



# Enna: Embedded Media Center

The GeeXboX and OpenBricks teams



## What is demonstrated

### Enna

- EFL-based low resources Media Center interface
- Meant to run on low-resources and embedded computers, such as:
  - Nokia N900
  - TI OMAP3 BeagleBoard and OMAP4 PandaBoard
  - Nvidia Tegra2
- Natively packaged for several distros:
  - Debian and Ubuntu
  - OpenBricks and OpenEmbedded

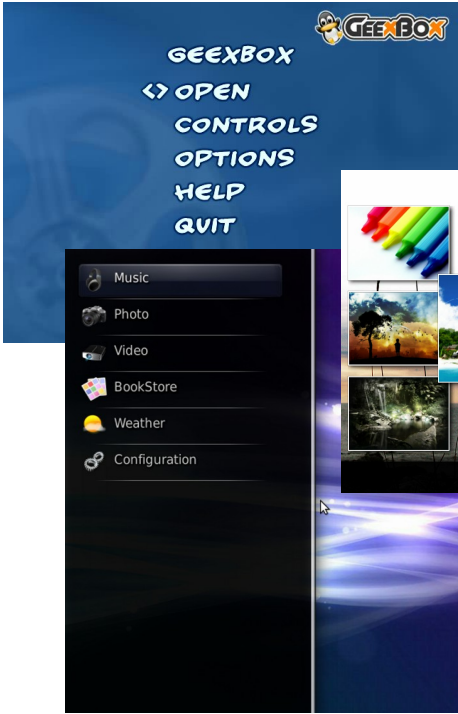
### GeeXboX

- Major embedded multimedia distribution since 2003.
- Bare-metal Linux distribution built from scratch using **OpenBricks** embedded Linux cross-compilation framework.
- 420+ packages, 8-128MB system footprint, 128-256MB RAM usage

## Hardware Information

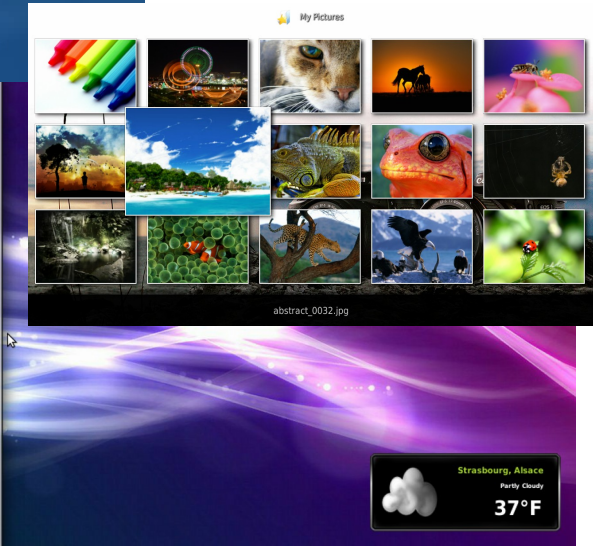
- Runs on ARM, MIPS, PowerPC and x86 architectures.
- Multi-Cores and SIMD (SSE, NEON ...) optimized.
- Hardware Accelerated: OpenGL|ES, OpenMAX, VAAP1

## What was improved



From 1.2.4...

...to 2.0-alpha2



**GeeXboX 2.0 uses Enna Media Center for its user interface**

Source code or detail technical information availability

<http://www.geebox.org>

<http://enna.geebox.org>

[team@geebox.org](mailto:team@geebox.org)



## **KBUS** Lightweight messaging for Linux

Tony Ibbs (Tibs)

### What is demonstrated

Kernel module

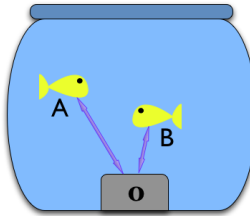
Use via:

- open, read, write, ioctl
- C library
- Python API (used for unit testing)

Buses are devices (/dev/kbusN)  
and are isolated from each other

- Ksock
- Sender, Listener, Replier
- Message, Request, Reply
- "\$.message.name"

Development supported by Kynesim



### What was improved

Simple to understand

Simple to use

Small codebase, in C

Predictable message delivery

Deterministic message order

Always get a reply to a request

Reliable and well-documented

*Other projects:*

**muddle** – build integration system  
particularly aimed at embedded systems

**tstools** - Cross-platform command line  
tools for working with MPEG data (TS,  
PS and ES)

### Hardware Information

Software only, hardware agnostic

### Source code or detail technical information availability

<http://code.google.com/p/kbus/>  
<http://code.google.com/p/muddle/>  
<http://code.google.com/p/tstools/>

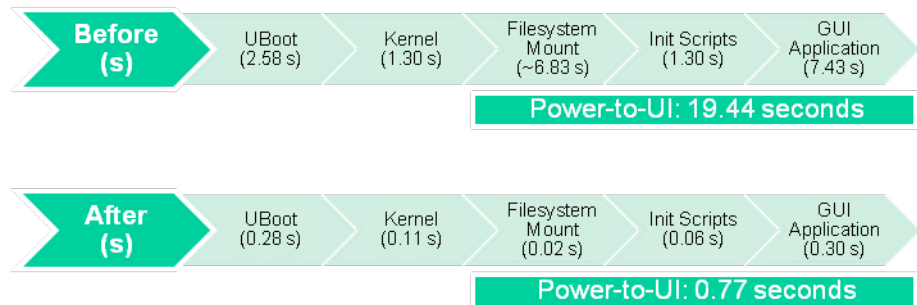


## MS7724 <1 second QT swiftBoot

Andrew Murray

### What is demonstrated

- The 'right' approach to boot time reduction
- Typical embedded Linux system
- Graphical QT application
- Video capture / render
- Less than <1 second boot to QT on warm reset



### What was improved

Modification In UBoot	Gain (ms)	Modification In Kernel	Gain (ms)	Modification In Userspace	Gain (ms)
Remove boot delay	1000	Remove driver delays	652	Use squashfs	6830
Remove Image verification	374	Prevent probing disconnected cameras	200	Optimise flash accesses	2890
Optimise memcpy code	342	Remove USB	144	Remove unused features from QT	2160
Remove USB ROMImage, filesystems	195	Don't allocate memory for unused camera components	90	Remove all init scripts	1300
Defer reading MAC address	124	Improve memset	71	Statically link QT with uclibc	900
Reduction due to kernel size	60	Defer network initialisation	20	Reduce readahead and block size	630
Remove delays	98	Remove keyboard driver	4	Re-order QT application	350
Eliminate use of console	103	Remove filesystems	0.8	Strip QT application	160
Total Gain	2.2 s	Total Gain	1.2 s	Total Gain	15.2 s

### Source code or detail technical information availability

- UBoot (2009-01)
- Linux (2.6.31-c7)
- BuildRoot Filesystem (2010.5)
- QT (OpenSource 4.6.2)

*Some patches submitted to linux-sh*





## Beagleboard videowall

Koen Kooi / Texas Instruments

### What is demonstrated

6 beagleboards driving a 3x2 screen videowall

Angstrom Distribution optimized for ARMv7a ISA

- Linux 2.6.32
- DM3730 CPU running 1GHz w/ 512MB ram
- 6 screens - DELL 19"

GNOME 2.30 desktop environment

Omapfbplay by Mans Rullgard

Synergy to move mouse from screen to screen

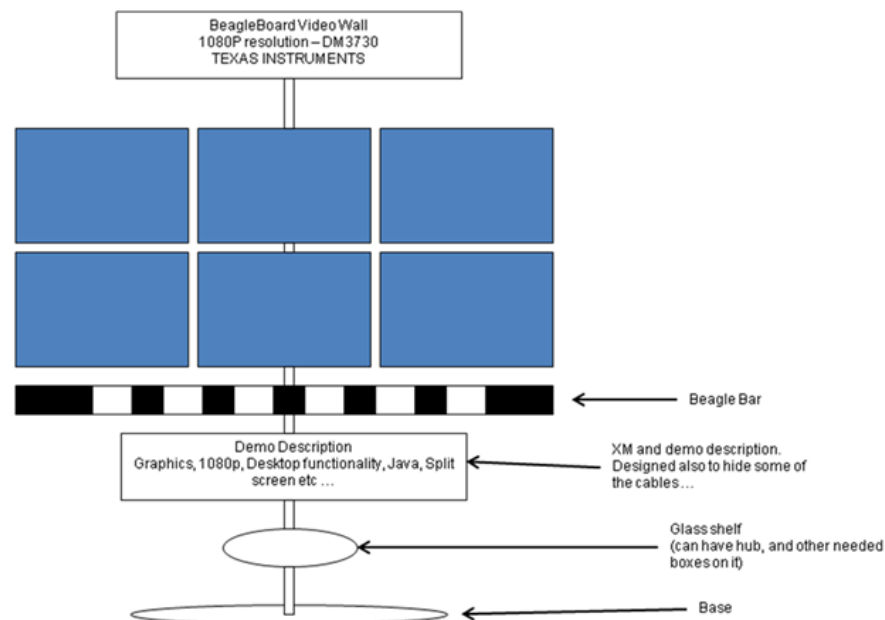
Various applications showing DSP capabilities

### What was improved

Addition of desktop and synergy to make control easier

3D and DSP applications added

Optimized split script to amount for gap between screens.



Source code or detail technical information availability

<http://git.mansr.com>

<http://beagleboard.org>

### Hardware Information

6x beagleboard-xM – DM3730@1GHz

6x Dell 19" screens

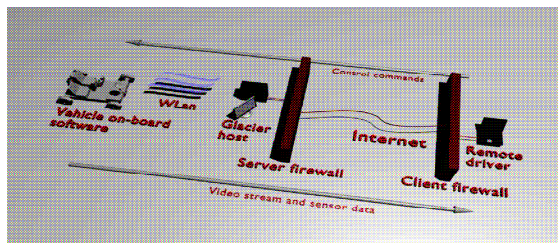
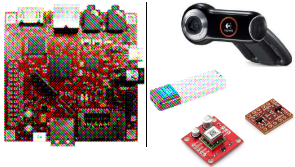


## VETER - vehicle controlled over the Internet

Andrey Nechypurenko & Maksim Parkachov

### What is demonstrated

- Vehicle which could be controlled over the Internet and built with open-source hardware and software.
- Implementation of the real-time servo control.
- How we integrate ICE middleware with GSreamer to provide low-latency adaptive video streaming.
- Solution for firewalls and NATs problems.

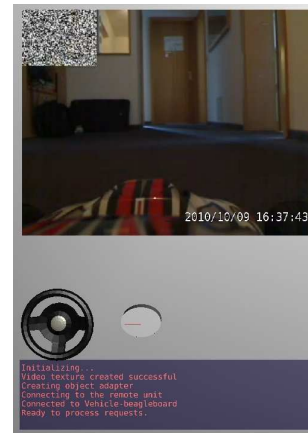


### Hardware Information

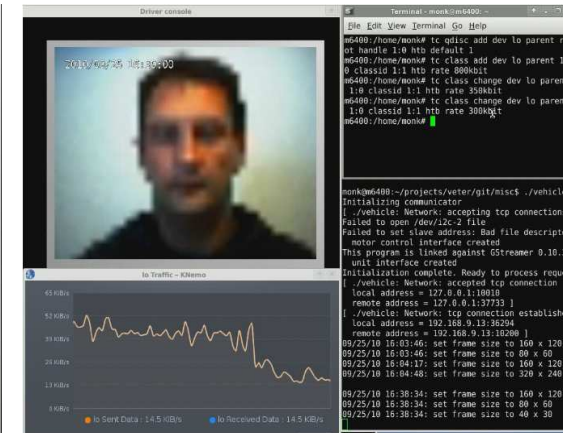
BeagleBoard C4, Logitech 9000 Pro USB camera, D-Link USB WLAN with Ralink chipset (rt73usb), SparkFun logic level converter and DC/DC converter breakout, Reely buggy.

### What was improved

- Improved streaming video quality for real-time remote vehicle control.
- Reduce the complexity of the system by integrating out of the box hardware and software components.
- Improved Fun-factor over many weekends ☺



Driver cockpit 3D application



Adaptation performance with reduced network bandwidth

### Source code or detail technical information availability

Gitorious: [www.gitorious.org/veter](http://www.gitorious.org/veter)  
Wiki: [www.gitorious.org/veter/pages/Home](http://www.gitorious.org/veter/pages/Home)  
Blog: [veter-project.blogspot.com](http://veter-project.blogspot.com)





## PandaBoard: low-cost, open OMAP™ 4 mobile development platform

Jayabharath Goluguri & Dave Anders

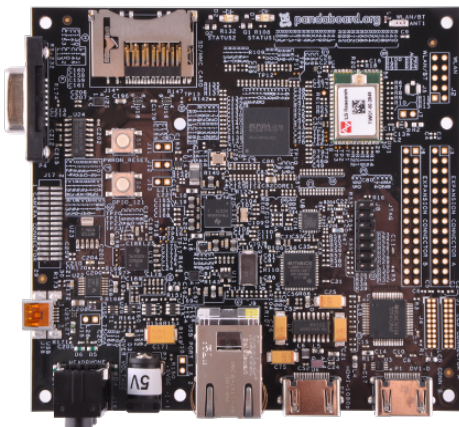


[pandaboard.org](http://pandaboard.org)

### What is demonstrated

OMAP™ 4 PandaBoard with

- Linux on Dual ARM Cortex™-A9
- Multiple display support
- Ubuntu 10.10
- Android Froyo 2.2
- Other aspects:
  - Expansion, HW Features, Projects, Documentation



### What was improved

- OMAP™ 4 processor based open hardware platform
- Support for native build and development
- Support for various projects & software distributions
- Open source community
- Basic Board support available in 2.6.37 kernel  
( work in progress by community)

### Hardware Information

OMAP™4 PandaBoard (Rev A1)

### Source code or detail technical information availability

Website: <http://pandaboard.org>

Wiki: <http://omappedia.org>

OMAP Public TRM: <http://tinyurl.com/omaptrm>