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Ubuntu ARM - What Is It?

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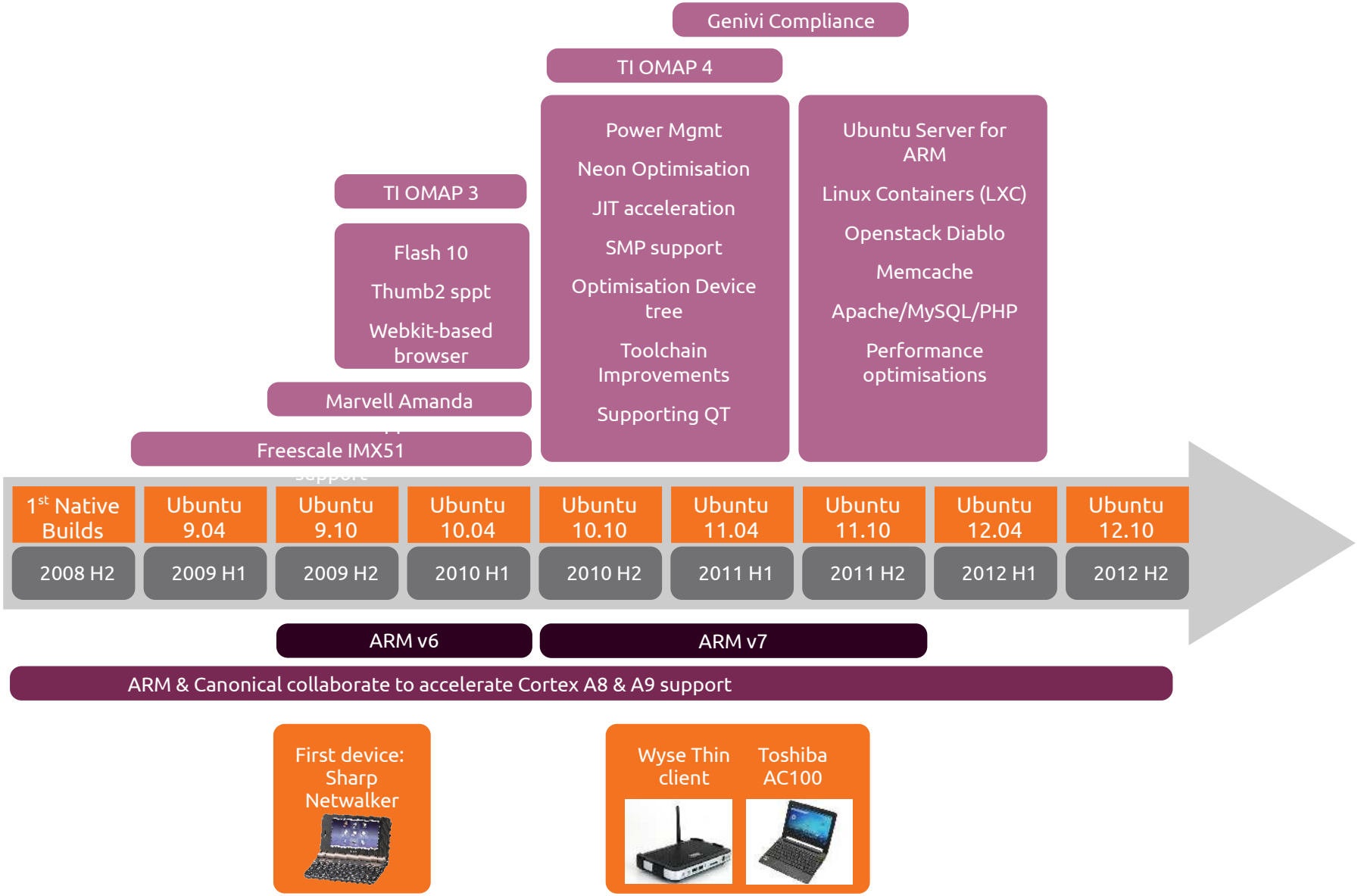
Ubuntu ARM - What is it?

Ubuntu ARM - What is it?

- Simply put, it's Ubuntu, the same Ubuntu as is on your x86 machine (laptop, desktop or server)
  - The same applications, recompiled for ARM System on Chip (SoC) RISC ARMv7 systems

Ubuntu and ARM – Since 2008



The Start

The Start

- First Started working on Ubuntu ARM in October 2008
  - Derived from Debian, but made significant compilation changes to improve speed:
    - ARM EABI
    - ARMv7 (ARMv5t, ARMv6 was available in early releases of the ARM port [jaunty, karmic])
    - Vector Floating Point (vfp)
    - Thumb2 instruction set (where possible) for smaller binaries
    - NEON (in Libraries only)
    - SMP support

The Start (cont)

- First release in April 2009 (9.04) supporting the Freescale iMX51 development

Compiled as ARMv5 UP

- Second release in October 2009 (9.10) supporting the Freescale iMX51 development and Marvell Dove

Compiled as ARMv6 UP

- Third release in April 2010 (10.04) supporting the Freescale iMX51 development, Marvell Dove, OMAP 3 Beagle board and very early OMAP 4 support

Compiled as ARMv7 SMP VFP

- Fourth release in October 2010 (10.10) supporting the Freescale iMX51 development, Marvell Dove, OMAP 3 Beagle board and OMAP 4 support

Compiled as ARMv7 SMP VFP

The Start (cont)

- Fifth release in April 2011 (11.04) supporting OMAP 3 Beagle board and OMAP 4 support Compiled as ARMv7 SMP

- Sixth release in October 2011 (11.10) supporting

The Client side: Compiled as ARMv7 SMP

  - TI OMAP 3 – BeagleBoard (community support)
  - TI OMAP 4 – PandaBoard (Canonical support)
  - Freescale iMX53 - Quickstart (Linaro support)
  - Nvidia Tegra 2 - Toshiba AC-100 Netbook (Canonical support)

- The Server side: Compiled as ARMv7 SMP
  - TI OMAP 4 – headless server image (technical pre-release)

Current Stable

Current Stable

- Seventh release in April 2012 (12.04) supporting:
  - The client side: Compiled as ARMv7 VFP SMP
    - TI OMAP 3 - BeagleBoard (community support)
    - TI OMAP 4 - PandaBoard (Canonical support)
    - Freescale iMX53 SoC - Quickstart platform (Linaro support)
    - Nvidia Tegra 2 SoC - Toshiba AC-100 Netbook (community support)

  - The server side: Compiled as ARMv7 VFP SMP
    - Will support certified hardware on LTS cycle (5 years)
    - Calxeda EnergyCore ECX-1000 (technical preview)
    - Marvell MV78460 – development board (Canonical support)

Current Stable (cont)

- Sizeable change to compilation options:
  - ARM architecture is now ARM hard float (ARMhf)
    - Ubuntu leading the way, first commercially supported OS compiled for ARMhf, we are working with ARM, and Linaro to set the standard
      - Better use of hardware registers in ARMv7 hardware, which makes all applications a little faster
      - Much faster rendering of fonts and other floating point intensive tasks
      - Future proofing, all ARMv7 hardware guaranteed to have floating point
  - ARM architecture ARM soft float (ARMel) deprecated but still present for 12.04 & 12.10
- Very large application base, ready to install
  - More then 20,000 application source packages in Ubuntu
  - More then 35,000 binary application packages ready to install

Current Stable (cont)

- Ubuntu is now multiarch clean, this is actually useful for several things
  - On Ubuntu x86 as a developer you can install exactly the same packages in the same directory space as will be found on your ARM hardware
    - You develop software for the ARM platform, cross-compiling it from your x86-64 desktop system. You install all of the build-dependencies as ARMhf packages, build your package, and test it directly on your desktop running it under qemu via binfmt-misc.
      - This makes sure that path dependencies are exactly the same on the development system as on the target system, no more errors due to incorrect paths
  - The multiarch directory scheme required in order to make library packages co-installable will be a target for FHS/LSB standardization in the future
    - Canonical is leading the way in standardization efforts around ARMhf
  - Allows installing both 32 bit and 64 bit Ubuntu OS on the same machine at the same time

Today

Today

- Latest working version Quantal Quetzal (12.10)
  - Will continue to support consumer development platforms
  - Will be third release of Ubuntu Server on ARM
  - ARM architecture continues to be ARM hard float (ARMhf)
  - ARM architecture ARM soft float (ARMel) deprecated but still present for 12.10
  - Expect to add several Enterprise ARM Servers in this release
    - Will back port to 12.04 LTS for 5 year support

Ubuntu Developers Summit May 2012

First public display of 2U ARM Server

Ubuntu Server

Ubuntu Server

Background	• Launched in 2006. Aimed at common workloads. More recently cloud and 'Big Data'
	• Aimed at Linux savvy administrators (No GUI)
Monetisation	• Security updates & critical updates are included without charge
A deeply disruptive model	• **Canonical charges for services only.** Ubuntu Advantage is a packaged set of services including telephone support, onsite technical help and management software
	• Customers are not forced to buy support on machines when deploying Ubuntu and can elect to only buy support on a subset of servers. This is very different from the Red Hat model
	• Over 200 ISV certifications
Strong adoption	• Emerging as the Linux of choice for next generation Cloud and Big Data workloads
ISVs, customers and OEMs	• Over 175 certifications with OEM server systems the likes of HP, Dell, Lenovo and IBM

ARM Server

ARM Server - Drivers for ARM Servers in the data center

Data center trends:

- Power = problem - $26B/yr to power and cool volume servers
- Facilities max'd on power means that there is a CapEx hurdle before deploying more servers
- Web and Cloud workloads are emerging as distinct addressable market

ARM SoCs fast evolving for server workloads

- ARM processors already deliver multicore 2GHz+ performance
- Virtualisation, 64 bit support coming over next 2 years
- Lower power is just the beginning. Re-architecting of the server subsystem , fabric and systems management to further increase the TCO advantages

Potentially large TCO Advantages (OpEx and CapEx)

- CapEx driven by lower acquistion costs and higher density at existing data centers
- OpEx drops based on power and cooling

ARM Server - Drivers for ARM Servers in the data center

Power & cool servers worldwide
$26B 2005
$45B 2011

*Source: IDC #203598 Worldwide Server Power and Cooling Expense 2006-2010 Forecast

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Ubuntu ARM Server

Ubuntu ARM Server

- Exactly the same source packages as Ubuntu for X86
- Targeting same work loads as X86 Ubuntu Server for the most part
- Recompiled for ARMv7 Thumb2, Hard Float
  - Contains some fixes as there were assumptions in some code:
    - Would never be SMP
    - Thumb2 vs Thumb (Thumb2 is ARMv7 only)
    - In some cases some code would not compile correctly for Thumb2 so just compiled those for ARM. (usually large amounts of assembly code)
    - Hard Float does not exist for platforms prior to ARMv7
      - Changes the calling conventions which broke code that has assumptions around that

Why Ubuntu Server on ARM?

Why Ubuntu Server on ARM?

Perfect match on target workloads

- Ubuntu is strongest in the areas that ARM will break into – Webservers, Hadoop & Cloud workloads.
- Popularity with developers will accelerate the very patching of FLOSS apps and ISV apps that is needed to see growing support for ARM in the ecosystem.

ARM experience

- Canonical has worked for three years with ARM and ARM partners on optimising for Cortex A8 and A9.
- Ubuntu is already natively compiled for Cortex A9 with Thumb2 optimisation and support for NEON switched on
- Ubuntu fully supports all Linaro optimisations and is the leading adopter of work from Linaro.

Ideal business model

- Canonical charges for Services not for bits. Customers do not pay for security patches or updates.
- Hyper-scale users (target market) strongly desire this model. This model also lends itself very neatly to Cloud deployments

Announced ARM Servers

Dell, May 2012

» **Company information**

» **Newsroom home**

News
- » News releases
- » **Online press kits**
- » Media relations contacts
- » Executive leadership
- » Newsroom archive

Multimedia
- » Videos
- » B-roll
- » Blogs
- » RSS feeds

Company info
- » Eco Solutions
- » Fast facts
- » Financial information
- » Global citizenship
- » HP Labs
- » Company history

More info
- » In the news
- » Awards
- » Student inquiries
- » Recalls and replacement programs
- » Trademarks

HP Innovations Shape the Future of Extreme Low-Energy Server Technology

Overview

HP today announced a new industry program, discovery lab and a server development platform focused on the advancement of extreme low-energy servers to significantly reduce complexity, energy use and costs. Combined with HP Converged Infrastructure innovations that allow the sharing of technology resources across thousands of servers, the offerings will pave the way to the future of low-energy computing for emerging web, cloud and massive scale environments.

News of the Day

» Press Release: HP Innovations Shape the Future of Extreme Low-Energy Server Technology

Additional Materials

» Quote Sheet: HP Helps Clients with Extreme Scale-Out Needs
» White Paper: Server Designs For Warehouse Computing Environments

Images and Video

Photo 1: HP Redstone Development Platform

HP Redstone Development Platform is the industry's first server development platform to feature extreme low-energy server processors that consume almost 90 percent less energy.
» Hi-Res Picture

Dell, May 2012

Shop Support Community

Solutions Services Industries Systems Printer Software Acces

Copper enables the ARM server ecosystem

Dell drives innovation for the ARM server ecosystem

Enterprises that run large web, cloud and big data environments are constantly seeking new technology to gain competitive advantage and reduce operations cost. This focus is motivating a dramatic interest in ARM-based server technologies as a way to meet these requirements.

What is ARM?

An advanced RISC machine (ARM) server employs small, low-power ARM processors, typically deployed as systems on a chip (SoC) to reduce space, power consumption and cost. ARM processors are present in billions of client devices, but they have not been previously adopted for use in servers, due to the feature set, performance and limited software ecosystem.

Moving ARM to the forefront

Dell "Copper" ARM server chassis and sleds

Unique issues around ARM server

Unique issues around ARM server

- ARM servers are very high density, on the order of 72 servers per rack unit (U) or even higher, so systems management becomes even more important then ever. When you are looking at more then 3,300 servers in one 19” rack, density becomes a real issue.

Unique issues around ARM server (continued)

- Some of these servers will require a minimum of 3 ip addresses per server so you use a lot of IP addresses quickly. On the order of 10,152 or more in a single standard 47U 8' tall rack, this translates to: Six racks of servers which will exhaust most of a class B IP address space (65,536 ip addresses)!
  - This presents some challenges to manage deployments, so we have validated Canonical tools to help make it easier both from deployment to management:
    - Juju
      - Multi system application management tool, think of it as apt-get for cloud and hyperdensity
    - MAAS
      - Manage hardware OS deployment (bare metal and virtual machines)
    - Landscape
      - Systems monitoring and management

Ubuntu ARM Server Project

Ubuntu ARM Server Project

- Goals
  - Validate Ubuntu ARM server packages on ARM enterprise server hardware
  - Benchmark and tune workloads on ARM enterprise server hardware
  - Complete project in two Ubuntu cycles (11.10 & 12.04) resulting in the first Ubuntu LTS release for Ubuntu ARM
- Target Workloads
  - Distributed Datastores
  - LAMP
  - Caching
  - Backup Server
  - Cluster

ARMv8 64bit ARM

ARMv8 64bit ARM

- ARMv8 64 bit ARM is coming
  - Canonical is working actively with ARM limited so that Ubuntu will be the first commercially supported OS running on ARMv8 hardware
  - There will be both Client and Server hardware for ARMv8
  - Canonical is working to standardize ARMv8 UEFI booting
    - This likely will take some time, we have a lot of experience booting u-boot and other methods of booting ARMv7 systems, they will still work if need be.
  - Canonical has been actively involved with unifying the ARM kernel tree, we continue to support a single unified Linux kernel
    - We will support ACPI on ARM as well as flattened device tree (FDT)
  - Of course the management tools that run on 32bit ARM today will run on 64bit ARM tomorrow

ARMv8 64bit ARM (cont)

- Ubuntu will allow management of your applications to get best use of RAM and power characteristics of the ARM cpu. The big draw to ARM servers clearly is much lower power consumption compared to other platforms
  - Ubuntu is now multi-arch, you can easily run both the 32 bit and 64 bit ARM applications on the same 64bit ARM machine at the same time.
    - This allows you to make best use of system resources, balance RAM and power usage to delivery needs
      - Not all applications running on a 64 bit system need to actually be 64bit, many applications don't use more then 4 gigs of RAM
      - Smaller 32bit binary save about ½ the memory space and load quicker
    - Allows you to select the appropriate sized application for best RAM and power usage. Clearly certain applications need to be 64bit (Databases, Java applications) but others can do everything needed in the smaller address space of the 32bit binaries

Ubuntu for Android

Ubuntu for Android

Inside every dual core phone, there's a PC trying to get out.

Ubuntu for Android

- Ubuntu for Android
  - There are a lot of separate devices out there today
  - Canonical has experience working with Android and Ubuntu running on the same device at the same time.
  - Boots as an Android phone, uses the Android kernel
  - Switches Ubuntu to the active display when docked
    - Can have a single mobile device that is the device that when docked drives devices with the correct screen layout

Ubuntu for Android

Desktop applications
100's of applications designed for desktop computing

Android & Ubuntu
Both experiences run alongside each other concurrently without the use of virtualisation

Connected
3G, 4G, Wifi, Bluetooth all integrated in desktop experience

Quick launch
Search for people apps, photos, music and video

Ubuntu Devices

Ubuntu Devices

- Ubuntu Phone, TV, Slate
  - Cell Phones, and Slates
    - Both run primarily ARM SoC's today and will continue to do so in the future.
    - TV's today run a mix of MIPS and ARM processors and are moving more and more to ARM
  - Announced at Ubuntu Developers Summit October 31st 2011
  - Early stages, work is being done on Unity to accommodate from small screen to very large screen
- See Mark Shuttlesworth's presentation at the October UDS.

Ubuntu Core

Ubuntu Core

- Ubuntu Core, what is it:
  - At its most basic level, Ubuntu Core is a minimal rootfs for use by anyone in the creation of custom images for specific needs
    - Smallest instance of Ubuntu that when combined with an Ubuntu kernel and a boot method will result in apt-get working (Base Core)
      - Delivers a functional user-space environment, with full support for installation of additional software from the Ubuntu repositories, through the use of the apt-get command
  - Gives full easy access to the entire Ubuntu archives via apt-get
    - Base Core - running basic system at a text prompt, as minimal as you can get.
    - Client Core / Ubuntu Interfaces - basic system including X, and if desired Ubuntu Unity interface or other GUI's from the archives
    - Applications – Community, Third Party, ISV, or Custom

Ubuntu Core (cont)

- Ubuntu Core, what is it:
  - Good for developing products from, it's the smallest Ubuntu footprint starting point
  - Available for ARM, and x86 both 32bit and 64bit
  - All open source with regular updates, just like the rest of Ubuntu
  - Gives OEM's and ODM's the ability to get commercial assistance and support for products.
- What Ubuntu Core is not:
  - Ubuntu Core is not a super small run-in-memory embedded distribution; it is the smallest implementation of Ubuntu that enables one to install other packages

Links

Links

- http://www.ubuntu.com/arm
- http://www.canonical.com/arm
- https://wiki.ubuntu.com/arm
- https://wiki.ubuntu.com/Core
- http://www.canonical.com/engineering-services/ubuntu-core
- http://design.canonical.com/2011/11/ubuntu-phone-tablet-and-tv-discussion-opened/
- http://www.youtube.com/watch?v=0bOwyGYTMv8&feature=youtu.be&t=24m42s
- https://wiki.ubuntu.com/UbuntuTV/Designs
- https://wiki.ubuntu.com/UbuntuPhone/Designs
- http://www.theregister.co.uk/2011/11/01/hp_redstone_calxeda_servers/

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Questions ?

Thank you