



Android Common Kernel Testing at Google

September 14, 2017

Presentation by Marissa Wall <marissaw@google.com>

Presubmit Testing

- Obtain a target that can run unmodified Android Common Kernels
 - Supports all currently maintained Android Common Kernels (3.18, 4.4 and 4.9)
 - Easy switching of the kernel on a running instance
- Decide which test cases to run on each new patch
- Integrate the target with existing presubmit testing infrastructure
- Publicly publish the testing results on each patch uploaded to gerrit

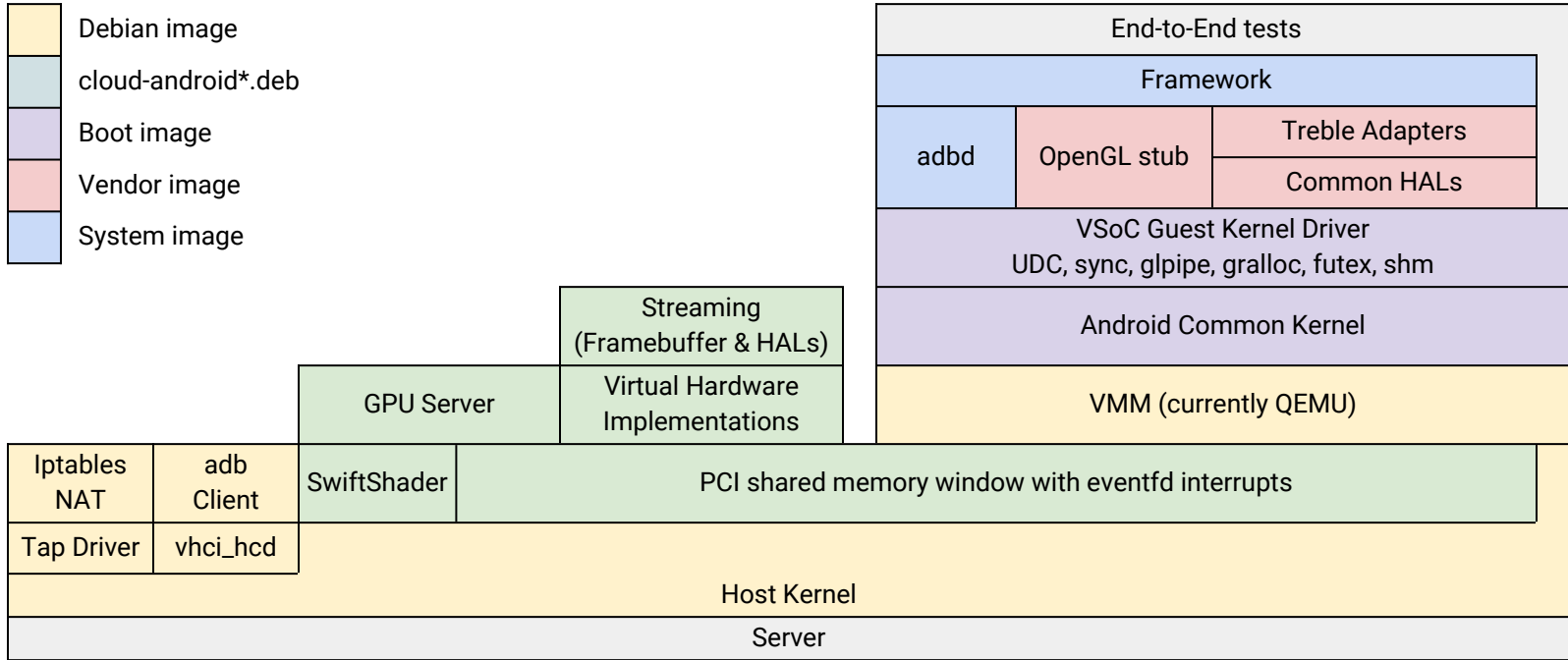
New Emulator

- Focused on kernel and framework developers
- Kernel changes confined to device drivers and upstreamed
- Supports Android common kernels 3.18, 4.4 and 4.9
- Runs on Linux server pool
 - Supports up to 64 cores per device
 - Runs on up to 100s of virtual devices
- Implements lower-level interfaces like USB, WiFi, and Bluetooth
- Security model on Android fully intact
- Tentatively scheduled to be open sourced with Oreo Maintenance Release 1

New Emulator versus Goldfish

- Engineered to run on Linux server pool
- Prioritize fidelity over performance
- No framework changes
 - e.g. no property based code paths in the framework code
- No attempt at ARM emulation
- Linux support only

New Emulator



Test cases

- VTS
 - Kernel / System / kselftest / LTP
 - HALs / HIDL
 - Security
 - Performance
 - Fuzz
- CTS
- Suggestions?

Sources

- VTS
 - https://source.android.com/devices/tech/test_infra/tradefed/fundamentals/vts
- CTS
 - <https://source.android.com/compatibility/cts/>

Thanks!

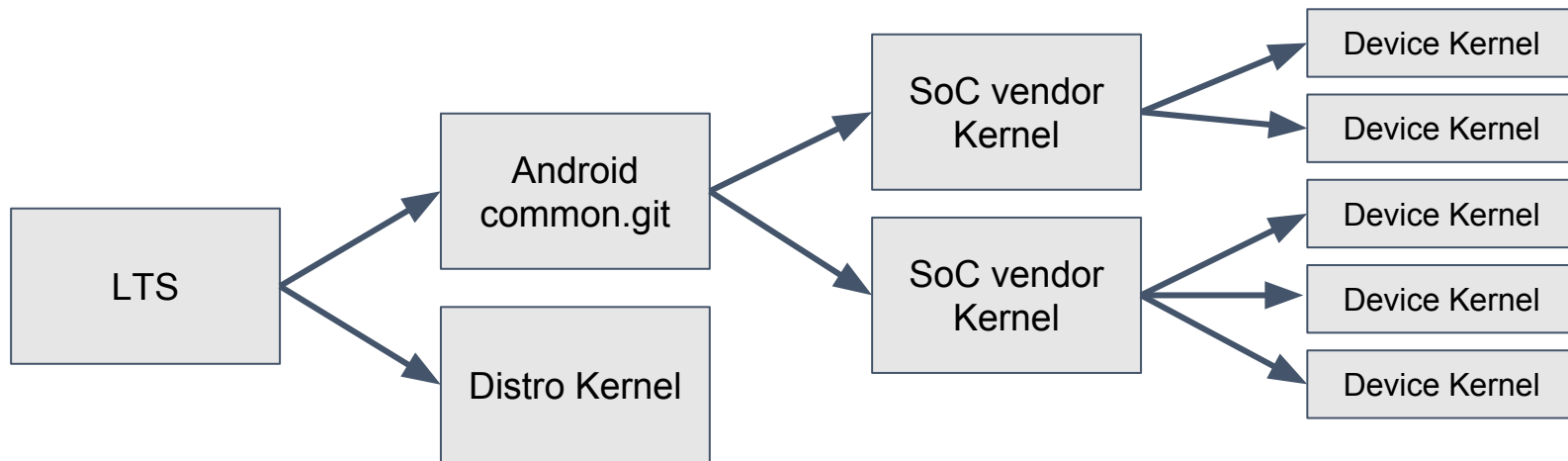


Linux Kernel Functional Testing Efforts at Linaro

LEADING
COLLABORATION
IN THE ARM
ECOSYSTEM

Linux Kernel Functional Testing at Linaro

- Project initiated by Google
 - To improve -stable and Android common kernel testing
 - Benefits downstream SoC vendor kernels



Existing Community Build/Boot Testing Efforts

0-day kernel tester: <https://01.org/lkp>

- Really efficient multi-arch build testing
- Pre-acceptance testing (developer git trees, lkml patches)
- Limited (virtualized x86 only) boot, functional and performance testing

KernelCI.org: <https://kernelci.org/>

- Build testing many kernels (mainline, -stable, -next, android-common) for handful of arm/arm64/mips/x86 platforms
- Boot testing on many platforms in many separate labs













Linux Kernel Functional Testing at Linaro

- Build + Boot + Functional testing on ..
 - Platforms: HiKey, x86, Beagle x15 (In Progress), db410c, Qemu (In Progress)
 - Kernels: Mainline, LTS (stable and rc for 4.4, 4.9), -next and android-common kernels
 - Userland: AOSP, OpenEmbedded
- Currently Running ..
 - LTP-syscall, kselftests, hugetlbfs (OpenEmbedded), Android CTS/VTS (AOSP)
- Hoping to grow and add more test as things settle down
 - LTP-(sub-testsuite), xfstest, lkp, piglit and others...
 - Suggestions welcome

Build, Test & Reporting Infrastructure

- Test setup built around Jenkins and LAVA v2
- Builds at <https://ci.linaro.org/>
- Test/QA reporting
 - Dashboard <https://qa-reports.linaro.org/lkft/>
 - Email notifications (Beta)

lkft

Project	Last update	Tests	Metrics
android-hikey-linaro-4.4-aosp	Sept. 1, 2017, 9:59 a.m. <i>5 days ago</i>		0.0
android-hikey-linaro-4.4-oe	Aug. 31, 2017, 6:31 a.m. <i>6 days, 3 hours ago</i>		0.0
android-hikey-linaro-4.9-aosp	Aug. 31, 2017, 6:31 a.m. <i>6 days, 3 hours ago</i>		0.0
android-hikey-linaro-4.9-oe	Aug. 31, 2017, 6:31 a.m. <i>6 days, 3 hours ago</i>		0.0
linaro-hikey-stable-4.4-oe	Sept. 4, 2017, 4:39 p.m. <i>1 day, 17 hours ago</i>		0.0
linaro-hikey-stable-rc-4.4-oe	Sept. 5, 2017, 8:30 a.m. <i>1 day, 1 hour ago</i>		0.0
linux-mainline-oe	Sept. 6, 2017, 2:27 a.m. <i>7 hours ago</i>		39.2189765265774
linux-next-oe	Sept. 6, 2017, 9:25 a.m. <i>40 minutes ago</i>		33.1296927472701
linux-stable-4.4-oe	Sept. 2, 2017, 10:16 a.m. <i>3 days, 23 hours ago</i>		0.0
linux-stable-4.9-oe	Sept. 2, 2017, 8:12 a.m. <i>4 days, 1 hour ago</i>		0.0
linux-stable-rc-4.4-oe	Sept. 5, 2017, 10:04 a.m. <i>1 day ago</i>		0.0
linux-stable-rc-4.9-oe	Sept. 5, 2017, 8:53 a.m. <i>1 day, 1 hour ago</i>		0.0

lkft/android-hikey-linaro-4.9-aosp/v4.9.44-638447-g8ce3724ad14b

Tests

Metadata

android.build	82
android.name	lkft-hikey-aosp-4.9
android.url	https://ci.linaro.org/job/lkft-hikey-aosp-4.9/82/
build-url	https://ci.linaro.org/job/lkft-hikey-aosp-4.9/82/
job_status	Complete
kernel-branch	android-hikey-linaro-4.9
kernel-commit	8ce3724ad14b3e82a62e7997f783949306c48ca0
kernel-describe	v4.9.44-638447-g8ce3724ad14b
kernel-repo	https://android.googlesource.com/kernel/hikey-linaro
series	lkft

Test run #22005 Environment: hi6220-hikey Status: Complete

[origin](#)

Suite	Metrics summary	Tests passed	Tests failed
CtsFileSystemTestCases/arm64-v8a.CtsFileSystemTestCases	0.0	8	0
CtsFileSystemTestCases/armeabi-v7a.CtsFileSystemTestCases	0.0	8	0
CtsFileSystemTestCases	0.0	2	0
Overall summary	0.0	18	0

Test run #22003 Environment: hi6220-hikey Status: Complete

[origin](#)

Suite	Metrics summary	Tests passed	Tests failed
CtsCompilationTestCases	0.0	2	0



LEADING COLLABORATION
IN THE ARM ECOSYSTEM

lkft/linux-next-oe/next-20170906

Tests

Metadata

kernel-branch	master
kernel-commit	e9fcbcd00963a2ef9ec7e9ffd892c5a45dc27729
kernel-describe	next-20170906
kernel-repo	https://git.kernel.org/pub/scm/linux/kernel/git/next/linux-next.git
series	lkft

Test run #22660 Environment: x86 Status: Complete

[origin](#)

Suite	Metrics summary	Tests passed	Tests failed
ltp-syscalls-tests	0.0	937	15
boot	39.48	1	0
Overall summary	39.48	938	15

Test run #22661 Environment: hi6220-hikey Status: Complete

[origin](#)

Suite	Metrics summary	Tests passed	Tests failed
boot	30.5	1	0
kseltest	0.0	34	17
Overall summary	30.5	35	17

Test run #22655 Environment: x86 Status: Complete

[origin](#)

Suite	Metrics summary	Tests passed	Tests failed
boot	40.10	1	0



LEADING COLLABORATION
IN THE ARM ECOSYSTEM

Testing Pain Points

- Modes of managing and testing mobile (AOSP) and classic linux clients (OpenEmbedded) are very different
 - Mobile: fastboot, adb, USB-gadget
 - Classic: tftp boot/install, ssh, ethernet
- Fastboot scaling issues
 - Fastboot flashing pin cpus, so flashing more boards than cpus at once run into errors
 - Have potential fix, but environment was reworked to avoid issue.
- Ghost bugs which are hard to reproduce outside of lab
 - Bad cables or potentially a few bad boards
 - Host BIOS tweaks for xHCI

Hikey (Primary test device)

- Mobile focussed Kirin620 SoC
 - Mostly upstream, supported in AOSP
- Single USB controller
 - Can be exclusively a gadget or a host, not both at once.
- UEFI bootloader doesn't support USB eth devices
 - No tftp booting
- Flashing via fastboot then requires gadget mode
 - No usb eth at runtime

Feedback / Questions / Want to join/help?

- Suggestion welcome on how to handle such mode of testing more reliably and efficiently?
- How to involve community as we scale up ..?
 - Reaching out to maintainers and test authors for help
 - Helping triage and fixing bugs found in the limited test run so far
 - UEFI support for usb eth devices on HiKey
 - adb gadget support in OE/classic linux distros
 - Fixing/expanding test infrastructure (LAVA)



Thank You

For further information: www.linaro.org