tianocore

UEFI & EDK II Training

EDK II Debugging with Windows Lab

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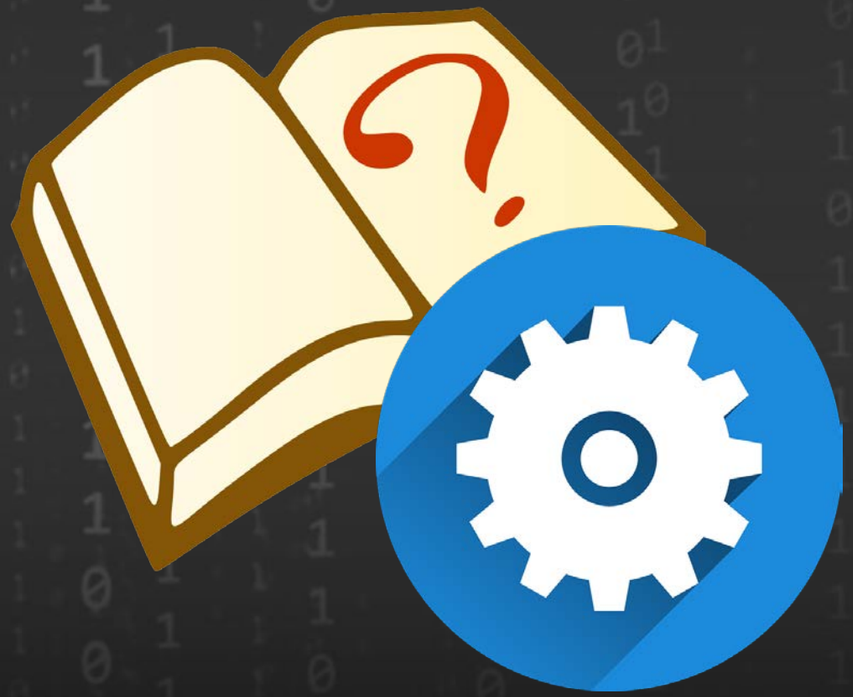
LESSON OBJECTIVE

- Using PCDs to Configure `DebugLib` - LAB
- Change the `DebugLib` instance to modify the debug output - LAB
- Debug EDK II using VS Debugger - LAB

Lab 1 – Adding Debug Statements

In this lab, you'll add debug statements to the previous lab's SampleApp UEFI Shell application



Lab 1: Catch up from previous lab

Skip if Lab Writing UEFI App Lab completed (Lab Guide)

- Perform Lab Setup from previous Labs (Lab Guide)
- Create a Directory under the workspace `C:/FW/edk2-ws/edk2` “`SampleApp`”
- Copy contents of `C:../FW/LabSampleCode/SampleAppDebug` to `C:/FW/edk2-ws/edk2/SampleApp`
- Open `C:/FW/edk2/EmulatorPkg/EmulatorPkg.dsc`
- Add the following to the [Components] section:

```
# Add new modules here
 SampleApp/SampleApp.inf
```

- Save and close the file `EmulatorPkg.dsc`

Lab 1: Add debug statements to SampleApp

- Open a VS Command Prompt and type: `cd C:/FW/edk2-ws` then

```
C:/FW/edk2-ws > setenv.bat
C:/FW/edk2-ws > cd edk2
C:/FW/edk2-ws/edk2 > edksetup
```

- Open `C:/FW/edk2-ws/edk2/SampleApp/SampleApp.c`

- Add the following to the include statements at the top of the file after below the last “`include`” statement:

```
#include <Library/DebugLib.h>
```

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Lab 1: Add debug statements to SampleApp

Locate the UefiMain function. Then copy and paste the following code after the "`EFI_INPUT_KEY  KEY;`" statement: and before the first `Print()` statement as shown in the screen shot below:

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```
DEBUG ((0xffffffff, "\n\nUEFI Base Training DEBUG DEMO\n") );
DEBUG ((0xffffffff, "0xffffffff USING DEBUG ALL Mask Bits Set\n") );

DEBUG ((DEBUG_INIT,     " 0x%08x USING DEBUG DEBUG_INIT\n" , (UINTN)(DEBUG_INIT))  );
DEBUG ((DEBUG_WARN,     " 0x%08x USING DEBUG DEBUG_WARN\n", (UINTN)(DEBUG_WARN))  );
DEBUG ((DEBUG_LOAD,     " 0x%08x USING DEBUG DEBUG_LOAD\n", (UINTN)(DEBUG_LOAD))  );
DEBUG ((DEBUG_FS,       " 0x%08x USING DEBUG DEBUG_FS\n", (UINTN)(DEBUG_FS))  );
DEBUG ((DEBUG_POOL,     " 0x%08x USING DEBUG DEBUG_POOL\n", (UINTN)(DEBUG_POOL))  );
DEBUG ((DEBUG_PAGE,     " 0x%08x USING DEBUG DEBUG_PAGE\n", (UINTN)(DEBUG_PAGE))  );
DEBUG ((DEBUG_INFO,     " 0x%08x USING DEBUG DEBUG_INFO\n", (UINTN)(DEBUG_INFO))  );
DEBUG ((DEBUG_DISPATCH, " 0x%08x USING DEBUG DEBUG_DISPATCH\n",(UINTN)(DEBUG_DISPATCH)));
DEBUG ((DEBUG_VARIABLE, " 0x%08x USING DEBUG DEBUG_VARIABLE\n",(UINTN)(DEBUG_VARIABLE)));
DEBUG ((DEBUG_BM,       " 0x%08x USING DEBUG DEBUG_BM\n", (UINTN)(DEBUG_BM))  );
DEBUG ((DEBUG_BLKIO,    " 0x%08x USING DEBUG DEBUG_BLKIO\n", (UINTN)(DEBUG_BLKIO))  );
DEBUG ((DEBUG_NET,      " 0x%08x USING DEBUG DEBUG_NET\n", (UINTN)(DEBUG_NET))  );
DEBUG ((DEBUG_UNDI,     " 0x%08x USING DEBUG DEBUG_UNDI\n", (UINTN)(DEBUG_UNDI))  );
DEBUG ((DEBUG_LOADFILE, " 0x%08x USING DEBUG DEBUG_LOADFILE\n",(UINTN)(DEBUG_LOADFILE)));
DEBUG ((DEBUG_EVENT,    " 0x%08x USING DEBUG DEBUG_EVENT\n", (UINTN)(DEBUG_EVENT))  );
DEBUG ((DEBUG_GCD,      " 0x%08x USING DEBUG DEBUG_GCD\n", (UINTN)(DEBUG_EVENT)) );
DEBUG ((DEBUG_CACHE,    " 0x%08x USING DEBUG DEBUG_CACHE\n", (UINTN)(DEBUG_CACHE)) );
DEBUG ((DEBUG_VERBOSE,  " 0x%08x USING DEBUG DEBUG_VERBOSE\n", (UINTN)(DEBUG_VERBOSE)) );
DEBUG ((DEBUG_ERROR,    " 0x%08x USING DEBUG DEBUG_ERROR\n", (UINTN)(DEBUG_ERROR))  );
```

Lab 1: Build, Run and Test Result

At the VS Command Prompt

```
$> Build
$> RunEmulator.bat
```

Run the application from the shell

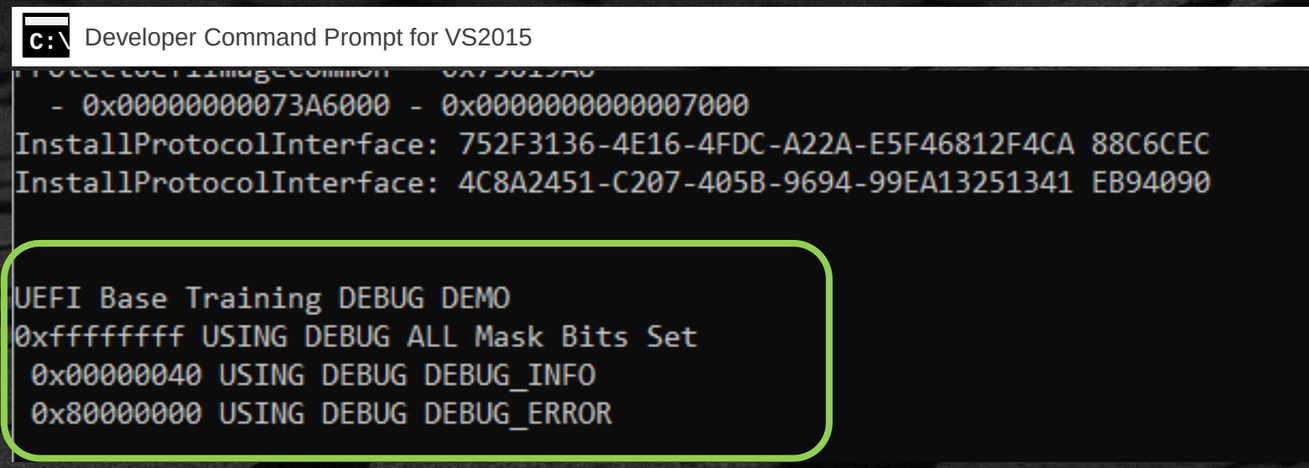
```
Shell> SampleApp
```

Check the VS Debug output

Exit

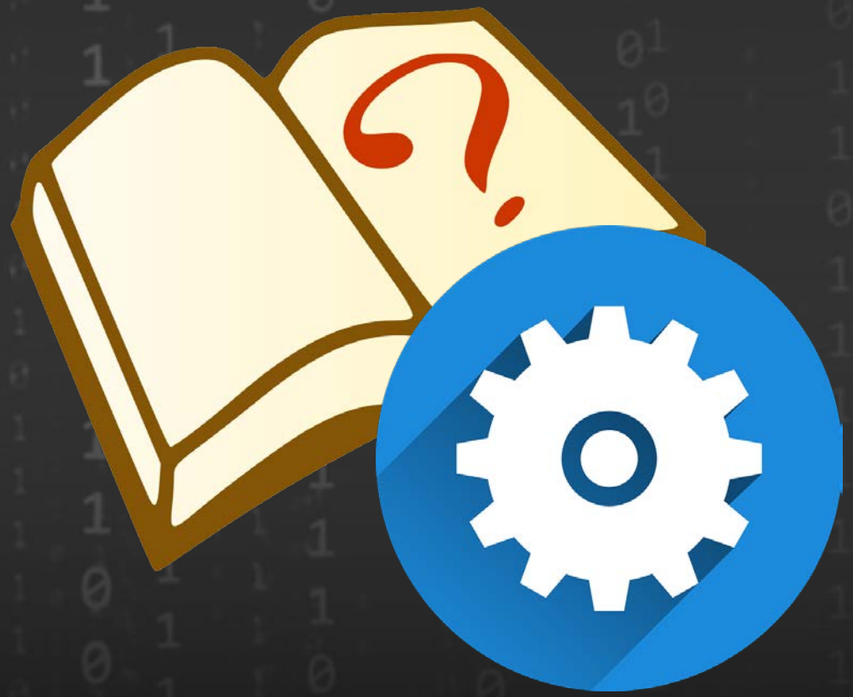
```
Shell> Reset
```

Visual Studio command prompt window output



Lab 2 – Changing PCD Value

In this lab, you'll learn how to use PCD values to change debugging capabilities.



Lab 2: Change PCDs for SampleApp

Open `C:/FW/edk2-ws/edk2/EmulatorPkg/EmulatorPkg.dsc`
Replace `SampleApp/SampleApp.inf` with the following:

```
SampleApp/SampleApp.inf {
   <PcdsFixedAtBuild>
    gEfiMdePkgTokenSpaceGuid.PcdDebugPropertyMask|0xff
    gEfiMdePkgTokenSpaceGuid.PcdDebugPrintErrorLevel|0xffffffff
 }
```

Save and **close** `EmulatorPkg.dsc`

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Lab 2: Build, Run and Test Result

At the VS Command Prompt

```
$> Build
$> RunEmulator.bat
```

Run the application from the shell

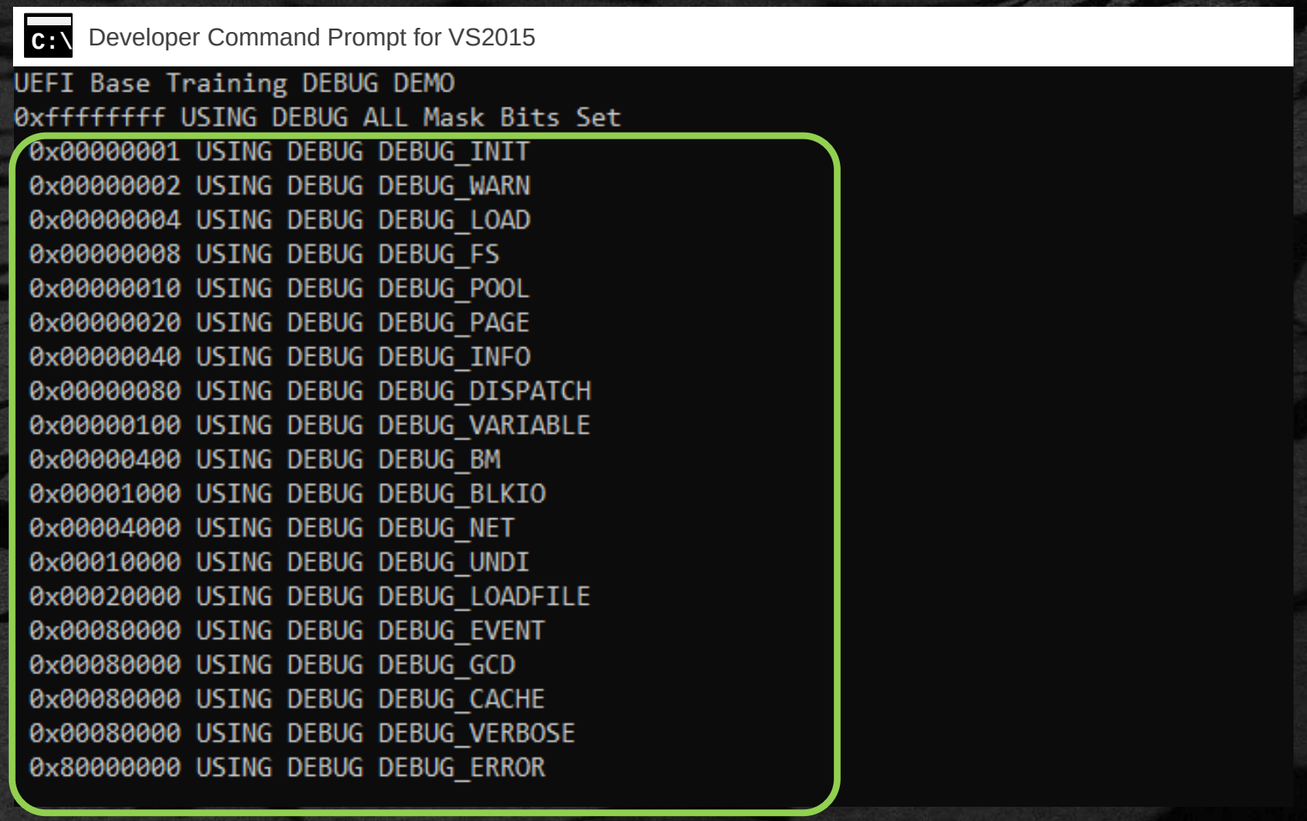
```
Shell> SampleApp
```

Check the VS Debug output

Exit

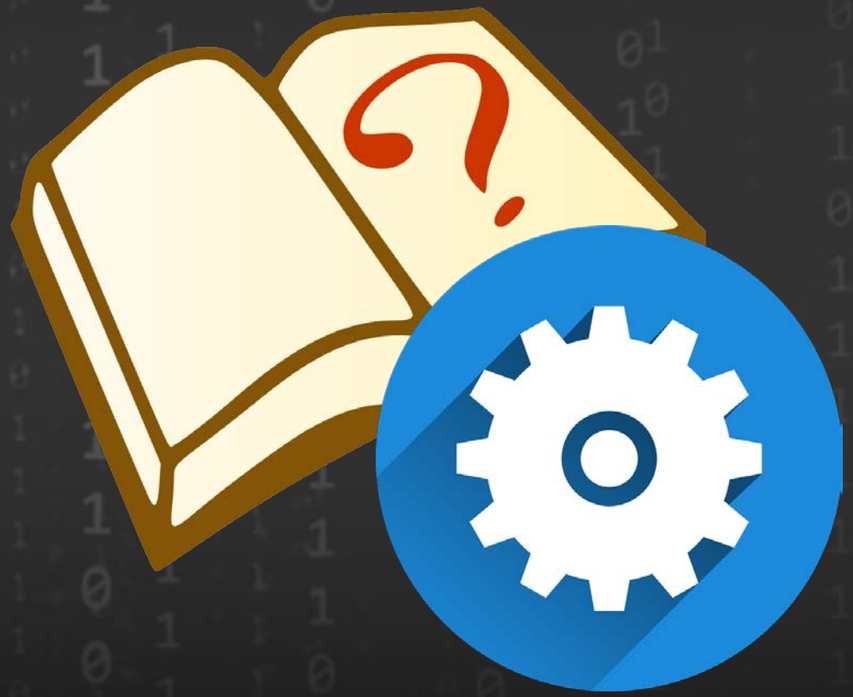
```
Shell> Reset
```

Visual Studio command prompt window output



Lab 3 – Library Instances for Debugging

In this lab, you'll learn how to add specific debug library instances.



Lab 3: Using Library Instances for Debugging

Open `C:/FW/edk2-ws/edk2/EmulatorPkg/EmulatorPkg.dsc`
Replace `SampleApp/SampleApp.inf { . . .}` with the following:

```
SampleApp/SampleApp.inf {
   <LibraryClasses>
    DebugLib|MdePkg/Library/UefiDebugLibConOut/UefiDebugLibConOut.inf
 }
```

Save and **close** `EmulatorPkgPkg.dsc`

LabGuide.md Slide for Copy and paste

Lab 3: Build, Run and Test Result

At the VS Command Prompt

```
$> Build
$> RunEmulator.bat
```

Run the application from the shell

```
Shell> SampleApp
```

See that the output from the Debug statements now goes to the console

Exit

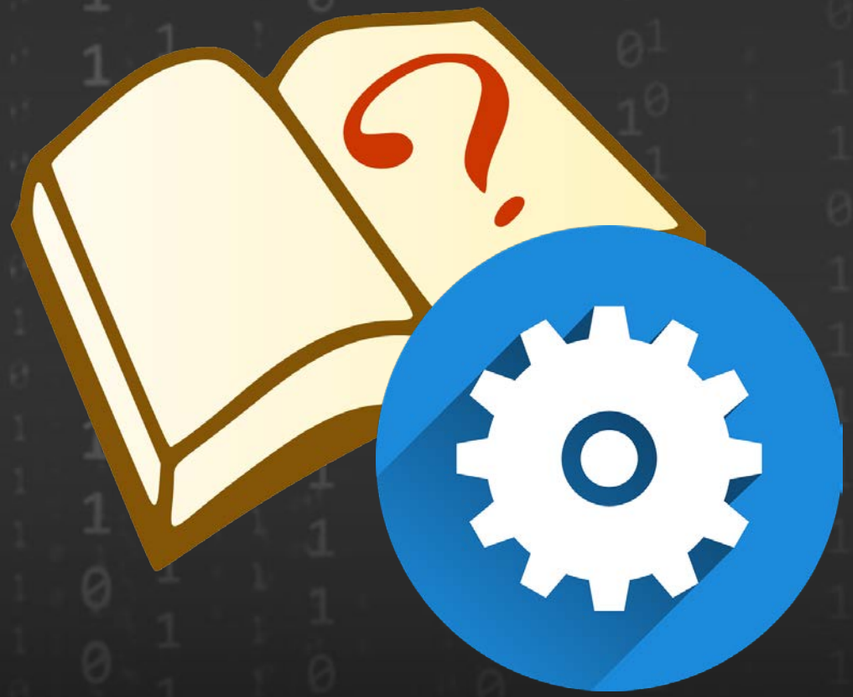
```
Shell> Reset
```

Debug output to console

```
Shell> sampleapp

                                                    EmulatorPkg

UEFI Base Training DEBUG DEMO
0xffffffff USING DEBUG ALL Mask Bits Set
 0x00000040 USING DEBUG DEBUG_INFO
 0x80000000 USING DEBUG DEBUG_ERROR
System Table: 0xB7A7C018

Press any Key to continue :
```

Lab 4: Null Instance of `DebugLib`

In this lab, you'll change the `DebugLib` to the Null instance.



Lab 4: Using Null Library Instances

Open `C:/FW/edk2-ws/edk2/EmulatorPkg/EmulatorPkg.dsc`
Replace `SampleApp/SampleApp.inf { . . .}` with the following:

```
SampleApp/SampleApp.inf {
   <LibraryClasses>
   DebugLib|MdePkg/Library/BaseDebugLibNull/BaseDebugLibNull.inf
}
```

Save and **close** `EmulatorPkg.dsc`

LabGuide.md Slide for Copy and paste

Lab 4: Build, Run and Test Result

At the VS Command Prompt

```
$> Build
$> RunEmulator.bat
```

Run the application from the shell

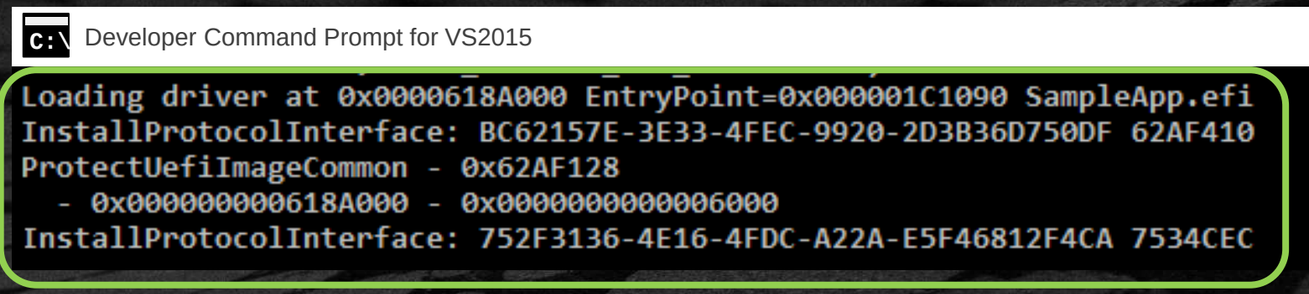
```
Shell> SampleApp
```

Check – now **NO** Debug output

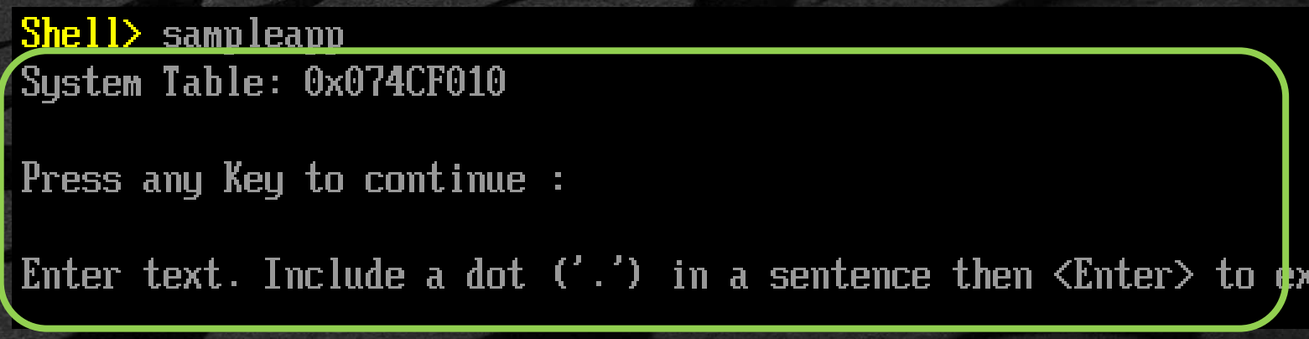
Exit

```
Shell> Reset
```

Visual Studio command prompt window output – NO DEBUG

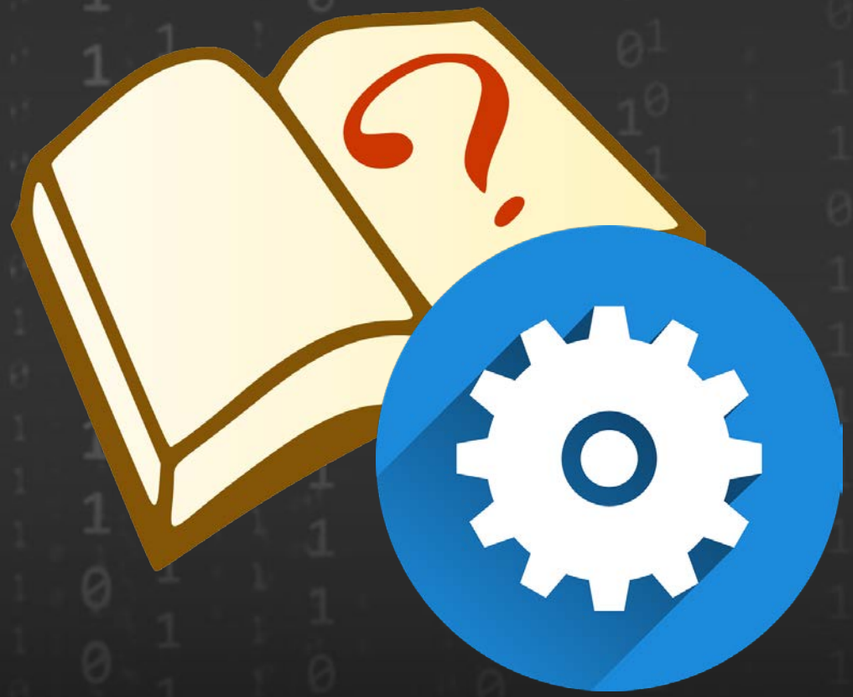


Console window – NO DEBUG



Lab 5: Debugging EDK II with VS Debugger

In this lab, you'll learn how setup the VS to debug the EDK II emulation



Lab 5: Debug with VS

Edit the SampleApp.c and add an “ASSERT_EFI_ERROR” :
Add the following:

```
EFI_STATUS      Status;
Status = EFI_NO_RESPONSE;
      . . .
ASSERT_EFI_ERROR(Status);
```

```
EFI_STATUS Status;
Status = EFI_NO_RESPONSE;  // or any EFI Error

DEBUG((0xffffffff, "\n\nUEFI Base Training DEBUG DEMO\n"));
DEBUG((0xffffffff, "0xffffffff USING DEBUG ALL Mask Bits Set\n"));

ASSERT_EFI_ERROR(Status);
```

Save SampleApp.c

LabGuide.md Slide for Copy and paste

Lab 5: Debug with VS - ASSERT

At the VS Command Prompt

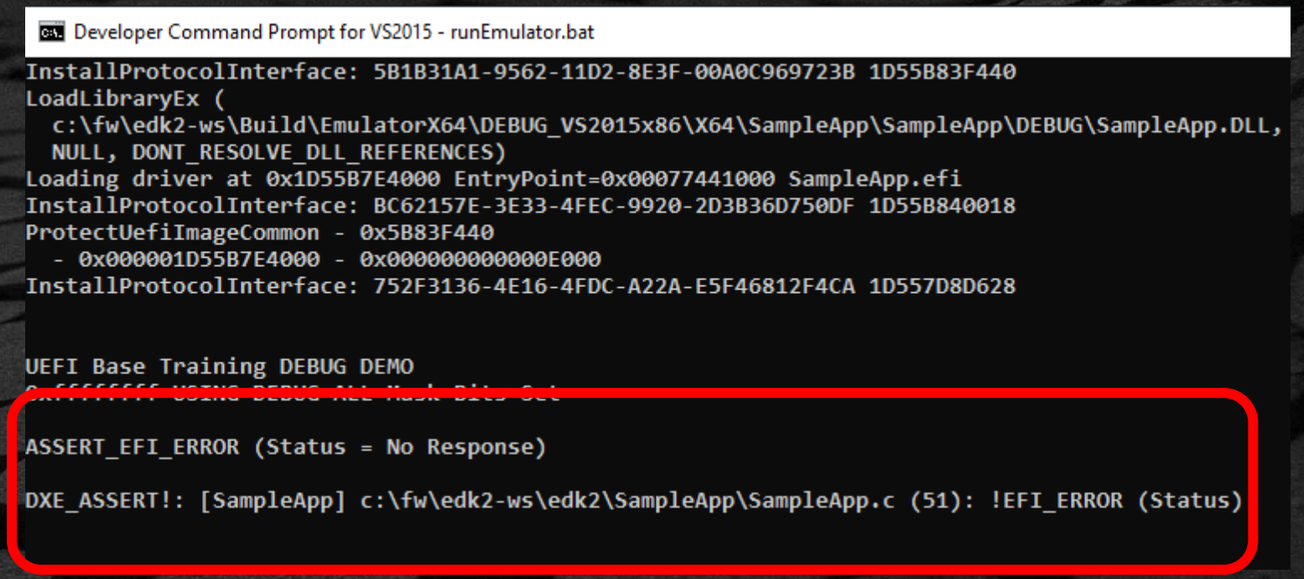
```
$> Build
$> RunEmulator.bat
```

Run the application from the shell

```
Shell> SampleApp
```

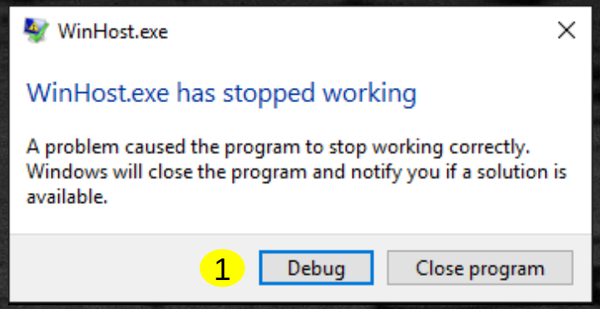
Assert in VS Command Prompt

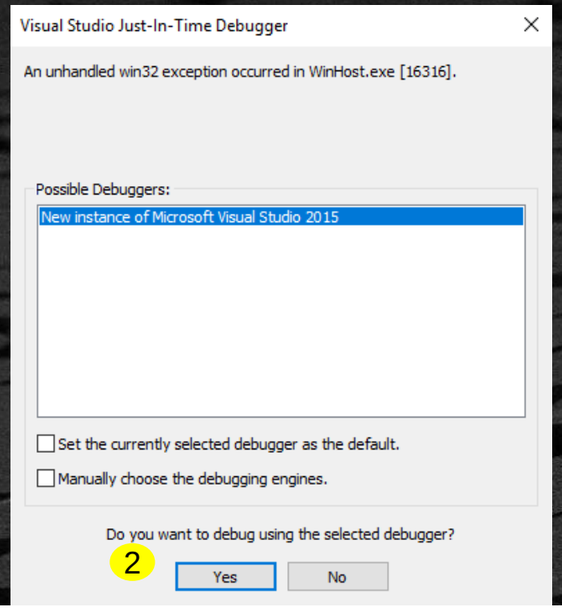
Visual Studio command prompt window output

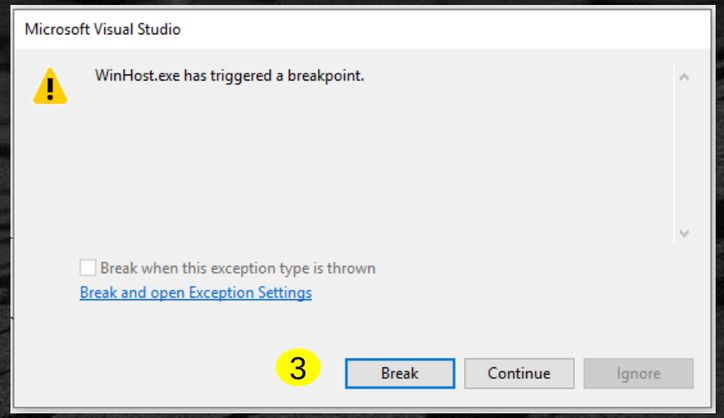


Lab 5: Debug with VS - ASSERT

Windows* VS Debugger Will Pop UP








```
24    **/
25    VOID
26    EFIAPI
27    CpuBreakpoint (
28      VOID
29      )
30    {
31      __debugbreak ();
32    }
33
```

4

“F10” - Step over

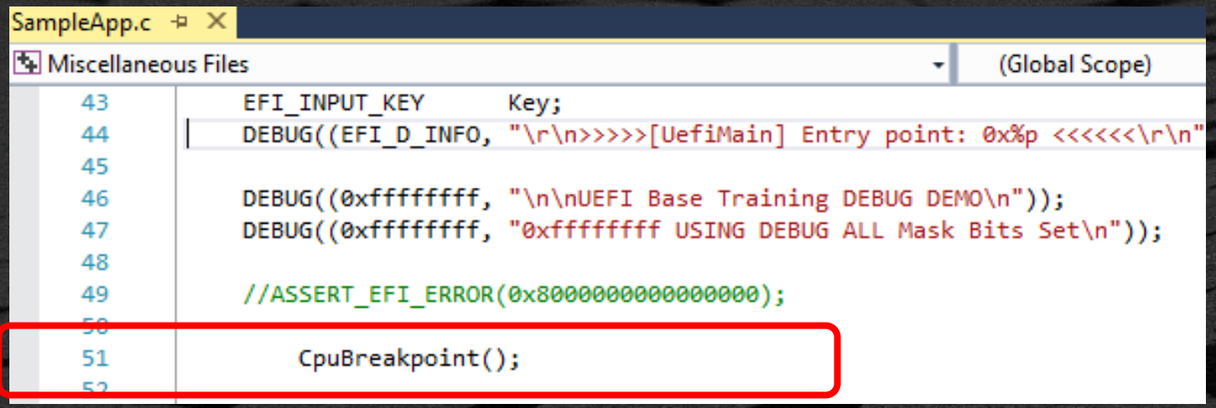
```
43      EFI_INPUT_KEY      Key;
44      EFI_STATUS      Status;
45      Status = EFI_NO_RESPONSE;  // or any other EFI Error
46
47    DEBUG ((0xffffffff, "\n\nUEFI Base Training DEBUG DEMO\n") );
48    DEBUG ((0xffffffff, "0xffffffff USING DEBUG ALL Mask Bits Set\r\n") );
49
50    ASSERT_EFI_ERROR(Status);  ≤4ms elapsed
51
```

SampleApp.c

Lab 5: Debug with VS - CpuBreakpoint

Edit the SampleApp.c and add "CpuBreakpoint();" Statement and comment out the "ASSERT":

```
CpuBreakpoint();
```



Save SampleApp.c

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Lab 5: Debug with VS

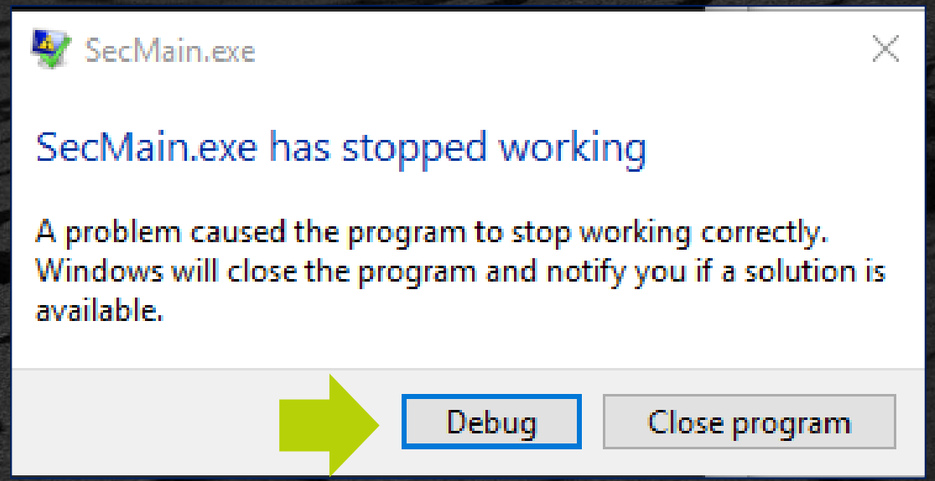
At the VS Command Prompt

```
$> Build
$> RunEmulator.bat
```

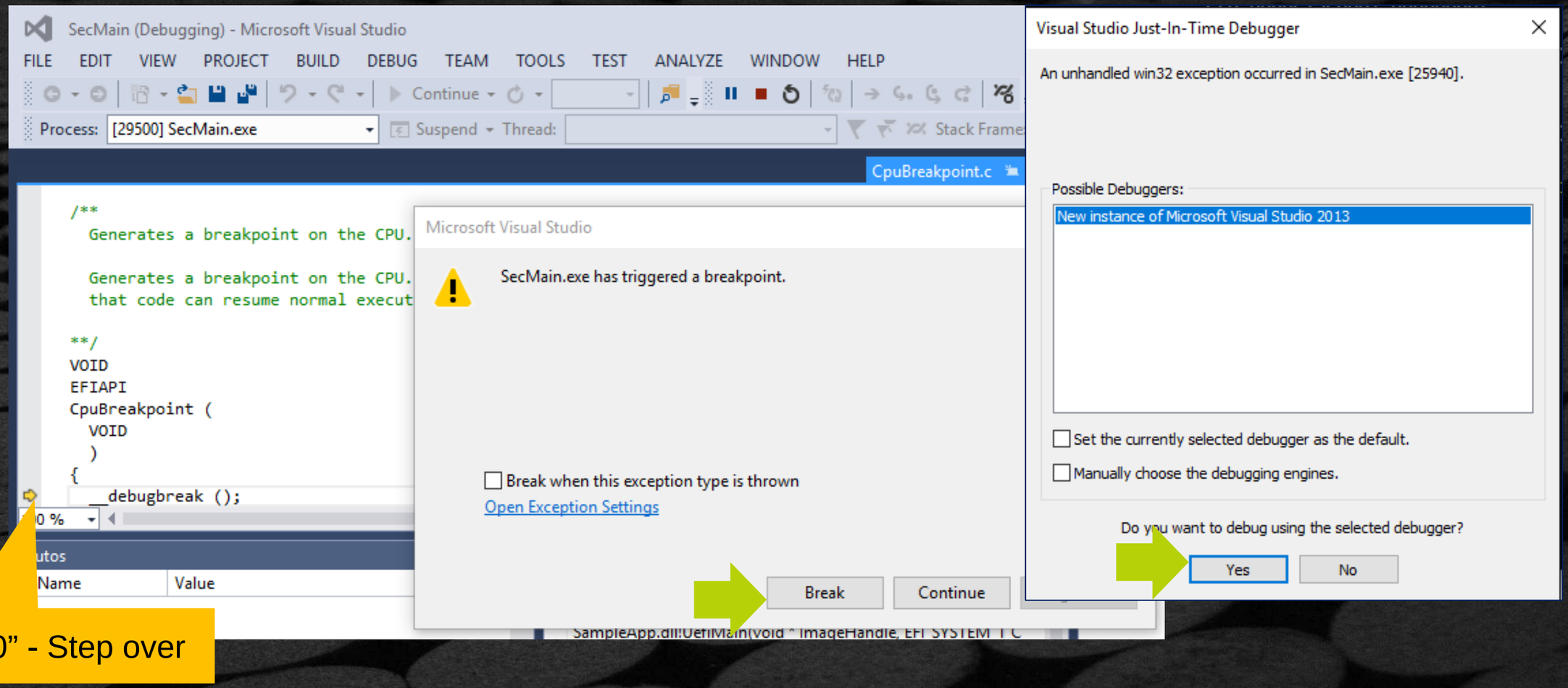
Run the application from the shell

```
Shell> SampleApp
```

VS option go to VS Debugger

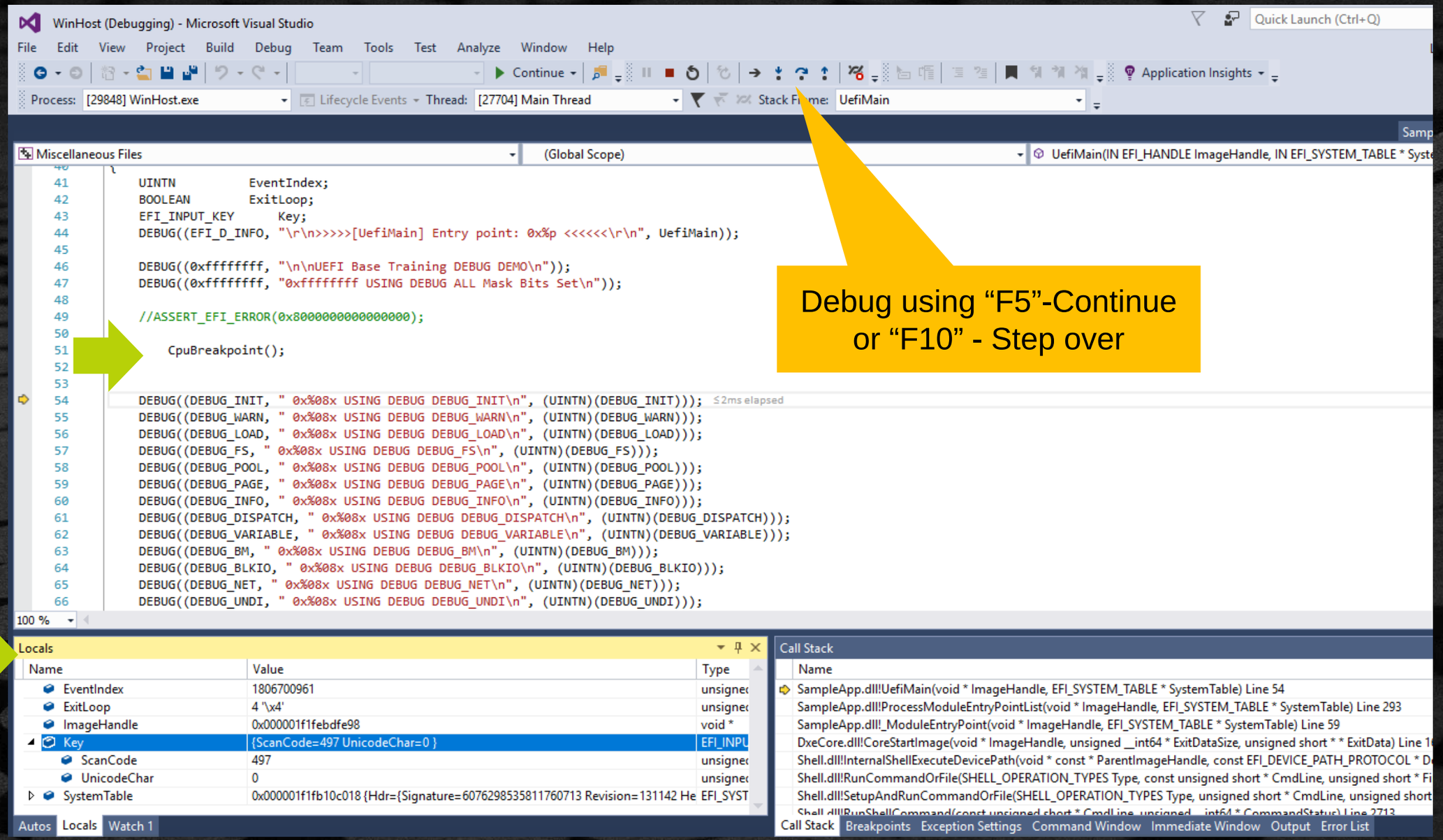


Invoke Windows Visual Studio Debugger



"F10" - Step over

Invoke Windows Visual Studio Debugger



SUMMARY

- Using PCDs to Configure `DebugLib` - LAB
- Change the `DebugLib` instance to modify the debug output - LAB
- Debug EDK II using VS Debugger - LAB

Questions?

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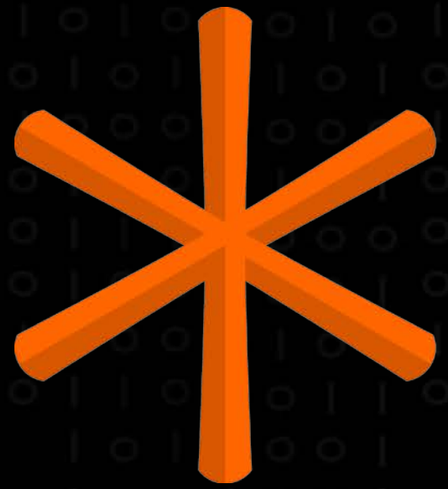

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BACK UP

ISSUE:

Debugging in Emulatior with Windows 7 and Visual Studio does not work?

Symptom: With Windows 7 a **`CpuBreakpoint()`** or **`ASSERT`** just exits with an error from the “Build Run” command.

Link to fix this issue:
https://github.com/tianocore/tianocore.github.io/wiki/NT32#Debugging_in_Nt32_Emulation_with_Windows_7_and_Visual_Studio_does_not_work

1. Run the RegEdt32
2. Navigate to the HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows NT\CurrentVersion\AeDebug
3. Add a string value entry called "Auto" with a value of "1“

Windows 10 Visual Studio does not seem to have this issue