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UEFI & EDK II TRAINING

EDK II BUILD SPECIFICATION FILES LAB

See also Lab_Guide.md for Copy & Paste examples in labs

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LESSON OBJECTIVE

- Examine the Build components and build text files DSC, DEC, & FDF

EDK II BUILD TEXT FILES

EDK II tools use INI-style text-based files to describe components, platforms and firmware volumes.

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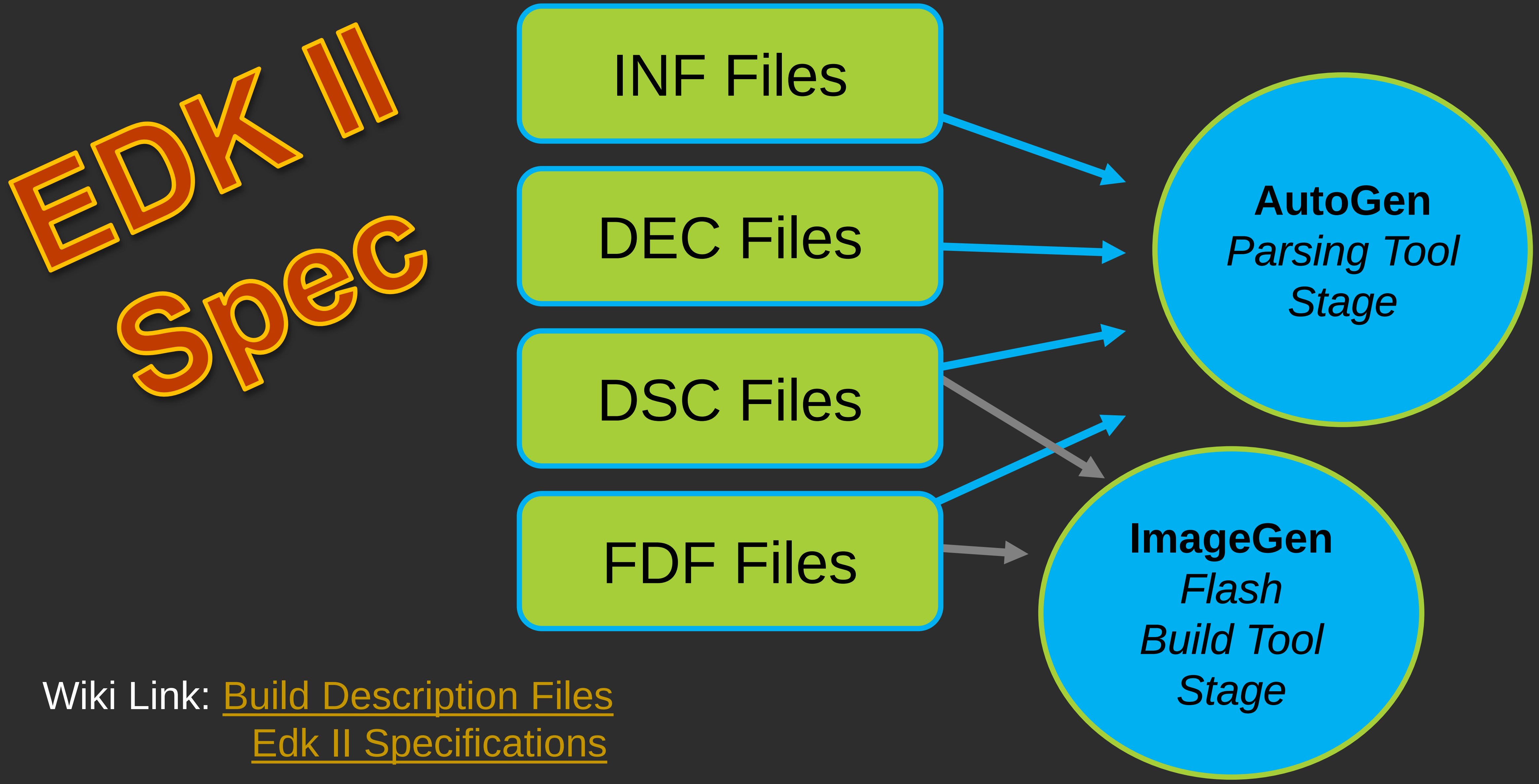
Build Description File Types



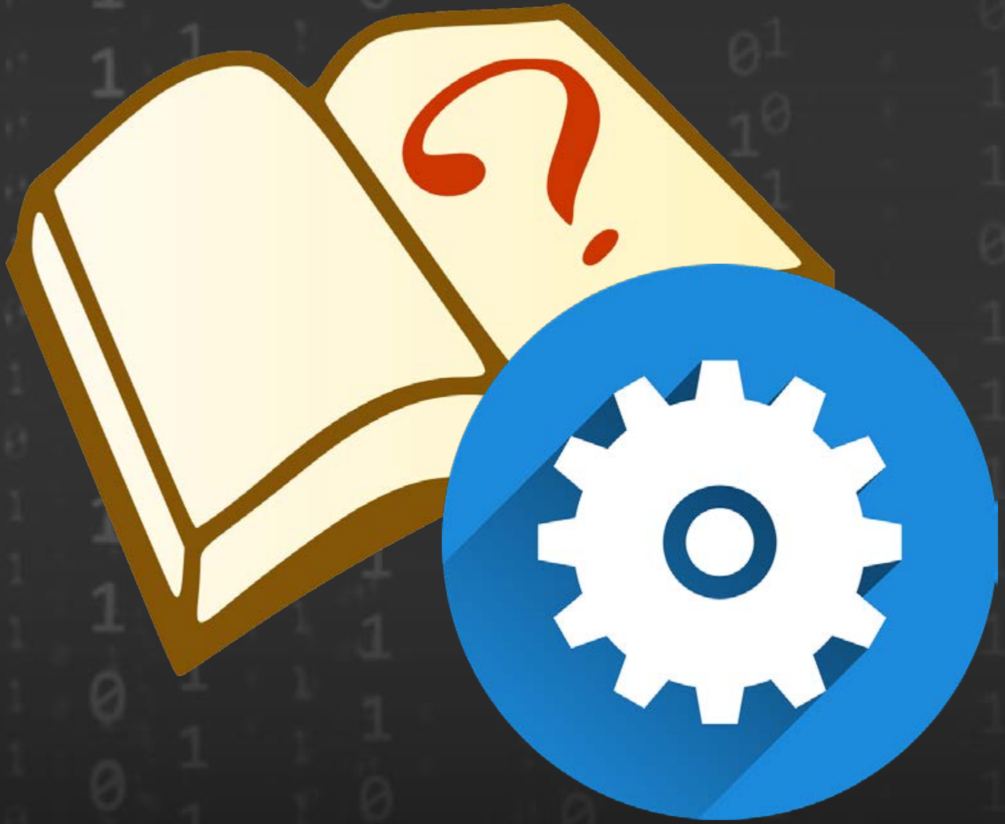
Wiki Link: Build Description Files
Edk II Specifications

General Format for All Build Text Files

INI	• The EDK II Build Text Files use meta-data files using the INI format style
Section “[ ]”	• All Build text files consists of sections delineated by section tags enclosed within Square “[“ “]” brackets
Case	• Section tag entries are case-insensitive
Mult-Sections	• Text of a given section can be used for multiple section names by separating the section names with a comma
Section End	• Sections are terminated by the start of another section or the end of the file.
Comments	• The hash-tag “#” indicates text following to EOL is a comment (exception is within a quoted string)
Include	• The “!include” statements are permitted in .DSC and .FDF but NOT .DEC
Conditional	• Condition Statements Supported in .DSC and .FDF but NOT .DEC • `!ifdef, !ifndef, !if, !elseif, !else and !endif`

Lab 1: Examine the DEC, DSC and FDF files

In this lab, you’ll learn about the layout of the DEC, DSC and FDF files.



Package Declaration File (DEC)

Syntax:

```
<DECfile> ::=   <Defines>
             Include
             [<LibraryClass>]
             [<Guids>]
             [<Protocols>]
             [<Ppis>]
             [<Pcd>]
             [<UserExtensions>]
```

Declare

Review the Wiki Explanation: https://github.com/tianocore/tianocore.github.io/wiki/Build-Description-Files#the-dec-file

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Example DEC File

```
[Defines]
  DEC_SPECIFICATION              = 0x00010005
  PACKAGE_NAME                   = OvmfPkg
  PACKAGE_GUID                   = 2daf5f34-50e5-4b9d-b8e3-5562334d87e5
  PACKAGE_VERSION                = 0.1

[Includes]
  Include

[LibraryClasses]
  ##  @libraryclass  Loads and boots a Linux kernel image
  #
  LoadLinuxLib|Include/Library/LoadLinuxLib.h

[Guids]
  gUefiOvmfPkgTokenSpaceGuid          = {0x93bb96af, 0xb9f2, 0x4eb8, {0x94, 0x62, 0xe0, 0xba, 0x74, 0x56, 0x42, 0x36}}
  gEfiXenInfoGuid                     = {0xd3b46f3b, 0xd441, 0x1244, {0x9a, 0x12, 0x0, 0x12, 0x27, 0x3f, 0xc1, 0x4d}}

[Protocols]
  gVirtioDeviceProtocolGuid           = {0xfa920010, 0x6785, 0x4941, {0xb6, 0xec, 0x49, 0x8c, 0x57, 0x9f, 0x16, 0x0a}}
  gXenBusProtocolGuid                 = {0x3d3ca290, 0xb9a5, 0x11e3, {0xb7, 0x5d, 0xb8, 0xac, 0x6f, 0x7d, 0x65, 0xe6}}

[PcdsFixedAtBuild]
  gUefiOvmfPkgTokenSpaceGuid.PcdOvmfPeiMemFvBase|0x0|UINT32|0x00001014
  gUefiOvmfPkgTokenSpaceGuid.PcdOvmfPeiMemFvSize|0x0|UINT32|0x00001015
```

Tokens need to be unique to the DEC file (1 per PCD)

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Examine the Dec File Details

Follow the following Links and examine the examples of the EmulatorPkg.dec file

Next open the same EmulatorPkg.dec in the %WORKSPACE% and become familiar with the different sections

EmulatorPkg.dec.md#dec-file-for-emulatorpkg
Link: List of List of Defines, Package Name, GUILD, Version ...
Link: The Include section
Link: Library classes section
Link: Protocols Section
Link: GUIDs section
Link: PCDs Section
Link: Patchable PCDs Section

Platform Description File (DSC)

Syntax:

```
DSCfile ::= [<Header>]
            <Defines>
            [<SkuIds>]
            [<Libraries>]
            [<LibraryClasses>]
            [<Pcds>]
            [<Components>]
            [<UserExtensions>]
```

Description

Review the Wiki Explanation: https://github.com/tianocore/tianocore.github.io/wiki/Build-Description-Files#the-dsc-file

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Platform Description File (DSC)

DSC file is the recipe for creating a package

Definitions for the package build

EDK II Library Class Instance Mappings (for EDK II Modules)

EDK II PCD Entry Settings

Components / Modules to build (list of .inf files)

DSC file must define all libraries, components and/or modules that will be used by one package

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Example: DSC File

```
[Defines]
  PLATFORM_NAME                  = Ovmf
  PLATFORM_GUID                  = 5a9e7754-d81b-49ea-85ad-69eaa7b1539b
  PLATFORM_VERSION               = 0.1
  DSC_SPECIFICATION              = 0x00010005
  OUTPUT_DIRECTORY               = Build/OvmfX64
  SUPPORTED_ARCHITECTURES        = X64
  BUILD_TARGETS                  = NOOPT|DEBUG|RELEASE
  SKUID_IDENTIFIER               = DEFAULT
  FLASH_DEFINITION               = OvmfPkg/OvmfPkgX64.fdf

  #
  # Defines for default states.  These can be changed on the command line.
  # -D FLAG=VALUE
. . .
[BuildOptions.common.EDKII.DXE_RUNTIME_DRIVER]
  GCC:*_*_*_DLINK_FLAGS = -z common-page-size=0x1000
  XCODE:*_*_*_DLINK_FLAGS =
[LibraryClasses]
  PcdLib|MdePkg/Library/BasePcdLibNull/BasePcdLibNull.inf
  TimerLib|OvmfPkg/Library/AcpiTimerLib/BaseAcpiTimerLib.inf
```

```
   . . .
#############################
# Pcd Section
#############################
  . . .
#############################
#
# Components Section - list of all
# EDK II Modules needed by this
# Platform.
#
#############################
[Components]

OvmfPkg/ResetVector/ResetVector.inf

  . . .
```

DSC must contain a [Components] Section

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Examine : DSC File Details

Follow the following Links and examine the examples of the EmulatorPkg.dsc file

Next open the same EmulatorPkg.dsc in the %WORKSPACE% and become familiar with the different sections

EmulatorPkg.dsc.md#dsc-file-for-emulatorpkg
Link: List of Defines
Link: Define Switches to determine some configurations
Link: Library Classes – Global
Link: Library Classes for UEFI Boot phases
Link: PCDs Section, changing the default
Link: Dynamic PCDs Section
Link: Components Section
Link: Build Options Section
Link: Adding More

Flash Description File(FDF)

Syntax:

```
FDFfile ::= [<Header>]
    [<Defines>]
    <FD>
    <FV>
    [<Capsule>]
    [<VTF>]
    [<Rules>]
    [<OptionRom>]
    [<UserExtensions>]
```

Flash Layout

Must have a FD (Flash Device) and FV (Firmware Volume) Section

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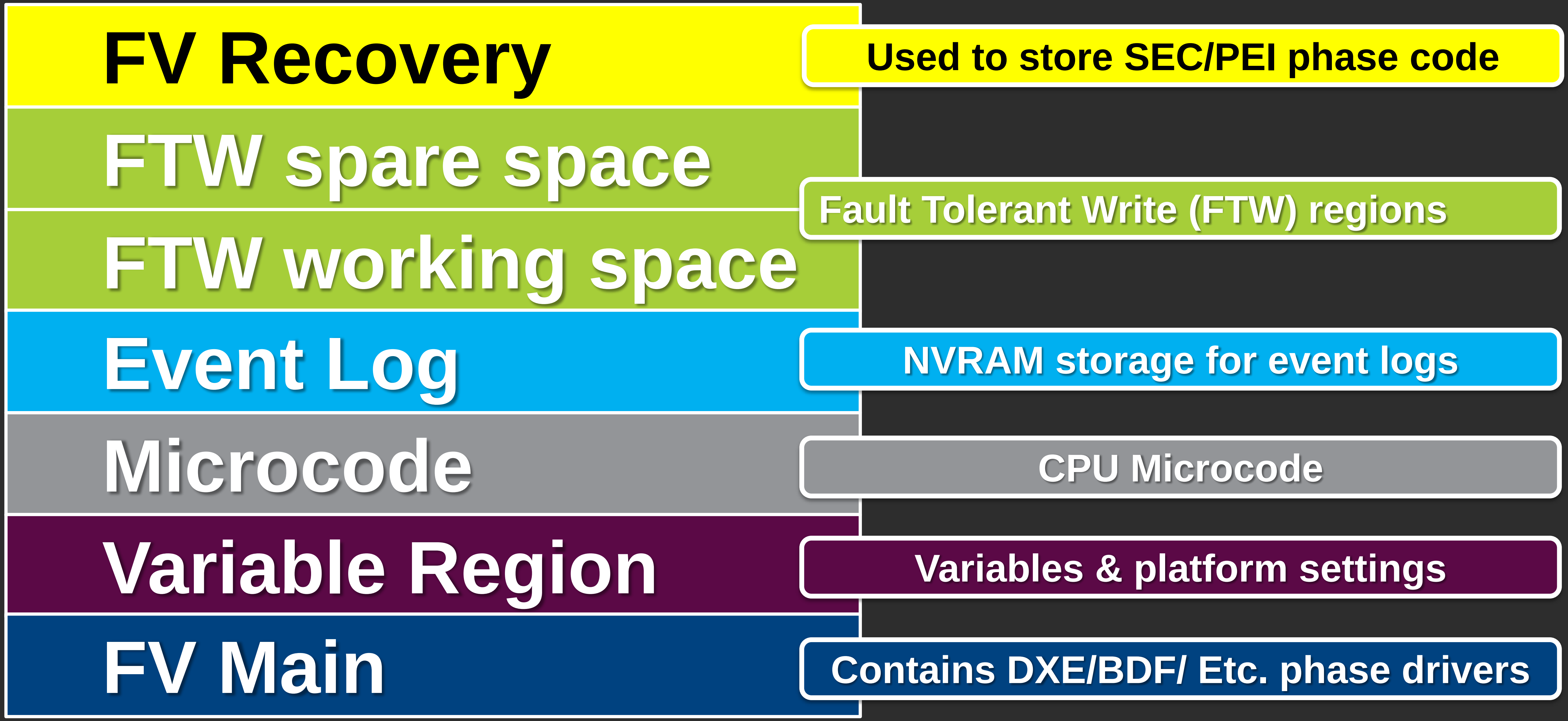
Flash Description File(FDF)

Describes information about flash parts

Used to create firmware images, Option ROM images or bootable images

Rules for combining binaries (Firmware Image) built from a DSC file

FLASH DEVICE CONFIGURATION COMMON LAYOUT FILE (.FDF)


FV Recovery
Used to store SEC/PEI phase code
FTW spare space
FTW working space
Fault Tolerant Write (FTW) regions
Event Log
NVRAM storage for event logs
Microcode
CPU Microcode
Variable Region
Variables & platform settings
FV Main
Contains DXE/BDF/ Etc. phase drivers

Example: FDF File

```
[Defines]
!include OvmfPkg.fdf.inc

#
# Build the variable store and the firmware code
# as one unified flash device image.
#
[FD.OVMF]
BaseAddress    = $(FW_BASE_ADDRESS)
Size           = $(FW_SIZE)
ErasePolarity = 1
BlockSize      = $(BLOCK_SIZE)
NumBlocks      = $(FW_BLOCKS)
```

Ovmf.fd file created by Build

Offset | Size

```
$(VARS_SIZE)|$(FVMAIN_SIZE)
FV = FVMAIN_COMPACT
```

Offset | Size

```
$(SECFV_OFFSET)|$(SECFV_SIZE)
FV = SECFV
```

Firmware Volumes created by Build

Included Mapping file

```
DEFINE BLOCK_SIZE         = 0x1000
DEFINE VARS_OFFSET        = 0

!if ($(FD_SIZE_IN_KB) == 1024) || ($(FD_SIZE_IN_KB) == 2048)
DEFINE VARS_SIZE          = 0x20000
DEFINE VARS_BLOCKS        = 0x20
DEFINE VARS_LIVE_SIZE     = 0xE000
DEFINE VARS_SPARE_SIZE    = 0x10000
!endif
# . . .

SET gUefiOvmfPkgTokenSpaceGuid.PcdOvmfFdBaseAddress     =
    $(FW_BASE_ADDRESS)
SET gUefiOvmfPkgTokenSpaceGuid.PcdOvmfFirmwareFdSize    =
    $(FW_SIZE)
SET gUefiOvmfPkgTokenSpaceGuid.PcdOvmfFirmwareBlockSize =
    $(BLOCK_SIZE)

SET gUefiOvmfPkgTokenSpaceGuid.PcdOvmfFlashNvStorageVariableBase =
   $(FW_BASE_ADDRESS)
SET gEfiMdeModulePkgTokenSpaceGuid.PcdFlashNvStorageVariableSize =
   $(VARS_LIVE_SIZE)
```

Link to Gitpitch

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Examine : FDF File Details

Follow the following Links and examine the examples of the EmulatorPkg.fdf file

Next open the same EmulatorPkg.fdf in the %WORKSPACE% and become familiar with the different sections

- EmulatorPkg.fdf.md#fdf-file-for-the-emulatorpkg
- Link: FD Section
- Link: Firmware Volume – FvRecovery
- Link: Begin Firmware Layout Regions
- Link: Declaring each Firmware Volumes
- Link: Apriori Section
- Link: Example: #include of fdf file
- Link: Rules Section
- Following are for the Whiskey Lake UPX (these examples will be used in later projects
- Link: FDF For Whiskey Lake Up Xtreme
- Link: Flash Map of Up Xtreme

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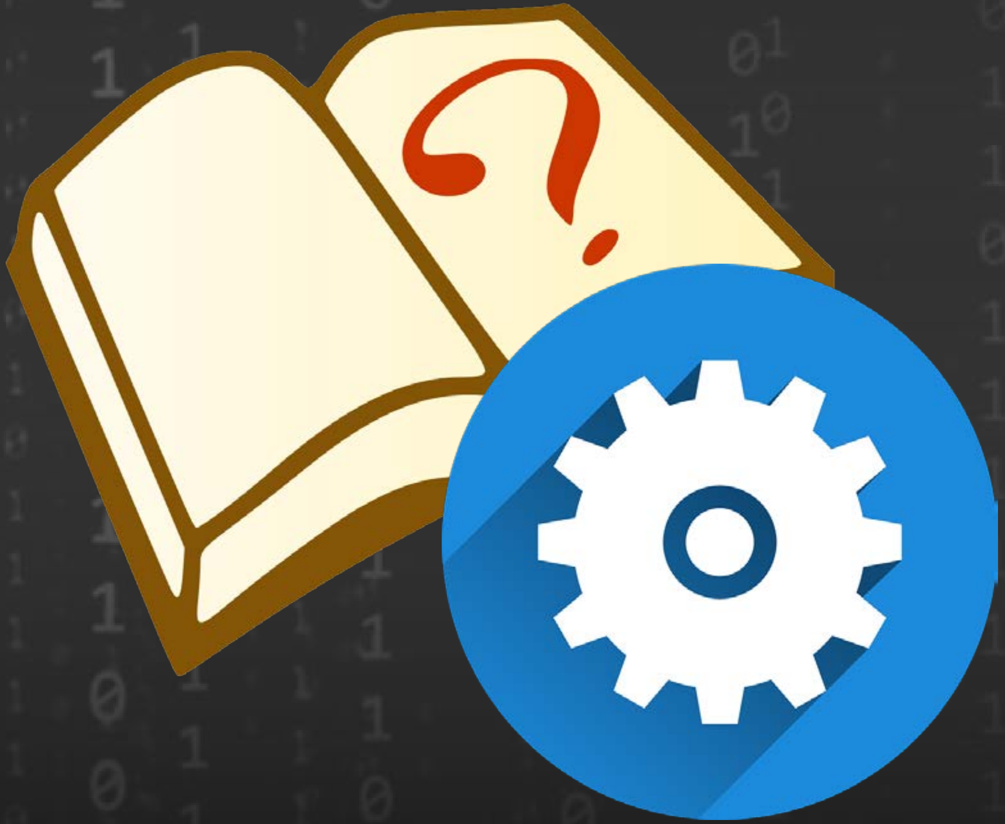
Lab 2: Add a Simple Driver to the Build

In this lab, you'll learn how to add a UEFI Driver to the Build and final image .FD file.



Add a UEFI Driver to a Platform

Requirements:

Add a simple UEFI driver to a platform based on a Macro switch passed to the build using “-D ADD_BLANKDRV”

This simple UEFI driver should also be added to the FV for the DXE code.

Requires Building the Platform Lab first

- Windows Build Emulator Platform Lab Link
- Linux Build Ovmf Platform Lab Link

- The simple UEFI driver to add is found on the Lab_Material_FW

  `FW/LabSampleCode/LabSolutions/BlankDrv`

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Add a UEFI Driver to a Platform

Windows

1. Copy the LabSampleCode/LabSolutions/BlankDrv directory to C:/FW/edk2-ws/edk2
2. Edit EmulatorPkg.dsc and add the BlankDrv component at the end and use a “if” statement based on macro ADD_BLANKDRV
3. Edit EmlatorPkg.fdf and add the BlankDrv Driver to the DXE section of Firmware Volumes and use a “if” statement based on macro ADD_BLANKDRV

```
C:/FW/edk2-ws/edk2> Build –D ADD_BLANKDRV
C:/FW/edk2-ws/edk2> RunEmulator.bat
```

Linux

1. Copy the LabSampleCode/LabSolutions/BlankDrv directory to ~/src/edk2-ws/edk2
2. Edit OvmfPkgX64.dsc and add the BlankDrv component at the end and use a “if” statement based on macro ADD_BLANKDRV
3. Edit OvmfPkgX64.fdf and add the BlankDrv Driver to the DXE section of Firmware Volumes and use a “if” statement based on macro ADD_BLANKDRV

```
bash$> cd ~/src/edk-ws/edk2
bash$> build -D ADD_BLANKDRV -a X64
bash$ cd $HOME/run-ovmf
bash$ cp ~/src/edk2-
ws/Build/OvmfX64/DEBUG_GCC5/FV/OVMF.fd bios.bin
bash$ . RunQemu.sh
```

Verify the BlankDrv Driver was Added

At the Shell Prompt:

```
Shell> Exit
```

This will open the BIOS Setup

Go to the "Device Manager" menu and Verify the "Blank Driver Configuration page" is available

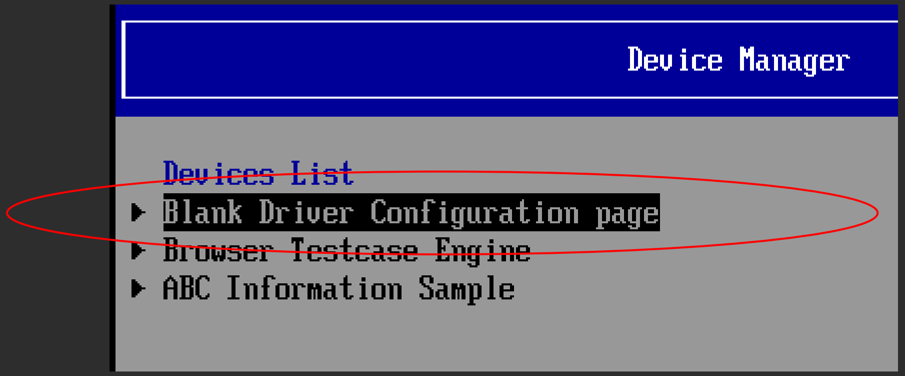
Enter into the BlankDrv Setup Page

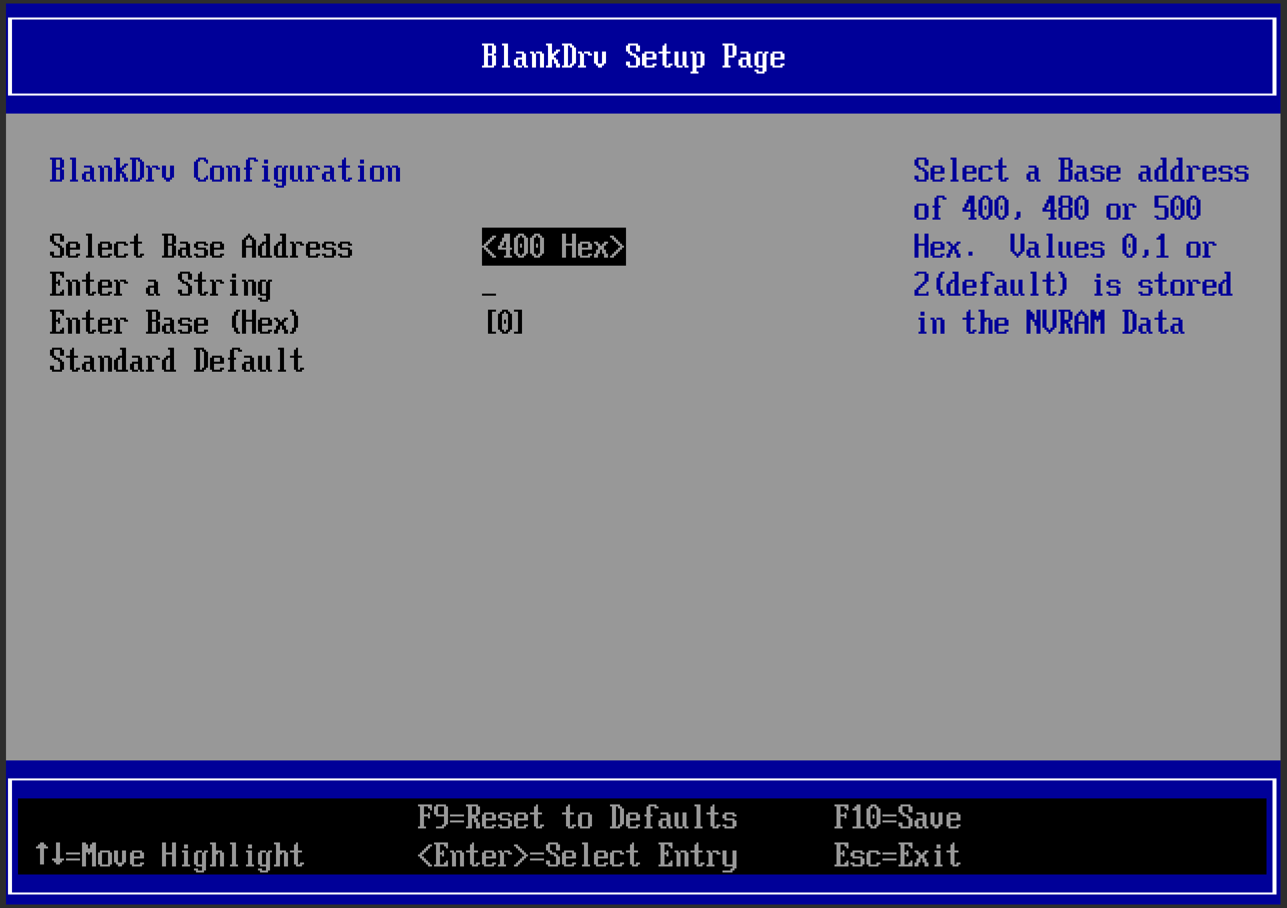
Exit Emulation

Windows: ESC key twice then use the “Reset”

Linux: Exit QEMU Linux

Solution: Lab_Material_FW
`FW/LabSampleCode/LabSolutions/BlankDrv_Solution`





```
BlankDrv Setup Page

BlankDrv Configuration                              Select a Base address
                                                    of 400, 480 or 500
Select Base Address          <400 Hex>              Hex.  Values 0,1 or
Enter a String               _                      2(default) is stored
Enter Base (Hex)             [0]                    in the NVRAM Data
Standard Default

                     F9=Reset to Defaults      F10=Save
↑↓=Move Highlight    <Enter>=Select Entry      Esc=Exit
```

Summary

- Examine the Build components and build text files DSC, DEC, & FDF

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Questions?

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ACKNOWLEDGEMENTS