ADB Commands for Debugging Performance Issues

Application Note

80-NR256-8 A

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

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MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION

Revision history

Revision	Date	Description
A	Sep 2014	Initial release

1 Introduction

1.1 Purpose

This document provides instructions for debugging common memory performance issues for customer reports.

Debugging instructions have been validated against MSM™ chipsets on an Android platform.

1.2 Conventions

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

1.3 References

Reference documents are listed in Table 1-1. Reference documents that are no longer applicable are deleted from this table; therefore, reference numbers may not be sequential.

Table 1-1 Reference documents and standards

Ref.	Document	
Qualcomm Technologies		
Q1	*Application Note: Software Glossary for Customers*	CL93-V3077-1

1.4 Technical assistance

For assistance or clarification on information in this document, submit a case to Qualcomm Technologies, Inc. (QTI) at https://support.cdmatech.com/.

If you do not have access to the CDMATech Support website, register for access or send email to support.cdmatech@qti.qualcomm.com.

1.5 Acronyms

For definitions of terms and abbreviations, see [Q1].

2 ADB Commands Common Across Most Chipsets

2.1 Sanity check

For any performance measurement, the kernel configuration must be perf defconfig or the following kernel configuration flags must be disabled. This is mandatory because these flags add additional logging in the kernel, which degrades performance.

- CONFIG_PREEMPT_COUNT=y
- CONFIG_PREEMPT_TRACER=y
- CONFIG_SCHED_DEBUG=y
- CONFIG_DEBUG_KMEMLEAK=y
- CONFIG_DEBUG_KMEMLEAK_EARLY_LOG_SIZE=400
- CONFIG_DEBUG_KMEMLEAK_DEFAULT_OFF=y
- CONFIG_DEBUG_SPINLOCK=y
- CONFIG_DEBUG_MUTEXES=y
- CONFIG_DEBUG_ATOMIC_SLEEP=y
- CONFIG_DEBUG_STACK_USAGE=y
- CONFIG_DEBUG_LIST=y
- CONFIG_FAULT_INJECTION_DEBUG_FS=y
- CONFIG_LOCKUP_DETECTOR=y
- CONFIG_DEBUG_PAGEALLOC=y
- CONFIG_PAGE_POISONING=y
- CONFIG_SLUB_DEBUG=y

2.2 Commands

2.2.1 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 also help understand CPU behavior in Performance mode and the maximum DDR bandwidth.

1. Commands to put the device into System Performance mode are:

    □ adb root

    □ adb wait-for-devices

    □ adb root

    □ adb wait-for-devices

    □ sleep 4

    □ adb shell stop MPDecision

    □ adb shell stop thermal-engine

    □ adb shell stop thermald

    □ adb shell echo 1 > /sys/devices/system/cpu/cpu1/online

    □ adb shell echo 1 > /sys/devices/system/cpu/cpu2/online

    □ adb shell echo 1 > /sys/devices/system/cpu/cpu3/online

    □ sleep 1

    □ adb shell echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor

    □ adb shell echo performance > /sys/devices/system/cpu/cpu1/cpufreq/scaling_governor

    □ adb shell echo performance > /sys/devices/system/cpu/cpu2/cpufreq/scaling_governor

    □ adb shell echo performance > /sys/devices/system/cpu/cpu3/cpufreq/scaling_governor

    □ adb shell sleep 1

    □ adb shell mount -t debugfs none /d

    □ adb shell *echo 1* > /sys/kernel/debug/msm-bus-dbg/shell-client/mas

NOTE: 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.

- □ 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

NOTE: 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. To understand the flow of mnoc and DDR clocks, make the following change. It cannot be definite on accuracy, but a good method to understand the flow.

- □ 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

NOTE: 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

2. Disable thread migration.

- □ adb shell echo 0 > /dev/cpuctl/apps/cpu.notify_on_migrate

3. Change the DDR frequency on MSM8084 targets through ADB. This node is enabled only on APQ8084 targets and not valid for any other chipsets.

- □ adb shell echo active clk2 0 1 max <frequency in KHz> > /d/rpm_send_msg/message

4. Commands to put DDR into Performance mode are:

- □ adb shell echo none > /sys/class/kgsl/kgsl-3d0/pwrscale/policy

- □ adb shell echo 600000000 > /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.26*/governor

NOTE: These commands are not applicable to MSM8916. See Section 3.1 for the commands applicable to MSM8916. (applicable to only step 4)

NOTE: The node in the adb shell echo performance >/sys/class/devfreq/qcom,*cpubw.26*/governor command may differ for each device; therefore, check usage accordingly.

5. Commands to read interactive governor parameters are:

- □ 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/sampling_down_factor

- □ 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/sync_freq

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_rate

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_slack

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/up_threshold_any_cpu_freq

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/up_threshold_any_cpu_load

- □ CPU boost parameters:

  - – adb shell cat /sys/module/cpu_boost/parameters/sync_threshold

  - – adb shell cat /sys/module/cpu_boost/parameters/boost_ms

  - – adb shell cat /sys/module/cpu_boost/parameters/input_boost_freq

  - – adb shell cat /sys/module/cpu_boost/parameters/input_boost_ms

- □ Krait DCVS parameters:

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/bw_step

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/decay_rate

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/guard_band_mbps

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/io_percent

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/sample_ms

  - – adb shell cat /sys/class/devfreq/qcom,cpubw.43/cpubw_hwmon/tolerance_percent

6. Enable perflock logging.

   □ Add the following in build.prop file. This prints perflock traces in logcat.

      – adb pull /system/build.prop

   □ Add the following at the end 'debug.trace.perf=1' and save the file.

      – adb push build.prop /system/

      – adb shell chmod 0644 /system/build.prop

      – adb shell sync

      – adb shell reboot

   □ Grep for PERF keywork in logcat for perflock logging.

7. Disable kernel thermal.

   □ adb shell

   □ echo 0 > /sys/module/msm_thermal/core_control/enabled

8. Adb over Wi-Fi

   a. 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.

   b. Remove the USB and try adb devices.

   c. To end the session:

      – adb disconnect

9. MP-Decision logs are:

   □ adb shell

   □ system/bin/mpdecision --no_sleep --avg_comp –debug&

   □ Open another shell and get the log using:

      – adb logcat | grep MP-D

2.2.2 GPU/display

The following ADB commands help debug graphics performance in GPU Performance mode. A common use case is low graphics benchmark scores.

To debug UX performance, e.g., scrolling:

1. Commands to put the GPU in Performance mode are:

   □ 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

2. Check scroll FPS through adb.

   □ adb pull /system/build.prop

   – 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

   – Enable the FPS calculation (and display the distribution of frame arrival times) by setting debug.gr.calcfps = 2.

   □ Grep for FPS in logcat.

3. Check composition and number of layers on the device.

   □ Get adb shell dumpsys SurfaceFlinger log.

   Search for the lines similar to the highlighted ones 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
```

   □ HWC – MDP composition

   □ GLES – GPU composition

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

2.2.3 Power

The following commands help understand system behavior when going into Power Collapse mode. Commands to enable and disable Power Collapse are:

- Wi-Fi

  – Enable in idle PC – adb shell echo 1 > /sys/module/ msm_pm /modes/cpuX/wfi/ idle_enabled

  – Disable in idle PC – adb shell echo 0 > /sys/module/ msm_pm /modes/cpuX/wfi/ idle_enabled

  – Enable in suspend PC – adb shell echo 1 > /sys/module/ msm_pm /modes/cpuX/wfi/ suspend_enabled

  – Disable in suspend PC – adb shell echo 0 > /sys/module/ msm_pm /modes/cpuX/wfi/ suspend_enabled

- Standalone PC

  – Enable in idle PC – adb shell echo 1 > /sys/module/ msm_pm /modes/cpuX/ standalone_power_collapse/idle_enabled

  – Disable in idle PC – adb shell echo 0 > /sys/module/ msm_pm /modes/cpuX/ standalone_power_collapse/idle_enabled

  – Enable in suspend PC – adb shell echo 1 > /sys/module/ msm_pm /modes/cpuX/ standalone_power_collapse/suspend_enabled

  – Disable in suspend PC – adb shell echo 0 > /sys/module/ msm_pm /modes/cpuX/ standalone_power_collapse/suspend_enabled

3 ADB Commands for MSM8916 Chipsets

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 also help understand CPU behavior in Performance mode and the maximum DDR bandwidth.

1. Commands to put the MSM8916 device into System Performance mode are:

   □ adb root

   □ adb wait-for-devices

   □ adb root

   □ adb wait-for-devices

   □ sleep 4

   □ adb shell stop MPDecision

   □ adb shell stop thermal-engine

   □ adb shell stop thermald

   □ adb shell echo 1 > /sys/devices/system/cpu/cpu1/online

   □ adb shell echo 1 > /sys/devices/system/cpu/cpu2/online

   □ adb shell echo 1 > /sys/devices/system/cpu/cpu3/online

   □ sleep 1

   □ adb shell echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor

   □ adb shell echo performance > /sys/devices/system/cpu/cpu1/cpufreq/scaling_governor

   □ adb shell echo performance > /sys/devices/system/cpu/cpu2/cpufreq/scaling_governor

   □ adb shell echo performance > /sys/devices/system/cpu/cpu3/cpufreq/scaling_governor

   □ adb shell sleep 1

   □ adb shell mount -t debugfs none /d

   □ adb shell *echo 1* > /sys/kernel/debug/msm-bus-dbg/shell-client/mas

NOTE: 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.

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- □ adb shell *echo 14928000000* > /sys/kernel/debug/msm-bus-dbg/shell-client/ib

NOTE: 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.

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- □ adb shell echo none > /sys/class/kgsl/kgsl-3d0/pwrscale/policy

- □ adb shell echo 550000000 > /sys/class/kgsl/kgsl-3d0/gpuclk

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2. Commands to read interactive governor parameters are:

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- □ 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/sampling_down_factor

- □ 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/sync_freq

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_rate

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/timer_slack

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/up_threshold_any_cpu_freq

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/up_threshold_any_cpu_load

- □ adb shell cat /sys/devices/system/cpu/cpufreq/interactive/boostpulse