UP Next

New Modern Backends for the **Cross-Platform Native GUI Library**

Web/DOM Mac/Cocoa iOS/CocoaTouch Android

> Eric Wing blurrrsdk.com @ewingfighter / @BlurrrSDK

cmatzenbach@gmail.com



Chris Matzenbach

Lua Workshop 2017

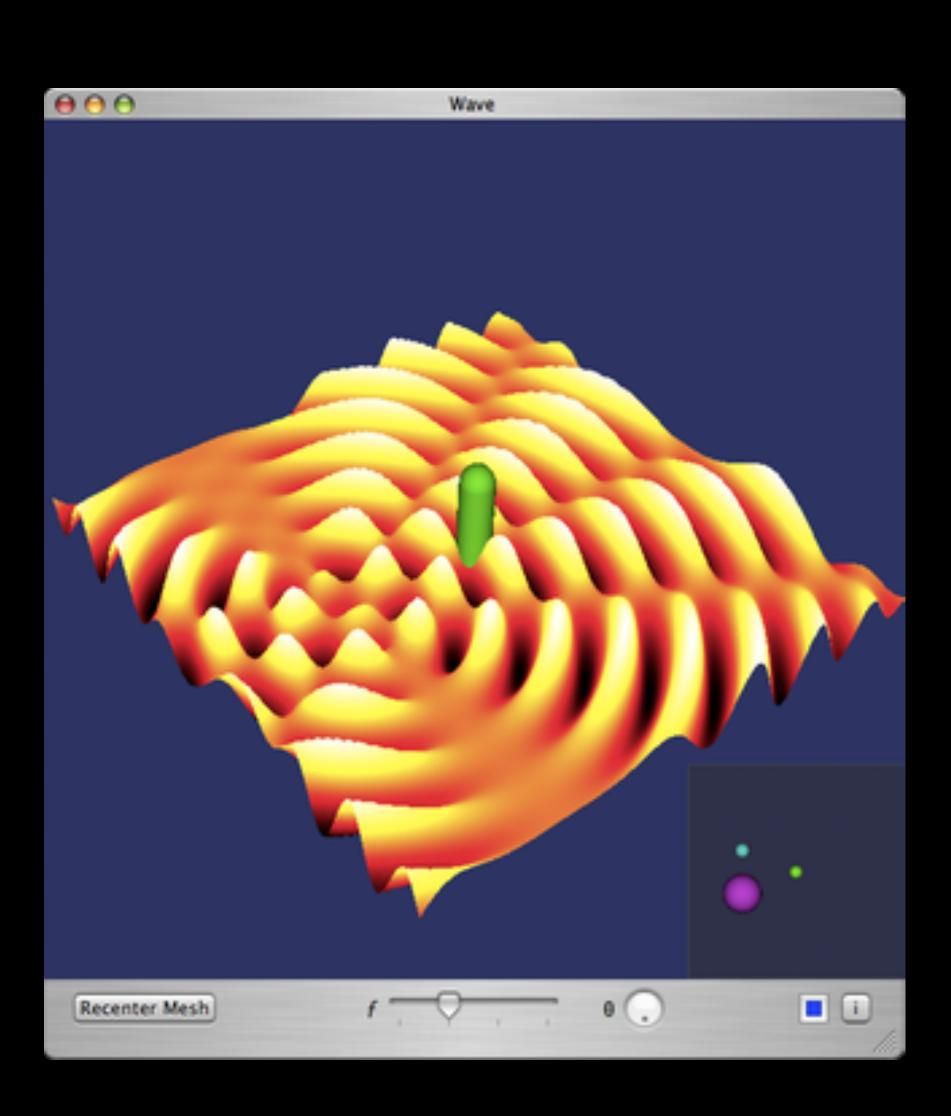
My Background: Worn lots of hats

- Global communication system based on constellation of satellites and ground stations
- Launch satellites into space with rockets!
 - (Not relevant for this talk, but I'm told it sounds cool)



From Cross-platform to Native Cocoa

- Cross-platform, Scientific Visualization
 - End of the Unix Wars => Microsoft Windows domination
 - Mac OS X: A Unix with a user-friendly UI
- Meld cross-platform OpenGL sci-viz with native Cocoa UI for best experience





- Wrote world's first *full-featured* bridge between Lua & Cocoa
 - Obj-C runtime + libffi + Mac OS X 10.5 BridgeSupport
 - Complete API coverage including C APIs
 - Dual mode: Obj-C garbage collection & traditional
 - PowerPC/Intel, 32-bit/64-bit Universal Binaries



Beginning iPhone Games Development

Essential Guide for all iPhone and iPod touch Game Developers



Peter Bakhirev PJ Cabrera Ian Marsh Scott Penberthy Ben Britten Smith Eric Wing



Beginning iPhone Games Development

Apress[®]

Corona SDK (Lua)



Primary platforms: iOS & Android

Also: Mac & Windows

Commercial Game Engines Platino (JavaScript)



BLURRR SDK

A MODULAR, CUSTOMIZABLE NATIVE CROSS-PLATFORM SDK FOR 2D GAMES & APPS MADE SIMPLE



Cross-platform Native App Dev Made Simple

Native application development is harder than it should be. Let's fix that.



IUP (Portable User Interface)

- Cross-platform *Native* GUI library
 - GUI-only (not bloated kitchen sink)
- From PUC-Rio (same as Lua) 0
- **MIT License**
- **Current Active Backends:**
 - Windows
 - GTK2 & GTK3
 - Motif
 - Haiku

SOFTWARE—PRACTICE AND EXPERIENCE, VOL. 0(0), 1–27 (? 1995)

IUP/LED: A Portable User Interface Development Tool

C. H. LEVY, L. H. DE FIGUEIREDO, M. GATTASS, C. J. P. LUCENA

Departamento de Informática, PUC-Rio Rua Marquês de São Vicente 225, 22453-900 Rio de Janeiro, RJ, Brazil levy, lhf, gattass, lucena@icad.puc-rio.br

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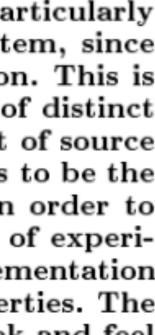
D. D. COWAN

Computer Science Department & Computer Systems Group University of Waterloo, Waterloo, Ontario, Canada N2L 3G1 dcowan@csg.uwaterloo.ca

SUMMARY

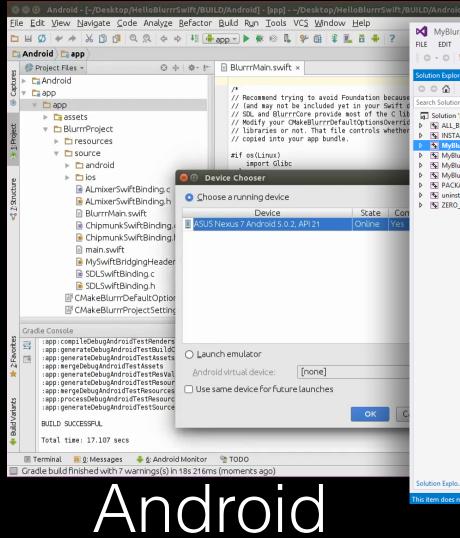
Minimizing the amount of code that must be written and maintained is particularly critical in the development of the user interface for a highly interactive system, since the code for the user interface represents a substantial part of the application. This is especially important where the interactive system is available on a number of distinct platforms. Providing a single user interface abstraction requiring only one set of source code that can be mapped automatically into specific interface systems appears to be the preferred approach; but the underlying model must be designed carefully in order to keep the system relatively simple, easy to use and maintain, and allow ease of experimentation as user interfaces are produced. We describe the design and implementation of IUP/LED, a portable user interface toolkit that we believe has these properties. The alkit is designed for repid prototyping and modification to provide a look and feel





Why IUP? Let me try to paint a picture with my story

- Needed crossplatform native-ish GUI tools for Blurrr SDK (blurrrsdk.com)
 - Launcher to generate native IDE projects



File Edit

New Pro

Studio

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Blurrr SDK Particle Editor made with Nuklear (game) GUI

The Usual Suspects

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- Blurrr SDK supports dev on Windows, Mac, Linux, Raspberry Pi
 - Make apps for Windows, Mac, Linux, Pi, iOS, Android
- wxWidgets, Qt, Java, Tk, NodeWebKit, etc.
- Decided to try QtQuick

Blurrr GenProj





New Project

Open Project



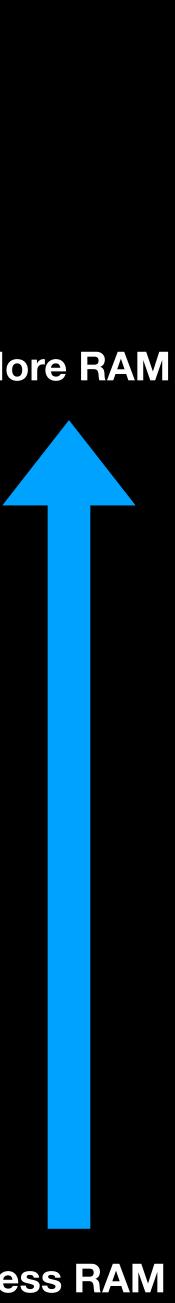
RAM Usage Comparison Mac OS X 10.12

Qt Version

Apple Calculator for reference

IUP Version

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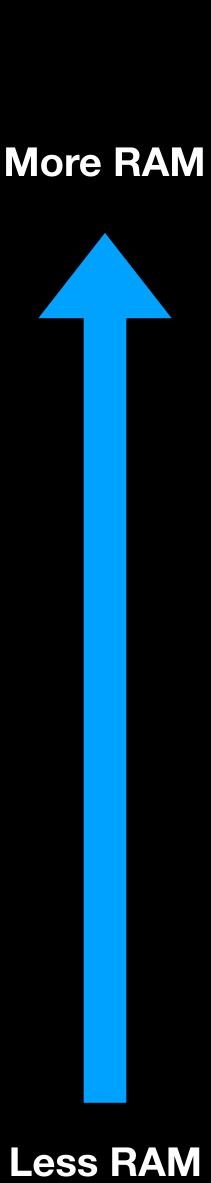


RAM Usage Comparison Ubuntu 12.04LTS

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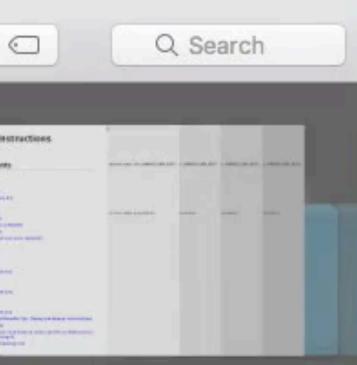


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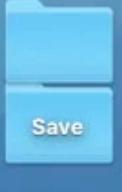
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Screen







GameVideos



LuaWorkshop

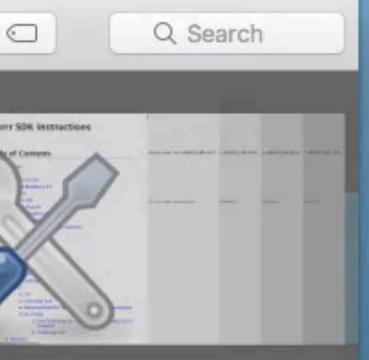


Native/IUP Launch Time (fast) 🔲 🤶 🜒 📰 1 1 6

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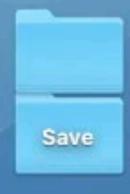


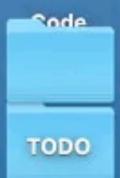


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GameVideos



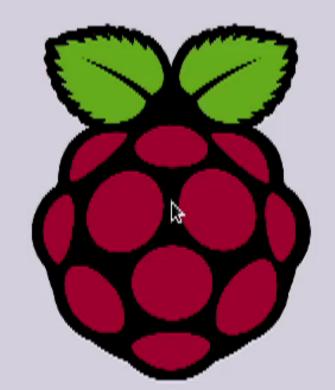
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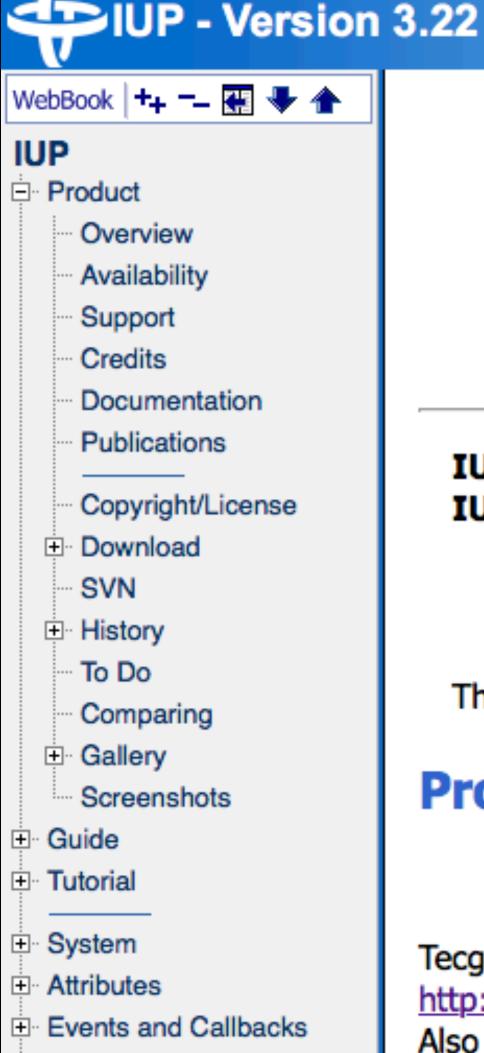
Then Raspberry Pi happened

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Irash



Oh, yeah. UP.



Dialogs

Layout Composition

IUP is a multi-platform toolkit for building graphical user interfaces. It offers a simple API in three basic languages: C, Lua and LED. **IUP**'s purpose is to allow a program source code to be compiled in different systems without any modification. Its main advantages are:

- high performance, due to the fact that it uses native interface elements.
- fast learning by the user, due to the simplicity of its API.

This work was developed at Tecgraf/PUC-Rio by means of the partnership with PETROBRAS/CENPES.

Project Management:

Antonio Escaño Scuri

Tecgraf - Computer Graphics Technology Group, PUC-Rio, Brazil http://www.tecgraf.puc-rio.br/iup Also available at http://iup.sourceforge.net/

SOURCEFORCE NET

Google Search

© Tecgraf/PUC-Rio (iup@tecgraf.puc-rio.br)

IUP Portable User Interface

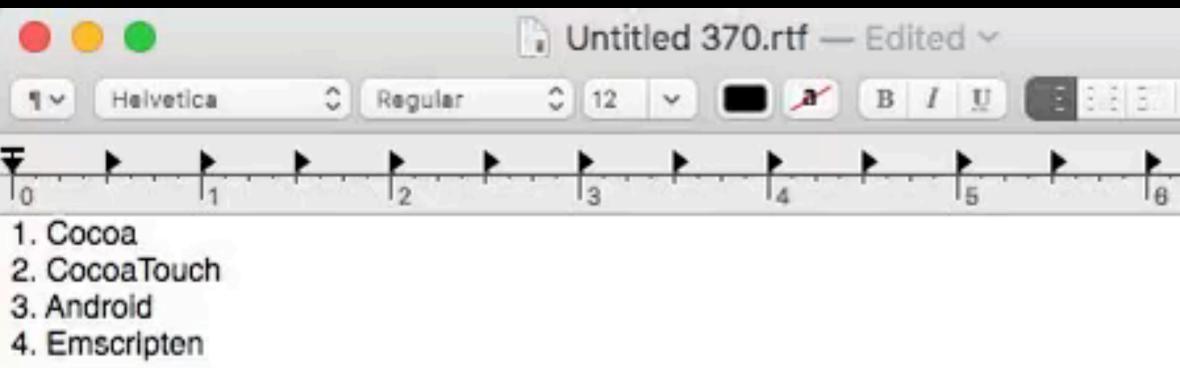
Version 3.23



Why does native UI matter?

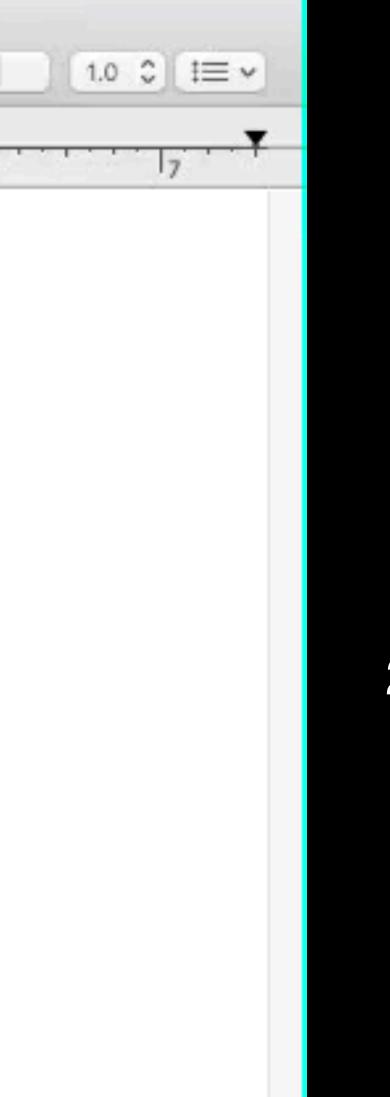
- Already mentioned RAM & Performance
- Also usability conventions

Cocoa Discontinuous Text Selection



The quick brown fox jumped over the lazy dog.

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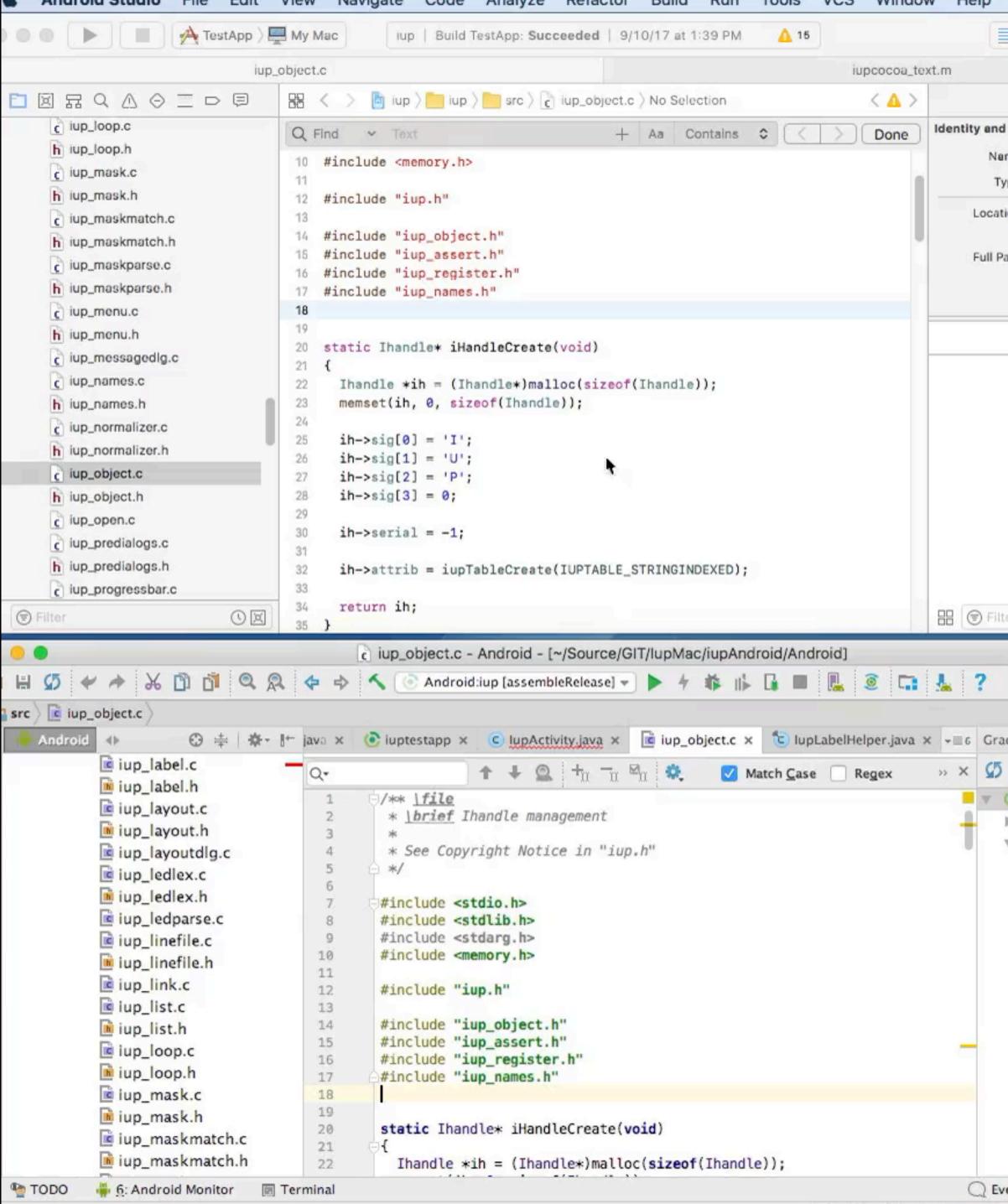


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1. Can cut & paste

2. Can select multiple discontinuous sections

1. Can cut & paste



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Find Buffer: Cmd-E, Cmd-G Native (top) VS. Java Android Studio (bottom)

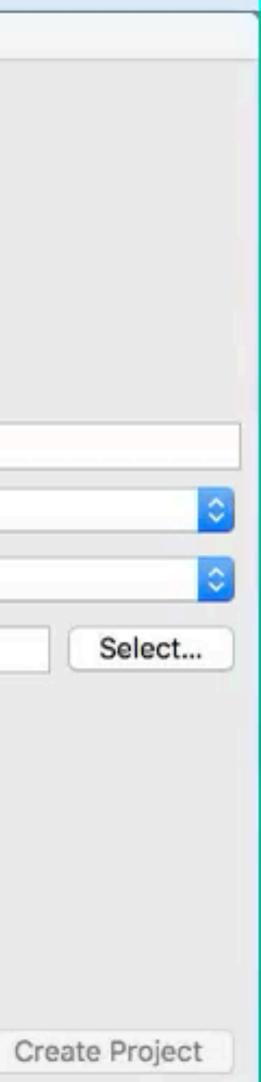
1.Cmd-E to put into Find Buffer

2. Cmd-G to find next



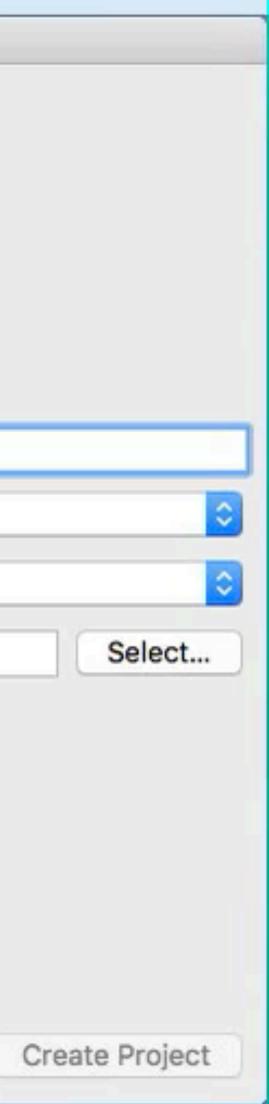
Services & Menu Built-ins Native (left) vs. Qt (right)

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Services & Menu Built-ins Native (left) vs. Qt (right)

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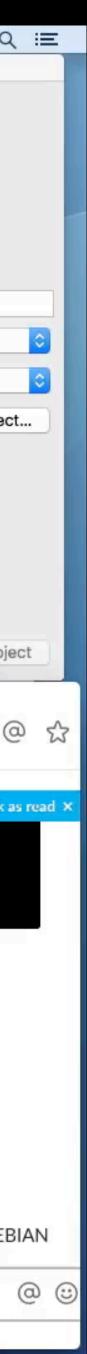
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Accessibility

- Microsoft, Apple, Google spend enormous effort to make their platforms accessibile to people with special needs
- Built-in behaviors are automatic if you use their stuff
- Many non-native app miss this
- Selling to the government usually requires apps to be Accessible

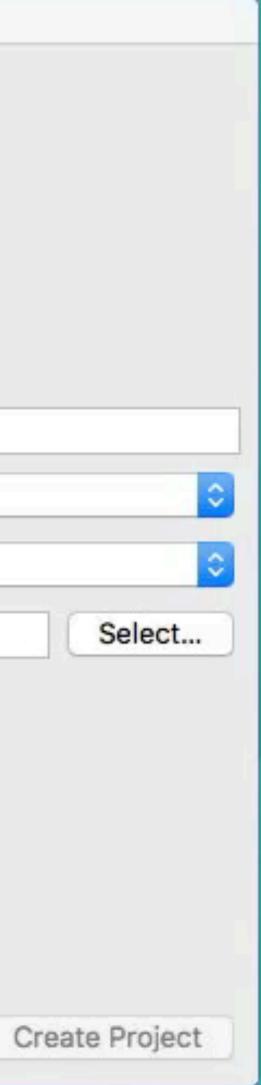
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Microphone Speech-to-Text Native (left) vs. Qt (right)

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Fn-Fn to activate

IUP the research side

- IUP started as a research project for good reason
 - How can you make a cross-platform interface when the native interfaces for every platform are so drastically different?
 - How do you provide access to features that not all platforms may support?
 - And how do you do this without constantly changing/breaking the API, especially when new platforms are introduced?
 - How do you deal with different sizes for widgets
 - Since every platform uses a different programming language for their native development, how do you deal with this in a flexible and cross-platform way?



IUP Solutions

- IUP's core and public API are implemented in pure C, because C is the one language that every language can talk to
- Platform backends are implemented in each platform's native language using the native widget set
- IUP does not employ language subclassing since that can't be expected to work across all the platforms.
 - Instead IUP uses attributes to set properties

UP Attribute Solution

IupSetAttribute(button, "TITLE", "OK");

- Can scale to cover entire native API features
- Does not require breaking/changing the API
- Unsupported properties on platforms can simply ignore the feature request
- Makes IUP simple to learn/use

IupSetAttribute(button, "ACTIVE", "NO"); // disables button

IUP Designed for Language Bindings

- Recognized most people don't wa easy binding
- Small API
 - Attributes help keep it small
- Lua bindings first class citizens
- Lots of other language bindings

Recognized most people don't want to write in C, so API was designed for

IUP LED: Textual Layout Description Format

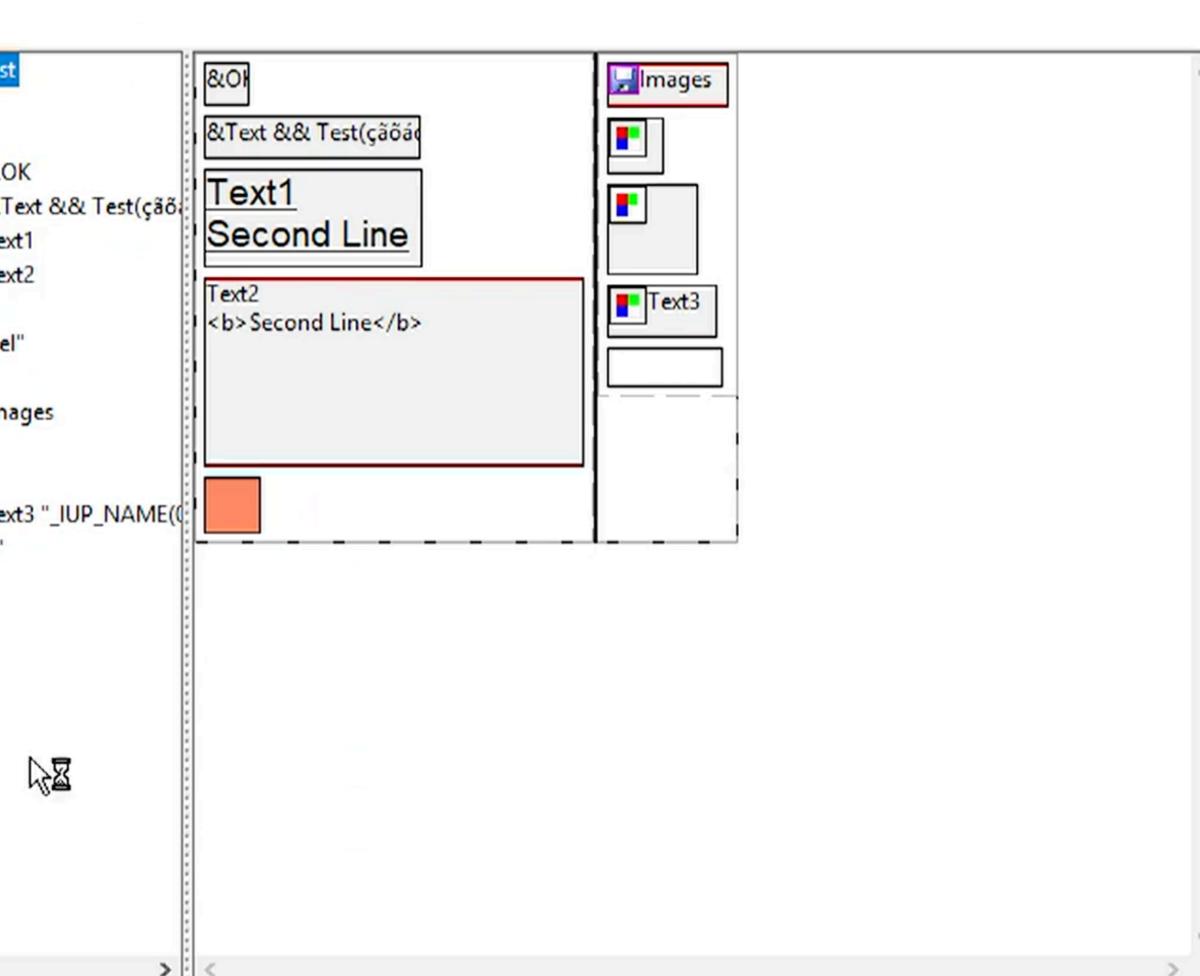
- Think: Windows XAML, Android XML layout, Apple Interface Builder XIB
- Optional: (can do everything programmatically)
- Normally runtime, but optional compiler to convert to compile time
- Optional use case: Can have different LED files for different platforms
- Example:
 - btn = button[ACTIVE=NO]("OK", action_ok)
 - dlg = dialog[SIZE = FULLxFULL TITLE = "Test"](btn)

lupLayoutDialog: (Live) Run-time Layout Editor

Real app/GUI on left

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Layout Editor on Right





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Other official IUP accessory libraries

- IupCD (Canvas Draw library)
 - Uses the native 2D drawing API on each system to implement "nonnative" widgets (like Qt)
 - Easy way to create new, cross-platform widgets
- IupPlot: Plot/graphing library built on lupCD
- lupGL: OpenGL

- Definition: Cocoa
 - The framework (library) you write native Mac applications in
 - Provides lots of widgets, e.g. Text, Buttons, Windows, etc.
 - Name is pun on "Java"
 - Favorite coffee vs. Favorite hot beverage



- Definition: Objective-C
 - The native programming language you write Cocoa applications in
 - It is a 100% pure superset of C (which C++ can't even claim)
 - Obj-C adds an object system and powerful runtime inspired by Smalltalk.
 - (Strange) Syntax was designed to avoid conflicting with C/C++, which allows intermixing all 3 languages in the same file



Quick Overview on Implemented things

- lupCocoa is not finished but...
 - It is also further along than most people think

Cocoa is pretty straight-forward and matches well with Windows & GTK

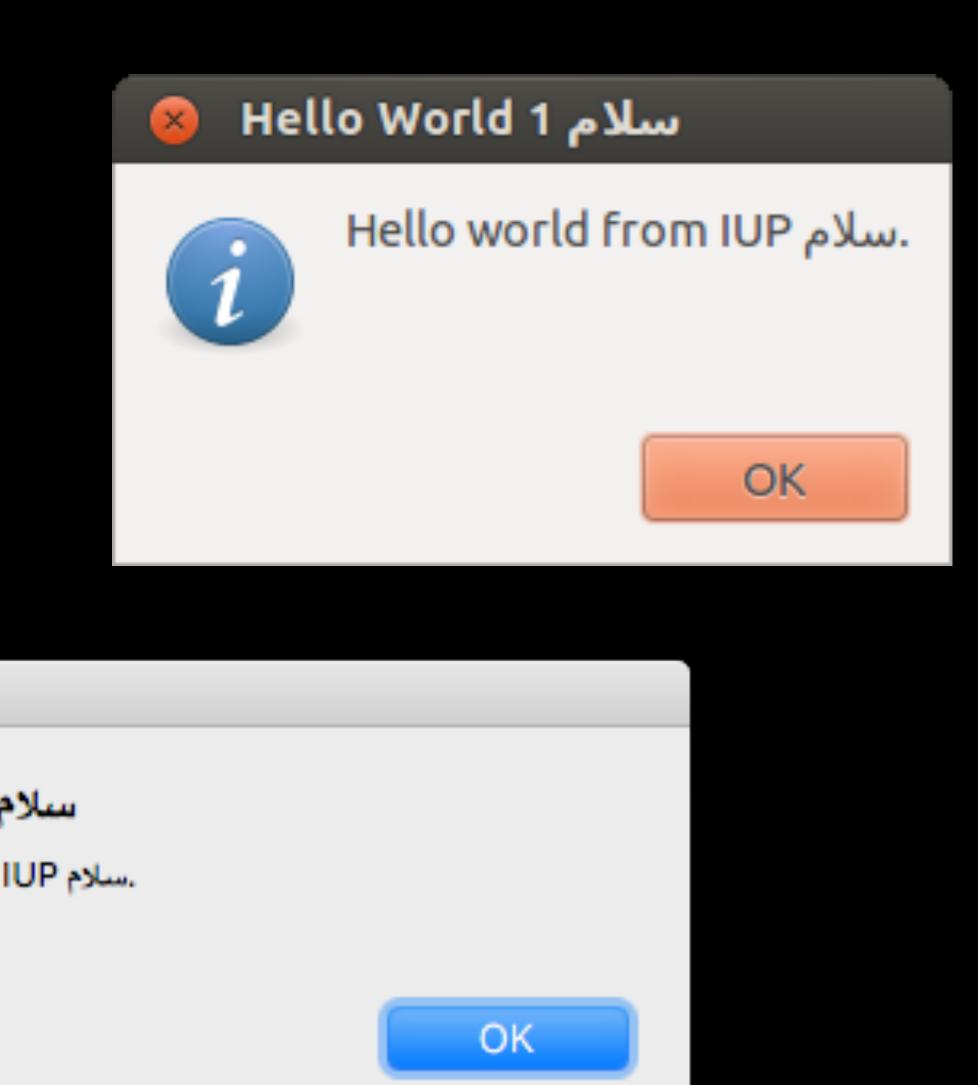
(I'm now shipping the Mac IUP version of BlurrGenProj seen earlier.)

Dialogs, Labels, & Buttons

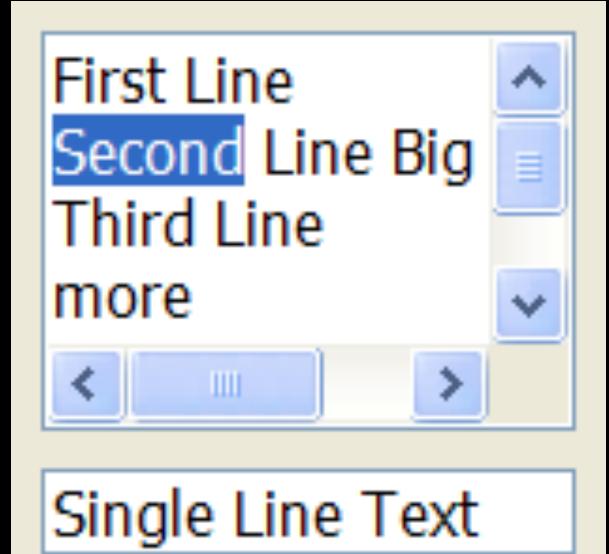
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Hello World 1 سىلام Hello world from IUP سىلام.



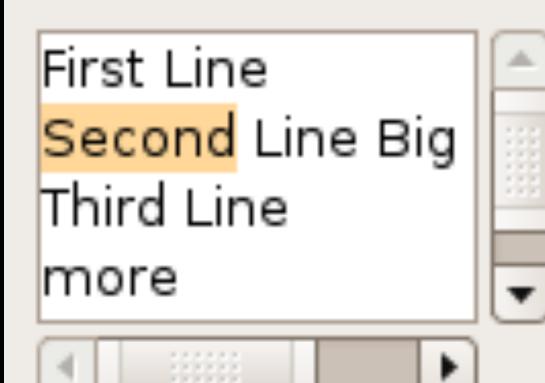
(Input) Text



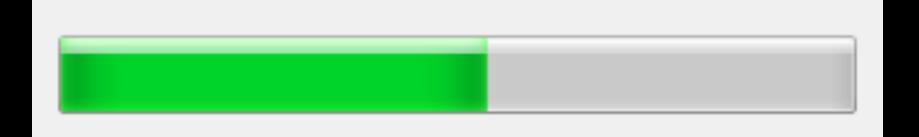
Multiline:

First Line Second Line Big Big Big Third Line more more

Single Line Text

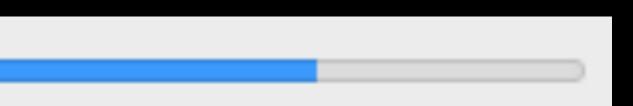


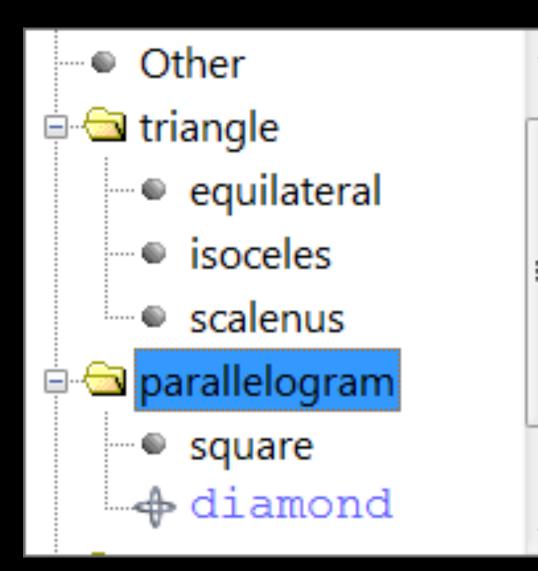
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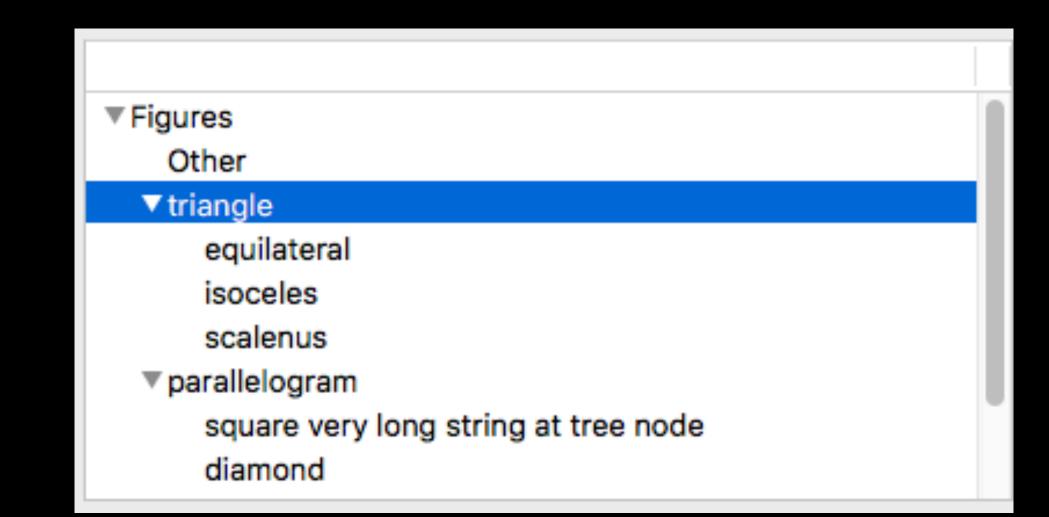




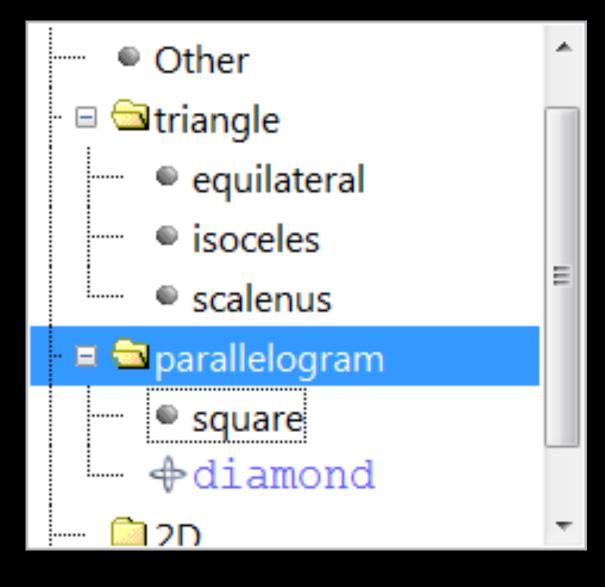








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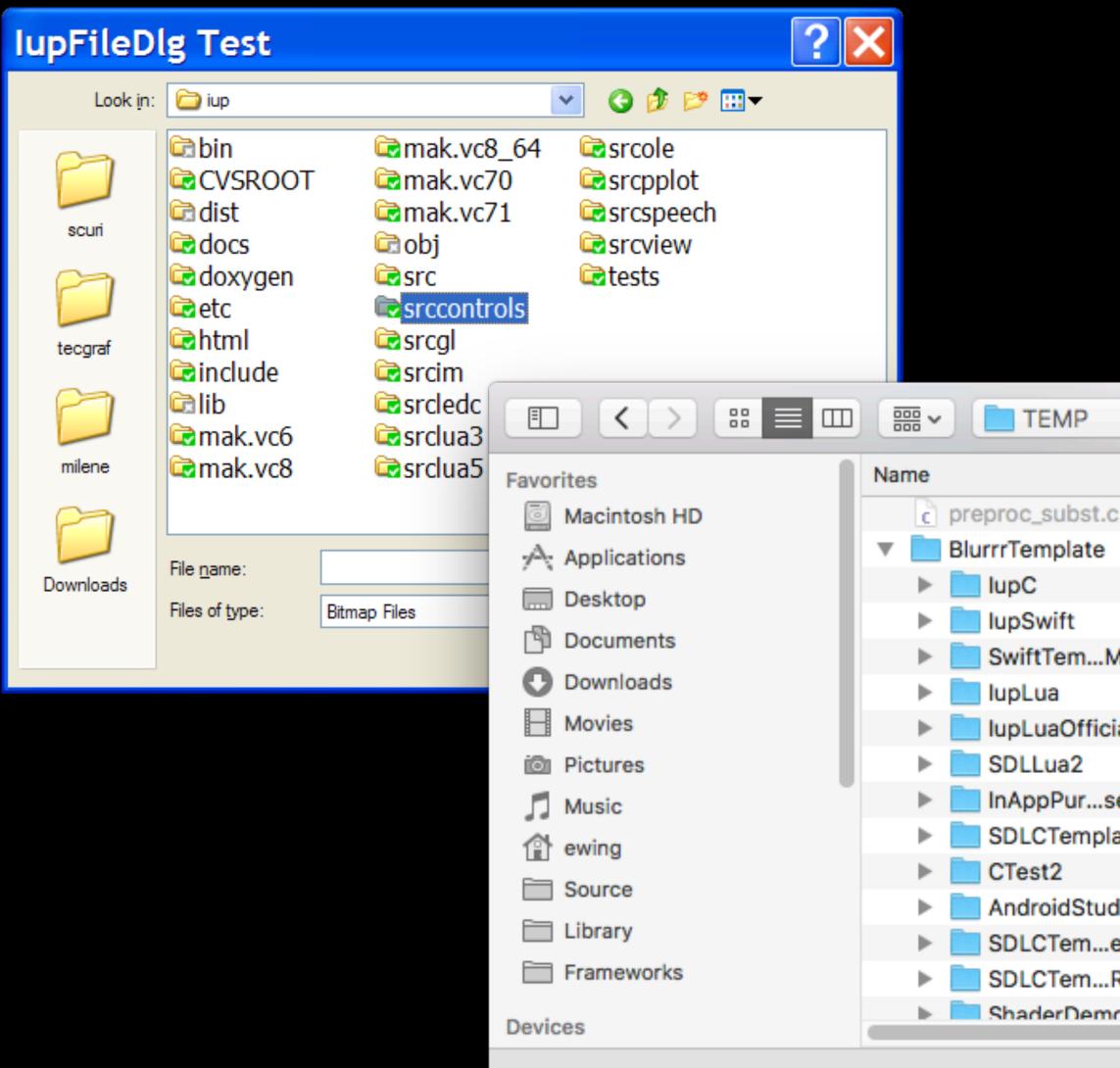
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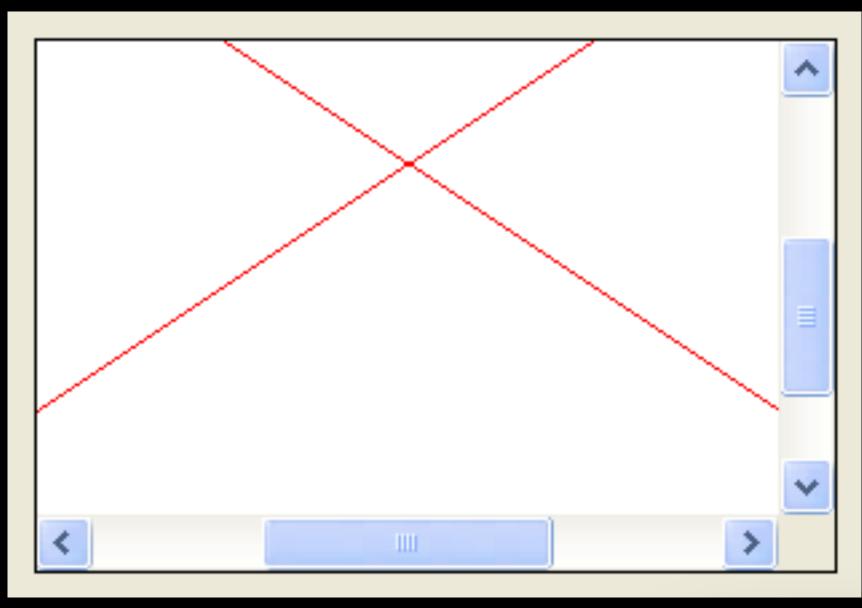


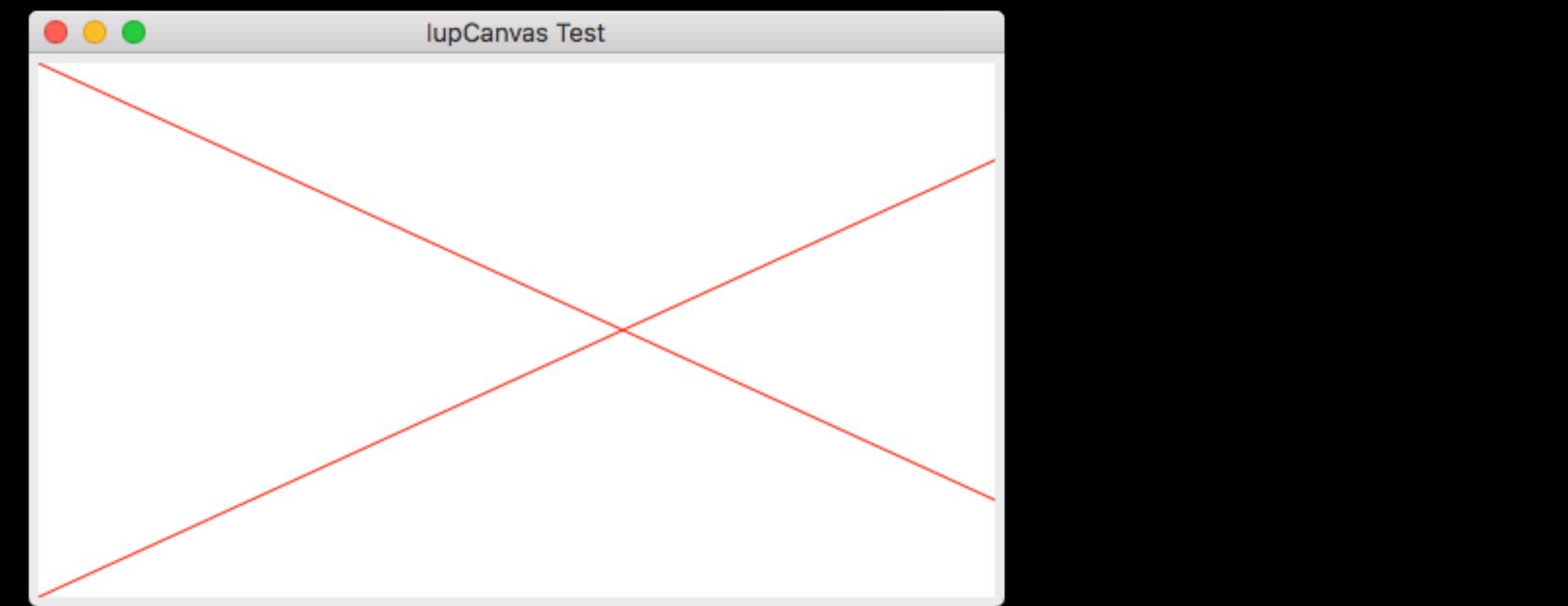


FIE Dialogs

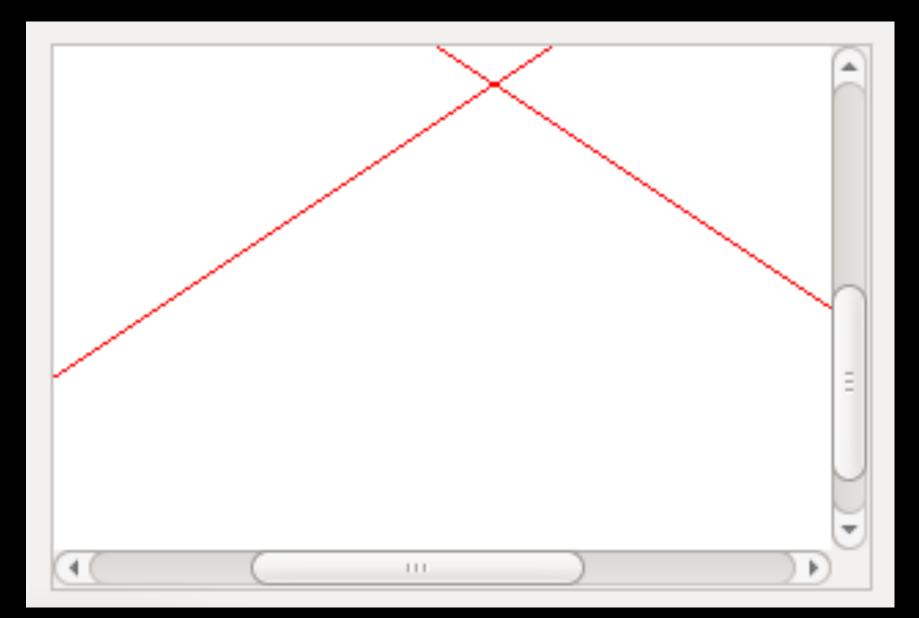
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Canvas



Some Impedance Mismatches

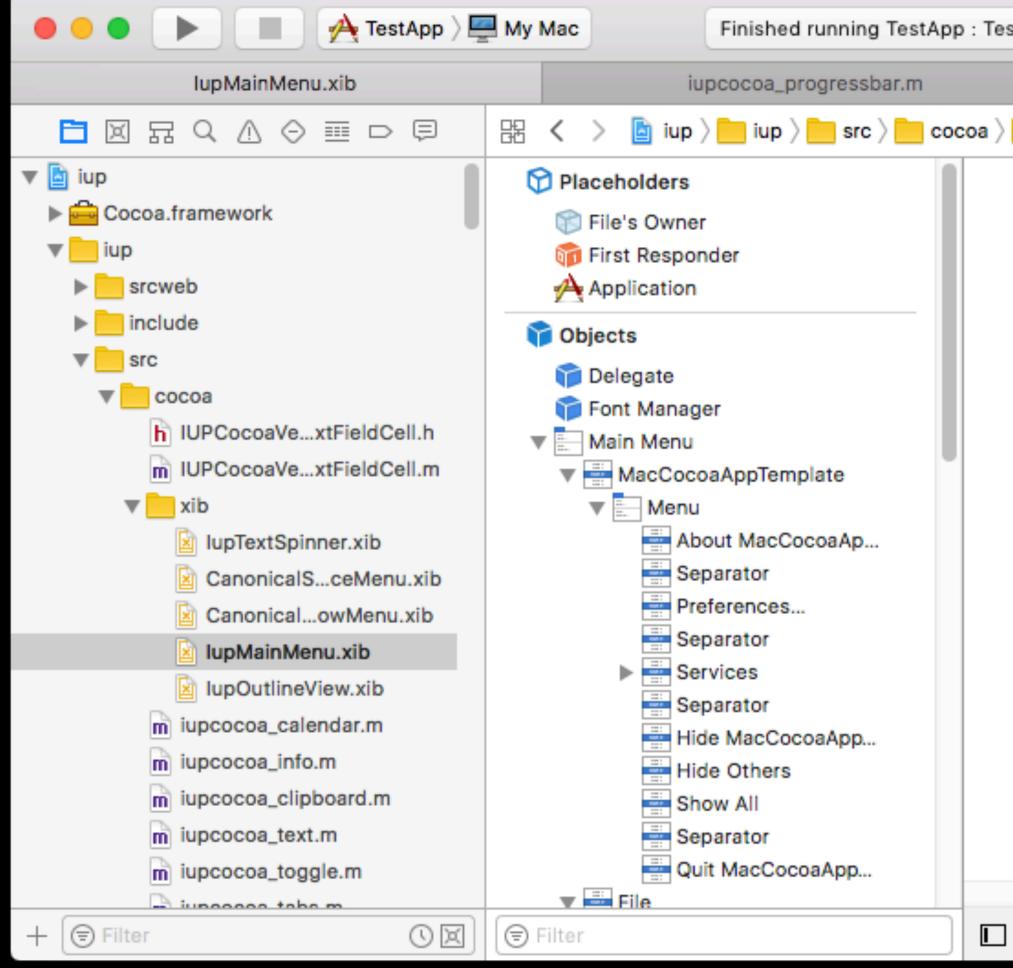
- Event Loop
- Application Menu system



- Cocoa wants to control the event loop
 - You are not supposed to pump it yourself
 - Yes, there are ways around this, but has been known to break things
 - Modal windows
 - menu bar behavior
 - Game Center

Cocoa Event Loop

Application Menu



- Using: lupSetGlobal("MENU", (const char*)main_menu);

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Instead of per-window: lupSetAttributeHandle(dialog, "MENU", main_menu);

One More Thing...GNUStep

Courtesy: Germán Arias



- But...

That's lupCocoa

But it's 2017... Mobile Revolution started in 2007

- 270 million PCs shipped in 2016 (Gartner)
- 1.5 billion smartphones shipped in 2016 (Gartner)
- PC sales declining

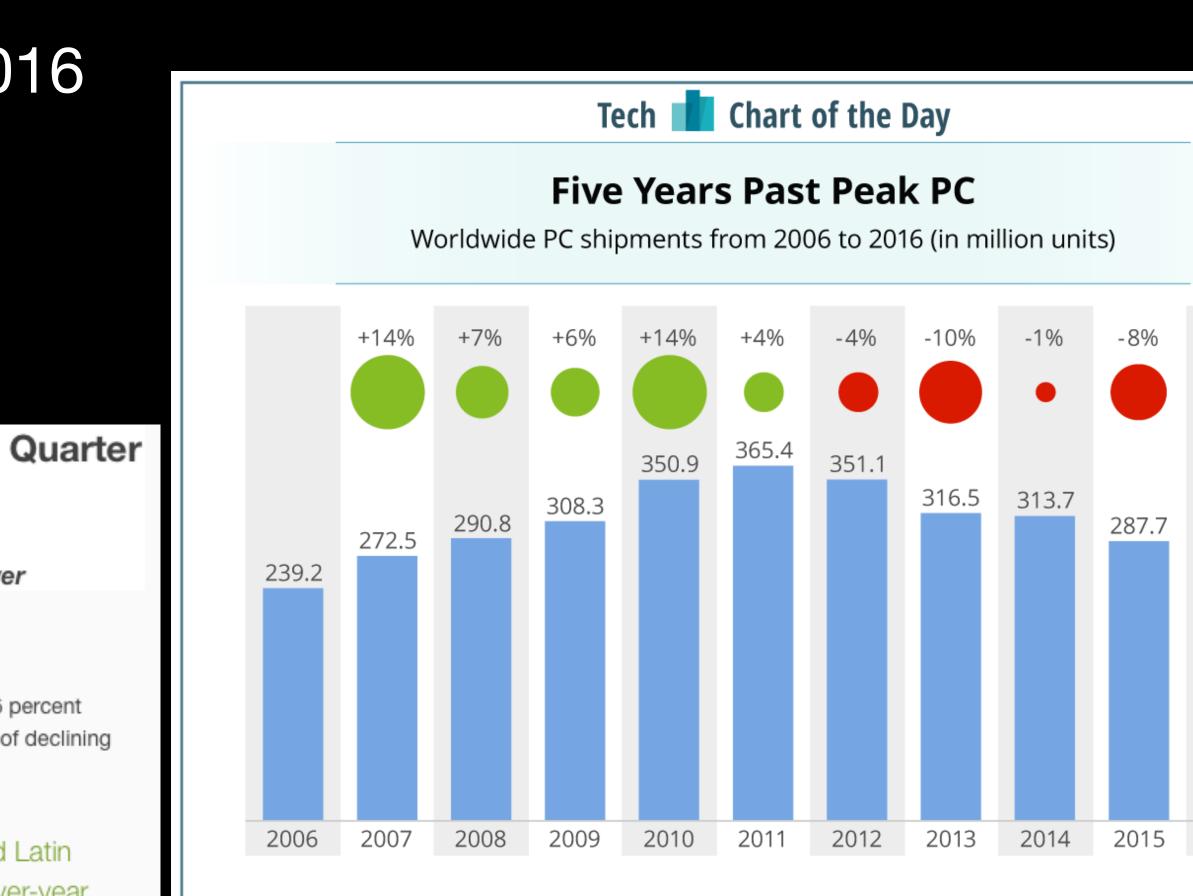
Gartner Says Worldwide PC Shipments Declined 3.6 Percent in Third Quarter of 2017

Traditional Promotions, Such as Back-to-School Sales, No Longer an Effective Growth Driver

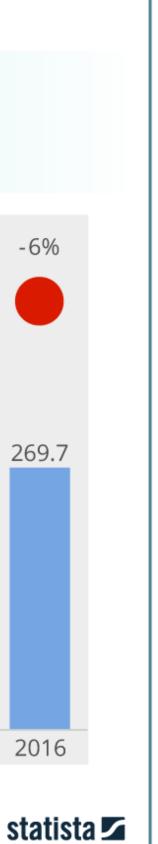
October 10, 2017 04:41 PM Eastern Daylight Time

STAMFORD, Conn.--(BUSINESS WIRE)--Worldwide PC shipments totaled 67 million units in the third guarter of 2017, a 3.6 percent decline from the third quarter of 2016, according to preliminary results by Gartner, Inc. This is the 12th consecutive quarter of declining PC shipments.

"While there were signs of stabilization in the PC industry in key regions, including EMEA, Japan and Latin America, the relatively stable results were offset by the U.S. market, which saw a 10 percent year-over-year decline in part because of a very weak back-to-school sales season"



BUSINESS INSIDER



Google switching to Mobile-first indexing

Mobile versions of sites will be used for ranking

Google Webmaster Central Blog

Official news on crawling and indexing sites for the Google index

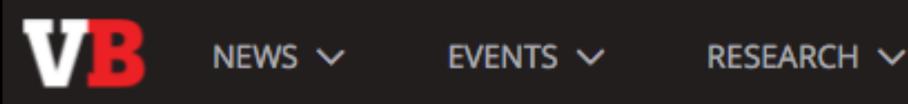
Mobile-first Indexing

Friday, November 04, 2016

Today, most people are searching on Google using a mobile device. However, our ranking systems still typically look at the desktop version of a page's content to evaluate its relevance to the user. This can cause issues when the mobile page has less content than the desktop page because our algorithms are not evaluating the actual page that is seen by a mobile searcher.

To make our results more useful, we've begun experiments to make our index mobile-first. Although our search index will continue to be a single index of websites and apps, our algorithms will eventually primarily use the mobile version of a site's content to rank pages from that site, to







Mobile game revenue finally surpasses PC and consoles

STEPHANIE CHAN @SWEIJUCHAN JULY 13, 2017 11:45 AM

Two-thirds of the world now has a mobile phone in their pocket, and apparently a lot of them are spending money on games. A new report from industry analyst DFC Intelligence found that mobile games revenue exceeded PC and console revenue for the first time ever in 2016.

The mobile games market grew 32 percent to reach \$38 billion last year, and according to market analyst Newzoo, will reach \$65 billion in 2020. In China, tech giants Tencent and NetEase both doubled their revenue. NetEase overtook Tencent as the No. 1 mobile publisher last year, but Tencent is still the largest gaming company in the world and has a huge presence in not just mobile but in the PC gaming world as well with subsidiaries like League of Legends studio Riot. It reported a 58 percent increase in Q1 this year and is currently valued at \$316 billion.

Search

IUP for iOS & Android

- Good News: IUP's original design seems flexible enough to handle this
 - "Attributes" instead of too many hardcoded APIs
 - We have "lupDialog" and not "lupWindow"
- But... requires some careful design/thought on how things should map/ work on mobile

Example "Thought-Exercise": What does "Dialog" mean for mobile?

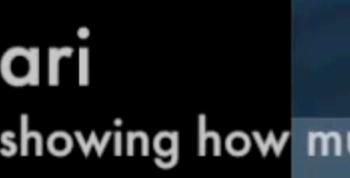
- "Dialog" is a "Window" on Desktop
- iOS: While a UIWindow exists, the paradigm isn't good for multiple dialogs
 - The more common and useful construct is the UIViewController
- Android: The corresponding construct is an Activity

iOS: UlWindow is not the best mapping for Dialog

- Not obvious how to deal with multiple dialogs
- Use Safari as an example of multiple UIWindows
- Safari "switching" behavior is not built-in

iOS Safari









Flappy Bird

Swing Copters

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BasicSDLC



Limdo-JSCore



9:41 AM





Limdo-C



OblivionC



playstream

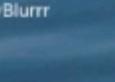
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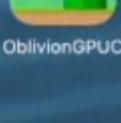
Find Friends

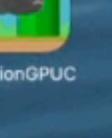




Find iPhone













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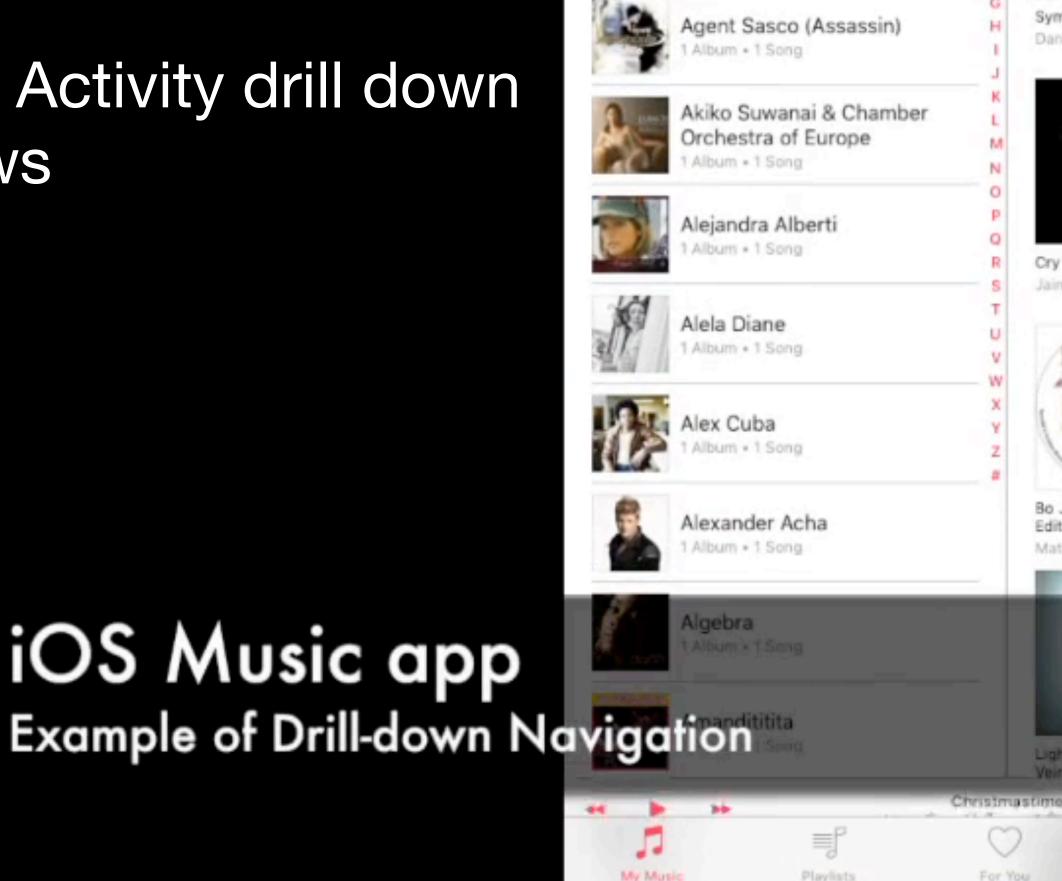




iOS UIViewController & Android Activity

- Both UINavigationController & Activity drill down & back through a stack of views
- Users expect this behavior
- Behavior is built-in

iOS Music app



.......

Recently Added 50 Albums + 71 Songs.

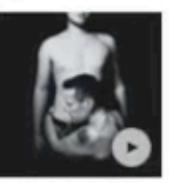
> iam Gregory um + 1 Song

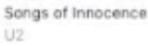
Addison Road Album + 1 Song

Album + 1 Song

9:41 AM

Artists~







Symphonies Dan Black



Cry Me a River laimee Paul



Bo Jack Pop Radio Matias Aguayo & Reb.



Light Through the Veins.

Nev

Christmustimo Is Here (Instrumenta



Christmastime Is Here (Instrumental) Vince Guaraldi Trip



All I Want for Christmas Is You The RR



Fireflies Owl City



Red Light David Nail

Mas Fuerte





Connect

















El Querendón y





Radio



100% 📟

Next Best Thing

Nikki & Rich



Must Be Santa Bob Dylan

Leslie Mendelson

Larry Hernandez

So let's implement it and put it all together

- Demo: Show a singular IUP program
 - Runs native on all platforms
 - Feels natural for every platform

```
var g_buttonCounter = 0;
```

```
func BlurrrMain() -> Int32 {
    IupOpen(nil, nil)
    IupSetFunction("ENTRY_POINT", IupEntryPoint);
    IupMainLoop()
    return 0;
```

```
func IupEntryPoint(_ ih:OpaquePointer?) -> Int32 {
    g_buttonCounter = 0
    return ShowNewDialogCallback(nil)
```

}

func ShowNewDialogCallback(_ ih:OpaquePointer?) -> Int32 { let button = IupButton(nil, nil) IupSetStrAttribute(button, "TITLE", "Iup Button \(g_buttonCounter)") IupSetCallback(button, "ACTION", ShowNewDialogCallback) let dialog = IupDialog(button) IupSetAttribute(dialog, "SIZE", "QUARTERXQUARTER") IupSetStrAttribute(dialog, "TITLE", "Iup Dialog \(g_buttonCounter)") IupShow(dialog) g buttonCounter += 1 return IUP_DEFAULT

Demo Program: Create Dialog & Button (recursive) *Fun Fact: Written in Swift using bindings to IUP



Ubuntu Linux (amd64)

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	<pre>pinky@Ubuntus [12%] Built [12%] Built [62%] Built [62%] Built [62%] Built [100%] Built pinky@Ubuntus [12%] Built [12%] Built [12%] Built [12%] Built [12%] Built [25%] Embed [37%] Embed [50%] Built [62%] Built [62%] Built [75%] Build [87%] Build [100%] Linki</pre>	<pre>I6vb:~/TEMP/IupSwift/BUILD/Linux\$ make target IupSwift_SyncIcons target IupSwift_SyncResources target IupSwift_SyncPlugins target IupSwift_SyncPlugins target IupSwift/BUILD/Linux\$ make I6vb:~/TEMP/IupSwift/BUILD/Linux\$ make ing icon /home/pinky/TEMP/IupSwift/ico target IupSwift_SyncIcons target IupSwift_SyncLibraries ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/Source/Blurre Make/C/resources/BlurreSDK3rdPartyLiced ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding resource /home/pinky/TEMP/IupSwift ding swift object CMakeFiles/IupSwift.ding Swift object CMakeFiles/IupSwift</pre>	ons/linux/icon.png //resources/icon.bmp //resources/VeraMono.ttf /Release/BlurrrSDKLinux/boots ises.txt //resources/gamecontrollerdb.t
	pinky@Ubuntu	<pre>L6vb:~/TEMP/IupSwift/BUILD/Linux\$ make</pre>	
	SO Blur	r GenProj	
	Project Type:	Swift	:
	Platform:	Linux	:
	Build Type:	Debug	:
		Open Project	
		Swift path must be setup in Preferences	Purge Generate
9	Back Resta	rt Wizard	

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Raspberry Pi (Raspbian)





Trash



New



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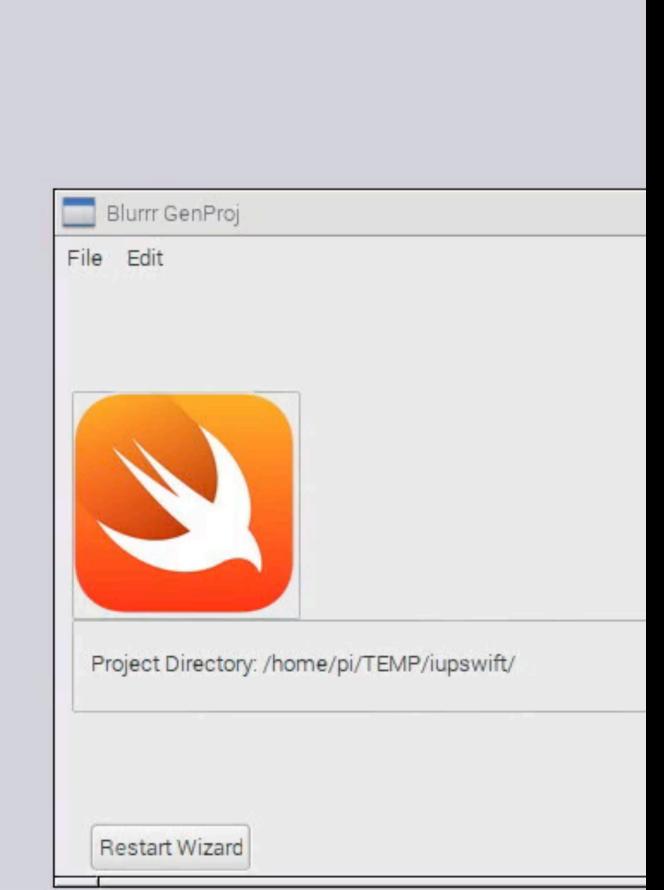
Blurrr GenProj

pi@raspberrypi: ~/TEMP/iupswift/BUILD/Raspbian

File Edit Tabs Help

CPackSourceConfig.cmake		
pi@raspberrypi:~/TEMP/iupswift/BUILD/Raspbian	ı \$	make
[0%] Built target IupSwift_SyncPlugins		
<pre>[12%] Built target IupSwift_SyncIcons</pre>		
<pre>[62%] Built target IupSwift_SyncResources</pre>		
<pre>[62%] Built target IupSwift_SyncLibraries</pre>		
[100%] Built target IupSwift		
pi@raspberrypi:~/TEMP/iupswift/BUILD/Raspbian	ı \$./IupSwift

pi@raspberrypi: ~/TEMP/iu...

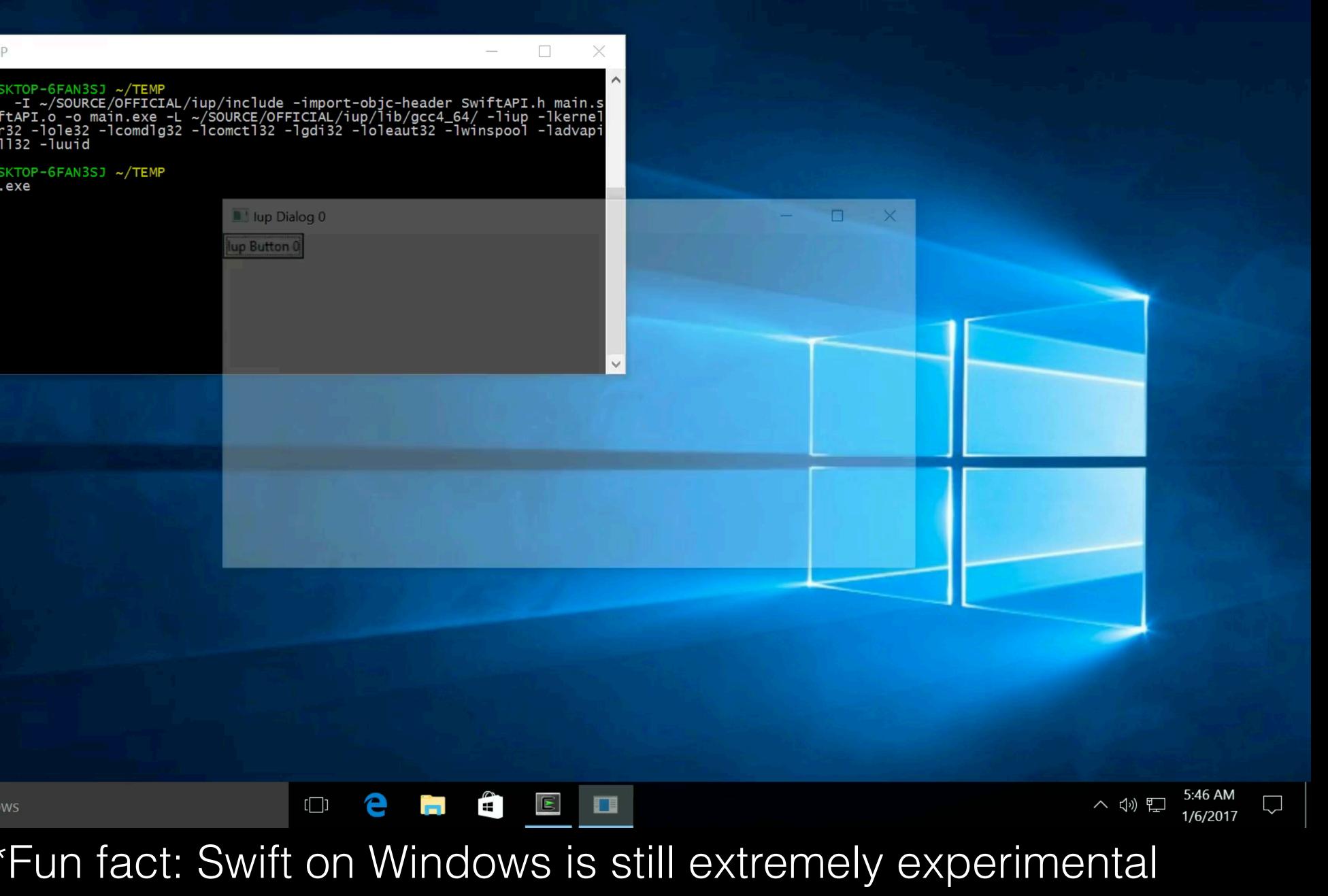


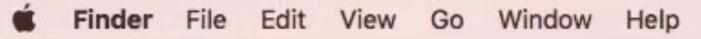
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Recycle Bin	<pre>pinky@DESKTOP-6 \$ swiftc -I ~/ wift SwiftAPI.o 32 -luser32 -lo 32 -lshell32 -l pinky@DESKTOP-6 \$ /main_oxo</pre>	SOURCE/OFFICIAL -o main.exe -L le32 -lcomdlg32 uuid	/iup/include ~/SOURCE/OFF -lcomctl32 -	-import-objc- ICIAL/iup/lib lgdi32 -lolea	header Swif /gcc4_64/ - ut32 -lwins	FtAP: -liu spoo
Cygwin64 Terminal	\$./main.exe hello		🔳 lup Dia	alog 0		
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Windows

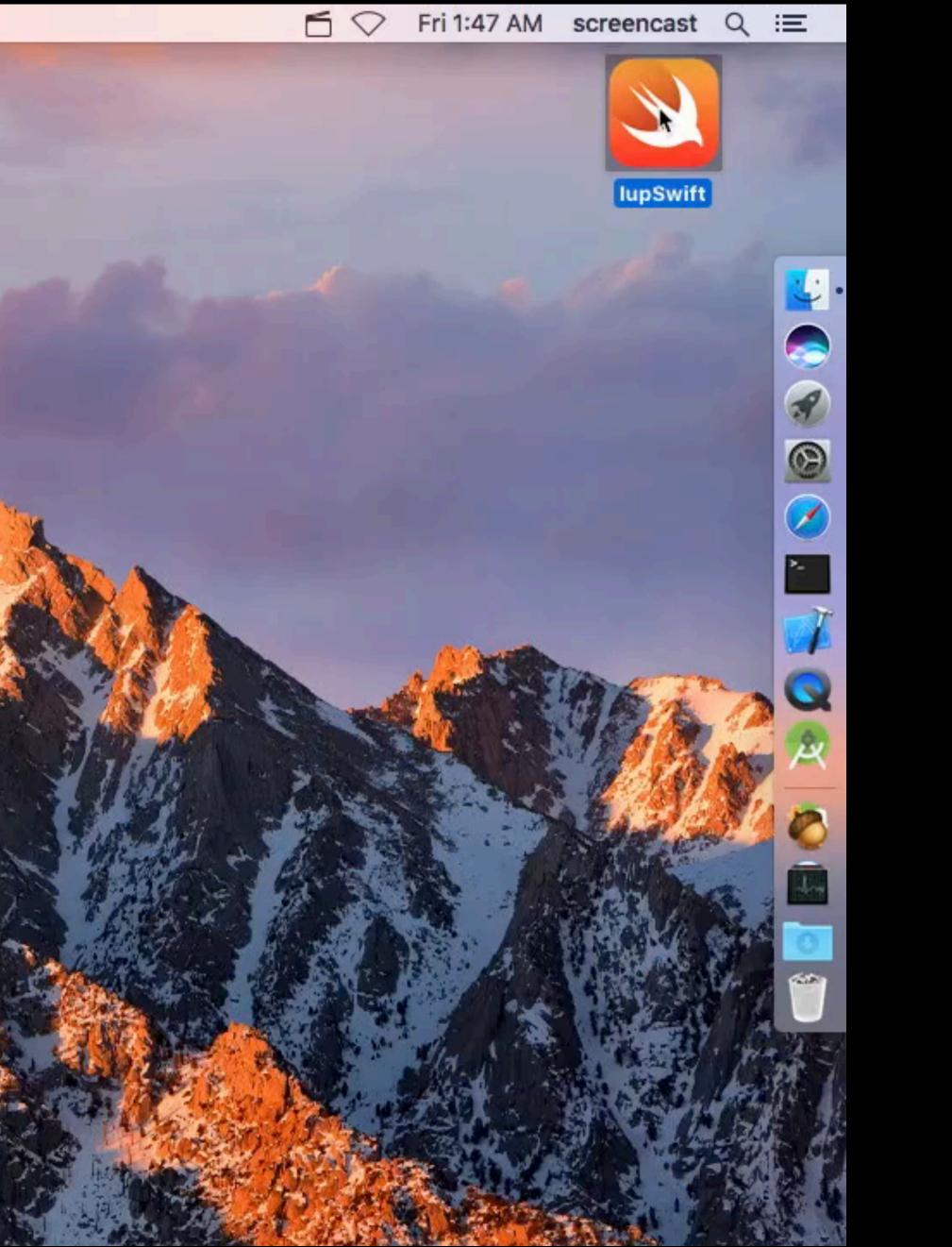






Mac





iOS

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BlurrrShader...





SimpleCurlJS







Sparkle Sparkle











Crossy Road

Angry Birds 2





TestApp







Safari

Mail

9:41 AM

* 100% 📼 +



SimpleCurlLua





Snakebird



PAC-MAN 256



Spider



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Settings



Android

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APPS

WIDGETS





AZ Screen Recorder

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Candy Cave

Chrome





Docs

Downloads





FlappyBlurrrC

Google

FlappyBlurrrJavaS cript



Google Settings

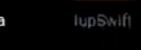
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HelloAndroidJava ScriptCore





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Calculator



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Calendar





Currents

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Camera



Drive



Email



FlappyBlurrrLua



Earth





Google+



Кеер



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Hangouts



HelloAndroidALm ixer



MyBlurrrlupProjec t

0



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IupCocoaTouch

- Very similar to Mac
 - APIs are a little different (UIViev similar

• APIs are a little different (UIView instead of NSView), but semantically

iOS Event Loop

- Apple controls the event loop (same as Mac)
 - More rigid than Mac

upAndroid

- All Android apps must use the Android SDK which is in Java
 - You cannot escape this
- Android GUI APIs are completely in Java
- Android NDK was later added to allow for C & C++ development

The Android NDK "Really Does Suck"

- John Carmack "Half-baked", "Really does suck"
- Second class citizen on Android
- Almost no Android libraries are provided in the NDK
- Lots of things are broken, slow to get fixed, if ever
- Word on the street (few years ago): Only 2 full-time Google engineers + a few part time
 - Consistent with number of Google employees on NDK mailing list lacksquare
 - No slight intended on those 2 engineers. Valiant effort. Google treats them as the black sheep.
 - Google: Among the richest, powerful companies in the world with #1 dominance in mobile, and this is the best effort Google chooses to put in. Shameful.
 - Android is 9 years old. Our pleas are ignored. Public ridicule is the only tool we have left. \bullet



Android's obsession with (Java) God Objects

- Context class
- Activity class
- Application class









added in API level 1 Summary: Constants | Ctors | Methods | Inherited Methods | [Expand All]

- public abstract class Context
- extends Object
- java.lang.Object
- → android.content.Context
 - Known Direct Subclasses
 - ContextWrapper_MockContext

Q

Android file system and the .apk

- Files that ship with your app are inside the ".apk" (think .zip)
 - Can't use standard C file family (fopen, fread)
 - Needs a "God" object from a Context class to get an AAssetManager
 - AAsset* AAssetManager_open(AAssetManager *mgr, const char *filename, int mode);
 - Existing cross-platform (ANSI) C/C++ libraries won't work without modification

An Activity is a Context

- Common mistake is to try to keep a reference to an Activity for the life of a program
 - They typically come-and-go in most apps

Developers

added in API level 1

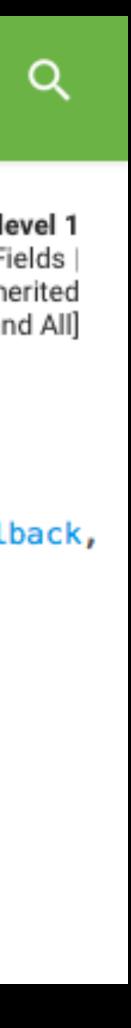
Activity

Summary: Constants | Inherited Constants | Fields Ctors | Methods | Protected Methods | Inherited Methods | [Expand All]

public class Activity extends ContextThemeWrapper implements LayoutInflater.Factory2, Window.Callback, KeyEvent.Callback, View.OnCreateContextMenuListener, ComponentCallbacks2

java.lang.Object

- ➡ android.content.Context
 - android.content.ContextWrapper
 - android.view.ContextThemeWrapper
 - → android.app.Activity



An Application is a Context

- Created my own lupApplication class
 - Will provide a public way to retrieve it to help other libraries in your app
- Does mean that any other library that uses this same approach is incompatible with IupAndroid

Developers DESIGN

Application

public class Application extends ContextWrapper implements ComponentCallbacks2

java.lang.Object

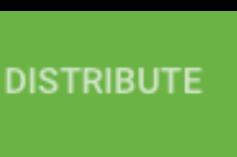
android.content.Context

android.content.ContextWrapper

→ android.app.Application

Known Direct Subclasses

MockApplication,MultiDexApplication



DEVELOP

- Android controls the event-loop. PERIOD.
- Never block the event loop
- You cannot manually pump the event loop
- Will impact lupMainLoop and start up sequence
- Also, there is no "int main" because we are Java, not C

Android Event Loop

Android (main) UIThread

- All GUI APIs must be called from the UIThread
- Working around the event-loop design with a background thread is usually a mistake
 - Makes you second-class citizen on the platform (can't directly call APIs)
 - Road-block when using single-threaded languages
 - Must understand threading model of your app, the library, and the OS
 - Callbacks must be redirected back to the proper thread of the handler
 - Performance usually suffers because of so many locks, context switches

IupEmscripten (Web Browser) Chris Matzenbach

- One other major platform to discuss O
- Native vs. Web fight is not over

IupEmscripten

Chris Matzenbach

Core Idea

- make a choice
- platform

Do I write a native application or a web application? Must

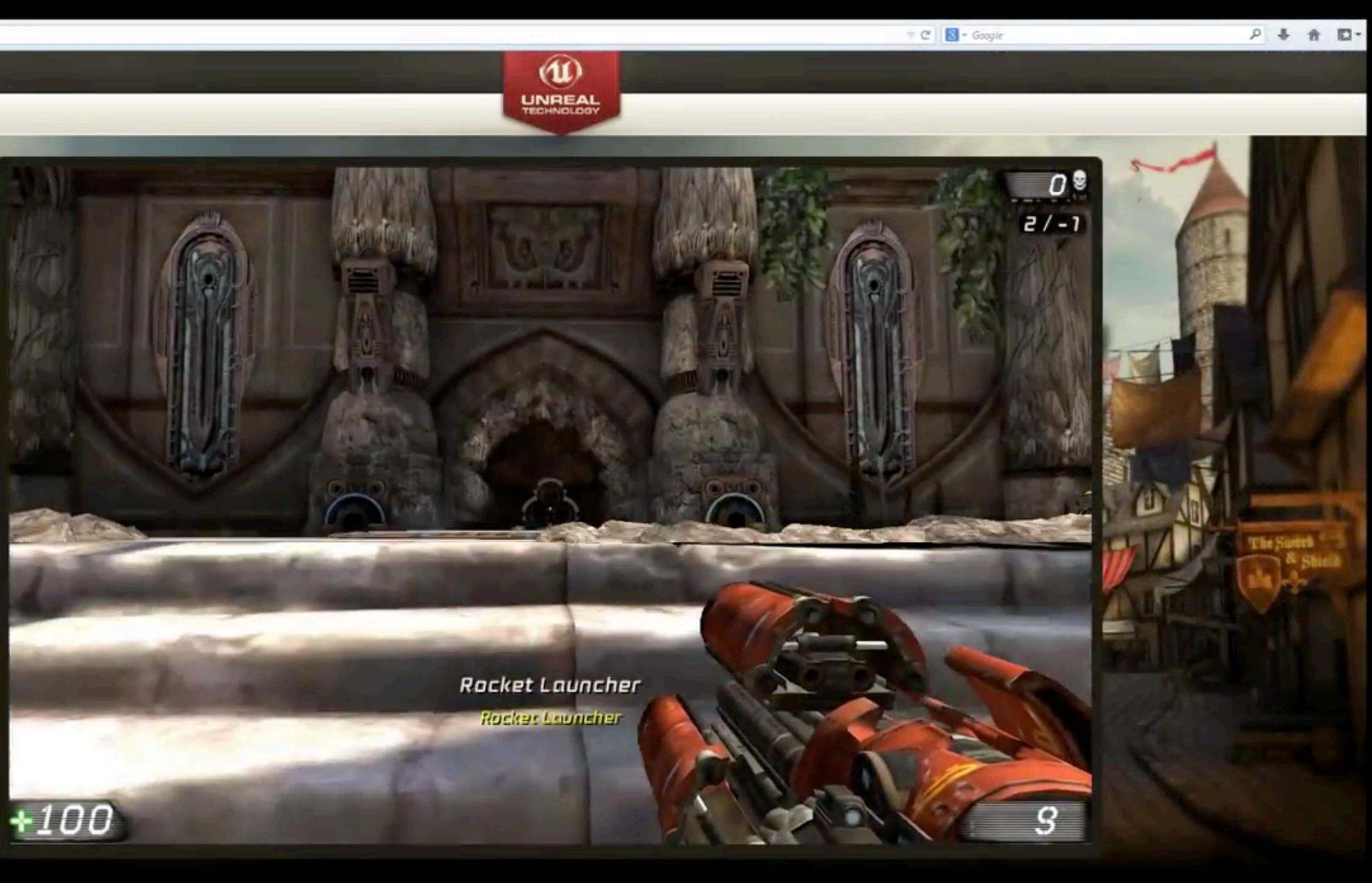
• Why not treat the web browser like any other platform?

• This is our core idea: let's take our native programs and deploy them to the web browser - as if it were any other

JavaScript - the problem child

- While many options exist for native development, when it comes to the web, there's only one choice - JavaScript
- In the past this has always required a re-write for native apps
- Solution? The Emscripten compiler, released in 2014

Nightly -		
Sanctuary	+	
Epic "Sanctuary"		
	West N	(Cash)
A CONTRACTOR		



Emscripten and the Birth of the Idea

- The Unreal team ported Unreal Engine 3 to the browser using Emscripten in just four days
- better native web widgets
- own native widgets

• What is Emscripten? C/C++ to JavaScript compiler, released in 2013

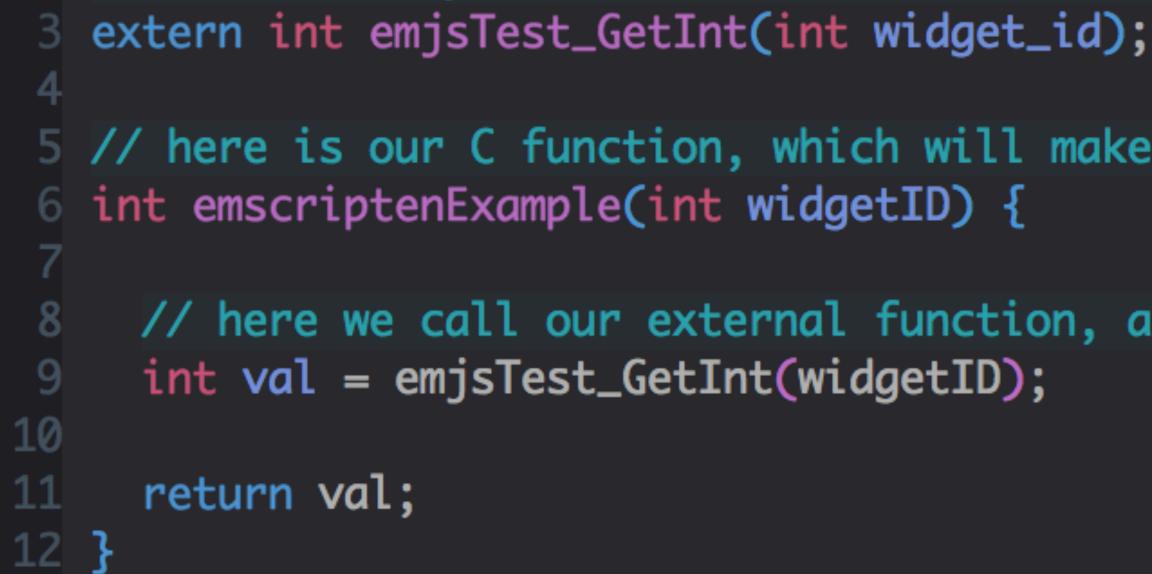
• While impressive, everything is drawn onscreen. We need something

lupEmscripten - the first cross-platform library using the browser's

How does this work?

- In order to render native web widgets, we need to call into JavaScript to access the DOM APIs
- Emscripten didn't intend for us to modify the JavaScript side
- We do have the ability to call into external JavaScript functions from there, we can access the necessary APIs to draw native widgets
- This is what differentiates us from other cross-platform libraries that also compile for the web

External Function Example



// library which holds our external JavaScript functions var Library = $\{$ 2 3 emjsTest_GetInt: function(widget_id) { 4 5 return document.getElementById(widget_id).innerHTML; 6 8 9 };

5 // here is our C function, which will make use of our external JavaScript function

// here we call our external function, as if it were any other C function

// pretending this returns an int (really returns a string)

Widget Creation

- we get this over to JavaScript?

 - No stack API like in Lua
 - We can, however, pass integers across
- We utilize a global ID map that maps integers to objects, serving as a proxy and allowing us object access on both sides of the bridge

• User defines the widget they want in lup, which we can access on the C-side. How do

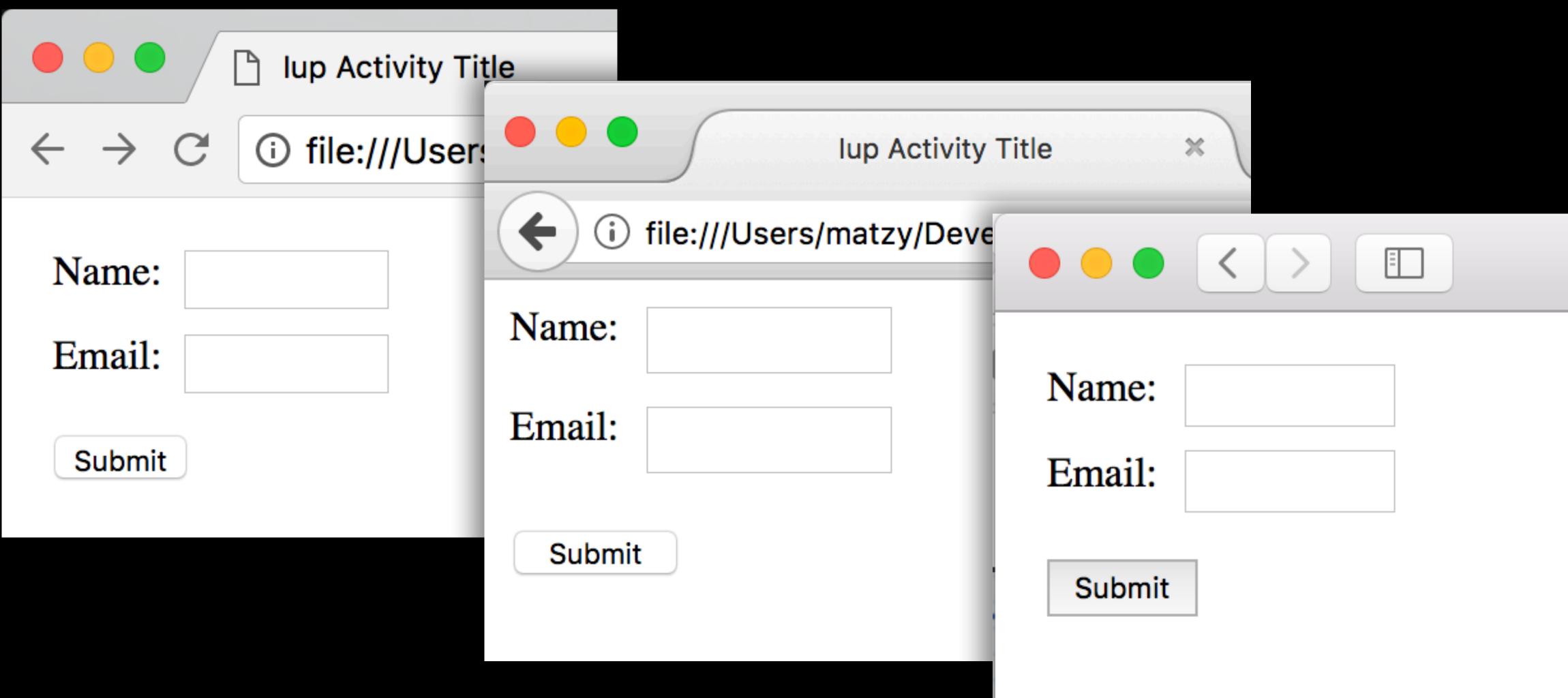
Emscripten does not allow us to pass objects over the C/JavaScript bridge

Each side references the same ID along with their own 'interpretation' of the widget

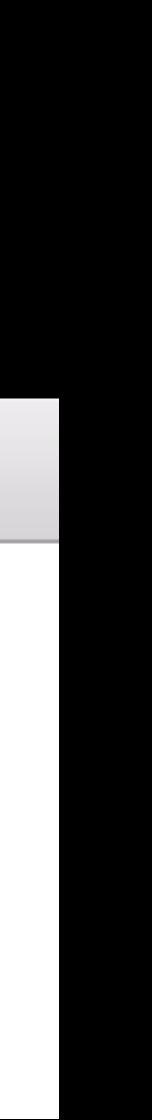


Label, Input Text and Button

Here we have a super sim text and button widgets



Here we have a super simple form, showing the label, input



Dialog, Label and Button Here we have an external dialog (aka "pop-up") with a simple label and button

Untitled

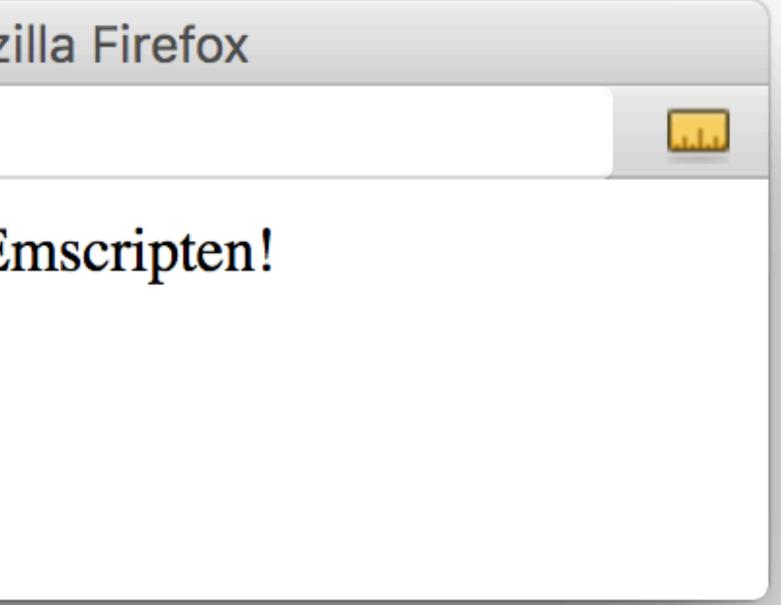
about:blank (i)

Hello world from IupEmscripten!

Button

	Moz
i about:blank	
Hello world from	n IupE
Button	

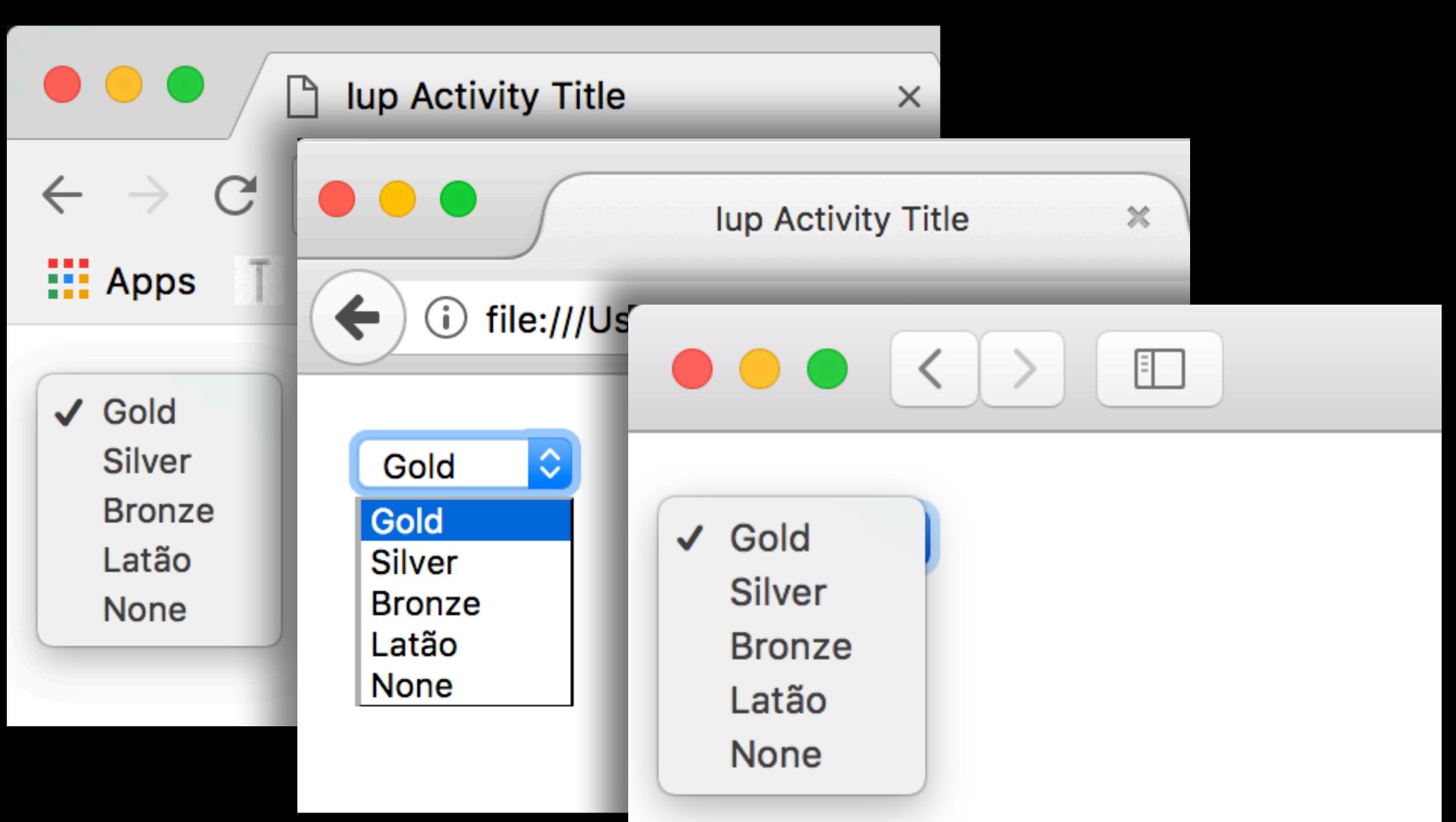
	file:///Users/matzy/Development/lu						
Hello world from IupEmscripten!							
Button							



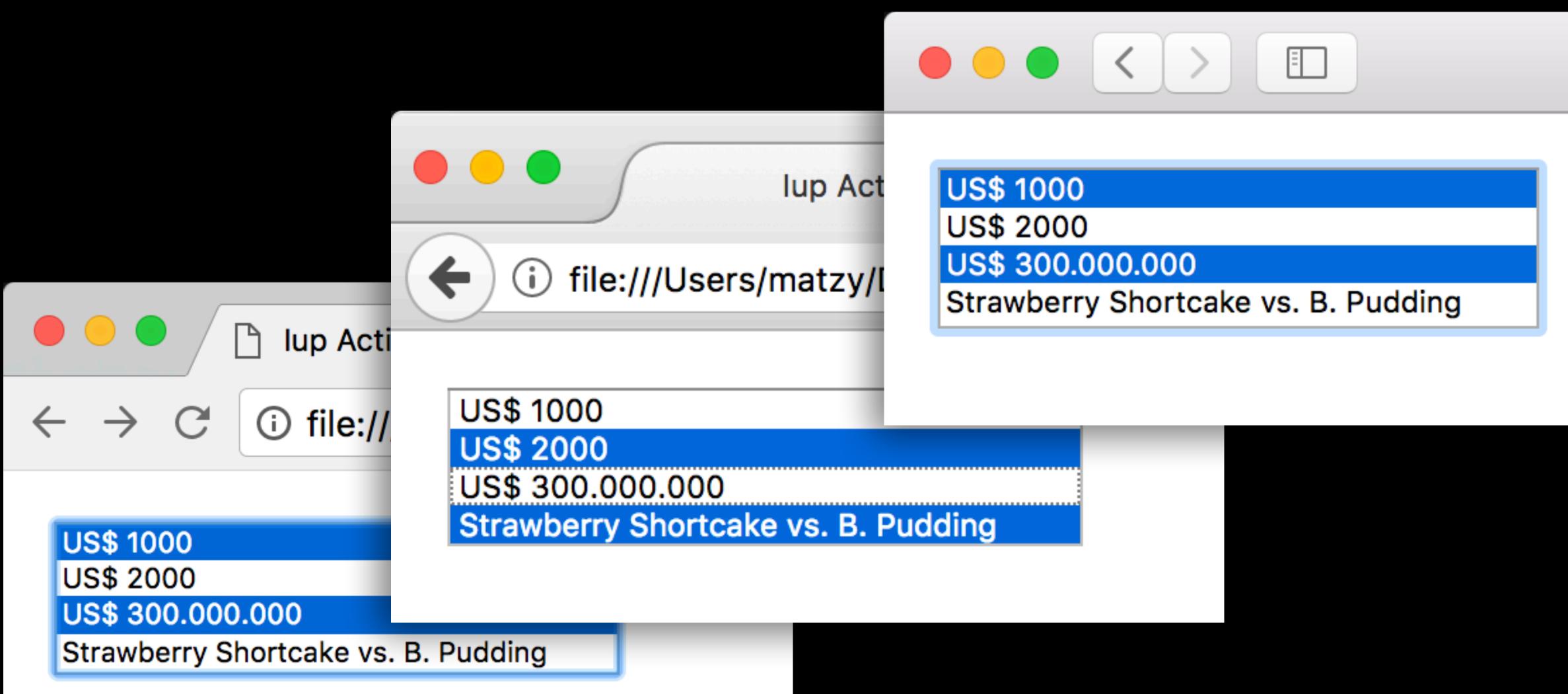




List - Dropdown • Standard dropdown list; sizes automatically based off of largest item

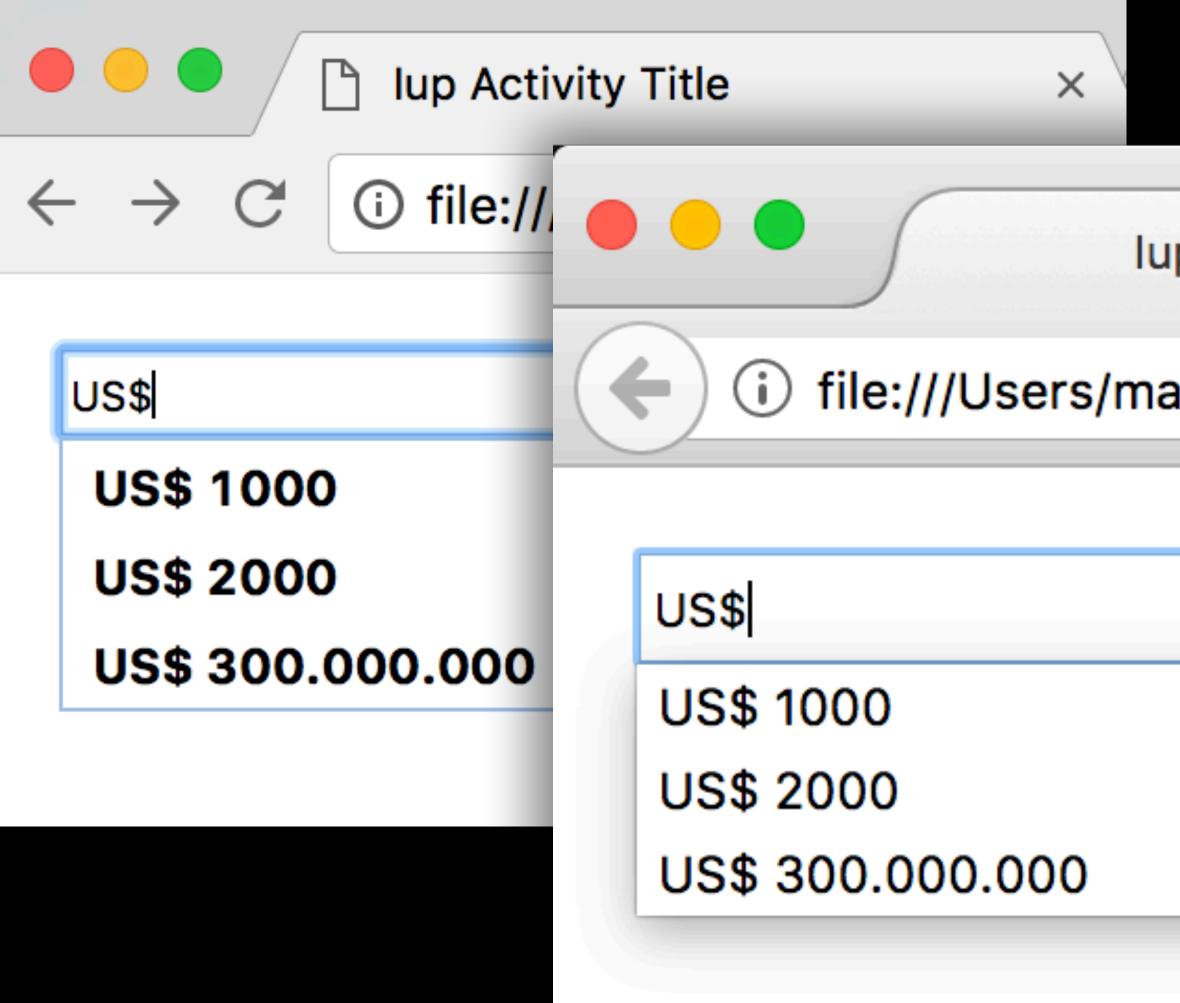


List - Multiple Multiple selection list; user can hold down command/ control to select/deselect multiple items within list



List - Editbox+Dropdown

• List type that functions as a dropdown, but also allows user to type in the input box, narrowing down the selections



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Memory Management

- Emscripten follows a C/C++ paradigm and assumes we manage memory ourselves - no garbage collector
- Iup manages the memory for us through the use of Map and UnMap functions
- However, any objects we create on the JavaScript side will be garbage collected once we return from the external function call
- How do we prevent this from happening?

The Global ID Map!!

- being garbage collected by JavaScript
- ensuring it is garbage collected by JavaScript

• The answer is our global ID map - because a reference to the object exists in the ID map, it prevents the object from

• Likewise, by calling into JavaScript from lup's UnMap function, we can remove the object from the ID map,

Event Loop

- We cannot let that happen!
- Event Loop. There is no other option.

• As Eric mentioned, lup wants to control the Event Loop.

• We need to let the web browser and JavaScript control the

What have we learned?

- The native experience lup promises can be brought to the web
- The web backend allows your applications to be more portable than ever
- If your user's device can run a web browser, it can run your application
- You no longer have to make the choice between native vs web!

Bringing Everything Together

A few changes to IUP are needed

IUP needed changes (for all platforms)

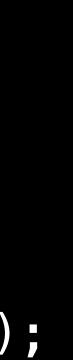
- Rules:
 - (Unchanged) Legacy code must continue to still run as before
 - But those who want the new platforms must opt-in by conforming to the new (slight) changes
 - Existing platforms are updated to work with these new changes

IUP Init (Legacy)

int main(int argc, char* argv[]) { IupOpen(&argc, &argv); CreateYourGui(); // your stuff here IupMainLoop(); IupClose(); return 0; }

int main(int argc, char* argv[]) ${$ IupOpen(&argc, &argv); CreateYourGui(); // your stuff here IupMainLoop(); IupClose(); return 0;

```
IUP Init (Old VS. New)
                       void IupExitPoint()
                       {\mathbf f}
                           IupClose();
                       }
                       void IupEntryPoint()
                       {
                           IupSetFunction("EXIT_CB",
                                       (Icallback)IupExitPoint);
                           CreateYourGui(); // your stuff here
                       }
                       int main(int argc, char* argv[])
                       {
                           IupOpen(&argc, &argv);
                           IupSetFunction("ENTRY_POINT",
                                       (Icallback)IupEntryPoint);
                           IupMainLoop();
                           return 0;
                       }
```



IUP Init (Old VS. New)

int main(int argc, char* argv[]) IupOpen(&argc, &argv); CreateYourGui(); // your stuff here IupMainLoop(); IupClose(); return 0;

```
void IupExitPoint()
    IupClose();
}
void IupEntryPoint()
{}
    IupSetFunction("EXIT_CB",
                 (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
int main(int argc, char* argv[])
{\mathsf{z}}
    IupOpen(&argc, &argv);
    IupSetFunction("ENTRY_POINT",
                 (Icallback)IupEntryPoint);
    IupMainLoop();
    return 0;
```

Acts as explicit Opt-in for new behavior



IUP Init (Old vs. New)

int main(int argc, char* prgv[])

IupOpen(&argc, &argv); CreateYourGui() // your stuff here IupMainLoop(); IupClose(); return 0; void IupExitPoint()

```
TupClose();
```

void IupEntryPoint()

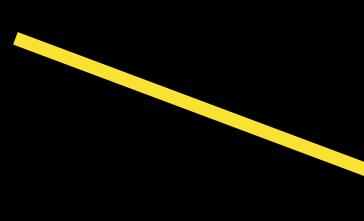
```
int main(int argc, char* argv[])
```

 \mathbf{I}



IUP Init on Cocoa/CocoaTouch

Starts native event loop
 Calls lupEntryPoint
 May never return



```
void IupExitPoint()
   IupClose();
}
void IupEntryPoint()
    IupSetFunction("EXIT_CB",
                (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
int main(int argc, char* argv[])
   IupOpen(&argc, &argv);
    IupSetFunction("ENTRY_POINT",
                (Icallback)IupEntryPoint);
   IupMainLoop();
    return 0;
3
```



Designated EntryPoint for Android

Never gets called

```
UPInit on Android
```

```
void IupExitPoint()
    IupClose();
void IupEntryPoint()
    IupSetFunction("EXIT_CB",
                (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
int mai (int ar
                   char* argv[])
                ,c, &argv);
    Iur
               cion("ENTRY_POINT",
    Iup
                 (Icallback)IupEntryPoint);
                ();
```



IUP Init on Emscripten

Must not block Calls lupEntryPoint Returns immediately

main finishes, but our application continues to run

```
void IupExitPoint()
   IupClose();
}
void IupEntryPoint()
    IupSetFunction("EXIT_CB",
                (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
int main(int argc, char* argv[])
   IupOpen(&argc, &argv);
    IupSetFunction("ENTRY_POINT",
                (Icallback)IupEntryPoint);
    IupMainLoop();
    return 0;
```



IUP Init on Updated Existing Platforms

Used to detect opt-in to activate new behavior

1. Blocks, manually pumps event loop 2. Calls lupEntryPoint on first time 3. Returns on Quit

```
void IupExitPoint()
    IupClose();
}
void IupEntryPoint()
    IupSetFunction("EXIT_CB",
                (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
}
int main(int argc, char* argv[])
    IupOpen(&argc, &argv);
    IupSetFunction("ENTRY_POINT",
                 (Icallback)IupEntryPoint);
   IupMainLoop();
    return 0;
}
```



lup Init is cross-platform again

ł

- Legacy Apps:
 - Don't design around manually pumping the event loop (nested lupMainLoop())
 - If you need to poll, use lupTimer to poll with periodic callbacks

```
void IupExitPoint()
{
    IupClose();
}
```

```
void IupEntryPoint()
    IupSetFunction("EXIT_CB",
                (Icallback)IupExitPoint);
    CreateYourGui(); // your stuff here
}
int main(int argc, char* argv[])
    IupOpen(&argc, &argv);
    IupSetFunction("ENTRY_POINT",
                (Icallback)IupEntryPoint);
   IupMainLoop();
    return 0;
```



Threading Model becomes more rigorous

- IUP was ambiguous about threads

Cocoa, CocoaTouch, Android, Emscripten all must be on the main thread

• That needs to be formalized to require people to write on the main thread

Putting it all together: Final questions & demos

• "How far can I take it?"

Can I use custom or platformspecific code in my IUP app?

• Yes!



- Last year demo: LuaCocoa (Muppet) Swedish Chef translator
 - Written with LPeg / Lua
- This year: Ported to IUP
 - Single cross-platform UI written in IUP
 - Native speech synthesizer implementation for each platform

bork = re.compile[[text <- {~ item* ~} WordChar <- [A-Za-z'] NotWord $<- [^A-Za-z']$ item <- ProcessedWord



NotWord

ExemptWord <- 'bork' / 'Bork'</pre>

EndOfParagraphPunctuation <- [.!?]%nl -> 'Bork Bork Bork!'

AccentSyllable <- 'an' -> 'un' / 'An' -> 'Un' / 'au' -> 'oo' / 'Au' -> 'Oo' / 'the' -> 'zee' / 'The' -> 'Zee' / $v' \rightarrow f'$ / 'V' -> 'F' / 'w' -> 'v' $/ W' \rightarrow V'$

• • •



IupBork: Windows Uses ISpVoice via C++

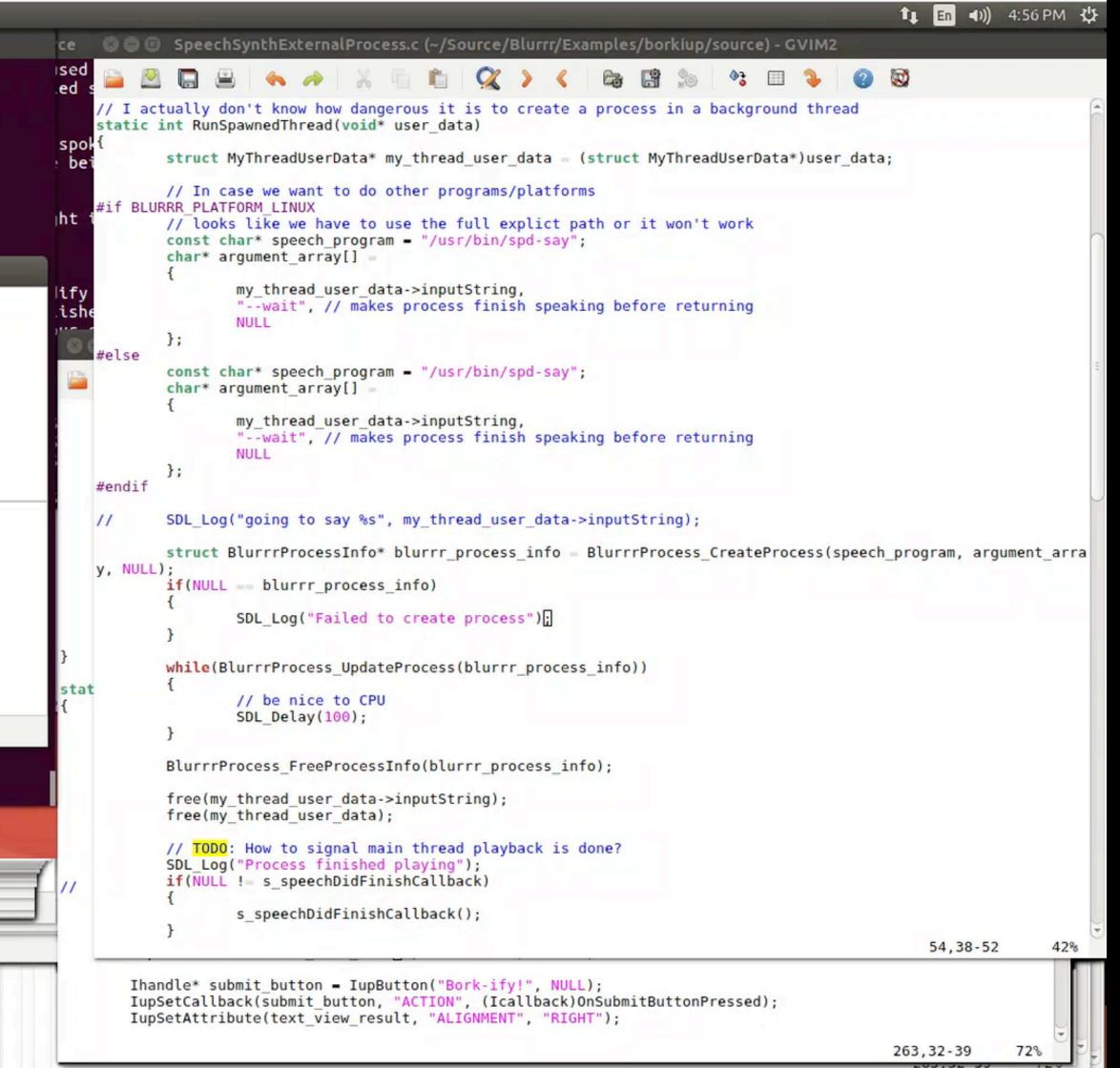
File Edit View Project Build Debug Test Analyze Window Help Image: I	
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Process: [26528] lupBork.exe - 💽 Lifecycle Events - Thread: - 👻 🐔 X Stack Frame:	
	BlurrrDefaul
C C G I TO - S I TO	obal Scope)
Search Solution Explorer (Ctrl+;)	
▲ BALL_BUILD ▲ 36 □static int RunSpawnedThread(void' user_data)	
▷ ■ References 37 38 HRESULT hr;	
External Dependencies 39 struct MyThreadUserData* my_thread_user_data (struct	MyThreadUse
CMakeLists.txt 40 ISpVoice* speech_synthesizer = NULL;	
▶ 💽 INSTALL 41	
IupBork 42 ::CoInitialize(NULL); Image: Sector process 43 hr = CoCreateInstance(CLSID_SpVoice, NULL, CLSCTX_ALL,	TID ISoVoid
44 if (ISUCCEEDED(br))	110_10010
45 {	
46 OutputDebugStringA("CoCreateInstance	
▲ Source Files 47 } Welcome to the v	vonderful wor
▶ ++ main_lua.c 49 ⊡ // Microsoft blocks on this API.	
b ++ SpeechSynthWindows.cop 50 // HRESULT hr = s_speechSynthesizer->Sr	
Bh. BluerrSDK2rdDuthd iconsos tit 51 hr speech_synthesizer->Speak(my_thread	
CMakeBlurrrDefaultOptionsOverride.cmake 53 speech_synthesizer->Release();	
CMakeBlurrrProjectSettings.cmake 54 speech_synthesizer NULL;	
CMakeBlurrrUserFiles.cmake 55 ::CoUninitialize();	
CMakeLists.txt 56	
Imain.lua 57 BlurnrCore_Free(my_thread_user_data->inplace 58 free(my_thread_user_data);	
relua 59	
IupBork_SyncLibraries 60 // TODO: How to signal main thread playt	
▶ ■•■ References 61	
External Dependencies 62 if (NULL ! s_speechDidFinishCallback)	
P _ CMake Rules 54	
CMakeLists.txt 65 }	
IupBork_SyncLibraries 66 IupBork_SyncPlugins 66 67 return 0;	
▲ [%] lupBork_SyncPlugins 67 return 0; ▶ ■ ■ References 68 }	
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IupBork_SyncPlugins 72 struct MyThreadUserData* my_thread_user_data = (struct	nyinneadus
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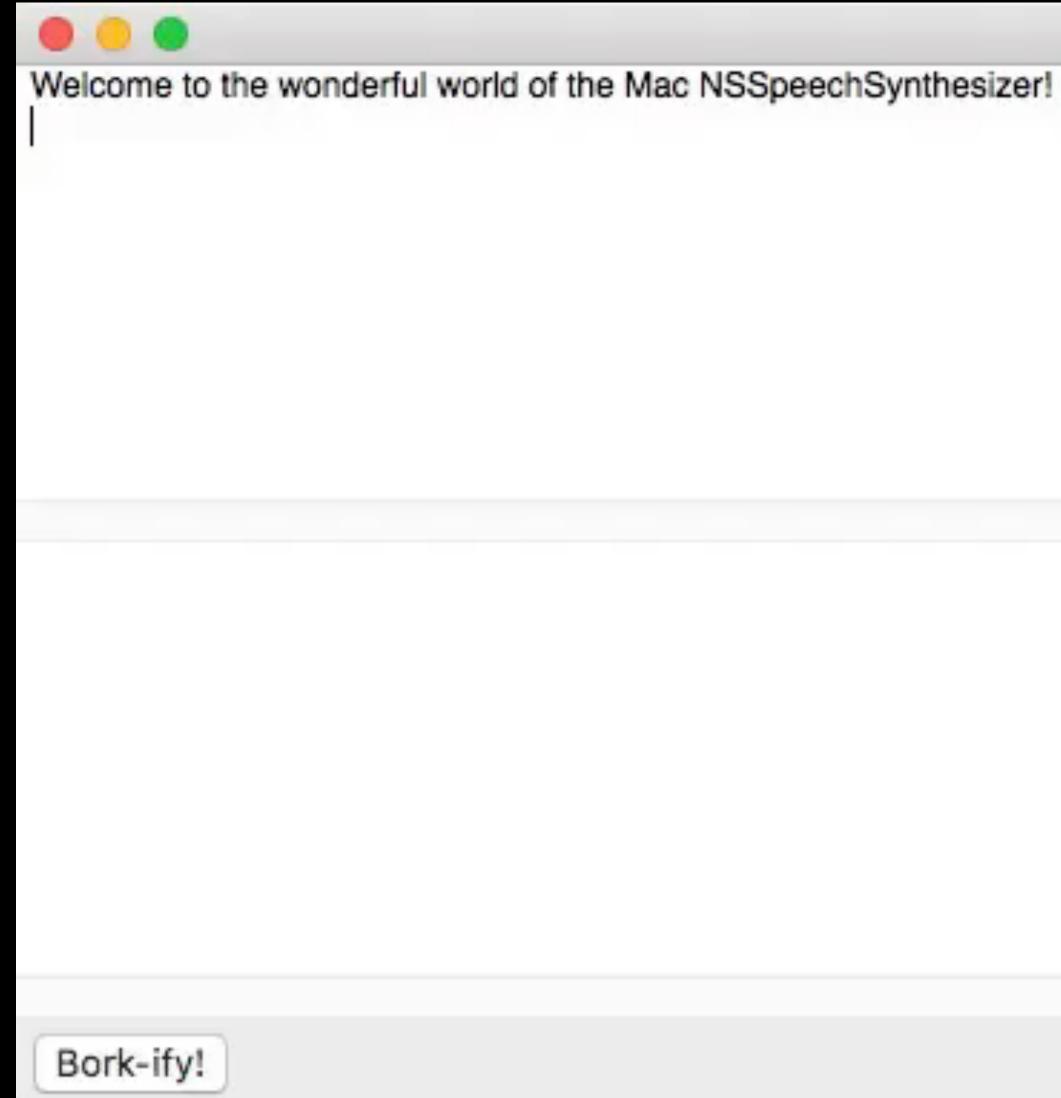
IupBork: Linux Fork/exec to external process 'spd-say'

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IupBork: Mac Uses NSSpechSynthesizer via Objective-C or Swift



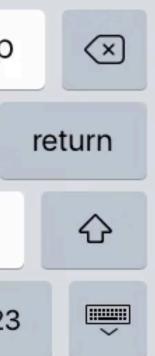
lupBork: iOS

Uses AVSpechSynthesizer via Objective-C or Swift

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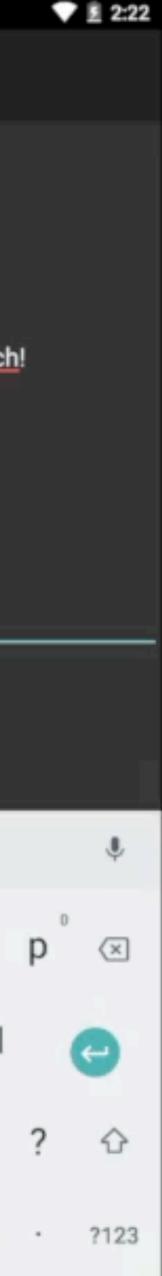
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lupBork: Android Uses TextToSpeech via Java

lupBork

Welcome to the wonderful world of the Android TextToSpeech!

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IupBork: Emscripten Uses SpeechSynthesisUtterance via JavaScript/Web

- Yes, convoluted/crazy...
 - 1. C code including IUP, Lua VM, LPeg all compiled to JavaScript via Emscripten
 - 2. Loading all compiled JS in a web browser
 - 3. Running Lua script inside JS-compiled LuaVM inside JS web browser VM
 - 4. Calling out to native JavaScript/Web APIs for speech (and GUI)

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Can I integrate my own custom/ native views with IUP?

- Yes!
 - (In fact, that's exactly how we implement IUP in the first place)

Example: lupWeb

- Separate, not part of the main IUP library
 - Each platform has a different native web widget
 - Native => tiny profile

```
web = IupWebBrowser();
IupSetAttribute(web, "VALUE
dlg = IupDialog(web);
IupShow(dlg);
```

IupSetAttribute(web, "VALUE", "https://www.blurrrsdk.com");

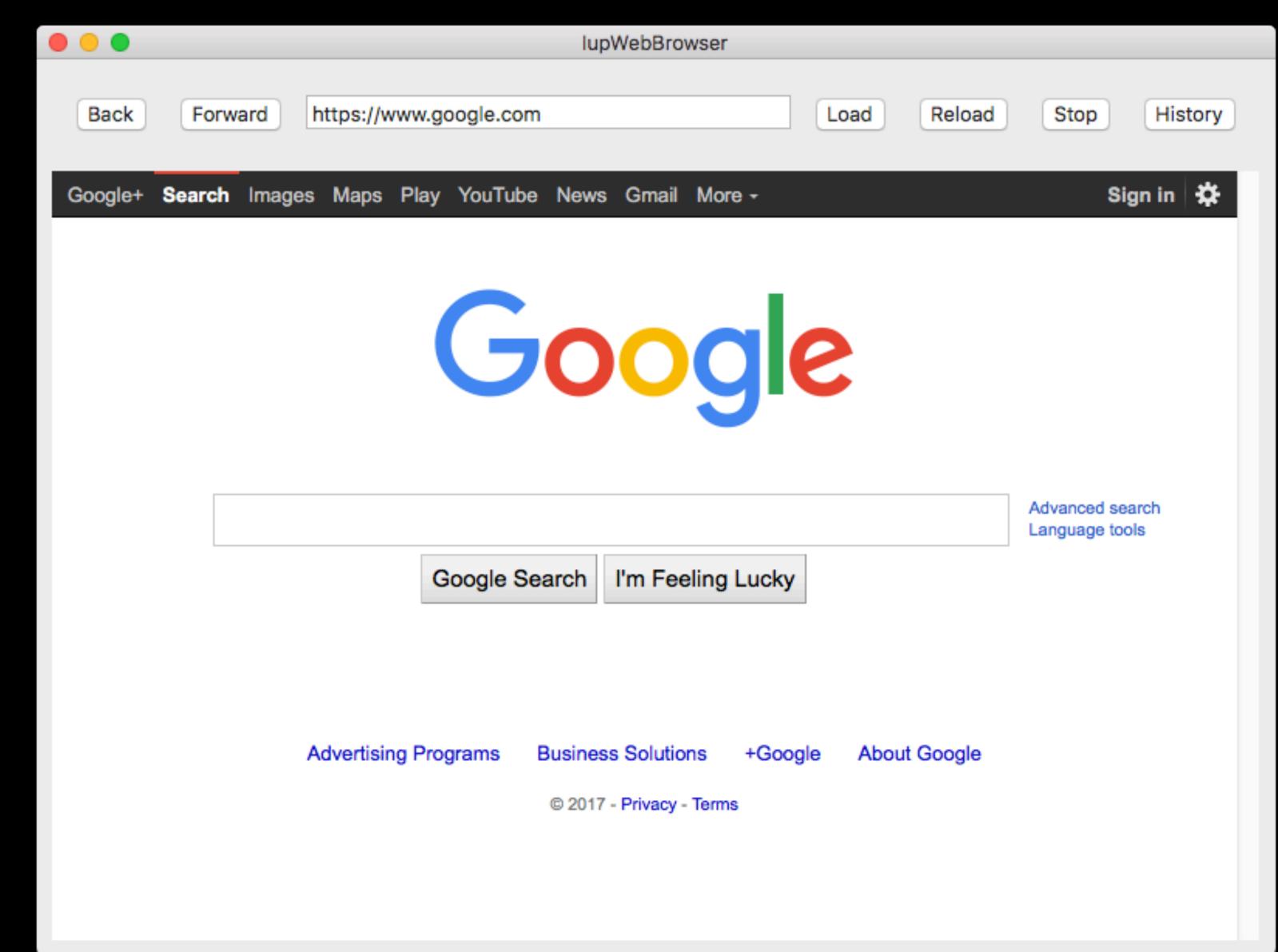
lupWeb: Windows

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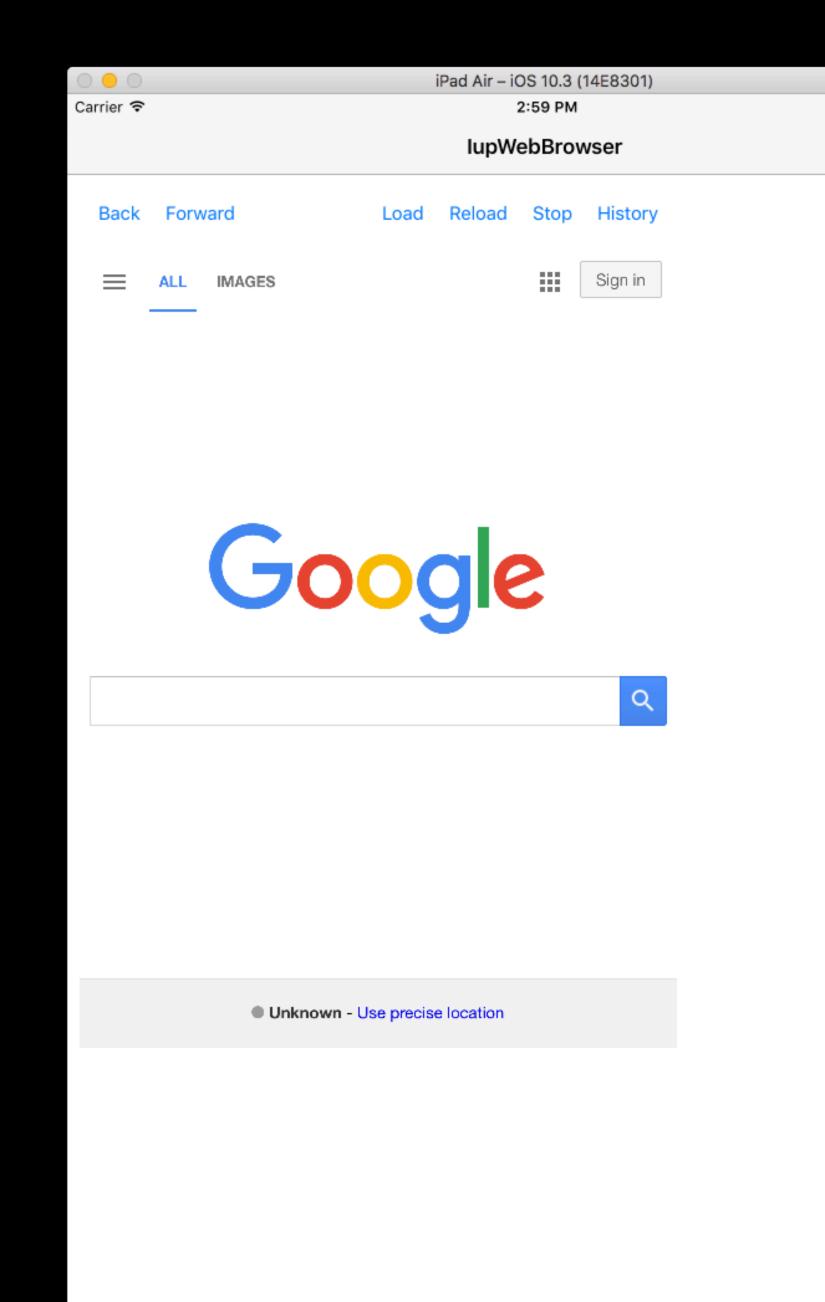
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lupWeb: Linux GTK

LupWeb: Mac



lupWeb: iOS



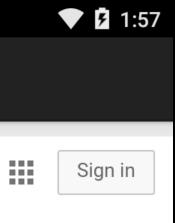
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lupWeb: Android

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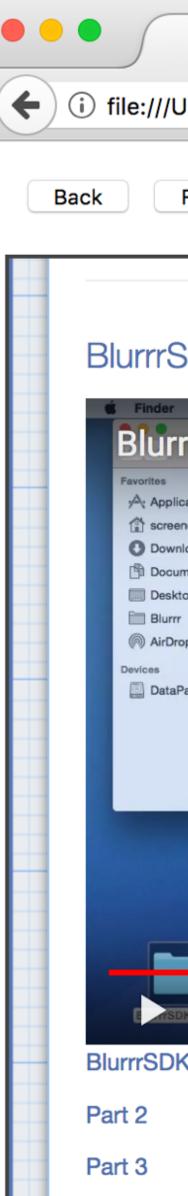
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lupWeb: Emscripten

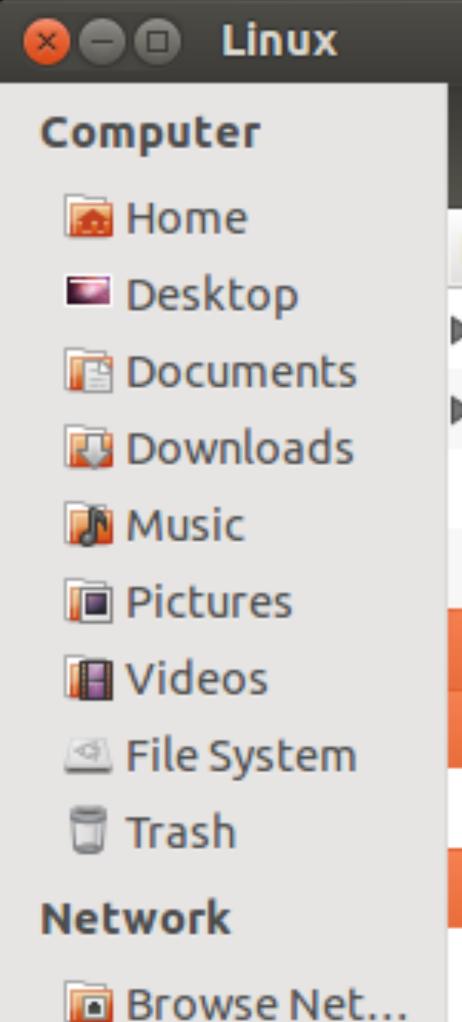


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BlurrrSDK Quick Introduction

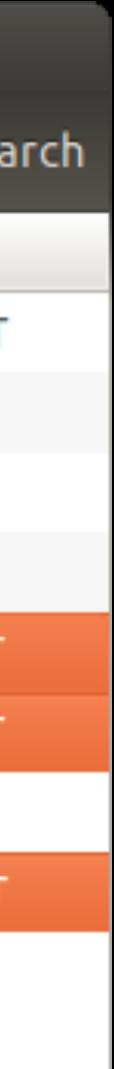
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Size is small too





- Blurrr SDK now shipping with "Sneak Preview
 - https://blurrrsdk.com
 - Contains templates & examples seen toda lupBork, lupWeb)
- Repos:
 - https://github.com/ewmailing/lupCocoa
 - https://github.com/ewmailing/lupCocoaTo
 - https://github.com/ewmailing/lupAndroid
 - https://github.com/ewmailing/lupEmscripten

Links

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Please Support Us

- Purchase Blurrr SDK (blurrrsdk.com)
- Donation link at blurrrsdk.com
- Corporate Sponsorships
- Consulting work?
- Volunteers/Contributions
- Google Summer of Code organization
 - Maybe LuaLab can help?
- Please spread the word about IUP Next. (Friends, Social Media)

GIST Walk for a Cure http://www.gistwalksanjose.org

GIST Walk

Walk for a Cure Sunday, October 22, 2017

Almaden Lake Park San Jose, CA





Carlos M. Icaza June 5, 1966 - May 17, 2016



Adobe



Corona SDK





Macromedia



Platino



Thank you

Eric Wing blurrrsdk.com @ewingfighter / @BlurrrSDK Chris Matzenbach cmatzenbach@gmail.com