Starterware: BeagleBone Black support

Introduction

This document describes the procedure to add a support in StarterWare package for BeagleBone Black by changing the existing BeagleBone White bootloader. It also explains the changes made in the code on abstract level. After applying the changes, the new bootloader code will work on both the platforms (BeagleBone White and BeagleBone Black). You need to apply the above changes in StarterWare 02.00.01.01 [1] release.

Changes made in the original BeagleBone White bootloader

1. Setting the maximum OPP configuration for the SOC based on the device revision and the EFUSE value if applicable. (**Note:** EFUSE value does not apply for the device revision PG1.0 and it is always 0. Refer section 1.2.12 in TRM [2]).

- For PG1.0, operating performance point TURBO is selected with MPU frequency 720 MHz.
- For PG2.x, operating performance point is selected based on the EFUSE value if correctly blown

Note :

- Experimental devices whose package name starts with 'X', EFUSE value may show 0 or invalid value. For value 0, operating performance point is set to TURBO with MPU frequency 800 MHz and for invalid value, operating performance point is set to OPP50 with MPU frequency 300 MHz.
- For different operating performance point and MPU frequency settings refer section 3.2 in AM335X datasheet [3].

2. To allow the bootloader to work for both BeagleBone White and BeagleBone Black, board identification logic is added.

- EEPROM on the Board stores the information related to board. BeagleBone White has the board name "A335BON" and BeagleBone Black has the board name "A335BNL".
- If the board is found to be BeagleBone White, it is configured for DDR2 memory.
- If the board Is found to be BeagleBone Black, it is configured for DDR3 memory.

3.BeagleBone Black configuration for DDR3 memory.

- PMIC is configured to generate 1.5V required by DDR3.
- DDR PLL is configured to generate 400 MHz required by DDR3.
- Timing parameters required by DDR3 are set.
  - You can refer the BeagleBone Black gel file for the timing parametres generated in "\tools\gel" as AM335X_beagleboneblack.gel.
  - You can also refer this link [4] which shows the procedure to tune the timing for DDR3.

How to apply changes?

You can follow the following steps either on Windows or on Linux to add a support for BeagleBone Black in the existing StarterWare installation. (**Note:** Make sure you are applying changes to StarterWare 02.00.01.01 release)

Step 1 : Download the tar.gz file and keep it in the existing StarterWare installation directory.

Step 2 : unzip and untar the downloaded file and Select 'Yes' when asked to merge any folder or copy and replace a file.

It will automatically replace the following four files in their respective directories.

- beaglebone.h

- bl_platform.c
- bl_platform.h
- hw_tps65217.h
- MLO(**Note:** This is a prebuilt MLO for BeagleBone Black and it will work for both the platforms now)

It will also add the following files as a BeagleBone Black support

- BBB_manual.pdf in "\docs\"
- AM335X_beagleboneblack.gel in "\tools\gel\"

Step 3 : Build your bootloader code.

After building, new bootloader binary is ready to work for both the platforms.

How to run a demo application?

- Locate the new bootloader binary in the following directory based on the tool chain being used.

    GCC: "\binary\armv7a\gcc\am335x\beaglebone\bootloader\Release_MMCSD\"

    CCS: "\binary\armv7a\cgt_ccs\am335x\beaglebone\bootloader\Release_MMCSD\"

- Rename the bootloader binary image appended with the TI Image Header boot_ti.bin with MLO.
- Further steps to run a demo application on BeagleBone Black are same as BeagleBone White. You can refer this link [5] to run a demo application.

Note :

- To run a simple LED blink example you can follow the same steps as explained above by renaming the gpioLedBlink_ti.bin file with app, found in the following directory based on the tool chain being used.

    GCC: "\binary\armv7a\gcc\am335x\beaglebone\gpio\Release_MMCSD\"

    CCS: "\binary\armv7a\cgt_ccs\am335x\beaglebone\gpio\Release_MMCSD\"

You can also find a prebuilt MLO file compatible for both the platforms generated in the booloader binary folder after applying this patch.

References

[1] http://software-dl.ti.com/dsps/dsps_public_sw/am_bu/starterware/latest/index_FDS.html

[2] http://www.phytec.com/wiki/images/7/72/AM335x_techincal_reference_manual.pdf

[3] http://www.ti.com/lit/gpn/am3359

[4] http://processors.wiki.ti.com/index.php/Sitara_Linux_Training:_Tuning_the_DDR3_Timings_on_BeagleBoneBlack

[5] http://processors.wiki.ti.com/index.php/Quick_Start_Guide_StarterWare_02.00.XX.XX_(supports_AM335x)

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