ClojureScript and core.async

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Agenda

- Part 1: ClojureScript
- Part 2: core.async

Part 1: ClojureScript

Current status

- JavaScript is everywhere, but not a robust and concise language - wat
  Requires discipline to only use "the good parts"
- JavaScript is taking over: UI logic from server to client
- JavaScript is not going away in the near future
- Advanced libraries and technologies exist to optimize JavaScript: (example: Google Closure)

ClojureScript

- Released June 20th 2011
- Client side story of Clojure ecosystem
- Serves Clojure community:

  50%* of Clojure users also use ClojureScript

  93%** of ClojureScript users also use Clojure
- ClojureScript targets JavaScript by adopting Google Closure
  - libraries: `goog.provide/require` etc.
  - optimization: dead code removal

*http://cemerick.com/2013/11/18/results-of-the-2013-state-of-clojure-clojurescript-survey/

** http://blog.cognitect.com/blog/2014/10/24/analysis-of-the-state-of-clojure-and-clojurescript-survey-2014

The following slides are just for reference.
Let’s see some live ClojureScript!

Syntax

```
f(x) -> (f x)
```

Syntax

```
if (...) {
  ...
} else {
  ...
}
```

->

```
(if ...
    ...
    ...)
```

Syntax

```
var foo = "bar";
```

```
(def foo "bar")
```

JavaScript - ClojureScript

```
// In JavaScript
// locals are mutable

function foo(x) {
  x = "bar";
}
```

```
;; this will issue an
;; error

(defn foo [x]
  (set! x "bar"))
```

source: http://himera.herokuapp.com/synonym.html

JavaScript - ClojureScript

```
if (bugs.length > 0) {
  return 'Not ready for release';
} else {
  return 'Ready for release';
}
```

```
(if (pos? (count bugs))
  "Not ready for release"
  "Ready for release")
```

source: http://himera.herokuapp.com/synonym.html

JavaScript - ClojureScript

`var foo = {bar: "baz"};`
`foo.bar = "baz";`
`foo["abc"] = 17;`
 	
`alert('foo')`
`new Date().getTime()`
`new`
`Date().getTime().toString()`
	`(def foo (js-obj "bar" "baz"))`
	`(set! (.-bar foo) "baz")`
	`(aset foo "abc" 17)`
	
	`(js/alert "foo")`
	`(.getTime (js/Date.))`
	`(.. (js/Date.) (getTime)`
	`(toString))`

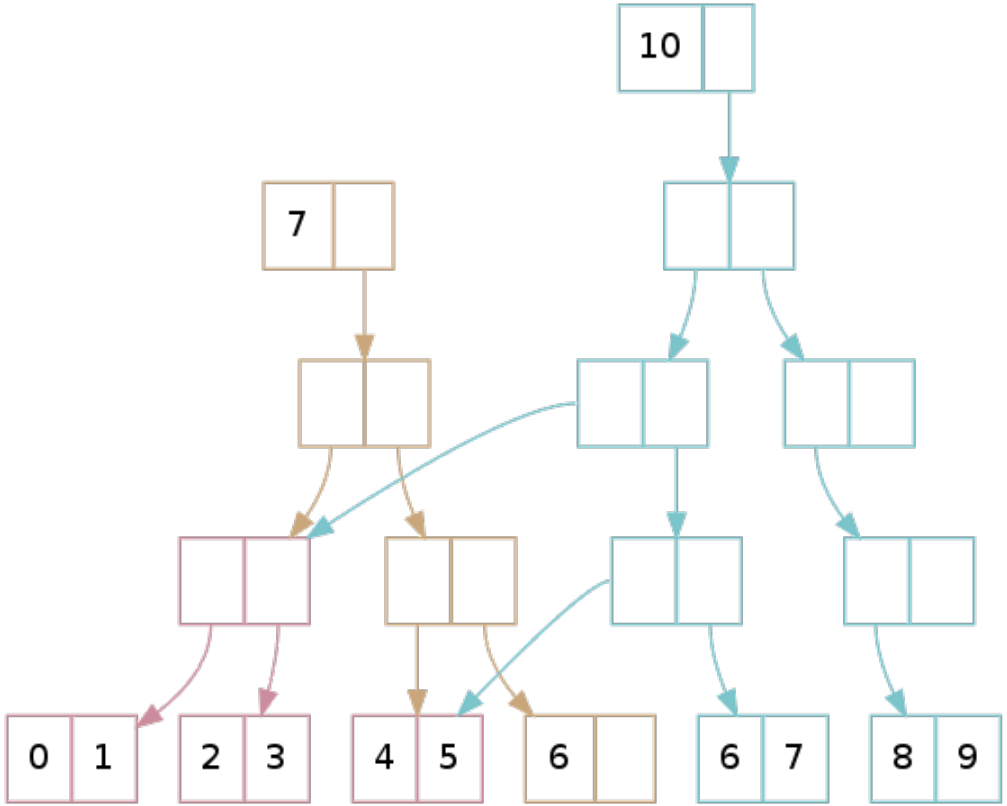
source: http://himera.herokuapp.com/synonym.html

Core language features

- persistent immutable data structures
- functional programming
- sequence abstraction
- isolation of mutable state (atoms)
- Lisp: macros, REPL
- core.async

Persistent data structures

```
(def v [1 2 3])
(conj v 4) ;; => [1 2 3 4]
(get v 0) ;; => 1
(v 0) ;; => 1
```



source: http://hypirion.com/musings/understanding-persistent-vector-pt-1

Persistent data structures

```
(def m {:foo 1 :bar 2})
(assoc m :foo 2) ;; => {:foo 2 :bar 2}
(get m :foo) ;;=> 1
(m :foo) ;;=> 1
(:foo m) ;;=> 1
(dissoc m :foo) ;;=> {:bar 2}
```

Functional programming

```
(def r (->>
         (range 10)     ;; (0 1 2 .. 9)
         (filter odd?) ;; (1 3 5 7 9)
         (map inc)))    ;; (2 4 6 8 10)
;; r is (2 4 6 8 10)
```

Functional programming

```
;; r is (2 4 6 8 10)
(reduce + r)
;; => 30
(reductions + r)
;; => (2 6 12 20 30)
```

```
var sum = _.reduce(r, function(memo, num){ return memo + num; });
```

Sequence abstraction

Data structures as seqs

```
(first [1 2 3]) ;;=> 1
(rest [1 2 3]) ;;=> (2 3)
```

General seq functions: `map`, `reduce`, `filter`, …

```
(distinct [1 1 2 3]) ;;=> (1 2 3)
(take 2 (range 10)) ;;=> (0 1)
```

See http://clojure.org/cheatsheet for more

Sequence abstraction

Most seq functions return lazy sequences:

```
(take 2 (map
          (fn [n] (js/alert n) n)
            (range)))
```

side effect

infinite lazy sequence of numbers

Mutable state: atoms

```
(def my-atom (atom 0))
@my-atom ;; 0
(reset! my-atom 1)
(reset! my-atom (inc @my-atom)) ;; bad idiom
(swap! my-atom (fn [old-value]
                 (inc old-value)))
(swap! my-atom inc) ;; same
@my-atom ;; 4
```

Isolation of state

one of possible pre-React patterns

function called from event handler

new todo

```
(def app-state (atom []))

(declare rerender)

(add-watch app-state ::rerender
           (fn [k a o n]
             (rerender o n)))


(defn add-todo [text]
  (let [tt (.trim text)]
    (if (seq tt)
      (swap! app-state conj
             {:id (get-uuid)
              :title tt
              :completed false}))))
```

adapted from: https://github.com/dfuenzalida/todo-cljs

Lisp: macros

```
(map inc
  (filter odd?
    (range 10)))

(->>
  (range 10)
  (filter odd?)
  (map inc))
```

thread last macro

Lisp: macros

```
(macroexpand
  '(->> (range 10) (filter odd?)))

;; => (filter odd? (range 10))

(macroexpand
  '(->> (range 10) (filter odd?) (map inc)))

;; => (map inc (filter odd? (range 10)))
```

Lisp: macros

JVM Clojure:

```
(defmacro defonce [x init]
 `(when-not (exists? ~x)
    (def ~x ~init)))
```

ClojureScript:

```
(defonce foo 1)
(defonce foo 2) ;; no effect
```

notes:

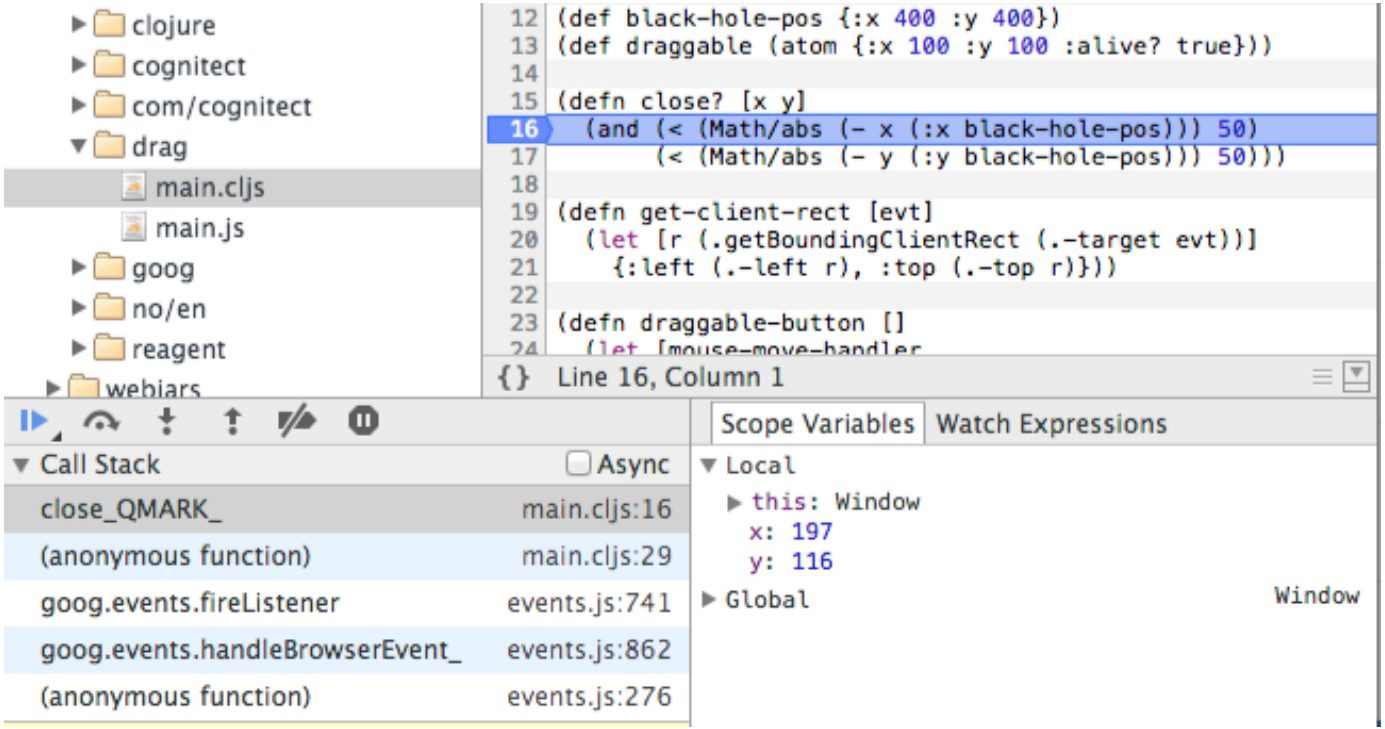
- macros must be written in JVM Clojure
- are expanded at compile time
- generated code gets executes in ClojureScript

Leiningen

- Used by 98% of Clojure users
- Clojure's Maven
- Managing dependencies
- Running a REPL
- Packaging and deploying
- Plugins:
  - lein cljsbuild – building ClojureScript
  - lein figwheel – live code reloading in browser

Debugging

Source maps let you debug ClojureScript directly from the browser



How to run at home?

- Install JDK 7+
- Install leiningen (build tool)
- `git clone https://github.com/borkdude/sytac-core-async.git`
- `cd sytec-core-async/code/cljs-demo`
- See `README.md` for further instructions

Probably Cursive IDE (IntelliJ) is most beginner friendly

Part 2: core.async

Excellent webinar by David Nolen

http://go.cognitect.com/core_async_webinar_recording
https://github.com/cognitect/async-webinar

core.async ajax with cljs-http

```
(go (let [email (:body
                 (<! (http/get
                      (str "/api/users/"
                           "123"
                           "/email"))))
          orders (:body
                  (<! (http/get
                       (str
                        "/api/orders-by-email/"
                        email))))]
      (count orders)))
```

Get started with Clojure(Script)

- Read a Clojure(Script) book
- Do the 4clojure exercises
- Start hacking on your own project
- Pick an online Clojure course
- Join the AMSCLJ meetup
- Join the Slack community