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UEFI Spec Version 2.4 Facilitates Secure Update

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Insyde Software

Agenda

- UEFI 2.4
- Background FMP
- New Capsule Defined
- Delivery on Disk
- Secure?
- Open Questions

UEFI 2.4 Spec is Public

- Some of the New Content:
  1. ARM 64-bit Bindings
  2. Custom Security Variable
  3. Variable Naming rules clarified
  4. Network driver changes including EFI_NO_MEDIA rules
  5. Async I/O Improvements
  6. Timestamp and Random Number protocols
  7. Time-based revocation
  8. Adapter Information Protocol and several AIP blocks defined
  9. Capsule Format containing FMP updates
  10. Deliver Capsule on Boot Disk
  11. Variable with Capsule processing status

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  9. **Capsule Format containing FMP updates**
  10. **Deliver Capsule on Boot Disk**
  11. **Variable with Capsule processing status**

Firmware Management Protocol

Background - FMP

- Added with UEFI version 2.3 update
- Designed to
  - allow individual firmware components to expose data on current running image(s)
  - accept update images

FMP in the Industry

- Mostly used in Enterprise segment
- Popular for high-performance expansion cards with multi-element firmware onboard
- But FMP is run in Boot Services – how to get the downloaded update to the FMP instance?

Factors inhibiting FMP

- Using EFI shell delivery is not secure and awkward for system admin
- For security, designers want to lock firmware store before Shell or OS boot
- Secure Boot rules block many of todays update delivery tools

UEFI 2.4 Update Has New Capsule Targeting FMP

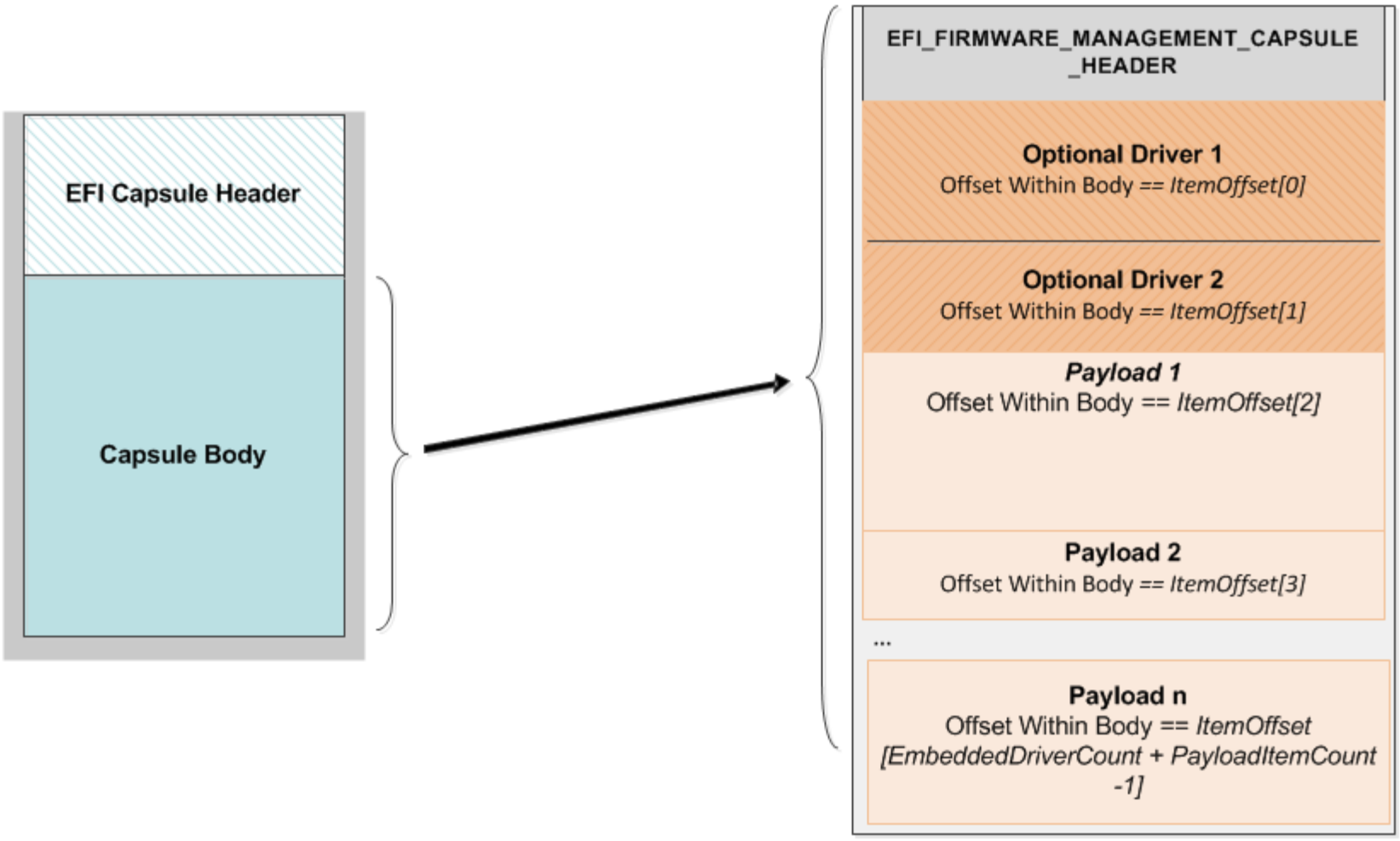
New Capsule for delivering FMP Updates

- UEFI Defines a Capsule header for UpdateCapsule() function
- UEFI 2.4 adds a complete description of internals of a Capsule targeting FMP
- System firmware unpacks the capsule and delivers updates to FMP instances early in pre-boot

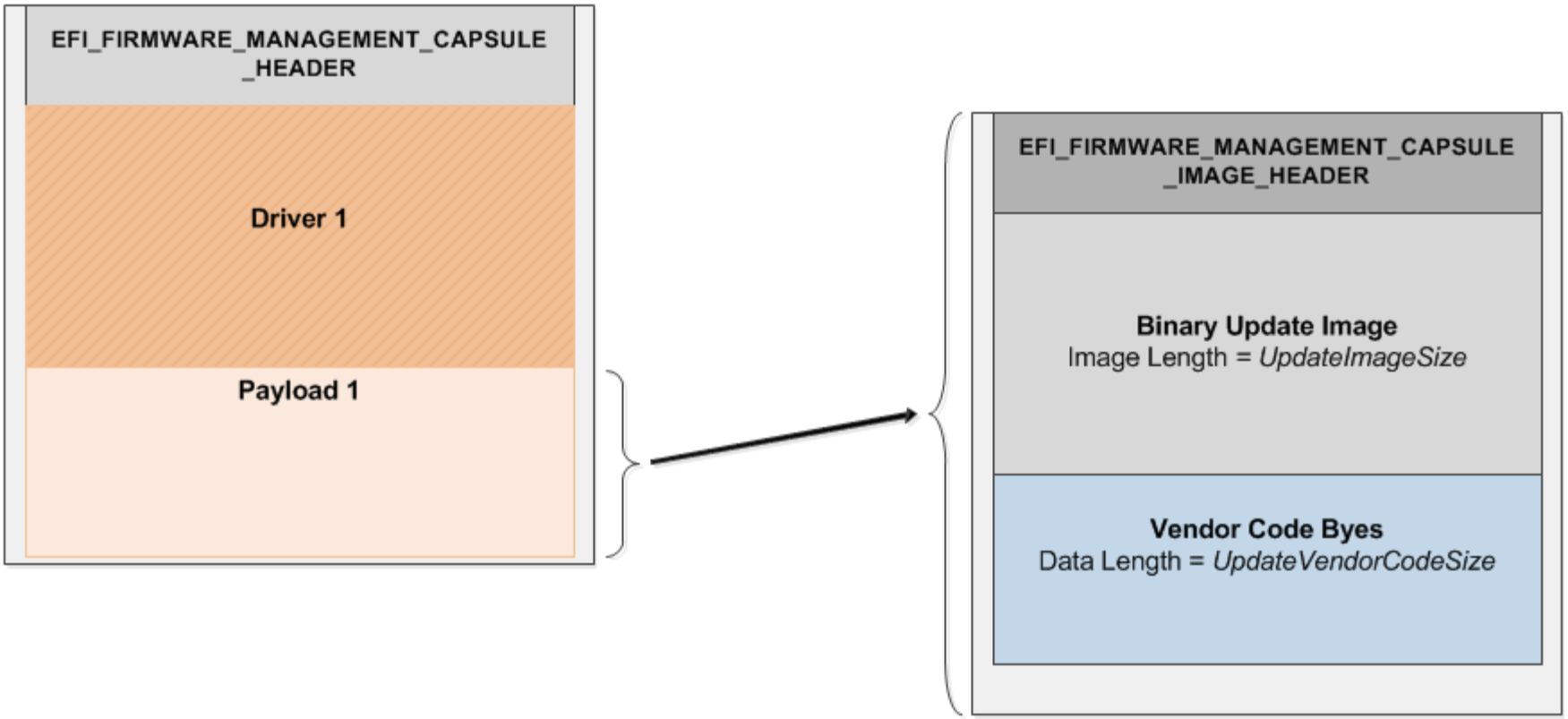
Capsule Format

- EFI_FIRMWARE_MANAGEMENT_CAPSULE_ID_GUID is the ID
- In some cases complete FMP function cannot fit inside production firmware store,
- Therefore new capsule format allows 0-n driver(s) and 0-n image(s)
- Minimum is 1 driver or 1 image

Example with 2 drivers, multiple update payloads



Payload Structure



UEFI 2.4 Update Adds New Capsule Delivery Solutions

Problem Statement

- UpdateCapsule() is run-time but:
  - FMP is not runtime so capsule needs to be conveyed to the system firmware after a restart
  - Persist in memory is possible but has disadvantages including:
    - Need to reserve block of memory of unknown size

UEFI 2.4 defines Capsule Delivery Via Disk

- OS tool Copies Capsule Image to `\EFI\CapsuleUpdate` directory on Boot Drive
- Then Sets OS_Indications bit
  - EFI_OS_INDICATIONS_FILE_CAPSULE_DELIVERY_SUPPORTED
- After Restart F/W finds Capsule and processes

UEFI 2.4 Defines Result Var

- After Capsule Processed, the result including any error status is left in created UEFI Variable
- Examined by the update launcher after OS restarts

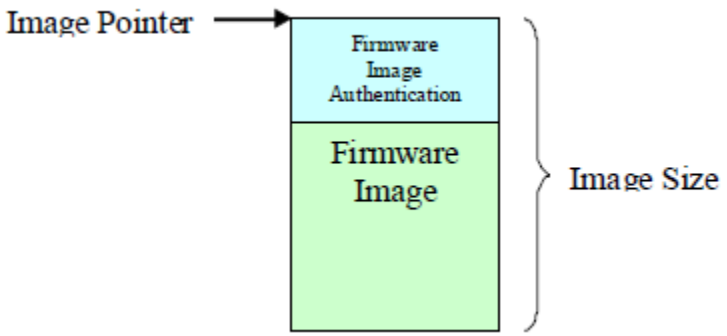
How Secure is This ‘New’ Method?

Driver Security

- Update driver launched from the capsule must be signed by CA trusted by the platform
- Same Security Level as the UEFI Option ROM (the thing that is being updated)
- The Updated Option ROM image is also checked at restart

Image Payload Security

- All FMP implementations should use IMAGE_ATTRIBUTE_AUTHENTICATION_REQUIRED



- FMP code doing check is signed, and download driver breaks any existing ROM size barrier and allows IHV to use crypto for strong image check

Discussion Questions

Non-FMP use

- I don’t use FMP for my card. Can I use this new Capsule for proprietary update?
  - Technically yes, a capsule could contain 1 or more drivers but no payloads.
  - But, the update image would need to be embedded inside the driver image and the combination sent to CA for signing…

Boot Drive Write-protected

- What about a system with a write-protected EFI System Partition?
  - Provide utility to use UpdateCapsule directly, but possible the device firmware store was locked before UpdateCapsule() caller can load?
  - What is the right event trigger for device firmware write-protect lock?

Thanks for attending the
UEFI Summerfest 2013

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

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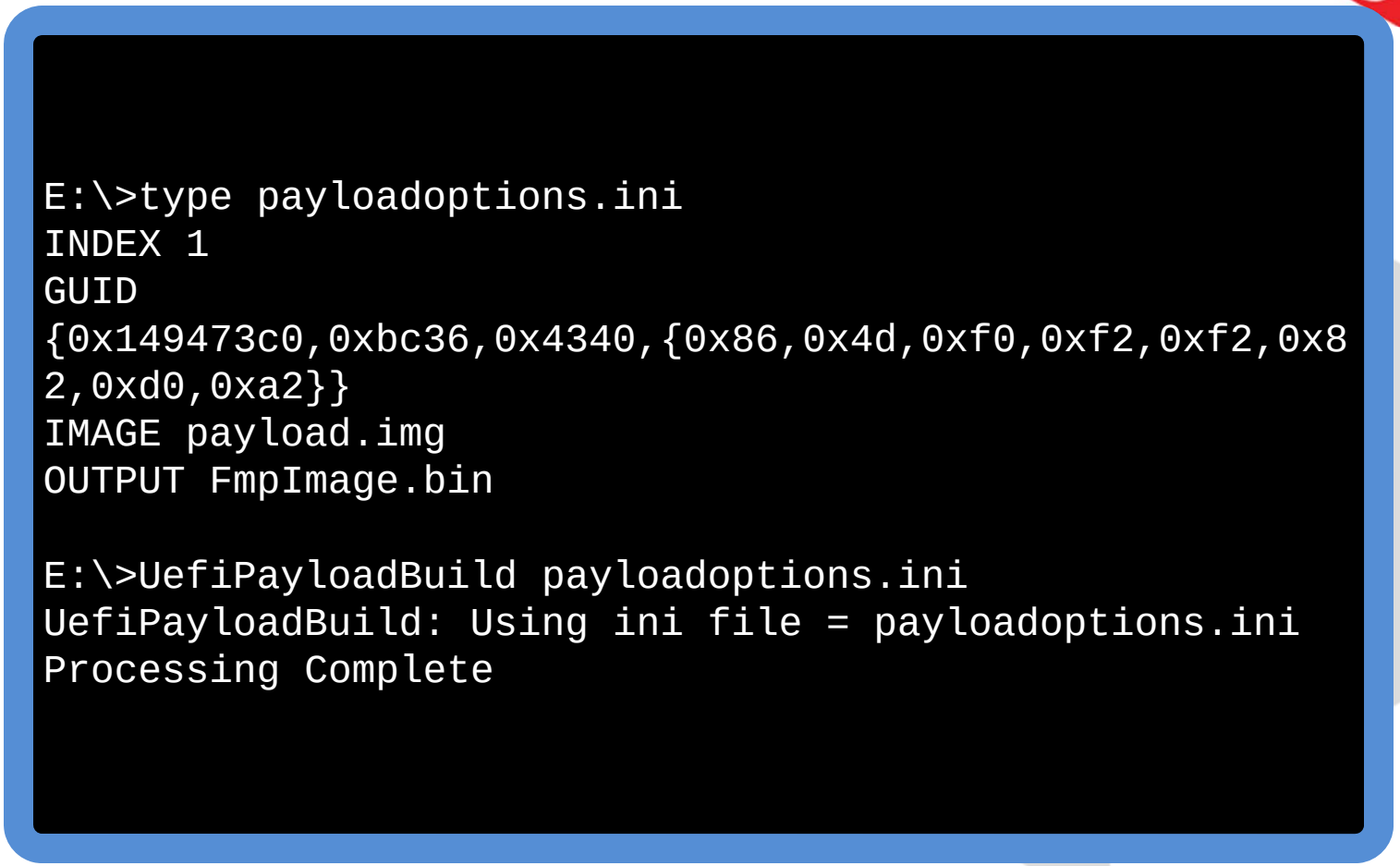
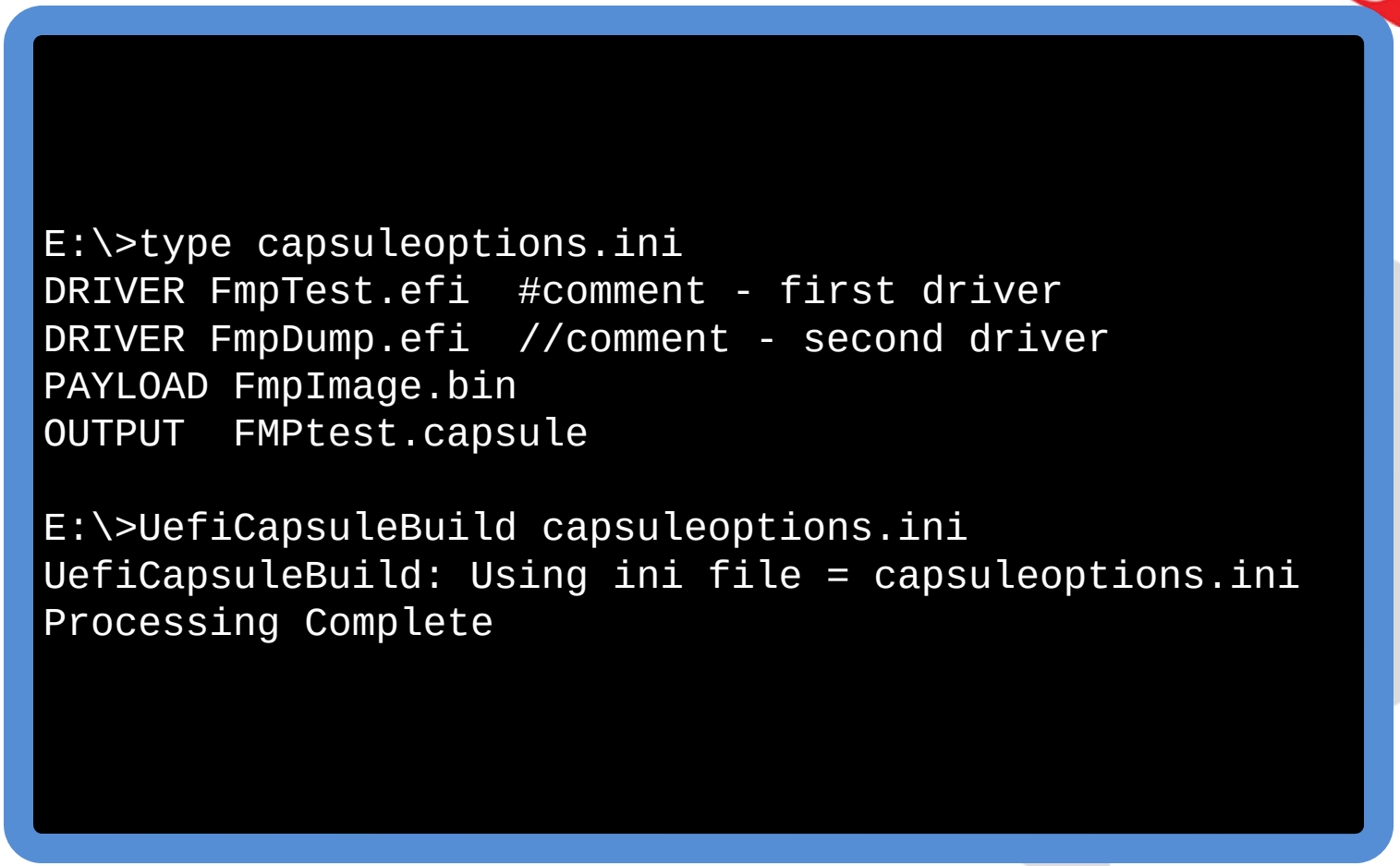
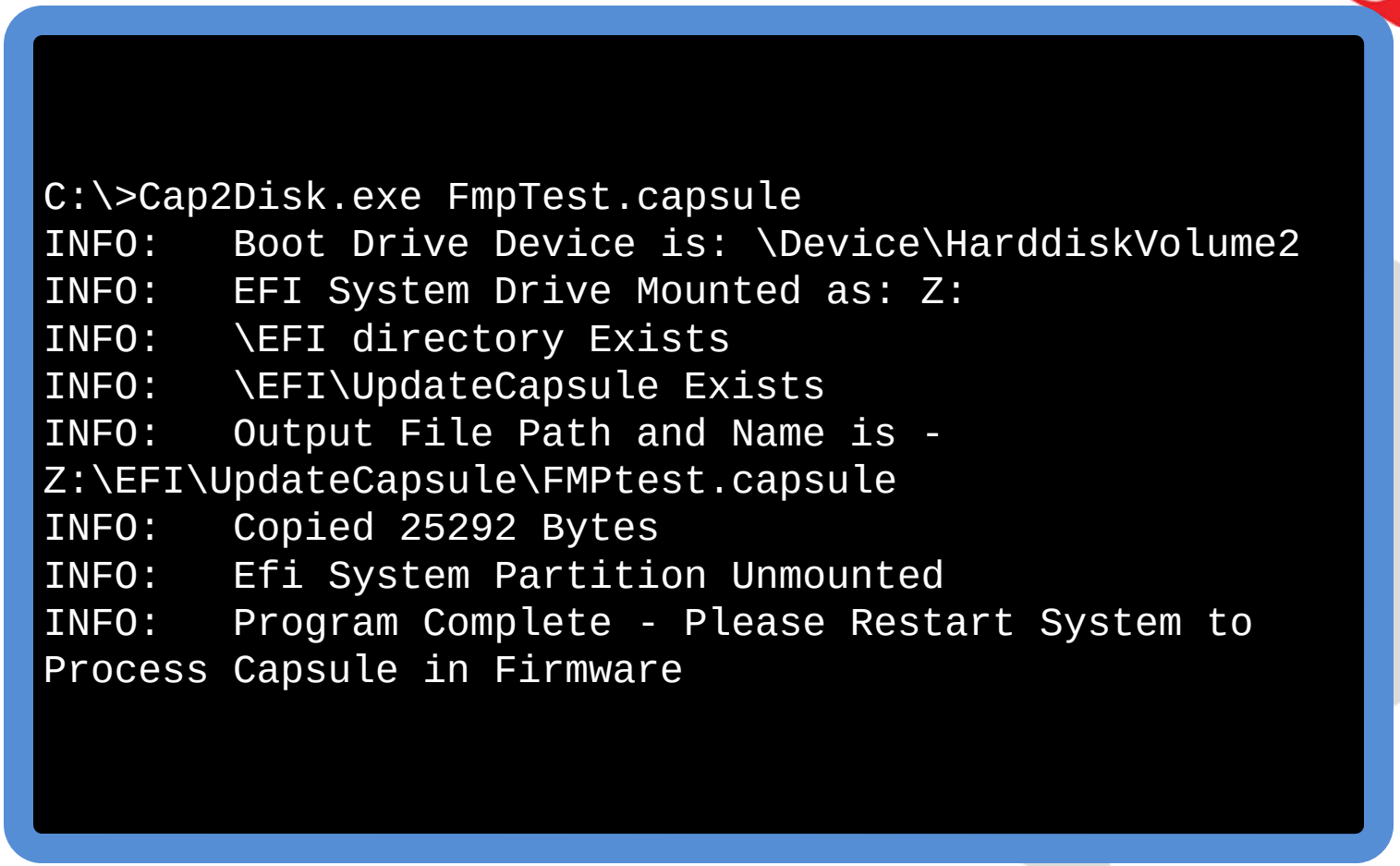
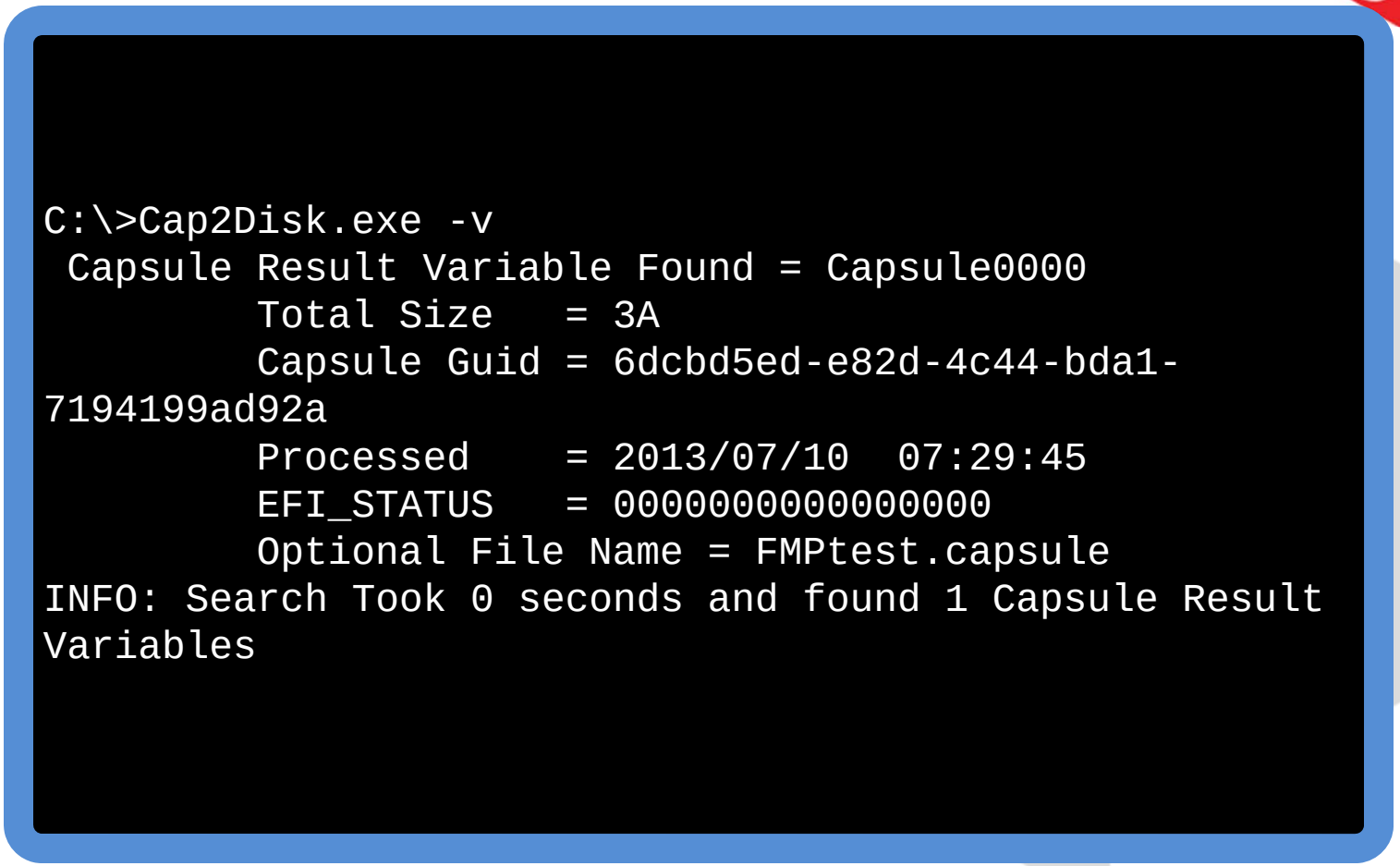
BACKUP


E:\>type payloadoptions.ini
INDEX 1
GUID
{0x149473c0,0xbc36,0x4340,{0x86,0x4d,0xf0,0xf2,0xf2,0x8
2,0xd0,0xa2}}
IMAGE payload.img
OUTPUT FmpImage.bin
E:\>UefiPayloadBuild payloadoptions.ini
UefiPayloadBuild: Using ini file = payloadoptions.ini
Processing Complete


E:\>type capsuleoptions.ini
DRIVER FmpTest.efi #comment - first driver
DRIVER FmpDump.efi //comment - second driver
PAYLOAD FmpImage.bin
OUTPUT FMPtest.capsule
E:\>UefiCapsuleBuild capsuleoptions.ini
UefiCapsuleBuild: Using ini file = capsuleoptions.ini
Processing Complete


C:\>Cap2Disk.exe FmpTest.capsule
INFO: Boot Drive Device is: \Device\HarddiskVolume2
INFO: EFI System Drive Mounted as: Z:
INFO: \EFI directory Exists
INFO: \EFI\UpdateCapsule Exists
INFO: Output File Path and Name is -
Z:\EFI\UpdateCapsule\FMPtest.capsule
INFO: Copied 25292 Bytes
INFO: Efi System Partition Unmounted
INFO: Program Complete - Please Restart System to
Process Capsule in Firmware


C:\>Cap2Disk.exe -v
Capsule Result Variable Found = Capsule0000
Total Size = 3A
Capsule Guid = 6dcbd5ed-e82d-4c44-bda1-7194199ad92a
Processed = 2013/07/10 07:29:45
EFI_STATUS = 0000000000000000
Optional File Name = FMPtest.capsule
INFO: Search Took 0 seconds and found 1 Capsule Result Variables