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# **Situation Services Development on the Intelligence S&T Integration Platform**

*Development Report Group B*

Daniel Bart, Daniel Walsh  
DMR Conseil

The scientific or technical validity of this Contract Report is entirely the responsibility of the Contractor and the contents do not necessarily have the approval or endorsement of the Department of National Defence of Canada.

**Defence Research and Development Canada – Valcartier**

Contract Report  
DRDC Valcartier CR 2011-262  
March 2011

**Canada**



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*Development Report Group B*

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## **Abstract**

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This document contains one section for each of the services or components developed for the Situational Facts Visualization. Each section contains the following content: a solution description to implement the service (or component), specification of the software component interface, bugs report related to the service (or component), software installation guide of the service (or component), and testing procedure and test results of the service (or component).

## **Résumé**

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Le document comprend une section pour chacun des services ou modules développés pour la visualisation de faits situationnels. Chacune des sections traite des points suivants : la description d'une solution permettant de mettre en place le service ou le module, les spécifications de l'interface du module logiciel, les rapports de bogue visant le service ou le module, le guide d'installation du service ou du module, et la procédure de mise à l'essai et les résultats des essais du service ou du module.

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***Situation Services Development on the Intelligence  
S&T Integration Platform***

**Development Report**

***Group B Deliverable 2***

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## **History**

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0.1	Initial Draft	Daniel Bart	January 31st, 2011
0.2	Final Version	Daniel Bart	March 30th, 2011
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## **NOTES**

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## Contents

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1. About this Document .....	1
2. Application framework.....	2
2.1 Solution description .....	2
2.1.1 Technology.....	2
2.1.2 Implemented Features .....	2
2.2 Bug report .....	4
2.3 Installation guide.....	5
2.3.1 Prerequisites .....	5
2.4 Testing procedure and test results .....	5
3. Situational Facts Visualization (SFV) .....	6
3.1 Solution description .....	6
3.1.1 SituationalFactsManagementGWT project .....	6
3.1.2 Services 7	
3.1.3 Widgets 7	
3.1.4 Data module .....	10
3.1.5 WAS Prototype / Workspace.....	10
3.2 Bug report .....	10
3.3 Installation guide.....	10
3.4 Testing procedure and test results .....	11

## **1. About this Document**

### **Purpose**

This document contains one section for each of the services or components developed for the SFV. Each section contains the following content.

- A solution description to implement the service (or component)
- Specification of the software component interface
- Bugs report related to the service (or component)
- Software installation guide of the service (or component)
- Testing procedure and test results of the service (or component)

## 2. Application framework

### 2.1 Solution description

#### 2.1.1 Technology

Following analysis of various technologies and open source libraries, Google Web Toolkit (GWT) has been selected to be the main technology. The reasons for that choice was:

- Large developers community
- Framework still evolving
- Open source libraries available to enhance features list
- Java-based development
- Allows to embed any technologies that could run in a web browser.
- Easier communication with back-end, using the same API and data objects.

In order to have better offer of base components, Smart GWT has been added to our solution. For map components, Open Layers for GWT has been retained for its easier integration and its documentation.

#### References:

- Google Web Toolkit (<http://code.google.com/webtoolkit/>)
- Smart GWT (<http://code.google.com/p/smartgwt/>)
- Open-Layers (<http://gwt-openlayers.sourceforge.net> , <http://openlayers.org>)

#### 2.1.2 Implemented Features

Here's a list of implemented features in Widgets Application Shell (WAS) project, with short description. For more technical information, refer to the JavaDoc of WAS project.

##### 2.1.2.1 Widgets Application Shell

The Widgets Application Shell (WAS) is a base application, developed with GWT whose primary purpose is to allow an easy creation of application using re-usable widgets. The application itself consists to one main class: WASEntryPoint. To create a new application, simply create a new GWT Application and create your EntryPoint class by extending the WASEntryPoint, as the WAS Prototype do. It also defines workspaces navigation through menus and tabs.

#### WASEntryPoint main features:

- Selection Manager
- Data Manager
- Ability to add workspaces

### 2.1.2.2 UI Context Manager

The class `UIContextManager` defines an event dispatcher that interacts with a `UIContext` (a key-value data structure, a `HashMap`), allowing to add, change and remove values using keys. It can also notifies event listeners when a value change occur. UI Context Manager is used by both Selection Manager and Data Manager.

### 2.1.2.3 Selection Manager

Using an instance of `UIContextManager`, the `SelectionManager` class defines an event dispatcher that manages selections. In the current framework, an instance of `SelectionManager` exists at the application level, and another exists in each workspace. These managers allows any objects, such as widgets, workspaces or windows, to interact using a specified channel, or key. The WAS prototype uses mainly the selection manager at the workspace level to communication selections (i.e.: facts containers, facts).

### 2.1.2.4 Data Manager

Using the same structure that the `SelectionManager`, the `DataManager` class defines an event dispatcher that manages data entries. In the current framework, an instance of `DataManager` exists at the application level, and another exists in each workspace. These managers allows any objects, such as widgets, workspaces or windows, to share data using a specified entry key. The WAS prototype uses mainly the data manager at the workspace level to share data loaded from server.

### 2.1.2.5 Data Cache

Data cache is a simple key-value data structure that allows to store and retrieve data objects using a unique key. `DataUtils` class has utility functions to creates easily data keys. The data cache must be used very carefully. Developers are responsible to decide when they clear the cache. Data cache has been used for the WAS Prototype to store Fact Definitions, loaded only one time, when loading facts containers in the SFM Service. When needed in the interface, a call is done to the singleton instance to retrieve them.

### 2.1.2.6 Workspaces

A workspace consists into a group of widgets that work together as a cohesive unit. A WAS application cannot live without at least one workspace. Two workspaces have been developed in the WAS prototype: Situational Facts and Spatial Features.

#### **Workspace main features:**

- Selection Manager
- Data Manager
- Ability to add widgets
- Ability to add menus, and menu items

### 2.1.2.7 Parameters Services

Parameters service in WAS is an equivalent to the parameters service in back-end. In fact, it uses the back-end version to load application parameters. URL used in the logout button is an example of usage done in the prototype. See the `ParametersService` interface and its implementation (`ParametersServiceImpl`) documentation for more information.

Application's web.xml file must contain the proper servlet definition.

```
<servlet>
  <servlet-name>parametersServiceImpl</servlet-name>
  <servlet-class>
    ca.gc.rddc.was.server.services.ParametersServiceImpl
  </servlet-class>
</servlet>
<servlet-mapping>
  <servlet-name>parametersServiceImpl</servlet-name>
  <url-pattern>/wasprototype/parametersService</url-pattern>
</servlet-mapping>
```

### 2.1.2.8 Base Widget

Base widget is a simple enhanced Smart GWT window that is linked to a workspace. All widgets of an application should extend it.

**Available features for widgets:**

- Ability to add custom buttons/controls in the widget's header
- Ability to position, size, minimize, maximize widget relative to workspace
- Direct access to application's Data Manager
- Direct access to application's Selection Manager
- Direct access to workspace's Data Manager
- Direct access to workspace's Selection Manager

### 2.1.2.9 Base Map Widget

BaseMapWidget is a base class that instantiate an open layers map visual control. BaseMapWidget delegates the control of map to a Strategy.

#### 2.1.2.9.1 Map Widget Strategy

IMapWidgetStrategy is the Strategy for all widgets based on an gwt-openlayers map. Its interface has behaviors and operations common to all Map widgets and it implements the Gang of Four's Strategy pattern. Its goal is to decouple the visual aspects of map widgets and the various general operations it needs support such as:

- widget initialization
- internal map creation
- etc.

This way, a map widget can be configured with different Strategies and implement specific behaviours. For further details on the GoF Strategy pattern, please visit: [http://en.wikipedia.org/wiki/Design\\_Patterns](http://en.wikipedia.org/wiki/Design_Patterns)

## 2.2 Bug report

There's no pending issue that was reported during the development. Every reported issues was fixed when they were reported.

## 2.3 Installation guide

To use WAS framework, you have to import WAS project in Eclipse and compile it using the ANT build.xml file located in the root folder of the project. Add the project, or the compiled .jar in your new application's project classpath.

### 2.3.1 Prerequisites

#### 2.3.1.1 Google Web Toolkit installation

See the "Get Started with the GWT SDK" for installation.

<http://code.google.com/webtoolkit/gettingstarted.html>

#### 2.3.1.2 Smart GWT installation

See installation guide at:

[http://code.google.com/p/smartgwt/wiki/Getting\\_Started](http://code.google.com/p/smartgwt/wiki/Getting_Started)

#### 2.3.1.3 Open Layers for GWT installation

To install Open Layers for GWT, download the library (a version is stored in SVN) from <http://gwt-openlayers.sourceforge.net> and add the .jar in your classpath.

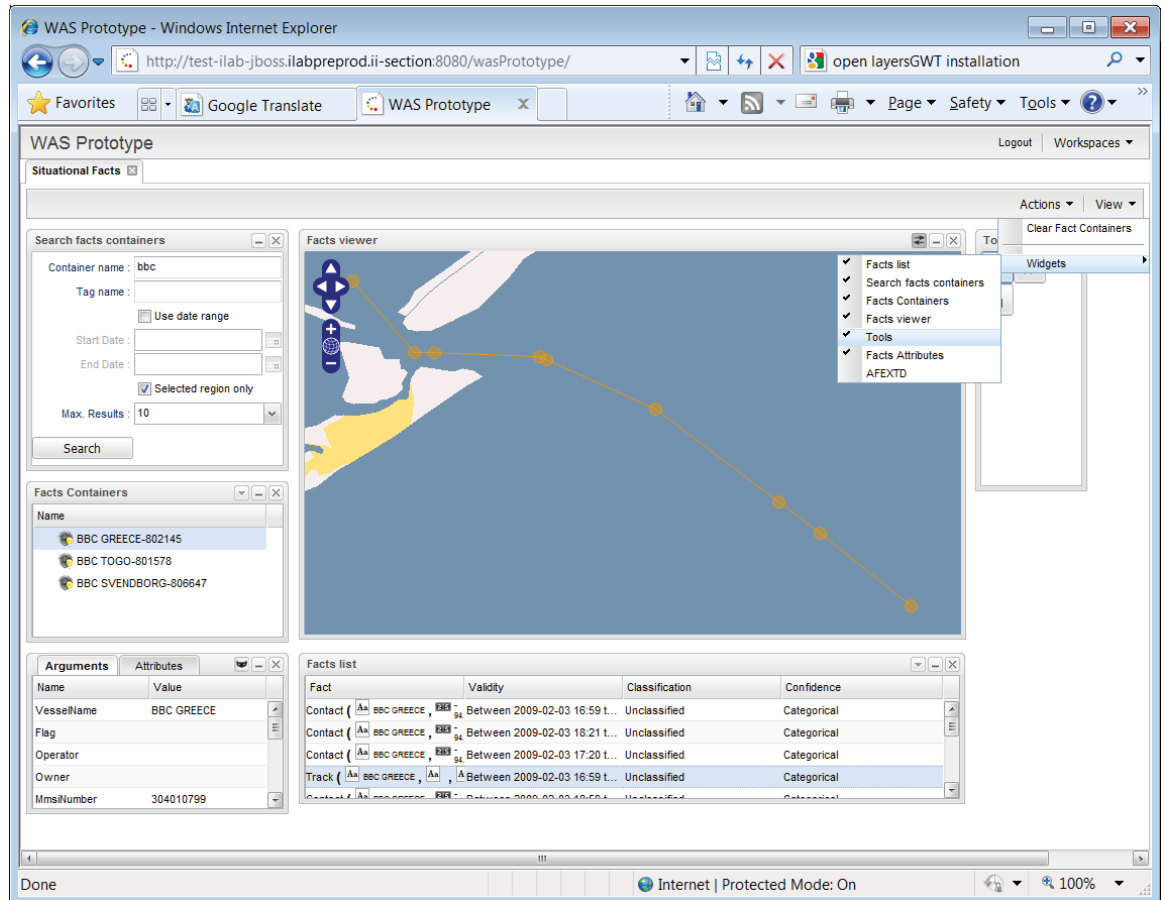
## 2.4 Testing procedure and test results

Framework features have been proved and tested through the parallel development of WAS prototype. Here's the list of tested features and how they are proved.

Data Manager	Data Manager is used to store the facts containers fetched by the search widget and also by the AFEXTD widget. Facts containers widget listen the data manager change event to list the current containers.
Selection Manager	Facts containers widget uses Selection Manager to notify its selection through the workspace. Facts list, and facts viewer (map) listen to the same selection name to synchronize their views with the selected containers.
Data Cache	In situational facts, Fact definitions are loaded by SFM service while loading fact containers. They're pushed to the data cache. In the attributes widget, or in fact renderer in the list, the fact definition is loaded from the cache using a unique key (composed with fact definition's class name and its ID).
Workspace	Situation Facts and Spatial Features have their own workspace.
Map Widget	In situational facts, and in spatial features.
Parameters Service	Logout button uses an URL defined in a configuration file on the server.
WAS Application / Entry point	WAS Prototype is a GWT Application that uses an extended WASEntryPoint as entry point.

### 3. Situational Facts Visualization (SFV)

#### 3.1 Solution description



#### 3.1.1 SituationalFactsManagementGWT project

Situational facts-related widgets and services have been developed in SituationalFactsManagementGWT project. To use these, applications must add the built .jar to their classpath or add a reference to the project itself. Application also have to add an inherit tag in the GWT application module.

```
<inherits name='ca.gc.rddc.was.sfm.SituationalFactsManagement' />
```

Application must also add the framework module and all data module required in the application.

```
<inherits name='ca.gc.rddc.was.Was' />
```

## 3.1.2 Services

### 3.1.2.1 SFM Service

SFMService and SFMServiceAsync interfaces and SFMServiceImpl define a GWT remote service that interacts with the SituationalFactsManagementAPI. It requires the deployment of Situational Facts Management service on the server.

Application's web.xml file must contain the proper servlet definition.

```
<servlet>
  <servlet-name>sfmServiceImpl</servlet-name>
  <servlet-class>
    ca.gc.rddc.was.sfm.server.SFMServiceImpl
  </servlet-class>
</servlet>
<servlet-mapping>
  <servlet-name>sfmServiceImpl</servlet-name>
  <url-pattern>/wasprototype/sfmService</url-pattern>
</servlet-mapping>
```

SFM Service is used in different widgets to load data such as Facts Containers, Facts, Facts Definitions, etc. See SFMService interface JavaDoc for all available methods.

## 3.1.3 Widgets

### 3.1.3.1 Facts Containers Search

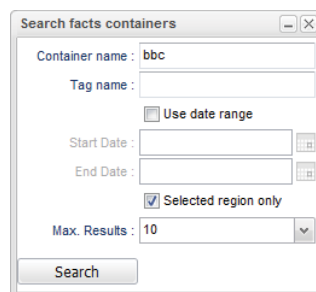
#### Description

Widget that allows to search for facts containers using filters on containers and facts.

#### Related Class

SearchFactContainersWidget

#### Screenshot





### 3.1.3.2 Facts Containers

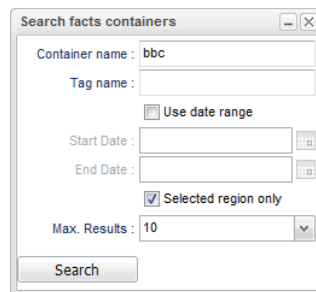
#### Description

Widget displaying Fact Containers located in the workspace's Data Manager at a specified entry name. In prototype, it interacts with the facts containers search and AFEXTD facts extraction. It also allows to create empty containers and sub containers and modify them thru a drop down menu in the widget's title bar.

#### Related Class

FactsContainerWidget

#### Screenshot



### 3.1.3.3 Facts List

#### Description

The facts list widget displays facts in a tabular way. It displays all facts of selected containers (using Selection Manager and a specified selection entry identifier) in 4 columns: Fact (fact attributes, using FactRenderer), Validity, Classification and Confidence. In the WAS Prototype, list listen for facts containers selection, interacting with FactsContainerWidget. It also push the selected facts to the selection manager. This widget allows to create a facts containers using selected facts thru the drop down menu, available in the title bar.

#### Related Classes

FactsListWidget  
FactsGrid  
FactRenderer  
ListGridFactRenderer  
FactsGridRecord  
FactUtils

#### Screenshot

Fact	Validity	Classification	Confidence
Contact ( [An] BBC GREECE, [R] -	94 Between 2009-02-03 16:59 t...	Unclassified	Categorical
Contact ( [An] BBC GREECE, [R] -	94 Between 2009-02-03 18:21 t...	Unclassified	Categorical
Contact ( [An] BBC GREECE, [R] -	94 Between 2009-02-03 17:20 t...	Unclassified	Categorical
Track ( [An] BBC GREECE, [An] ,	A Between 2009-02-03 16:59 t...	Unclassified	Categorical

### 3.1.3.4 Facts Viewer (Map)

#### Description

Facts Viewer Widget displays, in an open layer map, facts that have geographical information for selected facts containers. Actually, it displays all fact arguments that contains a geometry as a value. It listens to selection manager for current facts selection to enable auto-zoom to the selected facts (available in widget's title bar). Selecting a feature in the map will display the related fact into an overlay fact renderer. Another window is directly linked to the viewer: the tools. Currently, there are 3 different tools: Selection, Move and Region Selection/Zoom.

#### Related Classes

SituationalFactsMapWidget  
SituationalFactsMapWidgetFactory  
SituationalFactsMapStrategy  
FactRenderer

#### Screenshot



### 3.1.3.5 Fact's Attributes

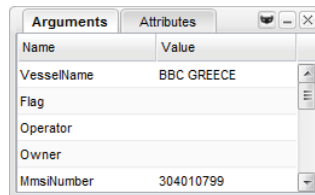
#### Description

Displays attributes and arguments for a specified fact. It can be synchronized with a fact selection or linked to a specified fact. Through a toggle button in the title bar, it's possible to show/hide attributes that have empty value. In WAS prototype, an instance of this widget is synchronized with fact selection done in facts list. It's also possible to open many instances linked to a specific fact by double-clicking a fact in the list.

#### Related Classes

FactArgumentRecord  
FactAttribute  
FactAttributeCategory  
FactAttributesWidget

#### Screenshot



### 3.1.4 Data module

The SituationalFactsManagementGWT project defines a data module to make the data objects of SituationFactsManagementAPI available in GWT applications. Thus, a Data.gwt.xml file has been created in the package ca.gc.rddc.istip.sfm to include sources of data objects. To make it working, the main module (SituationalFactsManagement.gwt.xml) has an inherits tag to include that data module:

```
<inherits name='ca.gc.rddc.istip.sfm.Data' />
```

### 3.1.5 WAS Prototype / Workspace

Situational facts visualization can be tested in the WAS Prototype within the Situational facts workspace (SFMPrototypeWorkspace) defined in the wasPrototype project. This workspace instantiate every widgets related to facts mentioned in this document.

## 3.2 Bug report

There's no pending issue that was reported during the development. Every reported issues was fixed when they were reported.

## 3.3 Installation guide

To build the WAS Prototype:

```
ant -f build.xml build.was.all  
ant -f build.xml build.was.sfm.all  
ant -f build.xml build.was.spftm.all  
ant -f build.xml build.wasprototype.all
```

To install WAS Prototype:

```
ant -f build-install.xml deploy.was.prototype.service
```

### **3.4 Testing procedure and test results**

Tests have been driven by human for the prototype. There were no automated tests developed for GUI. There's no pending issue.

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software architecture description; visualization; situational facts



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