



# Ubuntu on ARM: Improvements and Optimizations Done by Linaro

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Ricardo Salveti,  
[rsalveti@linaro.org](mailto:rsalveti@linaro.org)

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# Topics

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- Ubuntu on ARM
- Problems with ARM support at Ubuntu
- Linaro
- Developer Platform
- Why Ubuntu?
- Improvements done over past 2 years
- Future Development

# Ubuntu on ARM: Early Days (1/2)

- Started around 2008, in collaboration with ARM
- Derived from Debian
- Modifications to better support faster devices
  - Initial support for ARMv5
- First release: Ubuntu Jaunty Jackalope (9.04)
  - Supporting Freescale iMX51
  - Targets: internet tablets and netbooks
  - Support for native builds only
  - Lot of time building and fixing the packages at the archive

# Ubuntu on ARM: Early Days (2/2)

- Second release: Ubuntu Karmic Koala (9.10)
  - Support for Marvell Armada
  - ARMv6 with VFP
- Third release: Ubuntu Lucid Lynx (10.04)
  - Additional support for Omap 3 (Beagleboard)
  - ARMv7, VFP and Thumb 2 (NEON in a few libraries, with run time detection, not by default)
  - Huge amount of work fixing and porting packages to be compatible with Thumb 2
  - Netbook Edition (EFL-based interface)



# Problems with ARM support at Ubuntu (1/2)

- Different images for different devices:
  - Images not produced by architecture/ABI, as done for x86
  - Huge amount of work maintaining all BSP kernel trees
  - Each board had it's own kernel tree, locked at a specific version
  - Hard to improve kernel upstream support, lot of development needed
- Hard to work with Embedded developers:
  - Lack of focus and lack of good hardware to use



# Problems with ARM support at Ubuntu (2/2)

- Lack of support for cross compilers
- No easy way to cross build packages
- Lot of development needed for basic enablement:
  - Boot Loader (sw bootloader, redboot, u-boot, etc)
  - Kernel (integrating BSP kernel, forward porting, etc)
  - Integration of binary blobs and hardware acceleration support
  - Toolchain fixes
- Second Class Citizen

# Linaro





# Bootstrap

- Announced at Computex in June, 2010
- Focus on fixing the Linux on ARM ecosystem:
  - Avoid fragmentation
  - Work towards common solutions and architectures
  - Upstream enablement and development
  - Common development and optimization across ARM revisions (initial focus on ARMv7 Cortex A8/9)
  - Single point for embedded developers using, enabling and supporting newer ARM targets/boards

# Reference Platform for Developers

- Need of a reference platform for Linaro
- Goals:
  - Integrate Linaro outcome from the different working groups for people to consume, validate and test
  - Platform to be used at the validation lab (LAVA)
  - Reference for both internal and external developers
  - Demonstrate the benefits of the work done by Linaro
- Initial focus on a Generic Linux platform
  - Easier for developers
  - Common across other architectures

# Why Ubuntu?

- Good support for ARM already:
  - Support for the newer ARM devices (ARMv7)
  - Thousands of packages available at the archive
  - Optimized for ARMv7 Cortex A8/9 and Thumb 2
- Great relationship with ARM Ltd.
- Most popular Linux Distribution
- Key developers assigned to Linaro from start
- Always focusing on latest and greatest hardware available

# Initial platform goals for Linaro

- Extend the support for additional platforms
  - Main platforms from Linaro Partners
- Enable Cross Compilation support
- Multimedia optimizations for ARM (Neon)
- Full enablement:
  - Device drivers
  - 3D acceleration and OpenGL ES2.0 support
  - Hardware video decode
- Compiler Optimizations

# Work done over past 2 years

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- Ubuntu Linaro Evaluation Builds
  - Based on the latest Ubuntu release available
  - Released monthly
  - Experimental platform before going upstream
- Engineering:
  - Toolchain
  - Graphics
  - Multimedia
  - Distro's Core
  - Kernel and Boot-Loader

# Improvements: Toolchain

- Native Toolchain:
  - Ubuntu now includes Linaro's toolchain as default
  - Changes applied for all architectures
  - Contains Linaro Toolchain monthly releases until FF
  - After FF Linaro helps with bugfixes and backporting
- Cross Toolchain:
  - Packages for cross toolchain now included by default
  - Based on the native compiler (with Linaro sauce)
  - No need for external cross toolchain

# Improvements: Graphics

- OpenGL ES 2.0 enabled as the default OpenGL option for ARM
  - Support for the main toolkit libraries, such as Qt, EFL and others
- Porting for OpenGL ES2.0:
  - Mesa utils
  - Unity 3D
  - Nux
  - Compiz
  - Benchmarks



# Improvements: Multimedia

- libjpeg-turbo as the default libjpeg provider
- **Alsa UCM:**
  - Support for Pandaboard at Maverick/Oneiric
  - iMX53 quickstart at LEB
- Improved support for DRM on Omap
- Definition of a common eglImage extension in progress:
  - Support for XBMC and Ubuntu TV at the Panda LEB

# Improvements: Distro's Core

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- Multi-Arch
  - Main solution for cross package compilation
- Cross Build
- Ubuntu LEB:
  - Hardware Pack
- ARM Porting:
  - Fixes and porting for issues only affecting ARM
  - <http://bit.ly/arm-porting-queue>
- ARMHF

# Improvements: Kernel and Boot Loader

- Improved Kernel support for ARM targets:
  - Omap 4 flavour based on TI's Landing Team tree
  - iMX53 package provided from the Freescale LT tree
  - Support for Snowball, Origen and iMX6 at the LEB
- Boot Loader: U-Boot-Linaro
  - X-Loader replacement with U-Boot's SPL
  - USB Booting with U-Boot's SPL for Pandaboard
  - PXE and TFTP support
  - Additional boards: iMX6, Origen, Snowball

# Future Development (1/2)

- Finish porting and enabling ARMHF
  - Only ARMHF should be supported for Ubuntu Precise Pangolin (12.04)
- Ubuntu ARM for Servers
  - UEFI
  - Grub 2
- big.LITTLE
- ARMv8 64bit

# Future Development (2/2)

- Continuous Integration:
  - Components available as git trees
  - Daily builds
  - Validation with LAVA
  - Test report for boards and targets
- New Requirements:
  - Ubuntu TV/Tablet/Car/Phone
  - Optimizations at the toolkit and application level
- Single zImage to rule them all



# Thanks!

Ricardo Salveti,  
[rsalveti@linaro.org](mailto:rsalveti@linaro.org)

IRC: rsalveti