

# Time Tracker Report 2.0 Component Specification

## 1. Design

The Time Tracker Report custom component is part of the Time Tracker application. It provides the ability to create time and expense reports for employees, projects, and clients. This component handles the necessary database queries that make up the various reports. This component is required to generate the actual reports as tables embedded in a web page.

This component will be largely flexible in terms of the following areas:

1. The Columns that are displayed on the report. (Any subset of the Default set of columns should be configurable for display).
2. Runtime decision of Filters for the report. (A report will have mandatory filters as well as optional filters). At runtime, it should be possible to switch off or on a particular optional filter. (Example: For the same JSP page, if one user logs in, he should be able to see the report containing his details and if other user accesses the same JSP page, the report should be able to show his details. In addition to this, the user can pass on certain further filtering information (say a particular Project or a particular Client) to the same JSP page and he should be able to get the Filtered details in display back.
3. Configurable CSS styles for the report.
4. Has support provided in the framework to allow the generation of the Report in different formats. (Though only the implementation for generating the report as a HTML Table is provided)

Analyzing these configurations and the flexibility expected, we arrive at 2 sets of configurations that are possible, one which is configurable at runtime(Filters for the report) and one which does not require configuration at runtime(CSS Styles and Columns to be displayed).

It is important to note that, the Filters for the reports need to be configured at runtime or else two users cannot get data specific to them by accessing the same JSP page.

To keep the development using the component simple and also provide the required flexibility, we define a single JSP tag which has attributes specifying the *Runtime Configuration* of the report to be displayed and contains information as to:

1. The *Category* of the Report.
2. The *Type* of the Report.
3. The *Filters* for the Report.

The attributes of this JSP tag have been defined and explained in section 3.2. (TLD configurations for tag).

The configuration of what Columns, Column Headers, CSS Styles needs to be used for a JSP Page displaying the report is not a part of Runtime Configuration, but can be Configured by just changing the Namespace attribute in the JSP tag.

The design has categorized the handling of specific section of the Report rendering based on the category of Report. This is because, based on the Category the summarization information changes for a report.

The following table provides a quick reference to the locations in the document, in the associated configuration files and the UML diagrams, where the design meets the requirements specified:

No	Requirement	Location
1	Requirement 1.2.1.1	The enumeration classes for ReportCategory, ReportType, defines the various combinations of the reports that can be generated by the component.  <b>The SQL Queries for each of the nine Reports, is present in the Time_Tracker_Report.xml file. Please refer this file for the queries.</b>
2	Requirement 1.2.1.2 (Filters)	The Filter interface and its implementations and the FilterCategory and the FilterType enumerations work towards satisfying the requirement.
3	Requirement 1.2.1.3 (Configurable Columns)	This is present as a part of the configuration for the report in the Time_Tracker_Report.xml file.  The classes that work towards satisfying this requirement are Column, ColumnDecorator interface and its implementations.
4	Requirement 1.2.1.4 and 1.2.1.5.	The enumeration classes for ReportCategory, ReportType has been defined for the same and reports generation for the different combination of these is provided.
5	Requirement 1.2.2	The report implementation classes TimeReport, ExpenseReport and TimeExpenseReport.
6	Requirement 1.2.4 (Pluggable persistence)	The interface and classes defined in the package "com.cronos.timetracker.report.dbhandler" allow for pluggability of the Database.
7	Requirement 1.2.5 (CSS Styles)	The enumeration class StyleConstant and the style configuration in the Time_Tacker_Report.xml file for the report work towards satisfying this requirement.
8	Requirement 1.2.6 (Custom JSP Tag)	The taglib definition for the custom JSP tag for the Time Tracker Report application is defined in the "time_tracker_report.tld" file. The class handling this custom JSP Tag is ReportDisplayTag.

In addition to the basic set of requirements mentioned, the component also provides additional features which are detailed as follows:

No	Requirement	Location
1	Framework for allowing the report to be generated in different formats.	This is not a part of the core requirement, but extremely useful, if the report data is required to be rendered in some other format.
2	Column Decoration	This is again not a part of the core requirement, but a very useful functionality to actually decorate the column data before displaying it.  This component provides a basic decoration feature wherein the column data can be prefixed by a constant prefix and/or suffixed with a constant suffix.

**Note:** The design assume that a ConnectionProducer for the Informix database has been registered with the DBConnetionFactory, by the "Time Tracker" application. The required properties for creating the ConnectionProducer for the Informix database should be specified in the

configuration of the DBConnectionFactory component under the namespace "com.cronos.timetracker.report.Informix".

Also the configuration file Time\_Tracker\_Report.xml file has to be configured to be loaded by the ConfigManager component.

#### Functionality added in 2.0:

In all report table, adds company field, it will be generated as the first column of the report.

Header section of report has been added, which will add title before the table in following following format:

For worker reports, the header will display "[Username] [Start Date] to [End Date]".

For project reports, the header will display "[Project Name] [Start Date] to [End Date]".

For client reports, the header will display "[Client Name] [Start Date] to [End Date]"

Column sort added to, add SORT\_BY\_\_<REPORT\_TYPE>\_<REPORT\_CATEGORY> to query, details see the config section. And you can config it by ReportDisplayTag#setSortColumns, if the tag not set, use the configuration in config file, and developer can change the default by ReportDisplayTag#setSortColumns.

### 1.1 Design Patterns

1. Factory pattern is used for ReportFactory and DBHandlerFactory for handling the instantiation of the Report and DBHandler implementations.
2. Strategy pattern is used for Filter, ColumnDecorator, DBHandler and Report.
3. AbstractReport, TimeReport, ExpenseReport and TimeExpenseReport together form a Decorator pattern.
4. Data Transfer Object (DTO) pattern is used for ReportConfiguration class. (Basically a sort of bean with getter and setter methods).

### 1.2 Industry Standards

- JSP
- JSTL
- JDBC
- CSS

### 1.3 Required Algorithms

**Note:** (Important): It would be best to go through the details in the configuration file "Time\_Tracker\_Report.xml" file, before proceeding to read the algorithm section. This will be very much useful to help in understanding the algorithms better.

**Note:** (Important): The code in the following algorithms does only include the basic algorithm to get the point, all error/illegal argument/illegal value –handling has been omitted to reduce the pseudo code to its basic algorithm. Some of the methods referred to in the pseudo code do not actually exist, but are meant as placeholders for the action their name expresses.

#### 1.3.1 Get the Report instance, creation of Filters and executing the report.

(Inside the ReportDisplayTag:doStartTag( ) method)

1. Lookup the values typeValue and categoryValue from request parameters and if that is null from pageContext by using the values of the fields type and category as lookup keys. (The specification of the attributes names by the type and the category variables, allow us not to tie these attributes to be expecting to have a specific name, but the name can be changed by changing the value of the attributes of the tag in the JSP page rather than requiring to change the Client sending the parameter value.)

2. Call the method `createFilters()` to create a `List` containing `Filter` objects based on the data available in the HTTP Request object and the page's context.

3. Get a `Report` object instance corresponding to the category by invoking `ReportFactory.getInstance().getReport(FORMAT,categoryValue)`.

4. Invoke the `execute(namespace,typeValue,filters,sortBy)` method on the `Report` object and write out the `String` returned by the method to the `pageContext`:

```
pageContext.getOut().println(report.execute(namespace,typeValue,filters,
sortBy)).
```

5. Return `SKIP_BODY`.

### 1.3.2 Loading of the Report implementations by the ReportFactory: (loadConfiguration() method)

```
String namespace = "com.cronos.timetracker.report.Reports";

ConfigManager manager = ConfigManager.getInstance();

String reports[] = manager.getStringArray(namespace,"ReportClasses");

// registering of the Report Implementation from the configuration.

for(int i=0;i<reports.length;i++){
    String className = reports[i];
    Report report = loadReportInstaceThroughReflection(className);
    String key = report.getFormat() + "_" +
        report.getCategory().getCategory();
    reports.put(key, object);
}
```

### 1.3.3 Loading of the DBHandler implementations by the DBHandlerFactory: (loadHandlersFromConfiguration() method)

```
String namespace = "com.cronos.timetracker.report.DBHandlers";

ConfigManager manager = ConfigManager.getInstance();

String handlers[] = manager.getStringArray(namespace,"DBHandlers");

// registering of the DBHandler Implementation from the configuration.

for(int i=0;i<handlers.length;i++){
    String className = manager.getString(namespace,handlers[i]);
    DBHandler handler =loadDBHandlerThroughReflection(className);
    dbhandlers.put(handlers[i], handler);
}
```

### 1.3.4 Creation of Report Configuration: (Inside AbstractReport.createConfiguration() method)

1. Get the `List` containing the valid `Filters` for the current type of `Report` from the "validFiltersForType" map by using the type argument value as key.

2. Check if any of the filters in the List passed, is not a part of the `validFilters` List. If found any, then throw a `ReportConfigurationException` with appropriate message, else continue.
3. Check if the List passed contains the mandatory `defaultFilter` (looked up from `defaultFilterForType` map as in 1.) for the type of report. If not then throw a `ReportConfigurationException` with appropriate message, else continue.
4. Lookup the columns to be displayed in the report:  
`configManager.getStringArray(namespace, "CUSTOM_"+reportType+"_"+reportCategory+"_COLUMNS");`  
 Convert all Strings to Column instances using `Enum.getEnumByStringValue`
5. If the custom columns lookup returned null or empty array, use the default columns (lookup from `defaultColumnsForType` using the `reportType` as key)
6. Create a List columns to contain the `ColumnDecorators` for the report
7. For each column in the obtained list
  - a. check whether the column is allowed for that report type, by checking whether the default column list (see 5.) contains that column, If not then throw a `ReportConfigurationException` with appropriate message, else continue
  - b. `String columnLabel = configManager.getString(namespace, "COLUMN_"+column.getName());`
  - c. if `columnLabel` is null, `columnLabel=column.getName()`
  - d. create a `BasicColumnDecorator` and add the `ColumnDecorator` to the columns list:  
`columns.add(new BasicColumnDecorator(column.getName(),propertyValue));`
8. For each of the `BasicColumnDecorator` in the columns List, read the value of the property `PREFIX_` and `SUFFIX_` from the namespace and set prefix and suffix property on the `BasicColumnDecorator`.
9. Create a "styles" Map. A Local variable.
10. For each of the styles constants obtained from `StyleConstant.getStyleConstants()`:
  - try fetching the property value as in step 7 and if not null, then insert it into styles HashMap, else insert an empty string in the HashMap for the style.
11. Create the `ReportConfiguration` by using the columns List, the filters List, the namespace, type, category (obtained using the `getCategory()` method) and the styles Map.
12. Return the `reportConfiguration`.

### 1.3.5 Create ReportData as HTML table from ReportConfiguration

(`HTMLRenderUtil.renderTable()` method)

```
ConfigManager configManager = ConfigManager.getInstance();
String dbHandler = configManager.getProperty(config.getNamespace(), "DBHandler");
DBHandlerFactory factory = getDBHandlerFactory();
DBHandler handler = factory.getDBHandler(dbHandler);
```

```

ResultSet resultSet = handler.getReportData(config);
final Map styles = config.getStyles();
final List columnDecorators = config.getColumnDecorators();
final StringBuffer buffer = new StringBuffer();

final String trStyle = safeGetStyleValue(styles, StyleConstant.TR_STYLE);
final String tdStyle = safeGetStyleValue(styles, StyleConstant.TD_STYLE);
final String tableStyle = safeGetStyleValue(styles, StyleConstant.TABLE_STYLE);
final String thStyle = safeGetStyleValue(styles, StyleConstant.TH_STYLE);

buffer.append("<TABLE");
buffer.append(tableStyle);
buffer.append("><TR");
buffer.append(trStyle);
buffer.append(">");
Iterate all columnDecorators and do
    buffer.append("<TH");
    buffer.append(thStyle);
    buffer.append(">");
    buffer.append(decorator.getColumnDisplayText());
    buffer.append("</TH>");
buffer.append("</TR>");
For each of the row found in the ResultSet do:
    buffer.append("<TR");
    buffer.append(trStyle);
    buffer.append(">");
    For each columnDecorator in do:
        buffer.append("<TD");
        buffer.append(tdStyle);
        buffer.append(">");
        String string = resultSet.getString(columnDecorator.getColumn());
        string= columnDecorator.decorateColumn(temp);
        buffer.append(string);
        buffer.append("</TD>");
    For each Aggregator do:
        aggregator.add(resultSet.getBigDecimal(aggregator.getColumn().getName()));
        buffer.append("</TR>");
buffer.append("</TABLE>");
handler.release(resultSet);
return buffer.toString();

```

### 1.3.6 Create ReportData as HTML table from ReportConfiguration for TimeExpense category Reports (TimeExpenseReport.executeReport() method)

```

        final HTMLRenderUtil.Aggregator totalAmount = new
HTMLRenderUtil.Aggregator(Column.AMOUNT);
        final HTMLRenderUtil.Aggregator totalHours = new
HTMLRenderUtil.Aggregator(Column.HOURS);

        //renders the HTML table and cumulates the amount
        final String renderedTable = HTMLRenderUtil.renderTable(config,
getDBHandlerFactory(),
        new HTMLRenderUtil.Aggregator[]{totalAmount, totalHours});
        StringBuffer ret = new StringBuffer();
        ret.append("<CENTER>");
        ret.append(config.getHeader());
        ret.append("</CENTER>");
        ret.append(renderedTable);

```

```

//append the hours line
ret.append("<BR/><BR/><CENTER>Total Hours: ");
ret.append(totalHours.getCurrentValue());
ret.append("</CENTER>");

//append the amount line
ret.append("<BR/><BR/><CENTER>Total Amount: ");
ret.append(totalAmount.getCurrentValue());
ret.append("</CENTER>");

return ret.toString();

```

Note: The other report implementations work the same, except that they have only one Aggregator.

### 1.3.7 *Fetching of the Report data from the Database based on the ReportConfiguration (InformixDBHandler.() method)*

As this algorithm is quite long and the readability in this document would suffer from printing it here, it is referred to look at the source code of method `InformixDBHandler.getReportData()`.

## 1.4 Component Class Overview

### **ReportDisplayTag:** [class]

The `ReportDisplayTag` is a custom JSP Tag that is responsible for outputting the `ReportData` as a HTML table along with the summarization information.

Note: This tag is not a container tag and hence cannot contain subtags within this tag. This tag will render itself when the JSP Container will process the start of this tag by calling the `doStartTag()` method.

During the processing of this tag (`doStartTag()` method) the following sequence of operations occur:

1. Read the required values of parameters from the `PageContext` object available to the tag.
2. Obtain a `Report` object for the particular Category.
3. Create a List containing the Filter objects, constructed based on the values of the parameters from the `PageContext`
4. Invokes the `execute` method of the `Report`, by passing the required parameters.
5. The return value of the `execute` method contains the `ReportData` as a HTML table along with the summarization information which is output.

This class is as such not thread safe, but this class is invoked by the JSP Container and the thread-safe access to the class depends on the handling by the JSP Container.

### **Report:** [interface]

The `Report` interface defines the basic behavior of the report.

Whenever the `Report` is executed by calling the `execute()` method, the data for the `Report` is gathered based on the parameters passed.

The gathered data is then formatted based on the `Format` of the `Report` based used.

The namespace parameter defines the namespace from which the properties for the `Report` are fetched from the configuration file.

The formatted `Report Data` is then returned as a `String` on the completion of the execution of the `execute()` method.

The implementations of this interface are required to be thread-safe.

### **AbstractReport:** [abstract class]

`AbstractReport` class is an abstract class and is thread safe, as there are no setter methods to

modify the internal variables.

This is the class which provides the basic functionality of gathering the required information for the Report from the configuration file, and leaves the rendering of the data to the subclasses.

The constructor of this class has been made protected primarily to disallow creation of objects of this class outside the package

Note that the formation of the query and its subsequent execution and the report rendering in the specific format is done in the subclasses.

This is because each Category of report might require different summarization information and hence would be required to handle the fetched data for the Report in different ways.

#### **TimeReport:** [class]

TimeReport class is a subclass of AbstractReport and is responsible for generating the ReportData and organizing it in the HTML Table Format for the Time Category Reports.

This class is thread-safe as the instance members of this class are not modifiable.

#### **ExpenseReport:** [class]

ExpenseReport class is a subclass of AbstractReport and is responsible for generating the ReportData and organizing it in the HTML Table Format for the Expense Category Reports.

This class is also threadsafe as its instance variables are not modifiable.

#### **TimeExpenseReport:** [class]

TimeExpenseReport class is a subclass of AbstractReport and is responsible for generating the ReportData and organizing it in the HTML Table Format for the TimeExpense Category Reports.

This class is also threadsafe as its instance members are not modifiable.

#### **Filter:** [interface]

This interface defines the behavior of a Filter. A Filter is for a particular Column and a Filter also has a specific type, which defines its nature (equality filter or range filter or greater than filter etc.)

The implementers of this interface provide the behavior required based on its type.

The implementers of this interface may not be thread-safe. The component creates new Filter objects and ensures that it uses the Filter objects in a thread-safe manner.

#### **RangeFilter:** [class]

This class represents a Filter which of the type range. This filter defines that the values within the range specified by the Lower and Upper values needs to be selected.

This filter is multi-valued and can define set of ranges to be used.

This class is not thread-safe, but since the application creates new objects of this class for each of the reports and handles it in a thread-safe way, from the view of the entire component, this class will be used by the component in a thread-safe manner.

#### **EqualityFilter:** [class]

This class represents a Filter which of the type "equality". This filter defines that the values which are equal to the Filter value specified needs to be selected.

This filter is multi-valued and can define set of equality values to be used.



This class is not thread-safe, but since the application creates new objects of this class for each of the reports and handles it in a thread-safe way, from the view of the entire component, this class will be used by the component in a thread-safe manner.

**InFilter:** [class]

This class represents a Filter which of the type range. This filter defines that the values the field should matched.

This filter's values can contain one or multi value.

This class is not thread-safe, but since the application creates new objects of this class for each of the reports and handles it in a thread-safe way, from the view of the entire component, this class will be used by the component in a thread-safe manner.

**ColumnDecorator:** [interface]

This interface basically defines the behavior of a ColumnDecorator.

A ColumnDecorator will be associated with a Column and will assist in formatting the Columns Data. Additionally it also contains the information as to what should be the Columns display text and the name of the column it is decorating.

The implementers of this class may not be thread-safe. However, the ColumnDecorator objects are created and used by this component in a thread-safe manner. (The ColumnDecorator objects will not be reused and will not be passed across threads).

**BasicColumnDecorator:** [class]

This class implements the ColumnDecorator interface. It provides a basic column decoration feature, wherein the columns data can be prefixed with a specified constant prefix and/or be suffixed with a specified constant string.

This class is not as such thread-safe, but will be used the component in a thread-safe manner. (The objects created will not be used across threads and not reusing the objects.)

**ReportFactory:** [class]

This class is factory and contains all the Report implementation registered by the application. The registration of the Report implementation happens automatically during the loading of the class (This is when the singleton instance is created) from the configuration information specified in the configuration file (Time\_Tracker\_Report.xml). This class allows the fetching of a Report registered by Format and Category.

This class is thread-safe as the instance members are not modifiable.

**ReportConfiguration:** [class]

This class represents the ReportConfiguration that is interpreted for processing and the display of the report. This contains the full information required for the rendering of the report. This class is as such not thread-safe, but the component uses this class in a thread-safe manner (no reusing of the instance, no use of the same instance across threads)

This class is used by the implementation of the Report and the DBHandler interface to fetch the data for the Report and display it.

**DBHandlerFactory:** [class]

This class is factory and contains all the DBHandler implementation registered by the application. The registration of the DBHandler implementation happens automatically during the loading of the

class (This is when the singleton instance is created) from the configuration information specified in the configuration file (Time\_Tracker\_Report.xml). This class allows the fetching of a DBHandler registered by name.

This class is thread-safe as the instance members are not modifiable.

#### **DBHandler:** [interface]

This interface defines the basic behavior of a DBHandler. The DBHandler handles the Database operations like fetching of Data from the DataBase, managing the Connection to the database, setting and doing the necessary conversion for the parameters values used in the queries, creating the queries dynamically for the reports, executing the queries against the target Database and presenting the retrieved data in the form of a java.sql.ResultSet object.

The implementation of this class are required to handle the above mentioned operation in a manner specific to the Database is abstracts the usage.

The implementers of this class are supposed to be thread safe.

#### **InformixDBHandler:** [class]

This class implements the DBHandler interface and handles the Database specific operation defined by the interface for the Informix Database.

This class is thread-safe, because its instance member "baseQueries" is immutable and the access to the only other instance member "resultsetConnectionMap" is synchronized. (By making the map a synchronized Map).

#### **ColumnType:** [enumeration class]

This class is an enumeration and defines the different Data types for the Database column supported by the component. This enumeration defines the supported DataTypes and the corresponding DBHandler implementation would require to map this information to the DataTypes that are supported by the corresponding Database. As an example, the DataType for "MONEY" is not as such available with most of the Database and the DBHandler implementation would require to map it to the corresponding data type and handle the necessary conversion required.

This is an enumeration class and is thread-safe.

#### **ReportType:** [enumeration class]

This is an Enumeration class and is thread-safe. This class defines the different types of Reports possible.

#### **FilterCategory:** [enumeration class]

This is an enumeration class and is hence Thread-Safe.

This class defines the different categories of Filter for the reports of this component. It is important to note that all the FilterCategory defined here may not be applicable for all the Reports.

#### **FilterType:** [enumeration class]

This class is an enumeration and hence is Thread-safe. This enumeration defines the different types of Filters possible as a part of this component.

#### **ReportCategory:** [enumeration class]

This class is an enumeration class and hence is thread-safe. This enumeration class defines the different category of Reports possible.

**Column:** [enumeration class]

This class is an enumeration and hence is thread-safe. This enumeration class defines all the Columns used in the Time Tracker Report component.

The Columns here are not the actual Database column but the column as identified by the application. It is possible that the name of the application column is same as the Database column, but not necessary. For simplicity of understanding it has been kept same. It will be different if 2 or more tables have the column with the same name but different column types. If 2 or more tables have column with the same name and also the same data type, then the application level column name can be the same for them, but if the data type differs, then the application level column name has to be different.

**StyleConstant:** [enumeration class]

This is an enumeration and hence the class is Thread-safe.

This class defines constants for the property names for the CSS Styles specified in the configuration file for the Report (Time\_Tracker\_Report.xml file).

## 1.5 Component Exception Definitions

**ReportException[Custom]:**

This is the Base exception of all the exceptions that could occur in generating the Custom Report. This exception is thrown by the execute() method of the Report interface. Basically this Exception is thrown if there are any problems during the report generation.

This exception is sub-classed to throw the exceptions during specific operations during the report generation.

Example: 1. ReportSQLException: if there are problems in DataBase access or fetch of the Report Data from the Database.

2. ReportConfigurationException: if there are errors in the configuration information for a report or if there are errors during the reading of information using the ConfigManager

**ReportConfigurationException[Custom]:**

This exception is thrown if any Invalid configuration is detected for a report. This includes:

1. Missing required parameters in the configuration.
2. Invalid Filters are specified for a report. (Filters not applicable for a particular report are specified in the Configuration)
3. Missing parameter values for mandatory filter for a report.
4. Used as a wrapper for wrapping an exception thrown from the ConfigurationManager component.

**ReportSQLException[Custom]:**

This exception is thrown, if there is an exception during access to the Database or during the fetch of the data from the Database. This exception is basically a wrapper over the java.sql.SQLException and indicates an exception during Database operation.

**ReportNotFoundException[Custom]:**

This exception indicates that the particular Report requested is not registered.

During the loading of the ReportFactory, the Report instances are loaded through reflection after reading the corresponding properties from the configuration file and registered with the ReportFactory.

When a request for a particular Report is made and there is no Report registered for the specified ReportCategory and Format in the ReportFactory, then this exception is thrown to indicate the same.

**DBHandlerNotFoundException[Custom]:**

This exception indicates that the particular DBHandler requested is not registered.

During the loading of the DBHandlerFactory, the DBHandler instances are loaded through reflection after reading the corresponding properties from the configuration file and registered with the name specified in the configuration.

When a request for a particular DBHandler is made and there is no DBHandler registered with the requested name in the DBHandlerFactory, then this exception is thrown to indicate the same.

**JSPEException**

This exception will be thrown if any error occurs when starting or ending the JSP tags. It would wrap any other exceptions thrown in the doStartTag() method.

**NullPointerException**

This exception will be thrown when the argument is null where this is disallowed. Refer to the documentation tab for details.

**IllegalArgumentException**

This exception will be thrown when an invalid argument is used. Typically given String parameter is empty. Refer to the documentation for details.

**1.6 Thread Safety**

This component should be thread-safe. The user accesses just the JSP page which will create an instance of the ReportDisplayTag, set the attribute values using the setter methods and then call the doStartTag() method. This method delegates it to the Report instance the execution after obtaining the Report instance from the ReportFactory.

All the Report instances are thread-safe and also only new Objects for Filter, ReportConfigurator and ColumnDecorator are created. Since the non thread-safe classes have been used in a thread-safe manner [using only new instances of these classes for requests and not using these objects across threads] the component is thread-safe. Also the ReportFactory, DBHandlerFactory and the DBHandler implementations are also thread-safe.

**2. Environment Requirements****2.1 Environment**

- Development language: Java1.4
- Compile target: Java1.3, Java1.4

## 2.2 TopCoder Software Components

- Configuration Manager: 2.1.3
- DB Connection Factory: 1.0.
- BaseException: 1.0.
- TypeSafe Enum: 1.0.

This component does NOT depend on the Report Tags component and the reasons for it are:

1. The Report Tags component does not support the usage of CSS styles.
2. The Report Tags component does not support the creation of dynamic queries, which is required in our case. Report tags require the queries to be a part of the static configuration.
3. The Report Tags component does not provide rendering of the entire tables with contents, but only table tag and the table header tags.

This component handles by itself the rendering of the Report Data as an HTML table, with support for CSS styles and dynamic query construction.

**NOTE:** The default location for TopCoder Software component jars is `../lib/tcs/COMPONENT_NAME/COMPONENT_VERSION` relative to the component installation. Setting the `tcs_libdir` property in `topcoder_global.properties` will overwrite this default location.

## 2.3 Third Party Components

- Informix Database is being used.
- JSP API 2.0 and Servlet API 2.3 are needed at compile time (at runtime the implementation of this API is provided by the JSP container)
- Informix JDBC driver is needed to connect to the database
- Xerces 1.4.4 is needed by Configuration Manager
- JUnit 3.8.1 is used for the test cases
- Cactus 1.7.1 is used for test cases
- DBUnit 2.1 is used for test cases
- XMLUnit 1.0 is used for the test cases

## 3. Installation and Configuration

### 3.1 Package Name

1. `com.cronos.timetracker.report` [For the framework classes of the component]
2. `com.cronos.timetracker.report.htmlreport` [For classes handling the Report display in HTML Table format.]
3. `com.cronos.timetracker.report.dbhandler` [For classes handling the persistence logic]

### 3.2 Configuration Parameters

(The configuration file `Time_Tracker_Report.xml` is provided in `/docs` folder.)

The configuration file "Time\_Tracker\_Report.xml" contains all the configuration information required by this component. This configuration file is required to be loaded by the "Configuration Manager" component and the component needs to be configured for the same. The configuration file defines the following:

1. One DefaultConfiguration for report and any number of CustomConfiguration for report. (The "Time\_Tracker\_Report.xml" defines one custom configuration, but defines all the properties possible in the report configuration and could be used as an example to define further more Custom Configurations.)
2. The configuration for the Queries(Base Query configuration and the Filter extensions to the query).  
**Note:** The Filter extension for the query for the report defines the conditions (part of the query) that need to be added(appended) when optional filters for the report are present. As a result the final query for a report is dynamically generated from the Base query and Filter Extensions to the query for the report, based on the filters for the report being used.
3. The configuration for valid Filters for a report.  
 (This is required for validating whether a Filter specified is actually valid for report, since filters for report can be specified dynamically).
4. The configuration for default set of columns for a report.  
 (This is required for 2 reasons:
  - a. Validating whether the Columns requested for display (if defined) in Custom Configuration for report are valid for the report.
  - b. Display the default set of Columns for the report if Default Configuration for report is used or Custom Configuration does not override the columns to be displayed for a report.)

**Note:** Please go through the "Time\_Tracker\_Report.xml" file, as it contains detailed explanation for the various configuration properties.

### **1. Report Configuration**

Parameter	Description	Example Values
DBConnectionFactoryNamepace	The namespace to be used when initializing the DBConnectionFactoryImpl instance. (Required).	"com.cronos.timetracker.report.Informix"
Connection	The name with which the connection producer for the Informix Database used by the TimeTracker application is registered with the DBConnectionFactory(Required).	"InformixConnection"
Column properties. This includes the property names for all the columns that are possible across the nine different reports. The property names are: COLUMN_DATE, COLUMN_CLIENT, COLUMN_PROJECT, COLUMN_TASK, COLUMN_HOURS, COLUMN_PAY_RATE, COLUMN_BILLABLE, COLUMN_EMPLOYEE, COLUMN_TYPE,	These are optional properties and the value of the property defines the Label to be used when the corresponding column is rendered in the report.	Label for the particular column for the report.

COLUMN_DESCRIPTION, COLUMN_AMOUNT, COLUMN_STATUS, and COLUMN_COMPANY		
Prefix properties. These properties define the column prefix to be used when rendering the column data. The names of these properties can be obtained by prefixing the literal "PREFIX_" to the column properties names. Eg:PREFIX_COLUMN_DATE	These are optional properties. These properties define the column prefix to be used when rendering the column data.	Prefix for particular column data. (e.g. \$ for Amount columns)
Suffix properties. These properties define the column suffix to be used when rendering the column data. The names of these properties can be obtained by prefixing the literal "SUFFIX_" to the column properties names. Eg:SUFFIX_COLUMN_DATE	These are optional properties. These properties define the column suffix to be used when rendering the column data.	Suffix for particular column data. (e.g. \$ for Amount columns)
TABLE_STYLE	The CSS Style to be used in the Table HTML tag. (Optional)	background: blue; color: white;
TH_STYLE	The CSS Style to be used in the TH (Table Header) HTML tag. (Optional)	background: grey; color: white;
TR_STYLE	The CSS Style to be used in the TR (Table Row) HTML tag. (Optional)	color: white;
TD_STYLE	The CSS Style to be used in the TRD HTML tag. (Optional)	color: white;
Custom Columns property. This property defines custom set of columns for a particular type and category of Report.	This is a required property and is multi-valued and defines the valid and the default set of columns for a particular type and category of Report. (Optional – if not present for a specific report the default columns for that report will be used)  The property name for the "Columns property" for the report is in the format <REPORT_TYPE>_<REPORT_CATEGORY>_COLUMNS.	Example values can be looked in the sample configuration given below.

#### **Sample Report Configuration:**

```
<!-- Default Configuration for the reports. All reports irrespective of the
type or the category they belong to, can use this Configuration. This
configuration just specifies the value for the Connection property, which
```

is a required parameter for the Configuration. All other properties are optional for the configuration.

The namespace attribute in the "reportdisplay" JSP tag can specify this Configuration name as its value.

-->

```
<Config name="com.cronos.timetracker.report.DefaultConfiguration">
  <Property name="Connection">
    <Value>InformixConnection</Value>
  </Property>
</Config>
```

<!-- Customized Configuration for the report. This Configuration shows us an example as to what parameters could be provided in a Configuration and whats the intended use of the value of the parameter in Report generation. The namespace attribute in the "reportdisplay" JSP tag can specify this Configuration name as its value.

-->

```
<Config name="com.cronos.timetracker.report.CustomConfiguration">
```

```
  <!-- Required Property For the Configuration. -->
```

```
  <Property name="Connection">
    <Value>InformixConnection</Value>
  </Property>
```

```
  <!-- Optional Properties for the Configuration -->
```

```
  <!-- Column Properties.
```

These set of properties specify the Column Labels to be used for display during the rendering of the report. If no column property is specified then the default set of Columns for the report with the default Columns Labels will be used. The names of the Column properties for the reports under consideration are:

COLUMN\_DATE, COLUMN\_CLIENT, COLUMN\_PROJECT, COLUMN\_TASK, COLUMN\_HOURS, COLUMN\_PAY\_RATE, COLUMN\_BILLABLE, COLUMN\_EMPLOYEE, COLUMN\_TYPE, COLUMN\_DESCRIPTION and COLUMN\_AMOUNT.

The following property defines that only the columns for Employee and Amount will be displayed for the report and the Column Labels in the report display will be "Employee Name" and "Amount Spent" respectively.

-->

```
  <Property name="COLUMN_EMPLOYEE">
    <Value>Employee Name</Value>
  </Property>
```

```
  <Property name="COLUMN_AMOUNT">
    <Value>Amount Spent</Value>
  </Property>
```

```
  <!-- Custom Column Properties.
```

These set of properties specify the which set of Columns need to be



displayed for a particular Type and Category of the Report.  
The name of the property is in the format  
CUSTOM\_<ReportType>\_<ReportCategory>\_COLUMNS. eg:  
CUSTOM\_EMPLOYEE\_TIME\_COLUMNS.  
These properties are multivalued and each of the value is a valid  
application level Column name (DATE, CLIENT, PROJECT, TASK etc.)  
These properties are optional and the may not be present for a  
particular Type and the Category of the Report. If this property is  
not present  
for a particular Type and Catgeory of the Report, then the default set  
of columns for the Report will be displayed, else the set of Columns  
specified by this property are only displayed.  
As an example this property for the Employee Time Report is specified.  
-->

```
<Property name="CUSTOM_EMPLOYEE_TIME_COLUMNS">
  <Value>DATE</Value>
  <Value>CLIENT</Value>
  <Value>PROJECT</Value>
  <Value>HOURS</Value>
</Property>
```

<!-- Prefix and Suffix Properties.

These set of properties specify the prefix and the suffix for  
a particular Column. This is useful for supporting when certain  
prefix or suffix needs to be added to the Column data during  
display, an example being the display of "\$" symbol as prefix  
for AMOUNT Column.

Note that only the prefixes and the suffixes for the columns  
being display will be considered, others will be ignored.

The names of the prefix and the suffix properties are obtained  
by concatenating the "PREFIX\_" and the "SUFFIX\_" literals  
respectively to the COLUMN properties.

Examples of prefix and suffix property names are:

PREFIX\_COLUMN\_DATE, PREFIX\_COLUMN\_CLIENT,  
SUFFIX\_COLUMN\_TASK, SUFFIX\_COLUMN\_CLIENT etc.

-->

```
<Property name="PREFIX_COLUMN_AMOUNT">
  <Value>$</Value>
</Property>
```

<!-- Properties for CSS support. Note that not all properties required  
to be specified. -->

<!-- The CSS Style to be used in the Table HTML tag -->

```
<Property name="TABLE_STYLE">
  <Value>background: blue; color: white;</Value>
</Property>
```

<!-- The CSS Style to be used in the TH (Table Header) HTML tag -->

```
<Property name="TH_STYLE">
  <Value>background: grey; color: white;</Value>
</Property>
```

```

        <!-- The CSS Style to be used in the TR (Table Row) HTML tag -->
        <Property name="TR_STYLE">
            <Value>color: white;</Value>
        </Property>

        <!-- The CSS Style to be used in the TRD HTML tag -->
        <Property name="TD_STYLE">
            <Value>color: white;</Value>
        </Property>

</Config>

```

## **2. Queries Configuration**

The Queries Configuration defines the BaseQuery and FilterExtensions for a report. The complete Queries Configuration is specified in the "Time\_Tracker\_Report.xml" configuration for all the 9 different reports used by the Time Tracker application. The configuration name that has been defined for these set of properties in the "Time\_Tracker\_Report.xml" configuration file is "com.cronos.timetracker.report.QueriesConfiguration". The following table defines the names of the properties and description about what the property is meant for:

Parameter	Description	Example Values
BaseQuery properties. These properties define the "Base Query" for the different type and the category of the Report.	<p>These are required properties. These properties define the "Base Queries" for the report. (Required)</p> <p>The property name for the "Base Query" for the report is in the format BASE_QUERY_&lt;REPORT_TYPE&gt;_&lt;REPORT_CATEGORY&gt;.</p> <p><b>Note:</b> Base Query implies the query for the report without the filter conditions.</p>	Example values can be looked in the sample configuration given below.
"FilterExtension for query" properties. These properties define the "Filter extensions" that should be appended to the BaseQuery of the report to form the final query. The filter extensions will be appended based on the values for the filters passed by the user. It means a Filter extension will not be appended to the base query if the filter (filter value) is not by the user.	<p>These are required properties. These properties define the filter extensions to the "Base Queries" for the different type and category of the Report. (Required)</p> <p>The property name for the "Filter Extensions for Query" for the report is in the format &lt;FILTER_NAME&gt;_&lt;REPORT_TYPE&gt;_&lt;REPORT_CATEGORY&gt;.</p> <p><b>Note:</b> These are the parts of the query which are appended to the Base Query of the report to form the final query which is executed to fetch the data for the report.</p>	Example values can be looked in the sample configuration given below.
Sort by for query (required by 1.2.4). This optional properties to specify column sorting of the generated report.	<p>These are optional properties.</p> <p>The property name for the "sort Extensions for Query" for the report is in the format SORT_BY__&lt;REPORT_TYPE&gt;_&lt;RE</p>	Example values can be looked in the sample configuration given below.

	<b>PORT_CATEGORY&gt;.</b>  <b>Note:</b> These are the parts of the query which are appended to the Base Query of the report to form the final query which is executed to fetch the data for the report.	
--	---	--

The following sample configuration shows the configuration for "Employee Time Report".

**Sample Queries Configuration:**

```
<!--
    This is a required configuration and specifies the "Base Query" and
    the FilterExtension of Query for each of the Report.
    The property name for the "Base Query" for the report is in the format
    BASE_QUERY_<REPORT_TYPE>_<REPORT_CATEGORY>. eg.
    BASE_QUERY_EMPLOYEE_TIME

    The property name for the "FilterExtension for query" for a report is
    in the format <FILTER_NAME>_<REPORT_TYPE>_<REPORT_CATEGORY>.
    eg. FILTER_DATE_EMPLOYEE_TIME
    Note that the <REPORT_TYPE>, <REPORT_CATEGORY> and <FILTER_NAME>
    corresponds to the constants values defined by the enumeration classes
    ReportType, ReportCategory and FilterCategory class.
-->

<Config name="com.cronos.timetracker.report.QueriesConfiguration">

    <!-- Query Configuration and FilterExtensions for the "Employee Time
    Report" -->

        <Property name="BASE_QUERY_EMPLOYEE_TIME">
            <Value>
                SELECT TE.company_id COMPANY,
                       TE.entry_date DATE,
                       CL.name CLIENT,
                       PR.name PROJECT,
                       TT.description TASK,
                       TE.hours HOURS,
                       PW.pay_rate PAY_RATE,
                       TE.billable BILLABLE

                FROM time_entry TE,
                     task_type TT,
                     client CL,
                     project_time PT,
                     project PR,
                     client_project CP,
                     project_worker PW,
                     user_account US

                WHERE TE.task_type_id = TT.task_type_id
                AND PT.time_entry_id = TE.time_entry_id
                AND PT.project_id = PR.project_id
                AND PW.project_id = PR.project_id
                AND CL.client_id = CP.client_id
            </Value>
        </Property>
    </Config>
```

```

        AND CP.project_id = PR.project_id
        AND US.user_account_id = PW.user_account_id
        AND US.user_name = TE.creation_user
    </Value>
</Property>

<Property name="FILTER_EMPLOYEE_EMPLOYEE_TIME">
    <Value>TE.creation_user = ?</Value>
</Property>

<Property name="FILTER_DATE_EMPLOYEE_TIME">
    <Value>TE.entry_date BETWEEN ? AND ?</Value>
</Property>

<Property name="FILTER_CLIENT_EMPLOYEE_TIME">
    <Value>CL.name = ?</Value>
</Property>

<Property name="FILTER_PROJECT_EMPLOYEE_TIME">
    <Value>PR.name = ?</Value>
</Property>

<Property name="FILTER_BILLABLE_EMPLOYEE_TIME">
    <Value>TE.billable = ?</Value>
</Property>

    <!-- introduced in version 2.0, optional.
    specify multiple company IDs.
    -->
    <Property name="FILTER_COMPANY_EMPLOYEE_TIME">
        <Value>TE.company_id in (?)</Value>
    </Property>

    <!-- introduced in version 2.0, optional.
    Sorting can be based on single column or multiple columns.
    Sorting order can be ascending or descending.
    the property name is is in the form
    SORT_BY_<REPORT_TYPE>_<REPORT_CATEGORY>
    -->
    <Property name="SORT_BY_EMPLOYEE_TIME">
        <Value>DATE asc, HOURS desc</Value>
    </Property>

    <!--Similar configurations for other 8 reports can be found in the
    Time_Tracker_Report.xml configuration file →
</Config>

```

### **3. Filters Configuration**

The Filters Configuration defines the mandatory and optional filters for a report. The complete Filters Configuration is specified in the “Time\_Tracker\_Report.xml” configuration for all the 9 different reports used by the Time Tracker application. The configuration name that has been defined for these set of properties in the “Time\_Tracker\_Report.xml” configuration file is “com.cronos.timetracker.report.FiltersConfiguration”.

The following table defines the names of the properties and description about what the property is

meant for:

Parameter	Description	Example Values
Mandatory Filter property. This property defines the "Mandatory Filter" whose value should be provided for the report to be executed.	This is a required property and defines the value of the "Mandatory Filter" for a report.(Required)  The property name for the "Mandatory filter" for the report is in the format <REPORT_TYPE>_<REPORT_CATEGORY>_MANDATORY_FILTER.	Example values can be looked in the sample configuration given below.
Optional Filter property. This property is multi-valued and each value defines a filter which is optional for the report.	This is a required property and defines the value of the "Optional Filters" for a report.(Required)  The property name for the "Optional filters" for the report is in the format <REPORT_TYPE>_<REPORT_CATEGORY>_OPTIONAL_FILTER.	Example values can be looked in the sample configuration given below.

The following sample configuration shows the configuration for "Employee Time Report".

**Sample Queries Configuration:**

```
<!--
This is a required configuration and specifies the Filters valid for a
particular Report and also the one mandatory filter for the report.

The property name for the mandatory filter for a report is in the format
<REPORT_TYPE>_<REPORT_CATEGORY>_MANDATORY_FILTER.
The property name for the optional filters for a report is in the format
<REPORT_TYPE>_<REPORT_CATEGORY>_OPTIONAL_FILTER.

Note that a filter which is mandatory cannot be a part of the optional filter.
Note that the value for the property is from the Filter constants defined
by the enumeration constants in the enumeration
com.cronos.timetracker.report.FilterCategory.

-->

<Config name="com.cronos.timetracker.report.FiltersConfiguration">

    <!-- Filter Configuration for the "Employee Time Report" -->

    <Property name="EMPLOYEE_TIME_MANDATORY_FILTER">
        <Value>FILTER_EMPLOYEE</Value>
    </Property>

    <Property name="EMPLOYEE_TIME_OPTIONAL_FILTER">
        <Value>FILTER_DATE</Value>
        <Value>FILTER_CLIENT</Value>
        <Value>FILTER_PROJECT</Value>
        <Value>FILTER_BILLABLE</Value>
        <Value>FILTER_COMPANY</Value>
    </Property>
```

```
<!-- Similar configurations for other 8 reports can be found in the  
Time_Tracker_Report.xml configuration file →
```

```
</Config>
```

#### **4. Columns Configuration**

The Columns Configuration defines the default set of columns for a report. The complete Columns Configuration is specified in the “Time\_Tracker\_Report.xml” configuration for all the 9 different reports used by the Time Tracker application.

The configuration name that has been defined for these set of properties in the “Time\_Tracker\_Report.xml” configuration file is  
“com.cronos.timetracker.report.ColumnsConfiguration”.

The following table defines the names of the properties and description about what the property is meant for:

Parameter	Description	Example Values
Columns property. This property defines the valid and the default set of columns for a particular type and category of Report.	<p>This is a required property and is multi-valued and defines the valid and the default set of columns for a particular type and category of Report. (Required)</p> <p>The property name for the “Columns property” for the report is in the format &lt;REPORT_TYPE&gt;_&lt;REPORT_CATEGORY&gt;_COLUMNS.</p>	Example values can be looked in the sample configuration given below.

The following sample configuration shows the configuration for “Employee Time Report”.

#### **Sample Columns Configuration:**

```
<!--  
This is a required configuration and specifies the default and also the valid  
set of columns for a report, since by default all the columns valid for a  
report are available.  
The property name for the default columns for a report is in the format  
<REPORT_TYPE>_<REPORT_CATEGORY>_COLUMNS.  
Eg. EMPLOYEE_TIME_COLUMNS  
Note that the values for these properties will have a value from the  
enumeration constants defined in the enumeration  
com.cronos.timetracker.report.Column class.  
  
Note that these properties are multivalued.  
-->  
  
<Config name="com.cronos.timetracker.report.ColumnsConfiguration">  
  
    <!-- Default Columns Configuration for the "Employee Time Report" -->  
  
    <Property name="EMPLOYEE_TIME_COLUMNS">  
        <Value>COMPANY</Value>  
        <Value>DATE</Value>
```

```
<Value>CLIENT</Value>
<Value>PROJECT</Value>
<Value>TASK</Value>
<Value>HOURS</Value>
<Value>PAY_RATE</Value>
<Value>BILLABLE</Value>
</Property>

<!-- Similar configurations for other 8 reports can be found in the
Time_Tracker_Report.xml configuration file →

</Config>
```

**Note:** The “Time\_Tracker\_Report.xml” contains the complete configuration for the component (includes all **Queries** and configurations required for all the 9 different reports used by the Time Tracker application).

### **TLD configurations for tag:**

The TLD file for the taglib defined by this component is in the /conf directory. No modifications need to be made by a user of this component. This file is just mentioned as a reference.

The runtime taglib jar already contains the tld file, so for using the taglib, all you need to do is to include it in your web.xml:

```
<taglib>
  <taglib-uri>com.cronos.timetracker.report</taglib-uri>
  <taglib-location>/WEB-INF/lib/Time_Tracker_Report.jar</taglib-location>
</taglib>
```

### **3.3 Dependencies Configuration**

- The DBConnectionFactory component needs to be configured, for details on all possible configuration, review the CS document for DB Connection factory. A basic working configuration is already included in the Time\_Tracker\_Report.xml

## 4. Usage Notes

### 4.1 Required steps to test the component

The tests are run in a Servlet container using Apache cactus (<http://jakarta.apache.org/cactus/>). The cactus libraries needed for test are contained in the lib/-folder of the distribution.

The `build.xml` does all necessary steps to run the tests, it creates a cactified war file and starts a Tomcat 5 and runs the test and writes the test log to the `log/` directory. No manual steps beyond configuration of Tomcat home dir and database connection are needed to run the tests.

The following steps are needed to run the tests:

- Extract the component distribution.
- Configure the property `cactus.home.tomcat5x` in `build.xml` to point to a valid Tomcat 5.x installation home
- Configure the database connection to point to a database schema that containse the Time Tracker Report database tables (the Create scripts are also provided in the `docs/` directory):
  - a. The config file `test_files/demoWebapp/res/Time_Tracker_Report.xml` is the configuration file used by all unit tests and the demo.
  - b. In this file locate the namespace `com.cronos.timetracker.report.Informix` at the end of the file
  - c. Change the URL and username and password to reflect your local testing environment
- Execute `'ant test'` within the directory that the distribution was extracted to.

### 4.2 Required steps to use the component

1. The configuration file "Time\_Tracker\_Report.xml" is loaded by the "Configuration Manager" component. Please refer the "Configuration Manager" component for details to load the configuration file by the component. For an example on loading the configuration once on a central point of the web application refer to the demo web application.
2. The TLD definition mentioned in the file "time\_tracker\_report.tld" (also mentioned in section 3.2) is available to the JSP container at runtime. As the taglib jar file already contains the tld at the expected relative path inside the jar, the tld file does not need to be included in the using webapp, refer to 3.2 for an example on how to include the taglib in a web application.
3. The JSP page makes use of the "reportdisplay" tag defined in the TLD, by specifying the required attributes for the tag usage and also the optional attributes of the tag which might be required for the particular report.
4. The *Filter* values for a report (required filter values and also additional filter values (defined to be used in the tag) for a report) is required to be passed by the application calling the JSP page containing the tag as a part of the Http Request parameter or as an attribute in the Http Session.

### 4.3 Demo

A demo web application can be built using the `ant` target `demoWebapp`. The built war file is `build/dist/time_tracker_report.war`. This war file can be deployed into a JSP container and afterwards can be viewed using a web browser.

**Note:** as the database configuration is deployed into the war file, please adjust the database connection to reflect your local environment. See 4.1 for instructions on setting the database connection(The same config file is used by test and demo).

After the database connection has been configured, there are two additional convenience ant targets that can be called to have some demo data in the database, so that the reports actually contain data:

- `fillTestData` fill demo data into the database
- `clearDatabase` clears ALL data from the database

Both of the ant targets operate also on the database configuration that is used for test and demos.

The demo web application source is located at `test_files/demoWebapp`. The `web.xml` shows how to register the Time Tracker Report taglib for use in a web application. The `src/` subdir below the demo webapp root contains a Servlet class that serves as a placeholder for a central point in the web application,



at which the configuration file is loaded.

The `web/` subdirectory contains the JSP files to be available at the webapp root at runtime.

The following three demos and more are available in the demo web application:

**Note:** The sample code in this document just points out the most interesting points. Please refer to the source code located at `test_files/demoWebapp/web` for fully working versions of the demo code.

1. Employee Time Report with just the Employee Filter and Default Report Configuration:

This will demonstrate how Employee Time Report can be displayed on the JSP page. This example considers the display of the report with just the mandatory *Filter* for the report (Employee Filter).

Code for the Sample JSP Page for the Report: (Sample1.jsp)

```
<%@ taglib uri="com.cronos.timetracker.report" prefix="report" %>
<HTML>
<TITLE> Time Tracker Report </TITLE>
<BODY>
<!-- Render the Employee Time Report.
      The namespace specifies to use Default Configuration. -->
<report:reportdisplay
  namespace="com.cronos.timetracker.report.DefaultConfiguration"
  type="Report_Type"
  category="Report_Category"
  employeeFilter="Filter1"/>
</BODY>
</HTML>
```

**Note:** Please refer the "Time\_Tracker\_Report.xml" configuration file or section 3.2 of the document for details of the configuration of "com.cronos.timetracker.report.DefaultConfiguration" namespace.

Code for the an HTML page invoking the JSP Page (Sample1Form.html)for the Report:

```
<FORM ACTION="Sample1.jsp">
  Enter Employee Name:
  <INPUT TYPE="TEXT" NAME="Filter1" Value="ivern"/>
  <BR>
  <INPUT TYPE="HIDDEN" NAME="Report_Type" Value="EMPLOYEE"/>
  <INPUT TYPE="HIDDEN" NAME="Report_Category" Value="TIME"/>
  <INPUT TYPE="SUBMIT" NAME="Submit" Value="Submit"/>
</FORM>
```

**Note:** The colors have been specifically used to indicate that the value for the attributes (shown in color) in the "reportdisplay" tag should be passed by the application calling the JSP Page as parameters in the `HttpRequest` object or as attribute in the `HttpSession` object.

In the above example "type" of the report is the value of the "Report\_Type" parameter which is "EMPLOYEE".

Similarly the "category" of the report is the value of the "Report\_Category" parameter which is "TIME".

On similar lines the value for employee\_filter for the report is the value of the parameter "Filter1" which is "EmployeeName".

So the report that will be displayed is the EMPLOYEE TIME report with the mandatory filter for the report (employee\_filter) only with the value for the filter as "EmployeeName".

2. Employee Expense Report with Multiple Filters and Default Report Configuration:

This will demonstrate the how Employee Expense Report can be displayed on the JSP page. This example considers the display of the report with Multiple *Filters* for the report (Employee Filter, Date Filter and Billable Filter). **And shows how to use the companyFilter.**

Code for the Sample JSP Page for the Report: (Sample2.jsp)

```
<HTML>
<TITLE> Time Tracker Report </TITLE>
<BODY>
<!-- Render the Employee Expense Report.
      The namespace specifies to use Default Configuration. -->
<report:reportdisplay
  namespace="com.cronos.timetracker.report.DefaultConfiguration"
  type="Report_Type"
  category="Report_Category"
  employeeFilter="Filter1"
  startDateFilter="StartDate_Filter"
  endDateFilter="EndDate_Filter"
  companyFilter="companyFilter"
  billableFilter="Filter21"/>
</BODY>
</HTML>
```

Code for the an HTML page invoking the JSP Page (Sample2Form.html)for the Report:

```
<FORM ACTION="Sample2.jsp">
  Employee Name:
  <INPUT TYPE ="TEXT" NAME="Filter1"Value="ivern"/>
  <BR>
  Start Date:
  <INPUT TYPE ="TEXT" NAME="StartDate_Filter" Value="09-21-2004"/>
  <BR>
  End Date:
  <INPUT TYPE ="TEXT" NAME="EndDate_Filter" Value="01-01-2005"/>
  <BR>
  Billable:
  <INPUT TYPE ="TEXT" NAME="Filter21" Value="1"/>
  <BR>
  Company:
  <INPUT TYPE ="TEXT" NAME="companyFilter" Value="1,2"/>
  <BR>

  <INPUT TYPE="HIDDEN" NAME ="Report_Type" Value="EMPLOYEE"/>
  <INPUT TYPE="HIDDEN" NAME ="Report_Category" Value="EXPENSE"/>
  <INPUT TYPE="SUBMIT" NAME ="Submit" Value="Submit"/>
</FORM>
```

### 3. Project Time Report with just the Project Filter and Custom Configuration:

This will demonstrate the how Project Time Report can be displayed on the JSP page. This example considers the display of the report with just the mandatory *Filter* for the report (Project Filter).

#### Code for the Sample JSP Page for the Report: (Sample3.jsp)

```
<HTML>
<TITLE> Time Tracker Report </TITLE>
<BODY>
<!-- Render the Project Time Report.
      The namespace specifies to use Custom Configuration. -->
<report:reportdisplay
  namespace="com.cronos.timetracker.report.CustomConfiguration"
  type="Report_Type1"
  category="Report_Category1"
  projectFilter="Project_Filter"/>
</BODY>
</HTML>
```

#### Code for the an HTML page invoking the JSP Page (Sample3Form.html)for the Report:

```
<FORM ACTION="Sample3.jsp">
  Project Name:
  <INPUT TYPE = "TEXT" NAME="Project_Filter" Value="project1"/>
  <BR>
  <INPUT TYPE="HIDDEN" NAME ="Report_Type1" Value="PROJECT"/>
  <INPUT TYPE="HIDDEN" NAME ="Report_Category1" Value="TIME"/>
  <INPUT TYPE="SUBMIT" NAME ="Submit" Value="Submit"/>
</FORM>
```

#### 4. Client TimeExpense Report with Multiple Filters and Custom Configuration:

This will demonstrate the how Client TimeExpense Report can be displayed on the JSP page. This example considers the display of the report with Multiple *Filters* for the report (Client Filter and Billable Filter). And shows how to use the `sortColumn` attribute.

##### Code for the Sample JSP Page for the Report: (Sample4.jsp)

```
<HTML><BODY>
<FORM ACTION="Sample4.jsp">
  Client Name:
  <INPUT TYPE="TEXT" NAME="MyFilter1" Value="client1"/>
  <BR>
  The demo data contains entries of projects "client1" - "client4"
  <BR>
  Billable:
  <INPUT TYPE="TEXT" NAME="Billable" Value="1"/>
  <BR>
  The demo data contains entries of billable "0" or "1"
  <BR>
  <INPUT TYPE="HIDDEN" NAME="Type" Value="CLIENT"/>
  <INPUT TYPE="HIDDEN" NAME="Category" Value="TIMEEXPENSE"/>
  <INPUT TYPE="HIDDEN" NAME="sortColumns" Value="HOURS desc"/>
  <INPUT TYPE="SUBMIT" NAME="Submit" Value="Submit"/>
</FORM>
</BODY></HTML>
```

##### Code for the an HTML page invoking the JSP Page (Sample4Form.html)for the Report:

```
<%@ taglib uri="com.cronos.timetracker.report" prefix="report" %>
<%@ page import="com.topcoder.util.config.*"
import ="java.util.*"%>
<%
    try {
        ConfigManager cm = ConfigManager.getInstance();
        for (Iterator itor = cm.getAllNamespaces();
itor.hasNext();) {
            cm.removeNamespace((String) itor.next());
        }
        cm.add("Time_Tracker_Report.xml");
    } catch (ConfigManagerException e) {
        e.printStackTrace();
    }
%>
<HTML>
<TITLE> Time Tracker Report </TITLE>

<BODY>
<!-- Render the Client TimeExpense Report.
The namespace specifies to use Custom Configuration. -->
<report:reportdisplay
    namespace="com.cronos.timetracker.report.CustomConfiguration"
    type="Type"
    category="Category"
    clientFilter="MyFilter1"
    billableFilter="Billable"
    sortColumns="sortColumns" />
</BODY>
</HTML>
```

The Demos have shown how using the same JSP tag, the different types of reports can be generated and this flexibility is provided by the design.

An additional demo for creation of reports programmatically is provided as `ProgrammaticallyReportGenerationDemoTest`. Java in the unit tests source:

```
// create a reportFactory
    ReportFactory reportFactory = new ReportFactory();

    //get a report instance
    Report report = reportFactory.getReport("HTML", ReportCategory.EXPENSE);

    // define the filters
    final ArrayList filters = new ArrayList();
    final EqualityFilter equalityFilter = new EqualityFilter(Column.CLIENT,
FilterCategory.CLIENT);
    equalityFilter.addFilterValue("client1");
    filters.add(equalityFilter);

    // render the report
    String renderedResult = report.execute(DEFAULT_CONFIGURATION_NAMESPACE,
ReportType.CLIENT, filters,null);
```

## 5. Future Enhancements

- Tags can be added with additional attributes to support CSS configuration as a Runtime configuration.
- Additional formats for the reports can be supported.
- Additional filters and ColumnDecorators can be supported.