Cross-Language Interoperability for Fast, Easy, and Maintainable Code

David Chisnall

Our approach to cross-language interoperability involves compiling multiple languages down to a shared binary representation. We currently compile dialects of Smalltalk and JavaScript and an object-oriented parser generator down to the same object model as Objective-C. We can call C directly and use Objective-C as a hybrid language for more complex bridging. Objective-C effectively becomes a domain-specific language for calling C and C++ from high-level languages.

A single object may have methods implemented in different languages.

The World Today:

- You should use Python, it has bindings to C and C++!
- Oh, I finished already.
- Why are you still writing that app?
- Good have fun!
- I have a great idea for a new app!
- I want to use Ruby, it works with C as well!
- You should use Python, it has bindings to C and C++!
- Fine, then you’ll need to write a load of bridging code. It might be better if your app didn’t need to use C and C++!

The World We’re Building:

- But I wanted to use the Objective-C framework, and it’s only for Java. And Python is just too slow!
- Okay. And I think I’ll use the Frobnicator framework here?
- Why are you still using Objective-C?
- Good have fun!
- I have a great idea for a new app!
- But it relies on C, there is Orr, and I want to use Java!
- You should use Python, it has bindings to C and C++!

The demo shown at FOSDEM this year showed fully dynamic development spanning Objective-C and Smalltalk. The developer can inspect the existing class hierarchy and the code for any implemented Smalltalk. It is also possible to add, modify, or replace methods, add instance variables and classes at run-time. Invoking a nonexistent class or method pops up a dialog asking the user to implement it, all from within a running app. The final version is statically compiled, with no explicit user intervention required.

The Objective-C implementation developed as part of this work is used in a number of open source and commercial games and applications, with millions of installs, including Android ports of iOS apps.