Real Time Search and Analytics on Big Data - Solr Indexing via SolrJ

Introduction

This exercise will guide you through indexing documents via the native Java API. This exercise is intended to be run on the student's local environment.

Prerequisites

- Already downloaded and installed Solr
- Familiar with Solr Admin GUI

Creating the Stocks Core

Create the Configuration Files

Prior to this exercise you should have already installed and got Solr running. If you haven't make sure to go back to the installing-solr exercise and finish that first.

Your Solr install should be located in a file path somewhat similar to the following:

```
$ pwd
/RealTimeSearchAndAnalytics/03-installing-solr/apache-solr-4.0.0/testing-example/solr
```

You might have named the 'testing-example' directory something different, but if you recall it is simply a copy of the /apache-solr–4.0.0/example directory. Inside of this directory, you should have the following files:

```
$ ls
README.txt  bin     collection1 solr.xml    zoo.cfg
```

Now create a new folder called 'stocks'.

```
$ mkdir stocks
```

Copy over the configuration files that have been provided.

```
$ cp -r /RealTimeSearchAndAnalytics/05-solr-index/stocks/* /RealTimeSearchAndAnalytics/03-installing-solr/apache-solr-4.0.0/testing-example/solr/stocks/
$ cd stocks
$ ls -R
conf    data

./conf:
admin-extra.html          currency.xml            mapping-FoldToASCII.txt      schema.xml        spellings.txt         update-script.js
admin-extra.menu-bottom.html    elevate.xml          mapping-ISOLatin1Accent.txt scripts.conf           stopwords.txt           velocity
admin-extra.menu-top.html   lang                protwords.txt           solrconfig.xml        synonyms.txt            xslt

./conf/lang:
contractions_ca.txt stemdict_nl.txt     stopwords_cz.txt    stopwords_es.txt    stopwords_ga.txt    stopwords_id.txt    stopwords_no.txt    stopwords_th.txt
contractions_fr.txt stoptags_ja.txt     stopwords_da.txt    stopwords_eu.txt    stopwords_gl.txt    stopwords_it.txt    stopwords_pt.txt    stopwords_tr.txt
contractions_ga.txt stopwords_ar.txt    stopwords_de.txt    stopwords_fa.txt    stopwords_hi.txt    stopwords_ja.txt    stopwords_ro.txt    userdict_ja.txt
contractions_it.txt stopwords_bg.txt    stopwords_el.txt    stopwords_fi.txt    stopwords_hu.txt    stopwords_lv.txt    stopwords_ru.txt
hyphenations_ga.txt stopwords_ca.txt    stopwords_en.txt    stopwords_fr.txt    stopwords_hy.txt    stopwords_nl.txt    stopwords_sv.txt

./conf/velocity:
VM_global_library.vm    clusterResults.vm    facet_pivot.vm      facets.vm       header.vm       join-doc.vm     layout.vm       query.vm        richtext-doc.vm
browse.vm       debug.vm        facet_queries.vm    footer.vm       hit.vm          jquery.autocomplete.css main.css        queryGroup.vm       suggest.vm
cluster.vm      facet_fields.vm     facet_ranges.vm     head.vm         hitGrouped.vm       jquery.autocomplete.js  product-doc.vm      querySpatial.vm     tabs.vm

./conf/xslt:
example.xsl     example_atom.xsl    example_rss.xsl     luke.xsl        updateXml.xsl

./data:
```

Take a look at the schema.xml file.

```
$ cat ./conf/schema.xml
```

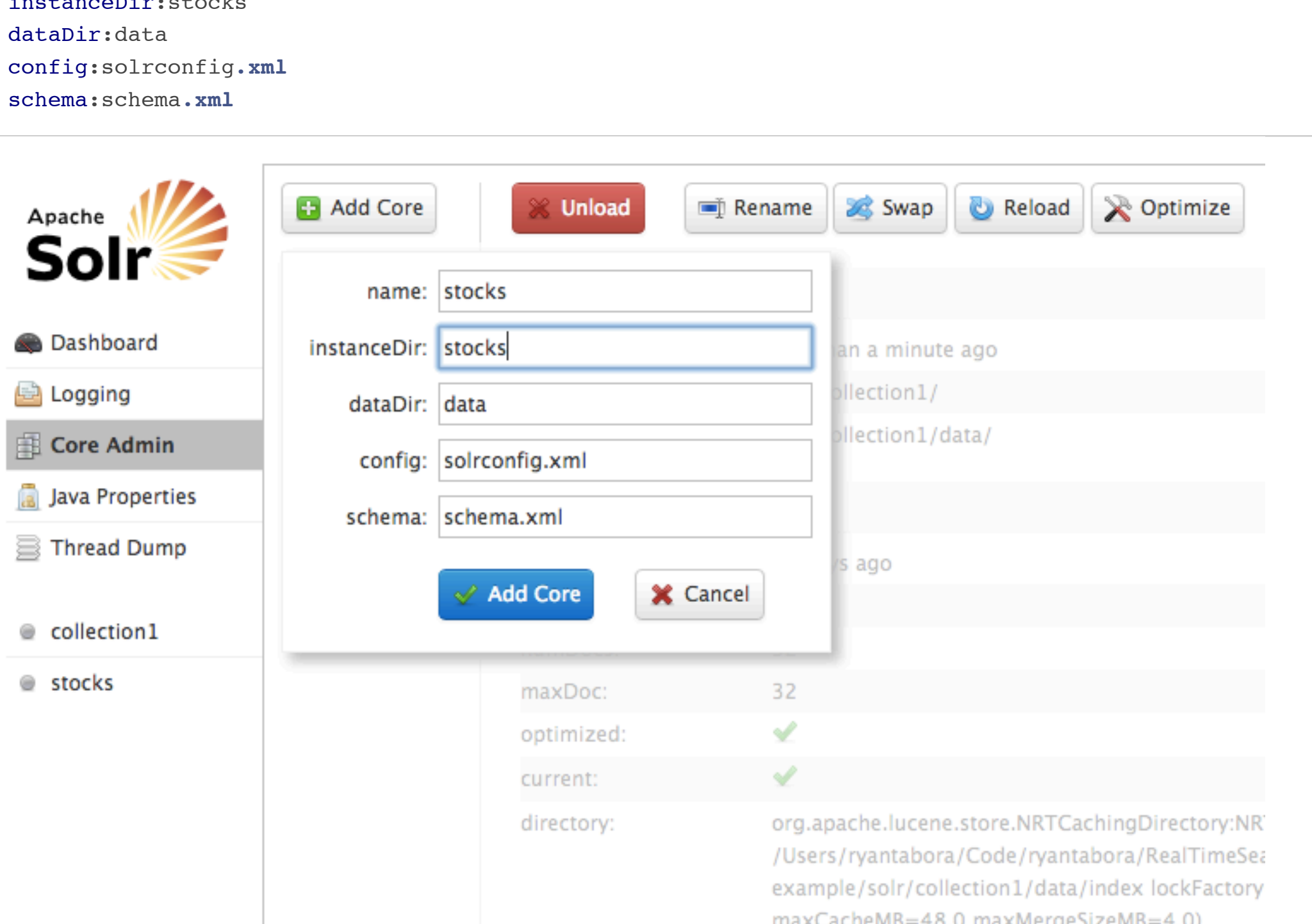
Add the Core To Solr

Now we need to get Solr to recognize the new core. Navigate to the Solr Admin GUI.

http://localhost:8983/solr/

Click on the Core Admin and select Add Core. Fill in the provided dialog box.

```
name:stocks
instanceDir:stocks
dataDir:data
config:solrconfig.xml
schema:schema.xml
```



Adding the Stocks Core

Select Add Core. Now refresh the page and you should see that Solr recognizes the new core. You can also view the log file from the terminal that is running the Solr process (the terminal you used to execute java -jar start.jar) to verify that it has recognized the new core.

```
Jan 18, 2013 9:24:14 AM org.apache.solr.core.CoreContainer register
INFO: registering core: stocks
Jan 18, 2013 9:24:14 AM org.apache.solr.core.CoreContainer persistFile
INFO: Persisting cores config to solr/solr.xml
Jan 18, 2013 9:24:14 AM org.apache.solr.core.SolrXMLSerializer persistFile
INFO: Persisting cores config to solr/solr.xml
Jan 18, 2013 9:24:22 AM org.apache.solr.core.SolrCore execute
INFO: [collection1] webapp=/solr path=/admin/system params={wt=json} status=0 QTime=32
Jan 18, 2013 9:24:23 AM org.apache.solr.core.SolrCore execute
INFO: [stocks] webapp=/solr path=/admin/file/ params={file=admin-extra.menu-top.html} status=0 QTime=2
Jan 18, 2013 9:24:23 AM org.apache.solr.core.SolrCore execute
INFO: [stocks] webapp=/solr path=/admin/luke params={numTerms=0&wt=json&show=index} status=0 QTime=8
Jan 18, 2013 9:24:23 AM org.apache.solr.core.SolrCore execute
INFO: [stocks] webapp=/solr path=/admin/file/ params={file=admin-extra.html} status=0 QTime=0
Jan 18, 2013 9:24:23 AM org.apache.solr.core.SolrCore execute
INFO: [stocks] webapp=/solr path=/admin/ping params={action=status&wt=json} status=503 QTime=3
Jan 18, 2013 9:24:23 AM org.apache.solr.core.SolrCore execute
INFO: [stocks] webapp=/solr path=/admin/file/ params={file=admin-extra.menu-bottom.html} status=0 QTime=0
```

Understanding the Data Model

Look at the Data

Included in this download is a sample set of freely available stock exchange data downloaded from Infochimps.

- Infochimps AMEX Stock Data
- Infochimps NYSE Stock Data
- Infochimps NASDAQ Stock Data

Lets take a look at some of the data included. Locate the data directory.

```
$ cd /RealTimeSearchAndAnalytics/data/
$ ls
infochimps_dataset_AMEX_Daily_1970-2010-csv.zip     infochimps_dataset_NASDAQ_Daily_1970-2010-csv.zip   infochimps_dataset_NYSE_Daily_1970-2010-csv.zip     tinydata
```

Unzip the NYSE dataset and look at some of the data.

```
$ unzip infochimps_dataset_NYSE_Daily_1970-2010-csv.zip
Archive:  infochimps_dataset_NYSE_Daily_1970-2010-csv.zip
  inflating: infochimps_dataset_4778_download_16677/README-infochimps
  inflating: infochimps_dataset_4778_download_16677/infochimps_dataset_4778_download_16677.icss.yaml
   creating: infochimps_dataset_4778_download_16677/NYSE/
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_I.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_2.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_L.csv
 extracting: infochimps_dataset_4778_download_16677/NYSE/NYSE_dividends_4.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_dividends_D.csv
  .
  .
  .
$ cd infochimps_dataset_4778_download_16677/NYSE/
$ ls
NYSE_daily_prices_0.csv NYSE_daily_prices_8.csv NYSE_daily_prices_G.csv NYSE_daily_prices_O.csv NYSE_daily_prices_W.csv NYSE_dividends_4.csv    NYSE_dividends_C.csv
NYSE_daily_prices_1.csv NYSE_daily_prices_9.csv NYSE_daily_prices_H.csv NYSE_daily_prices_P.csv NYSE_daily_prices_X.csv NYSE_dividends_5.csv    NYSE_dividends_D.csv
NYSE_daily_prices_2.csv NYSE_daily_prices_A.csv NYSE_daily_prices_I.csv NYSE_daily_prices_Q.csv NYSE_daily_prices_Y.csv NYSE_dividends_6.csv    NYSE_dividends_E.csv
NYSE_daily_prices_3.csv NYSE_daily_prices_B.csv NYSE_daily_prices_J.csv NYSE_daily_prices_R.csv NYSE_daily_prices_Z.csv NYSE_dividends_7.csv    NYSE_dividends_F.csv
NYSE_daily_prices_4.csv NYSE_daily_prices_C.csv NYSE_daily_prices_K.csv NYSE_daily_prices_S.csv NYSE_dividends_0.csv    NYSE_dividends_8.csv    NYSE_dividends_G.csv
NYSE_daily_prices_5.csv NYSE_daily_prices_D.csv NYSE_daily_prices_L.csv NYSE_daily_prices_T.csv NYSE_dividends_1.csv    NYSE_dividends_9.csv    NYSE_dividends_H.csv
NYSE_daily_prices_6.csv NYSE_daily_prices_E.csv NYSE_daily_prices_M.csv NYSE_daily_prices_U.csv NYSE_dividends_2.csv    NYSE_dividends_A.csv    NYSE_dividends_I.csv
NYSE_daily_prices_7.csv NYSE_daily_prices_F.csv NYSE_daily_prices_N.csv NYSE_daily_prices_V.csv NYSE_dividends_3.csv    NYSE_dividends_B.csv    NYSE_dividends_J.csv
```

As you can see we have two types of files, dividends and daily prices. Take a look at what these files look like.

```
$ head NYSE_daily_prices_A.csv
exchange,stock_symbol,date,stock_price_open,stock_price_high,stock_price_low,stock_price_close,stock_volume,stock_price_adj_close
NYSE,AEA,2010-02-08,4.42,4.42,4.21,4.24,205500,4.24
NYSE,AEA,2010-02-05,4.42,4.54,4.22,4.41,194300,4.41
NYSE,AEA,2010-02-04,4.55,4.69,4.39,4.42,233800,4.42
NYSE,AEA,2010-02-03,4.65,4.69,4.50,4.55,182100,4.55
NYSE,AEA,2010-02-02,4.74,5.00,4.62,4.66,222700,4.66
NYSE,AEA,2010-02-01,4.84,4.92,4.68,4.75,194800,4.75
NYSE,AEA,2010-01-29,4.97,5.05,4.76,4.83,222900,4.83
NYSE,AEA,2010-01-28,5.12,5.22,4.81,4.98,283100,4.98
NYSE,AEA,2010-01-27,4.82,5.16,4.79,5.09,243500,5.09
$ head NYSE_dividends_A.csv
exchange,stock_symbol,date,dividends
NYSE,AIT,2009-11-12,0.15
NYSE,AIT,2009-08-12,0.15
NYSE,AIT,2009-05-13,0.15
NYSE,AIT,2009-02-11,0.15
NYSE,AIT,2008-11-12,0.15
NYSE,AIT,2008-08-13,0.15
NYSE,AIT,2008-05-13,0.15
NYSE,AIT,2008-02-13,0.15
NYSE,AIT,2007-11-13,0.15
```

I've created another folder called tinydata which contains some of the smaller files so we can run our examples quickly.

Examine the Stocks schema.xml

```
$ cat ./03-installing-solr/apache-solr-4.0.0/testing-example/solr/stocks/conf/schema.xml
<?xml version="1.0" encoding="UTF-8" ?>
<schema name="stocks" version="1.5">
 <types>
   <fieldType name="string" class="solr.StrField"/>
   <fieldType name="long" class="solr.LongField"/>
   <fieldType name="float" class="solr.SortableFloatField"/>
   <fieldType name="date" class="solr.DateField"/>
   <fieldType name="text_general" class="solr.TextField" positionIncrementGap="100">
     <analyzer type="index">
       <tokenizer class="solr.StandardTokenizerFactory"/>
       <filter class="solr.StopFilterFactory" ignoreCase="true" words="stopwords.txt" enablePositionIncrements="true" />
       <filter class="solr.LowerCaseFilterFactory"/>
     </analyzer>
     <analyzer type="query">
       <tokenizer class="solr.StandardTokenizerFactory"/>
       <filter class="solr.StopFilterFactory" ignoreCase="true" words="stopwords.txt" enablePositionIncrements="true" />
       <filter class="solr.SynonymFilterFactory" synonyms="synonyms.txt" ignoreCase="true" expand="true"/>
       <filter class="solr.LowerCaseFilterFactory"/>
     </analyzer>
   </fieldType>
 </types>
 <fields>

   <field name="rowkey"  type="string" indexed="true"  stored="true"/>
   <field name="exchange"  type="string" indexed="true"  stored="true"/>
   <field name="stock_symbol"  type="string" indexed="true"  stored="true"/>
   <field name="date"  type="date" indexed="true"  stored="true"/>
   <field name="stock_price_open"  type="float" indexed="true"  stored="true"/>
   <field name="stock_price_high"  type="float" indexed="true"  stored="true"/>
   <field name="stock_price_low"  type="float" indexed="true"  stored="true"/>
   <field name="stock_price_close"  type="float" indexed="true"  stored="true"/>
   <field name="stock_volume"  type="float" indexed="true"  stored="true"/>
   <field name="stock_price_adj_close"  type="float" indexed="true"  stored="true"/>
   <field name="dividends"  type="float" indexed="true"  stored="true"/>
   <field name="_version_" type="long" indexed="true" stored="true"/>

   <field name="all" type="text_general" indexed="true" stored="false" multiValued="true"/>

   <copyField source="rowkey" dest="all" />
   <copyField source="exchange" dest="all" />
   <copyField source="stock_symbol" dest="all" />
   <copyField source="date" dest="all" />
   <copyField source="stock_price_open" dest="all" />
   <copyField source="stock_price_high" dest="all" />
   <copyField source="stock_price_low" dest="all" />
   <copyField source="stock_price_close" dest="all" />
   <copyField source="stock_volume" dest="all" />
   <copyField source="stock_price_adj_close" dest="all" />
   <copyField source="dividends" dest="all" />

 </fields>

 <defaultSearchField>all</defaultSearchField>
 <uniqueKey>rowkey</uniqueKey>

</schema>
```

Running the Exercise

Run the Stocks Indexer

The jar is already provided in the directory for this exercise, however if you want to build the jar yourself you can use the following Maven command.

```
$ cd ~/code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/
.classpath                .project                  .settings/                README.md                 dependency-reduced-pom.xml  pom.xml

$ mvn clean package
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building solr-index 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- maven-clean-plugin:2.4.1:clean (default-clean) @ solr-index ---
[INFO] Deleting /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target
[INFO]
[INFO] --- maven-resources-plugin:2.5:resources (default-resources) @ solr-index ---
[debug] execute contextualize
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:2.3.2:compile (default-compile) @ solr-index ---
[INFO] Compiling 1 source file to /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target/classes
[INFO]
[INFO] --- maven-resources-plugin:2.5:testResources (default-testResources) @ solr-index ---
[debug] execute contextualize
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:2.3.2:testCompile (default-testCompile) @ solr-index ---
[INFO] Compiling 2 source files to /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target/test-classes
[INFO]
[INFO] --- maven-surefire-plugin:2.10:test (default-test) @ solr-index ---
[INFO] Surefire report directory: /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target/surefire-reports

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Results :

Tests run: 0, Failures: 0, Errors: 0, Skipped: 0

[INFO]
[INFO] --- maven-jar-plugin:2.3.2:jar (default-jar) @ solr-index ---
[INFO] Building jar: /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target/solr-index-1.0-SNAPSHOT.jar
[INFO]
[INFO] --- maven-shade-plugin:2.0:shade (default) @ solr-index ---
[INFO] Including org.apache.solr:solr-solrj:jar:4.0.0-BETA in the shaded jar.
[INFO] Including org.apache.zookeeper:zookeeper:jar:3.3.6 in the shaded jar.
[INFO] Including org.apache.httpcomponents:httpmime:jar:4.1.3 in the shaded jar.
[INFO] Including org.apache.httpcomponents:httpcore:jar:4.1.4 in the shaded jar.
[INFO] Including commons-logging:commons-logging:jar:1.1.1 in the shaded jar.
[INFO] Including commons-io:commons-io:jar:2.1 in the shaded jar.
[INFO] Including org.apache.httpcomponents:httpclient:jar:4.1.3 in the shaded jar.
[INFO] Including commons-codec:commons-codec:jar:1.4 in the shaded jar.
[INFO] Including org.codehaus.woodstox:wstx-asl:jar:3.2.7 in the shaded jar.
[INFO] Including org.slf4j:slf4j-api:jar:1.6.4 in the shaded jar.
[INFO] Including junit:junit:jar:4.8.1 in the shaded jar.
[INFO] Replacing original artifact with shaded artifact.
[INFO] Replacing /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/target/solr-index-1.0-SNAPSHOT.jar with /Users/ryantabora/Code/ryantabora/Re
[INFO] Dependency-reduced POM written at: /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/dependency-reduced-pom.xml
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 5.404s
[INFO] Finished at: Fri Jan 18 10:11:35 PST 2013
[INFO] Final Memory: 11M/81M
[INFO] ------------------------------------------------------------------------
```

Now you can run the jar by providing it with the data location and Solr server URL.

```
$ java -jar ./solr-index-1.0-SNAPSHOT.jar --data ../data/tinydata/ --solr http://localhost:8983/solr/stocks
args: [--data, ../data/tinydata/, --solr, http://localhost:8983/solr/stocks]
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
Successfully put rowkey : QTM|2010-02-08 to Solr
Successfully put rowkey : QTM|2010-02-05 to Solr
Successfully put rowkey : QTM|2010-02-04 to Solr
Successfully put rowkey : QTM|2010-02-03 to Solr
.
.
.
Successfully put rowkey : OPY|1996-08-07 to Solr
Successfully put rowkey : OPY|1996-05-07 to Solr
Successfully put rowkey : OPY|1996-02-07 to Solr
Successfully put rowkey : OPY|1995-02-07 to Solr
Indexed 5983 documents
```

As the jar is running, you can watch the index count increase via the Solr Web REST Interface.

http://localhost:8983/solr/stocks/select?q=*:*

Examine the Code

You can find the code for the StocksIndexer at RealTimeSearchAndAnalytics/05-solr-index/src/main/java/com/ryantabora/tutorial/StocksIndexer.java. Take a look at the code and review the comments to help you understand how we indexed all that stock data!

Creating Your Own Code

In the test folder you will find two files, Exercise.java and Solution.java. The Exercise contains a skeleton class you can use to populate your own index based on some simple CSV data provided in the class. You will need to create another core (I called mine mycore) and write your own code. If you get stuck, take a look at the provided configuration files in the solution directory and the Solution.java code.