QUALCOMM STORAGE (EMMC) ISSUE DEBUGGING STANDARD OPERATION PROCEDURE (80-PA490-1)

Sometimes, we may encounter some I/O performance issues such as copying files from external sd card to internal storage is not as fast as we expected.

Firstly, expectation is hard to evaluate. We should use benchmark to evaluate the I/O performance. We recommend benchmark tools such as Androbench, Tiotest, Iozone.

Secondly, Copying files from external sd card to internal storage is a quite complicated process. This process includes reading from sd card, file system operations, writing to internal storage(eMMC/UFS), and system performance(CPU, DDR, BUS, etc). So we need to narrow down the I/O performance issue.

Thirdly, we can only compare I/O performance when it's comparable. For example, If you want to compare eMMC/sd card performance on two different platforms, you should use the same eMMC part or same sd card with the same software configurations. Here the same eMMC part or same sd card means the same part number, same firmware version and same disk capacity.

In order to narrow down the I/O performance issue, we may have to do the following experiments.

Experiment 1:

a) Use benchmark to collect performance numbers on default build.

b) Use benchmark to collect performance numbers on performance build and with following settings to make sure system is in performance mode.

For example: We use the following adb commands to make sure system works at performance mode. Make sure your device can be root.

Please understand that it's an example of msm8952. Different platforms may need different adb commands. Please refer performance team to get such commands.

```
adb wait-for-devices
adb root
adb wait-for-devices
adb remount
adb wait-for-devices
adb shell stop thermal-engine
adb shell "echo 0 > /sys/module/msm_thermal/core_control/enabled"
adb shell "echo 1 > /sys/devices/system/cpu/cpu0/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu1/online"
```

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adb shell "echo 1 > /sys/devices/system/cpu/cpu2/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu3/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu4/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu5/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu6/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu7/online"
adb shell "echo 1 > /sys/kernel/debug/msm-bus-dbg/shell-client/mas"
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 17464000000 > /sys/kernel/debug/msm-bus-dbg/shell-client/ib"
adb shell "echo 1 > /sys/kernel/debug/msm-bus-dbg/shell-client/update_request"
adb shell "echo performance > /sys/class/devfreq/qcom,cpubw.50/governor"
adb shell "echo performance > /sys/class/devfreq/qcom,gpubw.38/governor"
rem adb shell "echo performance > /sys/class/devfreq/qcom,cpubw.32/governor"
adb shell "echo performance > /sys/class/kgsl/kgsl-3d0/devfreq/governor"
adb shell "echo 0 > /sys/class/kgsl/kgsl-3d0/max_pwrlevel"
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 "echo performance > /sys/devices/system/cpu/cpu4/cpufreq/scaling_governor"
adb shell "echo performance > /sys/devices/system/cpu/cpu5/cpufreq/scaling_governor"
adb shell "echo performance > /sys/devices/system/cpu/cpu6/cpufreq/scaling_governor"
adb shell "echo performance > /sys/devices/system/cpu/cpu7/cpufreq/scaling_governor"
adb shell "echo 1 > /sys/devices/system/cpu/cpu4/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu5/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu6/online"
adb shell "echo 1 > /sys/devices/system/cpu/cpu7/online"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu0/pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu0/pc/suspend_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu0/standalone_pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu0/standalone_pc/suspend_enabled
"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu1/pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu1/pc/suspend_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu1/standalone_pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu1/standalone_pc/suspend_enabled
"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu2/pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu2/pc/suspend_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu2/standalone_pc/idle_enabled"
```

rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu2/standalone_pc/suspend_enabled
"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu3/pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu3/pc/suspend_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu3/standalone_pc/idle_enabled"
rem adb shell "echo N > /sys/module/lpm_levels/system/a53/cpu3/standalone_pc/suspend_enabled
"
adb shell cat /sys/devices/system/cpu/cpu*/online
adb shell cat /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor
adb shell cat /sys/devices/system/cpu/cpu*/cpufreq/scaling_max_freq
adb shell cat /sys/devices/system/cpu/cpu*/cpufreq/scaling_min_freq
adb shell cat /sys/devices/system/cpu/cpu*/cpufreq/scaling_cur_freq
adb shell cat /sys/class/devfreq/qcom,cpubw.59/governor
rem adb shell cat /sys/class/devfreq/qcom,cpubw.32/governor
adb shell cat /proc/meminfo | grep -i memtotal
adb shell wm size
adb shell wm density
rem adb shell cat /sys/kernel/debug/clk/oxili_gfx3d_clk/measure
adb shell cat /sys/kernel/debug/clk/bimc_clk/measure
adb shell "echo 1 > /sys/module/lpm_levels/parameters/sleep_disabled"
adb shell "echo 1 > /sys/module/lpm_levels/parameters/sleep_disabled"
adb shell "echo 1 > /sys/module/lpm_levels/parameters/sleep_disabled"
adb shell "echo 1 > /sys/module/lpm_levels/parameters/sleep_disabled"
adb shell "echo 1 > /sys/module/lpm_levels/parameters/sleep_disabled"
Note: You can save these adb commands to a file name 8952.bat then run it.
This experiment will give us a direction that whether this issue is system performance related.
Experiment 2:
Get the mmc driver level perfromance.
I had tested it on 8996 with kernel 3.18
7464900.sdhci eMMC
74a4900.sdhci sd card
kernel/arch/arm64/config/ msm_defconfig
CONFIG_MMC_PERF_PROFILING=y //Normally this configuration is enabled by default. Please confirm it.
1. echo 0 > /sys/bus/platform/devices/78a4900.sdhci/mmc_host/mmc1/perf
2. echo 1 > /sys/bus/platform/devices/78a4900.sdhci/mmc_host/mmc1/perf //actually, echo any non-zero value is ok. 78a4900 may be not the right number.
3. do R/W test
4. cat /sys/bus/platform/devices/78a4900.sdhci/mmc_host/mmc1/perf
Note 1: Different platforms may have different address. "74a4900.sdhci" is an example for 8996.
Note 2: This tools only work on sd card or eMMC which does not support command queue.

For eMMC with command queue support, we can use blktrace tools to get the block layer I/O performance. Which is quite complicated. (TBD)
This experiment can help us confirm whether it's mmc driver level issue.
Last but not least, you should collect the performance numbers at least 3 rounds then get the average. And for sd card, you should format it on your PC before you test it. Please don't use quick format.
For eMMC/UFS, you should do factory before you test it. This is going to make sure eMMC/UFS/sd card is clean. Dirty disk will affect the I/O performance.