OpenPhoenux Smartphone: Learnings from the past and ideas for next year

Christoph Mair, Lukas Märdian, Nikolaus Schaller
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What the inventors of „PC“ and „WWW“ did want…

**computation, storage and communication is personal**

**WWW connects decentralized servers and clients to share**

**everyone controls his/her data published to the net**
...but the Mainframe Dinosaur (or Borg?) is back!

- Cloud & **Centralized** Services
  (iTunes, AppStore, FaceBook, Google, ...)

- Facebook tries to become „The one and only Internet Portal“

- Mainframe architecture!
  (Logically) Centralized Storage + **thin clients** (= Smart?Phones)

- The user is not using the Web but becomes an **object** in the Web

- The operator of the Computing Center **owns the User** and the World...
  (they even know things about you that you don’t know)

- Millions of different Apps replace the universal **Web-Browser** concept and try to inject advertizing and data collection everywhere
You don‘t believe?

• Marketing and urban legends tell you:

  Android and iOS are open enough for everybody. Yes!

• No.
• not every bit and piece is open and extensible or even long-living
  • Try to provide your own home screen to iOS. Even Facebook Home failed.
  • Try to connect a hardware keyboard. If you are lucky you have an USB host port. But do you have the driver?
  • Try to get an upgrade for your 2 years old Android device.
  • Try to understand why your device fails in a specific situation.
  • Try to make sure your data is safe.
Solution: The Independent Mobile (communication) Tool Community

World of OpenPhoenuX

Software
- QtMoko
- SHR
- Replicant
- QuantumSTEP
- U-Boot/Kernel
- PVR-SGX

Hardware
- GTA04
- DIY Case
- Tablet
- FRNB
- GTA02
- GTA01

Community
- Openphoenix.org
- Mailing List
- Project Server
- Software Index
- OHSW.org
- Stammtisch
OpenPhoenux Community

wants to be independent from this policed but still unsafe world

needs support by independently thinking people

please join and support!
OpenPhoenux stands for

- **participation** by everyone
- **long-term support** (e.g. software upgrades for an 2007 Neo 1973)
- **fights** planned **obsolescence** through open hard- and software
- **hardware production** near to users (Europe) under **fair** labour **conditions**
- **everybody** plays client and server roles and **keeps control** over his/her participation
- allows to **inspect** what the system is doing
- can be **repaired** using standard parts
- **extensible** hard- and software - DIY (e.g. 3D case)
- **no** central, intransparent, stock exchange listed instance that gives **directions**
- **independent** from the "modern mainframe" and back to the networked, **decentralized web**
- makes the technical system **transparent**, not the user
OpenPhoenux already has

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- free&open GNU/Linux/U-Boot based

- Infrastructure

- Developed new hardware with open schematics and good documentation; assembled in Bavaria

- Community created cases (wooden, 3D printed, aluminium)
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Hardware

• GTA02 hardware (Openmoko Freerunner) did go out of production in 2009

• How do we improve the hardware?
  1. open kernel for big ${BRAND} \rightarrow$ reverse engineering
  2. order design from some ${MANUFACTURER} \rightarrow$ hope for openness and long-term support
  3. DIY, “Use the source, Luke!” \rightarrow GTA04
Using the source: Beagleboard

Beagleboard
• Full Linux support
• Open schematics
• Open layout
• Expansion connectors
• Lots of documentation
• Components available
In theory it could fit (Aug. 2010)
GTA04A2 (Feb. 2011)
GTA04A3 (June 2011)
GTA04 Features

- RS232
- Optional Camera
- GPS
- up to 32 GB SDHC
- USB 2.0 OTG
- Stereo handsfree
- Gyroscope
- Compass
- IrDA
- optional Torch/Flash
- WLAN/Bluetooth
- Barometer
- Accelerometer
- DM3730-800MHz (TI OMAP w. DSP and 3D Graphics)
- 512 MB RAM/NAND
- FM/RDS transceiver
- Audio in / TV out
- Display connector
- optional Ambient light sensor
- UMTS module
Production Problems...
Before Reflow Soldering

OMAP3530 -> DM3730 (Die-Shrink)
Heat to 260°C...

Warping squeezes balls in the middle
-> short circuits on VDD1, VDD2
-> difficult to repair, expensive
Solution: Vapour Phase
The GTA04 module approach
Letux 3704 portable terminal with WiFi/BT,

- Bigger display
- Big battery
- without 3G
- RFID reader included
Letux 7004 Tablet Prototype

- 7 inch tablet
- GTA04 inside
- UMTS (optional), WLAN, BT, GPS, USB
- ~10-15h operation time
- Qi inductive charger
Hardware Keyboard Prototype
Mass production: GTA04A5

• GTA04A5 revision of PCB is ready to go to production
  • small modifications to replace obsolete components or improve production process
  • fix small bugs

• Price is still high due to small batch size
• But: there are not enough orders to start a new batch
  (200 units could be produced within ca. 8-10
Is this a problem unique to OpenPhoenux?

• No:
  • - Ben Nanonote
  • - Vivaldi (Spark)
  • - Always Innovating, GeeksPhone, ...

What is the root cause?
• - building hardware costs money
• - components get only cheaper in high quantities
• - small projects don't have the financial backing to buy high enough quantities to fulfill users's price expectations that are defined by big players

• Kickstarter?
• - US based
• - needs something unique and new that attracts *new* customers/consumers (like Pebble, RFduino, ...)
• - but must also be comparable in price to alternatives (e.g. Nexus 4)
• - needs a big team to prepare a professional campaign or will fail immediately
• - the quality expectation is very high!

Für die „Tonspur“ / Diskussion
Community Hardware has an inherent cost problem (1)

<table>
<thead>
<tr>
<th>Cost</th>
<th>Development</th>
<th>Production</th>
<th>Distribution</th>
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</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>high</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td>lower</td>
<td>none</td>
<td>very low</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>(everything online)</td>
<td>(downloads only)</td>
</tr>
<tr>
<td>Commercial</td>
<td>high</td>
<td>goes down with volume</td>
<td>medium</td>
</tr>
<tr>
<td>Hardware</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td>lower</td>
<td>higher due to low volume</td>
<td>same</td>
</tr>
<tr>
<td>Hardware</td>
<td></td>
<td>(volunteers, less quality</td>
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<tr>
<td></td>
<td></td>
<td>management, documentation)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(and fair conditions)</td>
<td></td>
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</tbody>
</table>
Community Hardware has an inherent cost problem (2)

- Community Software is inherently cheaper than commercial.
- People compare prices of production batch size 1 Mio-units vs. 100 units and find the commercial (closed) HW much cheaper than the community developed (open) device.
- “... too expensive!“, “... scam!“, “... Vivaldi announces 200 EUR“!
- there is no solution or „white knight“ - open hardware is and will be more expensive.
OpenPhoenexus already has: Mechanics

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Infrastructure
Wooden case by Radek
Wooden case 2
Laser sintering by Shapeways

Modify 3D CAD data from Openmoko GTA01/02

Different materials and color options are available!
Case Production

• Step 1: reproducing the original Freerunner case, using 3D printing technology
Case production

• Step 2: generating a 3D model from the PCB data in a semi-automatic way.
How it works

PCB data
GTA04.brd

EAGLE ULP script

gta04-pcb.py

gta04-parts.py

gta04-case.py

Python scripts

FreeCAD Python Interpreter

gta04-model.stp

gta04-case.stp

3D data in standard format

code written by hand
• Step 3: design a good looking & feeling case (based on PCB model / generated ref. case)

Design contributions are VERY welcome. We're looking for industrial designers / 3D modellers!

http://download.goldelico.com/
gta04/CAD/
http://slyon.de/CAD/
Case Production 4

• Alternatives: Do It Yourself!

RepRap, Alu/Wood milling, deep-drawing
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QtMoko

• Based on Debian
• Consistent Qt UI (on Framebuffer)
• Primary OS in GTA04 community
• Stable and usable as daily phone (calls, messages, browsing, games/apps, …)
• http://qtmoko.sf.net
• Based on OpenEmbedded
• Xserver with Enlightenment, Qt,
• GTK, … (Freedom of choice)
• Small userbase, small group of developers
• Useable as daily phone, if few manual tweaks are applied
• http://shr-project.org
Replicant

- Based on Android (v2.3)
- Very fast UI (not accelerated)
- 1 kernel issue left (resolved?!)  
- Available for broader usage, now
- Small group of developers
- http://replicant.us
Debian/LXDE

• plain Debian, including minor addons
• Stable reference system, preinstalled
• Good starting point for own (HW/SW) projects
• LXDE (not optimized for touchscreen)
• http://projects.goldelico.com/p/gta04-rootfs
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Hardware

We could do a lot of things, if there were more support by interested people, e.g.:

• build many more GTA04A5 boards
• build new complete devices with 3D printed cases
• build a lot of Letux 7004 tablets
• prototype a Cortex A15 variant with bigger display and LTE
• work on a hardware keyboard
Software

• Due to the open bootloader, open drivers and open documentation it is possible to port any OS to the GTA04 platform.

• Are YOU interested to port e.g. WebOS, FirefoxOS, UbuntuPhone, SailfishOS, $\{your\_favourite\}OS to the most open hardware platform available?
WANTS YOU!
Q&A

• Meet us @ Booth 141-144, Hall 7.1c („Hardware & Embedded Corner“)

• Visit
  www.openphoenix.org

• Become Independent!