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UEFI & EDK II TRAINING

UEFI SHELL APPLICATION

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LESSON OBJECTIVE

- Explain UEFI, the shell, and how they work together
- Define the shell components
- Use the shell API in a UEFI application
- UEFI Shell command Library
- UEFI Shell scripts

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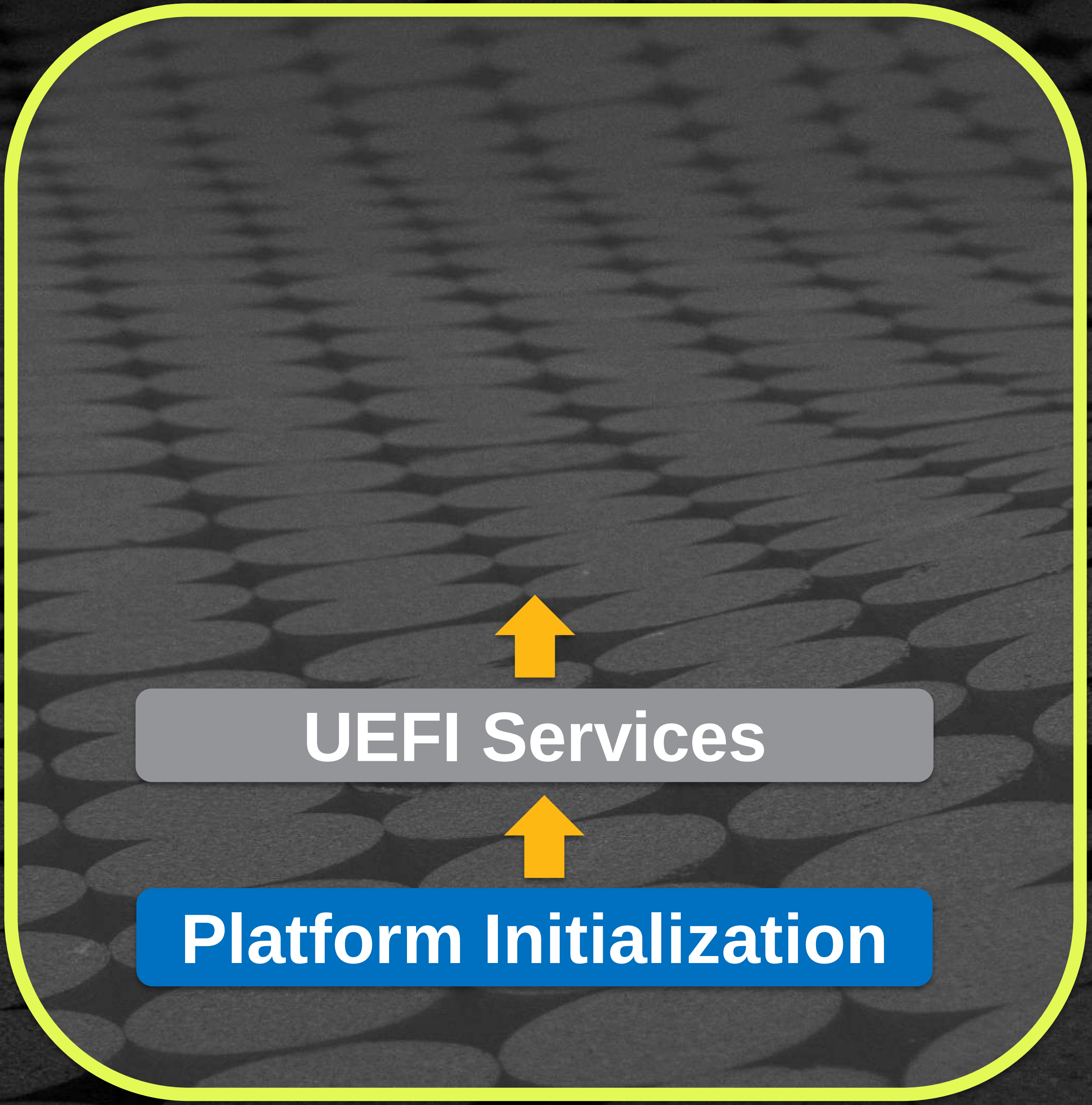
UEFI SHELL OVERVIEW

Components of the UEFI Shell

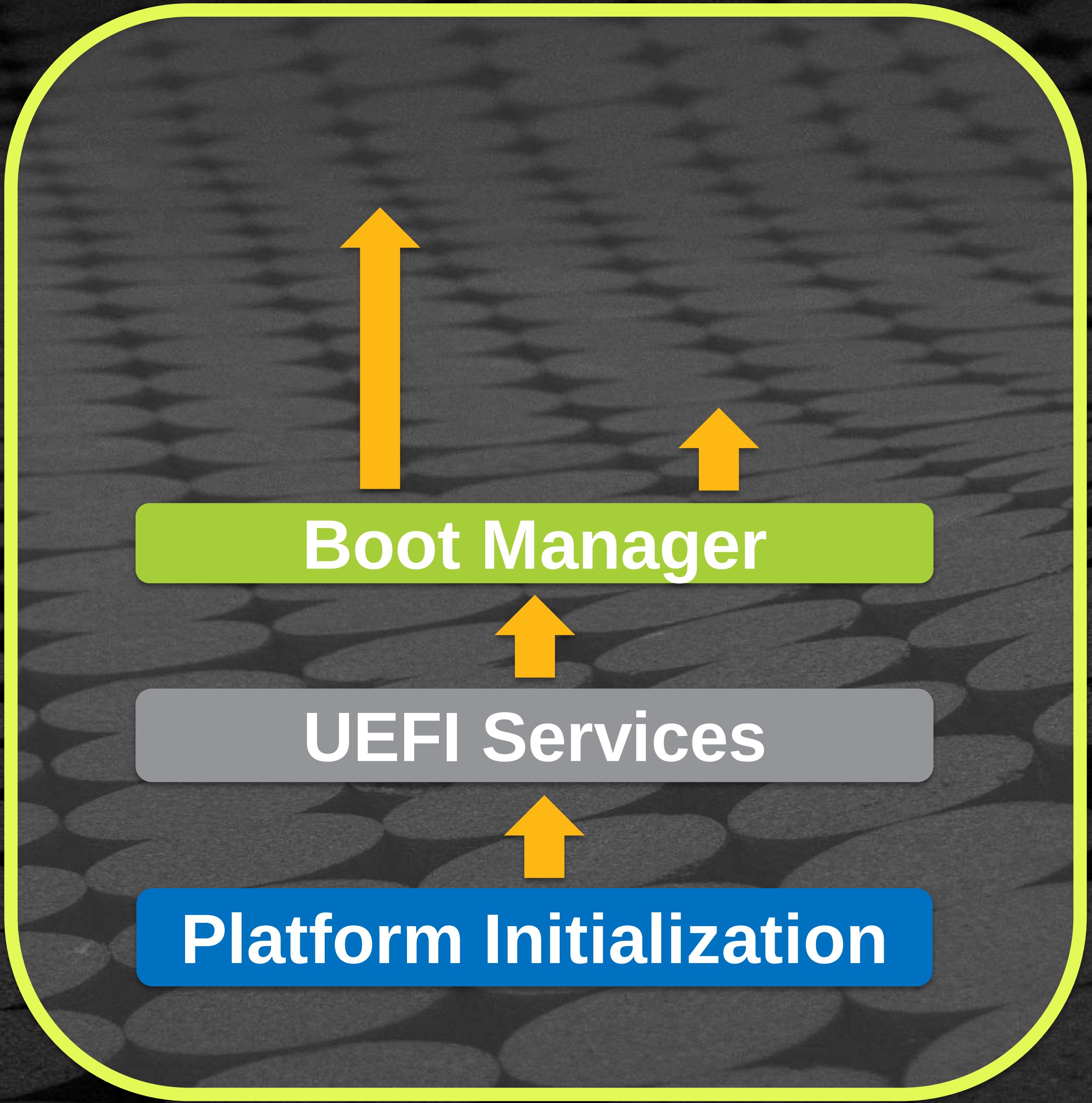
What is a UEFI Shell?

What is a UEFI Shell?

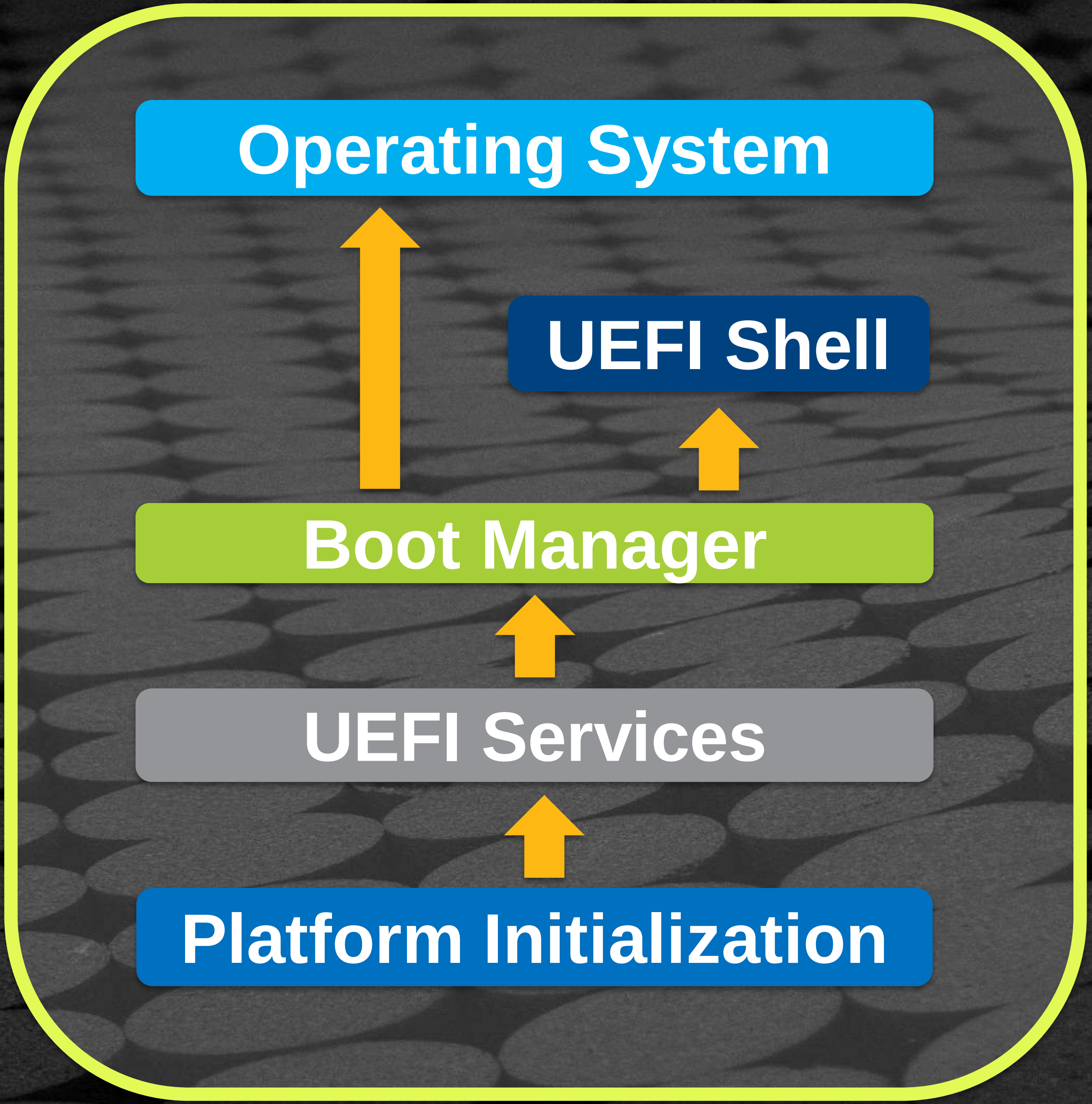
What is a UEFI Shell?



What is a UEFI Shell?



What is a UEFI Shell?



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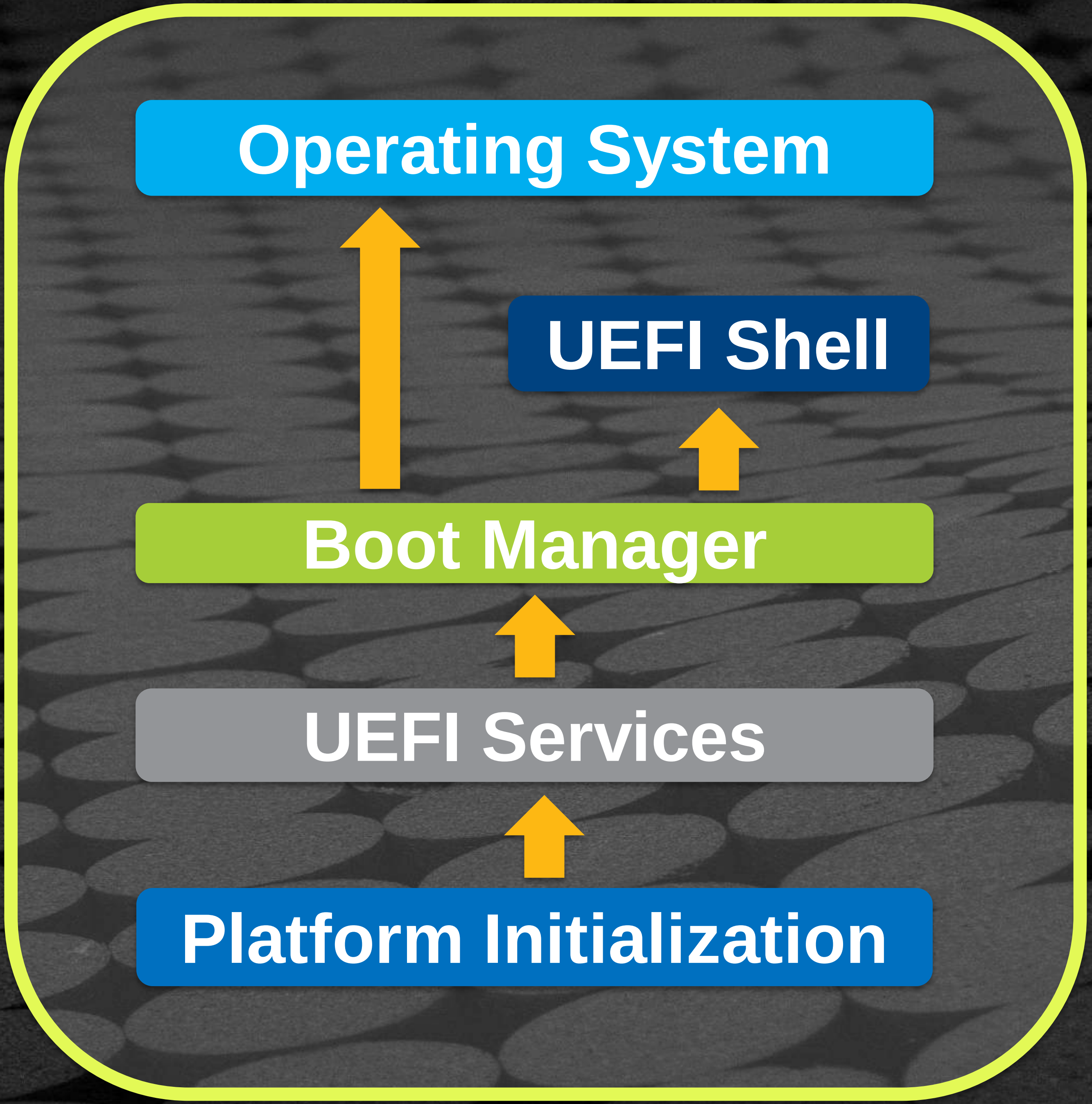
What is a UEFI Shell?



It's an

Extensive & Standardized Pre-OS UEFI Application

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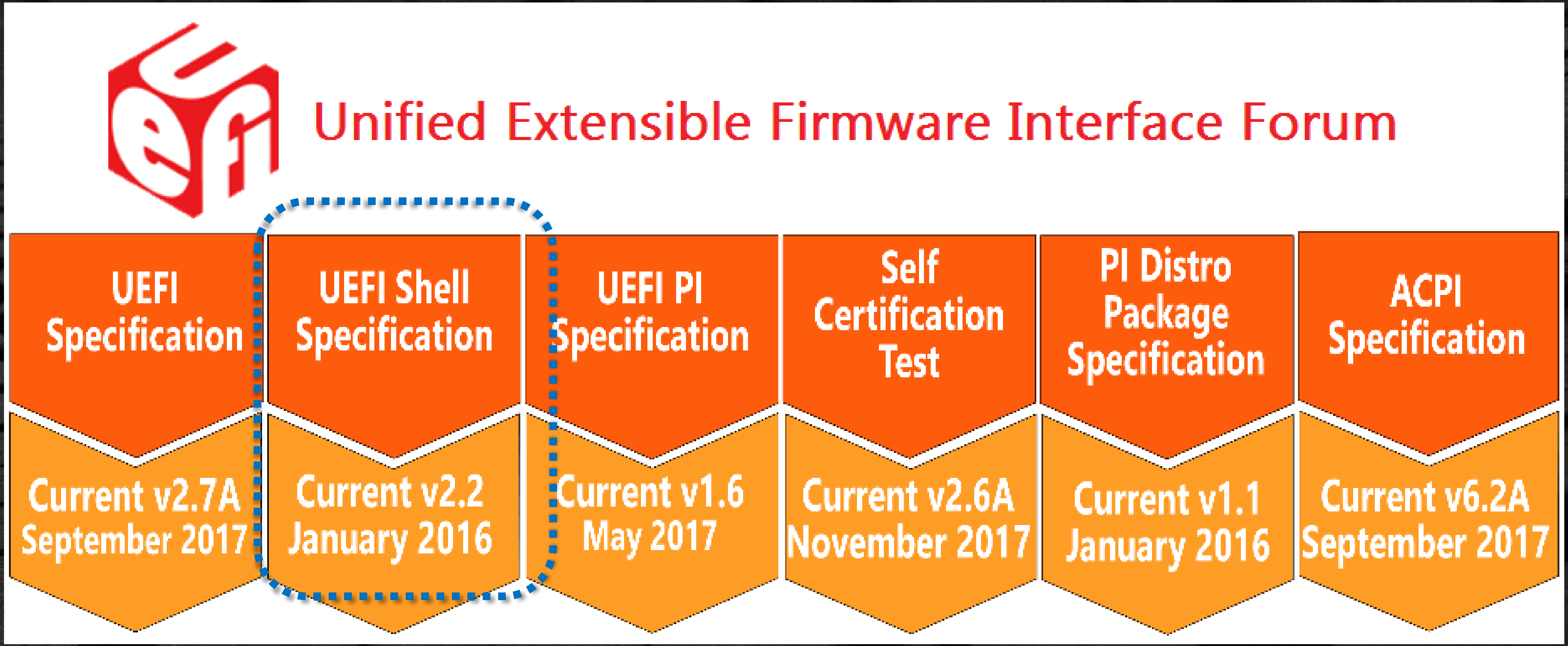
UEFI SHELL SPECIFICATION V. 2.2

http://www.uefi.org/specsandtesttools


Unified Extensible Firmware Interface Forum

UEFI Specification	UEFI Shell Specification	UEFI PI Specification	Self Certification Test	PI Distro Package Specification	ACPI Specification
Current v2.7A September 2017	Current v2.2 January 2016	Current v1.6 May 2017	Current v2.6A November 2017	Current v1.1 January 2016	Current v6.2A September 2017

UEFI Shell v2.0 specification first released 2008 – Latest V2.2 Jan 2016

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UEFI SHELL ELEMENTS

Small Size Profiles

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UEFI SHELL ELEMENTS

Small Size Profiles

Shell Commands

UEFI SHELL ELEMENTS

Small Size Profiles

Shell Commands

New Shell API

UEFI SHELL ELEMENTS

Small Size Profiles

Shell Commands

New Shell API

Enhanced Scripting

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Small Size Profiles

SMALL SIZE PROFILES

Level/Profile	Commands
Level 0	Shell API only
Level 1	Basic scripting support
Level 2	File support cmds (cd,cp,mv)
Level 3	Adds interactive CLI + profiles
UEFI Debug Profile	bcfg, comp, dblk, dmem, dmpstore, echo, edit,
UEFI Network Profile	ipconfig, ping
UEFI Driver Profile	drvdiag, openinfo, reconnect, unload

Shell Commands

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SHELL COMMANDS

```
help –b
```

```
attrib    -Displays or changes the attributes of files or directories.
cd        -Displays or changes the current directory.
cp        -Copies one or more source files or directories to a destination.
load      -Loads a UEFI driver into memory.
map       -Defines a mapping between a user-defined name and a device handle.
mkdir     -Creates one or more new directories.
mv        -Moves one or more files to a destination within a file system.
parse     -Command used to retrieve a value from a particular record which was output in a standard
formatted output.
reset     -Resets the system.
set       -Displays, changes or deletes a UEFI Shell environment variables.
ls        -Lists a directory's contents or file information.
rm        -Deletes one or more files or directories.
vol       -Displays the volume information for the file system that is specified by fs.
date      -Displays and sets the current date for the system.
time      -Displays or sets the current time for the system.
timezone  -Displays or sets time zone information.
stall     -Stalls the operation for a specified number of microseconds.
for       -Starts a loop based on for syntax.
goto      -moves around the point of execution in a script.
if        -Controls which script commands will be executed based on provided conditional
expressions.
shift     -moves all in-script parameters down 1 number (allows access over 10).
Press ENTER to continue or ‘Q’ break:
```

New Shell API

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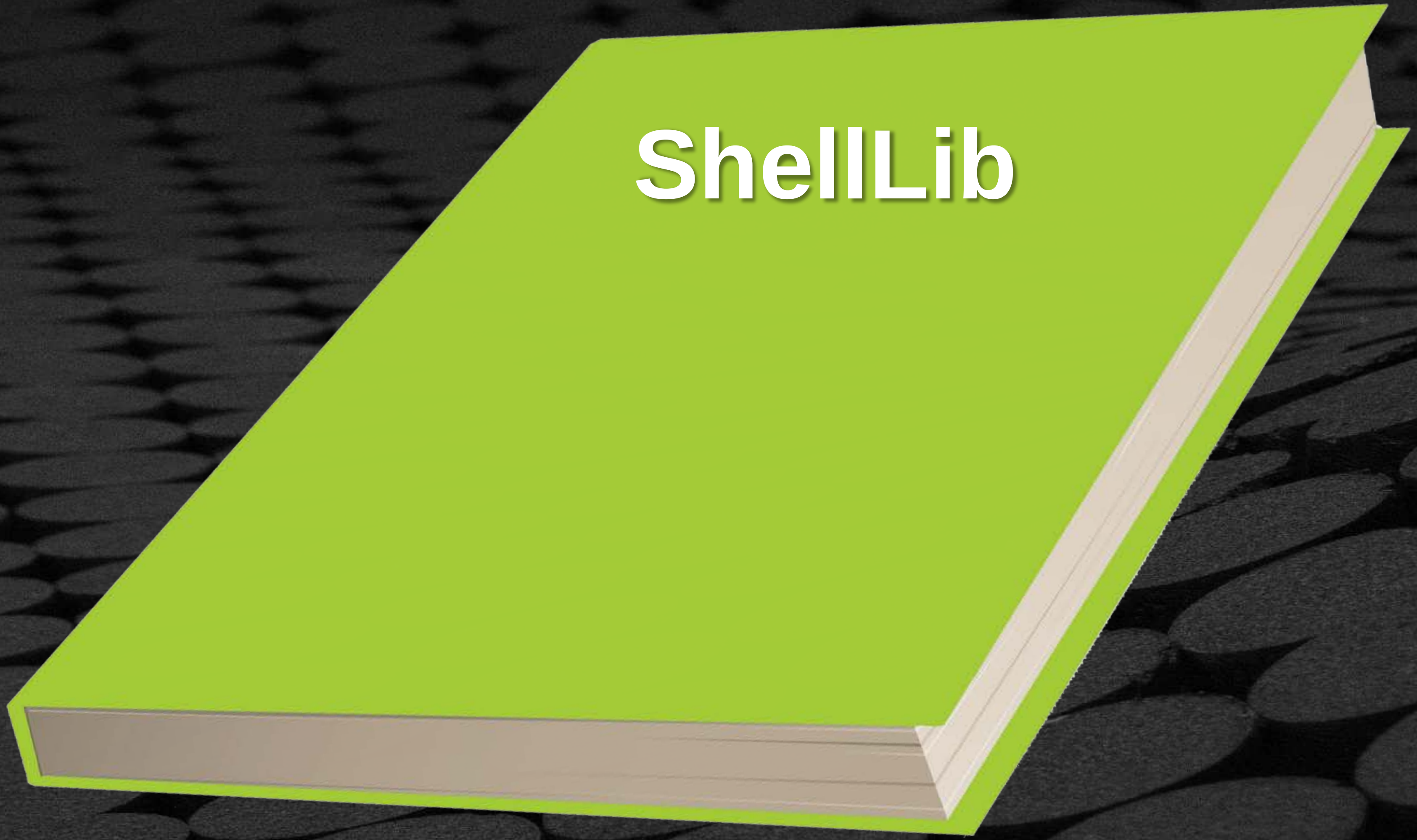
NEW SHELL API

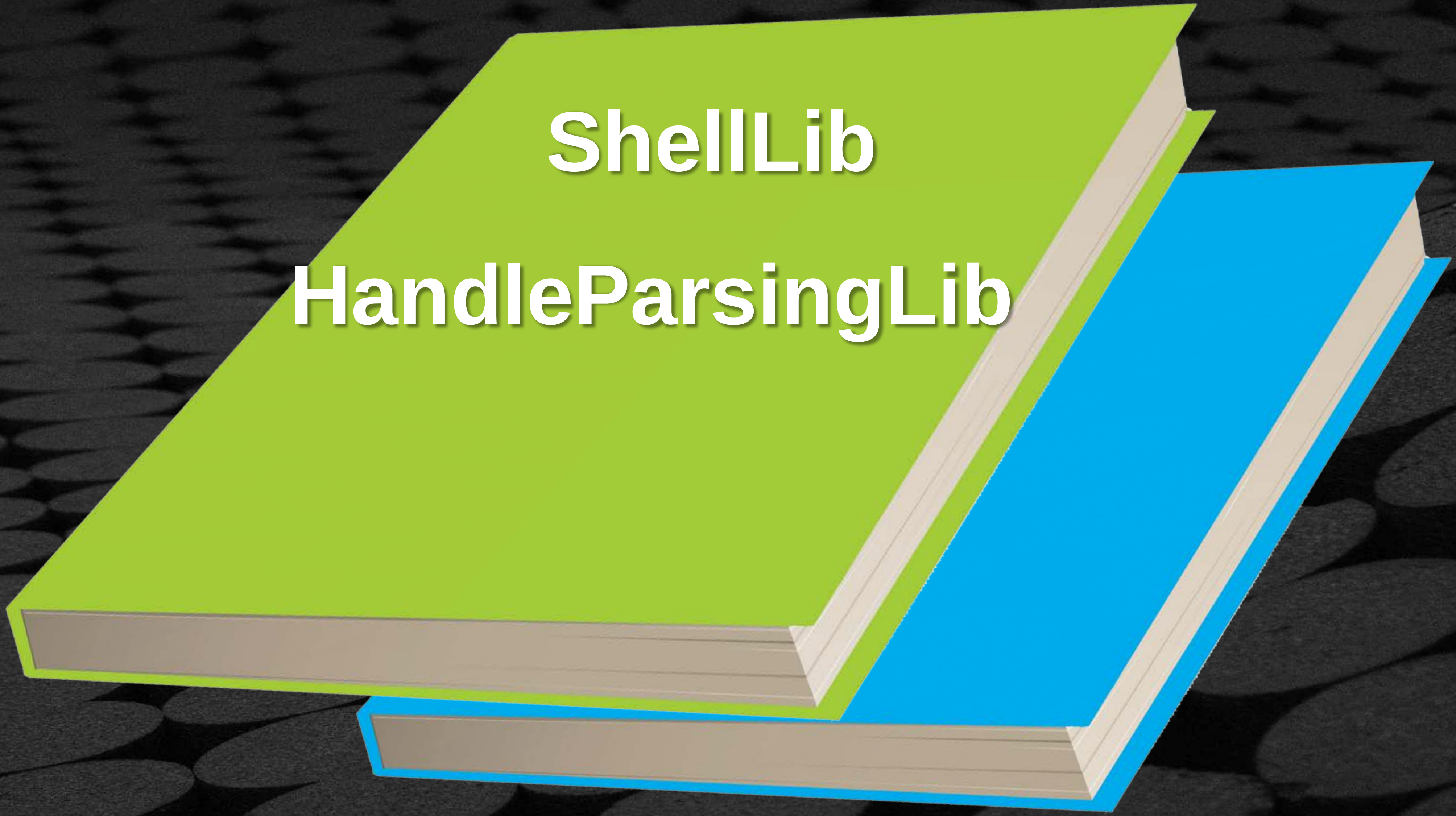
EFI_SHELL_PROTOCOL

Group	Functions
File Manipulation	OpenFileByName, WriteFile, etc…
Mapping, Alias & Environment Variables	GetMapFromDevicePath, GetFilePathFromDevicePath, etc…
Launch Application Or Script	Execute BatchIsActive, IsRootShell
Miscellaneous	GetPageBreak, EnablePageBreak , etc…

ShellPkg Main Libraries



ShellPkg Main Libraries



ShellPkg Main Libraries

ShellLib
HandleParsingLib
ShellCommandLib

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EDK II ShellPkg

Supports binary portability

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EDK II ShellPkg

Supports binary portability

Shell protocols

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EDK II ShellPkg

Supports binary portability

Shell protocols

Shell parameters

```
#Include <Library/ShellLib.h>
gEfiShellParametersProtocol
gEfiShellProtocol
```

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Shell Call Example

```
// use UEFI shell 2.x interface
//
 if (gEfiShellParametersProtocol != NULL) {
        Argc = gEfiShellParametersProtocol->Argc;
        Argv = gEfiShellParametersProtocol->Argv;
//Create the file with Argv[1] with
//                  read/write/create
       Status = gEfiShellProtocol->OpenFileByName
          (Argv[1], &Handle,
           EFI_FILE_MODE_READ |
           EFI_FILE_MODE_WRITE |
           EFI_FILE_MODE_CREATE);

// . . .
// Write the buffer data to the file
   Status = gEfiShellProtocol->WriteFile( Handle,
           (UINTN *)&BufferSize, (void *)Buffer);
```

Enhanced Scripting

Enhanced Scripting

- Contains .nsh extension
- “Startup.nsh” Runs first
- Supports:
  - ✓ Command-line arguments
  - ✓ Standard script commands
  - ✓ Input & output redirection & pipes

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Shell Scripts (Benefits)

Perform basic flow control

Allows branching/looping

Users can control input, output and script nesting

Script that Detects Shell Capabilities

```
# check if Shell supports level 3 commands
 # Exit on error
 if %uefishellsupport% ult 3 then
   echo Must support UEFI Shell, Level 3
   exit /b 2
 endif
 # check that Shell supports Debug1 profile.
 if profiles(Debug1)then
   echo UEFI Shell supports Debug1 profile
 endif
```

UEFI Shell Script Example

Script1.nsh

```
# Simple UEFI Shell script file
echo -off
script2.nsh
if exist %cwd%Mytime.log then
     type Mytime.log
endif
echo "%HThank you.” “%VByeBye:) %N“
```

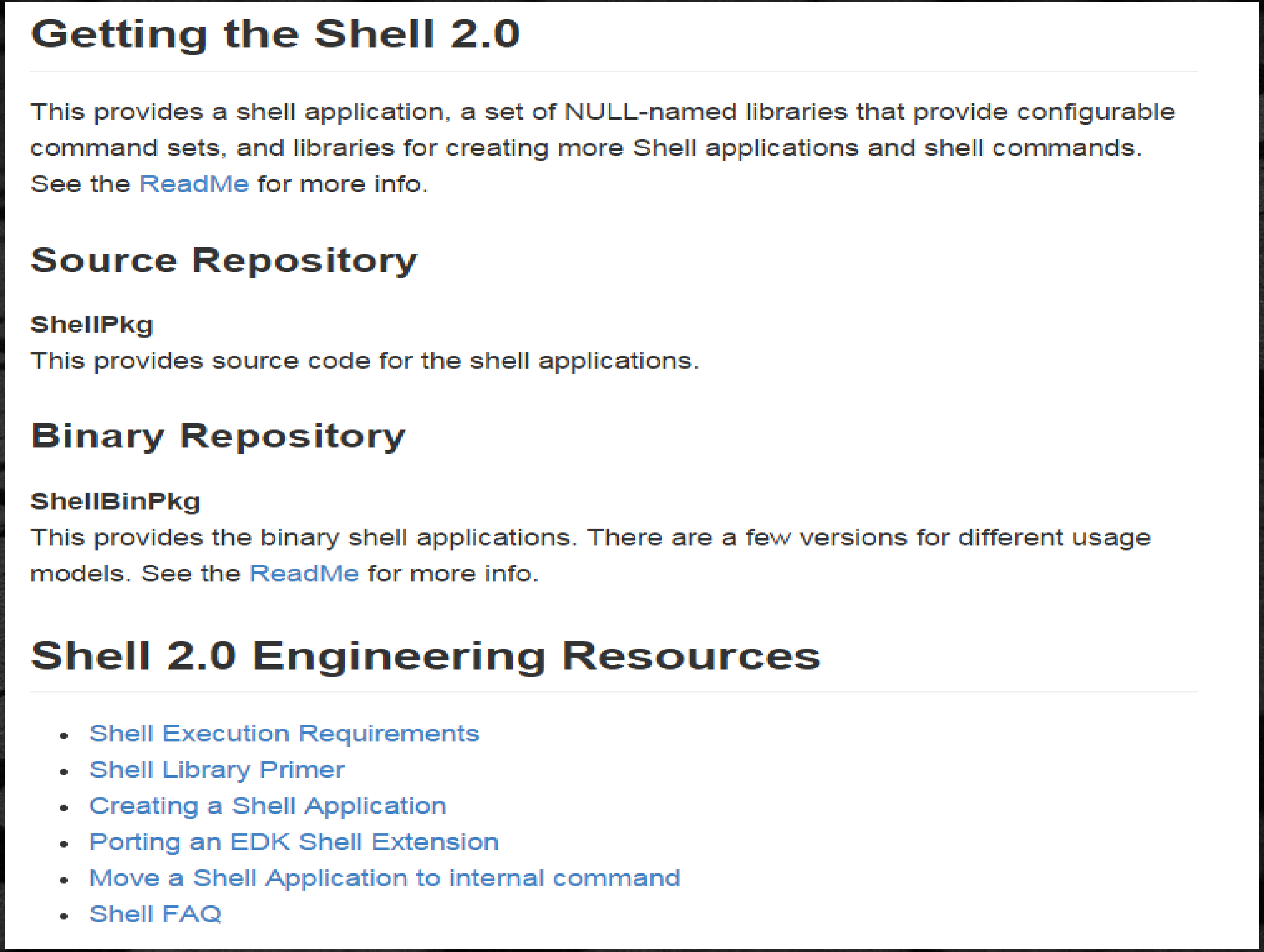
Script1.nsh

```
# Show nested scripts
time > Mytime.log
for %a run (3 1 -1)
    echo %a counting down
endfor
```

Documentation for EDK II ShellPkg

Documentation Link:

wiki Shell Package



Getting the Shell 2.0

This provides a shell application, a set of NULL-named libraries that provide configurable command sets, and libraries for creating more Shell applications and shell commands. See the ReadMe for more info.

Source Repository

ShellPkg
This provides source code for the shell applications.

Binary Repository

ShellBinPkg
This provides the binary shell applications. There are a few versions for different usage models. See the ReadMe for more info.

Shell 2.0 Engineering Resources

- Shell Execution Requirements
- Shell Library Primer
- Creating a Shell Application
- Porting an EDK Shell Extension
- Move a Shell Application to internal command
- Shell FAQ

UEFI Shell 2.2 Vs. EFI Shell 1.0

- **UEFI Shell 2.x** - EFI_SHELL_PARAMETERS_PROTOCOL
- **EFI Shell 1.0** - EFI_SHELL_INTERFACE

```
//
#include <Protocol/EfiShellInterface.h> //GUID protocol for EFI Shell 1.0
#include <Protocol/ShellParameters.h>   //GUID protocol for UEFI Shell 2.x

// . . .

 EFI_SHELL_PARAMETERS_PROTOCOL    *mEfiShellParametersProtocol;
 EFI_SHELL_INTERFACE              *mEfiShellInterface;
//
```

See example C file: MyShellApp.c

UEFI Shell 2.x Vs. EFI Shell 1.0

```
…
//Check for UEFI Shell 2.x
    Status = gBS->OpenProtocol(ImageHandle,
                               gEfiShellParametersProtocolGuid,
                                VOID **)&mEfiShellParametersProtocol,
                                ImageHandle,
                               NULL
                               EFI_OPEN_PROTOCOL_GET_PROTOCOL
                                );
     if (!EFI_ERROR(Status)) {
//
// use UEFI Shell 2.x Parameter Protocol
//
          Argc = mEfiShellParametersProtocol->Argc;
          Argv = mEfiShellParametersProtocol->Argv;
…
     {// Check if EFI shell 1.0 interface
```

See example C file: MyShellApp.c

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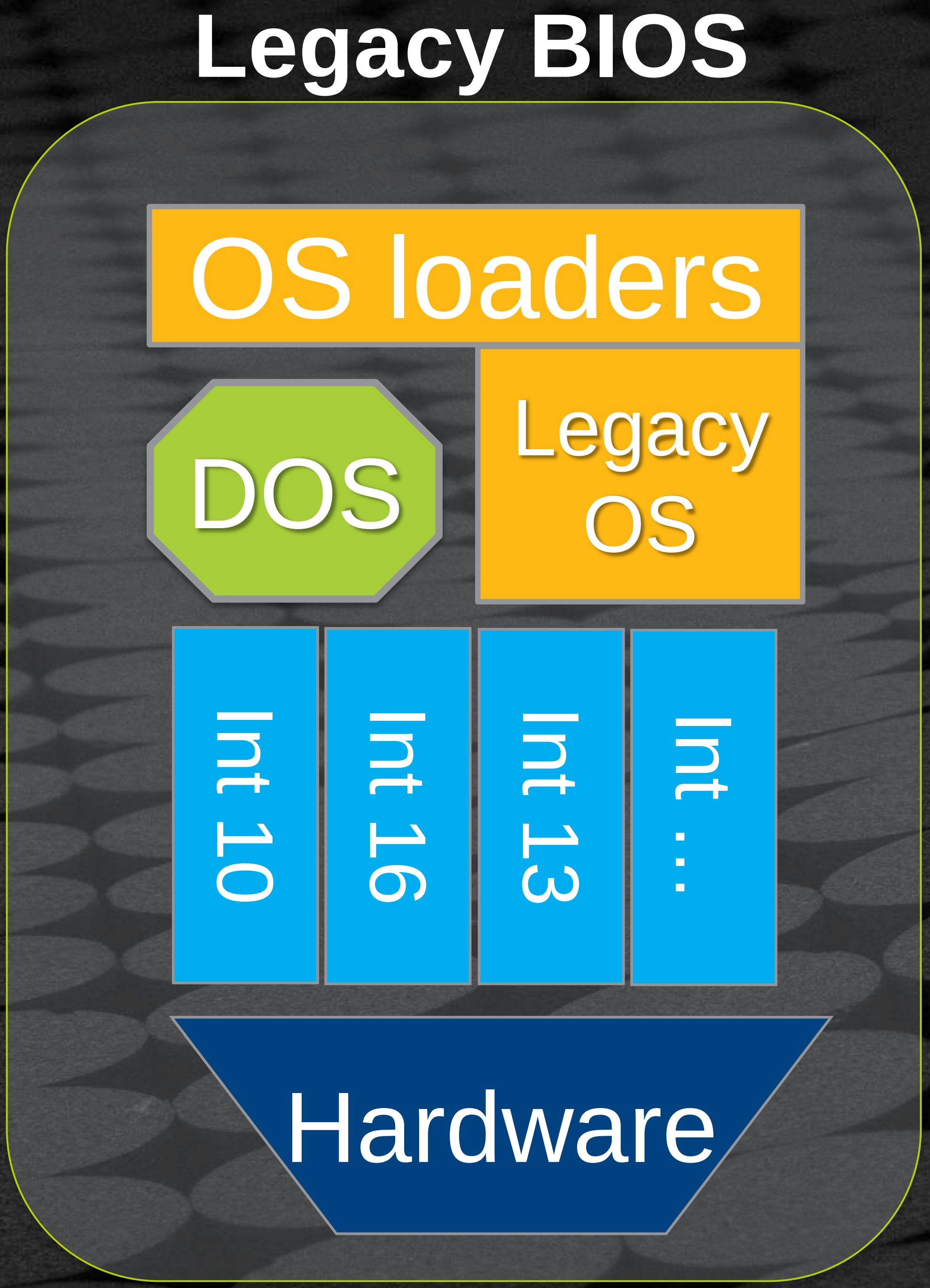
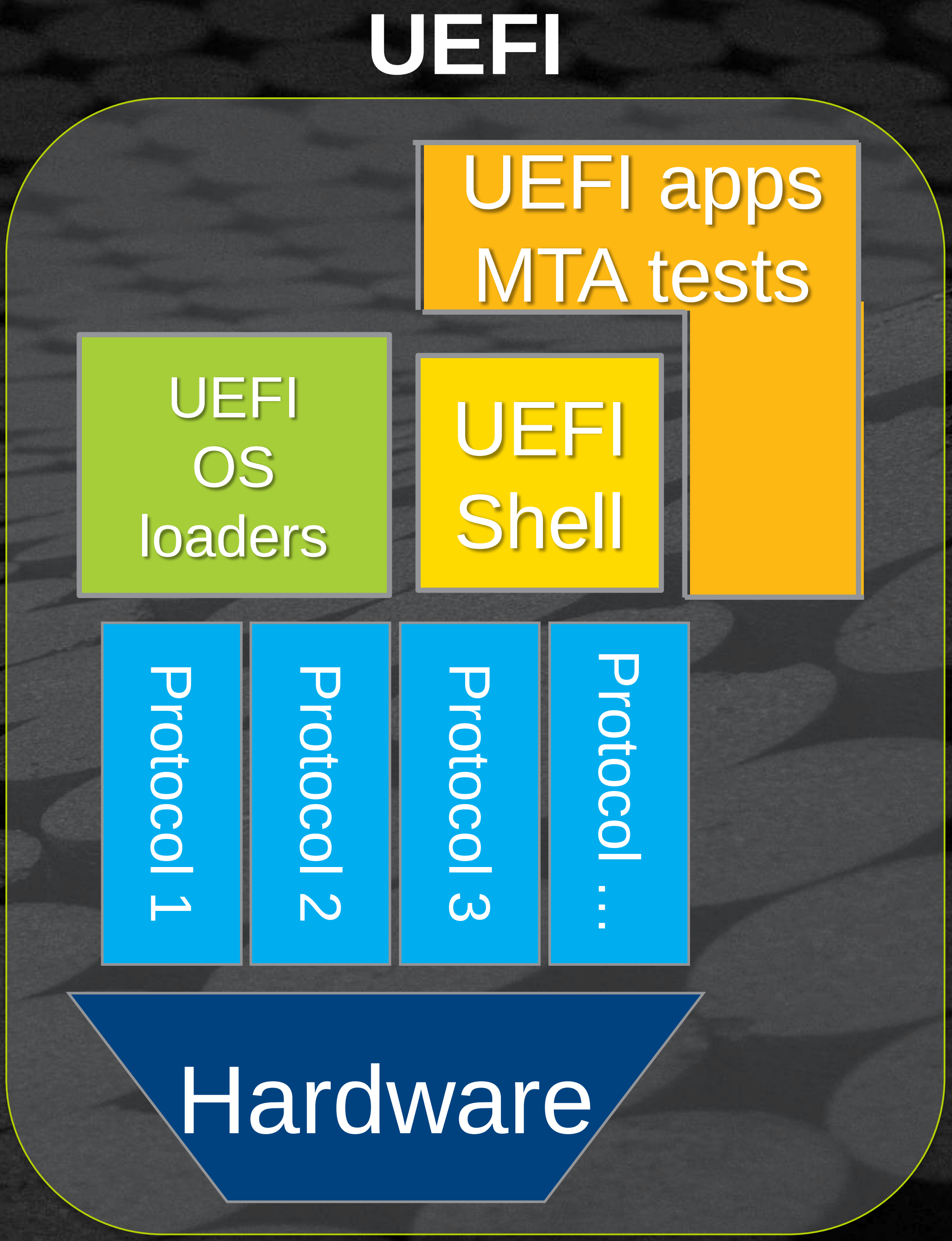
LEGACY VS. UEFI





SHELL USAGE

Execute preboot programs

Move files between devices

Load a preboot UEFI driver (.efi)

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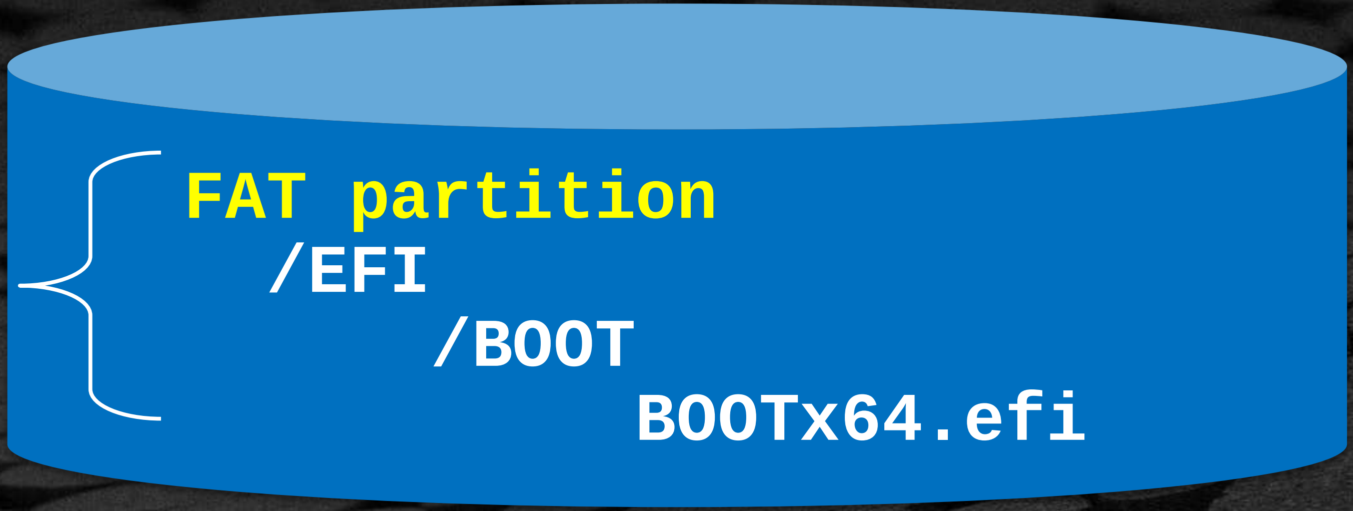
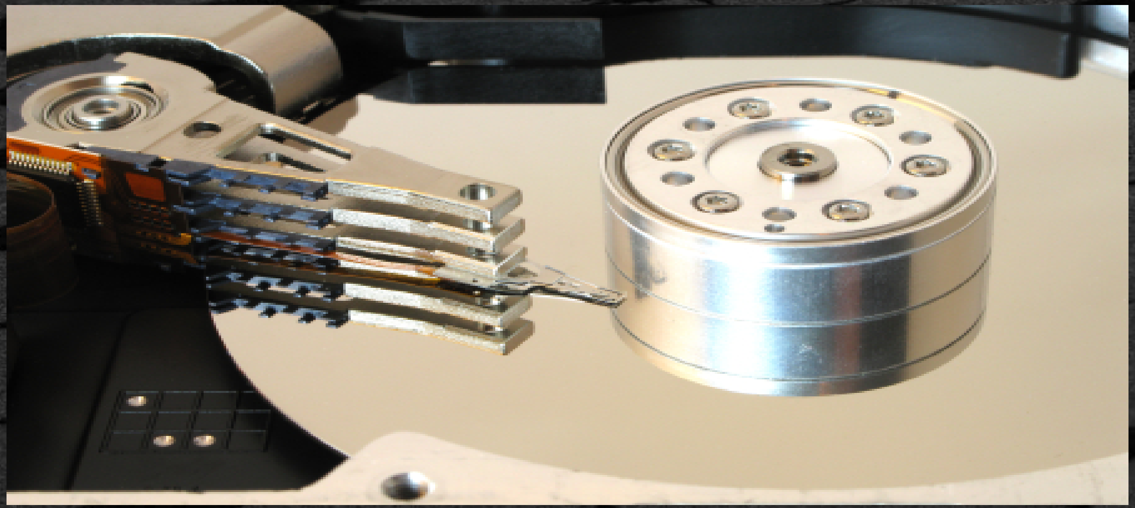
ACCESSING THE SHELL

/EFI/boot/BOOTx64.efi



```
FAT partition
  /EFI
      /BOOT
           BOOTx64.efi
```

BOOTx64.efi = OS loader, UEFI application, or UEFI Shell



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UEFI File System & Device Path

```
Shell> map
Device mapping table
fs0  : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/Scsi(Pun0,Lun0)/
HD(Part1,Sig8983DFE0-F474-01C2-507B-9E5F8078F531)
blk0 : Acpi(PNP0A03,0)/Pci(1F|1)/Ata(Primary,Slave)
blk1 : Acpi(PNP0A03,0)/Pci(1F|1)/Ata(Primary,Master)
blk2 : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/Scsi(Pun0,Lun0)
blk3 : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/Scsi(Pun0,Lun0)/
HD(Part1,Sig8983DFE0-F474-01C2-507B-9E5F8078F531)
blk4 : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/Scsi(Pun0,Lun0)/
HD(Part2,Sig898D07A0-F474-01C2-F1B3-12714F758821)
blk5 : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/Scsi(Pun0,Lun0)/
HD(Part3,Sig89919B80-F474-01C2-D931-F8428177D974)
```

UEFI File System & Device Path

```
fs0  : Acpi(PNP0A03,1)/Pci(1F|0)/Pci(2|0)/
Scsi(Pun0,Lun0)/HD(Part1, Sig8983DFE0-F474
01C2-507B-9E5F8078F531)
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```

- `fs0:`
- `Acpi(PNP0A03,1)`
- `Pci(1F|0)/Pci(2|0)`
- `Scsi(Pun0,Lun0)`
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UEFI File System & Device Path

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- `fs0:`
- `Acpi(PNP0A03,1)`
- `Pci(1F|0)/Pci(2|0)`
- `Scsi(Pun0,Lun0)`
- `HD(Part1,Sig8983DFE0-F474-01C2-507B-9E5F8078F531)`

EFI Variable **`BOOT0000`** **`==`** *Some Device Path*

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SUMMARY

- Explain UEFI, the shell, and how they work together
- Define the shell components
- Use the shell API in a UEFI application
- UEFI Shell command Library
- UEFI Shell scripts

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Questions?

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