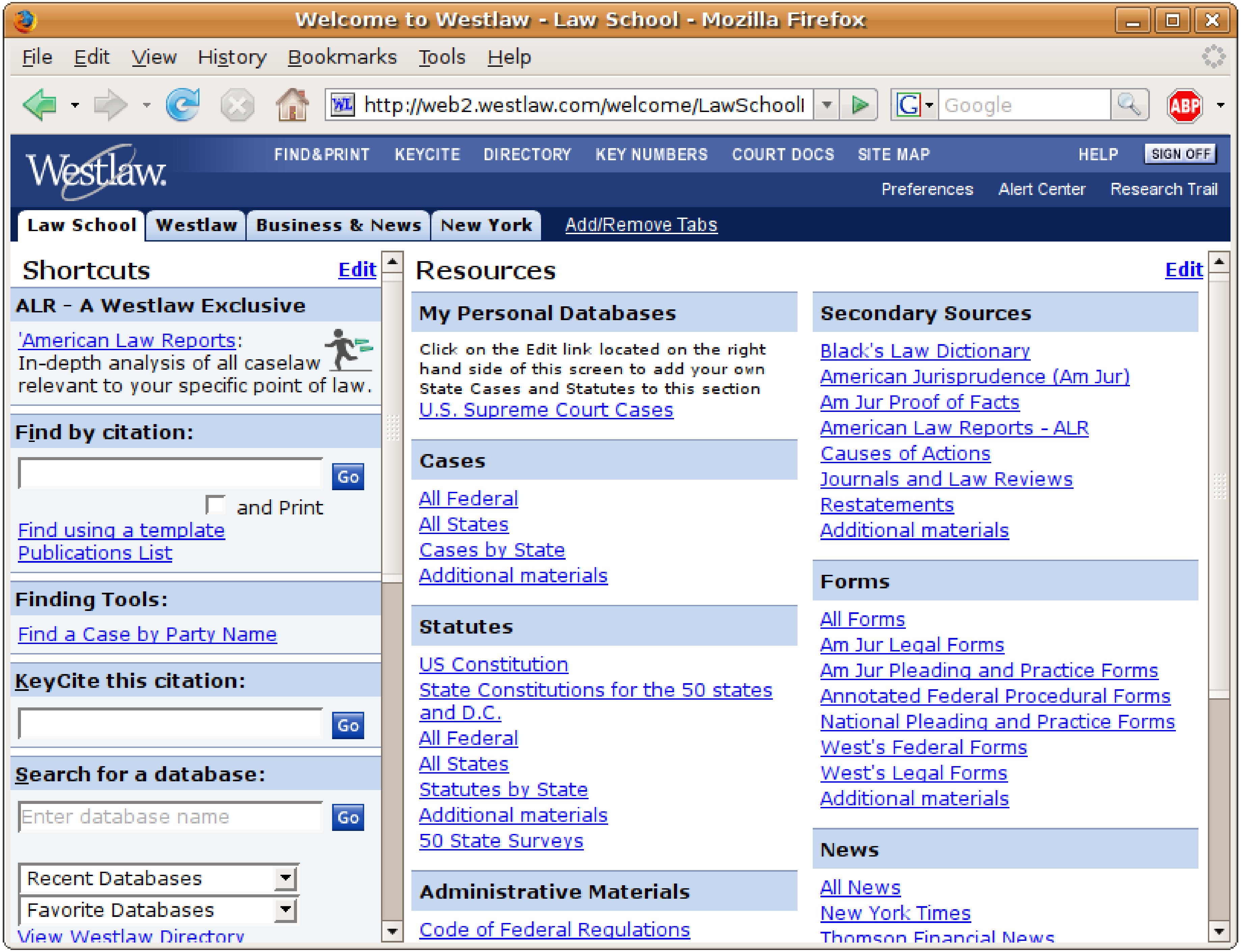
Hadoop, Clojure, and the Properties Pattern

NoSQL NYC
Monday, October 5, 2009

Stuart Sierra, AltLaw.org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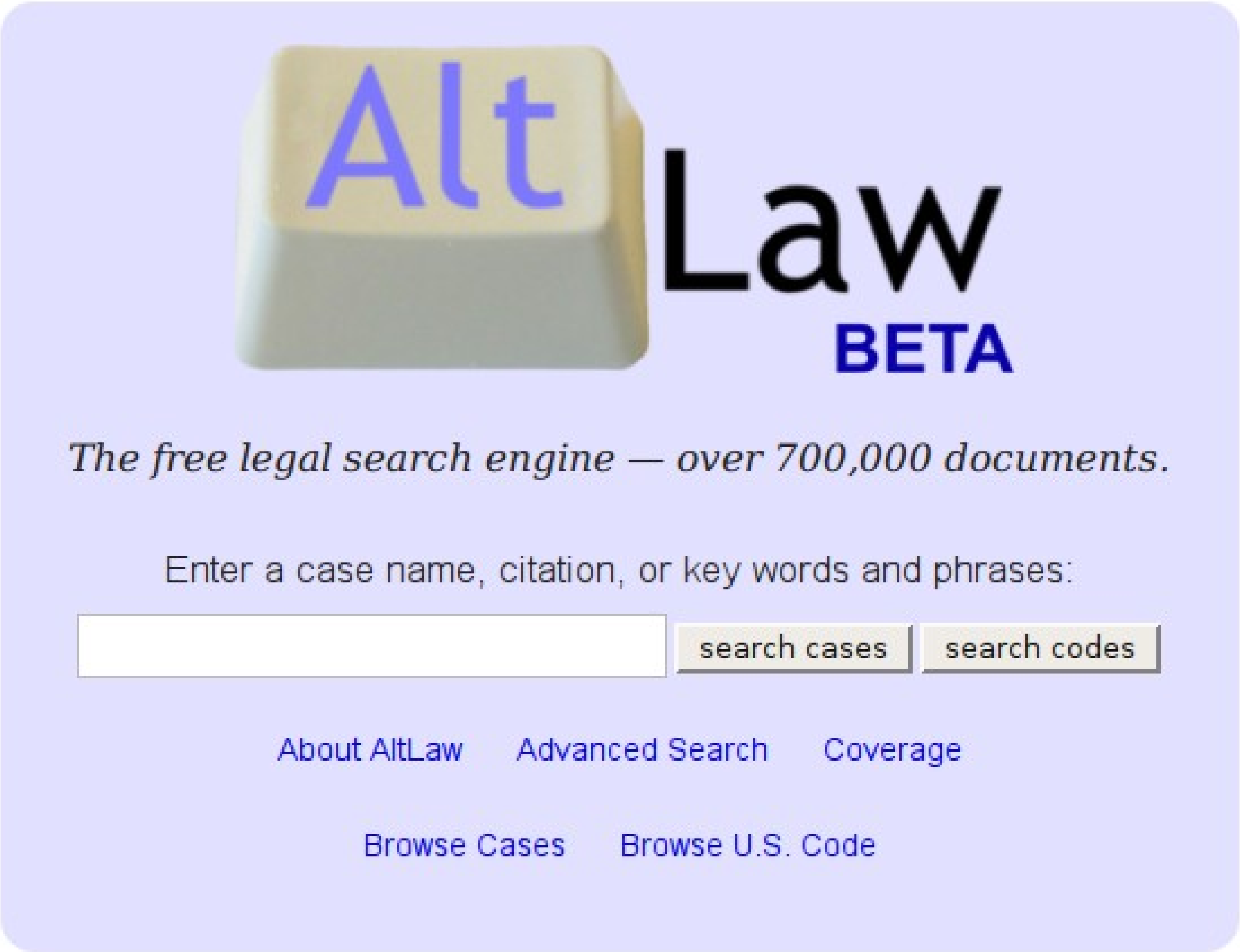

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14 appeals courts total
94 district courts
?? state courts
?? local/other courts

- 20-40 new cases daily
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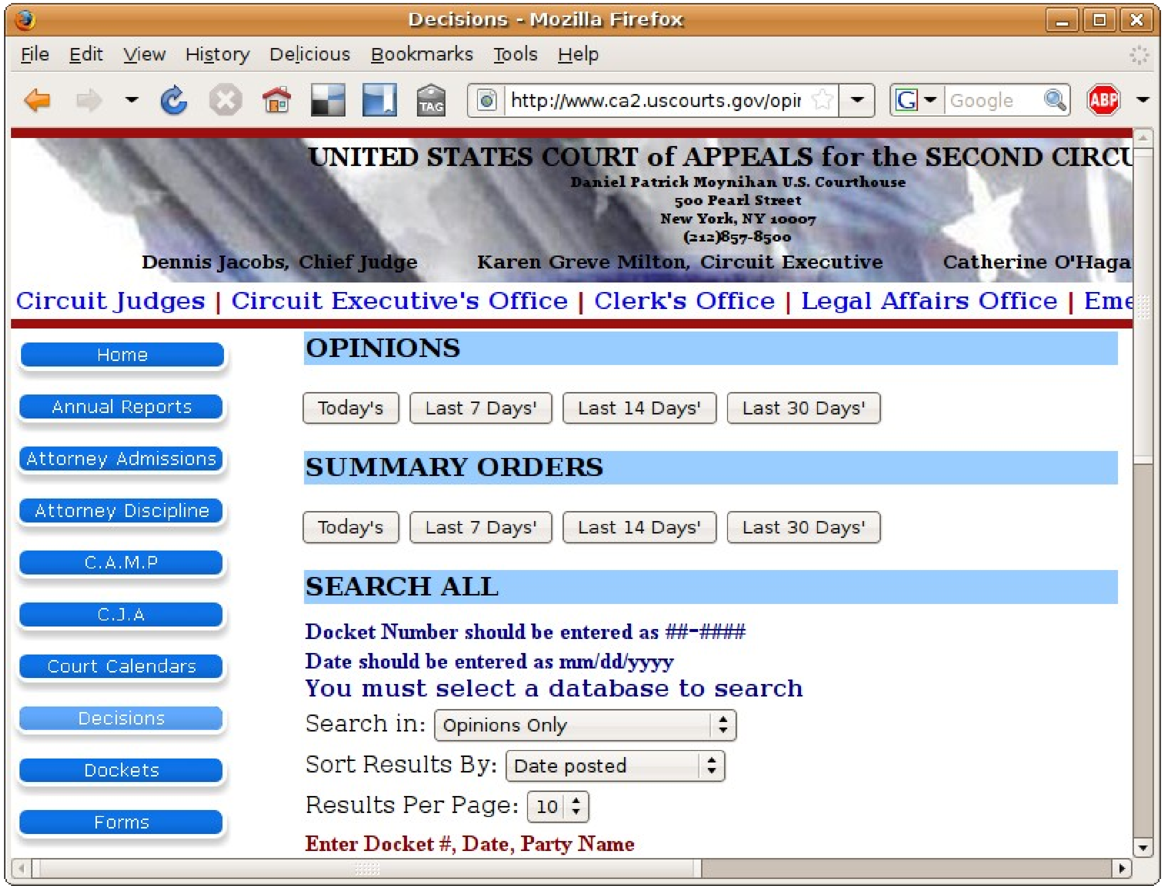
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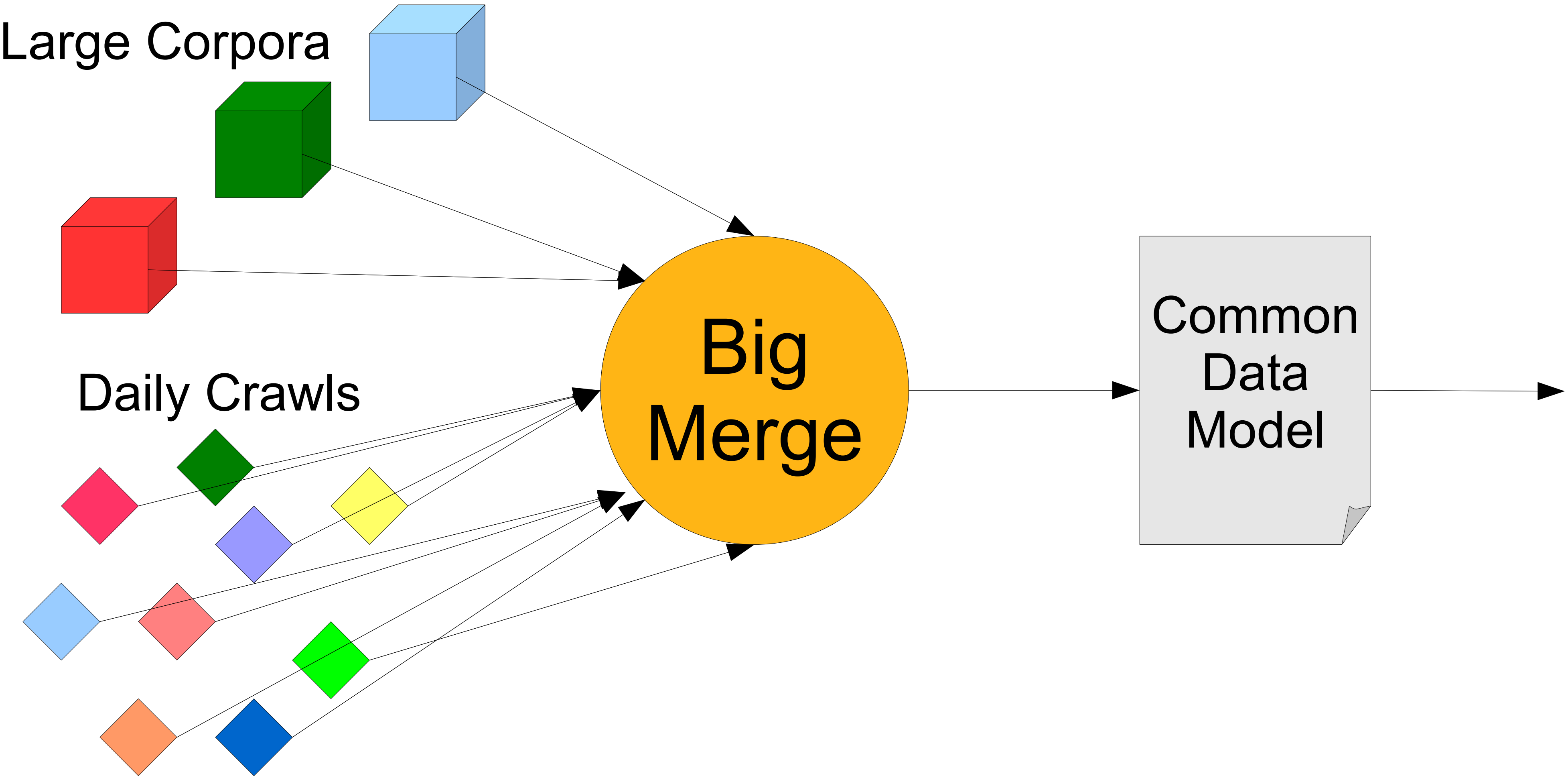

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Big Merge

Common Data Model

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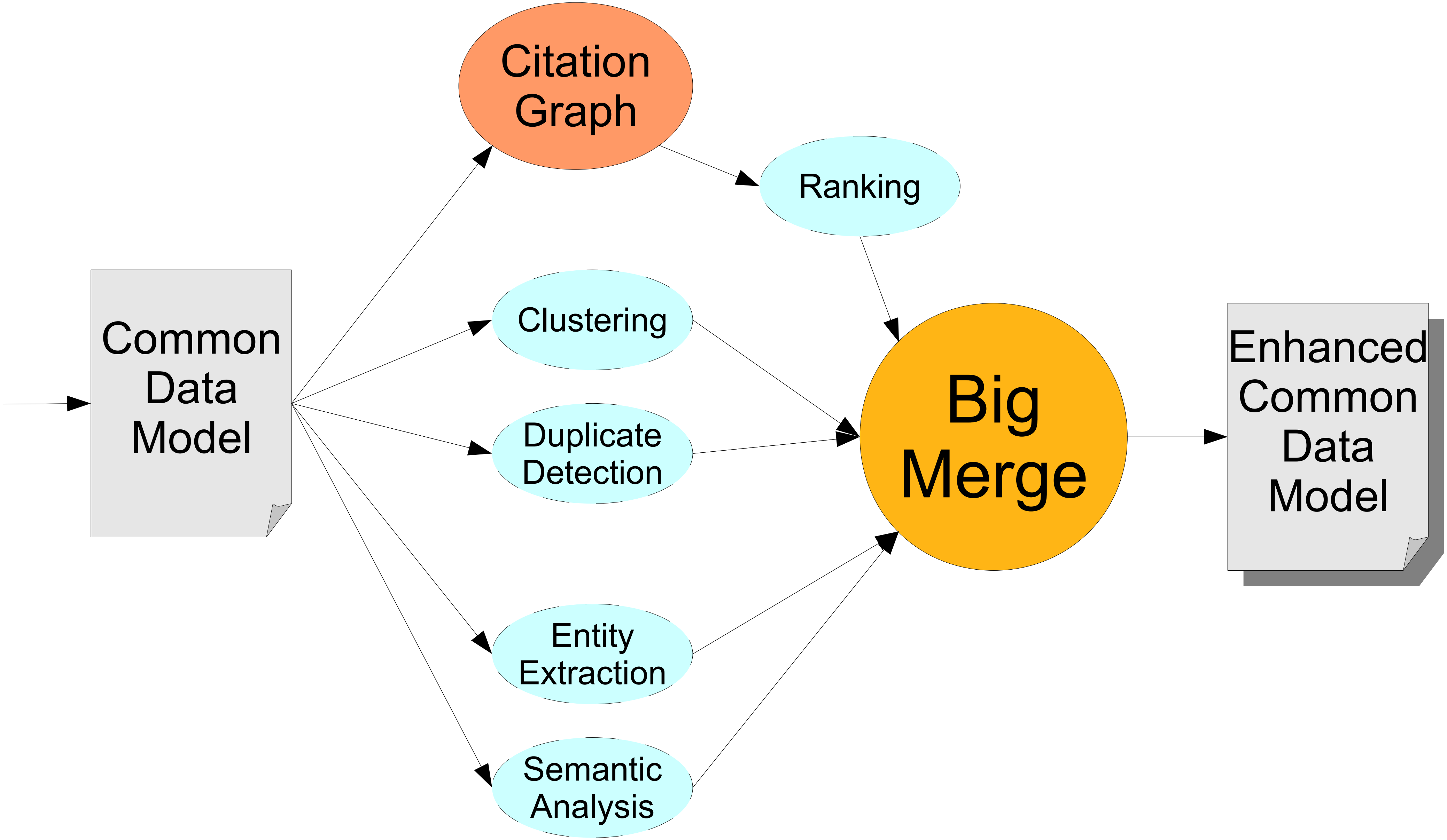
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Big Merge
Enhanced Common Data Model
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Semantic Analysis

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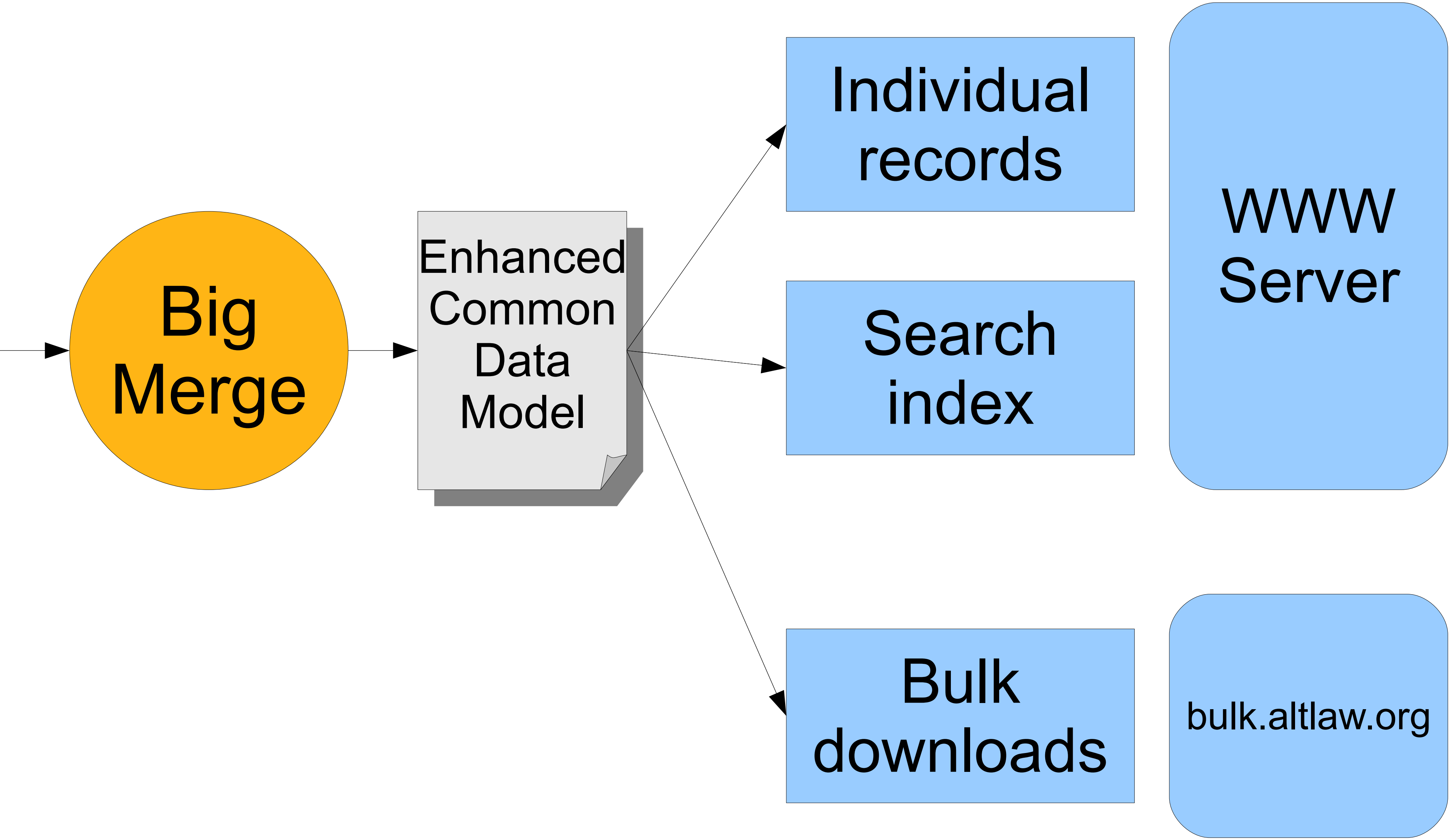

Big Merge

Enhanced Common Data Model

Individual records

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The Grand Unified Data Model

- Key-value pairs? (files, Berkeley DB)
- Documents? (Solr/Lucene, CouchDB)
- Trees? (XML, JSON, Objects)
- Graphs? (RDF, triple stores)
- Tables? (SQL)

hadoop

- “Disk is the new tape.”
  - NO random access
  - NO disk seeks
  - Run at full disk transfer rate, not seek rate
- Data must be splittable
- Process each record in isolation

```java
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);
    }
  }
}
```

```java
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));
  }
}
```

Clojure

- a new Lisp,
  neither Common Lisp nor Scheme
- Dynamic, Functional
- Immutability and concurrency
- Hosted on the JVM
- Open Source (Eclipse Public License)

Clojure Collections

List	`(print :hello "NYC")`
Vector	`[:eat "Pie" 3.14159]`
Map	`{:lisp 1  "The Rest" 0}`
Set	`#{2 1 3 5 "Eureka"}`

Homoiconicity

```
public void greet(String name) {
  System.out.println("Hi, " + name);
}

greet("New York");
Hi, New York
```

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

(greet "New York")
Hello, New York
```

```
(mapper key value)
```

↳ *list of key-value pairs*

```
(reducer key values)
```

↳ *list of key-value pairs*

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    }
    output.collect(key, new IntWritable(sum));
  }
}
```

Clojure-Hadoop

```
(defn my-map [key val]
 (map (fn [token] [token 1])
      (enumeration-seq (StringTokenizer. val))))

(defn my-reduce [key values]
  [[key (reduce + values)]])

(defjob job
  :map my-map
  :map-reader int-string-map-reader
  :reduce my-reduce
  :inputformat :text)
```

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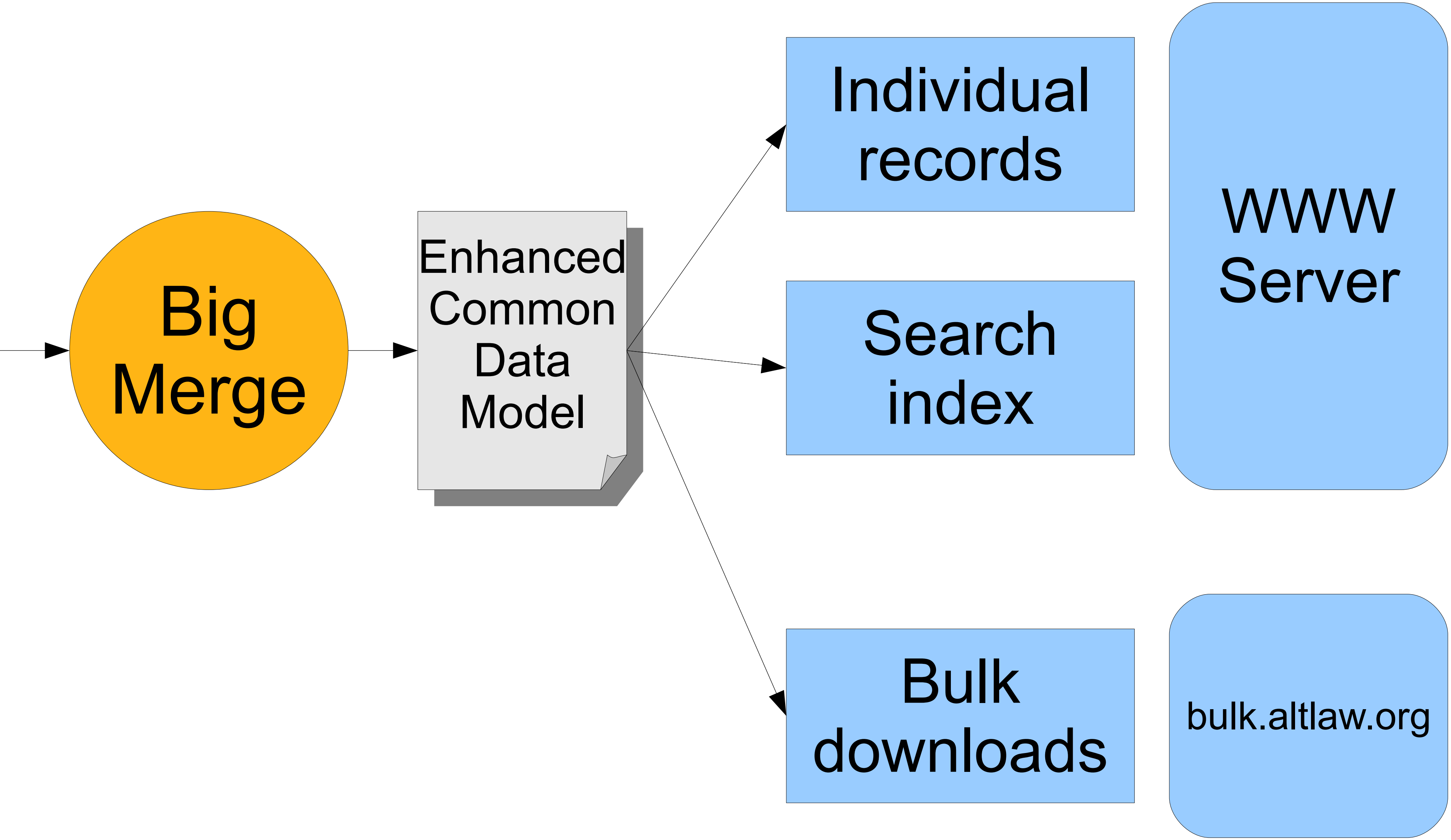
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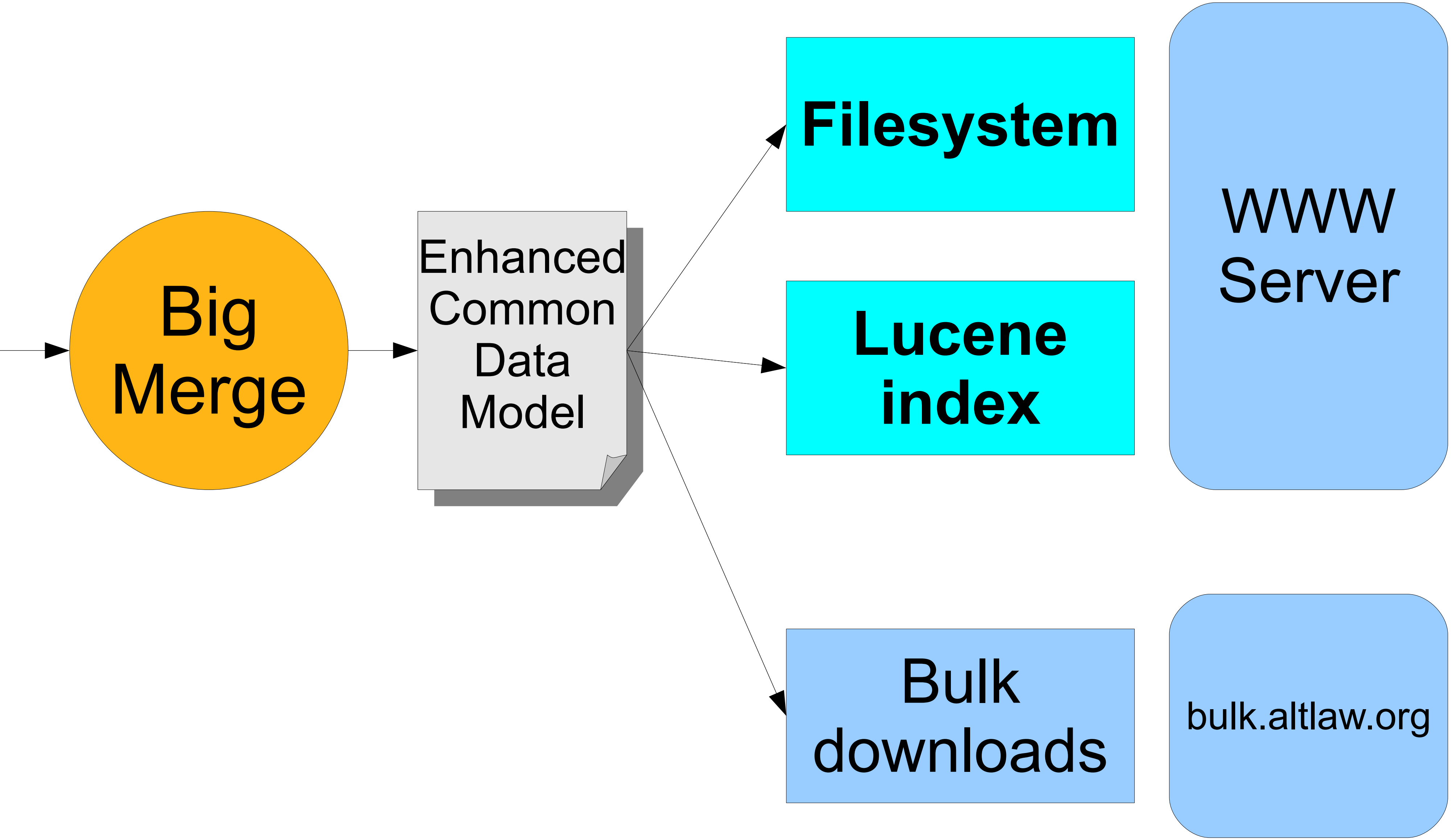
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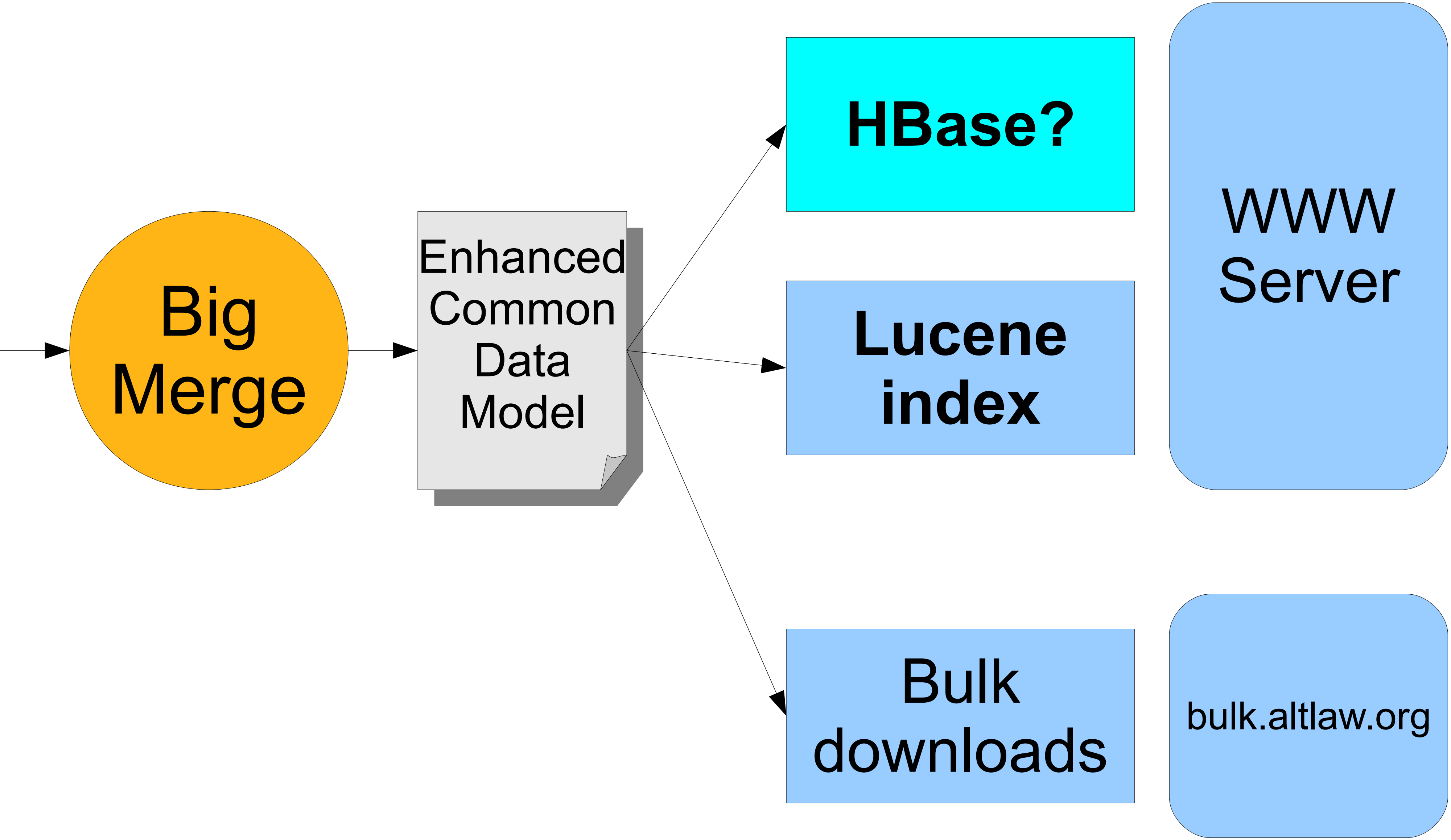

Big Merge

Enhanced Common Data Model

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Properties & RDF

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 :type    :Document
 :docid   101
 :title   "National Bank v. U.S."
 :cite    #{"101 U.S. 1" "25 L.Ed. 979"} }
```

```
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       <alt:docid>  "101"^xsd:integer ;
       <alt:title>  "National Bank v. U.S." ;
       <alt:cite>   "101 U.S. 1" ;
       <alt:cite>   "25 L.Ed. 979" .
```

The Properties Pattern:
http://steve-yegge.blogspot.com/2008/10/universal-design-pattern.html

More

- http://clojure.org/
- Google Groups: Clojure
- #clojure on irc.freenode.net & Twitter

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