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UEFI & EDK II Training

Platform Build Lab – Linux – UP Squared

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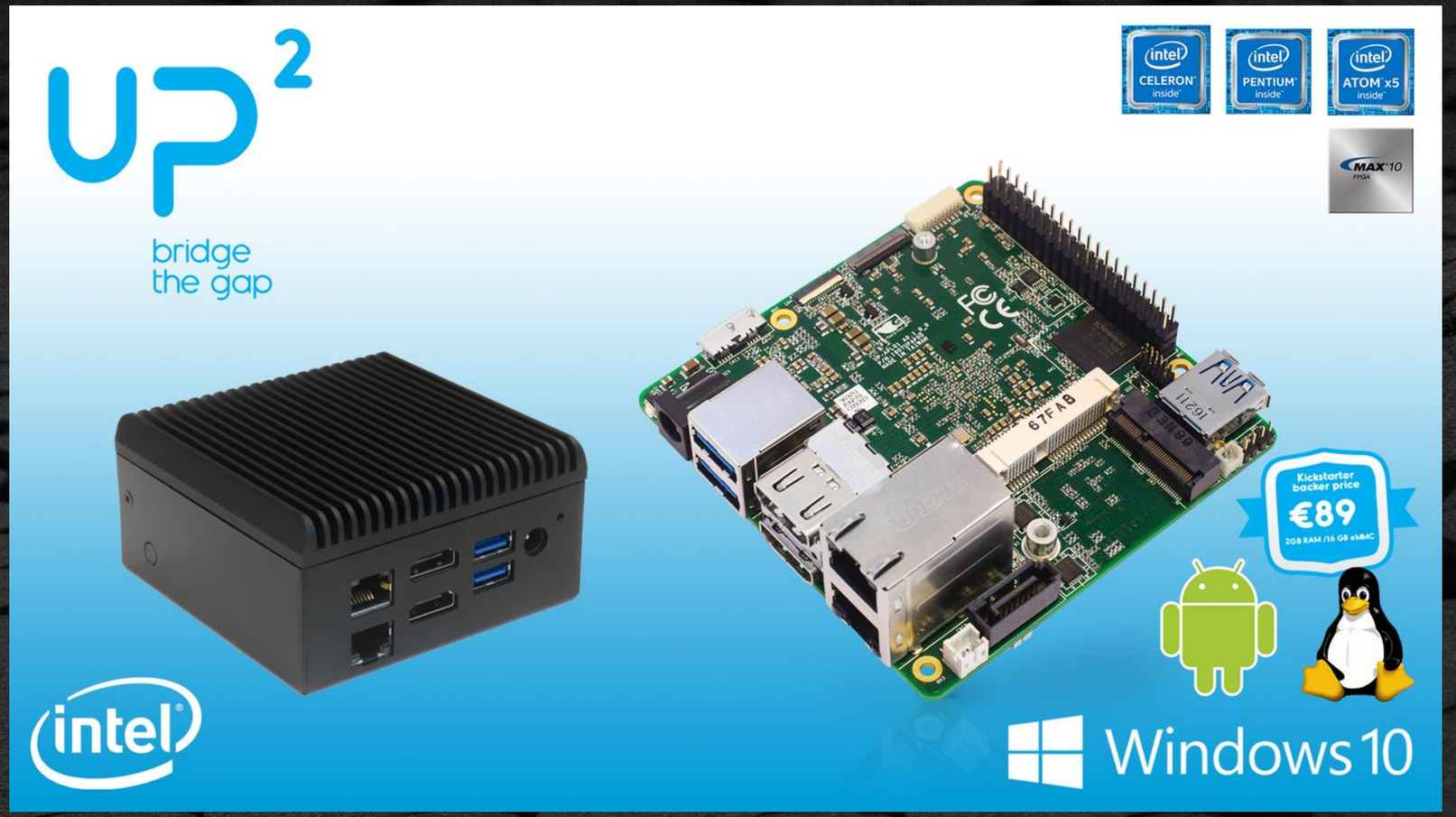
PLATFORM BUILD LABS

- Hardware Setup for UP Squared
- Build a EDK II Platform using Broxton – UP Squared

PLATFORM HW SETUP

Setup hardware for the Broxton – UP Squared

EDK II PLATFORM (UP SQUARED)

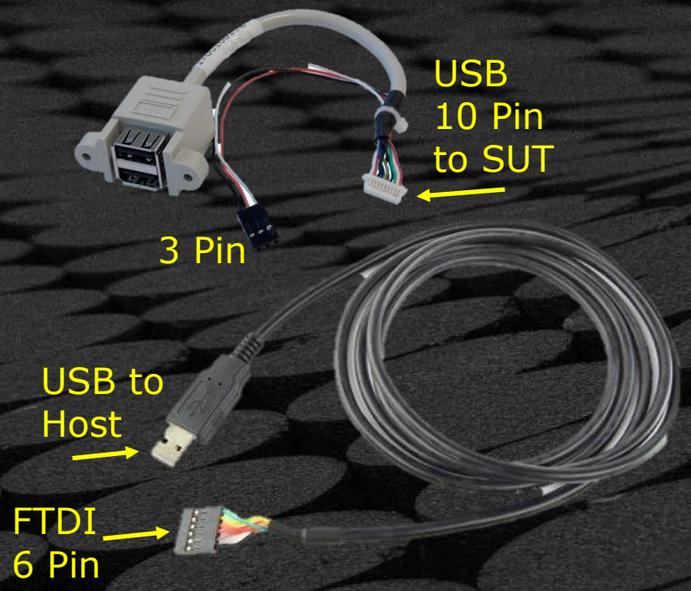


Intel® Celeron™ processor N3350 Series
(Formerly Apollo Lake)

Available from Aaeon
order at: here

UP SQUARED WORKSHOP LAB HARDWARE

FTDI & USB Cables



5V** Power Supply

USB thumb drive

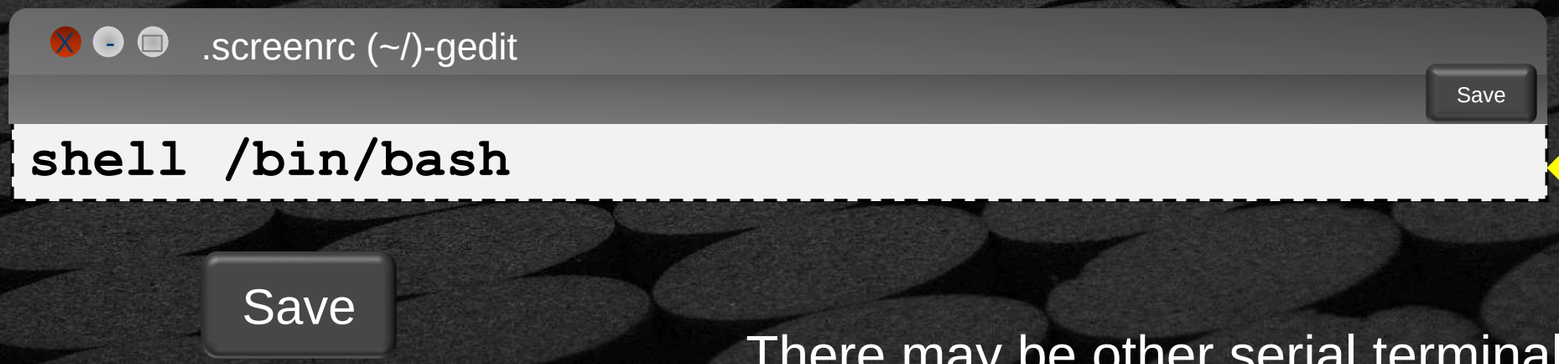
**Warning do not use any other power supply than 5V or the board will Fry

INSTALL UBUNTU “SCREEN”

Terminal prompt (Cnt-Alt-T)

```
bash$ sudo apt-get install screen
bash$ cd $Home
bash$ gedit ~.screenrc
```

Inside the editor, type
"shell /bin/bash" then save



While in screen

Cnt-A then **D** goes back to Terminal

```
bash$ screen –r
```

(returns to screen)

There may be other serial terminal applications that are supported.

Setup UP Squared Test System

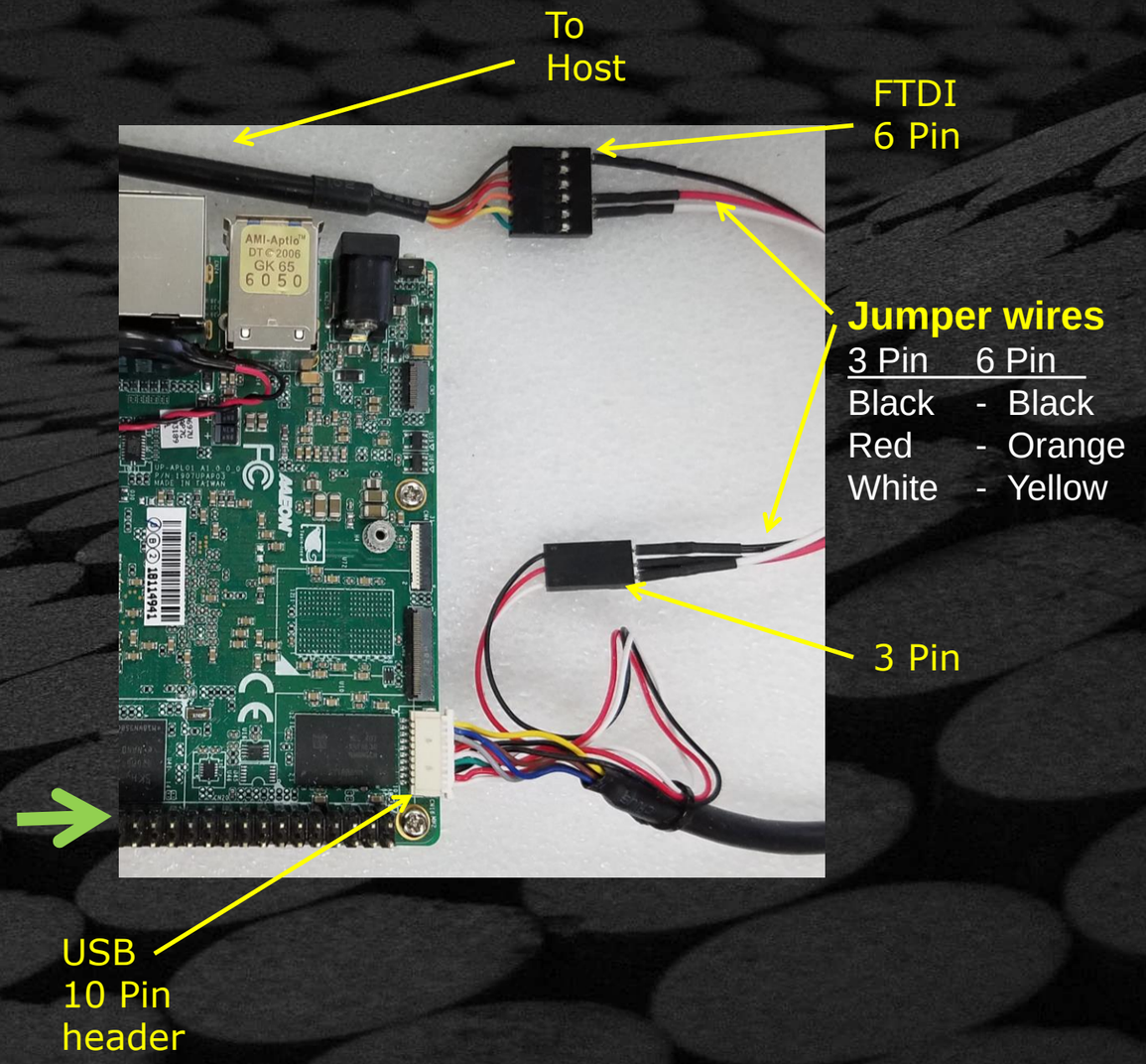
Hardware:

- System Under Test (SUT) – UP Squared
- FTDI USB to 3.3V TTL Cable (6 pin)
- USB / Uart EP-CBUSB10PFL01 (3 pin & 10 pin)
- 5V 6 amp power supply
- 3 jumper wires (black, red, white)

Connect the USB 10 pin header to SUT

Connect the FTDI USB w/ 6 pin to 3 pin connector using jumper wires

Connect the FTDI USB Type A connector to Host (Laptop)

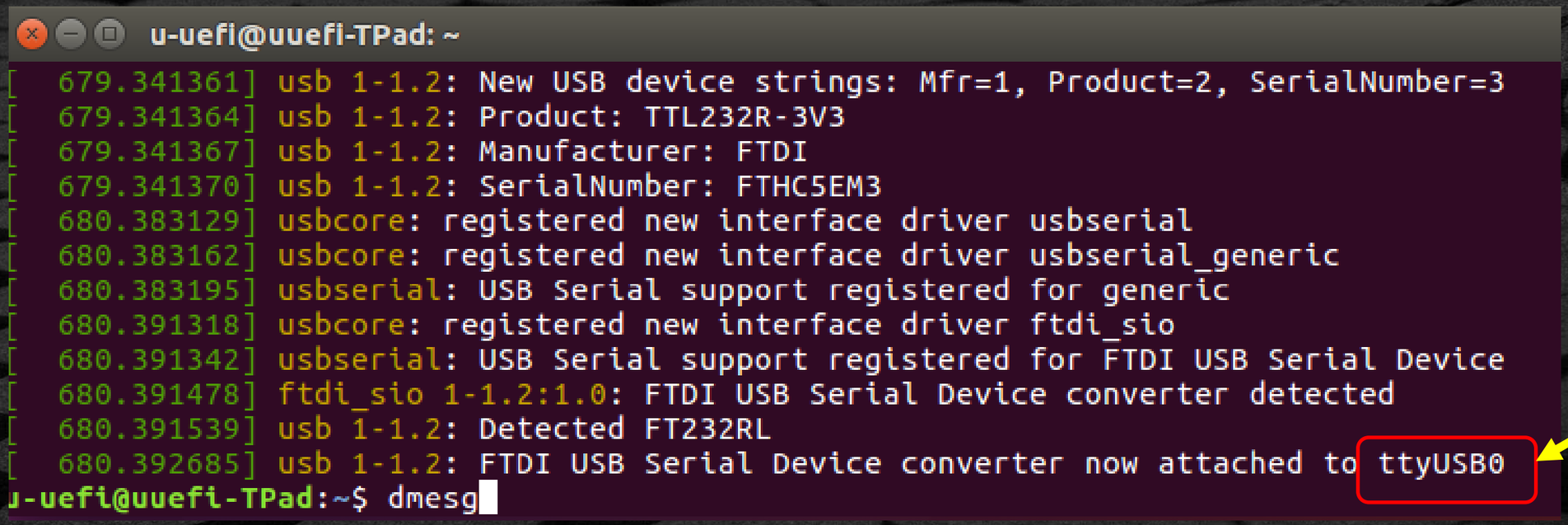


SETUP UP SQUARED TEST SYSTEM

Open Terminal Prompt (Cnt-Alt-T)

```
bash$ dmesg
bash$ sudo chmod 666 /dev/ttyUSBn
```

(to check which USB port is assigned)
(where ***n*** is the FTDI number)



dmesg command
- ttyUSB0

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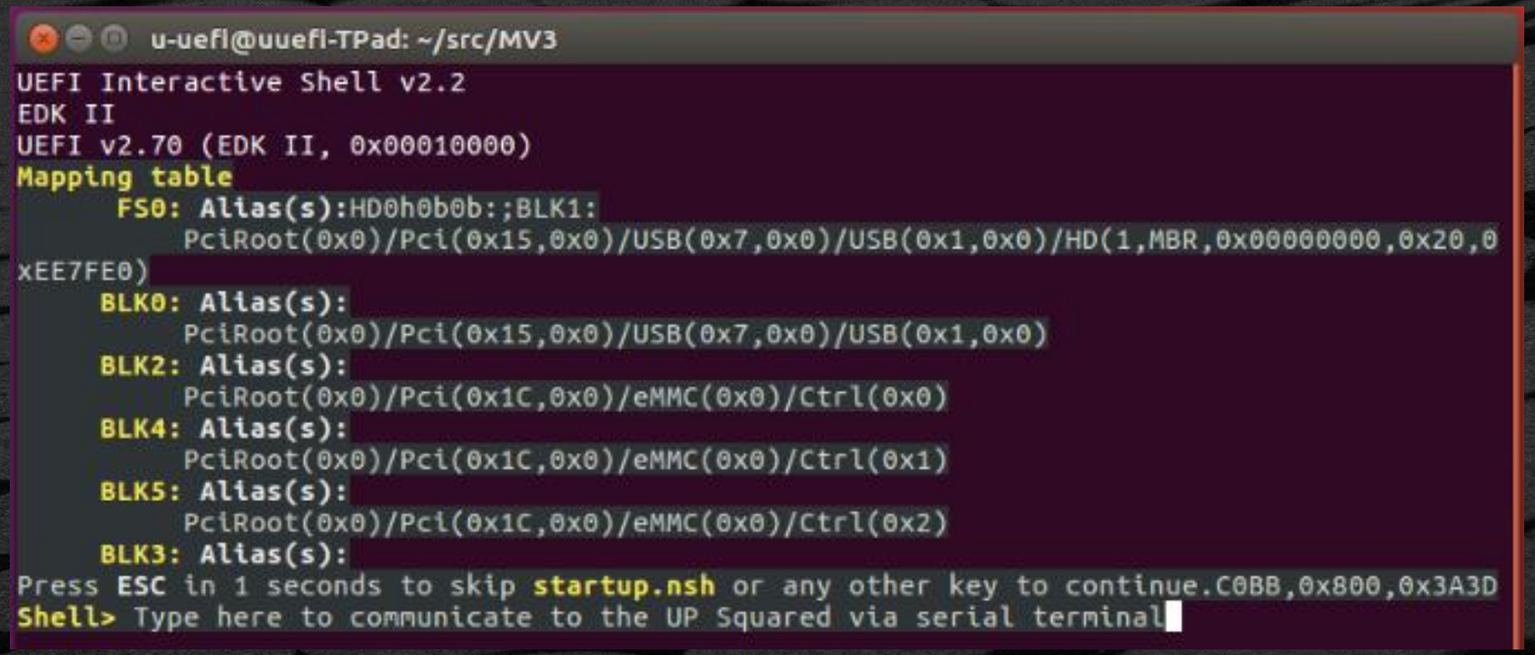
POWER ON UP SQUARED

Connect the Power supply cable to the UP Squared

```
bash$ screen /dev/ttyUSBn 115200
```

UP Squared should boot to the UEFI Shell in the Terminal – Screen .



While in screen

Cnt-A then **D** goes back to terminal

```
bash$ screen -r
```

(returns to screen)

Note: Cnt-H for Backspace

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END OF LAB

Return to the Beginning or > to continue

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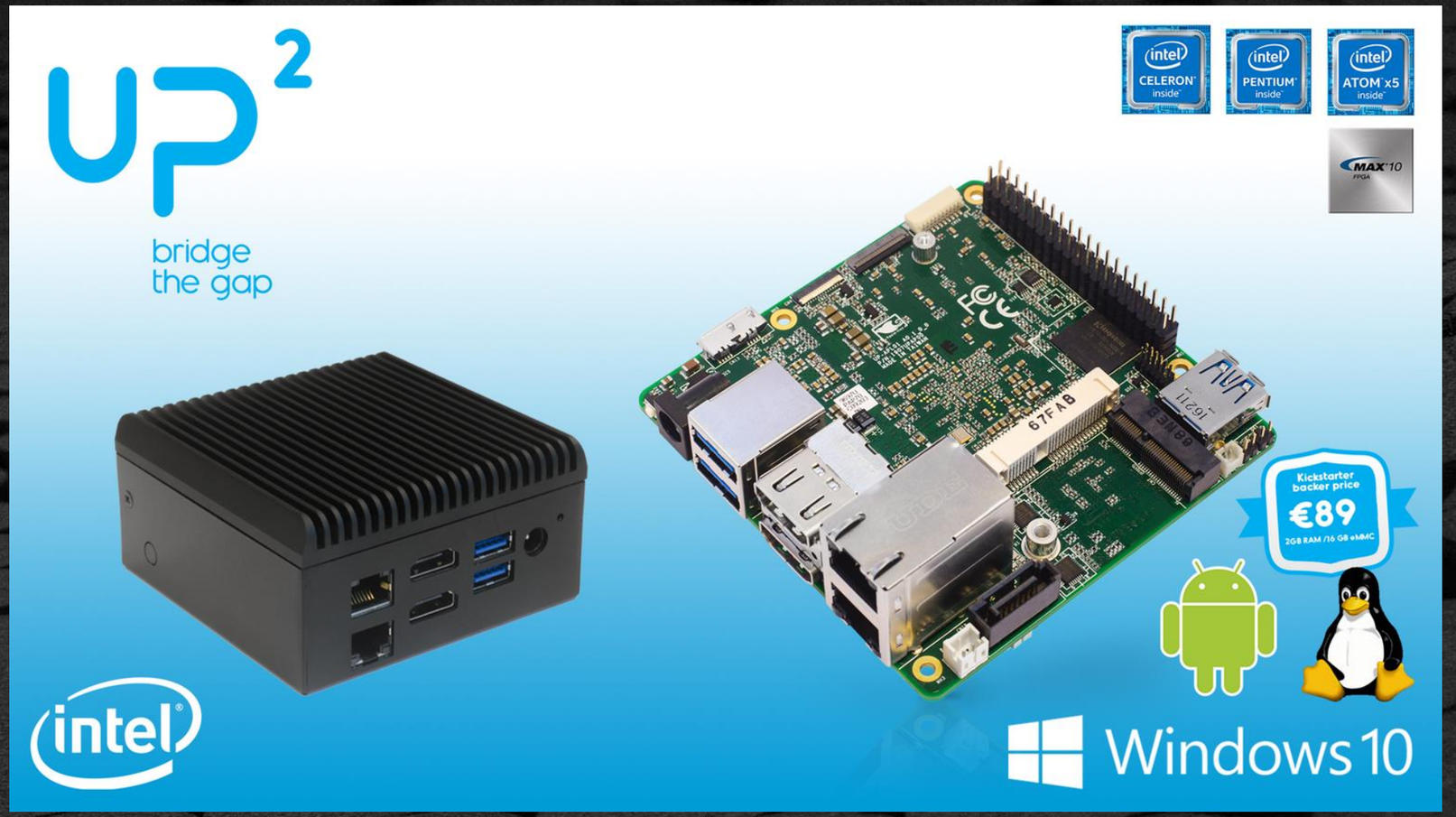
BUILD UP SQUARED

EDK II PLATFORM (UP SQUARED)



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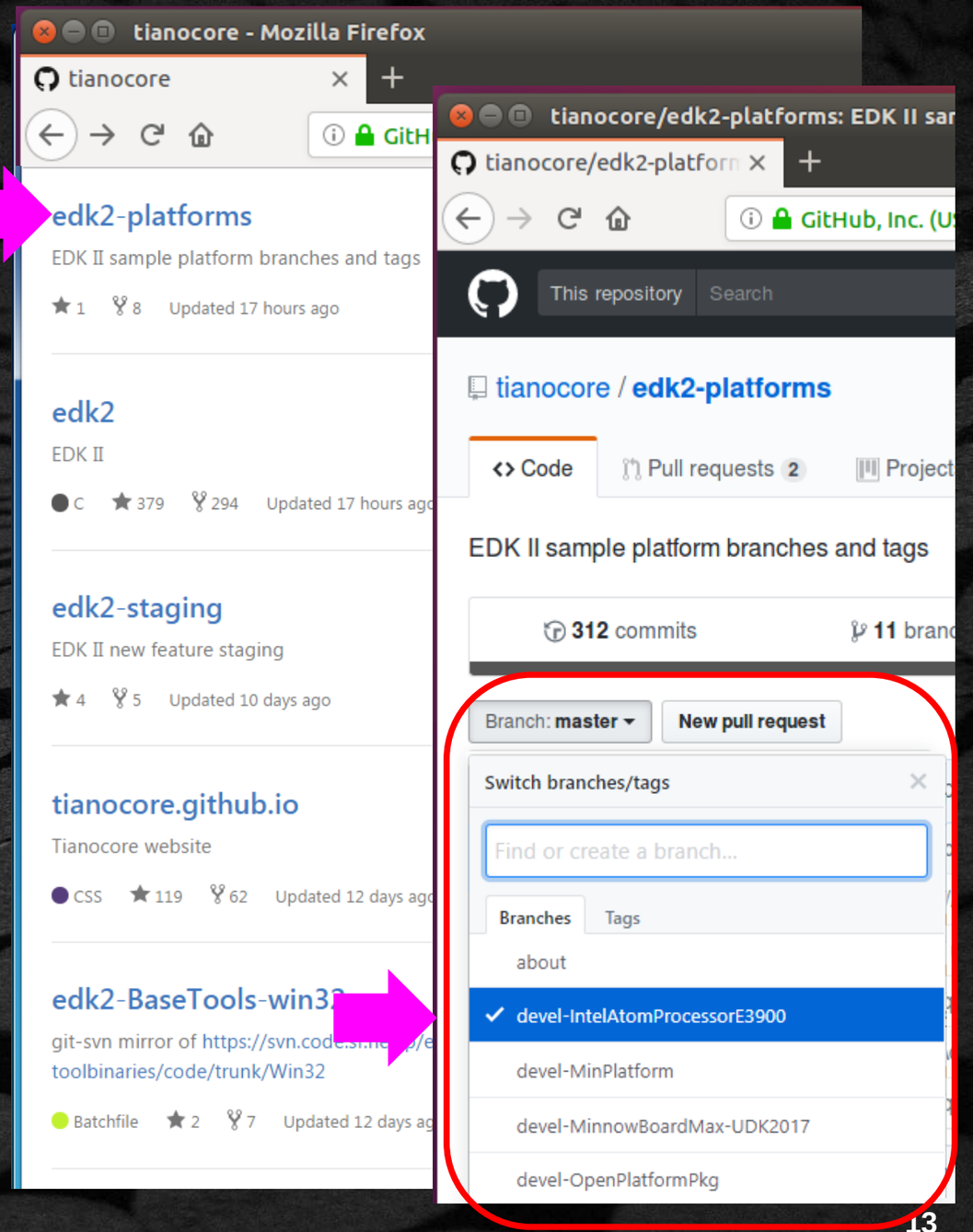
Where to get Open Source UP Squared

- Open Source Up² Wiki
  - V .71 -Github Link
- Binary Object Modules firmware.intel.com
- How to Build: Release Notes



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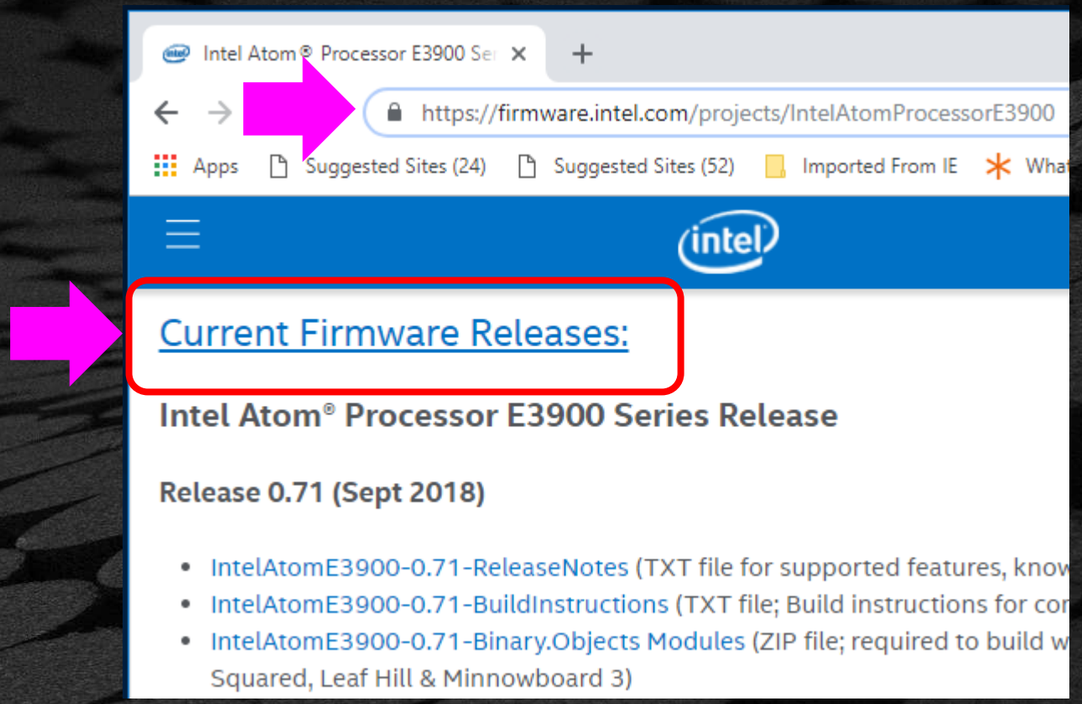


Download UP Squared Lab Source

Download the lab material .zip from : github.com PlatformBuildLab_UP2_FW.zip

OR

Use `git clone` to download the `PlatformBuildLab_UP2_FW`

```
bash$ cd $HOME
bash$ git clone https://github.com/tianocore-training/PlatformBuildLab_UP2_FW.git
```

Directory PlatformBuildLab_UP2_FW will be created

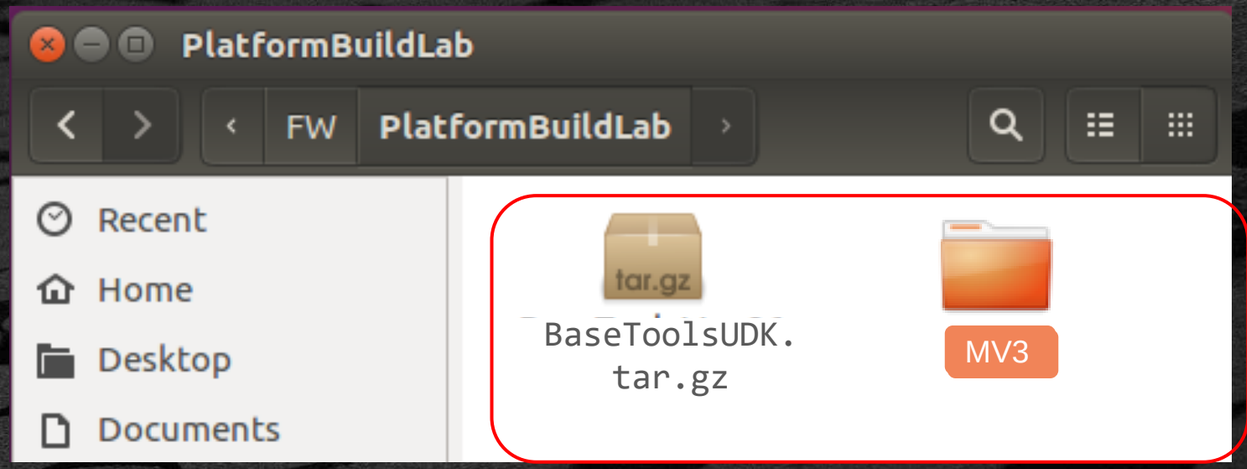
```
/FW
 /PlatformBuildLab
        - MV3                          - UP Squared Source for the Labs
        - BaseToolsUDK.tar.gz          - BaseTools for Linux GCC5 build
        - FirmwareUpdateX64.efi        - UEFI App to flash
```

UP SQUARED LAB SETUP

Previous Lab Setup Requirements

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

Additional Lab Setup –
. . ./FW/PlatformBuildLab



- MV3 – UP Squared Project source code
- BuildToolsUDK.tar.gz – build tools for GCC compiler

At Terminal prompt - Install Screen utility for Serial Console to run UEFI Shell

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

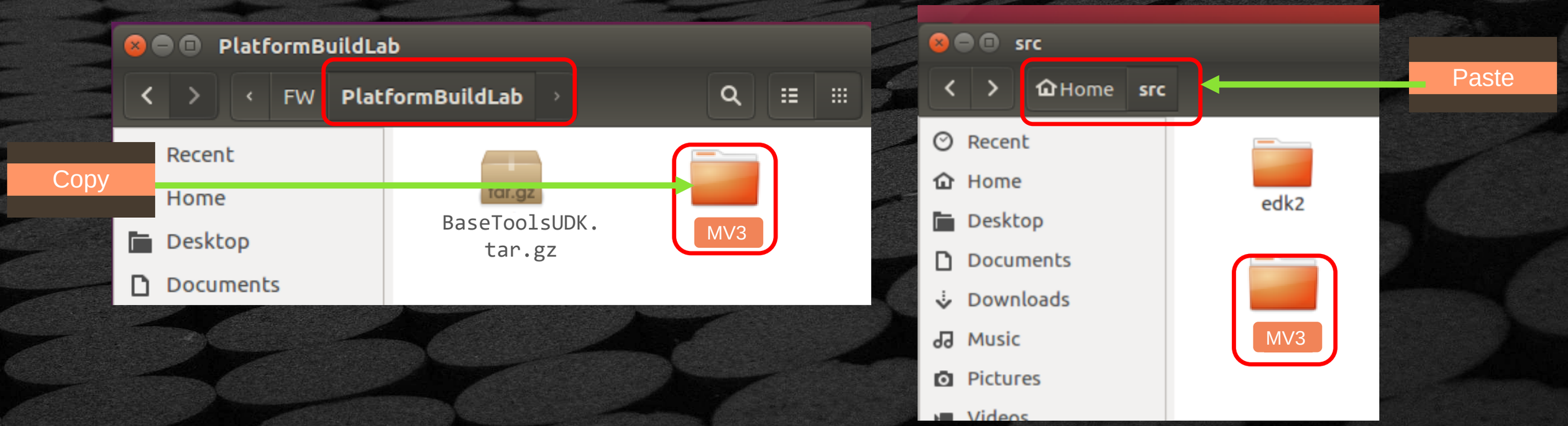
COPY UP SQUARED SOURCE

Open a terminal prompt (Alt-Cnt-T)

Create a working space source directory under the home directory

```
bash$ mkdir ~src
```

From the FW/PlatformBuildLab folder, copy and paste folder “~FW/MV3” to ~src

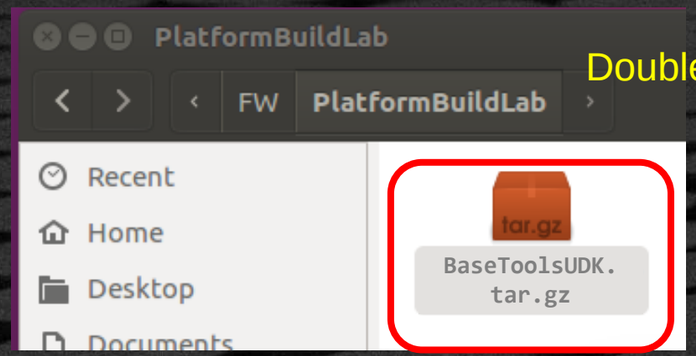


Get the BaseTools for UP Squared

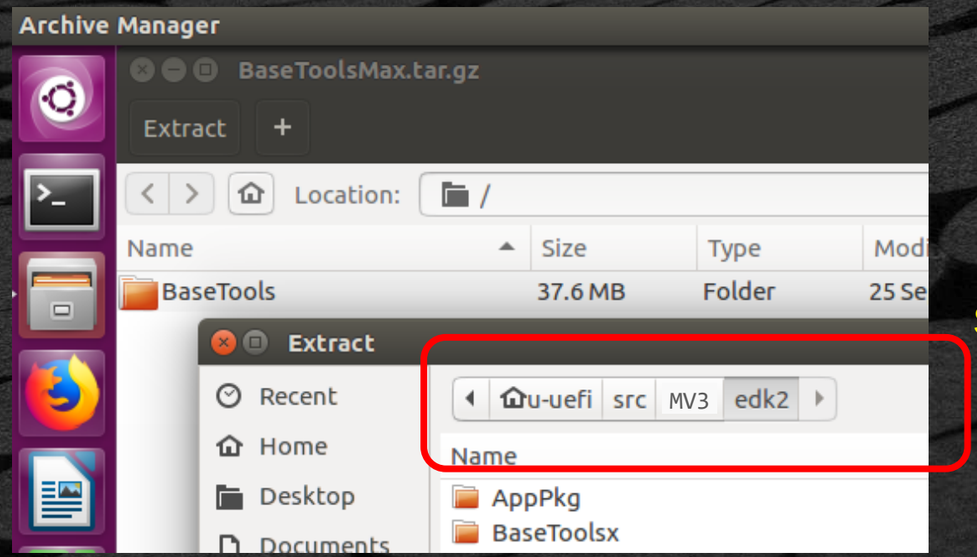
Rename or **mv** the directory "~src/MV3/edk2/BaseTools"

```
bash$ cd ~src/MV3/edk2
bash$ mv BaseTools BaseToolsX
bash$ tar -xf BaseToolsUDK.tar.xz
```

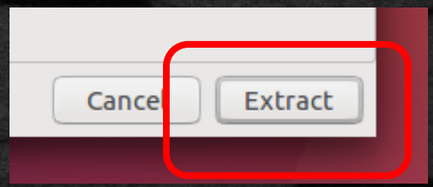
Extract the file ~FW/PlatformBuildLab/BaseToolsUDK.tar.gz to ~src/MV3/edk2



Double click



Select Extract directory $HOME/src/MV3/edk2



click

PLATFORM SOURCE DIRECTORY STRUCTURE

```
/MV3 (work space dir)
  /edk2
    /(UDK2018 Directories)
    /BaseTools (from BaseToolsUDK.tar.gz)

  /edk2-platforms

    /Platform

      /BroxtonPlatformPkg
        (Platform Dirs)
        PlatformPkg.dec,fdf,dsc
    /Silicon
      /BroxtonSoC
        /BroxtonFspPkg
        /BroxtonSiPkg
```

Invoke the Build script from here

`BuildBIOS` script

Platform Project directory

(includes platform build scripts `BuildIFWI` → `BuildBxtBios` called from above `BuildBIOS` above)

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STEPS TO BUILD & INSTALL FIRMWARE

1. Open Terminal prompt (Cnt-Alt-T) &
   Cd $HOME/src/MV3/edk2-platforms
2. Fix-up “chmod” bin executable files
3. Invoke the build process
4. Locate build output (.BIN file for BIOS image)
5. Flash binary image onto the platform
6. Reset and verify the new firmware

Next slide will follow the above steps

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Fix-up Script Properties to Execute

1. Terminal prompt (Cnt-Alt-T) & CD to work space directory
2. Fix Binary tools to “execute” with `chmod +x`

```
bash$ cd ~src/MV3/edk2-platforms/BroxtonPlatformPkg/Common/Tools

bash$ chmod +x GenBiosID/GenBIosId

bash$ chmod +x FCE/FCE

bash$ chmod +x FCE/BfmLib
```

Platform Build Scripts

Platform Build Scripts

Many Platforms have a bash or bat script file to pre or post process the EDK II build process

For UP Squared Broxton Platform: `BuildBIOS.bat` or `BuildBIOS.sh` calls:
`BuildIFWI` from the platform package directory

- pre build processing
- calls `BuildBxtBios` - a platform script to preform the EDK II build
- determines date
- board ID
- post build stitching

BUILD PROCESS FOR DEBUG

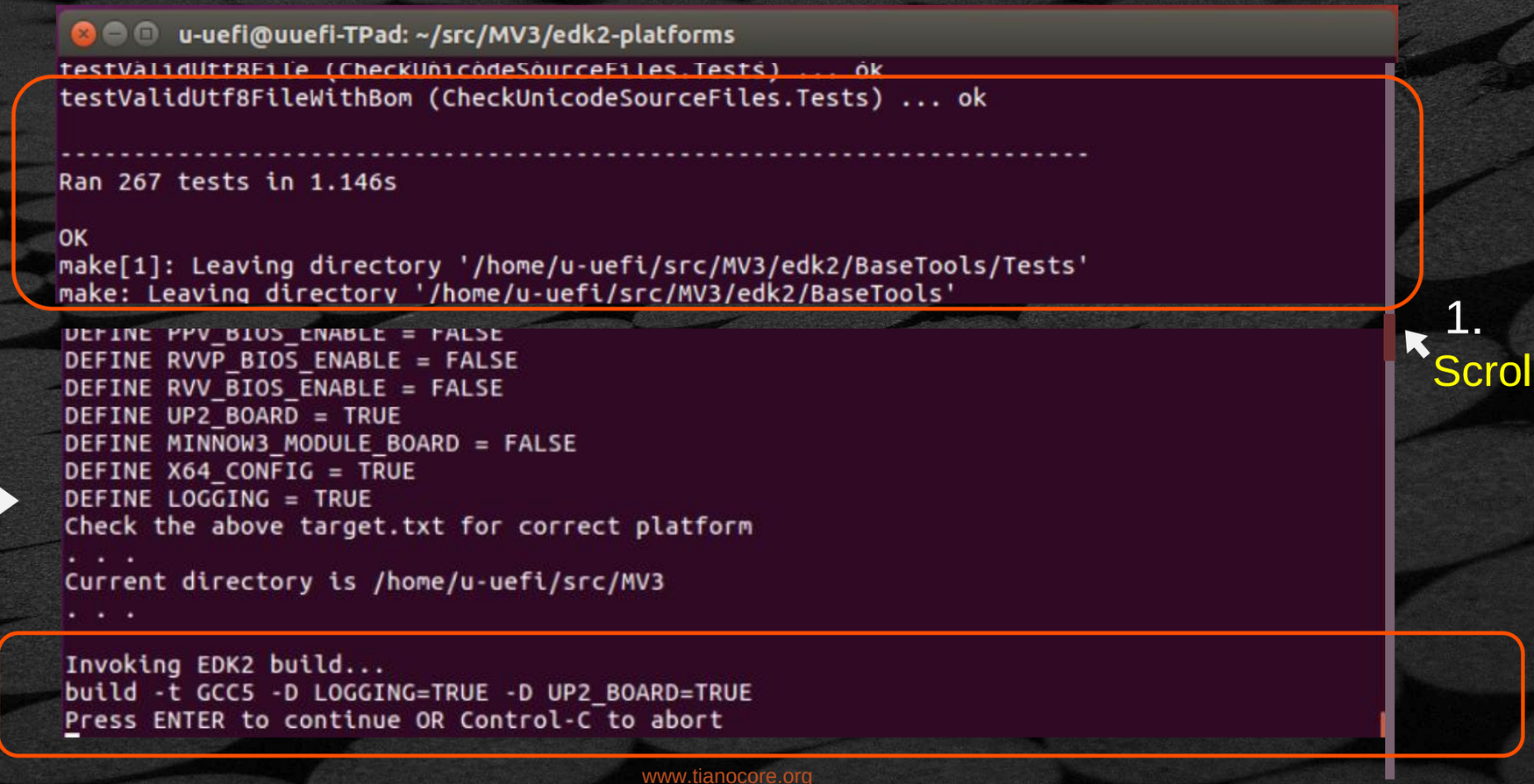
From Terminal Prompt enter:

Note: *the Build will Pause*

3

```
bash$ cd ~/src/MV3/edk2-platforms
bash$ . BuildBIOS.sh /UP /A Broxton Debug
```

2. Check MAKE for BaseTools OK



1. Scroll up

3. Check config…

4. Press ENTER to Continue

EXAMINE BUILD PARAMETERS

```
build    -D LOGGING=TRUE –D UP2_BOARD = TRUE
          . . .  -D Option (n)
```

MACROS

Logging

UP² Board

Properties from Conf\Target.txt

TARGET	= DEBUG	Build Mode
TARGET_ARCH	= IA32 X64	CPU Architecture
TOOL_CHAIN_TAG	= GCC5	VS Tool Chain
ACTIVE_PLATFORM	= .. BroxtonPlatformPkg /PlatformPkgX64	Platform DSC file
MAX_CONCURRENT_ THREAD_NUMBER	= 1	Thread Count

Platform Build and PCD Parameters

Platform Parameters

Many Platform Parameters are defined in a top .DSC file that controls PCD and build switches

For UP Squared:

Build Switches (dynamic)

`DefineAtBuildMacros.dsc` - Updated from `BuildBIOS` command line

`PlatformDsc/BuildOptionsEDKII.dsc` – Like PCDs on command line

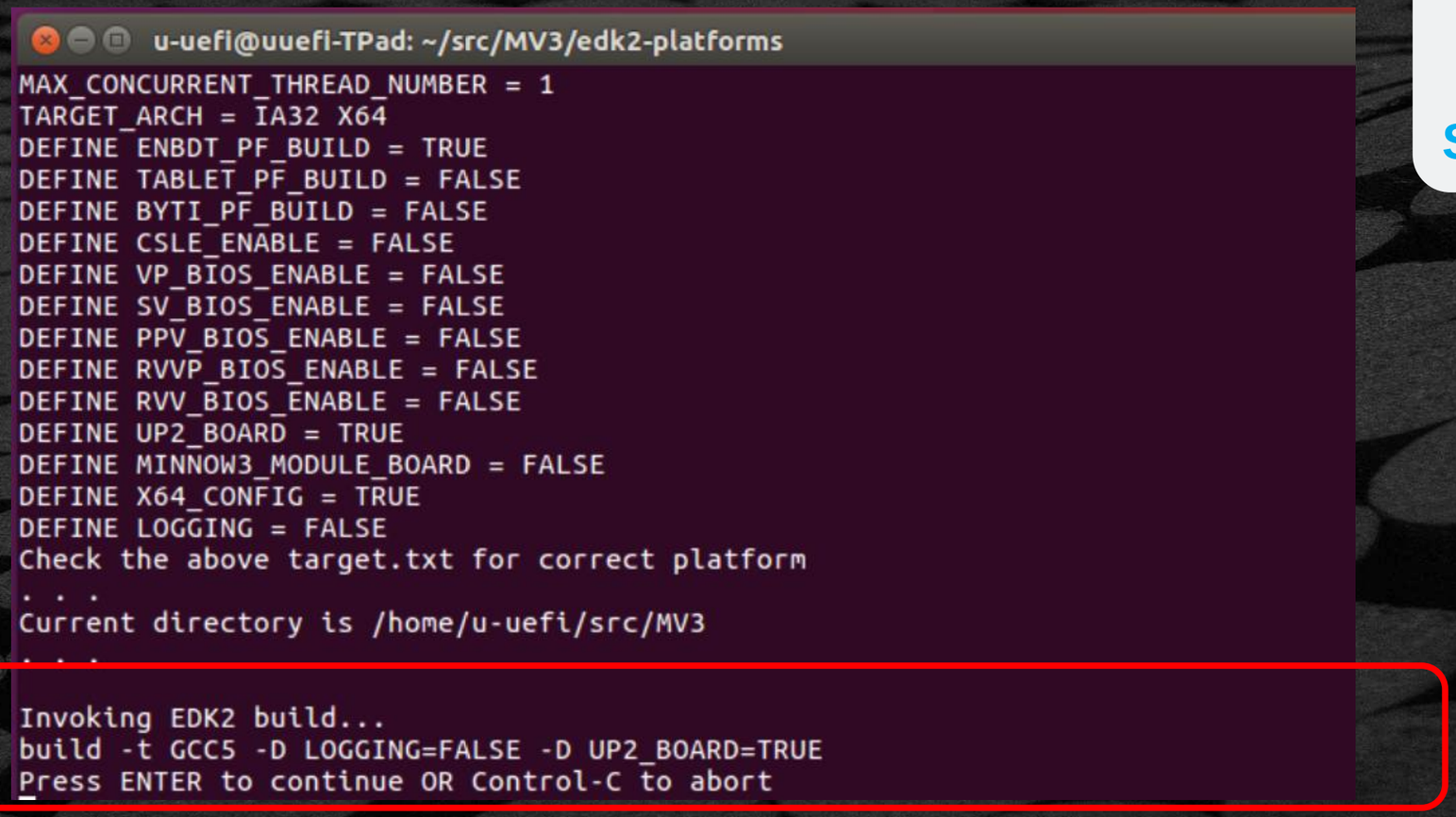
EDK II and Platform feature options

`PlatformDsc/Defines.dsc` - Manully updated before build command

BUILD PROCESS FOR RELEASE

From Terminal Prompt enter:

3 `bash$ . BuildBIOS.sh /UP /A Broxton Release`



NOTE: MACROS

Logging

Symbolic Debug

Set to False

DEBUG & RELEASE DIFFERENCES

Slower boot because the time it takes to display debug info

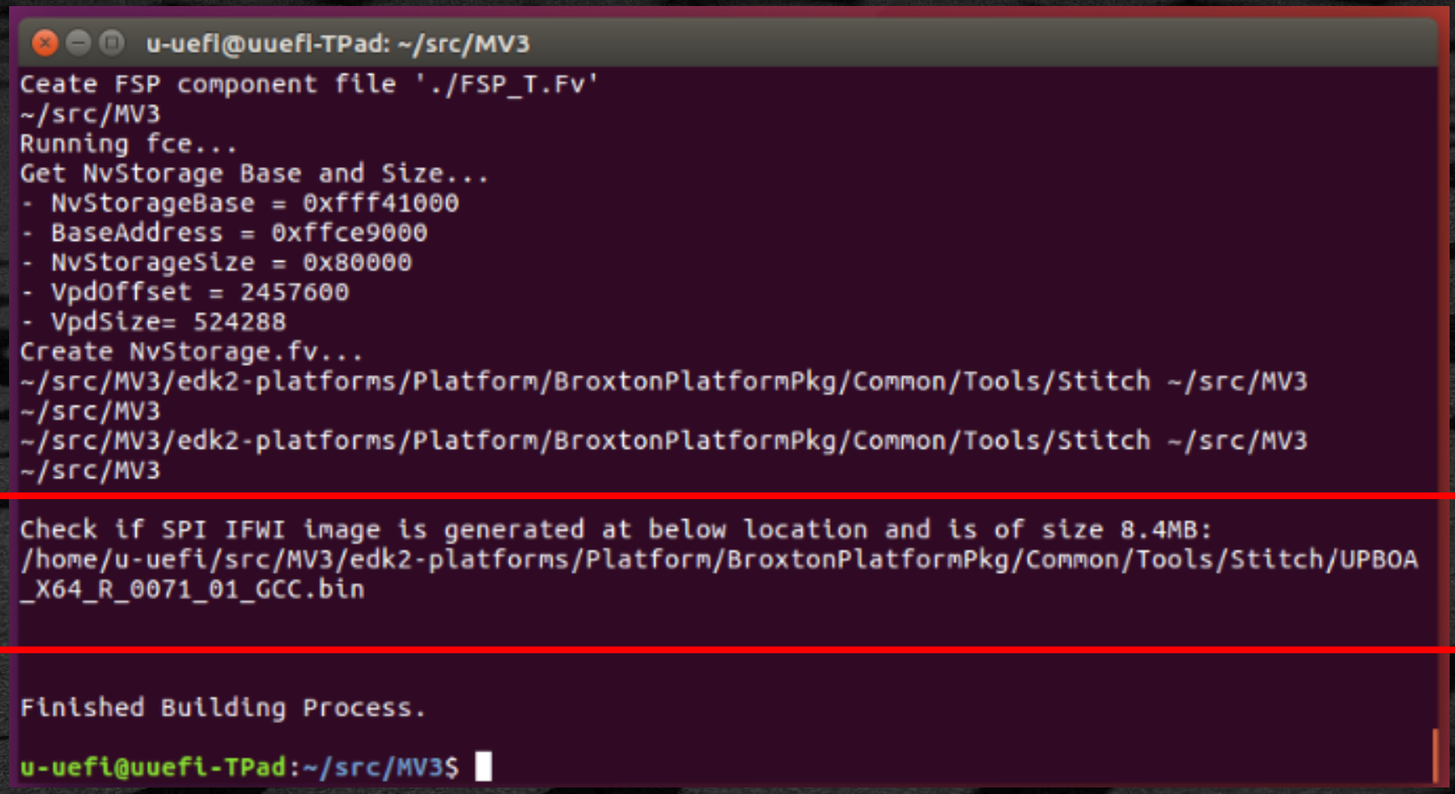
Larger image because of debug code & embedded info

Uses the serial port for debug string output

Contains detailed debug strings that show
the boot process and various ASSERT/TRACE errors

BUILD PROCESS COMPLETED

4 Locate the build .BIN image



The platform build script post build process will stitch the multiple firmware volumes generated by the EDK II build process into the final .BIN image.

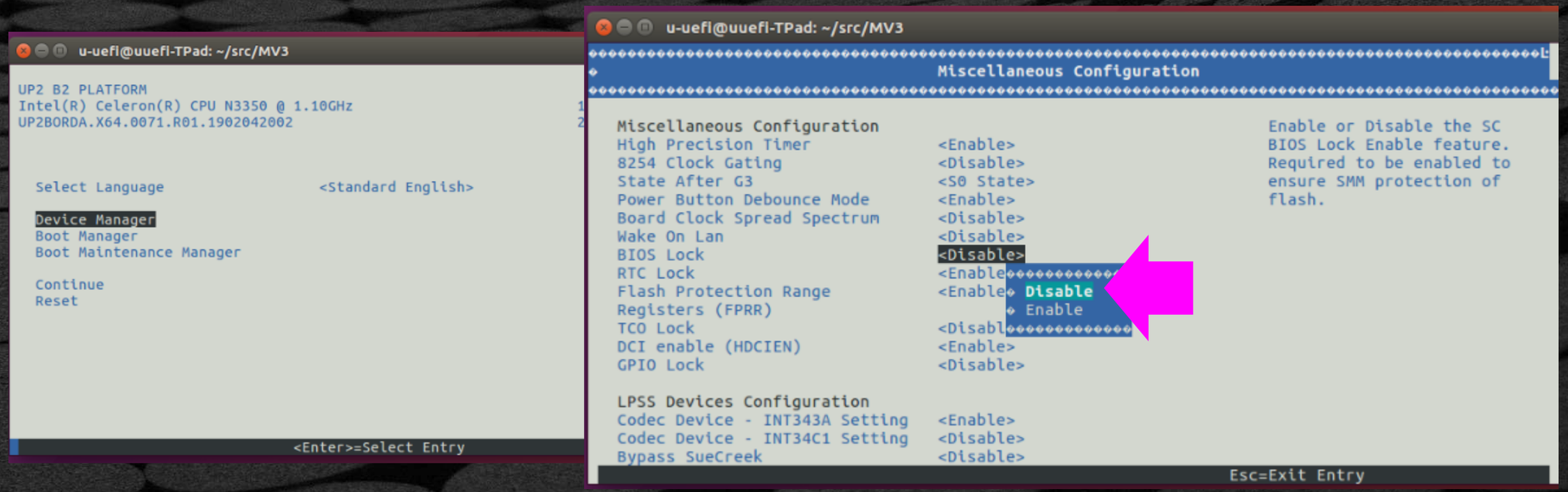
FLASHING THE NEW BIOS

5 Flash the binary image

1. Access UP Squared Binary image file from build folder
   - ~src/MV3/edk2-platforms\Platform\BroxtonPlatformPkg\Common\Tools\Stitch
   - DEBUG UPBOARDA_X64_D_0071_01_GCC.bin
   - RELEASE UPBOARDA_X64_R_0071_01_GCC.bin
2. Copy BIN files to a USB Thumb drive
3. Copy `FirmwareUpdateX64.efi` to a USB thumb drive from ~/FW/PlatformBuildLab
4. Reset the UP Squared board and be prepared to type “F2” to enter System Setup

FLASHING THE NEW BIOS

5. Set “BIOS Lock” to Disable in System Setup by the following:
   - Inside Setup go to “Device Manager” → “System Setup” → “South Cluster Configuration” →“Miscellaneous Configuration”
   - Open “BIOS Lock” and select “Disable”
   - Press “F10” to save and then reboot

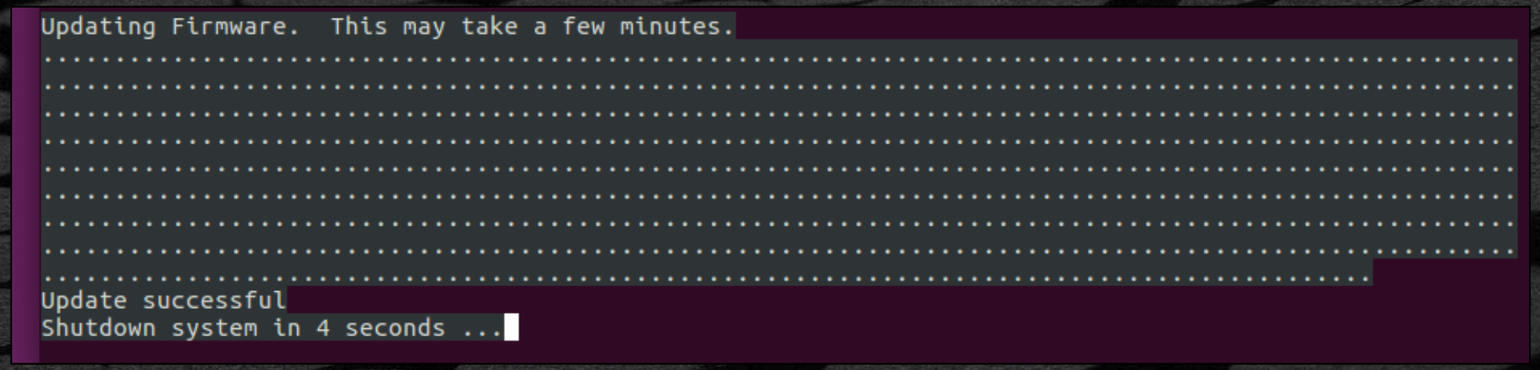


FLASING THE NEW BIOS

6. Boot into the UEFI Shell then type “FS0:”
7. Run update .efi utility with either BIN file
   (Note the “*TAB*” Key will fill out the command line for you)

```
FS0:\> FirmwareUpdateX64.efi UPBOA_X64_R_0071_01_GCC.bin
```

WAIT for the new firmware update to finish



NOTE for Ubuntu Screen terminal
Control –H for backspace
Control A then D to return to Ubuntu
Screen –r to return to UEFI Shell Console

Reset and boot new firmware

VERIFY AFTER FIRMWARE UPDATE

6 Reboot and Verify

- Verify that the Firmware was updated by checking the Date
- Go into setup by pressing “F2” after reboot
- The EDK II front page will show the BIOS ID with Date/time stamp

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SUMMARY

- Hardware Setup for UP Squared
- Build a EDK II Platform using Broxton – UP Squared

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Questions?


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