



Open-Q™ 845 (SDA845) Development Kit BSP Programmer Guide for BSP 1.0/Android 8.1

[Document: ITC-01IMP1200-BSPPG-001 Version: 1.0]

Your use of this document is subject to and governed by those terms and conditions in the Intrinsic Purchase and Software License Agreement for the Snapdragon 845 (SDA845) based Open-Q™ 845 Development Kit, which you or the legal entity you represent, as the case may be, accepted and agreed to when purchasing an Open-Q 845 Development Kit from Intrinsic Technologies Corporation (“**Agreement**”). You may use this document, which shall be considered part of the defined term “Documentation” for purposes of the Agreement, solely in support of your permitted use of the Open-Q 845 Development Kit under the Agreement. Distribution of this document is strictly prohibited without the express written permission of Intrinsic Technologies Corporation and its respective licensors, which they can withhold, condition or delay in its sole discretion.

Intrinsic is a trademark of Intrinsic Technologies Corporation, registered in Canada and other countries. Qualcomm and Snapdragon are trademarks of Qualcomm Incorporated, registered in the United States and other countries. Other product and brand names used herein may be trademarks or registered trademarks of their respective owners. This document contains technical data that may be subject to U.S. and international export, re-export, or transfer (“export”) laws. Diversion contrary to U.S. and international law is strictly prohibited.

Identification

Document Title Open-Q™ 845 (SDA845) Development Kit BSP Programmer Guide for BSP 1.0/Android 8.1

Document Number ITC-01IMP1200-BSPPG-001

Version 1.0

Date 23 July 2018

History

| REVISION | DATE | DESCRIPTION | PAGES |
|----------|---------------|-----------------|-------|
| 1.0 | July 23, 2018 | Initial version | All |

Table of Contents

| | | |
|-----------|---|-----------|
| 1. | INTRODUCTION..... | 4 |
| 1.1 | Purpose | 4 |
| 1.2 | Scope..... | 4 |
| 1.3 | Intended Audience | 4 |
| 1.4 | Organization | 5 |
| 1.5 | Acronyms..... | 6 |
| 1.6 | Resources..... | 7 |
| 2. | DOCUMENTS..... | 8 |
| 2.1 | Applicable Documents..... | 8 |
| 2.2 | Reference Documents..... | 8 |
| 3. | Software Licensing | 9 |
| 3.1 | Introduction..... | 9 |
| 3.2 | Software Licensing | 9 |
| 3.3 | Software Use Restrictions..... | 10 |
| 4. | Software Version Tracking..... | 11 |
| 4.1 | Introduction..... | 11 |
| 4.2 | Software Version Number Convention | 11 |
| 4.3 | Determining your Software's Version Number..... | 11 |
| 5. | Source Code Access | 12 |
| 5.1 | Introduction..... | 12 |
| 5.2 | Downloading the Board Support Package | 12 |
| 5.3 | Code Aurora Forum (CAF) | 13 |
| 6. | Building an Android BSP | 14 |
| 6.1 | Introduction..... | 14 |
| 6.2 | Development Environment Setup..... | 14 |
| 6.2.1 | Introduction..... | 14 |
| 6.2.2 | Initializing Build Environment..... | 15 |
| 6.2.3 | repo Installation..... | 15 |
| 6.3 | Downloading and Building Android BSP Images from Source..... | 16 |
| 6.3.1 | Introduction..... | 16 |
| 6.3.2 | Build Instructions | 16 |
| 7. | Installing an Android Software Image..... | 18 |
| 7.1 | Introduction..... | 18 |
| 7.2 | Fastboot and ADB | 18 |
| 7.2.1 | Introduction..... | 18 |
| 7.2.2 | USB Driver Configuration for fastboot and adb on Linux (Ubuntu) Machine | 18 |
| 7.2.3 | Programming System Images using fastboot | 19 |
| 7.2.4 | Fastboot and adb use on a Windows PC | 22 |
| 8. | Advanced Building Tips | 25 |
| 8.1 | Introduction..... | 25 |

| | | |
|---------------------------------|--|-----------|
| 8.2 | Reconfiguring / Recompiling and Updating Kernel Image on Device..... | 25 |
| 8.3 | FAQS for SDA845 BSP | 26 |
| 8.3.1 | Remounting system partition over adb..... | 26 |
| External references..... | | 27 |

Intrinsyc Confidential

1. INTRODUCTION

1.1 Purpose

The purpose of this BSP Programmers Guide is to provide primary user information for programming of and software intended for Android Board Support Package.

Visit the Open-Q 845 community website for more information. You can ask questions and get information about your Open-Q 845 or visit www.intrinsyc.com

For more Android-related device information, see the Qualcomm Developer Network page at <https://developer.qualcomm.com/get-started/android-development>

If you are looking for developing applications only, visit <https://developer.android.com/studio/index.html>

1.2 Scope

This document describes the following for the Open-Q 845 Development Kit:

- Software Licensing and Version Information
- Accessing Android software for the kit
- Setting up your PC development environment used to build/install software on the kit
- Building the software binaries from source code
- Methods to download/install Android software binaries from your PC onto on the kit
- Debug/ADB Usage

1.3 Intended Audience

This document is intended for end users who have purchased an Open-Q 845 Development Kit and who are interested in Android BSP customization / Linux Device driver development / modification

1.4 Organization

This document is organized as follows:

- **Section 1. Introduction:** This section describes the purpose, scope and structure of this document.
- **Section 2. Documents:** This section lists other documents that are parents of or supplement this document.
- **Section 3. Software Licensing:** This section identifies the Android Software licensing for the software supplied for use on your Open-Q 845 Development Kit.
- **Section 4. Software Version Tracking:** This section identifies Android Software version information for the software supplied for use on your Open-Q 845 Development Kit.
- **Section 5. Source Code Access:** This section describes where and how to access the Android BSP including the kernel source code that runs on the Open-Q 845 Development Kit.
- **Section 6. Building an Android Software Image:** This section describes how to setup your host PC software development environment and build software binaries from source code for use with your Open-Q 845 Development Kit.
- **Section 7. Installing an Android Software Image:** This section describes how to install Android software binaries onto your Open-Q 845 Development Kit
- **Section 8. Advanced Development and Debugging Tips:** This section describes how to configure and control the various subsystems that are part of your Open-Q 845 Development Kit.
- **Section 9. Troubleshooting:** This section describes some known problems and suggested solutions.

1.5 Acronyms

| TERM AND ACRONYMS | DEFINITION |
|-------------------|--|
| ADB | Android Debug Bridge |
| AMIC | Analog Microphone |
| ANC | Audio Noise Cancellation |
| B2B | Board to Board |
| BLSP | Bus access manager Low Speed Peripheral(Serial interfaces like UART / SPI / I2C/ UIM) |
| BSP | Board Support Package |
| CAF | Code Aurora Forum |
| CSI | Camera Serial Interface |
| DP | Display Port |
| DSI | MIPI Display Serial Interface |
| EEPROM | Electrically Erasable Programmable Read only memory |
| EMMC | Embedded Multimedia Card |
| GPS | Global Positioning system |
| HDMI | High Definition Media Interface |
| HSIC | High Speed Inter Connect Bus |
| JTAG | Joint Test Action Group |
| LNA | Low Noise Amplifier |
| MIPI | Mobile Industry processor interface |
| MPP | Multi-Purpose Pin |
| NFC | Near Field Communication |
| PID | (USB) Product ID |
| QHD | Quarter High Definition |
| RF | Radio Frequency |
| SATA | Serial ATA |
| SDK | Software Development Kit |
| SLIMBUS | Serial Low-power Inter-chip Media Bus |
| SOM | System On Module |
| SPMI | System Power Management Interface (Qualcomm PMIC / baseband proprietary protocol) |
| SSBI | Single wire serial bus interface (Qualcomm proprietary mostly PMIC / Companion chip and baseband processor protocol) |
| UART | Universal Asynchronous Receiver Transmitter |

| TERM AND ACRONYMS | DEFINITION |
|-------------------|----------------------|
| UIM | User Identity module |
| USB | Universal Serial Bus |
| USB HS | USB High Speed |
| USB SS | USB Super Speed |
| VID | (USB) Vendor ID |

1.6 Resources

The following resources were used in the creation of this document:

- <https://source.android.com/source/initializing.html>
- <https://developer.android.com/tools/publishing/versioning.html>
- <https://developer.android.com/studio/releases/platform-tools.html>

2. DOCUMENTS

This section lists any parent and supplementary documents for the Open-Q 845 Development Kit User Guide. Unless stated otherwise, applicable documents supersede this document and reference documents provide background and supplementary information.

2.1 Applicable Documents

| REFERENCE | AUTHOR | TITLE |
|-----------|-----------|--|
| A-1 | Intrinsyc | Intrinsyc Purchase and Software License Agreement for the Open-Q 845 Development Kit |

2.2 Reference Documents

| REFERENCE | DOCUMENT NUMBER | AUTHOR | TITLE |
|-----------|-------------------|-----------|---|
| R-1 | 01IMP1200-QSG-001 | Intrinsyc | Intrinsyc Open-Q 845 SDA845 Development Kit Quick Start Guide |
| R-2 | 01IMP1200-UG-001 | Intrinsyc | Intrinsyc Open-Q 845 SDA845 Development Kit User Guide |

3. SOFTWARE LICENSING

3.1 Introduction

As a part of purchasing the Open-Q 845 Development Kit, you are provided access to

- Android BSP binary images
- Android BSP source code

3.2 Software Licensing

Your use of this document is subject to and governed by those terms and conditions in the Intrinsic Purchase and Software License Agreement for the Snapdragon 845 based Open-Q™ 845 Development Kit, which you or the legal entity you represent, as the case may be, accepted and agreed to when purchasing an Open-Q 845 Development Kit from Intrinsic Technologies Corporation (“**Agreement**”). You may use this document, which shall be considered part of the defined term “Documentation” for purposes of the Agreement, solely in support of your permitted use of the Open-Q 845 Development Kit under the Agreement. Distribution of this document is strictly prohibited without the express written permission of Intrinsic Technologies Corporation and its respective licensors, which they can withhold, condition or delay in its sole discretion.

This document contains technical data that may be subject to U.S. and international export, re-export, or transfer (“export”) laws. Diversion contrary to U.S. and international law is strictly prohibited.

3.3 Software Use Restrictions

The Open-Q 845 Development Kit software is sold as a development platform kit as specified in the Intrinsic License Agreement.

The Open-Q 845 Development Kit software includes a number of third-party components which are subject to royalty fees in case of commercial use. The list of third-party components is updated for each BSP release; see below an example of list of third-party components:

| Component | Details |
|---------------------------|--|
| QCOM-SW-00001 MMV(Video) | MPEG-4 Simple / Advanced Simple Profile |
| | H.263 Profile 0 and Profile 3 |
| | H.264 Baseline / Main / High Profile |
| | H.265 / HEVC - Main profile |
| | Windows Media Video Simple Profile |
| | VC-1 Main / Advanced Profile |
| | MPEG-2 Main Profile |
| | DivX 3.11 / 4 / 5 / 6 |
| | Xvid |
| | VP6 / VP8 |
| | MVC High Profile |
| | Wi-Fi Display 1.0 optimized Video/Audio decoders |
| | MPEG-4 Simple / Advanced Simple Profile |
| | H.263 Profile 0 |
| | H.264 Baseline / Main / High Profile |
| | VC-1 Main / Advanced Profile |
| | MPEG-2 Main Profile |
| | On2 VP8 |
| | MVC High Profile |
| | .wmv |
| QCOM-SW-00001 MMV(Audio) | MPEG-4 AAC Low Complexity |
| | MPEG-4 AAC Plus (HE AAC) |
| | MPEG-4 Enhanced AAC+ (HE AAC v2) |
| | AMR-WB |
| | AMR-WB+ |
| | QCELP |
| | EVRC |
| | Windows Media Audio |
| Snapdragon Digital Camera | Snapdragon Digital Camera Face Detection with H3A |
| | Full facial: Blink detection-- Smile degree-- Gaze estimation-- Facial outline/contour |

4. SOFTWARE VERSION TRACKING

4.1 Introduction

Software releases from Intrinsic use a release version based on an underlying Linux Foundation-owned and Qualcomm-maintained software baseline from Code Aurora Forum (CAF).

4.2 Software Version Number Convention

The BSP software version of the Intrinsic Open-Q 845 Development Kit is a 2-digit version number signifying the major and minor software release (e.g., 1.1). This version is for Intrinsic Internal tracking purposes, and for maintaining bug reports. Based on the version information Intrinsic can provide better support.

4.3 Determining your Software's Version Number

You can check your BSP software version from the display under “Settings->About Phone->Build number” as follows:

```
sdm845-userdebug 8.1.0 Open-Q_845_0_vX.Y
```

[where X=major, Y= minor (bugfix)]

All users who received a board with any previous version of the BSP will have to upgrade the board using the Jflash tool (runs on both Linux and Windows) before upgrading to this new BSP release. This is a one-time upgrade.

Visit <http://support.intrinsic.com> to download the latest Open-Q_8450_Android -O_vX.Y-ITC_Jflash_Upgrade.zip file for your board.

After upgrading your board, you will have the following device version info:

```
sdm845-userdebug 8.1.0 Open-Q_845_0_v1.0
```

5. SOURCE CODE ACCESS

5.1 Introduction

As mentioned in section 4.1, software releases from Intrinsic use a release version based on an underlying Qualcomm software baseline from CAF.

Users can build their own BSP software images or they can use pre-built software images from Intrinsic to program new images on the Open-Q 845.

If you wish to program pre-built software images from Intrinsic, you can skip the information in this section and go directly to section 7, “Installing an Android Software Image”.

5.2 Downloading the Board Support Package

Users can download the Board Support Package from Intrinsic website.

Download the “Open-Q_845_Android -O_vX.Y.zip” to Linux build machine to build from source. Extract the zip file the content of the package would be as below:

```
Open-Q_845_Android -O_vX.Y.zip
├── Binaries                : Precompiled Binaries
│   ├── boot.img           : Linux Kernel + Ramdisk boot image
│   ├── dtbo.img           : Android Cache partition ext4 image
│   ├── flashall.sh         : Script to flash images over fastboot
│   ├── flashall.bat        : Script to flash images over fastboot for Windows
│   ├── persist.img         : Android persist partition image
│   ├── system.img          : Android system partition ext4 image
│   ├── vendor.img          : Android vendor partition ext4 image
│   └── vbmeta.img          : Android verified boot partition
├── README.txt              : A very quick README for the release
├── Source_Package          : Source Package
│   ├── getSource_and_build.sh : Script to download and build from source
│   ├── patches             : Patches for Open-Q 845
│   └── proprietary.tar.gz   : Qualcomm Proprietary Libraries
├── usb_driver              : Windows Driver for ADB for Open-Q 845
├── Intrinsic_Open-Q_845_Dev_Kit_Release_Notes_for_BSP_X.Y.pdf : Release Notes
└── Licence                 : Licence Information for Dev platform software update
```

After copying the above files to your Linux PC, follow the steps in section 6, "Building an Android " to extract and build the source code.

5.3 Code Aurora Forum (CAF)

The Source Package mentioned in the previous section includes a script file that will pull software from CAF to your Linux 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 development kit. Intrinsic-provided patches for fixes and features on the Open-Q development kit are applied on top of this specific CAF baseline via the installation script.

Note:

1. Do not post your board specific or BSP specific technical questions on CAF, as CAF contains many other projects for different families. They will not be answered.
2. For technical support contact <https://www.intrinsyc.com/contact-support>

6. BUILDING AN ANDROID BSP

6.1 Introduction

This section describes how to setup your development workstation (host PC), including the software tools required to build software from source code for your Open-Q 845 Development Kit.

6.2 Development Environment Setup

6.2.1 Introduction

A PC running Ubuntu Linux is required to setup the development environment for building the Android BSP.

The following table identifies the specific hardware, software and other equipment needed for a developer to install and run the software:

| Item # | Item description | Version | Source/vendor | Purpose |
|--------|--|-------------|--------------------------------------|---|
| 1 | Linux development workstation exceeding minimum desktop system requirements for running Ubuntu 64-bit OS | — | | Android build machine |
| 2 | Ubuntu 14.04.x Linux distribution for 64-bit architecture | 14.04.x LTS | Ubuntu Community/ Canonical, Ltd. | Android build host OS |
| 3 | Open JDK for Linux x64 | 1.8 | Oracle | Required for building Android |
| 4 | repo | -- | Android Open Source Project | Android source management tool |
| 5 | Internet connectivity for your Linux PC | -- | | The Linux PC will download packages from CAF to be built. |

Note:

1. Currently the BSP release supports “Ubuntu 14.04 – 64bit” as build environment.
2. Other versions of Ubuntu Linux are not tested against the release build and are unsupported. If you are running any other Ubuntu distribution other than the recommended, you may encounter build errors.
3. If at any point of time, if you encounter errors/issues, report these to <https://www.intrinsyc.com/contact-support> along with supporting logs.
4. The source code download from codeaurora.org takes up almost 60GB disk space. Full build takes up approx. 140 GB of disk space, so make sure you have necessary disk space before running the build script from the BSP package.

6.2.2 Initializing Build Environment

6.2.2.1 Installing JDK

The Android 8.1 build requires Open JDK 1.8. Install the JDK version of Java 8, use below commands

```
$ sudo add-apt-repository ppa:openjdk-r/ppa
$ sudo apt-get update
$ sudo apt-get install openjdk-8-jdk
```

If you already have other versions of Java installed on your PC, use the following commands to switch to JDK 1.8 before starting the build. First, to list out all the available JVMs, run:

```
$ update-java-alternatives -l
```

Then, select Java 1.8 using the command:

```
$ sudo update-java-alternatives -s java-1.8.0-openjdk-amd64
```

To confirm you have installed/switched to Java 8, check the version using the command:

```
$ java -version

openjdk version "1.8.0_XX"
```

Note: <https://source.android.com/setup/build/initializing> contains up-to-date information about the build environment setup. Please refer to this link if you are facing setup issues.

6.2.3 repo Installation

"repo" is a source code configuration management tool used by the Android project. It is a front end to git written in Python. repo uses a manifest file to aid downloading 3 code bases organized as a set of projects stored in different git repositories.

To install repo:

1. Create a ~/bin directory in your home directory, or, if you have root or sudo access, install for all system users under a common location, such as /usr/local/bin or somewhere under /opt
2. Download the repo script:

```
$ curl https://storage.googleapis.com/git-repo-downloads/repo > ~/bin/repo
```
3. Set the repo script's attributes to executable.

```
$ chmod +x ~/bin/repo
```
4. Make sure that the installed directory location for repo is included in your PATH.

```
$ export PATH=~/bin:$PATH
```
5. Try running "repo --help" to verify installation; you should see a message similar to the following:

```
$ repo --help
```

usage: repo COMMAND [ARGS] repo is not yet installed. Use "repo init" to install it here.

The most commonly used repo commands are:

init Install repo in the current working directory

help Display detailed help on a command

For access to the full online help, install repo ("repo init").

6.3 Downloading and Building Android BSP Images from Source

6.3.1 Introduction

This section describes how to build software for your Open-Q 845 Development Kit from source code and assumes your development workstation has already been setup according to section 6.2.

6.3.2 Build Instructions

Following contains Source_Package Structure of the release.

```
Source_Package -----Source code patches
|-- getSource_and_build.sh -----Main download and build script
|-- patches -----Patches for Open-Q 845 support
`-- proprietary.tar.gz -----Qualcomm-specific binaries required for Android
```

The source build depends on the following CAF project:

<https://www.codeaurora.org/project/android-for-msm>

For git /code browsing you can visit below

<https://www.codeaurora.org/cgit/quic/la>

Following are the release table matching the CAF manifest / TAG.

| Intrinsyc Release | CAF TAG |
|----------------------------|-----------------------------|
| Open-Q_845_Android -O_v1.0 | LA.UM.6.3.r4-04500-sdm845.0 |

To initiate the build, extract the BSP zip file and execute the `getSource_and_build.sh` script located in the `Source_Package` folder.

```
$ unzip Open-Q_845_Android -O_v1.0.zip
$ cd Open-Q_845_Android -O_v1.0/Source_Package
$ chmod +x getSource_and_build.sh
```

Before running `getSource_and_build.sh`, make sure the build environment meets below requirements:

- 1) Access internet to download code from Code Aurora
- 2) Minimum 32 GB RAM recommended for build process

3) Drive must have at least 140GB free space for complete build.

Run below command to download the source code and build the BSP:

```
$ ./getSource_and_build.sh
```

The script will automatically download source code from CAF, apply patches to respective Android projects, extract `proprietary.tar.gz`, and build Android.

After the build is complete, for subsequent builds, the following commands should be run from the root of the source (i.e. `SDA845_Open-Q_845_Android-O_v1.0` folder)

```
$ ./build.sh sdm845 -j $(nproc)
```

7. INSTALLING AN ANDROID SOFTWARE IMAGE

7.1 Introduction

This section describes how to install Android software binaries you built / prebuilt onto your Open-Q 845 Development Kit.

Note: In any following sections <android-source-tree> refers to the root Android directory (i.e. SDA845_Open-Q_845_Android-0_v1.0 folder).

7.2 Fastboot and ADB

7.2.1 Introduction

"fastboot" is the tool used to install an Android image from a Linux (Ubuntu) development PC over a USB connection to the Open-Q 845 Development Kit. fastboot can also be used to install an android image from Windows machine. Within the Snapdragon 845 embedded software, fastboot is implemented in the bootloader.

Android Debug Bridge (adb) is a debug interface over USB between your PC and the development kit. ADB is not required for installing a software image, but its configuration on a PC is similar to that of fastboot and therefore adb configuration included in this document for convenience of PC configuration.

Fastboot and adb for Linux are available from the following folder after you follow steps in section 6.3 to build an image successfully:

<android-source-tree>/out/host/linux-x86/bin/.

Alternatively, if you have not configured a full Linux development environment and built an image, you can use the fastboot and adb binaries supplied by Google's Android SDK Platform Tools (<https://developer.android.com/studio/releases/platform-tools.html>). In either case, ensure fastboot and adb are in your PATH for your Linux PC.

Before you can use fastboot and adb, you must ensure your PC is configured to recognize the Open-Q 845 by configuring the USB VID/PID. To configure the USB VID/PID for the Open-Q 845 for use with fastboot and adb on your PC, follow the instructions in section 7.2.2 before you connect your PC to your Open-Q 845.

7.2.2 USB Driver Configuration for fastboot and adb on Linux (Ubuntu) Machine

As described in Google's instructions for setting up a hardware device (<https://developer.android.com/studio/run/device.html>), your Linux development workstation USB driver configuration must be modified to recognize the development kit when you use adb or fastboot from Google's Android SDK Platform Tools.

Here is the configuration required for using adb and fastboot with the kit:

1. Create this file or edit this file as root in the folder /etc/udev/rules.d/ in your PC:

51-android.rules

Add the following lines to the end of the file to use platforms with software v3.0:

```
#Fastboot low-level bootloader
SUBSYSTEM=="usb", ATTR{idVendor}=="18d1", MODE="0777", GROUP="adm"
# adb composite interface device 9025
SUBSYSTEM=="usb", ATTR{idVendor}=="05c6", MODE="0777", GROUP="adm"
```

Restart the udev service on your PC using:

```
$ sudo service udev restart
```

2. After step 2, you need to connect UART FTDI serial cable (Refer to user guide for connectors) with Minicom or Putty or TeraTerm on your host machine. On your Host PC set your UART settings to following

```
BaudRate : 115200
Parity : None
Data Bits : 8
Hardware Flow Control : None
Software Flow Control : None
Stop Bits : 1
```

3. After step 2, you need to put your development kit into Fastboot mode before connecting via USB to the PC to communicate via fastboot or ADB. The following are 2 methods to put your development kit into Fastboot mode:

- a. Press the Volume (-) button on the carrier board while you power the board on
- b. Power on the board and type “su” and then “reboot bootloader” on the serial debug UART

In either case above, the board will boot into Fastboot mode, showing the following debug output on the serial debug UART:

```
Fastboot: Processing commandsThis will result in the dev kit rebooting into Fastboot mode
```

4. To confirm successful communication between the PC and dev kit in Fastboot mode, you can type “fastboot devices” to list the devices connected in Fastboot mode or “lsusb” shows:
18d1:d00d – Unnamed device

7.2.3 Programming System Images using fastboot

These steps assume your Open-Q 845 Development Kit eMMC has a pre-existing Android image configured (note kits supplied by Intrinsic will have a pre-existing Android image installed). At a minimum, a boot partition with the Android bootloader image is required for using fastboot to program a new image.

Steps to programming using fastboot:

1. Ensure you have followed the steps in sections 7.2.1 and 7.2.2 to have fastboot in your PATH, functional on your PC, and your dev kit booted into Fastboot mode.
2. If you are programming pre-built binary images downloaded from Intrinsic website:
 - a. You should have the following files:
 - i. Programming script: `flashall.sh`
 Note: `flashall.sh` assumes that `adb` and `fastboot` android utilities are already in the path on your PC. If not update your `.bashrc` accordingly.
 - ii. Image files: `boot.img`, `dtbo.img`, `persist.img`, `system.img`, `vbmeta.img`, `vendor.img`
 - b. Copy all the above files to a folder on your Linux PC
 - c. Make sure the `flashall.sh` programming script is executable.
 - d. Execute the `flashall.sh` script
 - e. If the dev kit does not reboot automatically after executing the script, turn off/on your board to reboot your dev kit.
3. If you are programming your own built binary images follow the instructions from section 6.3.
4. Obtain the flash programming script “`flashall.sh`” from the pre-built binary image folder from the BSP, you can find it under “Open-Q_820_Android-O_vX.Y/Binaries”
 - a. Copy the flash programming script to the following directory:
`<android-source-tree>/out/target/product/sdm845`
 - b. Execute the `flashall.sh` script¹
 - c. If the dev kit does not reboot automatically after executing the script, turn off/on your board to reboot your dev kit with the newly programmed images
5. Programming partitions using fastboot:

To program a partition on the device, use the fastboot command as follows:

```
$ fastboot flash <partition_name> <path to the partition image>
```

This will program partition with image provided.

For example, to flash the kernel image,

```
$ fastboot flash boot boot.img
```

To erase a partition, the command is:

¹ Note this script will erase user data, as part of the new image installation.

```
$ fastboot erase <partition_name>
```

Intrinsyc Confidential

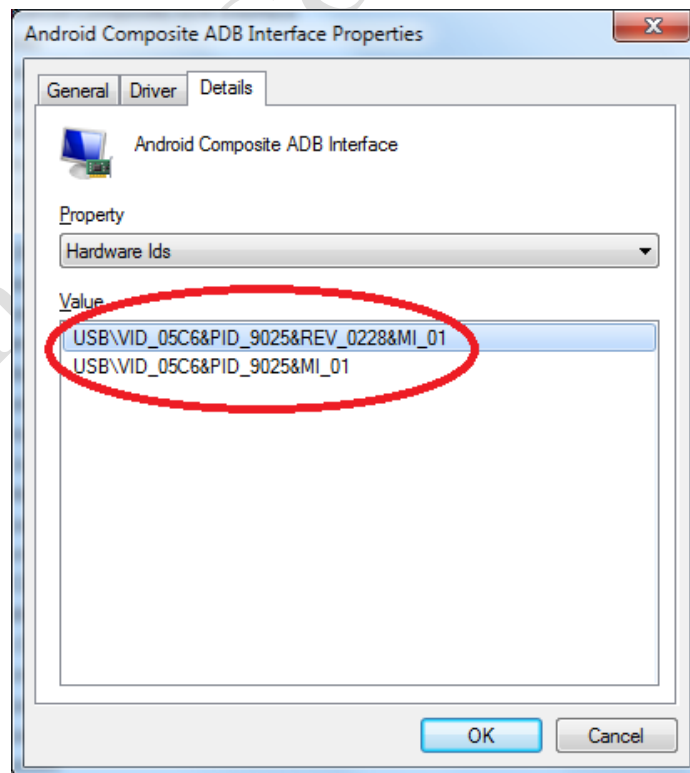
7.2.4 Fastboot and adb use on a Windows PC

It is also possible to use fastboot and adb from a Windows PC for software image programming and debugging. You will need to:

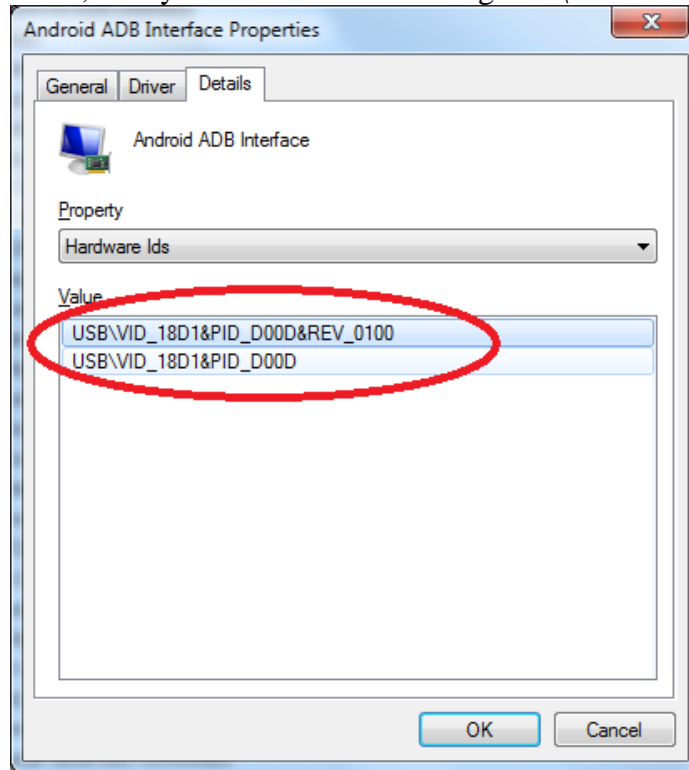
1. Install the Android SDK Platform Tools (<https://developer.android.com/studio/releases/platform-tools.html>) on your Windows PC.
2. Edit Environment variable to add adb and fastboot to path.
3. Install Windows drivers for the dev kit on your Windows PC. These drivers are available with the release from Intrinsic website, in folder “usb_driver” of Open-Q_845_Android -O_vX.Y.zip package.

Notes:

- a) If you have installed a previous version of PC drivers from an older release of the dev kit software, you must first uninstall those older drivers first.
- b) Terminate any pre-existing adb server on the PC using the “adb kill-server” command
- c) The device creates 4 different endpoints out of which only one endpoint will work; the other USB unknown-devices should be ignored.
- d) While the USB drivers are installed you should make sure to use the following VID\PID for the adb interface:



When device is in fastboot, then you will see the following VID\PID:



4. To install prebuilt binaries via windows machine just unzip release downloaded from Intrinsic web site. The image files to be flashed are located in “Open-Q_820_Android -O_vX.Y\Binaries”

The files are:

boot.img, dtbo.img, persist.img, system.img, vbmeta, vendor.img

Once the above steps are complete, you can open place the dev kit into Fastboot mode (refer to section 7.2.2, step 3), open a Windows command prompt from “Open-Q_845_Android -O_vX.Y\Binaries”

Directory and issue following fastboot commands (or simply run the batch file if supplied)²:

OR

4. If you have compiled your own images from the BSP source, as mentioned in Section 6.3

² Note this will erase user data, as part of the userdata programming.

Then copy boot.img, dtbo.img, persist.img, system.img, vbmeta.img, vendor.img files to your windows machine and use following commands from Windows Command prompt.

```
fastboot flash system system.img
fastboot flash persist persist.img
fastboot flash boot boot.img
fastboot flash dtbo dtbo.img
fastboot flash vbmeta vbmeta.img
fastboot flash vendor vendor.img
fastboot reboot
```

Or

Copy “flashall.bat” from “Open-Q_820_Android -O_vX.Y\Binaries” to the folder where you copied all the above files, and then runt the batch file.

Note:

flashall.bat file assumes you have adb and fastboot utilities in the path.

8. ADVANCED BUILDING TIPS

8.1 Introduction

This section describes how to configure the kernel / recompile kernel only.

8.2 Reconfiguring / Recompiling and Updating Kernel Image on Device

Use below command to use kernel menuconfig options for changing kernel configuration as per your need.

If you don't have ncurses development libraries installed on your build PC, you might get errors while running kernel menuconfig.

To install ncurses:

```
$ sudo apt-get install libncurses5-dev
$ cd <android-source-tree>
$ source build/envsetup.sh
$ lunch sdm845-userdebug

$ env KCONFIG_NOTIMESTAMP=true make -j4 -C kernel/msm-4.9
O=../../out/target/product/sdm845/obj/kernel/msm-4.9 DTC_EXT=dtc
DTC_OVERLAY_TEST_EXT=$PWD/out/host/linux-x86/bin/uftd_apply_overlay_host
CONFIG_BUILD_ARM64_DT_OVERLAY=y ARCH=arm64 CROSS_COMPILE=aarch64-linux-android-
menuconfig

$ env KCONFIG_NOTIMESTAMP=true make -j4 -C kernel/msm-4.9
O=../../out/target/product/sdm845/obj/kernel/msm-4.9 DTC_EXT=dtc
DTC_OVERLAY_TEST_EXT=$PWD/out/host/linux-x86/bin/uftd_apply_overlay_host
CONFIG_BUILD_ARM64_DT_OVERLAY=y ARCH=arm64 CROSS_COMPILE=aarch64-linux-android-
savedefconfig

$ cp out/target/product/sdm845/obj/kernel/msm-4.9/defconfig kernel/msm-
4.9/arch/arm64/configs/sdm845_defconfig
```

Change your kernel configuration options as needed, and use following command to recompile just the kernel:

```
$ make -j4 bootimage
```

This will build the boot image (kernel) with updated kernel configuration. Flash the boot image as mentioned in Section [7.2.3](#)

To build system image

```
$ make -j4 systemimage
```

To build userdata image

```
$ make -j4 userdataimage
```

To build vendor image

```
$ make -j4 vendorimage
```

8.3 FAQs for SDA845 BSP

8.3.1 Remounting system partition over adb

To remount the system partition while debugging on SDA845 BSP

1. Qualcomm recommends to use user-debug build for SDA845, which is default for Open-Q 845 Android BSP but for gaining root access you can compile a userdebug build with following commands:

```
$ cd <android-source-tree>
```

```
$ ./build.sh sdm845 -j $(nproc)
```

Note: Before switching build variants, it is recommended to perform a clean build and recompile.

To clean Android build, use the command:

```
$ make clobber
```

2. Program the new generated images
3. After the device boots with these images, use following adb commands on the host PC:

```
$ adb root
```

```
$ adb remount
```

EXTERNAL REFERENCES

Some Useful Links for Qualcomm Technologies and Accelerated Application Development and debugging tools.

Accelerated Computer Vision Processing for Snapdragon Family - Fast CV:

<https://developer.qualcomm.com/software/fastcv-sdk>

Gaming and Adreno GPU:

<https://developer.qualcomm.com/software/adreno-gpu-sdk>

Debugging Tools:

<https://developer.qualcomm.com/software/treppn-power-profiler>

Treppn Profiler for profiling applications

Multimedia and Qualcomm Hexagon DSP SDK:

<https://developer.qualcomm.com/software/hexagon-dsp-sdk>