

HP

Business Process Insight

For the Windows® Operating System

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Integration Training Guide - Importing BPEL

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Contents

1	Introduction to BPEL	9
	BPEL Basics	10
	A BPEL Business Process	11
	XML Elements	11
	Partner Links	12
	The Insurance Selection Process	13
	BPEL Process Engines/Development Tools	19
	Exporting BPEL	21
2	The HPBPI Modeler	23
	Importing BPEL	24
	Junction Steps	26
	Closing Junction Steps	26
	Start and End Steps	26
	No Partner Links	27
	Step Names	27
	Cleaning up the Process Diagram	29
	Start and End Steps	29
	Junction Steps	29
	Activity Steps	29
	Is the Process Correct?	30
	A Final Process Diagram	30
	What Next?	32
	The BPEL Import Wizard	33
	Replace Existing Process Definition	33
	Overall Size of the Process Canvas	34
	Name Generation	36
	File Location	36

File Format	38
Built-in Transformations (_hex_).....	42
Custom Transformations.....	43
Transformer Code.....	43
Compiling the Code.....	45
The Name Generator Properties File	46
Update the Modeler Script.....	47
3 BPEL Element Mappings	49
Formatting Conventions	50
process	51
The BPEL XML.....	51
HPBPI Step Structure	54
assign	56
The BPEL XML.....	56
HPBPI Step Structure	56
compensate.....	57
The BPEL XML.....	57
HPBPI Step Structure	57
empty	58
The BPEL XML.....	58
HPBPI Step Structure	58
flow	59
The BPEL XML.....	59
HPBPI Step Structure	59
invoke	61
The BPEL XML.....	61
HPBPI Step Structure	62
pick	64
The BPEL XML.....	64
HPBPI Step Structure	65
receive.....	67
The BPEL XML.....	67
HPBPI Step Structure	67
reply	69

The BPEL XML.....	69
HPBPI Step Structure	69
scope	71
The BPEL XML.....	71
HPBPI Step Structure	72
sequence	74
The BPEL XML.....	74
HPBPI Step Structure	74
switch	76
The BPEL XML.....	76
HPBPI Step Structure	77
terminate	79
The BPEL XML.....	79
HPBPI Step Structure	79
throw.....	80
The BPEL XML.....	80
HPBPI Step Structure	80
wait	81
The BPEL XML.....	81
HPBPI Step Structure	81
while	82
The BPEL XML.....	82
HPBPI Step Structure	82

1 Introduction to BPEL

This chapter provides an introduction to Business Process Execution Language (BPEL) and leads you through an example business process.

BPEL Basics

Business Process Execution Language (BPEL) defines a notation for specifying business process behavior, typically based on Web Services. Sometimes BPEL is also known by the acronyms WS-BPEL (Web Services BPEL) or BPEL4WS (BPEL for Web Services).

BPEL was first developed back in 2002 by BEA, IBM, and Microsoft. Since then the majority of vendors have become involved which has resulted in several modifications and improvements, and adoption of version 1.1 in March 2003. In April 2003, BPEL was submitted to OASIS (Organization for the Advancement of Structured Information Standards) for standardization purposes. This has led to even broader acceptance across the industry. Having said that, BPEL is still in its early days and you find that actual implementations of BPEL can vary between the different manufacturers.

BPEL has been designed specifically as a language for the definition of business processes. BPEL supports two different types of business processes:

- Executable processes

This is where you specify the exact details of your business process. This business process definition can then be executed by a BPEL Process Engine.

- Abstract processes

This is where you specify a high level overview of your business process. An abstract process definition does not include the internal details of each step and decision within the business process, and an abstract process definition can not be executed by a BPEL Process Engine.

A BPEL process specifies the order in which participating services should be invoked. Service can be invoked sequentially or in parallel. With BPEL, you can express conditional behavior, for example, a Web service invocation can depend on the value of a previous invocation. You can also construct loops, declare variables, copy and assign values, define fault and exception handlers, and so on. By combining all these constructs, you can define complex business processes in an algorithmic manner. So BPEL is indeed a form of programming language. Hence a BPEL Process Engine can be given an executable BPEL process definition, and actually run the business process.

BPEL process definitions are written in XML.

A BPEL Business Process

A BPEL business process is initiated by receiving a request. To fulfill this request, the process then invokes the specified Web service(s) and finally responds to the original caller. To be able to communicate with the involved Web services, the BPEL process requires the WSDL (Web Service Definition Language) definitions for each Web service.

A BPEL process consists of steps. Each step is called an activity.

XML Elements

Within BPEL there are XML elements for specifying actual work activities, such as the following:

- `<invoke>` - to invoke a Web service .
- `<receive>` - to wait for the client to invoke the business process through sending a message.
- `<reply>` - to generate a response for synchronous operations.
- `<assign>` - to manipulate data variables.
- `<throw>` - to indicate faults and exceptions.
- `<wait>` - to wait for some time.
- `<terminate>` - to terminate the entire process.

There are also XML elements within BPEL for defining code structures, such as the following:

- `<sequence>` - to define a set of activities that are to be invoked in an ordered sequence.
- `<flow>` - to define a set of activities that are to be invoked in parallel.
- `<switch>` and `<case>` - to implement branches.
- `<while>` - to define a while loop.
- `<pick>` - to select one of a number of alternative paths.

Each BPEL process also declares variables, using the `<variable>` element.

Partner Links

All external services that a BPEL process interacts with, are called partner links. Partner links can be links to Web services that are invoked by the BPEL process. Partner links can also be links to clients which invoke the BPEL process. Each BPEL process has at least one client partner link, because there has to be a client that invokes the BPEL process itself.

It is usual for a BPEL process to have at least one invoked partner link, because the process most likely invokes at least one Web service :-). Invoked partner links may, however, become client partner links - this is usually the case with asynchronous services, where the process invokes an operation. Later the service (or partner) invokes the call-back operation on the process to return the requested data.

All partner links are accessed through WSDL port types. A port type is a WSDL definition that describes the call interface (methods available) for a Web service.

The Insurance Selection Process

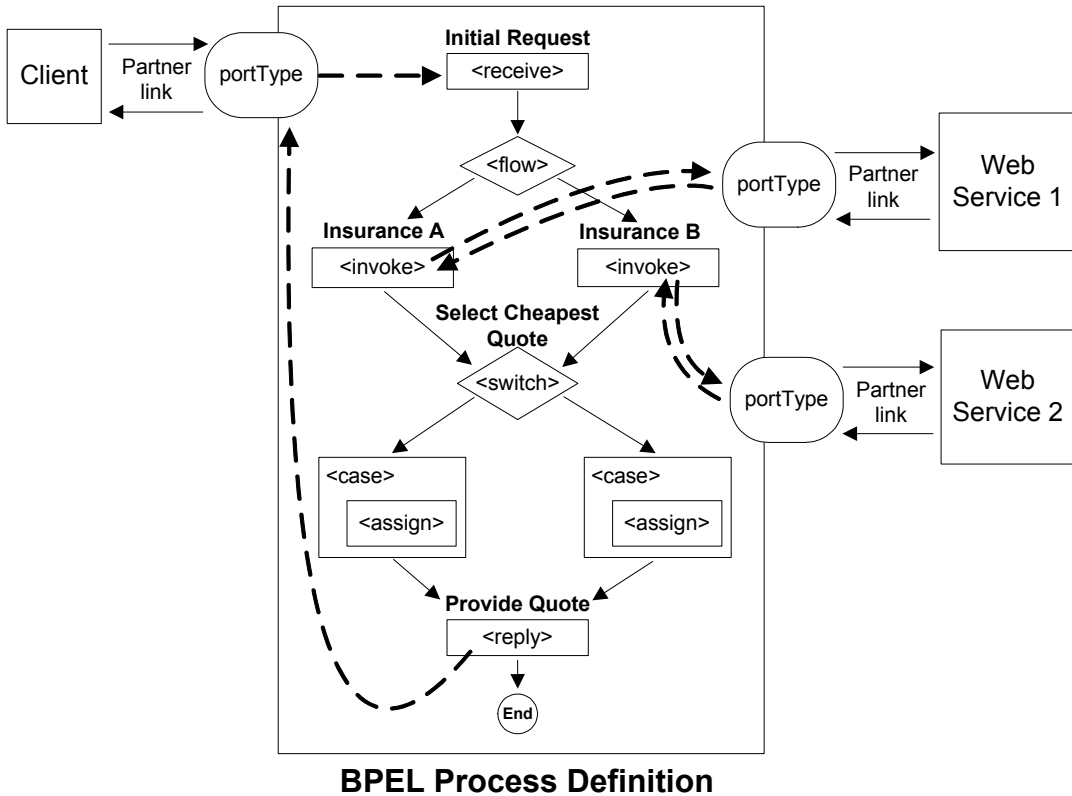
Let's consider an example business process and see how it might be represented in BPEL.

Suppose you have a simple process that looks for the cheapest insurance quote from two insurance brokers. The basic steps of this Insurance Selection process are as follows:

1. A client initiates a request to find the cheapest insurance quote.
2. The process then issues requests to both the insurance brokers, asking them to provide an insurance quote.
3. The process then compares the two quotes, and chooses the quote that is for the cheapest amount of money.
4. The cheapest quote is then passed back to the initiator.

[Figure 1](#) on page 14 shows how this process might execute within a BPEL/ Web Services environment.

Figure 1 Insurance Selection BPEL Process



Let's consider the steps shown above in [Figure 1](#):

- Someone initiates the process.
An external client (a partner link) invokes this BPEL process as a Web service.
- The first step in the BPEL process receives the request for an insurance quote.
- The process then starts up two parallel paths.
Each path of the process invokes the appropriate Web service to get an insurance quote.
- The process then chooses the cheapest quote and assigns the return details to be this cheapest quote.
- The cheapest quote details are then returned to the initiating client.

Let's now look in more detail at the actual BPEL XML for defining this example Insurance Selection process.

The first thing you do is declare the process and all XML name spaces that are used within this process, as follows:

```
<process name="Insurance Selection Process"
  targetNamespace="http://somewhere.com/bpel/example/"
  xmlns="http://schemas.xmlsoap.org/ws/2003/03/business-process/"
  xmlns:ins="http://somewhere.com/bpel/insurance/"
  xmlns:com="http://somewhere.com/bpel/company/" >
```

The process is called Insurance Selection Process.

You then declare the partner links to the BPEL process client (called `client`) and the two insurance Web services (called `insuranceA` and `insuranceB`).

The XML looks as follows:

```
<partnerLinks>
  <partnerLink name="client"
    partnerLinkType="com:selectionLT"
    myRole="insuranceSelectionService"/>

  <partnerLink name="insuranceA"
    partnerLinkType="ins:insuranceLT"
    myRole="insuranceRequester"
    partnerRole="insuranceService"/>

  <partnerLink name="insuranceB"
    partnerLinkType="ins:insuranceLT"
    myRole="insuranceRequester"
    partnerRole="insuranceService"/>
</partnerLinks>
```

The actual syntax for these `<partnerLink>` elements is not important for your basic understanding of BPEL. Essentially, each partner link is defining the link to each Web service used by this BPEL process definition.

Next, you declare the variables for the insurance request, insurance A and B responses, and for the final selection. The XML looks as follows:

```
<variables>
  <!-- Input for BPEL process -->
  <variable name="insuranceRequest"
            messageType="ins:insuranceRequestMessage"/>
  <!-- Output from insurance A -->
  <variable name="insurance-A-Response"
            messageType="ins:insuranceResponseMessage"/>
  <!-- Output from insurance B -->
  <variable name="insurance-B-Response"
            messageType="ins:insuranceResponseMessage"/>
  <!-- Output from BPEL process -->
  <variable name="insuranceSelectionResponse"
            messageType="ins:insuranceResponseMessage"/>
</variables>
```

Finally, you specify the actual steps of the process. First you wait for the initial request message from the client (<receive>). Then you invoke both insurance Web services (<invoke>) in parallel using the <flow> activity. The insurance Web services return the insurance premiums. Then you select the lower amount (<switch>/<case>/<assign>) and return the result to the client (the caller of the BPEL process) using the <reply> activity. The XML look as follows:

```
<sequence>

  <!-- Receive the initial request from client -->
  <receive name="Initial Request"
           partnerLink="client"
           portType="com:insuranceSelectionPT"
           operation="SelectInsurance"
           variable="insuranceRequest"
           createInstance="yes" />

  <!-- Make concurrent invocations to Insurance A and B -->
  <flow name="Get Quotes">

    <!-- Invoke Insurance A Web service -->
    <invoke name="Insurance A"
            partnerLink="insuranceA"
            portType="ins:computeInsurancePremiumPT"
            operation="ComputeInsurancePremium"
            inputVariable="insuranceRequest"
            outputVariable="insurance-A-Response" />
```



```

        <!-- Invoke Insurance B Web service -->
        <invoke name="Insurance B"
            partnerLink="insuranceB"
            portType="ins:computeInsurancePremiumPT"
            operation="ComputeInsurancePremium"
            inputVariable="insuranceRequest"
            outputVariable="insurance-B-Response" />

    </flow>

    <!-- Select the best offer and construct the response -->
    <switch name="Select Cheapest Quote">

        <case condition="bpws:getVariableData('insurance-A-Response',
            'resultData', '/resultData/Amount')
            &lt;= bpws:getVariableData('insurance-B-Response',
            'resultData', '/resultData/Amount') ">

            <!-- Select Insurance A -->
            <assign>
                <copy>
                    <from variable="insurance-A-Response" />
                    <to variable="insuranceSelectionResponse" />
                </copy>
            </assign>
        </case>

        <otherwise>
            <!-- Select Insurance B -->
            <assign>
                <copy>
                    <from variable="insurance-B-Response" />
                    <to variable="insuranceSelectionResponse" />
                </copy>
            </assign>
        </otherwise>
    </switch>

    <!-- Send a response to the client -->
    <reply name="Provide Quote"
        partnerLink="client"
        portType="com:insuranceSelectionPT"
        operation="SelectInsurance"
        variable="insuranceSelectionResponse"/>

</sequence>

</process>

```

Notice that you close off the process with a closing `</process>` element.

As each BPEL process is itself a Web service, each BPEL process also needs a WSDL document. However, understanding WSDL documents is beyond the scope of this document.

From this example BPEL process, you might think that this process could alternatively have been written in a programming language such as Java. Indeed, it could have been. However, it is important to realize that a BPEL process is portable, even outside the Java platform. BPEL processes can be executed on BPEL process engines that are based on either a Java platform, or on any other software platform (for example .NET). This is particularly important in business-to-business interactions where different partners may be using different platforms.

BPEL Process Engines/Development Tools

There are BPEL process engines for both the J2EE and .NET platforms. Some examples are as follows:

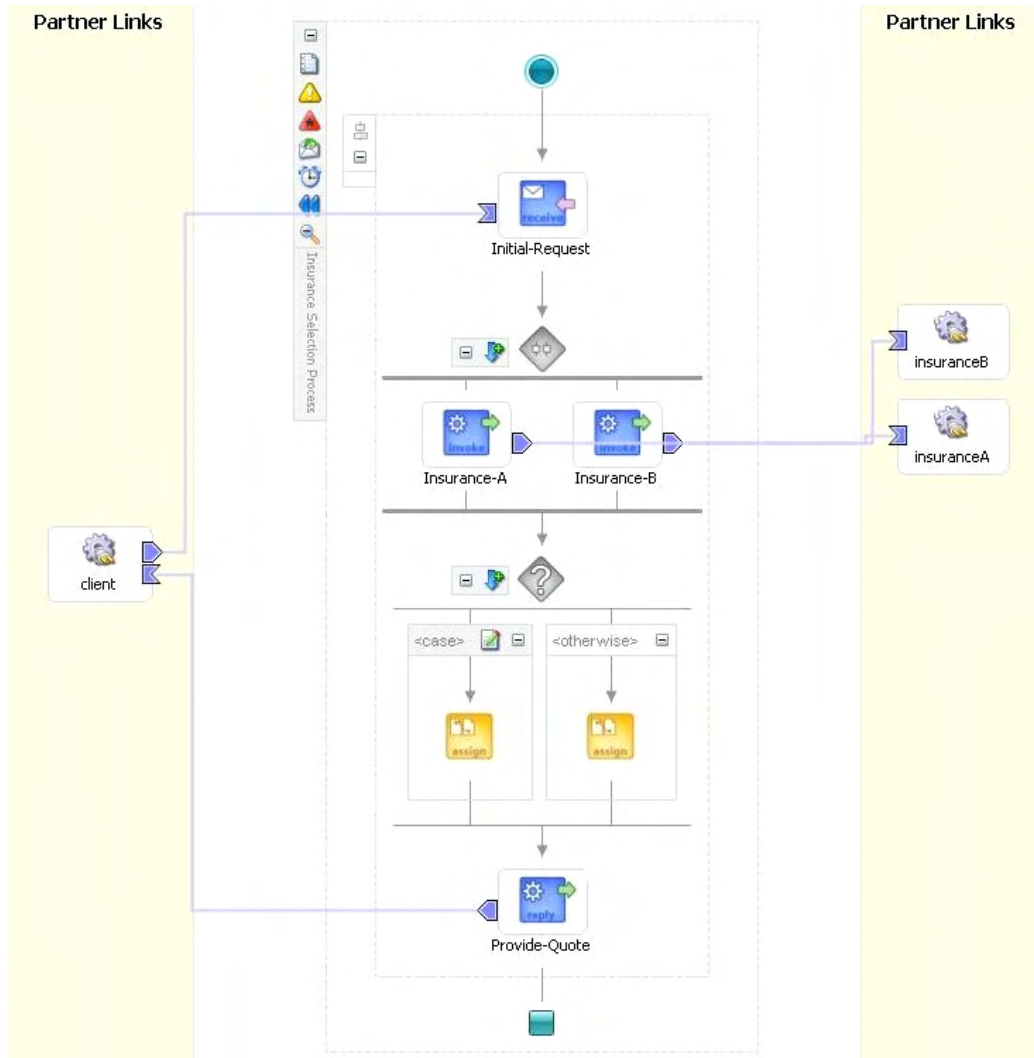
- Oracle BPEL Process Manager (J2EE)
- IBM WebSphere Business Integration Server Foundation (J2EE)
- ActiveBPEL engine (J2EE)
- OpenStorm Service Orchestrator (J2EE or .NET)
- Microsoft BizTalk (.NET)

In addition to BPEL process engines, there are also BPEL design tools available. These tools enable graphical development of BPEL processes and are often shipped with the BPEL process engine. Some example BPEL development tools are as follows:

- Oracle BPEL Designer
- ProVision - from Proforma
- IBM WebSphere Studio Application Developer, Integration Edition
- IBM BPWS4J Editor
- Active Endpoints Active Webflow Designer

To show you an example of how a BPEL design tool might represent a BPEL business process, let's consider the example Insurance Selection process as shown in [Figure 1](#) on page 14. If you were to look at this business process from within the Oracle BPEL Designer, the business process might be represented as shown in [Figure 2](#).

Figure 2 Oracle BPEL Designer



Notice that this diagram shows the partner links and the connections to/from these. The Oracle BPEL Designer also lets you collapse and expand the various sections of the process diagram.

Exporting BPEL

The BPEL design and development tools allow you to design your BPEL processes using a user friendly GUI front end. These tools also offer the ability to export the process as a BPEL XML file.

It is worth noting that the BPEL standard is still in its infancy and (believe it or not) not all of the BPEL design and development tools necessarily export BPEL that matches the business process being exported.

The fact that a BPEL development tool says it has “exported the process as BPEL” does not necessarily mean that it is correct. Indeed, with some of the BPEL tools at the moment, if you export the process as BPEL, and then re-import that BPEL, you can end up with a business process that bears little resemblance to the one you started with :-). This can become an issue when you are given a BPEL file and asked to import it into the HPBPI Modeler. The HPBPI Modeler correctly interprets the BPEL, but if the BPEL does not match the actual business process, then the HPBPI process definition will not match the business process either.

2 The HPBPI Modeler

This chapter looks at how to import a BPEL process into the HPBPI Modeler, and looks at the resultant HPBPI process definition.

Importing BPEL

The HPBPI Modeler is able to import a business process from a BPEL XML file.

Let's consider the Insurance Selection process from [Chapter 1](#). Take a look at [Figure 1](#) on page 14 to remind yourself of the business process. If you take the BPEL for this process (as listed in [Chapter 1](#)) and import this into the HPBPI Modeler (File->Import Definitions...) it creates an HPBPI process diagram as shown in the two figures [Figure 3](#) and [Figure 4](#).

Figure 3 Insurance Selection Process - Part 1

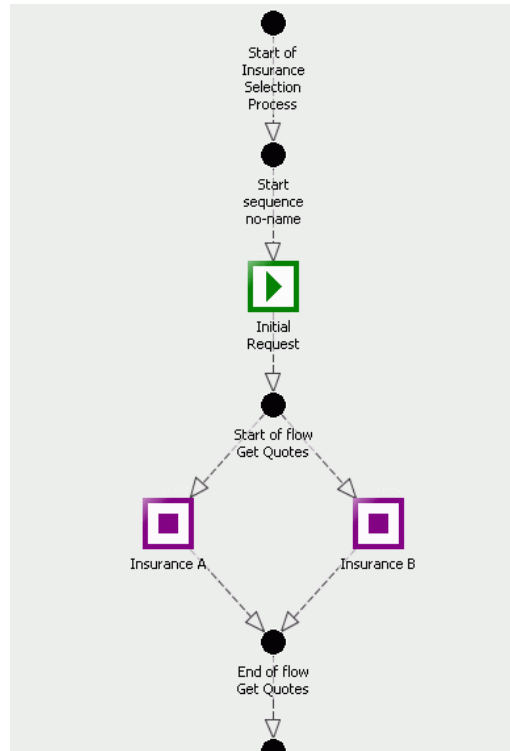
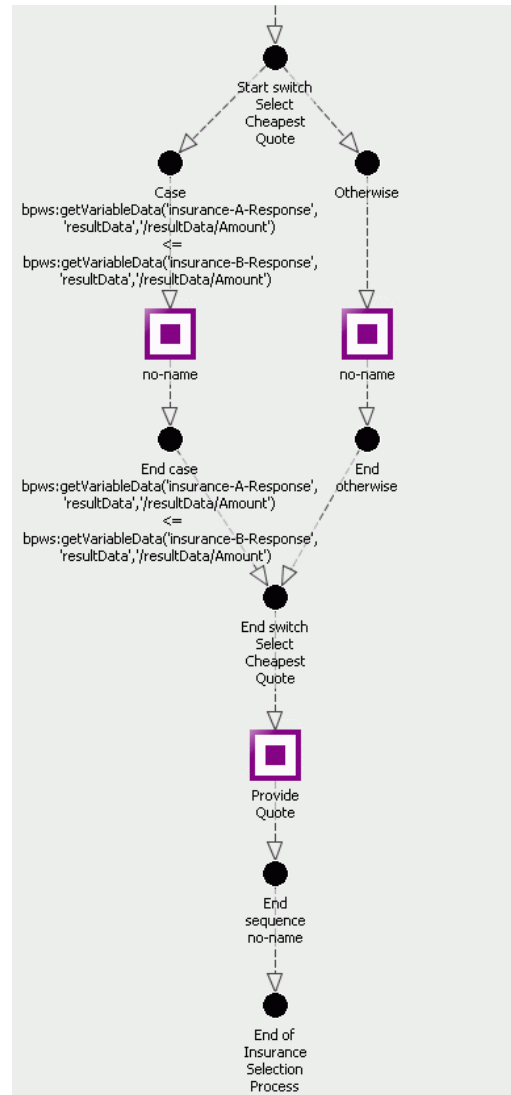


Figure 4 Insurance Selection Process - Part 2



Let's talk in more detail about figures [Figure 3](#) and [Figure 4](#), and gain an understanding of how the HPBPI BPEL importer works.

Junction Steps

The first thing to notice is that the process contains quite a lot of junction steps. This is mainly because the HPBPI BPEL importer has been written to preserve the BPEL process structure. The idea is that you can see the original BPEL structure and this might help you to better understand the resulting HPBPI process diagram.

Closing Junction Steps

For every junction step that starts a BPEL structure, there is a corresponding junction step for the closing of this structure. For example, in the BPEL definition, the `<switch>` element has a closing `</switch>` element, hence the HPBPI process diagram has a `Start switch Select Cheapest Quote` junction step, and an `End switch Select Cheapest Quote` junction step.

This is true for all BPEL structural elements. This why you also see junction steps for the start and end of the process itself, the start and end of the enclosing sequence that contains the process, the start and end of the switch, and the two cases within this switch structure. etc..

Indeed, within BPEL there is an assumption that, unless an element explicitly terminates the process, then the flow of control continues down to the next logical element in the process. Thus, when you import BPEL into the HPBPI Modeler, the default behavior is to draw arcs such that the steps are linked to the logically next step in the process. For example, notice the `Start switch Select Cheapest Quote` junction step in [Figure 4](#) on page 25. You see that two arcs come out of this junction step, and the flow of control continues until these two paths are merged back at the closing junction step called `End switch Select Cheapest Quote`.

Start and End Steps

The HPBPI BPEL importer tries to identify any BPEL elements that may start, or end, the BPEL process. Not all BPEL definitions necessarily contain this information within their elements.

In this example, the step `Initial Request` is shown as a start step. This is because the actual BPEL tag for the corresponding step contained the `createInstance` option, as follows:

```
<receive name="Initial Request"
  partnerLink="client"
  portType="com:insuranceSelectionPT"
  operation="SelectInsurance"
  variable="insuranceRequest"
  createInstance="yes" />
```

As there was no BPEL element marked as terminating the process, no end step has been shown in the HPBPI process diagram.

It is not uncommon to import a BPEL process and not see any start step or end step. Even if some steps are shown as start or end steps, it is up to you, as the HPBPI developer, to consider the resultant process and decide which step, or steps, should become start or end steps.

No Partner Links

The resulting HPBPI process does not show the partner links within the BPEL process. Partner link information does not have any affect on the resultant process diagram, so it is ignored.

Step Names

Notice that in [Figure 4](#) on page 25, some of the steps have been created with a name of `no-name`. This is simply because the corresponding BPEL element did not contain the `name` attribute. If you have more than one step with the name `no-name` then the HPBPI Modeler marks these as `ToDo` errors and you need to assign appropriate names before you can deploy the process.

You can also see that in [Figure 4](#) on page 25, junction steps have been created that represent the test conditions within the `<case>` elements (within the `<switch>` element). When processing a `<case>` element, the default behavior is to set the step name to be the test condition. This can help you to understand the logic of the original BPEL process. In this example scenario, some of the resultant step names are too long and the HPBPI Modeler `ToDo` list highlights these errors. You need to shorten these step names before the process can be deployed.

When you use the HPBPI BPEL importer you can specify a name generator file in which you can alter the way that step names are constructed. For example, you can configure which properties of the BPEL element are used to construct the resultant step name. See [Name Generation](#) on page 36 for more details.

Cleaning up the Process Diagram

The resultant process diagram as shown in [Figure 3](#) on page 24 and [Figure 4](#) on page 25 is a direct interpretation of the BPEL being imported. The Insurance Selection process was defined as executable BPEL, hence the detailed information of the actual test criteria in the `<case>` element. An abstract BPEL process might contain less detailed information.

So how useful is the resultant process diagram?

Once you have cleaned up details such as any duplicate step names, and/or step names that are too long, you then need to consider the actual process itself.

Let's look at some of the things you need to consider about the resultant process diagram...

Start and End Steps

You need to consider where the start and end step(s) should be on your process diagram. Remember, the HPBPI BPEL importer may not be able to correctly identify the start or end step(s).

Junction Steps

Do you want all the junction steps left in the diagram?

The Junction steps help you to understand the structure of the underlying business process, however you may not need all this detail within your HPBPI process diagram.

Activity Steps

Are the activity steps all correct for what you need to monitor?

The fact that the HPBPI BPEL importer has created an activity step does not necessarily mean that you need to keep this step in your process diagram. You may decide that some activity steps are not needed. On the other hand, you might decide that more activity steps need to be added. It all depends on how you are wanting to monitor the business process.

Is the Process Correct?

Not all BPEL development tools produce correct BPEL when they export a business process. You may find that the resultant HPBPI process diagram does not correctly represent your business process.

It is important to go through the HPBPI process and check that it matches your understanding of the corresponding business process. Do not simply assume that the BPEL you have imported is correct.

If there is any doubt about the accuracy of the BPEL, try importing the BPEL file back into the original BPEL development tool that produced the BPEL export. You may find that the BPEL development tool is unable to correctly rebuild the original process from its own exported BPEL.

A Final Process Diagram

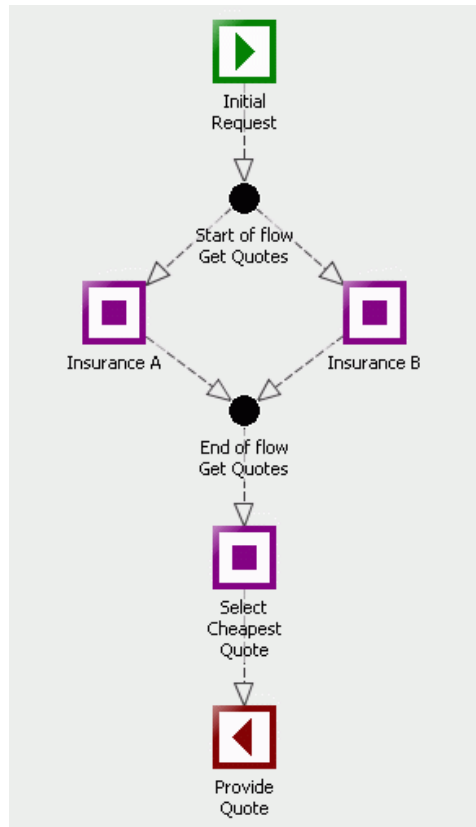
Let's consider the imported process as shown in [Figure 3](#) on page 24 and [Figure 4](#) on page 25, and look at one possible way to simplify this process definition.

You could simplify this process definition as follows:

1. Remove the first two `Start process` and `Start sequence` steps.
2. Remove the corresponding `End process` and `End sequence` steps.
3. Collapse the `switch/case/assign` segment of the diagram to be a simple activity step that assigns the cheapest insurance quote.
4. Change the `Provide Quote` step to be an `End` step.

The resultant process diagram is shown in [Figure 5](#) on page 31.

Figure 5 Final Insurance Selection Process



How you choose to alter your process definition is up to you. For example, you may decide to leave all the junction steps in the diagram. It also depends on the business events that you configure and the progression rules you set up for the steps. The process diagram shown in [Figure 5](#) on page 31 is just one possible alternative.

What Next?

So how helpful is it that you can import the BPEL into the HPBPI Modeler?

Some people might make the observation that, given a diagram of the original business process, the process diagram as shown in [Figure 5](#) on page 31 would not take very long to define yourself using the HPBPI Modeler - and for some processes that is going to be the case.

The main benefit that BPEL importing gives you is a starting point. That is, you are not just staring at a blank HPBPI Modeler screen and wondering how to start defining your process. Mind you, the process definition that is created from a BPEL import is likely to contain almost every step in your business process. Don't forget that in HPBPI you are trying to produce a high-level process definition that is useful for monitoring this business process, not run it.

The other thing to realize is that the BPEL import helps you define the process definition. You still need to then define and configure the data definition, the event definitions, the event subscriptions and step progression rules.

The BPEL importer can help you get started with the process definition, but you still have work to do before you can deploy this process and have it monitor your business process.

The BPEL Import Wizard

To actually import a BPEL process into the HPBPI Modeler, it is as simple as selecting the menu option: File->Import Definitions...

The various menu options within the BPEL import wizard are fully described in the HPBPI Modeler on-line help subsystem, so refer to the Modeler help if you need any details explained.

There are just a few points that are worth reiterating in this manual.

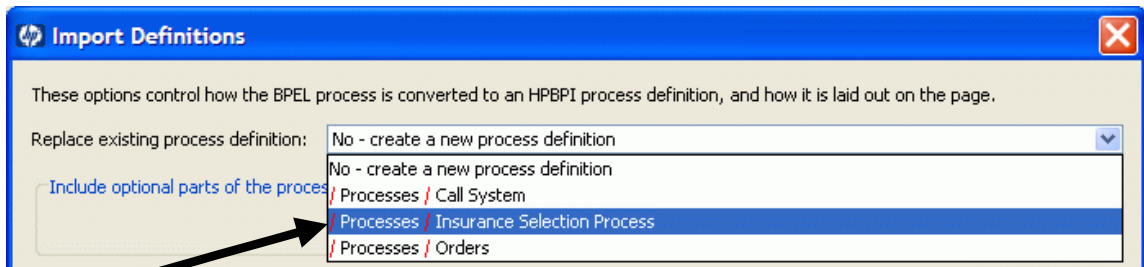
Replace Existing Process Definition

When importing a BPEL process into the HPBPI Modeler, the default behavior is to import the process and create it as a brand new process within the Model Repository. So the default is to **not** replace an existing process definition.

If you have previously imported the same BPEL process, the default behavior is to create a new process. This can cause some confusion at first, as you can end up with two (or more) processes in the Modeler, both listed in the Navigator pane with the same name. If you click on each process name within the Navigator pane, the Summary pane (below the Navigator pane) shows you the date and time at which that selected process was created.

If you want to replace an existing process, then you need to select an existing process from the pull-down, as shown in [Figure 6](#) on page 33. Once you have selected a process name from the pull-down, the BPEL process is imported and then renamed to the process name you selected. The imported process then replaces that selected process within the Model Repository. You need to make sure that you select the correct process name, otherwise you can overwrite a completely unrelated process definition.

Figure 6 Replacing an Existing Process



Overall Size of the Process Canvas

When you import a BPEL process into the HPBPI Modeler, you are presented with various options such as Grid cell size, Gaps between cells, Page border, and Minimum page size. These options all contribute to the resultant layout of the imported process. Again, please refer to the HPBPI Modeler on-line help for specific details about each option.

But there is one overall detail that is worth discussing here. When you import a BPEL process, you are probably only thinking about the final layout of the resultant process. You might also want to think about whether you intend adding more steps to this process and whether you will have enough room to do this.

Whenever a process is created within the HPBPI Modeler, the process is created within a process canvas. That is, each process has a limit to the overall size that it can grow to.

When you import a BPEL process, the resultant process might be quite large. So the HPBPI BPEL importer starts by allocating a default process canvas, as defined by the import setting Minimum page size. The importer then goes about creating the HPBPI process within this canvas. If the importer needs to grow the process canvas to fit a step on to the process, it does. The canvas is increased accordingly until all the steps and arcs have been added, and the process is complete.

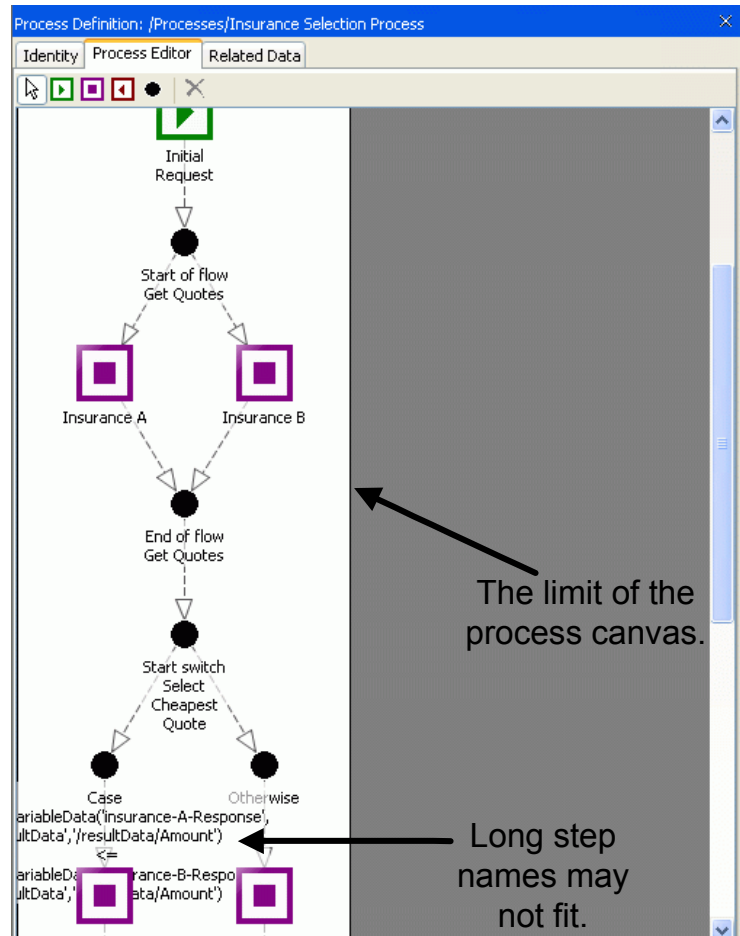
Once a process has been created, the process canvas is set and cannot grow any further. So when you import a BPEL process, take a look at the boundaries of the resultant process canvas. If you do not have enough space to add or reposition steps, then you might want to re-import the BPEL process with different values for settings such as the Page Border.

For example:

Suppose you import the Insurance Selection BPEL process where you explicitly set the import option Minimum page size to be zero(0)/zero(0). This imports the process, and creates a process with a process canvas just large enough to fit the newly imported process, plus any Page border size specified.

The process might look in the HPBPI Modeler as shown in [Figure 7](#) on page 35. The process canvas is just wide enough to fit the steps of the process. Notice also that the process canvas calculation does not take into account any extra-long step names that may be created.

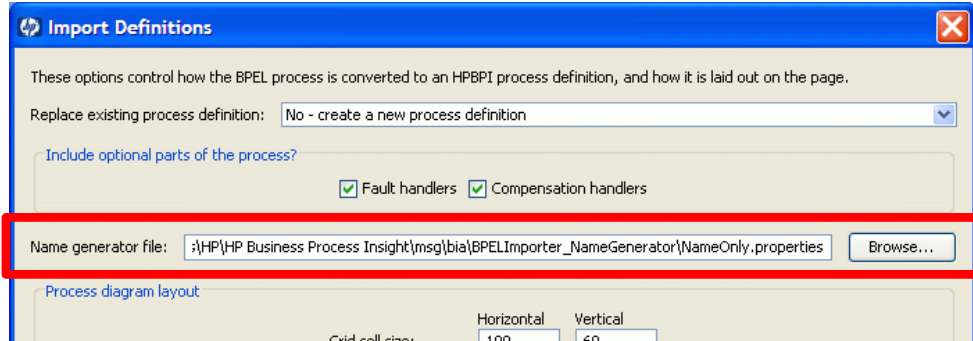
Figure 7 Minimum Process Canvas



Name Generation

When you import a BPEL file into the HPBPI Modeler you need to specify a Name Generator file. The option appears on the import screen as shown in Figure 8.

Figure 8 BPEL Import - Name Generator File



The name generator file determines how the HPBPI process name and step names are constructed from the BPEL elements being imported.

File Location

When the import dialog appears, as shown in Figure 8, you can browse to any location on your network, and choose a name generator file.

HPBPI provides a directory that contains some default name generator files that are set up ready for you to use. These name generator files are located in the directory:

HPBPI-install-dir\msg\bia\BPELImporter_NameGenerator

The name generator files provided in this BPELImporter_NameGenerator directory are as follows:

- NameOnly.properties

This file specifies that the process name and step names are to be generated by using only the name attribute from the corresponding BPEL element.

- `EscapedNameOnly.properties`

This file specifies that the process name and step names are to be generated by using only the `name` attribute from the corresponding BPEL element, in the same way that the file `NameOnly.properties` does. However, if the `name` attribute contains any hexadecimal encoding of the form `_xN_` where `N` is a two, three or four digit number, then this is transformed (decoded) into the actual character it represents. (See [Built-in Transformations \(_hex_\)](#) on page 42 for further details.)

- `FullNames.properties`

This file specifies that the process name and step names are to be generated by using more than just the `name` attribute from the corresponding BPEL element. The main feature of this name generator file is that the resultant step names contain the name of their corresponding BPEL element. This allows you to see which BPEL elements map to which HPBPI steps.

Be aware that selecting this property file can produce very long step names that you may need to manually edit, and shorten, within the HPBPI Modeler.

- `EscapedFullNames.properties`

This file is similar to the `FullNames.properties` file, and it also specifies that any hexadecimal encoding of the form `_xN_` where `N` is a two, three or four digit number, is transformed (decoded) into the actual character it represents. (See [Built-in Transformations \(_hex_\)](#) on page 42 for further details.)

Be aware that selecting this property file can produce very long step names that you may need to manually edit, and shorten, within the HPBPI Modeler.

File Format

Each name generator file contains a set of entries that specifies how to construct a name from each BPEL element.

Syntax

The syntax is as follows:

```
BPEL-element.identifier.pattern=  
BPEL-element.identifier.number.source=  
BPEL-element.identifier.number.default=  
BPEL-element.identifier.number.transform=
```

where:

- *BPEL-element*

This is set to the name of the BPEL element.

- *identifier*

For each BPEL element there are pre-defined identifiers. For example, the code that handles the BPEL element `case`, looks for the two identifiers `start` and `end`. Hence in the name generator file you see entries prefixed with `case.start` and `case.end`.

The name generator files shipped with HPBPI define the mappings for all elements handled by the HPBPI BPEL importer. So you just have to look into any of the name generator files to see all the identifiers for each BPEL element.

- *pattern*

You specify the pattern for the resultant name.

To substitute values from the corresponding BPEL element you can specify parameter substitution. For example, the pattern `Step {0}` forms a name starting with the text `Step`, followed by the contents of parameter zero. You then need to define parameter zero by setting up the `source`, `default` and `transform` properties.

- `number.source`
`number.default`
`number.transform`

This is how you set up parameter values that can then be substituted into the `pattern` string.

You must set all three properties for each numbered parameter. You can specify more than one parameter. Parameter numbers must be consecutive, starting from zero.

You set `source` to be the value of an attribute within the current BPEL element. You simply specify the name of the BPEL attribute, prefixed by the `@` sign. For example, `assign.node.0.source=@name` sets parameter zero to be the contents of the `name` attribute from within the `assign` BPEL element.

You set `default` to be the string you wish to use if the specified `source` attribute does not exist.

You set `transform` to be either `none` or the name of a predefined transformation. HPBPI provides one predefined transformation, which is called `_hex_`. (See [Built-in Transformations \(_hex_\)](#) on page 42 for further details.)

Example 1

The following properties configure how the BPEL element `assign` is used to create a name for the step that is created in the HPBPI process:

```
assign.node.pattern={0}
assign.node.0.source=@name
assign.node.0.default=unnamed assign
assign.node.0.transform=none
```

where:

- The resulting name is simply the contents of the `name` attribute from the BPEL `assign` element.
The string `{0}` is replaced by the contents of parameter zero.
- The `source` defines that parameter zero is the contents of the `name` attribute from the BPEL `assign` element.
- If the `name` attribute does not exist then parameter zero is set to the string `unnamed assign`.

- The `transform=none` line simply says that no transformation is to be applied to this parameter.

So if the BPEL element is defined as follows:

```
<assign name="My Assign">
```

the corresponding step name within the HPBPI process becomes `My Assign`.

Example 2

The following properties configure how the BPEL element `case` is used to create HPBPI step names:

```
case.start.pattern=Case {0}
case.start.0.default=no-condition
case.start.0.source=@condition
case.start.0.transform=none

case.end.pattern=End case {0}
case.end.0.default=no-condition
case.end.0.source=@condition
case.end.0.transform=none
```

where:

- The HPBPI importer code that handles the `case` element is able to handle the creation of both a `start case` and an `end case` step.
- When creating the case start step, the step name is going to be the string `Case` , followed by the value of the `condition` attribute within the BPEL element.
- When creating the case end step, the step name is going to be the string `End case` , followed by the value of the `condition` attribute within the BPEL element.
- If there is no `condition` attribute within the BPEL element, the `condition` parameter is set to the string `no-condition`.

If the BPEL element is defined as follows:

```
<case condition="ExpediteOrder=No">
```

the corresponding step name within the HPBPI process becomes:

```
Case ExpediteOrder=No
```

Example 3

The following properties configure how the BPEL element `receive` is used to create a name for the step that is created in the HPBPI process:

```
receive.node.pattern="{0}" - {1} - {2} (receive)
receive.node.0.default=no-name
receive.node.0.source=@name
receive.node.0.transform=_hex_
receive.node.1.default=no-partnerLink
receive.node.1.source=@partnerLink
receive.node.1.transform=none
receive.node.2.default=no-operation
receive.node.2.source=@operation
receive.node.2.transform=_hex_
```

where:

- The pattern substitutes three parameters.
- Parameter zero is set to the `name` attribute and this is passed through the `_hex_` transformation. (See [Built-in Transformations \(_hex_\)](#) on page 42 for further details.)
- Parameter one is set to the `partnerlink` attribute and this is not passed through any transformation.
- Parameter two is set to the `operation` attribute and this is passed through the `_hex_` transformation. (See [Built-in Transformations \(_hex_\)](#) on page 42 for further details.)

If the BPEL element is defined as follows:

```
<receive name="Initial Request"
  partnerLink="client"
  portType="com:insuranceSelectionPT"
  operation="SelectInsurance"
  variable="insuranceRequest"
  createInstance="yes" />
```

the corresponding step name within the HPBPI process becomes:

```
"Initial Request" - client - SelectInsurance (receive)
```

Built-in Transformations (hex)

HPBPI provides one predefined transformation that you can use when configuring your name mapping. This transformation is called hex.

The hex transformation converts any hexadecimal encoding of the form _xN_, where N is a two, three or four digit number, into the actual character it represents.

For example, suppose you have the following scenario.

Your BPEL element is defined as:

```
<receive name="Initial_x20_Request"
  partnerLink="client"
  portType="com:insuranceSelectionPT"
  operation="SelectInsurance"
  variable="insuranceRequest"
  createInstance="yes" />
```

Your name generator file has the entry:

```
receive.node.pattern="{0}" (receive)
receive.node.0.default=no-name
receive.node.0.source=@name
receive.node.0.transform=_hex_
```

The resultant step name becomes: "Initial Request" (receive). This is because the string _x20_ is transformed into the space character.

Custom Transformations

HPBPI provides the built-in transformation called `_hex_`. But suppose you are importing BPEL files that use a different type of encoding within the XML. Maybe you have a combination of `_xN_` style encoding and some other more involved encoding.

If you need to be able to carry out additional name transformations, then you simply need to write some Java code to extend the supplied name generator class, and provide your own transformations.

Transformer Code

The default name generator class that you need to extend is:

```
com.hp.ov.bia.model.repository.api.utils.bpel.NameGenerator.
```

Your class then needs to do the following main things:

1. Initialize itself by calling `super()`.
2. Define a new `NameGenerator.Transform`, and implement the `transform()` method.
3. Call `addTransform()` to add this new transformation and assign it a name.

The code might look as follows:

```

package com.customer.bpel;

import com.hp.ov.bia.model.repository.api.utils.bpel.NameGenerator;

public class MyNameGenerator extends NameGenerator
{
    public MyNameGenerator()
    {
        super();

        /**
         * Now define an additional transform called "MyXform".
         */
        addTransform("MyXform", new NameGenerator.Transform()
        {
            public String transform(String text)
            {
                if (text == null)
                {
                    return null;
                }

                // Now do the transformation
                return text.replaceAll("-mysub-", "***");
            }
        });
    }
}

```

where:

- The **MyNameGenerator** class extends **NameGenerator**.
- The **addTransform()** method adds a new **NameGenerator.Transform** class, and calls this transform **MyXform**.
- The **NameGenerator.Transform** class just needs to implement the method **transform()**.

The **transform()** method is passed the current name as a string. You then code whatever transformations you require and return the resultant string.

This example shows a substitution where any occurrence of the string **-mysub-** is replaced with the string *******.

Compiling the Code

To compile your transformer code, you need the following JAR files on your classpath:

- *HPBPI-install-dir\java\bia-model-repository.jar*
- *HPBPI-install-dir\nonOV\jdom\jdom.jar*

An example compilation script might look as follows:

```
@echo off

set BPI_ROOT=C:/Program Files/HP/HP Business Process Insight

set CP=.
set CP=%CP%;%BPI_ROOT%/java/bia-model-repository.jar
set CP=%CP%;%BPI_ROOT%/nonOV/jdom/jdom.jar

javac -classpath "%CP%" com/customer/bpel/MyNameGenerator.java
```

The Name Generator Properties File

You can now edit your name generator file to make use of your newly created transformation (`MyXform`).

You set the `transform` property for all BPEL elements where you would like this `MyXform` transform to be performed.

Note that you can only call one transformation for a BPEL attribute. Hence if you need this single transformation to cope with both the `-mysub-` replacement and the built-in `_xN_` replacement, then you need to implement both transformations within your own transform code.

Each element in your name generator properties file can use a different transform, but each element can only invoke one transform.

An extract from your name generator properties file might look as follows:

```
assign.node.pattern={0}
assign.node.0.default=unnamed assign
assign.node.0.source=@name
assign.node.0.transform=MyXform

process.flow.pattern={0}
process.flow.0.default=no-name
process.flow.0.source=@name
process.flow.0.transform=_hex_
```

where:

- The `assign` element has its name passed through the `MyXform` transformation.
- The `process` element has its name passed through the `_hex_` transformation.

The `process.flow` set of elements determines the name that is given to the process when it is imported. This can be overridden at import time if you select a process name from the pull-down.

Update the Modeler Script

To be able to use your new transform, you need to create a new script that can invoke the HPBPI Modeler and include your name generator class on the classpath.

Rather than edit the current script that invokes the HPBPI Modeler you probably should create a copy and make your changes in the copy.

These are the steps you need to carry out:

1. Change to the directory: *HPBPI-install-dir\bin*
2. Make a copy of the file: *biamodeler.bat*
Call this copy: *mybiamodeler.bat*
3. In the *mybiamodeler.bat* script, locate the line:

```
set NAMEGENERATORCLASS=  
    com.hp.ov.bia.model.repository.api.utils.bpel.NameGenerator  
(all on one line)
```

4. Edit this line to set *NAMEGENERATORCLASS* to point to your newly compiled name generator class (*MyNameGenerator.class*).

For example:

```
set NAMEGENERATORCLASS=com.customer.bpel.MyNameGenerator
```

5. Now add this class (*MyNameGenerator*) to the classpath.

Locate the lines that set the *CLASSPATH* variable, and then add your class to the classpath.

For example:

```
set CLASSPATH=%CLASSPATH%;C:\bia\manuals\bpel-tg\sols\src
```

6. Now run the *mybiamodeler.bat* script.

The HPBPI modeler starts up.

7. Import a BPEL file

- File->Import Definition...
- Select the name generator file that makes use of your new `MyXform` transform.
- Import your BPEL process

Your new transformations are applied to the incoming BPEL.

3 BPEL Element Mappings

This chapter shows how each BPEL XML element is mapped to a corresponding HPBPI step, or steps.

This chapter looks at each BPEL element and provides the following information:

- The general format of the XML for the BPEL element.
- An indication of which attributes within the BPEL element XML are handled by the HPBPI BPEL Importer.
- The resultant HPBPI step structure.
- Details of how the HPBPI step names are derived.

Formatting Conventions

Here are the convention used throughout this chapter.

Within the BPEL XML listings:

- Attributes shown in **bold** type are handled by the BPEL Importer.
- All non-bold attributes are ignored.
- The token `activity` is used to represent a nested element that may correspond to more HPBPI steps. This nested element can be any one of the elements `<assign>`, `<compensate>`, `<empty>`, `<flow>`, `<invoke>`, `<pick>`, `<receive>`, `<reply>`, `<scope>`, `<sequence>`, `<switch>`, `<terminate>`, `<throw>`, `<wait>`, `<while>`.
- To save space, wherever you see the token `source` this refers to the element definition:

```
<source linkName="ncname" transitionCondition="bool-expr"?/>
```

and wherever you see the token `target` this refers to the element definition:

```
<target linkName="ncname" />
```

- Some attributes are optional within BPEL XML and these are shown with a trailing `?` character.
- Some attributes can appear more than once. This is indicated by a trailing `+` or `*` character, where:
 - `+` indicates one or more occurrences.
 - `*` indicates zero or more occurrences.

Within the diagrams that show the resultant HPBPI step structure, the “cloud” image is used to indicate any nested activities.

process

The BPEL XML

```
<process
  name="ncname"
  targetNamespace="uri"
  abstractProcessProfile="anyURI"?
  queryLanguage="anyURI"?
  expressionLanguage="anyURI"?
  suppressJoinFailure="yes|no"?
  enableInstanceCompensation="yes|no"
  abstractProcess="yes|no"?
  xmlns="http://schemas.xmlsoap.org/ws/2004/03/business-process/"
  xmlns="http://schemas.xmlsoap.org/ws/2003/03/business-process/">
  <extensions?
    <extension
      namespace="anyURI"
      mustUnderstand="yes|no"/>*
  </extensions>
  <import namespace="uri" location="uri" importType="uri"/>*
  <partnerLinks?
    <partnerLink
      name="ncname"
      partnerLinkType="qname"
      myRole="ncname"?
      partnerRole="ncname"?>+
    </partnerLink>
  </partnerLinks>
  <partners?
    <partner name="ncname">+
      <partnerLink name="ncname"/>+
    </partner>+
  </partners>
  <variables?
    <variable
      name="ncname"
      messageType="qname"?
      type="qname"?
      element="qname"?/>+
  </variables>
  <correlationSets?
    <correlationSet
      name="ncname"
      properties="qname-list"/>+
  </correlationSets>
  <faultHandlers?

```

```

<catch
  faultName="qname"?
  faultVariable="ncname"?
  faultMessageType="qname"?
  faultElement="qname"?>*
  activity
</catch>
<catchAll>?
  activity
</catchAll>
</faultHandlers>
<compensationHandler>?
  activity
</compensationHandler>
<eventHandlers>?
  <onMessage
    partnerLink="ncname"
    portType="qname"?
    operation="ncname"
    variable="ncname">*

    <correlations>?
      <correlation
        set="ncname"
        initiate="yes|no"?/>+
      </correlations>
    activity
  </onMessage>
  <onAlarm
    for="duration-expr"?
    until="deadline-expr"?>*
    activity
  </onAlarm>
  <onEvent
    partnerLink="ncname"
    portType="qname"?
    operation="ncname"
    messageType="qname"
    variable="ncname"
    messageExchange="ncname"? >*
    <correlationSets>?
      <correlationSet
        name="ncname"
        properties="qname-list"/>+
      </correlationSets>
    <correlations>?
      <correlation
        set="ncname"
        initiate="yes|join|no"?/>+
      </correlations>
  </onEvent>

```

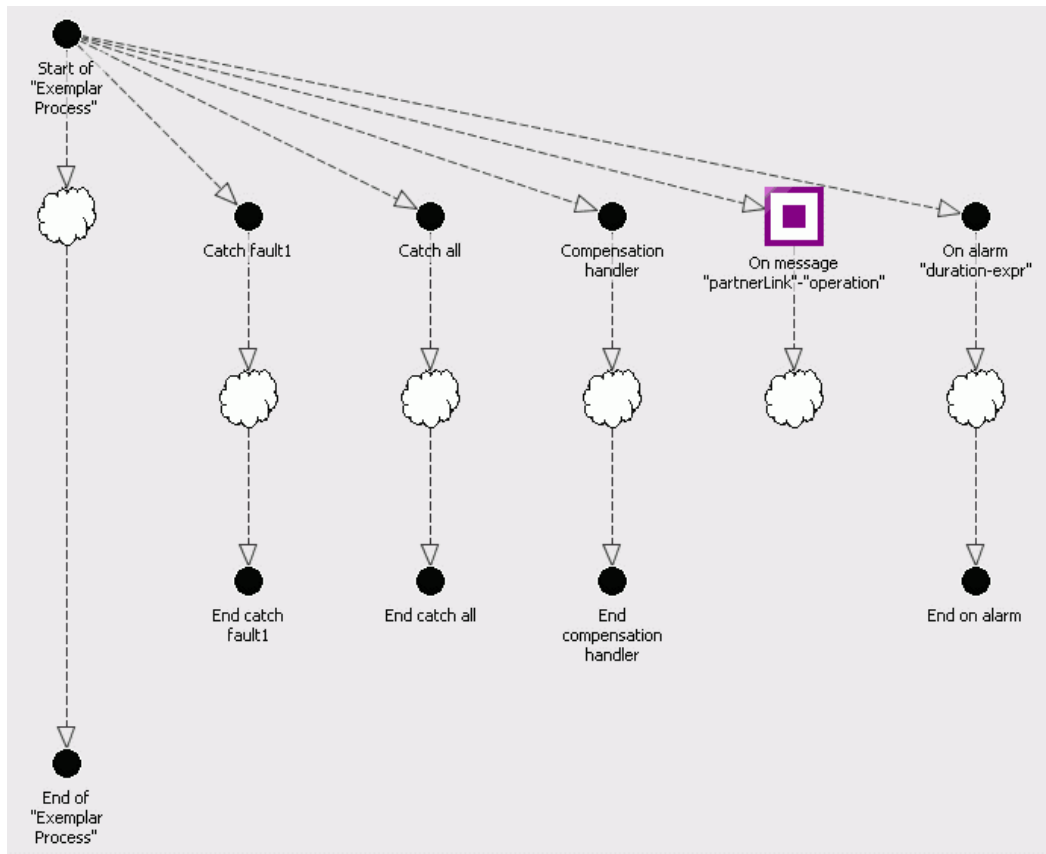
```

    scope-activity
  </onEvent>
  <onAlarm>*
  (
    ( <for expressionLanguage="anyURI"?>duration-expr</for> |
      <until expressionLanguage="anyURI"?>deadline-expr</until> )
    <repeatEvery expressionLanguage="anyURI"?>
      duration-expr
    </repeatEvery>?
  ) |
  <repeatEvery expressionLanguage="anyURI"?>
    duration-expr
  </repeatEvery>
  scope-activity
</onAlarm>
</eventHandlers>
activity
</process>

```

HPBPI Step Structure

Figure 9 Resultant process Step Structure



If there are no fault or compensation handlers defined within the BPEL then these branches are simply not created in the resultant HPBPI process definition.

If there is more than one activity where only one is expected, the HPBPI BPEL Importer issues a warning and continues to import the process anyway. All activities are included in the resultant process diagram and they are included in parallel, but only one of them is then properly linked to following steps.

If no activities are found when one or more are expected the HPBPI BPEL Importer issues a warning, and proceeds to attach any following steps to the start junction step.

The HPBPI BPEL Importer issues a message to say whether the process is executable or abstract. This is derived from the `abstractProcess` attribute.

The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
<code>process.start</code>	Start of "{@name}"	1
<code>process.end</code>	End of "{@name}"	1
<code>catch.start</code>	Catch {@faultName}	0 or more
<code>catch.end</code>	End catch {@faultName}	0 or more
<code>catchall.start</code>	Catch all	0 or more
<code>catchAll.end</code>	End catch all	0 or 1
<code>compensationHandler.start</code>	Compensation handler	0 or 1
<code>compensationHandler.end</code>	End compensation handler	0 or 1
<code>onMessage.node</code>	On message "{@partnerLink}"- "{@operation}"	0 or more
<code>onAlarm.for.start</code>	On alarm "{@for}"	0 or more
<code>onAlarm.until.start</code>	On alarm "{@until}"	
<code>onAlarm.neither.start</code>	On alarm "no-condition"	
<code>onAlarm.end</code>	End on alarm	0 or more

The above table assumes that you are using the name generator file `FullNames.properties`.

assign

The BPEL XML

```
<assign
  validate="yes|no"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  (
    <copy>
      from-spec
      to-spec
    </copy> |
    <extendibleAssign>
      ...assign-element-of-other-namespace...
    </extendibleAssign> ) +
</assign>
```

HPBPI Step Structure

Figure 10 Resultant assign Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
assign.node	{@name} (assign)	1

The above table assumes that you are using the name generator file FullNames.properties.

compensate

The BPEL XML

```
<compensate
  scope="ncname"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
</compensate>
```

HPBPI Step Structure

Figure 11 Resultant compensate Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
compensate.node	"{@name}" compensate scope {@scope}	1

The above table assumes that you are using the name generator file `FullNames.properties`.

empty

The BPEL XML

```
<empty
  name="ncname"?
  suppressJoinFailure="yes|no"?
  source+
  target+
</empty>
```

HPBPI Step Structure

Figure 12 Resultant empty Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
empty.node	{@name} (empty)	1

The above table assumes that you are using the name generator file `FullNames.properties`.

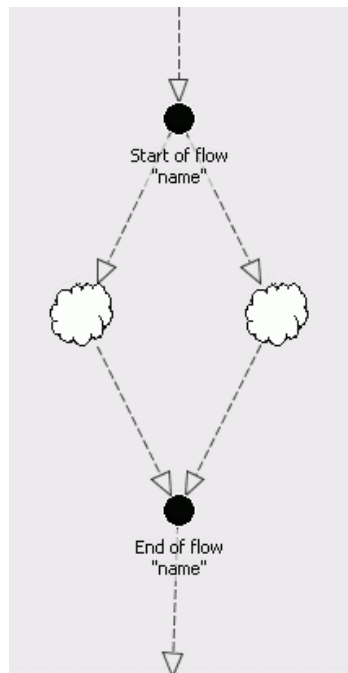
flow

The BPEL XML

```
<flow
  name="ncname"?
  suppressJoinFailure="yes|no"?
  source+
  target+
  <links>?
    <link name="ncname"/>+
  </links>
  activity+
</flow>
```

HPBPI Step Structure

Figure 13 Resultant flow Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
flow.start	Start of flow "{@name}"	1
flow.end	End of flow "{@name}"	1

The above table assumes that you are using the name generator file `FullNames.properties`.

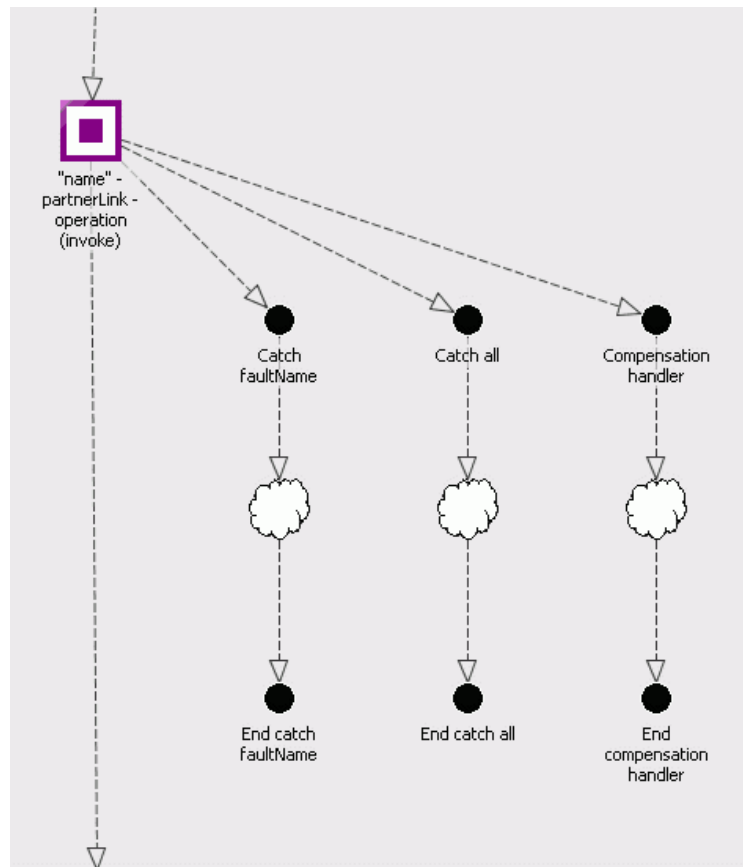
invoke

The BPEL XML

```
<invoke
  partnerLink="ncname"
  portType="qname"?
  operation="ncname"
  inputVariable="ncname"?
  outputVariable="ncname"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <correlations>?
    <correlation
      set="ncname"
      initiate="yes|join|no"?
      pattern="in|out|out-in"/>+
  </correlations>
  <catch
    faultName="qname"?
    faultVariable="ncname"?
    faultMessageType="qname"?>*
    activity
  </catch>
  <catchAll>?
    activity
  </catchAll>
  <compensationHandler>?
    activity
  </compensationHandler>
  <toPart part="ncname" fromVariable="ncname"/>*
  <fromPart part="ncname" toVariable="ncname"/>*
</invoke>
```

HPBPI Step Structure

Figure 14 Resultant invoke Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
invoke.node	"{@name}" - {@partnerLink} - {@operation} (invoke)	1
catch.start	Catch {@faultName}	0 or more
catch.end	End catch {@faultName}	0 or more
catchall.start	Catch all	0 or 1
catchAll.end	End catch all	0 or 1
compensationHandler.start	Compensation handler	0 or 1
compensationHandler.end	End compensation handler	0 or 1

The above table assumes that you are using the name generator file `FullNames.properties`.

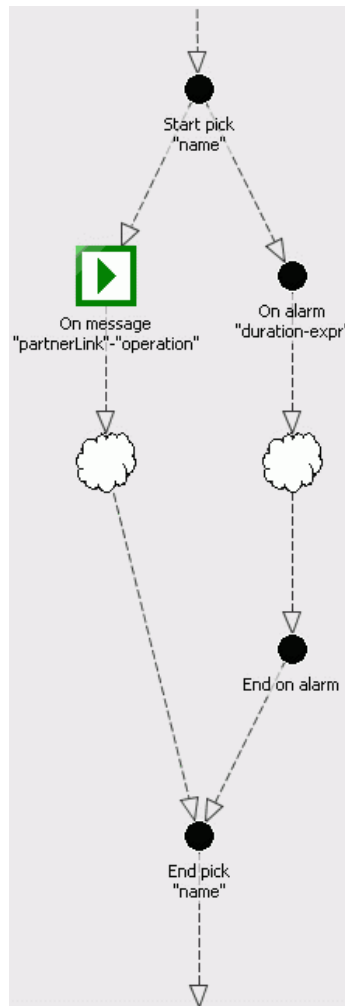
pick

The BPEL XML

```
<pick
  createInstance="yes|no"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <onMessage
    partnerLink="ncname"
    portType="qname"?
    operation="ncname"
    variable="ncname"?
    messageExchange="ncname"? >+
    <correlations>?
      <correlation set="ncname" initiate="yes|join|no"?/>+
    </correlations>
    <fromPart part="ncname" toVariable="ncname"/>*
    activity
  </onMessage>
  <onAlarm ( for="duration-expr" | until="deadline-expr" ) >*
    activity
  </onAlarm>
  <onAlarm>*
    ( <for expressionLanguage="anyURI"?>duration-expr</for> |
      <until expressionLanguage="anyURI"?>deadline-expr</until> )
    activity
  </onAlarm>
</pick>
```


HPBPI Step Structure

Figure 15 Resultant pick Step Structure



If the `createInstance` attribute in the pick element is set to `yes` then the `onMessage` step(s) are start steps, otherwise they are activity steps.

The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
pick.start	Start pick "{@name}"	1
pick.end	End pick "{@name}"	1
onMessage.node	On message "{@partnerLink}" - "{@operation}"	0 or more
onAlarm.for.start	On alarm "{@for}"	0 or more
onAlarm.until.start	On alarm "{@until}"	
onAlarm.neither.start	On alarm "no-condition"	
onAlarm.end	End on alarm	0 or more

The above table assumes that you are using the name generator file `FullNames.properties`.

receive

The BPEL XML

```
<receive
  partnerLink="ncname"
  portType="qname"?
  operation="ncname"
  variable="ncname"?
  createInstance="yes|no"?
  messageExchange="ncname"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <correlations>?
    <correlation
      set="ncname"
      initiate="yes|join|no"?/>+
  </correlations>
  <fromPart
    part="ncname"
    toVariable="ncname"/>*
</receive>
```

HPBPI Step Structure

Figure 16 Resultant receive Step Structure



This results in a single activity step being created, unless the `createInstance` attribute is set to `yes`, in which case a start step is created.

The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
receive.node	"{@name}" - {@partnerLink} - {@operation} (receive)	1

The above table assumes that you are using the name generator file `FullNames.properties`.

reply

The BPEL XML

```
<reply
  partnerLink="ncname"
  portType="qname"?
  operation="ncname"
  variable="ncname"?
  faultName="qname"?
  messageExchange="ncname"?
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <correlations>?
    <correlation
      set="ncname"
      initiate="yes|join|no"?/>+
  </correlations>
  <toPart
    part="ncname"
    fromVariable="ncname"/>*
</reply>
```

HPBPI Step Structure

Figure 17 Resultant reply Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
reply.node	"{@name}" - {@partnerLink} - {@operation} (reply)	1

The above table assumes that you are using the name generator file `FullNames.properties`.

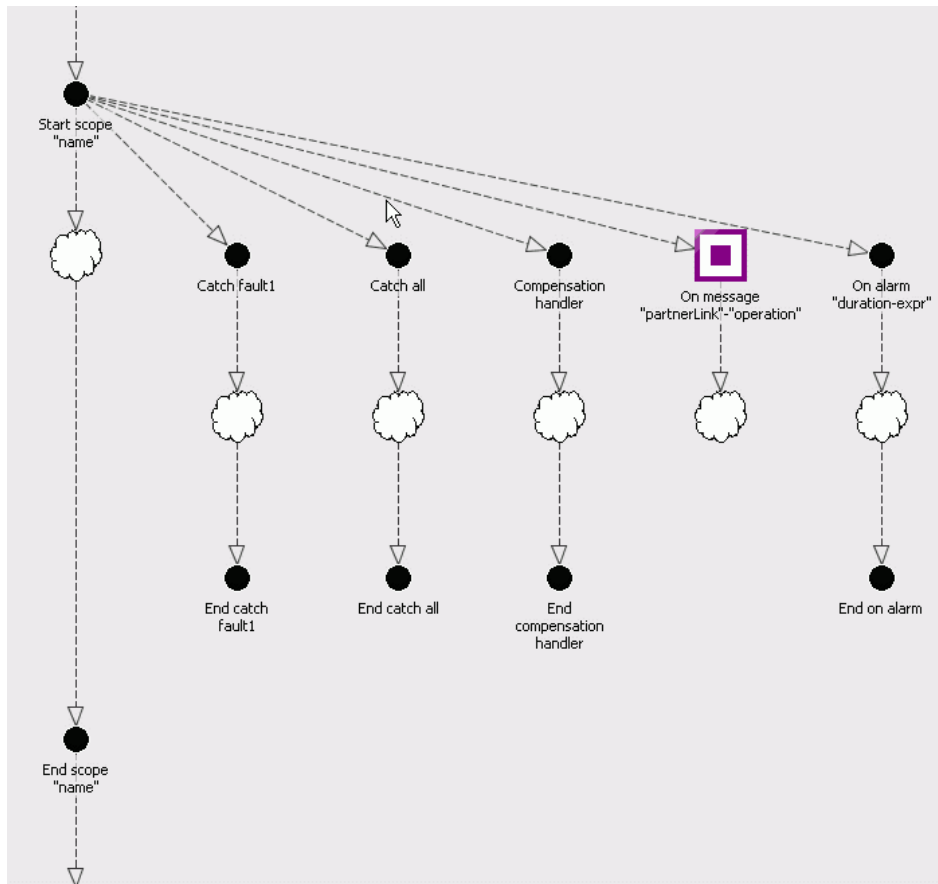
scope

The BPEL XML

```
<scope
  variableAccessSerializable="yes|no"
  isolated="yes|no"
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <partnerLinks>?
    ... see process on page 51 for syntax ...
  </partnerLinks>
  <variables>?
    ... see process on page 51 for syntax ...
  </variables>
  <correlationSets>?
    ... see process on page 51 for syntax ...
  </correlationSets>
  <faultHandlers>?
    ... see process on page 51 for syntax ...
  </faultHandlers>
  <compensationHandler>?
    ... see process on page 51 for syntax ...
  </compensationHandler>
  <terminationHandler>?
    ...
  </terminationHandler>
  <eventHandlers>?
    ... see process on page 51 for syntax ...
  </eventHandlers>
  activity
</scope>
```

HPBPI Step Structure

Figure 18 Resultant scope Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
scope.start	Start scope "{@name}"	1
scope.end	End scope "{@name}"	1
catch.start	Catch {@faultName}	0 or more

Name Identifier	Default Name	Occurrence
catch.end	End catch {@faultName}	0 or more
catchall.start	Catch all	0 or 1
catchAll.end	End catch all	0 or 1
compensationHandler.start	Compensation handler	0 or 1
compensationHandler.end	End compensation handler	0 or 1
onMessage.node	On message "{@partnerLink}"-"{@operation}"	0 or more
onAlarm.for.start	On alarm "{@for}"	0 or more
onAlarm.until.start	On alarm "{@until}"	
onAlarm.neither.start	On alarm "no-condition"	
onAlarm.end	End on alarm	0 or more

The above table assumes that you are using the name generator file `FullNames.properties`.

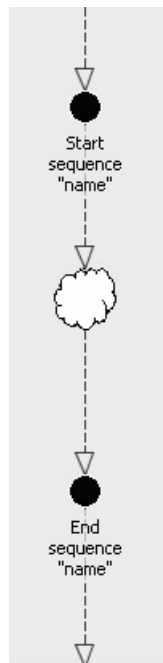
sequence

The BPEL XML

```
<sequence  
  name="ncname"?  
  suppressJoinFailure="yes|no"?  
  source+  
  target+  
  activity+  
</sequence>
```

HPBPI Step Structure

Figure 19 Resultant sequence Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
sequence.start	Start sequence "{@name}"	1
sequence.end	End sequence "{@name}"	1

The above table assumes that you are using the name generator file `FullNames.properties`.

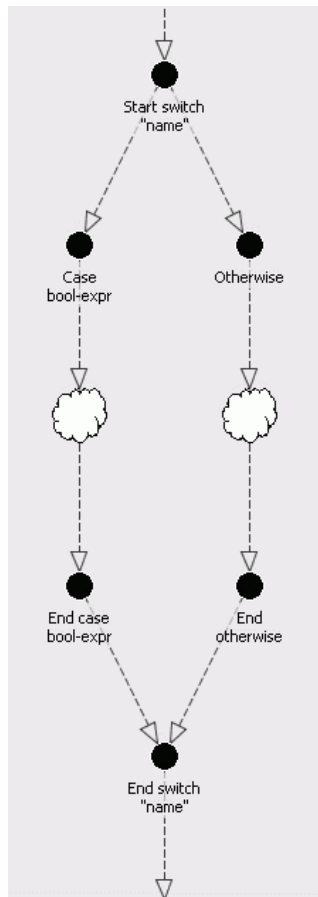
switch

The BPEL XML

```
<switch
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  <case
    condition="bool-expr">+
    activity
  </case>
  <otherwise>?
    activity
  </otherwise>
</switch>
```

HPBPI Step Structure

Figure 20 Resultant switch Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
switch.start	Start switch "{@name}"	1
switch.end	End switch "{@name}"	1
case.start	Case {@condition}	1 or more

Name Identifier	Default Name	Occurrence
case.end	End case {@condition}	1 or more
otherwise.start	Otherwise	0 or 1
otherwise.end	End otherwise	0 or 1

The above table assumes that you are using the name generator file `FullNames.properties`.

terminate

The BPEL XML

```
<terminate
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
</terminate>
```

HPBPI Step Structure

Figure 21 Resultant terminate Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
terminate.node	"{@name}" (terminate)	1

The above table assumes that you are using the name generator file `FullNames.properties`.

throw

The BPEL XML

```
<throw
  faultName="qname"
  faultVariable="ncname"?
  name="ncname"?
  suppressJoinFailure="yes|no"?
  source+
  target+
</throw>
```

HPBPI Step Structure

Figure 22 Resultant throw Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
throw.node	"{@name}" - {@faultName} (throw)	1

The above table assumes that you are using the name generator file `FullNames.properties`.

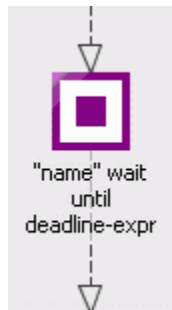
wait

The BPEL XML

```
<wait
  for="duration-expr"
  until="deadline-expr"
  name="ncname"?
  suppressJoinFailure="yes|no"?>
  source+
  target+
  ( <for expressionLanguage="anyURI"?>duration-expr</for> |
    <until expressionLanguage="anyURI"?>deadline-expr</until> )
</wait>
```

HPBPI Step Structure

Figure 23 Resultant wait Step Structure



The following table shows the identifier used by the name generator to name the step, the format of the default name assigned to the step, and the number of occurrences of the step that may be created:

Name Identifier	Default Name	Occurrence
wait.for.node	"{@name}" wait for {@for}	1
wait.until.node	"{@name}" wait until {@until}	
wait.neither.node	"{@name}" (wait)	

The above table assumes that you are using the name generator file `FullNames.properties`.

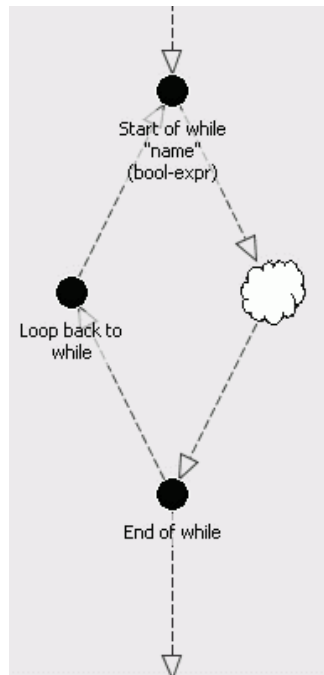
while

The BPEL XML

```
<while  
  name="ncname"?  
  condition="bool-expr"  
  suppressJoinFailure="yes|no"?>  
  source+  
  target+  
  <condition expressionLanguage="anyURI"?>  
    ... bool-expr ...  
  </condition>  
  activity  
</while>
```

HPBPI Step Structure

Figure 24 Resultant while Step Structure



The following table shows the identifier used by the name generator to name each step, the format of the default name assigned to each step, and the number of occurrences of each step that may be created:

Name Identifier	Default Name	Occurrence
while.start	Start of while "{@name}" ({@condition})	1
while.end	End of while	1
while.loop	Loop back to while	1

The above table assumes that you are using the name generator file `FullNames.properties`.

