Bootstrapping ARM 64-bit with OpenEmbedded

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About me

- OpenEmbedded developer since 2004
  - Also Poky in 2007-2009
- At Linaro since beginning in 2010
  - as Canonical secondee
- Ubuntu developer since 2011
  - ARM cross toolchains since 2010
- Debian maintainer for some tools
  - Some Linaro ones and Android related
- Blogging about embedded Linux since 2005
  - http://marcin.juszkiewicz.com.pl/

AArch64?

- Aarch64, arm64, ARMv8
- New, 64-bit version of the ARM architecture
- New instruction set
- New triplet: aarch64-gnu-linux
- No hardware yet – expected in 2013
  - Free (as a beer) software model available: http://www.linaro.org/engineering/armv8

OpenEmbedded

- Build system capable to build everything from package to whole distribution with repositories
- Supports wide selection of architectures
- Allows to have overrides per architecture
- Uses layers to make doing changes easier

Linaro

First steps

- Create own layer for AArch64 stuff
- Adding basic support into OE classes
  - Siteinfo
  - Insane
  - Kernel-arch
- Machine definition
  - Architecture tuning files

Toolchain

- Gcc 4.7 with ARM patches
- Binutils trunk
- Eglibc with preliminary patches
- Gnu-config updated to 2012-08-14 one

- First problem: OE has huge amount of GCC patches and expects most of them to be applied

Build results

- September
  - 265 source packages built
  - OE 'micro-base-image' booted fine
- October
  - ~800 source packages built
  - LAMP image
  - SDK image
- Several toolchain bugs found and reported
  - Most of them fixed already

Typical problems

- Hand edited configure scripts
- Old gnu-config files in upstream sources (even 2002!)
  - OE takes care of it for most packages
- CPU or Architecture related definitions

Current status

- Merged into OpenEmbedded
  - Classes/ changes
  - Most of gnu-config related changes
  - Gnu-config update
- Available in meta-linaro layer
  - Gcc-linaro 2012.10 + some Aarch64 fixes
- Available in meta-aarch64 layer
  - Aarch64 backport of gcc-4.7 made by ARM
  - Binutils trunk
  - Eglibc patches

Linaro

Build instructions

- First clone repositories
  - `git clone git://git.linaro.org/openembedded/meta-aarch64.git`
  - `bash meta-aarch64/scripts/init.sh`
- Then do build like usual:
  - `bitbake nano`
- Longer description in Linaro wiki:
  - https://wiki.linaro.org/HowTo/ARMv8/OpenEmbedded

Lessons learnt

- Adding new architecture into OE is easy
- Kernel oops is not always failure ;)
- Layered structure of OE is one of greatest changes in last years
- Small change in compiler may costs hours of build time

Questions?

More about Linaro: www.linaro.org/about/
More about Linaro engineering: www.linaro.org/engineering/