

# 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.

## 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-ISOLatinIAccent.txt  scripts.conf      stopwords.txt      velocity
admin-extra.menu-top.html    lang            protowords.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  stopwords_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      stopwords_sv.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
```

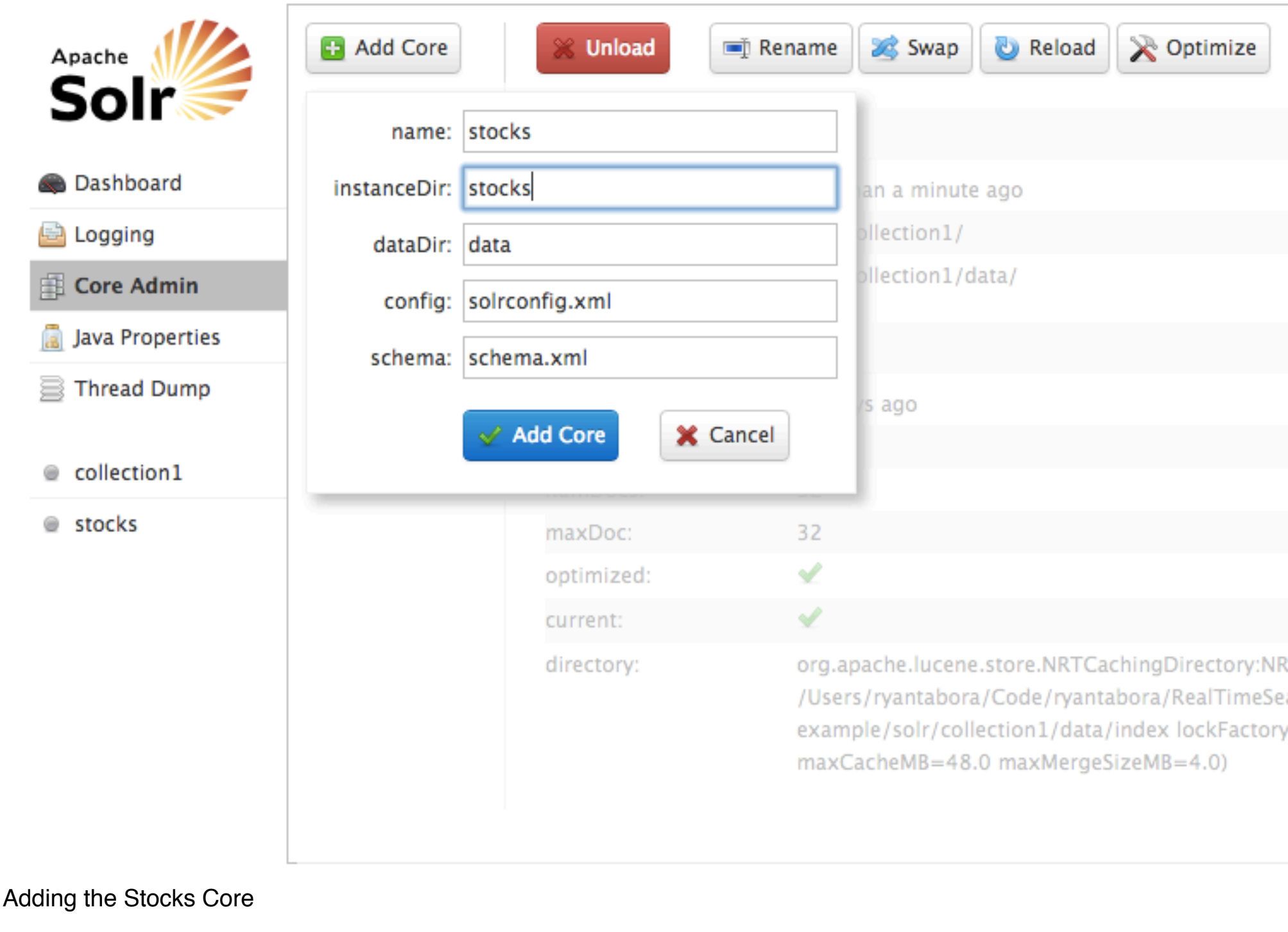
### Add the Core To Solr

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.ics.yaml
  creating: infochimps_dataset_4778_download_16677/NYSE/
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_1.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_2.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_3.csv
  inflating: infochimps_dataset_4778_download_16677/NYSE/NYSE_daily_prices_4.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_Q.csv  NYSE_daily_prices_0.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_B.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_Y.csv  NYSE_daily_prices_Z.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_0.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_daily_prices_1.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_9.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_8.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 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

-----
T E S T S
-----

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:stax-api:jar:1.3.2 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/RealTimeSearchAndAnalytics/05-solr-index/target/solr-index-1.0-SNAPSHOT-shaded.jar
[INFO] Dependency-reduced POM written at: /Users/ryantabora/Code/ryantabora/RealTimeSearchAndAnalytics/05-solr-index/dependency-reduced-pom.xml
[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 change via the Solr Web REST Interface.

[http://localhost:8983/solr/stocks/select?q=\\*"](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 next 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.