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Buildroot: flexible building of a custom embedded system

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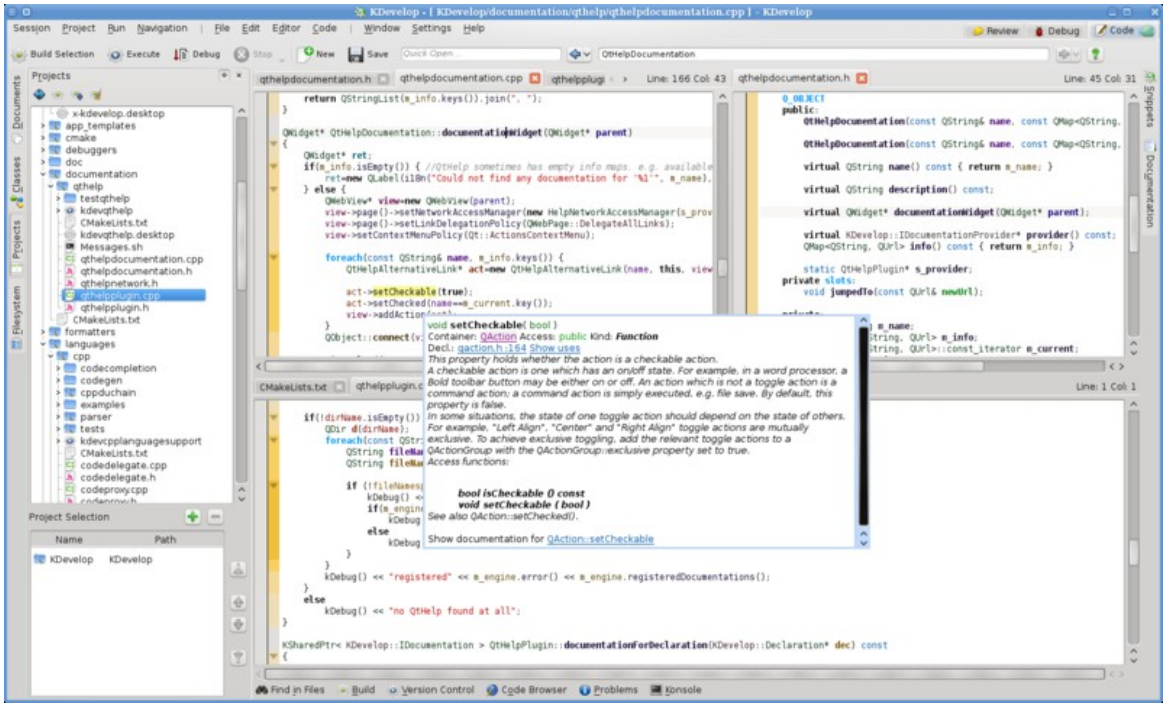
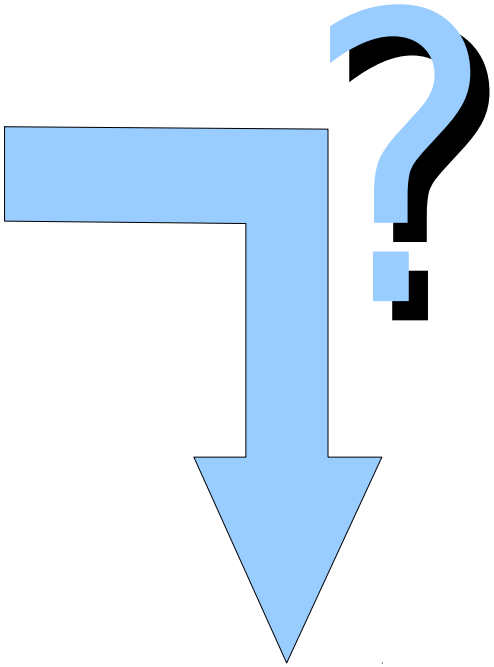
http://mind.be/content/Presentation_Buildroot-Open-Mobile.pdf

Is the device really hackable?





How easily can I install modified software?

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Buildroot: flexible building of a custom embedded system

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Overview

1. Buildroot for the device hacker
2. Buildroot for the device “vendor”
3. What's missing

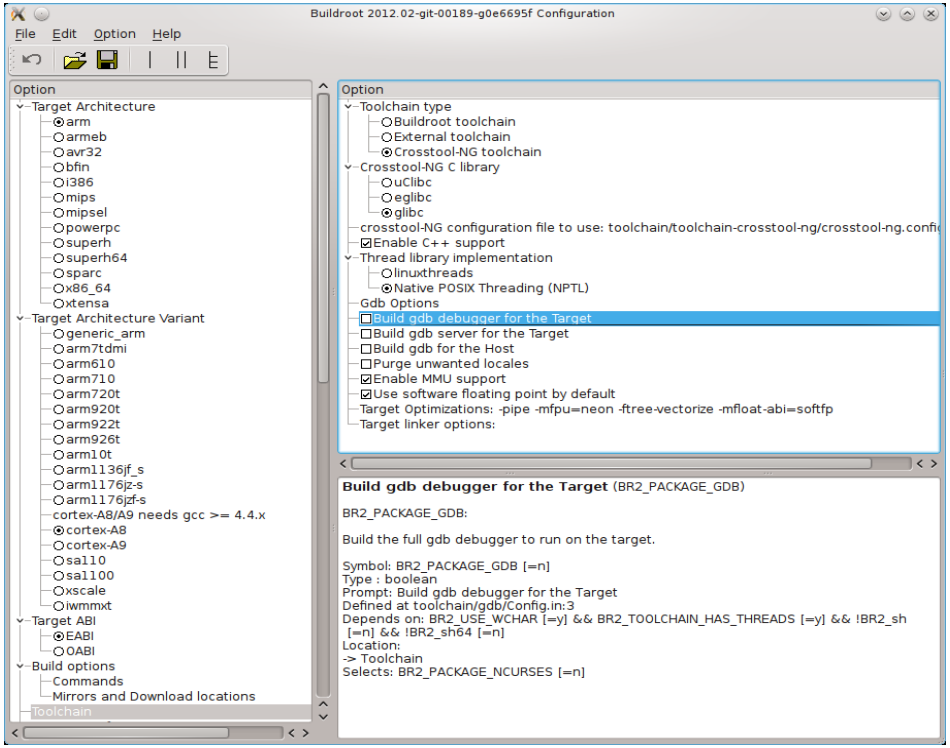
builds a complete system

- Buildroot builds:
  - Cross-compiling toolchain
  - Packages
  - Root filesystem image (ext2, jffs2, ubi, ...)
  - Kernel image
  - Bootloader (u-boot, barebox, syslinux, ...)
- Configuration system (Kconfig)
- Simple make-based system
- *No* run-time packaging system
- Small & medium-sized embedded devices
- Stable releases published every three months
- Active user/developer community

Workflow for Open Mobile device user (1/3)

Neuros buildroot

Makefiles
Kconfigs
patches



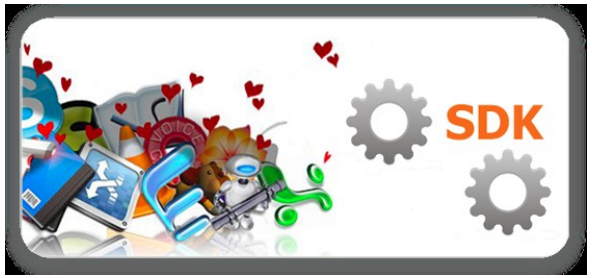

```
make neuros_defconfig;
make xconfig
```

Workflow for Open Mobile device user (2/3)

gnu.org
kernel.org
sf.net

make

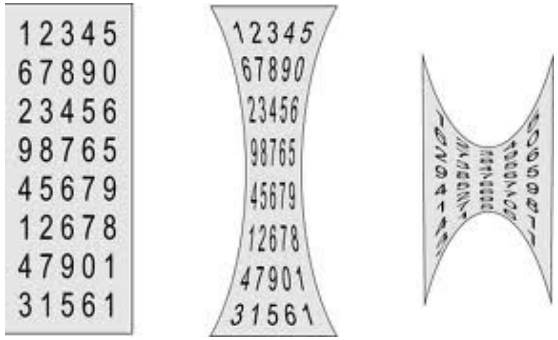
gcc
µClibc
linux
busybox
mtd-utils



compiler
C library
debugger
tools

boot loader

kernel



packages
skeleton
init

root fs image

Workflow for Open Mobile device user (3/3)

Create upgrade image

Upload to target

Workflow for Open Mobile device vendor (1/3)

Makefiles
Kconfigs
patches

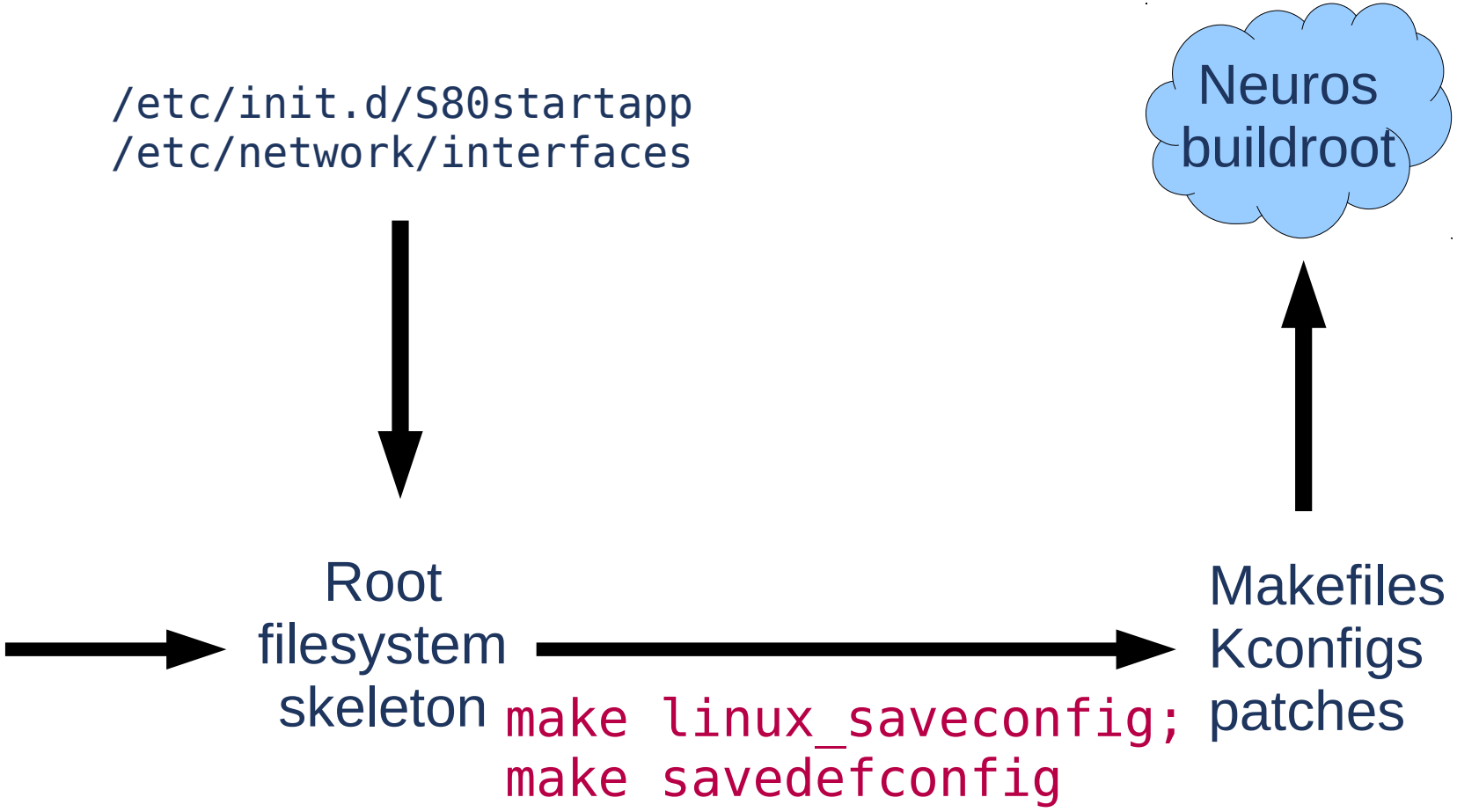
→ `make xconfig; make` →

board
kernel
patches

→

device
applications

Workflow for Open Mobile device vendor (2/3)



Workflow for Open Mobile device vendor (3/3)

Create production image

Upload to target

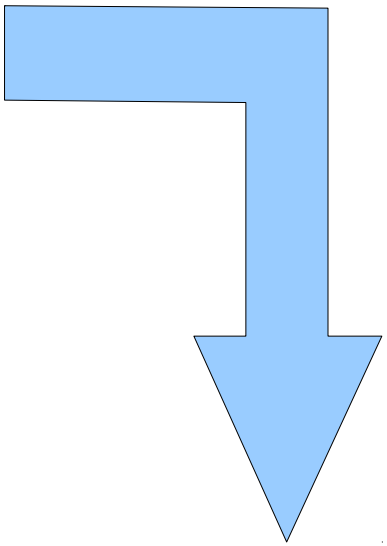
What is missing in buildroot

- No package manager (or appstore)
  - Doesn't generate packages to install individually (can create a package manager, though)
  - But can easily regenerate device firmware
  - Actually **gives you more control**
- No post-processing of images
  - E.g. write images to flash using JTAG
  - Device vendor should produce script to prepare upgrade image
  - Is very device-specific
- No standardized upgrade system
  - because there is no package manager
  - Somewhat device specific
  - See my talk in the Embedded devroom

Similar projects

- OpenWRT
  - focused on routers
  - does use package manager
  - UCI for configuration data
- PTXdist
  - very similar in goals and results
  - fully bash-based
  - slightly smaller community
- OpenEmbedded + derivatives
  - very popular
  - IMO more difficult to customize
  - slow :-)

Hacking the device is easy!



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