SPARX *SYSTEMS*

ENTERPRISE ARCHITECT

User Guide Series

Business Process Model and Notation (BPMN)

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Business Process Model and Notation (BPMN)

Model Business Processes and Interactions Using a Standard Language

Business Process Model and Notation (BPMN) is a standard for business process modeling that provides graphical notation for specifying business processes in a Business Process diagram (BPD), based on traditional flowcharting techniques. The Object Management Group (OMG) develops and maintains the BPMN specification.

BPMN represents the amalgamation of best practices within the business modeling community to define the notation and semantics of Collaboration diagrams, Process diagrams, and Choreography diagrams. It is intended to be used directly by the stakeholders who design, manage and realize business processes, but at the same time be precise enough to allow BPMN diagrams to be translated into software process components.

Business Process Model and Notation has become the de-facto standard for business process diagrams. It has an easy-to-use flowchart-like notation that is independent of any particular implementation environment.
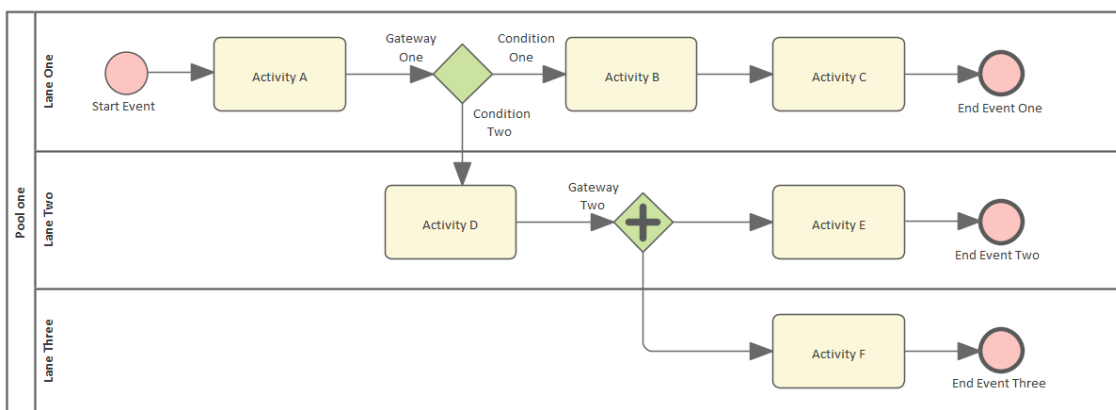
BPMN in Enterprise Architect

Key Features and Benefits

- Verification of the model through simulation
- Generation of documentation from the model
- Re-use of common components in other models, such as re-using a sub-process from the 'current' system when modeling the 'future' system
- Serialization to XML for exchanging model information
- The BPMN Profile can be used to model BPEL process descriptions
- A technology-specific Glossary is provided for BPMN

How to Access the BPMN Facilities

BPMN facilities are provided in the form of:

- A BPMN diagram type, accessed through the 'New Diagram' dialog
- BPMN pages in the Toolbox
- BPMN element and relationship entries in the 'Toolbox Shortcut' menu and Quick Linker

Specifications of BPMN elements and relationships are defined by Tagged Values; for example, to define the Message and Timer symbols in this diagram:
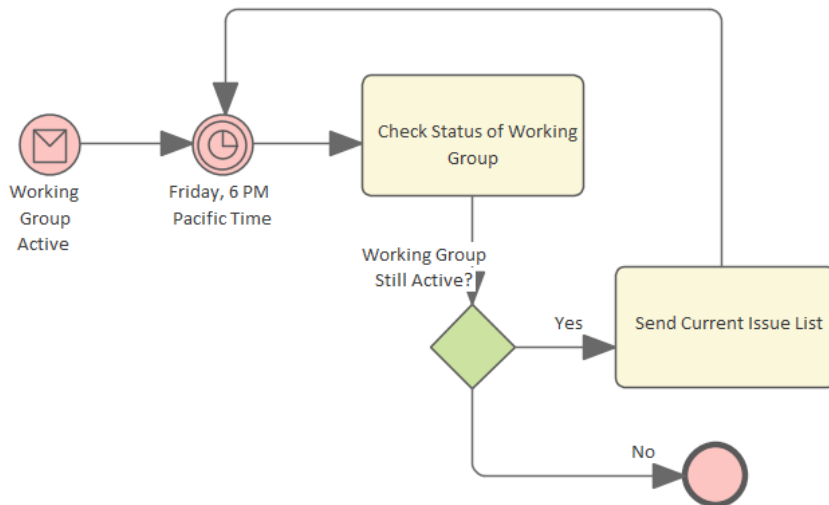
BPMN Toolbox Pages

You can access the BPMN Toolbox pages through the 'Design > Diagram > Toolbox : 'Hamburger" ribbon option, then select BPMN 2.0.

You can also set BPMN as the active default technology to access the Diagram Toolbox pages directly.

Please note: Toolboxes for BPMN 1.0 and 1.1 can be accessed by selecting the perspective 'Business Modeling > All Business Modeling".

Getting Started

The Business Process Model and Notation is well supported in Enterprise Architect and you can create any of the four diagrams that describe both the internal workings of an entity or the interaction of one entity with other entities. You can describe business, technology or engineering work flows and interactions. Business Process diagrams are an important technique in the Business Analyst's toolbox and are often used as part of a processes re-engineering effort.

You and your team might want to prescribe the interactions between entities using a Collaboration, Choreography or Conversation diagrams or just define or describe the Business Processes within a single entity such as an organization, division or department.
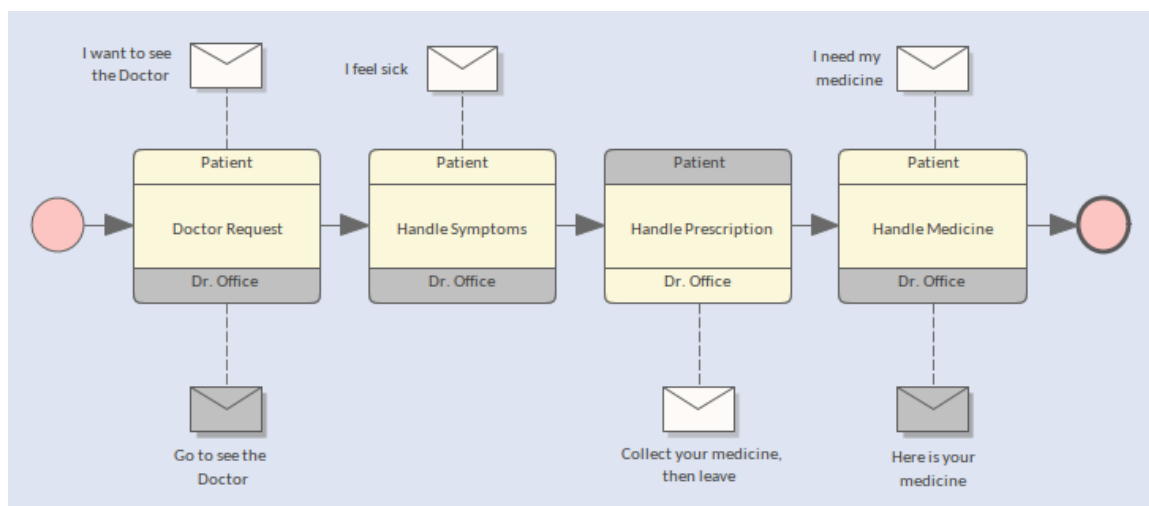
Choreography diagram describing the interaction between a doctor and a patient.

The basic Steps to create a Business Process Diagrams are:

1. Create a Business Process diagram within the Business Process (recommended)
2. Add Flow Objects such as Initial and Final Nodes, Activities, Tasks and Gateways.
3. Add Pools and Lanes to segment the diagram.
4. Validate the diagram
5. SImulate the diagram

Within Enterprise Architect, modeling with BPMN 2.0 is well supported, quick and simple. Use these notes to guide you as you create your business models.

Selecting the Perspective

Enterprise Architect partitions the tool's extensive features into Perspectives, which ensures that you can focus on a specific task and work with the tools you need without the distraction of other features. To work with the Business Process Model and Notation (BPMN) features you first need to select this Perspective:

👁 <perspective name> > Business Modeling > BPMN

Setting the Perspective ensures that the Business Process Model and Notation diagrams, their tool boxes and other features of the Perspective will be available by default.

Please note: If you select the 'BPMN' perspective, you will be using BPMN 2.0. If you want to use BPMN 1.0 or 1.1, select the perspective 'All Business Modeling' or create your own custom perspective.

Creating a Business Process Diagram

With the BPMN perspective selected you can add a new diagram by selecting the location in the Browser window and choosing the Add Diagram option from the Context menu or from the Browser tool bar. You will be prompted to create the diagram within a Business Process which you should select as this is compliant with the BPMN grammar and ensures the diagram objects are located in a container.

You can also use some of the built-in patterns available for BPMN from the Model Patterns window to create a diagram of any type from the wizard. Spend some time reading the description of the pattern to understand the diagram and objects that will be inserted as part of the pattern.
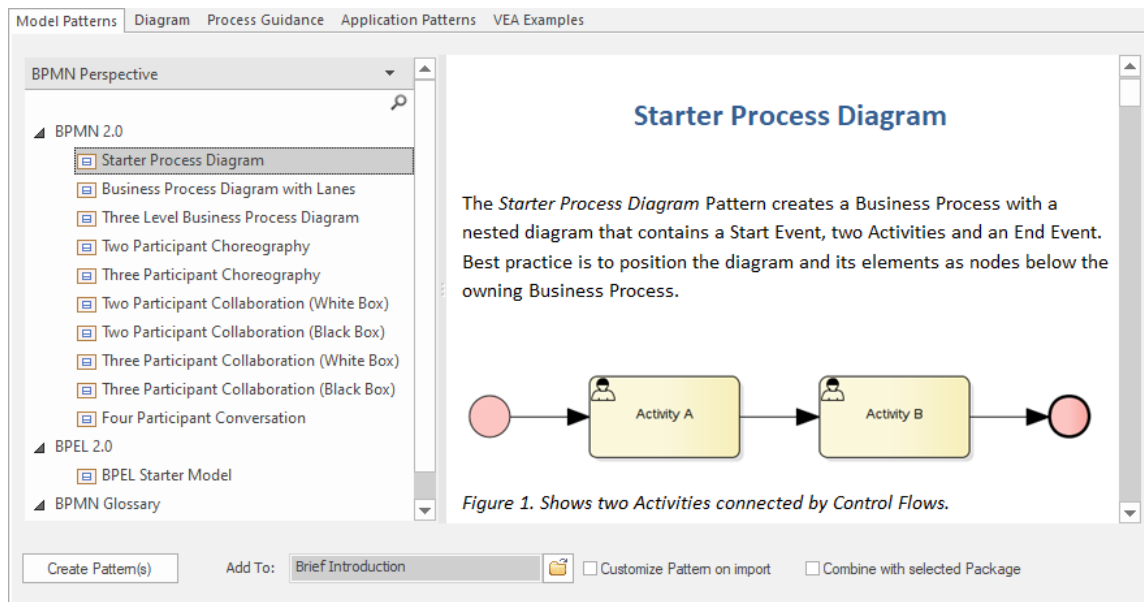
Model Patterns window showing a basic Business Process diagram.

Adding Flow Objects to the Diagram

If you created the diagram from a pattern a number BPMN Flow Objects will be inserted in the diagram including an Initial Node a number of Activities connected by Sequence Flows and a Final Node. You can add any number of other Flow objects to the diagram dragging them from the appropriate toolbox or if you have elements for reuse you can drag them from the Browser window. Notes can be added to each of the diagram elements which can be useful when documenting the process.
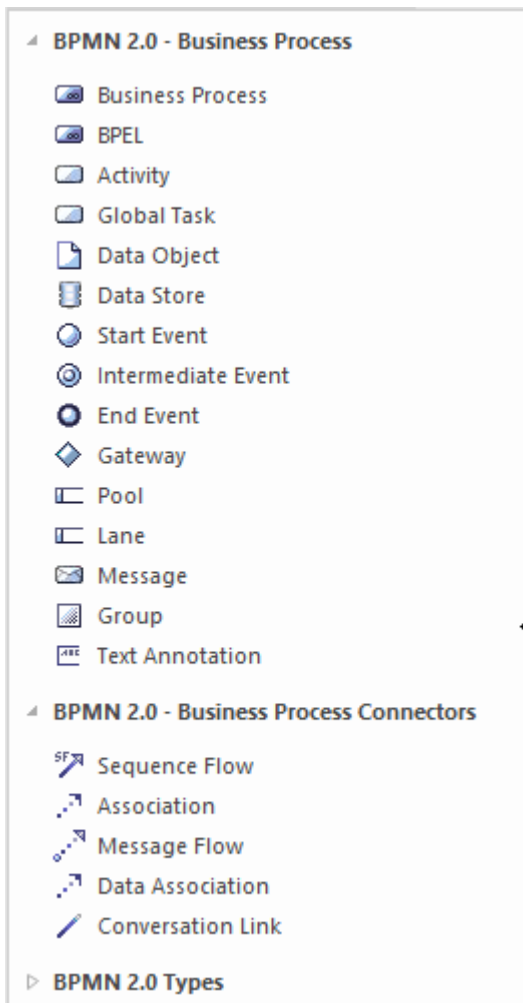
BPMN Toolbox pages showing elements and connectors.

Adding Pools and Lanes

Analysts will have different opinions but it is often easier to create the Pools and Lanes after a Business Process diagram has been laid out. You might have to move some diagram objects around to ensure they fall into the appropriate lane but some forward planning can assist with this. You can set the height and width of the Pools and Lanes and then make them non-selectable by using the option from the Behavior item on the diagram element context menu.


Diagram Object menu showing the choice to make an object selectable or non selectable.

This ensures you are able to move diagram objects around freely without inadvertently selecting and moving the Pools or their Lanes. You can make them selectable again at any time if required.

Example Diagram

While there are four diagrams that make up the standard, Business Process Diagrams are the most ubiquitous and resemble traditional flowcharts. You use them to describe or specify business, technology or engineering work flows and their simple but expressive graphical elements are for the most part universally understood by most stakeholders. You can keep diagrams simple and when combined with Decision Model and Notation models straight through processes can be achieved, ensuring the diagrams are free of visual clutter. You use Business Process diagrams to describe sequences of Activities and Tasks controlled by Gateways that act like traffic cops, controlling the flow. You can add Pools and Lanes, commonly called swimlanes, to represent the participants who carry out the Activities or Tasks.
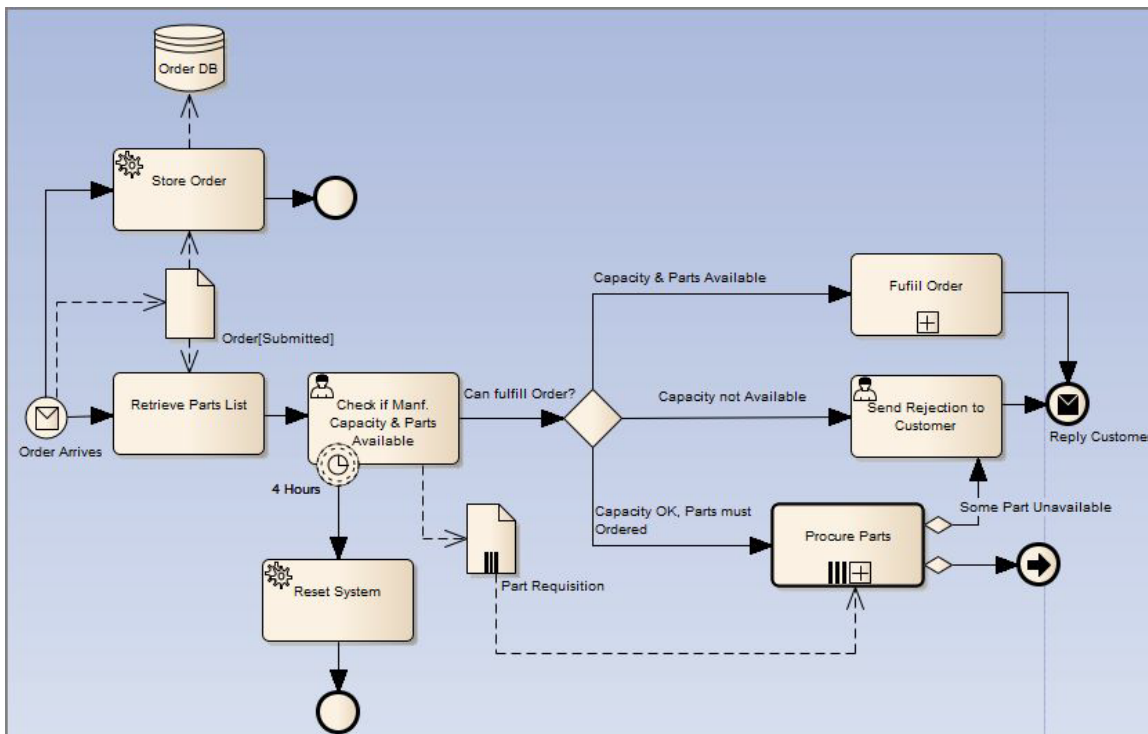
Business Process diagram for a parts fulfillment process.

Diagram Types

The Business Process Model and Notation standard comprises four types of diagrams that you use to describe the interactions between two or more business entities or to describe the Activities and Tasks that make up a discrete processes within an entity such as an organization or one of its divisions or departments. The Business Process diagram is the most ubiquitous of these and resembles a traditional flowchart but with richer semantics and the ability to generate Business Process Execution Language directly from a well-formed diagram. You use these other diagrams to describe or specify the way two or more entities (Participants) interact by exchanging messages. These diagram are instrumental in visualizing business to business interactions and allow an organization to describe its internal processes ensuring they are compliant with the message flows required for communication with other entities.

You can create BPMN elements and relationships on diagrams in BPMN 2.0 and BPEL formats using the BPMN 2.0 pages of the Diagram Toolbox.

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on 🔍 to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0'.

Ribbon	Design > Diagram > Toolbox
Keyboard Shortcuts	Ctrl+Shift+3
Other	Click the » icon on the Diagram caption bar to display the Diagram Toolbox

Diagram Type Toolboxes

Enterprise Architect provides a set of pages for each of these BPMN 2.0 diagram types:

Diagram Type
Business Process - contains the constructs needed to build Business Process models.
Choreography - contains the constructs needed to build Choreography models.
Collaboration - contains the constructs required to build Collaboration models.
Conversation - contains the constructs needed to build Conversation models.
Types - contains the constructs common to all BPMN 2.0 diagrams.

Business Process Diagrams

Business Process Diagrams are one of the most commonly used diagrams to describe the way a business works; they can also be used to describe technology and engineering processes. You can draw the diagrams using the basic elements of the language or alternatively you can create more detailed diagrams using many of the advanced elements. The level of details you choose will not only be determined by the complexity of the processes you are describing but also by the audiences' ability to interpret and understand the diagram. At their simplest they will comprise of a sequence of activities with intervening gateways that act as decision points. You can add Pools and Lanes to a diagram to indicate the participants in the process or who is responsible for each of the Activities and Tasks.
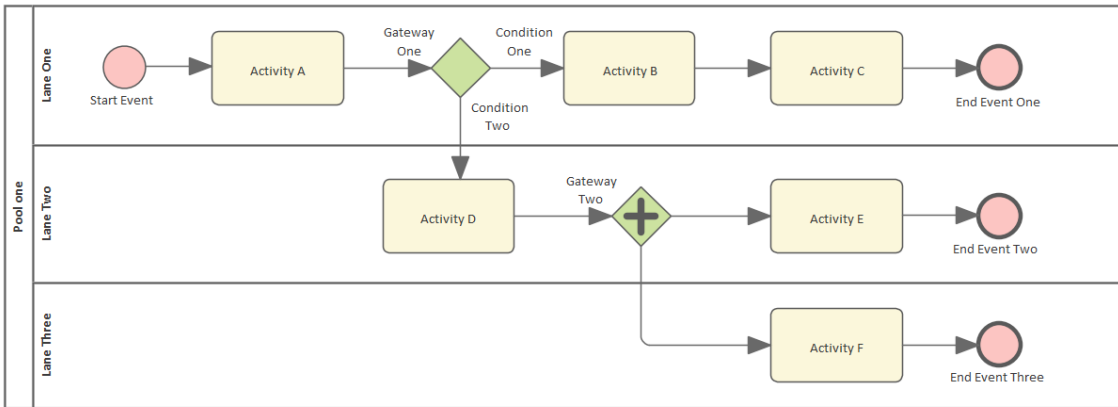
Business Process Diagram with two gateways and a single Pool that contains three Lanes indicating three participants.

To create BPMN elements and relationships on Business Process diagrams in either BPMN 2.0 or BPEL formats, you can use the 'BPMN 2.0 Business Process' pages of the Diagram Toolbox.

BPMN 2.0 Diagram Orientation

On a BPMN 2.0 diagram, you can set the flow orientation to horizontal or vertical, or none (the default).

To set or clear the orientation, right-click on the diagram background and click on 'Set Diagram Flow Direction'. Then click on either:

* None (the default, no specific orientation set)

* Horizontal (diagram flows across the page, Pool and Lane elements occupy the full width of the diagram), or

* Vertical (diagram flows down the page, Pool and Lane elements occupy the full height of the diagram)

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Business Process'.

Ribbon	Design > Diagram > Toolbox : to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Business Process'
Keyboard Shortcuts	Ctrl+Shift+3 : | BPMN 2.0 | BPMN 2.0 Business Process

| Other | Click the ⟫ icon on the Diagram caption bar to display the Diagram Toolbox, then ☰ | BPMN 2.0 | BPMN 2.0 Business Process |

BPMN 2.0 Business Process Elements

Item	Use to
Business Process	Extend a composite Activity that defines a business process.
BPEL	Define the behavior of an executable or abstract business process.
Activity	Represent work that is performed within a Business Process. An Activity can be modeled as a: • Sub-Process - a compound Activity that is defined as a flow of other BPMN 2.0 elements or • Task - an atomic Activity that cannot be broken down into a smaller unit As a sub-process, the Activity can be made a composite element that links to a child diagram containing the flow of other BPMN elements. A BPMN Activity is initially created on a diagram with the name centered at the top. If you drag elements onto the Activity the name can be obscured, so the system automatically moves the name into the top-left corner out of the way. You can also control this movement manually, by right-clicking on the element and selecting the 'Is Expanded' option to toggle the setting.
Global Task	Define a task or activity performed in the top-level process, at a higher level of execution.
Data Object	Provide or store the information for an Activity.
Data Store	Represent a mechanism for an Activity to retrieve or update stored information.
Start Event	Define the initiating event in a process. Elements of this type cannot be edge-mounted on other elements.
Intermediate Event	Define an intermediate event in a process. Elements of this type can only be edge-mounted on Activity elements.
End Event	Define the terminating event in a process. Elements of this type cannot be edge-mounted on other elements.
Gateway	Define a decision point in a business process. If a condition is true then processing continues one way; if false, then another.
Pool	Extend a Partition element to logically organize an Activity.
Lane	Extend a Partition element to subdivide a Pool.

Message	Represent the contents of a communication between two elements.
Group	Extend a Boundary element to group other elements.
Text Annotation	Create a comment.
BPMN 2.0 Business Process Connectors	Sequence Flow Use to: Extend a Control Flow relationship to define the flow of activity.
Association	Link the information and Artifacts with BPMN graphic elements.
Message Flow	Extend a Control Flow relationship to define the flow of communications in the process.
Data Association	Move data between Data Objects, Data Store, Properties and Activities, Processes.
Conversation Link	Connect a Conversation Node with a Pool, in either direction.

BPMN 2.0 Business Process Connectors

| Item	Use to
Sequence Flow	Sequence Flow Use to: Extend a Control Flow relationship to define the flow of activity.
Association	Link the information and Artifacts with BPMN graphic elements.
Message Flow	Extend a Control Flow relationship to define the flow of communications in the process.
Data Association	Move data between Data Objects, Data Store, Properties and Activities, Processes.
Conversation Link	Connect a Conversation Node with a Pool, in either direction.

Notes

- The appearance and specification of many elements and connectors are defined by Tagged Values

Choreography Diagrams

You can visualize the way two or more Participants coordinate their interactions using a Choreography diagram. The focus in this type of diagram is not on orchestrations of the work performed within these Participants, but rather on the exchange of information (Messages) between these Participants. The standard leverages the familiarity of Business Process Diagrams that resemble simple flowcharts but where each activity reference two or more participants. Thus Choreographies, like Business Process Diagrams, also have ordered sequences of "activities" connected by Sequence Flows but these activities represent one or more interactions between Participants. These interactions are sometimes called message exchange patterns (MEPs) which are the atomic units ("Activity") of a Choreography. Message exchanges between Participants can be more complex than simple request-response interactions into multi-cast, contingent requests, competing receives, streaming, and other service interaction patterns. As a partner you can visualize and plan your Business Processes for inter-operation with other business entities without introducing conflicts or having to wait for definitions of how another participant's would respond to a message.
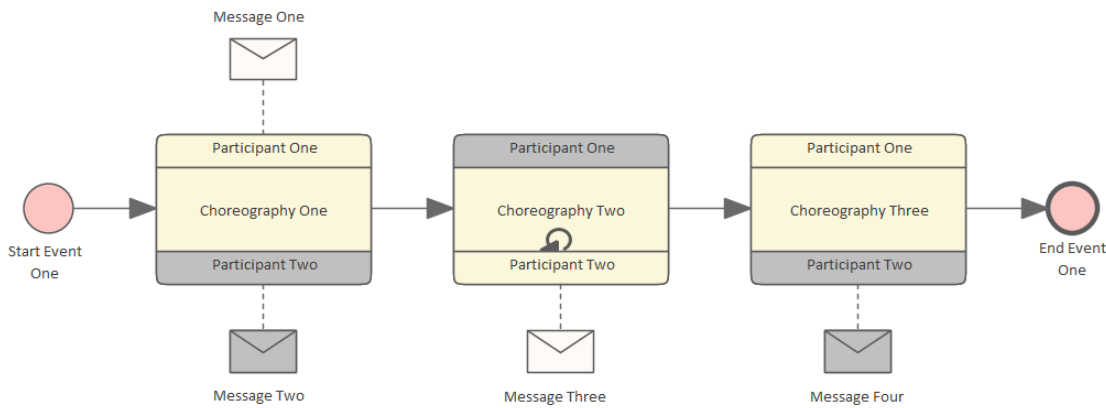
A Choreography diagram with three Activities (Choreographies) involving the interaction between two participants

To create BPMN elements and relationships on Choreography diagrams in either BPMN 2.0 or BPEL formats, you can use the BPMN 2.0 Choreography pages of the Diagram Toolbox.

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Choreography'.

Ribbon	Design > Diagram > Toolbox : to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Choreography'
Keyboard Shortcuts	Ctrl+Shift+3 : > Specify 'BPMN 2.0 Choreography' in the 'Find Toolbox Item' dialog
Other	Click the icon on the Diagram caption bar to display the Diagram Toolbox, then > Specify 'BPMN 2.0 Choreography' in the 'Find Toolbox Item' dialog.

BPMN 2.0 Chorography Elements

Item	Use to
Choreography Model	Extend a composite Activity that defines a Choreography process.
Choreography	Extend an Activity element to represent a process unit of information exchange between elements.
Start Event	Define the initiating event in a process. Elements of this type cannot be edge-mounted on other elements.
Intermediate Event	Define an intermediate event in a process. Elements of this type can only be edge-mounted on Activity elements.
End Event	Define the terminating event in a process. Elements of this type cannot be edge-mounted on other elements.
Gateway	Define a decision point in a business process. If a condition is true then processing continues one way; if false, then another.
Message	Represent the contents of a communication between two elements.
Pool	Extend a Partition element to logically organize an Activity.
Text Annotation	Create a comment.

BPMN 2.0 Chorography Connectors

Item	Use to
Sequence Flow	Define the order of activity in a Choreography.
Association	Link the information and Artifacts with BPMN graphic elements.
Message Flow	Extend a Control Flow relationship to define the flow of communications in the process.

Notes

- The appearance and specification of some elements and connectors are defined by Tagged Values

Collaboration Diagrams

You can describe the messages that flow between two or more participants using Pools, where each pool in a Collaboration diagram represents a participant . Messages that are exchanged as part of the interaction are visualized as Message Flows between the pools. In a White Box collaboration the messages flows start with flow objects in one pool and target flow objects in another pool. In Black Box collaborations the message flows target the edge of the pool and the flow objects in the second pool are not represented.
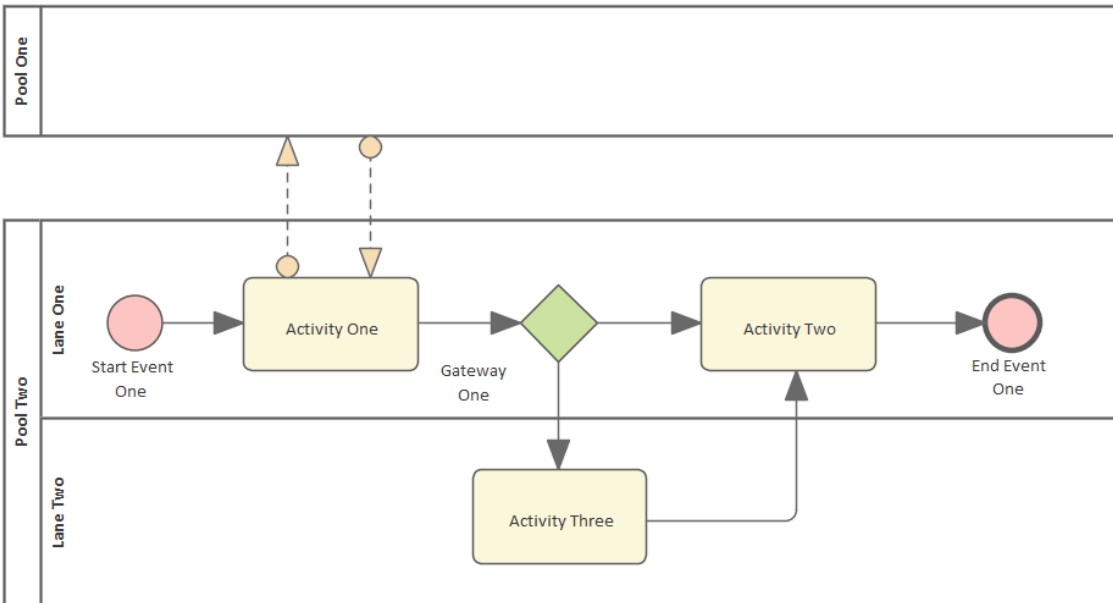
Black Box Collaboration diagram, showing Message Flows that originate from flow objects and target the boundary of the other participant's Pool.

The goal is to describe the interactions between the participants (organizations or people) showing the detailed flow objects in one participant and the messages that flow between them. In black box collaborations the diagram does not describe the details of how the other participant processes the messages, whereas in White Box the details of the other participants' processes are described and the messages cross the pool boundary.
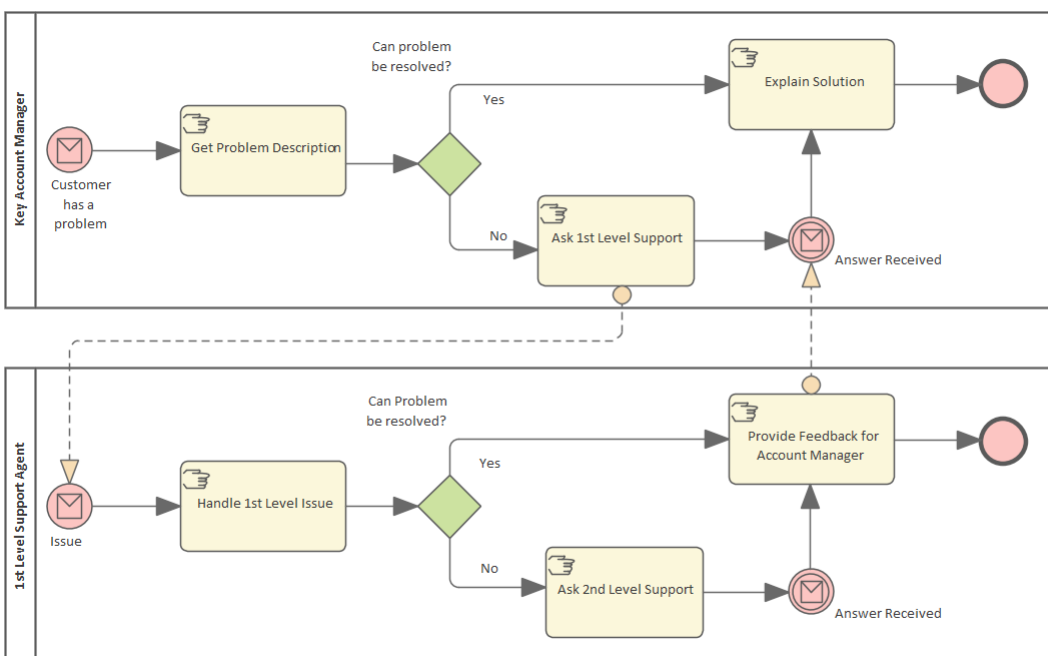
White Box Collaboration diagram, showing Message Flows that originate from flow objects and target objects in the other participant's Pool.

To create BPMN elements and relationships on Collaboration diagrams in either BPMN 2.0 or BPEL formats, you can use the 'BPMN 2.0 Collaboration' pages of the Diagram Toolbox.

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Collaboration'.

Ribbon	Design > Diagram > Toolbox : > Specify 'BPMN 2.0 Collaboration' in the 'Find Toolbox Item' dialog
Keyboard Shortcuts	Ctrl+Shift+3 : > Specify 'BPMN 2.0 Collaboration' in the 'Find Toolbox Item' dialog
Other	Click the ⟫ icon on the diagram caption bar to display the Diagram Toolbox, then > Specify 'BPMN 2.0 Collaboration' in the 'Find Toolbox Item' dialog

BPMN 2.0 Collaboration Elements

Item	Use to
Collaboration Model	Extend a composite Activity that defines a Collaboration process.
Pool	Extend a Partition element to logically organize an Activity.
Lane	Extend a Partition element to subdivide a Pool.
Conversation	Extend a Class element to group a set of Message Flows based on a certain concept.
Start Event	Define the initiating event in a process. Elements of this type cannot be edge-mounted on other elements.
Intermediate Event	Define an intermediate event in a process. Elements of this type can only be edge-mounted on Activity elements.
End Event	Define the terminating event in a process. Elements of this type cannot be edge-mounted on other elements.
Gateway	Define a decision point in a business process. If a condition is true then processing continues one way; if false, then another.

Activity	Represents work that is performed within a Business Process. An Activity can be modeled as a: • Sub-Process - a compound Activity that is defined as a flow of other BPMN 2.0 elements or • Task - an atomic Activity that cannot be broken down into a smaller unit As a sub-process, the Activity can be made a composite element that links to a child diagram containing the flow of other BPMN elements.
Data Object	Provide or store the information for an Activity.
Data Store	Represent a mechanism for an Activity to retrieve or update stored information.
Choreography	Extend an Activity element to represent a process unit of information exchange between elements.
Group	Extend a Boundary element to group other elements.
Text Annotation	Create a comment.

BPMN 2.0 Collaboration Connectors

Item	Use to
Message Flow	Extend a Control Flow relationship to define the flow of communications in the process.
Conversation Link	Connect a Conversation Node to or from an element.
Sequence Flow	Extend a Control Flow relationship to define the flow of activity.
Association	Link the information and artifacts with BPMN graphic elements.

Notes

• The appearance and specification of some elements and connectors are defined by Tagged Values

Conversation Diagrams

You can visualize a high level representation of groups of messages (conversations) transmitted between two or more participants in a domain using a Conversation diagram. The goal is to present a summary of the messages that flow between a group of participants in a domain. You group sets of messages into conversations thus hiding the complexity of the choreography of the underlying messages. The conversations (hexagonal elements) are connected to the participants that engage in the conversation. This creates an overview of how the participants interact together. Just as in human speech it is possible simply to say that two (or more) parties engaged in a conversation about a topic without going into the detail of what was said.
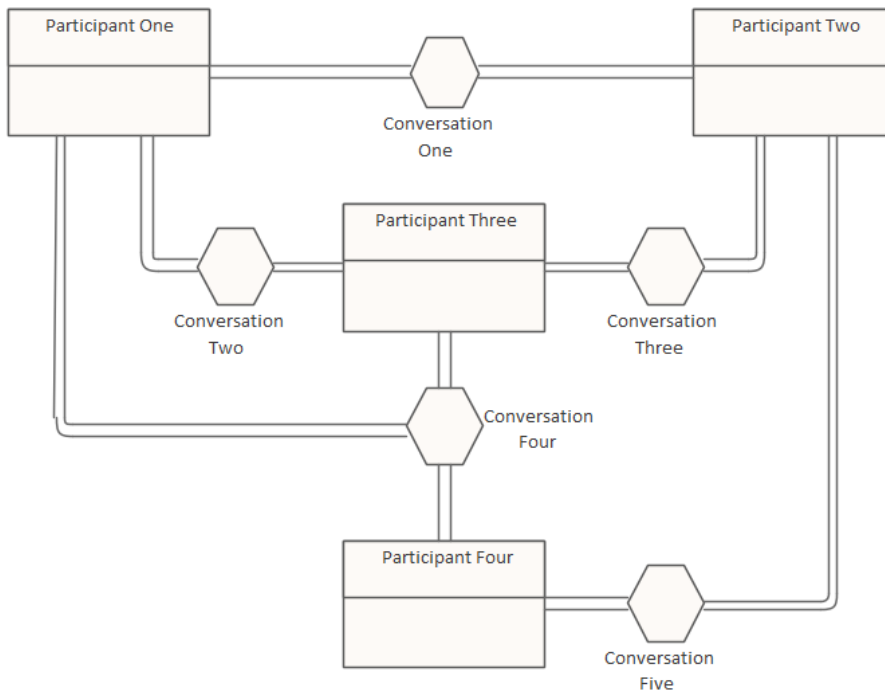
Conversation diagram with four Participants showing an overview of their interactions (conversations).

To create BPMN elements and relationships on Conversation diagrams in either BPMN 2.0 or BPEL formats, you can use the BPMN 2.0 Conversation pages of the Diagram Toolbox.

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 Business Process'.

Ribbon	Design > Diagram > Toolbox : > Specify 'BPMN 2.0 Conversation' in the 'Find Toolbox Item' dialog
Keyboard Shortcuts	Ctrl+Shift+3 : > Specify 'BPMN 2.0 Conversation' in the 'Find Toolbox Item' dialog
Other	Click the icon on the Diagram caption bar to display the Diagram Toolbox, then > Specify 'BPMN 2.0 Conversation' in the 'Find Toolbox Item' dialog

BPMN 2.0 Conversation Elements

Item	Use to
Conversation Model	Extend a composite Activity that defines the logical relationship of Message exchanges between two or more business entities.
Conversation	Extend a Class element to group a set of Message Flows together based on a certain concept.
Pool	Extend a Partition element to logically organize an Activity.
Activity	Represents work that is performed within a Business Process. An Activity can be modeled as a: • Sub-Process - a compound Activity that is defined as a flow of other BPMN 2.0 elements or • Task - an atomic Activity that cannot be broken down into a smaller unit As a sub-process, the Activity can be made a composite element that links to a child diagram containing the flow of other BPMN elements.
Start Event	Define the initiating event in a process. Elements of this type cannot be edge-mounted on other elements.
Intermediate Event	Define an intermediate event in a process. Elements of this type can only be edge-mounted on Activity elements.
End Event	Define the terminating event in a process. Elements of this type cannot be edge-mounted on other elements.
Gateway	Define a decision point in a business process. If a condition is true then processing continues one way; if false, then another.
Text Annotation	Create a comment.

BPMN 2.0 Conversation Connectors

Item	Use to
Conversation Link	Connect a Conversation Node to a Pool element, in either direction. Either the source or target element for a Conversation Link must be a Conversation Node element.
	Extend a Control Flow relationship to define the flow of communications in the

Message Flow	process.
Sequence Flow	Extend a Control Flow relationship to define the flow of activity.
Association	Link the information and artifacts with BPMN graphic elements.

Notes

- The appearance and specification of some elements and connectors are defined by Tagged Values

Common Types

When you are working on a BPMN 2.0 diagram, you can also create a range of elements and connectors that are common to all of the BPMN 2.0 diagram types, by dragging them from the BPMN 2.0 Types page of the Diagram Toolbox. The 'BPMN 2.0 Types' Toolbox page is common to all of the BPMN 2.0 Toolboxes.

Access

Use any of the methods outlined here to display the Diagram Toolbox, then click on to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 <diagram type>'.

Ribbon	Design > Diagram > Toolbox : to display the 'Find Toolbox Item' dialog and specify 'BPMN 2.0 <any diagram type>'
Keyboard Shortcuts	Ctrl+Shift+3 : | BPMN 2.0 | BPMN 2.0 <any diagram type>
Other	Click the icon on the Diagram caption bar to display the Diagram Toolbox, then > BPMN 2.0 > BPMN 2.0 <any diagram type>

BPMN 2.0 Types

These items define the non-graphic elements or properties (Tagged Values) of the Core BPMN 2.0 graphic elements.

- Assignment
- CorrelationKey
- CorrelationProperty
- CorrelationPropertyBinding
- CorrelationPropertyRetrievalExpression
- CorrelationSubscription
- Category
- CategoryValue
- ComplexBehaviorDefinition
- ItemDefinition
- Error
- Escalation
- Signal
- IOSpecification
- InputSet
- OutputSet
- InputOutputBinding
- Interface
- Endpoint

- Operation
- Participant (use Pool element)
- Resource
- ResourceRole
- ResourceParameter
- Property
- ConversationAssociation
- PartnerEntity
- PartnerRole

Model Structure and Reuse

A Business Process can be re-used by encapsulating the Pool (see *Notes* at the end of this topic). Once the Pool is encapsulated, a Business Process is created that is referenced by the Pool's Tagged Value processRef. At this point, elements that appeared in the Pool on the diagram will be nested in the referenced Business Process.

In Enterprise Architect, a BPMN Participant is represented by the Pool element. When you export your BPMN model to another tool, in order to comply with the BPMN 2.0 specification the Pool is interpreted as a Participant in the XML. On import to Enterprise Architect, a Participant is interpreted as a Pool.

You can also use a Call Activity to reference another Business Process. As an illustration:

1. Drop an Activity element onto a diagram.

2. Open the element's 'Properties' dialog.

3. On the 'BPMN2.0' tab, click on the drop-down arrow in the Type field and select 'callProcessActivity'.

4. In the Activity Tagged Value list, click on the [...] button at the right of the calledActivityRef Tagged Value, and browse for the appropriate Business Process.

5. Click on the browser OK button and on the 'Properties' dialog OK button.

Now, whenever you move an element onto this Call Activity, it will be nested in the referencing Business Process.

BPMN 2.0 Sequence Flow and Message Flow Rules

Rules concerning the use of Sequence Flows and Message Flows, as defined in the BPMN 2.0 Specification and described here, are implemented by the BPMN 2.0 UML profile.

These rules apply to Sequence Flows in relation to Events (Start, Intermediate and End), Activities (Task and Sub-Process, for Processes), Choreography Activities (Choreography Task and Sub-Choreography, for Choreographies) and Gateways:

- A Sequence Flow cannot cross a Pool boundary

- An End Event cannot be the source element for a Sequence Flow

- A Start Event cannot be the target element for a Sequence Flow

- An Intermediate Event, if edge mounted on an Activity element, cannot be the source element for a Sequence Flow; it cannot have incoming Sequence Flows

- An Intermediate Event - if edge mounted on an Activity element and having the Tagged Value eventDefinition=Compensation, cannot be either the source or target element for a Sequence Flow

- Objects within a Sub-Process cannot have a Sequence Flow relationship with objects outside the Sub-Process

- A Sequence Flow cannot connect directly to a Pool

These rules apply to Message Flows in relation to Events (Start, Intermediate and End), Activities (Task and Sub-Process, for Processes), Choreography Activities (Choreography Task and Sub-Choreography, for Choreographies) and Pools:

- Message Flows can be created from objects in one Pool to objects in another Pool; Message Flows can connect directly to another Pool

- A Message Flow can connect to Events (Start, Intermediate and End) only if they have the Tagged Value eventDefinition=Message or eventDefinition=Multiple

- A Start Event cannot be the source element for a Message Flow

- An End Event cannot be the target element for a Message Flow

Generate Call Activities

If you drag a BPMN 2.0 Global Task or Business Process element from the Browser window onto a diagram, the system creates a Call Activity element containing Tagged Values appropriate to the type of element from which the Call Activity was generated.

Grammar of Pools and Lanes

- If a Pool element has the partnerEntity and partnerRole Tagged Values assigned, and an empty 'Name' field, the element will display the Tagged Values

- If a Lane element has the partitionElementRef Tagged Value assigned, and an empty 'Name' field, the element will display the Tagged Value

- When you create Lanes in a Pool, the first Lane will fill half the Pool and subsequent Lanes will fill the remaining space

- In the Browser window, you can right-click on the diagram, Pool or Collaboration model and select 'Encapsulate Process', which will move all the object's nested elements to a Business Process; elements placed inside the encapsulated element (during diagramming) will be moved to the Business Process

- Encapsulating the diagram and the Collaboration/Choreography model give the same result; the action:
    - Creates a 'main Pool' that the Collaboration Model will reference via the mainPool Tagged Value
    - Creates a Business Process that the 'main Pool' will reference via the processRef Tagged Value
    - Moves everything nested in or added to the Collaboration (minus pools and diagrams) to the new Business Process

- When you create a BPMN 2.0 diagram, the system prompts you to select whether or not to create an encapsulating element for the diagram; that is, a:
    - Business Process for a Business Process diagram
    - Choreography Model for a Choreography diagram
    - Collaboration Model for a Collaboration or BPEL diagram
    - Conversation Model for a Conversation diagram

- When a Pool is dropped onto a BPMN diagram that is directly under a Package (and only in this circumstance), the system prompts you to select whether or not to create a Collaboration Model for the Pool (rather than always creating the Collaboration Model)

- The two prompts each have the checkbox 'Do not show this message again' that, if checked, blocks the prompt from displaying and retains the current setting as the automatic action; you can reset the checkbox to unselected using the Reset BPMN Prompts button on the 'Diagram > Behavior' page of the 'Preferences' dialog

- Encapsulating supports the re-use of processes, in that you can create links to Pools in other Collaboration models for diagramming, and elements moved into them will be placed in the same Business Process (since the Pool represents a Process)

Process Simulation

Business Process Simulations provide a way of bringing your Business Process diagrams to life. Viewing Business Process diagrams is a convenient way to visualize how a Business Process works, and by manually following the Sequence flows between Activities and Tasks and the intervening Gateways, the flow can be understood in the context of different scenarios. Simulations, however, can bring your diagrams to life and allow detailed analysis and what-if analysis to determine through-puts, bottle-necks, processing time and much more. You can create walk-throughs with multi-disciplinary teams and analyze and visualize process outcomes.   There are two mechanism for Simulation available in the tool:

- BPMN Standard Process Simulation

- BPSIM Process Simulation
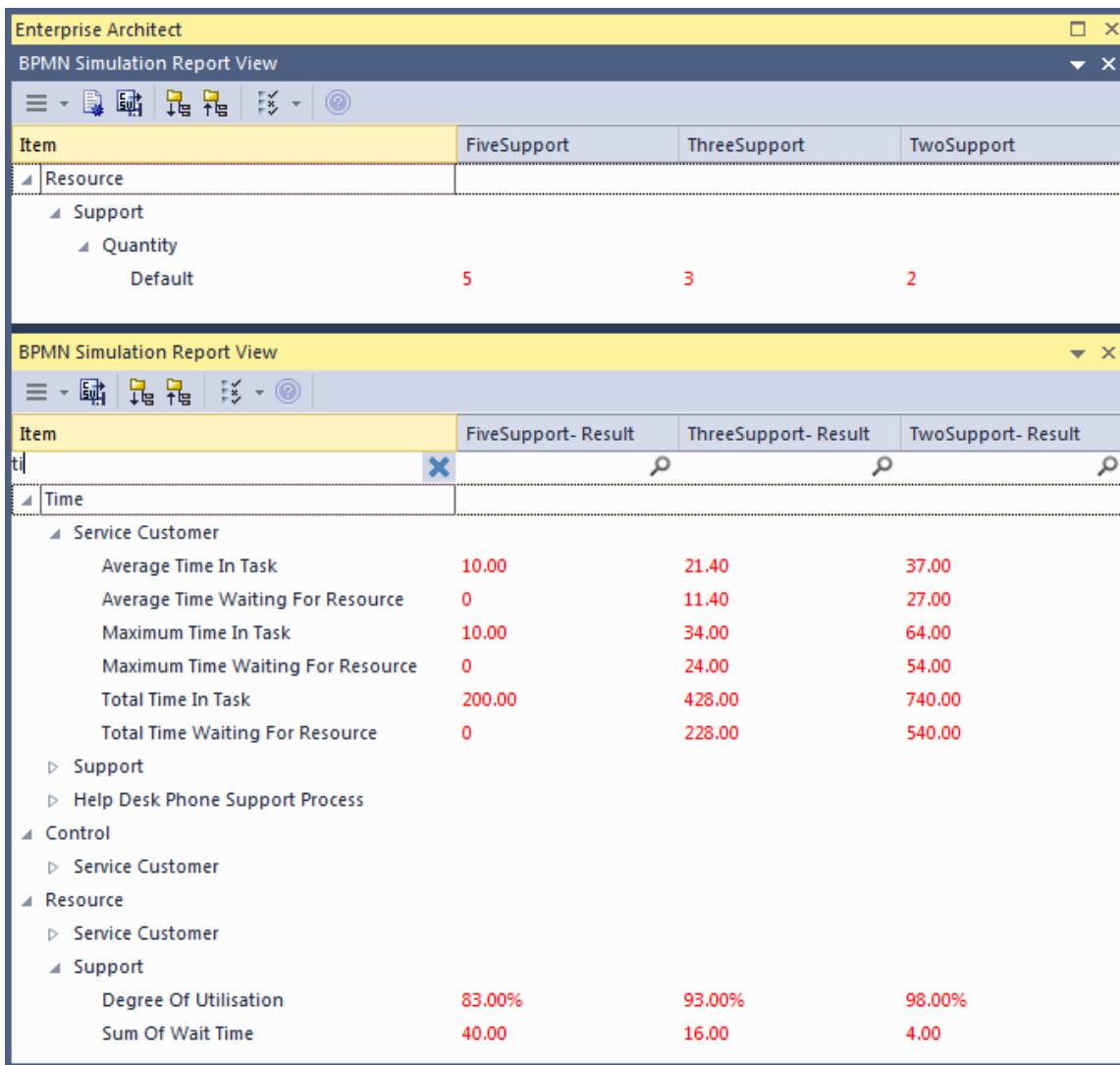
BPMN Standard Process Simulation

This type of Simulation requires no set up and can be run for any well-formed Business Process diagram, including when sub-Activities have been defined. The Simulation will do a depth-first traversal, following the Sequence Flows through the depth of the process hierarchy. It is useful as a presentation tool in workshops and can be used for process walk-throughs.

BPSIM Process Simulation

Using this Simulation tool you can create full Simulation of your models and perform sophisticated analysis of how the processes will perform in practice. The tool does require set-up by a technician before it can be run, but this is a straight forward task and within a short time you can be performing what-if analysis, measuring through-puts and doing Monte Carlo analysis.

BPMN Simulation

BPMN simulation is a method for visualizing and validating the behavior of your BPMN Business Process diagrams. With visual indications of all currently executing activities and the possible activities that can be executed next, you will easily be able to identify and resolve potential issues with the process you have modeled.

Simulating BPMN models is similar to simulating standard UML Behavioral models, except that BPMN:

- Uses some different element types (such as Gateway instead of Decision) and
- Operates on scripting placed, generally, in the appropriate 'Tagged Value' field associated with the connectors and elements, instead of in the 'Properties' fields (and, if you prefer, rather than in the 'Execution Analyzer Build Scripts' dialog); the scripting is written in JavaScript

Working with BPMN Simulation

Activity	Detail
Create a BPMN Simulation Model	When you create a BPMN model suitable for simulation, you take into consideration how you represent the start point, the flow and the conditions to be tested.
Compare UML Activities to BPMN Processes	The simulation of BPMN Business Process models has a number of differences to the simulation of UML Activity diagrams.

Notes

- BPMN simulation is available in the Unified and Ultimate Editions of Enterprise Architect

Create a BPMN Simulation Model

As part of the process of developing a simulation model, consider which of the three options for performing the simulation you prefer to apply:

- Execute a simulation script to initialize the variables for the diagram - select 'BPMN' as the Platform, execute the simulation as 'As Script' and select the script; you would then define the conditions and decisions as JavaScript declarations within the Tagged Values of the elements and connectors on the diagram, either before you start the simulation or during the simulation

- Do not use a script, but initialize the variables within the first Activity and, again, modify the conditions and decisions within the Tagged Values of the elements and connectors, then execute the simulation as 'Interpreted'; you can then re-initialize the variables during simulation, as well as the conditions

- Execute the simulation as 'Manual' and manage the flow and conditions manually at each step

Create a BPMN diagram suitable for simulation

Step	Action
1	Create a Business Process or BPEL diagram from the BPMN 2.0 technology. If you create a BPEL diagram Enterprise Architect displays specialized dialogs to streamline the creation of compliant models.
2	We recommend that you create a Start Event to clearly show where your simulation starts. You have several choices for the Event Type; the choice does not influence the simulation of your model. If no Start Events are defined, the simulation will start from an Activity that has no incoming Sequence Flows.
3	Add all of the Activities that are involved in the Process being modeled. You have several choices for the Task Type; the choice does not influence the simulation of your model. The behavior of Activities can be further decomposed by specifying an Activity Type of Sub-Process and selecting Embedded or CallActivity. Standard Loops are also supported.
4	Add Sequence Flows between your activities. In the 'BPEL properties' dialog you can enter the condition that must be satisfied (True) before the Sequence Flow will be followed. You can also set the conditionType to 'Default' to ensure that this flow will be taken if all other branches fail the condition specified. If you are not working with a BPEL diagram, you use the conditionExpression and conditionType Tagged Values.
5	Add End Events for any conditions that will cause the process or active execution path to end. You have several choices for the Event Type; of these only the Terminate type will influence the execution. In simulations with multiple active nodes, it causes the entire process to terminate instead of just the thread that reaches that node.

Notes

- To include Activities that are in Packages external to the Package being simulated, either draw a:
  - Package Import connector from the Package containing the diagram being simulated to each external Package, or
  - Dependency connector from the Package containing the diagram being simulated to each Activity in the external Packages

Initialize Variables and Conditions

For a BPMN simulation model, you can initialize your variables in an Execution Analyzer script. You can also initialize these variables in the Tagged Values of the first Activity element of the process, which gives you greater flexibility in adding and changing variables as the simulation proceeds. Similarly, you can define the conditions and values to apply at the various decision points (Gateways) in the process, in the Tagged Values of the Sequence Flow connectors.

If you want to incorporate a user-interface into your simulation process, using Win32, you again use Tagged Values to identify the dialog or prompt to display, in the Activity element just prior to the point at which the value or decision is processed.

For the simulation of UML diagrams, variables inside the 'sim' object and 'this' object are displayed in the Local Variables window.

Access

Display the 'Tags' tab of the Properties window, using one of the methods outlined here.

Ribbon	Explore > Portals > Windows > Properties > Properties > Tags
Keyboard Shortcuts	Ctrl+2 > 'Tags' tab of the Properties window

Initialize Variables

1. On the diagram, click on the first Activity element in the process.

2. In the 'Tags' tab of the Properties window, click on the drop-down arrow of the taskType 'value' field, and select 'Script'.

3. In the script 'value' field, type in the appropriate JavaScript code, such as:

   sim.loan=true; sim.status="undefined';

Define Conditions

1. On the diagram, click on a Sequence Flow connector that issues from a Gateway element.

2. In the 'Tags' tab of the Properties window, click on the drop-down arrow of the conditionType 'Value' field, and select 'Expression'.

3. In the conditionExpression 'Value' field (<memo>*) click on the ⸱⸱⸱ button to display the Tagged Value Note window. Type in the appropriate JavaScript code, such as:
   sim.status=="Hold"

4. Click on the OK button. The statement text displays as a label of the connector.

Incorporate Win32 User Interface

1. On the diagram, click on the Activity element that represents where the decision is made.

2. In the 'Tags' tab of the Properties window, click on the drop-down arrow of the 'taskType value' field, and select

'Script'.

3. In the 'script value' field, type in the appropriate JavaScript code, such as:
    dialog.Screen1.Show=True;
    (This statement displays the dialog Screen1. You can temporarily hide the dialog by changing 'Show' to False.)

BPSim Business Simulations

The open BPSim specification provides a rich set of materials on how to configure and assign resources to activities or tasks, how to raise events, decision making and other real-world capabilities. Once configured according to the BPSim specification, a business process model (constructed in BPMN) can be passed to a suitable BPSim simulation engine and run according to the process defined in the BPMN model, using the configuration data attached in the BPSim information.

The BPSim specification is very detailed and offers the interested modeler and business strategist an unprecedented flexibility in assigning operating information to a model and then assessing the quality of the solution based on information received back from the Simulation engine. This section describes in detail the various screens and options available when configuring a model for BPSim execution.

Sparx Systems provide a BPSim-capable Simulator - the **BPSim Execution Engine.** This Add-In integrates with the BPSim and BPMN models defined in Enterprise Architect, providing the capability to run and store the results from multiple simulations and to perform convenient comparisons across each configuration's result set.

The **BPSim Execution Engine** is a pre-requisite for accessing and using the BPSim configuration facilities. The Execution Engine is integrated with the Unified and Ultimate editions of Enterprise Architect; for use in the Corporate edition, it can be purchased and installed under separate licence.

Once you have set up a BPSim configuration, the simulation execution process exports the BPMN model with its BPSim data in a standard form. This ensures that changes to the model are always incorporated into the simulation. Similarly, the model export process captures the BPMN model with its BPSim data in a form that can be imported into another model and consumed by the Sparx Systems BPSim Execution Engine or by any other standards-compliant BPSim engines.

Install BPSim

Whilst BPSim is integrated with the Unified and Ultimate editions of Enterprise Architect, it is separate from the Corporate edition and - after purchase - has to be installed on your system.

For all three editions, you must ensure that the right versions of Java Runtime Environment (JRE) and Java Development Kit (JDK) are also installed on your system.

BPMN Model With BPMN Simulation
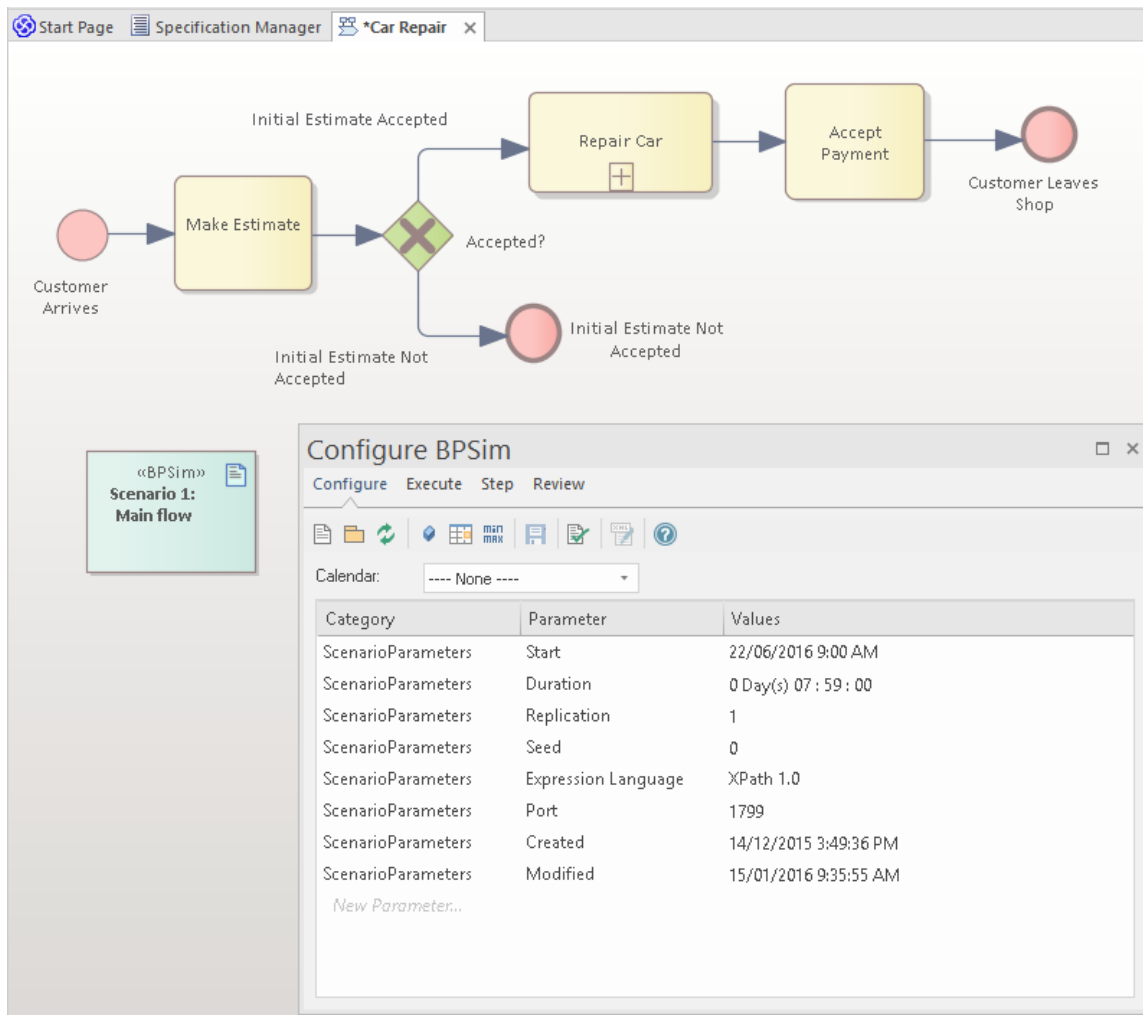
The Configure BPSim window helps you to define several categories of Simulation parameter, each category focusing on one aspect of the Simulation Configuration. For example, you would define:

- ScenarioParameters, which define how the Simulation itself should proceed

- Control Parameters, which examine how activity flows through the business process, moderated by the likelihood of a sequence of events and the priorities of certain events

- Time (Temporal) Parameters, which examine how the duration of one or more phases in the processing of an Activity influences the business process

- Resource Parameters, which examine the involvement of types and roles of workers and other resources, their required numbers, their costs and their availability

You can also maintain multiple versions of a configuration (as separate BPSim Artifacts) and easily compare the differences between versions to see how each configuration will vary the flow of the proposed Simulation or process execution. You might, for example, establish a baseline configuration and then create multiple 'what-if?' configurations that vary one or more parameters. Once you have run these configurations through a Simulation Engine, you can examine each result and decide on the relative merits of each configuration. One useful principle to apply here is the simple inheritance of common, unchanged data in one configuration by another configuration that contains only the data being varied - you can therefore run the simulation on a current set of variables, which draws on the standard data configuration at the same time.

Users can combine the BPSim and Charting facilities to quickly vary, simulate and compare aspects of a Business Process model, and show the differences between the Simulations in one of the many Chart formats.

If you are working across multiple projects, you can export and import the BPSim configurations between them. The configuration automatically carries with it the BPMN 2.0 model on which it is based.

The Enterprise Architect Business Process Simulation configuration tool is based on the BPSim Framework developed by the Workflow Management Coalition (WfMC).

Notes

- If you click on a business process element or connector in a diagram or in the Browser window, it is highlighted and selected in the Configure BPSim window

- The Business Process that you simulate can contain elements from more than one Package; to include the external elements in the simulation, you must create a Package diagram containing the 'parent' Package and either the 'external' Packages containing the external elements, or the external elements themselves; create a:
    - Package Import connector from the parent Package to each external Package, or
    - Dependency connector from the parent Package to each external element

Model Validation

It is possible to validate your BPMN Model directly. To do this, select the root Package containing the BPMN model, then select the 'Design > Package > Manage > Validate > Validate Current Package' ribbon option. All errors and warnings will be reported in the System Output window.

You can also validate your BPMN model through a BPSim Configuration Artifact as part of BPMN Simulation, as documented in the *BPSim Business Simulation* and *The BPSim User Interface Components* Help topics.

Exchanging BPMN Models

It is possible to serialize BPMN 2.0 Models in BPMN 2.0 XML. The serialized XML file contains both the model semantics as well as the diagram-interchange information. You can also import a BPMN 2.0 XML file into your project.

Access

For Serialization:

Select a Package in the Browser window, then use one of the methods outlined here, to open the 'Publish Model Package' dialog.

Ribbon	Publish > Model Exchange > Export > BPMN 2.0 XML : Export
Keyboard Shortcuts	Ctrl+Alt+E : Export

Serialize a Model

Step	Action
1	Open the 'Publish Model Package' dialog.
2	In the 'XML Type' field, select 'BPMN 2.0 XML'.
3	Click on the Export button to initiate the BPMN 2.0 XML serialization.

Access

For Import:

Select a Package in the Browser window, into which to import the XML file. Then use the method outlined here to open the 'Import Package from BPMN 2.0' dialog.

Ribbon	Publish > Model Exchange > Import > BPMN 2.0

Import BPMN 2.0 XML

Step	Action
1	In the 'Import Package from BPMN 2.0' dialog, specify the file path name, or click on the file browser icon and choose a file.

2	Click on the Import button to import the file into the Package.

Notes

- The Package being serialized is assumed to be self-contained

- Only the contents of the selected Package are considered for serialization - child Packages (and their contents) are ignored

- Serialization of these items in the BPMN 2.0 Types section of the Toolbox is not supported:
    - InputOutputBinding
    - Conversation Association

- Exporting to and importing from BPMN 2.0 XML is supported in all editions of Enterprise Architect

Business Process Execution Language (BPEL)

Business Process Execution Language (BPEL) is an Orchestration language, serialized in XML, which specifies an executable process that involves message exchanges with other systems. This messaging facility depends on the use of the Web Services Description Language (WSDL) 1.1 to describe outgoing and incoming messages.

This text is derived from the BPEL entry in the online Wikipedia:

'Business Process Execution Language (BPEL), short for Web Services Business Process Execution Language (WS-BPEL), is an executable language for specifying interactions with Web Services. Processes in Business Process Execution Language export and import information by using Web Service interfaces exclusively.'

Web service interactions can be described in two ways:

1. Executable business processes, which model the actual behavior of a participant in a business interaction.

2. Abstract business processes, which are partially specified processes that are not intended to be executed. An Abstract Process might hide some of the required concrete operational details.

BPEL in Enterprise Architect:

Enterprise Architect supports generating BPEL from executable processes in the Unified and Ultimate Editions. Although there is no standard graphical notation for WS-BPEL, Enterprise Architect uses the BPMN profile as a graphical front-end to capture BPEL Process descriptions. Through the BPMN Profile, Enterprise Architect helps you to develop BPEL diagrams quickly and simply. While BPMN provides a graphical notation for visualizing business process, BPEL provides a way for visualizing this graphical business process in XML.

Enterprise Architect supports generating:

*   BPEL 2.0 from models created using constructs in BPMN 2.0 Profile

Notes

*   BPEL is supported in the Unified and Ultimate Editions of Enterprise Architect

*   Enable BPMN 2.0 Technology for BPEL 2.0 modeling in the 'MDG Technologies' dialog ('Specialize > Technologies > Manage Technology')

BPEL 2.0 Model

Enterprise Architect uses BPMN 2.0 as a graphical front-end to capture BPEL 2.0 Process descriptions (as BPEL 2.0 does not have a standard graphical notation). Enterprise Architect uses the partial mapping specified in the BPMN 2.0 specification to map BPMN 2.0 constructs to BPEL 2.0.

Map Constructs

Step	Action
1	Create a BPEL 2.0 Package Structure. Alternatively: 1. Create a Package in the Browser window. 2. Click on the 'New Diagram' option in the Browser window header drop-down menu. 3. Select 'BPMN 2.0' in the 'Select From' field and 'BPEL' in the 'Diagram Types' field. 4. Click on the 'BPEL' icon from the BPMN 2.0 - Business Process Toolbox and drag it into the created BPEL diagram.
2	Open the BPEL diagram under the <<BPELProcess>> stereotyped element.
3	Model the BPEL 2.0 Process using the constructs on the 'BPMN 2.0 - Business Process' Toolbox pages. BPMN 2.0 - Business Process page: • BPEL • Activity • Data Object • Start Event • Intermediate Event • Event • Gateway • Pool BPMN 2.0 - Business Process Connectors page: • Sequence Flow • Association • Message Flow BPMN 2.0 Types page: • Assignment • Error • Interface • Operation • Property
4	Create Web Service Operations for the BPEL Process and other related Pools, if required.
5	Generate BPEL 2.0 code from the BPEL Process.

Notes

- Generating BPEL 2.0 from a BPMN 2.0 model is supported in the Unified and Ultimate Editions of Enterprise Architect

- Enable the BPMN 2.0 Technology in the 'MDG Technologies' dialog ('Specialize > Technologies > Manage Technology')

BPEL 2.0 Example

- The Enterprise Architect Example file (EAExample.EAP) has a sample BPMN 2.0 model from which BPEL 2.0 can be generated

- If you have installed Enterprise Architect at the default location, open this file: C:\Program Files\Sparx Systems\EA\EAExample.EAP

- The BPMN 2.0 model Package is in: Example Model > Analysis and Business Modeling > BPEL Example > BPEL 2.0 Model

Modeling Restrictions

- Every BPEL Process and Sub-Process should start with a Start Event and end with an End Event

- Boundary Start and End Events are not supported

- Sequence Flow Looping is not supported in both Normal and Exception Paths

- All Sequence Flows should flow downstream and not upstream

- Sub-Process cannot be a Loop node and have boundary Intermediate Events

- Event Sub-Process cannot act as a Loop Node

- Assignments are not supported on:
  - Start Events on Event Sub-Processes
  - End Events
  - Sub-Processes
  - Boundary Intermediate Events
  - Gateways
  - Tasks and Intermediate Events that immediately follow an XOR Event Gateway

- Exception Path has to merge back into the Normal Path

- An exception to this rule is boundary Compensation Intermediate Event, which should have a BPMN 2.0 Association to a Compensation Activity (that has no incoming or outgoing Sequence Flows)

- Multiple Exception Paths from an Activity must join at the same location in the Normal Path

- An Exception Path should not cross another Exception Path

- Activities in an Exception Path cannot have boundary Intermediate Events

- Pools are treated as black boxes (that is, they do not expose any details) and hence they cannot contain any child elements or have any incoming/outgoing Sequence Flow connectors

Create BPEL 2.0 Model Structure

A BPEL 2.0 model consists of a BPEL Process (containing a BPEL diagram and mappable BPMN 2.0 constructs) and other supporting elements (such as a BPMN 2.0 Assignment or BPMN 2.0 Operation) required for generating a BPEL 2.0 code.

A sample BPEL 2.0 Package structure can be created in the Browser window, using the Model Builder. You can use this Package structure as a template for developing your BPEL Process.

Access

Ribbon	Start > Personal > Model Builder
	Design > Package > Model Builder
Context Menu	'Project' tab of the Browser window | Right-click on Package | Model Builder (pattern library)
Keyboard Shortcuts	Ctrl+Shift+M
Other	Browser window header bar : ☰ ▾ | Model Builder (pattern library)

Create a BPEL 2.0 Package structure as a starting point for developing a BPEL Process

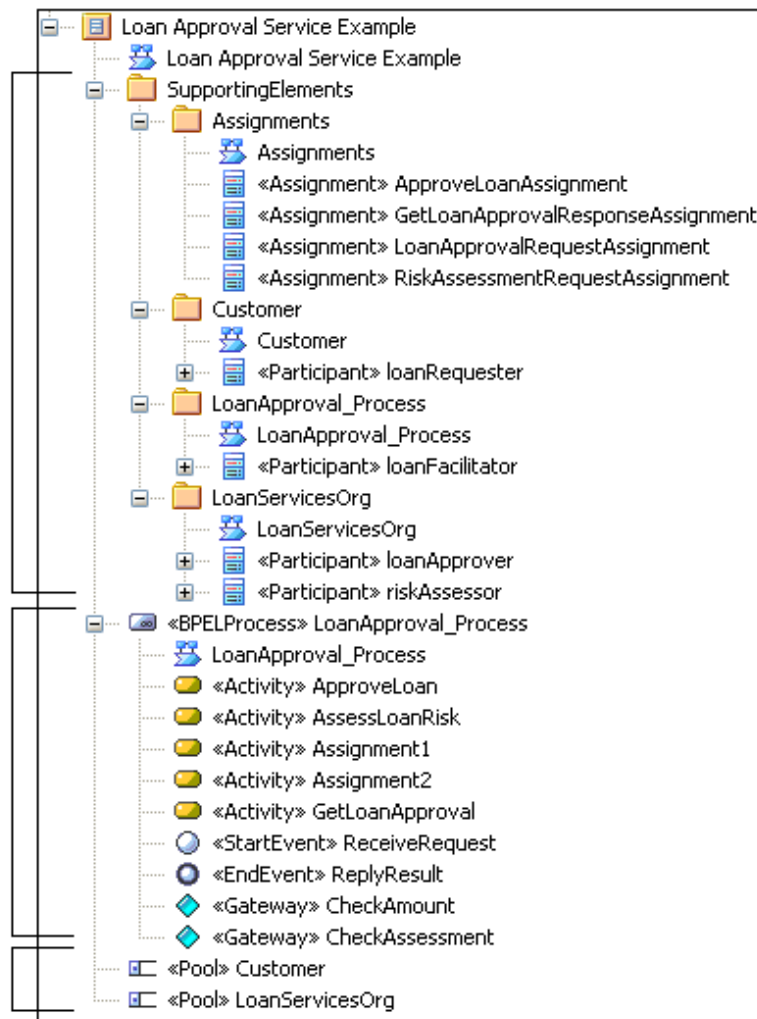| Step	Action
1	Select the root node or a Package in the Browser window.
2	Click on the menu option 'Model Builder (pattern library)' in the Browser window header.
3	Select the value BPMN 2.0 in the Technology section.
4	Check the option 'BPEL 2.0 Model' in the 'Name' section.
5	Click on the OK button to create the sample BPEL 2.0 Package structure.

Example BPEL 2.0 Package Structure

The BPEL Process LoanApproval_Process acts as container for the BPEL diagram and elements. The SupportingElements Package contains supporting components such as Assignments and Web Service Operations.

Loan Approval Service Example
    Loan Approval Service Example
    SupportingElements
        Assignments
            Assignments
            «Assignment» ApproveLoanAssignment
            «Assignment» GetLoanApprovalResponseAssignment
            «Assignment» LoanApprovalRequestAssignment
            «Assignment» RiskAssessmentRequestAssignment
        Customer
            Customer
            «Participant» loanRequester
        LoanApproval_Process
            LoanApproval_Process
            «Participant» loanFacilitator
        LoanServicesOrg
            LoanServicesOrg
            «Participant» loanApprover
            «Participant» riskAssessor
    «BPELProcess» LoanApproval_Process
      LoanApproval_Process
      «Activity» ApproveLoan
      «Activity» AssessLoanRisk
      «Activity» Assignment1
      «Activity» Assignment2
      «Activity» GetLoanApproval
      «StartEvent» ReceiveRequest
      «EndEvent» ReplyResult
      «Gateway» CheckAmount
      «Gateway» CheckAssessment
    «Pool» Customer
    «Pool» LoanServicesOrg

Web Services and other supporting elements like Assignments

BPEL Process

Participants

Model a BPEL 2.0 Process

The BPEL Process in Enterprise Architect represents the top-level container for the BPMN 2.0 elements, from which BPEL 2.0 can be generated. Conceptually it maps to the BPEL process element.

BPEL Properties

- Double-click on the BPEL Process in the BPEL diagram, or
- Right-click on the BPEL Process in the BPEL diagram (or the Browser window) and select BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the BPEL Process.
Query Language	Specify the language used in the BPEL Process for the selection of nodes in Assignments. Defaults to 'XPath 1.0'.
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Start Event

A BPMN 2.0 Start Event indicates where a particular Process begins. Every Process in Enterprise Architect must begin with a Start Event.

BPEL Properties

- Double-click on the Start Event in the BPEL diagram, or
- Right-click on the Start Event | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Type the name for the Start Event.
Event Type	Select a trigger for the Start Event, namely: • Compensation • Conditional • Error • Escalation • Message • Multiple • None • Parallel Multiple • Signal • Timer

Details Tab	Depending on the selected Event Type, the 'Details' tab changes as shown:
	 • Message Event Type
	   - Pool Package - Select the Package that represents one of the involved Participants
	   - Operation - Select an Operation from the list of operation(s) in the selected Pool Package
	 • Timer Event Type
	   - Time Cycle - Specify the value for the time duration
	   - Time Date - Specify the value for the time date
	 • Error Event Type
	   - Error - Select an Error element

Assignments	(Optional) Select one or more Assignment elements created in the SupportingElements Package in this tab.
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.

Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Notes

- Either set 'Time Cycle' or 'Time Date for Timer Event Type' but not both, as they are mutually exclusive fields
- The 'Assignments' tab is not available on Start Events that are used to start an Event Sub-Process
- Compensation, Error and Timer event types are valid only on an Event Sub-Process
- Conditional, Escalation, Multiple, Parallel Multiple and Signal event types cannot be mapped to BPEL 2.0

Intermediate Event

A BPMN 2.0 Intermediate Event indicates where an event occurs somewhere between the start and end of a Process.

BPEL Properties

- Double-click on the Intermediate Event in the BPEL diagram
- Right-click on the Intermediate Event | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the Intermediate Event.
Event Type	Select the type for the Intermediate Event, namely: • Cancel • Compensation • Conditional • Error • Escalation • Link • Message • Multiple • None • Parallel Multiple • Signal • Timer

Details Tab	Depending on the selected Event Type, the 'Details' tab changes:
	• Message Event Type
	   - Pool Package - Select the Package that represents one of the involved Participants
	   - Operation - Select an Operation from the list of operation(s) in the selected Pool Package
	• Link Event Type
	   - Link Event - Select a Link Event element (to act as a target for this Link Event) from the list of Link Event elements under the current Process or Sub-Process
	• Timer Event Type
	   - Time Cycle - Specify the value for the time duration
	   - Time (Date)Date - Specify the value for the time date
	• Compensation Event Type
	   - Activity - Select an Activity from the list of Activity elements under the current Process or Sub-Process
	• Error Event Type

	- Error - Select an Error element
Assignments	(Optional) Select one or more Assignment elements created in the SupportingElements Package in this tab.
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Notes

- Cancel, Conditional, Escalation, Multiple, None, Parallel Multiple and Signal event type cannot be mapped to BPEL 2.0
- The 'Assignments' tab is not available on Intermediate Events that are attached to the boundary of an Activity
- Either set 'Time Cycle' or 'Time Date for Timer Trigger Type' but not both as they are mutually exclusive fields
- The Error event type is valid only on an Intermediate Event attached to the boundary of an Activity
- The Compensation event type is valid only on an Event Sub-Process or when attached to the boundary of an Activity
- The Link Intermediate Event can be used either as a GOTO or an off-page connector; therefore, this event can have either incoming or outgoing Sequence Flows - but not both

Activity

A BPMN 2.0 Activity represents work that is performed within a Process. An Activity can be modeled as a:

- Sub-Process - a compound Activity that is defined as a flow of other BPMN 2.0 elements or
- Task - an atomic Activity that cannot be broken down into a smaller unit

Activities - both Tasks and Sub-Processes - can also, optionally, act as Looping constructs. The OMG BPMN 2.0 Specification defines two types of Looping construct:

- Standard Loop (while or until)
- Multi-Instance Loop (for each)

BPEL Properties

- Double-click on the Activity in the BPEL diagram
- Right-click on the Activity | BPEL | BPEL 2.0 Properties

Options

Option	Action
Name	Type a name for the Activity.
Type	Specify whether the Activity is a: - Task or - Sub-Process

Task Type / SubProcess Type	Depending on the value selected in the 'Type' field, the 'Task Type / SubProcess Type' field has these values:
	- Task Type:
	  - Abstract
	  - Business Rule
	  - Manual
	  - Receive
	  - Script
	  - Send
	  - Service
	  - User
	- SubProcess Type:
	  - Ad-Hoc
	  - Call Activity
	  - Compensation
	  - Embedded
	  - Event
	  - Transaction

Details Tab	Depending on the selected Task Type, the 'Details' tab changes: Receive / Send / Service Task Type - Pool Package - Select the Package that represents one of the involved

	Participants
	• Operation - Select an Operation from the list of operation(s) in the selected Pool Package
Assignments	(Optional) Select one or more Assignment elements created in the SupportingElements Package in this tab.
Loop Details	(Optional) Activities can be repeated sequentially, in a looped circuit. Specify the Activity looping details in this tab. • Loop Type - Select 'Standard' for creating a 'while' or 'until' loop, or 'MultiInstance' for creating a 'for each' loop • Evaluate condition at the beginning of loop - Check this option to create a 'while' Standard loop; defaults to unselected for an 'until' loop • Loop Condition - Enter a Boolean condition for a Standard loop or a numeric condition for a MultiInstance loop • Loop Maximum - (Optional) Specify the maximum value for the loop evaluation for a Standard loop • Loop Ordering - For a MultiInstanceLoop Type select 'Parallel' for generating instances in parallel, or 'Sequential for generating instances in sequence
OK	Click on this button to save the values entered in the dialog.
Cancel	Click on this button to discard the values entered in the dialog.
Help	Click on this button to display this Help topic.
General	Click on this button to open the 'UML Properties' dialog.

Notes

- The 'Assignments' tab is not applicable for Sub-Process
- The 'Loop Details' tab is not applicable for Event Sub-Process
- Business Rule, Manual, Script and User Task types cannot be mapped to BPEL 2.0
- Ad-Hoc, Call Activity and Transaction Sub-Process types cannot be mapped to BPEL 2.0

Gateway

A BPMN 2.0 Gateway controls the way in which Sequence Flows converge and diverge within a Process. They provide a gating mechanism that either allows or blocks a Sequence Flow.

BPEL Properties

- Double-click on the Gateway in the BPEL diagram
- Right-click on the Gateway | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the Gateway.
Gateway	Select the type for the Gateway, namely: - Complex - Event - Exclusive - Inclusive - Parallel
Details Tab	Depending on the selected Gateway, the 'Details' tab changes as shown: - Event Type - Set to 'Exclusive' to represent an Exclusive Event Based Gateway
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Notes

- The target of the outgoing Sequence Flows of this Event Exclusive Gateway must be either a:
  - Receive Task or a
  - Message or Timer Intermediate Event
- If a Message Task is one of the targets of the outgoing Sequence Flow of an Event Exclusive Gateway, then a Message Intermediate Event cannot be the target of the other outgoing Sequence Flows of this Event Exclusive Gateway

End Event

A BPMN 2.0 End Event indicates where a particular Process ends. Every Process in Enterprise Architect must end with an End Event.

Display BPEL Properties

- Double-click on the End Event in the BPEL diagram
- Right-click on the End Event | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the End Event.
Event Type	Select the type for the End Event, namely: • Cancel • Compensation • Error • Escalation • Message • Multiple • None • Signal • Terminate

Details Tab	Depending on the selected Event Type, the 'Details' tab changes:
	• Message Event Type:
	  - Pool Package - Select the Package that represents one of the involved Participants
	  - Operation - Select an Operation from the list of operation(s) in the selected Pool Package
	• Compensation Event Type:
	  - Activity - Select an Activity from the list of Activity elements under the current Process or Sub-Process
	• Error Event Type
	  - Error - Select an Error element

OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Notes

- The Compensation Event type is valid only on an Event Sub-Process
- Cancel, Escalation, Multiple and Signal Event types cannot be mapped to BPEL 2.0

Data Object

A BPMN 2.0 Data Object is mapped to a BPEL 2.0 Variable and occurs in the context of a Process or Sub-Process, as does a Property. A Data Object cannot have an incoming or outgoing Sequence Flow or Message Flow.

BPEL Properties

- Double-click on the Data Object in the BPEL diagram
- Right-click on the Data Object | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the Data Object.
Type	Either: • Select an XML Schema basic type from the drop-down list, or • Use the […] button to select XML Schema ComplexType, SimpleType, Union or Enumeration
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Property

A BPMN 2.0 Property is mapped to a BPEL 2.0 Variable and occurs in the context of a Process or Sub-Process, as does a Data Object.

However, unlike a Data Object, a Property is not displayed on a BPEL diagram. Enterprise Architect supports Properties on BPMN 2.0 BPEL and BPMN 2.0 Activity elements.

Access

Ribbon	Design > Diagram > Toolbox : 🔍 > Specify 'BPMN 2.0 Types' in the 'Find Toolbox Item' dialog
Keyboard Shortcuts	Ctrl+Shift+3 : 🔍 > Specify 'BPMN 2.0 Types' in the 'Find Toolbox Item' dialog
Other	You can display or hide the Diagram Toolbox by clicking on the ≫ or ≪ icons at the left-hand end of the Caption Bar at the top of the Diagram View.

BPEL Properties

- Right-click on the Property | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the Property.
Type	Either: • Select an XML Schema basic type from the drop-down list or • Use the [...] button to select XML Schema ComplexType, SimpleType, Union or Enumeration
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the attribute properties.

Sequence Flow

A BPMN 2.0 Sequence Flow connector shows the order in which the activities (Tasks and Events) are performed in a BPEL Process.

Access BPEL Properties

- Double-click on the Sequence Flow in the BPEL diagram
- Right-click on the Sequence Flow | BPEL | BPEL 2.0 Properties

Define the Sequence Flow

Field/Button	Action
Condition Type	Click on the drop-down arrow and select the type of the condition on the Sequence Flow, namely: • None • Default • Expression
Expression	This field is enabled when the 'Condition Type' is set to 'Expression'. Type in a Boolean expression to act as a gating condition.
Ordering	This field is enabled when the 'Condition Type' is set to 'Expression'. Type in a numerical value that determines the order in which the condition set in the 'Expression' field is to be evaluated.
OK	Click on this button to save the values entered in the dialog.
Cancel	Click on this button to discard the values entered in the dialog.
Help	Click on this button to display this Help topic.
General	Click on this button to open the 'UML Properties' dialog.

Pool

A BPMN 2.0 Pool represents a Participant in a Process and does not map to any specific BPEL 2.0 element. Enterprise Architect uses Pools to represent external Participants, with which the BPEL Process communicates. These are 'black box' pools; that is, they are abstract and do not expose any details (they do not have any BPMN 2.0 elements inside them).

BPEL Properties

- Double-click on the Pool in the BPEL diagram
- Right -click on the Pool | BPEL | BPEL 2.0 Properties

Options

| Field/Button	Action
Name	Specify the name for the Pool.
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Fill Opacity

For a given Pool in a diagram, you can make the element strongly visible or less obvious, depending on how much you want to emphasize its significance, temporarily or for a longer period. You can apply these nuances in the display of the element by changing the opacity of the element fill.

Before setting the opacity, check that the element has a fill color.

You set the opacity using an icon from either of these two pop-up element toolbars:

- Click on the Pool element and on the icon:
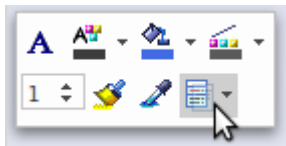
- Right-click on the Pool element and look above the context menu:

Click on the [icon] icon and select:

- 100% for total opacity, where anything behind and overlapping or covered by the element is hidden

- 0% for no opacity, where the fill color is not applied and anything behind the element is fully visible

- 75%, 50% or 25% to set the appropriate degree of opacity and make the background visible but over-shaded

Notes

- A BPEL Process should not contain a Pool as its child element

- A BPEL diagram under a BPEL Process contains an implicit Pool, so it is invalid to add a Pool in this BPEL diagram to represent the BPEL Process

- Pool cannot have any incoming or outgoing Sequence Flow connectors - it can have only incoming or outgoing Message Flow connectors

Assignment

A BPMN 2.0 Assignment element enables data to be copied between messages and variables within a BPEL Process. An Assignment element maps to a BPEL 2.0 assign activity and copies the specified value from the source to the target.

In Enterprise Architect, Assignment elements should be created in the Assignments Package in SupportingElements. If they are created elsewhere, they cannot be enacted correctly.

Access

Ribbon	Design > Diagram > Toolbox : > Specify 'BPMN 2.0 Types' in the 'Find Toolbox Item' dialog
Keyboard Shortcuts	Ctrl+Shift+3 : > Specify 'BPMN 2.0 Types' in the 'Find Toolbox Item' dialog
Other	You can display or hide the Diagram Toolbox by clicking on the or icons at the left-hand end of the Caption Bar at the top of the Diagram View.

BPEL Properties

- Double-click on the Assignment in the BPEL diagram
- Right-click on the Assignment | BPEL | BPEL 2.0 Properties

Options

Field/Button	Action
Name	Specify the name for the Assignment.
Copy From	Complete the fields in this panel, as directed.
Type	Depending on the value selected in this field, further details are required.
Literal	Specify a literal value.
Expression	Specify an expression.
Message	Select a BPMN 2.0 Message in the Package representing the BPEL Process / Pool under the SupportingElements Package.
Part	Select a BPMN 2.0 Property belonging to the selected Message.
Variable	Select a BPMN 2.0 Data Object or BPMN 2.0 Property created under the BPEL

	Process.
Copy To	Complete the fields in this panel, as directed.
Message	Select a BPMN 2.0 Message in the Package representing the BPEL Process / Pool under the SupportingElements Package.
Part	Select a BPMN 2.0 Property belonging to the selected Message.
Variable	Select a BPMN 2.0 Data Object or BPMN 2.0 Property created under the BPEL Process.
OK	Save the values entered in the dialog.
Cancel	Discard the values entered in the dialog.
Help	Display this Help topic.
General	Open the 'UML Properties' dialog.

Notes

- Messages are created when you create a Web Service Operation

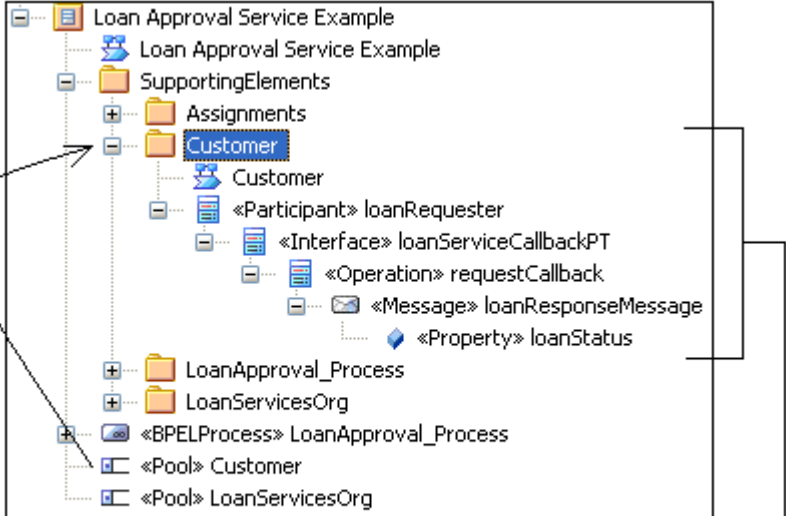# Create BPEL 2.0 Web Service Operation

BPEL is an Orchestration language, which orchestrates services that are exposed using WSDL 1.1. It coordinates the execution of the various operations of these involved services. BPEL 2.0 supports WSDL 1.1 one-way and request-response operations only (and not solicit-response and notification operations). Enterprise Architect enables you to create, for BPEL Process and Pool elements, Web Service Operations that support either synchronous (request-response) or asynchronous (one-way) interactions.

Access

Context Menu	In the Browser window or on a diagram: Right-click on a BPEL Process or Pool element | BPEL | Create WebService

Options

Field/Button	Action
Operation	Specify whether to create a new Web Service Operation or create one from an existing WSDL created / imported into Enterprise Architect (using the 'Import WSDL' dialog) by selecting either: • Create New, or • Create from existing WSDL PortType Operation
Type	Specify whether to create a one-way or request-response Operation by selecting either: • Asynchronous or • Synchronous

Partnership Details	The interaction between the Web Service and the BPEL Process is modeled as a BPEL partnerLink. For this interaction, provide:
	
	• Name - Name of the BPEL partnerLink
	
	• Role - In the BPEL partnerLink, the name of either:
	  - myRole (if this operation belongs to the BPEL Process Web Service) or
	  - partnerRole (if this operation belongs to the Web Service of a Pool)

Web Service	• When 'Create New' is selected in the 'Operation' field:
	  - PortType - Name of the WSDL 1.1 PortType (Interface)
	  - Operation - Name of the WSDL 1.1 PortType Operation
	
	• When 'Create from existing WSDL PortType Operation' is selected in the 'Operation' field:
	  - WSDL Package - Select an existing WSDL Package created or imported into Enterprise Architect
	  - PortType - Select a WSDL 1.1 PortType from the selected WSDL Package
	  - Operation - Select a WSDL 1.1 PortType Operation in the

	selected PortType
Input	When 'Create New' is selected in the 'Operation' field: • Message Name - Name of the WSDL 1.1 Message. • Properties - Click on the [...] button to enter the WSDL 1.1 Message Part Name and XSD Type When 'Create from existing WSDL Port Type Operation' is selected in the 'Operation' field: • The fields in this tab are pre-filled with the details of the input WSDL 1.1 Message (of the WSDL 1.1 PortType Operation selected in the 'Operation' field in the 'Web Service' tab)
Output	When 'Create New' is selected in the 'Operation' field: • Message Name - Name of the WSDL 1.1 Message • Properties - Click on the [...] button to enter the WSDL 1.1 Message Part Name and XSD Type When 'Create from existing WSDL Port Type Operation' is selected in the 'Operation' field: • The fields in this tab are pre-filled with the details of the output WSDL 1.1 Message (of the WSDL 1.1 PortType Operation selected in the 'Operation' field in the 'Web Service' tab)
OK	Create a Web Service Operation based on the values entered in the dialog. The operation is created in a Package that has the same name as the BPEL Process / Pool from which this dialog is invoked, under the SupportingElements Package.
Cancel	Discard the values entered in the dialog and abort creating the Web Service Operation.
Help	Display this Help topic.

Notes

- The 'Output' tab is not applicable for an Asynchronous operation

Generate BPEL 2.0

BPEL 2.0 code can be generated from a BPEL Process. The system validates the BPEL Process before generating the code. In addition to generating the code, WSDL 1.1 files are generated for the BPEL Process and all the involved Pools (provided Web Service Operations are defined for them).

Access

Context Menu	In the Browser window or on a diagram: Right-click on a BPEL Process element | BPEL | Generate BPEL 2.0

Options

| Field/Button	Action
File Name	Specify the path where the BPEL 2.0 file is to be generated.
Namespace Details	Double-click on an entry (if any) in this field to open the 'Namespace Details' dialog and add / edit the namespace details. The entry DefaultPool represents the current BPEL Process.
Generate BPEL	Validate the model and generate BPEL 2.0.
Close	Click on this button to close this dialog.
Help	Display this Help topic.
View BPEL	View the generated BPEL 2.0 file.

BPEL Model Validation

The BPEL model is validated for both syntax and semantic errors before generating the BPEL code. Upon successful validation, the BPEL file (and the associated WSDL 1.1 files, if any) are generated. The results of the validation, as well as the progress of the BPEL generation, are displayed in the 'BPEL Progress' tab of the System Output window.

Example BPEL Model Violation

This model shows several basic BPEL violations:
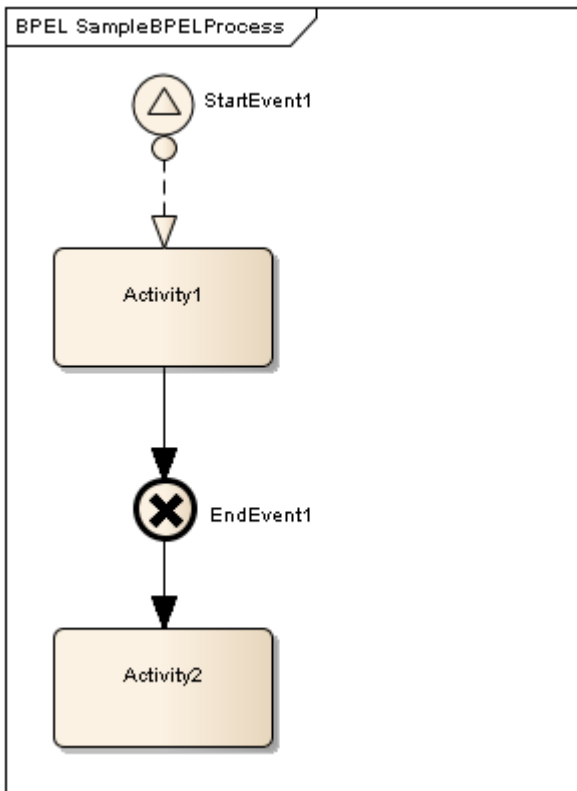
- StartEvent1 is of type Signal, which cannot be mapped to BPEL

- The Message Flow connector between StartEvent1 and Activity1 is invalid, as Message Flow cannot be used to connect Activities or Events within a Process

- EndEvent1 is of type Cancel, which cannot be mapped to BPEL

- EndEvent1 cannot have any outgoing Sequence Flow connector, as it represents the end of a Process

- Activity2 is not valid, as only an End Event represents the end of a Process

Notes

- Double-click on a validation error entry in the 'BPEL Progress' tab of the System Output window to go to the source of the error in the Browser window

Migrating from Previous Versions

It is possible to migrate a BPMN 1.1 model (or part of a model) to BPMN 2.0, using the Automation Interface function Migrate(). This function updates the Tagged Values and, if required, stereotypes to BPMN 2.0 for all elements, attributes, connectors and diagrams under the selected Package or element.

Example

This VB script calls the Migrate() function to migrate the Package or element to BPMN 2.0:

```
Sub MigrateElement (sGUID, lngPackageID)
    Dim proj as EA.Project
    set proj = Repository.GetProjectInterface
    proj.Migrate sGUID, "BPMN1.1", "BPMN2.0"
    'refresh the model
    If lngPackageID<>0 Then
        Repository.RefreshModelView (lngPackageID)
    End If
End Sub
Sub MigrateSelectedItem
    Dim selType
    Dim selElement as EA.Element
    Dim selPackage as EA.Package
    selType = GetTreeSelectedItemType
    If selType = 4 Then 'means Element
        set selElement = GetTreeSelectedObject
        MigrateElement selElement.ElementGUID, selElement.PackageID
        MsgBox "Element Migration Completed",0,"BPMN 2.0 Migration"
    ElseIf selType = 5 Then 'means Package
        set selPackage = GetTreeSelectedObject
        MigrateElement selPackage.PackageGUID, selPackage.PackageID
        MsgBox "Package Migration Completed",0,"BPMN 2.0 Migration"
    Else
        MsgBox "Select a Package or element in the Browser window to initiate migration",0,"BPMN 2.0 Migration"
    End If
End Sub
Sub Main
    MigrateSelectedItem
End Sub
Main
```

Notes

- Please backup your project before you run the BPMN 2.0 Migrator

- Normalization occurs on these tags:
  - BPMN1.1::Activity::InMessageRef
  - BPMN1.1::Activity::OutMessageRef
  - BPMN1.1::Activity::IORules
  - BPMN1.1::Activity::InputSets
  - BPMN1.1::Activity::OutputSets
  - BPMN1.1::Activity::ComplexMI_FlowCondition
  - BPMN1.1::Activity::Performers
  - BPMN1.1::BusinessProcess::InputSets
  - BPMN1.1::BusinessProcess::OutputSets
  - BPMN1.1::BusinessProcess::Performers
  - BPMN1.1::EndEvent::ErrorCode
  - BPMN1.1::IntermediateEvent::ErrorCode

  Taking BPMN1.1::Activity::InMessageRef as an example, these steps take place:

  (1) Create a new element BPMN2.0::Operation (this is the bridging element)
  (2) Insert the reference tag 'BPMN2.0::Activity::operationRef'
  (3) Migrate BPMN1.1::Activity::InMessageRef to BPMN2.0::Operation::InMessageRef

- Denormalization occurs on these tags:
  - A BPMN1.1::Transaction referenced by a BPMN1.1::Activity::TransactionRef
    > BPMN1.1::Transaction::TransactionMethod
    > BPMN1.1::Transaction::TransactionProtocol
  - A BPMN1.1::WebService referenced by a BPMN1.1::Activity::WebServiceRef,
    BPMN1.1::StartEvent::WebServiceRef,
    BPMN1.1::IntermediateEvent::WebServiceRef,
    BPMN1.1::EndEvent::WebServiceRef
    > BPMN1.1::WebService::Operation
    > BPMN1.1::WebService::Interface
    > BPMN1.1::WebService::ParticipantRef
  - A BPMN1.1::Condition referenced by a BPMN1.1::StartEvent::ConditionRef,
    BPMN1.1::IntermediateEvent::ConditionRef
    > BPMN1.1::Condition::ConditionExpression

  Taking BPMN1.1::Activity::TransactionRef as an example, these steps take place:

  (1) Find element BPMN1.1::Transaction by BPMN1.1::Activity::TransactionRef
  (2) Migrate this referenced BPMN1.1::Transaction::TransactionMethod's value to
      BPMN2.0::Activity::transactionMethod
  (3) Migrate this referenced BPMN1.1::Transaction::TransactionProtocol's value to
      BPMN2.0::Activity::transactionProtocol

- If a BPMN1.1 stereo tag is discarded in BPMN2.0, it is preserved if the tag has a value

More Information

See these further topics for additional information:

- [Composite Elements](#)
- [Getting Started](#)
- [Diagram Types](#)
- [Exchanging BPMN Models](#)
- [Migrating from Previous Versions](#)
- [Business Process Execution Language (BPEL)](#)
- [Add New Diagrams](#)
- [Manage MDG Technologies](#)
- [Diagram Behavior Options](#)
- [Rules Reference](#)
- [BPSim Business Simulations](#)