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Guilt Free Ruby on the JVM

Forgetting Conventional Wisdom

Chris Seaton
Research Manager
Oracle Labs
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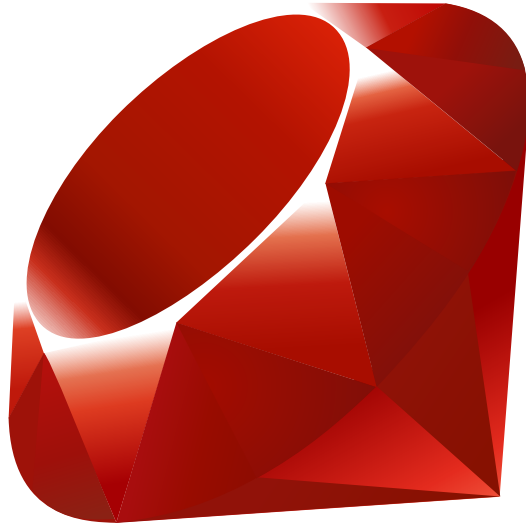
Safe Harbor Statement

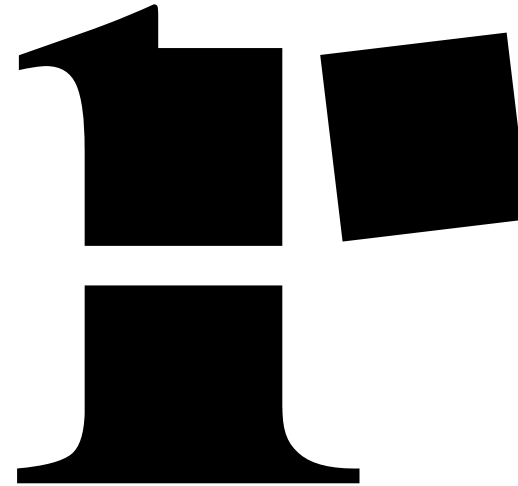
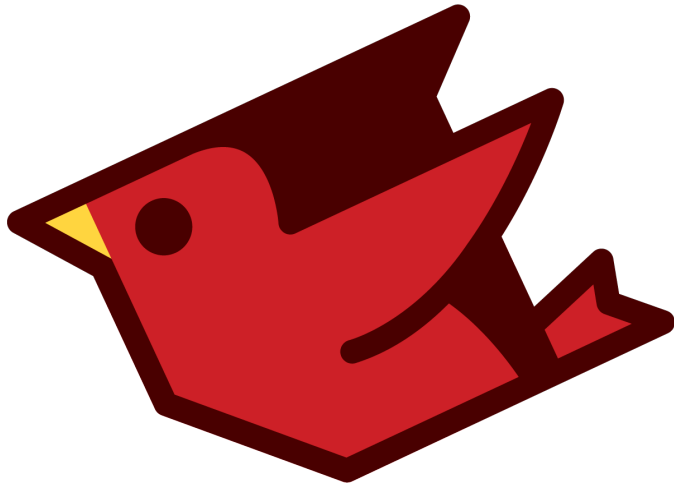
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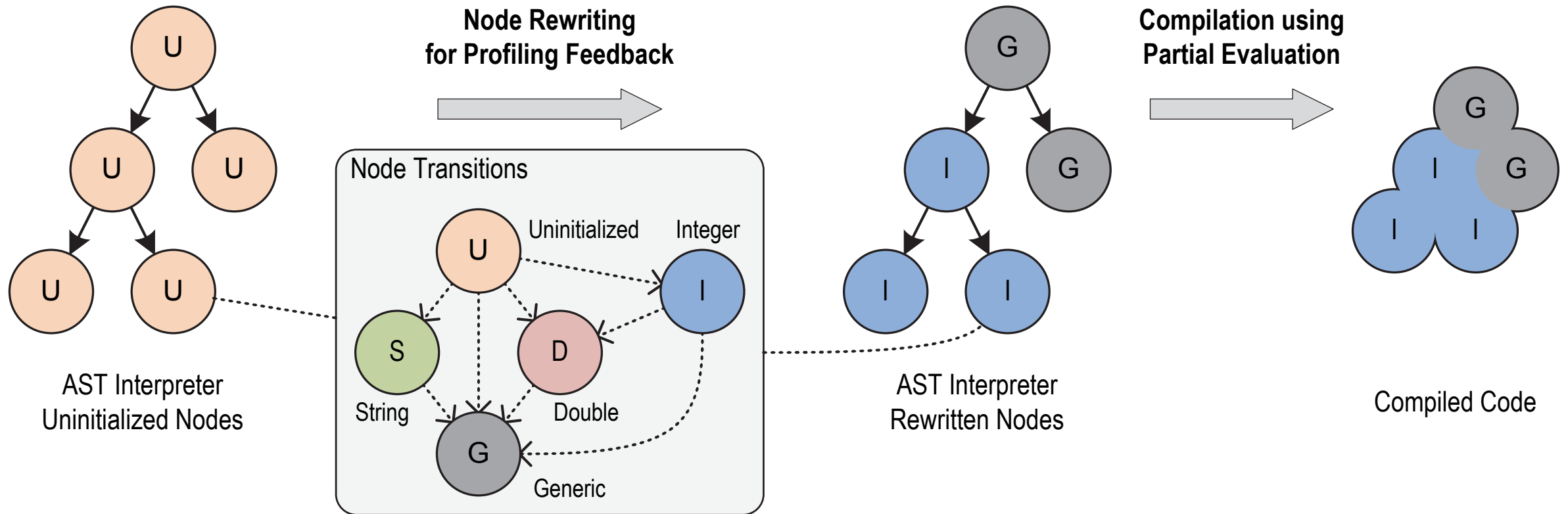
Program Agenda

- 1 ➤ Ruby on the Graal VM
- 2 ➤ How do people want to write Ruby?
- 3 ➤ Why would they feel guilty about it?
- 4 ➤ How can we fix that?
- 5 ➤ Optimisation deep dive

Ruby on the Graal VM







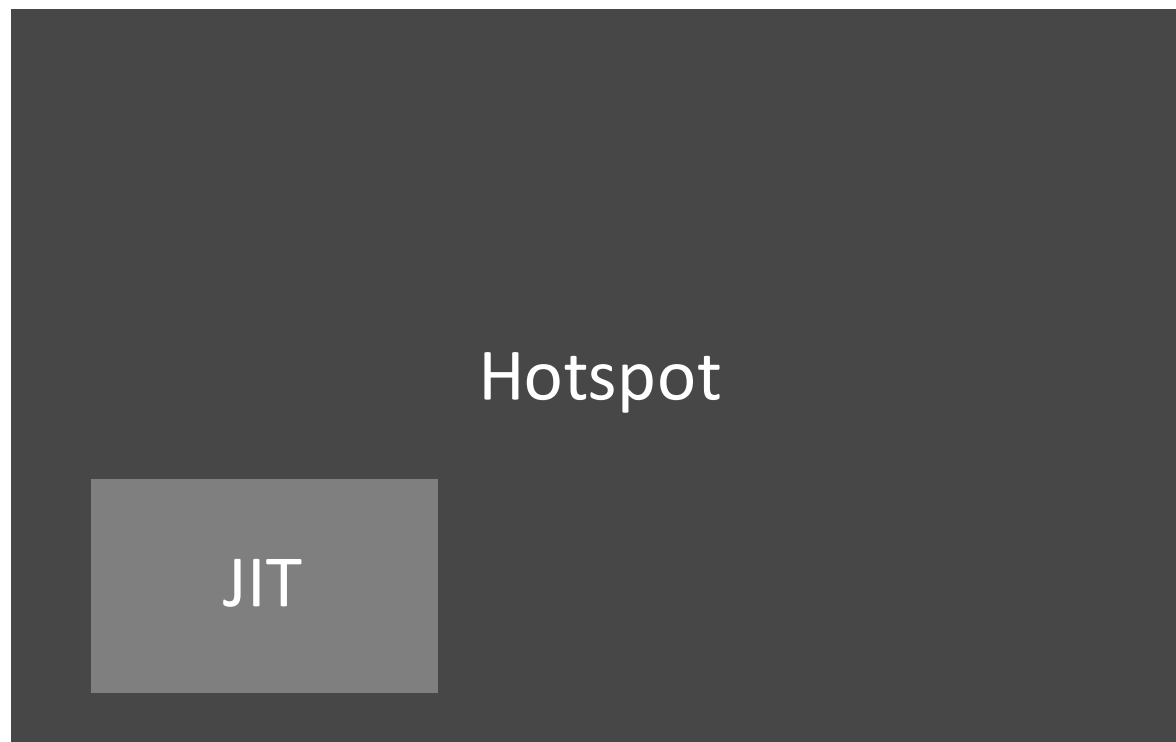
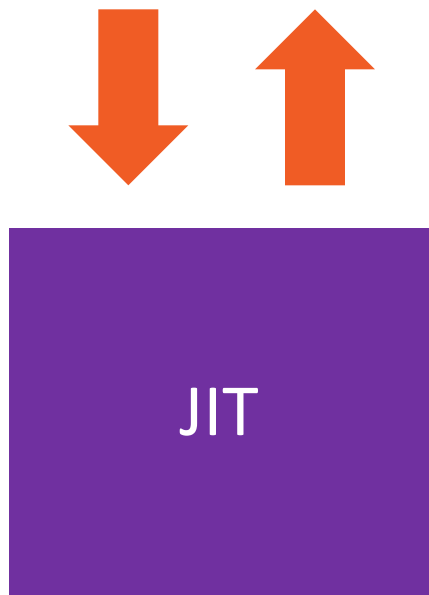


Hotspot



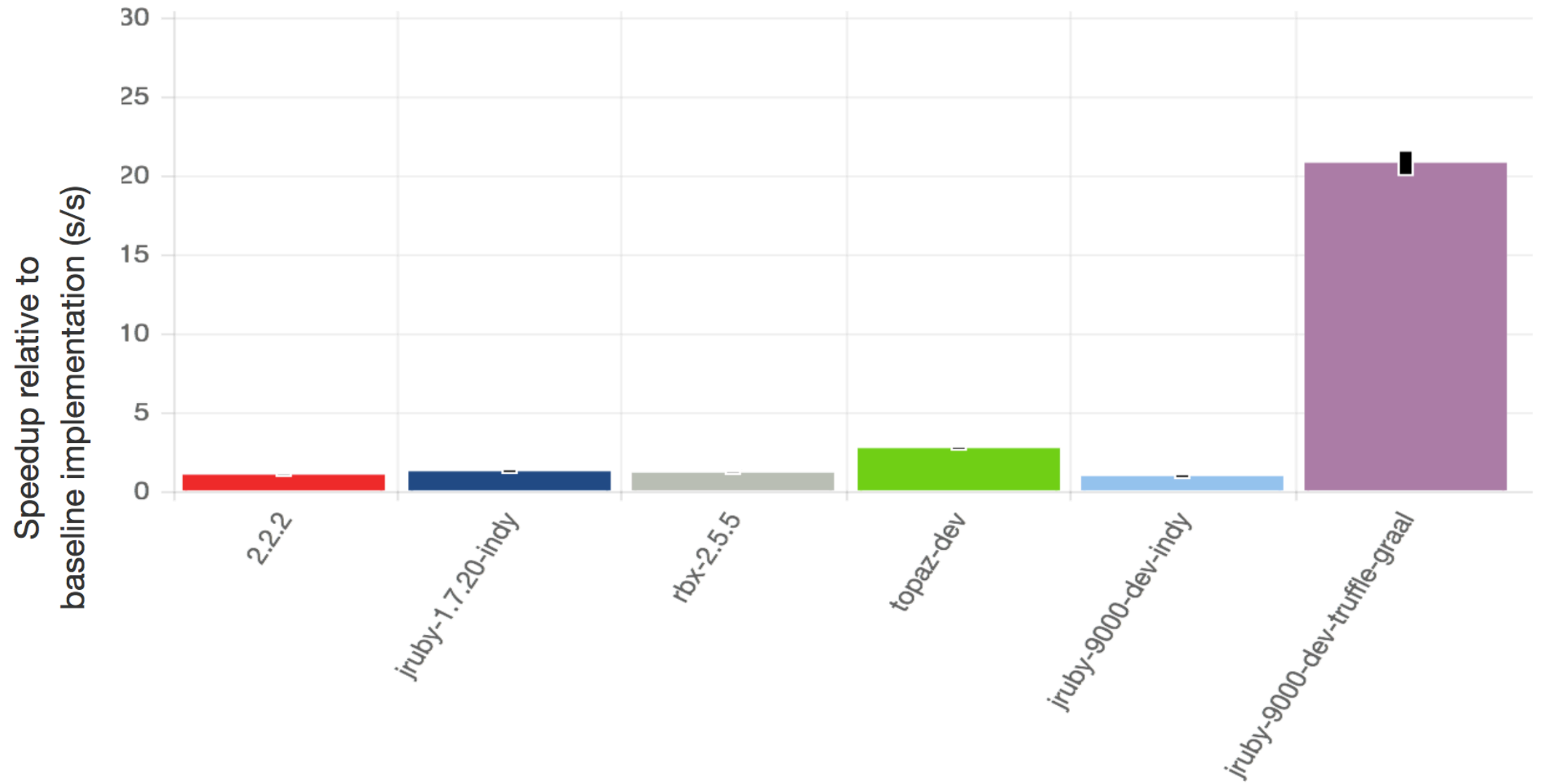
Hotspot

JIT



90%

Compatibility with the language and
core library



Can I run real code today?

<http://goo.gl/ssTA2T>

(or search for 'graal' on the Oracle Technology Network)

```
rbenv install jruby-master+graal-dev
```



```
git clone https://github.com/lucasicon/openweather.git
```



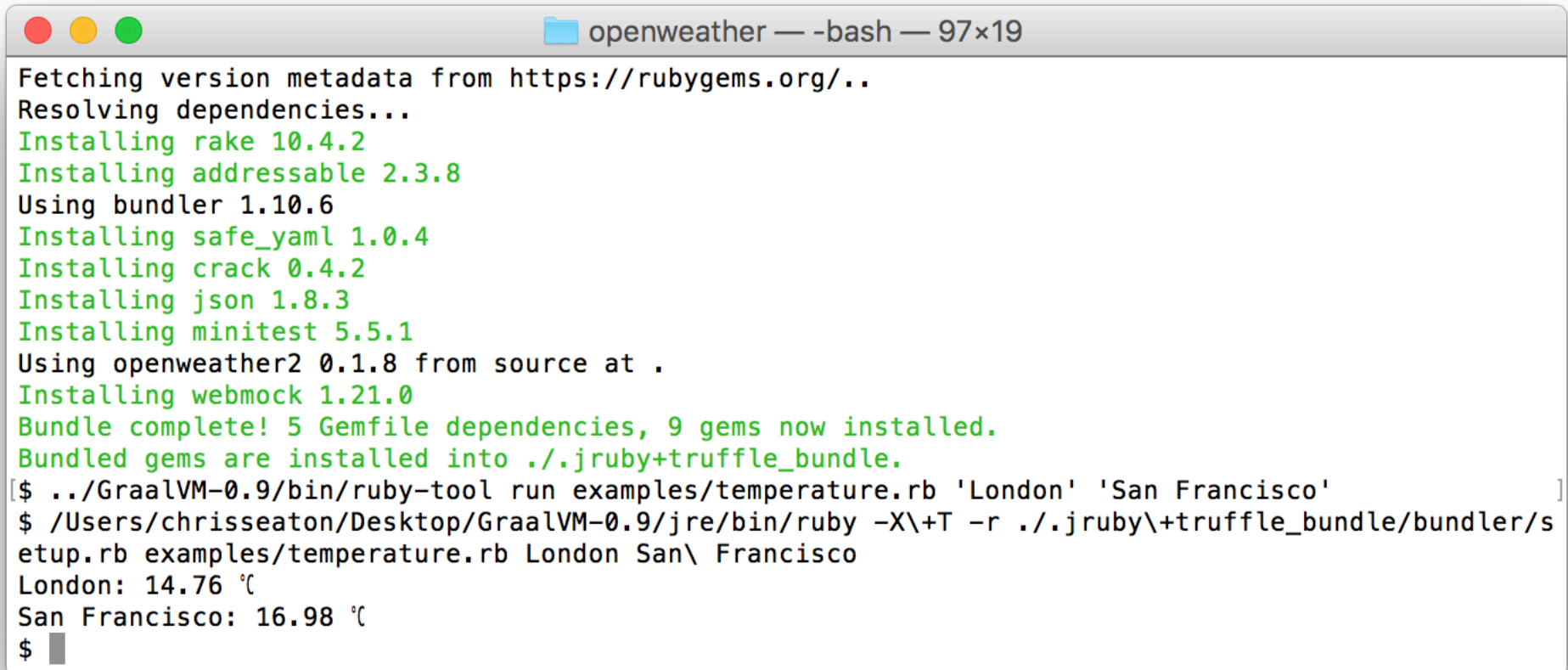
```
Desktop — -bash — 97x19
[$ git clone https://github.com/lucasicon/openweather.git
Cloning into 'openweather'...
remote: Counting objects: 188, done.
remote: Total 188 (delta 0), reused 0 (delta 0), pack-reused 188
Receiving objects: 100% (188/188), 27.54 KiB | 0 bytes/s, done.
Resolving deltas: 100% (75/75), done.
Checking connectivity... done.
$ █
```

../GraalVM-0.9/bin/ruby-tool setup



```
openweather — -bash — 97x19
Resolving deltas: 100% (75/75), done.
Checking connectivity... done.
[$ cd openweather/
[$ ../GraalVM-0.9/bin/ruby-tool setup
Fetching gem metadata from https://rubygems.org/.....
Fetching version metadata from https://rubygems.org/..
Resolving dependencies...
Installing rake 10.4.2
Installing addressable 2.3.8
Using bundler 1.10.6
Installing safe_yaml 1.0.4
Installing crack 0.4.2
Installing json 1.8.3
Installing minitest 5.5.1
Using openweather2 0.1.8 from source at .
Installing webmock 1.21.0
Bundle complete! 5 Gemfile dependencies, 9 gems now installed.
Bundled gems are installed into ./jruby+truffle_bundle.
$
```

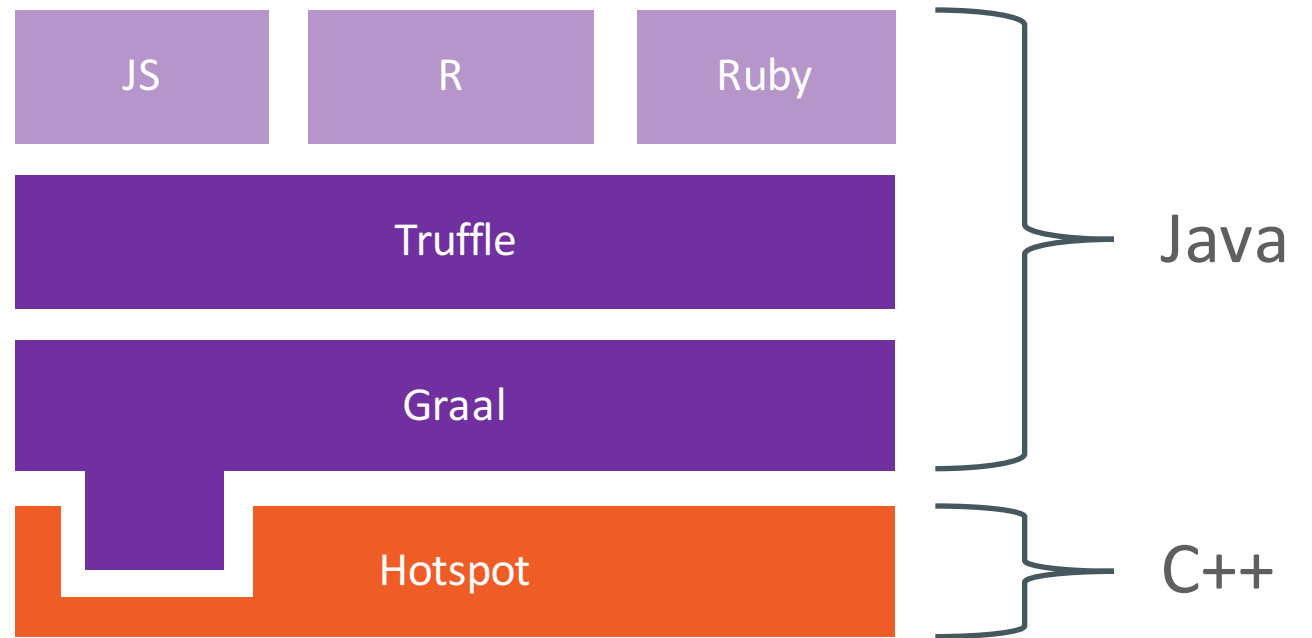
../GraalVM-0.9/bin/ruby-tool run London 'San Francisco'

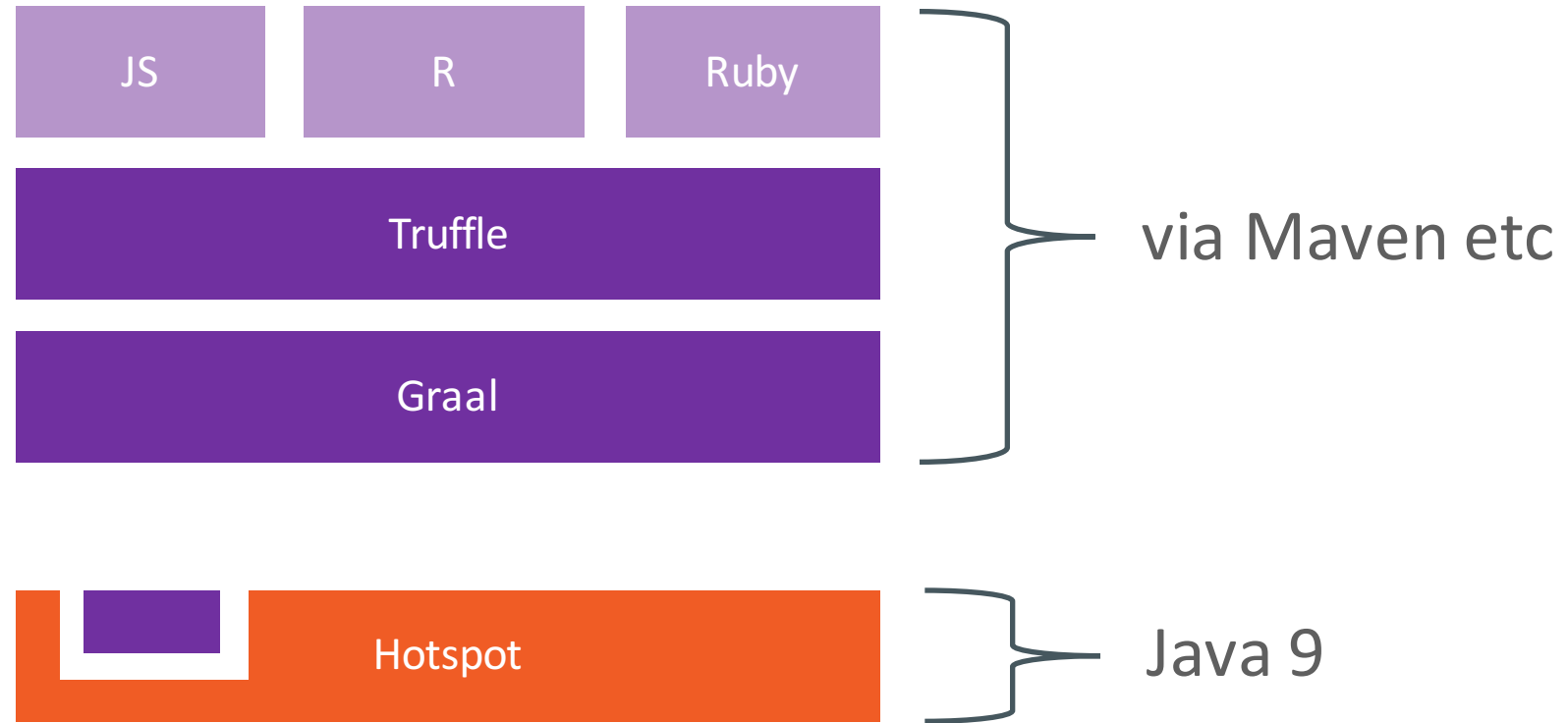


```
openweather — -bash — 97x19
Fetching version metadata from https://rubygems.org/..
Resolving dependencies...
Installing rake 10.4.2
Installing addressable 2.3.8
Using bundler 1.10.6
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Using openweather2 0.1.8 from source at .
Installing webmock 1.21.0
Bundle complete! 5 Gemfile dependencies, 9 gems now installed.
Bundled gems are installed into ./jruby+truffle_bundle.
[$ ../GraalVM-0.9/bin/ruby-tool run examples/temperature.rb 'London' 'San Francisco' ]
$ /Users/chrisseaton/Desktop/GraalVM-0.9/jre/bin/ruby -X\+T -r ./jruby\+truffle_bundle/bundler/s
etup.rb examples/temperature.rb London San\ Francisco
London: 14.76 °C
San Francisco: 16.98 °C
$
```

Will it be supported in standard Java?

JVMCI
(JVM Compiler Interface)





How do people want to write Ruby?

```
class Object
```

```
  # An object is blank if it's false, empty, or a whitespace string.
```

```
  # For example, '', ' ', +nil+, [], and {} are all blank.
```

```
  def blank?
```

```
    respond_to?(:empty?) ? !!empty? : !self
```

```
  end
```

```
end
```



```

def hard_mix(fg, bg, opts={})
  return apply_opacity(fg, opts)
  if fully_transparent?(bg)

  return bg if fully_transparent?(fg)

  mix_alpha, dst_alpha = calculate_alphas(
    fg, bg, DEFAULT_OPTS.merge(opts))

  new_r = blend_channel(r(bg), (r(bg)
    + r(fg) <= 255) ? 0 : 255, mix_alpha)
  new_g = blend_channel(g(bg), (g(bg)
    + g(fg) <= 255) ? 0 : 255, mix_alpha)
  new_b = blend_channel(b(bg), (b(bg)
    + b(fg) <= 255) ? 0 : 255, mix_alpha)

  rgba(new_r, new_g, new_b, dst_alpha)
end

def method_missing(method, *args, &block)
  return ChunkyPNG::Color.send(method, *args)
  if ChunkyPNG::Color.respond_to?(method)
    normal(*args)
  end
end

```

```
def grayscale_entry(bit_depth)
  value = ChunkyPNG::Canvas.send(
    :decode_png_resample_#{bit_depth}bit_value",
    content.unpack('n')[0])
  ChunkyPNG::Color.grayscale(value)
end
```

```
class Duration
  attr_accessor :value

  def initialize(value)
    @value = value
  end

  def as_json
    ...
  end

  def inspect
    ...
  end

  def method_missing(method, *args, &block)
    value.send(method, *args, &block)
  end
end
```

```
def delegate(method)
  method_def = (
    "def #{method}(*args, &block)\n" +
    "  delegated.#{method}(*args, &block)\n" +
    "end"
  )
  module_eval(method_def, file, line)
end
```

```
def clamp(num, min, max)
  [min, num, max].sort[1]
end
```

Why would you feel guilty about this?

Need to C extensions to remove abstraction

```
def clamp(num, min, max)  
    [min, num, max].sort[1]  
end
```

Need to C extensions to remove abstraction

```
VALUE psd_native_util_clamp(VALUE self,  
    VALUE r_num, VALUE r_min, VALUE r_max) {  
    int num = FIX2INT(r_num);  
    int min = FIX2INT(r_min);  
    int max = FIX2INT(r_max);  
    return num > max ?  
        r_max  
        : (num < min ? r_min : r_num);  
}
```


Metaprogramming method calls are slow

14 + 2

14.send(:+, 2)

14.send('+', 2)

operator = '+'; 14.send("#{operator}", 2)

Eval is slow

14 + 2

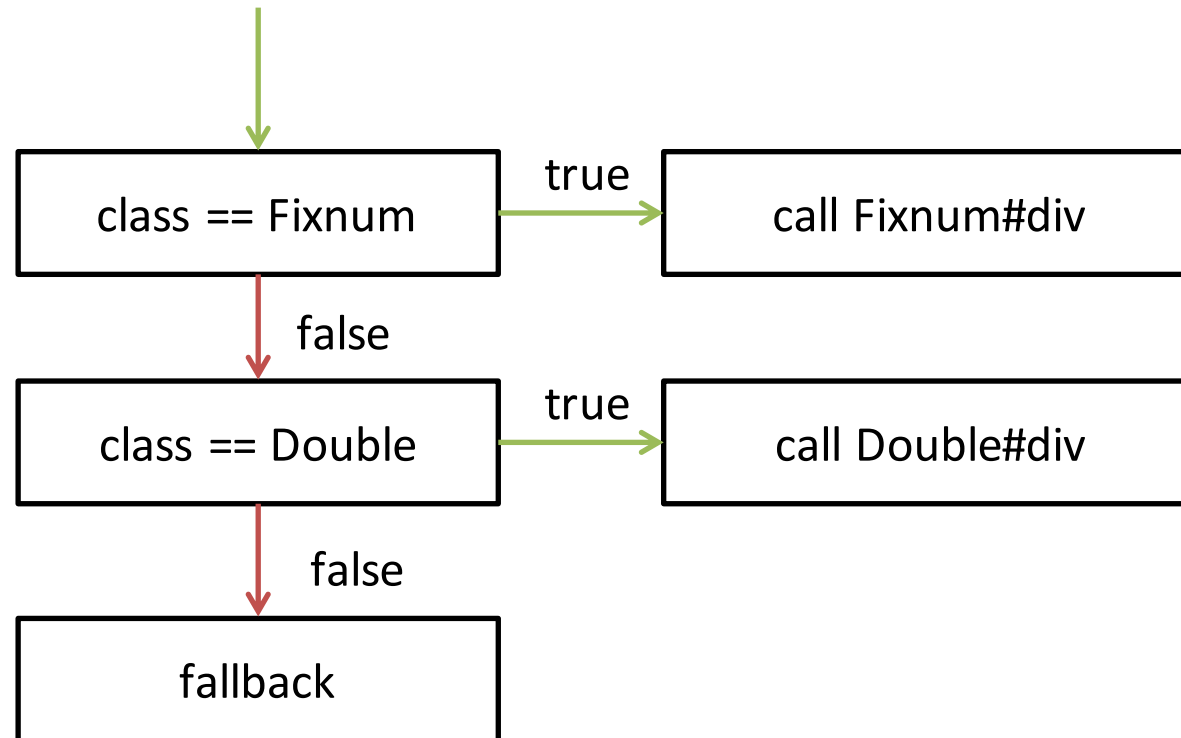
eval('14 + 2')

x = 14; y = 2; eval("#{x} + #{y}")

Making Ruby as people use it fast

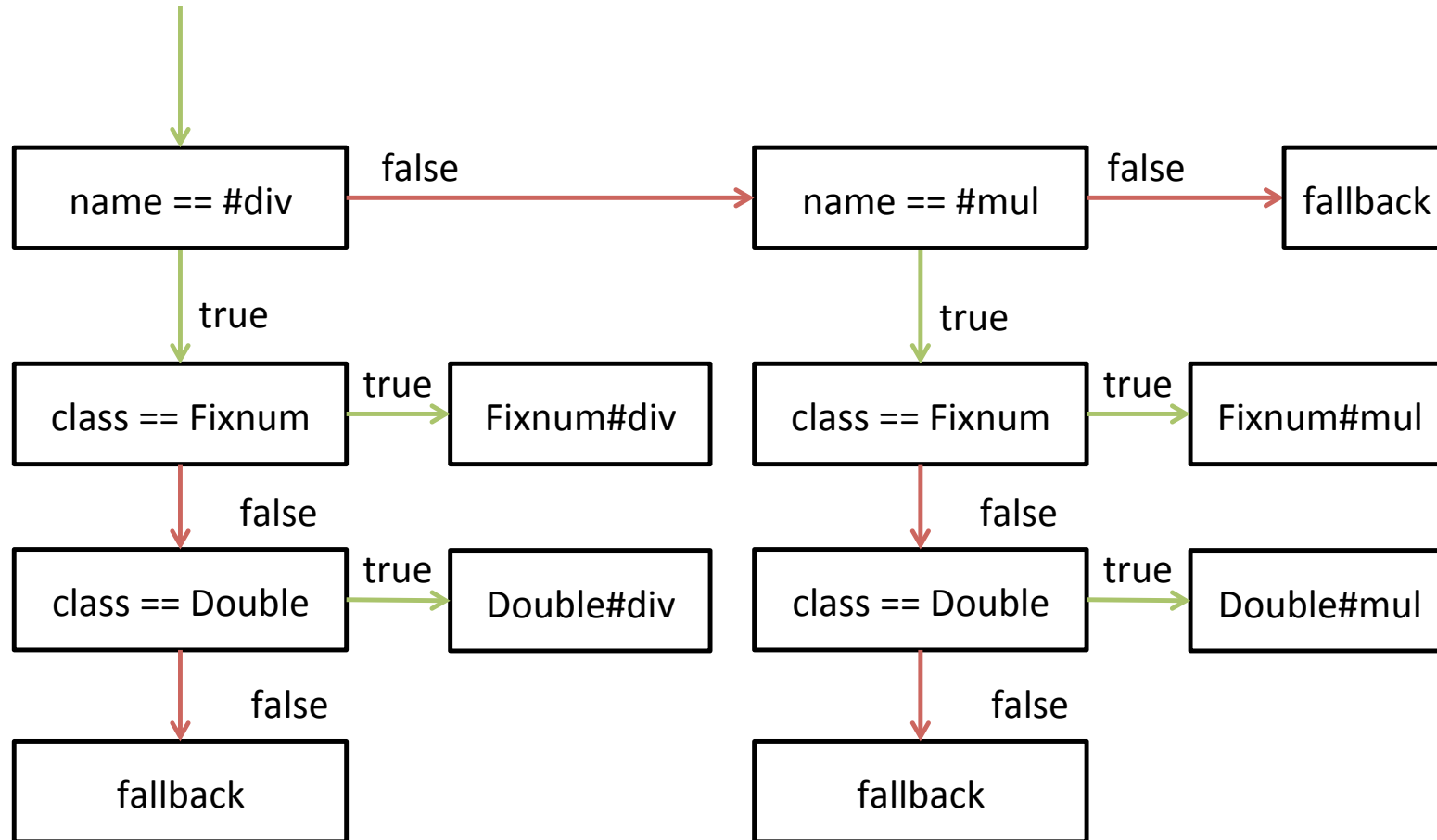
Method caching

14 / 2
14.0 / 2.0



Metaprogramming method caching

```
14.send(:/, 2)
14.0.send(:/, 2.0)
14.send(:*, 2)
14.0.send(:*, 2.0)
```

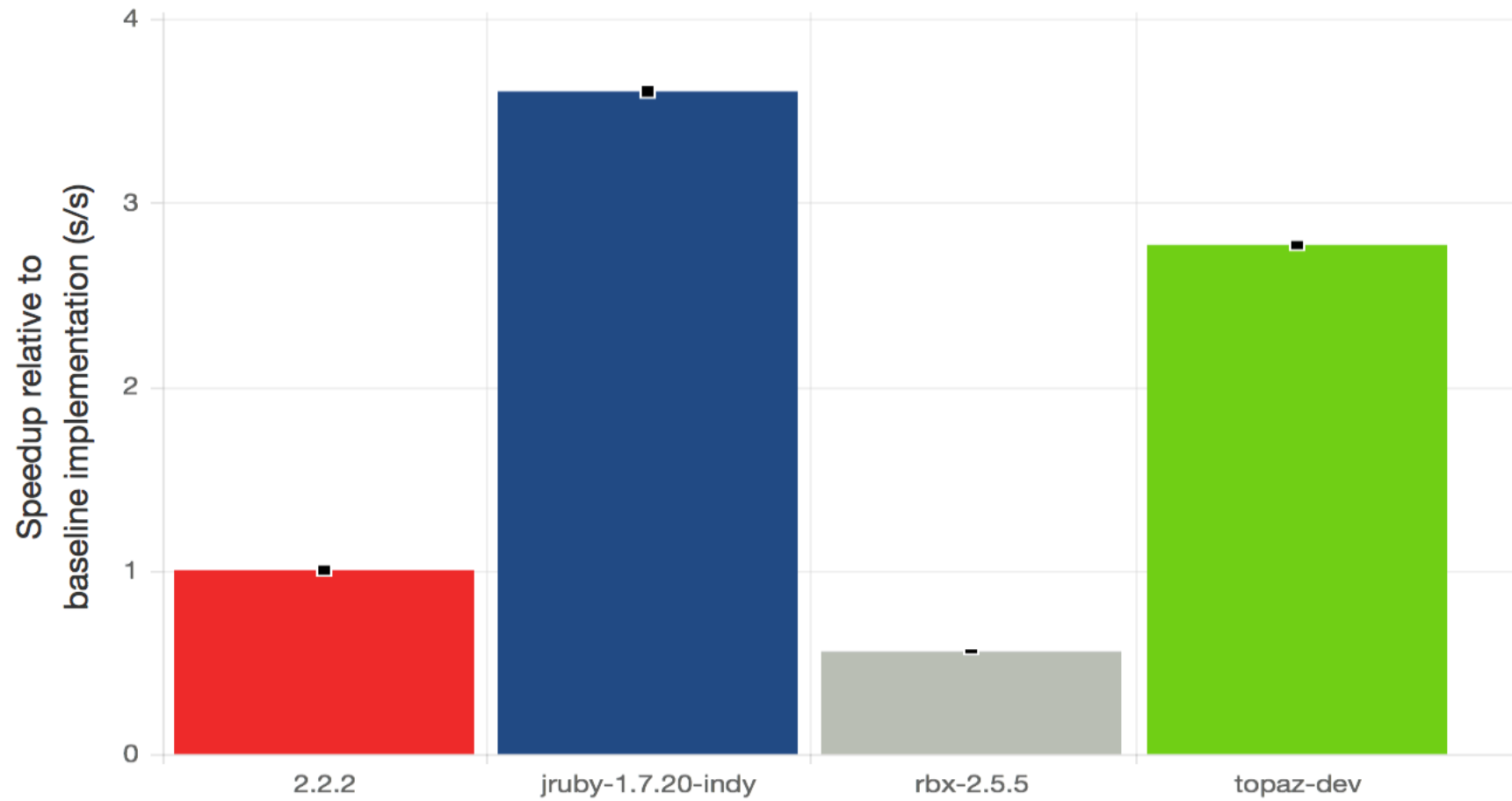


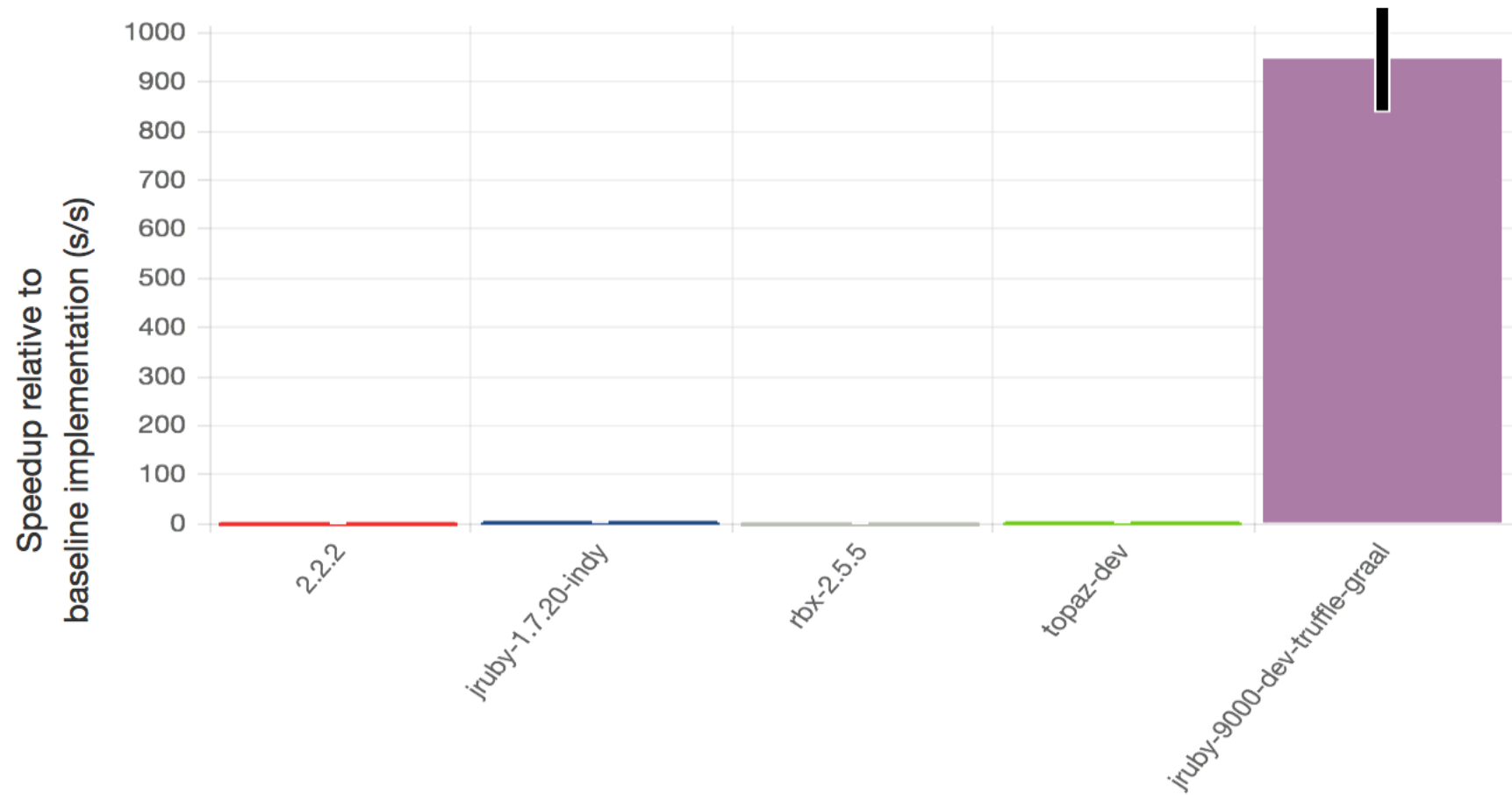
```
module Foo
  def self.foo(a, b, c)
    hash = {a: a, b: b, c: c}
    array = hash.map { |k, v| v }
    x = array[0]
    y = [a, b, c].sort[1]
    x + y
  end
end

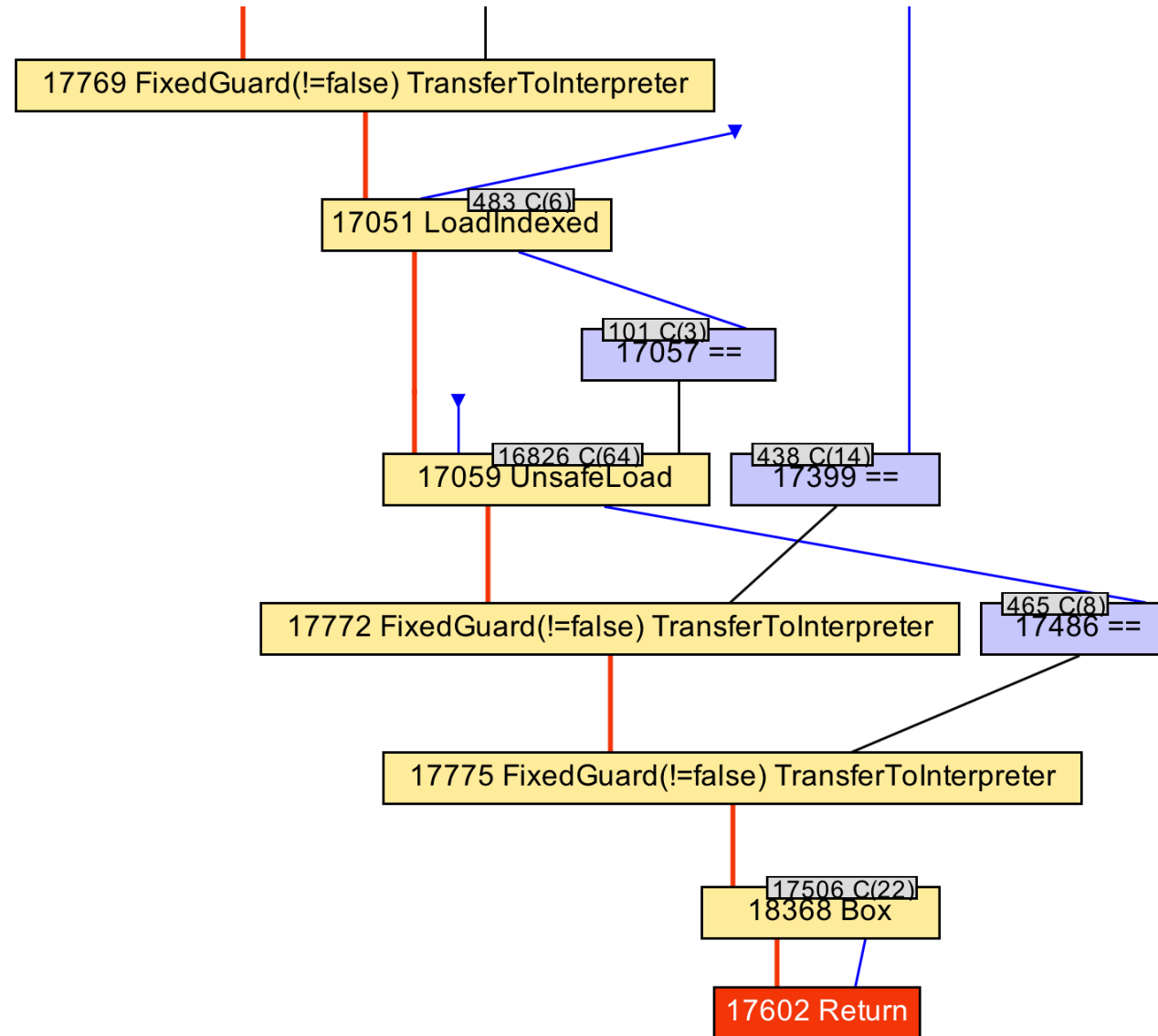
class Bar
  def method_missing(method, *args)
    if Foo.respond_to?(method)
      Foo.send(method, *args)
    else
      0
    end
  end
end
```

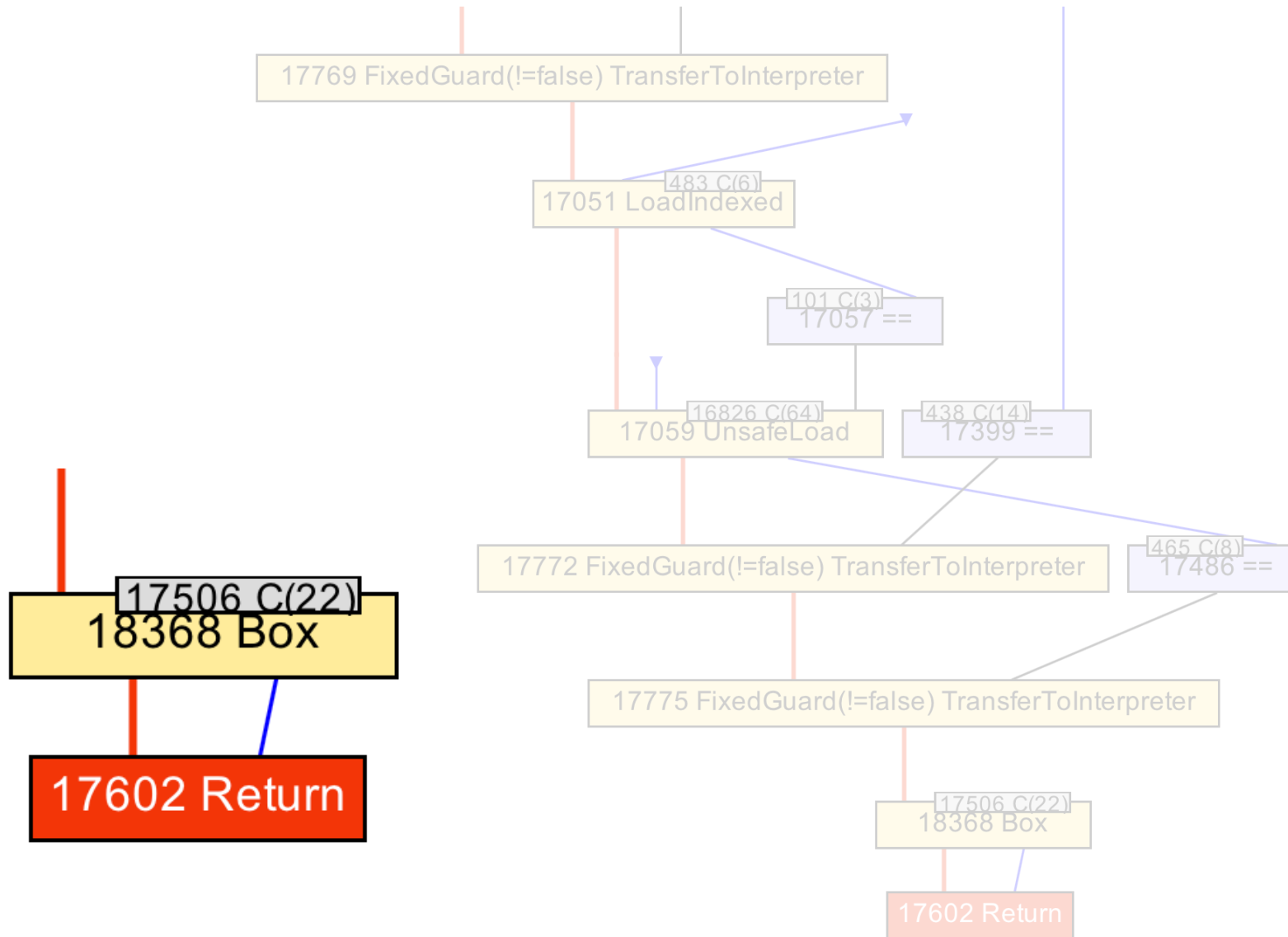
```
bar = Bar.new
```

```
loop do
  start = Time.now
  1_000_000.times do
    bar.foo(14, 8, 6)
  end
  puts Time.now - start
end
```









```
...  
movabs 0x11e2037a8, %rax ; {oop(a 'java/lang/Integer' = 22)}  
...  
retq
```

Can we fold yet?

Conclusions

We don't have to pretend Ruby is Java in order to optimise it

Conclusions

We don't have to pretend Ruby is Java in order to optimise it

We don't need to tell Ruby programmers to avoid language features to get performance

chris.seaton@oracle.com

@ChrisGSeaton

<https://github.com/jruby/jruby/wiki/Truffle>

(or just search for 'jruby truffle')

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Questions?

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