Developing Client Proxy Classes and Web Services

This section describes how to develop client proxy classes and Web services. The following topics are covered:

- Generate a Client Proxy Class
- Customize a Generated Client Proxy Class
- Use the Generated Client Proxy Classes
- Generate log4j Log Statements

Generate a Client Proxy Class

You can use the Natural Business Services Eclipse plug-in to create proxy classes in Java. Client proxy classes provide access to business services running in Natural. The generated classes are plain Java classes. Typically, proxy classes have properties and methods that map to their Natural counterparts.

Note:
This procedure differs, based on whether the target Java Virtual Machine (VM) is original or enhanced.

During generation, the wizard creates a folder called .nbsMetadata containing the specifications for the Java class. This allows the specifications to be associated with a project rather than a workspace. The metadata can be stored in CVS, as well as exported with the project.

Note:
A Java project must currently exist. For information, refer to the Eclipse documentation.

This section covers the following topics:

- Java Original
- Java Enhanced
- Deploy the Client Proxy Class as a Web Service Class

Java Original

This section describes how to generate a client proxy class for Java Virtual Machine (VM) version 1.4.

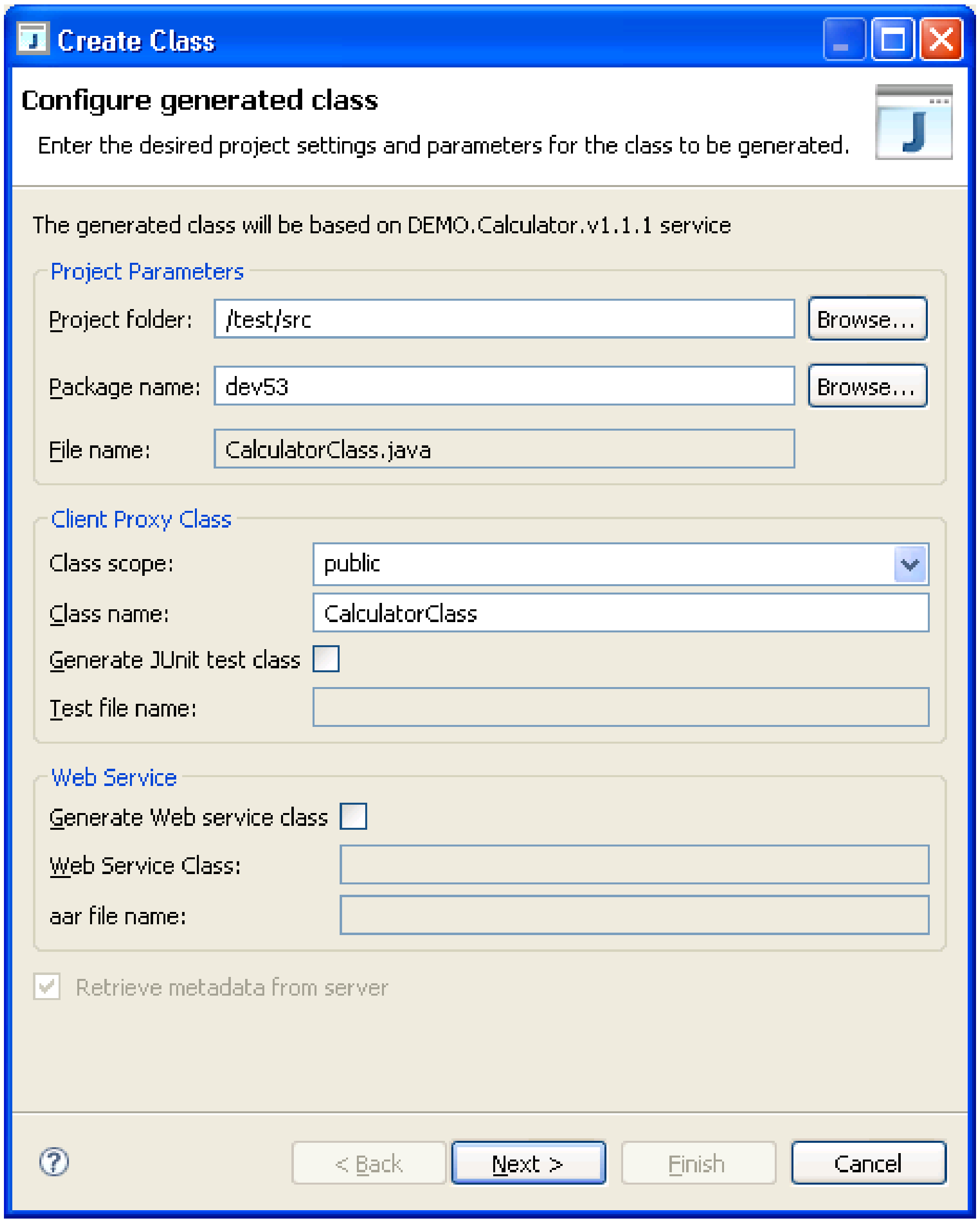
Note:
For information on setting the VM version, see Preferences for Java Classes.

To generate a client proxy class for Java original:

1. Open the context menu for a business service in the **NBS Repositories** view.

2. Select **Create class**.

   The **Configure generated class** panel is displayed. For example:



Configure generated class

Enter the desired project settings and parameters for the class to be generated.

The generated class will be based on DEMO.Calculator.v1.1.1 service

Project Parameters

Project folder:	/test/src
Package name:	dev53
File name:	CalculatorClass.java

Client Proxy Class

Class scope:	public
Class name:	CalculatorClass
Generate JUnit test class	☐
Test file name:	

Web Service

Generate Web service class	☐
Web Service Class:	
aar file name:	

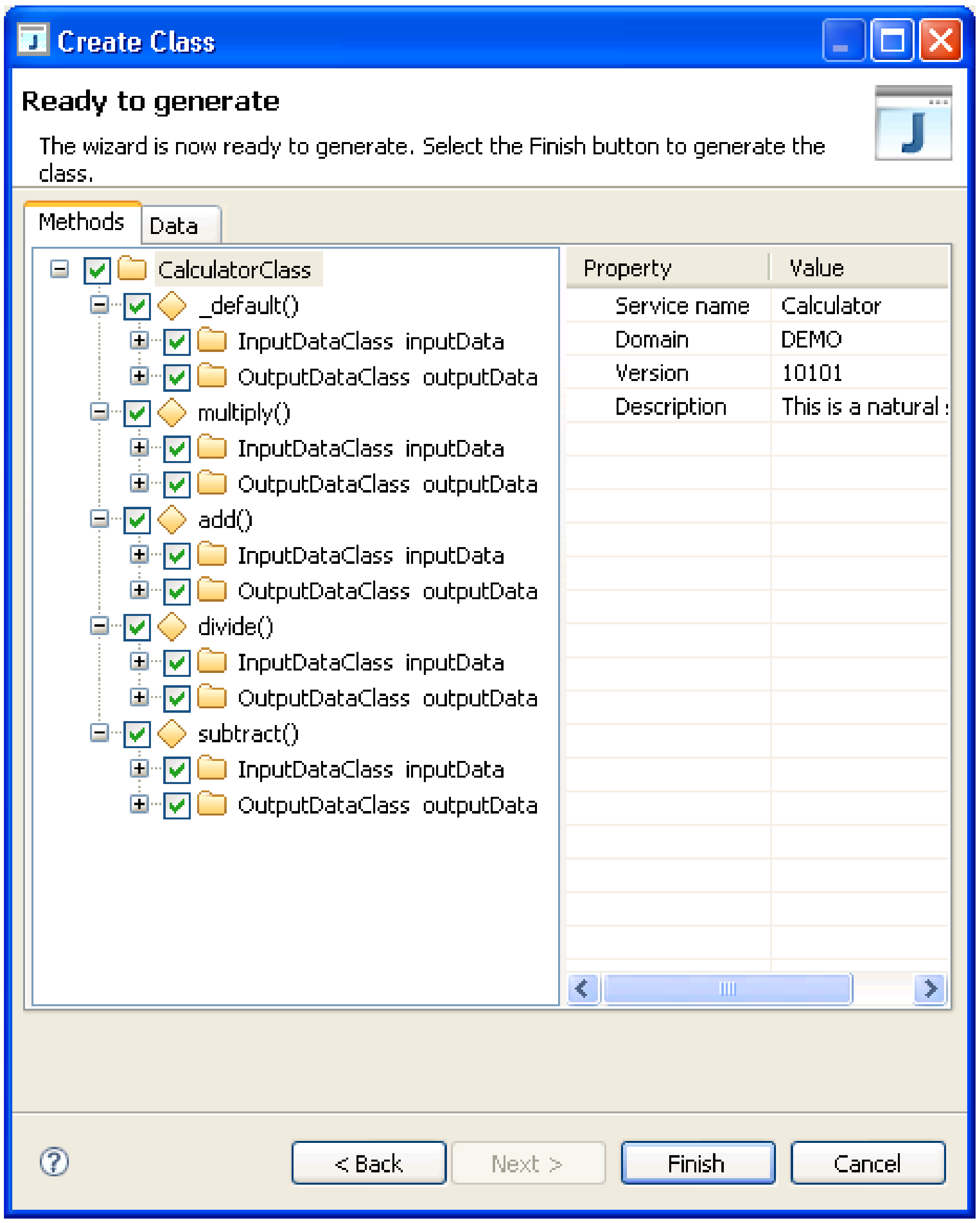
✓ Retrieve metadata from server

This panel displays the default configuration settings for the class to be generated. Optionally, you can:

Task	Procedure
Change the project folder	Select a new root source folder in **Project folder**.
Change the package name	Select a new package in **Package name**.
Change the scope of the class	Select the class scope from **Class scope**. By default, public is the class scope.
Rename the class	Enter a new name in **Class name**.
Create a class that can be run in the JUnit testing framework	Select **Generate JUnit test class**. This test class will contain default tests for each method used by your business service. The name of the file used to store the test is displayed in **Test file name**.
Create additional Web service deployment files and classes	Select **Generate Web service class** and enter the Web service class name and .aar file name. For more information, see Deploy the Client Proxy Class as a Web Service Class.
Rename the Web service	Enter a new name in **Web service name**.
Refresh metadata from the server	Select **Retrieve metadata from server**.

3. Select **Next**.

   The wizard downloads metadata from the service repository on the server and displays the **Ready to generate** panel. For example:



Ready to generate

The wizard is now ready to generate. Select the Finish button to generate the class.

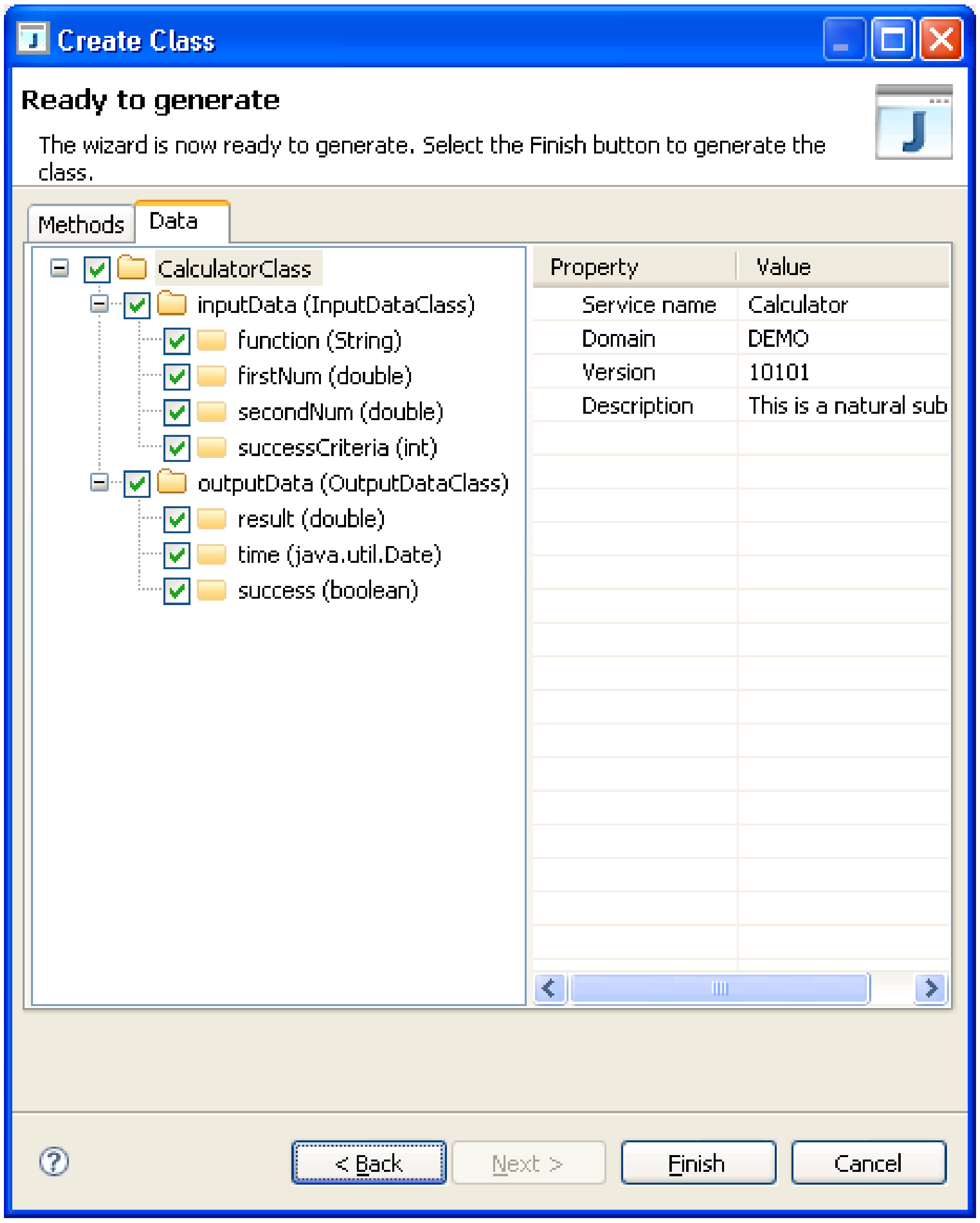
```
CalculatorClass
  _default()
    InputDataClass inputData
    OutputDataClass outputData
  multiply()
    InputDataClass inputData
    OutputDataClass outputData
  add()
    InputDataClass inputData
    OutputDataClass outputData
  divide()
    InputDataClass inputData
    OutputDataClass outputData
  subtract()
    InputDataClass inputData
    OutputDataClass outputData
```

Property	Value
Service name	Calculator
Domain	DEMO
Version	10101
Description	This is a natural :

Use this panel to customize the methods and data parameters your class will support. The **Methods** tab allows you to customize how class methods will be generated based on your existing business service methods.

4. Select the **Data** tab.

   For example:



Ready to generate

The wizard is now ready to generate. Select the Finish button to generate the class.

- ✓ CalculatorClass
  - ✓ inputData (InputDataClass)
    - ✓ function (String)
    - ✓ firstNum (double)
    - ✓ secondNum (double)
    - ✓ successCriteria (int)
  - ✓ outputData (OutputDataClass)
    - ✓ result (double)
    - ✓ time (java.util.Date)
    - ✓ success (boolean)

Property	Value
Service name	Calculator
Domain	DEMO
Version	10101
Description	This is a natural sub

The **Data** tab allows you to customize how Get and Set methods for your business service properties will be generated.

5. Select **Finish** to generate the client proxy class.

Java Enhanced

This section describes how to generate a client proxy class that takes advantage the enhanced features of Java Virtual Machine (VM) version 5. These features include:

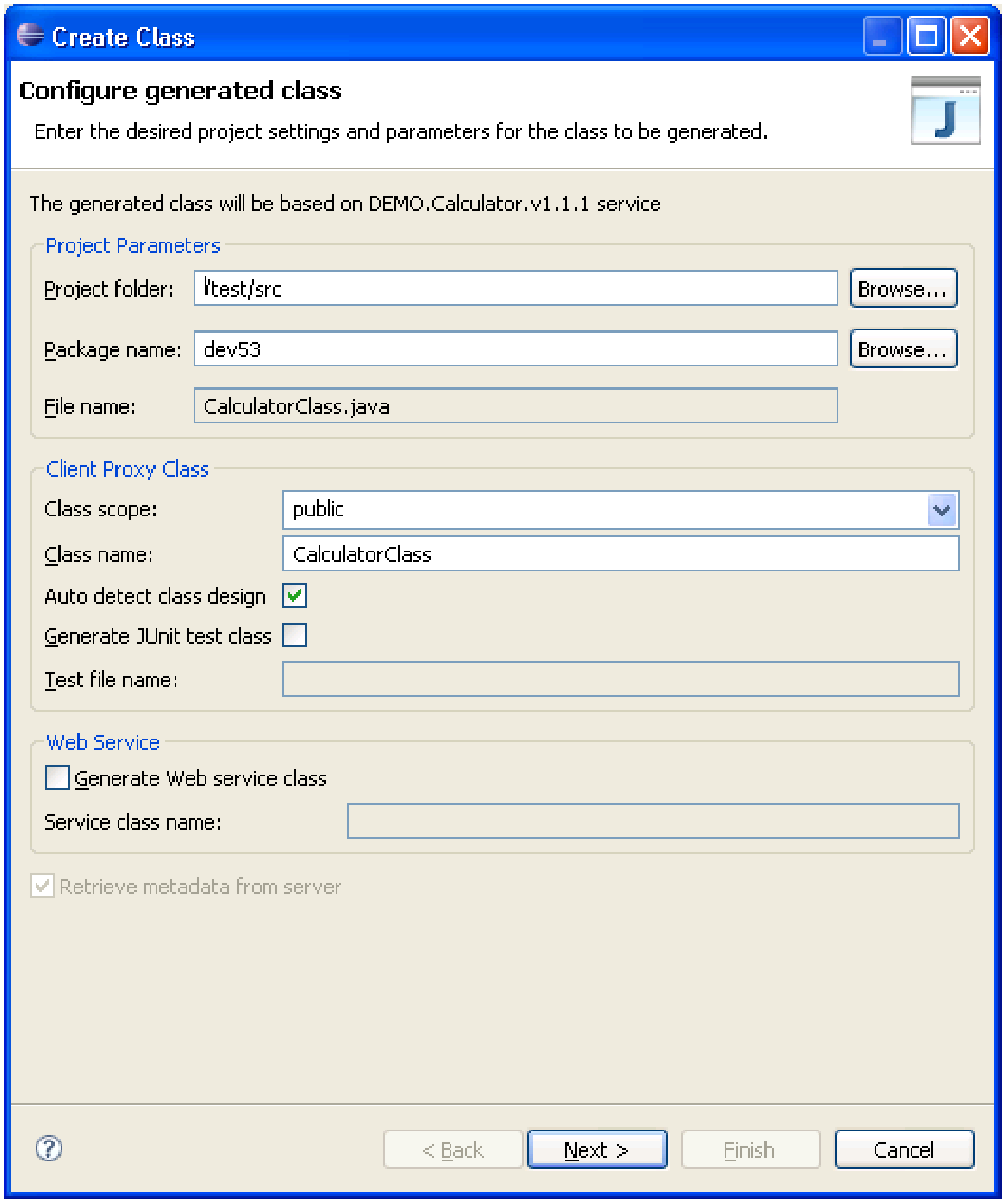
- Try/Catch statements that throw exceptions for server errors when calling business service methods for a class
- Method definitions that include the correct input/output parameters based on the style of business service

Note:
For information on setting the VM version, see Preferences for Java Classes.

To generate a client proxy class for Java enhanced:

1. Open the context menu for a business service in the **NBS Repositories** view.
2. Select **Create class**.

   The **Configure generated class** panel is displayed. For example:



Configure generated class

Enter the desired project settings and parameters for the class to be generated.

The generated class will be based on DEMO.Calculator.v1.1.1 service

Project Parameters

Project folder: /test/src

Package name: dev53

File name: CalculatorClass.java

Client Proxy Class

Class scope: public

Class name: CalculatorClass

Auto detect class design ✓

Generate JUnit test class ☐

Test file name:

Web Service

☐ Generate Web service class

Service class name:

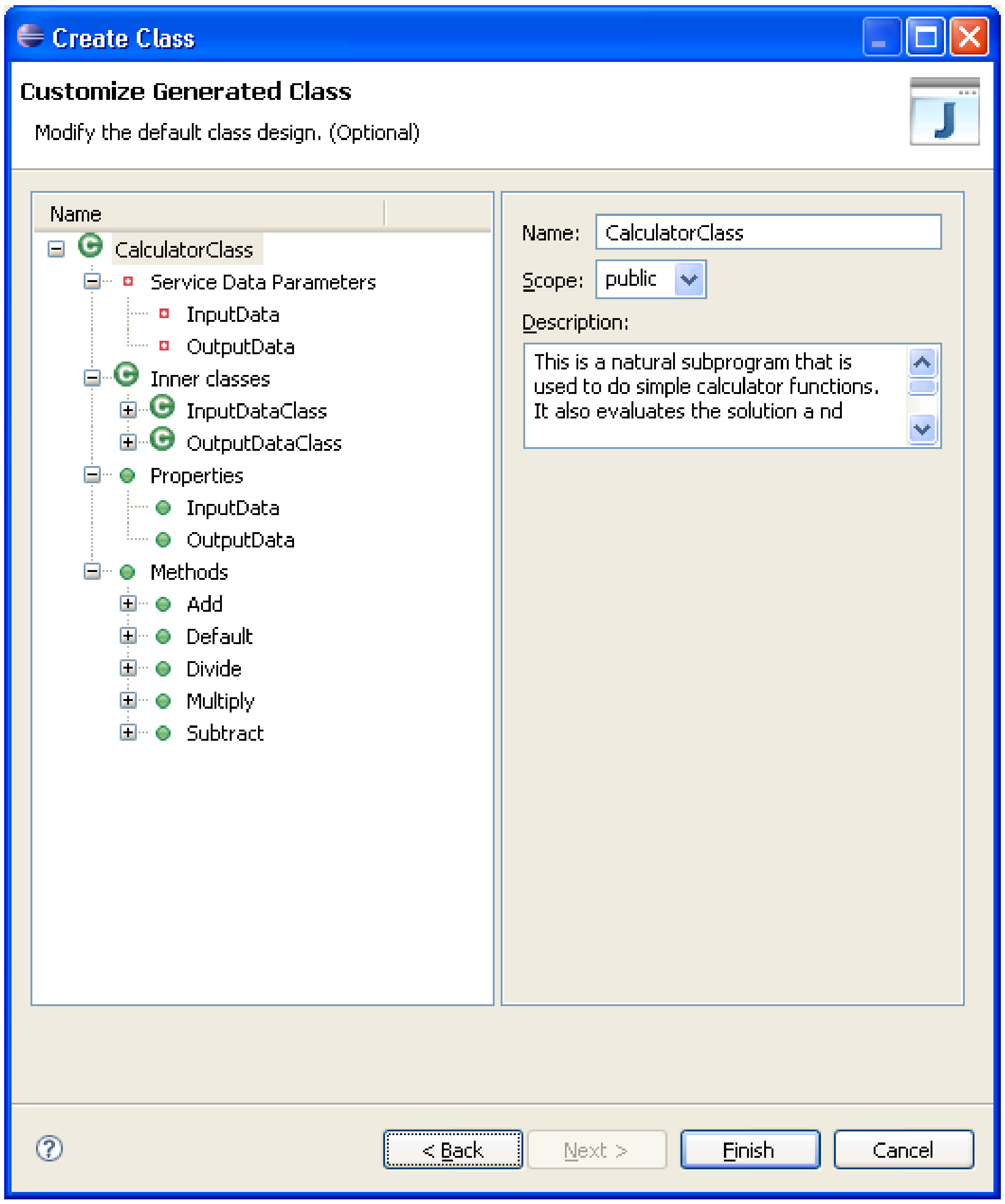
✓ Retrieve metadata from server

This panel displays the default configuration settings for the class to be generated. Optionally, you can:

Task	**Procedure**
Change the project folder	Select a new root source folder in **Project folder**.
Change the package name	Select a new package in **Package name**.
Change the scope of the class	Select the class scope from **Class scope**. By default, public is the class scope.
Rename the class	Enter a new name in **Class name**.
Copy the field structure as defined in the PDAs generated for the business service subprograms	De-select **Auto detect class design**. If this option is selected, the wizard will determine which model to use when generating the subprograms on the server and design an object class hierarchy that is appropriate for the model. For example, the generated Get method will accept the primary key as input and return an object that includes all fields. The wizard recognizes subprograms generated by the Object-Maint-Subp, Object-Browse-Subp, and Object-Browse-Select-Subp models.
Create a class that can be run in the JUnit testing framework	Select **Generate JUnit test class**. This test class will contain default tests for each method used by your business service. The name of the file used to store the test is displayed in **Test file name**.
Create additional Web service deployment files and classes	Select **Generate Web service class** and enter the Web service class name in **Service class name**. For more information, see Deploy the Client Proxy Class as a Web Service Class.
Rename the Web service	Enter a new name in **Web service name**.
Refresh metadata from server	Select **Retrieve metadata from server**.

3. Select **Next**.

   The wizard downloads metadata from the service repository on the server and displays the **Customize Generated Class** panel. For example:



Name: CalculatorClass

Scope: public

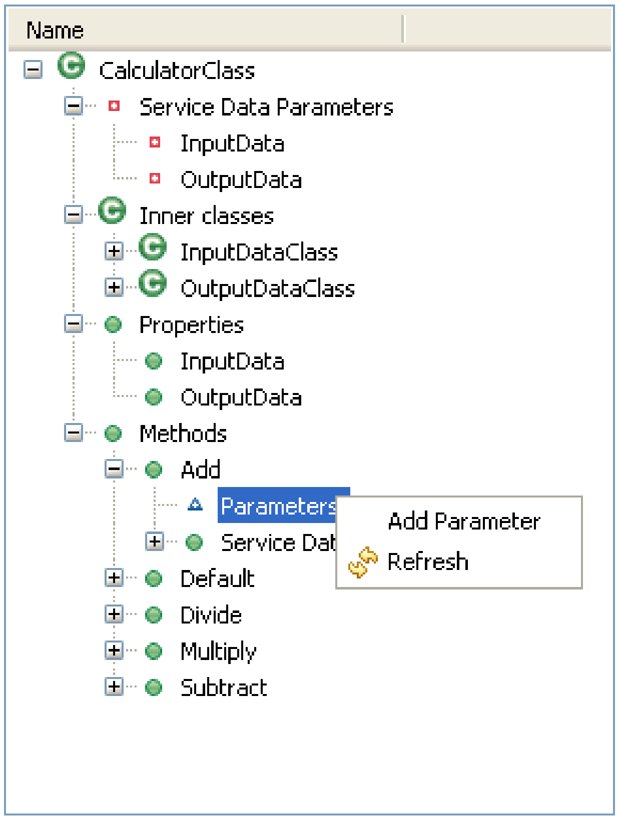
Description:

This is a natural subprogram that is used to do simple calculator functions. It also evaluates the solution a nd

Use this panel to design how each method will work when generating Java classes for services that were not generated by Natural Construct models.

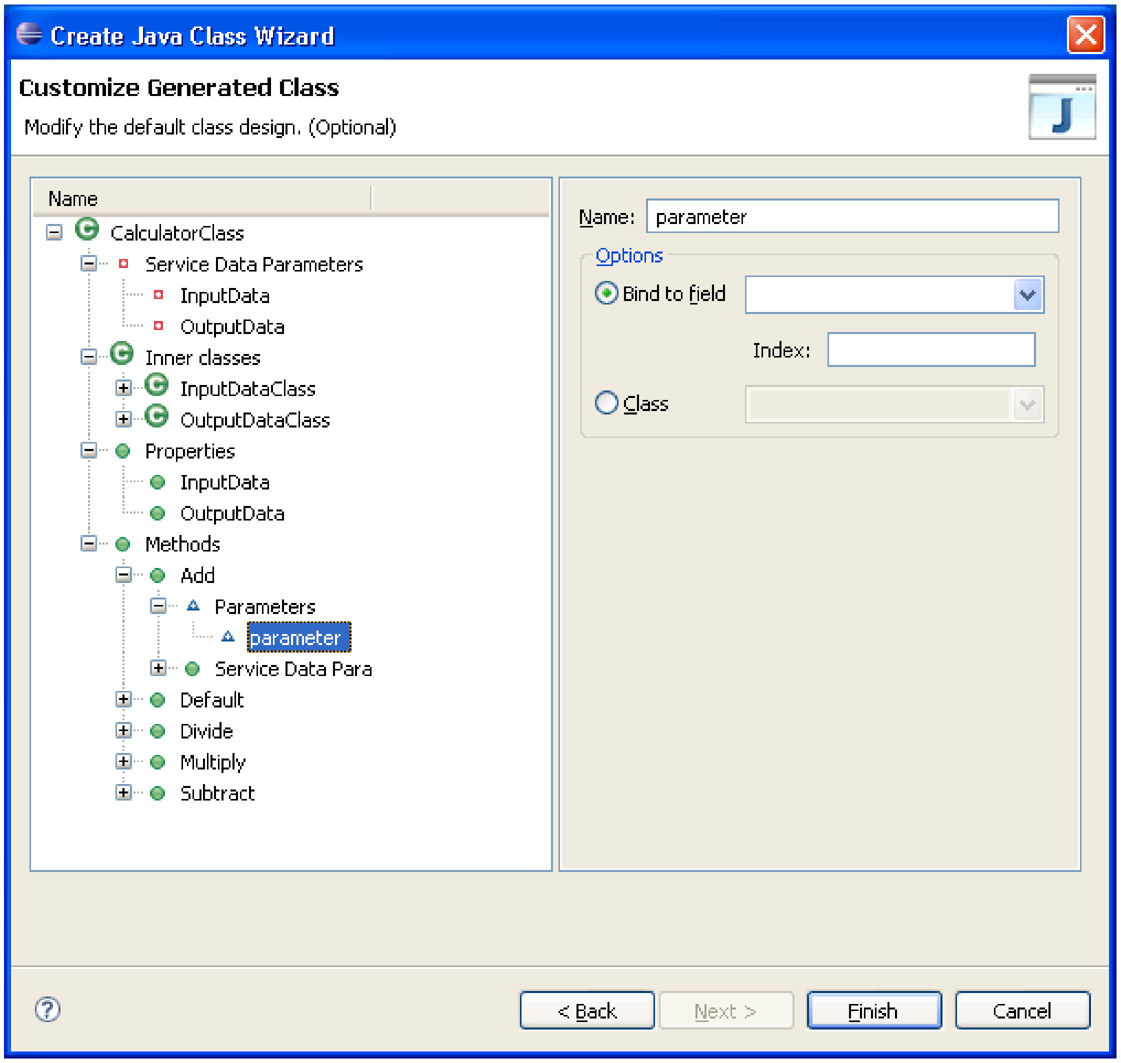
4. Expand a method listed in **Methods**.
5. Open the context menu for Parameters.

   For example:



6. Select **Add Parameter**.

   The parameter settings are displayed. For example:



Use this panel to add a parameter to the method and bind it to an existing field in the service. Optionally, you can:

Task	**Procedure**
Provide an index value for the Natural field	Type the value in **Index**.
Bind the parameter to an inner class	Select **Class** and specify the class.
Select the return value for a method	Select the method (for example, Add) and specify the return settings. For information, see Select Return Value for a Method.

7. Type the name of the parameter in **Name**.

8. Select the Natural field in **Bind to field**.
9. Select **Finish** to generate your classes and files.

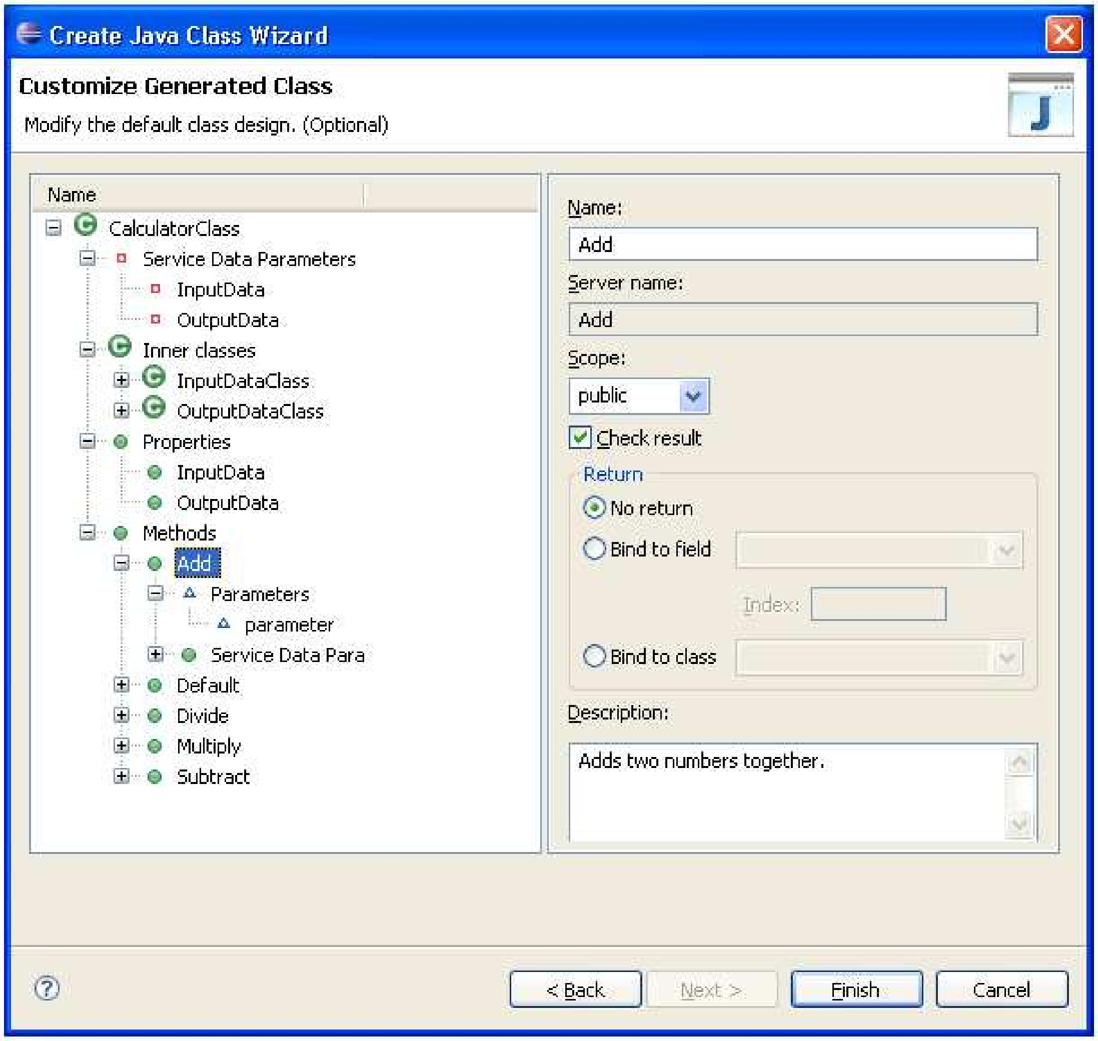
   The new class is displayed in the program editor view.

Select Return Value for a Method

To select the return value for a method:

1. Select a method listed in **Methods**.

   Information about the method is displayed. For example:



Name: Add

Server name: Add

Scope: public

[✓] Check result

Description: Adds two numbers together.

This panel displays the name of the method on the client and on the server, as well as the scope (public or private) and description of the method. Optionally, you can:

Task	**Procedure**
Change the name of the method	Type a new name in **Name**.
Change the scope of the method	Select the new scope in **Scope**.
Remove the option to verify the result	De-select **Check result**.
Change the description of the method	Type a new description in **Description**.

2. Select one of the following binding options for the return value:

   - Bind to field

     To bind the return value to a field, select the field and, optionally, provide an index value.

   - Bind to class

     To bind the return value to an inner class, select the class.

For example, if you select **Bind to field** and OUTPUT-DATA.#RESULT, the Add method changes from:

```
public void Add() throws BusinessServiceException
```

to:

```
public double Add(double firstNum,
                  double secondNum)
       throws BusinessServiceException
```

Deploy the Client Proxy Class as a Web Service Class

When generating a client proxy class, one of the wizard options generates a class and descriptor files to deploy the client proxy class as a Web service class. Web service deployment is handled by the WS-Stack plug-in. For information about this plug-in, refer to *http://rndcvweb.eur.ad.sag/Projects/WSS/Kits/*.

Note:
To deploy the client proxy class as a Web service class, **Generate Web service class** must be selected on the **Configure Generated Class** panel.

This section covers the following topics:

- Add CentraSite Associations
- Deploy to an Internal Axis Server
- Deploy to an External Application Server
- Override the Generated Connection Settings

Add CentraSite Associations

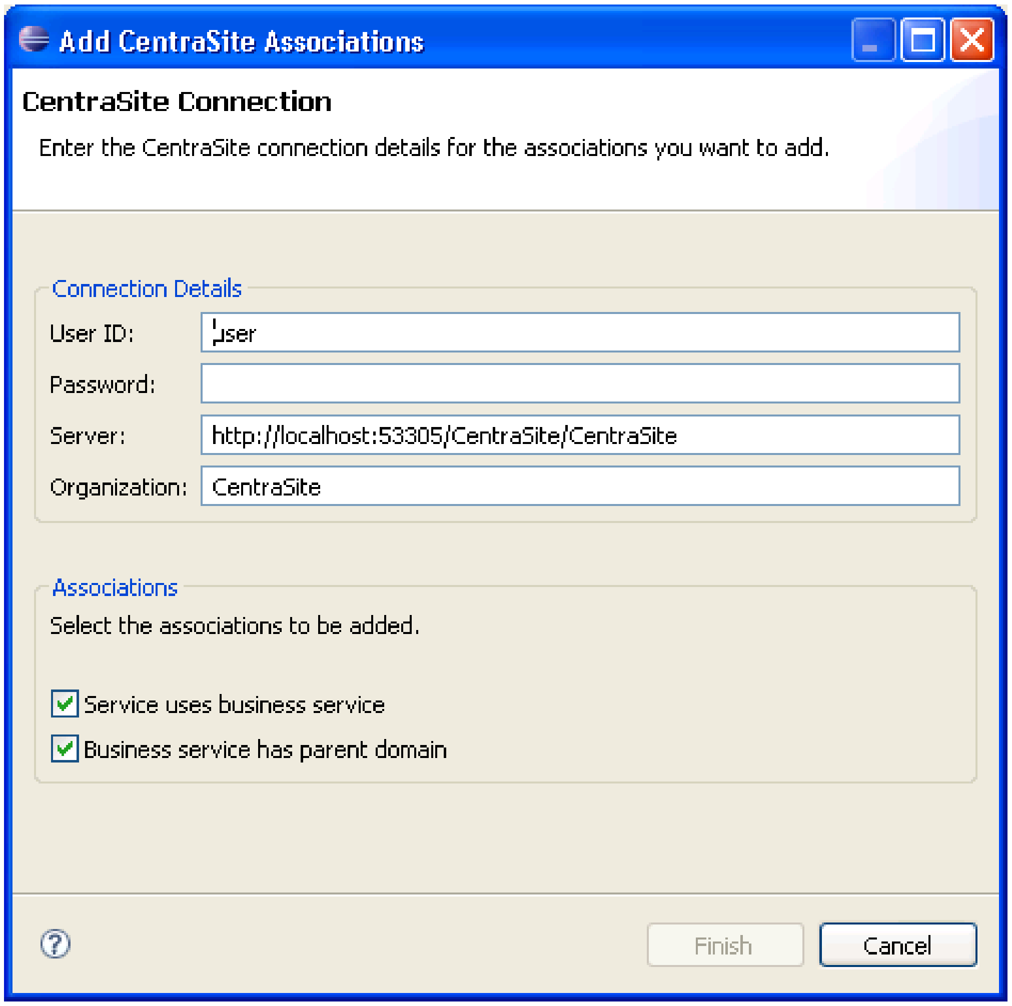
The WS-Stack plug-in will not add an association between a Web service being added to CentraSite and the NBS repository metadata in CentraSite. You must add each association manually.

To add associations to CentraSite:

1. Open the context menu for the .aar file in the **Package Explorer** view.

2. Select **Business Services** > **Add CentraSite association**.

   The **CentraSite Connection** window is displayed. For example:


Add CentraSite Associations

CentraSite Connection

Enter the CentraSite connection details for the associations you want to add.

Connection Details

User ID:	user
Password:	
Server:	http://localhost:53305/CentraSite/CentraSite
Organization:	CentraSite

Associations

Select the associations to be added.

[✓] Service uses business service

[✓] Business service has parent domain

Use this window to add up to two associations between a Web service and the NBS repository metadata to CentraSite. These associations are:

Association	Description
Service uses business service	Association between the Web service and its corresponding NBS business service metadata (for example, CalculatorClassWS Uses DEMO.Calculator.v1.1.1).
Business service has parent domain	Association between the NBS business service metadata and its corresponding NBS domain metadata (for example, DEMO.Calculator.v1.1.1 HasParent DEMO).

3. Confirm the connection details.

4. Type the CentraSite password in **Password**.

5. Select the associations you want to add.
6. Select **Finish**.

   The selected associations are added to CentraSite.

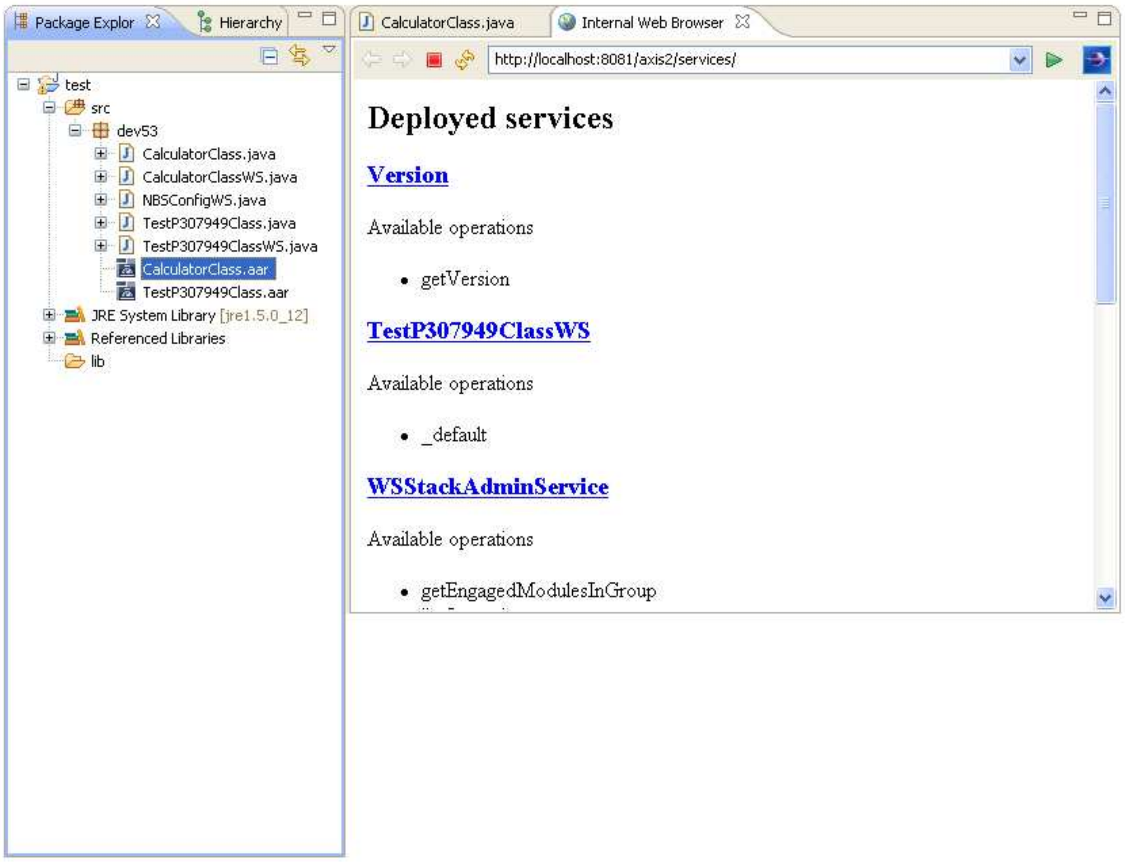
Deploy to an Internal Axis Server

The Web service can be deployed to an internal Axis server. The internal server will use your PC name as the web server name.

To deploy to an internal Axis server:

1. Open the context menu for the .aar file in the **Package Explorer** view.
2. Select **Business Services > Internal Axis Deploy**.

   The deployed service is displayed in the Internal Web Browser view. For example:



Deployed services

Version

Available operations

- getVersion

TestP307949ClassWS

Available operations

- _default

WSStackAdminService

Available operations

- getEngagedModulesInGroup

Deploy to an External Application Server

The Web service can be deployed to an external application server. This functionality is handled by the WS-Stack plug-in. For information, refer to *http://rndcvweb.eur.ad.sag/Projects/WSS/Kits/*.

Before you can deploy the Web service, you must prepare the application server.

To prepare the application server for Web service deployment:

- Copy the *NBSAxis2.war* file to the *..\tomcat\webapps\Axis2 Install* folder.

Note:
While deploying a Web service, the wizard can generate debug log statements. For information, see Generate log4J Log Statements.

Tip:
After making changes (such as changing the Java runtime version used by your classes and then redeploying the class), you may have to restart the application server.

Tip:
If an error occurs while deploying a service to an external application server, ensure that the Java version running on the server is correct. To determine which version is running, open the context menu for your Java project and select **Properties**. View the Java Build Path and verify the JRE system library setting.

Override the Generated Connection Settings

When deploying a client proxy class as a Web service class, the Java Class wizard creates two files: the .aar file and the NBSConfigWS class. This class is responsible for creating the dispatcher and setting the credentials used to communicate with the server. If desired, you can override the connection settings generated into the NBSConfigWS class by overwriting the settings in the *NBSAxis.properties* file (located in *C:\Documents and Settings\All Users\Application Data\Software AG\Natural Business Services\Configuration*).

Customize a Generated Client Proxy Class

After generating a client proxy class, you can customize the code that was generated for a method or field used by the class. However, regeneration will overwrite your changes unless you place the following annotation immediately preceding the customized code:

```
@NBSPreserve("")
```

The annotation preserves the code for that method or field only.

Note:
Although providing a comment about the customization is optional, you must include the comment indicators (i.e., the brackets and quotation marks).

Use the Generated Client Proxy Classes

This section describes the contents of the generated client proxy classes, how to execute the methods of a client proxy, and how to use the Natural Business Services runtime client dispatcher. The following topics are covered:

- Contents of a Generated Client Proxy Class
- Execute Methods of a Client Proxy Class
- Use the Natural Business Services Runtime Client Dispatcher

Contents of a Generated Client Proxy Class

Generated client proxy classes have the following contents:

- Init Method
- Methods
- Data

Init Method

This method contains a parameter called IRemoteCaller, which communicates with the server (it is also called a client dispatcher). You must create an instance of a class that supports the IRemoteCaller interface. Use the NBS runtime and ServiceFactory contained in the dispatchclient package to do this. For example:

```
import com.softwareag.nbs.bshelper.*;
import com.softwareag.nbs.dispatchclient.*;

Config.getDispatchClientConfig("c:/eclipse/plugins/com.softwareag.nbs.ui_5.3.1/DispatchClient.config");
IRemoteCaller dispatcher = ServiceFactory.createDispatcher("Default Broker");
dispatcher.setUserID("GUEST");
dispatcher.setPassword("");
dispatcher.logon();

CalculatorClass bs = new CalculatorClass();
bs.init(dispatcher);
```

Note:
Although calling the `dispatcher.logoff()` method is not mandatory, it is recommended. Calling the logoff method is important, especially with SPoD connections, as it releases server connections sooner rather than waiting for them to be released during garbage collection. Calling the logon method is mandatory.

When using the ServiceFactory to create an instance of IRemoteCaller, you must pass in the name of a connection ID. For example:

```
IRemoteCaller dispatcher = ServiceFactory.createDispatcher("My Connection");
```

This is the name you specified when creating new connections in the **NBS Repositories** view. You must also load the configuration file using the getDispatchClientConfig method of the Config object. For example:

```
Config.getDispatchClientConfig("c:/My NBS Files/DispatchClient.config");
```

Methods

Each method in the class corresponds to a method in the business service.

Data

Each level 1 field from a PDA used in a business service becomes a Get/Set function of the class. Each group within a PDA becomes a subclass. For example, if the following definition is specified:

```
01 Group1
  02 Group2
    03 Field1 (A10)
```

The following is generated in the client proxy class:

```
public class Group1 {

  public class Group2 {

     public String getField1() {
       return pda_inputData.getString("Field1",_ax);
     }
  }
}
```

Execute Methods of a Client Proxy Class

When executing a method of a client proxy class, use the BusinessServiceResult return value to check for communication and/or runtime errors. For example:

```
BusinessServiceResult bsr = businessSerivce.add(); // Invoke the add method.
if (bsr.isSuccess())
{
   // Success
}
else
{
   String s = bsr.getDispatchResult().toString();
}
```

If your business service was generated using code generation patterns, or it uses a standard error message parameter group, verify whether business service errors or warnings are present. The msg field will also contain status messages. For example:

```
if (bs.getMessage().getReturnCode() == "E")
{
  String s = bs.getMessage().getMsg(); // Error, warning or status message
  Int I = bs.getMessage().getMsgNr(); // Error number
}
```

Use the Natural Business Services Runtime Client Dispatcher

The runtime client dispatcher that uses the IRemoteCaller interface has properties and methods you can use to provide additional functionality.

Set Security

When creating dispatcher objects, you must set the correct user ID and password to be used for remote calls. For example:

```
dispatcher.setUserID("GUEST");
dispatcher.setPassword("secret");
```

Use Transactions

You can invoke business services in a transactional context by using the `startTransaction`, `commit`, and `abort` methods. For example:

```
Service1 sv1 = new Service1Class();
Service2 sv2 = new Service2Class();

IRemoteCaller dispatcher = ServiceFactory.createDispatcher("Default Broker");
sv1.init(dispatcher);
sv2.init(dispatcher);

dispatcher.startTransaction();
// Call methods of sv1 and sv2.
...
// If successful calls
dispatcher.commit();
...
// If an error in a method
dispatcher.abort();
```

Note:
To control transactions, the same dispatcher object must be used for each business service. For more information, see the Java transaction example in the Samples folder. You can copy the Samples folder from the installation CD.

Generate log4j Log Statements

While creating a Java class and deploying a Web service to an external application server (for example, Apache Tomcat), the wizard can generate debug log statements into each Web service method that corresponds to a business service method.

Each Web service request is recorded in a log file with the following information:

- Name of the Web service (unique identifier)
- User ID (found in DispatchClient.config)
- Timestamp indicating when the application server retrieves the Web service (Start of Request)
- Timestamp indication when the Web service leaves the application server (End of Request)
- Calculated time difference between the two timestamps (Request Elapsed Time)

To enable logging:

1. Edit the *log4j.properties* file.

   This file is located in a subfolder in the *\NBSAxis2\WEB-INF\classes* folder where your application server is running.

2. Add the following line:

   ```
   log4j.logger.[package]=DEBUG, CONSOLE
   ```

   where `[package]` is the Java package for your project containing the generated Java and Web service classes. This will log all Web services in this package to the log file.

   Tip:
   You can also include the class name after the package name, for example `[package].[classnameWS]`, which will enable logging for that class only.

3. Restart your application server.

   Entries will be written to log files for standard output.

The log files use the following naming convention:

```
stdout_[date].log
```

These files are stored in different locations, depending on the application server you are using. (For Apache Tomcat, they are stored in the Logs subfolder in which Tomcat is installed.)

For more information, see:

- Log4J manual: http://logging.apache.org/log4j/1.2/manual.html
- Using Log4J from Tomcat: http://tomcat.apache.org/tomcat-5.5-doc/logging.html