UEFI & EDK II TRAINING

How to Write a UEFI Driver- Port Lab with Linux

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

Lesson Objective

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- Compile a UEFI driver template created from UEFI Driver Wizard

- Test driver in QEMU using UEFI Shell 2.0

- Port code in the template driver

Note: Since this is a lab, to follow examples for copy & paste, use the following Markdown link LabGuide.md

LAB 1: UEFI DRIVER TEMPLATE

Use this lab, if you're not able to create a UEFI Driver Template using the UEFI Driver Wizard.
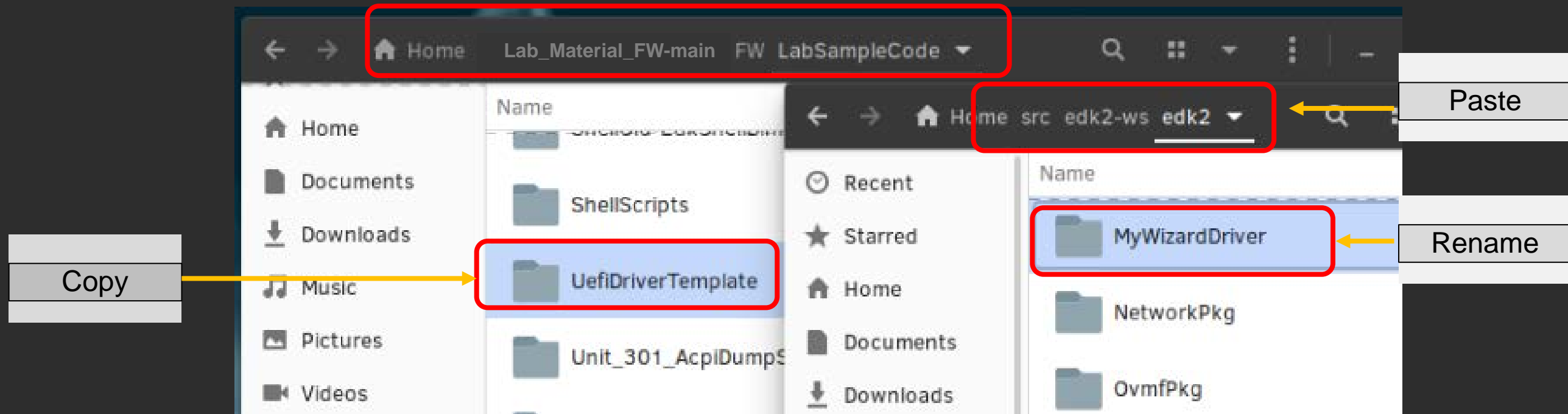
Skip if LAB 1 UEFI Driver Wizard completed successfully
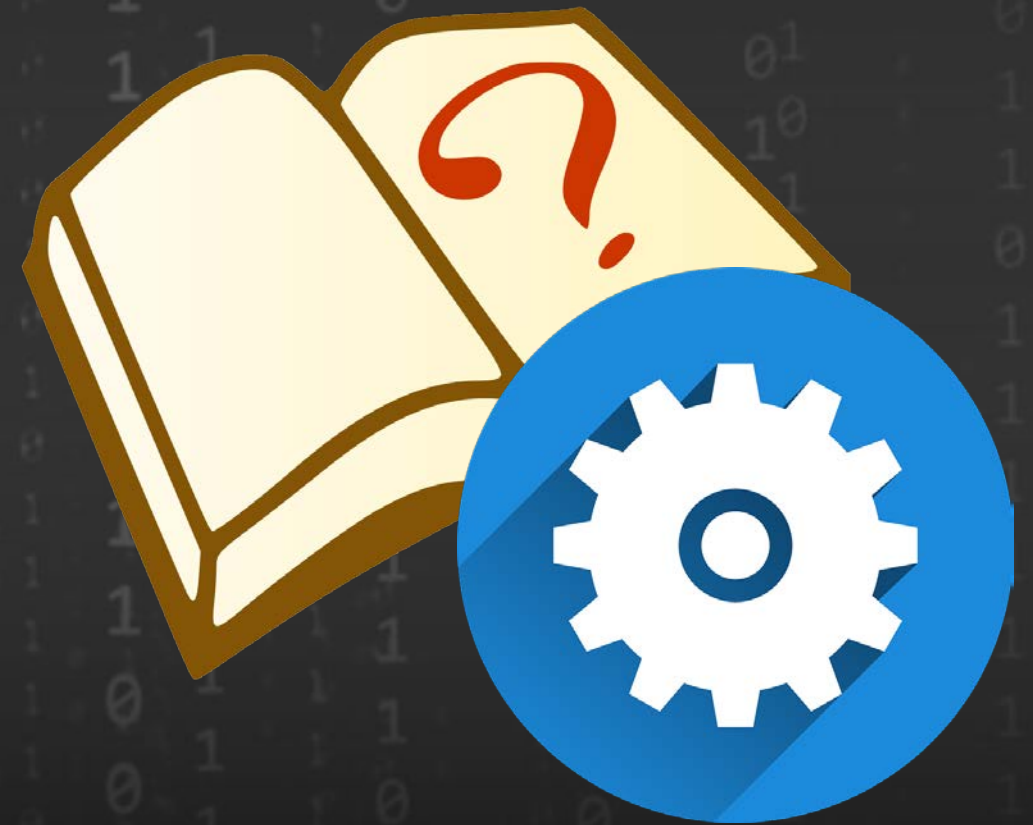
Lab 1: Get UEFI Driver Template

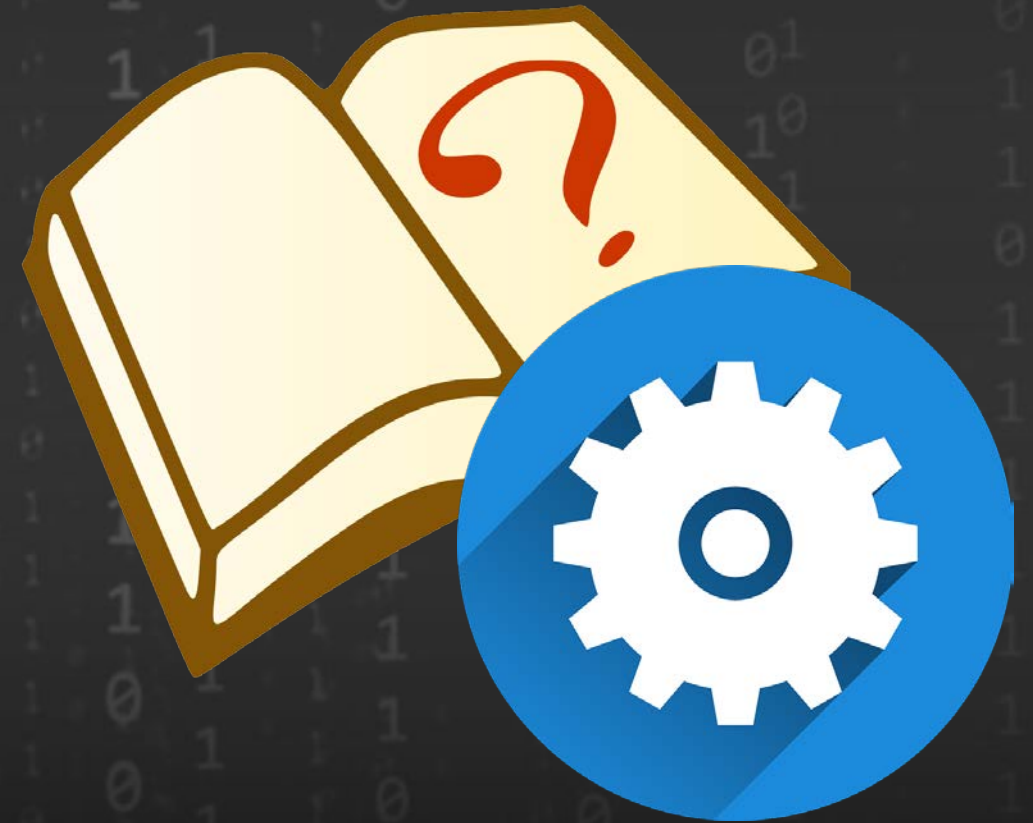Non-Ubuntu Linux users or Python UEFI Driver Wizard does not work:
1. Copy the directory `UefiDriverTemplate` from
   `~. . ./FW/LabSampleCode/` to `~/src/edk2-ws/edk2`
2. Rename Directory `UefiDriverTemplate to MyWizardDriver`

Review UEFI Driver Wizard Lab for protocols produced and which are being consumed

LAB 2: BUILDING A UEFI DRIVER

In this lab, you'll build a UEFI Driver created by the UEFI Driver Wizard. You will include the driver in the OVMF project. Build the UEFI Driver from the Driver Wizard

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Two Ways to Compile a Driver	
Standalone	*In a Project*
The build command directly compiles the .INF file	Include the .INF file in the project's .DSC file
Results: The driver's .EFI file is located in the Build directory	Results: The driver's .EFI file is a part of the project in the Build directory

Lab 2: Build the UEFI Driver

- Perform Lab Setup from previous Labs

- Open ~src/edk2-ws/edk2/OvmfPkg/OvmfPkgX64.dsc

- Add the following to the [Components] section:

Hint:add to the last module in the [Components] section

```
# Add new modules here
   MyWizardDriver/MyWizardDriver.inf{
      <LibraryClasses>    DebugLib|MdePkg/Library/UefiDebugLibConOut/UefiDebugLibConOut.inf
}
```

- Save and close the file ~src/edk2-ws/edk2/OvmfPkg/OvmfPkgX64.dsc

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Build MyWizardDriver – Cd to ~/src/edk2-ws/edk2 dir

```
bash$ . edksetup.sh
bash$ build
```

Build error Known issue from UEFI Driver Wizard:
  ComponentName.c Line 148 col 74 needs "//" in front of "## TO_START"

```
bash$ build
```

Build ERRORS: Copy the solution files from
~/.../FW/LabSampleCode/LabSolutions/LessonC.1 to ~/src/edk2-ws/edk2/MyWizardDriver

Lab 2: Build and Test Driver

Copy MyWizardDriver.efi to hda-contents

```
bash$ cd ~/run-ovmf/hda-contents
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/X64/MyWizardDriver.efi .
```

Test by Invoking Qemu

```
bash$ cd ~/run-ovmf
bash$ . RunQemu.sh
```

Load the UEFI Driver from the shell
At the Shell prompt, type `Shell> fs0:`
Type: `FS0:\> load MyWizardDriver.efi`

```
Shell> fs0:
FS0:\> load MyWizardDriver.efi
Image 'FS0:\MyWizardDriver.efi' loaded at 5E7F000 - Success
FS0:\> _
```

At the shell prompt Type: `drivers`

Verify the UEFI Shell loaded the new driver. The drivers command will display the driver information and a driver handle number ("a9" in the example screenshot)

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Lab 2: Test Driver

At the shell prompt using the handle from the drivers command,
Type: `dh -d a9`

Note: The value a9 is the driver handle for MyWizardDriver. The handle value may change based on your system configuration.(see example screenshot - right)

```
FS0:\> dh -d a9
A9: SupportedEfiSpecVersion(0x0002003C) ComponentName2 ComponentName DriverBin
ng HiiPackageList ImageDevicePath(..0xFBFC1)/\MyWizardDriver.efi) LoadedImage(
yWizardDriver.efi)
    Driver Name [A9]     : MyWizardDriver
    Driver Image Name    : \MyWizardDriver.efi
    Driver Version       : 00000000
    Driver Type          : <Unknown>
    Configuration        : NO
    Diagnostics          : NO
    Managing             : None
FS0:\> _
```

At the shell prompt using the handle from the drivers command, Type: `unload a9`

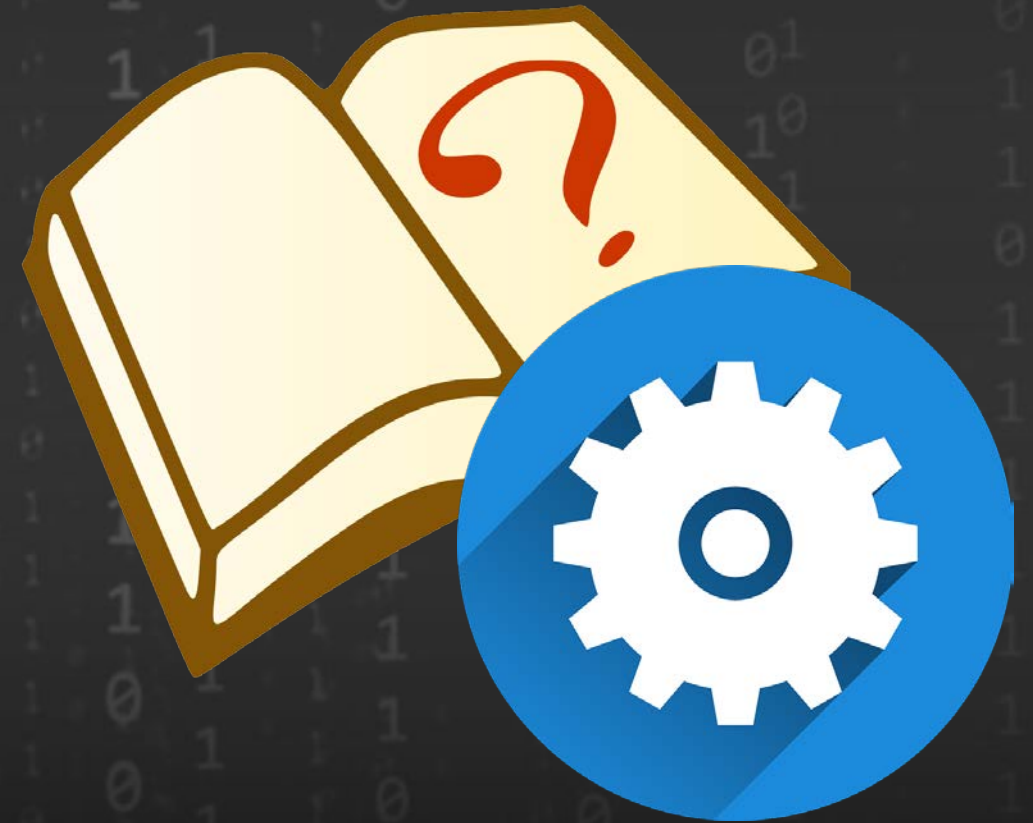See example screenshot - below
Type: `drivers` again

Notice results of unload command

Exit QEMU

```
managing          · none
FS0:\> unload a9
Unload - Handle [6B1B798].  [y/n]?
y
Unload - Handle [6B1B798] Result Success.
FS0:\> _
```

LAB 3: COMPONENT NAME

In this lab, you'll change the information reported to the drivers command using the `ComponentName` and `ComponentName2` protocols.

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- Open `~/src/edk2-ws/edk2/MyWizardDriver/ComponentName.c`

- Change the string returned by the driver from `MyWizardDriver` to:
  `UEFI Sample Driver`

```
/// Table of driver names
///
 GLOBAL_REMOVE_IF_UNREFERENCED
 EFI_UNICODE_STRING_TABLE mMyWizardDriverDriverNameTable[] = {
    { "eng;en", (CHAR16 *)L"UEFI Sample Driver" },
    { NULL, NULL }
 };
```

- Save and close the file: `~/src/edk2-ws/edk2/MyWizardDriver/ComponentName.c`

Lab 3: Build and Test Driver

Build MyWizardDriver – Cd to ~/src/edk2-ws/edk2 dir

```
bash$ build
```

Copy MyWizardDriver.efi to hda-contents

```
bash$ cd ~/run-ovmf/hda-contents
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/X64/MyWizardDriver.efi .
```

Test by Invoking Qemu

```
bash$ cd ~/run-ovmf
bash$ . RunQemu.sh
```

Load the UEFI Driver from the shell

At the Shell prompt, type `Shell> fs0:`

Type: `FS0:\> load MyWizardDriver.efi`

Type: `drivers`

Observe the change in the string
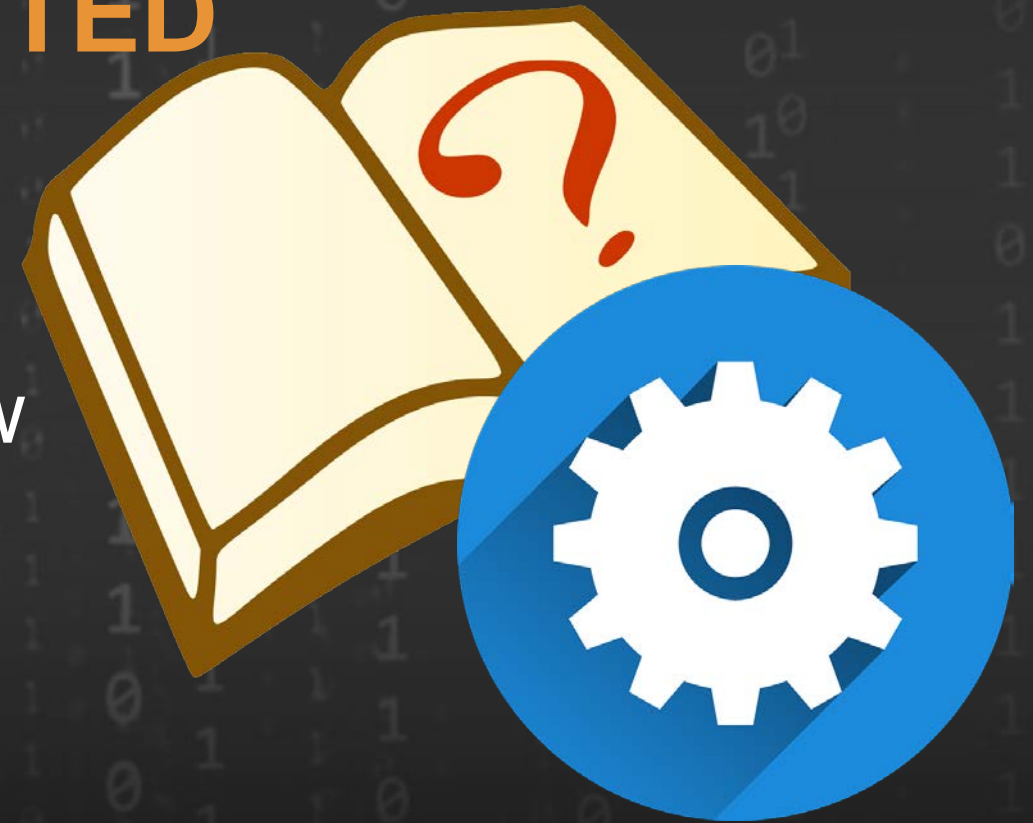that the driver returned

Exit QEMU

```
92 00000011 ? - -   -  - Usb Mass Storage Driver        UsbMassStorageDxe
93 00000010 B - -   1  1 QEMU Video Driver              QemuVideoDxe
94 00000010 ? - -   -  - Virtio GPU Driver              VirtioGpuDxe
A9 00000000 ? - -   -  - UEFI Sample Driver             \MyWizardDriver.efi
FS0:\> _
```

LAB 4: PORTING THE SUPPORTED & START FUNCTIONS

The UEFI Driver Wizard produced a starting point for driver porting … so now what?

In this lab, you'll port the "Supported" and "Start" functions for the UEFI driver

Review the Driver Binding Protocol

Supported()
Determines if a driver supports a controller

Start()
Starts a driver on a controller & Installs Protocols

Stop()
Stops a driver from managing a controller

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The UEFI Driver Wizard produced a `Supported()` function but it only returns `EFI_UNSUPPORTED`

Supported Goals:

- Checks if the driver supports the device for the specified controller handle

- Associates the driver with the Serial I/O protocol

- Helps locate a protocol's specific GUID through UEFI Boot Services' function
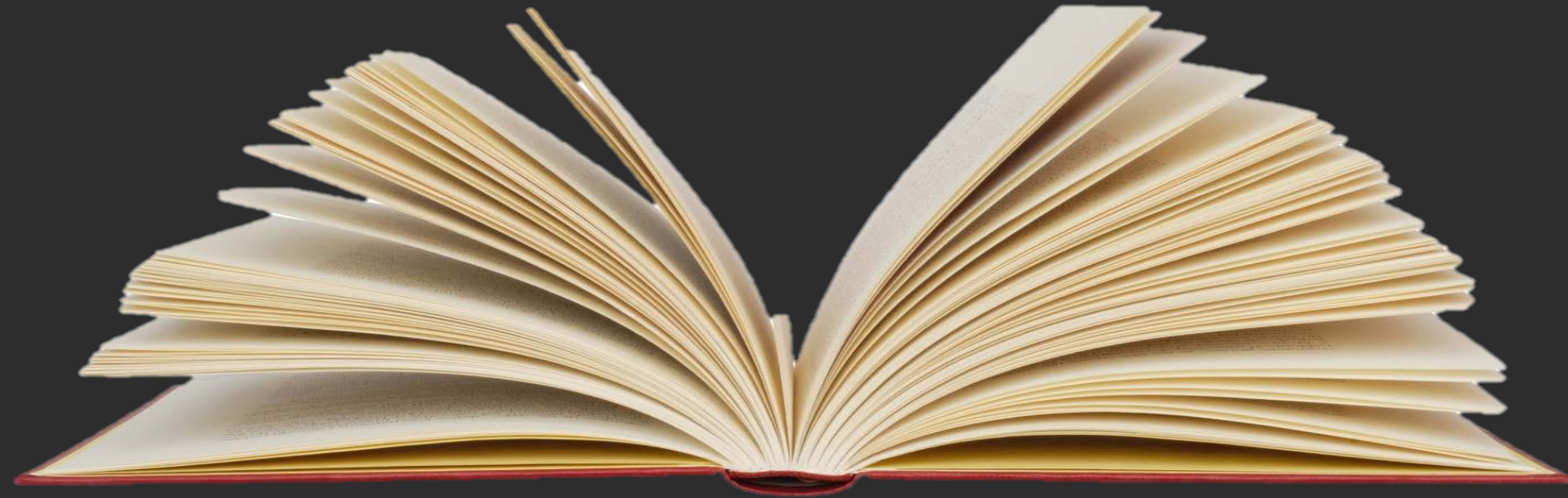
Lab 4: Help from Robust Libraries

EDK II has libraries to help with porting UEFI Drivers

AllocateZeroPool() include - [MemoryAllocationLib.h]

SetMem16() include - [BaseMemoryLib.h]

Check the MdePkg with libraries help file (.chm format)

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- Open ~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.c
- Locate MyWizardDriverDriverBindingSupported(), the supported function for this driver and comment out the "//" in the line: "return EFI_UNSUPPORTED; "

```
EFI_STATUS
EFIAPI
MyWizardDriverDriverBindingSupported (
  IN EFI_DRIVER_BINDING_PROTOCOL  *This,
  IN EFI_HANDLE                   ControllerHandle,
  IN EFI_DEVICE_PATH_PROTOCOL     *RemainingDevicePath OPTIONAL
  )
{
  // return EFI_UNSUPPORTED;
}
```

- copy and past (next slide)

Copy & Paste   the following code for the supported function

`MyWizardDriverDriverBindingSupported():`

```
    EFI_STATUS Status;
    EFI_SERIAL_IO_PROTOCOL *SerialIo;
    Status = gBS->OpenProtocol (
                    ControllerHandle,
                    &gEfiSerialIoProtocolGuid,
                    (VOID **) &SerialIo,
                    This->DriverBindingHandle,
                    ControllerHandle,
                    EFI_OPEN_PROTOCOL_BY_DRIVER | EFI_OPEN_PROTOCOL_EXCLUSIVE
                    );

if (EFI_ERROR (Status)) {
    return Status; // Bail out if OpenProtocol returns an error
}

    // We're here because OpenProtocol was a success, so clean up
    gBS->CloseProtocol (
        ControllerHandle,
        &gEfiSerialIoProtocolGuid,
        This->DriverBindingHandle,
        ControllerHandle
        );

    return EFI_SUCCESS;
```

Lab 4: Notice UEFI Driver Wizard Includes

- Open ~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.h
- Notice the following include statement is already added by the driver wizard:

```
// Produced Protocols
//
#include <Protocol/SerialIo.h>
```

- Review the Libraries section and see that UEFI Driver Wizard automatically includes library headers based on the form information. Also, other common library headers were included

```
// Libraries
//
#include <Library/UefiBootServicesTableLib.h>
#include <Library/MemoryAllocationLib.h>
#include <Library/BaseMemoryLib.h>
#include <Library/BaseLib.h>
#include <Library/UefiLib.h>
#include <Library/DevicePathLib.h>
#include <Library/DebugLib.h>
```

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- **Copy & Paste** the following in `MyWizardDriver.c` after the `#include "MyWizardDriver.h"` line:

```
#define   DUMMY_SIZE 100*16            // Dummy buffer
CHAR16       *DummyBufferfromStart = NULL;
```

Locate MyWizardDriverDriverBindingStart(), the start function for this driver and comment out the "//" in the line "return `EFI_UNSUPPORTED; `"

```
EFI_STATUS
EFIAPI
MyWizardDriverDriverBindingStart (
  IN EFI_DRIVER_BINDING_PROTOCOL  *This,
  IN EFI_HANDLE                   ControllerHandle,
  IN EFI_DEVICE_PATH_PROTOCOL     *RemainingDevicePath OPTIONAL
  )
{
  // return EFI_UNSUPPORTED;
}
```

Lab 4: Update Start Add Code

Copy & Paste the following code for the start function

`MyWizardDriverDriverBindingStart():`

```
    if (DummyBufferfromStart == NULL) {      // was buffer already allocated?
        DummyBufferfromStart = (CHAR16*)AllocateZeroPool (DUMMY_SIZE * sizeof(CHAR16));
    }

    if (DummyBufferfromStart == NULL) {
        return EFI_OUT_OF_RESOURCES;     // Exit if the buffer isn't there
    }

    SetMem16 (DummyBufferfromStart, (DUMMY_SIZE * sizeof(CHAR16)), 0x0042);  // Fill buffer

    return EFI_SUCCESS;
```

- Notice the Library calls to `AllocateZeroPool()` and `SetMem16()`
- The `Start()` function is where there would be calls to `"gBS-InstallMultipleProtocolInterfaces()"`

Lab 4: Debugging before Testing the Driver

UEFI drivers can use the EDK II debug library

DEBUG( ) include - [DebugLib.h]

DEBUG() Macro statements can show status progress interest points throughout the driver code

```
Developer Command Prompt for VS2015 - RunEmulator.bat
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
 BlockSize : 512
 LastBlock : FFFFFFFFFFFFFFFF
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Not Supported
[MyWizardDriver] Supported SUCCESS
[MyWizardDriver] Buffer pointer 0x19818738018
Terminal - Mode 0, Column = 80, Row = 25
Terminal - Mode 1, Column = 80, Row = 50
Terminal - Mode 2, Column = 100, Row = 31
[2J[01;01H[=3h[2J[01;01HPROGRESS CODE: V01040001 I0
InstallProtocolInterface: 387477C1-69C7-11D2-8E39-00A0C969723B 19818739EC0
InstallProtocolInterface: DD9E7534-7762-4698-8C14-F58517A625AA 19818739FA8
InstallProtocolInterface: 387477C2-69C7-11D2-8E39-00A0C969723B 19818739ED8
InstallProtocolInterface: 09576E91-6D3F-11D2-8E39-00A0C969723B 19818958D98
[MyWizardDriver] Not Supported
```

Lab 4: Add Debug Statements Supported()

Copy & Paste the following `DEBUG()` macros for the supported function:

```
Status = gBS->OpenProtocol(
      ControllerHandle,
      &gEfiSerialIoProtocolGuid,
      (VOID **)&SerialIo,
      This->DriverBindingHandle,
      ControllerHandle,
      EFI_OPEN_PROTOCOL_BY_DRIVER | EFI_OPEN_PROTOCOL_EXCLUSIVE
      );

    if (EFI_ERROR(Status)) {
      DEBUG((EFI_D_INFO, "[MyWizardDriver] Not Supported \r\n"));
      return Status; // Bail out if OpenProtocol returns an error
    }

    // We're here because OpenProtocol was a success, so clean up
    gBS->CloseProtocol(
      ControllerHandle,
      &gEfiSerialIoProtocolGuid,
      This->DriverBindingHandle,
      ControllerHandle
      );
    DEBUG((EFI_D_INFO, "[MyWizardDriver] Supported SUCCESS\r\n"));
    return EFI_SUCCESS;
```

Lab 4: Add Debug Statements Start()

Copy & Paste the following DEBUG macro for the Start function just before the `return EFI_SUCCESS;` statement

```
DEBUG ((EFI_D_INFO, "\r\n***\r\n[MyWizardDriver] Buffer 0x%p\r\n", DummyBufferfromStart));
return EFI_SUCCESS;
```

Note: This debug macro displays the memory address of the allocated buffer on the debug console

Save `~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.c`

Lab 4: Build and Test Driver

Build MyWizardDriver – Cd to ~/src/edk2-ws/edk2 dir

```
bash$ build
```

Copy MyWizardDriver.efi to hda-contents

```
bash$ cd ~/run-ovmf/hda-contents
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/X64/MyWizardDriver.efi .
```

Test by Invoking Qemu

```
bash$ cd ~/run-ovmf
bash$ . RunQemu.sh
```

Load the UEFI Driver from the shell

At the Shell prompt, type `Shell> fs0:`

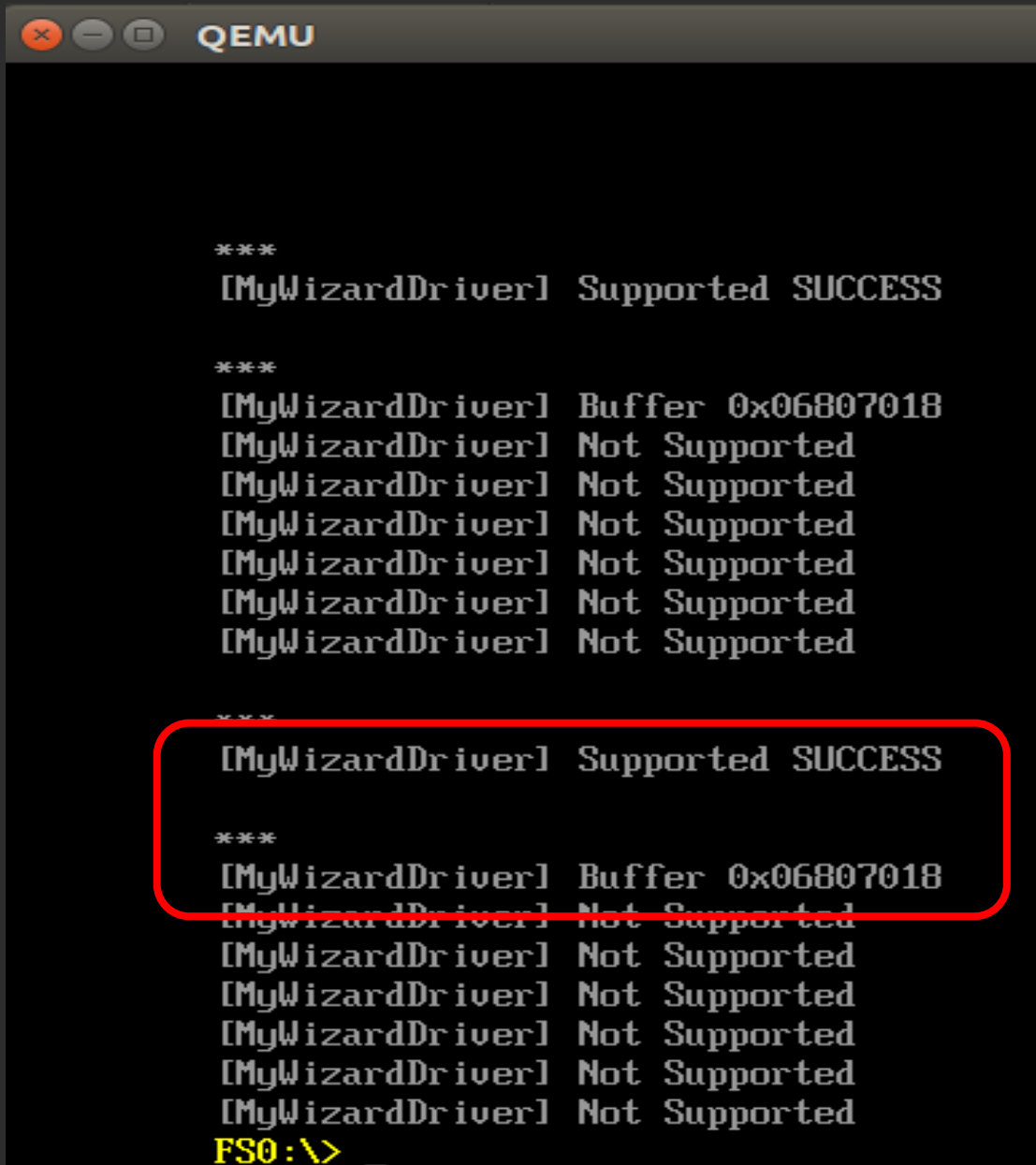Type: `FS0:\>  load MyWizardDriver.efi`

```
Shell> fs0:
FS0:\> load MyWizardDriver.efi
Image 'FS0:\MyWizardDriver.efi' loaded at 5E7F000 - Success
FS0:\> _
```

Lab 4: Build and Test Driver

- Check the QEMU debug console output.

- Notice Debug messages indicate the driver did not return EFI_SUCCESS from the "Supported()" function most of the time.

- See that the "Start()" function did get called and a Buffer was allocated.

Exit QEMU

LAB 5: CREATE A NVRAM VARIABLE

In this lab you'll create a non-volatile UEFI variable (NVRAM), and set and get the variable to return a successful supported function

Use Runtime services to "SetVariable()" and "GetVariable()"
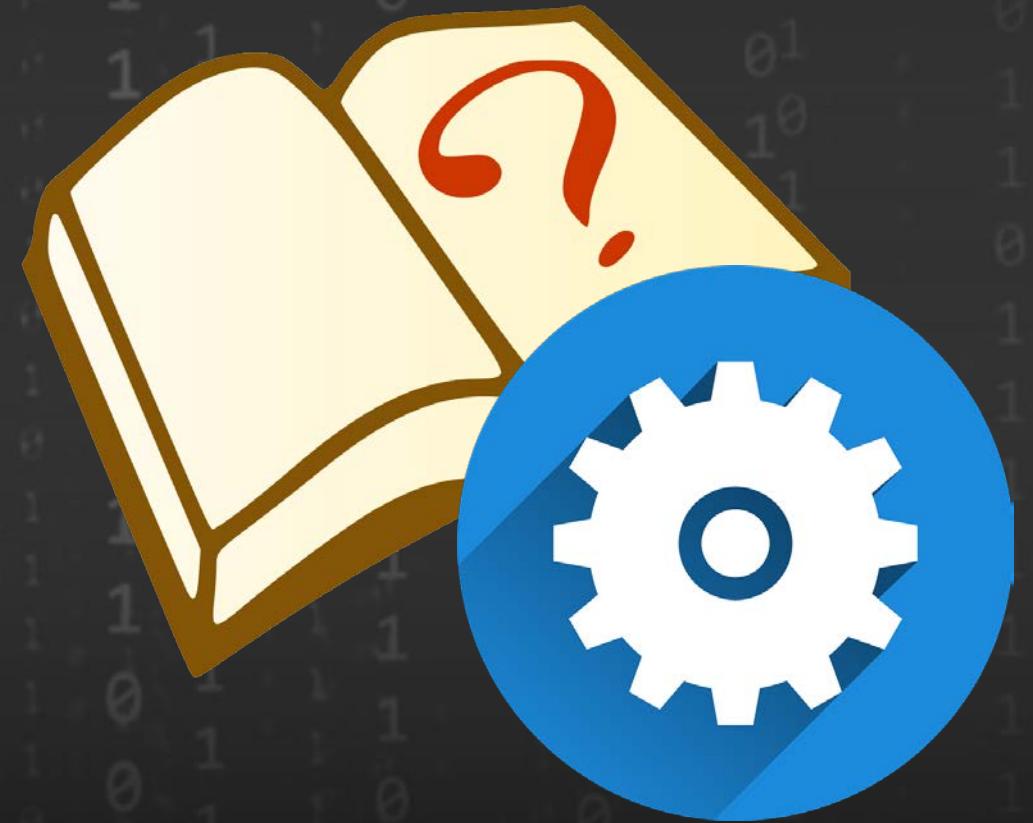
Lab 5: Adding a NVRAM Variable Steps

1. Create .h file with new `typedef` definition and its own `GUID`

2. Include the new .h file in the driver's top .h file

3. In the `Start()` make a call to a new function to set/get the new NVRam Variable

4. Before `EntryPoint()` add the new function `CreateNVVariable()` to the driver.c file.

Lab 5: Create a new .h file

Create a new file in your editor called: "MyWizardDriverNVDataStruc.h"

Copy, Paste and then **Save** this file

```
#ifndef _MYWIZARDDRIVERNVDATASTRUC_H_
#define _MYWIZARDDRIVERNVDATASTRUC_H_
#include <Guid/HiiPlatformSetupFormset.h>
#include <Guid/HiiFormMapMethodGuid.h>

#define MYWIZARDDRIVER_VAR_GUID \
  { \
    0x363729f9, 0x35fc, 0x40a6, 0xaf, 0xc8, 0xe8, 0xf5, 0x49, 0x11, 0xf1, 0xd6 \
  }

#pragma pack(1)
typedef struct {

    UINT16  MyWizardDriverStringData[20];
    UINT8   MyWizardDriverHexData;
    UINT8   MyWizardDriverBaseAddress;
    UINT8   MyWizardDriverChooseToEnable;

} MYWIZARDDRIVER_CONFIGURATION;

#pragma pack()
#endif
```

Lab 5: Update MyWizardDriver.c

Open "~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.c"

Copy & Paste the following 4 lines after the #include "MyWizardDriver.h" statement:

```
#include "MyWizardDriver.h"

EFI_GUID    mMyWizardDriverVarGuid = MYWIZARDDRIVER_VAR_GUID;

CHAR16      mVariableName[] = L"MWD_NVData";  // Use Shell "Dmpstore" to see
MYWIZARDDRIVER_CONFIGURATION    mMyWizDrv_Conf_buffer;
MYWIZARDDRIVER_CONFIGURATION    *mMyWizDrv_Conf = &mMyWizDrv_Conf_buffer;  //use the pointer
```

Lab 5: Update MyWizardDriver.c

Locate "MyWizardDriverDriverBindingStart ()" function

Copy & Paste at the beginning of the start function to declare a local variable

```
    EFI_STATUS                    Status;  // Declare a local variable Status
```

Copy & Paste the 6 lines: 1) new call to "CreateNVVariable();", 2-6) if statement with DEBUG just before the line "return EFI_SUPPORTED" as below:

```
Status = CreateNVVariable();
if (EFI_ERROR(Status)) {
      DEBUG((EFI_D_ERROR, "[MyWizardDriver] NV Variable already created \r\n"));
   }
   else {
      DEBUG((EFI_D_ERROR, "[MyWizardDriver] Created NV Variable in the Start \r\n"));
   }

   return EFI_SUCCESS;
```

Lab 5: Update MyWizardDriver.c

Copy & Paste the new function before the call to "`MyWizardDriverDriverEntryPoint()`"

```
EFI_STATUS
EFIAPI
CreateNVVariable()
{
    EFI_STATUS                    Status;
    UINTN                         BufferSize;

    BufferSize = sizeof (MYWIZARDDRIVER_CONFIGURATION);
    Status = gRT->GetVariable(
        mVariableName,
        &mMyWizardDriverVarGuid,
        NULL,
        &BufferSize,
        mMyWizDrv_Conf
        );
    if (EFI_ERROR(Status)) {  // Not definded yet so add it to the NV Variables.
        if (Status == EFI_NOT_FOUND) {
            Status = gRT->SetVariable(
                mVariableName,
                &mMyWizardDriverVarGuid,
                EFI_VARIABLE_NON_VOLATILE | EFI_VARIABLE_BOOTSERVICE_ACCESS,
                sizeof (MYWIZARDDRIVER_CONFIGURATION),
                mMyWizDrv_Conf   //  buffer is 000000  now for first time set
                );
            DEBUG((EFI_D_INFO, "[MyWizardDriver] Variable %s created in NVRam Var\r\n", mVariableName));
            return EFI_SUCCESS;
        }
    }
    // already defined once
    return EFI_UNSUPPORTED;
}
```

- Note: the `gRT->GetVariable` and `gRT->SetVariable` use Runtime services table
- The Runtime Services Table was not automatically included with the Driver Wizard

Open "~/src/edk2/MyWizardDriver/MyWizardDriver.h"

Copy & Paste the following "#include" after the list of library include statements:

```
// Libraries
// . . .
#include <Library/UefiRuntimeServicesTableLib.h>
```

Copy & Paste the following "#include" after the list of protocol include statements:

```
// Produced Protocols
// . . .
#include "MyWizardDriverNVDataStruc.h"
```

Save "~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.h"

Save "~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.c"

Lab 5: Build and Test Driver

Build MyWizardDriver – Cd to ~/src/edk2 dir

```
bash$ build
```

Copy MyWizardDriver.efi to hda-contents

```
bash$ cd ~/run-ovmf/hda-contents
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/X64/MyWizardDriver.efi .
```

Test by Invoking Qemu

```
bash$ cd ~/run-ovmf
bash$ . RunQemu.sh
```

Load the UEFI Driver from the shell

At the Shell prompt, type `Shell> fs0:`

Type: `FS0:\> load MyWizardDriver.efi`

Observe the Buffer address returned by the debug statement

```
Shell> fs0:
FS0:\> load MyWizardDriver.efi
Image 'FS0:\MyWizardDriver.efi' loaded at 6801000 - Success
[MyWizardDriver] Supported SUCCESS with Faux Supported by NVRam Var

***
[MyWizardDriver] Buffer 0x06808018
```

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At the Shell prompt, type `FS0:\> mem 0x6808018`

Observe the Buffer is filled with the letter "B" or 0x0042

```
[MyWizardDriver] Buffer 0x06808018
FS0:\>
FS0:\> mem 0x6808018
Memory Address 0000000006808018 200 Bytes
  06808018: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
  06808028: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
  06808038: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
  06808048: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
  06808058: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
  06808068: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B.B.B.B.B.B.B.*
```

Lab 5: Verify NVRAM Created by Driver

At the Shell prompt, type `FS0:\> dmpstore -all -b`

Observe new the NVRAM variable "MWD_NVData" was created and filled with 0x00s

```
FS0:\> dmpstore -all -b
Variable NV+BS '363729F9-35FC-40A6-AFC8-E8F54911F1D6:MWD_NVData' DataSize = 0x2B

  00000000: 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00  *................*
  00000010: 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00  *................*
  00000020: 00 00 00 00 00 00 00 00-00 00 00              *...........*
```

Exit QEMU

LAB 6: PORT STOP AND UNLOAD

In this lab, you'll port the driver's "Unload" and "Stop" functions to free any resources the driver allocated when it was loaded and started.
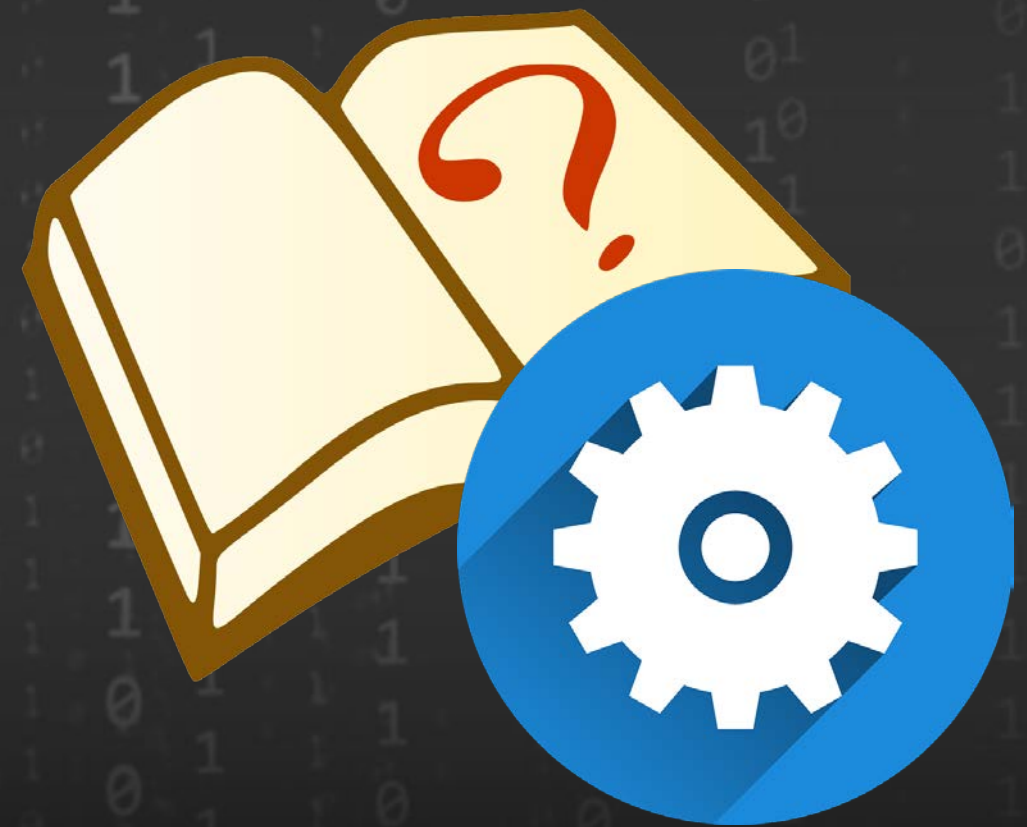
Lab 6: Port the Unload function

Open "~/src/edk2-ws/edk2/MyWizardDriver/MyWizardDriver.c"

Locate "MyWizardDriverUnload ()" function

Copy & Paste the following "if" and "DEBUG" statements before the "return EFI_SUCCESS;" statement.

```
// Do any additional cleanup that is required for this driver
//
if (DummyBufferfromStart != NULL) {
    FreePool(DummyBufferfromStart);
    DEBUG((EFI_D_INFO, "[MyWizardDriver] Unload, clear buffer\r\n"));
}
DEBUG((EFI_D_INFO, "[MyWizardDriver] Unload success\r\n"));

return EFI_SUCCESS;
```

Lab 6: Port the Stop function

Locate "MyWizardDriverDriverBindingStop ()" function

Comment out with "//" before the "return EFI_UNSUPPORTED;" statement.

Copy & Paste the following "if" and "DEBUG" statements before the "return EFI_SUCCESS;" statement.

```
if (DummyBufferfromStart != NULL) {
      FreePool(DummyBufferfromStart);
      DEBUG((EFI_D_INFO, "[MyWizardDriver] Stop, clear buffer\r\n"));
  }
  DEBUG((EFI_D_INFO, "[MyWizardDriver] Stop, EFI_SUCCESS\r\n"));

  return EFI_SUCCESS;
//  return EFI_UNSUPPORTED;
}
```

Save & Close "MyWizardDriverDriver.c"

Lab 6: Build and Test Driver

Build MyWizardDriver – Cd to ~/src/edk2-ws/edk2 dir

```
bash$ build
```

Copy MyWizardDriver.efi to hda-contents

```
bash$ cd ~/run-ovmf/hda-contents
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/X64/MyWizardDriver.efi .
```

Test by Invoking Qemu

```
bash$ cd ~/run-ovmf
bash$ . RunQemu.sh
```

Load the UEFI Driver from the shell

At the Shell prompt, type `Shell> fs0:`

Type: `FS0:\> load MyWizardDriver.efi`

Observe the Buffer address is at 0x06808018 as this slide example

```
Shell> fs0:
FS0:\> load MyWizardDriver.efi
Image 'FS0:\MyWizardDriver.efi' loaded at 6801000 - Success
[MyWizardDriver] Supported SUCCESS with Faux Supported by NVRam Var


***
[MyWizardDriver] Buffer 0x06808018
```

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At the Shell prompt, type `FS0:\> drivers`

Observe the handle is "A9" as this slide example

Type: `mem 0x06808018`

Observe the buffer was filled with the "0x0042"

```
92 00000011 ? - - - - Usb Mass Storage Driver       UsbMassSt
93 00000010 B - - 1 1 QEMU Video Driver             QemuVideo
94 00000010 ? - - - - Virtio GPU Driver             VirtioGpu
A9 00000000 ? - - - - UEFI Sample Driver            \MyWizard
FS0:\>
```

```
[MyWizardDriver] Buffer 0x06808018
FS0:\>
FS0:\> mem 0x6808018
Memory Address 0000000006808018 200 Bytes
  06808018: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
  06808028: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
  06808038: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
  06808048: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
  06808058: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
  06808068: 42 00 42 00 42 00 42 00-42 00 42 00 42 00 42 00  *B.B
```

At the Shell prompt, type `FS0:\> unload a9`

Observe the DEBUG messages from the Unload

```
Hanaying         . None
FS0:\> unload a9
Unload - Handle [6B1B798].  [y/n]?
y
Unload - Handle [6B1B798] Result Success.
FS0:\>
```

```
[MyWizardDriver] Unload, clear buffer
[MyWizardDriver] Unload success
```

Lab 6: Verify Unload

At the Shell prompt, type `FS0:\> mem 0x06808018 -b`

Observe the buffer is now NOT filled

```
FS0:\> mem 6808018
Memory Address 0000000006808018 200 Bytes
  06808018: AF AF AF AF AF AF AF AF-AF AF AF AF AF AF AF AF  *................*
  06808028: AF AF AF AF AF AF AF AF-AF AF AF AF AF AF AF AF  *................*
  06808038: AF AF AF AF AF AF AF AF-AF AF AF AF AF AF AF AF  *................*
  06808048: AF AF AF AF AF AF AF AF-AF AF AF AF AF AF AF AF  *................*
```
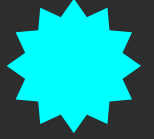
Exit QEMU

Adding strings and forms to setup (HII)

Publish & consume protocols

Hardware initialization

Refer to the UEFI Drivers Writer's Guide for more tips– Pdf link

Lesson Objective

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- Compile a UEFI driver template created from UEFI Driver Wizard

- Test driver in QEMU using UEFI Shell 2.2

- Port code into the template driver

Questions?

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