REiA

A Ruby-like language for the Erlang VM

http://github.com/tarcieri/reia

Rhymes with Leia...

...not diarrhea

What does it mean?

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- Not named after Princess Leia

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What does it mean?

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- An acronym?
- Ruby Erlang something something?
- It doesn’t mean anything
- I made it up

State of Reia

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- One year old (as of May 11th)

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- Prototype

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- Nearing alpha-stage

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- Prototype
- Nearing alpha-stage
- Ready for eager early adopters

Ruby features you may miss...

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- Modifiable core

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- Everything is an object

Ruby features you may miss...

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- Monkeypatching
- Mutable state
- Everything is an object
- Perlisms

What you get instead

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- Binaries

Syntax Tour

No longer indent sensitive!!!

Syntax example

```
# The Greeter class
class Greeter
  def initialize(name)
    @name = name.capitalize()
  end

  def salute
    "Hello #{@name}!".puts()
  end
end

# Create a new object
g = Greeter("world")
g.salute()
g.kill()
```

Lists

Reia

```
[1,2,3]
[1,2,3,*rest]
```

Erlang

```
[1,2,3]
[1,2,3|Rest]
```

Tuples

Reia

```
(1,2,3)
(1,)
()
```

Erlang

```
{1,2,3}
```

Atoms

Reia

```
:foobar
```

Erlang

```
foobar
```

Maps (i.e. Dicts)

Reia

```
{:foo=>1,:bar=>2,:baz=>3}
```

Erlang

```
{dict,3,16,16,8,80,48,...}
```

Strings

Reia

```
“Hello, #{name}”
‘Hello, Robert’
```

Erlang

```
“Hello, Joe”
```

Binaries

(Same as Erlang)

```
<<1,2,3>>
<<“Foobar”>>
```

Regular Expressions

Reia

```
/fo{2}b[a-z]r/
```

Erlang

```
N/A
```

Ranges

Reia

```
1..10
```

Erlang

```
lists:seq(1,10) % kinda
```

Pattern Matching

Reia

```
(a,b,c)=(1,2,3)
```

Erlang

```
{A,B,C}={1,2,3}
```

Blocks

Brace form

```
[1,2,3].map { |n| n * 2 }
```

Do/End Form

```
Mnesia.transaction do
  Mnesia.read(:user, id)
end
```

Funs

Reia

```
fn = fun(n) { n + 2 }
fn(2)
```

Erlang

```
Fun = fun(N) -> N + 2 end,
Fun(2).
```

Function Calls

Reia

```
Foobar.baz()
```

Erlang

```
‘Foobar’:baz().
```

Function References

Reia

```
fn = Foo.baz
Baz.qux(&fn)
```

Erlang

```
Fn = fun foo:baz/0,
baz:qux(Fn).
```

Processes

Reia

```
pid = Process.spawn(&myfunc)
pid ! message
```

Erlang

```
Pid = proc_lib:spawn(fun myfunc/0),
Pid ! Message.
```

List Comprehensions

Reia

```
[n * 2 | n in 0..10]
```

Erlang

```
[N * 2 || N <- lists:seq(0, 10)]
```

Object System

What is OOP?

What is OOP?

- Messaging

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- Hidden state

What is OOP?

- Messaging
- Hidden state
- Polymorphism/inheritance

Messaging

"I thought of objects being like biological cells and/or individual computers on a network, only able to communicate with messages (so messaging came at the very beginning -- it took a while to see how to do messaging in a programming language efficiently enough to be useful)."

— Alan Kay, creator of Smalltalk

Imperative OOP

Kool-Aid

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- Object

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- Send message

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Reality

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Reality

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Reality

- State
- Call function

Kool-Aid	Reality
• Object	• State
• Send message	• Call function
• Invoke method	• Mutate state

Kool-Aid

- Object
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Reality

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FAIL

C++ Style OOP

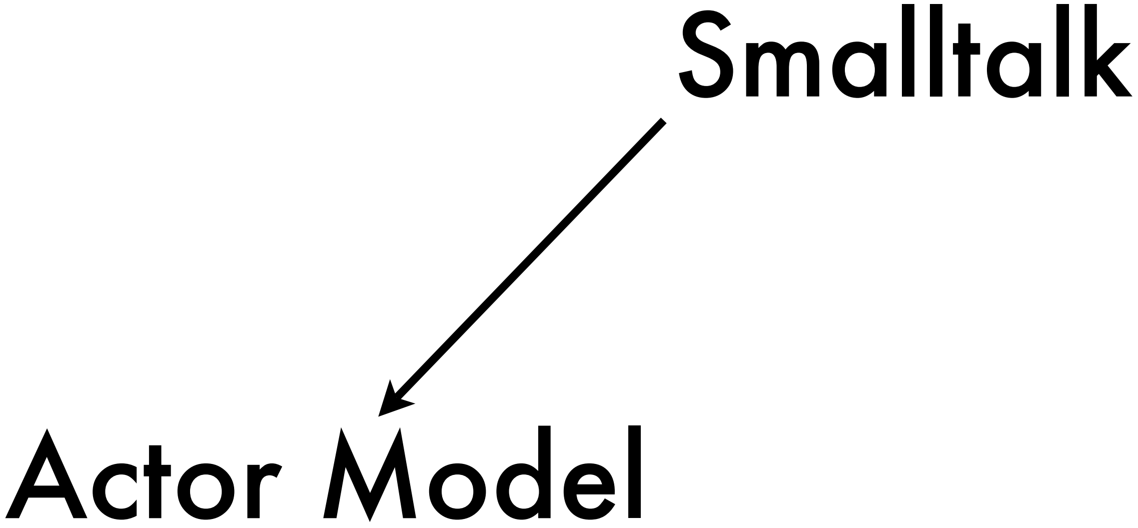
"I made up the term object-oriented, and I can tell you I did not have C++ in mind."

— Alan Kay, creator of Smalltalk

Journey to Reia

Smalltalk

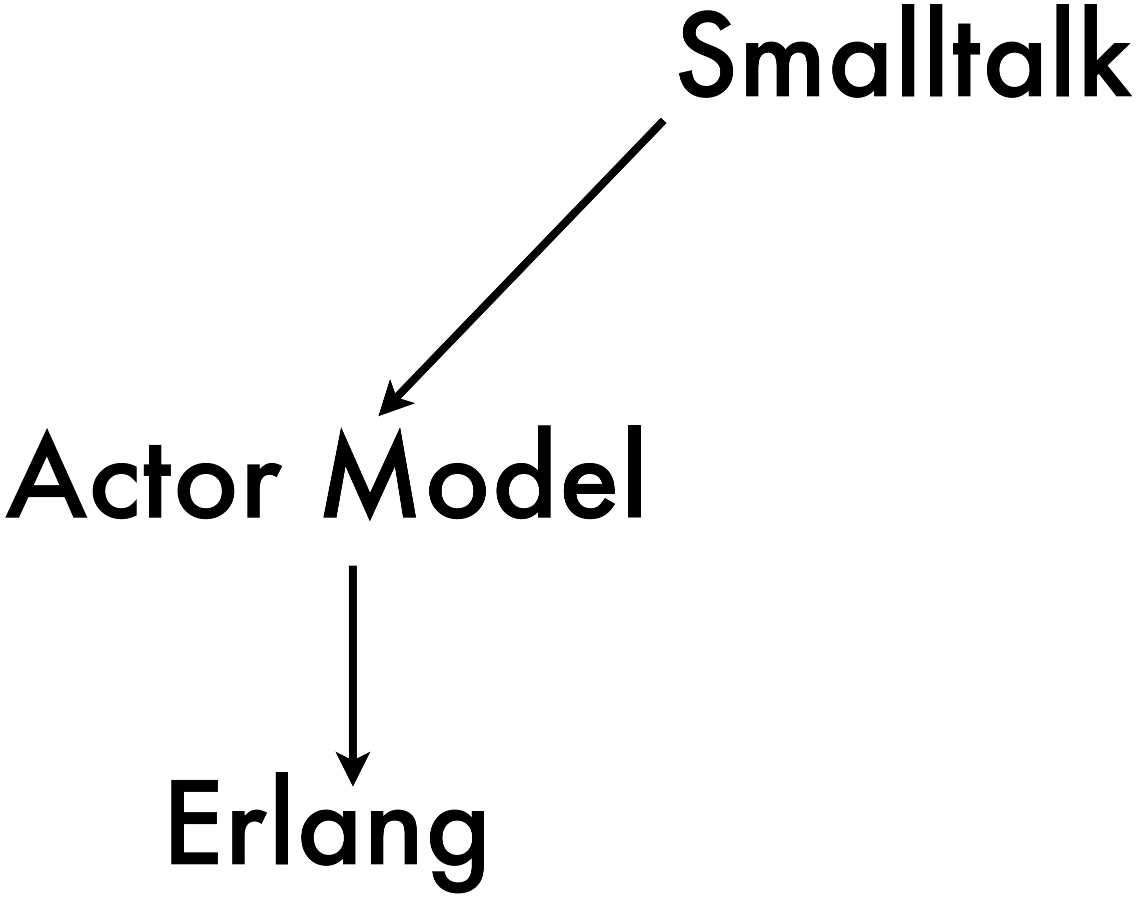
Journey to Reia



Smalltalk

Actor Model

Journey to Reia



Smalltalk

Actor Model

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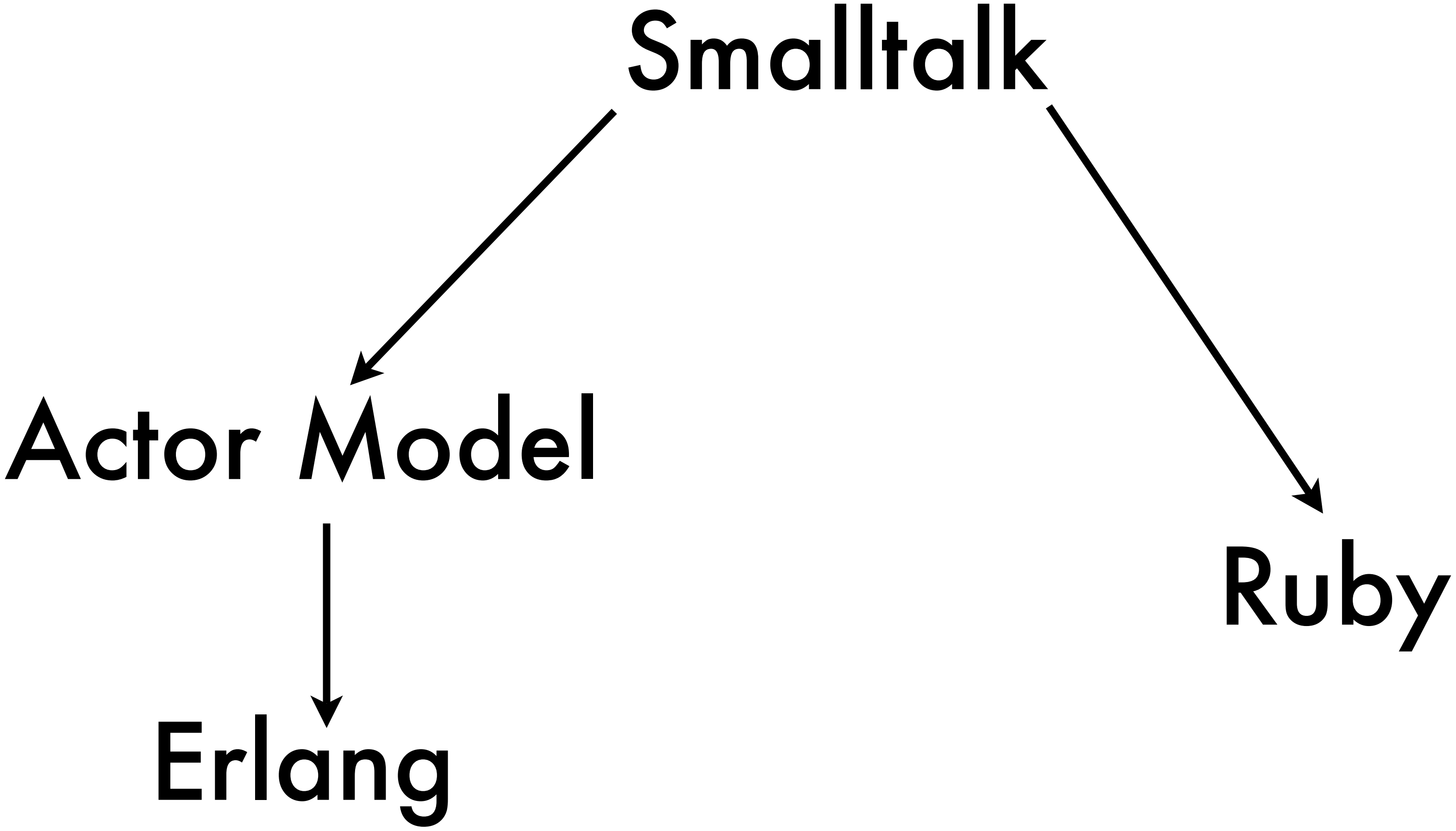


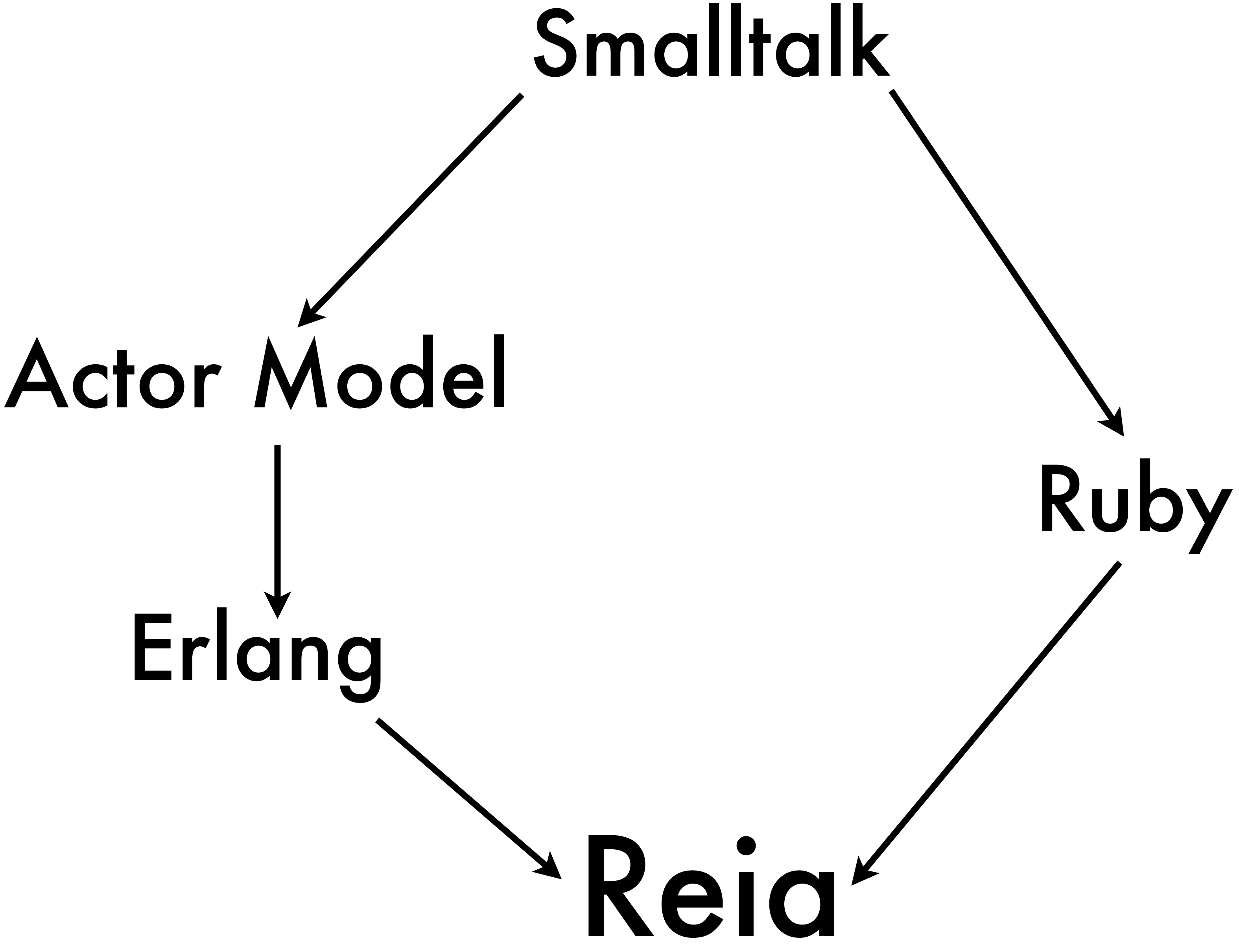
Smalltalk

Actor Model

Erlang

Ruby

Journey to Reia



Reia objects are concurrent

Reia objects really communicate with messages

Objects aren't a one-size-fits-all solution

Messaging

“95% of the time standard synchronous RPCs will work - but not all the time, that's why it's nice to be able to open up things and muck around at the message passing level.”

— Joe Armstrong, creator of Erlang

Defining Classes

```
class Adder
  def initialize(n)
    @n = n
  end

  def plus(x)
    @n + x
  end
end
```

Instantiating Classes

```
Adder.spawn(2)
Adder.spawn_link(2)

Adder(2)

>> a = Adder(2)
=> #<Adder:0.214.0>
```

Invoking Methods

Synchronous (RPC)

```
a.plus(2)
```

Asynchronous (Cast)

```
a<-plus(2)
```

Inheritance & Polymorphism

Inheritance

“Coordinating activities involving multiple actors is very difficult. You can't observe anything without its cooperation/coordination - making ad-hoc reporting or analysis impossible, instead forcing every actor to participate in each protocol.”

— Rich Hickey, creator of Clojure

Inheritance

```
class Animal
  def initialize(name)
    @name = name
  end

  def name
    @name
  end
end

class Cat < Animal
  def talk
    'Meow!'
  end
end

class Dog < Animal
  def talk
    'Woof! Woof!'
  end
end

animals = [Cat('Missy'), Dog('Mr. Bojangles'), Dog('Lassie')]

animals.each do |animal|
  "#{animal.name()} the #{animal.class()} says: #{animal.talk()}".puts()
end
```

What’s the catch?

Garbage Collection

Garbage Collection

- It doesn’t exist for objects

Garbage Collection

- It doesn’t exist for objects
- Use linking

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- It doesn’t exist for objects
- Use linking
- Use explicit termination

Garbage Collection

- It doesn’t exist for objects
- Use linking
- Use explicit termination
- Use deterministic finalization strategies

Garbage Collection

- It doesn’t exist for objects
- Use linking
- Use explicit termination
- Use deterministic finalization strategies
- Use fewer objects

Circular Calls

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- Call loops cause deadlocks

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- Magical workaround???

Circular Calls

- Call loops cause deadlocks
- Magical workaround???
- No

Circular Calls

- Call loops cause deadlocks
- Magical workaround???
- No
- But it can be detected

Destructive Assignment

State in Reia is immutable

Static Single Assignment

Reia

```
a = a + 1
```

Erlang

```
A1 = A0 + 1.
```

Rebind on Update

Reia

```
m = {}
m[:foo] = 42
```

Erlang

```
D0 = dict:new(),
D1 = dict:store(foo, 42, D0).
```

Ruby-style Immutability

Pure

```
list.reverse()
```

“Dangerous”

```
list.reverse!()
```

Matz on "Immutable Ruby"

"I have once dreamed of a such language, and had a conclusion that was not Ruby at least, although a pretty interesting language."

— Yukihiro "Matz" Matsumoto, Creator of Ruby

So what?

Ryan

A Web Framework for Reia

By Phil Pirozhkov

http://github.com/pirj/ryan

http://groups.google.com/group/ryan-framework

Ryan Demo

Ryan Controller

```
class Mail < Controller
  def new
    selected = {}.insert(:new, :selected)
    total = Mailbox.total()
    values = {}
    if(@parameters[:error] != nil)
      to = @parameters[:to]
      message = @parameters[:message]
      error = @parameters[:error]
      values = {}.insert(:to, to).insert(:message, message).insert(:error,
error).insert(:error_class, :error)
    end
    contents = view('mail/new', values)
    bindings = {}.insert(:contents, contents).insert(:total, total).insert(:selected,
selected)
    render('home', bindings, [])
  end
```

Retem Template

```
      <div id=menu class=float>
        <a class={selected.home} icon=home href='/app/home'>home<span>general info</
span></a>
        <a class={selected.new} icon=mail_new href='/app/mail/new'>new<span>create 
message</span></a>
        <a class={selected.unread} icon=mail_unread href='/app/mail/
unread'>unread<span>{total.unread} new messages</span></a>
        <a class={selected.inbox} icon=mail_inbox href='/app/mail/
inbox'>inbox<span>{total.inbox} messages</span></a>
        <a class={selected.sent} icon=mail_sent href='/app/mail/
sent'>sent<span>{total.sent} messages</span></a>
        <a class={selected.spam} icon=mail_spam href='/app/mail/
spam'>spam<span>{total.spam} messages</span></a>
        <a class={selected.trash} icon=mail_trash href='/app/mail/
trash'>trash<span>{total.trash} messages</span></a>
      </div>
```

Future Features

Immutable Objects

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- Immutable objects can be garbage collected

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Immutable Objects

- Immutable objects don’t need to be Erlang processes
- Immutable objects can be garbage collected
- Almost everything could be an object
- Immutable objects could tap into “rebind on update”

Default Arguments

Declaration

```
def foo(bar, baz: 2, qux: 3)
```

Invocation

```
foo(1)
```

Keyword Arguments

Declaration

```
def foo(bar, baz: 2, qux: 3)
```

Invocation

```
foo(1, qux: 4, baz: 3)
```

“Splatted” Arguments

Declaration

```
def foo(*list)
```

Invocation

```
foo(:foo, :bar, :baz)
foo(*list)
```

Namespaces

Operator Overloading

instance_eval

Class Bodies

Metaclasses

DSLs

Reflection

Links

Main Site:

http://reia-lang.org

Github:

http://github.com/tarcieri/reia

Blog:

http://unlimitednovelty.com

Twitter:

http://twitter.com/bascule