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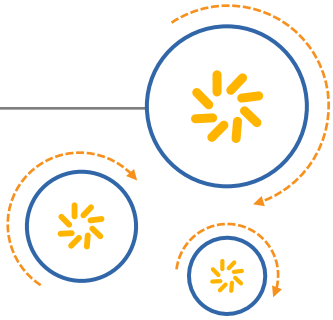

DragonBoard™ 410c Linux Embedded

Release Notes

LM80-P0337-4 Rev. A

November 9, 2017

For additional information or to submit technical questions, go to: https://www.96boards.org/DragonBoard410c/forum

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Revision history

Revision	Date	Description
A	November 2017	Initial release

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1 Introduction

This document describes how to obtain, build, and program the software that is applicable to the Linux embedded software product “as-is” into a reference platform. This document describes the following:

- Set up a development environment and install the software
- Build the software and flash it onto the DragonBoard™ 410c platform

This document provides a description of chipset capabilities. Not all features are available, nor are all features supported in the software.

NOTE: Enabling some features may require additional licensing fees.

1.1 Introduction to www.codeaurora.org

Open source HLOS (high-level operating system) software for Qualcomm® Snapdragon™ chipsets is available on the Linux Foundation hosted site www.codeaurora.org.

1.2 Introduction to DragonBoard 410c

See the following websites for additional information:

https://developer.qualcomm.com/hardware/dragonboard-410c

https://www.96boards.org/DragonBoard410c/docs

1.3 Documentation conventions

Function declarations, function names, type declarations, attributes, and code samples appear in a different font, for example, `#include`.

Code variables appear in angle brackets, for example, `<number>`.

Shading indicates content that has been added or changed in this revision of the document.

1.4 Terms and acronyms

Table 1-1 Acronyms and terms

Acronym or Term	Definition
CDT	Configuration data table
EABI	Embedded application binary interface
eMMC	Embedded multimedia card
GCC	GNU Compiler Collection (GCC) tool
GPT	General-purpose timers

Acronym or Term	Definition
HLOS	High-level operating system (generic term for WinMob, Linux, and so on)
INITRD	Initial RAM disk
OE	OpenEmbedded
RPB	Reference plaftorm build

2 Set up a Linux build environment

2.1 Required equipment and software

Table 2-1 Required equipment and software

Serial number	Item description	Version	Source/vendor	Purpose
1	Power supply	x	x	DragonBoard 410c required power of 12 V, 2 A
2	Linux host	x	x	LE build host operating system
3	Repo	x	Google	Source management tool
4	GCC compiler	5.3 and above	Linaro	GCC compiler with ARM 64-bit support
5	ARM-EABI	N/A	Linaro	Compiler tool for little kernel (LK)
6	SKALES tool	N/A	Qualcomm Technologies, Inc. (QTI)	SKALES tool to pack images
7	INITRD image	N/A	Linaro	INITRD image
8	signLK	N/A	QTI	Sign LK images

2.1.1 Linux host

Compilation process for DragonBoard 410c LE requires Linux host machine. Recommended Linux machine for compiling the code is the latest release from Ubuntu.

Create an installation CD and install it onto the computer by following the instructions at http://releases.ubuntu.com/.

2.1.2 Install Repo

The Repo tool is a source code configuration management tool used by the Android project. The Repo tool is a front-end to Git written in Python. It uses a manifest file to help download the code organized as a set of projects that are stored in different Git repositories.

To install Repo, perform the following steps:

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 attributes to executable.
   ```
   $ chmod a+x ~/bin/repo
   ```
4. Include the installed directory location for Repo in your PATH.
   ```
   $ export PATH=~/bin:$PATH
   ```
5. Run Repo --help to verify the installation.
   ```
   $ repo –help
   ```
   The following message is displayed:

   usage: repo COMMAND [ARGS]

   Repo is not yet installed. Use “repo init” to install it here.

   The most commonly used Repo commands are as follows:

   - `init` → Install Repo in the current working directory
   - `help` → Display detailed help on a command

NOTE: To access to the online help, install Repo (repo init).

2.1.3 Set up kernel build environment

Set up the following tools to compile Linux kernel without rebuilding the complete HLOS.

2.1.3.1 Download SKALES

To pack images, download the SKALES tool from the following link:

- https://source.codeaurora.org/quic/imm/imm/skales/

2.1.3.2 Download GCC compiler

Download the GCC compiler with ARM 64-bit support from Linaro from the following link:

- https://releases.linaro.org/components/toolchain/binaries/latest/aarch64-linux-gnu/

2.1.3.3 Download INITRD image

Download the initial RAM disk (INITRD) image from the following location:

- http://builds.96boards.org/releases/dragonboard410c/linaro/debian/latest/

2.1.3.4 Download ARM-EABI compiler

The ARM-EABI compiler is used to compile the LK file. Use the following command to download the compiler:

```
git clone git://codeaurora.org/platform/prebuilts/gcc/linux-x86/arm/arm-
eabi-4.8.git -b LA.BR.1.1.3.c4-01000-8x16.0
```

2.1.3.5 Download signLK tool

The signLK tool is used to sign the LK files (emmc_appsbl.mbn) before flashing to the device.

NOTE: When the device rejects unsigned LK images, Fastboot is not available. In such scenarios, other alternative methods to update the device images are required.

Download the latest version of signlk from the following website:

Git clone https://git.linaro.org/landing-teams/working/qualcomm/signlk.git

3 Load images

3.1 Overview

A Linux build is references to a set of images that must be loaded to the device for proper functionality.

A full build content contains the following components:

- gpt.bin – See Section 4.1 for more information.
- CDT.bin – See Section 4.2 for more information.
- Sbl1.mbn
- tz.mbn
- hyp.mbn
- rpm.mbn
- NON-HLOS.bin
- emmc_appsboot.mbn (LK)
- boot.img
- rootfs.ext4

The following proprietary images are available only in the binary format and delivered in the BSP as described in the section that follows. The source code for other components is available for the user to download and self-compile.

See Section 4 for more information about self-building the images.

3.1.1 Download the proprietary images

Board support packages are available at the following link:

https://developer.qualcomm.com/hardware/dragonboard-410c/software

It is mandatory that you match the board support package release to the HLOS release.

For example, BSP file ‘linux-board-support-package-r1032.1’ matches HLOS release 1032.1.

3.1.1.1 BSP content

The BSP contains the following:

- All proprietary images:
  - sbl1.mbn
    - sbl1.sd.mbn – Use this file to boot from SD rescue card
  - tz.mbn
  - hyp.mbn
  - rpm.mbn
  - NON-HLOS.bin
- CDT file
- Proprietary firmware for WLAN and video

3.2 Boot from eMMC (normal boot)

3.2.1 Program images using Fastboot

1. To bring the device into the Fastboot mode, perform the following steps:
   a. Hold down the VOL-key.
   b. Connect the DC supply to the DragonBoard 410c.
   c. Press the power ON button.
   d. Plug the USB cable into the target.
2. Depending on your build environment, choose *one* of the following options:
   - Run the following command from the Windows command shell:
     `Fastboot devices`
   - Perform the following from the Linux environment:
     - Navigate to the following directory:
       `cd <$BUILDROOT>build\tmp-glibc\deploy\images\dragonboard-410c`
     - Run the following command:
       `sudo fastboot devices`

   The list of registered devices is displayed.
3. After the device is detected, flash the binaries to the target. Run the following commands to flash all the LE application images:
   - Bootloaders <usually not needed>

```
Fastboot flash patition <path to gpt.bin>
Fastboot flash cdt <path to cdt.bin>
fastboot flash sbl1 <path to sbl1.mbn >
fastboot flash tz <path to tz.mbn >
fastboot flash rpm <path to rpm.mbn >
```

```
fastboot flash hyp <path to hyp.mbn >
fastboot flash modem <path NON-HLOS.bin>
```

- LE application images

```
fastboot flash aboot <path to emmc_appsboot.mbn >
fastboot flash boot <path to boot.img>
fastboot flash rootfs <path rootfs.ext>
```

4. Reboot the board. During power-up, the USER LED #4 glows green, which indicates that the bootup is completed.

3.3 Boot from SD

See the 96Boards.org and follow the latest release instructions to create a rescue SD card.

http://builds.96boards.org/releases/dragonboard410c/linaro/rescue/latest/

4 Set up a project

4.1 GPT

The GPT maps the eMMC partitions to suit the build.

NOTE: The device rejects to download images without the presence of the GPT in the eMMC.

4.1.1 GPT creation

Use the db-boot-tool to generate a GPT that is required to flash images to the eMMC.

- To create a GPT with CDT support, use the following commands:
  - `git clone https://git.linaro.org/landing-teams/working/qualcomm/db-boot-tools.git/`
  - `cd db-boot-tools`
- To create an empty image (sd.img) with the partition table from linux.txt, run the following command:
  - `sudo ./mksdcard -g -o sd.img -p dragonboard410c/linux/partitions.txt`
- To create a GPT backup, run the following command:
  - `sudo sgdisk -bgpt.bin sd.img`
- To convert GPT backup into the 'fastboot' format, run the following command:
  - `./mkgpt -i gpt.bin -o gpt_both0.bin`
- To flash the GPT to the DragonBoard 410c, run the following command:
  - `Fastboot flash partition gpt_both0.bin`

4.2 CDT

The configuration data table (CDT) is one of the most important data for functionality. The CDT is delivered within the BSP and used by the boot loaders to identify the hardware.

CAUTION: Flash the CDT to the board before booting the LE machine or else the device will fail to boot. See Section 6 for debugging assistance in this scenario.

4.2.1 CDT flashing using Fastboot

Flash the CDT (provided in the BSP) with the following command:

```
Fastboot flash cdt cdt.bin
```

If there is a failure to flash the file, see Section 6 for debugging assistance.

4.3 Building HLOS

4.3.1 Yocto project reference manual

The HLOS is built using the Yocto project. See the following for more information:
http://www.yoctoproject.org/docs/current/ref-manual/ref-manual.html

Additional information is available at https://www.yoctoproject.org/

4.3.2 Download the source files

Table 4-1 Download the source files

Date	Tag/Build ID	Chipset	Manifest
July 7, 2017	IMM.LE.1.0-28000-8x16.0	APQ8016, APQ8016E	IMM.LE.1.0-28000-8x16.0.xml

See the Code Aurora Forum to download the source files:
https://source.codeaurora.org/quic/imm/?h=IMM.LE.1.0-28000-8x16

https://source.codeaurora.org/quic/imm/manifest/tree/?h=IMM.LE.1.0-28000-8x16.0

To download the source files, run the following commands:

- `mkdir apps_proc`
- `cd apps_proc`
- `repo init -u git://codeaurora.org/quic/imm/manifest.git -b IMM.LE.1.0 -m IMM.LE.1.0-28000-8x16.0.xml --repo-url=git://codeaurora.org/tools/repo.git --repo-branch=caf-stable`
- `repo sync`

4.3.3 Set up a bitbake environment

To set up a build environment for the bitbake tool, run the following commands:

- `export OE_MACHINE="dragonboard-410c"`

- `export BUILD_NUMBER=IMM.LE.1.0-8x16_28000`
- `export IMAGES="rpb-desktop-image"`
- `QCOM_EULA=1 MACHINE=${OE_MACHINE} source ./setup-environment build`
- `echo "IMAGE_NAME_append = \"-${BUILD_NUMBER}\"" >> conf/local.conf`
- `echo "LICENSE_FLAGS_WHITELIST = \"commercial\"" >> conf/local.conf`
- `echo "ACCEPT_EULA_dragonboard-410c = \"1\"" >> conf/local.conf`
- `echo "MACHINE_ESSENTIAL_EXTRA_RRECOMMENDS += \" lk\"" >> conf/local.conf`
- ```
  echo "MIRRORS += \"\\
  http://libndp.org/files/ http://www.go-parts.com/mirrors-
  usa/blfs/conglomeration/libndp/ \\n \\
  http://libndp.org/files/
  http://ftp.osuosl.org/pub/blfs/conglomeration/libndp/ \\n \\
  http://libndp.org/files/
  http://ftp.cc.uoc.gr/mirrors/linux/lfs/LFS/svn/l/
  \\n \\
  http://libndp.org/files/ https://www.jabawok.net/gentoo/distfiles/ \\n
  \""
  >> conf/local.conf
  ```

4.3.4 Generate build images

A build content is composed from the following images:

- LK: emmc_appsboot.mbn
- Kernel: boot-dragonboard-410c.img
- HLOS: rpb-desktop-image-dragonboard-410c.ext4.gz

When the process is completed, all the images are available in the following directory:

- build/tmp-glibc/deploy/images/dragonboard-410c

To create a build, run the following commands in apps_proc directory:

- `bitbake ${IMAGES}`
- `cd build/tmp-glibc/deploy/images/dragonboard-410c`
- `gunzip -fk rpb-desktop-image-dragonboard-410c.ext4.gz`
- `mv rpb-desktop-image-dragonboard-410c.ext4 rootfs.ext4`
- `mv boot-dragonboard-410c.img boot.img`

Use the simple open SignLK tool to sign LK for DragonBoard 410c. Download the latest version of SignLK tool from one of the following websites:

https://source.codeaurora.org/quic/imm/imm/sources/tree/signlk?h=IMM.LE.1.0

https://git.linaro.org/landing-teams/working/qualcomm/signlk.git

To sign emmc_appsboot.mbn, run the following commands in apps_proc/build folder:

- ```
  ./signlk -i=tmp-glibc/deploy/images/dragonboard-410c/emmc_appsboot.mbn -
  o=tmp-glibc/deploy/images/dragonboard-410c/
  ```

- `mv tmp-glibc/deploy/images/dragonboard-410c/emmc_appsboot.mbn tmp-glibc/deploy/images/dragonboard-410c/emmc_appsboot_unsigned.mbn`
- `mv tmp-glibc/deploy/images/dragonboard-410c/default/appsbl/emmc_appsboot.mbn tmp-glibc/deploy/images/dragonboard-410c/emmc_appsboot.mbn`
- `rm -Rf tmp-glibc/deploy/images/dragonboard-410c/default/`

NOTE: This environment allows to build each recipe alone.

- Kernel: `bitbake linux-linaro-qcomlt`
- LK: `bitbake lk`

4.4 Build the kernel

Linux kernel image can be compiled without rebuilding the complete HLOS part. To declare the global variables that are used for compilation process, run the following commands:

- `declare -x ARCH="arm64"`
- `declare -x CROSS_COMPILE="<Path to ARM 64bit gcc compiler>/aarch64-linux-gnu-"`

To generate the kernel image and modules, run the following commands:

- `cd apps_proc/sources/kernel`
- `declare -x ARCH="arm64"`
- `declare -x CROSS_COMPILE="<Path to ARM 64bit gcc compiler>/aarch64-linux-gnu-"`
- `make O=../build-${ARCH} defconfig distro.config`
- `make O=../build-${ARCH} -j4 Image dtbs KERNELRELEASE=4.9.29-linaro-lt-qcom`
- `make O=../build-${ARCH} -j4 modules KERNELRELEASE=4.9.29-linaro-lt-qcom`
- `make O=../build-${ARCH}  modules_install INSTALL_MOD_PATH=../build-${ARCH}-modules`

NOTE: The kernel modules (content of build-${ARCH}-modules) must be placed in the root file system under /lib/modules

- `<Path to Skales>/skales/dtbTool -o ../qfpr_dt.img -s 2048 ../build-arm64/arch/arm64/boot/dts/qcom/`
- `<Path to Skales>/skales/mkbootimg --kernel ../build-arm64/arch/arm64/boot/Image --ramdisk ../../initrd.img-4.9.29-linaro-lt-qcom --output ../qfpr-db410c.img --dt ../qfpr_dt.img --pagesize 2048 --base 0x80000000 --cmdline "root=/dev/disk/by-partlabel/rootfs rw rootwait console=ttyMSM0,115200n8 earlycon=msm_serial_dm,0x78b0000"`

4.5 Build LK

Before building the LK, see Section 2.1.3.4 for information on downloading the ARM-EABI compiler.

To generate the LK image, run the following commands:

- `cd apps_proc/sources/lk`
- `make -j4 msm8916 EMMC_BOOT=1 TOOLCHAIN_PREFIX=<path to arm-eabi tree>/bin/arm-eabi-`

NOTE: The LK images must be signed using the signLK tool to boot on the device. If an unsigned LK image was booted, see Section 6 for guidelines.

4.5.1 Sign LK image

Use the simple open SignLK tool to sign LK image for DragonBoard 410c.

- `mv ./build-msm8916/emmc_appsboot.mbn ./build-msm8916/emmc_appsboot_unsigned.mbn`
- `../signlk/signlk.sh -i=./build-msm8916/emmc_appsboot_unsigned.mbn -o=./build-msm8916/emmc_appsboot.mbn -d`

5 Supported features

The following software features have been validated in this release on DragonBoard 410c:

- File system on flash memory
- HDMI display
- Wi-Fi STA (Open and WPA2 PSK) (via wpa_supplicant)
- Wi-Fi SoftAP (Open and WPA2 PSK) (via hostapd)
- Bluetooth (via hcitool and bluetoothctl)
- USB HID (mouse/keyboard)
- USB mass storage
- USB ethernet dongle
- USB camera
- SD card
- GPIOs (compliant to 96boards.org)
- SPI/I^2C (compliant to 96boards.org)
- Serial port (UART) (compliant to 96boards.org)
- Fastboot
- X Window server
- 3D graphics
- GPS (via gpsd and gpsmon)

- Video playback (via gstreamer, up to 1080p 30 fps, hardware decoder)
- Audio playback (software decoder)
- Power button (long press for 10 sec to shut down the device/2 sec to power up)
- Software deployment via fastboot
- CSI YUV camera (OV5640/5)
- RTC read and write
- Chromium browser
- Linaro OpenEmbedded (OE) reference platform build (RPB) for DragonBoard/corresponding morty release version
- Linux Kernel 4.9.29

5.1 GPS enablement

This build contains the initial release of GPS software. To start the GPS, run the following commands:

- `systemctl start gpsd.socket`
- `systemctl start gpsd`
- `systemctl start gnss-gpsd`
- `gpsdctl add /dev/ttyGPS0`
- `gpsmon`

To stop the GPS software, run the following commands:

- `close gpsmon`
- `gpsdctl remove /dev/ttyGPS0`
- `systemctl stop gnss-gpsd`

To restart the GPS software, run the following commands:

- `systemctl start gnss-gpsd`
- `gpsdctl add /dev/ttyGPS0`
- `gpsmon`

5.2 Real time clock usage

The power management chip (PM8916) contains inside hardware real time clock (RTC) that can be used to track current time even when the device is not connected to power.

5.2.1 Connect coin-cell battery for RTC on DragonBoard 410c

Coin-cell battery can be used to keep RTC up-to-date when device has no power attached.
The system was tested with ML-621S/ZTN. The user can use larger capacity coin-cell battery for longer keep alive periods, such as ML-2020/H1CN.

Rework instructions:

1. Remove metallic shield from APQ/PMIC area.
2. Remove C81.
3. Connect positive battery side to PM_VCOIN pad (U9.L11 or C81.1), and negative side to close GND (for example, C81.2).

5.2.2 RTC read and write from user space

To read and update RTC, you must have root access. To read and update RTC, run the following commands:

- Read RTC: `hwclock –r`
- Save current system time in RTC: `hwclock -w`

By default HLOS is limited to read-only access to hardware RTC. To overcome this limitation, when RTC is updated, a file with offset in seconds from current RTC is stored in file /etc/rtc_offset.

5.3 Enablement and test examples

5.3.1 Enable USB camera

- `gst-launch-1.0 -vv v4l2src device=/dev/video1 ! glimagesink`

5.3.2 Enable CSI camera

5.3.2.1 Inspect V4L2 configuration

- `media-ctl -d /dev/media0 -p`

5.3.2.2 Enable driver debug messages

- `echo 0x1e > /sys/class/video4linux/video0/dev_debug`

5.3.2.3 Switch between RDI and PIX

- `media-ctl -d /dev/media0 -l '"msm_ispif0":1->"msm_vfe0_rdi0":0[1]'`
- `media-ctl -d /dev/media0 -l '"msm_ispif0":1->"msm_vfe0_pix":0[0]'`
- `media-ctl -d /dev/media0 -l '"msm_ispif0":1->"msm_vfe0_rdi0":0[0]'`
- `media-ctl -d /dev/media0 -l '"msm_ispif0":1->"msm_vfe0_pix":0[1]'`

5.3.2.4 PIX mode 1280 × 960

5.3.2.4.1 Configure

- `media-ctl -d /dev/media1 -l '"msm_csiphy0":1->"msm_csid0":0[1],"msm_csid0":1->"msm_ispif0":0[1],"msm_ispif0":1->"msm_vfe0_pix":0[1]'`

- media-ctl -d /dev/media1 -V '"ov5645 1-0076":0[fmt:UYVY2X8/1280x960],"msm_csiphy0":0[fmt:UYVY2X8/1280x960],"msm_csid0":0[fmt:UYVY2X8/1280x960],"msm_ispif0":0[fmt:UYVY2X8/1280x960],"msm_vfe0_pix":0[fmt:UYVY2X8/1280x960]'

5.3.2.4.2 Preview

- export DISPLAY=:0
- GST_GL_PLATFORM=egl GST_GL_API=gles2 gst-launch-1.0 v4l2src device=/dev/video3 ! 'video/x-raw,format=NV12,width=1280,height=960,framerate=30/1' ! glimagesink sync=false

5.3.2.4.3 Still capture

- gst-launch-1.0 v4l2src device=/dev/video3 num-buffers=1 ! videoparse format=nv21 width=1280 height=960 framerate=30/1 ! jpegenc ! filesink location=image_1280x960.jpg

  OR

- yavta -B capture-mplane -c10 -I -n 5 --requeue-last -f NV12 -s 1280x960 /dev/video3

5.3.2.5 Video recording

- gst-launch-1.0 -v -e v4l2src device=/dev/video3 num-buffers=300 ! video/x-raw,format=NV12,width=1280,height=960,framerate=30/1 ! v4l2video5h264enc extra-controls="controls,h264_profile=4,video_bitrate=15000000;" ! h264parse ! mp4mux ! filesink location=enc.h264.1280x960.mp4

5.3.3 RDI mode 1080p

- media-ctl -d /dev/media0 -l '"msm_csiphy0":1->"msm_csid0":0[1],"msm_csid0":1->"msm_ispif0":0[1],"msm_ispif0":1->"msm_vfe0_rdi0":0[1]'
- media-ctl -d /dev/media0 -V '"ov5645 1-0078":0[fmt:UYVY2X8/1920x1080],"msm_csiphy0":0[fmt:UYVY2X8/1920x1080],"msm_csid0":0[fmt:UYVY2X8/1920x1080],"msm_ispif0":0[fmt:UYVY2X8/1920x1080],"msm_vfe0_rdi0":0[fmt:UYVY2X8/1920x1080]'
- export GST_GL_XINITTHREADS=1
- export DISPLAY=:0
- GST_GL_PLATFORM=egl GST_GL_API=gles2 gst-launch-1.0 v4l2src device=/dev/video0 ! glimagesink sync=false

  OR

- yavta -B capture-mplane -c10 -I -n 5 --requeue-last -f UYVY -s 1920x1080 /dev/video0

  OR

- gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=1 ! 'video/x-raw,format=UYVY,width=1920,height=1080,framerate=30/1' ! jpegenc ! filesink location=image01.jpg

  OR

- `gst-launch-1.0 filesrc location=image01.jpg ! jpegparse ! jpegdec ! imagefreeze ! glimagesink sync=false`

5.3.4 RTSP

5.3.4.1 Server

- `cvlc $1 --sout=#rtp{sdp=rtsp://:$port/$stream_name}`

5.3.4.2 Client

- `gst-launch-1.0 -vvv rtspsrc location=rtsp://$IP:5004/stream.sdp latency=10 ! rtph264depay ! h264parse ! v4l2video4dec ! glimagesink sync=false`

5.4 Swap partition

For some distinct memory intensive tasks, such as running Chromium browser for accessing rich web pages, a memory extension via swap partition can be helpful for faster operation.

To define and use a swap partition on an SD card, perform the following steps:

1. Insert a blank SD card into the SD card slot on the device (for example, DragonBoard 410c).
2. Partition and mount it.
3. Run the following commands:

NOTE: The red color text in the following code example displays user input.

```
sudo gdisk /dev/mmcblk1
Command (? for help): o
This option deletes all partitions and creates a new protective MBR.
Proceed? (Y/N): y
Command (? for help): n
Partition number (1-128, default 1):
First sector (34-123764702, default = 2048) or {+-}size{KMGTP}:
Last sector (2048-123764702, default = 123764702) or {+-}size{KMGTP}: 7G
Current type is 'Linux filesystem'
Hex code or GUID (L to show codes, Enter = 8300): 8200
Changed type of partition to 'Linux swap'
Command (? for help): n
Partition number (1-128, default 2):
First sector (34-123764702, default = 16779264) or {+-}size{KMGTP}:
Last sector (2048-123764702, default = 123764702) or {+-}size{KMGTP}:
Current type is 'Linux filesystem'
Hex code or GUID (L to show codes, Enter = 8300):
Command (? for help): w
Final checks complete. About to write GPT data. THIS WILL OVERWRITE
EXISTING PARTITIONS!!
Do you want to proceed? (Y/N): y
```

4. Reboot the device (for example, DragonBoard 410c).
5. To define swap partition, run the following commands:
   ```
   sudo reboot now
   sudo mkfs -t ext4 /dev/mmcblk1p2
   sudo mkswap /dev/mmcblk1p1
   ```
6. To update `/etc/fstab`, run the following command:
   ```
   sudo sed -i '$a /dev/mmcblk1p1 none swap sw 0 0\n' /etc/fstab
   ```
7. Reboot the device. To verify that the swap was properly defined, run the following commands:
   ```
   sudo reboot
   free
   ```

6 Troubleshooting

6.1 Cannot flash CDT using Fastboot

Flash a proper GPT that includes a CDT partition, see Section 4.1 for more information.

6.2 Device fails to boot

If the device does not boot properly, check and find out the root cause of the failure.

The following are the most common problems that prevent the device from booting:

- The build images were not loaded successfully – See Section 3.2.1 for more information.
- If the CDT was not flashed to the device, perform the following steps:
  a. Connect the DragonBoard to a terminal using UART (external mezzanine is required) or ssh.
  b. Follow the boot log and search for the CDT configuration stated as follows:
     ```
     B -    291671 - CDT version:3,Platform ID:24,Major ID:1,Minor
     ID:0,Subtype:0
     ```
     If the platform ID is not 24, see Section 4.2.1 for guidelines to flash the CDT.
- DIP switch 1 is set to ‘ON’ – For proper boot, set the DIP switch 1 to 0.
- LK image is not signed – Perform the following steps:
  a. Connect the DragonBoard to a terminal using UART(external mezzanine is required) or ssh.
  b. Search for the following line:
     B - 417972 - Error code 3063 at boot_authenticator.c Line 407

The log displays that the LK image (emmc_appsboot.mbn file) was not signed before loading it to the device. See Section 4.5.1 for the steps and guidelines to sign the image.

CAUTION: If the LK image is not authenticated and loaded properly, Fastboot is not supported. See Section 3.3 for the steps on SD rescue.

7 Known issues and limitations

7.1 Limitations

- Internal GPS antenna requires clear open sky environment for optimal performance, so external antenna usage is recommended: https://developer.qualcomm.com/qfile/29467/lm80-p0436-42_add_ufl_ant_and_valid_gps_on_android_app_note.pdf
- When restarting the device by power cable reinsertion:
  - If micro-USB cable is attached, press the power-on button for at least 2 seconds.
  - If micro-USB cable is not connected – the device starts automatically.

7.2 Known issues

- Wi-Fi hidden SSID mode is not functional
- Wi-Fi and Bluetooth LE cannot be used at the same time.

7.3 Resolved issues

This section is not applicable to this release.

EXHIBIT 1

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