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410

Android User Guide

Designed by **eInfochips**

Confidentiality Notice

Contents

List of Figures

Tables

1   Document Details

Version	Author		Reviewer		Approver		Description Of Changes
	Name	**Date**	**Name**	**Date**	**Name**	**Date**	
Release ver. 1.0	*eInfochips*	*08-Dec-2015*	*eInfochips*	*08-Dec-2015*	*eInfochips*	*08-Dec-2015*	*Initial release*

Table 1: Document History

1.1   Definition, Acronyms and Abbreviations

Definition/Acronym/Abbreviation	Description
ADB	Android Debug Bridge
BSP	Board Support Package
BT	Bluetooth
CAF	Code Aurora Forum – www.codeaurora.org
CSI	Camera Serial Interface
DDR	Double Data Rate
DSI	Display Serial Interface
eMMC	Embedded Multimedia Card
Git	Open Source Version control system
GPIO	General-purpose input/output
GPS	Global Positioning system
HDMI	High-definition multimedia interface
OEM	Original Equipment Manufacturer
OS	Operating System
OTG	On-the-go
Patches	Collection of open source modifications that are to be applied to modify the base software from CAF.
PC	Personal Computer
Repo	Command built on top of git for source repository management
SOM	System On Module

UART	Universal asynchronous receiver-transmitter

Table 2: Definition, Acronyms and Abbreviations

1.2　References

No.	Document	Version	Remarks
1.	Quick Start Guide.pdf	1.0	
2.	Environment Setup Guide.pdf	1.0	

Table 3: References

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3   Preface

This document provides an overview of the ERAGON410 SOM and development kit based on Qualcomm's APQ8016 SoC. It provides step by step information about how to start with the basic setup, build & flashing steps for Android 5.1.1. It also gives overview of software architecture and usage, debugging tips etc.

3.1   Intended Audience

This document is intended for technically qualified personnel. It is not intended for general audiences.

3.2   Intended Use

The development platform supports a wide range of industry interfaces and offers a comprehensive hardware and software design. It comes with Android 5.1.1 software package and sample demo application binaries for easy adaption.

This platform enables developers to evaluate and create solutions targeted at various market segments while customers and OEMs can build their products based on these designs directly or with customizations.

3.3   Conventions

The following conventions are used in this document:

CAUTION: Cautions warn the user about how to prevent damage to hardware or loss of data.

NOTE: Notes call attention to important information.

4   Android BSP Package Distribution

Android Lollipop 5.1.1 BSP is available at the same location from where you obtained this document.

ERAGON410_Android–LP-BSP_Relv1.0 is the release package supplied by eInfochips. In this Package you should get the following contents as shown below.

- Prebuilt Android binaries in which you get all the images required to flash on ERAGON410 platform.
- ERAGON410 Android bootloader.
- The Source Package folder includes a script file that will pull software from CAF to your Linux HOST PC. This script file will automatically download the correct branch of code from CAF using the specific manifest needed for building the appropriate android software image for the ERAGON410 development Platform.

Android BSP Package tree structure is as shown below.

ERAGON410_Android-LP_Release	**: Android Release Package**
|-- ERAGON410_Android-LP_bootloader.tgz	: Android LP Bootloader
|-- ERAGON410_Android-LP-BSP_Relv1.0	: Android LP BSP
|-- ERAGON410_Android-LP-BSP-Relv1.0_binaries.tgz	: Prebuilt Android binaries
|-- source	: Android LP BSP Source
|-- ERAGON410_build.sh	: Script to download source and build
|-- PATCH_LA_BR.1.2.4_00410_8x16.tar.gz	: Patches for ERAGON410
`-- proprietary_LA.BR.1.2.4-00410-8x16.tgz	: Qualcomm proprietary libraries

Figure 1 : ERAGON410 Android Board Support Package

5   Getting Started

5.1   Setup requirements

- 64 bit Host Machine running Ubuntu 14.04 with root privileges
- ERAGON410_Android-LP_Release release package supplied from eInfochips
- ERAGON410 board
- 12V power supply
- Micro USB cable
- HDMI Module with FFC cable
- HDMI cable
- HDMI Monitor
- UART debug cable

5.2   ADB and Fastboot drivers installation on Host machine

- ADB: Android Debug Bridge (ADB) is a debug interface over USB between your PC and the development Platform. ADB is not required for flashing a software image, but its configuration on a PC is similar to that of fastboot.
- Fastboot: Fastboot is used to flash an android/Linux images from a Linux (Ubuntu) / Windows development PC over a USB connection to the ERAGON410.

In order to install ADB and fastboot driver on Host machine, refer all the steps as mentioned in the "ADB and Fastboot drivers Installation on Host machine" from ERAGON410 Environment setup guide.

6   Configure ERAGON410 board into fastboot mode

In order to flash images in ERAGON410 board, you need to boot ERAGON410 board into fastboot mode. There are three ways to bring ERAGON410 board into fastboot mode.

- Fastboot mode via Command line
- Fastboot mode via Reset Switch
- Fastboot mode via Rescue Image

6.1   Prerequisite

- ADB and fastboot drivers Installation should be completed.
- Ensure the boot switches SW5 are set to 000 on ERAGON410 board as mentioned below in image.

Figure 2 : Boot Selection switches

- Connect the micro-usb cable to the board as mentioned below in image.

Figure 3 : Micro-USB cable Connection with board.

6.2   Fastboot mode via command line

This is 1st way to boot ERAGON410 in fastboot mode through command line

- Please make sure that Prerequisite as mentioned in the section 4.1 is completed.
- Connect the power supply to the board.
- Let board boot with Android. Once the board is booted successfully with Android, then configure board in fastboot mode as mentioned in following sections:-

ERAGON410 Board is pre-flashed with latest Android images. So this method is only Applicable in ERAGON410 board with Android OS.

6.2.1 For Windows

Steps to boot ERAGON410 board into fastboot mode on windows through command line:-

- Open a "Command prompt" window by clicking on shortcut icon "Minimal ADB and Fastboot" as shown below in Figure 4:-
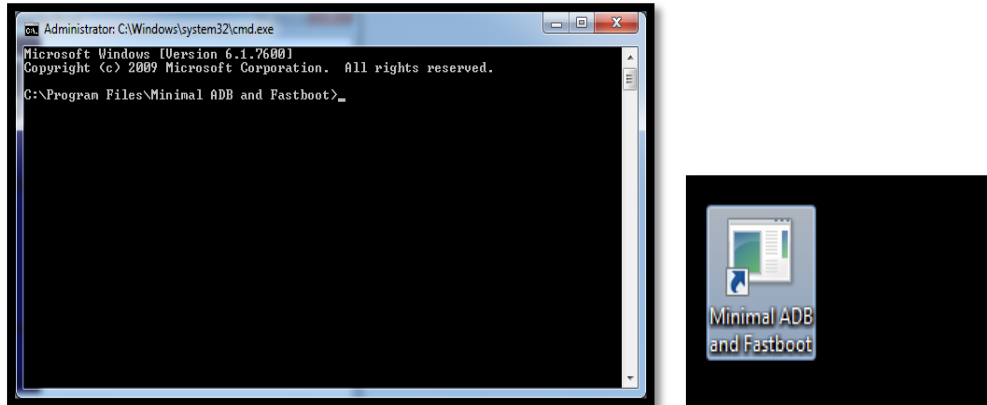

Figure 4 : Minimal ADB and fastboot window

- Execute '*adb devices*' command on "Command prompt" as shown below and you will get output as shown in Figure 5.

Figure 5: ADB devices in command prompt

- Execute following two commands on "Command Prompt" and you will get output as shown in Figure 6.

adb reboot bootloader

fastboot devices
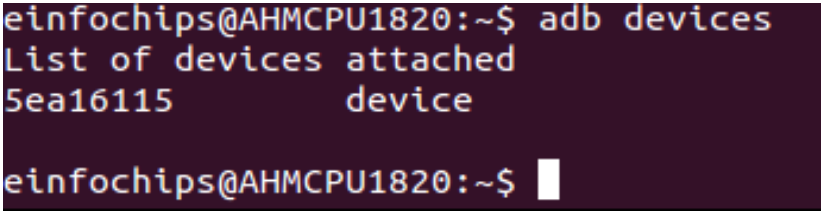
Figure 6: Fastboot devices in command prompt

6.2.2 For Linux

Steps to boot ERAGON410 board into fastboot mode On Linux Host machine through command line:-

- Open a "Shell terminal" in Linux Host machine and execute *adb devices* command, you will get output as shown in Figure 7.

$ adb devices
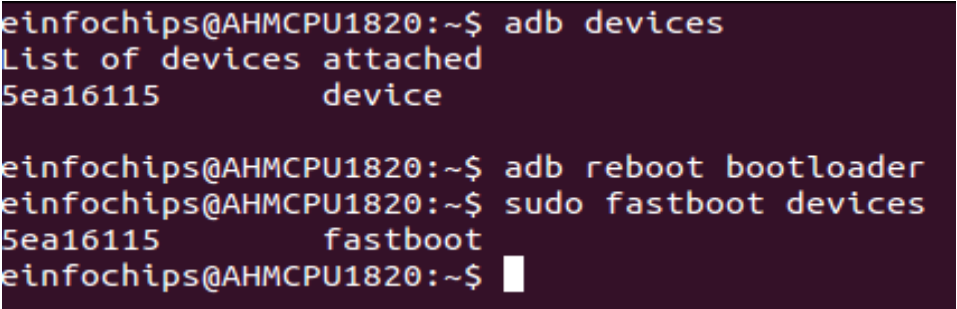
Figure 7: ADB devices in Shell terminal

- Execute following two commands on "Shell terminal" and you will get output as shown in Figure 8.

$ adb reboot bootloader

$ sudo fastboot devices

Figure 8: Fastboot devices on Shell terminal

6.3   Fastboot mode via reset switch

This is 2nd way to boot ERAGON410 board in fastboot using reset switch on board. To boot ERAGON410 board in fastboot mode perform following steps as mentioned below:

- Please make sure that prerequisite should be completed.
- Press and hold the Reset-Switch (SW4) as shown below in Figure x.

Figure 9: Fastboot switch

- Now connect the power supply to the board.

6.3.1 For windows

Now Run command in command prompt as mentioned below and you will get output as mentioned in the below image.

fastboot devices

Figure 10 : Fastboot devices in Command prompt

6.3.2 For Linux

Open a "Shell terminal" in Linux machine and run command in "Shell terminal" as shown below.

$fastboot devices

Figure 11: Fastboot devices in Shell terminal

6.4 Fastboot mode via rescue image

If ERAGON410 board is not able to boot into fastboot mode using reset switch or through command line, then ERAGON410 board can be configured/boot into fastboot mode using rescue image. To recover/boot/configure the ERAGON410 board using rescue-image, follow below steps:-

- Get rescue image for ERAGON410 from the release supplied by eInfochips
- Copy rescue image on a SD-card
- Boot ERAGON410 board from the SD-card

6.4.1 Get rescue image for ERAGON410 from the release supplied by eInfochips

Locate **Rescue Image** for ERAGON410 board at below path in the supplied package.

ERAGON410_Package_v1.0/Software/Software_Package/ERAGON410_Board-Rescue/ Eragon410_SD_Rescue_Image.zip

6.4.2 Copy rescue image on SD-card

In order to make Rescue SD card for ERAGON410 board, perform following steps:-

6.4.2.1. For Windows

- You can get Disk Imager tool from release package at below path: *ERAGON410_Package_v1.0/Software/Software_Package/ERAGON410_Board-Rescue/ Win32DiskImager_tool.zip*
- Unzip Win32DiskImager_tool.zip
- Start the Disk Imager tool.
- Under Image file select the path to the rescue-image.
- Under Device choose the drive letter under which the SD-card was detected.
- Click Write -> This will write the image onto the micro SD-card.
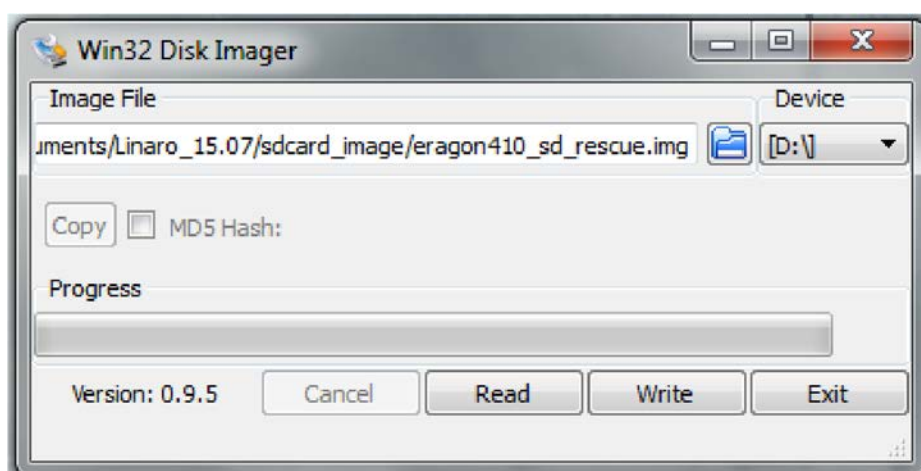
Figure 12: Win32 Disk Imager Tool Window

6.4.2.2. For Linux

Open a "Shell terminal" on a Linux host Machine and perform following steps:-

```
$ sudo dd if=eragon410_sd_rescue.img of=/dev/xxx bs=2M

$sync
```

Where XXX is the device name

⚠️Do not override your hard drive. In most cases, XXX will be mmcblk0 or sdx where x depends on the number of fixed disks in your system.

You can determine the SD-cards device name by using the following command.

```
$ sudo fdisk –l
```

Alternatively you can also use the following command to determine the SD-card device name.

```
$ dmesg | tail
```

6.4.3 Boot ERAGON410 board from the SD-card.

- Insert SD card in slot on ERAGON410 board as shown in Figure 13

Figure 13: SD Card connection with board

- Set the boot switches SW5 to 010 (SD-card boot) as shown in Figure 14
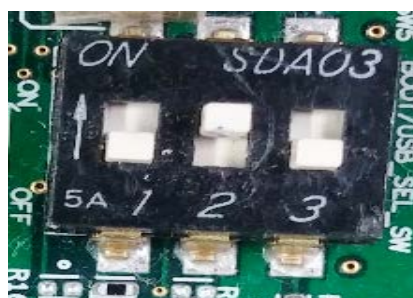
Figure 14: SD card boot selection switches configuration

- Connect Power Supply to the board.
- The board should boot into fastboot mode and you should be able to communicate to board from the Host via the fastboot tool as shown below.

6.4.3.1.   For Windows

- Execute *fastboot devices* command in command prompt as mentioned below in Figure 15

<div>

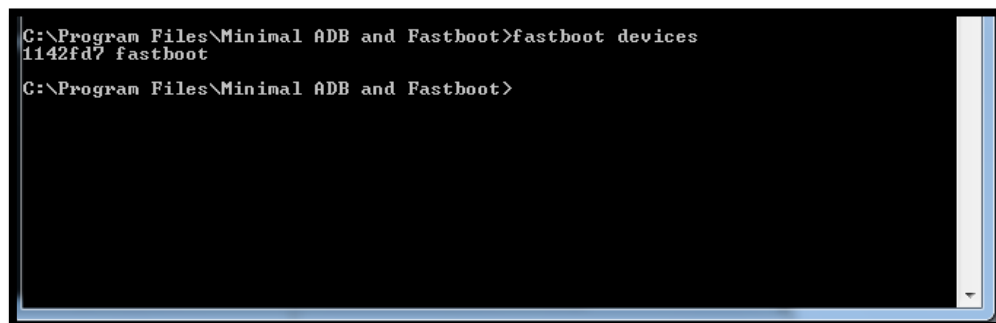*fastboot devices*

</div>
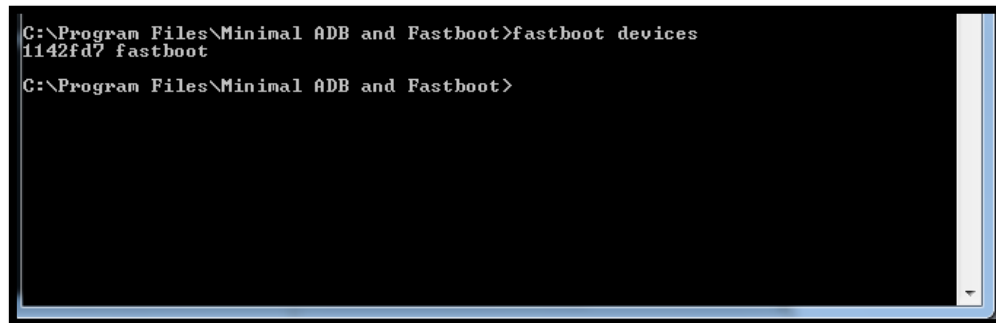
Figure 15: Fastboot devices in command prompt

6.4.3.2.   For Linux

- Open a "Shell terminal" in Linux machine and run command in "Shell terminal" as shown in Figure 16

<div>

$ sudo fastboot devices

</div>

- And you will get output as shown below.

Figure 16: Fastboot devices in Shell terminal

7 Installing Android 5.1.1(Lollipop)

7.1 Installing Prebuilt Android 5.1.1 (Lollipop) images from Host PC.

This method is recommended for experienced users. This guide describes the process for both Windows and Linux Host machines. In this method prebuilt Android binary images are flashed on board from a Host machine via a USB cable through fastboot mode.

In order to install Android images in ERAGON410 board from a Host machine follow below steps:-

- Get the Prebuilt Android Binaries from release package.
- Bring ERAGON410 board into fastboot-mode.
- Flash the Binaries.
- Reboot ERAGON410 board.

7.1.1 Get the Prebuilt Android Binaries from release package.

Locate ERAGON410_Android-LP-BSP-Relv1.0_binaries.tgz inside release package at below path.

ERAGON410_Package_v1.0/Software/Software_Package/Android_Releases/ERAGON410_Android-LP-BSP_Relv1.0/ ERAGON410_Android-LP-BSP-Relv1.0_binaries.tgz

### 7.1.2 Bring the ERAGON410 board into fastboot mode.

To configure/boot ERAGON410 board into fastboot, refer section 6 "*Configure ERAGON410 board into fastboot mode*" in details.

7.1.3 Flash the Binaries

After booting the ERAGON410 board into fastboot mode, flash the remaining images via fastboot into their respective partitions on the board as mentioned below.

7.1.3.1. For Windows
- Unzip the ERAGON410_Android-LP-BSP-Relv1.0_binaries.tgz
- Now open a command prompt and execute following commands:-

fastboot flash boot boot.img

fastboot flash cache cache.img

fastboot flash persist persist.img

fastboot flash system system.img

fastboot flash userdata userdata.img

fastboot flash recovery recovery.img

7.1.3.2. In Linux
Open a "Shell terminal" in Linux machine and execute following commands in "Shell terminal" as shown below.

```
$tar –xvf  ERAGON410_Android-LP-BSP-Relv1.0_binaries.tgz

$cd ERAGON410_Android-LP-BSP-Relv1.0_binaries

$sudo fastboot flash boot boot.img

$sudo fastboot flash cache cache.img

$sudo fastboot flash persist persist.img

$sudo fastboot flash system system.img

$sudo fastboot flash userdata userdata.img

$sudo fastboot flash recovery recovery.img
```

7.1.4 Reboot ERAGON410 board.

Once all the images are flashed on board, then reboot the board (soft or hard) as mentioned below.

7.1.4.1.   Soft Reboot

Execute following command for Soft Reboot

```
$fastboot reboot
```

7.1.4.2.   Hard Reboot

Perform following steps for Hard Reboot.

- Unplug the board from the power supply
- Disconnect the micro-usb cable from ERAGON410 board.
- Connect the board to the power supply.
- Connect HDMI module or LCD Panel to the board as suggested in ERAGON410 Quick start Guide.

After few seconds, you should see Android start up logo followed by lock screen on HDMI display or on the LCD Panel as shown below.
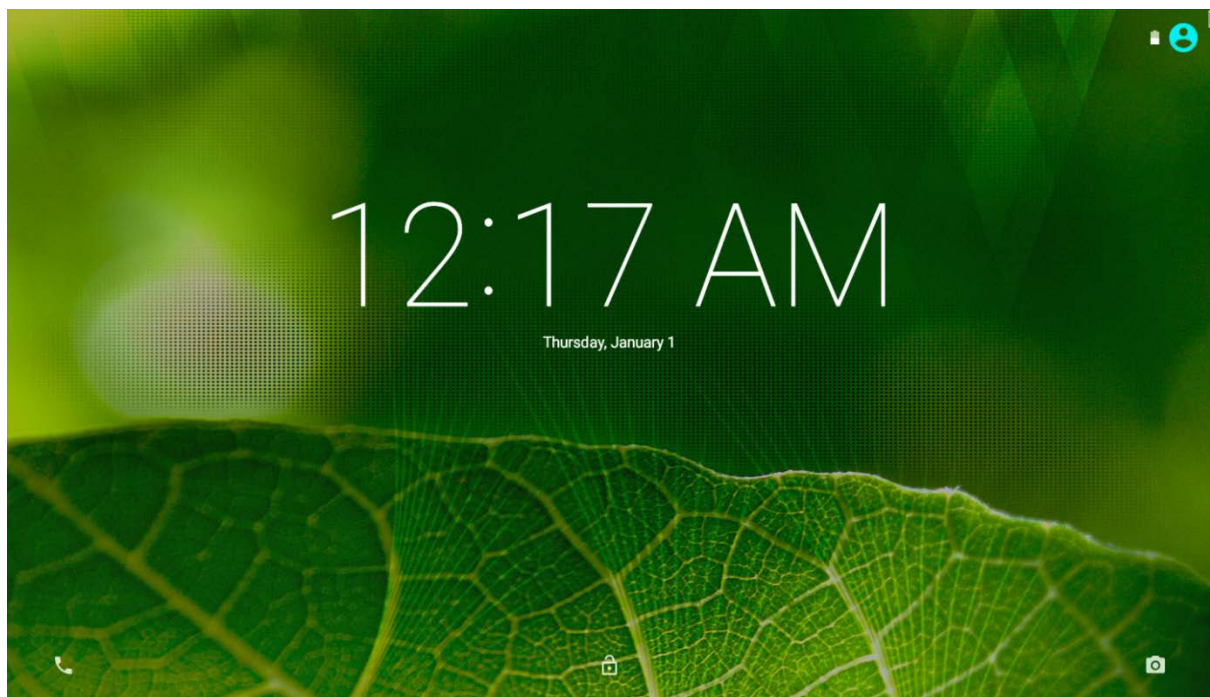
Figure 17 : Android Boot logo

Figure 18: Android Home Screen

7.2   Building Android 5.1.1 (Lollipop) on Host Machine

This section provides step by step information about building Android 5.1.1(Lollipop) source on Host machine. Please follow below steps:-

- Development Workstation setup.
- Accessing Android source for ERAGON410 platform.
- Build procedure of Android source for ERAGON410 platform.
- Flashing procedure from PC to ERAGON600 board.

Software releases from eInfochips use a release version based on an underlying QUALCOMM software baseline from CAF. The user can build their own android images or use pre-built software images received from eInfochips to flash on ERAGON410 board.

If user wish to flash pre-built Android images received from eInfochips, skip this section and go directly to section "Installing Prebuilt Android 5.1.1 (Lollipop) images from Host machine".

7.2.1 Development Workstation setup

As first step, the developer has to setup host machine (Ubuntu 14.04 or higher with root privilege and internet access) for building Android platform source.

Please follow the step by step instruction as in the ERAGON410 Environment Setup Guide.

7.2.2 Accessing Android source for ERAGON410 platform

Android source is located in Android Release Package *ERAGON410-Android-LP-BSP-Relv1.0* at below location:-

ERAGON410_Package_v1.0/Software/Software_Package/Android_Releases/ERAGON410_Android-LP-BSP_Relv1.0/source

Source Package includes a script file ERAGON410_build.sh that will pull software from Code Aurora Forum (CAF) to your Linux machine. This script file will automatically download the correct branch of code from CAF using the specific manifest needed for building the appropriate android software image for the ERAGON410 platform.

7.2.3 Build procedure of Android source for ERAGON410 platform

This section specifies the procedure to download the source and build the android images for APQ8016 based ERAGON410 platforms.do follow below steps as mentioned below.

- Copy ERAGON410_Android-LP-BSP_Relv1.0 from provided source into development host machine at preferred path let's take "/home/user" for example and enter into "source" directory.

```
$ cd ERAGON410_Android-LP-BSP_Relv1.0

$ cd source

$ ls

ERAGON410_build.sh    PATCH_LA_BR.1.2.4_00410_8x16.tar.gz    proprietary_LA.BR.1.2.4-00410-8x16.tgz
```

- At this place, the user should see "ERAGON410_build.sh".This is a bash shell compatible script that automates all the process from fetch source packages to build.
- To start build process, run the mentioned script using below command. Make sure the internet connection is available on this host machine before you run this script.

$ sudo chmod 777 ERAGON410_build.sh

$ sh ERAGON410_build.sh

- This script will first check for necessary dependencies/programs like tar, repo, git, java etc.
- Now this will create a directory named "LA.BR.1.2.4-00410-8x16.0_Relv1.0" and start downloading android source from CAF inside this directory. This will take long time depends on user host machine network connection. Around 30GB of source will be downloaded.
- After downloading the source from CAF, it will sync the source to put all sources in "LA.BR.1.2.4-00410-8x16.0_Relv1.0" folder.

    Sometimes it may fail to sync complete work tree and shell script is exited with error, in such a case please re-run ERAGON410_build.sh in the same way as mentioned in point 4 till you get success message.

- After successful execution of above steps, the build procedure is started and takes long time (approximately 3-4 hours on Xeon Quad core processor) on first compilation. The time may vary based on host machine's configuration.
- After successful compilation, you should get the built images inside "out/target/product/msm8916_64" directory.
- Now you can follow same steps to flash images on ERAGON410 board as mentioned in the Section "Installing Prebuilt Android 5.1.1 (Lollipop) images from Host PC".

8   Switching between Android and Linaro Linux release

It is possible to switch back and forth between the Android and the Linaro Linux builds. The partition table used for both Android and Linux are different. So make sure to install the appropriate bootloader from release package.

The Android bootloaders are provided in the Android BSP release supplied by the eInfochips.

So in order to switch Android release from Linaro Linux release, do steps as mentioned below.

Locate Android Bootloaders inside Release package supplied by eInfochips as mentioned in below path.

ERAGON410_Package_v1.0/Software/Software_Package/ERAGON410_Android-LP_Release

So copy the ERAGON410_Android-LP_bootloader.tgz to Host machine and extract it.

Then flash the Bootloader-image via fastboot:

```
fastboot flash partition gpt_both0.bin

fastboot flash hyp hyp.mbn

fastboot flash modem NON-HLOS.bin

fastboot flash rpm rpm.mbn

fastboot flash sbl1 sbl1.mbn

fastboot flash sec sec.dat

fastboot flash tz tz.mbn

fastboot flash aboot emmc_appsboot.mbn

# Android (for some reasons) have bak partition with duplicate..

fastboot flash sbl1bak sbl1.mbn

fastboot flash hypbak hyp.mbn

fastboot flash rpmbak rpm.mbn

fastboot flash tzbak tz.mbn

fastboot flash abootbak emmc_appsboot.mbn

fastboot erase boot

fastboot erase recovery

fastboot erase system

fastboot erase userdata

fastboot erase cache
```

> *fastboot erase devinfo*
>
> *fastboot erase persist*

If you use fastboot on a Linux Host Machine you might have to execute fastboot with sudo privileges.

For example:

> *$ sudo fastboot flash <partition-name> <Binary-name>*

After flashing Android bootloaders, you can refer Section 7.1 Installing Prebuilt Android 5.1.1 (Lollipop) images from Host PC.

9 Switch between HDMI Panel to LCD Panel and vice versa

ERAGON410 board is pre-flashed with Android latest images with HDMI Panel supported by default. But MIPI LCD Panel support is also provided in this release package.

9.1 Prerequisite

- Prerequisite as mentioned in the Section 1 should be completed.
- ADB and fastboot drivers' installation should be completed.
- Ensure the boot switches SW5 are set to 000 on ERAGON410 board.
- Connect micro-usb cable to the board.
- Connect power supply to the board.

9.2 Switch between HDMI Panel to LCD Panel

Do the following steps to switch from HDMI Panel to LCD panel.

- Bring ERAGON410 board into fastboot mode. Refer Section 4 to bring ERAGON410 board into fastboot mode.
- Open a shell terminal in Linux Host Machine and run commands as shown in below Figure.

> *$sudo fastboot devices*
>
> *$sudo fastboot oem select-display-panel ssd2080m_720p_video*
>
> *$sudo fastboot reboot*

```
einfochips@AHMCPU1820:~$ sudo fastboot devices
5ea16115        fastboot
einfochips@AHMCPU1820:~$ sudo fastboot oem select-display-panel ssd2080m_720p_video
...
OKAY [  0.027s]
finished. total time: 0.027s
einfochips@AHMCPU1820:~$ sudo fastboot reboot
rebooting...

finished. total time: 0.006s
einfochips@AHMCPU1820:~$
```

Figure 19: HDMI Panel to LCD Panel Configuration

- Once ERAGON410 board is booted successfully, you can see configured panel name in the kernel logs as shown in below figure.

Figure 20: LCD Panel Kernel console logs

9.3   Switch between LCD Panel to HDMI Panel

Do the following steps to switch from LCD Panel to HDMI panel.

- Bring ERAGON410 board into fastboot mode. Refer Section 4 to bring ERAGON410 board into fastboot mode.
- Open a shell terminal in Linux Host Machine and run commands as shown in below Figure.

$sudo fastboot devices

$sudo fastboot oem select-display-panel adv7533_1080p

$sudo fastboot reboot

Figure 21: LCD Panel to HDMI Panel Configuration

- Once ERAGON410 board is booted successfully, you can see configured panel name in the kernel logs as shown in below figure.

Figure 22 : HDMI Panel in kernel logs

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10   About eInfochips

eInfochips is a Product and Semiconductor Design Solutions company, based out of Sunnyvale (USA) and Ahmedabad (India). The company has delivered turnkey solutions from its global offshore development centres for industries like Aerospace & Defence, Security & Surveillance, Semiconductor, Consumer Electronics, Medical Devices, Media & Broadcast, Retail and Software.

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Technical Support:	qcsupport@einfochips.com
Sales/Marketing Support:	marketing@einfochips.com