
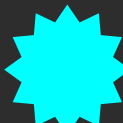



UEFI & EDK II Training

UEFI Aware Operating System

tianocore.org

LESSON OBJECTIVE

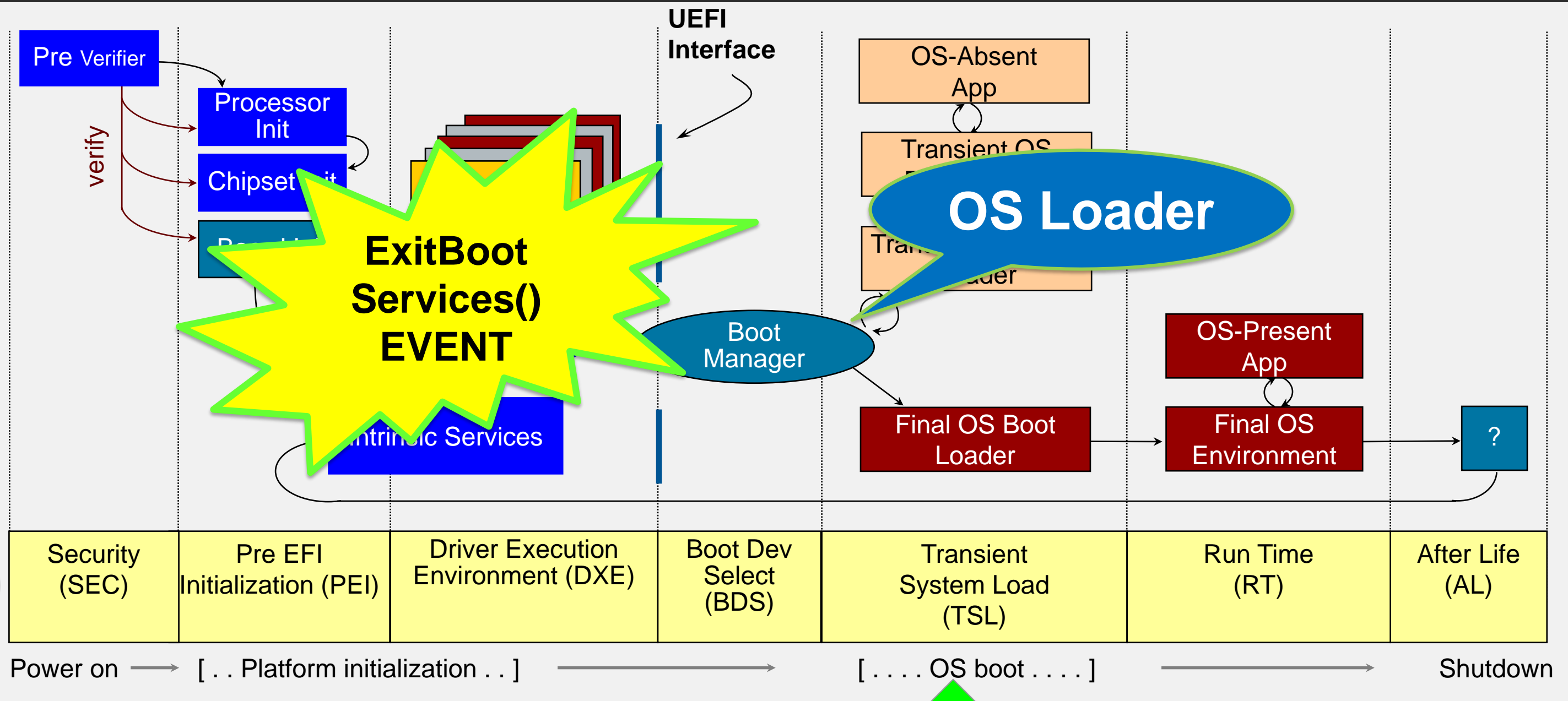
-  Explain How the OS and UEFI Work together
-  Explain the UEFI Requirements for UEFI aware OS
-  Explain How Secure Boot Fits with UEFI

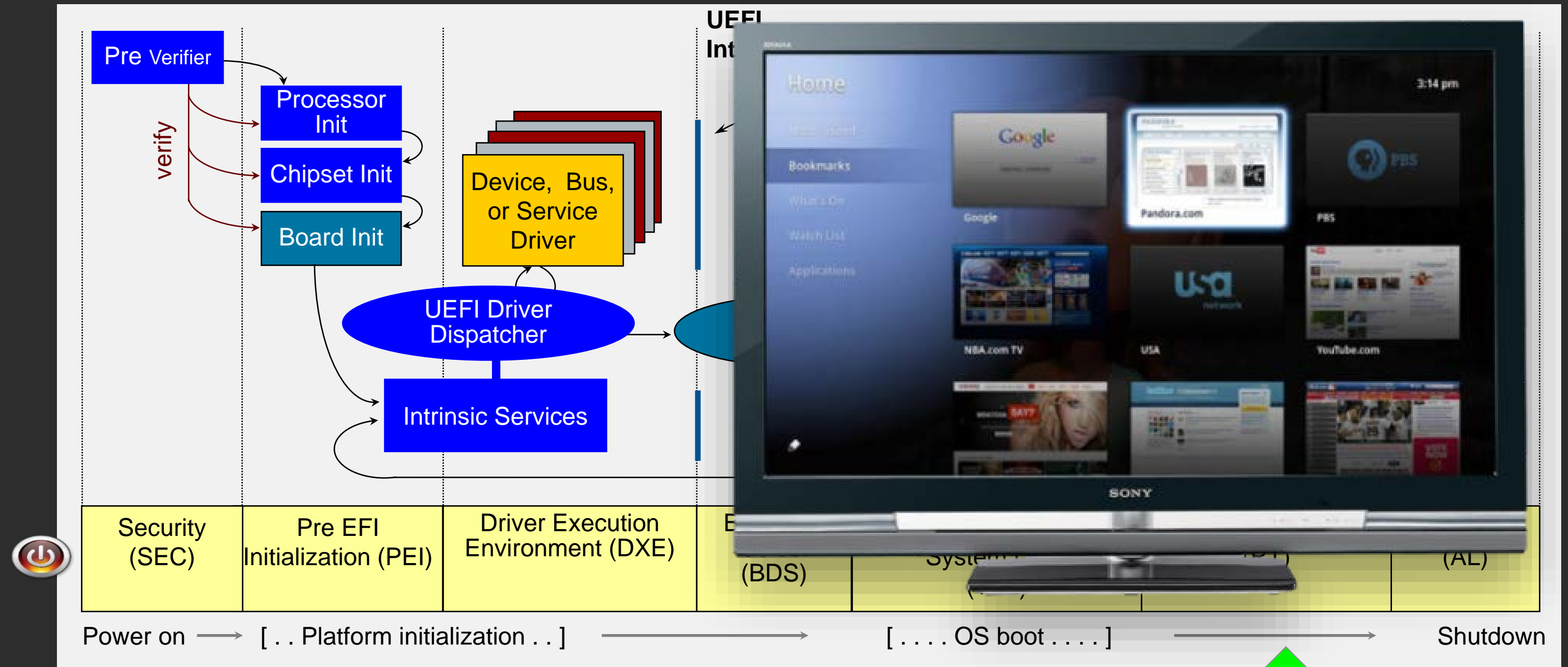
UEFI AWARE OS REQUIREMENTS

Common Requirements

UEFI OPERATING SYSTEMS







UEFI OS REQUIREMENTS

UEFI Drivers:
Boot devices/console

UEFI OS installer

UEFI OS Loader

Disk
Partition/Formats

Firmware
Requirements

Set Boot Path to
Boot to UEFI OS

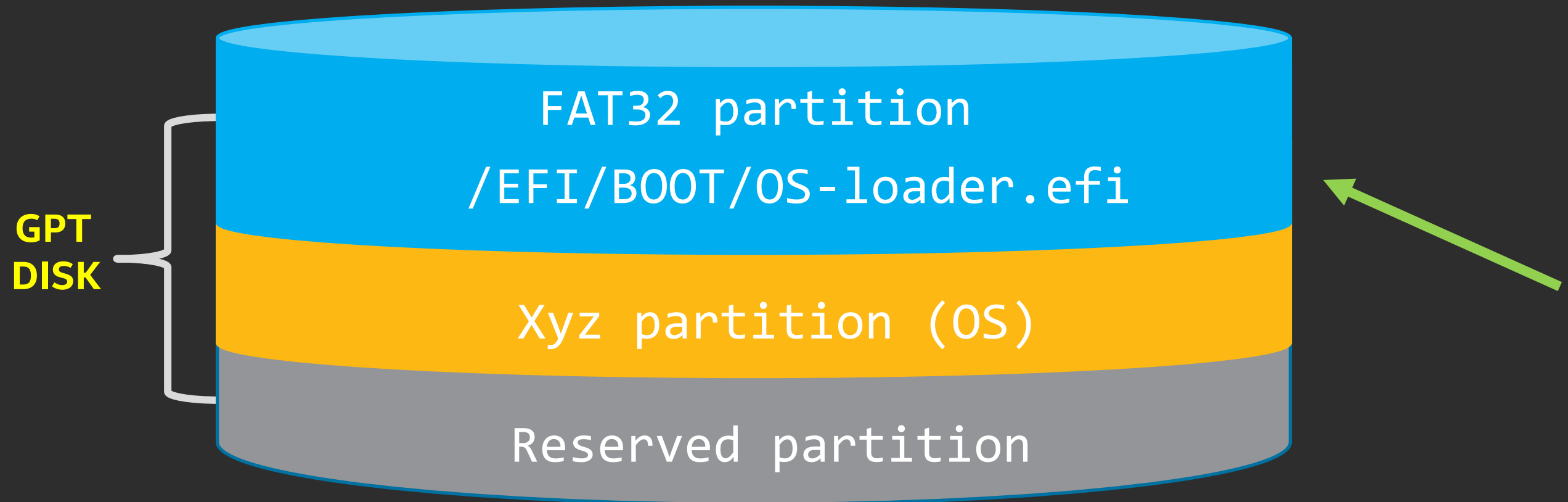
UEFI OS LOADER

- OS install process includes UEFI loader
 - `/efi/boot/bootx64.efi` `/efi/redhat/grub.efi`
- Call UEFI boot & runtime services to start OS
- Exit UEFI Boot Services
- Transfer control to native OS

UEFI OS INSTALLER

- Discover UEFI storage devices
- Setup storage device: GPT w/ FAT32 boot partition
- Create boot variables `BootXXXX` and set the `BootNext`

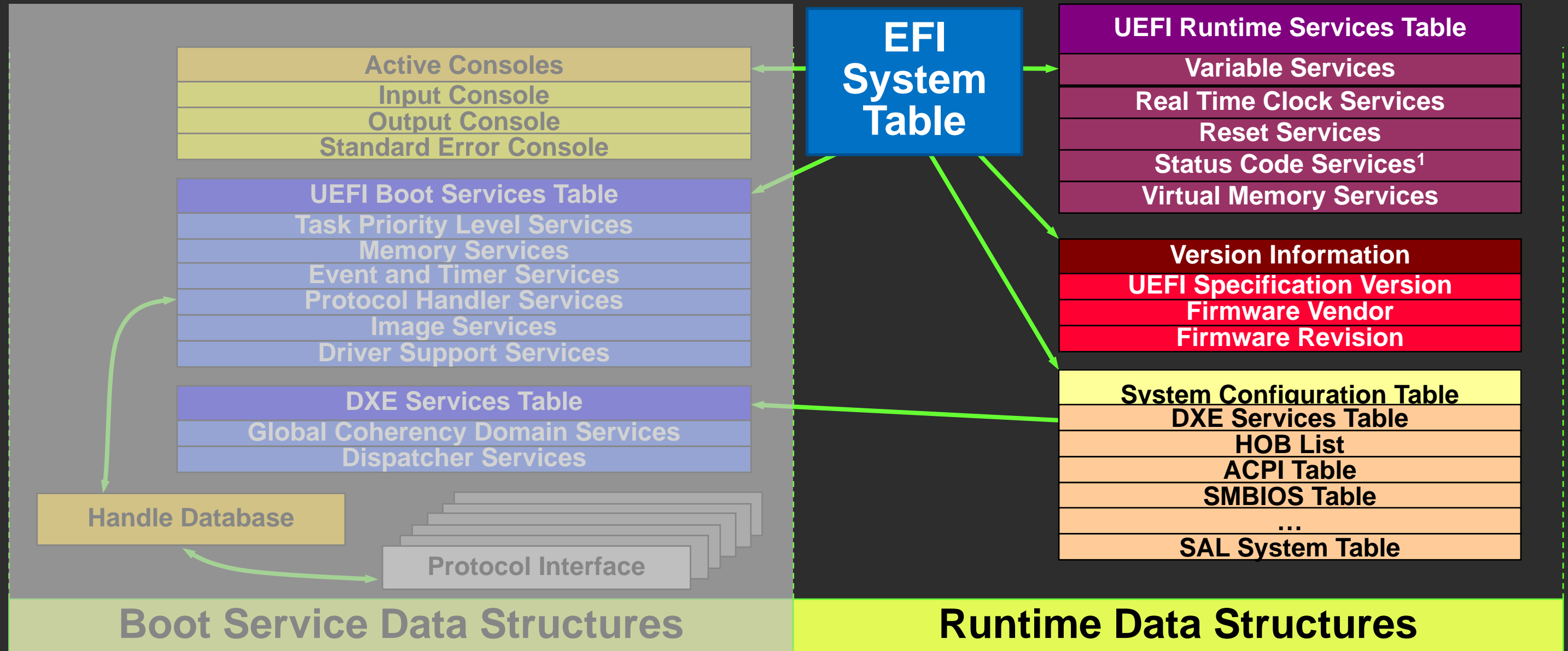
Disk Partition and Format



INTERFACE INSIDE OS RUNTIME

UEFI Runtime Services

Runtime Services Available to the UEFI Aware OS



SECURITY WITH UEFI

How does UEFI ensure the Operating System is trusted?

Security Resources: <https://github.com/tianocore/tianocore.github.io/wiki/EDK-II-Security-White-Papers>

BOOT SECURITY TECHNOLOGIES

Hardware Root of Trust

Boot Guard, Intel® TXT

Measured Boot

Using TPM¹ to store hash values

Verified Boot



Boot Guard +
UEFI Secure Boot

¹TPM – Trusted Platform Module

Resources: <https://firmwaresecurity.com/2015/07/29/survey-of-boot-security-technologies/>

HARDWARE ROOT OF TRUST

Boot Guard

CPU verifies signature

Verification occurs before system FW starts

Hash of public key is fused in CPU

Verification

Intel® TXT

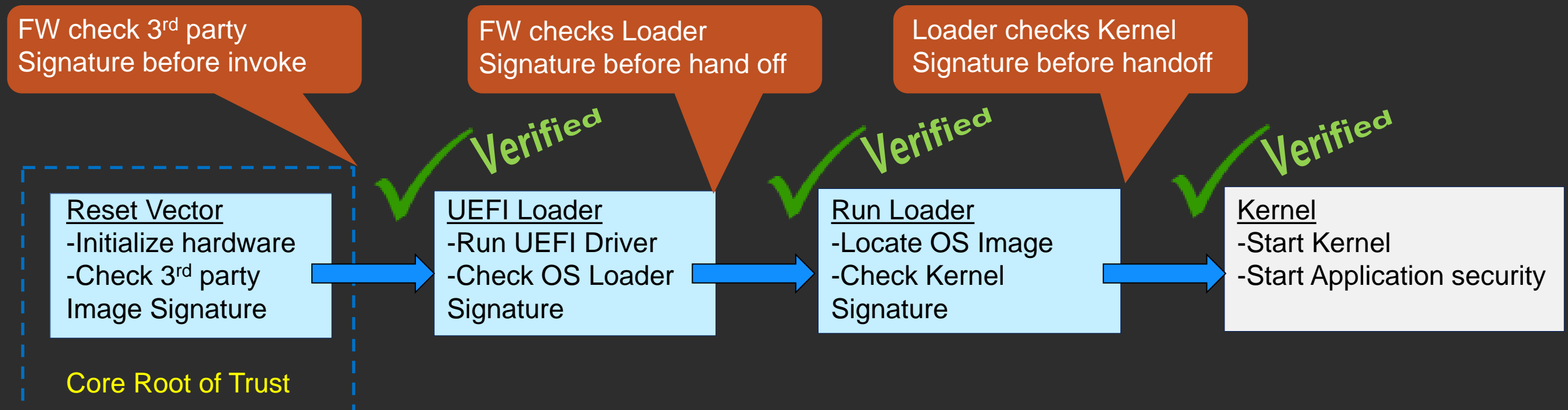
Uses a Trusted Platform Module (TPM) & cryptographic

Provides Measurements

Measurements

Software ID checking during every step of the boot flow:

1. UEFI System FW (updated via secure process)
2. Add-In Cards (signed UEFI Option ROMs)
3. OS Boot Loader (checks for “secure mode” at boot)



AUTHENTICATED VARIABLES

PK

KEK

DB

DBX

SetupMode

SecureBoot

```
2.0 Shell> dmpstore SecureBoot
```

```
Variable - RS+BS - '8BE4DF61-93CA-11D2-AA0D-00E098032B8C:SecureBoot' - DataSize
```

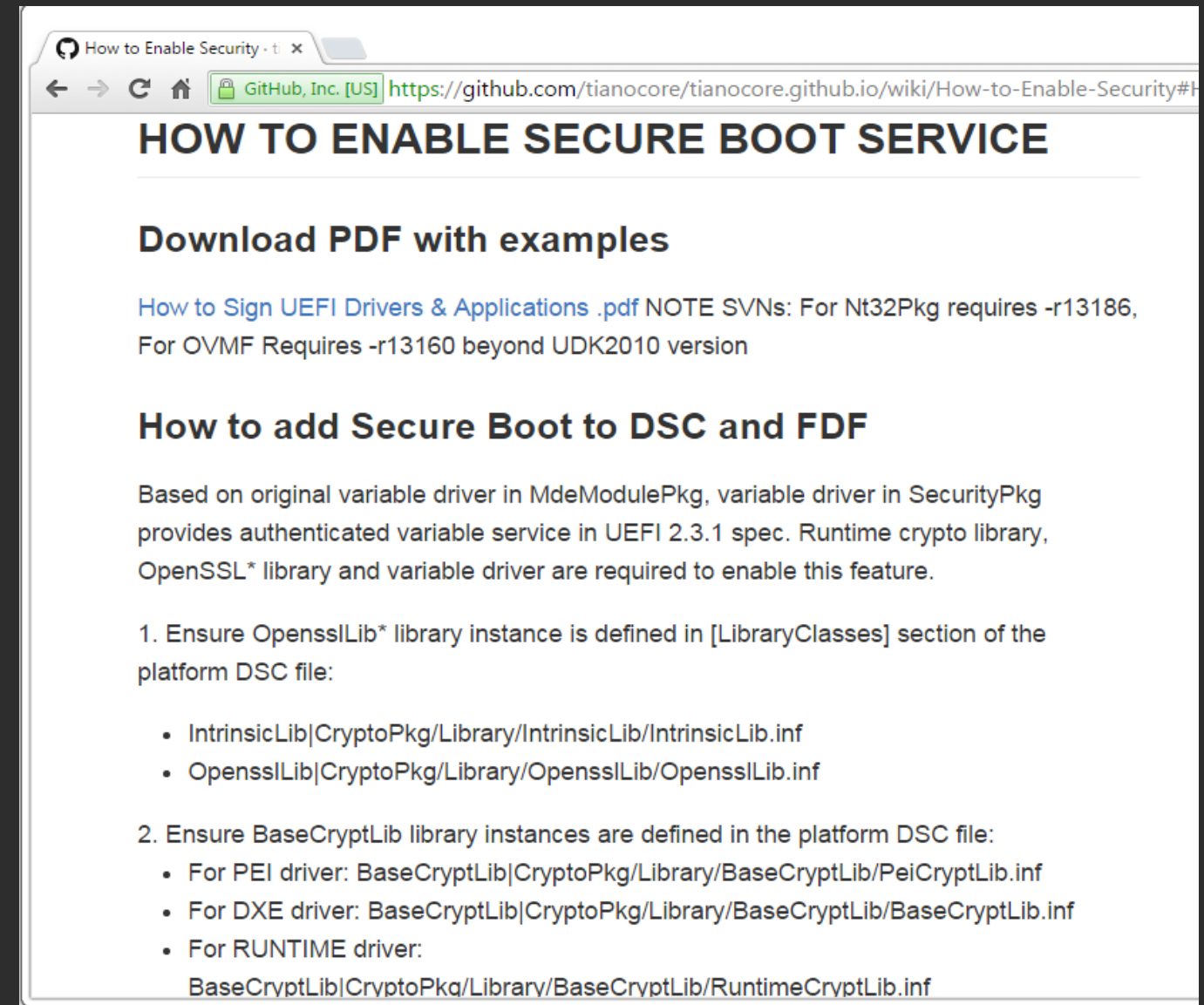
```
= 0x01
```

```
00:
```

```
00 * *
```

Security Package Project Page [Wiki Link](#)

- Wiki Link: [How-to-Enable-Security](#)
- PDF: [How to Sign UEFI Images V1.31](#)
- [Beyond BIOS UEFI Secure Boot](#)
- Build command line switch -
SECURE_BOOT_ENABLE = TRUE
- Install the OpensslLib CryptoPkg :
From edk2: “git submodule update --init”



The screenshot shows a web browser window with the URL <https://github.com/tianocore/tianocore.github.io/wiki/How-to-Enable-Security#h>. The page title is "HOW TO ENABLE SECURE BOOT SERVICE". Below the title, there is a section "Download PDF with examples" with a link to "How to Sign UEFI Drivers & Applications .pdf". A note states: "NOTE SVNs: For Nt32Pkg requires -r13186, For OVMF Requires -r13160 beyond UDK2010 version". Another section is titled "How to add Secure Boot to DSC and FDF". The text explains that based on the original variable driver in MdeModulePkg, the variable driver in SecurityPkg provides authenticated variable service in UEFI 2.3.1 spec. It mentions that the Runtime crypto library, OpenSSL* library, and variable driver are required to enable this feature. Two numbered steps are provided: 1. Ensure OpensslLib* library instance is defined in [LibraryClasses] section of the platform DSC file, with a bulleted list of file paths: IntrinsicLib|CryptoPkg/Library/IntrinsicLib/IntrinsicLib.inf and OpensslLib|CryptoPkg/Library/OpensslLib/OpensslLib.inf. 2. Ensure BaseCryptLib library instances are defined in the platform DSC file, with a bulleted list of file paths: For PEI driver: BaseCryptLib|CryptoPkg/Library/BaseCryptLib/PeiCryptLib.inf, For DXE driver: BaseCryptLib|CryptoPkg/Library/BaseCryptLib/BaseCryptLib.inf, and For RUNTIME driver: BaseCryptLib|CryptoPkg/Library/BaseCryptLib/RuntimeCryptLib.inf.

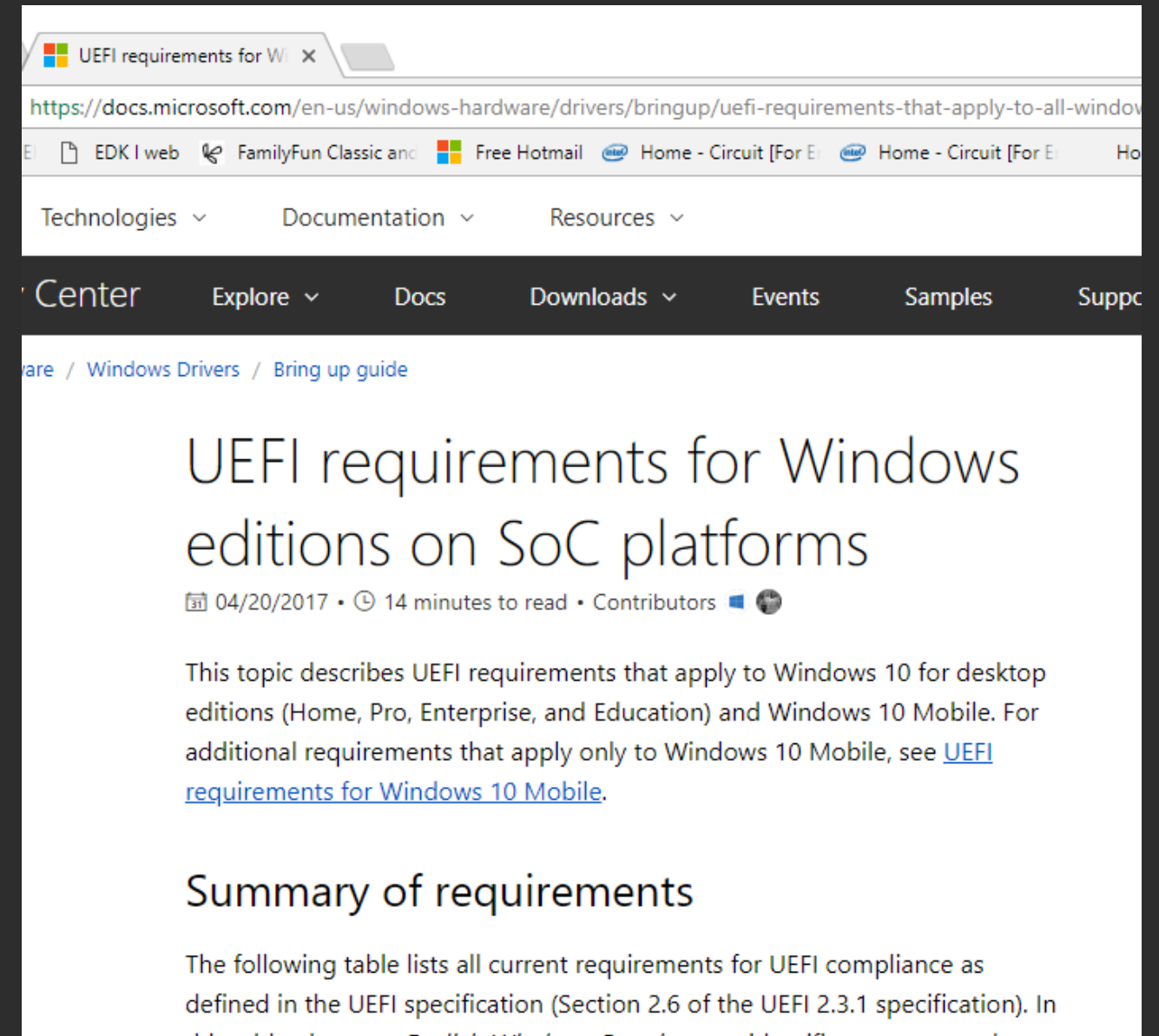
Windows Secure Boot Key Creation and Management Guidance

- Windows - Secure Boot Key Creation & Management Guide
- Creation and management of the Secure Boot keys and certificates in a manufacturing environment.
- Addresses questions related to creation, storage and retrieval of Platform Keys (PKs), secure firmware update keys, and third-party Key Exchange Keys (KEKs).



Many Platforms are Requiring UEFI Secure Boot Enabled

- Secure Boot now mandated for specific platforms
- See “Security requirements” on UEFI requirements for Windows editions on SoC Platforms



SUMMARY

- ★ Explain How the OS and UEFI Work together
- ★ Explain the UEFI Requirements for UEFI aware OS
- ★ Explain How Secure Boot Fits with UEFI

Questions?



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ACKNOWLEDGEMENTS

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