

Debian or Yocto Project?

Which is the Best for your Embedded Linux Project?

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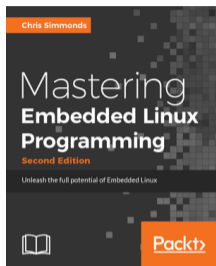
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About Chris Simmonds



- Consultant and trainer
- Author of *Mastering Embedded Linux Programming*
- Working with embedded Linux since 1999
- Android since 2009
- Speaker at many conferences and workshops

"Looking after the Inner Penguin" blog at <http://2net.co.uk/>



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Agenda

- The dilemma
- Debian
- Yocto Project
- Conclusions

The dilemma



- I am designing a new gizmo thing
- I want it to do many things
- I want to have it on the market as soon as possible - before the other gizmo folks get there
- BUT
- I want it to be robust, updateable, maintainable
- What should I do????

Choices

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Bespoke Build everything from scratch using a build system like Yocto (or Buildroot)

Debian

- Debian is a full distro with tens of thousands of packages
- Stable, long term support
- Binary, so no need to cross-compile

Board support for Debian

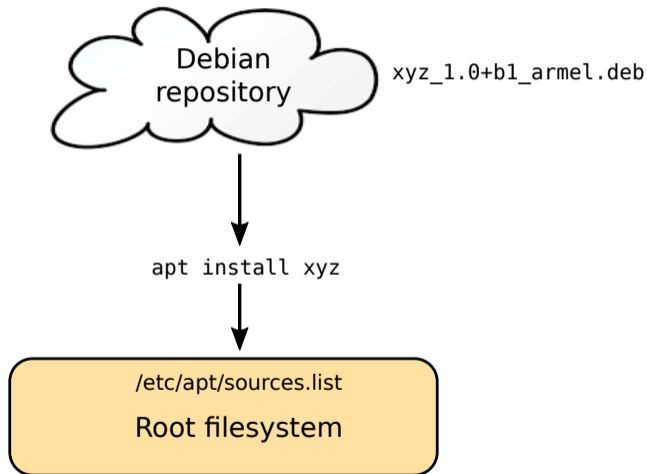
Debian architectures most relevant to embedded devices:

Architecture	Description
amd64	x86-64
arm64	ARMv8-A
armhf	ARMv7-A with floating point unit
armel	ARMv4T instruction set

Popular boards

- Raspberry Pi (Raspbian is Debian compiled for ARMv6 so that it is compatible with the Raspberry Pi 1 and Zero)
- BeagleBoards of all sorts
- many others...

Building a Debian rootfs



Developing on Debian: first pass

The overall procedure would be

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Resulting in a "Golden Master" image

The "Golden Master"

- Once development is done, use dd (or similar) to take a copy of the filesystem
- Clone it to all units shipped

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- Probably contains a finger-print of the person who created it
 - user accounts and passwords
 - `$HOME/.bash_history`
 - old system log files

Developing on Debian: second pass

You need a **robust, reproducible** build process

- Build a base system image using Rootstock, debootstrap, or similar
- Install only the packages you need
- Import your own software and configuration (ideally encapsulated as Debian packages)
- Examples
 - BeagleBoard Image Builder:
<https://github.com/beagleboard/image-builder>
 - Raspberry **Pi Gen** <https://github.com/RPi-Distro/pi-gen>

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 - just `apt update`
- But, updates via `apt` are not atomic resulting in corruption if power is lost during an update
- You will probably end up doing a full image update

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- Compiling natively on a low powered device is slow
- You still have to build the bootloader (e.g.U-Boot), kernel and kernel modules - these are not updated as part of the distro update

Yocto Project/OpenEmbedded

- With OpenEmbedded/Yocto Project you create a distribution to your own specification

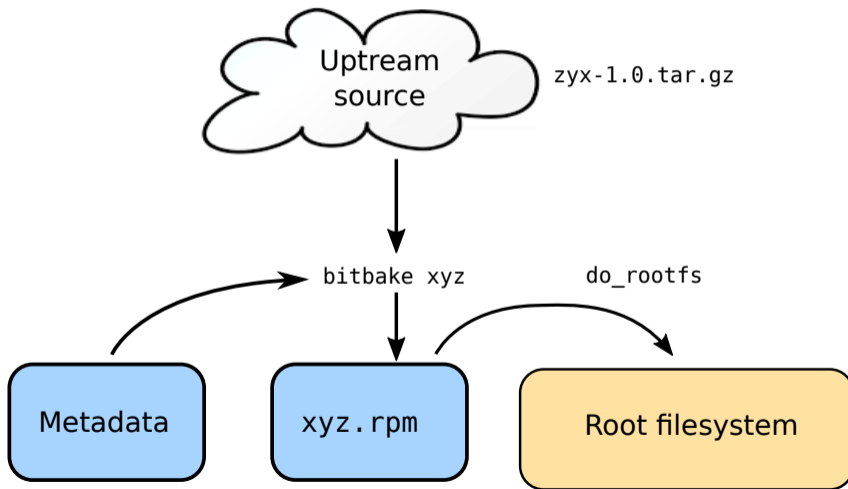
Yocto Project/OpenEmbedded

- With OpenEmbedded/Yocto Project you create a distribution to your own specification
- Build from up-stream **source** code
 - Control over every stage of compiling and building the target

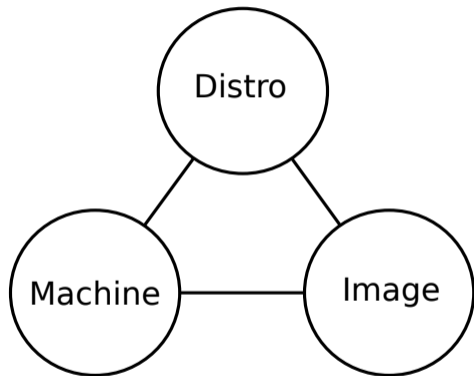
Support for Yocto Project

- Industry-wide support
 - Chip vendors of ARM, MIPS, PowerPC and X86 architectures
 - Board and System On Module vendors
 - Commercial embedded Linux software vendors, such as ENEA, Mentor Graphics, Montavista, Timesys and more

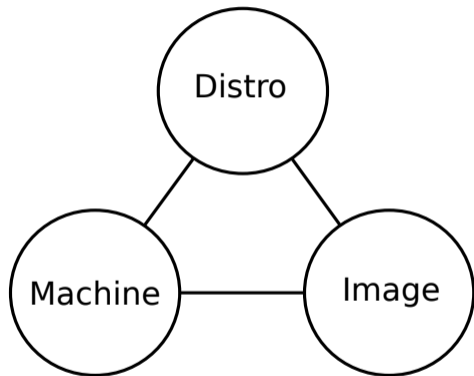
Building a rootfs with Yocto Project



It's all in the metadata

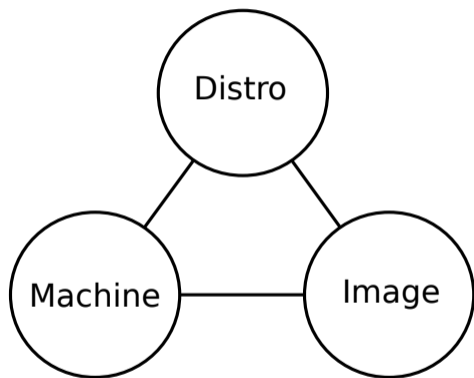


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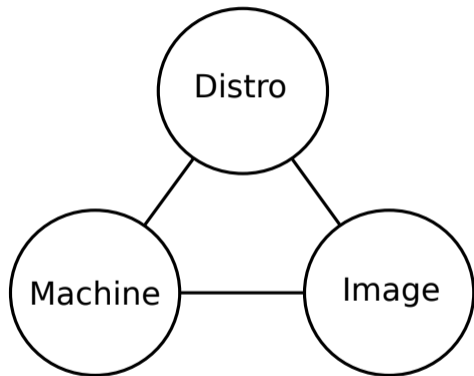
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- **Distro**: how I want to put my system together
- **Machine**: the board I want to build for
- **Image**: the selection of packages I want

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- The support window is less than Debian
 - Yocto Project LTS (Long Term Support) releases are supported for 2 years
 - the Debian LTS team provides support for up to 5 years
- Building the rootfs from source requires powerful hardware

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- One-off projects
- ... using commodity hardware such as Raspberry Pi

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Yocto Project is best for ...

- custom hardware (no distro available)
- reduced attack surface
- optimized for minimal memory and storage
- full report of packages and their licenses (needed license compliance)

- Questions?

Slides at <https://tinyurl.com/u7glahp>

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