Touch your NetBSD

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Pierre Pronchery <khorben@netbsd.org>

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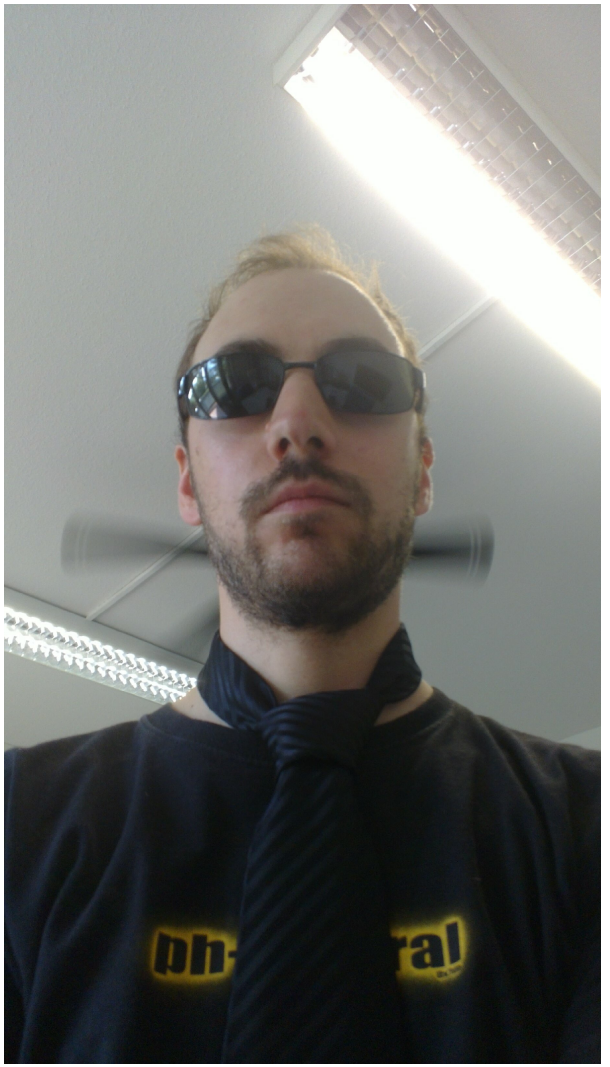
Background information

- Freelance IT-Security consultant
  DUEKIN Consulting
  pierre.pronchery@duekin.com
- OSDev hobbyist
  The DeforaOS Project
  khorben@defora.org
- NetBSD developer
  khorben@netbsd.org
- Based in Berlin, Germany



Agenda

I. The concept
  - DeforaOS Project
  - NetBSD

II. Previous steps
  - Openmoko Freerunner
  - AFULTab contest

III. Current status
  - Demo
  - Technical details

IV. The future

Concept: DeforaOS (1/3)

- Open Source project since 2005
- Born from my frustration with the existing stuff:
  - I just wanted to synchronize IRC chat logs between my two computers!
  - Rinse, repeat, apply (RSS, bookmarks, playlists, SCM, documents... possibly running programs)
- Really:
  - Ubiquitous computing
  - Seamless networking
- All the more relevant today...

Concept: DeforaOS (2/3)

Three parts:

1. **Self-hosted capability**
   kernel, libc, assembler, compiler...
2. **Distributed framework**
   RPC, interfaces, services...
3. **Desktop environment**
   desktop, embedded devices...

Portable, also meant to run on today's systems

Not fully implemented...

Concept: DeforaOS (3/3)

- Started with the kernel back then
  ...but I didn't know what to do!
- So I went from top to bottom:
  - UNIX utilities and libc
  - Graphical interface
  - And then the more innovating parts
- Therefore, the system:
  - The system works on existing platforms
  - Progressively implement each part as need be
  - Trying to build up and connect the different parts

Concept: NetBSD

IT'S OUT
THERE!!1

(6.0.1 too btw)

(©™ Nike)

Concept: NetBSD (1/2)

Discovered it at sysadmin school:

- « *Install and network three different Operating Systems together, sharing user data and authentication; to make it equally difficult to everyone, one of them has to be NetBSD 2.0* »

...but I liked it, using it daily since version 3.0

Personal preference:

- Clean, portable, embedded, coherent
- ...fun!

The NetBSD Project

"Of course it runs NetBSD"

Concept: NetBSD (2/2)

- About these silly rumors I heard:
  - You do ***not*** have to compile anything at all
  - Portability comes from good design (not a goal)
- Some advantages for this kind of project:
  - Cross-compilation is free
  - Target any NetBSD architecture from Linux, Mac...
- Reference system for DeforaOS development

The NetBSD Project

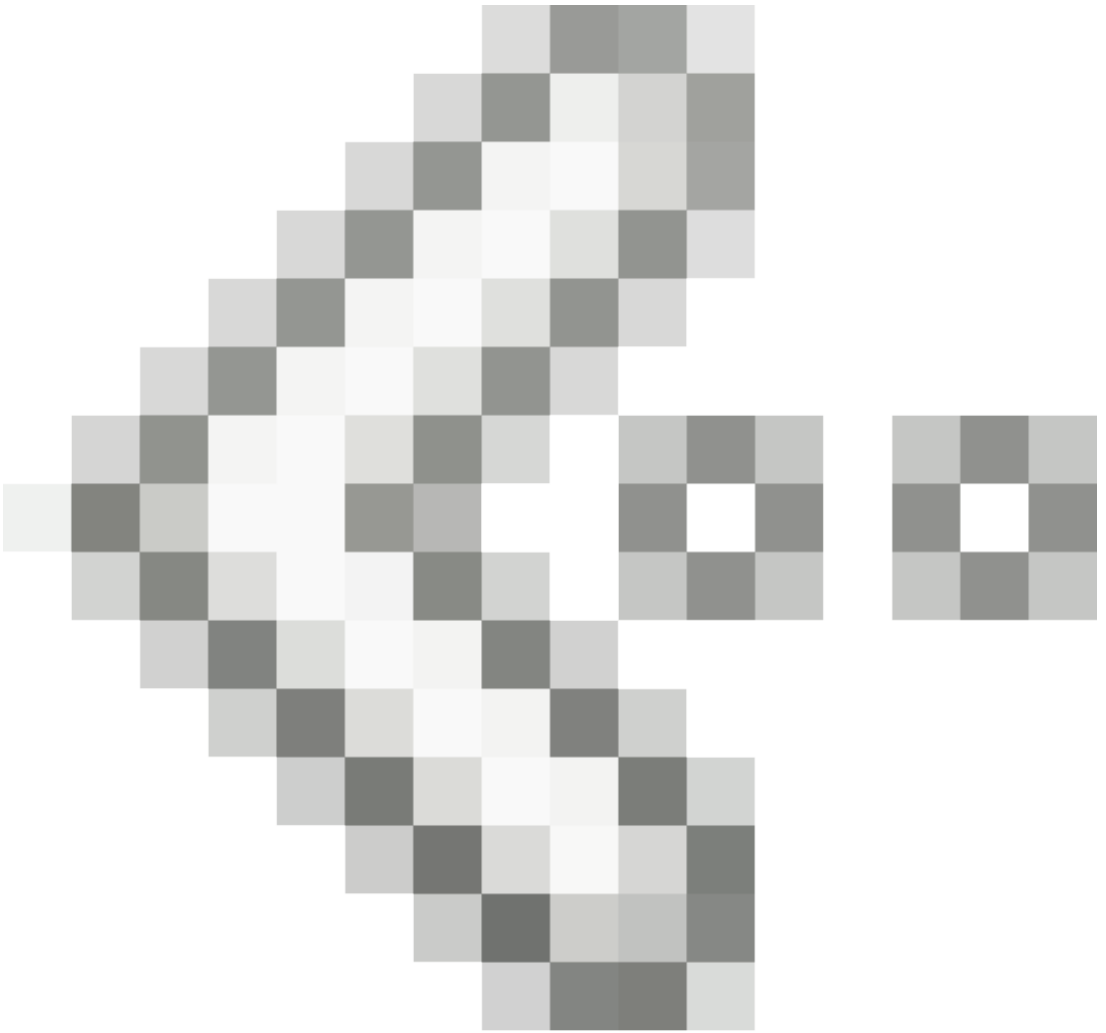
"Of course it runs NetBSD"

Concept: NetBSD on tablets

- Not really new:
  - Sharp Zaurus
  - uep(4)
  - hpctp(4)
  - sstouch on s3c2440

- Existing touchscreen framework: tpcalib
- There was no modern touchscreen driver

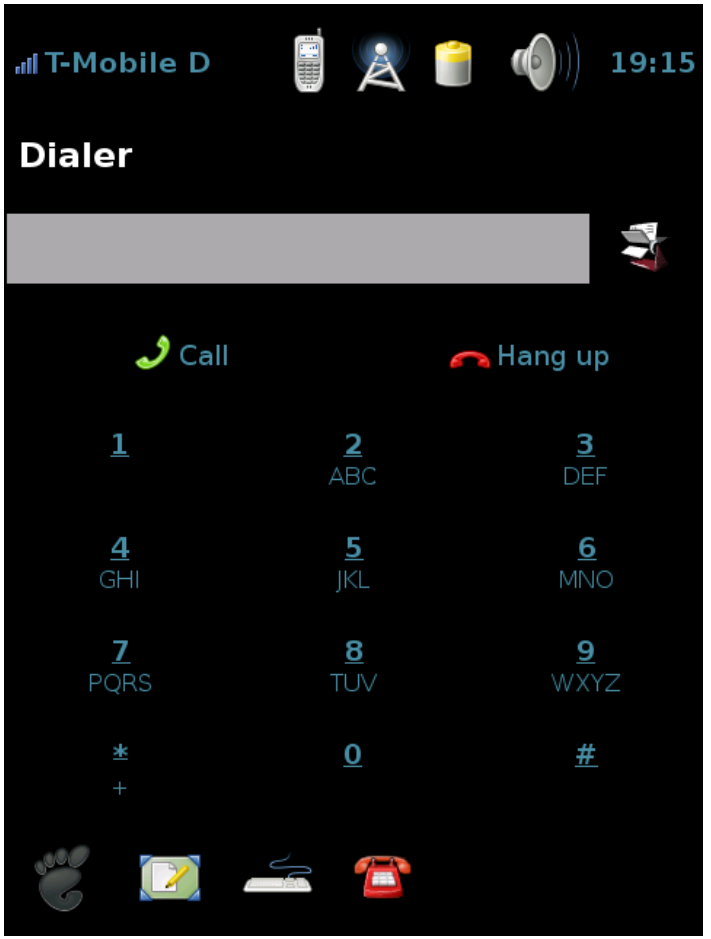
Previous steps



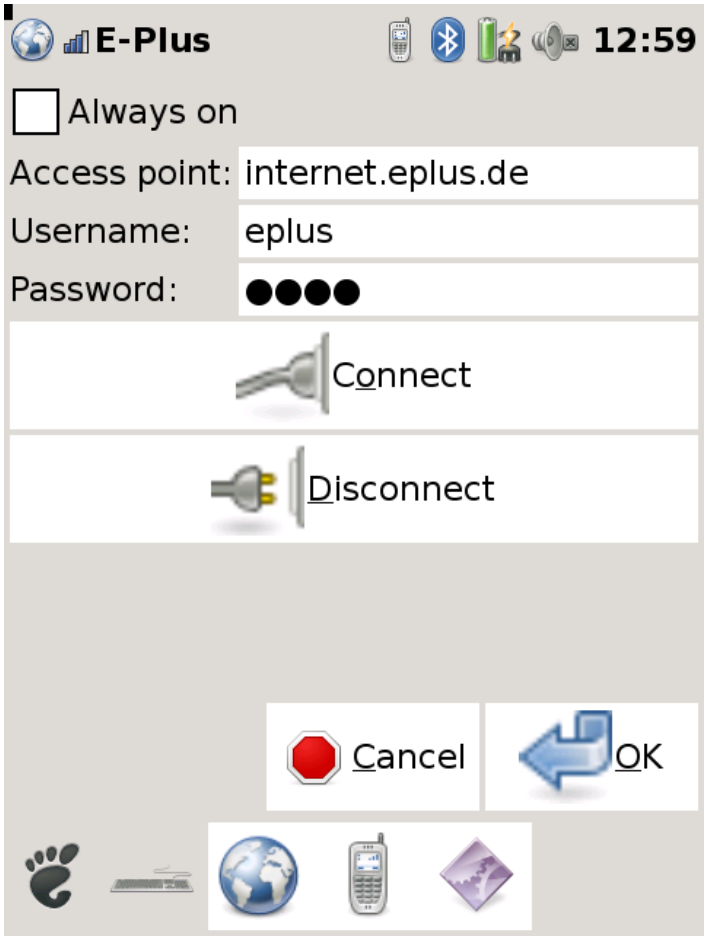
Step: Openmoko Freerunner (1/3)

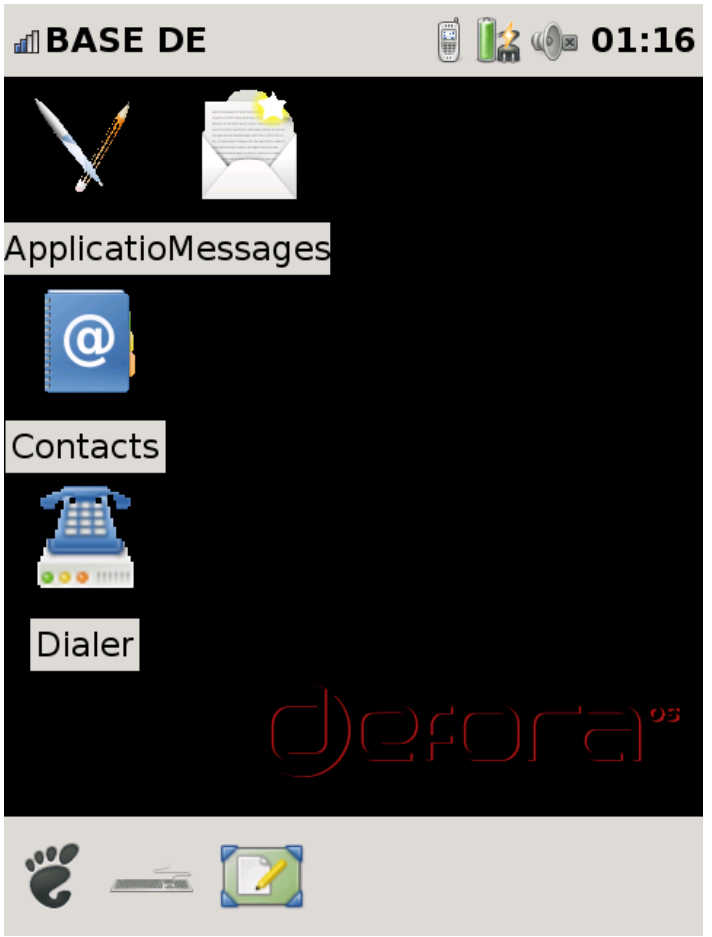
- Worked with Bearstech on hackable:1
- Debian-based GNU/Linux distribution, originally for the Openmoko Freerunner
- Smartphone released in 2008
- ARM-based Open Source hardware
- Ported the DeforaOS desktop for such embedded platforms
- Eventually made it on HTC TouchPro and Nokia N900 as well

Step: Openmoko Freerunner (2/3



Step: Openmoko Freerunner (3/3)





Step: AFULTab contest (1/3)

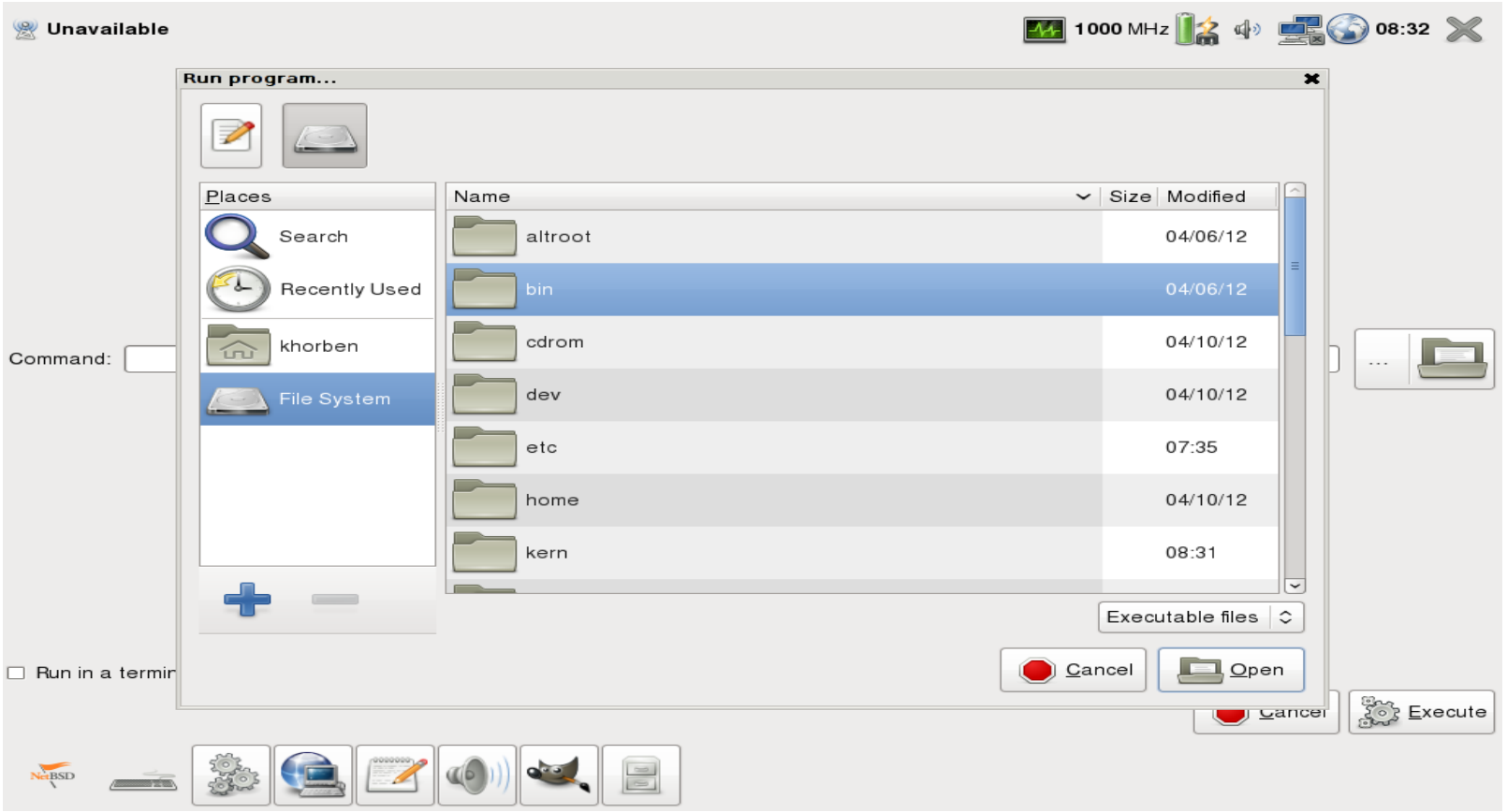
- AFUL is a French FOSS user group
- Launched an international contest end of 2011:
  - Create a 100% OSS tablet within 6 months
  - Guidelines for hardware:
    - 10” touchscreen, 6+ hours of battery life
    - Wireless support, mobile networking...
- Planned to use the WeTab tablet
- Prepared on a Lenovo IdeaPad S10-3t
- Presented at FOSDEM 2012

Step: Back in February... (1/2)

- FOSDEM 2012, BSD Devroom
- First functional demonstration:
  - uts(4) driver committed (touchscreen)
- Many shortcomings:
  - Required some patches
  - Limited screen resolution
  - No wireless or mobile networking
  - Had not received the final hardware yet

Step: Back in February... (2/2)

- FOSDEM 2012, BSD Devroom (still)
- It looked like this:



Step: WeTab hardware

- Intel Atom N450-based, 1.6 GHz, 1 GB RAM
- 11.6” multi-touch screen, 1366x768
- Wireless chipset (Atheros)
- Huawei 3G modem built-in, with GPS support
- Bluetooth, 2 USB ports, SD card slot
- 32 GB internal flash
- Front camera, MP

Step: AFULTab contest (2/3)

- A few months later...
- Received the WeTab
- Co-won the contest in May 2012!
- Released extensive documentation: http://www.duekin.com/downloads/papers/WeTab%
- Became a NetBSD developer in the process, khorben@ (breaking USB keyboard drivers since May 2012)

Step: AFULTab contest (3/3)

And it looked like this at the time:
(Solutions Linux 2012, NetBSD booth)

Overview

Citroën GT concept car (probably under copyright)

Overview: Under the hood

Reminder:

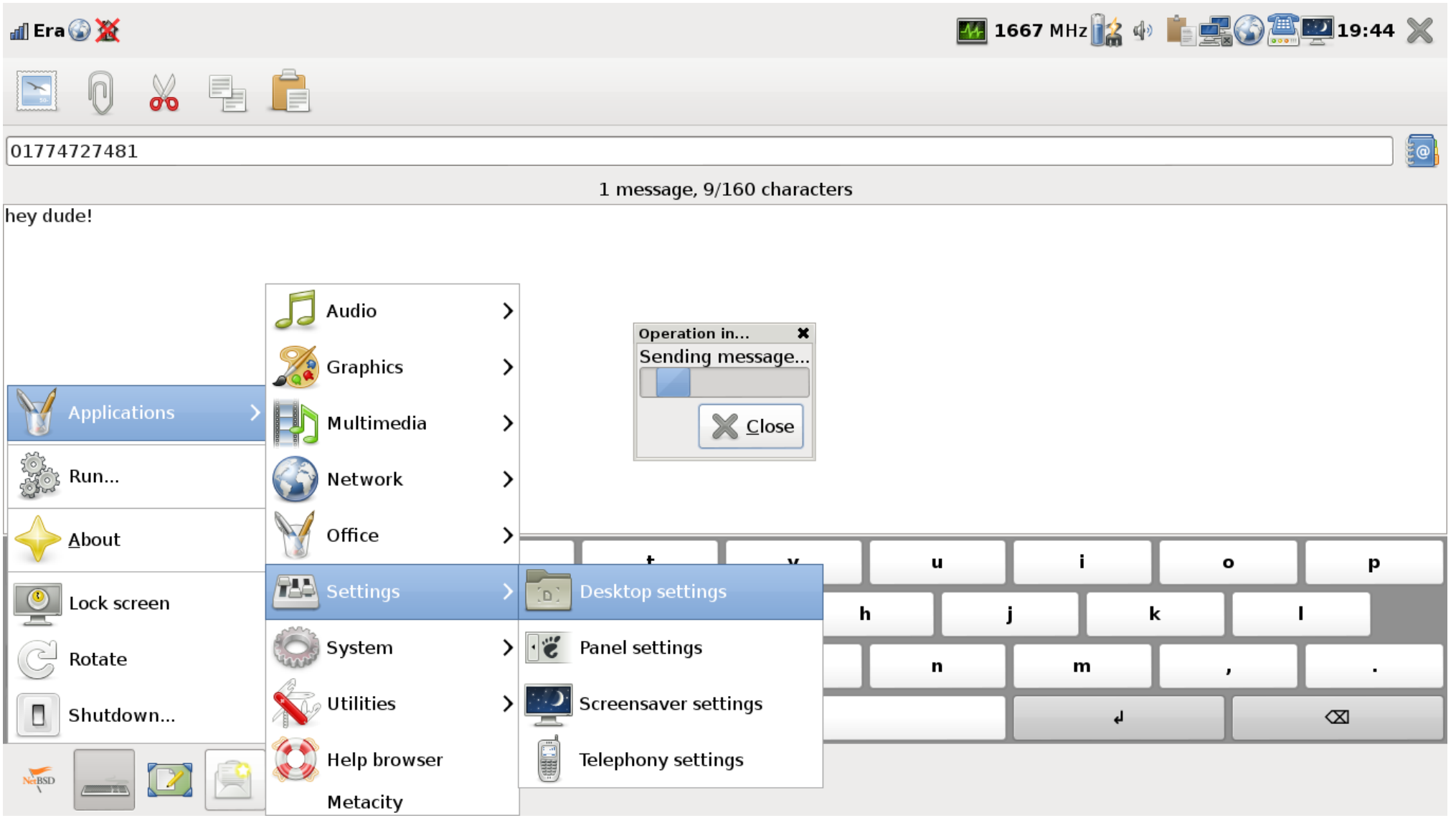
- NetBSD's kernel and base system
- Packages from pkgsrc
- Default to the DeforaOS embedded desktop

Make it a real tablet experience:

- Finger-based interaction
- Look appealing!

Here's my approach...

Overview: Today



Overview: Boot time (1/2)

Splash screen!

Overview: Boot time (2/2)

Splash screen on genfb(4), 800x600 at 16 bpp

- Particular JPEG format (not progressive)

Silent boot through boot.cfg, boot -z:

```
banner=Welcome to NetBSD [...]
menu=Boot normally:rndseed /var/db/entropy-file;vesa
800x600x16;splash /deforaos.jpeg;boot /netbsd.gz -z
menu=Boot normally (text mode):rndseed /var/db/entropy-
file;boot /netbsd.gz
menu=Boot single user:rndseed /var/db/entropy-file;boot
/netbsd.gz -s
menu=Disable ACPI:rndseed /var/db/entropy-file;boot /netbsd.gz
-2
menu=Drop to boot prompt:prompt
default=1
timeout=5
```

Overview: Instant use

Where “instant” means about 45 seconds (yay!)

GDM auto-login:

- Can be configured through the graphical user interface
- Otherwise in `/usr/pkg/etc/gdm/custom.conf`:

```
[daemon]
AutomaticLoginEnable=True
AutomaticLogin=khorben
```

Overview: Calibration (1/2)

- Set of patches, see PR kern/45872

```
$ wsconsctl -f /dev/wsmouse2 -ma
type=touch-panel
calibration.minx=0
calibration.miny=0
calibration.maxx=32767
calibration.maxy=32767
calibration.samples=0,0,0,0:32767,32767,1365,76
7:72,0,3,0:0,140,0,3
repeat.buttons=none
repeat.delay.first=0
repeat.delay.decrement=0
repeat.delay.minimum=0
```

- There is also tpctl(8) for initial calibration

Overview: Calibration (2/2)

- Specification by Microsoft as “digitizer devices”: http://msdn.microsoft.com/en-us/library/windows/ha
- Really a USB HID device, working like a mouse
- ...or like two simultaneously (relative, absolute)
- Good to know: device mode through usbhidctl

```
$ usbhidctl -f /dev/uhid1 \
  Device_Configuration.Finger.Device_Mode=2
```

Overview: X11 support

- xf86-input-mouse needs support for absolute coordinates (through wscons)
- Both base and pkgsrc should be patched now
- Needs more work: wrong coordinates when the screen is rotated in portrait mode...

Overview: Gtk+ settings

- ~/.Xdefaults, set DPI:

```
!Xft
Xft*dpi: 132
```

- ~/.gtkrc-2.0, some possibilities:

```
gtk-icon-sizes=...:panel-smaller=24,24:panel-
small=32,32:panel-large=48,48
gtk-touchscreen-mode=1
```

- Additional tweaking through the Gtk+ engine:
  - Larger scrollbars...
- Third button emulation:

```
export GTK_MODULES=libgtkstylus.so
```

Overview: DeforaOS desktop (1/2)

- wip/deforaos-desktop, meta-package:
  - deforaos-browser
  - deforaos-camera
  - deforaos-editor
  - deforaos-keyboard
  - deforaos-locker
  - deforaos-mixer
  - deforaos-panel
  - deforaos-pdfviewer
  - deforaos-phone
  - deforaos-player
  - deforaos-surfer
  - deforaos-todo
  - libgtkstylus
  - matchbox-wm (for now)
- For embedded devices, set in `/etc/mk.conf`:
  `PKG_DEFAULT_OPTIONS+=embedded`

Overview: DeforaOS desktop (2/2)

User's ~/.Xclients file:

```
#!/bin/sh
export GTK_MODULES=libgtkstylus.so
desktop &
dhcpcd-gtk &
locker &
panel &
phone &
exec matchbox-window-manager -use_titlebar no \
    -use_cursor no -use_desktop_mode plain
```

Overview: Screensaver, unlocking

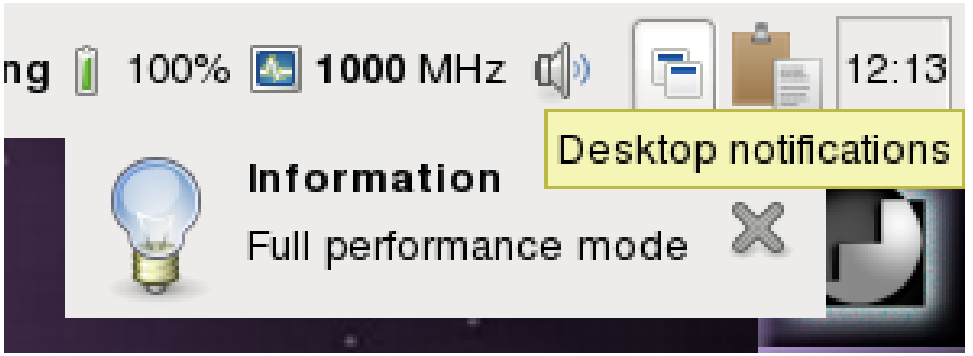
Overview: powerd integration

- Panel notifications:

```
_message()
{
    DISPLAY=:0.0 /usr/bin/su -- "khorben" \
    -c "/etc/powerd/actions/message '$1' '$2'"
}
```

- Power management, `/etc/powerd/scripts/*`:

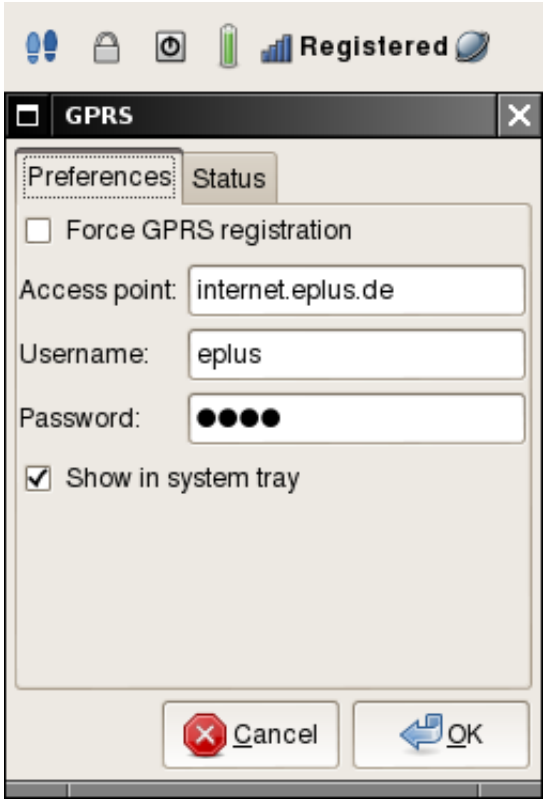
```
_message -E 'All hell loose, power down.'
```



Overview: Mobile networking

DeforaOS Phone calls pppd in pty mode, see `/etc/ppp/peers/phone`:

```
notty
defaultroute
local
noauth
usepeerdns
```



Name resolution via resolvconf(8), see the `/etc/ppp/ip-up` and `ip-down` scripts:

```
[ “$USEPEERDNS” -eq 1 ] && /sbin/resolvconf -a “$1” \
        < /etc/ppp/resolv.conf
/sbin/resolvconf -d “$1”
```

Overview: Wireless networking

- dhcpcd-gtk from Roy Marples
- In wpa_supplicant.conf, set:

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
update_config=1
```

- In rc.conf, set:

```
dhcpcd=YES                dhcpcd_flags=”-bq”
wpa_supplicant=YES   wpa_supplicant_flags="-B
-iath0 -c/etc/wpa_supplicant.conf"
```

Overview: GPS support

- Add /dev/ttyU2 and /dev/ttyU3:
  ```
  # cd /dev && ./MAKEDEV ttyU2 ttyU3
  ```
- Enable the GPS plug-in in DeforaOS Phone
- Click “Start” in the GPS preferences there
- Install and configure geography/gpsd
- Start wip/foxtrotgps:
  ```
  GLib (gthread-posix.c): Unexpected error from
  C library during 'pthread_mutex_unlock':
  Operation not permitted.  Aborting.
  Abort trap (core dumped)
  ```
- More work required...

Overview: Hardware support

- Fully supported:
  - Video camera, uvideo(4)
- Some issues remaining:
  - Touchscreen, uts(4) (multi-touch...)
  - 3G modem, u3g(4) (maybe not related)
  - Wireless support, ath(4) (likewise)
  - Video driver, x11/xf86-video-intel (HDMI output)
- Needs more ♥
  - GPS, via u3g(4) and wip/foxtrotgps
  - Power management (suspend, permissions)

Future

<insert picture of a skate hoverboard here>

Future

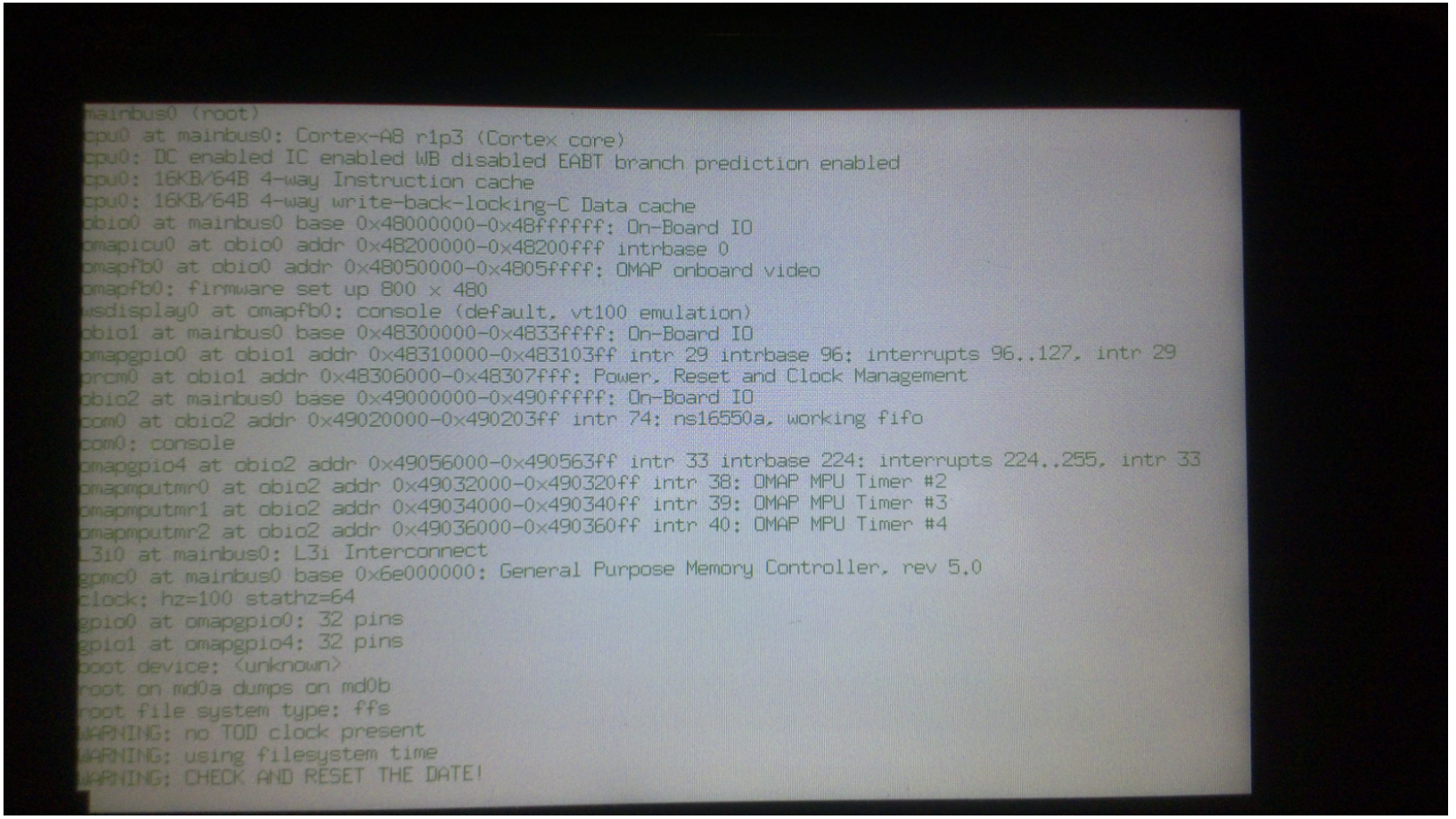
(from blogdegeek.com)

EXIST

EXIST

Future: I can haz potentialz

- NetBSD on the Nokia N900
- A NetBSD-based Open Source phone?



Future: NetBSD/N900

- Kernel configuration file committed upstream
- Installer starts (sysinst)
- mount_chfs(8) for flash-based storage
- Keyboard driver ongoing (needs OMAP I2C)
- More drivers required:
  - Modem, audio, sensors, camera, USB OTG...
  - Flash memory optionally (Onenand)

Future: DeforaOS on Github (1/2)

README.md

DeforaOS Project

This github repository was generated from DeforaOS' CVS tree as of Thursday 18th 2012, around 17:30 CEST. The basic idea is to try to commit to this repository instead of CVS from now on. This was not exactly planned, so I apologize for the lack of structure around.

Structuring should happen gradually, and it is currently expected that:

- this repository will be owned by the "DeforaOS" organization;
- each sub-project will get its own repository;
- the current structure will be kept, and refer to the respective sub-projects accordingly.

Any help, advice, feedback will be much appreciated!

Cheers, -- khorben

Future: DeforaOS on Github (2/2)

- 41 repositories by now
- A lot is still broken after migration from CVS :(
  - Daily builds
  - Development mailing-list
  - Meta-project tree
  - Repository browsing from the website...

Future: More on DeforaOS

- Make the ubiquitous seamless networking computing goodness happen!
- Also, switch to Gtk+ 3:
  - Finger scrolling?
  - (almost ready)
- Other ideas?

Future: But for now...

- DeforaOS Project, http://www.defora.org/
- NetBSD Project, http://www.netbsd.org/
- DUEKIN Consulting at http://www.duekin.com/
- Myself at http://people.defora.org/~khorben/
  @khorben on Twitter