/mount

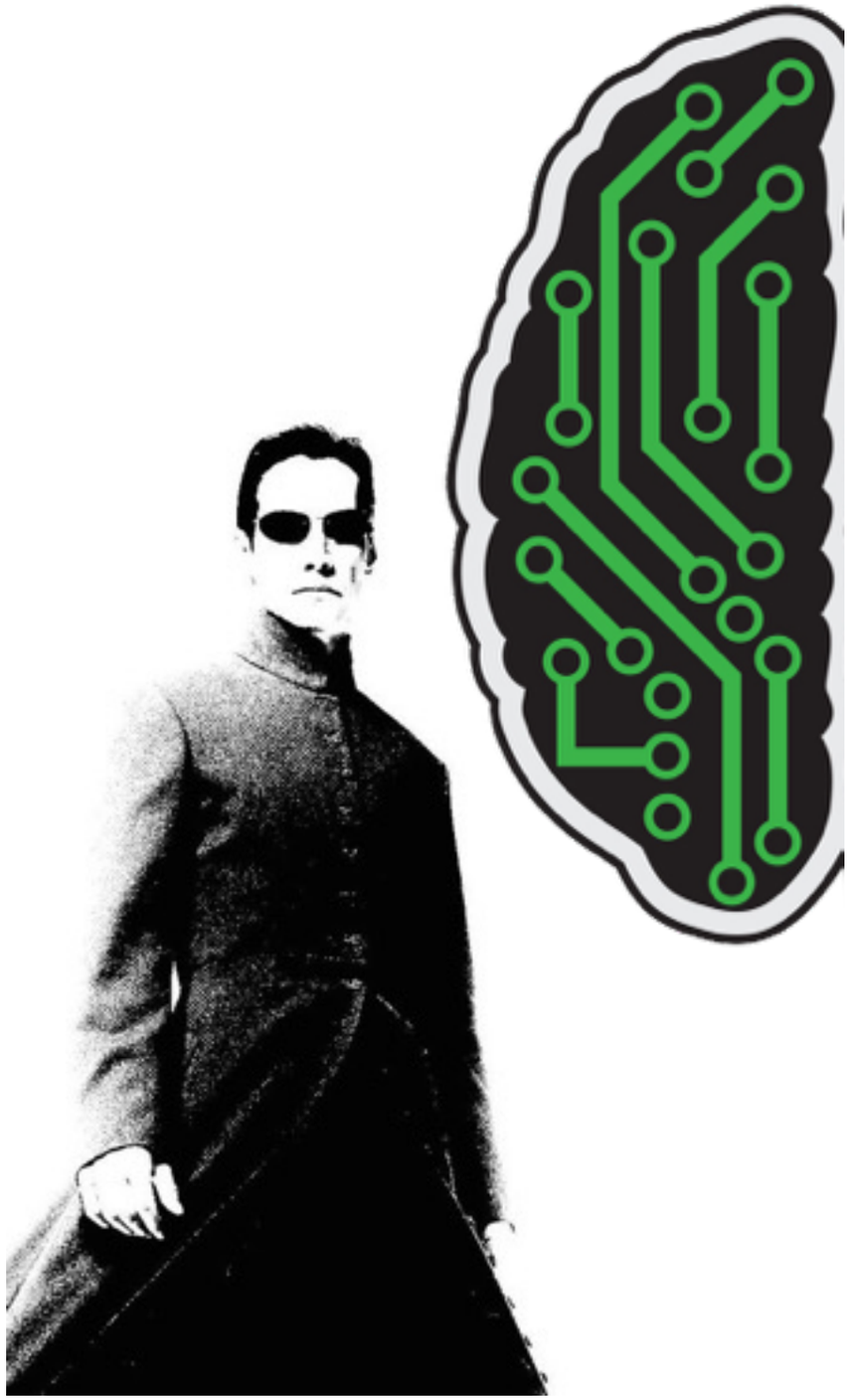
@tolitius

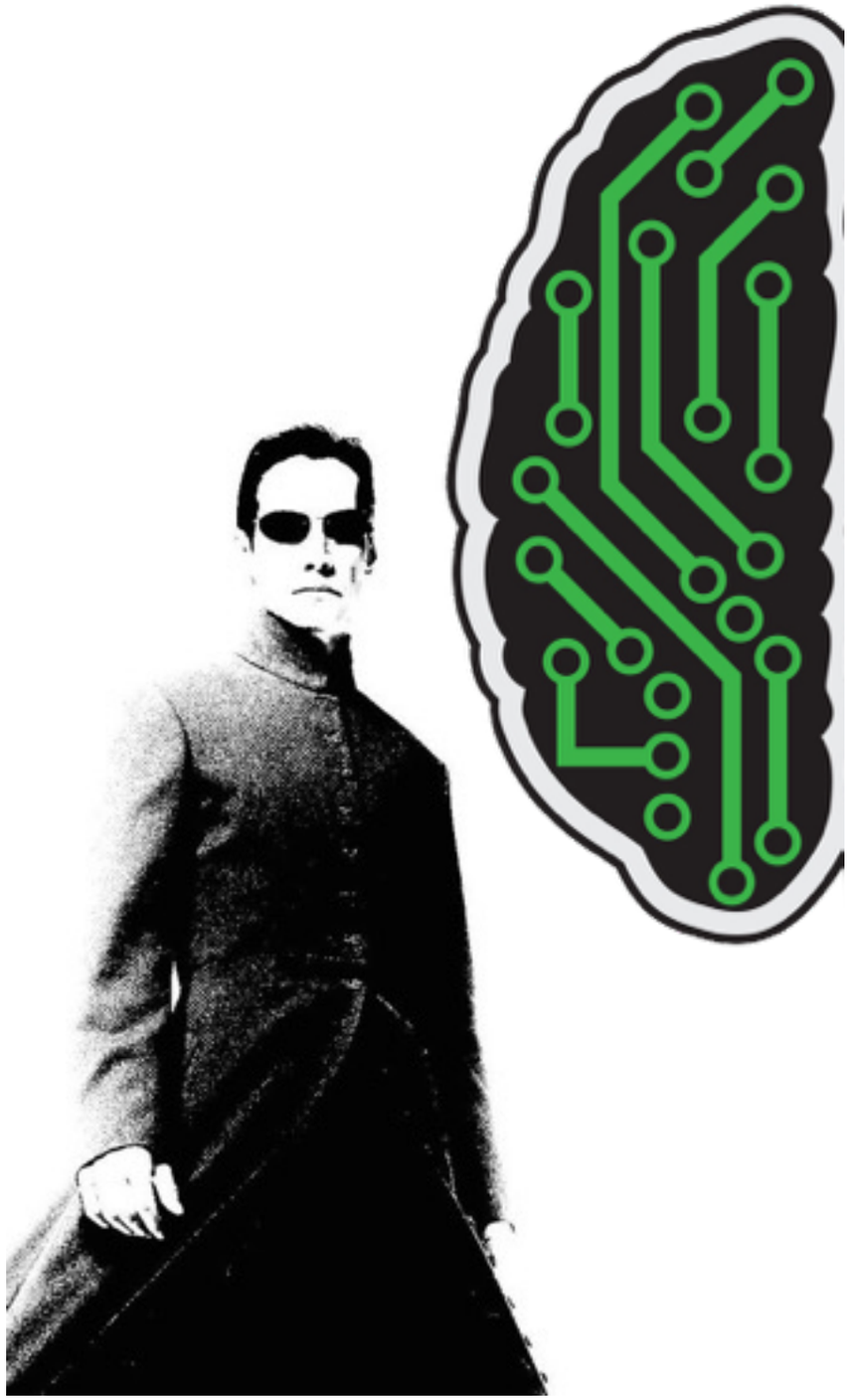
CHARIOT SOLUTIONS

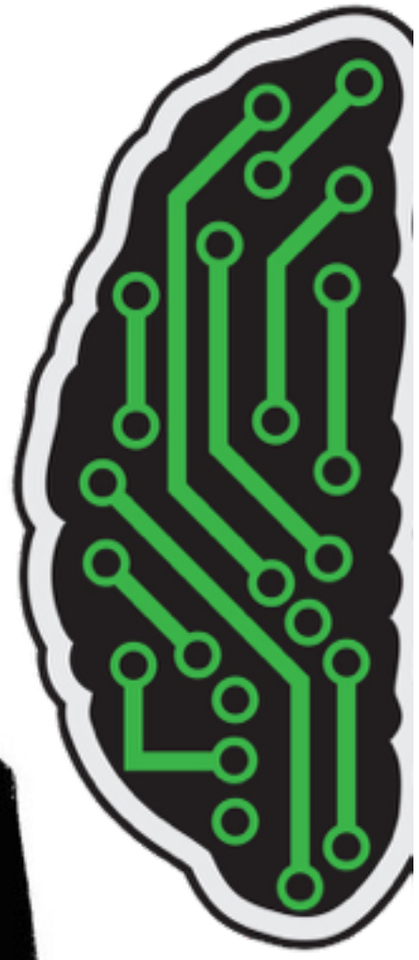
doall

```
(map thank #{   })
```

HOMEGROWNLABS







(reload :neo)

REPL

Level 9

Score 100

react to business needs

as secure as possible

rely on

defonce

as open as possible

react to *my* needs

explore / hack on

redef

Level

Score ***Overflow***

Level 9

Score 100

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Level 9

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::

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redef

Level

Score ***Overflow***

Problems

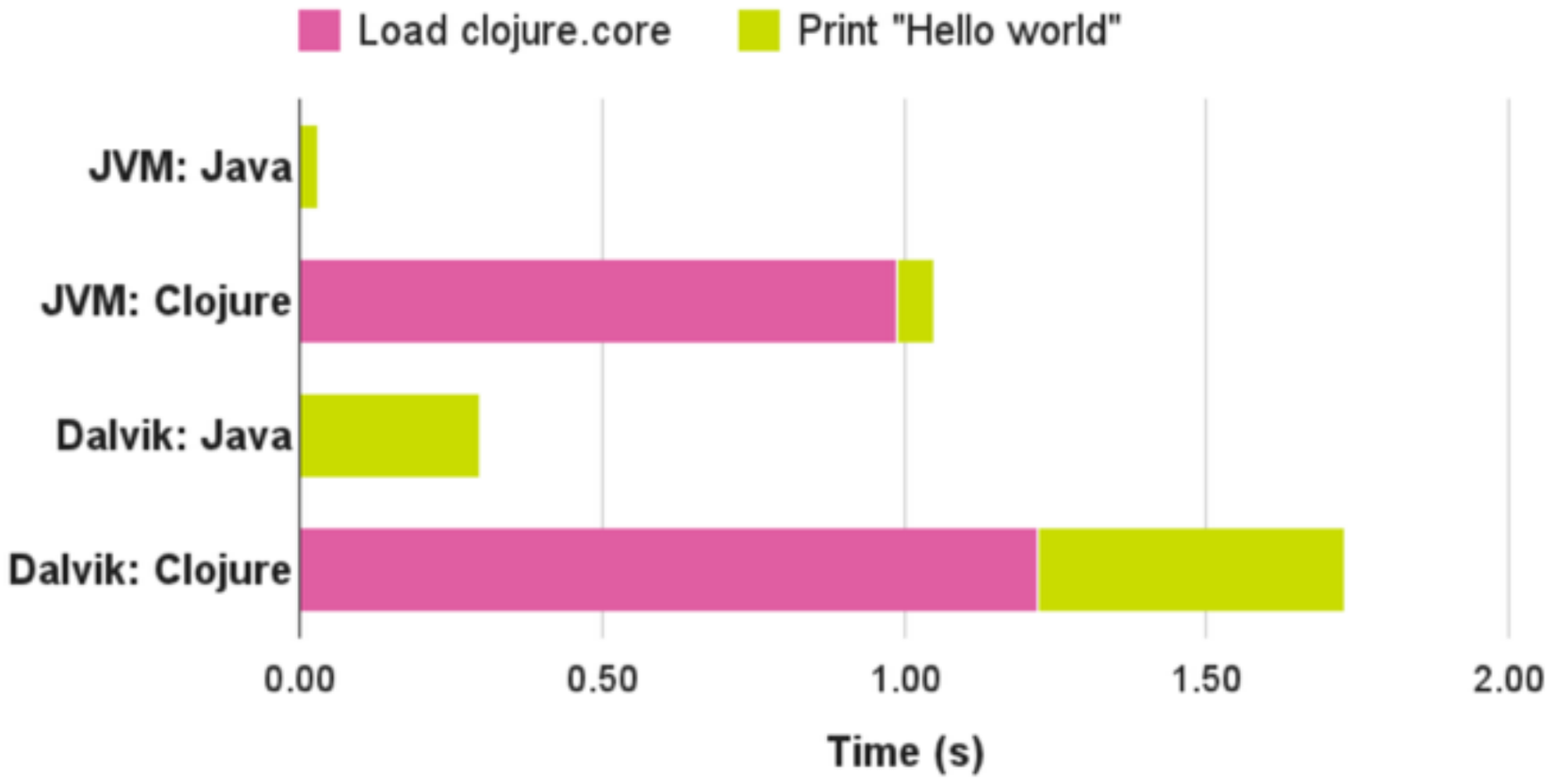
Problems

that impact development flow

problem

REPL Launch Time

source: "Why is Clojure bootstrapping so slow?"



problem

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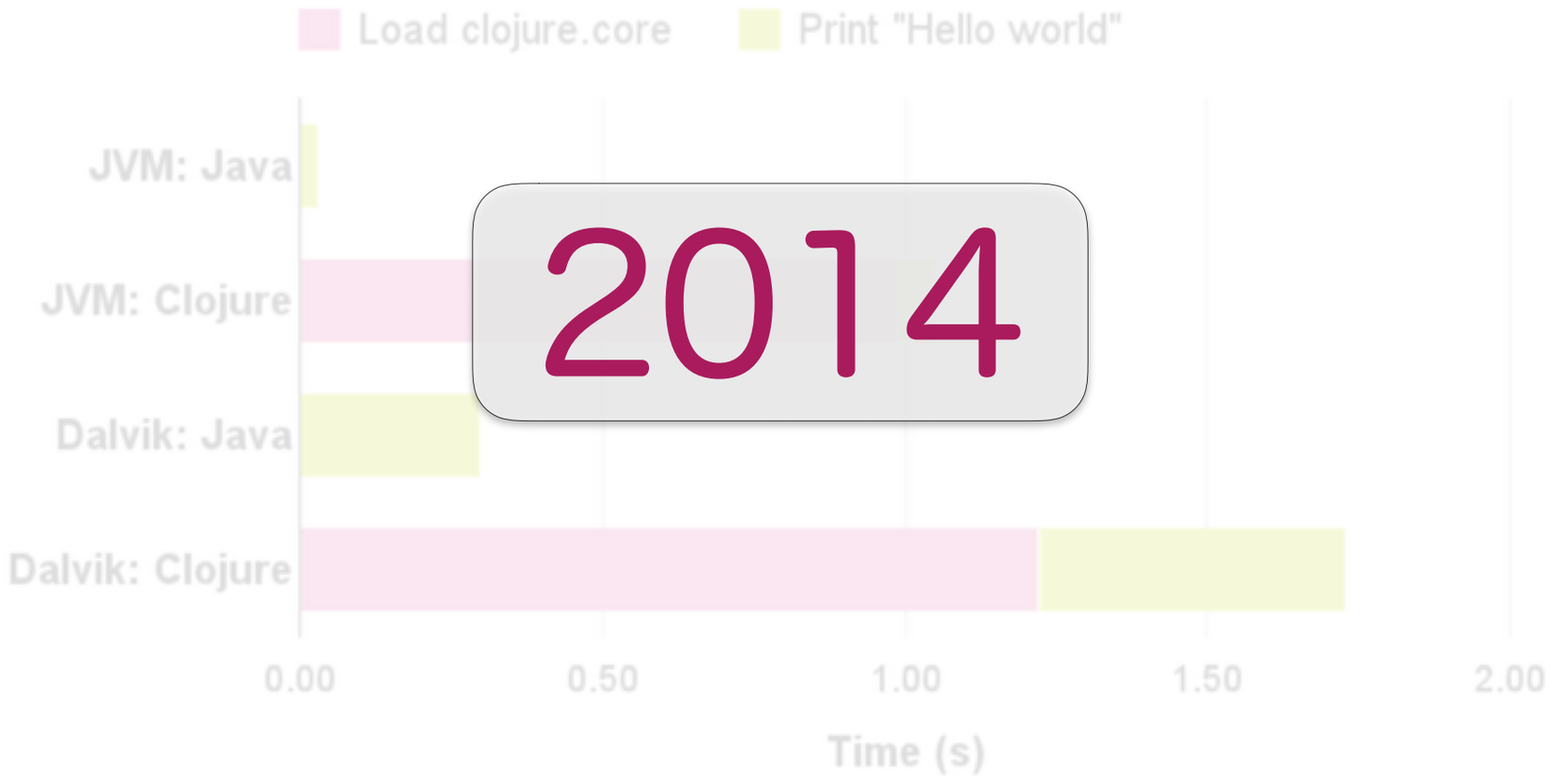

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REPL Launch Time

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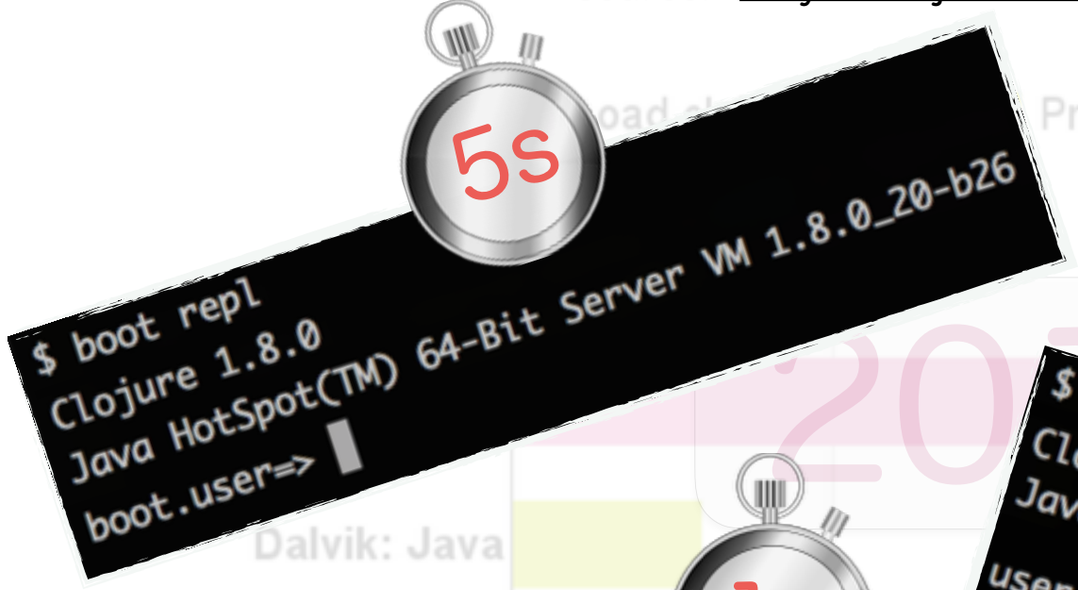

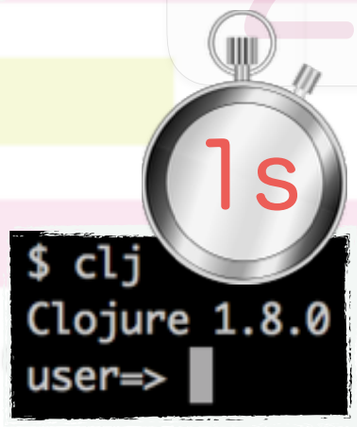

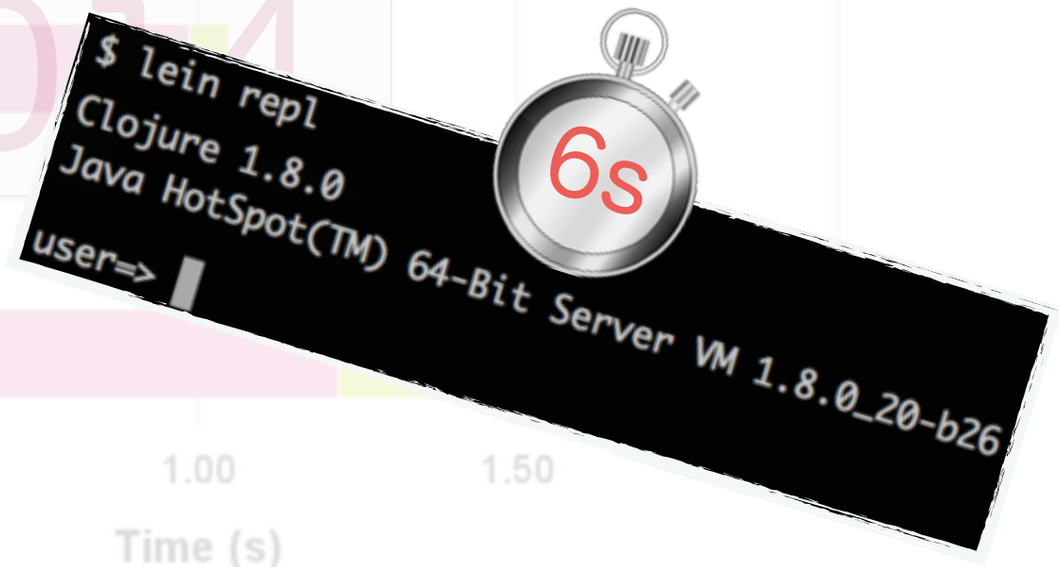

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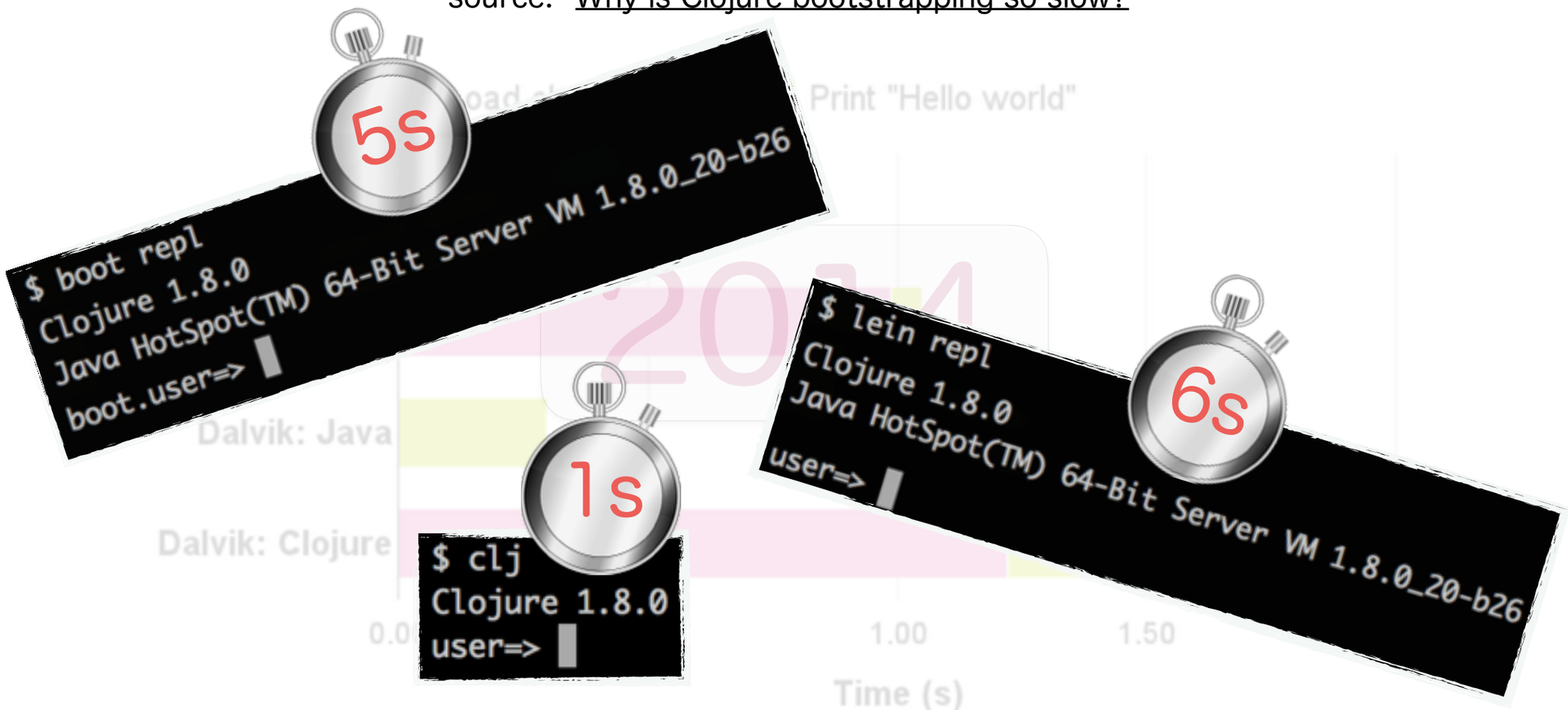

impacts development flow

problem

REPL Launch Time

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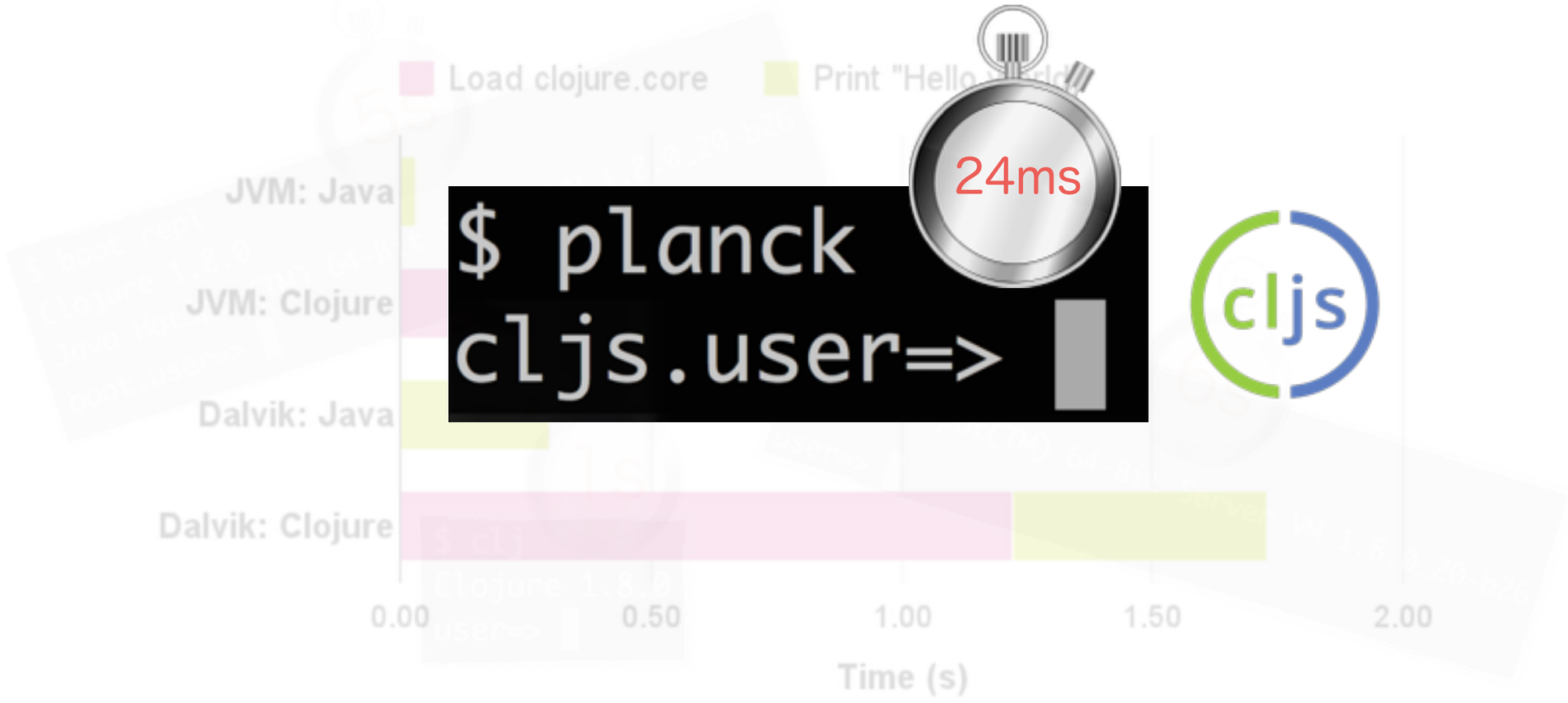


impacts development flow

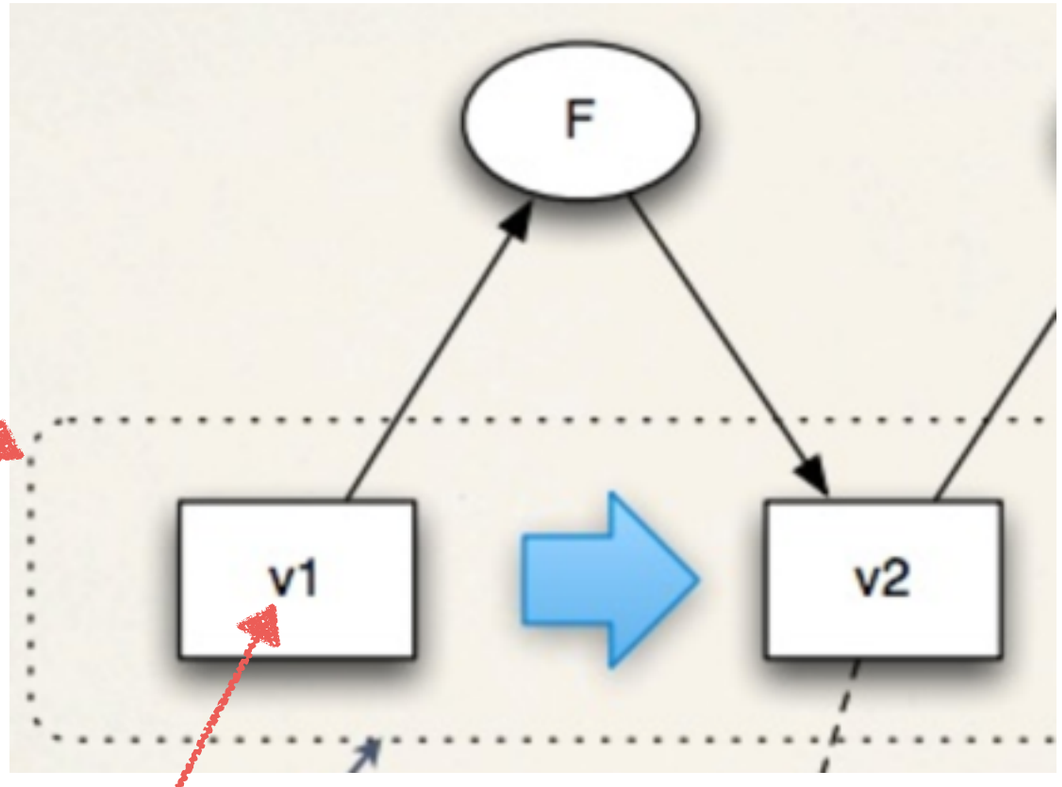
problem

Namespace Recompilation

problem

Namespace Recompilation

db connection

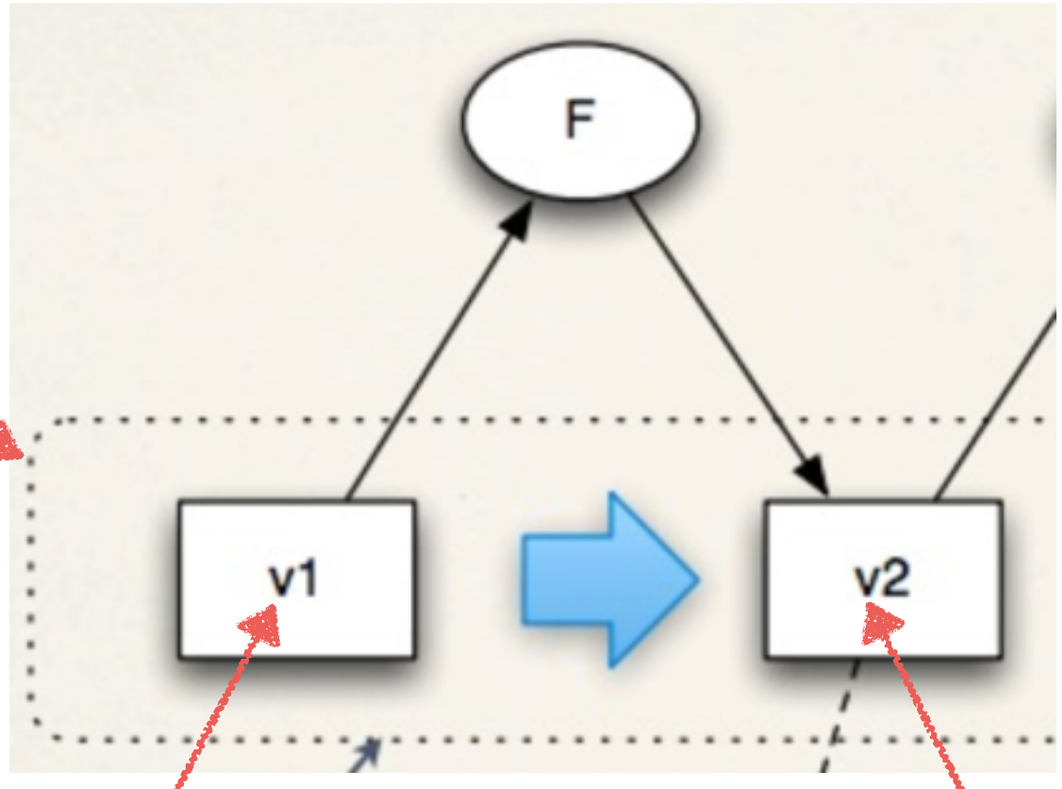



```
{:status :disconnected
 :conn connection-object}
```

problem

Namespace Recompilation

db connection




```
{:status :disconnected
 :conn connection-object}
```

```
{:status :connected
 :conn connection-object}
```

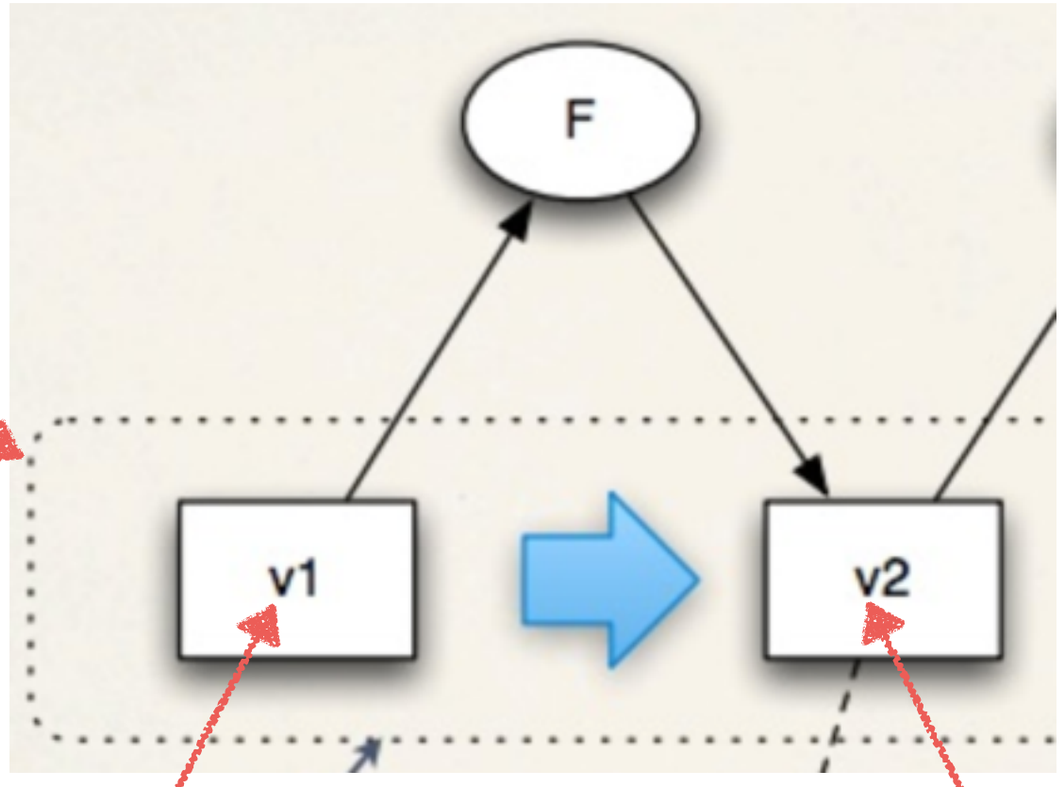
problem

Namespace Recompilation

i.e. atom

db connection

ns reload

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problem

impacts development flow
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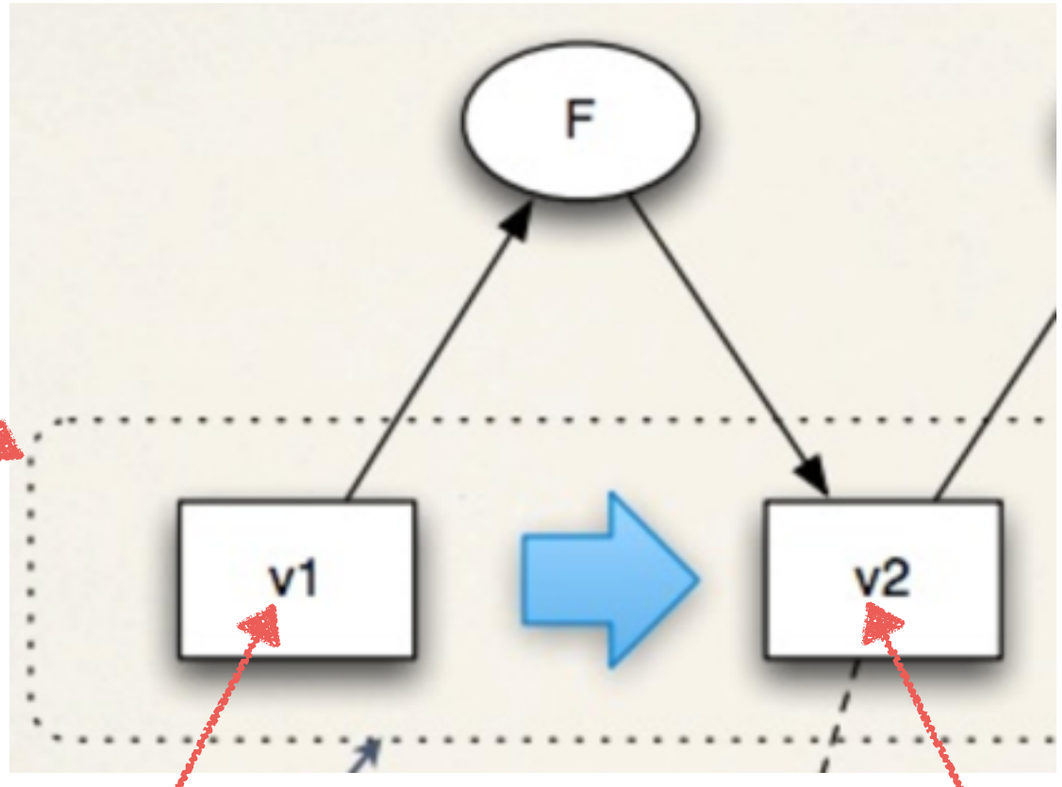


```
{:status :disconnected
 :conn connection-object}
```

```
{:status :connected
 :conn connection-object}
```

problem

Mutability of External Resources

problem

Mutability of External Resources

- DB connections close
- DB is used by other applications (data)
- Socket connections close / timeout
- Files get moved
- Threadpool workers die / livelock / deadlock

problem

Mutability of External Resources

- DB connections close
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gets a little out of control

problem

Mutability of E l Resources

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- Threadpo ck / deadlock

gets a little out of control

problem

Mutability of E… l Resources

- Files ge… / timeout
- Threadpo… …ck / deadlock

gets a little out of control

impacts development flow

Decouple Resources from Application Logic

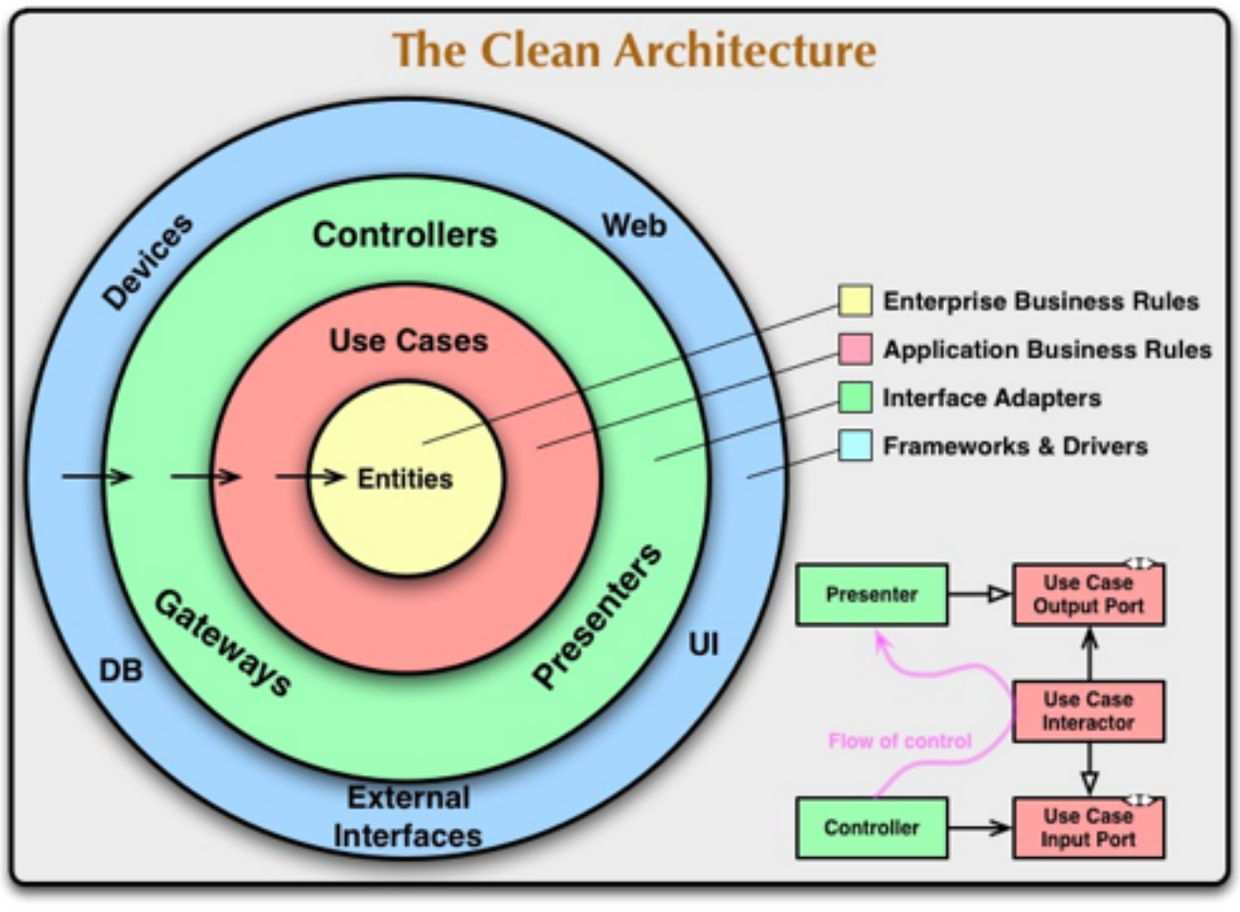
Decouple Resources from Application Logic

- Minimizing code that has access to the resource
- Keeping external resources at the application edges

idea

Decouple Resources from Application Logic

- Minimizing code that has access to the resource
- Keeping external resources at the application edges

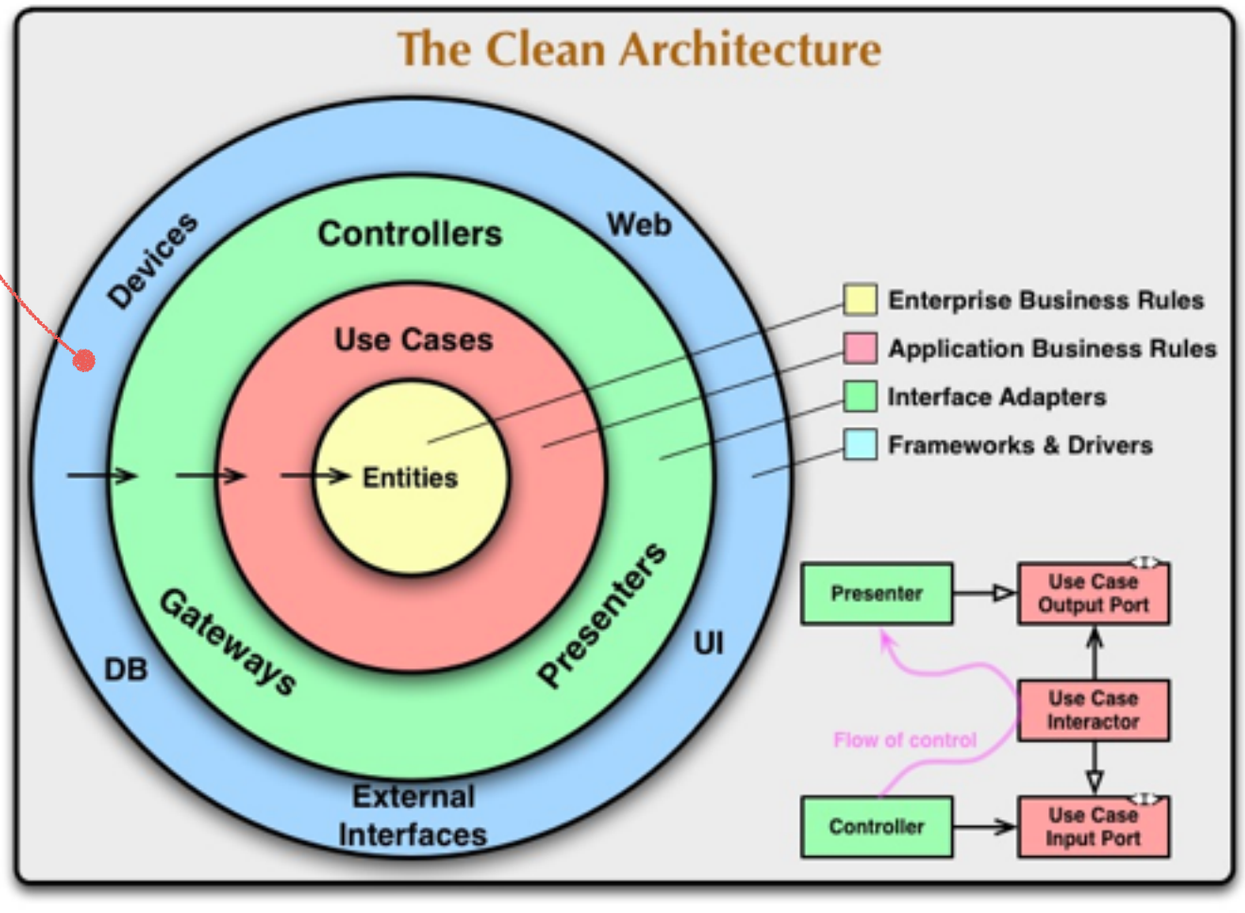


source: "https://blog.8thlight.com/uncle-bob/2012/08/13/the-clean-architecture.html"

idea

Decouple Resources from Application Logic

- Minimizing code that has access to the resource
- Keeping external resources at the application edges



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idea

Decouple Resources from Application Logic

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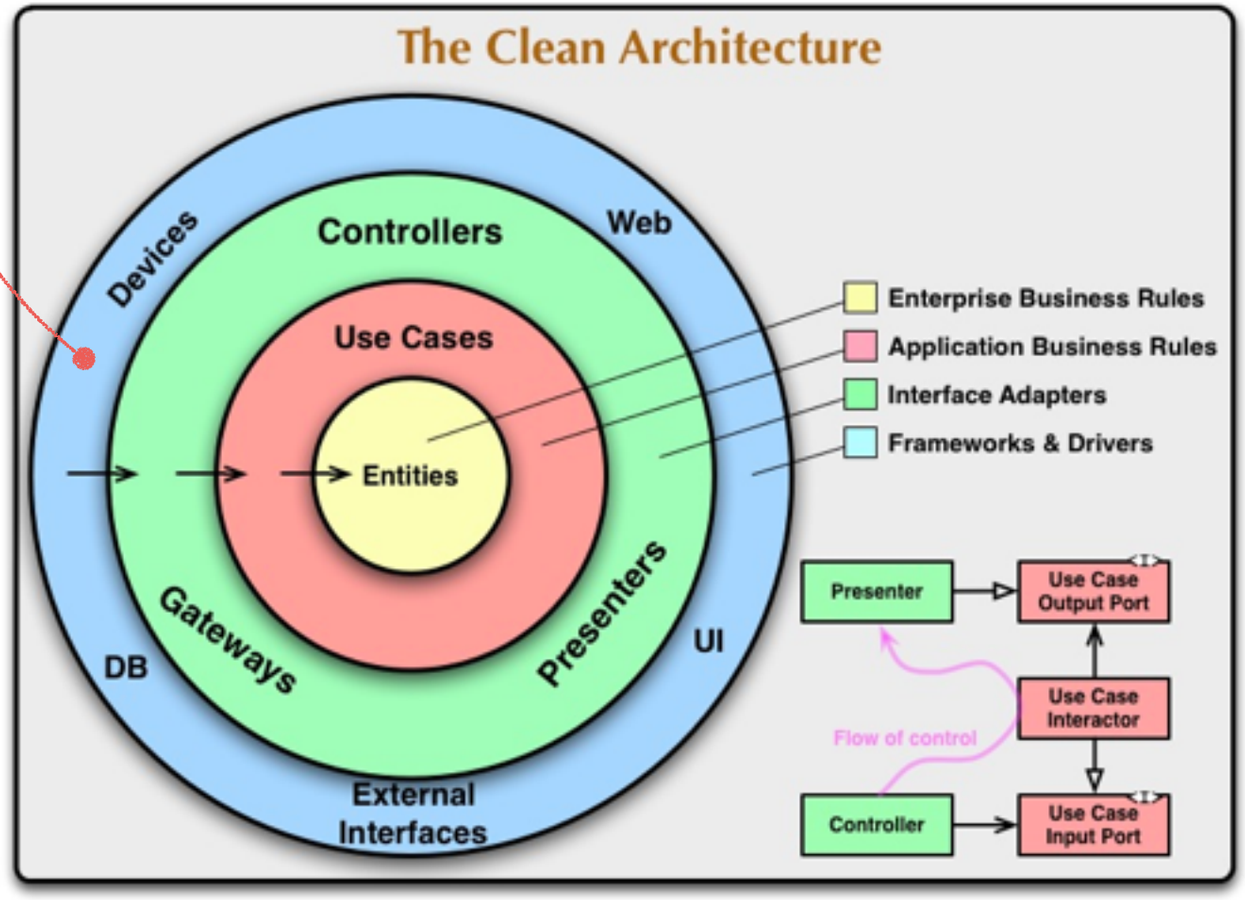

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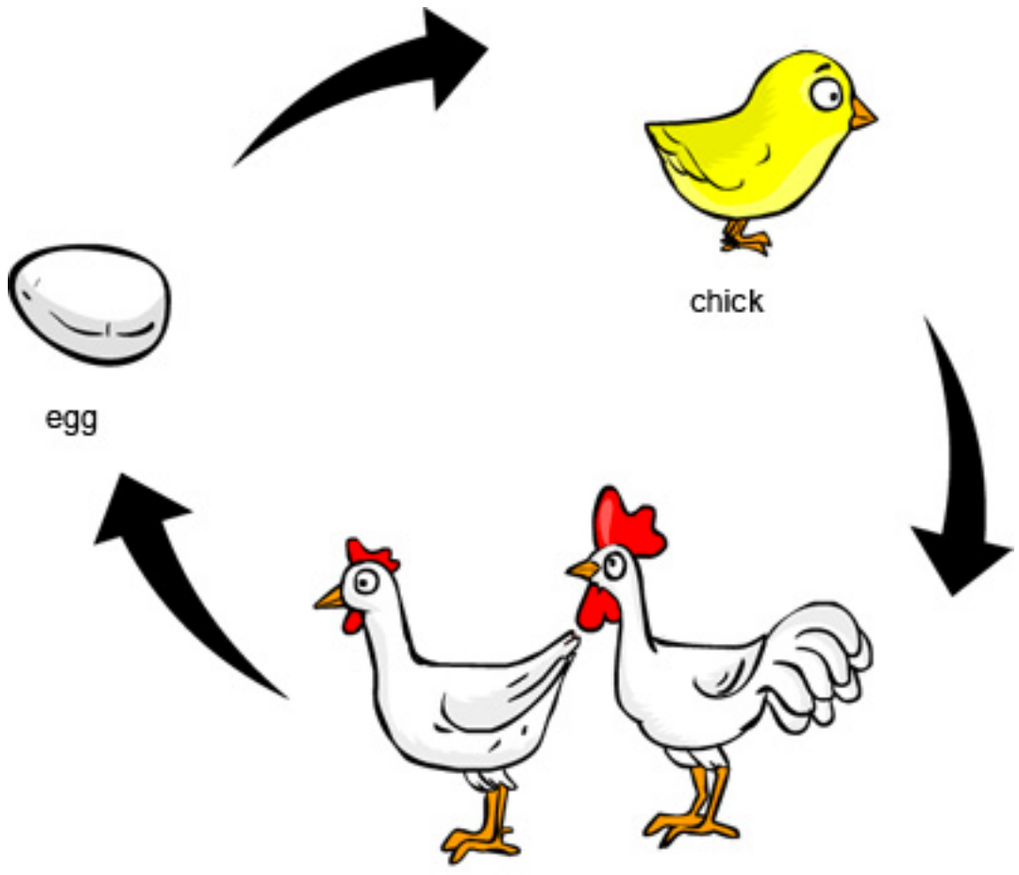
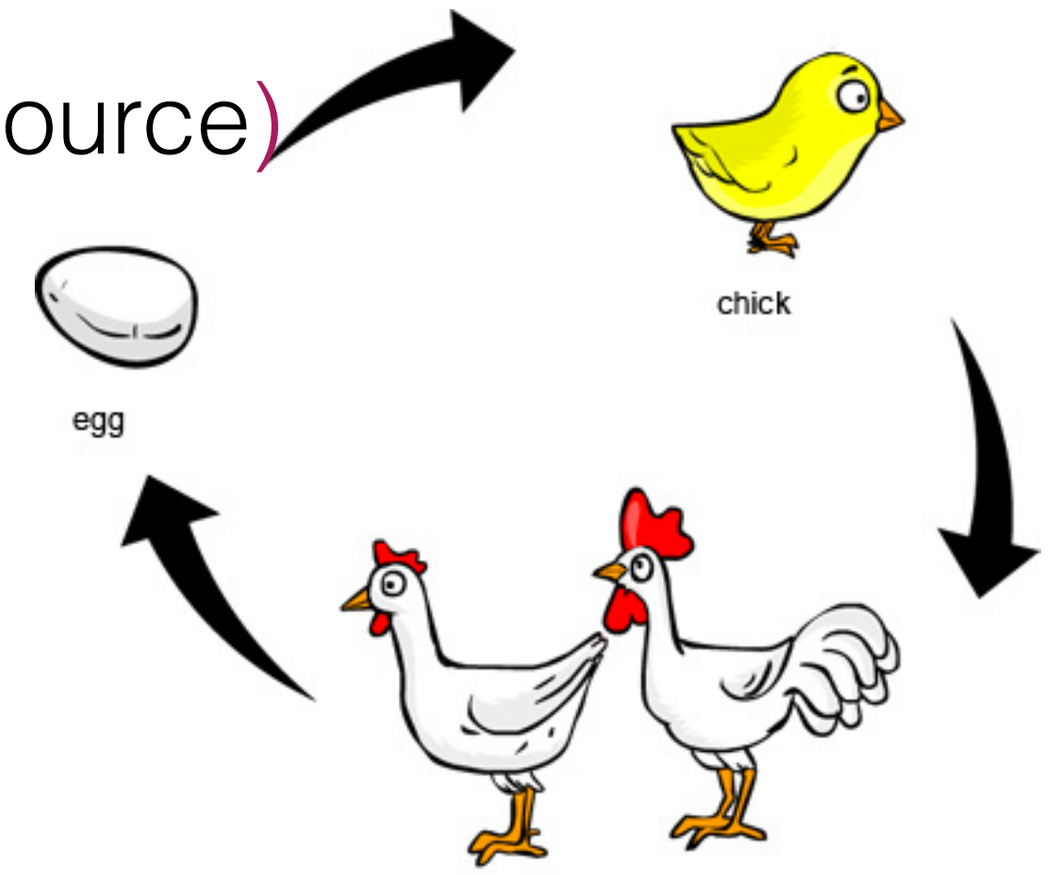
Add Lifecycle to States

Add Lifecycle to States



Add Lifecycle to States

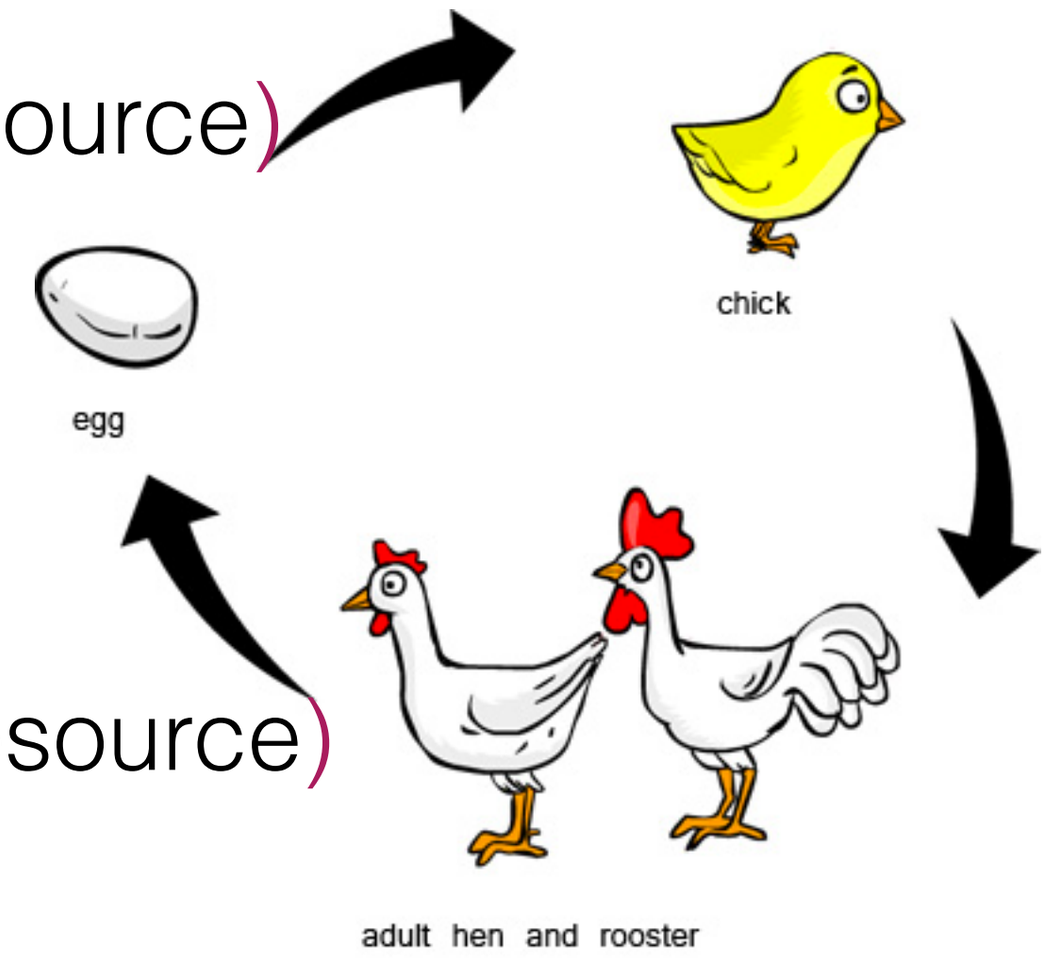
(start resource)



idea

Add Lifecycle to States

(start resource)



(stop resource)

Code as Clay

Code as Clay

with mount

Code as Clay

Taming that State

Taming that State

Taming that State

(defstate state)

with mount

Taming that State

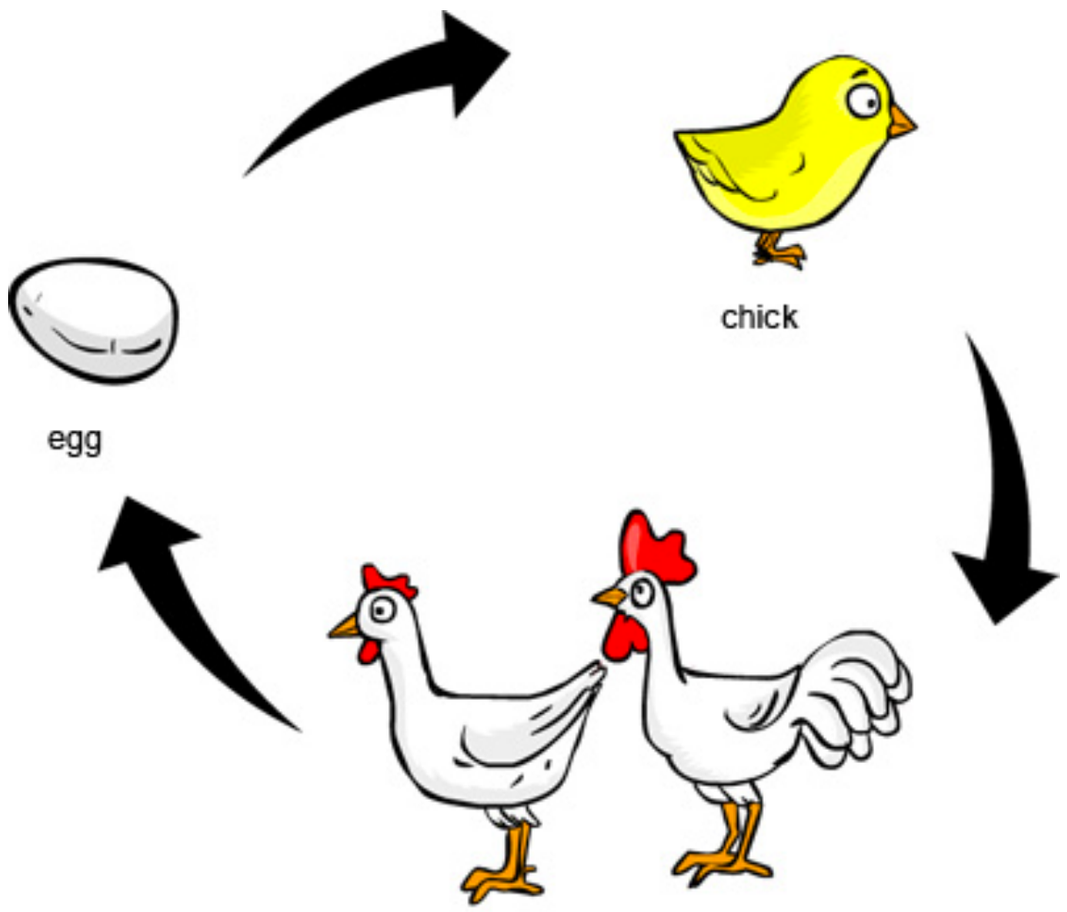
(defstate state)

with mount

The Cycle of Life

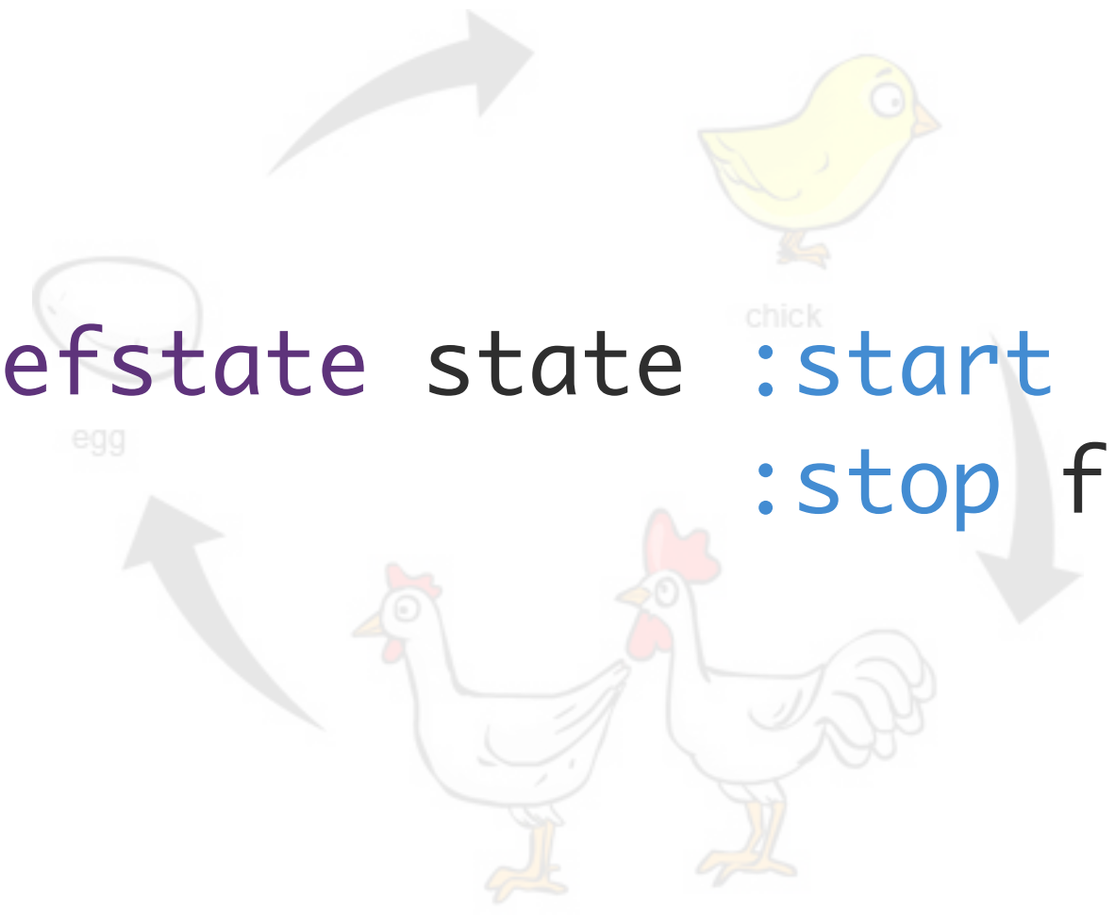
with mount

The Cycle of Life



with mount

The Cycle of Life

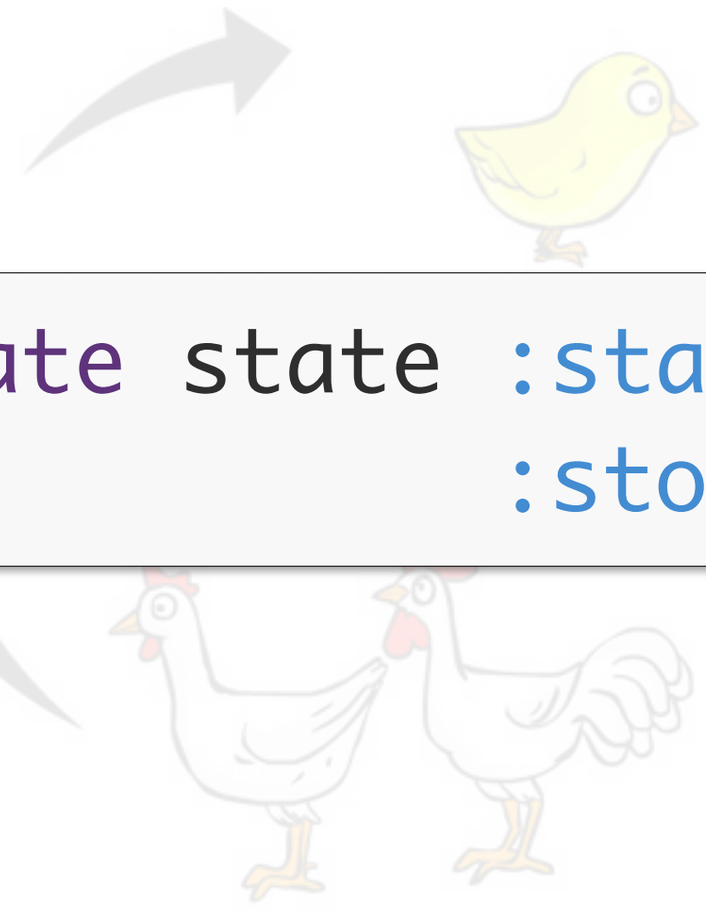



```
(defstate state :start fn
                :stop fn)
```

with mount

The Cycle of Life

```
(defstate state :start fn
                :stop fn)
```



adult hen and rooster

with mount

I Depend on You

with mount

I Depend on You

```
(defstate config :start (load-config path))
```

with mount

I Depend on You

```
(defstate config :start (load-config path))
```

```
(defstate db :start (connect config)
             :stop (disconnect db))
```

with mount

I Depend on You

```
(defstate config :start (load-config path))
```

```
(:require [app.conf :refer [config]]
```

```
(defstate db :start (connect config)
             :stop (disconnect db))
```

with mount

Rock ’n’ Roll

with mount

Rock 'n' Roll

```
(mount/start)
```

```
INFO  app.utils.logging - >> starting..  #'app.conf/config
INFO  app.utils.logging - >> starting..  #'app.db/conn
{:started ["#'app.conf/config" "#'app.db/conn"]}
```

with mount

Rock 'n' Roll

```
(mount/start)
```

```
INFO  app.utils.logging - >> starting..  #'app.conf/config
INFO  app.utils.logging - >> starting..  #'app.db/conn
{:started ["#'app.conf/config" "#'app.db/conn"]}
```

```
(mount/stop)
```

```
INFO  app.utils.logging - << stopping..  #'app.db/conn
{:stopped ["#'app.db/conn"]}
```

with mount

Namespace Recompilation

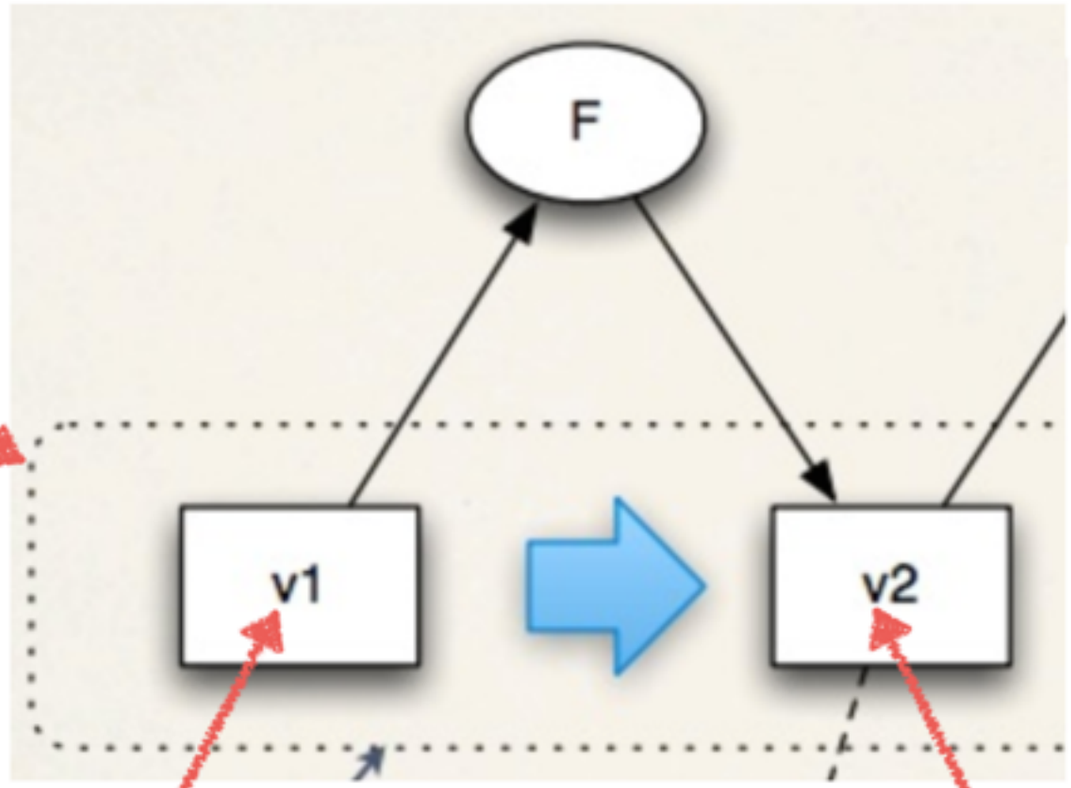
with mount

Namespace Recompilation

i.e. atom

db connection

ns reload




```
{:status :disconnected
 :conn connection-object}
```

```
{:status :connected
 :conn connection-object}
```

with mount

Namespace Recompilation

ns reload

i.e. atom

db conne

ns re

```
23
24 (defstate conn :start (new-connection config)
25                :stop (disconnect config conn))
26
~/1/fun/stater/neo/src/neo/db.clj
"<< stopping.. #'neo.db/conn (namespace was recompiled)"
">> starting.. #'neo.db/conn (namespace was recompiled)"
Press ENTER or type command to continue
```

```
{:status :disconnected
 :conn connection-object}
```

```
{:status :connected
 :conn connection-object}
```

with mount

Namespace Recompilation

with mount

Namespace Recompilation

(defstate server)

DEFAULT

with mount

Namespace Recompilation

```
(defstate server)
```

DEFAULT

```
(defstate ^{:on-reload :stop} server)
```

with mount

Namespace Recompilation

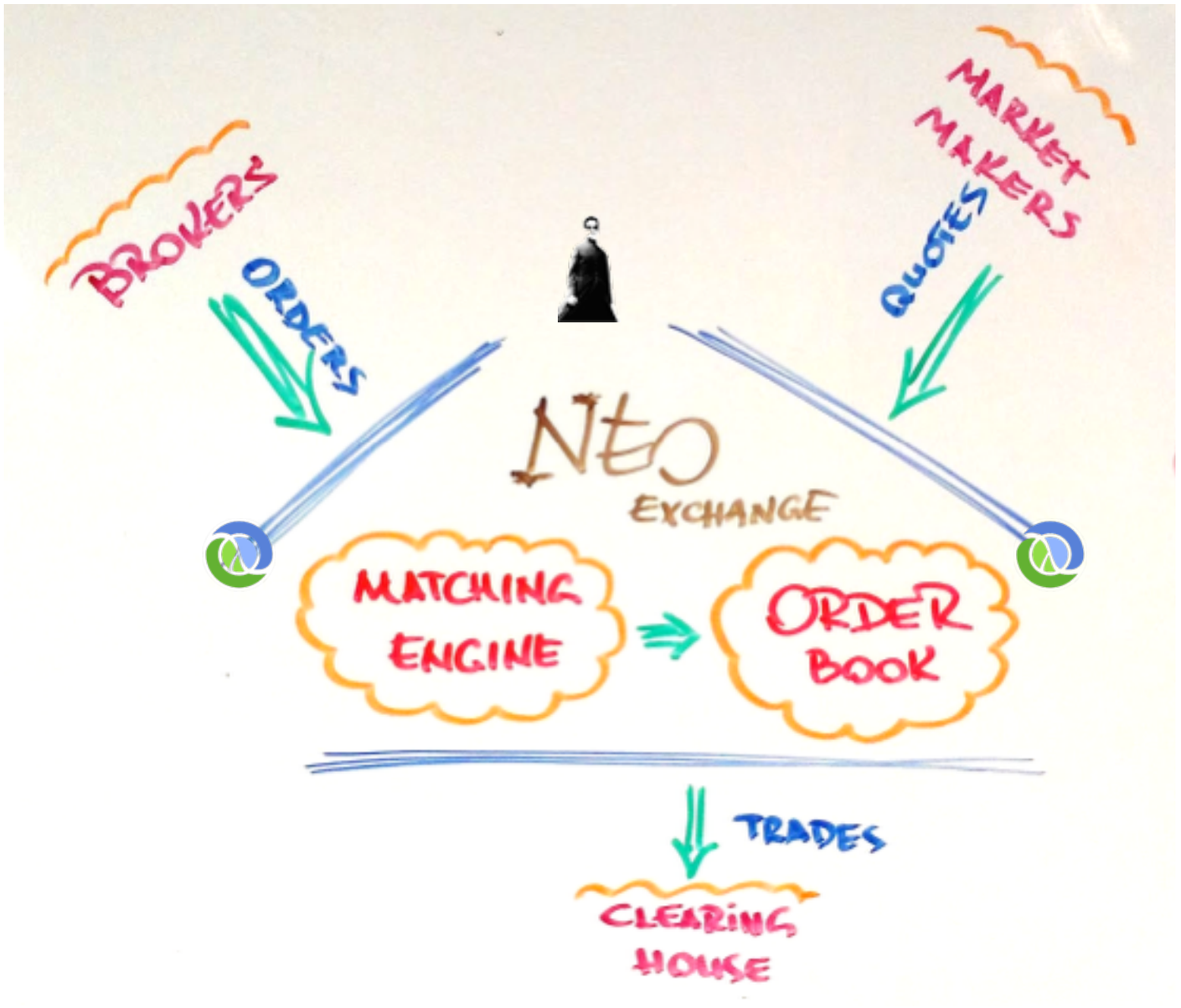
```
(defstate server)
```

DEFAULT

```
(defstate ^{:on-reload :stop} server)
```

```
(defstate ^{:on-reload :noop} server)
```

Neo Options Exchange



source: "https://github.com/tolitius/stater/tree/master/neo"

Neo Options Exchange

```
dev=> (mount/start)
{:started ["#'neo.conf/config" "#'neo.db/conn" "#'neo.www/neo-app" "#'neo.app/nrepl"]}
dev=>
```

with mount

Neo Options Exchange

```
dev=> (mount/start)
{:started ["#'neo.conf/config" "#'neo.db/conn" "#'neo.www/neo-app" "#'neo.app/nrepl"]}
dev=>
```

```
|~src/
  |~neo/
  | |~options/
  | | |-book.clj
  | | |-engine.clj
  | | `-orders.clj
  |   -app.clj
  |   -conf.clj
  |   -db.clj
  |   -www.clj
```

"#'neo.app/nrepl"

"#'neo.conf/config"

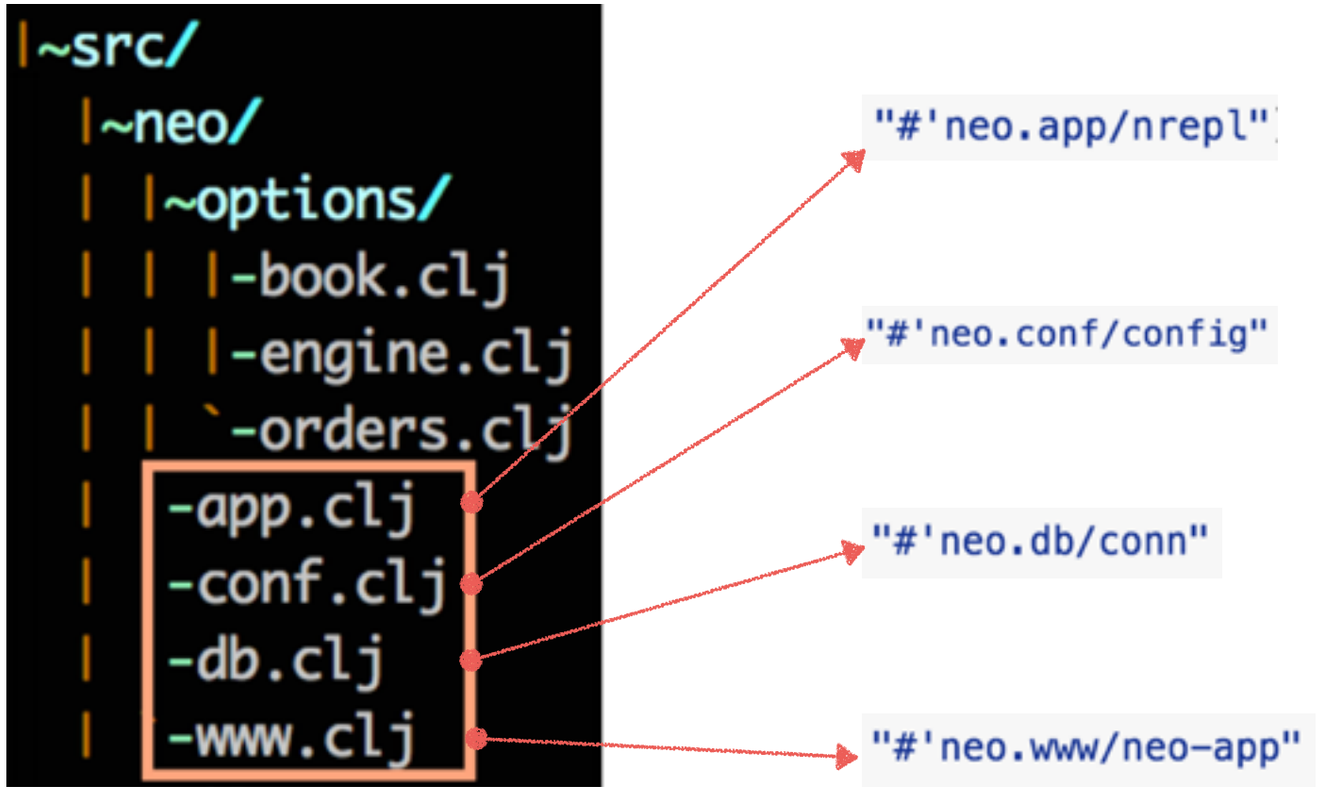
"#'neo.db/conn"

"#'neo.www/neo-app"

with mount

Neo Options Exchange

```
dev=> (mount/start)
{:started ["#'neo.conf/config" "#'neo.db/conn" "#'neo.www/neo-app" "#'neo.app/nrepl"]}
dev=>
```



with mount

Neo Options Exchange

localhost:4242/neo/match-quote?ticker=GOOG&qty=500&bid=665.54&offer=665.58

```
{
    matched: 300
}
```

localhost:4242/neo/orders/GOOG

```
[
  - {
        order/symbol: "GOOG",
        order/bid: 665.51,
        order/qty: 100,
        order/offer: 665.59
    },
  - {
        order/symbol: "GOOG",
        order/bid: 665.5,
        order/qty: 300,
        order/offer: 665.58
    },
  - {
        order/symbol: "GOOG",
        order/bid: 665.48,
        order/qty: 100,
        order/offer: 665.53
    },
  - {
        order/symbol: "GOOG",
        order/bid: 665.49,
        order/qty: 200,
        order/offer: 665.52
    }
]
```

```
|~src/
  |~neo/
  |  |~options/
  |  |  |-book.clj
  |  |  |-engine.clj
  |  |  `-orders.clj
  |  |-app.clj
  |  |-conf.clj
  |  |-db.clj
  |  `-www.clj
```

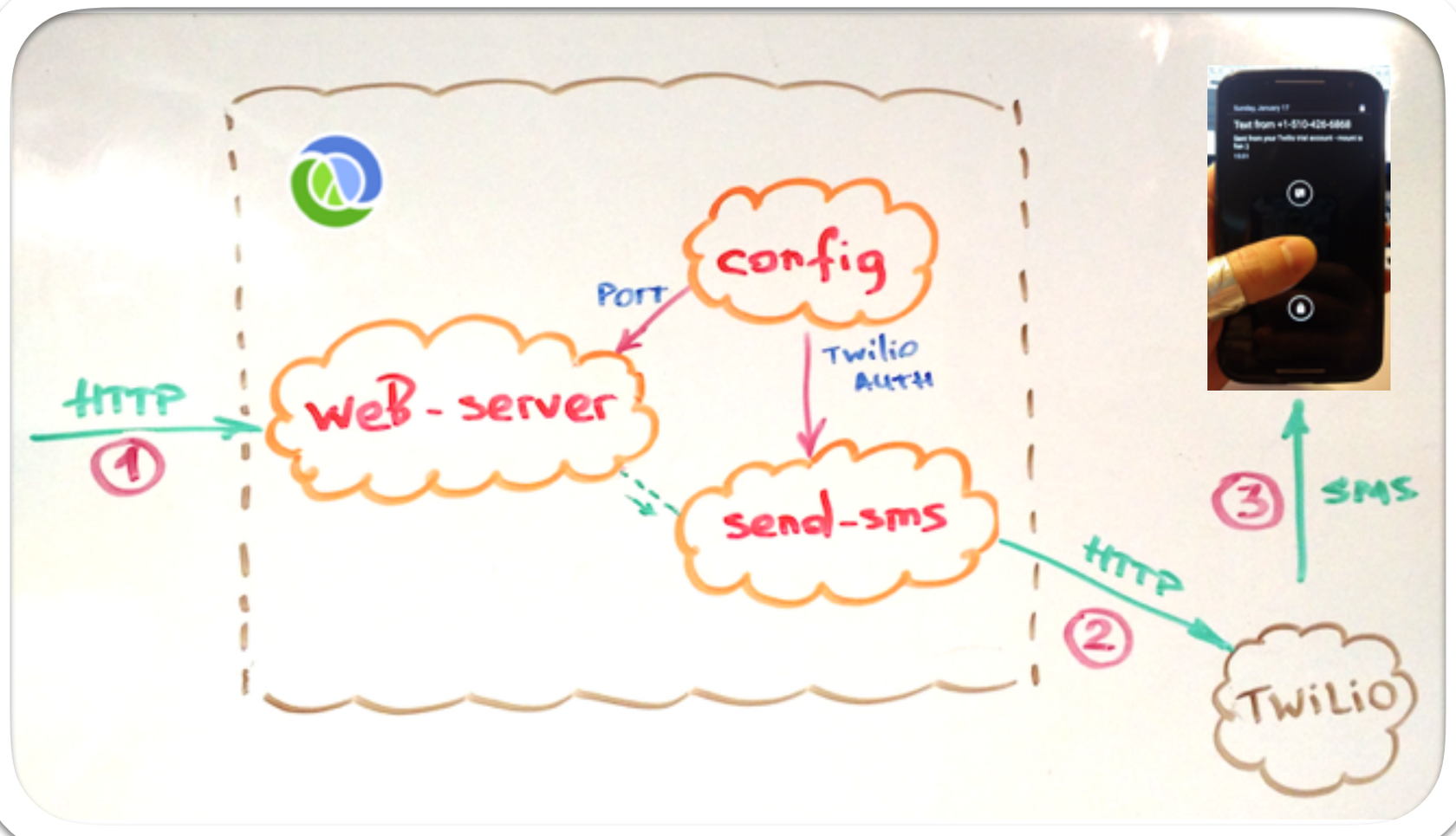
Demo

with mount

with mount

Swapping Alternate Implementations

source: "https://github.com/tolitius/stater/tree/master/smsio"



with mount

Swapping Alternate Implementations

```
(defn create-sms-sender [{:keys [sid auth-token]}]
  (fn [{:keys [from to body]}]
    (twilio/with-auth sid auth-token
      (twilio/send-sms
        (twilio/sms from to body)))))

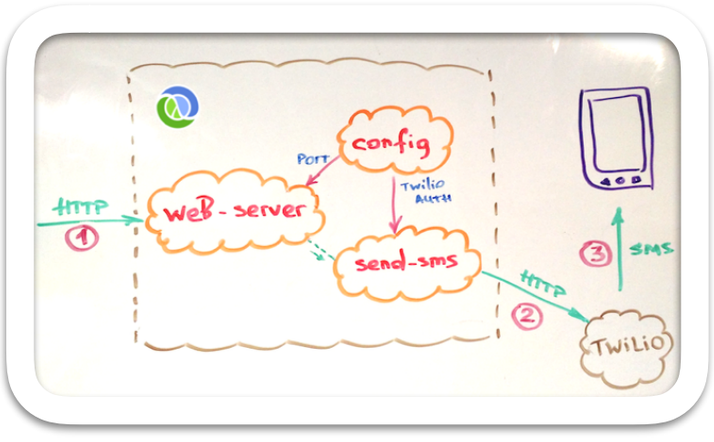
(defstate send-sms :start (create-sms-sender
                            (:sms config)))
```

with mount

Swapping Alternate Implementations

```
(defn create-sms-sender [{:keys [sid auth-token]}]
  (fn [{:keys [from to body]}]
    (twilio/with-auth sid auth-token
      (twilio/send-sms
        (twilio/sms from to body)))))

(defstate send-sms :start (create-sms-sender
                            (:sms config)))
```

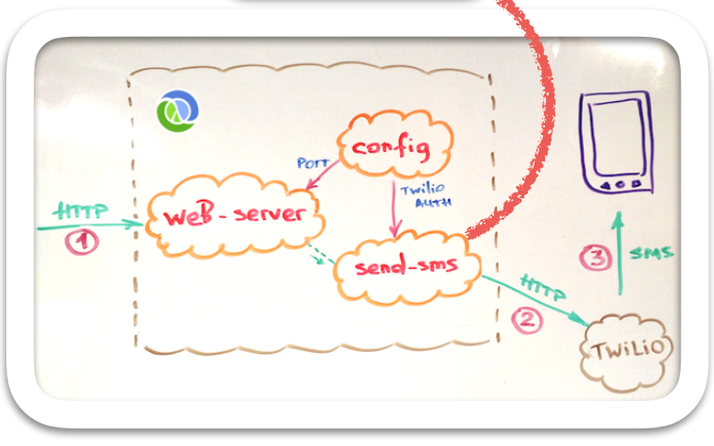


with mount

Swapping Alternate Implementations

```
(defn create-sms-sender [{:keys [sid auth-token]}]
  (fn [{:keys [from to body]}]
    (twilio/with-auth sid auth-token
      (twilio/send-sms
        (twilio/sms from to body)))))

(defstate send-sms :start (create-sms-sender
                            (:sms config)))
```



with mount

Swapping Alternate Implementations

```
(let [sms-ch (chan)
      send-sms (fn [sms] (go (>! sms-ch sms)))]
  (mount/start-with {#'app.sms/send-sms send-sms})
  ;; testing.. checking "sms-ch" channel..
  (mount/stop))
```

with mount

Swapping Alternate Implementations

```
(let [sms-ch (chan)
      send-sms (fn [sms] (go (>! sms-ch sms)))]
  (mount/start-with {#'app.sms/send-sms send-sms})
  ;; testing.. checking "sms-ch" channel..
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with mount

Swapping Alternate Implementations

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  (mount/start-with {#'app.sms/send-sms send-sms})
  ;; testing.. checking "sms-ch" channel..
  (mount/stop))
```

with mount

Swapping Alternate Implementations

```
(mount/start-with {})
```

```
(let [sms-ch (chan)
      send-sms (fn [sms] (go (>! sms-ch sms)))]
  (mount/start-with {#'app.sms/send-sms send-sms})
  ;; testing.. checking "sms-ch" channel..
  (mount/stop))
```

with mount

Treasure Box

Treasure Box

Treasure Box

- ★ Swap Alternate Implementations
- ★ Start and Stop Order
- ★ Start and Stop Parts of Application
- ★ Start an Application Without Certain States
- ★ Stop an Application Except Certain States

problems ideas mount cljs visual yurt criticism adoption balance

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Namespace API in ClojureScript

clojurescript

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is there a way to get a namespace interns at runtime in `cljs`?

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@tolitius: not possible, and it won't ever be

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---

status: meh
reason: :advanced

note: **Great improvements** in ClojureScript Bootstrap

CLJC Mode

Relying on "DerefableState"
instead of "Clojure Var"

```
(ns app.websockets
  (:require [app.conf :refer [config]]
            [app.audit-log :refer [audit log]])
  (:require-macros [mount.core :refer [defstate]]))
;; ...
(defstate system-a :start (connect (get-in @config
                                           [:system-a :uri]))
                   :stop (disconnect system-a))
```

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(ns app.websockets
  (:require [app.conf :refer [config]]
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```

@

CLJC Mode

Relying on "DerefableState"
instead of "Clojure Var"

```
(deftype DerefableState [name]
  #?(:clj clojure.lang.IDeref
     :cljs IDeref)
```

@

CLJC Mode

(mount/in-cljc-mode)

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this approach has very nice properties:

- ★ deref (@) is intuitively associated with a state behind it
- ★ system may start lazily without an explicit call (mount/start)
- ★ States may have watchers (just an idea at this point)
- ★ Plays nicely with direct linking (introduced in Clojure 1.8)

more details @
https://github.com/tolitius/mount/blob/master/doc/clojurescript.md

Visualization

Visualization

```
dev=> (require '[mount.tools.graph :as graph])
```

```
dev=> (graph/states-with-deps)
({:name "#'app.conf/config",
  :order 1,
  :status #{:started},
  :deps #{}}
 {:name "#'app.db/conn",
  :order 2,
  :status #{:started},
  :deps #{"#'app.conf/config"}}
 {:name "#'app.www/nyse-app",
  :order 3,
  :status #{:started},
  :deps #{"#'app.conf/config"}}
 {:name "#'app.example/nrepl",
  :order 4,
  :status #{:started},
  :deps #{"#'app.www/nyse-app" "#'app.conf/config"}})
```

Yurt

Yurt

Standalone Application Yurts

with mount

multiple

```
(def dev-yurt (yurt/build (yurt/blueprint)))

(def test-yurt (yurt/build-with
                 (yurt/blueprint)
                 {"app.conf/config" test-config}))
```

local

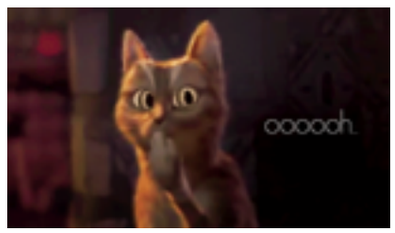
```
dev=> (yurt/blueprint)
{:components
{"neo.conf/config" {:status :not-started},
 "neo.db/db" {:status :not-started},
 "neo.www/neo-app" {:status :not-started},
 "neo.app/nrepl" {:status :not-started}},
:blueprint
{"neo.conf/config" {:order 1},
 "neo.db/db" {:order 2},
 "neo.www/neo-app" {:order 3},
 "neo.app/nrepl" {:order 4}}}
```

Yurt

Standalone Application Yurts

with mount

used simultaneously
in the same Clojure runtime



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https://github.com/tolitius/yurt

Criticism

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namespaces and vars

vs.

records and protocols

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mount is orthogonal to the use of records

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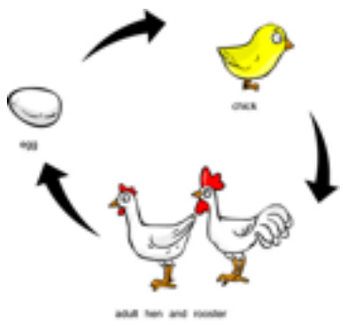
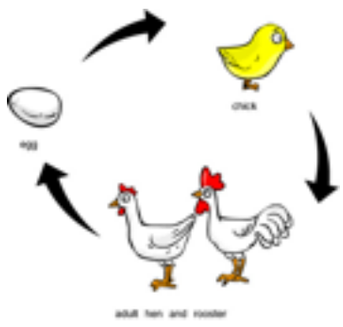


the lifecycle of each instance of the record would be managed using `(defstate state)`

Criticism

namespaces and vars
vs.
records and protocols

mount is orthogonal to the use of records



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reddit thread with an example

Criticism

state is
singleton

Criticism

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Different Resource? Different State

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```
42   (mount/start-with {#'meaning.of/life 42})
```

Testing?

swap alternate implementations
with values

Criticism

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Different Resource? Different State

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app with a swap example

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Multiple "Systems" in the Same JVM

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were a "system" is a group of app resources

Why? "I run tests *in the same* REPL where I do development"

Ok. use Yurt.

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You can also run `boot watch test` in a *different* REPL :)

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You can also run `boot watch test` in a *different* REPL :)

more details on multiple systems

Mantra Stays

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- ★ Prefer values and immutability
- ★ Prefer functions and locally bound state
- ★ Minimize the code that has access to resources
- ★ Prefer balance: formal + pragmatic = balance

Mount Adoption

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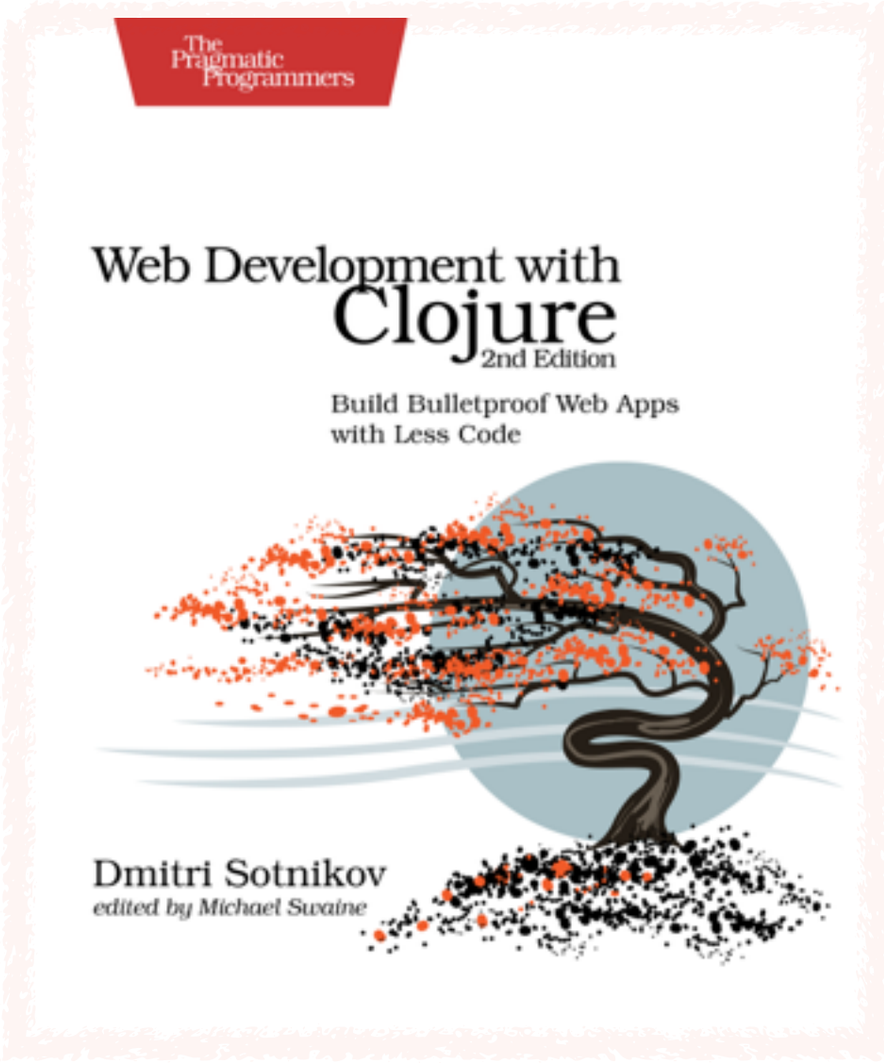
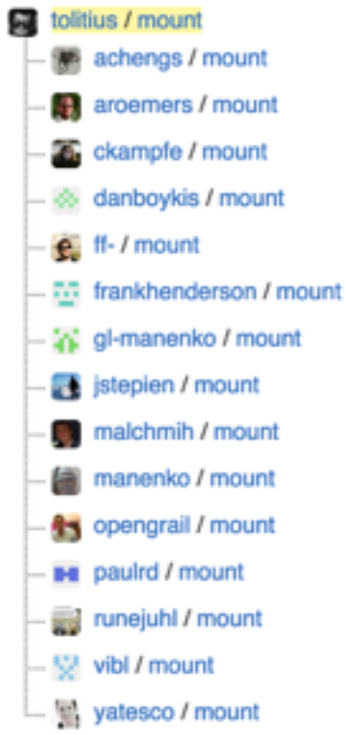
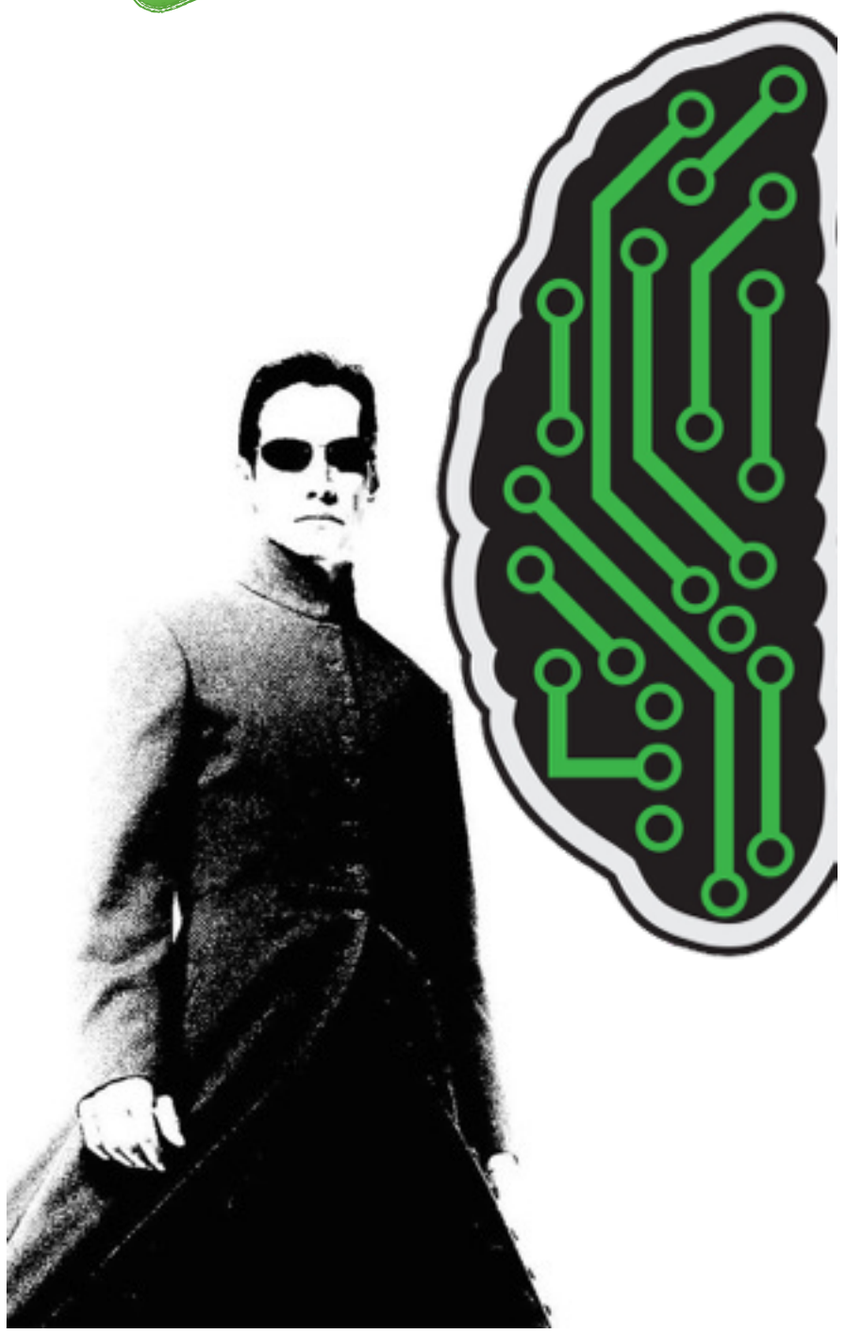




with mount

Balance is...



with mount

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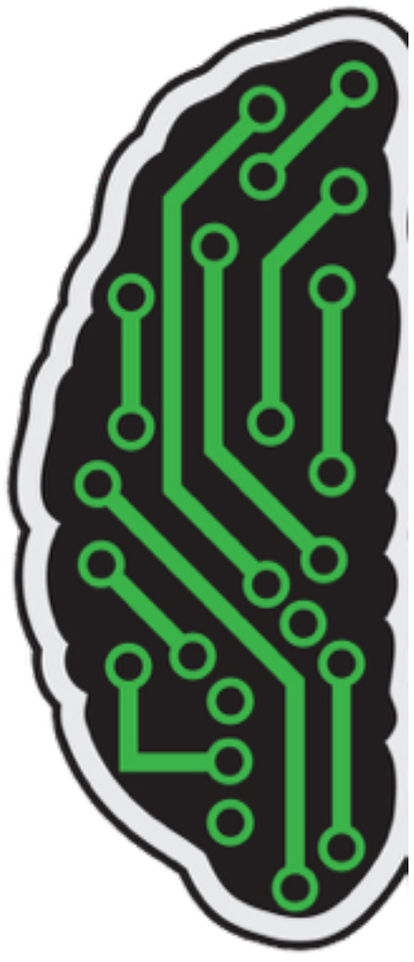

with mount

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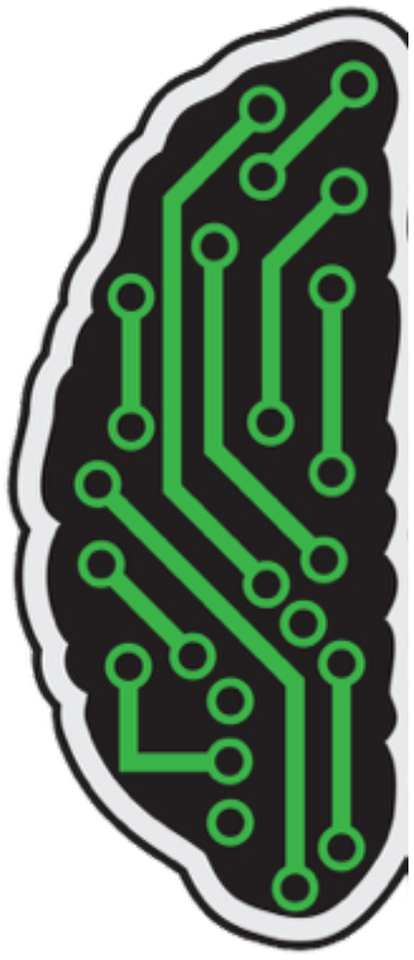

Composable

Thanks to

Thanks to

for mount

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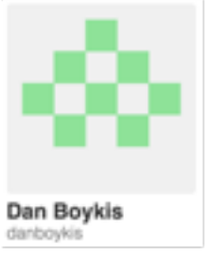
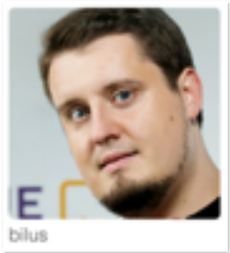


Dan Boykis
danboykis



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voxdolo

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Collin Alexander Bell
SlightlyCyborg

https://github.com/tolitius/mount

let's talk!