HiKey in AOSP - Update

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HiKey boards

Google supports HiKey, a certified 96Board, as an Android reference board. AOSP provides kernel source and board support for HiKey to enable developers to easily create and debug new and existing peripheral drivers, do kernel development, and perform other tasks with fewer OEM encumbrances.

HiKey boards are available in 1GB RAM and 2GB RAM configurations from Lenovator:

![HiKey board](https://source.android.com/source/devices.html#hikey-boards)

**Figure 1.** HiKey board by Lenovator
Continuing Collaboration

Working closely with folks at Google. Submitting changes directly to AOSP Gerrit.
New Features Added Since Announcement

Updated to Nougat
v4.4-stable based kernel
(Staying current w/ -stable)
Suspend/Resume support
Interactive cpufreq gov
powerHAL integration
HDMI & USB Audio
Display panel mezzanine

Bootloader source integration
Abootimg support in UEFI
Unique serial no setup
“fastboot boot <kernel>”
USB Tethering
Overlay_Manager
FIQ_debugger*
And more...

* FIQ bouncing from secure mode not yet implemented, so really this is an irq_debugger
Energy Aware Scheduler Integration

Working through and documenting how to integrate EAS code (core, schedtune, schedfreq gov) in with AOSP & PowerHAL

Working with other Linaro teams to benchmark and measure power and performance impact

Collaboration between Linaro, ARM and Google got EAS merged in android-4.4 and integrated into HiKey!
OP-TEE/Trusty Integration

Working to support both, with co-existence via build time options

OP-TEE kernel driver merged into HiKey AOSP kernel

OP-TEE bootloader integration in progress.

Trusty integration also being actively worked on.
Overlay Manager

How to handle and support various hardware configurations in AOSP

Driver which switches between DeviceTree overlay objects in the DeviceTree source based on boot argument

Submitted upstream to lkml by Dmitry
Factory Images

Now, installing the latest AOSP master build is easy!
https://developers.google.com/android/nexus/images-preview#hikey

# Set the J15 3-4 jumper
$ unzip <filename>
$ cd <filename>
$ ./flashall.sh /dev/ttyUSBn
# Unset J15 3-4 jumper & reboot

That’s it!
Common.git AOSP Efforts

- Appended dtb support (Image-dtb)
- Integrated upstream timerslack_ns support
- Align with upstream cgroup migration update
- stable merged android-4.4.y branches
- EAS forward ported from android-3.18 to android-4.4
- Deep review of common/android-4.4 tree
- Sending reverts for obsolete features
- Prep-work for next LTS android-4.9 tree
Android upstreaming...

Amit Pundir’s talk on state of the Android patches:

Video: https://www.youtube.com/watch?v=IX14Y6IG4Aw

Slides: https://goo.gl/XUzXkm
Generic Build Integration

Not AOSP, but HiKey is also used in Rob Herring’s generic build project, which supports multiple devices (and architectures) out of a single build directory using Kconfig.
TODOs

- Moving forward to next android-4.9 LTS kernel
- Work with Mali devs to avoid custom tweaks for Hikey
- Op-tee & Trusty coexisting in AOSP
- A/B updates partitioning & switching
- Memory reductions to help 1GB variant
- Fixing bugs as they crop up.
Why this is useful...

- HiKey in AOSP (Apr 2016)
- 2015 Nexus devices (Oct 2015)
- Latest flagship devices (Mar 2016)
- Following upstream kernels

- v3.10 Released June 2013
- v3.18 Released Dec 2014
- v4.4 Released Jan 2016

- 2 years, 4 months
- 1 year, 3 months
- 4 months
Regressions fixed in android-4.4

- Two separate xt_qtaguid bugs
- USB eth adapter regression
- USB Configfs gadget fixes
- PTP null pointer deref fix
- Missing cpuset allow_attach hooks
- Performance regression in cgroup migration
- UID routing enum collision
Regressions found and fixed upstream

- /sys/module/mmcblk path ABI change
- wlcore_op_get_expected_throughput null ptr dereference
- Dwc2 gadget TX FIFO breakage
- Missing CAP_WAKE_ALARM in AOSP userspace
- fib_rules routing collision w/ upstream
- iptables alignment breakage
- Cgroup migration permissions issue
HiKey Upstreaming Status

4.6:
- PMIC
- thermal

4.7:
- eMMC
- uSD
- USB
- Wifi
- DRM display

4.8:
- power-key
- RTC
- media-reset
- adv7533

4.9:
- K3DMA fixes
- HDMI dts
- Reboot-reason dts,
- Pstore dts
- Kconfig fix
HiKey Upstreaming TODOs (~35 patches)

- HDMI audio support [5 patches]
- USB speed autonegotiation / fixes [5 patches]
- Adv7511 improvements [4 patches]
- Android uid-routing workarounds [2 patches]
- Upstream Bluetooth solution for AOSP [4 patches]
- Mali driver (we can dream!) [~15 patches]
Differing focuses

**AOSP (&m HW Vendors)**

- Maximum power efficiency
- High performance & low latency graphics
- Only has to work on this one device
- v3.10 kernels
- Shipping to consumers in 6-12mo
- Fully enabled devices
- 2M+ line vendor patchsets

**Upstream Kernel Community**

- Long term maintainability
- One binary kernel runs on all devices
- Can’t hurt functionality on other devices
- Linus HEAD, -next or bust
- Maximum throughput / capacity
- X86_64 (and everything else!)
- Server workloads
Creating an overlap with HiKey

AOSP
(\& HW Vendors)

Affordable \& available devices
aarch64
Working against Latest -LTS \& Linus HEAD
Allows for validation of latest upstream kernel using AOSP userspace

Upstream Kernel Community
Thanks!

Questions?
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