Embedded building tools
An audience survey

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Bootlin
https://bootlin.com/
Which tools to build your system?

OpenEmbedded
Buildroot
Scratchbox
PTXdist
LTIB
Home made tools
Firmware Linux

Vendor tools (Eclipse)
Gentoo embedded
Crosstool (toolchain only)
Crosstool-ng (toolchain only)
ELDK
Others?
Buildroot

Pros
Supports uClibc
Simple design (kernel config interface, set of Makefiles)
Efficient
Reproducibility of the build process

Cons
Fragmented community (official and unofficial repositories)
Doesn't support glibc
Takes care of building the toolchain (2 in 1)
No clean way of separating product-specific changes
No stable releases
Scratchbox

Pros
- Transparent cross-compilation
- Transparent execution
- Supports both uClibc and glibc

Cons
- No infrastructure for build reproducibility
- Complex to add new host tools (need to compile them)
- Only uses its own toolchains (can compile your own)
- No recipes, no tool patches shared with the community.
OpenEmbedded

Pros
Clean separation of the build tool and the recipes
Ability to generate a root filesystem and packages
Clean separation of product-specific changes
Widely used in the community

Cons
No stable releases
Steep learning curve
Very slow to run (for what reason?)
Too generic. Huge boot times
Packages mandatory
By Rob Landley

Not using cross-compiling, 
   but only native compiling thanks to Qemu

Similar approach than Scratchbox, but less tricks.

How mature is it (Rob?)
Home made tools

Pros
Meets your product needs

Cons
No free updates to mainstream software changes
High maintenance cost. Sometimes difficult to extend.
Only one person understands its design.
Lot of legacy cruft in it.
Don't always meet future product needs.
Pros
Clean separation of build system and packages
Supports both uClibc and glibc
Easy to extend to support new boards
Accepts standard toolchains

Cons
Only used on Freescale boards?
Size of community?
The other ones?

PTXdist
  Looks like Buildroot too
  Only supports glibc

Vendor tools
  Great features
  But difficult to evaluate without a subscription.
<table>
<thead>
<tr>
<th>Tools compared</th>
<th>License</th>
<th>Small systems</th>
<th>glibc (G) uClibc (U)</th>
<th>Reproducibility / Leverage</th>
<th>Popularity</th>
<th>Actively maintained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildroot</td>
<td>Free</td>
<td>Yes</td>
<td>G</td>
<td>Good</td>
<td>Good</td>
<td>Not really</td>
</tr>
<tr>
<td>Scratchbox</td>
<td>Free</td>
<td>Yes</td>
<td>G + U</td>
<td>Poor</td>
<td>Low</td>
<td>Yes</td>
</tr>
<tr>
<td>OpenEmbedded</td>
<td>Free</td>
<td>No</td>
<td>G + U</td>
<td>Good</td>
<td>Very good</td>
<td>Definitely</td>
</tr>
<tr>
<td>LTIB</td>
<td>Free</td>
<td>Yes</td>
<td>G + U</td>
<td>Good</td>
<td>Low</td>
<td>Yes</td>
</tr>
<tr>
<td>PTXdist</td>
<td>Free</td>
<td>Yes</td>
<td>G</td>
<td>Good</td>
<td>Low</td>
<td>Yes</td>
</tr>
<tr>
<td>Gentoo embedded</td>
<td>Free</td>
<td>No?</td>
<td>G (U?)</td>
<td>?</td>
<td>Low?</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware Linux</td>
<td>Free</td>
<td>Yes</td>
<td>?</td>
<td>Poor</td>
<td>Low</td>
<td>Rob never sleeps</td>
</tr>
<tr>
<td>Vendor tools</td>
<td>Closed</td>
<td>?</td>
<td>G + U</td>
<td>Good</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Home made</td>
<td>Closed</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>N/A</td>
<td>?</td>
</tr>
</tbody>
</table>
Building the toolchain

Buildroot
   Mixed with root filesystem construction, not really nice
   Only uClibc supported

Crosstool
   Not really nice configuration through shell scripts
   Only glibc supported

Crosstool-ng
   Much better configuration interface
   Supports both uClibc and glibc
   Hasn't attracted a lot of community attention (yet ?)
A universal tool?

Will you use...

to build...
A universal tool?

Will you use...

to build...
The ideal solution

Building ...

with ...

and ...
Tool survey

Number of users per tool in the embedded BOF

![Bar chart showing the number of users per tool in the embedded BOF.]

- Buildroot
- Scratchbox
- OpenEmbedded
- PTXdist
- LTIB
- Firmware Linux
- Gentoo embedded
- Vendor tools
- Home made
- ELDK
- uClinux-dist
- OpenWrt
Thank you!

Slides sources and PDF are available on