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UEFI & EDK II Training

UEFI Aware Operating System

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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

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UEFI AWARE OS REQUIREMENTS

Common Requirements

UEFI OPERATING SYSTEMS

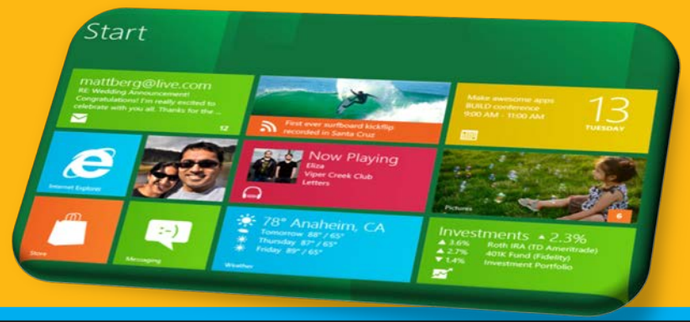
Windows Server 2008 R2

Windows 10

Windows 7

Windows Storage Server 2008 R2 Enterprise

Microsoft



CANONICAL

yocto PROJECT

ubuntu

debian

suse

Clear Linux* Project

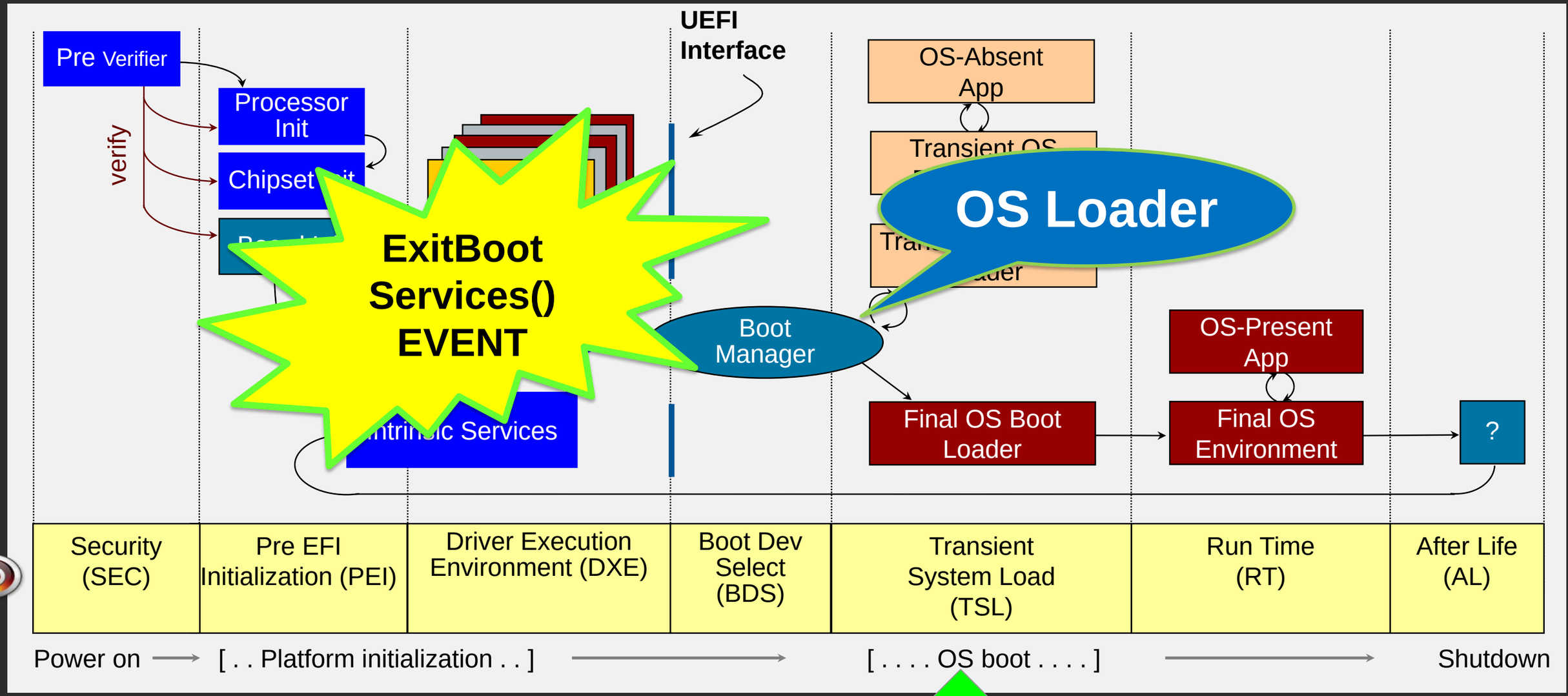
redhat.

Novell

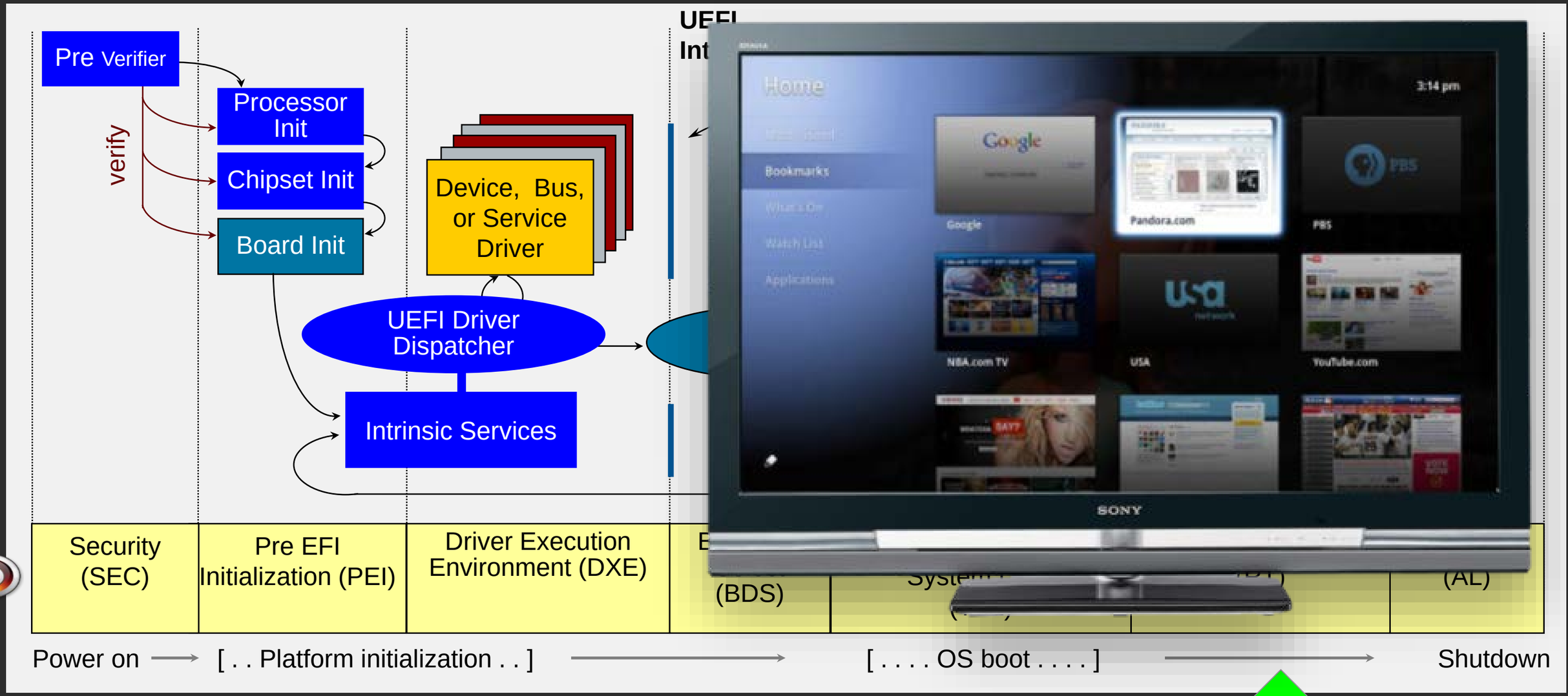
fedora

vmware

UEFI - PI & EDK II BOOT FLOW - REVIEW



UEFI - PI & EDK II BOOT FLOW - REVIEW



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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

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UEFI OS LOADER

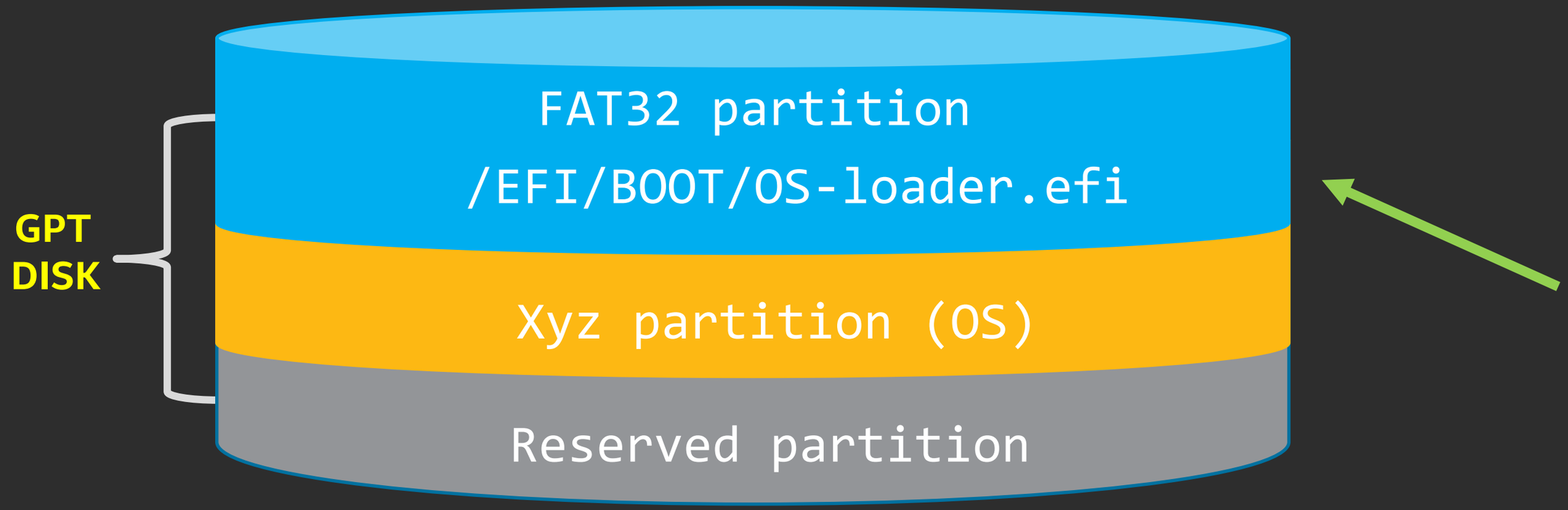
- OS install process includes UEFI loader

  `/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



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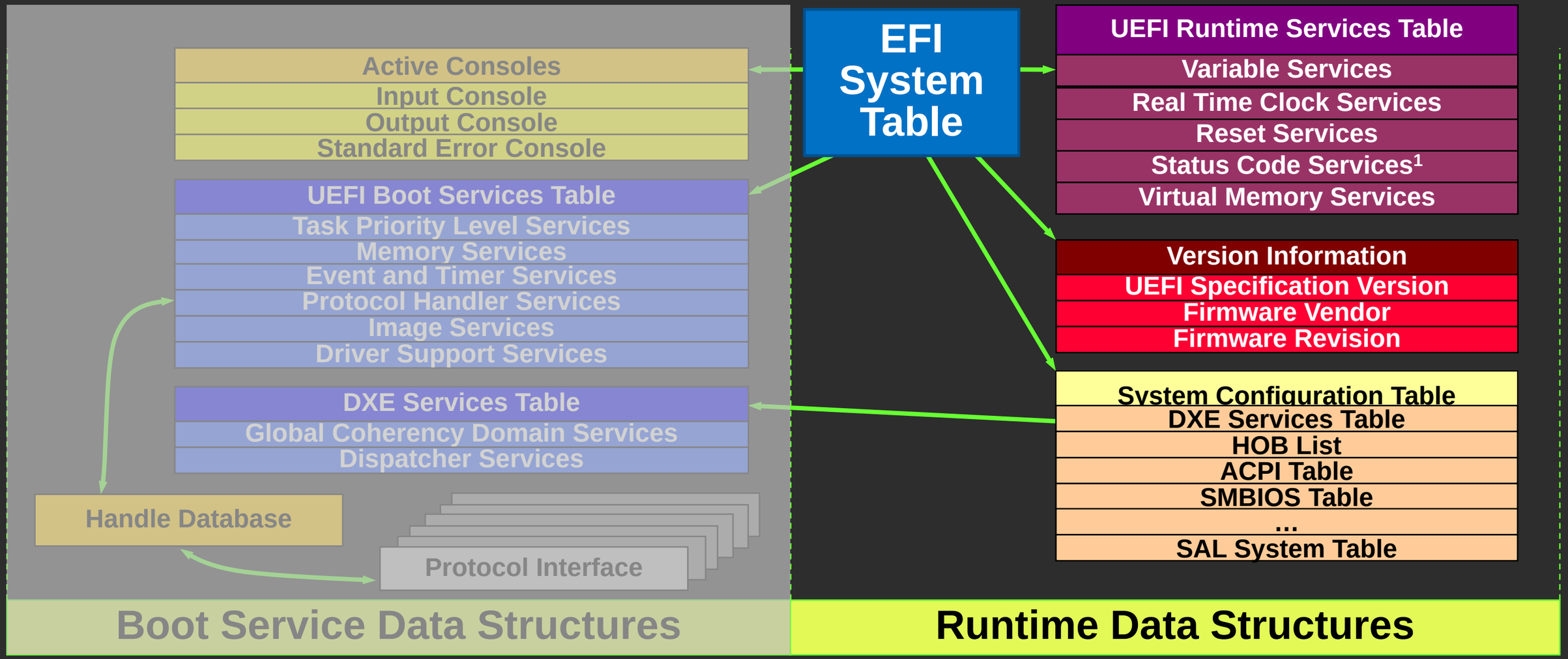
INTERFACE INSIDE OS RUNTIME

UEFI Runtime Services

Runtime Services Available to the UEFI Aware OS



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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 TPM[1] to store hash values
Verified Boot	Boot Guard + UEFI Secure Boot

[1]TPM – Trusted Platform Module

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

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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

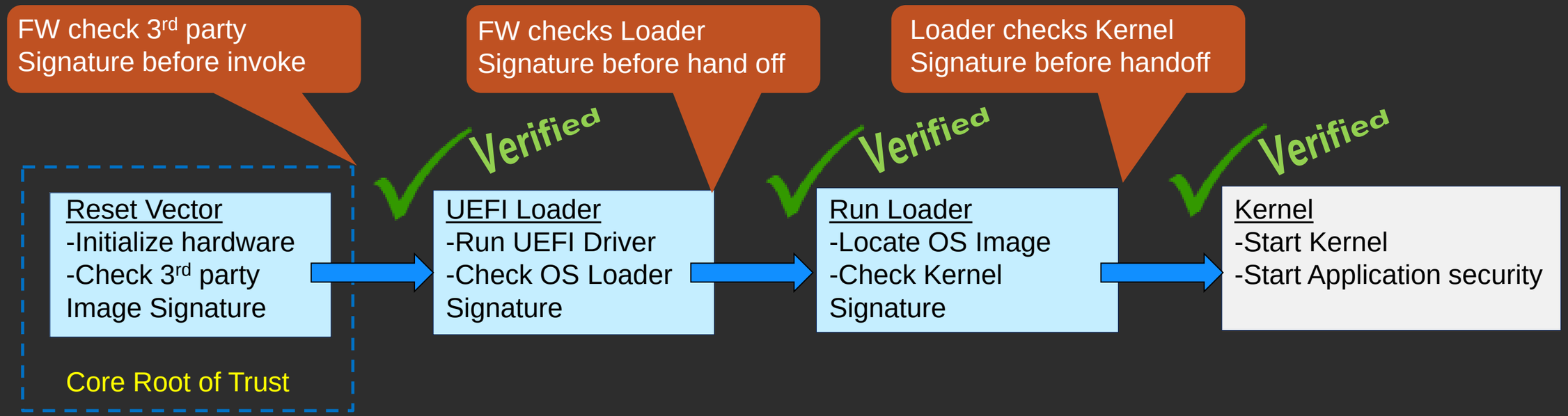
Provides Measurements

Measurements

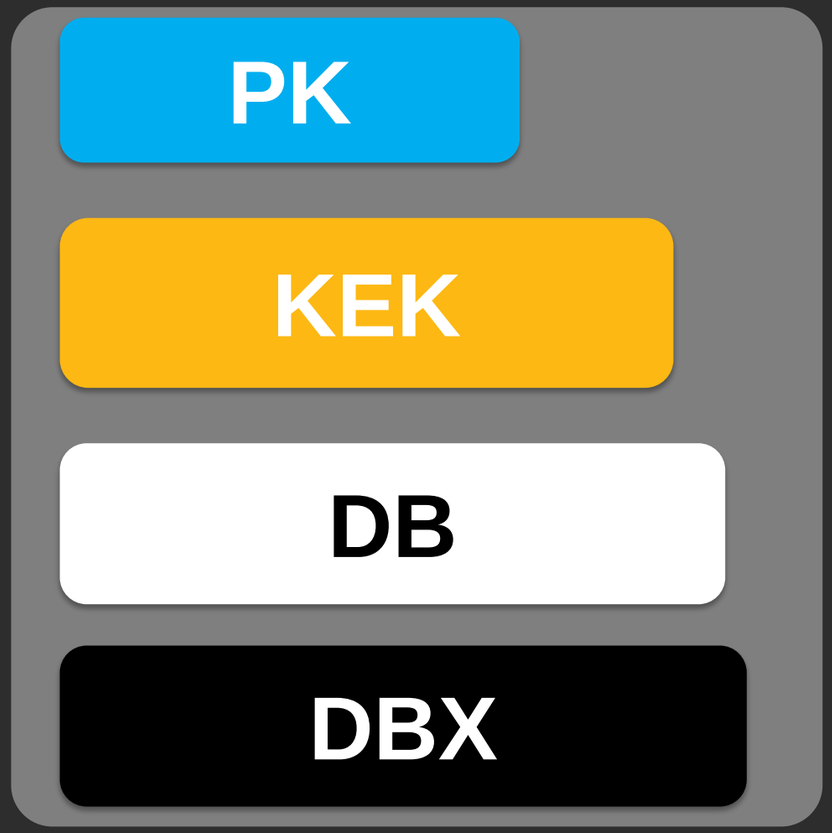
UEFI SECURE BOOT

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



SetupMode

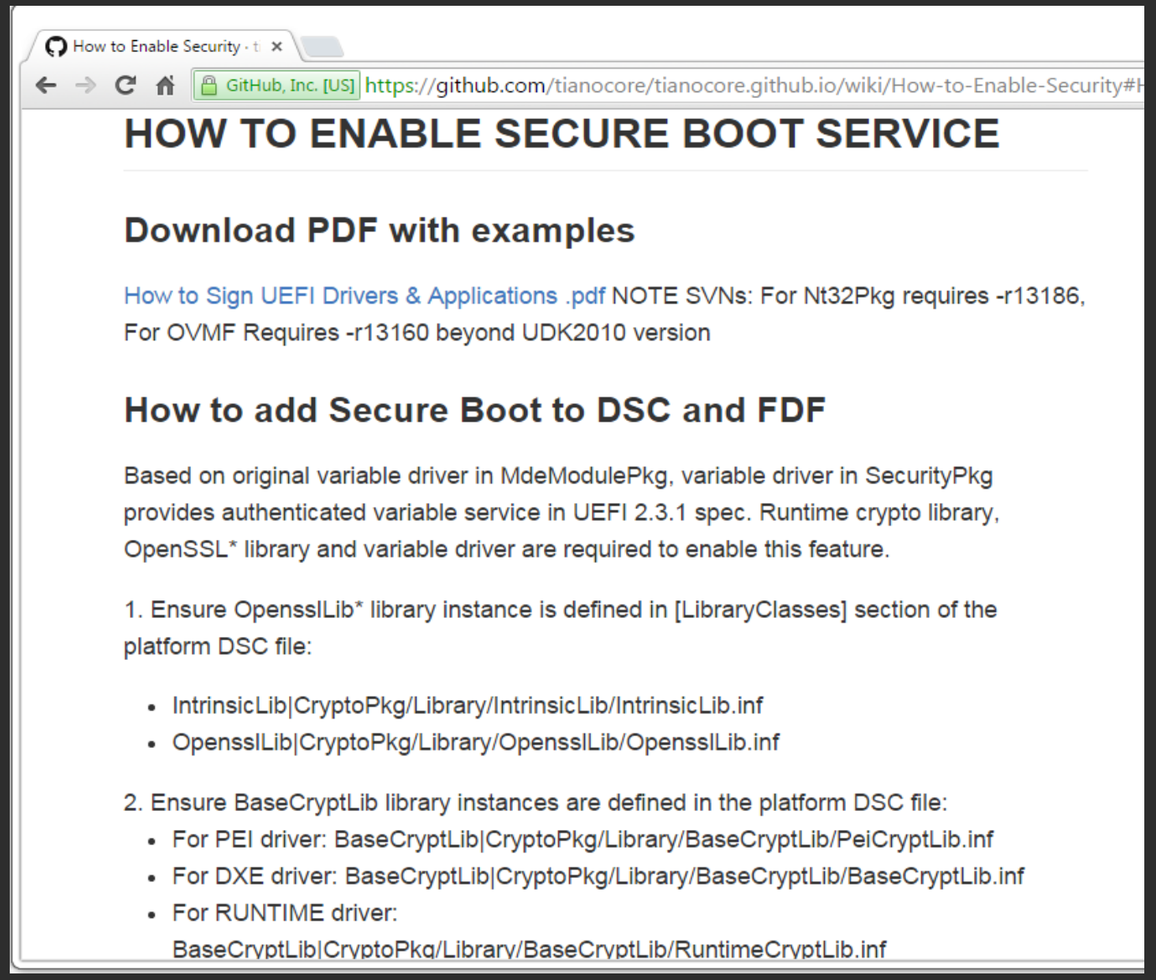
SecureBoot

```
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`”

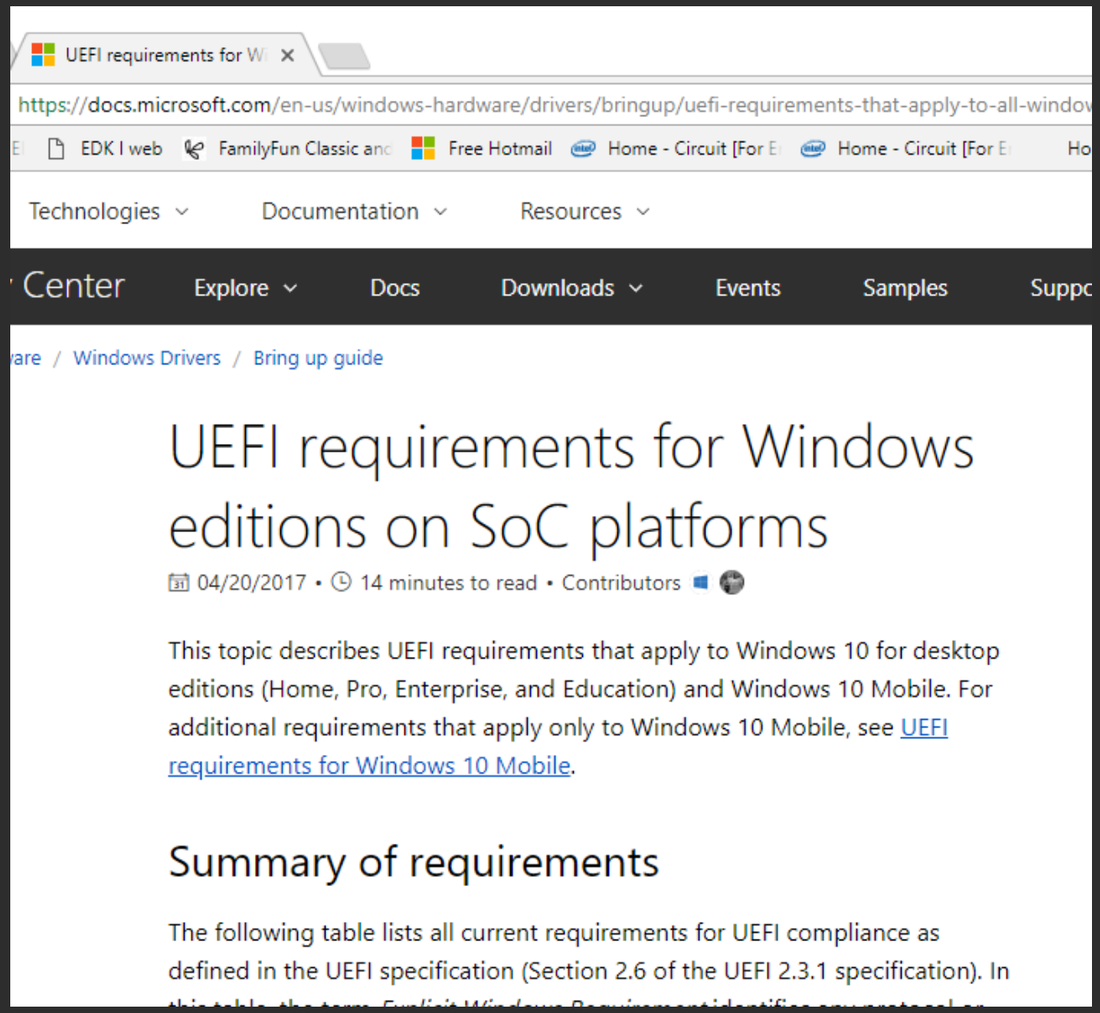


Windows Secure Boot Key Creation and Management Guidance

- 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



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SUMMARY

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- Explain How Secure Boot Fits with UEFI

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Questions?

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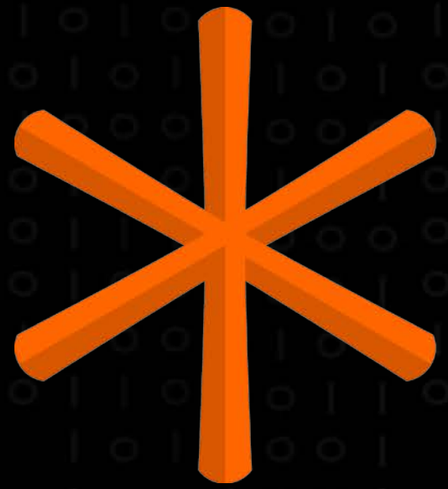

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ACKNOWLEDGEMENTS