i.MX51 EVK Linux
User's Guide

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About This Book

This document explains how to build and install the Freescale Linux BSP to the i.MX51 EVK board including board dip switch settings for image download and all kinds of boot mode, the steps to download image through ATK, U-Boot, as well as the boot commands for each boot mode.

Audience

This document is intended for software, hardware, and system engineers who are planning to use the product and for anyone who wants to understand more about the product.

References

1. i.MX Family Linux Software Development Kit Reference Manual
2. Advanced Toolkit Standard User's Guide

Chapter 1
Introduction

The i.MX51 EVK Linux BSP is a collection of binary, source code, and support files that can be used to create a Linux kernel image and a root file system for i.MX51 EVK board. This document is for general Linux platform. See i.MX5x_EVK_Ubuntu_StartupGuide.pdf to setup Ubuntu system.

1.1 Boot Loader

The i.MX51 EVK Linux delivery package contains U-Boot binary.

The default `u-boot-bbg.bin` in the release package supports SPI and MMC/SD boot for MX51 EVK board.

1.2 Linux Kernel image

This Freescale i.MX BSP contains the Freescale Linux 2.6.35 EVK kernel, driver source code, and a pre-built kernel image. The i.MX51 EVK kernel image is found at the following location:

`uImage` - uImage is used together with U-Boot.

1.3 Root File System

The root file system package provides busybox, common libraries, and other fundamental elements. The i.MX51 EVK BSP package contains the following rootfs file system:

`imx51/rootfs.ext2.gz`

`rootfs.ext2.gz` file system includes Freescale specific libraries and gnome GUI. It can be mounted as NFS or the source of the storage of rootfs.

Chapter 2
Building the Linux Platform

This chapter explains how to set up the build environment, install and build LTIB, set rootfs for NFS, and set up the host environment.

2.1 Setting Up the Linux Host

See “ltib_build_host_setup.pdf” to setup Linux host server.

NOTE

A Windows tftp program `tftp.zip` is located under LTIB release package `Common/` folder. You can install it in Windows OS to setup Windows tftp server for downloading images.

2.2 Installing and Building LTIB

To install and build LTIB, follow the steps below:

NOTE

In some Linux systems, the following procedure must be done with **root** permissions. However, these instructions are for performing the procedure “not as root”.

To run LTIB, some host packages are needed. If any error related to a host package is raised, install the host package.

1. Remove all packages on `/opt/freescale/pkgs/` which are installed before.
2. Install the LTIB package not as root:

```
tar zxf <ltib_release>.tar.gz
./<ltib_release>/install
```

This command installs LTIB to your directory.

3. Build LTIB:

```
cd <LTIB directory>
./ltib -m config
```

4. Select platform to **Freescale iMX reference boards** and exit, saving the changes. At the next menu, select platform type as **imx5x** and package profile. Exit and save changes. Please note that only **Min profile** and **FSL gnome release packages** are tested by default.

5. To build U-Boot for MX51 EVK board, Select “Choose your board for u-boot” as “mx51_bbg”. Please note this option is only for U-Boot. For kernel image, current default kernel configuration can build the same images for all i.MX5 parts boards.

```
|--- Choose your board for u-boot                                    |  |
  |  |    board (mx51_bbg)  --->
```

6. Run the following command:

```
./ltib
```

   When this procedure is completed, the kernel image is located at rootfs/boot/zImage.

7. Input the following command to get LTIB command help:

```
./ltib -help
/* Get the source code of one package */
./ltib -m prep -p <package name>
/* Build one package */
./ltib -m scbuild -p <package name>
/* Install one package to rootfs */
./ltib -m scdeploy -p <package name>
```

2.3 Setting rootfs for NFS

There are two ways to set the rootfs for NFS on this package.

- Using the ext2 format rootfs package already provided in the distribution
- Using the rootfs that is created after making the build of the kernel

Use the following commands to set the `rootfs` directory for NFS using the `rootfs.ext2.gz` package already included in the distribution (you must be the root user for this operation):

```
mkdir /mnt/rootfs
cp imx51/rootfs.ext2.gz  /tools
cd /tools
gunzip rootfs.ext2.gz
mount -o loop -t ext2 rootfs.ext2 /mnt/rootfs
cp -r /mnt/rootfs .
export ROOTFS_DIR=/tools/rootfs
```

NOTE

In some Linux distributions (such as Fedora) the user needs to make sure that the contents inside `/tools/rootfs` has the proper permission for user access. Since the mount command is made as root, the content shows as restricted access after

the command `cp -r /mnt/rootfs`, this may cause the NFS not been able to get mounted.

To use the root file system created in the LTIB directory after the kernel build, use the command:

```
%export ROOTFS_DIR=/<LTIB directory>/rootfs
```

2.4 Copying images to TFTP server

To use tftp server to download the image, copy the kernel image in the release package or LTIB to the tftp directory. For example:

```
cp imx51/zImage /tftpboot
```

Or:

```
cp /<LTIB directory>/rootfs/boot/zImage /tftpboot
```

2.5 How to generate no-padding U-Boot

To generate no-padding U-Boot, run:

```
sudo dd if=u-boot-bbg.bin of=u-boot-bbg-no-padding.bin bs=512 skip=2
```

2.6 How to generate uImage

In kernel source code, change build target from “zImage” to “uImage”.

If you want to generate uImage from zImage you built, you can generate a “uImage" based on the above zImage as below:

- Build u-boot package to get “mkimage” tool under /opt/freescale/ltib/usr/bin/mkimage.
- Copy mkimage to /usr/bin/
- Run the below command:

  mkimage -A arm -O linux -T kernel -C none -a 0x90008000 -e 0x90008000 -n "Linux-<kernel_version>" -d zImage uImage

  Note: Replace kernel version for your image. For example, 2.6.31-151-xxxx.

2.7 How to build U-Boot and Kernel in standalone environment

To build U-Boot in the standalone environment, do as the following:

```
cd <your_u-boot_folder>
```

```
make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-
2.11.1-multilib-1.0/arm-fsl-linux-gnueabi/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-gnueabi/bin/arm-none-linux-gnueabi-
mx51_bbg_config

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

To build kernel in the standalone environment, do as the following:

```
cd <your_kernel_folder>

make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.4.4-glibc-2.11.1-multilib-
1.0/arm-fsl-linux-gnueabi/bin/arm-none-linux-gnueabi- imx5_defconfig

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

2.8 Build Manufacturing Firmware

Please setup LTIB environment and then configure Firmware build profile.

```
./ltib --selectype
```

Choose correct item as below:

```
--- Choose the platform type

          Selection (imx5x)  --->

--- Choose the packages profile

          Selection (mfg firmware profile)--->
```

In “Freescale iMX5x Based Boards” section, choose the board information as the following:

```
--- Choose your board

      board (mx51_bbg)  --->
```

After ltib complete build, **initramfs.cpio.gz.uboot** is generated under ltib root folder. **u-boot.bin** and **uImage** for MFG tool are generated under `rootfs/boot/`. Copy the above 3 files to “`Profiles¥MX51 Linux Update¥OS Firmware`” folder to replace old firmware.

Chapter 3 Boot configuration switch

The boot modes of the i.MX51 EVK board are controlled by the boot configuration DIP switch on the main board. To locate the boot configuration switch refer to the i.MX51 EVK Hardware User's Guide.

3.1 Configuration setup for ATK/MFG downloading

Table 3-1 shows the boot switch settings to allow programming via the Advanced Toolkit application.

Table 3.1 Main board switch setup for ATK downloading

Boot mode	D1	D2	D3	D4	D5	D6	D7	D8	D9	D0
Serial	1	1	0	0	0	0	0	0	0	1

3.2 Configuration switch setup for boot modes

Table 3-2 shows the boot switch settings to select the different boot options.

Table 3.2 Main board switch setup for boot

Boot mode	D1	D2	D3	D4	D5	D6	D7	D8	D9	D0
SPI-NOR	0	0	1	1	1	0	1	1	0	0
MMC-1	0	0	0	0	0	0	1	1	0	0
MMC-2	0	0	0	0	0	1	1	1	0	0

Note that the MMC slot 1 is located on the backside of the EVK board. The MMC slot 2 is located on the topside of the EVK board.

Chapter 4 Flash memory map

This chapter describes the software layout in MMC/SD cards. It can be useful to understand the later sections about image download.

4.1 MMC/SD flash memory map

MMC/SD flash scheme is different from NAND and NOR flash which are deployed in the BSP software. MMC/SD flash must keep the first sector (512 bytes) as MBR (Master Boot Record) in order to use MMC/SD as the rootfs.

At boot up, MBR is executed to look up the partition table to determine which partition to use for booting. Bootloader should be at the end of MBR. Kernel Image and rootfs can be put any address after bootloader.

MBR can be generated through `fdisk` command when creating partitions in MMC/SD cards in the Linux Host server.

4.2 SPI-NOR flash memory map

SPI- NOR flash scheme is configured statically by the software. The SPI- NOR flash size is only 4 Mbytes; it has space only for the bootloader and kernel image as shown in figure 4-1.

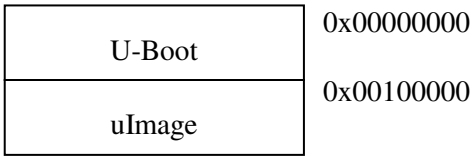

Figure 4-1 SPI-NOR flash memory scheme

Chapter 5 Downloading images using ATK

This chapter explains the procedure to use the ATK tool to download U-Boot to the MMC/SD card.

5.1 ATK Tool

5.1.1 Installing the ATK Tools

Install the ATK tool Version 1.70 included in the package, download it from the Freescale web site or request it from Freescale support. Follow the ATK user guide to install the application.

5.1.2 MMC/SD

5.1.2.1 Download U-Boot to MMC/SD

To download the U-Boot bootloader to MMC/SD card, use the following steps:

1. Set the boot configuration switch for serial download mode, see section 3.1: Configuration setup for ATK downloading.
2. Power on the board. Configure the ATK options as shown in Figure 5-1.
3. Select **Flash Tool** and **Go**.
4. Program U-Boot by selecting options as shown in Figure 5-2 if no MBR is present in the MMC/SD. If MBR is already created in the card, which means the rootfs has been programmed to MMC/SD, program the no-padding U-Boot binary with the offset 0x400 as shown in Figure 5-3. Verify the selection before upgrading the bootloader; otherwise, the rootfs must be re-programmed if MBR is broken.
5. Click **Program** to download the binary to the MMC/SD card in the target.

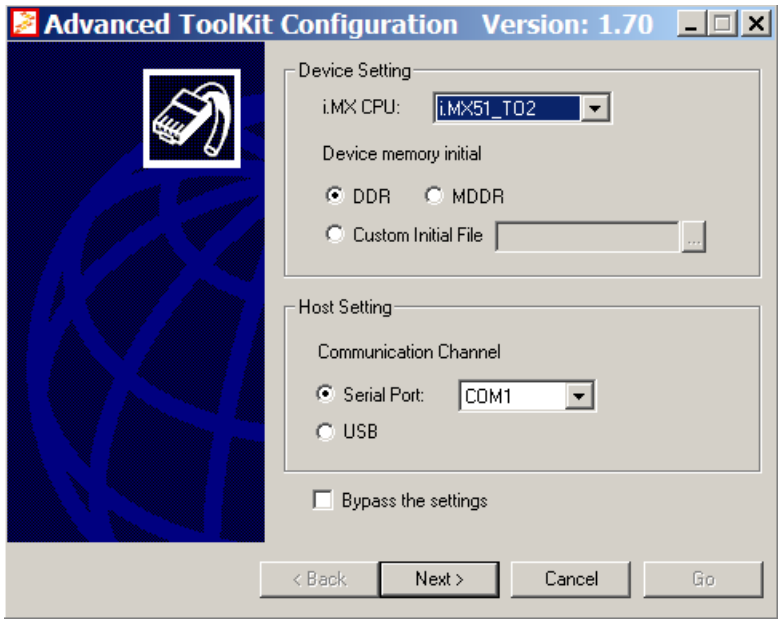

Figure 5-1 ATK configuration for i.MX51

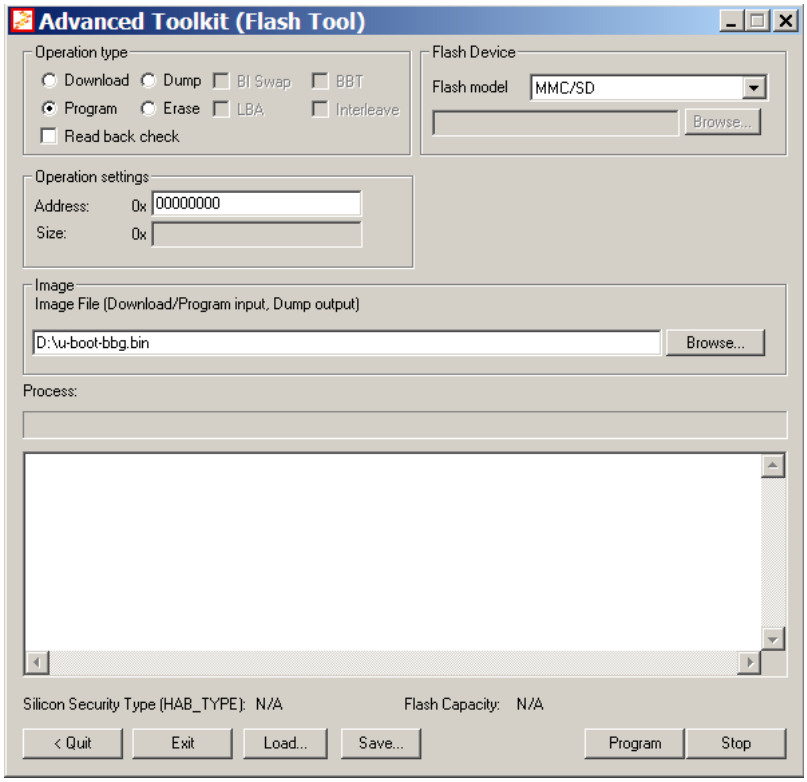

Figure 5-2 Programming U-Boot image to MMC/SD Flash

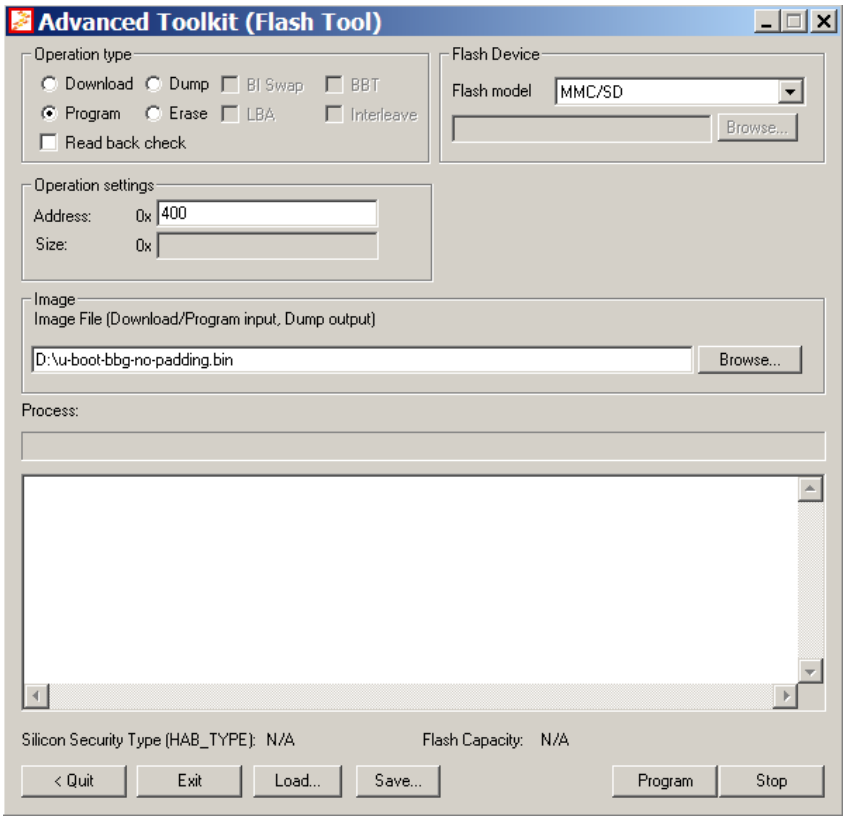

Figure 5-3 Programming U-Boot, no padding, to MMC/SD Flash

5.1.3 SPI-NOR

5.1.3.1 Download U-Boot to SPI-NOR

To download the U-Boot bootloader to SPI-NOR, use the following steps:

1. Set the boot configuration switch for serial download mode, see section 3.1: Configuration setup for ATK downloading.
2. Power on the board. Configure the ATK options as shown in Figure 5-1.
3. Select **Flash Tool** and **Go**.
4. Program U-Boot by selecting options as shown in Figure 5-4.
5. Click **Program** to download the binary to the SPI-NOR in the target.

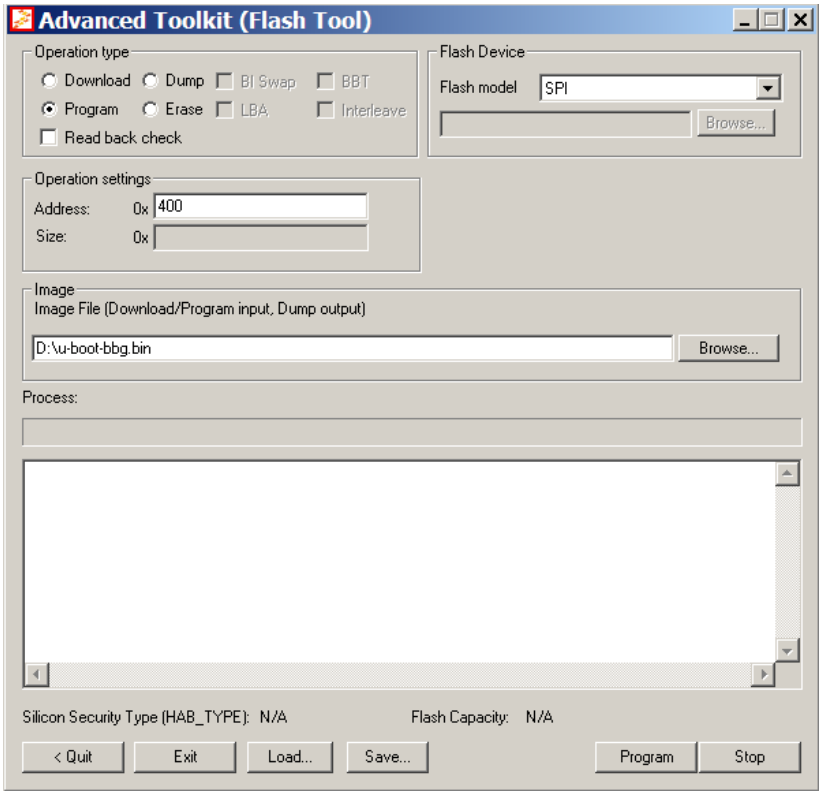

Figure 5-4 Programming U-Boot to SPI-NOR flash

5.2 MFG Tool

5.2.1 Installing the MFG Tools

Unzip Mfgtools-Rel-<version>_MX51_UPDATER.tar.gz

5.2.2 MFG tool Usage

Please read MFG documents under “Document” folder before you start to use MFG tool.

Following are some instructions for MX51 EVK MFG usage:

- Connect USB cable from PC to USB OTG port (J6) on MX51 EVK board.
- Connect UART to PC for console output. Open Terminal program.
- Set boot dips as “serial download mode”.

- Power up board.
- Manufacturing tool requires your file system to be packed and compressed using bzip2 algorithm. To create this file you can run next commands as a root user:

  >cd *your_rootfs_dir*

  >tar –cjf rootfs.tar.bz2 *
- At this point you can specify your images in two ways: First is by editing "Profiles\MX51 Linux Update\OS Firmware\ucl.xml" to modify file path or flash operations according to your usage. Please note "SD" lists are the example codes for MX51 EVK. You can modify them for MX51EVK programming. After the modification is completed, save the changes and exit. The other way is by coping your files in "Profiles\MX51 Linux Update\OS Firmware\files" directory. You can replace the files inside this folder. Note that you will find an u-boot.bin and uImage binaries in "Profiles\MX51 Linux Update\OS Firmware" folder, you must not replace these files. They are different from your image files and have other purpose.
- Execute "MfgTool.exe" program. Select "Options -> Configuration…" menu. If it's the first time to connect MX51 with MFG tool, please install USB driver under "Drivers\iMX_BulkIO_Driver". At this point if windows ask for a *imxusb.sys* file, you can find it in "i386" or "amd64" folders, use the correct file depending of your system.
- Select the right USB port in the sheet "USB Ports".
- Select the right profile in the sheet "Profiles". Type the item in "Operations". Right click and select "Edit…". Select "SD" to program the images to SD. Please note the default profiles are just the examples. You must modify them for right programming operations according to your detailed purpose.
- Start the downloading process by pressing green **Start** button. You will see the progress bar as well as the current task in the notification bar as shown in Figure 5-5. When you receive a "Update Complete" in the notification bar, press the red **Stop** button to finish.

Sometimes manufacturing tool reports an error message when it is downloading the file system in a SD card. That can be caused by insufficient space in the SD due to a small partition size. To fix this edit the file "Profiles\MX51 Linux Update\OS Firmware\ fdisk-u.input" and increase the size of the partition according to your file system requirements. You can note that the content of this file are *fdisk* inputs, so to increase the partition size just increase the number before "w" letter.

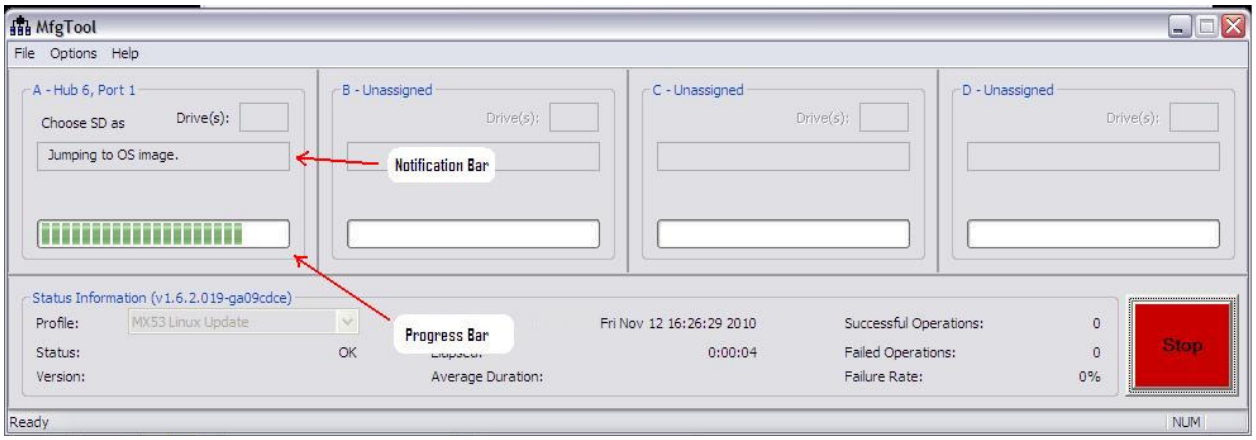

Figure 5-5 Programming SD with Manufacturing tool.

Chapter 6 Download images by bootloader or NFS

6.1 Setup Terminal

The i.MX51 EVK board can communicate with a host server (Windows or Linux) via the serial cable. Common serial communication programs such as HyperTerminal, Tera Term or PuTTY can be used. The example below describes the serial terminal setup using HyperTerminal in a Windows host:

1. Connect the target and the Windows PC via a serial cable.
2. Open HyperTerminal on the Windows PC, and select the settings shown in Figure 6-1.

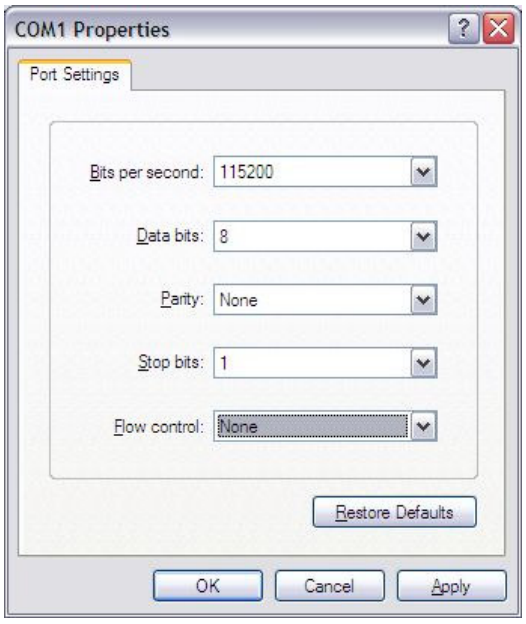

Figure 6 -1 HyperTerminal Settings for terminal setup

3. Set the boot configuration options as described in section 3.2 and power up the target. Status messages and the bootloader prompt are displayed on the terminal screen.

6.2 Download by U-Boot

6.2.1 SPI-NOR

- Power on the board from SPI-NOR by following the dip setting in Section Dip switch setup for boot modes. Then set environment variables. For example,

```
BBG U-Boot > setenv serverip 10.193.100.158
BBG U-Boot > setenv bootfile ulmage
BBG U-Boot > saveenv
```

- Check the MAC address of FEC by "iim read fecmac". If it's the invalid value, you can use "iim blow fecmac" to blown fec mac values. Please note iim blown operation is one-time irreversible operation. Or you can set fec mac value via the environment.
- BBG U-Boot > setenv ethaddr 00:04:9F:00:EA:CF
- Download kernel image from tftp server:

```
BBG U-Boot > dhcp
```

- Program kernel image to SPI-NOR with the address 0x100000. Please note the below example assumes the kernel image is less than 0x300000 bytes. If the kernel image exceeds 0x300000, please enlarge the image length.

```
BBG U-Boot > sf probe 1

JEDEC ID: 0x1f:0x27:0x01

4096 KiB AT45DB321D - 4MB at 0:1 is now current device

BBG U-Boot > sf erase 0x100000 0x300000

Erase is built in program.

EVK U-Boot > sf write ${loadaddr} 0x100000 0x300000

Writing SPI NOR flash 0x100000 [0x300000 bytes] <- ram 0x70800000

.....
.....SUCCESS
```

- Check environment variables. Ensure the right values are set.

```
BBG U-Boot > print
```

- Set the environment variables to load kernel from SPI-NOR:

```
BBG U-Boot > setenv bootcmd_nor 'run bootargs_base bootargs_nfs;sf probe 1;sf read
                ${loadaddr} 0x100000 0x300000;bootm'
```

- Boot up system from NFS or other storage as the rootfs. For example,

```
BBG U-Boot > setenv nfsroot /data/rootfs_home/rootfs_mx51
BBG U-Boot > setenv bootcmd 'run bootcmd_nor'
BBG U-Boot > saveenv
```

```
BBG U-Boot > reset
```

6.2.2 MMC/SD

- Power on the board from MMC/SD by following the dip setting in Section Dip switch setup for boot modes. Then set environment variables. For example,

```
BBG U-Boot > setenv serverip 10.193.100.158
BBG U-Boot > setenv ethaddr  00:04:9F:00:EA:CF
BBG U-Boot > setenv bootfile uImage
BBG U-Boot > saveenv
```

- Copy uImage to tftp server. Then download it to RAM:

```
BBG U-Boot > dhcp
```

- Query the information about MMC/SD card. Note current version doesn't support 64bit. So the capability information (>=4G) is shown as negative value.

```
BBG U-Boot > mmcinfo
Device: FSL_ESDHC
Manufacturer ID: 3
OEM: 5344
Name: SD04G
Tran Speed: 25000000
Rd Block Len: 512
SD version 2.0
High Capacity: Yes
Capacity: -1755448706
Bus Width: 4-bit
```

- Check the usage of "mmc" command. "blk#" is equal to "<the offset of read/write>/<block length of the card>". "cnt" is equal to "<the size of read/write>/<block length of the card>".

```
BBG U-Boot > help mmc
mmc - MMC sub system

Usage:
mmc read <device num> addr blk# cnt
mmc write <device num> addr blk# cnt
mmc rescan <device num>
mmc list - lists available devices
```

- Program the kernel uImage into MMC/SD. For example, the below command writes the image with the size 0x300000 from ${loadaddr} to the offset 0x100000 of the MMC/SD card. Here 0x800 =0x100000/512, 0x1800=0x300000/512. The block size of this card is 512. This example assumes the kernel image is less than 0x300000 bytes. If the kernel image exceeds 0xe00000, please enlarge the image length.

```
BBG U-Boot > mmc write 0 ${loadaddr} 0x800 0x1800
```

- Boot up the system through NFS

```
BBG U-Boot > setenv bootargs_mmc 'setenv bootargs ${bootargs} console=tty0
                root=/dev/mmcblk0p1 rootwait rw'
BBG U-Boot > setenv bootcmd_mmc 'run bootargs_base bootargs_mmc;mmc read 0 ${loadaddr}
                0x800 0x1800;bootm'
BBG U-Boot > setenv bootcmd 'run bootcmd_mmc'
BBG U-Boot > saveenv
```

- To program the rootfs to MMC/SD, See section "Use i.MX51 as Host server to create rootfs" or section "Using a Linux Host to set up an SD/MMC card".

6.2.3 U-Boot configurations

U-Boot "print" command can be used to check environment variable values. "setenv" command is to set environment variable value. See U-Boot User Guide for the details.

6.3 Use i.MX51 as Host server to create rootfs

Linux provides multiple methods to program images to the storage device. This section describes how to use the i.MX51 EVK as Linux Host server to to create the rootfs on MMC/SD card.

1. Boot from NFS or other storage. To create a partition in MMC/SD Slot 0.use the `fdisk` command in the Linux console:

```
root@freescale ~$ fdisk /dev/mmcblk0
Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel
Building a new DOS disklabel. Changes will remain in memory only,
until you decide to write them. After that the previous content
won't be recoverable.

The number of cylinders for this disk is set to 124368.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
1) software that runs at boot time (e.g., old versions of LILO)
2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/mmcblk0: 4075 MB, 4075290624 bytes
4 heads, 16 sectors/track, 124368 cylinders
Units = cylinders of 64 * 512 = 32768 bytes

        Device Boot      Start         End      Blocks  Id System
```

2. As described in Chapter 4, the rootfs partition should be located after kernel image; the first 0x300000 bytes can be reserved for MBR, bootloader and kernel sections.

From the above log, the `Units` of current MMC/SD card is 32768 bytes. The begin cylinder of the first partition can be set as "0x300000/32768 = 96". The last cylinder can be set according to the rootfs size. Create a new partition by typing `n`:

```
Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-124368, default 1): 96
Last cylinder or +size or +sizeM or +sizeK (96-124368, default 124368):
Using default value 124368

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-r mmcblk0:ead partition table
 p1
```

3. Format the MMC/SD partitions as types ext3 or ext2 type. For example, to use ext3:

```
root@freescale ~$ mkfs.ext3 /dev/mmcblk0p1
mke2fs 1.41.4 (27-Jan-2009)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
248992 inodes, 994184 blocks
49709 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=1019215872
31 block groups
32768 blocks per group, 32768 fragments per group
8032 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736

Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 20 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
```

4. Copy the rootfs contents into the MMC/SD card (copy the rootfs.ext2 to NFS rootfs)

```
mount -t ext2 -o loop /rootfs.ext2 /mnt/cdrom
```

```
cd /mnt
mkdir mmcblk0p1
mount -t ext3 /dev/mmcblk0p1 /mnt/mmcblk0p1/
cp -rf /mnt/cdrom/* /mnt/mmcblk0p1/
umount /mnt/mmcblk0p1
umount /mnt/cdrom
```

5. Type `sync` to write the contents to MMC/SD.
6. Type `poweroff` to power down the system. Follow the instructions in Chapter 7 to boot the image from MMC/SD card.

Chapter 7
Running the Image on the Target

This chapter explains how to run an image on the target from downloaded flash and NFS. These instructions assume that you have downloaded the kernel image using the instructions in Chapter 5 or Chapter 6. Also you can check Release Notes document for more details about kernel arguments e.g. video output, by default is DVI but you can specify a desired output and other configurations.

7.1 Run the image from NFS

To boot from NFS, do as the follows (Please pay attention to the items marked as blue color. You need to modify them per your environment or HW information):

1. Set boot configuration switch as indicated in Chapter "Boot configuration switch". Power on the board.
2. Enter the following commands in the U-Boot prompt:

```
BBG U-Boot > setenv ethaddr 00:04:9f:01:32:e0

BBG U-Boot > setenv serverip 10.192.225.216

BBG U-Boot > setenv bootfile ulmage

BBG U-Boot > setenv nfsroot 10.192.225.216:/data/rootfs_home/rootfs_mx51

BBG U-Boot > setenv bootargs_base 'setenv bootargs console=ttymxc0,115200'

BBG U-Boot > setenv bootargs_nfs 'setenv bootargs ${bootargs} root=/dev/nfs ip=dhcp
nfsroot=${nfsroot},v3,tcp'

BBG U-Boot > setenv bootcmd_net 'run bootargs_base bootargs_nfs;bootm'

BBG U-Boot > setenv bootcmd 'dhcp; run bootcmd_net'

BBG U-Boot > saveenv

BBG U-Boot > run bootcmd
```

7.2 Run the image from MMC/SD flash

To boot the system from MMC/SD flash follow the steps bellow:

1. Set boot configuration switch as indicated in section 3.2 Configuration switch setup for boot modes. Power on the board.

2. Assume the kernel image start from the address 0x100000 byte (the block start address is 0x800). The kernel image size is less than 0x300000 byte. The rootfs is located into /dev/mmcblk0p1 partition. Enter the following commands in the U-Boot prompt:

```
BBG U-Boot > setenv ethaddr 00:04:9f:01:32:e0

BBG U-Boot > setenv bootargs_base 'setenv bootargs console=ttymxc0,115200'

BBG U-Boot > setenv bootargs_mmc 'setenv bootargs ${bootargs} root=/dev/mmcblk0p1
rootwait rw'

BBG U-Boot > setenv bootcmd_mmc 'run bootargs_base bootargs_mmc;mmc read 0 ${loadaddr}
0x800 0x1800;bootm'

BBG U-Boot > setenv bootcmd 'run bootcmd_mmc'

BBG U-Boot > run bootcmd
```

Chapter 8
Using a Linux Host to set up an SD/MMC card

This chapter describes the steps to prepare an SD/MMC card to boot off an i.MX51 EVK.

8.1.1 Requirements

An SD/MMC card reader, like a USB card reader, is required. It will be used to transfer the boot loader and kernel (`uImage`) images, to initialize the partition table and copy the root file system. To simplify the instructions, it is assumed that a 4GB SD/MMC card is used.

Any Linux distribution can be used for the following procedure. It is recommended to use a Linux distribution that LTIB has been tested against (like Fedora, Ubuntu, etc).

The Linux kernel running on the Linux host will assign a device node to the SD/MMC card reader. The kernel might decide the device node name or udev rules might be used. In the following instructions, it is assumed that udev is not used.

To identify the device node assigned to the SD/MMC card, enter the command:

```
$ cat /proc/partitions

major minor  #blocks  name

   8     0   78125000 sda

   8     1   75095811 sda1

   8     2          1 sda2

   8     5    3028221 sda5

   8    32  488386584 sdc

   8    33  488386552 sdc1

   8    16    3921920 sdb

   8    18    3905535 sdb1
```

In this example, the device node assigned is `/dev/sdb` (a block is 1kB large)

8.1.2 Copying the boot loader image

The U-Boot binary files can be found in the release package as explained in section 1.1.

Enter the following command to copy the U-Boot image to the SD/MMC card (please note that this operation will delete the partition table present on the media):

```
$ sudo dd if=u-boot.bin of=/dev/sdb bs=512 && sync && sync
```

To update U-Boot to another version, please run the following command instead:

```
$ sudo dd if=u-boot.bin  of=/dev/sdb bs=512 seek=2 skip=2 && sync && sync
```

The first 1kB, that includes the partition table, will be preserved.

8.1.3 Copying the kernel image (zImage)

The following command will copy the kernel image to the SD/MMC card

```
$ sudo dd if=uImage of=/dev/sdb bs=512 seek=2048 && sync && sync
```

This will copy the `zImage` to the media at offset 1MB.

8.1.4 Copying the file system (rootfs)

A partition table must be first created. If a partition already exists and it is big enough for the file system you want to deploy, then you can skip this step.

To create a partition, at offset 8192 (in sectors of 512 bytes) enter the following command:

```
$ sudo fdisk /dev/sdb
```

Type the following parameters (each followed by **<ENTER>**):

```
u         [switch the unit to sectors instead of cylinders]
d         [repeat this until no partition is reported by the  'p'  command ]
n         [create a new partition]
p         [create a primary partition]
1         [the first partition]
8192      [starting at offset sector #8192, i.e. 4MB, which leaves enough space for the
kernel, the boot loader and its configuration data]
<enter>   [using the default value will create a partition that spans to the last sector of
the medium]
w         [ this writes the partition table to the medium and fdisk exits]
```

The file system format ext3 is a good option for removable media due to the built-in journaling. Run the following command to format the partition:

```
$ sudo mkfs.ext3 /dev/sdb1
```

Copy the target file system to the partition:

```
$ mkdir /home/user/mountpoint
```

```
$ sudo mount /dev/sdb1 /home/user/mountpoint
```

Let's assume the root file system files are located in `/home/user/rootfs`:

```
$ cd /home/user/rootfs
$ sudo cp -rpa [A-z]* /home/user/mountpoint
$ sudo umount /home/user/mountpoint
```

The file system content is now on the media.

8.1.5 Final configuration

RedBoot needs to be configured and its partition table initialized. A kernel entry in the partition table must be created using the following commands:

```
EVK U-Boot > setenv bootargs_mmc 'setenv bootargs ${bootargs} console=tty0
             root=/dev/mmcblk0p1 rootwait rw'
EVK U-Boot > setenv bootcmd_mmc 'run bootargs_base bootargs_mmc;mmc read 0 ${loadaddr}
             0x800 0x1800;bootm'
EVK U-Boot > setenv bootcmd 'run bootcmd_mmc'
```