Linaro Connect
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# MAD24-220: LCG Lightning Talks

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- Introduction
- Linaro Devboards in AOSP (Android™ Open Source Project) Update
- LKFT (Linux Kernel Functional Testing framework) for Android Updates

# Update on Linaro DevBoards in AOSP

Amit Pundir, pundir on #linaro-android IRC @OFTC

# linaro_swr-userdebug

- A generic 64-bit only arm64 (Arm®v8) build target booting with software rendering support SwANGLE
  - SwANGLE = ANGLE (GLES implementation) on top of SwiftShader's Pastel (Vulkan implementation)

- Experimental build target to support AOSP bring-up on newer or pre-silicon / resource constraint SoCs

- Developed and tested for Qualcomm® target devices for now, but the plan is to make it generic enough to boot on any generic arm64 device

** using "-userdebug" as a short-hand for "-trunk_staging-userdebug" build types

# sm8x50-userdebug

- A 64-bit only generic build target for Qualcomm Arm®v9 (Snapdragon™ 8 Gen) devboards. Boots to UI with upstream kernel using software rendering and linux-firmware.git project binaries

- Primarily developed and tested on SM8550-HDK
  - Smoke tested on SM8450-QRD and SM8650-QRD
  - Used `fdtoverlay` command to overlay `qcom,board-id` and `qcom,msm-id` device-tree properties at build time for single/unified boot image support

- `lunch` will be added once the firmware binaries land in linux-firmware
  - To make sure that the device has more features enabled and is in a more usable state

# rb5-userdebug

- Dropped rb5-userdebug build target from AOSP in favour of db845c-userdebug
- db845c-userdebug is a unified build target which supports both DB845c (aka Robotics Board RB3) and Robotics Board RB5
  - https://www.linaro.org/blog/supporting-multiple-devices-with-the-same-aosp-images/
- db845c-userdebug is being used in LKFT to test both the devboards for a long time already

# Booting AOSP from mmc-sdcard

- Added an experimental build configuration flag in db845c-userdebug build target to boot AOSP from mmc sdcard
  - Booting from external sdcards will help prevent the internal emmc/ufs wear off in the long run and extend the lab-life of devboards in the LKFT lab

- To avoid flashing anything on internal UFS and boot solely from a sdcard, we are switching to chainloading U-Boot from ABL
  - U-Boot will take care of creating partitions and fastboot flash AOSP images on to the mmc-sdcard
  - For now we are using an upstream U-Boot fork. We plan to switch to AOSP/external/u-boot project to catch up with all the Android bootloader features

- Parallel kernel module loading support on db845c-userdebug build target
- Updated to FCM version 7 and API level 33
- Freedreno-Turnip (Vulkan) support on device/linaro/dragonboard devices
  - external_memory_android_hardware_buffer() implementation is still missing upstream
  - Zink + Turnip (for sm8x50)
    - Boots with debug.hwui.renderer = skiagl

# Work-in-Progress | ToDos

- ❏ Rebase upstream U-Boot fork to AOSP/external/u-boot project
  - ❏ To enable boot image header v4, userspace fastbootd et al.

- ❏ Enable features specific to API level 33
  - ❏ Mount /data as F2FS
  - ❏ Fix wakeup selinux denials
  - ❏ init_boot partition support
  - ❏ userspace snapshot support

- ❏ Drop sm8450_mini-userdebug build target
  - ❏ Support folded in sm8x50-userdebug

# LKFT for Android Updates

Yongqin Liu, liuyq on #linaro-android IRC @OFTC

# Linux Kernel Functional Test (LKFT) for Android

- The LKFT framework is a collection of software tools and hardware devices.
- LKFT for Android includes running relevant subsets of CTS / VTS on Linaro managed devboards, triaging the results, and reporting and/or fixing bugs found.
- These tests are run on **4** devices, with **5** userspace, **15** kernel resulting in total of **78** combinations on a daily basis.
- We ran **1.17B** AOSP tests since May'23, **3.44B** since we started testing.

# LCG GUI based Triaging - List of what are tested

## LKFT Android Projects

| Kernel | AOSP(30) | Android14(9) | Android13-GSI(4) |
|---|---|---|---|
| android-mainline-sanity-debug(1) | mainline-debug-aosp-master-sanity (0 →) | | |
| android-mainline-sanity(2) | mainline-aosp-master-sanity (qrb5165-rb5) (0 →)<br>mainline-aosp-master-sanity (dragonboard-845c) (0 →) | | |
| android-mainline-debug(1) | mainline-gki-debug-aosp-master-db845c (-55 ↘) | | |
| android-mainline(2) | mainline-gki-aosp-master-rb5 (10↗)<br>mainline-gki-aosp-master-db845c (6↗) | | |
| android15-6.6(2) | 6.6-gki-android15-aosp-master-rb5 (205 →)<br>6.6-gki-android15-aosp-master-db845c (-2 ↘) | | |
| android15-6.6-debug(1) | 6.6-gki-android15-debug-aosp-master-db845c (9↗) | | |
| android15-6.6-presubmit(1) | 6.6-gki-android15-aosp-master-db845c-presubmit (5/7) | | |
| android15-6.6-full-cts-vts(1) | 6.6-gki-android15-aosp-master-db845c-full-cts-vts (36/38) | | |
| android14-6.1-lts(2) | 6.1-lts-gki-android14-aosp-master-rb5 (16 →)<br>6.1-lts-gki-android14-aosp-master-db845c (5↗) | | |
| android14-6.1(4) | 6.1-gki-android14-aosp-master-rb5 (-2 ↘)<br>6.1-gki-android14-aosp-master-db845c (19 →) | 6.1-gki-android14-android14-rb5 (-2 ↘)<br>6.1-gki-android14-android14-db845c (5↗) | |
| android14-6.1-presubmit(1) | | 6.1-gki-android14-android14-db845c-presubmit (3/7) | |
| android14-6.1-full-cts-vts(1) | | 6.1-gki-android14-android14-db845c-full-cts-vts (36/37) | |
| android14-5.15-lts(2) | 5.15-lts-gki-android14-aosp-master-rb5 (2↗)<br>5.15-lts-gki-android14-aosp-master-db845c (-6 ↘) | | |
| android14-5.15(4) | 5.15-gki-android14-aosp-master-rb5 (-9 ↘) | 5.15-gki-android14-android14-rb5 (-2 ↘) | |

List of configurations based on kernel versions and AOSP versions, and hardware platforms

# LCG GUI based Triaging - across configurations

▼ CtsGraphicsTestCases has 32 failures

| Index | Test | 5.10-gki-android13-aosp-master-db845c(6) | 5.10-gki-aosp-master-db845c(9) | 5.10-gki-aosp-master-hikey960(8) | 5.15-gki-android13-aosp-master-db845c(6) | 5.15-gki-android13-aosp-master-rb5(6) | 5.15-gki-android14-aosp-master-db845c(6) | 5.15-gki-android14-aosp-master-rb5(6) | 5.15-lts-gki-android14-aosp-master-db845c(6) | 5.15-lts-gki-android14-aosp-master-rb5(6) | 5.4-gki-android11-aosp-master-db845c(6) | 5.4-gki-android11-aosp-master-hikey960(9) | 5.4-gki-android11-aosp-master-db |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | android.graphics.cts.BitmapTest#testWrapHardwareBufferWithProtectedUsageFails#arm64-v8a | | | Fail | | | | | | | | Fail | |
| 2 | android.graphics.cts.BitmapTest#testWrapHardwareBufferWithProtectedUsageFails#armeabi-v7a | | | Fail | | | | | | | | Fail | |
| 3 | android.graphics.cts.FrameRateOverrideTest#testAppBackpressure#arm64-v8a | | | | | | | | | | | | |
| 4 | android.graphics.cts.FrameRateOverrideTest#testAppBackpressure#armeabi-v7a | | | | | | | | | | | | |
| 5 | android.graphics.cts.FrameRateOverrideTest#testAppChoreographer#arm64-v8a | | | | | | | | | | | | |
| 6 | android.graphics.cts.FrameRateOverrideTest#testAppChoreographer#armeabi-v7a | | | | | | | | | | | | |
| 7 | android.graphics.cts.FrameRateOverrideTest#testGlobalBackpressure#arm64-v8a | | | | | | | | | | | | |
| 8 | android.graphics.cts.FrameRateOverrideTest#testGlobalBackpressure#armeabi-v7a | | | | | | | | | | | | |
| 9 | android.graphics.cts.FrameRateOverrideTest#testGlobalChoreographer#arm64-v8a | | | | | | | | | | | | |
| 10 | android.graphics.cts.FrameRateOverrideTest#testGlobalChoreographer#armeabi-v7a | | | | | | | | | | | | |
| 11 | android.graphics.cts.HardwareRendererTest#hardwareBufferRendererLeakTest#armeabi-v7a | | | | | | | | | | | | |

1. The same AOSP version, but different kernel versions and platforms

▼ CtsGraphicsTestCases has 6 failures

| Index | Test | 5.15-gki-android13-android13-db845c(4) | 5.15-gki-android13-android13-rb5(4) | 5.15-gki-android13-android14-db845c(4) | 5.15-gki-android13-android14-rb5(4) | 5.15-gki-android13-aosp-master-db845c(6) | 5.15-gki-android13-aosp-master-rb5(6) |
|---|---|---|---|---|---|---|---|
| 1 | android.graphics.cts.VulkanFeaturesTest#testVulkan1_1Requirements#arm64-v8a | Fail | Fail | Fail | Fail | Fail | Fail |
| 2 | android.graphics.cts.VulkanFeaturesTest#testVulkan1_1Requirements#armeabi-v7a | Fail | Fail | Fail | Fail | Fail | Fail |
| 3 | android.graphics.cts.VulkanFeaturesTest#testVulkanExposedDeviceExtensions#a... v8a | | | | | | |
| 4 | android.graphics.cts.VulkanFeaturesTest#testVulkanExposedDeviceExtensions#a... v7a | | | | | | |
| 5 | android.graphics.cts.VulkanFeaturesTest#testVulkanHardwareFeatures#arm64-v8 | | | | | | |
| 6 | android.graphics.cts.VulkanFeaturesTest#testVulkanHardwareFeatures#armeabi-v | | | | | | |

2. The same kernel commit, but different AOSP versions and platforms

▼ CtsGraphicsTestCases has 6 failures

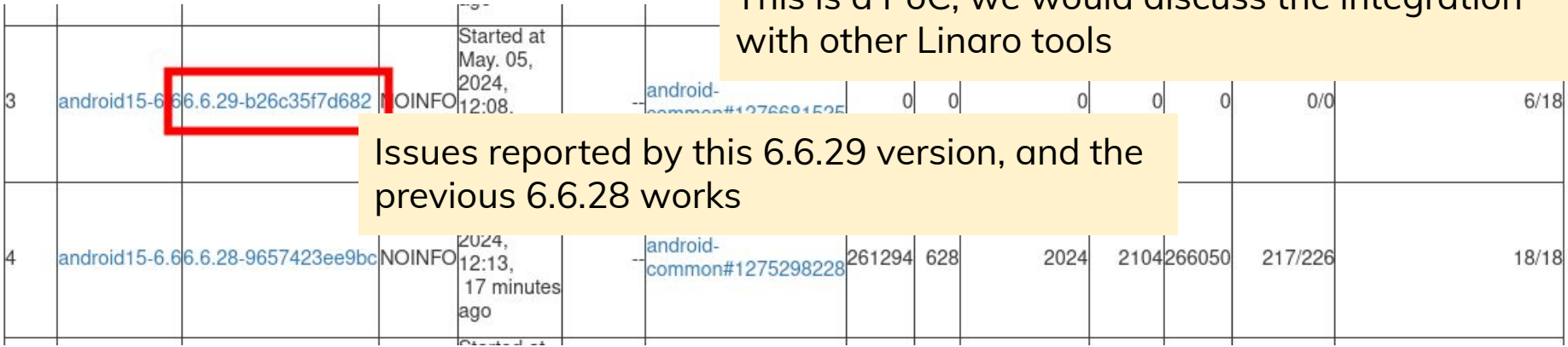
| Index | Test | 6.6.23-e1c0fd4e4964 | 6.6.23-7ea52c72b350 | 6.6.23-1ee7deeefc44 | 6.6.23-6f2c320c37f0 | 6.6.23-e83fcc6fa5d5 | 6.6.23-acad3ca8c6e0 | 6.6.22-64018a934a2 |
|---|---|---|---|---|---|---|---|---|
| 1 | android.graphics.cts.VulkanFeaturesTest#testVulkan1_1Requirements#arm64-v8a | Fail | Fail | Fail | Fail | Fail | Fail | Fail |
| 2 | android.graphics.cts.VulkanFeaturesTest#testVulkan1_1Requirements#armeabi-v7a | Fail | Fail | Fail | Fail | Fail | Fail | Fail |
| 3 | android.graphics.cts.VulkanFeaturesTest#testVulkanExposedDeviceExtensions#arm64-v8a | | | | | | | |
| 4 | android.graphics.cts.VulkanFeaturesTest#testVulkanExposedDeviceExtensions#armeabi-v7a | | | | | | | |
| 5 | android.graphics.cts.VulkanFeaturesTest#testVulkanHardwareFeatures#arm64-v8a | | | | | | | |
| 6 | android.graphics.cts.VulkanFeaturesTest#testVulkanHardwareFeatures#armeabi-v7a | | | | | | | |

3. The same AOSP version + same platform + same kernel branch, different commits

# LCG GUI based Bisecting - start from triaging

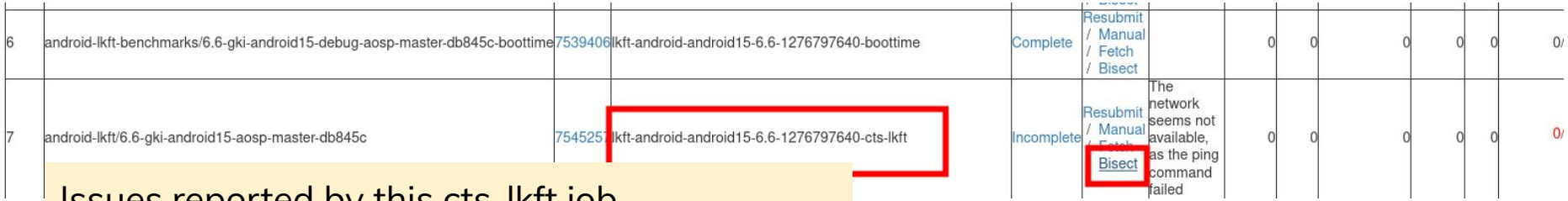
This is a PoC; we would discuss the integration with other Linaro tools

Issues reported by this 6.6.29 version, and the previous 6.6.28 works



| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | android15-6 | 6.6.29-b26c35f7d682 | NOINFO | Started at May. 05, 2024, 12:08. | -- | android-common#12766815 | 0 | 0 | 0 | 0 | 0 | 0/0 | 6/18 | |
| 4 | android15-6.6 | 6.6.28-9657423ee9bc | NOINFO | 2024, 12:13, 17 minutes ago | -- | android-common#1275298228 | 261294 | 628 | 2024 | 2104 | 266050 | 217/226 | 18/18 | |

Issues reported by this cts-lkft job



| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | android-lkft-benchmarks/6.6-gki-android15-debug-aosp-master-db845c-boottime | 7539406 | lkft-android-android15-6.6-1276797640-boottime | Complete | Resubmit / Manual / Fetch / Bisect | | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | android-lkft/6.6-gki-android15-aosp-master-db845c | 7545257 | lkft-android-android15-6.6-1276797640-cts-lkft | Incomplete | Resubmit / Manual / Bisect | The network seems not available, as the ping command failed | 0 | 0 | 0 | 0 | 0 | 0 |

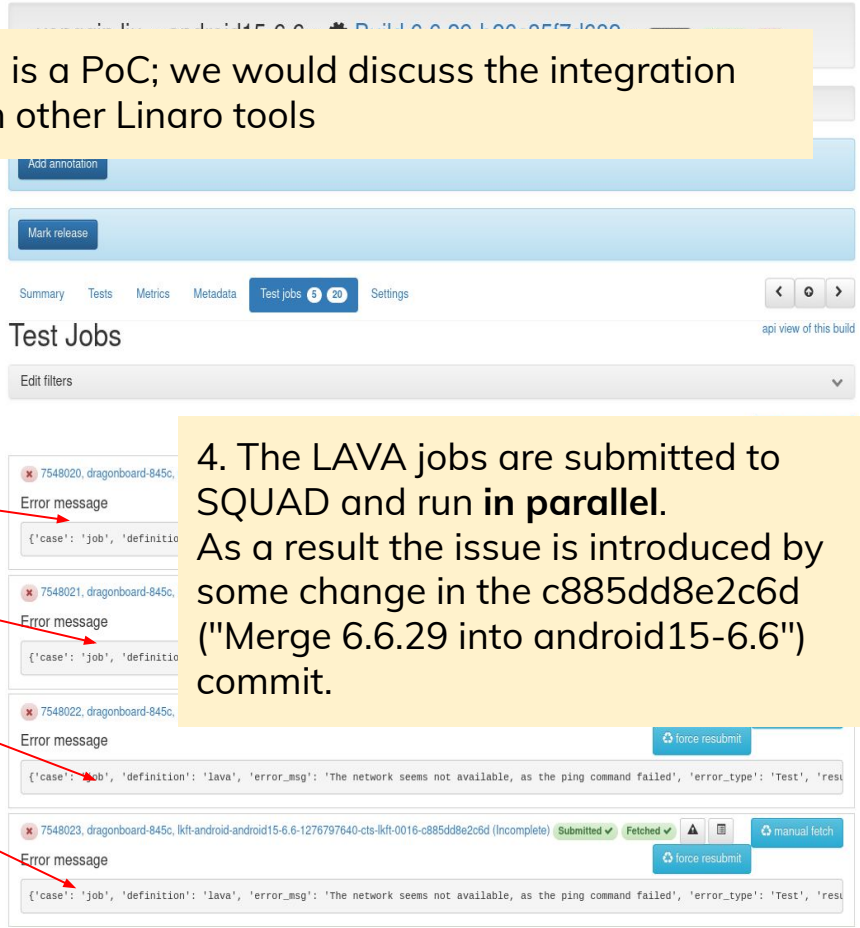
## Job Resubmission

| | |
|---|---|
| **Orirnal LAVA Job Name:** | lkft-android-android15-6.6-1276797640-cts-lkft |
| **Project Full Name:** | ~yongqin.liu/android15-6.6 |
| **Build Branch:** | android15-6.6 |
| **Build Version:** | 6.6.29-b26c35f7d682 |
| **Environment:** | dragonboard-845c |
| **QAReport Job Id.** | 21658077 |
| **No Update On Job Definition:** | ☐ |
| **Bisect First Parents:** | ☑ |
| **Original QAReport Job URL:** | https://c |
| **Original LAVA Job URL:** | https://l |
| **Reason For Resubmission:** | Bisect i |
| **First Parents:** | ☐ b26c<br>☐ 55ad<br>☐ f932b<br>☐ 2291<br>☐ 8c2a<br>☐ be77<br>☐ 48c1<br>☐ f18c3<br>☐ 096a<br>☐ b846<br>☑ 4955<br>☐ 0217<br>☐ 78adeb53eea1 ("ANDROID: KVM: arm64: Fix account_locked_mm() call in non-preemptible section")<br>☑ a0ffabb3cd7e ("Revert "usb: xhci: Add timeout argument in address_device USB HCD callback"")<br>☑ cbe8956c96f6 ("Revert "usb: new quirk to reduce the SET_ADDRESS request timeout"")<br>☐ e769c68cf7d1 ("Revert "serial: core: Fix missing shutdown and startup for serial base port"")<br>☑ c885dd8e2c6d ("Merge 6.6.29 into android15-6.6")<br>☐ 9657423ee9bc ("FROMGIT: usb: typec: tcpm: Check for port partner validity before consuming it") |
| **Definition:** | actions:<br>- deploy:<br>images:<br>partition:0:<br>url: https://images.validation.linaro.org/snapshots.linaro.org/96boards/dragonboard845c/linaro/rescue/101/dragonboard-845c-bootloader-ufs-aosp-101/gpt_both0.bin<br>os: android<br>postprocess:<br>docker:<br>image: linaro/lava-android-postprocess:bullseye-2024.03.13-01<br>local: true<br>steps:<br>- linaro-lkft-android.sh -g -v http://lkft-cache.lkftlab/api/v1/fetch?url=https://storage.tuxsuite.com/public/linaro/lkft-android/oebuilds/2fvwtB0fSdaMR3LXOPQp7VnLKYf -ru http://testdata.linaro.org/lkft/aosp-stable/android/lkft/lkft-aosp-main-db845c/2328 -c lkft-db845c-aosp-master-android15-6.6-gki<br>timeout:<br>super:<br>url: downloads://super.img |

submit

List of the first parent commits:
1. only **suspicious commits** needs to be selected
2. **multiple commits** could be selected to be checked **in parallel**

This is a PoC; we would discuss the integration with other Linaro tools




4. The LAVA jobs are submitted to SQUAD and run **in parallel**.
As a result the issue is introduced by some change in the c885dd8e2c6d ("Merge 6.6.29 into android15-6.6") commit.

3. Original LAVA job definition provided, it could be fine-tuned as necessary

# Boottime test

- Both the fresh boot time and the reboot boot time are collected
  - Including the time for kernel boot, android boot, the total boot time
- The data for the last 10 builds is reported
  - Improvement and regression could be observed based on that
- Triage is done based on the report and results are shared to the relevant owners for both the improvement and regressions

# Boottime test related components

- Test-definition: automated/android/boottime
- Lava-test-plan: lava_test_plans/testcases/android-boottime.yaml
- SQUAD projects:
  - the ones with the -boottime suffix under SQUAD android-lkft-benchmarks
- Mail report scripts:
  - squad_report/androidbenchmark.py
- Report examples:
  - android-benchmark-boottime-2024-04-16-09-02.txt
  - android-benchmark-boottime-2024-04-16-09-02.pdf
- Online pages:
  - LKFT Projects the “Boottime Projects“ tab, it’s the same list as the SQUAD side.
  - E.g. 6.6-gki-android15-aosp-master-db845c-boottime

# Work-in-Progress | ToDos

- ❏ Support to test AOSP images from the SDCard setup
  - ❏ Make it work for LAVA jobs in the lab
- ❏ Enable more AOSP Upgrade testing
  - ❏ API Level upgrade tasks in progress
- ❏ Hikey + android11-5.4 configurations enabling
  - ❏ vendor tree build enabled
  - ❏ Need to make it work with the GKI kernel
- ❏ Enable testing of relevant AOSP features in the LKFT setup
- ❏ Bisections
- ❏ Migration to The Tuxsuite setup
  - ❏ Work with Tuxsuite trigger & Tuxplan
  - ❏ AOSP build with Tuxsuite to build the userspace images and test them

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# Thank you

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