96problems

Dreams, troubles and opportunities for improvement in the 96boards ecosystem

John Stultz <john.stultz@linaro.org>
The 96boards Dream

Provide developers access to affordable 64bit ARM hardware (which was mostly inaccessible at the time)

Ability for vendors to enable and demonstrate latest 32/64bit SoC technologies within the open source ecosystem.

Standard hardware form-factor that vendors can easily use to give their SoCs access to a large ecosystem of hardware peripherals.

Ability for developers to get wide access to SoCs of varying price/performance that utilize a standard form-factor minimizing peripheral cost and minimizing risk to investment
96boards Status

~27% Complete
But we’ve had troubles
VaporBoards

Inconsistent level of vendor commitment

Success rate of each board going all the way to production varies
Mezzanine Ecosystem

While powerful in concept, mezzanines aren’t probe-able, and we’re missing primitives in DT to be able to describe mezzanines generically.

- Thus mezzanine software enablement has to be done against every board BSP independently, making it unrealistic to scale up.

Still need upstream DT connectors definitions

Additionally, while it is growing, the overall mezzanine ecosystem has been somewhat weak.
Multiple Hardware standards

Original goal of common form-factor somewhat diluted by increase in number of form factors (consumer, IOT, enterprise, TV, etc)

Also standard is lagging on modern interfaces

- USB-C (for power or display)
- M.2 PCIe
- Headphone jack
Multiple Hardware standards

Original goal of common form-factor somewhat diluted by increase in number of form factors (consumer, IOT, enterprise, TV, etc)

Also standard is lagging on modern interfaces
- USB-C (for power or display or audio)
- M.2 PCIe
- Headphone jack
Hardware standard, not software standard

No consistency board to board with regard to software

- Some only have Android images, some only have Debian/OE images

Vendor who produces the board may have no influence with the Vendor who creates the SoC

Upstream effort and success drastically vary from board to board
These issues aren’t new

There has always been internal criticism over the spec, implementations and marketing.
These issues aren’t new

There has always been internal criticism over the spec, implementations and marketing.
Misalignment for Linaro groups

Most specifically LCG, but I suspect the issues are shared
LCG History w/ 96boards

- ~Sept 2015: Start work on HiKey in AOSP
- Intense effort with lots of collaboration
  - Landing teams upstreaming code
  - LCG(LMG) working on AOSP
  - QA teams validating
  - Wide usage across Linaro
- March 2016: Announcement
- Upstreaming efforts continue through late 2017 (takes ~2 years)
- Hardware availability ends early 2018
LCG History w/ 96boards

- ~Oct 2016: HiKey960 work begins
  - Parallel board bringup w/ AOSP integration
- ~April 2017: Announced
LCG History w/ 96boards

- ~Oct 2016: HiKey960 work begins
  - Parallel board bringup w/ AOSP integration
- ~April 2017: Announced
- Lots of other 96boards from various vendors being worked on w/ Linaro teams!
LCG History w/ 96boards

- Vendor hardware pace increases
- ~March 2018: HiKey970 announced
  - Less than a year after HiKey960
  - Original HiKey had ~2 years before HiKey960 was announced.
- Upstreaming effort on HiKey960 slows down
LCG History w/ 96boards

- ~Oct 2016: HiKey960 work begins
  - Parallel board bringup w/ AOSP integration
- ~April 2017: Announced
- ~June 2018: HiSi refocuses upstreaming efforts on HiKey960, and is making good progress
Why is upstreaming important?

- Once upstream, HiKey has become a very useful test platform for finding -stable regressions.
- Also has been very useful for finding regressions during the upstream merge window.
- Allows us to validate the latest mainline kernels w/ the latest AOSP code branches.
- This helps make Android bringup w/ future LTS kernels much easier.
Crux of the issue

LCG is supposed to be doing work developing and testing, working with the upstream Kernel and AOSP ecosystems

We need a platform to do this. 96boards should be ideal.

But we’re left spending a lot of time doing board support and upstreaming for specific vendor hardware.

Fully upstreaming a device takes ~2 years

This investment has weak returns because vendor hardware lifetimes are often short
Opportunities for improvement
Consider other successful boards

Raspberry Pi
- Only ~3 SoCs on 4 form-factors since 2012
- Original board still sold!

BeagleBone
- One SoC on on a handful of form-factors since 2011

While underpowered for LCG uses, note Upstream Support & Long Manufacturing Lifetimes
Improve Linaro’s Focus

We’ve long talked about high-involvement vs low-involvement

- Consider HiKey vs Bubblegum boards
- Be more selective (even proactive at design time) with high-involvement boards

Fewer boards with longer lifetimes

- More collaboration between groups on specific boards
LCG hardware platform needs

Upstream support (ideally @ release!)
- We need good landing teams working w/ vendor during SoC bringup
- We need vendors building on-top of existing upstream support
- Make it easier to transition to new platforms

Long production/availability lifetimes
- Improve return on upstreaming investment
- Ideally with price dropping over its production lifetime
- Avoids the need for “new” low-end boards
- Spec bumps like memory/storage have worked well!

Relevant performance & capability
- Good to be flagship SoC on announcement
- Provides 3-4 year relevancy

Open Features
- Open Graphics & Video decoding
- Opensource bootloader
Difficulties

Different groups have different needs

- LCG - Open source graphics / Higher performance
- Media - Working accelerated video pipeline
- Security - Open bootloader & OPTEE integration
- LITE - Zephyr or other IoT OS support
- LEG - SBSA, PCI-E & high performance
- Testing - Power/reset/flashing automation

Will be hard to have a single board we can share efforts on, but reviewing these helps us in picking/co-designing boards
Difficulties

We also need members hardware interests to align with our needs

- Some vendors may not want to share details, but otherwise match well.

And in order to deliver all this, 96boards.org may need additional investment.

96boards organization role isn’t just to serve Linaro’s needs
Things were much worse
before 96boards...
Discussion

Ideas for extending device market lifetime if not through manufacturing?

How to balance bringing latest SoCs to community w/ longer device lifetimes?

How do we get vendors to push more code upstream earlier?

Where should Linaro focus in all of this?
Thank you

Join Linaro to accelerate deployment of your Arm-based solutions through collaboration

contactus@linaro.org