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

ADB Debugging Commands Guide

September 2016

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## Revision history

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>September 2016</td>
<td>Updated to ‘E’ part.</td>
</tr>
<tr>
<td>B</td>
<td>June 10, 2015</td>
<td>Miscellaneous update</td>
</tr>
<tr>
<td>A</td>
<td>May 29, 2015</td>
<td>Initial release</td>
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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>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADB</td>
<td>Android Debug Bridge</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td>DDR</td>
<td>Dual Data Rate</td>
</tr>
<tr>
<td>FPS</td>
<td>Frames Per Second</td>
</tr>
<tr>
<td>GLES</td>
<td>OpenGL for Embedded Systems</td>
</tr>
<tr>
<td>GPU</td>
<td>Graphics Processing Unit</td>
</tr>
<tr>
<td>HWC</td>
<td>Hardware Composer</td>
</tr>
<tr>
<td>IP</td>
<td>Information Provider</td>
</tr>
<tr>
<td>MDP</td>
<td>Mobile Development Platform</td>
</tr>
<tr>
<td>MSM</td>
<td>Mobile Station Modem</td>
</tr>
<tr>
<td>UI</td>
<td>User Interface</td>
</tr>
<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>UX</td>
<td>User Experience</td>
</tr>
</tbody>
</table>
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:

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**

<table>
<thead>
<tr>
<th>System Performance</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GPU</td>
</tr>
<tr>
<td></td>
<td>UI responsiveness</td>
</tr>
<tr>
<td></td>
<td>Applications launch latency</td>
</tr>
<tr>
<td></td>
<td>Popular Android market benchmarks</td>
</tr>
<tr>
<td>Technology Specific Performance</td>
<td>Camera</td>
</tr>
<tr>
<td></td>
<td>Camcorder</td>
</tr>
<tr>
<td></td>
<td>Video playback</td>
</tr>
<tr>
<td></td>
<td>Audio</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>adb shell echo 512 &gt; /sys/kernel/debug/msm-bus-dbg/shell-client/slv</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo 0 &gt; /sys/kernel/debug/msm-bus-dbg/shell-client/ab</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo 14928000000 &gt; /sys/kernel/debug/msm-bus-dbg/shell-client/ib</code></td>
<td>In the <code>adb shell echo 14928000000 &gt; /sys/kernel/debug/msm-bus-dbg/shell-client/ib</code> 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 $933 \times 16 \times 10^6$. Generally, the formula for ib is (Clock Freq $\times 16 \times 10^6$). The clock frequency of mnoc or DDR is determined by the clock plan of each chipset.</td>
</tr>
<tr>
<td><code>adb shell echo 1 &gt; /sys/kernel/debug/msm-bus-dbg/shell-client/update_request</code></td>
<td></td>
</tr>
<tr>
<td><code>sleep 1</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo none &gt; /sys/class/kgsl/kgsl-3d0/pwrscale/policy</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo 550000000 &gt; /sys/class/kgsl/kgsl-3d0/gpuclk</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo performance &gt;/sys/class/devfreq/qcom,cpubw.40/governor</code></td>
<td>The node in the <code>adb shell echo performance &gt;/sys/class/devfreq/qcom,cpubw.40/governor</code> command differs for each device; therefore, use it accordingly.</td>
</tr>
<tr>
<td><code>adb shell echo 0 &gt; /sys/module/cpubw_krait/parameters/enable</code></td>
<td></td>
</tr>
</tbody>
</table>

### 3.1.1 Commands to put DDR into performance mode

<table>
<thead>
<tr>
<th>Command</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>adb shell echo 400000000 &gt; /sys/class/kgsl/kgsl-3d0/gpuclk</code></td>
<td></td>
</tr>
<tr>
<td><code>adb shell echo performance &gt;/sys/class/devfreq/qcom,cpubw.40/governor</code></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The node in the `adb shell echo performance >/sys/class/devfreq/qcom,cpubw.40/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`.


### 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

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