

# UEFI & EDK II Training

## PLATFORM BUILD LAB WINDOWS EMULATOR

[tianocore.org](https://tianocore.org)

See also [LabGuide.md](#) for Copy & Paste examples in labs



# PLATFORM BUILD LABS

- ✱ Pin Visual Studio Command Prompt to Windows Task Bar
- ✱ Build a EDK II Platform using Emulator package
- ✱ Run the Emulator in Windows

# PIN VS COMMAND PROMPT

Pin the Visual Studio Command prompt to  
Windows Task Bar



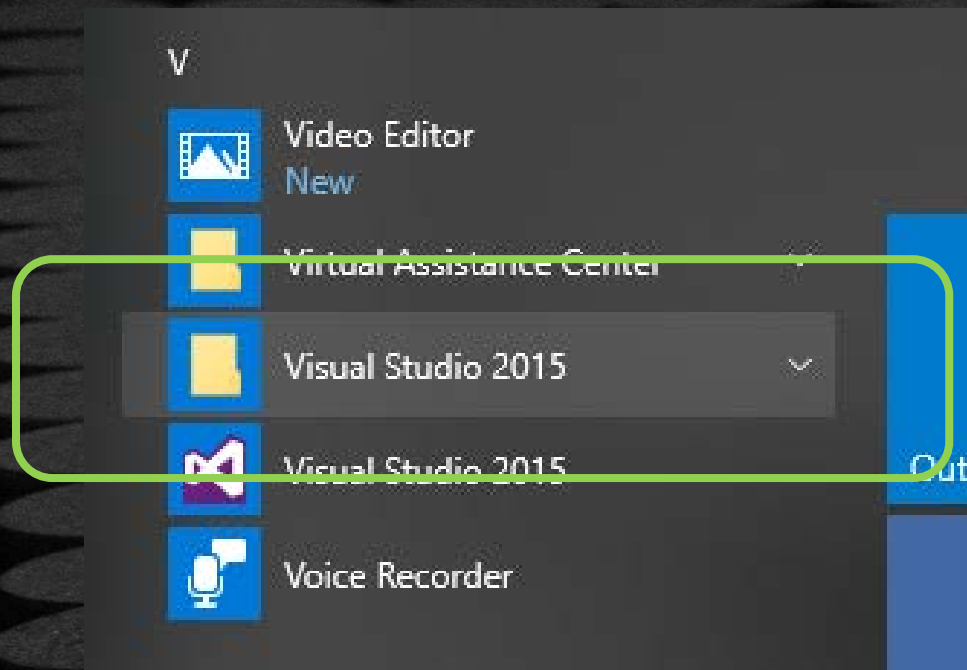
# PIN VS COMMAND PROMPT



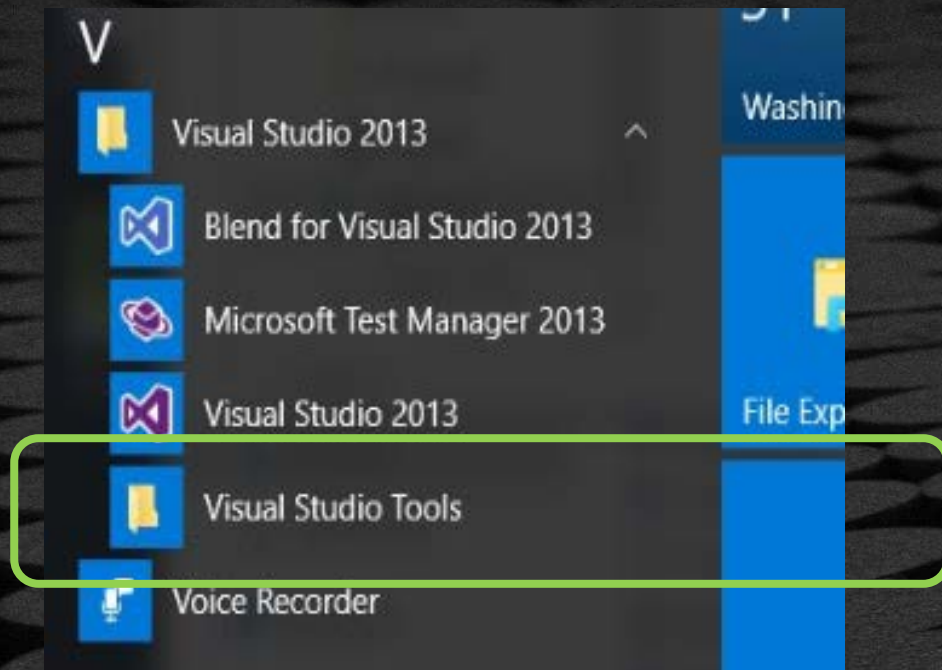
Windows 10

Steps to Pin Visual Studio Command Prompt to task bar for Windows 10

1. Using the Start menu in Windows 10, Left Click on “Windows Key” Lower Left 
2. Scroll down from the scroll bar on the right until “**Visual Studio 201***n*”
3. Left Click “**Visual Studio 201***n*”







VS 2013

## 4. Left Click “Visual Studio Tools”

This will open another Windows file explorer window

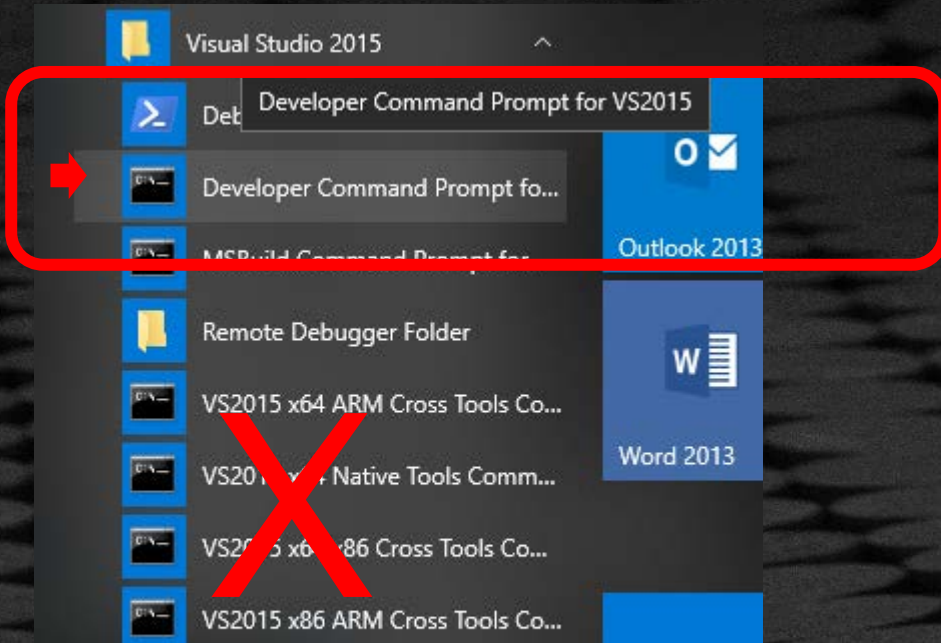
Note: *VS 2013 example, other version of VS maybe different*



# PIN VS COMMAND PROMPT

VS 2015

VS 2017 is similar

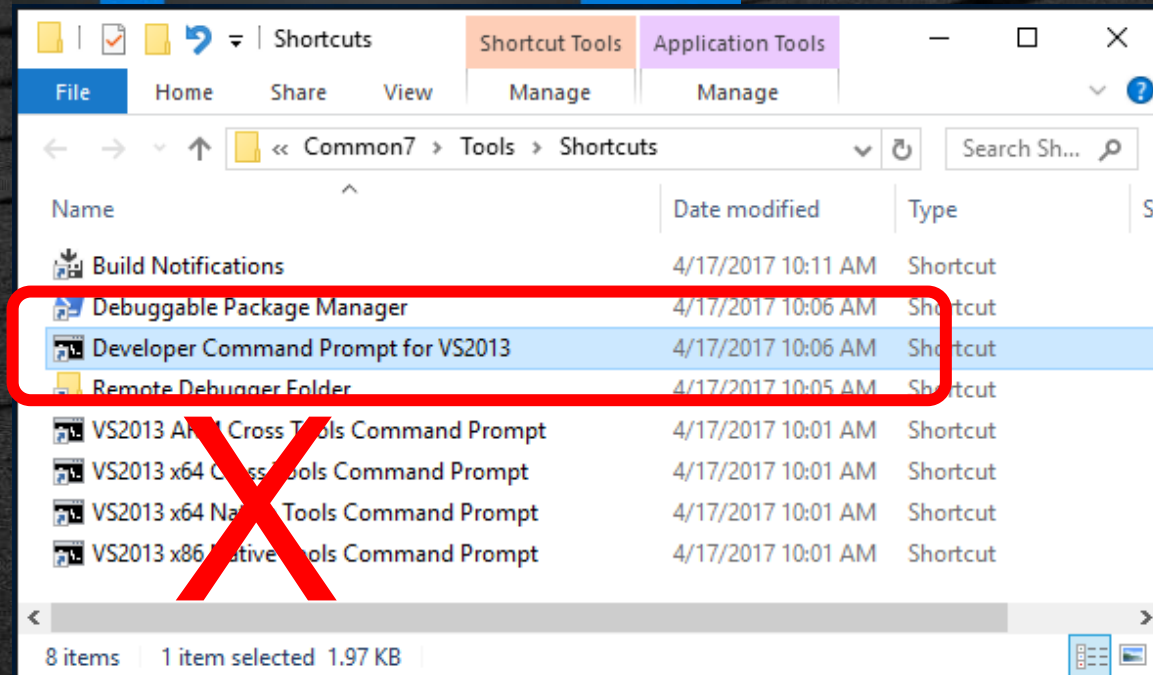


5. Select  
“Developer Command Prompt for VS201n”

6. Right Click to open Windows dialog box

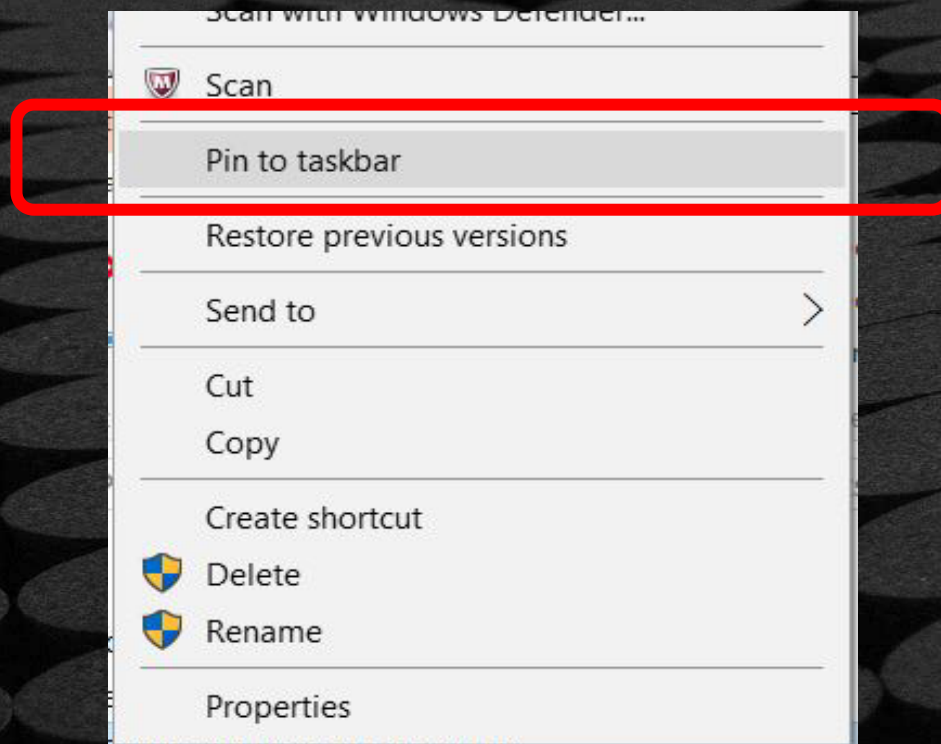
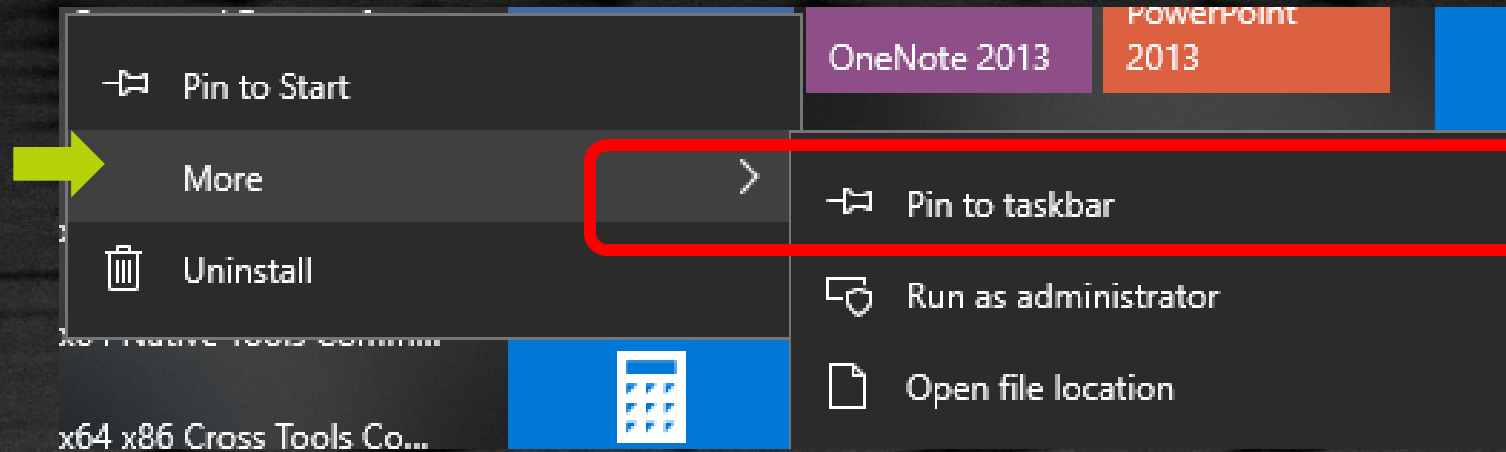
**Do not use any of the other  
“.. Command Prompts”**

VS 2013



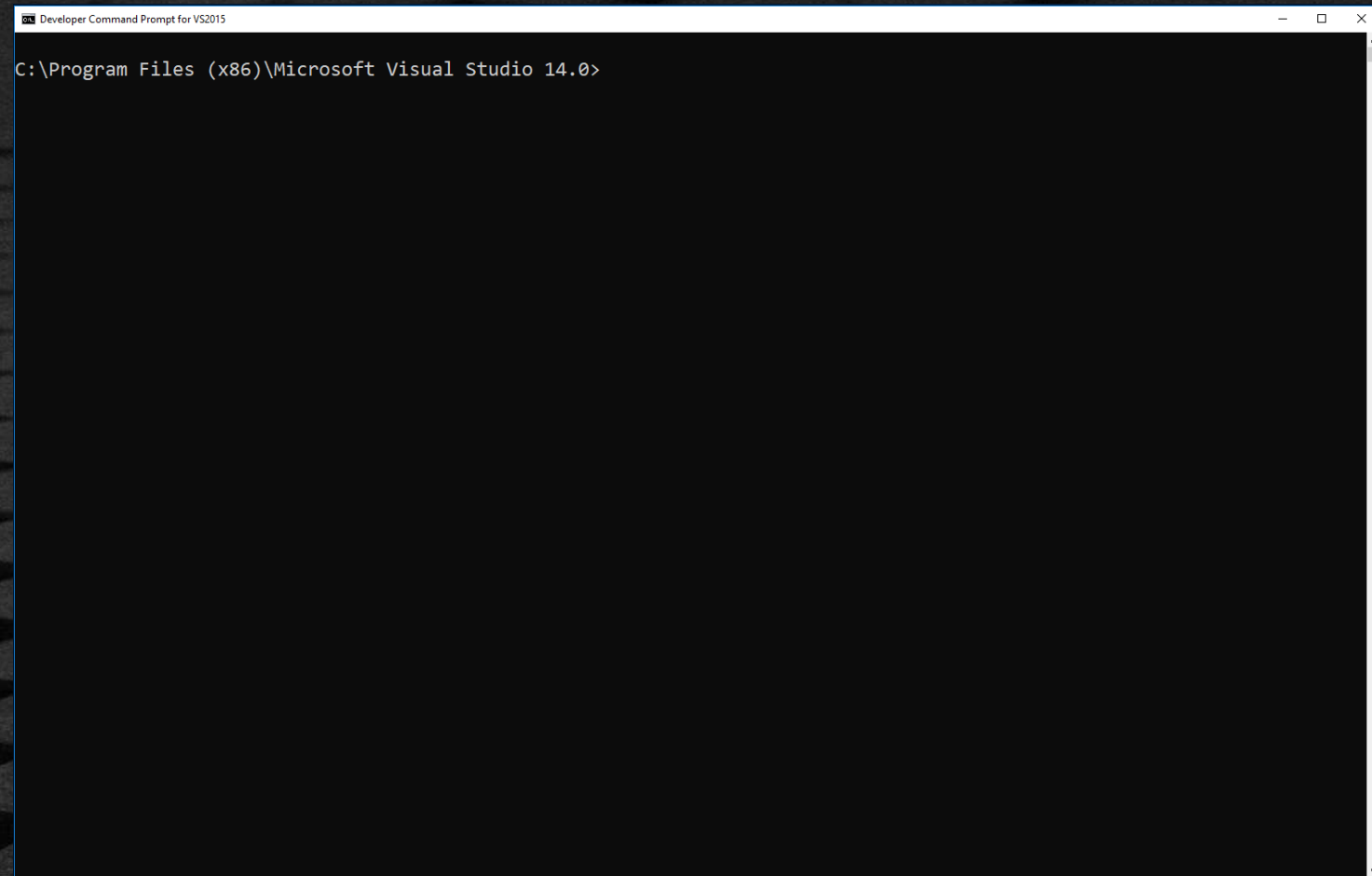


7. Left Click on  
“Pin to taskbar”





# PIN VS COMMAND PROMPT



## 8. Open VS Command Prompt”

All Windows Labs use this short-cut to Build Edk II platforms and projects using Windows Visual Studio :  
2010 / 2012 / 2013 / 2015 or 2017



# END OF PIN VS PROMPT







# **BUILD EMULATOR**

Setup EmulatorPkg to build and run  
emulation with Windows



# Prerequisites

– Done Before Class

- Windows 10: 
  - Continuous Integration (CI) - Stuart CI Build with Visual Studio VS2017 or VS2019 
  - Non-Stuart CI - Visual Studio VS2015, VS2017 or VS2019
  - Windows SDK (for rc)
  - Windows WDK (for Capsules)
- Python 3.7.x or greater and /Scripts directories on Path: [Link](#) to download  python<sup>TM</sup>
- Git for Windows on Path : [Link](#) 
- NASM for Win64 : [Link](#)

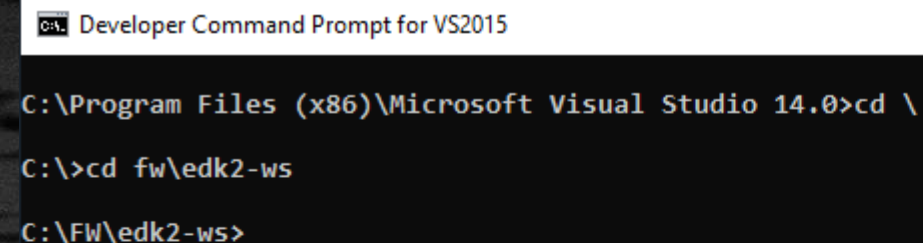


# Create Workspace Directory

Open Windows Command Prompt

Make new directory for Workspace:

```
$ cd /  
$ Mkdir FW  
$ cd FW  
$ Mkdir edk2-ws  
$ cd edk2-ws
```



```
Developer Command Prompt for VS2015  
C:\Program Files (x86)\Microsoft Visual Studio 14.0>cd \  
C:\>cd fw\edk2-ws  
C:\FW\edk2-ws>
```



# Download the EDK II Source Code

Download the open source EDK II from Github 

From the command prompt use “git clone” to download

```
> git clone -b Edk2Lab_21Q1 https://github.com/tianocore-training/edk2.git  
> git clone -b LabBranch https://github.com/tianocore-training/edk2-libc.git
```

Download the Submodules and Checkout the Lab Branch

```
C:\FW\edk2-WS> Cd edk2  
C:\FW\edk2-WS\edk2> git submodule update --init  
C:\FW\edk2-WS> Cd ..
```

Note if behind a firewall, set PROXYS FIRST (example shows Intel OR)

```
$ git config --global https.proxy proxy.jf.intel.com:911  
$ git config --global http.proxy proxy.jf.intel.com:911
```



# Download Lab Material

Download the Lab\_Material\_FW.zip from :  [github.com Lab\\_Material\\_FW.zip](https://github.com/tianocore-training/Lab_Material_FW.zip)

OR

Use git clone to download the Lab\_Material\_FW

```
C:\> git clone https://github.com/tianocore-training/Lab_Material_FW.git
```

Directory Lab\_Material\_FW will be created

FW

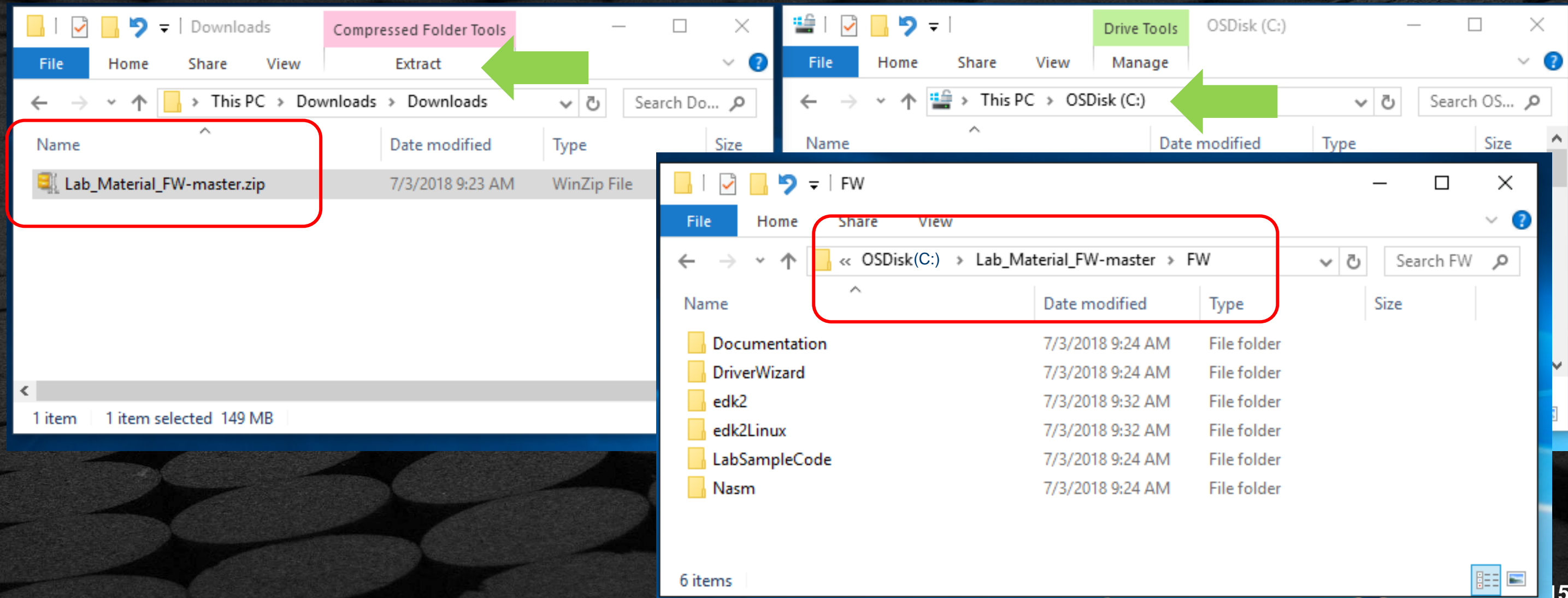
- Documentation
- DriverWizard
- edk2-ws
- LabSampleCode
- Nasm



# Build EDK II

## -Extract the Source

Extract the Downloaded Lab\_Material\_FW-master.zip to C:\



The image shows three overlapping screenshots of Windows File Explorer windows illustrating the steps to extract the source code:

- Left Window:** Shows the 'Downloads' folder. The file 'Lab\_Material\_FW-master.zip' is selected and highlighted with a red rectangle. A green arrow points to the 'Extract' button in the 'Compressed Folder Tools' ribbon.
- Middle Window:** Shows the 'OSDisk (C:)' drive. A green arrow points to the address bar, which shows the path 'This PC > OSDisk (C:)'. A red rectangle highlights the address bar area.
- Right Window:** Shows the 'FW' folder. The address bar shows the path 'OSDisk(C:) > Lab\_Material\_FW-master > FW'. A red rectangle highlights the address bar area. The file list below shows the extracted contents:
 

Name	Date modified	Type	Size
Documentation	7/3/2018 9:24 AM	File folder	
DriverWizard	7/3/2018 9:24 AM	File folder	
edk2	7/3/2018 9:32 AM	File folder	
edk2Linux	7/3/2018 9:32 AM	File folder	
LabSampleCode	7/3/2018 9:24 AM	File folder	
Nasm	7/3/2018 9:24 AM	File folder	

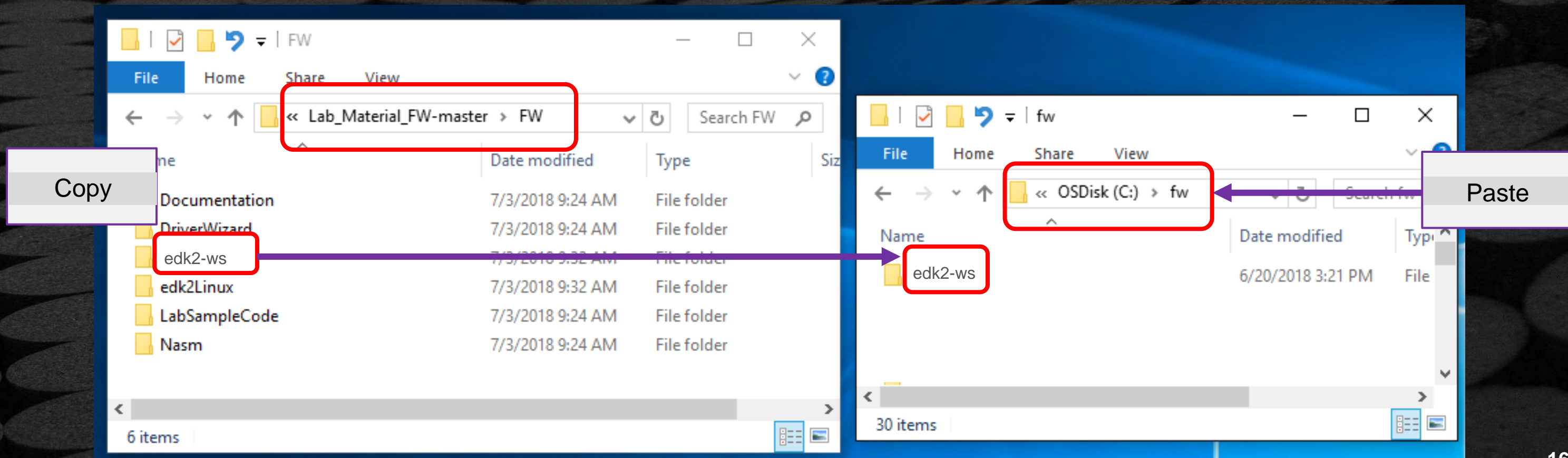


# Build EDK II

## - Copy edk2-ws

From the downloaded Lab\_Material\_FW folder, **copy** and **paste** folder “..\edk2-ws” to C:/FW

*Note:* Overwrite existing files and directories

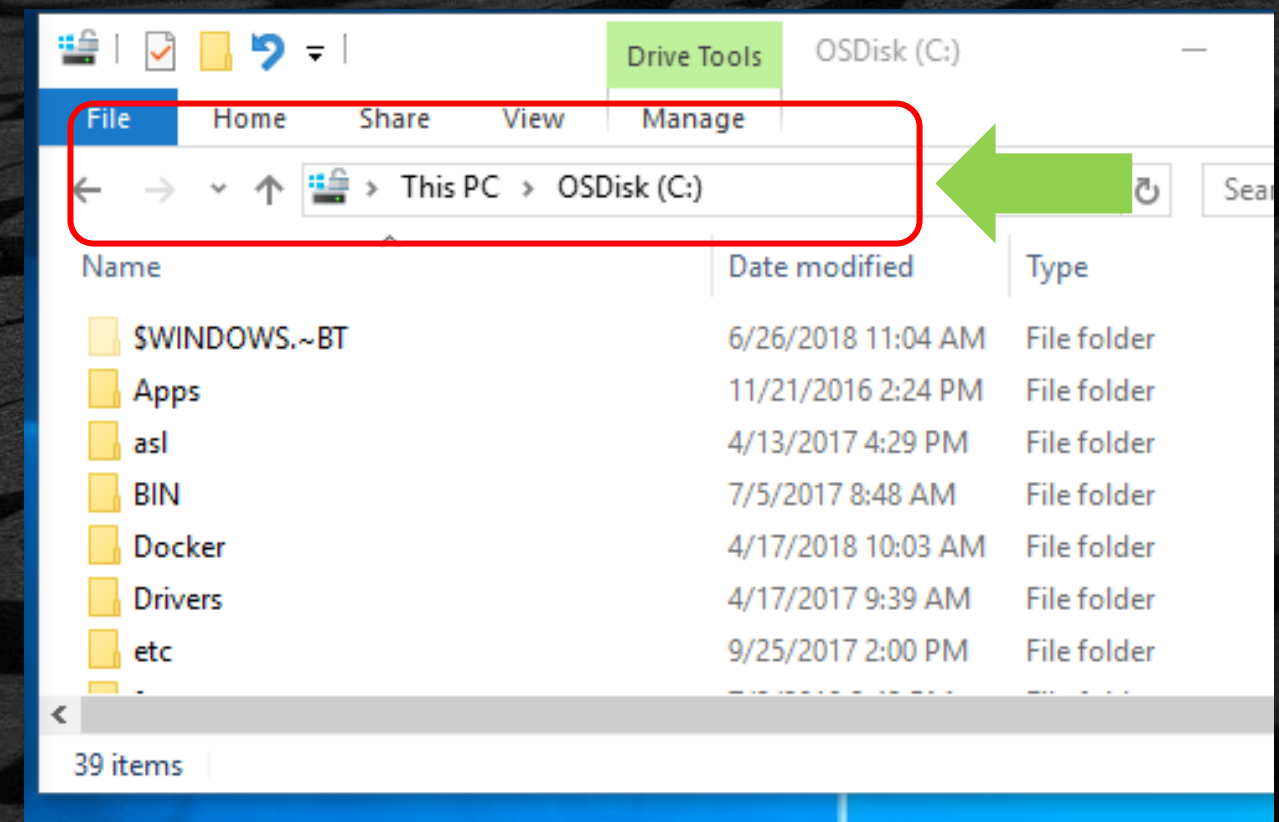
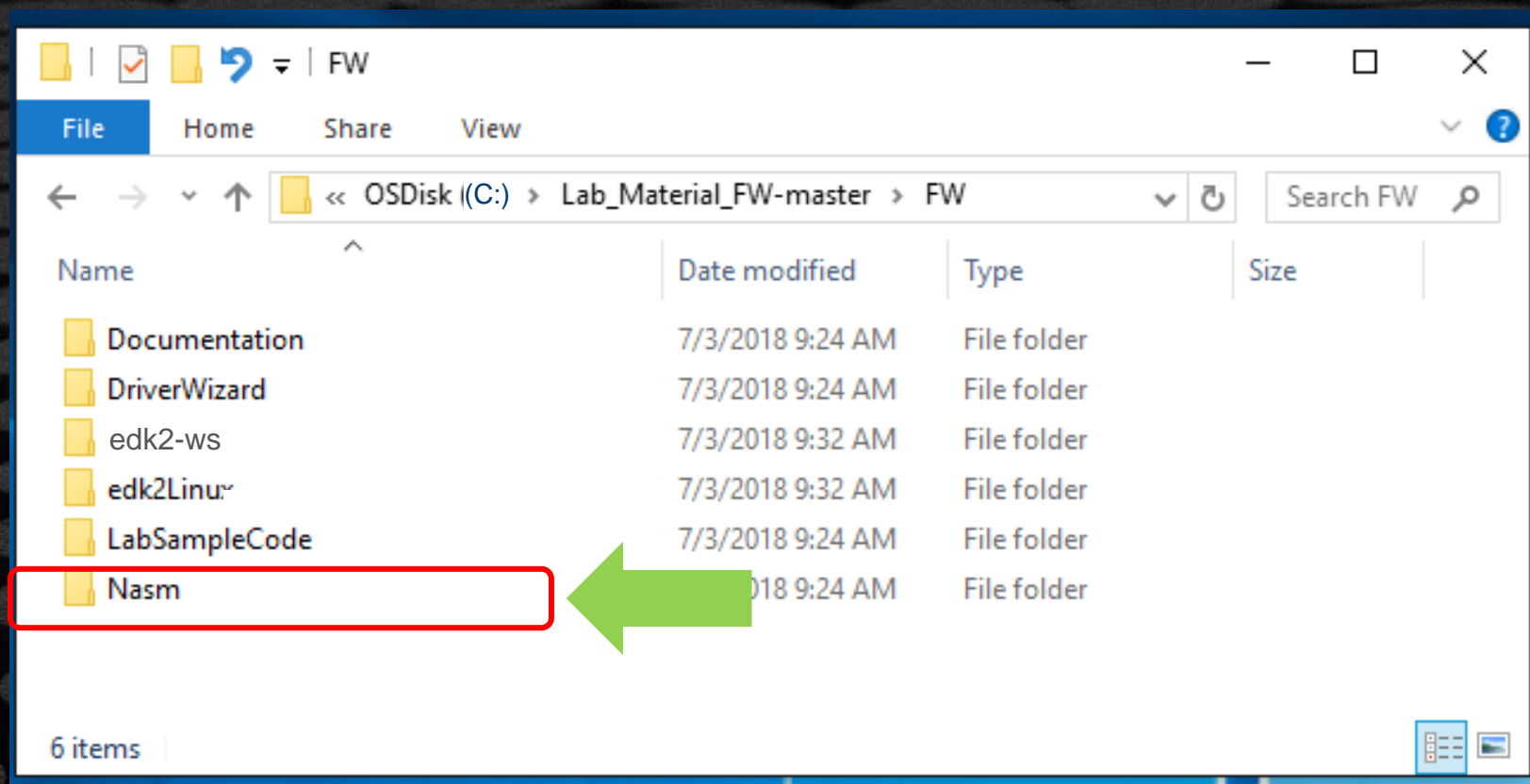




# Build EDK II

## -Get Nasm

Copy Nasm directory to C:\  
(creating C:\Nasm directory)





# STUART CI BUILD EMULATORPKG







## 1. CD to C:/FW/edk2-ws

```
$ setenv.bat  
$ cd C:\FW\edk2-ws\edk2
```

## 2. Install the pip requirements (Note, Proxy option needed behind a firewall)

```
$ pip install --upgrade -r pip-requirements.txt --proxy http://proxy-chain.intel.com:911
```

## 3. Get the code dependencies (done only when submodules change)

```
$ stuart_setup -c EmulatorPkg/PlatformCI/PlatformBuild.py TOOL_CHAIN_TAG=<Your TAG> -a X64
```

## 4. Update other dependencies (done on new VS Command Prompt)

```
$ stuart_update -c EmulatorPkg/PlatformCI/PlatformBuild.py TOOL_CHAIN_TAG=<Your TAG> -a X64
```

## 5. Build the BaseTools (done only when BaseTools change and first time)

```
$ python BaseTools\Edk2ToolsBuild.py -t <Your TAG>
```

## 6. Compile the EmulatorPkg

```
$ stuart_build -c EmulatorPkg/PlatformCI/PlatformBuild.py TOOL_CHAIN_TAG=<Your TAG> -a X64  
BLD_*_ADD_SHELL_STRING=1 BLD_*_WORKSPACE=%WORKSPACE%
```

Where “<Your TAG>” is either VS2017 or VS2019



# Output from CI Stuart Build

```
Developer Command Prompt for VS 2017
INFO - Region Size = 0x2000
INFO - Region Name = DATA
INFO -
INFO - Generate Region at Offset 0x590000
INFO - Region Size = 0x10000
INFO - Region Name = None
INFO -
INFO - GUID cross reference file can be found at d:\lab\fw\edk2-ws\edk2\Build\EmulatorX64\DEBUG_VS2017\FV\Guid.xref
INFO -
INFO - FV Space Information
INFO - FVRECOVERY [48%Full] 5767168 total, 2769848 used, 2997320 free
INFO -
INFO - - Done -
INFO - Build end time: 13:17:07, Jul.27 2020
INFO - Build total time: 00:01:33
INFO -
INFO - -----
INFO - -----Cmd Output Finished-----
INFO - ----- Running Time (mm:ss): 01:33 -----
INFO - ----- Return Code: 0x00000000 -----
INFO - -----
PROGRESS - Running Post Build
DEBUG - Plugin Success: Windows RC Path Support
DEBUG - Plugin Success: Windows Visual Studio Tool Chain Support
INFO - Writing BuildToolsReports to D:\lab\FW\edk2-ws\edk2\Build\EmulatorX64\DEBUG_VS2017\BUILD_TOOLS_REPORT
DEBUG - Plugin Success: Build Tools Report Generator
PROGRESS - End time: 2020-07-27 13:17:07.515485 Total time Elapsed: 0:01:37
SECTION - Log file is located at: D:\lab\FW\edk2-ws\edk2\Build\BUILDLOG_EmulatorPkg.txt
SECTION - Summary
PROGRESS - Success
```

Finished build





# NON-STUART CI BUILD EMULATORPKG

**Skip** if doing Stuart CI

Note: will need to update conf/target.txt for other labs



# Non-Stuart CI Build EDK II

## - build BaseTools

Open VS Command prompt & Cd to workspace directory

```
$> cd C:\FW\edk2-ws
```

Setup the local environment: (see batch file [setenv.bat](#) )

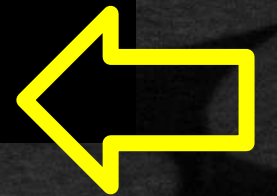
```
$> set WORKSPACE=%CD%
```

```
$> set PACKAGES_PATH=%WORKSPACE%\edk2;%WORKSPACE%\edk2-libc
```

Invoke Edksetup.bat from directory C:/FW/edk2-ws/edk2 to Build BaseTools

```
$> cd edk2
```

```
$> edksetup.bat Rebuild
```



Building BaseTools only needs to be done once but setting up local environment and edksetup.bat needs to be done each new VS prompt session



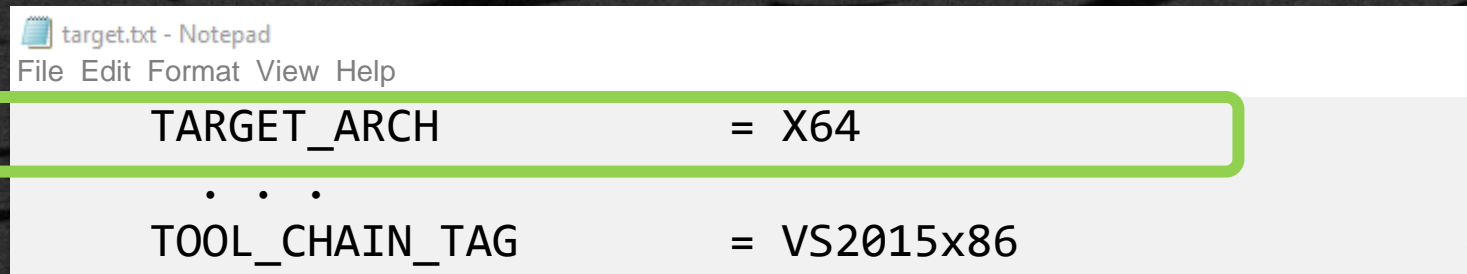
# Non Stuart CI Build EDK II

## EmulatorPkg – Non Stuart CI Build with edk2 -Update Target.txt

Invoke Edksetup.bat

```
$> cd C:\FW\edk2-ws\edk2
$> edksetup.bat
```

Edit the file Conf/target.txt (*change* TOOL\_CHAIN\_TAG)  
notepad Conf/target.txt



VS version	TOOL_CHAIN_TAG
2015	VS2015x86
2017	VS2017
2019	VS2019

Save and Exit

Build EmulatorPkg

```
$> build -D ADD_SHELL_STRING -a X64
```



# Possible Build Errors

1. If you get a BUILD Error: Error “C:/Program “ not found
  - First check that you have opened Visual Studio and installed the “C++”
  - Open Visual Studio and create a “C++” project
  - (This will take some time to install)
2. If you get a BUILD Error: Check if RC.Exe compiler not found is the error -[here](#)
3. If you get a BUILD Error: fatal error C1041: cannot open program database ... Check [here](#)



# Build EDK II -Inside VS Prompt

```

C:\FW\edk2-ws\edk2>build -D WIN_SEC_BUILD -a X64

# Install to C:\FW\edk2-ws\edk2
#####
execute command "nmake all" in

!!! WARNING !!! NASM_PREFIX env
Found nasm.exe, setting the e

!!! WARNING !!! No CYGWIN_HOME

C:\FW\edk2-ws\edk2>build -D WIN
Build environment: Windows-10-1
Build start time: 11:13:20, Aug

WORKSPACE      = c:\fw\edk2-w
PACKAGES_PATH  = c:\fw\edk2-w
EDK_TOOLS_PATH = c:\fw\edk2-w
EDK_TOOLS_BIN  = c:\fw\edk2-w
CONF_PATH      = c:\fw\edk2-w
PYTHON_COMMAND = py -3

Processing meta-data
.Architecture(s) = X64
Build target     = DEBUG
Toolchain        = VS2015x86

Active Platform  = c:\f
...

d\Emulator\
orX64\DEBU
LowBitSet6
RRotU32.c
DivU64x64R
SetJump.c
FilePaths.
X86Thunk.c
X86EnableP

X86FxRestor
SwapBytes1
X86FxSave.
LinkedList
HighBitSet
LRotU64.c
X86RdRand.
GetPowerOf
LongJump.c
"C
6 /SUBSYS
d\Emulator\
x86\X64\DE
latorX64\DI
LShiftU64.
CpuDeadLoop
ModU64x32.
DivU64x32R
X86ReadGdt
Checksum.c
DivS64x64R
"C
d\Emulator\
orX64\DEBU
LowBitSet6
RRotU32.c
DivU64x64R
SetJump.c
FilePaths.
X86Thunk.c
X86EnableP

Generate Region at Offset 0x580000
Region Size = 0xC000
Region Name = DATA

Generate Region at Offset 0x58C000
Region Size = 0x2000
Region Name = None

Generate Region at Offset 0x58E000
Region Size = 0x2000
Region Name = DATA

Generate Region at Offset 0x590000
Region Size = 0x10000
Region Name = None

GUID cross reference file can be found at c:\fw\edk2-ws\Build\EmulatorX64\DEBUG_VS2015x86\FV\Guid.xref

FV Space Information
#####
FVRECOVERY [47%Full] 5767168 total, 2726792 used, 3040376 free
#####
#####- Done -
#####
Build end time: 11:17:31, Aug.12 2019
#####
Build total time: 00:04:11
#####
###

C:\FW\edk2-ws\edk2>

```

Finished build



# RUN THE EMULATOR



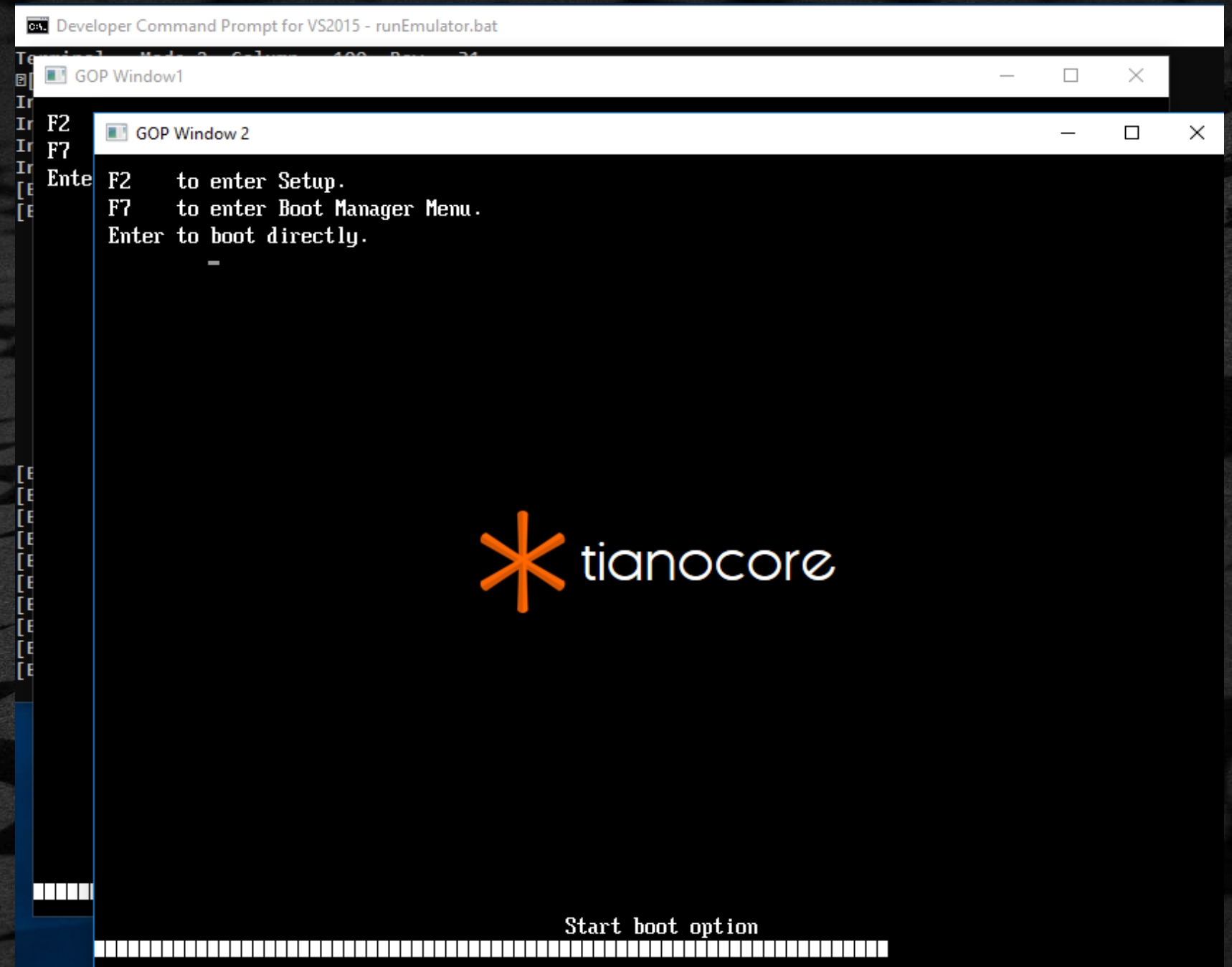
# Invoke Emulation

From the command prompt

```
$> RunEmulator.bat
```

Or  
run **WinHost.exe** from:  
Build/ . . ./X64 directory

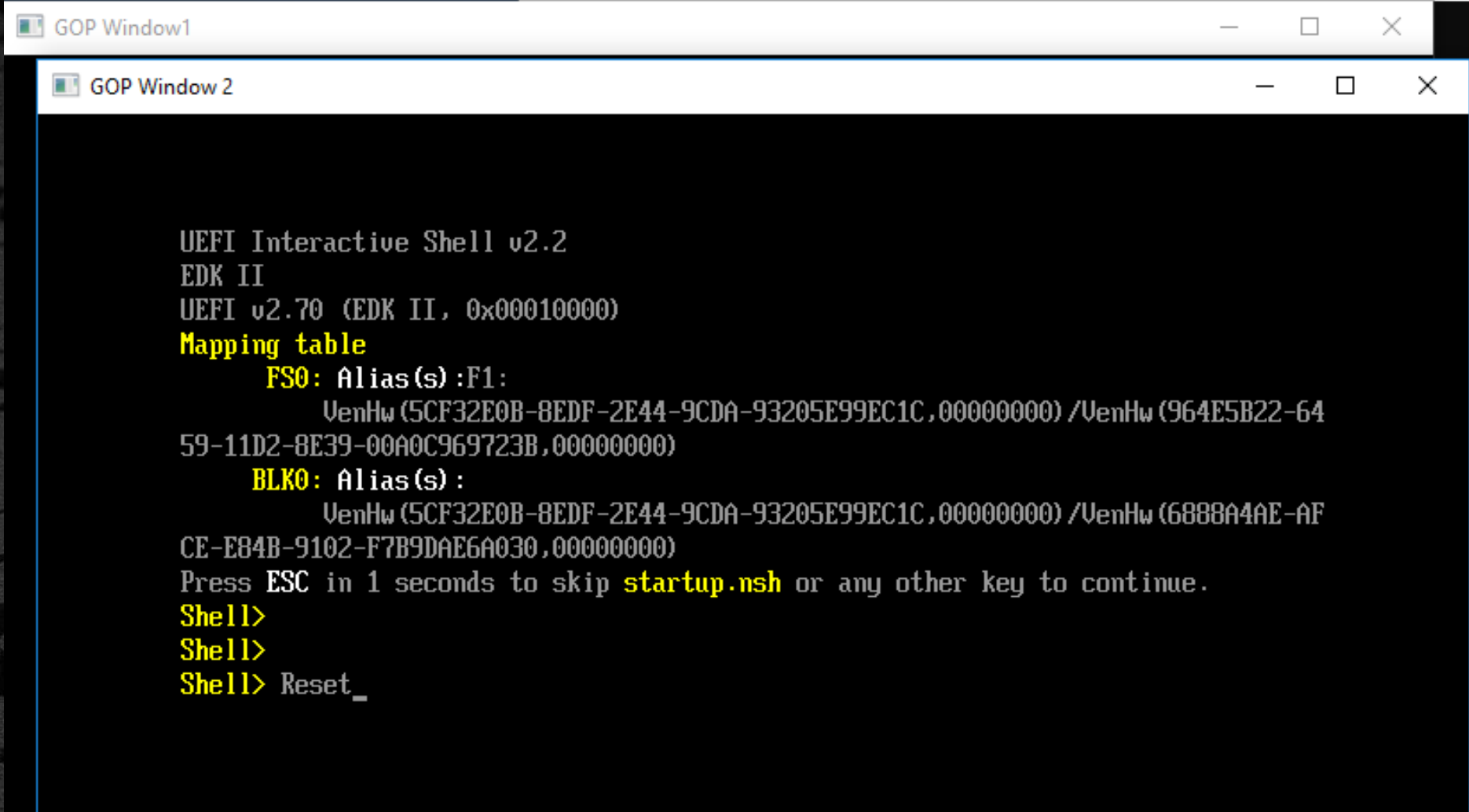
**Notice 2** "GOP Window n" opened





# EMULATOR AT SHELL PROMPT

Type : “Reset” to exit



```
UEFI Interactive Shell v2.2
EDK II
UEFI v2.70 (EDK II, 0x00010000)
Mapping table
  FS0: Alias(s) :F1:
        VenHw (5CF32E0B-8EDF-2E44-9CDA-93205E99EC1C,000000000) /VenHw (964E5B22-64
59-11D2-8E39-00A0C969723B,000000000)
  BLK0: Alias(s) :
        VenHw (5CF32E0B-8EDF-2E44-9CDA-93205E99EC1C,000000000) /VenHw (6888A4AE-AF
CE-E84B-9102-F7B9DAE6A030,000000000)
Press ESC in 1 seconds to skip startup.nsh or any other key to continue.
Shell>
Shell>
Shell> Reset_
```



# SUMMARY

- ✱ Pin Visual Studio Command Prompt to Windows Task Bar
- ✱ Build a EDK II Platform using Emulator package
- ✱ Run the Emulator in Windows



# Questions?





# Return to Main Training Page



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[Link](#)







# ACKNOWLEDGMENTS

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BACKUP

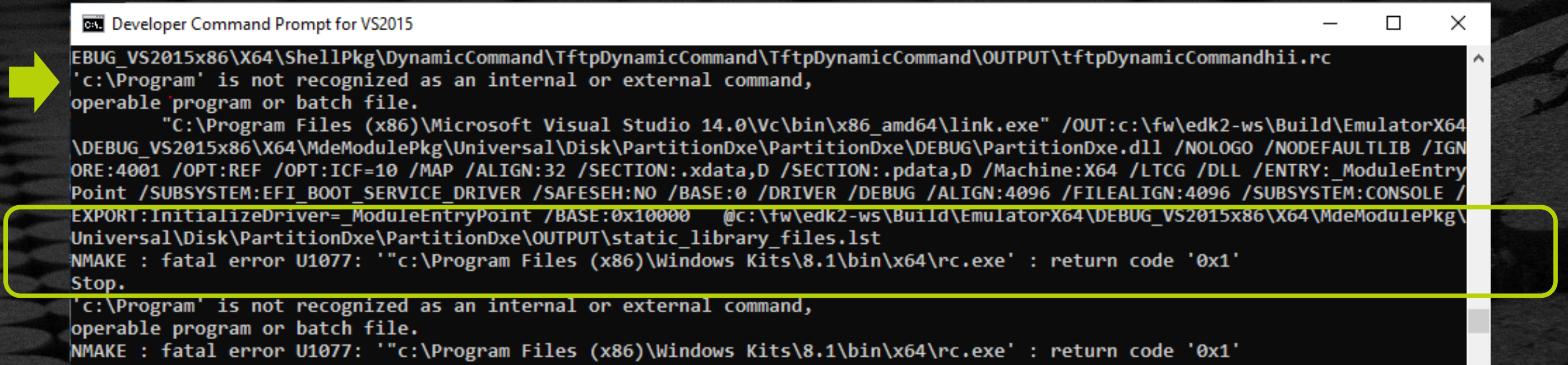


# BUILD ERRORS



# Build Error- RC.exe

Error message:



```

C:\> Developer Command Prompt for VS2015

EBUG_VS2015x86\X64\ShellPkg\DynamicCommand\TftpDynamicCommand\TftpDynamicCommand\OUTPUT\tftpDynamicCommandhii.rc
'c:\Program' is not recognized as an internal or external command,
operable program or batch file.
"C:\Program Files (x86)\Microsoft Visual Studio 14.0\VC\bin\x86_amd64\link.exe" /OUT:c:\fw\edk2-ws\Build\EmulatorX64
\DEBUG_VS2015x86\X64\MdeModulePkg\Universal\Disk\PartitionDxe\PartitionDxe\DEBUG\PartitionDxe.dll /NOLOGO /NODEFAULTLIB /IGN
ORE:4001 /OPT:REF /OPT:ICF=10 /MAP /ALIGN:32 /SECTION:.xdata,D /SECTION:.pdata,D /Machine:X64 /LTCG /DLL /ENTRY:_ModuleEntry
Point /SUBSYSTEM:EFI_BOOT_SERVICE_DRIVER /SAFESEH:NO /BASE:0 /DRIVER /DEBUG /ALIGN:4096 /FILEALIGN:4096 /SUBSYSTEM:CONSOLE /
EXPORT:InitializeDriver=_ModuleEntryPoint /BASE:0x10000 @c:\fw\edk2-ws\Build\EmulatorX64\DEBUG_VS2015x86\X64\MdeModulePkg\
Universal\Disk\PartitionDxe\PartitionDxe\OUTPUT\static_library_files.lst
NMAKE : fatal error U1077: '"c:\Program Files (x86)\Windows Kits\8.1\bin\x64\rc.exe' : return code '0x1'
Stop.
'c:\Program' is not recognized as an internal or external command,
operable program or batch file.
NMAKE : fatal error U1077: '"c:\Program Files (x86)\Windows Kits\8.1\bin\x64\rc.exe' : return code '0x1'

```

Find where the RC.EXE is located on your VS Installation:

Example (VS 2015): The RC.exe is located on this machine:

C:\Program Files (x86)\Windows Kits\8.1\bin\x64

Edit Conf\tools\_def.txt



# Build Error- RC.exe Cont.

Edit [Conf\tools\\_def.txt](#)

Search for your installation of Visual Studio (2013, 2015, 2017) “RC.EXE”

Probably in path [C:\Program Files \(x86\)\Windows Kits\](#)

Update according to the path for where the RC.EXE is found

```
# Microsoft Visual Studio 2013 Professional Edition
DEFINE WINSDK8_BIN      = c:\Program Files\Windows Kits\8.1\bin\x86\
DEFINE WINSDK8x86_BIN   = c:\Program Files (x86)\Windows Kits\8.1\bin\x64

# Microsoft Visual Studio 2015 Professional Edition
DEFINE WINSDK81_BIN     = c:\Program Files\Windows Kits\8.1\bin\x86\
DEFINE WINSDK81x86_BIN  = c:\Program Files (x86)\Windows Kits\8.1\bin\x64

# Microsoft Visual Studio 2017 Professional Edition
DEFINE WINSDK10_BIN     = C:\Program Files (x86)\Windows Kits\10\bin\x86
```

Paths on your  
machine



Copy and Paste RC error: [Link](#)



# Build Error: fatal error C1041:

Build Error from fatal error C1041: cannot open program database

This Error is usually because the location you are building is being shared by another application in Windows. Example: Syncplicity may cause this

## Error Message:

```
k:\fw\edk2\MdePkg\Library\BaseLib\LinkedList.c : fatal error C1041: cannot open program
database
'k:\fw\edk2\build\nt32ia32\debug_vs2013x86\ia32\mdepkg\library\baselib\baselib\vc120.pdb'; if
multiple CL.EXE write to the same .PDB file, please use /FS
NMAKE : fatal error U1077: '"C:\Program Files (x86)\Microsoft Visual Studio
12.0\Vc\bin\cl.exe"' : return code '0x2'
Stop.
```

**Solution:** Try using a Workspace that is not shared