EFL – A UI Toolkit Designed for the Embedded World

Tom Hacohen `<tom@stosb.com>`

Embedded Linux Conference Europe 2013

Where We Come From

- The Enlightenment project is old (1996)
- Initially a window manager – split to a set of libraries
- EFL as we know it dates back to at least 2000
- Targeted the embedded world since the beginning

Where We Are Now

- We released, and keep on releasing
- Still evolving and improving
- Used on a variety of platforms
- Staying true to our philosophy

What Guides Us

- Choice is good
- Vanilla vs. strawberry vs. chocolate
- Efficiency matters
- Not everyone drives an F1
- Eye candy matters
- Porting matters
- We have a sense of humour
- The world is not English
- Open is best
- Do not break API/ABI

Real-Life Products Using the EFL

Electrolux I-Kitchen

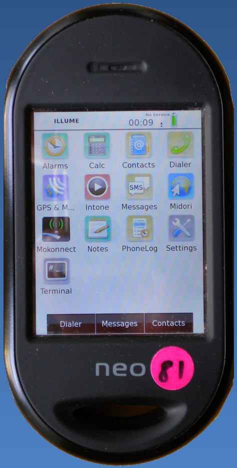
- Freescale i.MX25 ARM running at 400Mhz
- 128MB of RAM
- 480x800 screen resolution
- Does rotation in software (EFL)

Open Wide High-Voltage Monitoring

- Texas Instruments OMAP ARMv5 running at 300Mhz
- 32MB of RAM
- 1 bit per pixel (black/white)
- Whole rootfs is 4MB gzipped, 8.9MB uncompressed

OpenMoko FreeRuner (SHR)

- Samsung ARMv4T running at 400Mhz
- 128MB of RAM
- 480x640 screen resolution (16bit)



Useful Features and Concepts

General Purpose Library

- Stringshares for reducing memory footprint
- In-line lists/arrays for reducing memory usage and fragmentation
- Copy-on-write support for C structures and unions
- Magic checks for structures
- Many others – list, hash, rb-tree and more

Binary Serialization Library

- Serialize, de-serialize C structures and unions
- Decompile to text, and re-compile from text
- Reduces memory usage (mmap)
- Faster to load
- Supports compression and signing

Mainloop and General-Glue Library

- Animators – Timers that tick at most on every frame
- Easy support for thread-workers
- Execute, monitor and pipe input/output of executables
- Integrates with other main loop implementations

Canvas and Scene-Graph Library

- Objects on a scene-graph – render only when needed
- Render when done – No flickering
- Double (and triple) buffering – No tearing

Theme and Layout Library

- Fast, light and portable (utilises Eet, our binary serialization library)
- We use it to theme each of our widgets
- Developers don't need to know about colours, but about state:
  - "alert" state, instead of a red rectangle
  - "music is playing" state, instead of changing images and animating
- Designers do design – developers do code
- Scalable, automatically fits different resolutions

Widgets and Some Cool Concepts

- A lot (too many) widgets
  - All can be themed and styled
- Variable scale factor
- Adapt to “finger-size”
- Automatic UI-mirroring

General Things

- Everything is async – no blocking
- A lot is deferred, only waste CPU when really needed
- Abstracts engine – can switch between Wayland, X, FB and more
- You can configure out and get rid of fat if needed

We Love Wayland

+ We were quick to jump on the Wayland bandwagon
+ We were the first to have full client support
+ We were the first to have our own compositor implementation
− We have yet to release anything of the above (get from Git)

We Are Even More Reliable Than Before

- We finally have working CI and an ever increasing number of tests
- After many years, we have releases and point releases
- We have stable API and ABI

More Alluring Features

- Develop once, run everywhere – faster development
- We are speed, memory and power consumption obsessed
- Many of the developers work in embedded companies/departments

Fluff and Buzzwords

Strong Corporate Support

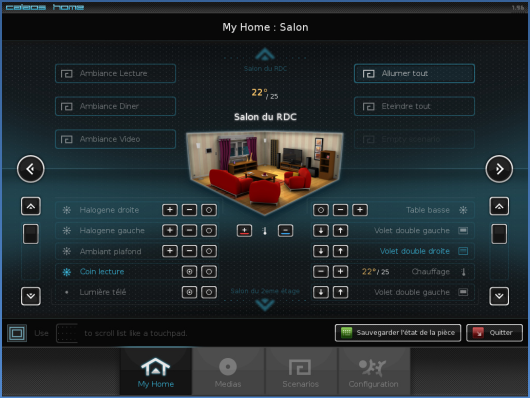
- Backed by Samsung and Intel
- Tizen uses the EFL as its UI toolkit
- Been used in products: Fridges, high-voltage monitoring, smart-homes, cellphones, low-end cellphones, tablets, in-flight entertainment systems, set top boxes, and more...

Corsair In-Flight Entertainment (Higher Spec)

- Intel Atom E660 running at 1.30GHz
- 1GB of RAM
- PowerVR GPU (GPU rendering)
- 1024x600, 800x480 and 1280x800 screen resolutions

Calaos Home-Automation (Higher Spec)

- Intel Atom D510 running at 1.66GHz (dual-core)
- 1GB of RAM



Use to scroll list like a touchpad.

Intermec Printer

- It is a printer running the EFL!

Terminology – A Crazy Terminal Emulator

- Terminology was created “because we can”
- Craziest Terminal emulator around
- Runs on X, Wayland, Framebuffer and more
- Actually has some cool and useful features
- Everything can be themed
- Fast and beautiful

Crazy Enlightenment

- Desk-switch animations
- Sparkle border theme
- Focused window theme

Making Development Easier

Clouseau – UI Inspector

- Makes it easy to query UI components and structure
- Supports remote debugging
- Works with GDB
- Can save the object tree to Eet and load it later
- Easy to extend
- Pixel inspection

Excatness – Pixel-Perfect Regression Testing

- Simple to use
- Supports running tests in parallel
- Has it’s limitations, for example, animations

Enventor – Visual EDC Editor

- Real-time preview of the Edje file
- Does syntax highlighting
- Highlights relevant parts while editing
- Still under development

Our Plans for the Future

Bob – Edje v2

- Don't ask me about the name
- Have variables instead of signals
- Simplify the layout-logic
- Make the syntax support methods to reduce code duplication
- Make it Lua only and even more powerful

Bob 2 – Eo v2

- Don't ask me about the name
- Improve debug-ability
- Reduce code overheard/boiler plate

Release EFL 1.8 and E18

- Release EFL 1.8
  - Wayland support
  - Many improvements, bug fixes and optimisations
  - Unified source for all the components
  - Uses Eo internally
- Release Enlightenment 0.18
  - Compositor rewrite and improvements
  - A lot of things rewritten and improved
  - Many bug fixes
  - Wayland clients under X (no Wayland only yet)

General Plans

- Bob 3
- GUI builder
- Improve our test-suites even more
- Get the EFL running on more crazy devices
- ... and some more projects

Where to Find Us

- Website: https://www.enlightenment.org
- Sources: https://git.enlightenment.org
- Continuous Integration: https://build.enlightenment.org
- Mailing Lists: https://enlightenment.org/p.php?p=contact&l=en
- IRC: #edevelop@FreeNode
- Me: Tom Hacohen <tom@stosb.com>

Thanks for Listening, Questions?

- Page 6, `resources/infinity.jpg` (no longer available)
- Page 8, `resources/openmoko_shr.png`
- Page 22, `resources/corsair.png` (no longer available)
- Page 23, `resources/calaos_home.jpg`
- Page 24, `resources/intermec.png`