Utah Open Source Conference

Mobile Linux Devices

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Who is this for?

- This presentation is aimed at those who are just getting into Linux on mobile or other embedded devices. We cover the components of embedded Linux solutions. These include bootloaders, Linux kernel, BusyBox, glibc, uClibc, GUI choices such as Qtopia, TinyX, GPE, Maemo, OpenMoko, and other packages that make up a commercial-grade consumer device.

Why Linux?

- Tested / Stable
- Multiple vendor
- Open Source - focus on **your** business

Needs of Mobile Devices

- Flash / Removable storage
- Power needs

Bootloader

- No BIOS / Protect it!
- board initialization
- Flash partitioning / writes
- Flash from external storage
- Serial port
- USB access
- Ethernet (not often on mobile devices)

Filesystems

- ext3 / reiserfs – journaled but large
- initrd - mapped rom is better
- jffs / jffs2
- cramfs / squashfs
- /dev - avoid writes udev, ramfs
- yaffs - nand
- ramdisk / ramfs / tmpfs

kernel code

- Prune unused code
  - PCI / ISA / MCA / PnP / audio / SCSI
  - PCMCIA drivers for CF only hardware
  - Swap
  - test code
- Connectivity
  - WiFi / Bluetooth / IrDA / USB / Serial

Libraries

```
glibc is not the right thing for [an embedded OS].
  It is designed as a native library (as opposed to
  embedded). Many functions (e.g., printf) contain
  functionality which is not wanted in embedded
  systems.
  ---Ulrich Drepper <drepper@cygnus.com> 24 May 1999
```

- glibc - too large
- dietlibc - GPL
- uClibc - LGPL, more POSIX than glibc, shared libraries, threads, c++, some locale support, multiplatform
- mklibs.py - if user cannot add apps

Applications

- GNU fileutils, textutils, grep, modutils, etc.
- shells
  - bash (large)
  - ash
- login, su, ps, vi, nc, etc.
- BusyBox
  - includes all of these
  - 600k vs 5M+

Crypto

- OpenSSL
  - need small https server
- OpenSSH
  - Dropbear SSH Client / Server
- IPSec - FreeS/WAN
- crypto hardware

Package management

- rpm - large data files
- deb - data files, policy requires docs, man pages
- BusyBox rpm, dpkg
- handhelds.org ipkg
- sync model?

Graphical User Interface

- Qt/E, Qtopia, OPIE (non-free or GPL)
- X11 (TinyX), GTK, GPE
- PicoGUI, Pixel, Nano-X
- DirectFB, GTKfb, Qt/E, SDL, fb
- X11, Qt/X11 - GPL / commercial
- Maemo (maemo.org)
- OpenMoko (openmoko.org)

Web Browser

- Netscape, Mozilla - large
- Dillo, ViewML
- lynx, elinks, w3m
- Opera, NetFront
- Konqueror embedded
- Minimo

"Small" Example

- TuxScreen.net
  - 4M flash
  - bootloader, kernel, modules, uClibc, BusyBox, pcmcia-cs, lrzsz, inetd, telnetd, XFree86 TinyX, rxvt, matchbox (window manager), and more, with over 500k left in writable space.

Where to Go from Here?

- many Linux consulting companies
- Some solutions include non-free portions
- Linux benefits
  - pool of resources
  - reduce duplication
  - alternate support paths
  - reduced development on future revisions

The Community

- available hardware
- release early / release often
- support the developers
- release documentation where possible
- contract work **must** be pushed upstream
- small expense in working with avoids large expenses of doing all the work yourself.

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Questions