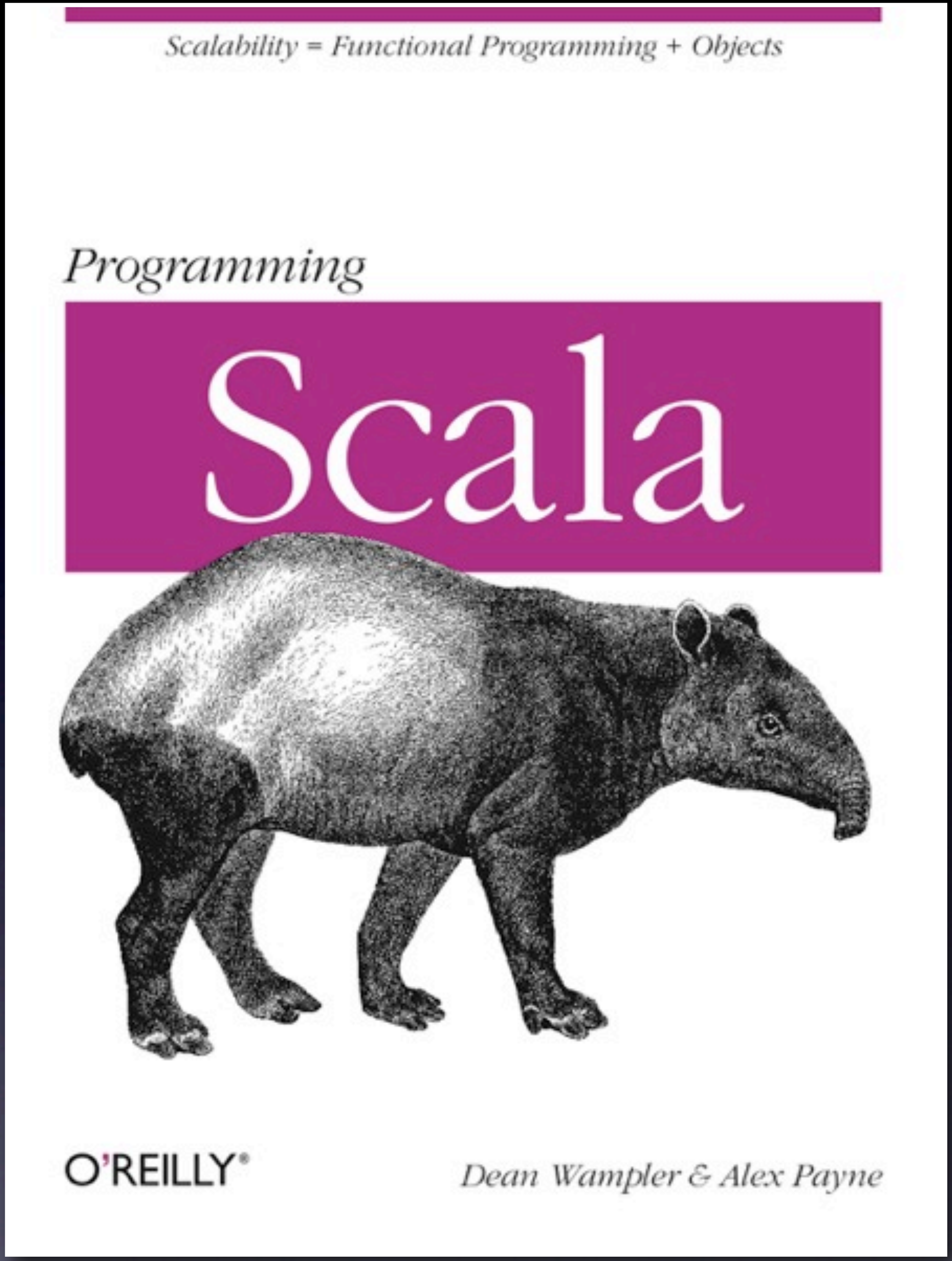
Heresies and Dogmas in Software Development

@deanwampler

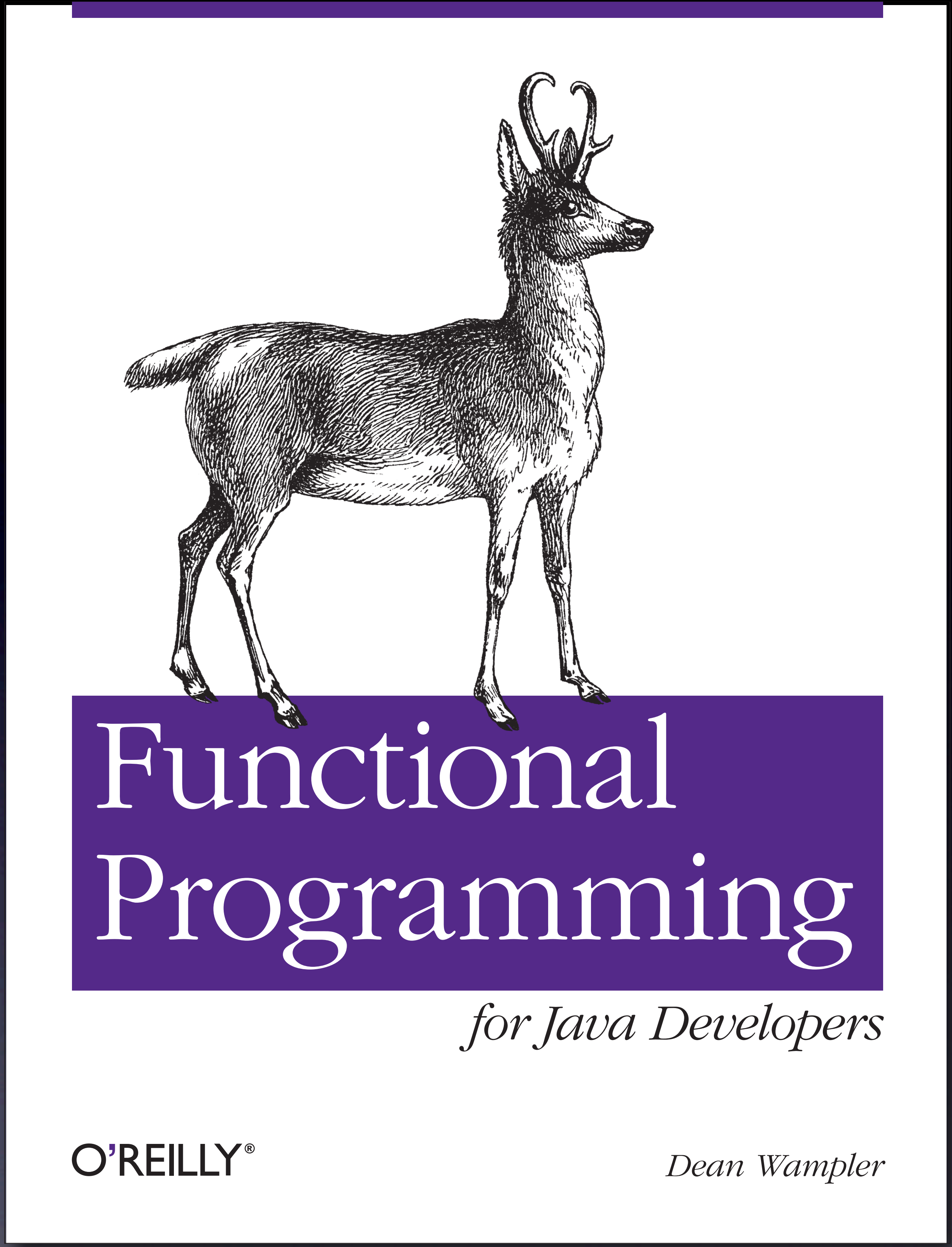
CME Group Technology Conference 2011


Scalability = Functional Programming + Objects

Programming Scala

O'REILLY®

Dean Wampler & Alex Payne


Functional Programming for Java Developers

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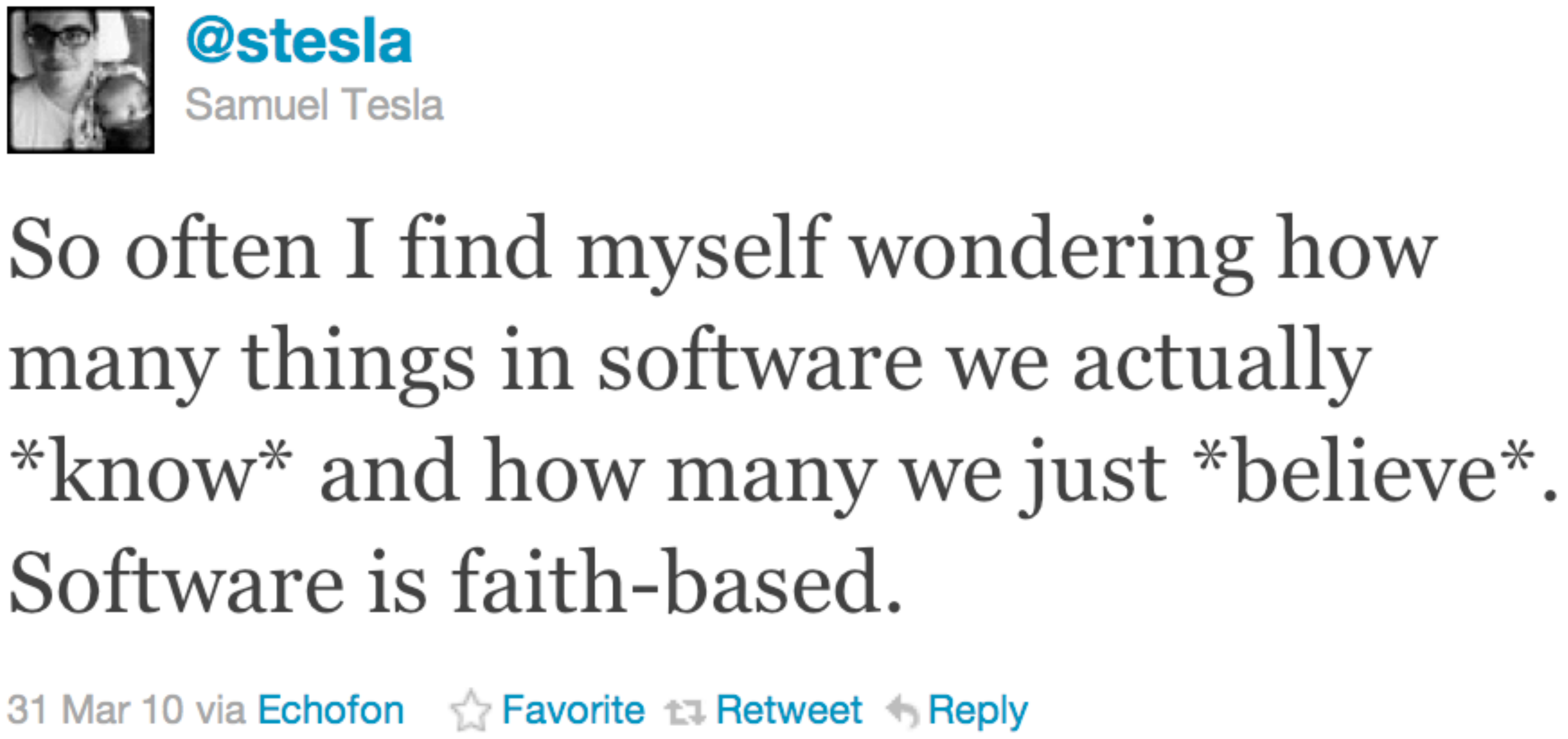
Dean Wampler

programmingscala.com

polyglotprogramming.com/fpjava



@stesla

Samuel Tesla

So often I find myself wondering how many things in software we actually *know* and how many we just *believe*. Software is faith-based.

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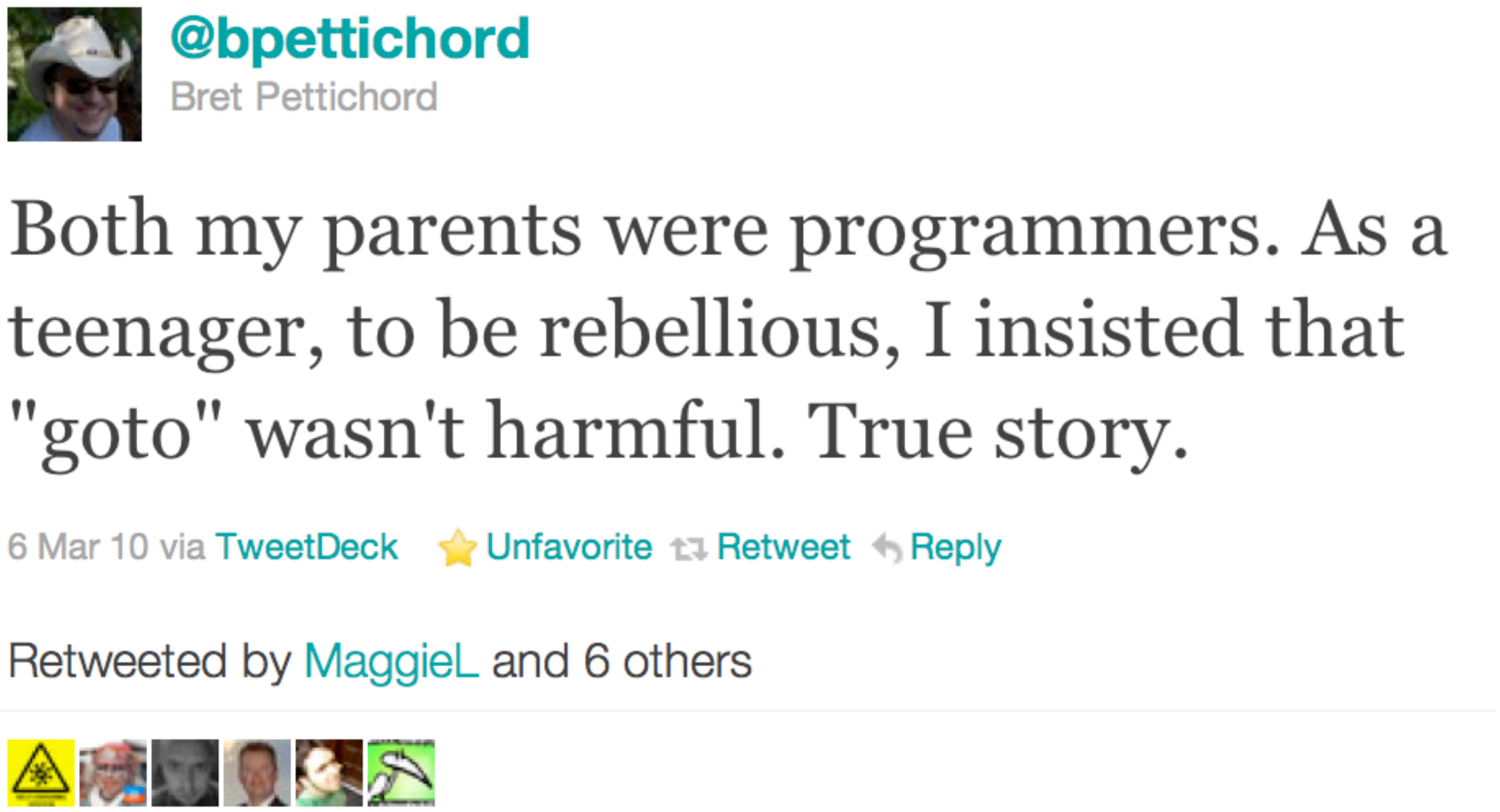
https://twitter.com/#!/stesla/status/11390744100

Goto (Considered Harmful)



@bpettichord
Bret Pettichord

Both my parents were programmers. As a teenager, to be rebellious, I insisted that "goto" wasn't harmful. True story.

6 Mar 10 via TweetDeck Unfavorite Retweet Reply

Retweeted by MaggieL and 6 others

http://twitter.com/bpettichord/status/10062856309

The Goto

A non-local jump, often to a label

```
while (true) {
  doSomeWork();
  if (hasMoreWork() == false)
    goto finished;
  wait(1000);
}
label finished;
```

“Go To Statement Considered Harmful”

Edsger Dijkstra, Communications of the ACM 11 (3): 147–148 (March 1968).

“Go To Statement Considered Harmful”

- Complicates analysis and verification of program correctness, especially loops.

“Go To Statement Considered Harmful”

- Structured Programming replaces gotos with:
  - Sequence (i.e., sequential instructions)
  - Repetition (e.g., loops)
  - Selection (e.g., branches)

“Structured Programming with Go To Statements”

Donald Knuth,
Computing Surveys 6 (4): 261–301 (1974).

“Structured Programming with Go To Statements”

- Programmers found it difficult to eliminate gotos.

“Structured Programming with Go To Statements”

- Some code constructs are actually simpler to understand with gotos.
  - breaking out of loops.

“Structured Programming with Go To Statements”

- Some code with gotos was noticeably faster.

Even Linus Torvalds has defended gotos.

http://kerneltrap.org/node/553

Whither Gotos?

Heresy or Dogma?

Whither Gotos?

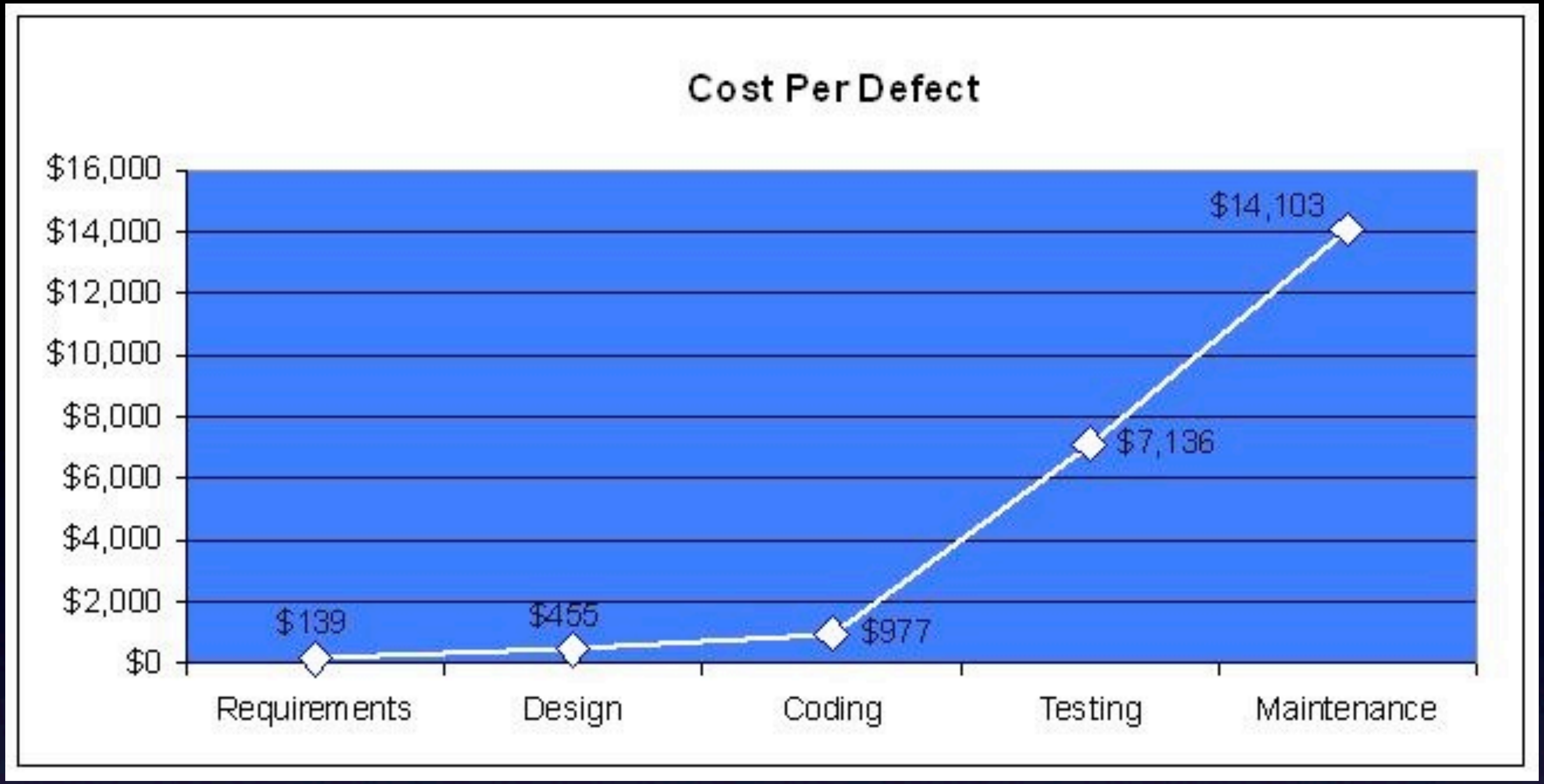
- Can lead to spaghetti code.
- Can also lead to fast, intuitive code.
- Constructs like break are rebranded, constrained gotos.

Whither Gotos?

Whether an idea is a heresy or a dogma depends on the context.

Design Before Code

Wait! That building is supposed to be square!



???

Capers Jones, Software Assessments, Benchmarks, and Best Practices, Addison-Wesley, 2000

If rework is expensive, can we eliminate it by deciding exactly what to code before we code it?

Agile Taught Us:

- Requirements change is inevitable.
  - We learn the requirements while building.

Agile Taught Us:

- Reducing the cost of change to near zero lets us defer decisions to the last responsible moment.

Agile Taught Us:

- Iterations eliminate risk in small chunks.

Design Before Code

Heresy or Dogma?

Design Before Code

Even building construction is an adaptive process.

Design Before Code

Since software is virtual,
it is even more adaptable.

Design Patterns

“A solution
to a problem
in a context.”

Obviously good, right?

“Are Design Patterns Missing Language Features?”

http://www.c2.com/cgi/wiki?AreDesignPatternsMissingLanguageFeatures

“Design Patterns in Dynamic Languages”

Peter Norvig,
http://norvig.com/design-patterns/

“Design Patterns in Dynamic Languages”

“16 of the 23 patterns in Design Patterns were 'invisible or simpler' in Lisp.”

Some GoF patterns are language features in functional languages.

Iterator, Composite, Command...

Other patterns are (fortunately) eliminated.

Visitor

Functional programming has its own patterns.

Fold, Monoid, Monad, Iteratee, Arrows,...

“Programming with Effects”

Graham Hutton,
http://www.cs.nott.ac.uk/~gmh/monads

“Programming with Effects”

“Monads are an example of the idea of abstracting out a common programming pattern as a definition.”

Design Patterns

Heresy or Dogma?

Design Patterns

The concept of patterns remains useful.

Specific examples come and go.

CORBA vs. REST

Common Object Request Broker Architecture

- Objects are instantiated on the server.
- Clients call methods on the objects.
- Messages are binary encoded.

REpresentational State Transfer

- Resources are represented by documents, etc.
- Client sends a request to initiate a transfer from one state of the resource to another.
- Platform neutral encoding: HTTP.
    - But not limited to HTTP...

The difference between
abstracting the
essence of something
vs.
requiring the thing itself.

CORBA's Flaws

- Every version change forces a global upgrade.
  - Binary changes!
  - CORBA interfaces aren't sufficient as abstractions.

Objects are at the wrong level of abstraction.

Objects are not very modular.

Modularity

`interface`	Single responsibility, clear abstraction, hides internals.
`composable`	Easily combines with other modules to build up behavior.
`reusable`	Can be reused in many contexts.

Modularity

- Two successful modularity schemes:
  - Digital circuits.
  - HTTP.

Digital Circuits

- Each wire: 0 or 1
- 32 together: 4 Billion unique values!

HTTP

- 9 “Request Methods”
  - GET, POST, HEAD, OPTIONS, ...
- Text Oriented
  - Key-Value header fields.
  - Payload encoding - MIME type.

Reuse

- Simple abstractions.
- Low-level of abstraction.
- Enable higher-level abstractions => protocols.

Paradox of Objects

Unconstrained freedom to create abstractions undermines reuse.

Paradox of Objects

Abstraction boundary is too high, without a lower-level boundary.

CORBA vs. REST

Heresy or Dogma?

CORBA vs. REST

- REST/HTTP meets requirements for modularity.
  - Low-level, simple abstraction.
  - Minimal coupling.
  - The constraints enable reuse.

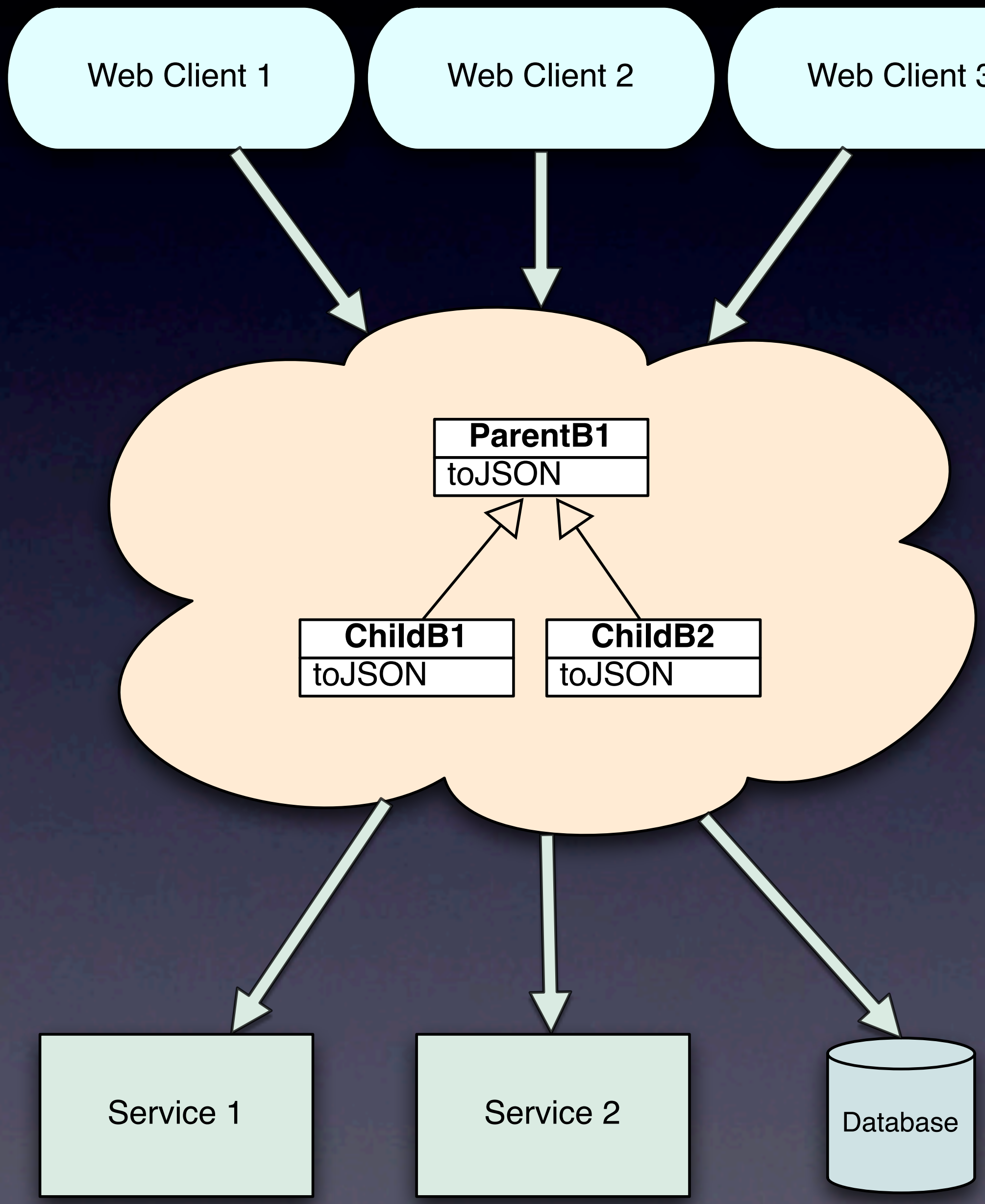
CORBA vs. REST

- CORBA isn’t modular.
  - High-level, ad-hoc abstractions.
  - Maximal coupling.

Object Middleware and ORMs

In a highly concurrent world, do we really want a middle?

Which Scales Better?



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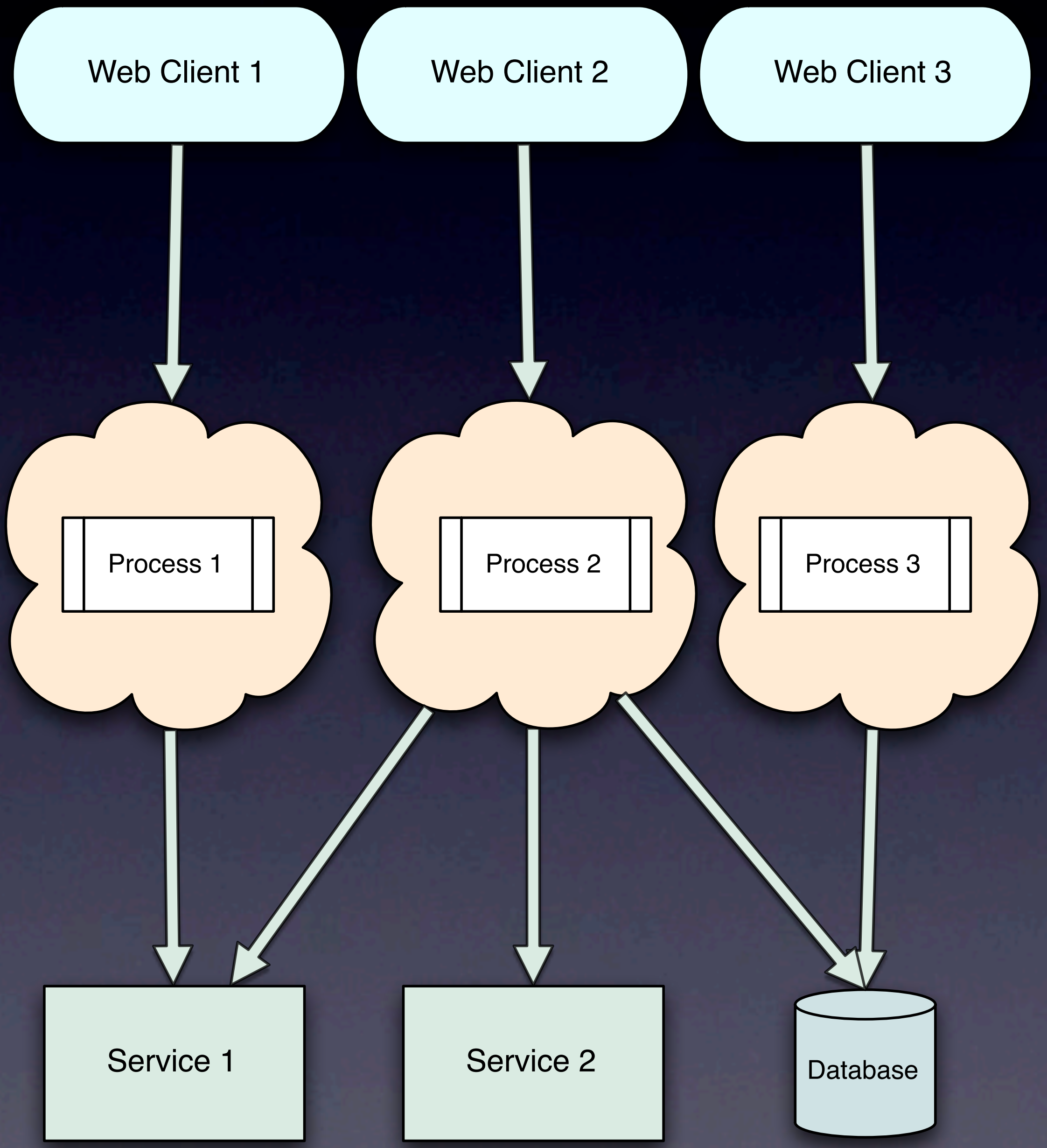


Implementing a
rich domain model
encourages
fewer, fatter services.

Object-Relational Mapping

ORM Pros

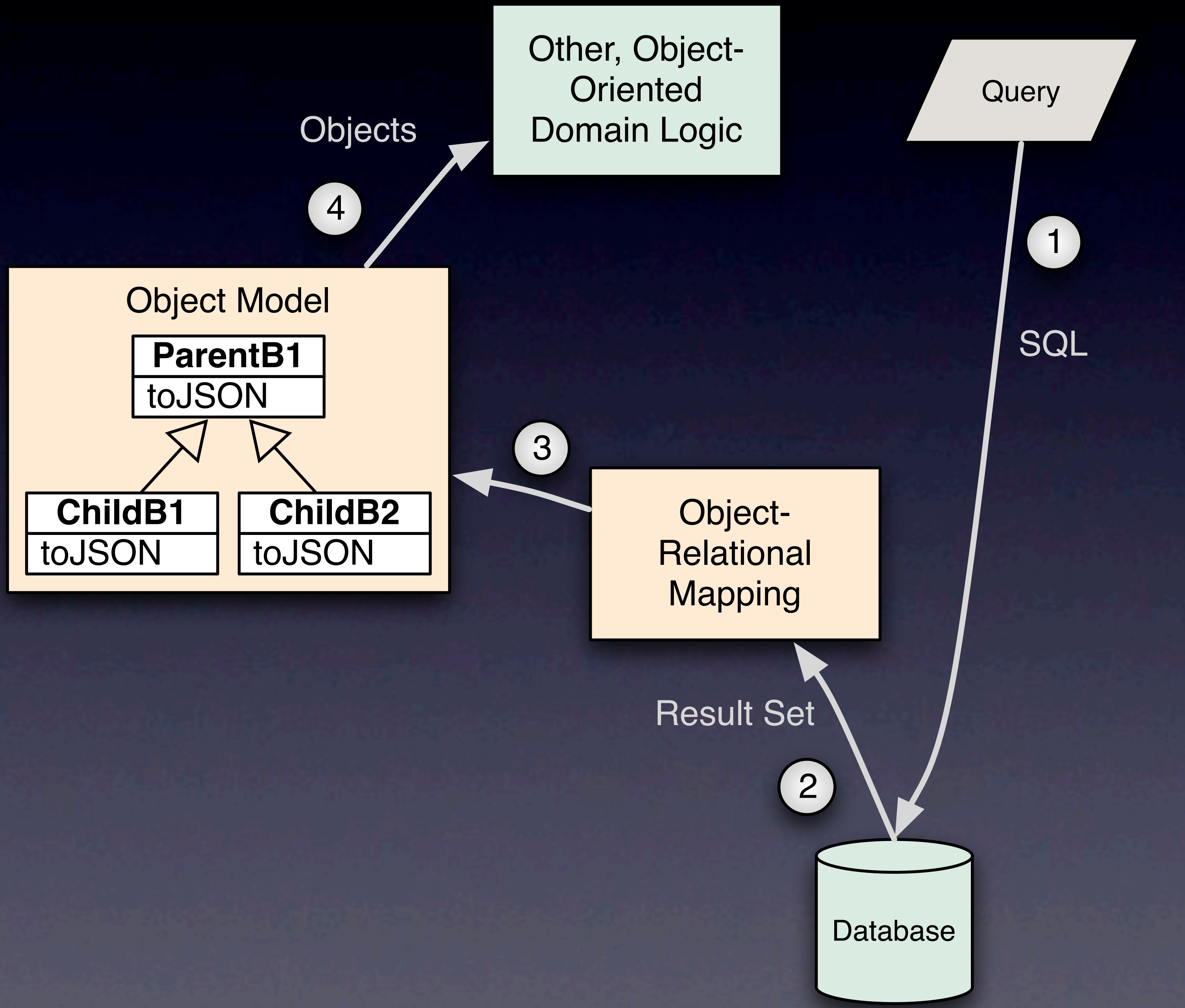
- Mostly eliminate the need for SQL.
- Generate boilerplate code.
- Inefficient, but “good enough”.

ORM Cons

- Poor abstraction - don’t eliminate SQL.
- Objects are a poor fit for relational data.
- Not really efficient enough, especially for “big data”.

http://seldo.com/weblog/2011/08/11/orm_is_an_antipattern

Which Is Simpler?



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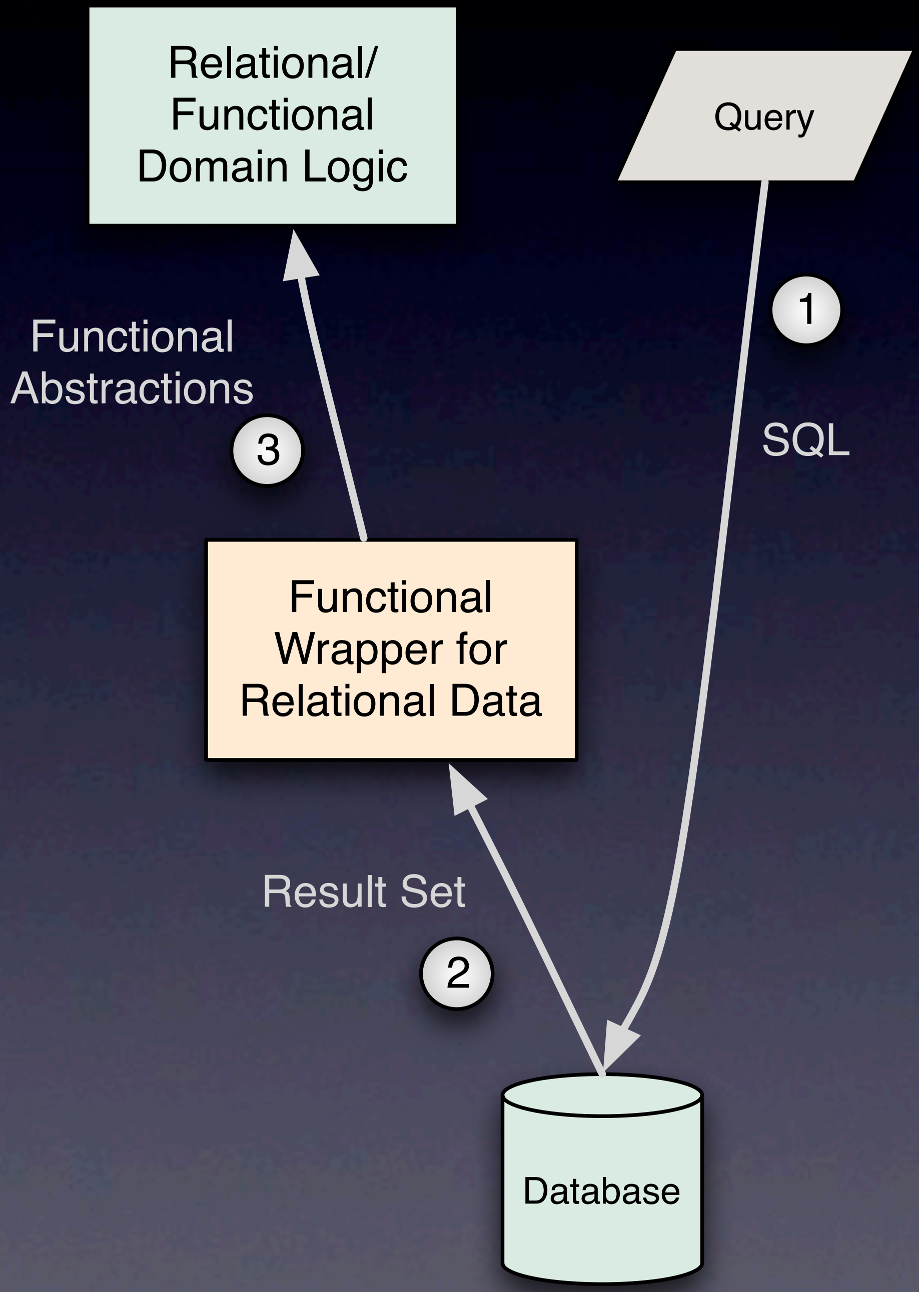
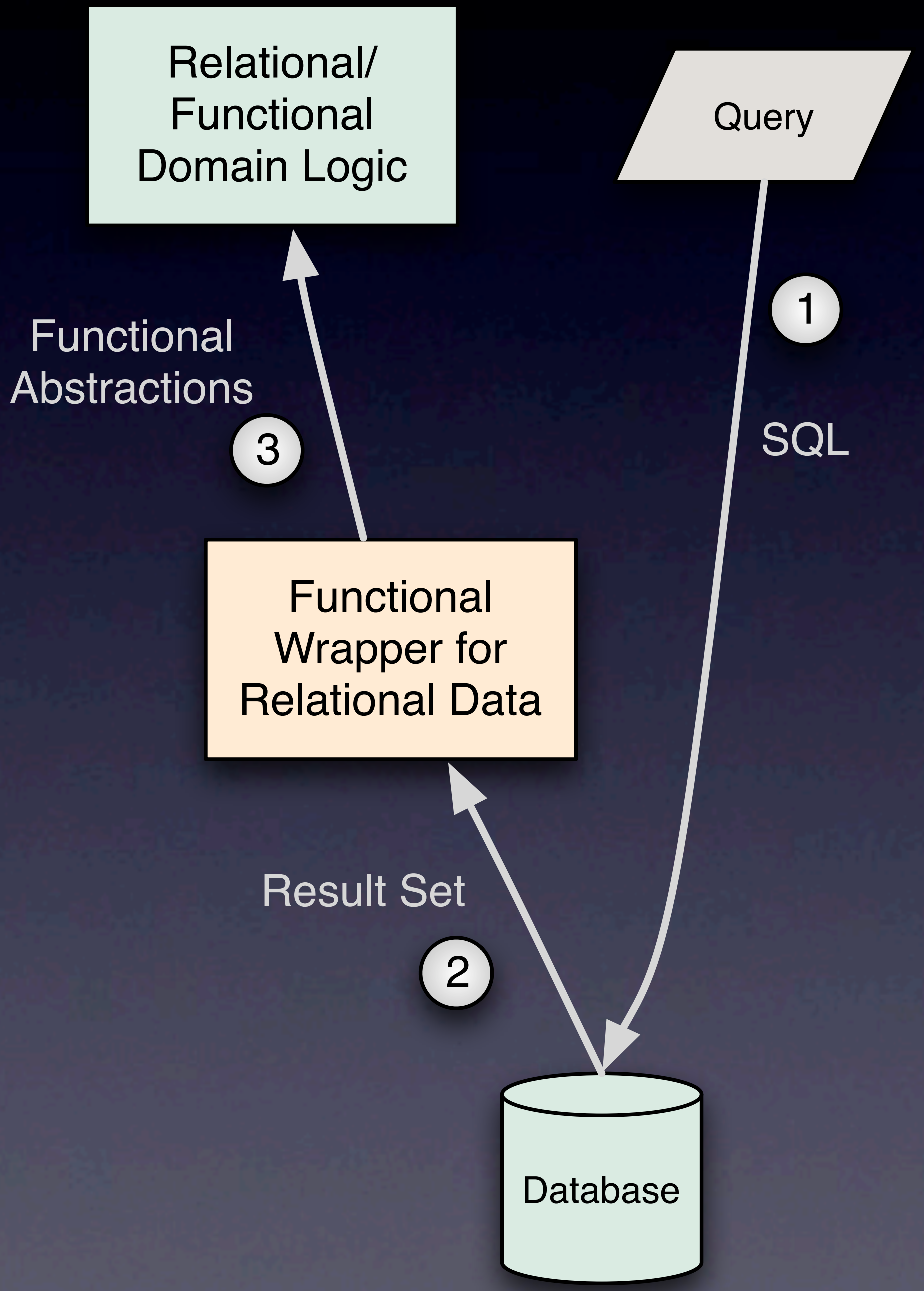


Relational/ Functional Domain Logic
Query
1
SQL
Functional Abstractions
3
Functional Wrapper for Relational Data
Result Set
2
Database

Functional data structures fit Relational data.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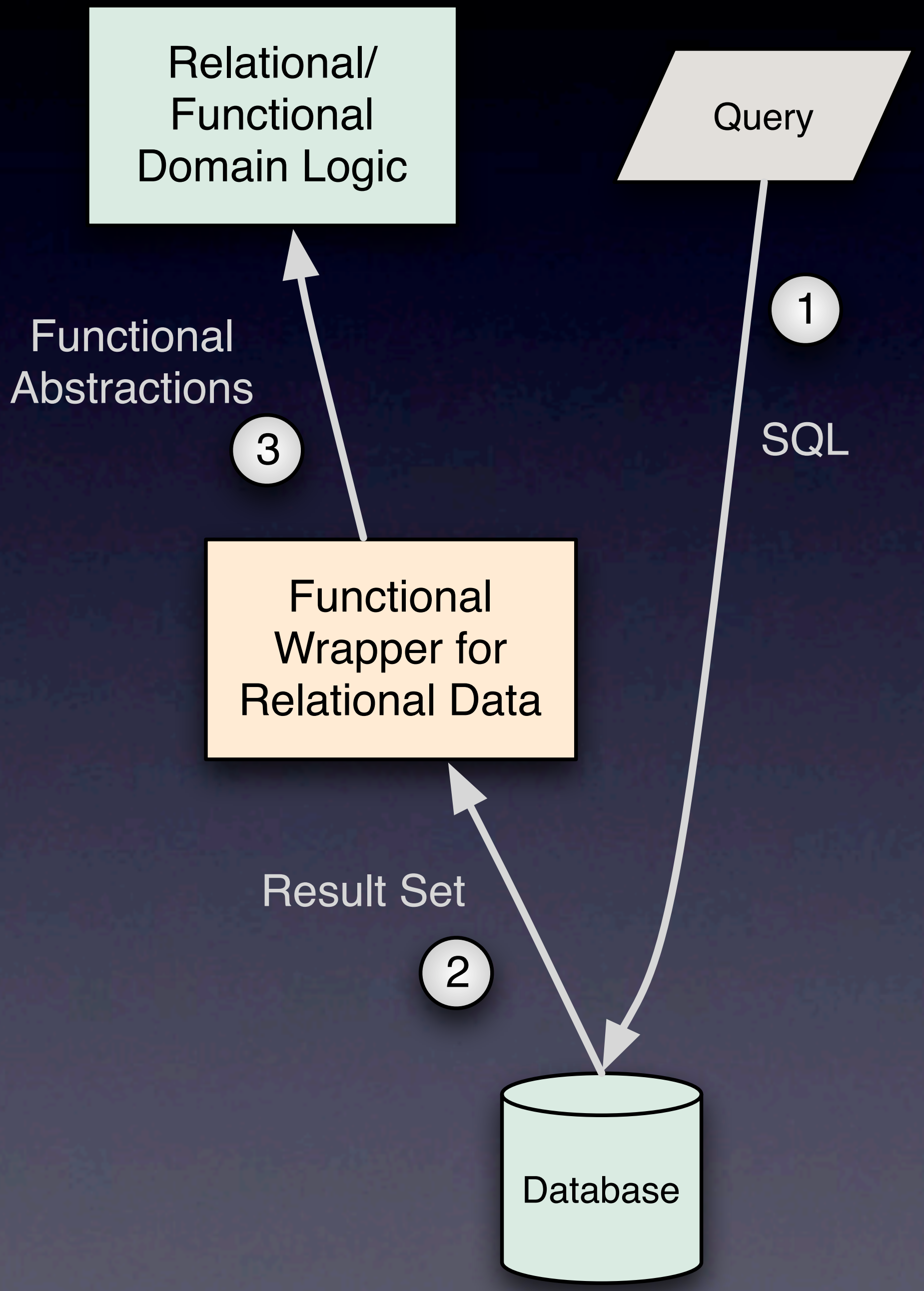
LINQ and similar tools minimize the object-relational impedance.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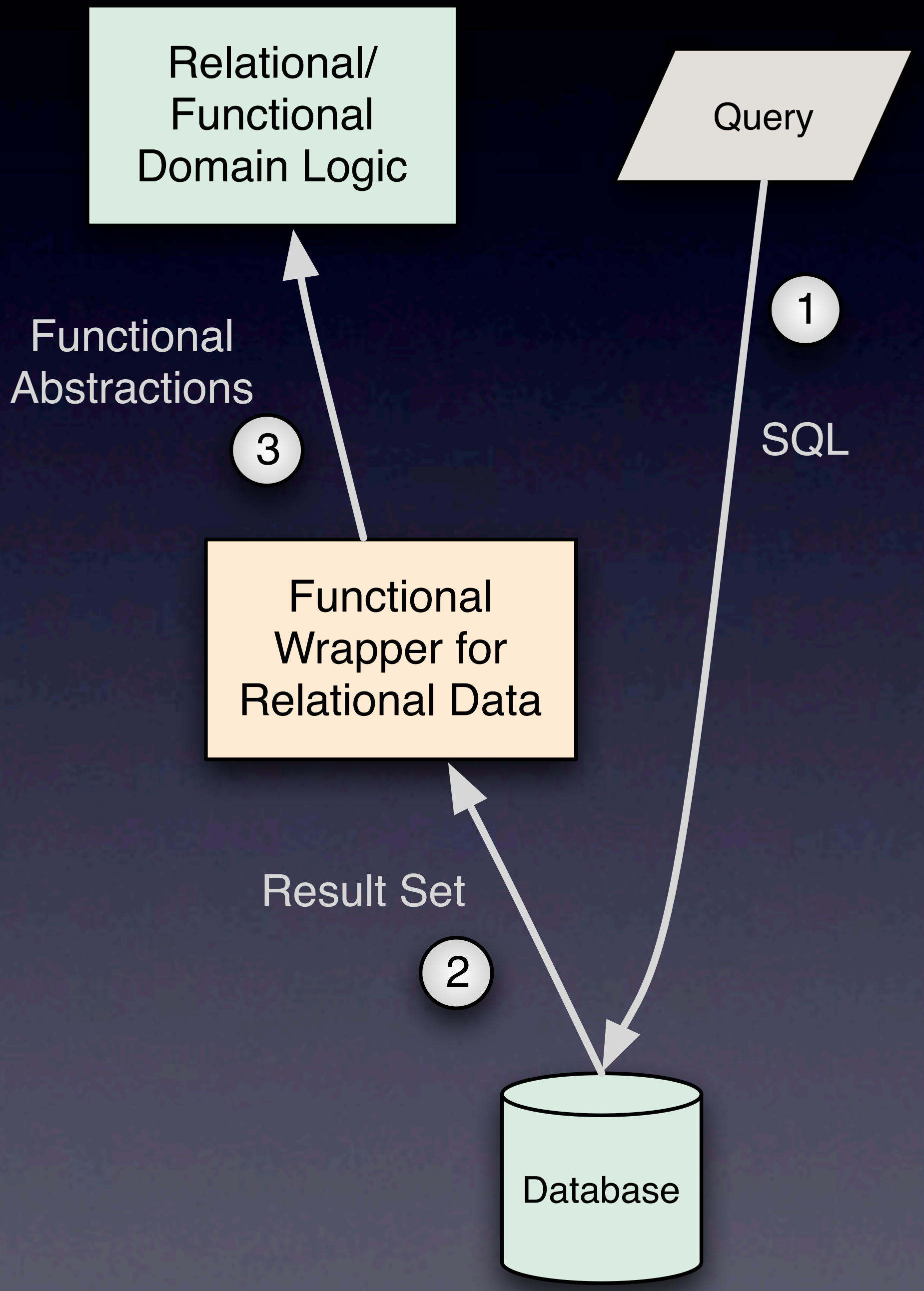
Also, your browser wants JSON...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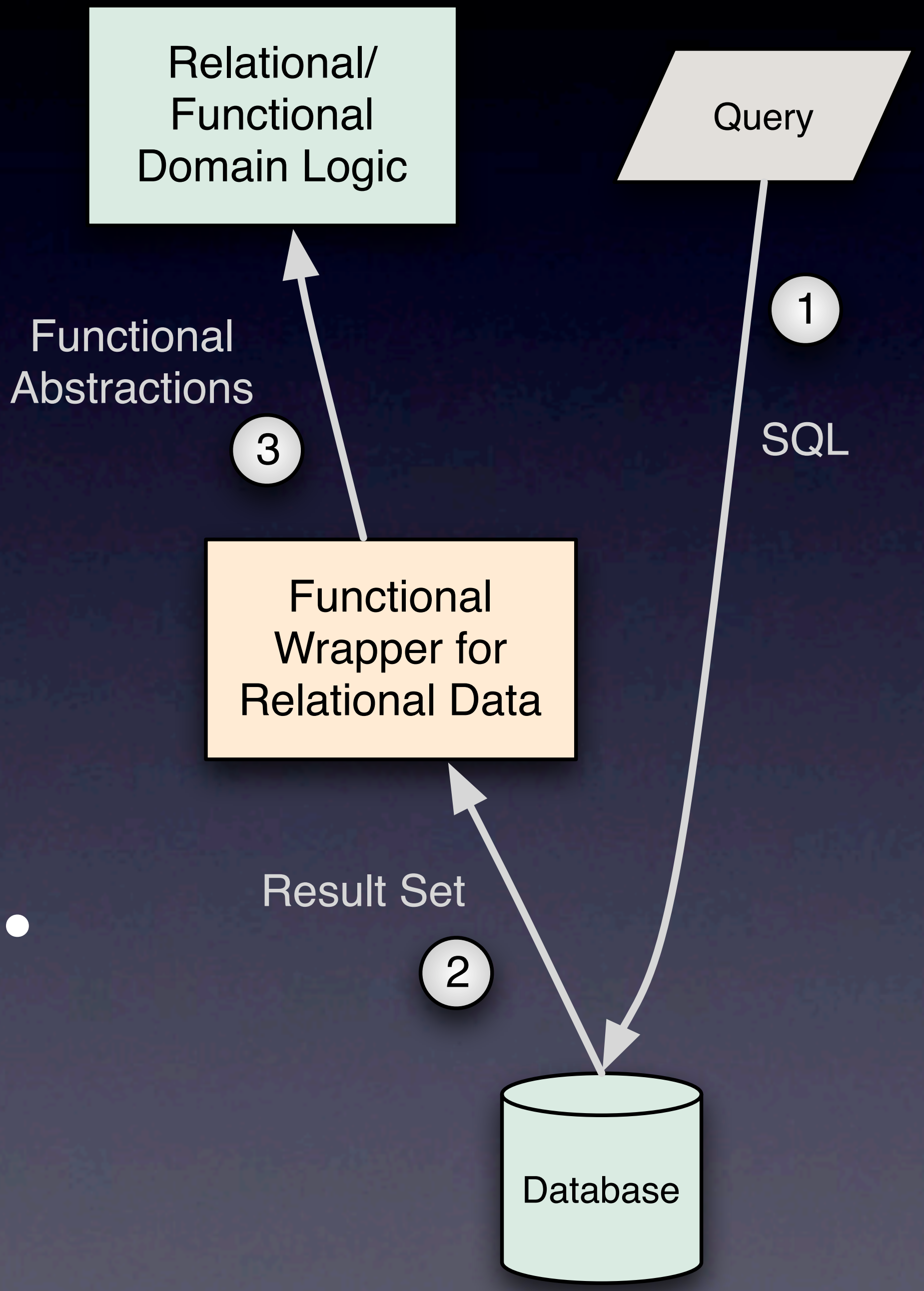
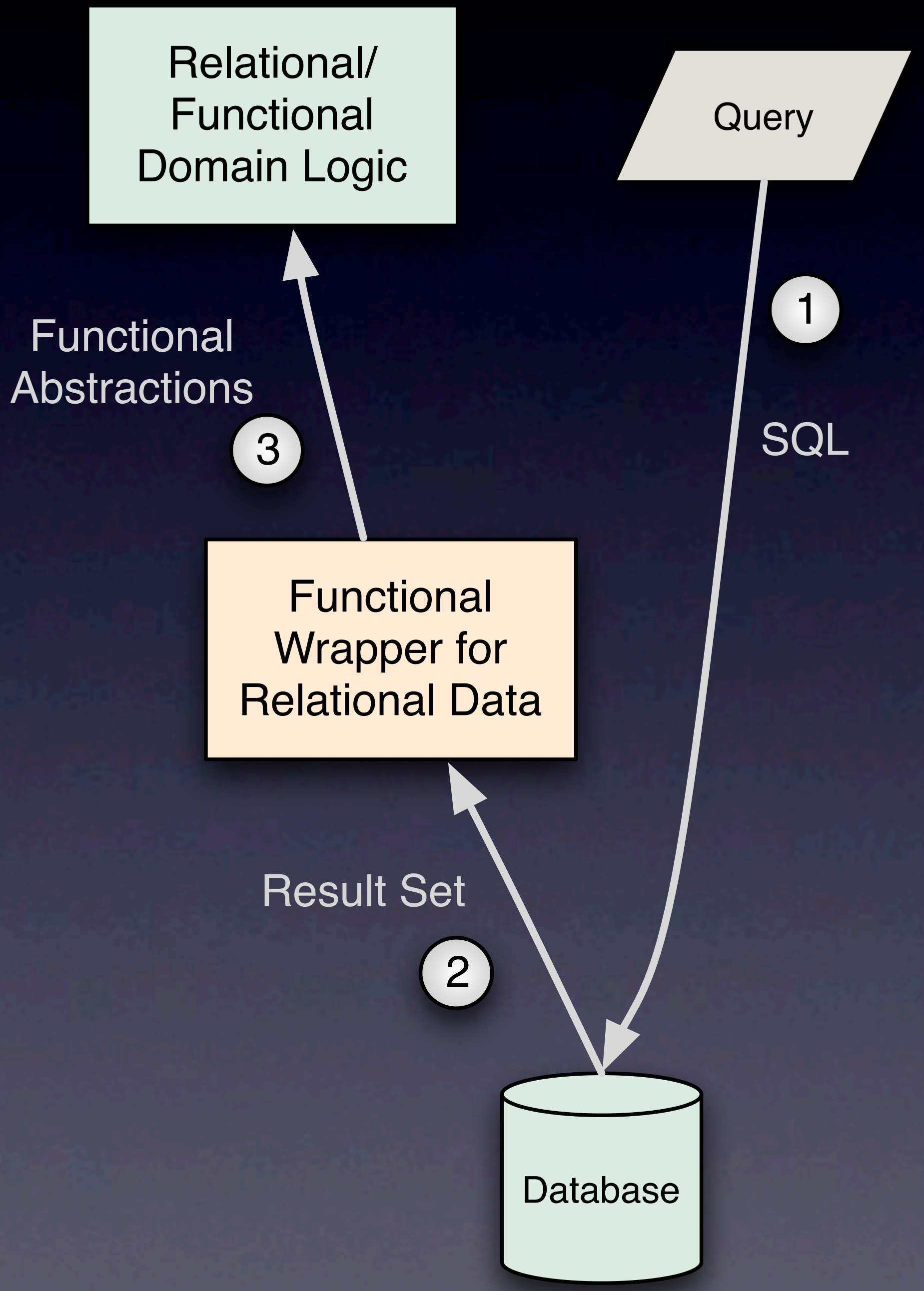
Javascript stack: Browser, Node.js and MongoDB/CouchDB.



Uniform language and data representation.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Object Middleware and ORMs

Heresy or Dogma?

Object Middleware and ORMs

+ if your object model is relatively stable.

+ for many OO languages.

Object Middleware and ORMs

- if high performance is essential.

- for functional languages.

Stupid Scala Trick...

Identifiers with Spaces

```
scala> case class `My Class Has Spaces`(
                     `some int`: Int)
defined class My$u0020Class$u0020Has
$u0020Spaces

scala> val `a value`=
              new `My Class Has Spaces`(1)
a value: My Class Has Spaces = My Class Has
Spaces(1)

scala> println(`a value`)
My Class Has Spaces(1)
```

blog.polyglotprogramming.com/2011/9/14/scala-identifiers-with-spaces

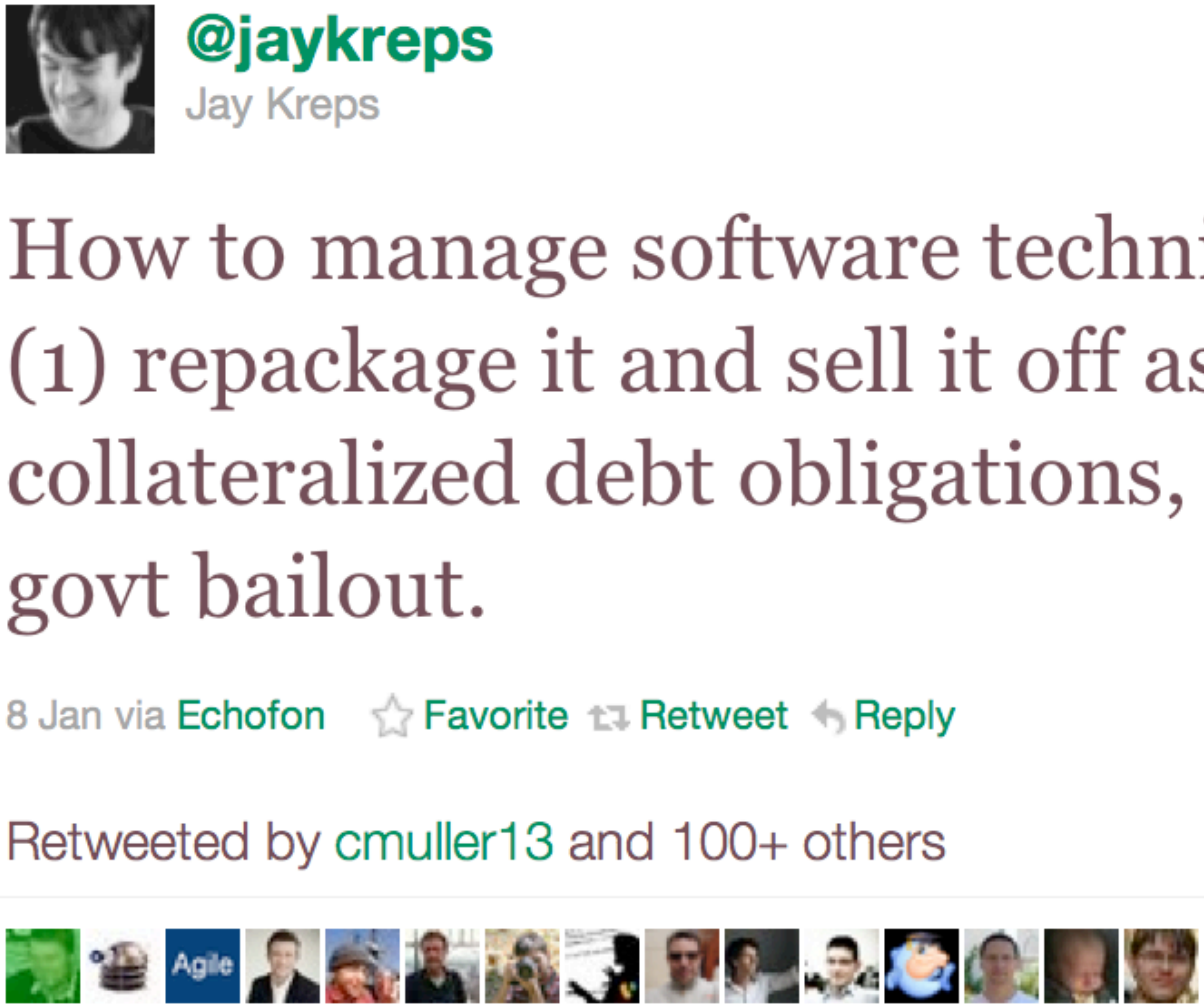
Identifiers with Spaces

Heresy or Dogma?

Java Syntax

```
// JUnit tests:
@Test public static void
`delete(n) removes the nth item`() {
    …
}
// Enums
enum ErrorCodes {
    `Not Found`,
    `Permission Denied`,
    `Corrupt Format`;
    `Get Off My Lawn`;
}
```

Sometimes, whether it's a Dogma or a Heresy is a matter of branding...



@jaykreps
Jay Kreps

How to manage software technical debt: (1) repackage it and sell it off as collateralized debt obligations, (2) await govt bailout.

8 Jan via Echofon ☆ Favorite Retweet Reply

Retweeted by cmuller13 and 100+ others

https://twitter.com/#!/jaykreps/status/23814156104769536

Thank You!

dean@deanwampler.com
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