Serverless Applications with ClojureScript and Firebase

Jake McCrary
@jakemcc

Who am I?

- Write at jakemccrary.com
- Author of lein-test-refresh and lein-autoexpect
- Developer at Outpace Systems
- Adviser for Metonymy Labs

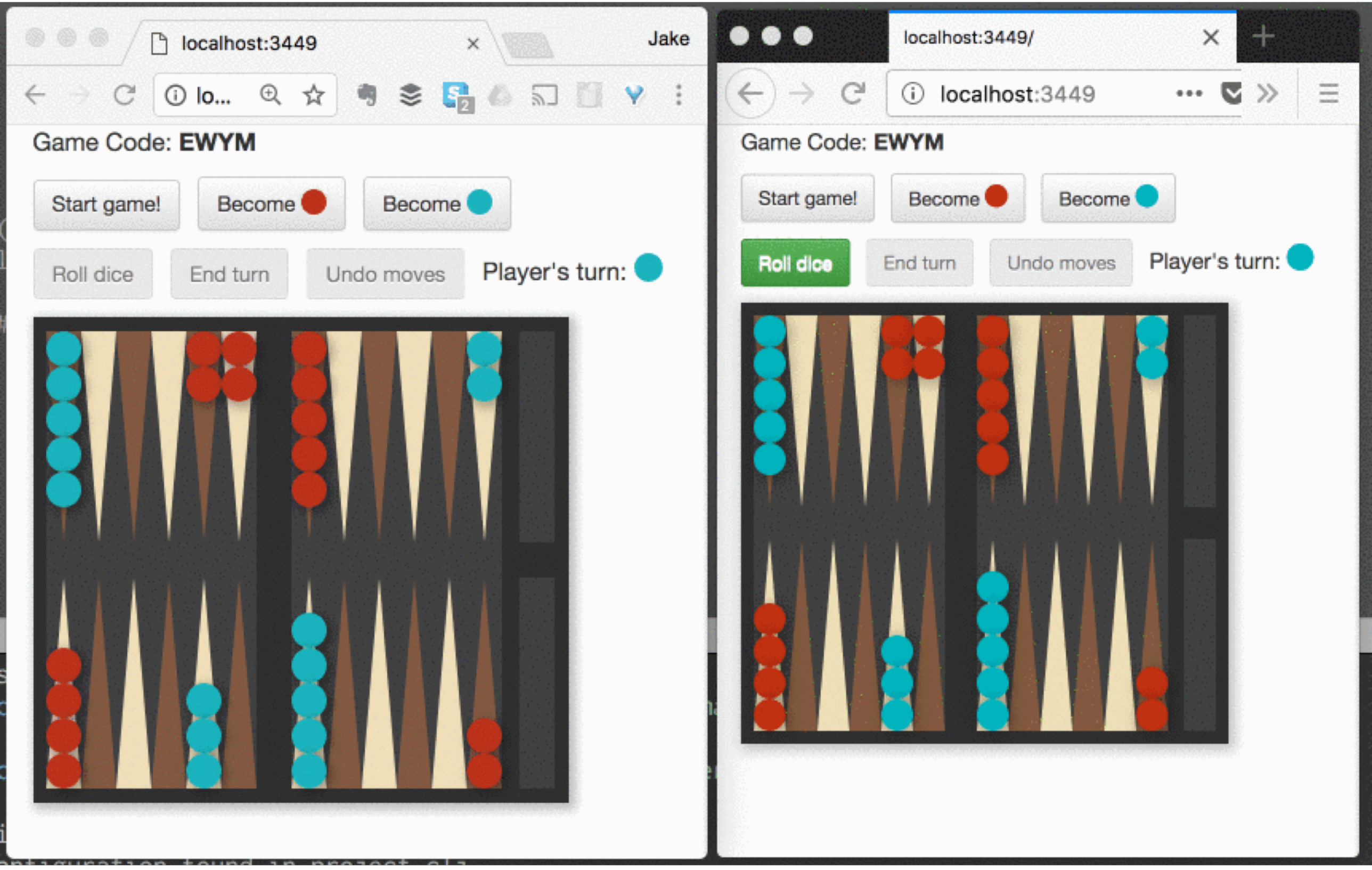
Serverless Applications

with ClojureScript and Firebase

Serverless

~~Applications~~ Games

with ClojureScript and Firebase


localhost:3449
Jake
lo...
Game Code: EWYM
Start game!
Become
Become
Roll dice
End turn
Undo moves
Player's turn:
localhost:3449/
localhost:3449
Game Code: EWYM
Start game!
Become
Become
Roll dice
End turn
Undo moves
Player's turn:

Why?

Why? Quick

Why?

Learn new tools

Why?

Fun

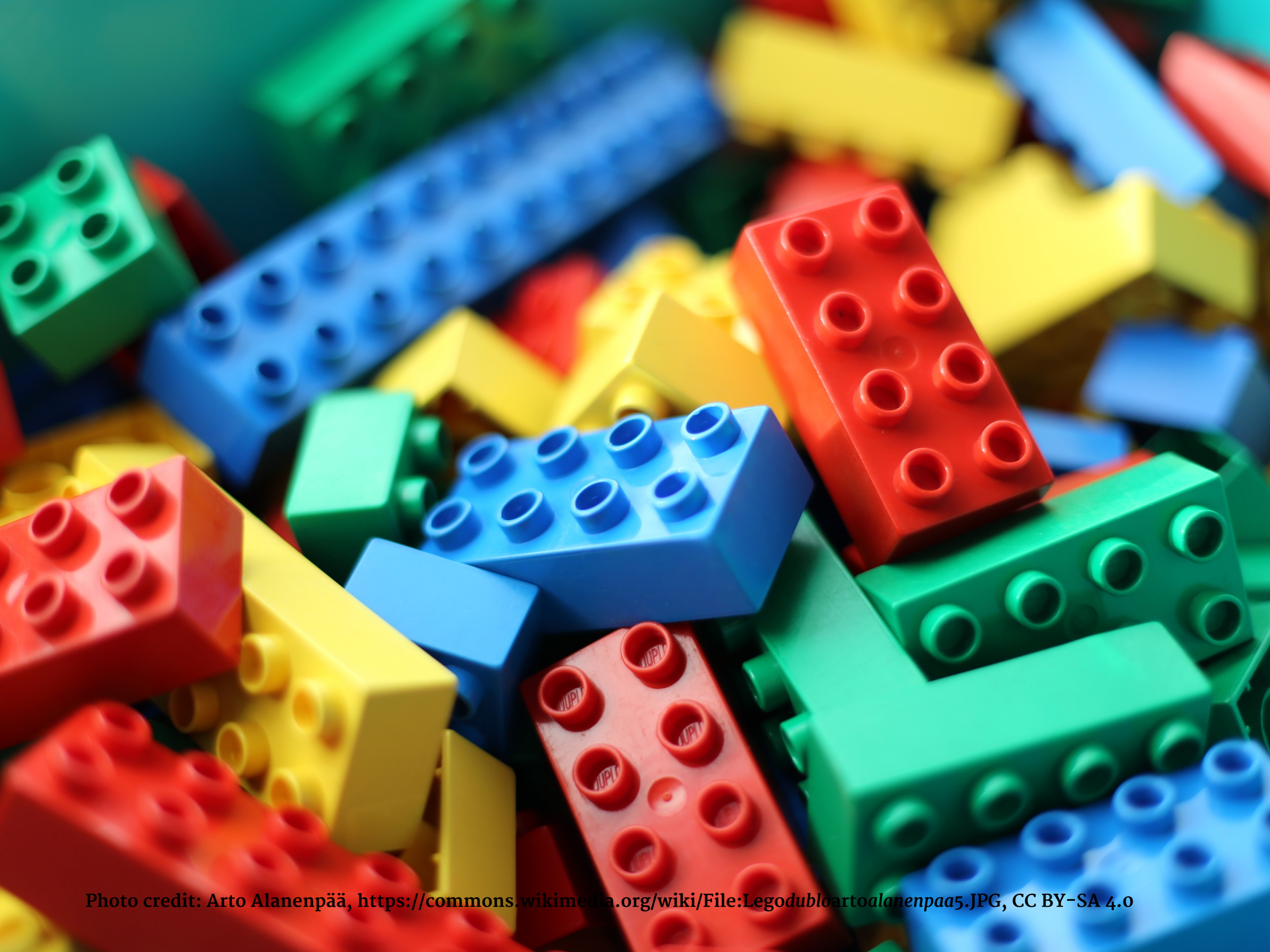


Photo credit: Arto Alanenpää, https://commons.wikimedia.org/wiki/File:Lego*dubblo*arto*alanenpaa*5.JPG, CC BY-SA 4.0


cljs

Reagent

Reagent

```
(defn simple-component []
  [:div
   [:p "I am a component!"]
   [:p.someclass
    "I have " [:strong "bold"]
    [:span {:style {:color "red"}} " and red "] "text."]])
```

Reagent: ratoms

```
(def click-count (reagent/atom 0))

(defn counting-component []
  [:div
   "The atom " [:code "click-count"] " has value: "
   @click-count
   [:input {:type "button" :value "Click me!"
            :on-click #(swap! click-count inc)}]])
```


reframe

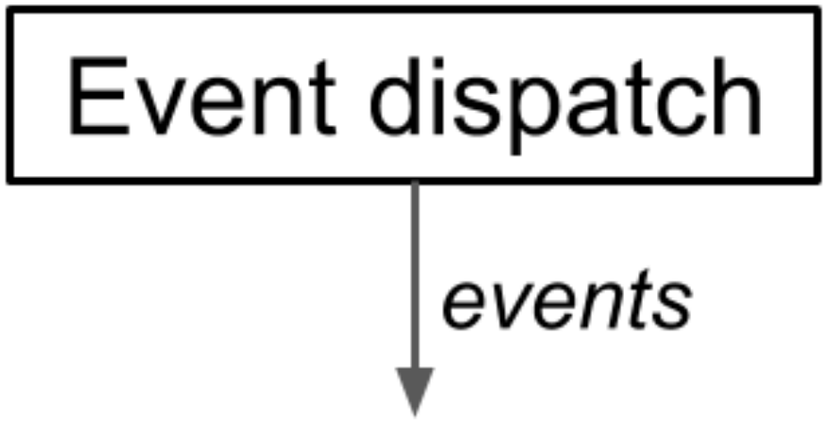
SPAs are full of mutation

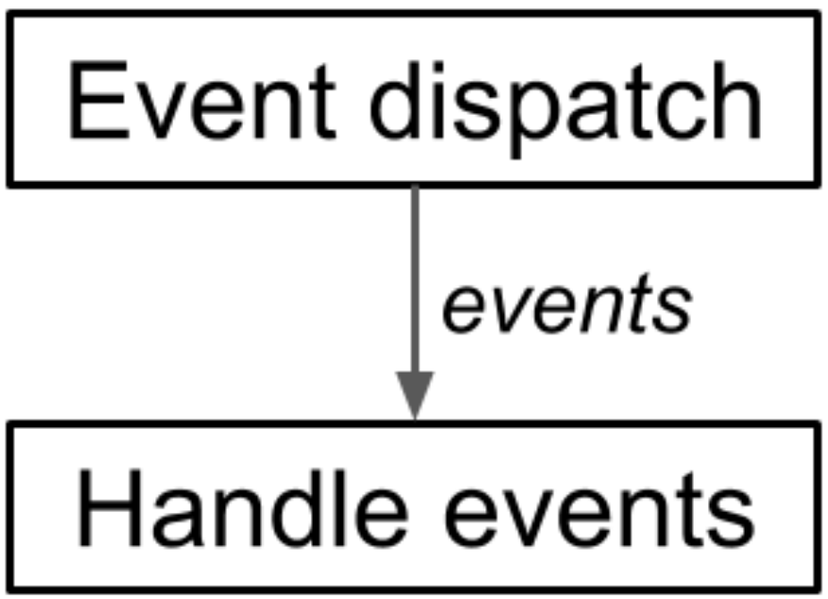
re-frame isolates the mutation

Event dispatch

re-frame: event dispatch

```
(rf/dispatch [:join-game (random-code)])
```


Event dispatch
events


Event dispatch
events
Handle events

re-frame: handle event

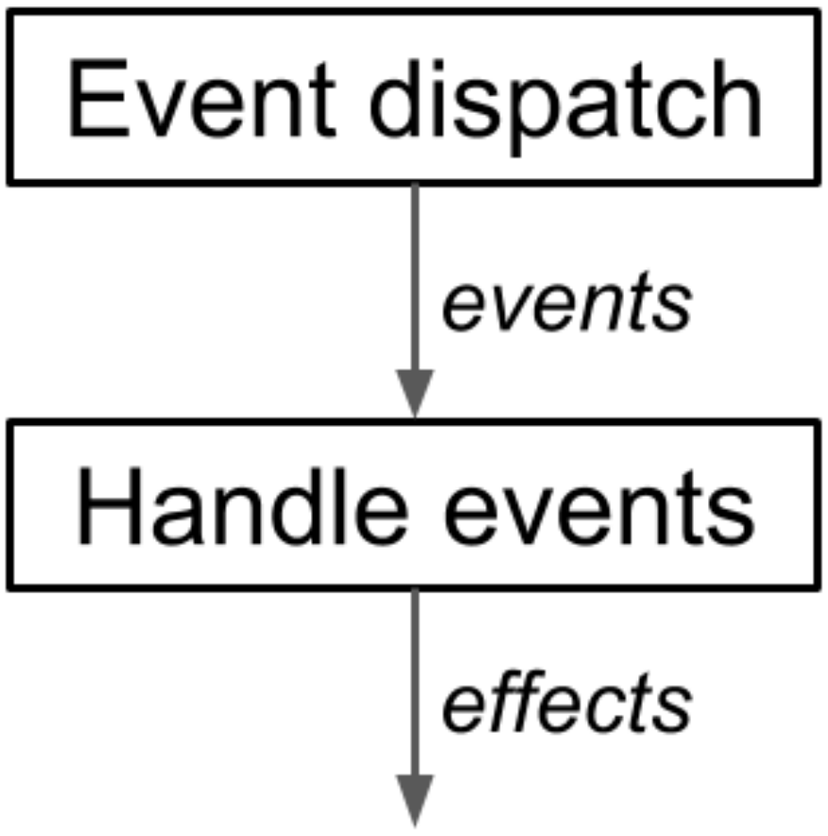
```
(rf/reg-event-fx
 :join-game
 (fn [coeffects [_ game-id]]
   (let [db (:db coeffects)]
     {:db (assoc db :game-id game-id)
      :firebase/subscribe {:game-id game-id
                           :default db/initial-game}})))
```

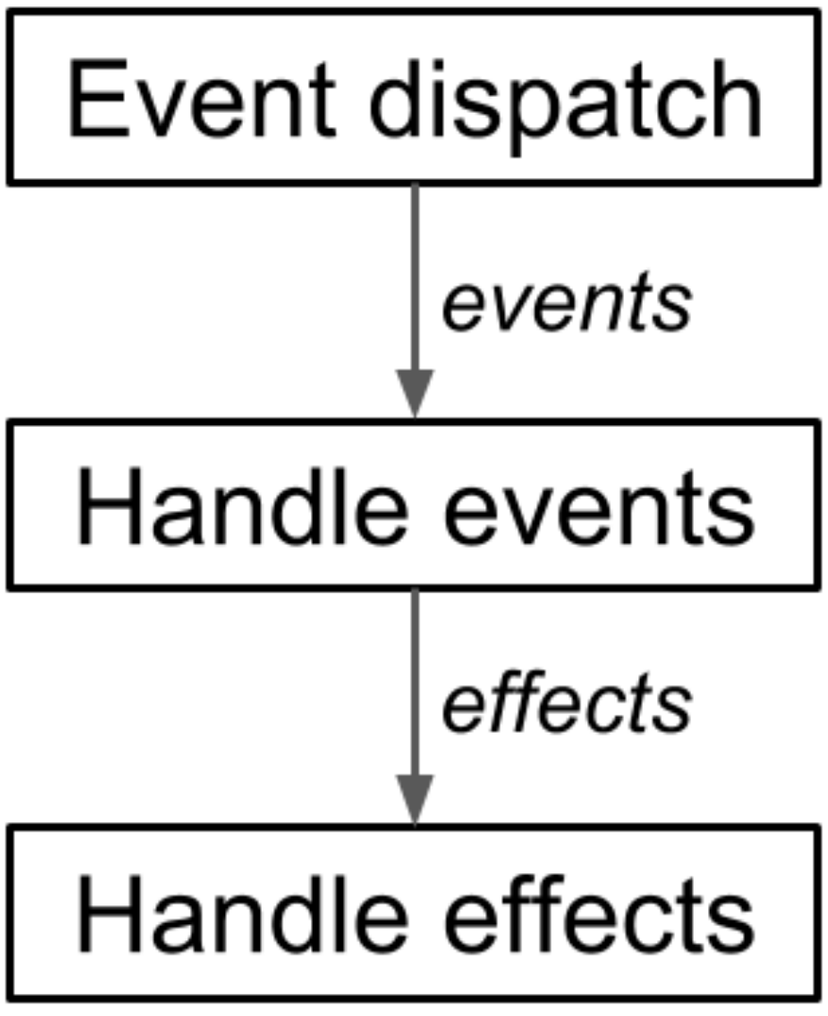
re-frame: handle event

```
(rf/reg-event-fx
 :join-game
 (fn [coeffects [_ game-id]]
   (let [db (:db coeffects)]
     {:db (assoc db :game-id game-id)
      :firebase/subscribe {:game-id game-id
                           :default db/initial-game}})))
```

re-frame: handle event

```
(rf/reg-event-db
 :sync
 (fn [db [_ data]]
 (assoc db :external data)))
```

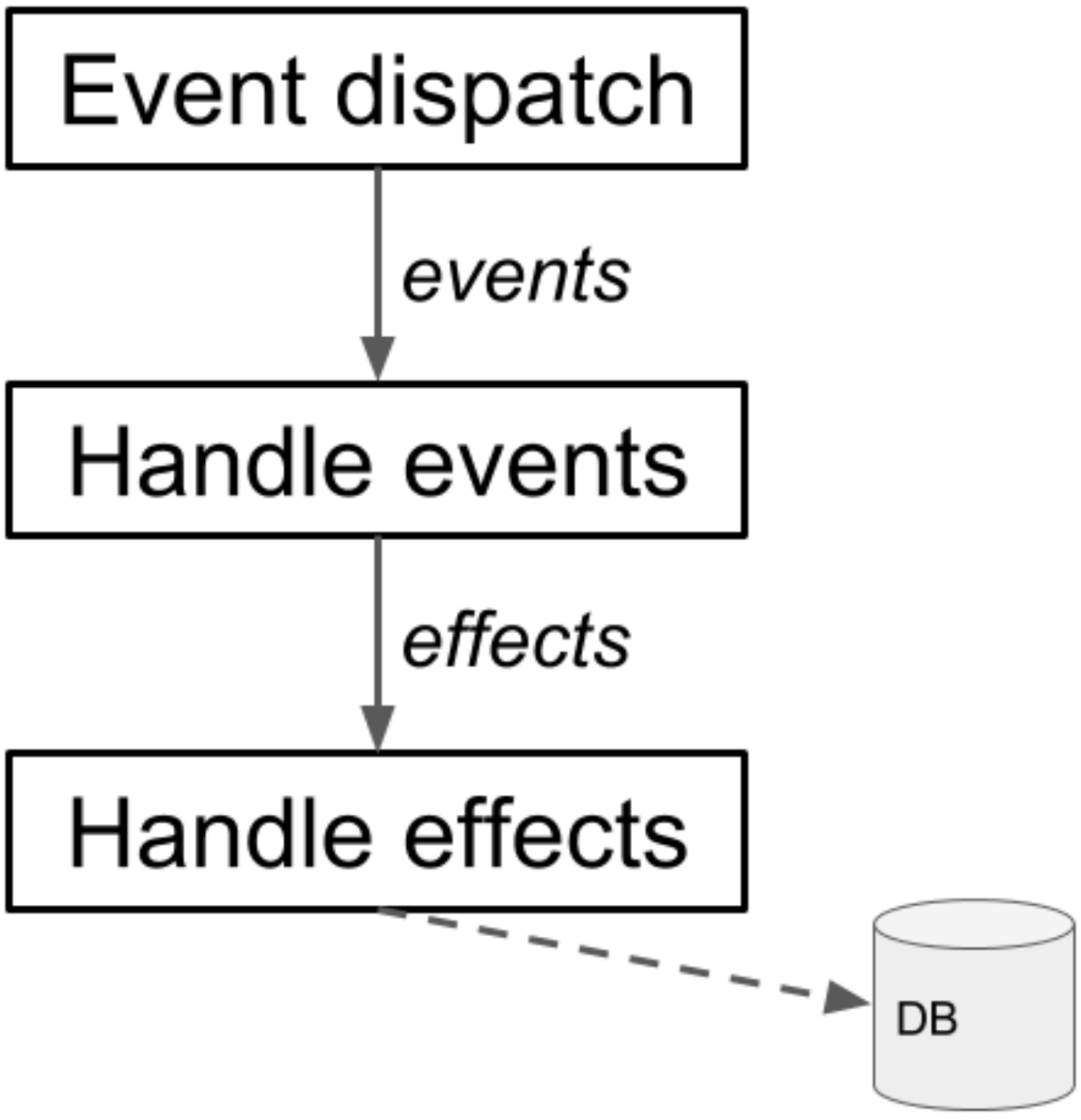

Event dispatch
events
Handle events
effects

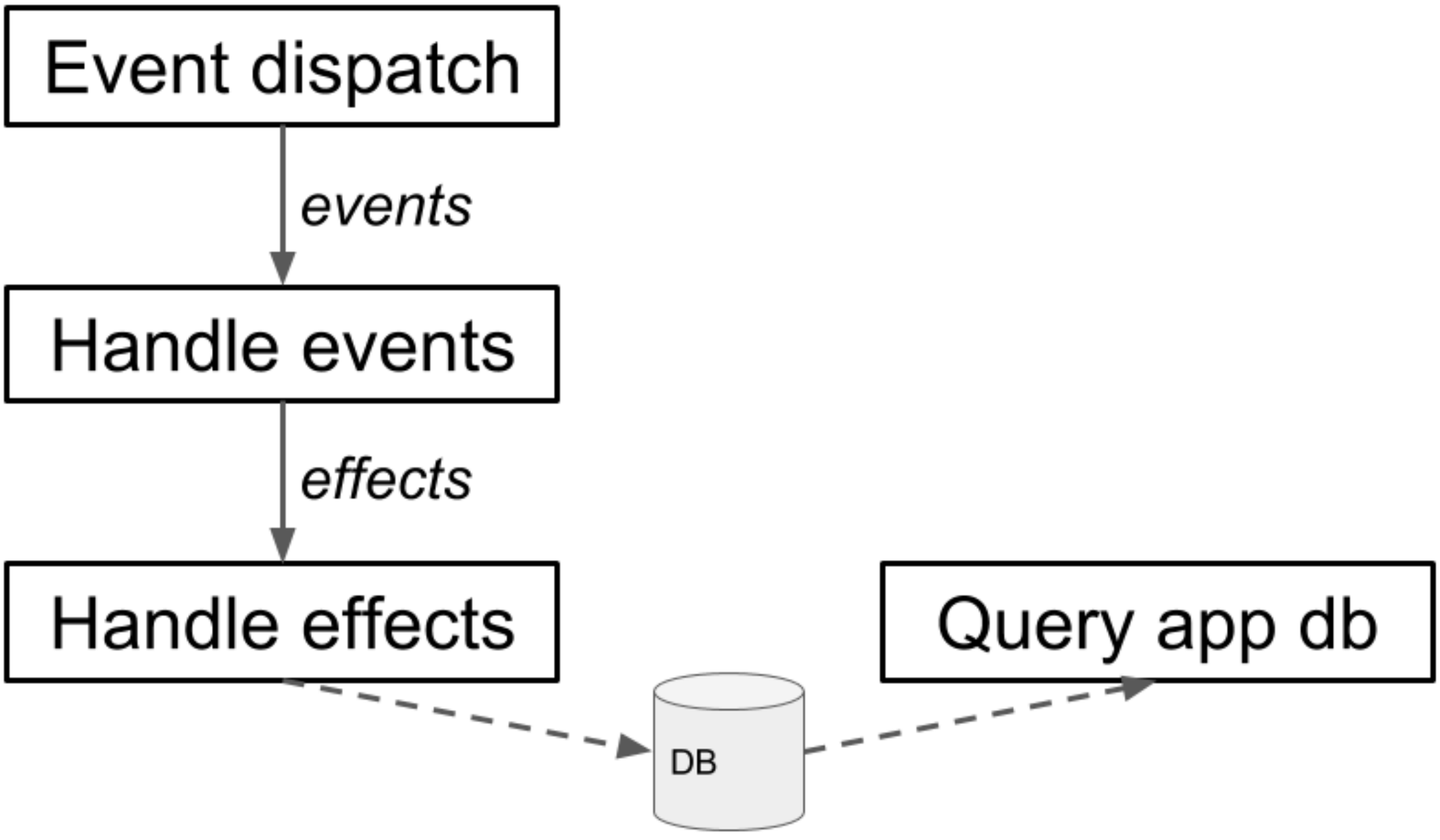

Event dispatch
events
Handle events
effects
Handle effects

re-frame: Handle effects

```
;; from re-frame.fx namespace

(reg-fx
  :db
  (fn [value]
    (if-not (identical? @app-db value)
      (reset! app-db value))))
```


Event dispatch
events
Handle events
effects
Handle effects
DB


Event dispatch
events
Handle events
effects
Handle effects
Query app db
DB

re-frame: query app db

```
(rf/reg-sub
 :game-id
 (fn [db]
 (:game-id db)))
```

re-frame: query app db

```
(rf/reg-sub
  :my-turn?
  (fn [_ _]
    [(rf/subscribe [:me])
     (rf/subscribe [:current-player])]))
(fn [[me current-player]]
  (same-player? me current-player)))
```

re-frame: query app db

```
(rf/reg-sub
  :my-turn?
  (fn [_ _]
    [(rf/subscribe [:me])
     (rf/subscribe [:current-player])]))
(fn [[me current-player]]
  (same-player? me current-player)))
```

re-frame: query app db

```
(rf/reg-sub
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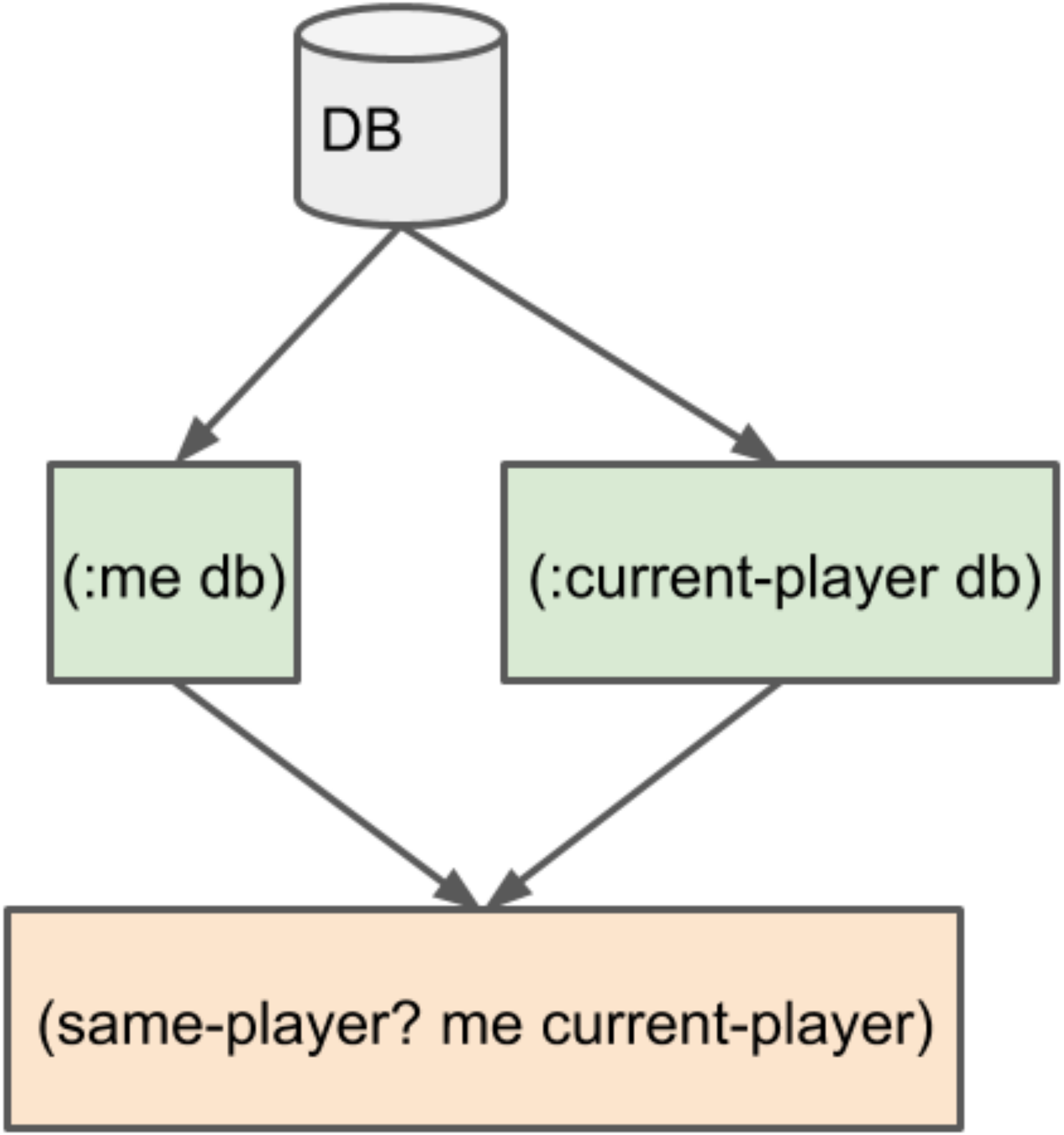
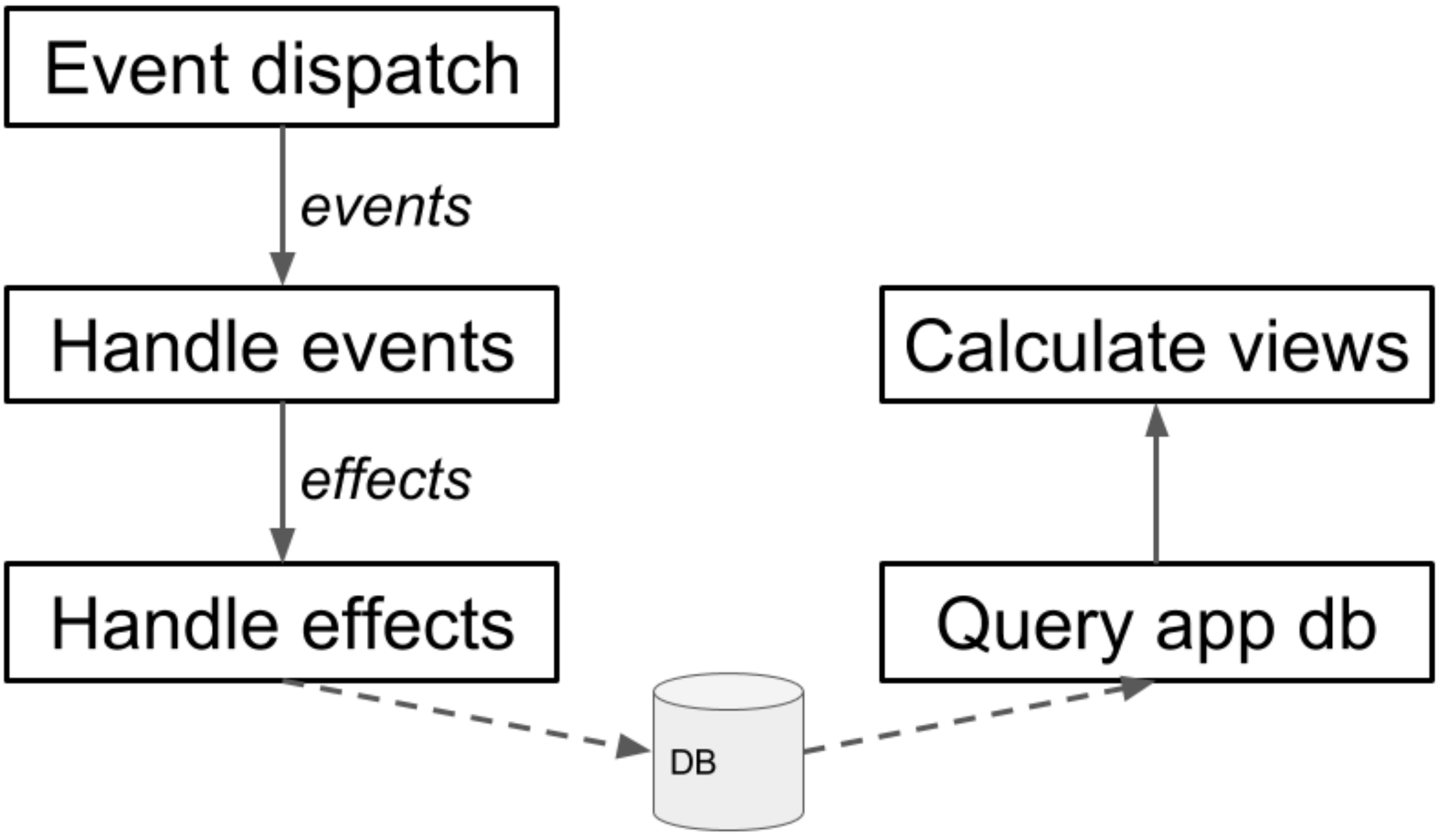
(fn [[me current-player]]
  (same-player? me current-player)))
```

```
(rf/reg-sub
 :my-turn?
 :<- [:me]
 :<- [:current-player]
 (fn [[me current-player]]
(same-player? me current-player)))
```


DB
(:me db)
(:current-player db)
(same-player? me current-player)

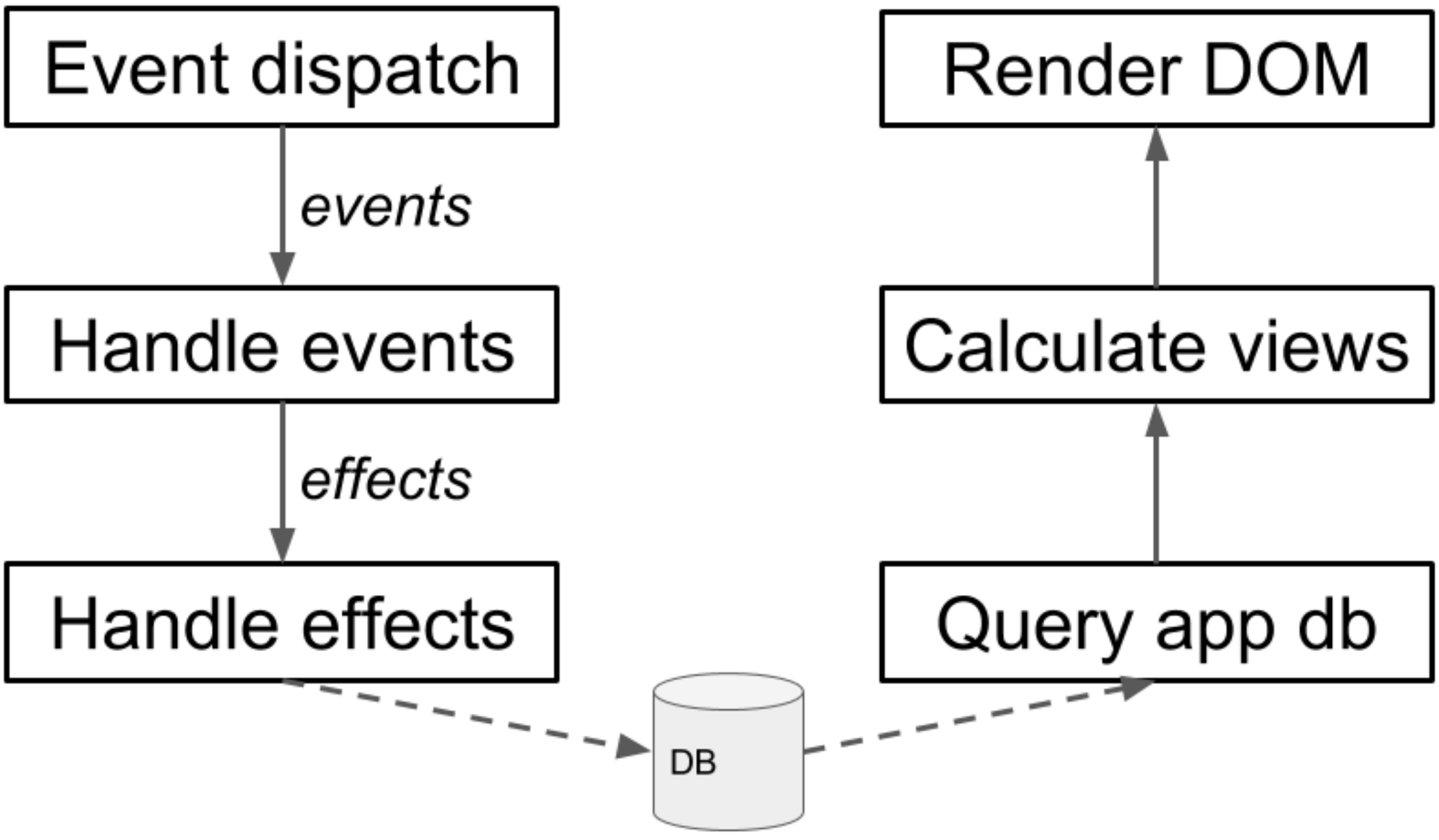

Event dispatch
events
Handle events
effects
Handle effects
DB
Calculate views
Query app db

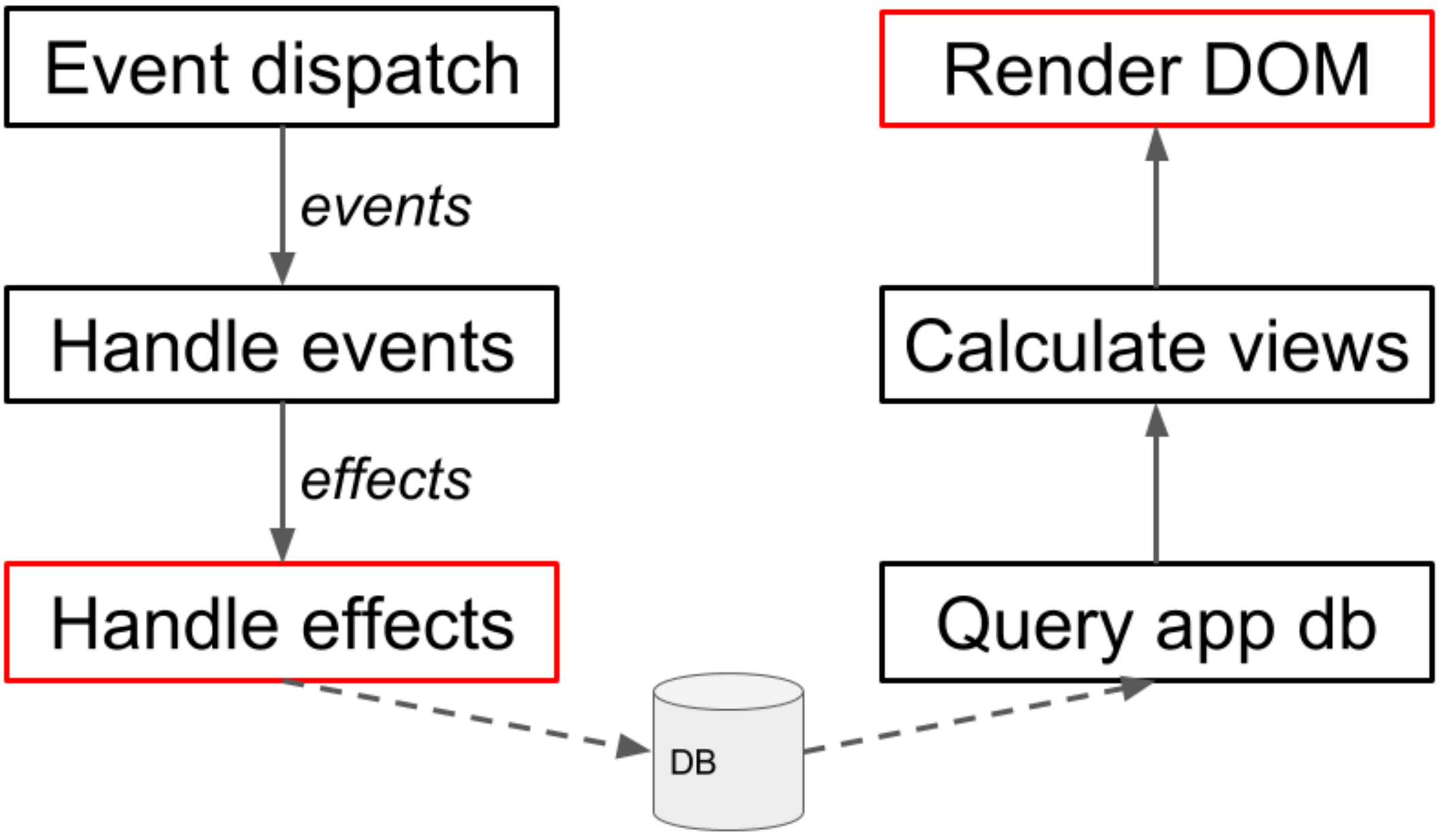
re-frame: calculate views

```
(defn main-panel []
  [:div
   [:div {:class "container"}
    (if @(rf/subscribe [:game-id])
      [on-going-game-view]
      [start-game-view])]])
```

re-frame: calculate views

```
(defn main-panel []
  [:div
   [:div {:class "container"}
    (if @(rf/subscribe [:game-id])
      [on-going-game-view]
      [start-game-view])]])
```


Event dispatch
events
Handle events
effects
Handle effects
DB
Render DOM
Calculate views
Query app db


Event dispatch
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DB
Render DOM
Calculate views
Query app db

Additional re-frame

» spec the database

Additional re-frame

- spec the database
- interceptors

Additional re-frame

- spec the database
- interceptors
- use namespaced keywords `:panel1/edit` and `:panel2/edit`

re-frame: local reagent/atom

```
(defn todo-input [title]
  (let [val (reagent/atom title)
        save #(rf/dispatch [:save (-> @val str string/trim)])]
    (fn [props]
      [:input (merge props
                     {:value @val
                      :on-blur save
                      :on-change #(reset! val (-> % .-target .-value))
                      :on-key-down #(case (.-which %)
                                      13 (save)
                                      27 (fn [] (reset! val ""))
                                      nil)})])))
```

Firebase

messaging

authentication

storage

cloud functions

hosting

realtime database

Firebase Hosting

Firebase Realtime Database

Realtime Database

```
(defn init []
  (js/firebase.initializeApp
   #js {:apiKey "AIzaSyAb1IwbJHuNylWap1MFraBKVYRUFk4ShsY",
        :authDomain "bg-example-81c6b.firebaseapp.com",
        :databaseURL "https://bg-example-81c6b.firebaseio.com",
        :projectId "bg-example-81c6b",
        :storageBucket "bg-example-81c6b.appspot.com",
        :messagingSenderId "391548202910"}))
```

Realtime Database

```
(defn db-ref [path]
  (.ref (js/firebase.database)
        (string/join "/" path)))
```

```
(defn save! [ref data]
  (.set ref (pr-str data)))
```

Realtime Database: Subscribe

```
(defn subscribe [ref]
  (.on ref "value"
       (fn [snapshot]
         (when-let [d (.val snapshot)]
           (rf/dispatch [:sync (reader/read-string d)])))))
```

How to draw an owl

1.

2.

1. Draw some circles

2. Draw the rest of the owl

Step 1

Step 1:
Create a new project

```
lein new re-frame bg +re-frisk
```

Step 2: Modify template

1. Update dependencies

Step 2: Modify template

1. Update dependencies
2. `rm -rf src/clj`

Step 2: Modify template

1. Update dependencies
2. `rm -rf src/clj`
3. `mv src/cljs/bg/core.cljs src/cljs/bg/main.cljs`

Step 2: Modify template

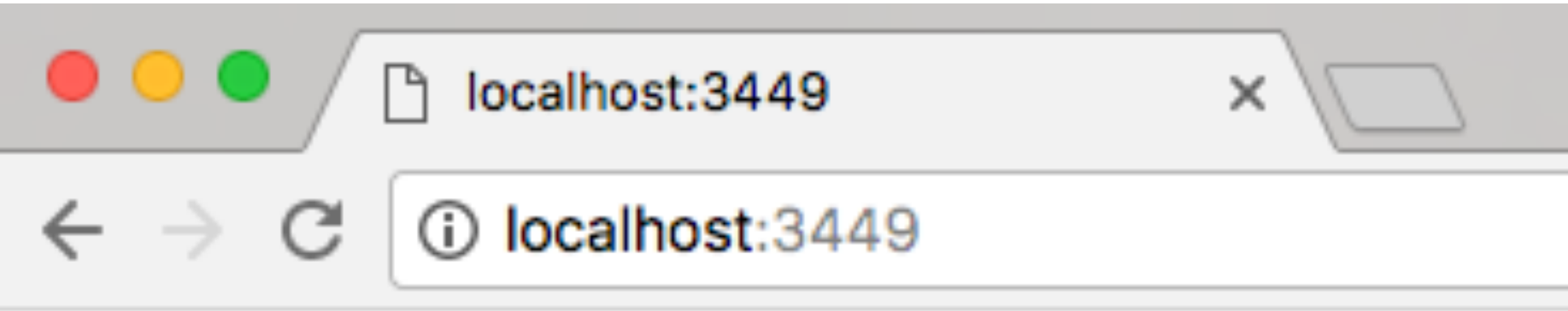
1. Update dependencies
2. `rm -rf src/clj`
3. `mv src/cljs/bg/core.cljs src/cljs/bg/main.cljs`
4. Update references from `bg.core` to `bg.main`.

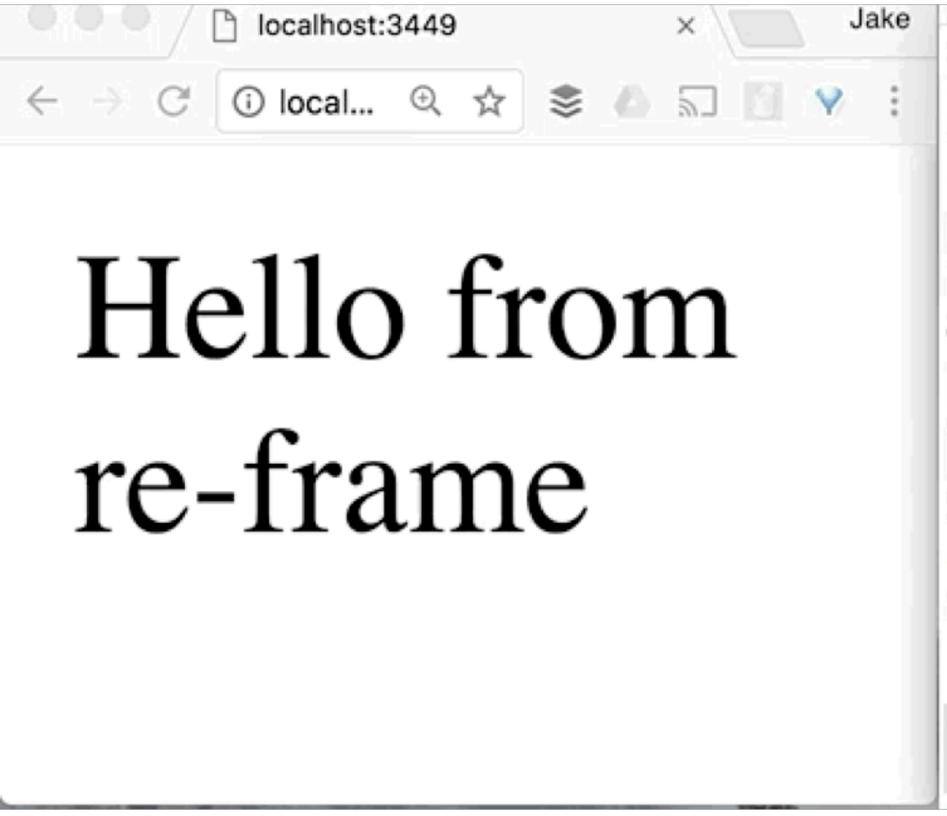
Step 2: Modify template

1. Update dependencies
2. `rm -rf src/clj`
3. `mv src/cljs/bg/core.cljs src/cljs/bg/main.cljs`
4. Update references from `bg.core` to `bg.main`.
5. Add `[cljsjs/firebase "4.8.1-0"]` dependency in project.clj

Step 3: Build

```
lein figwheel dev
```

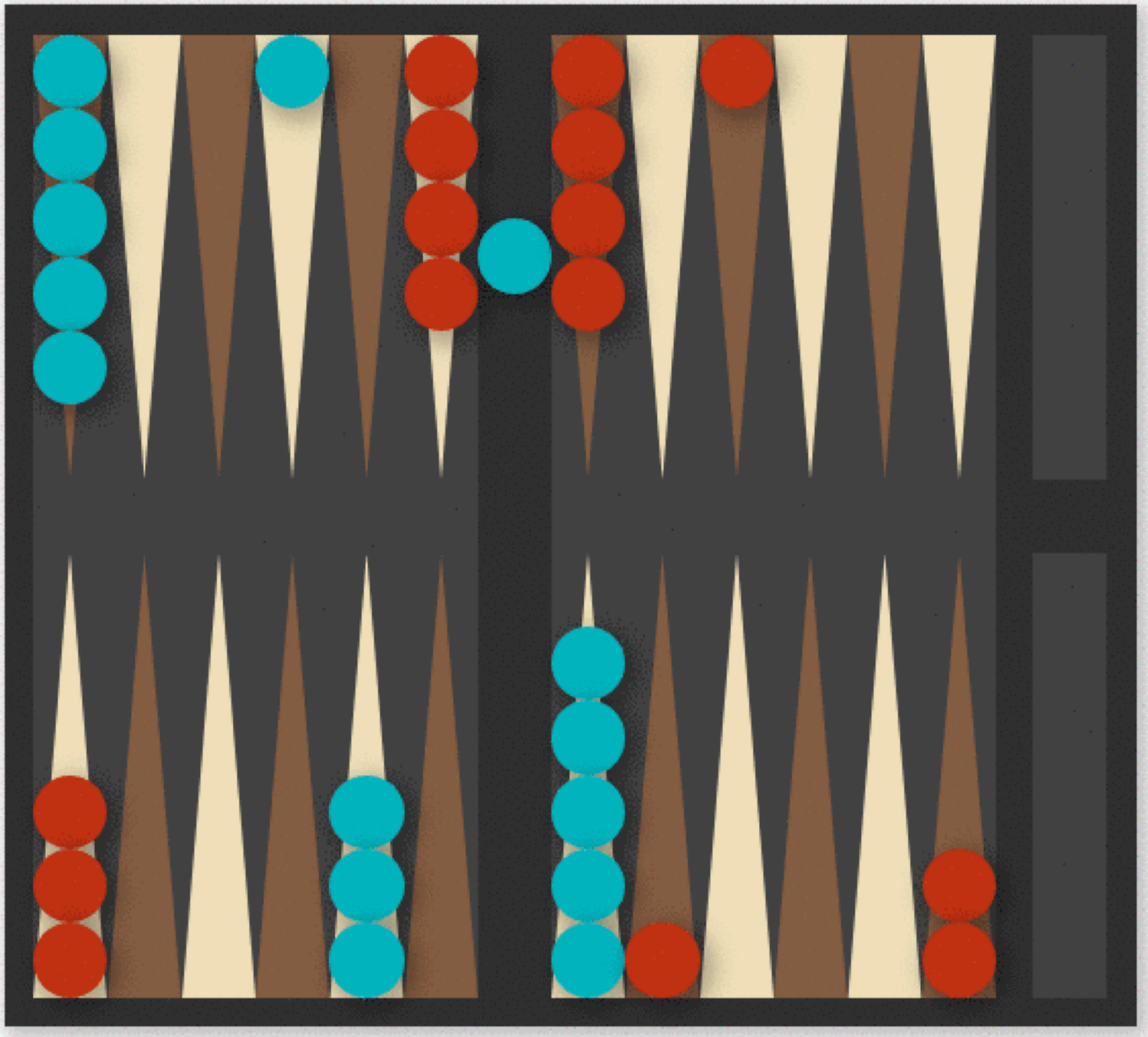

localhost:3449
localhost:3449
Hello from re-frame




```
1 (ns backgammon.views
2   (:require [re-frame.core :as rf]
3             [backgammon.subs :as subs]))
4
5 (defn main-panel []
6   (let [name (rf/subscribe [::subs/name])]
7     [:div "Hello from " @name]))
```

```
-:---   views.cljs      All L7     Git:master
```

Roll dice | End turn | Undo moves | Player's turn:



▶ re-frisk

Step 4: Deploy

Step 4: Deploy

1. Sign-in at https://firebase.com

Step 4: Deploy

1. Sign-in at https://firebase.com
2. Go to console and add a new Firebase project

Step 4: Deploy

1. Sign-in at https://firebase.com
2. Go to console and add a new Firebase project
3. Copy your project's configuration from the Firebase console

bg-example

Go to docs

Welcome to Firebase!

Get started here.

iOS

Add Firebase to your iOS app

Add Firebase to your Android app

Add Firebase to your web app

Receive email updates about new Firebase features, research, and events

SIGN UP

Discover Firebase

Step 4: Deploy

1. Sign-in at https://firebase.com
2. Go to console and add a new Firebase project
3. Copy your project's configuration from the Firebase console
4. `npm install -g firebase-tools`

Step 4: Deploy

1. Sign-in at https://firebase.com
2. Go to console and add a new Firebase project
3. Copy your project's configuration from the Firebase console
4. `npm install -g firebase-tools`
5. `firebase init`

Step 4.5: Initialize project

```
$ firebase init

? Which Firebase CLI features do you want to setup for this folder?

 ◉ Database: Deploy Firebase Realtime Database Rules
 ◯ Firestore: Deploy rules and create indexes for Firestore
 ◯ Functions: Configure and deploy Cloud Functions
❯◉ Hosting: Configure and deploy Firebase Hosting sites
 ◯ Storage: Deploy Cloud Storage security rules
```

Step 4: Deploy

1. Sign-in at https://firebase.com
2. Go to console and add a new Firebase project
3. Copy your project's configuration from the Firebase console
4. `npm install -g firebase-tools`
5. `firebase init`
6. `lein do clean, cljsbuild once min`

Step 4: Deploy

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2. Go to console and add a new Firebase project
3. Copy your project's configuration from the Firebase console
4. `npm install -g firebase-tools`
5. `firebase init`
6. `lein do clean, cljsbuild once min`
7. `firebase deploy`

https://bg-example-81c6b.fire

Secure | https://bg-example-81c6b.firebaseapp.com

Hello from re-frame

Step 5: Implement game logic

java ⌘1 bash ⌘2

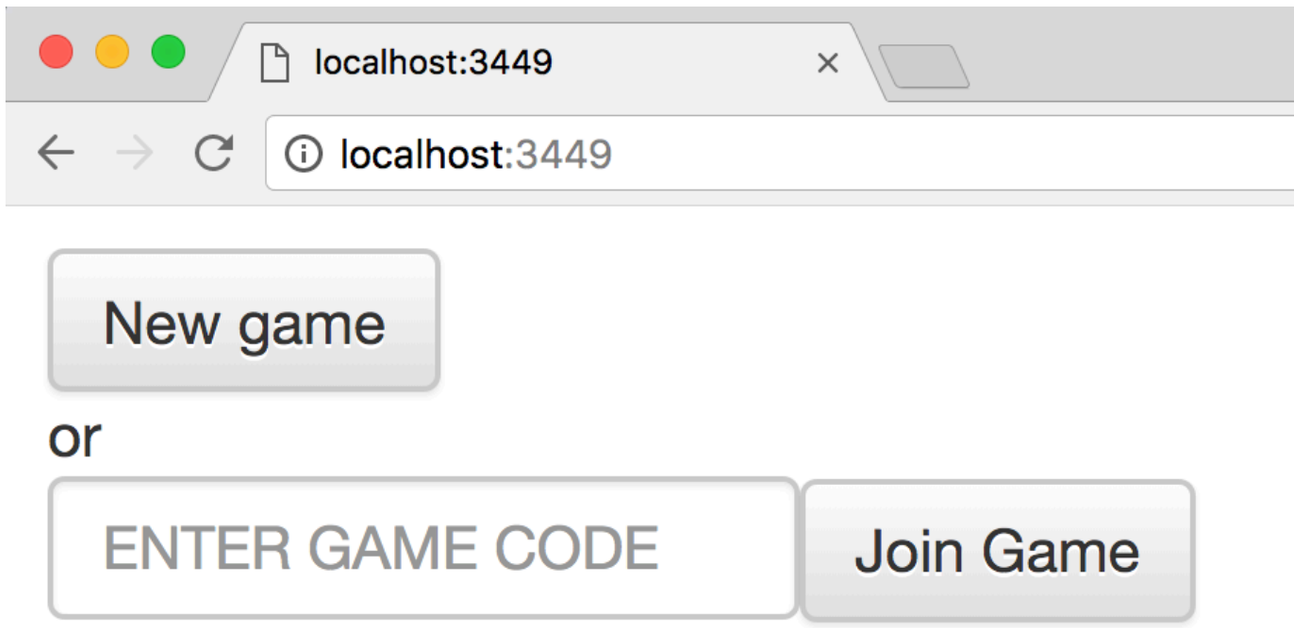
```
**********************************************
*************** Running tests ***************
:reloading (re-frame.db re-frame.loggers re-frame
.registrar re-frame.interceptor re-frame.cofx re-
frame.utils re-frame.trace re-frame.subs re-frame
.std-interceptors re-frame.events re-frame.router
 re-frame.fx re-frame.core bg.game bg.game-test)

Ran 7 tests containing 72 assertions.
0 failures, 0 errors.

Passed all tests
Finished at 07:07:55.858 (run time: 0.689s)
```

```
6
7  (deftest test-moving-piece
8    (is (= {:points [[:black] []]
9            :bar []}
10           (game/move-piece {:points [[] [:b
11                             :bar []}
12                            :black
13                            1
14                            0)))
15
16   (is (= {:points [[:black] []]
17           :bar [:red]}
-:---  game_test.cljc    1% L8     (ClojureC
```

Step 6: Implement views



The New button

```
[:div.row
 [:button {:class ["btn" "btn-default"]
           :on-click #(rf/dispatch [:join-game
                                    (random-four-characters)])}
  "New game"]]
```

The New button

```
[:div.row
 [:button {:class ["btn" "btn-default"]
           :on-click #(rf/dispatch [:join-game
                                    (random-four-characters)])}
  "New game"]]
```

:join-game event handler

```
(rf/reg-event-fx
 :join-game
 (fn [coeffects [_ game-id]]
   (let [db (:db coeffects)]
     {:db (assoc db :game-id game-id)
      :firebase/subscribe {:game-id game-id
                           :default db/initial-game}})))
```

:join-game event handler

```
(rf/reg-event-fx
 :join-game
 (fn [coeffects [_ game-id]]
   (let [db (:db coeffects)]
     {:db (assoc db :game-id game-id)
      :firebase/subscribe {:game-id game-id
                           :default db/initial-game}})))
```

:firebase/subscribe effect handler

```
(rf/reg-fx
 :firebase/subscribe
 (fn [{:keys [game-id default]}]
   (let [ref (db-ref [game-id])]
     (.once ref "value"
            (fn received [snapshot]
              (subscribe ref)
              (if-let [data (.val snapshot)]
                (rf/dispatch [:sync (reader/read-string data)])
                (do (save! ref default)
                    (rf/dispatch [:sync default])))))))))
```

:firebase/subscribe effect handler

```
(rf/reg-fx
 :firebase/subscribe
 (fn [{:keys [game-id default]}]
   (let [ref (db-ref [game-id])]
     (.once ref "value"
            (fn received [snapshot]
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              (if-let [data (.val snapshot)]
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                (do (save! ref default)
                    (rf/dispatch [:sync default])))))))))
```

:firebase/subscribe effect handler

```
(rf/reg-fx
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                    (rf/dispatch [:sync default])))))))))
```

:firebase/subscribe effect handler

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   (let [ref (db-ref [game-id])]
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            (fn received [snapshot]
              (subscribe ref)
              (if-let [data (.val snapshot)]
                (rf/dispatch [:sync (reader/read-string data)])
                (do (save! ref default)
                    (rf/dispatch [:sync default])))))))))
```

Step 7: Play game!

Tips

localhost:3449

Jake

lo...

Game Code: **EWYM**

Start game!

Become

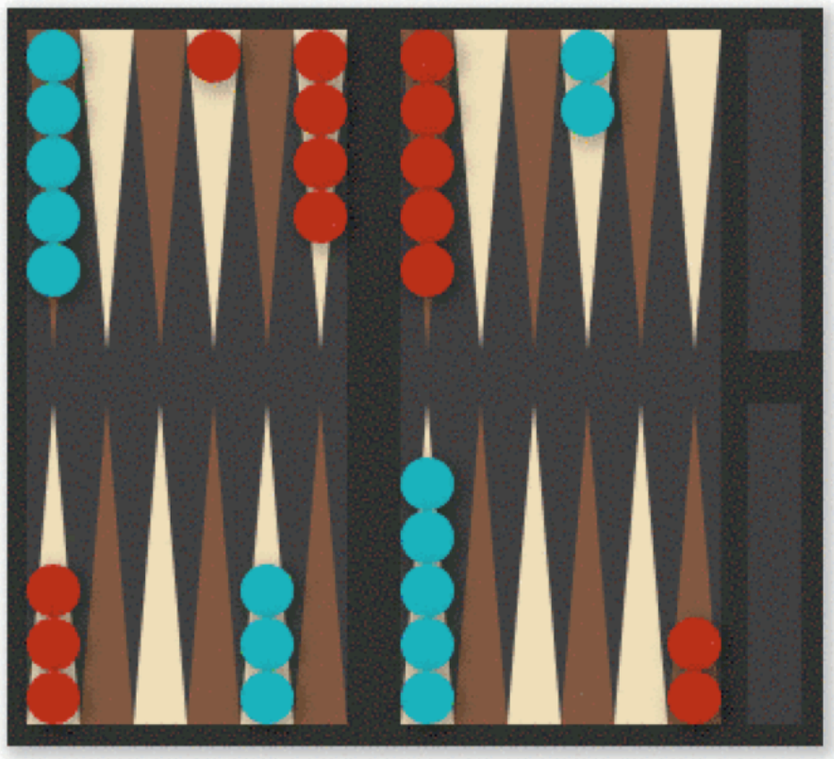
Become

Roll dice

End turn

Undo moves

Player's turn:



▸ re-frisk

Review

CLJS + reagent + re-frame is a compelling stack for building SPAs

CLJS tooling provides quick feedback cycles

Firebase provides good tools for serverless programming

More resources

- #re-frame ane #reagent in Clojurians slack
- re-frame repo has a lot of documentation
- Eric Normand has some great articles on PurelyFunctional.tv
- https://github.com/jakemcc/backgammon

Thank you

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