

Flashing Binaries to DRA7xx Factory Boards Using Device Firmware Upgrade (DFU)

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ABSTRACT

This application report provides detailed procedures for flashing the binary images to eMMC Flash memory using Device Firmware Upgrade (DFU). Generally, the MMC/SD boot mode can be used to boot the fresh production board/EVM. In case there is not an external MMC/SD card available as part of production EVM or final product, this application report will be useful to flash the images to the factory boards using DFU and USB peripheral boot mode of DRA7xx.

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1 Introduction

The Device Firmware Upgrade feature is used to program the firmware to flash memory devices such as eMMC, MMC/SD, and so forth. The DFU feature is available as part of second stage boot loader (U-Boot) in mainline. The dfu-util tool (version 0.5) executes from the Ubuntu host machine used to program the target resident Flash memory devices, which communicate through USB interface with the target resident DFU software.

The first time assembled or manufactured, the factory boards/EVMs do not have any binaries loaded in the Flash memory devices. In order to boot the EVM, various boot modes are available as shown below:

- MMC/SD boot mode
- QSPI boot mode
- eMMC boot mode
- USB Peripheral boot mode

The MMC/SD boot mode can be used to boot the fresh production. In case there is not an external MMC/SD card available as part of the production EVM or final product, this application report will be useful to flash the images to the factory boards using USB Peripheral mode and DFU support in single stage bootloader or MLO.

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Flashing binaries to eMMc via DFU is a two step procedure:

1. DRA7xx Boot ROM downloads single stage bootloader (MLO) via USB peripheral boot mode from Ubuntu host PC.



Figure 1. ROM Downloads MLO From Ubuntu Host PC

2. MLO on DRA7xx will download eMMC boot image via DFU from Ubunut host.



Figure 2. MLO Downloads Binaries From Ubuntu Host PC

Figure 3 shows the setup, where J6 EVM with the SW2 switch are set to the peripheral USB boot mode connected to the Ubuntu Host PC through a super speed (SS) USB device cable. From the Ubuntu host, the usbbboot is used to load the single stage bootloader (MLO+DFU) and dfu-util tool that are used to flash the boot images to the eMMC device.



Figure 3. Setup of Flashing eMMC From ubuntu-host Using USB Interface

2 Building First Stage Bootloader With DFU Support

Git clone the U-boot repository as per the GLSDK Software Development User's Guide . Apply the DFU patch from the [3] the link on top of GLSDK 7.01 release (3.14 kernel). No need to apply the patch for the GLSDK 7.02 release onwards. Run the command below:

make ARCH=arm CROSS_COMPILE=arm-linux-gnueabihf- distclean

make ARCH=arm CROSS_COMPILE=arm-linux-gnueabihf- dra7xx_evm_usbboot_config

make ARCH=arm CROSS_COMPILE=arm-linux-gnueabihf-

The spl/u-boot-spl.bin will be created.

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2.1 Creating Boot Image to Flash to eMMC From Ubuntu Host

Create bootable disk image from the MMC/SD card:

- 1. Install the GLSDK package and set the GLSDK environment variable to point to the GLSDK installation path.
 - # chmod +x ti-glsdk_dra7xx-evm_7_00_00_04_linux-installer.bin
 - # ./ti-glsdk_dra7xx-evm_7_00_00_04_linux-installer.bin
 - # export GLSDK="\${HOME}/ti-glsdk_dra7xx-evm_7_01_00_03"
- 2. Insert the MMC/SD card to the Ubuntu machine and create the MMC/SD bootable card.

sudo \${GLSDK}/bin/mksdboot.sh --device /dev/sdY --sdk \${GLSDK}

- **NOTE:** This creates two partitions in the mmc/sd card: boot(vfat) and rootfs(ext4). Overwrite uenv.txt using uenv-emmc.txt in the boot partition before creating boot.img.
- 3. Create the SD card image and program it to eMMC.

dd if=/dev/sdY of=boot.img bs=1M count=<size, 2048 for 2GB card>

3 ROM Downloading u-boot-spl.bin From Ubuntu Host

Download the usbboot host tool from the link to load the first-stage bootloader to target EVM [4], then run the command below from the Ubuntu host PC.

- # chmod +x usbboot
- #sudo ./usbboot –S u-boot-spl.bin

4 Setting Up EVM and Reset the Board

- Connect the EVM to the Ubuntu host machine using the USB superspeed device cable. Connect the USB device cable to the USB1 port (superspeed) of the EVM.
- Set the SYSBOOT setting to the peripheral USB boot mode.

SW2[7..0] = OFF OFF OFF OFF - OFF OFF OFF

5 ROM Download the u-boot-spl.bin From Ubuntu Host

After executing step 4, issue reset to the board; the ROM loads u-boot-spl.bin from the host into internal RAM and executes. You can observe the message below on the host machine.

On Target console you will see console output similar to mentioned below:

```
U-Boot SPL 2014.07-01768-gbb8c815 (Apr 21 2015 - 12:27:16)
DRA722 ES1.0
set_config: high speed config #1: usb_dnload
```

6 Flashing the Boot Image to eMMC Device

Programming the Sdcard image (boot.img) to eMMC device.

From Ubuntu PC

Install dfu-util if not installed on Ubuntu machine.

```
#sudo apt-get install dfu-util
# sudo dfu-util -1
```

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Executing From eMMC

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The following output will be appear:

```
dfu-util 0.5
(C) 2005-2008 by Weston Schmidt, Harald Welte and OpenMoko Inc.
(C) 2010-2011 Tormod Volden (DfuSe support)
This program is Free Software and has ABSOLUTELY NO WARRANTY
dfu-util does currently only support DFU version 1.0
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=0, name="rawemmc"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=1, name="MLO.raw"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=2, name="u-boot.img.raw"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=3, name="spl-os-args.raw"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=4, name="spl-os-image.raw"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=5, name="spl-os-args"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=6, name="spl-os-image"
Application Note
Flashing binaries to factory boards using DFU
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Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=7, name="u-boot.img"
Found DFU: [0403:bd00] devnum=0, cfg=1, intf=0, alt=8, name="uEnv.txt"
```

The dfu-util command list the available number of interfaces with alternate interface for configuration #1. "cfg" stands for DFU configuration, "intf" stands for interface number, "alt" stands for alternate interface with specific name for each alternate interface.

Load the boot.img created from Section 4

sudo dfu-util -D boot.img -c 1 -i 0 -a 0

7 Executing From eMMC

- 1. Set the SYSBOOT setting to Automotive eMMC boot mode.
 - SW2[7..0] = OFF OFF ON ON ON OFF OFF OFF
- 2. Reset the board, the board will boot from eMMC.

8 References

- 1. DRA7xx GLSDK Software Developers Guide
- 2. GLSDK DFU Use's Guide
- 3. DFU Support in U-Boot SPL
- 4. usbboot Host Utility

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