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UEFI & EDK II Training

PLATFORM BUILD LAB - OVMF

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PLATFORM BUILD LABS

- Build a EDK II Platform using OVMF package 
- Run Ovmf using Qemu

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BUILD OVMFPKG

Setup OvmfPkg to build and run w/ QEMU

Pre-requisites Ubuntu 20.04

Example Ubuntu 20.04
The following need to be accessible for building Edk2, From the terminal prompt (Cnt-Alt-T):

```
bash$ sudo apt install build-essential uuid-dev iasl git nasm  python-is-python3
```

- build-essential - Informational list of build-essential packages
- uuid-dev - Universally Unique ID library (headers and static libraries)
- iasl - Intel ASL compiler/decompiler (also provided by acpica-tools)
- git - support for git revision control system
- nasm - General-purpose x86 assembler
- python-is-python3 - Ubuntu 20.04 python command is 'python3' but edk2 tools use 'python'

The following will install the QEMU for Intel X86 & 64 bit

```
bash$ sudo apt install qemu-system-x86-64
```

- Qemu – Emulation with Intel architecture with UEFI Shell

See Lab guide for Ubuntu 16.04 pre-requisites

Pre-requisites Clear Linux* Project

Example Using Clear Linux* Project
The following need to be accessible for building Edk2, From the terminal prompt (Cnt-Alt-T):

```
bash$  sudo swupd bundle-add devpkg-util-linux
```

Devpkg-util-linux – includes bundles for developer tools for writing "C" Applications included:
gcc, nasm, uuid, etc.

```
bash$  sudo swupd bundle-add kvm-host
```

Qemu – Emulation with Intel architecture with UEFI Shell

Clear Linux* Project

Create QEMU Run Script

1. Create a run-ovmf directory under the home directory

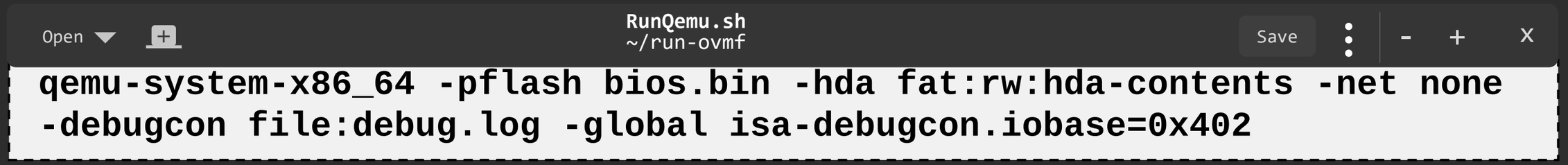
```
bash$ cd ~
bash$ mkdir ~run-ovmf
bash$ cd run-ovmf
```

2. Create a directory to use as a hard disk image

```
bash$ mkdir hda-contents
```

3. Create a Linux shell script to run the QEMU from the run-ovmf directory

```
bash$ gedit RunQemu.sh
```



4. Save and Exit

DOWNLOAD the EDK II Source

Open a terminal prompt and create a source working directory

```
bash$ mkdir ~/src
bash$ cd ~/src
bash$ mkdir edk2-ws
```

Internet Proxies – (company Firewall used for example)

```
bash$ export http_proxy=http://proxy-us.company.com:911
bash$ export ftp_proxy=$http_proxy
```

Download edk2 source tree using Git

```
bash$ git clone -b Edk2Lab_22Q1 https://github.com/tianocore-training/edk2.git
Bash$ git clone https://github.com/tianocore/edk2-libc.git
```

Download the Submodules and Checkout the Lab Branch

```
bash$  cd edk2
bash$ submodule update –init
bash$  cd ..
```

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SETUP LAB MATERIAL

Lab_Material_FW.zip

DOWNLOAD LAB MATERIAL

Download the Lab_Material_FW.zip from :  github.com Lab_Matrial_FW.zip

OR

Use git clone to download the Lab_Material_FW

```
bash$ cd $HOME
bash$ git clone https://github.com/tianocore-training/Lab_Material_FW.git
```

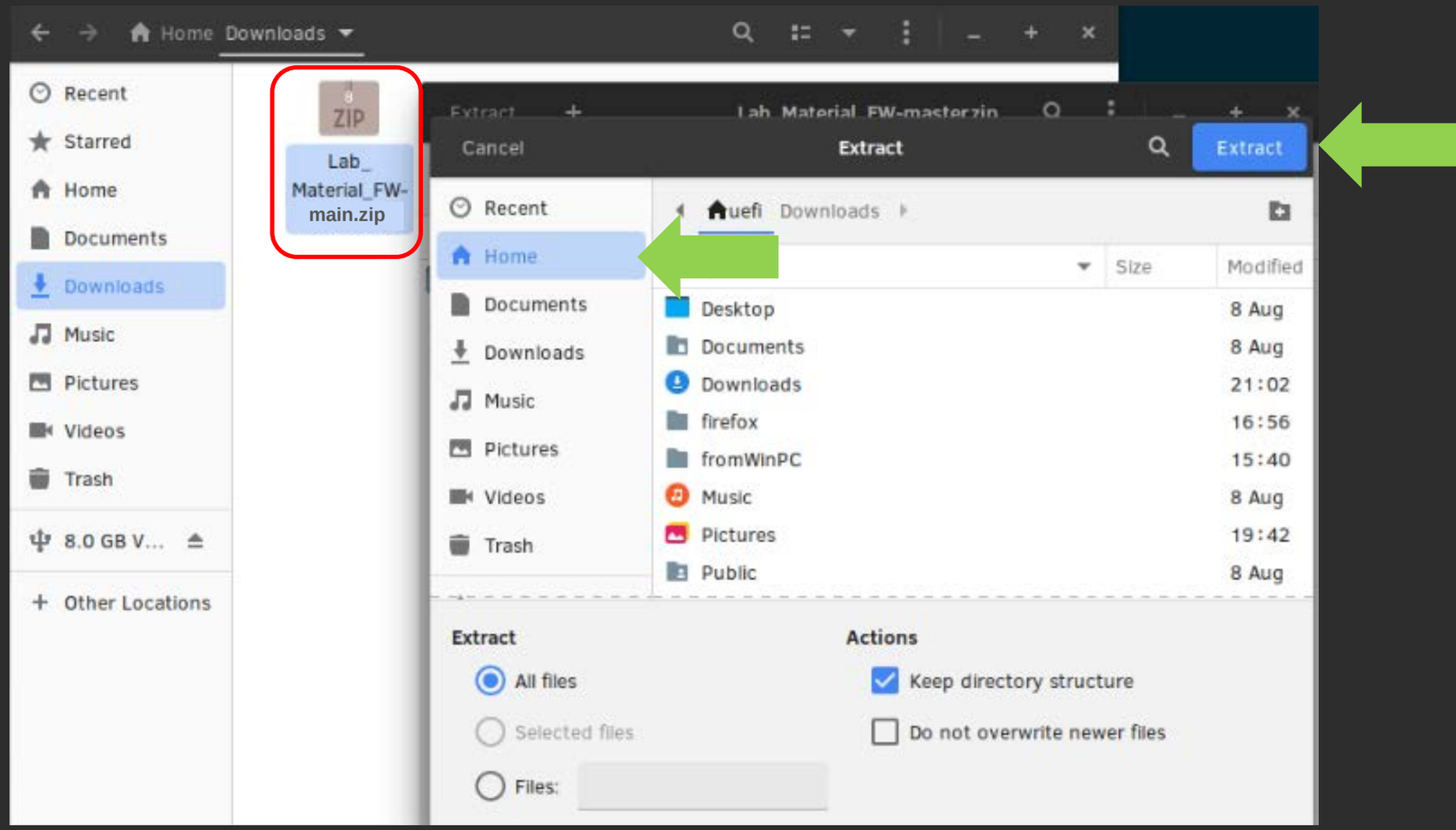
Directory Lab_Material_FW will be created

```
FW
 - Documentation
 - DriverWizard
 - edk2-ws
 - edk2Linux
 - LabSampleCode
```

BUILD EDK II OVMF

-Extract the Source

1. Extract the Downloaded **`Lab_Material_FW-main.zip`** to `Home` (this will create a directory `~/FW`)

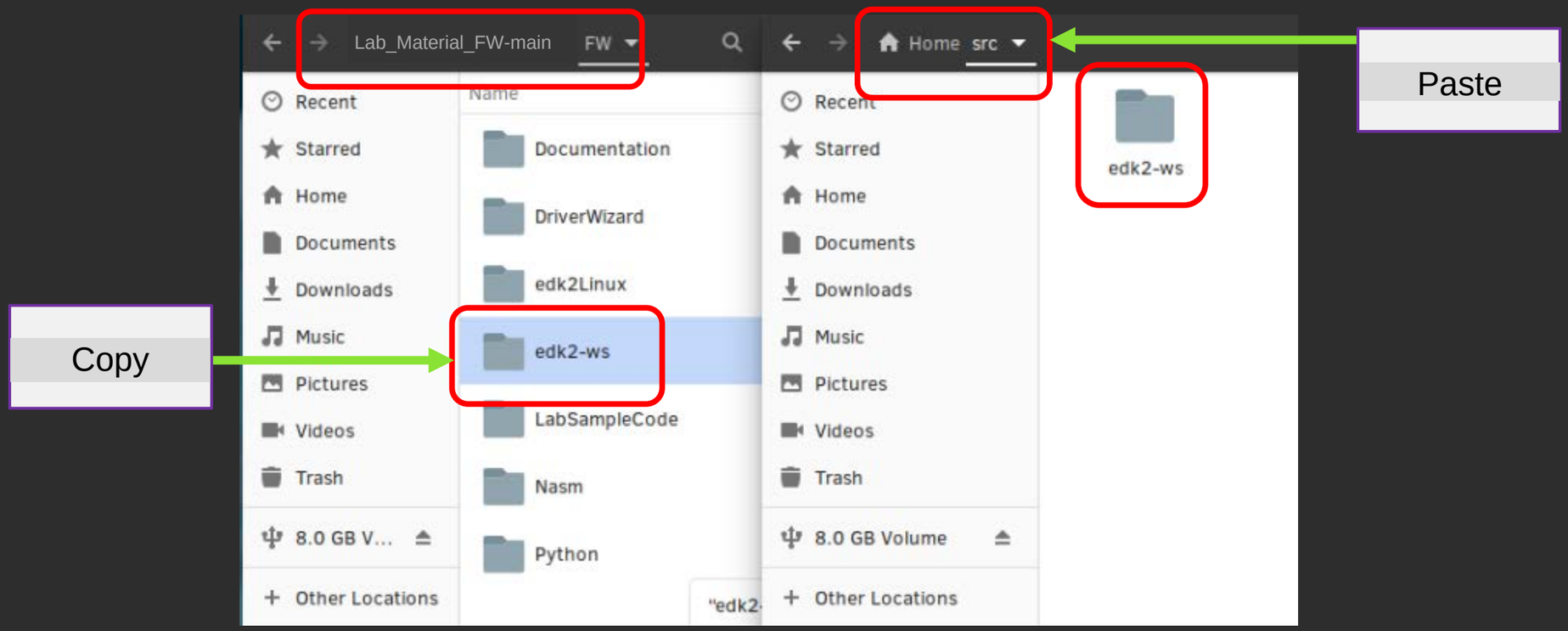


BUILD EDK II OVMF
- Copy the Source

2. Open a terminal prompt (Alt-Cnt-T)
3. Create a working space source directory under the home directory

```
bash$ cd ~src
```

4. From the FW folder, copy and paste folder “~…/FW/edk2-ws” to ~src



BUILD EDK II OVMF
- Building BaseTools

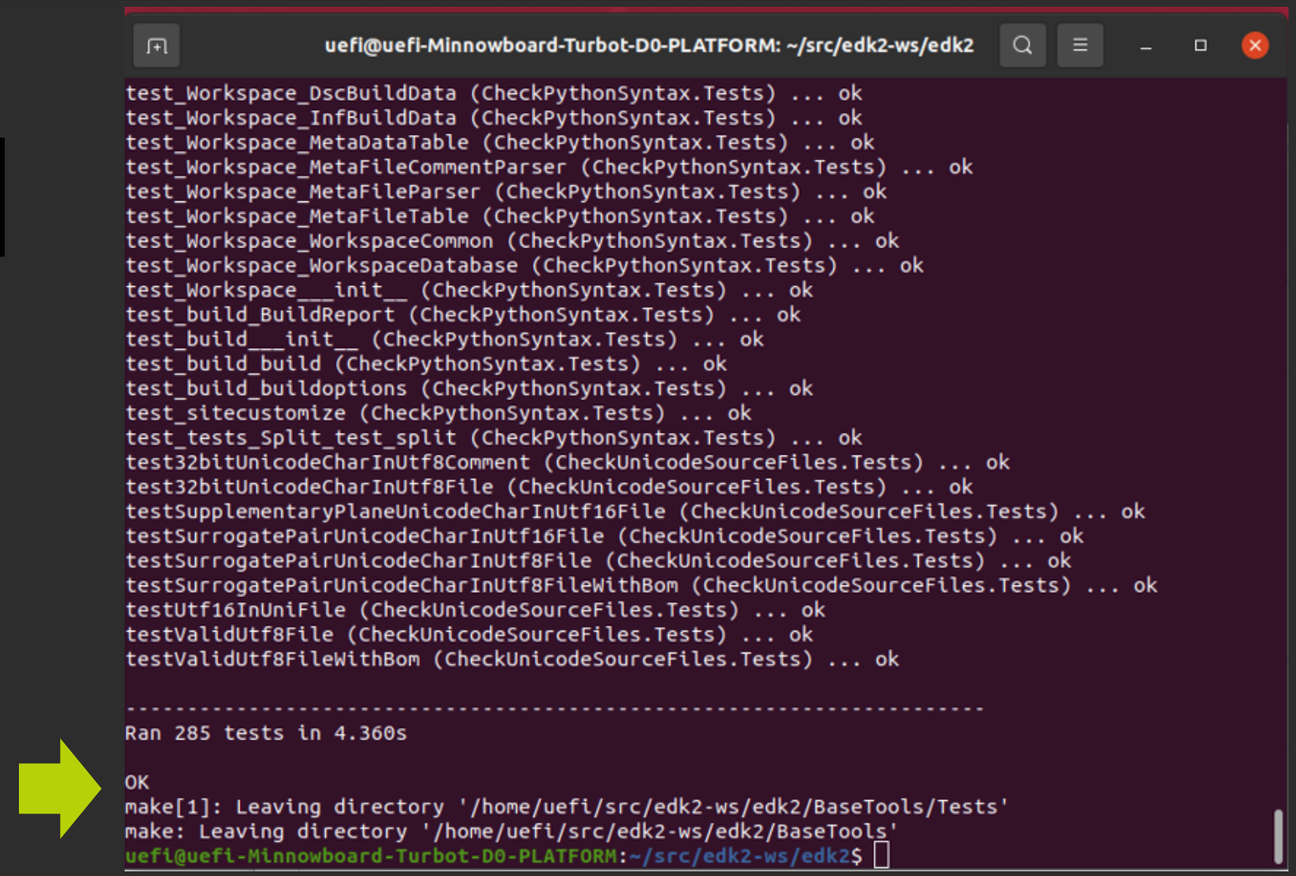
5. Export work space & platform path

```
bash$ cd ~src/edk2-ws
bash$ export WORKSPACE=$PWD
bash$ export PACKAGES_PATH=$WORKSPACE/edk2:$WORKSPACE/edk2-libc
```

6. Run Make

```
bash$ cd edk2
bash$ make –C BaseTools/
```

7. Make sure the tests pass OK



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BUILD OVMF PLATFORM

BUILD EDK II OVMF
-Update Target.txt

What is OVMF?
Open Virtual Machine Firmware - Build with edk2

```
bash$ cd ~/src/edk-ws/edk2
bash$ . edksetup.sh
```

```
uefi@clr-0~/src/edk2-ws/edk2 $ . edksetup.sh
Loading previous configuration from /home/uefi/src/edk2-ws/edk2/Conf/Build
WORKSPACE: /home/uefi/src/edk2-ws
EDK_TOOLS_PATH: /home/uefi/src/edk2-ws/edk2/BaseTools
CONF_PATH: /home/uefi/src/edk2-ws/edk2/Conf
uefi@clr-0~/src/edk2-ws/edk2 $
```

Edit the file Conf/target.txt

```
bash$ gedit Conf/target.txt
```

Open | Target.txt ~/src/edk2-ws/edk2/Conf | Save | - + X

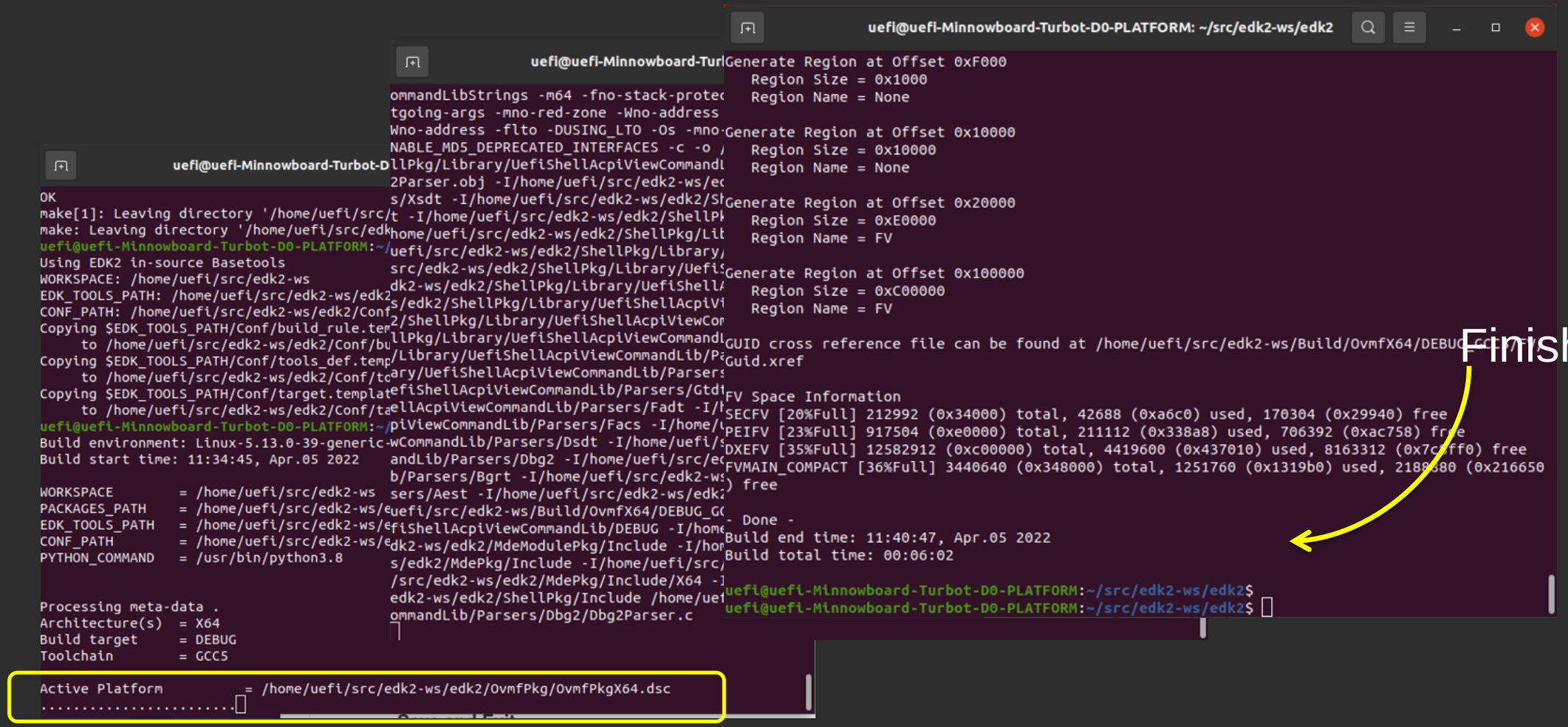
```
1.  ACTIVE_PLATFORM       = OvmfPkg/OvmfPkgX64.dsc
    #. . .
2.  TARGET_ARCH           = X64
    #. . .
3.  TOOL_CHAIN_TAG        = GCC5
```

Save and build

```
bash$ build -D ADD_SHELL_STRING
```

More info: tianocore - wiki/OVMF

BUILD EDK II OVMF
-Inside Terminal



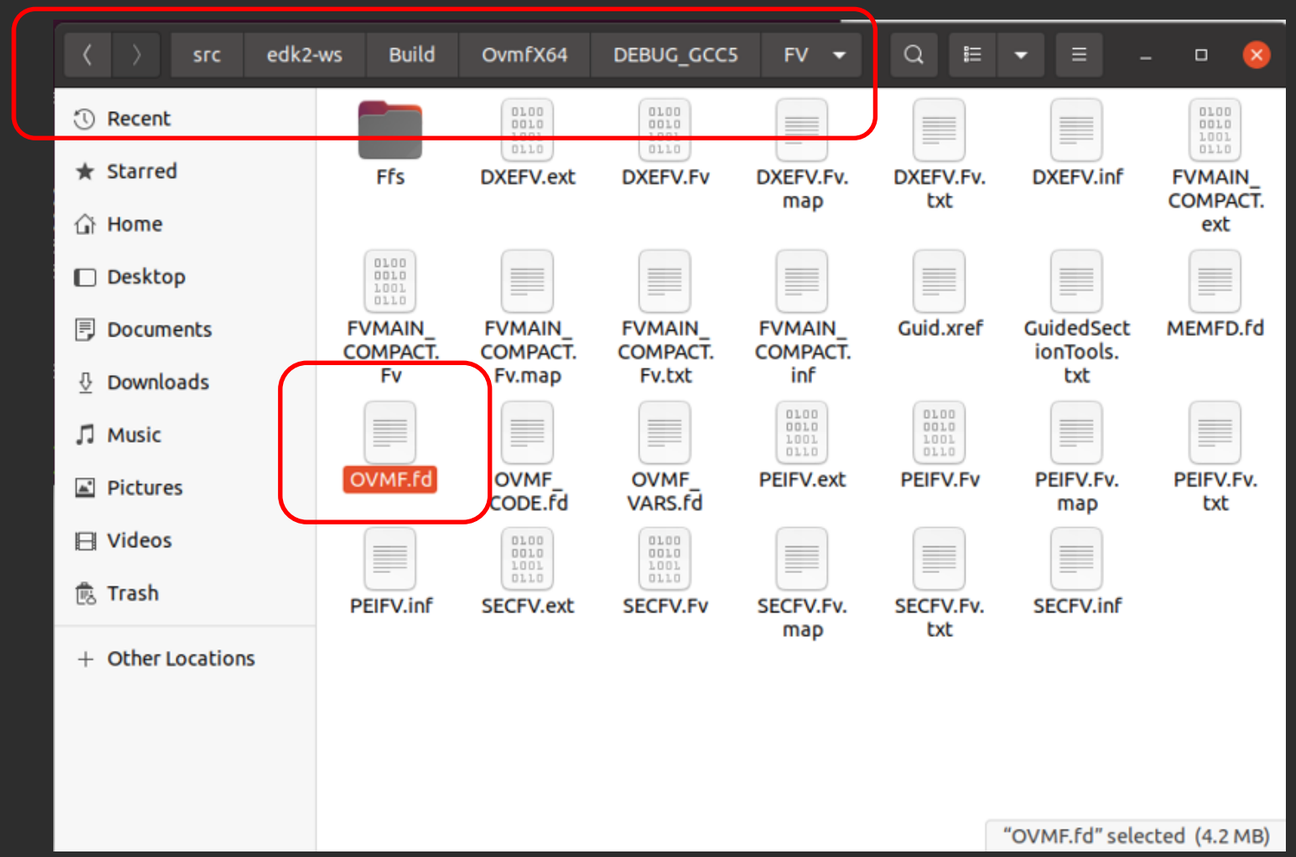
Finished build

BUILD EDK II OVMF
-Verify Build Succeeded

OVMF.fd should be in the Build directory

- For GCC5 with X64, it should be located at

```
~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/FV/OVMF.fd
```



INVOKE QEMU

Change to run-ovmf directory under the home directory

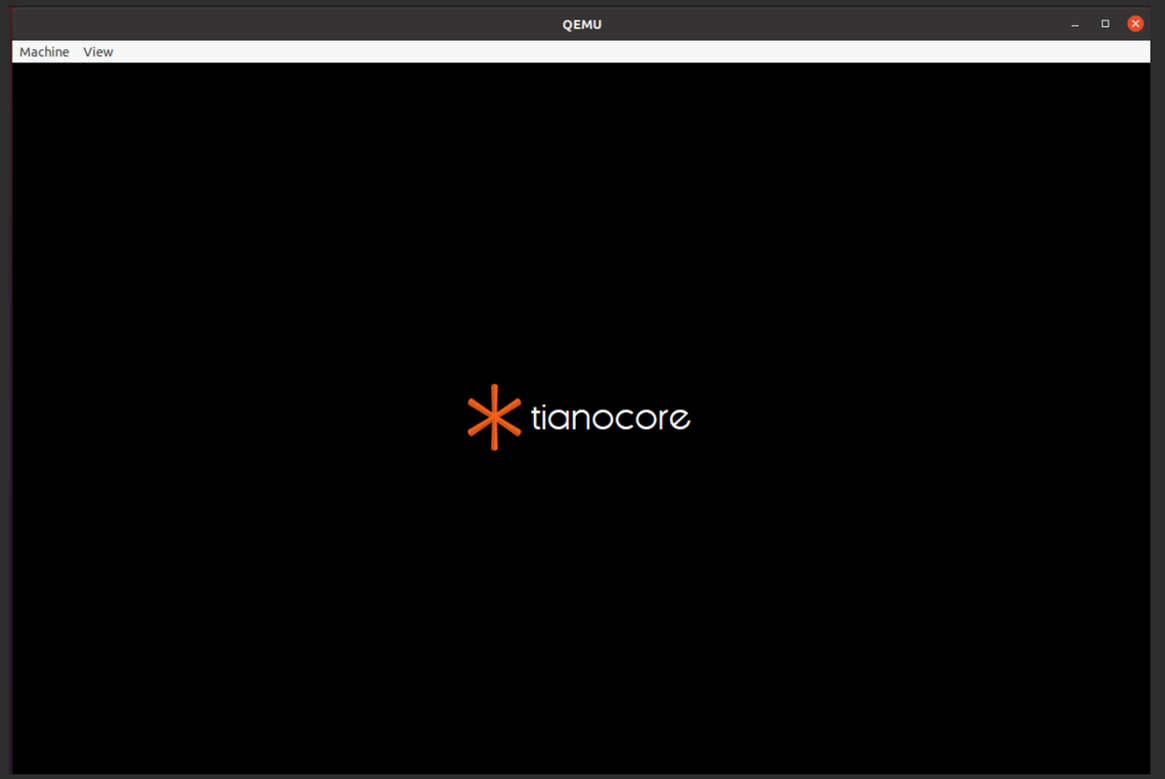
```
bash$ cd $HOME/run-ovmf
```

Copy the OVMF.fd BIOS image created from the build to the run-ovmf directory naming it bios.bin

```
bash$ cp ~/src/edk2-ws/Build/OvmfX64/DEBUG_GCC5/FV/OVMF.fd bios.bin
```

Run the RunQemu.sh Linux shell script

```
bash$ . RunQemu.sh
```



Show the UEFI Boot Variables

At the Shell Prompt:

```
Shell> FS0:

FS0:> BCFG Boot Dump
```

```
  Desc    - UEFI BootManagerMenuApp
  DevPath - Fv(6D99E806-3D38-42C2-A095-5F4300BFD7DC)/FvFile(EEC25BDC-67F2-4D95-B
1D5-F81B2039D11D)
  Optional- N
Option: 02. Variable: Boot0002
  Desc    - UEFI Misc Device
  DevPath - VenHw(5CF32E0B-8EDF-2E44-9CDA-93205E99EC1C,00000000)/VenHw(6888A4AE-
AFCE-E84B-9102-F7B9DAE6A030,00000000)
  Optional- Y
Option: 03. Variable: Boot0003
  Desc    - UEFI Non-Block Boot Device
  DevPath - VenHw(5CF32E0B-8EDF-2E44-9CDA-93205E99EC1C,00000000)/VenHw(964E5B22-
6459-11D2-8E39-00A0C969723B,00000000)
  Optional- Y
Option: 04. Variable: Boot0004
  Desc    - UEFI BootManagerMenuApp
  DevPath - Fv(6D99E806-3D38-42C2-A095-5F4300BFD7DC)/FvFile(EEC25BDC-67F2-4D95-B
1D5-F81B2039D11D)/BootManagerMenuApp
  Optional- Y
Option: 05. Variable: Boot0000
  Desc    - UEFI Enter Setup
  DevPath - Fv(6D99E806-3D38-42C2-A095-5F4300BFD7DC)/FvFile(462CAA21-7614-4503-8
36E-8AB6F4662331)/Enter Setup
  Optional- N
FS0:\> _
```

Use the Dmpstore to Show the Boot Order

At the Shell Prompt:

```
FS0:> Dmpstore BootOrder
```

```
FS0:\> dmpstore bootorder
Variable NV+RT+BS 'EFIGlobalVariable:BootOrder' DataSize = 0x0C
  00000000: 05 00 01 00 02 00 03 00-04 00 00 00             *............*
FS0:\> _
```

Use the BCFG to Move a boot item

Use BCFG to Move the 5th boot item too 1st location.

Then verify using the “dmpstore”

(Hint: use BCFG -? –b for help menu)

The dmpstore output should look like the screen shot

Result

```
FS0:\> dmpstore bootorder
Variable NV+RT+BS 'EFIGlobalVariable:BootOrder' DataSize = 0x0C
  00000000: 00 00 05 00 01 00 02 00-03 00 04 00                *.....
```

Use the BCFG to Add a boot item

Copy the old EFI Shell from
`~/src/edk2-ws/edk2/ShellPkg/OldShell/Shell_FullX64.efi`
`to the run-ovmf directory  ~/run-ovmf/hda-contents`

Use BCFG to Add a 06 entry for a new boot option with `Shell_FullX64.efi`

Then verify using the “`BCFG Boot Dump`”

Hint: make sure `Shell_FullX64.efi` is in the FS0: directory by doing:

`FS0:\> Dir`

```
FS0:\> dir shell*.efi
Directory of: FS0:\

08/26/2021  15:33           771,136  Shell_FullX64.efi
```

After the `bcfg` add, The output should look like

Result

```
  Optional- Y
Option: 06. Variable: Boot0006
  Desc    - Olde EFI Shell 1.0
  DevPath - VenHw(5CF32E0B-8EDF-2E44-9CDA-93205E99EC1C,00000000)/VenHw
6459-11D2-8E39-00A0C969723B,00000000)/\Shell_FullX64.efi
  Optional- N
FS0:\> _
```

Exit QEMU

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SUMMARY

- Build a EDK II Platform using OVMF package
- Run Ovmf using Qemu 

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Questions?

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ACKNOWLEDGEMENTS

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BACKUP

Pre-requisites Ubuntu 16.04

Instructions from: tianocore wiki Ubuntu_1610
Example Ubuntu 16.04
The following need to be accessible for building Edk2, From the terminal prompt (Cnt-Alt-T):

```
bash$ sudo apt-get install build-essential uuid-dev iasl git gcc-5 nasm  python3-distutils
```

```
build-essential - Informational list of build-essential packages
uuid-dev - Universally Unique ID library (headers and static libraries)
iasl - Intel ASL compiler/decompiler (also provided by acpica-tools)
git - support for git revision control system
gcc-5 - GNU C compiler (v5.4.0 as of Ubuntu 16.04 LTS)
nasm - General-purpose x86 assembler
python3 - distutils - distutils module from the Python standard library
```

```
bash$ sudo apt-get install qemu
```

Qemu – Emulation with Intel architecture with UEFI Shell