JogAmp: 2D/3D & Multimedia across Devices

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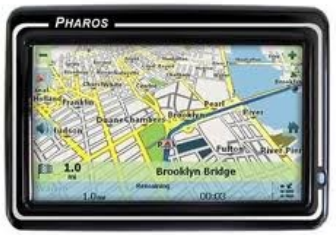
MAKE IT HOME SIGGRAPH2011 VANCOUVER

JogAmp

What is JogAmp?

JogAmp

JOGL – JOCL – JOAL ...



Example Usage

C3D – Visual Project Control

C3D Viewer	C3D Studio	C3D Mobile
		
Model Visualization Project Progress Update 4D Animation Report Generation Design Review	Scenario Creation Data Integration Vertical Application Dev. ...	Model Visualization OnSite progress update ...

http://c3d.com

Looking back: 2010 - Roadmap

- OpenMAX (A/V)
  - HW Implementation (mobile)
  - SW Implementations (desktop)
    - LIMOA - LIM OpenMAX Implementation
    - Bellagio
- Text Rendering
  - Loop/Blinn alternative, GLSL, ..
- Generic UI
- Android Binding
- Linux ARM Binding
- API Maturity (currently: 300+ unit tests)
- AWT Parenting Enhancement
- Documentation & Tutorials

About US

- Open!
- 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

Why Java?

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

Why Java?

- Managed Code
  - Common API for
    - Windowing
    - GLContext
    - Rendering
    - SwapBuffer
  - OpenGL Pipelining / Debugging / Trace
  - Access to vast number of API / Middleware

Continuity / Usage

- Usage http://jogamp.org
  - Ardor3D
  - C3D Studio http://c3d.com
  - Elflight Engine
  - Field/Processing
  - Gephi
  - NASA Worldwind
  - ...

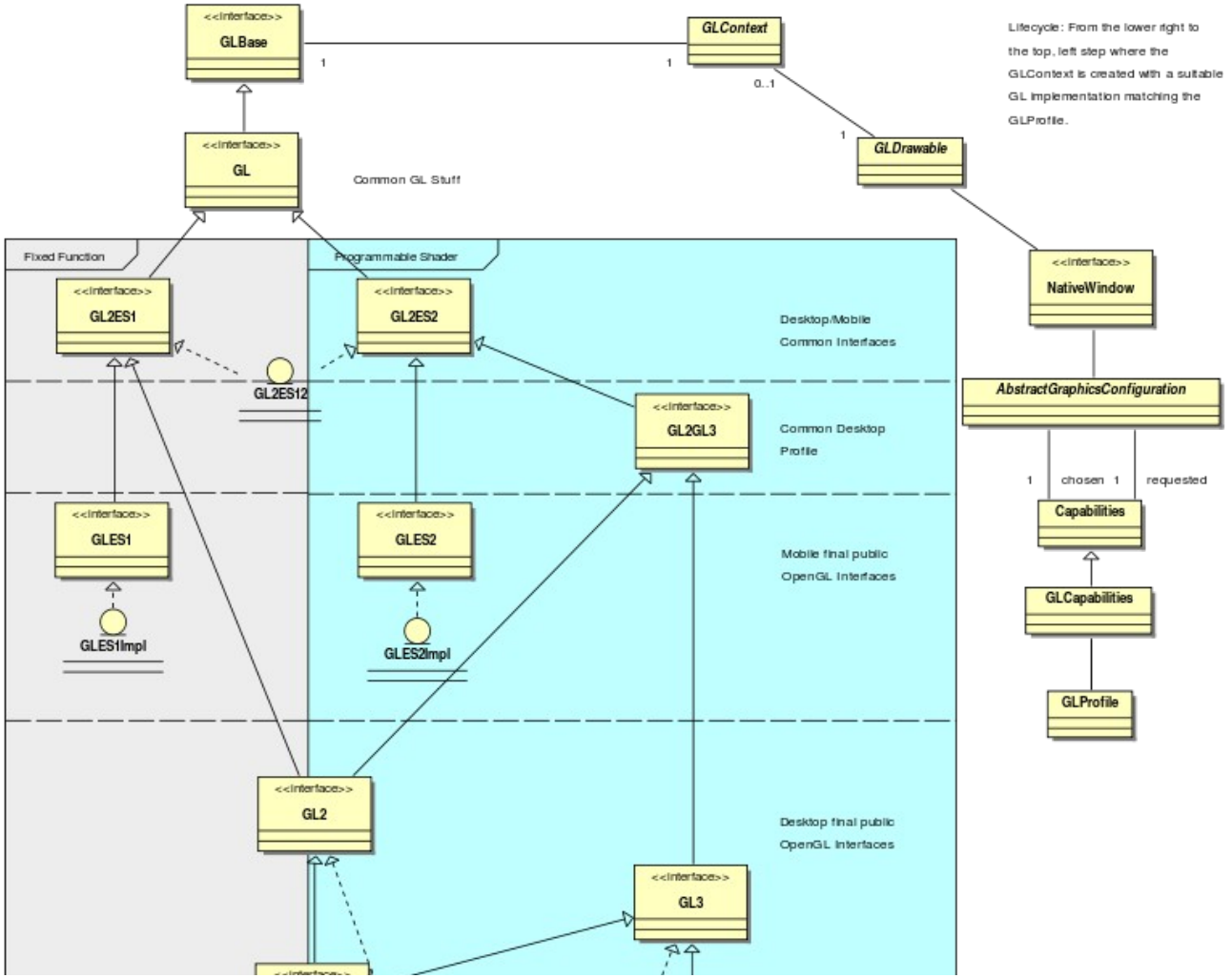
Deployment

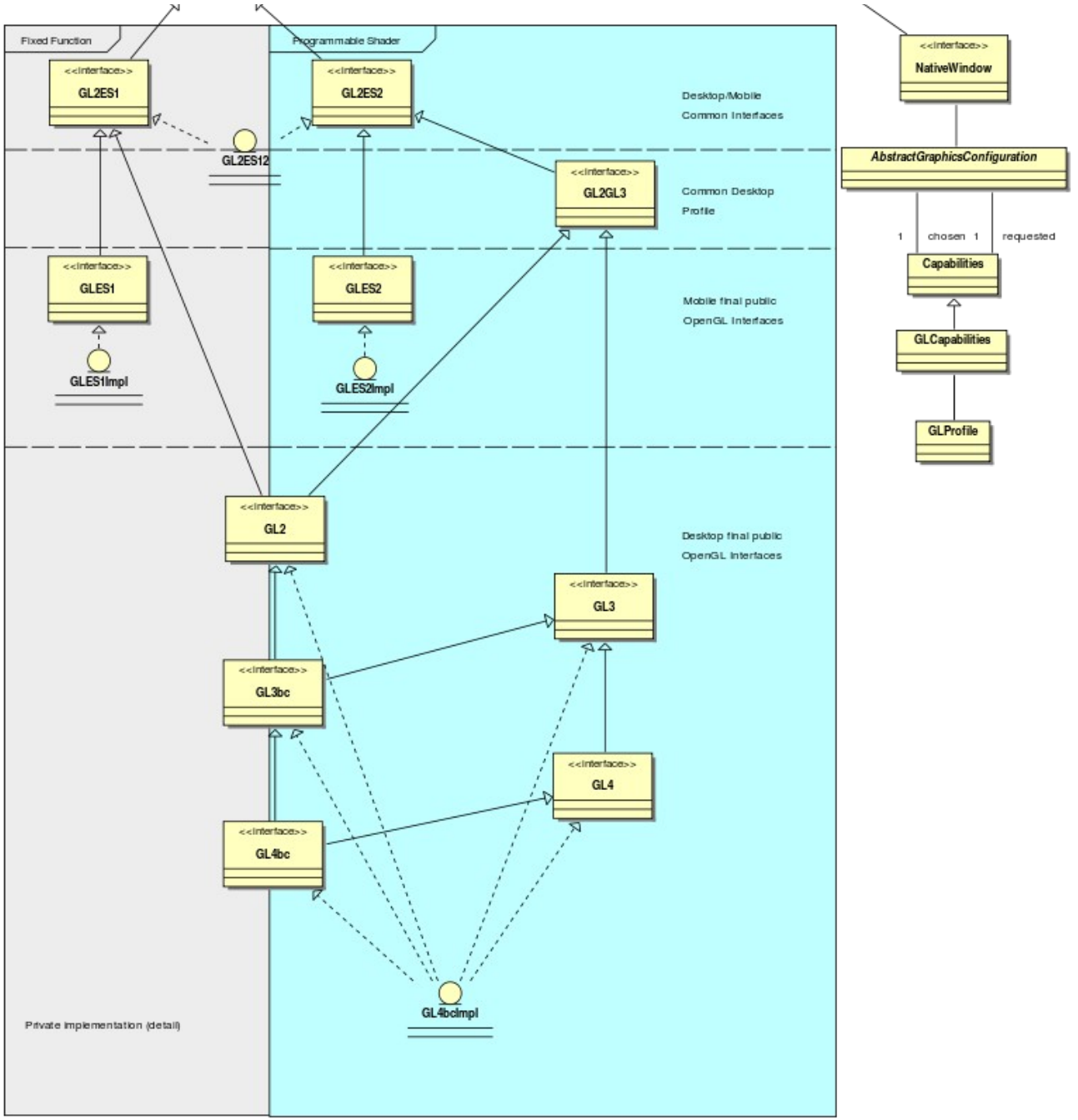
- Preinstalled Bundles
  - Modularized JARs
  - Android APKs
- Online / Cached
  - Applet
    - Classical
    - JNLP
  - Webstart (JNLP)

Continuity / Maturity

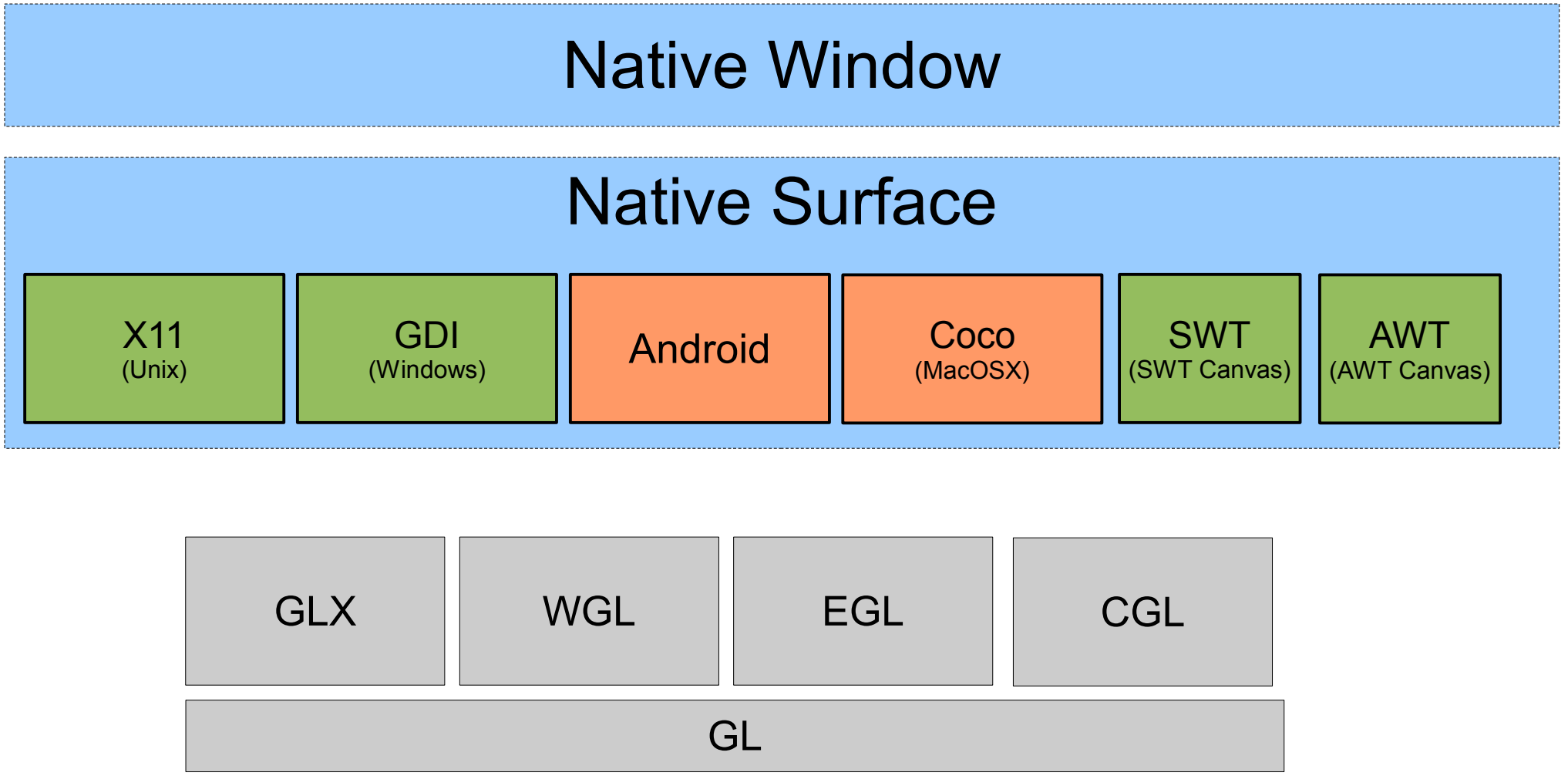
- Maturity
  - Version 1
    - JSR-231
  - Version 2
    - OpenGL Profiles (ES 1+2, GL 2 + 3 + 4)
    - Windowing Toolkit Abstraction
    - Continuity Build/Test Server http://jogamp.org/chuck/
- Community Contributions
  - FreeBSD Port
  - JOAL Fixes
  - JOCL Project
  - Bugzilla Entries and Test Cases
  - Code Reviews

OpenGL Profiles




Fixed Function
Programmable Shader
<<interface>>
GL2ES1
<<interface>>
GL2ES2
GL2ES12
Desktop/Mobile
Common Interfaces
<<interface>>
GL2GL3
Common Desktop
Profile
<<interface>>
GLES1
<<interface>>
GLES2
Mobile final public
OpenGL Interfaces
GLES1Impl
GLES2Impl
<<interface>>
GL2
Desktop final public
OpenGL Interfaces
<<interface>>
GL3
<<interface>>
GL3bc
<<interface>>
GL4
<<interface>>
GL4bc
GL4bcImpl
Private implementation (detail)
<<interface>>
NativeWindow
AbstractGraphicsConfiguration
1
chosen
1
requested
Capabilities
GLCapabilities
GLProfile

Windowing Toolkits



NEWT

- Seamless integration into the platform's
  - Creation/Destruction of top level and child windows
  - Multithreaded Access to Window Surface
  - Re - Parenting
  - Decorated- and Undecorated - Windows
  - Exclusive Full screen Mode
  - Screen Mode API
  - Event handling

NEWT Requirements *(todo)*

- Transparency *(API prepared)*
- Drag & Drop *(Pending)*
- *Enhance SWT Parenting*
- *Enhance Android Parenting*

New Stuff...

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”, to be 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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JOGL Graph API

- Outline → OutlineShapes → GLRegion
- Renderer
  - RegionRenderer
  - TextRenderer (same as RegionRender)
    - Helper methods for texts and fonts.

```
outline.addVertex(x, y, z, w, onCurve);
….
outlineShape.addOutline(outline);
outlineShape.addOutline(outline2);
region = GLRegion.create(outlineShape, getRenderModes());
region.render(gl, outlineShape,...);
```

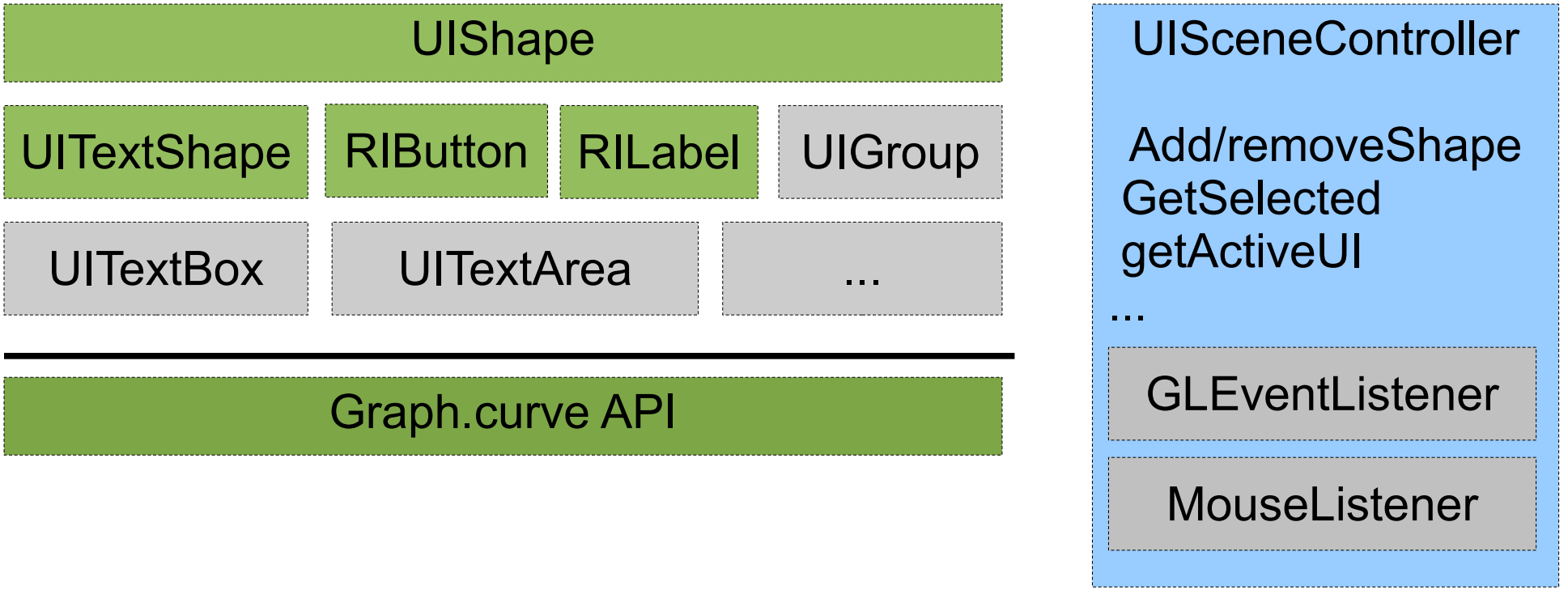
JOGL Graph API

- Initializing:
  - Read Outlines (from font, svg, application, ...)
  - Modified Constrained Delaunay Triangulation
  - Generate Region
- Rendering:
  - VBO buffers
  - Realtime manipulation – weights
  - Transformation....

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

JOGL Graph.UI API



UI Requirements *(WIP)*

- Generic UI Rendering
  - Rendering shall be performed using native rendering TKs (JOGL, ..)
  - Render primitives on an offscreen 2D plane to be
    - integrated into a custom 3D scenegraph
    - rendered as a HUD.
- Generic User Input
  - Input events should be delegated from the custom scenegraph to the UI input module.

JOGL on Embedded Devices

JOGL on Embeded Devices

- Development Env:
  - Beagleboard Devkit with ARM7l / PowerVR
    - Linux
    - Android
  - Platform based Unit tests
  - Continuous Integration with auto-builds.
  - Cross platform compilation/building

JOGL on Linux ARM

JOGL on Linux ARM

- EGL binding
- Tested with Ubuntu for embedded Devices.
- Demo!

JOGL on Android

JOGL Android Binding

- Why?
  - Short Development Cycles
  - No device specific development
  - Multitouch actions captured by Newt EDT
  - Same code compiled for all.
- Deployment:
  - adb install jogl.apk
  - adb install myFancyapplication.apk
  - Manual Daisy Chained ClassLoader.

JOGL Android Binding

- Details:
  - Enhanced EGL binding
  - Exposing GLES1 and GLES2 native profiles
  - GL2ES1 and GL2ES2 profiles for Desktop/Mobile
  - Using Android SDK/NDK
    - Requires SDK Level 9, Android 2.3 Gingerbread for NIO Surface access
  - Tested with:
    - Beagleboard with TI-rowboat gingerbread
    - Samsung Galaxy SII – Arm/Mali
    - Samsung Galaxy S
    - More soon with CI hook-up.

JOGL Android Binding

- Cross platform builds/tests with Linux host
- Scripts provided in source code repository
- NEWT Helper class (NewtActivity)
  - Android Surface / NEWT Window mapping
  - Android Input Event / NEWT translation

JOGL Android Binding

- http://www.youtube.com/watch?v=VHxtVT4tWjM

Multitouch

- com.jogamp.newt.MouseEvent extended!
  - e.getPointerCount()
  - e.getX(int index)
  - e.getY(int index)
  - e.getPointerId(int index)
  - e.getPressure(int index)

Q&A

- Whats Next?
- Why is neither Swing nor AWT recommended?
- What are the supported IDEs?

Thank You

- Sven Gothel
- Rami Santina
- Dominik aka DemoscenePassivist
- Wade Walker
- and all the many contributors!