

SemTalk 4.2 Simulation Toolkit



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1. Introduction

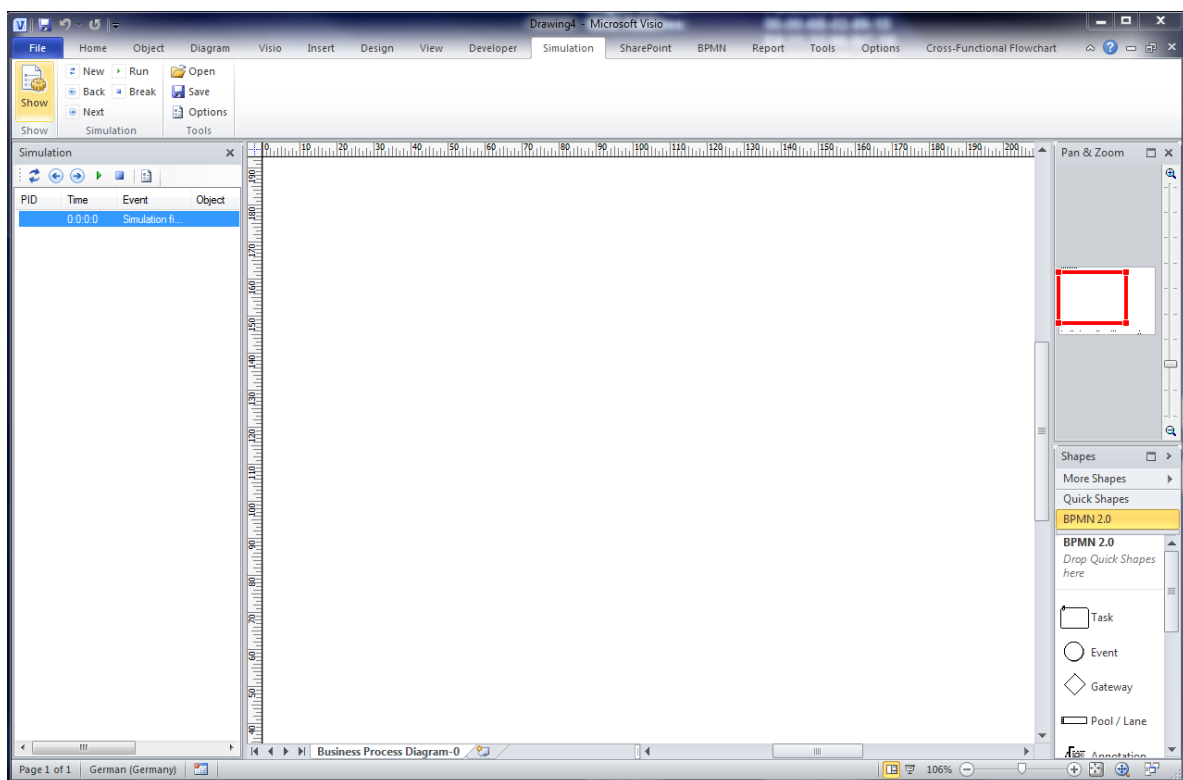
The main purpose of the SemTalk Simulation Toolkit is to offer an open and readily adaptable platform to investigate the dynamic behaviour of business processes. Process threads are interpreted by a colored Petri-Nets discrete simulation engine. Simulation helps analysts to understand the dynamic structure of a process by identifying weaknesses, media breaks or bottlenecks. It also provides a more reliable process trace to better compute and analyse activity-based costing. Simulation data is being used to support a variety of business processes activities.

Simulated processes are analysed in either a single stepping mode or by running the simulation over multiple processes at once. Instances of object behaviour such as in the processing of a specific “*purchase order*” object are created and their associated attribute values are manipulated as the process is being executed. VBScript Macros can be attached to every process step in order to program sophisticated computations or to open custom dialogs .

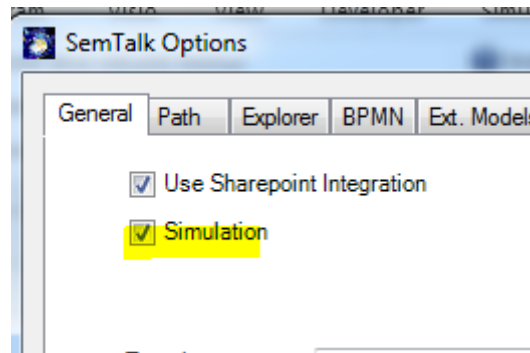
The SemTalk Simulation Toolkit may be used with SemTalk KSA Edition and all other related BPM methods which have a compatible meta model such as SemTalk FlowChart Edition, SemTalk BPMN Edition. The simulation functionality for EPC is limited by the restricted expressiveness of the language.

1.1 The SemTalk Simulation Window

You can open the SemTalk Simulation window via the Tools->Simulation->Show:



In case you cannot see the Simulation tab, you should activate it with Options->SemTalk Options

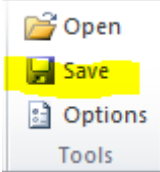
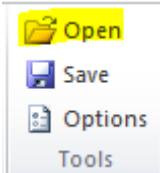
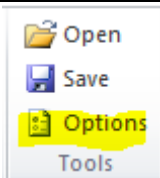


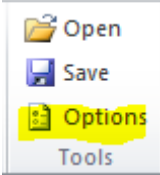
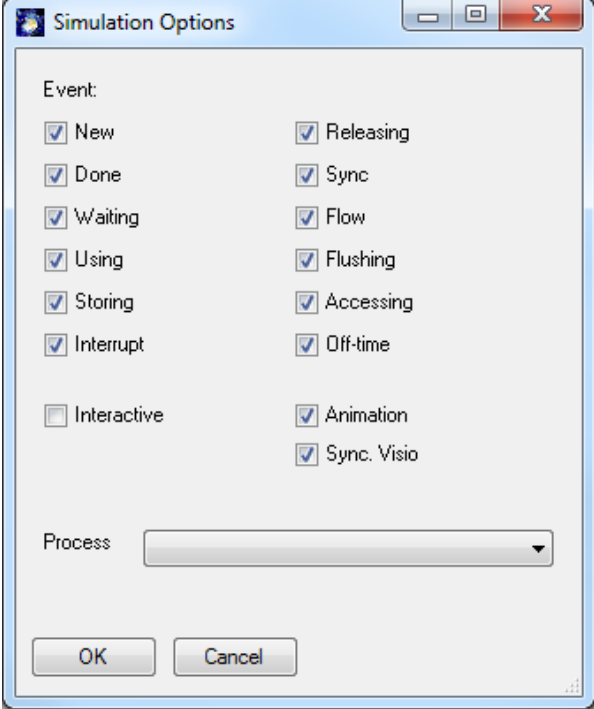
The window consists of two areas:

- Buttons to start and step the simulation
- A list of events

The Simulation Menu and the Button Bar of the Simulation Window has the following options:

	<p>Initialize simulation. Using this command you will start a new simulation. All existing simulation data is kept in memory so that you can compare the results. The simulation engine is being reset and a first simulation step is being executed. The simulation engine is in stepping mode. To continue with simulation you can either executed another step using the “Next/Step” command or enter the running mode using “Last / Run”</p>
	<p>This command is used to navigate in a completed or stopped simulation trace. Works as above to navigate backward.</p>
	<p>This command is used to navigate in a completed or stopped simulation trace. Same as above to navigate forward. If the simulator is in stepping mode, a single step of the simulation engine is being executed.</p>
	<p>The simulation continues until there are no more tasks to execute, or the user interrupts the simulation</p>
	<p>This command interrupts the simulation. The simulation is in step mode</p>

	Save the current simulation data to an XML file. You may apply XSLT to simulation data for your own purpose.
	Opening previously saved simulation data allows to compare the results in a Simulation report
	Options for the simulation protocol:

	
New	An entry in the trace list is made for each activity to be executed
Done	An Entry in the trace list is created for each completed activity
Waiting	Shows an entry if an activity is waiting for a resource
Using	Shows an entry if an activity is using/occupying a resource
Storing	Information is being stored to a buffer
Interrupt	An activity has been interrupted by a process of higher priority or an activity has been resumed after interruption

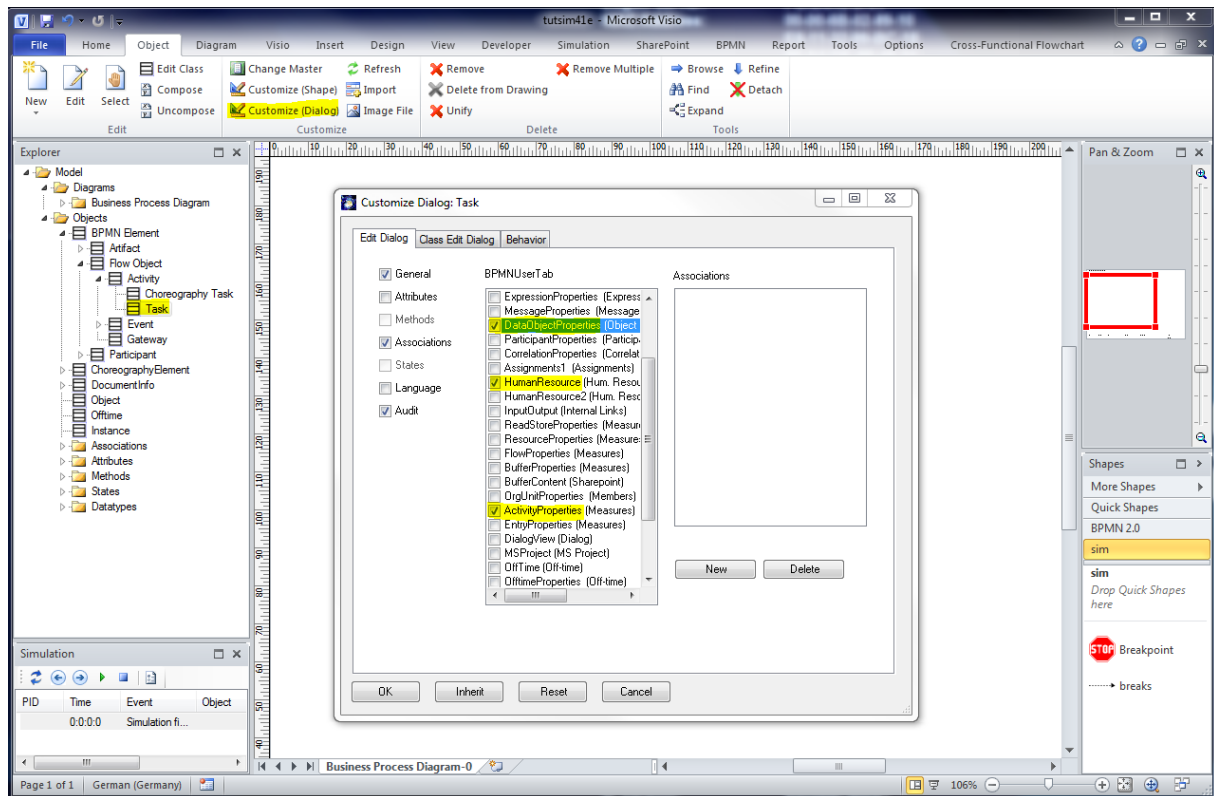
	Releasing	Shows an entry if an activity is not using/releasing a resource
	Sync	An activity is waiting for multiple inputs
	Flow	An entry in the trace list is made for each new flow of information to be executed
	Flushing	Buffer is being flushed, existing or new information is being sent. This can happen because a threshold has been reached or it is periodic
	Accessing	Information is being retrieved / removed
	Off-time	Off-time has been entered or finished. Resources will break/resume their current jobs
	Interactive	In interactive mode, the user can manually select a specific process flow in a stepwise fashion. In non-interactive mode the simulation engine is using probabilities specified on the control flow links. Default setting is non-interactive.
	Animation	Each activity, resource of buffer which is touched by simulation will be selected and greyed
	Sync. Visio	Adds Simulation data to shapes, so that it can be displayed with Visio Data Graphics

Using “Up” and “Down” arrow keys in the protocol trace list behaves similar to the “Next” / “Back” commands. If possible, the current focus in the list is moved to another object and the object is being displayed in the drawing.

Please note that the simulation engine cannot simulate until you specify input parameters in the Measures tab for each EntryPoint object.

2. Preparing a Simulation

Since edit dialogs can be customized in SemTalk you may not directly see all tabs mentioned in the following chapters in all documents. Customization of dialogs is easy and does not harm existing documents. Select the system class in the SemTalk Explorer e.g. “Activity” and choose **Object->ProcessElement->Activity->Customize (Dialog)** from the menu.

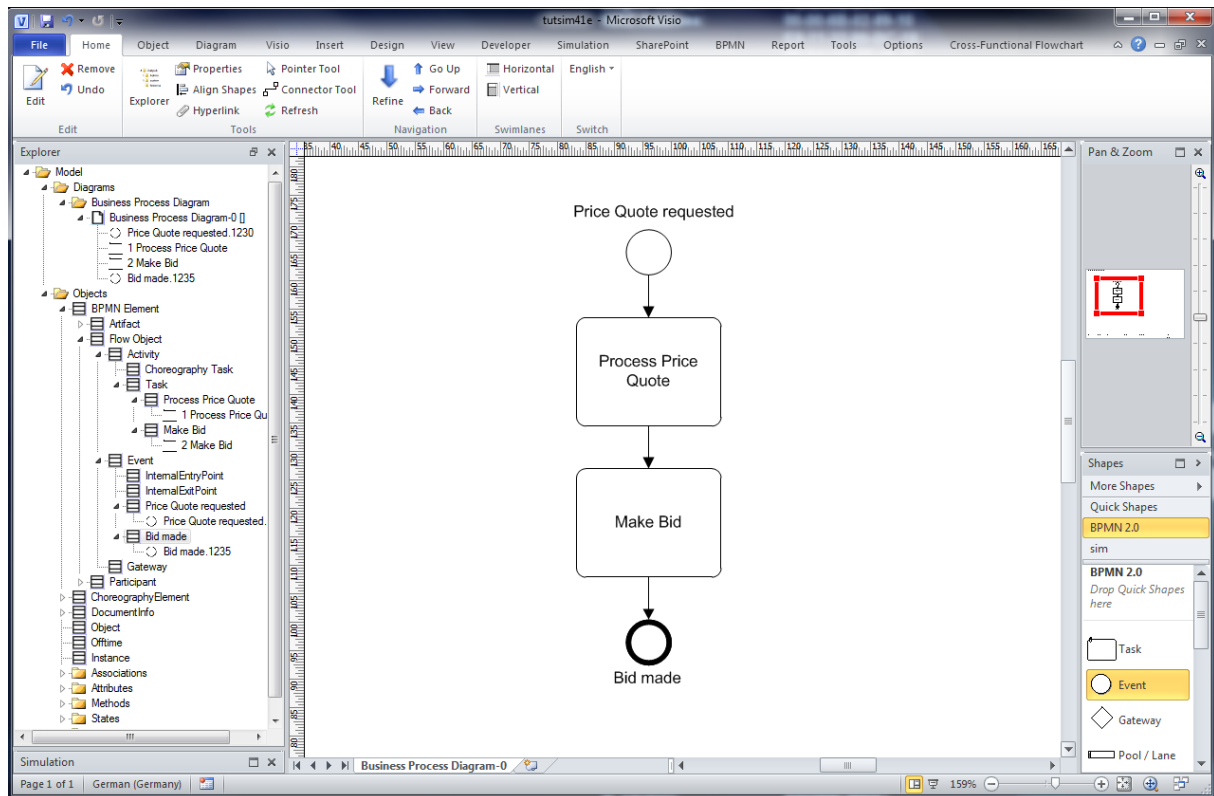


Please select the tabs you need for simulation. For simulation of activities please select “ObjectFlow” and “ScriptProperties” may be useful in some situations. For (human & physical) resources “OffTime” may be needed.

3. Basic Simulation Elements

The starting elements for the SemTalk Simulation Toolkit are “Entry Points” (“Inputs” in CSA or “Events” in EPC notation and BPMN) which trigger the simulation by a certain amount of tokens. Activities are the process steps being executed. The execution of activities (tasks, functions, process steps...) is called a “Job” and takes a specified amount of time. Physical or human resources may be needed to execute an activity. These resources can have a limited capacity, which act as a constrained resource that determines the maximum number of activities that can be executed in parallel. As soon as a resource is not available, a process instance has to wait for the resource. Processes and activities may have an assigned priority. Jobs with lower priority will be interrupted. The priority of a job (process thread) is the sum of the priorities of the process (specified by its entry point) plus the priority of the activity.

In order to explain simulation elements we will create a simple process. Please add an entry point and some activities as shown in the following picture.



3.1 Entry Points

Open the “Edit” dialog of the entry point (“Price Quote requested”) and select the “Measures” tab.

Trigger Type	BPMN ONLY
Start day	Begin time of this event
End day	End time of this event
Period	After each period the entry point is firing events
Inputs	The number of process instances (tokens) to create from this entry point while simulation. You must set this value to something higher than zero in order to activate the entry point.
Priority	Process instances with higher priority interrupt jobs with lower priority events
Distribution	Choose the distribution type from: <ul style="list-style-type: none"> • Constant Value • Even Distribution • Normal Distribution • Exponential Distribution • Values • Evenly spaced
Distribution	Parameters for the distribution: For a constant distribution this is simply the time. For an even distribution we have min time and max time. A normal distribution needs a mean and a std. deviation.

File	For the distribution type “Values” a text file is specified containing all the times is entry is supposed to fire (e.g. a flight plan of an airport). Units a seconds.
------	--

Event: Price Quote requested

General Measures Audit

Trigger Type: None

Start day: Days: 0 Hrs: 0 Min: 0 Sec: 0

End day: Days: 1 Hrs: 0 Min: 0 Sec: 0

Period: Days: 0 Hrs: 0 Min: 0 Sec: 0

Inputs: 0 Priority: 1

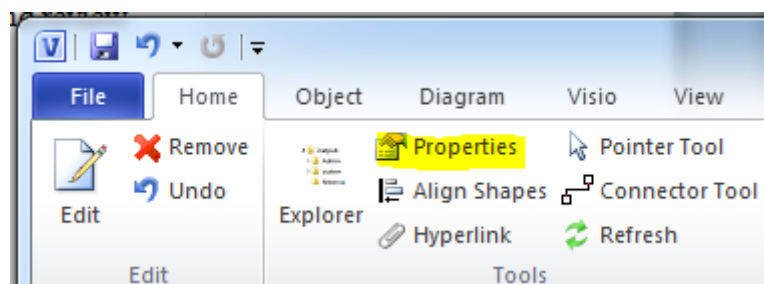
Distribution: Constant Value

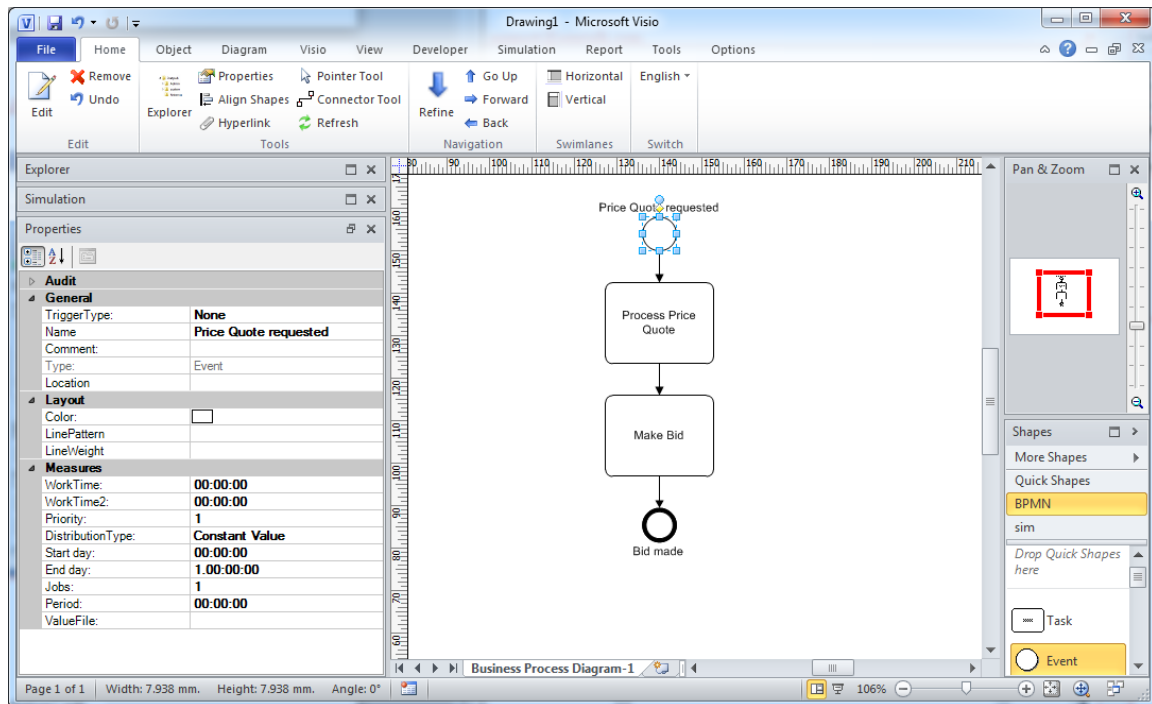
Input start time: Days: 0 Hrs: 0 Min: 0 Sec: 0

OK Cancel

Please make sure you have specified at least one input.

You may also use the property window (Home->Properties) to enter and review your settings.





3.2 Activities (FlowChart: “Process”)

Open the “Edit” dialog of an activity (“process Price Quote”) and select the “Measures” tab (or just select it, if you are using the property window)

Cost Driver	<i>Just for documentation</i>
Priority	The priority is added to the priority of the process instance which was specified at the entry
Distribution	Choose the distribution type from: <ul style="list-style-type: none"> • Constant • Even Distribution • Normal Distribution • Exponential Distribution
Distribution Parameters	Parameters for the distribution: For a constant distribution this is simply the time. For an even distribution we have min time and max time. A normal distribution needs a mean and a std. deviation.
Waiting Time	Waiting time is not a simulation parameter. It can be used in reports to compare estimated times with simulated times
Interruption	Specifies the behaviour after the activity was interrupted. “Resume” continues with the remaining time and “Restart” will start the activity again.

The screenshot shows a dialog box titled 'Task: Process Price Quote.1' with several tabs: General, Associations, Object Flow, Hum. Resource, Measures (selected), and Audit. The Measures tab contains the following fields:

- Task Type: None (dropdown)
- Cost Driver: (empty text box)
- Priority: 0 (spin box)
- Distribution: Constant Value (dropdown)
- Processing Time: Days (0), Hrs. (0), Min. (0), Sec. (0) (spin boxes)
- Waiting Time: Days (0), Hrs. (0), Min. (0), Sec. (0) (spin boxes)
- Interruption: ☒ Resume, ☐ Restart (radio buttons)

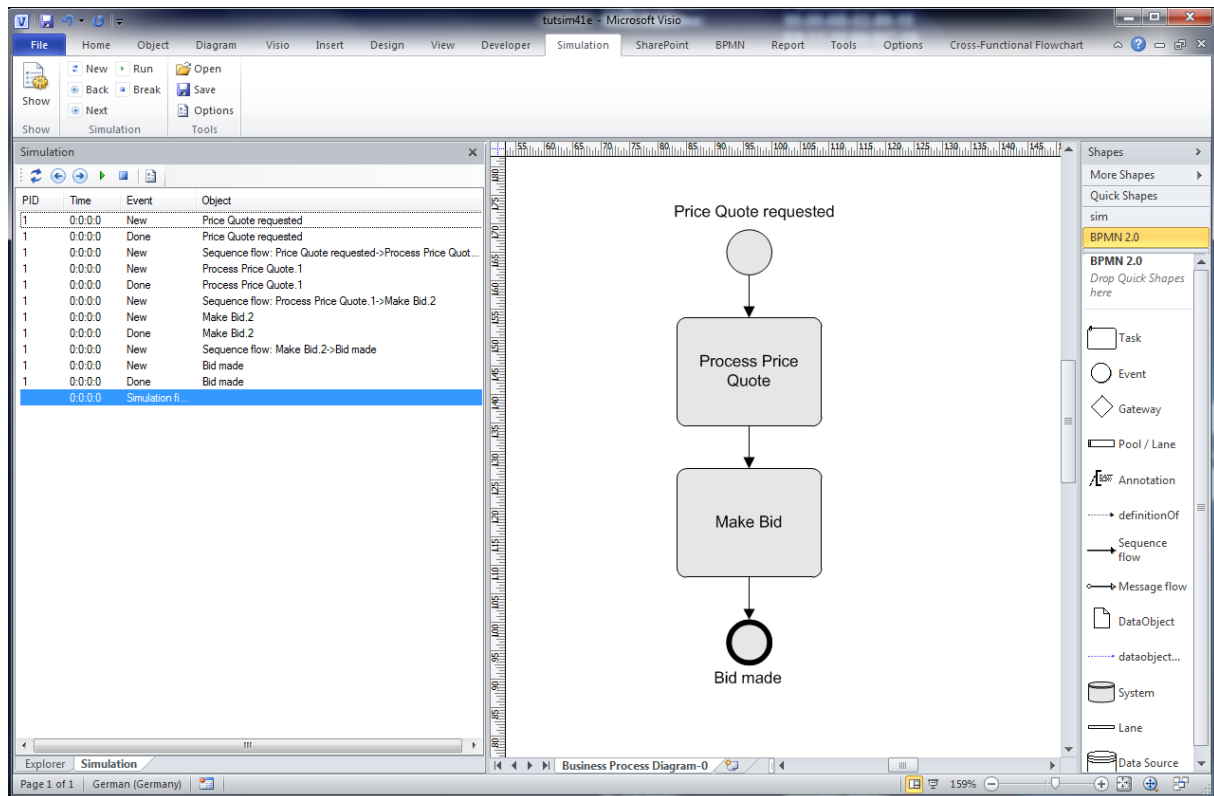
At the bottom, there are 'OK' and 'Cancel' buttons, and a 'System' checkbox.

Your first simulation is already executable now. Please open the Simulator Window if you have not opened it yet. Select **Simulation->New** to execute the first step of the simulation.

The screenshot shows a 'Simulation' window with a toolbar and a table of events. The table has four columns: PID, Time, Event, and Object.

PID	Time	Event	Object
1	0:0:0:0	New	Price Quote requested
1	0:0:0:0	Done	Price Quote requested
1	0:0:0:0	New	Sequence flow: Price Quote requested->Proces...

In the simulation window you will notice, that the entry point has been fired and the first information flow has been started. You can proceed now in the single step mode Simulation → Next or run it with Simulator->Run.



Once the simulation is finished or interrupted, you can navigate in the simulation trace using arrow keys or the command buttons. SemTalk will highlight the current object in the drawing.

The trace shows the ID of the process instance, the name of the object, the type of simulation event (started, finished etc.) and the current simulation time. By default all processes are shown. You can filter out single processes by using the “Process” combo box in the Options Dialog..

Refined activities (sub processes) are being interpreted by the simulation engine.

3.3 Information flow

The SemTalk Simulation engine not only supports the working time at activities but also the transportation time on the information flow.

On the “Object Flow” tab of an information flow you can specify the type of information, which is passed from activity to activity. Using the “Measures” tab you can specify the transportation time and costs for the information flow.

Transportation Time	Constant Distribution only
Fixed Cost	To be used in reports. Cost per usage (e.g. a letter)
Variable Cost	To be used in reports. Cost depending on flow time (e.g. a phone call)
Probability	The probability for this information flow, if it is an outbound control flow of an activity with outbound OR or XOR setting (see next chapter)

The screenshot shows a dialog box titled "Sequence flow: Sequence flow". It has five tabs: "General", "Condition", "Measures", "Object Flow", and "Audit". The "Measures" tab is currently selected. Inside the dialog, there are several input fields:

- Transportation Time:** This is a group of four spinners labeled "Days", "Hrs.", "Min.", and "Sec.". Each spinner currently displays the value "0".
- Fixed Cost:** A text input field containing the value "0".
- Variable Cost:** A text input field containing the value "0".
- Probability:** A spinner displaying "100" followed by a percentage sign "%".

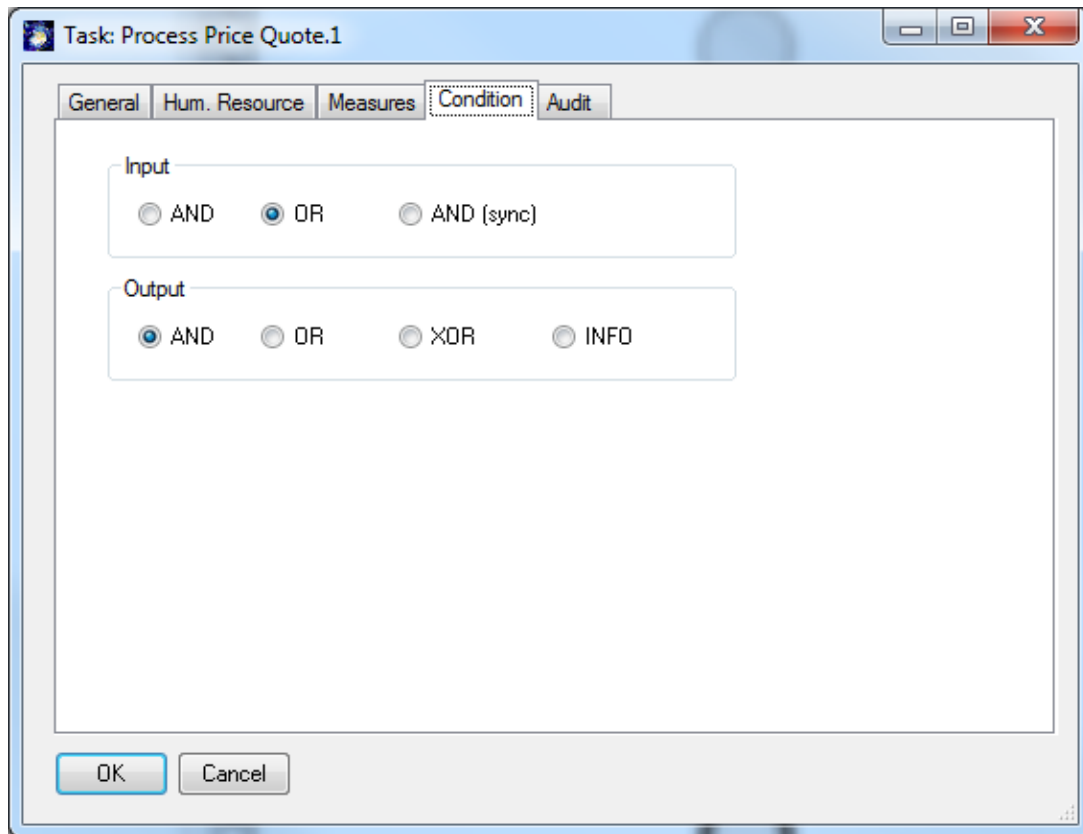
At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

Control of the information flow may also depend on the values of object attributes or states as they are specified in the Object Flow tab. This functionality is described in Chapter 3.

You can visualize the probability of flows by customizing the layout of sends info link (Object → Customize (Shape). Select "Probability" in the list of visible attributes.

3.4 Input and Output Logic of Activities

For notations which do not have explicit operators or decision SemTalk specifies the logic for the control flow in the Condition tab of an activity.



The Condition tab allows the specification of input and output conditions. Input and output conditions are used to set the simulation rules.

Input conditions:

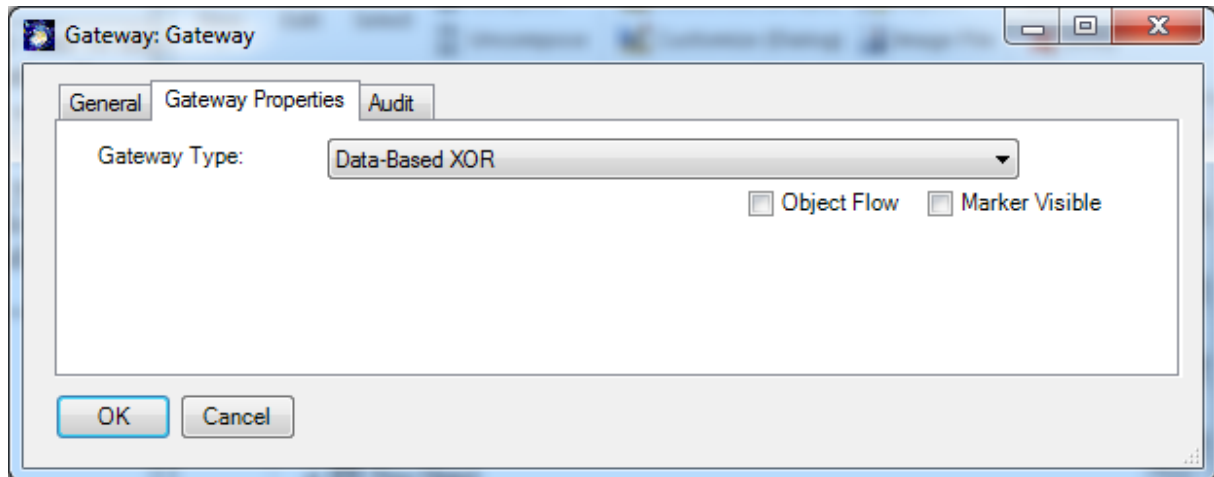
AND	The process waits until tokens come in from all inbound sends info links.
OR	The process waits until a token comes in from one of the inbound sends info links.
AND (sync)	The process waits until a token from the same original Entry Point (color) comes in from all inbound sends info links. The option is used for synchronization.

Output condition:

AND	A token will be sent to all outbound sends info links
OR	This is a non-exclusive OR. A token will be randomly sent to single or multiple outbound sends info links depending on whether the random number is lower than the probability specified on the sends info link.
XOR	A token will be sent to the first outbound sends info link where the random number is lower than the probability specified on the sends info link.
INFO	A token will be sent to those outbound sends info links where the object expression specified on the object flow tab of the send info link is true e.g. Person.Age>10

In notations which have operators such as EPC or in notations using explicit decision (“Gateway”) nodes, the input and output conditions will be only specified at those operators/decisions. The Input/Output tab is usually hidden in pre-defined methods.

BPMN use operators to express to logic



BPMN Input conditions:

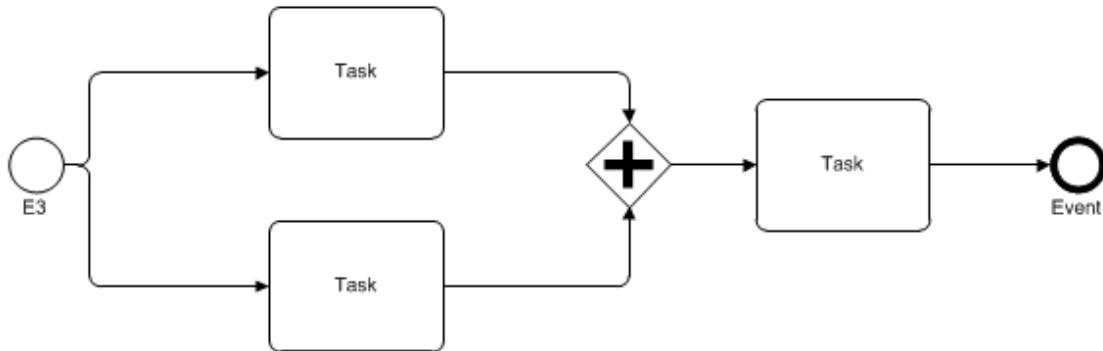
Parallel-AND	The process waits until tokens come in from all inbound sends info links.
Data-Based XOR, Event-Based XOR, Inclusive-OR	The process waits until a token comes in from one of the inbound sends info links.
Parallel-AND (sync)	The process waits until a token from the same original Entry Point (color) comes in from all inbound sends info links. The option is used for synchronization.

BPMN Output condition:

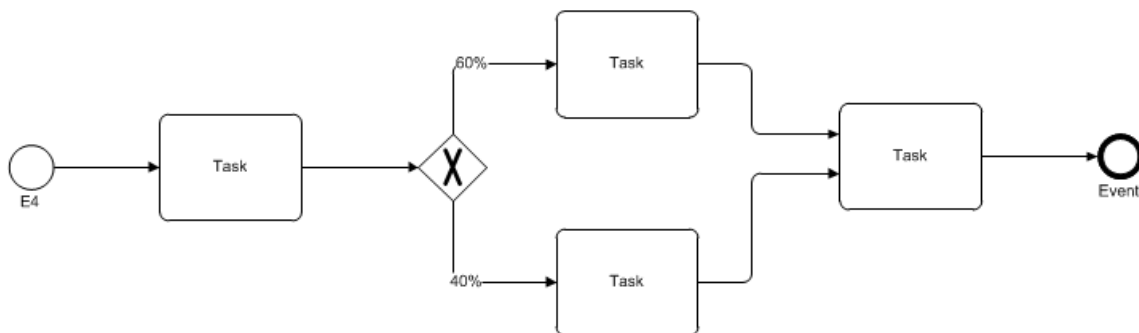
Parallel-AND	A token will be sent to all outbound sends info links
Inclusive-OR	This is a non-exclusive OR. A token will be randomly sent to single or multiple outbound sends info links depending on whether the random number is lower than the probability specified on the sends info link.
Data-Based XOR, Event-Based XOR	A token will be sent to the first outbound sends info link where the random number is lower than the probability specified on the sends info link.
Data-Based XOR, Event-Based XOR (with Object Flow)	A token will be sent to those outbound sends info links where the object expression specified on the object flow tab of the send info link is true e.g. Person.Age>10
Complex	Can not be simulated

The default behavior for activities with multiple outputs is AND. For activities with multiple inputs the default behavior is OR:

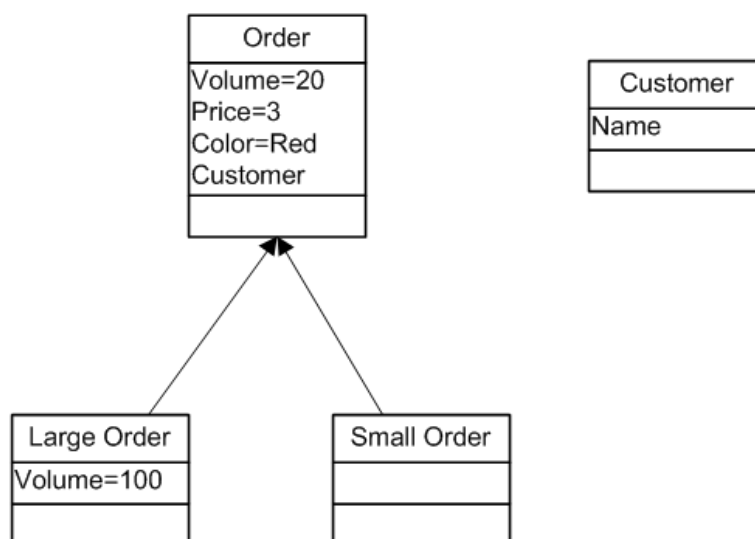
Examples:



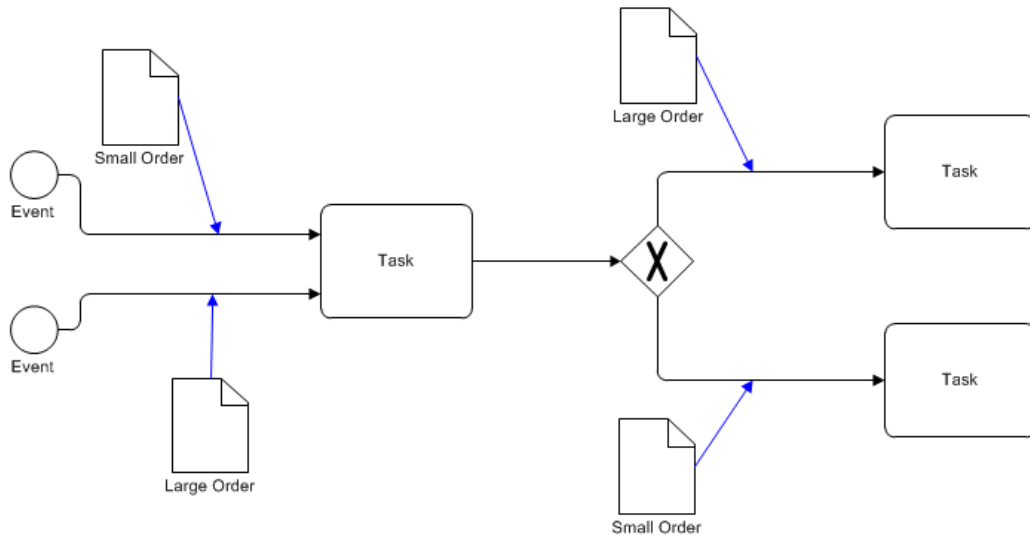
A Parallel-AND synchronizes 2 branches



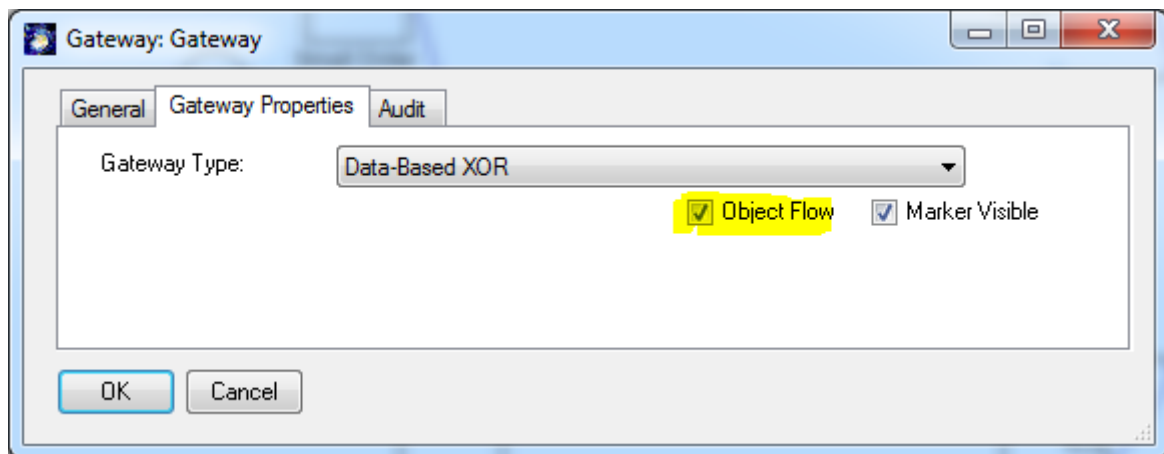
A Data based-XOR with branches and probabilities



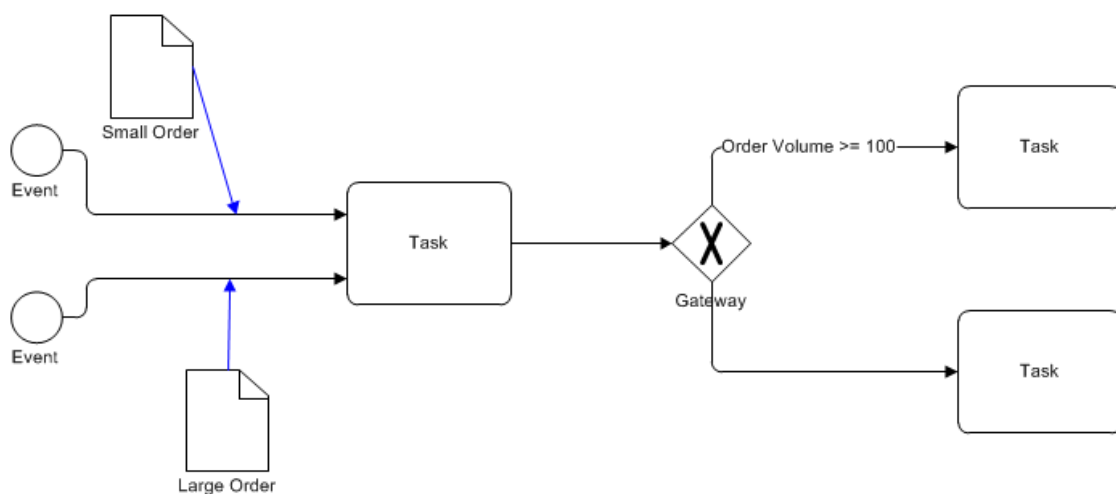
Object model for the following flow samples



Decisions based on object types. Large Orders take the upper branch, small orders take the lower branch. The gateway must be set to “Object Flow”.

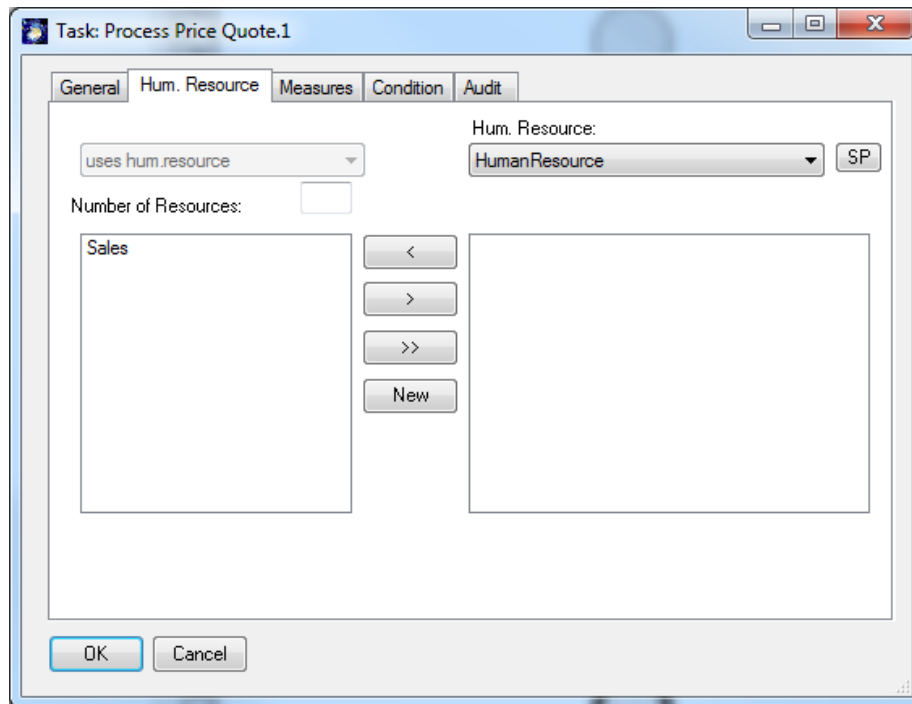


Decision based on attribute values.

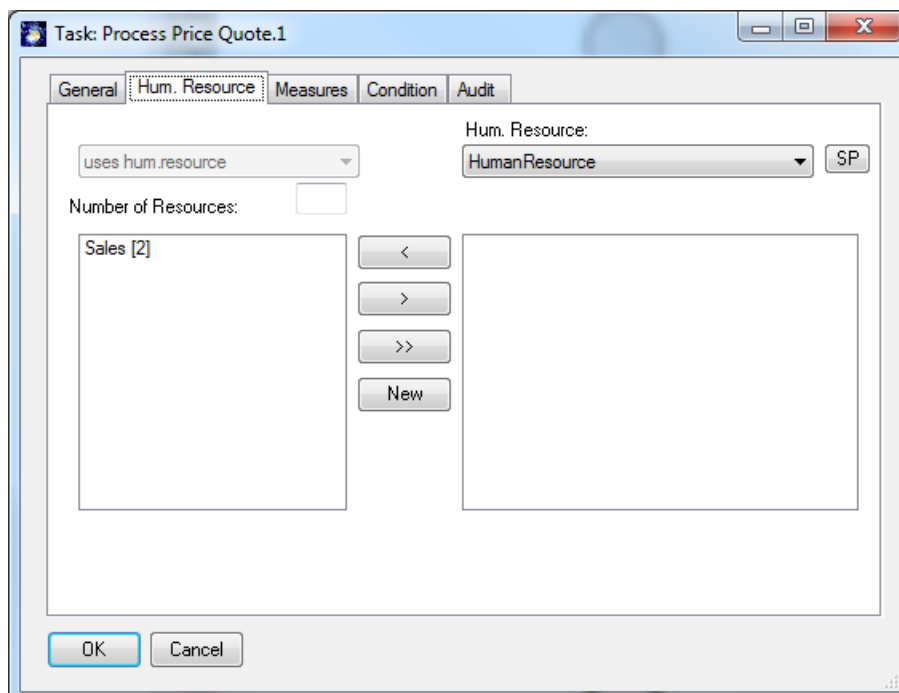


3.5 Resources

The next step is to add the human or physical resources required to execute the activities. There are multiple ways to assign human or physical resources to activities in SemTalk. In all methods you may use the “Hum. Resource” tab (New Button) of the activity to create/assign human resources. They can also be assigned by using Swim lanes or directly by a graphical representation (EPC). Physical Resources such as a hammer or a PC are usually assigned graphically. Please refer to the manual of your preferred modelling method.

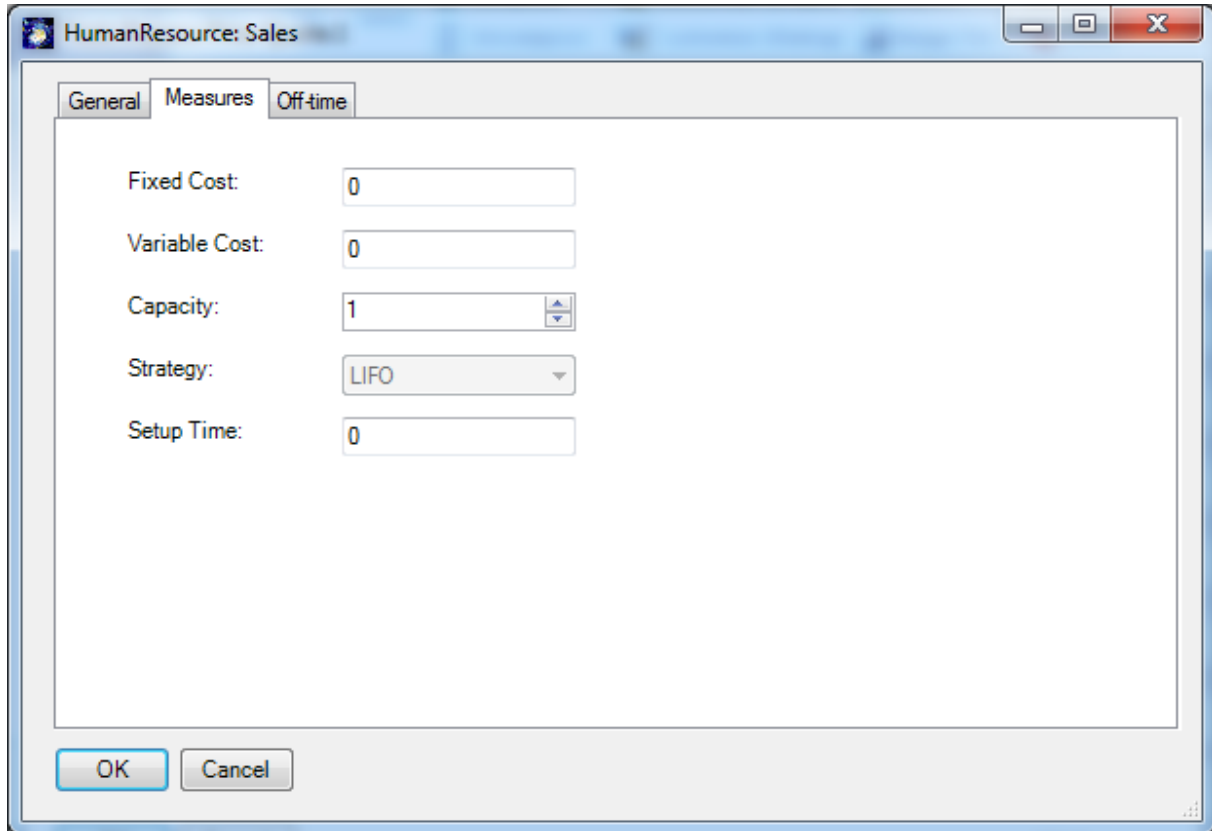


For each resource you can specify the number of units needed.



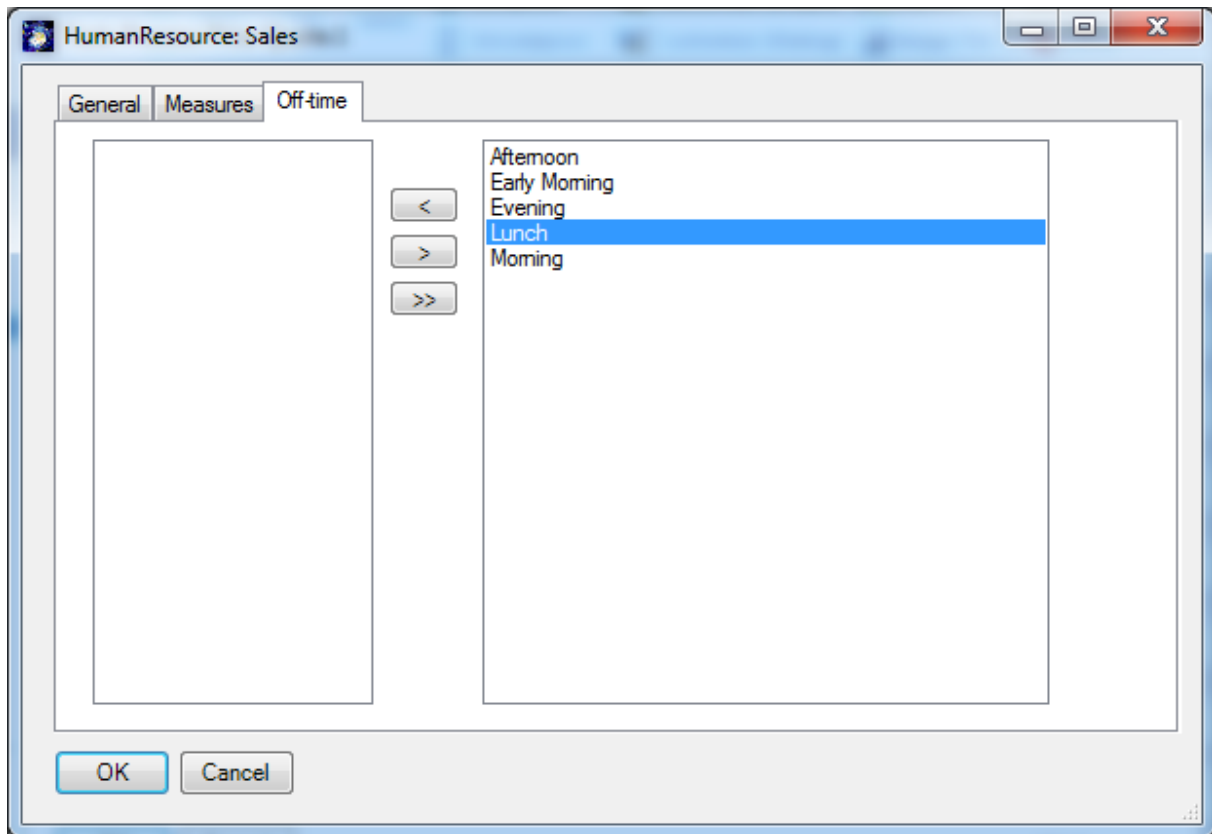
By double-clicking the resource (Sales) in the left list box you can edit its attributes.

For each resource we can specify the following attributes:



Capacity	The number of activities which can be executed in parallel using the resource. For organizational units or positions this should correspond to the number of people. Default value is 1. Please make sure that the value is at least 1 to use the resource in simulation. The process will stop if no resource is available.
Fixed Cost	To be used in reports. Cost per usage
Variable Cost	To be used in reports. Cost depending on working time
Setup Time	Amount of time needed additional to the working time to set-up
Strategy	Processing strategy is not supported. Resources always execute the job first in first out unless a job arrives with a higher priority

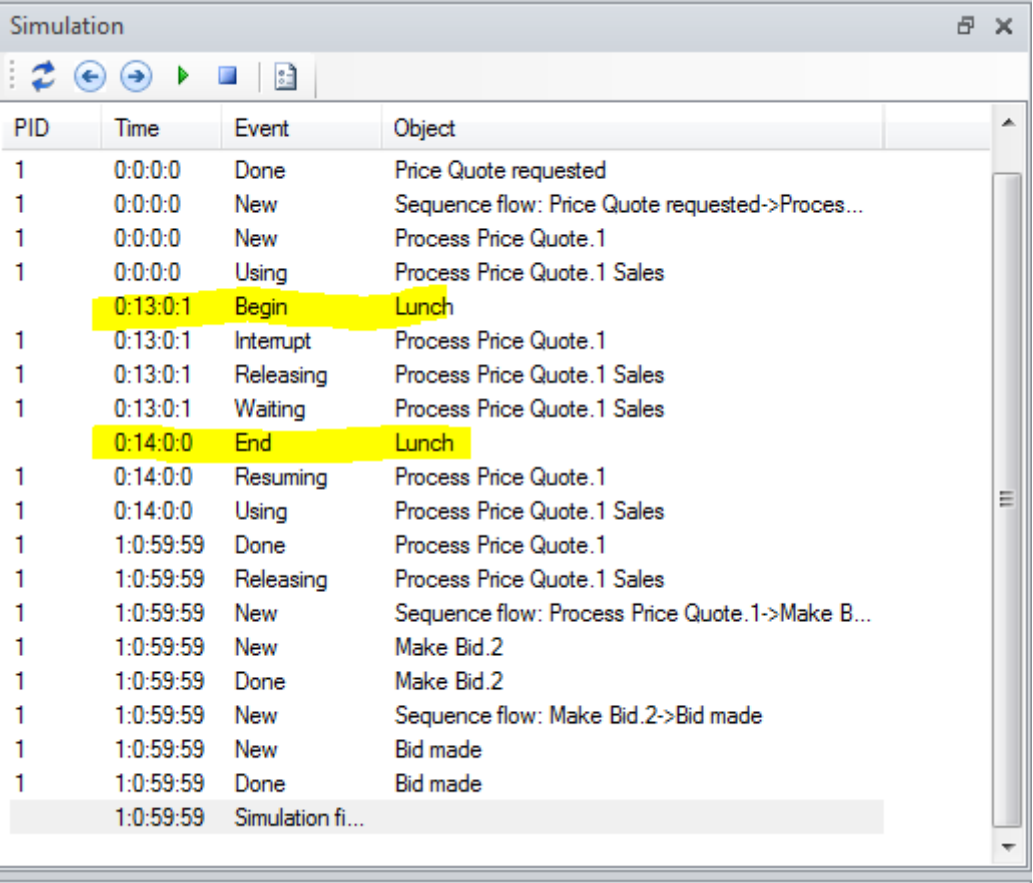
Off-times (unavailability times for resources) can also be added.



Off-times have a start time and an end time. If an off-time is reached in a simulation, resources will break and then resume when the off-time is over.

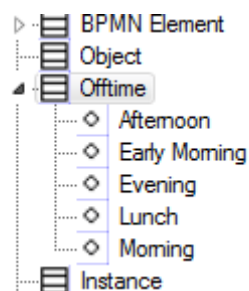
In the demo model, Sales is assigned as a resource in the first activity. The work time is changed in this example to one day in order to show the impact of a lunch break. (The resource only breaks for lunch but works through the night in our demo...)

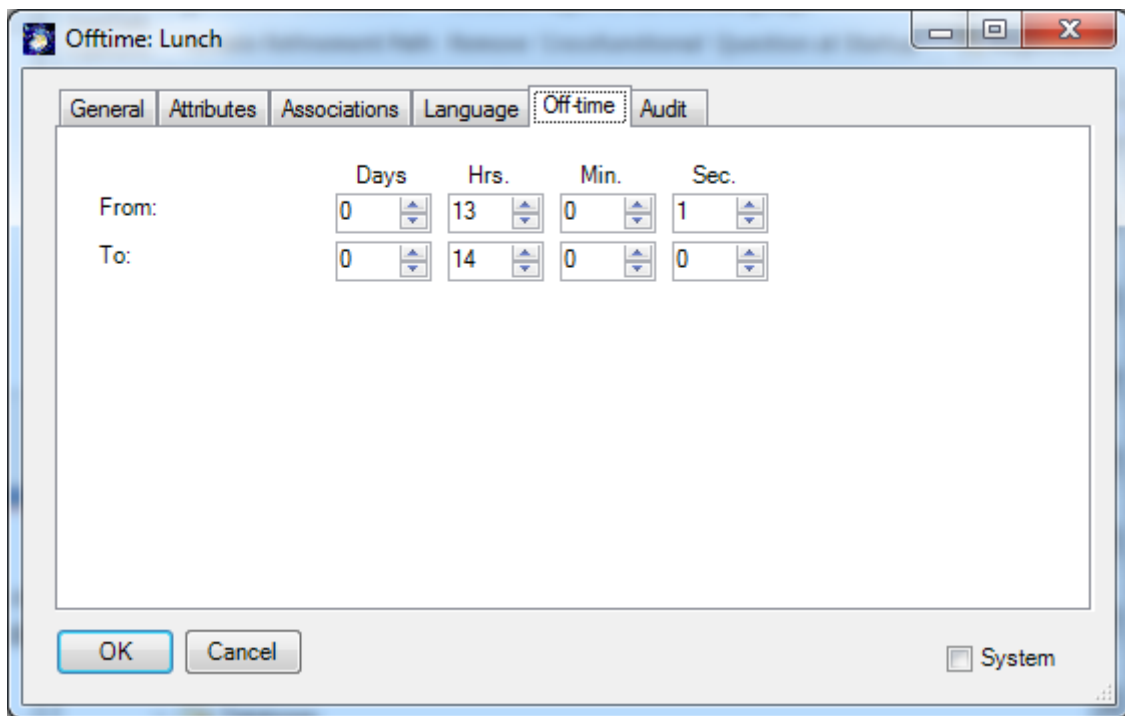
In order to work with Off-times in a meaningful way you must use 24 hour mode of SemTalk instead of the default 8h mode. If it looks strange, please check Options->SemTalk Options->General->Hours per day. SemTalk only stores seconds as time unit. This option simply specifies how it is displayed.



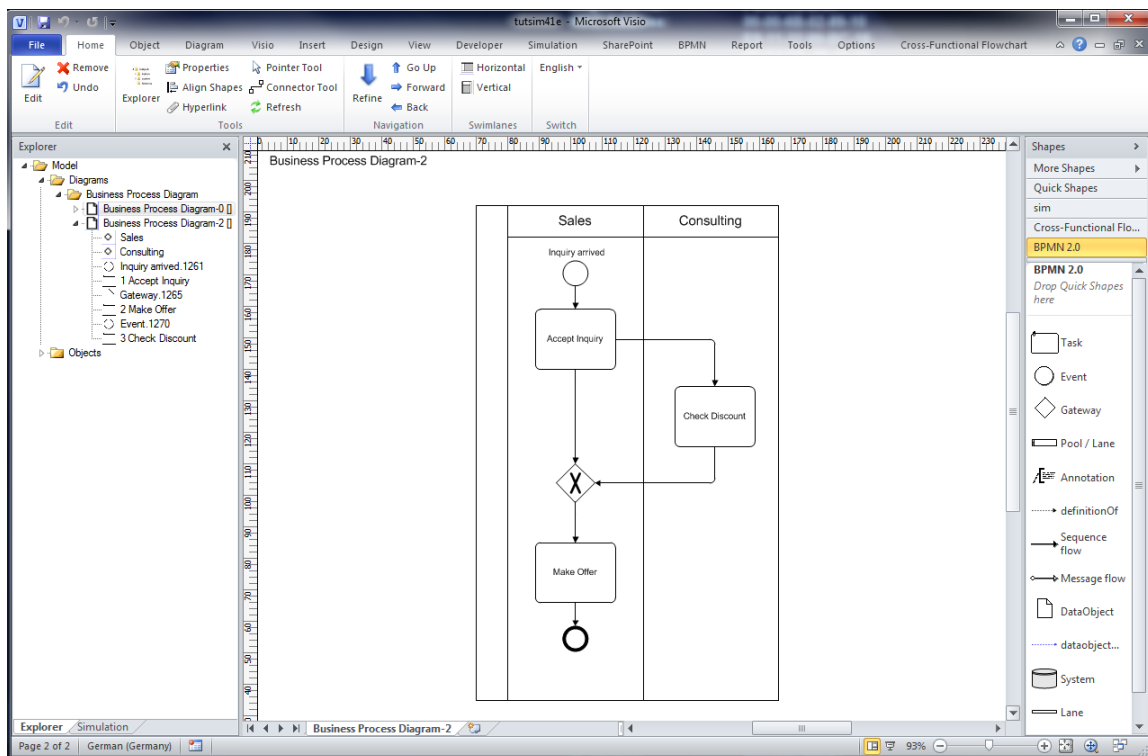
PID	Time	Event	Object
1	0:0:0:0	Done	Price Quote requested
1	0:0:0:0	New	Sequence flow: Price Quote requested->Proces...
1	0:0:0:0	New	Process Price Quote.1
1	0:0:0:0	Using	Process Price Quote.1 Sales
	0:13:0:1	Begin	Lunch
1	0:13:0:1	Interrupt	Process Price Quote.1
1	0:13:0:1	Releasing	Process Price Quote.1 Sales
1	0:13:0:1	Waiting	Process Price Quote.1 Sales
	0:14:0:0	End	Lunch
1	0:14:0:0	Resuming	Process Price Quote.1
1	0:14:0:0	Using	Process Price Quote.1 Sales
1	1:0:59:59	Done	Process Price Quote.1
1	1:0:59:59	Releasing	Process Price Quote.1 Sales
1	1:0:59:59	New	Sequence flow: Process Price Quote.1->Make B...
1	1:0:59:59	New	Make Bid.2
1	1:0:59:59	Done	Make Bid.2
1	1:0:59:59	New	Sequence flow: Make Bid.2->Bid made
1	1:0:59:59	New	Bid made
1	1:0:59:59	Done	Bid made
	1:0:59:59	Simulation fi...	

It is also possible to manipulate off-time definitions using the SemTalk Explorer. The off-time attributes for start and end times are available by double-clicking on the named off-time.

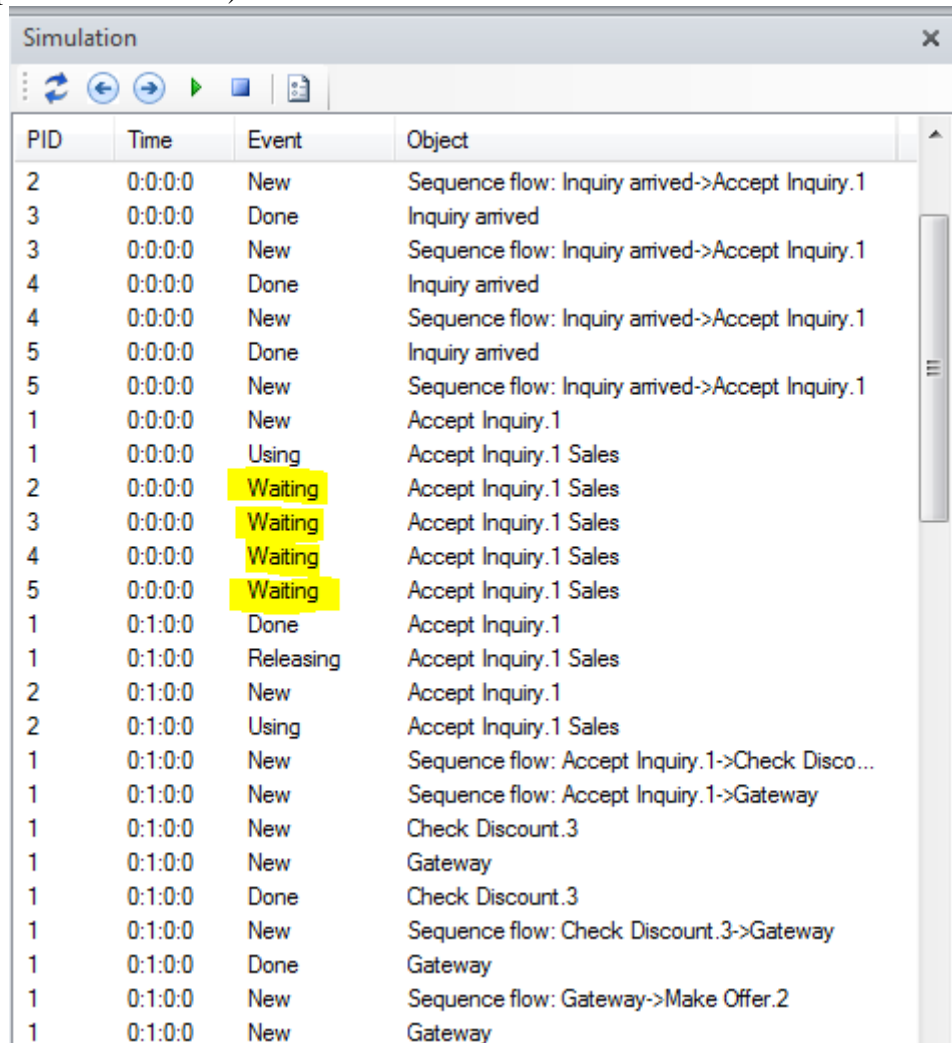




Please use either the swim lanes or the Hum. Resource tab for activities to assign human resources to activities. Then add a processing time to the existing activities “Accept Inquiry” and “Check Discount” and increase the number of inputs in the entry point to 5.



In the simulation trace you will notice now that some process instances are waiting for resources (process instance 2 is waiting for Sales, which is already busy processing the price quote in process instance 1).



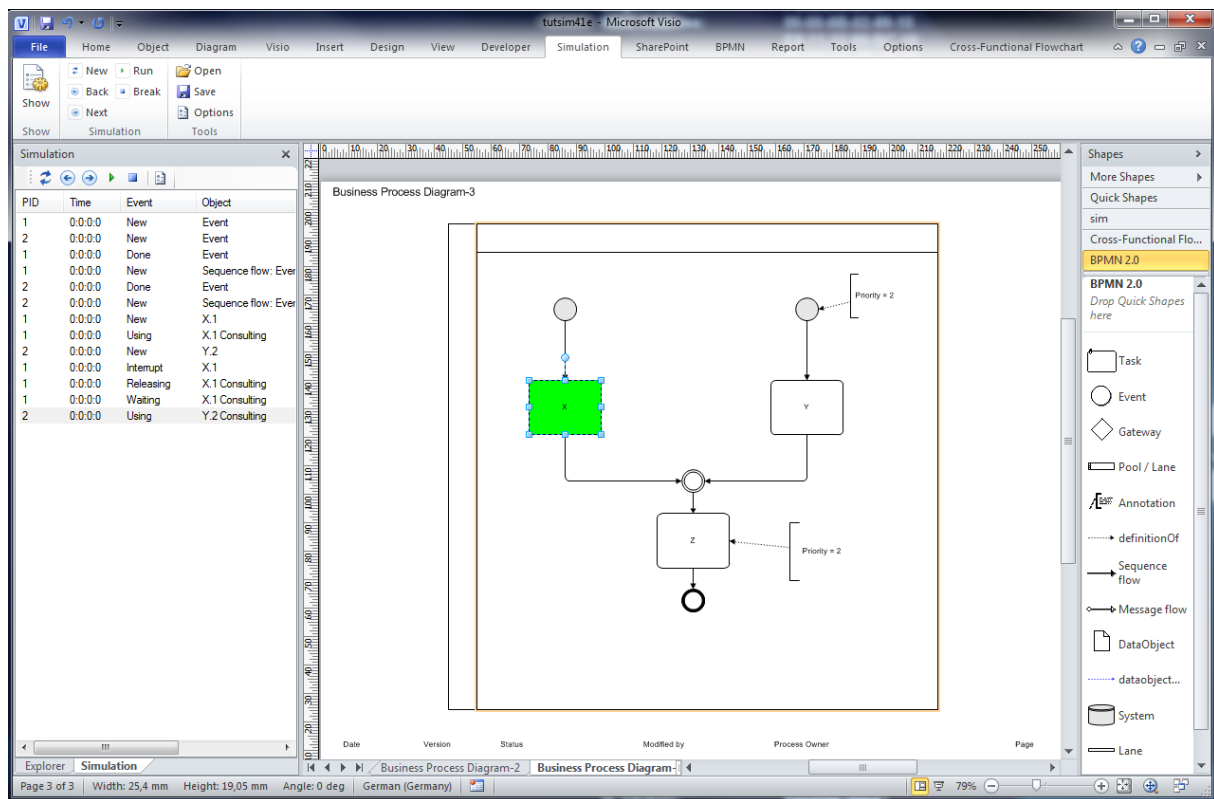
PID	Time	Event	Object
2	0:0:0:0	New	Sequence flow: Inquiry arrived->Accept Inquiry.1
3	0:0:0:0	Done	Inquiry arrived
3	0:0:0:0	New	Sequence flow: Inquiry arrived->Accept Inquiry.1
4	0:0:0:0	Done	Inquiry arrived
4	0:0:0:0	New	Sequence flow: Inquiry arrived->Accept Inquiry.1
5	0:0:0:0	Done	Inquiry arrived
5	0:0:0:0	New	Sequence flow: Inquiry arrived->Accept Inquiry.1
1	0:0:0:0	New	Accept Inquiry.1
1	0:0:0:0	Using	Accept Inquiry.1 Sales
2	0:0:0:0	Waiting	Accept Inquiry.1 Sales
3	0:0:0:0	Waiting	Accept Inquiry.1 Sales
4	0:0:0:0	Waiting	Accept Inquiry.1 Sales
5	0:0:0:0	Waiting	Accept Inquiry.1 Sales
1	0:1:0:0	Done	Accept Inquiry.1
1	0:1:0:0	Releasing	Accept Inquiry.1 Sales
2	0:1:0:0	New	Accept Inquiry.1
2	0:1:0:0	Using	Accept Inquiry.1 Sales
1	0:1:0:0	New	Sequence flow: Accept Inquiry.1->Check Disco...
1	0:1:0:0	New	Sequence flow: Accept Inquiry.1->Gateway
1	0:1:0:0	New	Check Discount.3
1	0:1:0:0	New	Gateway
1	0:1:0:0	Done	Check Discount.3
1	0:1:0:0	New	Sequence flow: Check Discount.3->Gateway
1	0:1:0:0	Done	Gateway
1	0:1:0:0	New	Sequence flow: Gateway->Make Offer.2
1	0:1:0:0	New	Gateway

You can now vary the capacities of your resources or you can move tasks from one resource to another in order to optimize your business process. In order to get a better overview of where processes use time and/ or increase costs, you can use the simulation reports described in chapter 5.

3.6 Setting Priorities

In the last chapter we saw how activities may be interrupted by off-times. In case you work with priorities you can express situations like this: An activity with a high priority can interrupt an activity with a lower priority if they compete for the same resource. It “steals” the resources instead of waiting. The activity with the lower priority is resumed afterwards. The priority of a process is maintained at an entry point. The priority of an activity will be added to the priority of the process.

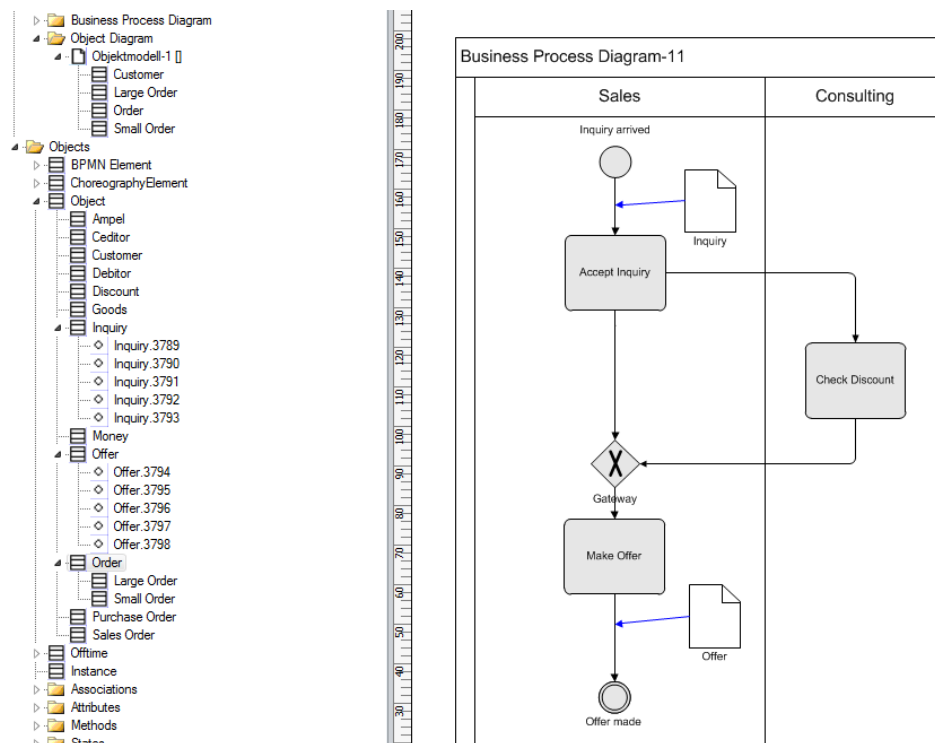
The lowest priority is “1”, any activity having the priority “2” or higher can interrupt it.



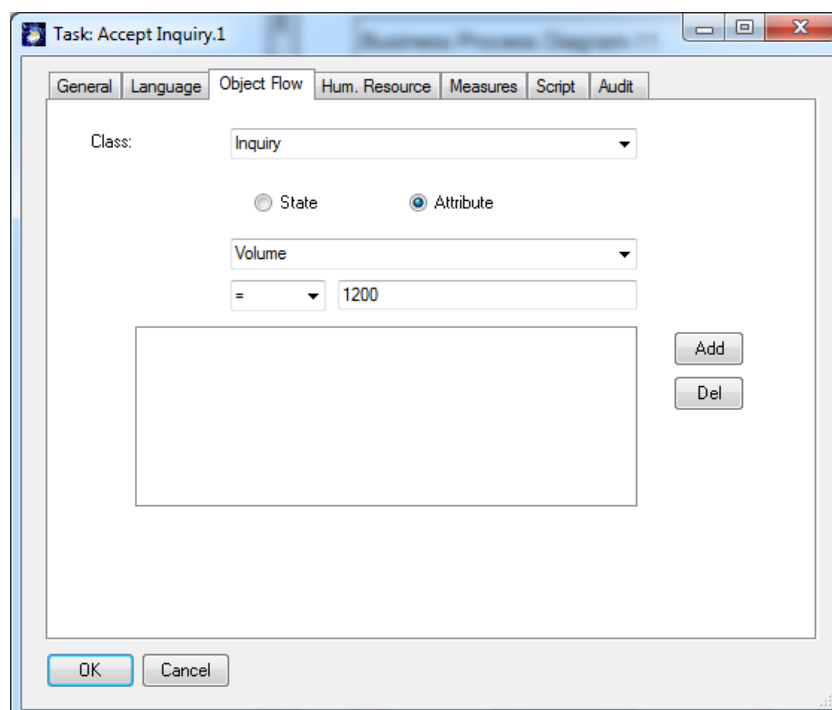
3.7 Object Instances

In the sample process, objects (information instances) are being created for each process instance. For each process instance, an information instance for each information type is created as the process is being executed. This only happens for those classes that are included in the process flow. In this process there is a “Offer” and a “Price Quote”. For each class exactly one instance is created during simulation.

When you restart simulation, all information instances will be deleted.



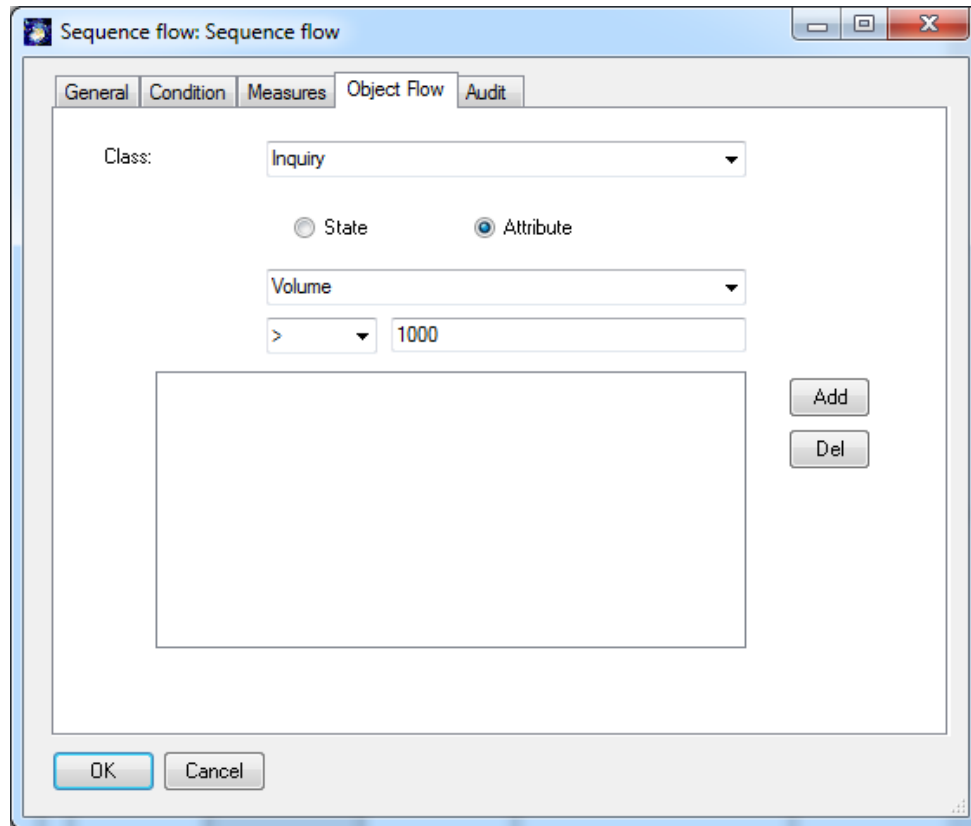
Activities can have post-execution conditions, which are able to change attribute values or states of the information instances after the activity has been executed.¹



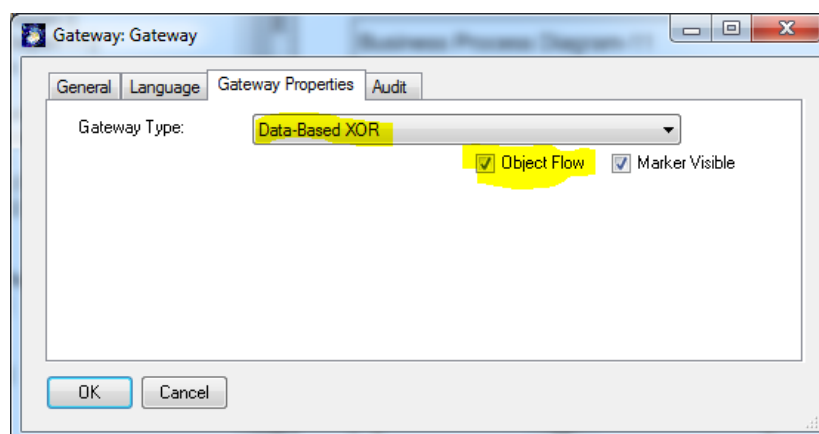
An activity can have multiple post-conditions.

¹ The post conditions are specified using the Object flow tab on activities. This tab needs to be made visible using Object "Customize" when the "Activity" is selected in the explorer

On the “Object Flow” tab of an information flow you can also specify attribute values constraints.



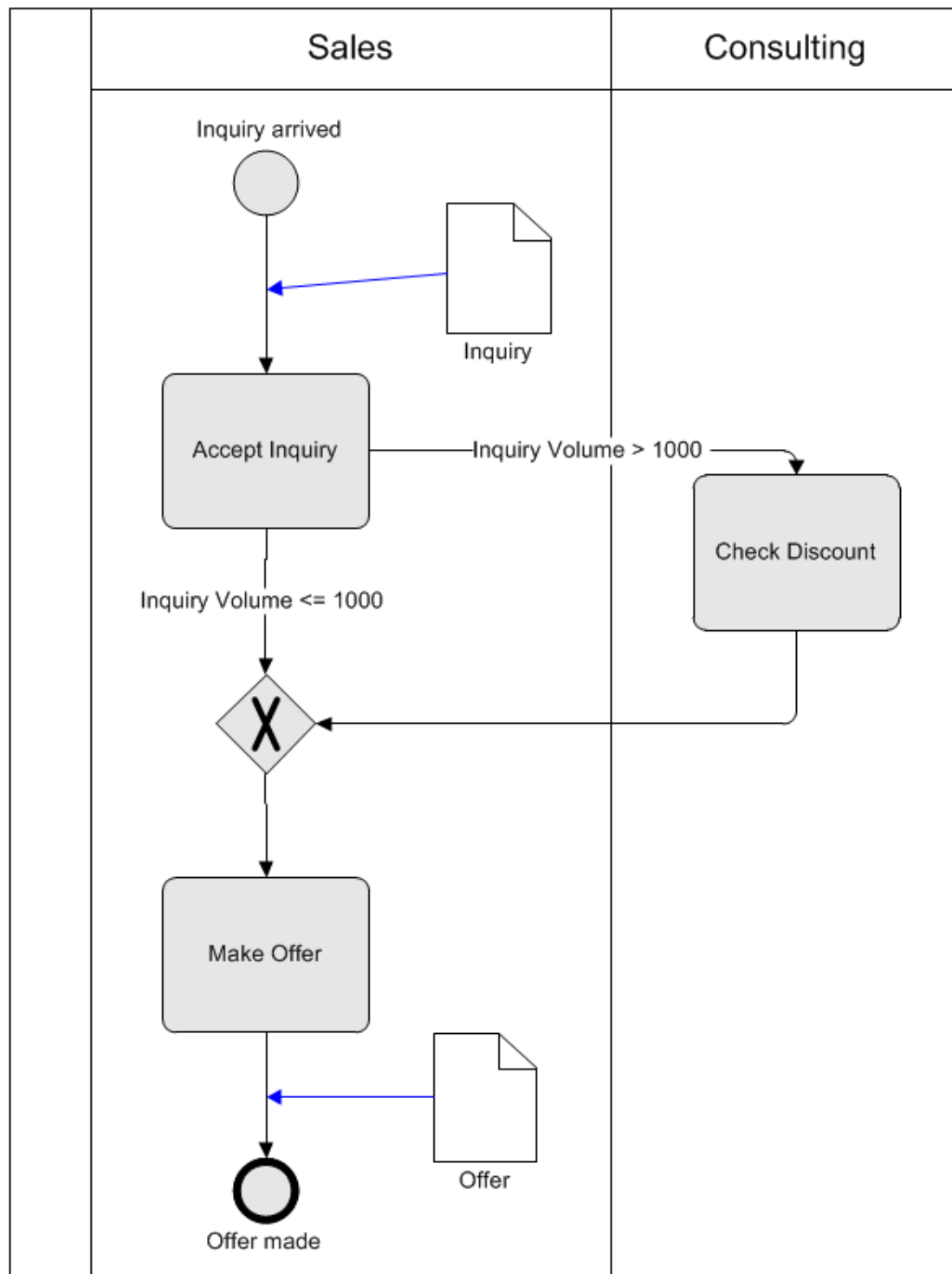
If attribute or state constraints are assigned, they will only be interpreted if the output condition of the preceding activity is set to INFO (for CSA) . At BPMN you must Select XOR or OR and check “Object Flow”.

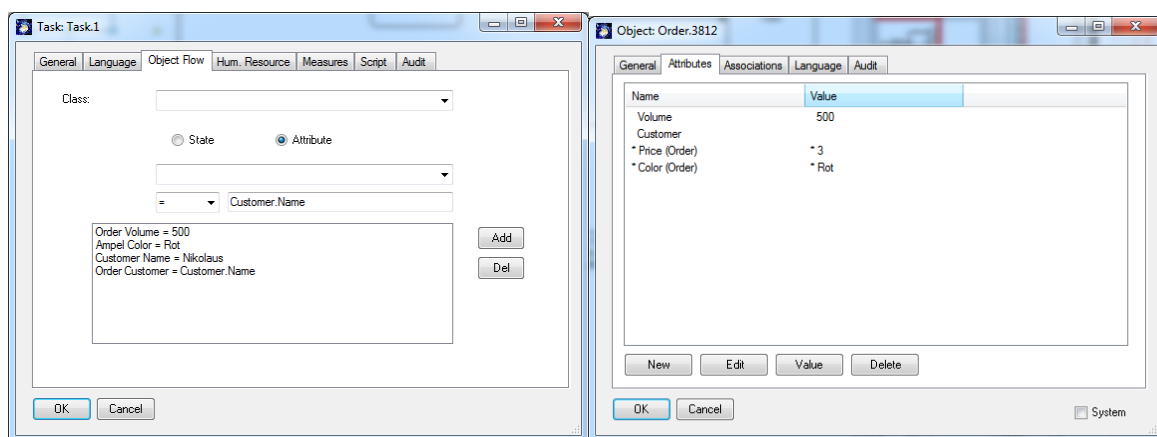
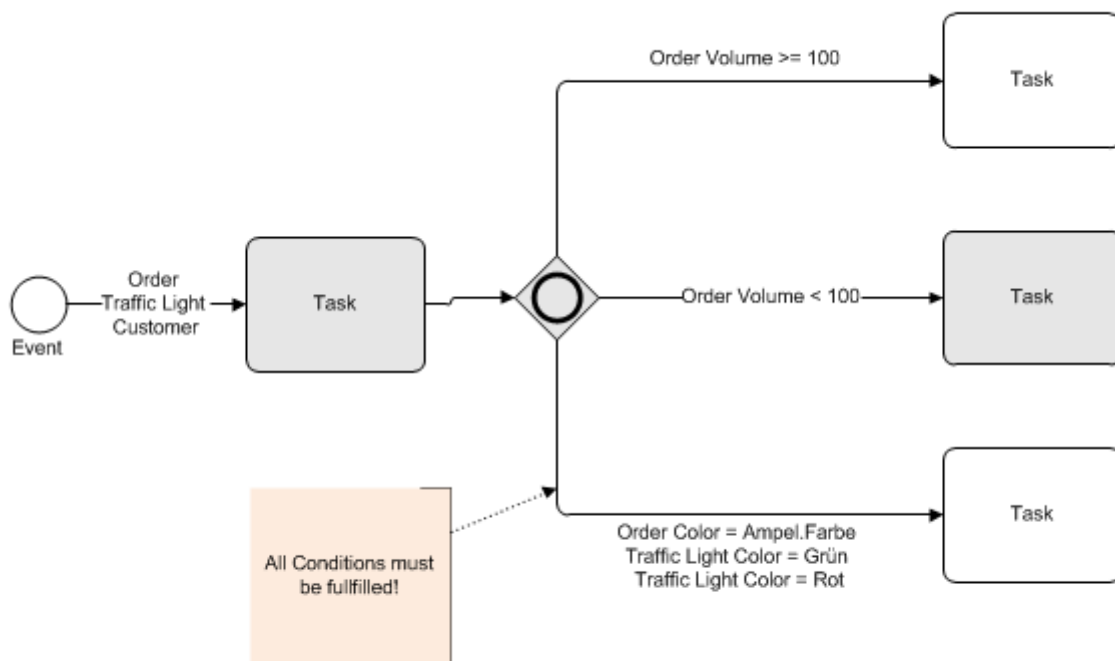


This will overwrite any given probabilities that have been assigned.

Using attribute values you can more exactly specify the dynamic behaviour of a process at a much higher level of detail compared using simply probabilities.

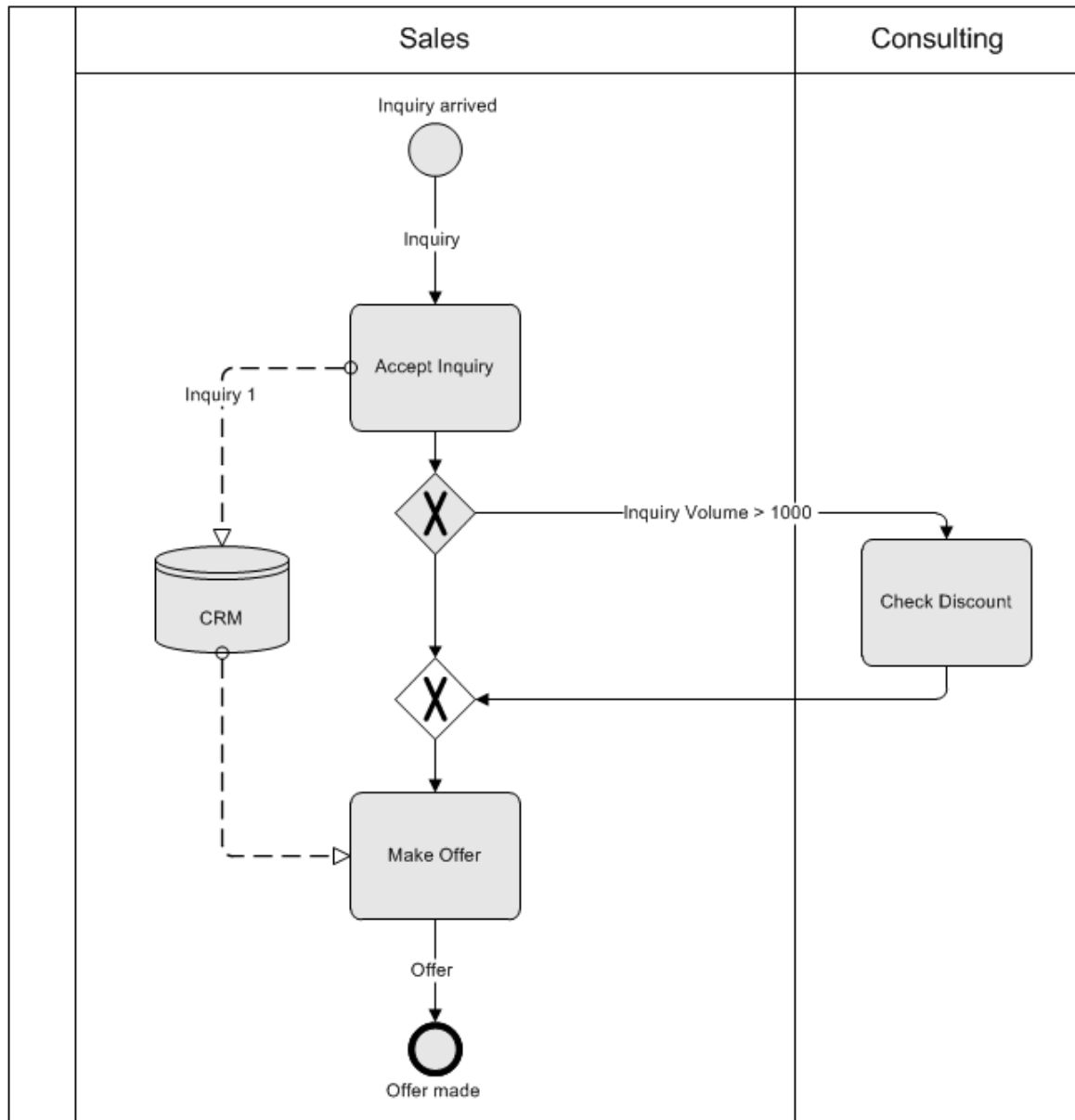
You also can change attribute values when preparing more detailed Reports. Setting post-conditions is a simple way to mark objects and branches of a process. If you run an Information Instance SemTalk Report, you will get a list of objects and their attribute values.



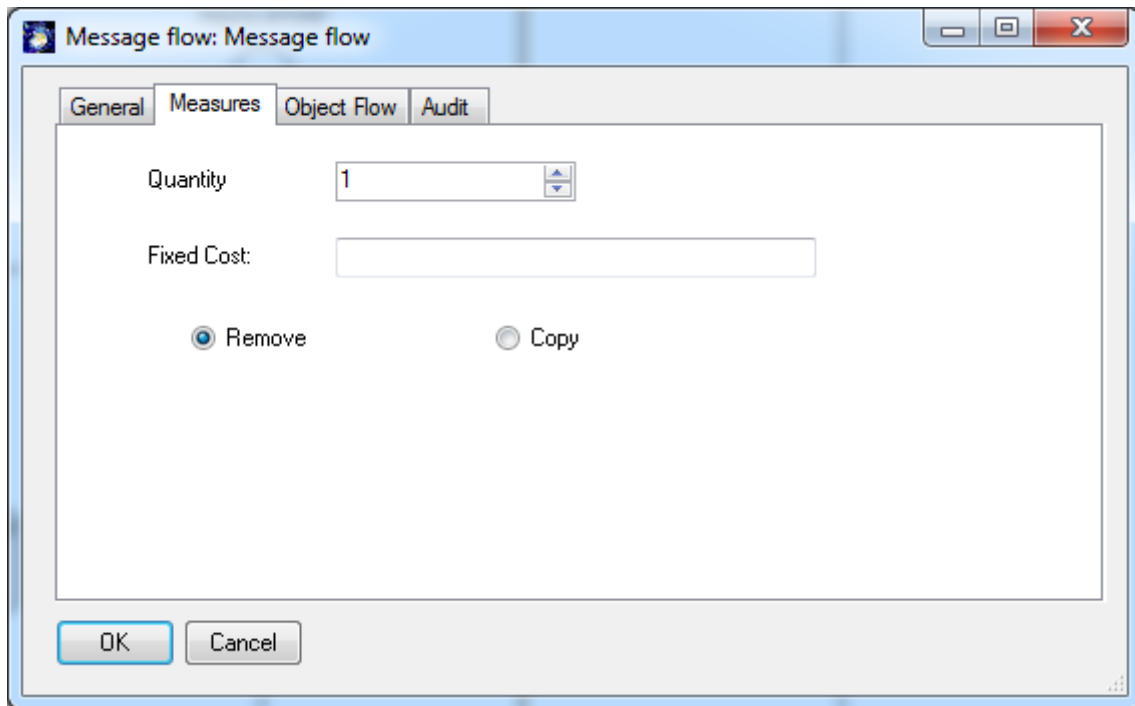


4. Buffers

Buffers are used to store information. Buffers are usually used to read or write information in and out of databases or ITsystems such as an ERP system.

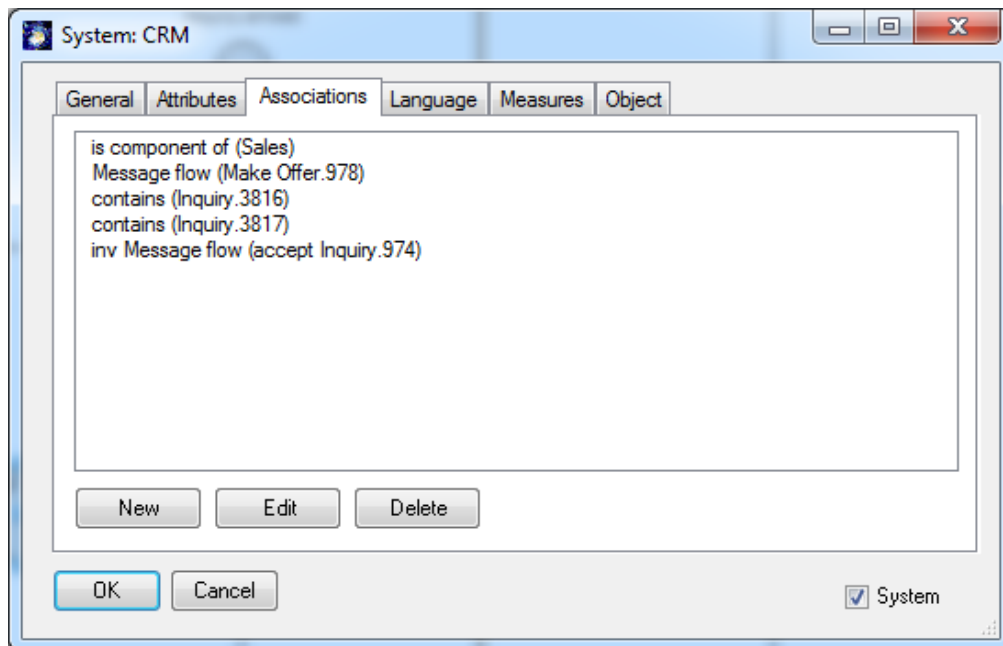


Each time “Accept Inquiry” is executed, associated information is stored in the CRM system. “Make Offer” reads from this buffer. It can only execute if the required information is contained in the Buffer.

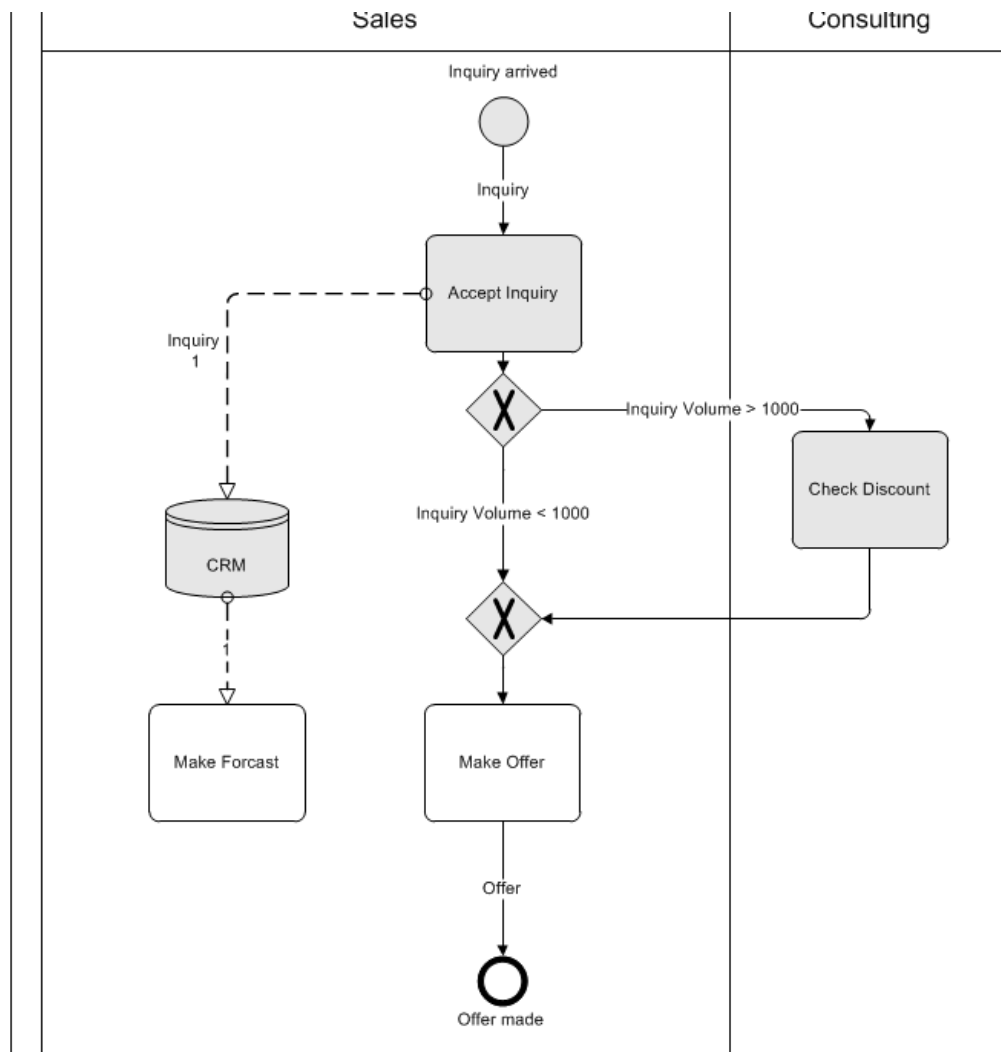


If you choose the „Remove“ option, designated information is removed from the buffer and it will not be available to other activities anymore (e.g. removing a book from the shelf). Use the Copy option if you want the information to remain in the buffer (record in a database) so it will continue to be available for other activities.

After, or while a simulation runs, you can watch the contents in the buffer:



You can also use “sends info / Message flow” with buffers. Information can flow from and to buffers and activities.



Buffers also may need to be emptied (flushed). If this is the case, please specify at which Flush interval (time) or at which Flush level (count) the buffer should be emptied.

System: CRM

General Attributes Associations Language Measures Object

Fixed Cost: 0

Variable Cost:

Flush Level: 3

Flush Interval: Days: 0 Hrs: 0 Min: 0 Sec: 0

Initial Contents: 0

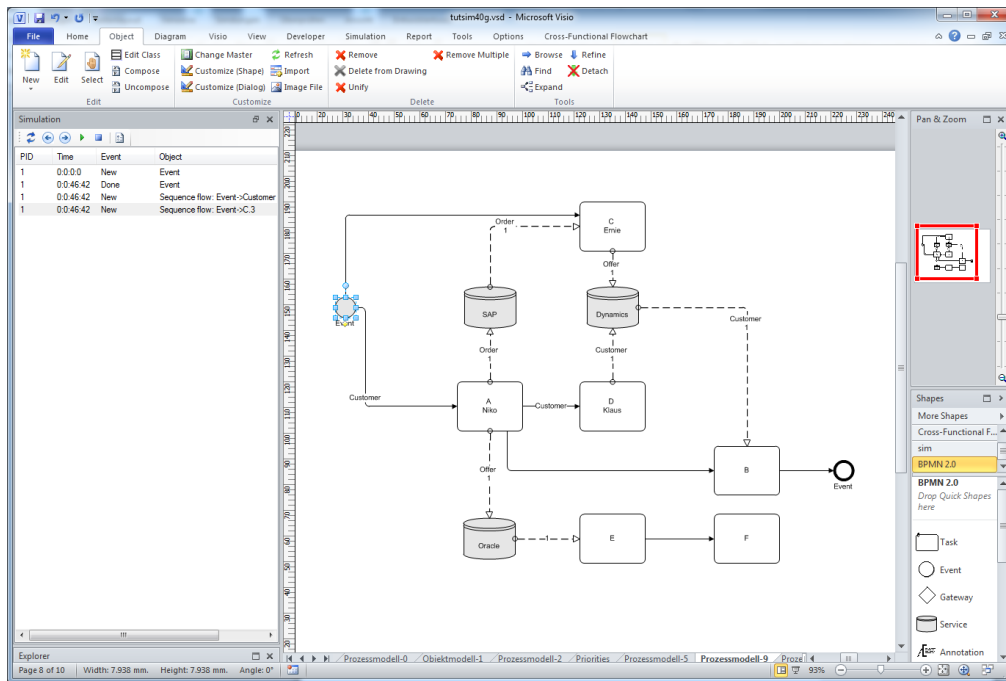
☐ Process independent

OK Cancel

☒ System

Flush Level	The buffer sends all contained information into outbound information flows if a certain threshold is reached. e.g. Make a sales forecast after every 4 bids.
Flush Interval	The buffer sends all contained information into outbound information flows if a certain time interval of is reached. e.g. Make a sales forecast every week.
Initial Contents	This is the content of the buffer at the start of simulation run. If the information is being read by a job that has a process ID, the information will be assigned the same process ID as the job that it is processing. Flushing such information instances will actually start a new process with a new ID.

A more complex sample is:



4.1 Process Independent Buffers

Buffers used in the tutorial so far are process related. This means only the process instance which writes to a buffer can read it later on. This is the most important case since an object like e.g. a bill must be assigned to the “right” customer, which came from the same entry point or order.

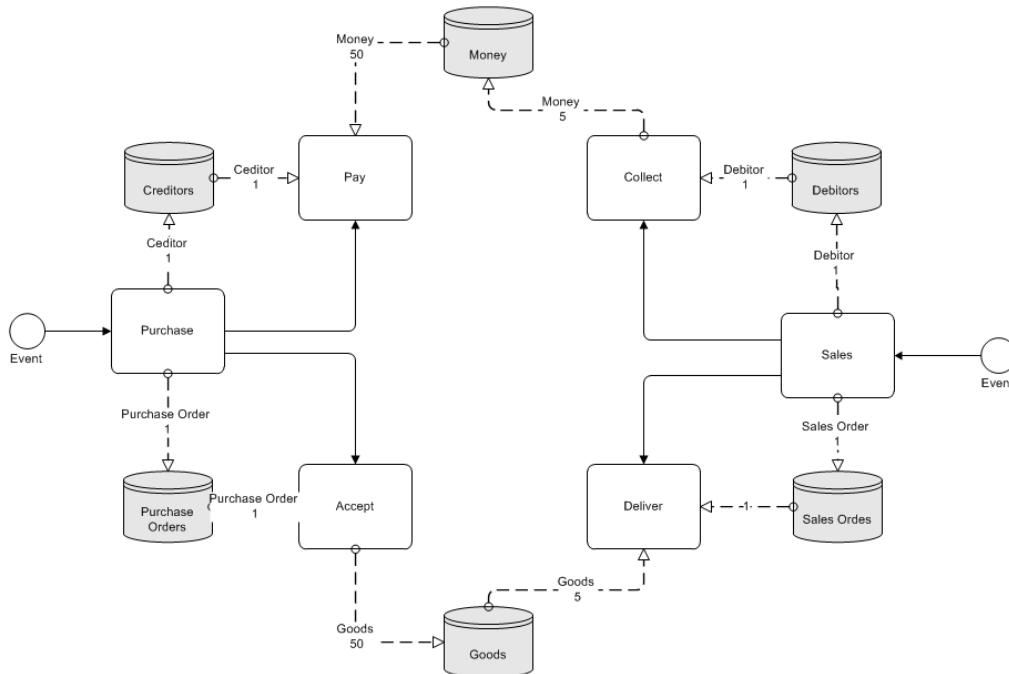
Process independent buffers are able to store anonymous things like money or goods.

The screenshot shows the 'System: Money' dialog box in SemTalk. The dialog has several tabs: General, Attributes, Associations, Language, Measures, and Object. The 'Measures' tab is selected. The dialog contains the following fields and controls:

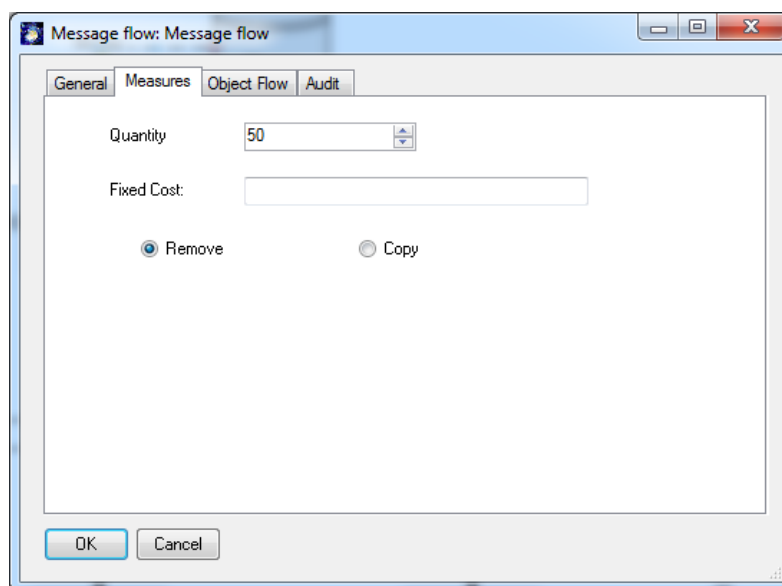
- Fixed Cost: 0
- Variable Cost: (empty)
- Flush Level: 0
- Flush Interval: Days: 0, Hrs: 0, Min: 0, Sec: 0
- Initial Contents: 0
- ☒ Process independent

At the bottom, there are 'OK' and 'Cancel' buttons, and a 'System' checkbox.

In the following example you will see a purchase and a sales process (so called “Supercycle” of accounting). This purchase process has two process dependent buffers “Purchase Orders” and “Creditors”. The sales process also has two process dependent buffers - “Sales Orders” and “Debitors”. Both of them access the commonlyshared process independent buffers “Money” and “Goods”.



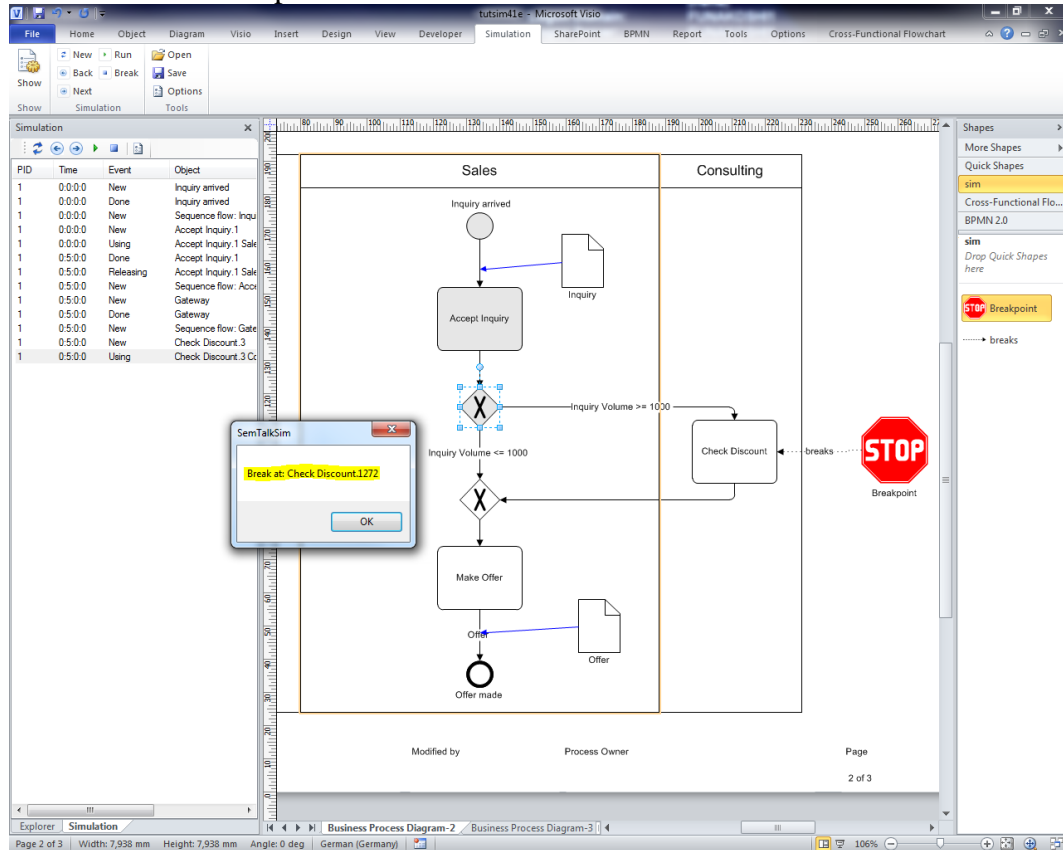
The sales process can only deliver goods which have been ordered by the purchase process. For process independent buffers only the overall number of stored tokens is relevant. How many tokens are stored is specified on the links to the buffers.



No SemTalk unique instances are generated for money or goods.

5. Breakpoints

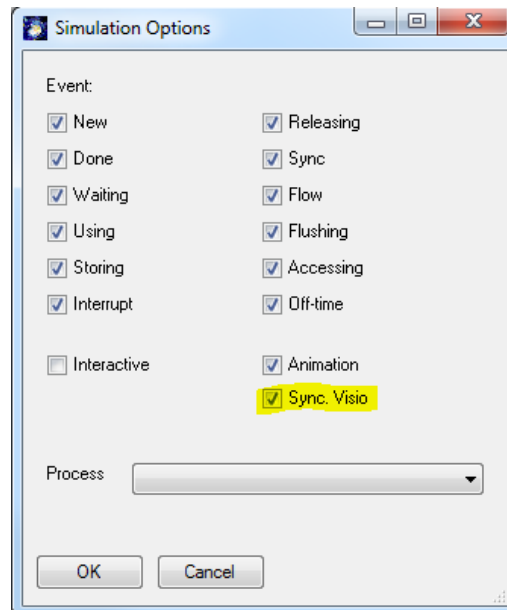
Breakpoints stop a running simulation at a specific activity instead of requiring that you step through the simulation until you reach the desired activity. Breakpoints are ordinary SemTalk objects which can be navigated, deleted, renamed or listed in a report. They are often used to check milestones within a process.



To add a Breakpoint just use the Breakpoint (STOP sign) shape available in the process stencil and connect it to one or more activities using the “breaks” connector.

6. Data Graphics

Visio Data Graphics are the best way to visualize simulation data dynamically. They have been available since the release of SemTalk3 and Visio 2007. Please make sure you have checked “Sync. Visio Data” in the simulation options.



Current simulation data will be copied to the Visio shapes.

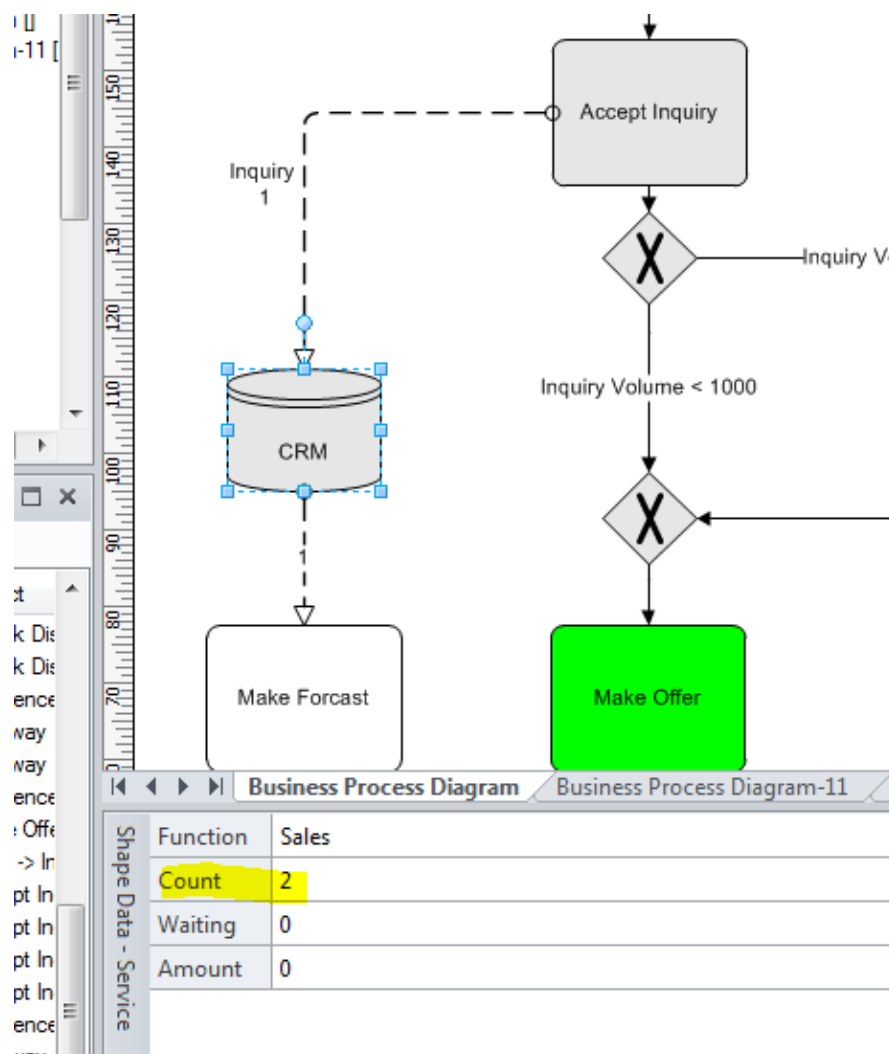
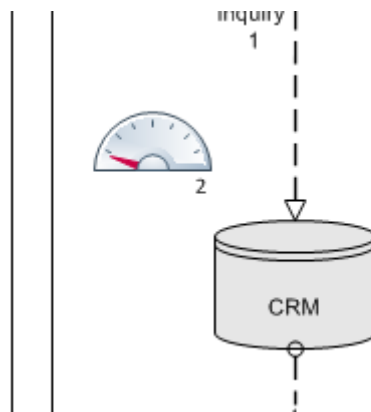


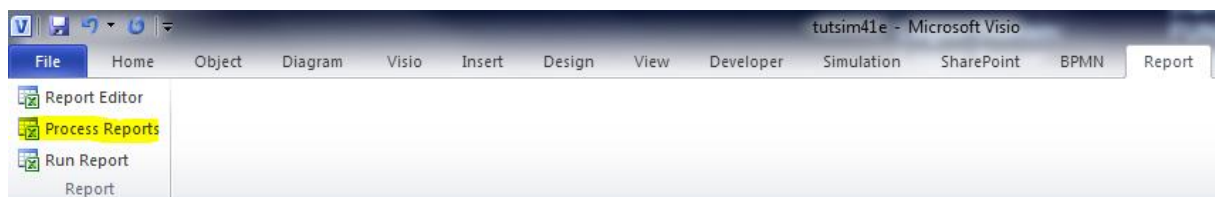
Figure 1 Shape Data

This shape data can be visualized using Visio Data Graphics.

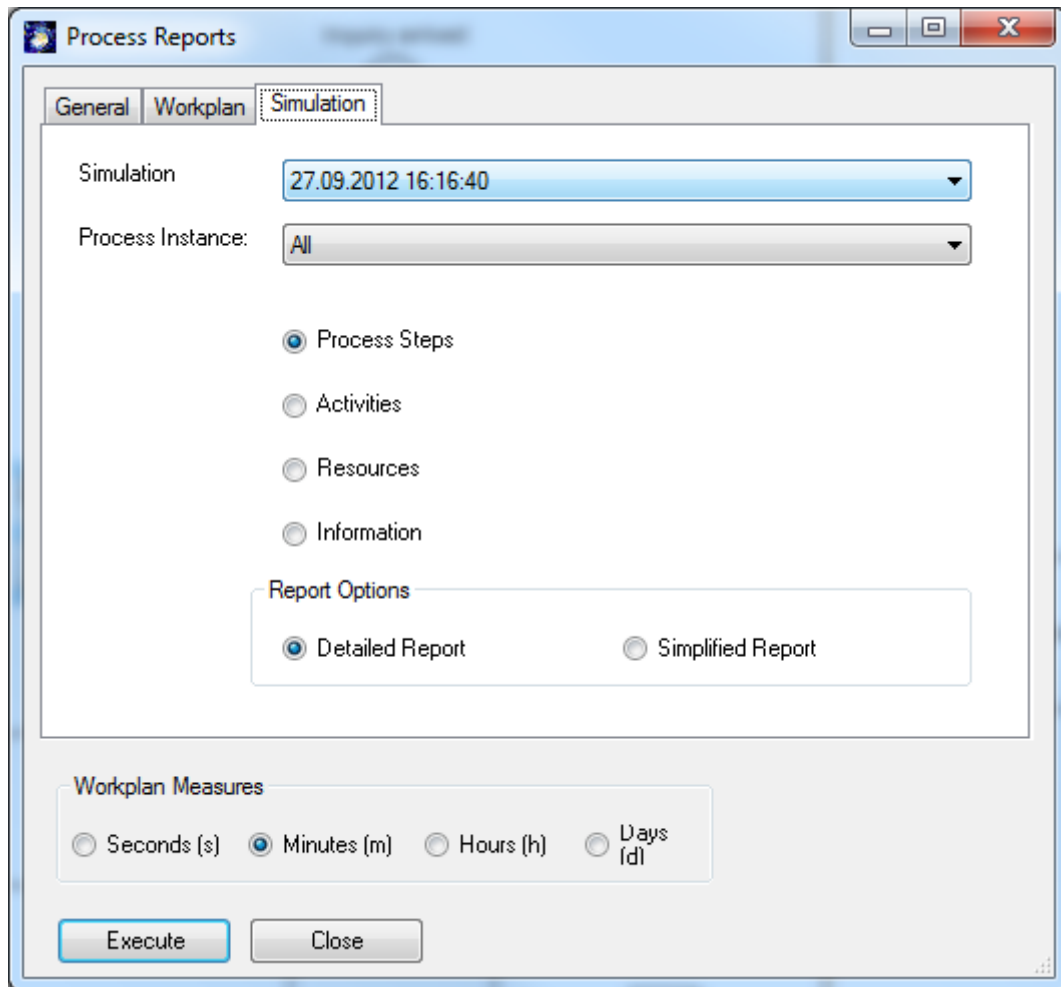


7. Simulation Reports

The SemTalk Simulation reports are opened the same way as other SemTalk process reports.



If simulation data is available, the simulation dialog will show a tab having the simulation reports.



You can select a report that covers a single process instance or you can select all process instances.

Process Steps	A list of process steps plus working times, waiting times (simulation) and costs taken from the resources.
Activities	A list of process steps aggregated by activity class (task) with working times, waiting times (simulation) and costs taken from the resources.
Resources	Process steps by resource with activities, working times, waiting times (simulation) and costs.
Information	All – All information types with the number of instances Single process - A list of the information objects with their attribute values.

You can select from all available simulation runs (each simulation run is listed as a time). For each simulation run you can run a report for a single process instance or for all process instances.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	PID	JID	No	Name	Processing time min	From	To	Human Ressources	Physical Ressources	Synchronisation	Buffers	Waiting time	Cost		
1	1	0													
2	1	0		Inquiry arrived	0	0:0:0	0:0:0	0	0	0	0	0	0		
3	2	1		Inquiry arrived	0	0:0:0	0:0:0	0	0	0	0	0	0		
4	3	2		Inquiry arrived	0	0:0:0	0:0:0	0	0	0	0	0	0		
5	1	7	1	Accept Inquiry	60	0:0:0	0:1:0	0	0	0	0	0	0		
6	2	9	1	Accept Inquiry	60	0:1:0	0:2:0	60	0	0	0	60	0		
7	1	11		Gateway	0	0:1:0	0:1:0	0	0	0	0	0	0		
8	1	13	4	Check Discount	0	0:1:0	0:1:0	0	0	0	0	0	0		
9	1	15		Gateway	0	0:1:0	0:1:0	0	0	0	0	0	0		
10	3	18	1	Accept Inquiry	60	0:2:0	0:3:0	120	0	0	0	120	0		
11	2	20		Gateway	0	0:2:0	0:2:0	0	0	0	0	0	0		
12	2	22	4	Check Discount	0	0:2:0	0:2:0	0	0	0	0	0	0		
13	2	24		Gateway	0	0:2:0	0:2:0	0	0	0	0	0	0		
14	1	30	2	Make Offer	2880	0:3:0	2:3:0	120	0	0	0	120	0		
15	1	32	5	Make Forecast	0	0:3:0	0:3:0	0	0	0	0	0	0		
16	2	33	5	Make Forecast	0	0:3:0	0:3:0	0	0	0	0	0	0		
17	3	34	5	Make Forecast	0	0:3:0	0:3:0	0	0	0	0	0	0		
18	3	35		Gateway	0	0:3:0	0:3:0	0	0	0	0	0	0		
19	3	37	4	Check Discount	0	0:3:0	0:3:0	0	0	0	0	0	0		
20	3	39		Gateway	0	0:3:0	0:3:0	0	0	0	0	0	0		
21	2	88	2	Make Offer	2880	2:3:0	4:3:0	2940	0	0	0	2940	0		
22	1	91		Offer made	0	2:3:0	2:3:0	0	0	0	0	0	0		
23	3	139	2	Make Offer	2880	4:3:0	6:3:0	5760	0	0	0	5760	0		
24	2	142		Offer made	0	4:3:0	4:3:0	0	0	0	0	0	0		
25	3	192		Offer made	0	6:3:0	6:3:0	0	0	0	0	0	0		
26				Total	8820								0		
27				Duration Time	8820										
28															
29															

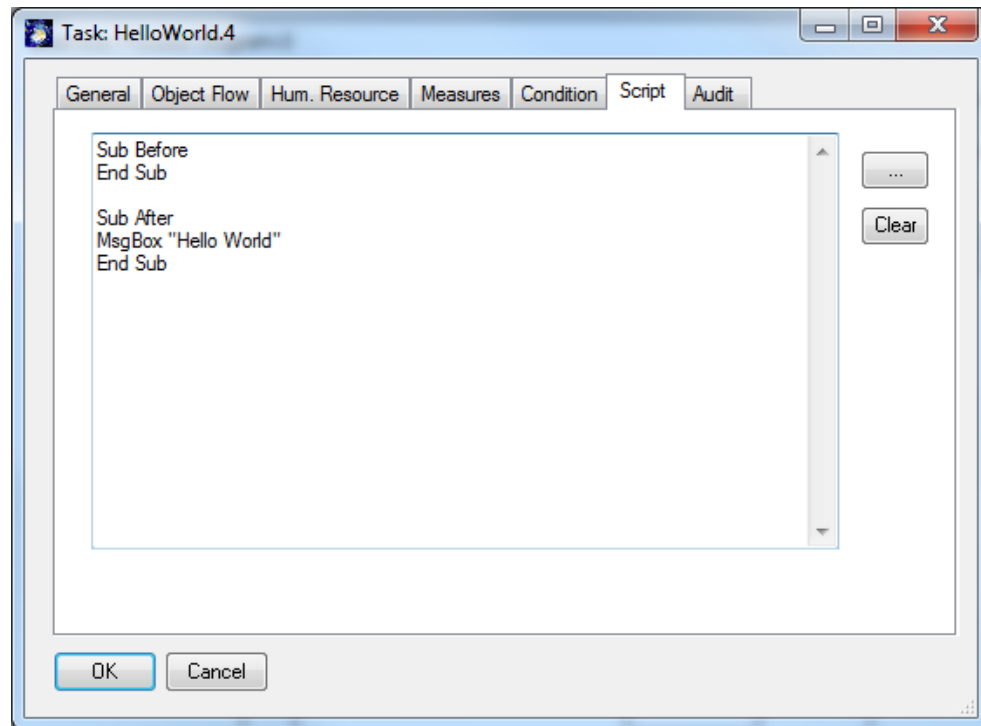
The resulting Excel Sheet contains detailed information for each job such as start time, end time, waiting time for resources, synchronization time. Duration time is the difference between the start time of the first job and the end time of the last job.

8. Scripting

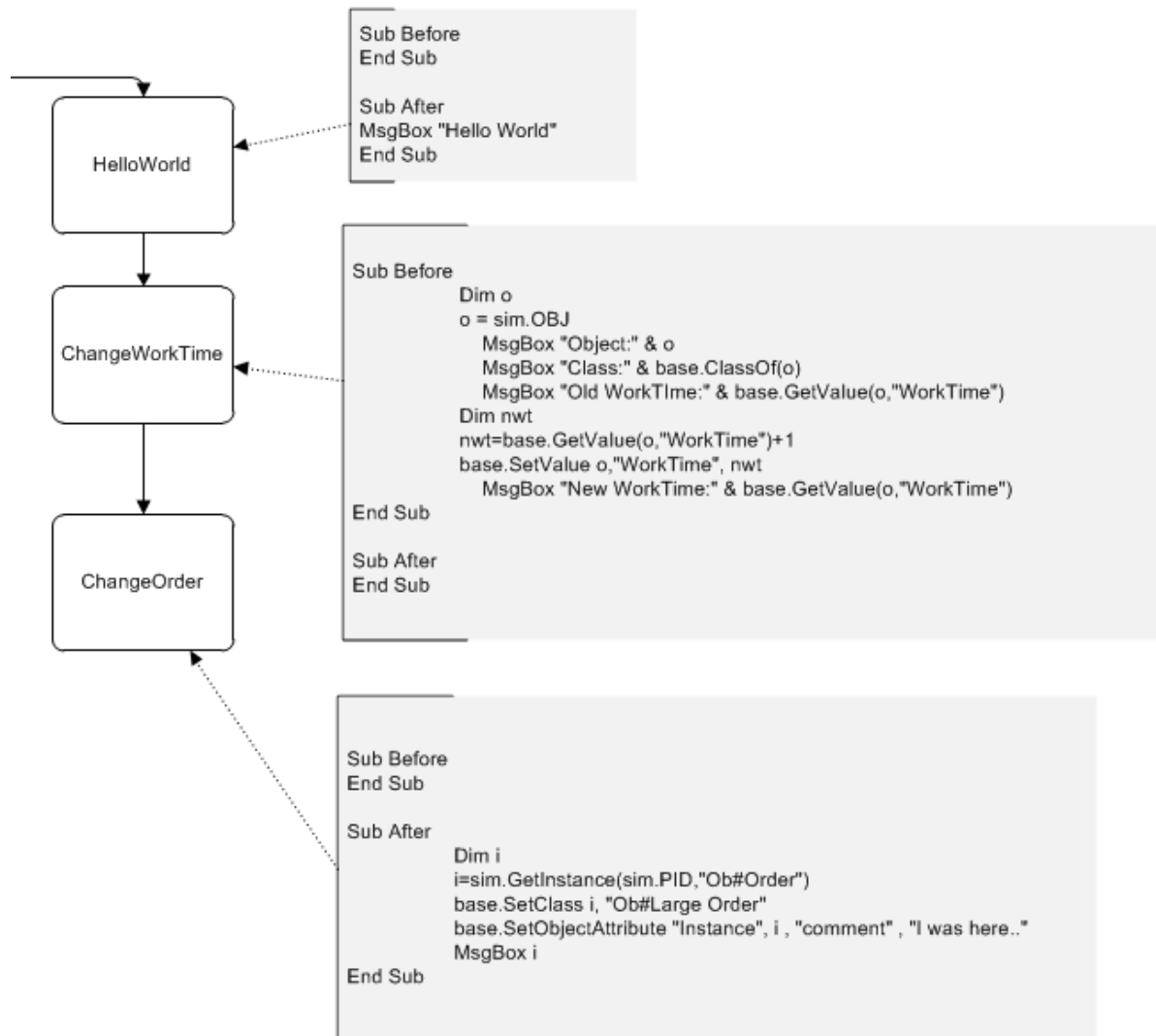
The use of post conditions opens up some very powerful opportunities, but even more sophisticated solutions are available using scripting. VBScript is one of the most popular scripting environments.

Before and after the execution of an activity it is possible to call a function. Inside these macros you have read/write access to process and simulation data. You can modify SemTalk objects, popup dialog boxes or even call up SAP R/3 transactions.

You can add any scripting code to activities. A procedure named “Before” is executed before the activity starts and one called “After” is executed afterwards.



SemTalk Simulation binds the variable “base” to the SemTalk Object engine. The current simulation is bound to the object “sim”. The variable “job” is bound to the current job which is being executed.



Programming scripts requires a user to have basic knowledge about the SemTalk API. Some samples of how to use this API are in the MS Excel interface to SemTalk.

“Hello World” simply pops up a message box

“ChangeWorkTime” increases the work time of the current activity by 1 second

“ChangeOrder” changes the class of an order dynamically and leaves a comment on the instance

For additional information email: support@semtalk.com

or call: +49 331 581 39 36