

# webMethods Unit Test Framework Help

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This document applies to webMethods Unit Test Framework Version 10.3 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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## About this Guide

This guide provides information on service testing options of Integration Server using webMethods Test Suite. The scope of this document is to introduce the suite, design and execute test cases.

It is assumed that the user is familiar with the standard build and test tools such as, Ant and JUnit.

## Document Conventions

Convention	Description
<b>Bold</b>	Identifies elements on a screen.
Narrowfont	Identifies service names and locations in the format <i>folder.subfolder.service</i> , APIs, Java classes, methods, properties.
<i>Italic</i>	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text. References to other documentation sources.
Monospace font	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the   symbol.
[ ]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [ ] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

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# 1 Unit Test Framework

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## Overview

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Test Suite is an Eclipse based testing tool that allows developers to create unit tests for their development. These tests improve the overall development quality and provide a mechanism to create automated tools for continuous integration and delivery.

Test Suite provides the following functionalities:

- Provides service unit testing and regression testing tools that allows service developers to assemble unit tests without the need for additional development
- Enables integration with JUnit to leverage a standard unit testing framework, which already works well with Continuous Integration tools
- Enables ease of use for test development
- Provides a Java API for advanced users to create JUnit test cases
- Provides a user interface that is integrated in Software AG Designer. Software AG Designer ensures that users do not switch between tools for services development and corresponding test cases
- Provides a mechanism to repeatedly execute the service with same inputs and compare the results with an expected set of outputs
- Provides a framework for mocking service execution for steps that cannot be executed during the testing. For details, see [“Using Mocks ” on page 32](#)

## Terms and Concepts

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This section provides information on the terms and concepts used to understand Test Suite.

### Services

The webMethods Integration Server hosts packages that contain services and related files. The server contains several packages.

For example, Packages that contain built-in services, which can be invoked from services or client applications and services that demonstrate features of the webMethods Integration Platform.

You can create additional packages to hold the services that your developers create. Developers can create services that perform functions, such as, integrating your business systems with those of your partners, retrieving data from legacy systems, and accessing and updating databases.

Integration Server provides an environment for the orderly, efficient, and secure execution of services. It decodes client requests, identifies the requested services, invokes

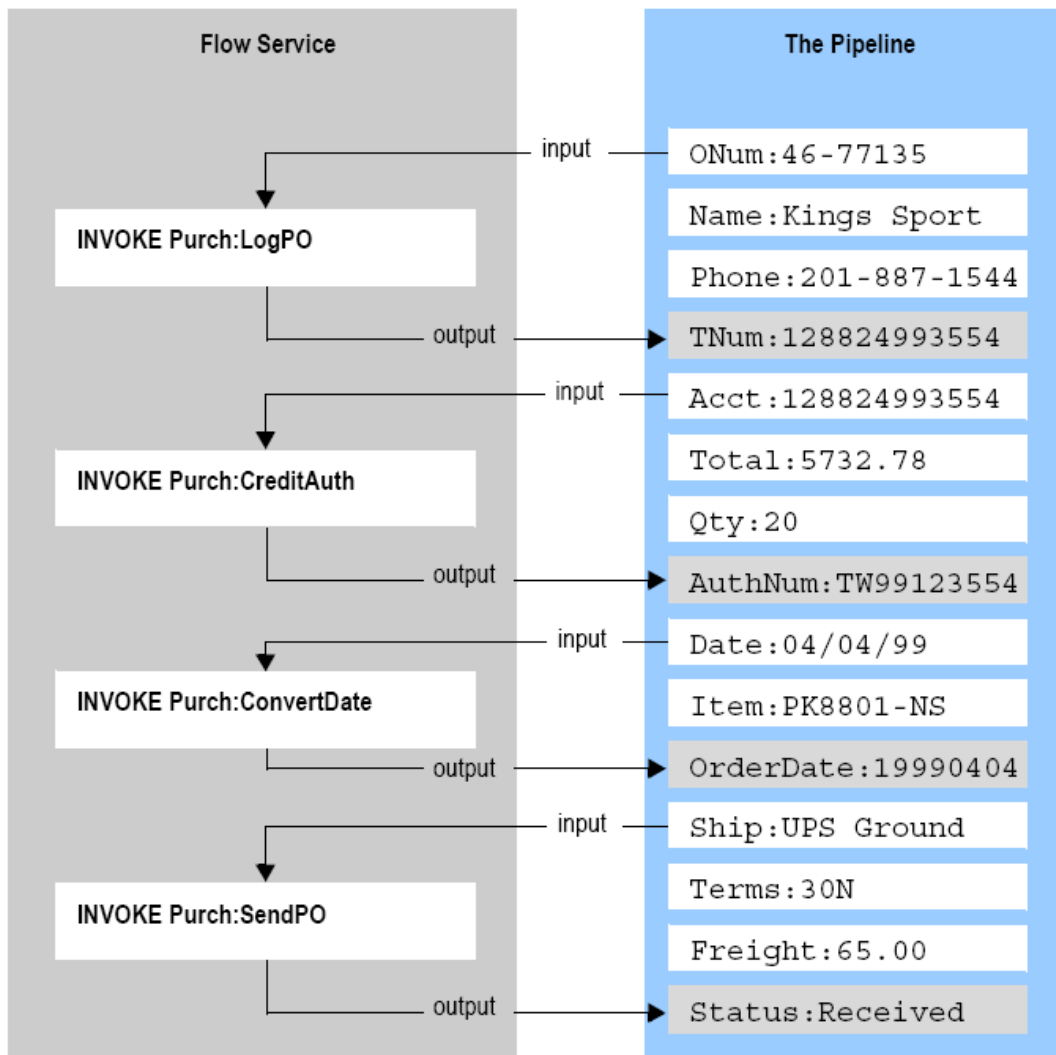


the services, passes data to them in the expected format, encodes the output produced by the services, and returns output to the clients.

## Pipeline

Pipeline refers to the data structure in which input and output values are maintained for a flow service. It allows services in the flow to share data.

### The pipeline holds the input and output for a flow service



Pipeline starts with the input to the flow service and collects inputs and outputs from subsequent services in the flow. The service in the flow has access to all data in the pipeline at that point.

## Unit Testing

Test Suite uses the concepts of service execution, pipeline data, and the open source JUnit testing framework to provide unit testing functionality for Integration Server Flow and Java services. Test Suite provides the ability to create a suite of tests consisting of individual test cases. Each test case defines a service to be tested, the type of test to be performed, and provides a user interface to define input data to the test case through the pipeline. When the service execution is completed, the pipeline output is validated against the expected output defined in the test case.

## Test Case

A test case is a unit of testing for a service that provides:

- service to be tested
- inputs to the service
- expected output from the service

A test case can also define expected output from a service as an exception or error. The service returns the defined errors when incorrect data is sent to it.

## Test Suite

A test suite is one or more test cases grouped together. Test suites are used to organize test cases into sets of related tests. For example, a service may provide a variety of capabilities based upon the inputs provided to it. A complete test suite should include test cases that provide inputs that fully test all of the possible outputs of the service, including errors or exceptions.

## Mock

Mocks provide a means of simulating interaction with resources that are unavailable or the data provided by these resources or systems is not consistent for test purposes. Mocks also have a lifetime that can either be limited to the test case in which they are defined or applied to all of the test cases that follow within a test suite from the point of the definition.

Mock intercept can control the session, user, and server based on the scope setting. If the scope is set to session, the test sessions will be affected by the mock. It is recommended to set the scope to session for most users. If the scope is set to user, all the sessions for the particular user will be affected by the mock. If the scope is set to server, all user sessions will be affected by the mock. Mocks can be enabled or disabled for test case or test suite execution.

## Service Mock

A service mock is used to replace the call to a service with a call to a different service. Any call to the mocked service is intercepted and the alternate service defined in the mock is called instead. The output of the mocked service is then returned to the calling service. This kind of mock is useful when the output of the mocked service needs to be dynamic based on some logic that can be created in the service.

## Exception Mock

An exception mock is used to return an error or exception to the calling service and can be useful for testing error handling in a service. As with the other mocks described, any call to the service defined in the mock is intercepted and the exception defined in the mock is returned instead. This kind of mock is useful to simulate behavior that can cause exceptions in the normal flow.

## Factory Mock

A factory mock is used when a call to a service produce multiple different outputs based on the provided input. A factory mock is implemented as a Java class. Any call to the class defined in a factory mock is intercepted and the input is passed to the factory which evaluates the input and returns the appropriate results. While both the factory mock and the service mock options provide dynamic output simulation, the factory mock does not require an extra test service to be created on the server and relies on a lightweight java implementation.

## Capabilities

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Test Suite has following capabilities:

- Unit testing
- Mock testing
- Regression testing

### Unit testing

Test Suite is a unit-testing tool. You can design, build, and execute unit test cases using Eclipse User Interface. You can also execute the test cases externally using Ant scripts.

### Mock testing

Mocking is a feature that mimics the functionality of services that are dependent on external resources. When a test case encounters a service that is mocked, it executes the service.

## Regression testing

You can save the test cases, along with their inputs and outputs, in xml files. Run the reusable artifacts to ensure that the latest changes do not reintroduce the errors fixed in the earlier versions.

## Server Definition

Integration Server preferences in Designer describe the connection to for Test Suite.

Designer always uses the active default Integration Server definition for Test Suite. Secure connection option in default server definition indicates whether the session will be opened through HTTP or HTTPS. In Designer, navigate to **Window > Preferences > Software AG > Integration Server** to add, edit, and update connection configurations. For details, refer the *webMethods Service Development Help*.

The editor does not always require an active connection to the test development. But some of the introspection features that allow service lookup and service signature are not available if a connection is not available and so, the user should enter them manually.

## Environment

Option	Description
Hardware Requirements	No additional hardware is required other than the ones that are already in use for Integration Server and Software AG Designer.
Software Requirements	<p>Developer Installation Requirements</p> <ul style="list-style-type: none"> <li>■ Unit Test Framework Eclipse plug-in (<b>Designer &gt; Services &gt; Unit Test Framework</b>)</li> <li>■ WmServiceMock package for Integration Server (Integration Server or <b>Microservices Runtime Packages &gt; Unit Test Framework</b>)</li> </ul> <p>Unit Test Framework Software AG Designer plug-in can work with both Local and Remote Integration Server.</p> <p>Continuous Integration Installation Requirements</p> <ul style="list-style-type: none"> <li>■ WmServiceMock package for Integration Server (Integration Server or <b>Microservices Runtime Packages &gt; Unit Test Framework</b>)</li> <li>■ Unit Test Framework libraries (<b>Infrastructure &gt; Libraries &gt; Unit Test Framework Libraries</b>)</li> <li>■ Ant Build tool 1.7 (optional)</li> </ul>

Option	Description
Version Compatibilities	<ul style="list-style-type: none"><li data-bbox="461 323 711 359">■ JDK 1.8 or later</li></ul> <p data-bbox="461 401 1281 436">This suite depends on open source products like Ant and JUnit.</p> <p data-bbox="461 453 951 489">Following are the supported versions:</p> <ul style="list-style-type: none"><li data-bbox="461 506 613 541">■ Ant: 1.7</li><li data-bbox="461 558 643 594">■ JUnit: 4.11</li></ul> <p data-bbox="461 611 1243 716">Unit Test Framework works with all the currently supported General Availability (GA) versions of Integration Server and Software AG Designer.</p>

## What it is not

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- Test Suite is not an integration or system test platform. However, this suite is used to mock the application dependencies and simulate the integration or system test.
- Test Suite is not a performance-testing tool. It cannot be used for performance, load, or volume testing.



## 2 Working with Unit Test Framework

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## Opening the Unit Test Framework Perspective

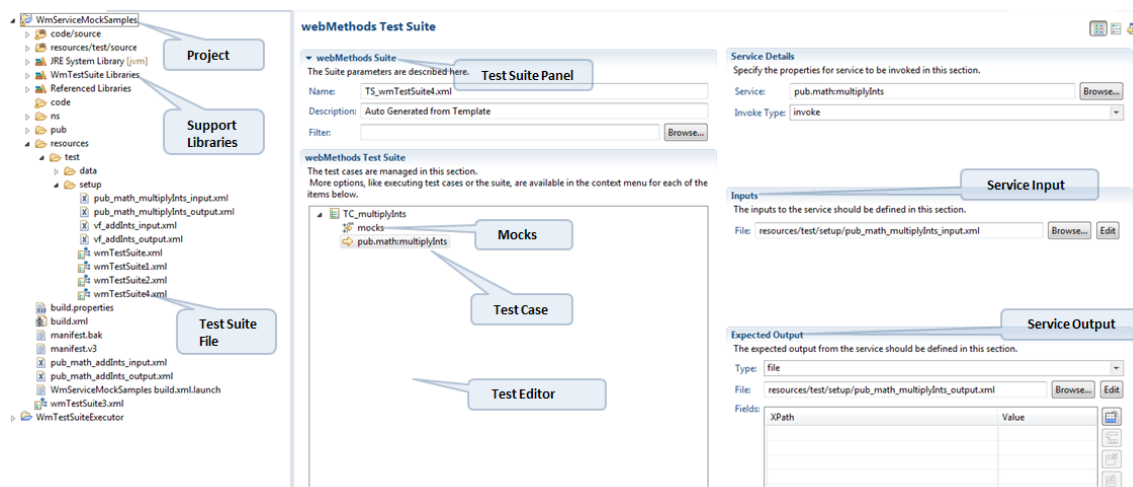
Software AG Designer provides a Unit Test Framework perspective that contains the views, editors, and tabs needed to build test suites and other supporting elements.

1. In Designer, select **Windows > Open Perspective > Other**.
2. In the Open Perspective dialog box, select Unit Test Framework and click **OK**.

Designer switches to Unit Test Framework perspective.

## Layout

The figure below shows various components of Software AG Designer with a test suite file open for editing.



Use the following icons on the toolbar to tailor the layout.

Icon	Description
	Allows you to place the Master and Details views next to each other, master on the right and details on the left.
	Allows you to make the master appear at the top of the display, and the details view gets aligned underneath it.
	Allows you to toggle the display between the master and details views, each occupying the entire display. Click again to return to the original layout .



## Test Suite Preferences

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To display the preferences dialog box, select **Window>Preferences>Software AG>webMethods TestSuite**.

### Advanced

The Advanced preferences control other behaviors of Test Suite.

Preference	Description
<b>Use Relative Paths in Filenames</b>	Makes file name references relative to the Eclipse project containing the test suite rather than using the full path. Using relative names helps in executing tests when the test suite and data files are moved between environments and systems. This option is enabled by default.
<b>Allow Comparator Configuration</b>	Controls the display of the field that allows the selection of the comparator and does not allow/disallow this during execution.
<b>Allow client side mock factory objects</b>	Enables the option of creating client side factory object that do not need to be deployed on the server before executing test cases. This option controls the display of the field that controls whether the mock factory objects are needed on the server or can be pushed during the execution of the tests.
<b>Display all fields in the expression editor</b>	Enables additional fields in the Expected Output section of a test case. This option is useful if you want to check several output conditions together.
<b>Allow editing of XML (Effective after reopen)</b>	Enables editing of the XML source for the test suite. This option requires that the open test suite file is closed and reopened before its behavior reflects in the editor.
<b>Allow scope selection for mocks</b>	Enables scope selection for the mock. The default setting of unchecked is appropriate for most test case scenarios.

Preference	Description
<b>Confirm delete of single objects</b>	Enables the display of a confirmation dialog box for every mock service or data entry delete.
<b>Confirm delete of multiple objects</b>	Enables the display of a confirmation dialog box when you delete multiple mock service or data entries.
<b>Confirm service paste</b>	Enables the display of a confirmation dialog box when you paste a test services.

## License

The License preferences provide the license related information of Test Suite.

Preference	Description
<b>License file</b>	Allows you to select the license file for Test Suite.
<b>Check License</b>	Allows you to check the validity of the license file.

## Editor

The Editor preference allows you to list the packages to load to the service browser. connection to webMethods Integration Server.

Preference	Description
<b>Package Filter</b>	Optional. Allows you to optionally enter a comma-separated list of packages for Test Suite to load to the service browser. When a large number of packages exist on the Integration Server, this feature loads only those services for which test cases are developed and thereby conserves memory in Test Suite.

## Validation

The Validation preferences describe when and how Test Suite should validate the information that you enter.

<b>Preference</b>	<b>Description</b>
<b>Validate on Save</b>	Allows Test Suite to validate the test suite prior to saving it to the file system. This option is enabled by default.
<b>Validate before switching mode</b>	Allows Test Suite to perform validation of the test suite prior to switching from the XML editor mode to the test suite editor.
<b>Validate against schema</b>	Allows Test Suite to validate the test suite against the XML schema. This is useful if you use the XML Source tab to enter details of one or more test cases in the suite. This option is enabled by default.



# 3 Creating a Test Suite

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## Before You Begin

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Before creating a test suite, ensure that you organize the required test cases and data files in a test folder.

If the test cases are packaged in the Integration Server package, it provides a common source location for all related assets. You can import the package on eclipse workspace.

Example: Consider that the test cases are created in the resources test folder of the Integration Server package.

While any organizational structure that conforms to Integration Server package structure can be used, the following example provides a useful approach for organizing test cases in your environment. For ease of organization, follow the steps below:

1. Right click the **Resources** directory and create a subdirectory under it called **test**.
2. Right-click the **test** directory and create two additional folders **data** and **setup**.
3. Add the test suites to the **setup** directory and organize the **data** directory using subdirectories for each test suite to contain the input data files for the test cases comprising a test suite.

## To Create a Test Suite

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Follow the below steps to create a test suite:

1. Navigate to **resources> test> setup folder**.
2. Select **File>New> Test Suite**.
3. On the **webMethods TestSuite** screen, enter the folder path that contains the test suite setup files, provide a file name, and a suite name.
4. Click **Finish**.

You can now start creating the test cases.

## Creating a Sample Test Suite

---

Designer allows you to create sample Test Suite projects.

1. Navigate to **resources> test> setup folder**.
2. Select **File>New> Test Suite Example**.
3. On the **Sample wmTestSuite Project** screen, enter the project name and location. You can choose to use the default values.

This Test Suite familiarises you on building test cases.

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# 4 Adding Test Cases

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## Adding a Test Case

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Adding a test case involves the following steps:

1. Adding required test details. See [“Test Details” on page 24](#).
2. Adding the required service details. See [“Service Details” on page 24](#).
3. Defining inputs to services. See [“Inputs” on page 24](#).
4. Defining the expected output. See [“Expected Output” on page 25](#).

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## Test Details

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To add test cases:

- Right click on the **webMethods Test Suite** section.

The **Test Details** section appears in the details area to the right side of the display. Provide a name and description for the test case.

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## Service Details

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After creating the test details, you can now select the service to be tested.

1. Click **Browse** in the Service Details section to enable searching for the service within the Integration Server.

**Note:** You can narrow the search by entering a package name or service name and the service browser will restrict the display to only those packages or services matching the search criteria entered.

2. Click  to refresh or set additional options for service browser.

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## Inputs

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Test Suite looks at the *service signature* for services in the Integration Server. When defining the inputs to the service selected in [“Service Details” on page 24](#)

- Click **Edit** to modify the values of the input parameters and click OK to save the changes.
  - Click **Save...** to save the file in the location designated for the input data after defining the input.
  - Click **Load** to import a saved input data.



- Click **Browse** to add a saved file as the input to the service.




## Expected Output

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The final step in defining a test case is to complete the Expected Output section. Expected Output can be in the form of data returned from the service or an exception returned from the service.

Use the class browser to define an exception or error output from the service. Click **Browse** to display the classes and select the proper exception class to use.

To define the data output from the service, use the following methods:

- Use XPath expressions to define which data elements in the output data should be evaluated.
  1. Copy the XPath expressions from Software AG Designer. To copy the XPath expression, right click on the variable in the **Results** area when executing the service within Software AG Designer and select **Copy**.
  2. Click , , or  and paste the copied value into the XPath field.
 

An entry for the variable selected is created. However, in most cases it is not required to edit them as the webMethods paths are 0 index based whereas XPath expressions are 1 index based.
  3. Enter the expected output for the field in the **Value** field.
 

You can select AND, OR, parentheses, and operators from the drop-down lists to create complex evaluations of the output.
- Use regular expressions to evaluate the output returned from the service. The regular expression should be placed in the Value field preceded and followed by "/" character.

## Output Comparison

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Unit Test Framework allows you to select predefined or customize the output comparison to compare service results and check the destination table to confirm the operation executed successfully.

### Prerequisite

For the Output Comparison section to appear on the webMethods TestSuite screen, ensure that you select the **Display all comparators** option on the Preferences dialog box. To select **Allow Comparator Configuration**, navigate to **Window > Preferences > Software AG > webMethods TestSuite > Advanced**.

1. On the Output Comparison section, select **Comparator Type**.

2. Select one of the following options:


Select...	To...
<b>Default</b>	Compare the actual and expected service result without any filter.
<b>Ignore Namespace Prefix</b>	Ignore the namespace prefix from the service results. For example, for a field value <code>demotest:employee</code> in the actual result, where <code>demotest</code> is the namespace prefix, Unit Test Framework ignores the namespace and uses <code>employee</code> for comparison.
<b>Use Field Alias</b>	Specify which fields in the service result should be compared.  You have to provide a field alias for the field in the actual result that you want to Unit Test Framework to compare against in the expected output.  For example, for a field value <code>demotest:employee</code> in the actual result, you can assign a <code>1002</code> as the field alias. Then, Unit Test Framework uses <code>1002</code> instead of <code>demotest:employee</code> for comparison.  Click  to add the list of fields to compare.  Click  , or  to edit or delete the entries.
<b>Custom</b>	Specify a custom comparator for expected output other than provided with the plug-in.

# 5 Generating Tests

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## Generating Tests Suites using Service Execution Results

Test Suite allows you to generate tests from the details of recently run services present in the Result view. Using the Generate Test icon  on the Results view, you can export the available service invoke or run details to form a unit test and save in a Test Suite.

Ensure that you have installed the Test SuiteDesigner plugin.

1. In the Service Development perspective, navigate to the **Results** view of recently run services and select the service for which you want to generate a test.

**Note:** For details on viewing the Results view, see the *Software AG Designer Online Help*.

2. Click .
3. In the Export Pipeline dialog box, provide the following details and click **Finish**.

Type	Function
<b>Container</b>	<p>Specifies the project or directory location of the Test Suite.</p> <p>Ensure that you use an organizational structure that conforms to Integration Server package structure.</p> <p>Ensure that the specified project exists in the workspace.</p>
<b>TestSuite</b>	<p>Specifies the name of the TestSuite file.</p> <p>Use <b>Overwrite</b> to rebuilt the Test Suite. This overwrites the existing Test Suite.</p> <p>Use <b>Append</b> to append to the existing Test Suite.</p> <p><b>Note:</b> Ensure that you provide the filename with the extension. For example, <i>wmTestSuite.xml</i>.</p>
<b>Input</b>	<p>Specifies the service input file location.</p> <p><b>Note:</b> You can choose to retain the default value.</p>
<b>Output</b>	<p>Specifies the expected output file location.</p> <p><b>Note:</b> You can choose to retain the default value.</p>

The Test Suite is created at the specified location.

4. Double click the newly created Test Suite.

The test details are displayed. You can edit the test details. To edit the test details, see .



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# 6 Mocks

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## Using Mocks

Mocks are used when resources that a service may require to properly execute may not be available when a test case or test suite is developed or executed. Mocks provide a means of simulating interaction with resources that are unavailable.

### To create a mock

1. Expand the test case for which you want to define the mock, right click on **Mocks** and select **Add**.
2. Click **Browse** and use the **Service Browser** to select the service to be mocked.
3. Enter the first few characters of the service name to reduce the list. Click to refresh the list and access preferences for the **Service Browser**.
4. Select the required **Lifetime**.  
Valid selections are **test** (mock is effective only for the selected test case) and **suite** (mock will be effective for all of the test cases that follow in the test suite).
5. Select the required **Type**.

Following are the valid selections:

Type	Function
<b>pipeline</b>	Intercepts the service and returns the specified pipeline (for details on creating or editing pipeline data see <a href="#">“Inputs” on page 24</a> ).
<b>service</b>	Intercepts the service and substitutes the selected service with a call (for details on working with the Service Browser, see <a href="#">“Service Details” on page 24</a> ).
<b>exception</b>	Intercepts the service and returns an exception (for details on selecting exception classes, see <a href="#">“Expected Output” on page 25</a> ).
<b>factory</b>	Intercepts a call to the mocked service and returns the data based on the input (for details on creating a mock factory, see <a href="#">“Sample Mock Factory” on page 33</a> ).

6. Select the scope.

It is recommended to use the **session** scope for most purposes. To allow the scope selection, select the corresponding preference.



## Sample Mock Factory

The following code snippet illustrates the minimum requirements for creating a mock factory. The factory class and any other classes should be designed to evaluate the input data to the factory and return data relevant to that input in an IData format. The example below returns static data.

```
package com.wm.ps.serviceMock.samples;
import com.wm.app.b2b.server.BaseService;
import com.wm.app.b2b.server.invoke.ServiceStatus;
import com.wm.data.IData;
import com.wm.data.IDataFactory;
import com.wm.ps.serviceMock.MockDataFactory;
public class SampleMockDataFactory implements MockDataFactory
{
    private static final long serialVersionUID = 2L;
    public IData createData(BaseService baseService, IData pipeline, ServiceStatus serviceStatus)
    {
        IData[] results = new IData[]{IDataFactory.create(new Object[][]{
            {"originationSource", "W"},
            {"bizType", "RT"},
            {"lockExpirationDate", "20050427"},
            {"floatLoanIndicator", "Y"},
            {"uwFinalDecisionCode", "0"},
            {"uwDecisionExpiryDate", "20050427"},
            {"canDate", "20050427"},
            {"loanCloseStatusType", "T"},
            {"fileReceivedAtRocDate", "20050221"},
            {"loanReadyToFundIndicator", "P"},
            {"regisDate", "20051221"},
            {"loanSubmitToUwDate", "20050427"},
            {"loanNumber", "0000000001"},
            {"branch", "TOTAL ADVANTEDGE LLC", ""},
            {"underwritingDecisionCode", "0"},
            {"underwritingDecisionExpirationDate", "20050427"},
            {"lockDate", "20051220"},
            {"lockIndicator", "Y"},
            {"tmoLoanStageCode", "3"},
            {"tmoLoanStageDate", "20050427"},
            {"product", "C30", ""},
            {"borrowerFirstName", ".", ""},
            {"borrowerLastName", "XX", ""},
            {"propertyAddress", "937 S MEYER", ""},
            {"propertyCity", "TUCSON", ""},
            {"propertyState", "AZ"},
            {"propertyZip", "85701"}
        })};
        IData output = IDataFactory.create(new Object[][]{{"results", results}});
        return IDataFactory.create(new Object[][]{{"getPotentialDuplicatesOutput", output}});
    }
}
```

## Mocks beyond Unit Testing

---

Although Test Suite added the ability to mock service calls in Integration Server for unit testing, the feature is so powerful that its use cannot be limited to unit testing alone. One common case is to use the mocking capability to provide flow service instrumentation.

Using the `wm.ps.serviceMock:loadMock` service in the `WmServiceMock` package, any service can be mocked with an alternate service or class. The new service or Java class code can invoke any operations and then invoke the original mocked service. The mocking framework is intelligent enough to detect recursion and, as such, provides an instrumentation capability.

Mocks can be used to design test cases. A service being tested can also itself be mocked with other code. In such a scenario, the mocked test service can be replaced with other code that can execute pre and post-test operations. This can provide some basic functional testing capabilities for Test Suite.

---

# 7 Advanced Options

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## Pipeline Filter

---

The execution of test cases is initiated as a client to the Integration Server hosting the services to be tested. For this reason, the inputs supplied to the service during execution and the expected outputs need to be serialized over the client-server interaction. If the input or output pipeline contains non-serializable objects, these objects are either lost or seen incorrectly during test execution. In addition, the service input needs to be more dynamic in nature than the static pipeline setup in the test case. Pipeline Filter helps to resolve these issues.

The Pipeline Filter is set once for the entire suite and provides a callback mechanism for the test developer to inject code that can modify various pipeline objects during execution. The Pipeline Filter is a class that implements the `com.wm.ps.test.PipelineFilter` interface and enables a user to add, remove, or change variables in the pipeline that are created from files, as pipelines created from files may not be able to persist custom java objects. The output pipeline from a service can also be filtered using the appropriate method. Only one such instance of the implementing class is created for the test suite and the name of test case is passed as a parameter.

The pipeline filter can be setup for the test suite in the main panel for the suite parameters.

## Comparators

---

Comparator provides an extension that can be used to extend, enhance, or replace the standard comparison of expected output.

Each test suite can have its comparator that can be specified from the user interface.

Custom comparators are Java classes that implement the `com.wm.ps.test.ResultsValidator` interface.

Comparators also provide a mechanism to execute operations pre and post service execution. Using comparators you can build some basic functional testing capability. For example, if a service writes to a database table, a comparator can compare the results from the service and check the destination table to confirm the operation executed successfully. You can also specify filters while comparing.

## Client Mock Factory

---

The benefit of using a mock factory object as opposed to a service is that it provides a light-weight alternative that does not require the creation of a new service on the server.

Test Suite provides an option to dynamically push the classes needed for supporting the mock factory on the server during test execution. This option can be used to avoid the need for frequent restart when Java objects are changing. Once stabilized, it would be

helpful to deploy the code to the server as this feature is experimental in nature and will only work if the dependency tree is not too complex. Using the user interface, you can set the option to dynamically push the objects to the server.

If the option is disabled, enable the corresponding preference as discussed in the Advanced section.

<b>webMethods expression</b>	<b>JXPath equivalent</b>
PosRequest/ns:Log/ns:Transaction[0]/@Flag	PosRequest[@name='ns:Log'] [@name='ns:Transaction'] [1] [@name=@Flag]
PosRequest/ns:Log/ns:Transaction[0]/ ns:BUnit[0]/ns:ID/*body	PosRequest[@name='ns:Log'] [@name='ns:Transaction'] [1][@name='ns:BUnit'] [1] [@name='ns:ID'] [@name='*body']

## XPath Expressions

The XPath expressions used in the expected output panel are different from the usual webMethods path expressions. As mentioned in the [“Expected Output” on page 25](#) section, the indices start at 1 instead of the 0 based webMethods indices.

Test Suite uses JXPath for evaluating XPath expressions. For details on JXPath expressions, visit [“http://commons.apache.org/jxpath/”](http://commons.apache.org/jxpath/). Special characters such as '@' and ':' in the name have special meaning in JXPath expressions hence, you should use special syntax variant to use these characters in variable name.



# 8 Test Suite Internals

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## Test Suite Internals

In Software AG Designer, test suite editor provides a user interface to graphically and quickly develop test cases for Integration Server services. The test suite and the test cases are saved in an XML file. The Software AG Designer editor allows editing the XML source directly, provided that the user is aware of the format and the associated schema.

It is not recommended to edit the XML file as it is error-prone. It provides the option to automate the creation of test cases automatically by using code to generate the XML file directly. One such use case is the scenario where service inputs and outputs have been captured in an environment and test cases have to be generated to use these files for regression testing.

A sample XML test suite file in its simplified form can be as shown in the figure below:

```
<?xml version="1.0" encoding="UTF-8"?>
<webMethodsTestSuite description=
"Sample tests for the WmServiceMockSamples implementation" name="Sample Tests">
  <webMethodsTestCase description=
"Duplicate Check Success with IData results" name="Duplicate Check Success With Results">
    <mock folder="wmServiceMockSamples.data.services" name="getPotentialDuplicates">
      <pipeline filename="resources/test/data/mockDupCheckOutputResults.xml"/>
    </mock>
    <service folder="wmServiceMockSamples.services" name="getDuplicateLoans">
      <input>
        <file filename="resources/test/data/dupCheckInput.xml"/>
      </input>
      <expected>
        <file filename="resources/test/data/dupCheckSuccessWithResults.xml"/>
      </expected>
    </service>
  </webMethodsTestCase>
  <webMethodsTestCase description=
"Duplicate Check Failure handled by the catch block" name="Duplicate Check Catch Block">
    <mock folder="wmServiceMockSamples.data.services" name="getPotentialDuplicates">
      <exception class="java.lang.IllegalArgumentException" message="Bad argument"/>
    </mock>
    <service folder="wmServiceMockSamples.services" name="getDuplicateLoans">
      <input>
        <file filename="resources/test/data/dupCheckInput.xml"/>
      </input>
      <expected>
        <exception class="java.lang.IllegalArgumentException" message="Bad argument"/>
      </expected>
    </service>
  </webMethodsTestCase>
</webMethodsTestSuite>
```



# 9 Java Unit Tests

---

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-------------------------	----

## Java Unit Tests

Test Suite Java API allows you to create pure JUnit test cases that can provide the same features that a user interface driven codeless test cases do.

The change when creating a Test Suite JUnit test case from the traditional test case is that the implementing class extends `com.wm.ps.test.WmTestCase` instead of `junit.framework.TestCase`. `com.wm.ps.test.WmTestCase` does extend the `junit.framework.TestCase`. The two important methods that are needed for creating test cases using the java API are:

- `invokeService` – The method to invoke a service on the server
- `mockService` – There are various variants of this method that allow the user to setup a mock for a service on the server.

A sample JUnit test case is provided here:

```
package com.wm.ps.serviceMock.samples;
import com.wm.data.*;
import com.wm.ps.test.*;
public class DuplicateCheckTest extends WmTestCase
{
    public void testDupCheckCatchBlock() throws Exception
    {
        IData input = IDataFactory.create(new Object[][]{
            {"lienType", "1"},
            {"borrowerSSN", "111-11-1111"},
            {"propertyAddress", "937 S Meyer"},
            {"propertyZip", "85701"}
        });
        String exceptionText = "Bad argument";
        mockService("wmServiceMockSamples.data.services", "getPotentialDuplicates", new
        IllegalArgumentException(exceptionText));
        try
        {
            invokeService("wmServiceMockSamples.services", "getDuplicateLoans", input);
            assertFalse(true); //Control getting here means failure
        }
        catch (Exception e)
        {
            assertTrue(e.getMessage().endsWith(exceptionText));
        }
    }
    public void testDupCheckSucessWithResults() throws Exception
    {
        IData input = IDataFactory.create(new Object[][]{
            {"lienType", "1"},
            {"borrowerSSN", "111-11-1111"},
            {"propertyAddress", "937 S Meyer"},
            {"propertyZip", "85701"}
        });
        IData mockOutput =
        WmTestSuiteUtils.getIDataFromFile("resources/test/data/mockDupCheckOutputResults.xml");
        mockService("wmServiceMockSamples.data.services", "getPotentialDuplicates",
        mockOutput);
        IData output = invokeService("wmServiceMockSamples.services", "getDuplicateLoans",
        input);
        IDataCursor outCursor = output.getCursor();
    }
}
```

```
IData response = IDataUtil.getIData(outCursor, "response");
IDataCursor responseCursor = response.getCursor();
String creationTime = IDataUtil.getString(responseCursor, "@creationTime");
assertNotNull(creationTime);
assertEquals(28, creationTime.length());
IData[] duplicateLoans = IDataUtil.getIDataArray(responseCursor, "duplicateLoans");
assertEquals(duplicateLoans.length, 1);
}
}
```



---

# 10 Executing Tests

---

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## Executing Test Cases

---

To execute test cases created with Test Suite, right click in the webMethods Tests section and select one of the following options:

- **Run Tests** - executes the selected test case, using the mocks that are defined for the test case.
- **Run Test with Mocks Disabled** - executes the selected test case by disabling the mocks defined for the test case.
- **Disable Test** - marks test case as disabled. Tests are not executed until it is enabled again.
- **Disable Mocking in Tests** - marks mocks defined for selected test as disabled. Mocks are not executed until they are enabled again.
- **Add** - adds another test case to the suite.
- **Insert** - inserts another test case to the suite after the selected test case.
- **Remove** - removes the selected test case from the suite.

## Executing Test Suites

---

To execute test suites created using Test Suite, right click in the webMethods Tests section and select one of the following options:

- **Run Suite** - executes the selected test suite, using the mocks that are defined for the test suite.
- **Run Suite with Mocks Disabled** - executes the selected test suite by disabling the mocks de-fined for the test suite.
- **Disable Suite** - marks test suite as disabled. The test suite is not executed until it is enabled again.
- **Disable Mocking in Suite** - marks mocks defined for this suite as disabled. Mocks are not executed until they are enabled again.
- **Shift Up or Shift Down** - changes the order of test cases in the test suite by shifting the selected test case up or down in the test suite.

## Debugging Java Code

---

Various components in Test Suite rely on Java code.

Example: Java mock factory and pipeline filter classes.

Use the **Debug** menu to debug a Java code. The support library jar files also have source code associated with them. Debugging into the source can be helpful to understand the internals of the test execution or to enhance capabilities new features like custom comparators.

## Continuous Integration

For continuous integration you can invoke headless tests through Test Suite Executor which provides default Ant script to start with.

### Creating a Test Suite Executor

Software AG Designer allows you to create Test Suite executor projects and execute tests in headless mode.

Perform the following steps to create a sample test suite executor using the default files.

1. Select **File>New> Test Suite Executor**.
2. On the **Test Suite Executor Project** screen, enter the project name, folder path that contains the test suite setup files, and the file system. You can choose to use the default values.
3. Click **Finish**.

Project contains default Ant build targets and properties to drive the tests.

### Configuring a Test Suite Executor

Software AG Designer allows you to configure Test Suite executor after you have successfully created the projects.

Perform the following steps to configure a sample test suite using the default files.

1. To initiate the tests, use the ant build file, run-composite-runner.xml and ant target, composite-runner-all-tests.
2. Modify the properties file, run-test-suites.properties to specify project locations and setting up target Integration Server definition.
3. Specify the following properties in the run-test-suites.properties file.

Name	Description
<code>webMethods.integrationServer.name</code>	Specifies the Integration Server host name. For example: localhost, 27.0.0.1
<code>webMethods.integrationServer.port</code>	Specifies the Integration Server port.

Name	Description
<code>webMethods.integrationServer.userid</code>	<p>For example: 5555</p> <p>Specifies the Integration Server user name. For example: Administrator, Developer</p>
<code>webMethods.integrationServer.password</code>	<p>Specifies the Integration Server user password. For example: manage</p>
<code>webMethods.integrationServer.ssl</code>	<p>Specifies the Integration Server port uses SSL connection or normal. For example: false or true</p>
<code>webMethods.home</code>	<p>Specifies the product installation location. For example: C:\SoftwareAG</p>
<code>webMethods.test.setup.location</code>	<p>Specifies multiple project locations (absolute directory path) in \$AbsolutePath1, \$AbsolutePath2, \$AbsolutePath3 format. In this case, Test Suite Executor searches for all available and valid WmTestSuite files in these directories.</p> <p>For example:</p> <p>C:/SoftwareAG/IntegrationServer/instances/default/packages/SampleTestSuite,C:/_gitRepo/packages/SampleTestSuite1.</p> <p>It executes specific and multiple WmTestSuite files by specifying it in the following format: \$AbsolutePath1; \$RelativeTestSuitePath1, \$AbsolutePath2; \$RelativeTestSuitePath2.</p> <p>For example :</p> <p>C:/SoftwareAG/IntegrationServer/instances/default/packages/SampleTestSuite;resources/test/setup/</p>



Name	Description
	wmTestSuite.xml,C:/_gitRepo/packages/SampleTestSuite1;resources/test/setup/wmTestSuite.xml
webMethods.test.setup.external.classpath	<p data-bbox="878 457 1422 793">Specifies the relative paths within the projects where required classes or jar files are expected to be in Test Executor build-classpath. For example, when third-party libraries or Mockfactory classes are referred from the Tests, specify the locations where these are stored at, so that executor can load these dependencies during headless tests. Append the default comma separated list if required.</p> <p data-bbox="878 814 1409 915">Default value: resources/test/classes,resources/java/classes,resources/test/jars,resources/java/jars,resources/jars</p>
webMethods.test.profile.result.location	<p data-bbox="878 961 1398 1024">Specifies the absolute directory location where the reports are stored.</p> <p data-bbox="878 1045 1398 1115">For example: C\:/git_sources/GitRepo3/WmTestSuiteExecutor/test/reports/</p>

**Note:** Alternatively, you can also use the ant build file run-test-suites.xml and target runall-test. Test Suite Executor cleans and builds the projects included in target runall-test, then searches for the TestSuites and executes. List of projects can be included within runall-test target (under dirset contents). Reports are generated at the following default location: \$basedir/test/reports. To use runall-test, the test projects or packages has to conform to the default project layout. Refer to the SampleTestSuite for the default project layout.



---

# 11 Code Coverage Analysis

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## Running a Coverage Analysis

---

Unit Test Framework allows you to record and analyze which flow steps and map actions of your flow service(s) are executed during a particular test launch. It helps to identify untested steps and improve the corresponding tests.

### Pre-requisites:

Before running the test coverage analysis, ensure that you activate the wM Code Coverage Agent. To activate the wM Code Coverage Agent, perform one of the following steps:

- On the Package Navigator right-click the default Integration Server instance and select **wM Code Coverage Agent > Activate**

OR

1. In Designer, navigate to **Window > Preferences > Software AG > Integration Server** and select the default server.
2. Click wM Code Coverage Agent.
3. On the wM Code Coverage Agent Settings dialog, select **Activate**.

.

---

### To run a test coverage analysis

1. In the webMethods Tests section, right click and select **wM Code Coverage Tools**.
2. Select one of the following:
  - **Run Suite:** executes the selected test suite.
  - **Run Suite with Mocks disabled:** executes the selected test suite with Mocks disabled.
  - **Run Tests:** executes the selected test case.
  - **Run Tests with Mocks disabled:** executes the selected test case with Mocks disabled.

The test or suite coverage analysis appear as a graphical data under the **wM Code Coverage** view.

## Viewing Code Coverage Analysis

---

After you run the test, wM Code Coverage view displays a detailed coverage report of the test session.

The tested flow steps and map actions or Services appear in green and the untested flow steps and map actions appear in red.

---

### To view the code coverage analysis

1. On the **wM Code Coverage** view, perform one of the following:

Click...	To..
Show Full Packages View	Represent elements under the corresponding Packages and Service namespace. This View provides detailed coverage analysis of the flow steps and map actions of all the individual service(s) under test in the test suite.
Show Execution Model View	Represent elements based on invocation hierarchy. This View provides individual test coverage analysis of the flow steps and map actions of the individual service(s) involved in the test case.
Show Service Level View	Represent only Invoked Services as elements under corresponding Packages. This view provides the coverage analysis of only the services invoked during the test case or test suite execution.  Exclude System Packages:  Hides all the Integration Server Core Packages from the Report.
Show All Entries	Displays full coverage details.  This is default selection.
Hide Missed Entries	Hides the untested parts of test coverage  This does not effect the Coverage percentage.
Hide Covered Entries	Hides the tested parts of test coverage.  This does not effect the Coverage percentage.

## Defining the Coverage Scope

---

Unit Test Framework allows you to edit and redefine the scope of a test coverage session. To achieve this, you can edit an existing launch configuration or create one. You can select packages that you want to include under the coverage purview. Flow elements and services belonging to the selected packages determine the coverage percentage.

---

### To create a launch configuration

1. In the webMethods Tests section, right click and select **wM Code Coverage Tools**.
2. Click **Code Coverage Launch Configurations....**
3. On the Code Coverage Launch Configurations box, select **wM Code Coverage** and click to add a new launch configuration.
4. Enter a name in the **Name** field and a project name in **Project** field.
5. On the Test tab, enter the following information:

Field	Description
<b>Project</b>	Specifies the project name for..... You can click <b>Browse...</b> to select from the
<b>Test Suite</b>	Specifies the test suite path. You can click <b>Search...</b> to select from a list of valid test suite files in the specified Project.
<b>Test Method</b>	Optional. Specifies the test name. You can click <b>Search...</b> to fetch the list of tests from the specified test suite. If this field is left blank, all the tests are selected.

6. On the Project Filter tab, perform the following

Field	Description
Server Node	Specifies the server node name. You can select the Default server node to list all the available packages from the server.
Profiler Scope	Defines the scope of coverage analysis for the launch. You can select the required packages from the list.

7. Click **wM Code Coverage Tools**.

The coverage analysis appear as a graphical data under the **wM Code Coverage** view.

## Coverage Analysis in Headless Mode

---

Test Suite Executor (see [“Creating a Test Suite Executor” on page 47](#)) provides the Ant build file `run-composite-runner.xml` with necessary tasks and properties to start a test. Use the task `composite-runner-all-tests` for headless test execution to generate code coverage analysis report.

Specify the following properties:

<u>Name</u>	<u>Description</u>
<code>webMethods.test.setup.profile.mode</code>	Sets to <b>Coverage</b> to generate coverage report. Set to <b>None</b> for regular test execution.
<code>webMethods.test.scope.packages</code>	Specifies the list of comma separated target Integration Server package names. This Defines the full scope for the coverage analysis and percentage calculation.  Example: SampleTestSuite,SampleTestSuite1





---

# 12 Service Usage

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## WmServiceMock Services

The services in the WmServiceMock package deal with the mocking aspects of testing. These services provide a way to enable or disable mocks for individual services or server-wide.

### **wm.ps.serviceMock:loadMock**

Sets up mocking for a service.

Inputs	scope	session, user, or server. The default is session.
	service	The name of the service to be mocked. No validation is performed on the name of the server or its existence.
	mockObject	The mockObject is an object type. The behavior of the mock is controlled by the type of the actual object.
Inputs	java.lang.String	The name of the alternate service to mock the mocked service with.
	java.lang.Exception	The exception to be thrown for the mocked service.
	com.wm.data.IData	The fixed pipeline to return for the mocked service
	com.wm.ps.serviceMock.MockDataFactory	The implementation of the factory objects that creates the dynamic pipeline for

**wm.ps.serviceMock:loadMock**

the mocked  
service.

parms Optional document containing all extra parameters for the alternate service. This parameter is only needed when mocking a service with an alternate service and the alternate service needs additional inputs.

Outputs None

**wm.ps.serviceMock:clearMock**

Removes mocking for a service.

Inputs scope session, user or server. The default is session.

service The name of the service to be mocked. No validation is performed on the name of the server or its existence.

Outputs None

**wm.ps.serviceMock:clearAllMocks**

Removes mocking for all services.

Inputs None

Outputs None

**wm.ps.serviceMock:suspendMocks**

Suspends mocking for all services.

Inputs None

Outputs None

---

**wm.ps.serviceMock:resumeMocks**

Resumes mocking for all services, for which it was suspended.

---

Inputs      None

---

Outputs     None

---

**wm.ps.serviceMock:getMockedServices**

Retrieves the list of services that are currently mocked in all the scopes.

---

Inputs      None

---

Outputs     mockedServices The list of services that are currently mocked in the session, user, or server scope.

---

## References

---

- [Javadoc API Reference](#) - The javadoc reference for the Test Suite java API. This is useful for advanced Test Suite features as well as creating pure java unit tests for Integration Server services.
- [“JXPath”](#) – Documentation for JXPath API