Business Console

Developing Gadgets

Version 9.10

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WEBMETHODS

This document applies to webMethods Business Console 9.10 and to all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

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CONTENTS

1 Overview

Business Console gadgets are independent pluggable components that can be rendered using the Business Console gadget framework on a My webMethods Server instance. The Business Console gadget framework is a client-side JavaScript framework, which enables rendering of gadgets in Business Console by using each gadget's metadata information. Business Console gadgets enable you to customize dashboards in Business Console.

Business Console offers built-in gadgets for creating dashboards. However, you can create your own gadgets and use them in Business Console dashboards.

Currently, the use of gadgets is limited to Business Console. This document provides guidelines for creating gadgets for use in Business Console. You will learn to:

- Program gadgets
- Create the user interface for gadgets
- Configure gadgets
- Test gadgets

1.1 Pre-requisites

To use this guide effectively, you should have good knowledge of using:

- JavaScript, XML, HTML, and CSS
- RESTful Services
- AngularJS
- Portlet applications and web applications
- Composite Application Framework (CAF) in Software AG Designer
- New Business Console Gadget wizard in Designer
- webMethods Business Console

For information about creating portlet applications and web applications in Software AG Designer, see *webMethods CAF Development Help*.

For information about using gadgets in Business Console, see *Working with webMethods Business Console*.

1.2 Using JavaScript for Gadget Development

Use JavaScript to program each gadget to handle business logic in an application. You can use JavaScript to process the data received from the server (using the underlying JavaScript APIs), perform data manipulation, and update the UI of the gadget.

Gadgets can invoke RESTful services for:

- Retrieving data
- Updating the gadget's user interface after receiving data

- Firing events (limited to AngularJS gadgets only) and notifying any updates to other gadgets

1.3 Understanding AngularJS and non-AngularJS Gadget Development

AngularJS, a client-side web application framework supported by Google, enables you to create single page applications (SPA). AngularJS framework adapts and extends traditional HTML to present dynamic content through two-way data-binding that allows automatic synchronization of models and views.

AngularJS is built on a declarative programming model that places markers known as directives on the Document Object Model (DOM). DOM element manipulation is against the construct of AngularJS, but AngularJS allows DOM manipulation with the use of custom directives.

Non-AngularJS frameworks that support imperative programming model such as JQuery, allow remote selection of DOM elements, and manipulation of DOM elements. However, using element IDs for DOM selection and manipulation might not always be the best approach. For example, if a single gadget is embedded multiple times in a page, and if you use element IDs for DOM selection, only the first gadget in the DOM would be selected, and would ignore other gadgets. When a gadget is used multiple times in a single page, it helps to use AngularJS custom directives because the custom directives automatically pass the respective element references to the directives' link function.

You should consider the differences between AngularJS framework and non-AngularJS framework, and choose either a non-AngularJS (imperative) approach or AngularJS (declarative) approach for developing gadgets. If you decide to use JQuery or any other alternatives for DOM manipulation, use AngularJS directives for DOM elements.

We recommend that you use AngularJS for developing gadgets.

1.4 Using Model View Controller (MVC) in AngularJS

AngularJS uses the following Model View Controller (MVC) architecture for organizing applications.

- **Model** for managing data retrieved from a database or from a JSON file.
- **View** for displaying the model.
- **Controller** for programming the interactions between the Model and View.

Use the MVC architecture for developing the user interface of a gadget. MVC architecture helps in separating the gadget logic from gadget data and gadget view. For each gadget, create a:

- **Model** to manage the gadget data, and respond to requests from View and instructions from Controller.
- **View** to display the gadget data.
- **Controller** to control the interactions between Model and View, receive input, validate input, and perform operations to modify gadget data.

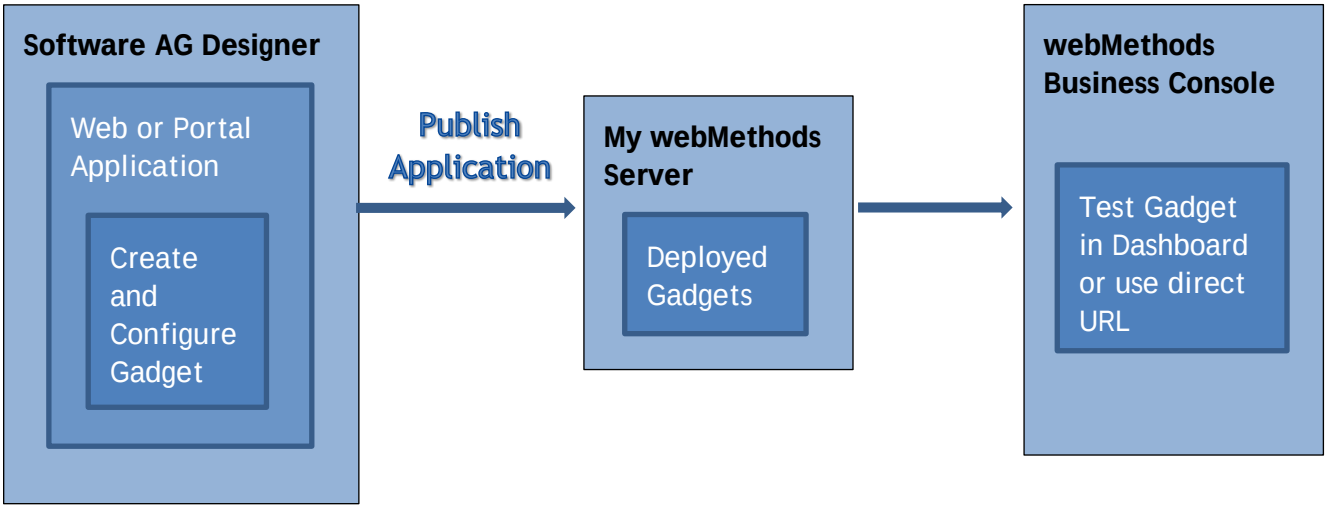
1.5 Organizing Gadget Files

Gadget information is organized in the following folders when you use the New Business Console Gadget wizard for creating a gadget in Designer. For information about the files in these folders, see *webMethods CAF Development Help*.

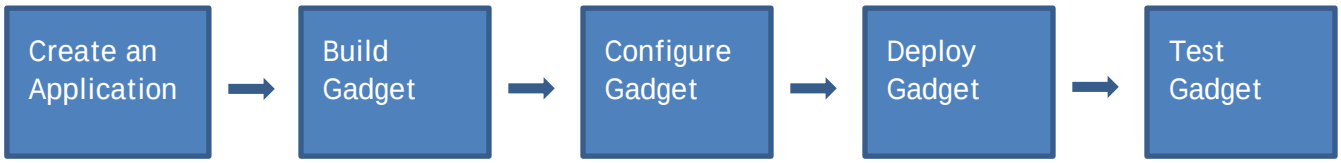
Folder	Contains...
Images	Image files to be used by the gadget.
Scripts	JavaScript files for programming the gadget.
Views	HTML or XHTML files for defining the user interface of the gadget.
Styles	CSS files for defining the styles for the gadget.

1.6 Understanding Business Console Gadget Development

The diagram below shows the Software AG products required for developing and testing gadgets.



Steps you need to perform for creating, deploying, and testing gadgets:



Step	Action	See...
1	Create a portlet or web application in the UI Development perspective in Software AG Designer.	Create an Application
2	Create gadgets in the application project.	Generate a Gadget
3	Define the user interface and business logic for the gadgets	Update the User Interface of a Gadget (view.xhtml) For more information see, Creating User Interface for Gadgets
	Add functions to the gadget controller	Add Functions to a Gadget Controller (controller.js) For more information see, Programming Gadgets and Improving Gadget Perfor-

Step	Action	See...
		mance
4	Publish the application to deploy the gadgets to My webMethods Server.	Deploy Gadgets to My webMethods Server
5	View gadgets either by using the gadgets in a Business Console dashboard or by using gadget's direct URL.	Add/View Gadgets Testing Gadgets

1.6.1 Create an Application

The first step in creating gadgets for Business Console is to create a portlet application or a web application for the gadgets to reside.

Use Composite Application Framework (CAF) in Software AG Designer to create a portlet or web application project.

To create a web or portal application project in Designer

1. In the UI Development perspective, select one of the following options depending on whether you want to create a web application or portlet application:
   - File > New > Web Application Project
   - File > New > Portlet Application Project
2. In the application wizard, provide the project name, and click Finish. This will create an application project under which you can create multiple gadgets for Business Console.

For more information about creating a portlet or web application project by using Composite Application Framework (CAF) in Software Designer, see *webMethods CAF Development Help*.

1.6.2 Generate a Gadget

To create a new gadget in an application project

1. Select the UI Development perspective in Designer.
2. Select the web or portlet application project where you want to create the new gadget.
3. In Solutions view, expand User Interfaces, right-click on the project where you want to create a new gadget, and select **New Business Console Gadget**.

   The New Business Console Gadget wizard starts.
4. In the New Business Console Gadget wizard, provide the following specification for the new gadget. The New Business Console Gadget wizard creates the configuration files and definition file for the new gadget.

Field	Description
Gadget Type	Specify **AngularJS** for AngularJS based gadgets or **Default with empty stubs** for non AngularJS gadgets.
Gadget Root Directory	(Optional) Specify a name for the folder in which the new gadget should be stored under project's WebContent node. If you do not

Field	Description
	specify a folder name,the new gadget will be stored directly under project's WebContent node.
Gadget Name	Specify a name to identify the new gadget.
Gadget Title	Specify the title to be displayed on the gadget.
Preview Image	Browse and select an icon in .png or .jpg format for the gadget. The image size should not be more than 50KB, and the recommended size for the image is 70 X 70.
Settings Title	Specify a name for the gadget settings dialog.
Description	Provide a description for the new gadget.
Gadget Group Name	Specify • **Use project name** if you want to use the project name as the gadget group name. • **Use custom name** if you want to enter the name for the gadget group in the input field. The group name provided here will be used to categorize gadgets in the Add New Gadget dialog in Business Console.

1.6.3 Update the User Interface of a Gadget (view.xhtml)

A new gadget will reside under a portlet application or web application project. If you have specified the root directory during gadget creation, the gadget would be in the root directory.

To update the user interface of a gadget

1. Navigate to *Portlet/Web Application Project* > *Gadget_root_directory* > *Gadget_name* > views.
2. Double-click **view.xhtml** and edit the file.
3. Provide the HTML code in view.xhtml to define the UI of the gadget.

1.6.4 Add Functions to a Gadget Controller (controller.js)

After you define the UI for the gadget, add the business logic for the AngularJS based gadgets in the controller.js file.

To define the business logic for an AngularJS based gadget

1. Navigate to *Portlet/Web Application Project* > *Gadget_root_directory* > *Gadget_name* > scripts.
2. Open controller.js for edit and specify the client-side business logic for the gadget.

Code Block	Description
URLS	This section is for specifying a JavaScript array of RESTful service URLs for the gadget. You must provide relative URLs. Server de-

Code Block	Description
	tails can be provided at runtime.
init	Constructor block which initializes the core services with the $scope object, including config (gadget configuration object), restClient (AngularJS based service to invoke the RESTful services), eventBus (AngularJS based object to pass events to the listening controllers and also receive events fired from other controllers), and URLS (the URL object mentioned in the URL section)
defineScope	This section allows you to define the JavaScript functions to be added to AngularJS $scope object. These functions can be invoked from any place where there is access to the controller's $scope object, even from view.xhtml by using appropriate AngularJS directives such as **data-ng-click.**
defineListeners	This section is for attaching the listeners to the AngularJS eventBus object.
_handleEvents	This section is for the event handling functions for every event handler.
destroy	This section gets invoked on controller unload. Use this to clean up any used object including event registration.

1.6.5 Deploy Gadgets to My webMethods Server

After the gadgets are developed, deploy the portlet application or web application to MWS.

When you deploy a portlet application or web application, the gadgets in the application project are deployed to My webMethods Server, and the deployed gadgets are registered in Business Console.

To manually deploy the gadgets from a portlet or web application to My webMethods Server

1. Package the web application as a .war file.
2. Copy the .war file to this directory:

   Software AG_directory\MWS\server*server_name*\deploy

1.6.6 Add/View Gadgets

You can view a gadget by either using the direct URL of the gadget, or by using the gadget in a Business Console dashboard.

Note: You must be logged into Business Console to view a gadget.

To view a gadget using direct URL

1. Login in to Business Console.
2. Open another browser window.

3. Specify the URL of the gadget in the following format:

   http://*Host*:*Port*/wmbcgadgets#/Application Name/*Gadget_name*

   For example, URL for the charts gadget is http://localhost:8585/wmbcgadgets#/bc/taskcharts

4. View and test the gadget.

To view a gadget in Business Console

1. Login in to Business Console.
2. Create a dashboard. For more information, See the *Working with webMethods Business Console* guide.
3. Add the gadget to the dashboard.
4. Configure the gadget settings.
5. Check the view and behavior of the gadget in the dashboard.

   If you make any further changes to a gadget, publish the updated gadgets to MWS, and refresh the dashboard to view the gadget changes.

2 Getting Started

The samples in this section will help you quickly learn and develop gadgets. You will learn to first create a simple gadget, and then to add more features and create complex gadgets.

2.1 Creating Your First Hello World! Gadget

This section describes how to create and test your first **Hello World** gadget.

1. Create "MyPortletAppProject" application project.
2. Create HelloWorld gadget.
3. Create a view for HelloWorld gadget.
4. Publish **MyPortletAppProject** application and deploy HelloWorld gadget.
5. Test HelloWorld gadget.

2.1.1 Create MyPortletAppProject Application

The first step in creating gadgets for Business Console is to create a portlet application or a web application for the gadgets to reside.

To create MyPortletAppProject portal application project in Software AG Designer

1. In the UI Development perspective, select File > New > Portlet Application Project.
2. In the application wizard, provide the project name as **MyPortletAppProject**, and click Finish. This will create **MyPortletAppProject** application project under which you can create multiple gadgets for Business Console.

For more information about creating a portlet or web application project by using Composite Application Framework (CAF) in Software Designer, see *webMethods CAF Development Help*.

2.1.2 Create HelloWorld Gadget

To create a new gadget in an application project

1. Select the UI Development perspective in Designer.
2. In Solutions view, expand User Interfaces, right-click on **MyPortletAppProject** project where you want to create a new gadget, and select **New Business Console Gadget**.

   The New Business Console Gadget wizard starts.
3. In the New Business Console Gadget wizard, provide the following specification for the new gadget. The New Business Console Gadget wizard creates the configuration files and definition file for the new gadget.

Field	Specify
Gadget Type	**AngularJS**
Gadget Root Directory	gadgets

Field	Specify
	The gadgets directory will be created directly under **MyPortletAppProject** project, and will hold the gadget files.
Gadget Name	HelloWorld
Gadget Title	Hello World!
Description	My First Gadget!
Gadget Group Name	MyGadgets

4. Click **Next.**
5. Click **Finish**.

   You have just created your first gadget!

2.1.3 Create a View for HelloWorld Gadget

To create a view for the HelloWorld gadget

1. Select the UI Development perspective in Designer.
2. In Solutions view, expand User Interfaces, right-click on **MyPortletAppProject** project.
3. Open the view.xhtml file located under /**MyPortletAppProject**/gadgets/HelloWord/views.
4. The view.xhtml file of the new HelloWorld gadget will contain only the basic HTML header as shown below.

```
<html>
<h3> HelloWorld Gadget</h3>
</html>
```

5. Add content to the view as shown below.

```
<html>
<h3> HelloWorld Gadget</h3>
    <div>
        Hello World!
    </div>
</html>
```

6. To style the text in the gadget, add a class as shown below.

```
<html>
<h3> HelloWorld Gadget</h3>
    <div class="hello-world">
        Hello World!
    </div>
</html>
```

7. To add styling to the css file
   a. Expand the 'styles' directory.
   b. Double click on gadget.css.
   c. Add the following to gadget.css.

```
.hello-world{
```

```
    font-weight:bold;
    color:#ff0000;}
```

2.1.4 Deploy HelloWorld Gadget

Publish the MyPortletAppProject application in Designer to My webMethods Server.

When you publish a portlet application or web application, the gadgets in the application project are deployed to My webMethods Server, and the deployed gadgets are registered in Business Console.

To manually deploy the gadgets from an application to My webMethods Server

1. Package the web application as a .war file.
2. Copy the .war file to this directory:

   Software AG_directory\MWS\server\server_name\deploy

2.1.5 Test HelloWorld Gadget

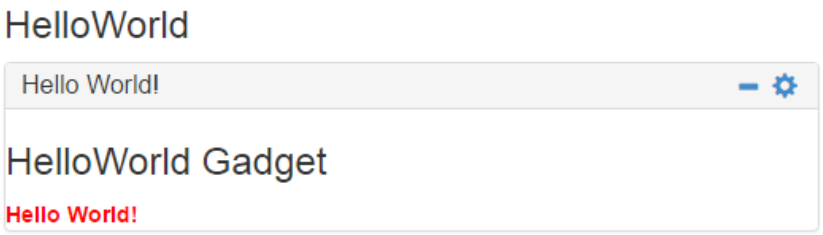
Test the HelloWorld gadget using the following URL format:

```
http://<HOST>:<PORT>/wmbcgadgets#/<PROJECT_NAME>/<GADGET_NAME>
```

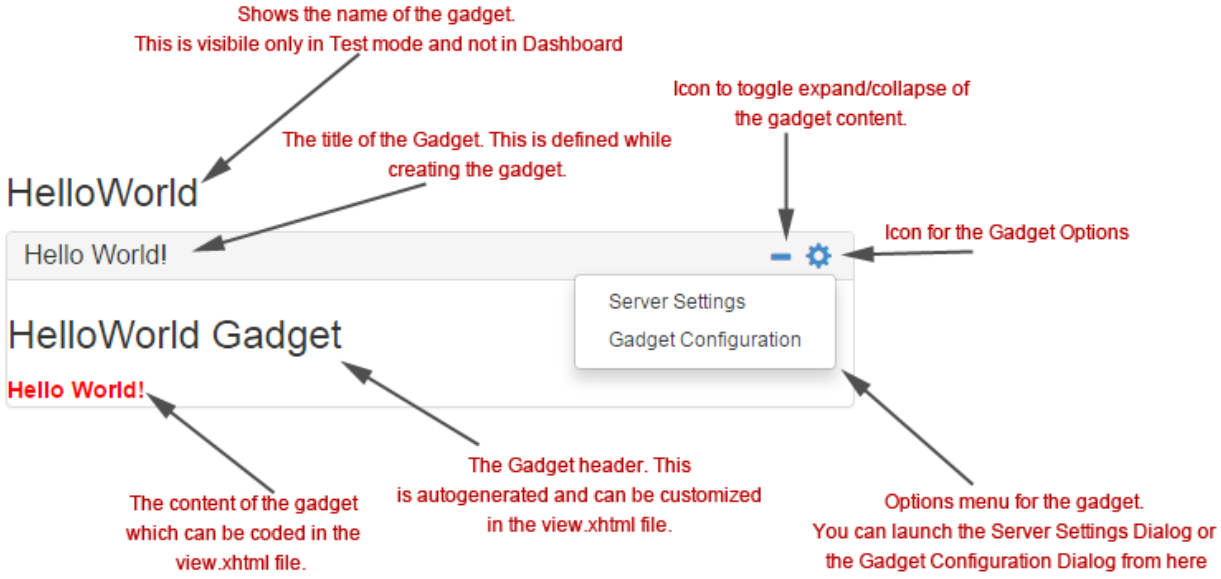
Type the following URL in your browser by replacing <HOST> with the host name of My webMethods Server.

```
http://<HOST>:8585/wmbcgadgets#/MyPortletAppProject/HelloWorld.
```

HelloWorld gadget displays as shown below.



The diagram below shows the structure of the gadget.



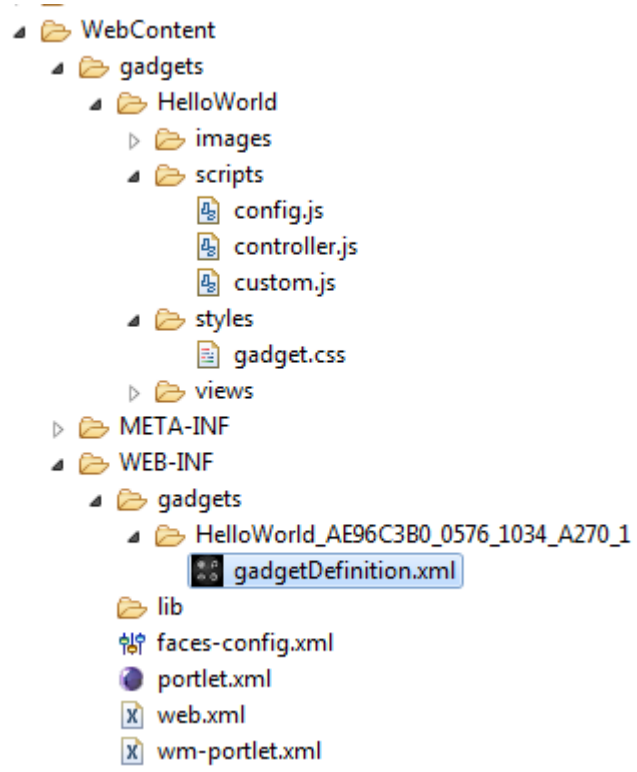
2.2 Using RESTful Services with Gadgets

You can enhance the HelloWorld gadget to display data from My webMethods Server. To do this, you would need to make a REST call to your MWS Server. Use an existing RESTful API (<HOST>:<PORT>/rest) that shows MWS node information, and display that information in the gadget.

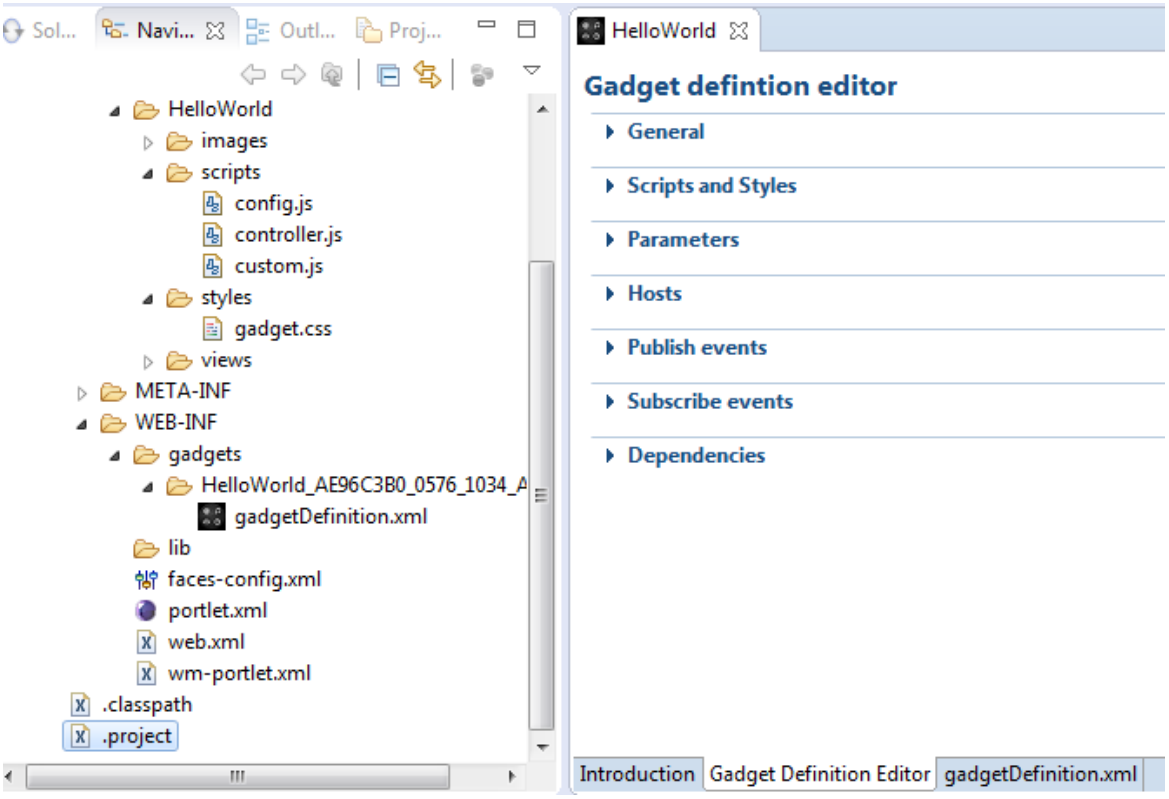
1. Define the server
2. Write the business logic
3. Add the UI code to XHTML
4. Deploy and test the gadget

2.2.1 Define the Server

1. Define the My webMethods Server from where the data must be fetched. If you have already defined the My webMethods Server during gadget creation, skip this step.
   a. Open the gadget-deninition.xml located under /WEB-INF/gadget/Hello_World<ID> (for example, ID is HelloWorld_AE96C3B0_0576_1034_A270_1)



b. On the right pane, click **Gadget Defintion Editor**.



c. Expand the Hosts section, and click **Add**.

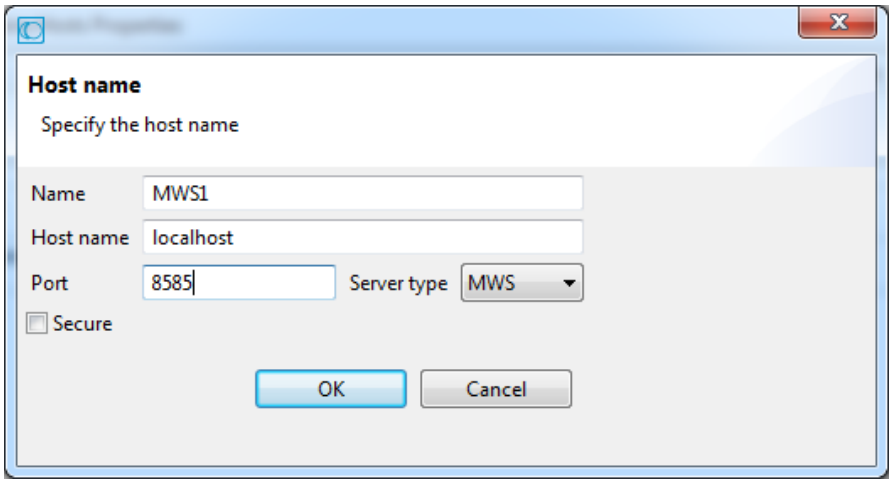
d. Enter the following:

Name: MWS1

Host Name: localhost (or appropriate HOST name)

Port : 8585 (or appropriate port)

Server Type: MWS



e. Click **OK**.

f. Click on the Save icon on the top (or press Ctrl+S).

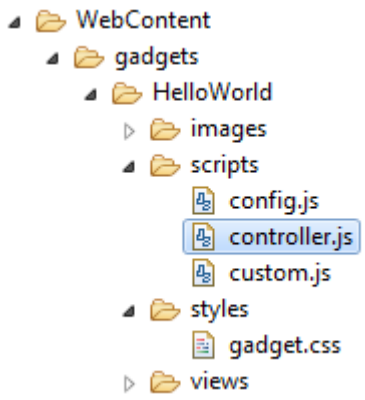
g. Verify that the server is successfully added by checking the config.js (located under /MyPortletAppProject/WebContent/gadgets/Hello_World/script). You will find an auto-generated structure like this which shows the server details.

```
"config": {
    "params": {
        "servers": {
            "MWS1": {
                "serverType": "MWS",
                "host": "localhost",
                "port": "8585",
                "protocol": "http"
            }
        },
    },
    "title": ""
}
```

2.2.2 Write the Business Logic to Invoke RESTful Service

To write the business logic to invoke the RESTful API

1. Open the contoller.js located under /gadgets/HelloWorld/scripts in the editor.



2. Decide when the RESTful service should be invoked. To invoke the RESTful service on gadget load, the call should be made through the 'init' block. By default, some RESTful API invocation stubs are auto-generated when a gadget is created.You can enhance the generated stub or create your own.
3. For example, to invoke the RESTful service on gadget load, add the folllowing code in the 'init' section of the gadget's controller.js file.

```
init : function($scope, restClient,eventBus,log,config) {
       try{
         .....
            this.$scope.restInvocationCORS(config); //ADD THIS BLOCK IN YOUR INIT
         ....
}
```

4. Replace the 'restInvocationCORS' function autogenerated under the 'defineScope' block with the following code.

```
this.$scope.restInvocationCORS = function(gadgetConfig) {
    var $scope = this;
    var selectedAlias = "MWS1";
    $scope.Math=window.Math;  // Enable the Javascript Math function
    $scope.restClient.url("/rest")  //Provide the server alias to connect to
        .serverAlias(selectedAlias)
        .remote(true)
        .cors(true)
        .scope($scope)
        .gadgetConfig(gadgetConfig)
        .success(function(response, $scope) {
            $scope.restData = response;   // The RESPONSE will be captured in a
variable called restData
        }).error(function(response, $scope, status, headers, config) {
            $scope.eventBus.fireEvent(NotificationConstants.ERROR, "Unable to
invoke REST " +
                gadgetConfig.params.servers[selectedAlias].host + ":" +
                gadgetConfig.params.servers[selectedAlias].port + "/rest for
gadget MWS Remote");
        }).invoke();
}
```

Notice that the server response is captured in a variable called 'restData'. This object is then assigned to the AngularJS $scope object. Assigning it to the $scope object will make the object available for UI rendering.

A sample response for the RESTful API (localhost:8585/rest), is of the following structure:

```
{
    "host": "<HOST>",
    "nodeName": "<HOST>-node<NUMBER>",
    "httpPort": "8585",
    "httpsPort": "0",
    "frontEndUrl": "http://<HOST>:<PORT>",
    "clusterRoles": "[notification, search, taskengine, autodeploy]",
    "uptime": "17461.0",
    "freeMemory": "741135632",
    "maxMemory": "954728448"
}
```

2.2.3 Add the UI Code to XHTML

To display information in a table

1. Use HTML table tag to create a table.
2. Add the HTML below to the gadget‘s view.xhtml file.

```
<table class="table table-bordered">
    <thead>
        <tr>
            <th>Host</th>
            <th>Port</th>
            <th>Uptime (sec)</th>
            <th>Free/Max Memory(MB)</th>
        </tr>
    </thead>
    <tr>

        <td>{{restData.host}}</td>
        <td>{{restData.httpPort}}</td>
        <td>{{restData.uptime}}</td>

<td>{{Math.round(restData.freeMemory/1000000)}}/{{Math.round(restData.maxMemory/100
0000)}}</td>
    </tr>
</table>
```

'table', 'table-bordered' from bootstrap enhances the look and feel of the table. You can add more styles to the gadget.css if required.

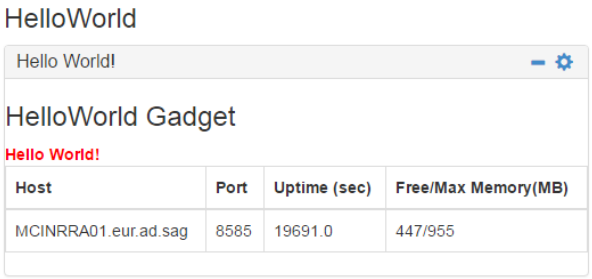
The 'restData' object that was associated with $scope object is directly accessible in the UI. If rest-Data is an Array, you can iterate restData by using an 'data-ng-repeat' tag of AngularJS to populate multiple rows of the table.

2.2.4 Deploy and Test the Gadget

1. Publish the application to deploy the enhanced gadget
2. Test the HelloWorld gadget using the following URL format:

   http://<HOST>:<PORT>/wmbcgadgets#/<PROJECT_NAME>/<GADGET_NAME>.

The enhanced gadget renders as shown below.



2.3 Invoking POST Calls

To understand how to make POST calls, let's use the Task Engine RESTful service for MWS to create a task instance of a task type from a gadget. The examples below describe how to accept a task type ID in the gadget, pass the task type ID as POST request, and display the task instance in the gadget.

2.3.1 Add a POST Call in Controller

1. Create a "Hello World Task" task type for the task application, and note the taskType ID.
2. In the defineScope block in controller, add the code in the try block as shown below.

```
    defineScope: function(){
           var _this=this;
           ....
          _this.$scope.tasks= new Array();
// TAKING AN ARRAY OF TASK INSTANCES. THIS WILL BE DOUBLE BINDED TO THE UI
           _this.$scope.createTaskInstance=function(){
//FUNCTION TO INVOKE FROM THE UI
               var selectedAlias = "MWS1";
//SELECTED MWS SERVER ALIAS
               var $scope=_this.$scope;
               var requestData = {
//POST CALL REQUEST DATA
                   "taskTypeID":_this.$scope.config.params.taskTypeId,
// REPLACE THIS WITH THE TASK TYPE ID
                   "taskInfo":{
                   "name":"hello world1"
//YOU CAN GIVE ANY NAME TO THE TASK INSTANCE CREATED
                   }
                };

           _this.$scope.restClient.url("/rest/pub/opentask")
//Provide the server alias to connect to
                    .serverAlias(selectedAlias)
                    .method("POST")
//HTTP METHOD TO BE INVOKED
                    .requestData(requestData)
                    .remote(true)
                    .cors(true)
                    .scope($scope)
                    .gadgetConfig($scope.config)
```

```
                    .success(function(response, $scope) {
                        $scope.tasks.push(response.taskID);
                    }).error(function(response, $scope, status, headers, config)
{
                        $scope.eventBus.fireEvent(NotificationConstants.ERROR,
"Unable to invoke REST " +
                            gadgetConfig.params.servers[selectedAlias].host + ":"
+
                            gadgetConfig.params.servers[selectedAlias].port +
"/rest for gadget MWS Remote");
                    }).invoke();
            }
}
```

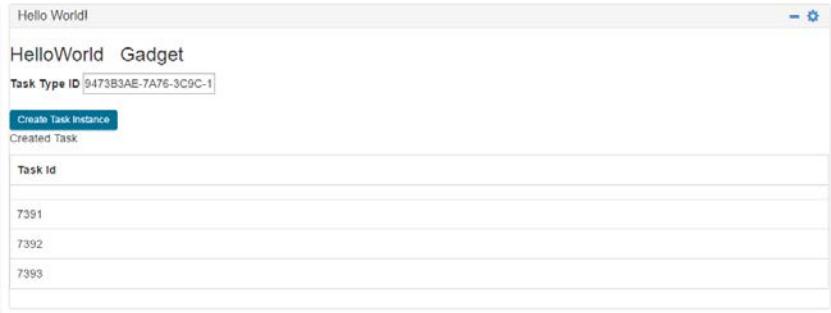
2.3.2 Define the UI

1. Open the view.xhtml file and add the following code.

```
<html>
<h3> HelloWorld Gadget</h3>
<label>Task Type ID</label>
<input type="text" ng-model="config.params.taskTypeId"></input><br/><br/>
<input class="btn bc-button" type = "button" ng-click="createTaskInstance()"
value="Create Task Instance"></input>
<p>Created Task</p>
<table class="table table-bordered table-responsive" width="100px">
    <thead>
        <tr>
            <th>Task Id</th>
        </tr>
    </thead>
    <tr ng-repeat="taskId in tasks">
        <td>{{taskId}}</td>
    </tr>
</table>
</html>
```

2. Deploy the gadget.
3. Access the gadget using the direct URL for the gadget.
4. Specify the task type ID.
5. Click **Create Task Instance** on the gadget.

   Task instance of the specified task type will be created, and the gadget lists the task IDs of the task instances in the table as shown below.



2.4 Using Forms with Gadgets

In this section, let's try to create a gadget with HTML forms and submit the form data. We will use the same gadget to put the form.

Since we are building a form, we have to add the form parameters to the gadget.

2.4.1 Build the Gadget

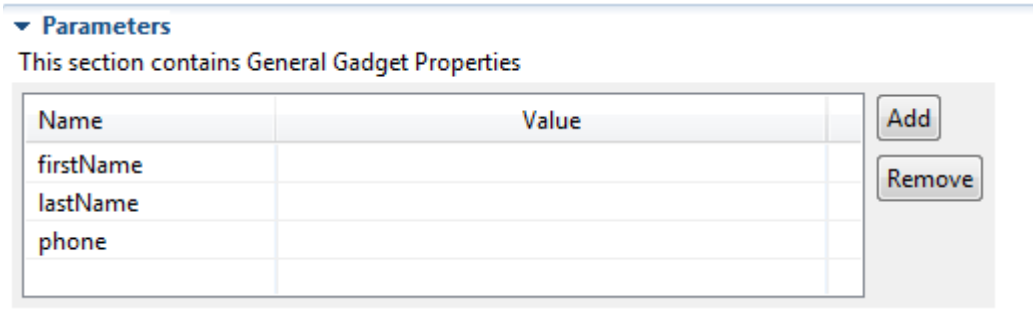
1. Navigate to /WebContent/WEB-INF/gadgets/HelloWorld_<ID>/gadgetDefinition.xml.
2. Select the "Gadget Definition Editor" tab and expand "Parameters".
3. Click Add.
4. Enter the following parameters

   name: firstName, value: <empty>

   name: lastName, value: <empty>

   name: phone, value: <empty>
5. Save the editor (Click Ctrl+S).

   The added parameters are displayed as shown below.



2.4.2 Add HTML UI Code to Show Form

1. Navigate to view.xhtml of the gadget.
2. Add the following under the HTML tag.

```
<html>
<body>
<h3>HelloWorld Gadget</h3>
...
<div class="container-full">
<form role="form" name="myForm">
    <div class="form-group row">
        <label for="firstName" class="col-md-4">First Name:</label>
        <input type="text" class="col-md-8 remove-paddings" name="firstName"
id="firstName" data-ng-model="config.params.firstName"></input>
    </div>
    <div class="form-group row">
```

```
        <label for="lastName" class="col-md-4">Last Name:</label>
        <input type="text" class="col-md-8 remove-paddings" name="lastName"
id="lastName" data-ng-model="config.params.lastName"></input>
    </div>
    <div class="form-group row">
        <label for="phone" class="col-md-4">Phone:</label>
        <input type="text" class="col-md-8 remove-paddings" name="phone"
id="phone" data-ng-model="config.params.phone"></input>
    </div>
    <input class="btn bc-button row" type="button" value="Submit Form"
onclick="submitForm()"></input>
</form>
</div>

...
</body>
</html>
```

2.4.3 Add JavaScript Code to Submit Form

To add the JavaScript logic to first get the form values and then to construct the URL to submit form, create a <head> tag under <html> tag, and add the code block given below.

```
<head>
<script>
    function submitForm(){
        var firstName= document.getElementById("firstName").value;
        var lastName= document.getElementById("lastName").value;
        var phone= document.getElementById("phone").value;


        var href ="";
        if(window.location.href.indexOf("?")>0){
            href = window.location.href.substring(0,
            window.location.href.indexOf("?"));
        }else{
            href=  window.location.href;
        }


        var actionUrl = href+"?firstName="+firstName;
        actionUrl =actionUrl+"&amp;lastName="+lastName;
        actionUrl +="&amp;phone="+phone;

        window.location.href=actionUrl;
        window.location.reload();

    }
</script>
</head>
```

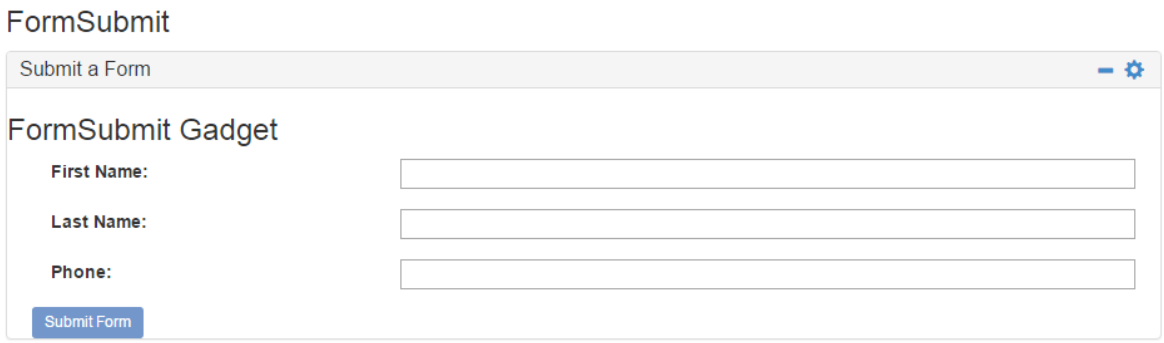
2.4.4 Deploy and Test Gadget

1. Publish the application to deploy the updated gadget.

2. Use the direct URL to test the gadget:

```
http://<HOST>:<PORT>/wmbcgadgets#/MyPortletAppProject/HelloWorld)
```

Gadget displays as shown below.



2.4.5 Display FORM Values in another Gadget

Let's create a new gadget called FormDisplay to display the values submitted through a form in the HelloWorld gadget. The FormDisplay gadget can consume data passed through the URL parameters.

1. Create a FormDisplay gadget with the following options.

   Gadget Name: FormDisplay

   Gadget Title: Form Display

   Click Next and then click Finish.

2. Edit the gadget-defintion.xml to add the parameters in the same way as you did for the HelloWorld gadget earlier.
3. Add the parameters below.

   name: firstName, value: <empty>

   name: lastName, value: <empty>

   name: phone, value: <empty>

4. Change the view.xhml of the FormDisplay gadget to include the following code.

```
<form role="form">
    <div class="form-group">
        <label for="firstName">First Name:</label>
        <label>{{config.params.firstName}}</label>
    </div>
    <div class="form-group">
        <label for="lastName">Last Name:</label>
        <label>{{config.params.lastName}}</label>
    </div>
    <div class="form-group">
        <label for="lname">Phone:</label>
        <label>{{config.params.phone}}</label>
    </div>
</form>
```

5. Deploy the gadgets.
6. To test the gadgets, login in to Business Console using URL:

```
http://<HOST>:<PORT>/business.console
```

7. Click on Dashboards->Plus Icon.
8. Create a dashboard and add these two gadgets side by side.
9. Click **Submit Form** on the HelloWorld gadget.

   HelloWorld gadget passes the form values to the FormDisplay Gadget " through the URL.

2.5 Communicating Between Two Gadgets

Communication between gadgets is possible by using a custom JavaScript service called EventBus provided by the gadget framework. Each gadget can act as an event subscriber or publisher or both. This section provides basic information for using the EventBus service.

To make a gadget trigger events, you can use the fireEvent method of EventBus. The first argument is the Event Name, the second argument is the payload or the data to be passed, and the third argument is an optional context.

```
this.eventBus.fireEvent("SOME_EVENT_NAME", "Some Event!");
```

To make a gadget receive events, you need to define the listener in the 'defineListener' block in the controller of the subscribing gadget and then put the handling logic in the '_handleEvents' block.

```
this.eventBus.addEventListener("SOME_EVENT_NAME",this._handleEvents.bind(this));
_handleEvents:function(eventType,payload,context){
            /* Logic to handle events
             */
             switch(eventType){
             case "SOME_EVENT_NAME":
                    /* Add Event Handling Logic for GLOBAL_EVENT */
                    this.$scope.exampleHandleEventAction(payload); //ONCE EVENT
IS RECEIVED , INVOKE THE exampleHandleEventAction function on $scope.
                    break;
             }
      },
```

2.5.1 Implement Communication between Gadgets

Let's create a new HelloWorld2 gadget to trigger events, and pass information from HelloWorld2 gadget to the HelloWorld gadget.

1. Create HelloWorld2 gadget and provide the following to the new gadget.

   Gadget Name: HelloWorld2

   Gadget Title: Hello World 2

2. Open the view.xhtml file of HelloWorld2, and add the following code.

```
<input type="button" value="Click to Publish Data" ng-
click="publishData()"></input>
```

3. Open the controller.js file of HelloWorld2, and add the following code under the defineScope block.

```
defineScope : function() {
    var _this=this;
    this.$scope.publishData= function(){
       _this.eventBus.fireEvent("PUBLISH_DATA", "Hello using Event");
    }
  }
```

4. Open the view.xhtml file of HelloWorld, and add the following code anywhere.

```
<h3>HelloWorld Gadget</h3>
<div class="hello-world">Hello World!</div>
{{data}}
```

5. Open the controller.js file of HelloWorld, and add the following under defineListeners block.

```
defineListeners:function(){
             this._super();

this.eventBus.addEventListener("PUBLISH_DATA",this._handleEvents.bind(this));
}
```

6. In the same controller.js file of HelloWorld, add the following under "defineScope' block

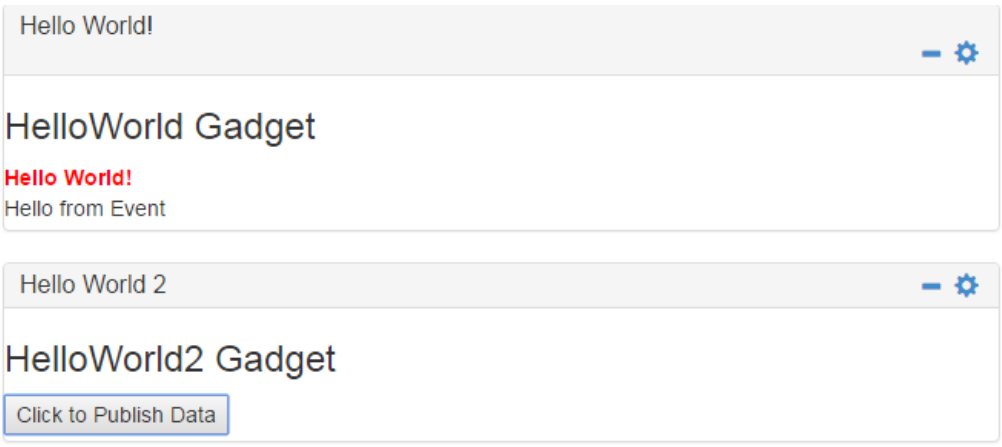
```
_handleEvents:function(eventType,payload,context){
              if(eventType=="PUBLISH_DATA"){
                  this.$scope.data=payload;
              }
       },
```

7. Deploy both the gadgets.
8. To test the gadgets, login in to Business Console using URL:

```
http://<HOST>:<PORT>/business.console
```

9. Create a dashboard and add these two gadgets side by side.
10. Click **Click to Publish Data** in HelloWorld2 gadget.

    HelloWorld gadget displays "Hello using Event" text as shown below.



2.6 Using Third Party Libraries

If you want a gadget to accept one or more locations as input and plot these locations in a Google Map. The gadget must use Maps API

Google Maps is one of the most popular libraries, which provides a map implementation. However, to use Google Maps in gadget, you need an API Key. You can use a standard API key or use a premium Key if you have Maps license.

To generate your API key, use URL:

```
https://developers.google.com/maps/documentation/javascript/get-api-key
```

Most of the third party libraries can be downloaded in your local system and then these library files can be added under the scripts folder.

Google Maps restricts the use of maps by downloading. Gadget code must directly refer to Google maps library. This leads to synchronization issue as the gadget has to wait for the library to be loaded from the URL. To achieve this, gadget framework includes a lazyLoader (ocLazyLoader) module to load all the modules.

2.6.1 Write UI Code for Using Third-party Libraries in Gadget

1. Navigate to the view.xhtml file of the gadget.
2. Add the following code

```
<div class="table">
    <div class="row remove-margins table-row " ng-repeat="item in locations track
by $index">
        <input type="text" ng-model="item.location" class="table-cell location-
publish-text" placeholder="Enter city, country, zip code etc."></input>
        <div style="white-space: nowrap;" class="table-cell">
            <!-- remove button should not be shown if it is a first entry -->
            <button type="button" class="bc-button" data-ng-click="addRow()">
                <i class="fa fa-plus"></i>
            </button>
            <button type="button" class="bc-button"
                data-ng-click="removeRow($index)">
                <i class="fa fa-minus"></i>
            </button>
        </div>
    </div>
    <div class="row remove-margins table-row ">
        <input type="button"
        value="Publish Locations" ng-click="publishLocation()" class="bc-button
table-cell"></input>
        <input type="button"
        value="Clear" ng-click="clearLocation()" class="bc-button table-
cell"></input>
    </div>
</div>

<div oc-lazy-
load="['js!https://maps.googleapis.com/maps/api/js?key=YOUR_API_KEY']">
    <div class="row remove-margins">
```

```
        <h4>Maps Gadget</h4>
        <label class="location-maps-header"> Use this gadget to display
locations.
        </label>
        <googlemaps id="google_map_canvas" style="height: 760px;"></googlemaps>
<!--CONTAINER FOR THE MAP. CUSTOM DIRECITVE -->
    </div>
</div>
```

Replace the YOUR_API_KEY with the Maps API key you have retrieved from Google.

In the first , added a textbox control with plus/minus buttons to add/remove one or more locations.

In the second , used a tag called <googlemaps .../>. This is not an HTML tag, but a custom AngularJS directive. By using this directive, we can get a reference to the container and then place our Map pointers accordingly.

This also contains a call to Angular lazy loader (oc-lazy-load) to load the maps API from a URL. The custom directive <googlemaps.../> should go inside the containing the oc-lay-load attribute.

2.6.2 Style the Gadget

Style the controls before writing the business logic.

1. Navigate to gadget.css file located under (/WebContent/gadgets/HelloWorld/styles) of the application project.
2. Add the following to the gadget.css file.

```
.location-publish-header{
    font-size: 13px;
    font-family: Arial;
    font-weight: normal;
    padding-left: 8px;
    padding-top: 5px;
}
.table{
    display:table;
}
.table-row{
    display:table-row;
}
.table-cell{
    display:table-cell;
    padding: 3px;
    margin-bottom: 3px;
    margin-left: 5px;
}
.location-publish-text{
    width:100%;
}
```

2.6.3 Write Custom Maps Directive in custom.js File

To create a custom directive, follow the steps below. You need to replace <ID> with the one generated by your gadget.

1. Open the /webapp/gadgets/HelloWorld/scripts/config.js file and lookup the gadget module name in the config.js file. In the code below, „HelloWorld_<ID>_module " refers to the gadget module.

```
var HelloWorld_<ID>_module = angular.module(..... .
```

2. Use the code below in the custom.js file.

```
HelloWorld_<ID>_module.directive('googlemaps', function() {
    return {
        restrict: 'E',
//Restrict to HTML Tags only
        replace: true,
//Replace existing content with the content from this directive
        template: '<div></div>',
//Base Template for the tag
        link: function($scope, element, attrs) {
//This function is invoke when the directive get linked to the DOM
                var center = new google.maps.LatLng(50.1, 14.4);
//Taking a randon centre point in Map
                var map_options = {
// Default Options for Maps
                    zoom : 2,
                    mapTypeId : google.maps.MapTypeId.ROADMAP,
                    center : center,
                };

// Create a Map Object
                var map = new google.maps.Map(document.getElementById(attrs.id),
map_options);

// Create a Marker Array. Each marker will correspond to a point in the map
                $scope.markers = [];

//Function to be invoke from controller. This takes a an array of location
objects and points each location on the map

// a typical locations array would be something like this
[{"location":"Bangalore"},{"location":"Seattle"},{"location":"Reston"}]
                $scope.locateInMap= function(locations){
                    $scope.hideMarkers();
// Hide existing markers and plot new ones
                    geocoder = new google.maps.Geocoder();
                    for(var key in locations){
                        if(locations.hasOwnProperty(key)){
                            geocoder.geocode({
                                'address' : locations[key].location
// Decode the location string to a specific geocode
                            }, function(results, status) {
                                if (status == google.maps.GeocoderStatus.OK) {
```

```
//In this case it creates a marker, but you can get the lat and lng from the
location.LatLng
                                    map.setCenter(results[0].geometry.location);
                                    var marker = new google.maps.Marker({
                                        map : map,
                                        position : results[0].geometry.location
                                    });
                                    $scope.markers.push(marker);
                                } else {
                                    alert("Geocode was not successful for the
following reason: "
                                            + status);
                                }
                            });
                        }
                    }

                };
                $scope.hideMarkers=function() {
                    /* Remove All Markers from the Map*/
                    while($scope.markers.length){
                        $scope.markers.pop().setMap(null);
                    }
                }

                window.setTimeout(function() {
                    google.maps.event.trigger(map, 'resize');
                }, 100);

        }
    }
});
```

2.6.4 Code the Gadget Controller

Provide appropriate logic in the gadget controller to invoke the "locateInMap" function

Add the following code to the gadget controller file to receive location from the same gadget and then plot the map.

1. Add an empty 'locations' variable and bind it to scope. By doing this, you are ensuring that there will be one textbox in the UI to capture location.

```
 init:function(){
.....
 this.$scope.locations=[{location:''}];
```

2. In the defineScope block of gadget controller, add the logic to add/remove textboxes on the UI when +/- icons are clicked. Also, add logic for a "Clear" button to remove all markers from the map. Add the following code.

```
defineScope : function() {
           var _this = this;
           this.$scope.addRow=function(){
                var row={location:''};
                _this.$scope.locations.push(row);
```

```
            }

            this.$scope.removeRow=function($index){
                _this.$scope.locations.splice($index, 1);
            }

            this.$scope.clearLocation=function(){
                 _this.$scope.hideMarkers();
            }
}
```

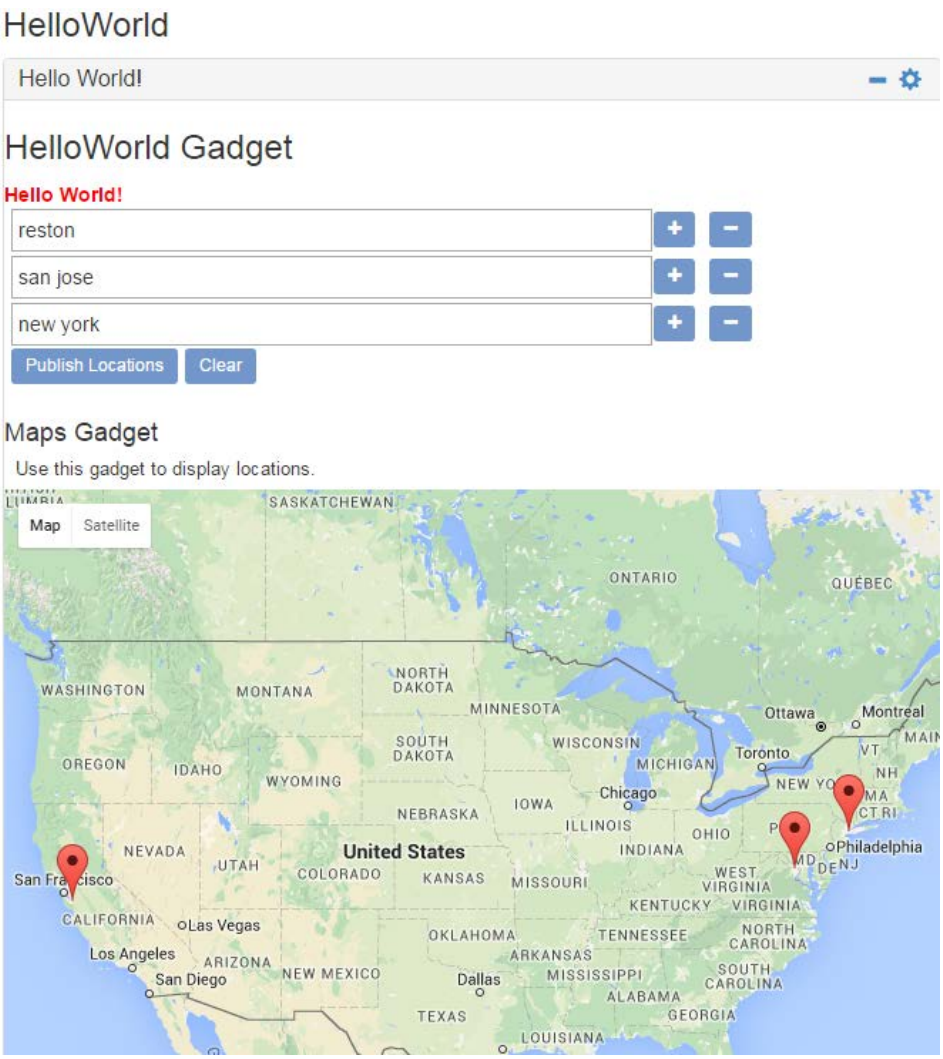
3. In the define scope block, add logic to plot the locations on the map.

```
defineScope : function() {
     .......
     this.$scope.publishLocation=function(){
             //Check to remove empty locations
             var locations=[];
             for(var key in _this.$scope.locations){
                 if(_this.$scope.locations.hasOwnProperty(key)){
                     if(_this.$scope.locations[key].location!==''){
                         locations.push(_this.$scope.locations[key]);
                     }
                 }
             }

             _this.$scope.locateInMap(locations);

       };
}
```

2.6.5 Deploy and Test Maps Gadget

1. Deploy the map gadget to My webMethods Server.
2. Test the gadgets using the direct URL:

```
http://<HOST>:8585/wmbcgadgets#/MyPortletAppProject/HelloWorld.
```


HelloWorld
Hello World!
HelloWorld Gadget
Hello World!
reston
san jose
new york
Publish Locations
Clear
Maps Gadget
Use this gadget to display locations.
Map
Satellite
SASKATCHEWAN
ONTARIO
QUEBEC
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
Ottawa
Montreal
SOUTH DAKOTA
WISCONSIN
MICHIGAN
Toronto
OREGON
IDAHO
WYOMING
Chicago
NEBRASKA
IOWA
ILLINOIS
OHIO
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
INDIANA
United States
Philadelphia
San Francisco
CALIFORNIA
Las Vegas
KENTUCKY
WEST VIRGINIA
VIRGINIA
OKLAHOMA
TENNESSEE
NORTH CAROLINA
Los Angeles
San Diego
ARIZONA
NEW MEXICO
ARKANSAS
MISSISSIPPI
Dallas
SOUTH CAROLINA
ALABAMA
GEORGIA
TEXAS
LOUISIANA

3 Creating User Interface for Gadgets

3.1 Using Bootstrap Components

Gadget framework provides the following files for each gadget for defining the user interface:

- view.xhtml file
- settings.xhtml file

view.xhtml contains information about the user interface to be displayed when the gadget is rendered on the web page.

settings.xhtml contains information about the user interface for configuring the gadget at run time, if the gadget loading requires any runtime configuration.

view.xhtml and **settings.xhtml** files of each gadget are individually bootstrap enabled by default. This means that the gadgets are already within a bootstrap container, and the use of Grid System within a gadget is sufficient to make the layout responsive. If you are using AngularJS version of the gadget, you can also use the AngularUI Bootstrap library that are already included as part of the application.

3.2 Creating Responsive Gadgets

Using bootstrap styles for your gadgets would ensure that the gadgets are internally responsive. However, there might be a situation where you need to use responsive large controls in the user interface. For example, HTML tables are not responsive by default, and if you use a big table in a gadget, the table in the gadget might overlap with other gadgets. The best solution for these scenarios would be to use percentages (%) for defining widths.

3.3 Using Form Layouts

If you need to use a form in a gadget, you can use the "form-horizontal" class to style the form controls.

Note: Tooltips can be specified using the data-hint attribute, and the orientation can be controlled using hint--top,hint--bottom,hint--left,hint–right classes.

A typical example of a form is shown below:

```
<form class="form-horizontal">
    <div class="control-group">
        <label class="control-label hint--top" data-hint="Tooltip Message1"
for="">Control-1</label>
        <div class="controls">
            <<Add the form control>>
        </div>
    </div>

    <div class="control-group">
```

```
        <label class="control-label hint--top" data-hint="Tooltip Message2"
for="">Control-2</label>
        <div class="controls">
            <<Add the form control>>
        </div>
    </div>

</form>
```

3.4 Adding Static or Dynamic Content

You can add your static content to the view.xhtml file.

You can build dynamic content in the view.xhtml file by using one of these methods:

- Invoking services written in the controller.js
- Importing external JavaScript libraries and using the functions in the JavaScript library.

Note: For importing JavaScript library, use tag instead of the <script import="jsFileName.js"/> tag. The normal <script import="jsFileName.js"/> tag will not work.

You should NOT import the internally generated.js JavaScript files such as custom.js that are automatically available in the controller.js and view.xhtml files.

3.5 Styling Gadgets

For each gadget, you can provide your custom styles in the gadget.css file of the gadget. You also have the option to provide the style in-line in view.xhtml or settings.xhtml files under a <style> tag.

4 Programming Gadgets

4.1 About Programming Gadgets

AngularJS provides a MVC framework to manage the business logic of a gadget. The base logic for programming a gadget should reside in the controller.js. The gadget framework binds the controller to the view file dynamically at runtime so that you DO NOT have to mention the controller explicitly in the view using the **data-ng-controller** attribute.

In the gadget development framework, we have included a base controller (BaseController.js) which wires some of the required services to the controller. As a best practice, all AngularJS controller for a gadget should extend BaseController. Though JavaScript does not provide inheritance directly, you can use JavaScript prototype inheritance.

Extending BaseController provides a way to overload some of the functions defined in BaseController. Functions in BaseController provide a structured coding approach.

4.1.1 Functions Defined in BaseController

1. **init**

   The init function can be considered as the constructor function of the controller class. init function is invoked when the gadget is loading into the dashboard. Gadget loading occurs when a gadget is added to a dashboard or when an existing dashbaord is lauched. All invocations or business logic that are required for loading a gadget must be included in the init function. The init function arguments must match the injected components in the controller. For example, code as shown below.

```
....
 init : function($scope, restClient,eventBus,log,config)
 {
 ....
 }
....

ExampleController.$inject = [ '$scope',
'RestServiceProvider','EventBus','$log','config'];
```

   The "ExampleController" controller is injected with $scope, RestServiceProvider, EventBus, $log and the $config objects. These are the services that the gadget framework exposes for various business logic. The order of the injection must match the order of the arguments in the init function to receive the injected object in the init function. Once the objects are injected in the init function, specify a call as shown below.

```
this._super($scope,eventBus,restClient);
```

   This call registers the $scope, eventBus, and restClient objects with the BaseController.

2. **defineScope**

   All functions required to be defined on the controller scope is defined here. The scope functions are the main business logic of the gadget that are related to the user interface. Scope functions

can be invoked in the init function (after _super call) or through any other flow (for example, on event handling).

As a best practice, all functions that are related to te user interface such as a button click should be defined under the defineScope block. Since 'scope' is an AngularJS object accessibly locally within a gadget, any function defined the defineScope block makes the function available for invocation from the UI (for example, using ng-click=<function name>) or from any other place that has access to the controller scope. However, generic business logic that is not tied to the UI should not be made a part of the controller and should be added to an AngularJS Service or Factory. This allows the code, to be injectable as well as unit testable.

3. **defineListeners**

   This function block is invoked once during controller load, and is used to define all the listeners on the EventBus that are related to the controller. Event listners are fined as shown below.

   ```
   this.eventBus.addEventListener("EVENT_TYPE_NAME", this._handleEvents.bind(this));
   ```

   The code above will register the controller as a listener for the type of event mentioned in the first argument of addEventListener. For every listener added to the controller, a respective handling block should be provided under the _handleEvents function block.

4. **destroy**

   The destroy function is synonymous to the defineListeners block mentioned above.

4.2 Defining Module Dependencies

Modularize all AngularJS services, directives, factories defined in controller.js or custom.js for better code management as specified below.

1. Define a module for each angular directive, factory, or service as shown below.

   ```
   var module_name = angular.module('MODULE_NAME',[DEPENDENCIES]);
   ```

2. Provide a dependency for the module in the gadget. This can be done using Software AG Designer while creating the gadget or later while using the gadget definition editor.
3. Inject the module, services, or factories in the controller (in the $inject code) and use it appropriately.
4. In case of Providers, do as shown:

   ```
   angular.module('MODULE_NAME',[DEPENDENCIES]).provider('PROVIDER_NAME',function
   PROVIDER_FUNCTION(){
       this.$get =  [<INJECTABLES>,function (<INJECTED_OBJECTS>){
              this.instance={};
              this.instance.<providerFunction>= new function(){
                 //INJECTED OBJECTS CAN BE SET ON THE INSTANCE OBJECT
              };
              return this.instance;
       }]
   });
   ```

5. In case of Factories

   ```
   angular.module('MODULE_NAME',[DEPENDENCIES]).factory(<INJECTABLES>,
   [<INJECTED_OBJECTS>, function <FactoryFunction>() {
   ```

```
  ....
  return <OBJECT>;
}]);
```

6. In case of Services

```
angular.module('MODULE_NAME',[DEPENDENCIES]).service('<SERVICE_NAME',
[<INJECTABLES>, new ServiceFunction(<INJECTED_OJECTS>){
   //Service Code

}]);
In case of Directives,
module_name.directive('<DIRECTIVE_NAME>', function () {
    return {
         restrict: 'E, A, C',
         link: function ($scope, element, attrs, controller) {
            //Directive code goes here
         }
    };
});
```

An alternative way to create directive, services, or factories is by using modules to extend the Classes function, and use the function name to link them. For example, see the directive below.

```
var ExampleDirective= Classes.extend({

    $scope : null,
    $attrs:null,
    $controller:null,


    /**
     * Initialize Directive
     *
     * @param $scope,
     *            current  scope
     */
    init : function(scope,element, attrs, controller,) {



    },


    /**
     * Initialize listeners needs to be overrided by the subclass. Don't forget
     * to call _super() to activate
     */
    defineListeners : function() {
        his.$scope.$on('$destroy', this.destroy.bind(this));
    },
    /**
     * Use this function to define all scope objects. Give a way to instantaly
     * view whats available publicly on the scope.
     */
    defineScope : function() {
```

```
    },


});
angular.module('MODULE_NAME',[DEPENDENCIES]).directive('<DIRECTIVE_NAME>',
function () {
    return {
         restrict: 'E, A, C',
         link: function ($scope, element, attrs, controller) {
            //Directive code goes here
            return new ExampleDirective();
         }
    };
});
```

4.3 Injecting Services/Factory/Providers

As mentioned above all AngularJS Services, Factories, and Providers should be created as AngularJS modules, and then associated to the gadget module. Each gadget is by default created as an AngularJS module, and the dependencies should be set to allow the services to be injected in the controller. To inject any custom object use the '$inject' to do the injection.

```
<CONTROLLER_FUNCTION>.$inject = [ '$scope',
'RestServiceProvider','EventBus','$log','config'...];
```

4.4 Defining Angular $scope Object

Each controller for the gadget is injected with AngularJS $scope object in the 'init' function and then passed over to other functions such as 'defineScope' and 'defineListeners'. For functions that are defined on the scope, for example, $scope.functionName=function(){}, the scope object is accessible within the function using 'this' operator in JavaScript. However, the value of ‘this’ changes dynamically depends on how the function is invoked.

To get an instance of the $scope effectively inside a scope function, the $scope object needs to be assigned to 'this' operator, and then the object can be used throughout the function.

```
this.$scope.restInvocation = function(gadgetConfig){
      var $scope = this;
//depending on how the restInvocation function is invoked,
//'this' object inside the function will have an instance of the $scope object

....
}
```

4.5 Invoking RESTful Services

The gadget framework provides an AngularJS provider called RestServiceProvider, which provides several ways to invoke RESTful services.

Steps to invoke RESTful services

1. In the URLS object, define the URL required for invoking the RESTful service.

```
URLS:{
             MY_REST_SERVICE1:{url: '/rest/rs/myRest1',method:'GET',
isArray:true},
             MY_REST_SERVICE2:{url: '/rest/rs/myRest2',method:'GET',
isArray:true}
      },
```

2. Define a function (for example, invokeMyRestFunction) inside the "defineScope" block that makes the actual invocation.

```
this.$scope.invokeMyRestFunction= function(gadgetConfig) {
                var $scope = this;

                $scope.restClient.url($scope.URLS.MY_REST_SERVICE1)
//POINT TO THE RESTful SERVICE TO INVOKE
                 .serverAlias("IS1")
// POINT TO THE SERVER ALIAS FROM THE GADGET CONFIGURATION
                 .remote(true)
// IF LOCAL OR REMOTE CALL
                 .cors(true)
// IF CORS SUPPORTED FOR REMOTE CALLS ONLY
                 .scope($scope)
                 .gadgetConfig(gadgetConfig)
                 .success(function(response,$scope){
                     $scope.responseData =  response;
// HANDLE THE RESPONSE IN A SCOPE OBJECT
                 }).error(function(response,$scope,status, headers, config){

$scope.eventBus.fireEvent(NotificationConstants.ERROR,"Unable to invoke REST
");// HANDLE ANY ERROR IN INVOCATION
                 }).invoke();
            }
```

3. Call the invokeMyRestFunction function from init (if the RESTful service needs to be called on Gadget load) or from any other place depending on the business logic.

```
init : function($scope, restClient,eventBus,log,config) {
            ...
            this.$scope.invokeMyRestFunction(config);
            ...
      },
```

4.5.1 Using Builder Style Pattern or Traditional RESTful Service Invocation

As part of the gadget framework, there are two ways to invoke a RESTful service:

- Builder Style pattern RESTful service invocation
- Traditional RESTful service invocation

4.5.1.1 Builder Style Pattern RESTful Service Invocation

In this pattern, you can provide various parameters to the restClient object, and use the invoke method.

Following are the parameters for builder style pattern:

Parameter	Description
url	(REQUIRED) This is the relative URL for RESTful service invocation. The 'server' to connect to will be picked up using the **serverAlias** parameter. In the gadget definition, you must define a list of servers (alias) that this gadget must invoke.
method	(OPTIONAL) This can be GET/POST/PUT/DELETE or any other HTTP Request Method. Default method is 'GET'.
requestData	(OPTIONAL) This can be GET/POST/PUT/DELETE or any other HTTP Request Method. Default method is 'GET'.
serverAlias	(REQUIRED) The alias of the server the gadget must connect to. The list of servers and their alias must be defined in the gadget creation phase or by editing the gadget defintion xml file.
remote	(REQUIRED) If set to 'false', then the invocation will always go to the local MWS server. If set to true, the the remote server will be evaluated based on the 'serverAlias' provided.
cors	(OPTIONAL) If set to 'true', then a Cross Origin Request will be done to the remote server considering CORS headers are already set to allow the request to execute successfully. If set to 'false', the the request will be routed through a business console proxy URL to avoid Cross Origin Requests. Default value is 'true'.
scope	(REQUIRED) The scope of the gadget under AngularJS context. This will be passed back as part of the success callback function so that further actions can be taken.
gadgetConfig	(REQUIRED) The gadget configuration object that is passed to the controller needs to be set here.
success	(REQUIRED) The success callback function where the response will be passed to in case of a successful invocation. Passed arguments are as follows • response: The response object (JSON) • $scope: The $scope object associated with the gadget controller
failure	(REQUIRED) The error callback function where the response will be passed in case of a failed invocation. Arguments passed arguments are: • response: Error response from the invocation • $scope: The $scope object associated with the gadget

Parameter	Description
	controller • status: HTTP status code of the response. • headers: {function([headerName])}. This can be a function to retrieve the header object • config: The configuration object used to generate the request

invoke	This function must be invoked at the end after passing all required parameters
	`$scope.restClient.url($scope.URLS.MY_REST_SERVICE1)`
	`//POINT TO THE RESTful SERVICE TO INVOKE`
	`.serverAlias("IS1")`
	`// POINT TO THE SERVER ALIAS FROM THE GADGET CONFIGURATION`
	`.remote(true)`
	`// IF LOCAL OR REMOTE CALL`
	`.cors(true)`
	`// IF CORS SUPPORTED FOR REMOTE CALLS ONLY`
	`.scope($scope)`
	`.gadgetConfig(gadgetConfig)`
	`.success(function(response,$scope)`
	`{`
	`$scope.responseData = response;`
	`// HANDLE THE RESPONSE IN A SCOPE OBJECT`
	`}).error(function(response,$scope, status, headers, config){`
	`$scope.eventBus.fireEvent(NotificationConstants.ERROR,"Unable to invoke REST ");// HANDLE ANY ERROR IN INVOCATION`
	`}).invoke();`

4.5.1.2 Traditional RESTful Service Invocation

You can use the invokeREST function defined under the RestService Angular service to invoke RESTful services.

4.5.1.2.1 invokeREST Function

invokeREST function signature:

```
invokeREST:function(URLobj,successCallback,errorCallback,parameters,data,scope, pathParams, gadgetConfig, isCrossOriginRequest, serverAlias)
```

invokeREST function arguments:

- *URLobj*

  The URL object should point to a local URL object created under your controller. This can be defined as follows under your controller.

```
REST_URLS_OBJECT = {

          REST_SVC_1: {url: '/rest/svc1',method:'GET', isArray:true},
          REST_SVC_2: {url: '/rest/svc2',method:'GET', isArray:true},
}
```

  For example, to use REST_SVC_1, use REST_URLS_OBJECT.REST_SVC_1 as your URLobj.

  NOTE: All URLs defined here must be relative URLs without the host:port information. The host:port information will be fetched based on the 'serverAlias' argument of the function call.

- *successCallback*

  Success callback function signature:

```
var successFunc = function(response, status, headers, config,scope,gadgetConfig){
// YOU SUCCESS HANDLER CODE GOES HERE


}
```

  Success callback function arguments:

  - *response*: Function invocation success response
  - *status*: HTTP status code of the response.
  - *headers*: {function([headerName])}. This can be a function to retrieve the header object
  - *config*: The configuration object used to generate the request.
  - *scope*: The $scope object associated with the gadget controller.
  - *gadgetConfig*: The gadget configuration object. It contains the server list and any optional parameters that the gadget has been configured with.

- *errorCallback*

  This is the error callback function where the response will be passed when the invokeREST invocation fails.

  Arguments passed arguments to the error callback function:

  - *response*: Error response from the invocation.
  - *status*: HTTP status code of the response.
  - *headers*: {function([headerName])}. This can be a function to retrieve the header object.
  - *config*: The configuration object that was used to generate the request.
  - *scope*: The $scope object associated with the gadget controller.
  - *gadgetConfig*: The gadget configuration object. It contains the server list and any optional parameters that the gadget has been configured with.

- *Parameters*

  JavaScript object to build the query parameters. Build the query as follows:

```
            var parameters = new Array();
```

```
var param1 = new Object();
param1.name = "key1";
param1.value = value1;
parameters.push(param1);
param2.name = "key2";
param2.value = value2;
parameters.push(param2);
```

Query built: ?key1=value1&key2=value2

- *Data*

  Required in case of POST and PUT calls. The request data object that can be passed to the server. It can be a String or a JSON object.

- *Scope*

  The scope of the gadget in the AngularJS context. This will be passed back as part of the success callback function so that further actions can be taken

- *pathParams*

  The path parameters that are appended to the URL string. If *pathParams* is a string, then it is directly appended to the end of the URL prior to the query parameters. If it is an Arraay, then the params string is constructed as follows:

```
var pathParams= new Array();
pathParams.push("param1");
pathParams.push("param2");
pathParams.push("param3");
```

  URL constructed: /URL/param1/param2/param2?<Query Param>

- *gadgetConfig*

  The gadget configuration object. It contains the server list and any optional parameters that the gadget has been configured with.

- *isCrossOriginRequest*

  Set it to true in case of a Cross Origin Request to a server supporting CORS headers. Otherwise, set it to false to use a proxy invocation to remote server.

- *serverAlias*

  The alias of the server to make the call to. The list of servers should be defined in the gadget configuration file and the selected alias should be passed here.

4.5.2 Using CORS Support and Proxy for RESTful Services

4.5.2.1 Using CORS Support for RESTful Services

Business Console gadget supports direct invocation of URLs to a remote server, if the remote server supports Cross-Origin Resource Sharing (CORS). To make a cross-origin request, ensure that the remote server is configured with all the CORS settings.

Example

In Integration Server, provide the following in "Extended Settings" to support CORS headers.

```
watt.server.cors.allowedOrigins=http://localhost:8585, (Please specify the URLs
from where the invocation ishappening)
watt.server.cors.enabled=true
watt.server.cors.exposedHeaders=Set-Cookie,X-Frame-Options,Access-Control-Allow-
Origin
watt.server.cors.maxAge=1000000
watt.server.cors.supportedHeaders=samlassertion,accept,withcredentials
watt.server.cors.supportedMethods=GET,POST,PUT,DELETE,OPTIONS,HEAD
watt.server.cors.supportsCredentials=true
```

Example

After configuring CORS settings, you can invoke a RESTful service with cors (true) and remote (true) options.

```
$scope.restClient.url($scope.URLS.MY_REST_SERVICE1)
// POINT TO THE RESTful SERVICE TO INVOKE
                .serverAlias("IS1")
// POINT TO THE SERVER ALIAS FROM THE GADGET CONFIGURATION
                .remote(true)
// IF LOCAL OR REMOTE CALL
                .cors(true)
// IF CORS SUPPORTED FOR REMOTE CALLS ONLY
                .scope($scope)
                .gadgetConfig(gadgetConfig)
                .success(function(response,$scope){
                    $scope.responseData =  response;
// HANDLE THE RESPONSE IN A SCOPE OBJECT
                }).error(function(response,$scope,status, headers, config){
                 $scope.eventBus.fireEvent(NotificationConstants.ERROR,"Unable to
invoke REST ");
// HANDLE ANY ERROR IN INVOCATION
                }).invoke();
```

4.5.2.2 Using Business Console Proxy for RESTful Services

In case the remote server cannot be configured to support CORS headers, Business Console provides a proxy service to route the request through the host My webMethods Server.

To use this option, you need to make a local RESTful POST call to MWS using "/rest/bc/proxy" URL. Provide the server options for fetching the data in the POST body. Provide data in a JSON format with escaped quotes.

Example

```
$scope.restClient.url($scope.URLS.BC_PROXY)
//POINT TO THE RESTful SERVICE TO INVOKE
                .serverAlias("MWS1")
// POINT TO THE SERVER ALIAS FROM THE GADGET CONFIGURATION
                .remote(false)
// IF LOCAL OR REMOTE CALL
                .method("POST")
                .scope($scope)
                .requestData(data)
```

```
//JSON Structure of the Request data. See below
                .gadgetConfig(gadgetConfig)
                .success(function(response,$scope){
                    $scope.responseData =  response;
// HANDLE THE RESPONSE IN A SCOPE OBJECT
                }).error(function(response,$scope,status, headers, config){
                    $scope.eventBus.fireEvent(NotificationConstants.ERROR,"Unable
to invoke RESTful service");
// HANDLE ANY ERROR IN INVOCATION
                }).invoke();
Following are the example of different invocations
GET CALL TO IS
var data = { "serverType":"IS",
"url":"/rest/rs/monitor/process/model",
"requestMethod":"GET"
, "requestHeaders:{'key1':'value1','key2':'value2'}"
}
```

Example

POST call to IS

```
var data =  {"serverType":"IS",
"url":"/rest/rs/monitor/process/instanceSearch",
"host":"localhost",
"port":"5555",
"protocol":"http",
"requestMethod":"POST",
"data":"{\"instanceSearchQuery\":{\"processKey\":\"FeatureProject/Feature\",
\"pageNumber\":1,\"pageSize\":10,\"status\":\"2\",\"instanceId\":null,
\"customId\":null,\"businessConsoleRequest\":true}}"
"requestHeaders:{'key1':'value1','key2':'value2'}"
}
```

Example

GET call to remote MWS

```
var data =  { "serverType":"MWS",
"url":"/rest/bc/userpreferences",
"host":"localhost",
"port":"8585",
"requestMethod":"GET",
"protocol":"http" (optional)
"requestHeaders:{'key1':'value1','key2':'value2'}"
}
```

4.6 Including Independent AngularJS Module in Gadget

All Business Console Gadgets are defined as independent AngularJS modules. However, if you want to design your services and directives in your gadgets as independent modules, do the following:

1. Define your services, factories, and directives as independent modules in custom.js.

2. Set the dependency of your gadget module to those independent modules.

   For example, in custom.js, define a directive as a module.

```
angular.module("MY_GADGET_DIRECTIVE_MODULE", []).directive("myDirective",
function(){

// ADD DIRECTIVE CODE HERE
})
```

   The "myDirective" directive above is defined in an independent "MY_GADGET_DIRECTIVE_MODULE" module.

3. To use "myDirective" directive in your gadget or in any other gadget, in the gadget-definition.xml file, set the dependency of the gadget to "MY_GADGET_DIRECTIVE_MODULE" .

   After the dependency is set, if you look up the config.js of the gadget, you will find the dependency as shown below.

```
var myGadget = angular.module('myGadget-<ID>', ['adf.provider',
'MY_GADGET_DIRECTIVE_MODULE'])
```

   This makes the gadget dependent on the "MY_GADGET_DIRECTIVE_MODULE" module, and the gadget will be able to use all the services, factories, and directives from the new module.

4.7 Invoking JavaScript Functions with Same Names in Different Libraries

For AngularJS gadget, JavaScript functions must be specifically defined in either controller.js or as AngularJS services, which are singleton objects or single use classes. Duplicate functions inside different services can be easily invoked by using the service injections. For non-AngularJS based gadgets, because the functions can be directly defined on the Window object, functions with same might result in conflicts.

To resolve conflict between similarly named functions, it is recommended that you encapsulate functions inside a binding function, and then use the binding functions to invoke the functions inside.

Example

```
var GadgetOne_Controller = function($scope) {

    this.userDefinedFunctionOne = function() {
        console.log("from userDefinedFunctionOne function of mygadget");
    }


    this.userDefinedFunctionTwo = function() {
        console.log("from userDefinedFunctionTwo function of mygadget"); }
    }
}

var gadgetOne_Controller= new GadgetOne_Controller(); // NOTE THE DIFFERENT CASES
```

In this case, you can invoke the gadgetOne_Controller.userDefinedFunctionOne() from your view file.

4.8 Using Third Party Libraries in Gadgets

There are several ways to include third party libraries in gadgets.

Approach 1

1. Save the external libraries (js files) under the scripts directory in the gadget.
2. Update the gadget-defintion.xml file of the gadget to include the library.
   h. Open the gadget-defintion.xml file under the Scripts and Styles section.
   i. Click **Add** to add the scripts to the gadget.
3. Deploy the gadget to My webMethods Server.

   The external scripts will be loaded as part of your gadget. You can now add the required behavior to the gadget controller using the external scripts.

Approach 2

Use "OC Lazy Loader" to load external libraries.

Some external JavaScript libraries cannot be used by saving a copy of the JavaScript files in a local system. For example, you cannot store libraries of Google Maps in a local file system and add reference to these libraries in the local folder. Such external libraries must be accessed directly in the view.xhtml file. Referring to these libraries using the <script> tag inside the view.xhtml will not work because the gadgets are AngularJS based, and for the controller to work, the external JavaScript files must be completely loaded. Hence, use the ocLazyLoader provided by the gadget framework to import the external JavaScript files in your view.xhtml file.

Following code snippet shows how to use ocLazyLoader to load external JS libraries.

```
<div oc-lazy-load="['..js/testModule1.js', '..js/testModule2.js']">

//YOU CAN PROVIDE DIRECT URL TO THE JAVASCRIPT SERVED THROUGH A CDN

//YOUR HTML CODE GOES HERE

</div>
```

If the link to the JavaScript file does not end with a .js extension, use a " js!" prefix to your URL as shown below.

```
 <div oc-lazy-
load="['js!https://maps.googleapis.com/maps/api/js?key=YOUR_API_KEY']">
<div class="row">

    <map id="map_canvas" style="height: 760px;"></map>

</div>
```

You can get the API key from Google site:
https://developers.google.com/maps/documentation/javascript/get-api-key

You can also use external AngularJS libraries by directly including the module through **ocLazyLoad**.

4.9 Defining Success and Error Notifications in Gadgets

Use EventBus to trigger success and error notifications from a gadget.

To send a success notification, use the code below.

```
$scope.eventBus.fireEvent(NotificationConstants.SUCCESS,"PROVIDE YOUR SUCCESS
MESSAGE HERE");
```

To send an error notification, use the code below.

```
$scope.eventBus.fireEvent(NotificationConstants.ERROR,"PROVIDE YOUR ERROR MESSAGE
HERE");
```

You can send notifications to any place that is within the scope of the EventBus object. In controller init block, you normally add the EventBus in the $scope object so that the EventBus is easily accessed through the $scope object (such as directives).

4.10 Using Forms in Gadgets

Using gadgets, you can capture HTML form values and pass it to other gadgets by submitting the form.

Example

Use the following code in your gadget view.xhtml file if you want to submit a form with three fields - First Name, Last Name and Phone.

```
<form role="form" name="myForm">
    <div class="form-group row">
        <label for="fname" class="col-md-4">First Name:</label>
        <input type="text" class="col-md-8 remove-paddings" name="fname" id="fname"
data-ng-model="config.params.fname"></input>
    </div>
    <div class="form-group row">
        <label for="lname" class="col-md-4">Last Name:</label>
        <input type="text" class="col-md-8 remove-paddings" name="lname" id="lname"
data-ng-model="config.params.lname"></input>
    </div>
    <div class="form-group row">
        <label for="lname" class="col-md-4">Phone:</label>
        <input type="text" class="col-md-8 remove-paddings" name="phone" id="phone"
data-ng-model="config.params.phone"></input>
    </div>
    <input class="btn bc-button row" type="button" value="Submit Form"
onclick="submitMyForm()"></input>
</form>
```

The code above provides a form with three fields. Each field can be data-bound to the config parameters if required.

On click of the SUBMIT button on a form, a JavaScript function, submitForm is called. The code for submitForm function is as shown below:

```
function submitForm(){
```

```
        var fname= document.getElementById("fname").value;
        var lname= document.getElementById("lname").value;
        var phone= document.getElementById("phone").value;

        var href ="";
        if(window.location.href.indexOf("?")>0){
            href = window.location.href.substring(0,
            window.location.href.indexOf("?"));
        }else{
            href=  window.location.href;
        }

        var actionUrl = href+"?fname="+fname;
        actionUrl =actionUrl+"&amp;lname="+lname;
        actionUrl +="&amp;phone="+phone;
        window.location.href=actionUrl;
        window.location.reload();

    }
```

The code above will append the values to the URL as URL parameters that get bound to the receiving gadget through the 'config' object.

Note: For parameters to work, add the parameter names to the Gadget-Definition.xml under the parameters section. Only the parameters defined in the gadget-defintion.xml will be received or bound to other gadgets.

Example

To display the form parameters in another receiving gadget, use the code below:

```
<div class="form-group">
    <label for="fname">First Name:</label>
    <label>{{config.params.fname}}</label>
</div>
<div class="form-group">
    <label for="lname">Last Name:</label>
    <label>{{config.params.lname}}</label>
</div>
<div class="form-group">
    <label for="lname">Phone:</label>
    <label>{{config.params.phone}}</label>
</div>
```

Note: To send multiple values (array of values) as part of a form field, you can send coma separated values. An array of values can be parsed on the receiving gadget and rendered in a dropdown list.

4.11 Accessing Services/Functions in XHTML files and Controller

4.11.1 Accessing Services/Functions in AngularJS Gadgets

You can define your services, factories, and providers in custom.js.

1. Attach the services, factories, and providers to the gadget module or define them within your own module.
2. Set the dependency of the gadget module to the custom module.

   If you look up config.js of your gadget, you would find the gadget module defined as below:

```
var myGadget = angular.module('<MY_GADGET_MODULE>', ['adf.provider',
'MY_GADGET_DIRECTIVE_MODULE'])
.config(){.....
```

   Here "MY_GADGET_MODULE" refers to the gadget module.

To define services/factories or providers, either attach them to MY_GADGET_MODULE as shown:

```
MY_GADGET_MODULE.service('<SERVICE_NAME', [<INJECTABLES>, new
ServiceFunction(<INJECTED_OJECTS>){
   //Service Code

}]);
```

Or define them in their own module as shown:

```
angular.module("MY_CUSTOM_MODULE",[]).service('<SERVICE_NAME', [<INJECTABLES>,
new ServiceFunction(<INJECTED_OJECTS>){
   //Service Code

}]);
```

In the second approach, you need to set the dependency of the gadget to "MY_CUSTOM_MODULE" in the gadgetDefintion.xml to use the service in your gadget.

Service can be injected into the Controller function using the $inject method. Inject objects of services, factories, and providers in the init method of the Controller. Take care of the order of injection.

4.11.2 Accessing Services/Functions in Non AngularJS Gadgets

Non AngularJS Gadgets will not have access to AngularJS services, factories, or directives. If you have custom functions defined in the custom.js, use them directly in your controller code or in view.xhtml. It is always safer to make them unique to avoid potential conflicts. For example:

```
var SomeUniqueFunction1 = function() {
         this.userDefinedFunctionOne = function() {
            console.log("from userDefinedFunctionOne function of mygadget");
        }
        this.userDefinedFunctionTwo = function() {
            console.log("from userDefinedFunctionTwo function of mygadget");
        }
}
var SomeUniqueFunctionId= new SomeUniqueFunction1();
```

In your view.xhtml, you can call SomeUniqueFunctionId.userDefinedFunctionOne(). This will print "from userDefinedFunctionOne function of mygadget" in the console.

4.12 Including Independent AngularJS Module in Gadget

All Business Console gadgets are defined as independent AngularJS modules.

If you want to design services and directives in your gadgets as independent modules, perform these steps.

Define your services, factories, and directives as independent modules in custom.js. Set the dependency of your gadget module to those modules.

For example: In your custom.js, define a directive as a module.

```
angular.module("MY_GADGET_DIRECTIVE_MODULE", []).directive("myDirective",
function(){

// ADD DIRECTIVE CODE HERE
})
```

The "myDirective" directive above is defined in an independent "MY_GADGET_DIRECTIVE_MODULE" module.

To use "myDirective" directive in your gadget or in any other gadget, set the dependency of the gadget in gadget-definition.xml file to "MY_GADGET_DIRECTIVE_MODULE".

Navigate to gadget definition xml file and then under 'Dependencies' section, add the module names.

After the dependency is set, if you look up the config.js file of the gadget, you will find the dependency as shown below.

```
var myGadget = angular.module('myGadget-<ID>', ['adf.provider',
'MY_GADGET_DIRECTIVE_MODULE'])
```

This makes the gadget dependent on the module and is not able to use all services, factories, and directives from the new module.

If you are using third-party AngularJS libraries,

1. Save the library js files under the script directory of your gadget.
2. Include module(s) in your gadget by editing the gadget definition file.
3. Specify the modules under the "Dependecnies" section .

4.13 Using Custom JS/CSS files in Gadgets

To include your own JS/CSS files in gadgets, perform the following steps.

1. Copy the custom JS /CSS files to the respective directories under the gadget directory.
   - For JS files, copy to /YOUR_PROJECT/WebContent/gadgetName/scripts
   - For CSS files, copy to /YOUR_PROJECT/WebContent/gadgetName/styles
2. Navigate to the gadgetDefinition.xml located under /YOUR_PROJECT/WebContent/WEB-INF/gadgets/<Gadget_ID>.

3. Edit the gadget definition xml file to include the scripts/css.
4. Select the Gadget Defintion Editor tab.
5. Expand scripts and styles, and add the JS files/CSS files by navigating to the respective directory. If your JS files contains one or more AngularJS modules you want to add to the gadget, specify the module names in the "Dependencies" section.
6. Directly invoke the custom functions from your own JS files directly in the controller. For CSS files, the styles will be automatically applied to your gadget.

   NOTE: Styles under CSS files are applied universally to all the gadgets. Make sure you have applied selectors in your CSS to apply it selectively to your gadgets. For example, if you use a style shown below, this style will get applied to all elements having myStyle as class.

   ```
   .myStyle{
      border:solid 1px #FFF;
   }
   ```

   To ensure proper encapsulation, use style as shown below.

   ```
   .myGadget .myStyle{
      border:solid 1px #FFF;
   }
   ```

7. Use myGagdet style in the class of the root element in your gadget's view file.

   ```
   <div class="myGadget">
      <div class="myStyle">
         //STYLE GETS APPLIED HERE
      </div>
   </div>
   ```

   In this case below, style does not get applied.

   ```
   <div class="myGadget2">
      <div class="myStyle">
         //STYLE DOES NOT GET APPLIED HERE
      </div>
   </div>
   ```

4.14 Reusing JS files and CSS files Across Gadgets

The JS files and CSS files added to the gadgetDefintion.xml are also globally available for use in other gadgets. All JS files are included in the common gadget-framework.js file, and the CSS files are included in gadget-framework.css file.

For AngularJS modules, to use modules of other gadgets, set the dependencies to the modules of other gadgets.

```
var GadgetOne_Controller = function($scope) {

    this.userDefinedFunctionOne = function() {
        console.log("from userDefinedFunctionOne function of mygadget");
    }


    this.userDefinedFunctionTwo = function() {
        console.log("from userDefinedFunctionTwo function of mygadget"); }
```

```
    }
}

var gadgetOne_Controller= new GadgetOne_Controller(); // NOTE THE DIFFERENT CASES
```

5 Communicating Between Gadgets

5.1 Communicating Between Gadgets Using Events

Communication between gadgets is necessary to allow information to be shared between one or more gadgets. Gadget communication is possible only between AngularJS gadgets.

Two ways to allow communication between gadgets:

- JavaScript based EventBus
- AngularJS events

AngularJS defined events are sometimes not favorable for communication between gadgets as we need to decide the event flow (upwards or downwards) based on the logic. A more appropriate way for communication is to provide publish-subscribe mechanism for communication.

Gadget framework provides another communication mechanism using a JavaScript based EventBus that registers all the events from the controller when the controller is getting loaded.

5.1.1 Using EventBus

The gadget framework provides an AngularJS service called as EventBus to allow communication between gadgets. The EventBus can effectively provide gadget communication using publish-subscribe mechanism.

To use EventBus in your gadgets

1. Inject the 'EventBus' provider in the controller if not already included

```
gadget_controller.$inject = [ '$scope',
'RestServiceProvider','EventBus','$log','config'];
//INJECTING EVENTBUS IN CONTROLLER
```

2. Add the listener/handler logic to the subscriber controller(s).

   In the defineListener block, invoke addEventListener on the eventBus with the event type name.

```
this.eventBus.addEventListener("SOME_EVENT_NAME",this._handleEvents.bind(this));
```

3. Provide the logic for handling the event in the _handeEvents block as shown below.

   Here, the 'exampleHandleEventAction' function is invoked after receiving the event. Define the 'exampleHandleEventAction' function on $scope inside the 'defineScope' block.

```
_handleEvents:function(eventType,payload,context){
            /* Logic to handle events
             */
             switch(eventType){
             case "SOME_EVENT_NAME":
                    /* Add Event Handling Logic for GLOBAL_EVENT */
                    this.$scope.exampleHandleEventAction(payload); //ONCE EVENT
IS RECEIVED, INVOKE THE exampleHandleEventAction function on $scope.
                    break;
             }
      },
```

4. Clean up the listener on Controller unload. This is required to elimiate unnecessary event calls when no controller is available on the view.

```
this.eventBus.removeEventListener("SOME_EVENT_NAME",this._handleEvents.bind(this)
);
```

5. Trigger the event from the publisher controller.

```
this.eventBus.fireEvent("SOME_EVENT_NAME", "Some Event!");
```

5.1.2 Using Angular Events

AngularJS provides three services to allow communication between gadgets:

- $broadcast
- $emit
- $on

5.1.2.1 $emit

$emit service dispatches an event name upwards through the scope hierarchy, and notifies the registered $scope listeners. The event life cycle starts at the scope on which $emit was called. The event traverses upwards towards the root scope, and calls all the registered listeners along the way. The event will stop propagating if one of the listeners cancels it.

```
$scope.$emit('eventName', { message: msg });
```

5.1.2.2 $broadcast

$broadcast service dispatches an event name downwards to all child scopes (and their children) and notify to the registered $scope listeners. The event life cycle starts at the scope on which $broadcast was called. All listeners for the event on this scope get notified. Afterwards, the event traverses downwards toward the child scopes and calls all registered listeners along the way. The event cannot be canceled.

```
$scope.$broadcast('eventName', { message: msg });
```

5.1.2.3 $on

$on service listens to the events of an event type. $on can catch the event dispatched by $broadcast and $emit and handle the event accordingly.

```
$scope.$on('eventName', function (event, args) {
 $scope.message = args.message;
 console.log($scope.message);
});
```

5.2 Adding Gadget Settings

The settings.xhtml file of a gadget provides specific configurations at runtime to a gadget.

For example, in a gadget for charting, you might want to specify the chart type and other parameters for charting. The communication between the gadget controller and the settings.xhtml settings file is done through a config object injected to the controller as shown below.

```
//INJECTING CONFIG TO CONTROLLER

ExampleGadgetController.$inject = [ '$scope',
'RestServiceProvider','EventBus','config'];
```

The 'config' object injected in the code above is the gadget configuration service, which contains the configuration information and is available at the 'init' function in the controller, and is tied to the controller scope so that the values can be two-way bound in the settings.xhtml file.

For example, the code to bind an input box to a config object, and handle the input box in the controller is shown below.

```
settings.xhtml
<form class="form-horizontal">
    <div class="control-group">
        <label class="control-label hint--top">Gadget Configuration 1</label>
        <div class="controls">
            <input type="text" data-ng-model="config.params.config1">
        </div>
    </div>
    <input type="button" data-ng-click="applySettings()"></input>
</form>


controller.js
....
init : function(scope, restClient,EventBus,config) {
        ...

//ADDING THE CONFIG OBJECT TO SCOPE TO BIND TO UI
        scope.config = config;
        ....
}

...
defineScope : function() {
        var _this=this;
        this.$scope.applySettings:function(){
            console.log(_this.config.params.config1)
// This would print the value from the settings.xhtml file
            if(_this.config.params.config1==="SOME VALUE"){
            //Handle Accordingly
            }
        }
}
```

5.3 Connecting Multiple Views with Controller

All AngularJS gadgets generated using Designer have a controller that is automatically bound to view.xhtml. If you have multiple xhtml files to create the view, specify the sub-views in view.xhtml file.

To define the view when you have sub-views in multiple xhtml files

1. Create the <file_name>.xhtml under the views directory.
2. Use "data-ng-include" attribute to tie up with the parent view.

   For example, if you have created view1.xhtml and view2.xhtml, edit view.xhtml as shown below.

```
<div data-ng-
include="/<CONTEXT_ROOT_OF_APPLICATION/<GADGETS_DIRECTORY>/views/view1.xhtml">
</div>
<div data-ng-
include="/<CONTEXT_ROOT_OF_APPLICATION/<GADGETS_DIRECTORY>/views/view2.xhtml">
</div>
```

   Replace <CONTEXT_ROOT_OF_APPLICATION> and <GADGETS_DIRECTORY> accordingly. All views specified under the view.xhtml are automatically bound to the controller.

Note: You can use the **data-ng-model** or **data-ng-bind** attributes to setup two-way binding to the controller scope variables.

To invoke a function on the controller

1. Define a scope function under the "defineScope" block in the controller

```
defineScope : function() {
     ...
     this.$scope.myFunction= function() {

        //DO SOMETHING
     }
   ....
},
```

2. Invoke the function on the scope directly on user action or based on some business logic.

```
<button data-ng-click="myFunction()"> value="CLICK ME!"
// INVOKES THE FUNCTION myFunction defined on $scope on user click
</button>
```

6 Improving Gadget Performance

Business Console gadgets are built on top of AngularJS. Hence, improving gadget performance would mean improving the way the gadgets are coded.

6.1 Techniques for Improving Gadget Performance

6.1.1 Paginate

Ensure that all RESTful services that return huge datasets are well paginated on the server side. For example, if you are trying to load a grid with 1000 records, paginate 10-20 records at a time. You can have grid control, and lazy load datasets as and when users scroll through the grid. This will ensure that less data is processed by the UI, and will improve performance.

6.1.2 Minimize Use of Watchers

AngularJS scans and keeps track of all the changes in the application. This means that every watcher is monitored for update requests (digest cycle). If one of the watchers relies on another watcher, AngularJS re-runs the digest cycle to make sure that all of the changes are propagated. Digest cycle runs continuously until all the watchers are updated and the application is stabilized. Even though JavaScript execution is really fast in modern browsers, if you add too many watchers in AngularJS, your gadget might slow down. Although it is impossible to avoid watchers, minimizing watchers will definitely help performance.

For example, when ‘use bind once where possible‘watchers are set, AngularJS adds the ' ::' notation to allow one time binding. AngularJS will wait for a value to stabilize after the first series of digest cycles, and will use that value to render the DOM element. After that, AngularJS will remove the watcher and forget about that binding. You can use this to bind constant values which do not change throughout the application.

```
$scope.$watch
{{ }} type bindings
Most directives (i.e. ng-show)
Scope variables scope: { bar: '='}
Filters {{ value | myFilter }}
ng-repeat
```

6.1.3 Use ng-if Instead of ng-show

Use **ng-if** instead of **ng-show** wherever possible. **ng-show** will add the "display:none" style to your HTML code depending on the condition. So your HTML will always be part of the DOM even if it is hidden. **ng-if** will not add the HTML code to your DOM if the condition is not satisfied, thus minimizing the size of the DOM object. Make sure that your use case is satisfied by ng-if.

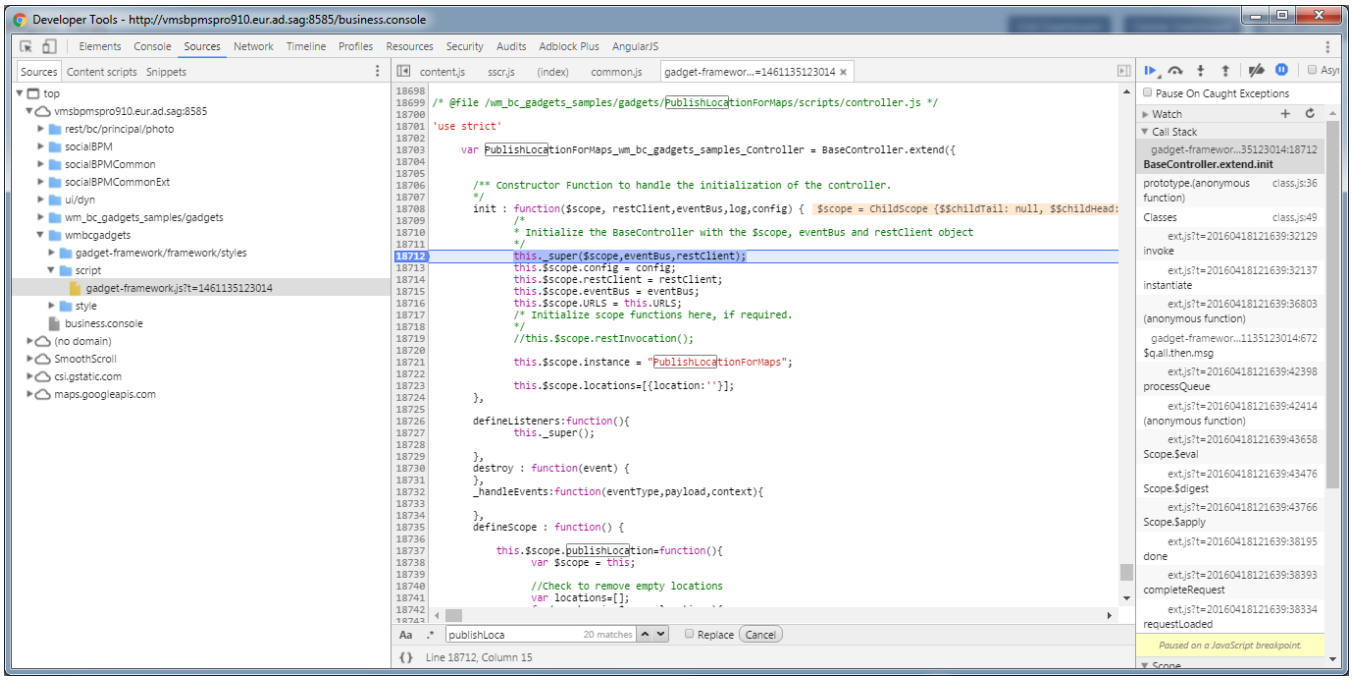
7 Troubleshooting Gadgets

All your gadget code is included in a JavaScript file called gadget-framework.js. Use the gadget-framework.js file of a gadget to test the gadget code.

7.1 Testing Gadget in a Browser

Testing a gadget in Chrome browser

1. Open the "Developer Tools" (Press F12).
2. In "Sources" tab, from the left hand side menu, expand wmbcgadgets > script.
3. Double-click on gadget-framework.js. This file contains all your gadget code.
4. Search for your controller function (Use Ctrl+F).
5. Set break points accordingly.



7.2 Handling Exceptions

The gadget framework in Designer handles all the compile-time errors in your gadget code. To ensure that your gadget is free of syntax error, check the errors and warnings sections, and ensure that no errors are listed. If there are any warnings, program the gadget to handle the warnings to ensure that your gadget works properly. To handle runtime exceptions, you can encapsulate your scope functions in a try/catch block, and log the errors appropriately.