# Issues w/ running mainline on form-factor devices

Linux Plumbers 2015

**Presented by**

John Stultz
john.stultz@linaro.org

**Date**

Aug 20th 2015

# Why bother?

# Benefits

Validate upstream changes (enable CI)

Allow for more experimentation

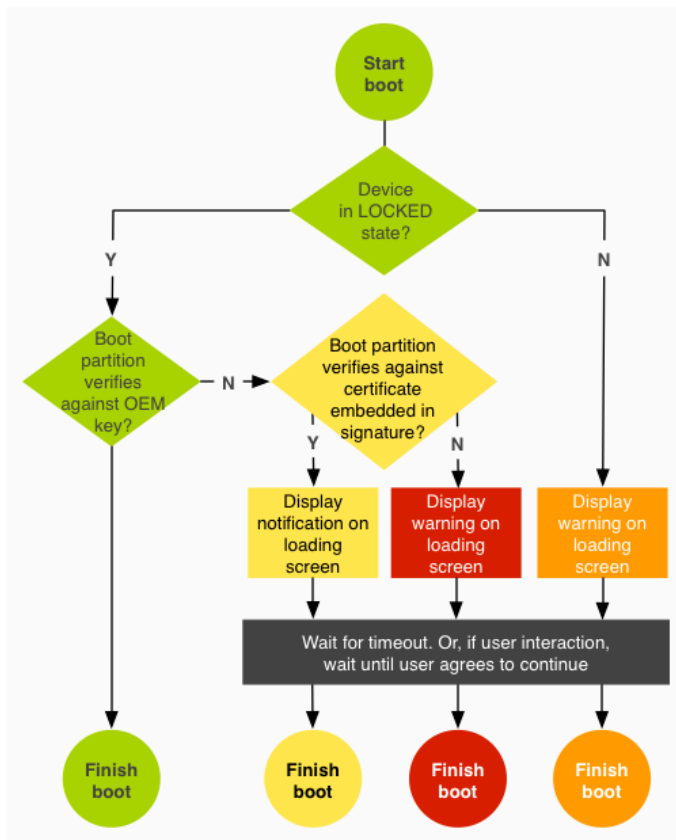Testing holes from devboard functionality gaps

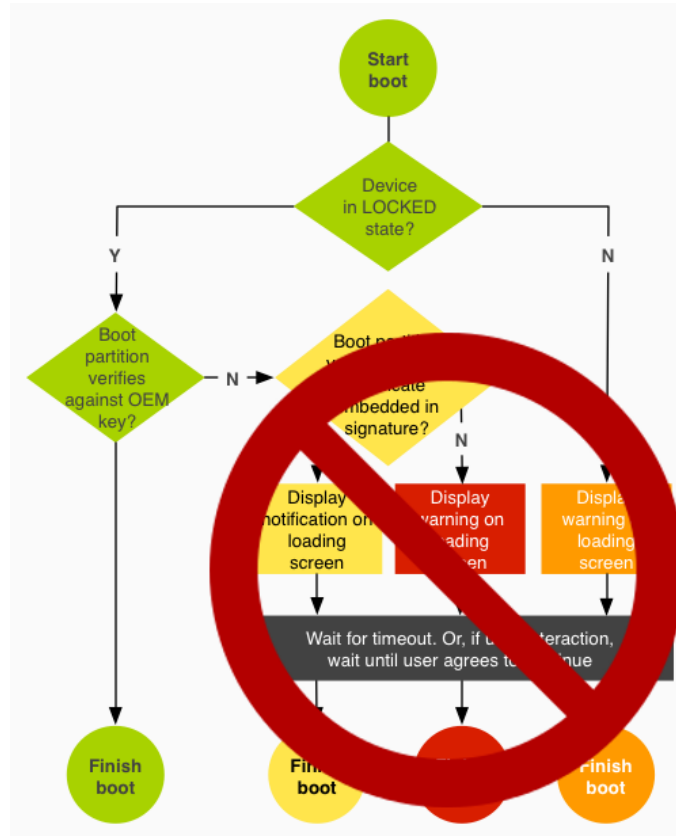Enable selfish maintainer interest

Improve collaboration

# Hardware

Key requirements

# Unlockable bootloader
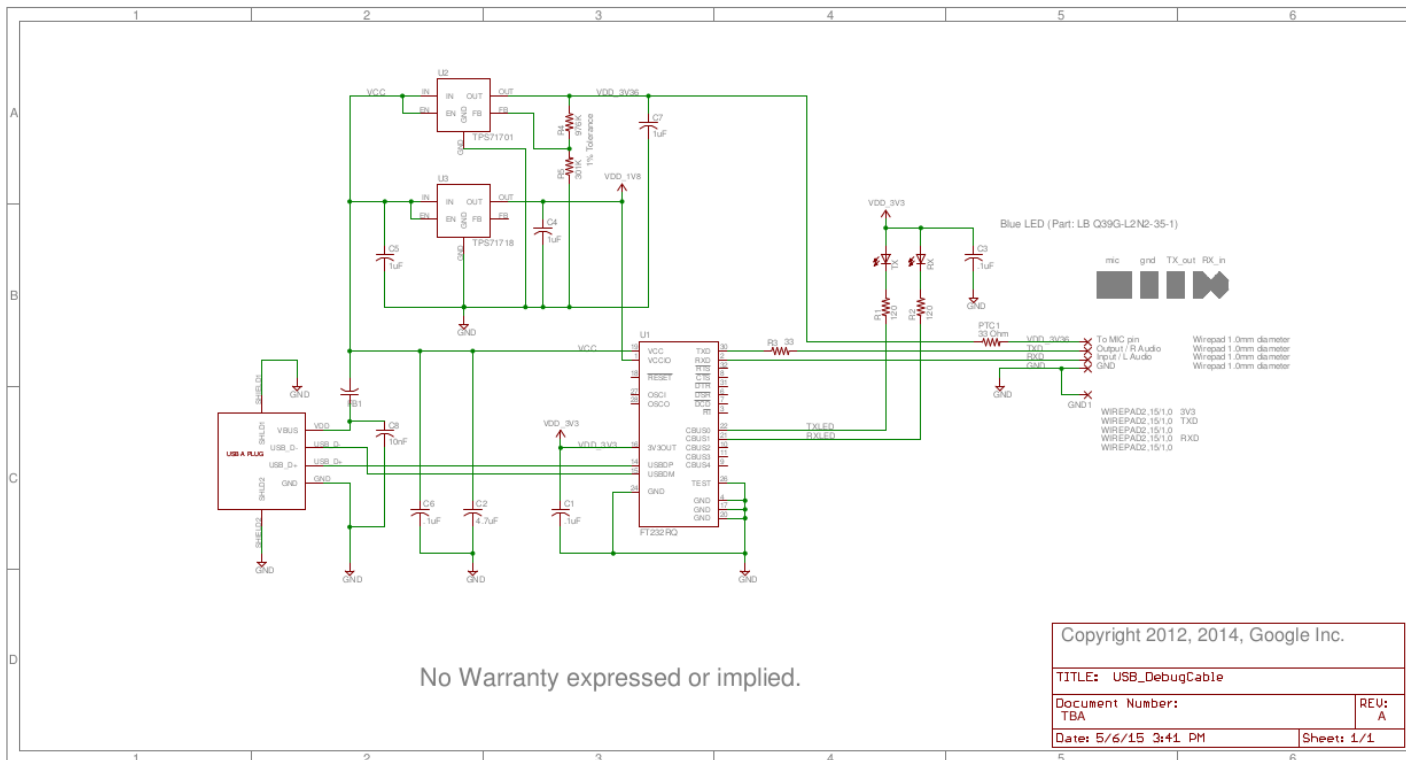
# Most device's bootloader

# Access to the serial UART

# Nexus Headphone Debug UART

TITLE: USB_DebugCable

Document Number: TBA

REV: A

Date: 5/6/15 3:41 PM     Sheet: 1/1

https://android.googlesource.com/device/google/debugcable/+/master

# USB-C to the rescue?

**USB Type-C connector pinouts**

| Pin | Name | Description | Pin | Name | Description |
|-----|------|-------------|-----|------|-------------|
| A1 | GND | Ground return | B12 | GND | Ground return |
| A2 | SSTXp1 | SuperSpeed differential pair #1, TX, positive | B11 | SSRXp1 | SuperSpeed differential pair #1, RX, positive |
| A3 | SSTXn1 | SuperSpeed differential pair #1, TX, negative | B10 | SSRXn1 | SuperSpeed differential pair #1, RX, negative |
| A4 | $V_{BUS}$ | Bus power | B9 | $V_{BUS}$ | Bus power |
| A5 | CC1 | Configuration channel | B8 | SBU2 | Sideband use (SBU) |
| A6 | Dp1 | USB 2.0 differential pair, position 1, positive | B7 | Dn2 | USB 2.0 differential pair, position 2, negative |
| A7 | Dn1 | USB 2.0 differential pair, position 1, negative | B6 | Dp2 | USB 2.0 differential pair, position 2, positive |
| A8 | SBU1 | Sideband use (SBU) | B5 | CC2 | Configuration channel |
| A9 | $V_{BUS}$ | Bus power | B4 | $V_{BUS}$ | Bus power |
| A10 | SSRXn2 | SuperSpeed differential pair #2, RX, negative | B3 | SSTXn2 | SuperSpeed differential pair #2, TX, negative |
| A11 | SSRXp2 | SuperSpeed differential pair #2, RX, positive | B2 | SSTXp2 | SuperSpeed differential pair #2, TX, positive |
| A12 | GND | Ground return | B1 | GND | Ground return |
| *USB 2.0 differential pair connects only in one position; position 2 is not physically present in the plug* | | | | | |

# Avoiding Binary Blobs

# Binary Blobs

QmlnZ2VzdCBpc3N1ZSB3LyBHUFUFUKCldpZmkvQmx1ZXRvb3RoIGZpcm13YXJlIGFsc28gcHJvYmxlbWF0aWMsIHNpbmNlIHRoZXkgbGltaXQgZHJpdmVyIHVwc3RyZWFtaW5nCgpOZXQgZWZmZWN0OiBSZXN0cmljdCB1c2FibGUgaGFyZHdhcmUgZm9yIHVwc3RyZWFtIGRldmVsb3BtZW50Cg==

# Android Kernel Patches

# Decreasing common.git delta
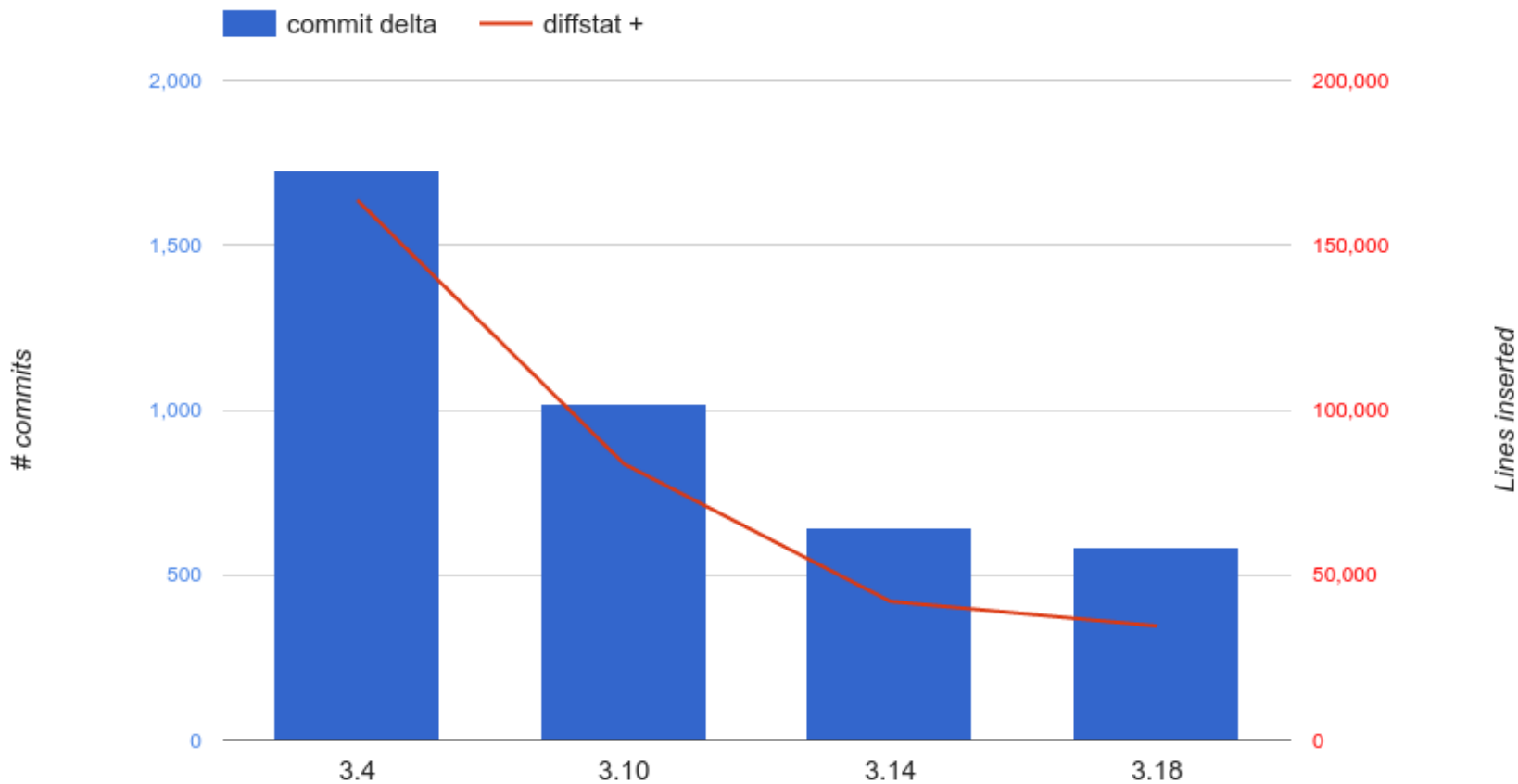
# Remaining areas (android-3.18)

```
15.9% drivers/usb/gadget/
12.7% drivers/video/adf/
13.4% net/netfilter/
 8.7% include/
 6.1% drivers/input/
 5.4% drivers/staging/android/fiq_debugger/
 4.7% drivers/cpufreq/
 3.5% arch/arm/
 3.3% arch/arm64/
(~25% spread out elsewhere)
```
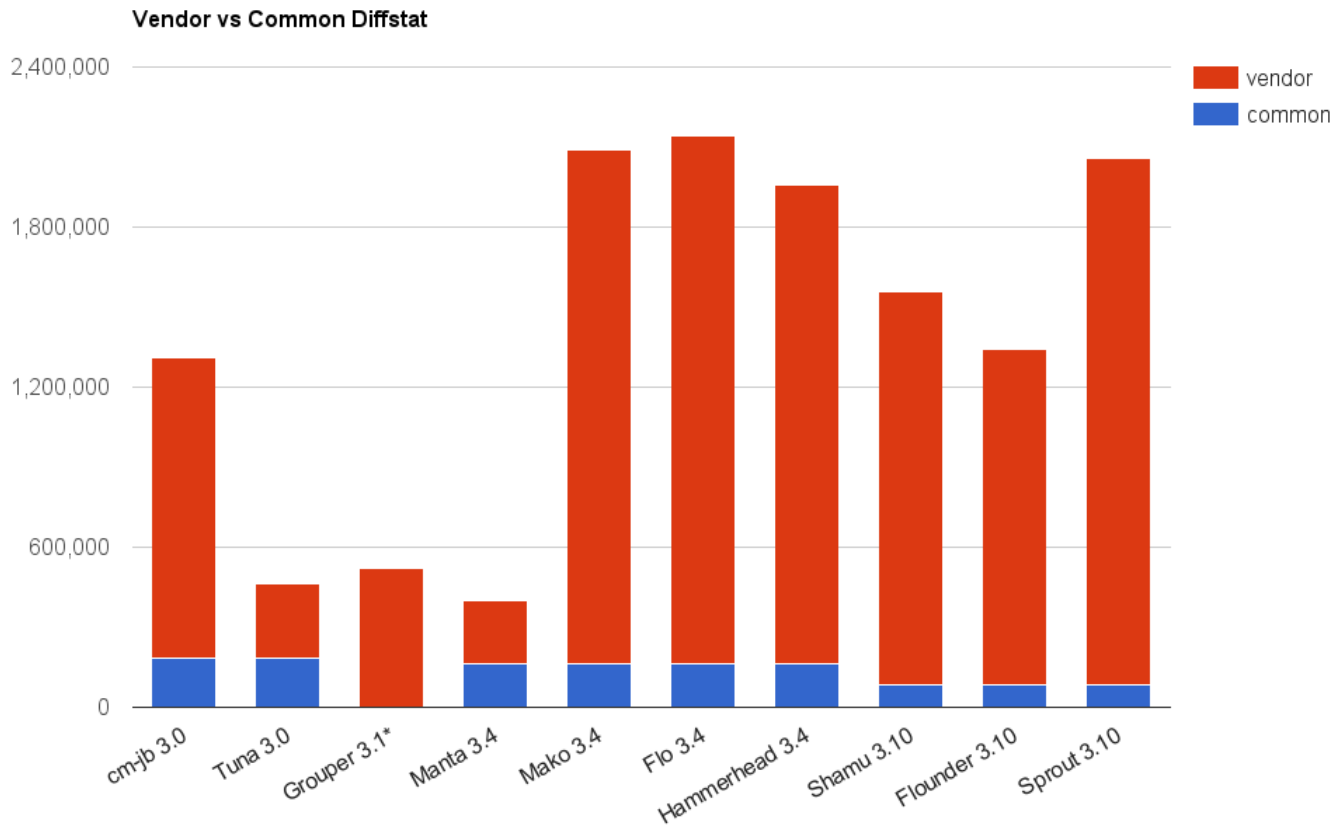
# Infrastructural deltas

Android kernel and upstream kernel interfaces still differ in places.

So a fair amount of userspace may need to change

# Lagging Upstream SoC Support

# SoC Android Trees



Vendor vs Common Diffstat

# Device Tree conversions

Adding support upstream using device tree has been painful for moving 3.4 board-file era devices forward.

Recent devices have been shipped using DT with 3.10 (still 11+ revisions behind).
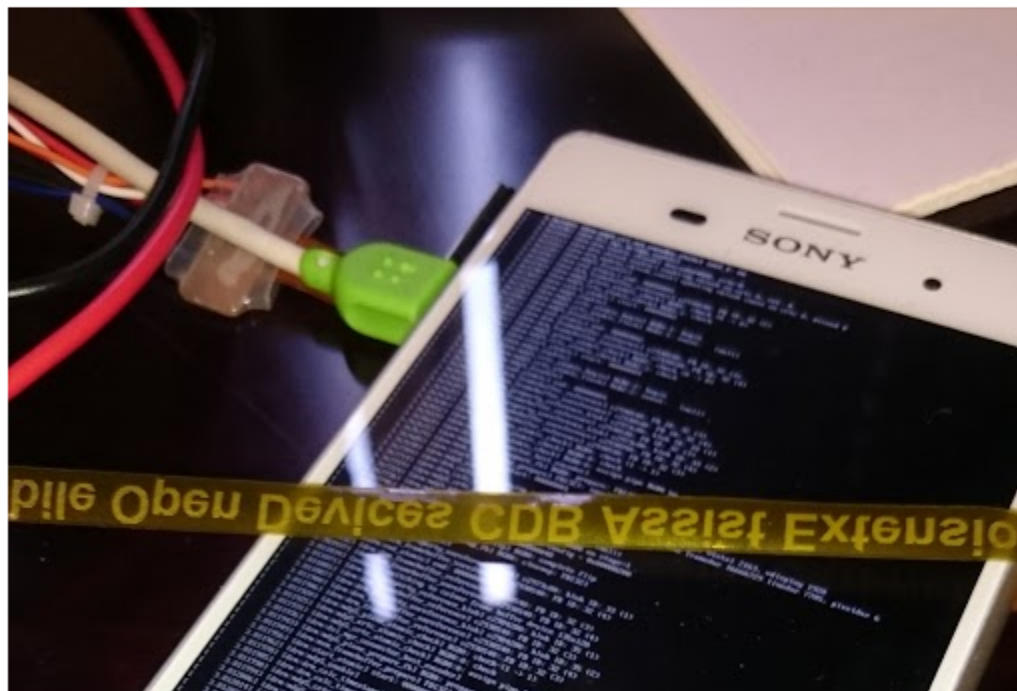
# Nexus 7 (2013)

Status

Bjorn Andersson

Shared publicly  ·  Jul 21, 2015

Achievement unlocked (Xperia Z3 + mainline + a few patches). Now we need to get those patches merged.

# Credits!

Björn Andersson
Stephen Boyd
Rob Clark
Kumar Gala
Lina Iyer
Ivan T. Ivanov

Srinivas Kandagatla
Vinay Simha

And everyone else at Qualcomm, Sony, Inforce, and Linaro who have helped get code upstream

# Currently ~32 kernel patches

## DeviceTree changes

- hw_rng
- usb gadget
- pinctrl / gpio-keys

## Real features

- mmc > 8 partitions
- MTP usb gadget
- "reboot bootloader"
- pm8921 pmic gpio

## Build helpers

- flo_defconfig
- Android.mk
- ATAG MEM fixup

## Hacks for now

- virtual fb
- mmc wp gpio hack
- allow broken gcc 4.8

# Lots left TODO

Display panel  Bluetooth
GL acceleration  Sensors
USB hotplug  Audio
Battery charger  Cameras
Power Management  NFC
Wifi  Slimport

# Reproduce it yourself!

```
$ repo init -u https://android.googlesource.com/platform/manifest -b android-5.1.1_r6

$ git clone https://git.linaro.org/people/john.stultz/AOSP/flo-mainline/manifest.git .
repo/local_manifests

$ repo sync

<fetch & install the (lmy48g) firmware blobs from
     https://developers.google.com/android/nexus/drivers >

$ build/envsetup.sh
$ lunch aosp_flo-userdebug
$ make -j24
```

Linaro

# Already seeing benefits

Making clear what code is most critical to upstream, helping find pain points

Using as a test platform to validate transition to ConfigFS gadget

Targeting for cenalloc proof of concept

# Wishing and hoping

$199 Nexus-like tablet released on "decently upstreamed" SoC

Standard USB-C alternative UART mode.