

Introduction to eClarus BPMN Simulator

Business Process Modeling and Simulation

Business Process Modeling Notation (BPMN) is the new standard for modeling business process flows and web services. Created initially by the Business Process Management Initiative (BPMI) and later adopted by the Object Management Group (OMG), it is a rich notation that simplifies the modeling of complex processes. For the first time, a standard business modeling notation has been developed with consideration for implementation, architecture and technology in environments such as web services, with the primary goal of being easy to use and readily understandable by business and technology users.

eClarus has developed a new-generation business process modeler that is fully compliant with BPMN and other SOA standards, including BPEL and web services. The eClarus business process modeler accelerates business process design and model-driven development and integration projects.

- Through shared BPMN-BPEL models and round-trip engineering, eClarus products enable better process collaboration between business analysts and SOA architects by providing role-specific interfaces that share standard process notation, models, documents and architecture.
- Open-standard process description, modeling and reuse of services deliver breakthrough BPM productivity, governance, compliance and quality gains for Service Oriented Architecture projects.
- Business Analysts provide better-defined processes, using intuitive BPMN-compliant diagramming and flexible documentation of goals, KPIs and requirements.

The eClarus BPMN simulator extends and complements the eClarus business process modeling functions and analytical capabilities. Analysts can use the simulation feature to evaluate the impact of process changes and new processes in a model environment through the creation of "what-if" scenarios. Simulation enables examination and testing of options prior to actually implementing them in the "real" environment. Since simulation approximates reality, it also permits the inclusion of uncertainty and variability into the forecasts of process performance.

The following table lists several of the features and benefits provided by a comprehensive BPMN simulation system such as the one uniquely available from eClarus.

Feature	Benefit
<ul style="list-style-type: none"> Executable BPMN simulation that supports all of BPMN's rich semantics, such as intermediate events and control flows 	<p>Essentially any business process can be described using BPMN and then simulated at the BPMN level by a business analyst, with no requirement to involve scarce IT resources. This, coupled with eClarus powerful model exchanges (BPEL, UML2, Visio, XPDL), enables business analysts to build simulation models at record speed from any existing business process model.</p>
<ul style="list-style-type: none"> User-defined Key Performance Indicators (KPIs), coupled with a powerful simulation engine, provide for the creation and capture of new KPIs as the simulated model is executed "Dynamic" simulation uses instance-based data with rule-based action to mimic complicated business environments in real time 	<p>Use simulation to improve the business process beyond the default KPIs, such as resource utilization and cycle time. Examples include cost and profit, operational risk metrics and quality metrics.</p>
<ul style="list-style-type: none"> Simultaneous simulations of multiple business processes with shared resources help identify resource contentions and bottlenecks Flexible resource modeling supports resource pools and alternative resources 	<p>Predicting and highlighting resource bottlenecks and utilization issues allows the design of optimal human-centric business processes and work flows.</p>
<ul style="list-style-type: none"> Visible animation of the flow of business objects Easy-to-use UI provides for property editing directly from the properties list 	<p>Reducing the learning curve for applying simulation to business modeling. The overall operational flow can be viewed directly and the effects of process changes are immediately visible. Coupled with the eClarus modeler's "as is" and "to be" features, undesirable or ineffective changes can be immediately backed out.</p>
<ul style="list-style-type: none"> Analysis of simulation output using Excel 	<p>Almost every business user knows how to use Excel for data analysis and to take advantage of Excel's powerful analysis capability. Simulation operational results, at both the summary and detail level, are exported to Excel for off-line analysis and reporting. This analysis can be used to plan new "what if" scenarios to be implemented and tested (at the BPMN level) prior to committing resources to implementation.</p>

Example

eClarus Business Process Modeler for SOA Architects includes an Eclipse example project for simulation. To create the example project, click **New->Example->BPMN Simulation Example**. This simulation example project includes two business process models with shared resources that illustrate the use of the eClarus business process simulator to discover resource utilizations, costs and business process performance bottlenecks.

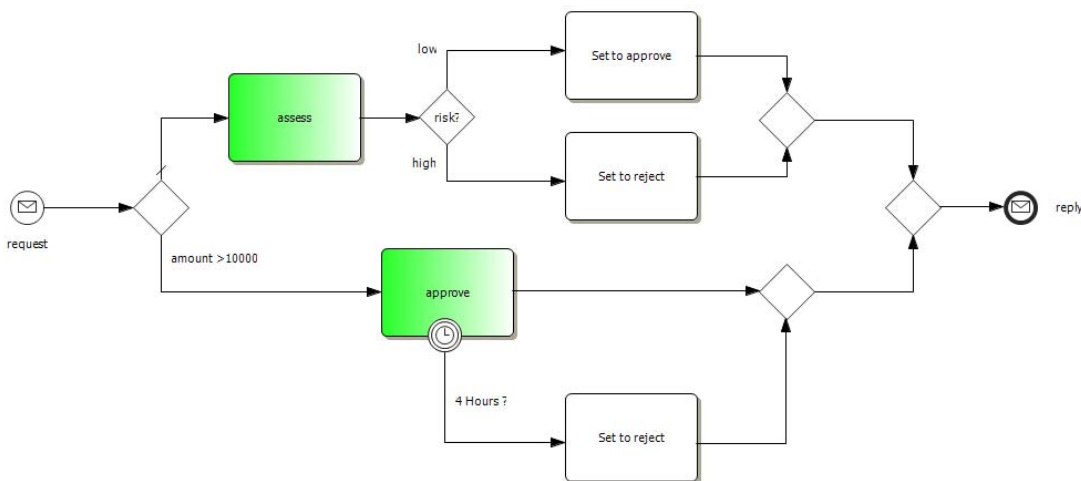
The loan approval model (loan.bpm) is an application where a mortgage company wants to simulate a loan approval/denial process.

1. There are two main tasks; **Assess**, to assess credit risk and **Approve**, to review the loan application. There are three types of bulk resources— assessor, approver and supervisor. The primary resource for task **Assess** is assessor and the primary resource for task **Approve** is approver. Supervisor can be scheduled for both tasks.
2. Upon receiving the loan request, if the loan amount is below a specified threshold and the credit risk is low, the loan can be approved without going through the approval process. Otherwise, the loan application must be routed for approval.
3. According to the company's Service Level Agreement with its customers, the company is required to complete a loan application in 4 hours. If the loan application review cannot be completed, the company is required to notify users and pay fines.

Using simulation, the company plans to discover:

- The average cycle time for processing a credit application
- Resource utilization
- The resources needed for various loan application flows to meet the service level agreement
- Activity-based costing and accounting
- Quality of service—percentage of loan applications that would be rejected because of timeout

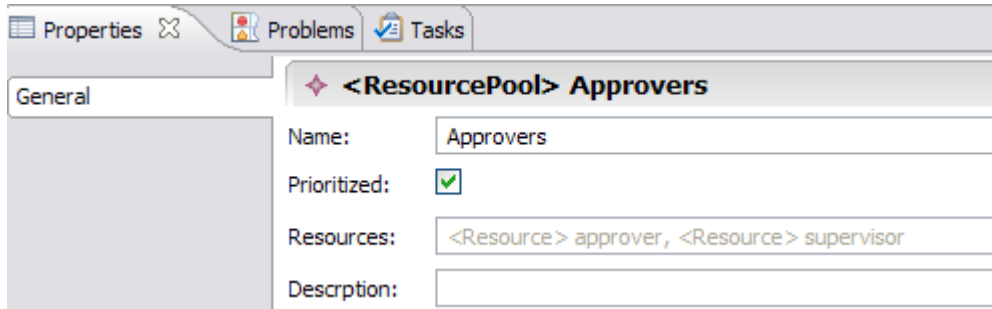
1. Preparing the business process model



2. Modeling resources

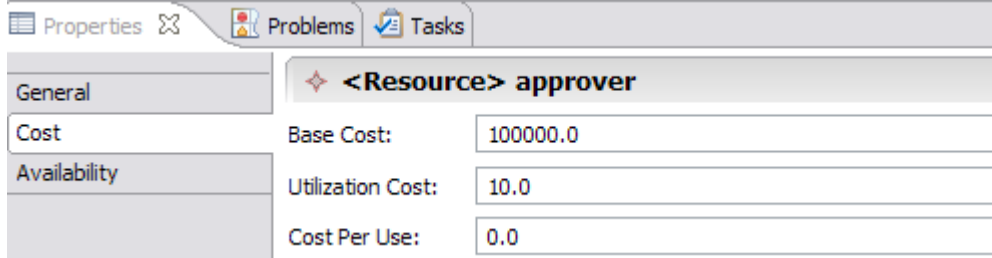
Model two resource pools (assessor pools and approver pools) and three types of bulk resources (assessor, approver and supervisor). Both pools are prioritized and assessor and approver are given priority in their respected groups.

You can further model a resource cost structure that includes base cost, utilization cost and availability.



The screenshot shows the 'Properties' window for a ResourcePool named '<ResourcePool> Approvers'. The 'General' tab is selected. The fields are as follows:

Name:	Approvers
Prioritized:	<input checked="" type="checkbox"/>
Resources:	<Resource> approver, <Resource> supervisor
Description:	

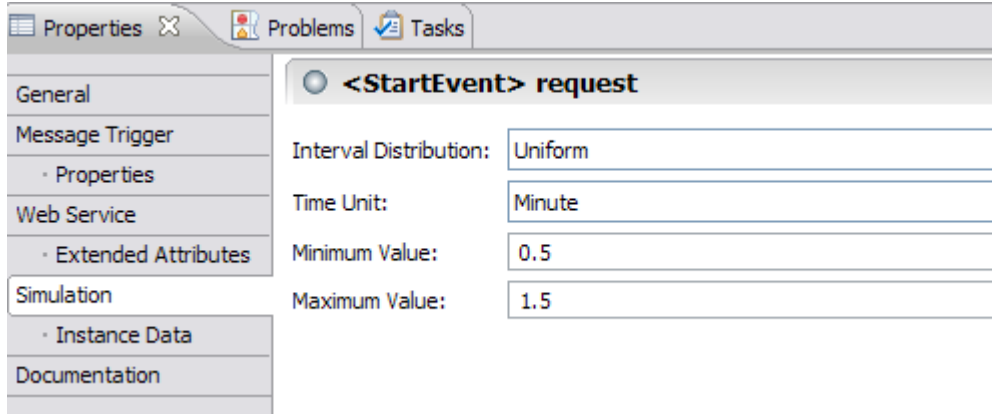


The screenshot shows the 'Properties' window for a Resource named '<Resource> approver'. The 'Cost' tab is selected. The fields are as follows:

Base Cost:	100000.0
Utilization Cost:	10.0
Cost Per Use:	0.0

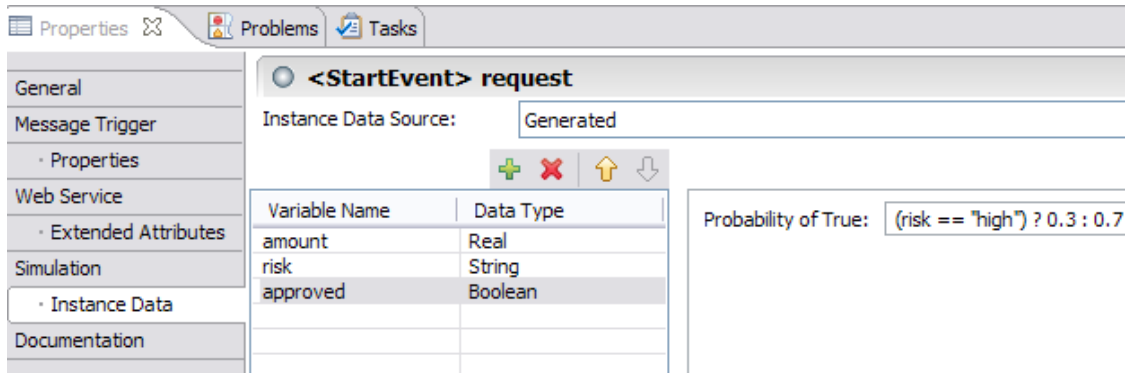
3. Preparing the simulation input

You can model your instance arrival rate and instance data. eClarus BPMN simulator supports four different distribution methods (uniform, constant, normal and exponential) to model arrival rate distribution.



Instance data is optional. eClarus BPMN simulator supports two ways to specify the input data; it can be generated or it can be imported directly from either an Excel or flat file.

In this example, we generate instance data. Note that in this example, the "approve" column is based on another column called "risk." If risk is high, then the approval rate is 30%; otherwise it is 70%.



eClarus integrates the open source JavaScript engine Rhino as the rule engine. Each simulation parameter can be either expressed as a constant or an expression using the rule engine.

4. Specifying sequence flow branch condition

You can specify the branch condition either using probability or based on an expression.

The screenshot shows the 'Properties' window for a sequence flow. The 'General' tab is selected, and the title is '<SequenceFlow> amount >10000'. The 'Probability Based' checkbox is unchecked. The 'Condition' field contains the expression 'amount > 10000'.

Note that in our example the other sequence flow is modeled as the "default." In BPMN, the default marker is a backslash near the beginning of a line. There is no need to further model branch conditions for a default sequence flow.

5. Specifying resource processing time and waiting time

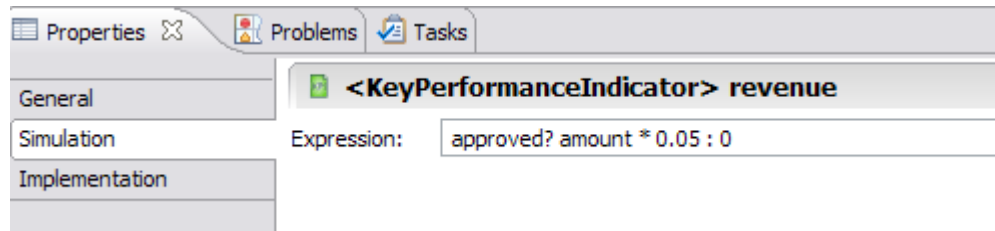
You need to associate a resource pool with activities that require resources. You then specify the resource processing time for each resource type in the pool. You can choose from different distribution models and use either a constant value or an expression to simulate the resource processing time.

The screenshot shows the 'Properties' window for an activity named 'approve'. The 'Simulation' tab is selected. The 'Resource Pool' is set to 'Approvers'. The 'Resources' list contains 'approver' and 'supervisor'. The 'Duration Distribution' is set to 'Normal', the 'Time Unit' is 'Minute', the 'Mean Value' is '180 + amount/100000', and the 'Standard Deviation' is '15'.

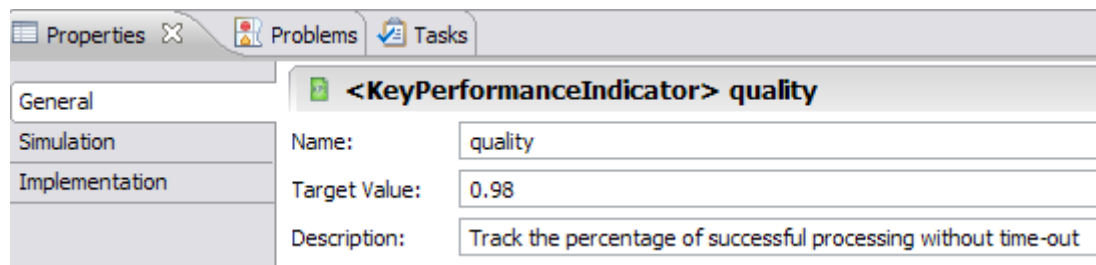
6. Specifying additional KPIs to be captured during simulation

You can define additional KPIs to be captured during simulation. The KPIs, along with other information (cycle time, cost, and instance data), will be saved and exported to Excel for further analysis.

In this example, we define two KPIs: one called *revenue* that is 5% of loan amount if the loan is *approved* (approved? amount * 0.05 : 0). We further define a variable (KPIVariable) called *approved*. It will be set to TRUE when approved and set to FALSE when rejected.



The other KPI quality is used to track whether the loan is rejected because of timeout.



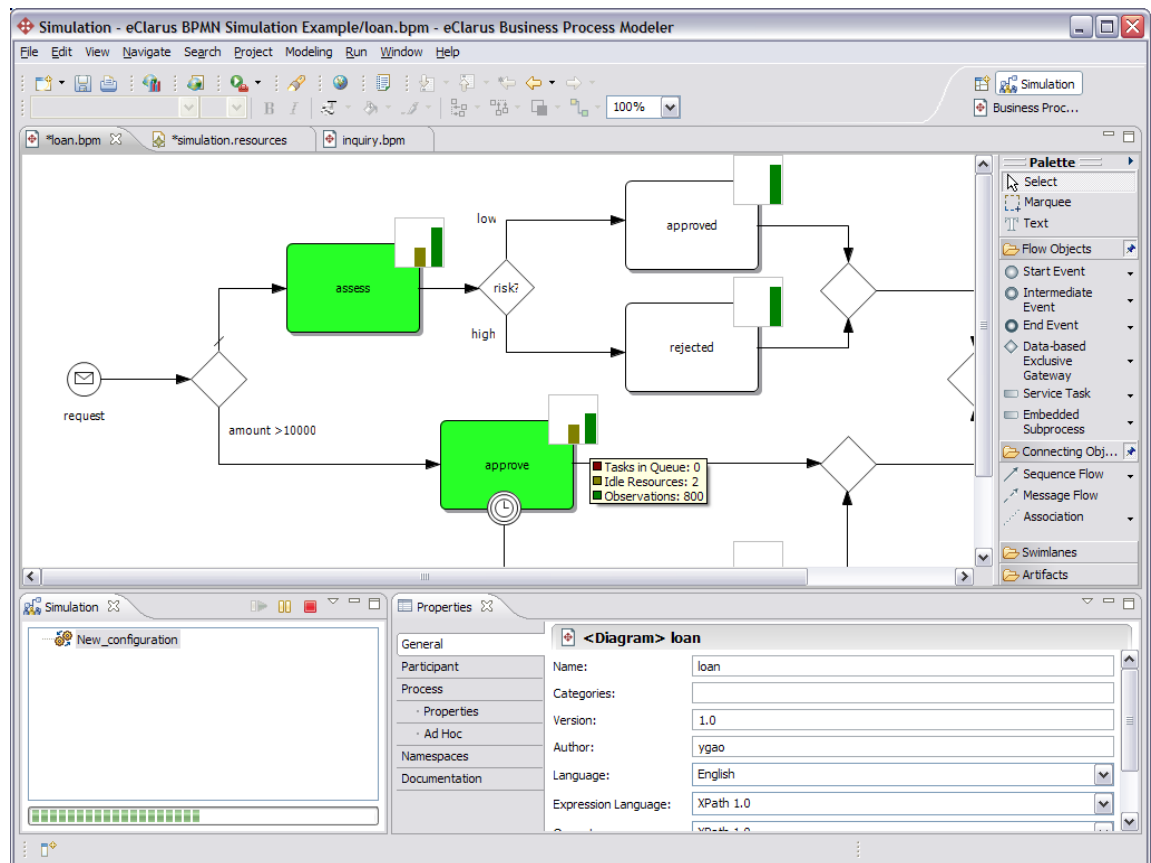
7. Running a simulation

Use the Run Simulation command to run simulation. Each run configuration can be saved and used again later. The run configuration parameters include:

- Business process model(s) to simulate—you can select one or more business process model to simulate
- Simulation time
- Reference calendar time
- Tracing log
- Excel output template

Once the simulation starts, it switches to the animation mode, where you can monitor the flow of information and the dashboard for each activity. You can pause, cancel and restart the simulation any time.

Simulation Run-time View



8. Analyzing simulation output

Simulation results are automatically saved as an Excel file for further analysis. (Users can modify the Excel template to meet their needs.) The simulation output includes data captured in summary form, as well as detailed activities and resources utilized information captured for each instance.

In this example, the simulation indicates Assessor is under-utilized and Approver and Supervisor are overloaded. Possible actions include readjusting resources or changing the business process (more loans can be approved via assessor, for example).

Conclusions

Simulation is a powerful tool that can be used to considerable advantage, often avoiding problems or leading to breakthroughs in the improvement of business processes.

Based on eClarus' powerful innovations—such as instance data generation, the rule engine and complete BPMN semantics support—business analysts can now use the eClarus business process modeler to model business processes that mimic real life and can improve processes without needing a strong statistical background.