Process Simulator
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1. Product Overview

ProModel Solutions' Process Simulator is an economical and easy-to-use flow-chart-based process simulation tool whose dynamic animation capabilities make it powerful enough to provide meaningful insight and decision support for modeling and analyzing a range of business processes.

Table 1 provides an overview of Process Simulator. Process Simulator utilizes Microsoft Visio’s for its front-end diagramming tools and ProModel's simulation and analysis technology on the back-end. It incorporates a flexible and intuitive interface for process diagramming, but also provides access to dynamic analysis, sensitivity testing and scenario evaluation capabilities that, until only recently, were primarily available only in higher-end simulation environments.

Process Simulator's tight integration with Visio allows users to quickly and easily simulate Visio flowcharts, Value Stream Maps and workflow diagrams. In addition, models generated with Process Simulator feature also automatic performance tracking and visual animation, enabling effective communication by helping all constituents see the impact of proposed changes, making it a general process modeling and analysis tool for improving business processes of all types.

Table 1. Overview of Process Simulator

| Process Simulator | General-purpose flow-chart-based process simulation tool that functions as an ad-on to Microsoft Visio: Visio serves as the diagramming front-end and ProModel's simulation technology provides the ability to simulate Visio flowcharts, Value Stream Maps, and workflow diagrams. Processes can be defined using virtually all of the process-oriented templates provided in Visio, including those developed by third parties. Models generated with Process Simulator feature automatic performance tracking and visual animation. Utilizes the Visio diagramming tools, database (with models stored as standard Visio .vsd files), and repository. Process Simulator can also utilize Visio Shared Workspace, which supports collaboration via Microsoft Windows SharePoint Services, enabling users to share models over the web or embed them in other documents and applications. Process Simulator can be used to help make decisions for a range of process improvement applications, including Lean, Value Stream Mapping, and Six Sigma. |
| Statistical Fit/Data Analysis | Process Simulator integrates with the Strat:Fit statistical analysis package (marketed by Geer Mountain Software), which automatically fits continuous distributions, compares distribution types, and provides an absolute measure of each distribution's acceptability. It also translates the fitted distribution data into specific form, directly readable by Process Simulator. |

2. Product Architecture

2.1. Architecture Overview

Figure 1 provides an overview of the Process Simulator architecture. Process Simulator functions as a Visio plug-in designed to enhance a Visio flowchart with simulation and animation capabilities, thus allowing users to create and run simulation models seamlessly inside the familiar Visio environment. It
also integrates with Microsoft Excel for additional reporting and analysis capabilities and with the Strat:FitStat statistical analysis package (sold by ProModel technology partner Geer Mountain Software).

**Figure 1. Process Simulator architecture.**

### 2.2. Usability and User Interface

There are a number of simulation products on the market. Most of these, however, are fairly complex, requiring a considerable learning curve. Or, they have been developed for specific vertical markets. Process Simulator is a general-purpose, end-user-friendly simulation and analysis tool designed for business managers.

Process Simulator features an intuitive interface that basically functions as a supplemental component within Visio. The procedure for building and simulating a model using Process Simulator consists of creating a process flowchart in Visio, adding simulation properties, and running the simulation. Process flowcharts like the one shown in Figure 2 are easy to create using Visio’s drag-and-drop paradigm. Simulation properties are then added to the flowchart through (Process Simulator) dialogs that appear for each shape in the flowchart. Activity times, routing rules, and resource schedules are all easily defined. Figure 2 shows simulation properties being defined for “Activity 2.”

The simulation of the process flowchart is accomplished by clicking on a play button. As entities animate through the defined activities, values such as throughput and cycle times are dynamically updated and displayed on the flowchart. Users also have the capability to increase or decrease the speed of the animation in order to study the behavior of their model in a better way.

Process Simulator’s functionality is tightly integrated with Visio. For example, property dialogs for flowcharting shapes are modeless so that all the user has to do is simply click on different shapes to show the property dialog for each shape.

The Process Simulator GUI also enhances Visio functionality. For example, an important feature found in Process Simulator is the Object Explorer, which displays the names of all of the shapes in a flowchart. As shown in Figure 3, Object Explorer displays routings coming from each activity together with the routing rules of each. Users can easily display the properties for each object by simply clicking on objects in the tree structure or by clicking on shapes in the process flowchart.

Process Simulator can also utilize Visio Shared Workspace, which supports collaboration via Microsoft Windows SharePoint Services, thus allowing users to share models over the web or embed them in other documents and applications.
2.3. Repository Options/Team Development

Because the Process Simulator modeling tool is based on Visio and utilizes the Visio database, all repository support provided by Visio is available to the user. This includes Shared Workspace, which supports collaboration with Microsoft Windows SharePoint Services. In addition, Process Simulator stores its model data in a Visio .vsd file that can be converted to XML or read as is.

All of the repository capabilities provided by Visio are supported in Process Simulator. However, it does not automatically assume that an activity in one diagram with the same name as an activity in another diagram is the same activity. The next release of Process Simulator (version 4.0) will feature a hierarchical modeling capability that will support linked diagrams so that when a linked diagram is updated, any diagram linking to this diagram will be automatically updated as well. This will allow a repository of diagrams and activities to be shared by multiple users with automatic updates. The hierarchical modeling capability is slated for release in the next version in April 2005.

2.4. Integration with Other Products

In addition to offering seamless integration with Visio, Process Simulator can integrate with MS Office applications and the Strat:Fit and MINITAB statistical analysis packages (discussed in Section 3.4.5).

Process Simulator also has the ability to export directly to a ProModel .mod file, which enables more advanced simulation and optimization capabilities offered with other ProModel products.
3. Analysis and Process Modeling

3.1. Enterprise and Organization Models

Process Simulator is a simple, yet flexible, flowcharting simulation tool that can simulate Visio flowcharts, Value Stream Maps, and workflow diagrams. It can be adapted to a number of architectures. Virtually any graphical representation or template supported in Visio can be used in Process Simulator. (Basically, Process Simulator is not diagram specific, so any diagram may be used so long as it can be adapted to a process flow paradigm.)

Enterprise Architecture Models

Process Simulator does not provide direct support for any of the popular enterprise architecture models (e.g., Rummler-Brache, Zachman Framework, etc.); however, these models can be adapted to run in Process Simulator.

Organizational Models

Process Simulator can be used to map processes to organizational or functional areas through the use of swim lanes or other visual partitioning that might be meaningful to the user.

Resource and Cost Modeling

Process Simulator is capable of modeling all types of resources, including equipment, human, consumable, and service resources. Resources can be shared and allocated based on the priority of tasks. Additionally, cost, schedules, and usage rules can be defined for them.
Mapping Organization Strategies to Performance Measures
All key process performance metrics are automatically reported, including processing time, value-added and non-value added times, throughput, resource utilization, and so on. Additionally, custom statistics can be gathered, such as time in a subprocess. Users, thus, have the ability to arrive at meaningful balanced scorecards for their particular processes. This allows the user to visualize performance metrics from multiple perspectives (i.e., cost, utilization, service level, and efficiency).

Managing Process Portfolios
Process Simulator utilizes the Visio database, meaning that all repository support provided by Visio is available to the user. This includes Shared Workspace, which supports collaboration with Microsoft Windows SharePoint Services.

Visio diagrams saved on a Windows SharePoint Services workspace can be opened directly in Visio from the workspace (through a drop-down list box). When a diagram is opened from a Windows SharePoint Services workspace, Visio opens a Shared Workspace task pane that contains all of the information in the workspace, including other files, members, tasks, and links.

3.2. Defining Processes

Defining Processes
In Process Simulator, processes are defined as a process flow diagram in which activities (represented by any shape chosen by the user) are connected to represent the processing sequence for the items being processed. Information about each activity used to drive the simulation is supplied through property dialogs for each shape. Additionally, the user can define supplemental text and properties for each shape for documentation purposes.

Processes Information Storage and Integrity
See Section 3.1.5.

Graphical Notations
Process Simulator can simulate Visio flowcharts, Value Stream Maps, and workflow diagrams. Virtually any graphical representation or template supported in Visio can be used in Process Simulator.

Process Simulator does not support BPMN.

Process Simulator does not directly support UML 2.0 activity diagrams; however, the program is flexible, and could be customized to incorporate the diagrams.

3.3. Subprocesses and Activities

Handling Subprocesses and Activities
In Process Simulator, users define subprocesses by graphically creating the desired decomposition. Currently, only a single Visio page is supported, although the page can be expanded to be as large as necessary. However, hierarchical modeling and multi-page support will be incorporated in the next release, due to be shipped in April 2005. These new hierarchical modeling features will allow the capture and simulation of subprocesses and activities.

Defining Activities
Activities are defined by either entering the time and resource required in the properties dialog for the activity, or by defining more detailed logic using a command language that enables multiple resources to be captured and entities to be accumulated. Cost, resource, and time data are all stored with the activity.

Documenting Decision Rules
Process Simulator provides numerous built-in rules for activities and routings. Activity rules include batching before or after an activity and the use of buffering. Routing rules include the following:

- Percentage
Additionally, users can define custom rules for activities and routings, using inference logic and testing the value of attributes and variables.

Rules Entry
See above.

Activity Costs, Resources, and Time
Process Simulator stores cost, resource, and time data with the activity.

3.4. Simulation

Simulation Capabilities
Process Simulator uses a Discrete Event simulation engine that takes a Visio flowchart, adds operational properties, and simulates the process. Included is a scenario analyzer that enables users to define, run, and compare multiple scenarios.

Analytic Capabilities
Users can use Process Simulator’s simulation features to conduct various analyses, including

- Creation and simulation of alternative process scenarios
- Simulation and analysis of “as is” and “to be” workflow models
- Time-based quantitative impact analysis
- Predicting resource requirements, capital equipment investments, process times, and service levels, etc.

Real-time Data Utilization
Process Simulator cannot interact with other applications while running.

Model Distribution and Simulation on Enterprise Networks
Because Process Simulator models are stored in a standard Visio .vsd file, users can share models over the web as well as embed them in other documents and applications.

Statistical Fit/Data Analysis
Users can fit input data to distributions using the Strat:Fit add-on tool. Strat:Fit is a comprehensive yet user-friendly curve fitting package developed and marketed by Geer Mountain Software (a ProModel technology partners). It is available as an option with Process Simulator.

Strat:Fit will take raw data from spreadsheets, text files, or manual input, and fit the data to convert the data into the appropriate distribution input into a format directly readable for use by Process Simulator. It automatically fits continuous distributions, compares distribution types, and provides an absolute measure of each distribution's acceptability. It also translates the fitted distribution into specific forms for use in Process Simulator.

Process Simulator users can also export data to the MINITAB statistical analysis tool (marketed by MINITAB) in order to conduct more advanced statistical analysis.

Capture and Reporting of Simulated Metrics
Process Simulator can dynamically display simulation output during the simulation and store simulation output in an output database. Included is a 3D Report Viewer that shows process performance over
time, including cycle time, throughput, resource utilization, and cost. As shown in Figure 4, Process Simulator’s 3D Report Viewer displays these statistics in both report format and 2-and-3-D graphs. In addition, users also have the choice of exporting output statistics to Excel for further graphing and analysis. Simulation output can also be accessed through ActiveX.

![Figure 4. Process Simulator 3D Report Viewer Displaying Simulation Results.](image)

4. Business Process Methodologies

4.1. Business Process Methodologies

Process Simulator is based on a simple flowcharting methodology that anyone can pick up in minutes. Activities are connected by arrows depicting the activity sequence of work items. And each activity has properties defined by data entry to a properties dialog.

Processes can be defined using virtually all of the process-oriented templates provided in Visio, including those developed by third parties. Process Simulator can be adapted to a number of templates and frameworks. Adapting to any process-flow template such as UML requires only that simulation properties be added to any of the shapes and connections representing the process activities and flow. Additional shapes and operational information can be easily added to a diagram if necessary to make it simulation-ready. For example, in the world of LEAN, users are using Value Stream Maps as a popular template and framework for the LEAN methodology.

4.2. Six Sigma Support

Process Simulator does not package any direct process support (i.e., best practices, etc.) for Six Sigma. However, it can be used in the Define, Analyze, and Improve steps by Six Sigma teams. In addition, users can export Process Simulator’s output to the MINITAB statistical analysis software, which provides a range of statistical capabilities for Six Sigma, statistical process control, Design of Experiments (DOE), and other quality improvement projects.
5. Report Generation and Document Management

Process Simulator stores output statistics in a file that is compatible with MS Access. A custom output viewer is provided for viewing output reports and graphs. The output file is also exportable to Excel and other statistical analysis apps that support CSV files. Users can also create custom interfaces through the ActiveX channel made available to the user.

6. Development Environment

6.1. Language of Tool

Process Simulator is written in Visual Basic .NET. Models are created in Visio and stored in a standard .vsd file. The utilization of the Visio file structure ensures that updates are compatible with the Visio file specification.

6.2. Product Support, Maintenance, and New Versions

Process Simulator has an Auto Update feature for downloading program updates over the Internet.

7. Software Modeling and Code Generation

Process Simulator generates ProModel model files that can be read directly into other ProModel products for more detailed modeling and simulation. However, it does not automatically generate code for managing a process.

7.1. UML Model Generation

Process Simulator is a flow-chart-based process simulation tool and therefore does not support UML model generation.

7.2. BPEL Generation

Process Simulator does not generate BPEL.

8. Templates and Frameworks

As mentioned earlier, Process Simulator is a simple, yet extremely flexible, flowcharting simulation tool that can be adapted to a number of templates and frameworks. Processes can be defined using virtually all of the process-oriented templates provided in Visio, including those developed by third parties.

9. Systems Administration and Security

Process Simulator relies on the shared document capabilities provided by Visio for administering and securing the user environment.

10. Scalability

Process Simulator provides scalability through the export of Visio models to full ProModel models that provide large-scale simulation capabilities.

11. Platforms

12. Pricing

ProModel offers several price points for Process Simulator, starting as low as US $3,500 for a single seat to $80,000 for 40 users. The company also offers on-site training and “Jump Start” programs to ensure client success.

As with many software products, typical maintenance and support costs are at 15% of the initial investment. ProModel’s technical services are offered typically on a per-project basis and based on a defined scope of work.


13.1. Company Background Information

ProModel Solutions is a privately held company that was formed in January 2000 as a result of the merger between ProModel Corporation and QuestOne Decision Sciences. ProModel Corporation, founded in 1988 in Orem, UT, USA, was a leader in advanced simulation technology. QuestOne Decision Sciences, founded in 1987 in Bethlehem, PA, USA, provided decision support solutions. Today ProModel Solutions combines professional services and innovative technology to deliver business process optimization and decision support solutions to the pharmaceutical, healthcare, financial services, and manufacturing and logistics industries.

ProModel offers a number of simulation-based business process improvement products. These include Process Simulator (a Microsoft Visio add-on), Project Simulator (a Microsoft Project add-on), Portfolio Simulator (a PPM add-on that can link to Microsoft’s EPM and other data sources), ProModel (a powerful general-purpose simulation package), MedModel (a general-purpose simulation packaged for healthcare), EMERGENCY DEPARTMENT Simulator (an application-specific tool for healthcare), ServiceModel (a general-purpose simulation tool for the service industry), and other ProModel products.

Today, there are over 4,000 users of ProModel’s products. The company has served 43 of the top Fortune 100, including Pfizer, Johnson & Johnson, Ford, UPS, General Motors, GE, DuPont, Lockheed Martin, Northrup Grumman, IBM, and the US Department of Defense. ProModel has also worked with many of the nation’s most progressive hospitals, some of which include Baylor Health System, Duke University Medical Center, HCA Doctors Hospital (Augusta GA), Mayo Clinic, and Miami Valley Hospital.

ProModel has approximately 50 employees (Sales: 10; Consultants: 15; Support: 8; Administration: 5) and over 50 worldwide independent sales representatives.

Major ProModel investors include Safeguard Sciences, Inc., PA Early Stage Investors, and Pfizer Corp.

13.2. Positioning

Process Simulator’s ability to add simulation and dynamic (animation) capabilities to Visio makes it a general-purpose business process modeling and analysis tool that can support

- Process modeling and analysis, redesign, and improvement
- Detailed process modeling and analysis through simulation
- Development of management and measurement systems

As a general-purpose modeling and analysis tool, Process Simulator can be used to help make decisions for a range of process improvement efforts, including

- Resource planning
- Resource management
- Capacity planning
Throughput analysis
Capital equipment justification
Inventory control
Supply chain planning
Supplier quality programs
Process flow analysis
Time compression management

For business process analysis and re-engineering, Process Simulator can be used to quickly create “as is” and “to be” workflow models, while its simulation and animation features support detail process modeling and analysis, allowing users to understand time-based quantitative impacts of changes quickly. It is also useful for predicting resource requirements, capital equipment investments, process times, and service levels.

For Lean and Value Stream Mapping, users can apply Process Simulator to capture Value Stream Maps in Visio and see what performance gains might be expected before implementing any actual changes. For instance, users can also simulate alternative scenarios to understand which LEAN project will give the biggest benefit.

Finally, Process Simulator can be used for Six Sigma projects – for example, to test the impact of variability on a process and understand the impact of reducing the variability on Six Sigma metrics – all within the familiar Visio environment.

13.3. Product Training

ProModel offers several Process Simulator training courses.

Process Simulator Training
Process Simulator training consists of a one-day class of hands-on training with a ProModel instructor at the ProModel training facility. (On-Site Training is also available.) This class is designed to teach users everything they need to know to use Process Simulator successfully. Attendees learn how to build models from scratch as well as how to add simulation parameters to existing Visio flowcharts and workflow diagrams. The course covers both manufacturing and service examples and discusses the proper use of statistical distributions in simulation modeling.

Two-Day Jumpstart Class
This class consists of the one-day basics class plus a second day of working closely with the instructor on the attendee’s own applications. The goal is provide attendees with their first completed application-specific model.

13.4. Business Process Consulting

ProModel offers services and custom solutions for software implementation, and consulting in manufacturing, logistics, business reengineering, LEAN enterprise, healthcare, government, pharmaceuticals, and financial services.

14. Case Study

IBM was looking to understand the impact of adding technology to their business-to-business (B2B) order transaction process. Automated order handling was thought to reduce errors in orders, and, with a forecasted increase in server sales and new product offerings, a reduction in head count and lower “cost per transaction” was anticipated. The outlay in technology, software, and hardware could be measured in millions of dollars with additional costs allocated for IBM internal resources to implement the new system.
The office of the CIO wanted to understand the impact of this implementation and contracted ProModel technical services to construct a flexible model using ProModel software. The goals was to replicate the “as is” order transaction process and allow IBM to run hundreds of “what if” analyses on a large number of “to be” proposed process changes.

The modeling and analysis effort consisted of a team of four people from IBM and three from ProModel operating over a period of twelve weeks. The subsequent model that was developed included over 1200 flexible process steps, each with dynamic and variable process times, over 50 different types of resources, and 2 methods of collecting costs (including activity-based and usage-based).

The model was able to run forward three years worth of orders (dynamically) in about 3 minutes, and provided key decision support metrics, including cost per transaction, labor demand over time, work in process, error reductions, and many others. In addition, scenarios reflecting different potential demands and changes in the overall process were run to evaluate the impact of proposed changes quickly.

Based on the dynamics of the simulation, key findings demonstrated that IBM could phase in certain technical improvements, thereby deferring costs and investments over time. In addition, ProModel’s dynamic simulation capabilities helped IBM focus on the processes that needed improvement first, through a sensitivity analysis. Additional findings identified with the model revealed that staff reductions needed to be planned and work re-allocated in order to avoid impacting service levels and causing bottlenecks.