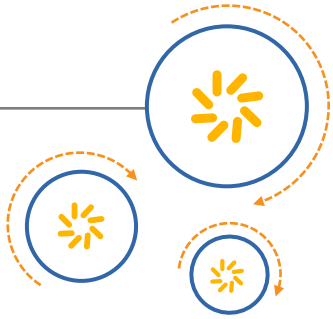
Qualcomm Technologies, Inc.



DragonBoard™ 410c based on Qualcomm® Snapdragon™ 410E processor

ADB Debugging Commands Guide

September 2016

Questions or comments: https://www.96boards.org/DragonBoard410c/forum

Qualcomm Technologies, Inc.
5775 Morehouse Drive
San Diego, CA 92121
U.S.A.

LM80-P0436-11 Rev C

Revision history

Revision	Date	Description
C	September 2016	Updated to ‘E’ part.
B	June 10, 2015	Miscellaneous update
A	May 29, 2015	Initial release

Contents

Tables

1 Introduction

1.1 Purpose

This document provides ADB commands for debugging. These instructions have been validated on DragonBoard 410c based on Snapdragon 410E processor.

Most of the commands are available to normal users but some require root access.

1.2 Conventions

Function declarations, function names, type declarations, and code samples appear in different font; e.g., `#include`:

1.3 Acronyms, abbreviations, and terms

Table 1-1 provides definitions for the acronyms, abbreviations, and terms used in this document.

Table 1-1 Acronyms, abbreviations, and terms

Term	Definition
ADB	Android Debug Bridge
CPU	Central Processing Unit
DDR	Dual Data Rate
FPS	Frames Per Second
GLES	OpenGL for Embedded Systems
GPU	Graphics Processing Unit
HWC	Hardware Composer
IP	Information Provider
MDP	Mobile Development Platform
MSM	Mobile Station Modem
UI	User Interface
USB	Universal Serial Bus
UX	User Experience

1.4 Additional information

This document does not cover exhaustive ADB commands and assumes you have ADB drivers set up. For additional information on ADB, go to:

http://developer.android.com/tools/help/adb.html

For additional information on DragonBoard 410c, go to

http://www.96boards.org/db410c-getting-started/

2 Debugging system performance

2.1 Overview

This section provides ADB commands that help debug system performance.

The most common uses cases of debugging system performance are summarized in Table 2-1.

Table 2-1 Common system performance use cases

System Performance	CPU
	GPU
	UI responsiveness
	Applications launch latency
	Popular Android market benchmarks
Technology Specific Performance	Camera
	Camcorder
	Video playback
	Audio

2.2 Best practices

- Allow root access in ADB shell in user mode binary (modify `system/core/adb/adb.c`)
- Reduce log messages as much as possible
  - Search for the following string and ensure all instances are commented out/or not active
    ```
    #define LOG_NIDEBUG 0
    ```
  - Remove severe warning/error log messaging
- Wi-Fi should work properly if profiling/debugging Web user experience.

3 ADB commands

3.1 CPU

The following ADB commands help debug system performance. The most common use case is low system benchmark scores, launch latencies, and CPU bound operations. These commands help understand CPU behavior in Performance mode and the maximum bandwidth usage of the chipset.

Commands to put the device into System Performance mode are:

Table 3-1 Commands to put the device into system performance mode

Command	Comments
`adb root`	To get root access
`adb wait-for-devices`	Wait for adb devices
`sleep 4`	
`adb shell stop thermal-engine`	Stopping system service /system/bin/thermal-engine
`adb shell stop thermald`	Stopping thermal daemon
`adb shell echo 1 > /sys/devices/system/cpu/cpu1/online`	Bringing cpu1 to active
`adb shell echo 1 > /sys/devices/system/cpu/cpu2/online`	Bringing cpu2 to active
`adb shell echo 1 > /sys/devices/system/cpu/cpu3/online`	Bringing cpu3 to active
`sleep 1`	
`adb shell echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor`	Put the cpu0 scaling governor to performance mode
`adb shell echo performance > /sys/devices/system/cpu/cpu1/cpufreq/scaling_governor`	Put the cpu1 scaling governor to performance mode
`adb shell echo performance > /sys/devices/system/cpu/cpu2/cpufreq/scaling_governor`	Put the cpu2 scaling governor to performance mode
`adb shell echo performance > /sys/devices/system/cpu/cpu3/cpufreq/scaling_governor`	Put the cpu3 scaling governor to performance mode
`adb shell sleep 1`	
`adb shell mount -t debugfs none /d`	
`adb shell echo **1** > /sys/kernel/debug/msm-bus-dbg/shell-client/mas`	In the adb shell echo 1 > /sys/kernel/debug/msm-bus-dbg/shell-client/mas command, value 1 is for DDR clock and value 22 is for mnoc clock.

Command	Comments
`adb shell echo 512 > /sys/kernel/debug/msm-bus-dbg/shell-client/slv`	
`adb shell echo 0 > /sys/kernel/debug/msm-bus-dbg/shell-client/ab`	
`adb shell echo 14928000000 > /sys/kernel/debug/msm-bus-dbg/shell-client/ib`	In the adb shell echo 14928000000 > /sys/kernel/debug/msm-bus-dbg/shell-client/ib command, 14928000000 is the value based on the limit of the bimc_clk(DDR). In this case, the maximum limit of this particular chipset is 933 MHz; therefore, the value of ib is 933*16*10^6. Generally, the formula for ib is (Clock Freq*16*10^6). The clock frequency of mnoc or DDR is determined by the clock plan of each chipset.
`adb shell echo 1 > /sys/kernel/debug/msm-bus-dbg/shell-client/update_request`	
`sleep 1`	
`adb shell echo none > /sys/class/kgsl/kgsl-3d0/pwrscale/policy`	
`adb shell echo 550000000 > /sys/class/kgsl/kgsl-3d0/gpuclk`	
`adb shell echo performance >/sys/class/devfreq/qcom,cpubw.40/governor`	The node in the adb shell echo performance >/sys/class/devfreq/qcom,cpubw.40/ governor command differs for each device; therefore, use it accordingly.
`adb shell echo 0 > /sys/module/cpubw_krait/parameters/enable`	

3.1.1 Commands to put DDR into performance mode

```
adb shell echo 400000000 > /sys/class/kgsl/kgsl-3d0/gpuclk
adb shell echo performance > /sys/class/kgsl/kgsl-3d0/devfreq/governor
adb shell echo performance >/sys/class/devfreq/qcom,cpubw.30/governor
```

NOTE: The node in the adb shell echo performance >/sys/class/devfreq/qcom,cpubw.30/governor command may be different for each device; therefore, check usage accordingly.

3.1.2 Commands to read interactive governor parameters

These parameters are tuned in order to balance the performance/power of chipset. These can be tuned further if required by the end user.

```
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/above_hispeed_delay
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/go_hispeed_load
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/hispeed_freq
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/target_loads
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/min_sample_time
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/boost
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/boostpulse_duration
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/io_is_busy
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_rate
adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_slack
```

3.1.3 Commands to disable kernel thermal

```
adb shell
echo 0 > /sys/module/msm_thermal/core_control/enabled
```

3.1.4 Adb over Wi-Fi

1. Connect a USB and verify that Wi-Fi is working on the device.
   - `adb tcpip 5555`
   - `adb shell netcfg`
   - `<output> wlan0 UP 10.42.118.17/22 0x00001043 f0:25:b7:f5:02:81`
   - `adb connect 10.42.118.17  # In Wi-Fi settings, click the Wi-Fi network name to get the IP.`
2. Remove the USB and try adb devices.
3. To end the session:
   - `adb disconnect`

3.2 GPU/Display

The following ADB commands help debug graphics performance in GPU performance mode. A common use case is low graphics benchmark scores. This section explains how to debug UX performance, e.g., gmail scrolling, gallery scrolling, etc.

3.2.1 Commands to put the GPU in performance mode

```
adb shell echo 0 > /sys/class/kgsl/kgsl-3d0/bus_split
adb shell echo performance > /sys/class/kgsl/kgsl-3d0/devfreq/governor
adb shell echo 1 > /sys/class/kgsl/kgsl-3d0/force_bus_on
adb shell echo 1 > /sys/class/kgsl/kgsl-3d0/force_rail_on
adb shell echo 1 > /sys/class/kgsl/kgsl-3d0/force_clk_on
adb shell echo 1000000 > /sys/class/kgsl/kgsl-3d0/idle_timer
```

3.2.2 Check scroll frames per second through adb

1. adb pull /system/build.prop

2. Enable the properties debug.gr.calcfps = 1 and debug.gr.calcfps.period = 1 in the build.prop file and save the file.

```
adb push build.prop /system/
adb shell chmod 0644 /system/build.prop
adb shell sync
adb shell reboot
```

3. Enable the FPS calculation (and display the distribution of frame arrival times) by setting debug.gr.calcfps = 2.
4. Grep for FPS in logcat.

3.2.3 Check composition and number of layers on the device

1. Get the adb shell dumpsys SurfaceFlinger log.
2. Search for lines similar to those highlighted in the following log:

```
numHwLayers=4, flags=00000000
type | handle | hints | flags | tr | blend | format | source crop | frame name
------------+----------+----------+----------+----+-------+----------+---------------------------+---------
HWC | b71a1610 | 00000000 | 00000004 | 00 | 00100 | 00000002 | [ 160, 25, 480, 480] | [ 0, 25, 320, 480]
com.android.systemui.ImageWallpaper
```

NOTE:

HWC – MDP composition

GLES – GPU composition

During transition, the log sometimes shows HWC and GLES, which is Mixed mode composition.

EXHIBIT 1

PLEASE READ THIS LICENSE AGREEMENT ("AGREEMENT") CAREFULLY. THIS AGREEMENT IS A BINDING LEGAL AGREEMENT ENTERED INTO BY AND BETWEEN YOU (OR IF YOU ARE ENTERING INTO THIS AGREEMENT ON BEHALF OF AN ENTITY, THEN THE ENTITY THAT YOU REPRESENT) AND QUALCOMM TECHNOLOGIES, INC. ("QTI" "WE" "OUR" OR "US"). THIS IS THE AGREEMENT THAT APPLIES TO YOUR USE OF THE DESIGNATED AND/OR ATTACHED DOCUMENTATION AND ANY UPDATES OR IMPROVEMENTS THEREOF (COLLECTIVELY, "MATERIALS"). BY USING OR COMPLETING THE INSTALLATION OF THE MATERIALS, YOU ARE ACCEPTING THIS AGREEMENT AND YOU AGREE TO BE BOUND BY ITS TERMS AND CONDITIONS. IF YOU DO NOT AGREE TO THESE TERMS, QTI IS UNWILLING TO AND DOES NOT LICENSE THE MATERIALS TO YOU. IF YOU DO NOT AGREE TO THESE TERMS YOU MUST DISCONTINUE AND YOU MAY NOT USE THE MATERIALS OR RETAIN ANY COPIES OF THE MATERIALS. ANY USE OR POSSESSION OF THE MATERIALS BY YOU IS SUBJECT TO THE TERMS AND CONDITIONS SET FORTH IN THIS AGREEMENT.

1.1 **License.** Subject to the terms and conditions of this Agreement, including, without limitation, the restrictions, conditions, limitations and exclusions set forth in this Agreement, Qualcomm Technologies, Inc. ("QTI") hereby grants to you a nonexclusive, limited license under QTI's copyrights to use the attached Materials; and to reproduce and redistribute a reasonable number of copies of the Materials. You may not use Qualcomm Technologies or its affiliates or subsidiaries name, logo or trademarks; and copyright, trademark, patent and any other notices that appear on the Materials may not be removed or obscured. QTI shall be free to use suggestions, feedback or other information received from You, without obligation of any kind to You. QTI may immediately terminate this Agreement upon your breach. Upon termination of this Agreement, Sections 1.2-4 shall survive.

1.2 **Indemnification.** You agree to indemnify and hold harmless QTI and its officers, directors, employees and successors and assigns against any and all third party claims, demands, causes of action, losses, liabilities, damages, costs and expenses, incurred by QTI (including but not limited to costs of defense, investigation and reasonable attorney's fees) arising out of, resulting from or related to: (i) any breach of this Agreement by You; and (ii) your acts, omissions, products and services. If requested by QTI, You agree to defend QTI in connection with any third party claims, demands, or causes of action resulting from, arising out of or in connection with any of the foregoing.

1.3 **Ownership.** QTI (or its licensors) shall retain title and all ownership rights in and to the Materials and all copies thereof, and nothing herein shall be deemed to grant any right to You under any of QTI's or its affiliates' patents. You shall not subject the Materials to any third party license terms (e.g., open source license terms). You shall not use the Materials for the purpose of identifying or providing evidence to support any potential patent infringement claim against QTI, its affiliates, or any of QTI's or QTI's affiliates' suppliers and/or direct or indirect customers. QTI hereby reserves all rights not expressly granted herein.

1.4 **WARRANTY DISCLAIMER.** YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT THE USE OF THE MATERIALS IS AT YOUR SOLE RISK. THE MATERIALS AND TECHNICAL SUPPORT, IF ANY, ARE PROVIDED "AS IS" AND WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS OR IMPLIED. QTI ITS LICENSORS AND AFFILIATES MAKE NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE MATERIALS OR ANY OTHER INFORMATION OR DOCUMENTATION PROVIDED UNDER THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR AGAINST INFRINGEMENT, OR ANY EXPRESS OR IMPLIED WARRANTY ARISING OUT OF TRADE USAGE OR OUT OF A COURSE OF DEALING OR COURSE OF PERFORMANCE. NOTHING CONTAINED IN THIS AGREEMENT SHALL BE CONSTRUED AS (I) A WARRANTY OR REPRESENTATION BY QTI, ITS LICENSORS OR AFFILIATES AS TO THE VALIDITY OR SCOPE OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT OR (II) A WARRANTY OR REPRESENTATION BY QTI THAT ANY MANUFACTURE OR USE WILL BE FREE FROM INFRINGEMENT OF PATENTS, COPYRIGHTS OR OTHER INTELLECTUAL PROPERTY RIGHTS OF OTHERS, AND IT SHALL BE THE SOLE RESPONSIBILITY OF YOU TO MAKE SUCH DETERMINATION AS IS NECESSARY WITH RESPECT TO THE ACQUISITION OF LICENSES UNDER PATENTS AND OTHER INTELLECTUAL PROPERTY OF THIRD PARTIES.

1.5 **LIMITATION OF LIABILITY.** IN NO EVENT SHALL QTI, QTI'S AFFILIATES OR ITS LICENSORS BE LIABLE TO YOU FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL DAMAGES, ARISING OUT OF THE USE OR INABILITY TO USE, OR THE DELIVERY OR FAILURE TO DELIVER, ANY OF THE MATERIALS, OR ANY BREACH OF ANY OBLIGATION UNDER THIS AGREEMENT, EVEN IF QTI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE FOREGOING LIMITATION OF LIABILITY SHALL REMAIN IN FULL FORCE AND EFFECT REGARDLESS OF WHETHER YOUR REMEDIES HEREUNDER ARE DETERMINED TO HAVE FAILED OF THEIR ESSENTIAL PURPOSE. THE ENTIRE LIABILITY OF QTI, QTI's AFFILIATES AND ITS LICENSORS, AND THE SOLE AND EXCLUSIVE REMEDY OF YOU, FOR ANY CLAIM OR CAUSE OF ACTION ARISING HEREUNDER (WHETHER IN CONTRACT, TORT, OR OTHERWISE) SHALL NOT EXCEED US$10.

2. **COMPLIANCE WITH LAWS; APPLICABLE LAW.** You agree to comply with all applicable local, international and national laws and regulations and with U.S. Export Administration Regulations, as they apply to the subject matter of this Agreement. This Agreement is governed by the laws of the State of California, excluding California's choice of law rules.

3. **CONTRACTING PARTIES.** If the Materials are downloaded on any computer owned by a corporation or other legal entity, then this Agreement is formed by and between QTI and such entity. The individual accepting the terms of this Agreement represents and warrants to QTI that they have the authority to bind such entity to the terms and conditions of this Agreement.

4. **MISCELLANEOUS PROVISIONS.** This Agreement, together with all exhibits attached hereto, which are incorporated herein by this reference, constitutes the entire agreement between QTI and You and supersedes all prior negotiations, representations and agreements between the parties with respect to the subject matter hereof. No addition or modification of this Agreement shall be effective unless made in writing and signed by the respective representatives of QTI and You. The restrictions, limitations, exclusions and conditions set forth in this Agreement shall apply even if QTI or any of its affiliates becomes aware of or fails to act in a manner to address any violation or failure to comply therewith. You hereby acknowledge and agree that the restrictions, limitations, conditions and exclusions imposed in this Agreement on the rights granted in this Agreement are not a derogation of the benefits of such rights. You further acknowledges that, in the absence of such restrictions, limitations, conditions and exclusions, QTI would not have entered into this Agreement with You. Each party shall be responsible for and shall bear its own expenses in connection with this Agreement. If any of the provisions of this Agreement are determined to be invalid, illegal, or otherwise unenforceable, the remaining provisions shall remain in full force and effect. This Agreement is entered into solely in the English language, and if for any reason any other language version is prepared by any party, it shall be solely for convenience and the English version shall govern and control all aspects. If You are located in the province of Quebec, Canada, the following applies: The Parties hereby confirm they have requested this Agreement and all related documents be prepared in English.