

# Running Linux on Handhelds

## A trip through the land of handheld computing

Koen Kooi

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- ▶ 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

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## Summary

- ▶ 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

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## Summary

- ▶ 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

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Summary

- ▶ 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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*maemo.org*

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## Summary

- ▶ 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

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Summary

- ▶ **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

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## Summary

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?
- ▶ Filesystem: 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?

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- ▶ 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

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## Summary

- ▶ 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**<sup>TM</sup>
- ▶ 0.9 will focus on stability and polish and merge in improvements proven to be stable from Angstrom

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- ▶ 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

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- ▶ 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

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- ▶ 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

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# 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

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## Summary

- ▶ Graphical bootmanager to allow booting from internal storage, external storage or network
- ▶ easy access to thousands of applications
- ▶ planned release: 2006.04

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# 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

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

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# Success Stories

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

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- ▶ developers don't scale!  $\pm$  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

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# 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](http://oe.handhelds.org) has a detailed guide, but we'll skip the details now

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Summary

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 to add 'DEPENDS = "guile gtk+ libgnome libgnomeui libsvg gnome-vfs gconf libglade gnome-common"'

Start a build: 'bitbake gnome-games'

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- ▶ 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>

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