AltLaw and Clojure

Reston, VA
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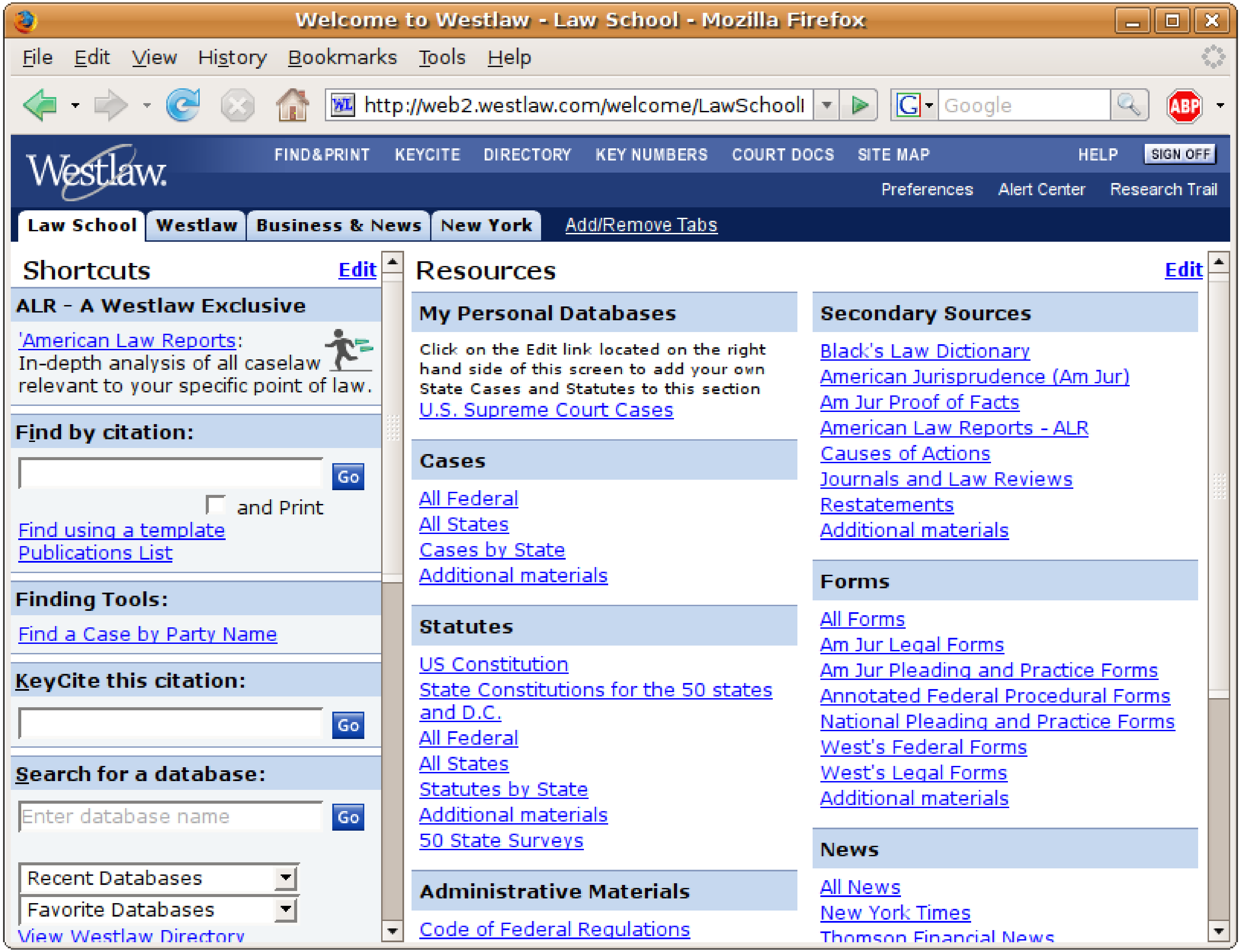
Stuart Sierra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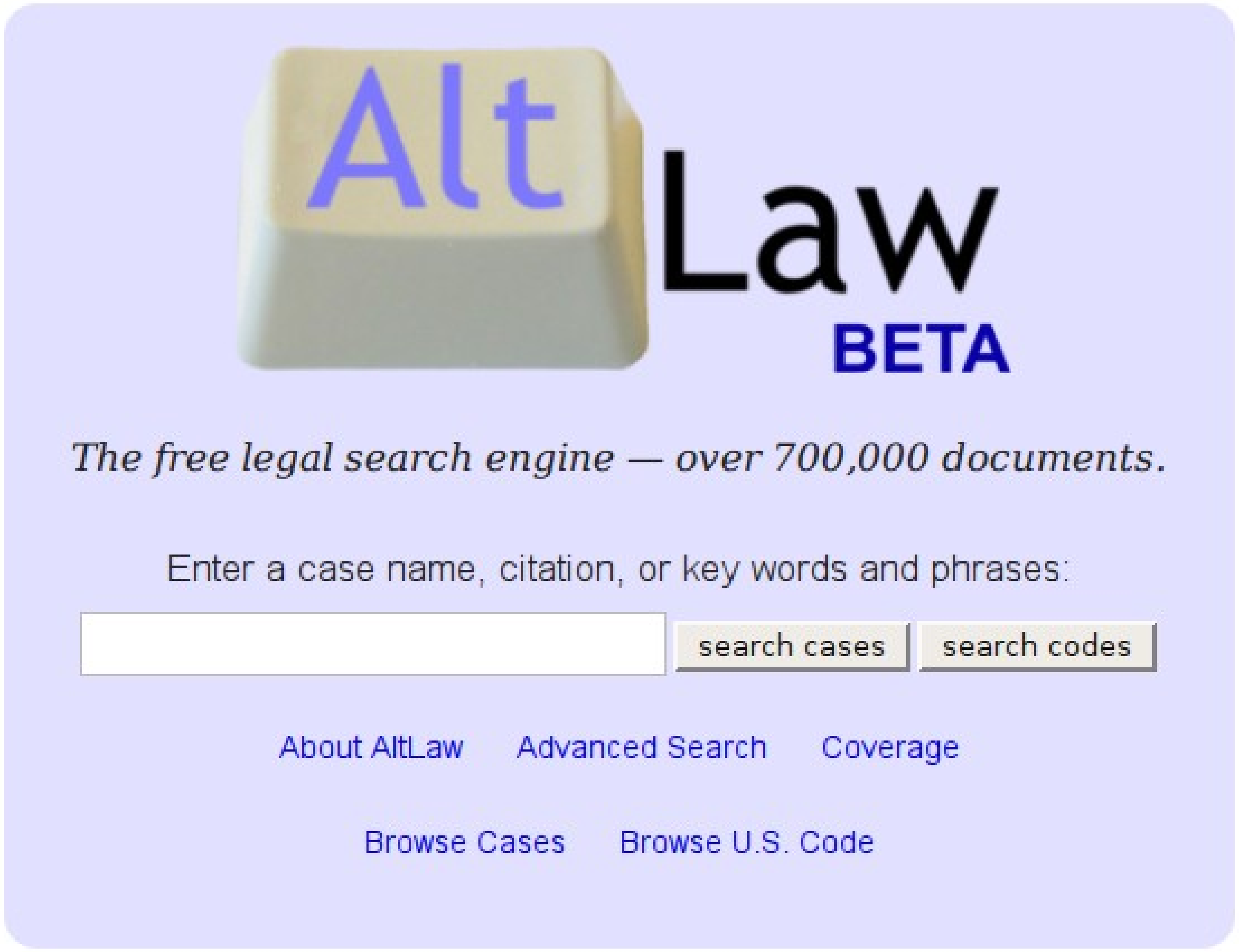

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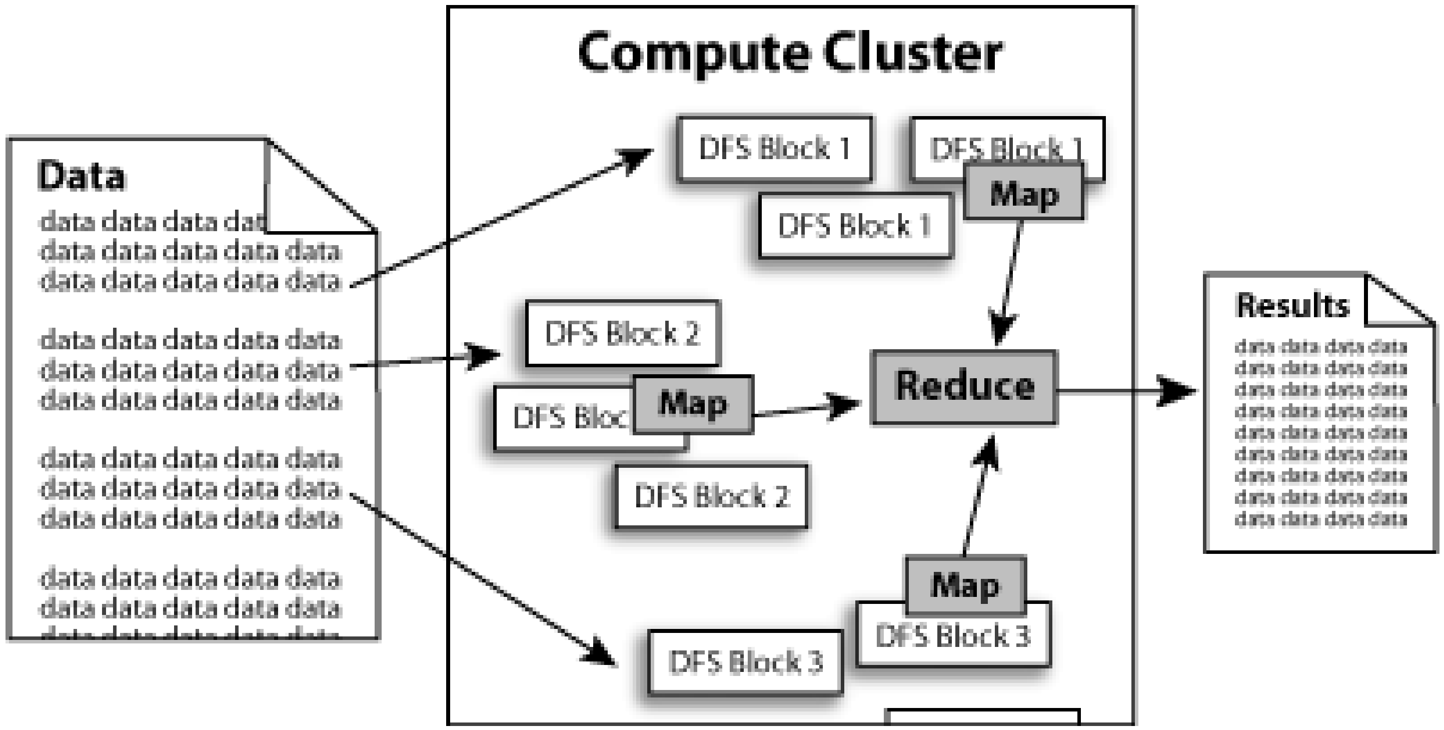
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Data
data data data data data
DFS Block 1
DFS Block 1
DFS Block 1
Map
DFS Block 2
DFS Bloc
Map
DFS Block 2
Reduce
Map
DFS Block 3
DFS Block 3
Results
data data data data

```
public static class MapClass extends MapReduceBase
  implements Mapper<LongWritable, Text, Text, IntWritable> {

  private final static IntWritable one = new IntWritable(1);
  private Text word = new Text();

  public void map(LongWritable key, Text value,
                  OutputCollector<Text, IntWritable> output,
                  Reporter reporter) throws IOException {
    String line = value.toString();
    StringTokenizer itr = new StringTokenizer(line);
    while (itr.hasMoreTokens()) {
      word.set(itr.nextToken());
      output.collect(word, one);
    }
  }
}
```

```
public static class Reduce extends MapReduceBase
  implements Reducer<Text, IntWritable, Text, IntWritable> {

  public void reduce(Text key, Iterator<IntWritable> values,
                     OutputCollector<Text, IntWritable> output,
                     Reporter reporter) throws IOException {
    int sum = 0;
    while (values.hasNext()) {
      sum += values.next().get();
    }
    output.collect(key, new IntWritable(sum));
  }
}
```

```
(map key value)

(reduce key values)
```

```
(setup-mapreduce)

(defn my-map [key value]
 ... return list of [key,value] pairs)

(defn my-reduce [key values]
 ... return list of [key,value] pairs)
```

Apache Solr

Lucene

```
(ns org.altlaw.www.DocResource
  (:gen-class :extends org.restlet.resource.Resource))

(defn -getVariants [this]
  ... return list of supported media types ...)

(defn -represent [this variant]
  ... respond to GET request ...)

(defn -acceptRepresentation [this]
  ... respond to POST request ...)

(defn -storeRepresentation [this entity]
  ... respond to PUT request ...)

(defn -deleteRepresentation [this]
  ... respond to DELETE request ...)
```

StringTemplate

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <title>$html_title$</title>
    <meta http-equiv="content-type" content="text/html;charset=utf-8" />
    <meta http-equiv="Content-Style-Type" content="text/css" />
    $html_head$
  </head>
  <body>
    $html_body$
  </body>
</html>
```

StringTemplate

```
$xhtml_page(
    html_head=default_html_head(),
    html_body={
        <div id="container" class="$page_class$">
          <div id="site_head">$site_head$</div>
          <div id="site_body">$site_body$<div id="content">
          <div id="site_foot">$site_foot$</div>
        </div>
        $analytics()$
    }
)$
```

test-is assertions

```
(is (= 4 (+ 2 2)))
true

(is (= 5 (+ 2 2)))
FAIL in ...
expected: (= 5 (+ 2 2))
  actual: (not (= 5 4))

(is (instance? Integer (/ 3 5)))
FAIL in ...
expected: (instance? Integer (/ 3 5))
  actual: clojure.lang.Ratio
```

test-is assertions

```
(is (thrown? ArithmeticException (/ 1 0)))
#<ArithmeticException java.lang.ArithmeticException: Divide
by zero>


(is (thrown? IllegalArgumentException (/ 1 0)))
ERROR in ..
expected: (thrown? IllegalArgumentException (/ 1 0))
  actual: java.lang.ArithmeticException: Divide by zero
 at clojure.lang.Numbers.divide (Numbers.java:138)
    user/eval (NO_SOURCE_FILE:1)
    clojure.lang.Compiler.eval (Compiler.java:4580)
    clojure.core/eval (core.clj:1728)
    swank.commands.basic/eval_region (basic.clj:36)
```

Clojure tests as metadata

```
(defn add
  ([x y] (+ x y))
  {:test (fn [] (assert (= 7 (add 3 4))))})


(test #'add)
:ok
```

test-is tests as metadata

```
(with-test
    (defn add [x y] (+ x y))
  (is (= 7 (add 3 4)))
  (is (= 8 (add 2 2))))

(run-tests)
Testing user

FAIL in (add) ...
expected: (= 8 (add 2 2))
  actual: (not (= 8 4))

Ran 1 tests containing 2 assertions.
1 failures, 0 errors.
```

test-is tests in isolation

```
(deftest addition
  (is (= 4 (add 2 2)))
  (is (= 7 (add 3 4)))
  (is (= 9 (add 5 5))))
```

```
(addition)
FAIL in (addition) ...
expected: (= 9 (add 5 5))
  actual: (not (= 9 10))
```

assertions with shared structure

```
(deftest addition
  (are (= _1 (add _2 _3))
       4  2 2
       7  3 4
       9  5 5))
```

```
(deftest addition
  (is (= 4 (add 2 2)))
  (is (= 7 (add 3 4)))
  (is (= 9 (add 5 5))))
```

code walker

```
(defn walk [inner outer form]
  (cond
   (list? form) (outer (apply list (map inner form)))
   (seq? form) (outer (doall (map inner form)))
   (vector? form) (outer (vec (map inner form)))
   (map? form) (outer (into (outer (if (sorted? form)
                                      (sorted-map) {}))
                            (map inner form)))
   (set? form) (outer (into (outer (if (sorted? form)
                                      (sorted-set) #{}))
                            (map inner form)))
   :else (outer form)))
```

code walker

Post-order traversal

```
(defn postwalk [f form]
  (walk (partial postwalk f) f form))
```

Pre-order traversal

```
(defn prewalk [f form]
  (walk (partial prewalk f) identity (f form)))
```

using the code walker

```
(defn macroexpand-all [form]
  (prewalk (fn [x]
             (if (seq? x) (macroexpand x) x))
           form))


(defn postwalk-replace [smap form]
  (postwalk (fn [x]
              (if (contains? smap x) (smap x) x))
            form))
```

templates

```
(template (= _1 (add _2 (* x y))))
```

```
(let [HOLE_1282 (* x y)]
  (fn [_1 _2] (= _1 (add _2 HOLE_1282))))
```

```
(do-template (is (= _1 (add _2 _3)))
             4   2 2
             7   3 4
             9   5 5))
```

```
(do (is (= 4 (add 2 2)))
    (is (= 7 (add 3 4)))
    (is (= 9 (add 5 5))))
```

assertion templates

```
(deftest addition
  (are (= _1 (add _2 _3))
       4  2 2
       7  3 4
       9  5 5))
```

```
(deftest addition
  (is (= 4 (add 2 2)))
  (is (= 7 (add 3 4)))
  (is (= 9 (add 5 5))))
```

singletons

```
(def *thing* (ThingFactory/getInstance))
```

```
(defn make-new-thing []
  (ThingFactory/getInstance))

(declare *thing*)

(defmacro with-thing [& body]
  (binding [*thing* (make-new-thing)]
    ~@body))
```

global singletons

```
(defn global-singleton [f]
  (let [instance (atom nil)
        make-instance (fn [_] (f))]
    (fn [] (or @instance
               (swap! instance make-instance)))))
```

```
(def thing (global-singleton
             (fn [] (ThingFactory/getInstance))))

(thing)
```

per-thread singletons

```
(defn per-thread-singleton [f]
  (let [thread-local (proxy [ThreadLocal] []
                       (initialValue [] (f)))]
    (fn [] (.get thread-local))))
```

```
(def thing (per-thread-singleton
             (fn [] (ThingFactory/getInstance))))

(thing)
```

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