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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

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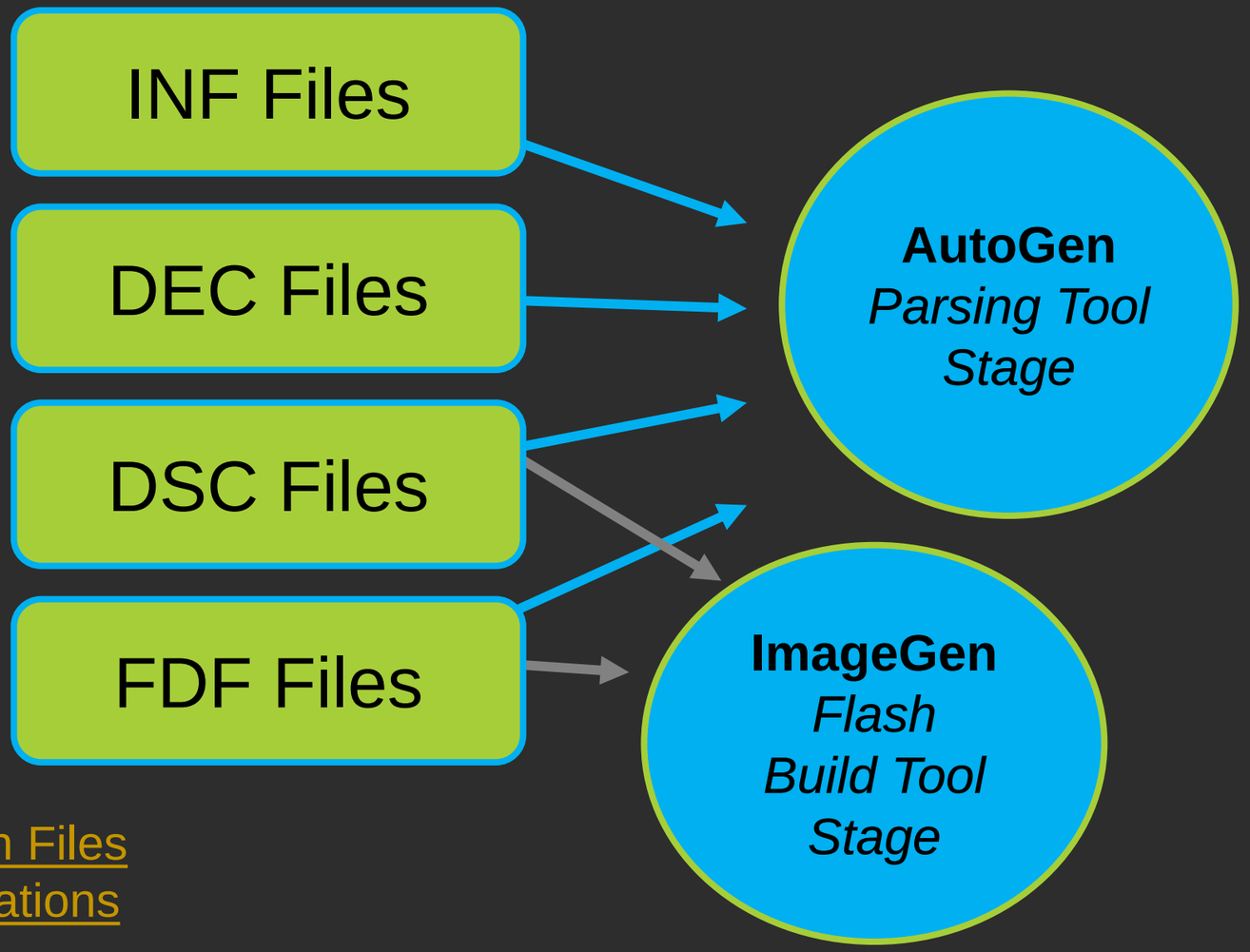
EDK II BUILD TEXT FILES

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

Build Description File Types

EDK II Spec



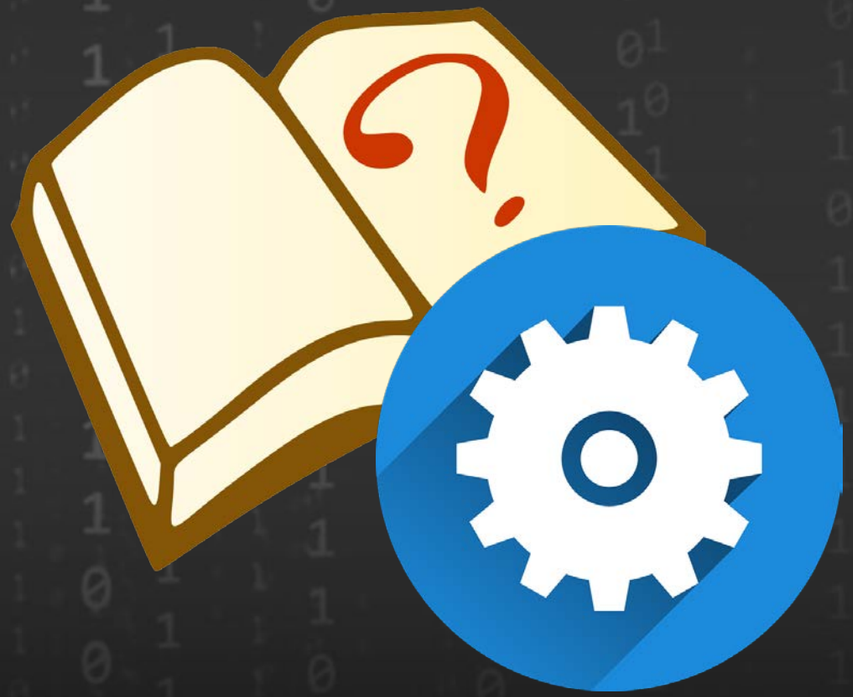
Wiki Link: Build Description Files
Edk II Specifications

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>]
```

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

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)

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>]
```

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

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

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

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)

Flash Layout

Syntax:

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

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

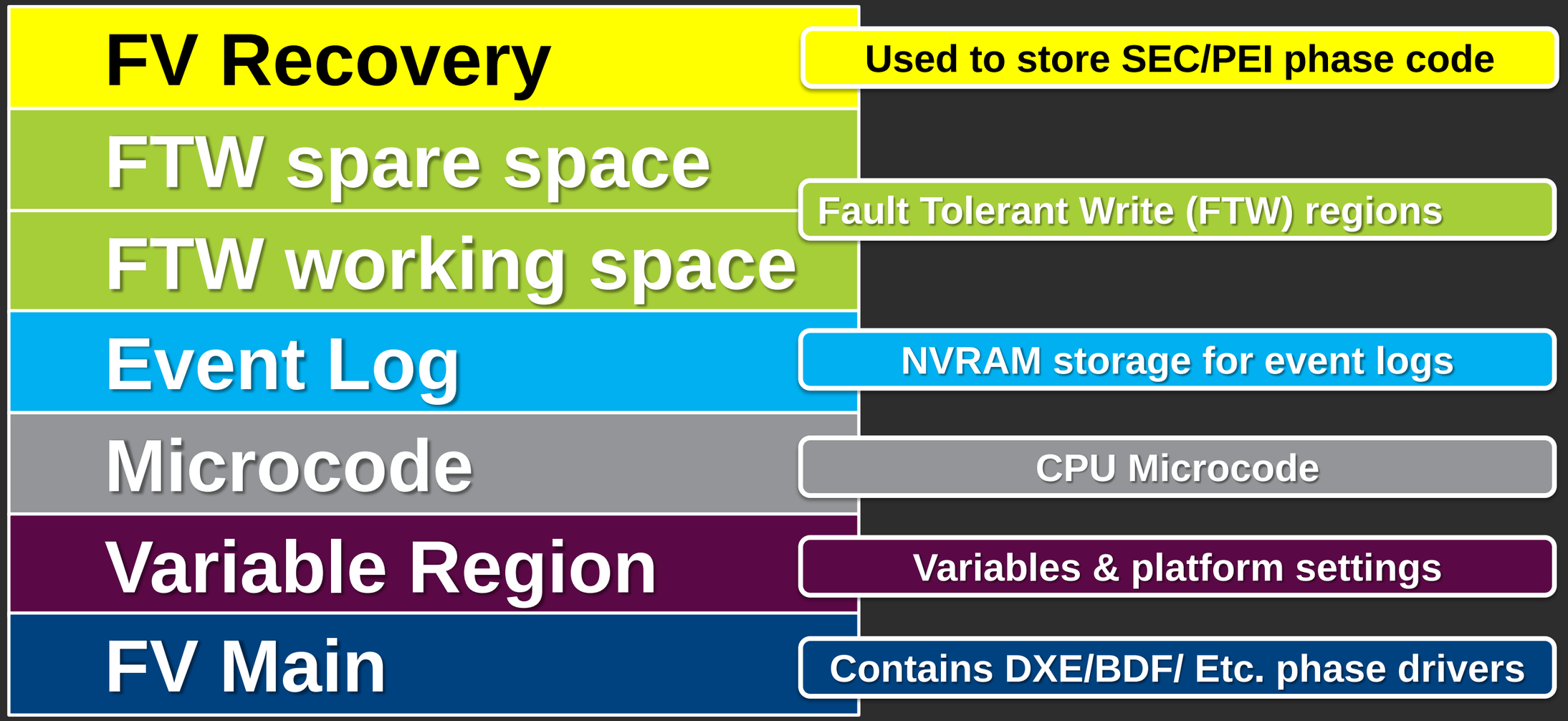
Flash Description File(FDF)

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)



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)

Offset | Size
$(VARS_SIZE)|$(FVMAIN_SIZE)
FV = FVMAIN_COMPACT

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

Ovmf.fd file created by Build

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

Examine : FDF File Details

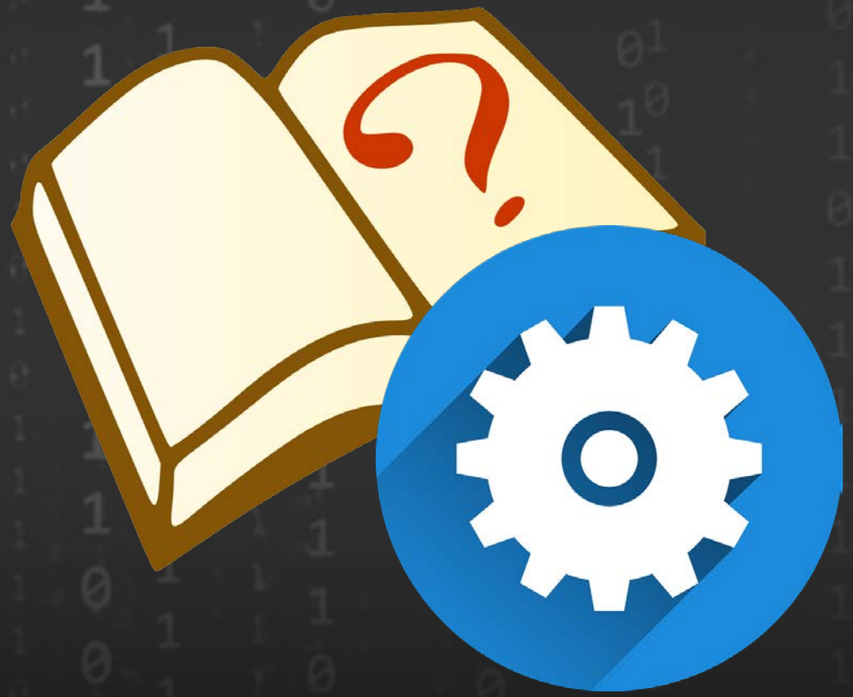
Follow the following Links and examine the examples of the EmulatorPkg.fdf file

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

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`

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

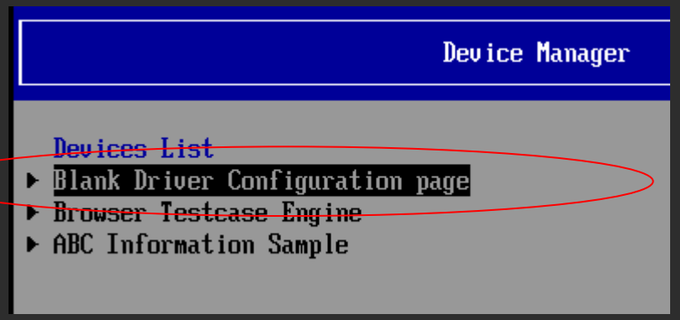
Go to the "Device Manager" menu and Verify the "Blank Driver Configuration page" is available

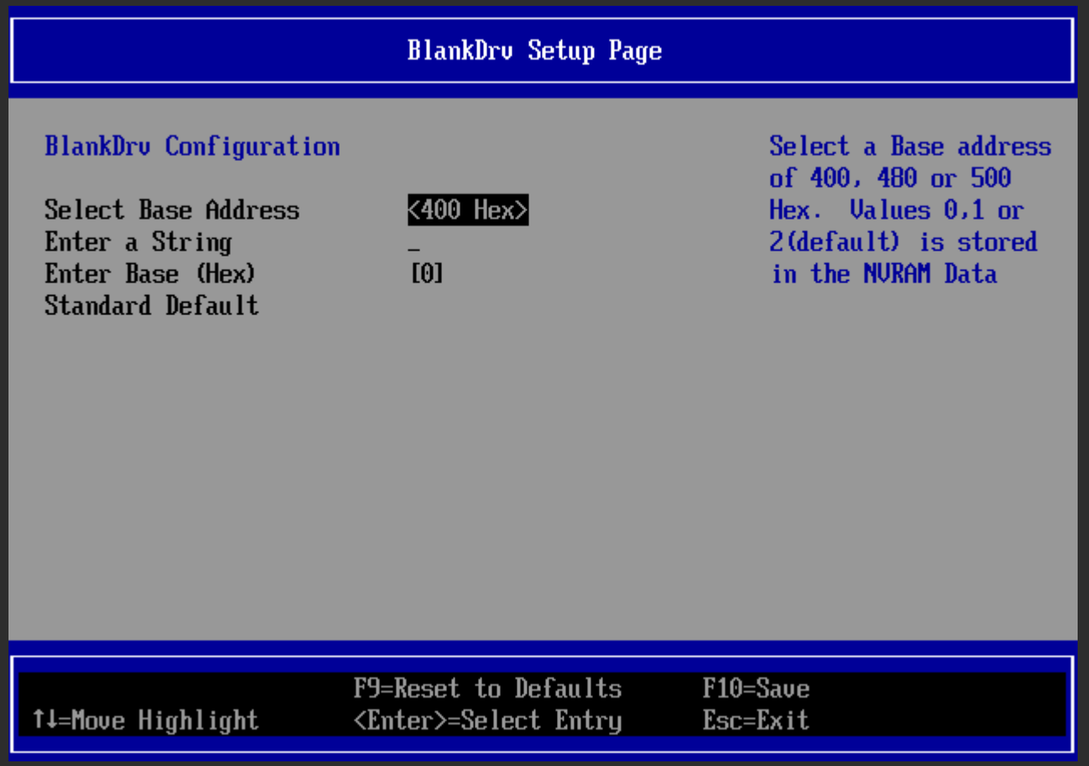
Enter into the BlankDrv Setup Page

Exit Emulation

Windows: ESC key twice then use the “Reset”

Linux: Exit QEMU Linux





Summary

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

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ACKNOWLEDGEMENTS