JogAmp Fast Media & Processing

Across devices – Desktop & Mobile

SIGGRAPH 2013 – Anaheim

July 24, 2013

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Info

Slides and BOF Video

will be made available

on

Jogamp.org.

10 Years ...

- 2003-06-06 GlueGen, JOGL, JOAL
- 2008-04-30 JOGL Release 1.1.1
- 2009-07-24 JOCL
- 2009-11-09 Independent Project
- 2010-05-07 JogAmp Project Name, Server, ..
- 2010-11-23 JogAmp RC 2.0-rc1
- 2013-07-17 JogAmp Release 2.0.2

… used by

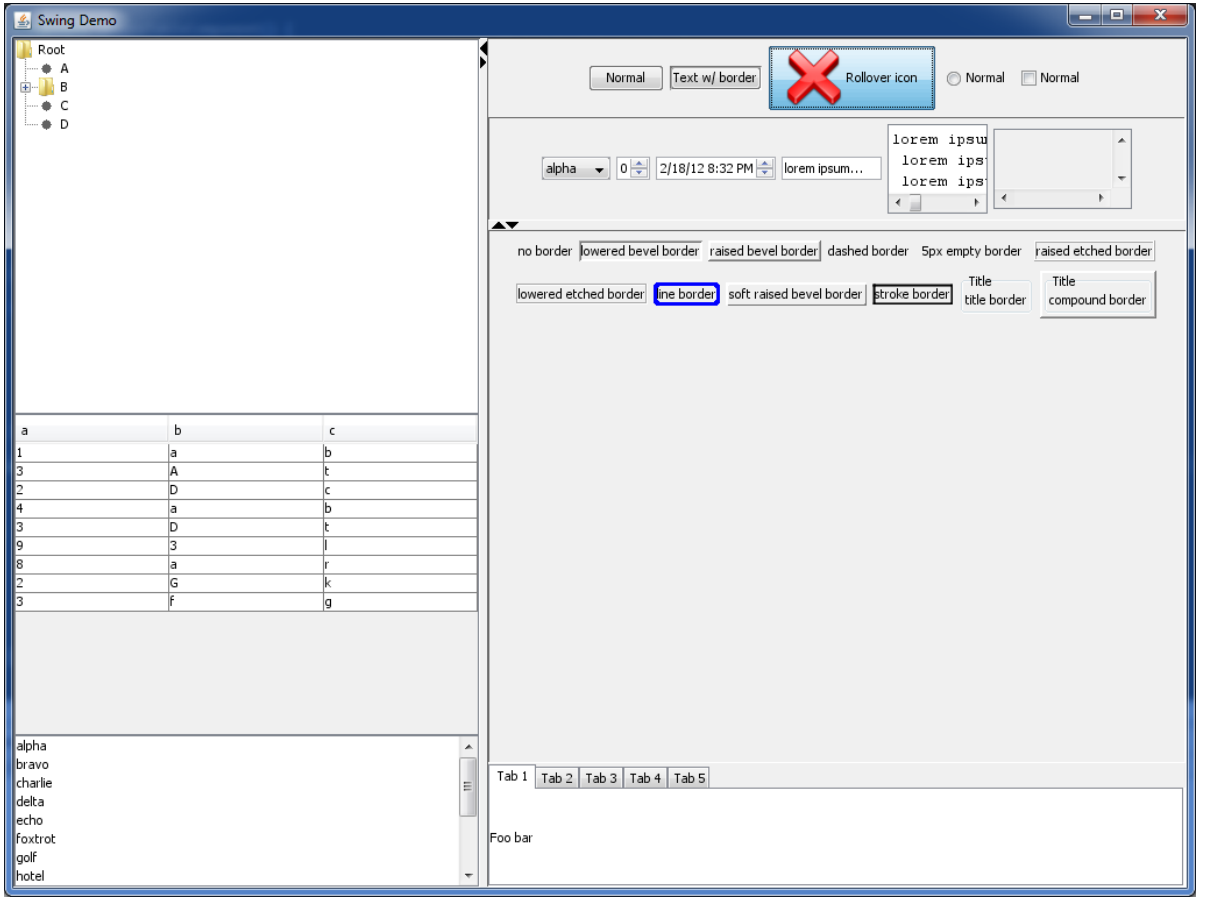
- GLG2D, Java3D (Vzome, SweetHome3d, XTour), Jake2, ...
- JMonkey3, libGDX, Ardor3D, ...
- Catequisis, Ticket to Ride
- Nifty GUI, Graph, MyHMI, ...
- Jspatial, SciLab, GeoGebra, BioJava, WorldWind, FROG, jReality, Gephi, Jzy3D, dyn4J, Processing, JaamSim, C3D, ...

GLG2D

- Problem:
  - Traditional Java2D uses a CPU based rendering engine.
  - Modern Java2D uses a hidden GPU based rendering engine.
- Replaces CPU Java2D rendering engine with painting using OpenGL.
- Accelerate the most common ways that applications use Java2D drawing.
- Uses the latest JogAmp JOGL libraries for the OpenGL implementation.

GLG2D

- Swing behaves exactly as before, except that it' being painted to an OpenGL canvas instead.



GLG2D – More Information

- Project Pages:
  - Github:

    https://github.com/brandonborkholder/glg2d
  - Homepage:
    http://brandonborkholder.github.io/glg2d/

Java3D – I'm not Dead!

- Work underway as early as 1997
- 1.5.2 released Feb2008, GPLv2 w/ classpath
- Abandoned in 2008 for JavaFX...coming soon?
- Native OpenGL, D3D backends and Jogl 1.1
- 1.6 devel branch in SVN....with a handful of fixes – vecmath, j3dcore, j3dutils but no release
- No longer functions on contemporary OSX

Jogl2 Port Feb 2012

- Julien Gouesse did initial work
- August Lammersdorf gave invaluable advice
- Harvey Harrison current ~~victim~~ maintainer
- Pure Java project, all native backends removed
- Jogl2 is the only supported backend
- Assume Java6 minimum (remove Java 1.3 compat code – not kidding)

The Future

- Very mature API
- NO API CHANGES
- Drop in replacement for 1.5.2
- Support existing users, advise others to start with something more 'alive'
- 1.6.0-final when contemporary OSX regressions are fixed

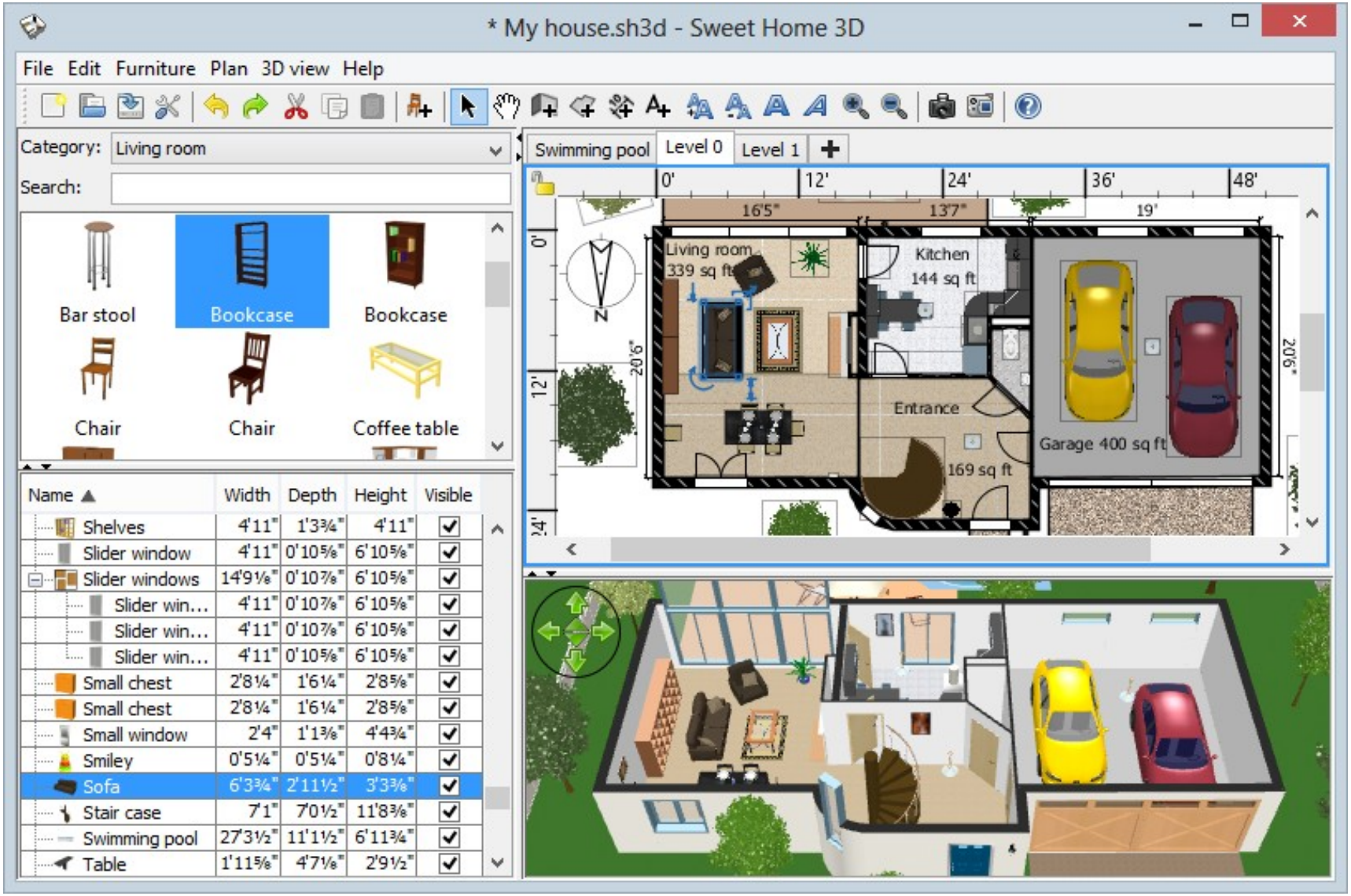
RTFS

- Harvey Harrison <harvey.harrison@gmail.com>
- PGP 0x40A76BC6
- https://github.com/hharrison/vecmath
- https://github.com/hharrison/j3dcore
- https://github.com/hharrison/j3dutils
- http://jogamp.org/deployment/java3d/
- http://forum.jogamp.org

Sweethome3d

- http://www.sweethome3d.com
- Used for the applet version on Java7/MacOSX
- Mostly a drop-in replacement
- Wider use expected after Java7u40

Sweethome3d

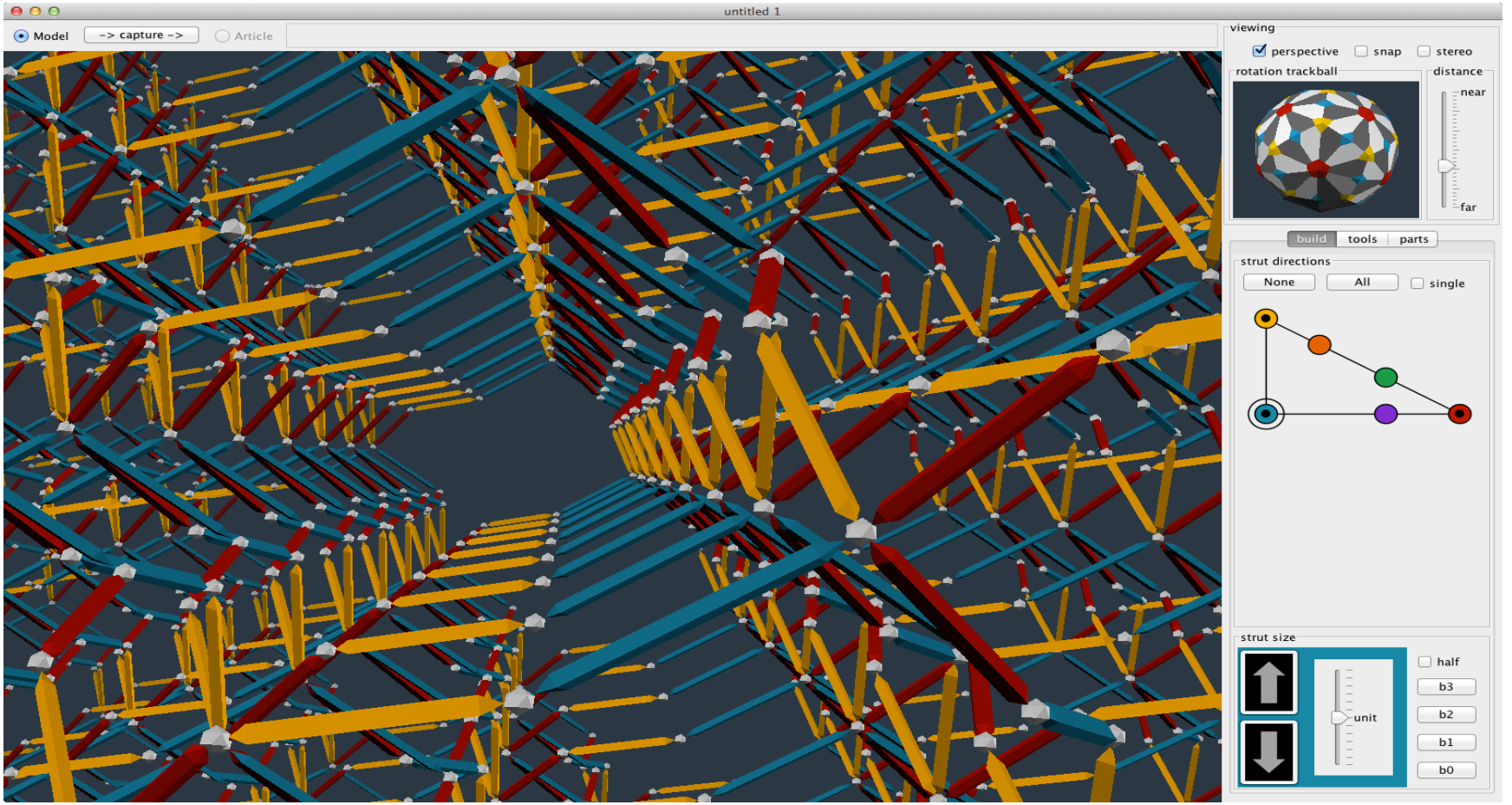


Sweethome3d

VZome

- http://vzome.com/
- Worked well out of the box
- Worked with webstart even with recent JVM updates

VZome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Model
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Article
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perspective
snap
stereo
rotation trackball
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tools
parts
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None
All
single
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half
b3
b2
b1
b0
unit

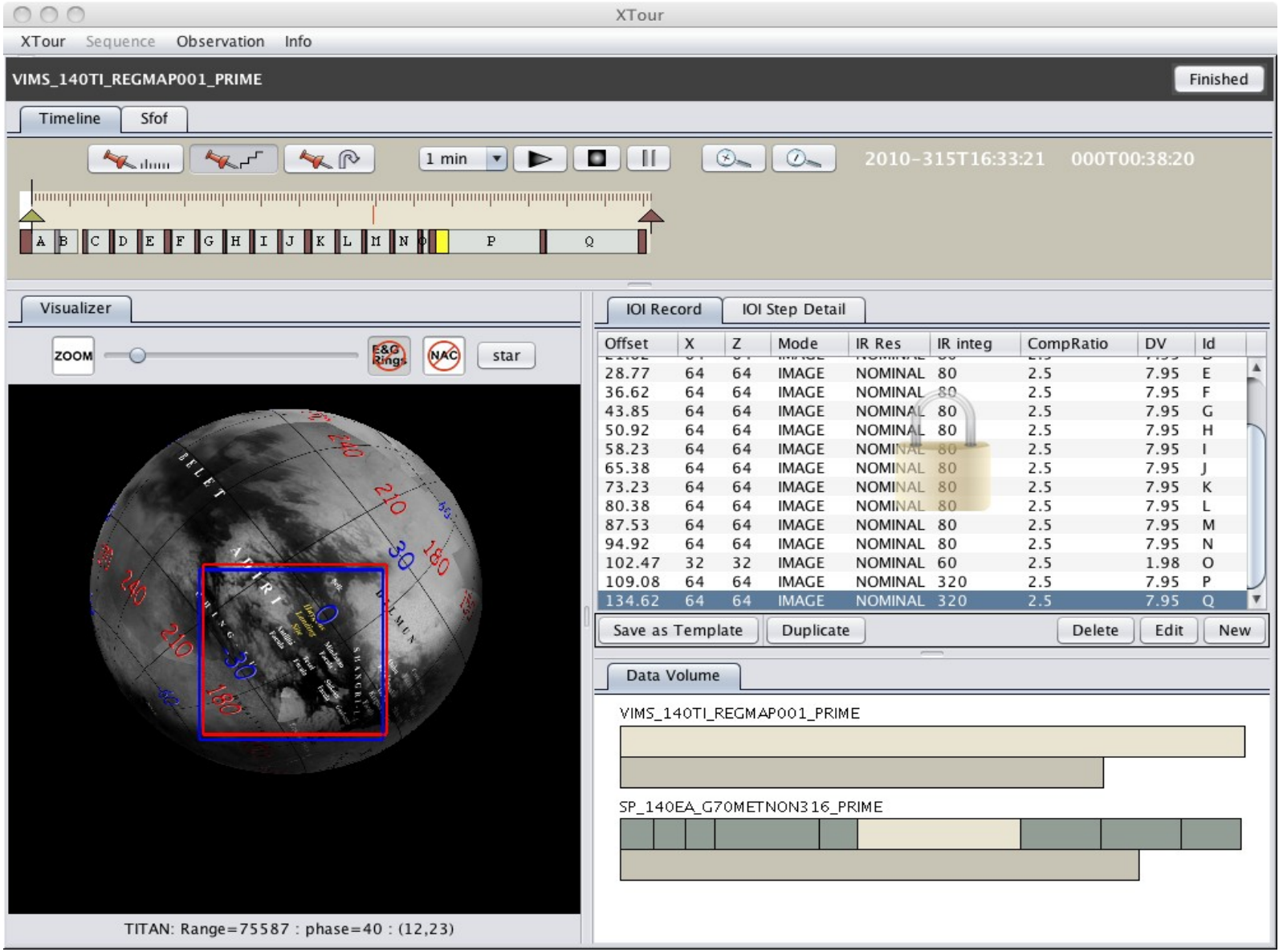
XTour

- Planning software for VIMS instrument on the Cassini Probe orbiting Saturn
- Used to plan observation, visualize likely results from a given command stream
- Client-Server solution

XTour

- Updated Java3d removed need for installation on client machines
- Worked out of the box, drop in replacement
- Avoided rewriting application

XTour


XTour
XTour Sequence Observation Info
VIMS_140TI_REGMAP001_PRIME
Finished
Timeline
Sfof
1 min
2010-315T16:33:21
000T00:38:20
A B C D E F G H I J K L M N O P Q
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ZOOM
E&G Rings
NAC
star
TITAN: Range=75587 : phase=40 : (12,23)
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IOI Step Detail
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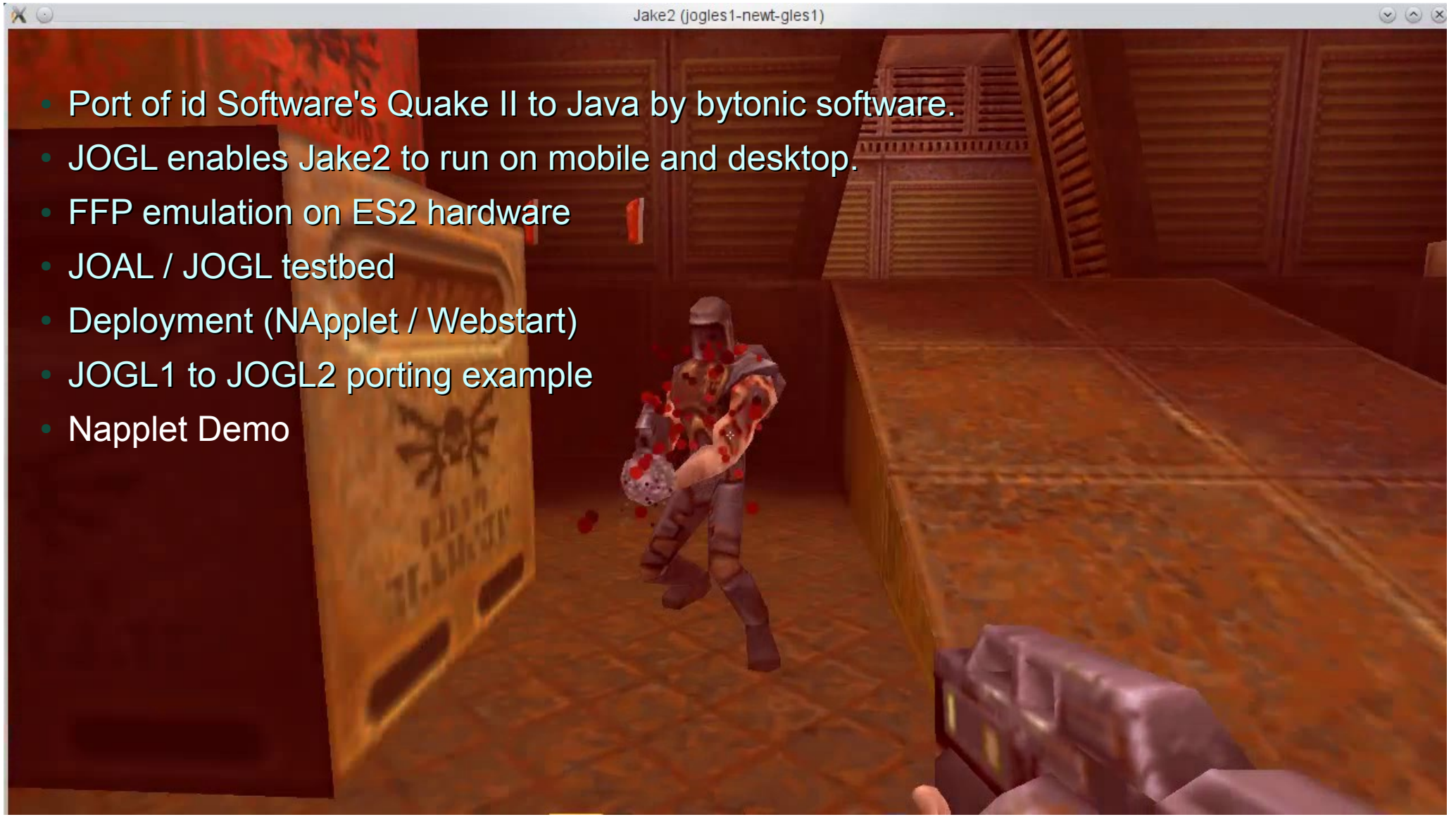
Jake2

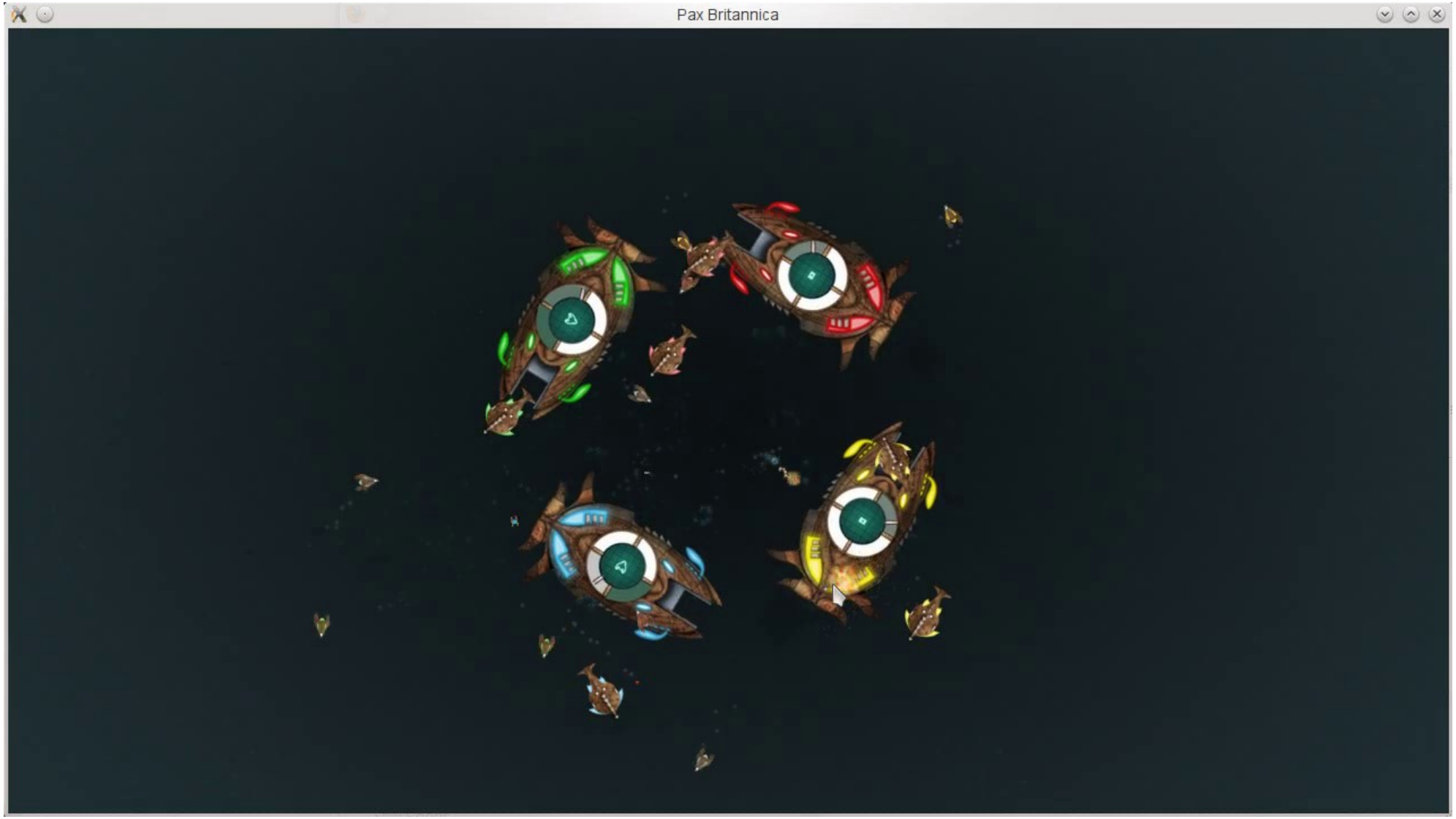


- Port of id Software's Quake II to Java by bytonic software.
- JOGL enables Jake2 to run on mobile and desktop.
- FFP emulation on ES2 hardware
- JOAL / JOGL testbed
- Deployment (NApplet / Webstart)
- JOGL1 to JOGL2 porting example
- Napplet Demo

libGDX

- Cross-platform API for game and real-time application development.
- Flexible workflow, NOT *one size fit all.*
- Availability on desktop and mobile utilizing the JogAmp backend.
- Released under the Apache 2.0 license.

libGDX



libGDX – More Information

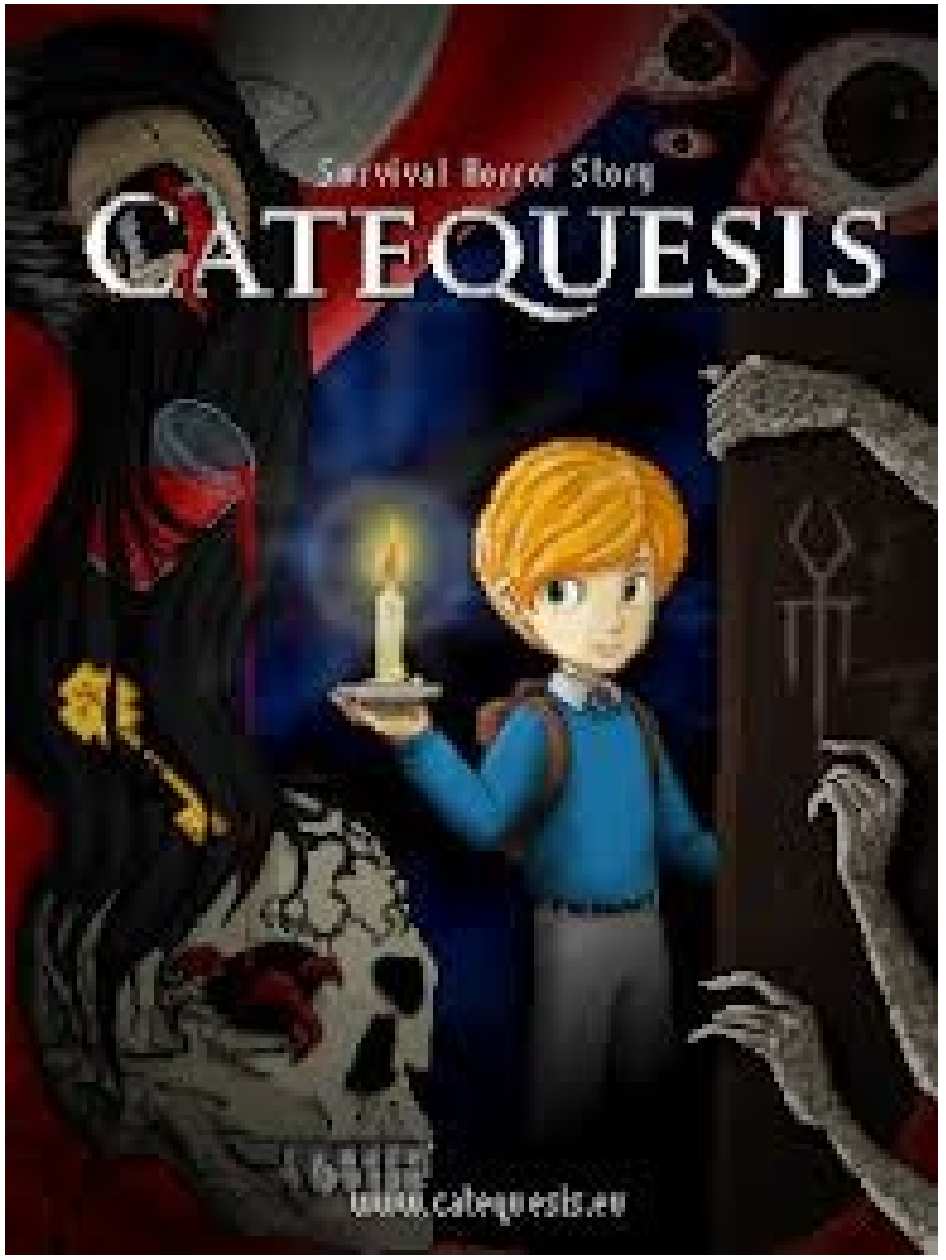
- Project Pages:
  - Github:

    https://github.com/libgdx/libgdx

  - Homepage: http://libgdx.badlogicgames.com/
  - Twitter:https://twitter.com/badlogicgames
  - Blog:

    http://www.badlogicgames.com/

- Project Pages:
  - Homepage: http://jmonkeyengine.org



http://www.catequesis.eu/

Ticket to Ride

Ticket to Ride

- Video game adapted from the board game
- Solo game offline
- Multiplayers game online
  - Client and server written in Java
- Available as Java applet, plain installer, via Steam (Windows, MacOS, Linux), via Google Play, via Amazon App store

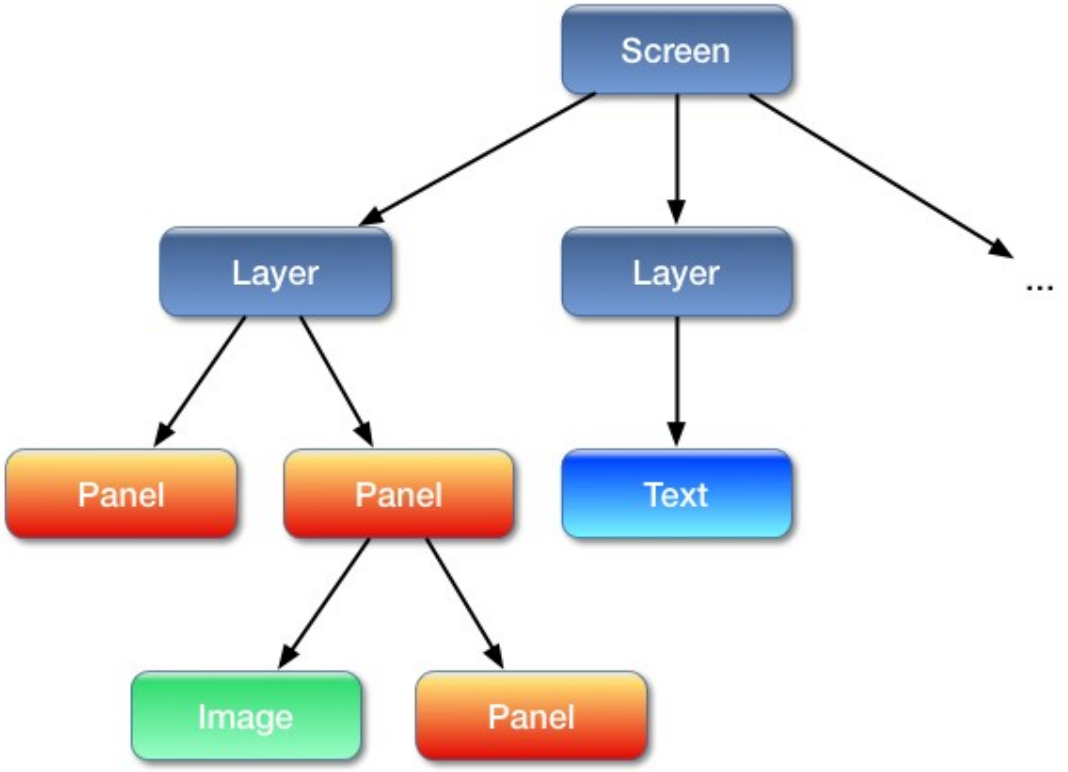
Ticket to Ride

- Java + JOGL + JOAL
- Runs (almost) everywhere:
  - Applet (no JOGL, but code shared with other clients)
  - Desktop (Windows, MacOS, Linux)
  - Mobile & tablets (Android) with a few platform-specific optimizations like native image loading
- Passed Google Android Validation

- Java Library in Development since 2007
  - Open source at Sourceforge since April 2008
  - Several major releases so far (latest: 1.3.3)
  - BSD-License
- Use it to build interactive user interfaces for games and other interactive applications
  - Can be extended and styled easily and provides many visual effects
  - However, it is different from AWT/Swing or your other usual GUI framework

nifty-gui

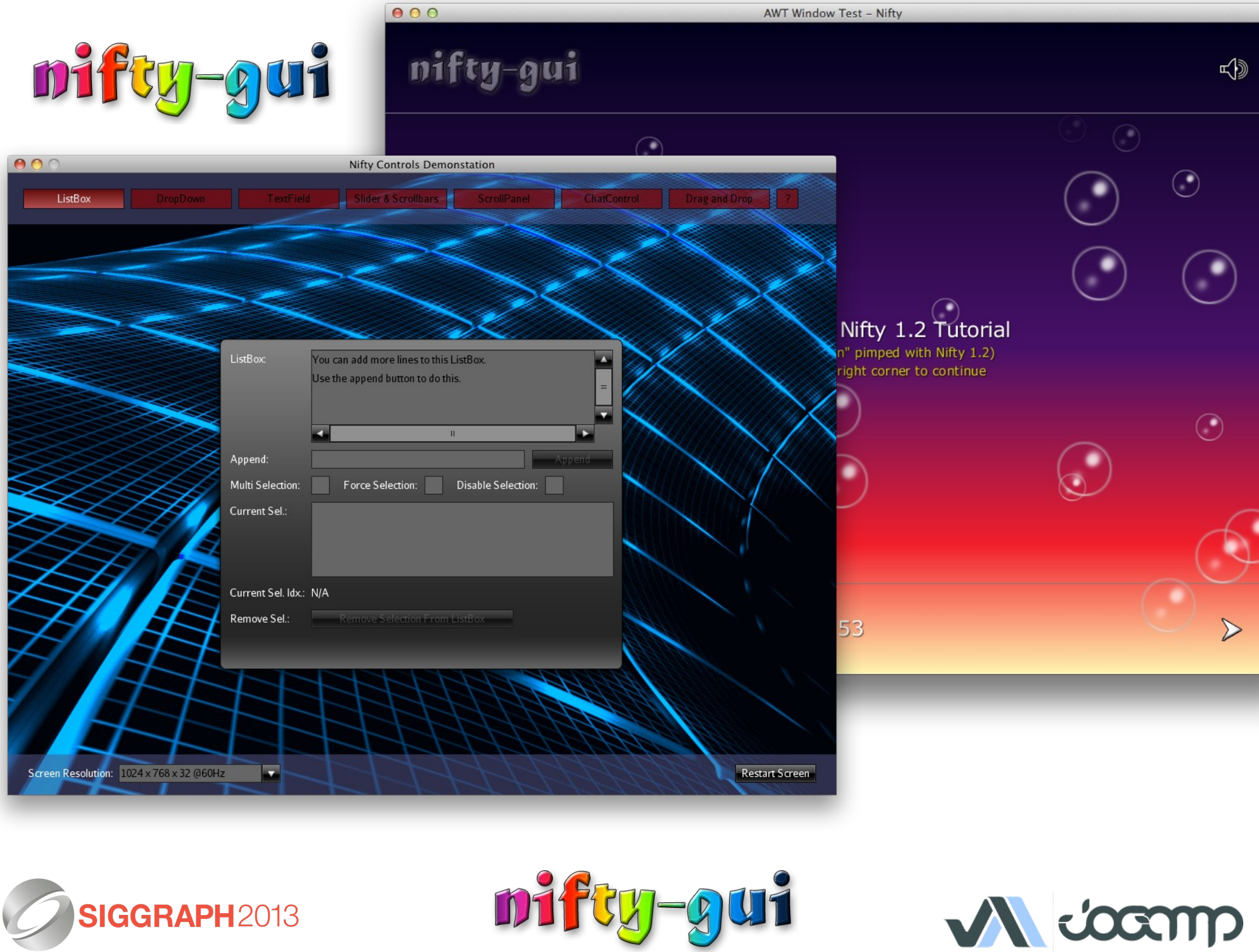
- Think of Nifty as a scenegraph



- Scenegraph is stored in XML
- Can be dynamically modified at runtime

```
<?xml version="1.0" encoding="UTF-8"?>
<nifty>
   <screen id="start">
    <layer id="layer" backgroundColor="#003f" childLayout="center">
      <panel width="50%" height="50%" backgroundImage="nifty-logo-150x150.png"
             imageMode="repeat:0,0,150,150" backgroundColor="#0f08" />
    </layer>
  </screen>
</nifty>
```

- Existing adapters to several libaries available:
  - JOGL, LWJGL, jMonkeyEngine, Slick2D, Java2D
  - Need a different one? a SPI (Service Provider Interface) is available and can be easily implemented by yourself!
  - Seamless integration with your rendering workflow
- General use-cases for Nifty:
  - Interactive Menus and Displays
  - Game Option screens
  - In-Game HUD Displays
  - Anything that displays icons or text with Java and wants to do that in a somewhat nifty way ;)



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nifty-gui

jogamp

nifty-gui – More Information

- Project Pages:
  - Github:

    https://github.com/void256/nifty-gui

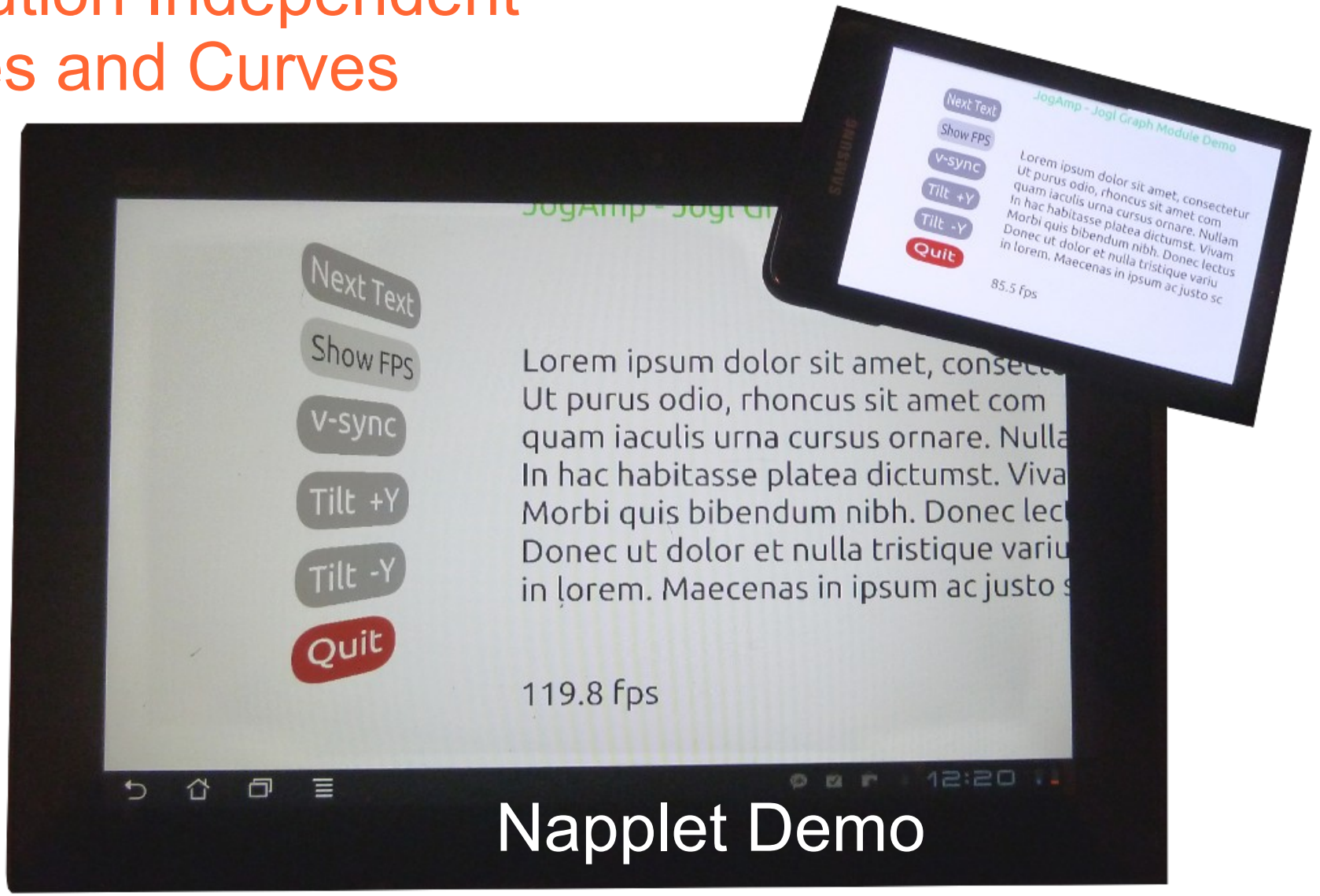
  - Sourceforge:
    https://sourceforge.net/projects/nifty-gui/
  - Twitter:

    https://twitter.com/niftygui

  - Blog:

    http://nifty-gui.lessvoid.com/

Graph API
Resolution Independent
Shapes and Curves



Resolution Independent Curve Rendering API

- Based on Paper:
  - R Santina, “Resolution Independent NURBS Curve Rendering using Programmable Graphics Pipeline”, presented in GraphiCon2011.
- **NOT** Loop/Blinn
- Patent Free
- Can Render Bezier, Bsplines, NURBS

Resolution Independent Curve Rendering API

- Why?
  - Resolution Independent Text Rendering
  - GPU based - Fast
  - Seamless integration into Renderer (Scenegraph,...)
  - New User Interface – across devices

- http://jogamp.org/deployment/jogamp-current/jogl-test-applets.html
- http://www.youtube.com/watch?v=Rqsu46ifMaw

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GPU based Resolution Independent UI

- Abstracted from the windowing toolkit
- Support multithreading
- Seamless integration into
  - A native window (HUD)
  - A custom Scenegraph (2D plane within 3D)
- High Quality rendering
- Super Fast

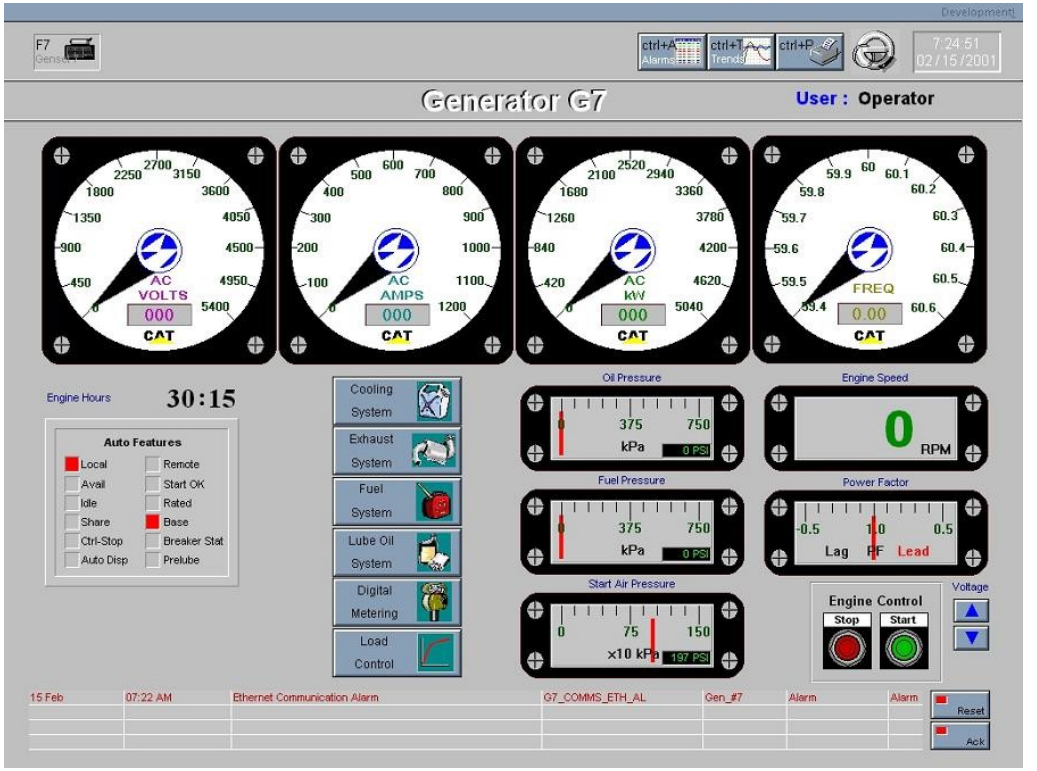
MyHMI

- Primary guidance in MyHMI framework development:
  - vehicle infotainment and instrument cluster applications
- extensions of those applications
  - automation and process control industries

Beginnings of MyHMI development

What HMI trends resulted in?

Deep gap in HMIs market:



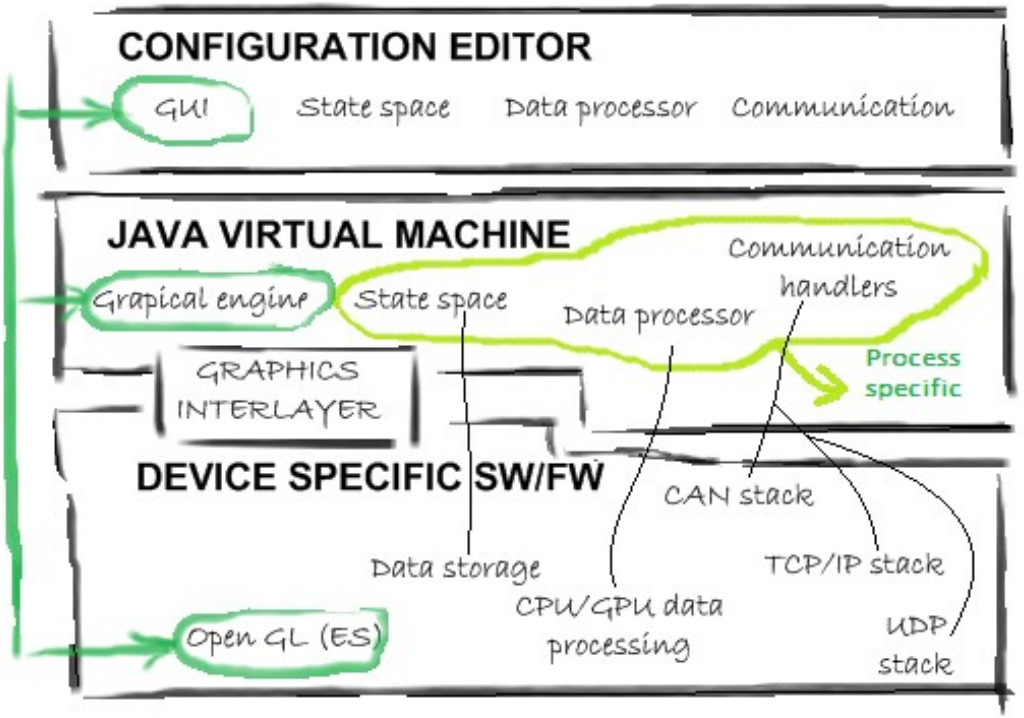
Graphically expressive HMI solutions, with proprietary communication and processing mechanisms

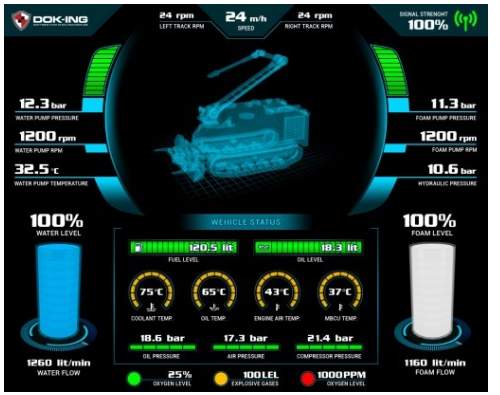
Solutions with vast processing and communication possibilities, but plain graphics

Bridging the gap

MyHMI & Jogamp

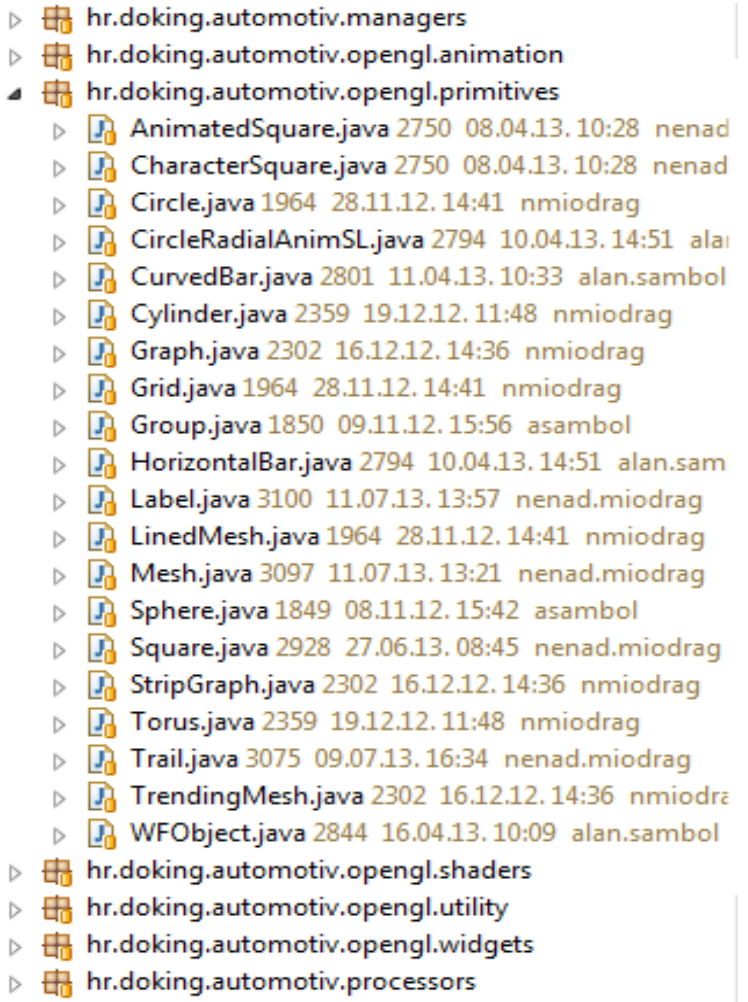
- Designed as a multiplatform framework
  - Java → CPU agnostic development
  - Jogamp's Jogl → GPU agnostic development





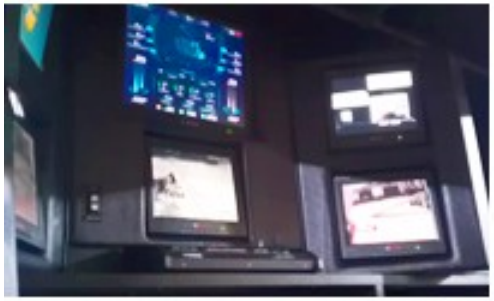
MyHMI framework

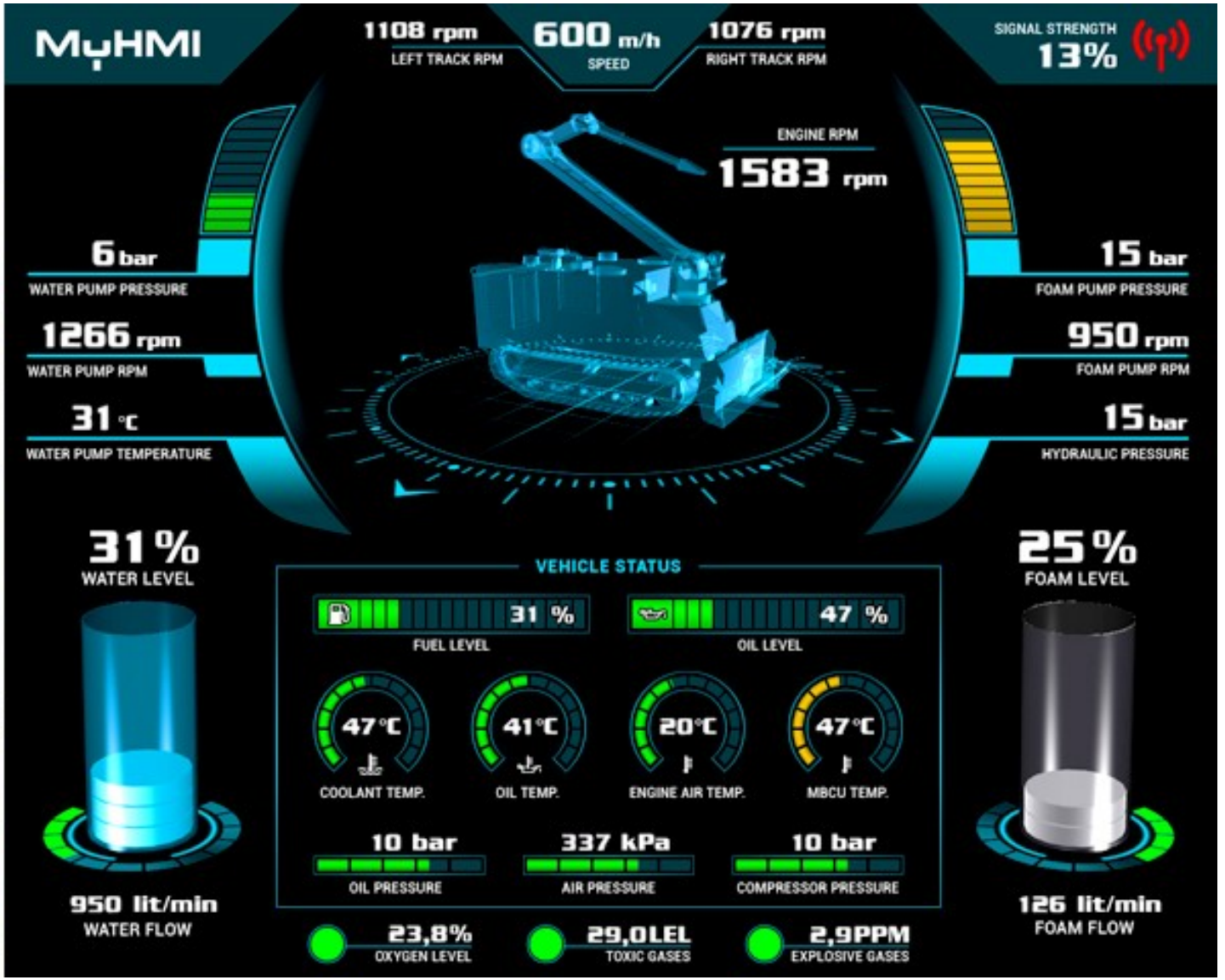
- Modules
  - Display (widgets, primitives, animations)
  - Communication (UDP, TCP/IP, CAN, serial...)
  - Data processing



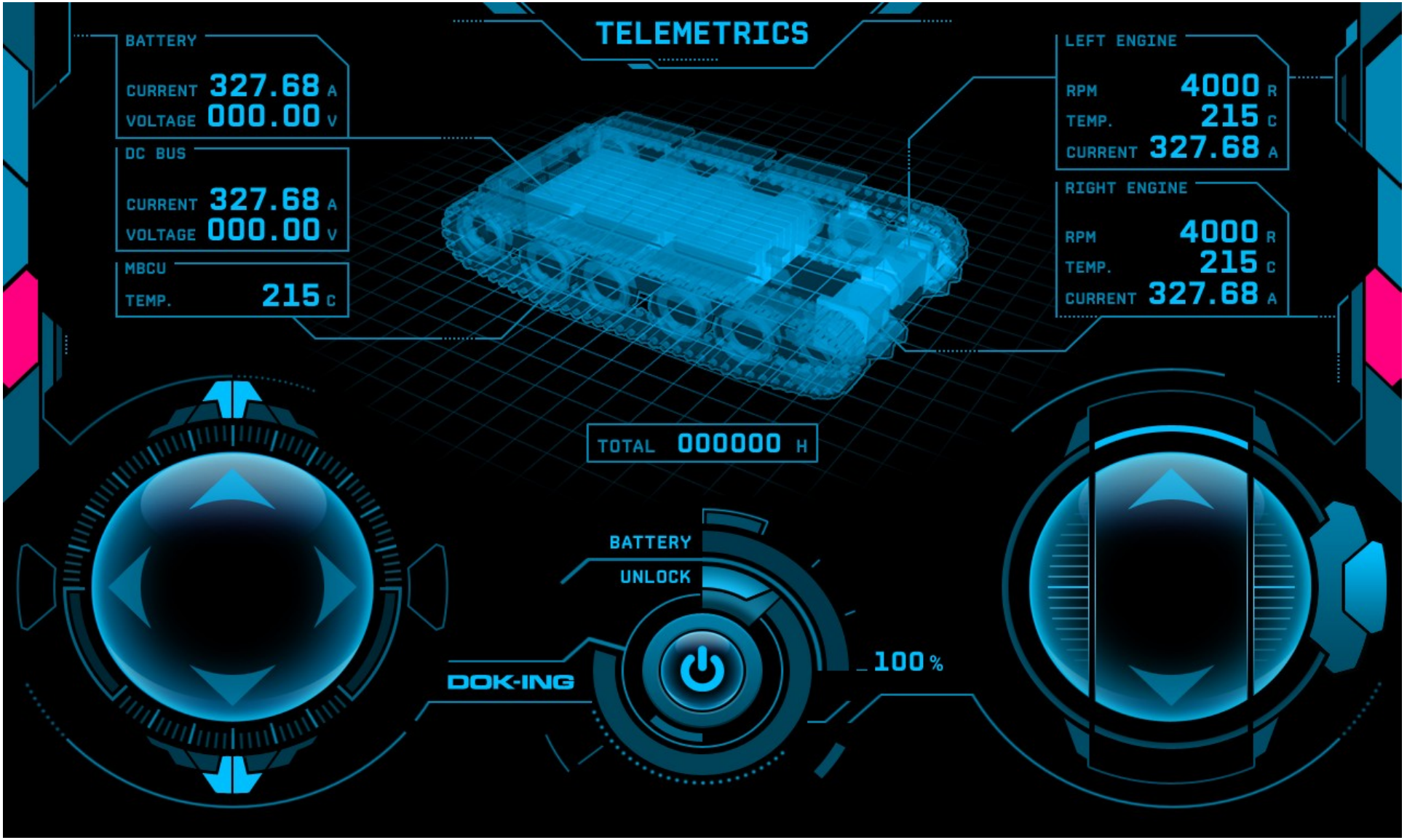
MyHMI approvals in industries
LOOX instrument cluster

MyHMI approvals in industries
UNIMOG control center

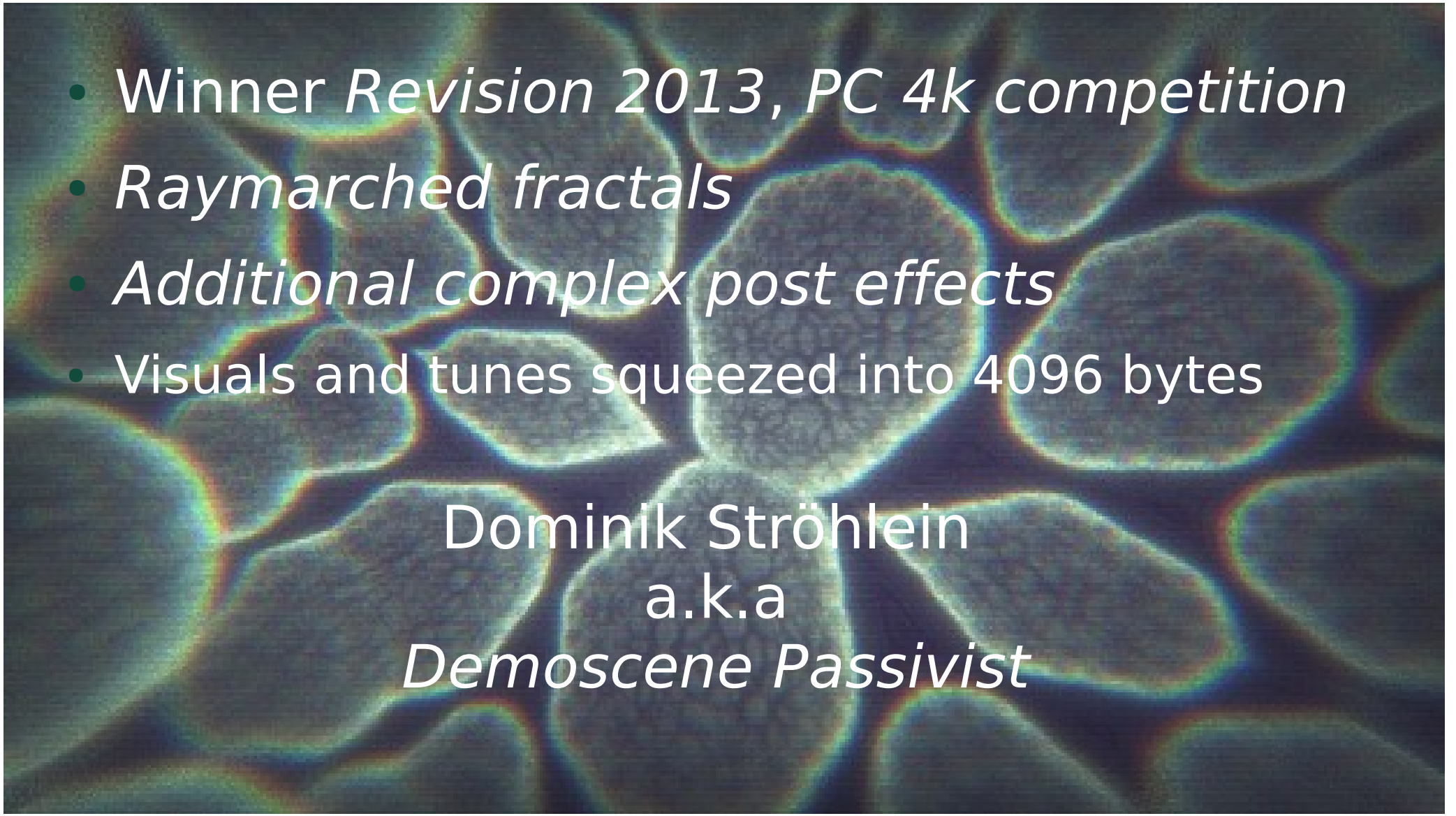




MyHMI approvals in industries
SCADA / remote control



Kohlenstoffeinheit



- Winner *Revision 2013, PC 4k competition*
- *Raymarched fractals*
- *Additional complex post effects*
- Visuals and tunes squeezed into 4096 bytes

Dominik Ströhlein
a.k.a
Demoscene Passivist

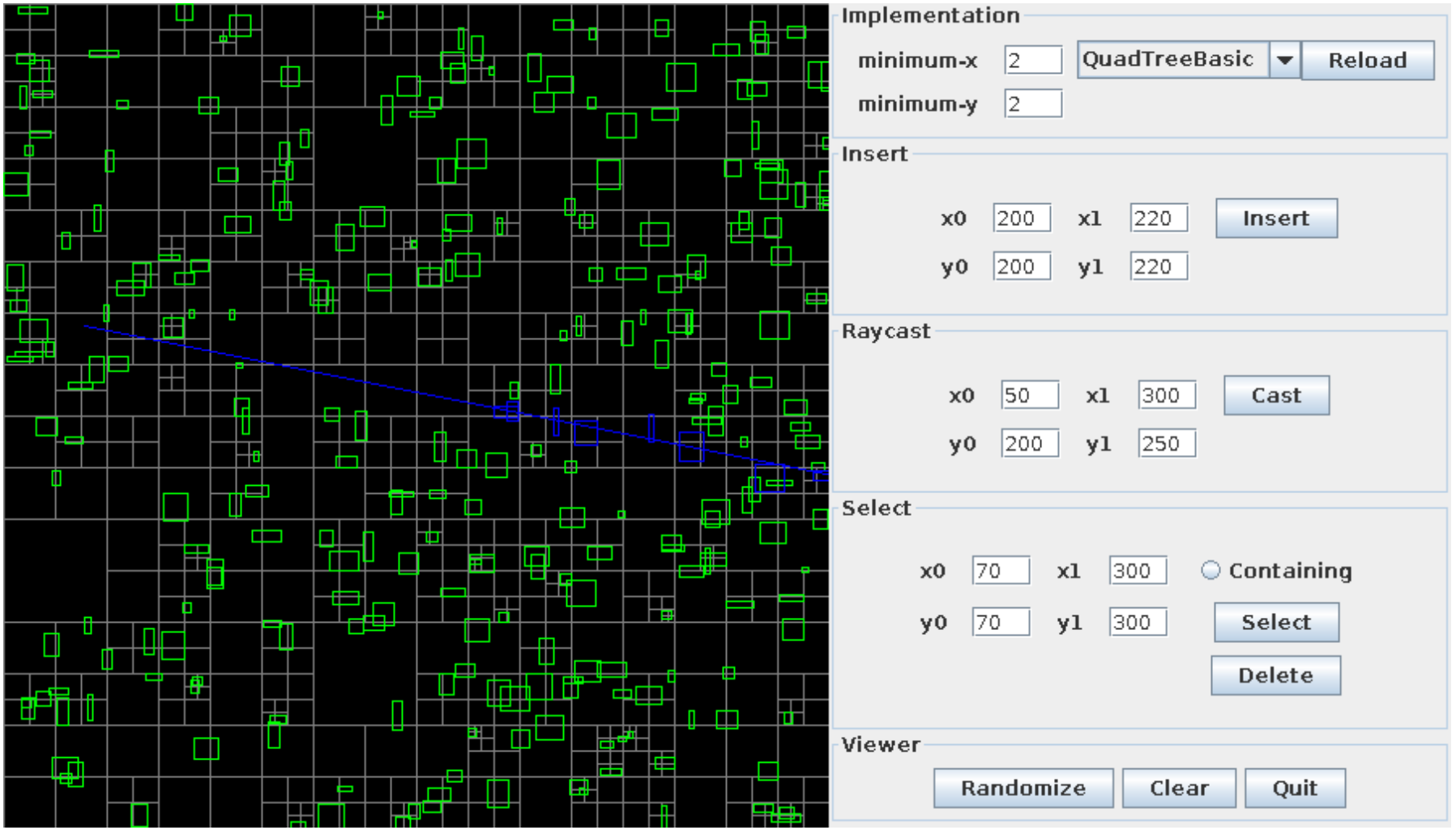
jSpatial

Offers multiple implementations of Quad-tree and Oct-tree data structures.

Functionalities:

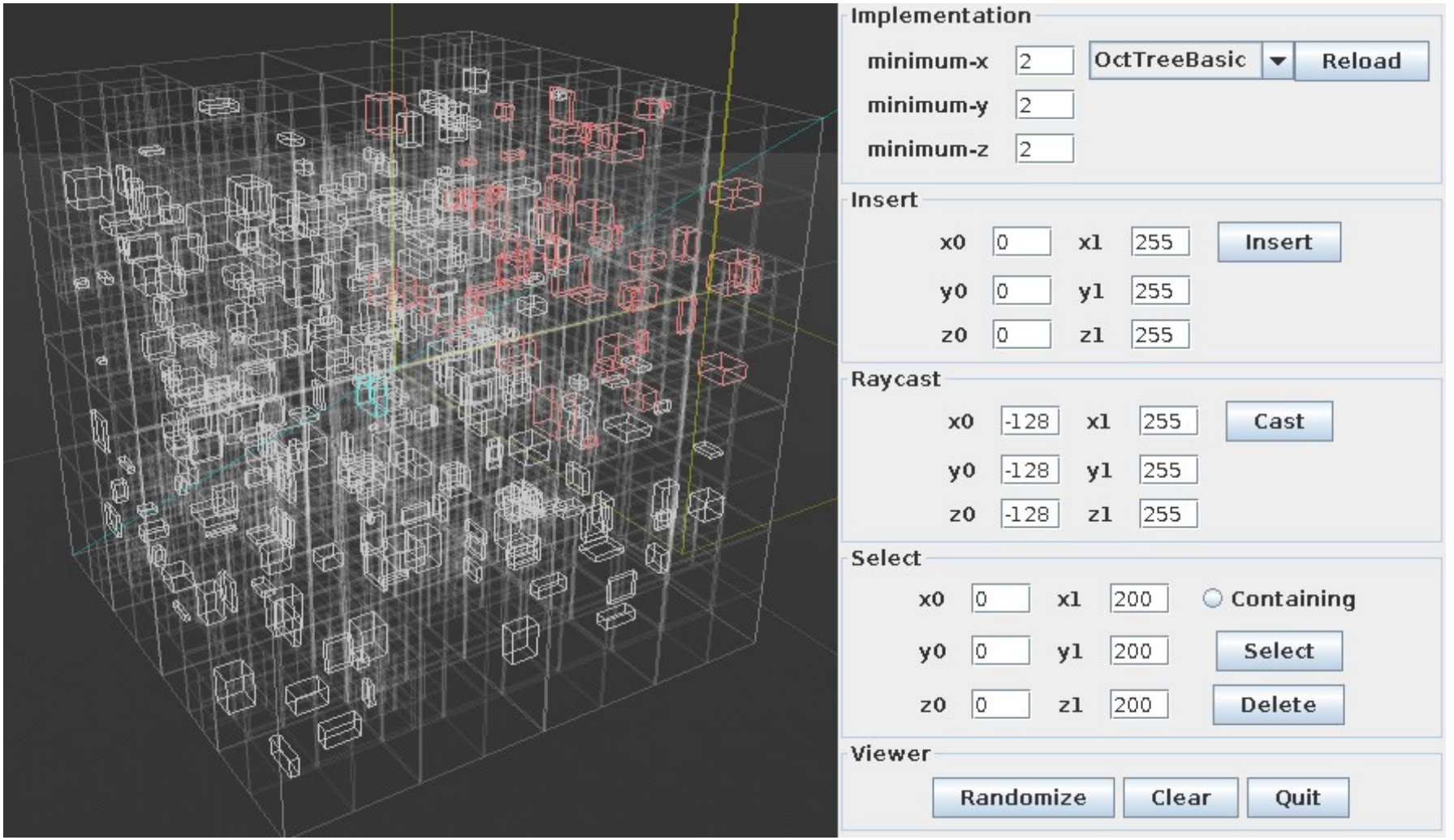
- Divide your 2D/3D world into smaller spatial regions.
- Fast Object insertion and deletion with no preprocessing.
- Raycast queries
- Optional min spatial size limit.

jSpatial



Quad-tree example with a ray cast

jSpatial



Oct-tree example with a ray cast

Thanks!

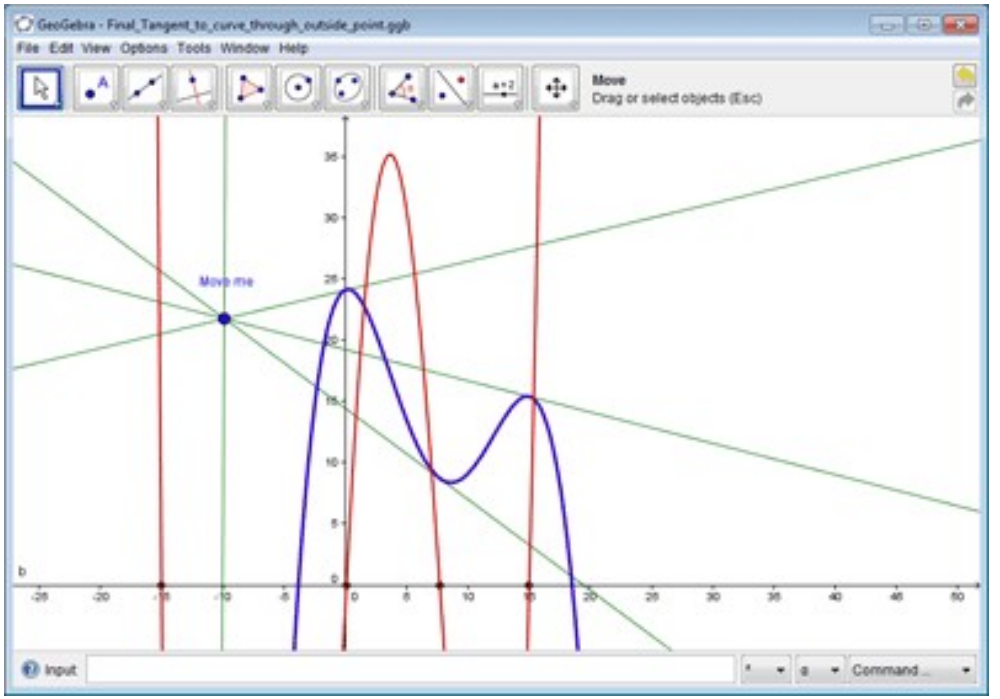
Mark Raynsford
http://io7m.com/
code@io7m.com

PGP: 0x60824220

GeoGebra

Free and multi-platform dynamic mathematics software for all levels of education that joins in one easy-to-use package:

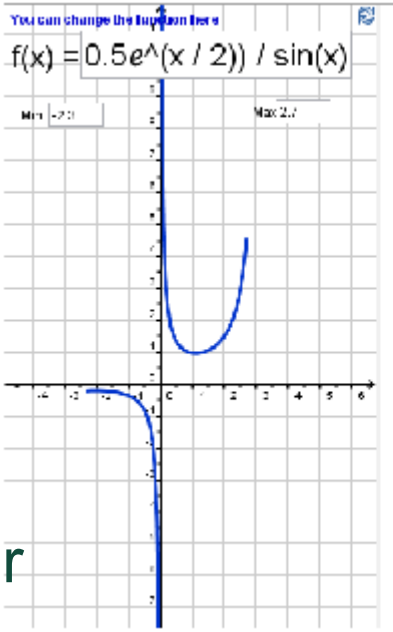
- Geometry
- Algebra
- Tables
- Graphing
- statistics
- calculus

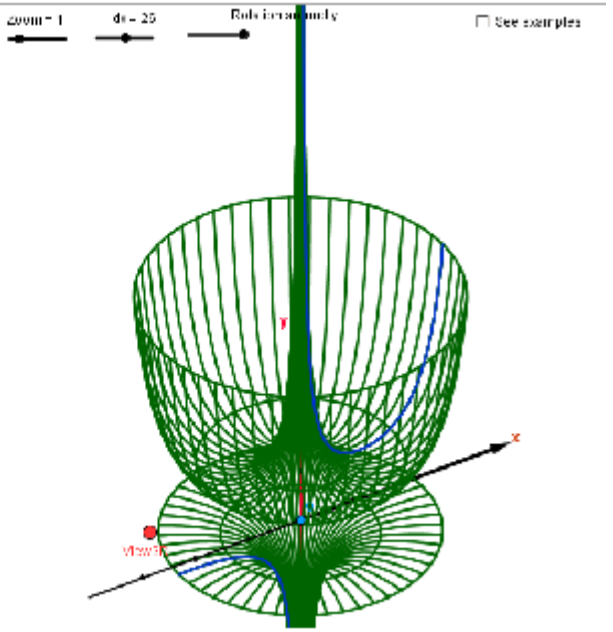


GeoGebra

Facts:

- Graphics, algebra and tables are connected and fully dynamic
- Easy-to-use interface, yet many powerful features
- Authoring tool to create interactive learning materials as web pages
- Available in many languages for our millions of users around the world





webstart example

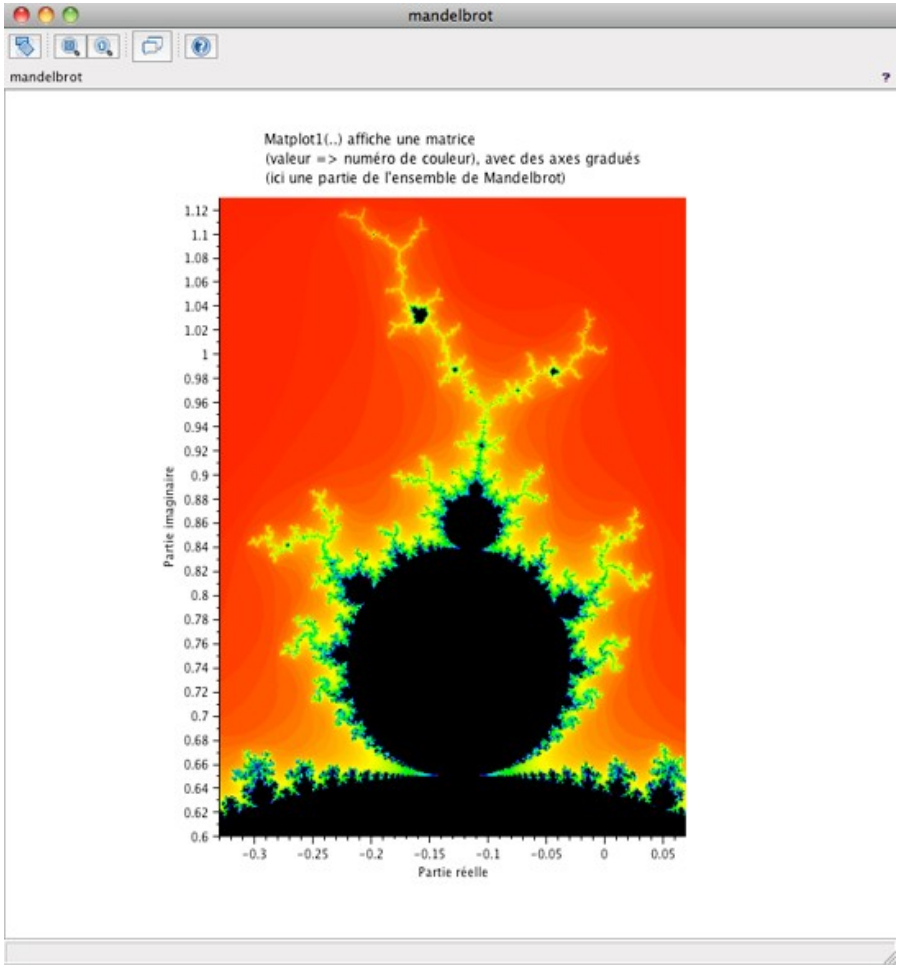
http://www.geogebra.org/

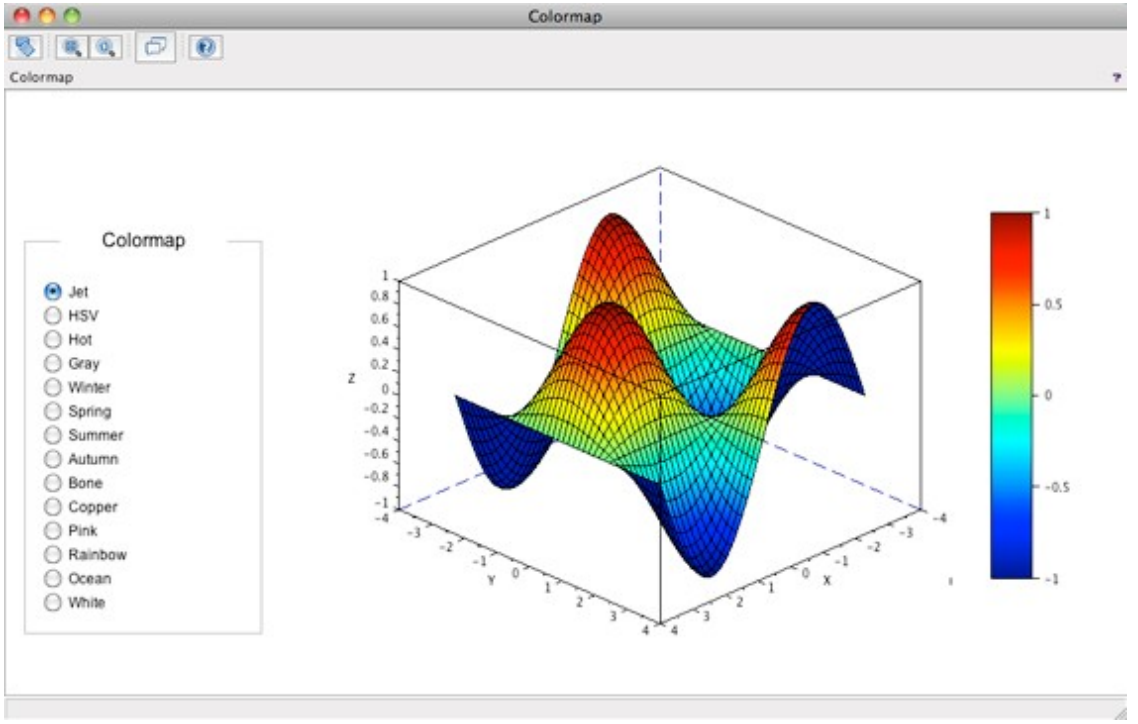
SciLab

Scilab is free and open source software for numerical computation providing a powerful computing environment for engineering and scientific applications.

- Functionalities is included in Scilab:
  - Maths & Simulations
  - 2D & 3D Visualizations
  - Optimization
  - Statistics
  - Control System Design & Analysis
  - Single Processing
  - Application Development

SciLab

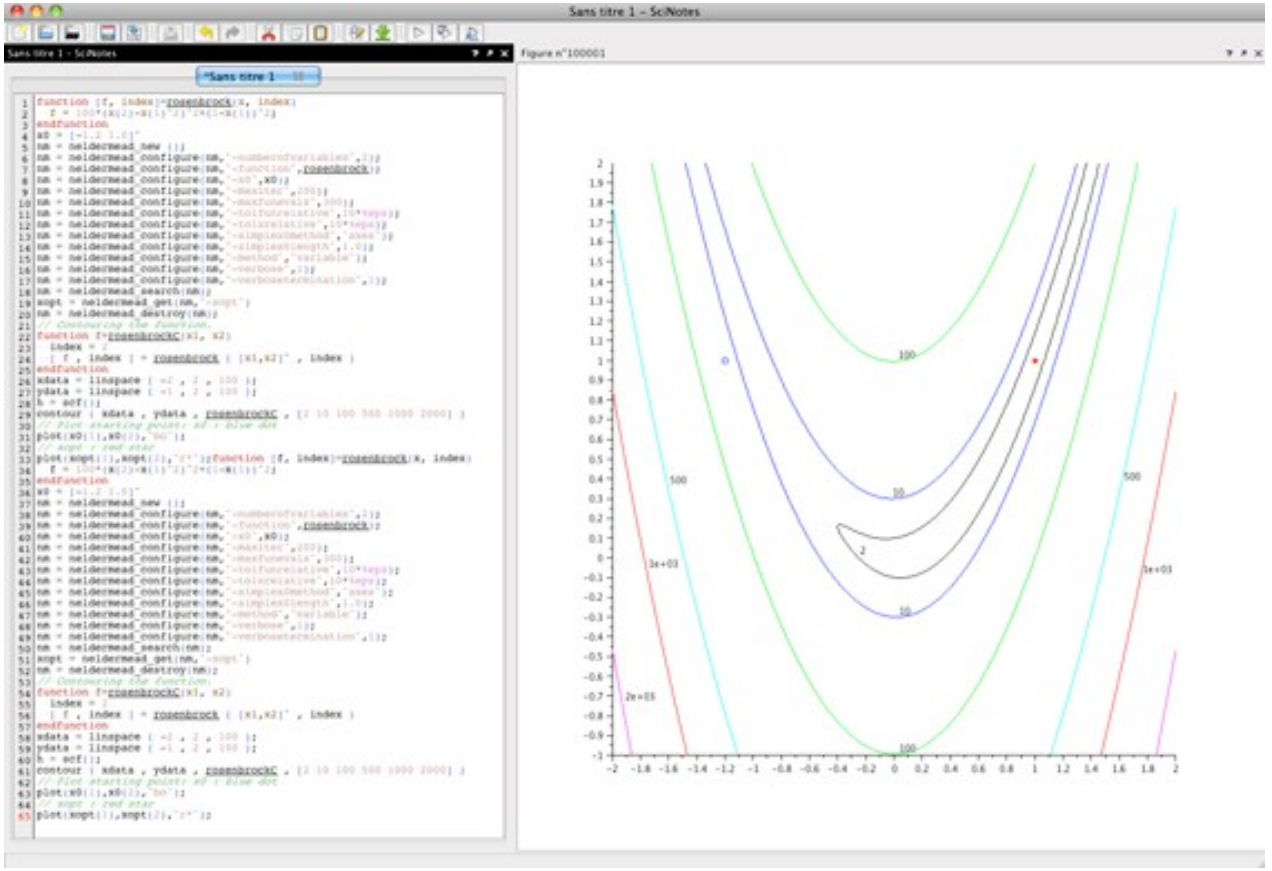




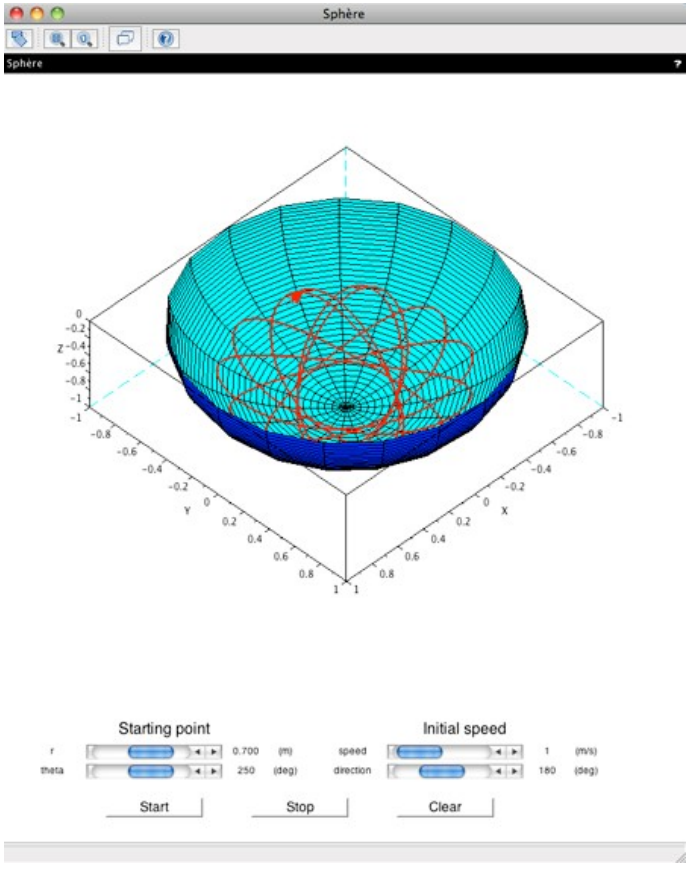
Visualization: Function

SciLab

Art / Science



Optimization: Nelder–Mead



Simulation: Particle Flow

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Scilab

JOGAMP

jReality

jReality is a full-featured 3D scene graph package designed for 3D visualization and specialized in mathematical visualization.

Webstart Examples.

BioJava

BioJava is a framework for processing biological data.

It provides analytical and statistical routines, parsers for common file formats and allows the manipulation of sequences and 3D structures.

The RCSB Viewers suite of frameworks provides the capability of creating 3-d viewing applications.

Example: RCSB Protein Data Bank.

WorldWind

NASA World Wind Java provides a suite of **open-source** **3-D virtual globe technologies** for Java applications, which can be utilized in user applications.

Version 2.0 now uses JOGL 2. It provides a rich set of features for displaying and interacting with geographic data and representing a wide range of geometric objects. **Online demos** are available, as well as an **F-16 Flight Simulator** from Disti.

Processing

Processing is an open source programming language and environment for people who want to program images, animation, and interactions.

Processing – More Information

- Project Pages:
  - Homepage: http://processing.org/

JaamSim

- Ausenco opensource simulation environment
- Not just a library, full modelling environment
- Internal modelling group of 16 professionals
- Licensed by large external customers

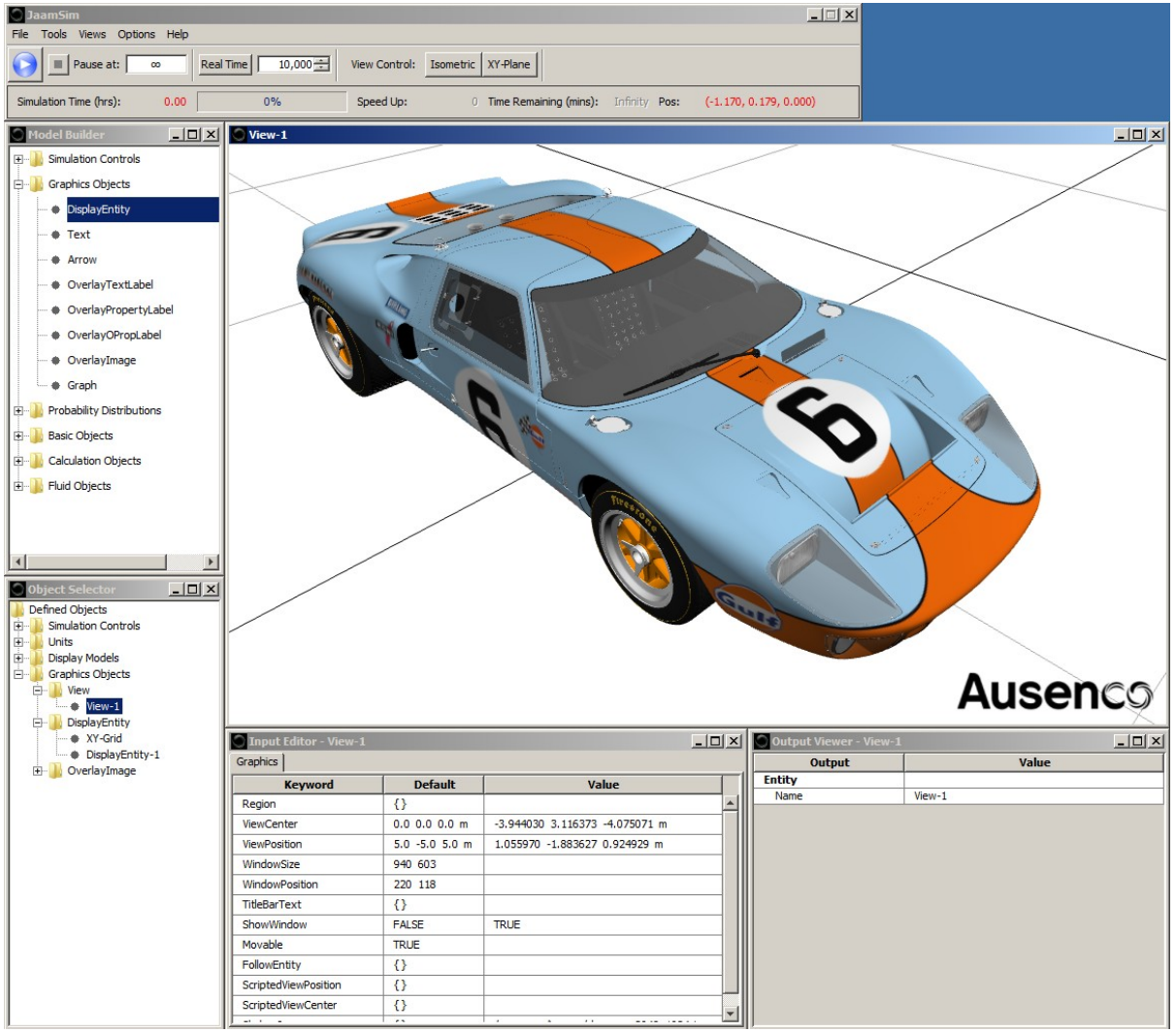
JaamSim - Features

- Graphical user interface
- Drag and drop model building
- 3D visualization of engineering assets
- End-user documentation generated from code
- Interactive Input editor, Output viewer
- Units required throughout

JaamSim

- Originally conceived with a Java3D renderer
- New Jogl2 based renderer started April 2012
- Assume OpenGL 3.0 as minimum functionality
- Collada loader/importer
- Zero install – single exe distribution
- http://github.com/AusencoSimulation/JaamSim

JaamSim


JaamSim
File Tools Views Options Help
Pause at:
Real Time
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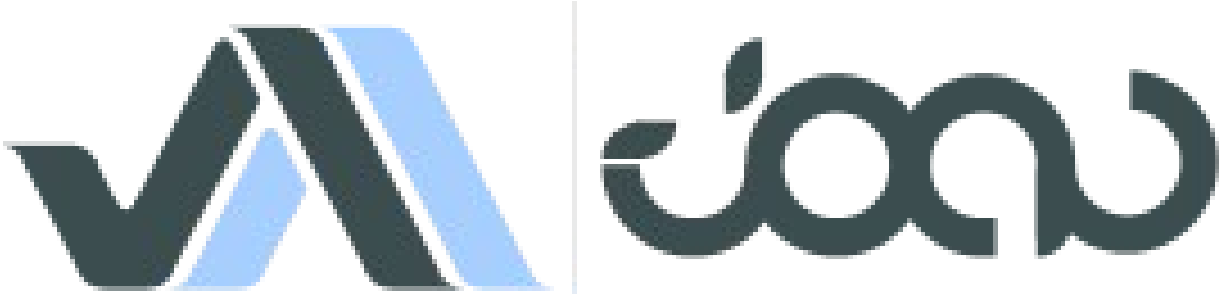
View Control:
Isometric
XY-Plane
Simulation Time (hrs):
0.00
0%
Speed Up:
Time Remaining (mins):
Infinity
Pos:
(-1.170, 0.179, 0.000)
Model Builder
Simulation Controls
Graphics Objects
DisplayEntity
Text
Arrow
OverlayTextLabel
OverlayPropertyLabel
OverlayOPropLabel
OverlayImage
Graph
Probability Distributions
Basic Objects
Calculation Objects
Fluid Objects
Object Selector
Defined Objects
Simulation Controls
Units
Display Models
Graphics Objects
View
View-1
DisplayEntity
XY-Grid
DisplayEntity-1
OverlayImage
View-1
Ausenco
Input Editor - View-1
Graphics
Keyword
Default
Value
Region
{}
ViewCenter
0.0 0.0 0.0 m
-3.944030 3.116373 -4.075071 m
ViewPosition
5.0 -5.0 5.0 m
1.055970 -1.883627 0.924929 m
WindowSize
940 603
WindowPosition
220 118
TitleBarText
{}
ShowWindow
FALSE
TRUE
Movable
TRUE
FollowEntity
{}
ScriptedViewPosition
{}
ScriptedViewCenter
{}
Output Viewer - View-1
Output
Value
Entity
Name
View-1

C3D

Webstart Examples



Java™ binding for the OpenAL® API

- JOAL is a Java binding of the OpenAL API
- OpenAL provides:
  - Spatial Sound
  - Low level audio buffer control / Streaming
  - Mixing of streams, incl. Doppler Effect
- Using and providing OpenAL-Soft on all platforms but OSX.

Recreational Laser-Gun Use Case

- Low-latency: Max. 10 ms from stimulus to sound
- High fidelity: Quality audio is a must in order to create a realistic user experience.
- Using miniature devices such as *Overo (ARM), running GNU/Linux.*
- Headless mode.
- Low RAM footprint.

Recreational Laser-Gun Use Case

- Search for a sound backend:
  - We tried a number of audio solutions before settling on JOAL, most of which we ran with Paul Lamb's 3D Sound System library.
  - JJack: Memory footprint too high.
  - LWJGL: Graphical dependencies forbidding headless usage.
  - Java Sound: Inconsistent latency between 2ms and 30ms.
  - JOAL: Perfect blend of resource efficiency, ease of use, platform compatibility and low latency.

JOAL – More Information

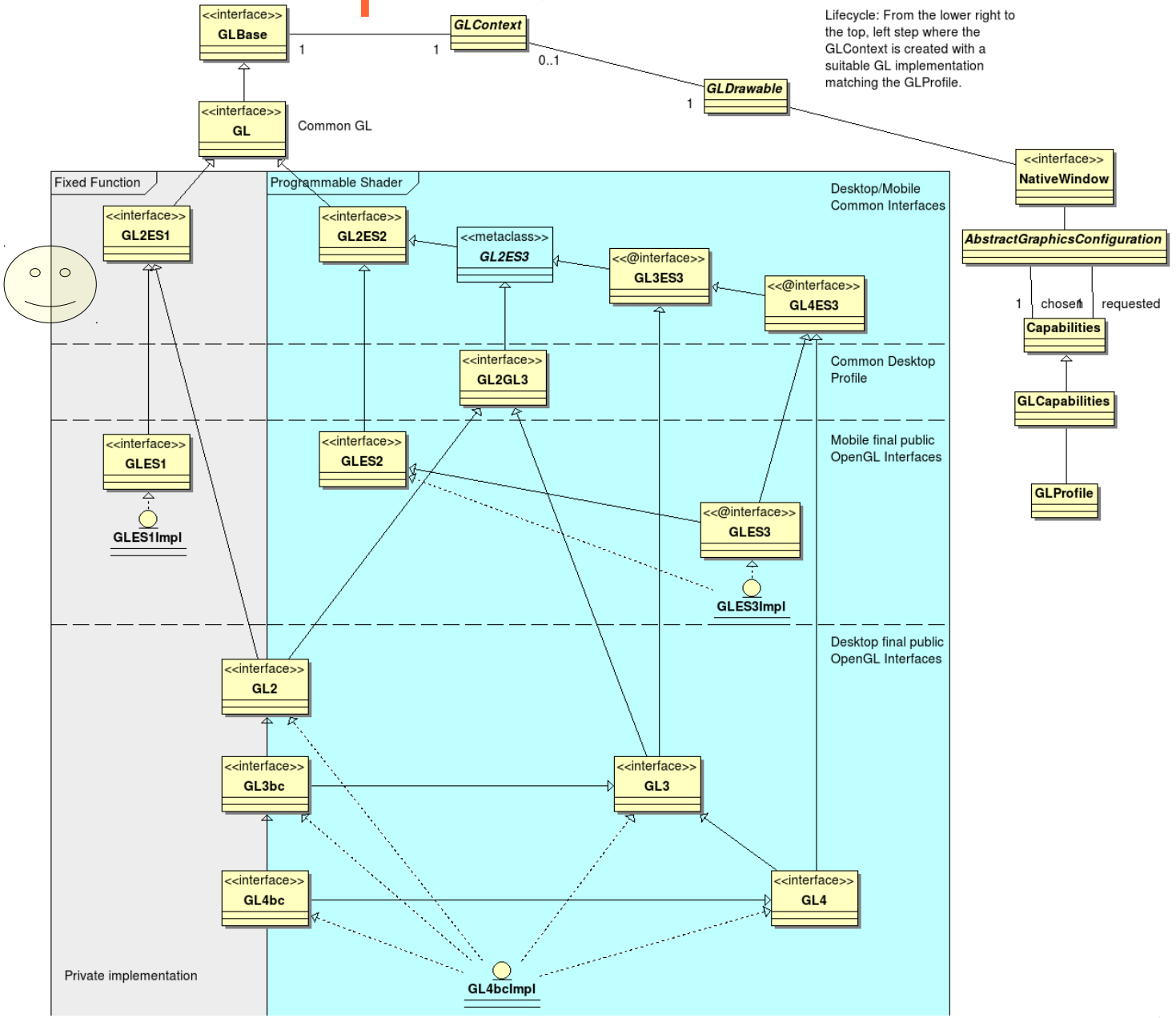
- Project Pages:
  - Demo code and tutorials
    https://jogamp.org/joal-demos/www/
  - Homepage: https://jogamp.org/joal

GLMediaPlayer

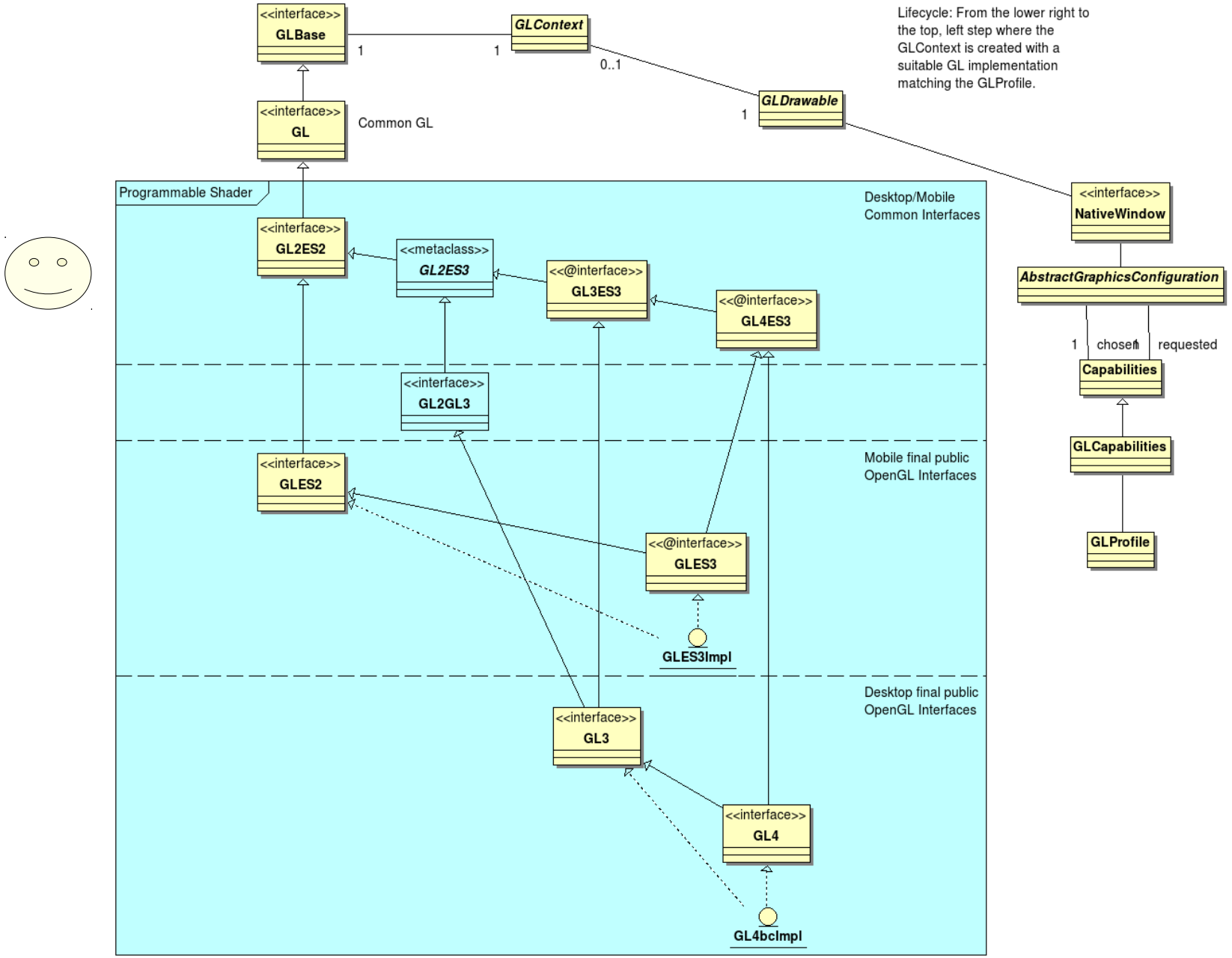
- Platform agnostic API
- Backends:
  - Android
  - FFMPEG / libav*
  - OpenMAX (wip)
  - JOAL

* Binds to system library, providing libav is WIP.

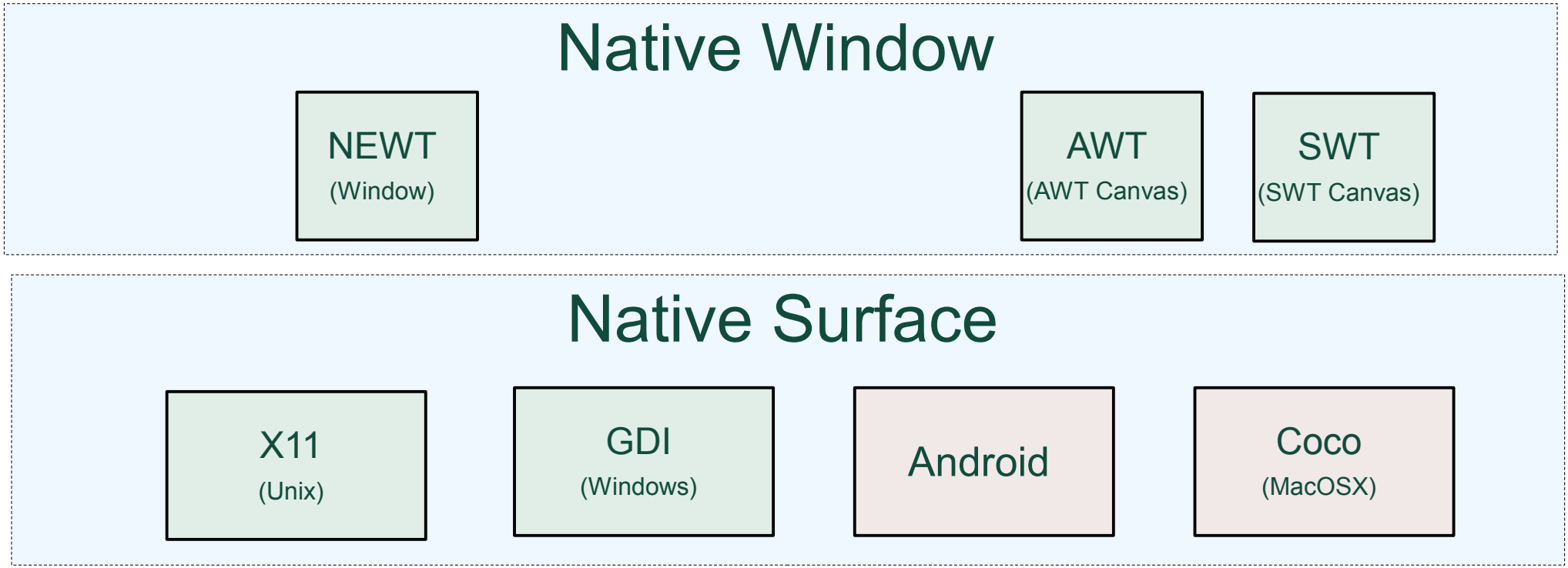
OpenGL Profiles



OpenGL Profiles



Windowing Toolkits



NEWT

- Cross Platform & Devices
- Multithreaded Surface Access
- Lock free event handling

Input Events

Keybd

Pointer

Output Events

Monitor

Windowing Features

- Create / Destroy
- Native Parenting
  - NEWT
  - AWT, SWT, …
- Fullscreen & Transparency
- Monitor
  - Multiple Devices
  - Mode Change

Backends

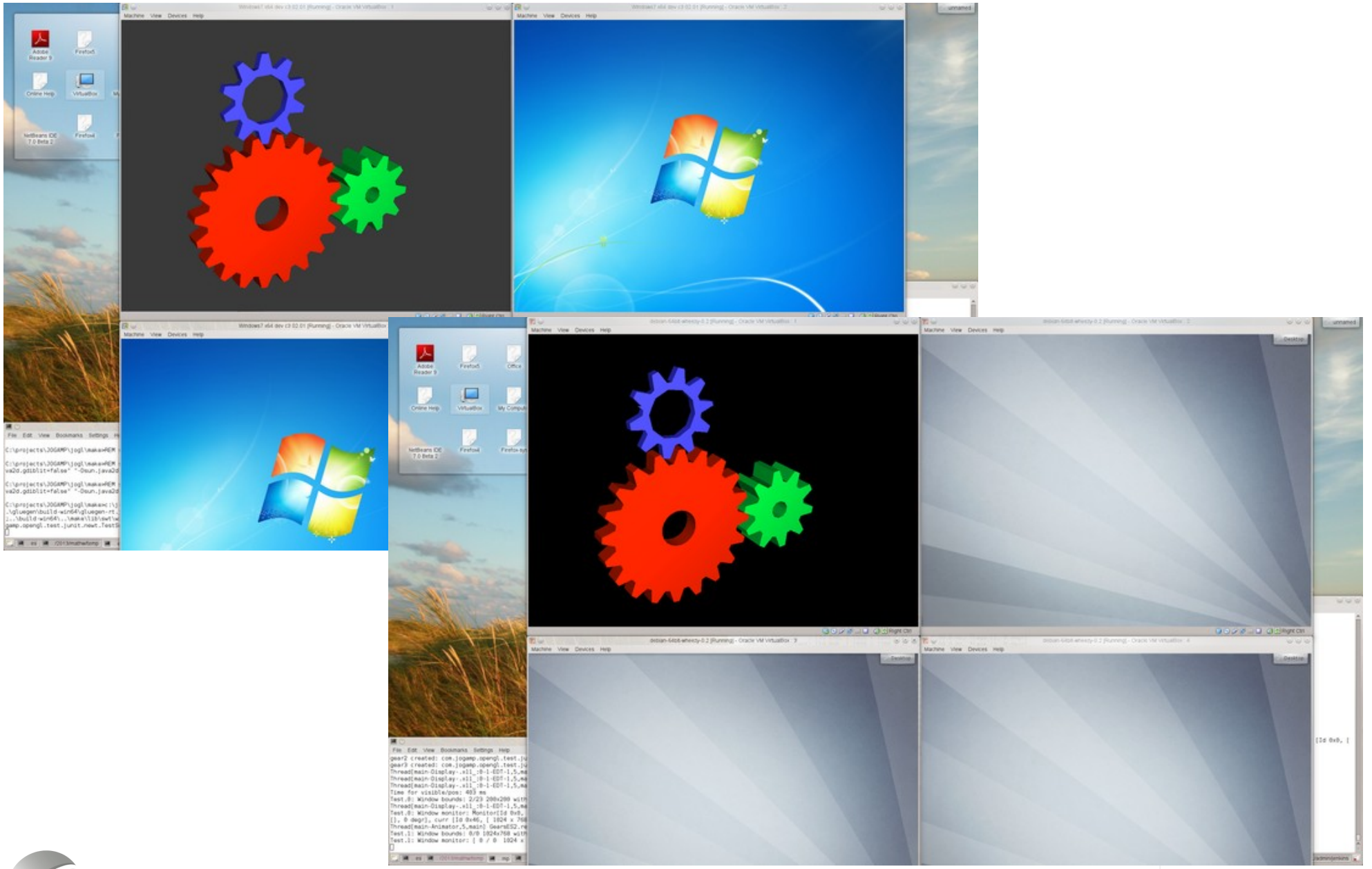
X11
(Unix)

GDI
(Windows)

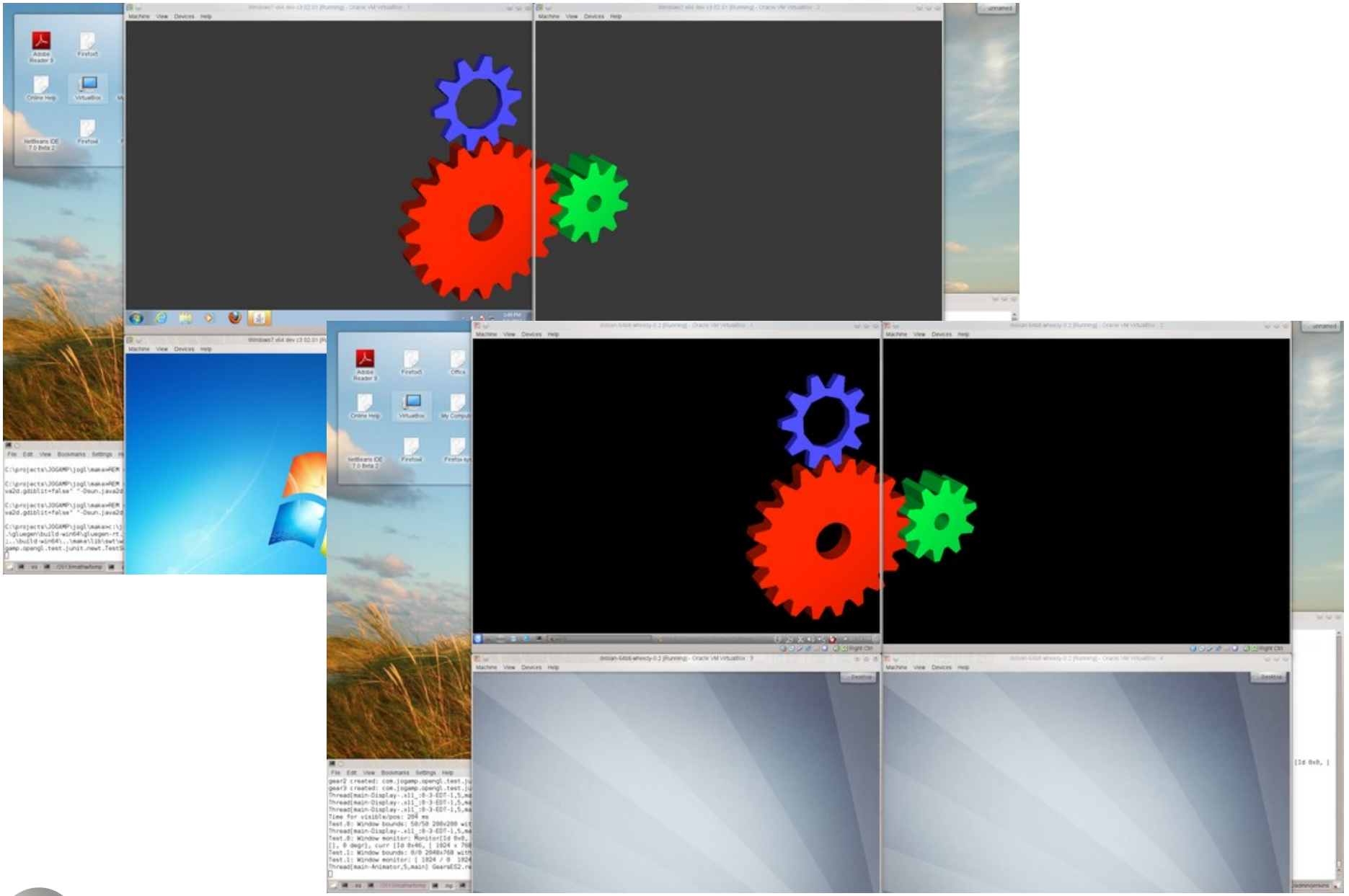
Android

Coco
(MacOSX)

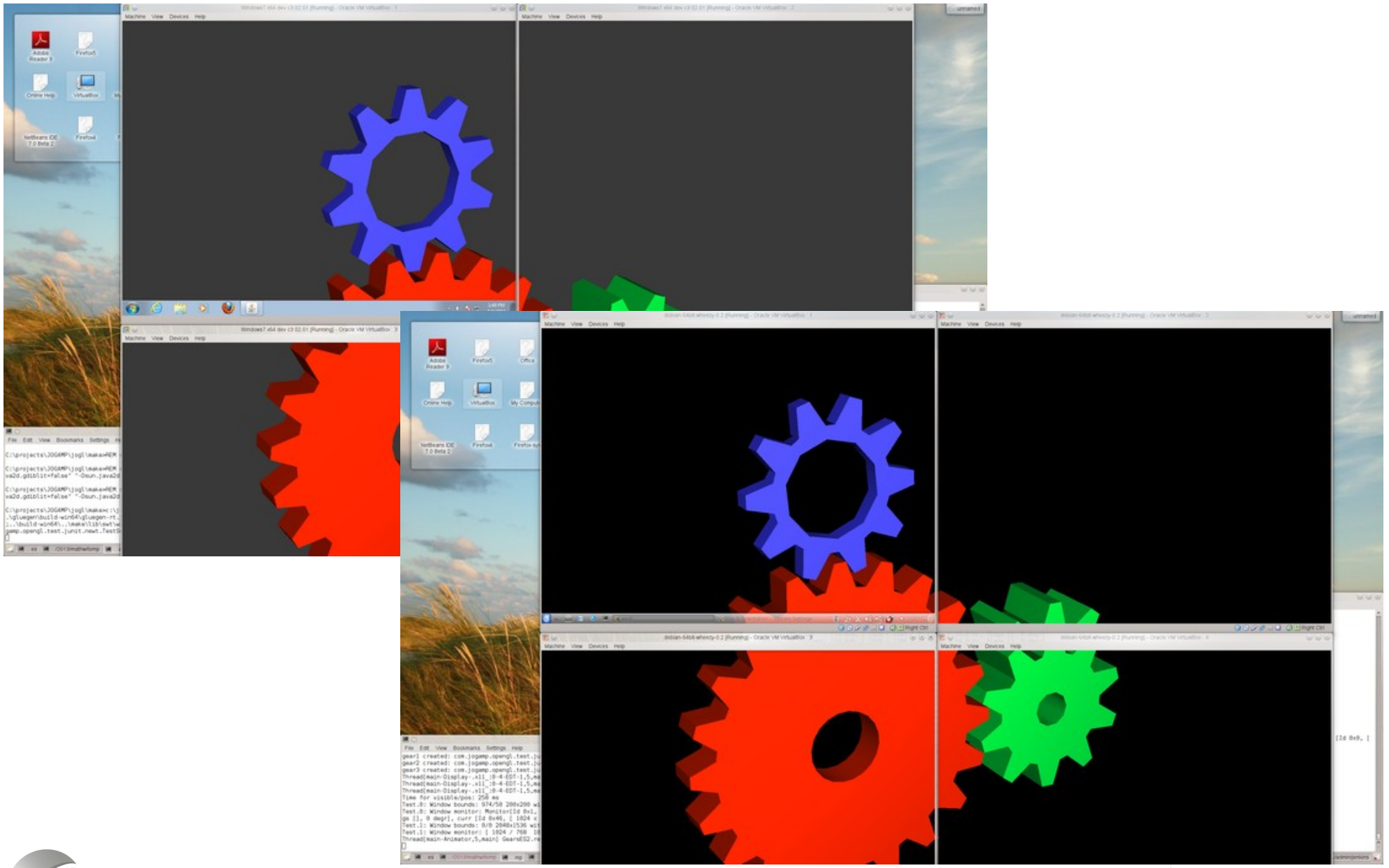
NEWT



NEWT



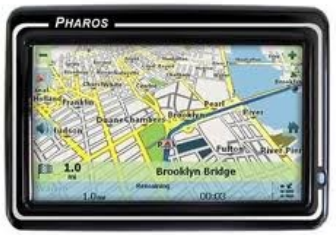
NEWT



Love in all shapes & Colors ..

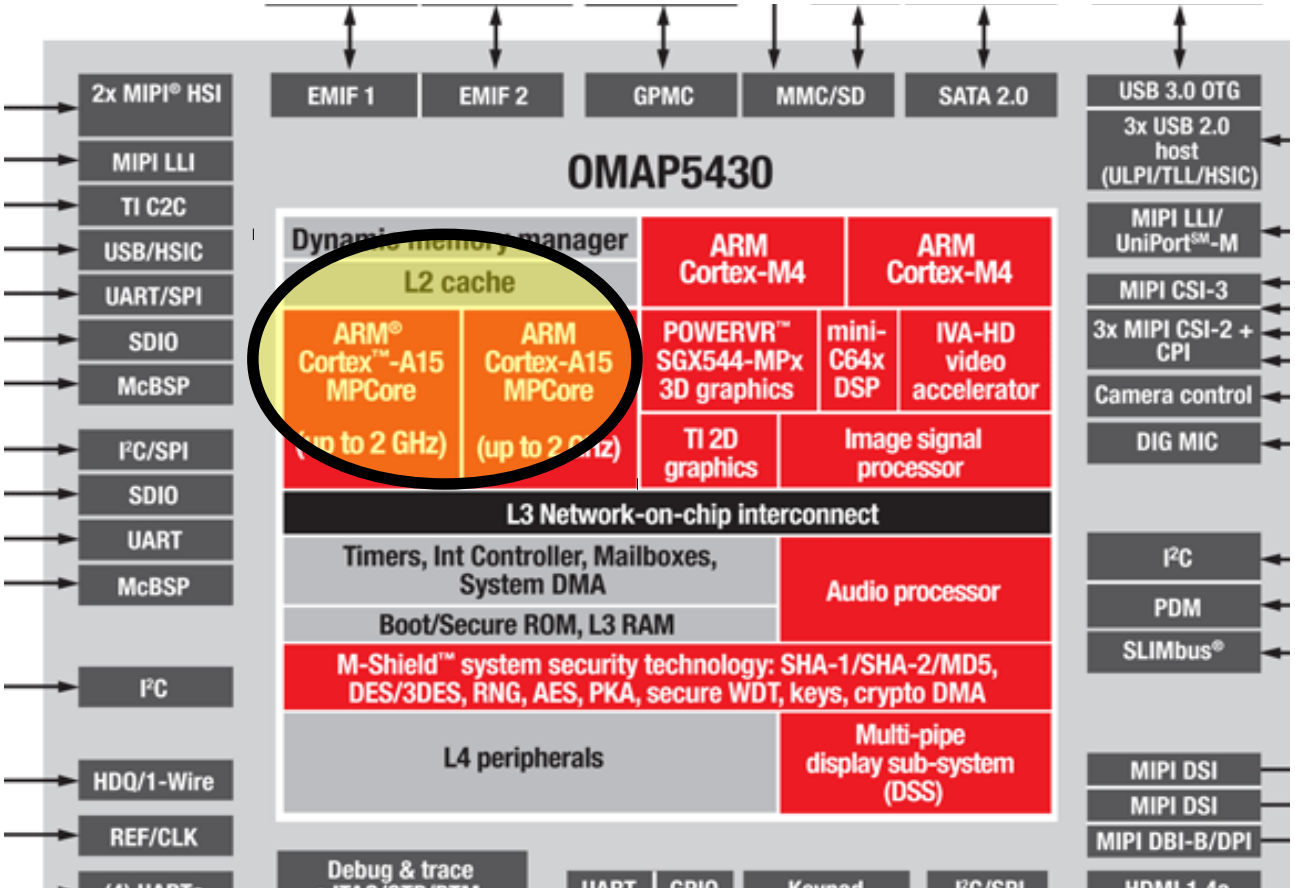
JogAmp

JOGL – JOCL – JOAL ...



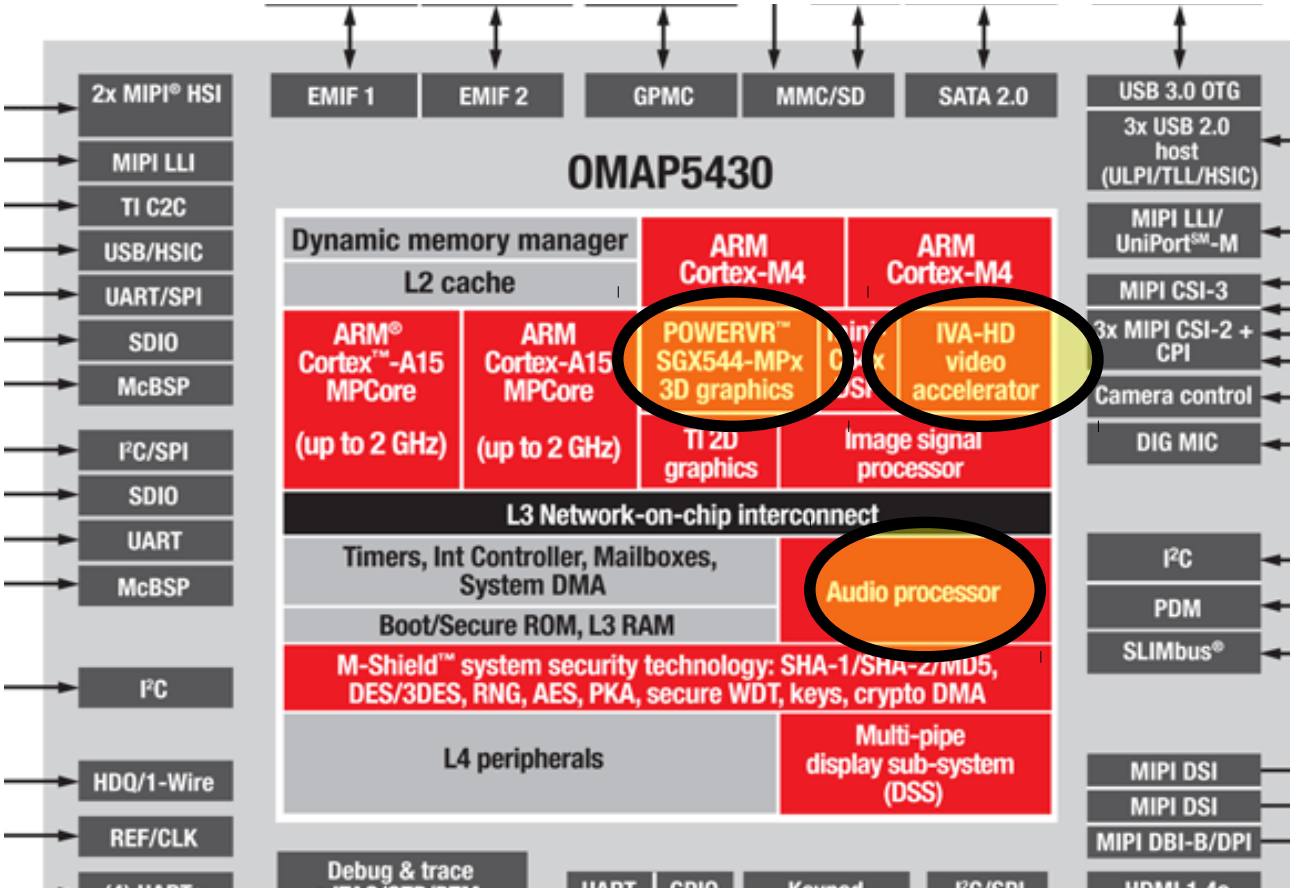
General Love

- Agnostic CPU for general purpose



Dedicated Love

- **Fast** Discrete Graphics, Audio, Video ...



General Love

Java

- Intel x32, amd64
- ARM 32 and 64 bit
- SuperH
- PowerPC
- Sparc
- MIPS

Dedicated Love

- Immaginative Technologies PowerVR SGX
- ARM Mali
- Qualcomm Adreno
- Vivante
- BCM VideoCore
- Nvidia Tegra
- Special DSPs (Audio/Video)
- Heterogenous CPUs (big.LITTLE)

OpenGL, OpenCL, OpenAL, ..

JogAmp Deployment

- Preinstalled Bundles
  - Modularized JARs
  - Android APKs (modular, or all-in-one)
  - Maven
- Online / Cached
  - Automatic Native-JAR loading support
  - Applet
    - Classical
    - JNLP
  - Webstart (JNLP)

Maven

- The JogAmp project currently distributes Jar files and .7z archives containing compiled code, source code, and documentation
- June 2012 - Stable versions and release candidates are released to the Central Repository, and bleeding edge packages are published to a testing repository at http://jogamp.org/deployment/maven

Android

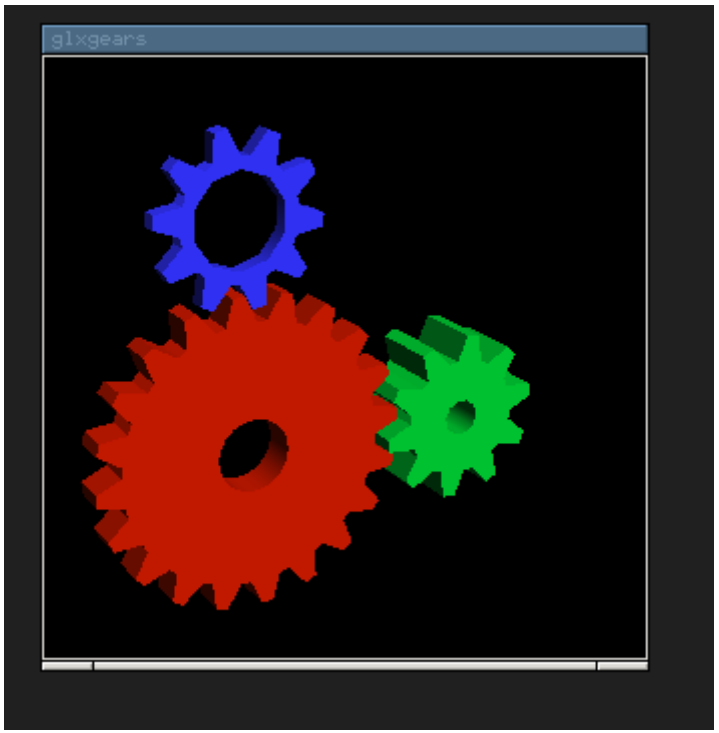
- The JogAmp project provides an abstraction known as the **GLEventListener** that allows one to write applications in a renderer and display independent manner. That is, the programmer writes their program using **GLEventListener** and does not need to modify it to run on Android, or on other platforms that do not provide programming interfaces that look like typical Java programs.

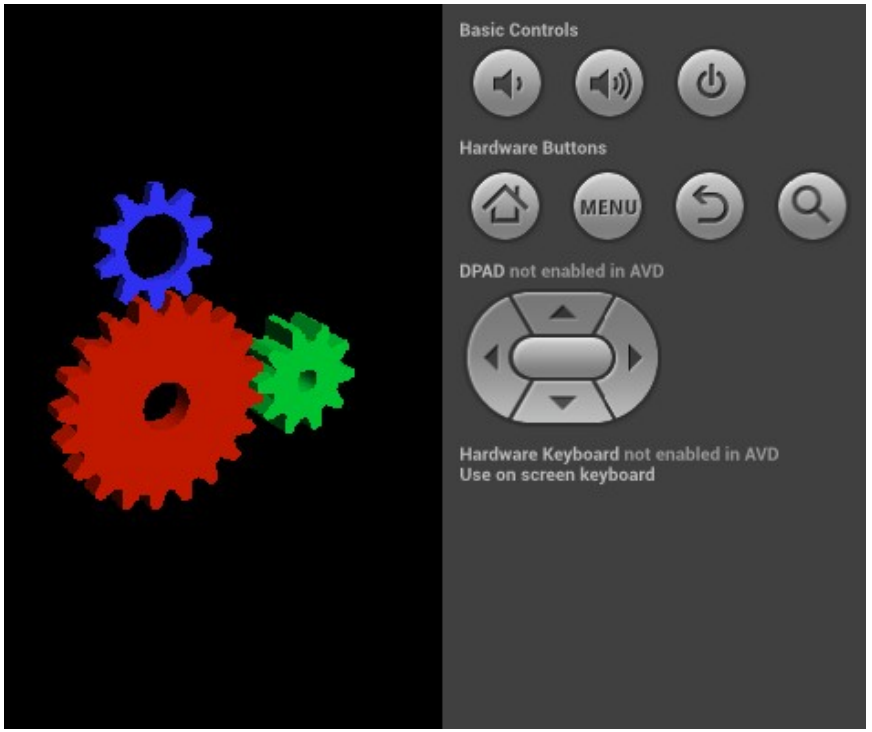
Android

- Writing a program that works unmodified on both traditional Java desktop/workstation systems and Android devices is simply a matter of providing trivial frontend code to the bulk of your application written using the **GLEventListener** abstraction.

Android

- The desktop code specifies dependencies on the standard JOGL packages, and the Android code specifies dependencies on the published JOGL Android packages.





Thank You & Love You

Rami Santina

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Erik Brayet & DoW Team

… all the many contributors & users

COMPUTERS & COMMUNICATION technology

jausoft Göthel Software e.K.

SIGGRAPH2013

jogamp

Why JogAmp on Java?

- Availability:
  - Java, OpenGL, OpenCL, OpenAL, ..
  - Multiple Vendors
    - OpenJDK / IcedTea
    - Oracle JDK
    - IBM J9, ..
    - PhoneME
    - JamVM
    - CacaoVM
    - Dalvik
  - x86, arm, ppc, sh4, ..
  - GNU/Linux, Android, BSD, Mac OSX, Solaris/OpenIndiana, MS Windows

About US

- Open & Vendor Independent
- BSD License
- Java Graphics, Audio, Media & Processing
  High Performance Bindings
- One Stop Community Platform
  - SCM, Bugtracking, Build Server, Mailinglist/Forum,..
- Commercial Support
- http://jogamp.org