The Making of the Openmoko Neo

http://www.openmoko.org/

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What's the goal ?

A Free* mobile phone for the masses.

- What does that mean ?
- How to do it ?

* "Free" as in "Free speech". We're still working on the "Free beer".

Making a phone ...

... is easy. All you need is:

- a hardware design
- a factory
- a bit of software

Outline

- Chronological structure for hardware, system, and company
- The GUIs
- The future

What freedom ?

- Freedom to tinker
- OSS-friendly hardware
- Linux (but could be anything)
- Open Source user space
  Middleware, GUI, applications
- Open standards and protocols
  E.g., X11, DFU, . . .

How it all began

- Harald Welte: OpenEZX, kernel hacker
- Sean Moss-Pultz (manager of feature phone project at FIC): likes the idea and convinces his superiors
- Michael 'Mickey' Lauer: OpenEmbedded, OpenZaurus, Opie
- OpenMoko starts as project inside FIC
  FIC makes features phones, PCs, ...
  FIC has software and hardware people, factory, ...
- Kick-off August 2006

Openmoko today

- Openmoko Inc. is independent company
- Some 70+ employees (mainly engineers)
- Headquarters in Taipei
- FIC's factory in China
- External contractors located in .de, .uk, .us, .au, .fr, .cn, .ar
- Contributors from all over the world

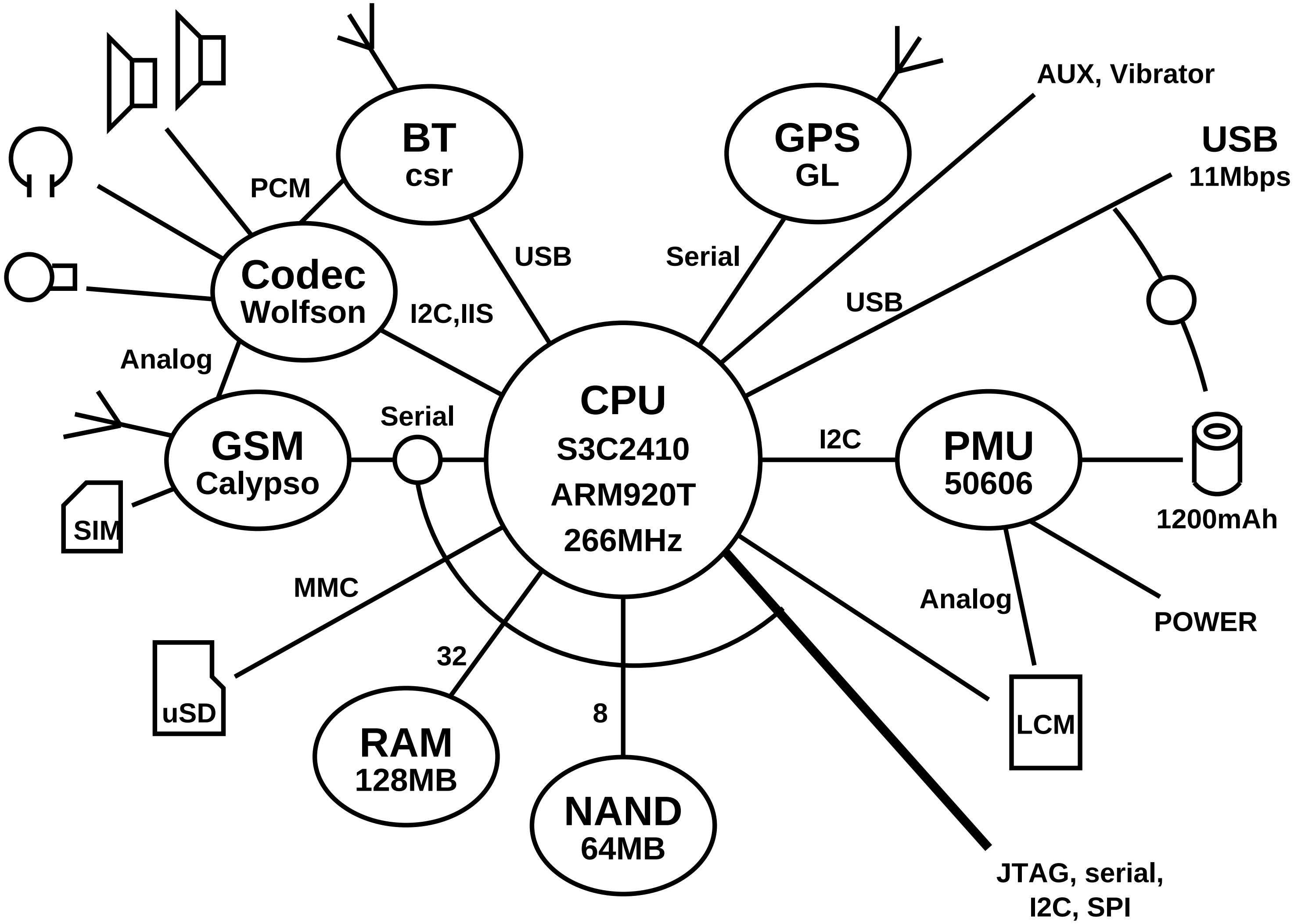
Challenges

- Start-up “coreteam” vs. big company
- Open source vs. traditional industry
  - Find OSS-friendly chips
  - No proprietary drivers
- East vs. west

Neo 1973 (GTA01)

- Proof of concept
- Hackers only
- Available ~~February~~ July 2007

Neo 1973 hardware



Tinkering with GTA01

- Use only chips with Open Source drivers (well, almost ...)
- Debug connector
  JTAG, serial console, and other goodies
- Test points
- Boot loader with feature-rich console (u-boot)
- DFU for firmware upgrades
- We even shipped torx screwdriver and guitar pick

Debug board

- JTAG
  Supported by OpenOCD
- Serial console
- Assorted gadgets
  - 2 downstream USB ports (100 mA)
  - JTAG header (optional)
  - Console header (optional)
  - SPI/I2C header (optional)

Why so late ?

- Everything is new
  Sourcing, factory, distribution, . . .
- User interface
- 9 hardware revisions until it worked
  (or so we thought . . .)

Neo 1973 problems

- GUI is slow
- GPS not as free as we thought
- Where's the 4th band of our Quad-band-*capable* GSM chipset ?
- GSM/console multiplexer

Open vs. industry

- What they say: "It will be free"
- What we hear: "It will be Free"
  (i.e., "GPL fun for all")
- What they mean:
  We will provide a binary daemon licensed to your customers (and only them) free of charge under the usual EULA.
- What we get in the end: an ugly binary

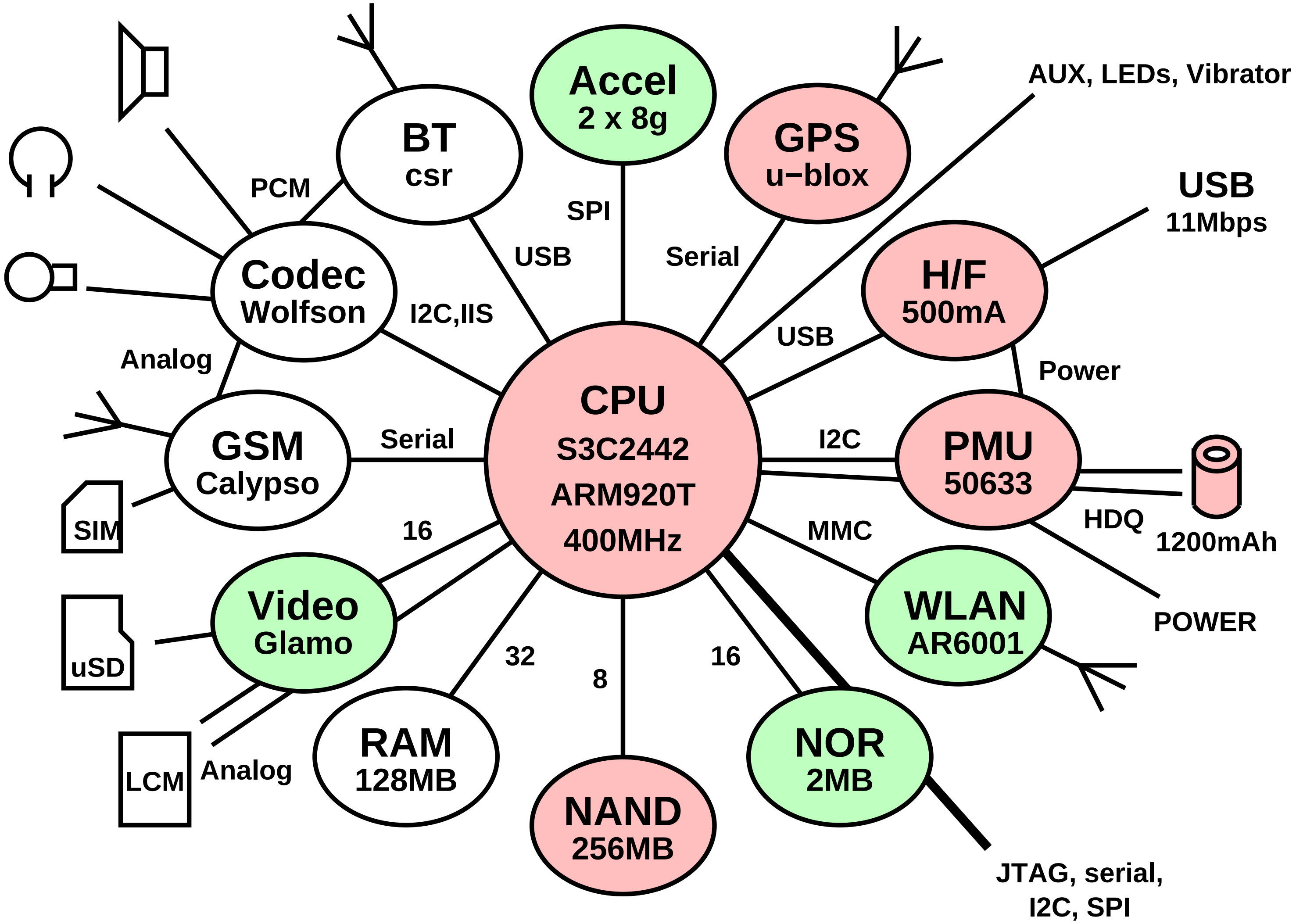
Finding chips

- Many don't understand what we need
- Culture of closedness in certain areas
- Maketing vs. reality
- We're small
  Fortunately, Linux is big

Neo FreeRunner (GTA02)

- Make it faster
  Particularly graphics
- Add WLAN
- Replace GPS
- 850/1800/1900 MHz and 900/1800/1900 MHz version
- Recovery with “unbrickable” NOR
- Intended for wider audience
- Marketing made the box look nice
- Available ~~September 2007~~ July 2008

GTA02 hardware



Openness progress

- Published the GTA01/GTA02 CAD files
- More technical discussion on public lists
- Almost all code moved to publicly accessible repositories
  Applications, Production testing
- Schematics (GTA01/GTA02) to be released
  (minus a few modules under NDA)
  Early August, check `www.openmoko.com`

Did we say late ?

- Competing project (Dash)
- Internal (re)structuring
- Transfer to the factory went slowly
- 5 hardware revisions until it worked
  (or so we thought . . .)

Neo FreeRunner problems

- Graphics "Acceleration"
- GSM audio noise and echo
- Charging issues
- Bad GPS reception
- Sluggish boot

Community

- Very enthusiastic
- Fans made even "commercial" videos
- Find and fix bugs
- Even maintain large subsystems
  E.g., Mike Westerhof

User interfaces

Why only one if we can have four ?

- OM2007.1 (shipped with Neo 1973)
- OM2007.2 (shipped with Neo FreeRunner)
- ~~April~~ August Software Update
- FSO and SHR

OM2007.1

- Gtk+
- Lots of eye candy
- Overweight
- Ad hoc middleware
- Went through too many hands
- It's dead, Jim

OM2007.2

- Same foundation as OM2007.1
- Leaner
- Cryptic
- Main reason it still exists:
  Need to have *something* to ship
- Obsolete ? (See below)

ASU

- Qtopia-based
- Mature "standard" applications (from Qtopia)
- Plus our own goodies

  Built around EFL, Enlightenment Foundation Libraries
  - "Illume" (Application launcher, keyboard, applets, etc.)
  - "Assassin" (Installer)
  - "Splinter" (GPS maps and annotations)
  - "Exposure" (configuration: suspend time, ring profiles, Wifi selection)
- Coming soon

FSO

FreeSmartphone.Org

- Not a GUI but middleware/framework
  Hardware abstraction: GSM, GPS, ...
  Services: PIM, ...
- DBus-based
- Proof-of-concept EFL-based UI on top of it
  Might get scrapped
- Language-agnostic (as long as you speak DBus)
- Python recommended for GUI applications
- Basis for future development
- Coming later this year

Future GUIs

- SHR (Stable Hybrid Release)
  - OM2007.2 based on FSO
  - Community effort
- ??? (by Openmoko)
  - Remove Qtopia (too incestous)
  - Merge FSO and non-Qtopia part of ASU
- Anyone can play !
  - It's open
  - Android (secretly runs on GTA02)

Development

- OpenEmbedded (a little hard-core)
- MokoMakeFile (by Rod Whitby)
- Toolchain (`arm-angstrom-linux-gnueabi-gcc`, etc.)
- QEMU

Company development

- Developer-centric, need to work better with community
  - Strategy often poorly communicated, e.g., OM2007.2
  - Once the product ships, it's deprecated
- Support infrastructure
- Improve internal communication and organization
  Anarchy is cool, but management has its uses

System software future

- Push kernel patches upstream
- Fixed-size NAND partitions
- kboot (or similar) instead of u-boot
- Fix suspend/resume

Next hardware (GTA03)

- Similar to FreeRunner
- No Glamo
- Main storage is microSD
  Cheap, flexible, frees NAND for booting, sane semantics
- No NOR (just use NAND)
- Probably quad-band and EDGE
- Nicer case

Future hardware

- Better, faster
- Faster and probably smaller graphics
- High-Speed USB (480 Mbps)
- UMTS ?

Resources

- General/Wiki
  `http://www.openmoko.org/`
- Shop
  `http://www.openmoko.com/`
- Mailing lists
  `http://lists.openmoko.org/mailman/listinfo/`
- Sources
  `http://git.openmoko.org/`
  `http://svn.openmoko.org/`
- This talk
  `http://people.openmoko.org/werner/ols2008.ps`
  `http://svn.openmoko.org/developers/werner/ols2008/`