Chapter 1
How to enable NAND on i.MX 6Solo SABRE-AI board

1.1 Overview

This document is intended to describe how to enable NAND on i.MX 6Solo SABRE-AI board. The example codes in this document are based on i.MX 6Solo/DualLite SS2 release.

1.2 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/mx6solo_sabreauto_mfg.h b/include/configs/
mx6solo_sabreauto_mfg.h
index 0e29229..7b094d0 100644
--- a/include/configs/mx6solo_sabreauto_mfg.h
+++ b/include/configs/mx6solo_sabreauto_mfg.h
@@ -115,7 +115,9 @@
 #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"
 #define CONFIG_BOOTCOMMAND      "bootm 0x10800000 0x10c00000"
```

   - Run the following build command:

```
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi- distclean
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi-
mx6solo_sabreauto_mfg_config
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi-
```

   - Rename "u-boot.bin" as "u-boot-mx6solo-sabreauto-nand.bin" and copy "u-boot-mx6solo-sabreauto-nand.bin" to "MX6DL Linux Update\OS Firmware" folder.

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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-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi-
imx6_updater_defconfig
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/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-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/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-SABREAUTO-NAND" desc="Choose NAND as media">
    <CMD type="find" body="Recovery" timeout="180"/>
    <CMD type="boot" body="Recovery" file ="u-boot-mx6solo-sabreauto-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="$ flash_eraseall /dev/mtd0">Erasing Boot partition</CMD>
    <CMD type="push" body="send" file="files/u-boot-mx6solo-sabreauto-
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"/>
 <!--
```

```
     <CMD type="push" body="$ ubidetach /dev/ubi_ctrl -m 2"/>
    The below commands will trigger reboot
    <CMD type="push" body="!3">Done</CMD>
 -->
</LIST>
```

1.3 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 i.MX 6Solo SABRE-AI board:

```
diff --git a/include/configs/mx6solo_sabreauto.h b/include/configs/
mx6solo_sabreauto.h
index 999fb2a..281e595 100644
--- a/include/configs/mx6solo_sabreauto.h
+++ b/include/configs/mx6solo_sabreauto.h
@@ -96,7 +96,7 @@

 /* 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_REGUL

@@ -240,7 +240,7 @@
 /*
  * GPMI Nand Configs
  */
-/* #define CONFIG_CMD_NAND */
+#define CONFIG_CMD_NAND

 #ifdef CONFIG_CMD_NAND
        #define CONFIG_NAND_GPMI
@@ -286,8 +286,8 @@
 #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-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi- distclean
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi-
mx6solo_sabreauto_config
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi-
```

   - Rename "u-boot.bin" as "u-boot-mx6solo-sabreauto-nand.bin" and copy "u-boot-mx6solo-sabreauto-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-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi- imx6_defconfig
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/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-4.6.2-glibc-2.13-linaro-
multilib-2011.12/fsl-linaro-toolchain/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.

1.4 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
SW3	OFF	ON	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-SABREAUTO-NAND".
- Click the Start button.
- MFG tool will flash u-boot, kernel and rootfs images into NAND.

1.5 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	D9	D10
SW1	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
SW2	OFF	OFF	OFF	ON	-	-	-	-	-	-
SW3	OFF	OFF	ON	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
```

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