Embedded Mobile Linux

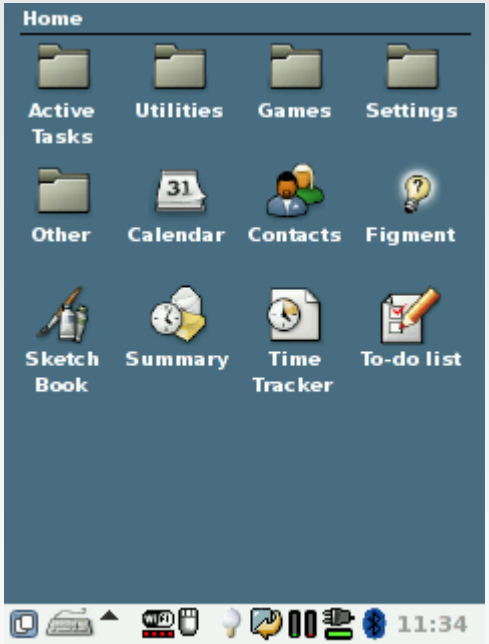
- UIs: The Faces of Embedded Mobile Linux
- Brief Survey of Distros
- Ångström
  - Flashing
  - Package Installation
  - Tips and Caveats
- Links
- Ångström GPE Demo

UI: Qtopia

- Trolltech's commercial implementation of Qt
- Closed source, but Qt is an open spec
- Not X11 compatible

UI: GPE

- ”Boxy, but good.” --paraphrasing *Crazy People*
- X11 compatible: You can run GPE apps on the PDA and display on your desktop (and probably vice-versa).

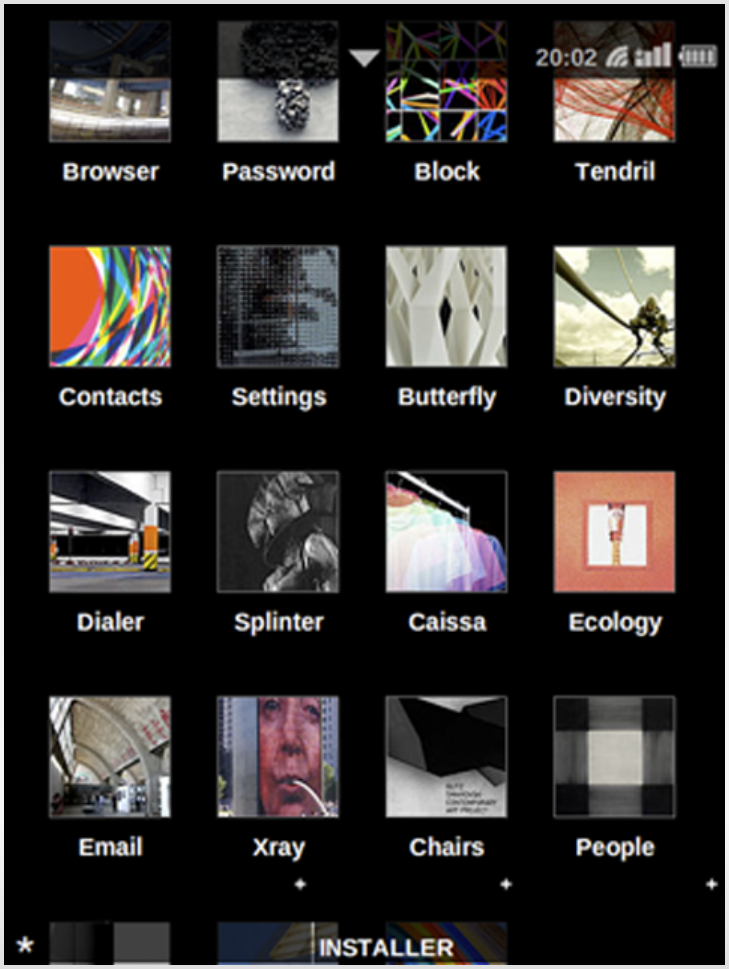


UI: Opie

- Open implementation of Qt

UI: Qtopia on X11

- OpenMoko's UI; allows Qt apps to display on X11



UI: Clutter

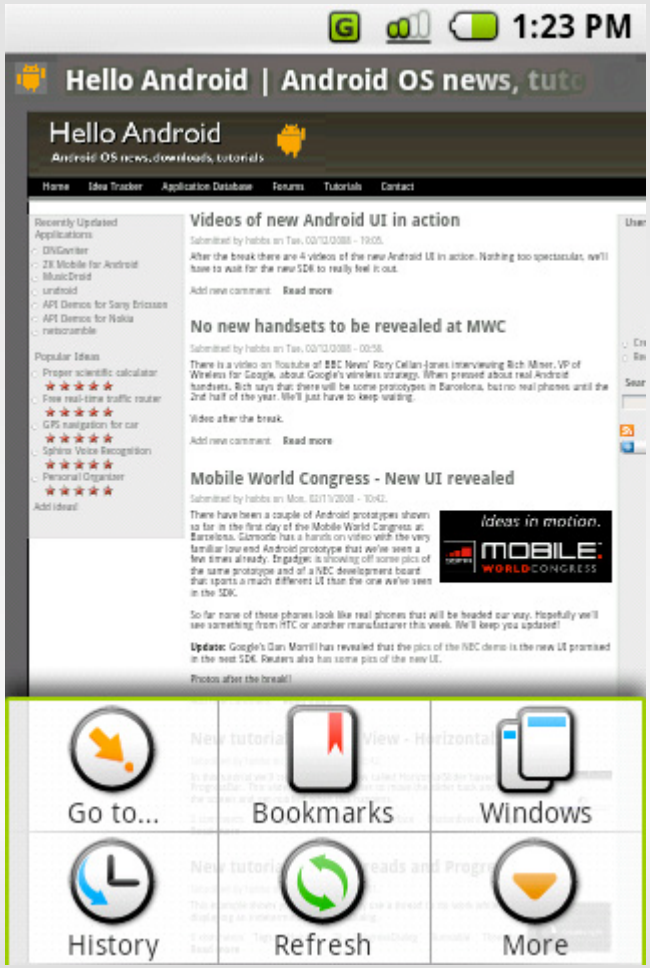
- One UI for Ubuntu MID
- Unsure about compatibility

UI: Flash

- The second UI for Ubuntu MID
- Flash-based

UI: Android

- I'm not sure what the underlying technology is, and the look & feel seems to be in flux.



Brief Survey of Distros (1)

- SharpROM (latest release ~03/2006)
  - Sharp's commercial Linux ROM, in Japanese
  - Supports ~16 models of PDAs (Zaurus only)
  - Qtopia
- Cacko (defunct; latest release ~2001-2002)
  - Compatible version of the Sharp ROM in English

Brief Survey of Distros (2)

- OpenZaurus (defunct; latest release 09/2006)
  - Incompatible with Sharp ROM but 100% open.
  - GPE
  - Opie
- Familiar (defunct; last release 08/2006)
  - GPE
  - Opie
- emdebian (no releases)
  - seems to focus on enabling distro builders, rather than *being* a distro

Brief Survey of Distros (3)

- pdaXrom (latest release 04/2007)
  - Only for a few Zauri: SL-5000D/5500, SL-6000, SL-C1000/C3100, SL-C7x0/860/7500
  - GPE
- OpenSimpad (defunct)
  - Port of Familiar for SIMpad
- OpenEmbedded (defunct)
  - First attempt at unifying other distros under one umbrella

Brief Survey of Distros (4)

- OpenMoko (latest release 08/2008)
  - Only works on 1 phone, the Neo FreeRunner
  - Qtopia on X11
- Android (no releases; DIY with SDK)
  - Works on no devices (emulation on PC only)
  - UI technolgy unclear
- Ubuntu MID Edition (latest release 07/2008)
  - Builds for two devices; plans target Intel Atom CPU
  - Clutter UI
  - Flash UI

Brief Survey of Distros (5)

- Ångström (latest release 12/2007 – 04/2008, depending on device)
  - Started by refugees of OpenZaurus, OpenSimpad, OpenEmbedded
  - Stable release supports **16+** devices (including the SIMpad and all the Zauri supported by OpenZaurus)
  - RC status for **54+** devices
  - GPE
  - Opie (beta)

Ångström: Installing (1)

- Start by looking at the devices that have stable builds:
  - http://www.angstrom-distribution.org/releases/2007.12/images/
- If yours isn't there, and you're feeling frisky, try looking for an unstable build:
  - http://www.angstrom-distribution.org/unstable/images/
- If yours isn't listed, I don't recommend going further unless you really know what you're doing.

Ångström: Installing (2)

- The hx4700 is supported by the stable release, but before I download anything, let's think about what it means to install Linux on a PDA.
- A PDA is not a PC
  - Just about everything is proprietary
  - There's a BIOS (kinda)
  - There's a boot loader in flash RAM
  - There's no HDD, just more flash RAM
  - Just like flashing a BIOS with a bad/incompatible image, you can brick your PDA by flashing with a bad/incompatible image.

Ångström: Installing (3)

- We need to flash the bootloader for two reasons:
  - It'll let us install Linux
  - It'll boot Linux once we've installed
- The hazards:
  - The bootloaders that let you do this all work with different devices
  - See http://linuxtogo.org/gowiki/LinuxDevices for a list of some devices and some bootloaders
  - You can brick your PDA if this goes wrong

Ångström: Installing (4)

- Cheating
  - Familiar has a HOWTO for flashing an hx4700 with a compatible bootloader and Familiar image
    - http://www.handhelds.org/moin/moin.cgi/HpIpaqHx4700HowtoInstallLinux
  - It works for Ångström although it isn't documented centrally

Ångström: Installing (5)

- Install the SDG bootloader
- Next, we need to know how to install Linux
  - http://linuxtogo.org/gowiki/AngstromManual
  - Choose which image to install
    - I went with x11-gpe-image
  - Follow the guide for installing on your device
    - Since there's no hx4700 guide, we cheat and use the Familiar guide

Ångström: Installing (6)

- hx4700-specific steps
  - Download these files and put them on a FAT32-formatted CF card, which you insert into the PDA:
    - Angstrom-x11-image-glibc-ipk-2007.12-hx4700.rootfs.jffs2
    - zImage-2.6.21-hh20-r6-hx4700.bin
    - reflash.ctl
  - Lock the battery in place, and plug in wall power.
  - Start the SDG bootloader's flash utility by depressing the Contacts and Inbox buttons and pressing and releasing the Reset button at the bottom of the device, using the stylus.

Ångström: Installing (7)

- You should see the SDG Systems logo and the message Scanning for images... for a couple of seconds. Following that, the screen should prompt you to select an image file to load.
- Navigating up and down with the Contacts and Calendar buttons on the left, select hx4700-kernel and press iTask. Proceed according to the on-screen instructions. In about 15 seconds, the flashing will be complete.
- When prompted press Record and not Power.

Ångström: Installing (8)

- Next, select the Angstrom-x11 image, and follow the directions as above. It will take about 1 minute to load the image and 8.5 minutes to erase the flash memory and write the image.
- After the flashing has been completed, hit the Power button on the top right of the hx4700 device.
- If nothing went wrong, your PDA should be running Ångström in 8.5 minutes. Such speed!

Ångström: Installing Packages

- Installing pre-built software
  - Browse the feed/repo
    - http://www.angstrom-distribution.org/repo/
  - use 'ipkg' command, similar to 'apt-get', e.g.
    - ipkg update
    - ipkg install mysql
- Building your own packages
  - Easiest method
    - http://blog.leggewie.org/?p=39
    - Goes faster with psyco: http://psyco.sourceforge.net/psycoguide/sources.html
  - Hardest method
    - http://www.angstrom-distribution.org/building-angstrom

Ångström: Tips and Caveats

- Busybox 'sh' implementation sucks a lot; install bash for sanity.
- Even with bash, you may run into ”strangeness” with scripts.
- You can customize what happens when you hibernate and wake your PDA with scripting in /etc/apm/{suspend,resume}.d/
- GPE lets you assign a command to each hardware button.
- I have a fix for the timezone bug.
- Don't upgrade kernel or modules.

hx4700 notes

- The built-in **speaker blows out** easily, even with M$ OS
- The wireless chipset needs special handling (i.e. ”kicking”) under Ångström
  - This can be easily scripted
- Devices are about 4 years old; battery life is short, even in standby.
  - Larger replacement batteries are $30 - $100
- At 624MHz, you'd expect to feel more power
- Overall, a good Linux PDA platform

Links: UIs

- Qtopia
  - http://trolltech.com/products/qtopia
- GPE
  - http://gpe.handhelds.org/
- Opie
  - http://opie.handhelds.org/cgi-bin/moin.cgi/
- Qtopia on X11
  - http://opie.handhelds.org/cgi-bin/moin.cgi/
- Clutter and Flash UIs
  - http://www.ubuntu.com/products/mobile

Links: Distros (1)

- SharpROM
  - AFAIK, not downloadable unless you buy a Zaurus from Japan: http://www.ezaurus.com/
- pdaXrom
  - http://www.pdaxrom.org/
- emdebian
  - http://www.ubuntu.com/products/mobile
- Ångström
  - http://www.ubuntu.com/products/mobile

Links: Distros (2)

- OpenMoko
  - http://wiki.openmoko.org/wiki/Main_Page
- Ubuntu MID Edition
  - http://www.ubuntu.com/products/mobile
- Android
  - http://code.google.com/android/

Links: Miscellaneous

- Flashing the hx4700
  - http://www.handhelds.org/moin/moin.cgi/HpIpaqHx4700HowtoInstallLinux
- Ångström Timezone Fix
  - http://bugs.openembedded.net/show_bug.cgi?id=3315
- Linux Devices
  - http://www.linuxdevices.com/
- Download These Slides
  - http://bob.igo.name