Report-Engine tutorial

Version

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# What is report-engine?

Report Engine is a set of JAVA classes for reports and pivot tables with support for columns, groupings, totals/subtotals. It accepts input from memory, files, databases and exports the data in a multitude of formats: HTML, RTF, PDF, TXT, SVG etc.

# What report-engine can do for you?

For any kind of data (files, databases, etc) report engine can help you re-arranging, computing sums, averages, combining columns and exporting your data.

# What java version is ReportEngine designed for?

ReportEngine is developed and designed for JAVA 6 or higher

# Limitations

* Report-engine cannot create charts.
* No programmatic paging. This doesn’t mean there’s no paging at all but the paging is supported by the viewer-application.
* Printing is fully handled by the viewer-application (e.g Adobe Reader, Firefox, Internet Explorer, etc.)

# How to add report-engine to your project?

## Using Maven

* First and foremost you need Apache Maven installed on your computer. If you don’t have it just follow the instructions [here](http://maven.apache.org/download.html).
* Add report-engine dependency to your project

<dependency>

<groupId>net.sf.reportengine</groupId>

<artifactId>reportengine</artifactId>

<version></version>

</dependency>

## Using Groovy Grape

@Grapes(

@Grab(group='net.sf.reportengine', module='reportengine', version='')

)

## Using Grails

compile 'net.sf.reportengine:reportengine:'

## Using Scala SBT

libraryDependencies += "net.sf.reportengine" % "reportengine" % ""

## Using Apache Buildr

'net.sf.reportengine:reportengine:jar:'

# How to see the logs of ReportEngine?

Reportengine is using [SLF4J](http://slf4j.org/) as logging framework. The Simple Logging Facade for Java (SLF4J) serves as a simple facade or abstraction for various logging frameworks (e.g. java.util.logging, logback, log4j) allowing the end user to plug in the desired logging framework at deployment time.

What does that mean? If you use log4j in your current project and you want to see the logs of reportengine you just need to add the slf4j-log4j bridge (jar file) in your classpath. For maven this can be done like:

<dependency>

<groupId>org.slf4j</groupId>

<artifactId>slf4j-log4j12</artifactId>

<version>1.7.5</version>

</dependency>

The same for other logging frameworks, just add the bridge in your classpath.

[Here’s a nice tutorial](http://saltnlight5.blogspot.ro/2013/08/how-to-configure-slf4j-with-different.html) on how to configure SLF4J with different logging frameworks. More details on SLF4J can be found in [SLF4J’s user manual](http://slf4j.org/manual.html)

# Flat Reports

## What is a flat report?

This is a normal tabular report (don't get confused by its name) whose layout will look like:

|  |  |  |
| --- | --- | --- |
| Report title | | |
| **Header 1** | **Header 2** | **Header 3** |
| data 11 | data 12 | data 13 |
| data 21 | data 22 | data 23 |
| data 31 | data 32 | data 33 |
| data 41 | data 42 | data 43 |

## The code structure of a flat report

Each report needs several elements configured: title, input, output and column definitions. Let’s have a look at the report below:

FlatReport flatReport = **new** FlatReport.Builder()

.title("Statistics")

//input configuration

.input(**new** TextInput("employees.txt"))

//output configuration

.output(**new** ExcelOutput("output.xls"))

//columns configuration

.addDataColumn(**new** DefaultDataColumn("Country", 0))

.addDataColumn(**new** DefaultDataColumn("City", 1))

.addDataColumn(**new** DefaultDataColumn("Population", 2))

.build();

The above code is can be written in a more fluent manner like but we’ll see about that later. For the moment it’s important to see the main configurations of a flat report.

## The input

The main input classes are:

* ***TextInput***- handles input from text streams of any kind and reads data columns separated by a user-defined separator (comma, tab, semicolon, etc).

Let’s see the example below:

ReportInput input = **new** TextInput("employees.txt", "\t");

//constructs the input based on a file having as data-separator between data //columns the TAB character

…but remember, TextInput can get data from any java.io.Reader (not only files).

URL url = **new** URL("http://www.mysite.com/inputData/expenses.csv");

TextInput reportInput = **new** TextInput(

**new** InputStreamReader(url.openStream()),",");

flatReport.setIn(reportInput);

* ***SqlInput*** - executes a query and handles the result as input for your reports

1. If you already have a database connection you can use it like:

java.sql.Connection dbConnection = ...

SqlInput sqlInput = **new** SqlInput();

sqlInput.setConnection(connection);

sqlInput.setSqlStatement(

"select id, country, region, city, population from DB\_TABLE");

1. if you don’t have the connection, report-engine can create one for you given the right parameters:

SqlInput sqlInput = **new** SqlInput();

sqlInput.setDbConnString("jdbc:hsqldb:mem:countriesDB");

sqlInput.setDbDriverClass("org.hsqldb.jdbcDriver");

sqlInput.setDbUser("sa");

sqlInput.setDbPassword("secret");

sqlInput.setSqlStatement(

"select id, country, region, city, population from DB\_TABLE");

* ***Custom Input***

If these classes don’t cover your needs you can always write your own input by implementing the *ReportInput* interface or, even better, by extending the [AbstractReportInput](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/in/AbstractReportInput.html) class as instructed [here](#_Writing_a_custom)

## Report Output

Some of the most important output formats for your reports are:

* *Html5Output - fast html output that creates a html page with styles into any java.io.Writer (including files)*

Html5OuputhtmlOut **= new** Html5Output("employees.html")

* *ExcelOutput* – creates an excel output into a java.io.OutputStream (files included)

ExcelOuput output = **new** ExcelOutput("employees.xls");

* *PdfOutput*

PdfOutput pdfOutput = **new** PdfOutput("employees.pdf");

* *Other formats accepted are: png, xml, xsl-fo, fo*
* Of course you can always write your own report output by implementing the *ReportOutput* interface as [here](#_Writing_a_custom)

## Report Columns Configuration

There are two kinds of columns accepted by a flat report: data columns and group columns.

### Data columns

Data columns are normal report columns displaying data and total results. For each column there are a few configurations to set:

* + header
  + values to be displayed
  + group calculator (if totals of any kind are needed )
  + data formatter
  + horizontal/vertical alignment of text
  + sorting ( If necessary)

Let’s discuss each of these parameters in detail.

#### What is the column header?

It’s the string that will appear in the column header section of the report. In the example below the **Year, Month, Amount** are column headers.

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Month | | Amount |
| 2011 | Aug. | 500 | |
| 2011 | Sept. | 300 | |
| 2011 | Oct. | 134 | |

#### What values to display?

ReportEngine can be instructed to get data from a specific **input** column or the user can define its own way of getting data. For the moment we will discuss only the default implementation. To customize your own data columns please consult the section

The default implementation for a data column ([net.sf.reportengine.config.DefaultDataColumn](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/config/DefaultDataColumn.html)) has an inputColumnIndex attribute which tells report-engine which column from your input should be displayed in that column. Using inputColumnIndex you instruct report-engine to display your data on the desired position.

**new** DefaultDataColumn

.Builder(0) // builds a column based on the first input column

.header("Month")

.build();

Report-Engine uses column indexes starting from zero, so zero is our first input column. Another important note: for report-engine, the order in which you define your columns is very important because **it defines the output order of your columns**.

For instance, assuming an input with three columns: year, month and amount spent (like the one presented above in the [“What is the column header ?“](#_What_is_the) section, I may decide to show the Year column as the third in the final report and show the Month column as the first in the report. To do that I will add my columns in the following order:

//show Month first with data from column 1 (second input column)

//the column will be displayed first because it is added first in the report

report.addDataColumn( column month having inputColumnIndex = 1)

//show Amount second with data from column 2 (third input column)

//the values in the Amount will be displayed second because this

//column is added second

report.addDataColumn(column amount having inputColumnIndex = 2)

//show the Year last with data from the column 0 (first)

report.addDataColumn(column year having inputColumnIndex = 0)

#### What is the group calculator?

The group calculator compiles all values of a column in order to get a SUM or an Average or whatever computation comes to your mind. You can use an existing calculator (SUM, AVG, MIN, MAX, COUNT, FIRST, LAST) or you can create your own by implementing the [net.sf.reportengine.core.calc.GroupCalculator](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/core/calc/GroupCalculator.html) interface.

#### How to set these properties to a column?

* by using the builder (recommended)

DefaultDataColumn column = **new** DefaultDataColumn.Builder(0)

.header("Amount")

.useCalculator(GroupCalculators.*SUM*)

.horizAlign(HorizontalAlign.*LEFT*)

.build();

* or by using one of the available constructors (strongly discouraged but useful for demonstration purposes)

DefaultDataColumn column = **new** DefaultDataColumn("Month",0,Calculators.*SUM*);

DefaultDataColumn column = **new** DefaultDataColumn("Month",0);

DefaultDataColumn column = **new** DefaultDataColumn(0);

### Your first report

It’s now time to build our first report: a report containing my expenses. We will use as input [a file](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/inputData/expenses.csv) containing the list of my expenses during several months. Our initial target is to create just a simple html report containing all input column and nothing more.

**import** net.sf.reportengine.FlatReport;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* this is your first report having the following steps

\*

\* 1. construct a flat report builder

\* 2. adds an input to my report

\* 3. adds an output

\* 4. configures the columns of my report

\* 5. executes the report

\*/

**public** **class** FirstReport {

**public** **static** **void** main(String[] args) {

FlatReport flatReport = **new** FlatReport.Builder()

.title("My first expenses report");

//the input

.input(**new** TextInput("./inputData/expenses.csv",","))

//the output

.output(**new** Html5Output("./out/myFirstReport.html"))

//columns configuration (using column constructors – not recommended)

//remember the order we add these columns is the order of displaying

.addDataColumn(**new** DefaultDataColumn("Month",0))

.addDataColumn(**new** DefaultDataColumn("Spent on",1))

.addDataColumn(**new** DefaultDataColumn("Amount",2))

.build();

//the execution

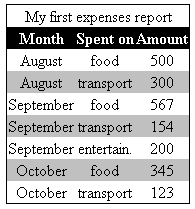
flatReport.execute();

}

}

The always up to date source code can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/FirstReport.java)

After executing the code, the result should be an html file



Now, there are some things we can improve, for instance, the “Amount” column should have its values right-aligned while the other string columns should be left aligned. Let’s see how we can do this:

**import** net.sf.reportengine.FlatReport;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.config.HorizAlign;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* this report is the same as {@link FirstReport} only that

\* the first and the second columns are horizontally-aligned to left

\* and the third (Amount column) is right aligned

\*/

**public** **class** SecondReport {

**public** **static** **void** main(String[] args) {

FlatReport flatReport = **new** FlatReport.Builder()

.title("My first expenses report")

//the input

.input(**new** TextInput("./inputData/expenses.csv",","))

//the output

.output(**new** Html5Output("./out/myAlignedOutput.html"))

//columns configuration

.addDataColumn(**new** DefaultDataColumn.Builder(0)

.header("Month")

.horizAlign(HorizAlign.*LEFT*)

.build());

.addDataColumn(**new** DefaultDataColumn.Builder(1)

.header("Money spent on ..")

.horizAlign(HorizAlign.*LEFT*)

.build());

.addDataColumn(**new** DefaultDataColumn.Builder(2)

.header("Amount")

.horizAlign(HorizAlign.*RIGHT*);

.build());

.build();

//report execution

flatReport.execute();

}

}

The always up to date source code can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/ColumnsWithAlignmentReport.java)

### Sorting your column data

Sorting data on a specific column can be easily done by calling one of the sorting methods: sortAsc() , sortDesc() available in the builder of [DefaultDataColumn](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/config/DefaultDataColumn.Builder.html).

flatReport.addDataColumn(**new** DefaultDataColumn.Builder(2)

.header("Amount")

.**sortAsc()**

.build());

The sample report having the amount sorted can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/SortedFlatReport.java)

### Formatting column data

Another useful feature of every type of column is formatting. Currently data and group columns can be formatted using String.format() which is called by the framework. You just need to specify the string format as in [the specs](http://docs.oracle.com/javase/1.5.0/docs/api/java/util/Formatter.html).

flatReport.addDataColumn(

**new** DefaultDataColumn.Builder(2)

.header("Amount")

.**valuesFormatter(**"%.2f"**)**

.build());

flatReport.addDataColumn(

**new** DefaultDataColumn.Builder(2)

.header("Birth Date")

.**valuesFormatter(**"%tD"**))**

.build());

Please note that totals follow another formatting because they usually have another data type. To format the total values (i.e. those returned by calculators) you need to use the long version of the useCalculator() method as in the example below:

**Group columns**

DefaultDataColumn column = **new** DefaultDataColumn.Builder(0)

.header("Amount")

.useCalculator(GroupCalculators.*SUM,* "%.2f")

.horizAlign(HorizontalAlign.*LEFT*)

.build();

As the name suggests, group columns are helpful when one needs to group rows in order to have subtotals or a better display. At each change in the values of a declared group column the current group finishes and the totals are displayed. Please keep in mind that totals can be only added to the Data Columns by setting a Calculator. Let’s check the following example:

My list of monthly expenses

|  |  |  |  |
| --- | --- | --- | --- |
| August |  | food | 500$ |
| August |  | transportation | 300$ |
| September |  | food | 567$ |
| September |  | transportation | 154$ |
| September |  | entertainment | 200$ |

If we declare the first column as a group column then report-engine will make sure to display totals, averages (or whatever you’ve set ) at each change in the values of the first column… something like

|  |  |  |  |
| --- | --- | --- | --- |
| August |  | food | 500$ |
| August |  | transportation | 300$ |
| **Total August** |  |  | **800$** |
| September |  | food | 567$ |
| September |  | transportation | 154$ |
| September |  | entertainment | 200$ |
| **Total September** |  |  | **921$** |

Please note that group calculators are added to data columns not to group columns.

### Your first report with groups

**import** net.sf.reportengine.FlatReport;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.config.DefaultGroupColumn;

**import** net.sf.reportengine.core.calc.GroupCalculators;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* The first report containing a group column.

\* The month column is declared as a group column so

\* after each change in this column the totals will

\* be displayed.

\*/

**public** **class** FirstGroupReport {

**public** **static** **void** main(String[] args) **throws** Exception{

FlatReport flatReport = **new** FlatReport.Builder()

.showTotals()

.showGrandTotal(**false**)

.title("Mothly Expenses")

//define the input

.input(**new** TextInput("expenses.csv”))

//define the output

.output(**new** Html5Output("xpenses.html"))

//group column configuration

.addGroupColumn(**new** DefaultGroupColumn.Builder(0) //input col. idx

.header("Month")

.build())

//data columns configuration

.addDataColumn(**new** DefaultDataColumn.Builder(1)

.header("Spent on")

.build(())

.addDataColumn(**new** DefaultDataColumn.Builder(2)

.header("Amount")

.useCalculator(GroupCalculators.*SUM*)

.build())

.build();

//start executing the report

flatReport.execute();

}

}

The full-code of the above report can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/FirstGroupReport.java).

Let me draw your attention on the way we defined the Month column as a group column:

//group column configuration

.addGroupColumn(**new** DefaultGroupColumn.Builder(0) //input col. idx

.header("Month")

.build());

Don’t forget, calculators are specific to data columns not to group columns, that’s why, in the previous report having groups, we’ve added the SUM to a data column:

flatReport.addDataColumn(**new** DefaultDataColumn.Builder(2)

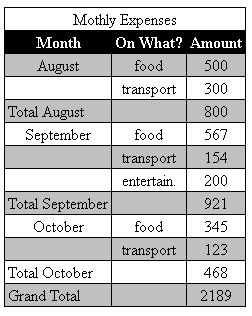
.header("Amount")

.useCalculator(GroupCalculators.*SUM*)

.build());

This is how you tell report-engine that all values on this column will be computed as a SUM.

The result of your first report containing a group should be something like:



### More on totals and groupings

Now, let’s see a more complex example: my yearly expenses report, a report having 2 group columns and 2 data columns with totals.

Here’s a list of my expenses over two years (simplified for clarity):

2011 August food 500

2011 August transportation 300

2011 September food 567

2011 September transportation 154

2011 September entertainment 200

2012 January food 205

2012 January transportation 100

2012 February food 301

2012 March entertainment 302

…and I want to build a report that will show the totals on the last column at each change in the year and month. For this I will declare in my report the first and the second columns (year and month) as group columns and I will add a SUM calculator on the last column (last is actually 3 as the count starts from 0).

It’s time to introduce another attribute of the group columns: the group level. The group level helps report-engine decide which of the group columns has the highest priority (priority 0) and then the second highest and so on. If your report has only one group column this parameter is not important but if you have more than one group column then the group level becomes much more important. The next section will further clarify this.

**new** DefaultGroupColumn.Builder(1) //1 is the input column index

.header("Month")

.level(1) //1 - is the grouping level

.build());

**import** net.sf.reportengine.FlatReport;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.config.DefaultGroupColumn;

**import** net.sf.reportengine.core.calc.GroupCalculators;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* **yearly expenses report**

\*/

**public** **class** YearlyExpenses {

**public** **static** **void** main(String[] args) {

FlatReport flatReport = **new** FlatReport.Builder();

.title("Yearly expenses report")

//the input

.input(**new** TextInput("yearlyExpenses.txt","\t"))

.showGrandTotal(**false**)

.showTotals()

//the output

.output(**new** Html5Output("yearlyExpensesOut.html"))

//groups configuration

.addGroupColumn(**new** DefaultGroupColumn.Builder(0) //input column index

.header("Year")

.level(0) //group priority

.build())

.addGroupColumn(**new** DefaultGroupColumn.Builder(1) //input column index

.header("Month")

.level(1) //group priority

.build())

//data columns

.addDataColumn(**new** DefaultDataColumn.Builder(2)

.header("Spent on")

.useCalculator(GroupCalculators.*COUNT*)

.build())

.addDataColumn(**new** DefaultDataColumn.Builder(3)

.header("Amount")

.useCalculator(GroupCalculators.*SUM*)

.build())

.build();

//the one and only execute

flatReport.execute();

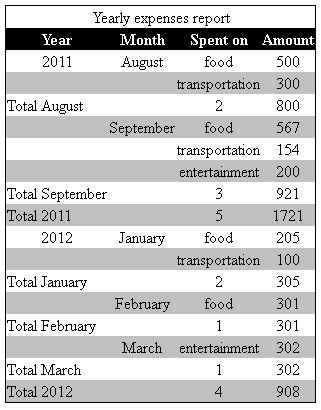
}

}

The full source code can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/YearlyExpenses.java)

Notice that a GroupCalculators.COUNT has been added to the first data column. This will count the number of items on which I spent money during the month/year while the second data column contains a SUM calculator which will compute the amount spent on that specific month/year.

The output should be:



Let’s see one more time the groupings:

.addGroupColumn(**new** DefaultGroupColumn.Builder(0) //input column index

.header("Year")

.level(0) //group priority

.build())

.addGroupColumn(**new** DefaultGroupColumn.Builder(1) //input column index

.header("Month")

.level(1) //group priority

.build())

.. and discuss about group level or group priority: the year groups takes precedence over the month groups. How is this translated into the report? When a change in the year happens then not only the totals for the year are shown but also the totals for the month as in the extract from the final result shown previously:

|  |  |  |  |
| --- | --- | --- | --- |
| **Total December** |  | **3** | **921** |
| **Total 2011** |  | **5** | **1721** |

### What if my input data doesn’t have the group columns sorted

In order to perform correct groupings the reportengine needs all data on group columns to be sorted. Usually the data comes sorted already (especially from sql queries where a simple “order by” statement can solve the ordering). If your group columns data is not sorted already you should inform reportengine about this by calling the sortValues() method from the builder of the FlatReport. This way, reportengine will programmatically sort your values.

FlatReport flatReport = **new** FlatReport.Builder()

.showTotals()

**.sortValues()**

.title("Mothly Expenses")

.input(**new** TextInput("unsorted\_expenses.csv”))

.output(**new** Html5Output("sortedExpenses.html"))

//group column configuration

.addGroupColumn(**...**)

//data columns configuration

addDataColumn(**...**)

...

A full example can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/UnsortedGroupValues.java).

# Auto configured flat reports

Starting with version 0.8.0 report engine added a new kind of report: the auto configured report. This report gets the most out of the input, by reading the available metadata, and tries to configure the report with the available information. Of course the default configuration can be always overwritten.

A simple auto configured flat report looks like:

AutodetectFlatReport report = **new** AutodetectFlatReport.Builder()

.input(…)

.output(…)

.build()

report.execute();

The full source code can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/autoconfig/AutoconfigReportFirstSample.java)

As you can see there’s no column configuration, everything is guessed by checking the metadata of the sql input. How is this possible? By checking the metadata of your sql column and providing default values according to the type of column. For instance, if your column contains numbers the alignment of your column will be to the right.

When a special configuration needs to be set to one column, the auto-configured report gives you the opportunity to do it:

report.forColumn("COUNTRY").group().horizAlign(HorizAlign.*CENTER*);

report.forColumn("REGION").group().header("East/West");

report.forColumn("VALUE").useCalculator(GroupCalculators.*SUM*);

For the moment this is only supported for reports having as input the sql input: SqlInput.

Here’s an example of an auto configured report where some of the default values are being overwritten:

The full source code can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/autoconfig/AutoconfigFlatReportWithGroupings.java)

**import** net.sf.reportengine.AutoconfigFlatReport;

**import** net.sf.reportengine.config.HorizAlign;

**import** net.sf.reportengine.core.calc.Calculators;

**import** net.sf.reportengine.in.SqlInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* simple auto configured report

\* having some default configurations overwritten

\*/

**public** **class** AutoconfigFlatReportWithGroupings{

**public** **static** **void** main(String... args){

SqlInput input = **new** SqlInput();

input.setDbDriverClass("org.hsqldb.jdbcDriver");

input.setDbConnString("jdbc:hsqldb:file:./inputData/databases/testdb");

input.setDbUser("SA");

input.setDbPassword("");

input.setSqlStatement(

"select cntry, region, city, sex, religion, value "+

"from testreport "+

"order by country, region, city");

AutoconfigFlatReport report = **new** AutoconfigFlatReport.Builder()

.input(input);

.output(**new** Html5Output("./output/ConfiguredAutodetect.html"))

.build();

report.forColumn("cntry").group().horizAlign(HorizAlign.*CENTER*);

report.forColumn("region").group().header("East/West");

report.forColumn("value").useCalculator(Calculators.*SUM*);

report.execute();

}

}

# Pivot Tables /Crosstab reports

## What is a pivot table?

Pivot tables are particular types of reports where data is arranged as a 2 dimensional table. Let’s go back to our first example: the monthly expenses report. As a flat report this used to look like this:

|  |  |  |
| --- | --- | --- |
|  | | |
| **Month** | **Spent on** | **Amount** |
| August | food | 500 |
| August | transportation | 300 |
| September | food | 567 |
| September | transportation | 154 |
| September | entertainment | 200 |

Note that all values in the second column repeat themselves. Wouldn’t be easier to follow and compare data if those would have been arranged like in the table below?

|  |  |  |  |
| --- | --- | --- | --- |
| **Month** | **food** | **transportation** | **entertainment** |
| August | 500 | 300 | 0 |
| September | 567 | 154 | 200 |

Absolutely! Think about a situation where you’d have much more data. Arranged in a pivot table all your data is much easier to follow and compare but this is only possible when the values in the column you want as header repeat themselves. Otherwise the column header would be much longer and it wouldn’t allow you to compare the values.

## What else I have to set up for a Pivot table?

The pivot table accepts all settings of a flat report (input, output, data columns, group columns) and it introduces two more settings: the header row and the crosstab data.

### The header rows

As previously seen, the header row is the list of distinct values that should be displayed in the header of the report:



Here’s how you configure a header row based on the values in the second column (column index = 1) to the report:

report.addHeaderRow(**new** DefaultCrosstabHeaderRow(1));

There is no limit on the rows that can be displayed in the header, still, if you add too many; your report will be hard to follow. Here’s a report with two header rows (in blue):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Males | | | Females | | |
| **Country** | under 20 | under 50 | under 80 | under 20 | under 50 under | 80 |
| Sweden | 1000 | 10 | 4 | 1 | 0 | 0 |
| Norway | 0 | 100 | 0 | 0 | 0 | 0 |
| Italy | 2000 | 0 | 0 | 0 | 0 | 0 |
| Romania | 0 | 0 | 0 | 0 | 200 | 0 |
| France | 300 | 0 | 3000 | 30 | 0 | 0 |

The order in which you add the header rows is very important. For instance for the report above the first header row is the one containing the Males, Females values and the second one would be the one containing “under 20”, “under 50” …

### The crosstab data

The crosstab data is the data shown in the report. It usually comes from an input column.

Here’s the initial data (the input)

|  |  |  |  |
| --- | --- | --- | --- |
| August |  | food | **500** |
| August |  | transportation | **300** |
| September |  | food | **567** |
| September |  | transportation | **154** |
| September |  | entertainment | **200** |

And now, the pivot table result



In order to configure the crosstab data to a report you just have to add an instance of DefaultCrosstabData to the report:

**new** CrosstabReport.Builder().crosstabData(**new** DefaultCrosstabData(2));

The example above constructs a DefaultCrosstabData based on the third input column (column index 2)

## Your first Pivot table report

It’s time to create our first pivot table report:

**import** net.sf.reportengine.CrossTabReport;

**import** net.sf.reportengine.config.DefaultCrosstabData;

**import** net.sf.reportengine.config.DefaultCrosstabHeaderRow;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* this is my first pivot table report

\*/

**public** **class** FirstPivotTableReport {

**public** **static** **void** main(String[] args) {

CrossTabReport report = **new** CrossTabReport.Builder()

.title(“My first pivot table”)

.input(**new** TextInput("expenses.csv"))

.output(**new** Html5Output("xpenses.html"))

//set up data column

.addDataColumn(**new** DefaultDataColumn("Month", 0))

//set up the header rows (from the second column)

.addHeaderRow(**new** DefaultCrosstabHeaderRow(1))

//set up the crosstab data

.crosstabData(**new** DefaultCrosstabData(2))

.build();

//report execution

report.execute();

}

}

The source code for the above report can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/pivot/FirstPivotTableReport.java)

## Totals and groupings for pivot reports

Everything a flat report supports is also available for Pivot tables: Grouping columns, totals, grand total. Now let’s see the yearly expenses flat report translated into a pivot table:

* the input

2011 August food 500

2011 August transportation 300

2011 September food 567

2011 September transportation 154

2011 September entertainment 200

2012 January food 205

2012 January transportation 100

2012 February food 301

2012 March entertainment 302

* then … the code

**import** net.sf.reportengine.CrossTabReport;

**import** net.sf.reportengine.config.DefaultCrosstabData;

**import** net.sf.reportengine.config.DefaultCrosstabHeaderRow;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.config.DefaultGroupColumn;

**import** net.sf.reportengine.core.calc.Calculators;

**import** net.sf.reportengine.in.TextInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* my first pivot table with groupings and totals

\*/

**public** **class** YearlyExpensesPivotTable {

**public** **static** **void** main(String[] args) **throws** Exception {

CrossTabReport report = **new** CrossTabReport.Builder()

.input(**new** TextInput("yearlyExpenses.txt", "\t"))

.output(**new** Html5Output("yrlyXpensesPivot.html"))

//set up the group and data columns

.addGroupColumn(**new** DefaultGroupColumn("Year", 0, 0))

.addDataColumn(**new** DefaultDataColumn("Month", 1))

//set up the header rows, crosstab data

.addHeaderRow(**new** DefaultCrosstabHeaderRow(2))

.crosstabData(**new** DefaultCrosstabData(3, Calculators.*SUM*))

.showTotals()

.build();

//the report execution

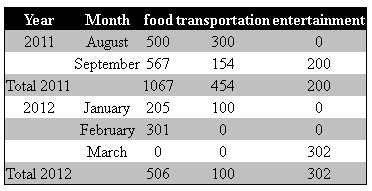
report.execute();

}

}

The full source code for the report above can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/pivot/YearlyExpensesPivotTable.java)

* and the result:



# Advanced features

## Spring integration

Any report can be easily configured in spring, just remember what any report needs: input, columns configuration and output. A simple text file input can be configured in spring like this:

<bean id=*"input"* class=*"net.sf.reportengine.in.TextInput"*>

<property name=*"filePath"* value=*"./inputData/expenses.csv"*/>

<property name=*"separator"* value=*","*/>

</bean>

…and an html output can be configured like:

<bean id=*"output"* class=*"net.sf.reportengine.out.Html5Output"*>

<property name=*"filePath"* value=*"./output/springConfiguredReport.html"*/>

</bean>

…finally a data column can be defined in spring like:

<bean class=*"net.sf.reportengine.config.DefaultDataColumn"*>

<property name=*"header"* value=*"Amount"*/>

<property name=*"inputColumnIndex"* value=*"2"*/>

<property name=*"calculator"*>

<bean class=*"net.sf.reportengine.core.calc.UniversalSumCalculator"* />

</property>

</bean>

Now, using the easily configurable lists of beans, here’s the final spring configuration for my report:

<?xml version=*"1.0"* encoding=*"UTF-8"*?>

<beans>

<bean id=*"expensesReport"* class=*"net.sf.reportengine.FlatReport"*>

<property name=*"reportTitle"* value=*"Spring Configured Report"* />

<property name=*"showTotals"* value=*"true"* />

<property name=*"showGrandTotal"* value=*"true"*/>

<property name=*"showDataRows"* value=*"true"* />

<property name=*"in"* ref=*"input"*/>

<property name=*"out"* ref=*"output"*/>

<property name=*"groupColumns"*>

<list>

<bean class=*"net.sf.reportengine.config.DefaultGroupColumn"*>

<property name=*"header"* value=*"Month"*/>

<property name=*"inputColumnIndex"* value=*"0"*/>

<property name=*"groupingLevel"* value=*"0"*/>

</bean>

</list>

</property>

<property name=*"dataColumns"*>

<list>

<bean class=*"net.sf.reportengine.config.DefaultDataColumn"*>

<property name=*"header"* value=*"Spent On"*/>

<property name=*"inputColumnIndex"* value=*"1"*/>

</bean>

<bean class=*"net.sf.reportengine.config.DefaultDataColumn"*>

<property name=*"header"* value=*"Amount"*/>

<property name=*"inputColumnIndex"* value=*"2"*/>

<property name=*"calculator"*>

<bean

class=*"net.sf.reportengine.core.calc.UniversalSumCalculator"* />

</property>

</bean>

</list>

</property>

</bean> <!—end report bean -->

<!-- THE INPUT -->

<bean id=*"input"* class=*"net.sf.reportengine.in.TextInput"*>

<property name=*"filePath"* value=*"./inputData/expenses.csv"*/>

<property name=*"separator"* value=*","*/>

</bean>

<!-- THE OUTPUT -->

<bean id=*"output"* class=*"net.sf.reportengine.out.Html5Output"*>

<property name=*"filePath"* value=*"./output/springConfiguredReport.html"*/>

</bean>

</beans>

The source code for the above spring configuration can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/resources/application-context.xml).

The java code is very simple:

**import** net.sf.reportengine.FlatReport;

**import** org.springframework.context.ApplicationContext;

**import** org.springframework.context.support.ClassPathXmlApplicationContext;

/\*\*

\* this is my first spring configured flat report

\*/

**public** **class** SpringConfiguredFlatReport {

**public** **static** **void** main(String[] args) {

ApplicationContext context =

**new** ClassPathXmlApplicationContext("application-context.xml");

FlatReport report = (FlatReport)context.getBean("expensesReport");

report.execute();

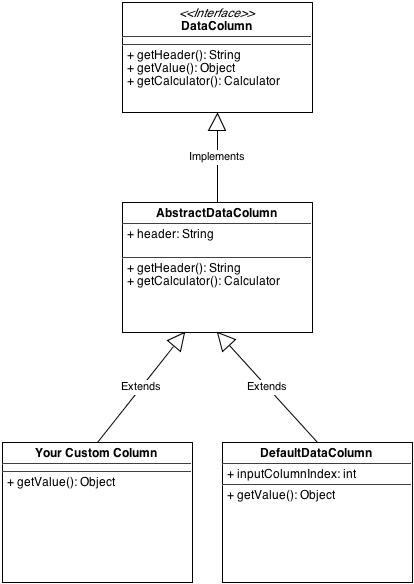
}

}

The source code for the above report can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/SpringConfiguredFlatReport.java).

## Writing a custom data column

As you probably remember, report-engine doesn’t support only DefaultDataColumns. There’s a class hierarchy supporting the columns feature.



If you don’t want a special column you can always implement the [DataColumn](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/config/DataColumn.html) interface or, even better, extend the [AbstractDataColumn](http://reportengine.sourceforge.net/html/apidocs/net/sf/reportengine/config/AbstractDataColumn.html) abstract class. Let’s assume you want to append the values of two other columns into one. There no default implementation for this behavior but this is where you can extend the framework and add your custom implementation. Let’s assume you have the following 4 columns input

**Bonus FirstName Salary LastName**

100 john 2000 doe

170 jack 1250 the ripper

220 tom 1340 jones

34 bill 254 clinton

… but you need a list of only two columns where the first contains the full name (i.e. 2nd + 4th column) and the second column contains the sum of the first and the third

First let’s see the code for the full name (2nd + 4th column values)

**import** net.sf.reportengine.config.AbstractDataColumn;

**import** net.sf.reportengine.core.algorithm.NewRowEvent;

/\*\*

\* This custom column contains the appended values

\* of the second and the fourth columns

\*/

**public** **class** FullNameCustomDataColumn **extends** AbstractDataColumn {

/\*\*

\* Constructor for full name data column

\* **@param** header

\*/

**public** FullNameCustomDataColumn(){

**super**("Full Name");

}

@Override

**public** Object getValue(NewRowEvent newRowEvent) {

Object[] inputRow = newRowEvent.getInputDataRow();

String secondColumnValue = (String)inputRow[1];

String fourthColumnValue = (String)inputRow[3];

//append the second and fourth column values

**return** secondColumnValue + " " + fourthColumnValue;

//this is just for instructional purposes.

//One should use a String Builder/Buffer for such operations

}

}

You can find the code [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/customColumns/FullNameCustomDataColumn.java).

The [SumCustomColumn](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/customColumns/SumCustomColumn.java) is almost the same only that returns an integer. More important is the code for of the report itself:

**import** java.io.FileOutputStream;

**import** net.sf.reportengine.FlatReport;

**import** net.sf.reportengine.config.DefaultDataColumn;

**import** net.sf.reportengine.in.StreamReportInput;

**import** net.sf.reportengine.out.Html5Output;

/\*\*

\* this report uses a custom column (full name column)

\*/

**public** **class** CustomColumnFlatReport {

**public** **static** **void** main(String[] args) {

FlatReport flatReport = **new** FlatReport.Builder()

.title("My custom columns report")

.input(**new** TextInput("names.txt","\t"))

.output(**new** Html5Output("customColsResult.html"))

.addDataColumn(**new** FullNameCustomDataColumn())

.addDataColumn(**new** SumCustomColumn())

.build();

flatReport.execute();

}

}

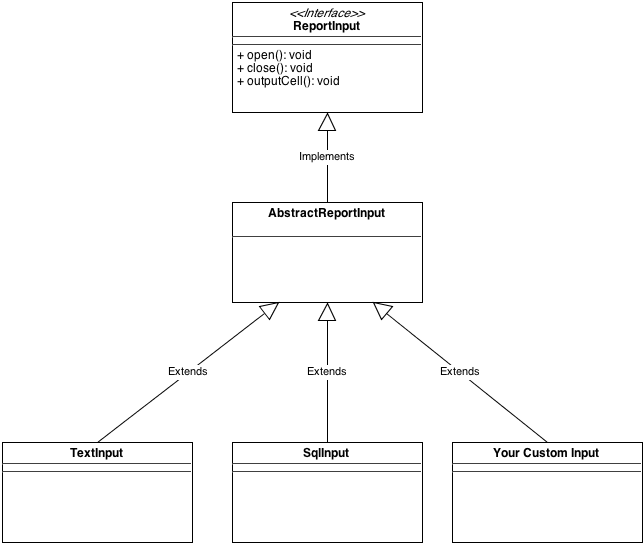
The code above can be found [here](http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/src/main/java/net/sf/reportengine/samples/flat/customColumns/CustomColumnFlatReport.java)

The final output will look like:

|  |  |
| --- | --- |
| My custom columns report | |
| **Full-name** | **Full Salary** |
| john doe | 2100 |
| jack the ripper | 1420 |
| tom jones | 1560 |
| bill clinton | 2880 |

## Writing a custom input (section under construction)

The hierarchy for input is straightforward: an interface defining the basic behavior is the parent then an abstract class with multiple children.



Basically your input class should be able to provide to its listeners data line by line. The methods of the ReportInput interface are:

/\*\*

\* opens the input for reading

\*/

**public** **void** open();

/\*\*

\* closes the input and releases all resources used

\*/

**public** **void** close();

/\*\*

\* retrieves the next row of data

\* **@return** an array of data objects

\*/

**public** Object[] nextRow();

/\*\*

\* true if there are any rows left otherwise false

\* **@return** true if the input has more rows to return

\*/

**public** **boolean** hasMoreRows();

## Writing a custom output (section under construction)

## Writing a custom calculator (section under construction)

# Useful links

* Reportengine website: <http://reportengine.sourceforge.net>
* The report engine source code can be found at: <http://svn.code.sf.net/p/reportengine/code>
* The samples presented in this tutorial can be found at : <http://svn.code.sf.net/p/reportengine/code/trunk/reportengine-samples/>
* Developer’s email: dragos dot balan at gmail dot com