Clojure on Mongo: Fun and Easy with CongoMongo

MongoDB Los Angeles
Aaron Crow, Software Engineer
aaron@factual.com
@factual_aaron

Clojure on Mongo at Factual

I wanted high developer productivity while writing a task queueing system that uses MongoDB

Factual Global Places

- 55+ million place entities
- 45+ countries
- 17+ million sources
- 2.3 billion inputs

Factual curates data for you...

...all day long...

AGGREGATING
NORMALIZING
MERGING
PURGING
DE-DUPING
MAPPING
KEEPING EVERYTHING UP TO DATE

Find sushi restaurants in LA

Factual Public API Call:

```
api.v3.factual.com /t/places?filters=
  {"locality":"los angeles"}&q=sushi
```

Returns JSON:

```
factual_id: "0015f529-1a5d-4966-9cc9-ce59423f09af", name: "Chopstick Sushi and Roll",
factual_id: "053514fc-65f2-42a7-948d-787f9e050bf9", name: "Sushi Ko", ...
factual_id: "05f2847a-acbf-4dcd-ac16-5d828d40721d", name: "Sushi Moon", ...
...
```

We Need Solid Task Management

factual.

Otherwise, badness:

- Too many humans need to be involved
- Too much manual labor
- Confusion reigns, lack of coordination
- Tasks “die on the vine”

“Vineyard” -- Task Management

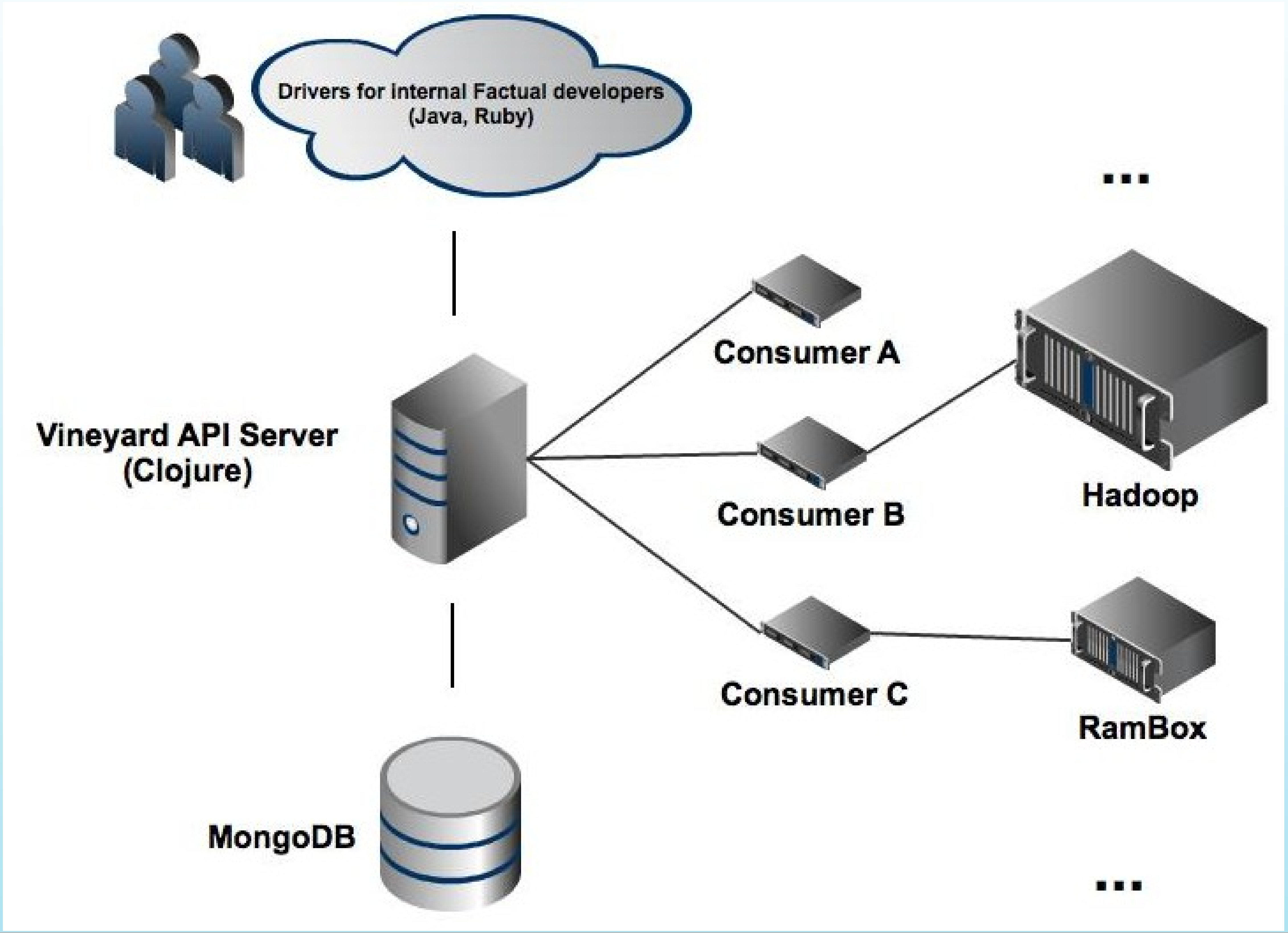
factual.

Simple Requirements

- Push tasks on to resource queues
- Associate tasks with each other
- Pop tasks off of resource queues
- Track and admin tasks
- Support Factual specific requirements

Vineyard Architecture

factual



?

Why MongoDB?

factual.

Why Clojure?

factual

"It is better to have 100 functions operate on one data structure than 10 functions on 10 data structures."

-- Alan Jay Perlis (1922 – 1990)

First recipient of Turing Award

Clojure, Mongo, and Data Structures

```
{:status :RUNNING
 :submitter_hostname "Aaron-Crows-MacBook-Air.local"
 :heartbeat {:$lt 1326848557622}
 :attempts {:$lt 3}}
```

Clojure, Mongo, and Data Structures

factual.

```
({:_id "de2e139b-cd9c-4491-a1a1-70351147db76",
  :status "PENDING",
  :attempts 0,
  :init_data {:key1 "value1", :key2 "value2"}}
 {:_id "06d11a9d-8740-40f6-991c-176f35670320",
  :attempts 0,
  :status "PENDING",
  :init_data {:my_key "1", :another_key "2"},
 {:_id "6b8ae690-f4e8-4a0d-a084-6b8feb5aa9ed",
  :attempts 0,
  :heartbeat 1326945926732,
  :status "DONE",
  :next_tasks
    ["27926cb3-2fd0-49f6-817b-acecef6ab673"
     "20dfec67-457e-4a82-8c7d-e78b0b3dc9b5"
     "bec1caea-e8ef-4409-8073-ef7131425359"]})
```

Clojure, Mongo, and Data Structures

```
(first (get-in t [:init_data :key2]))

(assoc-in t [:init_data :key2] :new_val)

(map :submitter_hostname tasks)

;; etc. etc. etc.
```

Why CongoMongo?

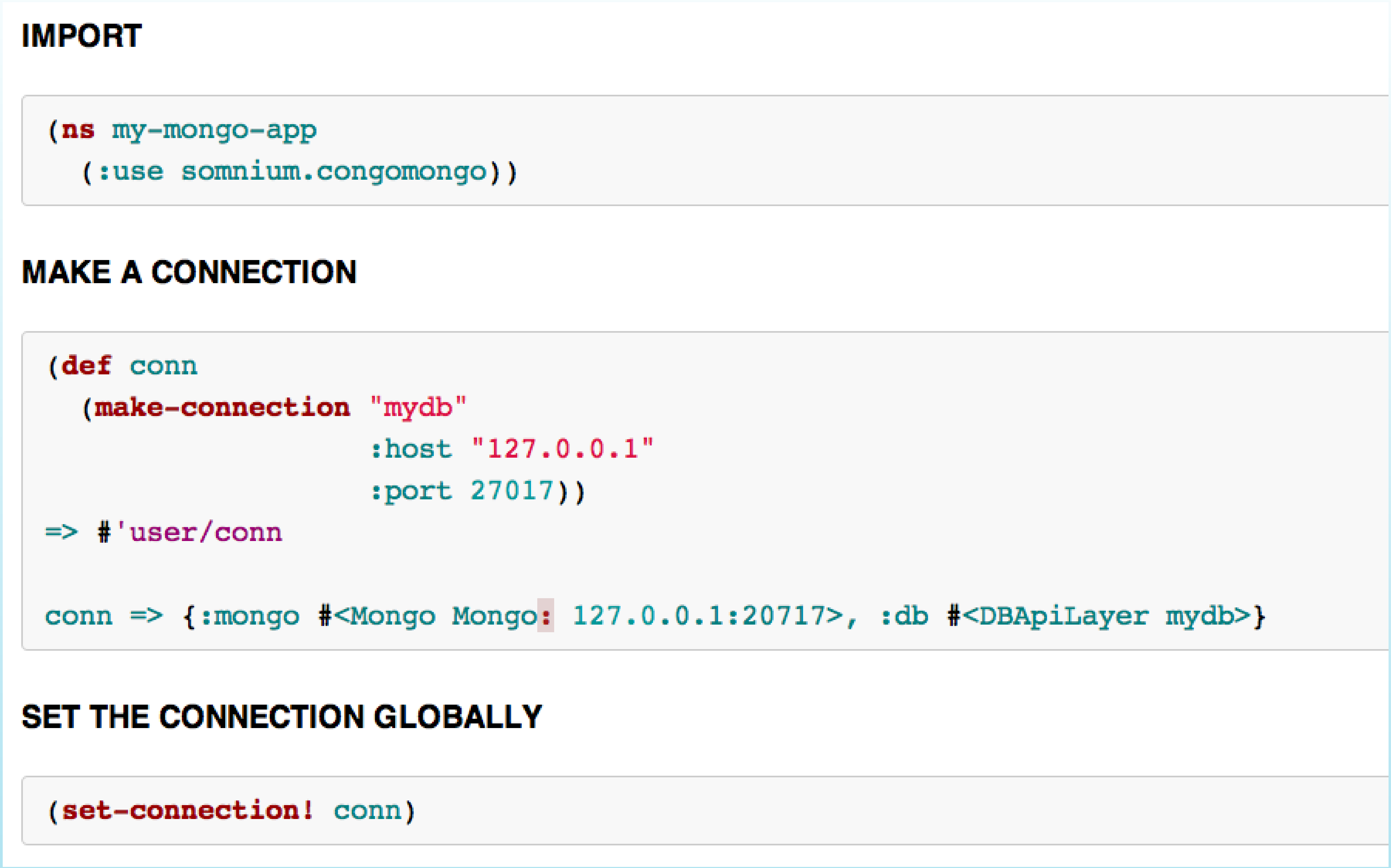
factual

- Because it was there!

But also...

- Well designed
- Well maintained
- Well documented

https://github.com/aboekhoff/congomongo



IMPORT

```
(ns my-mongo-app
  (:use somnium.congomongo))
```

MAKE A CONNECTION

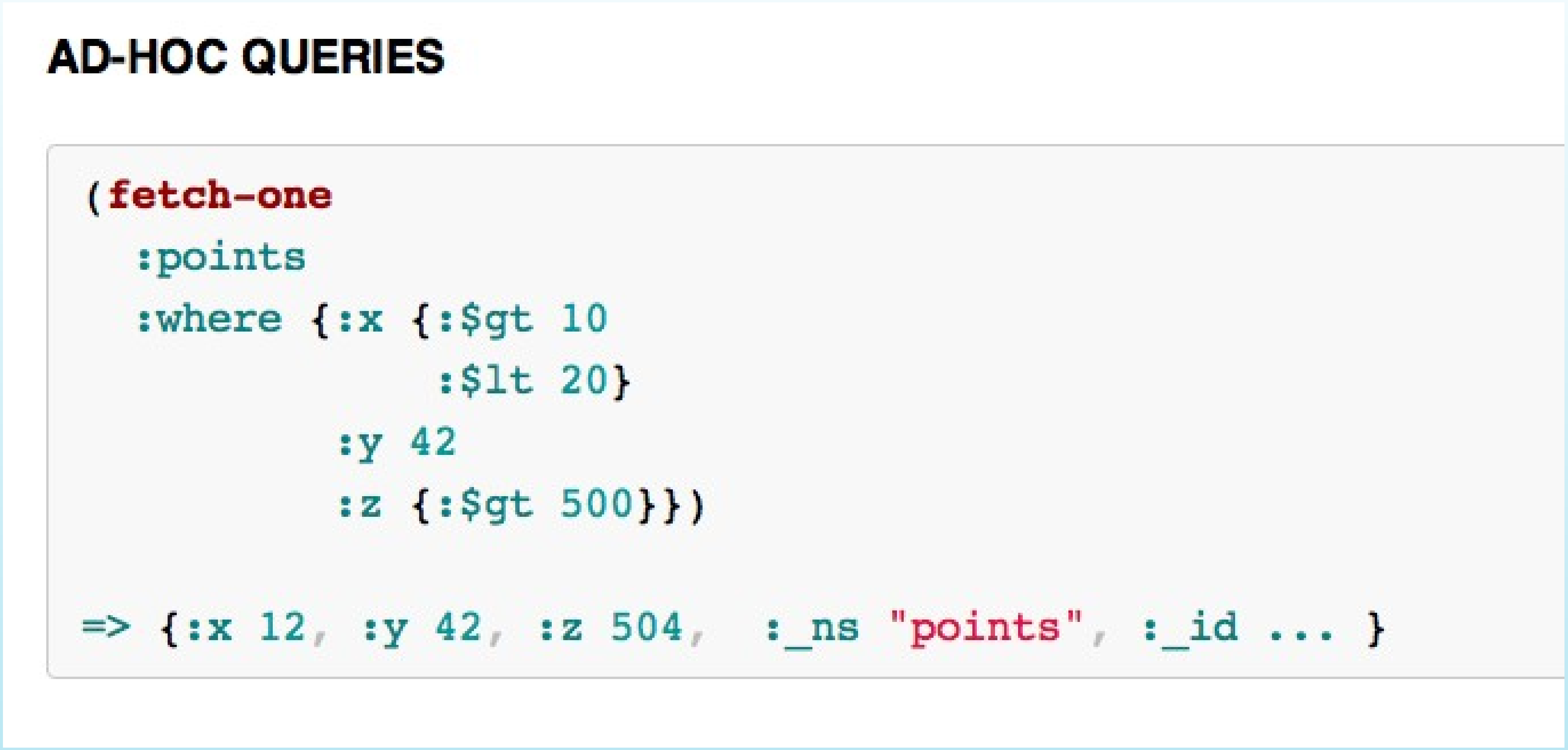
```
(def conn
  (make-connection "mydb"
                   :host "127.0.0.1"
                   :port 27017))
=> #'user/conn

conn => {:mongo #<Mongo Mongo: 127.0.0.1:20717>, :db #<DBApiLayer mydb>}
```

SET THE CONNECTION GLOBALLY

```
(set-connection! conn)
```

https://github.com/aboekhoff/congomongo



AD-HOC QUERIES

```
(fetch-one
  :points
  :where {:x {:$gt 10
              :$lt 20}
          :y 42
          :z {:$gt 500}})

=> {:x 12, :y 42, :z 504,  :_ns "points", :_id ... }
```

Exemplary Java

```
DBCollection coll = db.getCollection("tasks");
BasicDBObject query = new BasicDBObject();
query.put("attempts", new BasicDBObject(
  "$gt", 3));

return coll.find(query).toArray();
```

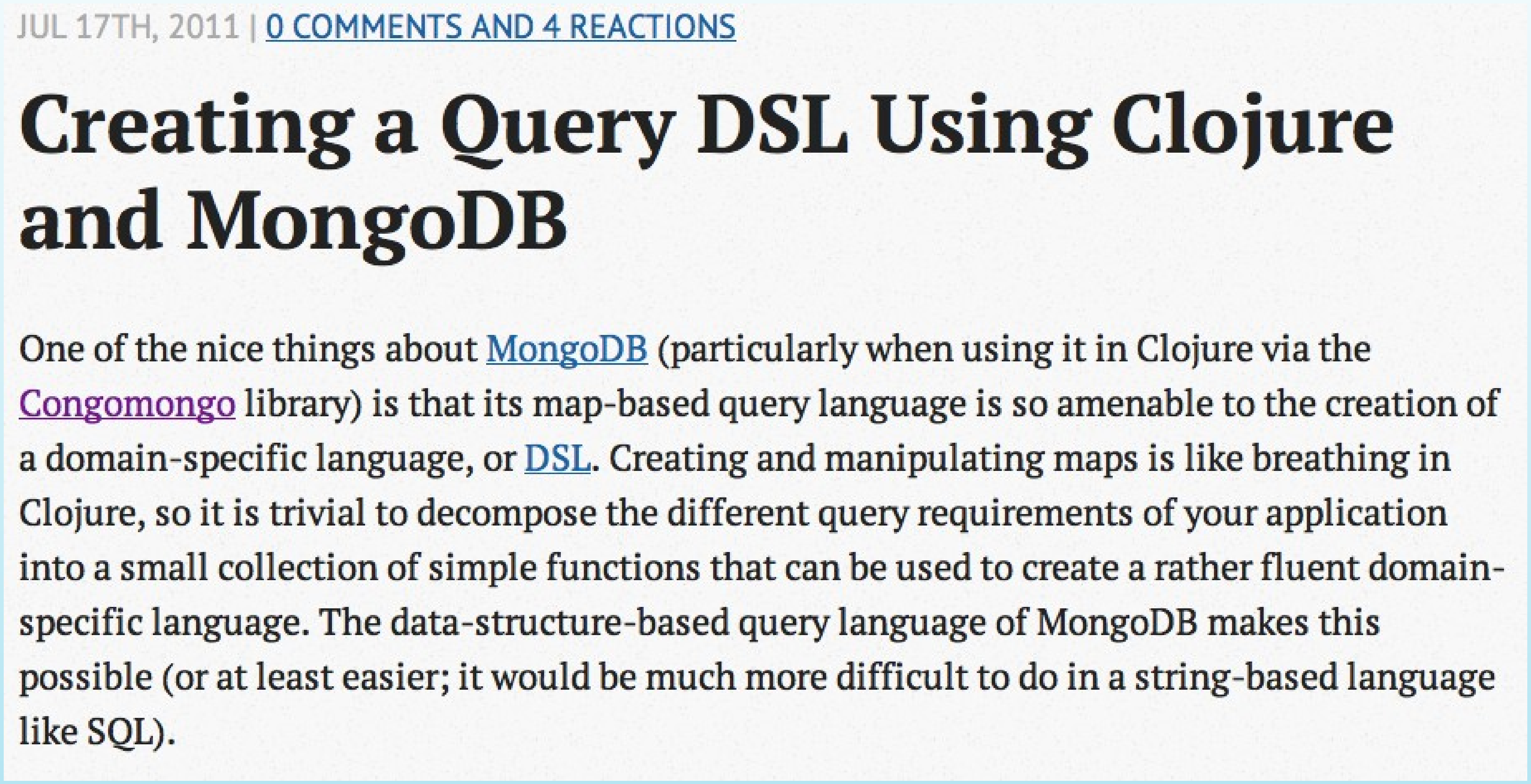
Exemplary Clojure

```
(fetch :tasks :where {:attempts {:$gt 3}})
```

Exemplary DIY DSL

```
(get-tasks (where (attempts< 3)))
```

Inspired by “Christopher Maier's Technical Blog”



JUL 17TH, 2011 | 0 COMMENTS AND 4 REACTIONS

Creating a Query DSL Using Clojure and MongoDB

One of the nice things about MongoDB (particularly when using it in Clojure via the Congomongo library) is that its map-based query language is so amenable to the creation of a domain-specific language, or DSL. Creating and manipulating maps is like breathing in Clojure, so it is trivial to decompose the different query requirements of your application into a small collection of simple functions that can be used to create a rather fluent domain-specific language. The data-structure-based query language of MongoDB makes this possible (or at least easier; it would be much more difficult to do in a string-based language like SQL).

```clojure
; “That’s almost exactly what the
; equivalent request would be in
; plain English. You don’t get much
; simpler.”
(find-psms
  (matching-peptide "GLYQRPHDSTRFK")
  (with-e-value-cutoff 0.001)
  (in-region {:chromosome "X"
              :strand "+"
              :start 12345
              :stop 34567}))
```

Insulate from changes

Working with maps in Clojure is like breathing

Small simple DSL fns that you can compose

?

“Trellis”: Watch over tasks

```
(fetch
   :tasks
   :where {:status :RUNNING
           :heartbeat {:$lt (minutes-ago 10)}
           :attempts {:$lt 3}})
```

Trellis with a DSL

```
(get-tasks
   (where
    (status= :RUNNING)
    (stale-heartbeat)
    (attempts< 3)))
```

How I really want to live!

factual.

```
(repush-all! (died-on-vine))
```

Some DSL implementation

```clojure
(defn where [& criteria]
  (apply merge criteria))

(defn get-tasks [filters]
  (fetch :tasks :where filters))

(defn heartbeat< [time]
  {:heartbeat {:$lt time}})

(defn stale-heartbeat []
  (heartbeat< (minutes-ago 10)))
```

?

Clojure DSL on Factual (PrettyQL)

```
(select restaurants-us
  (around {
   :lat 34.06021 :lon -118.4183 :miles 3})
  (where
    (= :meal_deliver true)
    (= :meal_dinner true))
  (order :$distance)
  (limit 3))
```

A blaster is f ne... but...

… a lightsaber is a game changer.

Thanks CongoMongo devs!
aboekhoff
purcell
christophermaier
njackson
seancorfield
(and friends!)

Mongo LA Meetup @ Factual!

aaron@factual.com
@factual_aaron
http://github.com/dirtyvagabond/mongola