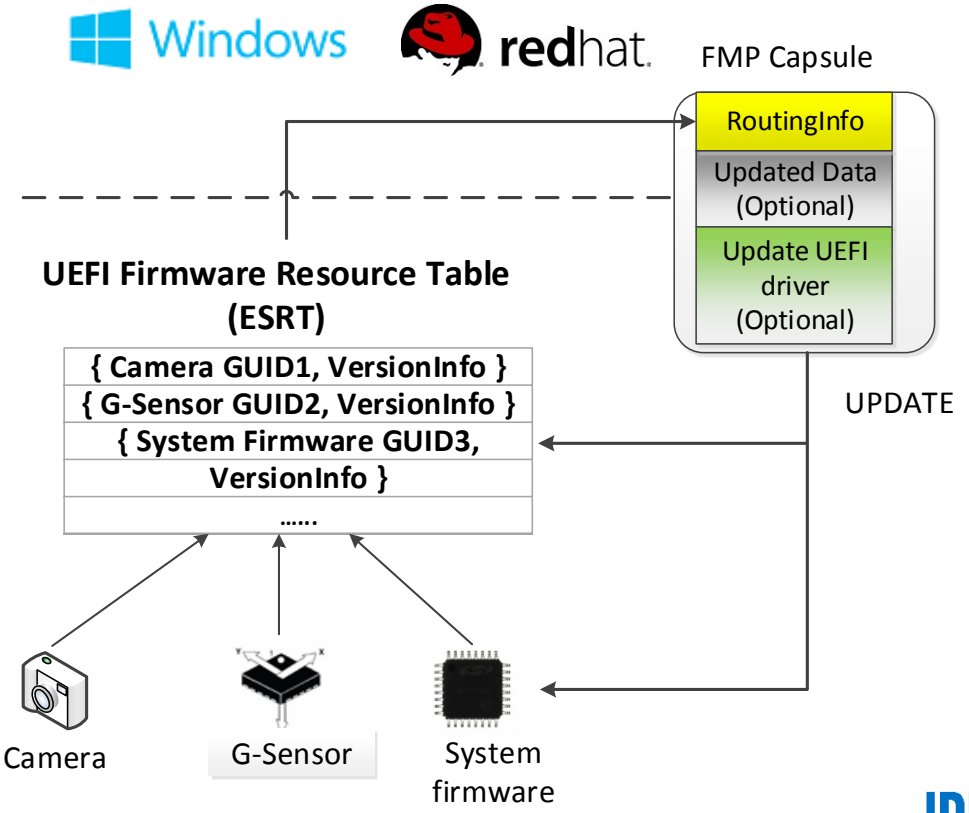
- 不含特有解决方案 → 安全性
- 提高利用率 → 灵活性
- 保存查证结果 → 可扩展性

可定制的UEFI安全启动进一步降低平台特有方案引入的安全风险。目前处于和OS供应商合作以提高互操作性和接受度的推广阶段。

固件安全升级

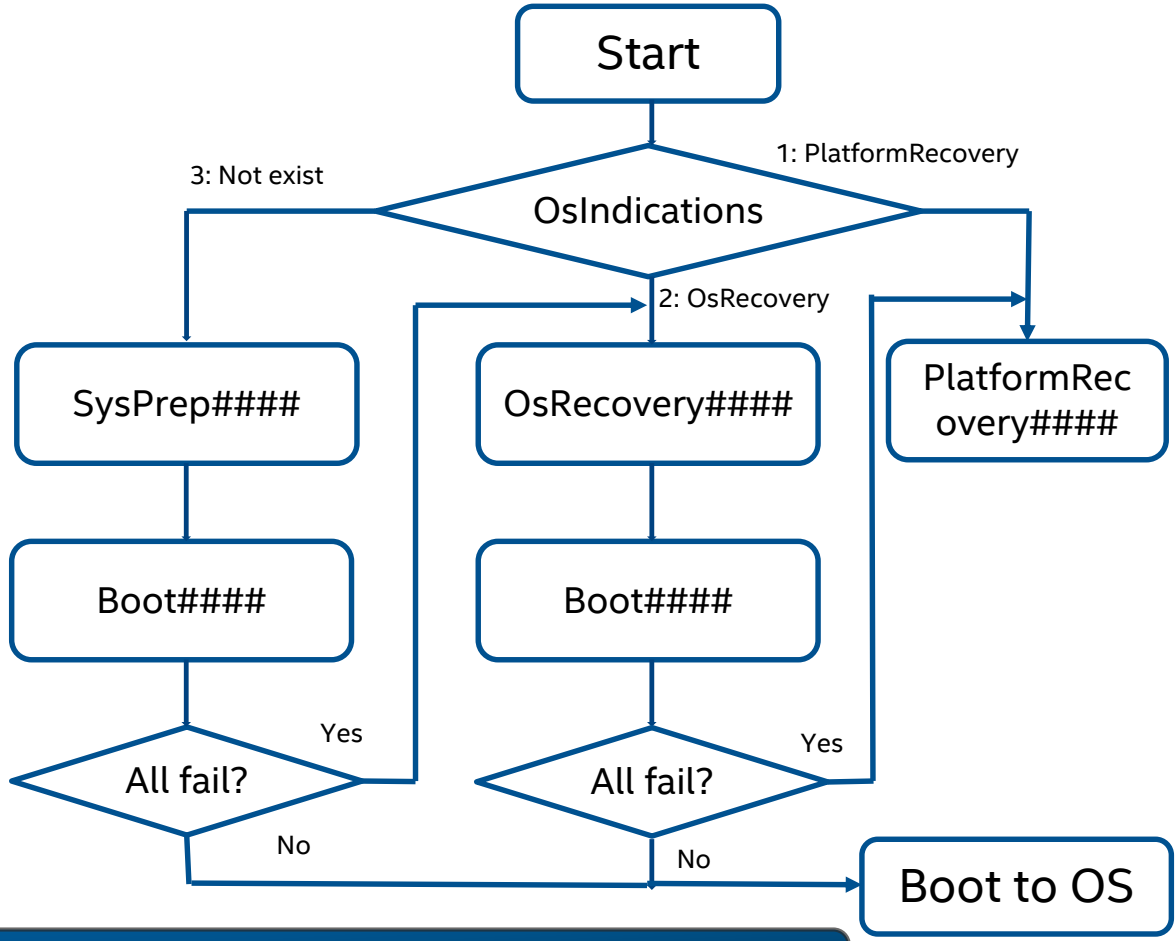
- 固件升级中的双重保护:
  - OS在构建capsule时验证升级驱动程序
  - 在执行升级前UEFI安全启动验证capsule中有效负载数据

- 相关技术:
  - ESRT
  - FMPv3
  - FMP capsule



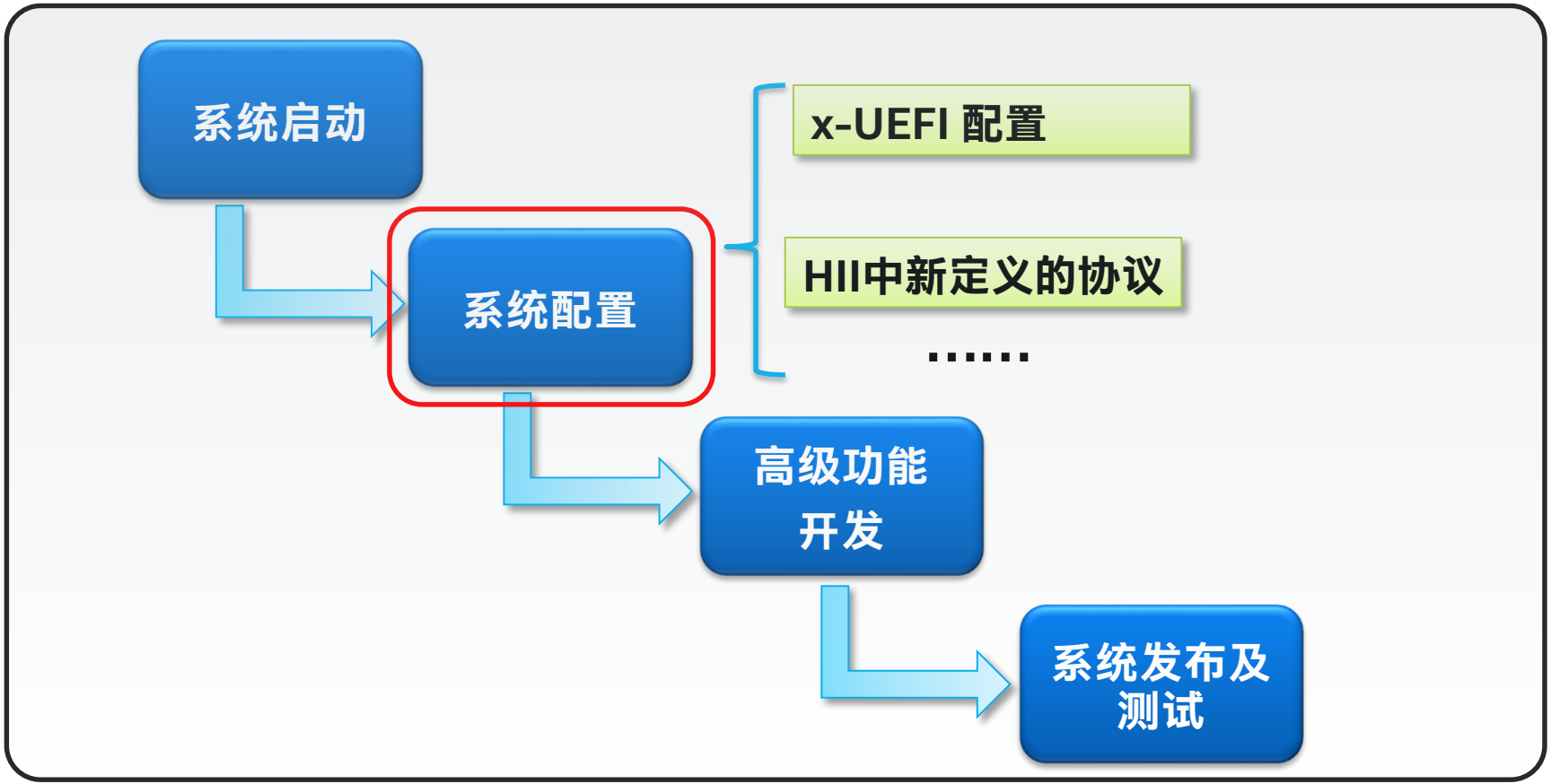
启动恢复

- 相关技术
  - OS定义的恢复策略
  - 平台定义的恢复策略
  - 恢复策略使用认证技术进行保护，相关UEFI变量如下:
    - OsRecoveryOrder
    - dbrDefault, dbr
  - 支持缺省平台恢复机制



安全技术升级在系统启动阶段加速固件安全性开发

用UEFI核心功能进行开发



x-UEFI 脚本化配置

- 基于不同命名空间中的关键词
- 利用现有的UEFI HII架构

- 技术要点:
  - x-UEFI 语言
  - Keyword Handler 协议

x-UEFI 配置范例

iSCSIInitiatorName

VFR file

```
string  varid    = ISCSI_CONFIG_IFR_NVDATA.InitiatorName,
          prompt  = STRING_TOKEN(STR_ISCSI_CONFIG_INIT_NAME),
```

UNI file

```
#string STR_ISCSI_CONFIG_INIT_NAME    #language en-US "iSCSI Initiator Name"
#string STR_ISCSI_CONFIG_INIT_NAME    #language x-UEFI "iSCSIInitiatorName"
```

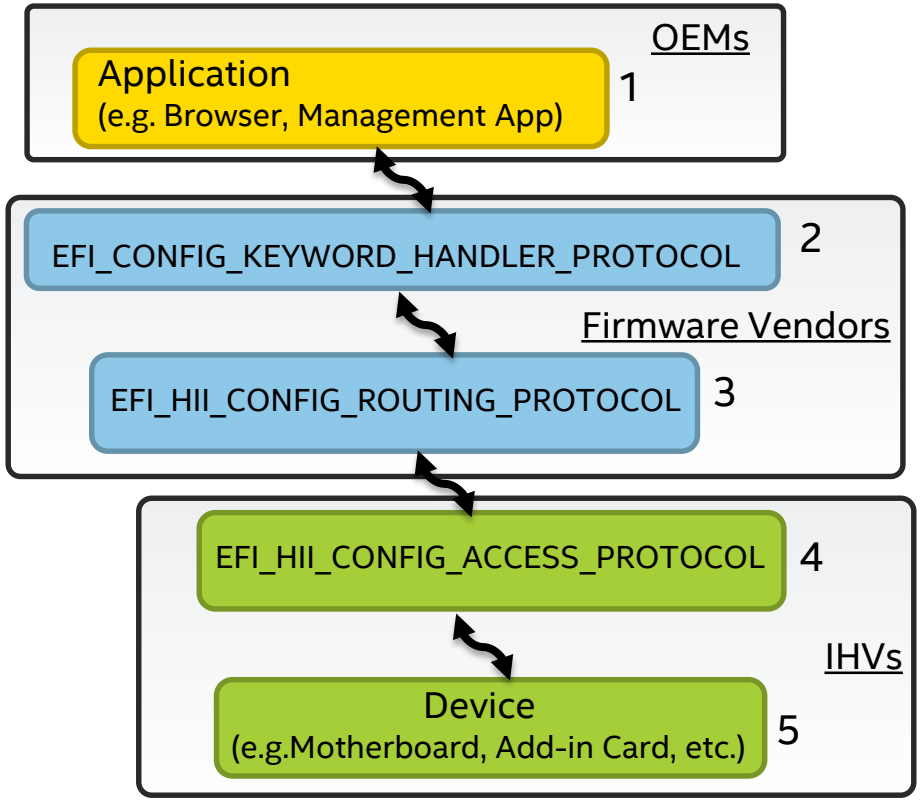
Script file

```
IScsiScript -i iqn.edkii.intel.com
```

x-UEFI配置如何实现?

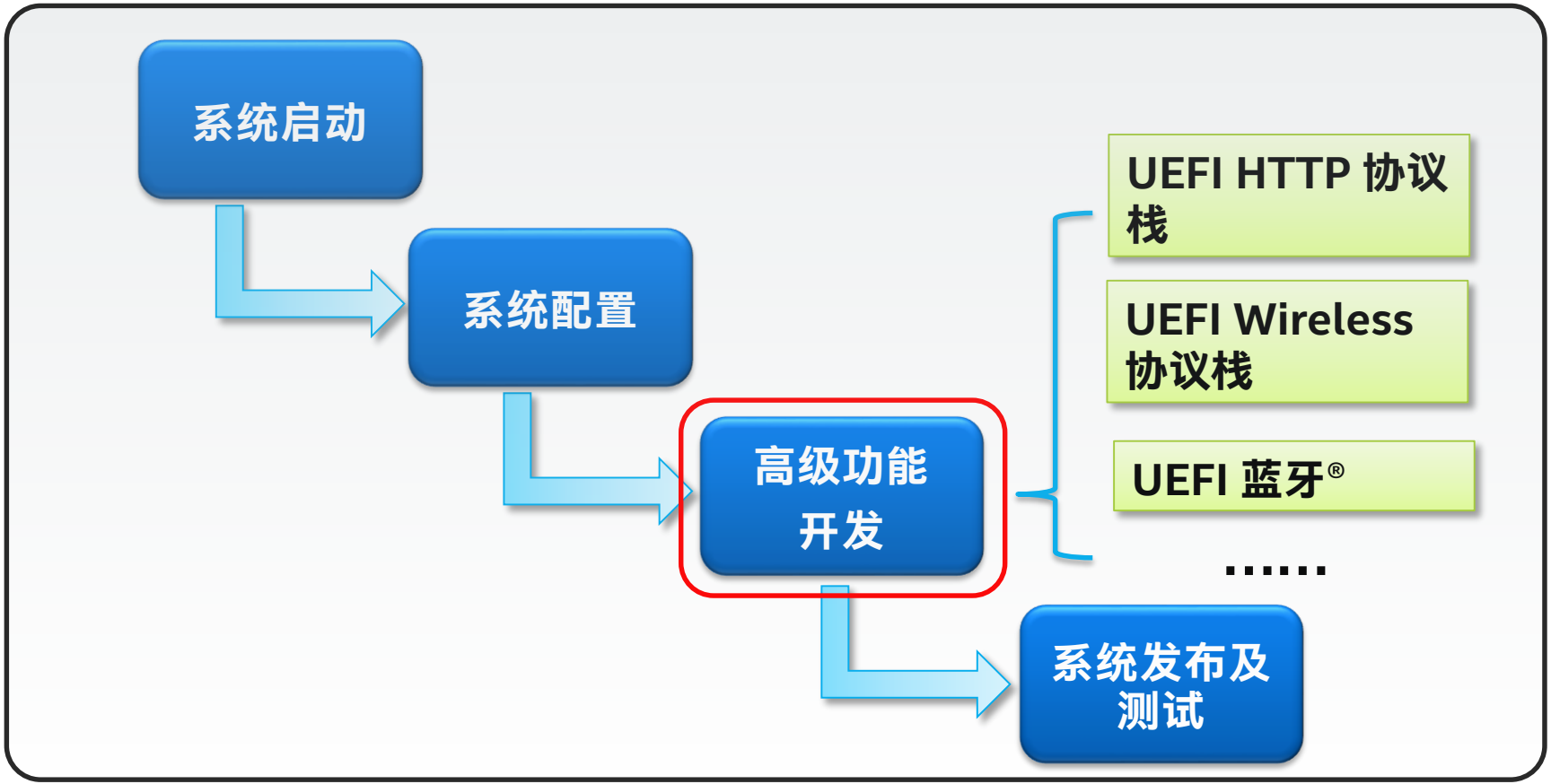
- OEMs …
  - 查阅关键词

    http://www.uefi.org/configNamespace
  - 调用 KeywordHandler.GetData/SetData
- Firmware Vendors …
  - 从英特尔® UEFI 开发套件 (Intel® UDK) 2015获取HII最新实现
- IHVs …
  - 定义并注册x-UEFI关键词
  - 在ConfigAccess.RouteConfig 中实现基于关键词的配置



配置技术升级在系统配置阶段 加速固件开发

用UEFI核心功能进行开发

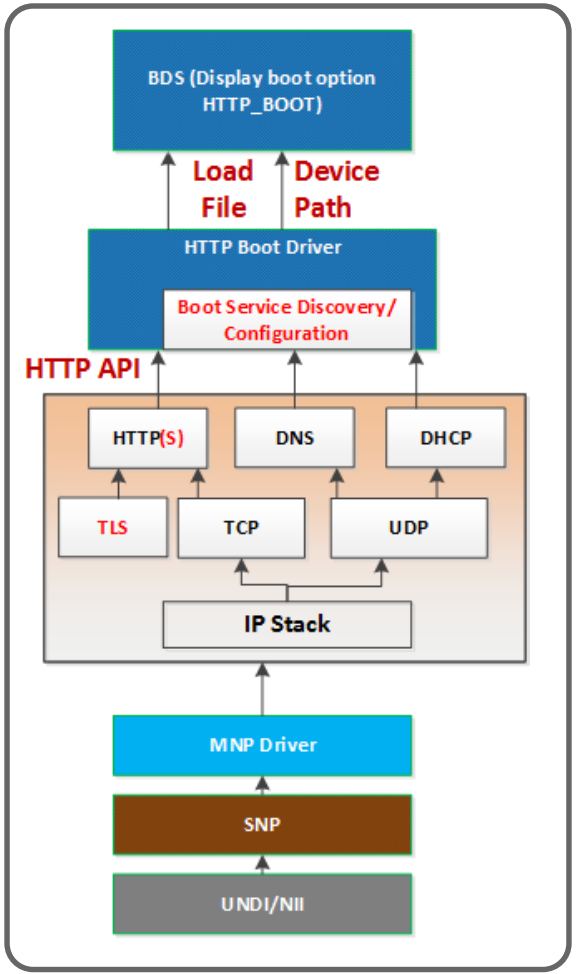


UEFI HTTP 协议栈

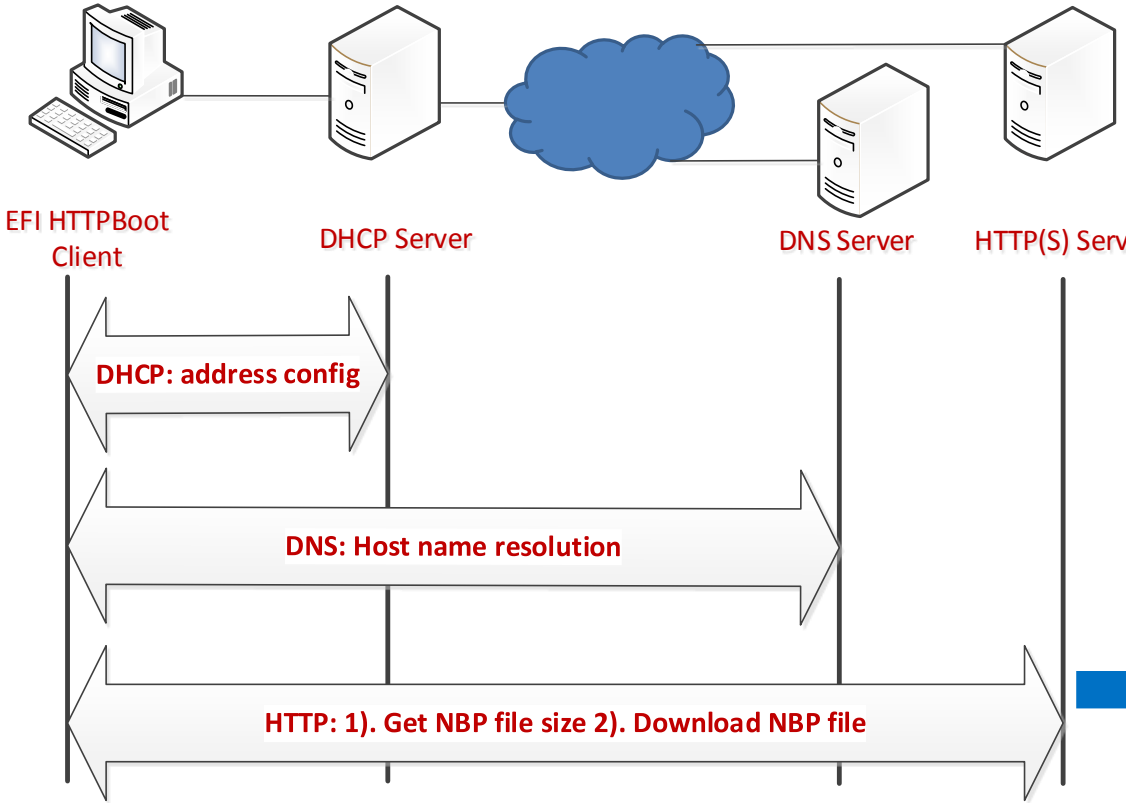
新模块

驱动程序	库
HTTP启动程序 HTTP 程序 HTTP 工具程序 TLS 程序	HTTP 库 TlsLib库 OpenslTlsLib库

- 灵活的网络部署方案
- 对家庭环境的支持
- 对企业环境的支持



HTTP(S) 启动流程



启动成功！

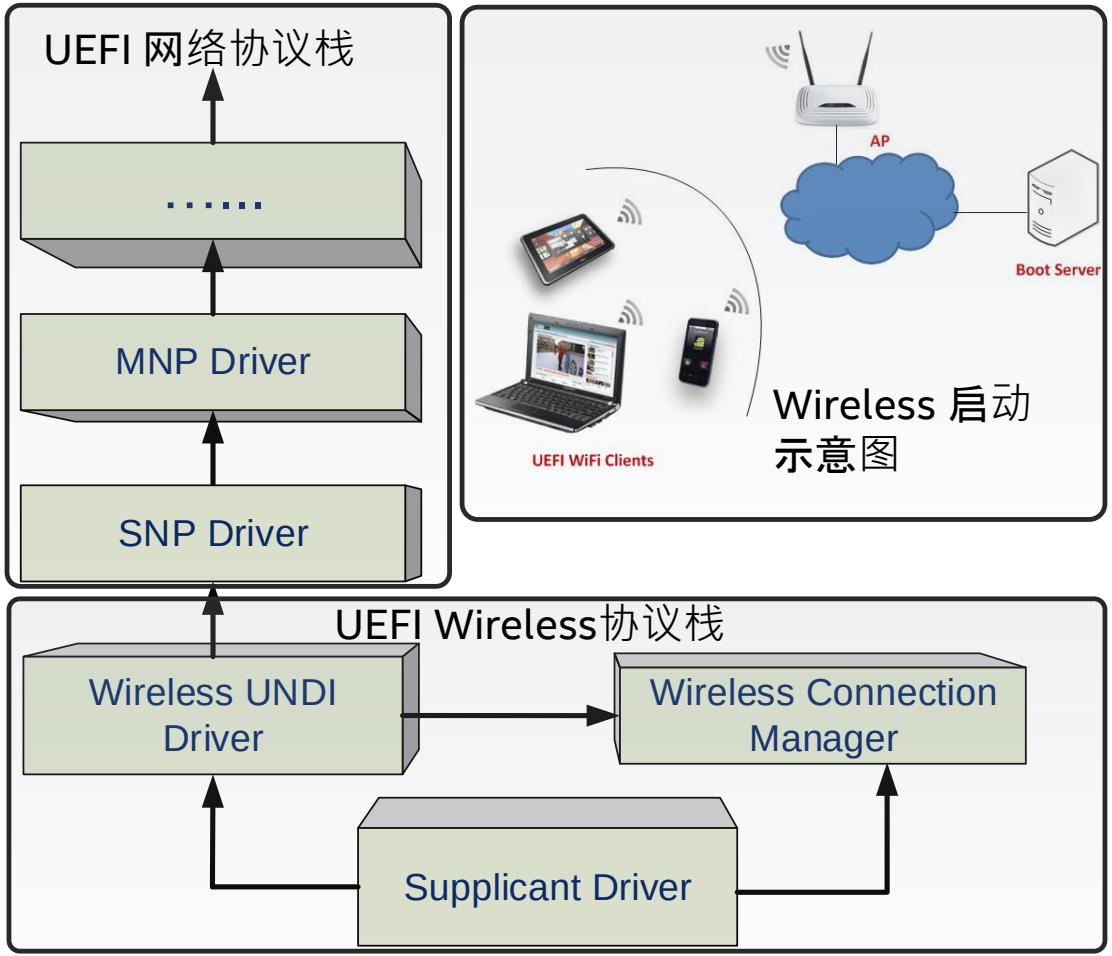
演示 - UEFI HTTP(S) 启动

- 步骤 0: 配置TLS证书
  - 用于HTTPS启动
- 步骤 1: 配置启动URI
  - 进入设备管理
  - 选择一张网卡
  - 进入HTTP启动配置
  - 输入启动URI并保存
- 步骤 2: 找到启动选项
  - 进入启动管理
  - 选择新增加的启动选项
- 步骤 3: 启动Windows* 预安装环境

TLS仅是一个补丁程序。目前的实现中对证书的管理仍然不够安全。希望和业界合作以加强安全性以及和OS供应商合作增加互操作性。

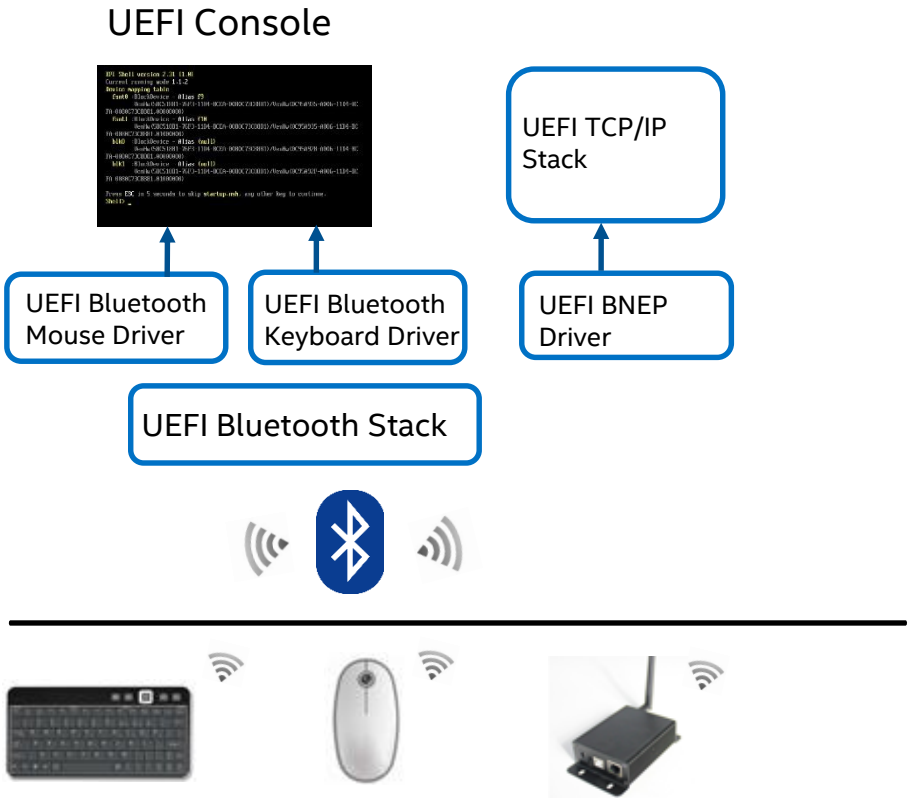
UEFI Wireless 协议栈

- 符合802.11协议规范的无线协议栈:
  - 基于HII的连接管理
  - 提供通用的supplicant 功能，包括:
    - PSK 认证
    - EAP 802.1x 认证
  - CCMP 加密



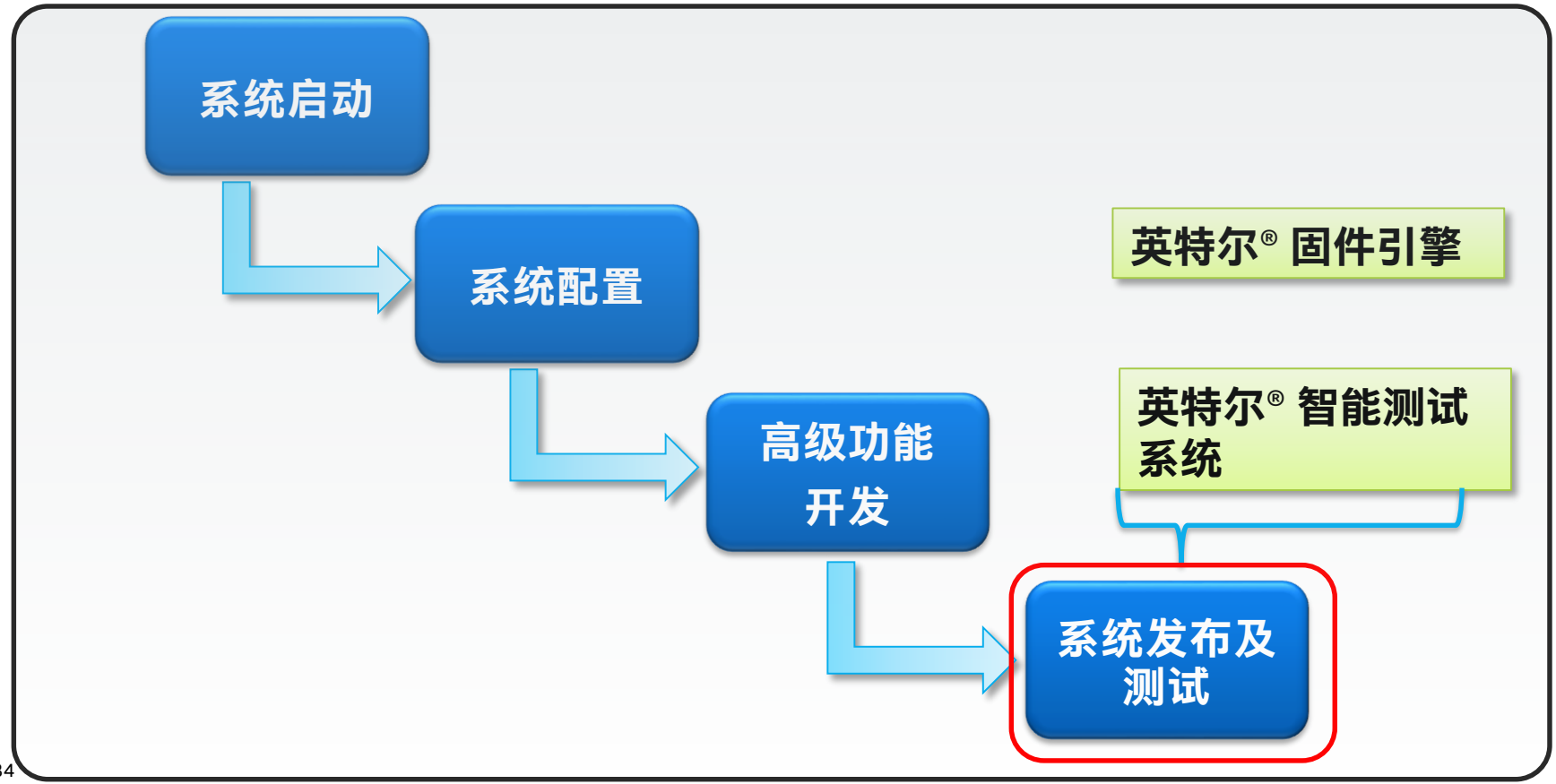
UEFI 蓝牙®

- 提供通用 I/O 接口:
  - UEFI 设备驱动程序可提供丰富的功能
- UEFI 蓝牙® 协议层包括:
  - 蓝牙®主控制器
  - 蓝牙®总线
  - 蓝牙®服务



连接技术升级在高级功能开发阶段加速固件开发

将UEFI核心功能应用于UEFI开发



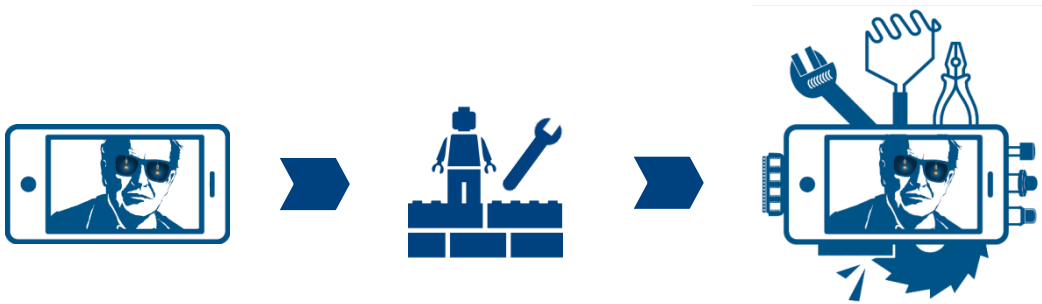
英特尔® 固件引擎

无需源代码即可为IoT设备快速生成固件

可扩展的二进制固件架构

基于已验证参考设计的二次开发

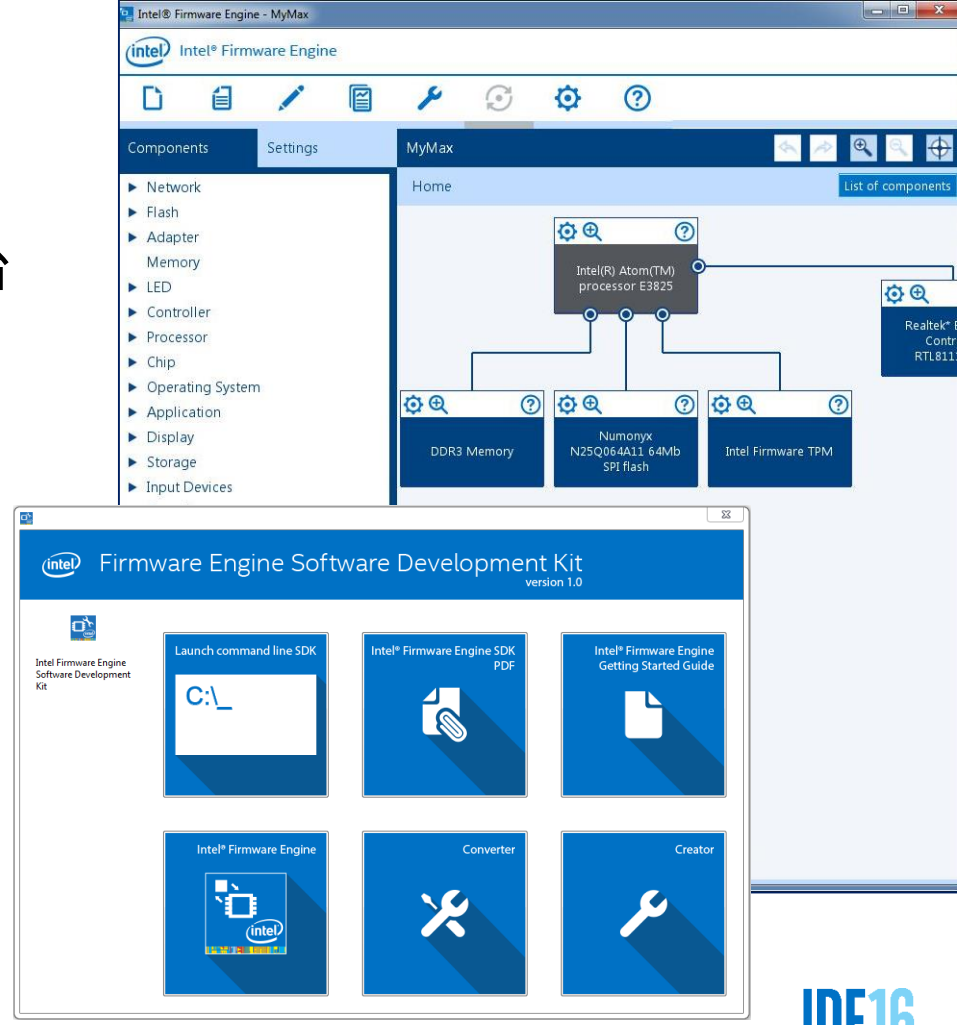
GUI开发进一步缩短上市时间



更多信息：
intel.com/firmwareengine

英特尔® 固件引擎

- 应用程序、SDK以及开放式硬件平台在这里提供下载：
  intel.com/firmwareengine
- 英特尔® 固件引擎2.0已发布
- SDK新版本将于2016年四月份发布
- 将支持更多英特尔IoT平台



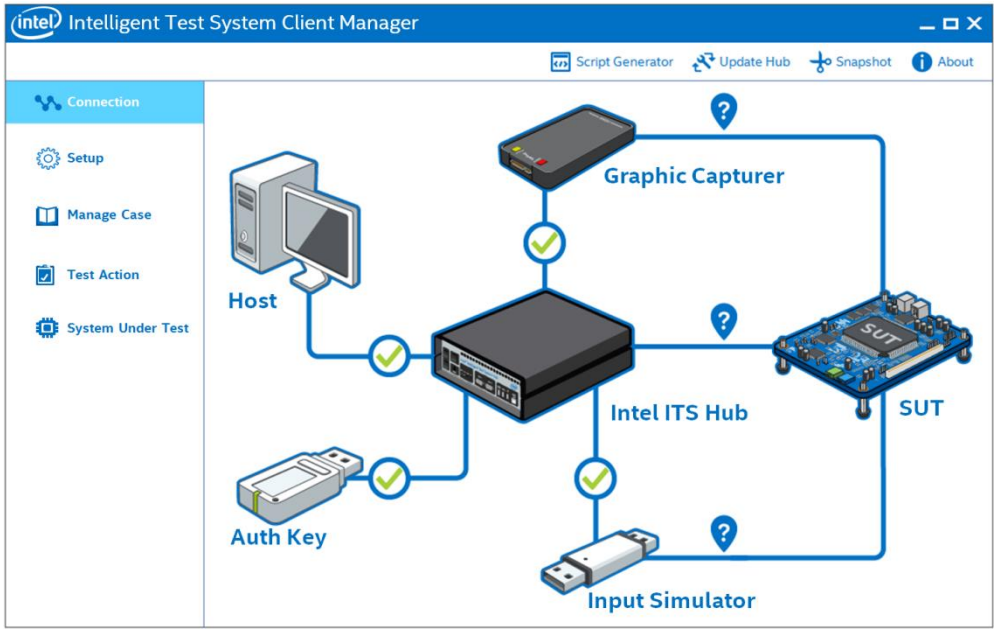
英特尔® 智能测试系统 (英特尔® ITS)

可扩展的硬件/软件测试框架

自动测试、设备控制以及UEFI代码覆盖率检查

减少成本同时提高测试效率

英特尔® 固件引擎和英特尔® 智能测试系统简化固件发布和固件测试流程



更多信息: intel.com/intel-its

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总结和下一步计划

- UEFI和ACPI规范的更新有助于加速固件开发
- UEFI高级功能加速了固件开发进程，帮助了Redfish在数据中心中使用 RESTful管理模式
- 更多在安全、配置、网络相关方面的升级已准备就绪
- 英特尔® 固件引擎和英特尔® 智能测试系统极大地简化了固件发布和固件测试流程

下一步计划:

- 在固件开发中使用UEFI 2.6实现的高级功能
- 在服务器和管理软件上使用Redfish
- 进一步加强业界合作，提升UEFI高级功能的安全性、互操作性以及接受度

补充信息

- 您可通过IDF网站的技术课程目录下载此次课程的PDF演讲文稿 www.intel.com/idfsessionsSZ 也可以在技术课程目录的首页链接下载。

- 更多相关信息：
  - 英特尔® 固件资源中心: firmware.intel.com
  - UEFI 论坛学习中心: uefi.org/learning_center
  - UEFI 和ACPI 协议规范: www.uefi.org/specs/
  - Redfish 协议规范: www.dmtf.org/standards/redfish

英特尔EDK II和UEFI 开发人员调查

英特尔正在开展一项EDKII和UEFI开发工具相关的调查。我们希望得知您常用的编译器、调试方法、以及在固件开发方面我们仍需提升的地方。

请访问以下链接或扫二维码参与：

http://intelcustomer.az1.qualtrics.com/SE/?SID=SV_6lJbxG5BYFFMPSl&Source=IDF

其他技术课程

课程编号	标题	日期	时间	教室
STTS001 ✓	使用 UEFI 高级功能加速固件开发	周三	13:15	演播厅
STTS002	借助面向 WebRTC 的英特尔®协同通信开发套件增强互联网上的实时通信用户体验	周三	14:30	演播厅
STTS003	规划和预测大数据与物联网解决方案	周三	15:45	演播厅

✓ = 完毕

下一个精彩是什么?

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Rev. 1/14/16

补充

UEFI Shell 2.2 规范更新

- 网络相关的更新
- 允许调用**Execute()** 时不重新嵌套新的shell
- 增加自动退出的命令行参数
- **setvar**命令重构
- 以下命令引入新功能

  dh, disconnect, comp, dmem, cls, reset, pci, bcfg, dmpstore

PI Packaging 1.1 的更新

- 基于离散型子集配置模式传递PCD配置信息
- 本地化发布包中的名字
- 传递详细的有关协议/PPI/GUIDs的生成信息
- 传递二进制模块中PCD的使用方法
- 传递详细的有关协议/PPI/GUIDs的使用信息
- 传递PCD显示信息
- 传递PCD枚举类信息(允许字符串)
- 支持抽象化类型
- 传递BY_START/TO_START相互作用信息
- 传递产品中有关协议/PPI/GUIDs的设置或生成的受限信息

使用HPREST的配置脚本范例

```
# Login to iLO
hprest login https://clientilo.domain.com -u username -p password

# Configure UEFI network settings (Use Auto and DHCP defaults)
hprest set PreBootNetwork=Auto --selector HpBios.
hprest set Dhcpv4=Enabled

# Configure UEFI Shell startup script from URL
hprest set UefiShellStartup=Enabled
hprest set UefiShellStartupLocation=NetworkLocation
hprest set UefiShellStartupUrl=http://192.168.1.1/deploy/startup.nsh

# Set one-time-boot to Embedded UEFI Shell
hprest set Boot/BootSourceOverrideEnabled=Once --selector ComputerSystem.
hprest set Boot/BootSourceOverrideTarget=UefiShell

# Save and reboot server
hprest commit --reboot=ON
```