Chapter 1
How to enable NAND on i.MX6DL ARM2 CPU board

1.1 Overview

This document is intended to describe how to enable NAND on i.MX6DL ARM2 CPU board. The example codes in this document are based on i.MX6DL SS1 release.

1.2 HW preparation

To support NAND on i.MX6DL ARM2 CPU board, the board needs to be reworked (Remove R342, R343,R345, R346,R348, R347,R350,R324,R249,R247,R246,R245,R242,R241,R240,R238; Populate R551/R548/R585). For the detailed rework instructions, please refer to "i.MX6DQ&DL ARM2 CPU board rework instructions".

This HW change causes uSDHC slot 3, uSDHC slot 4 function unsupported and cause SD boot failure. So this change can only be used for NAND test.

1.3 To enable MFG tool

1. To build U-boot for MFG tool:
    - Apply the following patch which is used to enable NAND boot command options by default:

```
diff --git a/include/configs/mx6dl_arm2_mfg.h b/include/configs/mx6dl_arm2_mfg.h
index 4baf4c6..4001958 100644
--- a/include/configs/mx6dl_arm2_mfg.h
+++ b/include/configs/mx6dl_arm2_mfg.h
@@ -113,8 +113,12 @@
 #define CONFIG_LOADADDR                 0x10800000      /* loadaddr env var */
 #define CONFIG_RD_LOADADDR      (CONFIG_LOADADDR + 0x300000)
-#define CONFIG_BOOTARGS         "console=ttymxc3,115200 rdinit=/linuxrc"
+#define CONFIG_BOOTARGS         "console=ttymxc3,115200 rdinit=/linuxrc "\
```

```
+       "mtdparts=gpmi-nand:20m(boot),20m(kernel),1024m(rootfs),-(user) "\
+       "gpmi_debug_init enable_wait_mode=off"
```

- Run the following build command:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- distclean
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- mx6dl_arm2_mfg_config
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi-
```

- Rename "u-boot.bin" as "u-boot-mx6dl-nand.bin" and copy "u-boot-mx6dl-nand.bin" to "MX6DL Linux Update\OS Firmware" folder.

2. To build kernel for MFG tool:
   - Select the default configuration of kernel MFG kernel and ensure menuconfig:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- imx6_updater_defconfig
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- menuconfig
```

   - Enable NAND via enabling "Driver->MTD->NAND Device Support-> GPMI NAND Flash Controller driver" and "Device Drivers > DMA Engine support > MXS DMA support".
   - Disable SPI via un-checking "Driver->MTD->Self-contained MTD device drivers->Support most SPI Flash chips (AT26DF, M25P, W25X, ...)". So mtd number for NAND can start from 0
   - Disable MMC/SD via un-checking "Driver->MMC/SD/SDIO card support"
   - Build uImage:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- uImage
```

   - Rename "arch/arm/boot/uImage" as "uImage-mfg-nand" and copy "uImage-mfg-nand" to "MX6DL Linux Update\OS Firmware" folder.

3. To build kernel for MFG tool:
   - To add NAND profile into MX6DL Linux Update\OS Firmware\ucl.xml:

```
<LIST name="i.MX6Solo/DL-ARM2-NAND" desc="Choose NAND as media">
    <CMD type="find" body="Recovery" timeout="180"/>
    <CMD type="boot" body="Recovery" file ="u-boot-mx6dl-nand.bin" >Loading U-boot</
CMD>
    <CMD type="load" file="uImage-mfg-nand" address="0x10800000"
        loadSection="OTH" setSection="OTH" HasFlashHeader="FALSE" >Loading Kernel.</
CMD>
    <CMD type="load" file="initramfs.cpio.gz.uboot" address="0x10C00000"
        loadSection="OTH" setSection="OTH" HasFlashHeader="FALSE" >Loading
Initramfs.</CMD>
    <CMD type="jump" > Jumping to OS image. </CMD>
```

```
    <CMD type="find" body="Updater" timeout="180"/>
    <!--
      Please use "cat /proc/mtd" to check the right partitions for NAND
    -->
    <CMD type="push" body="mknod class/mtd,mtd0,/dev/mtd0"/>
    <CMD type="push" body="mknod block,mtdblock0,/dev/mtdblock0,block"/>
    <CMD type="push" body="mknod class/mtd,mtd1,/dev/mtd1"/>
    <CMD type="push" body="mknod block,mtdblock1,/dev/mtdblock1,block"/>
    <CMD type="push" body="mknod class/mtd,mtd2,/dev/mtd2"/>
    <CMD type="push" body="mknod block,mtdblock2,/dev/mtdblock2,block"/>
    <CMD type="push" body="mknod class/mtd,mtd3,/dev/mtd3"/>
    <CMD type="push" body="mknod block,mtdblock3,/dev/mtdblock3,block"/>
    <CMD type="push" body="mknod class/misc,ubi_ctrl,/dev/ubi_ctrl"/>

    <CMD type="push" body="$ flash_eraseall /dev/mtd0">Erasing Boot partition</CMD>
    <CMD type="push" body="send" file="files/u-boot-mx6dl-nand.bin">Sending U-Boot</
CMD>
    <CMD type="push" body="$ kobs-ng init $FILE">write U-Boot to NAND</CMD>
  <CMD type="push" body="$ flash_eraseall /dev/mtd1">Erasing Kernel partition</CMD>
    <CMD type="push" body="send" file="files/uImage-nand">Sending Kernel Image</CMD>
    <CMD type="push" body="$ nandwrite -p /dev/mtd1 $FILE">Flashing Kernel</CMD>
    <CMD type="push" body="$ flash_eraseall /dev/mtd2">Erasing rootfs partition</
CMD>
    <CMD type="push" body="$ ubiattach /dev/ubi_ctrl -m 2">ubiattach</CMD>
    <CMD type="push" body="mknod class/ubi,ubi0,/dev/ubi0"/>
    <CMD type="push" body="$ ubimkvol /dev/ubi0 -N rootfs -m">ubimkvol</CMD>
    <CMD type="push" body="$ mkdir -p /mnt/ubi0; mount -t ubifs ubi0:rootfs
/mnt/ubi0">mount</CMD>
    <CMD type="push" body="pipe tar -jxv -C /mnt/ubi0" file="files/
rootfs.tar.bz2">Sending and
writting rootfs</CMD>
    <CMD type="push" body="frf">Finishing rootfs write</CMD>
    <CMD type="push" body="$ umount /mnt/ubi0"/>
</LIST>
```

1.4 To enable NAND in U-boot and Kernel for normal boot

1. To build NAND U-Boot:
   - Apply the following patches into U-Boot which is used to disable MMC/SD and enable NAND for ARM2 CPU board:

```
diff --git a/include/configs/mx6dl_arm2.h b/include/configs/mx6dl_arm2.h
index 48b9066..8f0c1b2 100644
--- a/include/configs/mx6dl_arm2.h
+++ b/include/configs/mx6dl_arm2.h
@@ -95,7 +95,7 @@
 /* Enable below configure when supporting nand */
 #define CONFIG_CMD_SF
-#define CONFIG_CMD_MMC
+/* #define CONFIG_CMD_MMC */
 #define CONFIG_CMD_ENV
 #define CONFIG_CMD_CLOCK
@@ -231,7 +231,7 @@
 /*
  * GPMI Nand Configs
  */
-/* #define CONFIG_CMD_NAND */
+#define CONFIG_CMD_NAND
 #ifdef CONFIG_CMD_NAND
        #define CONFIG_NAND_GPMI
@@ -277,8 +277,8 @@
 #define CONFIG_SYS_NO_FLASH
 /* Monitor at beginning of flash */
-#define CONFIG_FSL_ENV_IN_MMC
```

```
-/* #define CONFIG_FSL_ENV_IN_NAND */
+/* #define CONFIG_FSL_ENV_IN_MMC */
+#define CONFIG_FSL_ENV_IN_NAND
 #define CONFIG_ENV_SECT_SIZE    (8 * 1024)
 #define CONFIG_ENV_SIZE         CONFIG_ENV_SECT_SIZE
```

- To build NAND U-Boot:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- distclean
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- mx6dl_arm2_config
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi-
```

- Rename "u-boot.bin" as "u-boot-mx6dl-nand.bin" and copy "u-boot-mx6dl-nand.bin" to "MX6DL Linux Update\OS Firmware\files" folder.

2. To build kernel:
   - Select the default configuration of kernel MFG kernel and ensure menuconfig:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- imx6_defconfig
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- menuconfig
```

   - Enable NAND via enabling "Driver->MTD->NAND Device Support-> GPMI NAND Flash Controller driver" and "Device Drivers > DMA Engine support > MXS DMA support".
   - Disable SPI via un-checking "Driver->MTD->Self-contained MTD device drivers->Support most SPI Flash chips (AT26DF, M25P, W25X, ...)". So mtd number for NAND can start from 0
   - Disable MMC/SD via un-checking "Driver->MMC/SD/SDIO card support"
   - Build uImage:

```
make ARCH=arm
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-1.0/arm-fsl-
linux-gnue
abi/bin/arm-none-linux-gnueabi- uImage
```

   - Rename "arch/arm/boot/uImage" as "uImage-nand" and copy "uImage-nand" to "MX6DL Linux Update\OS Firmware\files" folder.

1.5 To use MFG tool to program the images

- Follow up the dip settings intro for MFG Tool

Table 1. The boot switch setup for MFG tool

Switch	D1	D2	D3	D4	D5	D6	D7	D8
SW4	OFF	OFF	OFF	OFF	-	-	-	-

- Open MfgTool.exe
- Power up the board and connect it with PC via USB cable
- Click "Options" -> "Configurations", pop up one dialog sheet. In "Options", select "i.MX6Solo/DL-ARM2-NAND".
- Click the Start button.
- MFG tool will flash u-boot, kernel and rootfs images into NAND.

1.6 To boot from NAND

- Follow up the dip settings intro for NAND boot

Table 2. The boot switch setup for NAND boot

Switch	D1	D2	D3	D4	D5	D6	D7	D8
SW4	OFF	ON	OFF	OFF	-	-	-	-
SW1	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
SW2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SW5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SW8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

- Power on the board
- Setup these environment variables and commands in u-boot if read kernel and mount rootfs from NAND.

```
setenv bootargs_nand 'setenv bootargs noinitrd console=ttymxc3,115200n8 ubi.mtd=2
root=ubi0:rootfs rootfstype=ubifs rootwait rw
mtdparts=gpmi-nand:20m(boot),20m(kernel),1024m(rootfs),-(user) gpmi_debug_init'
setenv bootcmd_nand 'run bootargs_base bootargs_nand;nand read ${loadaddr} 0x1400000
0x400000;bootm'
setenv bootcmd 'run bootcmd_nand'
run bootcmd
```

How to Reach Us:

Home Page:
www.freescale.com

Web Support:
http://www.freescale.com/support

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, EL516
2100 East Elliot Road
Tempe, Arizona 85284
+1-800-521-6274 or +1-480-768-2130
www.freescale.com/support

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
www.freescale.com/support

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064
Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor China Ltd.
Exchange Building 23F
No. 118 Jianguo Road
Chaoyang District
Beijing 100022
China
+86 10 5879 8000
support.asia@freescale.com

Document Number: how_to_enable_nand_on_i.mx6dl_arm2_cpu_board
Rev. X, 1/2012

Preliminary