QPR ProcessGuide

BPMN Modeling Guide

Version 7.6.1

Table of Contents

1 Introduction to BPMN Modeling

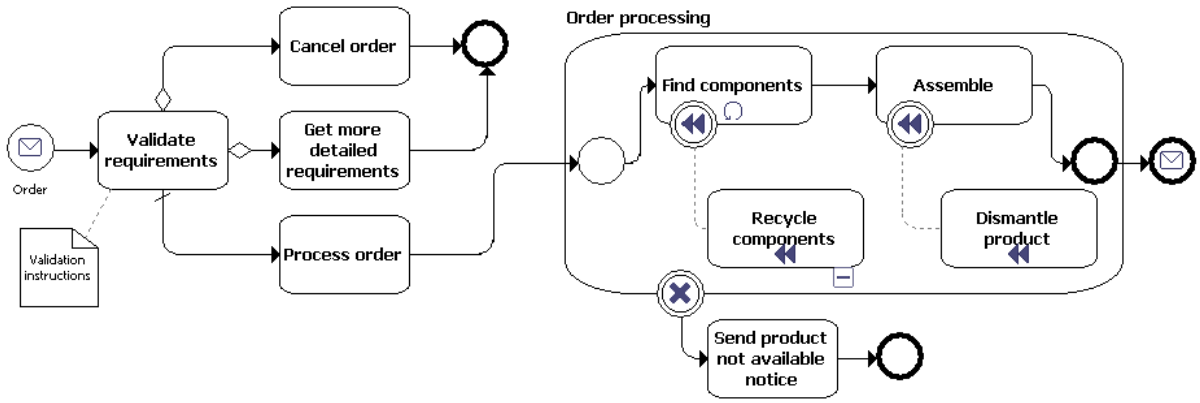
BPMN (Business Process Modeling Notation) is a modeling notation specification. Its primary goal is to provide a notation that is understandable by all business users. Thus, the core set of BPMN modeling elements enables easy development of simple Business Process Diagrams (BPD) which are made up of a set of graphical elements that are familiar to most business users.

BPMN defines the visual appearance of BPMN elements so that the appearance of shapes and icons is fixed. However, sizes, colors, line styles, and text positions can be modified. Furthermore, new icons and indicators can be added to model elements but the basic shapes cannot be changed. New artifacts can also be added to diagrams for as long as the shape does not conflict with any existing shape or icon.

QPR ProcessGuide 7.6 supports the BPMN standard. In addition to supporting the core set of BPMN elements, QPR ProcessGuide 7.6 supports the complete set of business process diagram elements including e.g. events, gateways, artifacts, pools, lanes and extended sub-processes. For the purposes of creating a BPMN model, there is a built in BPMN modeling template that can be selected as an option to the default template. The BPMN template includes all the BPMN-specific graphical objects, as well as a set of attributes defined for the objects.

The graphical objects of BPMN have been mapped to the Business Process Execution Language for Web Services (BPEL4WS v1.1), which is the standard for process execution. This means that BPMN models can be exported to BPEL4WS and the process/workflow can be executed in the process automation tools or workflow engines, such as QPR WorkFlow.

The flow of elements in BPMN defines the order of activities performed in the process. The process flow begins with a start event and ends to an end event. The flow can have parallel or alternative paths defined by gateways.



Example BPMN process flow created with QPR ProcessGuide

For further information on BPMN and for the full specification, see www.bpmn.org.

1.1 BPMN Core Set

In this topic, the core set of BPMN elements is introduced. For simple process modeling for documentation and communication purposes, the core set provide adequate means to easily create understandable diagrams. For creating more complex process models, the complete set of BPMN elements is required. For information on the complete set of elements, see BPMN Elements and its sub-topics.

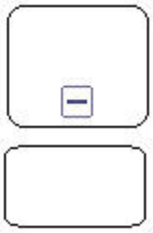
The basic categories of BPMN elements are:

- Flow objects

- Connecting objects
- Swimlanes
- Artifacts

Flow Objects

Flow objects include events, activities, and gateways.

Name	Description	Symbol
Event	Refers to something that happens during a process. The basic event types are: • Start event: starts a process flow • Intermediate event: happens during the course of a process flow • End event: ends a process flow	
Activity	Functions as a generic term for the work that a company performs. The types of activities are: • Sub-process: used when the work in the process is further modeled in more detail on a lower process level • Task: used when the work in the process is not broken down to a finer level of process model detail	
Gateway	Acts as a decision point in a process flow. Internal markers will indicate the type of behaviour control, which can be, in addition to traditional decision making, forking, merging, and joining of paths.	

Connecting Objects

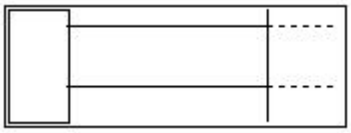
Connecting objects include sequence flows, message flows, and associations.

Name	Description	Symbol
Sequence flow	Used for showing the order in which activities will be performed in a process.	
Message flow	Used for showing the flow of messages between two separate process participants (such as two pools in the diagram) that send and receive them.	
Association	Used for showing the inputs and outputs of activities by associating data, text, and other artifacts with flow objects.	

Swimlanes

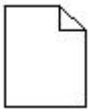
Swimlanes include pools and lanes.

Name	Description	Symbol
Pool	Represents a participant in a process. It also acts as a graphical container for partitioning a set of activities from other pools.	

Name	Description	Symbol
Lane	Functions as a sub-partition within a pool and extends the entire length of the pool, either vertically or horizontally. Lanes are used for organizing and categorizing activities.	

Artifacts

Artifacts include data objects, groups, and text annotations.

Name	Description	Symbol
Data object	Shows how data is required or produced by activities. Data objects are connected to activities through associations.	
Group	Grouping can be used for documentation or analysis purposes. It does not affect the sequence flow.	
Text Annotation	Allows a modeler to provide additional text information for the reader of a BPMN diagram.	

2 BPMN Elements

In BPMN, the graphical aspects of the notation have been organized into specific categories. To support the requirements for complexity in BPMN, additional variation and information can be added within the basic categories of elements without dramatically changing the basic look and feel of the diagram.

Elements in BPMN have typically numerous attributes defined for them. Some of the attributes are designed to separate elements types from one another. For example, EventType attribute defines whether the event is of type start, end, or intermediate. Attributes form a conditional hierarchy where attributes can have sub-attributes but not necessarily all attributes need to be defined.

Common BPMN Attributes

All BPMN elements share some attributes. These attributes are listed in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Common Graphical Object Attributes			
Categories	N	String	Defines one or more categories that can be used for purposes such as reporting and analysis.
Documentation	1	String	Defines textual documentation about the object.

2.1 Flow Objects

Flow objects are the main graphical elements to define the behavior of a business process. Flow objects include events, activities, and gateways.

Common Flow Object Attributes

All flow objects share some common attributes. These common attributes are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Common Flow Object Attributes			
Assignments	N	Assignment	Defines one or more assignment expressions for the object. Assignment is used in the definition of attributes for process, activities, events, and gateways.

2.1.1 Events

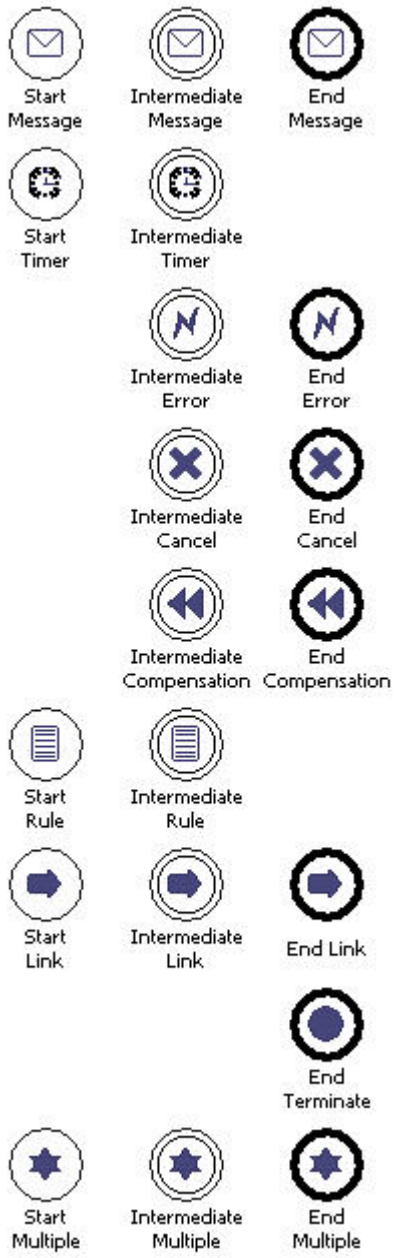
An event is something that happens during the course of a business process. These events affect the flow of the process and often have a cause (trigger) or an impact (result). They can start, interrupt, or end the flow. Events are used for e.g. exception handling to interrupt the activity or to trigger an activity to start (timer event).

Events are represented as circles with open centers to allow internal markers to differentiate different triggers or results.

The default template in QPR ProcessGuide does not have a corresponding element to event.

Events can be of type start, intermediate or end in a business process flow. Events have different triggers depending on the event type.

Event types are illustrated below.



Creating and Modifying Events

Tool Palette of the BPMN template contains tools for creating events with the event type and the trigger or result specified. When you have selected the right tool in the Tool Palette, create a new event by pointing and clicking the location for it in the flow chart.

You can edit the properties of events (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Process Step Properties...** For further information on this dialog, see topic "Process Step Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the event properties, such as the event type.

Common Event Attributes

All events share some common attributes. These common attributes are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Common Event Attributes			
EventType	1	String	The type of event. The possible options are: • Start • Intermediate • End

Start Event

The start event indicates where a particular process will start. Start events can have none, message, timer, rule, link and multiple type triggers.

The attributes for the start event are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Start Trigger	1	String	The type of start trigger. The possible options are: • None: The type of event is not displayed. • Message: A message arrives from a participant and triggers the start of the process. • Timer: A specific time-date or a specific cycle can be set that will trigger the start of the process. • Rule: The event is triggered when the conditions for a defined rule become true. • Link: A link is a mechanism for connecting the end (result) of one process to the start (trigger) of another. • Multiple: This means that there are multiple ways of triggering the process. Only one of them will be required to start the process.
Message Trigger Attributes			
Message	1	Message	Message is an object that has properties name, properties (0-n), from, to. It describes the relations of the message. In QPR ProcessGuide, information items are used as messages.

Attribute / Attribute group	Cardinality	Type	Description
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Timer Trigger Attributes			
TimeDate	1	Date	TimeDate is the date of the event which can be selected from a pop-up calendar. Either TimeDate or TimeCycle must be entered (see the attribute below).
TimeCycle	1	String	TimeCycle provides the time cycle of the event as a string. Either TimeDate or TimeCycle must be entered (see the attribute above).
Rule Trigger Attributes			
RuleName	1	Rule	Rule contains the name of the rule and the rule expression. • Name: String name is an attribute that is the textual description of the rule. • RuleExpression: Defines the rule expression as a string. In some cases the rule itself will be stored and maintained in a separate application (e.g., a Rules Engine).
Link Trigger Attributes			
LinkId		String	The ID of the link.
ProcessRef		Process	Defines the process to be used. A dialog is opened for selecting the model element.
Multiple Trigger Attributes			
Triggers	N	Trigger	Trigger is an attribute that defines the type of trigger expected for that start event. The possible options are: • None (the default) • Message • Timer • Error • Cancel • Compensation • Rule • Link • Multiple • Terminate You can add multiple triggers and combine different trigger types.

Intermediate Event

Intermediate events occur between a start event and an end event. It will affect the flow of the

process, but will not start or (directly) terminate the process. Intermediate events can have none, message, timer, error, compensation, cancel, rule, link, and multiple type triggers.

The attributes for the intermediate event are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Trigger	1	String	The type of trigger. The possible options are: • None: the type of Event is not displayed. • Message: A message arrives from a participant and triggers the event. • Timer: A specific time-date or a specific cycle can be set that will trigger the event. • Error: This is used for error handling, both to set (throw) and to react to (catch) errors. • Compensation: This is used for compensation handling, both setting and performing compensation. • Cancel: This type of intermediate event is used within a transaction sub-process. • Rule: This is only used for exception handling. This type of event is triggered when a rule becomes true. • Link: A link is a mechanism for connecting an end event (result) of one process to an intermediate event (trigger) in another process. • Multiple: This means that there are multiple ways of triggering the event. Only one of them will be required.
Message Trigger Attributes			
Message	1	Message	Message is an object that has properties name, properties (0-n), from, to. It describes the relations of the message. In QPR ProcessGuide, information items are used as messages. A dialog is opened for selecting the information item.
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Timer Trigger Attributes			
TimeDate	1	Date	TimeDate is the date of the event which can be selected from a pop-up calendar. Either TimeDate or TimeCycle must be entered (see the attribute below).
TimeCycle	1	String	TimeCycle provides the time cycle of the event as a string. Either TimeDate or TimeCycle must be entered (see the attribute above).
Error Trigger Attributes			

Attribute / Attribute group	Cardinality	Type	Description
ErrorCode	1	String	If the Event is within a Normal Flow, you must enter the error code. The ErrorCode "throws" the error. If the event is attached to the boundary of an activity, you may enter the error code. This event "catches" the error. If there is no error code, any error triggers the event. If there is an error code, only an error that matches the error code triggers the event.
Compensation Trigger Attributes			
Activity	1	Object	Defines the activity for the compensation. A dialog is opened for selecting the model element.
Rule Trigger Attributes			
RuleName	1	Rule	Rule contains the name of the rule and the rule expression. • Name: String name is an attribute that is the textual description of the rule. • RuleExpression: Defines the expression for the rule as a string. In some cases the rule itself will be stored and maintained in a separate application (e.g., a Rules Engine).
Link Trigger Attributes			
LinkId		String	The ID of the link.
ProcessRef		Process	Defines the process to be used. A dialog is opened for selecting the model element.
Multiple Trigger Attributes			
Triggers	N	Trigger	Trigger is an attribute that defines the type of trigger expected for that intermediate event. The possible options are: • None (the default) • Message • Timer • Error • Cancel • Compensation • Rule • Link • Multiple • Terminate You can add multiple triggers and combine different trigger types.

End Event
The end event indicates where a process will end. End events can have none, message, error, cancel, compensation, link, terminate and multiple type results.

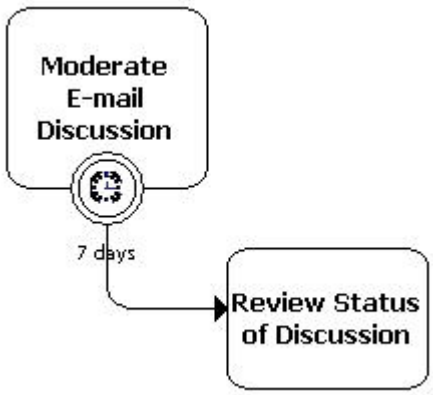
The attributes for the end event are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Result	1	String	The type of Result. The possible options are: • None: The type of event is not displayed. • Message: This type of end indicates that a message is sent to a participant at the conclusion of the process. • Error: This type of end indicates that a named error should be generated. • Cancel: This type of end is used within a transaction sub-process. It will indicate that the transaction should be canceled and will trigger a cancel intermediate event attached to the sub-process boundary. • Compensation: This type of end will indicate that a compensation is necessary. The compensation identifier will trigger an intermediate event when the process is rolling back. • Link: A link is a mechanism for connecting the end (result) of one process to the start (trigger) of another. • Terminate: This type of end indicates that all activities in the process should be immediately ended. • Multiple: This means that there are multiple consequences of ending the process. All of them will occur.
Message Result Attributes			
Message	1	Message	Message is an object that has properties name, properties (0-n), from, to. It describes the relations of the message. In QPR ProcessGuide, information items are used as messages. A dialog is opened for selecting the information item.
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Error Result Attributes			
ErrorCode	1	String	If the event is within a normal flow, you must enter the error code. The ErrorCode "throws" the error. If the event is attached to the boundary of an activity, you may enter the error code. This event “catches” the error. If there is no error code, any error triggers the event. If there is an error code, only an error that matches the error code triggers the event.
Compensation Result Attributes			
Activity	1	Object	Defines the activity for the compensation. A dialog is opened for selecting the model element.

Attribute / Attribute group	Cardinality	Type	Description
Link Result Attributes			
LinkId		String	The ID of the Link.
ProcessRef		Process	Defines the process to be used. A dialog is opened for selecting the model element.
Multiple Result Attributes			
Results	N	Result	Result is an attribute that defines the type of trigger expected for that end event. The possible options are: • None (the default) • Message • Timer • Error • Cancel • Compensation • Rule • Link • Multiple • Terminate You can add multiple triggers and combine different trigger types.

2.1.1.1 Attached Events

In BPMN one use of Intermediate Events is to represent exception or compensation handling. This will be shown by placing an intermediate event on the boundary of an activity (task or sub-process, either collapsed or expanded). For example, in the following diagram the "Moderate E-mail Discussion" task has an intermediate timer event attached to its boundary that will function as a trigger for the "Review Status of Discussion" task.



For further information on attached events, see topic "Attach Elements to Process Steps" in QPR ProcessGuide - User's Guide.

2.1.2 Activities

An activity is work that is performed within a business process. An activity can be atomic or non-atomic (compound). There are two types of activities: sub-process and task. They are represented with rounded rectangles.

Activity is quite similar to the activity and sub-process elements in the default template of QPR ProcessGuide.

Creating and Modifying Activities

Tool Palette of the BPMN template contains tools for creating sub-processes  and tasks  . When you have selected the right tool in the Tool Palette, create a new sub-process or task by pointing and clicking the location for it in the flow chart. If you create a sub-process, a new process level is added to the model.

You can edit the properties of activities (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Process Step Properties...** For further information on this dialog, see topic "Process Step Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the activity properties, such as hiding or showing the subprocess content in the case of a sub-process, or changing the task type in the case of a task.

Common Activity Attributes

All activities share some common attributes. These common attributes are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Common Activity Attributes			
Status	1	String	The status of a process is determined when the process is being executed by a process engine. The status of a process can be used within assignment expressions. The possible options are: • None • Ready • Active • Cancelled • Aborting • Aborted • Completing • Completed
Properties	N	Property	Property, which is used in the definition of attributes for a process and common activity attributes.
InputSets	N	Input	The InputSets attribute defines the data requirements for input to the activity. Each InputSet is sufficient to allow the activity to be performed (if it has first been instantiated by the appropriate signal arriving from an incoming sequence flow).
InputSets Attributes			

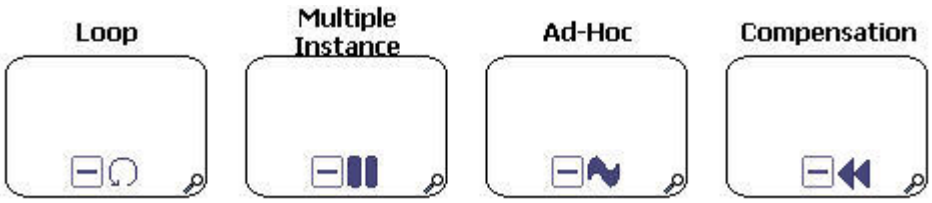
Attribute / Attribute group	Cardinality	Type	Description
Inputs	N	Artifact	One or more inputs must be defined for each InputSet. An input is an artifact, such as a data object. A dialog for selecting the model object is opened.
OutputSets	N	Output	The OutputSets attribute defines the data requirements for output from the activity.
OutputSets Attributes			
OutputSets	N	Artifact	One or more outputs must be defined for each OutputSet. An output is an artifact, such as a data object. A dialog for selecting the model object is opened.
IORules	N	Expression	This attribute is an expression that defines the relationship between one InputSet and one OutputSet.
StartQuantity	1	Integer	This attribute defines the number of tokens that must arrive from a single sequence flow before the activity can begin. The default value is 1.
LoopType	1	String	If the value of this attribute is something else than none, the loop marker is placed at the bottom center of the activity shape. The possible options are: • None • Standard: A boolean expression is evaluated after each cycle of the loop. If the expression is still true, then the loop will continue. • MultiInstance: A numeric expression is evaluated only once before the activity is performed. The result of the expression evaluation will be an integer that will specify the number of times that the activity will be repeated.
Standard Loop Attributes			
LoopCondition	1	Expression	Standard loops have a boolean expression to be evaluated, plus the timing when the expression is evaluated.
LoopCounter	1	Integer	This attribute is used at runtime to count the number of loops and is automatically updated by the process engine.
LoopMaximum	1	Integer	This is an optional attribute that provides is a simple way to add a cap to the number of loops.
TestTime	1	String	This attribute defines whether the expressions are evaluated before the activity begins or after the activity finishes. The possible options are: • Before • After
Multi-Instance Loop Attributes			
MI_Condition	1	Expression	MultiInstance loops have a numeric expression to be evaluated.

Attribute / Attribute group	Cardinality	Type	Description
LoopCounter	1	Integer	This attribute is used at runtime to count the number of loops and is automatically updated by the process engine.
MI_Ordering	1	String	This attribute defines whether the loop instances will be performed sequentially or in parallel. The possible options are: • Sequential • Parallel
Parallel MI_Ordering Attributes			
MI_FlowCondition	1	String	This attribute is equivalent to using a gateway to control the flow past a set of parallel paths. The possible options are: • All • None • One • Complex
ComplexMI_FlowCondition Attributes			
ComplexMI_FlowCondition	1	Expression	This attribute determines when and how many Tokens will continue past the activity.

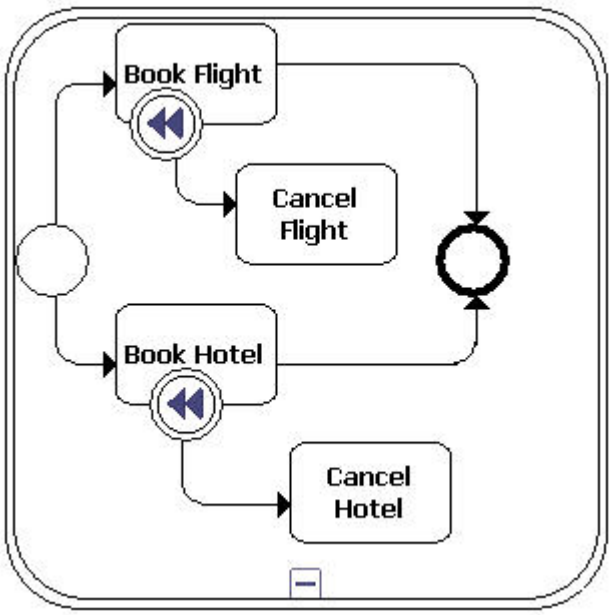
Sub-Process
A Sub-Process is a compound activity in that it has detail that is defined as a flow of other activities. A sub-process is a graphical object within a process flow, but it also can be "opened up" to show another process (either embedded or independent).

The sub-process can be in a collapsed view that hides its details or a sub-process can be in an expanded view that shows its details within the view of the process in which it is contained. In the collapsed form, there is a "plus" sign in the lower-center of the shape indicating that the activity is a sub-
process and has a lower-level of detail. For further information on showing or hiding sub-process contents, see topic "Use Pop-up Menus to Modify Elements in Flow Chart" in QPR ProcessGuide - User's Guide.

BPMN specifies five types of standard markers for sub-processes. The collapsed sub-process marker can be combined with four other markers: a loop marker or a parallel marker, a compensation marker, and an ad hoc marker. A collapsed sub-process may have one to three of these other markers, in all combinations except that loop and multiple instance cannot be shown at the same time. In QPR ProcessGuide sub-process markers are implemented with attribute set enumerated custom attribute symbols to the BPMN template.



A sub-process, either collapsed or expanded, can be set to be a transaction, which will have a special behavior that is controlled through a transaction protocol (such as BTP or WSTransaction). The boundary of the activity will be double-lined to indicate that it is a transaction, as illustrated in the following figure.



In QPR ProcessGuide, there are the following three sub-process element types in the BPMN template:
- Embedded sub-processes: Modeling is done inside the sub-process container.
- Independent sub-processes: Sub-process modeling can be done in the sub-process level.
- Reference sub-processes: Reference is made to external processes.

The attributes for a sub-process are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
SubProcessType	1	String	This attribute defines whether the sub-process details are embedded within the higher level Process or refers to another, re-usable process. The possible options are: • Embedded (the default): an activity that contains other activities (a process). • Independent: an activity within a process that "calls" to another process that exists within the diagram. • Reference: a sub-process that references another sub-process that has been defined.
Embedded Sub-Process Attributes			

Attribute / Attribute group	Cardinality	Type	Description
AdHoc	1	Boolean	Specifies whether the embedded sub-process is ad hoc or not. The default value is false.
AdHoc Attributes			
AdHocOrdering	1	String	Defines if the activities within the process can be performed in parallel or must be performed sequentially. The default setting is parallel and the setting of sequential is a restriction on the performance that may be required due to shared resources.
AdHocCompletionCondition	1	Expression	This attribute defines the conditions when the process will end.
Independent Sub-Process Attributes			
DiagramRef	1	Business Process Diagram	This attribute defines the business process diagram.
ProcessRef	1	Process	This attribute defines the process.
InputPropertyMaps	1	Expression	Multiple input mappings may be made between properties of the independent sub-process and the properties of the process referenced by this object. These mappings are in the form of an expression.
OutputPropertyMaps	1	Expression	Multiple output mappings may be made between properties of the independent sub-process and the properties of the process referenced by this object. These mappings are in the form of an expression.
Reference Sub-Process Attributes			
SubProcessRef	1	Task	Identifies the sub-process being referenced. A dialog is opened for selecting the model element.
IsATransaction	1	Boolean	This attribute determines whether or not the behavior of the sub-process will follow the behavior of a transaction.
Transaction Attribute			
Transaction	1	Attribute set	
TransactionId	1	String	This attribute provides an identifier for the transactions used within a diagram.
TransactionProtocol	1	String	This attribute identifies the protocol (e.g., WS-Transaction or BTP) that will be used to control the transactional behavior of the sub-process.
TransactionMethod	1	String	This attribute defines the technique that will be used to undo a transaction that has been cancelled. The possible options are: • Compensate (the default) • Store • Image

Task

A Task is an atomic activity that is included within a process. A task is used when the work in the process is not broken down to a finer level of process model detail. Generally, an end-user and/or an application are used to perform the task when it is executed.

BPMN specifies three types of markers for a task: a loop marker or a multiple instance marker and a compensation marker. A task may have one or two of these markers. In QPR ProcessGuide task markers are implemented with attribute set enumerated custom attribute symbols to the BPMN template.

The attributes for a task are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
TaskType	1	String	The type of task. The possible options are: • None • Service (the default): a task that provides some sort of service, which could be a Web service or an automated application • Receive: a task that is designed to wait for a message to arrive from an external participant. Once the message has been received, the task is completed. • Send: a task that is designed to send a message to an external participant. Once the message has been sent, the task is completed. • User: a "workflow" task where a human performer performs the task with the assistance of a software application and is scheduled through a task list manager of some sort. • Script: a task which is executed by a business process engine. The modeler or implementer defines a script in a language that the engine can interpret. When the task is ready to start, the engine will execute the script. When the script is completed, the task will also be completed. • Manual: a task that is expected to be performed without the aid of any business process execution engine or any application. • Reference: a task that references another activity that has been defined. If the two (or more) activities share the exact same behavior, then by one referencing the other, the attributes that define the behavior only have to be created once and maintained in only one location.

Attribute / Attribute group	Cardinality	Type	Description
Service Task Attributes			
InMessage	1	Message	The message that will be sent at the start of the task, after the availability of any defined InputSets. In QPR ProcessGuide, information items are used as messages.
OutMessage	1	Message	The arrival of this message marks the completion of the task, which may cause the production of an OutputSet. In QPR ProcessGuide, information items are used as messages.
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Receive Task Attributes			
Message	1	Message	The message that will be received by the task. In QPR ProcessGuide, information items are used as messages.
Instantiate	1	Boolean	Receive tasks can be defined as the instantiation mechanism for the process with the Instantiate attribute. The possible options are: • True • False
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Send Task Attributes			
Message	1	Message	The Message that will be sent by the task. In QPR ProcessGuide, information items are used as messages.
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
User Task Attributes			
Performers	1	String	This attribute defines the human resource that will be performing the user task.
InMessage	1	Message	The message will be sent at the start of the task, after the availability of any defined InputSets. In QPR ProcessGuide, information items are used as messages.

Attribute / Attribute group	Cardinality	Type	Description
OutMessage	1	Message	The arrival of this message marks the completion of the task, which may cause the production of an OutputSet. In QPR ProcessGuide, information items are used as messages.
Implementation	1	String	This attribute specifies the technology that will be used to receive the message. The possible options are: • Web service (the default) • Other • Unspecified
Script Task Attributes			
Script	1	String	This attribute defines a script that can be run when the task is performed. If a script is not included, then the task will act equivalent to a task type of None.
Manual Task Attributes			
Performers	N	String	This attribute defines the human resource that will be performing the manual task.
Reference Task Attributes			
TaskRef	N	Assignment	This attribute defines the task being referenced. A dialog is opened for selecting the model element.

2.1.3 Gateways

Gateways are modeling elements that are used to control how sequence flows interact as they converge and diverge within a process. Thus, it will determine branching, forking, merging, and joining of paths. If the flow does not need to be controlled, then a gateway is not needed. Each type of control affects both the incoming and outgoing flow. A gateway is represented by the diamond shape. Each type of gateway has an internal indicator or marker to show the type of gateway that is being used.

Gateway is quite similar to the decision element in the default template of QPR ProcessGuide but also has different variations with accurate definitions in BPMN.

The following gateway types are included in the BPMN template for QPR ProcessGuide:

- Exclusive gateway (XOR) (data-based)
- Exclusive gateway (XOR) (event-based)
- Inclusive gateway (OR)
- Complex gateway
- Parallel gateway (AND)

An exclusive gateway (XOR) restricts the flow so that only one of a set of alternatives may be chosen during runtime. The data-based gateway refers to a branching point where alternatives are based on conditional expressions contained within the outgoing sequence flow. The event-based gateway refers to a branching point where alternatives are based on an event that occurs at that point in the process.

An inclusive gateway (OR) represents a branching point where alternatives are based on conditional expressions contained within the outgoing sequence flow.

A complex gateway is used for handling complex conditions and situations.

Parallel gateways provide a mechanism to synchronize parallel flow and to create parallel flow. These gateways are not required to create parallel flow, but they can be used to clarify the behavior of complex situations where a string of gateways are used and parallel flow is required.

Creating and Modifying Gateways

Tool Palette of the BPMN template contains tools for creating gateways with the gateway type specified. When you have selected the right tool in the Tool Palette, create a new gateway by pointing and clicking the location for it in the flow chart.

You can edit the properties of gateways (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Process Step Properties...** For further information on this dialog, see topic "Process Step Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the gateway properties, such as the gateway type.

Common Gateway Attributes

All gateways share some common attributes. These common attributes are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Common Gateway Attributes			
GatewayType	1	String	Specifies the type of the gateway which will determine the behavior of the gateway, both for incoming and outgoing sequence flow.The possible values are: • XOR (the default): Exclusive gateway • OR: Inclusive gateway • Complex: Complex gateway • AND: Parallel gateway

The attributes for an exclusive gateway are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
XORType	1	String	Defines the type of exclusive gateway. The possible options are: • Data (the default) • Event
Data Attributes			

Attribute / Attribute group	Cardinality	Type	Description
MarkerVisible	1	Boolean	Determines if the XOR marker is displayed in the center of the gateway diamond (an "X"). By default, the marker is not shown.

The attributes for a complex gateway are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
IncomingCondition	1	Expression	If there are multiple incoming sequence flows, an IncomingCondition expression must be set.
OutgoingCondition	1	Expression	If there are multiple outgoing sequence flows, an OutgoingCondition expression must be set.

2.2 Connecting Objects

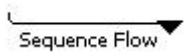
Connecting objects are used to connect the flow objects to each other or other information. There are three types of connecting objects: sequence flows, message flows, and associations.

2.2.1 Sequence Flow

A sequence flow is used to show the order that activities will be performed in a process. Each flow has only one source and only one target.

Sequence flows can be drawn between activities, gateways and events in the same pool i.e. a sequence flow cannot be drawn between elements in different pools.

Sequence flow can have a condition expression. The default flow must be used if conditions are used.



Sequence flow is similar to the control flow element in the default template of QPR ProcessGuide.

Creating and Modifying Sequence Flows

Tool Palette of the BPMN template contains a tool for creating sequence flows with the flow type specified. When you have selected the tool in the Tool Palette, create a new sequence flow by clicking first the starting point and then the ending point for the flow. The flow is automatically routed from the starting point to the ending point. The route is shown while the flow is being drawn.

You can edit the properties of sequence flows (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Flow Properties...** For further information on this dialog, see topic "Flow Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the flow properties, such as the flow type or the condition type.

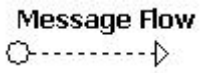
Sequence Flow Attributes

The attributes of sequence flows are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
ConditionType	1	String	The possible values are: • None (the default): there is no evaluation at runtime to determine whether or not the sequence flow will be used. Once a token is ready to traverse the sequence flow (i.e., the source is an activity that has completed), then the token will do so. • Expression: a condition marker is added to the line if the sequence flow is outgoing from an activity. Expression can be selected if the source of the sequence flow is a task, a sub-process, or a gateway of type exclusive data-based or inclusive. • Default: the default marker is displayed. Default can be selected if the source of the sequence flow is an activity or an exclusive data-based gateway.
Expression Attributes			
ConditionExpression	1	Expression	Defines the valid expression is ConditionType attribute is set to expression. The expression will be evaluated at runtime.
Sequence Flow Attributes			
Quantity	1	Integer	Defines the number of tokens that will be generated down the sequence flow. The default value is 1. The value cannot be less than 1.

2.2.2 Message Flow

A Message Flow is used to show the flow of messages between two elements (activities, events, or pools) that are prepared to send and receive them. Message Flows thus synchronize the flow of separate processes.



Message Flow is similar to the information flow element in the default template of QPR ProcessGuide but the usage in BPMN is more strictly defined.

Creating and Modifying Message Flows

Tool Palette of the BPMN template contains a tool for creating message flows with the flow type specified. When you have selected the tool in the Tool Palette, create a new message flow by clicking first the starting point and then the ending point for the flow. A new dialog for selecting an information item is then displayed. Select an information item from the list or create a new information item to be used as the message (see table in section "Message Flow Attributes" below).

You can edit the properties of sequence flows by right-clicking on the element in the flow chart view and selecting **Set Flow Properties...** For further information on this dialog, see topic "Flow Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the flow properties, such as the flow type.

Message Flow Attributes

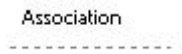
The attributes of Message Flows are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Message	1	String	Identifies the message that is being sent. In QPR ProcessGuide, the message refers to an information item. A dialog is opened for selecting the information item when creating a new message flow.

2.2.3 Association

An association is used to associate information and artifacts with flow objects. Text and graphical non-flow objects can be associated with the flow objects and flow. An association is also used to show the activities used to compensate for an activity.

A directional association is often used with data objects to show that a data object is either an input to or an output from an activity.



The default template in QPR ProcessGuide does not have a corresponding element to association.

Creating and Modifying Associations

Tool Palette of the BPMN template contains a tool for creating associations ····· with the flow type specified. When you have selected the tool in the Tool Palette, create a new association by clicking first the starting point and then the ending point for the flow.

You can edit the properties of associations (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Flow Properties...** For further information on this dialog, see topic "Flow Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the association properties, such as the flow type or the direction.

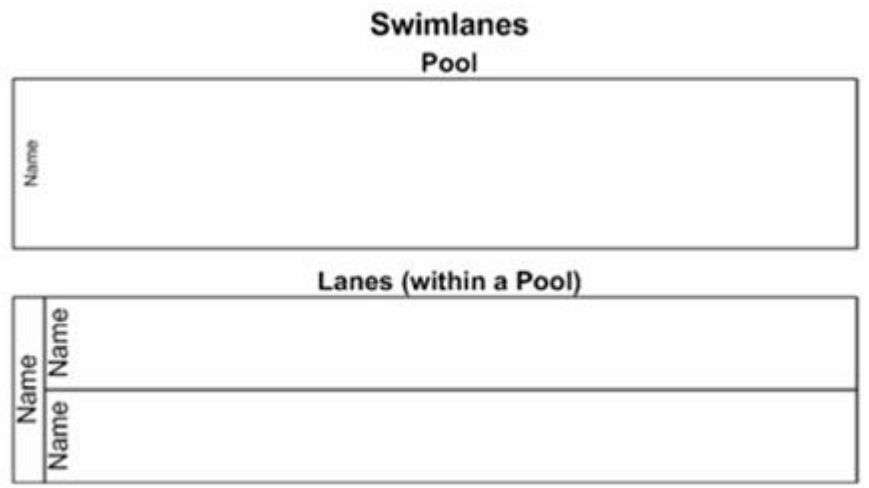
Association Attributes

The attributes of association are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Association Attributes			
Direction	1	String	Defines whether or not the association shows any directionality with an arrowhead. The possible values are: • None (the default): no arrowhead shown • To: the arrowhead is shown at the source object • From: the arrowhead is shown at the target artifact • Both: the arrowhead is shown at both ends of the association line

2.3 Swimlanes

Swimlanes are used to group the primary modeling elements. There are two types of swimlanes: pools and lanes.



2.3.1 Pool

A pool represents a participant in the process. It can contain other modeling elements including collapsed sub-processes and lanes. A pool is drawn as a rectangular region drawn horizontally across the diagram or vertically down it.

Pool is similar to the sub-process element in the default template of QPR ProcessGuide.

Creating and Modifying Pools

Tool Palette of the BPMN template contains a tool for creating pools . When you have selected the tool in the Tool Palette, create a new pool by pointing and clicking the location for it in the flow chart. A new process level is added to the model.

You can edit the properties of pools (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Process Step Properties...** For further information on this dialog, see topic "Process Step Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the pool properties, such as the name.

Pool Attributes

The attributes of pool are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Process Attributes			
Name	1		Defines textual description of the object.

Attribute / Attribute group	Cardinality	Type	Description
AdHoc	1	Boolean	Specifies whether the process is ad hoc or not. The activities within an ad hoc process are not controlled or sequenced in a particular order, their performance is determined by the performers of the activities. The default value is false.
AdHoc Attributes			
AdHoc Ordering	1	String	Defines if the activities within the process can be performed in parallel or must be performed sequentially. The possible values are: • Parallel (the default) • Sequential
AdHocCompletionCondition	1	Expression	Defines the conditions when the process will end.
ProcessType	1	String	Provides information about which lower level language the pool will be mapped. The possible options are: • None (the default) • Private: may be mapped to an executable BPEL4WS process • Abstract: may be mapped to an abstract BPEL4WS process • Collaboration: has two lanes that represent business roles and shows the interactions between these roles
Status	1	String	The status of a process is determined when the process is being executed by a process engine. The possible options are: • None • Ready • Active • Cancelled • Aborting • Aborted • Completing • Completed
SuppressJoinFailure	1	Boolean	This attribute is included for mapping to BPEL4WS. This specifies whether or not a BPEL4WS joinFailure fault will be suppressed for all activities in the BPEL4WS process.
EnableInstanceCompensation	1	Boolean	This attribute is included for mapping to BPEL4WS. It specifies whether or not a compensation can be performed after the process has completed normally.
Categories	N	String	One or more defined categories can be added to be used for purposes such as reporting and analysis.
Documentation	1	String	Provides textual documentation about the process.
Property	N	Property	Defines the properties of a process.
Assignments	N	Assignment	Defines one or more assignment expressions for the object. Assignment is used in the definition of attributes for process, activities, events, and gateways.

Attribute / Attribute group	Cardinality	Type	Description
Participant Attributes			Participant, which is used in the definition of attributes for a pool, message, and web service.
ParticipantType	1	String	The possible options are: • Role • Entity
Name	1	String	Provides the textual description of the role or entity.
Web Service	N	String	Defines the set of attributes of a web service, which is used in the definition of attributes for message start event, message intermediate event, message end event, receive task, send task, service task, and user task.
Web Service Attributes			
Interface	1	String	Defines the interface for the web service (i.e. portType).
Operation	1	String	Defines one or more operations for the web service.
namespacePrefix	1	String	BPEL4WS process attributes, required for mapping to BPEL4WS.
targetNamespace	1	String	BPEL4WS process attributes, required for mapping to BPEL4WS.
WSDLpath	1	String	BPEL4WS process attributes, required for mapping to BPEL4WS.

2.3.2 Lane

A lane is a sub-partition within a pool and will extend the entire length of the pool, either vertically or horizontally. Lanes are used to organize and categorize activities. BPMN does not specify the usage of lanes.Typically, a pool represents an organization, whereas a lane represents a department within that organization.

Lanes can also be nested or defined in a matrix.

Lane is similar to the organization item element in the default template of QPR ProcessGuide.

Creating and Modifying Lanes

Tool Palette of the BPMN template contains a tool for creating lanes . When you have selected the tool in the Tool Palette, create a new lane by pointing and clicking the level for the upper edge of the lane. If you have already created lanes in the model, a dialog for selecting a lane to be reused is

shown. In the dialog you can also create a new lane.

You can edit the properties of lanes by right-clicking on the element in the flow chart view and selecting **Set Organization Item Properties...** For further information on this dialog, see topic "Organization Item Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the lane properties, such as the name.

Lane Attributes

The attributes of lanes are described in the following table.

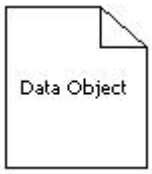
Attribute / Attribute group	Cardinality	Type	Description
ParentPool	1	Pool	Specifies the parent pool.
ParentLane	1	Lane	Specifies the parent lane if the Lane is nested within another Lane.

2.4 Artifacts

Artifacts are used to provide additional information about the Process. The standardized artifacts include data objects, groups, and annotations, but modelers are free to add as many artifacts as required. In the BPMN template of QPR ProcessGuide additional artifacts are picture and milestone.

2.4.1 Data Object

Data objects provide information about how documents, data, and other objects are used and updated within a process. Data objects are often associated with flow objects.



Data object is quite similar to the activity and information item elements in the default template of QPR ProcessGuide.

Creating and Modifying Data Objects

Tool Palette of the BPMN template contains a tool for creating data objects . When you have selected the tool in the Tool Palette, create a new data object by pointing and clicking the location for the data object on the flow chart.

You can edit the properties of data objects (such as the attributes listed in the tables below) by right-clicking on the element in the flow chart view and selecting **Set Process Step Properties...** For further information on this dialog, see topic "Process Step Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the data object properties, such as the name.

Data Object Attributes

The attributes of data objects are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Data Object Attributes			
State	1	Assignment	State is an optional attribute that indicates the impact the process has had on the data object.
Property	N	Property	Defines the properties of the data object.
Property Attributes			
Type	1	String	Each property has a type (e.g. type="String").
Name	1	String	Each property has a name (e.g. name="Customer Name").
Correlation	1	Boolean	This attribute is included for mapping to BPEL4WS. The property will map to a correlation set and the child properties will be properties of that correlation set.
RequiredForStart	1	Boolean	If the value for this attribute is true, the input is required for an activity to start. If set to false, then the activity may start within the input, but may accept the input (more than once) after the activity has started. The default value is true.
ProducedAtCompletion	1	Boolean	If the value for this attribute is true, the output will be produced when an activity has been completed. If set to false, then the activity may produce the output (more than once) before it has completed.

2.4.2 Group

Groups provide a mechanism to visually organize activities. It has no effect on the process.

Group is similar to the group element in the default template of QPR ProcessGuide.

Creating and Modifying Groups

Tool Palette of the BPMN template contains a tool for creating groups  . When you have selected the tool in the Tool Palette, create a new group by pointing and clicking the location for the group on the flow chart.

You can edit the properties of groups by right-clicking on the element in the flow chart view and selecting **Set Group Properties...** For further information on this dialog, see topic "Group Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the group properties, such as the name.

Group Attributes

The attributes of groups are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Group Attributes			
Name	1	String	Name is an optional attribute that is text description of the group.

2.4.3 Text Annotation

Text annotations are a mechanism for a modeler to provide additional information for the reader of a BPMN diagram. Text annotations can be linked to an element using an association flow.

Text annotation is similar to the note or text element in the default template of QPR ProcessGuide.

Creating and Modifying Text Annotations

Tool Palette of the BPMN template contains a tool for creating text annotations  . When you have selected the tool in the Tool Palette, create a new text annotation by pointing and clicking the location for the text annotation on the flow chart.

You can edit the properties of text annotations by right-clicking on the element in the flow chart view and selecting **Set Note Properties...** For further information on this dialog, see topic "Note Dialog" in QPR ProcessGuide - User's Guide. Using the pop-up context menu, you can also change directly some of the data object properties, such as the name.

Text Annotation Attributes

The attributes of text annotations are described in the following table.

Attribute / Attribute group	Cardinality	Type	Description
Text Annotation Attributes			
Text	1	String	Text is an attribute that is text that the modeler wishes to communicate to the reader of the diagram.

3 Using the BPMN Template

The BPMN Template is delivered with all QPR ProcessGuide installations. You can select it from a list when creating a new model (see topic "New Model Dialog" in QPR ProcessGuide - User's Guide).

The BPMN Template has its own Tool Palette which is used in the same way as the Tool Palette of the default template for creating a model. The model elements defined in the Tool Palette include all the standard BPMN attributes by default. To modify these attributes, select **Modeling Options** from the **File** menu, select the model element you want to modify and click **View...** The **Custom Attribute Types** tab includes all the BPMN specific attributes. For further information on custom attribute types, see topic "Custom Attributes" in QPR ProcessGuide - User's Guide.

To make changes to the graphical appearance of elements, select **Graphical Properties...** from the pop-up menu.

Some of the attributes can also be set using the pop-up menu. For enumerated custom attributes, you can change the value by right-clicking on the element on the flow chart and selecting the value from the pop-up menu, instead of opening the properties dialog. The attribute name is shown in the menu and its values are shown as sub-items. Select the value by clicking the sub-item. The custom attributes are shown in the pop-up menu only when a single element is selected. Enumerated attributes in attribute sets or enumerated attributes with cardinality N are not shown. Thus, these values can only be changed in the properties dialog.

When creating a model using the BPMN Template, note that QPR ProcessGuide is not validating the model against the BPMN standard.

3.1 Tool Palette of the BPMN Template

Tool Palette is located by default on the right side of the Flow Chart view as a dockable vertical panel. It consists of drawing tools divided into categories depending on the chosen modeling options and the chosen template. You can toggle the visibility of Tool Palette by selecting **View ▸ Panel Visibility ▸ Tool Palette**.

The tool palette for the BPMN Template consists of the following controls by default:

Tools
Select

Events
Start Event
Intermediate Event
End Event

Events ...
Start Event - Message
Start Event - Timer
Start Event - Rule
Start Event - Link
Start Event - Multiple
Intermediate Event - Message
Intermediate Event - Timer
Intermediate Event - Error
Intermediate Event - Cancel

Intermediate Event - Link
Intermediate Event - Compensation
Intermediate Event - Rule
Intermediate Event - Multiple
End Event - Message
End Event - Error
End Event - Cancel
End Event - Compensation
End Event - Link
End Event - Terminate
End Event - Multiple

Activities
Sub-Process
Task

Gateways
Exclusive Gateway (XOR)
Inclusive Gateway (OR)
Complex Gateway
Parallel Gateway (AND)

Swimlanes
Pool
Lane

Connecting Objects
Sequence Flow
Message Flow
Association
Conditional Flow
Default Flow

Artifacts
Data Object
Text Annotation
Group
Picture
Milestone

For descriptions of BPMN model elements and their attributes, see BPMN Elements.

Model elements are created by selecting a tool from the Tool Palette for drawing the desired model element and then clicking on the flow chart in a position where the model element should be located. (For further information, see topic "Create Model Elements in a Flow Chart" in QPR ProcessGuide - User's Guide).

Administrators or model administrators can create or modify categories or buttons. Thus, if you are an administrator or model administrator, you can add new categories or delete old ones. You can also add a new button for the element type and have the same element type in different categories. For further information on making changes to the Tool Palette, see topic "Tool Palette" in QPR ProcessGuide - User's Guide.

4 BPMN to BPEL Transformation

BPEL4WS (BPEL for short) is an executable business process modeling language. BPEL defines business processes using an XML-based language. There is no defined graphical modeling notation but there are separate tools that can graphically model BPEL4WS.

BPEL uses web services as its external communication mechanism. Thus BPEL's messaging facilities depend on the use of the Web Services Description Language (WSDL) 1.1 to describe outgoing and incoming messages.

You can export a BPMN model to BPEL using a script called PGExportToBPEL in QPR ProcessGuide. This script will check the BPEL validity of the model which is based on the BPMN template and create the necessary WSDL and BPEL files from it. If the model is not valid for BPEL, the script will stop running and an error message is displayed.

To use the script, select **Tools ▸ Run Script** and select PGExportToBPEL.pmf from the list. For further information on using the script, please contact QPR.