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Strategies for Firmware Support of Self-Encrypting Drives

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Agenda

- Background
- System Firmware Flows
- UEFI Storage Security Command
- Plan for Older OS
- Partner Coordination
- Questions

Background :
TCG OPAL Self-Encrypting Drives

Terms and Definitions

- TCG = Trusted Computing Group
- OPAL = Specification Of Security Storage Class published by TCG
- eDrive = Feature name coined by MS
- IEEE1667 = Related spec for Removables
- Banding = Encrypted Range on Drive

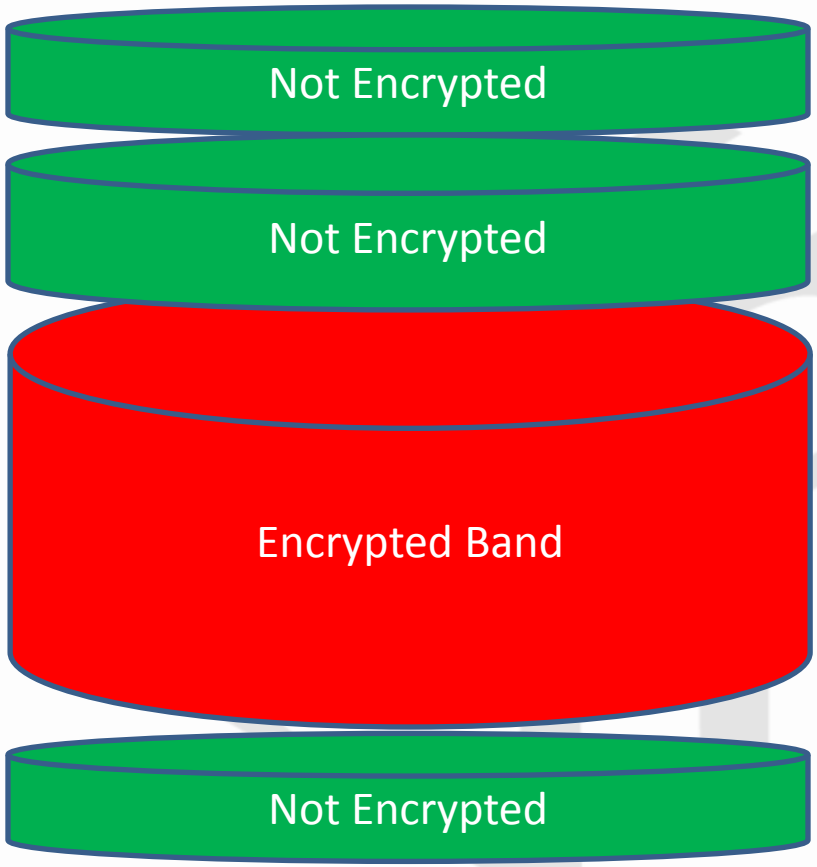
Typical Banding

UEFI System Partition

OS Recovery

UEFI OS Partition

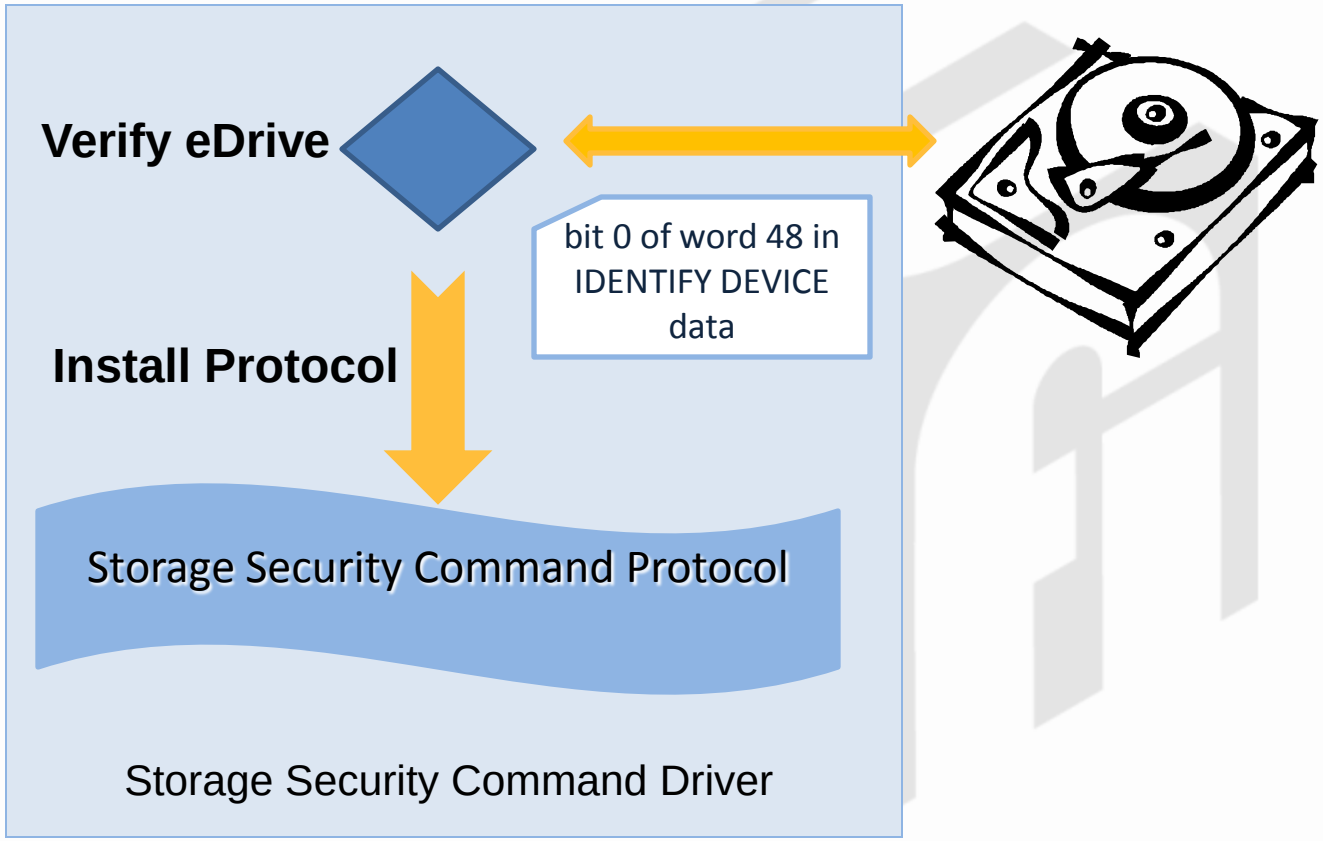
OEM Tools Partition



New System Firmware Flows

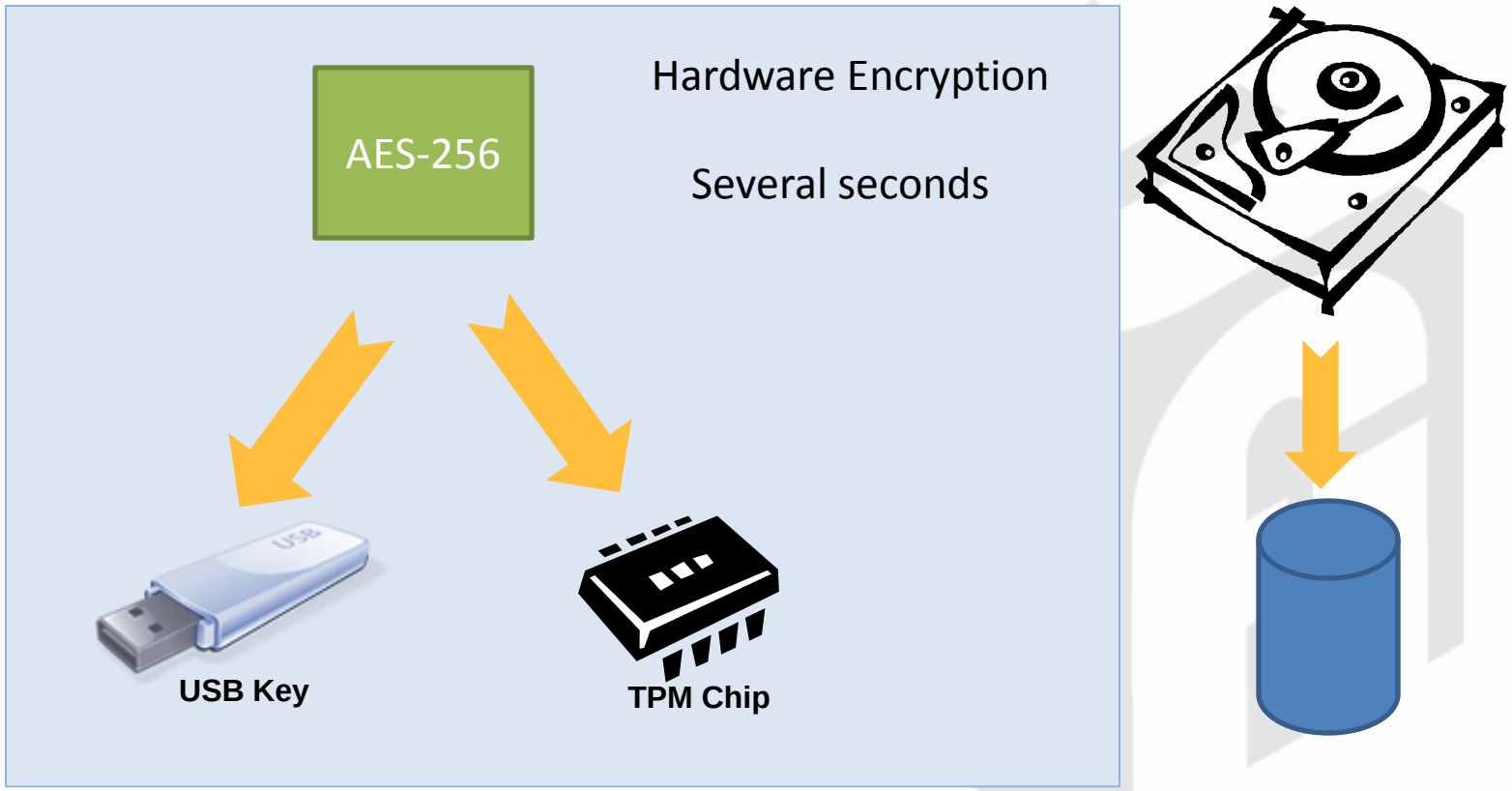
POST Flow Chart

See if the ATA device support trust computing feature or not. If yes, then install Storage Security Protocol at the ATA device handle.



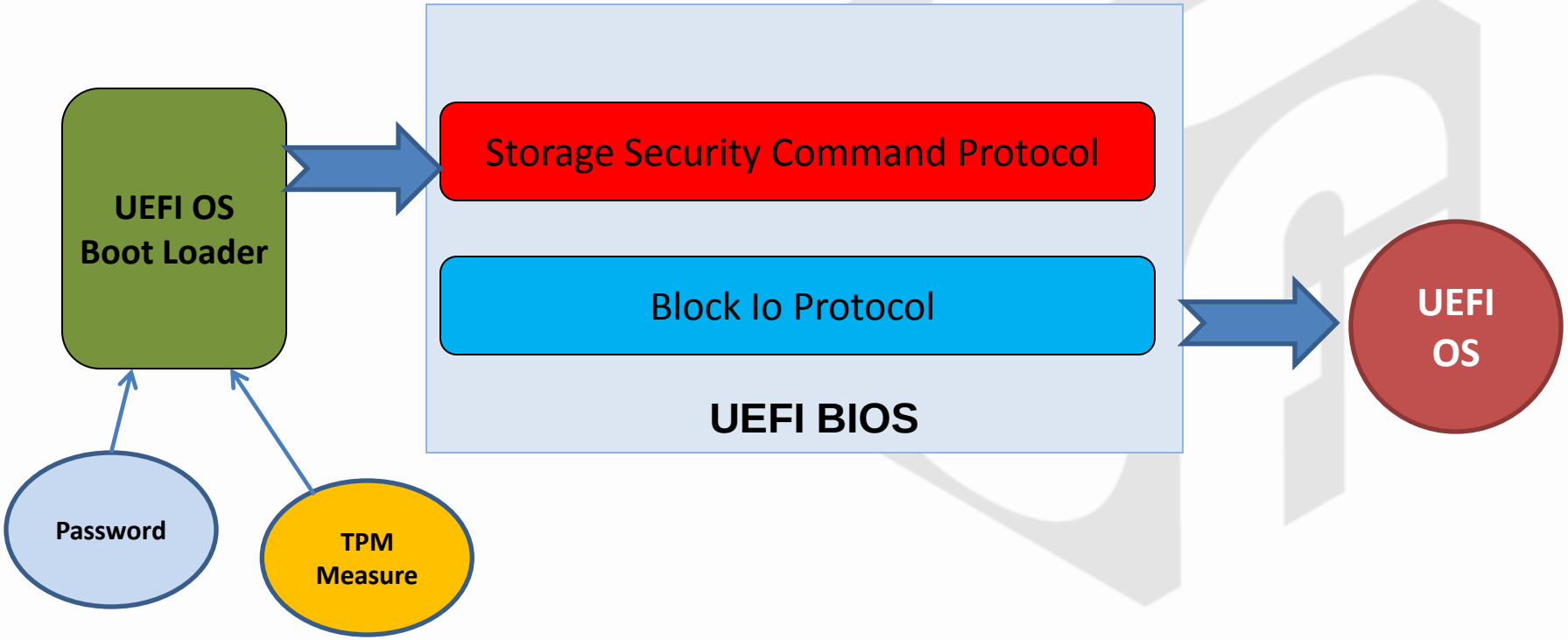
Initial Drive Encryption

Encryption with OPAL disk h/w encryption only needs several seconds. This step performed in OS.



Boot Flow

The UEFI Operating System Bootloader is responsible for unlocking the protected bands via the *Storage Security Command Protocol*. Unlock data is based on User Password or TPM measurements or both

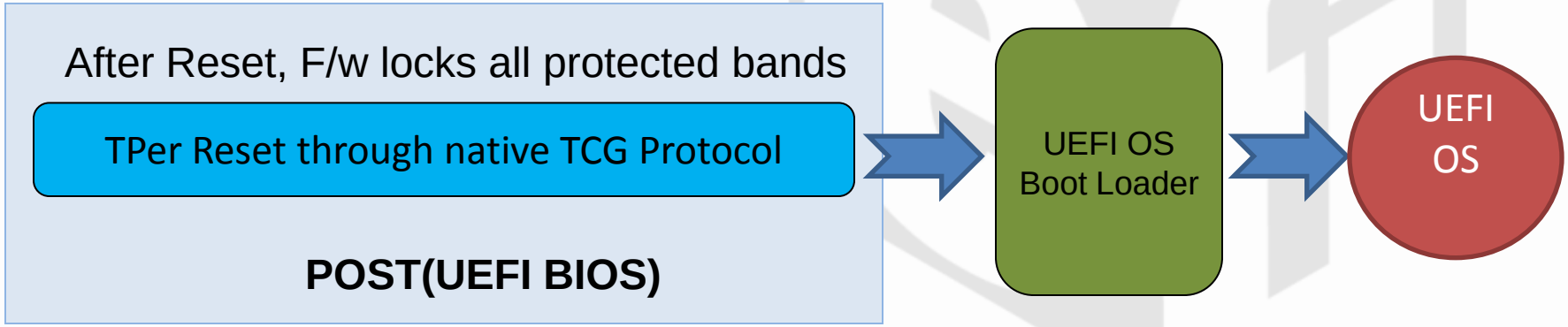


TPer Reset Flow

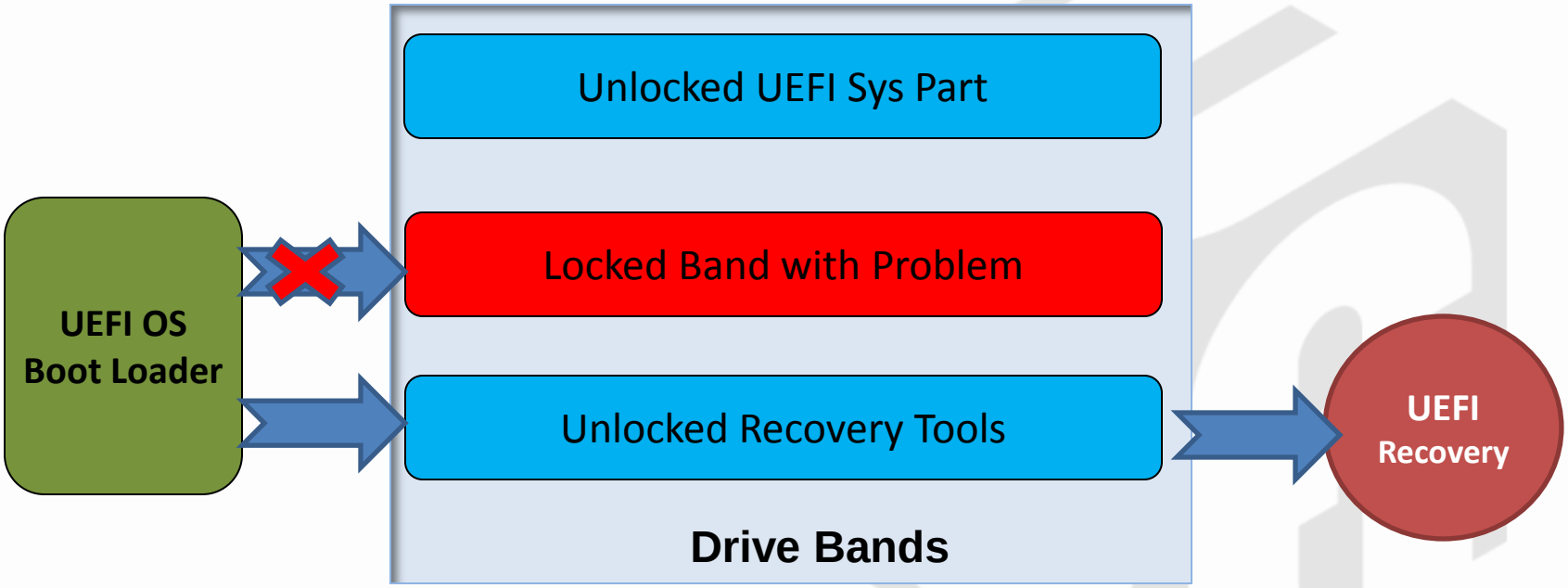
This is to prevent the scenario where the system is accidentally rebooting into a malicious environment that gains access to the unlocked protected bands.
TCG Working Group defines two simple mechanisms allowing the BIOS to "reset" eDrives during restart.

TPer = Trusted Peripheral

- TPer Reset through IEEE 1667 protocol.
- TPer Reset through native TCG protocol.



Typical Recovery Flow



UEFI Storage Security Command Protocol

Storage Security Command Protocol

This protocol is used to abstract mass storage devices to allow code running in the EFI boot services environment to send **security protocol commands** to mass storage devices without specific knowledge of the type of device or controller that manages the device. Functions are defined to **send** or **retrieve** security protocol defined data to and from mass storage devices. This protocol shall be supported on all physical and logical storage devices supporting the **EFI_BLOCK_IO_PROTOCOL** in the EFI boot services environment and one of the following command sets (or their alternative) at the bus level.

- TRUSTED SEND/RECEIVE commands of the ATA8-ACS command set or its successor
- SECURITY PROTOCOL IN/OUT commands of the SPC-4 command set or its successor. (SPC-4 : SCSI Primary Commands - 4)

Protocol Interface Structure

- **Protocol Interface Structure**

  typedef struct _EFI_ STORAGE_SECURITY_COMMAND _PROTOCOL {

  EFI_STORAGE_SECURITY_RECEIVE_DATA *ReceiveData*;

  EFI_STORAGE_SECURITY_SEND_DATA *SendData*;

  } EFI_ STORAGE_SECURITY_COMMAND _PROTOCOL;

- **ReceiveData()**

  Send a security protocol command to a device that receives data and/or the result of one or more commands sent by *SendData.*

- **SendData()**

  Send a security protocol command to a device.

Planning for users with Older OS Requirement

Older OS Validation

- Possible to use old-style BIOS whole-drive lock
  - Most Drive Manufacturers will still support the older Whole-Drive Password Feature on OPAL drives
  - No Expense to user but no recovery for lost password

Adding OPAL Support to Older OS

- Several ISV Packages available…

  A few examples :

1. Embassy ® Trusted Drive Manager from Wave Systems (www.wave.com)

   (For Windows XP, Vista, 7)

2. SecureDoc Full Disk Encryption from Winmagic (www.winmagic.com)

   (For Windows, Mac and Linux)

Partner Coordination

Bare-metal Restore Software

- The boot disk of any supported Restore Software will need tools to unlock the band to be restored!
  - Big changes for Tool – UEFI booting and OPAL unlock
  - OEM needs to confirm coordination between favorite OS and B/R vendors

Repair and Return

- Need to make sure training and procedures are in place for repair contractor handling of drives locked by consumer
- Need Field Service Tool to return drive to blank (all data lost)

SUMMARY

- TCG OPAL Drives provide High Security with great convenience
- UEFI 2.3.1 provides smooth boot path for UEFI OS
- OEMs need to consider Ecosystem Partners in OPAL Deployments

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

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