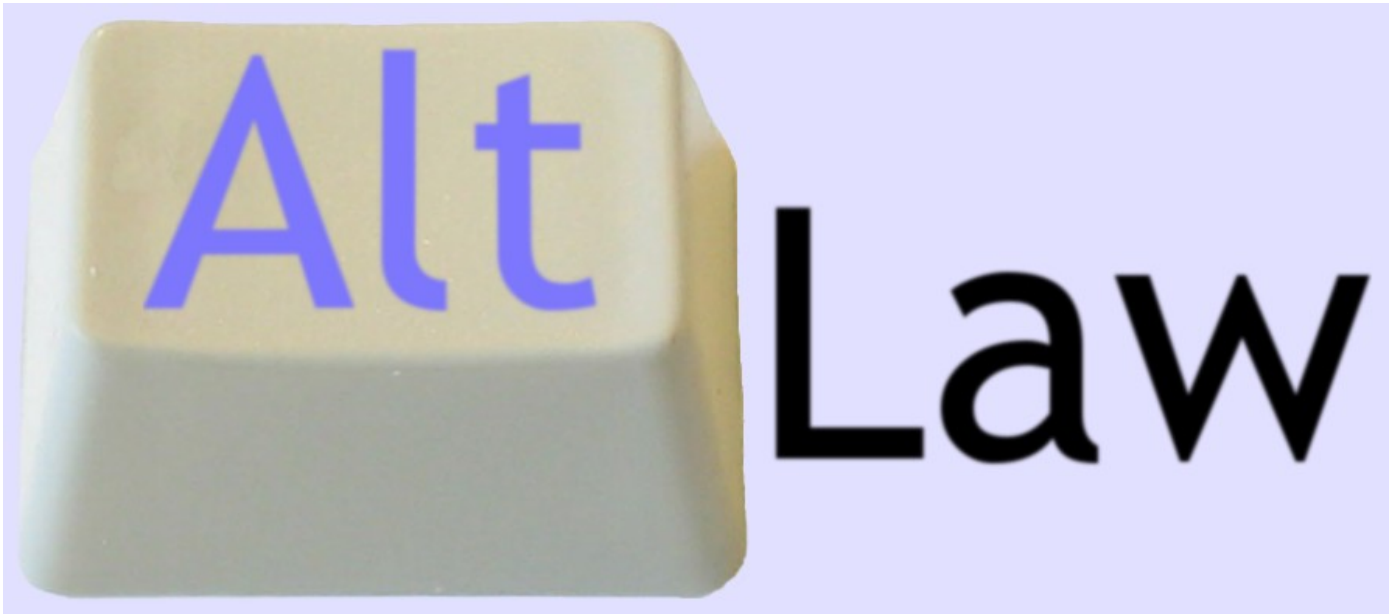
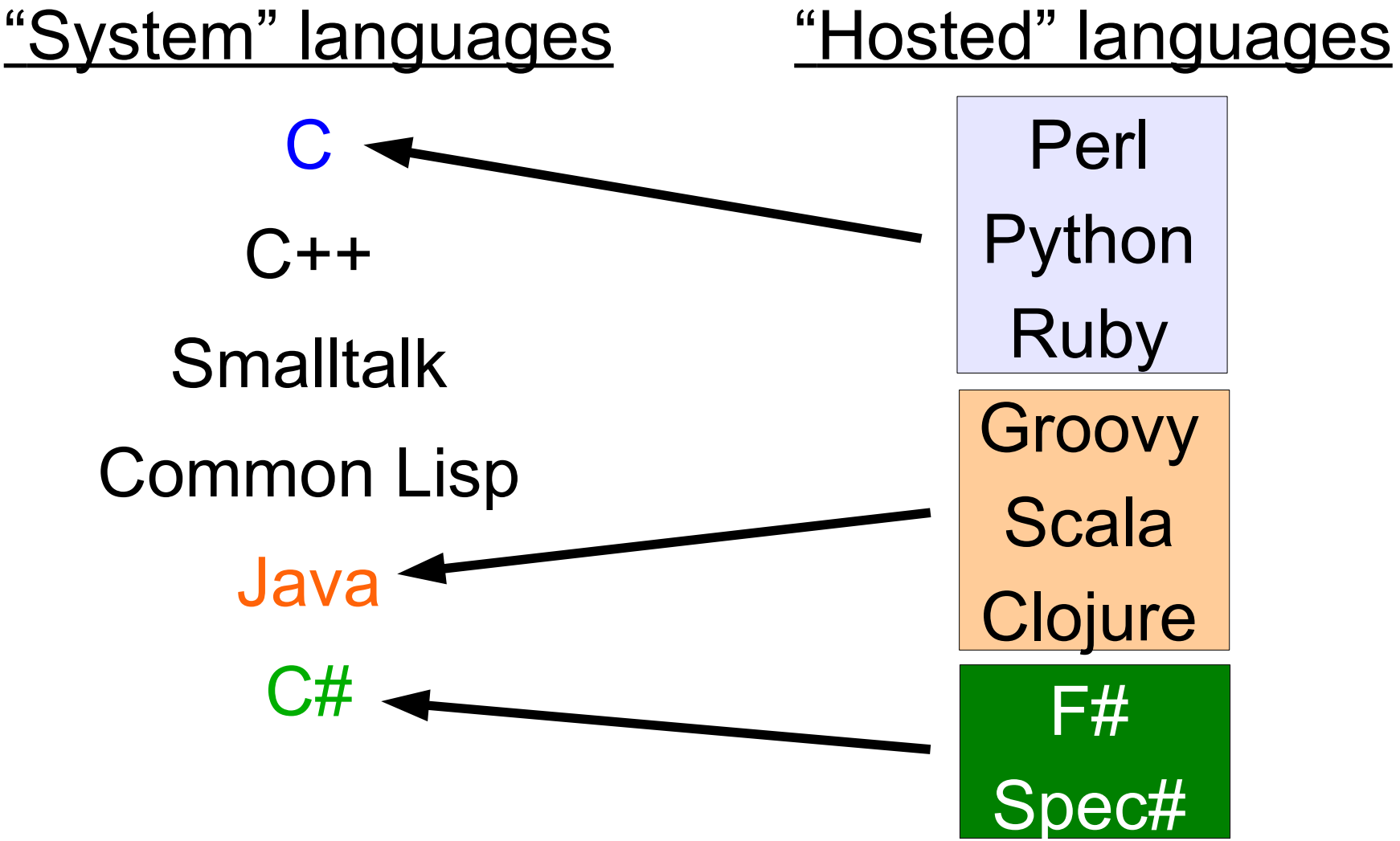


Clojure and AltLaw.org

LispNYC
June 9, 2009

Stuart Sierra


“System” languages
“Hosted” languages
C
C++
Smalltalk
Common Lisp
Java
C#
Perl
Python
Ruby
Groovy
Scala
Clojure
F#
Spec#

Platforms

C / C++ / Unix

Java / JVM

C# / .NET / CLR

(filter good? java)

```
( garbage-collection
  bytecode
  jit-compiler
  threads
  interfaces
  unicode )
```

(filter bad? java)

```
( syntax
  primitives
  imperative
  mutable-state
  locks
  utf-16 )
```

Clojure's Four Elements

List `(print :hello "LispNYC")`

Vector `[:eat "Pie" 3.14159]`

Map `{:lisp 1  "The Rest" 0}`

Set `#{2 1 3 5 1 "Eureka"}`

Data are Functions

```
({:f "foo" :b "bar"} :f)
"foo"

(:key {:key "value", :x "y"})
"value"

([:a :b :c] 2)
:c

(#{1 5 3} 3)
true
```

defn

```
(defn greet [name]
  (println "Hello," name))

(defn average [& args]
  (/ (reduce + args) (count args)))
```

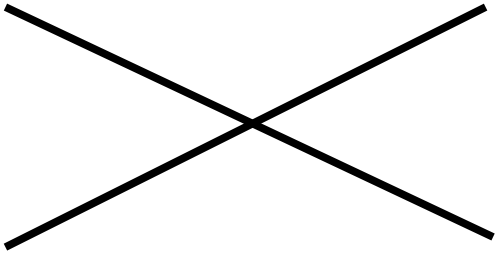
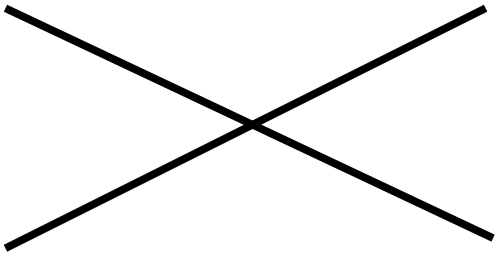
Java

```
(import '(com.example.package
                MyClass YourClass))

(.method object argument)

(MyClass/staticMethod argument)

(MyClass. argument)
```

	synchronous	asynchronous
coordinated	`ref`	
independent	`atom`	`agent`
unshared	`var`	

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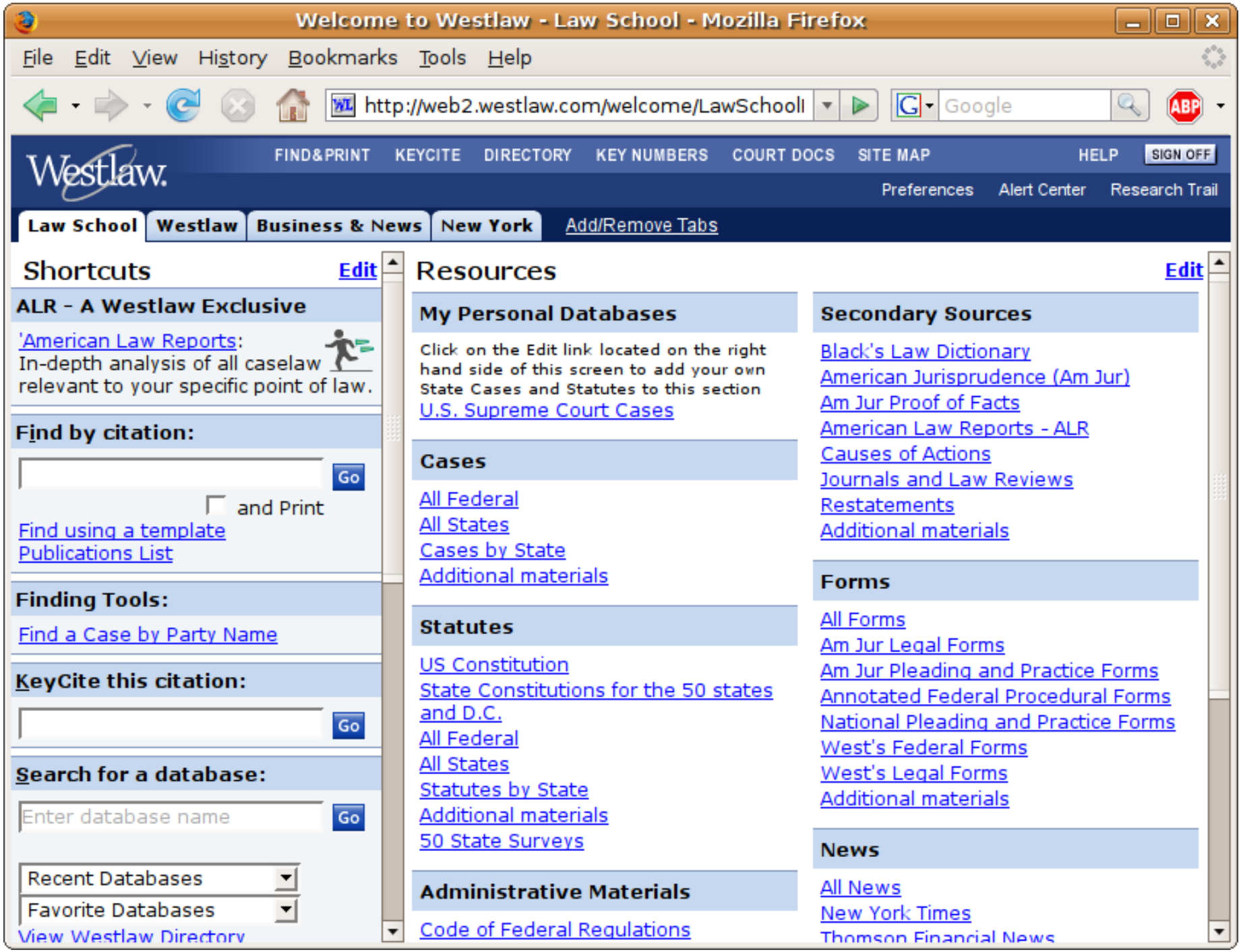
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Cases
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All States
Cases by State
Additional materials
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US Constitution
State Constitutions for the 50 states and D.C.
All Federal
All States
Statutes by State
Additional materials
50 State Surveys
Administrative Materials
Code of Federal Regulations
Secondary Sources
Black's Law Dictionary
American Jurisprudence (Am Jur)
Am Jur Proof of Facts
American Law Reports - ALR
Causes of Actions
Journals and Law Reviews
Restatements
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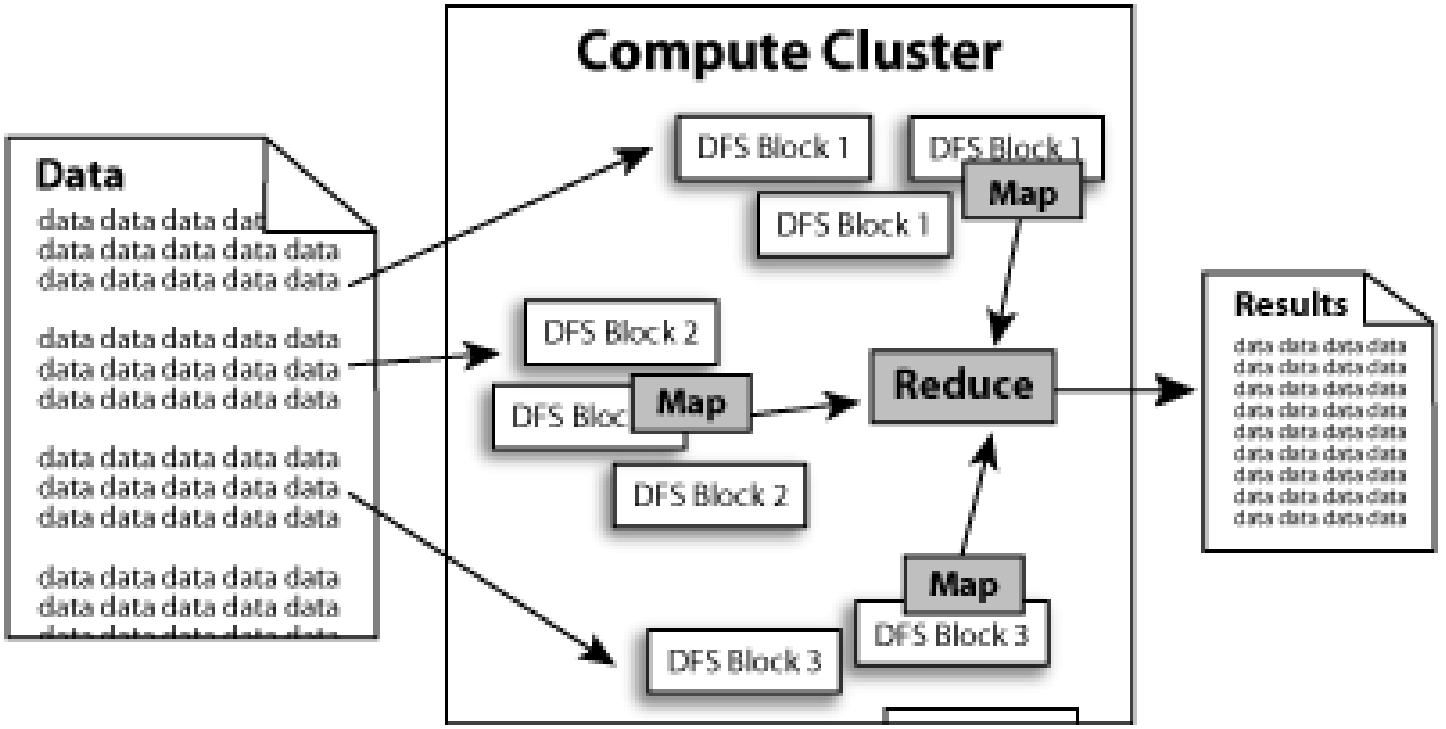
Am Jur Pleading and Practice Forms
Annotated Federal Procedural Forms
National Pleading and Practice Forms
West's Federal Forms
West's Legal Forms
Additional materials
News
All News
New York Times
Thomson Financial News


hadoop


Compute Cluster
Data
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DFS Block 1
DFS Block 1
DFS Block 1
Map
DFS Block 2
DFS Bloc
Map
Reduce
DFS Block 2
Map
DFS Block 3
DFS Block 3
Results
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```
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

Restlet

```
(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 ...)
```

Simple

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>
        $analytics()$
    }
)$
```

(count lines-of-code)

53,000 

36,000 

200,000 

88,000 

184,000 

21,000 

```
(reduce + [53 36 200 88 184 21])
```

582,000
lines of (free) code

clojure.contrib.test-is

```
(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
```

clojure.contrib.test-is

```
(defmacro is [form msg]
  (assert-expr msg form)))

(defmulti assert-expr
  (fn [msg form]
    (cond
      (nil? form) :always-fail
      (seq? form) (first form)
      :else :default)))
```

clojure.contrib.test-is

```
(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)
```

(with-meta ...)

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


(test (var add))
:ok
```

clojure.contrib.test-is

```
(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.
```

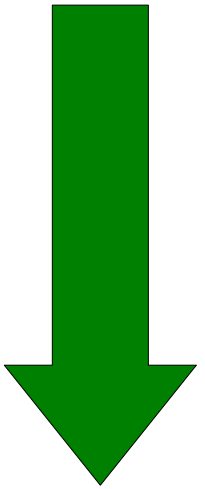
clojure.contrib.test-is

```
(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))
```

clojure.contrib.test-is

```
(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))))
```

clojure.contrib.walk

```
(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 (if (sorted? form)
                              (sorted-map) {})
                            (map inner form)))
   (set? form) (outer (into (if (sorted? form)
                              (sorted-set) #{})
                            (map inner form)))
   :else (outer form)))
```

clojure.contrib.walk

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)))
```

clojure.contrib.walk

```
(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))
```

clojure.contrib.template

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

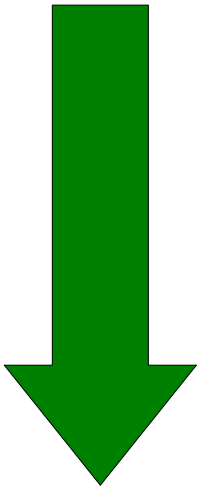
```
(let [HOLE_1282 (* x y)]
  (fn [_1 _2] (= _1 (add _2 HOLE_1282))))
```

```
(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))))
```

clojure.contrib.test-is

```
(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 & Factories

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

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

(declare *thing*)

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

clojure.contrib.singleton

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

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

(thing)
```

clojure.contrib.singleton

```
(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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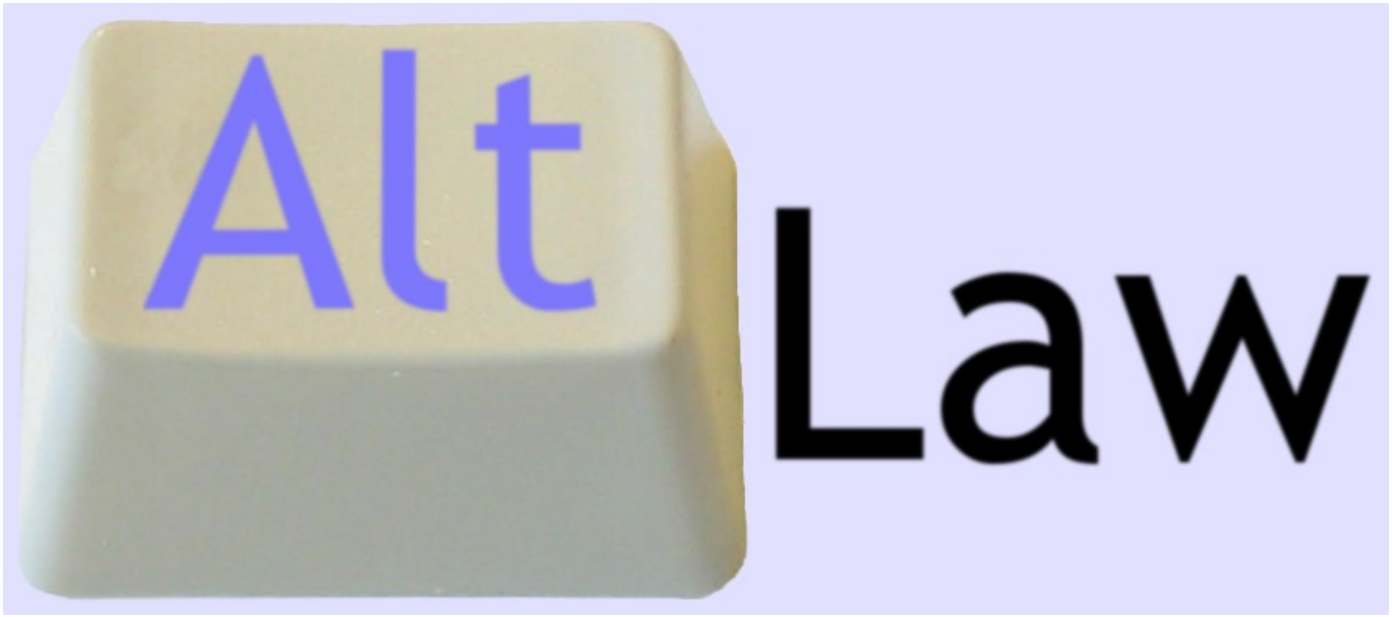

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