Debian or Yocto Project?

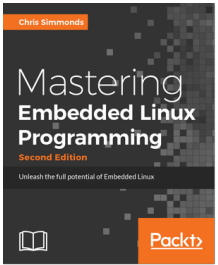
Which is the Best for your Embedded Linux Project?

Chris Simmonds

Embedded Linux Conference Europe 2019

License

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

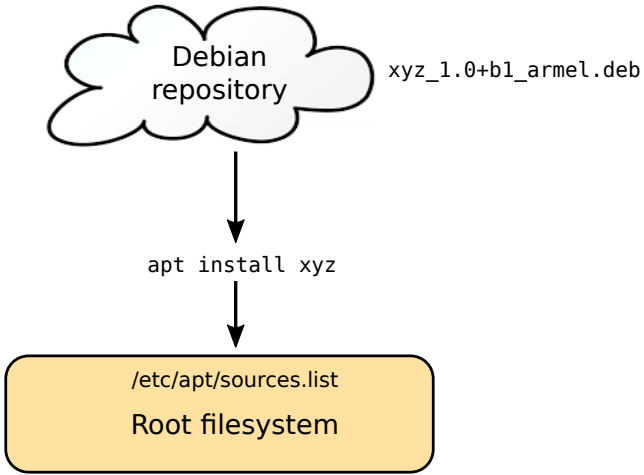
Debian architectures most relevant to embedded devices:

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 Debain compiled for the Broadcom chipset)
- BeagleBoards of all sorts
- many others...

Building a Debian rootfs



Developing on Debian: first pass

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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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  - 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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- 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

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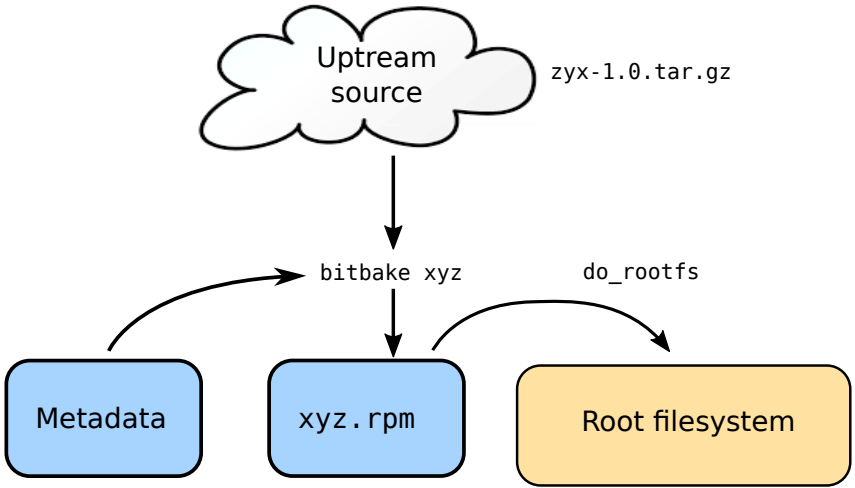
- With OpenEmbedded/Yocto Project you create a distribution to your own specification
- Build from up-stream **source** code
  - Control over every stage of compiling and building the target

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



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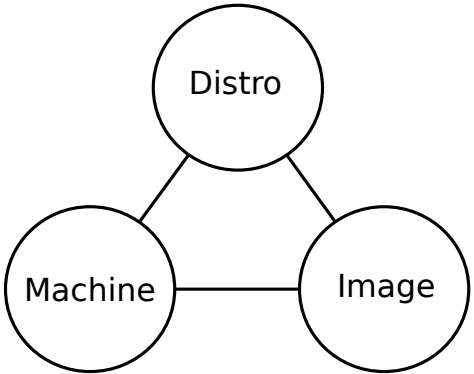

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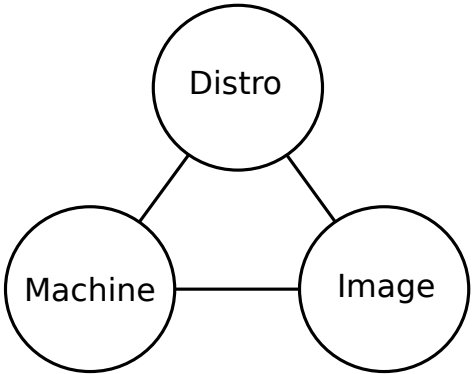

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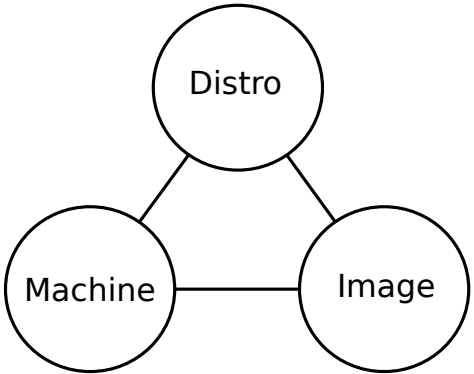

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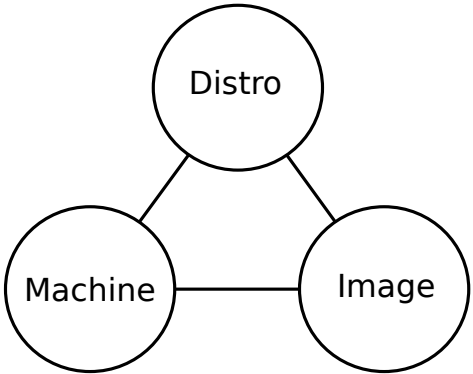

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- **Machine**: the board I want to build for
- **Image**: the selection of packages I want

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- ... using commodity hardware such as Raspberry Pi

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- full report of packages and their licenses (needed license compliance)

- Questions?