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

realization. Art most not for tangible, physical—it requires skill and a desire to communicate. It its design will become accepted as a critical fairs 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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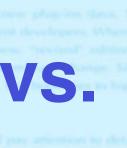
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3a. C/C++ Compilers

Essentially two choices:

- Metrowerks CodeWarrior
- Xcode 2.1







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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 compliance
 Universal 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

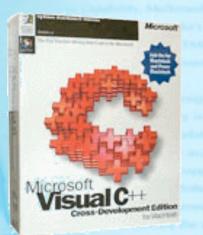
4. Legacy X-Platform Frameworks

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 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

	wxDesigner - /Users/robert/wxDesigner/wxDesigner.wdr wxCheckBox dialog	Mar II S X
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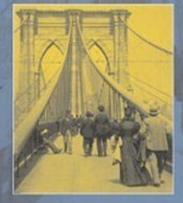
5b. wxWidgets Further Reading

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



JULIAN SMART AND KEVIN HOCK

Build advanced crossplatform 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

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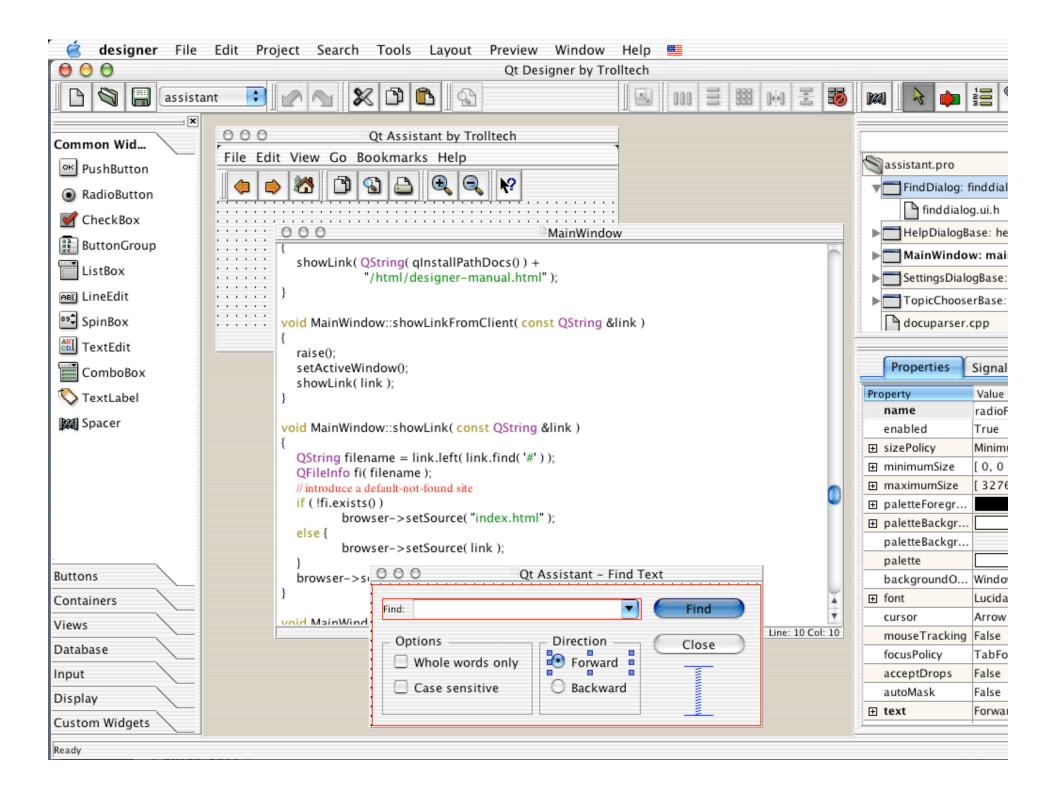
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5c. Qt by Trolltech

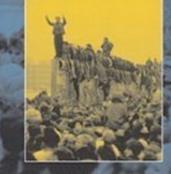
- Tiered pricing: \$1790 Pro license,
 \$2880 Enterprise, free for Open Source
- Mac OS X, Windows, Linux
- Xcode, Visual C++, gcc
- Very sophisticated, 400 C++ classes
- Many Mac apps: KOffice & PostgreSQL
- RAD tools: *QtDesigner* and others

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



5c. Qt Further Reading

CHically Approved by Trollect



Of 3 programming from the ground up, including advanced GUI programming techniques Coverage of key Qt features—signals a

layouts, and arothic

Straight from the source-written by

Foreword by Matthias Ettrich, Trailitech'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

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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:

> of here have in common! They all pay attention to detail, not just on the horse page, but on the subsey feature invocative, well-executed designs characterized by effective one of color and shape as well as intent. They make efficient and sensible use of available technology—schether it's just scripting. Cit'B's in Real-Audio—while at the same time keeping the total size of images, sounds, and animations usual to unboards without crashing.

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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); }

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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

6d. Example: REALbasic (3)

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

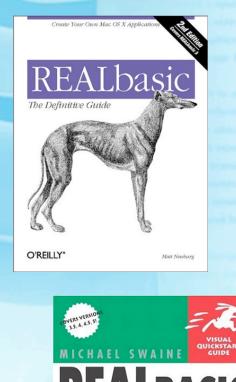
modelHandle = MyModel_Create()
MyModel_Foo(modelHandle, 12, 3.0)
barValue = MyModel_Bar(modelHandle, "MacHack!")
MyModel Destroy(modelHandle)

return barValue

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6. REALbasic Further Reading



Teach yourself REALbasic the

Visual QuickStart Guide uses

pictures rather than lengthy explanations. You'll be up

quick and easy way! This

REALbasic Cross-Platform Application Development

Mark S. Choate

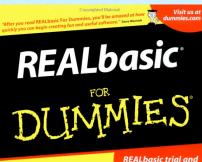




in REALbasic 4 Create an MP3 Player, Multimedia Player, 2D Animations & Games, 3D Graphics and more CD-ROM is loaded with source code for each chapter, controls, grapt and ad-ons



CLAYTON E. CROOKS II





7. 5 Rules for a X-Platform Project

- 1. Design using MVC architecture
- 2. Have Mac & Windows developers working together from the start
- 3. Single shared code branch, using #ifdef's if necessary
- 4. Be ANSI compliant. Use standardized tools and code, such as STL.
 - 5. 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