Application Report
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Using UBL to Boot Custom Application

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ABSTRACT

This application report discusses how to use the UBL to load a custom application developed on Code Composer Studio™ to DDR and then to execute the application from DDR. The UBL, sfh tool, and custom applications are tested on the TMS320DM355 evaluation module (EVM) with a NAND Flash.

Contents

1 Introduction

UBL is provided as part of the PSP package for Davinci™ processors and widely used to initialize the EVM and to load uboot to DDR. However, sometimes it is required to "boot load" an application developed on Code Composer Studio.

2 UBL

No changes are required in UBL to boot a custom application. UBL reads the NAND pages and looks for a magic number. When it finds a valid magic number, the data following the magic number points to the start address, load address, size, etc., of the application. When the open source serial Flash tool (sfh) for Davinci is used, this header information is inserted by the sfh tool itself.

3 Serial Flashing Tool

The serial Flash utility (available at the following URL) is used to Flash the UBL and application to NAND:

http://sourceforge.net/projects/dvflashutils/files/

This utility is used to program the NAND on the Davinci EVM with UBL and uboot. There are no changes required to use this utility to Flash UBL + custom application.

Documentation for this utility can be downloaded from the following location:

Serial Boot and Flash Loading Utility

4 Preparing the Custom Application

Application binary built by Code Composer Studio is in COFF (.out) format. The .out file needs to be converted to a binary format using the hex conversion utility (`hex470.exe`) provided as part of the TMS470 cg tools. On Code Composer Studio 3.3, this utility is in the path:
`C:\CCStudio_v3.3\tms470\cgtools\bin.`

hex470.exe is a command line utility.

hex470.exe –options application.out convert the .out file to a format specified by the options provided.

It is difficult to put all the options for hex conversion utility on the command line; therefore, it is better to put the options in a separate file as shown below.

Create a new file that says `out2bin.cmd` and add the following options:

```
-b
-image
-zero
-linkerfill
-fill 0x00000000
ROMS
{
     DDR2: org = 0x80000000, len=0x5000, romwidth=8
]
```

Then, using the windows command prompt - execute:

- `hex470.exe out2bin.cmd` application.out

This converts the .out file to a binary file with .b0 as extension.

5 Testing

Use the following options to program the NAND Flash via serial Flash programmer.

- *sfh_DM644x.exe -nandflash -APPStartAddr 0x80000c80 -APPLoadAddr 0x80000000 path:\ubl.bin path:\app.b0*

APPStartAddr is the _c_int00 address of the application. This can be taken from the .map file generated by linker.

APPLoadAddr is the start address where the application is to be executed. This is not the NAND Flash address, this is the address of DDR memory space that is used in the `linker.cmd` file of the application.

Once the binary is flashed to the NAND:

- Switch off the board
- Set the boot pins to NAND boot configuration
- Power on the board

First the UBL loads and then it loads the custom application to the DDR, and branches to the entry point provided.

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