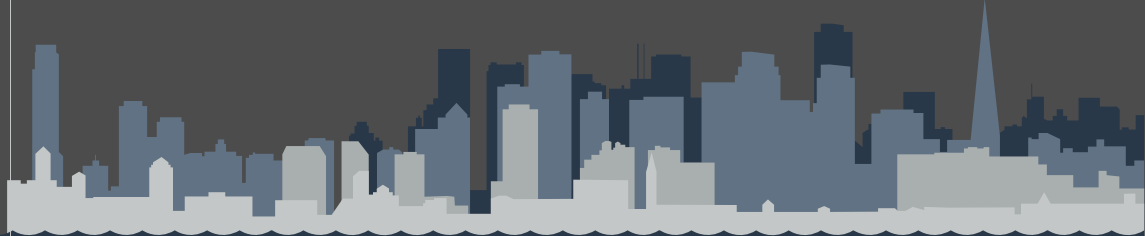


TIZEN™ DEVELOPER CONFERENCE MAY 7-9, 2012



Tizen graphics core. The scene graph (Evas)

Tizen native display layer – Architecture & Usage
<http://www.enlightenment.org>

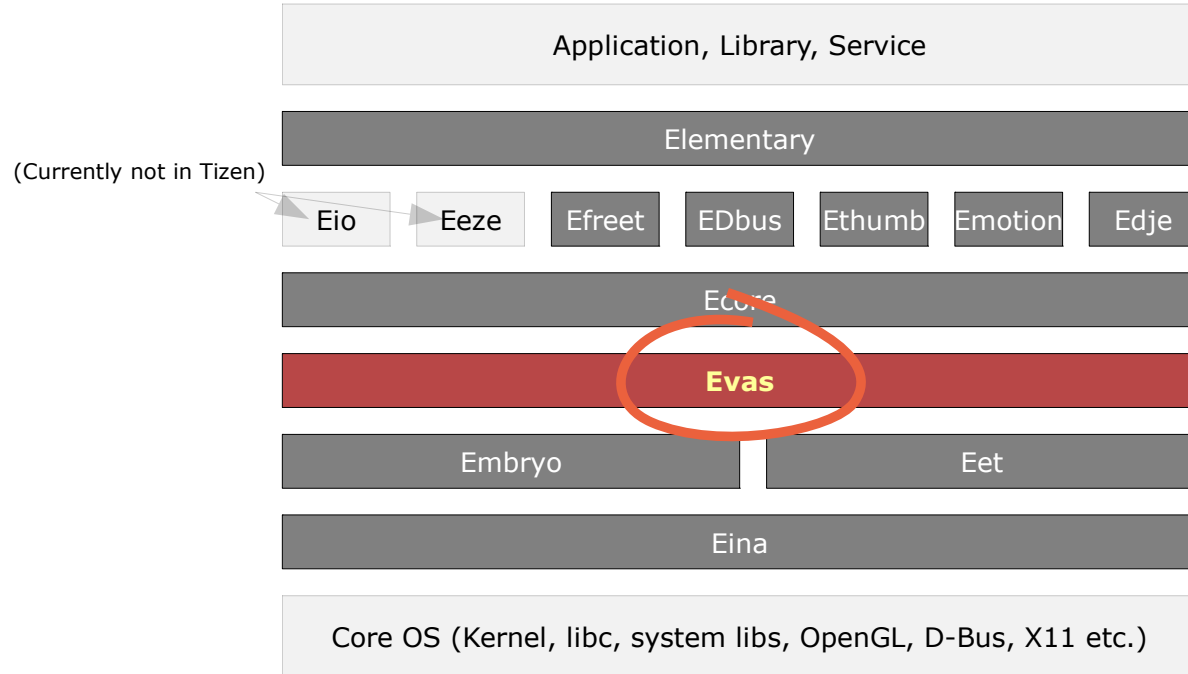
Carsten Haitzler

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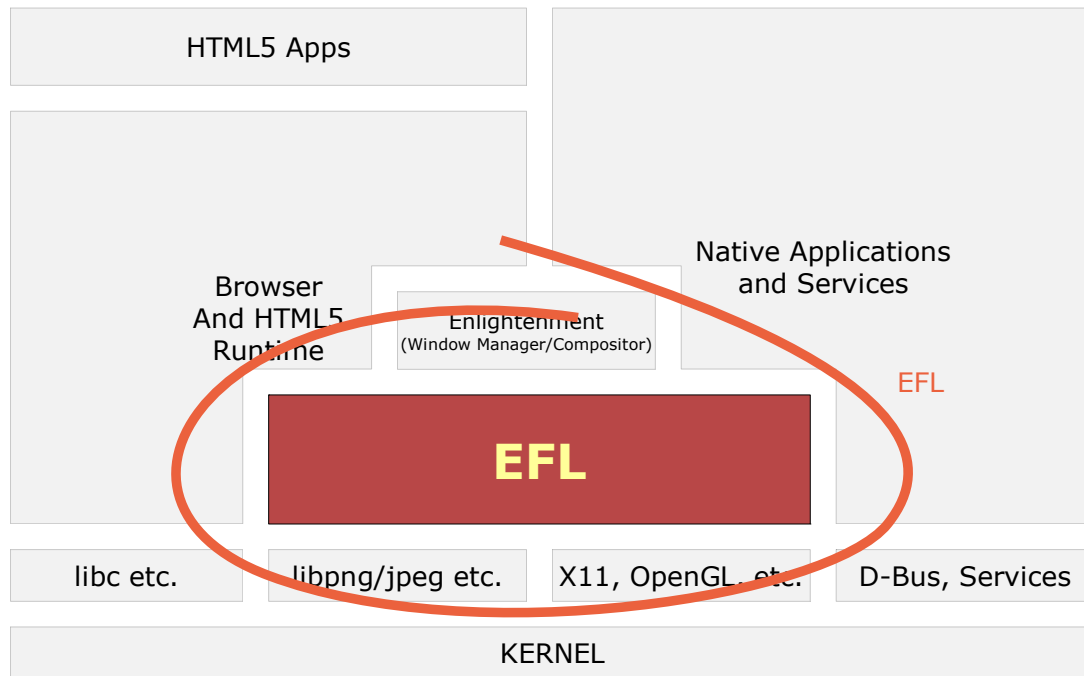
Evas is part of EFL

- A collection of libraries
 - From the same team working on Enlightenment (E)
 - Built for the purpose of making E17 (Enlightenment 0.17)
 - Focused on staying lean and still providing fanciness
 - Almost all development focus on EFL vs E17
 - Cover a wide range of functionality
- 26% of code for E17 is E, rest is EFL.
 - E17+EFL make up only 50% of code in SVN though

Where does it live



Evas is part of EFL



Why Evas?

- Very fast software rendering
- Solid accelerated OpenGL/OpenGL-ES2.0 support for years
- 60fps+ on common phones with high quality (32bpp)
- Memory footprint vs existing Linux toolkits & desktops
 - Measured with full desktop environment (closest apples to apples comparison)
 - Approx 60% less memory usage than Unity (Ubuntu 11.04)
 - Both have approximately equivalent features

Why is this relevant?

- If you are building Tizen platforms, you'll run into Evas or need it
- With OpenGL acceleration, overhead may not always be worth it
 - Fast software rendering needed
 - Some uses (low end phones, mp3 players) may have no GPU
 - Texture Atlases expand memory needs of OpenGL
- Memory on phones and tablets is a fraction of PC's
 - 128Mb-512Mb common
 - No swap (limited write cycled to flash)

Why is this relevant?

- High level abstraction allows for more optimizing in Evas
- Easier app development
- Means ports to other display systems (e.g. Wayland) are simpler
 - Also more optimal
- Makes for easy prototyping without target devices
 - Use Evas on your desktop Linux as-is and get the same results
 - Fast write+test+debug cycles compared to cross-development

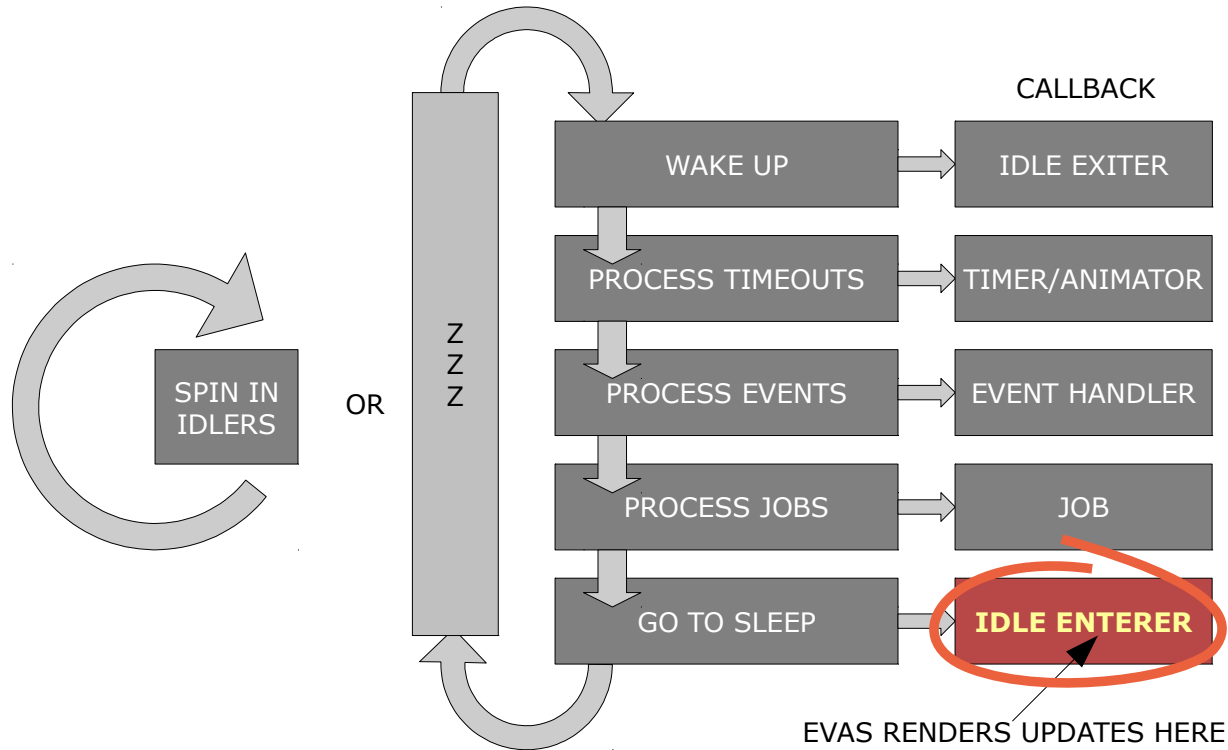
Where do I look?

- Tizen itself – <http://source.tizen.org>
 - Emulator in SDK, git repositories
- Enlightenment based distributions & packages
 - <http://www.enlightenment.org/p.php?p=download>
- Upstream source – <http://www.enlightenment.org>
 - <http://www.enlightenment.org/p.php?p=contribute>
- Easy to use scripts
 - http://omicron.homeip.net/projects/easy_e17/easy_e17.sh

How does this glue in

- Ecore is the core loop, event & marshaling library for EFL
 - Also provides glue to other subsystems
 - Display system (X11, FB, Wayland, Win32, WinCE, etc.)
 - Networking & IPC
 - Threading & inter-thread communication
 - Evas input feeding and output driving
 - More...

How does this glue in



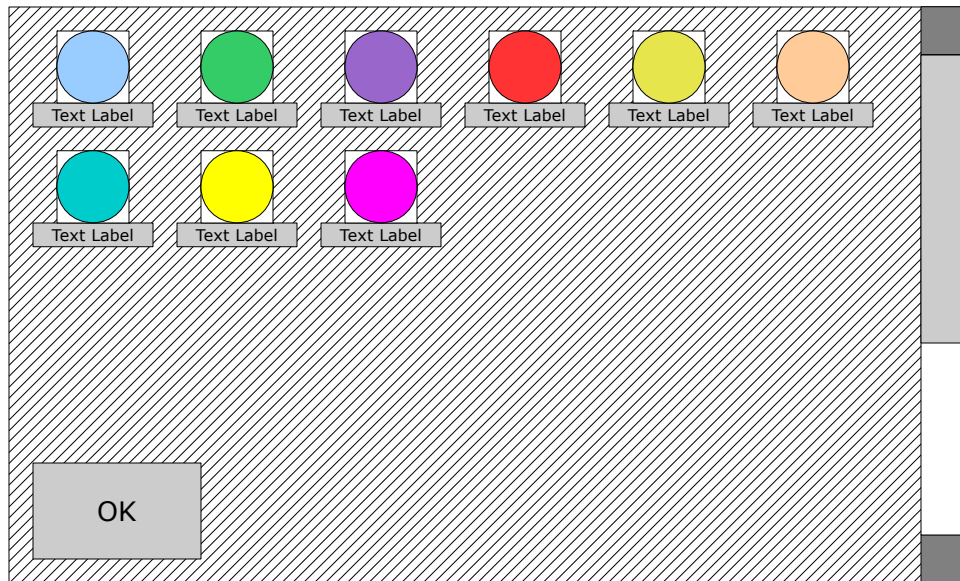
What is a scene graph?

- Tracks state of all display objects
 - Position, size, visibility, color, properties etc.
- Handles rendering of each object
 - Loading fonts, images, rendering glyphs, scaling, fading etc.
- Handles minimizing of rendering
 - Only update areas changed
 - If changes obscured, reduce to a NOP
- Optimize rendering
 - Abstract to OpenGL, software, or anything else

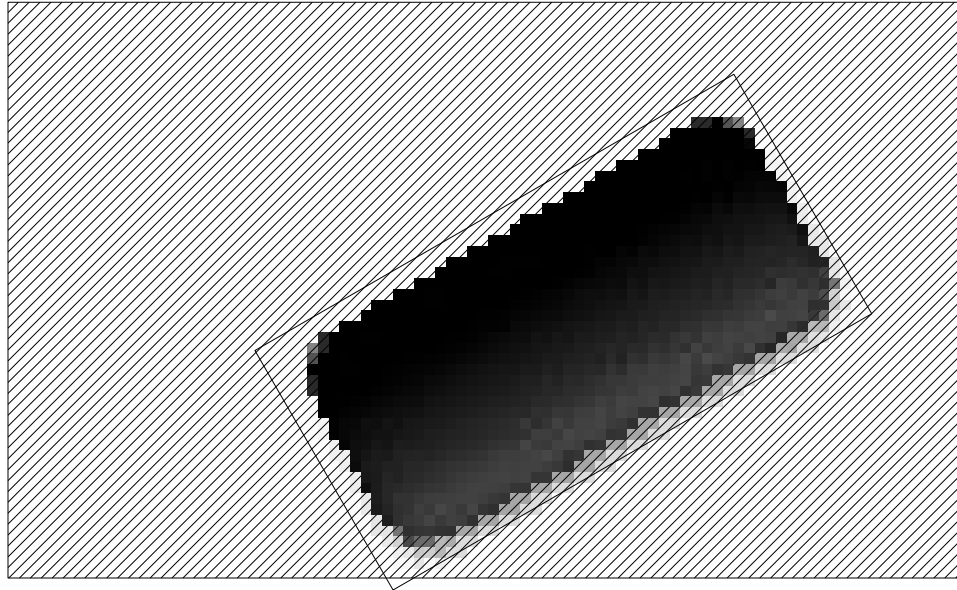
What is a scene graph?

- Handles generation and caching of pre-scaled data for you
 - Saves adding such logic to your apps
 - Can parallelize such preparation silently for you
- Can “unload” data from memory and re-fetch from original source
 - Can minimize memory footprint when idle or in the background
 - Clear out unused data while running normally
- Tree setup with parent and child objects
 - Allows you to build entire object trees, not just flat.

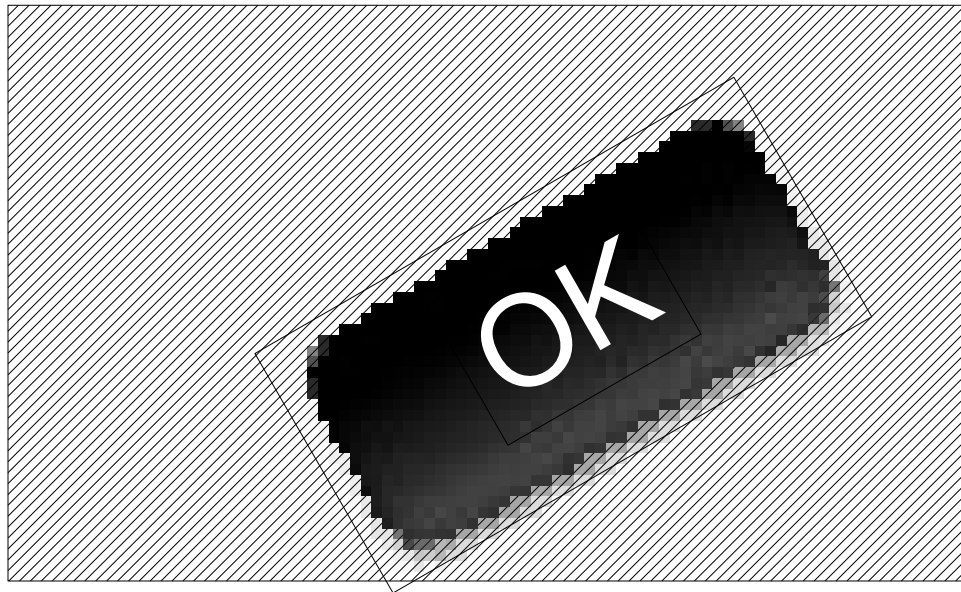
A traditional layout



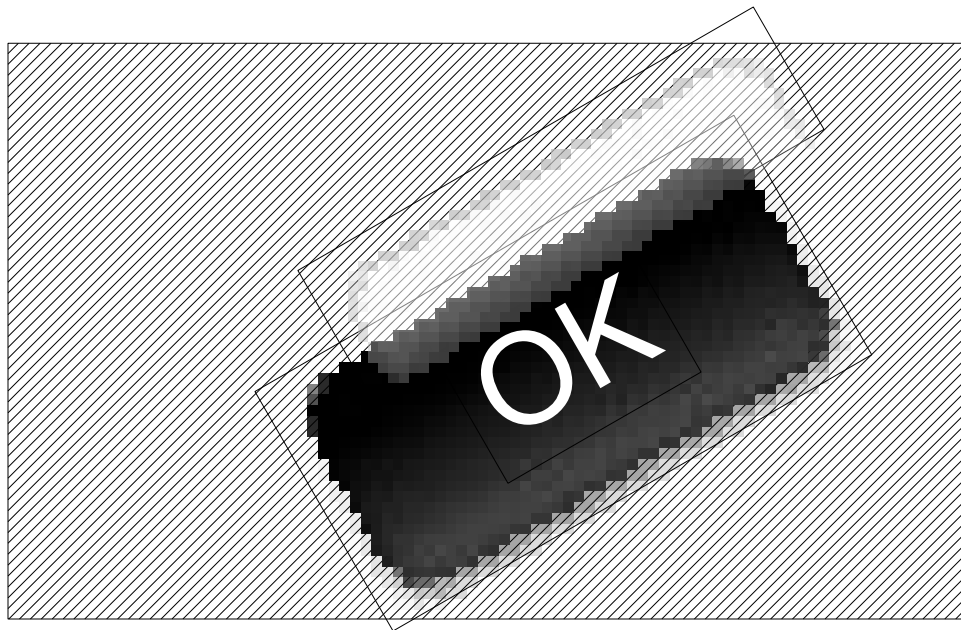
Complex objects out of simple ones



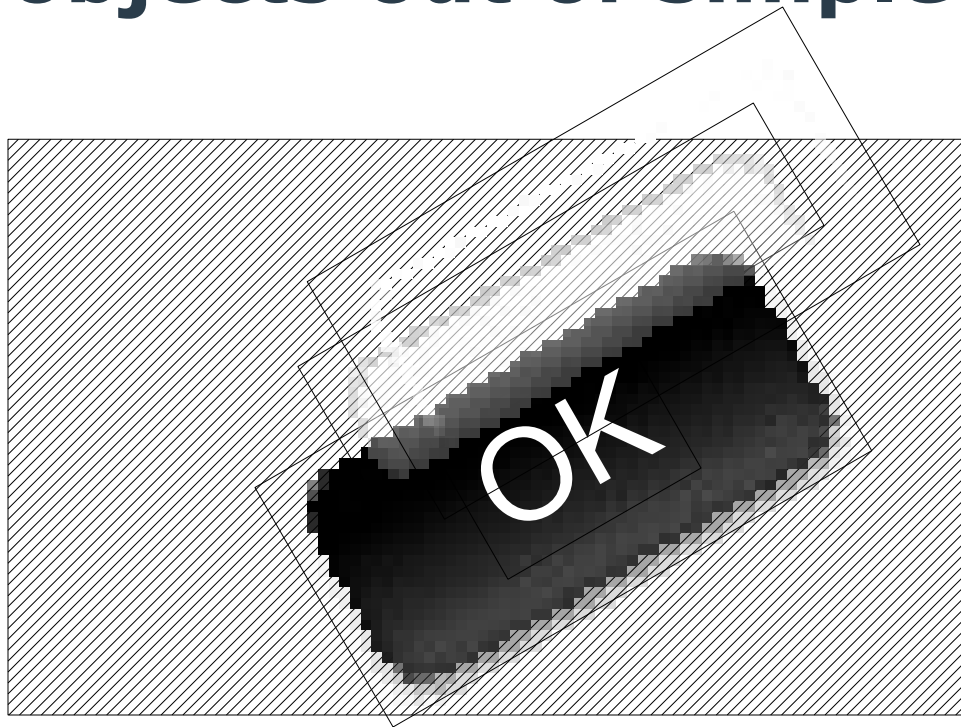
Complex objects out of simple ones



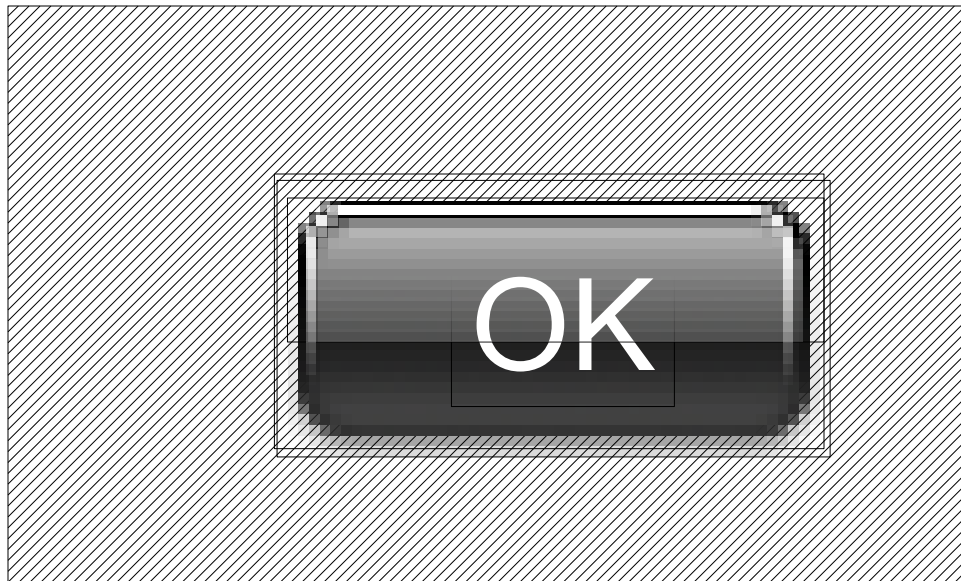
Complex objects out of simple ones



Complex objects out of simple ones



Complex objects out of simple ones



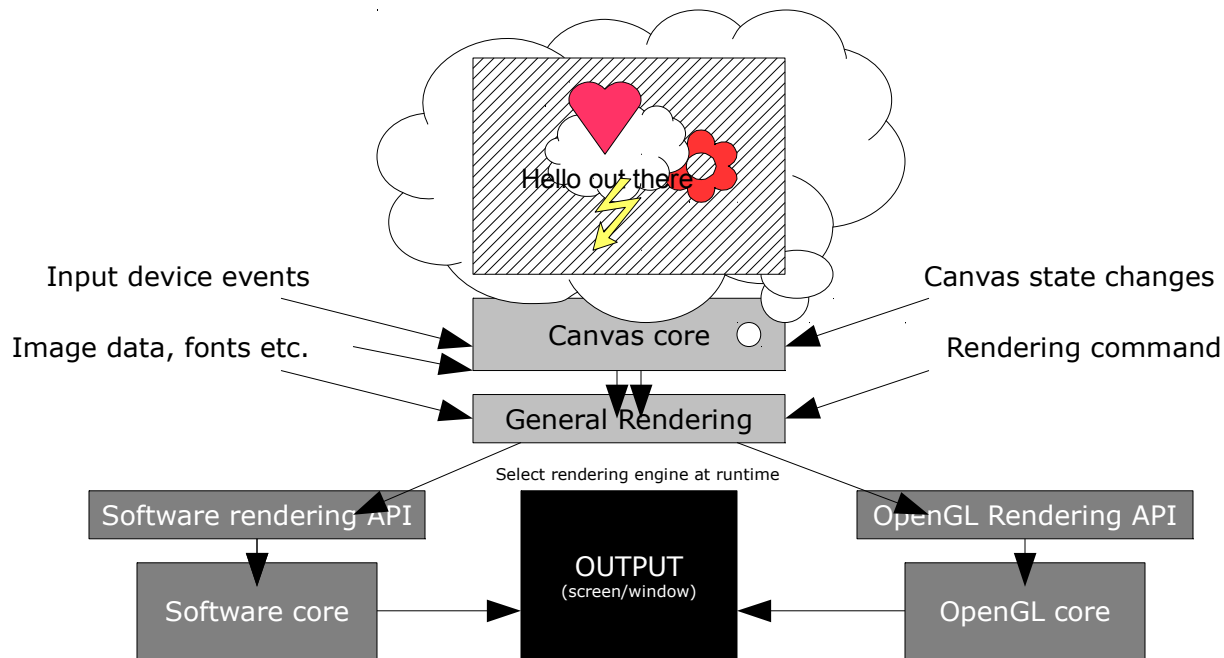
Mimics design closer

- Designers & artists work in objects and layers
- Lets you just modify the elements you need to
- With enough objects (layers) you can build almost anything
- Libraries like Edge can load whole object trees from files on disk
 - File contents pre-designed by designers and hold all content
 - Handles animation and event reaction for you

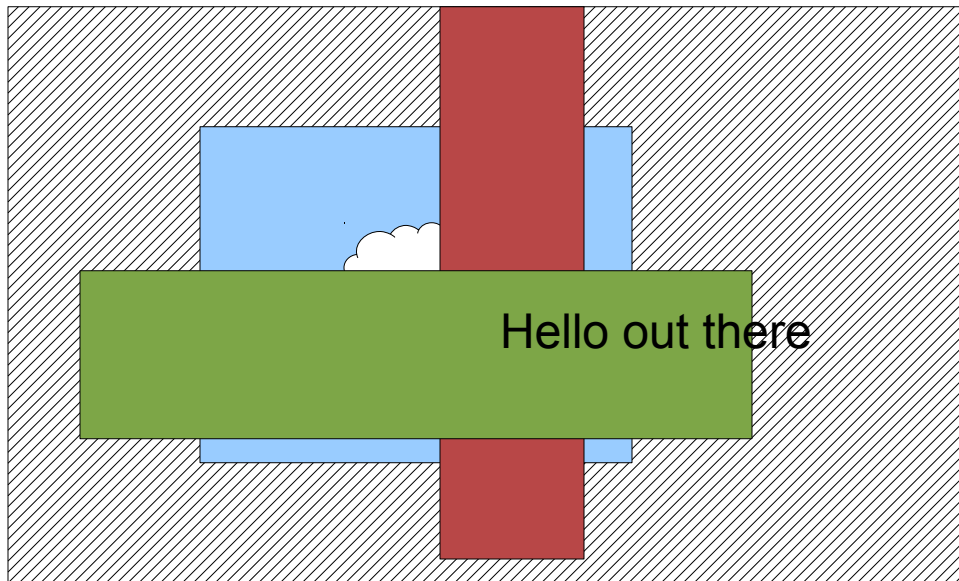
Putting together objects



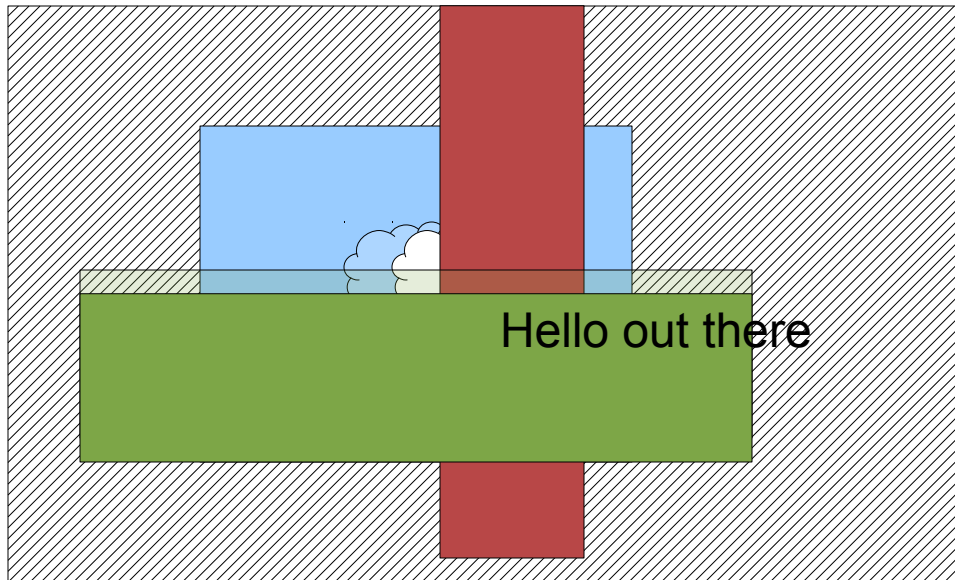
Abstracting rendering



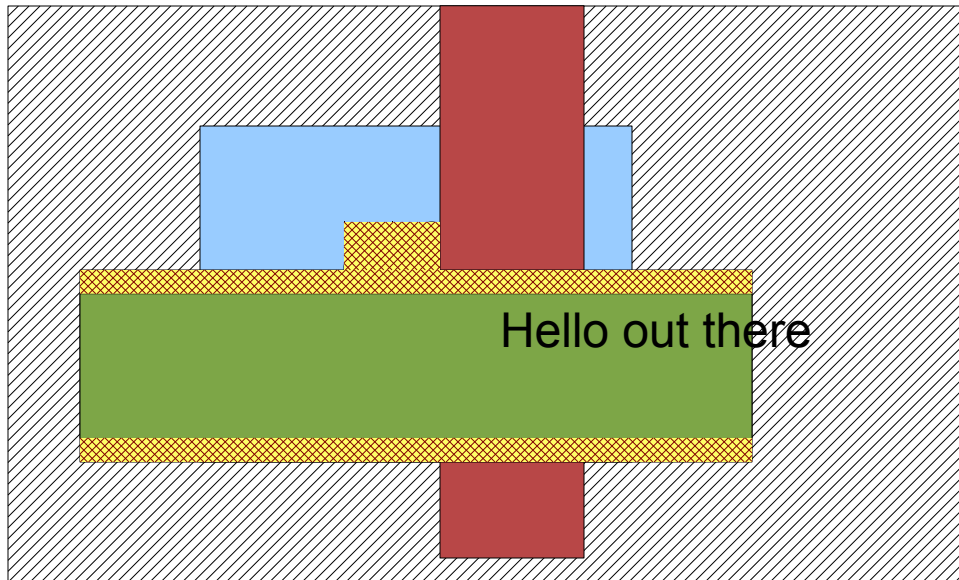
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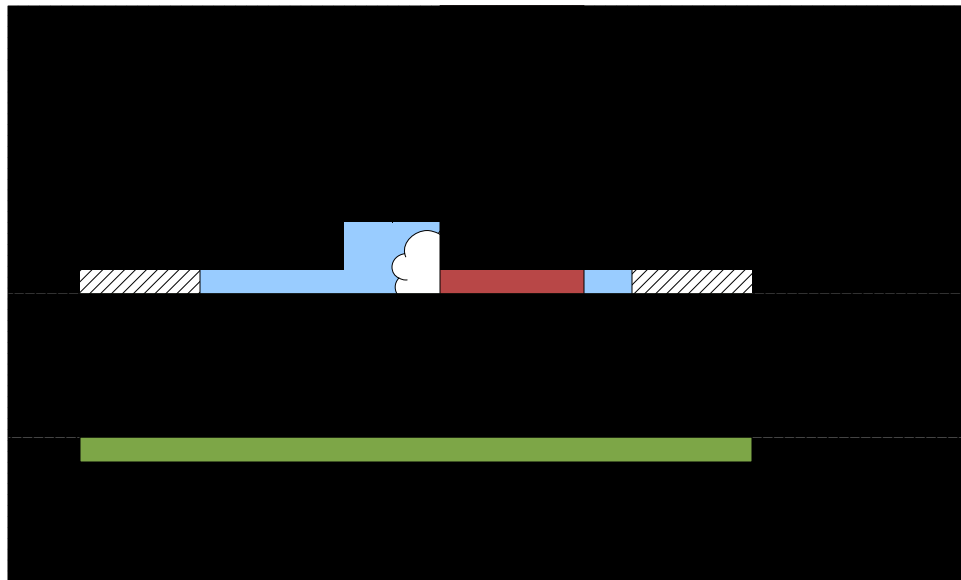
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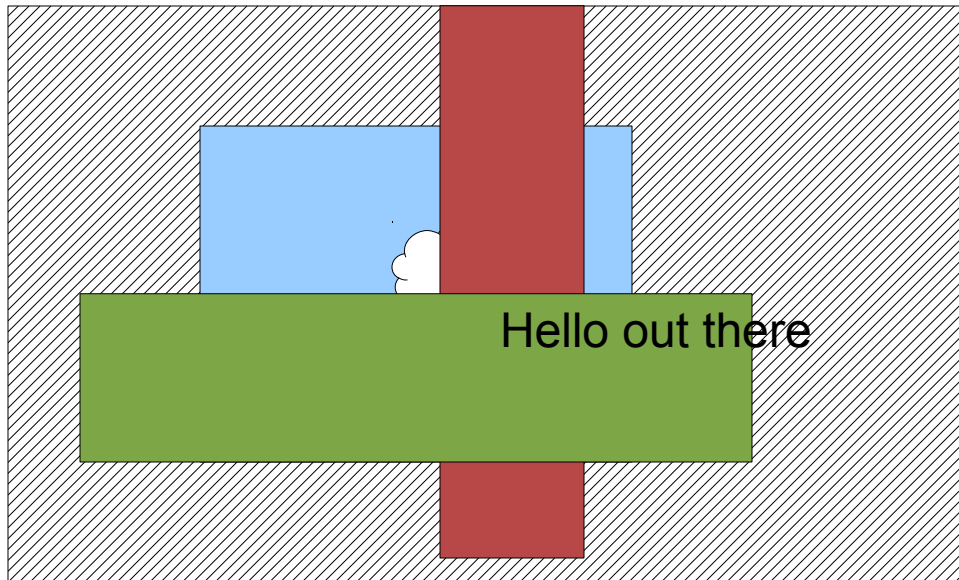
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Multiple output paths

- Pure software
 - Universal (works everywhere)
 - MMX, SSE, SSE3, NEON ASM (runtime detected)
 - High quality scaling (super-sampling + linear-interpolation)
 - Caching of scaled image data on the fly
 - Output rotation and down-convert

Multiple output paths

- OpenGL/OpenGL-ES2
 - Uses texture atlases where possible
 - Defers texture upload and removes duplication where it can
 - Multi-pipeline out-of-order rendering optimizing
 - Batches up as much geometry as it can for best performance
 - Specialized shaders for performance
 - Pushes all rendering via GL (not just compositing surfaces)
 - Text, polygons too
 - Tries to remove texture uploads with zero-copy (if possible)

Multiple output paths

- X11 (OpenGL, Xlib & XCB)
- Wayland (OpenGL & SHM)
- Raw Framebuffer
- Memory buffers
- PS3 Native
- SDL (OpenGL)
- Windows (32/64/CE) (GDI & DirectDraw)
- ... others too

Input Data

- Images
 - CMP, EDB, EET, GIF (animated + still), ICO, JPEG, PPM/PGM/PBM, PSD, SVG, TGA, TIFF, WBMP, XPM, XCF, PS, PDF, RAW, MOV/AVI/MPG/etc.
- Fonts
 - TTF, OpenType (anything Freetype 2 supports)
- Text
 - UTF-8 Unicode
 - Complex text formatting (LTR, RTL, Composition)

Questions, Answers & Flames

<http://www.samsung.com>
<http://www.enlightenment.org>

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