Fancy and Fast GUIs on Embedded Devices

Using the Enlightenment Foundation Libraries to achieve maximum performance on embedded devices.

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Now costumers are used to fancy devices and expect newer to be even fancier...

Users Expectations

- Quick feedback: responsive;
- Natural animations:
  - Matches real life;
  - Clarifies the work flow;
  - Clue whenever device is working or frozen;
  - Quick distraction while system is processing;
- Beauty.

Technologies

X11 Window System

- Input/Output communication with Hardware;
- Networked protocol to communicate with Apps;
- Used in every UNIX system since 1987;
- Very basic primitives;
- Very difficult to get right;
- Often used through high-level abstraction libs:
  - GTK, Qt, SDL, Evas, Tk, Xaw, Motif, ...

OpenGL - Open Graphics Library

- Industry standard for Hardware and Software;
- Focus on 3D (2D is handled as consequence);
- Fast triangle/rectangle/polygon drawing;
- Fast matrix transformations (scale, rotate, shear, perspective);
- Fast alpha blend;
- High-end cards support programs-per-pixel (pixel shaders): advanced render, light and effects;

GTK - The GIMP Toolkit

- Created in order to help development of The GIMP (Photoshop-like tool) with X11;
- Focus on visual widgets (buttons, text box, ...);
- Some efforts to run on non-X11 platforms;
- Basic free-drawing operations;
- Adopted by GNOME project due its LGPL license;
- No OpenGL support;

SDL - Simple Direct Layer

- Created to aid port of Windows games to Linux;
- Multi-platform by design;
- Framebuffer and events abstraction layer;
- Almost no drawing primitives;
- Easy to draw images everywhere (nothing more);
- Low entry barrier;
- Developer must care about everything;
- OpenGL "support";

Evas

- Created to aid development of graphical appealing Window Manager and File Manager;
- Focus on animation and alpha blending;
- Efforts to run on non-X11 platforms;
- Easy to draw objects everywhere;
- Powerful and extensible drawing system;
- State-full canvas;
- GUI stack built upon Evas and Edje (ETK, EWL);
- OpenGL support;

Scene Renderer/Manager - Concept

- Every screen can be thought as a scene;
- Someone (or something) must manage scene contents (objects);
- Keep object state (color, opacity, position, size and layer);
- Old states must be cleared;
- New states must be draw;
- Avoid painting unnecessary areas;
- On events, translate (x,y) coordinate to object.

Scene Renderer/Manager - Role

X11	Developer
SDL	Developer
GTK	Developer
Evas	Software

Scene Renderer in SDL or GtkDrawingArea

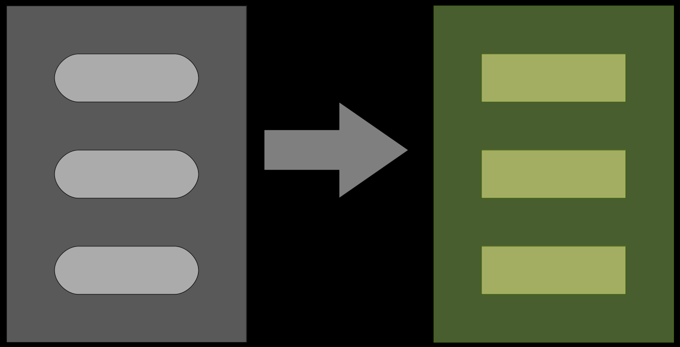
- Moving 2 balls over a background image:
  - Calculate ball_1 and ball_2 positions (x,y);
  - Repaint old (dirty) regions with background;
  - Paint ball_1 and ball_2;
  - Update screen on repainted (cleared) and new areas.
- Problems:
  - Same background area may be repainted more than once;
  - If images are opaque and overlap, you should not paint the lower image;
  - Screen may have the same area updated more than once;
  - Make number of items variable and you **must** write your own scene manager;
  - This does not cover properties like opacity, size or clipping.

Scene Renderer with Evas

- Moving 2 balls over a background image:
  - Calculate ball_1 and ball_2 positions (x,y);
- Solutions:
  - Evas remember what is dirty and need to be repainted;
  - No opaque area is draw more than once;
  - No screen area is updated more than once;
  - Opacity, size, clipping and other properties are also handled!

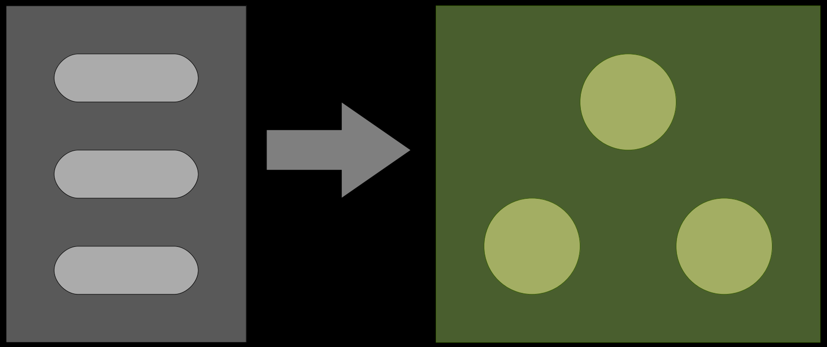
Theme Ability

Enables application look and feel to be changed without being rewritten.



Basic:

change colors, font and images



Advanced:

change colors, font, change layout, animations

Theme Ability

X11	None	
SDL	None	
GTK	Basic	
Evas	Software	Edje style + script

Why not SDL?

- Too much burden on developers with mundane tasks;
- Error prone;
- Not scalable (both graphical and development);
- Barebones;
- Building upon will lead to Evas (which run on SDL by the way);
- **Too much work and difficult to get right.**

Why not GTK?

- Too much focus on Forms;
- Rigid layouts;
- Lack of transparency support;
- Too tied to X11;
- No OpenGL acceleration;
- No animation support;
- Poor theme capabilities;
- **Difficult to get beautiful.**

Why Evas?

- Edje theme system;
- ETK widget toolkit (themed by Edje);
- Optimized core engine;
- Excellent X11 and OpenGL support;
- Small footprint (about 600Kb the whole stack);
- Few external dependencies;
- BSD license enables to build closed source products (if required!);
- Designers will depend less on developers;
- **Rich view applications made easy;**

Artists do not depend on developers

- Without Evas:
  - Artist design a new layout and animation;
  - Developer write code to load images, remember position, remember current, draw them, compile, debug, test, run;
  - Artist validates result.
- With Evas/Edje:
  - Artist design a new layout and animation using Edje, already visualize with **edje_viewer** or **edje_editor**, validating result as it's created.

Like web development, which most artists are used to!

EFL Stack

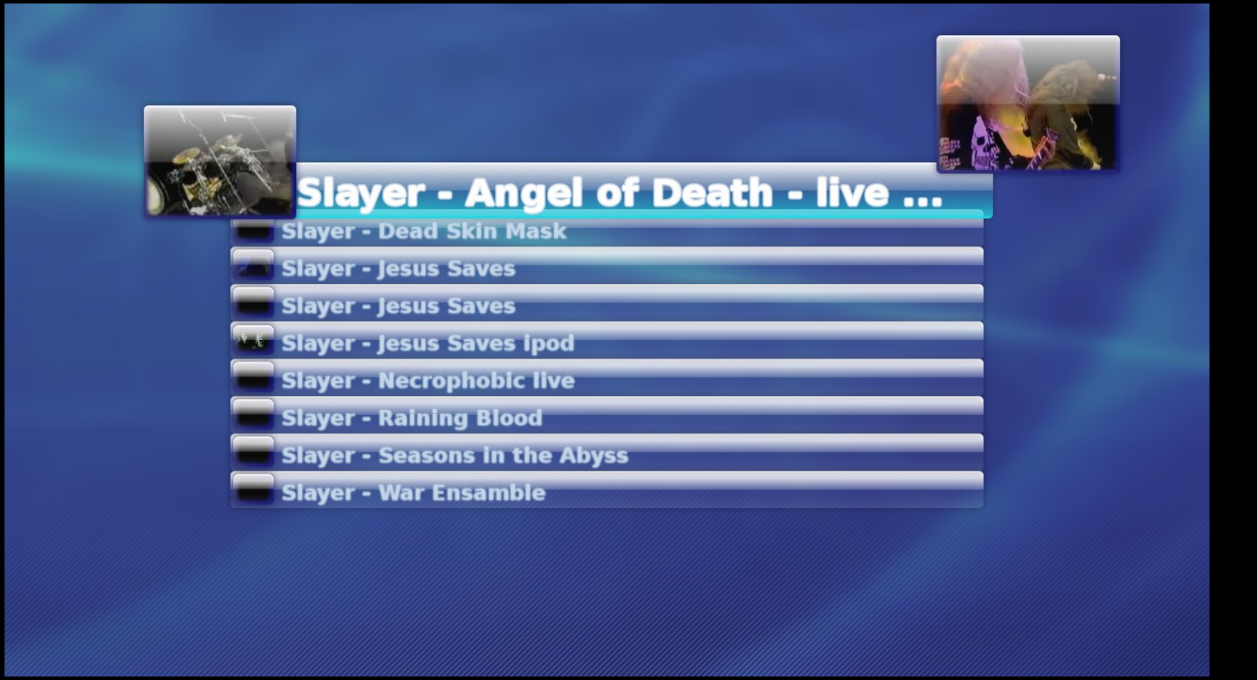
- Evas: drawing canvas;
- Ecore: events & main loop;
- Ecore_Evas: glue of Evas with various I/O;
- Edje: High-level management of Evas objects (Theme/Script support);
- ETK, EWL: toolkits built on top of Evas, Ecore and Edje.

Technology Showroom

- Rage 0.2 on desktop;
- Enlightenment E17 on desktop;
- Expedite on desktop;
- Expedite (x11 and x11-16) on N800;
- Canola folder view on desktop;
- Canola folder view on N800;
- etk_test on destkop;
- ewl_embed_test on desktop.

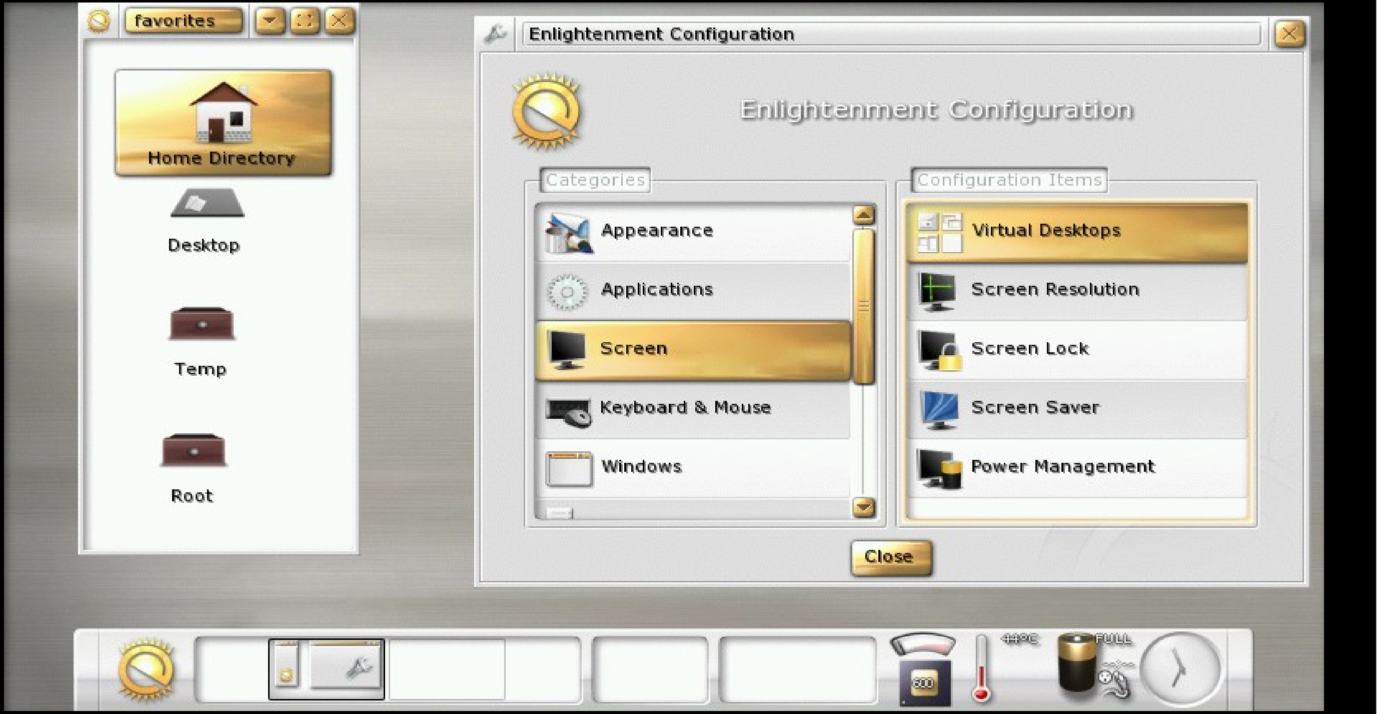
Rage 0.2

- Multimedia application for set-top boxes;
- Visual appealing with shiny overlays on video;
- Less than 7K lines of C, 1K lines of style desc.;
- Mostly written by one person in one weekend.


Slayer - Angel of Death - live ...
Slayer - Dead Skin Mask
Slayer - Jesus Saves
Slayer - Jesus Saves
Slayer - Jesus Saves ipod
Slayer - Necrophobic live
Slayer - Raining Blood
Slayer - Seasons in the Abyss
Slayer - War Ensamble

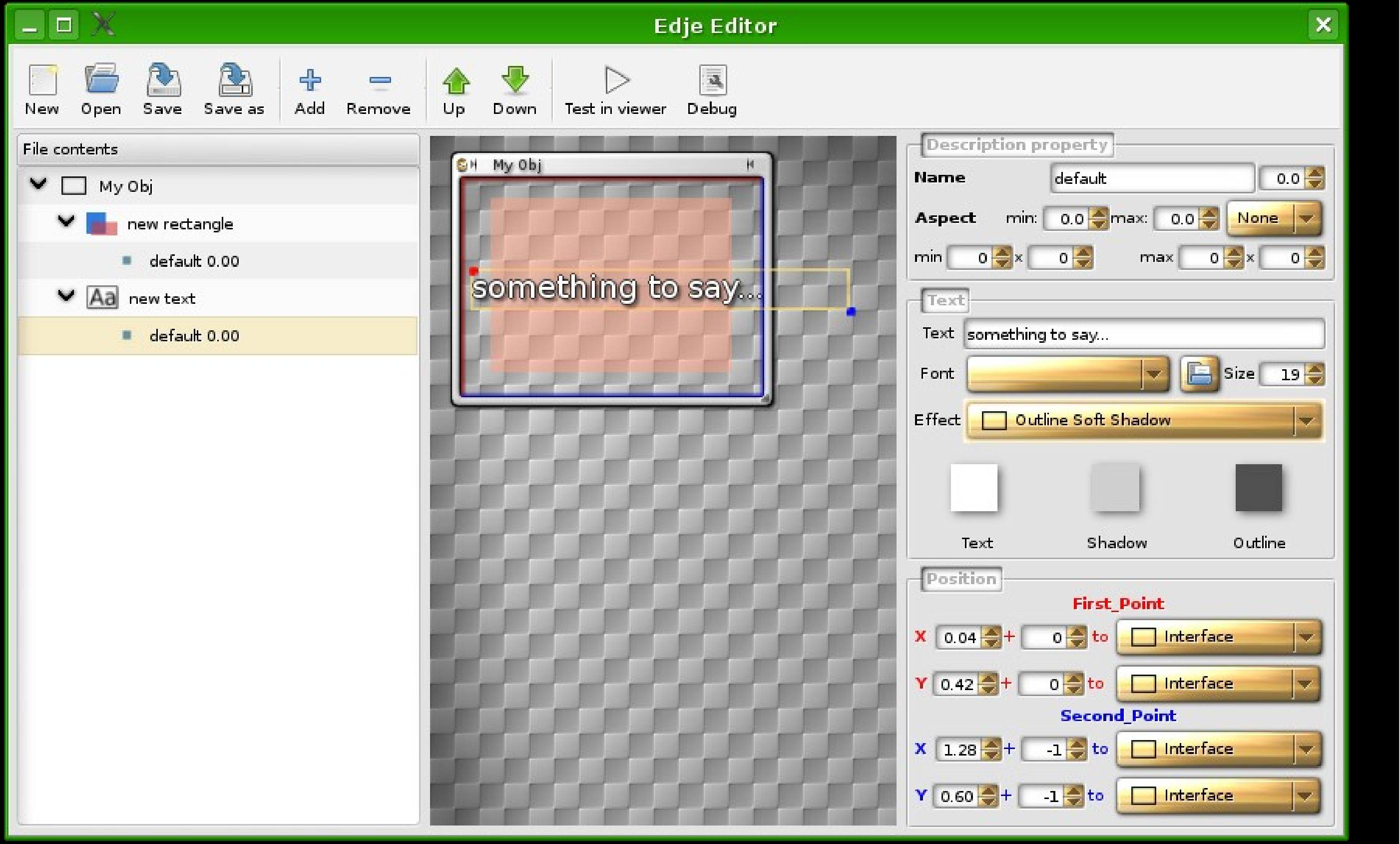
Enlightenment E17

- Main project using Evas, Edje and others;
- Provides requisites and test case;
- Huge WOW! Effect;
- Resource efficient.



Edje Editor

- What-You-See-is-What-you-Get Edje editor;
- Target at artists/designers;
- Still in early stages.



Name: default 0.0
Aspect min: 0.0 max: 0.0 None
min 0 x 0 max 0 x 0

Text: something to say...
Font: Size 19
Effect: Outline Soft Shadow

First_Point
X 0.04 + 0 to Interface
Y 0.42 + 0 to Interface

Second_Point
X 1.28 + -1 to Interface
Y 0.60 + -1 to Interface

Expedite

- Benchmark toolbox;
- Used to compare various engines.

EXPEDITE

ESCAPE - exit, FPS: 26.374

Contact

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