BEA WebLogic Integration™

BPEL Import and Export User Guide

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CHAPTER 1

Using the BPEL Import Tool

This section describes how to use the BPEL Import tool in WebLogic Workshop® to import a BPEL file.

Topics Included in This Section

Introduction to BPEL
Provides a brief background on BPEL and how it evolved.

BPEL Import Tool
Provides an overview on how the BPEL Import tool works.

Importing a BPEL File
Describes how to import a BPEL file using WebLogic Workshop.

Known Limitations and Issues
Provides information on the import tool that will enable you to use is more effectively and efficiently.

Introduction to BPEL

BPEL4WS (Business Process Execution Language for Web Services, commonly referred to as "BPEL") defines a language for the formal specification of automated business processes. Processes written in BPEL can orchestrate interactions between Web services using XML documents in a standardized manner. These processes can be executed on any platform or product that complies with the BPEL specification. BPEL therefore enables customers to protect their investment in process automation by allowing them to move these process definitions between a

wide variety of authoring tools and execution platforms. While there have been previous attempts to standardize business process definitions, BPEL has attracted an unprecedented level of interest and is the first to gain critical mass among software vendors.

BPEL4WS 1.1 is the latest published specification from BEA, Microsoft®, and IBM®, but it does not reflect the upcoming BPEL standard, which is still under development by the OASIS standards organization. It is important to bear in mind that the final standard will be different from BPEL4WS 1.1, and therefore this tool is provided largely to enable design-time interoperability with other tools that support the 1.1 specification.

For more information on the BPEL language, refer to the BPEL4WS specification v1.1, published by BEA, IBM, and Microsoft and submitted to OASIS for standardization, which is available at:

http://dev2dev.bea.com/webservices/BPEL4WS.csp

and the official Home page for the BPEL standardization effort, hosted by OASIS at:

http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wsbpel

In BEA WebLogic Integration™, a business process is defined using BEA Process Definition for Java (JPD). The BPEL import tool is a design-time aid to help convert a BPEL file into a JPD file.

BPEL Import Tool

You can use the BPEL Import tool to import a BPEL file into a JPD file, where it can be used in the WebLogic Workshop design environment. While the main orchestration logic of the BPEL file is imported into a JPD file, it is not expected that the imported JPD file will be immediately executable in WebLogic Workshop. You will need to manipulate the JPD file in WebLogic Workshop to get the imported process to run.

In certain cases, runtime semantics are not guaranteed, due to the functional mismatches between the JPD and BPEL languages, or between various expression languages including differences between XQuery, Xpath, and XSLT. Runtime semantics are also not guaranteed when they involve vendor extensions, external artifacts, or environment settings. For the above reasons, the imported JPD file should be reviewed and tested with any required changes that were made to ensure that it runs properly.

In general, the BPEL Import tool expects complete BPEL and WSDL artifacts as input. To some extent, the tool also handles incomplete BPEL and WSDL artifacts, so that in-progress BPEL files can be imported as JPD, and then completed in the WebLogic Integration environment. Incomplete cases are numerous and may include missing WSDL files, missing type definitions, missing port type definitions, or incomplete constructs of `<while>`, `<switch>`, `<invoke>`,

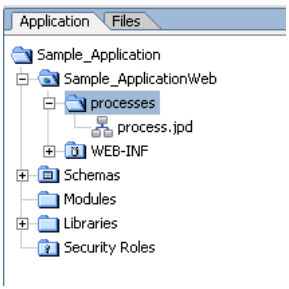
<receive>, <reply>, <onMessage>, <onAlarm>, <throw>, as well as other cases. If the BPEL Import is not able to import the input artifacts into a JPD file, error messages appear that enable you to correct the input artifacts for future imports.

Importing a BPEL File

To Import a BPEL File to a JPD File

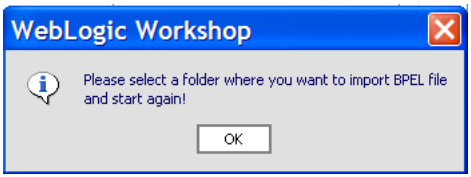
1. In WebLogic Workshop, create or open a Workshop application.
2. Open the folder under the project root to which you want to import the BPEL file. For example, **processes** in the following figure.

Figure 1-1 Location for Imported File



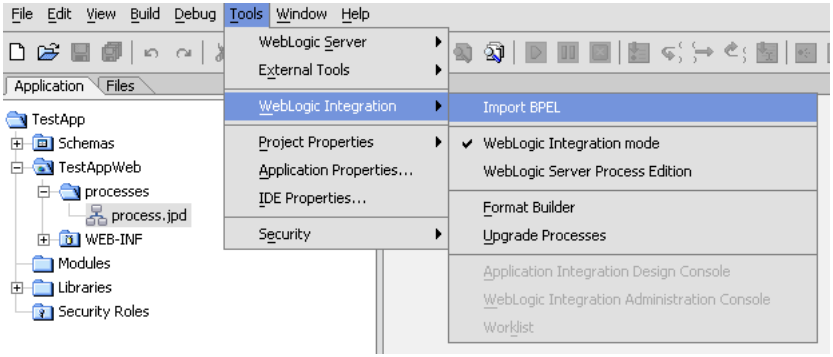
Note: The BPEL Import tool does not support importing to Schemas/Project root directories. If you try to import into a root directory, you get the following error message.

Figure 1-2 Error Message



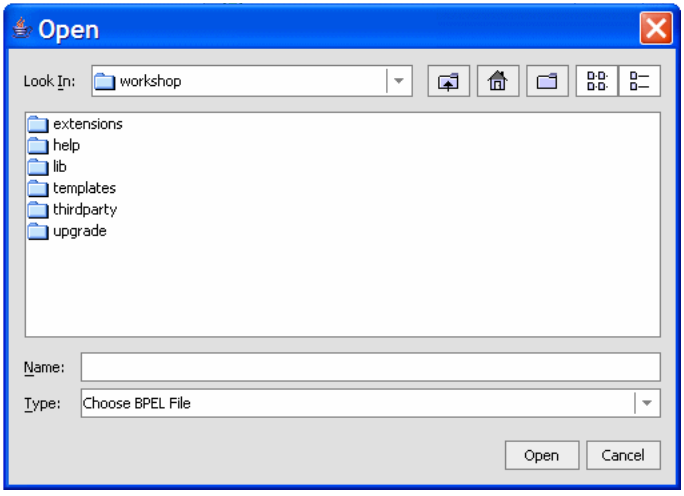
3. Select **Tools→WebLogic Integration→Import BPEL** from the WebLogic Workshop menu.

Figure 1-3 Import BPEL Option



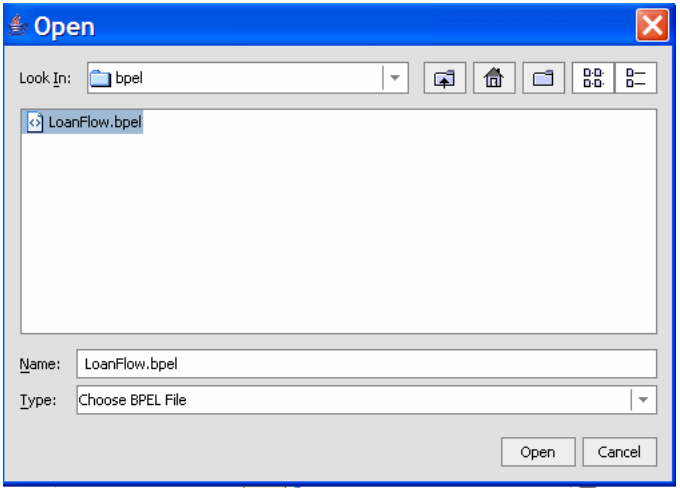
The Select BPEL Source window appears.

Figure 1-4 Select BPEL Source Window



4. Locate the BPEL file that you want to import.

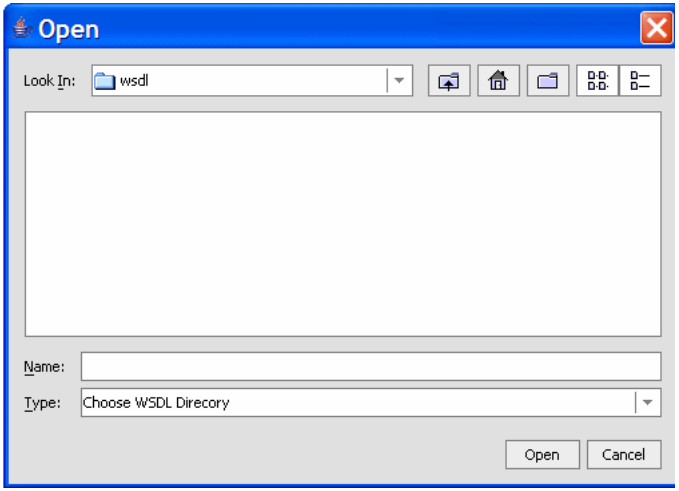
Figure 1-5 File To Import



5. Highlight the required BPEL file and click **Open**.

   The next step is specifying the location of the folder containing the Web Services Description Language (WSDL) files.

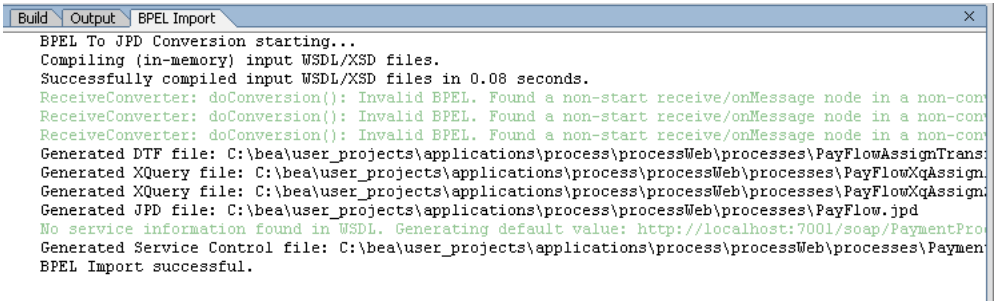
Figure 1-6 WSDL Location



6. Select the required folder and click **Open**. The BPEL Import tool will pick up all WSDL and XSD files in the selected folder.

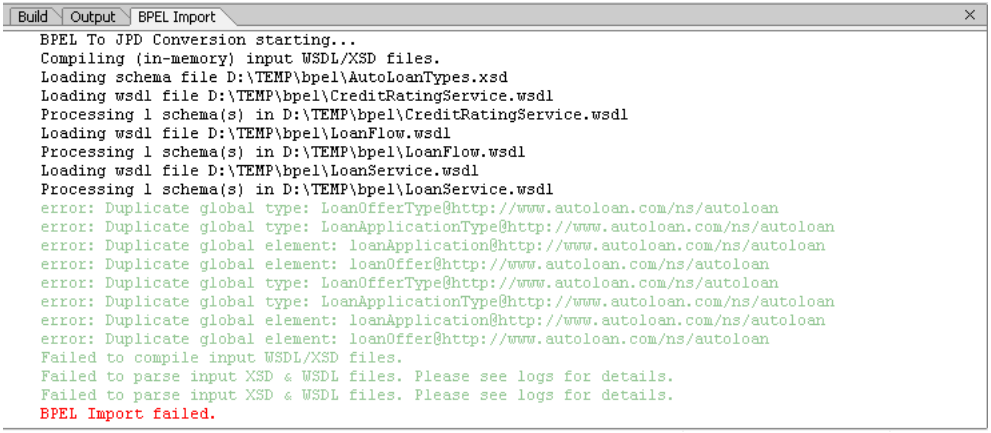
The import begins and the progress of the import is shown in the **BPEL Import** pane below the **Design** pane, as shown in the following figure.

Figure 1-7 BPEL Import Pane - Conversion Successful



If the conversion is not successful, the conversion is aborted and error messages are displayed in the **BPEL Import** pane, as shown in the following figure.

Figure 1-8 BPEL Import Pane - Conversion Failed

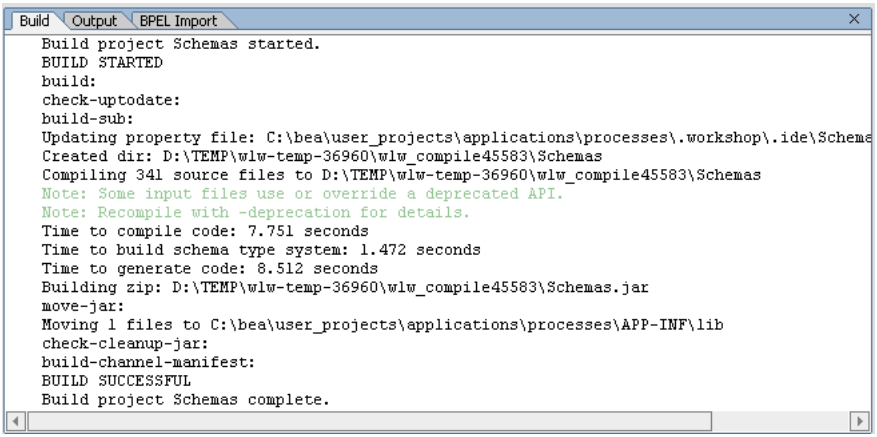


In the **BPEL Import** pane:

- All warning messages are shown in green.
- If the import is successful, the following message appears in black: `BPEL Import SUCCESSFUL`.
- If the import fails, the following warning message appears in red: `BPEL Import Failed`.

Note: The **Build** pane below the **Design** pane displays diagnostic messages about the schema import process as shown in the following figure.

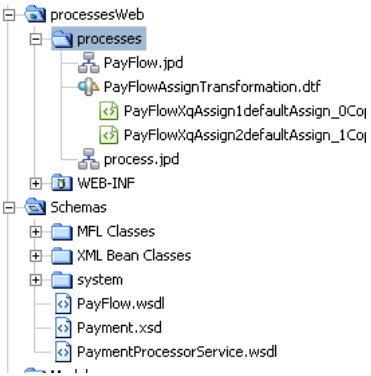
Figure 1-9 Build Pane - Schema Diagnostic Messages



Note: A log file for the import process, named `BpelImport.log`, is stored in `%BEA_HOME%\weblogic81\workshop` where `%BEA_HOME%` is the directory in which you installed WebLogic Workshop. This log file provides information about the import process.

The new JPD file appears in the folder specified in step 2 on page 1-3 and the WSDL files are copied and placed in the Schemas folder, as shown in the following figure.

Figure 1-10 New JPD and WSDL Files



This completes the import process and your new JPD file is located in the folder specified in step 2 on page 1-3.

Known Limitations and Issues

This section details some known limitations and issues of the BPEL Import tool. The majority of these issues exist because of the inherent differences between the JPD and BPEL languages.

It is very important that you confirm that the generated JPD file corresponds semantically with the input BPEL file.

- Conversion of Compensation Handlers is not supported. If you try to convert a BPEL file that contains Compensation Handlers, a warning appears stating that Compensation Handlers are not supported and are ignored in the generated JPD file. The conversion process will continue after this warning is displayed.
- Global `eventHandler` is not supported. If it is included in the BPEL file, it is ignored during the conversion process and the following message appears: `Global EventHandlers are not supported, hence ignored.`
- Conversion of `wait` and `onAlarm` for which the duration is specified using the `until` attribute is not supported. If the `until` attribute is contained in the BPEL file, a warning appears stating that it is not supported and is ignored in the generated JPD file. The conversion process will continue after this warning is displayed.

  Note: Both attributes (`for` and `until`) cannot be specified in a valid BPEL file.
- A BPEL file that starts with a `flow` is not supported. You cannot convert a BPEL file that has a `flow` construct as a first logical child. In this instance, logical activity refers to any activity other than sequence and scope.
- Conversion of `links` from activity `flow` is not supported. If `links` are present in the BPEL file that you want to convert, a warning appears stating that the generated JPD file may be erroneous as it contains `links`, `source`, `target`. The conversion process will continue and will ignore these unsupported activities.
- Conversion of a BPEL file in which more than one `reply` activity is used to return normal output/outcome is not supported. In order to qualify for conversion, a BPEL file must only contain one `reply` activity to return a normal outcome. This is due to the fact that in a JPD file, there can only be one `returnMethod` for any synchronous `clientReceive`. However, in a BPEL file, there can be several `reply` activities for a single `receive`. There is no direct way to map one `receive` and several `reply` nodes to a single `clientRequestWithReturn`.

- A `pick` activity with more than one `OnAlarm` activity is not supported for conversion. This is due to the fact that `pick` gets converted to `eventChoice`. Each `eventChoice` can have at most one `timeoutEvent` node, which is generated for an `onAlarm` activity.
- Specifying the `for` attribute of `onAlarm` activity using `bpws:getVariableData(..)` is not supported. When a `for` attribute is specified using `bpws:getVariableData(..)`, the imported code produces a syntax error.
- If the import fails with the following message: `WARNING: Failed to parse input XSD & WSDL files. Please see logs for detail`, and the log file contains the following error message: `Duplicate global type`, you should specify that multiple definitions of the namespace are ignored.

  The log file for the import process, named `BpelImport.log`, is stored in `%BEA_HOME%\\weblogic81\workshop` where `%BEA_HOME%` is the directory where you installed WebLogic Workshop. This log file provides information about the import process.

  To specify that multiple definitions of the namespace are ignored, select **Schema Project→Properties→Build** and list the namespaces to be ignored in the **ignore multiple definitions in following namespaces** field.
- Limited query parsing is performed when `assign` activities are imported. Therefore, the generated XQuery expressions might not always be syntactically correct. Make sure that you check to verify the correctness of any generated XQuery expressions.
- Any reference to soapencoding types in your BPEL file will result in import failure. If you want to import a BPEL file that contains soapencoding types, you must place the *SOAP Encoding* xsd file in the WSDL directory when importing through WebLogic Workshop.
- When `assign` is converted to a variable, the resultant XQuery file may contain the following "PARSE ERROR" in the Design view: `The main XML element does not match the root node of the target schema`. However, you can ignore this message as the correct value is generated in runtime. This error is due to the fact that the **Design** view of XML Mapper has limitations and might not always be able to parse even correct XQuery expressions.
- After you import a BPEL file that contains scope level `eventHandlers` in the onMessage branch, a dummy Timer method may be generated for the `eventHandler` onMessage path. JPD specification mandates that `onMessage` and `onTimeout` paths can only be associated with process nodes (or block of nodes) that do not run automatically. To handle this constraint, a dummy Timer node with a 1 second timeout is created if an `eventHandler` is associated with a scope that does not contain any `receive`, `onMessage`, `flow`, or `wait` activity.

- When a BPEL file is imported, queries are not parsed, they are imported ‘as is’. You must properly qualify the query string or the generated XQueries will fail at runtime, by setting the `attributeFormDefault="qualified"` and `elementFormDefault="qualified"` and then using the qualified query string.
- A BPEL file may have `reply` activities on multiple partner links. This is not supported in a JPD file. Only one such partnerlink will be converted as `clientRequestWithReturn` that matches the reply semantics. `reply` activities on other partnerlinks will be converted into an asynchronous interface.
- BPEL Event Handlers are translated to JPD `onMessage` paths which have slightly different semantics. In the imported JPD file, once the event is received and the `onMessage` path is executing, the block (corresponding to the BPEL scope) does not continue executing until the `onMessage` path completes. This also means that only one instance of an Event Handler can be active at any one time.
- In the imported JPD file, Event Handlers will not be triggered while waiting for the response of a synchronous Web service.
- The BPEL Import tool converts BPEL `invoke` activities to Web Service `controlSend` calls. It generates a Web Service control for the specified partner service and the JPD file invokes the corresponding method on the control. This release has some limitations in its capability to generate a Web Service control (a JCX file) in certain situations. You should carefully examine the contents of the generated JCX file to ensure that you can compile it.
- If the input WSDL file does not have any bindings and service information for any portTypes, the BPEL Import tool tries to generate a method for each portType with some default values for the binding and service information. You should review these default values carefully. You should provide valid binding and service information after the import.
- The JPD file generated from BPEL processes that contain `<reply>` in Switch, Case, o Otherwise nodes may not be logically correct. This is because the matching `receive` and reply of the synchronous operation are not present at the same level.
- BPEL allows event handlers to be associated with any arbitrary activities. However, a JPD file does not support cases where event handlers are associated with any node inside a `<receive> - <reply>` block. In such a scenario, the generated JPD may not compile.

CHAPTER 2

Using the BPEL Export Tool

This section describes how to use the BPEL Export tool in WebLogic Workshop®, to export BPEL 1.1 compliant code from a JPD file.

Topics Included in This Section

Introduction to BPEL
Provides a brief background on BPEL and how it evolved.

BPEL Export Tool
Provides an overview on how the BPEL Export tool works.

Exporting a BPEL File to JPD
Describes how to export a BPEL file using WebLogic Workshop.

Known Limitations and Issues
Provides information on the export tool that will enable you to use is more effectively and efficiently.

Introduction to BPEL

BPEL4WS (Business Process Execution Language for Web Services, commonly referred to as "BPEL") defines a language for the formal specification of automated business processes. Processes written in BPEL can orchestrate interactions between Web services using XML documents in a standardized manner. These processes can be executed on any platform or product that complies with the BPEL specification. BPEL therefore enables customers to protect their investment in process automation by allowing them to move these process definitions between a

wide variety of authoring tools and execution platforms. While there have been previous attempts to standardize business process definitions, BPEL has attracted an unprecedented level of interest and is the first to gain critical mass among software vendors.

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http://dev2dev.bea.com/webservices/BPEL4WS.csp

and the official Home page for the BPEL standardization effort, hosted by OASIS at:

http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wsbpel

In BEA WebLogic Integration™, a business process is defined using BEA Process Definition for Java (JPD). The BPEL export tool is a design-time aid to help convert a JPD file into a BPEL file.

BPEL Export Tool

You can use the BPEL Export tool to export the semantics of a JPD file into BPEL where it can be used in a BPEL design environment. BPEL code exported using the BPEL Export is BPEL 1.1 compliant and can be used in design environments compliant with BPEL 1.1. While the main orchestration logic of the JPD is exported to BPEL, it is not expected that the exported BPEL will be immediately executable in the target environment. You will need to manipulate the BPEL in the target environment to get the exported process to run, or to get close to the run-time semantics.

This is due to the fact that some executable call-outs from the JPDs will be opaque to the exported BPEL code. These executable units generally include controls, code written in perform nodes, and XQuery transformations. The BPEL Export tool copies the Java code and the XQuery code as extension nodes in BPEL. As a result, you must re-implement the logic in the target BPEL environment, since JPD provides a superset of the functionality provided by BPEL.

One Web Service Definition Language (WSDL) file defines the WSDL interface of the business process and defines a partner-link type for the interface. The other file defines the WSDL interface and partner-link types of the partners. Partners are the artifacts interacting with the business process. These artifacts are either consumers or providers of services to the business process.

These WSDL files are not the same as the WSDL that WebLogic Workshop would generate for the corresponding JPD or JCX files. The differences are described in detail in "Known Limitations and Issues" on page 2-5.

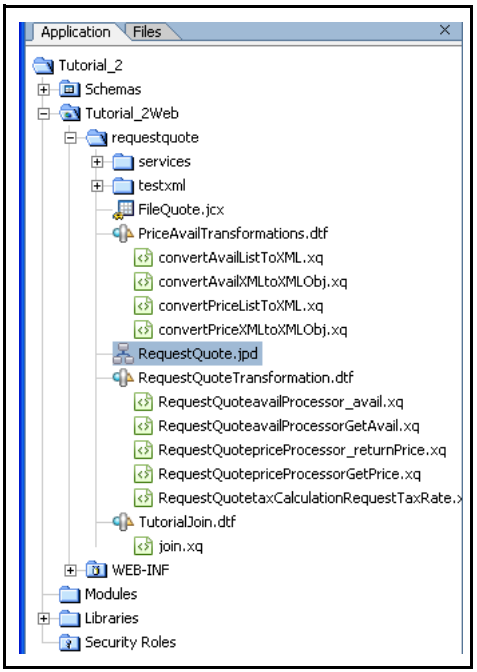
The relevant XSD schema files (which must be located in a schema folder in the WebLogic Integration application) are needed in the target environment, along with the WSDL and BPEL files.

Exporting a BPEL File to JPD

To Export a JPD

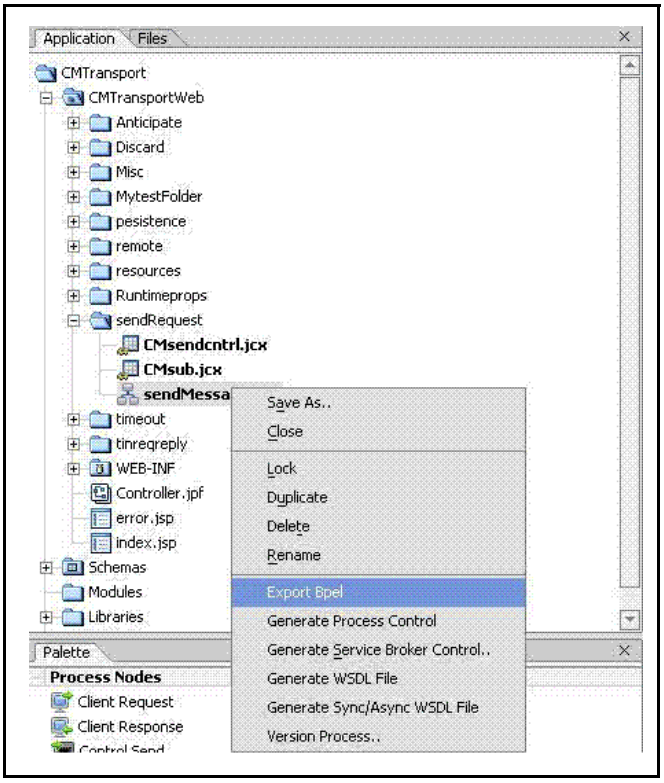
1. In WebLogic Workshop, right click on a JPD file in the **Application** pane. For example, in the following figure, right click on `RequestQuote.jpd`.

Figure 2-1 JPD Location



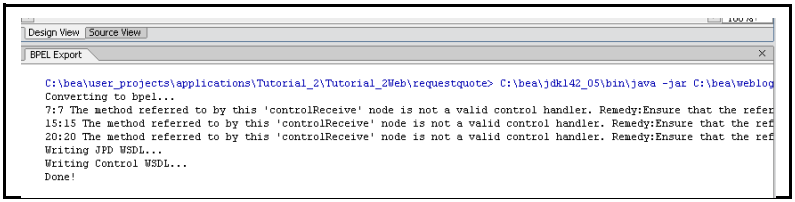
2. Select **Export Bpel**.

Figure 2-2 BPEL Export Selection



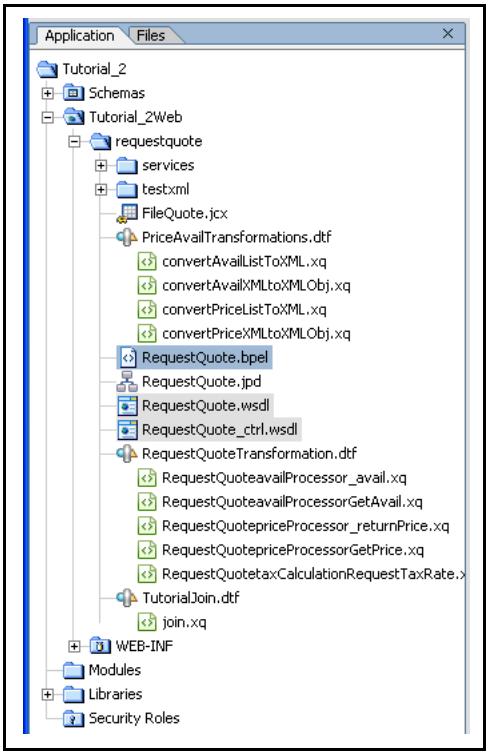
When you select Export Bpel, a **BPEL Export** pane appears below the **Design View** and displays diagnostic messages about the export process.

Figure 2-3 BPEL Export Pane



3. The BPEL Export tool will create files, `RequestQuote.bpel` and `RequestQuote.wsdl`, in the same directory as the `RequestQuote.jpd`. Another WSDL file `RequestQuotel_ctrl.wsdl` may also be created, as shown in the following figure.

Figure 2-4 Generated Files



Known Limitations and Issues

This section provides some notes on the export process and details some known limitations of the BPEL Export tool.

Notes

The section details information that you should remember when using the BPEL Export tool.

- The default expression language for the exported BPEL is XQuery. Specifically, the version of the XQuery specification described in Working Draft 16 from August 2002 which is available at:

  `http://www.w3.org/TR/2002/WD-xquery-20020816`

  This is the same version of XQuery used by WebLogic Integration 8.1.

- Process variables in a JPD file are converted to variables in the outermost scope of the BPEL file. `int`, `short`, `long`, `byte`, `float`, `boolean`, `double`, `String`, `java.util.Date`, and `java.util.Calendar` are converted to the corresponding schema built-in types. XMLBean types are converted to the corresponding XML Schema type. A wrapper element type is introduced for complex types, BPEL variables cannot have a complex type as their type. Any other types (including temporary transform variables) are converted to an element type with no type attribute.
- Controls are exported as partner-links. The operations for this partner-link are derived from the methods in the control JCX file. Each method parameter is treated as a separate input message part; the name of the part is the same as the name of the parameter. The output message is determined from the return type of the control method. It has a single part called `parameters`, since a method has a single return type with no name.
- XQuery expressions in the JPD file are copied 'as is' into the expression attributes of the corresponding BPEL activity. XQuery code referenced in a Data Transformation control is copied into the JPD namespace `xqueryCode` element.
- Before and after transformation, `send` or `receive` messages are exported to assign activities before or after the corresponding `invoke`, `reply`, or `receive` activities.

The following table details how various JPD file attributes, nodes, and so on are converted to a BPEL file.

Table 2-1 JPD File to BPEL FIle Conversion

In the JPD file	converted to in a BPEL file
`clientRequest` and `controlReceive` nodes	`receive` activity
`clientCallback` and `controlSend` nodes	`invoke` activity
synchronous `returnMethod` attribute	`reply` activity
`onMessage` paths	`onMessage` event handlers
`onTimeout` paths	`onAlarm` event handlers
`eventChoice` node	`pick` activity
`Parallel` node	`flow` activity
`onException` blocks	`faultHandlers`

Table 2-1 JPD File to BPEL FIle Conversion

In the JPD file	converted to in a BPEL file
`perform` node	`empty` activity with the java code from the `perform` method copied into the body of a JPD namespace javaCode element
control flow nodes: • `decision` • `switch` • `forEach` • `doWhile` • `whileDo`	to the equivalent BPEL activities.

Known Limitations

This section details some of the known JPD export limitations.

- Any warning messages that are generated during the export process do not include an exact line number reference of the original JPD file.
- Constants declared in a JPD file are captured in the BPEL file as `jpd:initialValue`.
- When you export a JPD file that contains a Service Broker control, the shape of the process and control WSDLs are derived from the JPD file and are different from the JPD WSDL.
- Any methods which are not directly associated with a JPD node are lost during the export.
- If a converted control (service or process) produces a method with a void return, there are two possible causes:
  - the corresponding operation has no output message.
  - the operation has an output message with no parts.

    The BPEL Export tool does not distinguish between the two cases and always assumes that the first case is true.
- User schemas are referenced by a `xsd:include` element. If the types used are in a WSDL file, it is exported using `wsdl:import`.

- If the schemas folder is created with the default name, all XSD files placed in the top level directory of this folder will be referenced by an absolute file URL. For all other XSD files, just the filename is referenced.
- If a JPD file contains `ArrayList` or another Collection class's `add()` method, a non-standard JPD namespace attribute `jpd:appendToCollection` is generated with its value set to `true`.
- If MFL types are used in the JPD file, they are converted to a dummy empty type. A warning to this effect is emitted. The warning message is: `MFL types are not supported for export. Creating an empty element type for <type>`.
- Assign statements are generated to assign global variables to and from Web service messages. However, if the Web service message does not have any part defined, no assign statement is generated.
- Service controls are treated as generic Java controls. The original WSDL file for the Service control is not used in the export.
- `afterExecute=resume` is not supported for the following paths:
  - `OnTimeout`
  - `OnException`
  - `OnMessage`
- `freezeOnFailure=true`, `onSyncFailure`, and `persistent` are not supported.
- `executeOnRollback` is not supported for `OnException` path.
- Transaction blocks are converted into a scope with BPEL extension `jpd:transaction` set to `true`.
- XQuery transformations are copied into the `<jpd:xquerycode>` node as a BPEL extension.
- During the export process, Java code is copied into the `<jpd:javacode>` node as a BPEL extension.
- Message Broker subscriptions are exported as partner links. The message broker channel name and subscription filter are not included in the export.
- Perform nodes are exported as an empty activity. Java code is included as a `<jpd:javacode>` extension.

- Attribute information for controls in the JCX file or before the control declaration are lost. For example, for Message Broker controls, the channel name and subscription filters are not copied into the exported BPEL or WSDL files.
- When process variable names, control file names (.dtf, .jcs and so on), control method names, parameters used in control methods, variable names defined for controls, and `.jpd` file names that contain special character like `$` are exported to *`.bpel`* files, these names are used as is in the "name" attribute of "variable" and "variable" attribute of "to". Since BPEL schema defines these attributes as NCName type, these special characters become invalid in the generated *`.bpel`* file. However, this limitation is no longer valid for the `$` character. For any other special character (that is not valid NCName or QName type), althought the .bpel file is generated, schema validation of the file fails.

  Workaround: The generated *`.bpel`* file needs to be manually modified by using valid characters.

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