Issues w/ running mainline on form-factor devices

Linux Plumbers 2015

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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

No Warranty expressed or implied.

https://android.googlesource.com/device/google/debugcable/+/master
USB-C to the rescue?

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>GND</td>
<td>Ground return</td>
<td>B12</td>
<td>GND</td>
<td>Ground return</td>
</tr>
<tr>
<td>A2</td>
<td>SSTXp1</td>
<td>SuperSpeed differential pair #1, TX, positive</td>
<td>B11</td>
<td>SSRXp1</td>
<td>SuperSpeed differential pair #1, RX, positive</td>
</tr>
<tr>
<td>A3</td>
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<td>SuperSpeed differential pair #1, TX, negative</td>
<td>B10</td>
<td>SSRXn1</td>
<td>SuperSpeed differential pair #1, RX, negative</td>
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<tr>
<td>A4</td>
<td>V_BUS</td>
<td>Bus power</td>
<td>B9</td>
<td>V_BUS</td>
<td>Bus power</td>
</tr>
<tr>
<td>A5</td>
<td>CC1</td>
<td>Configuration channel</td>
<td>B8</td>
<td>SBU2</td>
<td>Sideband use (SBU)</td>
</tr>
<tr>
<td>A6</td>
<td>Dp1</td>
<td>USB 2.0 differential pair, position 1, positive</td>
<td>B7</td>
<td>Dn2</td>
<td>USB 2.0 differential pair, position 2, negative</td>
</tr>
<tr>
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<td>Dn1</td>
<td>USB 2.0 differential pair, position 1, negative</td>
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<td>V_BUS</td>
<td>Bus power</td>
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<tr>
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<td>SSTXn2</td>
<td>SuperSpeed differential pair #2, TX, negative</td>
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<tr>
<td>A11</td>
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</table>

*USB 2.0 differential pair connects only in one position; position 2 is not physically present in the plug*
Avoiding Binary Blobs
Binary Blobs

QmlInZ2VzdCBpc3N1ZSB3LyBHUFUKCldpZmkvQmx1ZXRvb3RoIHZpcm13YXJlIGFsc28gcHJvYmxibWF0aWMsIHNpbmN1cHRoZXkgbGltaXQgZWZmZWN0cmljdCB1c2FibGUgaGFyZHdhcmUgZm9yIEVwZWFtImljdmVsb3BtZW50Cg==
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
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
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
GL acceleration
USB hotplug
Battery charger
Power Management
Wifi

Bluetooth
Sensors
Audio
Cameras
NFC
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
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.