Running Linux on Handhelds
A trip through the land of handheld computing

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Outline

GUIs
- GPE
- Opie
- Hildon

Distributions
- Familiar
- OpenZaurus
- Angstrom

OpenEmbedded
- History, Goals and Design
- Status
- Success Stories
- Problems
- Example
GUIs

- Like on the desktop multiple GUIs exist
- In the commercial work Qtopia is the biggest, but almost always closed source
- Two main freedom fighters: GPE and Opie
- GNOME vs KDE turns into GPE vs Opie ...
- ... but with less flames
- New kid on the block: Hildon/Maemo
- based on GTK/X11
- uses the kdrive X server
- builds on diet-x11 to save some space compared to regular Xlibs
- **Fully** open source
- was very iPAQ centric in the past
- Desktop/folder UI
- Small demo at the end of this presentation
- works on your desktop too! Debian and Gentoo packages available
- Can run any desktop app within CPU and RAM limitations
- key apps have been ported to Maemo
- Less polished as Opie and Hildon
Opie
- Fork of qtopia 1.5
- **Fully** open source
- does **not** use X11, which makes existing applications harder to port
- applications require porting to QT/e, **but** numerous QT/e apps are available
- can run on your desktop using qvfb
- plans exist for a QT Hildon layer
- port to QT4/X11 is in being planned
- compatible with qtopia desktop for syncing with windows/linux
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Summary

Hildon

maemo.org
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- based on GTK/X11
- uses the kdrive X server
- uses slimmed down GNOME features like gconf and gnomevfs
- uses DBUS throughout the system
- very polished
- Not fully open source
- Tightly bound to the nokia 770
- UI only work with 800x480 screen
- but Nokia promised to improve all this
Commercial vs Community

- Like on the desktop numerous choices
- The distribution you get with your device (phones, routers, etc) is usually an ugly hack
- The community distributions are usually much cleaner, but need bigger geek skills
When creating an embedded distro you have to make a few choices:

- C library: glibc or uclibc?
- Package management: ipkg, deb, rpm or none at all?
- Filsystem: jffs2, ext2 or cramfs?
- Floating point emulation: hardfloat or softfloat? fpa or vfp?
- Boot sequence: sysvinit, initng or a custom solution?
- support for volatile storage like ramdisks?
Familiar

- Started as a distro for iPAQs
- Runs on iPAQs, Zaurii, simpads and more
- Wide adoption: Xbow project, US army, several companies
- Aims to be compatible with debian/ARM
- glibc, ipkg, hardfloat and using different types of filesystems
- very connectivity centric: ipv6, ppp, wifi, bluetooth and ipsec support in every image
Switched from native building to OpenEmbedded in 2004

0.8.0 had a lot of teething problems and missed the polish 0.7.2 had

0.8 series are getting more and more mature and polished

0.8.3 will be out soon™

0.9 will focus on stability and polish and merge in improvements proven to be stable from Angstrom
OpenZaurus

- Started as a replacement image for the Sharp stuff
- strong focus on open source and doing everything the right way
- 'the right way' interfered with userfriendliness in the past
- Used to be very Opie centric (OpieZaurus jokes)
- glibc, ipkg, softfloat and using different types of filesystems
- Have their own kernel hackers to port 2.6 to the zaurii
OpenZaurus

- Switched from using BuildRoot to OpenEmbedded in 2004
- similar problems as Familiar
- 3.5.4 will probably be the last OZ release
- will be replaced by Angstrom
Maemo

- Started by Nokia for their Nokia 770 internet tablet
- Based on and compatible with debian/ARM
- Very tight OS/GUI integration
- uclibc for initfs, glibc + deb for rootfs
- uses Scratchbox for ’cross’compiling
- brought us goodies like dyntick and dsp-gateway
Maemo downsides

- too much nokia 770 centered
- distinction between distro and GUI very unclear
- sucky package management
- Nokia’s management and legal department do not fully understand Open Source yet
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Angstrom Overview

- founded to unite Familiar, OpenZaurus and OpenSimpad
- No releases yet!
- builds on the principles of above distros: open source, connectivity and 'The right way'
- Aims to be very userfriendly
- wants to do for the handheld linux world what ubuntu did for the desktop world: polished, easy to use and robust distro
- Graphical bootmanager to allow booting from internal storage, external storage or network
- easy access to thousands of applications
- planned release: 2006.04
History, Goals and Design

- Founded by several OZ developers
- Designed after Gentoo's portage
- Built to scale from building a single app to a complete distribution with one command
- The project was split into `bitbake`, the core and `OE`, the metadata for the core
Status

- supports more than thirty different machines
- contains recipes for over 2700 packages
- supports numerous archs like x86, arm, mips, powerpc, sh3, sparc, .....
Success Stories

- Siemens uses it for internal projects
- as well as AMD
- and Philips
- Lineo just downloads our patches :)

Summary

Siemens uses it for internal projects
as well as AMD
and Philips
Lineo just downloads our patches :)
Problems

- developers don’t scale! ± 10 people actively maintaining over 2700 packages and machine descriptions
- steep learning curve because it’s too flexible
- Lacks documentation (excuse: ’over 2700 examples’)
- weak QA
Things that are good to know

- organized in **classes** (classes/*/*.bbclass), **configuration files** (conf/*/*.conf) and **recipes** (packages/*/*.bb)
- The GettingStarted wiki page at oe.handhelds.org has a detailed guide, but we’ll skip the details now
A few variables have to get in conf/local.conf (use local.conf.sample as a start) set before starting:

- Paths for storing downloaded sources, building, etc
- MACHINE=h2200
- DISTRO=familiar-0.8.3

start a build: 'bitbake nmap'
example recipe

- Shortest content of a recipe for a GNOME application (gnome-games_2.6.1.bb): 'inherit gnome’
- location of the source (SRC_URI) is loaded from gnome.bbclass using the filename to get the name and version
- build sequence (autoreconf, configure, make, make install) loaded from autotools.bbclass via gnome.bbclass
- does not know about dependencies yet, so we’ll need too add ’DEPENDS = "guile gtk+ libgnome libgnomeui librsvg gnome-vfs gconf libglade gnome-common”’

Start a build: ’bitbake gnome-games’
Summary

- Linux on handhelds is growing, but open source stays a bit behind
- Lots of choice
- Most tools are hard to use
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Links:
▶ http://handhelds.org
▶ http://gpe.handhelds.org
▶ http://opie.handhelds.org
▶ http://familiar.handhelds.org
▶ http://oe.handhelds.org
▶ http://www.openzaurus.org
▶ http://www.maemo.org