## Cross-Platform Approaches from a Macintosh Perspective

Jonathan Hoyle AdHoc/MacHack 20 7/29/05

## Who am I?

- Jonathan Hoyle
- Just a Mac developer with an opinion
- Made enough bad mistakes in crossplatform projects to learn a little bit
- Currently working for Eastman Kodak
- Not representing Kodak, just me
- My vacation time here at MacHack

calization. Are most not for tangible, physical—it requires skill and a desire to communicate, it i design will become accepted as a critical form in its own right.

## What this is / What this isn't

#### Is:

A survey of cross-platform frameworks

Overview on using REALbasic with C/C++

(zoology not biology)

- Highly opinionated rantings by the author
- Isn't:
  - An in-depth tutorial on every framework
  - An complete introduction on REALbasic

Although not coverage of every approach, after 18 pages it should feel like it is.

## **Paper Outline**

- 1. Motivation
- 2. A Word About Java
- 3. Development Considerations
- 4. Legacy Cross-Platform Frameworks
- 5. Modern Cross-Platform Frameworks
- 6. REALbasic with C/C++
- 7. 5 Rules for a Cross-Platform Project
  - 8. Summary

## 1. Motivation

- Mac has a smaller user base
- Difficult to justify separate development efforts for a small market gain
- Many cross-platform approaches
- Not all are Macintosh "friendly"
- Focus on development for:
  - Mac OS X
  - Windows
    - Classic & Linux (if available)

## 2. A Word About Java

- Great cross-platform environment, but
  - Two Javas: Language front-end/bytecode back-end. Not always the same
  - Performance penalties due to JVM
  - Java's future? (Microsoft vs. Sun)
  - "Lowest common denominator" look & feel
  - Many Java apps are Windows-only
  - Java not exclusive with C++: JNI
    - Recommended compilers:
      - Free: Eclipse
      - Paid: Idea from Intellij

## **3. Development Considerations**

- a. C/C++ Compilers
- b. Mac OS X on Intel
- c. Architecting with MVC (Model-View-Controller)

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e of realization. Art most not be tangible, physical—it requires skill and a desire to communicate. It in Webs design will become accepted as a critical fairs in its own right.

## 3a. C/C++ Compilers

#### Essentially two choices:

- Metrowerks CodeWarrior
- Xcode 2.1







and the subset

#### The best compiler for the future?

## 3a. C++: CodeWarrior



Dominant for over 10 years 90% of shipping Mac apps Mac & Win compilers (v9.4) Supports Classic & OS X Better ANSI compliance (until gcc 4) Arguably much better user interface Faster compiler, more optimal builds but... Future very much in doubt **Bash Metrowerks session Friday 3PM Venice Room** 

## 3a. C++: Xcode 2.1



- Ships free with Mac OS X
- gcc-based
- Improving ANSI complianceUniversal Binaries
- G5 optimizations and 64-bit compilation
- Improved UI with multiple workspaces
- Distributed Builds, Fix & Continue, etc.
  - Mac OS X-only
  - Apple supported

## **3a. Best Compiler?**

- CodeWarrior's twin compilers was ideal, BUT
- Metrowerks sold off x86 compiler in '05
- No Mac commitment since v9.0 in '03
- Already written off by most Mac developers
- Xcode has complete support from Apple
- Only Xcode supports Universal Binaries
- Xcode supports G5, 64-bit, forward thinking
- Apple needs to improve Xcode's GUI more

FINAL ANALYSIS: If CodeWarrior does not support Universal Binaries by 2006, developers will have *no choice* but to choose Xcode. 3b. Mac OS X on Intel Xcode's simple checkbox makes it easy Be careful about byte-swapping Most frameworks will support Intel: CPLAT wxWidgets Qt Other IDE's will build Universal Binaries Xcode REALbasic CodeWarrior? **Supporting Intel Mac's:** Jonathan Johnson

## **3c.** Architecting with MVC

- Separate coding of application:
  - Model: Core data and business logic
  - View: User Interface
  - Controller: connects Model & View
- An MVC architected application does not require a x-platform framework
- Model can be written in standard C++
  - View can the be separate, eg:
    - Interface Builder on Mac
    - Visual C# on Windows

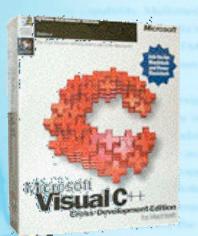
### 4. Legacy X-Platform Frameworks

a. Visual C++ Cross-Compiler
b. Yellow Box for Windows
c. Mac2Win
d. PowerPlant for Windows

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## 4a. Visual C++ Cross-Compiler



- Ported MFC apps to Mac
- Windows NT-hosted
- Add-on to VC++ compiler
- 68K first, PowerPC with v4.2
- Obscenely expensive: \$1999 (just for the add-on, \$495 VC++ not included)
- Built notoriously slow & clunky apps
  - Discontinued in 1996. Remaining inventory slashed to \$199.

## 4b. Yellow Box for Windows





DEVELOPED WITH YELLOW BOX

Part of Rhapsody NeXTStep API (known today as Cocoa API)

ProjectBuilder allowed the building of **Intel-based** applications

Ran on Rhapsody x86 or Windows

Windows runtime: \$249 per PC Killed with the advent of Mac OS X

## 4c. Mac2Win

Libraries emulating Mac Toolbox ~80% Mac API's ported ALTURA Very expensive, royalty-based Used to create many Windows ports: Metrowerks CodeWarrior Claris Works Macromedia Director Latest versions Carbonized, but barely: No Carbon Events No ultra-modern calls

## 4d. PowerPlant for Windows



PowerPlant: the most widely used framework on the Mac

- Using Latitude, created a Windows version in 2001/2002
- Embraced by Adobe
- Outrageously Expensive:
  - \$15,000
  - plus 1% royalty on sales > \$1.5M
  - capping at \$150,000
  - Killed in early 2004

#### 5. Modern X-Platform Frameworks

# a. CPLAT b. wxWidgets (formerly wxWindows) c. Qt d. Other Cross-Platform Frameworks

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## 5a. CPLAT by kSoft

- Price: \$50 per developer (no royalties)
- Mac OS X, Classic, Windows (Linux soon)
- CodeWarrior (Mac & Win), Xcode, Visual C++
- Mac target is a first class citizen
- Amazing work by one Ken Stahlman
- Reminiscent of PowerPlant
- Can convert .nib files into XML for GUI
  - Very comfortable, most Maclike feel of the frameworks

## 5a. CPLAT screenshots

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## 5b. wxWidgets (formerly wxWindows)

- Open Source, free no royalties, no restrictions
- Mac OS X, Classic, Windows, Linux, others
- CodeWarrior (Mac only), Xcode, VC++, others
- Reminiscent of MFC (awkward Mac feel)
- Improving with Open Source community
- Many apps, including AOL Communicator
- GUI design tools: wxDesigner & DialogBlocks
- Does not integrate with InterfaceBuilder
  - Bounties for bugs needing fixingBest free framework for general dev

## 5b. wxDesigner

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### **5b. wxWidgets Further Reading**

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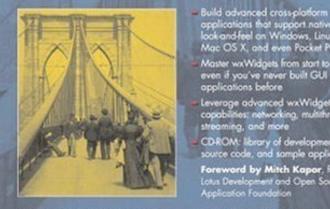
**BRUCE PERENS' OPEN SOURCE SERIES** CROSS-PLATFORM GUI PROGRAMMING WITH WXWIDGETS

> applications that support native look-and-feel on Windows, Linux, Unix, Mac OS X, and even Pocket PC Master wxWidgets from start to finisheven if you've never built GUI applications before

Leverage advanced wxWidgets copabilities: networking, multithreading, streaming, and more

CD-ROM: library of development tools, source code, and sample applications

Foreward by Mitch Kapor, founder, Lotus Development and Open Source Application Foundation

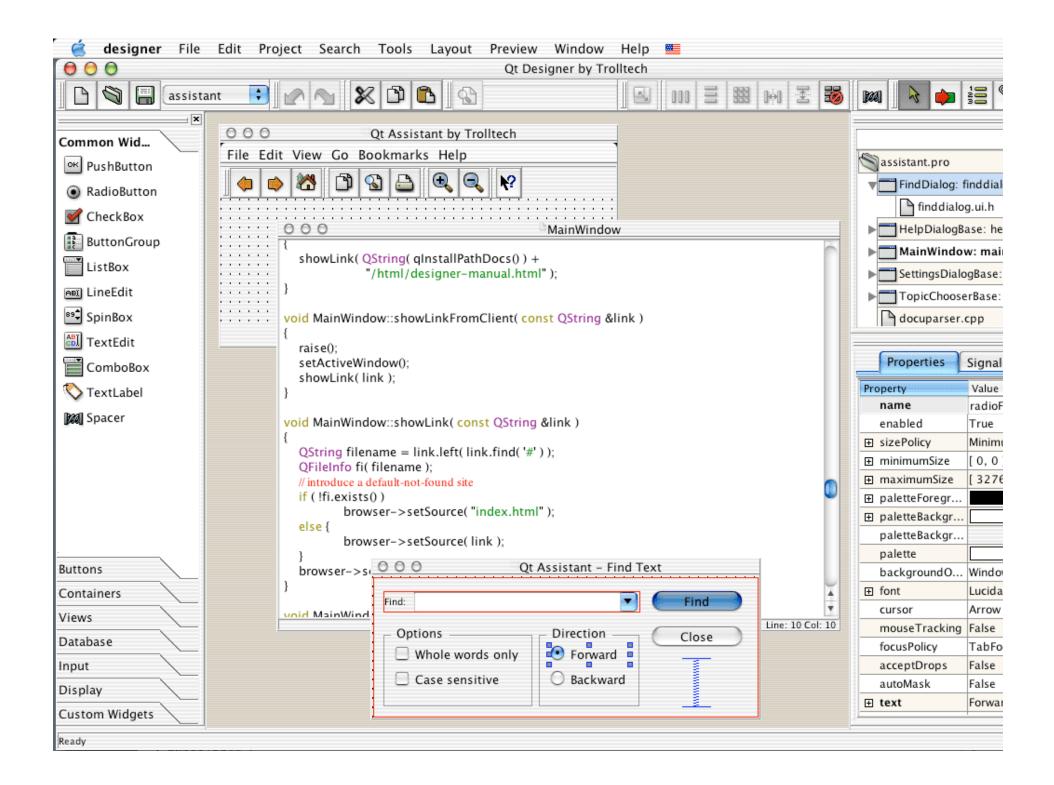


JULIAN SMART AND KEVIN HOCK

## 5c. Qt by Trolltech

- Tiered pricing: \$1790 Pro license, \$2880 Enterprise, free for Open Source
- Mac OS X, Windows, Linux
- Xcode, Visual C++, gcc
- Very sophisticated, 400 C++ classes
- Many Mac apps: KOffice & PostgreSQL
- RAD tools: *QtDesigner* and others

Cross-Platform Development with Qt Scott Collins, Friday 2PM Venice

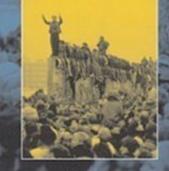


## 5c. Qt Further Reading

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Ot 3 programming from the ground up, including advanced GUI programming techniques

Coverage of key Git features—signals an slots, events, layouts, and graphics Straight from the source—written by Trailhich developers

Foreword by Matthias Ettrich, Trollech's lead developer, founder of the KDE project

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### 5d. Other X-Platform Frameworks

CroPL II (Cross-Platform Library)

- YAAF (Yet Another Application Framework)
- FLTK (Fast Light Toolkit)
- Whisper
- ZooLib

contributed Intervision spiciation, more phageine (Lova, Shockesave, Real-Audits, Virtual Reality Mudelling longe for designees and contern developers. Whereas print and video protosicals produce a static the flue interview of creating a new, "revised" edition--Web professionals create shifting and shares and flues to incorporate and embrace change. Siles because obsolete and tread easily, a tendency articipate and work around. This book trees to highlight siles that bring fresheem and incovation to

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## 6. REALbasic with C/C++

- A cross-platform "Interface Builder"
- Similar to Visual Basic
- Integrates with C++ code
  - Using MVC architecture, RB can generate the GUI and C++ the core:
    - a. Creating the REALbasic GUI
    - b. Creating the C++ Library
    - c. Example: C++ Code
    - d. Example: REALbasic Code

## 6a. Creating REALbasic GUI

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## 6a. REALbasic GUI (continued)

For more information, download the demo available at: <u>http://www.realbasic.com</u>

Also see: *Write a Cross-Platform Game in Two Hours* by Jonathan Johnson Saturday 2-4PM Pompeii 2

## 6b. Creating the C++ Library

#### Dynamic Library types:

- Mac OS 9/X CFM: Carbon Shared Library
- Mac OS X Mach-O: dylib
- Windows: DLL

#### Use C wrappers for flexibility:

- extern "C" around functions
- Standardize, eg: ClassName\_MethodName
  - CFM & Windows DLL functions need to be \_\_declspec(dllexport)

## 6c. Example: C++ code (1)

// Model C++ class
class MyModel

};

public: MyModel(); virtual ~MyModel(); void foo(int parm1, double parm2); int bar(const char \*parm); protected:

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col realization, Art meet not be tangible, physical—it requires skill and a desire to communicate, it Web design will become accepted as a critical form in its new right.

## 6c. Example: C++ code (2)

// Exported C Wrapper declarations
extern "C"

export int MyModel\_Bar(int modelHdl,

const char \*parm);

// Export macro
#ifdef \_\_MACH\_\_\_\_\_
#define export
#else
#define export \_\_declspec(dllexport)
#endif

## 6c. Example: C++ code (3)

// Wrapper function implementations
int MyModel\_Create()
{ return (int) new MyModel; }

void MyModel\_Destroy(int modelHdl)
{ delete ((MyModel \*) modelHdl); }

{ ((MyModel \*) modelHdl)->foo(parm1, parm2); }

int MyModel\_Bar(int modelHdl, const char \*parm)
{ return ((MyModel \*) modelHdl)->bar(parm); }

to above, put ment now too tongitile, provident of requires shall used a denore to contemporarily ale, i lenger will become accepted as a critical fairs in its own right.

## 6d. Example: REALbasic (1)

// Define the model library name
#if TargetCarbon
 const ModelLib = "MyModel Library"
#endif

#if TargetMachO
const ModelLib =
 "@executable\_path/../../libMyModel.dylib"
#endif

#if TargetWin32

const ModelLib = "MyModel.dll"

#endif

#if TargetLinux

const ModelLib = "libMyModel.so"

#endif

## 6d. Example: REALbasic (2)

Declare Sub MyModel\_Destroy lib ModelLib (modelHdl as integer)

Declare Sub MyModel\_Foo lib ModelLib(modelHdl
 as integer, parm1 as integer, parm2 as double)

Declare Function MyModel\_Bar lib ModelLib (modelHdl as integer, parm as Cstring) as integer

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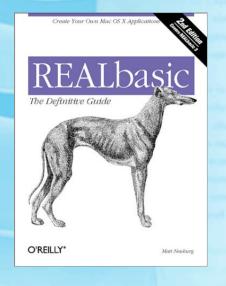
## 6d. Example: REALbasic (3)

// Call the library code Dim modelHandle as integer Dim barValue as integer

modelHandle = MyModel Create() MyModel Foo(modelHandle, 12, 3.0) barValue = MyModel\_Bar(modelHandle, "MacHack!") MyModel Destroy (modelHandle)

return barValue

## 6. REALbasic Further Reading



#### REALbasic Cross-Platform Application Development

#### Mark S. Choate





 Develop applications while learning how to program

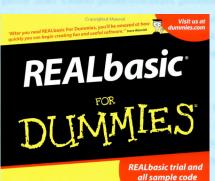
 Create on MP3 Player, Multimedia Player, 2D Aninotons & Games, 3D Graphics and morel
 CD-RCM is loaded with source code for each chapter, controls, graphics and add-ons

K



on CD-ROM

**CLAYTON E. CROOKS II** 



A Reference <sup>for the</sup> Rest of Us!

**Erick Tejkowski** 

Teach yourself REALbasic the quick and easy way! This Visual QuickStart Guide uses pictures rather than lengthy explanations. You'll be up and running in no time!

MICHAEL SWAIN

## 7. 5 Rules for a X-Platform Project

- 1. Design using MVC architecture
- 2. Have Mac & Windows developers working together from the start
- Single shared code branch, using #ifdef's if necessary
- 4. Be ANSI compliant. Use standardized tools and code, such as STL.
  - Place both a Mac & PC on each developer's desk

## 8. Summary

#### C++ cross-platform frameworks:

- CPLAT: Mac-friendly, great value for \$50
- wxWidgets: clumsy, MFC-like, but best for a free, non-restriction development
- Qt: most powerful, also most expensive, but free for Open Source development
- C++ with REALbasic
  - Architect using MVC
  - Place model code into a C++ DLL
  - View app written in REALbasic

## For more information...

Copies of the paper, slides & sample code:

http://www.jonhoyle.com/MacHack

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