



Linaro: A Year of Change

David A Rusling, CTO
April 2011



So, What is this Linaro Thing?



Linaro



ARM



freescale[™]
semiconductor



IBM



SAMSUNG



ST
ERICSSON



ti TEXAS
INSTRUMENTS



What I Thought in 2009 / 2010

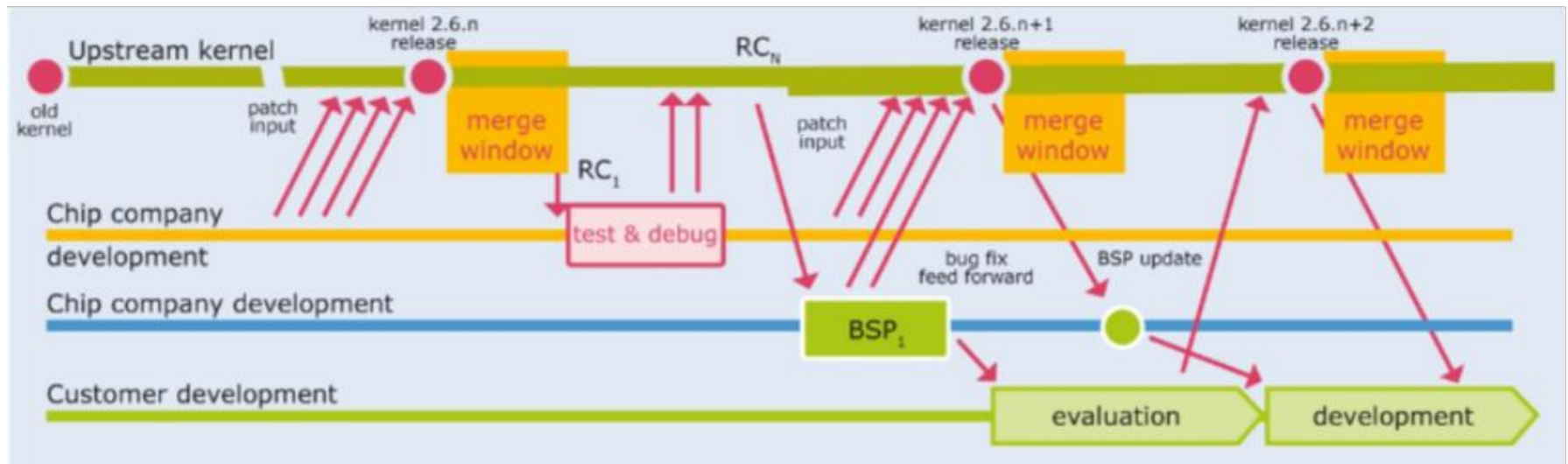
- ARM's were moving out of 'traditional' embedded Linux
- Diversity is good, fragmentation is bad
- Lack of upstreaming is inefficient
- Lack of collaboration
- Not enough engineers working in ARM Linux

Therefore, we need to do something...



Why is ARM Embedded Linux Different?

- Product timelines are extremely short (order of a few months)
- Products are highly diverse (SoCs and Systems)
- Products generally not based on leading edge open source
- Perceived value in proprietary components
- OEMs, ODMs, SiP are caught in a trap

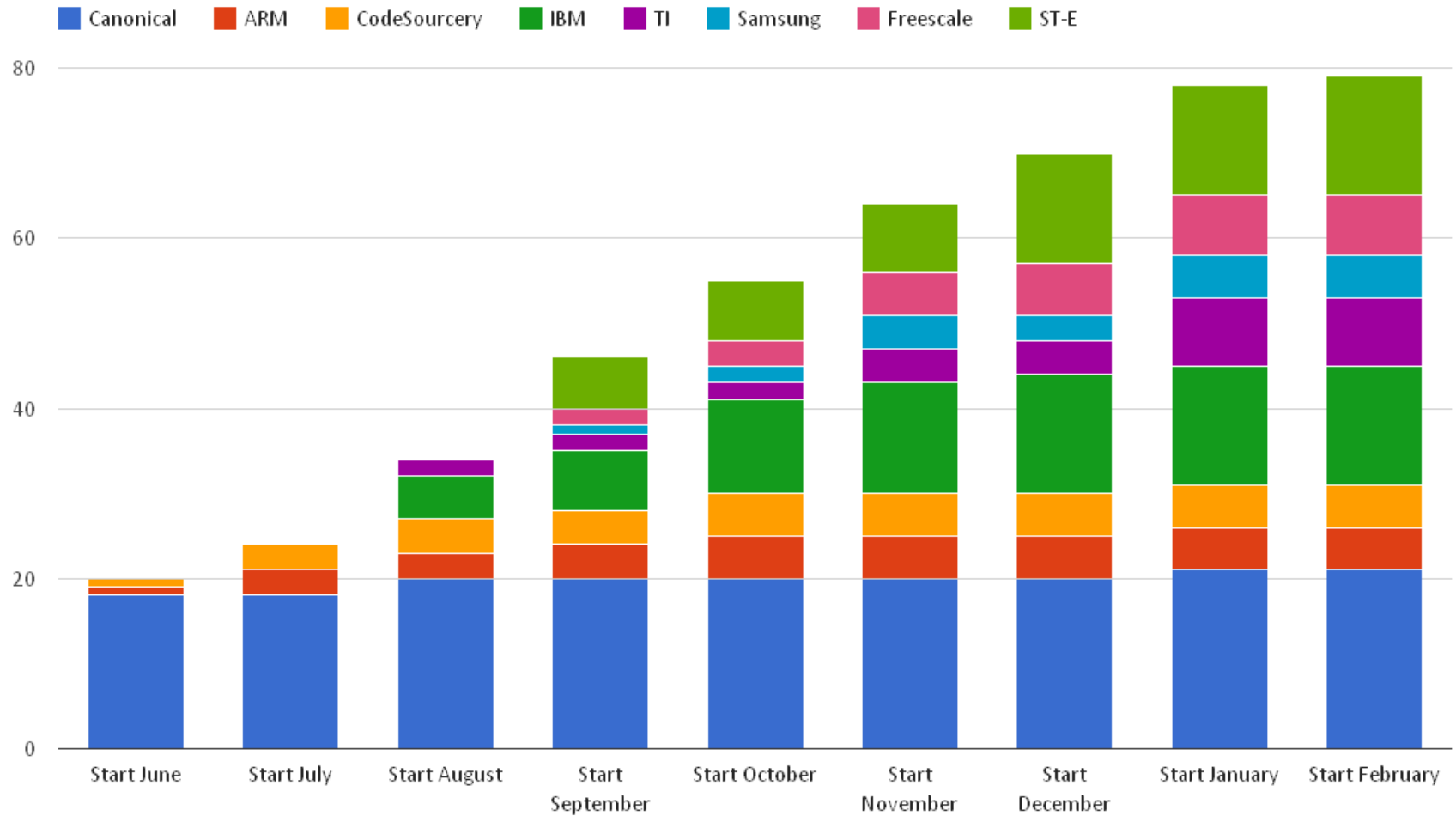


Linaro

- Linaro launched in June 2010
- Core engineering ~20
- Envisaged as an upstream engineering machine working on common embedded Linux problems
- Work in the open (see <http://wiki.linaro.org>)
- Spent the first six months building teams, fixing obviously broken things...



Engineering



Social Engineering

True

- Gatekeepers have strong views
- Open source release times are driven by engineering needs / realities
- Open source demands deeper involvement

False

- Open source is difficult to deal with
- Open source doesn't understand product time lines
- It's cheaper with open source

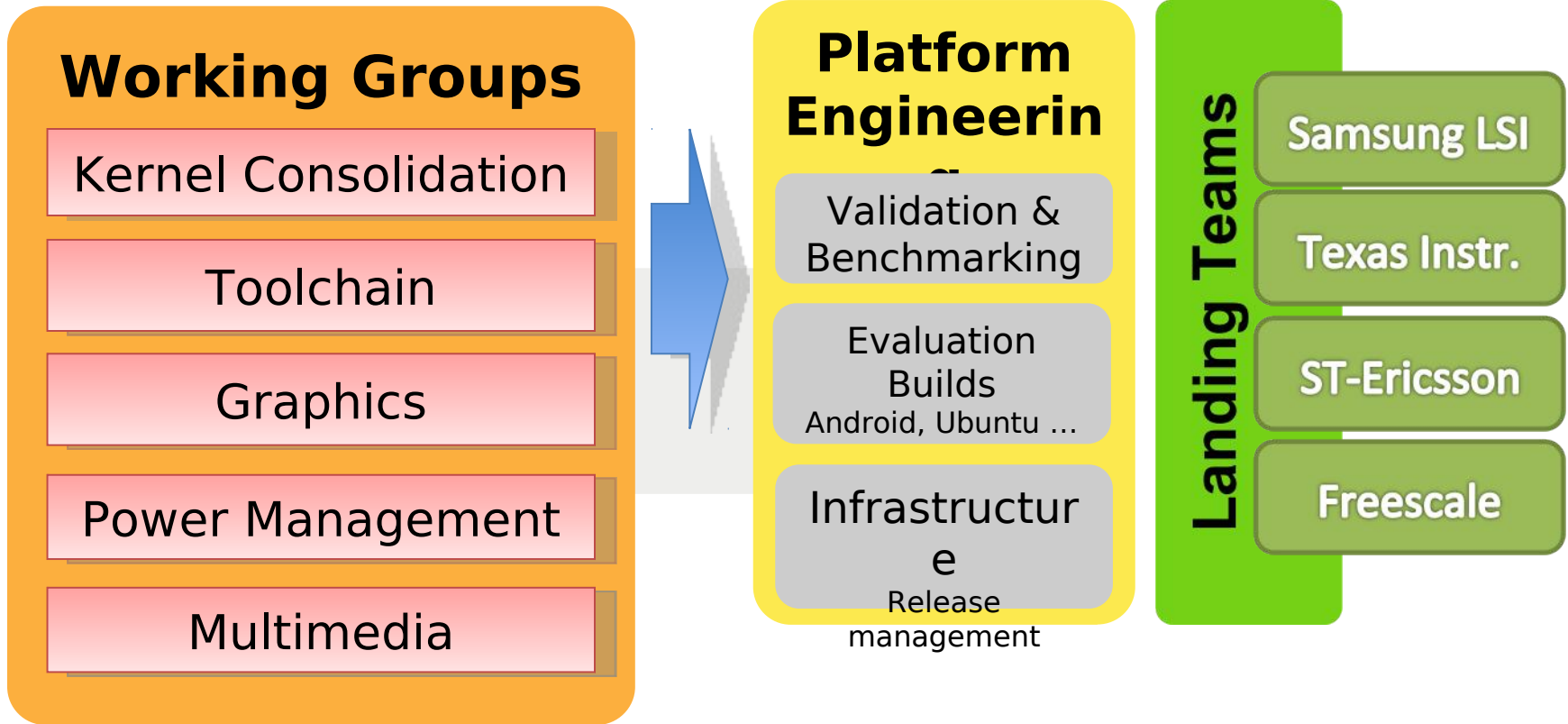
Command and control versus distributed engineering

How Does Linaro Work?

- Technical agenda driven by the members
- Working groups
 - Work in upstream projects
 - Consolidation and innovation
- Platforms
 - Evaluation builds
 - Validation and benchmarking
- Landing teams



Linaro Teams



The First Six Months...

- May 2010 to November 2010



Summary

- Mostly about building teams
- Focused on two key areas:
 - Toolchain
 - Kernel
- Span out power management from kernel
- Most engineering was consolidation (fixing obvious broken things)



Toolchain WG [1]

- Biggest problem, first to tackle
- Focus on ARMv7A, Thumb 2, Neon, SMP
- Work in the upstream, but
 - Current work lands in GCC 4.7
 - 4.7.0 ~April 2012
 - Distributions will use 4.7.1, ~July 2012 for their October 2012 release
 - So, need consolidation builds...



Toolchain WG [2]

- Scope
 - Core toolchain, gcc, glibc, binutils, gdb
 - Remedial work on qemu, valgrind ...
- Outputs
 - Stable integration branches (current and preview, now 4.5 and 4.6)
 - Upstream patches and reviews
 - Monthly tarballs



Nov 2011 Technical Highlights

- Kernel Working Group
 - BSP review reports
 - Implemented ARM kernel security, devicetree fixes
- Multiple toolchain releases
 - 8 linaro-gcc releases (4.4 and 4.5)
 - 2 linaro-gdb releases (7.2)
 - cortexstrings
- Power Management tools
 - Powertop for ARM, powerdebug
- Hardware packs for all upstream supported boards
 - OMAP3, Versatile and a very basic mx51
 - BSP-based for other boards
- Toolchain adoption by Ubuntu, OxLabs, Openbricks, OE...



The Second Six Months...

- November 2010 to May 2011



Summary

- Created two new working groups, Graphics and Multimedia
- Landing teams started up for all members
- Kernel, Power Management and toolchain started to tackle difficult, long term problems
 - Device tree
 - Segmented memory
 - Vectorization
 - Hotplug



Kernel

- Segmented memory
- Device Tree
- Use the latest SoC features
 - Thumb 2, SMP, HIGHMEM, Neon, Cortex-A9
- Help upstream code
 - Review patches, BSPs



Graphics

- Advance ARM Graphics state of the art
- GLES backends for Cairo, Skia, meegotouch-compositor, chromium-wm and compiz
- Work with vendors and upstream to document a common ARM-standard acceleration framework



Multimedia

- Benchmarking and testing
- Tuning codecs (Neon, T2)
- OpenMax standardized components
- Frameworks (gststreamer)



Linaro Lava Labs

- Web dashboard
- Collect metrics on a variety of hardware
- Run individual test frameworks from various Linaro WGs
- Smoke tests, build tests, testsuites, benchmarks...
 - Stream, LTP, Open Posix Test Suite, gmpbench, gtkperf, x11perf, glmempref, tiobench, qgears, es2gears, clutter-egl-es20, renderbench, glmark2-es2, UnixBench, Peacekeeper, Canvas Benchmark, GUIMark2, Biolab Disaster, Monster, Bbench v1.0, v8, quake3, coremark, sunspider, pybench, qa-regression-testing, LSB, MoonBat, Radiance test, Imbench, Kraken, GrafX Bot..



What Have I Learned So Far?

- That building a new engineering company from scratch (and donated engineers) is hard
- The ARM community can collaborate
- That things take longer than I want
- That there is still a lot to learn and do
- That open source is still wonderful



The Future...

- Beyond May 2011



Challenges

- Organizing ourselves better in open source communities such as kernel.org
- Boot architecture
- System wide power management (TTM, GEM, UMP other)
- Graphics – balancing proprietary and open source
- ‘Lumpy’ open source interaction



Graphics Acceleration

- Integrating GPU acceleration with distributions needs to be easier
 - Integration, redistribution and optimization
- The boundaries between open source and proprietary need to be more clearly drawn
 - Scope for moving these boundaries
 - As much a philosophical as a technical problem



Next Six Months

- Graphics
 - Embedded Memory Management
 - System-wide GPU Profiling
 - Compositing and OpenGL ES 2.0 Benchmarking
- Power Management
 - Consolidate around SMP Power Management
 - Drive forward Thermal management
 - Standardise measurement and tools



Next Six Months

- Toolchain
 - Improve GCC Performance
 - Widen the uptake of Linaro GCC through documentation, recipes, and binary releases
 - Standardize benchmarking



ARM Server

- ARM server hardware is coming
- The architectural details are published
 - <http://infocenter.arm.com/help/index.jsp?topic=/infocenter.arm.com/topic/DAI1486>
- Initially, this is all about consolidation
- Longer term, this is about tuning for diverse system implementations



Contacting Us

- IRC #linaro on Freenode; Twitter: @LinaroTech
- linaro-{dev,kernel,toolchain}@lists.linaro.org
- launchpad.net/~linaro-community
- wiki.linaro.org, www.linaro.org
- Public (phone) confcalls
- May Linaro@UDS (Budapest), July Rally (Dublin)





www.linaro.org

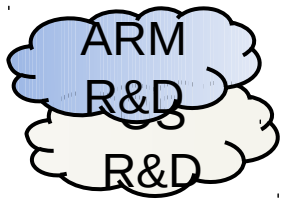


Changes

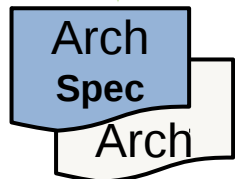
- ARM ARM license
- ARM published its LPAE and Virtualization extensions very early in the cycle
- Consolidation
 - Device tree
 - Power management
 - Kernel
- Upstreaming early
 - Panda board



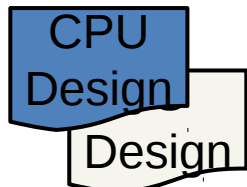
ARM Feature Development (5+ years)



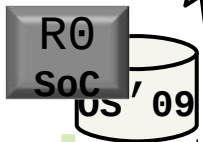
- Prototype ideas
 - Understand hardware and software benefits and implications.



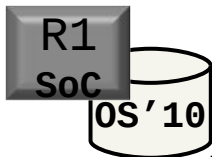
- Architect specifications
 - AEM models for architectural validation
 - Tool investigations
 - Fast ARM models for SW development.



- CPU design and implementations
 - RTL simulations, Palladium
 - FPGA systems for SW
 - Software and tools developments



- Open software developments
- SoC Delivery
 - Rev0 Silicon
 - Full speed SW development and tuning



- Product released

Software Development

