Ruby C Extensions

Fort Worth Ruby Brigade
Tuesday, February 26, 2013

Dan Swain @dantswain http://dantswain.com dan.t.swain@gmail.com

Lead Software Engineer
Simpli.fi

Who am I and who cares what I have to say?

- Simpli.fi is a real-time bidding (RTB) platform
  - ~300,000 queries per second
  - < 50 msec latency
    - Built on Ruby! (also Erlang, Node.js, ...)

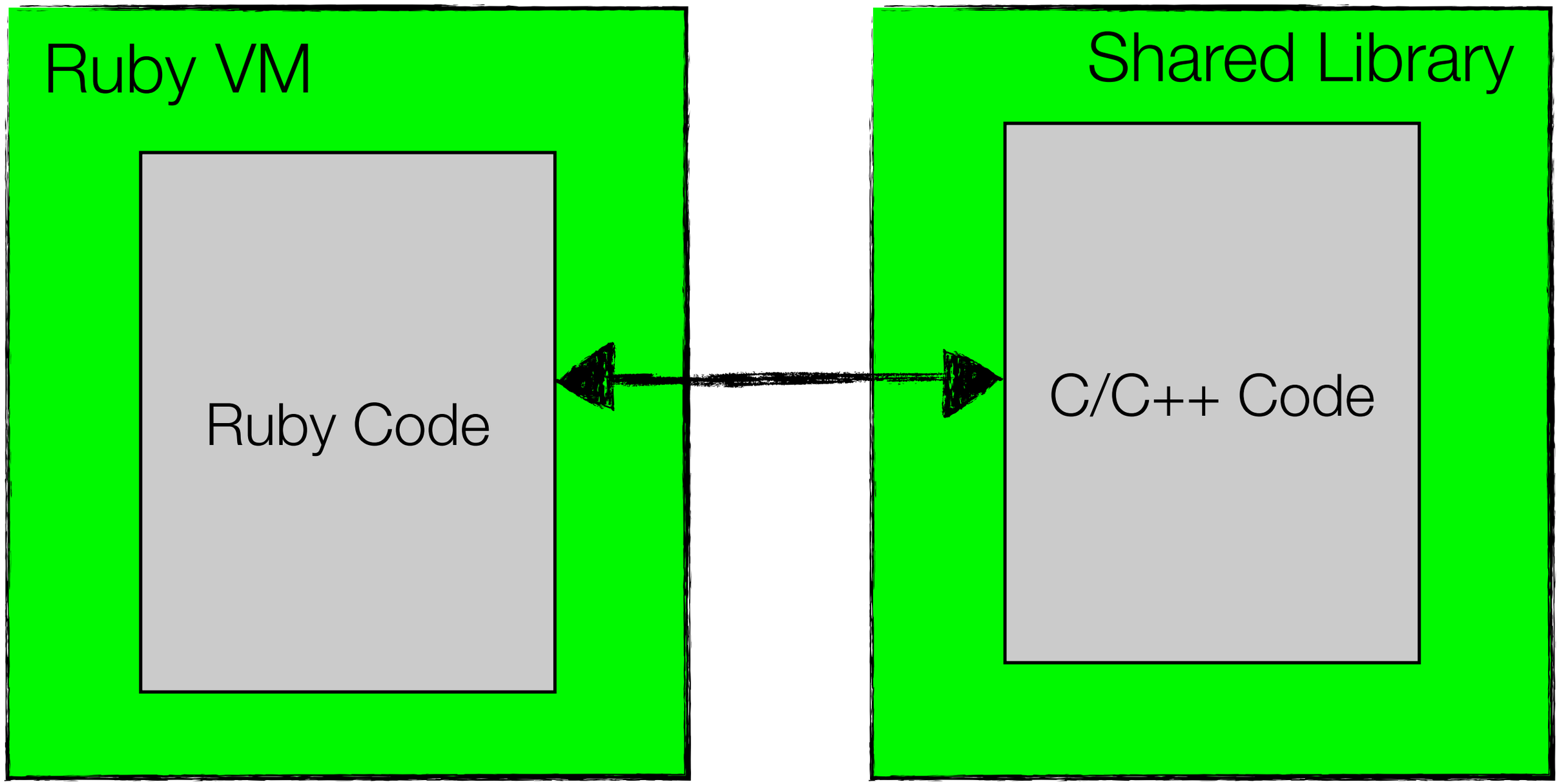
- We use a lot of C extensions at Simpli.fi
  - Build highly specialized and performant components in C/C++
  - Integrate with our Ruby code base using extensions
  - String parsing, large data structure handling

Outline

- What is a C extension?
- When (not) to use C extensions
- Basic procedure for creating a C extension
- The Ruby/C API by way of an example
- Creating a C extension gem (if time)

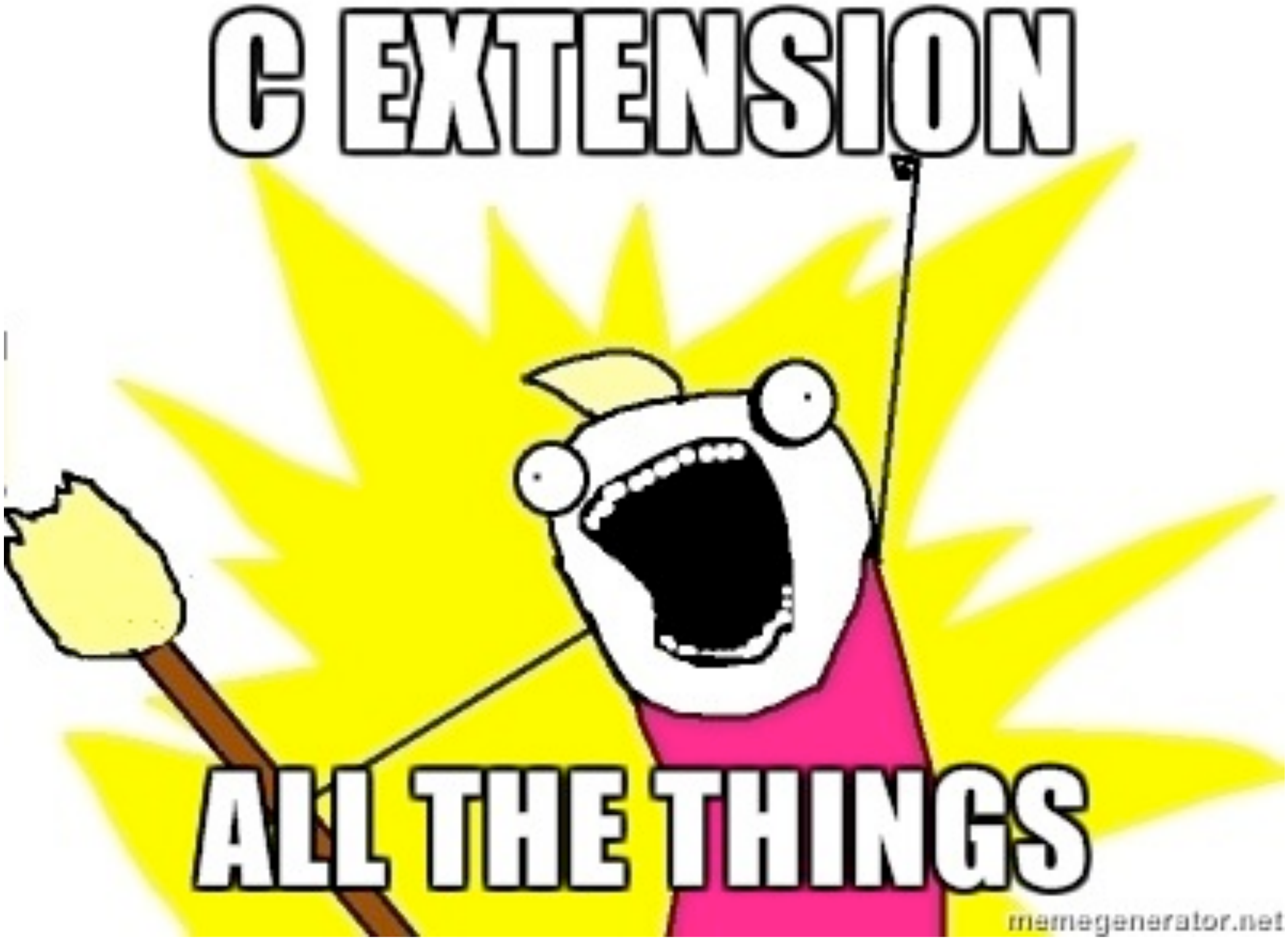
What is a C extension?

Basic Idea: Use the Ruby/C API to get Ruby to talk to C and vice versa



When to use C extensions

- Use C for raw performance
  - Repeated operations that can be highly-optimized (e.g., string parsing)
  - Optimally handling very large data structures
  - Fine-grained control over memory and garbage collection
  - Raw access to binary data
  - Numerical processing
- Use the Ruby/C API to interface with existing C/C++ libraries
  - Example: hiredis


C EXTENSION
ALL THE THINGS
memegenerator.net

When *not* to use C extensions

Don’t try to rewrite MRI/YARV (it’s already in C)

Don’t try to write around bad architecture choices

Compatibility / Gotchas

- The API was developed for MRI (“normal” Ruby) (now works with YARV)
- Limited compatibility with other C/C++-based VMs (Rubinius)
- Notably does NOT work with JRuby (Java-based)

- The API is C, can be interfaced with C++ code
- Lose some speed at the interface layer

Basic Procedure

1.Create your C source code - ‘my-extension.c’

- Your algorithm
- Interface / API code

2.Create an ‘extconf.rb’ file

3.ruby extconf.rb (generates Makefile)

4.make (generates my-extension.bundle)

5.In Ruby: require ‘my-extension’

6.Optional: Create wrapper code in Ruby

OS X

```
> RbConfig::CONFIG['DLEXT']
=> "bundle"
```

Linux

```
> RbConfig::CONFIG['DLEXT']
=> "so"
```

C/Ruby API

- #include <ruby.h>
- VALUE - Ruby object (actually a pointer)
- ID - Symbols (use SYM2ID(VALUE id) or rb_intern(const char* symbol_name)
- Functions Typically Start With “rb_”
- Data Conversions: FIX2INT/INT2FIX, NUM2DBL/DBL2NUM, etc...
- Strings: char* StringValueCStr(VALUE), VALUE rb_str_new2(const char*)
- It’s possible to wrap structs as Ruby objects

C/Ruby API

```
#include <ruby.h>

static VALUE rb_cFoo;

static VALUE dostuff(VALUE self, VALUE arg);

void Init_foo(void)
{
  rb_cFoo = rb_define_class(“Foo”, rb_cObject);
  rb_define_method(rb_cFoo, “dostuff”, dostuff, 1);
}

static VALUE dostuff(VALUE self, VALUE arg)
{
  return arg;
}
```

```
class Foo
  def dostuff arg
    arg
  end
end
```

Resources

- Pick-axe chapter: http://media.pragprog.com/titles/ruby3/ext_ruby.pdf
- https://github.com/ruby/ruby/blob/trunk/README.EXT
- Ruby source code cross-reference: http://rxr.whitequark.org/mri/source